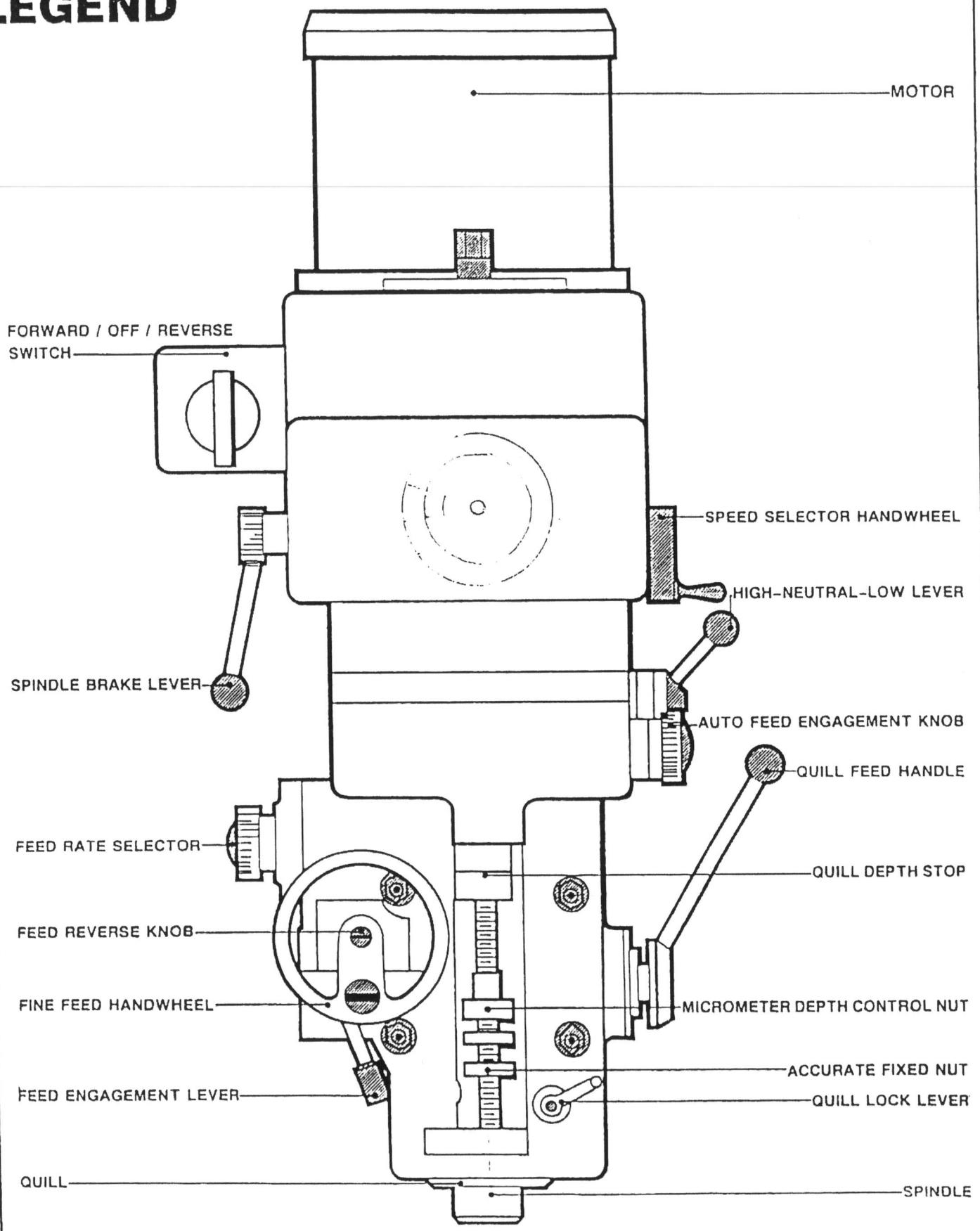


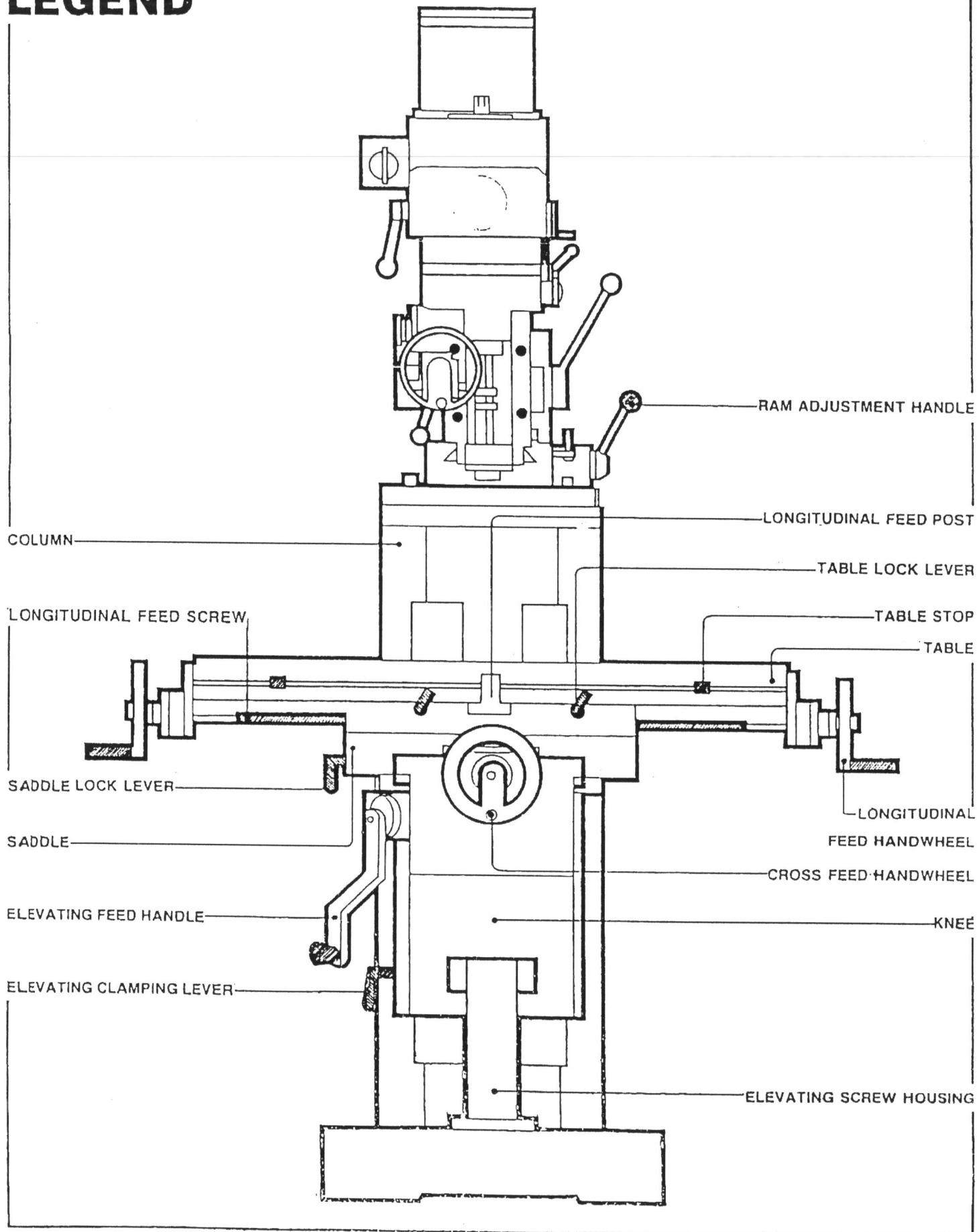
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LEGEND



LEGEND



INSTALLATION

UNCRATING

Be careful in remove protective crating, to avoid damaging the machine and parts. If the machine is damaged during transit, immediately contact your local distributor and the transportation company who delivered your machine.

CHECK FOR SHORTAGE

Be sure to check your machine against the packing list that is shipped with every machine. In case of shortages, immediately note items not received and contact your local distributor.

CLEANING

1. Remove rust preventative before moving any sideways.
2. The coating is best removed by using paraffin applied with a clean brush. When the coating has softened, remove with clean rags.

NOTE:

Do not use gasoline or any other flammable solution to clean the machine.

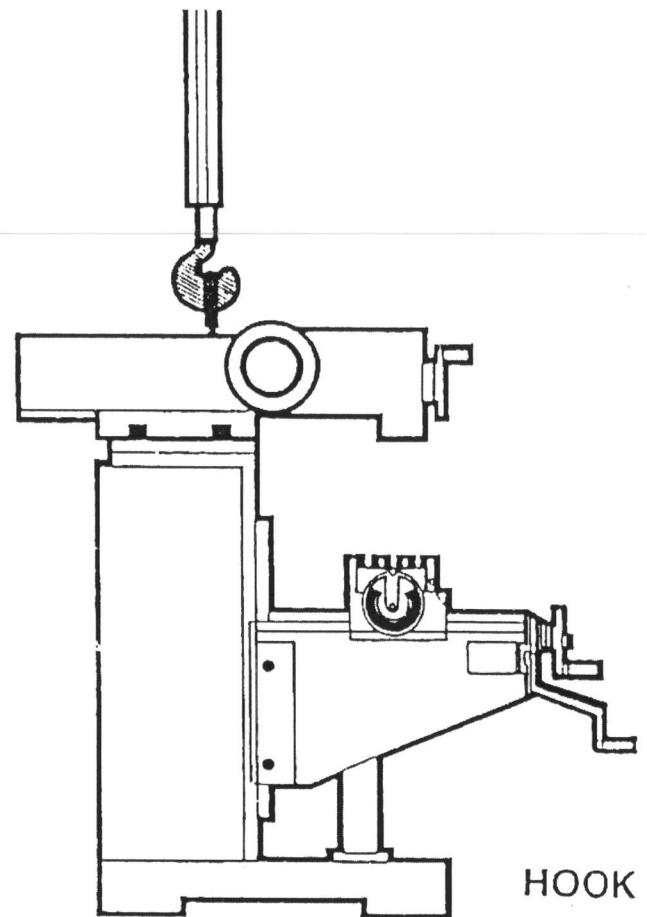
3. Oil or grease all lubrication points.

INSTALLATION

PROPER METHOD FOR LIFTING MACHINE

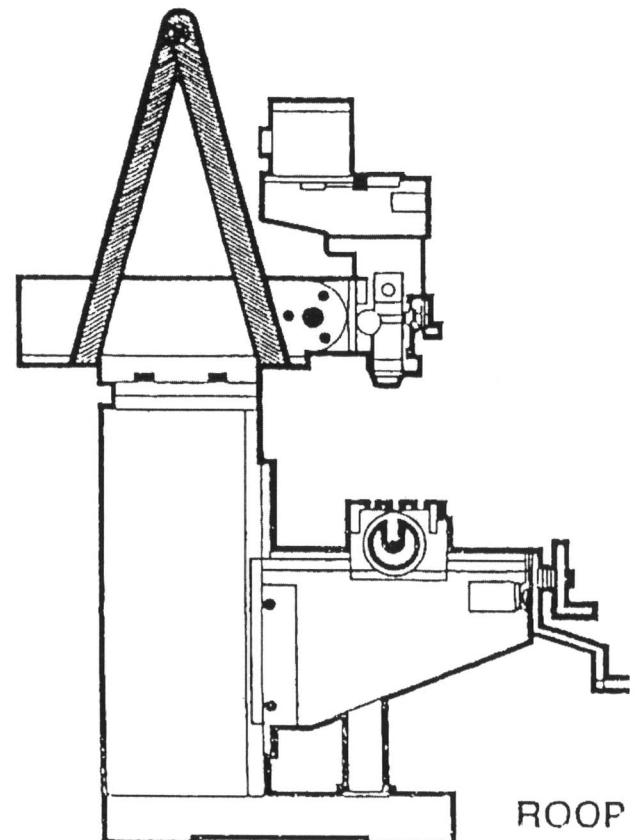
METHOD-1

Insert 5/8"-11 UNC Whitworth eye bolt in tapped hole. Ensure bolt is fully secured before lifting.



METHOD-2

Use rope sling as illustrated. Insert pads of soft cloth between rope and machined edges.



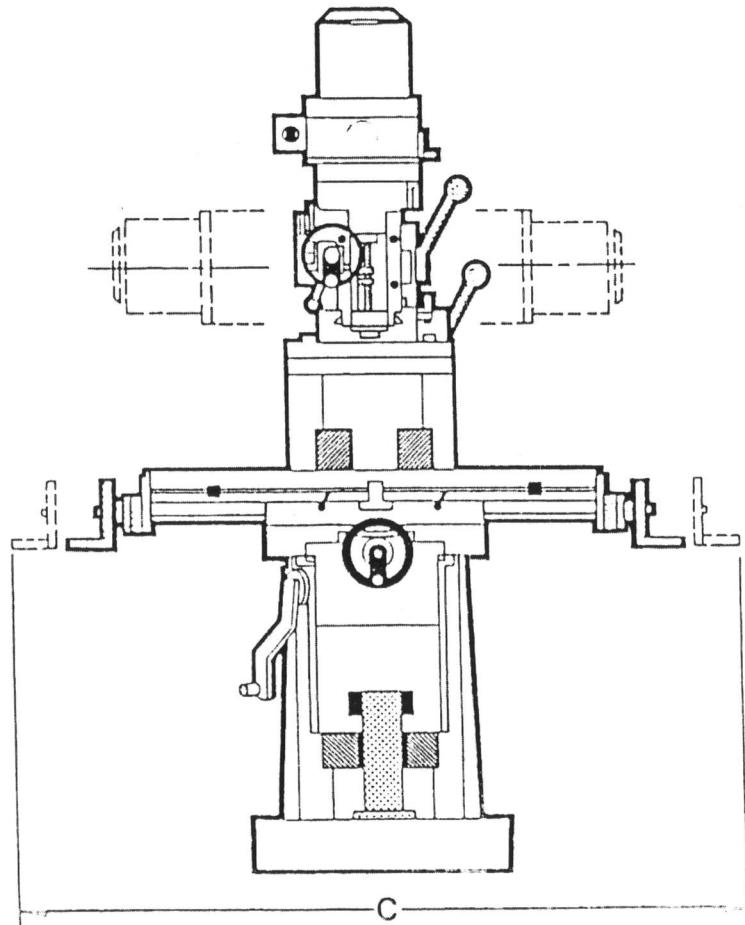
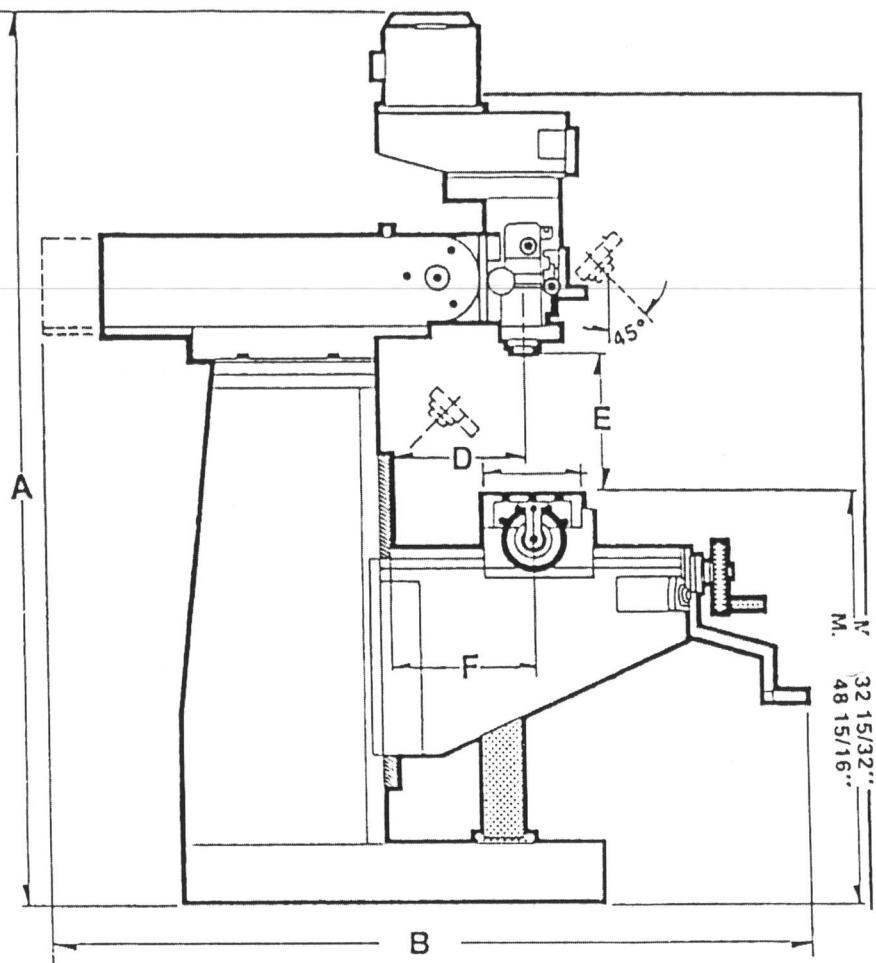
NOTE:

It is necessary to set the overarm and table at suitable position.

INSTALLATION

FLOOR PLAN

A. OVERALL HEIGHT _____ 81"
 B. OVERALL DEPTH _____ 70 5/8"
 FOR 16" CROSS _____ 73 5/8"
 C. OVERALL WIDTH _____ 97 3/8"
 FOR 49" TABLE _____ 104 3/8"
 D. SPINDLE CENTER TO COLUMN-5 7/16"-
 23 7/16"
 E. TABLE TO SPINDLE NOSE _____ 0-19"
 F. TABLE CENTER TO COLUMN _____ 5 9/32"-
 18 9/32"
 FOR 16" CROSS _____ 5 9/32"-
 21 9/32"
 MACHINE WEIGHTS (APPROX.) _____ 2200 lbs

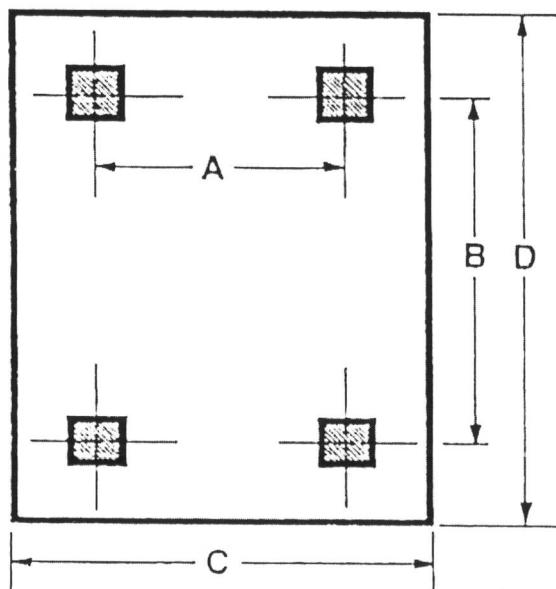


INSTALLATION

FOUNDATION

When setting machine on a concrete foundation, it is advisable to use a little grout to take care of unevenness in the concrete as well as to provide a solid foundation at all points.

FOUNDATION PLAN

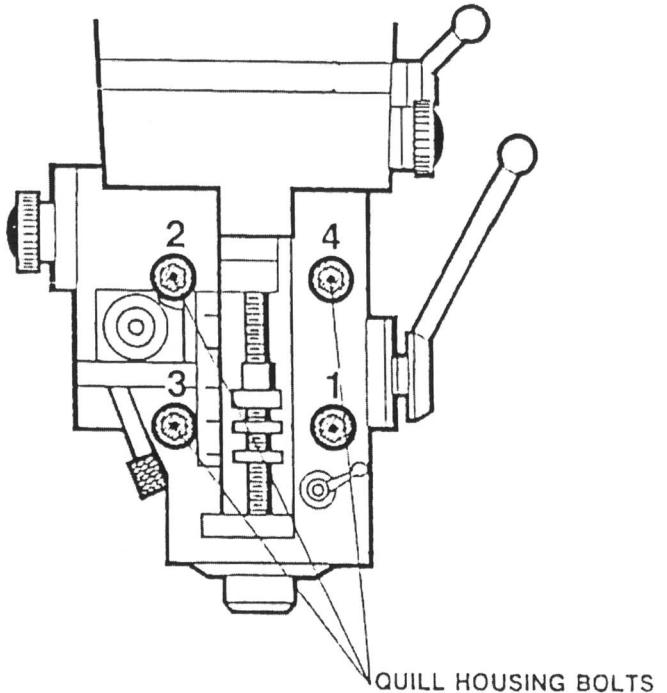


- A. 20 3/8" (518mm)
- B. 24 7/32" (742mm)
- C. 40 5/32" (1020mm)
- D. 48 7/8" (1242mm)

INSTALLATION

BRING HEAD TO UPRIGHT POSITION

Bring the milling head to the upright position by loosening the four quill housing bolts and rotating head to the upright position. Do not tighten quill housing locking bolts until the head has been properly aligned. To avoid quill distortion, tighten all quill housing locking bolts—according to the bolt rotation in Figure to exactly twenty-five ft.lbs., then repeat tightening according rotation to exactly fifty ft.lbs.



