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5/8 - 6 OPERATORS HANDBOOK

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$\frac{5}{8}$ in (16 mm.) SIX SPINDLE BAR AUTOMATIC,
MACHINE & ATTACHMENTS

OPERATOR'S HANDBOOK

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DRAWINGS

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SPECIFICATION

BAR CAPACITY: Round .625"
 Hexagon Across Flats .54"
 Square Across Flats .442"

BAR FEED STROKE:
 Short Cam 0-2"
 Long Cam 0-3.5"

HEXAGONAL LONGITUDINAL TOOL

BLOCK:
 feed
 Approach stroke at zero feed 1.45" (2.25")
 Approach stroke at max. feed .8" (1.25")

LONGITUDINAL SLIDES, STATIONS 4 & 5:

'A' Position feed 0-2"
 Approach stroke at zero feed 1.4" (2.25")
 Approach stroke at max. feed .8" (1.25")
 'B' Position (Light Duty) feed 1.0"-3.5"
 Approach stroke at 1.0 feed 1.53" (2.4")
 Approach stroke at 3.5 feed .75" (1.15")

NOTE: The approach stroke is partly overlapped with drum indexing: first figure is with drum locked; figure in brackets is total approach stroke.

LONGITUDINAL SLIDES, STATIONS 4 & 5, USING OPTIONAL INDEPENDENT

DISC CAMS:
 'A' Position 0-2"
 'B' Position (Light Duty) 1.06"-3.75"

OPTIONAL LONGITUDINAL MOTION TO STATIONS 1,2,3,6

(4 motions, 4 cam drums)
 Adjustable Stroke up to 3.25" up to 82.6 m/m

CROSS SLIDES:

Stations 1 & 2 (Lower) Feed 0-.5"
 Approach Stn. 1 .75"-.76"
 Approach Stn. 2 .91"-.78"

Stations 4 & 5 (Upper) Feed 0-.5"
 Approach Stn. 4 .93"-.72"
 Approach Stn. 5 .76"-.72"

Stations 3 & 6 (Intermediate) Feed 0-.35"
 Approach Stn. 6 .75"-.73"
 Approach Stn. 3 .93"-.78"

OPTIONAL AUXILIARY CROSS SLIDE MOTION:

(Any one or two stations at front and/or any station at rear, up to combined maximum of two stations).

Sins. 1 & 2 (Adjustable) 1.24" 31.5 m/m
 Sins. 3, 4, 5 & 6 (Adjustable) 1.35" 34.3 m/m
 .7 - 1.2xCam Height) Max. Stroke

SPINDLE SPEED:

Standard -23 speeds 400 r.p.m. to 5,000 r.p.m.
 Spindle Stopper -21 speeds 355 r.p.m. to 3,550 r.p.m.

FEEDS : 21 Feeds

Feed at 1" stroke Feed at 10 m/m stroke

* Standard Machine at 0.64 secs.

fast motion time
 ins./rev. .0032-.031
 mm/rev. .032-.31

* Cycle Times

* Equivalent Cutting Revs. 311-32 revs.

* Spindle Stopper at 0.77 secs.

fast motion time

ins./rev. .003-.029
 mm/rev. .03-.29

* Cycle Times

* Equivalent Cutting Revs. 1.4 secs. to 60 secs.
 335-35 revs.

* Other ranges available to order.

Motor, 10 HP x 1,480 r.p.m.

Weight of Machine including Motor, Panel, Guards, Stock Carriage and Stand excluding Oils and Conveyor. 6,725 lb 3,050 kg.

YOUR SPECIAL ATTENTION PLEASE

CONCERNING LUBRICATION

1. Check the oil level in the tanks and oil pockets listed below:
 - a) Oil Sump in the tray
 - b) 'Cyclic' Oil pump tank mounted above the main motor.
 - c) Drip tray in top of main drive housing; the level is maintained by drip from its adjacent oil pipe.
 - d) Reduction gearbox, and slipping clutch housing on the swarf conveyor

Sump (a) and tank (b) are supply tanks for the "Cyclic" and "Continuous" oil supplies the oil levels must be maintained on the sight glasses.

2. Check that the cyclic system is operating correctly by seeing that with each pulse (approx. every 10 mins) the gauge on the end brackets shows at least 30 P.S.I. (2.10 kg/sq. cm.) and falls between pulses to not lower than 2 P.S.I. (0.14 kg/sq.cm.).
3. Check the drip points and regulators through-out the machine regularly.
4. Turn the "Purolator" knob daily and apply grease gun to all nipples and use the oil can liberally.

CONCERNING CONTROLS

1. Whenever the machine is stopped for adjustment, ensure, as a safety measure, the Front-Rear Selector Switch is set for the side at which the operator is working.
2. Ensure the Feed Clutch is disengaged before starting the machine. When starting from cold, use the Jog button several times to allow the oil to circulate before running the machine. For normal starting press Start button (on Star-Delta equipment, allow control gear to change from "star" to "delta" i.e. machine running at full speed) before engaging the clutch.
3. Should it be necessary to engage the clutch before starting the motor, start the motor on the Jog button.
4. Ensure that tools are clear of work before using the fast motion lever.
5. If a slipping clutch disengages, locate the cause of overload before re-engaging the clutch and restarting the machine. Additional plungers and springs can be fitted to the slipping clutch to increase torque, and spares are included in the machine equipment kit for this purpose. They should only be applied in exceptional circumstances.
6. Do not handwind the machine through the feed part of the cycle when threading attachments are in use, unless the diehead is opened.
7. Regularly check adjustment of all multiple plate clutches by hand. They should be neither so slack as to cause slip, nor so tight that excessive pressure is required to engage them. Clutches should just "bite" when engaged.

CONCERNING TOOL SLIDES

1. Remember to release the slide stop before changing stroke or slide adjustments and to reset afterwards.
2. After adjusting cross slides by means of the micrometer knob, remember to clamp the locking screw.
3. Gib strip adjustment needs great care. Strips should not be so tight as to bind, or allowed to become too slack.

CONCERNING COOLANT

1. Avoid whenever possible the use of soluble oils which cause rust.
2. Keep the coolant level as high as possible.
3. Clean the tray of swarf and sediment at regular intervals.
4. Keep the strainer over the coolant intake. If a swarf conveyor is in use the additional strainer in place below the coolant discharge from the conveyor coolant overflow chute.

INSTALLATION

Continuous machined surfaces are provided on the underside of the machine tray so that the machine may be rolled into position. Fig. 1, shows the position of bolts and of levelling screws and wedges used to level the machine accurately. Longitudinal and lateral levels can be checked by use of a precision level placed on facings provided on the lips at both ends of the tray and on the top of the drum housing.

When wedged, bolted and levelled, the machine base should be cemented to retain the wedges and prevent movement.

The stock carriage stand should be placed roughly in position and the carriage then connected to the machine. Initial alignment can be carried out by sighting through the tubes and spindles and then more accurately by using a level. Steel plates should be placed under the levelling screws in the stock carriage stand and the holding-down bolts should be cemented in.

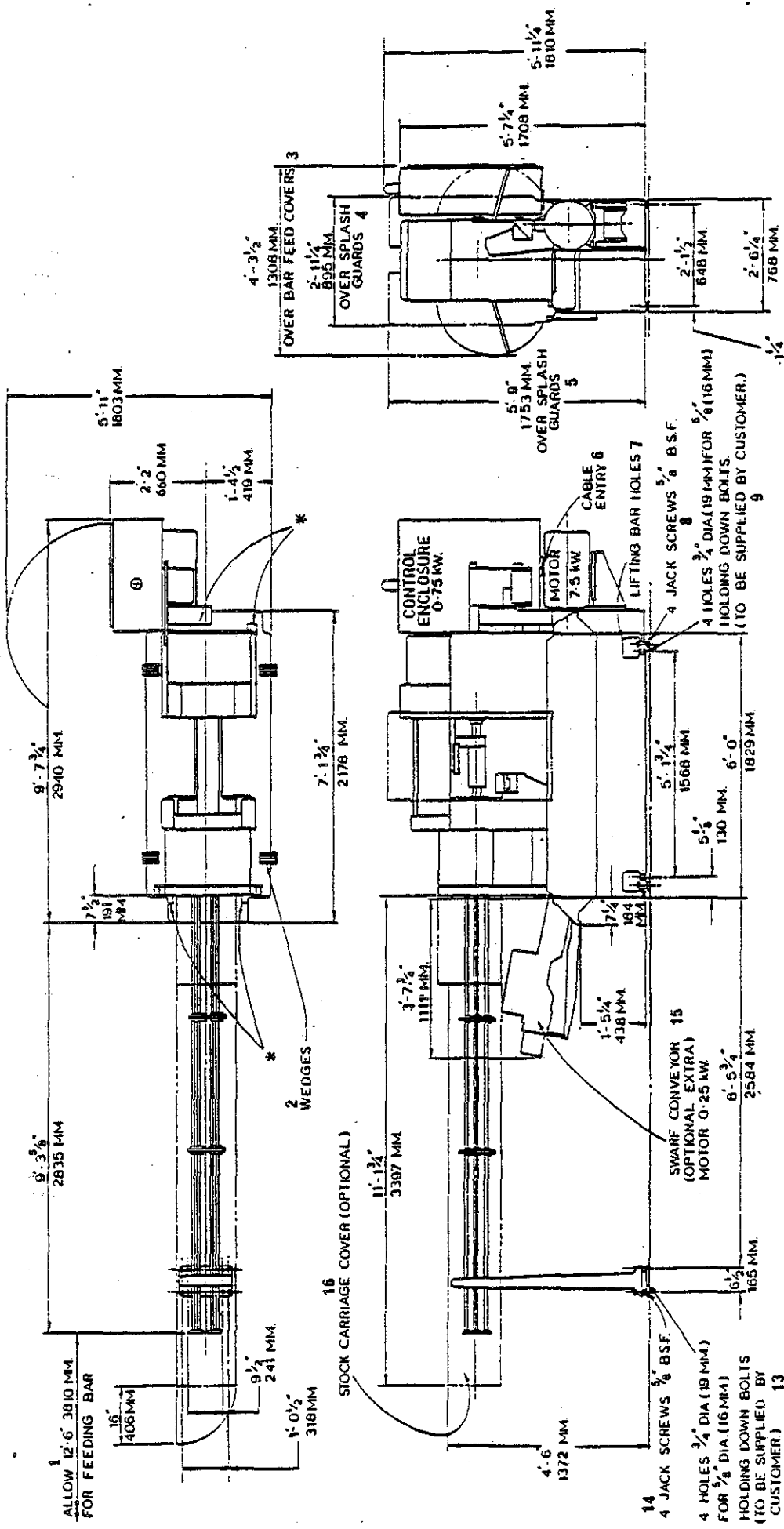
All protective grease should then be removed from both external and internal parts with paraffin or white spirit.

Coolant strainers, work baskets, chutes and slide, upper and lower splash guards should then be placed in position.

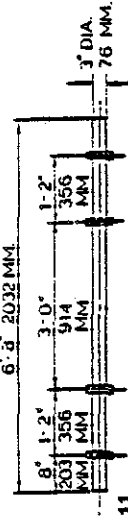
If a swarf conveyor is supplied, this can now be fitted. Fig. 2, shows the arrangement and position of all sheet steel parts.

Key to Fig.1

1. Allow 12ft 6in (3810 mm) for feeding bar
2. Wedges
3. Over bar feed covers
4. Over splash guards
5. Over splash guards
6. Cable entry
7. Lifting bar holes
8. 4 Jack screws 5/8 in. BSF
9. 4 holes 3/4" (19mm) diameter for 5/8" (16mm) holding down bolts (to be supplied by customer)
10. Weight of machine including motor:
panel and guards 6389lb (2898 kg)
stock carriage and stand 336lb (152 kg)
coolant capacity 100-120 GAL (455-545 litres)
11. Lifting bar (suggested dimensions)
2 required (supplied by customer)
2 collars each end 6 in. (152mm) diameter
secured by set screws; or 2 pins 1/2 in.
(13mm) diameter x 6 in. long, both pins at
one end of bar to be drive fit and both at
other end to be push fit.
12. Level the machine with screws provided. It
is recommended that plates (to be supplied by
customer) be fitted under levelling screws.
Use wedges where shown. Grout and bolt in
position. Levelling surfaces are provided on
top of tray shown thus*. Machine should rest
on concrete of not less than 6 in. (152mm) thickness
13. 4 holes 3/4 in. (19mm) diameter for 5/8 in. (16mm)
holding down bolts (to be supplied by customer)
14. 4 jack screws 5/8 in. BSF.
15. Swarf conveyor (optional extra) motor 0.25kW
16. Stock carriage cover (optional)



10
 WEIGHT OF MACHINE INCLUDING MOTOR
 PANEL AND GUARDS 6389 LB (2898 kg)
 WEIGHT OF STOCK CARRIAGE AND
 STAND 336 LB (152 kg)
 COOLANT CAPACITY 100 - 120 GALLONS
 (455 - 545 LITRES)



11
 LIFTING BAR (SUGGESTED DIMENSIONS)
 2 COLLARS EACH END 6" (152 MM) DIA. SECURED BY
 SET SCREWS OR
 2 PINS EACH END 1/2" (13 MM) DIA. x 6" LONG BOTH PINS
 AT ONE END OF BAR TO BE DRIVE FIT & PINS AT
 OTHER END OF BAR TO BE PUSH FIT

12
 LEVEL THE MACHINE WITH SCREWS PROVIDED. IT IS RECOMMENDED THAT
 PLATES BE FITTED UNDER LEVELLING SCREWS (PLATES SUPPLIED BY CUSTOMER.)
 USE WEDGES WHERE SHOWN.
 GROUT & BOLT IN POSITION.
 LEVELLING SURFACES ARE PROVIDED ON TOP OF TRAY SHOWN THUS *
 MACHINE SHOULD REST ON CONCRETE NOT LESS THAN 6" THICK (152 MM)

SWARF CONVEYOR

The Swarf Conveyor (See Fig. 2) is fitted as an optional extra, but conduit and wiring is normally fitted in the standard machine to simplify installation. The conveyor is of the screw type, driven by a 1/4 h.p. motor and reduction gearbox controlled by pushbuttons.

A slipping clutch is provided, adjacent to the gearbox, to provide overload protection. Before resetting the clutch with the plunger provided, the cause of the overload should be found and removed. The torque capacity of the slipping clutch can be adjusted by varying the number of spring plungers in use

TO HANDWIND THE CONVEYOR the motor must be switched off, then the hinged cover in front of the handwind crank can be lifted up and the dog clutch pulled back. The conveyor can now be handwound by using the machine handcrank. To return to motorised operation the above procedure is reversed.

Quickly detachable sheet steel chutes are fitted in the tray between the main housing to guide the swarf into the conveyor. A sheet steel channel is closely fitted into the conveyor trough and serves to prevent coolant washing swarf out of the conveyor before it is packed into the screw. The coolant overflows from the lip of the channel at a relatively high level and falls into a strainer placed below it. This strainer removes small swarf carried in suspension in the coolant. A broad chute below the conveyor outlet collects swarf and allows it to drain before removal, coolant flowing back to the machine tray through a perforated barrier.

- Key to Fig.2
1. Handwind crank
 2. Dog clutch
 3. Reduction gearbox
 4. Motor
 5. 6 taps each side
 6. Section "A-A"
 7. Strainer basket
 8. Coolant pump
 9. 3 taps each side
 10. Strainer box (coolant)
 11. Slipping clutch
 12. Reset plunger for slipping clutch

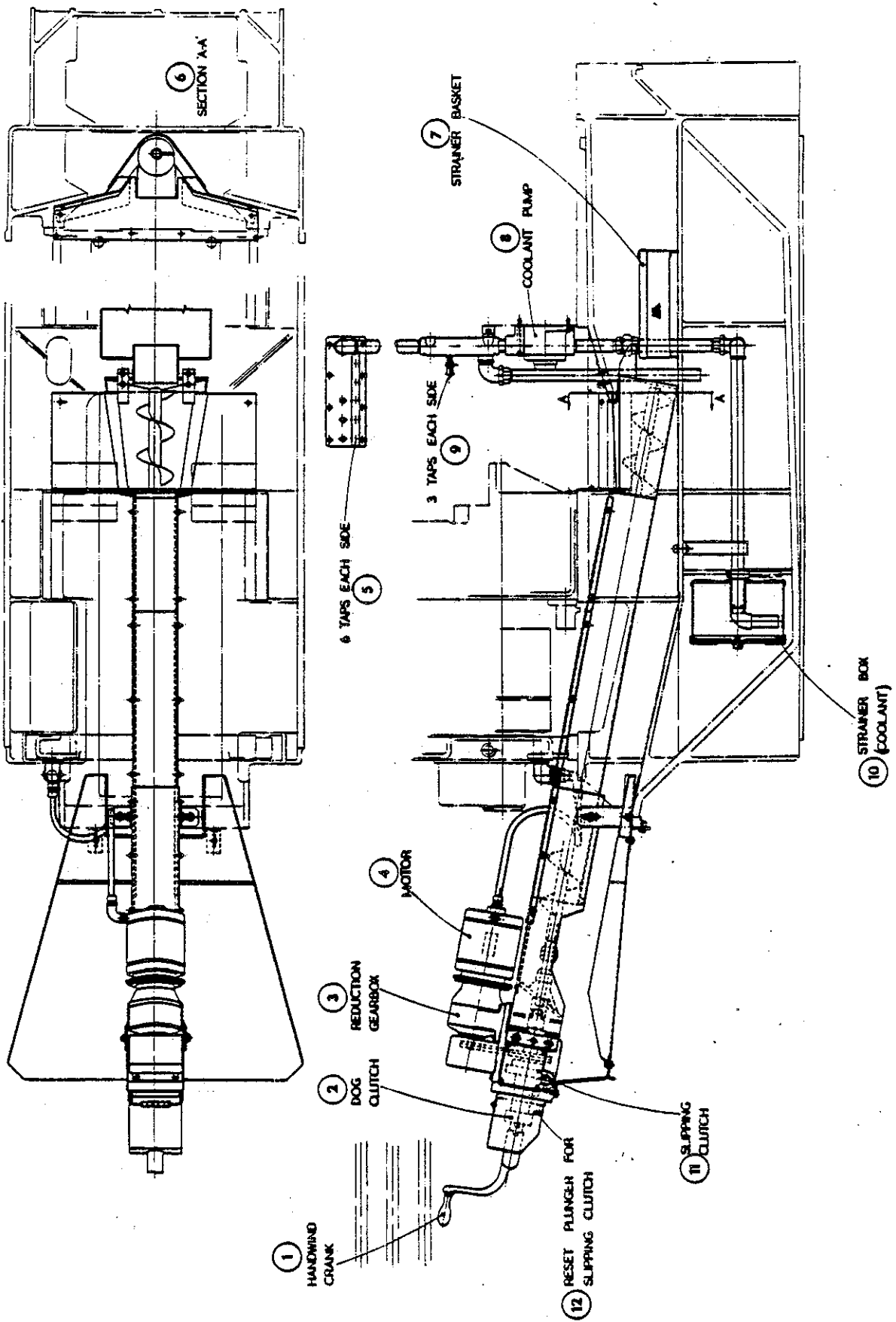
ELECTRICAL EQUIPMENT

Fig. 2 shows the position of the incoming conduit. The standard control panel includes an isolator and main fuses. It is only necessary to connect the line and earth. Direction of main motor rotation should be clockwise looking at the pulley, as indicated by the instruction plate on the belt guard.

Careful attention should be given to see that all main and control fuses, overload heaters and transformer primary and secondary (work lighting) tappings are correct for the customer's electrical supply. These details are checked before despatch by Wickman, but should be rechecked in case of any change in the customer's supply. Wiring diagram, spare parts and instruction sheets are included in the pocket inside the control panel door. The wiring diagram includes a list of fuses and overload heaters for the main and auxiliary motor.

On star-delta, equipment operation of the timer should be checked for a time-lag of approximately 15 seconds and all starters should be checked for freedom of operation.

On standard equipment the control circuit for all motor control and auxiliary circuits is at 110V, 50Hz (120V, 60Hz). Work lighting voltage is at 110V, 50V, or 25V, according to transformer tappings or to customer's order.



SWARF CONVEYOR UNIT AND CHUTES

Fig. 2 400 Z 56

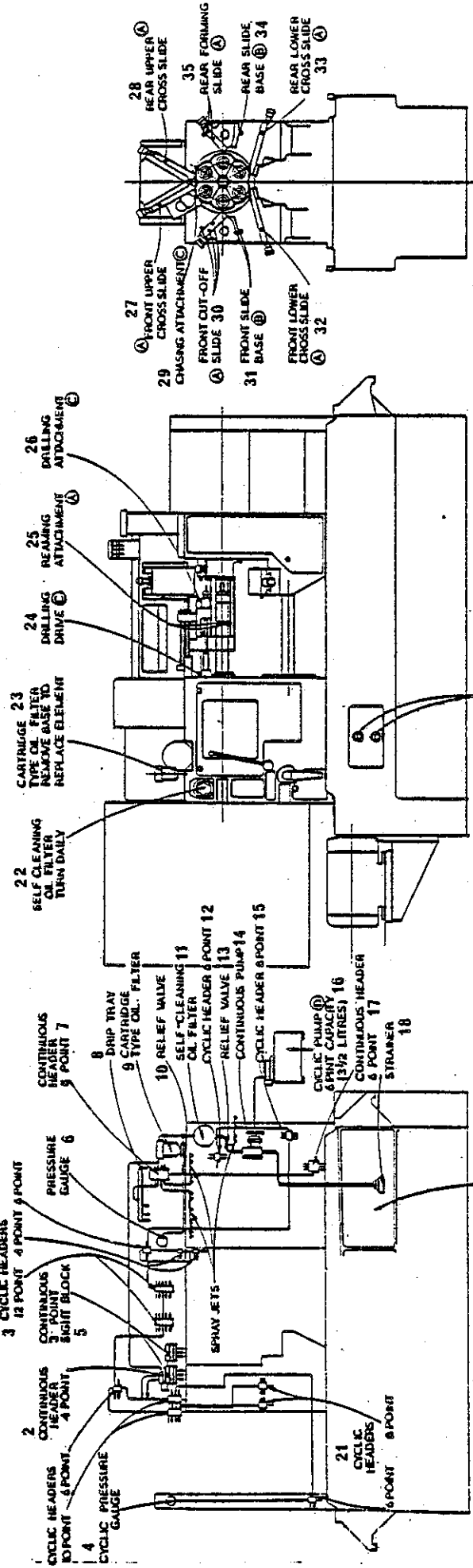
LUBRICATION

Lubrication Diagrams Fig. 3, 3a-3b) gives full details of all points requiring attention. Special attention is drawn to the following when installing a new machine.

1. When removing protective grease, pay particular attention to cleaning oil holes and drip and spray pipes.
2. Fill the oil sump in the tray by pouring oil into the main drive housing. Check the level in the sump by means of the sight glass. Ensure oil baths below the main and upper camshaft wormwheels are full. Fill the drip tray above the mechanism operating the end-working slides. Use Wickman Oil Grade 4.
3. Fill the "Cyclic" system tank, situated above the main motor, with oil. Use Wickman Oil Grade 4.
4. Apply the oil gun to all nipples as shown on Fig. 3, Use Wickman Oil Grade 4.
7. See that stock carriage tubes are well greased.

Key to Fig.3

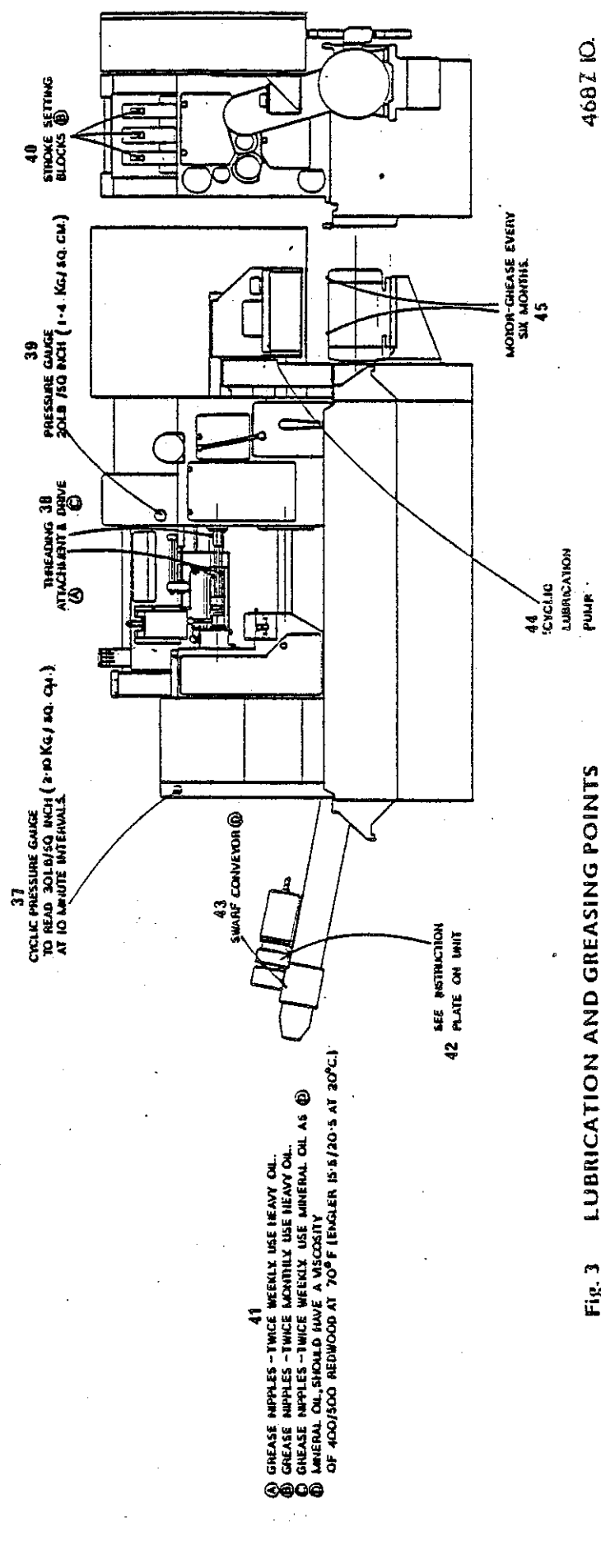
1. Cyclic headers
2. Continuous header
3. Cyclic headers
4. Cyclic pressure gauge
5. Continuous 3 point sight block
6. Pressure Gauge
7. Continuous header
8. Drip tray
9. Cartridge type oil filter
10. Relief valve
11. Self cleaning oil filter
12. Cyclic header
13. Relief valve
14. Continuous pump
15. Cyclic header 8 point
16. Cyclic pump 6 pint capacity
17. Continuous header
18. Strainer
19. Oil sump 4 gallons (18 litres) windows show high through attachment compartment in housing
20. Lubrication diagram
21. Cyclic headers
22. Self cleaning oil filter turn daily
23. Cartridge type oil filter
24. Drilling drive
25. Reaming attachment
26. Drilling attachment
27. Front upper cross slide
28. Rear upper cross slide
29. Chasing attachment
30. Front cut-off slide



36 OIL LEVEL WINDOWS

19 OIL SUMP 4 GALLONS (16 LITRES) WINDOWS SLOW HIGH & LOW LEVELS FILL THROUGH ATTACHMENT COMPARTMENT IN HOUSING.

20 LUBRICATION DIAGRAM



- 41 GREASE NIPPLES - TWICE WEEKLY USE HEAVY OIL.
- 42 SEE INSTRUCTION PLATE ON UNIT.
- 43 SWARF CONVEYOR.
- 44 CYCLIC LUBRICATION PUMP.
- 45 MOTOR-GREASE EVERY SIX MONTHS.

Fig. 3 LUBRICATION AND GREASING POINTS

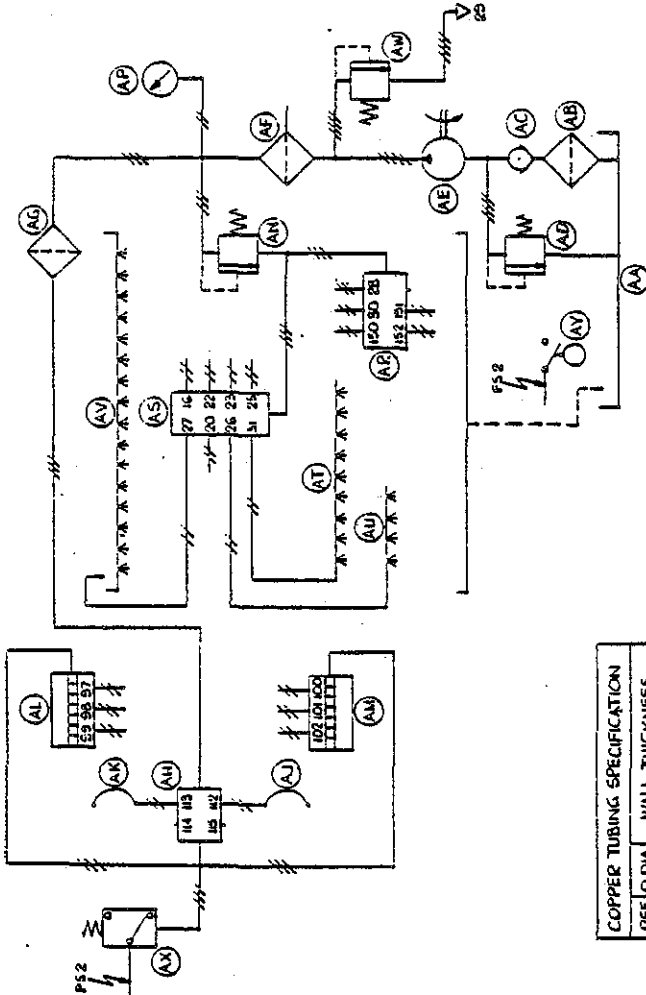
31. Front slide base
32. Front lower cross slide
33. Rear lower cross slide
34. Rear slide base
35. Rear forming slide
36. Oil level windows
37. Cyclic pressure gauge
38. Threading attachment and drive
39. Pressure gauge
40. Stroke setting blocks
41. A. Grease nipples - twice weekly use heavy oil
B. Grease nipples - twice monthly use heavy oil
C. Grease nipples - twice weekly use mineral oil as D
D. Mineral oil should have a viscosity of 400/500 redwood at 70°F (Engler 15.5/20.5 at 20°C)
42. See instruction plate on unit
43. Swarf conveyor
44. Cyclic lubrication pump
45. Motor grease every six months

Key to Fig.3a Sequence of Flow

1. Lubricant is drawn from a 4 gallon (18 litre) reservoir AA through strainer AB and check valve AC by means of a fixed displacement gear pump AE at 45 gallons/hour (204 litres/hour)
2. Pressure relief valve AD between pump and check valve returns lubricant to reservoir if action of pump is reversed, ie. if electrical connections to main drive or panel are incorrect
3. A continuous flow of lubricant is pumped through scraper type filter AF to a four-way connector
4. From one branch of this connector lubricant flows through a micronic filter AG to supply feed block AH and sight feed blocks AL and AM. The points served by these blocks taking priority
5. From another branch of the four-way connector lubricant flows through pressure relief valve AN to supply remaining feed blocks AS and AR
6. Pressure relief valve AW between pump and scraper filter supplies lubricant to point 29 (Relief valves AN and AW are adjusted to give 30lb/in (2.1kg/cm²) reading at pressure gauge AP)
7. Pressure switch AX stops machine on completion of one cycle if pressure falls below that set (Pressure switch range setting indicator is set to 15lb/in. (1.05kg/cm²) approximately)
8. Float switch AY stops the machine on completion of cycle if lubricant in reservoir falls below required level

SEQUENCE OF FLOW

- LUBRICANT IS DRAWN FROM A 4 GALLON (16 LITRE) RESERVOIR AA THROUGH STRAINER AB & CHECK VALVE AC BY MEANS OF A FIXED DISPLACEMENT GEAR PUMP AE AT 45 GALLONS/HOUR (204 LITRES/HOUR).
- PRESSURE RELIEF VALVE AD BETWEEN PUMP & CHECK VALVE RETURNS LUBRICANT TO MAIN RESERVOIR IF ACTION OF PUMP IS REVERSED. I.E. IF ELECTRICAL CONNECTIONS TO MAIN DRIVE OR PANEL ARE INCORRECT.
- A CONTINUOUS FLOW OF LUBRICANT IS PUMPED THROUGH SCRAPER TYPE FILTER AF TO POINT 29.
- FROM ONE BRANCH OF THIS CONNECTOR LUBRICANT FLOWS THROUGH A MICRONIC FILTER AG TO SUPPLY FEED BLOCK AH & SIGHT FEED BLOCKS AL & AM. THE POINTS SERVED BY THESE BLOCKS TAKING PRIORITY.
- FROM ANOTHER BRANCH OF THE FOUR-WAY CONNECTOR LUBRICANT FLOWS THROUGH PRESSURE RELIEF VALVE AN TO SUPPLY REMAINING FEED BLOCKS AS & AR.
- PRESSURE RELIEF VALVE AW BETWEEN PUMP & SCRAPER TYPE FILTER LUBRICANT TO POINT 29.
- (RELIEF VALVES AN & AW ARE ADJUSTED TO GIVE 30 LB./IN² (2.1 KG./CM²) READING AT PRESSURE GAUGE AP.)
- PRESSURE SWITCH AX STOPS MACHINE ON COMPLETION OF ONE CYCLE IF PRESSURE FALLS BELOW THAT SET.
- FLOAT SWITCH AY STOPS MACHINE ON COMPLETION OF ONE CYCLE IF LUBRICANT IN RESERVOIR FALLS BELOW REQUIRED LEVEL.



COPPER TUBING SPECIFICATION	
SIZE	WALL THICKNESS
1/2"	0.6 mm
3/8"	1.0 mm
1/4"	1.2 mm

REQ. REF.	DESCRIPTION	MANUFACTURER	MANUFACTURER'S REF.	WICKMAN REF.
1 AA	RESERVOIR	WICKMAN AUTO LATHES	---	MICRAL MC TRAY
1 AB	STRAINER	ADAMS	LV 10047	---
1 AC	CHECK VALVE	ADAMS	LV 10038	---
1 AD	PRESSURE RELIEF VALVE	ADAMS	LV 10037	---
1 AE	GEAR PUMP	WICKMAN AUTO LATHES	---	---
1 AF	FILTER (SCRAPER)	PURULATOR	W1609/27W1611/P16M	16B21B
1 AG	MICRONIC FILTER	PURULATOR	APF87300	---
1 AH	FEED BLOCK (FRONT)	ADAMS	LV 10060	---
1 AJ	FLEXIBLE HOSE	ENOTS	42.0020.0.0400	---
1 AK	FLEXIBLE HOSE	ENOTS	42.0020.0.0400	---
1 AL	SIGHT FEED BLOCK (3 POINT)	ADAMS	LV 10034	---
1 AM	SIGHT FEED BLOCK (3 POINT)	ADAMS	LV 10034	---
1 AN	PRESSURE RELIEF VALVE	ADAMS	LV 10037	---
1 AP	PRESSURE GAUGE	WICKMAN AUTO LATHES	---	4CB X178A
1 AR	FEED BLOCK (6 POINT)	ADAMS	LV 10061	---
1 AS	FEED BLOCK (6 POINT)	ADAMS	LV 10062	---
1 AT	SPRAY PIPE	WICKMAN AUTO LATHES	---	4CB X167A
1 AU	SPRAY PIPE	WICKMAN AUTO LATHES	---	4CB X169
1 AV	DIP TRAY	WICKMAN AUTO LATHES	---	4CB Z148B
1 AW	PRESSURE RELIEF VALVE	ADAMS	LV 10037	---
1 AX	PRESSURE SWITCH	ALLEN - BRADLEY	D36T-252J	---
1 AY	FLOAT SWITCH	INTERLURE SYSTEMS	75139	---

FIG. 3G. 468 ZII. CONTINUOUS LUBRICATION SYSTEM.

BEAM	
REF.	POINTS FED
97	FRONT SPINDLE BEARING
100	FRONT SPINDLE BEARING
114	SPARE
116	SPARE

DRUM HOUSING	
REF.	POINTS FED
98	CLUTCH SPINDLE STOPPING MC ONLY
99	REAR SPINDLE BEARING
101	DRUM GEAR
102	REAR SPINDLE BEARING

END BRACKET	
REF.	POINTS FED
112	COLLET OPERATING SIDE - 6th STAT.
113	COLLET OPERATING SIDE - 5th STAT.

MAIN DRIVE HOUSING	
REF.	POINTS FED
16	FAST MOTION CLUTCH SHAFT
20	FAST MOTION CLUTCH
22	FEED CLUTCH SHAFT
23	BEARING HSG. - SPEED RO. GEAR SHAFT
25	SPEED PICK-OFF GEAR 'B'
26	SPRAY PIPE - FEED GEARS
27	OIL DRIP TRAY
28	BIG HSG. - FEED SHIPING CL. SHAFT
29	UPPER WORMSHAFT CHAIN
30	BEVEL GEARS
31	SPRAY PIPE ATTACHMENT GEARS
150	ATTACHMENT DRING
151	ATTACHMENT DRING
152	ATTACHMENT DRING

WICKMAN REF. MACHINE ONLY

Setting Procedure

1. Set cam dial on gear pump AC to number 5 position and screw down stem of by-pass valve AF to close valve. Ensure that Reservoir AA is full of lubricant
2. Set timer on main control panel to 15 minutes
3. Fill bellows of pressure switch AR with lubricant ensuring that all air is expelled. Screw in adaptor and exclude air by connecting tubing while pump is running and instant feed button to cyclic valve AG is depressed
4. Keeping instant feed button depressed, bleed-off any air at pressure gauge AP and if air is apparent in any flexible lines, bleed at adjacent points
5. Adjust by pass valve screw to give a 30lb/in (2.1kg/cm) minimum reading at pressure gauge under normal running conditions. Check over three 10 minute pulses of pump
6. Adjust pressure switch range setting indicator to 7lb/in (0.5kg/cm) approximately and ensure that differential screw under switch cover is set to minimum
7. With machine running establish that "trip-in" occurs when pump pulses and that "trip-out" occurs within about 2 minutes

CONTROLS

PRINCIPAL CONTROLS are the A/B front/rear station selector switches, main motor pushbuttons, feed clutch lever, fast-slow clutch shaft, handwind crank, collet shoe lever, hand collet lever, bar feed shoe knob and bar stop lever.

SUBSIDIARY CONTROLS are auto-stop selector switch, reset pushbuttons and conveyor pushbuttons.

A/B Front-Rear Selector Switches and Main Motor Pushbuttons (Fig.4,4a,4b)

The A/B Front-Rear Selector switch, main motor Stop and Start-Jog Button are duplicated on the front and rear of the machine.

The A/B Front-Rear Selectors are two position switches and both front and rear must be at the same setting, either "A" (front) or "B" (rear), before the appropriate Start-Jog Button can be used to start the main motor. Either Stop button can, however, be used to stop the main motor.

The Start-Jog Buttons are dual purpose switches.

To set the button for "Jog", turn the knurled ring to the right. When one Start-Jog Button is set to "Jog" the other can only Jog the motor.

Therefore, before leaving one side of the machine to work at the other side, the A/B Front-Rear Selector should be set to side required and the Start-Jog Selector set to Start.

The machine is arranged so that the main motor will stop when bar stock is exhausted. If this occurs, the motor cannot be restarted until the Front or Rear reset button is pressed.

The stop button on either side of the machine, will stop all motors irrespective of the setting of any other switch. As a safety precaution a Front-Rear Selector switch should always be set to the side of the machine on which the operator is making adjustments.

Feed Clutch Levers are fitted at the front and rear of the machine. Each has three positions - towards the spindles to engage the feed clutch, away from the spindles to engage the feed brake, and a neutral position in which the handwind gear can be engaged.

Fast Slow Clutch shaft is fitted at the front of the machine for use when setting up. A bar can be fitted in the hole in the shaft but should be used with great care, and only when all tools are clear of the work. There are two positions; to engage slow feed and the other to engage fast motion. There is no effective neutral because a freewheel or roller over-running clutch is in the feed drive.

The Handwind Crank can be fitted to engage the dogs on the handwind pinion shaft at either front or rear. Handwind can only be engaged with the feed clutch lever in neutral, as an interlock prevents the pinion being slid into mesh. Handwind is engaged by pulling the shaft towards the front of the machine.

The Collet Shoe Lever is a small lever fitted on the collet slide and is used to disengage the collet shoe from the collet bobbins on the spindle, for setting-up purposes by means of an eccentric which either holds the shoe disengaged or allows it to engage by means of its spring.

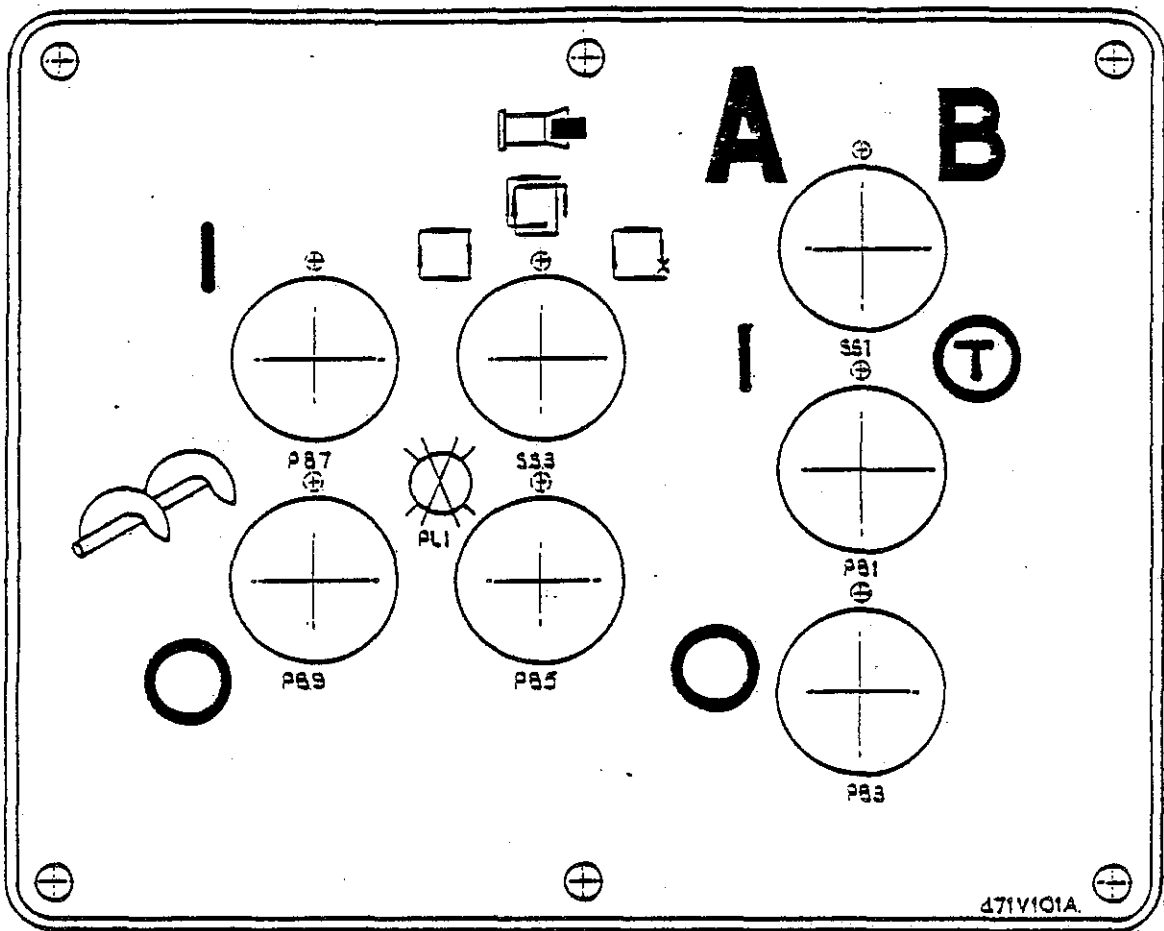


FIG. 4c. FRONT CONTROL PANEL.

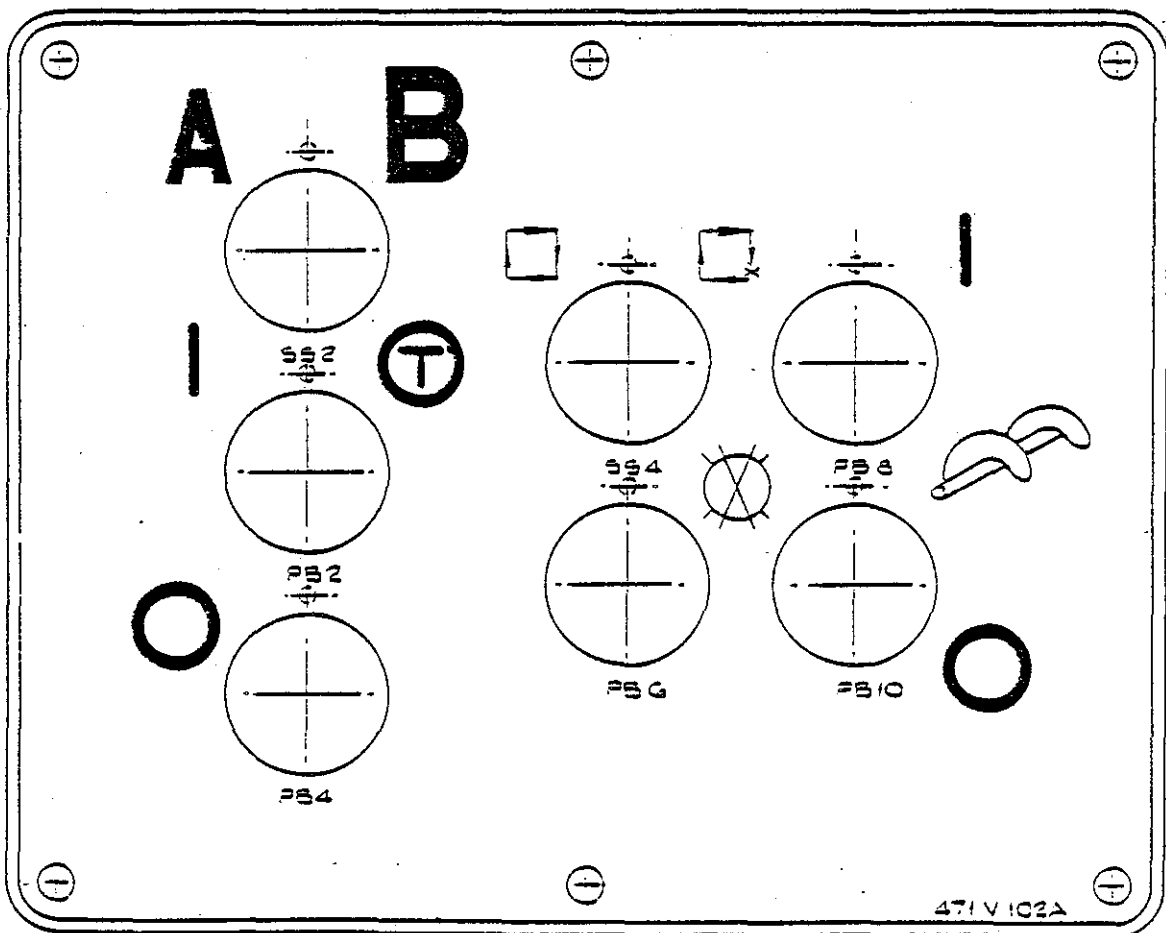


FIG. 4d. REAR CONTROL PANEL.

The Hand Collet Lever is loose and is fitted into its boss for checking collet adjustment. It is preferable that this lever should be removed after use. The collet can be operated by hand only during a limited period of the cycle where a space is provided in the cam track. The "auto-stop" mechanism timing cam should be set to trip the machine at this point, automatically when bar stock is exhausted or when the manual trip switch is operated.

The Bar Feed Shoe Knob operates the Bar Feed Shoe and allows the bar feed to be disengaged for setting up or bar loading purposes.

The Bar Stop Lever is used to retract the bar stop against its operating spring to allow the removal of bar ends from the collet.

The Auto-Stop Selector Switch SS3 with three positions on front Pushbutton panel operates:

- (a) (left) for continuous cycle until stopped manually
- (b) (middle) for continuous cycle until bar expires
- (c) (right) for one complete cycle only

The Auto-Stop Selector Switch SS4 with two positions on rear Pushbutton panel operates:

- (a) (left) to give condition depending on setting of front auto-stop selector switch
- (b) (right) for one complete cycle only

Conveyor Pushbuttons are mounted in the front and rear pushbutton panel and control the conveyor independently of the main motor. For safety the conveyor stops whenever the main motor stops, but the conveyor can be run independently to evacuate swarf.

Key to Fig. 4

- 1. Collet shoe lever
- 2. Bar stop lever
- 3. Pressure gauge for continuous lubricating system
- 4. Front control panel
- 5. Timing dial
- 6. Fast-slow clutch shaft
- 7. Handwind crank
- 8. Feed clutch lever
- 9. Collet lever hand operation
- 10. Bar feed shoe lever
- 11. Pressure gauge for cyclic lubricating system

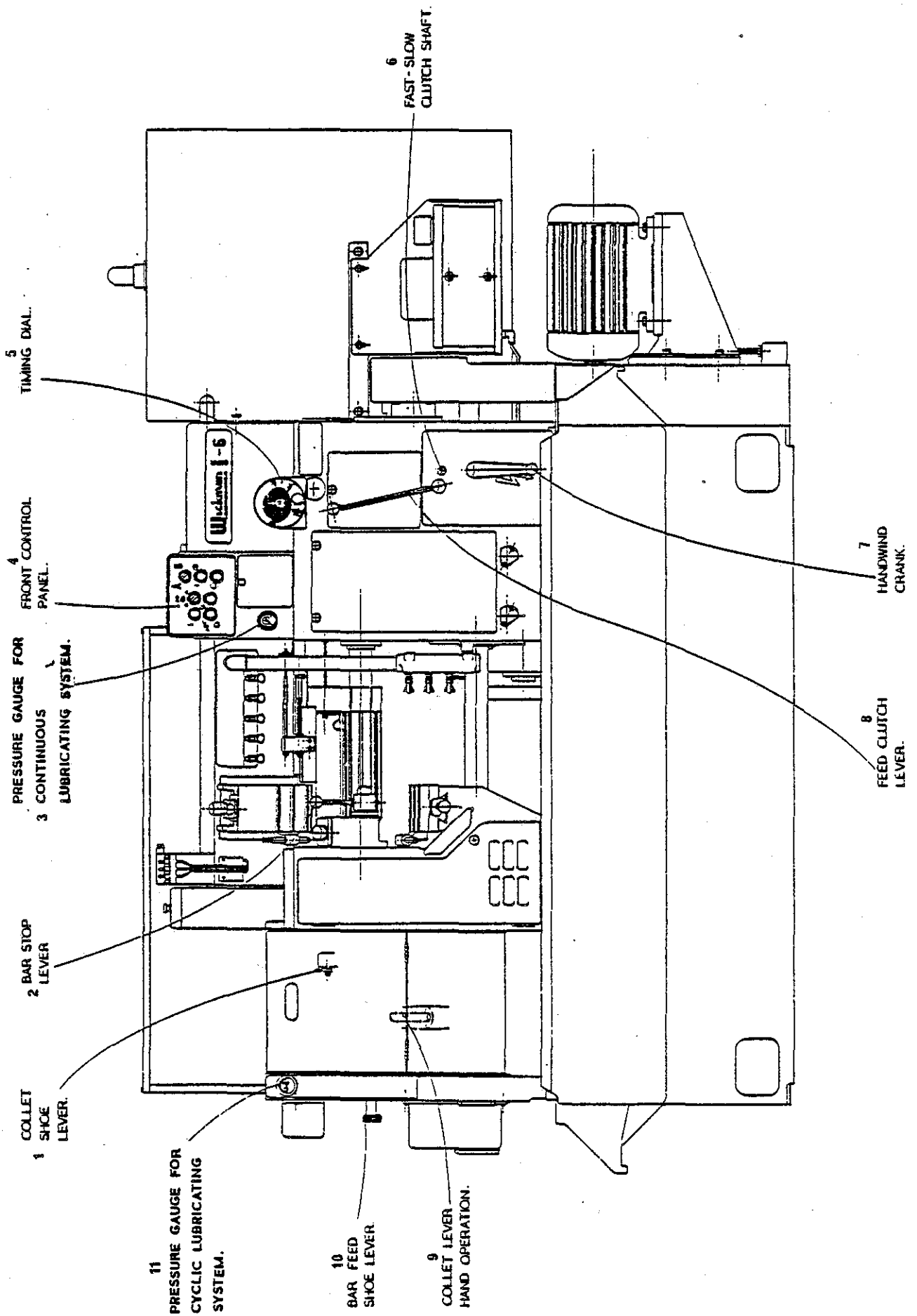


Fig. 4 CONTROLS 400 Z 101

STARTING UP

It is desirable to check the functioning of the lubrication systems, and also to see that all moving parts are free before running spindles and engaging power feed.

