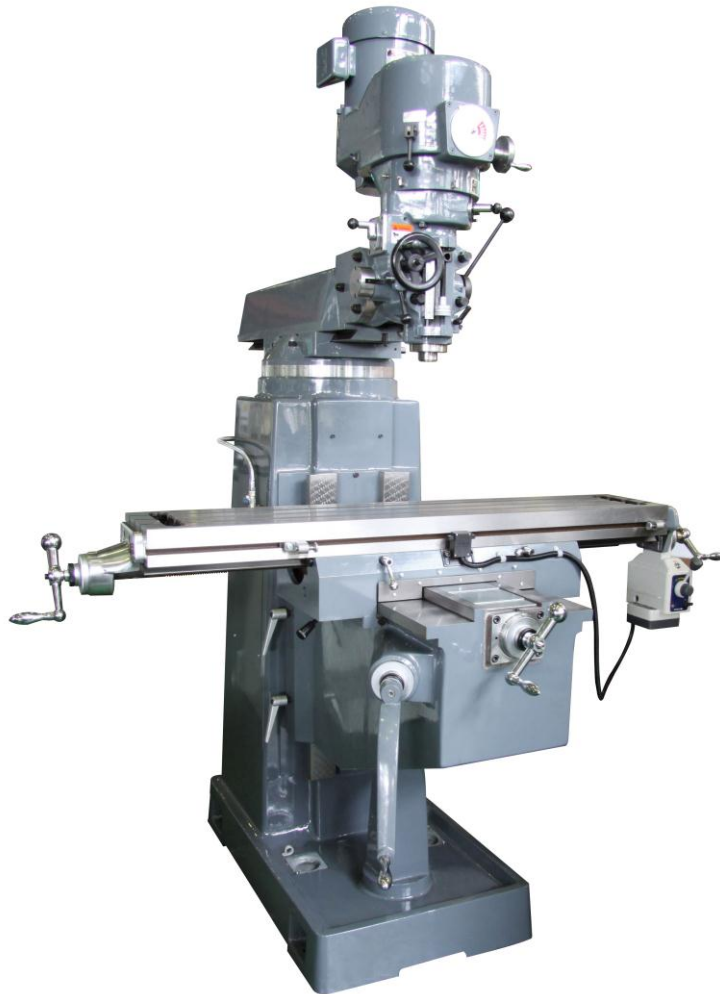


Sharp Precision Machine Tools

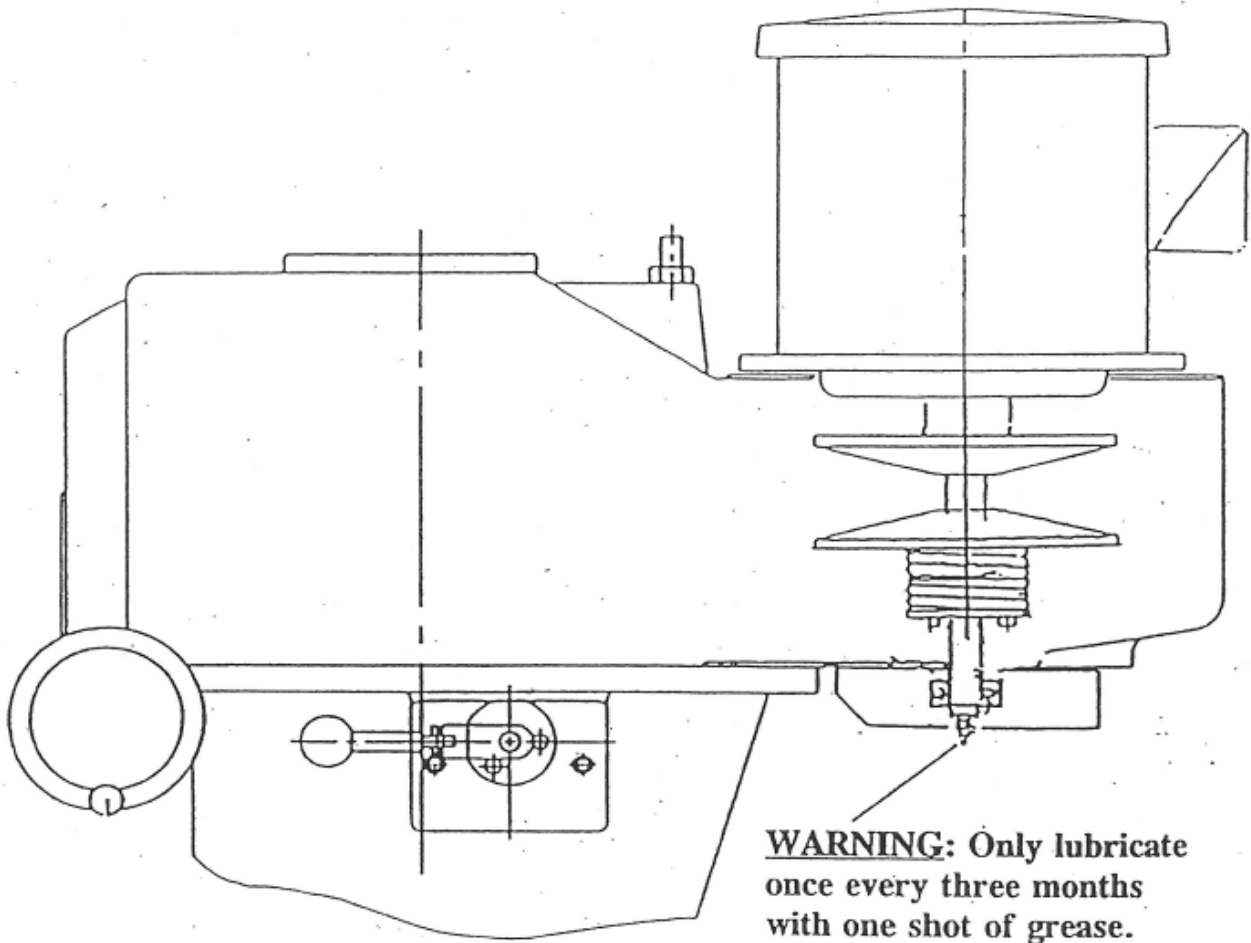
**SERVICE AND PARTS
MANUAL**

Vertical Mill



TMV

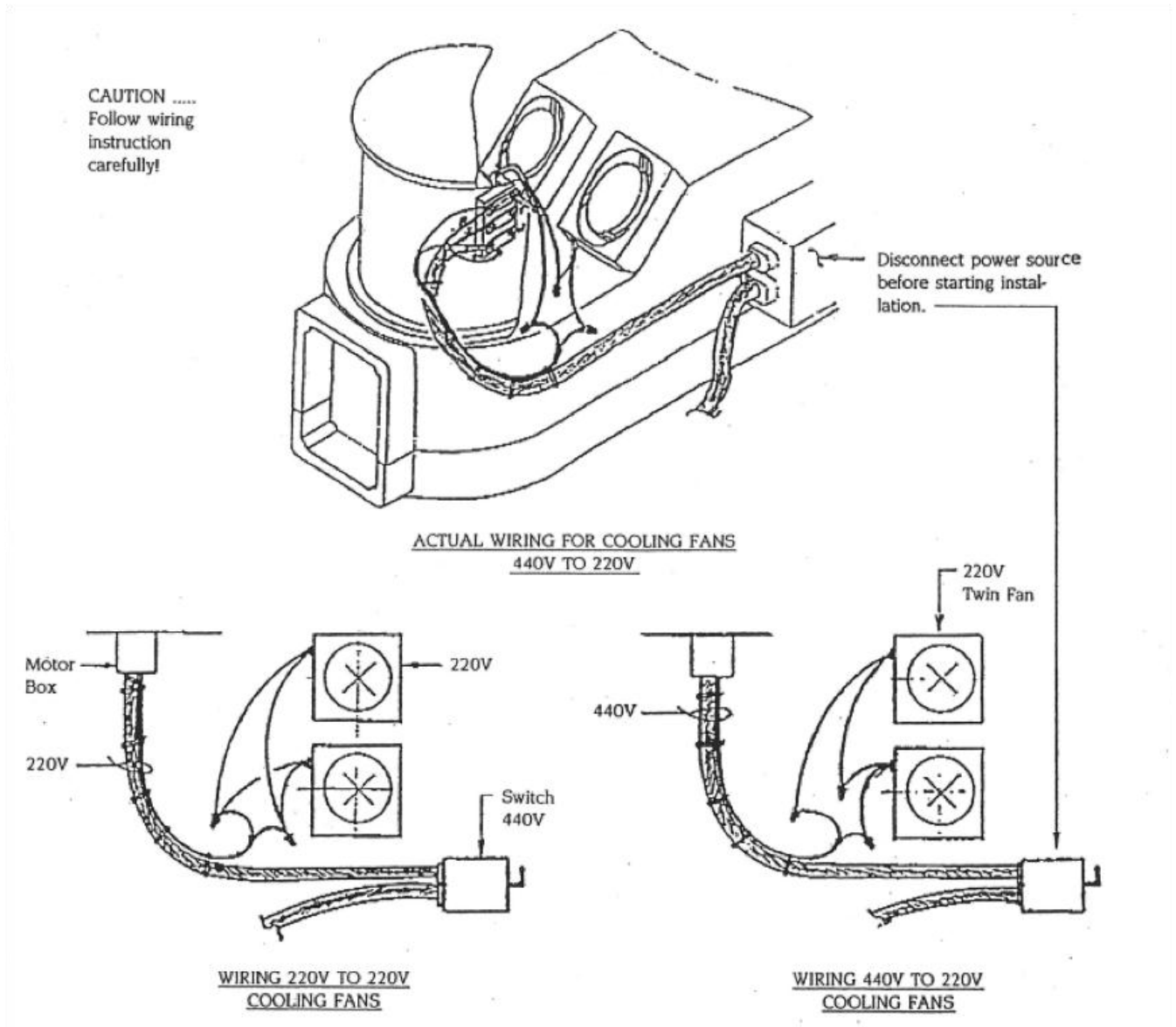
SHARP's all new design of 3 HP vari-speed head, just lubricate the van-disc every three months, keep the head running smoothly.



WARNING: Only lubricate once every three months with one shot of grease.

Over lubrication will cause to slip, which will allow irregular spindle speeds.

WIRING 440V TO 220V COOLING FANS



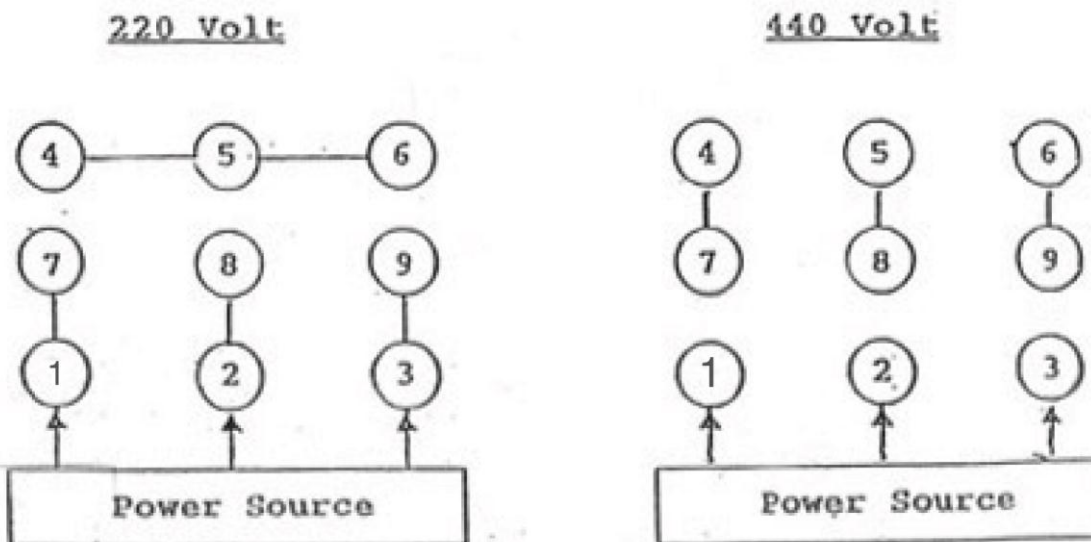
1. Warning: Disconnect power source before starting installation.
2. Caution: Follow wiring instruction carefully.
3. For trouble shooting, use a meter to check the current. Do not use the 440V current to check the fan individually.
4. This method of connecting the fans in series to run on 440V current is only applicable to the Twin Fan Model. Do not use it on the Single Fan Model.

SHARP INDUSTRIES INC.

Wiring for DUAL Voltage Motors

WARNING: Disconnect all power sources before you start to do wiring changes or checking wiring.

- 1) Most spindle motors are convertible between 220V & 440V. To change wiring, please follow the instructions below:
- 2) After power source has been disconnected, remove the cove, the motor, and make sure that a diagram as shown below is available; if not, please consult a qualified electrician from Sharp Industries Inc.
- 3) Make proper connection according to the following diagram.
- 4) Be sure that all connections have been done properly and check isolation carefully, then remount the cover.



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1. Forward:

LONG CHANG TMV-185 AND TMV-195 OF MILLING MACHINES are designed and manufactured to meet the demands by most of our customers. All parts and materials have been placed under strict quality control to ensure the machine quality superiority and permanent service life.

This manual shall give a detailed account of the structure, mechanism, methods of operation, maintenance, etc. of TMV -185 and TMV -195 Miller. For permanent hi-precision and maximum efficiency of each and every machine, the operators, maintenance and repair personnel are requested to study this manual thoroughly and follow the specific instructions in operations and maintenance exactly.

2. Safety Rules and Regulations:

- 1) Wearing of loose clothes by operators is not allowed.
- 2) Operators shall wear the goggles and safety boots.
- 3) Do not allow the body to get too close to the machine while it is in revolution.
- 4) Cautions must be exercised in machine handling in reference to the specific details in this manual.

3. Capacity:

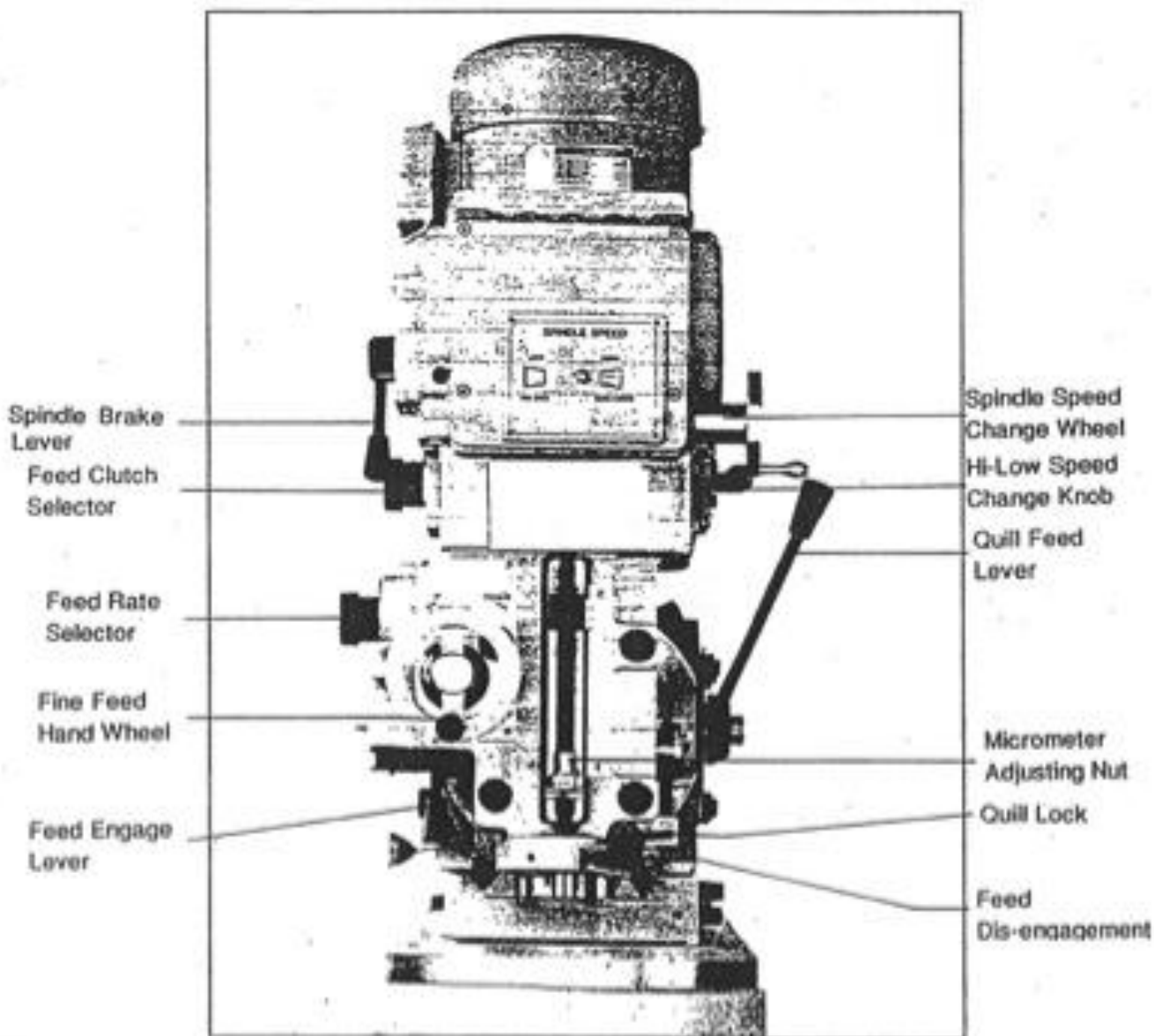
These models feature the multi-performances as follows:

