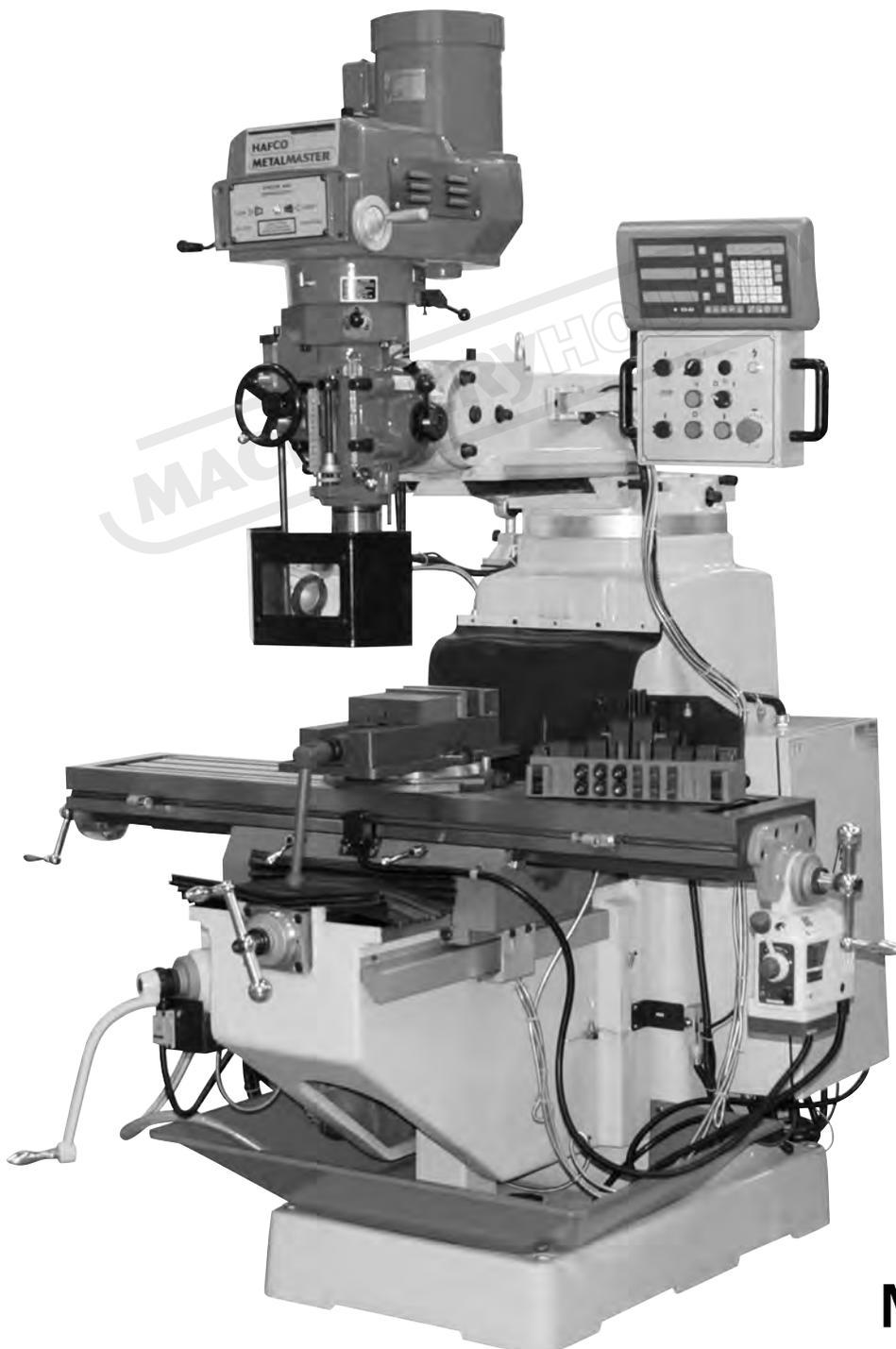


INSTRUCTION MANUAL

BM-62VE Turret Milling Machine (415V) (X) 865mm (Y) 420mm (Z) 400mm



M598D

Inspection Record of Knee Vertical Miller

I Specification

Application No:

Main size	Type	Spindle type		Surface table area		Mfg. no.	
	X6323B	NT30		9"X49" mm		054237	
Main motor	Type	Power	Voltage	Frequency	Pole	Phase	
		3 Hp	415 V	50 Hz	P	3 Ph	

II Precision Inspection

Unit: mm3

Inspection Items				A.T.	Inspection record				
Table surface		1	Straightness of table surface	at cross direction	0.06/1000	0.04			
			at horizontal direction	0.06/1000					
Spindle		2	Spindle deflection	at radial	0.01	0.01			
				3	Horizontal travel of the spindle		at axial	0.02	0.018
							4	Deflection of spindle countersink	
on inspection rod 300 mm of the countersink	0.02	0.02							
Table surface		5	straightness of table horizontal travel & the table surface		0.03	0.025			
				6	straightness of table front/back travel & the table surface		0.02	0.015	
T-tank		7	Parallel of table cross travel & T-tank profile		0.03	0.02			
				8	Vertical of table cross travel & T-tank profile		0.02	0.01	
Spindle head		9	Vertical of spindle head travel & table surface	at cross direction	0.02	0.018			
				at front/back direction (not lower before the front of working table)	0.02		0.02		
Knee position		10	Vertical of working table & knee lifting	at cross direction	0.02/300	0.02			
				at front/back direction (not lower before the front of working table)	0.02/300		0.02		
Spindle		11	Vertical of working table & center line of the spindle	at cross direction	0.02/300	0.018			
				at front/back direction (not lower before the front of working table)	0.02/300		0.02		

Sec. chief of O.C.

Inspector

Date of Inspection

III Mechanism Inspection:

Part	Item	Inspection Item	Inspection means	Qualified standard
spindle	1	on-off device	Repeatedly operate each 10 times	Accurate performance
Spindle	2	Variable-speed Device	All speed of variable speed for spindle	Accurate & smooth Performance
	3	Bearing temperature	Measured the temp by hands or meter after 30 minutes high speed revolutions	Temp below 15°C
Spindle head	4	Manual operation	Operate manual feed handle for whole working	Accurate & smooth operation
	5	Auto feed & stop	Feed & stop at preset position automatically	
	6	Spindle fixing	To fix at up-down center of gyrating & outer end	Accurate performance
Feed device	7	Feed variable speed operation	To feed at high mid & low speeds	Accurate & smooth operation
	8	Auto feed & stop	For cross horizontal & vertical directions	
	9	Bed high speed feed	To inspect manual & auto feed	
Bad surface	10	Bed fixing device	Firmly tight the side way & move Stop Device & push bed by hands	Be sure to fasten & have correct stop
	11	Screw gap	Positively & counter gyrate the screw to inspect the gap	Not over 1/20 pitch
	12	Screw gap adjusting device	Try to adjust this device	Accurate performance
Working table lifting device	13	On-off device	Repeatedly operate each on -off 10 times	Accurate function
	14	Auto lifting & stop device	Repeatedly operate the lifting-descending each 3 times & move stop device	Accurate & smooth operation
	15	Manual lifting & stop device		
	16	Table screwing device	To move the table to up-mid-down and screw	Be sure firmly screwed
Electrical apparatus	17	Insulation	To test by the resistor	Above 0.2MΩ
	18	Motor temp	To measure by hands or temp meter	Below 30°C
Safety device	19	Protection cover etc	To review	Complete & well installation
Lubricant device	20	Oil quality quantity & temp		Good quality rich quantity good passage & never leaking
Oil pressure device	21	Piping oil quality & quantity oil pump pressure		
Attachments	22	Spanner screwdriver & clamp		Complete & good function
others	23	Noise	To hear by ear or measure by sound instruments	To meet for industrial safety
	24	vibration	To touch by hands or measure by vibration instruments	

IV. outward Inspection:

Part	Inspection Items	Inspection points
Casting piece	1 Sand hole	Any hole or not? Condition?
	2 Gate burr	Does it completely remove?
	3 Concave	Concave in surface or not? Condition?
	4 Strong sand	Does it remove from the surface?
	5 Deformation	Any deformation or bevel?
Finish surface	6 Crack	Any crack or not?
	7 Angle	Be sure to have a round angle for surface?
	8 Black scar	Does remove completely the black scar?
	9 Flatness	Is the finish surface flatness without cutting scar?
	10 Smoothness	Is the outer sliding surface smooth or not?
Joint	11 Reverse angle	Any reverse angle for outer finish surface?
	12 Joint angle	Is joint surface flat and stick on?
		Any paper offered for packing?
fastener	13 Plain	Is the outer of two parts connection plain or not?
	14 Screw nut	Does the specification meet to the standard?
	15 Screw	Does it expose tooth at outward end and make as round head?
	16 Pin	Does two ends make as round head and expose only the round Head?
Gear	17 Key	Is not too long exposure for key head?
	18 tooth face	Is it smooth? No file % grinding scar?
Machine stand	19 Gear contact	Is the size of teeth gap proper?
Painting	20 Bottom ground	Well construction or not?
Electroplating	21 Smoothness	Is it flat & one color?
Plating	22 Outward	Is it glossy without plating taking off?
	23 Wheel housing oil box	Is the joint face smooth without any scar?

Total:	sets. Model:	Machine No:
Sampling	sets among	sets. Machine No.
Evaluation:	Shipping marks:	
Destination of delivery:		

Main parts	Material	Heat	Treatment	Grinding
Bed				
Gear				
Spindle				

“IMPORTANT SAFETY INSTRUCTIONS”

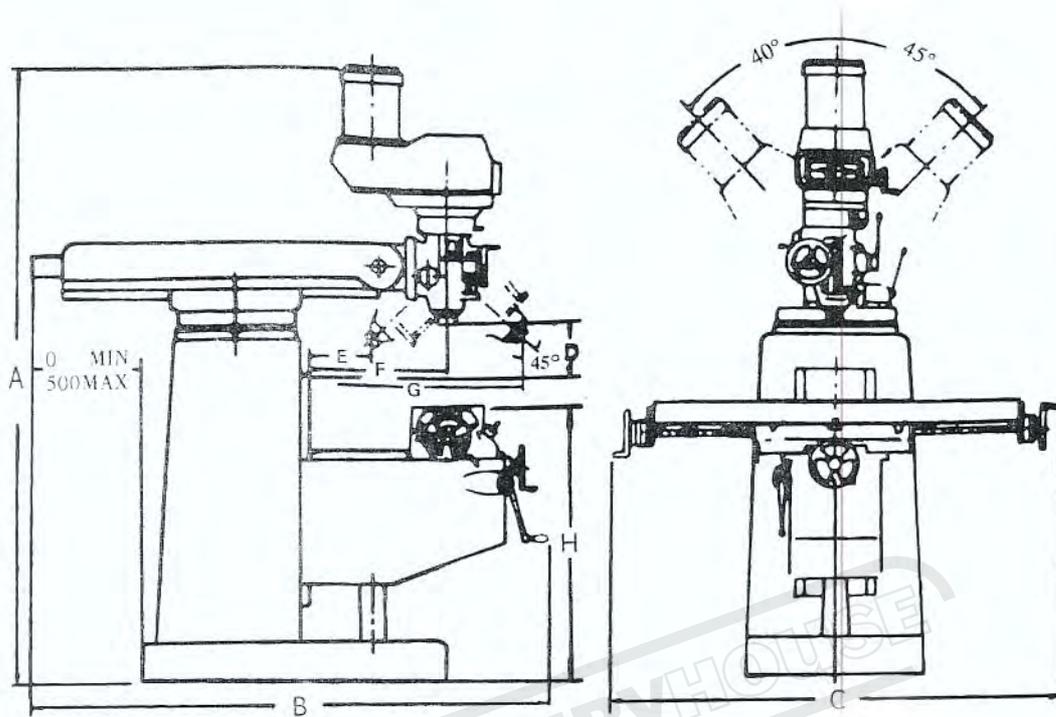
READ ALL INSTRUCTIONS BEFORE USING THE MACHINE

WARNING—TO REDUCE THE RISK OF ELECTRIC SHOCK, OR INJURY TO PERSONS

1. The machine should never be left unattended when powered on.
2. Always shut down the power before changing any electrical and mechanical parts.
3. Close attention is necessary when the machine is used by or near other persons.
4. Never leave any chuck keys or tool holder clamps on the spindle and chucks before the machine turns.
5. Very carefully and properly install on all chucks, tool holder and clamps. Must tighten them up very heavily. Please double check very carefully and re-tighten them up although they are ready installed on when you receive the machine.
6. Use the machine only for its intended use as described in this manual. Use only accessories recommended by the manufacturer as contained in this manual.
7. Flying parts may result in eye and body injury. Never operate the machine without proper eyes and body protection.
8. Bodily injury could occur. Never place your hands or any part of your body in the machine.

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Model		X6323 X6323B	X6325 X6325B X6325C X6325D	X6330	X6333
A	Overall Height	2006(79")	2235(88")	2130(84")	2180(86")
B	Overall depth	1600(63")	2156(85")	2057(81")	
C	Overall width	2156(85")	2540(100")	2235(88")	2970(117")
D	Min. distance	42	0	0	
	Max. distance	405(16")	405(16")	430(18-1/2")	
E	Min. distance	0	0	0	
	Max. distance	305(12")	456(18")	560(22")	
F	Min. distance	170(6-3/4")	140(5-1/2")	108(4-1/4")	
	Max. distance	482(19")	609(24")	760(29-7/8")	
G	Min. distance	228(9")	254(10")	285(11-1/4")	
	Max. distance	532(21")	710(28")	895(35-1/4")	
H	Min. distance	863(34")	965(38")	965(38")	
	Max. distance	1270(50")	1370(54")	1370(54")	

VERTICAL TURRET MILLING MACHINE

The machine can be widely used to process plane surface, oblique plane at any angle, to mill key slots, grooves, and to drill, ream and bore holes. Its milling head can turn by an angle of 90° rightward or leftward, of 45° forward or backward. The ram can revolve horizontally by an angle of 180° . The spindle can rotate at a high speed with wide ranges. The spindle quill can undertake automatic sizing feed, and protected by an overload safeguard. Both the spindle quill and the machine guideway have been specially treated. With pleasing appearance and well designed structure, the machine is an ideal universal equipment for metal working. Also it can be equipped with automatic feed unit and digital indication system on customers requirements.