1. See that instructions under Lubrication Fig.3 have been carried out.
2. Remove one of the speed pick-off gears Fig.7 and engage the feed brake Fig.16.
3. Check the direction of rotation of the motor (clockwise looking at end of machine, see instruction plate).
4. Run the motor to check that the lubrication system is working. Observe the pressure gauges, sight feeds for the spindle drum, and all drip points by removing covers. Regulate the oil feed where necessary.
5. The Cyclic system should be flooded by pressing the button on top of the pump unit, while observing the pressure gauges, for long enough to bring the pressure up to 30 psi (2.1 kg/cm) so that all points receive an initial shot of oil.
6. Handwind the machine through a complete cycle into the slow feed period of the cycle to check that all parts operate freely.
7. Disengage the collet operating shoe, and handwind through the index part of the cycle. If excessive pressure is required on the handcrank, locate and correct the cause.
8. Replace the speed pick-off gear and run the machine.
9. Engage the feed drive clutch and run the machine under power feed.

MAIN DRIVE

The motor (Fig.5) is mounted on a platform which is bolted to the end of the tray. Belt tension must be set at 11/32 in. (9mm) deflection when a load of 4 to 6 lbs (1.8 to 2.7 kilograms) per belt is applied in the position shown. The belt is adjusted by loosening the bolts holding the platform, adjusting the belt tension adjusting screw, and re-tightening the platform bolts.

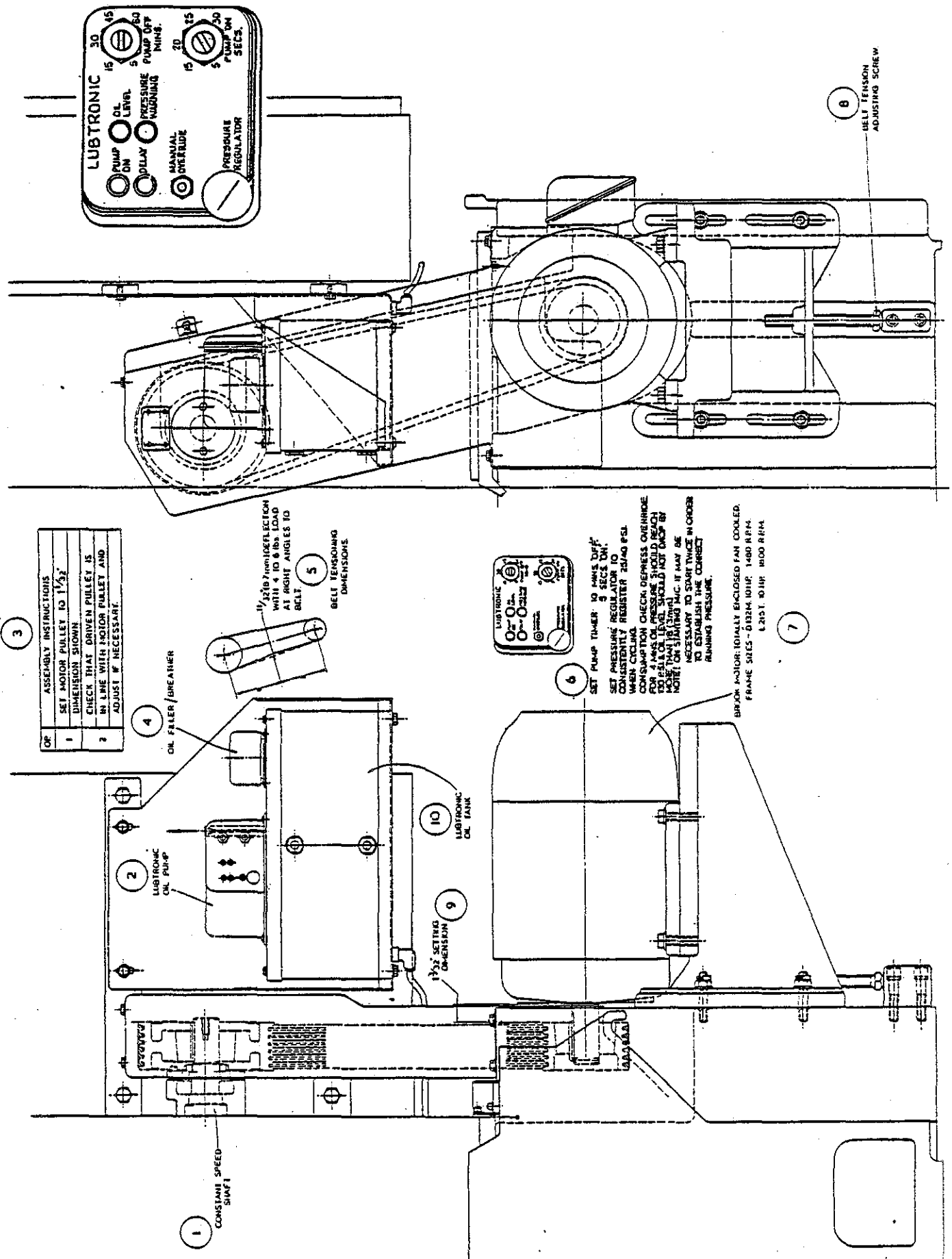
The constant speed pulley shaft (Fig.7) drives the second shaft and then the centre drive shaft by means of speed pick-off gears. These gears are accessible through covers on the main drive housing, and are mounted on taper shafts. An extractor for removing the gears is provided in the tool kit. Gears and shaft should be cleaned before fitting. The speed and feed chart (Fig.9) shows speeds and pick-off gears available.

The centre shaft drive passes through a coupling in the attachment drive compartment then through the centre guide to the spindle drum.

Various spacers are fitted as standard on the centre shaft in the attachment drive compartment and drive gears for standard attachments can be fitted as required according to the type of attachments in use.

Key to Fig.5

1. Constant Feed Shaft
2. Lubtronic Oil Pump
3. Assembly Instructions
 1. Set motor pulley to 1.1/32" dimension shown
 2. Check that driven pulley is in line with motor pulley and adjust if necessary
4. Oil Filler/Breather
5. 11/32" (8.7 mm) deflection with 4 to 6lbs load at right angles to belt. Belt tensioning dimensions
6. Set pump timer: 10 mins "off", 5 secs "on"
Set pressure regulator to consistently register 25/40lbs/in when cycling.
Consumption check: depress override for 4 mins.
Oil pressure should read 130lbs/in and oil level should not drop by more than .1/8" (3mm)
NOTE: On starting machine it may be necessary to start twice in order to establish the correct running pressure.
7. Brook motor: totally enclosed fan cooled.
Frame sizes - D132M 10 HP 1480 RPM
 - L215T 10 HP 1800 RPM
8. Belt Tension Adjusting Screw



3

ASSEMBLY INSTRUCTIONS	
1	SET MOTOR PULLEY TO 1 1/2\"/>
2	CHECK THAT DRIVEN PULLEY IS IN LINE WITH MOTOR PULLEY AND ADJUST IF NECESSARY.

6

SET PUMP TIMER TO 10 MIN. OFF, 5 SECS ON.
 SET PRESSURE REGULATOR TO CONSISTENTLY REGISTER 25/30 PSI. WHEN CYCLING. CHECK PRESSURE OVERRIDE FOR SHUTDOWN. CHECK OIL LEVEL. OIL LEVEL SHOULD NOT GO BELOW 1/2\"/>

7

BROOK MOTOR TOTALLY ENCLOSED FAN COOLED.
 FRAME SIZES - 0132M, 1014P, 148D R.P.M.
 1,215 T. 10.14P. 1100D R.P.M.

416ZIC

Fig. 5 MOTOR DRIVE

Key to Fig.6

DRIVEN/DRIVER			
SB-6	28T	42T	STANDARD
SB-65	48T	64T	SPINDLE STOPPER

- 1.
2. Work spindles
3. Coolant pump
4. Fast and slow cams
5. Timing dial
6. Upper camshaft
7. Cams for longitudinal slides
8. Continuous system lubrication pump
9. Cyclic system motorised lubrication pump
10. Speed pick off gears
11. Feed pick off gears
12. Motor
13. Feed slipping clutch
14. Fast motion clutch
15. Drive slipping clutch
16. Chain wheels on J & H shafts to suit fast motion time
17. Feed clutch
18. Brake clutch
19. Drive clutch
20. Hand wind gears
21. Drum for auxiliary longitudinal motions
22. Main camshaft
23. Cross slide feed cams
24. Bar stop cam
25. Drum locking cam
26. Collet operation cams
27. Cam operated timing switch
28. Bar feed cams
29. Index gears
30. Geneva wheel
31. Centre gear
32. Driver
33. Driven
34. Spindle drum
35. Auxiliary cam discs
36. Cross slide approach cam
37. Chasing attachment Sec.492
38. Chasing pick off gears
39. High Speed Drill Sec.490
40. Full threading attachment
41. Coupling
42. Plain threading attachment Sec.486
43. Speed pick-off gears
44. Off
45. On
46. Threading clutch Sec.481
47. Chasing drive Sec.492

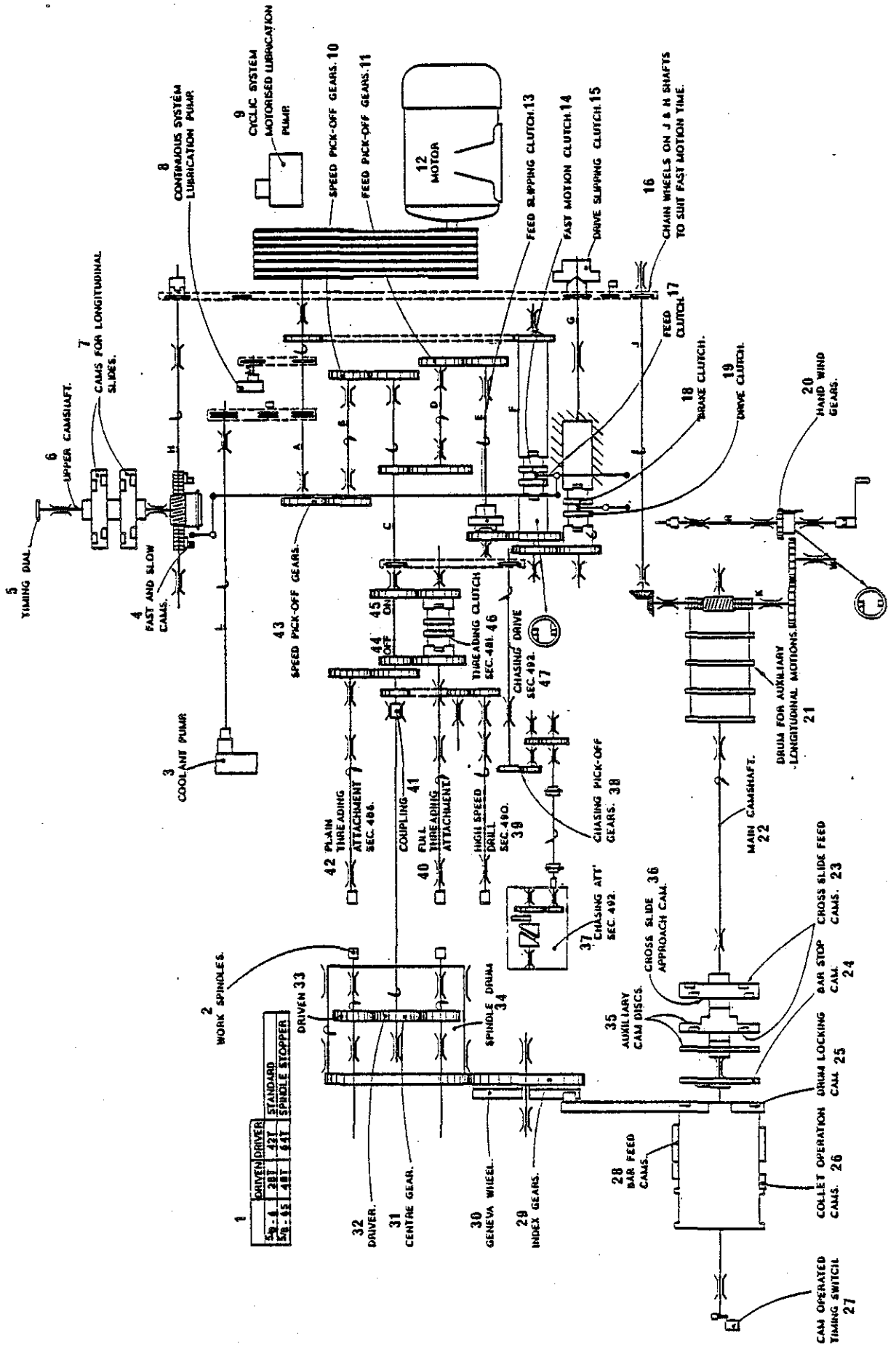


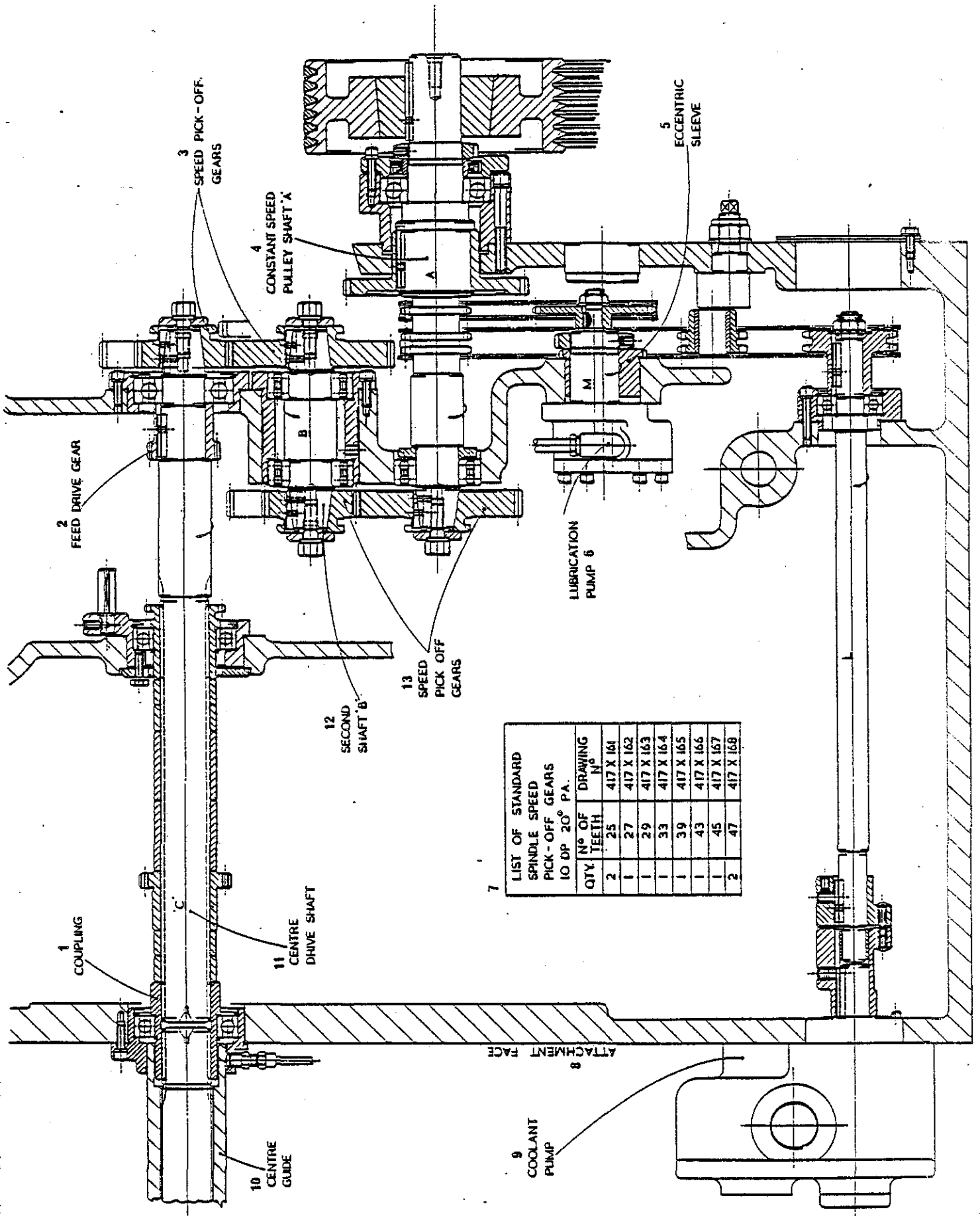
Fig. 6 LAYOUT OF GEARING AND CAMSHAFTS 400 Z 54

Key to Fig.7

1. Coupling
2. Feed drive gear
3. Speed pick-off gears
4. Constant speed pulley shaft "A"
5. Eccentric sleeve
6. Lubrication pump
- 7.

LIST OF STANDARD SPINDLE SPEED PICK-OFF GEARS 10 DP 20° PA.		
QTY.	N° OF TEETH	DRAWING N°
2	25	417 X 161
1	27	417 X 162
1	29	417 X 163
1	33	417 X 164
1	39	417 X 165
1	43	417 X 166
1	45	417 X 167
2	47	417 X 168

8. Attachment face
9. Coolant pump
10. Centre guide
11. Centre drive shaft
12. Second shaft "B"
13. Speed pick-off gears



7

LIST OF STANDARD SPINDLE SPEED PICK-OFF GEARS 10 DP 20° PA.		
QTY	N° OF TEETH	DRAWING N°
2	25	417 X 161
1	27	417 X 162
1	29	417 X 163
1	33	417 X 164
1	39	417 X 165
1	43	417 X 166
1	45	417 X 167
2	47	417 X 168

Fig. 7 SPEED GEARING 400 Z 67

FEED DRIVE

The Feed Drive Fig.8 is taken from the centre shaft by gears to the first feed pick-off gear shaft and then through the pick-off gear shaft and feed pick-off gears to the second pick-off gear shaft. Feed pick-off gears are mounted on taper shafts and an extractor is supplied in the tool kit.

- The second pick-off gear shaft carries the feed slipping clutch which is provided to protect the machine from excessive overload during the feed period of the cycle. The slipping clutch is arranged to disengage completely and operate the adjacent limit switch to trip the feed trip mechanism. Before re-engaging the slipping clutch the cause of overload must be located and corrected.

Slipping clutches are assembled with the minimum number of springs and plungers necessary to transmit the torque. Spare plungers, springs and screwed plugs are supplied in the equipment kit and can be fitted if necessary. It is strongly recommended that the number of plungers in use is kept at a minimum for each set-up, so that the clutch will slip when necessary.

The gear on the slipping clutch drives a gear on the "slow" side of the fast-slow clutch. A roller over running clutch is built into the boss of the gear to take up the drive when the clutch is in neutral as it shifts from "slow" to "fast".

Fast motion from a gear on the constant speed pulley shaft, drives the gear on the fast side of the fast-slow clutch.

At one end of the fast motion clutch shaft a gear transmits the fast or feed motion to the drive clutch gear. The drive clutch shaft transmits the drive by chain to the upper wormshaft and (via bevel gears) to the lower wormshaft. The brake clutch serves to brake the drive to the camshafts when the drive clutch is disengaged manually or by the trip mechanism.

Oil is fed through the hollow clutch shafts direct to all loose running bearings and clutch plates.

The fast-slow clutch is operated by cams fitted in the T-slot of the upper camshaft wormwheel (Fig.17). The timing of the cams is set according to requirements, normally shifting the clutch at the start of feed period 132° , and at the end of the dwell 288° , as shown on the timing dials located at front and rear of the machine. Hand operation of the clutch, which should be used judiciously, is provided at front by the fast-slow clutch shaft "R".

The feed-brake clutch is operated from front or rear by the feed clutch levers, see (Fig.16).

Clutch adjustment is made in each case by tapping round the serrated disc, a serration at a time, with the clutch disengaged. Adjustment should give a good "bite" to the feel of the lever.

The feed-brake should, however, be adjusted fairly slack so that when the trip mechanism operates it will be engaged fully, but the shock of braking will not be severe.

The camshaft drive chain tension is adjusted by means of a jockey wheel on an eccentric stud. The wheel should be adjusted to "trail" on the chain.

Timing of main and upper camshafts in relation to each other is carried out by handwinding the upper camshaft to 0° (V notches on the periphery of cam discs vertically above the centre of the shaft), disengaging the dog clutch on the rear end of the upper wormshaft (by slackening the hexagon nut and sliding the dog clutch). Handwind the main camshaft to 0° (keyway and V notches in discs and drums horizontal to the front of the shaft centre) and re-engage the dogs. Either camshaft may be advanced in relation to the other by this means where it is possible or desirable for tooling purposes.

The handwind pinion (Fig.15) on the handwind shaft can be engaged with an idler gear which is in constant mesh with a gear on the main camshaft wormshaft, by sliding the handwind shaft end-wise with the feed-brake clutch in neutral. An interlock lever on the feed-brake lever shaft prevents engagement of the handwind pinion if the clutch or brake is engaged and also engagement of the clutch or brake if handwind is engaged.

If the machine is taken out of feed and into neutral and the handwind engaged, a free wheel adjacent to the handwind pinion prevents any drive from the clutch bearings or plate drag being transmitted to the handwind shaft while the handwind gear is engaged.

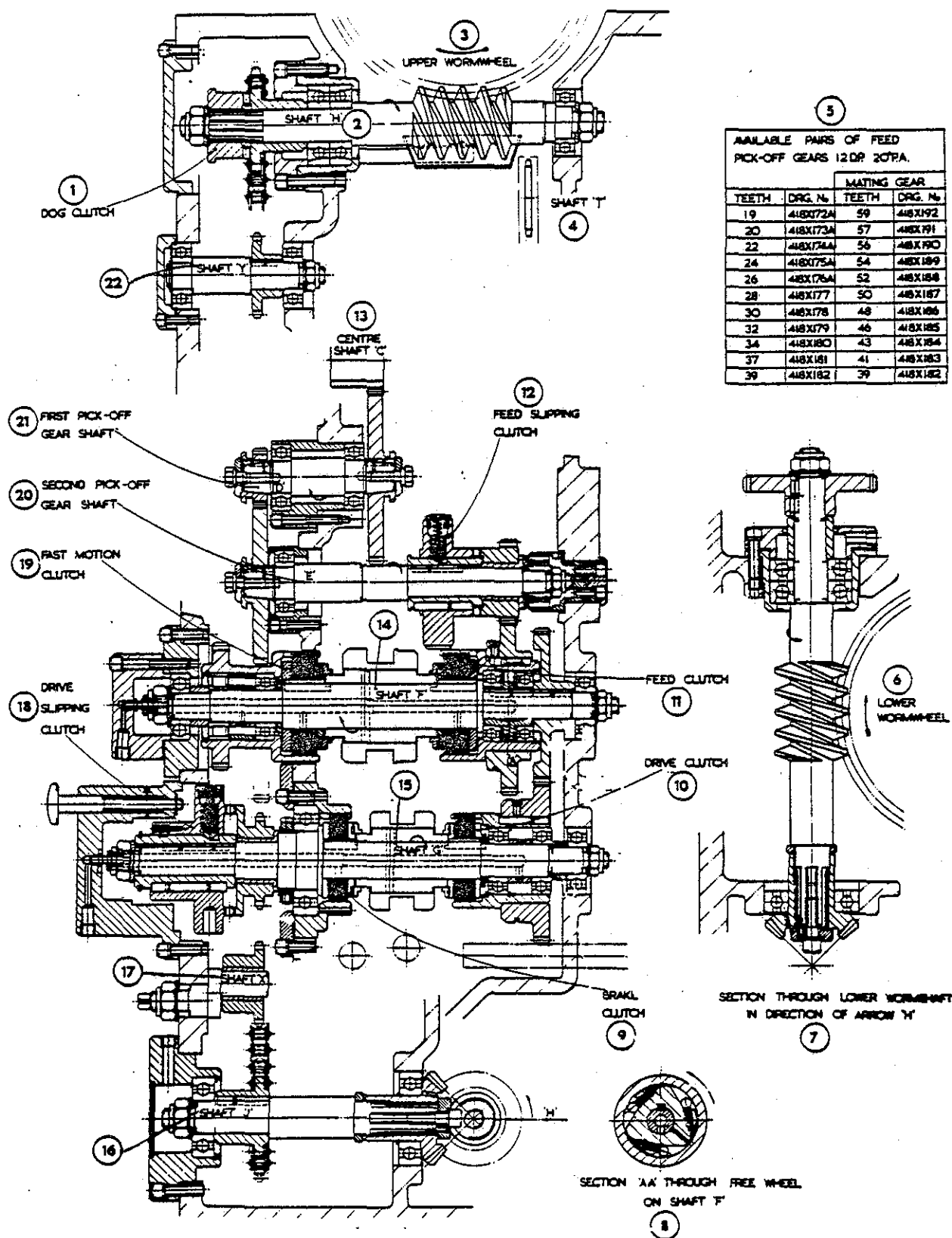
Different fast motion times for different versions of the machine can be obtained by fitting alternative chainwheels on shafts "J" and "H" (pairs of wheels have the same number of teeth) and using a suitable chain. See Speed and Feed Charts, Figures 9, 10 and 11.

Key to Fig.8

1. Dog Clutch
2. Shaft "H"
3. Upper Wormwheel
4. Shaft "T"
- 5.

AVAILABLE PAIRS OF FEED PICK-OFF GEARS 12DP 30°PA			
TEETH	DRG. No.	MATING GEAR	
		TEETH	DRG. No.
19	418X172A	59	418X192
20	418X173A	57	418X191
22	418X174A	56	418X190
24	418X175A	54	418X189
26	418X176A	52	418X188
28	418X177	50	418X187
30	418X178	48	418X186
32	418X179	46	418X185
34	418X180	43	418X184
37	418X181	41	418X183
39	418X182	39	418X182

6. Lower Wormwheel
7. Section through lower wormshaft in direction of arrow "H"
8. Section "A-A" through free wheel on shaft "F"
9. Brake Clutch
10. Drive Clutch
11. Feed Clutch
12. Feed Slipping Clutch
13. Centre Shaft "C"
14. Shaft "F"
15. Shaft "G"
16. Shaft "J"
17. Shaft "X"
18. Drive Slipping Clutch
19. Fast Motion Clutch
20. Second Pick-Off Gear Shaft
21. First Pick-Off Gear Shaft
22. Dog Clutch



FEED DRIVE

FIG. 8 400 Z 68

Wickman 5" 8-6

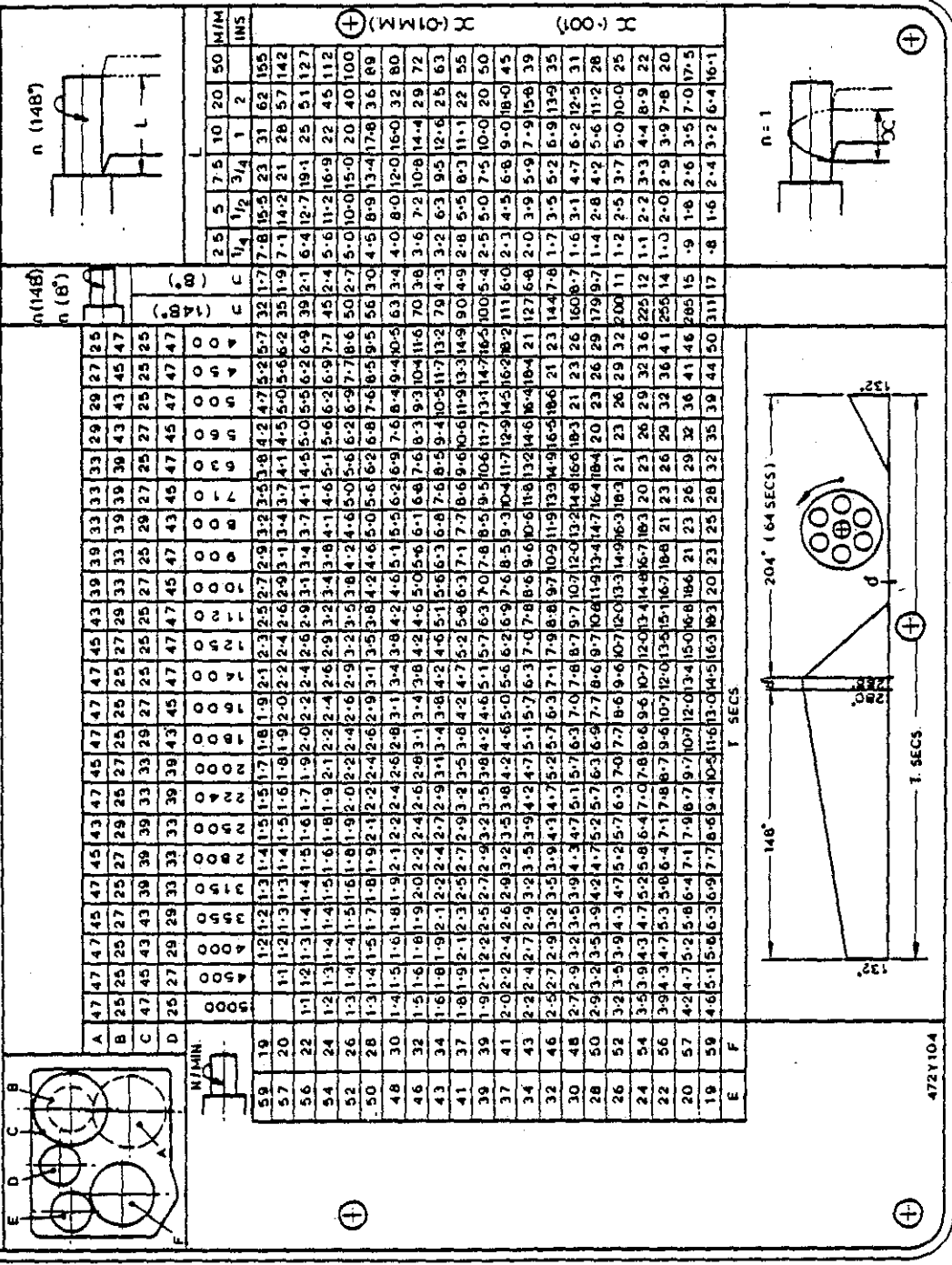


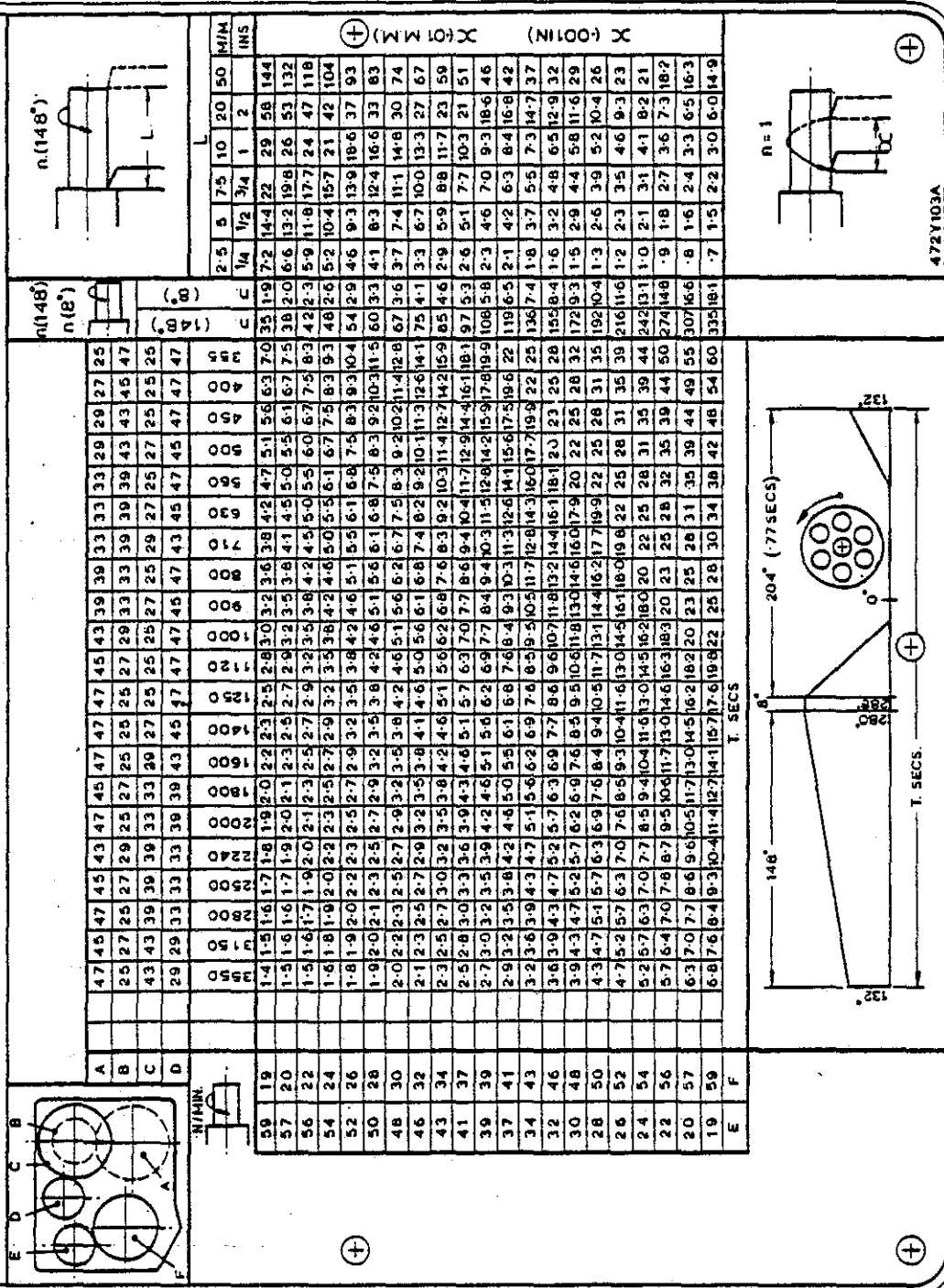
Fig. 9 SPEED AND FEED PLATE 1-6, 1,480 rev./min. MOTOR (FAST MOTION 0-64 SECONDS)

USED WITH CHAINWHEELS - 418 x 207 - 19T.

Fig. 9 472 Y 104

Wickman 5" 8-65

Fig. 11 SPEED AND FEED PLATE 1/8-65 (SPINDLE STOPPING)
1,480 rev./min. MOTOR (FAST MOTION 0.77 SECONDS)



USED WITH CHAINWHEELS - 418 x 181A - 23T.
- 418 x 182 - 23T.

Fig. 11 472 Y 103A

Key to Fig.10

This Speed and Feed plate is not standard, but where a slower fast motion than standard is required for special purposes, standard machines can be converted by fitting chainwheels 418 X 161A and 418 X 162 (23 teeth each) and a longer chain, in lieu of 418 X 207 and 418 X 208 (19 teeth each).

Wickman 5"-6

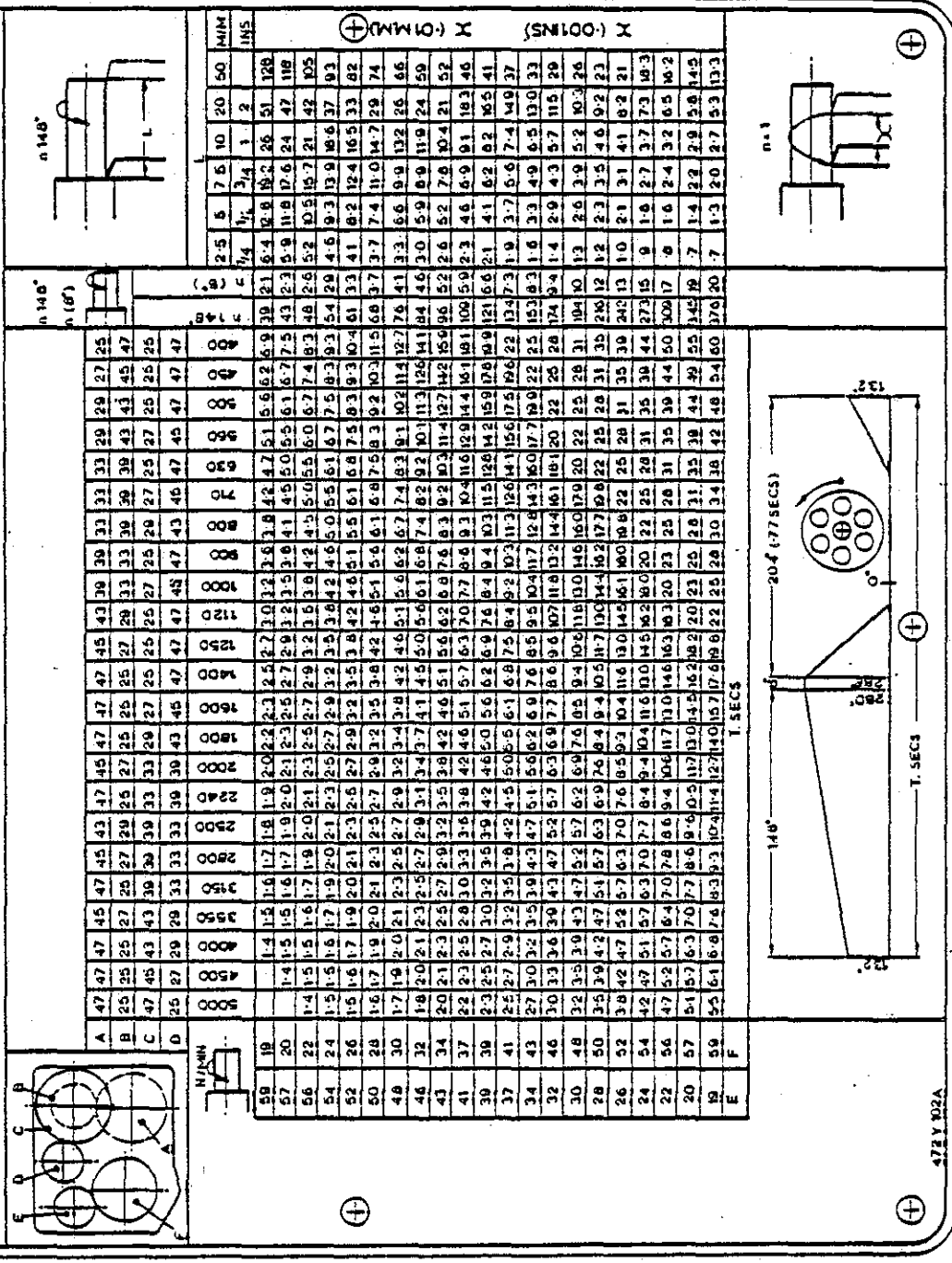


Fig. 10 SPEED AND FEED PLATE 1-6, 1,480 rev./min. MOTOR (FAST MOTION 0-77 SECONDS)

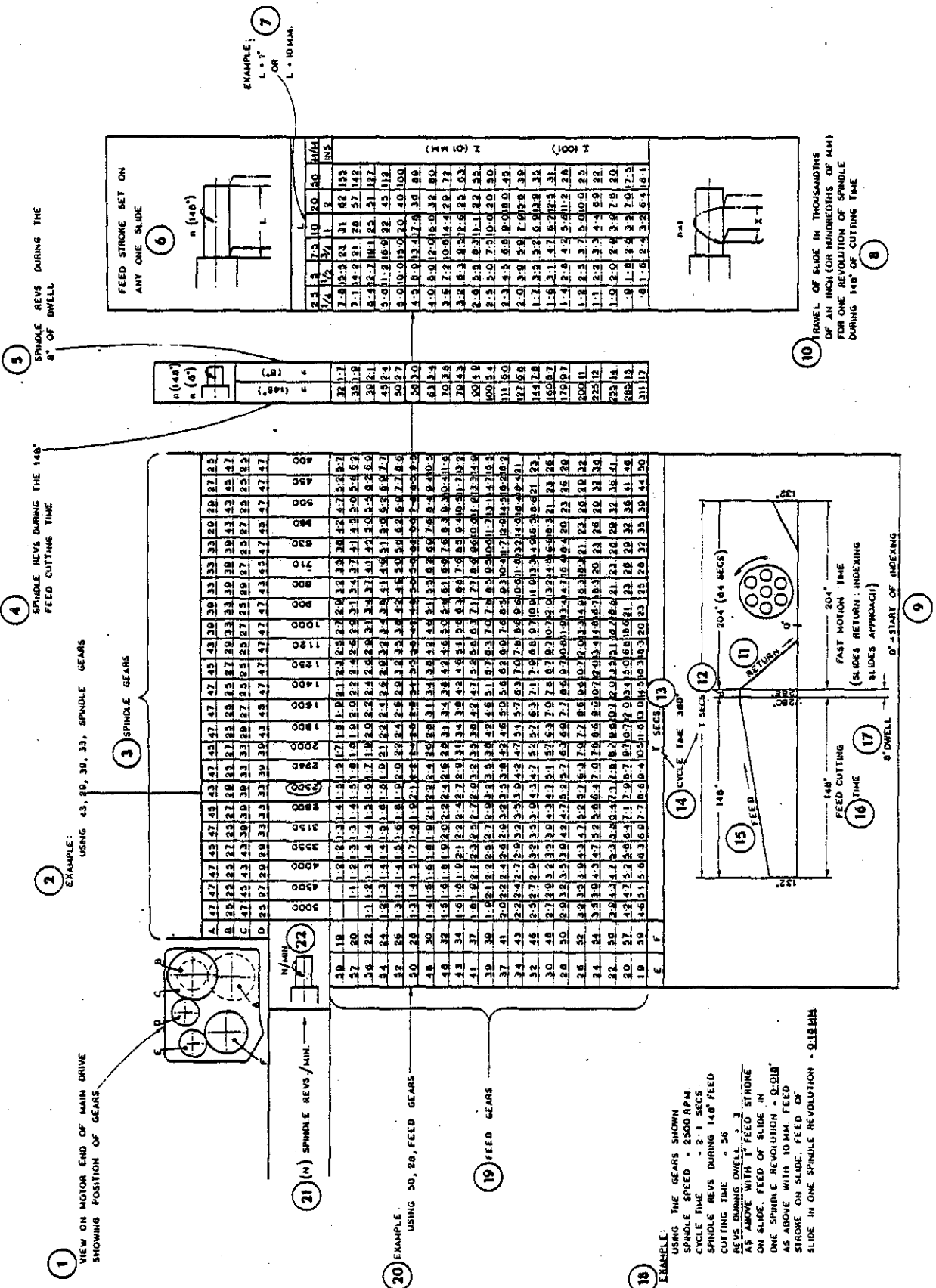
Fig. 10 472 Y 102B

USED WITH CHAINWHEELS - 418 X 161A - 23T.
- 418 X 162 - 23T.

Key to Fig.12

1. View on motor end of main drive showing position of gears
2. Example: using 43, 29, 39, 33) spindle gears
3. Spindle gears
4. Spindle revolutions during the 148° feed cutting time
5. Spindle revolutions during the 8° of dwell
6. Feed stroke set on any one slide
7. Example: L=1 in. or L=10 mm
8. Travel of slide in thousandths of an inch (or hundredths of a millimetre) during one revolution of spindle during 148° of cutting time
9. 0° = start of indexing
10. Fast motion time (slides return; indexing; slides approach)
11. Return
12. T seconds
13. T seconds
14. Cycle time 360°
15. Feed
16. Feed cutting time
17. 8° dwell
18. Example: Using the gears shown:
Spindle speed = 2,500 rev./min.
Cycle time = 2.1 seconds
Spindle revolutions during 148° feed cutting time = 56
Revolutions during dwell = 3
As above, with lin. feed stroke on slide -
feed of slide in one spindle revolution = 0.18 in.
As above, with 10mm feed stroke on slide
Feed of slide in one spindle revolution = 0.18mm
19. Feed gears
20. Example: using 50, 28 feed gears
21. (n) spindle rev/min.

Fig. 12 EXAMPLE OF USE OF SPEED AND FEED CHART 400 Y 74



SPINDLE DRUM

The Spindle Drum carries the work spindles and the centre guide on which the centre tool block slides. This arrangement ensures consistent alignment of work spindles with the centre block.

The end thrust of the tools and collet operation on the spindle drum is taken against the recess in the front face of the drum housing by the stop ring which is secured to the front of the spindle drum by six screws which should occasionally be checked for tightness. Reverse thrusts on the drum are taken by the bronze thrust ring at the rear against the drum housing. This ring is adjusted to minimum clearance of .0015" (0.04 mm) by 12 screws which are locked by set screws and brass pads.

The spindle drum is geared to the four-slot Geneva wheel and is indexed by the Geneva arm on the main camshaft. At each cycle it is indexed approximately .025/.035" (0.64/0.90 mm) past the final position, to allow the drum latch to drop into position, and is then drawn back against the accurately ground locators by the toggle operated drum locking mechanism. See Fig.22.

A large piston ring in a groove in the stop ring is fitted into a recess at the front of the drum housing and prevents coolant swarf entering around the periphery of the spindle drum.

A flanged stem bolted and dowelled to the back of the spindle drum drives the stock carriage and carries a disc supported by rollers in the end bracket. The stem also carries a support guide for the feed tubes, which is taper pinned to the stem.

WORKSPINDLES

The work spindles are mounted in extra precision preloaded angular contact ball journal bearings at the front with an extra precision parallel roller bearing at the rear.

The front bearings are protected against ingress of coolant and swarf by means of piston rings and a labyrinth seal. If the front bearing end cap is removed to inspect or replace the piston rings, the greatest care should be taken to tighten the screws equally.

The bearings are lubricated in the two upper (4th and 5th) stations by oil drip feeds from the beam casting above the drum housing. Sight feeds are provided giving details of the oil flow which should be carefully checked at regular intervals. More oil should be supplied to bearings at higher speeds and shorter cycle times than for slower speeds and longer cycle times.

Collets are of drawback type with internal thread and the collet tube is screwed left hand up to the shoulder in the collet. Adjustment is made by turning the adjusting ring (L.H. thread) at the rear using the special tool provided. One pin of the tool should be placed in the groove in the face of the nut while the other rests in one of the half-round notches. The tool is used to "ratchet" the nut in either direction giving very quick adjustment. The ring is locked by allowing the spring plunger to engage in one of the notches in the ring. Collets are removed complete with tubes from the front of spindle after unscrewing the adjusting ring assembly in the 6th station. Spindles and collet seats should be cleaned each time collets are changed.

Collets are closed by means of bobbin and toggles which hold the collet in the closed position.

When the bobbin is moved to "collet open" position, the collet is free to open by its own internal spring tension.

Feed fingers are screwed into the feed tube up to the shoulder (L.H. thread).

Steady bushes are positioned at the rear end of the feed tube in a sleeve and retained by a circlip.

When all feed tubes are positioned the bar feed shoe should be released to allow the shoe to move the feed tube ball journal, and the bar feed should be set. The stock carriage tubes should now be set so that there is approximately 3/8" (9.5 mm) between the end of the stock carriage tube and the end of the feed tube when the feed tube is in its back position.

Feed finger tube assemblies are fitted after sliding back in turn, each of the stock carriage tubes, in the loading (6th) station.

In standard 5/8"-6 machines (NOT Spindle Stoppers), as the spindle drum indexes six stations, i.e. one complete revolution, the work spindles "roll" around the centre gear exactly 2.1/2 times.

All spindles, driving and driven gears in the spindle drum, are keywayed and marked so that if correctly assembled, the angular position in any station of each collet driving key is successively the same or spaced at 180°.

This is of importance when using the Synchronous Drive (see Page 172) for Pick-Up Attachments; Synchronous Sawing or Milling Attachments, etc.