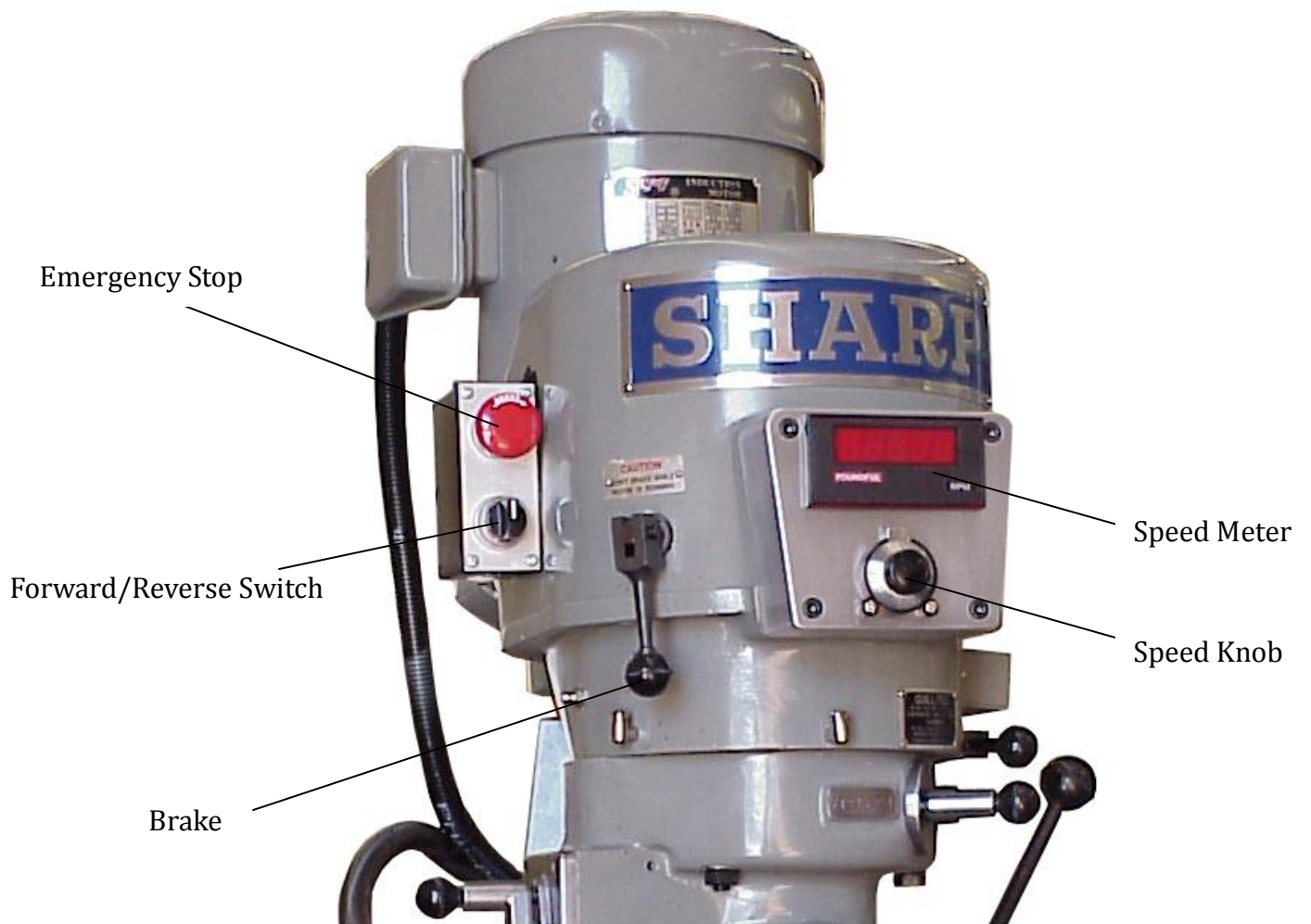
- (1) Drilling: Front and oblique, drillings.
- (2) Boring: Front and oblique borings by cutters installed.
- (3) Molding: Processing of irregular curves and mold removing angles.
- (4) Polishing: Surface polish on metallic parts.
- (5) Milling: Face, oblique, end, side millings, etc.

4. Headstock

(A) Stepless Speed Headstock (195VS)

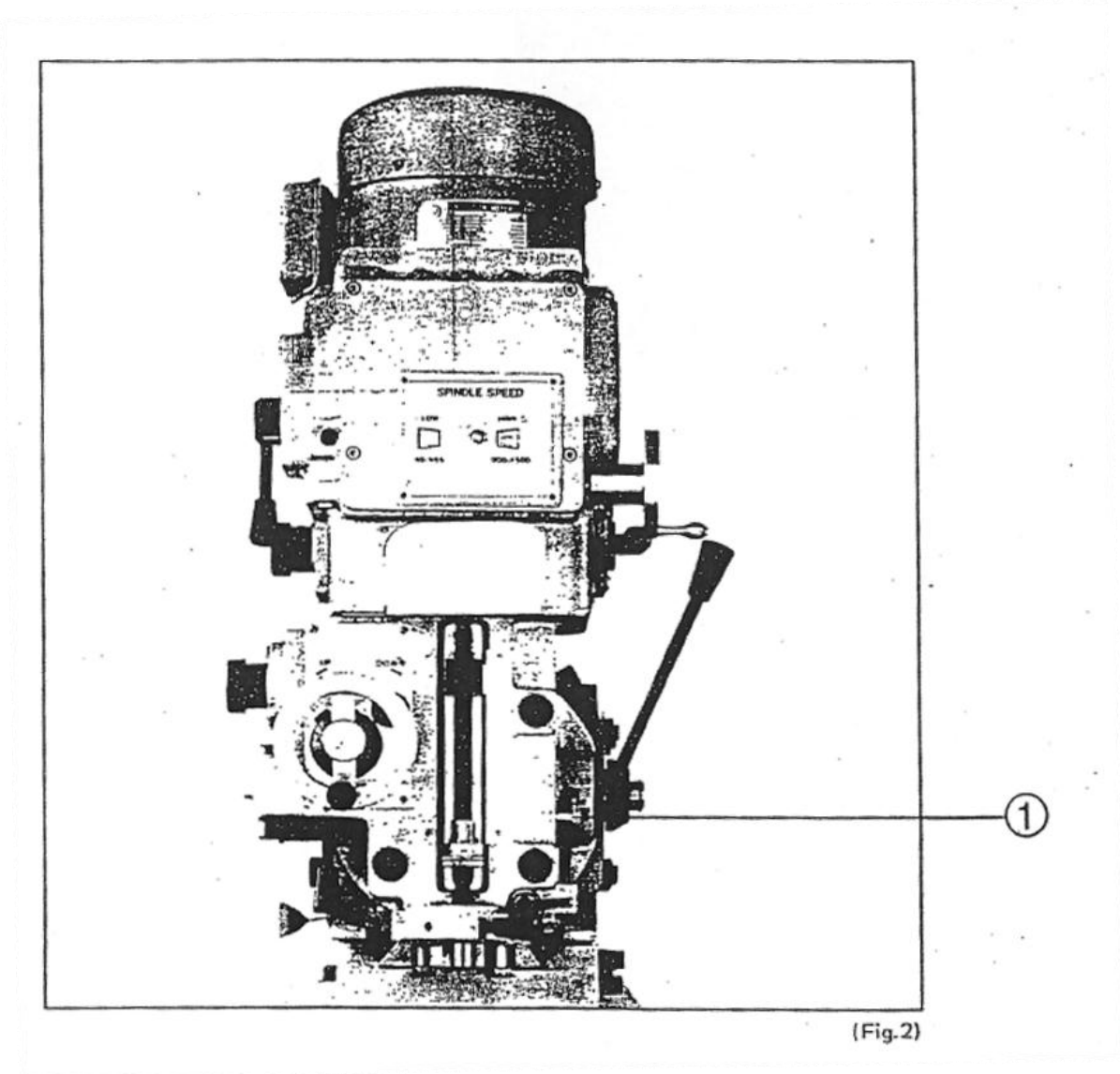
(a) Names of machine parts:





(b) Headstock lubrication:

Adopted with dripping lubricant in the headstock, it is to reassure driving mechanism and smooth sliding. Please refer to the chart as hereunder specified.



| Item | Position | Lubricant | Time(s) Q'th |
|------|--------------------------------|----------------|------------------|
| 1 | Headstock matching Quill Holes | SHELL TONNA 68 | Twice Daily Full |

(c) Operations:

1. Spindle brake: brake lever (E)

When arrow marks in (D) position, spindle motor power is on. When arrow marks in (C) position, spindle motor power off through the engagement of micro switch. When arrow marks in (B) position, make spindle brake.

The lever is cam operated and will never return back until you push it. The spindle will be powered again as you push it to position (D). All are controlled electric-magnetically. This provides you a great convenience for immediate stop of spindle and shifting back gears.

ADJUSTMENT (Fig.3) (A)

After long period usage, the brake shoe might be loosed and some adjustment is required. Use a flat head driver to adjust the bolt inside the hole at left-front position of pulley cage. Clockwise will tight the brake. Counter-clockwise will loosen it.

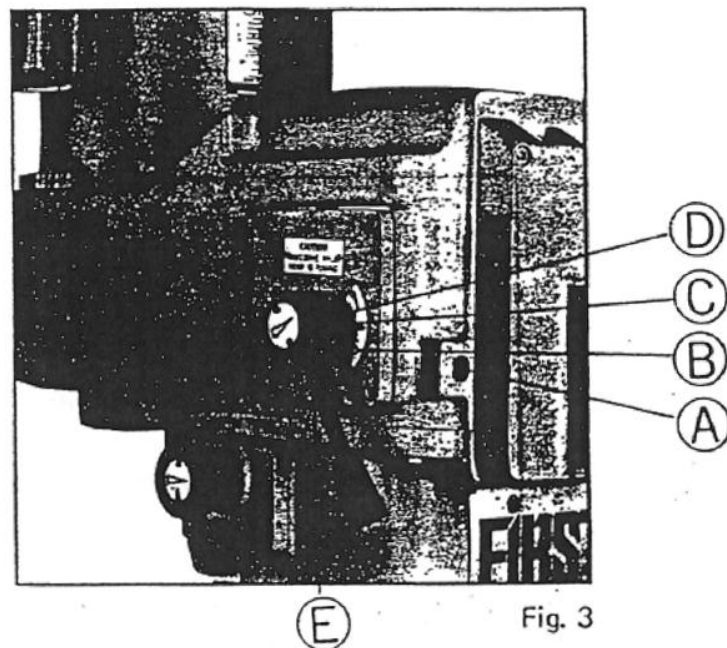


Fig. 3

2. Chucking of tooling shank and dismantling:

First the spindle must be raised up to its maximum height. The screw of draw bar is right turn. When the screw is turned clockwise, it is for locking of tooling shank; the draw bar must be turned from three to five rounds. Then, use a soft mallet to hit lightly on the draw bar to allow the tooling shank to separate from the spindle. Turn the draw bar until the tooling shank comes off totally.

Note: According to Spindle Braking, brake the spindle to a stop and the tooling shank may easily come off or chuck on.

3. Quill feed:

a. Manual feed:

- Turn the feed rate selector to any of the two "DUMMY" positions.
- Engage feed trip lever from (B) to (B')
- The quill is now under hand wheel (G) control

b. Automatic feed:

- Ensure quill lock is off (C)
- Set micrometer dial to required depth, (D)
- Engage Feed Clutch Selector (E)
- Select feed rate, (A)
- Engage feed trip lever (B) to (B')
- The feed will automatically trip out at a depth within 0.2 mm.

Note: 1. To interrupt power feed, just press down the disengagement lever (F).

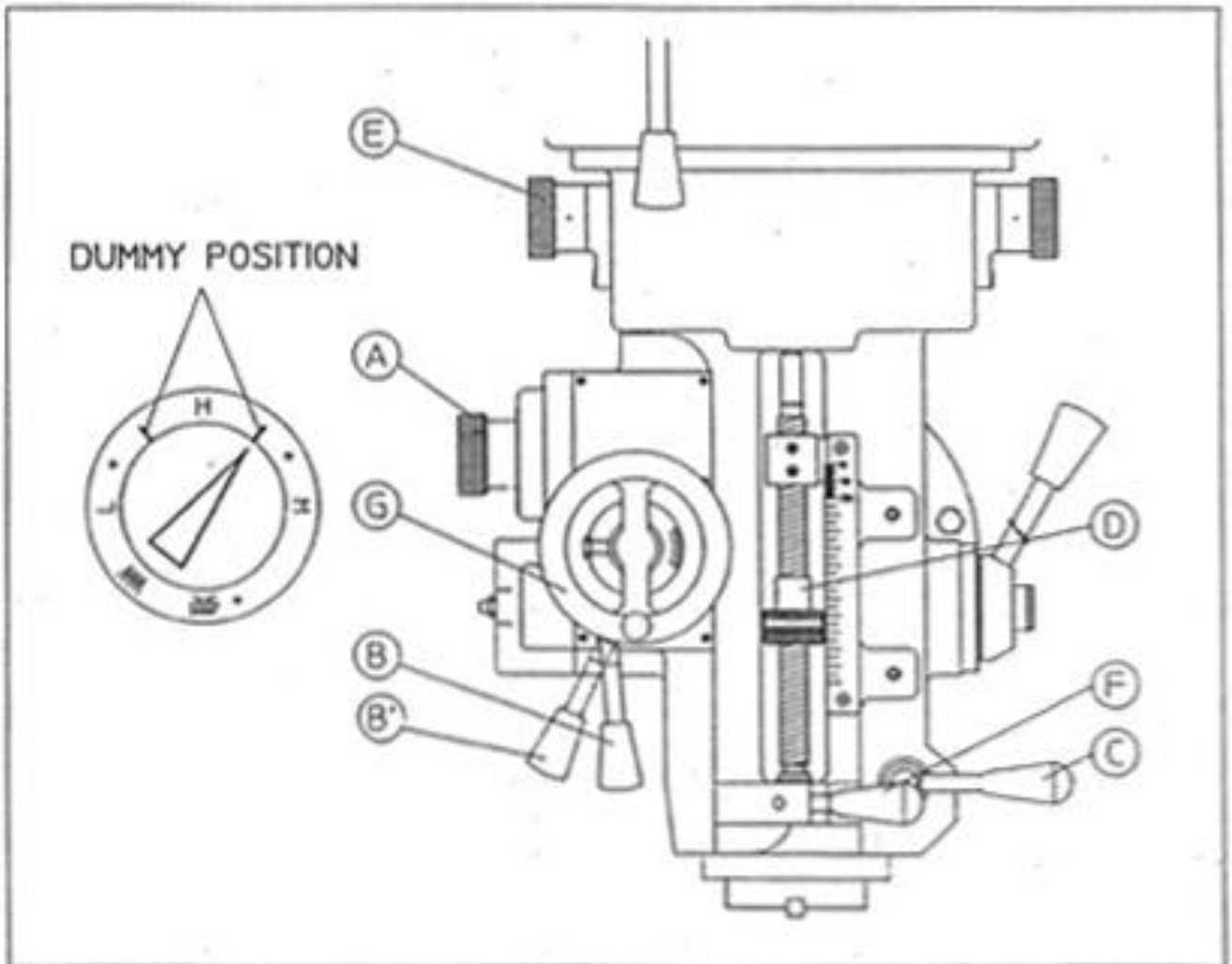


Fig. 4

- Note:
2. Maximum drilling capacity in automatic feed is 3/4" (19mm).
 3. The power feed transmission engagement crank shall be placed at "OUT" position when the automatic feed is not in operation. DO NOT move the power feed transmission engagement crank when the spindle is in revolution.
 4. Do not use automatic feed when the turning speed is in excess of 3,000 RPM
 5. Do not change the feed speed optionally by means of quill speed selector during the revolution.
 6. Lock up the quill lock of quill for far better milling surface when the unit is not making the manual or automatic feed.

4. Speed change of spindle:

By means of the variation of one set of sliding belt Pulley and counter shaft gear (high or low speed), the spindle revolution speed is changed accordingly.

a. Change of high and low speeds: (Fig.4)

Break the spindle

Push and Turn lever (H) in either direction to the next horizontal position. You can feel the "SNAP IN" correct position through the ball-spring mechanism if difficulty happened in meshing gears, inching the spindle through brake lever.

