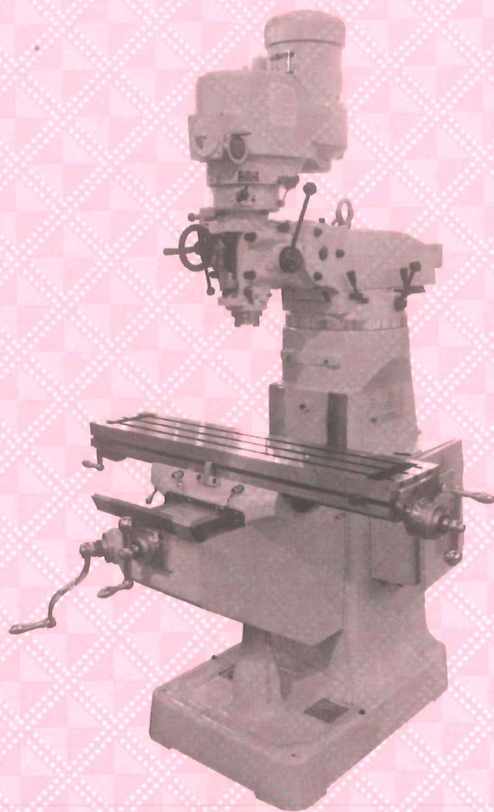




# OPERATION & PARTS MANUAL

## LMV



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## **1. Forward:**

SHARP LMV milling machines are designed and manufactured to meet the demands of our customers. All parts and materials have been placed under strict quality control to ensure the superior quality and durability.

This manual gives a detailed account of the structure, mechanism, and methods of operation and maintenance of the LMV mill. To ensure the maximum performance and precision operation, it is imperative that operators, maintenance and repair personnel read the manual thoroughly and follow the specific instructions in operating and maintaining the machine.

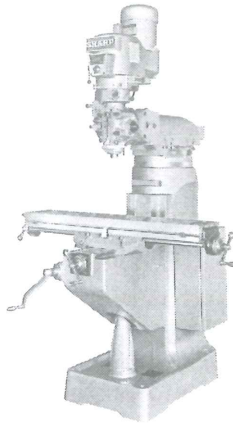
## **2. Safety Rules and Regulations:**

1. Do not wear loose clothing when operating the machine.
2. Operators shall wear goggles and safety boots.
3. Do not disturb the operator when the machine is running.
4. Caution should be taken when removing chips from work surface.

## **3. Notice:**

Retrofitting the Sharp Mill with a CNC control, such as Sony, AcuTire, Anilam or other similar controls without the installation of an approved auto-lube system will void the warranty on that machine.

# SHARP VARIABLE SPEED MILLING MACHINE



## 1. Specifications:

STANDARD								
SPECIFICATION	INCH	MM		SPECIFICATION		INCH	MM	
WORK TABLE				Spindle speed	50HZ	50-3750 rpm		
				RPM	60HZ	60-4500 rpm		
Working area of table		49 x 9				Machine Net Weight		1.01 kg
Table Travel		36.6						
Saddle Travel		12						
Knee Travel		16						
HEAD								
Motor		2HP 3HP						
Spindle Taper		R8 or N.S.T # 30						
Quill Travel		5		127				
Feed Rate per Revolution		0.0015, 0.003, 0.006		0.04, 0.08, 0.15				
OPTIONAL								
Working Area of Table		49 x 9	1245 x 230	Table Travel (Head)		36%	933	

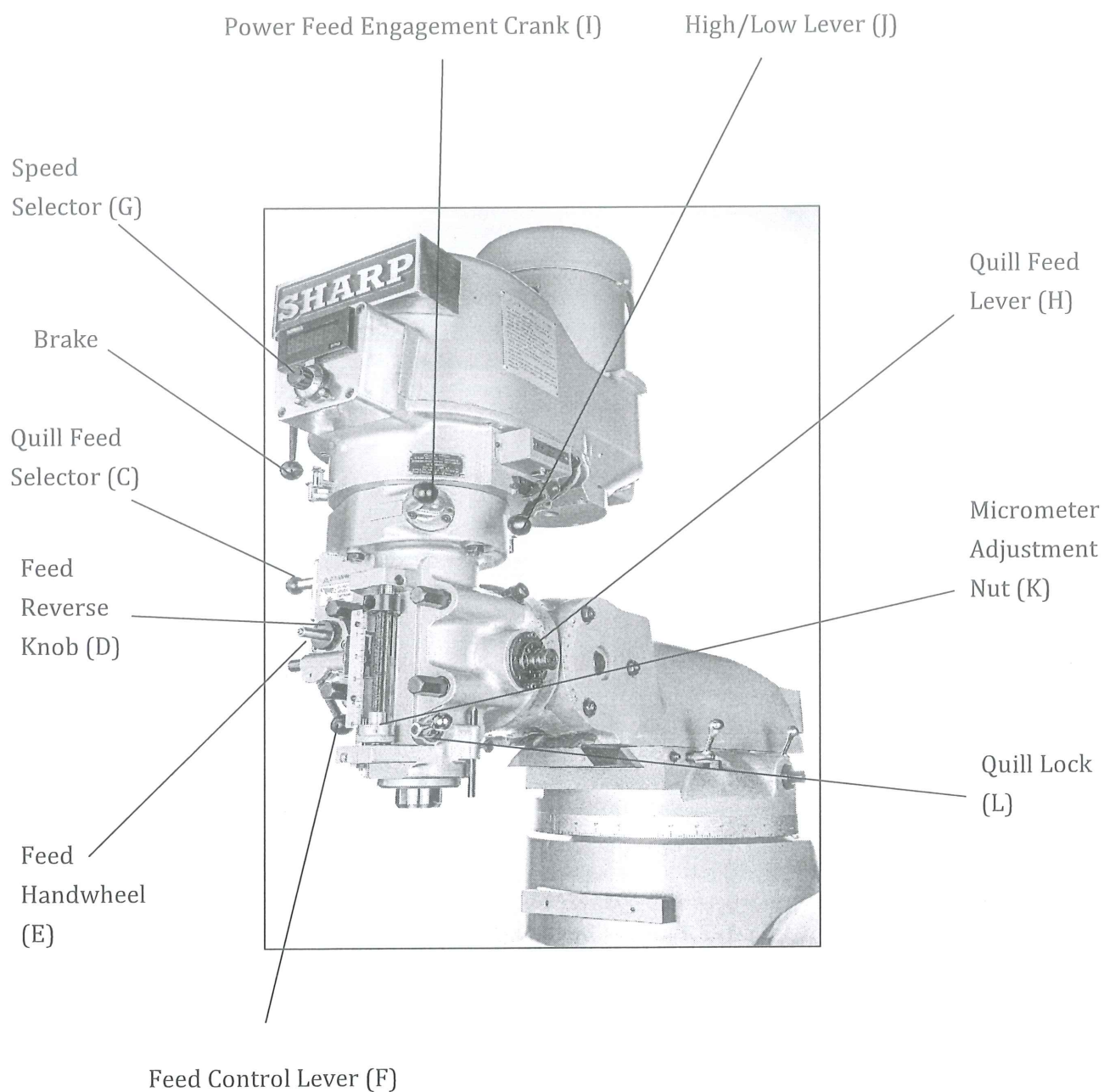
## 2. Machine uses:

1. Drilling
2. Milling
3. Molding
4. Polishing
5. Boring
- 6.

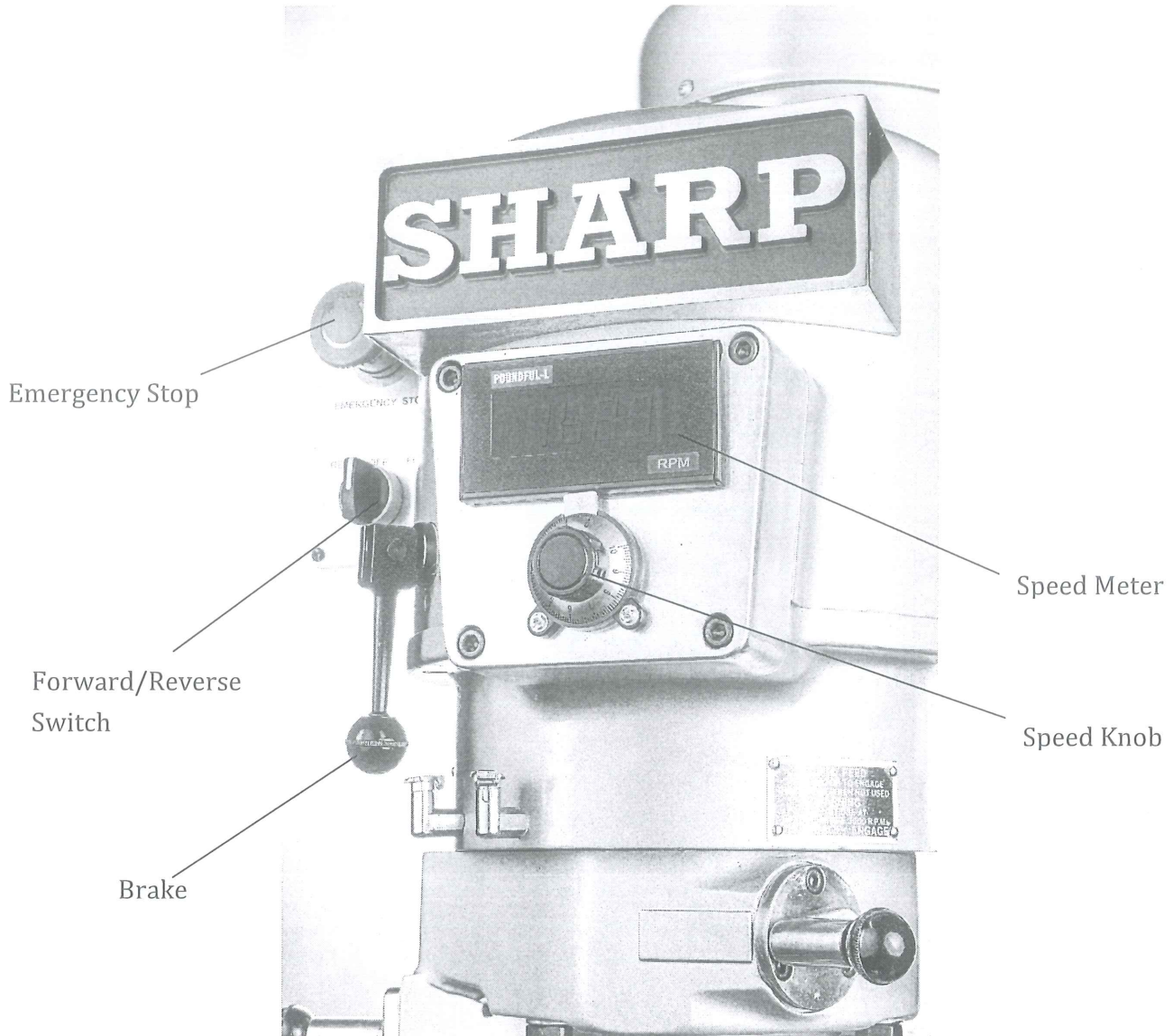


### 3. Machine parts:

#### 1. Headstock:



## DVS HEAD





## 2. Machine Body:

### 1. Columns, Turret, and Ram:

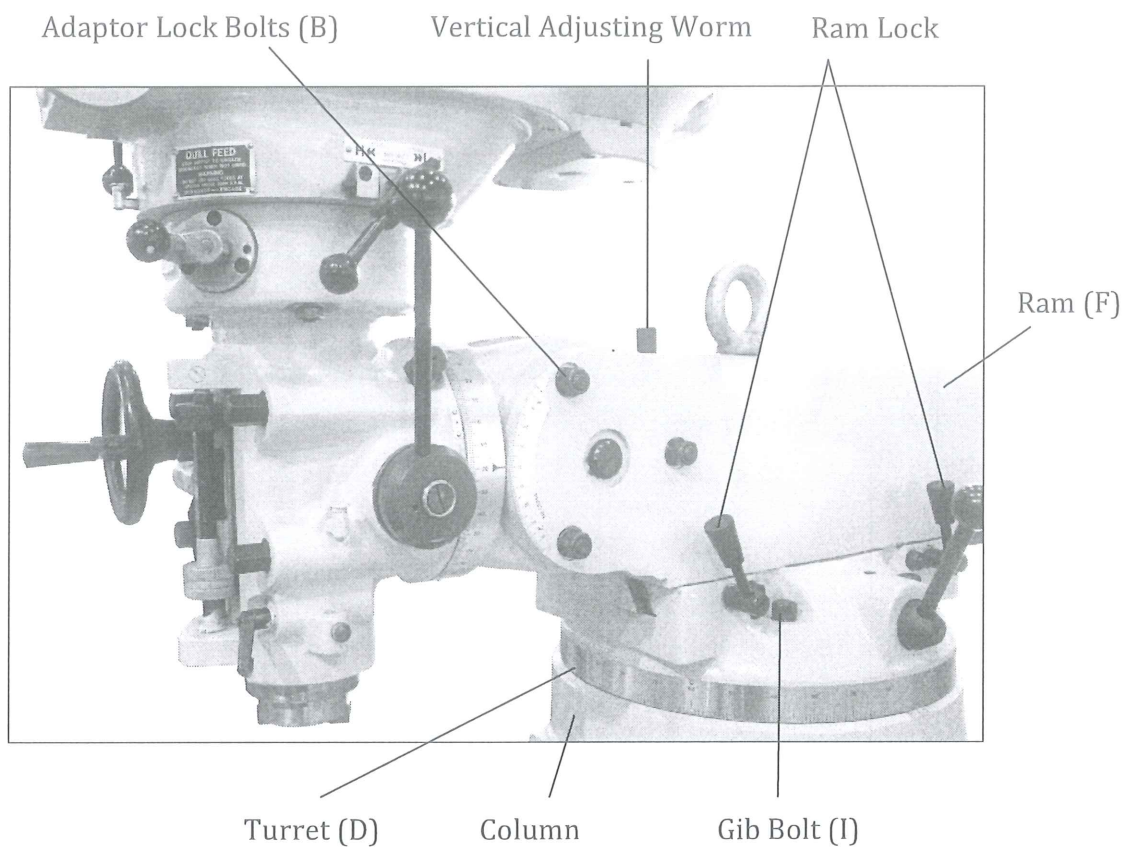


Figure 4

## 2. Tables, Saddle, and Knee:

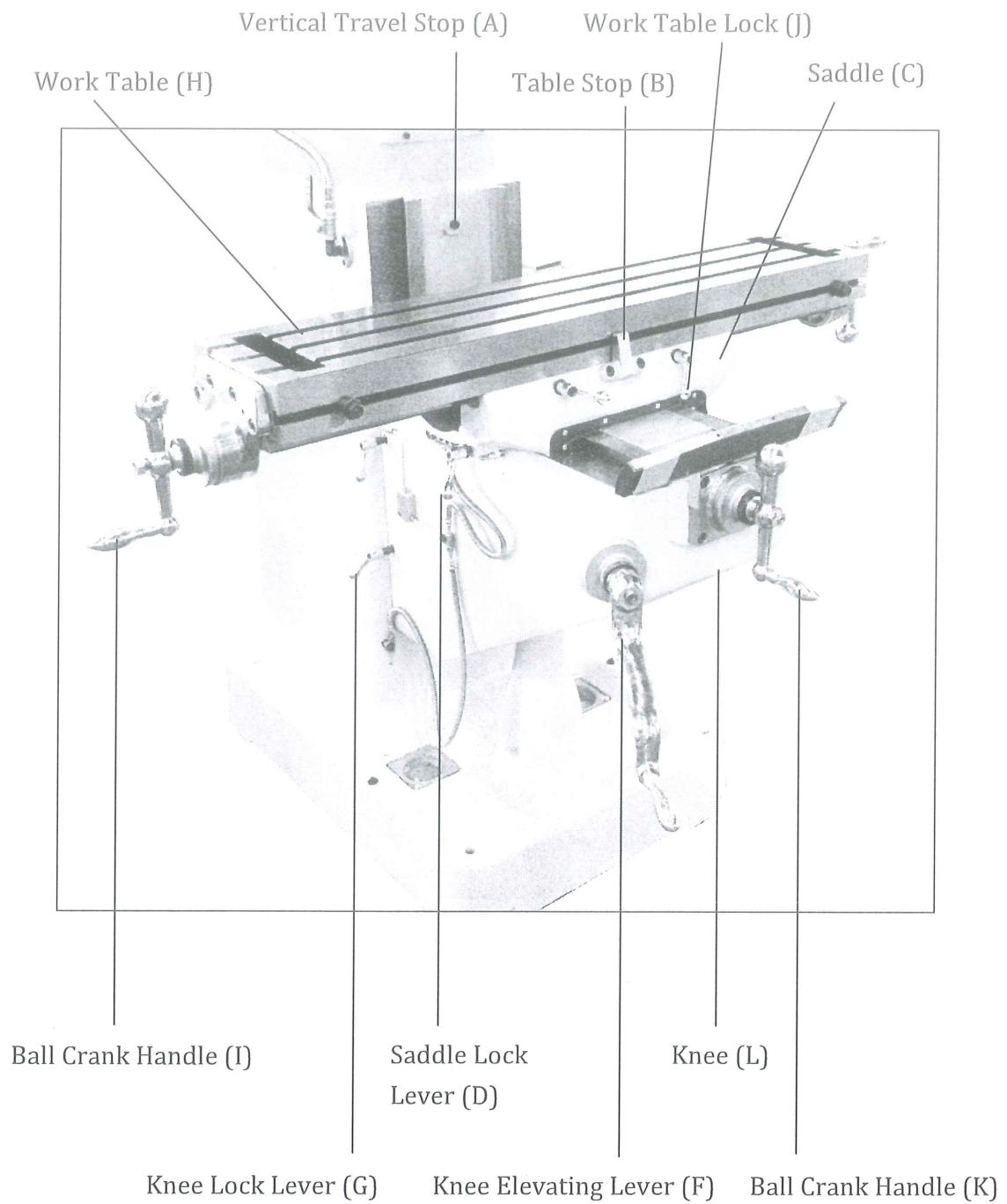


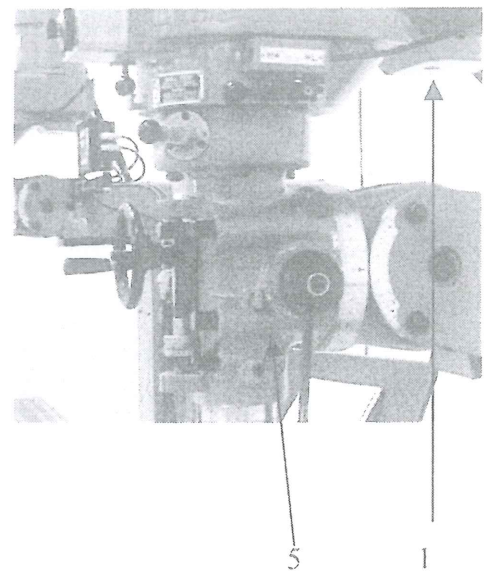
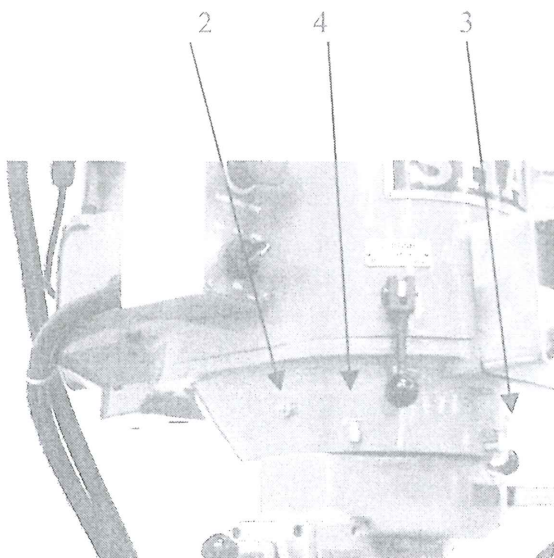
Figure 5



## 5. Lubrication:

### 1. Head:

	1	2	3	4	5
Grease	Grease E.P.NO1	Listan 1	Alvania Grease 1	Mobilux EP1	Cornex Grease NO1



## 2. Table, Saddle, and Knee

Position	The ways, saddle, knee and leadscrews are oiled by means of a manually operated pump, located on the back side of knee.
Frequency	2 pumps 3 to 5 times daily
Lubricant	Shell Tonna 33



Figure 8



## 6. Operation:

### 1. Headstock:

- a. Power to the motor is controlled by a three way switch, forward, reverse, and off (Fig. 9). When the high-low speed change lever (Fig. 3 (J), Page 3) is in high gear position and the switch is in FOR., the spindle rotation is clockwise. When the switch is in REV., the rotation is counter clockwise.

- b. Spindle Brake:

To prevent damage and prolong the life of the brake, the power must be off and the spindle must be below 200 RPM before engaging brake. The brake can be engaged by pushing or pulling the brake lever (Fig. 10). Pulling the brake lever up after it is engaged can lock the brake.

**Caution:** Be sure the brake is in neutral before starting the spindle.

- c. Installation of Collet:

1. Raise the spindle all the way up.
2. Insert collet, being sure the keyway lines up with the pin in the spindle.
3. To tighten, turn the drawbar clockwise while brake is engaged. To remove collet, loosen the drawbar (counter clockwise) three to five turns and tap the drawbar with a soft mallet to break the collet loose from the taper.

NOTE: When the mill is fitted with the R8 spindle, care must be taken that the collet keyway is aligned with the pin in the spindle (Fig. 36, page 35).

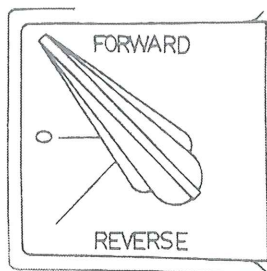


Figure 9

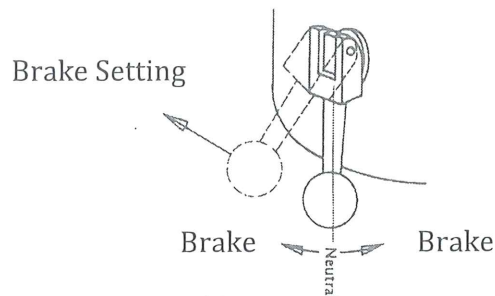


Figure 10

d. Manual Feed:

The manual feed lever is located on the right side of the headstock (Fig. 3 (H), Page 3). This lever controls the vertical movement of the spindle. For the operator's convenience the lever can be adjusted as needed.

Note: in manual feed, the feed control handle "F" (Fig. 11) must be in the "F1" position.

e. Manual Micro-feed:

To use the manual micro-feed, the power-feed transmission lever (J) (Fig. 11) must be placed at the "OUT" position, and the feed reverse knob (D) (Fig. 11) must be in the neutral position. To engage the overload clutch, lever "F" (Fig. 11) must be moved to the "F2" (Fig. 11). You can now turn handwheel "E" clockwise to lower the spindle, counter clockwise to raise it.

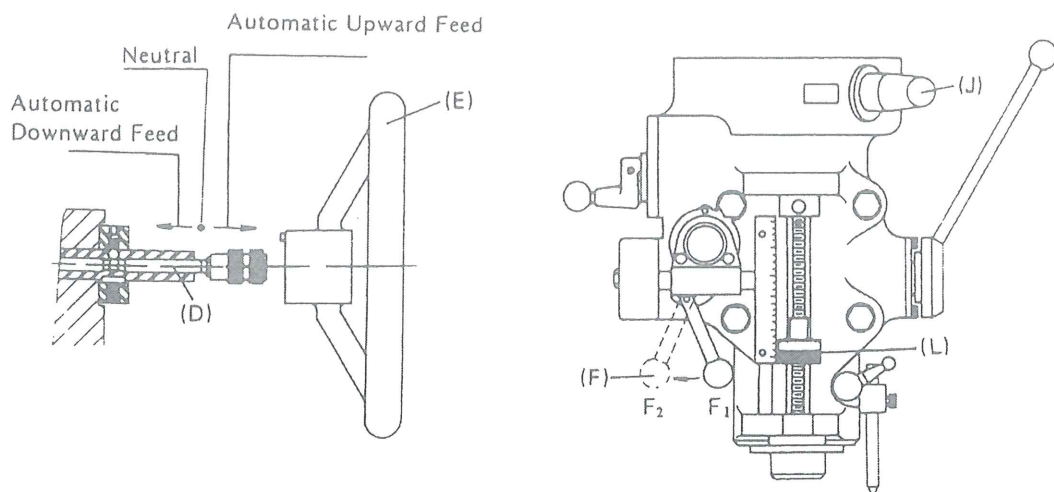


Figure 11

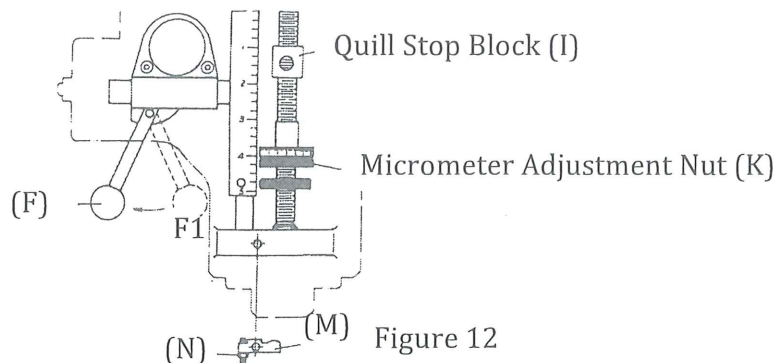
f. Automatic feed:

Procedure for using this function is:

- a. Loosen the quill lock "L" (Fig. 3, Page 3)
- b. Place the power feed transmission lever "I" (Fig. 3, page 3) in the "IN" position.
- c. Place feed speed lever "C" (Fig. 3, Page 3) in the desired position. (H, L, or M).
- d. To engage the overload clutch, place feed control lever "F" to the "F2" position (Fig. 12).
- e. The quill will move down when pressing knob "D" (Fig. 11) in, and pulling it out, the quill will go up (The middle is neutral).
- f. The working depth can be set by the use of micrometer adjustment nut "K" (Fig. 12). This adjusting nut is graduated in 0.001 and 0.02 mm increments. To activate the auto feed, pull the feed control lever "F" out. It will disengage when the adjusting nut contacts the quill stop block "I" (Fig. 12). For manual trip, you can push the feed control lever in manually.