POWER SUPPLY

1. Check motor voltages against supply.
2. Ensure that the supply is connected to comply with the local safety regulations.

NOTE:

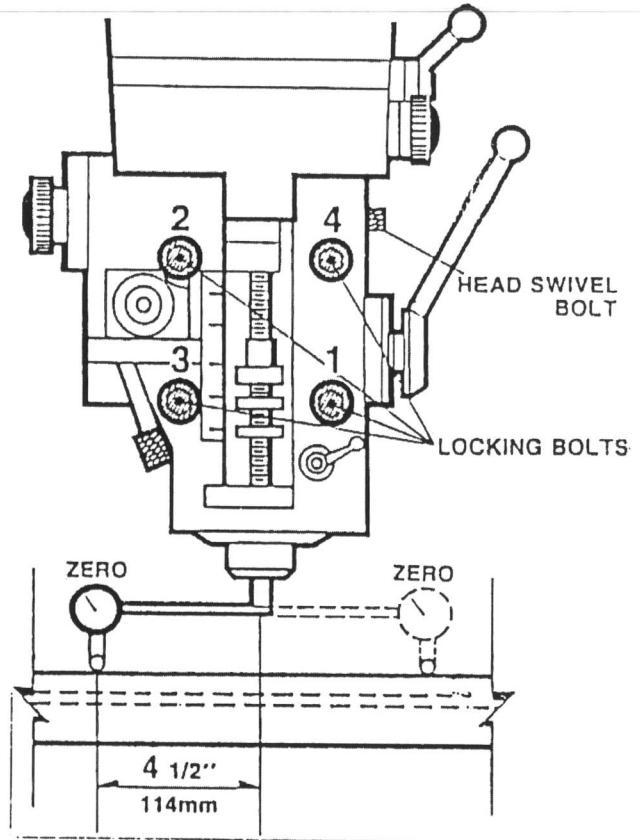
The head switch has no overload protection when a control panel is not fitted.

INITIAL SETTING

HEAD ALIGNMENT

1. X AXIS

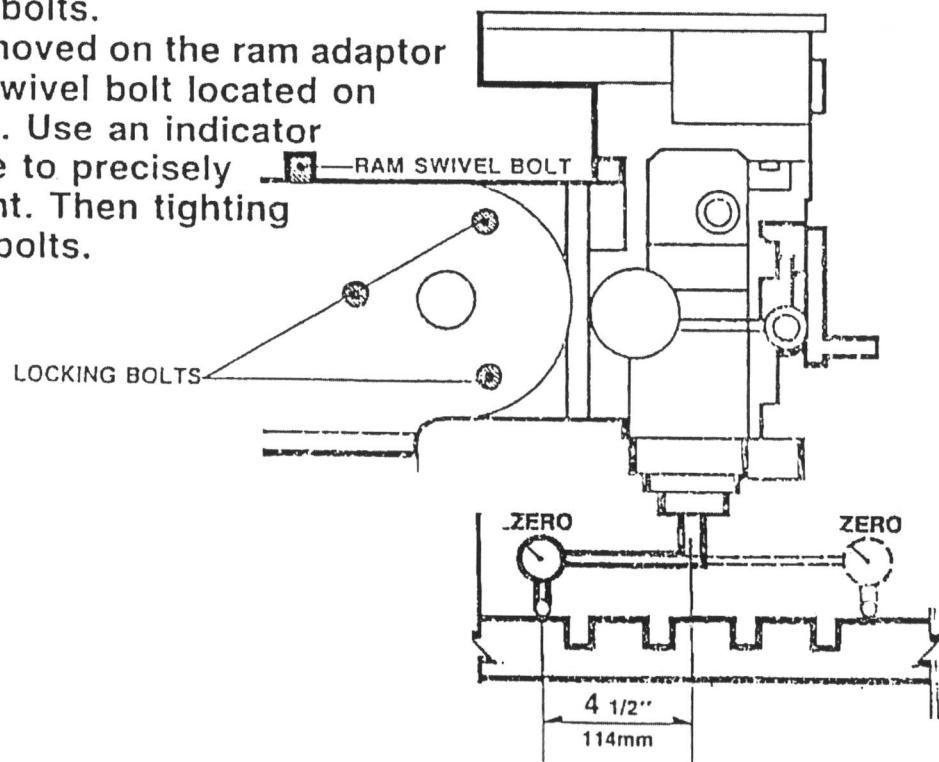
Loosen the four quill housing locking bolts. Be sure to leave a slight drag on these bolts. The head can now be moved from left to right by using the head swivel bolt that is located on the right side of the head. Use an indicate mounted in the spindle to indicate table alignment.



2. Y AXIS

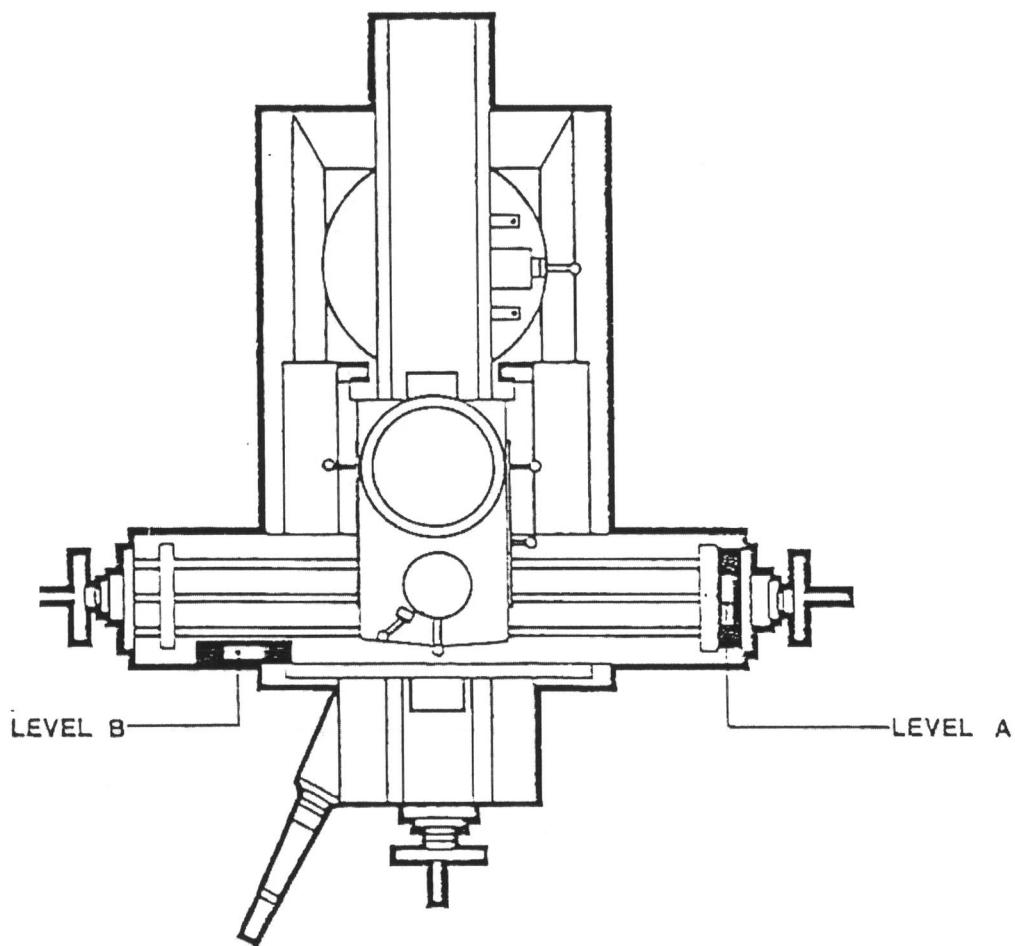
Loosen the three ram locking bolts on the ram adaptor. Be sure to leave a slight drag on these bolts.

The head can now be moved on the ram adaptor by using the adaptor swivel bolt located on top of the ram adaptor. Use an indicator mounted in the spindle to precisely indicate table alignment. Then tightening the three ram locking bolts.



LEVELING

1. Putting levels on the table as illustrated.
2. Check the levels A and B. The allowance approximate 0.06mm/M.
3. Putting the shims under the bed if necessary.



OPERATION

HEAD

SPINDLE SPEED

1. Start spindle.
2. Turn handwheel "H" to select required speed.

NOTE: Do not change speed while spindle has stopped.

HIGH-NEUTRAL-LOW LEVER

This lever "I" is to put the head into backgear or direct drive.

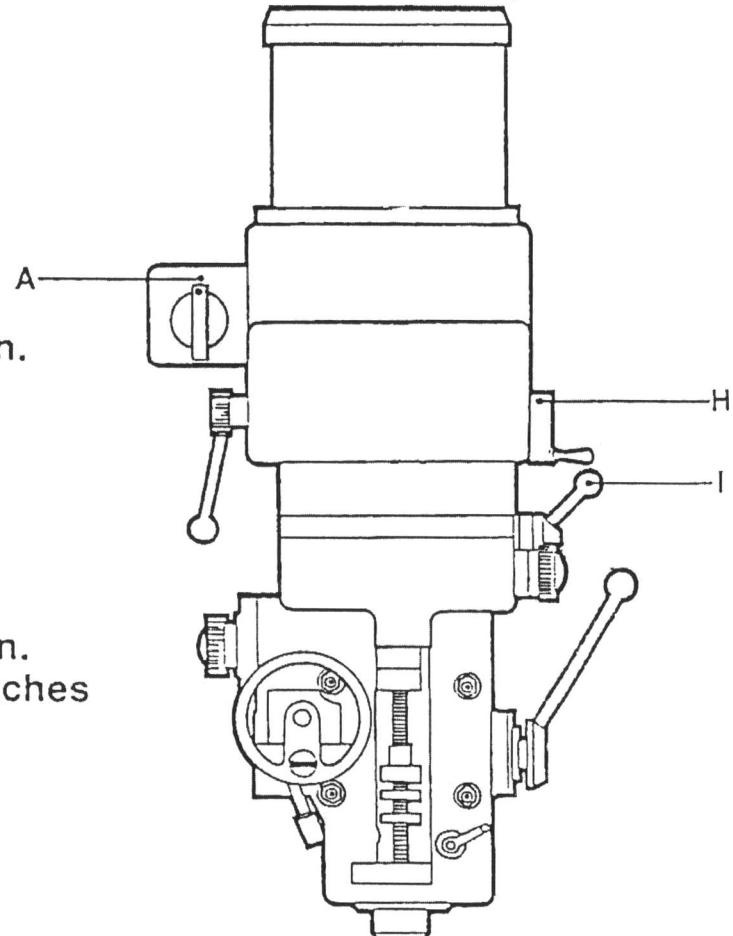
1. HIGH TO LOW

- A. Switch "A" to off.
- B. Move "I" through neutral to low.
This will reverse the spindle rotation.
- C. Switch "A" to the reverse position.

2. LOW TO HIGH

- A. Switch "A" to off.
- B. Move "I" through neutral to high.
This will reverse the spindle rotation.
- C. Rotate spindle by hand until the clutches are felt to engage.
- D. Switch "A" to the reverse position.

CAUTION:
DO not shift while the



OPERATION

HEAD

AUTOMATIC FEED

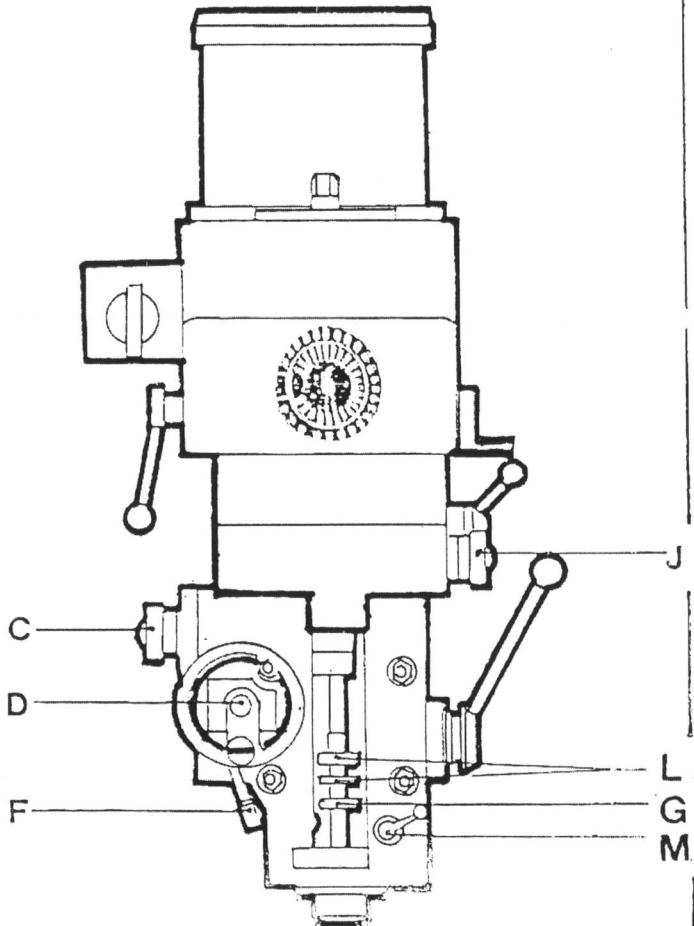
1. Loosen quill lock lever "M".
2. Engage auto quill fed "J".
3. Set micrometer dial "L" to required depth .
4. Select feed rate "C".
5. Turn the feed engagement lever " F " to left position .
6. The quill is now automatic feed.

NOTE : A. Do not engage quill feed when spindle is over 3000 RPM .
B. Maximum loading 3/8" Dia. drill in steel .

HOW TO GET THE ACCURACY QUILL FEED DEPTH ON AUTOMATIC FEED

1. Locate " D " in mid position .
2. Turn " F " to left position .
3. Turn nut " G " to the bottom and lock .
4. Adjust " L " to required position .
5. Locate " D " in required position .
6. When a series of clicks is heared the required depth is reach ,you should be turn " F " to right position by hand .

When this section is not in used please loose the nut " G ".

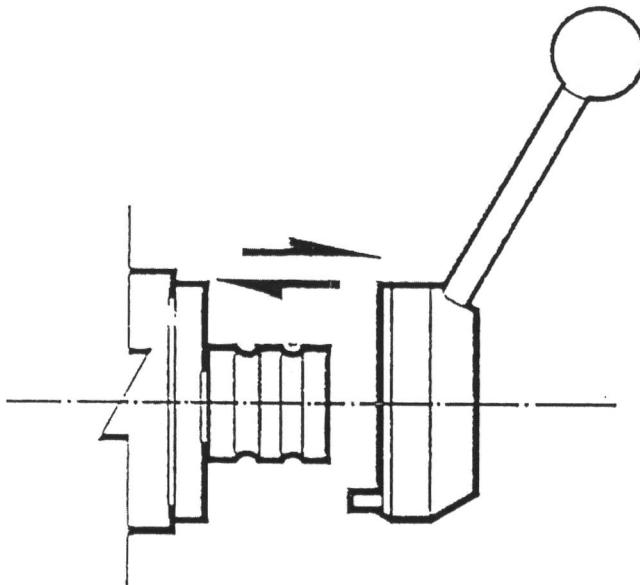


OPERATION

HEAD

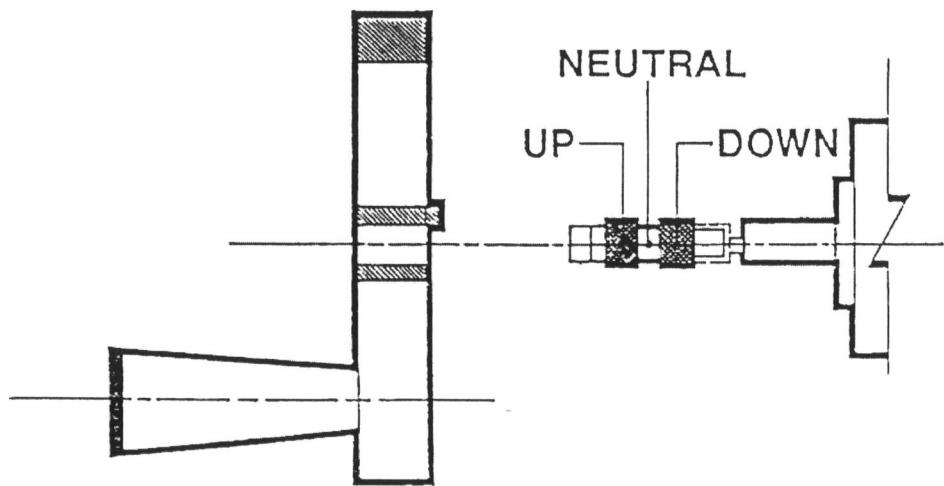
SENSITIVE HEAD FEED

1. Place the handle on the boss.
2. Select the most suitable position.
3. Push home until locating pin engages.



FINE HAND FEED

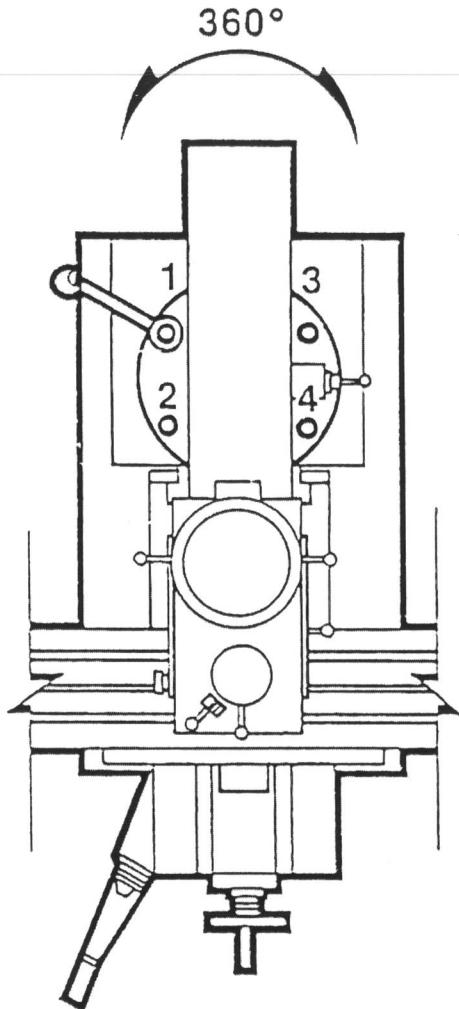
1. Disengage auto quill feed.
2. Locate feed selective knob in the mid position.
3. Set feed engagement lever to the left position.
4. The quill is now under handwheel control.