Key to Fig.13

1. Indexing Gear
2. Thrust Ring
3. Centre Shaft "C"
4. End Cap
5. Collet (L.H. Thread)
6. Feed Finger (L.H. Thread)
7. Thrust Ring
8. Adjusting Screws
9. Bobbin
10. Toggle
11. Collet Adjusting Ring (L.H. Thread)
12. Steady Bush
13. Stock Tube

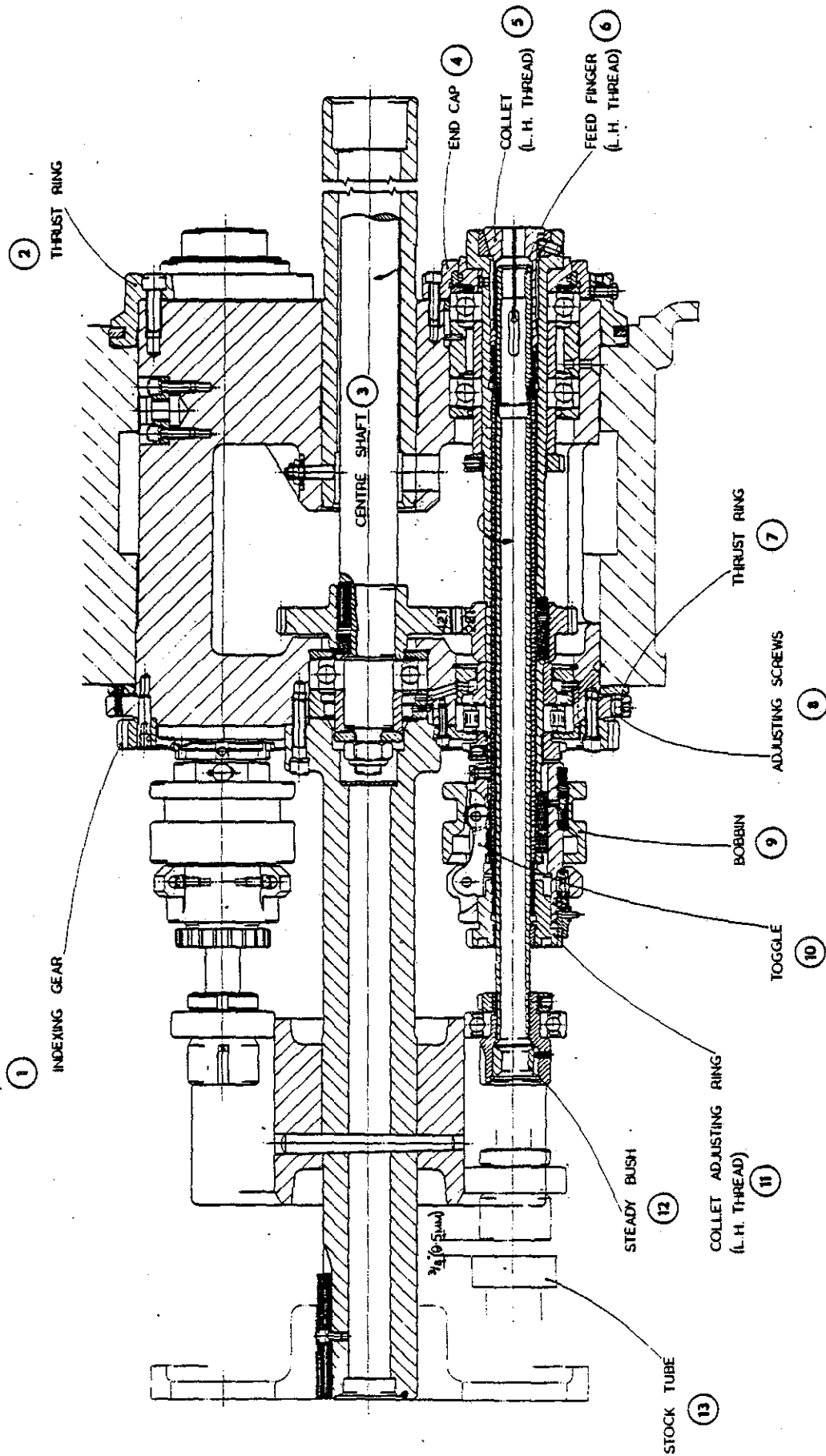


Fig. 13 400 Z 66 WORK SPINDLE ARRANGEMENT

Key to Fig.14

1. Constant Speed Pulley Shaft
2. Enots Lubrication Pump Shaft
3. Coolant Pump Drive Shaft
4. Feed Pick-Off Gears are on Shafts "D" & "E"
5. Speed Pick-Off Gears are on Shafts "A" "B" & "C"
6. Adjust Jocket Sprockets in trailing position as shown by the arcs arrowed thus
7. Upper Wormshaft
8. Centre Drive Shaft

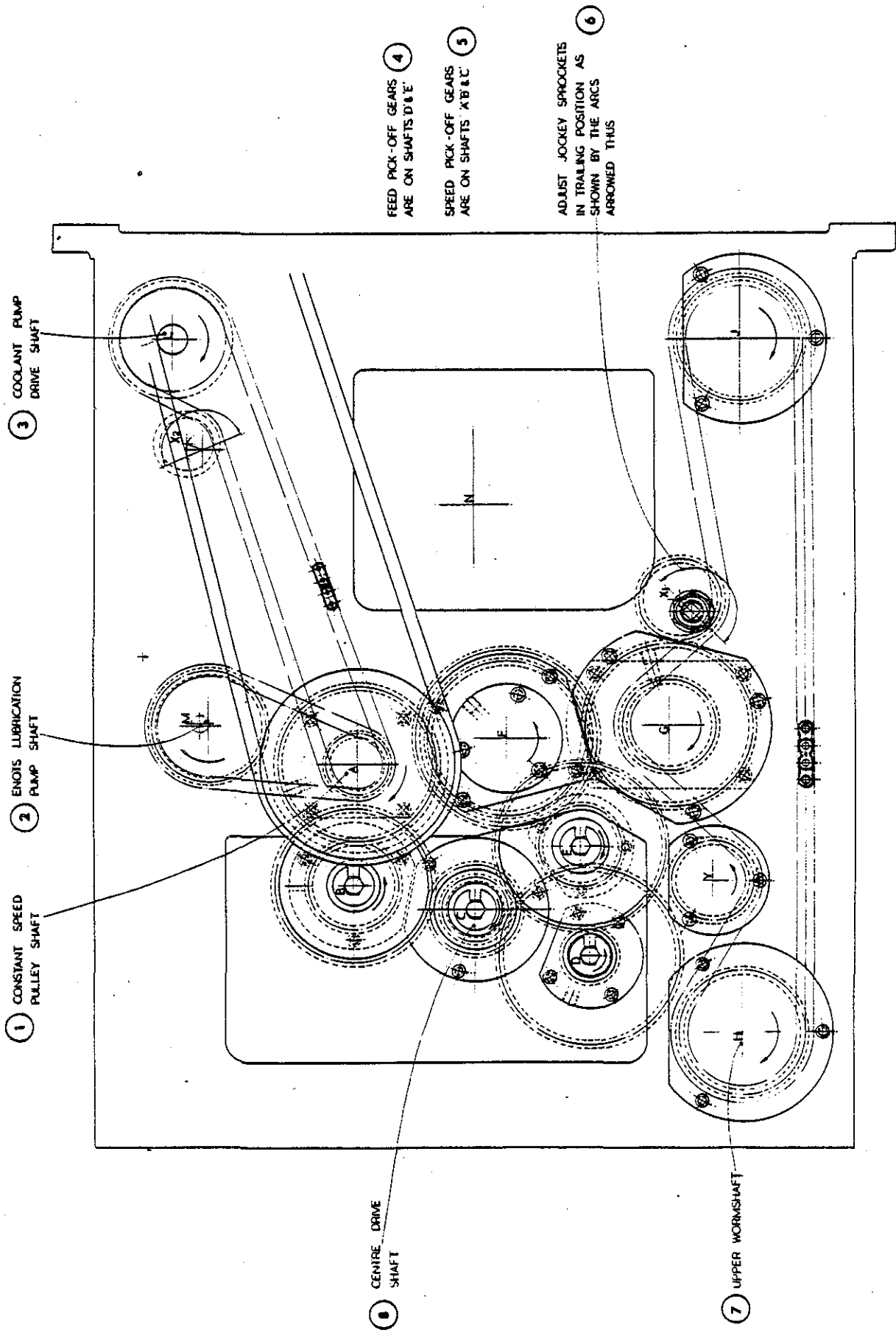


Fig. 14 400 Z 77 | SPEED AND FEED GEARS, END VIEW

Key to Fig.15

1. Section AA
2. Roller Sprag
3. Handwind Pinion
4. Interlock Lever
5. Feed-Brake Shaft
6. Shaft "U"
7. Shaft "R"
8. Idler Gear
9. Section "YY"
10. Shaft "K"
11. Shaft "L"
12. Shaft "W"
13. Handwind Shaft

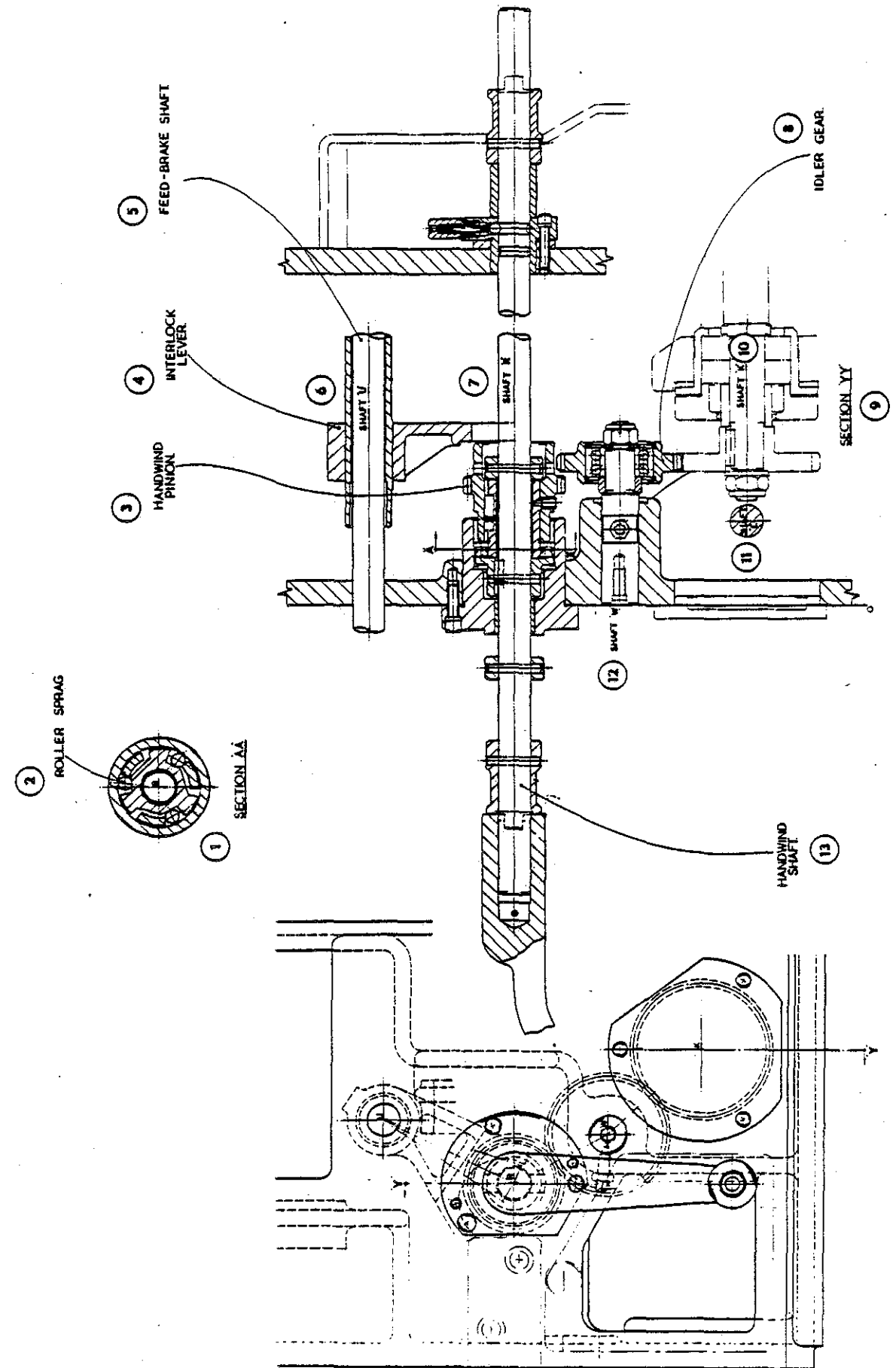


Fig. 15 400 Z 71 HANDWIND MECHANISM

AUTO STOP MECHANISM

THE AUTO STOP MECHANISM Fig.16 is provided to disengage the feed clutch and engage the brake when the trip solenoid is de-energised by switches operated by:

- (a) disengagement of the feed slipping clutch.
- (b) hand (auto-stop selector switch)
- (c) the bar feed trip mechanism which operates when bar stock is exhausted in any spindle
- (d) special tool safety devices

When the solenoid is de-energised, i.e. when one of the trip devices has operated, spring A pulls rod B upwards which in turn pulls lever C with detent D clear of plunger E.

The spring in plunger E pulls lever F, which through driving dogs G, turns shaft H to engage the brake in which position it is held by the ratchet and pawl J. The feed cannot be engaged until the trip device has been reset allowing the solenoid to be energised. When the solenoid is energised, rod B is pulled down, taking with it lever C and detent D. This retracts pawl J and spring loads detent D towards the plunger E so that when the feed is engaged by means of the handlever the plunger E is latched by the detent D. In this position the feed and brake can be hand operated normally as there is sufficient backlash in the driving dogs G. For handwinding, an intermediate latched position of plunger E is provided by an additional latching notch for detent D.

The Auto Stop Mechanism stops the feed in three main ways:

- (1) Non-timed emergency operation.
- (2) Timed safety operation.
- (3) Timed working operation.

1. A non-timed emergency operation stops the feed immediately due to :

- (a) The feed slipping clutch operating.
- (b) A tooling safety device operating (when fitted)

2. A timed safety operation stops the feed when:

- (a) A timed tooling safety device operates. Example: Threading Return Check Switch; this device stops the feed when the collet opens, and is timed by the timing switch adjacent to the bar feed end of the camshaft.
- (b) A special tooling safety device operates to stop the feed at some time other than when the collet opens. (This requires an additional cam, switches and wiring)

3. A timed working operation stops the feed via a control relay when the collet opens. The main motor is stopped via the relay and Feed Brake interlock switch. The red signal lamp on the control panel is "on" to signal this condition.

On a double bar feed machine the red signal lamp is "on" for the bar expired in 3rd or 6th station.

4. Stops operate in two ways:

- (a) The Auto Stop Mechanism operates when the bar stock is exhausted in any spindle at 6th Station (and 3rd on double bar feed machines).
- (b) The Auto Stop selector switch on the Push Button panel operates when set.

See Fig.16, for setting Brake Interlock Limit Switch

See Fig.20, for setting Timing Switch fitted on the bar feed end of the main camshaft.

Key to Fig.16

1. Driving Dogs "G"
2. With handwind engaged set head of screw 1/16in. (1.6mm) clear of roller
3. Lever "F"
4. Feed handwind brake
5. Spring "A"
6. Rod "B"
7. Solenoid
8. Lever "C"
9. Platform "K" 10. Plunger "E"
11. Screws "L"
12. Detent "D"
13. Pawl "J"
14. Adjusting screw and locknuts
15. Set adjusting screw to give 1/64in. (0.4mm) clearance at M when feed clutch is fully engaged. Set solenoid so that link rod "B" is vertical when solenoid is engaged by adjusting platform "K" at screws "L"
16. Shaft "H"

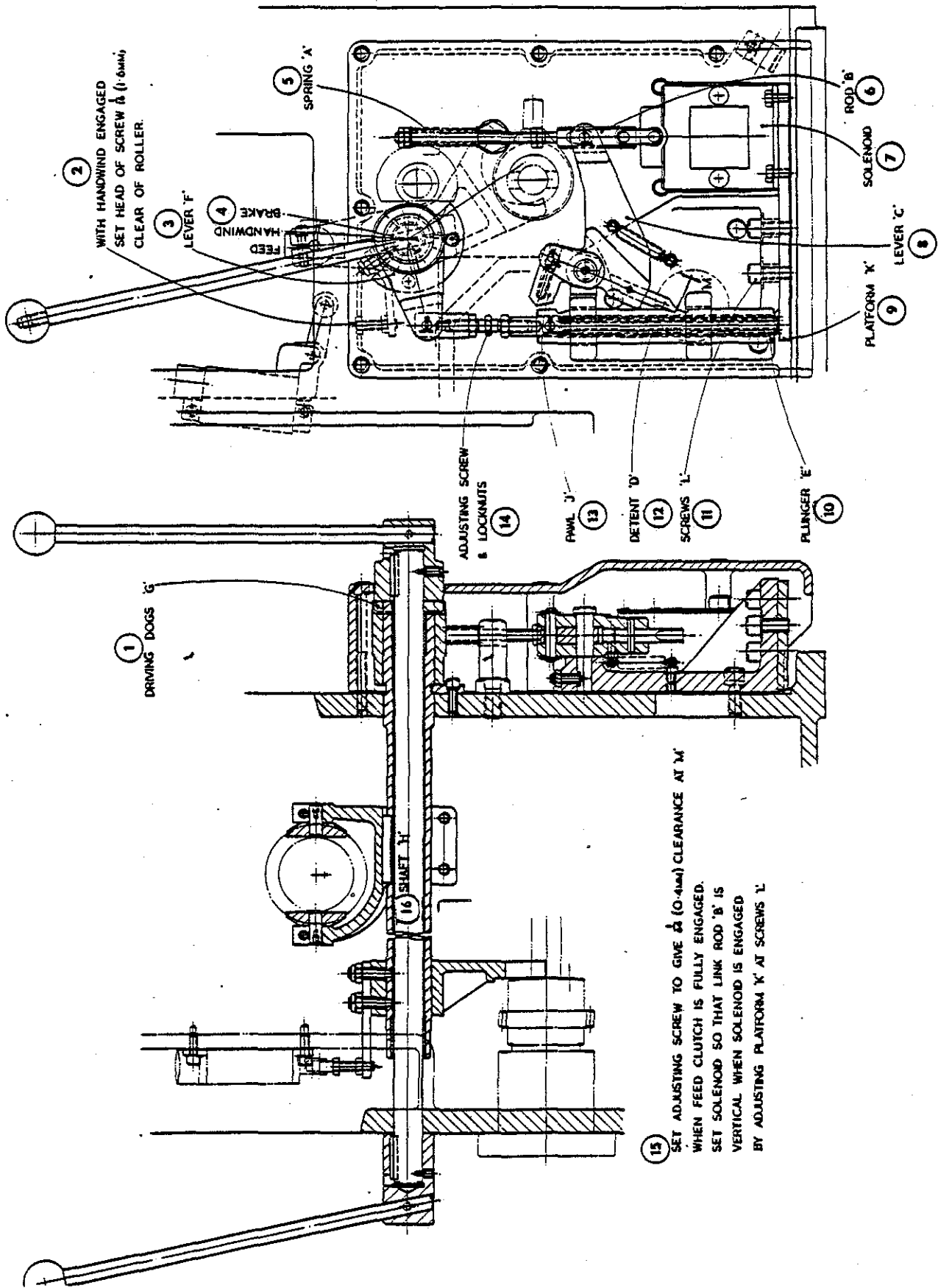


Fig. 16 400 Z 81

AUTOMATIC STOP MECHANISM

FAST MOTION & FEED OPERATION & FEED SLIPPING CLUTCH TRIP OPERATION

The operation of fast and feed motion is made by the fast and slow cams attached to the wormwheel on the upper camshaft. These cams move roller "L" on lever M from A to B, and through adjustable rod "N" to lever "P" and shaft "R" which carries the clutch operation yoke. Any excessive travel of roller "L" from the cams can be lost by adjusting the screw in the top of rod "N".

The Feed Slipping Clutch takes care of overloads during the feed part of the cycle. In the event of an overload the clutch slips and actuates switch "S" which de-energises a relay in the control panel, this brakes the feed and stops the main motor.

Key to Fig.17

1. Adjust screw to obtain correct amount of travel to clutch glut
2. Rotation
3. Fast motion cam
4. Position "A"
5. Position "B"
6. Roller "L"
7. Set limit switch roller 5/32in. (4mm) clear of slipping clutch when operating lever is 0.005 in (0.13mm) clear of plunger -
8. Shaft "V"
9. Section "A-A"
10. Shaft "R"
11. Lever "P"
12. Switch "S"
13. Feed slipping clutch
14. Adjustable rod "N"
15. Lever "M"
16. Shaft "E"
17. Shaft "F"
18. Adjust to obtain correct position of clutch glut travel
19. Feed motion cam

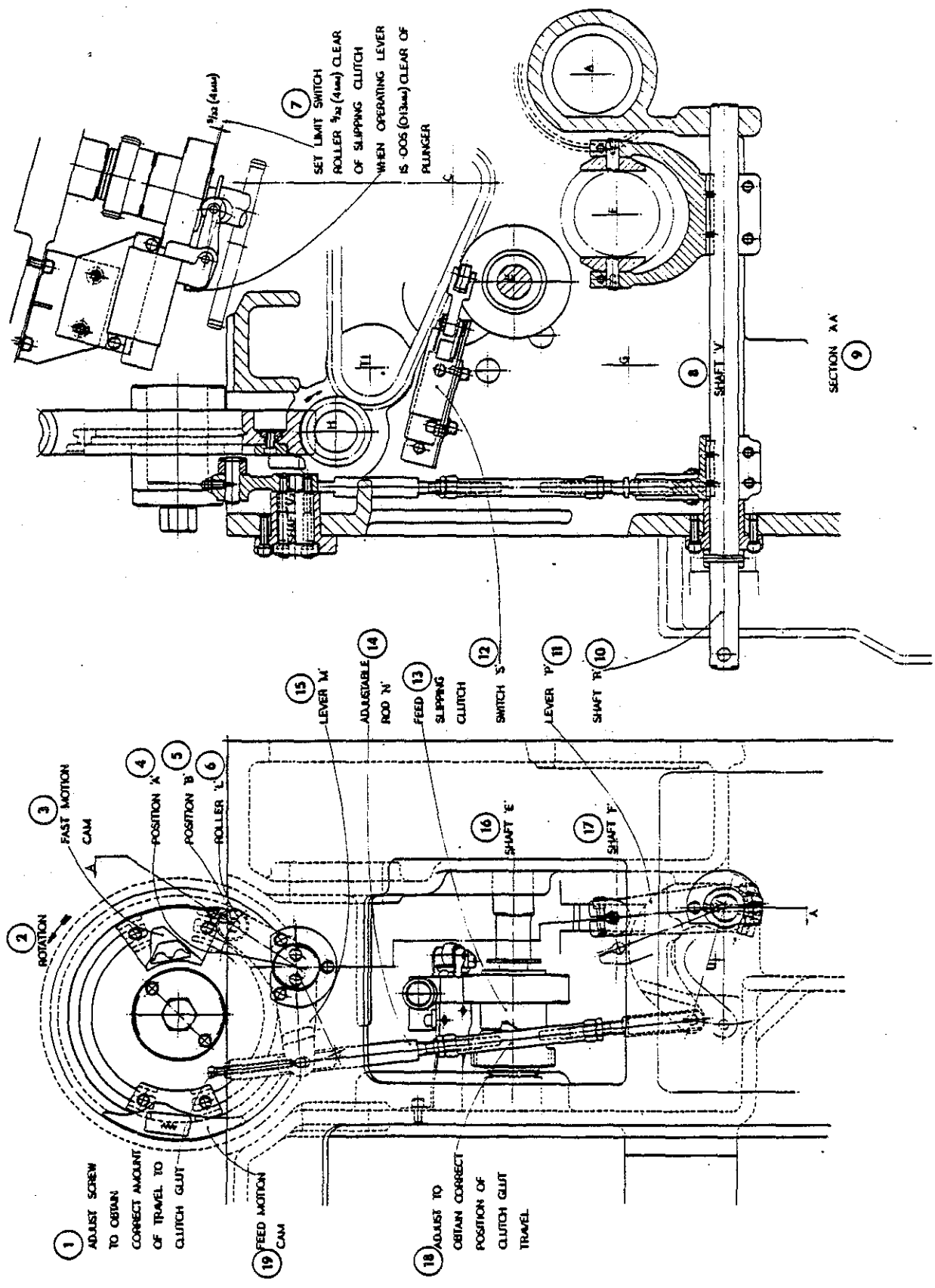


Fig. 17 FAST MOTION AND FEED OPERATION, AND FEED SLIPPING CLUTCH OPERATION 400 Z 73

MAIN CAMSHAFT

The Main Camshaft extends from the wormwheel in the main drive housing through the drum housing and the end bracket. In the drum housing it carries the front and rear cross slide feed cams, cross slide approach stroke cam and the auxiliary cam disc for cams used for special purposes. Filling pieces are fitted in the slots of certain cam discs.

Between the drum housing and end bracket are the bar stop cam disc, and the cam drum carrying spindle drum locking, collet operation and bar feed cams and the Geneva arm and roller.

Two sets of bar feed cams are supplied as standard, as follows:

Short Cams 458 V 173A and 458 V 174A for strokes 0-2in. (0-50.8mm).

Long Cams 458 V 171A and 458 V 172A for strokes 0-3.1/2in. (0-88.9mm).

The scale on the bar feed lever is marked on both sides; use the appropriate side.

Untooled machines are normally supplied with the Short Cams fitted and the Long Cams loose.

Beyond the end bracket an extension is fitted to the camshaft to carry various timing cams. The trip mechanism which stops the machine with the collet open is timed from one of these cams (Fig.20).

In the main drive housing a cam drum is fitted to carry standard and special cams when required. These cams normally operate reaming and threading attachments in Stations 1, 2 3 and 6 by means of the Auxiliary Longitudinal Motions Sections 489A, B, C and D. Special attachments can be operated by the same mechanisms.

A key is also provided in the camshaft in front of the drive housing for mounting special split cam discs or drums.

End thrusts on the camshaft are taken by angular contact ball bearings in the main drive housing.

At 0° timing (See Timing Dials and Timing Diagram Fig.21) the keyway and thenotches in the periphery of cam discs and drums are horizontal to the frontof the camshaft centre.

Key to Fig.18

1. Timing Cam
2. Collet Operating Cam
3. Bar Feed Cams: Short 458 V 173A and 458 V 174A
Long 458 V 171A and 458 V 172A
4. Drum Locking Cam
5. Cross-Slide Cam
6. Drum Housing
7. Key for Attachment Cams
8. Cam Drum for Auxiliary Longitudinal Motions
9. Main Drive Housing
10. Auxiliary Cams
11. Bar Stop Cam Disc
12. Geneva Disc and Roller
13. End Bracket

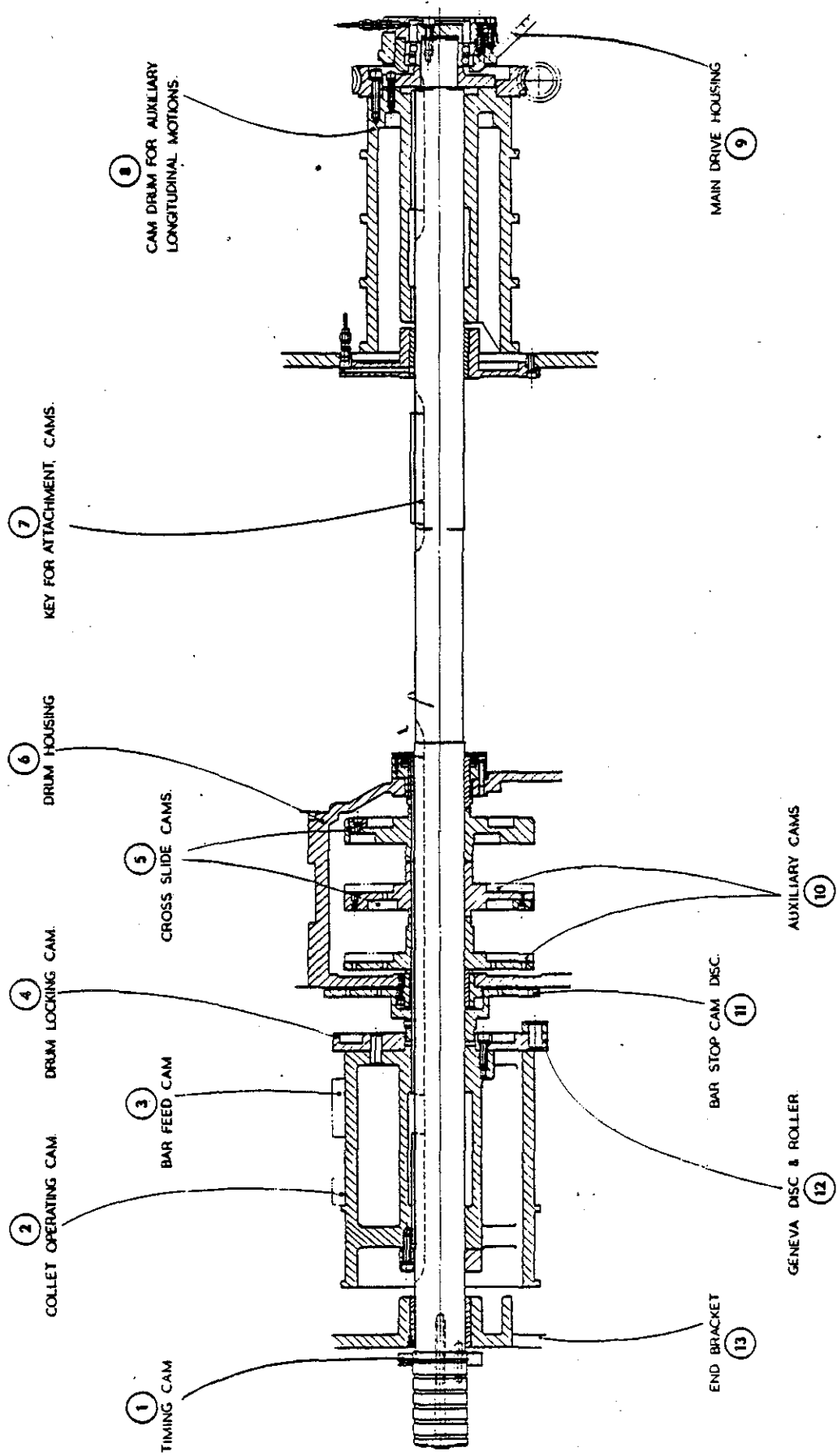


Fig. 18 400 Z 77 MAIN CAMSHAFT

UPPER CAMSHAFT

The upper camshaft is transversely mounted in two brackets on top of the main drive housing, the shaft being driven by the wormwheel at the front. Cams operating the fast-slow clutch are mounted in a T-slot in the wormwheel face. The cams are adjustable for timing, which should normally agree with the timing dials.

Timing dials are provided externally on covers near each end of the shaft and the pointers relating to them are carried on the shaft, and are easily set for correct timing. They assist the operator in observing the cycle of operations from either side of the machine.

V notches in the periphery of the cam discs should be vertically above the centre of the camshaft and the line across the face of the wormwheel should be level with the top of the drive housing at 0 time.

The timing of the main camshaft, can be altered in relation to the upper camshaft, by repositioning the dog clutch on the end of the upper camshaft.

The dog clutch is disengaged after loosening the holding down nut, the machine can then be handwound to advance or retard the main camshaft with respect to the upper camshaft.

The upper camshaft carries two permanent disc cams, for the centre block feed and approach strokes respectively. The outer face of each of these disc cams is provided with a series of tapped holes for mounting the feed cams for the longitudinal slides in Stations 4 and 5. These cams can be removed for fitting of standard or special cams.

Key to Fig.19

1. Fast Slow Clutch Cams
2. Wormwheel
3. 5th Station Longitudinal Feed Cam
4. Centre Block Feed Cam
5. Sliding Block Fast Motion Cam
6. 4th Station Longitudinal Feed Cam
7. Timing Indicator Rear
8. Timing Indicator Front

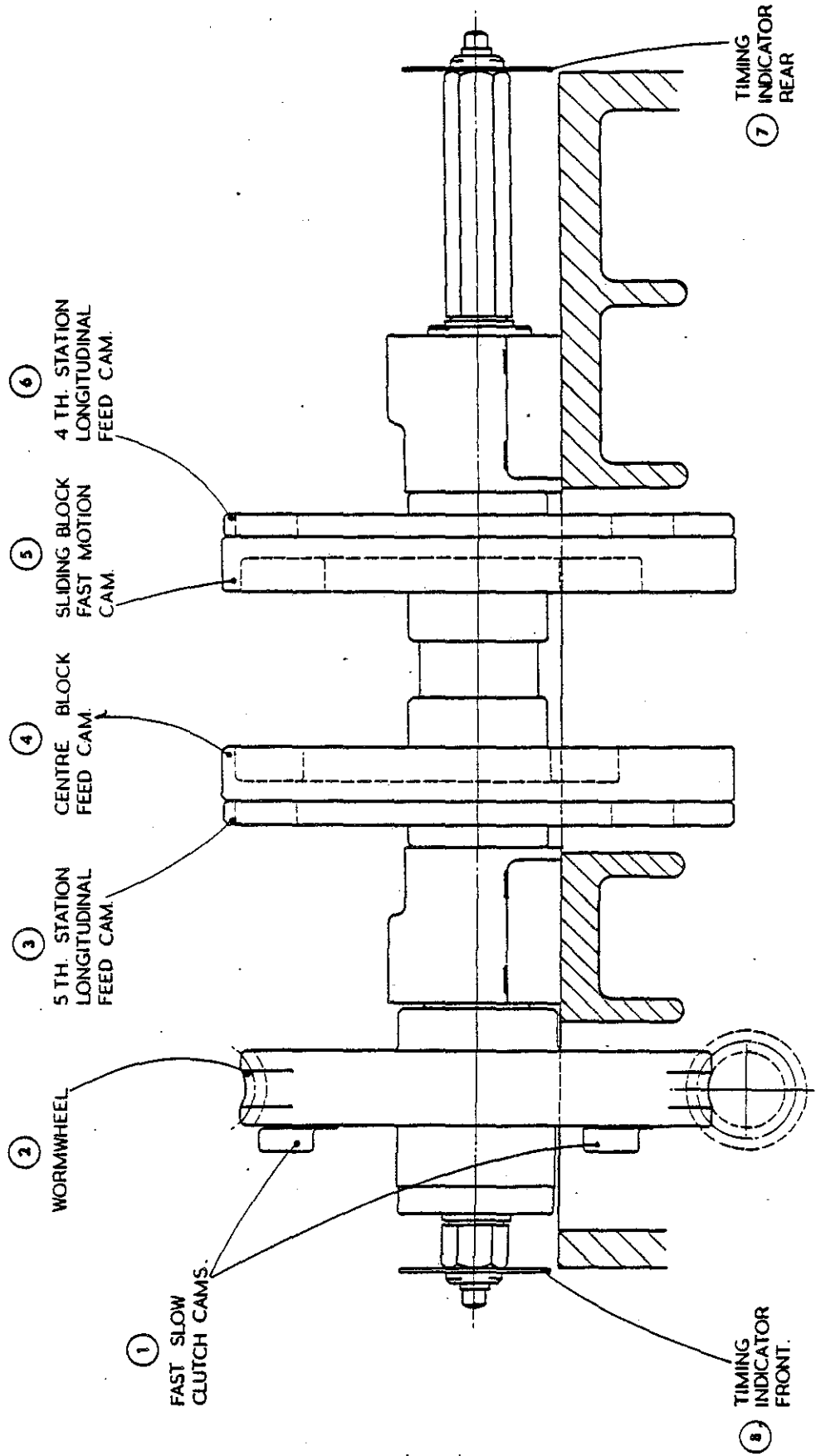
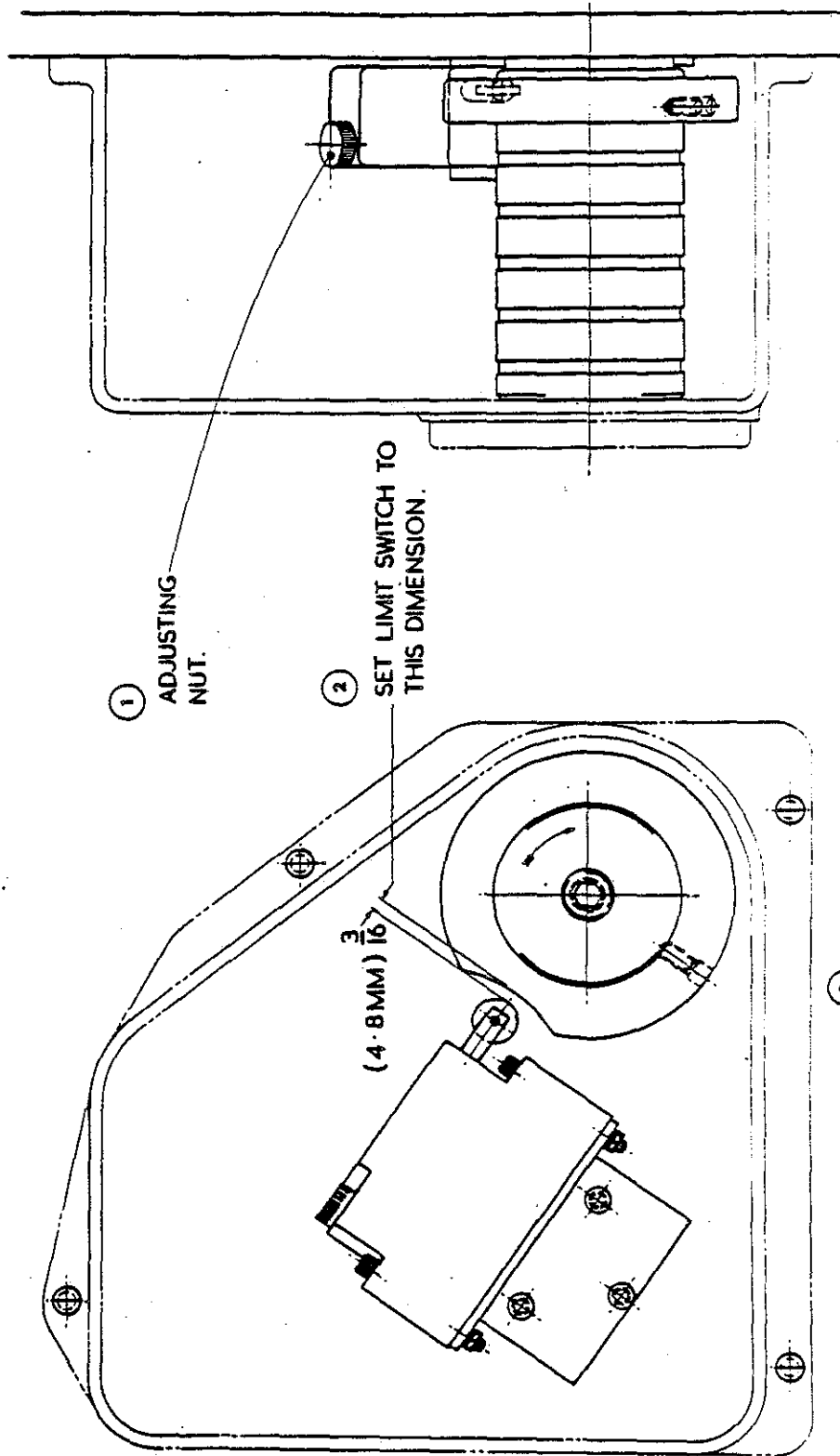


Fig 19 400 Y 70 UPPER CAMSHAFT.

Key to Fig.20

1. Adjusting Nut
2. Set Limit Switch to this dimension
3. Set cam to stop machine with collet open
and collet cam roller in cap between collet
cams, ie. with no pressure on collet closing
shoe



① ADJUSTING NUT.

② SET LIMIT SWITCH TO THIS DIMENSION.

③ SET CAM TO STOP MACHINE WITH COLLET OPEN & COLLET CAM ROLLER IN GAP BETWEEN COLLET CAMS. I.E. WITH NO PRESSURE ON COLLET CLOSING SHOE.

Fig. 20 400 Y 75 TIMING SWITCH SETTING

Key to Fig.21

1. Movement
2. Motion
3. Drum Index
4. Drum Locking
5. Longitudinal Slide actual slide movement
6. Longitudinal Slide Feed Cam
7. Longitudinal Slide Fast Motion Cam
8. Threading Stations 4 & 5 actual slide movement
9. Threading Stations 4 & 5 Feed Cam
10. Cross Slides
11. Collet
12. Bar Feed
13. Bar Stop
14. Auto-Stop
15. Camshaft Interlock
16. Reaming Stations 2 & 3 Standard Timing
17. Reaming Stations 2 & 3 Accelerated Timing
18. Reaming Stations 1 & 6 Standard Timing
19. Reaming Stations 1 & 6 Accelerated Timing
20. Threading Stations 2 & 3
21. Threading Stations 1 & 6
22. Transfer Arm Longitudinal Motion Station 6
23. Transfer Arm Rotary Motion Station 6
24. Synchronous Pick-Up & Back Burring Longitudinal Motion Station 6 & 3
25. Synchronous Plain Pick-Up Longitudinal Motion Station 6 & 3
26. Bar Stop with P.U. & B.B.
27. Fast 204°
28. Indexing
29. Unlocked
30. Closes
31. Test
32. Feed 59°
33. Feed 156°
34. Locked
35. Overtravel
36. Feed
37. Closed
38. Withdrawn
39. Eject
40. Pick-Up
41. Down to Pick-Up
42. Coarse Feed
43. Fine Feed
44. Eject
45. Out
46. Fast
47. Snaps Open
48. Hand Operated
49. Bar Feed
50. Advance
51. Trip
52. Feed
53. Up to Saw
54. Eject
55. Inwards

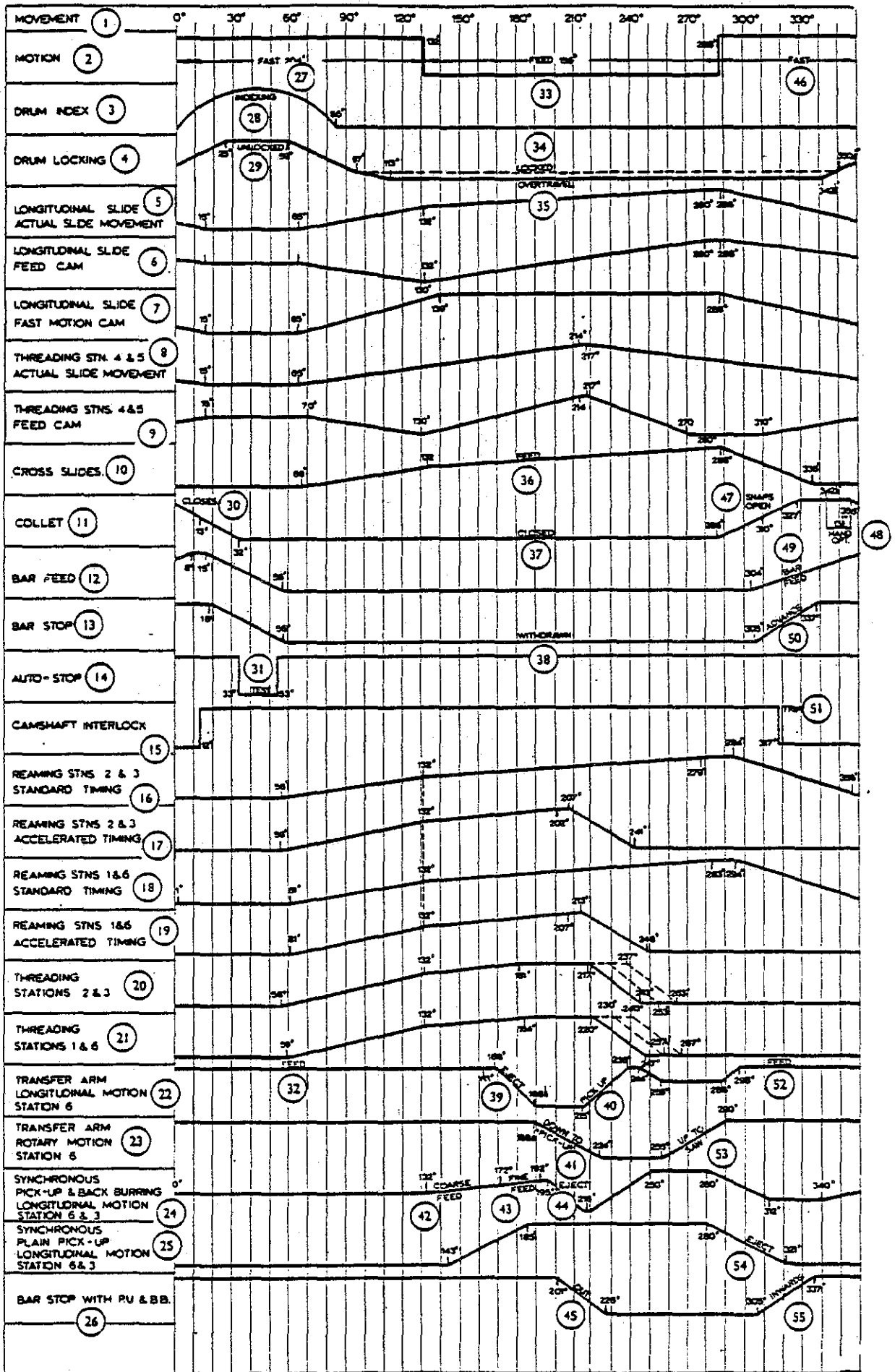


Fig. 21 TIMING DIAGRAM 400Y298

DRUM INDEXING & LOCKING

The spindle drum is indexed anti-clockwise, looking towards the collets, by gearing from the 4-slot Geneva wheel. The wheel is driven by the Geneva arm bolted and dowelled to the face of the cam drum on the main camshaft. The timing of the gears and the length of the Geneva arm are so arranged, that as the roller leaves the Geneva slot, the spindle drum is "over indexed" past the true position. This allows the spring-loaded latch to drop into position before the drum locking mechanism draws the drum into position against the hardened and ground locators.

The latch also serves to accurately locate the spindle drum and resist the torque of the centre shaft required to drive the spindles against the cut.

THE DRUM LOCKING MECHANISM at the rear of the machine is essentially a toggle mechanism arranged to lock the spindle drum very near the dead centre position of the toggle, and to hold it locked by means of a preloaded spring box.

The toggle mechanism should be adjusted with the machine cold so that the heel of the toggle link just touches the stop screw and the locking pad just locks the spindle drum when light hand pressure is applied to a tommy bar in the upper lever. To adjust the toggle mechanism the eccentric pin is adjusted and is locked by the pad bolt. The mechanism is so designed that during locking there is minimum sliding contact between the locking pad and the drum locators. With the toggle mechanism in the locked condition and the cam roller of the drum locking lever on the "locked" portion of the cam, the spring box should be adjusted to have 1/8" (3.2mm) clearance as shown.

Key to Fig.22

1. Pad Bolt
2. Drum Unlocked
3. Upper Lever
4. Stop Screw
5. Eccentric Pin, approximate position of the mark indicating the eccentric
6. Toggle Mechanism
7. Locking Pad
8. Drum Locator
9. Latch
10. Indexing
11. Camshaft Rotation
12. Drum Locked
13. Drum Locking Lever
14. Adjust Rod to maintain this dimension
15. Spring Box
16. Tommy bar in upper lever for testing clamping pressure
17. View on arrow "A"

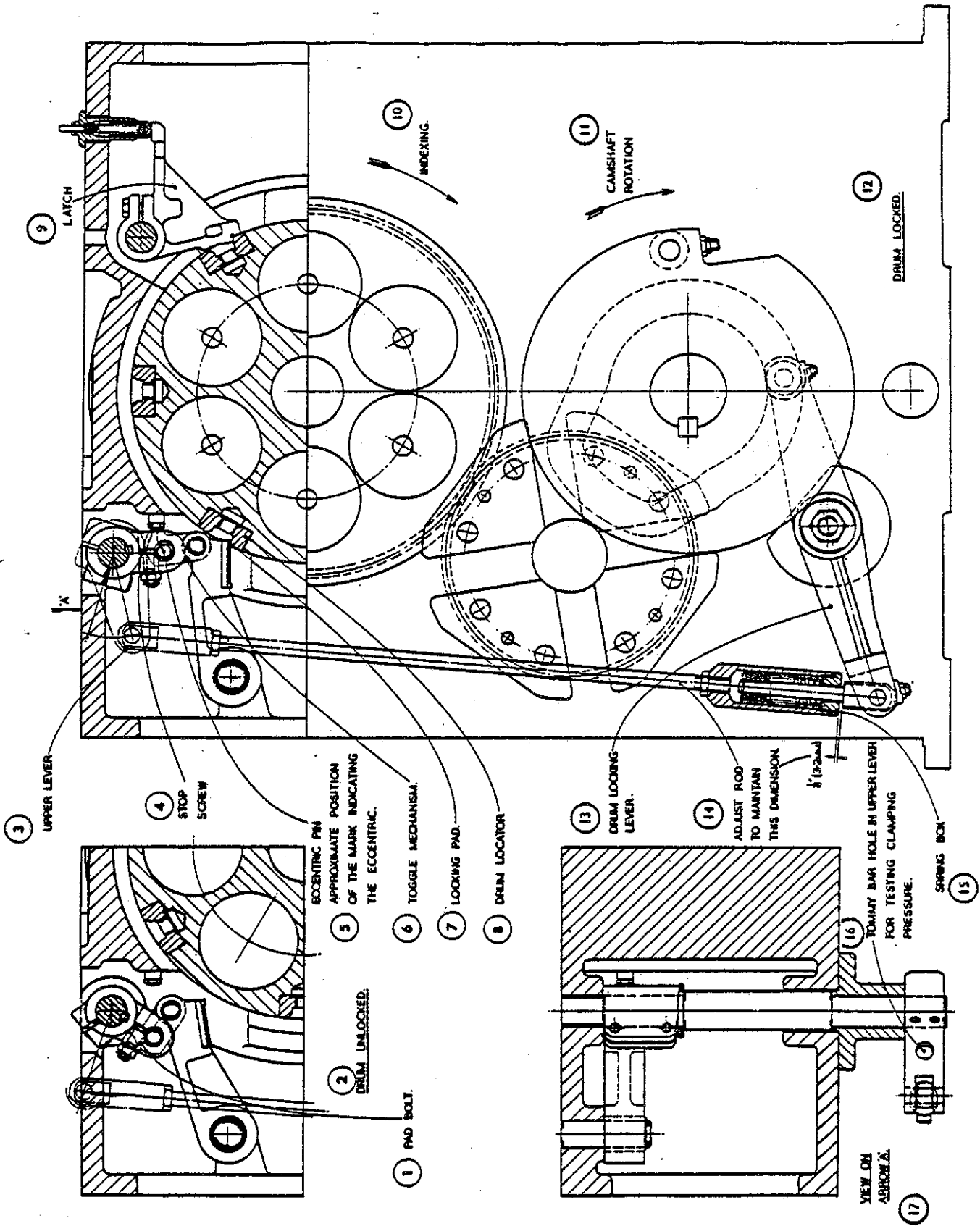


Fig. 22 DRUM INDEXING AND LOCKING MECHANISM 400 Z 57

CENTRE BLOCK & LONGITUDINAL SLIDES

CENTRE BLOCK (Fig.23)

The centre block, fitted with bushes and swarf scraper rings, slides on the centre guide, which indexes with the spindle drum. Torque loads on the block are taken against the guide faces in the beam by the guide block on the top of the guide arm, adjustment for wear being provided by a gib strip. Care should be taken, when adjusting the gib strip, to check adjustment throughout the travel, as wear will tend to occur mainly on the portion covered by the strokes in use over long periods.

Oil is fed from drip points in the beam through a strainer on the guide block and down a pipe to the reservoir between the bushes in the centre block. Drain and filler plugs are provided for periodical draining and flushing out.

The block is pushed by the lower link of the longitudinal mechanism and no endwise adjustment is provided. The stop rod is provided to control length accurately. Stop nuts should be slackened off well clear before adjusting the slide stroke, as the final position of the block is not constant for all strokes.

The faces and tenon slots are ground to close tolerances and the block positioned angularly so that stock tool holders and attachments may be fitted to any face without selection for height or centrality and without requiring boring in position.

LONGITUDINAL SLIDES

The longitudinal slides are mounted on parallel guides fitted on the beam, which are accurately adjusted for alignment and centrality by the tenon blocks. The tool slides are accurately adjusted for height and gib strips are provided.

Each slide is pushed by a rod screwed into the pusher bar and is adjustable for position by means of nuts on the rod. A spacer between the nuts is slightly wider than the bracket on the side of the slide, thereby allowing for slight misalignment of the push rod.

A stop rod is provided to control accurate length from each slide and is necked so that it will break in the event of overload. The stop nuts should be slackened well clear before adjusting slide stroke as the final position of the slide is not constant for all strokes.

Key to Fig.23

1. Adjusting Screws
2. Gib Strip
3. Locking Screws
4. Screwed Push Rod
5. Stop Rod
6. Alternative positions of slide base
7. Pusher Bar
8. Guide Arm
9. Centre Guide
10. Centre Block Stop
11. Centre Block
12. Enlarged view of scraper rings
13. Longitudinal Slide, Station 5
14. Longitudinal Slide, Station 4

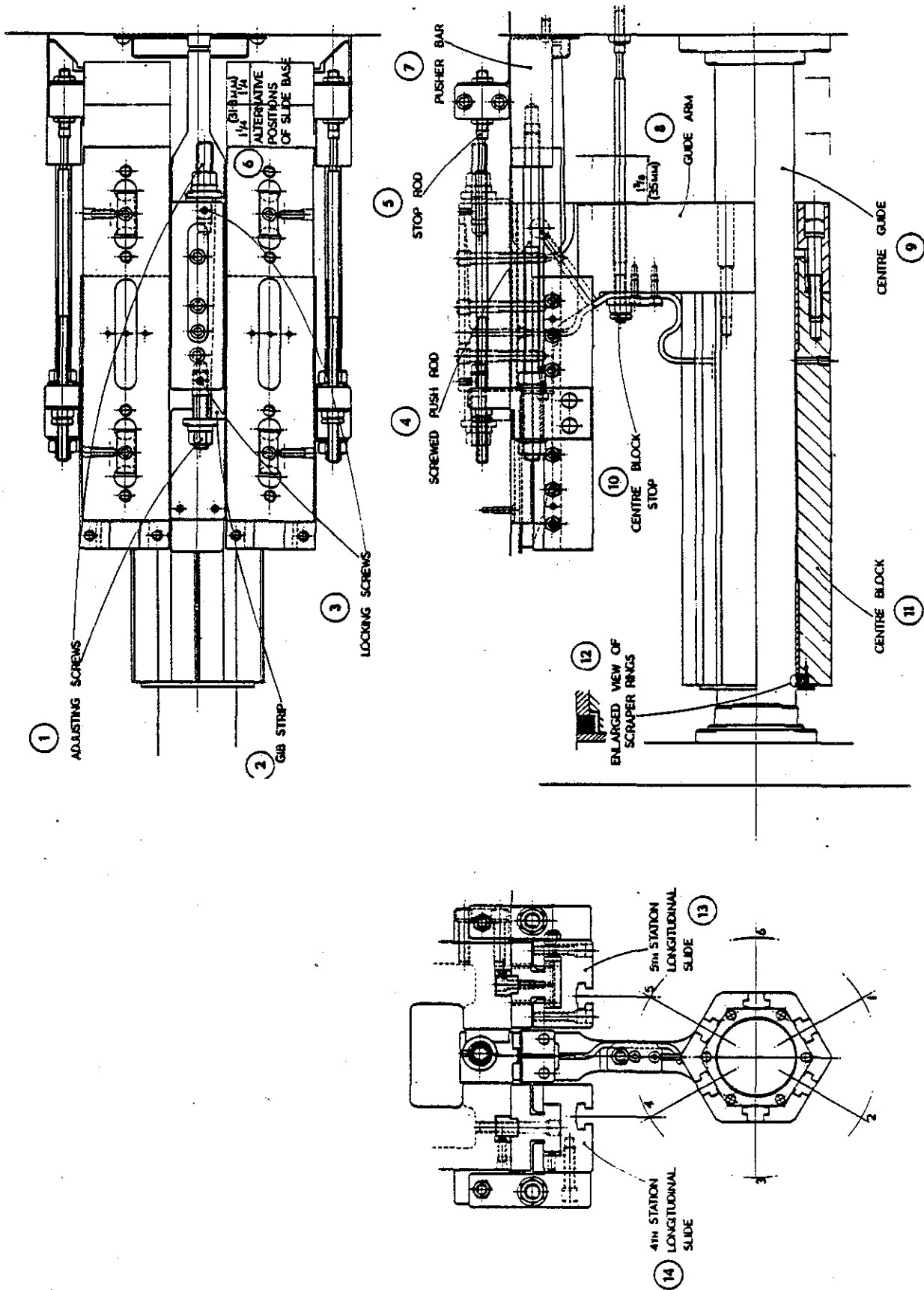


Fig. 23 CENTRE BLOCK AND LONGITUDINAL SLIDES 400 Z 61

CENTRE BLOCK & LONGITUDINAL SLIDES MECHANISM

The centre block link and the longitudinal slide pusher bars are operated by levers carried on fulcrum pins in the fast motion sliding block. The top ends of these levers are connected by links to stroke setting blocks in the feed operating levers which are each operated by a feed cam on the cam discs on the upper camshaft.

The fast motion sliding block is guided in a narrow guide in the top of the main drive housing with a gib strip at one side and is restrained vertically by keep strips at each side. It is roller operated from the fast motion cam and at the end of the fast approach stroke is locked against the transverse spring stop bar "A" so that it is held rigid during the slow feed cycle. The head of the stop screw is adjusted on assembly so that the spring bar is bent .035" (.90mm). The fast motion cam gives approach strokes shown on Fig.25. Two different ranges of feed strokes may be obtained for the longitudinal slides, by positioning the top links in either hole "A" or "B".