Note:

1. Maximum drilling capacity for automatic feed is 3/8" or 10 mm.
2. The power feed transmission lever "I" (Fig. 3, Page 3) should be in the "OUT" position when the power feed is not being used. To avoid damage to the gears, **do not** engage the power feed when the spindle is running.





g. Spindle speed change:

The speed of spindle is controlled by a set of sliding belt pulleys and a counter shaft gear. There are two options (High and low). High gear is for RPM from 500 to 3,000 and low gear for RPM from 60 and 580. When high-low lever "J" (Fig. 13) is in the forward position it is in high gear, when facing back it is in low gear.

Note: To change from high to low:

- a. The spindle must be stopped.
  - b. Moving the spindle slightly by hand when shifting from high to low makes it easier for the gears to engage. You will feel a click when it engages.
  - c. The direction of the spindle is reversed when in low gear. This can be overcome by the use of "FOR" "REV" switch.
- h. Speed change handwheel:
- a. Do not change speed when spindle is stopped.
  - b. Do not run spindle in excess of 3,000 RPM.
  - c. Slow speed changes are advised, to prevent premature wear on the belt, pulley, and other internal parts.

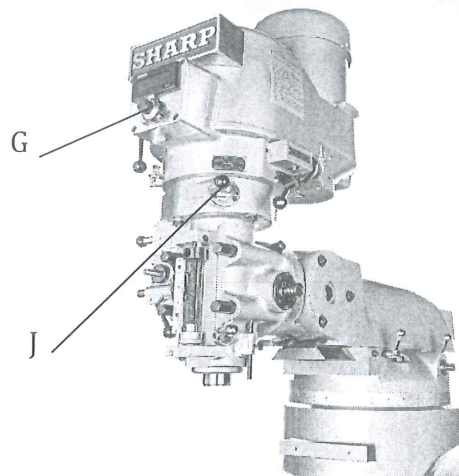


Figure 13

i. Tilting the headstock (Fig. 14):

To tilt the head up or down, evenly loosen the three adapter locking bolts (P) and move to desired angle using adjusting worm shaft "Q". Re-tighten the adapter bolts. NOTE: do not remove adapter bolts.

Cross tilting the headstock (Fig. 15):

Evenly loosen the four lock nuts "R". Using the worm shaft "S" move head to desired angle and retighten lock nuts.

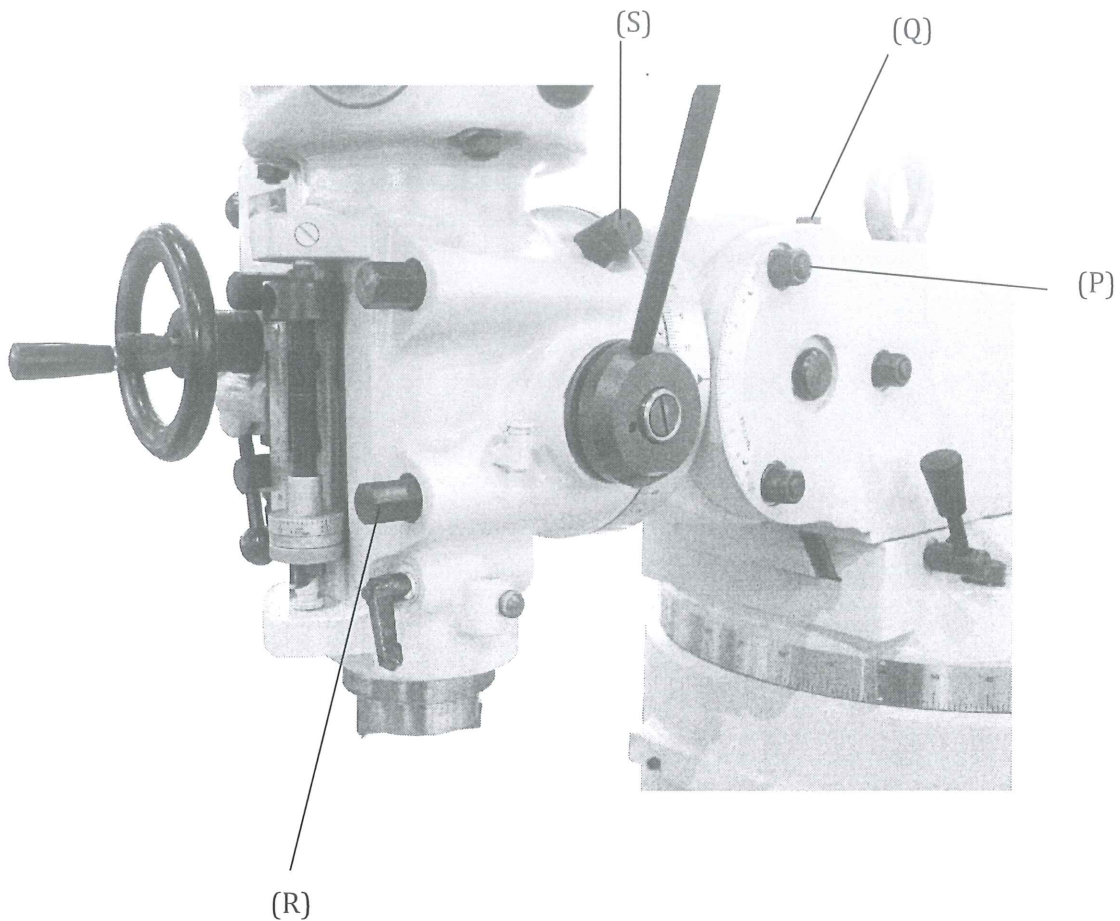


Figure 14 &15

## 2. Machine Body Operation:

### 1. Ram movement (Fig. 17):

- a. To move ram in or out, loosen Ram lock levers "A" and move to desired position using handle "B" and retighten levers.
- b. To swivel ram, loosen the four bolts "C", move to desired position and retighten bolts "C".

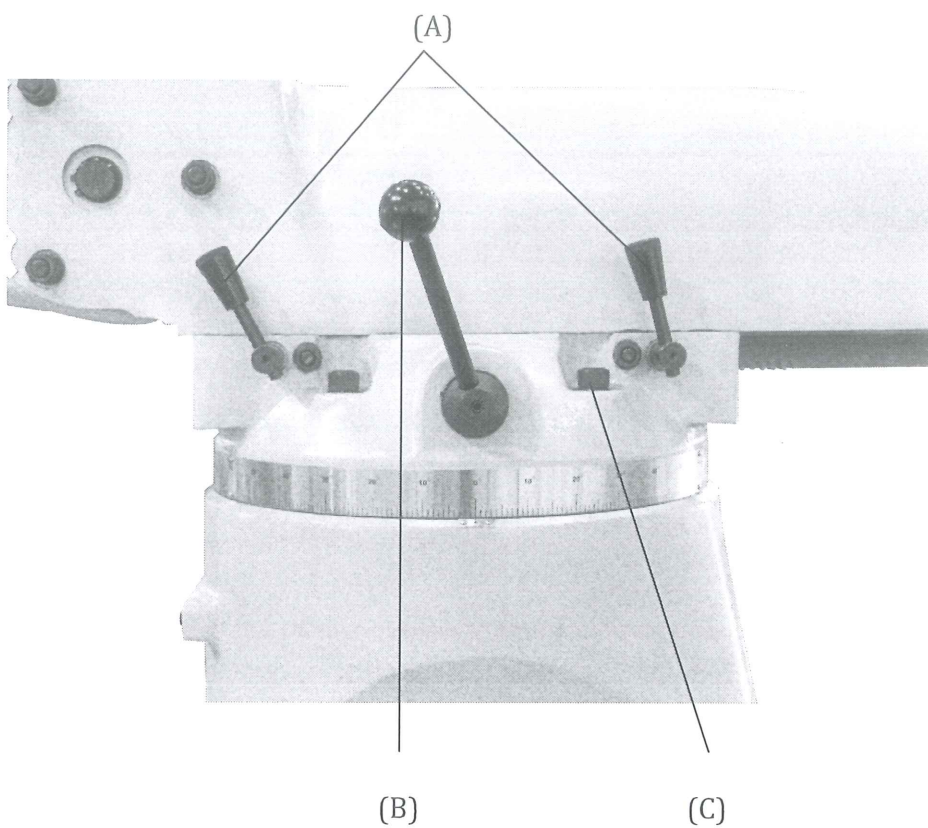


Figure 17

2. Setting handwheel dials to zero (Fig. 18):

- a. Loosen lock ring "D".
- b. Turn dial "E" to zero and tighten lock ring "D".

3. Locking the table, saddle, and knee:

To increase the stability of the mill and maintain a good workpiece finish, all non-feeding surfaces should be locked down. See Fig. 19 for location of locking levers.

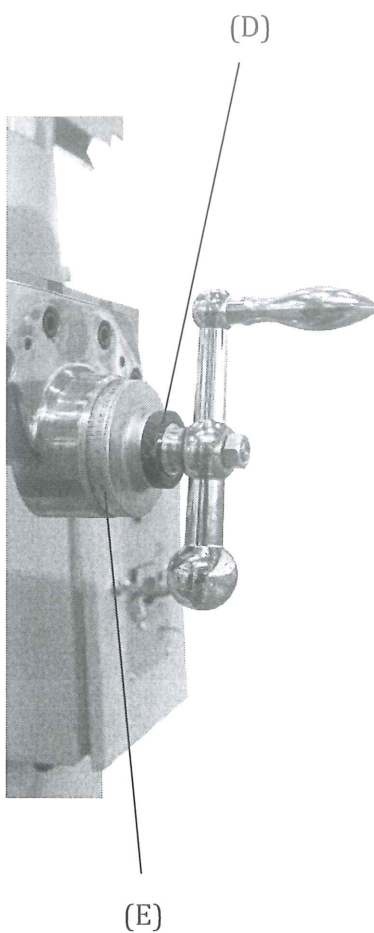
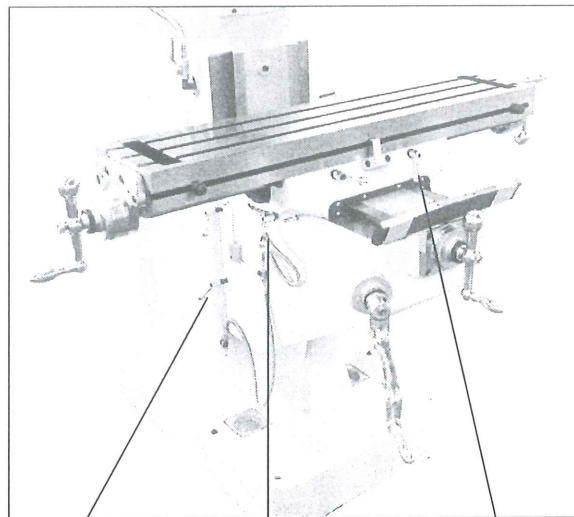


Figure 18



Knee Lock Lever

Saddle Lock  
Lever

Work Table Lock  
Lever

Figure 19



## **7. Unpacking, moving, and floor space:**

### **a. Methods of moving machine:**

1. Prior to unpacking or removing from skid, the machine should be moved by the use of a forklift or reinforced cable (Fig. 20 & 21).
2. Removal from the skid and any further movement of the machine should be done by the use of a reinforced cable or by the eye bolt located in the top of the ram.

### **Remarks:**

1. When lifting or moving machine, be sure area is clear of all personnel.
2. Lifting machine by the use of eye bolt should be only when absolutely necessary.
3. When lifting or moving the machine before unpacking or removing from the skid, observe any precautions or instruction that may be printed on the crate.
4. The machine can be balanced while being moved by changing the location of table and or saddle.
5. Do not attempt to raise the machine too high. The recommended height is approximately 10 cm from the ground.
6. If the machine is not stable when being lifted, adjust the rigging as needed.
7. Only use qualified forklift operators to move the machine.