MODEL		X6323、X6323B		X6325、X6325A、X6325B X6325C、X6325D		X6330	X6333
SPECIFICATIONS							
Table size		230×1067 (9"×42")	230×1246 (9"×49")	254×1270 (10"×50")	254×1370 (10"×54")	305×1370 (12"×54")	330×1370 (13"×54")
Table travel		565 (22")	745 (29")	700(27-1/2")	800 (31-1/2")	865 (38")	840 (33")
Cross travel		305 (12")		405 (16")		380 (15")	
Knee travel		360(14")		405 (16")			
Spindle taper		R8 or ISO30 or ISO40					
Quill travel		127 (5")					
Quill feeds		0.04 (0.0015"); 0.08 (0.003") 0.15 (0.006")					
Spindle speed	Shift without grade	3HP	50Hz	60~3600			
			60Hz	70~4320			
		Shift by grade	5HP	50Hz	50~3200		
	60Hz			60~3600			
	50Hz		65~4500				
	60Hz	80~5440					
Spindle motor		3HP		3HP、5HP		5HP	
Dimensions (L×W×H)		1651×1701×2006 (65"×67"×79")		1905×1879×2235 (75"×74"×88")		2057×1879×2130 (81"×74"×84")	
Weight		1000		1180	1200	1460	1560

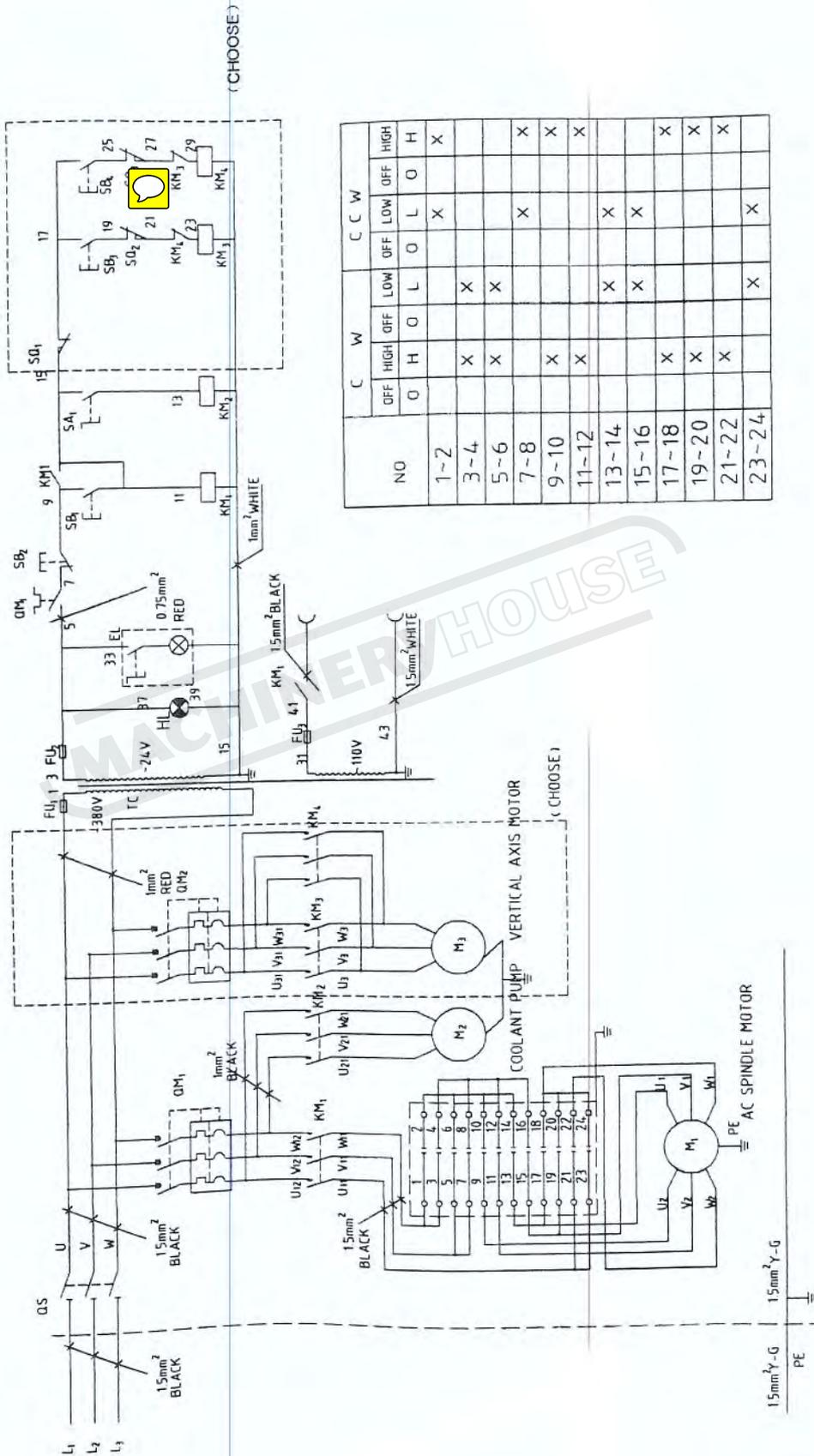
STANDARD ACCESSORIES:

Draw bar
Tools and tool box
One shot lubrication

OPTIONAL ACCESSORIES

Coolant pump
Electrical box

ELECTRICAL PRINCIPLE FIGURE



NO	C			W			C			C			W		
	OFF	HIGH	OFF	OFF	LOW	OFF	LOW	OFF	LOW	OFF	HIGH	OFF	LOW	OFF	HIGH
1-2															
3-4		X			X			X					X		
5-6		X			X			X					X		
7-8		X			X			X					X		
9-10		X			X			X					X		
11-12		X			X			X					X		
13-14		X			X			X					X		
15-16		X			X			X					X		
17-18		X			X			X					X		
19-20		X			X			X					X		
21-22		X			X			X					X		
23-24		X			X			X					X		

UNCRATING

Carefully remove protective crating and skids so that the machine and parts are not marred, scratched or impaired. In the event of damage in transit, communicate AT ONCE with our representative and the transportation company making delivery.

Machine should be lifted by placing a sling under the ram as illustrated on page 6.

SHORTAGES Check shipment carefully, against the itemized packing list which is included in the parts box. In case of shortages, report them IMMEDIATELY to the representative from whom the machine was purchased, indicating parts not received which have been checked on the packing list.

CLEANING Thoroughly clean protective coating from machine with suitable cleaning solution.

WARNING

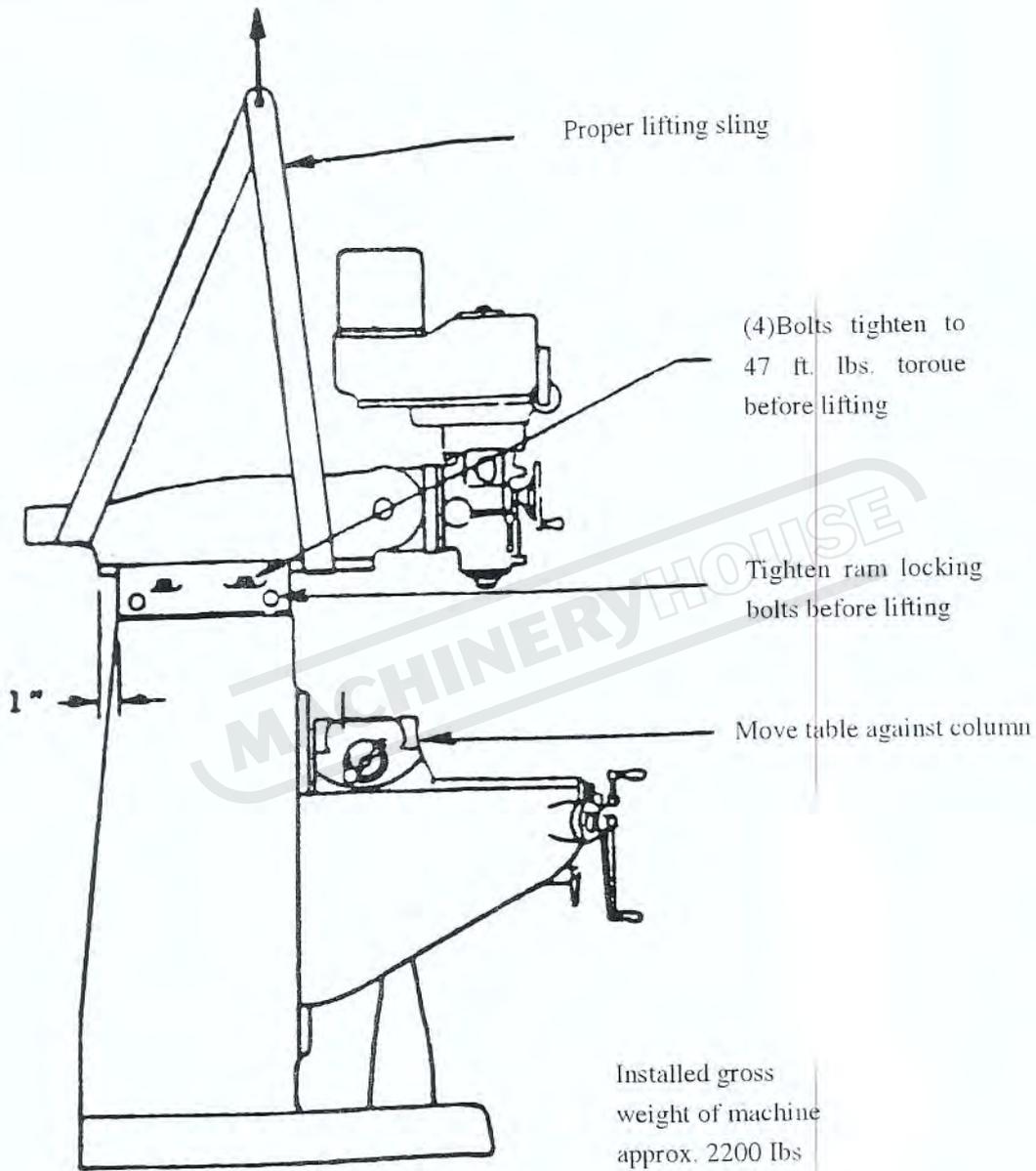
IT IS NOT RECOMMENDED THAT GASOLINE OR ANY OTHER HIGHLY INFLAMMABLE CLEANING AGENT BE USED.

Do not move the table, saddle, knee or any moveable part until all ways have been well cleaned and lubricated. Then, by hand, move table, saddle and knee to limit stop in one direction. Clean and lubricate exposed ways and then move each unit to the opposite limit stop and similarly clean and lubricate the exposed ways. Loosen bolts to unlock the ram, and move it forward and backward to the full length in order to clean and lubricate.

POSITIONING HEAD UPRIGHT Loosen four locknuts (#157 page 35), out to detent and rotate head to vertical position. Proceed with alignment of head as described on page 9. Tighten nuts evenly, using normal pressure. Care should be taken to avoid excessive pressure since this will cause distortion in the quill. Tighten all nuts to 25 ft. lbs. torque-then repeat to 50 ft. lbs.

LIFTING THE MACHINE

Note position of ram and table when lifting with sling



PLACING ON SOLID FOUNDATION

The column and base are cast in one piece. When setting machine on a concrete foundation, it is advisable to use a little grout (thin mortar) to take care of any unevenness in the concrete as well as to provide a solid foundation at all points.

When setting machine on a floor that has any surface irregularities, shims should be used correct this condition to the greatest extent possible. See Figure 2 for installation layout.

NOTE

IT IS RECOMMENDED THAT THE MACHINE BE SECURED TO THE FLOOR TO PREVENT MOVEMENT OR TIPPING DUE TO OFF-CENTER LOADING

Before securing machine to floor (i.e. tightening hold down bolts), make certain that all four corners are making contact with the floor after machine is leveled. If above condition is not met, it is possible to twist the column and put a bind into the ways.

LEVELING MACHINE Set machine by leveling the work table lengthwise and crosswise with a precision instrument. After leveling machine, lower the knee and remove protective material from between head and table.

HANDLES When crating, the three ball crank handles are sometimes turned to face the machine. In these cases the handles should be reversed before operating.

CONNECTING POWER SUPPLY To connect the machine to the plant supply, have qualified electrician proceed as follows:

1. Check required machine voltage against power supply to ensure that they are compatible.
2. Connect machine wiring to power supply making sure connection is in compliance with local safety regulations.
3. Check for correct spindle rotation. In the HIGH SPEED range, the spindle should rotate clockwise when viewed from the top of the machine.

NOTE

DRUM SWITCH AND HI - NEUTRAL - LO LEVER MUST BE IN HI RANGE.

ALIGNMENT OF HEAD

In case of precision boring or work of the nature, where it is necessary to have head perfectly square with the table use method prescribed below. For general milling use, graduations provided on the head are close enough. To set head perfectly square with table, see Figures 3 and 4. This may be done with Ram adapter (#2 page 26) on Ram (#10 page 26), by adjusting Ram adapter through vertical adjusting worm shaft (#8 page 26). Loosen four locknuts (#157 page 34) but leave drag on same for fine adjustment. To square head to table in the longitudinal axis, mount indicator as shown in Figure 4.