OPERATION

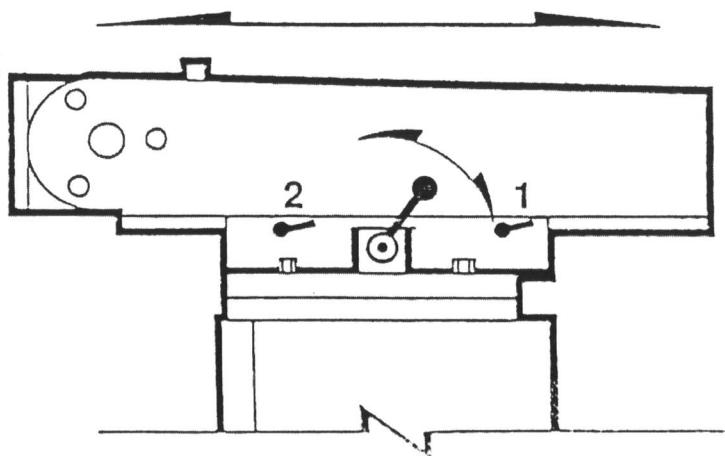
SWIVEL TURRET

1. Use spanner to unlock the four bolts.
2. Index to the required setting.
3. Lock the four bolts.



MOVE RAM SLIDE

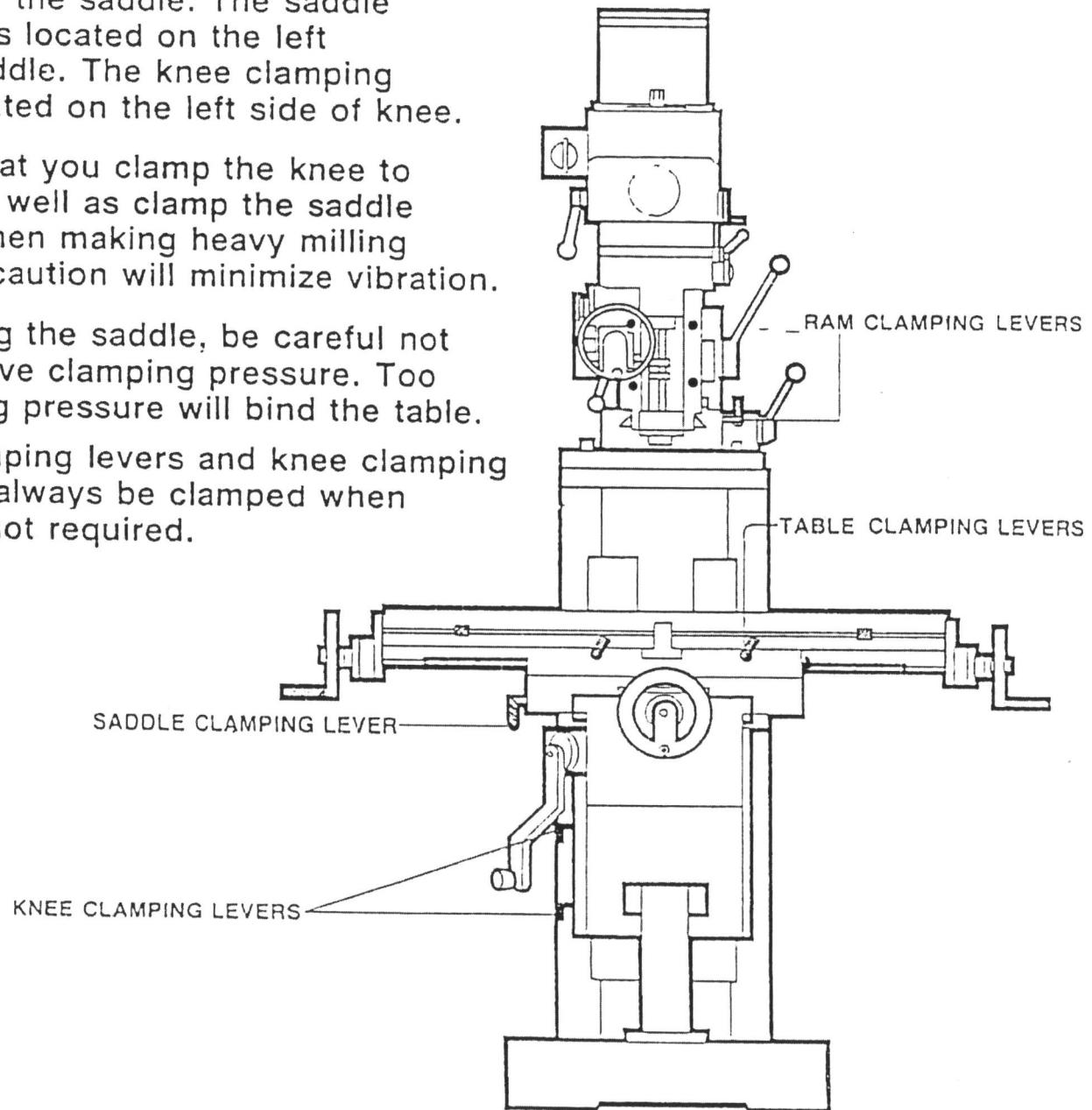
1. Loosen two lock levers.
2. Turn the handle to move the slide to the desired position.
3. Tighten, tightening the rear lock lever first.



OPERATION

CLAMPING THE RAM, TABLE, SADDLE AND KNEE

- Two ram clamping levers are located on the right of ram. Both ram clamping levers should always clamped.
- Two table clamping levers are located on the front of the saddle. The saddle locking lever is located on the left side of the saddle. The knee clamping levers are located on the left side of knee.
- We suggest that you clamp the knee to the column as well as clamp the saddle to the knee when making heavy milling cuts. This precaution will minimize vibration.
- When clamping the saddle, be careful not to use excessive clamping pressure. Too much clamping pressure will bind the table.
- The table clamping levers and knee clamping levers should always be clamped when movement is not required.



MAINTENANCE

MAY WE SUGGEST THAT

Before attempting any maintenance for safety you should isolate the machine electrically and for efficiency you had better read the relevant section of this manual.

WHEN ORDERING REPLACEMENT PARTS

PLEASE QUOTE:

- * THE MACHINE SERIAL NO.
situated on the right hand side of the column.

- * THE HEAD SERIAL NO.
found on the right side of the belt housing.

- * ITEM NUMBER.

- * PART NUMBER.

- * QUANTITY.

- * DESCRIPTION.

PREVENTIVE MAINTENANCE

For securing the accuracy and life of the machine,
we offer the following suggestions.

DAILY:

- A. It is necessary to oil each lubrication point before operation.
- B. Check the level of the oil lubrication and fill if necessary.
- C. It is necessary to release the clamps, clean and lubricate the table after operation.

MONTHLY:

- A. Check all the gibbs, and adjust if necessary.
- B. Check all the backlash between screws and nuts, and adjust if necessary.

QUARTERLY:

- A. Check and adjust the machine accuracy.

TROUBLE-SHOOTING

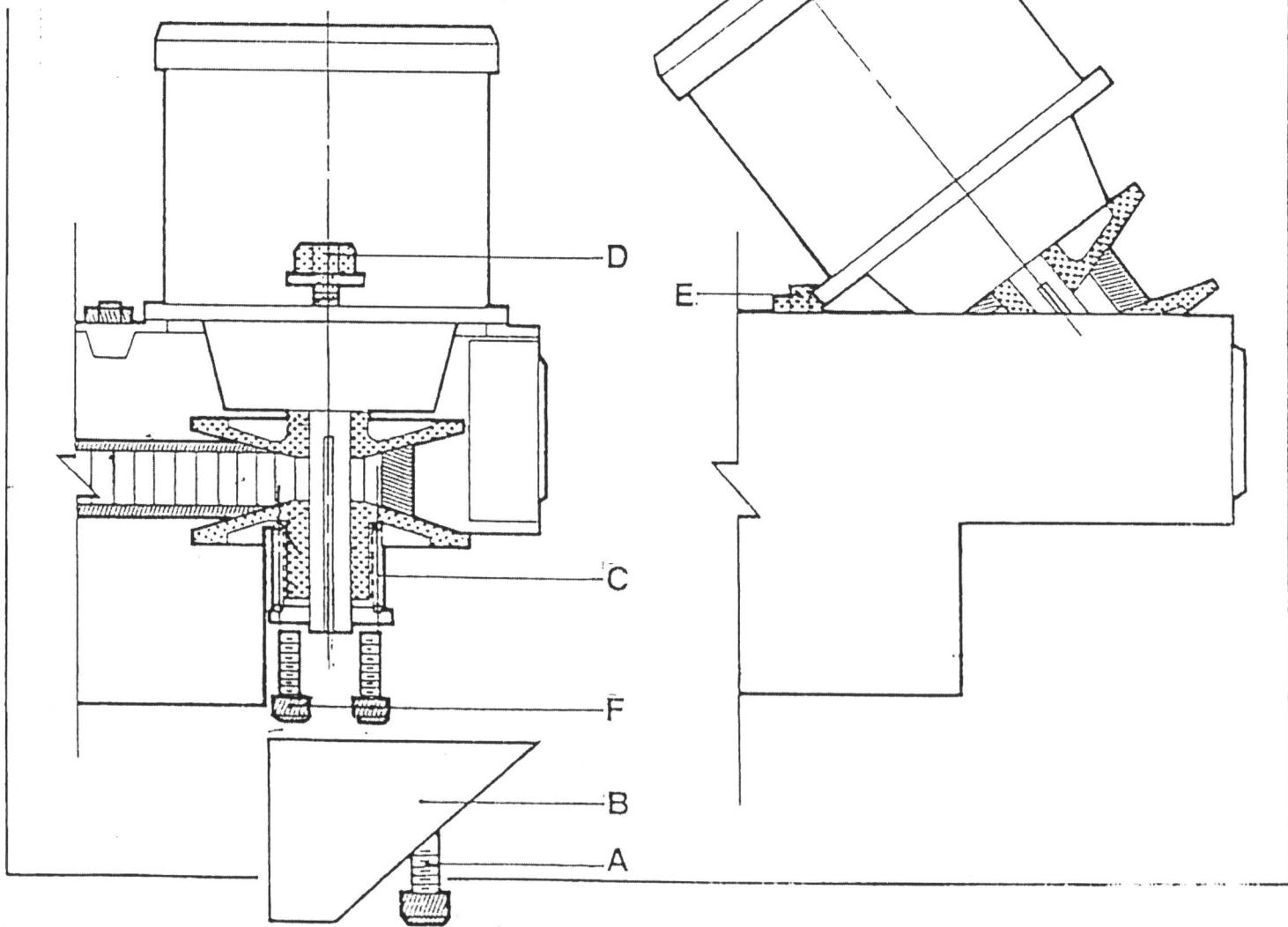
The following chart contains some typical probable troubles of operation, along with the possible causes and remedies for each.

TROUBLE	POSSIBLE CAUSE	REMEDY
SPINDLE FEED ABNORMAL	Quill clamp lever unrelease.	Release clamp lever.
SPINDLE BRAKE BRAKE-DOWN.	Brake shoe worn out	Replace.
SPINDLE UNROTATE	Poor contact on the switch,	Check the switch.
	Drive belt too slack.	Adjust or replace.
	Poor motor.	Repair or renew.
INCORRECT ROTATION	The switch knob indicated at wrong position.	Change to correct position.
3 AXES FEED UNSMOOTH	Gib strip too tight.	Release
	Unproper backlash between units and screws.	Adjust
	The lubricant not to lubrication point.	Check lubrication.
VIBRATIVE WHEN MACHINING	Machine unstable.	Reclamp
	unsuitable cutting condition.	Select proper cutting speed according to material and cutter.

MAINTENANCE

MOTOR REMOVAL

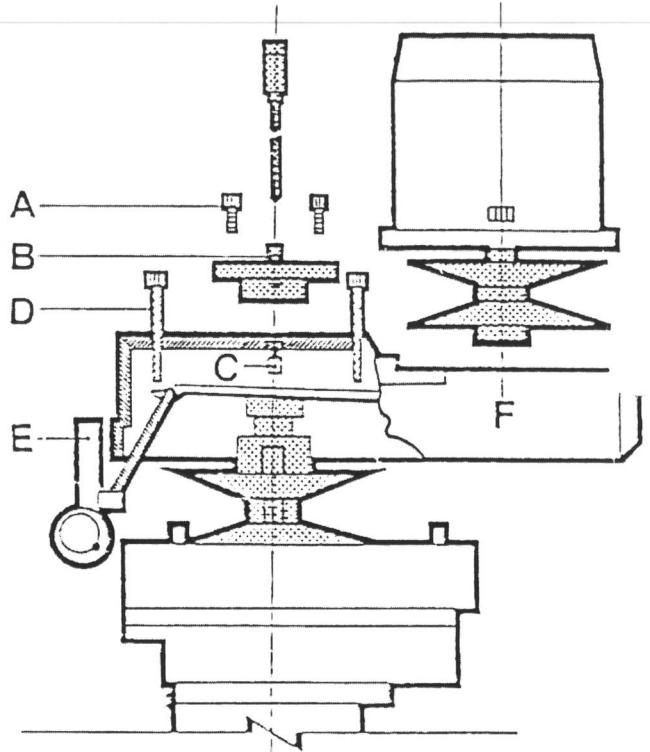
1. Run head to adjust to the lowest speed.
2. Isolate machine.
3. Remove two screws "A" and "B".
4. Using two M5—0.8P screws "F", compress spring "C".
5. Rotate the speed changer to the highest speed.
6. Remove the reversing switch from the belt housing.
7. Remove the two bolts "D".
8. Lift the motor and rest the case on stud "E".
9. Ease the belt over the lower drive disc and remove the motor.



MAINTENANCE

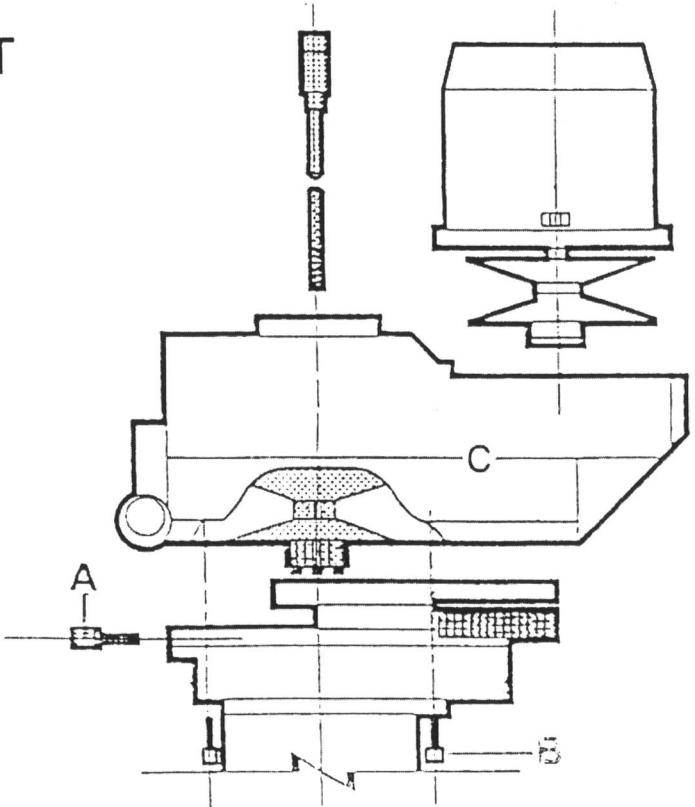
DRIVE BELT REPLACEMENT

1. Remove the motor.
2. Remove the three screws "A", insert into the adjacent tapped holes and withdraw bearing hosing "B".
3. Remove two screws and sleeves "C".
4. Remove four screws "D".
5. Remove screws "E".
6. Remove top housing "F", tap to clear the dowels.
7. Replace the belt.



TIMING BELT REPLACEMENT

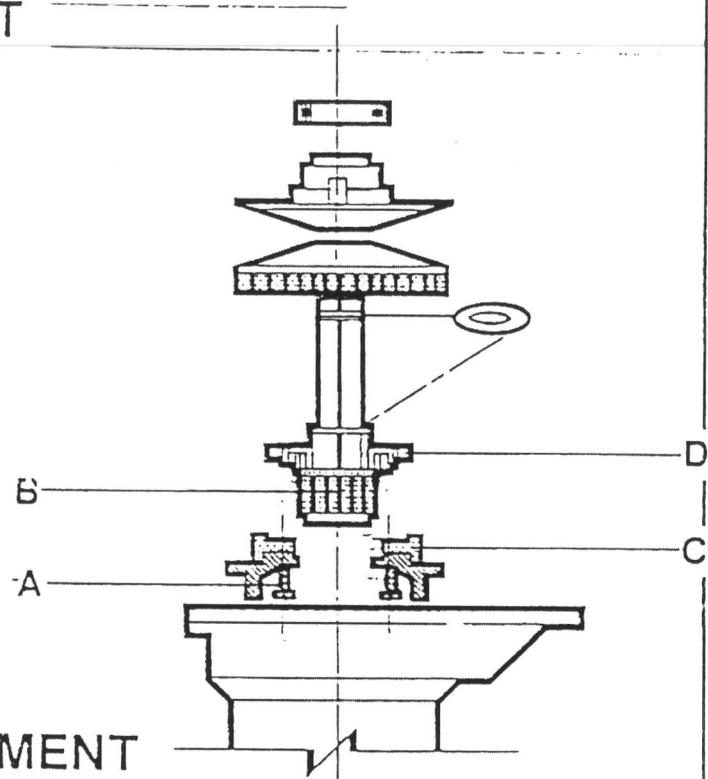
1. Remove the motor.
2. Lower the quill to full extent.
3. Remove the two screws "A" from the speed changer housing.
4. Remove the four screws "B".
5. Remove the top assembly "C" and tap to clear dowels.
6. Replace the belt.



MAINTENANCE

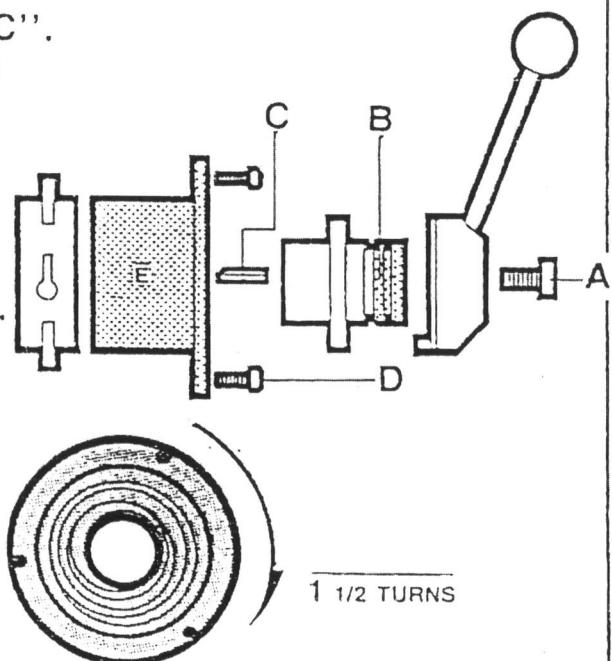
BRAKE SHOE REPLACEMENT

1. Remove the top section.
2. Remove the two screws "A".
3. Remove the clutch hub assembly "B" and "D".
4. Replace the brake shoes "C".



BALANCE SPRING REPLACEMENT

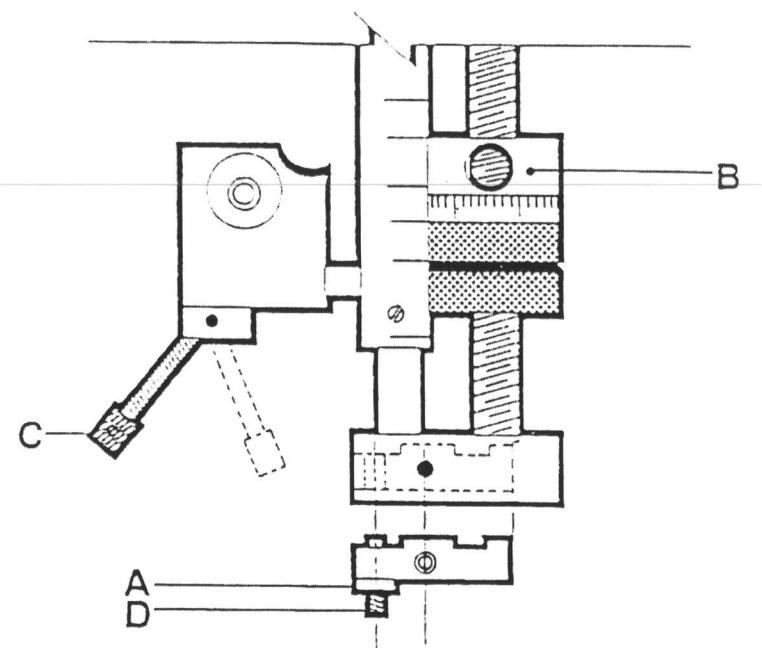
1. With quill at top of movement apply quill lock.
2. Remove screw "A", hub "B", and key "C".
3. Remove screws "D", allowing housing to rotate slowly releasing spring tension.
4. Lift end of spring from peg on the pinion shaft.
5. Rotate housing "E" anti-clockwise from head casting.
6. Remove spring from housing and replace.
7. Refit spring to main housing casting, turning housing clockwise until spring locates on peg in pinion shaft.