Figure 20

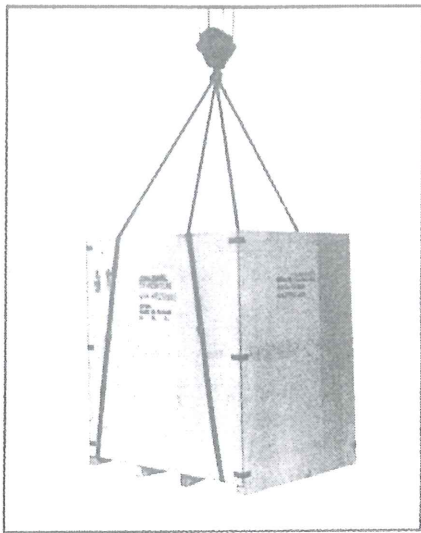


Figure 21

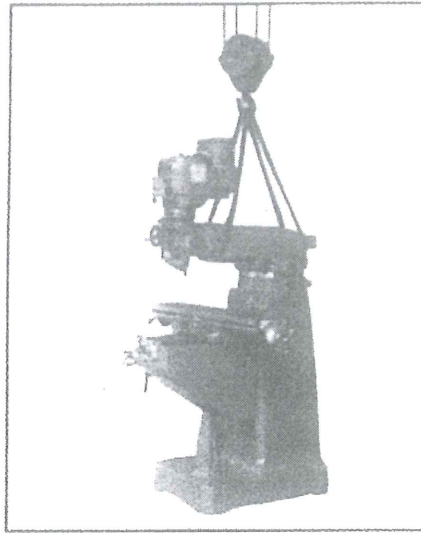


Figure 22

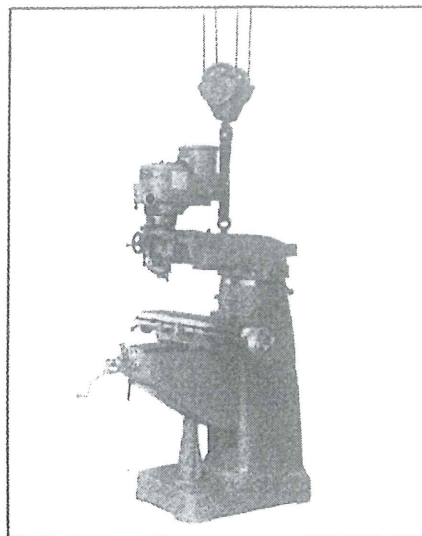
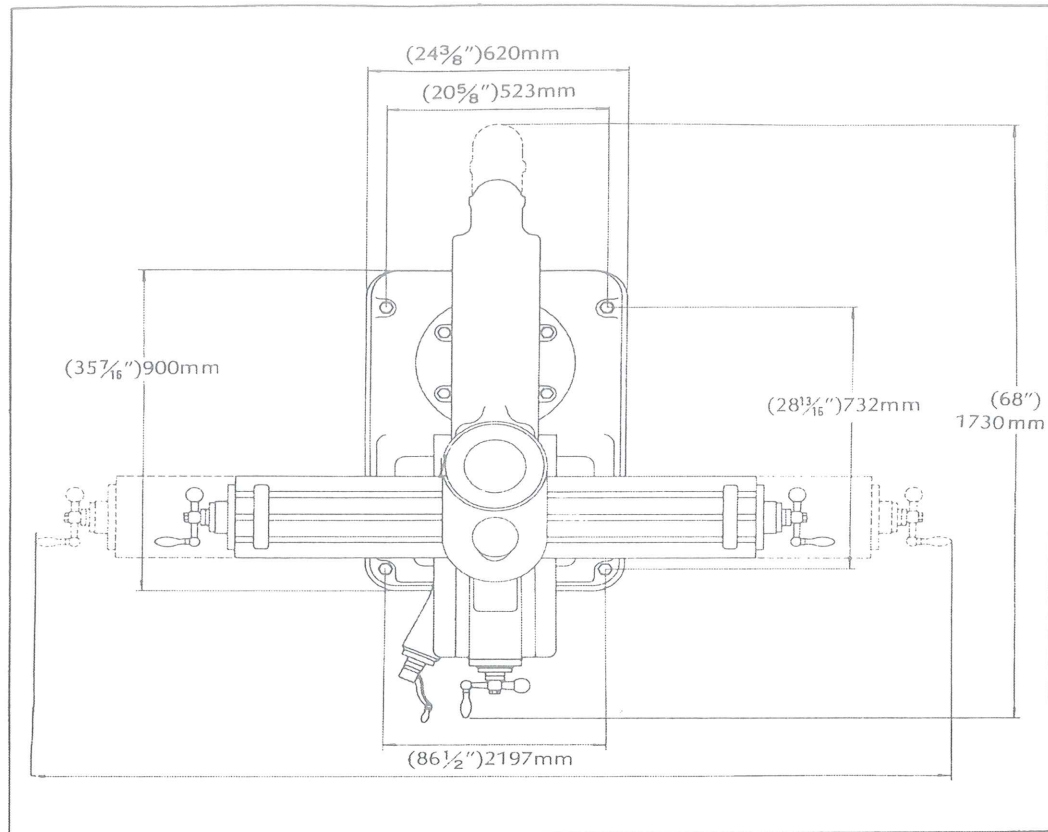


Figure 23

b. Unpacking:

1. To protect the machine while in transit it is necessary to cover it with a rust proof coating and a crate or plastic wrapping. In the event, there is damage due to moisture, please contact our agent or the transporter.
2. After unpacking, make sure all tools and accessories are intact. If not, contact our agent.
3. Restore headstock to its normal position (Fig. 3, Page 3)
4. Do not move the sliding surfaces until all of the protective rustproof coating is removed and all surfaces are well oiled.
5. Do not remove the oil wipers when cleaning the machine.
6. Do not use gasoline or other flammable cleaners.

(C) Floor Space:



(D) Machine Height: 2070 (81½")



7. Machine Alignment:

Maintaining close tolerances and proper alignment of the machine is critical to producing quality-machining results.

Please see the following table of Precision Inspection.

### Variable Speed Head Trouble shooting

Problem	Possible Cause	Solution
Consistent noise in both High and Low gear (Quiet in Neutral)	Upper and lower head not aligned Spindle spline and hub do not match	Align Replace either to match Replace H348 spindle bearing set or H349 top bearing if no chatter is present
Noise in High gear, Low gear & Neutral noise at all speed	Noise frequency follows the speed Noise frequency does not follow the speed	Replace spindle pulleys and H522 bearings.  Replace motor bearings/ Motor
Noise in High gear only	Worn clutch Clutch out of adjustment	Replace H561 & H572 Adjust position of H/L lever
Noise in Low gear only	Bull gear Timing belt  Timing pulley	Lubricate bull gear Hold brake & turn spindle by hand. If more than ¼ turn, replace timing belt. Replace bearing H301
Noise when quill is out	Twisted spindle Alignment of H & L head if noise Depends on position of spindle	Replace spindle  Align head

### Variable Speed Head Trouble shooting

Problem	Possible Cause	Solution
Intermittent Noise (Comes & goes) Noisy on first start up, goes away after 10 to 20 minutes	Drive belt stiff from sitting overnight	Normal
High pitch shriek when start up over 2,500 RPM	Motor shaft needs lubrication	Lubricate motor shaft (Do not over-grease. Excessive lubrication will cause belt to slip)
Vibration and noise in all speed and gears	H531 key too tight	Check key for proper clearance or replace
Noise in H/N/L at any speed, with a constant pitch	Worn or defective motor bearings	Replace motor bearings

### Variable Speed Head Trouble shooting

Problem	Possible Cause	Solution
Auto Quill Feed does not work:		
Wheel responds to feed reverse knob nut does not feed	Damaged worm gear	Replace worm gear (H060) and check for alignment
Auto feed only works in one direction	Broken bevel gear	Replace bevel gear (H115 or H110)
Feed select does not engage	Broken gears	Inspect H102, H104, H126, H324, and H327 (Replace as needed)



## 8. Trouble Shooting:

### 1. Removing Motor (Fig. 25):

- a. While running motor reduce speed to 60 RPM. This will lower the stationary motor vari-disc to its lowest position.
- b. Temporarily disconnect the power source.
- c. Remove motor pulley cover “B” under the motor shaft, remove grease fitting. Use 2 of the screws to insert into the pulley spring washer/ plate “D”, taking care to tighten evenly.
- d. Connect the power and increase the RPM to 3,000, which will raise the motor vari-disc to gain access to the snap ring “G”.
- e. Disconnect the power.
- f. Remove snap ring “G”.
- g. Remove the two motor mounting bolts “H”. You can now remove the motor. (The lower pulley and spring assembly will slide out and remain in the housing.)
- h. Reverse above procedure to re-assemble.

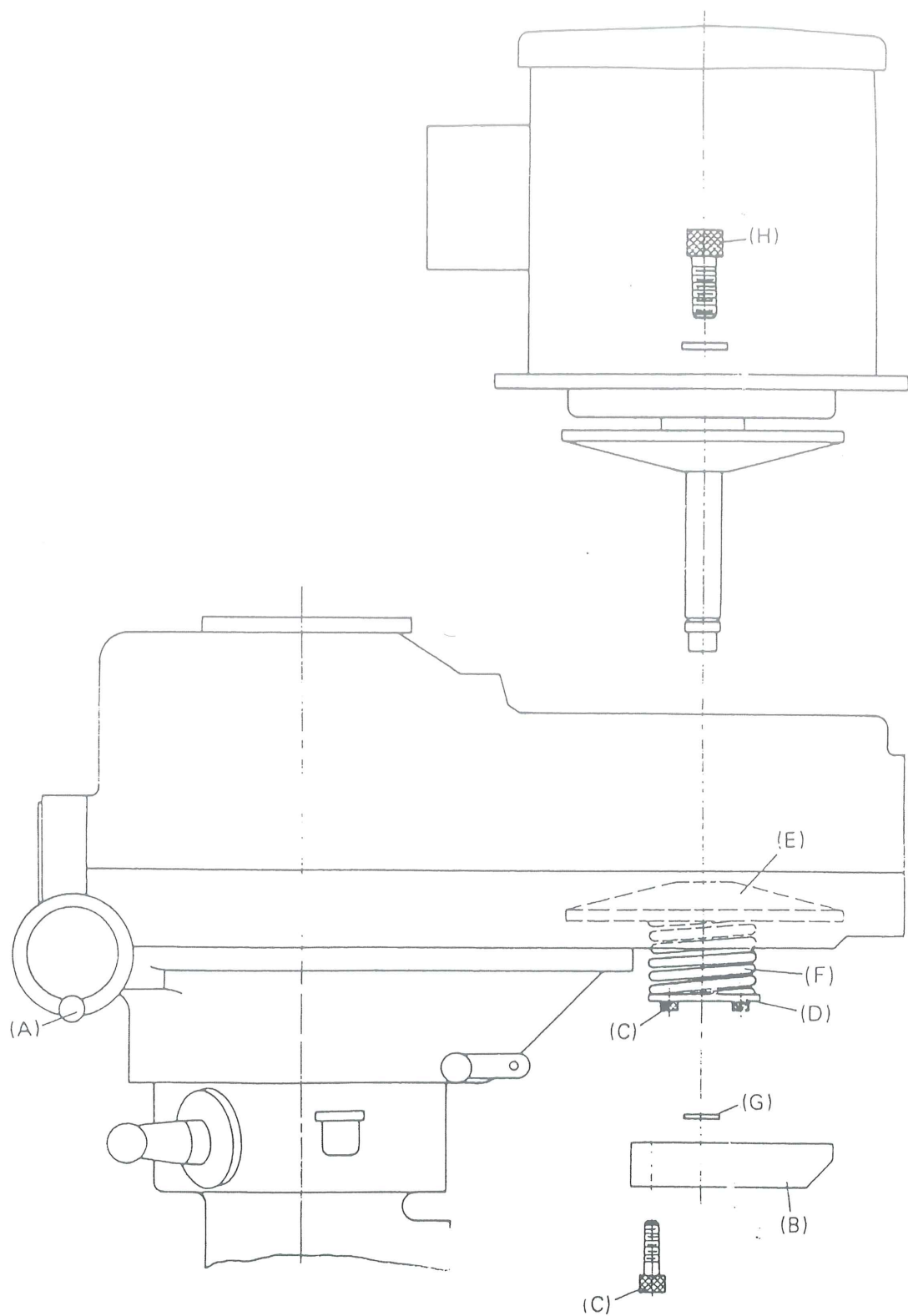


Figure 2<sup>c</sup>

## 2. Replacing the Speed Change Belt

- a. Refer to steps a. to g. on page 24 for removing motor.
- b. Remove drawbar.
- c. Remove bolts “J” from bearing housing “K”. Use 2 of the bolts to push housing off of the housing “T”.
- d. Remove the 2 bolts “L” and sleeves “M” that hold the speed change plate.
- e. Remove “N”, “O”, and “P” (Total of 6 bolts).
- f. Remove the 2 lower bolts “S” on the speed change housing “Q”.
- g. Separate the upper housing “T” because the housings are pinned together, it may be necessary to use a soft mallet to separate them.
- h. After replacing the belt, reverse the above order to re-assemble.