The feed stroke for each slide is set by sliding the stroke setting block up or down the slot in the feed operating lever to the position required, as indicated on the adjacent scale. Dead stops for the centre block and longitudinal slides must be slackened off before altering the stroke adjustment setting, as the fully forward position of the slides is not constant for all strokes.

The timing of the different movements is shown on the Timing Diagram Fig.21 and is as follows:

1. From 15° to 65° ie. mainly during indexing, the mechanism is in the position shown in Fig.24a.
2. As drum indexing and locking is completed, the fast motion cam moves the fast motion sliding block forward rapidly from 65° to 139° against the spring bar "A". During this time the feed operating levers move from mid position downwards to the start of feed stroke.
3. On completion of the fast approach stroke at 139°, the mechanism is in the position shown in Fig.24a. and the feed motion clutch is engaged. The feed operating levers commence their slow feed movement from 132° to 280°. The position of the strokes setting blocks determine the feed stroke which results.
4. At the end of slow feed the mechanism is in the position shown in Fig.24c and there is a "dwell" to 288° at the end of which the fast motion clutch is engaged.
5. From 288° to 15° the fast motion sliding block returns to the fully returned position while the feed levers return to the mid-position bringing the slides to their fully returned position.

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Operator's Handbook

When threading in Station 4 or 5, the feed cams are changed for standard threading cams, which have different timing and give different strokes.

When special cams are required for the operation of the 4th and/or 5th Station Longitudinal Slides the mechanism for either or both can be arranged as shown in Fig.24A. For this purpose the Fulcrum Pin 424 X 120 secured in the Sliding Block 423 Z 101 is withdrawn through the adjacent hole in the beam casting, and replaced by the flanged Fulcrum Pivot 242 X 152 which is normally fitted in a stowage position, for use only when required. The flanged fulcrum stud is arranged to carry the Side Lever 424 V 119, and is bolted to the beam casting as shown. Fig.24A, gives full details required for design of special cams using this method of operation. Special care should be taken when designing special cams, to ensure that movements which occur during the fast motion of the machine are as smooth as possible so as to avoid shocks and jerky movements due to unnecessary accelerations.

Key to Fig.24

1. Fast return stroke completed - 15° Fast approach stroke commences - 65°
2. Figure A
3. Fast approach stroke completed - 139°
Feed stroke commences - 132°
4. Stop bolt to deflect the spring bar 0.030in. -
0.035in. (0.76 - 0.9mm) when fully forward
5. Figure B
6. Feed stroke completed - 280° (8° dwell)
Fast return stroke commences - 288°
7. Fast motion sliding block
8. Operating link
9. Feed operating lever
10. Stroke setting block
11. Upper camshaft
12. Figure C
13. Stop bar
14. Link to centre block
15. Spring bar A

①

FAST RETURN STROKE COMPLETED -15°
FAST APPROACH STROKE COMMENCES -65°

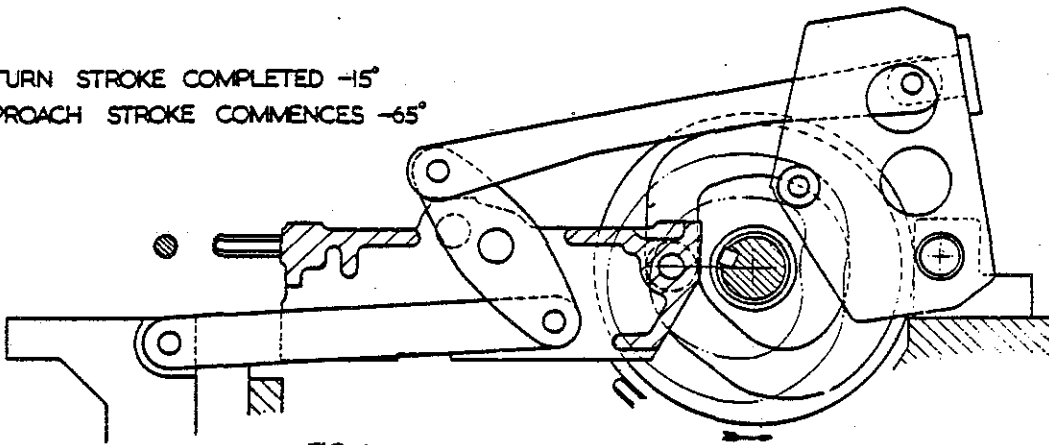


FIG. A.

②

③ FAST APPROACH STROKE COMPLETED -139°
FEED STROKE COMMENCES -132°

STOP BOLT TO DEFLECT
THE SPRING BAR
④ $0.30/0.35(0.76/0.9\text{MM})$
WHEN FULLY FORWARD

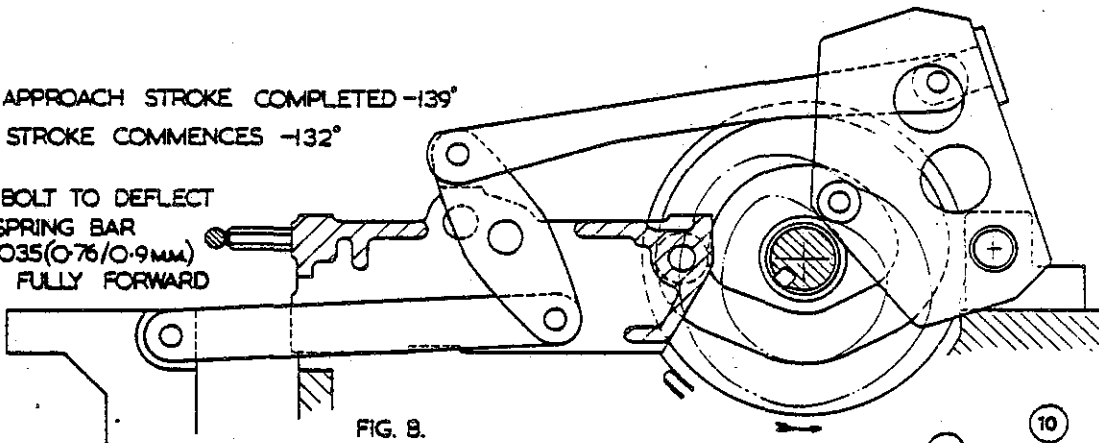


FIG. B.

⑤

⑧ OPERATING LINK
 ⑨ FEED OPERATING LEVER
 ⑩ STROKE SETTING BLOCK
 ⑦ FAST MOTION SLIDING BLOCK

⑥ FEED STROKE COMPLETED $-280^{\circ}(8^{\circ}\text{ DWELL})$
FAST RETURN STROKE COMMENCES -288°

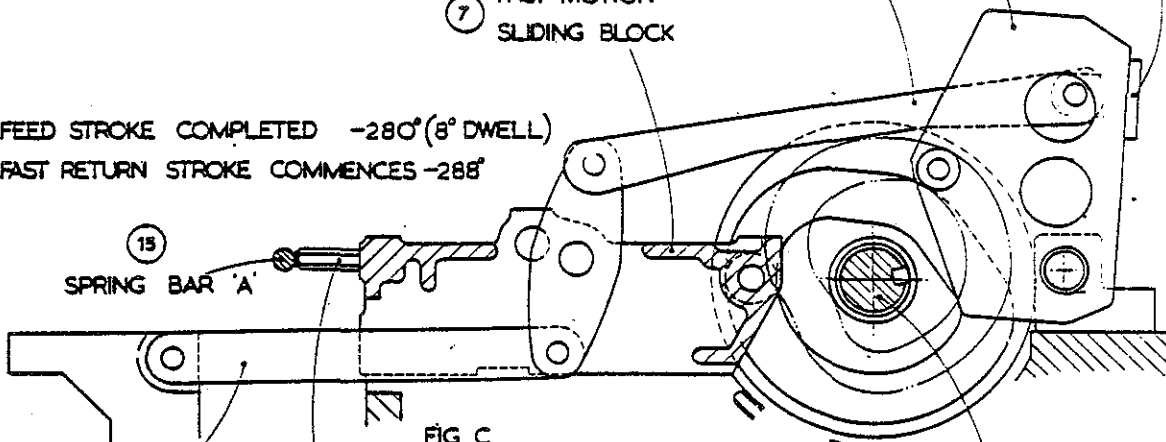


FIG. C.

⑬ SPRING BAR 'A'
 ⑭ LINK TO CENTRE BLOCK
 ⑮ STOP BAR

⑪ UPPER CAMSHAFT

Fig. 24 CENTRE BLOCK OPERATION 400 Y 60

CROSS SLIDES

Four main cross slides and the 6th station cut-off slides are fitted as standard, with the auxiliary 3rd Forming Slide available as optional equipment.

The two lower cross slides in Station 1 (front) and 2 (rear) are used principally for forming operations. They slide in dovetail ways in detachable guideways bolted and dowelled to the drum housing. The slideways are at an angle of 15° to the horizontal plane to give ample clearance for the work chute below the 6th (Cut-Off) station and to enable the toolholders to be clear when indexing takes place.

The two upper cross slides in Station 4 (rear) and 5 (front) are used for all kinds of finish forming, chamfering, undercutting, skiving and shaving operations. They can also be used to hold the pusher brackers for use with recessing slides. They slide in dovetail ways in detachable guideways bolted and dowelled to the beam at an angle of 30° to the vertical plane.

The cut-off slide in 6th Station and the optional 3rd Station Forming Slide, slide in brackets spigoted and dowelled to the drum housing.

All cross slides are fitted with micrometer knobs and locking screws.

All cross slides except the cut-off slide are fitted with dead-stops bearing on selective stop screws in the stop ring on the spindle drum. At each indexed position of the spindle drum, each slide dead-stop operates against a different stop screw so that such small errors as may exist in the position of spindles in the drum and in the accuracy of drum locators and locking can be cancelled out. During initial running these stops are accurately adjusted and should not normally require further adjustment for some time.

Cross Slide Stop Barrels are clamped in the stop brackets by pad bolts. If excessive stop pressure is used the pad bolts will slip. Each time cross slides are adjusted by the micrometer knob, the dead-stop should be reset. With an adjustable stroke mechanism of the type used it is impossible to arrange that the final position of each slide on the dwell portion of the cam is absolutely constant for all strokes in the range.

The position is, however, substantially constant apart from the micrometer adjustment, so that, with a particular type of toolholder in use on any slide, the micrometer needs only slight adjustment for a change in the slide stroke and a compensating adjustment of the stop should be made.

Each cross slide is fitted with a taper gib strip with an adjusting screw at each end. Both screws should be locked against the gib strip.

The front and rear lower slides are identical and the gib strips are, therefore, on opposite sides relative to the spindle nose. The same applies to the upper cross slides.

The lower slide guideways are protected from swarf by a short metal apron.

The top surface of slides are adjusted on assembly to bring the height of the spindle from the slide within the limits given on the Capacity Chart.

The capacity dimensions are so arranged that, from the nominal dimensions given, there is considerable backward adjustment and a limited amount of forward adjustment. Special toolholders designed to these nominal dimensions should then have adequate adjustment from the cross slide micrometer knob.

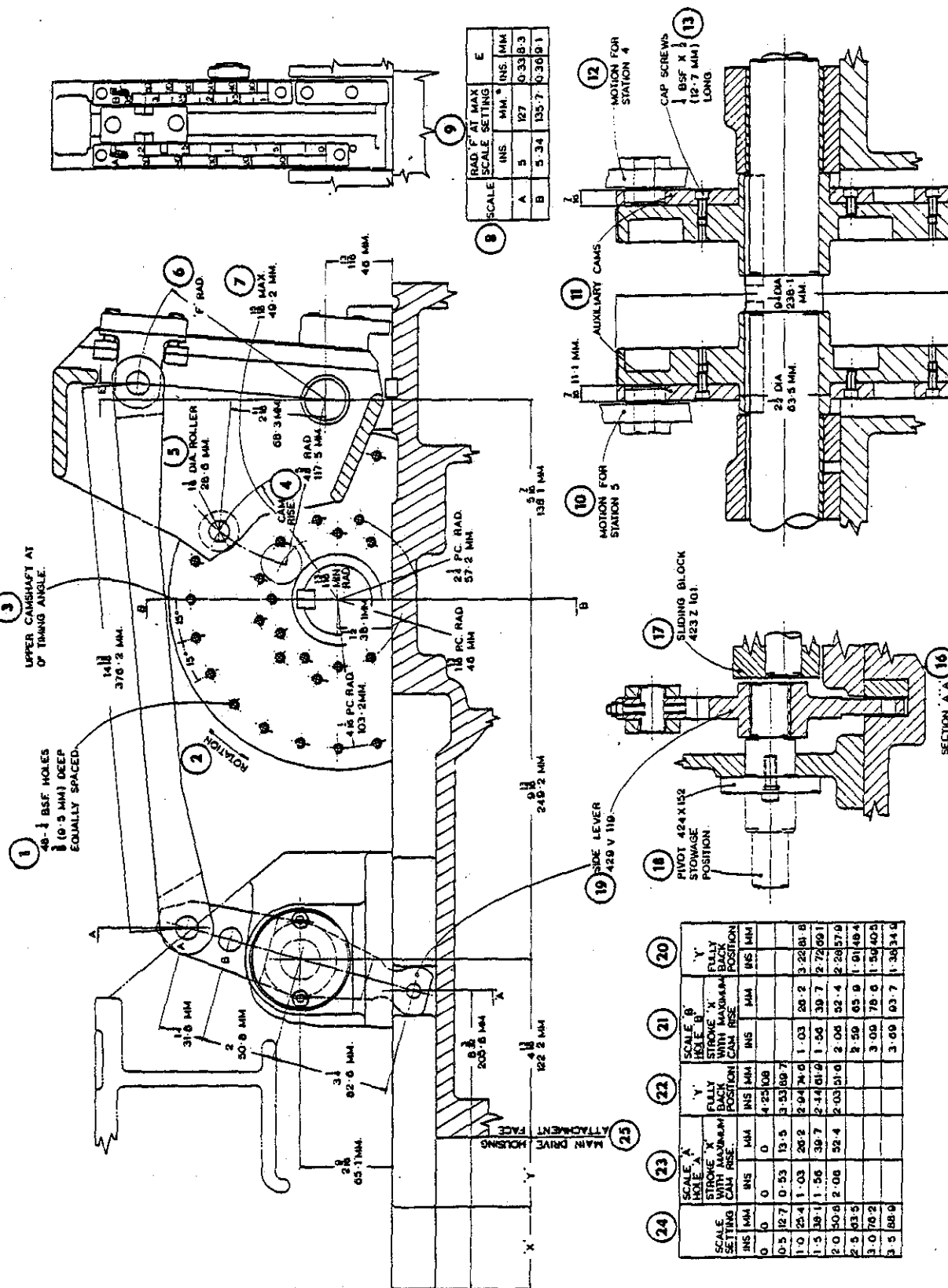
When Double Bar Feed arrangement is fitted, the cut-off slide then fitted in Station 3 is similar to the 6th station cut-off slide, i.e. narrower than the normal 3rd Forming Slide.

The Upper and Lower cross slides can be removed for cleaning by disconnecting the slide link and moving the slide forward until the forked lever under the slide, can be swung out of the way, the slide can then be drawn back from its guideway. The metal apron on the lower cross slide must be taken off before the slide can be removed.

To remove the intermediate cross slide, loosen and remove the centre holding bolt. Unscrew the micrometer adjusting knob from its thread and remove the slide.

Key to Fig. 24A

1. 48 1/4in. BSF holes 3/8in. (9.5mm) deep equally spaced
2. Rotation
3. Upper camshaft at 0° timing angle
4. Cam rise
5. 1.1/8in. (28.6mm) dia. roller
6. "F" radius
7. 1.15/16 in. (49.2mm) maximum
8. Scale
9. Radius "F" at maximum scale setting
10. Motion for station 5
11. Auxiliary cams
12. Motion for station 4
13. Cap screws 1/4 in. BSF x 1/2 in. (12.7mm) long
14. Section "BB"
15. View showing motion disconnected from fast motion block and connected to auxiliary motion pivot pin
16. Section "AA"
17. Sliding block 423 Z 101
18. Pivot 424 X 152 stowage position
19. Side lever 429 V 119
20. "Y" fully back position
21. Scale "B" hole "B" stroke "X" with maximum cam rise
22. "Y" fully back position
23. Scale "A" hole "A" stroke "X" with maximum cam rise
24. Scale setting
25. Main drive housing attachment face



SCALE	INS	MM	INS	MM	E
A	5	127	0.33	8.3	
B	5.34	135.7	0.30	7.6	

SCALE	INS	MM	SCALE	INS	MM	SCALE	INS	MM	SCALE	INS	MM	SCALE	INS	MM	SCALE	INS	MM
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.5	12.7	320	1.03	26.2	667	1.56	39.7	1008	2.00	50.8	1496	2.50	63.5	1601	3.00	76.2	1930
1.0	25.4	645	1.56	39.7	1008	2.00	50.8	1296	2.50	63.5	1601	3.00	76.2	1930	3.5	88.9	2267
1.5	38.1	968	2.00	50.8	1296	2.50	63.5	1601	3.00	76.2	1930	3.5	88.9	2267	4.0	101.6	2594
2.0	50.8	1296	2.50	63.5	1601	3.00	76.2	1930	3.5	88.9	2267	4.0	101.6	2594	4.5	114.3	2921
2.5	63.5	1601	3.00	76.2	1930	3.5	88.9	2267	4.0	101.6	2594	4.5	114.3	2921	5.0	127.0	3248
3.0	76.2	1930	3.5	88.9	2267	4.0	101.6	2594	4.5	114.3	2921	5.0	127.0	3248	5.5	139.7	3575
3.5	88.9	2267	4.0	101.6	2594	4.5	114.3	2921	5.0	127.0	3248	5.5	139.7	3575	6.0	152.4	3902

FIG.24A APPLICATION DRAWING OF AUXILIARY LONGITUDINAL MOTION STATIONS 4 & 5 424 Z 1

- 1 LONGITUDINAL SLIDES AND CENTRE BLOCK PUSHER ARM WITH CENTRE BLOCK SUPERPOSED
- 2 COOLANT TAP CENTRES
- 3 LONGITUDINAL SLIDES AND CENTRE BLOCK TEE SLOTS
- 4 CROSS-SLIDES TEE SLOTS
- 5 PLAN VIEW OF INTERMEDIATE SLIDES AND BAR STOP
- 6 MAXIMUM BAR FEED
- 7 DRUM HOUSING FACE
- 8 DIAMETER SPINDLE NOSE
- 9 FOR DOUBLE BAR FEED MACHINES A BAR STOP AND A NARROW CUTOFF SLIDE ARE FITTED IN STATION 3; DIMENSIONS AS SHOWN IN STATION
- 10 DRUM INDEXING
- 11 CAMELANT
- 12 ALL SLIDES SHOWN IN FULLY FORWARD POSITION. 0.625 IN (15.87 MM) BACKWARD ADJUSTMENT AVAILABLE ON ALL CROSS-SLIDES FROM POSITION SHOWN

14

LONGITUDINAL SLIDE STROKES.

FEED STROKE	USING SCALE B HOLE A		USING SCALE B HOLE B	
	APPROACH	TOTAL DRUM-LOCKED APPROACH	APPROACH	TOTAL DRUM-LOCKED APPROACH
0	1.45	2.2	---	---
0.5	1.3	2.0	---	---
1.0	1.15	1.8	1.6	2.45
1.5	1.0	1.55	1.4	2.20
2.0	.8	1.25	1.2	1.90
2.5	---	---	1.0	1.6
3.0	---	---	.90	1.35
3.5	---	---	.75	1.15

- 16 BETWEEN HOUSINGS
- 17 ATTACHMENT FACE
- 18 ALL SLIDES SHOWN FULLY FORWARD
- 19 FEED APPROACH
- 20 SEE APPROPRIATE TABLE OF VALUES
- 21 FEED APPROACH
- 22 ALTERNATIVE POSITIONS OF SLIDE BASE ADJUSTMENT
- 23 DRUM HOUSING FACE

13

CROSS SLIDE STROKES

STATION	1	2	3	4	5	6
FEED STROKE	0.70-5	0.70-5	0.70-5	0.70-5	0.70-5	0.70-5
APPROACH STROKE AT MIN (ZERO) FEED STROKE	.75	.91	.93	.93	.76	.75
APPROACH STROKE AT MAX FEED STROKE	.76	.76	.76	.72	.72	.73

15

CENTRE BLOCK STROKES.

FEED STROKE	APPROACH		TOTAL DRUM-LOCKED APPROACH	DIMENSION A
	---	---		
0	1.45	2.25	3.2	3.2
0.5	1.25	2.0	3.3	3.3
1.0	1.15	1.75	3.3	3.3
1.5	1.0	1.50	3.2	3.2
2.0	.75	1.25	2.95	2.95

Key to Fig. 25 CAPACITY CHART FOR 1-6 SPINDLE BAR AUTOMATIC 400 Z 21

For Metric version 400Z2 see Fig. 25A

- 1 LONGITUDINAL SLIDES AND CENTRE BLOCK
PUSHER ARM WITH CENTRE BLOCK SUPER-
IMPOSED
- 2 COOLANT TAP CENTRES
- 3 LONGITUDINAL SLIDES AND CENTRE BLOCK TEE
SLOTS
- 4 CROSS-SLIDES TEE SLOTS
- 5 PLAN VIEW OF INTERMEDIATE SLIDES AND BAR
STOP
- 6 MAXIMUM BAR FEED
- 7 DRUM HOUSING FACE
- 8 DIAMETER SPINDLE NOSE
- 9 FOR DOUBLE BAR FEED MACHINES A BAR STOP
AND A NARROW CUT-OFF SLIDE ARE FITTED IN
STATION 3; DIMENSIONS AS SHOWN IN STATION
6
- 10 DRUM INDEXING
- 11 CAMSHAFT

23

LONGITUDINAL SLIDE STROKES

FEED STROKE (IN INCHES)	USING SCALE B HOLE A		USING SCALE B HOLE B	
	APPROACH	TOTAL	APPROACH	TOTAL
0	34	57	—	—
10	34	53	—	—
20	31	48	—	—
30	27	45	38	60
40	24	38	34	54
50	21	33	31	48
60	—	—	24	41
70	—	—	24	38
80	—	—	21	33
85	—	—	20	31

22

CENTRE BLOCK STROKES

FEED STROKE (IN INCHES)	AVERAGE	
	APPROACH	TOTAL
0	37	61
10	33	55
20	30	48
30	28	44
40	25	38
50	20	32

- 12 ALL SLIDES SHOWN IN FULLY FORWARD POSI-
TION; 0.035 IN (1.57 MM) BACKWARD ADJUST-
MENT AVAILABLE ON ALL CROSS-SLIDES FROM
POSITION SHOWN
- 13 BETWEEN HOUSINGS
- 14 ATTACHMENT FACE
- 15 ALL SLIDES SHOWN FULLY FORWARD
- 16 FEED APPROACH
- 17 SEE APPROPRIATE TABLE OF VALUES
- 18 FEED APPROACH
- 19 ALTERNATIVE POSITIONS OF SLIDE BASE
ADJUSTMENT
- 20 DRUM HOUSING FACE
- 21 DRUM HOUSING FACE

24

CROSS SLIDE STROKES

STATION	CROSS SLIDE STROKES					
	1	2	3	4	5	6
FEED STROKE	0	10	10	10	10	10
APPROACH STROKE AT PLAN FEED STROKE	19	23	23	23	19	19
APPROACH STROKE AT PLAN FEED STROKE	19	20	20	19	19	19

Key to Fig. 25A CAPACITY CHART FOR 5/8-6 SPINDLE BAR AUTOMATIC (METRIC DIMENSIONS)

CROSS SLIDE OPERATING MECHANISM

The feed stroke for each cross slide is adjusted by sliding the appropriate stroke setting block along its slot to the position indicated by the scale and clamping it. As explained later, this should be done with the timing pointer at "dwell" on the dial.

Upper or lower slide stroke setting blocks are in T-slots, intermediate slide stroke setting blocks slide in a central slot and the adjustment is clamped by means of a ring spanner on the hexagon nuts on the four keep-strip studs.

The feed and fast motion of each rocking lever is derived from two cams - the appropriate cross slide feed cam and the fast motion cam. This mechanism is arranged to give a substantially constant fast motion and a slow feed motion. During indexing the mechanism is in the position shown by Fig.26a.

The Fast Approach stroke occurs from 66° to 132° by the fast motion cam operating the toggle mechanism, so that the upper toggle lever and the toggle link are almost straight and the toggle lever stop screws come into contact with the spring stop bar which is deflected $.030''$ ($.76\text{mm}$). The feed rocking lever cam roller moves only a short distance in the feed cam track, so that at the end of the fast approach stroke the mechanism is in the position shown by Fig.26b.

The feed stroke is obtained from 132° to 280° by the feed rocking lever being swung about its pivot on the toggle control lever by the feed cam. The toggle mechanism meanwhile remains stationary and extremely rigid in the locked position. At the end of the 8° "dwell" which follows the feed stroke, the mechanism is in the position shown in Fig.26c at 288° in which the T-slots in the feed rocking lever are approximately arcuate about the upper joint pins of the appropriate links.

Therefore, irrespective of the stroke adjustment, the cross slide position is substantially constant for a particular micrometer knob setting. For this reason it is easier to adjust the stroke in the "dwell" position, as indicated by the timing dial pointer, as the slides are not moved by adjusting the stroke. Access to the nuts locking the adjustments is also better in this position.

The fast return stroke is obtained from 288° to 366° during which time the mechanism returns to the position shown in Fig.26a.

Key to Fig.26

1. Link to rear upper cross slide station 4
2. Rocking lever for rear cross slide operation
3. Toggle levers
4. Fig. C
5. Feed stroke completed at 280° (8° dwell)
fast return stroke commences at 288°
6. Stop screw
7. Stop shaft
8. Adjust stop screw to give a stop shaft
deflection of 0.030in. (0.76mm)
9. Fast approach stroke completed and feed
stroke commences at 132° 10. Fig. B
11. Fig. A
12. Fast return stroke completed at 336° (90°
dwell), fast approach stroke commences
at 66°
13. Link to rear lower cross slide, station 2
14. Link to rear intermediate cross slide, station 3

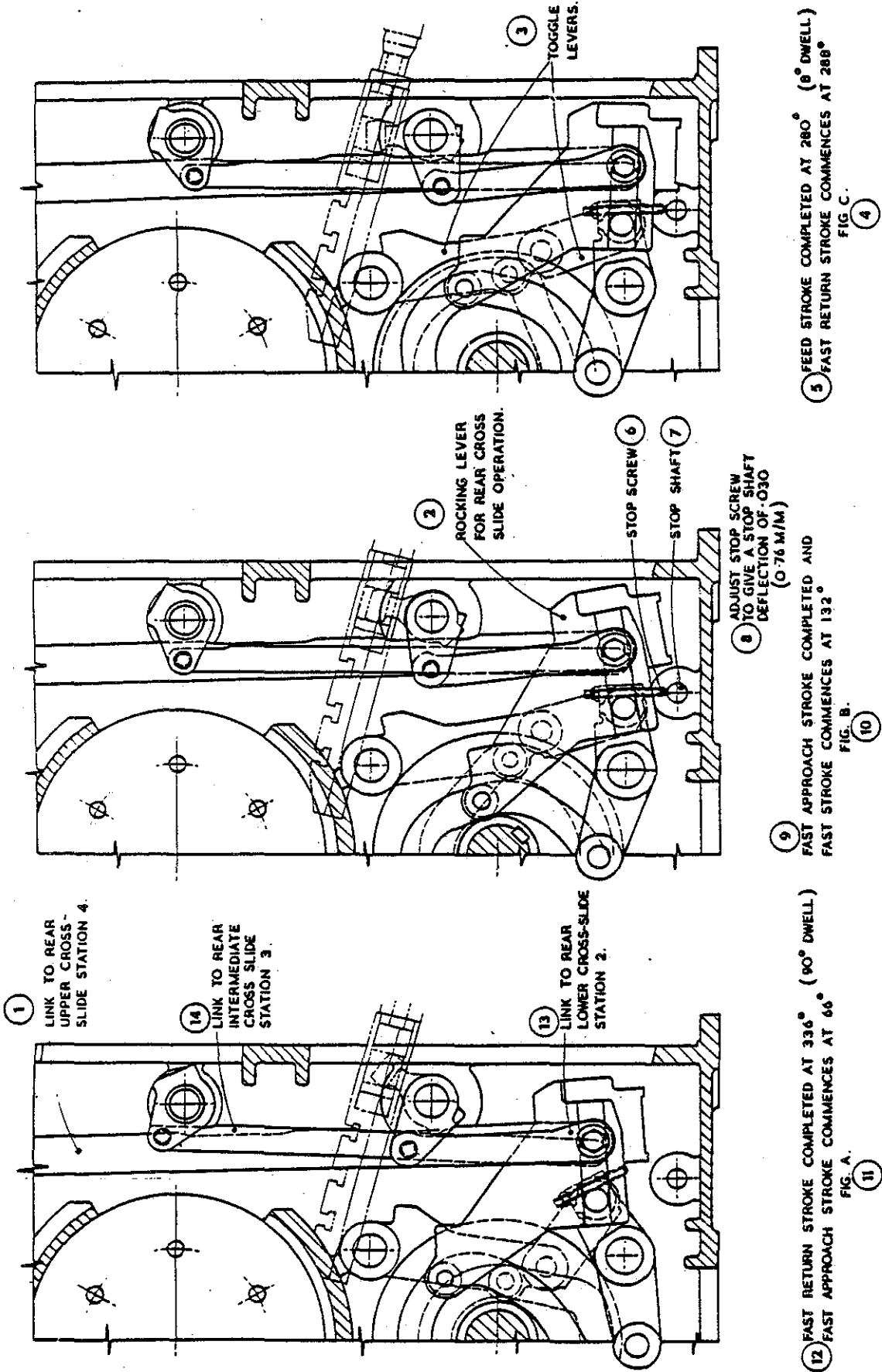


Fig. 26 400 Y 65 CROSS SLIDE OPERATION

AUXILIARY CROSS SLIDE OPERATION

For special purposes, where the timing of standard cross slide cams and operating mechanism is unsuitable, the cross slides can be operated from auxiliary cross slide mechanisms but with limitations as shown.

Auxiliary cams can be mounted on the auxiliary cam disc and on the front cross slide cam disc. Therefore, at any one time two auxiliary cross slide cams can be used.

A standard cam lever is available for operation by these cams and operates links which are used in place of the standard connections to the feed rocker levers. The identification of all parts required for conversions is shown.

The standard cam lever assembly has a split cap for the fulcrum boss and fits on the upper toggle lever pin between bosses on either side of the machine. A limited amount of adjustment of the ratio of the cam throw and the actual slide travel is provided, and gives a ratio of slide travel/cam throw according to the station scale setting. This scale cannot be calibrated in actual travel because of variations in the type of the cam used.

The link connecting to Stations 1, 2, 3 and 6 is out of line with the standard position of the lever on the side operating shaft or tube, so the lever must be moved along to bring it into line with the cam lever.

Information for design of Auxiliary Cross Slide cams is given on Fig.27 and should be used in conjunction with the Timing Diagram Fig.21.

Key to Fig.27

1. Station 4 or 5 Link assembly section 493A
493 V 120 assembly
2. Nominal fully forward slide position 2.1/2in.
(54mm) from spindle centre
3. Stroke setting stations 4 & 5
4. Absolute maximum
5. Slide stroke (1.1/2in. [28.6mm] cam rise)
6. 5th station 493A
7. Reverse side of scale used for station 1 & 2
operation
8. 1st section 493C
9. 6th section 493B
10. Section 493
11. Section 493
12. Cam block 493 X 111
13. 4th section 493A
14. 2nd section 493C
3rd section 493B
15. Section 493
16. Cam blank 493 X 111 width 0.440/0.435in. (11.18/
11.05mm)
17. Plan view of drum housing showing application
using the standard cam lever
Note: cam levers cannot be used operating on
the same cam disc
18. Application used when station 5 and any one
rear station operation is required
19. Cam lever assembly section 493

20. 4th section 493A
21. 2nd section 493C
3rd section 493B
22. Slide fully forward position
23. 1.1/8in. (28.6mm) cam stroke
24. Cams are interchangeable for front or rear operation by moving the cams around one set by moving the cams around one set of securing holes, if the error in timing shown on the diagram is permissible
25. 15° between holes
- 26.

STATION	SECTIONS REQUIRED					
	493	493A	493B	493C	493D	493E
1	1					
2	1					
3	1					
4	1	1				
5	1	1				
6	1			1		
15 2	2				2	
15 3	2			1	1	
15 4	2	1			1	
15 5	2	1			1	
25 6	2			1	1	
35 3	2			2		
45 6	2	1		1		
55 6	2	1		1		
* 25 5	1	1			1	1
* 35 5	1	1			1	1
* 45 5	1	2				

15 6 CANNOT BE USED
25 3 TOGETHER.
25 4
35 4

* THESE CONDITIONS REQUIRE THE SPECIAL CAM LEVER ASSEMBLY 493D WHICH CAN ALSO BE USED (IN CONJUNCTION WITH THE REQUISITE LINK ASSEMBLY) FOR OPERATION OF ANY OF THE OTHER TWO STATION CONDITIONS WITHOUT SUPPLYING AN ADDITIONAL 493 SECTION.

27. Special cam lever assembly 493D
28. 1st section 493C
6th section 493B
29. 5th section 493A
30. Cam lever assembly ssection 493-493V1 or special cam lever assembly section 493D - 493V2 (see plan view diagrams for application)
31. 1in. (25.4mm) diameter roller
32. 1.1/8in. (28.6mm) maximum cam stroke
33. Main camshaft
34. Keyway shown at 0° timing angle
35. 4.1/2 dia. - 0.001-0.003 in.
114.3 dia. - 0.025-0.076 mm.
36. Cam blank 493 X 111
37. Station 1 or 2 link assembly section 493C
493 X 118 assembly
38. Rotation
39. Nominal fully forward slide position 2.1/8in. (54mm) from spindle centre
40. Stroke setting ratio, stations 1 & 2
41. Slide stroke (1.1/8in. [28.6mm] cam rise)
42. 6th or 3rd link assembly section 493B
493 X 119 assembly
43. Stroke setting ratio
44. 2.1/8in. (54mm) nominal
45. Movement of "first tee slot" from the 2.1/8in. (54mm) position due to adjustment
46. Stroke setting ratio stations 6 & 3
47. Absolute maximum
48. Slide stroke (1.1/8in [28.6mm] cam rise)
49. 2.1/8in. (54mm) nominal
50. 6th (& 3rd)
51. Stroke setting ratio
52. Absolute maximum
53. 5th (& 4th)
54. 2.1/8in. (54mm) nominal
55. Stroke setting ratio

COLLET OPERATING MECHANISM

After the workpiece is cut off in 6th station, the collet is opened, bar stock is fed out to the bar stop which controls the length of bar fed out and the collet is closed as indexing commences (see Timing Diagrams Fig.21).

The Collet Operating Mechanism consists of a cam-operated lever carried on a fulcrum pin in the bracket suspended from the two guide bars and connected at its upper end to the collet slide by a link. The link pin in the upper end of the lever is eccentric and is clamped in the lever so that the position of the collet slide and bobbins have overtravel beyond the point where the collet is fully closed.

THE COLLET SLIDE slides on two round bars and carries the collet shoe, which is spring loaded to engage each collet bobbin in turn.

The shoe is spring loaded so, should a bobbin index out of position, the finger will be depressed, preventing damage. A stop rod and lock nuts are provided to prevent the slide being moved further than is required.

THE COLLET OPERATING SHOE LEVER engages and disengages the collet opening and closing operation. In the position shown on the drawing the collet operation is engaged. When the lever is moved to the position shown dotted, the collet operating shoe is disengaged from the collet bobbin, rendering the collet operating mechanism inoperative for setting purposes.

HAND OPERATION of the collet is provided by inserting the hand lever in its boss on the cam lever. The collet can be operated by hand only while the cam roller is in the gap provided in the cam track.

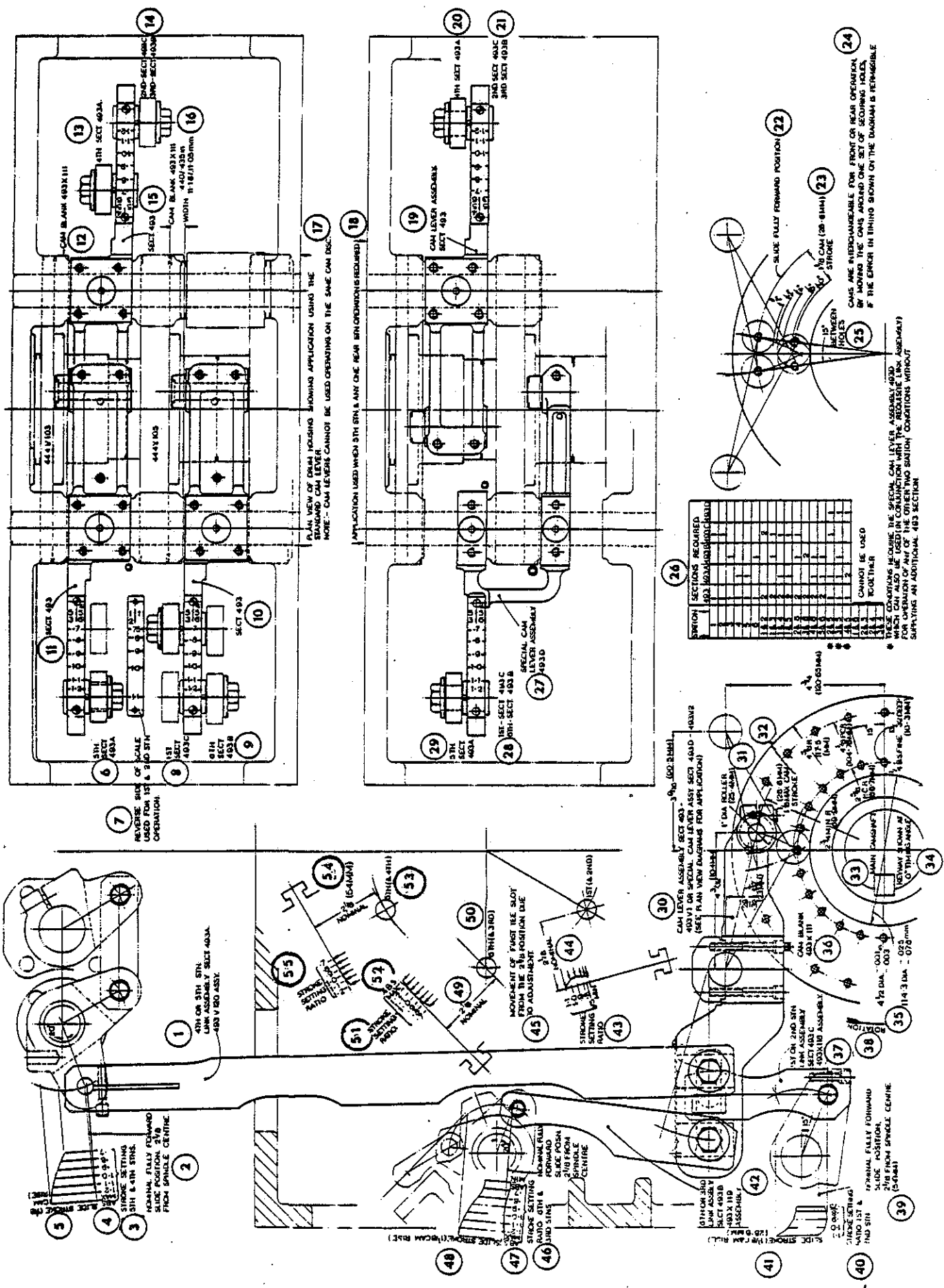


Fig. 27 AUXILIARY CROSS-SLIDE MOTION APPLICATION DRAWING 493 Z 10

Key to Fig.28

1. Indexing
2. Collet operating shoe lever
3. With the cam roller on top of the collet cam adjust eccentric pin to give $1/16$ in. (1.6mm) between the spindle bobbin and toggle carrier as shown. Check all spindles. Set nuts on stop rod $1/32$ in. (0.8mm) clear of the slide at the beginning of the stroke given by the cams. Adjust stop screw $1/32$ in. (0.8mm) clear of slide as shown
4. Eccentric pin
5. Spindle bobbin
6. Stop rod
7. Stop screw
8. Stroke
9. Operating shaft for double bar feed machines
10. Collet hand lever
11. Cam drum rotation

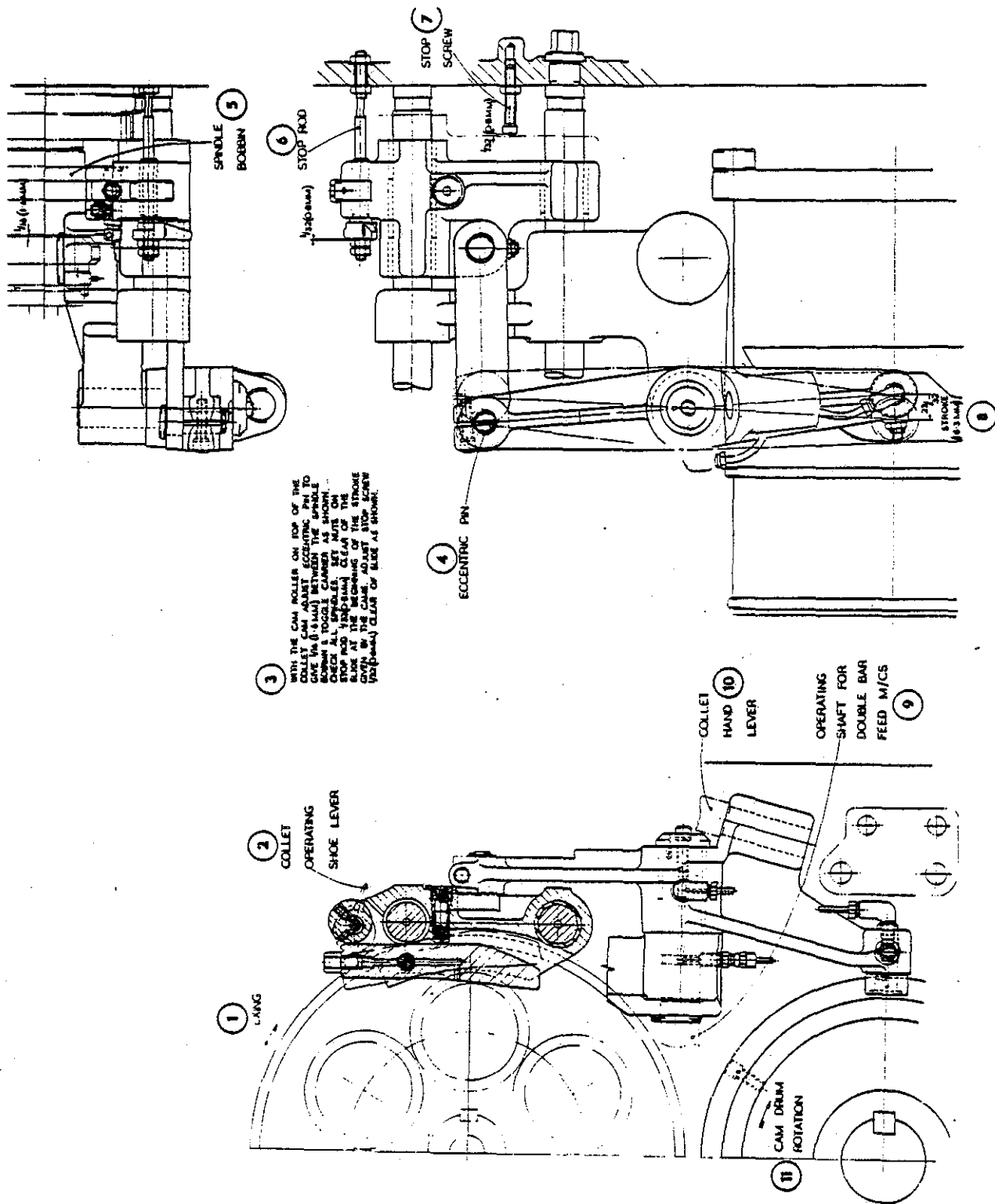


Fig. 28 400 Z 78 COLLET OPERATING MECHANISM

BAR FEED MECHANISM

The bar feed is operated in the forward direction by a spring-loaded, cam-controlled lever, carried on a fulcrum pin in the bracket suspended from the two guide bars and having an arcuate T-slot in its upper part. The return movement is positive by cam. Stop screws in the T-slot limit the range of adjustment of the slidable stroke-setting block which is clamped by a T-bolt and hexagon nut. A safety link connects the cam lever to the bar feed slide, which slides on the same guide rods as the collet slide.

THE BAR FEED SPRING TENSION may be adjusted by means of the two nuts on either side of the spring plate on the screwed rod. The spring load should always be kept at the maximum possible for consistent bar feeding length.

INCREASING LENGTH OF BAR FEED STROKE

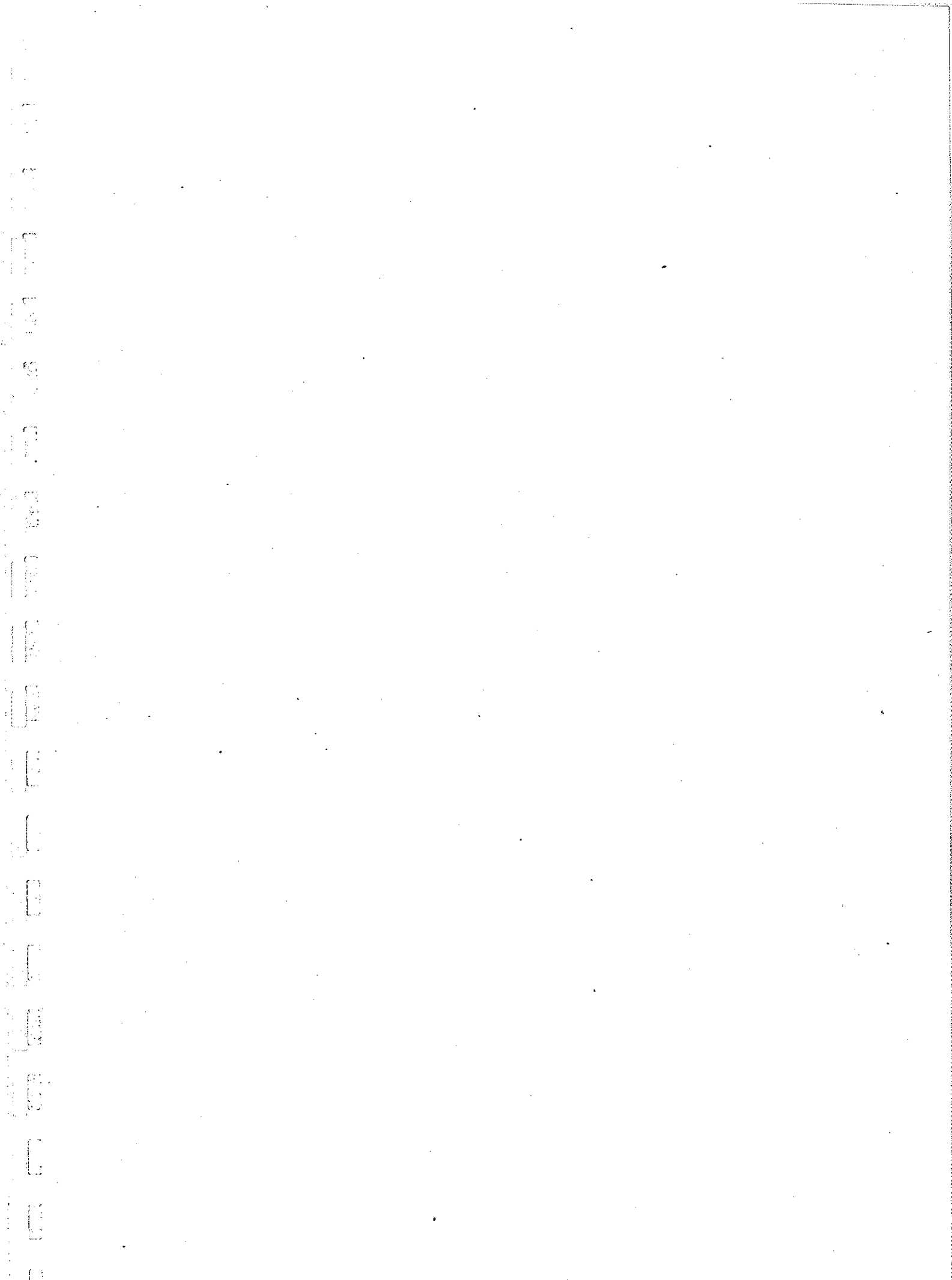
The forward position of the bar feed slide is constant irrespective of stroke. Before increasing the stroke with bars in the machine, open all collets, otherwise undue pressure is put on the Aligning Ring which will have to return all the feed tubes together over the increase in stroke and may cause the safety link to collapse. The guide ring must be loosened and pulled well back before the stroke is increased. With the bar feed mechanism in the forward position, the stroke can now be adjusted by moving the stroke setting block to the appropriate position on the scale. With the bar feed slide in its fully back position and preferably with the spindle drum locked, the Guide Ring should be reset so that there is about 1/32" (0.8mm) clearance between the feed tube ball bearings and the spring loaded guide ring segments.

DECREASING LENGTH OF BAR FEED STROKE

With the bar feed slide mechanism in the fully forward position, the stroke can be adjusted by moving the setting block to the appropriate position on the scale. The Guide Ring should be reset so that all the feed tube ball bearings are in line with the 1/32" (0.8mm) clearance between the feed tube ball bearings and the spring loaded guide ring segments.

THE SAFETY LINK between the bar feed stroke lever and the bar feed slide is hinged in the middle and provided with a spring plunger and suitable abutments, so that during the forward stroke it is rigid and during the return stroke it will collapse if there is an overload above the value determined by the plunger spring. Thus, with spring operation in the forward direction and the spring loaded safety link for protection in the return direction, the bar feed mechanism is protected from damage. Should the safety link collapse, the cause of overload should be found and corrected. The link can then be reset by tapping it into place with a mallet.

THE BAR FEED SLIDE has the feed tube Aligning Ring bolted to it and this serves to pull the feed tube in the 6th Station back after the collet is closed, during the first half of the index of the spindle from 6th to 1st station. The Aligning Ring also serves to keep all the other feed tubes in the back position.



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THE BAR FEED SHOE is carried in the bar feed slide and pushes the feed finger forward. The shoe is spring loaded against the bar feed shoe stop so that in the event of a feed tube indexing out of endwise position the shoe will be depressed without damage, but the tube will not be fed forward.

THE BAR FEED SHOE KNOB engages or disengages the bar feed and is mounted on a square shaft passing through the machine end bracket, into the bar feed shoe stop in the bar feed slide. The machine normally operates the bar feed spring loaded against its stop. However, when the bar feed shoe knob is turned to disengage the bar feed the shoe stop pushes the bar feed shoe out of engagement against its spring.

THE GUIDE RING (See Fig.30) is carried on two bars, is adjustable along them, and is clamped in position by pad bolts. The guide ring is cut away in 6th station to clear the bar feed slide. It guides the feed tube ball bearings during their progress from station to station between the aligning ring and several spring loaded ring segments which are provided to avoid damage in the event of faulty setting. The position of the guide ring should be set with the machine wound by hand to the position where the bar feed slide has been fully returned, and preferably with the spindle drum locked, so that there is about 1/32" (0.8mm) clearance between the feed tube ball bearings and the spring loaded guide ring segments.