NOTE

WHEN INDICATING AS IN FIGURE 3 IT SHOULD BE NOTED THAT THE TABLE IS FITTED TO BE SLIGHTLY HI FRONT USUALLY ABOUT 0.005"

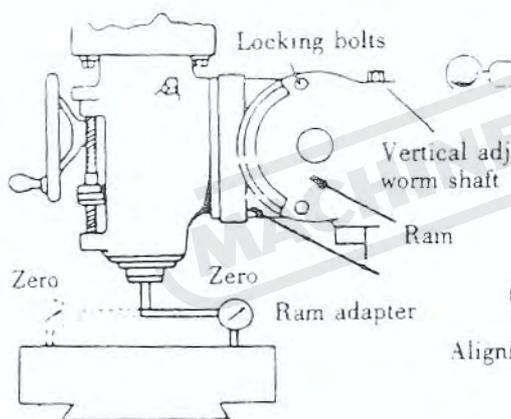


Figure 3 Head Alignment Y Axis

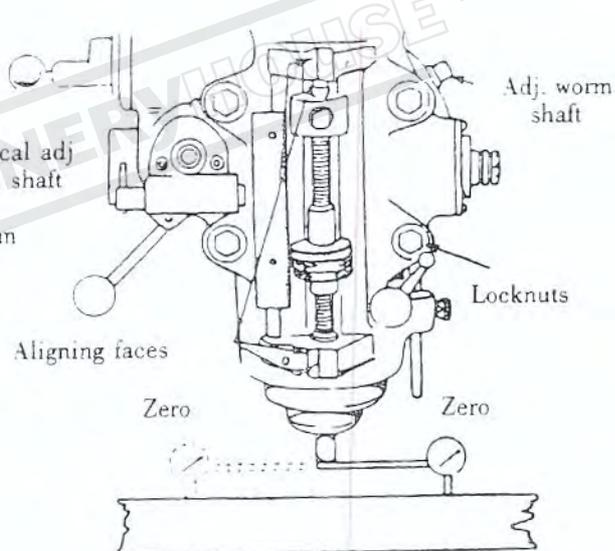
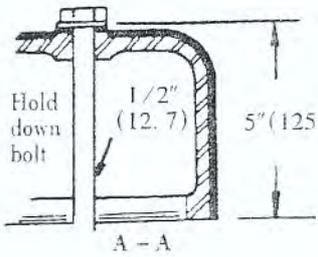


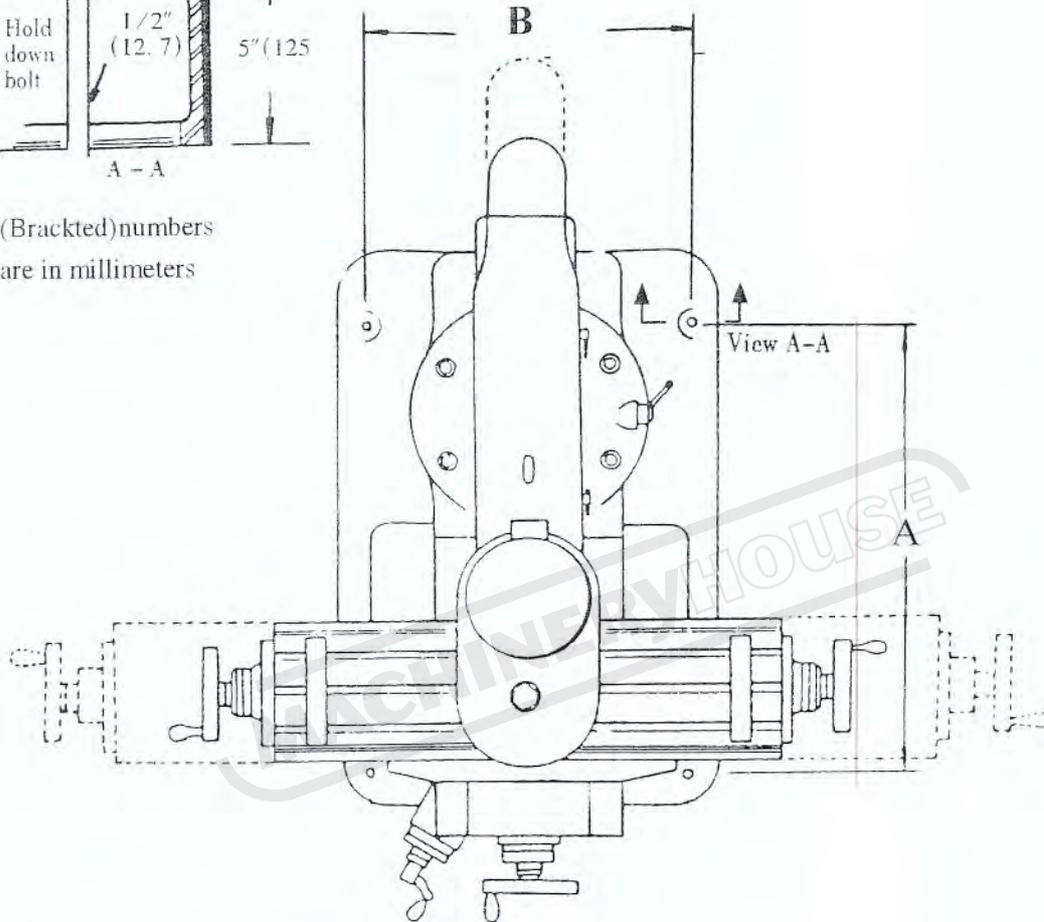
Figure 4 Head Alignment X Axis

LUBRICATION

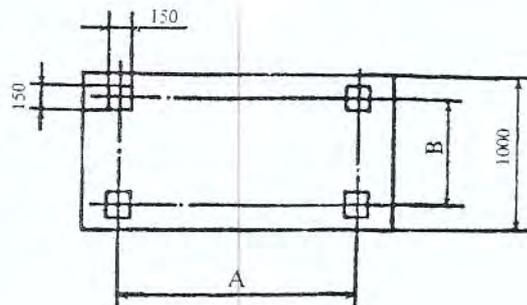
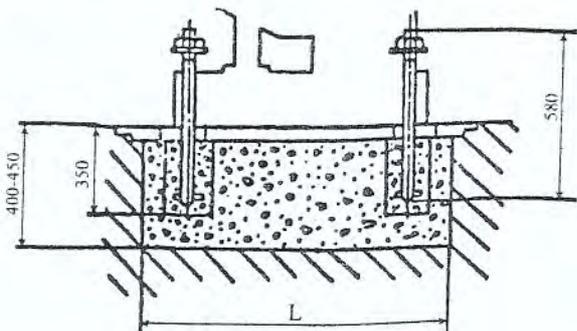
Do not operate machine until properly lubricated. Lubrication of head is obtained by use of the drip feed method through two oil cups located at right side of belt housing with light machine oil such as Socony D. T. E. light or equivalent.



(Bracketed) numbers are in millimeters



Size Model	L	A	B
6323series	1500	740	520
6325series	1500	889	540
6330series	1570	960	540



ADJUSTMENT OF TABLE GIB. The table is provided with a full length tapered gib (# 43 page 26) in the saddle, and an adjusting screw on the left side. To take up gib, tighten gib adjusting screw (# 4 page 26) slightly and repeat until a slight drag is felt when moving the table by hand.



Figure 5. Saddle/Table Gib
(# 43 page 25)

ADJUSTMENT OF SADDLE AND KNEE GIBS. A tapered gib(# 49 page 26) is used for adjusting the saddle bearing on the knee. This forms a guide for the saddle. To tighten gib, the same principal as described above is used; however, the chip wiper has to be removed first.

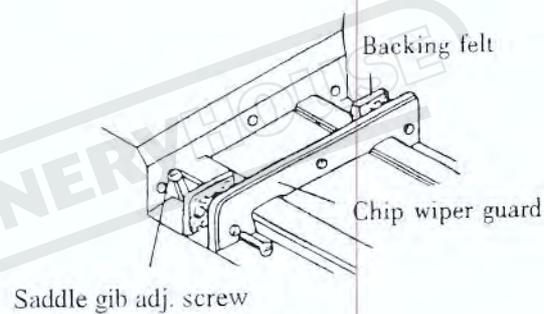


Figure 6. Saddle - knee gib
(# 49 page 25)

ADJUSTMENT OF KNEE GIB. Remove chip wiper and adjust screw until smooth movements attained.

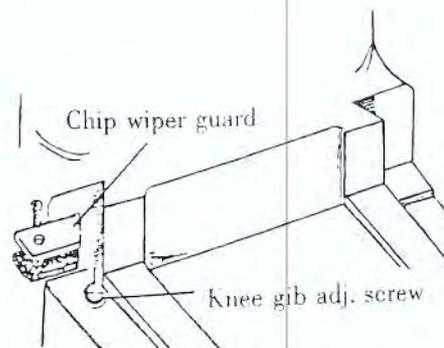
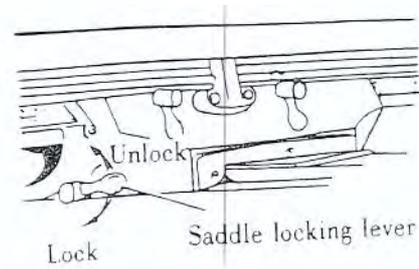


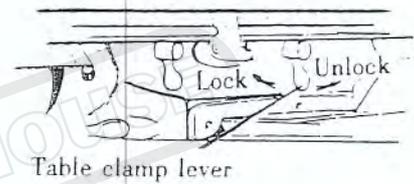
Figure 7. Knee - Column gib
(# 55 page 25)

CLAMPING TABLE, SADDLE AND KNEE. When milling with longitudinal table feed only, it is advisable to clamp the knee to the column and the saddle to the knee to add rigidity to these members and provide for heavier cuts with a minimum of vibration. The saddle locking lever is located on the left-hand side of saddle.

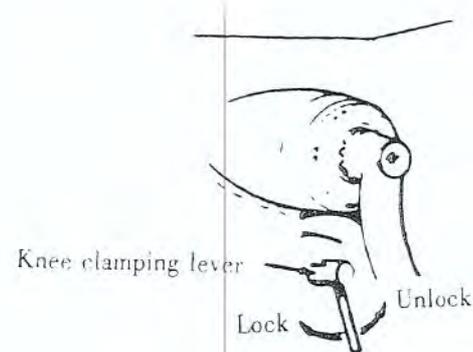


Excessive pressure can cause slight table bind. Use moderate clamping pressure, as this will hold saddle sufficiently.

The table clamp lever is located on front of saddle and should always be clamped when longitudinal movement is not required.



The knee clamping lever is at the left side of the knee and should be drawn upward to clamp the knee, this is only a tension brake and will not lock the knee completely. Leave clamped at all times unless using knee in operation.



REMOVING TABLE Remove as follows: ball crank handles, dial holders, bearing brackets. Lead screw will then turn all the way out so it can be removed. When this is accomplished, the table can easily be taken off by sliding it from the saddle. See Figure 8.

REMOVING SADDLE Follow along the same lines as removing table; however, it is necessary to remove the entire front bracket assembly. Next, remove the cross feed nut bracket which is made accessible by removal of the table. See Figure 8.

ASSEMBLY INSTRUCTIONS FOR MOUNTING DRIVE ATTACHMENT TO RAM ADAPTER

Lift the attachment. Insert the four tee bolts into the ram adapter and position them to match the bolt holes in the attachment.

Slide the attachment onto the bolts, insert the spacers and washers and secure with the nuts.

Tighten all the nuts with 25 ft. lbs. of torque, and then repeat with 50 ft. lbs.

CAUTION
IMPROPER TIGHTENING OF THESE COULD CAUSE
A CHOPPY QUILL MOVEMENT

LUBRICATION

The useful life of this attachment will be determined to a large extent by proper lubrication. Carefully observe the nameplate recommendations and avoid substitutions.

OPERATING INSTRUCTIONS

SPEED CHANGE HANDWHEEL (16, Figure 9): DO NOT attempt to change spindle RPM unless the motor is running. Dial speeds will only be approximate. Belt wear will cause a slight variation in speeds from what's indicated on the dial.

When tightening or loosening the drawbar (# 14 Page 38) it is necessary to lock the spindle. To accomplish this, use the spindle brake (3) which is located on the left side of belt housing, turning it either to the right or left until it binds, then raise the quill feed handle (13).

Drawbar (#14 page 38) has 7/16–20 right hand thread and should be tightened with normal amount of pressure using wrench furnished with machine. To loosen collet back off drawbar and if collet does not open immediately give knob on top of drawbar a slight tap. Spindle has non-sticking taper and collet should release readily.

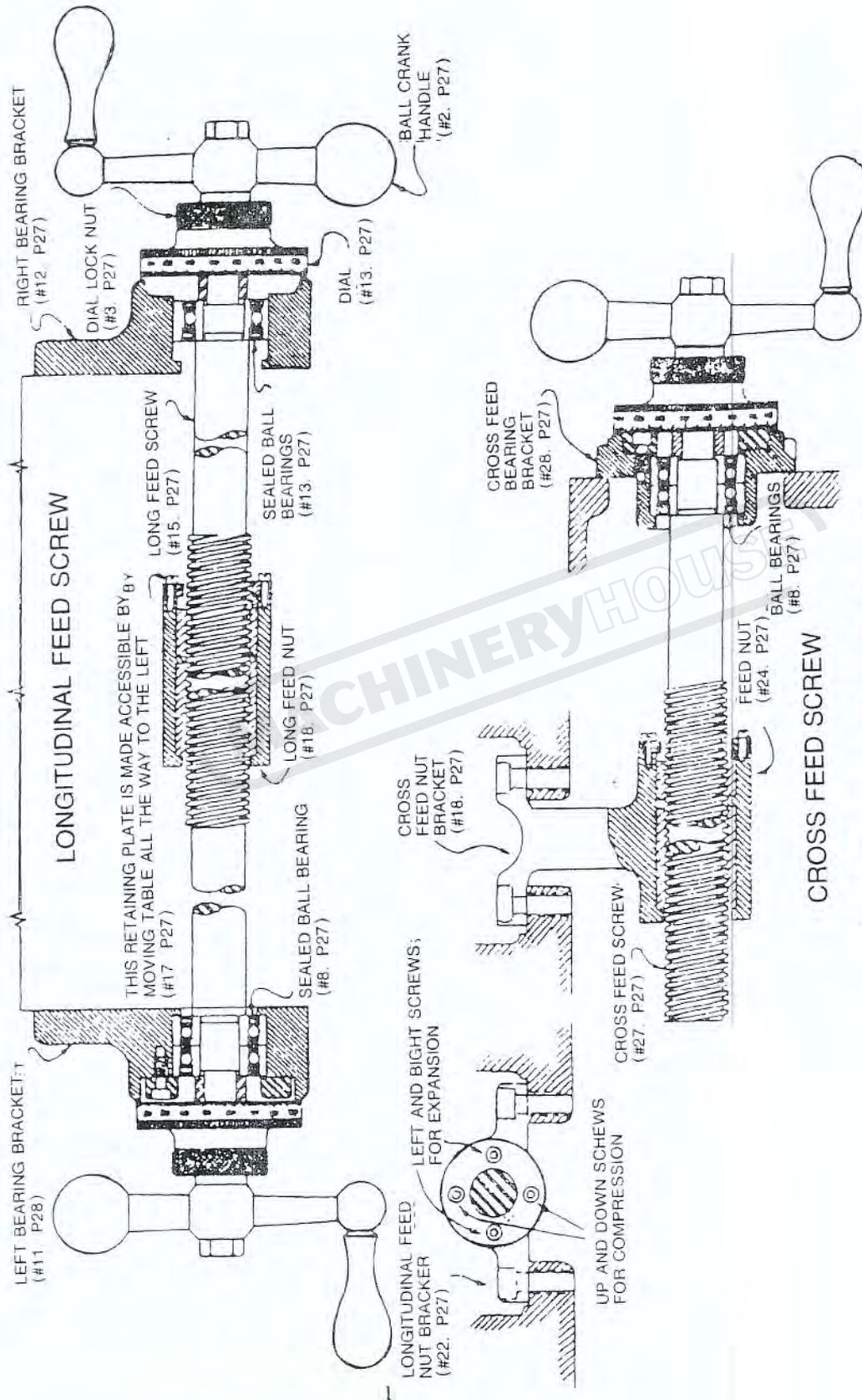
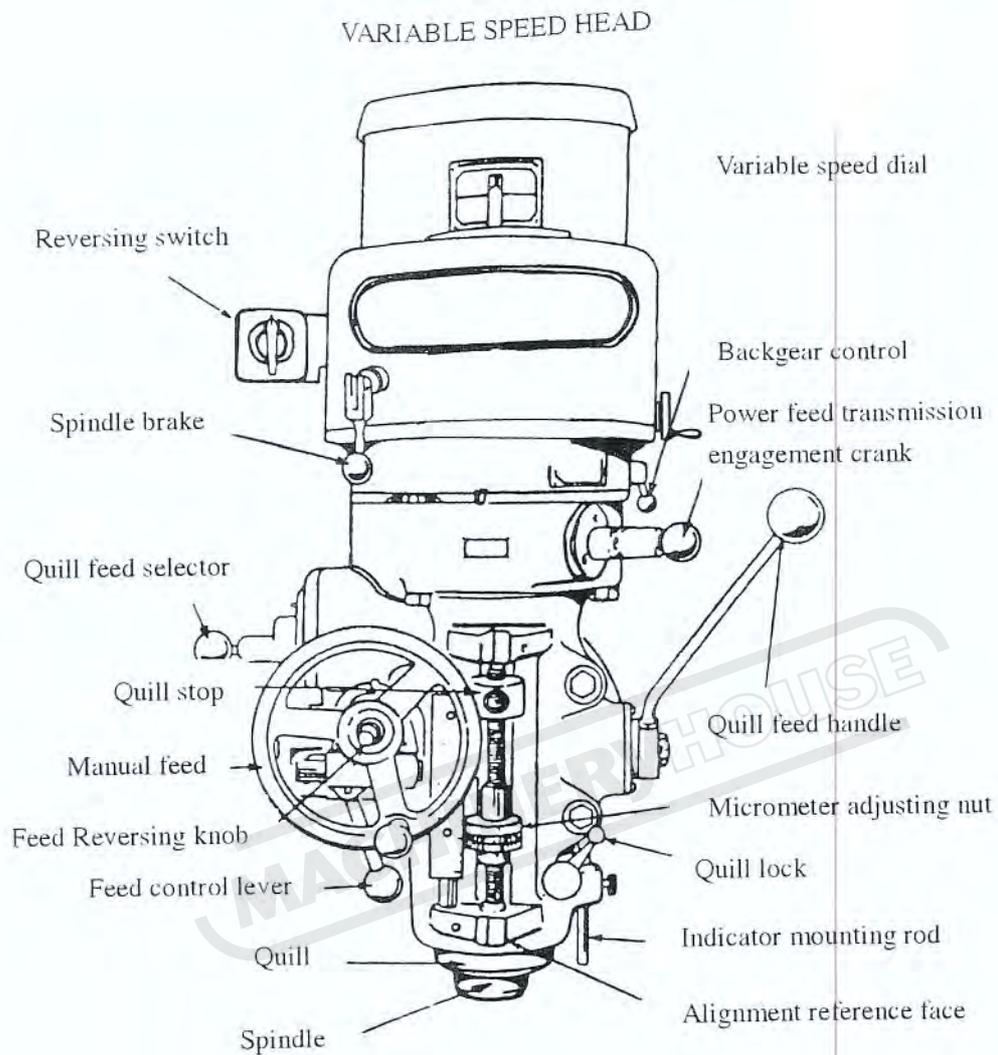