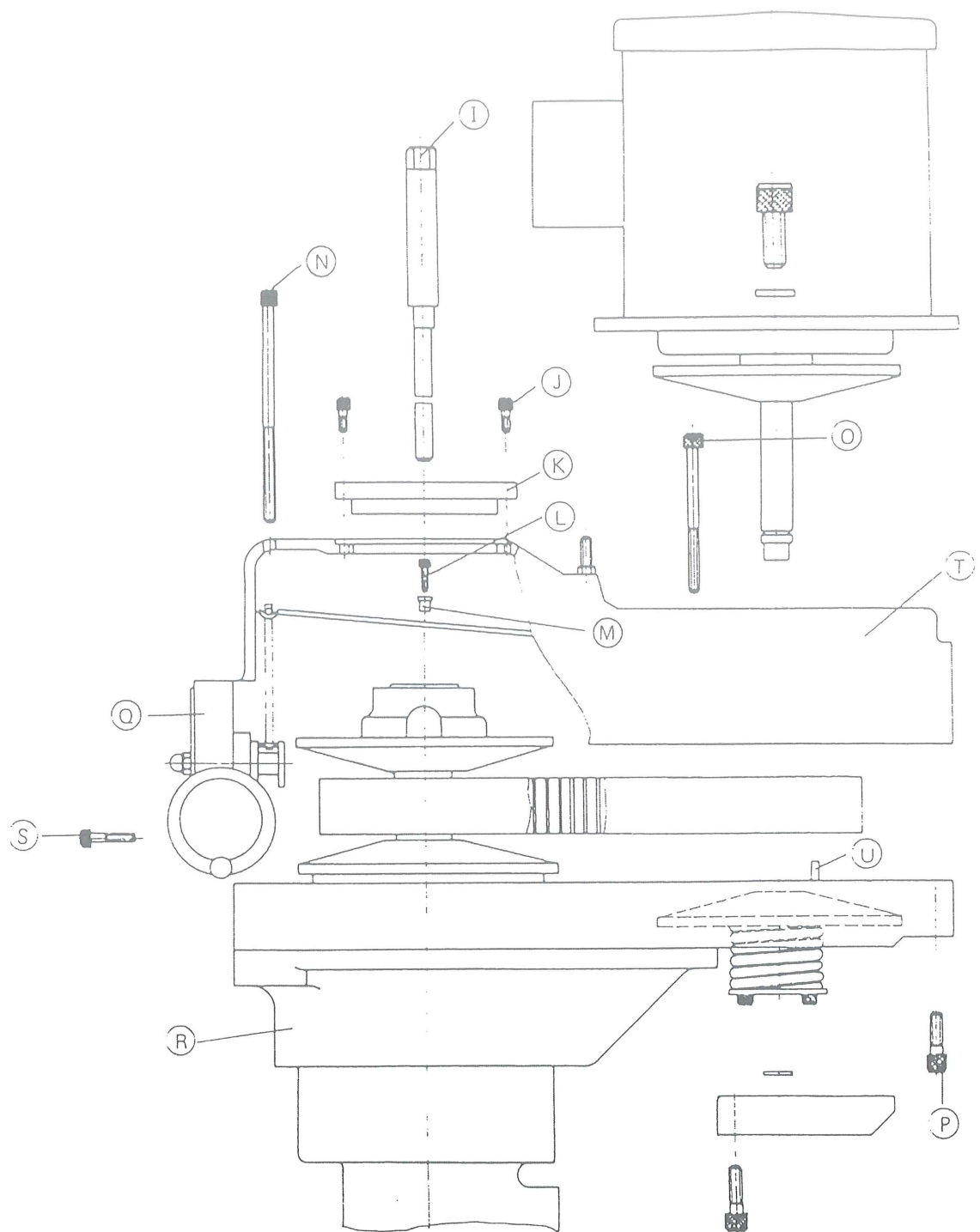


Figure 26



3. Brake Block Replacement (Fig. 27):

- a. Refer to steps a. to g. on page 24 and steps b. to g. on page 26.
- b. Remove the four bolts "V" (Fig. 28) so housing "T1" can be removed. It may be necessary to use a soft mallet. (Housing "T1" and "R" are pinned together).
- c. Remove vari-disk assembly set "E1" (Fig. 27) by removing bolt "X". Brake block "Y" can now be replaced.
- d. Reverse above order to re-assemble.

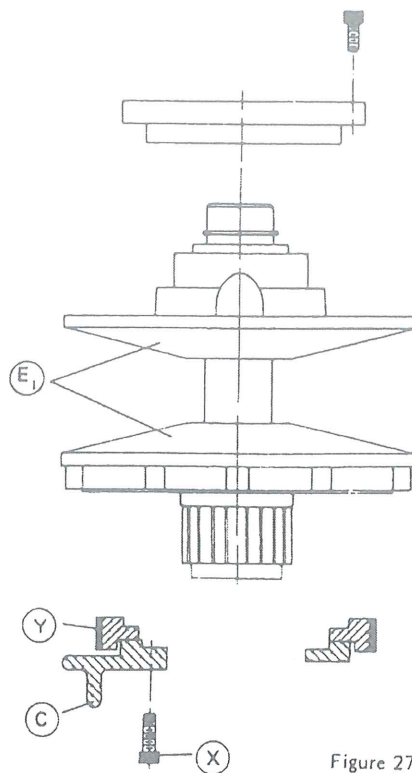


Figure 27

#### 4. Replacing Timing Belt:

- a. Follow disassembling procedures outlined in steps a. to g. on page 24 and steps b. to g. on page 26 and steps b. on page 28.
- b. Change the timing belt as shown in Fig. 28.
- c. Reverse above order to re-assemble.

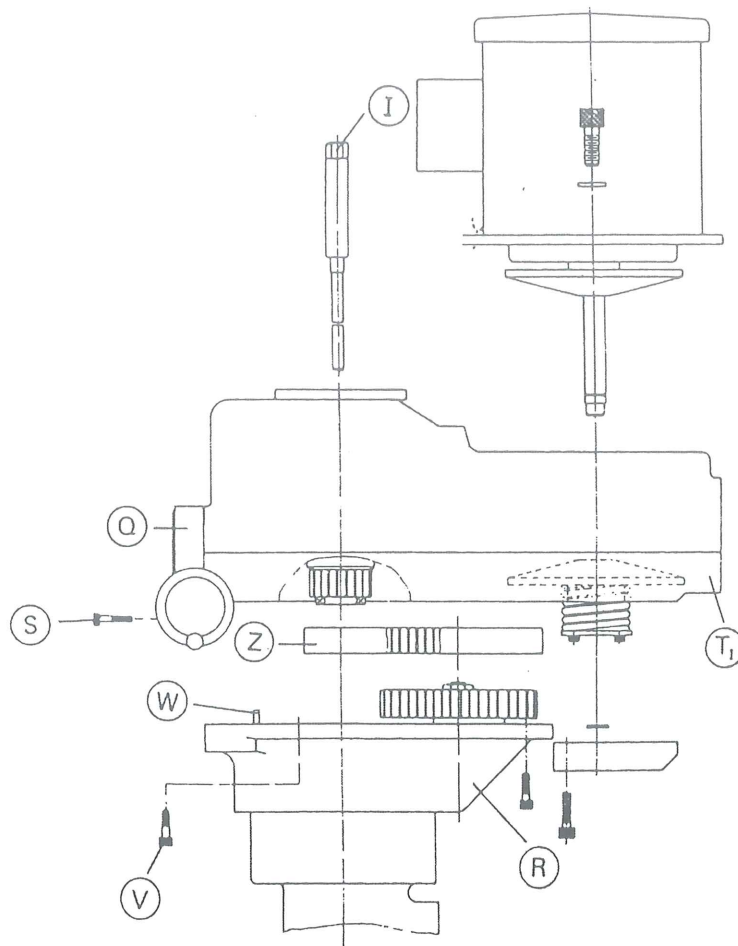


Figure 28

5. Adjusting leadscrew backlash:

A. Y-axis backlash adjustment:

- a. Move saddle to the middle of its travel.
- b. Remove 4 bolts "I" on bearing bracket "G".
- c. Lock saddle and turn hand crank "F" clockwise to separate bracket "G" from the knee.
- d. Unlock saddle and move screw until adjusting tool fits into the space.
- e. Use the large end of the tool to loosen the lock nut "J" (Counter clockwise).
- f. Turn adjusting nut "K" with the small end of the tool to reduce backlash (Counter clockwise).
- g. Using the large end of the tool, tighten lock nut "J".
- h. To re-assemble, turn hand crank "F" counter clockwise to seat.

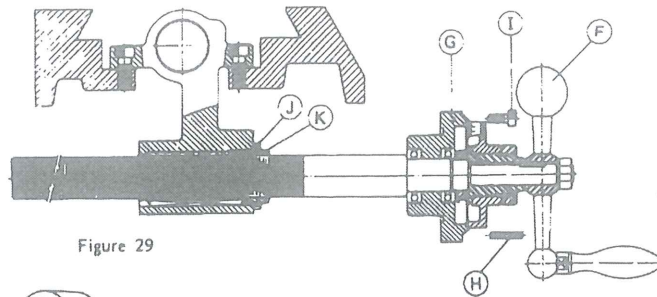


Figure 29

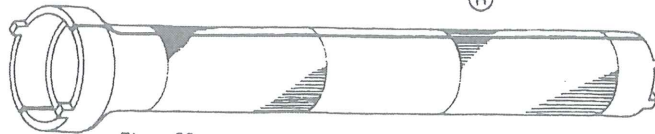


Figure 30

Bracket "G" to the knee, being careful to align the pins and replace bolts "I" to complete the process.

Resulting backlash should be 0.003 to 0.004

B. X axis backlash adjustment;

- a. Move the work table to the center of the saddle.
- b. Insert large end of adjusting tool into the left side of the saddle and turn lock nut "J" counter clockwise approximately one turn.
- c. Using small end of tool tighten adjusting nut "K".
- d. After adjusting nut "K", use large end of tool to re-tighten lock nut "J".

Resulting backlash should be 0.003 to 0.004

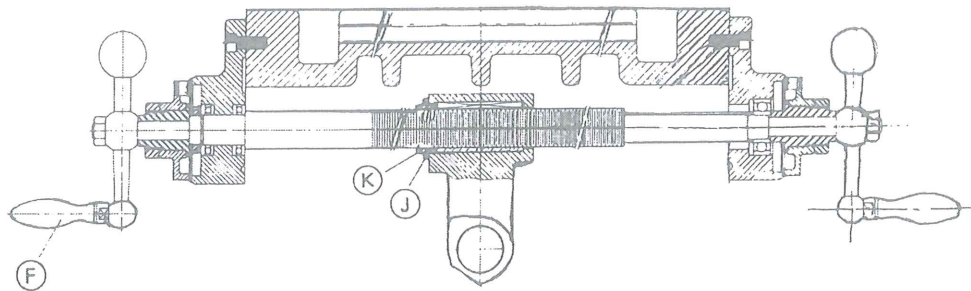


Figure 31

## 6. Adjusting Gibs:

After a period of time the gibs may become loose or worn and may need to be adjusted to maintain the integrity of the mill.

### A. Table Gib (Fig. 32):

The table gib is located between the saddle seat and the table dovetail.

- a. Loosen lock levers "L".
- b. Clean and lubricate slideways.
- c. Using a screwdriver to adjust the gib screws "M" located on both sides of the saddle. If moving the table and screws turn loose, they can be adjusted by:

Slightly loosen the adjusting screw on the right, then tighten the left screw. After adjusting, check movement of table. If still loose, repeat the process until desired fit is obtained.

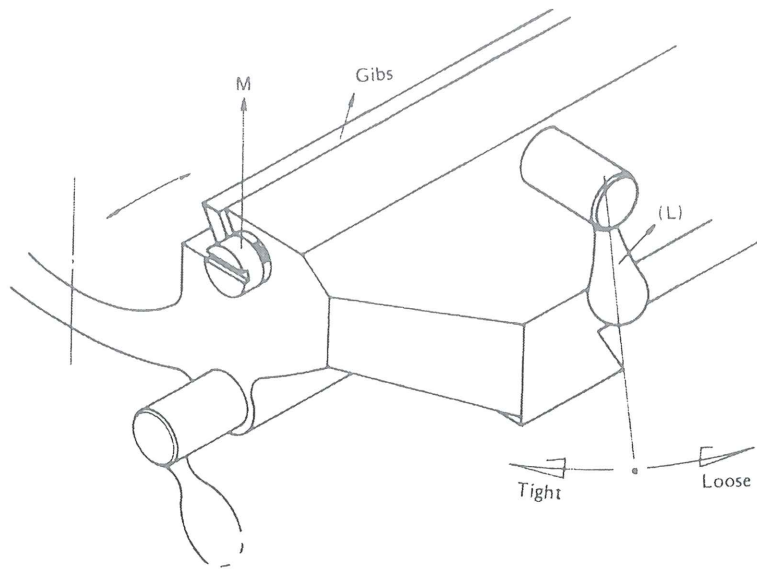


Figure 32



## B. Saddle Gib (Fig. 33)

The saddle gib is located between the left side of the saddle and knee dovetail, and it can be adjusted as follows:

- a. Loosen saddle lock "A".
- b. Move saddle to the front of knee.
- c. Remove wiper holder "B" on saddle.
- d. Clean and lubricate sideways.
- e. Adjusting gib using the same method used on table.
- f. After adjusting, replace wiper holder "B".

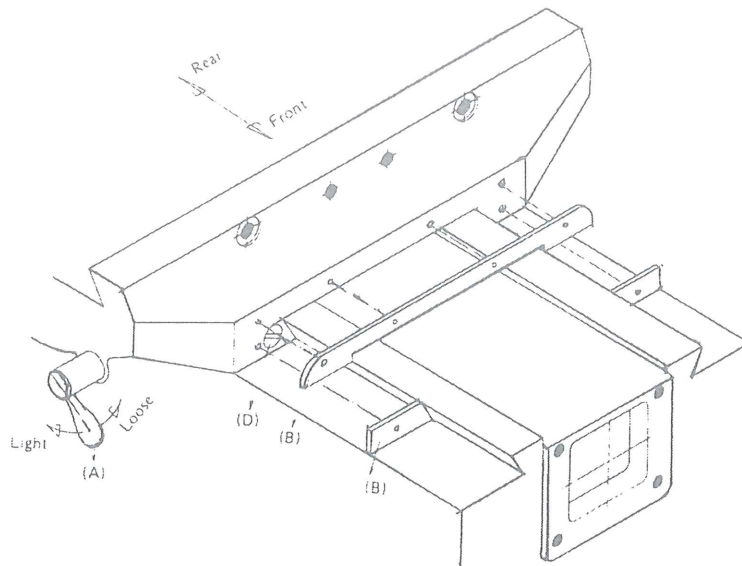


Figure 33

C. Knee Gib (Fig. 34)

The knee gib is located between the left side of knee and column dovetail, and it can be adjusted as follows:

- a. Loosen knee clamp (Fig. 5, Page 5).
- b. Remove wiper holder "Q".
- c. Clean and lubricate sideways.
- d. Raise knee to its uppermost position.
- e. Adjusting gib screw "R" using the same method used on table.
- f. After adjusting, replace wiper holder "Q".