Notes:

- a) The spindle must be motionless completely during the speed change.
- b) To shift the high speed into the low one, the spindle must be slightly turned to make it easier for the counter shaft to engage.
- c) To shift the low speed into the high one, use the brake lever so as to put a stop to the spindle clutch. Then turn the spindle slightly so that the clutch may be engaged feasibly. A "click" sound of engagement may be sensed at this moment.

b. Speed change hand wheel:

Stepless speed variation between high and low speeds may be controlled by means of the turning hand wheel (A) (Figure 5). When it is turned clockwise, it is for higher speed.

Note:

- a: Do not change the speed when the spindle stands still.
- b: Avoid to use it when the speed is in excess of 3,000 RPM.
- c: In the process of speed change from high speed to low speed, and vice-versa, do not change the speed rapidly to safeguard the service life of the internal mechanism.
- d: It takes roughly 10 to 15 second to change from low speed to the high one.

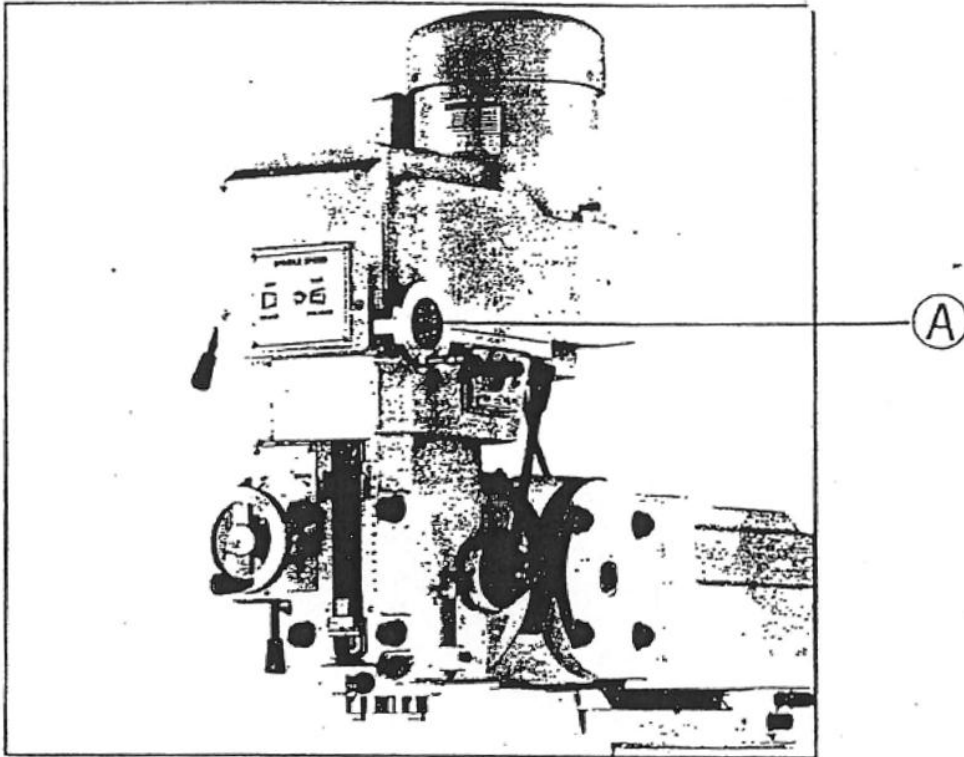


Fig. 5

5 Tilting of headstock

Cross tilting (Figure 6)

- a. Draw out 2 zero position securing taper pins.
- b. Loosen 4 lock nuts (A)
- c. Turn the worm shaft (B) so as to tilt the headstock to the desired position.
- d. Lock up 4 lock nuts (A) evenly.

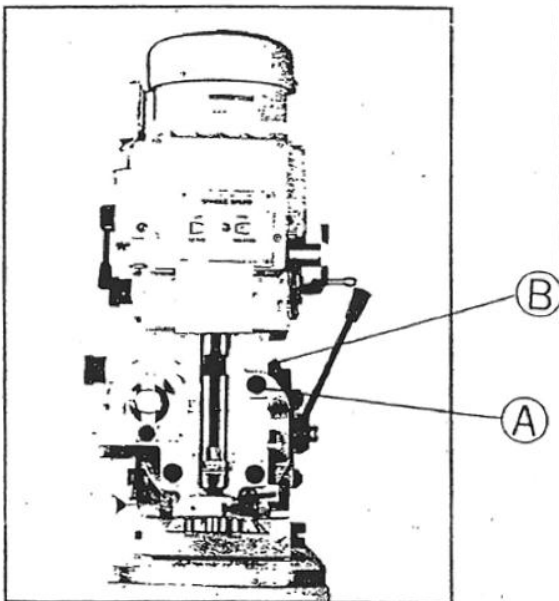


Fig. 6

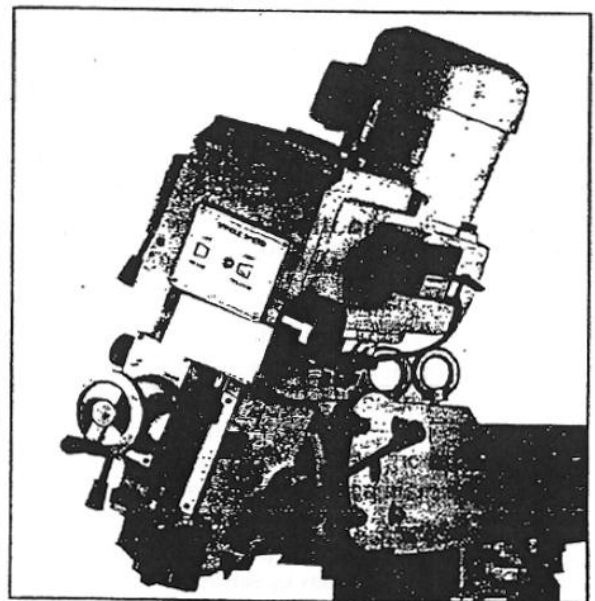


Fig. 7

6 Headstock Tilting:

In-and-Out Tilting (Figure 8):

Turn loose evenly the eight adapter locking bolt (P Both sides) and turn the vertical adjusting worm shaft (Q) until the angle desired is obtained. Lock up the bolts (P Both sides) tightly.

Note: Do not loosen all the headstock bolts totally.

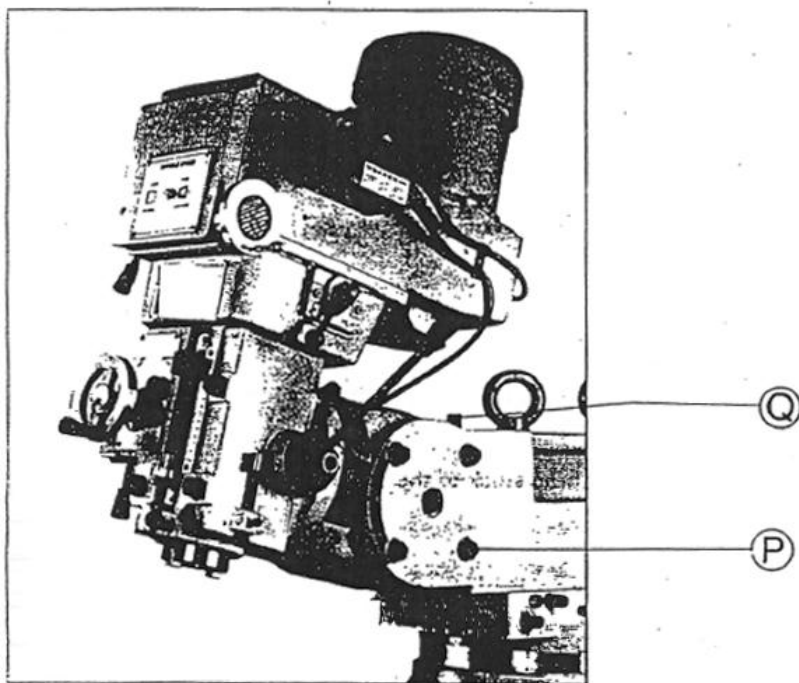


Figure 8

(d) Trouble Shootings:

1. Dismantling of Motor (Figure 9):

- a. Start the motor and turn the speed change handwheel (A) to the position of 60RPM appeared on the indicator to lower down the stationary motor vari-disc to the lowest position.
- b. Cut off the motor power source and take off main power source.
- c. Remove motor pulley cover (B) under the motor shaft. Then, use the two hexagonal concave bolts (C) that locked the bearing housing to , insert into the two holes of the speed change spring piece (D). Lock into the motor varj-disc (E) and evenly lock up the two bolts (C). Push down the speed change spring (F) so as to separate it from the retainer ring (G).
- d. Take out the retainer ring (G).
- e. Take off the two hexagonal bolts (H) that locked the motor. The motor may be lifted up. Motor vari-disc (E) and speed change belt are still kept inside the belt housing_ still kept inside the belt housing_
- f. Once the motor is replaced, just reverse the order of dismantling.

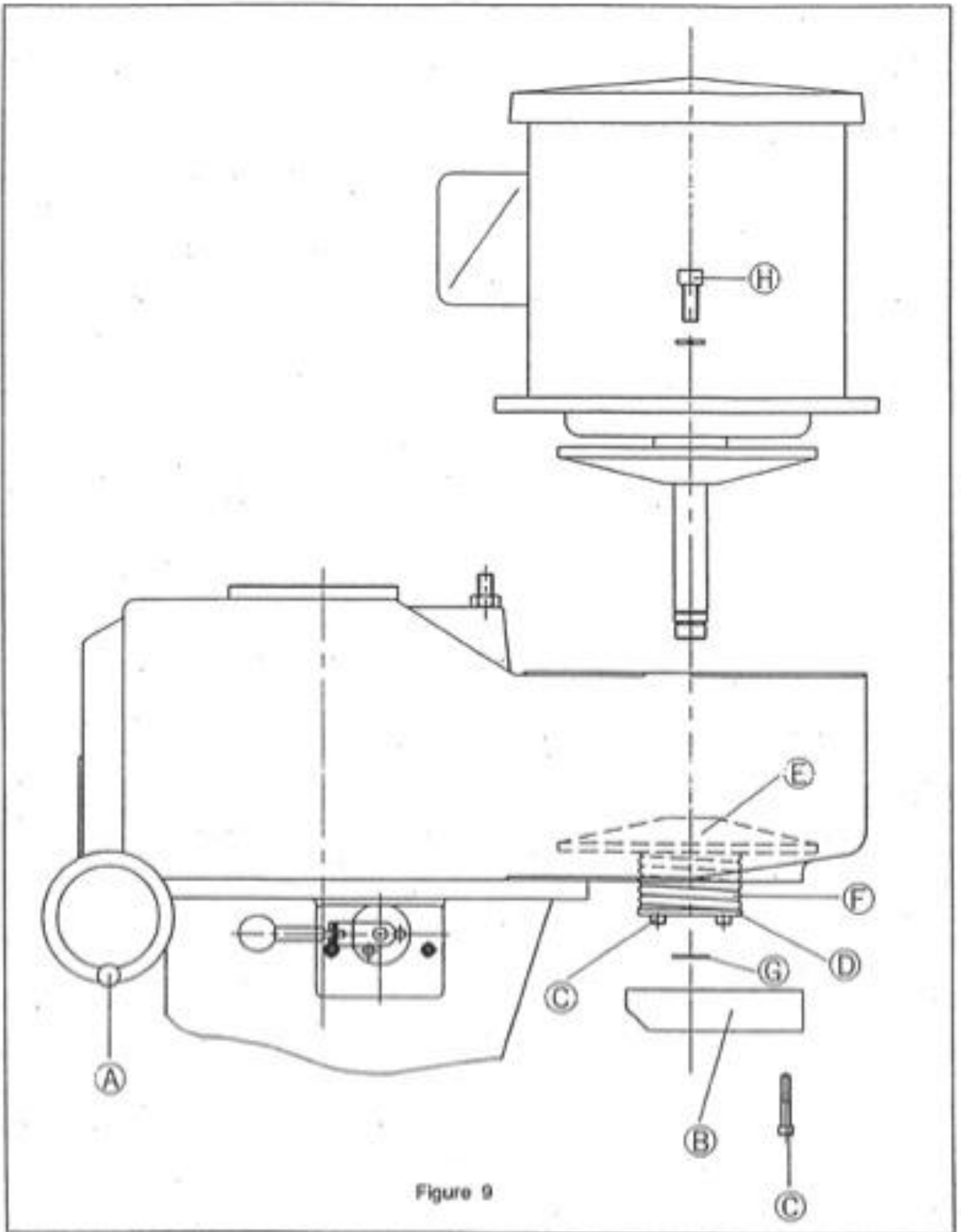


Figure 9

2. **Replacement of speed change belt(R) (Figure 10):**

- a. Please refer to Step a to e on motor dismantling on P.15.
- b. Pull out drawbar (1).
- c. Take off three concave hexagonal bolts (1) and use two of them to push up the bearing cover (K).
- d. Take down the two concave hexagonal bolts (L) setting the pressboards from the top and take out the bolt housing (M).
- e. Take off the six concave hexagonal bolts (N).
- f. Use a soft mallet to hit the belt housing (Q) lightly upward so as to disengage it from the gear housing (P).
- g. Reverse the order of dismantling to restore the assembly once the speed change belt is replaced.

Note: Replacing speed change belt shall conform to that of our company specifications.

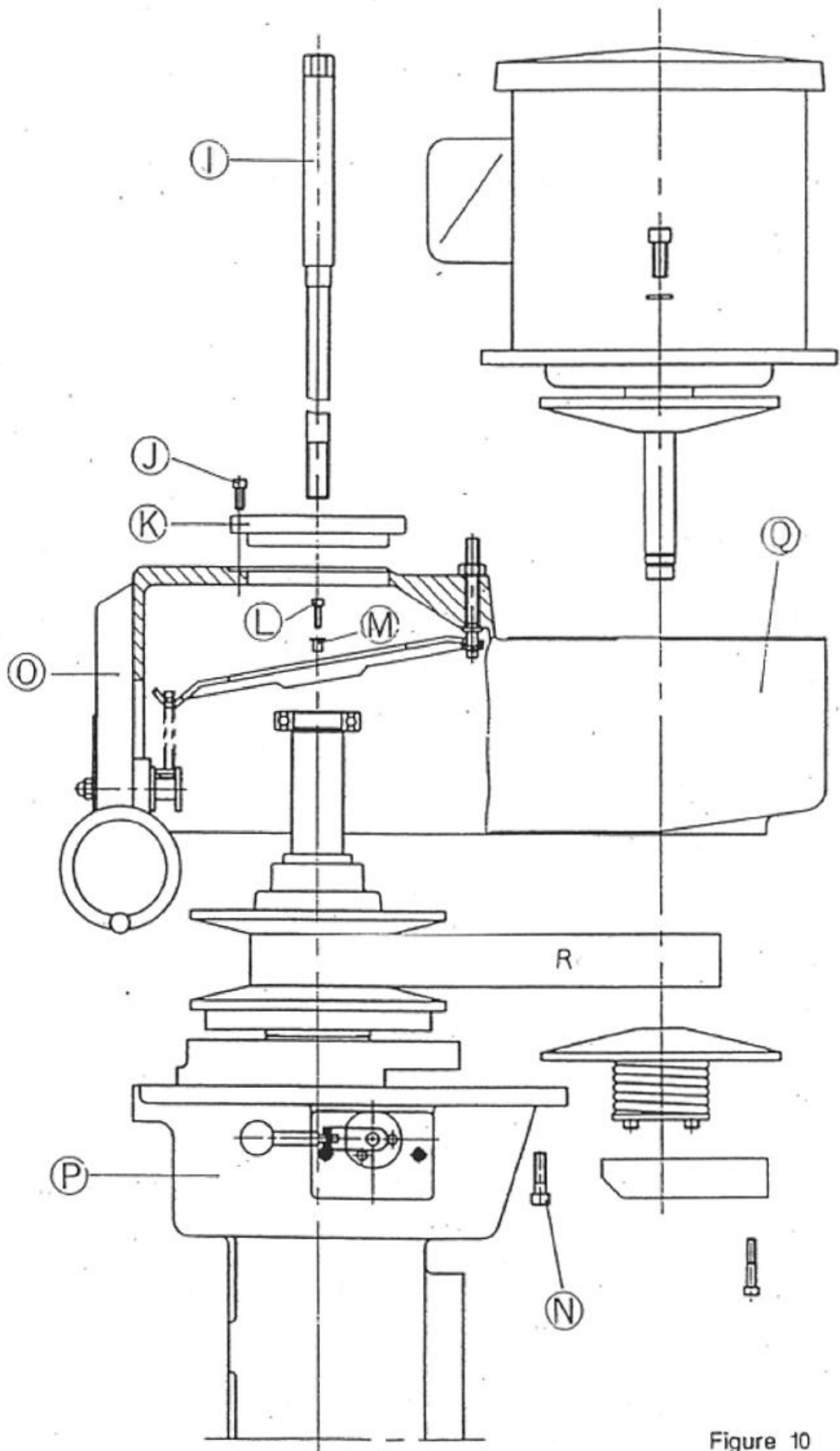


Figure 10

3 Replacement of brake block (Figure 11, 12):

- a. Refer to Step a to e on P.14 on motor dismantling.
- b. Refer to Step b to g on P.13 on replacement of speed change belt to dismantle the upper belt housing.
- c. Remove the spindle pulley off.
- d. Use flat head screw driver to kick-off the two half piece of brake shoe (A).
- e. Remove the two springs (B).
- f. Press the assembled brake shoe to rear support pin (C) first, then to the front cam (D).
- g. For new brake shoe, some adjustment is required.