MAINTENANCE

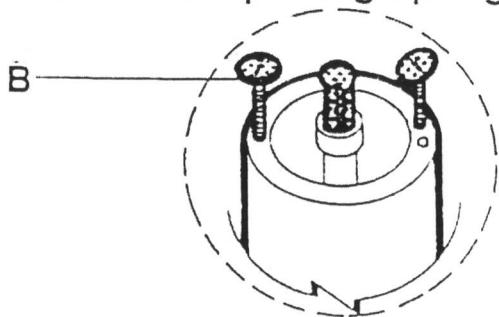
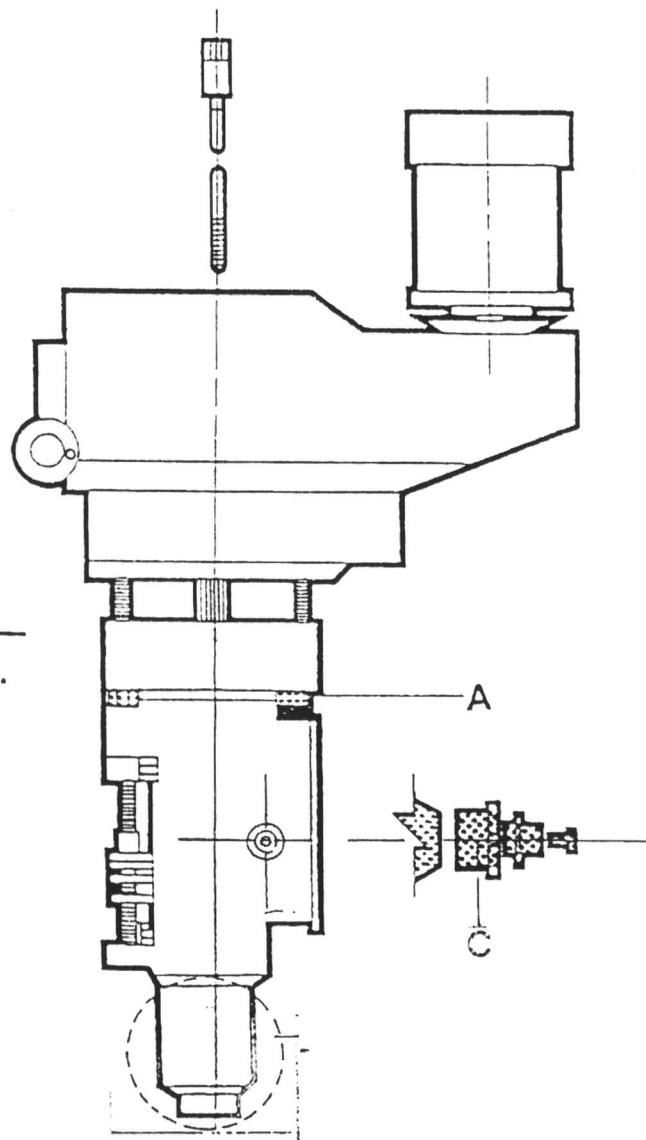
FEED TRIP ADJUSTMENT

1. Release lock nut "A".
2. Engage trip handle "C".
3. Adjust micro nuts against quill stop "B".
4. Slowly turn adjusting screw "D" until lever "C" trips.
5. At this point secures locknut "A".
6. Check that smart trip action is obtained.



QUILL REMOVAL

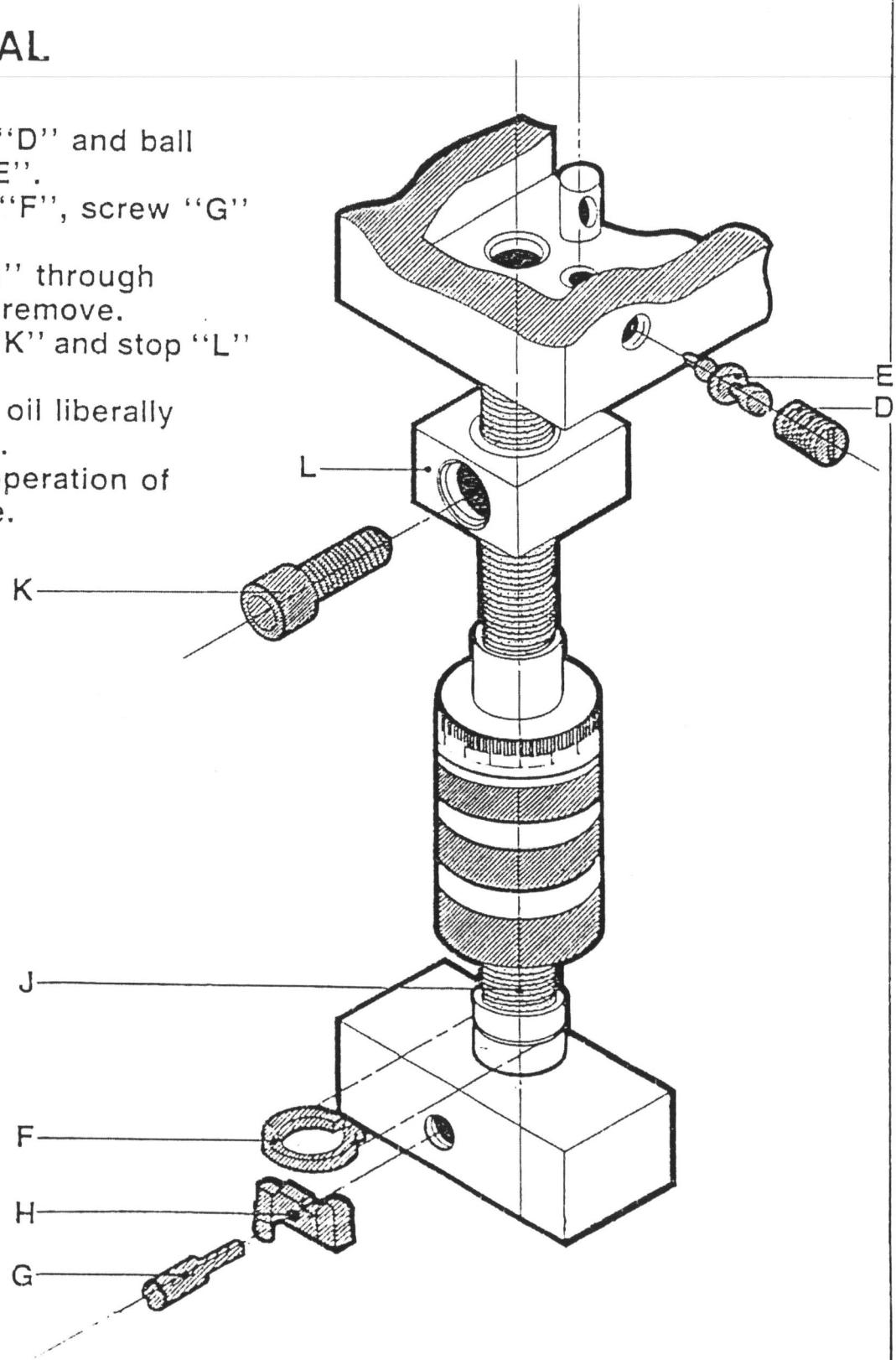
1. Isolate machine.
2. Remove motor.
3. Remove drawbar.
4. Full extend quill.
5. Remove four nuts "A".
6. Remove top section completely.
7. Remove two screws "B" from top of quill.
8. Remove clock spring housing "C"—see instruction on replacing spring.



MAINTENANCE

QUILL REMOVAL

9. Remove screw "D" and ball reverse lever "E".
10. Remove circlip "F", screw "G" and arm "H".
11. Thread shaft "J" through micro nuts and remove.
12. Remove screw "K" and stop "L".
13. Remove quill.
14. Clean all areas, oil liberally and reassemble.
15. Check correct operation of feed trip linkage.



MAINTENANCE

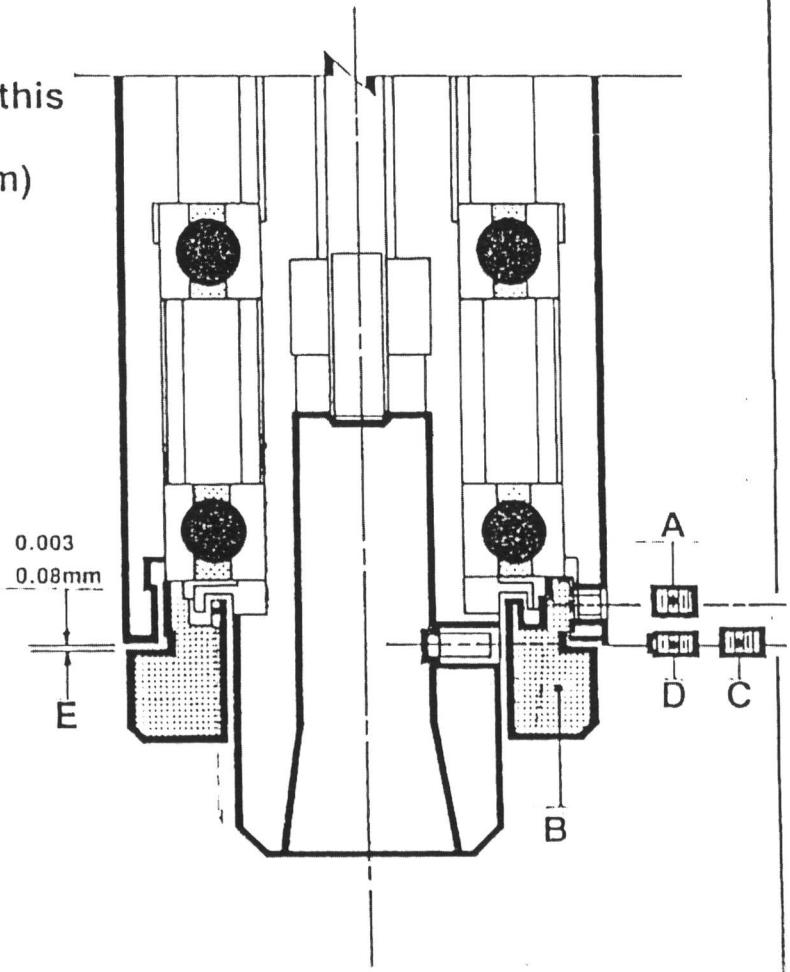
COLLET ALIGNING SCREW REPLACEMENT

1. Use felt pen to mark reference line on quill and nose cap "B".
2. Remove set screw "A".
3. Unscrew cap "B".
4. Remove lock screw "C" and screw "D"
5. Replace "D", insert R-8 collet and check that the dog on the end of the screw does not foul on the bottom of the guide slot.
6. Replace lock screw "C".
7. Repalce nose cap "B", check felt pen markings for correct alignment.
8. Replace set screw "A".

CAUTION:

Do not overtighten as this will cause distortion.

9. Check gap "E". ($0.003'' = 0.08\text{mm}$)

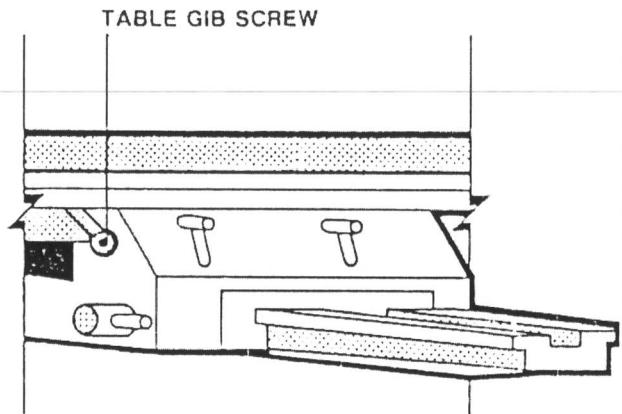


MAINTENANCE

GIB STRIP ADJUSTMENT

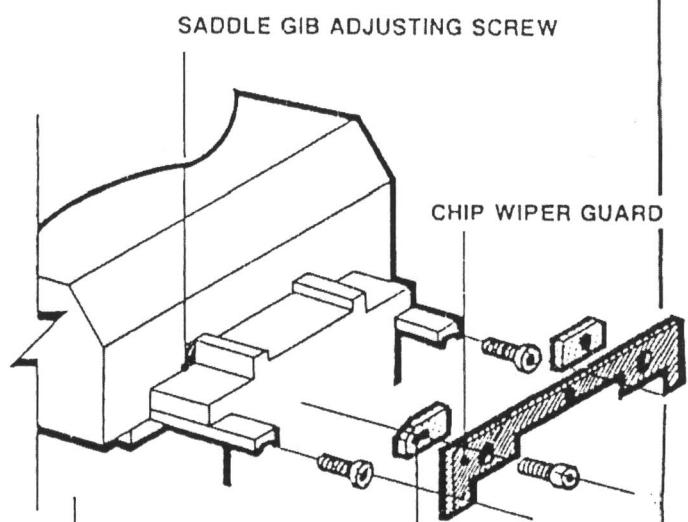
TABLE SADDLE WAYS

1. Remove all swarf from area.
2. Turn the table gib screw clockwise while moving the table until slight drag is felt.



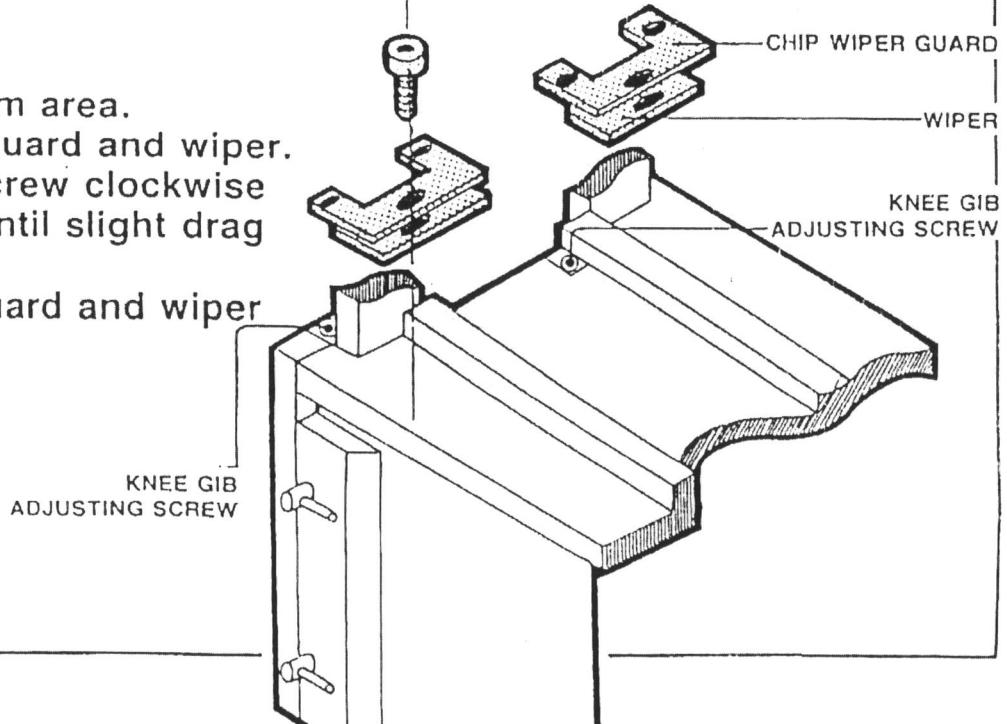
SADDLE KNEE WAYS

1. Remove all swarf from area.
2. Remove chip wiper guard and wiper.
3. Turn gib adjusting screw clockwise while moving the saddle until slight drag is felt.
4. Ensure chip wiper guard and wiper are replaced.



KNEE COLUMN WAYS

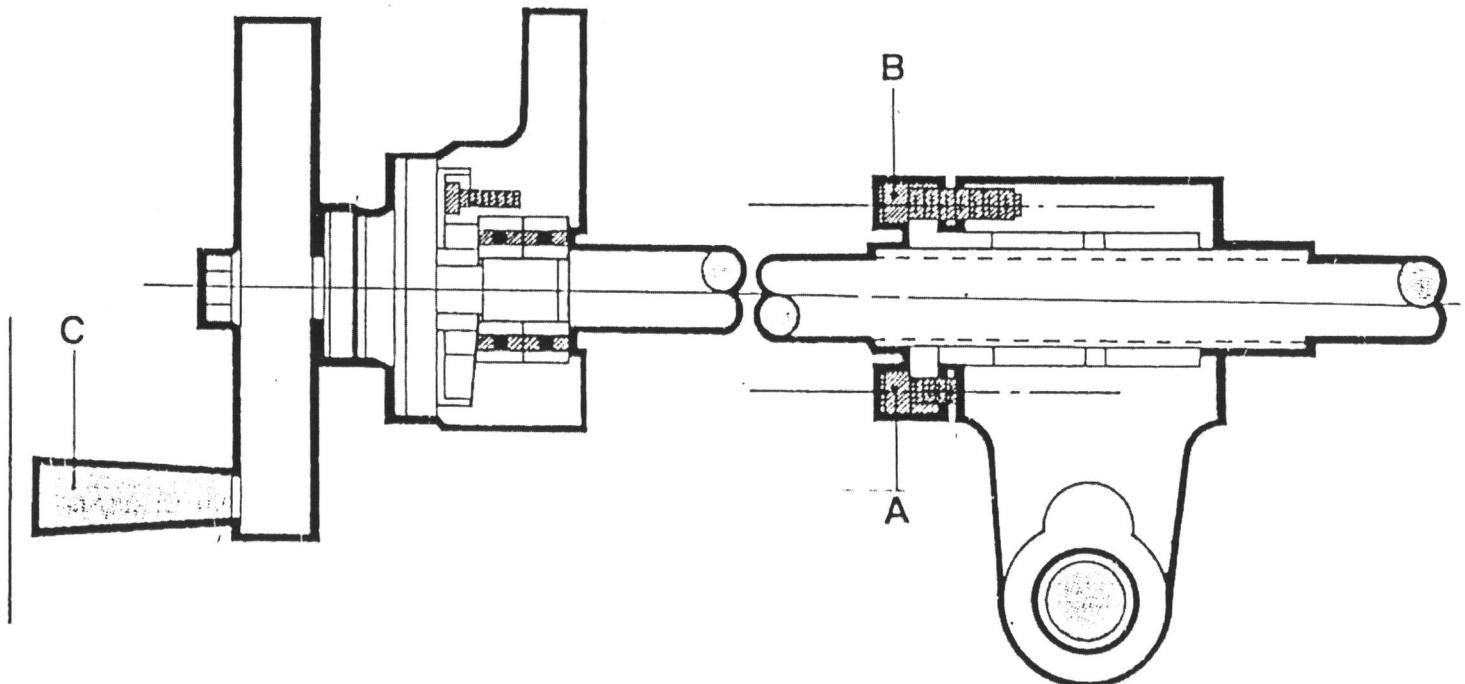
1. Remove all swarf from area.
2. Remove chip wiper guard and wiper.
3. Turn gib adjusting screw clockwise while moving knee until slight drag is felt.
4. Ensure chip wiper guard and wiper are replaced.



MAINTENANCE

TABLE SCREW BACKLASH ADJUSTMENT

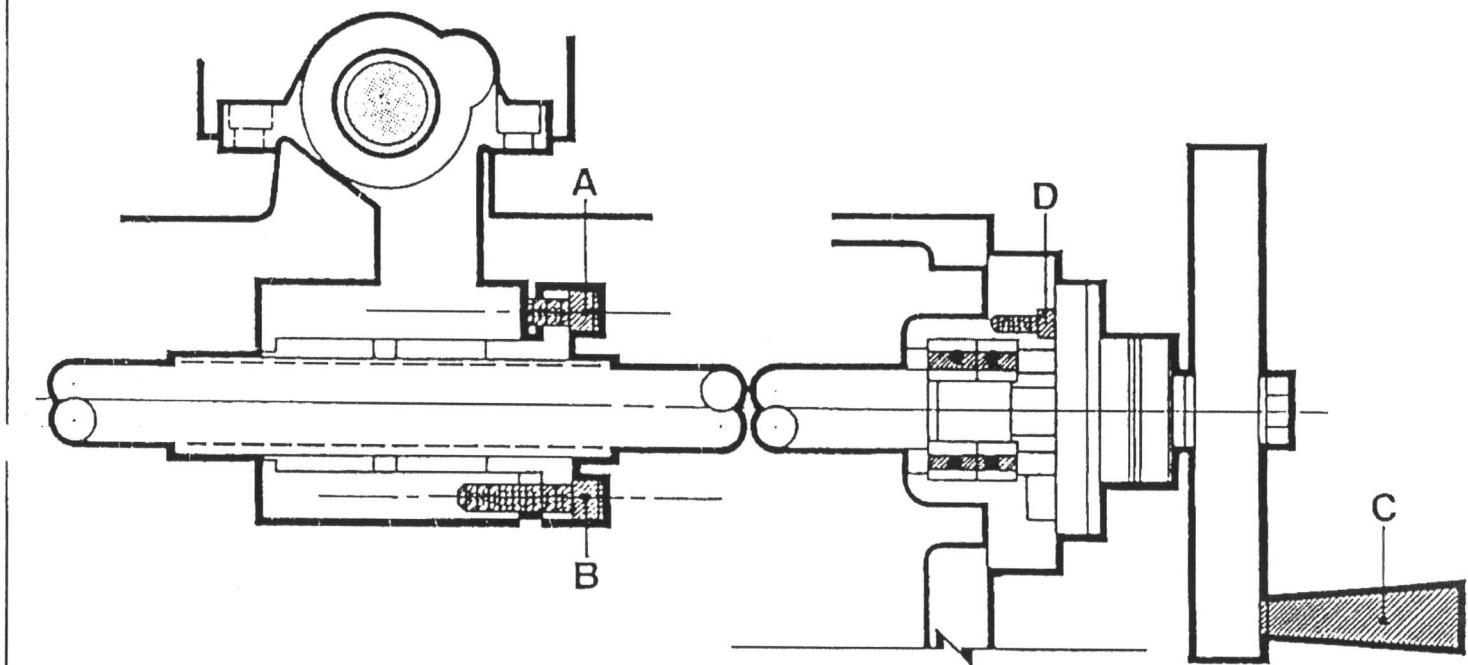
1. Crank the table to the left.
2. Remove the right side bearing support assembly.
3. Slowly turning handle "C", tighten screws "B" until 0.004" or 0.005" backlash is obtained.
4. Lock screws "A".
5. Finally assemble the right side bearing support assembly.