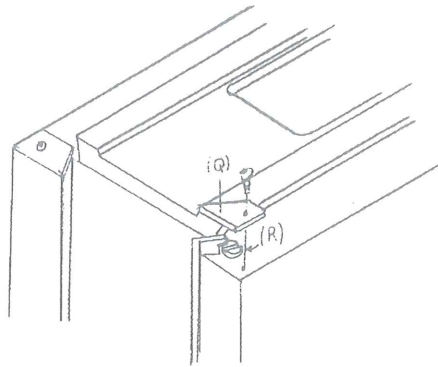


Figure 34

D. Ram Gib (Fig. 35):

The ram gib is located between ram and turret dovetail.

- a. Loosen ram lock lever "C".
- b. Clean and lubricate slideways.
- c. Loosen lock nuts on gib adjusting screw "T", adjust gib and retighten lock nuts.

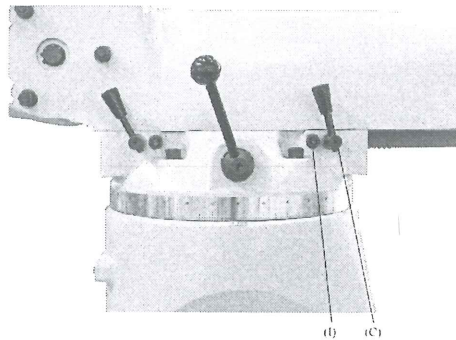


Figure 35

E. Collet Alignment Screw Replacement:

- a. First mark the location of nose piece "B" to its position to quill "A".
- b. Remove set screw "C" located on nose piece. Remove nose piece by inserting an adjustable spanner in two holes in the bottom of nose piece.
- c. Remove set screw "D", insert a collet in the spindle and adjust set screw "D". First, screw it in until it contacts the collet, then back it off approximately  $\frac{1}{4}$  turn to allow 0.25 mm (0.01") play.
- d. If collet fits properly, replace set screw "D" and replace nose piece. Be sure to tighten so that the mark made in step "a" line up.

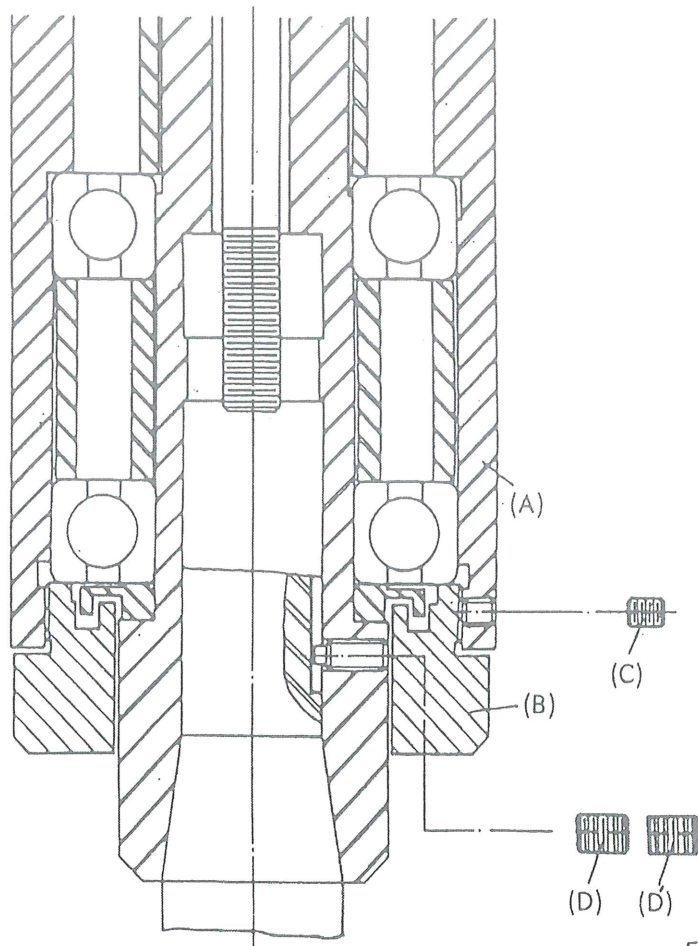


Figure 36

## 10. Maintenance

“Maintenance is more important than repair, and repair is better than purchase.”

The life of a machine can be greatly reduced if it has been properly maintained and operated. The result will be premature wear, inability to hold tolerance and poor finish on the workpiece. It is essential that operator be familiar with the operation and maintenance of the machine.

### Daily Maintenance:

1. Check oil level in the pump (Manual).
2. Lubricate machine per lubrication charts on page 7 & 8.
3. Run machine at 1,200 RPM for 2 to 3 min. prior to operation. This is to allow the belt to stabilize.
4. At the close of each day:
  - a. Workpiece should be removed, (if practical) and work table should be cleaned and oiled.
  - b. All machine locks should be loosened and sliding parts lubricated. If practical, remove cutter.
  - c. Headstock should be returned to its normal position if it has been operated in a tilted position.

### Monthly Maintenance:

- a. Check all clamping rails and sliding surfaces for wear.
- b. Check leadscrew backlash (Adjust if needed).
- c. Check quill lock and other moving parts for proper operation.

### Quarterly Maintenance:

- a. Check brake and belt.
- b. Check if table is square with the head.
- c. Do a general test on machine, check for worn parts and replace as needed.

11. Notice:

1. Machine Operation:

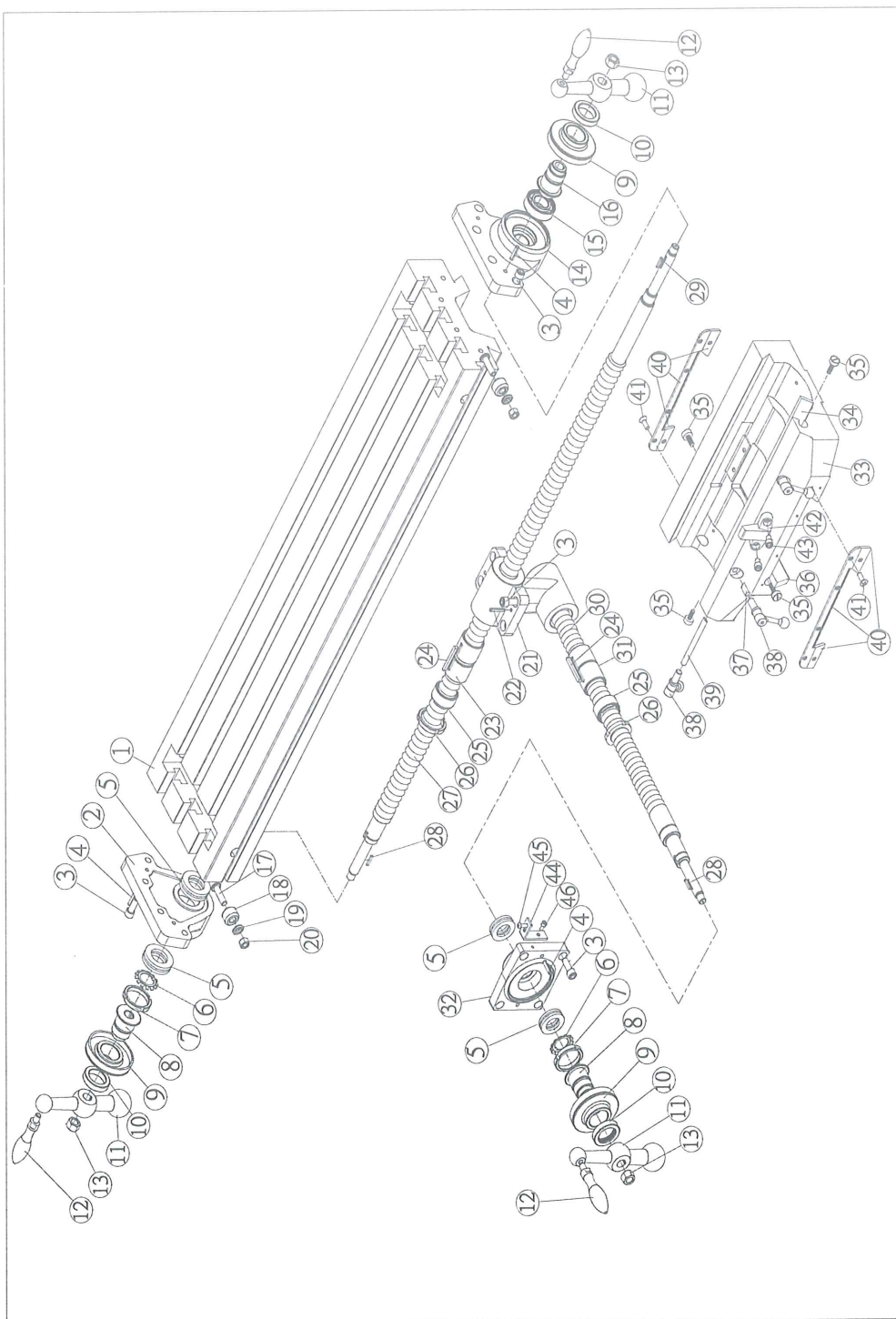
- a. Machine must be installed on a solid base.
- b. Be sure the machine base and surface have proper contact before tightening anchor bolts.
- c. Be sure motor voltage conforms to the source voltage and properly grounded.
- d. Turn off machine before changing gears.
- e. Be sure cutter or tool is clear of the workpiece before starting or stopping the machine.

2. Machine Operator:

- a. Only authorized personnel should operate mill.
- b. If a problem is suspected, stop mill immediately, check for the problem, and make any repair or adjustment that maybe required.
- c. Auto feed lever must be in neutral before starting mill.
- d. Stop machine when inspecting tool or workpiece.
- e. Be certain that workpiece is properly clamped prior machining.
- f. Spindle must be kept clean and lubricated at all times.
- g. Keep tools and other objects off of table to eliminate damage or nicks.
- h. Make sure spindle is up to speed before starting the machining operation.
- i. Use a brush to remove chips.