Figure 8 Longitudinal and Cross Feed Assembly



ADDITIONAL FEATURES

- *Spindle Speed Range
90 - 4000RPM 3HP Optional
- *Quill Power Feed
.0015, .003, .006" Inch/.04, .08, 0.15mm/rev
- *Quill Travel
5" Inch/127mm
- *Quill Diameter
3.3/8" Inch/85.725mm
- *Spindle Taper
R. 8 or ISO 30
- *Spindle Motor
3HP Optional
- *Spindle Straightness
Along 12" Inch/300mm and 90° .0004" Inch/* .01 mm
- *Spindle Nose Taper I. D, .002" kbcg/0.005mm TIR
- *Hard Chrome Quill

SPINDLE BRAKE (3 Figure 9)

Brake lever can be moved in either direction to stop spindle. When locking spindle, lever should be moved right or left and then raised. There are no adjustments on brake so it must be replaced when worn out.

CAUTION

BE SURE THAT THE SPINDLE BRAKE IS RELEASED BEFORE STARTING THE MOTOR. THIS IS IMPORTANT AS THE MOTOR CAN BE DAMAGED IF SWITCH IS TURNED ON WITH BRAKE IN LOCKED POSITION.

FORWARD - REVERSE SWITCH (#1 Figure 9)

This is the motor reversing switch. When the head is direct drive (High Range), the motor and spindle are turning the same direction. When the head is in "Back Gear" (Low Range), the spindle runs backwards unless the motor direction is reversed.

HI - NEUTRAL - LO LEVER (#15 Figure 9)

The lever is used to put the head into either direct drive or backgear. Rotate the spindle by hand to facilitate meshing of clutch or gears.

Neutral can be obtained at mid-way position, and is provided to permit free spindle rotation for indicating and set-up.

After an extended period of use, the neutral position may cause noise by allowing the clutch teeth to rub each other. This can be corrected by loosening set screw (#64, page 6) and reversing the position of the detent plate (#65, page 36).

In high speed (Direct Drive), the spindle is driven by tapered clutch teeth. If the clutch is not meshed tightly, clutch rattle will be heard. This can be corrected by moving the detent plate upward as the clutch wears. This is also the reason for possible loss of neutral, requiring the reversal of the detent plate.

CAUTION

DO NOT shift Hi - Lo Lever while motor is running.

POWER FEED TRANSMISSION ENGAGEMENT CRANK (4 Figure 9) Engages power feed worm gear. When lever is in right hand hole, the power feed worm gear is engaged. To disengage worm gear, pull knob out and crank handle in clockwise or down direction and move to opposite position.

NOTE

CRANK CANNOT BE SWUNG AROUND IN COUNTER CLOCKWISE DIRECTION, HOWEVER, NO DAMAGE WILL OCCUR IF MOVED IN THIS DIRECTION. TO ENGAGE THE WORM A CLOCKWISE MOVEMENT IS REQUIRED.

CAUTION

POWER FEED WORM GEAR MAY BE ENGAGED WHEN SPINDLE IS ROTATING. HOWEVER, IT SHOULD BE ENGAGED GENTLY TO AVOID DAMAGE TO WORM GEAR. THE WORM GEAR MAY BE DISENGAGED AT ANY TIME. DO NOT USE POWER FEED AT SPEEDS ABOVE 3000 RPM.

IMPORTANT: It is recommended that the Power Feed worm gear be disengaged whenever the power feed is not required. This will avoid unnecessary wear on power feed worm gear.

QUILL FEED SELECTOR (5): This crank is used for selecting the three feeds: .0015", .003" and .006" per revolution. It is shifted by pulling knob out and turning from one position to the other. Feeds are stamped on cover below indentation hole. Feed is more readily engaged when spindle is running.

FEED REVERSE KNOB (7): Position of this knob depends upon direction of spindle rotation. If boring with right hand cutting tools, pull feed handle towards operator until clutch becomes engaged.

Neutral position is between forward and reverse position. It is recommended that the handle be left in neutral position when not in use.

MANUAL FEED HANDWHEEL (6): Feed reversing knob should be in neutral position and feed control lever (8) engaged. Clockwise rotation of handwheel moves quill down. The Manual Feed Handwheel and the Quill Feed Handle may be disengaged by moving them outward about .8"

NOTE

The feed control lever must be engaged in order to use manual feed controls. The Quill Feed Handle and Manual Feed Handwheel may be taken off when not in use.

FEED CONTROL LEVER (8): Engages over -- load clutch on pinion shaft when positioned left and will stay engaged until either quill stop comes in contact with micrometer adjusting nut, forcing feed control lever to drop out automatically, or released manually by engaging lever to right.

NOTE

The Feed Control Lever is carefully set at plant to disengage automatically when quill stop goes against micrometer adjusting nut or against throw out pin at top. However, if this should go out of adjustment, it may easily be brought back by regulating the socket set screw located at bottom of tripping rod (item no. 144 page 35).

CAUTION

WHEN ADJUSTING THE SOCKET SET SCREW, CHECK AUTOMATIC DISENGAGEMENT IN BOTH DIRECTIONS; THAT IS WITH QUILL -- STOP NUT (# 161 PAGE 35) AGAINST THE FEED TRIP LEVER (# 145 PAGE 35) FOR DOWN POSITION, AND AGAINST REVERSE TRIP BALL LEVER (#183 PAGE 35) FOR THE UPPOSITION.

QUILL FEED HANDLE (13): May be removed by simply pulling handle off. It is recommended that handle be disengaged when using power feed.

QUILL STOP KNOB (14): Is used to disengage automatic feed in either direction as well as the setting point for working to given depths.

MICROMETER NUT (11): This nut is used for setting of depths. Each graduation on nut indicates .001" of depth. It reads directly to scale mounted along side of it. Depths may be obtained by setting micrometer nut in conjunction with quill stop.

QUILL LOCK (12): This is a friction quill lock to be used when quill is in stationary position such as milling operations. It is recommended that this lock be used whenever quill movement is not desired.

POSITION OF RAM: Can be regulated by loosening two Ram Lock Studs (# 119 page 26) on turret (# 124 page 26) and pulling the ram (# 10 page 26) in or out to desired position.

CAUTION

CARE SHOULD BE TAKEN TO LOCK RAM SECURELY AFTER SETTING.

NOTE

It is recommended that on heavy milling work, head, should be kept as close to column as possible, where maximum rigidity is obtained.

RECOMMENDATIONS:

Use 2, 3, or 4 flute end mills. Eight flute end mills are usually not as satisfactory for general milling. When using shell mills, face mills or any other tooling, proper machining practice should be observed.

Power feed can be used for drills up to 3/8" in diameter. Use manual feed for drills larger than 3/8"

Overload clutch is set at factory to hold up to 200 lbs down pressure on quill, which will accommodate drills up to 3/8" diameter in mild tool steel.

CAUTION

THIS CLUTCH SHOULD NOT BE TAMPERED WITH IN THE FIELD.

OPERATING INSTRUCTIONS

CAUTION

DO NOT TRY TO CHANGE SPEED POSITION UNTIL MOTOR IS RUNNING. THIS COULD CAUSE BREAKAGE OF PARTS.

Spindle Speeds are adjusted by turning speed change handwheel (# 21 page 36) on the front of the belt housing. There are two ranges shown; 60 to 500 and 500 to 4200.

60 to 500 is obtained through the back -- gear drive and is referred to as the low range. To engage the back - gears, use the lever marked Hi -- Neutral -- Lo on the right rear side of the attachment. Move this lever to the "LO" position and use the Low range on the down switch.

when shifting to "LO" DO NOT FORCE THE LEVER if the back gears do not mesh. Hold the lever so that the gears are clear of one another, rotate the spindle nose by hand until the gears line up, then put the unit in "LO" (back gear).

500 to 4200 RPM is obtained through direct drive and is the high range. The same lever and switch as above are used: selecting the " HI" range.

When shifting to "Hi" do not force the lever if the clutch teeth do not mesh. It is a simple matter to engage the brake and rotate the spindle nose by hand until the clutches engage.

Wear on the vari -- drive belt will cause a slight change in the speeds to that shown in windows(# 23 page 36)on the dial. this can be corrected as follows. Crand the speed change handwheel (# 16, Figure 9) snugly against the high speed stop. (This will be near the 4200 reading on the dial.) Use a tachometer to determine the spindle speed, then turn the pivot stud(# 16 page 38), after loosening the jam nut(Item # 7 page 38) until the spindle speed registers 4200 on the tachometer; tighten jam nut.

Now reposition the speed dial plate to match the tachometer reading. This is done by loosening the Hex nut (# 1 page 36)until the spindle speed registers 4200 on the tachometer; tighten jam nut.

CAUTION

TRY TO AVOID SHIFTING THE HI - LO LEVER WHEN THE FEED WORM IS ENGAGED.

DO NOT LOOSEN the 3 hex nuts(# 61 page 36)on the upper part of the Quill Housing(# 192 page 34). These are set at the factory and are used only for alignment.

SWIVELING THE VARI - DRIVE may be accomplished by loosening the lower 3 hex nuts(# 47 page 36) attaching the Vari - drive unit to the quill housing and then swiveling to any desired position. See arrangement of T -- Bolts(# 45 page 36)in Gear Housing(# 63 page 36)for this purpose.

WARNING

CARE MUST BE TAKEN TO SECURE THE NUTS (# 47 page 36)WHEN THE ATTACHMENT IS IN POSITION, BEFORE THE MOTOR IS TURNED ON.

REMOVING THE MOTOR(See Figure 10): Run the attachment to the bottom of either speed range and shut off the motor. This puts the vari -- drive belt in the best position for disassembly.

1. DISCONNECT THE POWER and then remove the switch from the side of the belt housing
2. Remove the cover (#54 page 36)(B, Figure 10) at the lower end of motor shaft. Use two cover screws (# 55 page 36)(A) to fasten the spring (# 44 page 38)(C) on the lower end of motor shaft, to the lower motor vari-drive pulley (# 43 page 38). This will reduce the hazard of personal injury that is always present when a heavy spring is under compression. When the pulley, spring retainer(# 45 page 38) and spring are securely fastened as a single unit, crank the speed change handwheel(# 16 Figure 9) to top speed position.
3. Now remove the screws(# 9 page 38)(D) that fasten the motor to the belt housing the motor should be lifted slightly and pulled firmly away from the spindle and toward the rear of the belt housing. This will pull the Vari-drive belt(# 27 page 38) deeply into the spindle pulley(# 25 page 38), providing the slack needed to slip the belt over the motor pulley (# 34 page 38)
4. Now lift the motor high enough to rest the motor base GENTLY on the adjusting screw(# 16 page 38) (E) seen directly in front of the motor flange. The belt can now be slipped over the lower pulley and the motor removed from the housing

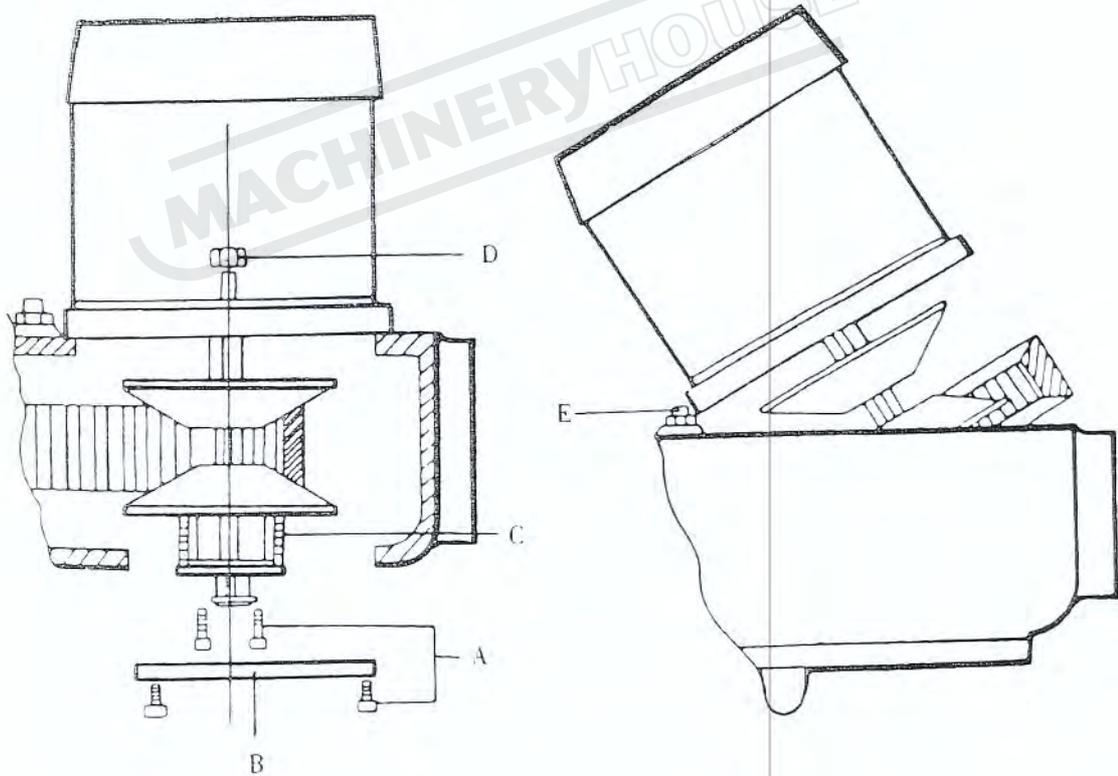


Figure 10 Removing the Motor (Side View)

CHANGING VARI - DRIVE BELT (Figure 11)

Complete the above procedures for removing the motor, then remove the three screws (# 1 page 38) (A, Figure 11) and lift out the top bearing cap move tow socket head cap screws (# 17 page 38) and sleeves (# 19 page 38) (C). Next, remove the four screws (# 6 page 38)(D) and the screw (# 55 page 38)(E) holding the belt housing the belt housing (G) to the base (# 53 page 38). Unscrew and remove the two lower screws (# 25 page 36) in the speed changer bracket just below the speed dial(# 2 page 36)(F).