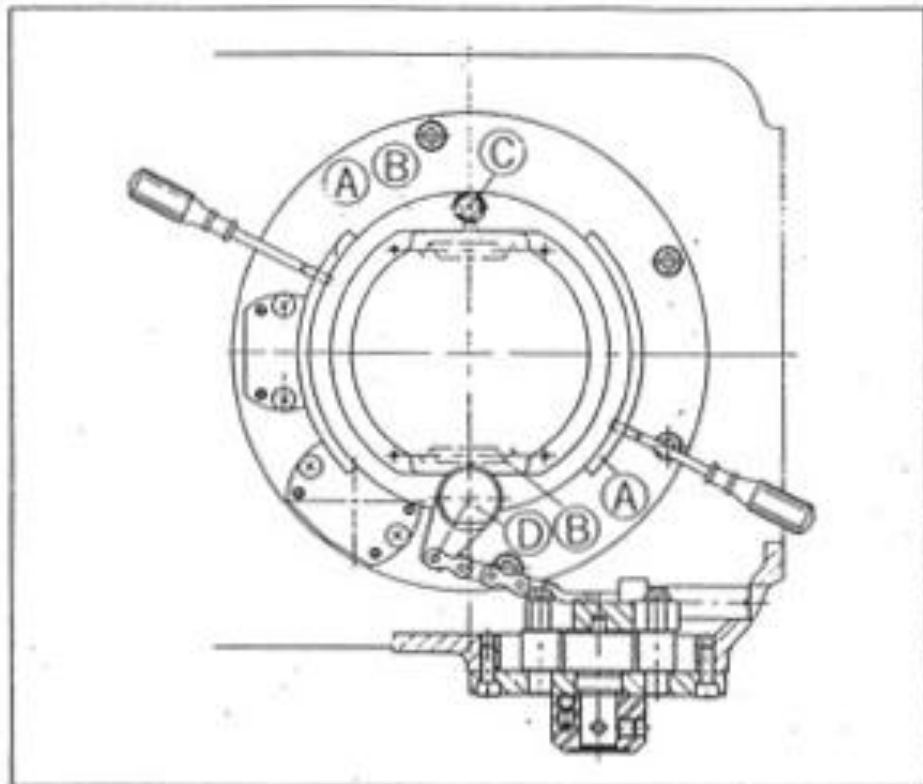


Figure 11

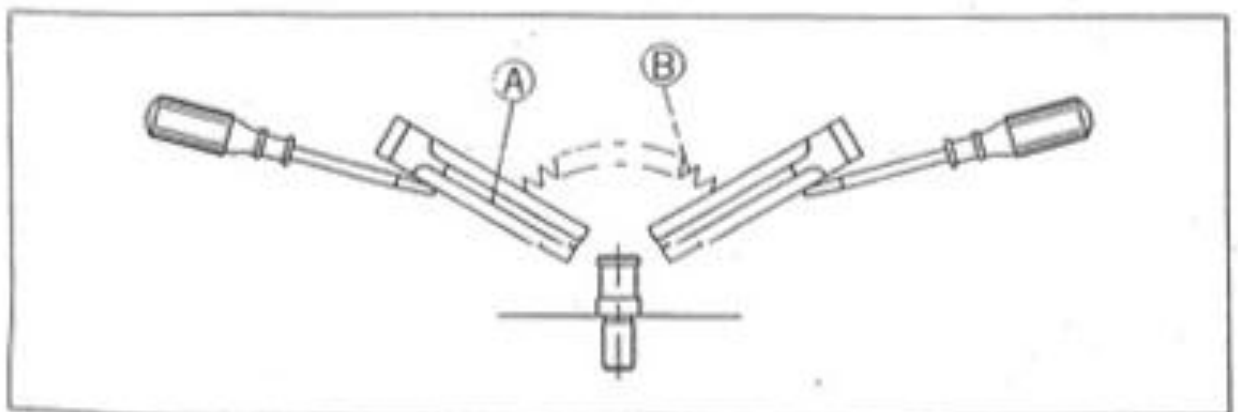
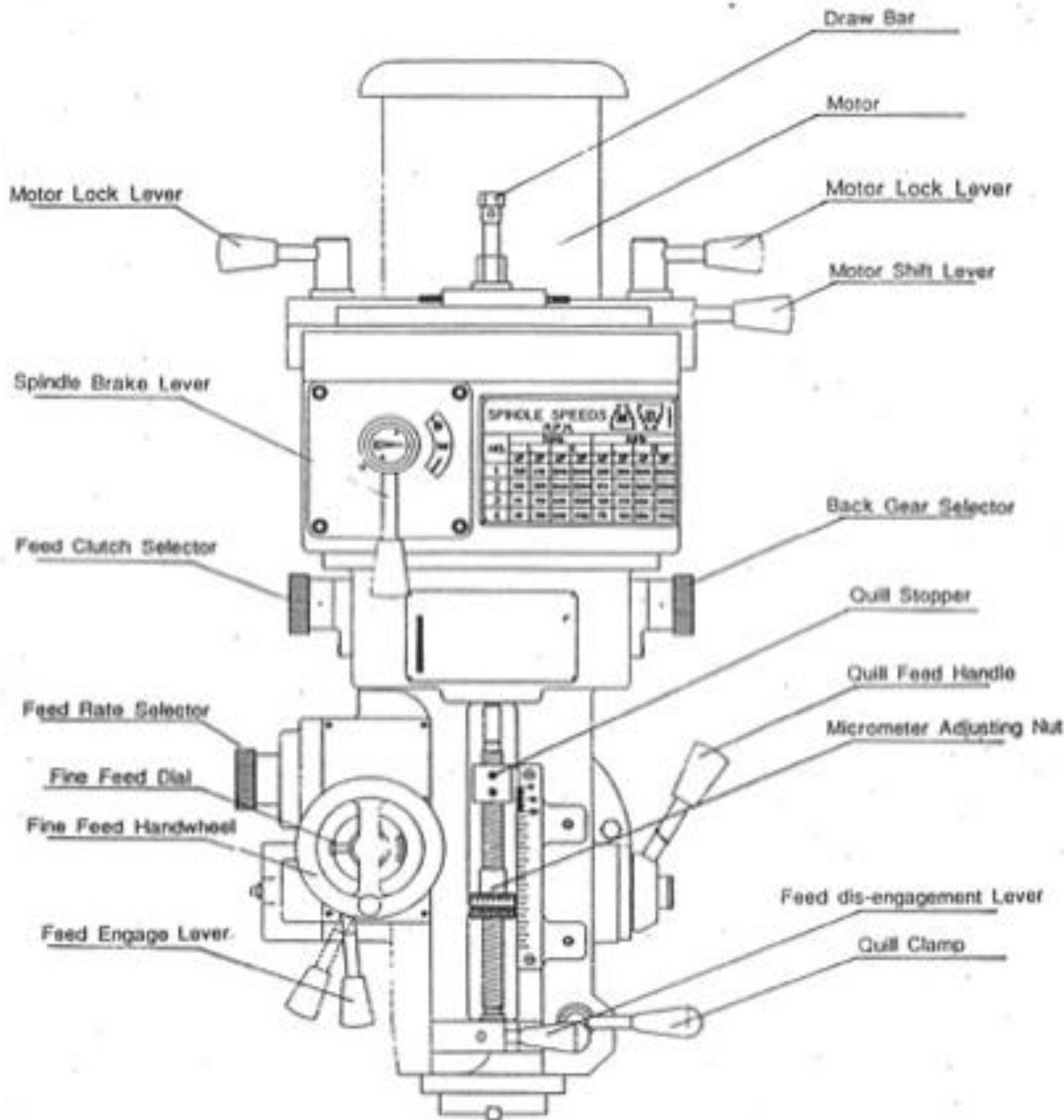


Figure 12

(B) Headstock (195TM)
 (a) Names of machine parts:



(b) Operation:

1. FINE HAND FEED

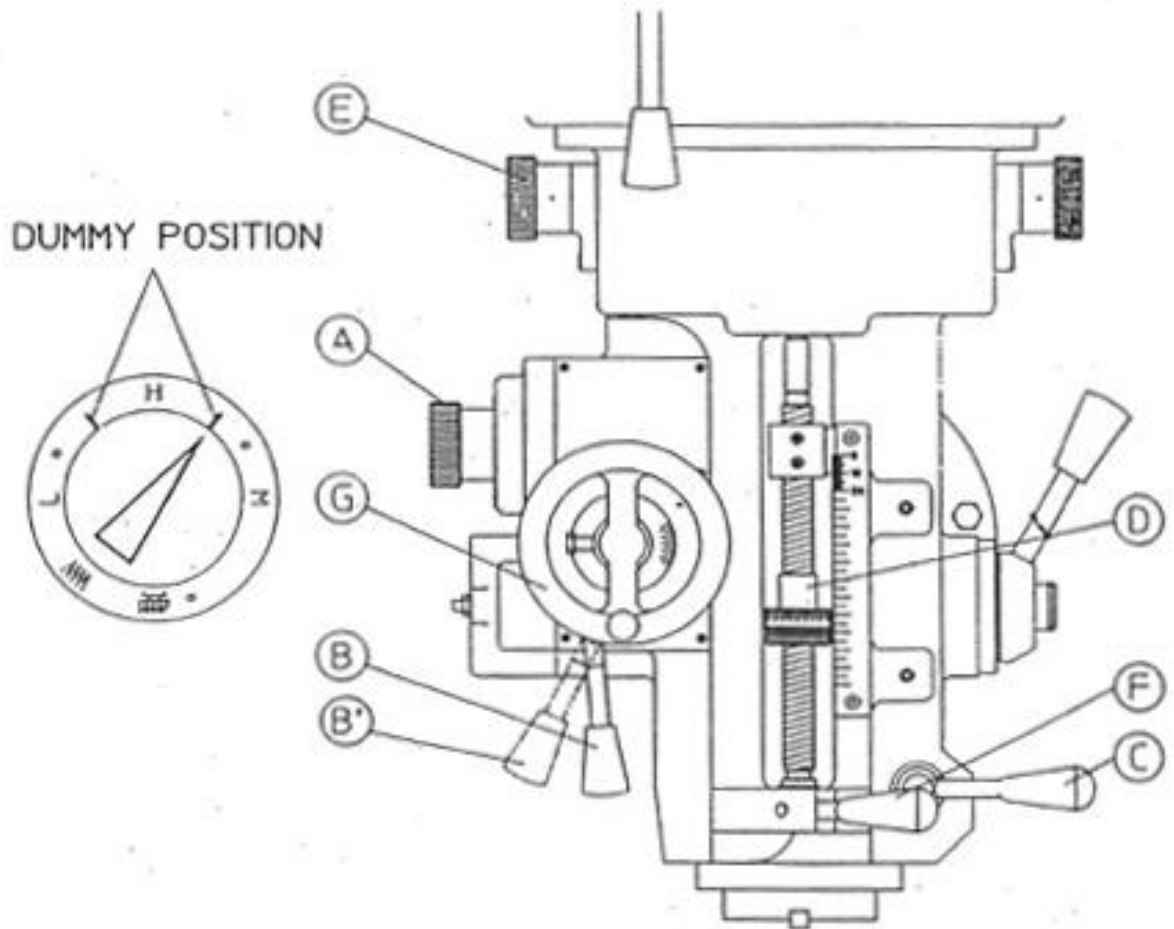
- a. Turn the feed rate selector to any of the two "DUMMY" positions.
- b. Engage feed trip lever from (B) to (B')
- c. The quill is now under handwheel (G) control

2. POWER FEED

- a. Ensure quill lock is off (C)
- b. Set micrometer dial to required depth, (D)
- c. Engage Feed Clutch Selector (E)
- d. Select feed rate, (A)
- e. Engage feed trip lever (B)
- f. The feed will automatically trip out at a depth within 0.2mm

NOTE: TO INTERRUPT POWER FEED, JUST PRESS DOWN THE DISENGAGEMENT LEVER (F)

DUMMY POSITION



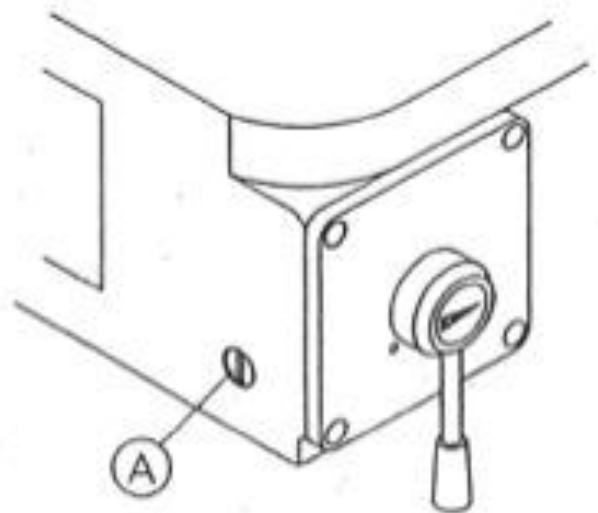
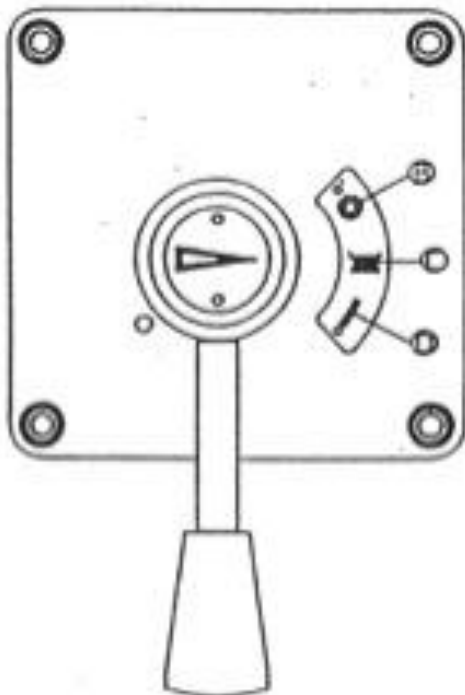
4. SPINDLE BRAKE

- a. When arrow marks in (D) position, spindle motor power is on.
- b. When arrow marks in (C) position, spindle motor power off through the engagement of micro switch.
- c. When arrow marks in (B) position, make spindle braked.

The lever is cam operated and will never return back until you push it. The spindle will be powered again as you push it to position (D). All are controlled electric-magnetically. This will provide you a great convenience for immediate stop of spindle and shifting back gears.