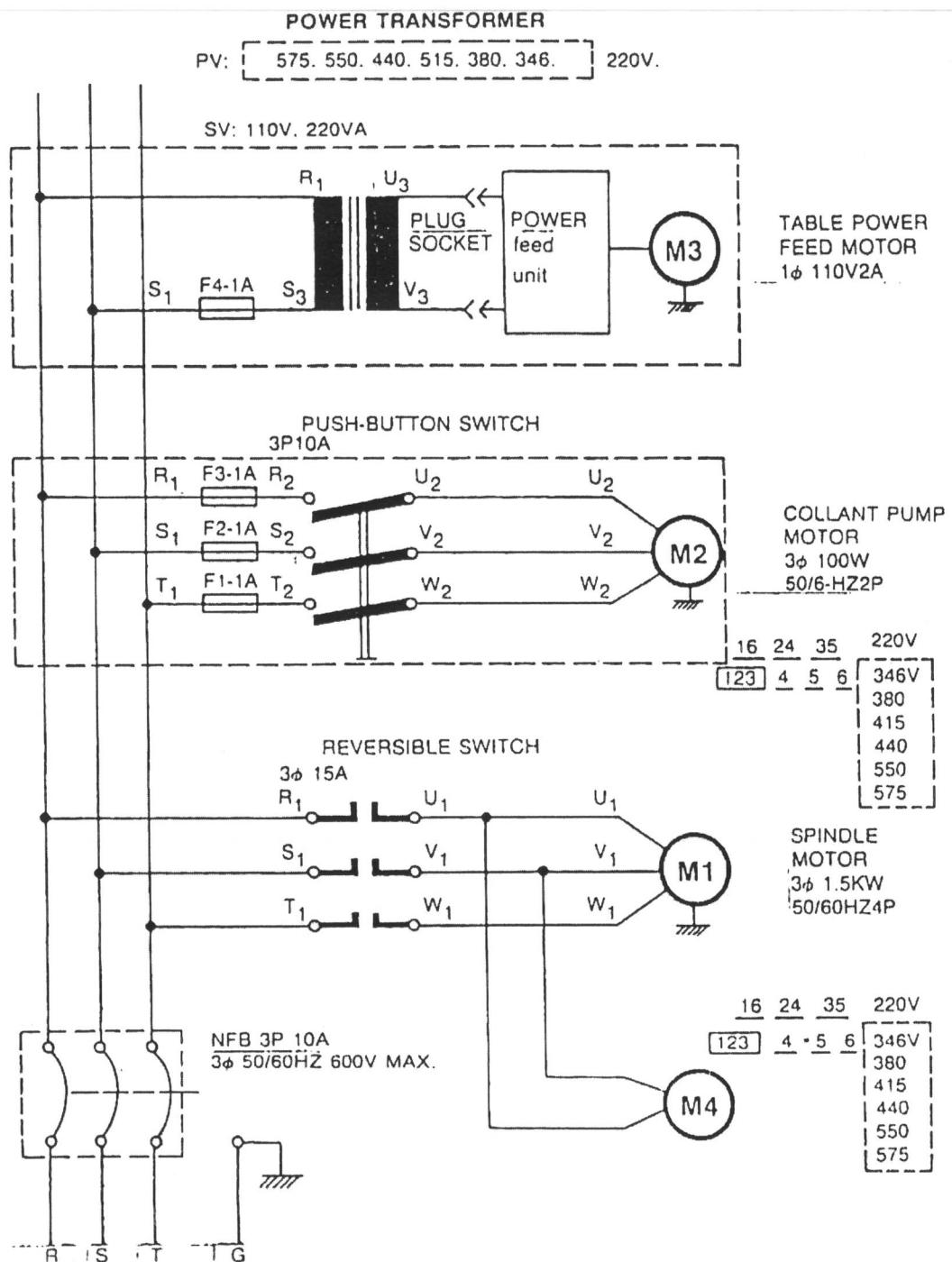
MAINTENANCE

CROSS SCREW BACKLASH ADJUSTMENT

1. Crank the saddle to mid position.
2. Withdraw four screws "D".
3. Pull the saddle forward to expose screws "A" and "B".
4. Slowly turning handle "C", tighten screws "B" until 0.004" or 0.005" backlash is obtained.
5. Lock screws "A".
6. Finally crank the saddle to the front of the knee and replace four screws "D".

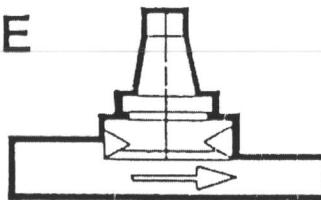


ELECTRIC CIRCUIT DIAGRAM



CUTTING DATA

MILLING DATA TABLE



CUTTING SPEEDS

Unit = m/min

Material to be cut	High speed steel tools		Carbide-tipped tools	
	Rough mill	Finish mill	Rough mill	Finish mill
Cast iron HB 150–180	21	36	80	150
Cast iron HB 180–220	16	27	70	120
Cast iron HB 220–300	12	21	60	90
Carbon steel (Medium)	24	35	75	75
Carbon steel (High)	12	24	60	70
Copper	38	53	180	300
Brass	76	90	240	300
Bronze	38	50	180	300
Aluminum	120	210	240	300

FEED PER TOOTH

Unit:mm/Tooth

Material to be cut	Face mills	Helical mills	Aide mills	End mills	Formrelleved cuters	Circular saws
Cast iron HB 150–180	0.40	0.33	0.22	0.2	0.13	0.10
Cast iron HB 180–220	0.33	0.25	0.15	0.15	0.15	0.075
Cast iron HB 220–300	0.28	0.20	0.15	0.13	0.075	0.075
Carbon steel (Medium)	0.25	0.20	0.15	0.12	0.075	0.075
Carbon steel (High)	0.15	0.13	0.10	0.075	0.05	0.05
Copper	0.30	0.25	0.17	0.15	0.10	0.75
Brass	0.35	0.28	0.20	0.18	0.10	0.75
Bronze	0.23	0.18	0.15	0.13	0.075	0.05
Aluminum	0.55	0.45	0.33	0.28	0.18	0.13

CUTTING DATA

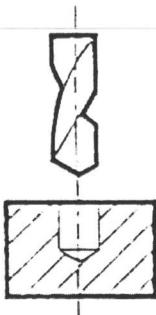
DRILLING DATA TABLE

$$V = \frac{\pi DN}{1000}$$

V: Cutting speed, M/min.

D: Drill diameter, mm.

N: Revolutions per minute, rpm.



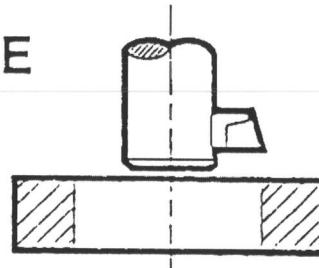
MATERIAL	HARDNESS Brinell	PERIPHERAL FEED SPEED M/min	mm/min	LUBRICANT
Cast iron, soft	126	42-45		Heavy
Cast iron, medium	196	24-33		Medium
Cast iron, hard	293-302	13-15		Light Soluble oil
Steel, 40-50 carbon	170-196	24		Soluble oil
Mild steel, 20-30 carbon	170-202	33-36		Heavy Soluble oil
Copper	80-85	21		Light Soluble oil
Brass	129-202	61-76		2/3 lard oil 1/3 kerosene
Bronze, common	166-183	61-76		Heavy Soluble oil or dry
Aluminum	99-101	193 309		2/3 lard oil 1/3 kerosene

KEY TO FEED REVOLUTION

DRILL MM	HEAVY FEED MM	MEDIUM FEED MM	LIGHT FEED MM
6	0.20	0.13	0.06
12	0.25	0.19	0.10
19	0.40	0.25	0.15
25	0.50	0.30	0.19

CUTTING DATA

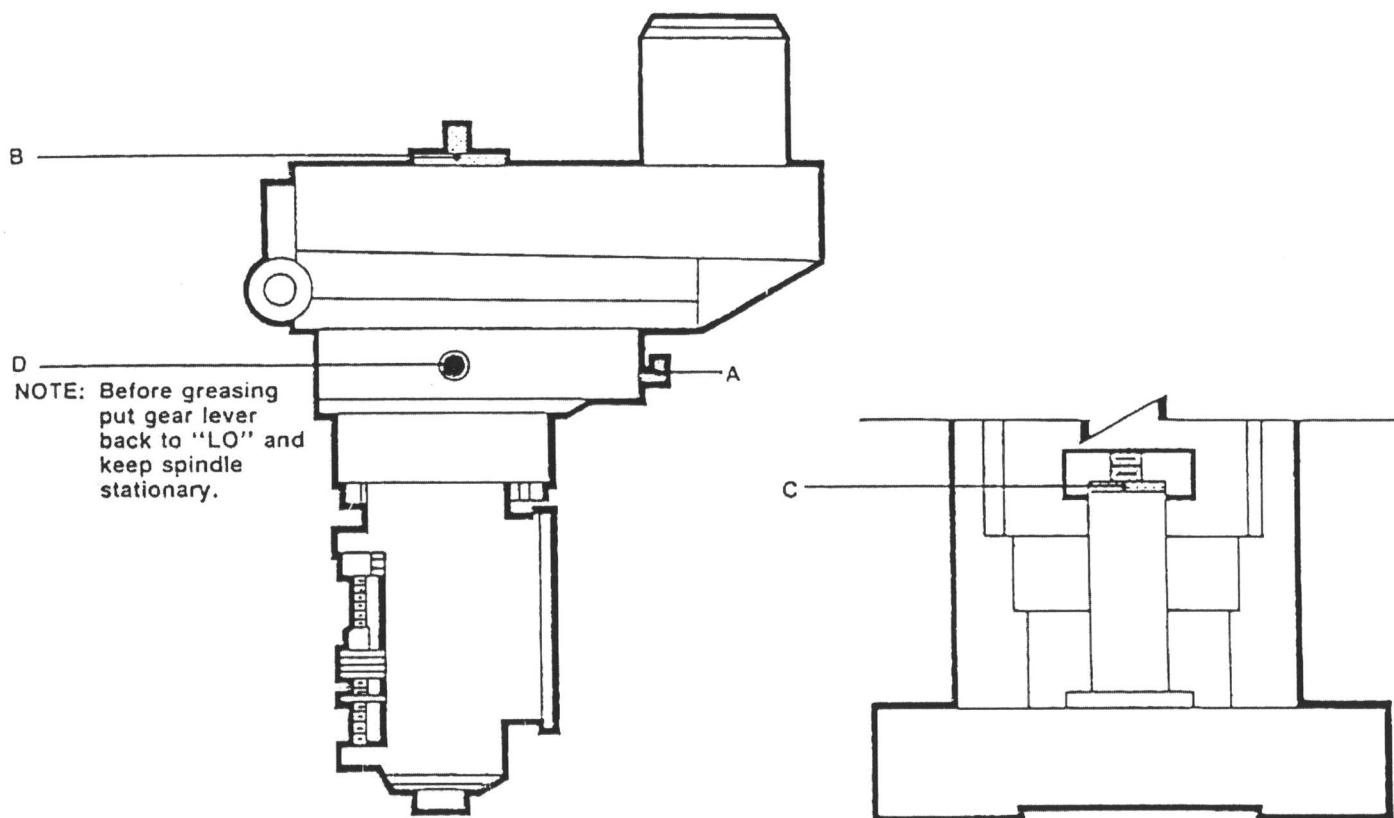
BORING DATA TABLE



Material	Cutting speeds M/min.	Lead mm/rev.	Depth of cut mm	Nose radius		Rake angles	
				Small bores mm	Large bores mm	Back rake	Side rake
Cast iron	91 182	0.075 0.15	0.127 0.38	0.38	0.76 1.5		
Aluminum	280 1800	0.0025 0.127	0.127 0.38	0.38	0.38 1.5	0-15°	5-15°
Lead copper	91						
Lead red brass						0°	5°
Free cutting yellow brass							
Forging brass	1200						
Red brass	150						
Yellow brass						0°	5°-10°
Naval brass	600						
Copper	150						
Chromium copper						5°-10°	15°-20°
Commercial bronze							
Nickel-silver	300						
High-carbon	80						
Alloy steels	100					0°-6°	3°-8°
Interrupted cuts	180						
and tough steels	210					5°-35°	11°-35°
Low-carbon	300						
and free-cutting steels	350					3°-10°	0°-15°
				0.25			

LUBRICATION

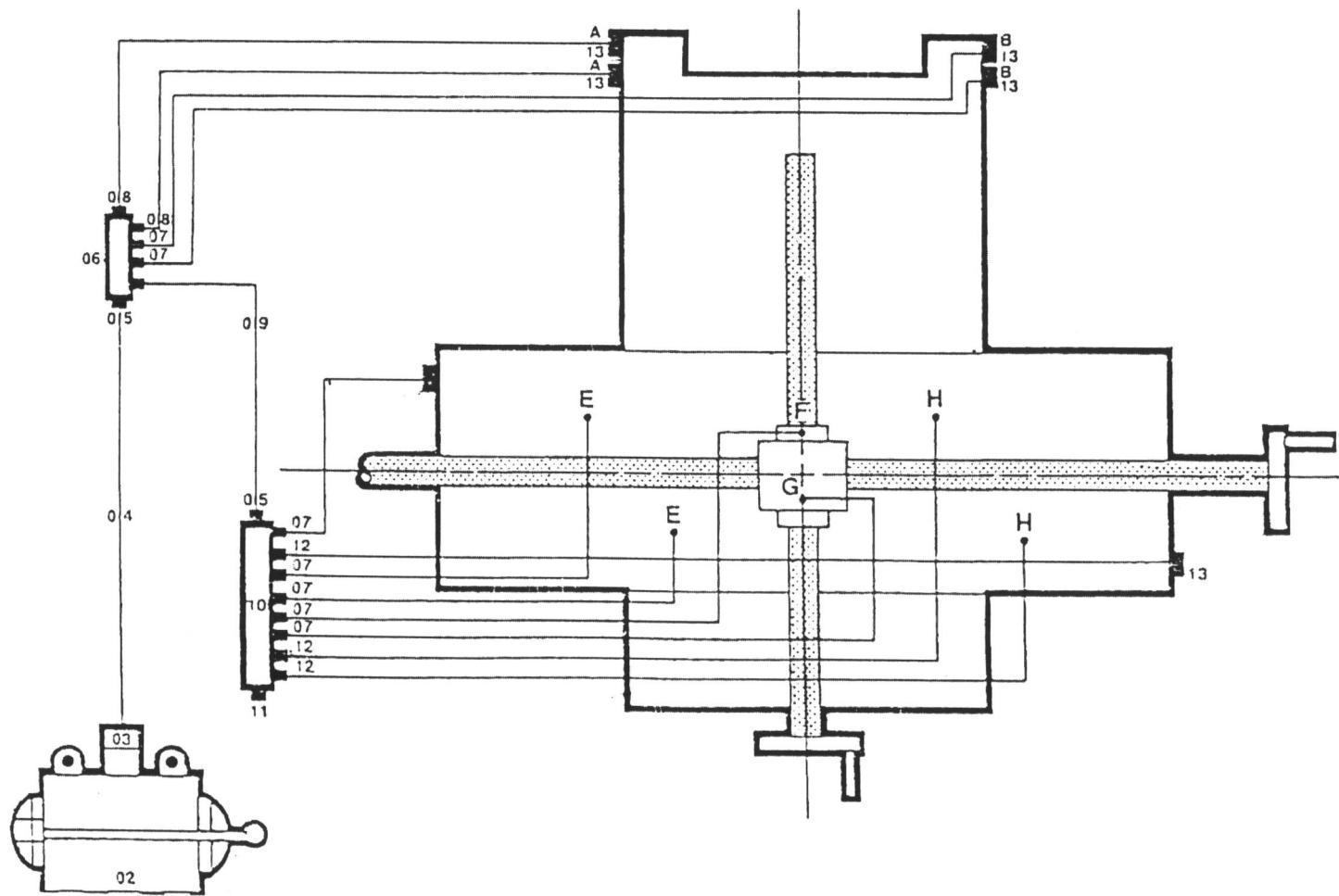
FREQUENCY	LUBRICATE	LUBRICANT	QUANTITY LUB.AT.	
Twice Daily (When feed is in use)	Spindle down feed	Vectra Heavy Medium S.A.E. 10 or 10W Light	Top-Up	A
Weekly	Drawbar splines (move quill down 2")	Ditto	5 drops	B
Twice Weekly	Elevating Screw	Shell Cornea Oil 41 MOBIL x 2 Socony Gargoyle Vactra No.2	5 Shots (Oil Gun)	C
Every 2 months (of normal use)	Back gear	Grease	Equivalent of one teaspoonful	D



LUBRICATION

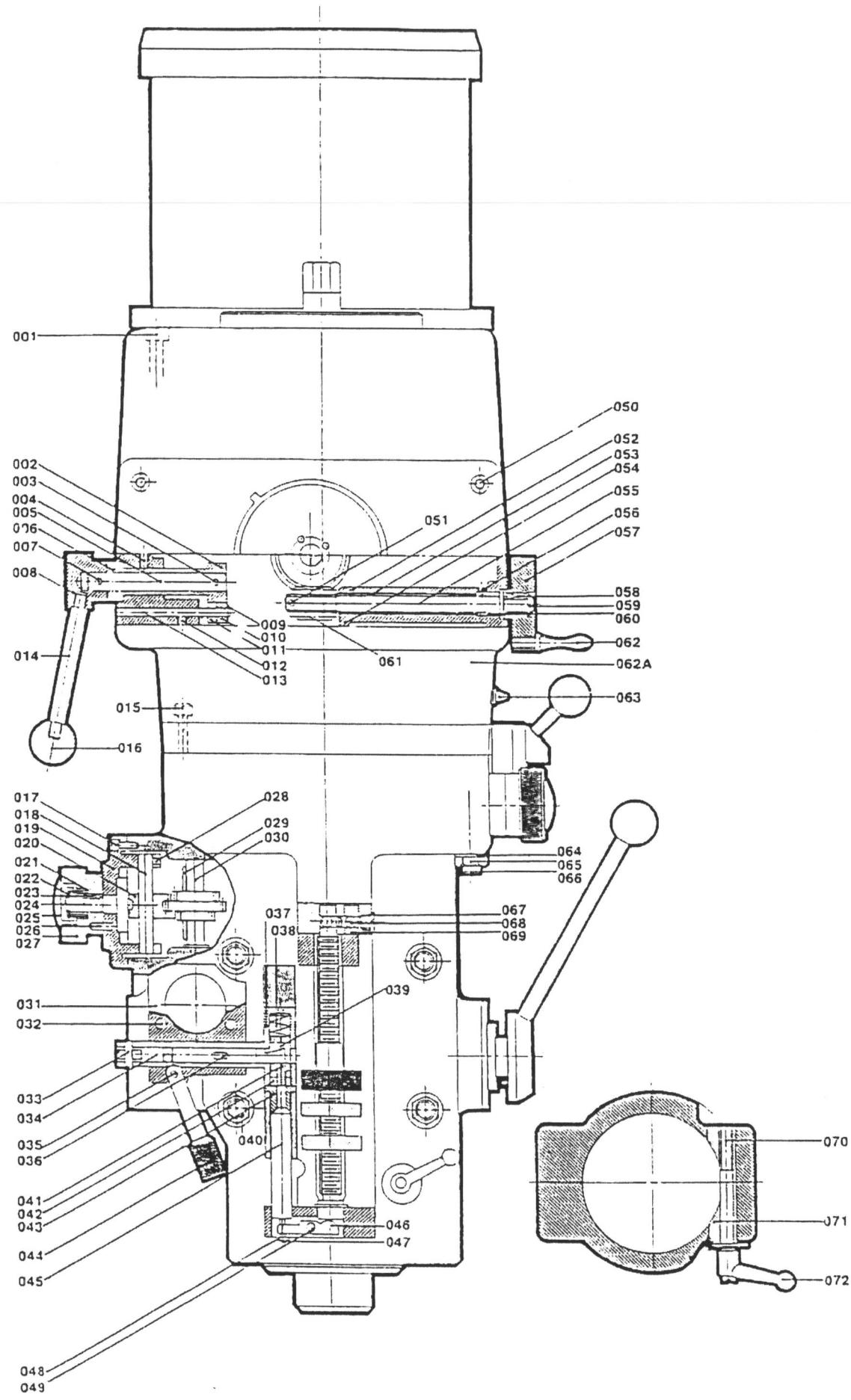
- A. To elevating left guideway.
- B. To elevating right guideway.
- C. To table and saddle rear guideway.
- D. To table and saddle front guideway.
- E. To knee and saddle left guideway.
- F. To cross screw.
- G. To longitudinal screw.
- H. To knee and saddle right guideway.