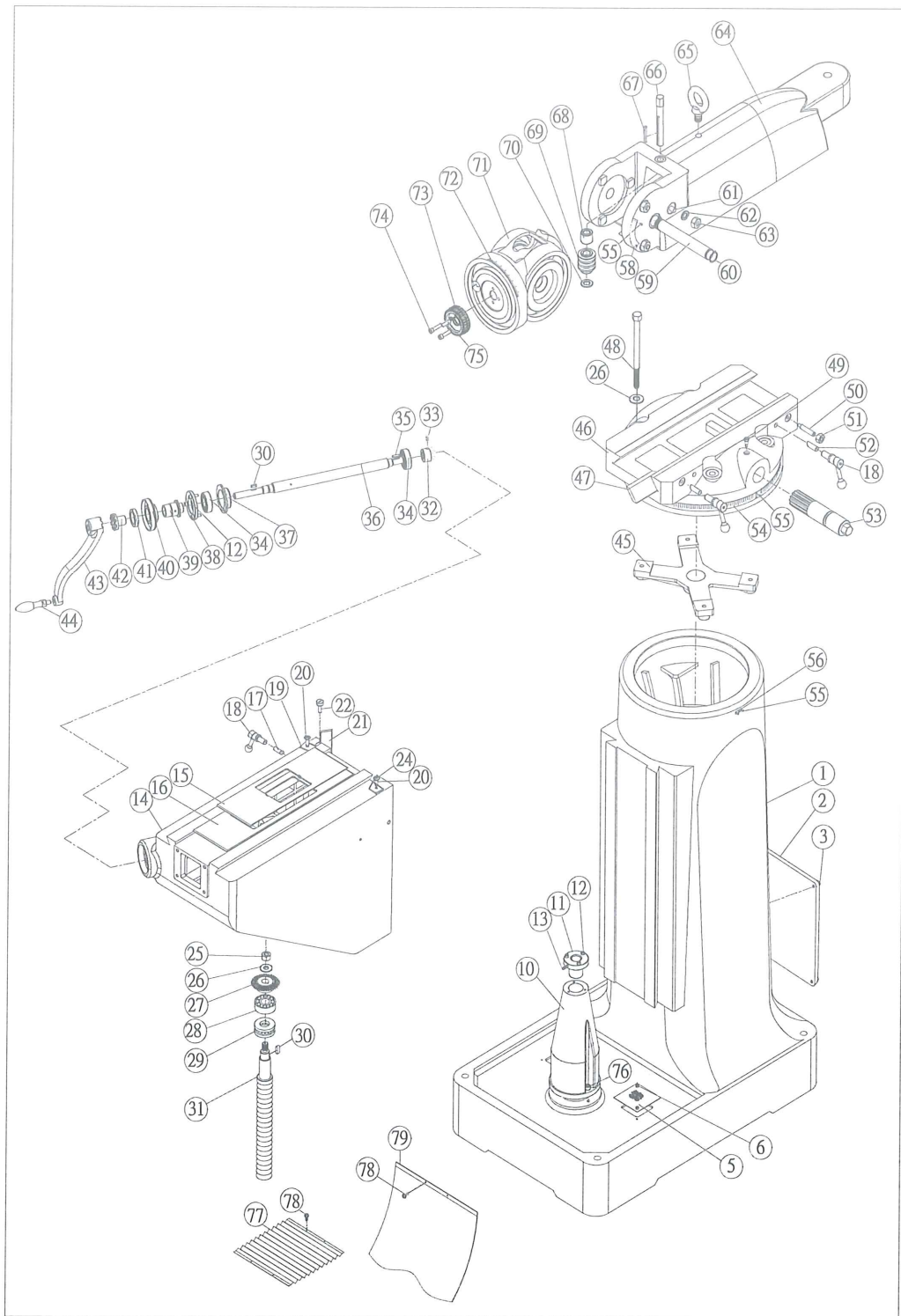


# PARTS LIST



NO.	PART NO.	DESCRIPTION	SPECIFICATION	Q'TY
1	1500-C035	Table	9"×49"	1
2	1500-D011	Left Bearing Bracket		1
3	HADA-W10141	Bolt	3/8"×1"	16
4	HPB-0530	Overload Clutch Lever Spring Plunger	Ø6×25	6
5	BR-51105	Bearing	51105	4
6	AW05-25MM	Lock Washer	AW05	2
7	HAN05	Locknut Washer	AN05	2
8	1500-D021	Dial Holder		2
9	1500-D016	Dial (Mertic Graduation 250mm)		3
10	1500-D006	Dial Nut		3
11	1500-D026	Three handle		3
12	1500-C086	Ball Crank Handle Lever		3
13	HBBE-W040-13	Nut	1/2"	3
14	1500-D012A	Right Bearing Bracket		1
15	BR-6204	Bearing	6204	1
16	1500-D005	Dial Holder		1
17	1500-C031	Stop Piece T-Bolt		2
18	1500-C032	Table Stop Piece		2
19	1500-C073	Washer		2
20	HBBE-W030-16	Nut	3/8"	2
21	1500-D022C	Feed Nut Bracket		1
22	HPB-0530	Overload Clutch Lever Spring Plunger	Ø5×30	2
23	1500-D033A	Longitudinal Feed Nut (Metric)		1
24	HKE-2R-5550	Flat Key	5×5×50	2
25	1500-D017	Backlash Adjustment Nut		2
26	1500-D018	Solid lock nut		2
27	1500-D032D	Longitudinal Feed Screw (Metric able)	Ø32×1503.6	1
28	HKE-2R-3320	Flat Key	3×3×20	2
29	HKE-2R-3325	Flat Key	3×3×25	1
30	1500-D035A	Cross Feed Screw (Metric)	Ø32×604.5	1
31	1500-D034A	Cross Feed Screw Nut (Metric)		1
32	1500-D028A	Cross Feed Bearing Bracket		1
33	1500-C052C	Saddle		1
34	1500-C043	Saddle Table Gib		1
35	1500-C041A	Adjusting Screw		4

36	1500-C049	Saddle Knee Gib		1
37	1500-C059A	Saddle Lock Plunger		2
38	1500-C037A	Table Lock Bolt Handle		3
39	1500-C039	Saddle Lock Plunger		1
40	1500-C044	Felt Wipers		2
41	HADA-W10141	Cross-Recessed Head Screw	3/16" x5/8"	12
42	1500-C042	Table Stop Bracket		1
43	HADA-W10030	Bolt	3/8" x5/8"	2
44	1500-C155	Front Rubber Chip Cover Shaft Bracket		2
45	HAEC-W150050	Cross-Recessed Head Screw		2
46	HCAP-M05010	Bolt		2

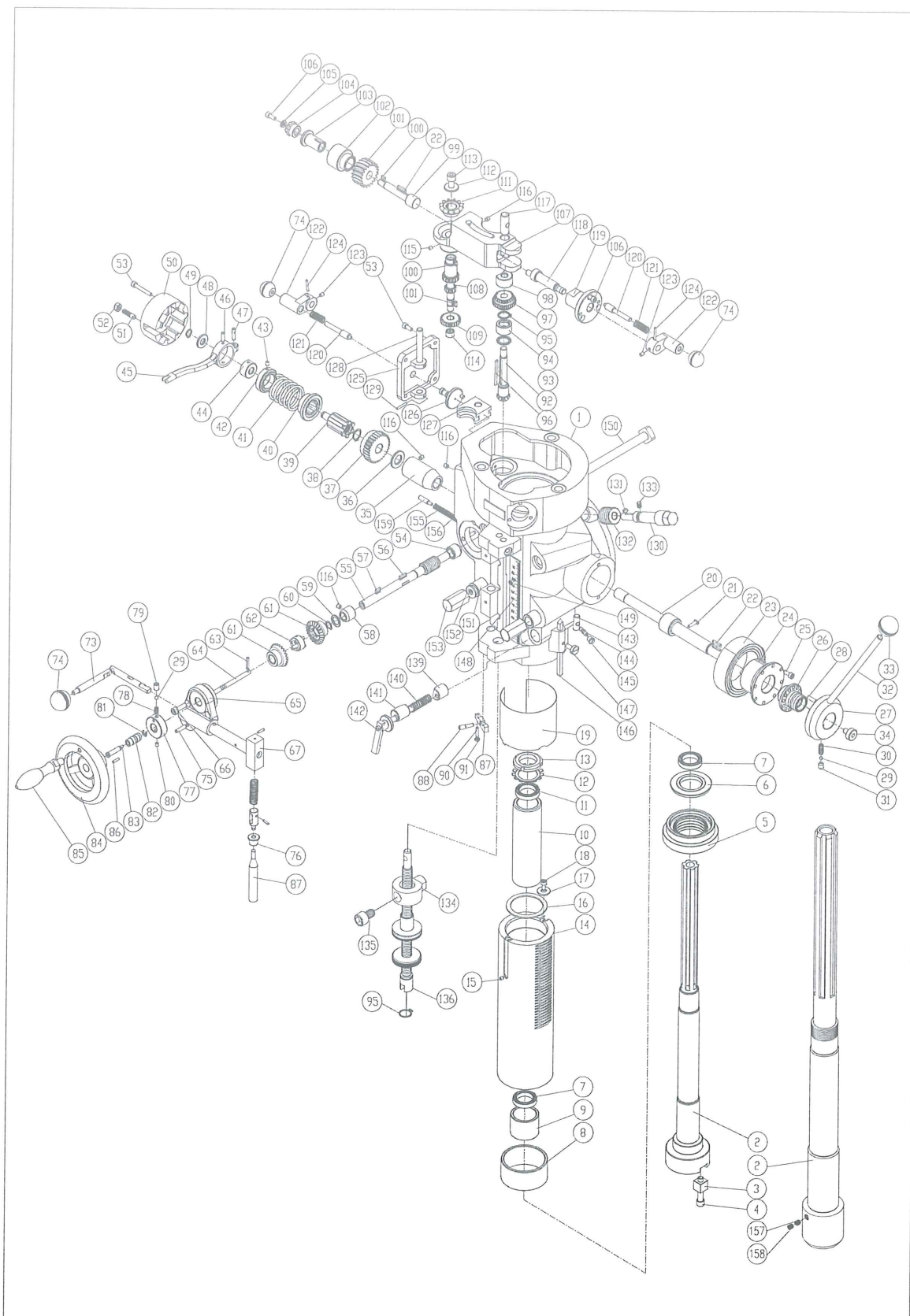




NO.	PART NO.	DESCRIPTION	SPECIFICATION	Q'TY
1	L-C271	Body		1
2	1500-C125	Back cover		1
3	HCAP-M06015	Hex-Soket Head Cap Screw	M6x 15	4
5	1500-C130	Filter Oil Net		2
6	HCAP-M05010	Hex-Soket Head Cap Screw	M5 × 10	4
7	1500-C170B	Level Screw And Nut		4
8	HBBE-W070	Nut	W7/8*32*18	4
9	1800-C146	Leveling Pads		4
10	1500-C103	Elevating Screw Housing		1
11	1500-C139	Elevating Screw Nut(Metric)		1
12	HCAP-M06020	Hex-Soket Head Cap Screw	M6 × 20	6
13	J2-0309	Nozzle	1/8PT	1
14	1500-C175	Knee		1
15	1500-C061	Chip Guards (Down)		1
16	1500-C060A	Chip Guards (Up)		1
17	1500-C069	Knee Lock Plunger		2
18	1500-C037	Table Lock Bolt Handle		4
19	1500-C044	Gear Shaft Clutch Insert		1
20	HADA-W10141	Cross-Recessed Head Screw	3/16 ×15	2
21	1500-C055	Knee Column Gib		1
22	1500-C041A	Adjusting Screw		2
24	1500-C044	Felt Wipers		1
25	HBBE-W031	Nut	1/2"	1
26	1500-C076	Washer		5
27	1500-C077	Bevel Gear (Big)		1
28	BR-6205	Bearing	6205	1
29	BR-51305	Bearing	51305	1
30	HKE-2R-5515	Flat Key	5x5x15	2
31	1500-C137	Elevating Screw (Metric)		1
32	1500-C096	Bevel Gear(Small)		1
33	HSET-M06010	Set Screw	M6x10	1
34	BR-6204	Bearing	6204	2
35	HKE-2R-5550	Flat Key	4x4x20	1
36	1500-C094	Elevating Shaft		1
37	1500-C092	Bearing Housing		1
38	1500-C090	Bearing Cap		1

39	1500-C088	Dial Holder		1
40	1500-C138	Dial With 125 Graduation(Metric)		1
41	1500-D006	Dial Nut		1
42	1500-C085	Gear Shaft Clutch Insert		1
43	1500-C084	Elevating Crank		1
44	1500-C083	Ball Crank Handle Lever		1
45	1500-C118	Spider		1
46	1500-C124	Turret		1
47	1500-C111	Turret-Ram Gib		1
48	1500-C127	Locking Bolt		4
49	1500-C128	Ram Pinion Set		1
50	1500-C110	Gib Lock Screw		2
51	HWS-3/8	Nut	3/8"	2
52	1500-C126	Ram Lock Plunger	.	2
53	1500-C120	Ram Pinion		1
54	N1500-C048	Turret scale		1
55	Ø2x5	Small Rivet Nut	Ø2x5	8
56	N1500-C144	Zeroing Point Plate		1
58	N1500-C015	Angle Plate		1
59	1500-C017	Adaptor Pivot Stud		1
60	HSTW-S28	Snap Ring C-Type	S-28	2
61	L-C473	Adaptor Locking Bolt		6
62	HWA-1/2	Washer	1/2"	6
63	HWS-1/2	Nut	1/2"	6
64	L-C224	Ram		1
65	1500-C011	Hook		1
66	1500-C008	Vertical Adjusting Worm Shaft		1
67	HKE-2R-5550	Flat Key	5x5x50	1
68	1500-C012	Worm Thrust Washer		1
69	1500-C006	Vertical Adjusting Worm		1
70	1500-C007	Washer		1
71	L-C225	Ram Adaptor		1
72	N1500-C003	Adaptor Scale		1
73	1500-C001	Quill Housing Adjusting Gear		1
74	HAEC-W025112	Hex-Soket Head Cap Screw	5/16x11/2	2
75	HPB-0830	Overload Clutch Lever Spring Plunger	Ø8x30	1
76	HCAP-M05010	Hex-Soket Head Cap Screw	M10 × 20	2

77	1500-C142	Rubber Chip Cover ( Front, Wave)		1
78	HAEC-M05010	Cross-Recessed Head Screw	M5×10	8
79	1500-C135	Rubber Chip Cover ( Rear, Flat )		1



NO.	PART NO.	DESCRIPTION	SPECIFICATION	Q'TY
1	1500-B192	Milling Head		1
2	L-H166	Spindle		1
3	1500-B026	Stop Block		2
4	5/16"x5/8"	Hex Socket Head Cap Screw	5/16"x5/8"	2
5	1500-B194	Nut	NT30	1
	L-H172	Nut	R8	1
6	1500-B134	Spindle Dirt Shield		1
7	BR-7207	Bearing	7207	2
8	1500-B137	Bearing Spacer (Large)		1
9	1500-B136	Bearing Spacer (Large)		1
10	L-H176	Sleeve		1
11	BR-6206	Bearing	6206	1
12	AW06-30MM	Lock Washer	AW-06	1
13	1500-B129	Locknut Washer	(M30)	1
14	L-H167	Quill		1
15	HSET-M05005	Set Screw	M5x5	2
16	<del>1500-B151</del>			+
17	HWA-M5	Washer	M5	1
18	HCAP-M05010	Hex Socket Head Cap Screw	M5x10	2
19	1500-B128	Quill Skirt		1
20	1500-B166	Quill Pinion Shaft		1
21	1500-B168	Pin		1
22	HKE-2R-3318	Flat Key	3x3x18	1
23	1500-B178	Clock Spring		1
24	1500-B177	Spring Cover		1
25	HCAP-M05012	Hex Socket Head Cap Screw	M5x12	2
26	1500-B176A	Pinion Shaft Hub Sleeve		1
27	1500-B175	Back Feed Handle Hub (Quill Feed Lever)		1
28	HPB-0516	Overload Clutch Lever Spring Plunger	Ø5x16"	1
29	HETC-W015	Steel Ball	3/16"	1
30	1500-B174	Compression Spring		1
31	HSET-W025030	Set Screw	5/16"x3/8"	1
32	1500-B190	Pinion Shaft Hub Handle		1
33	1500-B191	Black Plastic Ball	3/8"	1
34	1500-B172	Pinion Shaft Hub Screw		1
35	1500-B090	Quill Pinion Shaft Bushing		1