ADJUSTMENT

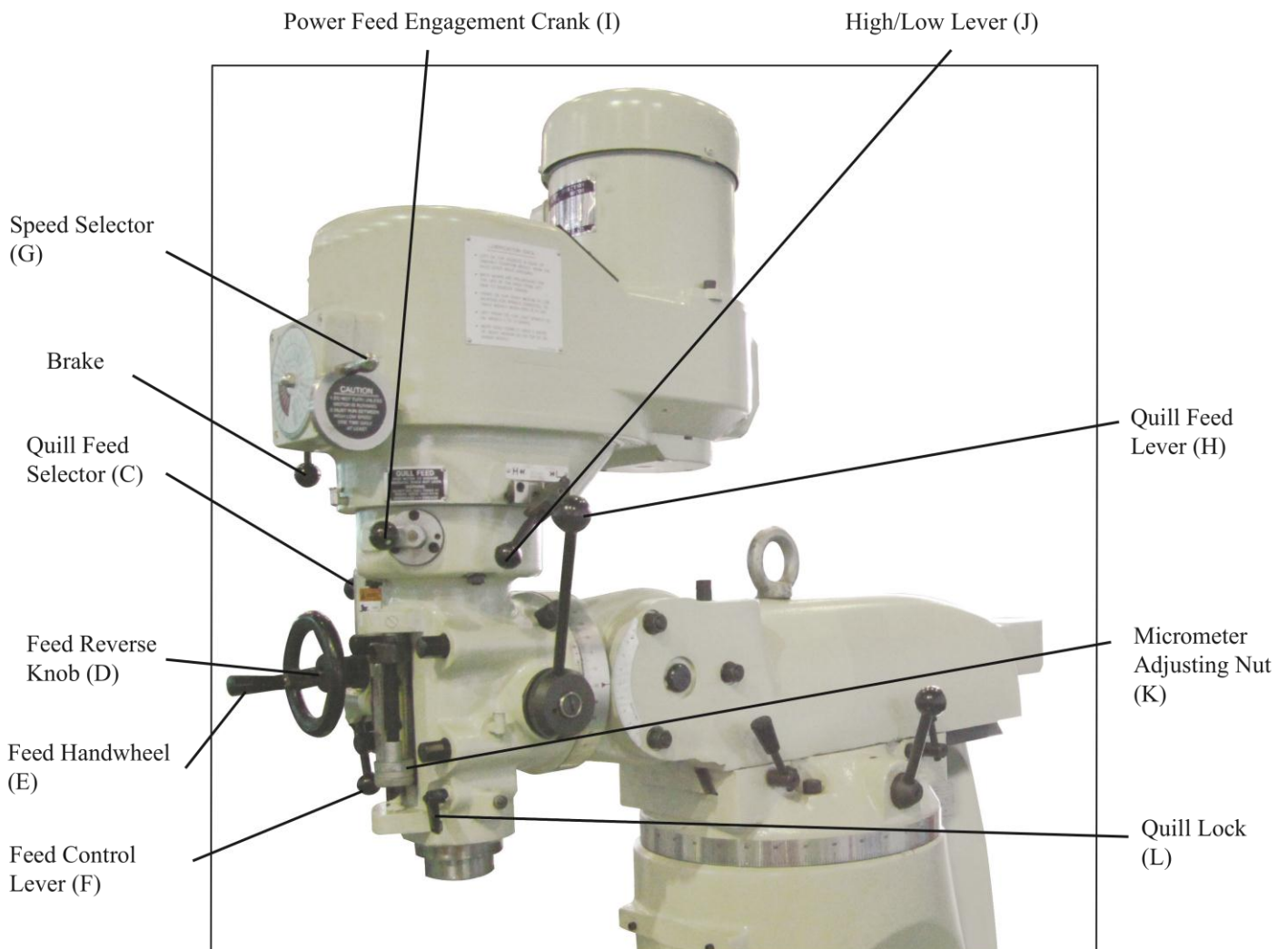
After long period usage, the brake shoe might be loosed and some adjustment is required. Use a flat head driver to adjust the bolt (A) inside the hole at left-front position of pulley cage. Clockwise will tighten the brake. Counter-clockwise will loosen it.

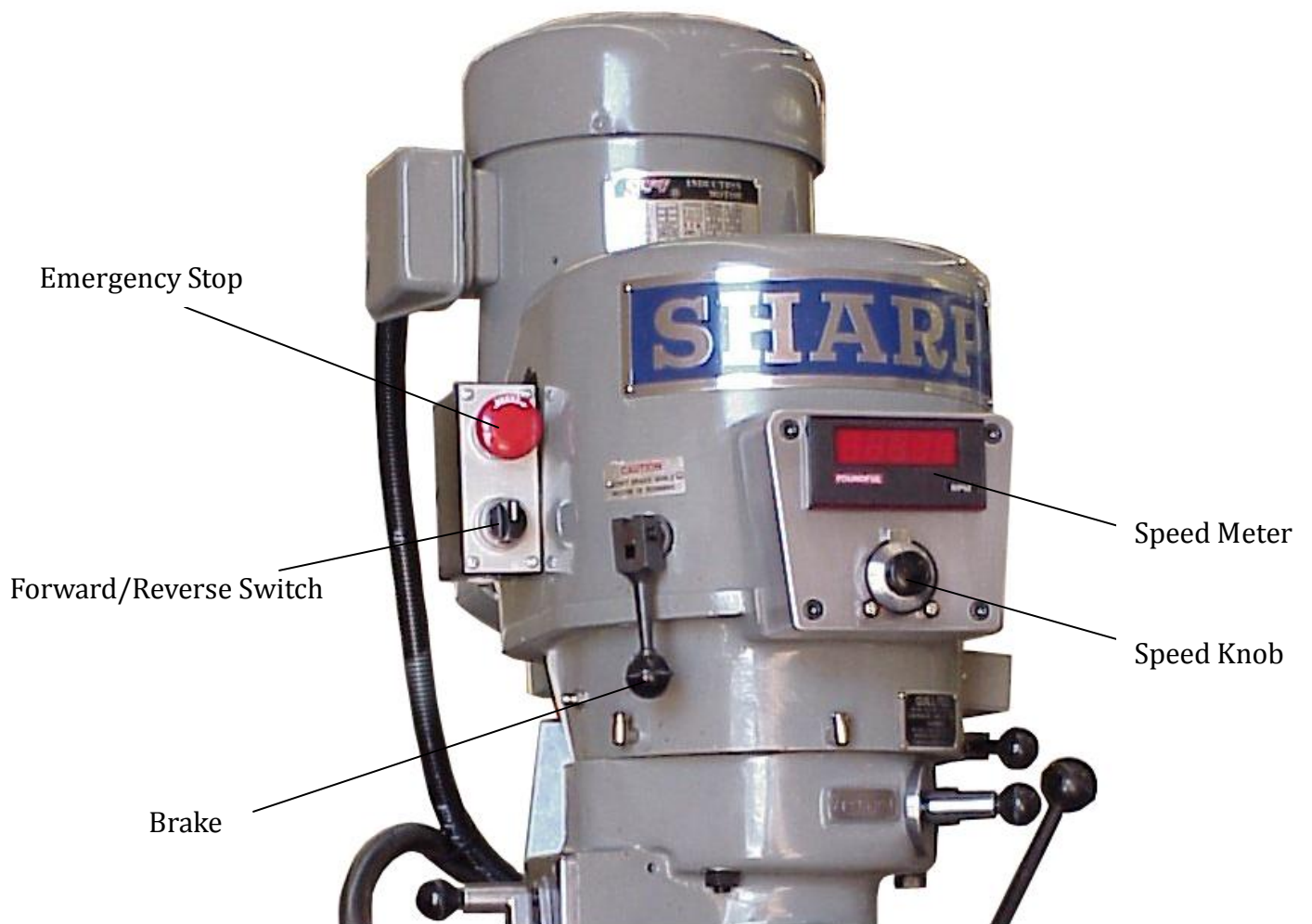


5. PARTS REPLACEMENT

(a) Names of machine parts:

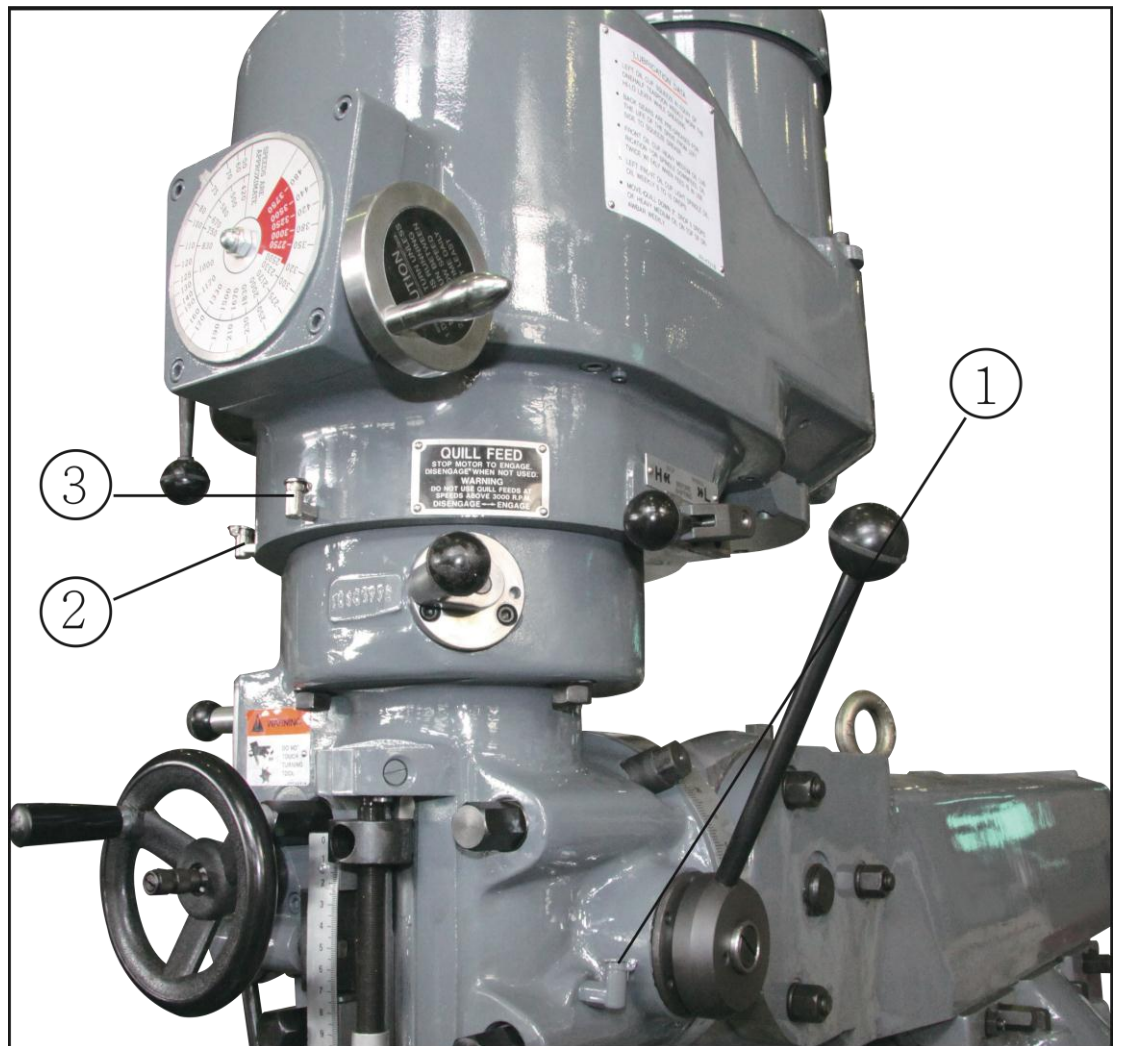
Step speed Headstock:(TMV-185TM)





(b) Headstock Lubrication:

1. TMV-185VS Headstock



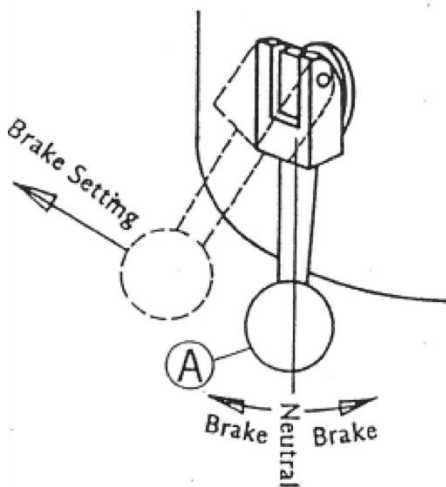
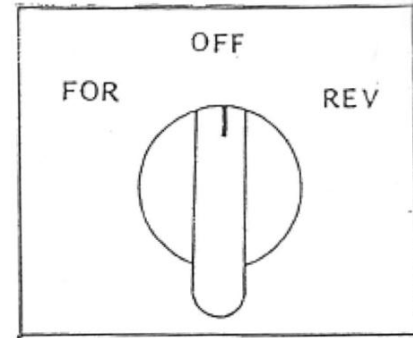
| Item | Lubricants | Qty. | Time | Position |
|------|----------------|------|-------------|-------------------------------------|
| 1 | SHELL TONNA 68 | Full | Twice Daily | Head Stock Matching Quill Holes |
| 2 | SHELL TONNA 68 | Full | Twice Daily | Bull Gear Bearing Sleeve |
| 3 | SHELL TONNA 68 | Full | Twice Daily | Counter Shaft Gear Worm Gear Cradle |

(c) Operations:

1 Reversing Switch:

Motor turning is controlled by the reversing switch (Vide the Figure in the right). When the high-low speed change lever (Vide P21, 22) is placed at the high gear position and the switch is on FOR, the motor turns clockwise. When the switch is on REV, the motor turns counterclockwise. When the switch is on OFF, then the power source is cut off.

Note: When the high speed change lever is placed at the low gear position, then, it is just on the opposite.



(a) Spindle Brake: (TMV-185VS)

Before braking, the power source must be switched off, and waiting until the spindle speed is lower than 200 RPM before the brake lever (A) (as shown in the figure on the left) is pushed to the left rear or left front to stop the turning and effectuate the braking. Push the brake lever (A) upward and the quill is braked to a full stop for easy cutter tool change

(b) Spindle Brake: (TMV-185TM)

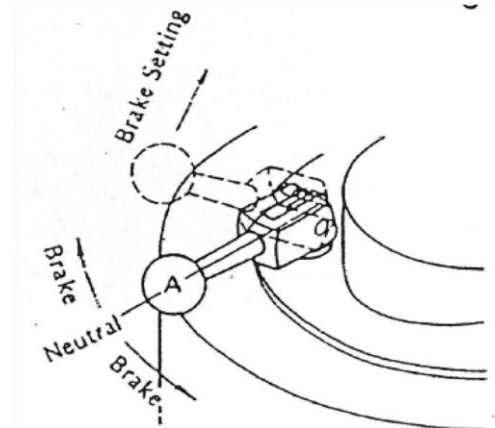
Before braking, the power source must be switched off, and waiting until the spindle speed is lower than 2 00 RPM before the brake lever (A) (Vide Fig below) is pushed to the left rear or left front to stop the Turning and effectuate the braking. Push the brake lever (A) upward and the quill is braked to a full stop for easy cutter tool change.

Note: Be sure that the brake lever is in neutral before starting motor.

2 Chucking of Tool Shank and Dismantling:

First the spindle must be raised up to its maximum height. The thread of draw bar is right turn. When the screw is turned clockwise, it is for locking of tool shank, and vice-versa. To take out the tool shank, the drawbar must be turned from three to five rounds. Then, use a soft mallet to hit lightly on the drawbar until the tool shank comes off totally.

Note: According to Spindle Braking, brake the spindle to a full stop and the tool shank may easily come off or chuck on.



3 Headstock Tilting

(I) In-and-Out Tilting

Turn loose evenly the six adapter locking bolt (P) and turn the vertical adjusting worm shaft (Q) until the angle desired is obtained. Lock up the bolts (P) tightly.

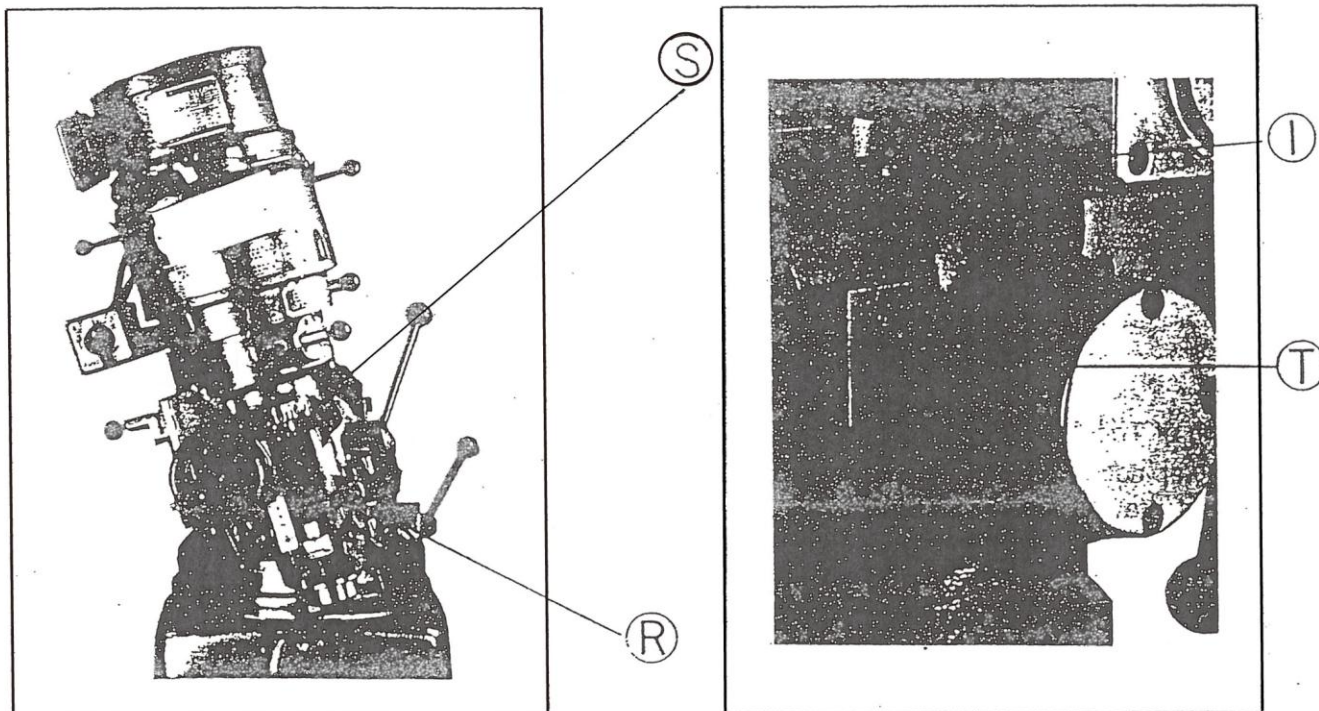
Note: Do not loosen all the headstock bolts totally.