ITEM NO.	PART NO.	PART NAME	Q.T.Y:
01	FE-038A	Oil plug	1
02	013008000	Plunger pump (LT-8)	1
03	FE-038	Oil pipe joint	1
	040004000	Pipe lock nut (PA-4)	1
	050004000	Pipe joint (PB-4)	1
04	058008200	Oil pipe 8 mm x 200	1
05	040004000	Pipe lock.nut (PA-4)	3
	050004000	Pipe joint (PB-4)	3
06	071060408	Oil distributor (DB-6)	1
07	111001000	Flow regulator (PSS-0)	9
	041004000	Pipe lock nut (PAN-4)	9
	050004000	Pipe joint (PB-4)	9
08	111000000	Flow rectifier (PSS-00)	2
	041004000	Pipe lock nut (PAN-4)	2
	050004000	Pipe joint (PB-4)	2
09	058008330	Oil pipe (8 mm x: 330)	1
10	071100408	Oil distributor (DB-10)	1
11	AC-087A	Bronze plug	1
12	111002003	Flow rectifier (PSS-3)	1
	041004000	Pipe lock nut (PAN-4)	1
	050004000	Pipe joint (PB-4)	1
13	FE-031	Copper connector	6
	040004000	Pipe lock nut (PA-4)	6
	050004000	Pipe joint (PB-4)	6



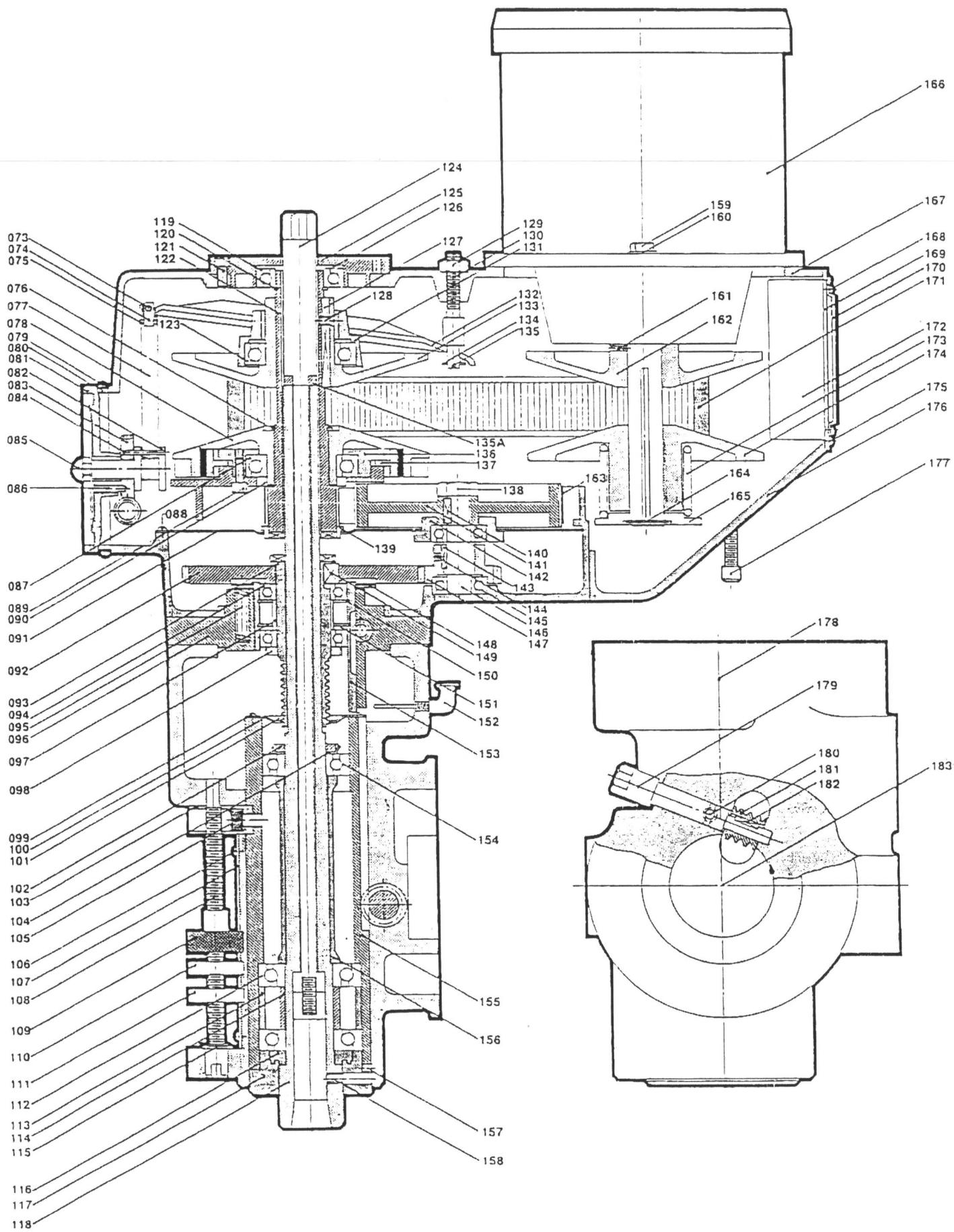
PARTS LIST

ITEM NO.	COMP NO.	DESCRIPTION	Q.T.Y.	ITEM NO.	COMP NO.	DESCRIPTION	Q.T.Y.
001	FB - 078A	Hex-Socket head cap screws	4	037	FA - 093	Cam rod sleeve	1
002	FB - 064	Brake lock cam	1	038	FA - 094	Compression spring	1
003	622040024	Spring pin (4 x 24)	1	039	622030012	Spring pin (3 x 12)	1
004	604060060	Set screw (M6 x 6)	1	040	FA - 040	Head fixed nuts	4
005	FB - 313	Brake lock shaft	1	041	FA - 095	Trip plunger	1
006	FB - 065	Sleeve for brake lock shaft	1	043	FA - 121	Trip plunger bushing	1
007	622040024	Spring pin (4 x 24)	1	044	FA - 328	Trip handle	1
008	FB - 319	Brake handwheel	1	045	FA - 097	Feed trip plunger	1
009	665005010	Retaining ring	1	046	FA - 098	Feed trip lever	1
010	FB - 067	Brake finger pivot stud	1	047	604040200	Set screw (M4 x 20)	1
011	FB - 067	Brake finger pivot stud	1	048	615040000	Nut (M4)	1
012	604040024	Set screw (M6 x 6)	1	049	FA - 099	Trip lever pin	1
013	FB - 068	Brake operating finger	1	050	600060300	Hex-Socket head cap screws (M6 x 30)	4
014	FA - 074	Brake handle	1	051	622030012	Spring pin (3 x 12)	1
015	600080750	Hex-Socket head cap screws (M8 x 75)	4	052	604060060	Set screw (M6 x 5)	1
016	AA - 039	Black plastic ball	1	053	FB - 322	Bushing	1
017	600050100	Hex-Socket head cap screws (M5 x 10)	4	054	FB - 301	Flange sleeve	1
018	FA - 150	Feed shift rod	1	055	FB - 309	Speed control shaft	1
019	FA - 337	Cluster gear cover	1	056	604060060	Set screw (M6 x 6)	1
020	FA - 149	Feed gear shift fork	1	057	FB - 308	Speed change handwheel	1
021	FA - 326	Spring	1	058	630030150	3 x 3 x 15 key	1
022	665010000	A-10 outer retaining ring	2	059	665010000	A-10 outer retaining ring	1
023	630030100	3 x 3 x 10 key	2	060	FB - 316	Flange sleeve	1
024	FA - 311	Cluster gear shaft	1	061	FA - 139	Worm	1
025	FA - 304	Cover	2	062	FB - 053	Speed change hand- heel knob	1
026	622040012	Set screw (M5 x 10)	1	062A	FB - 302	Gear housing	1
027	FA - 323	Handwheel	1	063	077004000	1/8"-28 PT nipple	1
028	604050100	Set screw (M5 x 10)	1	064	652038001	Spring washer (3/8")	4
029	630030460	Parallel key	1	065	615038001	Nut (3/8")	4
030	FA - 143	Cluster gear shaft	1	066	FB - 077	Studs	4
031	FA - 330	Feed trip bracket	1	067	FA - 124	Reverse trip ball lever screw	1
032	600060200	Hex-Socket head cap screws (M6 x 20)	2	068	FA - 113	Reverse trip ball lever	1
033	FA - 077	Dowel pin	1	069	FA - 114	Feed reverse trip plunger	1
034	FA - 091	Cam rod	1	070	FA - 110	Quill lock sleeve tapped	1
035	FA - 077	Dowel pin	1	071	FA - 111	Quill lock sleeve	1
036	622030016	Spring pin (3 x 16)	1	072	FA - 088M	Handle assembly	1

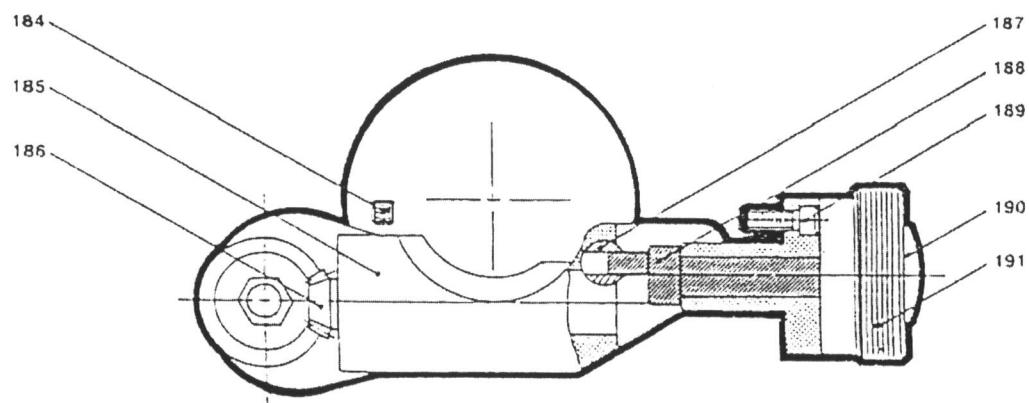


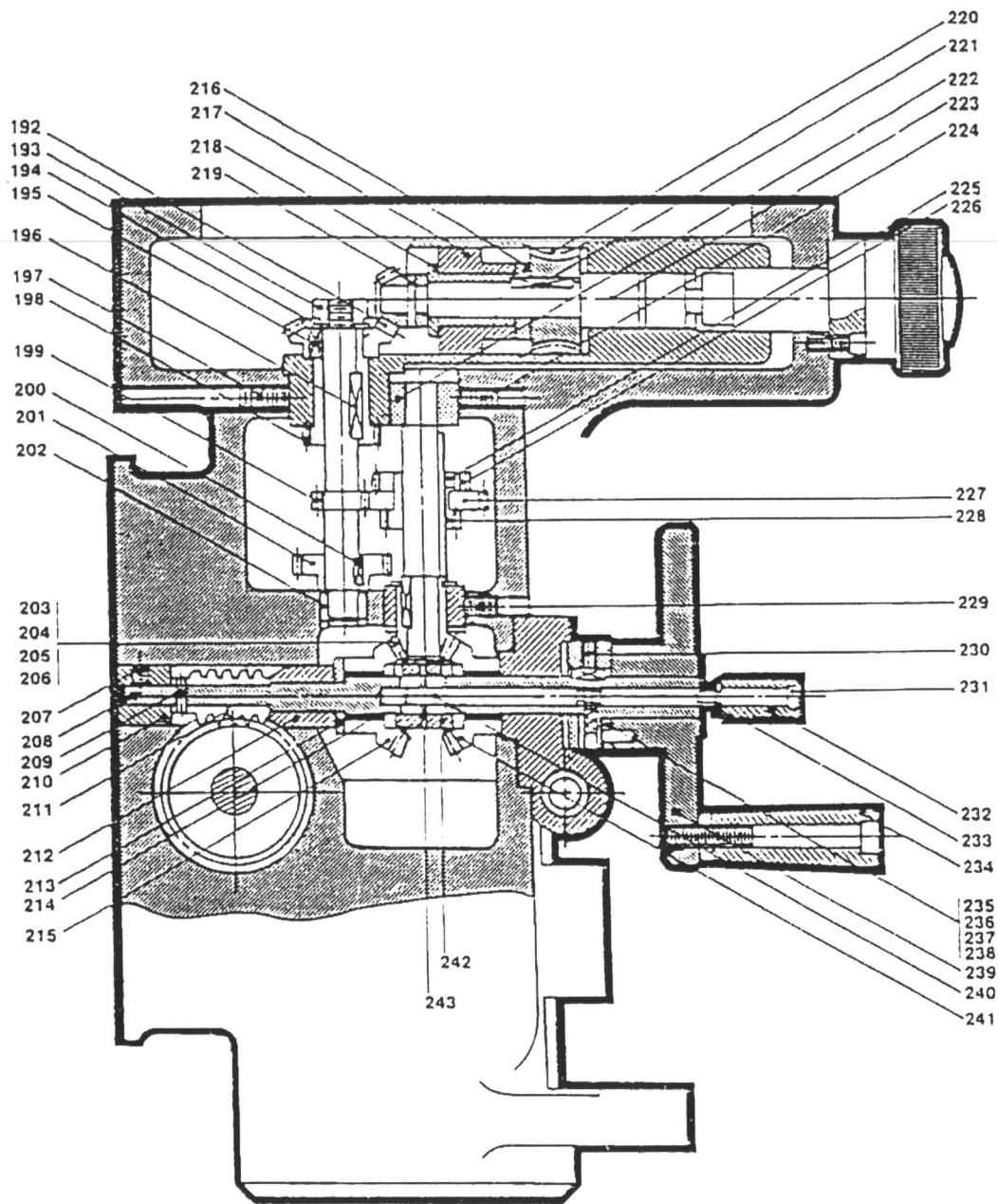
ITEM NO.	COMP NO.	DESCRIPTION	Q.T.Y.	ITEM NO.	COMP NO.	DESCRIPTION	Q.T.Y.
073	622040030	Spring pin	1	105	600100140	Hex-Socket head cap screw (M10 x 14)	1
074	FB - 059	Speed change chain stud	1	106	605016041	Round head screws (W 5/32" x 1/4")	2
075	131038000	Roller chain pin	1	107	403011040	Micrometer scale (Metre)	1
076	665040000	A-40 retaining ring	1	403011050	Micrometer scale (Inch)	1	
077	FB - 061	Roller chain	1	108	FA - 331A	Quill stop micro screw (Metre)	1
078	FB - 012	Stationary driven varidisc	1	FA - 331B	Quill stop micro screw (Inch)	1	
079	605040080	Pan head screws (M4 x 8)	4	109	FA - 307A	Micrometer nut (Metre)	1
080	FB - 320	Speed changer chip shield	2	FA - 307B	Micrometer nut (Inch)	1	
081	FB - 303	Speed changer housing	1	110	FA - 306A	Quill micro stop nut (Metre)	1
082	FB - 311	Speed changer chain drum	1	FA - 306B	Quill micro stop nut (Inch)	1	
083	FB - 310	Speed changer gear	1	111	FA - 332A	Fixed nut (Metre)	1
084	622030024	Spring pin (3 x 24)	1	FA - 332B	Fixed nut (Inch)	1	
085	FB - 056	Hexagon cap screw	1	112	726002070	JM207PP PRB DB bearing	1
086	FB - 085	Full dog	1	113	FA - 054	Bearing spacer	1
087	701060104	Bearing (6010 2RS)	1	114	FA - 053	Bearing spacer	1
088	605360581	Round head screws	3	115	665016000	A-16 retaining ring	1
089	600060200	Hex-Socket head cap screws (M6 x 20)	2	116	FA - 052	Spindle dirt shield	1
090	FB - 016	Spindle pulley spacer	1	117	FA - 051A	Nose-piece (For N.T. #30)	1
091	FB - 325	Gear housing plate	1	FA - 051B	Nose-piece (For R8 taper)	1	
092	FB - 021A	Spindle bull gear	1	118	FA - 050A	Spindle (N.T. #30)	1
093	FB - 018	Spindle gear hub	1	FA - 050B	Spindle-(R8 taper)	1	
094	701069084	Bearing (6908 2RS)	2	119	701060072	Bearing (6007 2Z)	1
095	FB - 024	Compression springs	3	120	665035000	A-35 retaining ring	1
096	FB - 304	Fixed clutch bracket	1	121	600060160	Hex-Socket head cap screws (M6 x 16)	3
097	FB - 027	Bull gear bearing spacer	1	122	FB - 015	Spindle pulley hub	1
098	FB - 019	Bearing locknut	1	123	701060104	Bearing (6010 2RS)	1
099	605360381	Round head screws (3/16" x 3/8")	2	124	FA - 213C	Drawbar (N.T. #30, 1/2-12W: standard)	1
0100	FA - 057	Oil strainer for quill bearing	1	FA - 213E	Drawbar (N.T. #30,		1
0101	FA - 056	Felt	1				
0102	617030000	Lock nut (M30 x 1.5P)	1				
0103	FA - 305	Quill stop knob	1				
0104	653030000	AW-06 washer	1				

ITEM NO.	COMP NO.	DESCRIPTION	Q.T.Y.	ITEM NO.	COMP NO.	DESCRIPTION	Q.T.Y.
		1/2-13UNC: option)		151	FB - 028	Wave spring	1
	FA - 2130	Drawbar (N.T. #30, M12-1.75P: option)	1	152	075008000	Oil cup (1/8"-28PT)	1
	FA - 2138	Drawbar (R8,7/16-20 UNF: option)	1	153	FB - 306	Bearing sleeve	1
	FA - 086A	Drawbar (N.T. #30 for RT. angle attach)	1	154	726002060	Bearing (M206KDO)	1
	FB - 086B	Drawbar (R8 for RT. angle attach)	1	155	FA - 058	Quill	1
125	FB - 006	Top bearing cap	1	156	FA - 055	Sleeve	1
126	FB - 028	Wave spring	1	157	604050060	Set screw (M5 x 6)	1
127	FB - 010	Key	1	158	FA - 172	Special socket set screw (for R8 only)	1
128	606530041	Pan head screw	1	159	602381041	Hexagon head bolts	2
129	615038001	Nut (3/8")	1	160	652038001	Spring washers (3/8")	2
130	FB - 060	Speed change plate pivot stud	1	161	604060100	Set screw (M6 x 10)	1
131	FB - 014	Spindle pulley bearing sliding housing	1	162	FB - 030	Stationary motor varidisc	1
132	FB - 057	Speed change plate	1	163	066225110	Belt (225L, 110)	1
133	FB - 008	Varidisc	1	164	665024000	A-24 retaining ring	1
134	FB - 084	Washer	1	165	FB - 036	Adjust varidisc spring collar	1
135	633061001	Cotter pin	1	166	413062010	Motor	1
135A	FA - 212	Washer (for N.T. #30)	1	167	FB - 300	Belt housing	1
	FA - 212A	Washer (for R8)	1	168	605080581	Round head screws (1/8" x 5/8")	4
136	FB - 007	Brake bearing cap	1	169	FB - 091	Plate	1
137	FB - 062	Brake shoes	1	170	FB - 088	Iron wire	1
138	615058001	Nut (5/8")	1	171	FB - 082	Belt (383032B-13)	1
139	FB - 017	Timing belt clutch sleeve	1	172	FB - 089	Fan	1
140	630050180	Parallel key (5 x 5 x 18)	1	173	FB - 035	Compression spring	1
141	FB - 041	Timing belt pulley	1	174	FB - 029	Adjustable motor varidisc	1
142	FB - 031	Pinion bearing cap	1	175	605532001	Round head screws (5/32" x 2")	4
143	630050180	Parallel key (5 x 5 x 18)	1	176	FB - 305	Motor pulley cover	1
144	604060060	Set screw (M6 x 6)	1	177	600080650	Hex-Socket head cap screws (M8 x 65)	2
145	701062034	Bearing (6203 2RS)	2	178	FA - 300	Head	1
146	FB - 039	Pinion shaft	1	179	FA - 017	Adj. worm shaft	1
147	FB - 040A	Pinion	1	180	FA - 173	Socket set screw	1
148	FB - 025	Washer	1	181	FA - 018	Worm gear	1
149	635080140	Parallel key (8 x 8 x 14)	1	182	630040180	Parallel key (4 x 4 x 18)	1
150	666062000	B-62 retaining ring	1	183	FD - 001	Worm wheel gear	1