Key to Fig.29

1. Safety link shown in disengaged position
2. Centre stop
3. Aligning ring
4. Scale
5. Stroke setting block
6. Guide ring
7. Safety link
8. Bar feed springs
9. Bar feed shoe disengaging knob
10. Operating shaft for double bar feed machines
11. End view bar feed mechanism
12. Rotation cam drum
13. 6th station
14. Bar feed shoe
15. Indexing

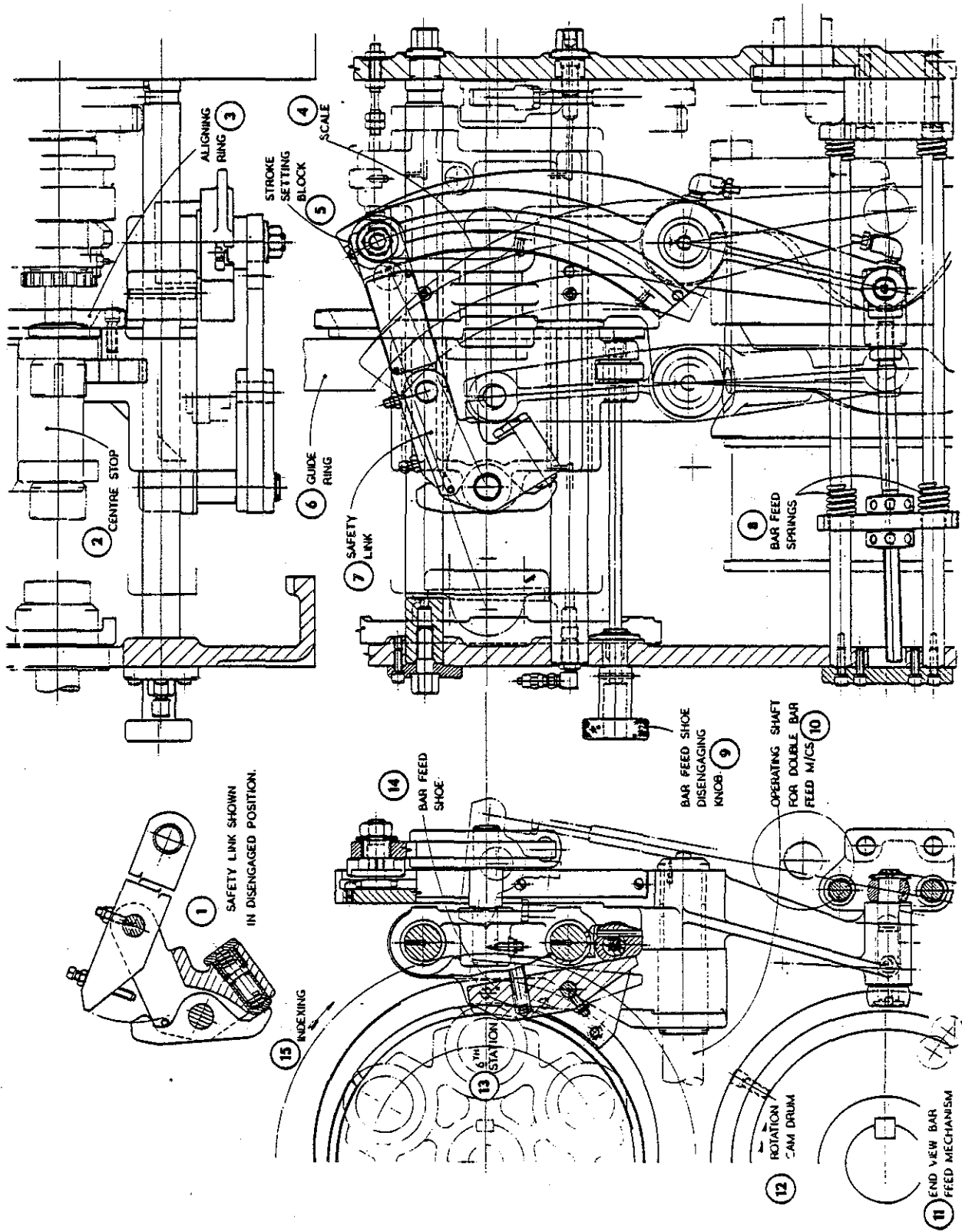


Fig. 29 400 Z 76 BAR FEED MECHANISM

BAR FEED TRIP MECHANISM

THE BAR FEED TRIP MECHANISM (Fig.30) (note setting instructions) is used to feel if the feed finger has been drawn off the end of the bar stock, and when this occurs to release a limit switch to prepare a circuit to an electrical control relay in the control panel. When the cam operate timing switch opens, the relay will be de-energised to open the circuit to the feed trip solenoid and light the signal lamp.

The Sensing Finger is mounted on sliding trip shaft A, spring loaded towards the stock carriage by the Spring B. The Finger is set in position (after setting the Guide Ring and with the spindle drum fully locked) so that it sits in the cut-out on the rear face of the Aligning Ring. When the boss of the sensing finger lever is pushed forwards into contact with Key L, the setting is correct. The spring load is adjusted by means of the cam sleeve nut C. The spring load is controlled by a cam roller D running on the cam E on the inside face of the stock carriage driving disc F. The sliding shaft is free to rotate within the cam roller bracket, for the purpose described later, and the cam roller bracket is prevented from twisting about the shaft by the torque pin.

The cam E is so timed that it will allow the sensing finger and its shaft to slide $5/32''$ (4mm) towards the stock carriage, if there is insufficient resistance, during the period when each spindle in turn is indexing towards the bar feeding station.

If the feed finger has already been drawn back off the end of the bar stock, the spring load of the sensing finger will be sufficient to draw it towards the stock carriage.

If the feed finger is still gripping the bar stock, the spring load of the sensing finger should be insufficient to move it.

When the feed tube, sensing finger, shaft and disc move endwise, the disc G releases the limit switch H, so that its contacts are opened. Opening of the limit switch contacts prepares the trip and signal relay circuit, which is completed when the cam operated timing switch closes at the point in the cycle when the collet is open ready for the next bar to be inserted. The feed clutch is tripped to brake, the signal lamp is illuminated and the main motor stops.

After a new bar has been loaded and the collet closed by hand, the reset button is depressed, opening the signal lamp circuit and energising the solenoid so that the feed clutch may again be engaged after starting the machine.

For setting up and test purposes, when it may be necessary to run the machine with only one or even no bars in the machine, the sensing mechanism may be made inoperative by turning the auto-stop selector switch to the position for continuous cycle.

An additional lever J is pivoted in the sensing mechanism bracket and is keyed to the sliding shaft which slides through it. The lever J has a spring and plunger attached to it and an adjustable stop is used to set the angular position of the sliding shaft and the sensing finger, so that the latter is set correctly in relation to the index circle and engages the feed tube ball bearing equally all round, but will be swung out of the way without damage in the event of a feed tube indexing out of alignment.

Key to Fig.30

1. Section "AA"
2. With roller "D" at bottom of cam track E on face of disc, trip disc to be set 0.002 in. (0.05mm) clear of the trip switch plunger.
3. Plan view
4. Key "L"
5. Set head of screw to obtain this clearance
6. Aligning ring
7. Guide ring
8. Cam "E" on face of disc
9. Roller "D" 10. Shaft "A"
11. Lever "J"
12. Spring "B"
13. Disc "F"
14. Lower pad bolt
15. Sensing finger
16. Nut "C"
17. Disc "G"
18. Limit switch "H"
19. Torque pin
20. Upper pad bolt

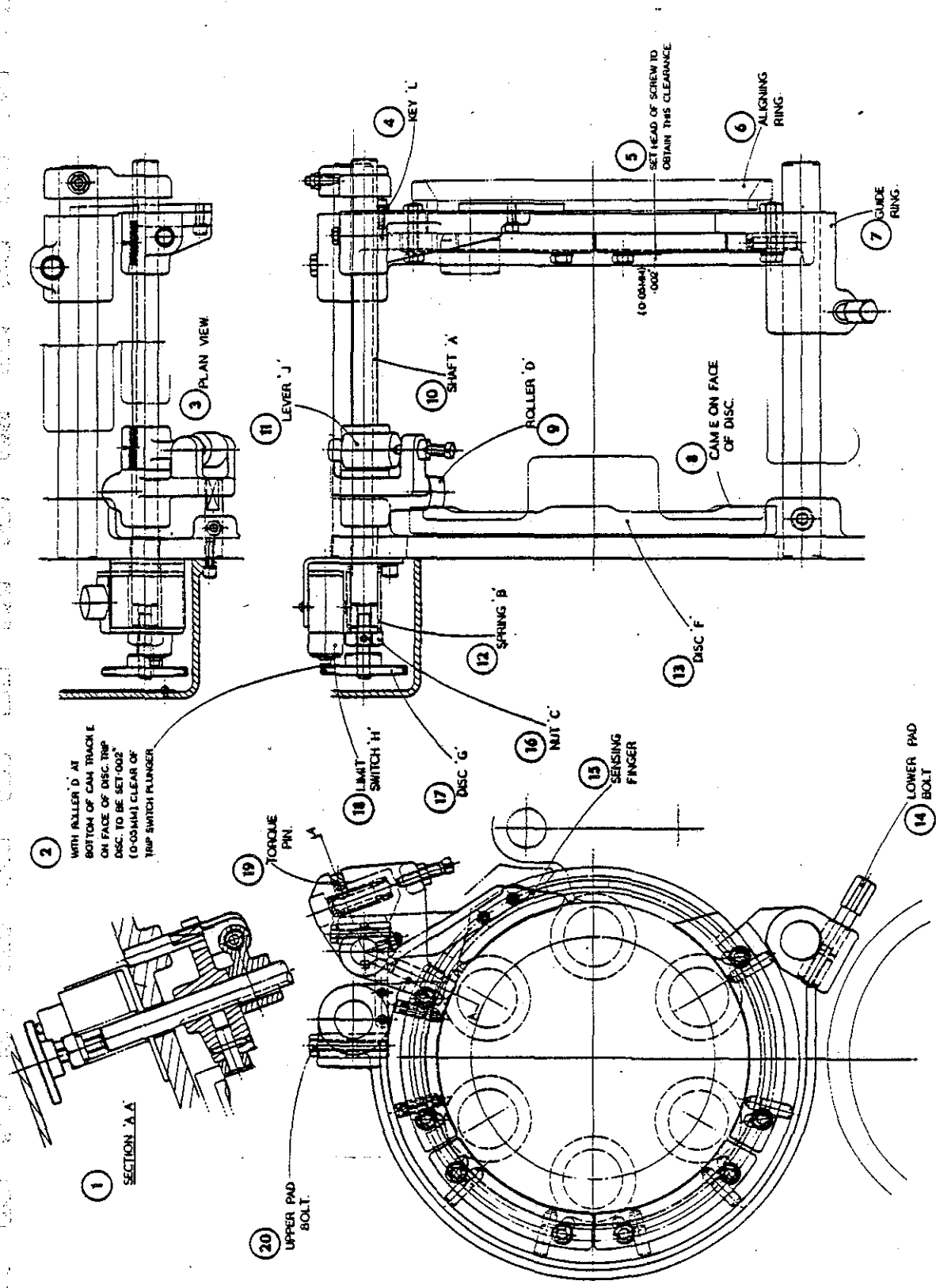


Fig. 30 400 Z 64 BAR FEED TRIP MECHANISM

BAR STOP NORMAL AND REVERSE OPERATION

THE BAR STOP (Fig.31)

The Bar Stop Arm is mounted and keyed to a shaft which passes through the Drum Housing and the Cut-off Slide base in 6th station. The arm is clamped to the shaft with a pad bolt which is an extension of the Bar Stop Hand Lever. To accommodate different lengths of component the bar stop arm can be adjusted along its shaft, and the projecting stop can be reversed in its Vee.

NORMAL OPERATION OF BAR STOP

The Bar Stop normally swings upwards away from its operative position. When required to clear attachments the operating mechanism can be arranged to swing the stop downwards away from its operative position, but this is not normally recommended as it tends to interfere with the work chute (see Reverse Operation of Bar Stop).

Operation of the stop is by a tension spring with a cam return through a pre-loaded spring box on a link rod "A" to a double lever "D" mounted on the end of the Bar Stop Shaft.

During the working cycle of the machine, the bar stop is held against the concentric portion of the cam, by the tension spring, and the stop is away from the workpiece. After parting-off the workpiece and during the fast motion return, the cam allows the tension spring to bring the stop into its operative position at 337°. The spring holds the double lever against a positive stop "B". After bar feeding, the cam operates the mechanism withdrawing the stop and the newly fed out bar indexes to Station 1.

Modifications to the angular position of the bar stop with respect to the spindle, can be made by turning the stop screw "C" and by adjusting the locknut on link rod "A" to maintain adequate spring tension.

When the automatic trip mechanism trips the feed clutch with the collet open ready for insertion of a new bar, the old bar end should first be taken out of the collet by holding the bar stop upwards out of its position by means of the Bar Stop Hand Lever which momentarily compresses the spring on the link rod.

REVERSE OPERATION OF THE BAR STOP

The stop can be arranged to swing downwards by connecting the link rod "A" to the second arm of the double lever "D". When used in this position, the stop "B" must be placed in the second hole and the stop screw "C" reversed. The links on the link rod may need re-adjustment after changing over.

With this arrangement the Hand Lever is used to depress the bar stop while removing bar ends.

DOUBLE BAR FEED MACHINES are equipped with bar stops in 3rd and 6th stations and the arrangement is similar in each case, both link rods and spring boxes being connected to the common cam lever.

WICKMAN 5/8"-6
Operator's Handbook

Key to Fig.31

1. Lever "D"
2. Spindle
3. Bar stop shown in maxium length position
4. Part-off slide
5. Bar stop swinging "up"
6. Bar stop swinging "down"
7. Bar stop hand lever
8. View on station 6 showing bar stop in position
9. Arrangement of rod and stop for reverse operation of bar stop
10. To set the bar stop to swing down change position of rod "A" in lever "D" and the position of stop ped "B", and adjust screw "A"
11. Ajust rod "A" to give 1/16 in. (1.6mm) operation of spring box
12. Operate bar stop in 3rd station on double bar feed machines
13. Camshaft
14. Rod "A"
15. Stop "B"
16. Stop screw "C"
17. Lever "D"
18. Plan view

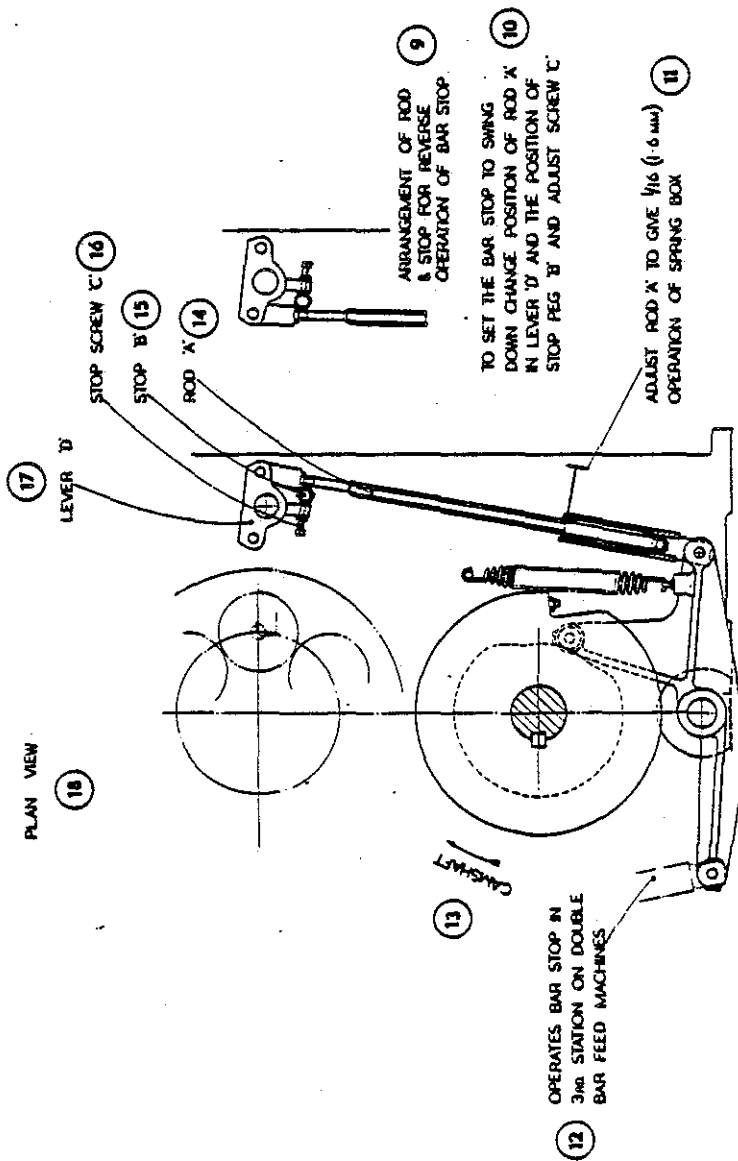
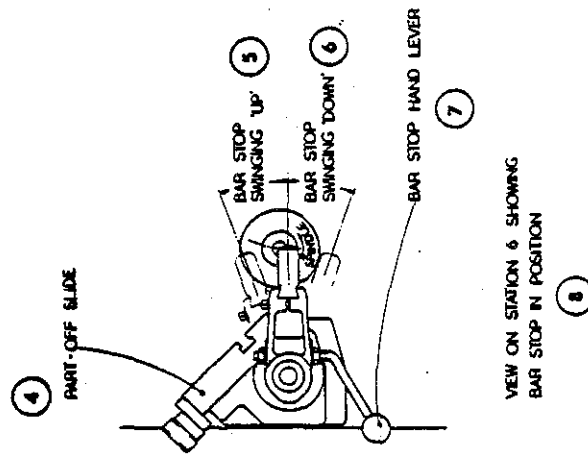
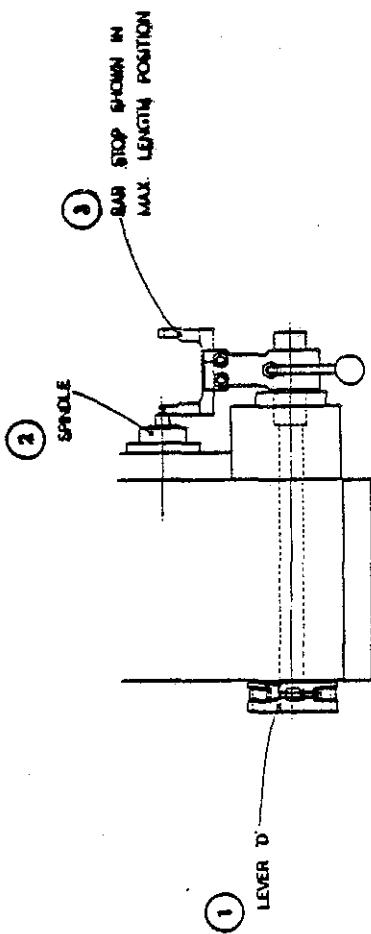


Fig. 31 400 Z 79 BAR STOP, STATION 6

STOCK CARRIAGE

THE STOCK CARRIAGE (Fig.32) comprises two principal parts, the stand and the tube assembly.

THE STAND is in one piece and should be bolted to the floor in line with the machine, to dimensions given on the Foundation Drawing. Alignment in both vertical and horizontal planes is made by adjusting the appropriate levelling screws which should bear on steel plates. The tube assembly rotates on extra wide ball bearings.

Cavities in the stand may be used for storing loose equipment and tools.

THE TUBE ASSEMBLY has a central tube to which are welded three discs to space and guide the stock tubes. The rear disc is carried on the bearings in the stand.

At the machine end the central tube is connected to its driving disc (which is driven by the stem bolted to the back of the spindle drum) by a coupling designed to have a limited amount of both torsional and longitudinal flexibility. A ring which is bolted and tenoned to the driving disc is provided with a cross pin and nylon plastic bushes which give the necessary flexibility.

When mounting the tube assembly, it is not necessary to detach the ring or cross pin as the complete assembly is secured by the six cap screws.

THE STOCK TUBES are each located by a flanged sleeve clamped to the tube and positioned against the Driving Disc by a headed peg and spring plunger. This arrangement, combined with slots in the flange of the sleeve, forms a bayonet type lock. Rapid release of the lock is by pushing the tube towards the driving disc, turning the tube clockwise approximately 15° and pulling back, bring the slot in the flange past the headed peg.

The stock tubes may be adjusted closer to the spindle by releasing the flanged sleeve on the tube and reclamping in the desired position. This is useful when using bars of small diameter, in order to give maximum support to the bar.

Before increasing the bar feed stroke, the tubes should be moved back, and then re-set after completing the change.

Key to Fig.32

1. Tube Assembly
2. End Bracket Face
3. Driving Disc
4. Section "A-A"
5. Stand

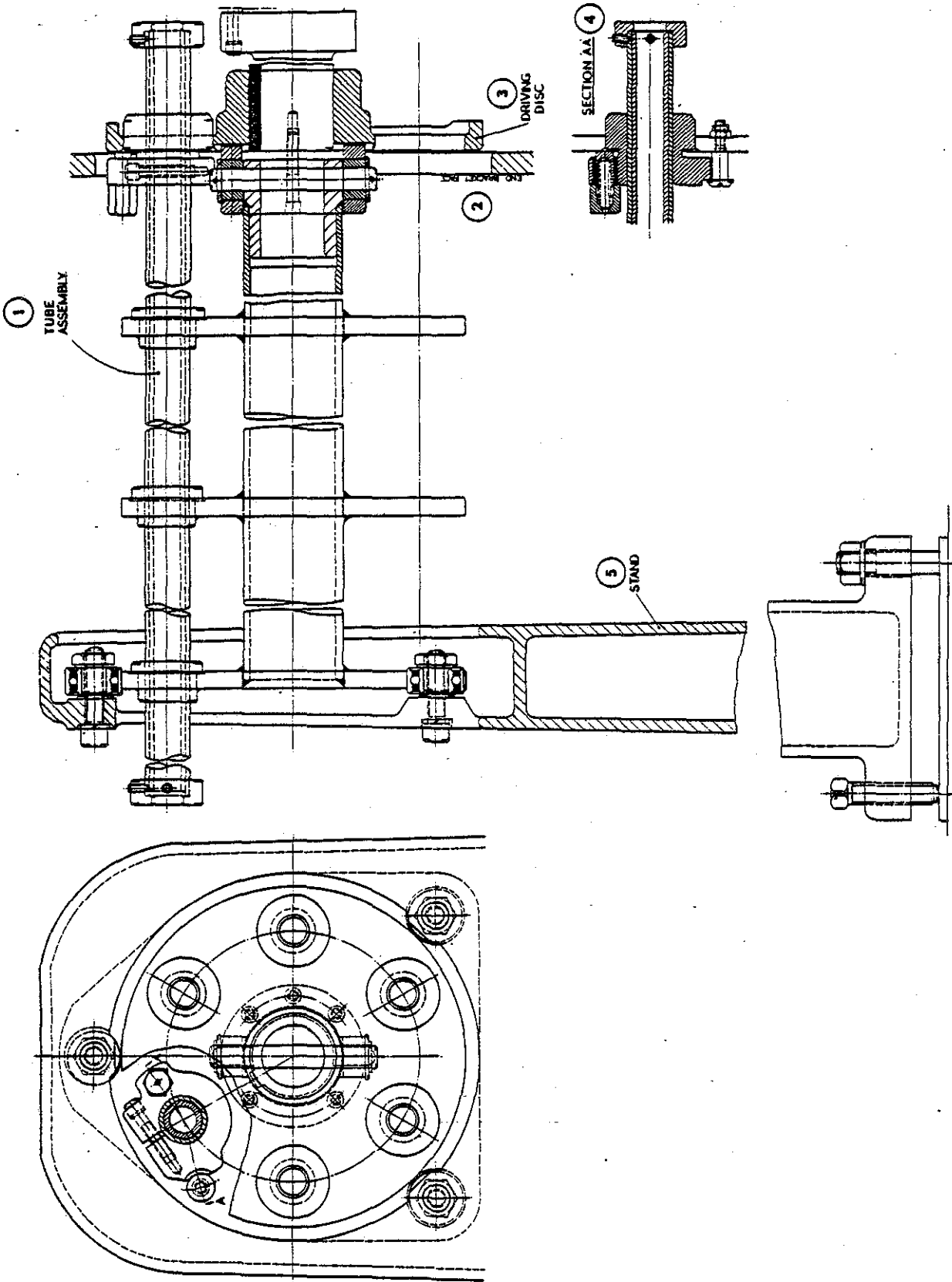


Fig. 32 400 Z 58 STOCK CARRIAGE

LUBRICATION SYSTEM

THE LUBRICATION OF THE MACHINE (See Figs.3,3a,3b) is by two separate systems, arranged to consume a minimum of oil. A low pressure splash system supplies oil to the spindles, ball bearings, clutches, gears etc, in the main drive housing, whilst a higher pressure cyclic system supplies metered amounts of oil to the cross slides, longitudinal slides, camshaft, collet and bar feed mechanism etc., in regular pulses determined by the pump drive ratio.

SPLASH SYSTEM. The oil reservoir for the low pressure system is situated in the tray below the main drive housing. The oil level should be inspected regularly and must be maintained on the sight glass. The tank is filled by removing an attachment drive compartment cover and pouring oil into the drive housing, it then drains into the tank. Mineral oil of viscosity 400/500 Redwood seconds at 70°F (Engler 15.5/20.5 at 20°C) should be used. The reservoir contains approximately 4 gallons (18 litres).

The lubrication pump is a gear pump chain driven from the constant speed shaft. The pump is mounted in an eccentric bush for chain adjustment. Oil is drawn through a strainer with an adjacent check valve to avoid priming. A relief valve is also fitted in the intake pipe to release pressure should the pump be removed and replaced the wrong way.

The oil is pumped through a "Purolator" scraper type filter to a further relief valve set at 20 PSI (1.4 kg/sq.cm) which does not normally require adjustment.

The "Purolator" knob (at the back of the machine) should be turned daily and the element removed and cleaned periodically.

The oil flow is then divided, some going to an oil tray at the top of the main drive housing, to drip on to gears and the longitudinal mechanism. The rest of the oil is passed through a "Micronic" filter* to the spindle housing to lubricate the spindle bearings and drive gears. Oil flow to the spindle bearings should be observed in the sight glasses provided, to see that the rate of feed is steady and in accordance with the instruction plate. The actual rate of feed should be adjusted according to spindle speed, but should be kept on the generous side while the machine is new.

A gauge to indicate the pressure in the lubrication system is fitted in the front of the machine above the main drive housing.

The lubrication system is adjusted correctly before despatch but should be checked on installation and at regular intervals.

CYCLIC SYSTEM. The combined pump and tank unit for the cyclic system is mounted at the back of the machine above the main motor (See Fig.5). The pump is driven by its own integral motor. The tank should be inspected and refilled regularly with mineral oil of viscosity 400/500 Redwood at 70°F (Engler 15.5/20.5 at 20°C).

The oil is pumped in regular pulses, approximately every 10 minutes direct to combined filter-meter fittings at the various lubrication points. The fittings are calibrated for flow and are non-adjustable. The oil supply pipe is also taken along the beam of the machine to lubricate points in the spindle housing and end bracket. A pressure gauge is mounted on the end bracket to indicate pressure in the system. During each pulse the pressure should rise to a minimum of 30 P.S.I. (2.10 kg/sq.cm.) and the sink slowly to not less than 2 P.S.I. (0.14 kg/sq.cm.).

The system can be checked for satisfactory operation by periodically setting the moveable pointer on the pressure gauge to zero. Operation of the pump will then move the pointer to indicate the maximum pressure in the system.

PRIMING THE CYCLIC SYSTEM

At the start of each day or night shift the system should be flooded by pressing the button on top of the pump unit, while observing the pressuregauge, for long enough to bring the pressure up, to 30 P.S.I. (2.1 kg/sq.cm.) so that all points receive an initial shot of oil.

SWARF CONVEYOR (Fig.2) Oil levels in the swarf conveyor must be kept up. A dip stick is proved in the reduction unit and a sight glass in the drive box.

COOLANT SYSTEM. The coolant pump is a gear pump attached to the main drive housing at the rear of the machine, chain driven from the main drive shaft. The coolant is drawn from the tray through a strainer box which should be kept fitted over the intake pipe while the pump is in use. The strainer should be turned for cleaning and dismantled occasionally.

A coupling fitted with a shear pin is fitted in the drive shaft to the pump.

Coolant taps are proved on the main drive housing and beam and alternative plugged tapped holes are proved for different tap positions or extra taps when necessary. A pressure relief valve is provided in the delivery pipe from the pump. Spare coolant hoses are provided in the machine tool kit.

*(the filter element of which should be renewed every 2,000 hours)

BAR LOADING

BAR STOCK should be in good condition and considerable loss in output time can be avoided if bars are of the correct size, clean, straight, free from burrs, scale, corrosion and paint. Bar loading is the operation performed most frequently, and can account for a large proportion of down time, particularly on longer components of short cycle time. To remove an unsatisfactory bar in a machine loses valuable working time; bars with a large variation in diameter are also disadvantageous. Grading of bars to approximately the same overall length is recommended.

BAR SHOULD BE CHAMFERED AT BOTH ENDS, and in certain cases an end squared to prevent drill breakage.

LOADING BARS. (Motor should normally be stopped after operation of the trip mechanism). Move the Bar Feed Shoe Lever to the disengaged position; operate the bar stop arm and remove the bar end; (do not drop bar end in conveyor); and withdraw stock carriage tube from the bayonet lock. Enter the new bar into the feeder tube until the feeder grips it (care is necessary on hexagon and formed section bar). Grip the bar by hand and withdraw tube and bar together. Return feeder tube and bar smartly against the aligning ring. Repeat until the bar protrudes slightly beyond the part-off blade. Close collet by hand, return the bar feed shoe lever to the engaged position, re-engage stock tube bayonet lock press reset button and start the machine.

Alternatively bars can be tapped lightly into the feed fingers from the rear end of the stock tubes. This procedure is not satisfactory for bars of insufficient stiffness.

In all cases a new set of bars should be inserted into the stock tubes in ample time before the set in use is consumed. The time at which bars can be inserted in the tubes can be readily timed on the first production run of a set-up.

Key to Fig.33

1. Diameter in inches
2. Spindle revolutions per minute
3. Cutting speed feed per minute
4. Cutting speed metres per minute
5. Diameter in millimetres

3

DIA. IN.	CUTTING SPEED FT./MIN.																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20				
1/8	131	118	105	93	82	73	65	59	52	47	42	37	33	29	26	24	21	19	16	15	13	12	10	400
3/16	262	236	209	186	165	147	131	117	105	94	84	73	65	59	52	47	42	37	33	29	26	24	21	450
1/4	393	353	314	279	247	220	196	176	157	141	126	110	98	88	79	71	63	56	49	44	39	35	31	500
5/16	524	471	419	372	330	293	262	235	209	188	168	147	131	117	105	94	84	74	66	59	52	47	42	42
3/8	654	589	524	465	412	367	327	293	262	236	209	183	164	147	131	118	105	93	82	73	65	59	52	52
7/16	785	707	628	558	495	440	393	352	314	283	251	220	196	176	157	141	126	112	99	88	79	71	63	63
1/2	818	736	654	581	515	458	409	367	327	295	262	229	205	183	164	147	131	116	103	92	82	74	65	65

4

DIA. M/M.	CUTTING SPEED METRES/MIN.																							
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
2	31	28	25	22	20	18	16	14	13	11	10	8.8	7.9	7.1	6.2	5.7	5.0	4.5	4.0	3.5	3.1	2.8	2.5	2.5
3	63	57	50	45	40	36	31	28	25	23	20	18	16	14	13	11	10	8.9	7.9	7	6.2	5.6	5	5
4	94	85	75	67	59	53	47	42	38	34	30	26	24	21	19	17	15	13	12	11	9.4	8.5	7.5	7.5
5	126	113	101	89	79	70	63	56	50	45	40	35	31	28	25	23	20	18	16	14	13	11	10	10
6	157	141	126	112	99	88	79	70	63	57	50	44	39	35	31	28	25	22	20	18	16	14	13	13
7	188	170	151	134	119	106	94	84	75	68	60	53	47	42	38	34	30	27	24	21	19	17	15	15
8	220	198	176	156	139	123	110	99	88	79	70	62	55	49	44	40	35	31	28	25	22	20	18	18
9	251	226	201	178	158	141	126	113	101	90	80	70	63	56	50	45	40	36	32	28	25	23	20	20

CUTTING SPEEDS

Fig. 33 400 V 153

SPINDLE STOPPING MACHINE 5/8"-6S

When very large quantities of components are to be produced, requiring one or more secondary cross operations such as cross drilling, reaming, milling, sawing, tapping etc., the 5/8"-6 machine can be supplied with Spindle Stopping Mechanism. Provision for fitting this mechanism is not made in normal machines and must be provided at an early stage of manufacture. The gear ratio from the centre shaft to the spindles is different from the standard machine, so that all attachment drive ratios are different.

An entirely special spindle drum is used, each spindle running on a pair of precision pre-loaded "Face to Face" angular contact ball journals at the rear and a precision parallel roller journal at the front. The range of spindle speeds available is lower than on the standard machine (see Fig.11)

Each spindle gear is driven from the central gear and runs loosely on ball and roller bearings when the multi-plate clutch is disengaged and the multi-plate brake is engaged.

The multi-plate clutch on each spindle is engaged by the axial thrust developed by a row of balls, squeezed inwards against conical and flat faces by the clutch bobbin, when it is shifted by the cam operated clutch glut. The clutch is adjusted by turning the slotted locknut from serration to serration on its right hand thread, the serrations being maintained in engagement by the clutch plate separating springs.

The clutch is accessible for adjustment in 6th Station and an adjustment of one serration at a time can easily be made by a sharp hammer blow on a suitable punch. After each adjustment each clutch must be checked by levering the glut rod into and out of engagement by means of the tool provided in the tool kit, ensuring that the adjustment is not too tight and that the glut pressure is not so excessive as to cause overheating or a jam.

The brake is non-adjustable, as a series of preloaded cushion springs are provided to limit and maintain the torque, and is sufficient to brake the spindles rapidly to a standstill.

The clutch gluts are operated in turn, during indexing of the spindle drum, by a suitable series of cams secured in the drum housing. The cams may be selected to suit varying tooling conditions and are supplied to order.

When fitting new cams, handwind through index to ensure that the rollers pass freely all round the cam track. Cross slide attachments and drives for use on Spindle Stopping machines are usually designed for a special and limited application to suit customer's components.

DISMANTLING

Spindles should be dismantled in 6th Station. Feed Tubes, collet tubes, collet adjustment assembly and the collet bobbin are removed from the rear end of the spindle. The toggle pins, toggles toggle carrier and thrust pads are removed followed by the rear bearing nut and spacer. The clutch glut can be removed after unscrewing the taper point screw on the operating rod and extracting the rod from the back.

With the centre block in the fully retracted position, the front bearing nose cap can be removed. The spindle is then carefully removed, leaving behind the rear spindle bearing, and stripping drive gear and bearings, the drive clutch carrier and the clutch plates and adjusting rings.

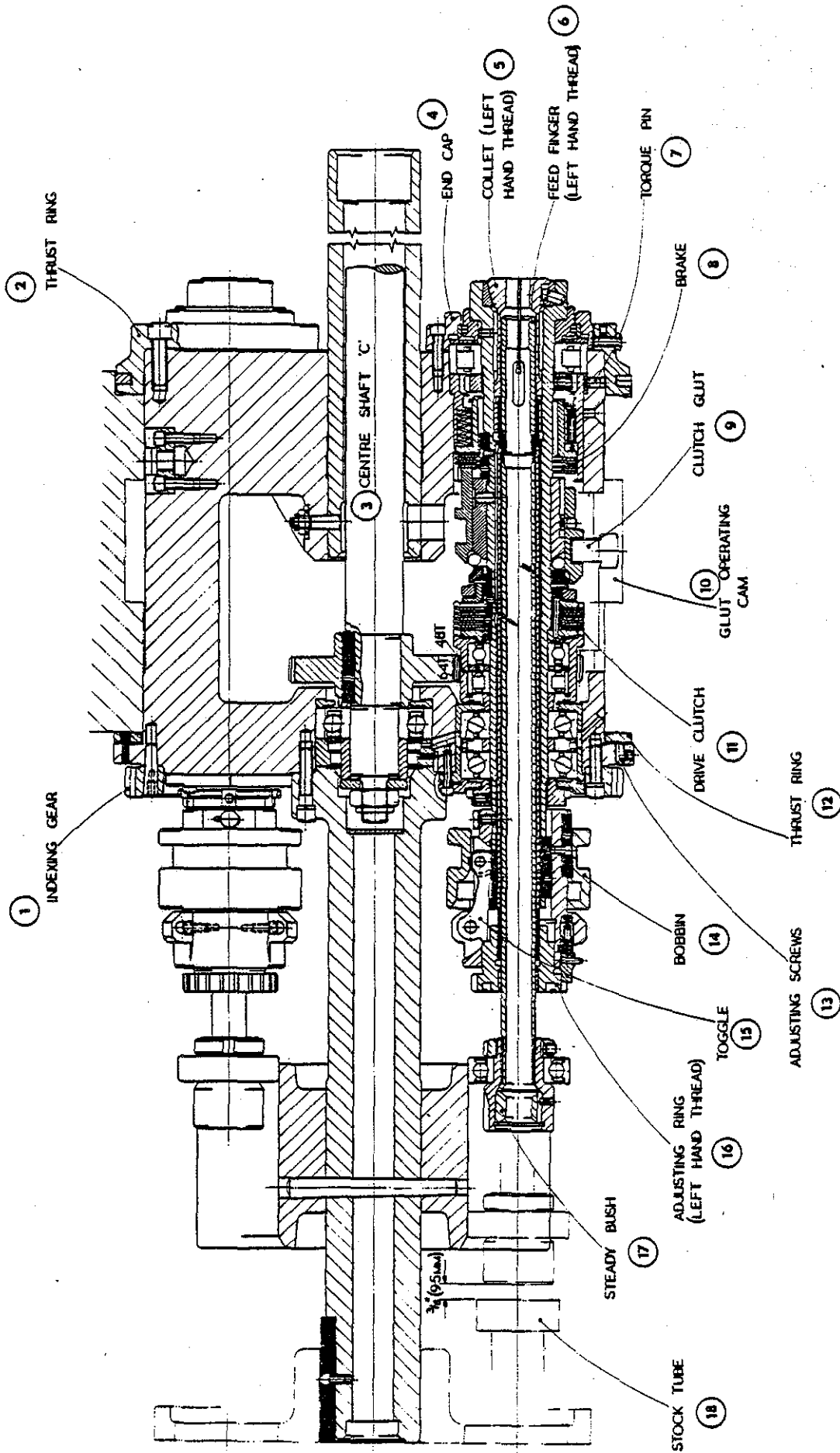
When reassembling spindles the brake housing keyway must be aligned with the torque pin fitted in the front bearing bore.

Retaining clips should be made to hold the drive clutch plate assembly together.

The clutch should be disengaged when tightening the rear bearing locknut. The spindle nose cap should be eased into place over the piston ring seal, and the screws carefully tightened equally so as not to distort the nose cap.

Key to Fig.34

1. Indexing gear
2. Thrust ring
3. Centre shaft "C"
4. End cap
5. Collet (left hand thread)
6. Feed finger (left hand thread)
7. Torque pin
8. Brake
9. Clutch glut
10. Glut operating cam
11. Drive clutch
12. Thrust ring
13. Adjusting screws
14. Bobbin
15. Toggle
16. Adjusting ring (left hand thread)
17. Steady bush
18. Stock tube



WORK SPINDLE ARRANGEMENT

Fig. 34 400 Z 83

DOUBLE BAR FEEDING MACHINE

This machine is arranged to bar feed in 3rd and 6th Stations. The bar feed operation and collet operation are duplicated on the front and rear of the machine.

The bar feed lever at the rear is operated by the bar feed lever at the front. The bracket to which the link is connected on the rear bar-feed slide is adjustable, so that components of different lengths can be produced up to a maximum of 1.3/4" (45 mm) difference. A scale is provided on the bracket which is set to the difference between the required bar-feed lengths. The longest component must always be set on the front bar-feed slide. Where the two components are equal in length, the scale is set at "0".

The rear collet slide is operated by an independent lever from its own cams.

The work is parted off the bar in 3rd and 6th Stations, cut-off slides being provided in both stations. Bar feed occurs as on the standard machine immediately before indexing.

The 3rd and 6th Stations bar-stops are operated from the same lever Fig.31.

Duplicate units of the auto stop are fitted to operate in both stations. The indicator lamp on the control panel lights up if the bar stock has been exhausted in either station.

The double feeding machine can be operated as a single feeding machine after making the following adjustments:

1. Remove the rear bar feed shoe complete with spring and plunger.
2. Set the same bar feed stroke on the rear as set on the front.
3. Retain the rear collet operating finger clear of the collet bobbins by means of the screw.
4. Remove spring "B" (Fig.30) from the lower bar feed trip mechanism. This will render the mechanism inoperative. The upper bar feed trip mechanism must not be altered.
5. Remove the rear bar stop from its shaft.

1 SCRAP VIEW OF FULCRUM PLATE FOR CLUTCH.
 2 ADJUSTMENT. SCALE: FULL SIZE
 3 SCRAP SECTION "A-A"

SPINDLE STOPPED & REMAINS STOPPED IN	CAMs REQUIRED											DEVM ¹	
	402X143	402X144	402X146	402V147	402V148	402V149	402V150	402V151	402V152	402V153	402V154		
1	1		1					1					B
2		1							1				D
3	1				1					1			A
4		1						1			1		E
5	1												C
1&2		1	1		1								F
1,2&3	1		1	1		1							H
1,2,3&4		1	1	2			1						J
1,2,3,4&5	1		1	2	1								K
2&3	1						1						L
2,3&4		1		1			1	1					M
2,3,4&5	1			1	1		1						N
3&4		1		1				1					P
3,4&5	1			1	1				1		1		R
4&5	1				1							1	G

- 4 DEVELOPMENT OF HOUSING RECESS
- 5 CLUTCH ENGAGED SPINDLE RUNNING
- 6 BRAKE ENGAGED SPINDLE STOPPED
- 7 CLUTCH ENGAGED SPINDLE RUNNING
- 8 BRAKE ENGAGED SPINDLE STOPPED
- 9 CLUTCH ENGAGED SPINDLE RUNNING
- 10 BRAKE ENGAGED SPINDLE STOPPED
- 11 CLUTCH ENGAGED SPINDLE RUNNING
- 12 BRAKE ENGAGED SPINDLE STOPPED
- 13 CLUTCH ENGAGED SPINDLE RUNNING
- 14 BRAKE ENGAGED SPINDLE STOPPED
- 15 CLUTCH ENGAGED SPINDLE RUNNING
- 16 BRAKE ENGAGED SPINDLE STOPPED
- 17 CLUTCH ENGAGED SPINDLE RUNNING
- 18 BRAKE ENGAGED SPINDLE STOPPED
- 19 CLUTCH ENGAGED SPINDLE RUNNING

- 20 BRAKE ENGAGED SPINDLE STOPPED
- 21 CLUTCH ENGAGED SPINDLE RUNNING
- 22 BRAKE ENGAGED SPINDLE STOPPED
- 23 CLUTCH ENGAGED SPINDLE RUNNING
- 24 BRAKE ENGAGED SPINDLE STOPPED
- 25 CLUTCH ENGAGED SPINDLE RUNNING
- 26 BRAKE ENGAGED SPINDLE STOPPED
- 27 CLUTCH ENGAGED SPINDLE RUNNING
- 28 BRAKE ENGAGED SPINDLE STOPPED
- 29 TOP OF DRUM BORE
- 30 START
- 31 START
- 32 START
- 33 START
- 34 START
- 35 START

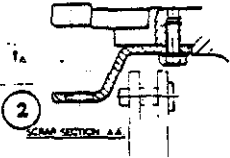
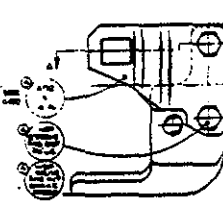
- 36 START
- 37 START
- 38 START
- 39 STOP
- 40 START
- 41 STOP
- 42 STOP
- 43 START
- 44 START
- 45 STOP
- 46 STOP
- 47 DEVELOPMENT OF CAMs VIEWED FROM INSIDE OF DRUM BORE
- 48 BOTTOM OF DRUM BORE
- 49 STOP
- 50 STOP

- 51 STOP
- 52 STOP
- 53 STOP
- 54 STOP
- 55 STOP
- 56 START
- 57 START
- 58 STOP
- 59 STOP
- 60 START
- 61 STOP
- 62 FIT THIS CAR AS STANDARD EXCEPT WHEN STOPPING IN STATION I

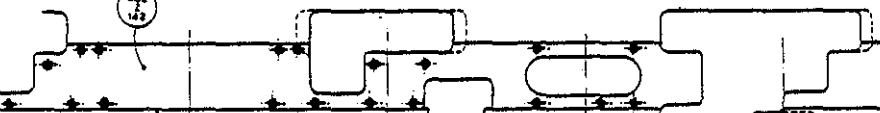
Key to Fig. 35 ARRANGEMENT OF SPINDLE STOPPING CAMS 402 Z 3

3

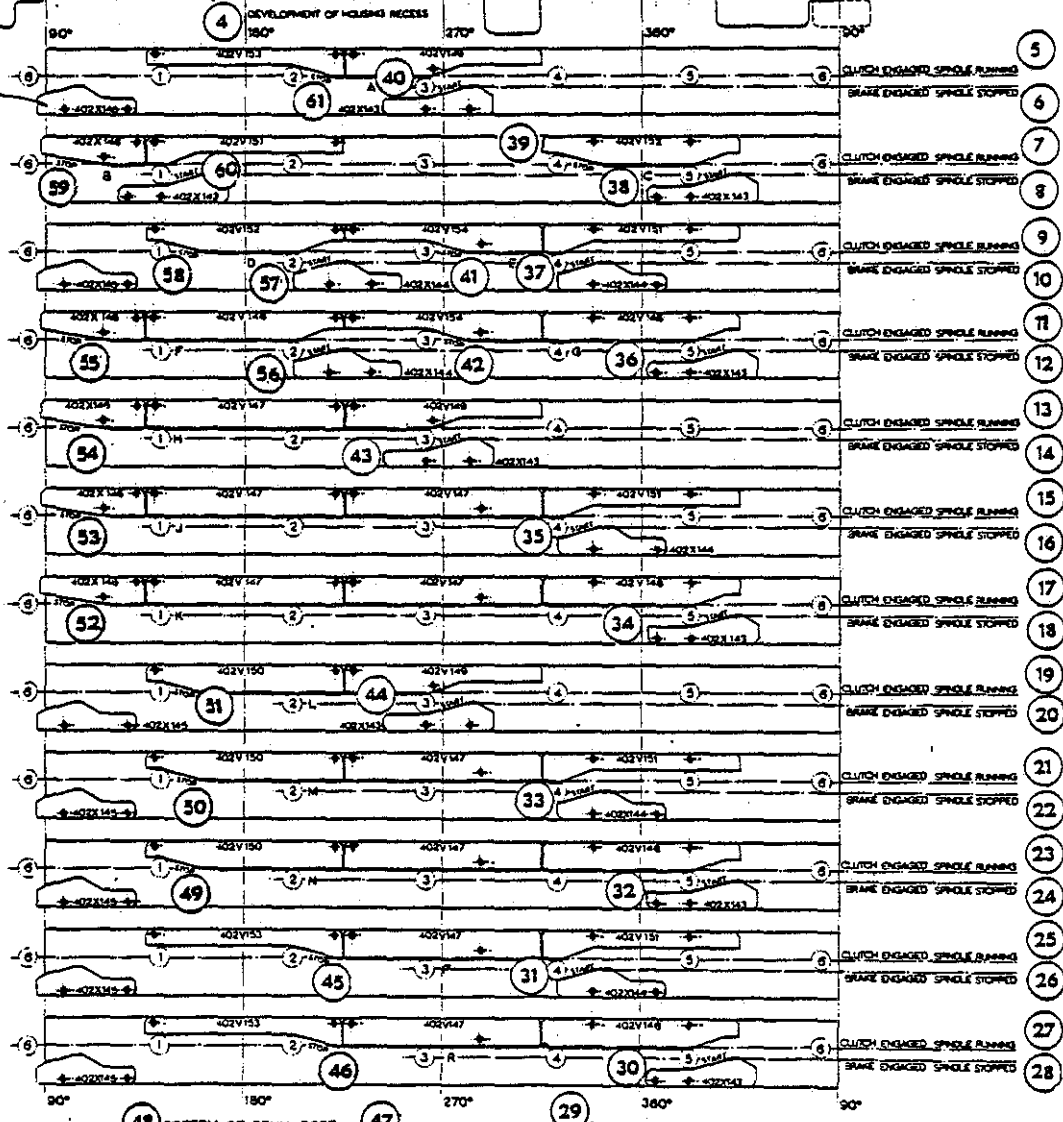
SPINDLE STOPPED & REARMS DUMPED IN	CAMS REQUIRED												DEVIANT	
1	1	1	1	1	1	1	1	1	1	1	1	1	1	B
2														O
3	1	1	1	1	1	1	1	1	1	1	1	1	1	A
4														E
5	1	1	1	1	1	1	1	1	1	1	1	1	1	C
1 & 2														P
1 & 3														H
1, 2, 3 & 4														J
1, 2, 3, 4 & 5														X
2 & 3														L
2, 3 & 4														M
2, 3, 4 & 5														N
3 & 4														P
3, 4 & 5														R
4 & 5														G



1 SCRAP VIEW OF FLANGE PLATE FOR CLUTCH ADJUSTMENT SCALE - FULL SIZE



62 FIT THIS CAM AS STANDING EXCEPT WHEN STOPPING IN STATION 1.



48 BOTTOM OF DRUM BORE 47 DEVELOPMENT OF CAMS VIEWED FROM INSIDE OF DRUM BORE 29 TOP OF DRUM BORE

Fig. 35 402 Z 3

ATTACHMENTS

Fig.37 gives General Data for Attachments
Fig.36 is a Master List of Attachments

Many attachments are stocked and supplied as separate Sections which can be combined to suit various requirements; see Figure 37 for full details.

The Wickman 5/8"-6 Parts List gives assembly drawings of each Section as stocked. The following pages give notes on application together with dimensional and other data.

A T T A C H M E N T S

GENERAL DATA FOR STANDARD ATTACHMENTS

FOR CHART INDICATING SECTIONS REQUIRED FOR VARIOUS TOOLING ARRANGEMENTS SEE
PAGE 37

FOR MASTER LIST OF ATTACHMENTS SEE PAGE 36

Auxiliary Cross-Slide Motion	See Fig.27 for Combinations and limitations
Auxiliary Longitudinal Motion	See Page 119 for combinations and and limitations
High Speed Drilling	Any combination up to 6 attachments Ratios 2:1 or 2.48:1 (Standard Machines) 2.13:1 or 2.67:1 (Spindle Stopper) All attachments in concurrent use must have the same ratio. Maximum recommended drill spindle speed 5,000 rpm. 2.48:1 and 2.67:1 ratios cannot be fitted in an adjacent station following a Threading or Synchronous Drive.
Die Head	Drives available in all stations and in any combination up to 6 attachments. Wide range of ratios.
Tapping	Drives available in all stations except station 1 and in any combination except 2 & 3 together. Full range of on ratios available. WORK SPINDLE SPEEDS LIMITED - see application drawing of Threading Clutch Drive.
Chasing	One drive at front and/or one at rear by chain from centre shaft to station 2 or 4 at rear and/or 5 at front.
Synchronous Drives	Drives available in all stations and in any combination up to 6 attachments.

Transfer Arm Pick-up and Sawing

Bore provided in 3rd and 6th for mounting transfer arm shaft in line with cut-off slide operating shaft. One or two transfer arm attachments possible. Transfer arm swing up, standard bar stop arranged to swing down. Motor driven saw attachment, adjacent to upper cross slides at front and/or rear. Longitudinal movement of transfer arm shaft from one of the four auxiliary drum cams and swing movement from disc cam outside main drive housing. 3rd station attachment is for Double Bar Feed Machines only.

Synchronous Pick-up Attachment

Available in stations 6 and/or 3. Drive from synchronous drive mentioned above. Longitudinal movement in each case from the auxiliary drum cam. Collet operation from dogs on disc on main camshaft in front of main drive housing. Maximum recommended spindle speed 3550 rev/min.