NOTE

On Models with plastic face plate (# 23 page 36)
remove screws (# 22 page 36) first.

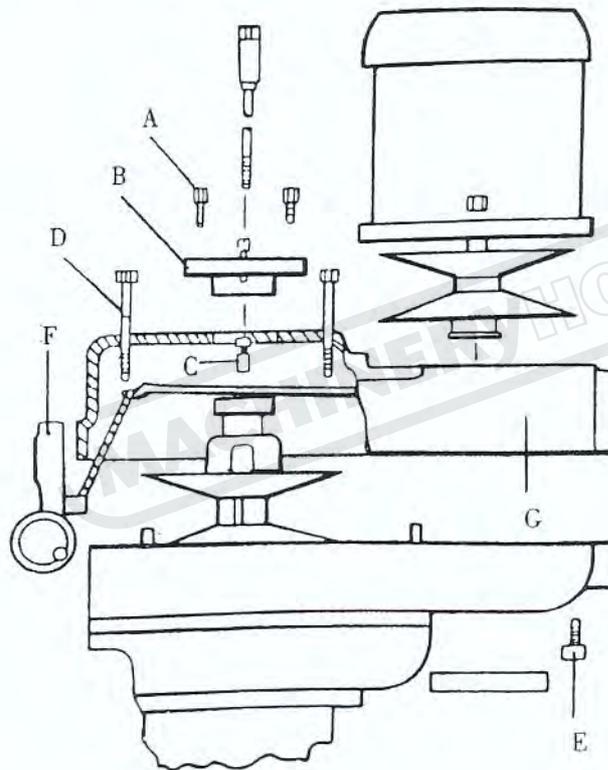


Figure 11. Removing the Vari - Drive Belt

The belt housing, complete with speed changer bracket, is now removed from its belt housing base(# 53 page 38). A slight blow under the speed changer bracket (# 5 page 36) may be needed to separate the belt housing(# 10 page 38) from the belt housing base(# 53 page 38).

Remove the lod belt (# 27 page 38) and replace it with a new belt. DO NOT use a substitute belt purchased from other than a Bridgeport Dealer, Vibration and heat could result from the use of the wrong belt.

CHANGING TIMING BELT (Figure 12)

Complete the operation for removing the motor. Then put the Hi - Neutral - Lo lever(# 15, Figure 9) in the Lo position, remove the drawbar(# 14 page 38)(A, figure 12) and lower the spindle.

Remove screws(# 55 page 38) (B) holding the upper and lower housings(# 63 page 38) together, including the two lower screws (C) in speed changer bracket just below the speed dial.

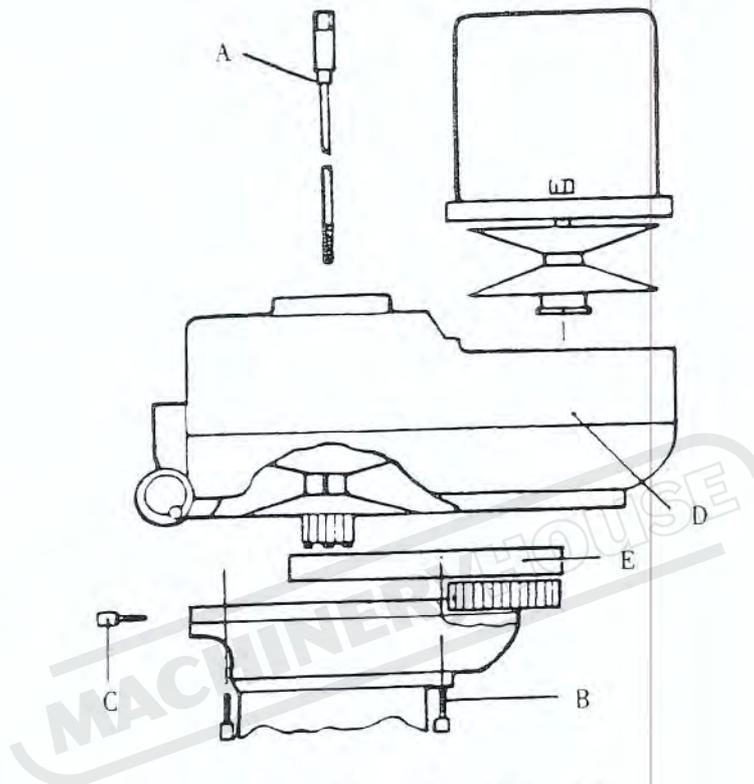


Figure 12. Removing Timing Belt

A slight blow under the speed changer bracket (# 5 page 36) may be needed to separate the upper housing (D) from its base.

As the housings are being separated, the HTD belt (D) (# 36 page 36) still connects them, resisting the separation movement. The separation can be assisted by gently pushing the belt off the large pulley (# 86 page 36) as the upper housing is being raised.

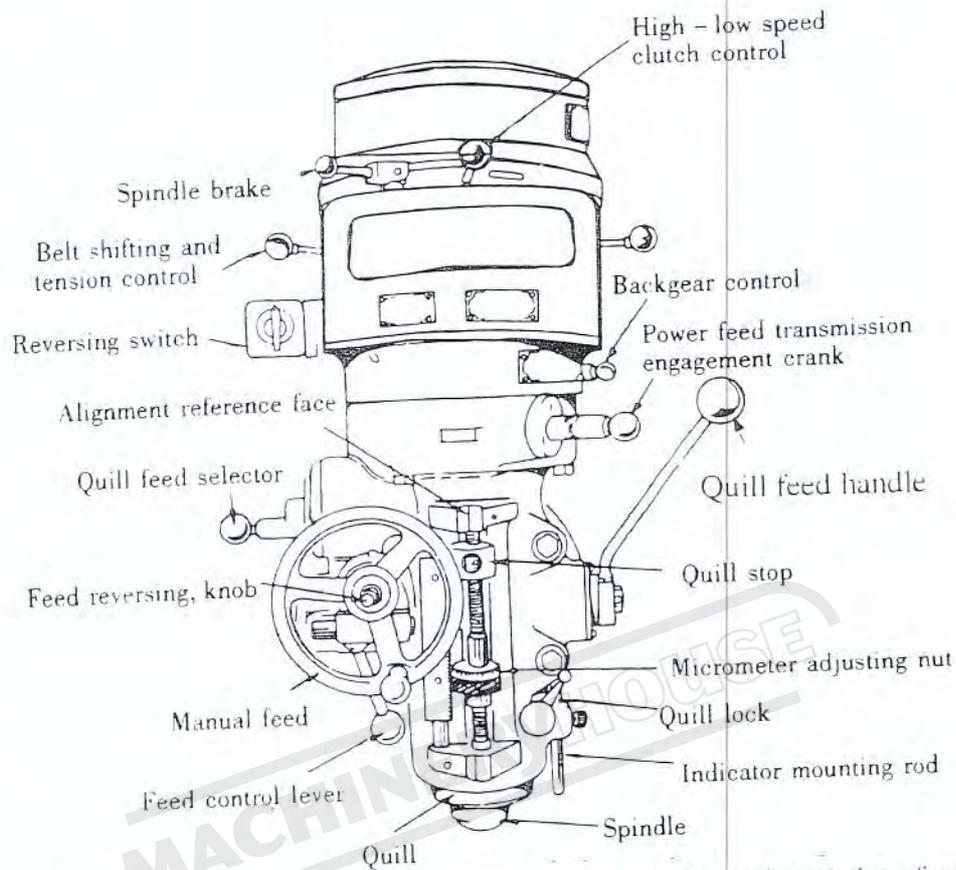
Remove the old belt and replace with a new belt.

GENERAL SPEED RECOMMENDATIONS

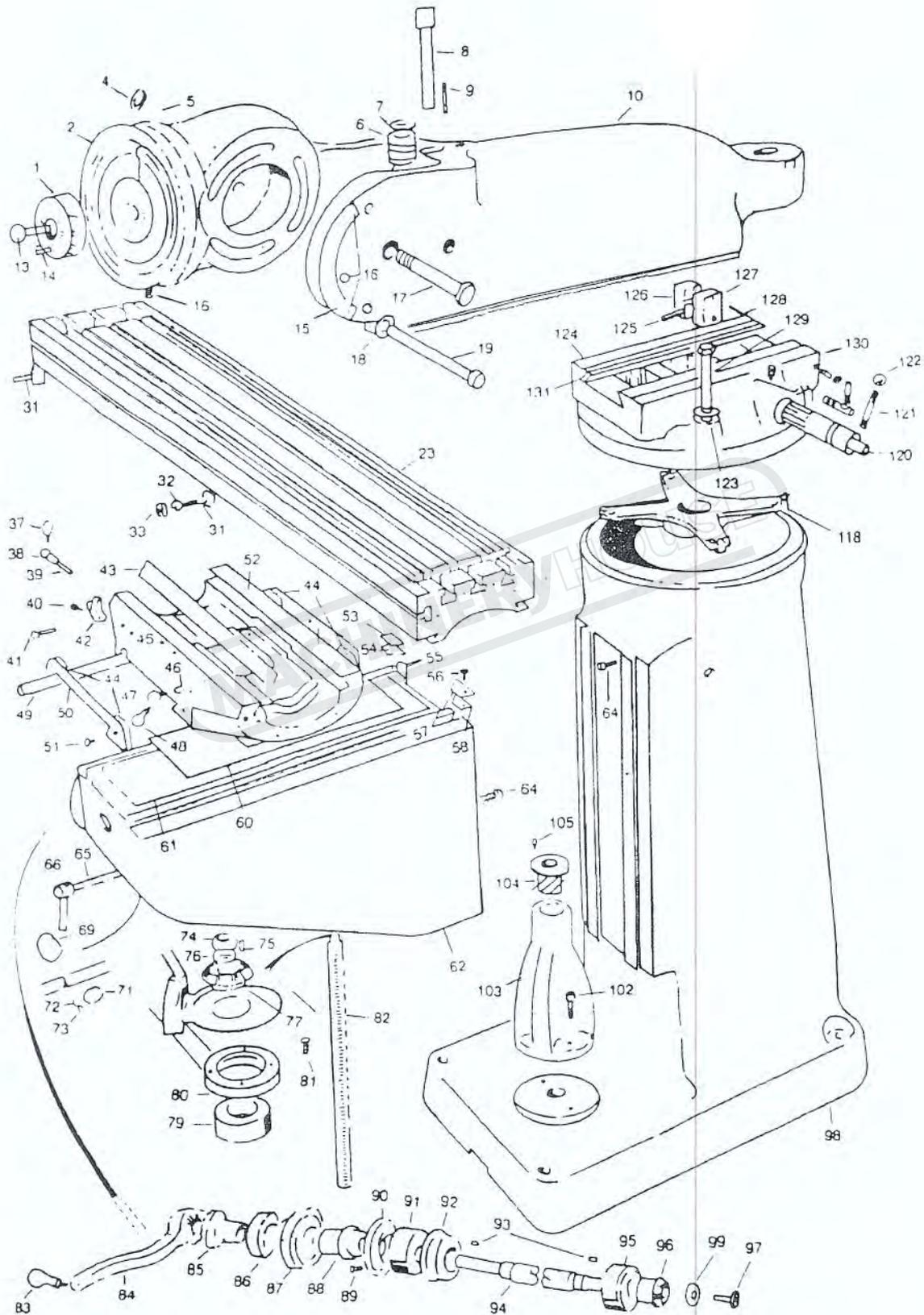
Material to be Cut	Feet Per Minute		
	Rough Cut	Rough and Finish	Light and Finish Cut
Cast Iron Soft . (Under 200 Brinnell)	70	80.90	120
Cast Iron . Med . (200 . 300 Brinnell)	55	60.70	90
Cast Iron . Hard . (Over 200 Brinnell)	40	50.60	70
Steel(Chrome Nickel 40-45 Shore)	30	40	50
Steel(Stainless)	60	80	90
Steel(Low Carbon)	80	90	140
Steel(High Carbon)	40	50	70
Bronze(Medium)	90	120	150
Bronze(Hard)	65	90	130
Brass(Hard)	100	150	200
Copper	150	200	300
Duraluminum	400	...	600
Aluminum	600	...	1000

TABLE OF CUTTING SPEEDS AND FEEDS

Feet Per Minute	Revolutions Per Minute											
	15	20	25	30	40	50	60	70	80	90	100	
Diemeter, Inches												
1/16"	917	1222	1528	1833	2445	3056	3667	4278	4889	5500	6112	
1/8"	458	611	764	917	1222	1528	1833	2139	2445	2750	3056	
3/16"	306	407	509	611	815	1019	1222	1426	1630	1833	2037	
1/4"	229	306	382	456	611	764	917	1070	1375	1375	1528	
5/16"	183	244	306	367	489	611	733	856	978	1100	1222	
3/18"	153	204	255	306	407	509	611	713	815	917	1019	
7/16"	131	175	218	262	349	437	524	611	698	786	873	
1/2"	115	153	191	229	306	382	458	535	611	688	764	
5/8"	91	122	153	183	244	306	367	428	489	550	611	
3/4"	76	102	127	153	204	255	306	357	407	458	509	
7/8"	65	87	109	131	175	218	262	306	349	193	437	
1"	57	76	95	115	153	191	229	267	306	344	382	
1 1/8"	50	67	84	102	136	170	204	238	272	306	340	
1 1/4"	45	61	76	91	122	153	183	214	244	275	306	
1 3/8"	41	55	69	83	111	139	167	194	222	250	278	
1 1/2"	38	50	63	76	102	127	153	178	204	229	255	
1 5/8"	35	47	58	70	94	118	141	165	188	212	235	
1 3/4"	32	43	54	65	87	109	131	153	175	196	218	
1 7/8"	30	40	50	61	81	102	122	143	163	183	204	
2"	28	38	47	57	76	95	115	134	153	172	191	