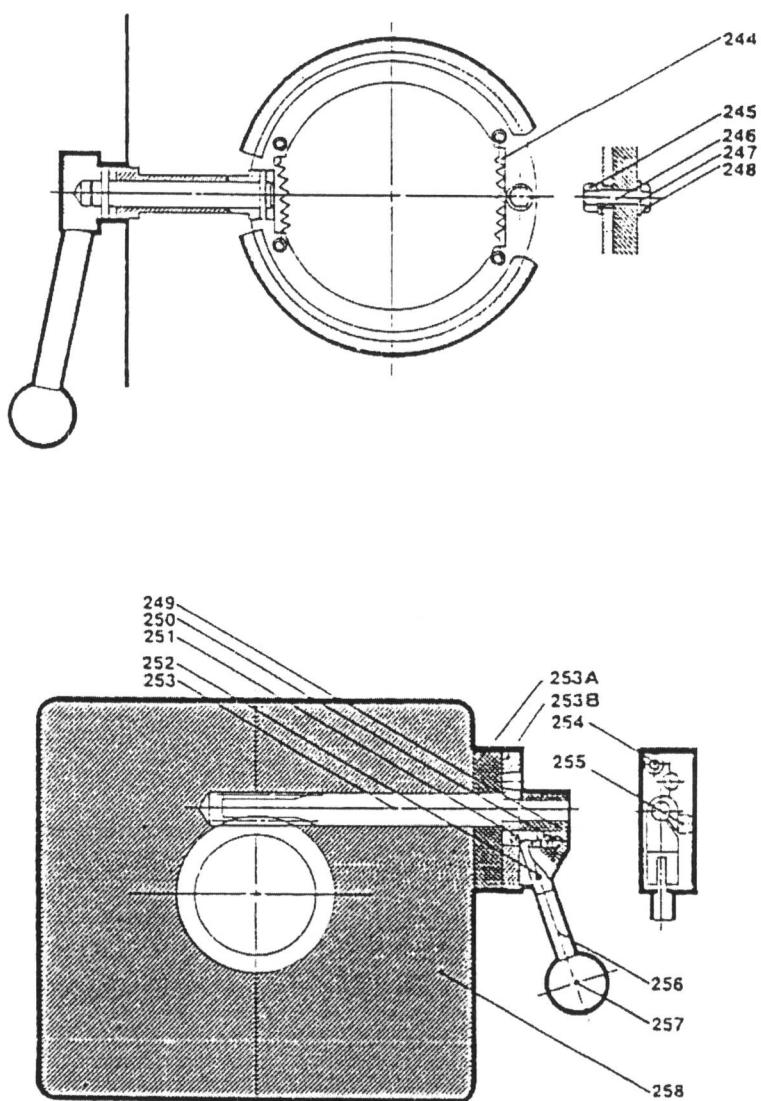
ITEM NO.	COMP NO.	DESCRIPTION	Q.T.Y.	ITEM NO.	COMP NO.	DESCRIPTION	Q.T.Y
184	604060060	Set screw	1	205	FA - 142	Bevel gear bushing	1
185	FA - 320	Worm gear cradle	1	206	665016000	A-16 outer retaining ring	1
186	FA - 160	Feed bevel pinion	1			604060080	Set screw (M6 x 8)
187	FA - 324	Feed engage pin	1	207	604060080	Set screw	1
188	FA - 325	Worm gear cradle throw-out	1	208	FA - 133	Feed worm shaft	1
189	600050100	Hex-Socket head cap screws (M5 x 10)	3	209	622030012	Spring pin (3 x 12)	1
190	FA - 304	Cover	1	210	FA - 168	Bushing	1
191	FA - 323	Speed select handle	1	211	FA - 139	Worm	1
192	FA - 154	Feed reverse bevel gear	1	212	FA - 138	Feed worm shaft bushing	1
193	615056003	Nut (5/16")	1	213	FA - 137	Feed worm shaft thrust washer	1
194	FA - 153	Washer	1	214	FA - 134	Feed reverse bevel gear bushing	1
	652056001	Spring washer (5/16")	1	215	FA - 135	Feed reverse bevel gear	1
195	630030080	3 x 3 x 8 key	1	216	FA - 163	Worm gear spacer	1
196	630030200	3 x 3 x 20 key	1	217	FA - 162	Worm cradle bushing	1
197	FA - 171	Set screw	1	218	FA - 161	Feed worm gear shaft sleeve	1
198	FA - 155	Feed driving gear	1	219	622030016	Spring pin (3 x 16)	1
199	FA - 156	Cluster gear input shaft	1	220	FA - 164	Feed drive worm gear	1
200	630030100	Key 3 x 3' x 10	1	221	630030200	Key (3 x 3 x 20)	1
201	FA - 157	Feed drive gear	1	222	FA - 147	Cluster gear shaft upper bushing	1
202	735000660	IKO BA-66 needle bearing	1	223	FA - 165	Feed drive worm gear shaft	1
203	FA - 140	Feed reverse bevel pinion	1	224	604060140	Set screw (M6 x 14)	1
204	FA - 141	Bevel gear thrust spacer	1				



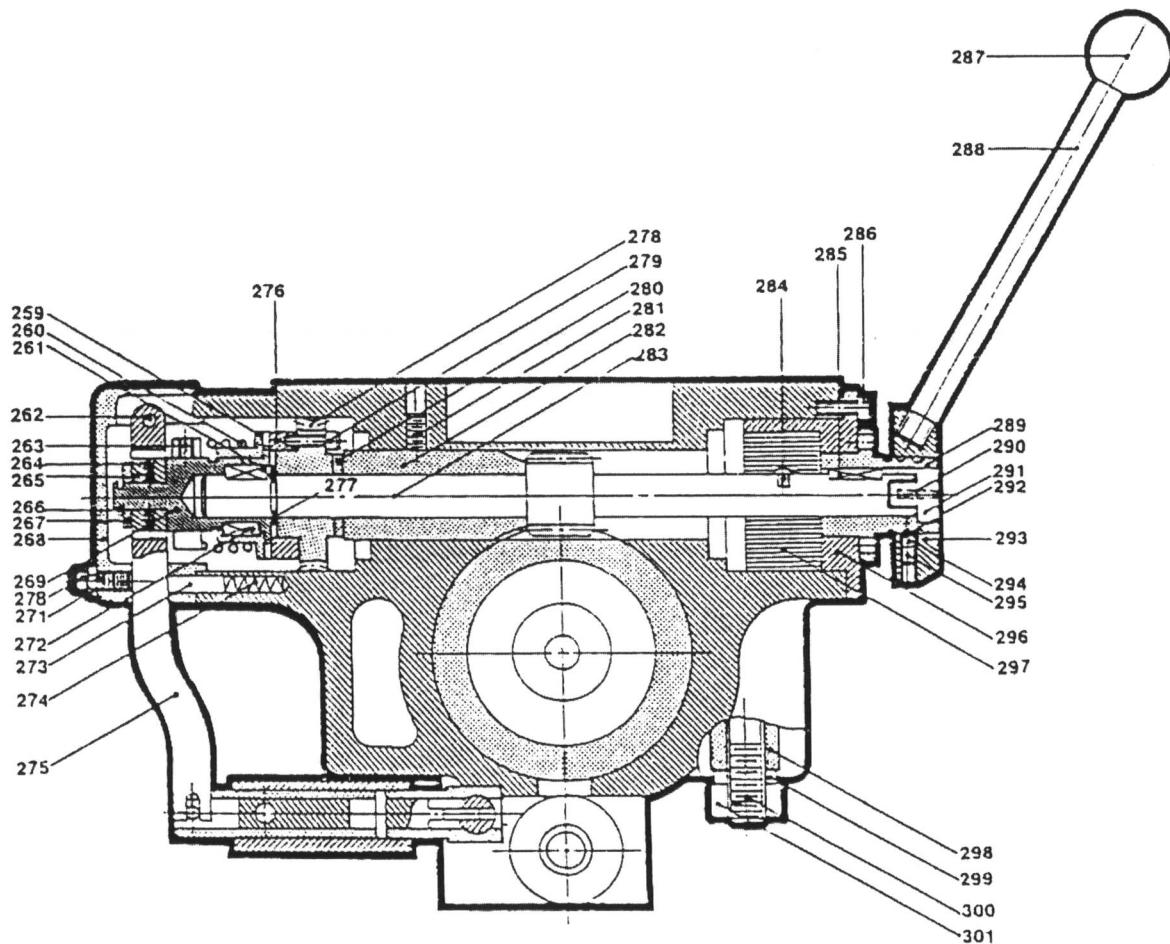


225	604040060	Set screw (M4 x 6)	1	235	FA - 129	Handwheel clutch	1
226	FA - 146	Cluster gear (upper)	1		FA - 129A	Handwheel clutch	1
227	FA - 145	Cluster gear (middle)	1			spring screw	
228	FA - 144	Cluster gear (low)	1		FA - 129B	Compression spring	1
229	604060120	Set screw (M6 x 12)	1	236	035036000	Ball (3/16")	1
230	604060100	Set screw (M6 x 10)	1	237	630030100	Key (3 x 3 x 10)	1
231	FA - 130	Feed reverse knob	1	238	FA - 128	Spring pin	1
		stud		239	FA - 321	Handwheel	1
232	FA - 131	Reverse knob	1	240	FA - 132	Reverse clutch rod	1
233	665005010	E-5 outer retaining	1	241	FA - 135	Bevel gear	1
		ring		242	FA - 136	Feed reverse clutch	1
234	FA - 312	Handwheel handle	1	243	622025020	Spring pin (2.5 x 20)	1

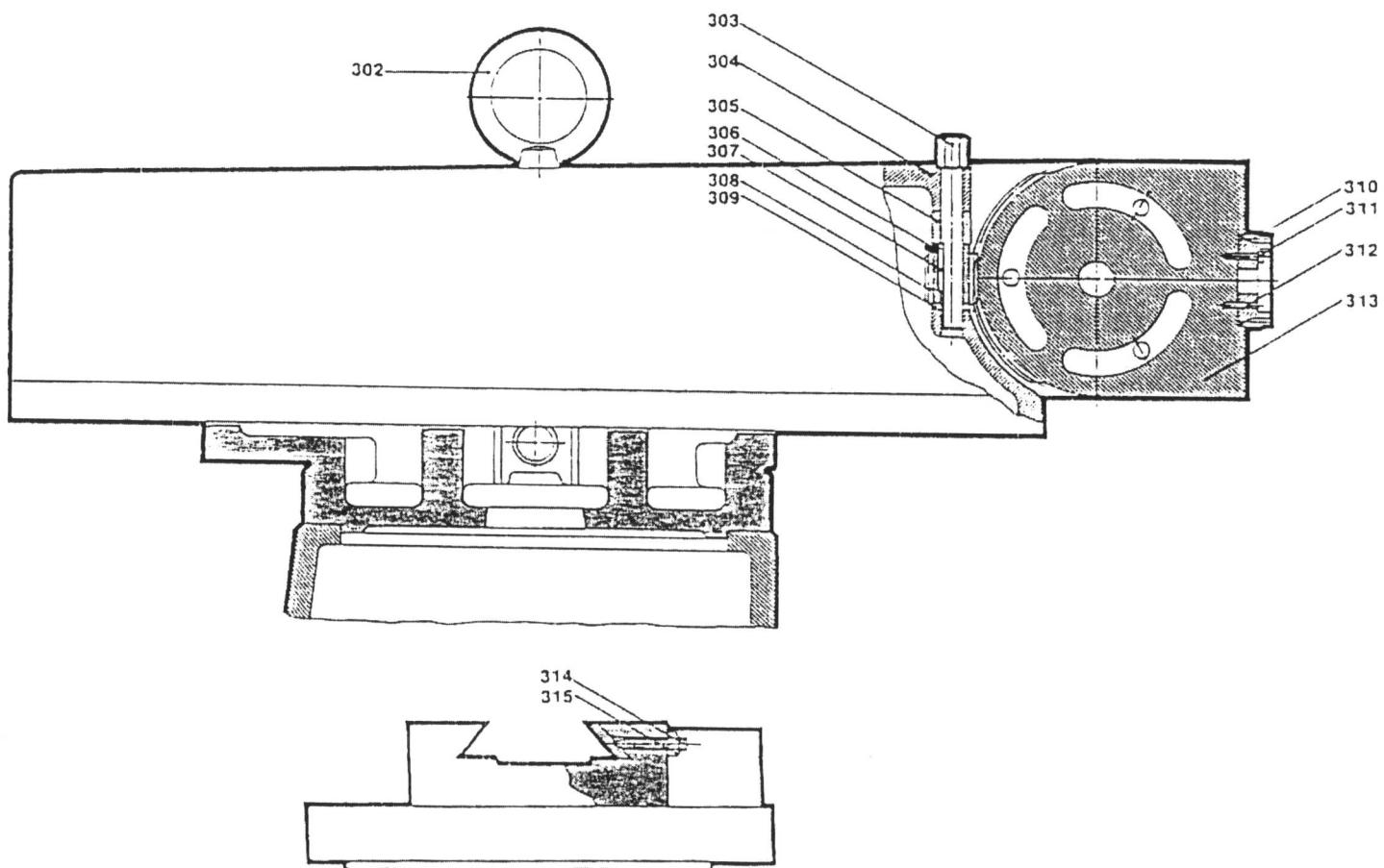
ITEM NO.	COMP NO.	DESCRIPTION	Q.T.Y.
244	FB - 063	Brake springs	2
245	602041001	Hexagon head bolt (1/4" x 1")	1
246	FB - 069	Brake shoe pivot sleeve	1
247	652004001	Spring washer (1/4")	1
248	615004001	Hexagon nut (1/4")	1
249	FB - 075	HI-LOW pinion block	1
250	FB - 072	Spring	1
251	FB - 071	HI-LOW detent plunger	1
252	622030016	Spring pin (3 x 16)	1
253	FB - 314	Bull gear shift pinion	1
253A	FB - 323	HI-LOW detent plate block	1
253B	FB - 324	HI-LOW detent plate	1
254	600050250	Hex-Socket head cap screws (M5 x 25)	2
	600050100	Hex-Socket head cap screws (M5 x 10)	2
255	600040140	Hex-Socket head cap screws (M4 x 14)	2
256	FB - 070	HI-LOW shift crank	1
257	FA - 006	Black plastic ball	1
258	FB - 304	Fixed clutch bracket	1
259	FA - 084	Overload clutch	1
260	FA - 083	Safety clutch spring	1
261	630050150	Key (5 x 5 x 15)	1
262	FA - 077	Dowel pin	1
263	FA - 082	Overload clutch locknut	1
	604060080	Set screw (M6 x 8)	1
264	FA - 081	Clutch ring pins	2
265	FA - 080	Clutch ring	1
266	665009000	A-9 circlip	1
267	FA - 078	Overload clutch washer	1
268	FA - 076	Clutch arm cover	1
269	FA - 085A	Overload clutch sleeve	1
270	604060140	Set screw (M6 x 14)	1
	600050350	Hex-Socket head cap screw (M5 x 35)	1
271	615006000	Nut (M6)	1
272	630050150	Key (5 x 5 x 15)	1

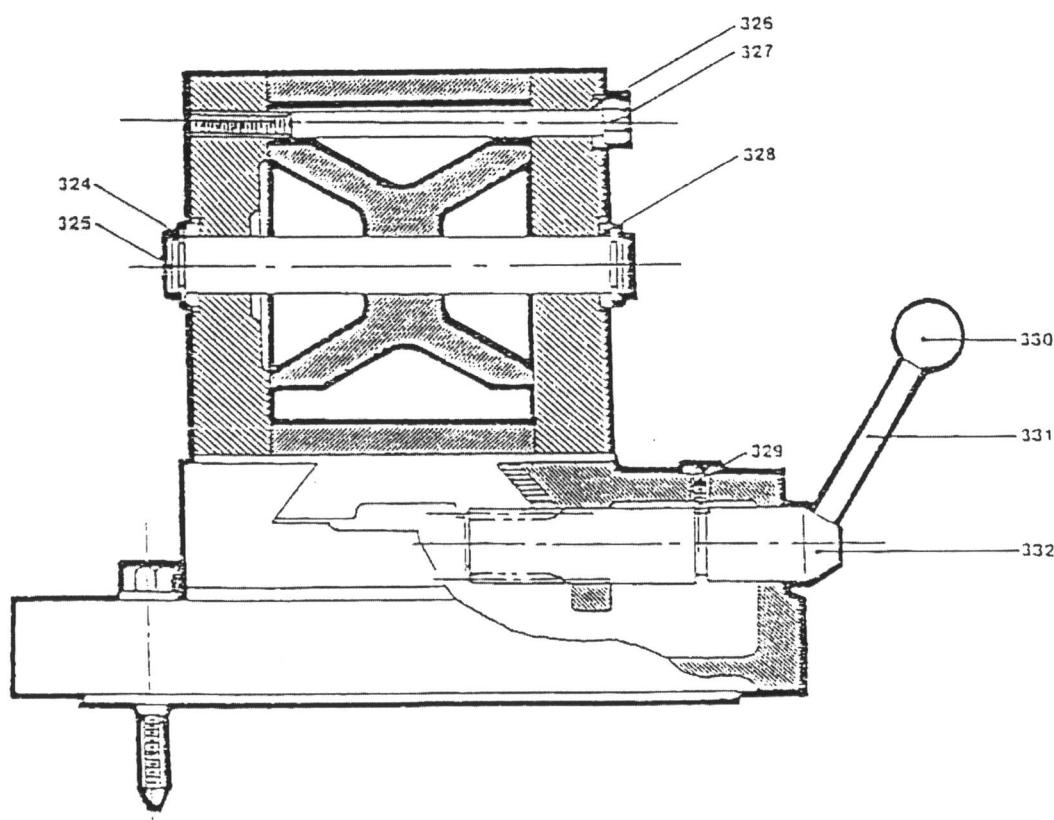
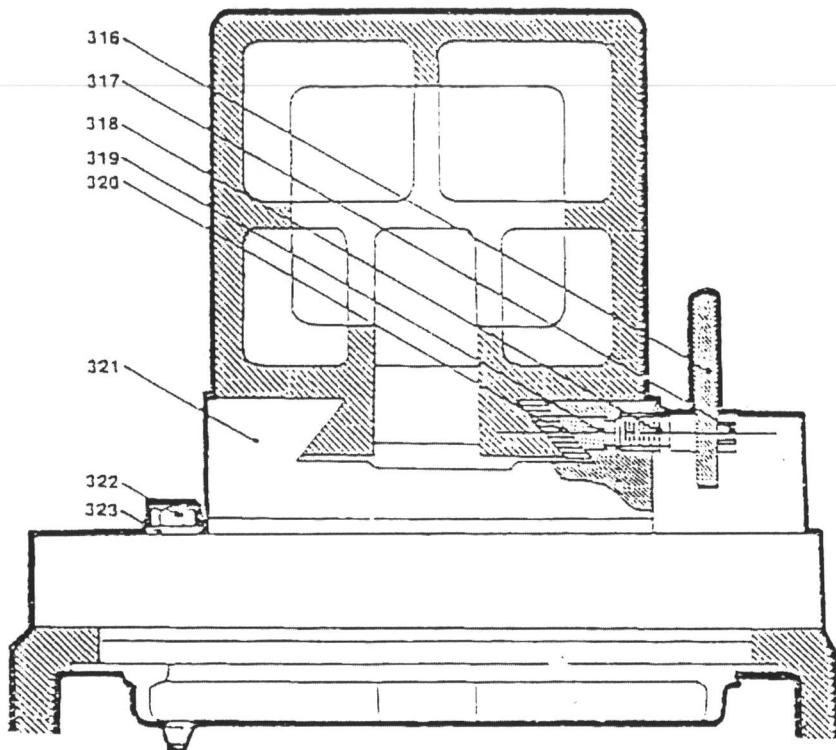