AUXILIARY LONGITUDINAL MOTIONS Mk.1

1st, 2nd, 3rd & 6th STATIONS

1st or 6th Station, Sec.489A)
2nd or 3rd Station, Sec.489B) [Fig.38]
3rd Station, Sec. 489D)
6th Station, Sec. 489C)

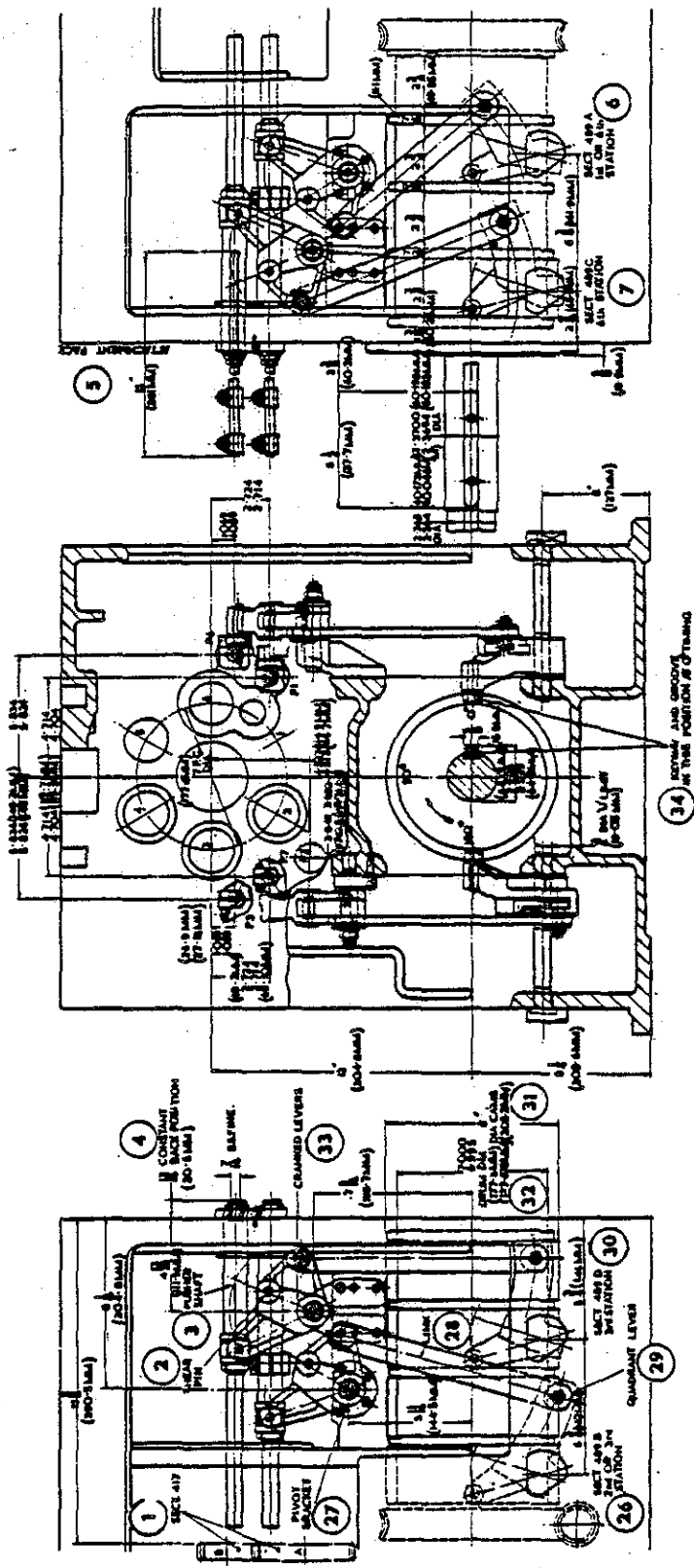
These units are used for operating the attachment body to perform reaming, threading, and other operations in Stations 1, 2 3 and 6. The stroke is adjusted by the link block along the quadrant lever. The scale reading gives the total stroke in inches and millimetres.

The upper lever is articulated and the two halves are connected by a shear pin. Should the pin shear due to overload, the attachment will be positively returned, but will not be fed forward during the next cycle.

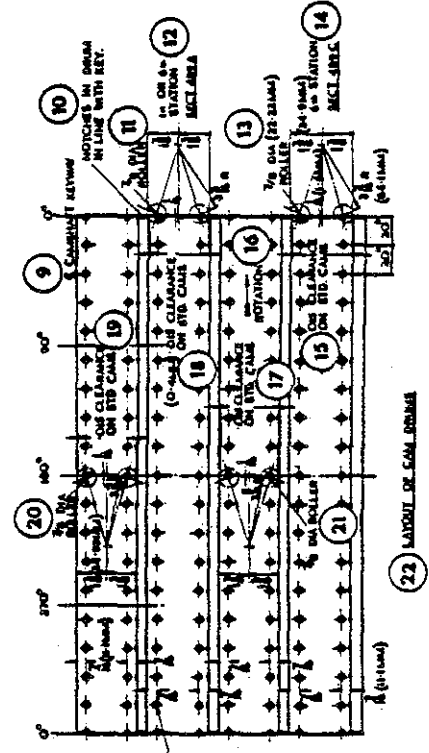
The articulated lever operates a pusher shaft, the back position of which is approximately constant. The attachment body and slide section is connected by suitable brackets to the pusher shaft.

Key to Fig.38

1. Section 417
2. Shear pin
3. Pusher shaft
4. Constant back position
5. Attachment face
6. Section 489A Station 1 or 6
7. Section 489C Station 6
8. Standard cams available sections 489A, B,C,D
in stations 1, 2, 3 & 6 -
Reaming, standard and accelerated timing
Stroke setting diagrams 487 Z 1A & 487 Z 2A
9. Camshaft keyway
10. Notches in drum in line with key
11. 7/8 in. (22.22 mm) dia. roller
12. Station 1 or 6 Section 489A
13. 7/8 in. (22.22 mm) dia. roller
14. Station 6 Section 489C
15. 0.015 in. (0.04 mm) clearance on standard cams
16. Rotation
17. 0.015 in. (0.04 mm) clearance on standard cams
18. 0.015 in. (0.04 mm) clearance on standard cams
19. 0.015 in. (0.04 mm) clearance on standard cams
20. 7/8 in. (22.22 mm) dia. roller
21. 7/8 in. (22.22 mm) dia. roller
22. Layout of cam drums
23. Station 3 section 489D
24. 18 holes per row 5.16 in. B.S.F.
25. Cams to be laid out on 7.9/16 in. (192.1 mm) dia.
developed length 23.758 in. (603.4 mm).
Station 2 or 3 section 489B
26. Station 2 or 3 section 489B
27. Pivot bracket
28. Link
29. Quadrant lever
30. Station 3 section 489D
31. Dia. cams
32. Drum dia.
33. Cranked levers
34. Keyway and groove in this position at 0° timing



⑧ STANDARD CAM AVAILABLE SECT. 4872A, 4872B, 4872C, 4872D IN 2-3-4 STATIONS. BEAMING - STANDARD & ACCELERATED TIMING. THREADING - ACCELERATED TIMING. STROKE SETTING DIAGRAMS 48721A & 48722A.



②⑤ CAMS TO BE Laid OUT ON 7/8" DIA (4871100) 2-3-4 STATION DEVELOPED LENGTH 25.750" (4871100) SECT. 4872B

②④ 1/4" DIA HOLES PER ROW. 3/4" DIA. UNEQUALLY SPACED

②③ 2-3-4 STATION MCL. 4872B

②② LAYOUT OF CAM DRUMS

Fig. 30 AUXILIARY LONGITUDINAL MOTIONS APPLICATION DRAWING 489 Z 10

REAMING

REAMING IN 1st, 2nd, and 6th STATION (See Fig.39)

The attachment consists of the auxiliary longitudinal motion coupled to the attachment body and slide, the reamer in its holder is clamped in the attachment body. It is operated by cams mounted on a drum in the main drive housing. Cams are available for standard timing in 1st, 2nd, 3rd and 6th stations and also accelerated timing in 3rd and 6th stations, see Fig. for layout of all reaming cams.

Four reaming feed cams are available for ACCELERATED TIMING in 3rd and 6th stations and two cams for STANDARD TIMING in Stations 1 or 6 and 2 or 3. This range of cams, give different proportions of feed to approach stroke.

STANDARD TIMING cams are timed with the centre tool block whereas ACCELERATED TIMING cams return early in order to clear the work before parting off.

When parting off occurs early, due to setting excessive travel on the parting off tool slide, the clearance of the reaming (or threading spindle) to the work will be reduced.

IN STATION 6 the minimum total stroke that can be used for reaming should allow for the thickness of the bar stop (Fig.40) and preferably allow clearance for easy extraction of bar ends from the collet; (also applies to Station 3 on Double Bar Feed machines).

SELECTING CAMS for reaming in 1st, 2nd, 3rd and 6th stations. Feed stroke and scale setting instructions are given on Fig.40. The cam giving the LOWEST SCALE SETTING should be used wherever possible.

Key to Fig.39

1. Reaming bracket section 488
2. Reaming bracket section 488
3. Use reamer holder W6-058-29
4. Attachment body and slide section 488
5. Stop rod and clamps section 488
6. Push rod and clamps section 489A
7. Reaming bracket section 488
8. Push rod and clamps section 489B
9. Push rod and clamps section 489D
10. Reaming bracket section 488A
11. Reaming bracket section 488A
12. Push rod and clamps section 489C
13. Maximum diameter swing over slide
14. Push rod and clamps section 489A
15. Push rod and clamps section 489B

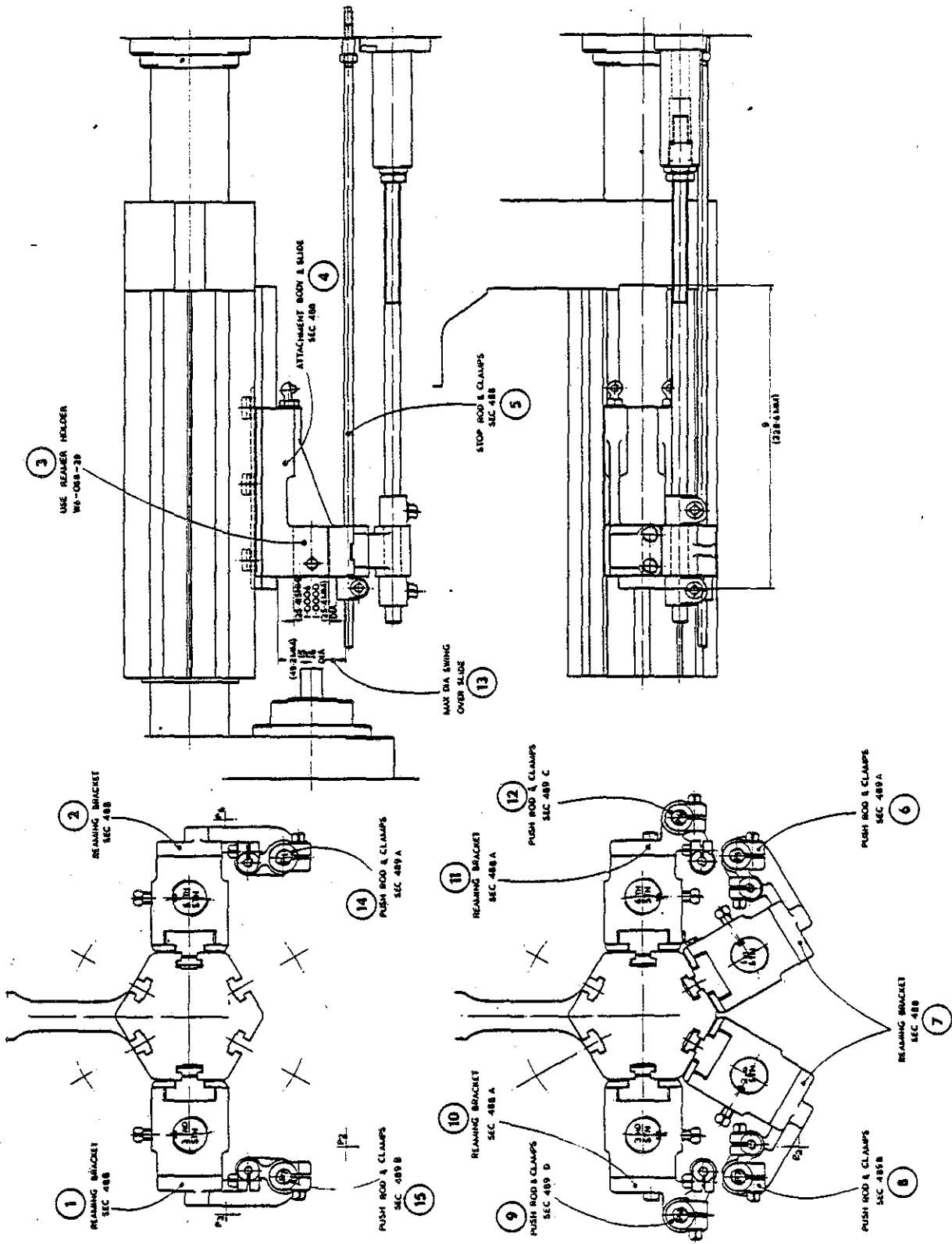


Fig. 39 APPLICATION DRAWING REAMING ATTACHMENT, SECTION 488 MK. I, STATIONS 1, 2, 3 & 6 488 Z 10

Key to Fig.40

1. Accelerated timing
2. Accelerated timing
3. Standard timing
4. Standard timing
5. Camshaft shown in 0° position
6. Station 6
7. Station 3
8. Station 1 or 6
9. Station 2 or 3
10. View showing cam drum with a selection of cams fitted
11. To obtain feed/rev:
When using accelerated timing cams multiply actual feed stroke by 2 and obtain from feed speed chart the feed/rev. for the equivalent stroke calculated.
When using standard timing cams the feed/rev. is obtained from the feed and speed chart directly with the actual feed stroke.
12. To obtain stroke setting:
 1. Mark feed stroke required on vertical scale
 2. Draw horizontal line across and where it cuts the cam line gives the scale setting.Note: Where a choice of more than one cam is available it is preferable to use the cam requiring the lowest scales setting. When reaming in station 6 (and 3 on double bar feed machines) clearance to the bar stop must be allowed for when the stroke is calculated.
13. Approach
14. Clearance must exist here when tool is fully back
15. Total stroke
16. Feed
17. Reamer
18. Bar Stop
19. Work
20. (487 V 102A station 1 or 6) Accelerated
(487 V 110A station 2 or 3) timing
Total stroke = $0.83 \times$ scale setting
21. (487 V 103A station 1 or 6) Accelerated
(487 V 111A station 2 or 3) timing
Total stroke = $0.9 \times$ scale setting
22. (487 V 104A station 1 or 6) Accelerated
(487 V 112A station 2 or 3) timing
(487 Y 118A station 1 or 6) Standard
(487 V 120A station 2 or 3) timing
Total stroke = scale setting
23. (487 V 105A station 1 or 6) Accelerated
(487 V 113A station 2 or 3) timing
(487 Y 119A station 1 or 6) Standard
(487 V 121A station 2 or 3) timing
Total stroke = scale setting
24. Direction of rotation
25. Feed stroke
26. 0° of cam drum (ie. centre line of keyway in camshaft)
27. Station 2 or 3
Auxiliary longitudinal motion mechanism section
489B

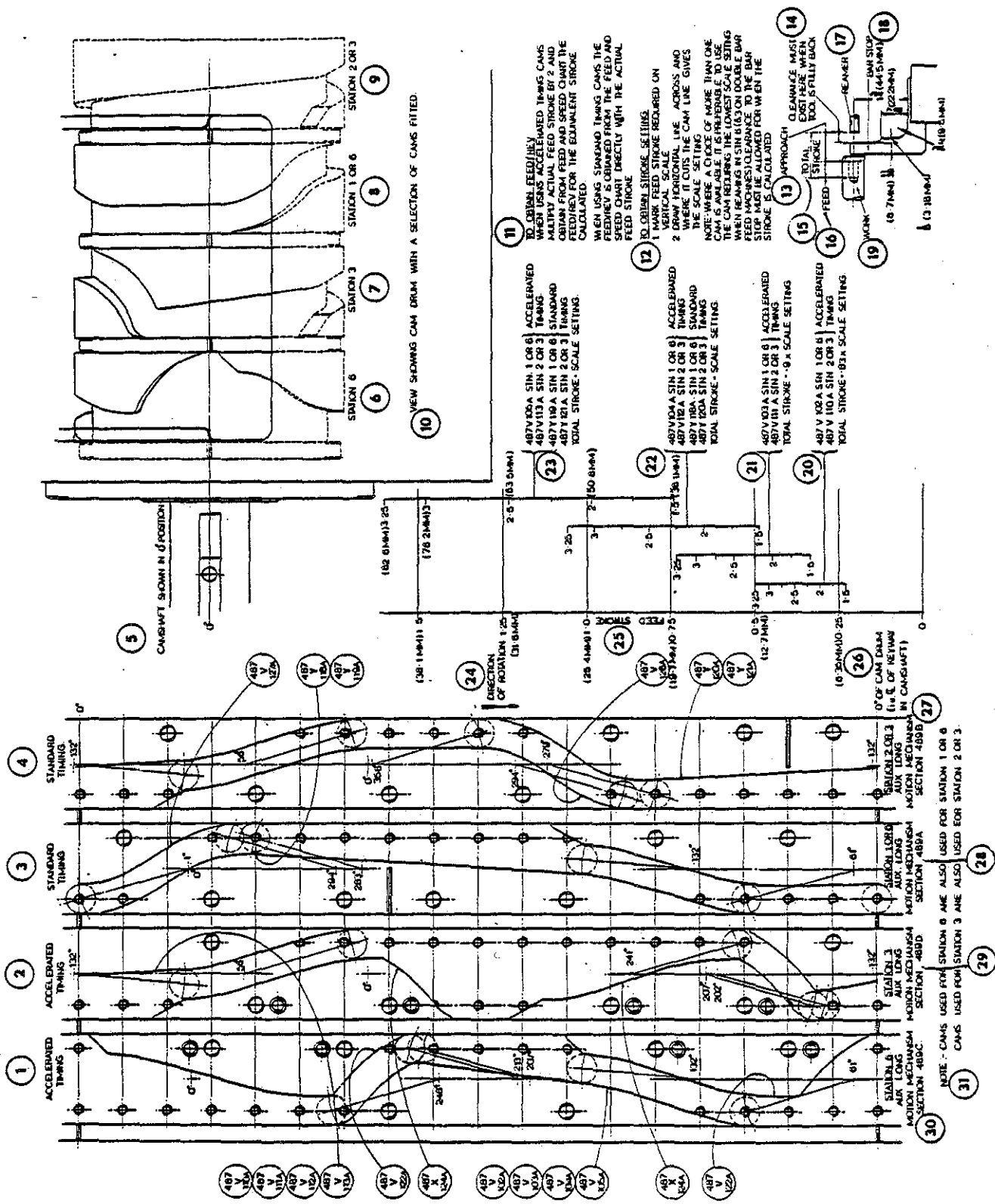


Fig. 40 487 Z 7A REAMING CAMS, STATIONS 1, 2, 3 & 6

28. Station 1 or 6
Auxiliary longitudinal motion mechanism section
489A
29. Station 3
Auxiliary longitudinal motion mechanism section
489D
30. Station 6
Auxiliary longitudinal motion mechanism section
489C
31. Note: Cams used for station 6 are also used for
station 1 or 6
Cams used for station 3 are also used for
station 2 or 3

HIGH SPEED DRILLING

DRIVE SECTION 490H SPINDLE UNIT Section 490G

This attachment can be fitted in all stations.

When more than one attachment is fitted, all must be driven at the same drill to work spindle ratio. Standard ratios available are 2:1, 2.48:1 (Standard machine), 2.13:1 or 2.67:1 (Spindle Stopping machine).

The drill and work spindle rotate in opposite directions; a quoted ratio allows for this and gives the relative speed of the drill to the work. A ratio of 2:1 means that the relative drill speed is twice the work spindle speed, i.e. the drill revolves at the same revs/min. as the work but in the opposite direction.

The driving gear for the ratio required is selected from the table.

The attachment will accommodate parallel shank drills up to 1/4" diameter (6.4mm) held in collets (Erickson Series 300).

The High Speed Drilling spindle unit fits in the standard bracket toolholder or the reaming attachment body.

NOTE: When selecting High Speed Drilling Attachment drive ratios the resulting Attachment Drill Spindle speed should be checked against recommendations.

Key to Fig.41 1.Distance to collet nose:

Minimum - MK.IA:1.1/2 in. (38.1 mm)

MK.II: 7/8 in. (22.2 mm)

Maximum - 10.1/4 in. (260.4 mm)

2. High Speed Drilling spindle, section 490G
3. Bracket toolholder -
W6-058-60 for stations 1, 2, 3 & 6
W6-058-33/4 for stations 4 & 5
33/5
4. High speed drilling drive, section 490H
5. Idler gear 22 teeth
6. Driving gear, see table
7. Centre shaft
8. Recommended maximum drill speed 5,000 rev/min

9.

DRIVING GEAR		STANDARD MACHINE RATIO	SPINDLE STOPPING MACHINE RATIO
TEETH	REFERENCE		
27	48L x .131 / 27.	2:1	2:13:1
40	48L x .131 / 40.	2.48:1	2.67:1

10. 2:1 ratio means that the relative speed of drill to work is twice the spindle speed
11. Station 6
12. Station 3
13. Drive fitted with 2:1 ratio
14. Station 4
15. Adjusting plate 490 X 126 must be reversed in this station
16. Bristol Erickson collet series 300 0.013 in. - 0.250 in. (0.33 - 6.4 mm) capacity
17. Drive fitted with 2.48:1 ratio
18. Note: 2.48:1 ratio cannot be fitted in an adjacent station following a threading drive or synchronous drive
19. Station 5
20. Adjust screws to give 0.005 in. (0.13 mm) backlash in gears

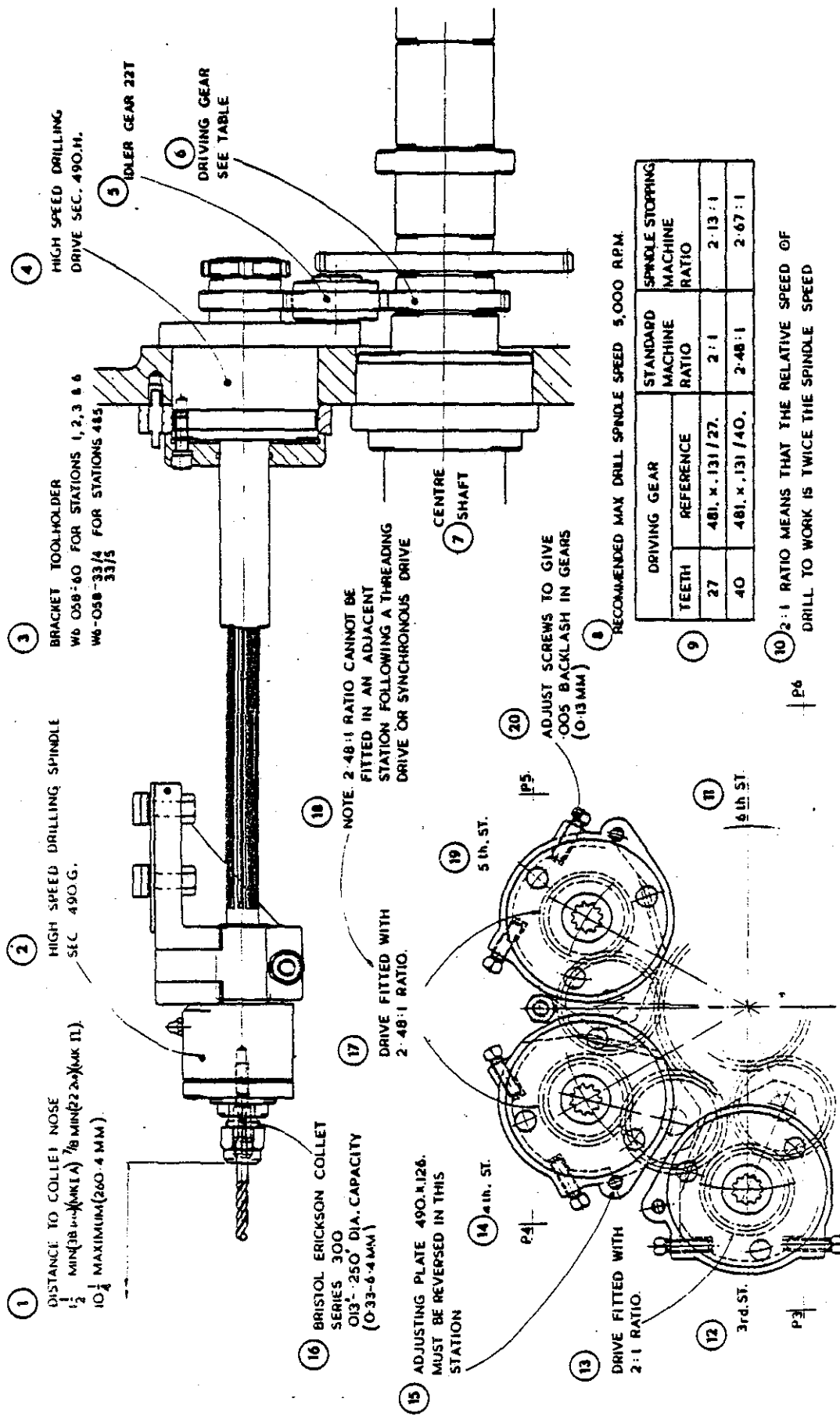


Fig. 41 HIGH SPEED DRILLING ATTACHMENT APPLICATION DRAWING 490 Y 10

THREADING ATTACHMENT

THREADING ATTACHMENTS can be fitted in all stations (see Fig.41)

Threading operations are usually performed at lower surface speeds than those suitable for turning or drilling. As it is not possible to vary the spindle speed during the time cycle and in order to obtain suitable surface speeds for threading, while still using economical work spindle speeds, it becomes necessary to rotate the threading tool in the same direction as the work spindle but at a faster or slower speed. The difference between the work spindle speed and the threading tool speed will then provide an effective surface speed for threading.

A commonly used threading speed is 1/5 of the work spindle speed, requiring the threading tool to be rotated at 4/5 of the work spindle speed for right-hand threads, or 1 1/5 times the work spindle speed for left-hand threads. This is termed an "ON" threading ratio of 5, being the relative speed of the work spindle and attachment spindle during the "ON" threading of the die or tap. If the cycle time permits, slower ratios may be used to reduce cutting speeds, increase tool life, and improve finish. Faster ratios may be employed on free cutting materials, thus permitting faster machine cycle times.

Since a solid tap or die, after performing the threading, must also be run "OFF" the component during the feed cycle, it is desirable that this non-productive operation be performed as quickly as possible. Excessive difference between forward and return speeds will, however, cause increased clutch wear and a possible difficulty in maintaining threaded length and finish. A commonly used "OFF" ratio is approximately 3:1, ie. the relative speed is one third the work spindle speed.

THREADING ATTACHMENT DRIVE SLEEVE Section 482

The drive sleeve unit is fitted to drive all threading attachments. It consists of a driving sleeve running in ball journals, and attached to the threading attachment in the attachment holder (section 486).

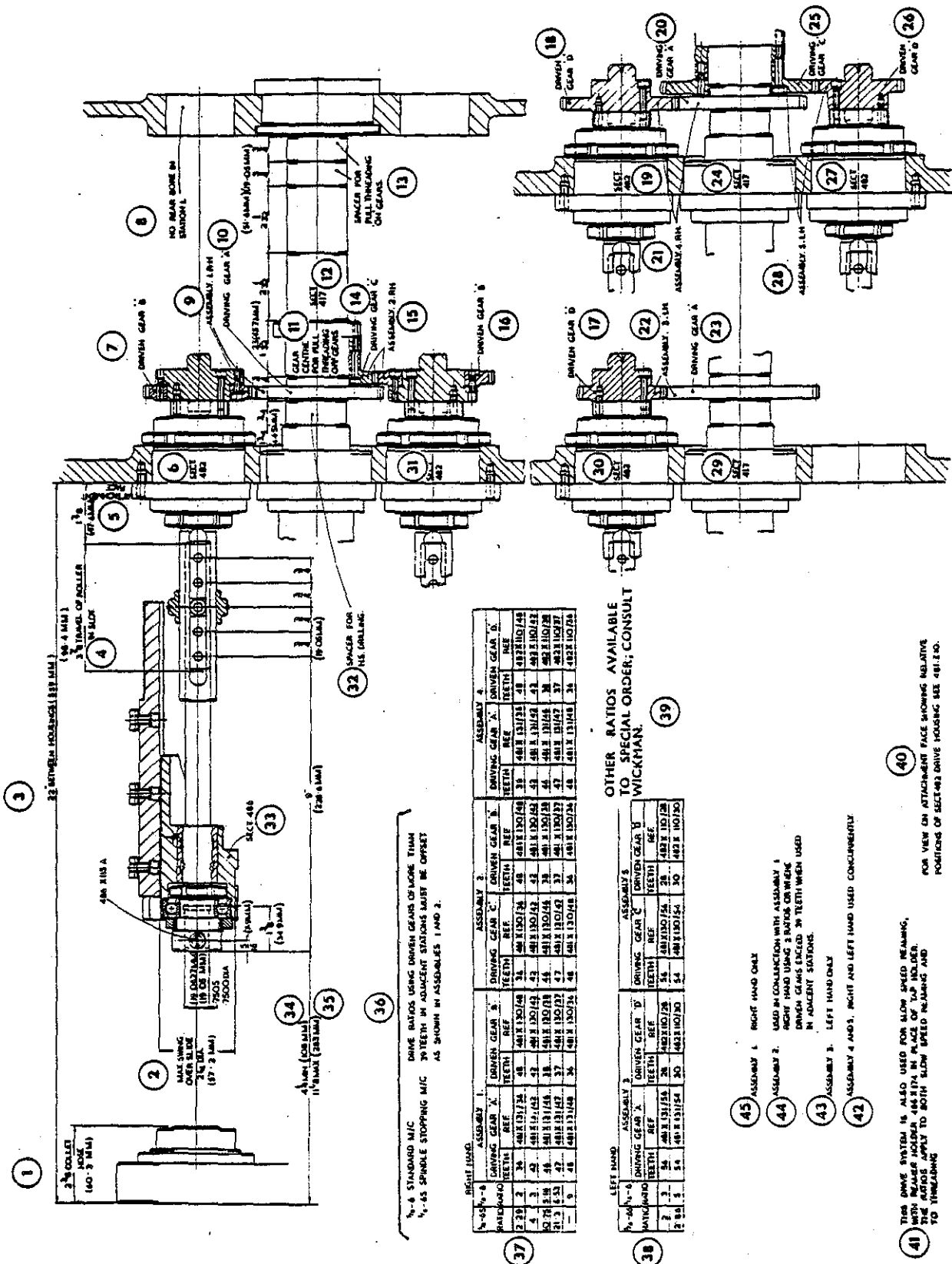
THREADING DRIVE (Fig.42)

This drive can only be used with self-opening dieheads, collapsing taps (or for slow speed reaming if required) because it has an "ON" ratio only.

It consists of an adaptor plate and gear on the drive sleeve being driven by a gear on the centre shaft. The "ON" ratio can be changed by changing the gears.

Key to Fig.42

1. Collet nose 2.3/8 in. (60.3 mm)
2. Maximum swing over slide
3. 22 in. (559 mm) between housings
4. 3.78 in. (559 mm) between housings
5. Attachment face
6. Section 482
7. Driven gear "B"
8. No rear bore in station 1
9. Assembly 1 R.H.
10. Driving gear "A"
11. Gear centre for full threading "OFF" gears
12. Section 417
13. Spacer for full threading "ON" gears
14. Driving gear "C"



N-4 STANDARD MIC
 N-4S SPINALE STOPPING MIC
 DRIVE RATIOS USING DRIVEN GEARS OF MORE THAN 30 TEETH IN ADJACENT STATIONS MUST BE OFFSET AS SHOWN IN ASSEMBLIES 1 AND 2.

RIGHT HAND

PART NO	ASSEMBLY 1		ASSEMBLY 2		ASSEMBLY 3		ASSEMBLY 4	
	DRIVING GEAR X	DRIVEN GEAR B	DRIVING GEAR C	DRIVEN GEAR B	DRIVING GEAR D	DRIVEN GEAR D	DRIVING GEAR A	DRIVEN GEAR D
2 29	34	48	48	48	48	48	48	48
4	48	48	48	48	48	48	48	48
5	48	48	48	48	48	48	48	48
6	48	48	48	48	48	48	48	48
7	48	48	48	48	48	48	48	48
8	48	48	48	48	48	48	48	48
9	48	48	48	48	48	48	48	48
10	48	48	48	48	48	48	48	48
11	48	48	48	48	48	48	48	48
12	48	48	48	48	48	48	48	48
13	48	48	48	48	48	48	48	48
14	48	48	48	48	48	48	48	48
15	48	48	48	48	48	48	48	48
16	48	48	48	48	48	48	48	48
17	48	48	48	48	48	48	48	48
18	48	48	48	48	48	48	48	48
19	48	48	48	48	48	48	48	48
20	48	48	48	48	48	48	48	48
21	48	48	48	48	48	48	48	48
22	48	48	48	48	48	48	48	48
23	48	48	48	48	48	48	48	48
24	48	48	48	48	48	48	48	48
25	48	48	48	48	48	48	48	48
26	48	48	48	48	48	48	48	48
27	48	48	48	48	48	48	48	48
28	48	48	48	48	48	48	48	48
29	48	48	48	48	48	48	48	48
30	48	48	48	48	48	48	48	48
31	48	48	48	48	48	48	48	48
32	48	48	48	48	48	48	48	48
33	48	48	48	48	48	48	48	48
34	48	48	48	48	48	48	48	48
35	48	48	48	48	48	48	48	48
36	48	48	48	48	48	48	48	48

OTHER RATIOS AVAILABLE TO SPECIAL ORDER; CONSULT WICKMAN.

LEFT HAND

PART NO	ASSEMBLY 1		ASSEMBLY 2		ASSEMBLY 3		ASSEMBLY 4	
	DRIVING GEAR X	DRIVEN GEAR B	DRIVING GEAR C	DRIVEN GEAR B	DRIVING GEAR D	DRIVEN GEAR D	DRIVING GEAR A	DRIVEN GEAR D
2 29	34	48	48	48	48	48	48	48
4	48	48	48	48	48	48	48	48
5	48	48	48	48	48	48	48	48
6	48	48	48	48	48	48	48	48
7	48	48	48	48	48	48	48	48
8	48	48	48	48	48	48	48	48
9	48	48	48	48	48	48	48	48
10	48	48	48	48	48	48	48	48
11	48	48	48	48	48	48	48	48
12	48	48	48	48	48	48	48	48
13	48	48	48	48	48	48	48	48
14	48	48	48	48	48	48	48	48
15	48	48	48	48	48	48	48	48
16	48	48	48	48	48	48	48	48
17	48	48	48	48	48	48	48	48
18	48	48	48	48	48	48	48	48
19	48	48	48	48	48	48	48	48
20	48	48	48	48	48	48	48	48
21	48	48	48	48	48	48	48	48
22	48	48	48	48	48	48	48	48
23	48	48	48	48	48	48	48	48
24	48	48	48	48	48	48	48	48
25	48	48	48	48	48	48	48	48
26	48	48	48	48	48	48	48	48
27	48	48	48	48	48	48	48	48
28	48	48	48	48	48	48	48	48
29	48	48	48	48	48	48	48	48
30	48	48	48	48	48	48	48	48
31	48	48	48	48	48	48	48	48
32	48	48	48	48	48	48	48	48
33	48	48	48	48	48	48	48	48
34	48	48	48	48	48	48	48	48
35	48	48	48	48	48	48	48	48
36	48	48	48	48	48	48	48	48

- 45 ASSEMBLY 1, RIGHT HAND ONLY
- 46 ASSEMBLY 2, USED IN CONNECTION WITH ASSEMBLY 1, RIGHT HAND USING 2 RATIOS OR WHEN DRIVEN GEARS EXCEED 30 TEETH WHEN USED IN ADJACENT STATIONS.
- 47 ASSEMBLY 3, LEFT HAND ONLY
- 48 ASSEMBLY 4 AND 5, RIGHT AND LEFT HAND USED CONCURRENTLY.

THIS DRIVE SYSTEM IS ALSO USED FOR SLOW SPEED MEASURING, WHEN MEASURE HOLDER 44817A IN PLACE OF TAP HOLDER. THE RATIOS APPLY TO BOTH SLOW SPEED MEASURING AND TO THREADING.

FOR VIEW ON ATTACHMENT FACE SHOWING RELATIVE POSITIONS OF SECT-483 DRIVE HOUSING SEE 481-1-0.

Fig. 42 482 Z 10
 APPLICATION DRAWING, THREADING ATTACHMENT AND SLOW SPEED REAMING, AND REVOLVING DIEHEAD DRIVE; ALL STATIONS, MK. I

15. Assembly 2 R.H.16. Driven gear "B"
 17. Driven gear "D"
 18. Driven gear "D"
 19. Section 482
 20. Driving gear "A"
 21. Assembly 4 R.H.
 22. Assembly 3 L.H.
 23. Driving gear "A"
 24. Section 417
 25. Driving gear "C"
 26. Driven gear "D"
 27. Section 482
 28. Assembly 5 L.H.
 29. Section 41730. Section 482
 31. Section 482
 32. Spacer for H.S. drilling
 33. Section 486
 34. 4.1/4 in. (108 mm) min.
 35. 11.1/8 in. (203 mm) max.
 36. 5/8"-6 Standard Machine
5/8"-6S Spindle Stopping Machine
- Drive ratios using driven gears of more than 39 teeth in adjacent stations must be offset as shown in assemblies 1 & 2

37.

RIGHT HAND												
ASSEMBLY 1				ASSEMBLY 2				ASSEMBLY 4				
RATIO/RATIO	DRIVING GEAR A		DRIVEN GEAR B		DRIVING GEAR C		DRIVEN GEAR D		DRIVING GEAR A		DRIVEN GEAR D	
	TEETH	REF	TEETH	REF	TEETH	REF	TEETH	REF	TEETH	REF	TEETH	REF
2 29 2	36	481 X 131/36	48	481 X 130/48	36	481 X 130/36	48	481 X 130/48	36	481 X 131/36	48	482 X 110/48
4 3	42	481 X 131/42	42	481 X 130/42	42	481 X 130/42	42	481 X 130/42	42	481 X 131/42	42	482 X 110/42
10 75 5 18	54	481 X 131/54	38	481 X 130/38	46	481 X 130/46	38	481 X 130/38	46	481 X 131/46	38	482 X 110/38
21 3 16 53	47	481 X 131/47	37	481 X 130/37	47	481 X 130/47	37	481 X 130/37	47	481 X 131/47	37	482 X 110/37
—	48	481 X 131/48	36	481 X 130/36	48	481 X 130/48	36	481 X 130/36	48	481 X 131/48	36	482 X 110/36

38.

LEFT HAND								
ASSEMBLY 1				ASSEMBLY 3				
RATIO/RATIO	DRIVING GEAR A		DRIVEN GEAR B		DRIVING GEAR C		DRIVEN GEAR D	
	TEETH	REF	TEETH	REF	TEETH	REF	TEETH	REF
2 1 1	54	481 X 131/54	28	482 X 110/28	54	481 X 130/54	28	482 X 110/28
2 50 1 1	54	481 X 131/54	30	482 X 110/30	54	481 X 130/54	30	482 X 110/30

39. For other ratios available to special order see 481 V 4
40. For view on attachment face showing relative positions of section 482 drive housing 481 Z 10
41. This drive system is also used for slow speed reaming with reamer holder 486 X 174 in place of tap holder. The ratios apply to both slow speed reaming and threading
42. Assembly 4 & 5 right and left hand used concurrently
43. Assembly 3 left hand only
44. Assembly 2 used in conjunction with assembly 1 using 2 ratios, or where driven gears exceed 39 teeth when used in adjacent stations
45. Assembly 1 right hand only

THREADING CLUTCH DRIVE

Section 481 Fig.43

On a threading attachment drive sleeve, Section 482, replacement of the driven gear (and adaptor plate) by a threading clutch results in a universal threading drive for use with solid taps and dies. This universal drive gives an "ON" ratio and an "OFF" ratio controlled by a threading clutch and when more than one is fitted to a machine the following conditions apply:

RIGHT HAND THREADS TO BE CUT:-

Two different "ON" ratios may be fitted
But only one "OFF" ratio can be fitted

LEFT HAND THREADS TO BE CUT:-

Only one "ON" ratio can be fitted, although two "OFF" ratios can be fitted

RIGHT HAND AND LEFT HAND THREADS TO BE CUT:-

One right hand "ON" and one left hand "ON" ratio may be fitted

One right hand "OFF" and one left hand "OFF" ratio may be fitted
ie. four different ratios

Additional universal drives to any of the above conditions, must employ the ratios fitted, but driven gears of more than 39 teeth in adjacent stations must be offset. When the universal threading drive is fitted and used with a self opening diehead, the "ON" ratio is engaged continuously by retaining the glut shaft in the one position. This avoids frequent stripping and refitting the drive to suit solid dies or self-opening dieheads.

FULL THREADING CANNOT BE USED IN STATION 1.

Key to Fig.43

1.

⁵/₈-6 STANDARD M/C.
⁵/₈-6S SPINDLE STOPPING M/C
RIGHT HAND 'ON'

⁵ / ₈ -6S RATIO	⁵ / ₈ -6 RATIO	DRIVING GEAR 'A'		DRIVEN GEAR 'B'	
		TEETH	REF	TEETH	REF
2.29	2	36	481X131/36	48	481X130/48
4	3	42	481X131/42	42	481X130/42
5.71	3.75	44	481X131/44	40	481X130/40
10.75	5.18	46	481X131/46	38	481X130/38
21.3	6.53	47	481X131/47	37	481X130/37
—	9	48	481X131/48	36	481X130/36

CHECK THAT SPINDLE SPEED AND "ON" AND "OFF" RATIOS GIVE DIFFERENTIAL SPEED WITHIN MAX. RECOMMENDED DIFFERENCE OF 3500 R.P.M.

THE FOLLOWING RATIOS MUST NOT BE USED SPINDLE SPEED

5,000 R.P.M. 2:1 ON WITH 2:1 OFF
3:1 ON WITH 2:1 OFF

4,500 R.P.M. 2:1 ON WITH 2:1 OFF
3:1 ON WITH 2:1 OFF

3,550 R.P.M. 2:1 ON WITH 2:1 OFF

RIGHT HAND 'OFF'

⁵ / ₈ -6S RATIO	⁵ / ₈ -6 RATIO	DRIVING GEAR 'C'		DRIVEN GEAR 'D'	
		TEETH	REF	TEETH	REF
—	2.05	58	481X130/58	26	481X132/26
2	3	56	481X130/56	28	481X132/28 *
2.86	5	54	481X130/54	30	481X132/30

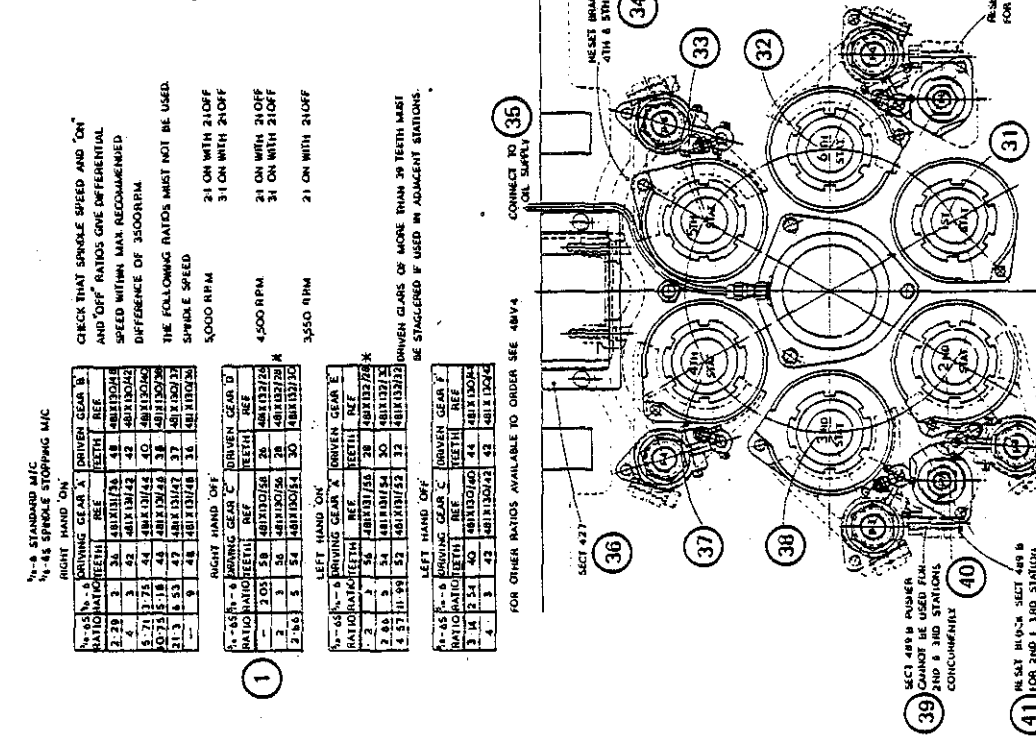
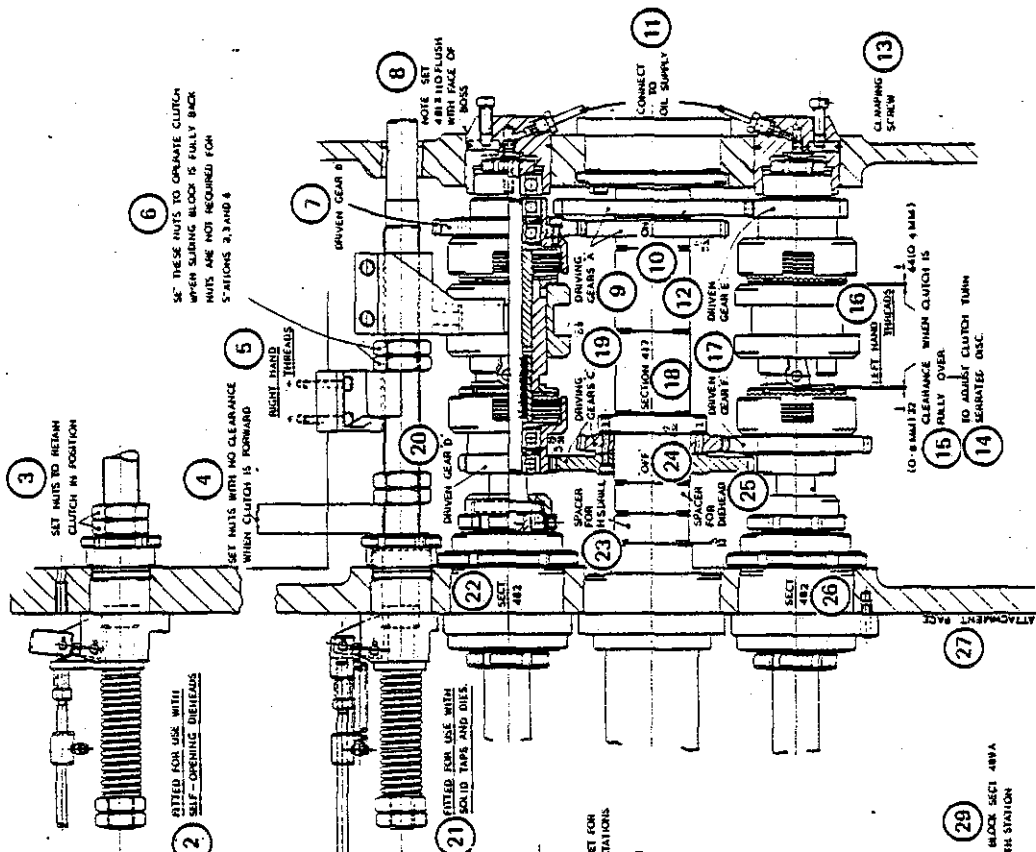
LEFT HAND 'ON'

⁵ / ₈ -6S RATIO	⁵ / ₈ -6 RATIO	DRIVING GEAR 'A'		DRIVEN GEAR 'E'	
		TEETH	REF	TEETH	REF
2	3	56	481X131/56	28	481X132/28 *
2.86	5	54	481X131/54	30	481X132/30
4.57	11.99	52	481X131/52	32	481X132/32

DRIVEN GEARS OF MORE THAN 39 TEETH MUST BE STAGGERED IF USED IN ADJACENT STATIONS.

LEFT HAND 'OFF'

⁵ / ₈ -6S RATIO	⁵ / ₈ -6S RATIO	DRIVING GEAR 'C'		DRIVEN GEAR 'F'	
		TEETH	REF	TEETH	REF
2.29	2	40	481X130/40	44	481X130/44
4	3	42	481X130/42	42	481X130/42



* CLUTCH NORMALLY SUPPLIED WITH
 481 X 132 / 28 FITTED.

* CLUTCH NORMALLY SUPPLIED WITH
 481 X 132 / 28 FITTED.

* CLUTCH NORMALLY SUPPLIED WITH
 481 X 132 / 28 FITTED.

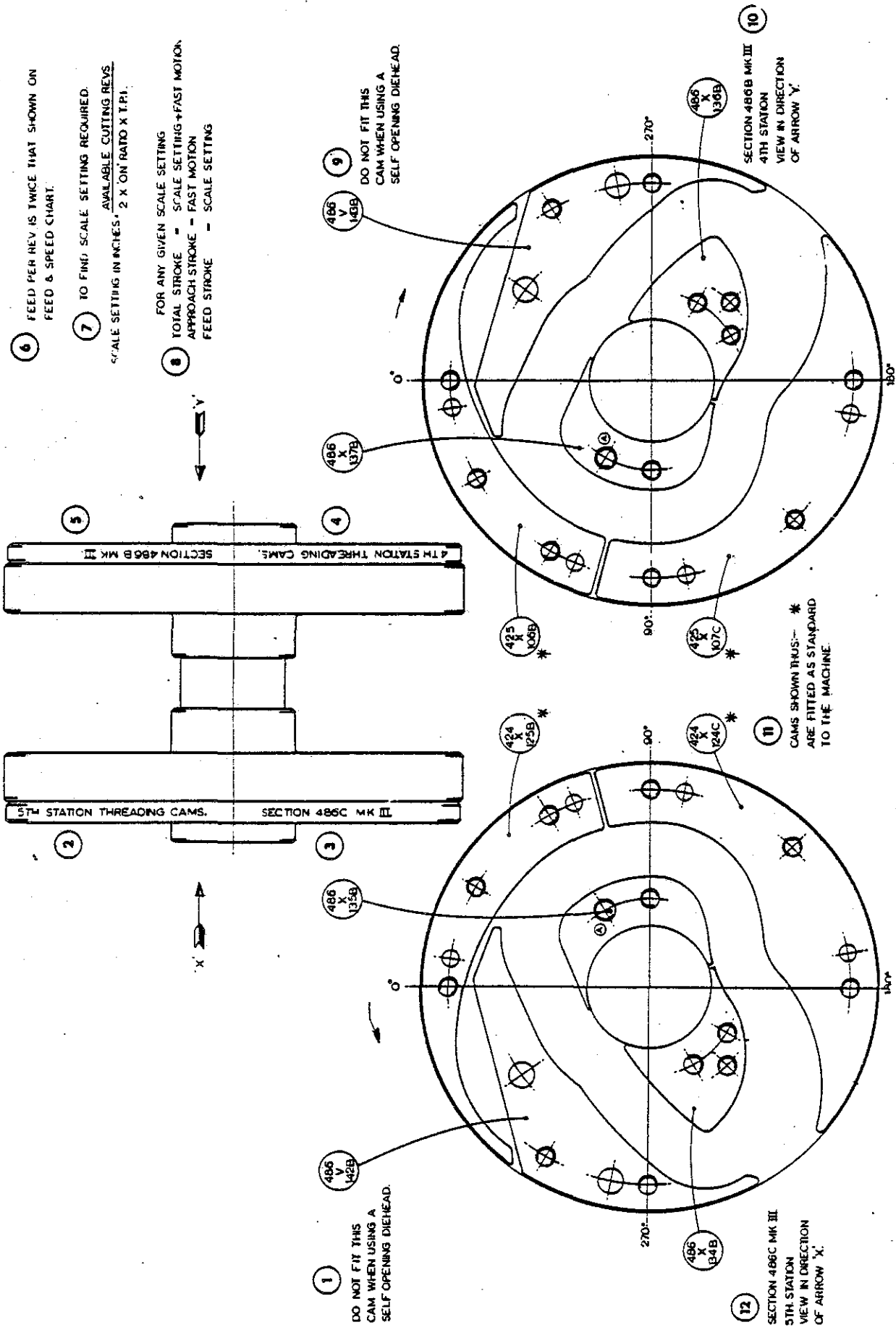
* CLUTCH NORMALLY SUPPLIED WITH
 481 X 132 / 28 FITTED.