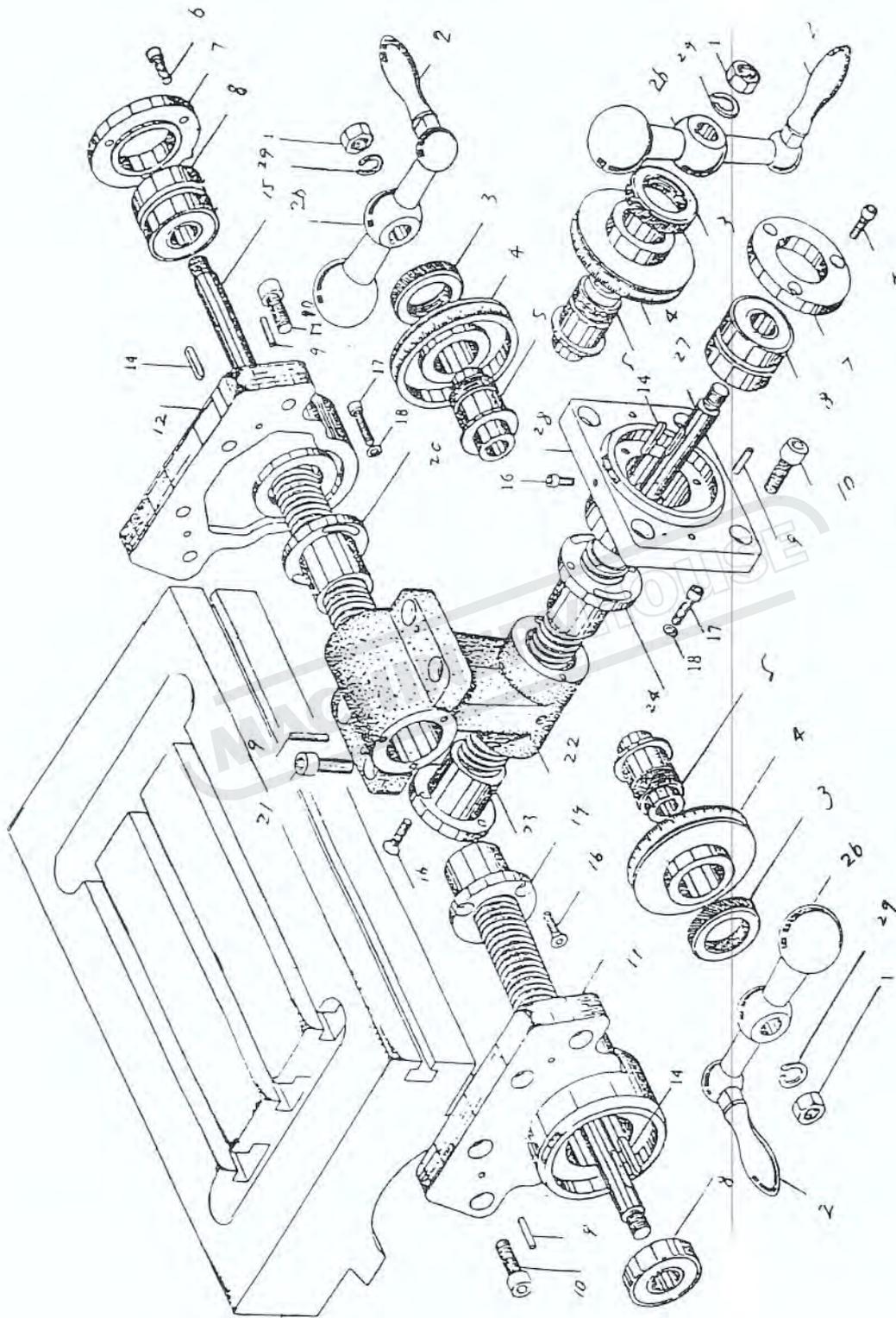


- (1) **REVERSING SWITCH** is used to obtain clockwise or counter clock wise rotation of spindle.
 Note: Due to back gear construction, When machine is running in low speed range, spindle rotation is opposite to that of high speed range. Therefore forward on your reversing switch becomes reverse switch in low speed range
- (2) **SPINDLE BRAKE**
 Lever can be moved in either direction to stop spindle; however, when locking spindle, lever should be moved to right or left and the raised.
CAUTION: Be certain that the spindle brake is released before starting the motor. This is important as the motor can be damaged if switch is left on with brake in locked position
- (3) **HIGH LOW SPEED CLUTCH CONTROL** is directly in front of motor. When knob is in position, as shown on picture, clutch is in high speed position. To put clutch into low speed position turn lever to the extreme right. It is necessary to rotate spindle while engaging high speed clutch. This can be accomplished by either turning spindle nose by hand or by turning drawbar knob using wrench, providing drawbar is pulled up tightly.
CAUTION: Do not shift clutch while motor is running.
- (4) **BACK GEAR CONTROL** is used in conjunction with high low speed clutch control above back gearcontrol handle is stamped IN and OUT. when back gear control handle is in OUT position, which is the position furthest from face of machine. Then HIGH LOW speed clutch control should be located as illustrated in photograph. With these controls in position as explained, head is set for operation in high speed range(660-2720 RPM). When back gear control lever moved to IN position and HIGH LOW speed clutch control moved to extreme right then the head is ready for operation in the low speed range(80 - 325 RPM)



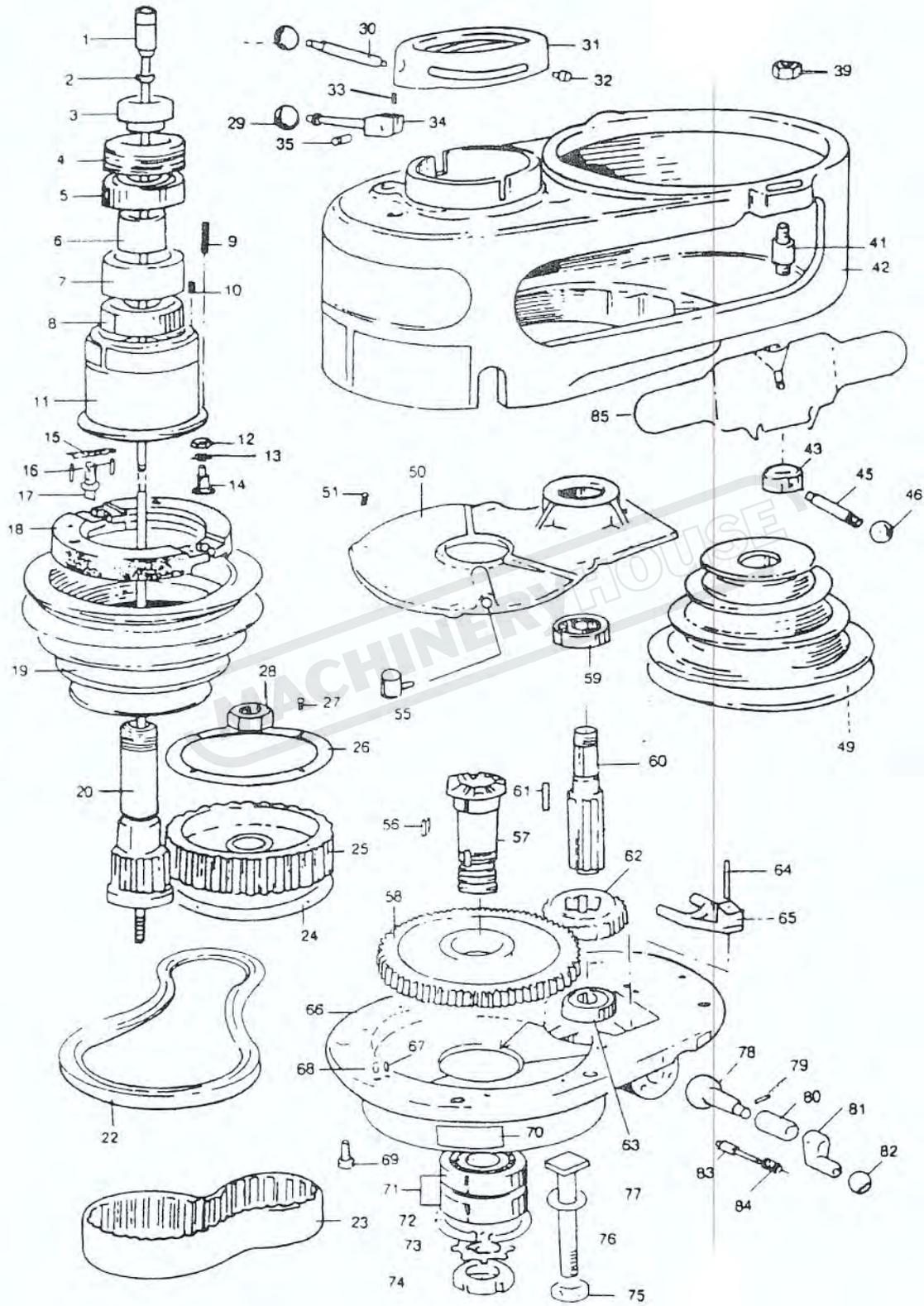
BASIC MACHINE

ITEM NO.	PARTS NO.	DESCRIPTION	ITEM NO.	PARTS NO.	DESCRIPTION
1	5033	Quill Housing ADJ. Gear	69	4001-1	Knee Lock Plunger
2	5019	Ram Adapter	71	4045	Knee Binder Plug(plastic)
4	5027	Nut	72	4049	Dog Point Set Screw
6	5020	Vertical Adjusting Worm	73	4049	Set Screw
7	5022	Worm Thrust Washer(2Req)	74	4023	Jam Nut
8	5021	Vertical Adjusting Worm Shaft	75	4020	Key
9	5023	Worm key	76	4022	Washer
10	5018	Ram	77	4019	Bevel Gear
13	5035	Socket cap Screw(2 Req.)	79	4040	Sealed Ball Bearing
14	5034	Roll Dowel Pin	80	4039	Bearing Retainer Ring
15	5043	Angle Plate	81	4041	Socket Head Cap Screw
16	5032	Round HD Drive Screw(5 Req.)	82	4021	Elevating Screw Assembly
17	5026	Adapter Pivot Pin	83	4003	Handle
18	5029	Chamfered & Hardened washer (7 Req.)	84	4002	Elevating Crank
19	5028	Adapter Locking Bolt(3 Req.)	85	4013	Gearshaft Clutch Insert
23	2001	Table 42" or 49"	86	2016	Dial Lock Nut
			87	4010	Dial with 100 Graduations
			88	4011	Dial Holder
31	2031	Stop Piece T-Bolt(3 Req.)	89	4009	Socket Head Cap Screw
32	2030	Table Stop Piece(2 Req.)	90	2011	Bearing Retaining Ring
33	2032	Hex Nut(3 Req.)	91	4007	Grease Sealed Bearing
37	3031	Table Lock Bolt Handle	92	4006	Bearing Cap
38	3030	Saddle Lock Bolt	93	4015	Key
39	3032	Saddle Lock Plunger	94	4017	Elevating Shaft for 12" Knee
40	3036	Socket HD cap Screw(2 Req.)	95	4016	Grease Sealed Bearing
41	3028	Gib Adjusting Screw(3 Req.)	96	4014	Bevel Pinion
42	3035	Table Stop Bracket	97	4042	Set Screw
43	3026	Saddle Table Gib Stop Bracket	98	1001	Column
44	3037	Felt Wipers(4 Req.)	99	4017-1	Washer
46	3029	Table Lock Plunger	102	4027	Socket Head Cap screw
47	3030	Table Lock Bolt	103	4026	Pedestal
48	3031	Table Lock Bolt Handle	104	4024	Elevating Screw Nut
49	3027	Saddle/Knee Gib	105	4025	Socket Head Cap screw
50	3037-2	Saddle Knee Wiper Plate (4 Req.)	118	5003	Spider
51	3038	Oval Head Screw (8 Req.)	119	5009-1	Ram Lock Stud
52	3001	Saddle	120	5012	Ram Pinion
53	4028-2	Left Hand Column Wiper Holder	121	5013	Ram Pinion Handle
54	4028-1	Knee Wiper Felt	122	5014	Plastic Ball
55	4038	Knee/Column Gib	123	5005	Chamfered X Hardened Washer
56	4029	Allen Cap Screw (2 Req.)	124	5001	Turret
57	4028-2	Right Hand Column Wiper Holder	125	5002-3	Ram Clamp Bar
58	4028	Knee Wiper Felt	126	5002-1	Ram Clamp Untapped
60	3040	Chip Guards-Upper	127	5002-2	Ram Clamp Tapped
61	3039	Chip Guards-Lower	128	5002-4	Split Pin
62	4001	Knee 12"	129	5004	Locking Bolt
64	1001-1	Stop Screw	130	5015	Ram Pinion Screw
65	4048	Knee Lock Shaft Assembly	131	5002	Ram/Turret Gib