36	1500-B091	Washer		1
37	1500-B092+B093	Overload Clutch Worm Gear		1
38	HSTW-S15	Snap Ring C-Type	S-15	1
39	1500-B081	Over Load Clutch		1
40	1500-B080	Overload Clutch		1
41	1800-B079	Safety Clutch Spring		1
42	1500-B078	Overload Clutch Locknut		1
43	HSET-M05005	Set Screw	M5x5	1
44	1500-B075	Clutch Ring		1
45	1500-B096	Overload Clutch Trip Lever		1
46	1500-B074	Clutch Ring Pin		2
47	HPB-0518	Overload Clutch Lever Spring Plunger	Ø5x18	1
48	1500-B097	Overload Clutch Washer		1
49	HSTW-S10	Snap Ring C-Type	S-10	1
50	1500-B099	Clutch Arm Cover		1
51	HSET-W020060	Set Screw	1/4"x3/4"	1
52	HBBA-W020	Nut	1/4"	1
53	HCAP-M05035	Hex Socket Head Cap Screw	M5x35	2
54	1500-B042	Bushing		1
55	1500-B057	Feed Worm Shaft		1
56	HKE-2R-3315	Flat Key	3x3x15	1
57	HKE-2R-3310	Flat Key	3x3x10	1
58	1500-B044	Feed Worm Shaft Bushing		1
59	1500-B047	Feed Worm Shaft Thrust Washer		1
60	HSTW-S12	Snap Ring C-Type	S-12	1
61	1500-B049	Feed Reverse Bevel Gear		2
62	1500-B050	Feed Reverse Clutch		1
63	HPB-0312	Overload Clutch Lever Spring Plunger	Ø3x20	1
64	1500-B055	Reverse Clutch Rod		1
65	L-H017	Feed Trip Bracket		1
66	HCAP-M06020	Hex Socket Head Cap Screw	M6x20	2
67	1500-B118	Cam Rod Sleeve Assembly		1
		Spring	1500-B120	1
		Trip Plunger	1500-B121	1
	HPB-0312	Overload Clutch Lever Spring Plunger	Ø3x12	1
	HPB-0314	Overload Clutch Lever Spring Plunger	Ø3x14	1
		Cam Rod	1500-B103	1



73	1500-B104	Trip Handle		1
74	1500-A046	Black Plastic Ball 1/4" Dia	1/4"	3
75	HPB-0520	Overload Clutch Lever Spring Plunger	Ø5x20	1
76	1500-B123	Trip Plunger Bushing		1
77	1500-B113	Hand wheel Clutch		1
78	1500-B115	Compression Spring		1
79	1500-B116	Hand wheel Clutch Spring Screw		1
80	HSET-W020020	Set Screw	1/4"x1/4"	1
81	HSTW-E5	SNAP RING E-Type	E5	1
82	1500-B111	Feed Reverse Knob Stud		1
83	1500-B110	Feed Reverse Knob Stud Bolt		1
84	1500-B125	Hand wheel & Hand wheel Handle		1
85	1500-B126	Ball Crank Handle	M8P1.25	1
86	HPB-0316	Overload Clutch Lever Spring Plunger	Ø3x16	1
87	1500-B124	Feed Trip Plunger		1
88	1500-B146	Trip Lever Pin		1
89	1500-B145	Feed Trip Lever		1
90	HSET-M04020	Set Screw	M4x20	1
91	HBBE-M04	Nut	M4	1
92	1500-B031	Cluster Gear Shaft		1
93	1500-B034	Bevel Gear Thrust Spacer		1
94	1500-B033	Bevel Gear Bushing		1
95	HSTW-S16	Snap Ring C-Type	S-16	1
96	HKE-2R-3345	Flat Key	3x3x45	1
97	1500-B028	Cluster Gear		1
98	1500-B027	Cluster Gear Shaft Upper Bushing		1
99	L-H690	Feed Drive Worm Gear Shaft		1
100	HKE-2R-3308	Flat Key	3x3x8	1
101	L-H126	Feed Drive Worm Gear		1
102	L-H688	Worm Cradle Bushing		1
103	L-H687	Feed Worm Gear Shaft Sleeve		1
104	1500-B003	Feed Bevel Pinion		1
105	1500-B002	Washer		1
106	HCAP-M05012	Hex Socket Head Cap Screw	M5xx12	1
107	L-H689	Worm Gear Cradle		1
108	1500-B036	Feed Driving Gear		1
109	1500-B040	Feed Drive Gear		1

110	HKE-2R-3310	Flat Key	3×3×10	1
111	1500-B015	Feed Reverse Bevel Gear		1
112	1500-B013	Washer		1
113	HCAP-M08016	Hex Socket Head Cap Screw	M8×16	1
114	BR-BA0606	Bearing	BA66	1
115	1500-B054	Set Screw M6×25		1
116	HSET-M06006	Set Screw	M6×6	1
117	1500-B016	Feed Engage Pin		1
118	1500-B018	Worm Gear Cradle Throw-Out		1
119	1500-B019	Shift Sleeve		1
120	1500-B020	Gear Shift Plunger		1
121	1500-B021	Compression Spring		1
122	1500-B023	Shift Crand		1
123	HSET-W020020	Set Screw	1/4"×1/4"	2
124	HPB-0320	Overload Clutch Lever Spring Plunger	3×20	1
125	1500-B066	Cluster Gear Cover		1
126	1500-B064	Cluster Gear Shift Crank		1
127	1500-B063	Feed Gear Shift Fork		1
128	1500-B060	Feed Shift Rod		1
129	HPB-0318	Overload Clutch Lever Spring Plunger	3×18	1
130	1500-B189	Adj Worm Shaft		1
131	HKE-2R-4418	Flat Key	4×4×18	1
132	1500-B186	Warm Gear		1
133	1500-B140	Set Screw		1
134	1500-B163	Quill Stop Knob		1
135	HCAP-W030050	Hex Socket Head Cap Screw	3/8"×5/8"	1
136	1500-B164	Quill Stop Micro-Screw (Meter)		1
	1500-B165	Quill Lock Sleeve	1500-B199	1
		Quill Lock Sleeve	1500-B162	1
		Quill Lock Sleeve	1500-B198	1
		Retaining nut	1500-B161	1
		Retaining nut	1500-B197	1
139	1500-B148	Quill Lock Sleeve		1
140	1500-B200	Springs		2
141	1500-B153	Quill Lock Sleeve Tapped		1
142	1500-B149	Quill Lock Bolt & Spring	5/16"-18UNC	1
143	1500-B184A	Feed Reverse Trip Plunger		1

144	1500-B183	Reverse Trip Ball Lever		1
145	1500-B185	Reverse Trip Ball Lever Screw		1
146	1500-B147	Indicator Rod		1
147	1500-B154	Indicator Rod Screw		1
148	N1500-B159	Micrometer Scale		1
	N1500-B195	Micrometer Scale(Inch)		1
149	HAEC-W100015	Cross-Recessed Head Screw	1/8"x3/16"	1
150	1500-B155	1/2"-12 Nc Tee Bolt		4
151	1500-B156	Lower Clamping Bolt Spacer		2
152	HWA-N4	Washer	1/2"	4
153	1500-B157	1/2"-12nc Adaptor Nut		4
154	HBBE-W040-13	Nut	1/2"	4
155	1500-B082	Compression Spring		1
156	1500-B088	Compression Spring		1
157	1500-B140	Special Socket Set Screw		1
158	HSET-M06005	Set Screw	M6x5	1
159	1500-B089	Overload Clutch Lever Spring Plunger		1
160				
161				
162				
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NO.	PART NO.	DESCRIPTION	SPECIFICATION	Q'TY
1		Motor		1
2	HCAP-W030100	Hex Socket Head Cap Screw	3/8"x1"	2
3	L-H658	Up COVER		2
4		Hex Socket Head Cap Screw	#8-32x3/8"	4
5	L-H505	Upper Pulley Box		1
6	L-H669	REAR COVER		1
7	HCAP-W015040	Hex Socket Head Cap Screw	#10-24x1/2"	4
8	1510-G087	Draw Bar (R8)		1
9	L-H515	Top Bearing Bracket		1
10	HCAP-W020040	Hex Socket Head Cap Screw	1/4"x1/2"	3
11	HWW-6007	Washer		1
12	BR-6007	Bearing	BR-6007	1
13	LT-H730	Spindle Clutch Device		1
14	LT-H727	RPM DISPLAY HOUSING		1
15	HCAP-020600	Hex Socket Head Cap Screw	1/4"x6"	4
16	E-OMT-01010	Digital Readout		1
17	E-OVR-08001	VR Knob		1
19	E-OVR-08002	Metal Plate		1
20	E-OVR-01001	VR Variable Resistor		1
21	LT-H722	SPINDLE PULLEY		1
22	1500-A022	V Belt	A-33	1
23	LT-H723	Motor pulley		1
24	LT-H731	Motor Washer		1
25	HCAP-M08016	Hex Socket Head Cap Screw	M8x16	1
26	L-H544	Cover		1
27	HCAP-W020100	Hex Socket Head Cap Screw	1/4"x1"	2
28	BR-6010	Bearing	BR-6010	1
29	L-H558	Spacer		1
30	1510-G032	Brake Shoe		1
31	L-H547	Brake Ring Screw		1
32	1510-G031	Brake Spring		2
33	L-H562	Spacer		1
34	L-H504	Gear Housing		1
35	Ø6x20L	Pin	Ø6x20L	2
36	L-H539	Cover		1
37	HCAP-W020120	Hex Socket Head Cap Screw	1/4"x1 1/4"	3



38	HBBE-W050-10	Nut	5/8"	1
39	L-H563	Pullet Set		1
40	1500-A025	Timing Belt	230H	1
41	1500-A024	Timing Belt Pulley Flange		1
42	L-H565	Cover		1
43	HCAP-W015040	Hex Socket Head Cap Screw	#10-24x1/2"	2
44	BR-6203	Bearing	BR-6203	2
45	L-H564	Bull Gear Pinion Counter Shaft		1
46	HKE-2R-0515	Key	5x15	1
47	HKE-2R-0620	Key	6x20	1
48	L-H569	Bull Gear Pinion Counter Gear		1
49	L-H554	Brake cam		1
50	L-H550	Brake Operation Finger		2
51	L-H557	Sleeve For Brake		1
52	L-H556	Brake Lock Shaft		1
53	L-H551	Brake Finger Pivot Stud		1
54	L-H092	BLACK PLASTIC BALL HANDLE		1
55	1510-G069	Black Plastic Ball Handle		1
56	1500-A035	Brake Lock Pin		1
57	HETW-E4	Snap Ring E-Type	E-4	1
58	L-H502	Gear Housing		1
59	L-H681	High-low nameplate		1
60	H002-02005	Small Rivet Nut	Ø2x5	2
61	L-H579	Bull Gear Shifter Pinion Shaft		1
62	L-H580	Hi-Low Detent Plate		1
63	1510-T065	Adj. Plate		1
64	1510-T066	Hi-Low Detent Plunger		1
65	1510-T070	Hi-Low Shift Crank		1
66	1500-A046	Black Plastic Ball Dia		1
67	1510-T067	Spring		1
68	HPB-0320	Hi-Low Detent Plunger	Ø3x20	2
69	L-H581	Hi-Low Pinion Block		1
70	HCAP-M06016	Hex Socket Head Cap Screw	M6x16	1
71	1510-G090	Studs		3
72	1500-A077	Washer		3
73	HBBE-W35	Nut	7/16"	3
74	1510-T051	Adj. Plate		2



75	HAAF-W015100	Screw	#10-24x1"	2
76	1510-T093	Spring Supported Pin		3
77	1510-T055	Spring		3
78	L-H503	Gear Housing Belt		1
79	HAAF-W015030	Hex Socket Head Cap Screw	#10-24x3/8"	3
80	L-H572	Spindle Pulley Hub		1
81	L-H571	Spindle Bull Gear Assembly		1
82	L-H576	Bull Gear Bearing Sleeve		1
83	1510-T048	Bull Gear Bearing Sleeve Washer		1
84	BR-6908	Bearing	BR-6908	2
85	1510-T044	Bull Gear Bearing Spacer		1
86	1510-T043	Bull Gear Bearing Spacer		1
87	HCAP-M05012	Hex Socket Head Cap Screw	M5x12	2
88	HKE-2R-0812	Key	8x12	1
89	HSET-M04016	Set Screw	M4x16	1
90	HCAP-M05012	Hex Socket Head Cap Screw	M5x12	2
91	HAAF-W015030	Screw	3/16"x3/8"	4
92	HCAP-W015040	Hex Socket Head Cap Screw	3/16"x1/2"	1
93	HCAP-W025100	Hex Socket Head Cap Screw	5/16"x1"	6
94	F26-55-04-084	nozzle	1/8"	1
95	HETL	Oil Cup	1/8"	2
96	HCAP-W025600	Hex Socket Head Cap Screw	5/16"x6"	6
97	HSET-W040025	Set Screw	1/2"x5/16"	1
98	HSET-M060006	Set Screw	M6x6	1
99	HETW-E5	Snap Ring E-Type	E-5	1
100	HCAP-W025600	Hex Socket Head Cap Screw	5/16"x6"	2
101	HKE-2R-8745	Key	8x7x45	1
102	1510-T090	Spacer		1
103	AW08-40MM	Spacer		2
104	1510-T056	Bearing Lock Nut		2
105	HRTW-R62	Snap Ring C-Type		1
106	1500-A040	Washer		1
107	LT-H732	Micro Switch Bracket		1
108	E-OLS-01017	Micro Switch	Z-15GD-B	1
109	LT-H733	Micro Switch Box		1
110	LT-H728	Switch Box		1
111	LT-H729	Nameplate		1

112	E-OPB-02004	Emergent Switch		1
113	E-OPA-01025	Emergent Switch		1
114	1510-T090	Spacer		1
115	L-H682	Sharp Nameplate		1
116	L-H659	Pin		2