(2) Cross Tilting

Loosen evenly the four lock nuts (R) and turn the worm shaft (S) until the desired angle is secured. Then lock up the lock nuts (R) evenly.

Note:

1. Do not loosen the lock nuts (R) totally during the adjustment.



4. Manual Feed

(1) The manual feed lever is installed on the right side of headstock (Figure 13, H). The spindle will travel vertically when the lever is turned. There are 12 positions to be chosen. An operator can freely take out the lever and install it again at the position deemed proper and fit.

Note: In manual feed, the feed control handle (F) must be placed at position (F1) as shown in (Fig.13).

(2) Manual Micromotion Feed:

To effectuate the manual micromotion feed, the power-feed transmission engagement crank (J) (Fig.13) shall be placed at "OUT" position, and feed reverse knob (D) at the neutral position.

Feed control lever (F) must be pulled from (F1) to (F2). This is to engage the overload clutch. Turn the feed handwheel (E) clockwise for quill downward feed, and vice-versa.

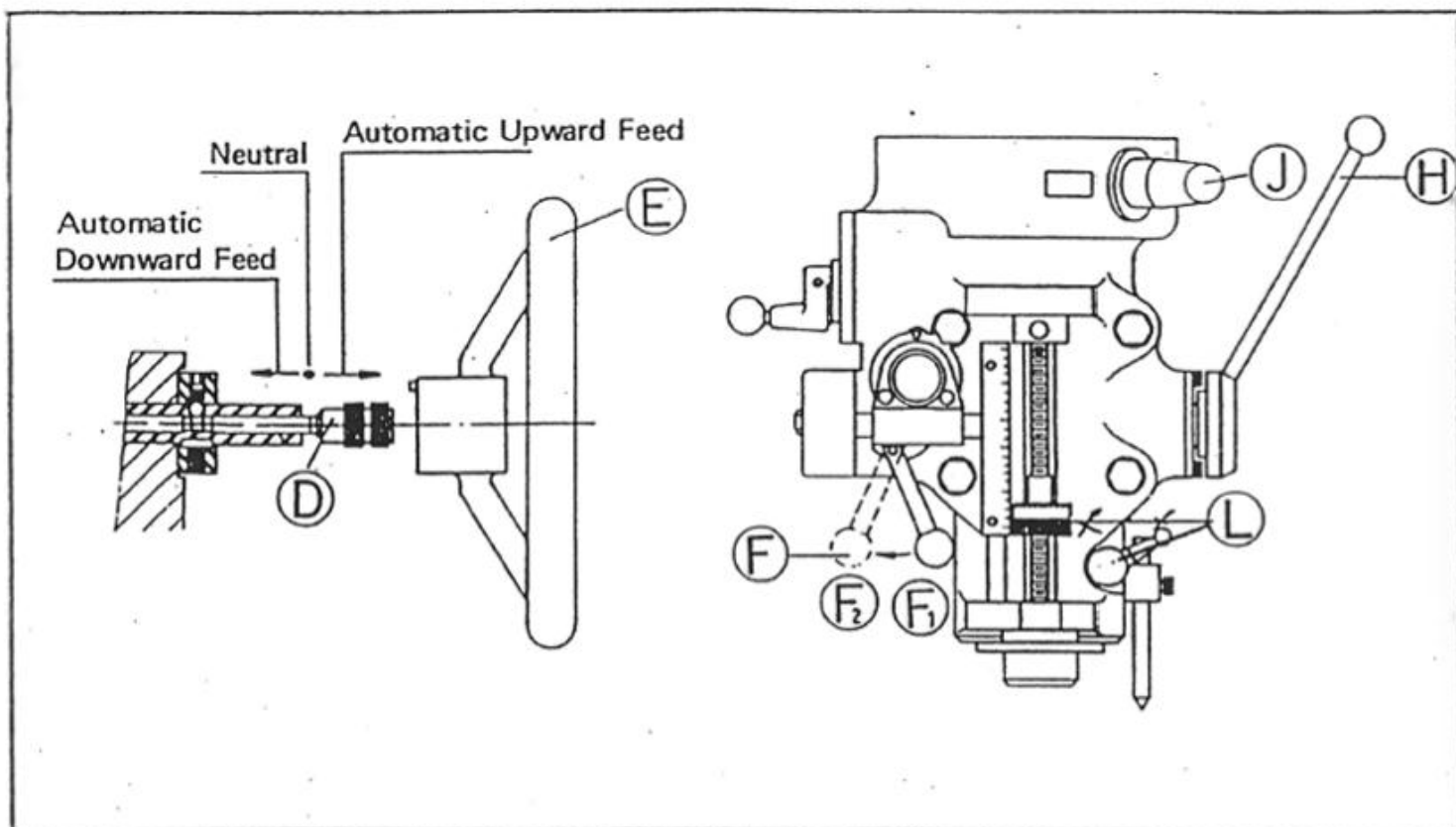


Fig. 13

5 Automatic Feed:

For automatic feeding, please take the following steps (Vide P.21 P22):

- a. Loosen the quill lock (L).
- b. Turn the power feed transmission engagement crank (j) from "OUT" to "IN" position. 'Make certain to engage the worm gear cradle with the spindle gear hub so that the driving will be directed from the spindle worm and worm gear before it is passed to the speed change gears.
- c. Feed speed is in three stages. H, L and M. Selection may be made by quill feed selector (C). Put feed reverse knob (D) (Fig. 13) on neutral before change feed speed.
- d. Pull the feed control lever (F) from (F1) to (F2) position (Fig.14) to engage the overload clutch for automatic feed mechanism.
- e. When the feed reverse knob (D) pressed inward (Fig.13), it is for downward feed, and vice-versa. The middle position is neutral.
- f. As shown in (Fig.14), the working depth may be set by micrometer adjustment nuts (K) (each graduation is 0.001" or 0.02mm). When the quill stop block (I) contacts the micrometer adjustment nut (K), the feed control lever (F) may simply jump from (F2) back to (F1) position owing to the connecting motion between the feed trip lever and feed trip plunger. This will disengage the overload clutch and stop the spindle feed.

Note:

1. Maximum drilling capacity in automatic feed is 3/8" or 10 mm.
2. The power feed transmission engagement crank (I)(Vide P.21, P.22) shall be placed at "OUT" position when the automatic feed is not in operation. Do not move the power feed transmission engagement crank when the spindle is in revolution.
3. Very Important!
Bring quill stop block (1) (Fig.14) at least 5mm downward from the high-end position before engage feed control lever (F).

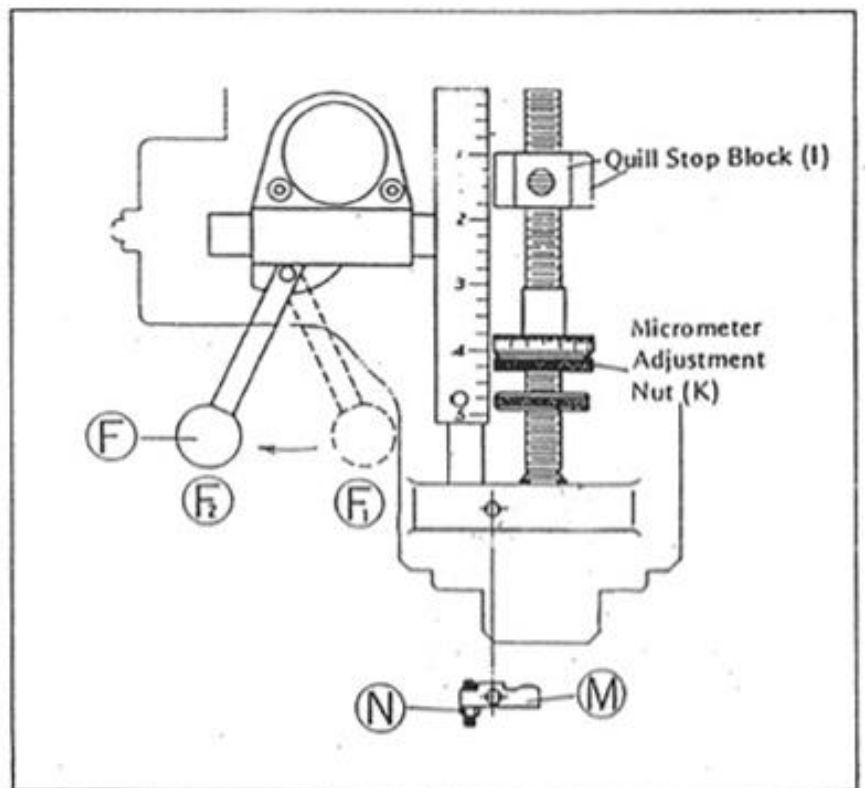


FIG.14

Spindle speed change

(a) TMV-185VS

By means of the variation of one set of sliding belt pulley and counter shaft gear (high or low speed), the spindle revolution speed is changed accordingly.

(1) Change of High and Low Speeds:

The speed change may be effectuated by the chosen high and low speed lever (figure 15 (J)). When (J) is engaged in the right front, it is for the high speed and the spindle may rotate as high as 500 to 3,000RPM. When (J) is positioned at the right rear, the spindle may have a speed of 60-580RPM. The neutral lever position is in the right down.

- Note:
- The spindle must be motionless completely during the speed change.
 - To shift the high speed into the low one, the spindle must be slightly turned to make it easier for the back-row gear to engage.
 - To shift the low speed into the high one, use the brake lever so as to put a stop to the spindle clutch. Then, turn the spindle slightly so that the clutch may be engaged feasibly. A "click" sound of engagement may be sensed at this moment.
 - The direction of low speed rotation is opposite to that of the high speed. By the reversing switch, the direction may change to that of the high speed revolution.

(2) Speed Change Handwheel:

Stepless speed variation between high and low speeds may be controlled by means of the turning handwheel (Figure 15(G)). When it is turned clockwise, it is for higher speed, and vice-versa.

- Note:
- Do not change the speed when the spindle stands still.
 - Avoid using it when the speed is in excess of 3,000RPM.
 - In the process of speed change from high speed to low speed, and vice-versa, do not change the speed rapidly to safeguard the service life of the internal mechanism.
 - It takes roughly 10 to 15 minutes to change from low speed to the high one, and vice versa.



Figure 15

(d) Trouble Shootings:

(A) TMV-185VS Head Stock

(1) Dismantling of TMV-185VS Motor (as shown in Figure 17):

- a. Start the motor and turn the speed change handvwheel (A) to the position of 60RPM appeared on the indicator to lower down the stationary motor van-disc to the lowest position.
- b. Cut off the motor power source and take off wire pressboard and reversing switch.
- c. Remove motor pulley cover (B) under the motor shaft. Then, use the two hexagonal concave bolts (C) that locked the bearing housing to insert into the two holes of the speed change spring pieces' (D). Lock into the motor vari-disc (E) and evenly lock up the two bolts (C). Push down the speed change spring (F) so as to separate it from the retainer ring (G).
- d. Take out the retainer ring (G).
- e. Take off the two hexagonal bolts (H) that locked the motor. The motor may be lifted up. Motor vari-disc (E) and speed change belt are still kept inside the belt housing.
- f. Once the motor is replaced, just reverse the order of dismantling.

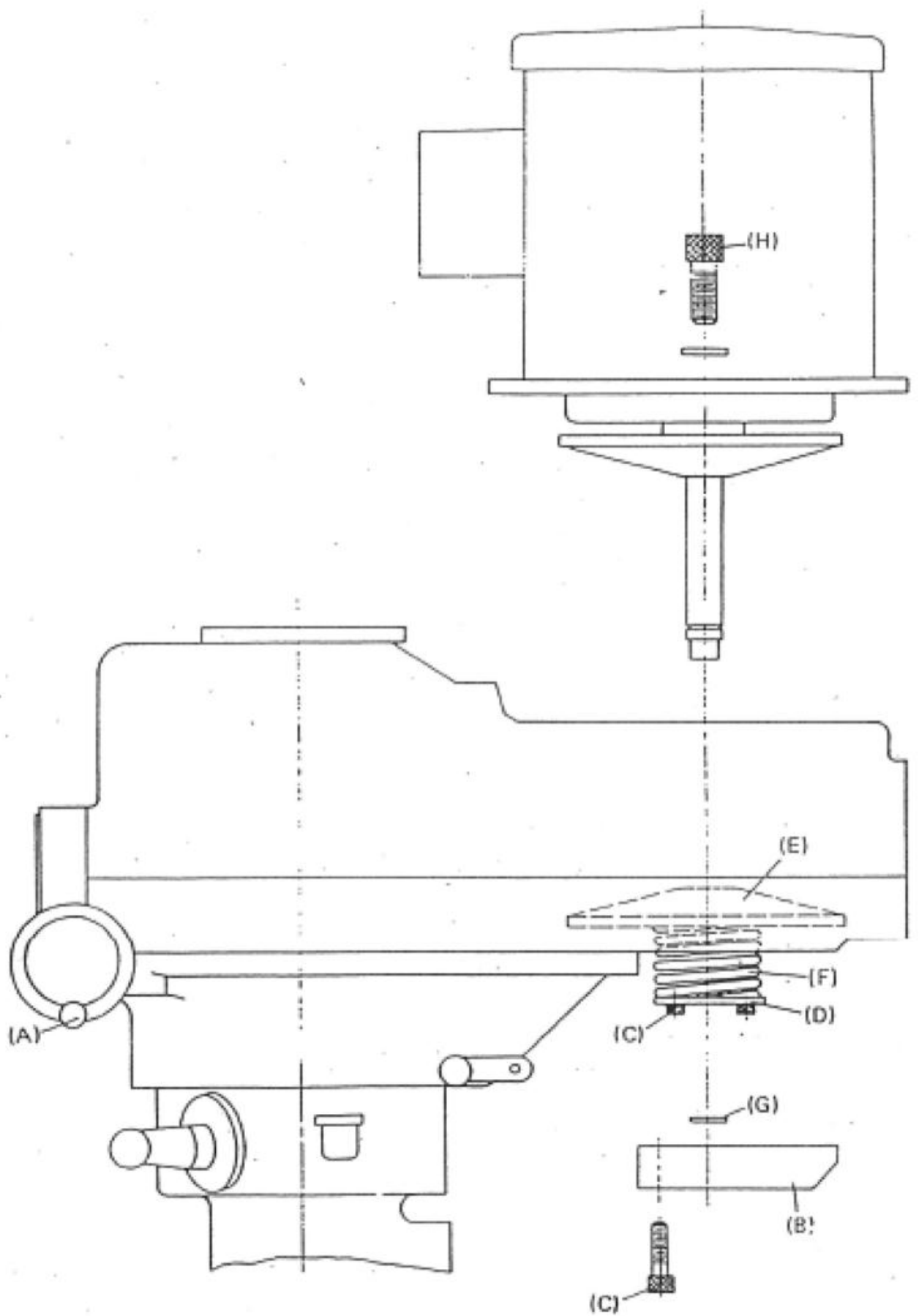


Figure 17

(2) Replacement of Speed Change Belt (as shown in Figure 18):

- a. Refer to Step a to e of motor dismantling on P. 31.
- b. Take off draw bar (I).
- c. Dismantle the three hexagonal concave bolts (j) and use two of them (j) to lift the bearing housing (K).
- d. Remove from top the two hexagonal concave bolts (L), fixing the speed change plate, and take off the bolt sleeves (M).
- e. Dismantle four hexagonal concave bolts (N)(O) and the two at the bottom (P).
- f. Take off the two hexagonal concave bolts (S) speed change housing (Q) and gear housing (R).
- g. Use a mallet and hit the upper belt housing (T) lightly so that it will break away from the fix pin (U) for dismantling of the upper belt housing.
- h. When the speed change belt is replaced accordingly, restore the machine by reversing the orders.

Note: The replaced speed change belt shall conform to that of our company specifications.