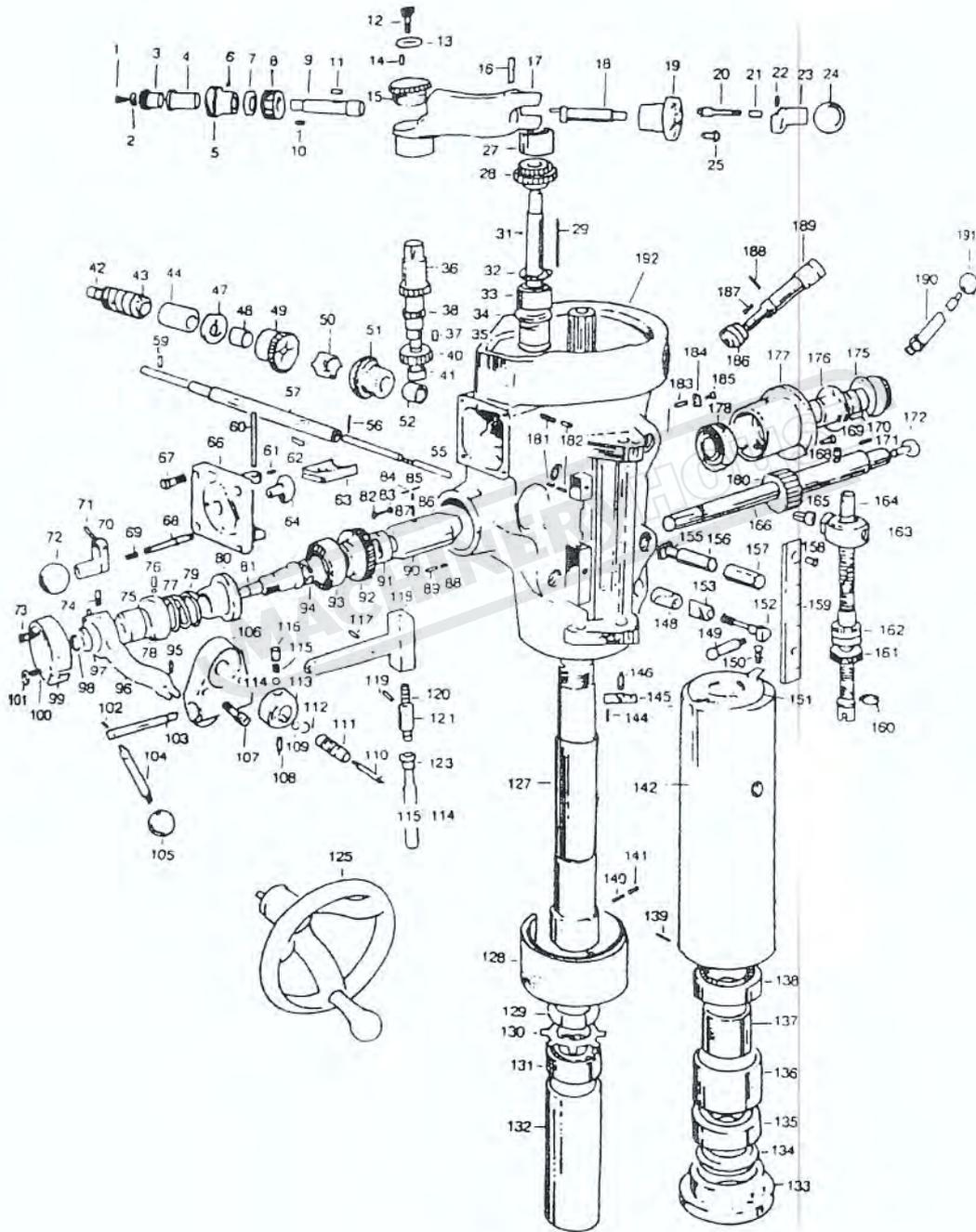
LEADSCREW ASSEMBLY

ITEM	NO	NAME
	1	Nut
	2	Ball crank handle
	3	Dial lock nut
	4	Dial
	5	Dial holder
	6	Screw
	7	Bearing retainer ring
	8	Bearing 204
	9	Pin
	10	Screw
	11	Left bearing bracket
	12	Right bearing bracket
	13	Bearing 204
	14	Key
	15	Longitudinal feed screw
	16	Screw
	17	Screw
	18	Washer
	19	Longitudinal feed nut
	20	Longitudinal feed nut
	21	Screw
	22	Nut bracket
	23	Cross feed nut
	24	Cross feed nut
	26	Three ball crank hand
	27	Cross feed screw
	28	Bearing bracket
	29	Lock washer



STEP PULLEY HEAD TOP HOUSING

ITEM NO.	PARTS NO.	DESCRIPTION	ITEM NO.	PARTS NO.	DESCRIPTION
1	6031	Drawbar for R. 8 Collet	43	6003	Motor Locknut (2 Req.)
2	6032	Drawbar Washer	45	6006	Motor Locknut Handle (2 Req.)
3	6041	Upper Bearing Locknut	46	6007	Black Plastic Ball (2 Req.)
4	6042	Bearing Sleeve Locknut	49	6009	Motor Pulley
5	6043	Ball Bearing	50	6078	Gear Housing Cover
6	6044	Upper Bearing Spacer(small)	51	6080	Round HD Screw (5 Req.)
7	6045	Upper Bearing Spacer (large)	55	6079	Oil Cup
8	6043	Ball Bearing	56	6075-1	Bull Gear Key
9	6049	Compression Spring(4 Req.)	57	6075	Splined Gear Hub
10	6249	Socket Set Screw(2 Req.)	58	6074	Splined Bull Gear Assembly
11	6047	Spindle Pulley Bearing Sleeve	59	6056	Bearing
12	6019	Jam Nut	60	6068	Countershaft
13	6022	External Lock Washer	61	6069	Key
14	6018	Brake Ring Screw (3 Req.)	62	6067	Countershaft Gear
15	6024	Spring(2 Req.)	63	6056	Bearing
16	6025	Machine Screw (4 Req.)	64	6066	Dowel Pin
17	6020	Brake Lock Stud	65	6065	Back Gear Shifter Fork
18	6014	Brake Assembly	66	6050	Gear Housing
19	6048	Spindle Pulley	67	6051	Dowel Pin(2 Req.)
20	6040	Spindle Pulley Hub	68	6052	Roll Pins (2 Req.)
22	6034	'V' Belt	69	6057	Socket Cap Screw (6 Req.)
23	6035	Timing Belt	71	6053	Ball Bearing
24	6072	Timing Belt Pulley Flange	72	6054	Snap Ring
25	6071	Timing Belt Pulley	73	6077	Lockwasher
26	6072	Timing Belt Pulley Flange	74	6076	Bearing Locknut
27	6073	Flat Head Screw	75	6083	Hex Nut Hardened(3 Req.)
28	6070	Hex Jam Nut	76	6081	Vertical Tee Bolt (3 Req.)
29	6038	Black Plastic Ball Handle (2 Req.)	77	6082	Vertical Bolt Washer (3 Req.)
30	6037	Spindle Clutch Lever	78	6060	Back Gear Shift Crank
31	6036	Cam Ring	79	6167	Roll Pin
32	6039	Cam Ring Pin (2 Req.)	80	6058	Back Gear Shift Bushing
33	6023	Socket Set screw	81	6168	Shift Crank
34	6016	Brake Lock Handle	82	6171	Black Plastic Ball 1" Dia
35	6021	Brake Lock Pin	83	6069	Gearshift Plunger
39	6008	Hex Jam Nut (2 Req.)	84	6170	Compression Spring
41	6002	Motor Mounting Studs(2 Req.)	85	6026	Belt Guard Assembly
42	6013	Belt Housing			

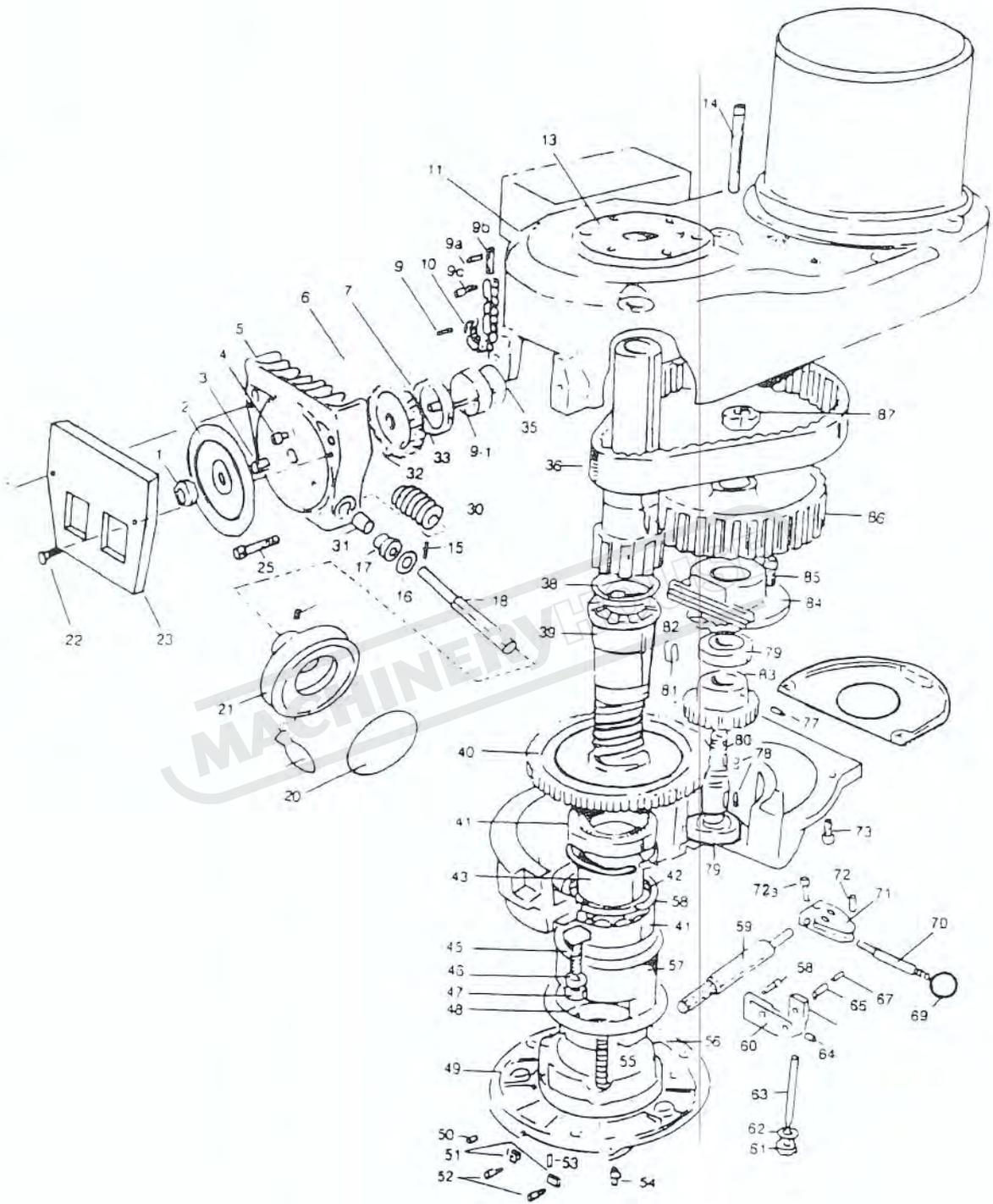


HEAD PARTS LIST

ITEM NO.	PARTS NO.	DESCRIPTION	ITEM NO.	PARTS NO.	DESCRIPTION
1	6141	RD.HD.Screw	61	6164	KP. Set Screw
2	6140	Bevel Pinion Washer	62	6230	Key
3	6139	Feed Bevel Pinion	63	6162	Feed Gear Shift Crank
4	6138	Feed Worm Gear Shaft Sleeve	64	6166	Cluster Gear Shift Crank
5	6137	Worm Cradle Bushing	66	6161	Cluster Gear Cover
6	6123	Set screw	67	6165	Cap Screw (4 Req.)
7	6136	Worm Cradle Spacer(4 Req.)	68	6169	Gear Shift Plunger
8	6134	Feed Drive Worm Gear	69	6170	Compression Spring
9	6133	Feed Drive Worm Gear Shaft	70	6168	Shift Crank
10	6142	Worm Shaft Key	71	6167	Roll Pin
11	6135	Key	72	6171	Black Plastic Ball
12	6150	Locknut	73	6206	Cap Screw (2 Req.)
13	6149	Washer	74	6202	Clutch Ring Pin(2 Req)
14	6147	Cluster Gear Key	75	6200	Clutch Ring
15	6148	Feed Reverse Bevel Gear	76	6199	Socket Set Screw
16	6122	Feed Engage Pin	77	6199-1	Brass Plug
17	6121	Worm Gear Cradle	78	6198	Overload Clutch Locknut
18	6126	Worm Gear Cradle Throw-out	79	6197	Safety Clutch Spring
19	6125	Shift Sleeve	80	6194	Overload Clutch
20	6169	Gearshift Plunger	81	6195	Overload Clutch Sleeve
21	6170	Compression Spring	82	6190	Single Spring Washer (3 Req.)
22	6128	Roll Pin	83	6189	Round Head Screw (3 Req.)
23	6168	Shift Crank	84	6228	Mock-it Lockscrew
24	6131	Black Plastic Ball	85	6228	Socket Set Screw
25	6132	Cap Screw (3 Req.)	86	6246	Lockscrew
27	6157	Cluster Gear Shaft Upper Bearing	87	6246	Socket Set Screw
28	6153	Cluster Gears Assembly	88	6191	Compression Spring
29	6160	Cluster Gear Key	89	6193	Overload Clutch Lever Spring Plunger
31	6151	Cluster Gear Shaft	90	6186	Quil Pinion shaft Bushing
32	6158	Snap Ring	91	6190	Pinion Shaft Worm Gear Spacer
33	6156	Bevel Gear Bearing	92	6187	Overload Clutch Worm Gear
34	6159	Bevel Gear Thrust Spacer	93	6188	Overload Clutch Ring
35	6151	Feed Reverse Bevel Pinion	94	6188-1	Snap Ring
36	6143	Feed Driving Gear	95	6236-1	Dowel Pin
37	6145	Key	96	6203	Overload Clutch Trip Lever
38	6143	Cluster Gear Input Shaft	97	6201	Overload Clutch WASHER
40	6144	Feed Drive Gear	98	6195-1	Snap Ring
41	6252	Needle Bearing	99	6205	Clutch Arm Cover
42	6227	Bushing	100	6207	Socket Set Screw
43	6225	Worm	101	6208	Chem Blacket Locknut
44	6224	Feed Worm Shaft Bushing	103	6239	Cam Rod
47	6223	Feed Worm Shaft Thrust Washer	104	6234	Trip Handle
48	6220	Bushing	105	6233	Black Plastic Ball
49	6220	Feed Reverse Bevel Gear	106	6231	Feed Trip Bracket
50	6222	Feed Teverse Clutch	107	6232	Cap Screw (2 Req.)
51	6220	Feed Reverse Bevel Gear	108	6219	Socket Set Screw
52	6220	Bushing	109	6229	Key
55	6216	Reverse clutch Rod	110	6214	Feed Reverse Knob Stud
56	6217	Roll Pin	111	6213	Reverse Knob
57	6209	Feed worm Shaft	112	6215	Snap Ring
59	6226	Pin	113	6218	Handwheel Clutch
60	6163	Feed Shaft Rod	114	6255	Steel Ball