Fig. 43 401 Z 10 | THREADING CLUTCH DRIVE APPLICATION DRAWING

2. Fitted for use with self-opening dieheads
3. Set nuts to retain clutch in position
4. Set nuts with no clearance when clutch is forward
5. Right hand threads
6. Set these nuts to operate clutch when sliding block is fully back. Nuts are not required for stations 2, 3 & 6
7. Driven gear "B"
8. Note: Set 481 X 110 flush with face of boss
9. Driving gears "A" 10. On
11. Connect to oil supply
12. Driven gear "E"
13. Clamping screw
14. To adjust clutch turn serrated disc
15. Clearance when clutch is fully over
16. Left hand thread
17. Driven gear "F"
18. Section 41719. Driving gears "C"
20. Driven gear "D"
21. Fitted for use with solid taps and dies
22. Section 482
23. Spacer for high speed drill
24. Off
25. Spacer for diehead
26. Section 482
27. Attachment face
28. Clutch normally supplied with 481 X 132/28 fitted
29. Reset block section 489A for station 6
30. Station 1:
Full threading cannot be used in this station.
A diehead can be used by fitting diehead drive 482 V 1
31. Station 1
32. Station 6
33. Station 5
34. Reset bracket for stations 4 & 5
35. Connect to oil supply
36. Section 427
37. Station 4
38. Station 3
39. Section 489B pusher cannot be used for stations 2 & 3 concurrently
40. Station 2
41. Reset block section 489B for stations 2 & 3
42. Stations 2 & 3
Full threading cannot be used in these stations concurrently. A diehead in station 3 can be used adjacent to full threading in station 2 by fitting diehead drive 482 V 1

Key to Fig.44

1. Do not fit this cam when using a self-opening diehead
2. 5th Station Threading Cams
3. Section 486C MK.III
4. 4th Station Threading Cams
5. Section 486B MK.III
6. Feed per rev. is twice that shown on feed and speed chart
7. To find scale setting required:
Scale setting in inches
= $\frac{\text{AVAILABLE CUTTING REVS.}}{2 \times \text{"ON" Ratio} \times \text{Threads/In}}$
8. For any given scale setting:
Total Stroke = Scale Setting + Fast Motion
Approach Stroke = Fast Motion
Feed Stroke = Scale Setting
9. Do not fit this cam when using a self-opening diehead
10. Section 486B MK.III 4th Station view in direction of arrow "Y"
11. Cams shown thus:* are fitted as standard to the machine
12. Section 486C MK.III 5th Station view in direction of arrow "X"



- 6 FEED PER REV IS TWICE THAT SHOWN ON FEED & SPEED CHART.
- 7 TO FIND SCALE SETTING REQUIRED. AVAILABLE CUTTING REVS. SCALE SETTING IN INCHES. $2 \times \text{ON RATIO} \times \text{T.P.I.}$
- 8 FOR ANY GIVEN SCALE SETTING TOTAL STROKE - SCALE SETTING + FAST MOTION APPROACH STROKE - FAST MOTION FEED STROKE - SCALE SETTING

1 DO NOT FIT THIS CAM WHEN USING A SELF OPENING DIEHEAD.

9 DO NOT FIT THIS CAM WHEN USING A SELF OPENING DIEHEAD.

10 SECTION 486B MK III 4TH STATION VIEW IN DIRECTION OF ARROW Y.

11 CAMS SHOWN THUS ARE FITTED AS STANDARD TO THE MACHINE.

12 SECTION 486C MK III 5TH STATION VIEW IN DIRECTION OF ARROW X.

Fig. 44 486 Y 5B THREADING CAMS MK. III, STATIONS 4 & 5

Key to Fig.45

1. Camshaft shown in 0° position
2. Station 6
3. Station 3
4. Station 1 or 6
5. Station 2 or 3
6. View showing cam drum with a selection of cams fitted
7. To obtain feed stroke required:
Feed Stroke required = $\frac{\text{Available cutting revs.}}{\text{"A" x threads/in. X "ON"}}$
8. To obtain stroke setting:
 1. Mark feed stroke required on vertical scale
 2. Draw horizontal line across and where it cuts the cam lines gives the scale settingNOTE: Where a choice of more than one cam is available it is preferable to use the cam requiring the lowest scale setting. When threading in station 6 (and station 3 on double bar feed machines) clearance to the bar stop must be allowed for when the stroke is calculated.
9. Approach
10. Clearance must exist here when tool is fully back
11. Tap (or diehead)
12. Bar Stop
13. Work
14. Feed
15. Total Stroke
16. (487 V 106A - Station 1 or 6
(487 V 114A - Station 2 or 3
Total Stroke = 0.77 in. x Scale Setting
"A" = 2.96 in.
17. (487 V 107A - Station 1 or 6
(487 V 115A - Station 2 or 3
Total Stroke = 0.82 in. x Scale Setting
"A" = 3.05 in.
18. (487 V 108A - Station 1 or 6
(487 V 116A - Station 2 or 3
Total Stroke = 0.89 in. x Scale Setting
"A" = 3.18 in.
19. (487 V 109A - Station 1 or 6
(487 V 117A - Station 2 or 3
Total Stroke = 0.97 in. x Scale Setting
"A" = 3.4 in.
20. Direction of rotation
21. Feed Stroke
22. 0° of Cam Drum (ie. centre line of keyway in camshaft)
23. Station 2 or 3
Auxiliary longitudinal motion mechanism Sec.489B
24. Station 1 or 6
Auxiliary longitudinal motion mechanism Sec.489B
25. Station 3
Auxiliary longitudinal motion mechanism Sec.489D
26. NOTE: Cams used for Station 6 are also used for Station 1 or 6
Cams used for Station 3 are also used for Station 2 or 3
27. Station 6
Auxiliary longitudinal motion mechanism Section 489C

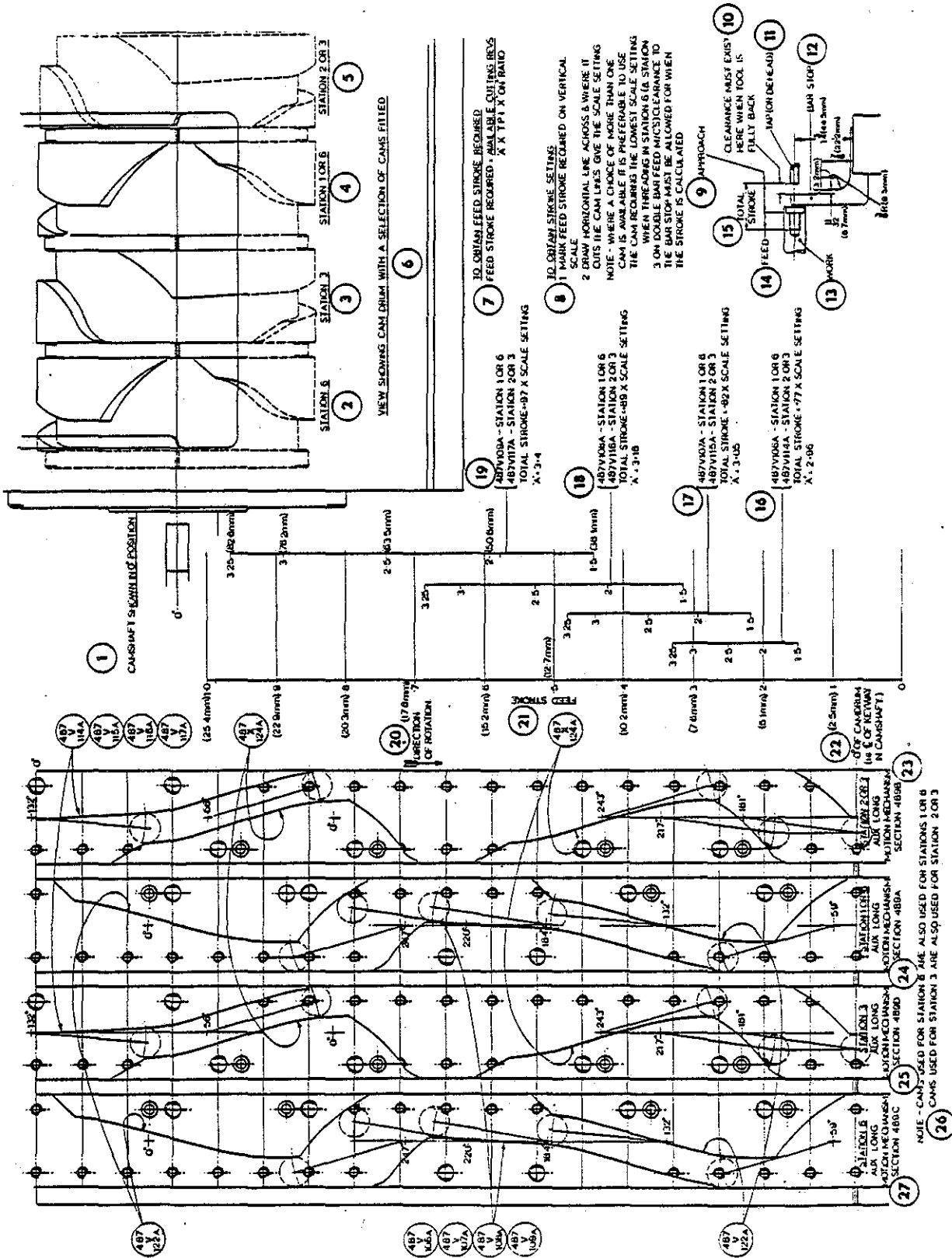


Fig. 45 487 Z 1A THREADING CAMS, STATIONS 1, 2, 3 & 6

CALCULATING WORK SPINDLE REVOLUTIONS FOR THREADING

When considering the use of a threading attachment, it is first necessary to establish the number of work spindle revolutions required. These depend on the lead, length of thread and threading ratios used; an allowance of two extra threads is usually made for starting.

WHEN USING SELF-OPENING DIEHEADS the number of revolutions may be found by multiplying the number of threads to be cut plus the allowance for starting, by the "ON" ratio used.

Number of threads to be cut = length of thread x T.P.I. to which is added two threads for starting.

CALCULATION (a)

Work spindle revolutions required =

$$[(\text{Length of thread} \times \text{T.P.I.}) + 2] \times \text{"ON" ratio}$$

For example:- To cut a 20 T.P.I. thread 3/4" long with an "ON" ratio of 5, work spindle revolutions required are as follows:

$$[(3/4" \times 20) + 2] \times 5 = 85 \text{ revolutions, or:-}$$

For a 1.5mm pitch thread x 30mm long with an "ON" ratio of 5 work spindle revs. are:-

$$\left[\frac{30}{1.5} + 2 \right] \times 5 = 110 \text{ revs.}$$

WHEN USING SOLID TAPS OR DIES extra revolutions must be allowed for the tap or die to run off the job.

CALCULATION (b)

Work spindle revolutions required =

$$[(\text{Length of thread} \times \text{T.P.I.}) + 2] \times [\text{"ON" ratio} + \text{"OFF" ratio}]$$

For example:- To cut a 20 T.P.I. thread 3/4" long with an "ON" ratio of 5 and an "OFF" ratio of 2, the work spindle revolutions required are as follows:-

$$[(3/4 \times 20) + 2] \times (5 + 2) = 119 \text{ work spindle revolutions}$$

or:-

For a 1.5 mm pitch thread x 30 mm long with an "ON" ratio of 5 and an "OFF" ratio of 2, work spindle revs are:-

$$\left[\frac{30}{1.5} + 2 \right] \times [5 + 2] = 154 \text{ revs.}$$

When threading in all stations ascertain that the work spindle revolutions required for threading do not exceed the available cutting revolutions which are given on the speed and feed chart. The available cutting revolutions depend on the cycle time and are determined by the longest operation, which in some cases may be the threading operation.

WHEN THREADING IN STATION 6 (and in Station 3 on double bar feed machines) to allow time for parting off, the work spindle revolutions required for threading should not normally exceed half of the available cutting revolutions.

Provision is made for the return cam to be retarded in 10° steps. Fig. shows the range provided, so that approximately $1/2$, $9/16$ and $5/8$ of the cutting revolutions are available for threading. The use of these figures depends upon the relative strength of the work at the time threading is completed, as the part off tool is usually part way through the work. This may be corrected in some cases, by setting a longer part off stroke than necessary, and arranging for the part off tool to cut only at the end of feed stroke. This will depend on the allowable feed rates on the part off tool. In the case where the calculated revolutions required for threading exceeds the maximum, the cycle time must be increased to give more available cutting revolutions, or a faster "ON" ratio must be used.

SELECTING CAMS FOR THREADING

Threading cams must be used when threading, the cam profile enabling consistent and accurate setting of the attachment. One threading cam available for 4th Station and one for 5th Station (see Fig.44). Four cams are available for 2nd and 3rd Stations and four cams for 6th Station (see Fig.45).

The timing of the movements given by these cams is shown on the timing diagram (Fig.21) and the following sequence of movements to the threading push rod is produced.

1. Fast approach stroke
2. Feed stroke. This is set to suit the thread being cut and serves to lead the threading tool correctly.
3. Dwell. This continues while the threading tool completes the cutting and in the case of solid taps and dies, allows the tool to run "OFF" the work.
4. Fast return, with accelerated timing cams. This occurs while the centre tool block and the cross slides are still feeding forward.

FITTING THREADING CAMS

FITTING THREADING CAMS for 4th and 5th Stations (Fig.44)

Threading cams are fitted in place of the feed cams in the upper motions. It will be found easier to fit the cams if the operating link is disconnected from the operating lever by the removal of the pin which is retained by a screw in the stroke adjusting block. Check that the cam roller will pass around the cam tank. Guard cam 486 V 142B should not be fitted when using a self-opening diehead.

FITTING THREADING CAMS for 1st, 2nd, 3rd and 6th Stations (Fig.45)

The three pieces comprising the threading cam are fitted to the drum in the position shown. A groove across the rim of the drum indicates 0° timing, and cams should be positioned from this groove. Check that a 7/8" (22.2 mm) diameter roller will pass at all points around the cam.

CALCULATING SCALE SETTINGS

CALCULATING SCALE SETTING FOR 4th and 5th Station Threading Cams (Fig.44)

These threading cams have the same rise as the standard feed cams. The total stroke is therefore equal to the scale setting.

The rate of feed during the feeds stroke is TWICE THE FEED RATE of the standard feed cams or TWICE THE FEED RATE shown on the speed and feed chart for the particular scale setting.

CALCULATION (c)

$$\text{Scale setting in inches} = \frac{\text{Available cutting revs.}}{2 \times \text{"ON" ratio} \times \text{T.P.I.}}$$

OR

$$= \frac{\text{Available cutting revs.} \times \text{pitch}}{2 \times \text{"ON" ratio}}$$

Maximum scale setting is 2" (50.8 mm)

For example:- To cut a 20 T.P.I. thread using an "ON" ratio of 5 from speed and feed chart, available cutting revolutions = 100 (This is determined by the longest operation).

Using calculation (c)

$$\begin{aligned} \text{The scale setting} &= \frac{100}{2 \times 5 \times 20} = \frac{100}{200} = \frac{1}{2} \\ \text{in inches} & \end{aligned}$$

For 1.5 mm pitch and an "ON" ratio of 5, scale setting (mm) =

$$\frac{100 \times 1.5}{2 \times 5} = 15 \text{ mm}$$

CALCULATING SCALE SETTINGS FOR 1st, 2nd, 3rd and 6th STATION THREADING CAMS
(Fig.45)

The feed stroke and scale settings are found from Fig. .

A choice of four lead cams is given, and the cam giving the greatest scale setting should be used wherever possible for ease of removal of bar-ends. The scale setting gives the total stroke, and the setting chosen must be at least equal to the distance from the end of the work to the further end of the thread, plus 3/4" (19 mm) to allow clearance for the bar stop.

DATA TO BE GIVEN ON THE TOOLING LAYOUT

The information obtained by methods explained in the previous pages should be incorporated in the tooling layout and not be left for the setter to calculate. The following items for instance, should be considered essential.

1. Full details to be used (see Attachments Sections Chart)
2. The Gears to be used on the drive units for "ON" and "OFF" ratios.
3. The cams to be used.
4. The scale settings to be set.

FITTING DRIVE UNITS

The Driving gears on the centre shaft (Fig.46) are fitted first. To facilitate this, remove the screws holding the bearing housing located behind the pick off gear and withdraw the shaft outwards, dropping off the spacers in the attachment compartment.

If the threading clutches are to be fitted in Stations 4 or 5, the glut shifting fork should be fitted next to the underside of the sliding block.

The rear housing must first be fitted into the drive housing. The clutch can then be fitted complete with its driven gears and the diehead drive slid in to support it. Secure the diehead drive by tightening the slotted locknut. The rear housing must be connected to the oil supply, three connections are provided (numbers 150, 151, 152) for attachment oiling in the main drive housing. The oil supply is adjusted at the distributor block in the bottom of the main drive housing. If the diehead drive only, Section 482, is to be used it is fitted as shown on Fig.42 but if in combination with a universal drive, see Fig.43.

The glut shaft should be fitted after the clutch, the spring being removed for the purpose. With the glut adjusted and clamped on the rod so that in the "ON" position there is 1/64" (0.4 mm) clearance between the clutch bobbin and adjacent clutch parts (as shown on Fig.43) the latch has 0.015" (0.4 mm) clearance to drop into engagement.

IN STATIONS 4 and 5 the nuts in front of the glut should be set with the sliding block FULLY BACK to obtain above condition.

IN STATIONS 2, 3 and 6 the clamp is set on the push rod to obtain above condition with the attachments mechanism FULLY BACK.

IN ALL STATIONS the pair of nuts limiting travel into the "OFF" position should be set so that there is 1/32" (0.8 mm) clearance between bobbin and adjacent clutch parts.

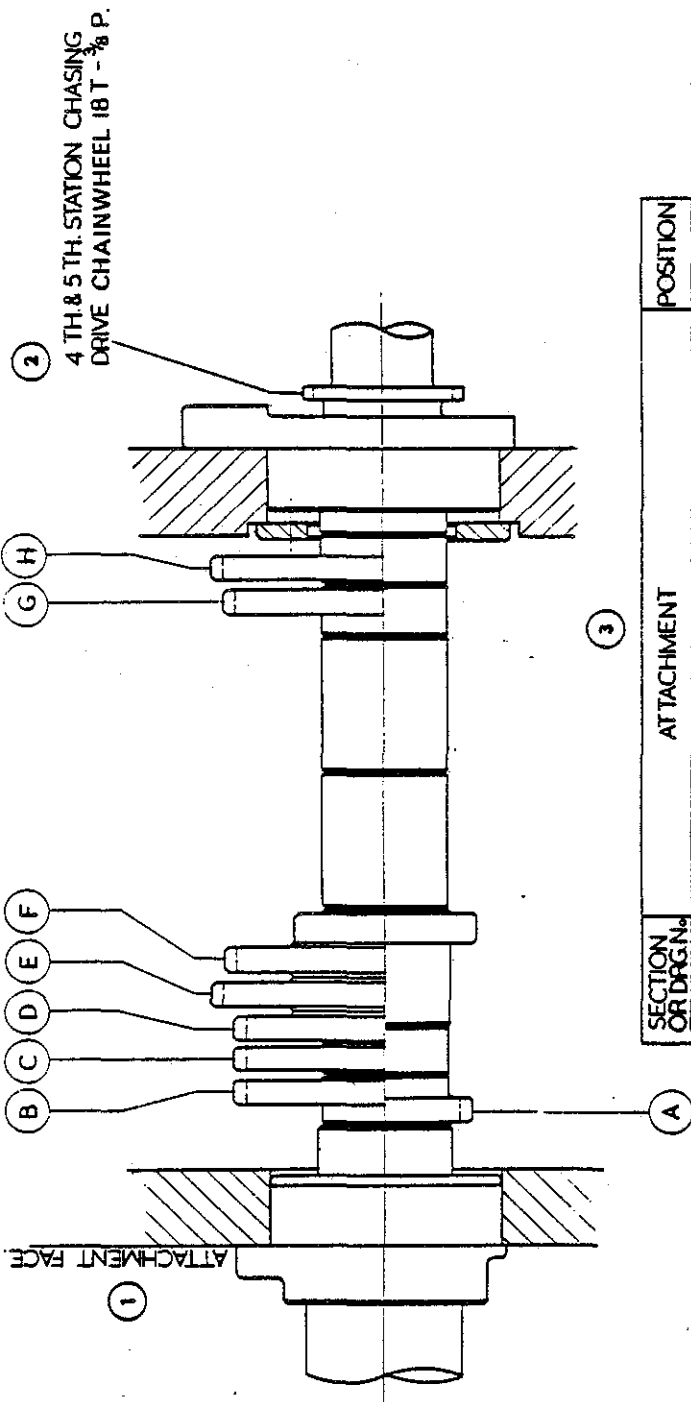
Both sides of the clutch should then be adjusted so that the clutch will trip satisfactorily.

When the clutch is set for use with a self-opening diehead, the latch spring taken off and the trip rod uncoupled from the latch. The latch and its pin are then removed. The nuts on the glut shaft are moved along to retain the clutch in the "ON" position.

Key to Fig.46

1. Attachment face
Chasing Drive Chainwheel
2. 4th & 5th Station
3.

SECTION OR DRG.N.	ATTACHMENT	POSITION
490 A9207	HIGH SPEED DRILLING. FLAT GENERATING (CROSS SLIDE MOUNTED).	A
490 J A 9168 A 9082	SYNCHRONOUS DRIVE. SYNCHRONOUS SLOTTING. FLAT GENERATING (LONGITUDINAL SLIDE MOUNTED).	B
490 J 482 A 9168 A 9082	SYNCHRONOUS DRIVE. THREADING. SYNCHRONOUS SLOTTING. FLAT GENERATING (LONGITUDINAL SLIDE MOUNTED).	C
490 J 482 A 9168 A 9082	SYNCHRONOUS DRIVE. THREADING. SYNCHRONOUS SLOTTING FLAT GENERATING (LONGITUDINAL SLIDE MOUNTED).	D
481	THREADING CLUTCH DRIVE.	E
481	THREADING CLUTCH DRIVE.	F
481 A 9168	THREADING CLUTCH DRIVE. SYNCHRONOUS SLOTTING (RATIO GEAR)	G
481 A 9168	THREADING CLUTCH DRIVE. SYNCHRONOUS SLOTTING (RATIO GEAR)	H



SECTION OR DRGN. NO.	ATTACHMENT	POSITION
490 A9207	HIGH SPEED DRILLING. FLAT GENERATING (CROSS SLIDE MOUNTED)	A
490 J A 9168 A 9082	SYNCHRONOUS DRIVE. SYNCHRONOUS SLOTTING. FLAT GENERATING (LONGITUDINAL SLIDE MOUNTED)	B
490 J 482 A 9168 A 9082	SYNCHRONOUS DRIVE. THREADING. SYNCHRONOUS SLOTTING. FLAT GENERATING (LONGITUDINAL SLIDE MOUNTED)	C
490 J 482 A 9168 A 9082	SYNCHRONOUS DRIVE. THREADING. SYNCHRONOUS SLOTTING FLAT GENERATING (LONGITUDINAL SLIDE MOUNTED)	D
481	THREADING CLUTCH DRIVE	E
481	THREADING CLUTCH DRIVE	F
481 A 9168	THREADING CLUTCH DRIVE. SYNCHRONOUS SLOTTING (RATIO GEAR)	G
481 A 9168	THREADING CLUTCH DRIVE SYNCHRONOUS SLOTTING (RATIO GEAR)	H

Fig. 46 400 Y 104

ATTACHMENT DRIVE GEARS ON CENTRE SHAFT

FITTING THREADING ATTACHMENTS

The threading attachment body, spindle and slide (Section 486) is fitted as shown on Fig. . When used in 4th and 5th station, it is fitted to the longitudinal slide and in 1st, 2nd, 3rd and 6th Stations to the centre block. The longitudinal slide and the attachment slide must be positioned to reduce to a minimum the overhang of the threading attachment to the slide during any of the working positions.

The diehead, tapholder or dieholder is fitted in the bore at the front end of the threading spindle and driven by a central screwed pin through the shank. It is essential that the split pin is replaced by retain this pin during running.

When using solid taps and dies it is essential that some form of floating holder be used.

IN 4th and 5th STATIONS the trip rods and push rods are fitted as shown in Fig.47; a self opening diehead and floating tap assembly are shown in the illustration.

IN 1st, 2nd, 3rd and 6th STATIONS the trip rods are fitted as shown on Fig.47.

The attachments in 1st, 2nd, 3rd and 6th are operated by auxiliary longitudinal motions; it is advisable to fit these motions before fitting the bracket and rods to the threading attachment.

The threading cams should be fitted and checked by passing a roller around the track.

When threading clutch is fitted in 2nd, 3rd or 6th, the clutch resetting clamp must be fitted on the pusher shaft (Fig.43). The back position of the pusher shaft is approximately constant so that once the glut shifting fork has been set, the stroke can be altered without affecting this setting.

- Key to Fig.47
1. Brackets Section 486A
 2. Section 432
 3. Section 429
 4. Brackets Section 486A
 5. Sections 486F & 486G Threading Attachment
Return Check Switch can be fitted to all stations except station 6 (and 3 on double bar feed machines)
 6. Clamp F Section 486
 7. Clamp D Section 486A
 8. Clamp J Section 486F
 9. Push Rod Section 486A
 10. Clamp B Section 486A
 11. Pusher Sleeve and Spring Assembly Section 486
 12. Clamp A Section 486A
 13. Push Rod Section 486A
 14. Limit Switch Section 486F and 486G
 15. Drive Sleeve Section 482
 16. Diehead Road Section 486
 17. Clamp G Section 486
 18. Clamp K Section 489
 19. Clamp C Section 486A

20. Pusher Sleeve and Spring Assembly Section 486
21. Diehead Assembly Stations 4 & 5
22. Clamp L Section 489
23. Bracket Section 486E
24. Brackets Section 486E
25. Brackets Section 486D
26. Section 486E is used in Stations 3 and 6 only when an attachment is being used in adjacent Station 1 or 2
NOTE: Section 486E cannot be used when tapping is required
27. Bracket Section 486D
- 28.

STN	DIEHEAD	TAP
1	486D	-
2	486D	486D
3*	486D	486D
	ORE	
4	486A	486A
5	486A	486A
6*	486D	486D
	ORE	

29. All Stations require Section 486. See table for extra Sections required for individual Stations
NOTE: Tapping is not available in Station 1
30. Clamp P Section 486
31. Diehead Assembly Stations 1, 2, 3 and 6
32. Clamp D Section 486A
33. Push Rod Section 486A
34. Clamp J Section 486F
35. Clamp B Section 486A
36. Clamp N Section 486
37. Pusher Sleeve and Spring Assembly Section 486
38. Clamp A Section 486A
39. Push Rod Section 48940. Push Rod Section 486A
41. Diehead Rod Section 486
42. Limit Switch Section 486F
43. Threading Clutch Mechanism Section 481
44. Drive Sleeve Section 482
45. Limit Switch Section 486F
46. Drive Sleeve Section 482
47. Clamp K Section 489
48. Trip Rod Section 486
49. Clamp C Section 486A
50. Pusher Sleeve and Spring Assembly Section 486
51. Clamp J Section 486F
52. Tapping Assembly Stations 4 & 5
53. Clamp E Section 486
54. Bracket Section 486D
55. Brackets Section 486D
56. Brackets Section 486D
57. 1 hole drill and ream for 5/32 in. (3.96 mm) taper pin with glut sleeve in position
58. 9/32 in. (7.1 mm) drill
59. Diehead glut; phosphor bronze casting
PB 2C BS 1400

60. Glut dimensions to suit diehead
61. Glut sleeve, mild steel
62. Clamp M Section 486
63. Clamp L Section 489
64. See 482 Z 10 for spindle nose (bore and driving pin) dimensions
65. Tapping Assembly Stations 2, 3 & 6
66. Trip rod section 486
67. Clamp R Section 486D
68. Push Rod Section 489
69. Threading Clutch Mechanism Section 481

SETTING THREADING ATTACHMENTS

SETTING THREADING ATTACHMENTS - 4th and 5th STATIONS

The following should be read in conjunction with the threading attachment diagrams Fig.47 FOR SELF OPENING DIEHEADS.

1. Set the operating block on the cam lever to the scale setting as calculated (Calculation c) Page 143
2. Handwind to the beginning of the feed stroke
3. Adjust clamp "A" until the dies are just clear of the work. If the length of thread is less than the scale setting, a minimum clearance equal to the scale setting minus the thread length must be set between the dies and the work.
4. Set clamp "C" in conjunction with clamp "A" to obtain the most advantageous working position of the attachment body on its slide.
5. Set clamp "B" just clear of the push sleeve.

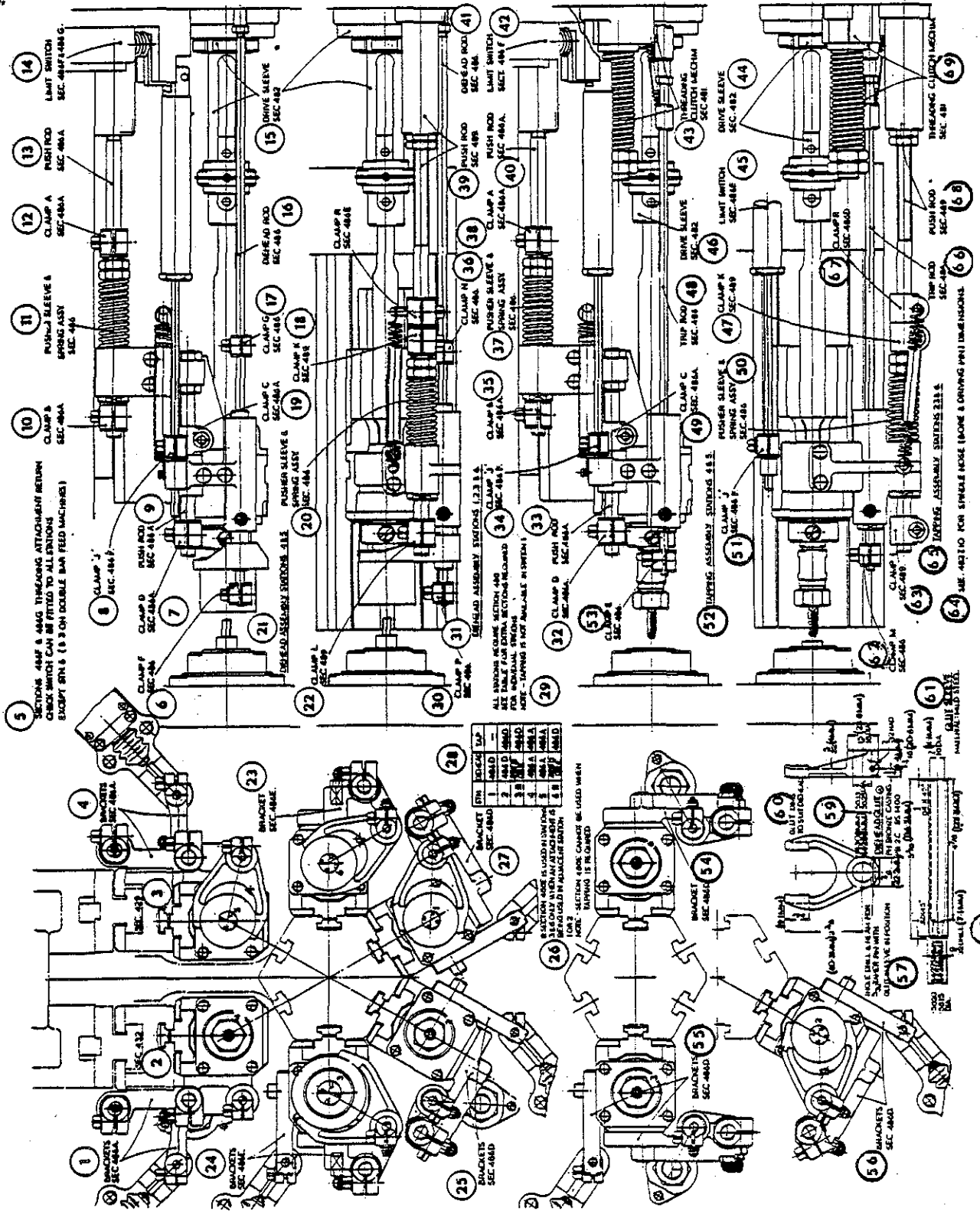


Fig. 47 486 Z 10

6. Set clamp "D" with a minimum clearance equal to the thread length plus the clearance set between the dies and the work, minus the scale setting. It is advisable to start with more clearance than this and adjust closer after diehead trip has been set correctly. This clamp must not contact the attachment body bracket, before the diehead has opened.

7. Set clamp "F" to open the diehead when the correct length of thread has been cut; the forward motion of the push rod must have ceased before the diehead opens.

8. Set clamp "G" to close the diehead when the attachment is fully back.

The following should be read in conjunction with diagrams Fig.47 FOR SOLID TAPS OR BUTTON DIES.

1. Set the operating block in the cam lever to the scale setting as calculated (Calculation c) Page

2. Handwind to the beginning of the feed stroke.

3. Adjust clamp, etc. (as for self opening dieheads)

4. As for self opening dieheads

5. As for self opening dieheads

6. Set clamp "D" with a minimum clearance equal to the thread length plus the clearance set between the tap or die and the work plus 1/8" (3.2 mm). It is advisable to start with more clearance than this and adjust closer after the clutch trip has been set correctly. This clamp must not contact the attachment body bracket before the tap or die has finished and is clear of the work.

7. Set clamp "E" to trip the clutch into reverse when the tap has reached full depth. This can be done by setting the clamp clear of the bush by an amount equal to the thread plus the clearance set, minus 1/8" (3.2mm)

SETTING THREADING ATTACHMENTS - 1st, 2nd, 3rd and 6th STATIONS.

The following should be read in conjunction with the threading attachment diagrams Fig.47 FOR SELF OPENING DIEHEADS

1. Having set the correct scale setting, handwind the machine to the beginning of feed stroke
2. Adjust clamp "K" until the dies are just clear of the work. If the feed stroke of the cam is greater than the thread length, a clearance equal to the feed stroke less the thread length must be set between the dies and the work.
3. Set clamp "P" to open diehead when the correct length of thread has been cut. Forward movement of the push rod must have ceased before the diehead opens.
4. Set clamp "L" so that, while never touching the push sleeve during the forward motion of the diehead, it would nevertheless give a positive pull back to the attachment should the return spring fail.
5. Set clamp "N" to close the diehead when the attachment is fully back.

The following should be read in conjunction with the threading attachment diagrams Fig.47 FOR SOLID TAPS OR BUTTON DIES

1. Set correct scale setting and handwind the machine to start of feed stroke
2. Set clamp "K" as in paragraph 2 of the diehead instruction above
3. Set clamp "M" to trip the clutch into reverse when the tap has reached full depth. This may be done by setting the clamp clear of the bush by an amount equal to the thread length plus the clearance set between the tap or die and the work less 1/8" (3.2 mm).
4. Set clamp "L" as in paragraph 4 of diehead instructions above.

SETTING THREADING ATTACHMENTS - GENERAL NOTES

It is advisable to check threading setting by use of the "Jog" button so that all settings and adjustments can be checked and modified if necessary.

Never handwind the machine through feed when threading is set and a component is at the threading station.

Never handwind backwards without either relieving the clamp "A" (see Fig.47) so that the tap or die is clear of the work, or removing the tap or die. When using a self-opening diehead, this may be tripped open in order to handwind backwards.

Scale setting, clearance to be set, and cams to be used should be specified on tooling layout and not left to the setter to calculate.

When setting, watch the movement of the attachment to observe whether clutches are slipping; movement ceases when this occurs.

THREADING ATTACHMENT - RETURN CHECK SWITCH

See Fig.47 Section 486F

The unit can be fitted to the threading attachment in all stations except bar feed stations and is normally fitted or supplied with threading. It consists of a bracket mounted micro-switch operated by a bell crank lever and a spring cushioned operating rod, stop plate and electrical conduit and wiring. The stop plate is needed on stations 1, 2 and 3 only.

The unit is designed to close the micro switch on the threading attachment return stroke; failure to return keeps the switch open, and allows the timing switch (2 LS) fitted at the bar feed end of the main camshaft to stop the machinery de-energising the feed trip solenoid (at collet open) see Fig.20 (refer to machine wiring diagram).

The switch bracket is bolted to the main drive housing attachment face, the stop plate screwed to the threading attachment bracket and the operated rod carrying clamp "J" is passed through the stop bracket.

When threading is completed the switch should operate when the tap or die is approximately 1/4" (6.4mm) clear of the work, clamp "J" can now be set to achieve this.

If a transfer arm pick-up attachment is used in station 3 the check switch for station 4 must be mounted as shown on 486 Y 11. If a transfer arm pick-up attachment is used in station 6 the check switch for station 5 must be mounted as shown on 486 Y 11.

When threading takes place without a transfer arm pick-up attachment being used, the check switches are mounted as shown on Fig.47.

CHASING ATTACHMENTS

These attachments can be fitted to the cross slides in 2nd or 4th and/or 5th station, and comprise: the chasing attachment and drive unit and extra parts.

CHASING ATTACHMENT 2nd STATION SECTION 492C, 4th or 5th STATION SECTION 492 MK.II

The chasing slide is oscillated by the lead cam and is moved to and from the work by the relief cam and tension spring. The tension of the spring can be adjusted by the nuts on the spring anchor whilst the attachment is running to give the quietest running. The tension required varies according to the speed.

The maximum speed at which the attachment should be run is 600 cycles per minute.

At stations 4 and 5 this attachment is lubricated by the system, for the attachment header on top of the beam casting. Fig.3. The attachment at station 2 is oiled from a reservoir on top of the attachment which must be kept filled up.

CHASING DRIVE SECTION 492 A MK.I

The drive is by chain from the centre shaft chain wheel to a shaft which extends through to the Drive Unit mounted on the attachment face of the Main Drive Housing. NOTE - The DRIVEN chainwheel has 16 TEETH ON STANDARD MACHINES and 18 TEETH ON SPINDLE STOPPING MACHINES. The final drive across to the Chasing Attachment is by a universally jointed shaft. The drive unit is fitted with two pick off gears which are selected to give the ratio required to suit the job.

The ratio is the number of work spindle revolutions during one revolution of the attachment camshaft, i.e. with a ratio of 6:1 the spindle revolves six times during one revolution of the camshaft.

The relation of the drive pin in the slotted shaft must be correct as indicated on Fig.48.

Oil must be maintained in two gear compartments and must be checked daily. When chasing in station 2 the drive unit must rotated through 180° to its correct position on the attachment face.

SELECTION OF THREADING RATIO

The ratio is chosen in conjunction with the lead cam to suit the lead of the thread to be cut, both of which are selected from the chart on Fig. With any lead cam, various leads can be cut by using different ratios. Normally ratios of 4:1, 5:1 and 6:1 are preferred in order to obtain the maximum number of passes of the chasing tool over the work during the cutting cycle. When using high work spindle speeds, the ratio chosen must be such as to keep the speed of the attachment within the maximum allowable.

The number of work-spindle revolutions during the 8° dwell (see Feed and Speed Chart Fig.9) must be more than the ratio used.

CHANGING LEAD CAMS

Remove attachment from cross slide. Remove cover plate above chasing slide. Release the tension on the relief spring and unhook it from the spring anchor. Swing the slide forward until roller is free from lead cam. Remove the large end cap on the face opposite to drive shaft. Remove the camshaft nut, bearing and spacer. The lead cam may then be removed. Extraction holes 2 BA are provided in the inner cam. The new lead cam is fitted in the reverse order checking that there is clearance for the lead roller all the way round the cam track.

CHASING CUTTER

This must be designed to suit the lead cut. The width of the chasing cutter may be determined by the job when threading behind a shoulder. The length behind the shoulder must be equal to the total travel due to the lead cam, plus the width of the chaser cutter, plus an allowance at each end for clearance. The minimum width of undercut required behind the shoulder can be determined as follows :

Minimum width of undercut =

$$.0725 L + \frac{L}{R} + \text{clearance}$$

Where L = Lead of cam
R = Ratio

$$\text{clearance} = .010 \text{ in (0.025 mm)}$$

If found necessary to reduce the cutting load, teeth may be ground off the chaser leaving 1 in $\frac{R}{2}$ teeth.*

(Take $\frac{R}{2}$ to nearest lesser whole number)

e.g. Using ratio of 7, leave one in every $(\frac{7}{2} = 3\frac{1}{2})$ i.e. 3 teeth.

The chasing cutter is mounted on a removable bracket which clamps to the dovetail on the slide. A stop screw in the bracket can be set so that the bracket may be removed and replaced without altering the endwise setting. The height of the cutting edge is set from the edge of the bracket by the gauge provided.

SETTING

The feed stroke set on the cross slide is set to the depth of thread plus .005 in. (0.01 mm). This is so small that the stroke must be set and checked by using a dial indicator. With the cross slide at the start of the feed, mount a dial indicator so that it registers the stroke of the slide. Handwind to the end of feed and check the travel indicated; adjust cross slide link until correct travel is obtained.

Taper in the thread can be eliminated by loosening the clamp bolts and adjusting the set screws in the strip behind the attachment. Ensure that all bolts are tight before running the attachment.

LEFT-HAND THREADS

Left hand threads are obtained by using left-hand lead cams.

The spring, plunger and cap in the attachment chasing slide must be reversed to give endwise pressure in the opposite direction.

APPLICATION

Fig.49 gives the diameter and length capacity of the attachment and also useful information on lead cams and ratios to be used, undercut dimensions etc.

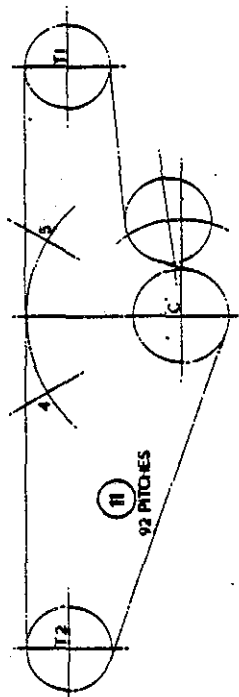
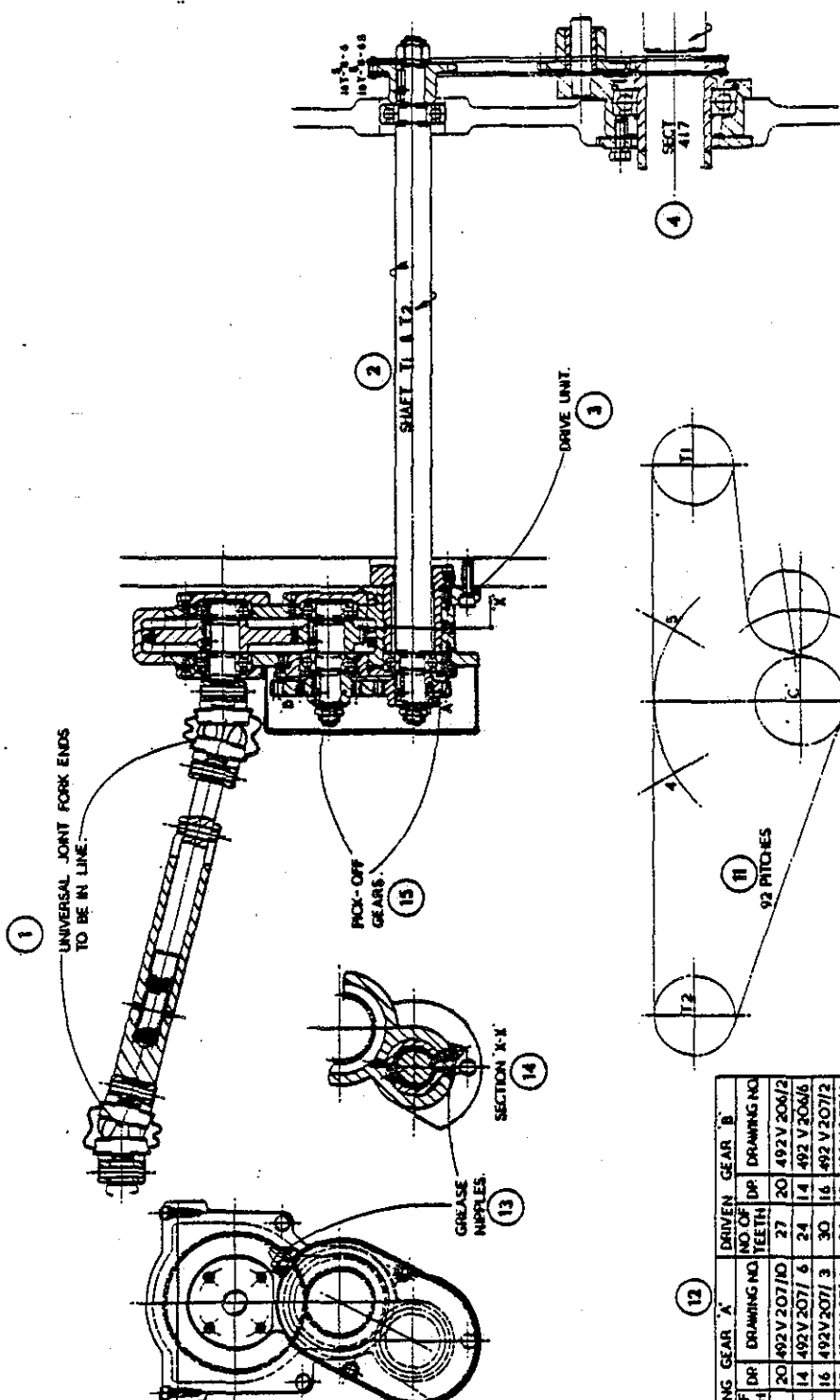
Chasing can take place with threading in any station, however, EXTRA PARTS are needed to operate the threading attachment check switch in stations 3 and 4 with chasing in 2 and 4, and in 5 and 6 with chasing in 5th station.

Key to Fig.48

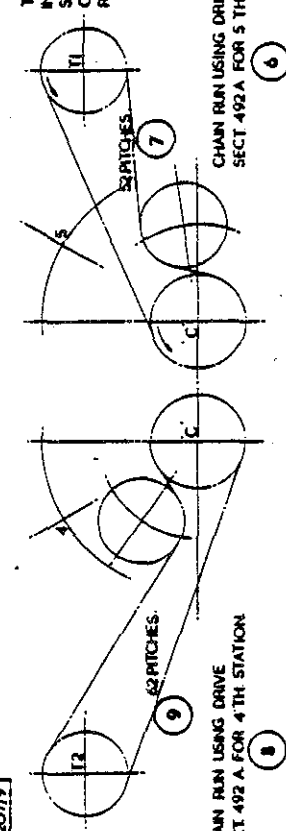
1. Universal joint fork ends to be in line 2. Shaft T1 and T2
3. Drive unit
4. Section 417
5. This drive is also used for chasing in station 2. When setting up for station 2 the drive unit is in its correct position after being rotated through 180°
6. Chain run using drive section 492A for station 5
7. 52 pitches
8. Chain run using drive section 492A for unit station
9. 62 pitches
10. Chain run using 2 drives section 492A for 4 I.H. & 5 I.H. stations
11. 92 pitches
- 12.

RATIO	DRIVING GEAR A			DRIVEN GEAR B		
	NO OF TEETH	DP	DRAWING NO.	NO OF TEETH	DP	DRAWING NO.
3 : 1	48	20	492V 207/10	27	20	492V 206/2
4 : 1	32	14	492V 207/ 6	24	14	492V 206/6
5 : 1	32	16	492V 207/ 3	30	16	492V 207/2
6 : 1	32	18	492V 207/ 1	36	18	492V 207/4
7 : 1	32	18	492V 206/ 5	42	18	492V 207/5
8 : 1	16	10	492V 206/ 4	24	10	492V 207/7
9 : 1	16	11	492V 206/ 3	27	11	492V 207/8
10 : 1	16	12	492V 206/ 1	30	12	492V 207/9

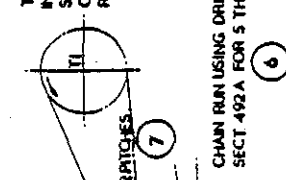
13. Grease nipples
14. Section "X-X"
15. Pick-Off gears



10 CHAIN RUN USING 2 DRIVES SECT 492A FOR 4 TH & 5 STATIONS CONCURRENTLY



9 CHAIN RUN USING DRIVE SECT 492 A FOR 4 TH STATION



6 CHAIN RUN USING DRIVE SECT 492A FOR 5 TH STATION

5 THIS DRIVE IS ALSO USED FOR CHASING IN STATION 2. WHEN SETTING UP FOR STATION 2 THE DRIVE UNIT IS IN ITS CORRECT POSITION AFTER BEING ROTATED THROUGH 180°

12

RATIO	DRIVING GEAR 'A' NO. OF TEETH	DRIVING NO. DRAWING NO.	DRIVEN GEAR 'B' NO. OF TEETH	DRIVEN NO. DRAWING NO.
3 : 1	48	20 492V 207/10	27	20 492V 206/2
4 : 1	32	14 492V 207/ 5	24	14 492 V 206/6
5 : 1	32	16 492V 207/ 3	30	16 492 V 207/2
6 : 1	32	18 492V 207/ 1	36	18 492V 207/4
7 : 1	32	18 492V 206/ 5	42	18 492 V 207/5
8 : 1	16	10 492V 206/ 4	24	10 492 V 207/7
9 : 1	16	11 492V 206/ 3	27	11 492 V 207/8
10 : 1	16	12 492V 206/ 1	30	12 492 V 207/9

Fig. 48 400 Z.89

CHASING ATTACHMENT DRIVE MK. I, 4th & 5th STATIONS

RATIO	DRIVING GEAR		DRIVEN GEAR	
	NO. OF TEETH	DP	NO. OF TEETH	DP
3:1	48	20	492 V 207/10	492 V 206/12
4:1	32	14	492 V 207/6	492 V 206/8
5:1	32	16	492 V 207/3	492 V 207/2
6:1	30/34	18	492 V 207/1	492 V 207/4
7:1	30/34	18	492 V 206/5	492 V 207/5
8:1	16	10	492 V 206/4	492 V 207/7
9:1	16	11	492 V 206/3	492 V 207/8
10:1	16	12	492 V 206/1	492 V 207/9

- 1 IN (7.94 MM) DIAMETER "U" LIMIT
- 1 IN (15.9 MM) MAXIMUM
- 1 IN (31.8 MM) MAXIMUM DIAMETER
- HOLE 3 IN (2.38 MM) DIAMETER "U" LIMIT
- CONNECT LUBRICATION PIPE TO MILLER HEADER ON BEAM. ARROW ON FITTING MUST POINT IN DIRECTION SHOWN
- RETAINING SLEEVE
- LOCKING SCREW
- LEAD CAM
- RELIEF CAM

CAM LEAD	CAM PITCH	DRAWING NUMBER	
		RIGHT HAND HEAD	LEFT HAND HEAD
1/2	0.1"	492 Y 151/12	492 Y 148/12
3/8	0.125"	492 Y 151/9	492 Y 148/9
1/4	0.15"	492 Y 151/7	492 Y 148/7
3/16	0.1875"	492 Y 151/5	492 Y 148/5
1/8	0.25"	492 Y 151/4	492 Y 148/4
3/32	0.3125"	492 Y 151/3	492 Y 148/3
1/16	0.375"	492 Y 151/2	492 Y 148/2
3/64	0.46875"	492 Y 151/1	492 Y 148/1
1/32	0.5625"	492 Y 151/0	492 Y 148/0
3/128	0.65625"	492 Y 151/27	492 Y 148/27
1/64	0.75"	492 Y 151/14	492 Y 148/14
3/256	0.84375"	492 Y 151/15	492 Y 148/15
1/128	0.9375"	492 Y 151/16	492 Y 148/16
3/512	1.03125"	492 Y 151/23	492 Y 148/23
1/256	1.125"	492 Y 151/17	492 Y 148/17
3/1024	1.21875"	492 Y 151/18	492 Y 148/18
1/512	1.3125"	492 Y 151/19	492 Y 148/19
3/2048	1.40625"	492 Y 151/22mm	492 Y 148/22mm
1/1024	1.5"	492 Y 151/10mm	492 Y 148/10mm
3/4096	1.5625"	492 Y 151/9mm	492 Y 148/9mm
1/2048	1.625"	492 Y 151/8mm	492 Y 148/8mm
3/8192	1.6875"	492 Y 151/7mm	492 Y 148/7mm
1/4096	1.75"	492 Y 151/6mm	492 Y 148/6mm
3/16384	1.8125"	492 Y 151/5mm	492 Y 148/5mm
1/8192	1.875"	492 Y 151/4mm	492 Y 148/4mm
3/32768	1.9375"	492 Y 151/3.5mm	492 Y 148/3.5mm
1/16384	2"	492 Y 151/3mm	492 Y 148/3mm
3/65536	2.0625"	492 Y 151/2.5mm	492 Y 148/2.5mm
1/32768	2.125"	492 Y 151/2mm	492 Y 148/2mm

- 11 CUTTING STROKE - 0.5 IN (12.70 MM) X CAM LEAD
- 12 TOTAL STROKE - 0.645 IN (16.38 MM) X CAM LEAD

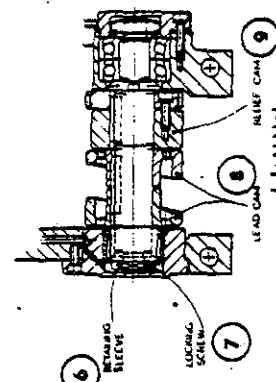
$$\text{RATIO} = \frac{b}{a} \times \frac{16}{3}$$

- 16 IN (15.9 MM) MINIMUM
- 1 IN (31.8 MM) AT END OF FEED STROKE

LEAD TO BE CUT	LEAD TO BE CUT = RATIO									
	5mm	6mm	7mm	8mm	10mm	12mm	15mm	17.5mm	20mm	25mm
CAM LEAD	5	6	7	8	10	12	15	17.5	20	25
CAM RATIO	5	6	7	8	10	12	15	17.5	20	25
CUT LEAD	5	6	7	8	10	12	15	17.5	20	25
CUT RATIO	5	6	7	8	10	12	15	17.5	20	25

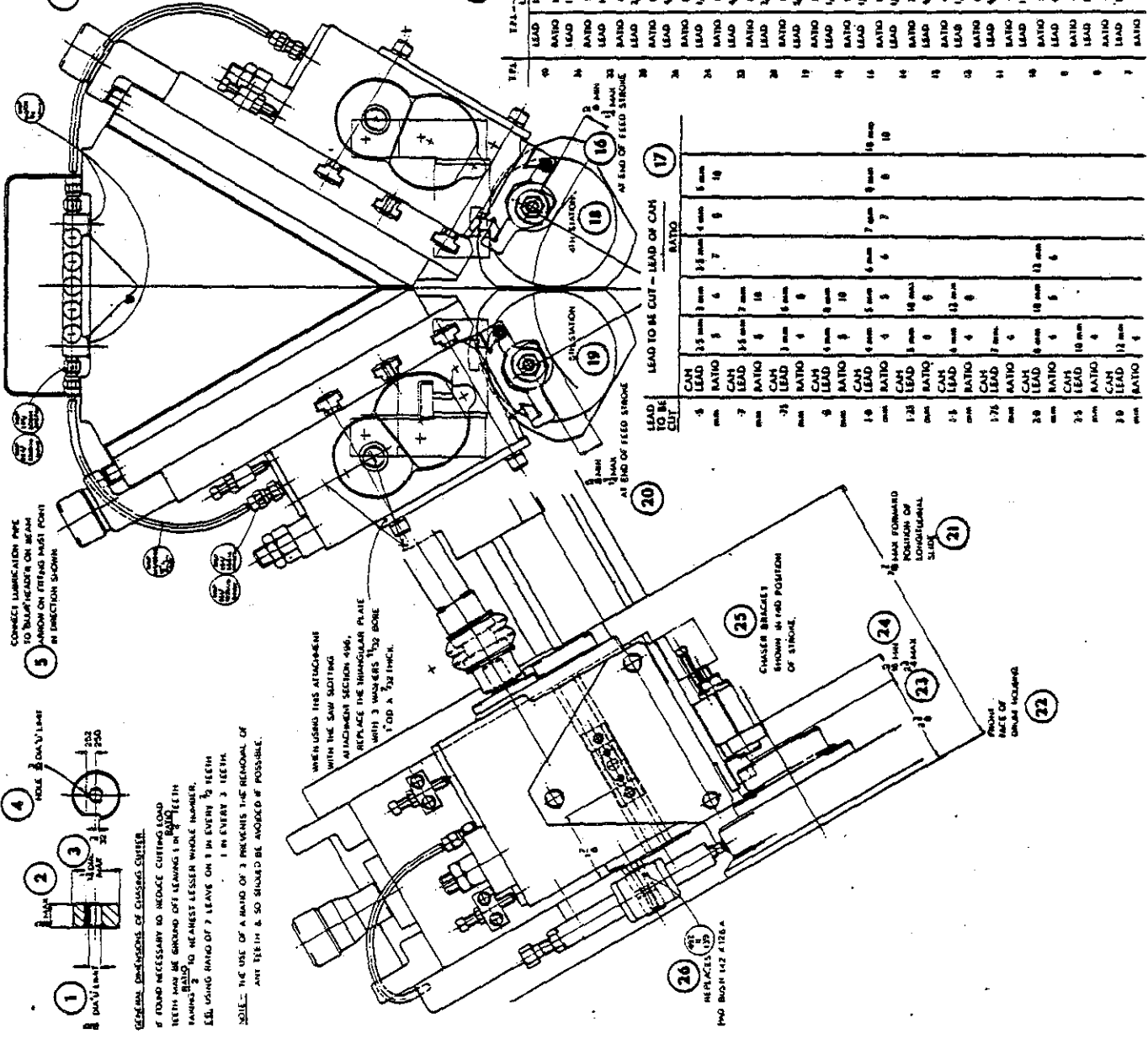
- 18 STATION 4
- 19 STATION 5
- 20 IN (15.9 MM) AT END OF FEED STROKE
- 21 IN (188.9 MM) MAXIMUM FORWARD POSITION OF LONGITUDINAL SLIDE
- 22 FRONT FACE OF DRUM HOUSING
- 23 IN (69.9 MM) MINIMUM CHASER BRACKET SHOWN IN MID POSITION OF STROKE
- 24 REPLACES PAD BUSH 142X126A
- 25 GENERAL DIMENSIONS OF CHASING CUTTER. IF FOUND NECESSARY TO REDUCE CUTTING LOAD TEETH MAY BE GRIND OFF LEAVING 1 IN RATIO
- 26 TEETH TAKING 2 TO NEAREST LESSER WHOLE NUMBER.
- 27 E.G. USING RATIO OF 7 LEAVE ON 1 IN EVERY 7/2 TEETH 1 IN EVERY 3 TEETH

NOTE: THE USE OF A RATIO OF 3 PREVENTS THE REMOVAL OF ANY TEETH AND SO SHOULD BE AVOIDED IF POSSIBLE.