ITEM NO.	COMP NO.	DESCRIPTION	Q.T.Y.	ITEM NO.	COMP NO.	DESCRIPTION	Q.T.Y
273	FA - 089	Overload clutch lever spring plunger	1	285	630040180	Key (4 x 4 x 18)	1
274	FA - 090	Compression spring	1	286	600050100	Hex-Socket head cap screws (M5 x 10)	2
275	FA - 079	Overload clutch trip lever	1	287	FA - 106A	Handle ball	1
276	FA - 084	Overload clutch	1	288	FA - 106B	Pinion shaft hub handle	1
277	665015000	A-15 circlip	1	289	FA - 104	Pinion shaft hub sleeve	1
278	FA - 087	Overload clutch worm gear	1	290	622050025	Spring pin (5 x 25)	1
279	600040160	Hex-Socket head cap screw (M4 x 16)	3	291	FA - 107	Screw	1
280	FA - 122	Pinion shaft worm gear spacer	1	292	035040000	Ball	1
281	604060140	Set screw (M6 x 14)	1	293	FA - 106	Back feed handle hub	1
282	FA - 123	Quill pinion shaft bushing	1	294	FA - 105A	Compression spring	1
283	FA - 101	Quill pinion shaft	1	295	FA - 105B	Set screw	1
284	FA - 101A	Pin	1	296	FA - 103	Spring cover	1
				297	FA - 102	Clock spring	1
				298	FA - 046	Clamping bolt spacer	4
				299	FA - 042	Washer	4
				300	FA - 306	Tee bolt	4
				301	FA - 040	Head fixed nut	4

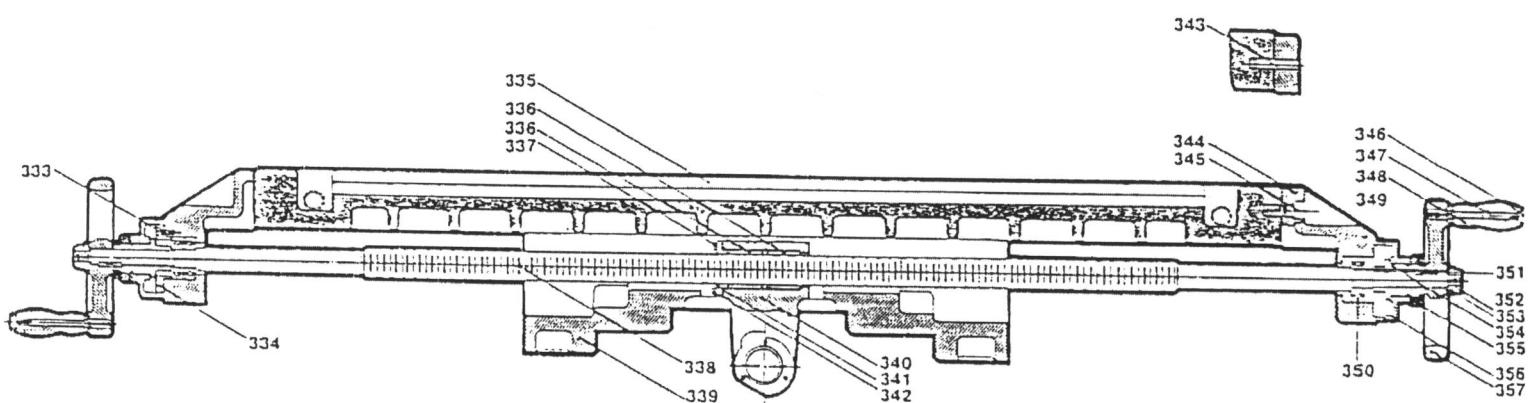


ITEM NO.	COMP NO.	DESCRIPTION	Q.T.Y.	ITEM NO.	COMP NO.	DESCRIPTION	Q.T.Y.
302	FD - 004B	Hook	1	317	604060060	Set screw (M6 x 5)	2
303	FD - 009	worm shaft	1	318	FD - 309	Ram clamp bolt	2
304	FD - 301	Ram	1	319	FD - 309A	Ram clamp piece	2
305	FD - 010	Worm thrust washer	1	320	FD - 307	Gib	1
306	604050060	Set screw (M5 x 6)	1	321	FD - 304	Turret	1
307	637050480	Parallel key (5 x 5 x 48)	1	322	FD - 308	Locking bolt	4
308	FD - 011	Adjust worm	1	323	652002001	Spring washer (1/2")	4
309	FD - 012	Worm thrust washer	1	324	665032000	A-32 retaining ring	2
310	FD - 001	Worm wheel gear	1	325	FD - 005	Adaptor pivot stud	1
311	600060250	Hex-Socket head cap screws (M6 x 25)	2	326	FD - 003	Washer	3
312	622060030	Spring pin	1	327	FD - 007	Adaptor locking bolt	3
313	FD - 303	Arm adaptor	1	328	FD - 006	Washer	2
314	FD - 310	Screw	2	329	FD - 014	Ram pinion set screw	1
315	615010000	Nut (M10)	2	330	FD - 015	Black plastic ball	1
316	FD - 320	Ram clamp handle	2	331	FD - 016	Ram pinion handle	1
				332	FD - 017	Ram pinion	1

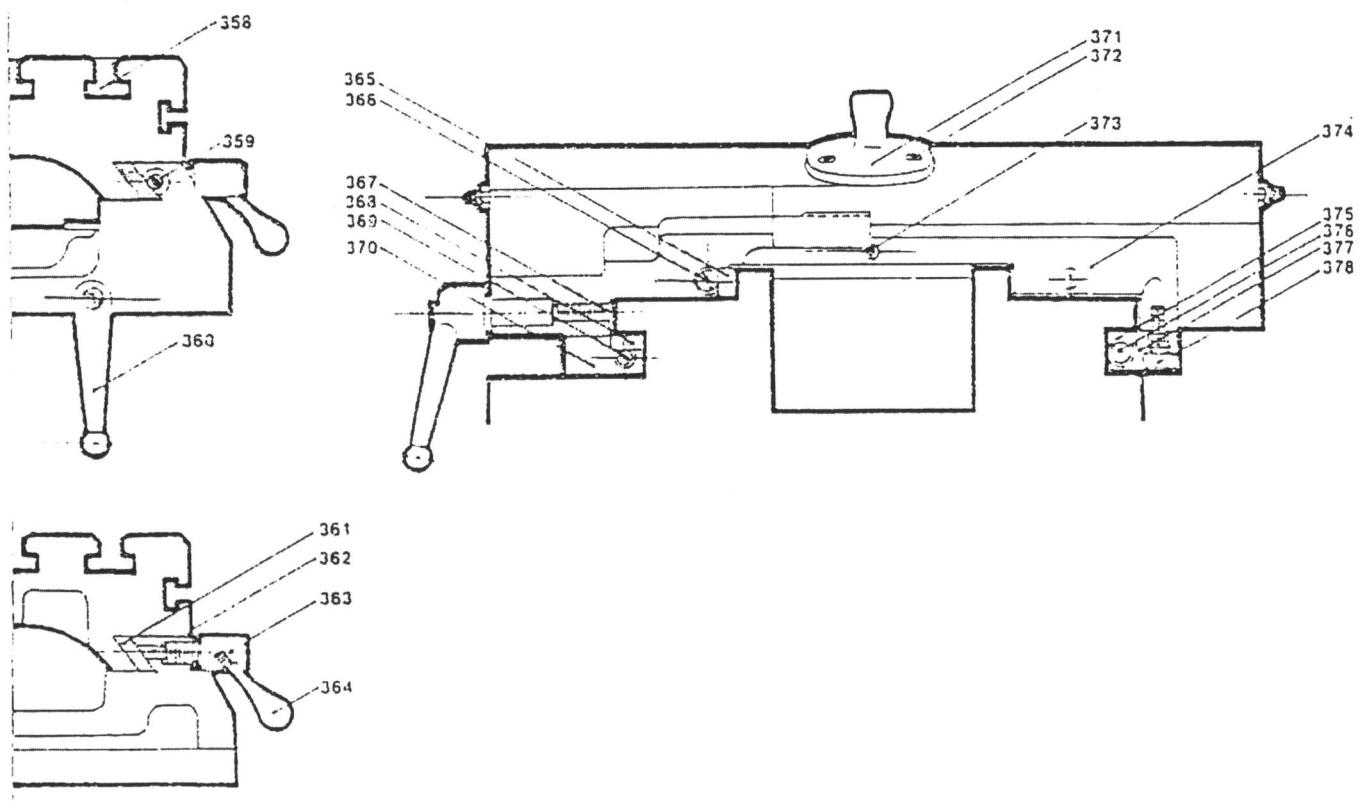




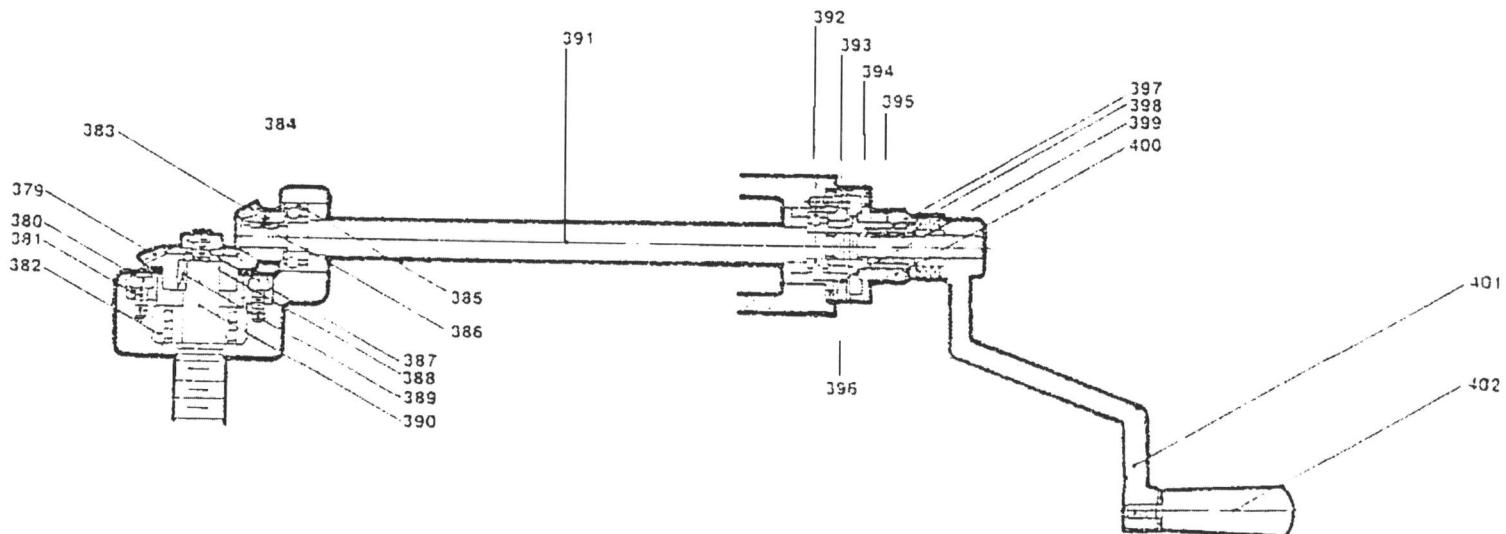
ITEM NO.	COMP NO.	DESCRIPTION	Q.T.Y.	ITEM NO.	COMP NO.	DESCRIPTION	Q.T.Y.
333	600060160	Hex-Socket head cap screws (M6 x 16)	6	343	622060040	Spring pin (6 x 40)	4
334	FC - 005	Bearing cover	1	344	FC - 300	Bearing brackets (L&R)	2
335	FC - 009	Table (42")	1	345	600100250	Hex-Socket head cap screws (M10 x 25)	8
		FC - 009B Table (49")	1	346	AA - 029	Screws	2
336	FE - 323A	Table feed nuts (metric)	2	347	FC - 002A	Grip shafts	2
	FE - 323B	Table feed nuts (inch)	2	348	AC - 053	Grips	2
337	600050200	Hex-Socket head cap screws (M5 x 20)	3	349	FC - 313A	Indicator (metric)	1
338	FC - 302A	Longitudinal feed screw (42" table metric)	1	350	701062040	Ball bearings (6204 2Z)	3
	FC - 302B	Longitudinal feed screw (42" table inch)	1	351	630040250	Parallel key (4 x 4 x 25)	2
	FC - 303A	Longitudinal feed screw (49" table metric)	1	352	615002003	Nut (1/2")	2
	FC - 303B	Longitudinal feed screw (49" table inch)	1	353	FC - 001D	Washers	2
339	FC - 304	Saddle	1	354	FC - 004	Dial holder	2
340	FC - 320	Feed nut bracket	1	355	FC - 002	Dial lock nut	2
341	FE - 322	Feed nut bracket ring	1	356	FC - 003A	Dial with 250 graduation (metric)	2
342	600050150	Hex-Socket head cap screws (M5 x 15)	3	357	FC - 003B	Dial with 200 graduation (inch)	2
				357	FC - 001B	Handwheel	2



ITEM NO.	COMP NO.	DESCRIPTION	Q.T.Y.	ITEM NO.	COMP NO.	DESCRIPTION	Q.T.Y.
358	FC - 028	T-slot plugs	6	370	FC - 311	Saddle guide plate (left)	1
359	AC - 090	Screws	2	371	FC - 319	Table stop bracket	1
360	FC - 314	Saddle lock handle	1	372	600100200	Hex-Socket head cap screws (M10 × 20)	2
361	FC - 306	Table gib	1	373	600050100	Hex-Socket head cap screws (M5 × 10)	6
362	FC - 019	Table lock plungers	2	374	FC - 315	Saddle knee wiper plates	2
363	FC - 014A	Table lock bolts	2	375	FC - 305	Gib	1
364	FA - 125	Handle	2	376	AC - 090	Screws	2
365	FC - 307	Saddle gib	1	377	FC - 312	Saddle guide plate (right)	1
366	AC - 090	Screws	2	378	600120300	Hex-Socket head cap screws (M12 × 30)	6
367	FE - 315	Plunger	1				
368	FC - 305	Gib	1				
369	AC - 090	Screws	2				



ITEM NO.	COMP NO.	DESCRIPTION	Q.T.Y.	ITEM NO.	COMP NO.	DESCRIPTION	Q.T.Y.	
379	FE - 024	Bevel gear	1	392	701062040	Ball bearing (6204 2RS)	1	
380	600100200	Hex-Socket head cap screws (M10 x 20)	3	393	600060160	Hex-Socket head cap screws (M6 x 16)	3	
381	FE - 026	Bearing retainer ring	1	394	FE - 019A	Dial with 125 graduation	1	
382	711033058	Bearings (#3305)	2		FE - 019B	Dial with 100 graduation	1	
383	FE - 015	Bevel pinion	1	395	630040180	Key 4 x 4 x 18	1	
384	604060060	Set screw (M6 x 6)	1	396	FE - 302	Bearing cap	1	
385	701062040	Bail bearing (6204 2RS)	1	397	FE - 326	Dial holder	1	
386	630040180	Key (4 x 4 x 18)	1	398	FE - 020	Gear shaft clutch insert	1	
387	615002003	Nut (1/2"-2OUNF)	1	399	FE - 303A	Bearing retainer ring (metric)	1	
388	FE - 023	Washer	1		FE - 303B	Bearing retainer ring (inch)	1	
389	637050019	Key (5 x 5 x 19)	1		400	FC - 002	Dial lock nut	1
390	FE - 027A	Elevating screw (metric)	1		401	FE - 310	Elevating crank	1
	FE - 027B	Elevating screw (inch)	1		402	FC - 316	Elevating crank handle	1
391	FE - 305A	Elevating shaft (13" knee)	1					
	FE - 305B	Elevating shaft (16" knee)	1					



ITEM NO.	COMP NO.	DESCRIPTION	Q.T.Y.	ITEM NO.	COMP NO.	DESCRIPTION	Q.T.Y.
403	FD - 306	Guide plate (right)	1	428	076008000	Nipple	1
404	600140350	Hex-Socket head cap screws (M14 x 35)	5	429	FE - 028A	Elevating screw nut (metric)	1
405	AC - 090	Screws	2		FE - 208B	Elevating screw nut (inch)	1
406	FD - 302	Gib	1	430	FE - 027A	Elevating screw (metric)	1
407	FE - 307	Gib	1		FE - 027B	Elevating screw (inch)	1
408	AC - 090	Screws	2	431	FE - 301	Elevating screw housing	1
409	FD - 023	Spider	1	432	600050200	Hex-Socket head cap screws (M5 x 20)	3
410	FD - 302	Big	1	433	FE - 321A	Feed nut (metric)	2
411	AC - 090	Screws	2		FE - 321B	Feed nut (inch)	2
412	600140350	Hex-Socket head cap screws (M14 x 35)	5	434	FD - 325	Cover	2
413	FD - 305	Guide plate (left)	1	435	FE - 300A	13" knee	1
414	FD - 300B	Column	1		FE - 300B	16" knee	1
415	605050120	Round head screws (M5 x 12)	6	436	FC - 320	Feed nut bracket	1
416	FD - 311	Cover	1	437	FE - 322	Feed nut bracket	1
417	FD - 021	Cover	1	438	600000150	Hex-Socket head cap screws (M5 x 15)	3
418	FD - 312	Chip guard plate (left)	1	439	FE - 304A	Cross feed screw (metric)-13" knee	1
	FD - 321A	Chip guard plate (right)	1		FE - 304B	Cross feed screw (inch)-13" knee	1
419	FD - 318	Left wiper	1	440	FC - 010	Cross feed screw (metric)-16" knee	1
	FD - 319	Right wiper	1	441	FC - 011	Cross feed screw (inch)-16" knee	2
420	FE - 034	Cap screw	1	442	FC - 011A	Stop piece T-bolts	2
421	FE - 034	Cap screw	1	443	FC - 010A	Table stop pieces	2
422	FE - 317	Chip guard (up)-13" knee	1	444	FC - 005	Washers	1
	FE - 316	Chip guard (up)-16" knee	1	445	FE - 008	Hexagon nuts (3/8"-16 UNC)	1
	FE - 312	Chip guard (middle)-13" knee	1	446	FC - 003A	Bearing retainer ring	1
	FE - 308	Chip guard (middle)-16" knee	1	447	FE - 005	Cross feed bearing bracket	1
423	FE - 313	Chip guard (down)-13" knee	1	448	FC - 003B	Dial with 250 graduation (metric)	1
	FE - 309	Chip guard (down)-16" knee	1		FC - 003B	Dial with 200 graduation (inch)	1
424	600060250	Hex-Socket head cap screws (M6 x 25)	3	447	701062040	Ball bearings (6204 2RS)	2
425	600100300	Hex-Socket head cap screws (M10 x 30)	2	448	FC - 002	Dial lock nut	1
426	622050040	Spring pins (5 x 40)	2				
427	600100250	Hex-Socket head cap screws (M10 x 25)	4				

ITEM NO.	COMP NO.	DESCRIPTION	Q.T.Y.	ITEM NO.	COMP NO.	DESCRIPTION	Q.T.Y.
449	FC - 001B	Handwheel	1	454	615002003	Nut (1/2"-20UNF)	1
450	600060150	Hex-Socket head cap screws (M6 x 15)	3	455	AC - 053	Grip	1
451	FC - 004	Dial holder	1	456	FC - 002A	Grip shaft	1
452	630040250	Key (4 x 4 x 25)	1	457	AA - 029	Screw	1
453	FC - 001D	Washer	1	458	FC - 315A	Knee lock plungers	2
				459	FE - 311	Knee lock handles	2