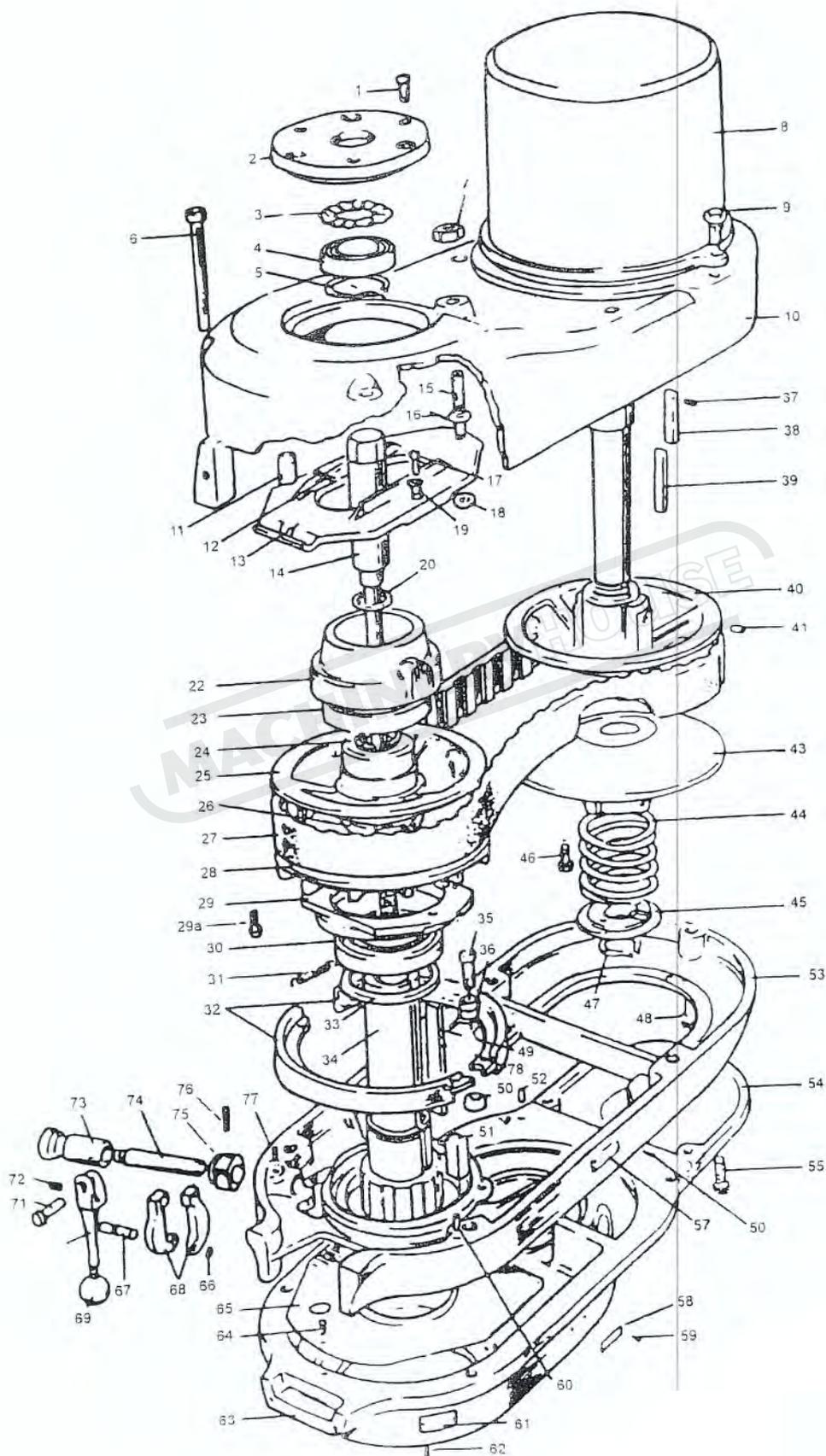
HEAD PARTS LIST (CONTINUED)

ITEM NO.	PARTS NO.	DESCRIPTION	ITEM NO.	PARTS NO.	DESCRIPTION
115	6219-2	Compression spring	158	6244	Chem Blacked RD. HD. Screws (2 Req.)
116	6219-1	Handwheel Clutch Spring Screw	159	6243	Micrometer Scale
117	6237	Roll Pin	160	6115	Snap Ring
118	6236	Cam Rod Sleeve Assy	161	6108	Quill Micro - stop Nut
119	6241	Roll Pin	162	6107	Micrometer Nut
120	6242	Compression Spring	163	6105	Quill Stop Knob
121	6240	Trip Plunger	164	6104	Quill Stop Micro - screw
123	6118-1	Trip Plunger Bushing	165	6106	Screw
124	6118	Feed Trip Plunger	166	6172	Quill Pinion Shaft
125	6210	Handwheel	168	6185	Spring Pin
127	6084	Spindle	169	6180-1	RD. Head Screw(2 Req.)
128	6086	Quill Skirt	170	6179	Roll Pin
129	6090	Locknut	171	6184	Key
130	6091	Lockwasher	172	6183	Pinion shaft Hub Screw
131	6092	Bearing	173	6176	Steel Ball
132	6094	Sleeve	174	6175	Compression Spring
133	6098	Nose - piece	175	6178	Rack Feed Handle Hub
134	6097	Spindle Dirt Shield	176	6182	Pinion Shaft Hub Sleeve
135	6093	Bearing	177	6180	Spring Vover
136	6095	(Bearing Spacer - Large)	178	6181	Clock Spring(Clock Spring Assy.) Assy.)
137	6096	(Bearing Spacer - Small)	180	6172	Quill Pinion
138	6093	Bearing	181	6246-1	Socket Set screw
140	6253	Special Socket Set Screw	182	6246	Lock screw
141	6254	Collet Alignment Screw	183	6110	Reverse Trip Ball Lever
142	6085	Quill	184	6109	Feed Reverse Trip Plunger
144	6113	Socket Set Screw	185	6114	Raverse/Trip Ball Lever Screw
145	6111	Feed Trip Lever	186	5039	Worm Gear
146	6112	Trip Lever Pin	187	5041	Key
148	6116	Quill lock Sleeve	188	5042	Socket Set Screw
149	6119	Lock Handle	189	5040	ADJ Worm Shaft
151	6088	Felt Washer	190	6174	Pinion Shaft Hub Handle
152	6117	Quick Lock Bolt	191	6173	Black Plastic Ball Handles
153	6116	Quill Lock Sleeve Tapped	192	6101	Quill Housing
155	5036	T - Blot Assy			
156	6120	Lower Clamping Blot Spacer(2 req)			
157	5038	Locknut			



VARIABLE SPEED HEAD TOP HOUSING

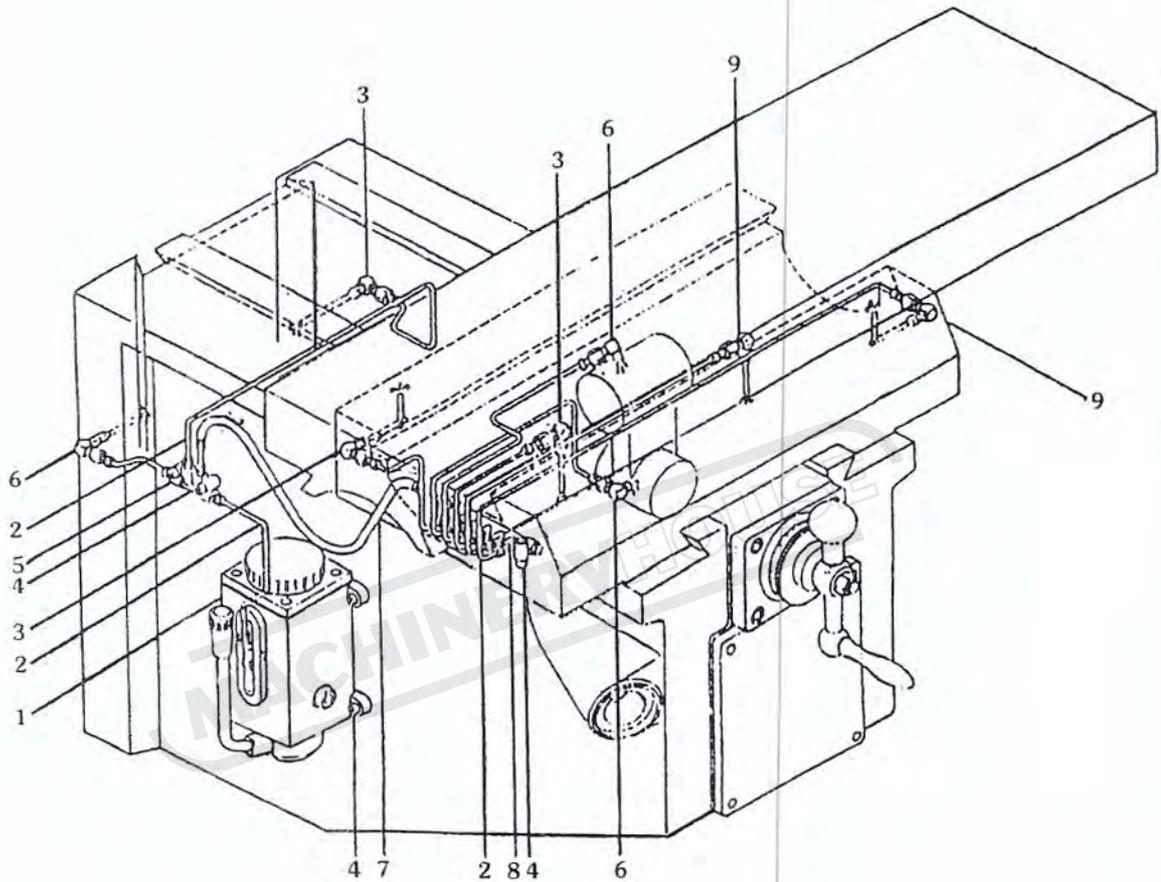
ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	Hex Cap Nut	47	Hex Jam Nut - Finished HdN:(3 Req.)
2	Vari - Speed Dial	48	Ball Bearing Gear Sleeve Washer
3	Bronze Bearing	49	Fixed Clutch Bracket
4	Full Dog Socket Set Screw	50	Socket Set Screw
5	Speed Changer Housing	51	Guide for Clutch Bracket
6	Speed Changer Chip Shield	52	Flat HD Socket Cap Screw(2 Req.)
7	Machine Screw(2 Req.)	53	Dowel Pin
9	Roll Pin	54	Oil Cup
9-1	Roll Pin	55	Compression spring (3 Req.)
9a	Roll Pin	56	Bearing Locknut
9h	Speed Change Stud	57	Bearing Sleeve
9c	Cotter Pin	58	Wave Spring Washer
10	Speed Changer Chain	59	Bull Gear Shift Pinion
11	Drum Switch	60	HI - LOW Detent Plate
13	Top Bearing Cap	61	Hex Nut(3 Req.)
14	Soc HD Cap Screw(2 Req.)	62	Lock Washer(3 Req.)
15	Roll Pin	63	Studs(3 Req.)
16	Spring	64	Socket Set Screw
17	Bearing	65	Adjustable Plate
18	Speed Change Shaft	66	HI - LOW Detent Plunger
19	Handle	67	Spring
20	Caution Plate	68	Socket Cap Screw(2 Req.)
21	Speed Change Handwheel	69	Bakelite Ball Handle
22	Flat Hd. Cap Screw(2 Req.)	70	HI - LOW Shift Crank
23	Plastic Face Plate	71	HI - LOW Pinion Block
24	Set Screw	72	Roll Pin(1 Req.)
25	Socket HD Cap Screw(4 Req.)	72a	Socket HD Cap Screw(2 Req.)
30	Worm Gear	73	Socket Cap Screw(4 Req.)
31	Bearing	77	Socket Set Screw
33	Speed Changer Spur Gear	78	Key(2 Req.)
35	Speed Change Chain Drum	79	Ball Bearing (2 Req.)
36	Belt	80	Bull Gear Pinion Counter shaft
38	Timing Pulley Clutch Sleeve	81	Key
39	Spindle bull Gear Hub	82	Wave Spring Washer
40	Spindle Bull Gear Assembly	83	Bull Gear Pinion
41	Ball Bearing (2 Req.)	84	Bull Gear Pinion Bearing Cap
42	Snap Ring (2 Req.)	85	Socket HD Cap Screw(2 Req.)
43	Bull Gear Bearing Spacer	86	Timing Belt Pulley
45	Vert. Tee Bolts(3 Req.)	87	Jam Nut
46	Steel Washer(3 Req.)		



VARIABLE SPEED HEAD BACK GEAR

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	Socket Cap Screw(3 Req.)	40	Stationary Motor Varidisc
3	Spring Washer	41	Socket Set Screw
4	Ball Bearing	42	Plastic Insert(2 Req.)
5	Snap Ring No.	43	Adjustable Motor Varidisc Assembly
6	Socket HD Cap Screw (2 Req.)	44	Spring for Varidisc Motor Shaft
7	Hex Jam Nut	45	Adjustable Varidisc Spring Collar
8	Motor 2HP(complete unit)230/460/3/60	46	Socket HD Cap Screw(2 Req.)
9	Hex HD Screw(2 Req.)	47	Ret. Ring
10	Belt Housing	48	Socket Cap Screw
13	Speed Change Plate	49	Plastic Key
14	Drawbar	51	Key
15	Cotter Pin	52	Taper Pin
16	Speed Change Plate Pivot Stud	53	Belt Housing Base
17	Socket HD Cap Screw(2 Req.)	54	Motor Pulley Cover
18	Washer	55	Socket Cap Screw
19	Pivot Sleeve(2 Req.)	58	HI - LOW Range Nameplate
20	Draw Bar Washer Draw Bar Washer	59	Drive Screw(4 Req.)
22	Spindle Pulley Bearing Sliding Housing	60	Taper pin(2 Req.)
23	Ball Bearing	61	Quill Feed Nameplate
24	Plastic Insert(2 Req.)	62	Rivets(4 Req.)
25	Adjustable - Driven Varidisc	63	Gear Housing
26	Snap Ring No.	64	Round HD Machine Screw(3. Req.)
27	Belt	65	Gear Housing Plate
28	Stationary Driven Varidisc	66	Snap Ring
29	Brake Bearing Cap	67	Brake Finger Pivot Stud
29a	Socket HD Cap Screw(2 Req.)	68	Brake Operating Finger
30	Ball Bearing	69	Bakelite Ball Handle
31	Brake Spring(2 Req.)	70	Brake Lock Handle
32	Brake Shoe Assembly(2 Req.)	71	Brake Lock Pin
33	Spindle Pulley Spacer	72	Socket Set Screw
34	Spindle Pulley Hub	73	Sleeve for Brake Lock Shaft
35	Hex HD. Screw	74	Brake Lock Shaft
36	Brake Shoe Pivot Sleeve	75	Brake Lock Cam
37	Roll Dowel Pin	76	Roll Pin
38	Drive Key	77	Socket Set Screw
39	Key for ADJ Varidisc Motor Shaft		

CENTRAL LUBRICATING OIL - FEEDING EQUIPMENT



ITEM NO	DESCRIPTION	ITEM NO	DESCRIPTION
B001	Hand Oiler	E006	Ratio Oil Distributor CPS3(3 sets)
B002	Aluminum Pipe $\Phi 4$	E007	Outside Steel Flexible Tube
B003	Ratio Oil Distributor CPS4(3 sets)	E008	A Type Oil Distributor A8
B004	Inhexagonal Screws	E009	Ratio Oil Distributor CPS5(2 sets)
B005	A Type Oil Distributor A4		