10

CAM LEAD	RIGHT HAND THREAD	LEFT HAND THREAD	DRAWING NUMBER
1/10	492 Y 1514/2	492 Y 1461/2	
3/20	492 Y 1517/6	492 Y 1464/6	
3/15	492 Y 1517/5	492 Y 1464/5	
4/11	492 Y 1517/4	492 Y 1464/4	
5/9	492 Y 1517/3	492 Y 1464/3	
6/8	492 Y 1517/2	492 Y 1464/2	
7/6	492 Y 1517/1	492 Y 1464/1	
8/5	492 Y 1517/0	492 Y 1464/0	
9/4	492 Y 1517/0	492 Y 1464/0	
10/3	492 Y 1517/0	492 Y 1464/0	
11/3	492 Y 1517/0	492 Y 1464/0	
12/2	492 Y 1517/0	492 Y 1464/0	
13/2	492 Y 1517/0	492 Y 1464/0	
14/1	492 Y 1517/0	492 Y 1464/0	
15/1	492 Y 1517/0	492 Y 1464/0	
16/1	492 Y 1517/0	492 Y 1464/0	
17/1	492 Y 1517/0	492 Y 1464/0	
18/1	492 Y 1517/0	492 Y 1464/0	
19/1	492 Y 1517/0	492 Y 1464/0	
20/1	492 Y 1517/0	492 Y 1464/0	
21/1	492 Y 1517/0	492 Y 1464/0	
22/1	492 Y 1517/0	492 Y 1464/0	
23/1	492 Y 1517/0	492 Y 1464/0	
24/1	492 Y 1517/0	492 Y 1464/0	
25/1	492 Y 1517/0	492 Y 1464/0	
26/1	492 Y 1517/0	492 Y 1464/0	
27/1	492 Y 1517/0	492 Y 1464/0	
28/1	492 Y 1517/0	492 Y 1464/0	
29/1	492 Y 1517/0	492 Y 1464/0	
30/1	492 Y 1517/0	492 Y 1464/0	
31/1	492 Y 1517/0	492 Y 1464/0	
32/1	492 Y 1517/0	492 Y 1464/0	
33/1	492 Y 1517/0	492 Y 1464/0	
34/1	492 Y 1517/0	492 Y 1464/0	
35/1	492 Y 1517/0	492 Y 1464/0	
36/1	492 Y 1517/0	492 Y 1464/0	
37/1	492 Y 1517/0	492 Y 1464/0	
38/1	492 Y 1517/0	492 Y 1464/0	
39/1	492 Y 1517/0	492 Y 1464/0	
40/1	492 Y 1517/0	492 Y 1464/0	
41/1	492 Y 1517/0	492 Y 1464/0	
42/1	492 Y 1517/0	492 Y 1464/0	
43/1	492 Y 1517/0	492 Y 1464/0	
44/1	492 Y 1517/0	492 Y 1464/0	
45/1	492 Y 1517/0	492 Y 1464/0	
46/1	492 Y 1517/0	492 Y 1464/0	
47/1	492 Y 1517/0	492 Y 1464/0	
48/1	492 Y 1517/0	492 Y 1464/0	
49/1	492 Y 1517/0	492 Y 1464/0	
50/1	492 Y 1517/0	492 Y 1464/0	
51/1	492 Y 1517/0	492 Y 1464/0	
52/1	492 Y 1517/0	492 Y 1464/0	
53/1	492 Y 1517/0	492 Y 1464/0	
54/1	492 Y 1517/0	492 Y 1464/0	
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70/1	492 Y 1517/0	492 Y 1464/0	
71/1	492 Y 1517/0	492 Y 1464/0	
72/1	492 Y 1517/0	492 Y 1464/0	
73/1	492 Y 1517/0	492 Y 1464/0	
74/1	492 Y 1517/0	492 Y 1464/0	
75/1	492 Y 1517/0	492 Y 1464/0	
76/1	492 Y 1517/0	492 Y 1464/0	
77/1	492 Y 1517/0	492 Y 1464/0	
78/1	492 Y 1517/0	492 Y 1464/0	
79/1	492 Y 1517/0	492 Y 1464/0	
80/1	492 Y 1517/0	492 Y 1464/0	
81/1	492 Y 1517/0	492 Y 1464/0	
82/1	492 Y 1517/0	492 Y 1464/0	
83/1	492 Y 1517/0	492 Y 1464/0	
84/1	492 Y 1517/0	492 Y 1464/0	
85/1	492 Y 1517/0	492 Y 1464/0	
86/1	492 Y 1517/0	492 Y 1464/0	
87/1	492 Y 1517/0	492 Y 1464/0	
88/1	492 Y 1517/0	492 Y 1464/0	
89/1	492 Y 1517/0	492 Y 1464/0	
90/1	492 Y 1517/0	492 Y 1464/0	
91/1	492 Y 1517/0	492 Y 1464/0	
92/1	492 Y 1517/0	492 Y 1464/0	
93/1	492 Y 1517/0	492 Y 1464/0	
94/1	492 Y 1517/0	492 Y 1464/0	
95/1	492 Y 1517/0	492 Y 1464/0	
96/1	492 Y 1517/0	492 Y 1464/0	
97/1	492 Y 1517/0	492 Y 1464/0	
98/1	492 Y 1517/0	492 Y 1464/0	
99/1	492 Y 1517/0	492 Y 1464/0	
100/1	492 Y 1517/0	492 Y 1464/0	



5 CONNECT LUBRICATION PIPE TO BALF HEADER ON REAR END OF ATTACHMENT POINT IN DIRECTION SHOWN

6 RETAINING SLEEVE

7 LUBRICATING SCREW

8 LEAD CAM

9 RELIEF CAM

10 MINIMUM WIDTH OF UNDERBOLT

11 CUTTING STROKE -- 3 X CAM LEAD

12 TOTAL STROKE -- 645 X CAM LEAD

13 DRIVING GEAR

14 DRIVEN GEAR

15 RATIO

16 LEAD OF CAR

17 LEAD TO BE CUT - LEAD OF CAM

18 DIVISION

19 DIVISION

20 LEAD CUT

21 MAX FORWARD POSITION OF LONGITUDINAL SLID

22 FRONT FACE OF DRIVE WHEEL

23 MAX

24 CHASER BRACKET SHOWN IN END POSITION OF STROKE

25 REPLACES 137

26 PWD BUSH 142 A 126A

27 GENERAL DIMENSIONS OF CLASSING GEAR

IF FOUND NECESSARY TO REDUCE CUTTING LOAD TEETH MAY BE GRIND OFF LEAVING 1 IN EVERY 3 TEETH BANKING BEING TO NEAREST LESSEST WHOLE NUMBER.

LEAD USING RATIO OF 7 LEAVE ON 1 IN EVERY 3 TEETH 1 IN EVERY 3 TEETH

NOTE: THE USE OF A RATIO OF 3 PREVENTS THE REMOVAL OF ANY TEETH IN 8, 50 SHOULD BE AVOIDED IF POSSIBLE.

WHEN USING THIS ATTACHMENT WITH THE SAW STOPPING ATTACHMENT SECTION 496, REPLACE THE TRIANGULAR PLATE WITH 3 WASHERS 1/32 BORE 1" OD X 3/32 THICK.

RATIO	No. OF TEETH	DP	DWG. NO.
3:1	48	20	492 V 2071/6
4:1	32	14	492 V 2071/6
5:1	24	10	492 V 2071/6
6:1	18	7	492 V 2071/6
7:1	14	5	492 V 2071/6
8:1	12	4	492 V 2071/6
9:1	10	3	492 V 2071/6
10:1	8	2	492 V 2071/6

Fig. 49 492 Z 80A

19 CUTTING STROKE - 0.5 IN (13.70 MM) X CAM LEAD
 TOTAL STROKE - 0.645 IN (16.38 MM) X CAM LEAD
 RATIO = $\frac{A}{B} \times \frac{3}{16}$

- 1 RETAINING SLEEVE
- 2 LOCKING SCREW
- 3 LEAD CAM
- 4 BELIEF CAM
- 5 1 IN (25.4 MM) MAXIMUM
- 6 1 IN (25.4 MM) MINIMUM
- 7 STRIKE BRACKET SHOWN IN MID POSITION OF
- 8 SPRING PAD BUSH 142X126A
- 9 SEE NOTE 1
- 10 REF. FIG. 492X17
- 11 1 IN (25.4 MM) MINIMUM
- 12 1 IN (25.4 MM) MAXIMUM
- 13 1 IN (25.4 MM) MAXIMUM
- 14 1 IN (25.4 MM) MAXIMUM
- 15 1 IN (25.4 MM) MAXIMUM
- 16 1 IN (25.4 MM) MAXIMUM
- 17 1 IN (25.4 MM) MAXIMUM

NOTE: THE USE OF A RATIO OF 3 PREVENTS THE REMOVAL OF ANY TEETH AND SO SHOULD BE AVOIDED IF POSSIBLE.
 NOTE: DRIVE SHAFT 492X517 REPLACES DRIVE SHAFT 492X14 (SECTION 492A) UNTIL SUCH TIME THAT ALTERATION TO 492X14A (SEE ALTERNATION NOTE 1408A12) BECOMES EFFECTIVE.

20

TPI	RATIO		LEAD OF CAM	
	LEAD	RATIO	LEAD	RATIO
40	1/4	1/8	1/8	1/4
36	1/4	1/8	1/8	1/4
32	1/4	1/8	1/8	1/4
28	1/4	1/8	1/8	1/4
26	1/4	1/8	1/8	1/4
24	1/4	1/8	1/8	1/4
22	1/4	1/8	1/8	1/4
20	1/4	1/8	1/8	1/4
18	1/4	1/8	1/8	1/4
16	1/4	1/8	1/8	1/4
14	1/4	1/8	1/8	1/4
13	1/4	1/8	1/8	1/4
12	1/4	1/8	1/8	1/4
11	1/4	1/8	1/8	1/4
10	1/4	1/8	1/8	1/4
9	1/4	1/8	1/8	1/4
8	1/4	1/8	1/8	1/4
7	1/4	1/8	1/8	1/4

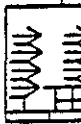


Diagram illustrating the relationship between cam lead and ratio.

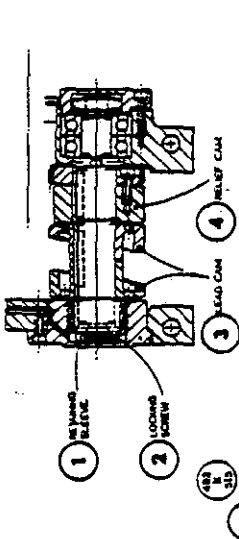
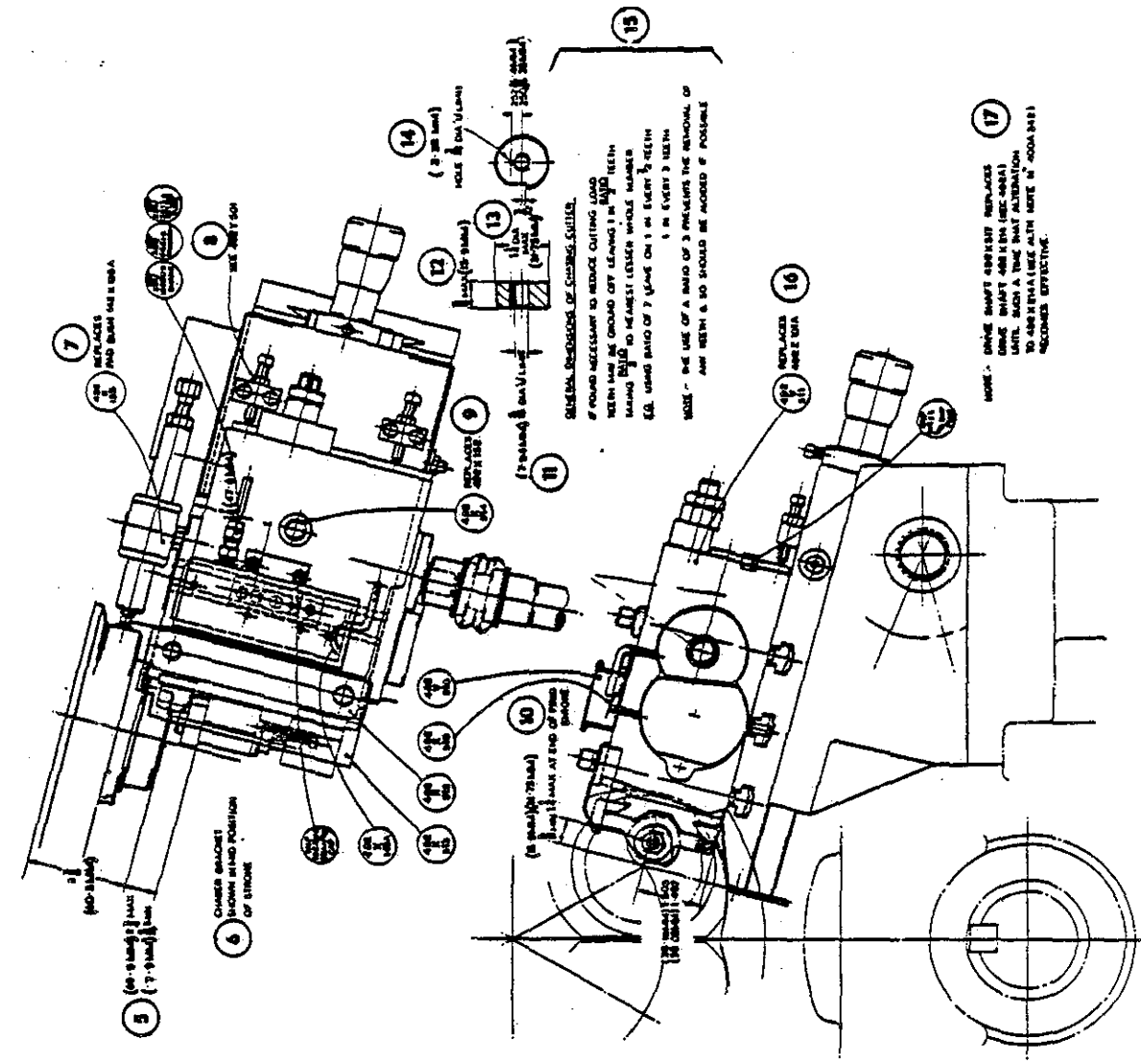
21

21 REPLACES 492 X 102A.

RATIO	DRIVING GEAR		DRIVEN GEAR	
	DP	DRG NO	DP	DRG NO
3:1	48	20	27	20
4:1	32	14	14	14
5:1	32	16	16	16
6:1	32(13)	18	18	18
7:1	32(13)	18	18	18
8:1	16	10	10	10
9:1	16	11	11	11
10:1	16	12	12	12

NOTE: DRIVEN SPROCKET 492 X222 (18 TEETH)
 REPLACES DRIVEN SPROCKET 492 X 217 (16 TEETH)
 WHEN USING THIS ATTACHMENT ON
 5/8-65 SPINDLE STOPPING MACHINE

LEAD TO BE CUT	LEAD OF CAM			
	3mm	4mm	5mm	6mm
5	5	6	7	8
7	5	6	7	8
7.5	5	6	7	8
8	5	6	7	8
10	5	6	7	8
12.5	5	6	7	8
15	5	6	7	8
17.5	5	6	7	8
20	5	6	7	8
25	5	6	7	8
30	5	6	7	8



20

SP1	DR. #	LEAD	DR. #	LEAD
1	10	1/8"	10	1/8"
2	11	1/8"	11	1/8"
3	12	1/8"	12	1/8"
4	13	1/8"	13	1/8"
5	14	1/8"	14	1/8"
6	15	1/8"	15	1/8"
7	16	1/8"	16	1/8"
8	17	1/8"	17	1/8"
9	18	1/8"	18	1/8"
10	19	1/8"	19	1/8"
11	20	1/8"	20	1/8"
12	21	1/8"	21	1/8"
13	22	1/8"	22	1/8"
14	23	1/8"	23	1/8"
15	24	1/8"	24	1/8"
16	25	1/8"	25	1/8"
17	26	1/8"	26	1/8"
18	27	1/8"	27	1/8"
19	28	1/8"	28	1/8"
20	29	1/8"	29	1/8"
21	30	1/8"	30	1/8"
22	31	1/8"	31	1/8"
23	32	1/8"	32	1/8"
24	33	1/8"	33	1/8"
25	34	1/8"	34	1/8"
26	35	1/8"	35	1/8"
27	36	1/8"	36	1/8"
28	37	1/8"	37	1/8"
29	38	1/8"	38	1/8"
30	39	1/8"	39	1/8"
31	40	1/8"	40	1/8"
32	41	1/8"	41	1/8"
33	42	1/8"	42	1/8"
34	43	1/8"	43	1/8"
35	44	1/8"	44	1/8"
36	45	1/8"	45	1/8"
37	46	1/8"	46	1/8"
38	47	1/8"	47	1/8"
39	48	1/8"	48	1/8"
40	49	1/8"	49	1/8"
41	50	1/8"	50	1/8"
42	51	1/8"	51	1/8"
43	52	1/8"	52	1/8"
44	53	1/8"	53	1/8"
45	54	1/8"	54	1/8"
46	55	1/8"	55	1/8"
47	56	1/8"	56	1/8"
48	57	1/8"	57	1/8"
49	58	1/8"	58	1/8"
50	59	1/8"	59	1/8"
51	60	1/8"	60	1/8"
52	61	1/8"	61	1/8"
53	62	1/8"	62	1/8"
54	63	1/8"	63	1/8"
55	64	1/8"	64	1/8"
56	65	1/8"	65	1/8"
57	66	1/8"	66	1/8"
58	67	1/8"	67	1/8"
59	68	1/8"	68	1/8"
60	69	1/8"	69	1/8"
61	70	1/8"	70	1/8"
62	71	1/8"	71	1/8"
63	72	1/8"	72	1/8"
64	73	1/8"	73	1/8"
65	74	1/8"	74	1/8"
66	75	1/8"	75	1/8"
67	76	1/8"	76	1/8"
68	77	1/8"	77	1/8"
69	78	1/8"	78	1/8"
70	79	1/8"	79	1/8"
71	80	1/8"	80	1/8"
72	81	1/8"	81	1/8"
73	82	1/8"	82	1/8"
74	83	1/8"	83	1/8"
75	84	1/8"	84	1/8"
76	85	1/8"	85	1/8"
77	86	1/8"	86	1/8"
78	87	1/8"	87	1/8"
79	88	1/8"	88	1/8"
80	89	1/8"	89	1/8"
81	90	1/8"	90	1/8"
82	91	1/8"	91	1/8"
83	92	1/8"	92	1/8"
84	93	1/8"	93	1/8"
85	94	1/8"	94	1/8"
86	95	1/8"	95	1/8"
87	96	1/8"	96	1/8"
88	97	1/8"	97	1/8"
89	98	1/8"	98	1/8"
90	99	1/8"	99	1/8"
91	100	1/8"	100	1/8"

21 REPLACES AND DIA

22 LEAD CAM

23 RELIEF CAM

24 LEAD CAM

25 RELIEF CAM

26 LEAD CAM

27 RELIEF CAM

28 LEAD CAM

29 RELIEF CAM

30 LEAD CAM

31 RELIEF CAM

32 LEAD CAM

33 RELIEF CAM

34 LEAD CAM

35 RELIEF CAM

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89 RELIEF CAM

90 LEAD CAM

91 RELIEF CAM

92 LEAD CAM

93 RELIEF CAM

94 LEAD CAM

95 RELIEF CAM

96 LEAD CAM

97 RELIEF CAM

98 LEAD CAM

99 RELIEF CAM

100 LEAD CAM

CUTTING STROKE - 3/8" CAM LEAD
 RETIAL STROKE - 1/4" CAM LEAD
 RATIO - 1/3

15

DR. NO.	DR. NO.	DR. NO.	DR. NO.
1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24
25	26	27	28
29	30	31	32
33	34	35	36
37	38	39	40
41	42	43	44
45	46	47	48
49	50	51	52
53	54	55	56
57	58	59	60
61	62	63	64
65	66	67	68
69	70	71	72
73	74	75	76
77	78	79	80
81	82	83	84
85	86	87	88
89	90	91	92
93	94	95	96
97	98	99	100

16 REPLACES AND DIA

17

NOTE - DRIVE SHAFT ASSEMBLY REPLACES DRIVE SHAFT 482.410 (SEE 482.410) UNTIL SUCH A TIME THAT ALTERATION TO 482.410 IS NECESSARY. THIS ALTERATION IS NECESSARY TO MAKE THE MACHINE OPERATE EFFECTIVE.

Fig. 50 492 Z 11A

SYNCHRONOUS PLAIN PICK-UP ATTACHMENT AND PICK-UP AND BACK MACHINING
ATTACHMENT

Notes apply to MK.II attachments but MK.I are similar in many respects

Note: Maximum recommended spindle speed of these attachments is 3550 rev/min.
Minimum suggested cycle time for Pick-Up and Back Burr Attachment is
2.4 seconds, depending on stroke, cams etc.

SYNCHRONOUS PICK-UP ATTACHMENTS are available for Station 6 and/or 3, (station 3 principally for use on Double Bar Feed Machines).

These attachments are either of the "plain" pick-up type for synchronous support of the work while parting off, or are of the "pick-up and back machining" type where back-chamfering, counter boring or similar operations are required, using a special cutter mounted in a special type of bar stop arm.

SYNCHRONOUS PICK-UP ATTACHMENT Station 6 or 3, Section 495, MK.II (Fig.51)

Each attachment consists of an attachment body and spindle with bobbin-operated, compensated dead length collet arranged on a slide bolted to the face of the centre block. The front end of the spindle is arranged to be flushed out with coolant to remove and exclude swarf. The spindle is fitted with an ejector (designed to suit the workpiece) operated by a push rod through the hollow drive shaft from a mounting bush on the rear attachment face of the main drive housing. The spindle head also carries a cam and yoke assembly for operating the collet bobbin at any point in the longitudinal travel of the attachment by means of a small splined shaft extending from a bracket bolted to the main driving housing face. Stops for controlling workpiece accuracy are provided.

SYNCHRONOUS DRIVE Section 490J Mk.I (Fig.54)

Each attachment is driven by a hollow splined shaft coupled to the attachment spindle and driven by the splined drive tube of the synchronous drive assembly by gears of suitable ratio from the centre shaft.

On standard machines (not spindle stopping machines) the spindles are so arranged that the angular position of collet driving keys of all spindles in any station is always the same within 180°, so that when a pick-up attachment is used a hexagon or square collet, for example can be used.

To achieve this, the attachment spindle must be arranged to come in line by selecting the best gear teeth to mesh and also choosing one of the 5 available keyways in the bush for the attachment driven gear for the key on the splined drive tube of Section 490J.

AUXILIARY LONGITUDINAL MOTION

Station 6 Section 489C, Station 3, Section 489D (Fig. 58)

Longitudinal movement is by means of a modified Auxiliary Longitudinal Motion incorporating a shear pin safety device with positive return, the special cams mounted on the appropriate part of the cam drum to increase the longitudinal travel are included in the attachment.

COLLET OPERATING MECHANISM Stations 3 & 6 Section 495C

COLLET OPERATING MECHANISM - Extra Parts for Station 3, Section 495G Fig.52

Operation of the collet for the 6th and/or 3rd Station attachments is from a split cam drum clamped around the main camshaft in front of the main drive housing and carrying separate adjustable dogs for opening and closing the collet by means of a cam lever having a spring over-centre device and adjustable deadstops in each direction. For 3rd attachments, extra levers and links connect to the lever on its splined shaft. The cam drum, dogs and levers are covered by sheet steel covers.

BAR STOP

For "Plain Pick-Up" Attachments the standard bar stop is used.

For "Pick-Up and Back-Machining" Attachments a special bar stop assembly Section 495E for Station 6, Section 495F for Station 3, adapted for mounting and adjusting the special cutter, is used in place of the standard bar stop.

CAMS

For "Plain Pick-Up" Attachments standard longitudinal cams are available.

For "Pick-Up and Back-Machining" Attachments the cams are designed to suit the workpiece, but certain semi-standard cams are available.

The capacity of the attachment is limited and should be carefully checked for each workpiece.

ASSEMBLY

Fit the synchronous drive O (Section 490J) in its appropriate bore together with drive gears from the centre shaft. Fit the ejector rod and bush assembly together with the splined drive shaft through the drive unit. Fit the cams and the longitudinal motion modified by means of the special lever parts supplied to increase the stroke available. Fit the spindle head assembly with the slide in the best position, to the centre block and couple the splined drive shaft to the spindle. Assemble the stop and pusher rods.

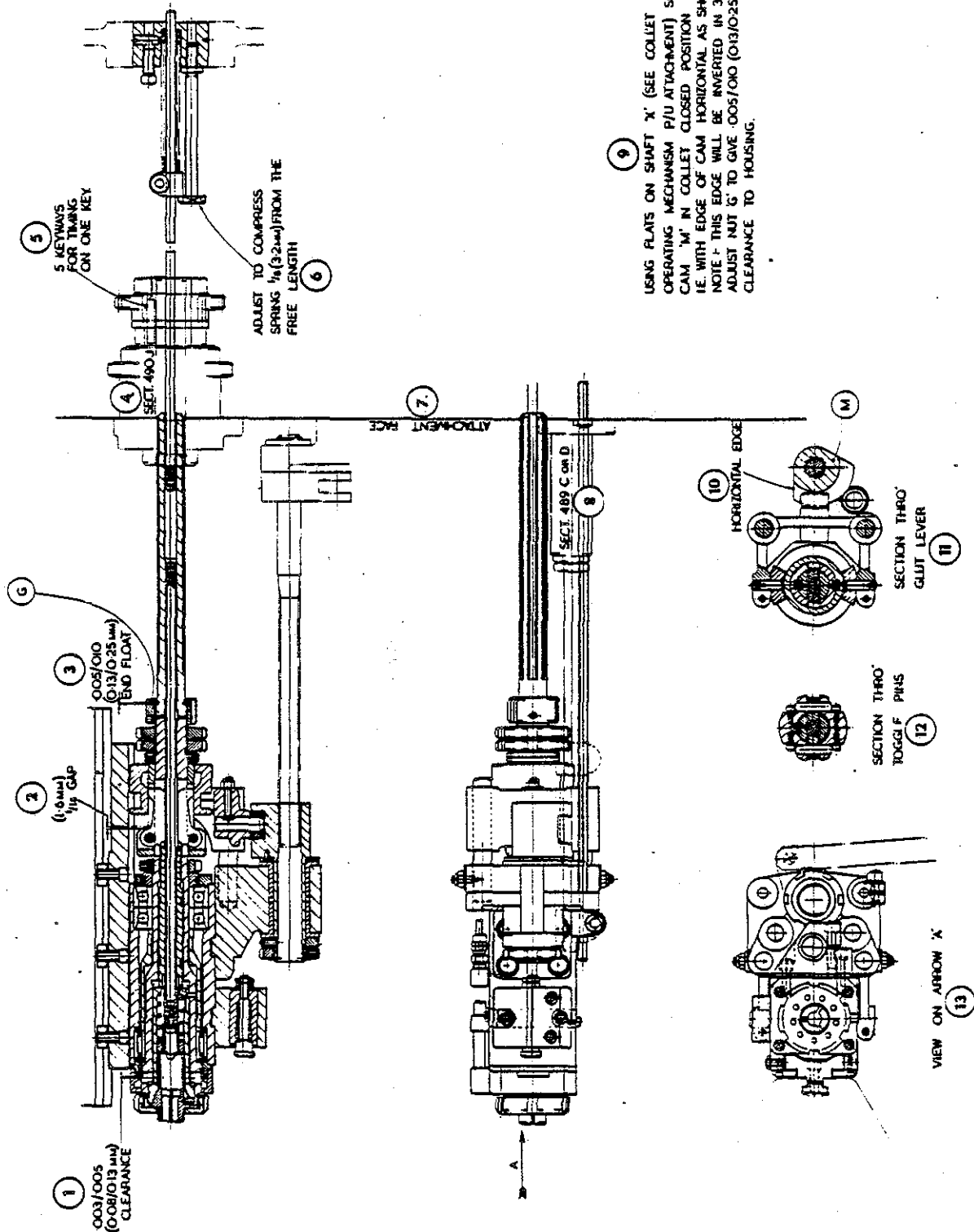
If necessary for the set up, align the attachment collet with the workspindle collet by selecting the best gear teeth and one of the 5 keyways as previously described (this is possible only on Standard Machines not Spindle Stopping Machines).

Assemble the cam disc to the main camshaft and the cam lever, pivot and stop to the housing face and connect up the collet operating link. Clamp the collet operating lever to the splined shaft to give correct collet operation on each of the dogs.

Fit ejector, collet closing sleeve, collet and spindle nut. Connect up coolant to the spindle head. Connect flexible tube to the Cyclic system for lubrication to the spindle, check operations. Finalise all adjustments.

Key to Fig.51

1. 0.003-0.005 in. (0.08-0.13 mm) clearance
2. 1/16 in. (1.6 mm) gap
3. 0.005-0.010 in. (0.13-0.25 mm) end float
4. Section 490J
5. 5 keyways for timing on one key
6. Adjust to compress spring 1/8 in. (3.2 mm)
- from the free length
7. Attachment face
8. Section 489C or D
9. Using flats on shaft "X" (see collet operating
mechanism pick-up attachment) set cam "M" in
collet closed position ie. with edge of cam
horizontal as shown. Note: This edge will be
inverted in station 3. Adjust nut "G" to give
0.005-0.010 in. (0.13-0.25 mm) clearance to
housing
10. Horizontal edge
11. Section through glut lever
12. Section through toggle pins
13. View on arrow "X"
14. 8.1/2 in. (216 mm) maximum
15. Drum housing face



9 USING FLATS ON SHAFT 'X' (SEE COLLET OPERATING MECHANISM P/U ATTACHMENT) SET CAM 'M' IN COLLET CLOSED POSITION IE. WITH EDGE OF CAM HORIZONTAL AS SHOWN. NOTE - THIS EDGE WILL BE INVERTED IN 3RD STATION. ADJUST NUT 'G' TO GIVE .005/010 (0.13/0.25 mm) CLEARANCE TO HOUSING.

Fig. 51 400 Z 102

ARRANGEMENT OF PICK-UP ATTACHMENT, STATIONS 3 & 6

Key to Fig.52

1. Part of section 495 MK.II
2. Section 495C MK.II
3. Lever "W"
4. Set flats on shaft "X" approximately in position shown with collet closed
5. Shaft "X"
6. Attachment face
7. Part of section 495 MK.II
8. Set stops "A" against detent peg with roller 0.015-0.030 in. (0.38-0.76 mm) clear of cam dog
9. Stop "A"
10. Stop "A"
11. Detent peg
12. Cam lever "Y"
13. 495G MK.II
14. Cam drum "Z"

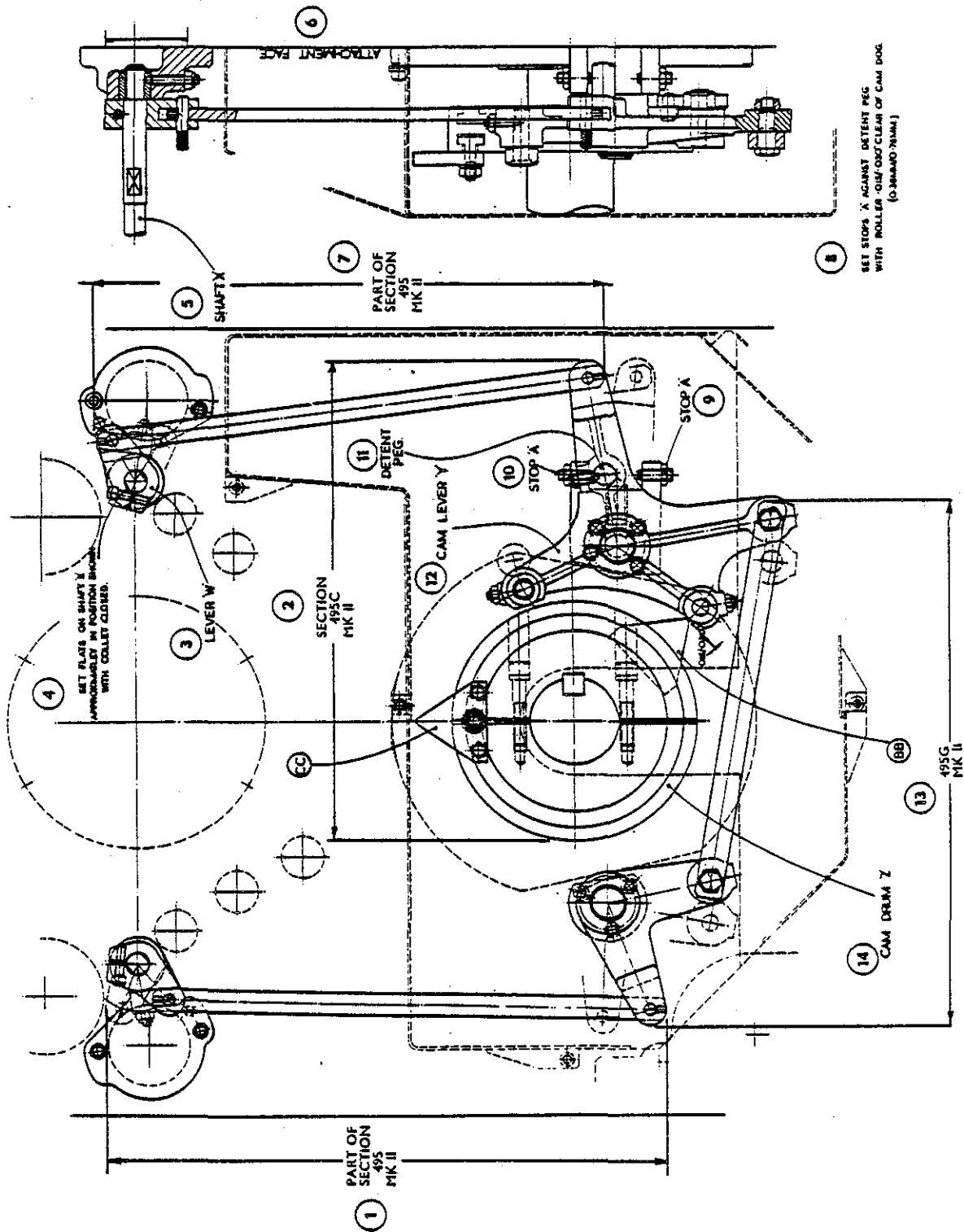


Fig. 52 400 Z 103
COLLET MECHANISM FOR PICK-UP ATTACHMENT-STATIONS 3 & 6

Key to Fig.53

1. Retract
2. Back burring tool
3. Section 495E shown assembled for 6th station
4. Bar stop
5. Component absolute maximum
6. Eject
7. Feed
8. Advance

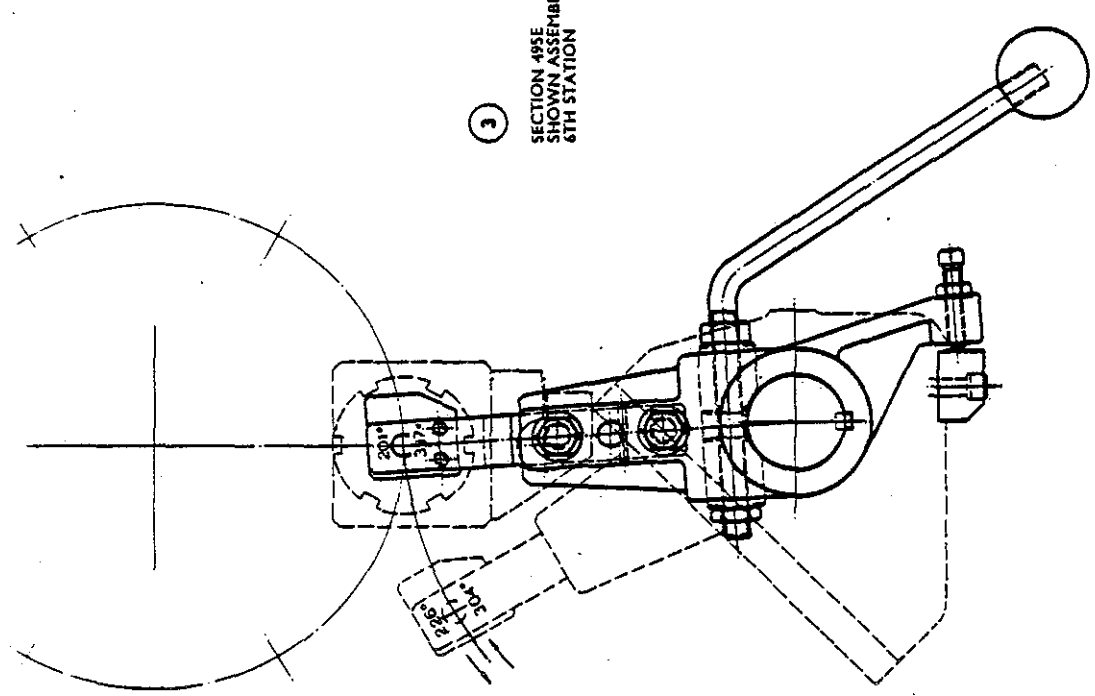
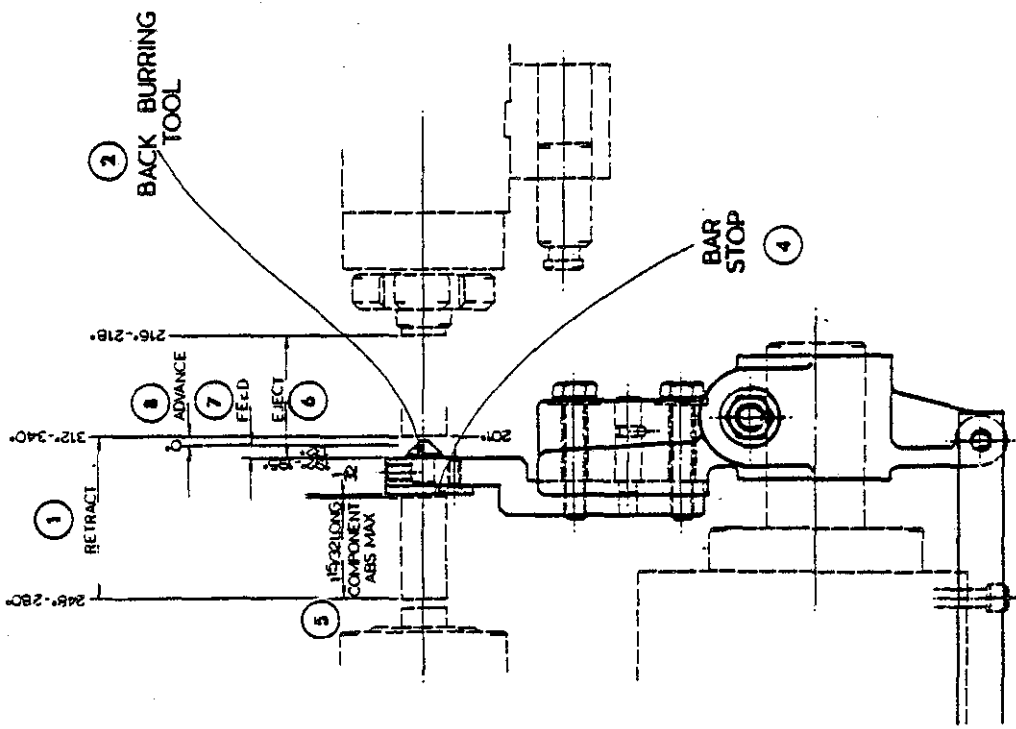


Fig. 53 400 Y 86

SPECIAL BAR STOP FOR BACK BURRING 6th &/OR 3rd STATION

- 1 ASSEMBLY "A" USED WITH ONE DIEHEAD RATIO
- 2 SECTION 490J
- 3 DRIVEN GEAR
- 4 ASSEMBLY "B" USED WHEN DRIVING GEAR FOR DIEHEAD IS NOT USED. SEE ALSO 482Z10
- 5 SECTION 490I
- 6 DRIVEN GEAR
- 7 DRIVING GEAR
- 8 SPACER FOR HIGH SPEED DRILLING DRIVE
- 9 CENTRE SHAFT
- 10 GEAR CENTRE FOR FULL THREADING "OFF" GEARS
- 11 ATTACHMENT FACE
- 12

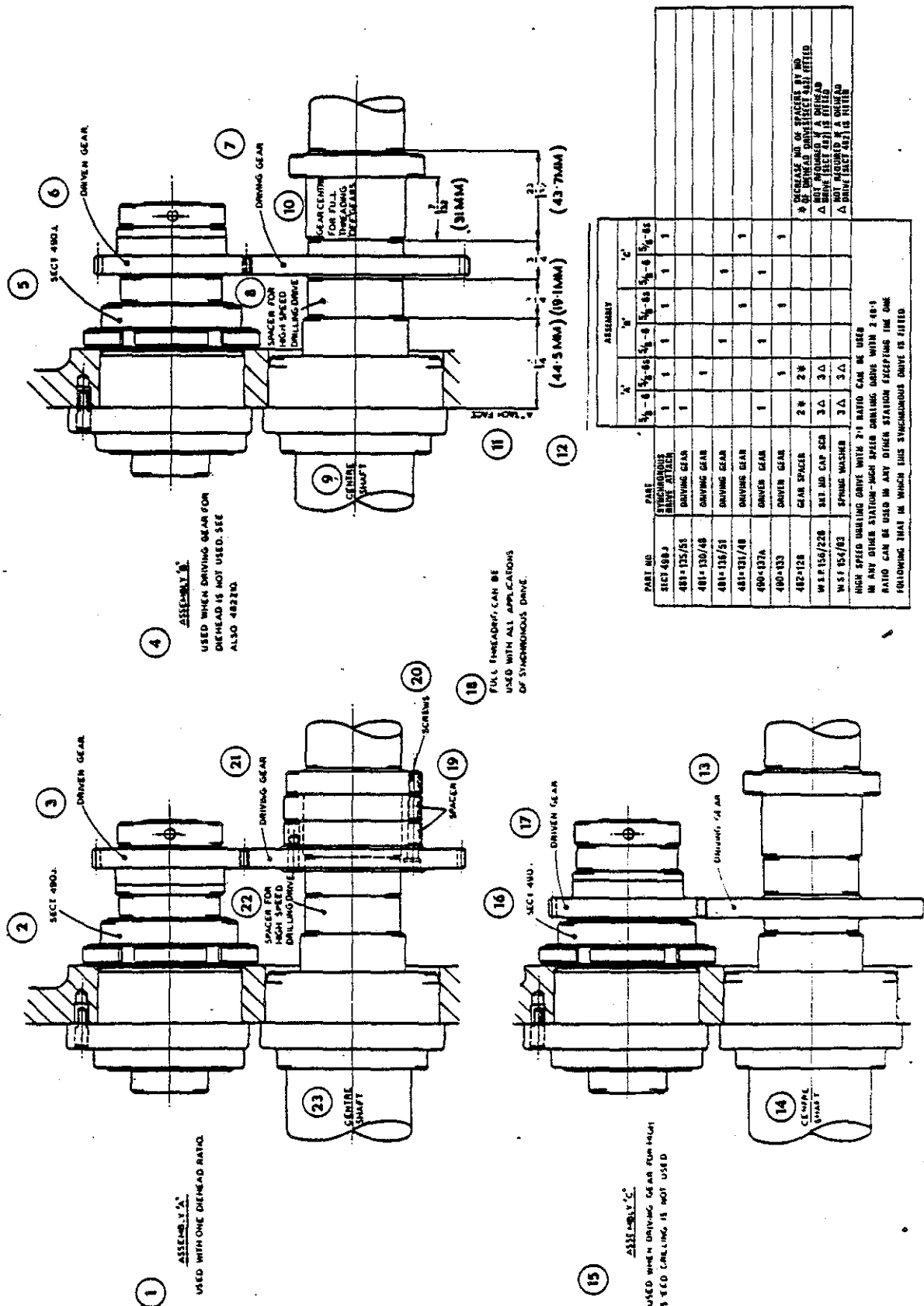
PART NO.	PART	ASSEMBLY					
		'A'		'B'		'C'	
		5/8 - 6	5/8 - 6S	5/8 - 6	5/8 - 6S	5/8 - 6	5/8 - 6S
SECT 490J	SYNCHRONOUS DRIVE ATTACH.	1	1	1	1	1	1
481*135/51	DRIVING GEAR	1					
481*130/48	DRIVING GEAR		1				
481*136/51	DRIVING GEAR			1		1	
481*131/48	DRIVING GEAR						1
490*137A	DRIVEN GEAR	1		1		1	
490*133	DRIVEN GEAR			1		1	
482*128	GEAR SPACER	2*					
W.S.P.156/228	SMT HD. CAP SCR.	3Δ					
W.S.F.154/03	SPRING WASHER	3Δ					

HIGH SPEED DRILLING DRIVE WITH 2:1 RATIO CAN BE USED IN ANY OTHER STATION-HIGH SPEED DRILLING DRIVE WITH 2-49:1 RATIO CAN BE USED IN ANY OTHER STATION EXCEPTING THE ONE FOLLOWING THAT IN WHICH THIS SYNCHRONOUS DRIVE IS FITTED.

* DECREASE NO. OF SPACERS BY NO. OF DIEHEAD DRIVES (SECT 482) FITTED
 Δ NOT REQUIRED IF A DIEHEAD DRIVE (SECT 482) IS FITTED
 Δ NOT REQUIRED IF A DIEHEAD DRIVE (SECT 482) IS FITTED

- 13 DRIVING GEAR
- 14 CENTRE SHAFT
- 15 ASSEMBLY "C" USED WHEN DRIVING GEAR FOR HIGH SPEED DRILLING IS NOT USED
- 16 SECTION 490I
- 17 DRIVEN GEAR
- 18 FULL THREADING CAN BE USED WITH ALL APPLICATIONS OF SYNCHRONOUS DRIVE
- 19 SPACER
- 20 SCREWS
- 21 DRIVING GEAR
- 22 SPACER FOR HIGH SPEED DRILLING DRIVE
- 23 CENTRE SHAFT

Key to Fig. 54 SYNCHRONOUS DRIVE ATTACHMENT APPLICATION DRAWING SECTION 490J 490 Y 11



PART NO	PART DESCRIPTION	ASSEMBLY					
		1	2	3	4	5	6
SECT 480A	DRIVEN GEAR	1	1	1	1	1	1
481-125/51	DRIVING GEAR	1	1	1	1	1	1
481-130/48	DRIVING GEAR	1	1	1	1	1	1
481-130/51	DRIVING GEAR	1	1	1	1	1	1
481-131/48	DRIVING GEAR	1	1	1	1	1	1
480-137A	DRIVEN GEAR	1	1	1	1	1	1
480-133	DRIVEN GEAR	1	1	1	1	1	1
482-128	GEAR SPACER	2	2	2	2	2	2
W.S.P. 154/228	SET NO CAP SCR	3	3	3	3	3	3
W.S.P. 154/83	SPRING WASHER	3	3	3	3	3	3

* HIGH SPEED DRILLING DRIVE WITH 2:1 RATIO CAN BE USED IN ANY OTHER STATION-HIGH SPEED DRILLING DRIVE WITH 2:1 RATIO CAN BE USED IN ANY OTHER STATION EXCEPTING THE ONE FOLLOWING THAT IN WHICH THIS SYNCHRONOUS DRIVE IS LISTED.
 * DRIVE (SECT 480) IS FITTED.
 * DRIVE (SECT 481) IS FITTED.
 * DRIVE (SECT 482) IS FITTED.
 * DRIVE (SECT 483) IS FITTED.
 * DRIVE (SECT 484) IS FITTED.
 * DRIVE (SECT 485) IS FITTED.
 * DRIVE (SECT 486) IS FITTED.
 * DRIVE (SECT 487) IS FITTED.
 * DRIVE (SECT 488) IS FITTED.
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 * DRIVE (SECT 495) IS FITTED.
 * DRIVE (SECT 496) IS FITTED.
 * DRIVE (SECT 497) IS FITTED.
 * DRIVE (SECT 498) IS FITTED.
 * DRIVE (SECT 499) IS FITTED.
 * DRIVE (SECT 500) IS FITTED.

Fig. 54 490 Y 11