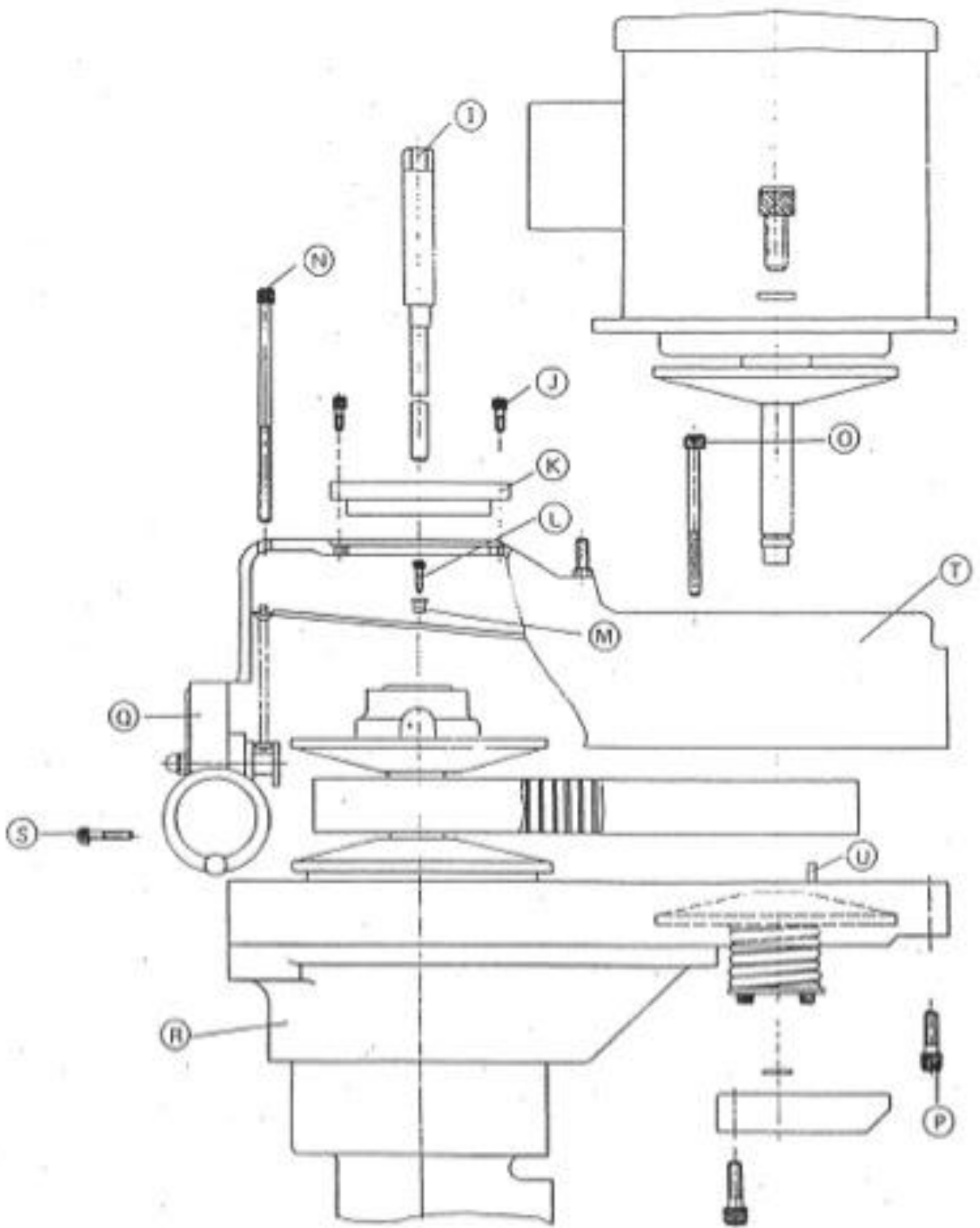
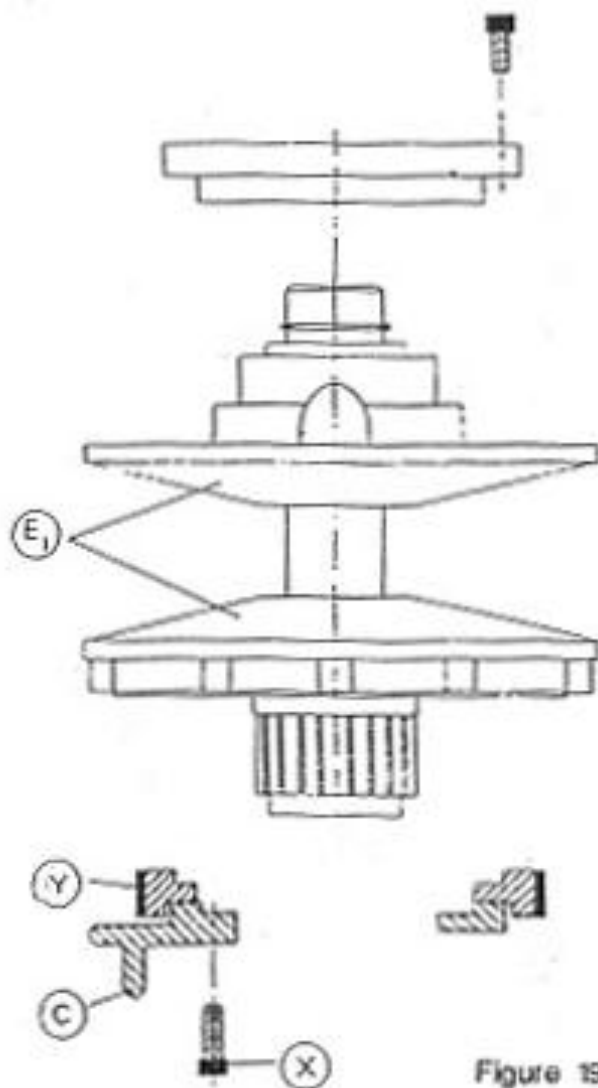


Figure 18

(3) Replacement of Brake Block (Figure 19):

- a. Refer to Step a to f on P.31 on motor dismantling.
- b. Refer to step b to g on P.33 on replacement of speed change belt to dismantle the upper belt housing.
- c. As shown in Figure 20, take off the connected gear housing (R) and the four hexagonal concave bolts (V) bottom belt housing (T1).
- d. Use a soft mallet and hit the bottom belt housing lightly to disengage it with the fix pin (W) to dismantle the bottom belt housing (Ti) as shown in Figure 20.
- e. Take off the hexagonal concave bolt (X) of the two setting bearing housing and remove the front vari-disc assembly set (E1). Brake block (Y) can be replaced then.
- f. Reverse the order to restore the machine assembly after the brake block is replaced.



(4) Replacement of Timing Belt

- a. Refer to Step a to e of motor dismantling on P.24.
- b. Refer to Step b to g speed change belt replacement on P.26 to take off the upper belt housing.
- c. Refer to Step c to d on P.28 replacement of brake block for the dismantling of bottom belt housing and change the timing belt as shown in Figure 28.
- d. Restore the machine structure by reversing the steps once the timing belt is replaced.

Note: Belt to be replaced shall conform to the manufacturer's specs.

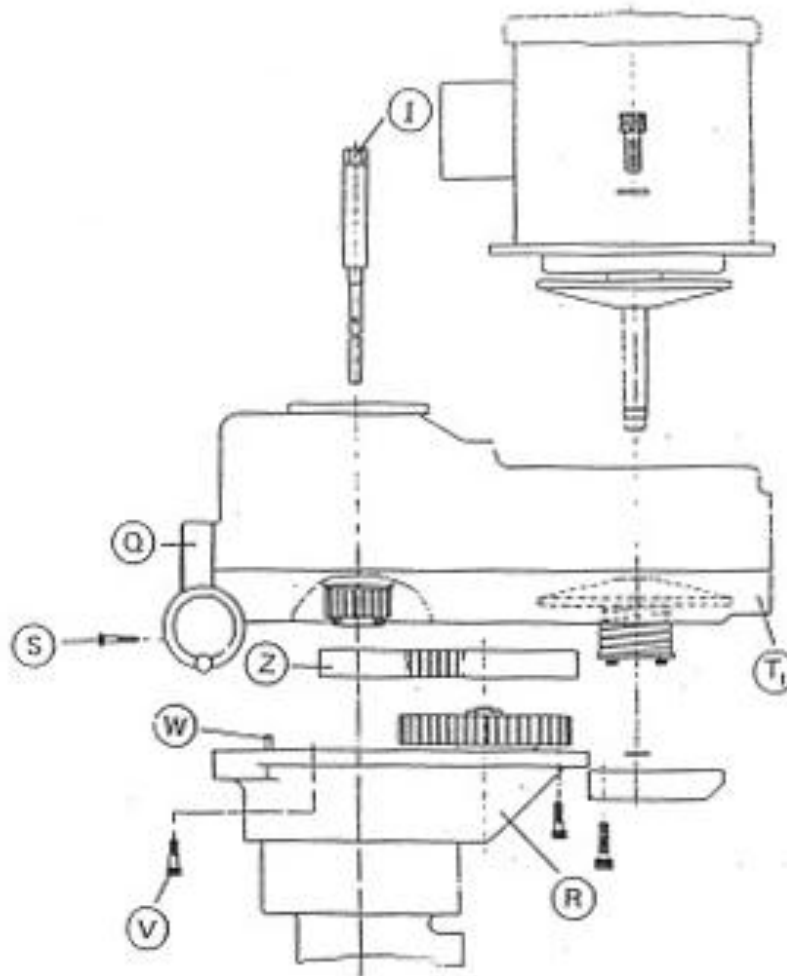
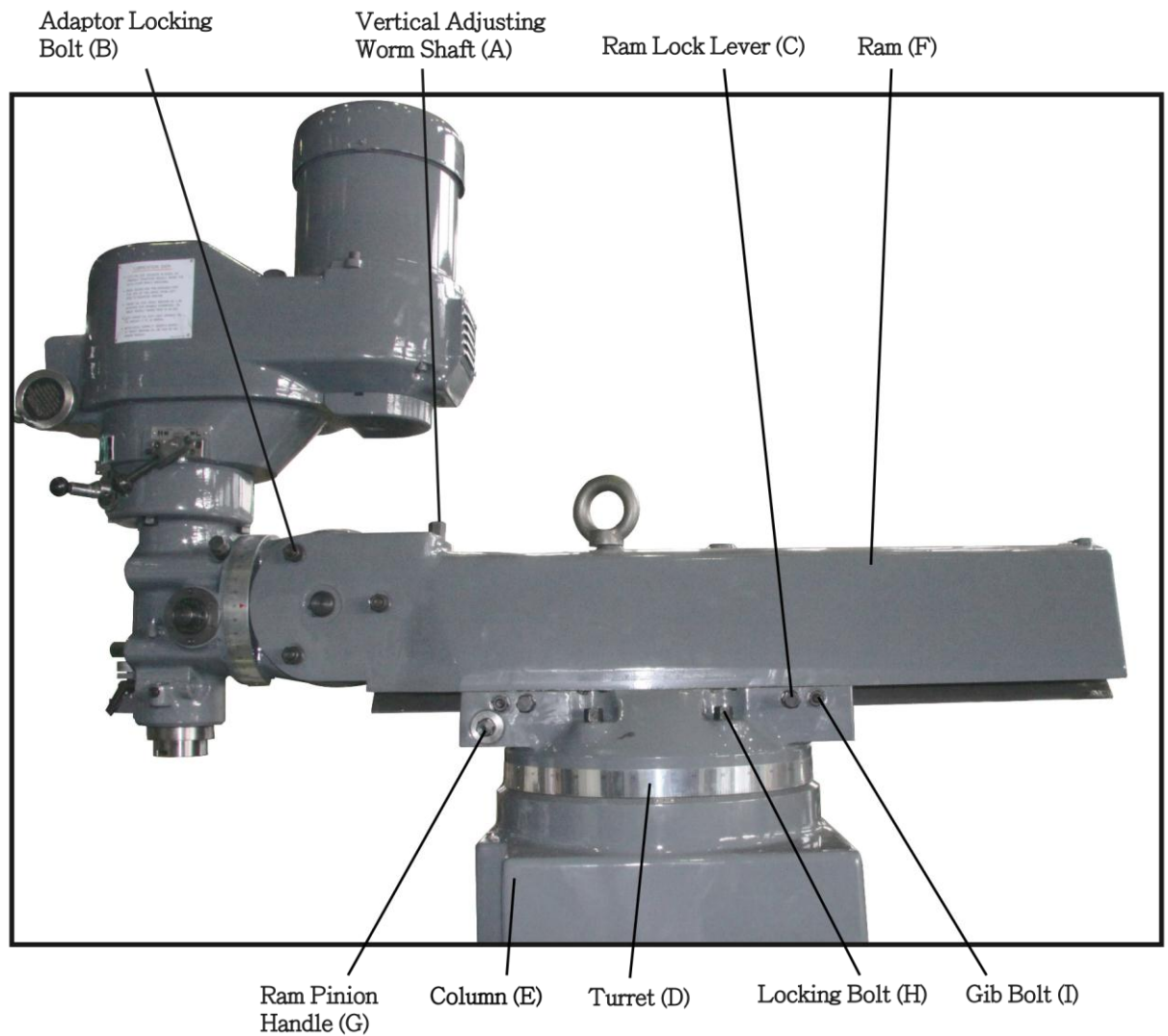


Figure 20

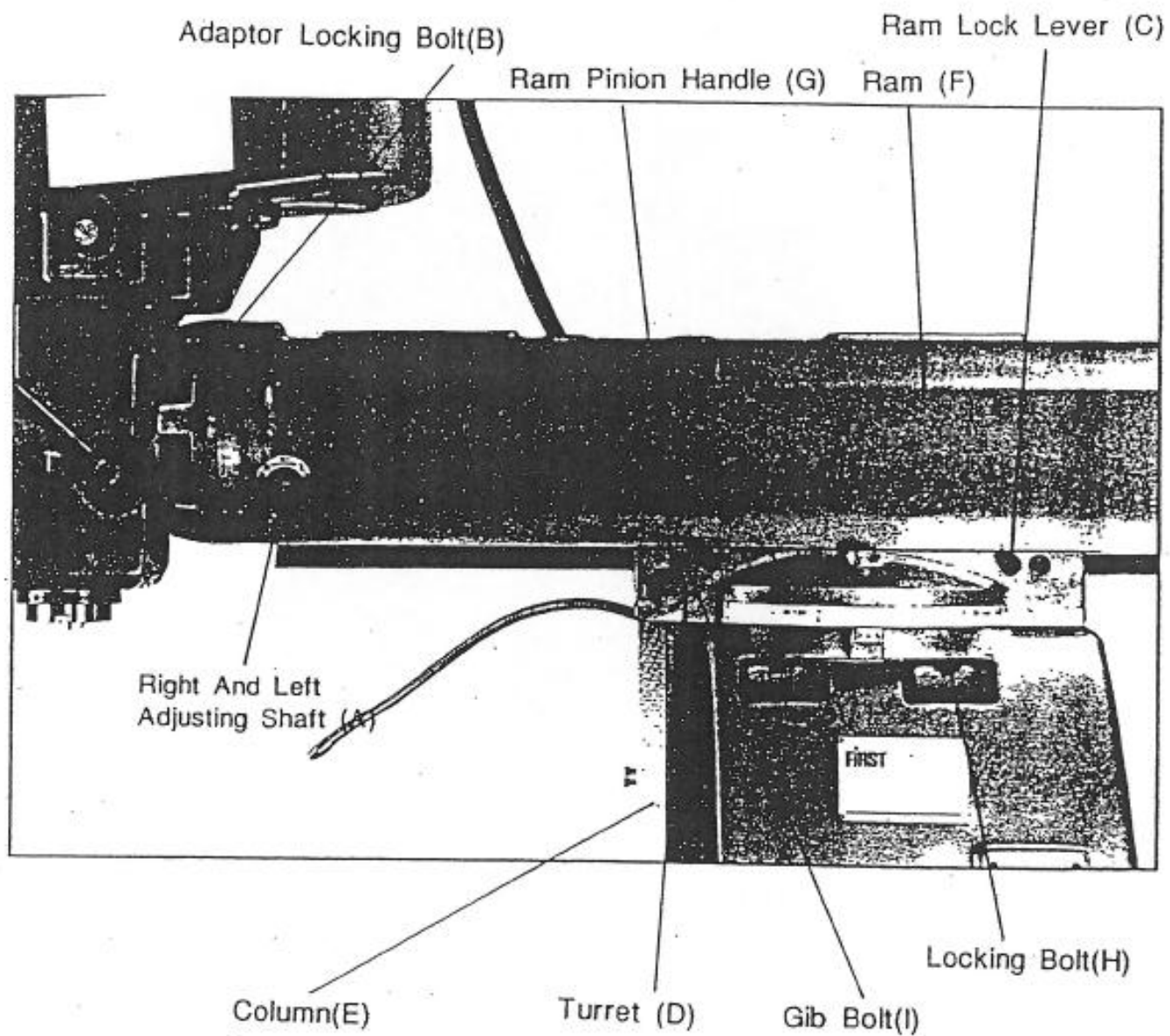
5. Machine Body

(A) Names of machine parts:

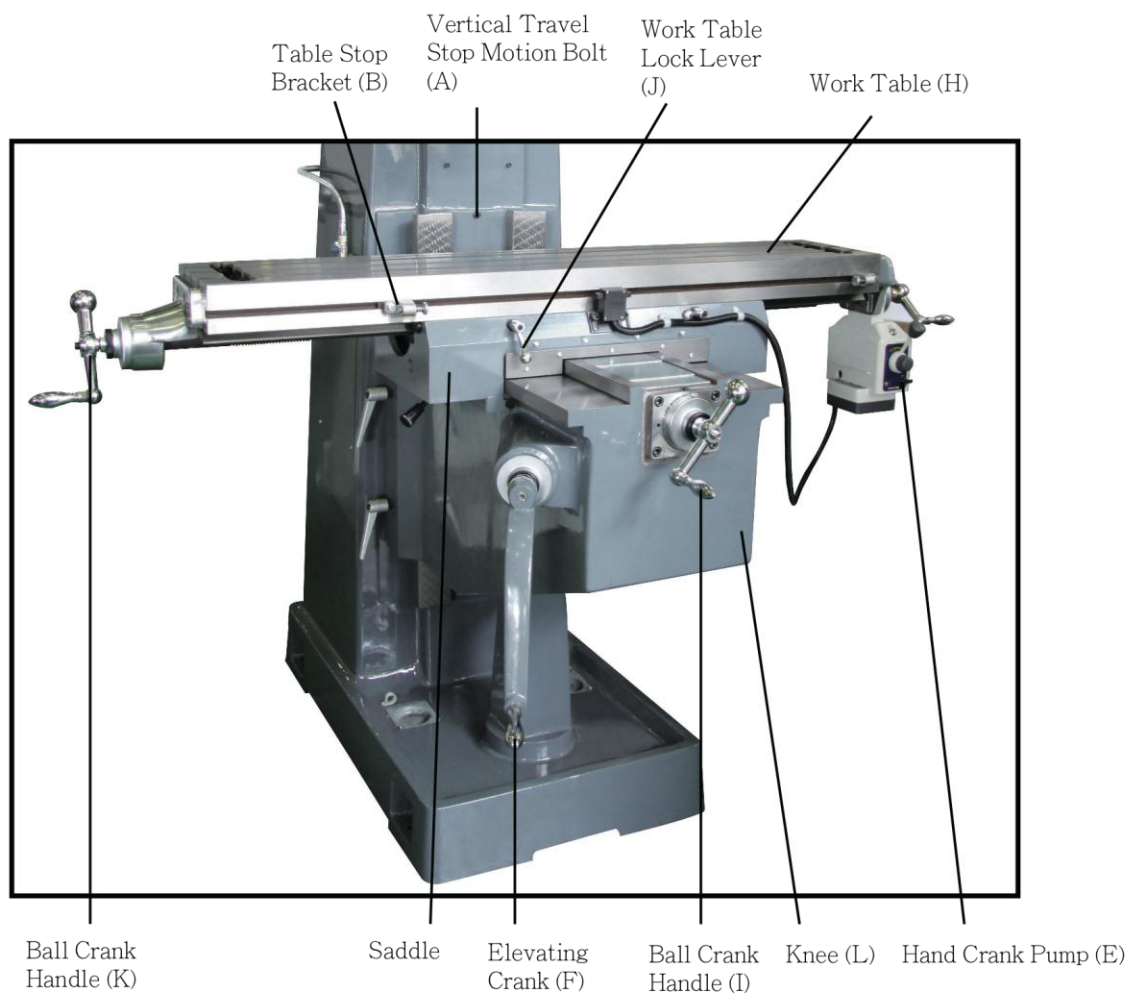
(a) Column, Turret and Ram: (185 TM/VS)



(b) Column, Turret and Ram: (195 TM/VS)



(c) Work Table, Saddle and Knee:(TMV-185/LC-195)



(B) Machine lubrication



| | |
|-----------|--|
| Position | Lubrication of work table, saddle, knee, sliding surface and leadscrews may be effectuated by means of the hand crank pump on the left side of knee. |
| Method | 3 to 5 times daily by pulling twice each time. |
| Lubricant | SHELL TONNA 68 |

(C) Operations:

(a) Ram Movement and

Swiveling:

1. Ram

Movement:

- a. Loosen the two Ram lock levers (A).
- b. Swivel the Ram pinion handle (B), and the Ram can be moved.
- c. When it moves to the desired position, lock up (A).

2. Ram Swiveling:

Loosen the four locking bolts (C), and force the cross arm to turn until the desired angle is obtained. Lock up (C).

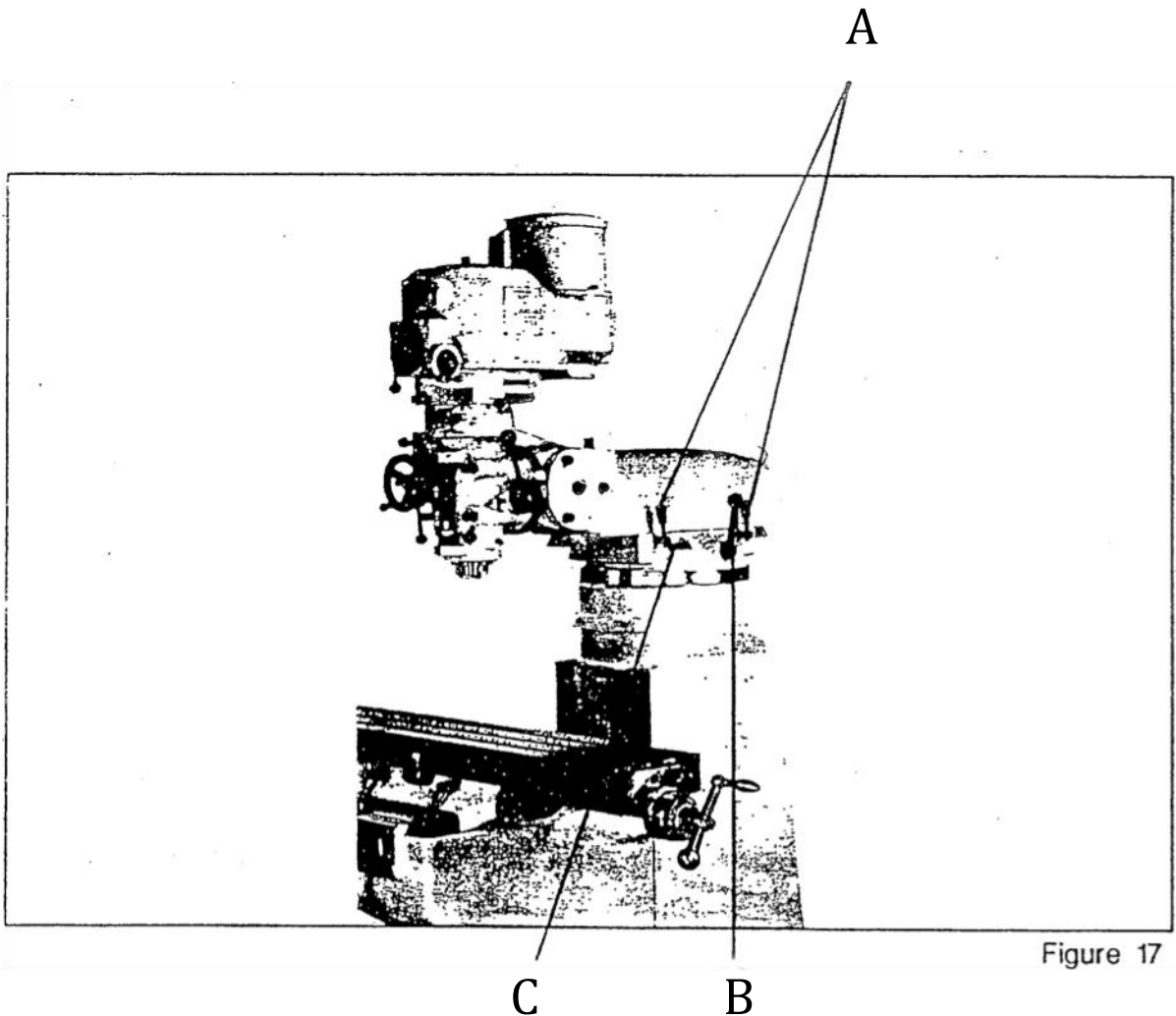


Figure 17

(b) Zero Positioning (as shown in Figure 23) of Dial Ring of Table Feed.

1. Loosen the nut (D) of dial ring.
2. Turn the dial right (E) to zero position.
3. Lock the nut (D) of dial ring.

(c) Setting of Sliding Surfaces of Work Table, Saddle and Knee:

All non-feed sliding Surfaces shall be secured and set to prevent slipping and increase machine body's rigidity. The sliding surface setting levers (as shown in Figure 24) are clockwise for setting and counterclockwise for release.

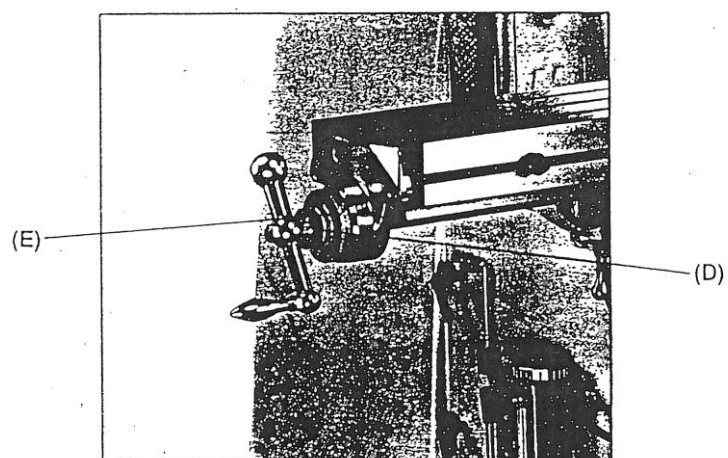


Figure 23

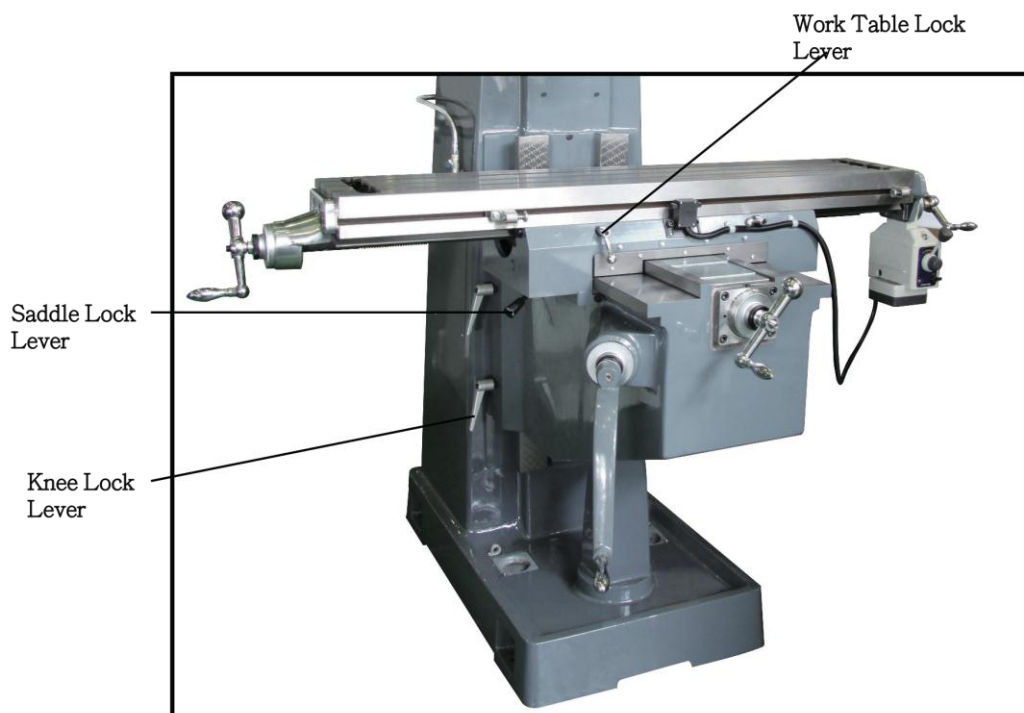


Figure 24

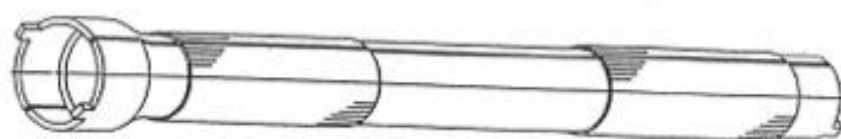
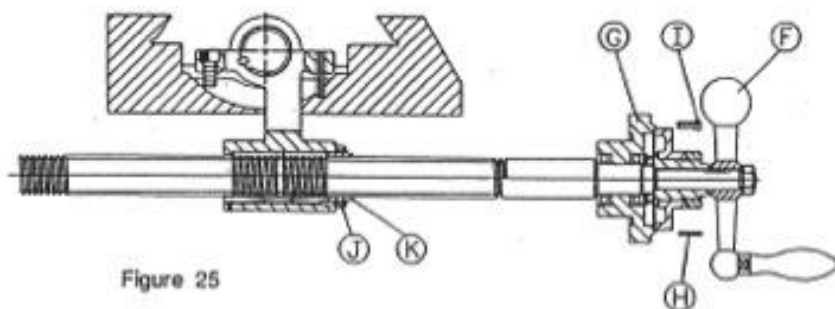
(D) Adjustment:

(a) Adjustment of Backlash of Leadscrew:

After a certain period of time, a clearance is developed between the leadscrew and its nut due to frictions. Positioning accuracy will become impossible. Therefore, the nut must be adjusted so as to keep a proper tension between itself and the leadscrew.

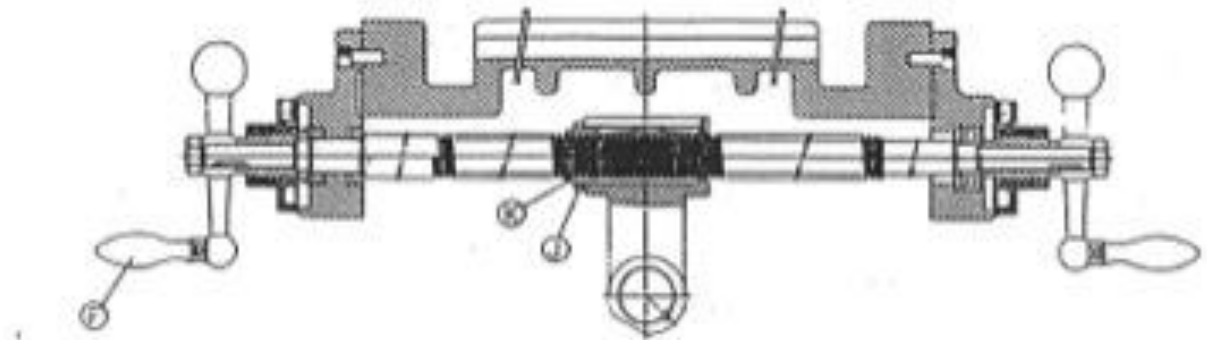
1. Adjustment of cross leadscrew (Vide Figure 25):

- a. Turn counterclockwise the crank (F) and move the saddle seat to the foremost position of knee.
- b. Remove the two setting pins (H) of the front bearing bracket (G) and take off the four socket HD cap screw (I).
- c. Support the cross feed bearing bracket (G) and turn clockwise the crank (F) so that the bracket will be separated from the knee with a certain distance between them (as shown in Figure 26, the distance must be longer than the length of the adjusting tool).
- d. Insert the larger end of clearance adjusting tool into the knee and turn the locking nut (J) one round Counterclockwise. Reverse the adjusting tool and insert the smaller end into the knee. Turn the nut (K) clockwise and lock it up.
- e. Turn clockwise and Counterclockwise the crank (F) and measure a clearance of approximately 3-4 graduations (0.06mm-0.08mm or 0.003-0.004") on the dial. Lock up (J) consequently.
- f. Turning counterclockwise the leadscrew into the knee until the front bearing bracket seat gets in contact with the knee. Insert the two setting pins (H) and lock up tightly the four cap screw (I) of the bearing bracket.



2. Adjustment of Backlash of Longitudinal Leadscrew:

- a. Move the work table to the center of saddle.
- b. Insert the large end of backlash adjustment tool into the left side of saddle. Turn the locking nut (J) counterclockwise one round. Reverse the end of adjustment tool and insert the small end into same position and turn the leadscrew adjusting nut (K) clockwise.
- c. Turn the crank (F) slightly clockwise and counterclockwise and measure a clearance of approximately 3 to 4 graduations on the dial (0.06-0.08mm or 0.003"-0.004"), before the nut is locked up lightly again.



3. Adjustment of Work Table Gib (Figure 27):

Work table gib (C) is attached between saddle and work table dovetail.

- a. Loosen the setting lever (A) (Vide Figure 27).
- b. Clean the slideway and add the lubricant
- c. Use a screwdriver to adjust the big bolts (B) on left and right sides of the saddle.
- d. Method of Adjustment. If the Long feed handwheel is felt too loose by turning, loosen the adjusting bolt on the right side of the saddle a little bit. Then, lock •up the adjusting bolt on the left side before turning the handwheel again. If the handwheel is too tight, just reverse the steps repeatedly until the work table sliding is satisfactorily smooth.
- e. Replace the worn out gibs whenever it is necessary.

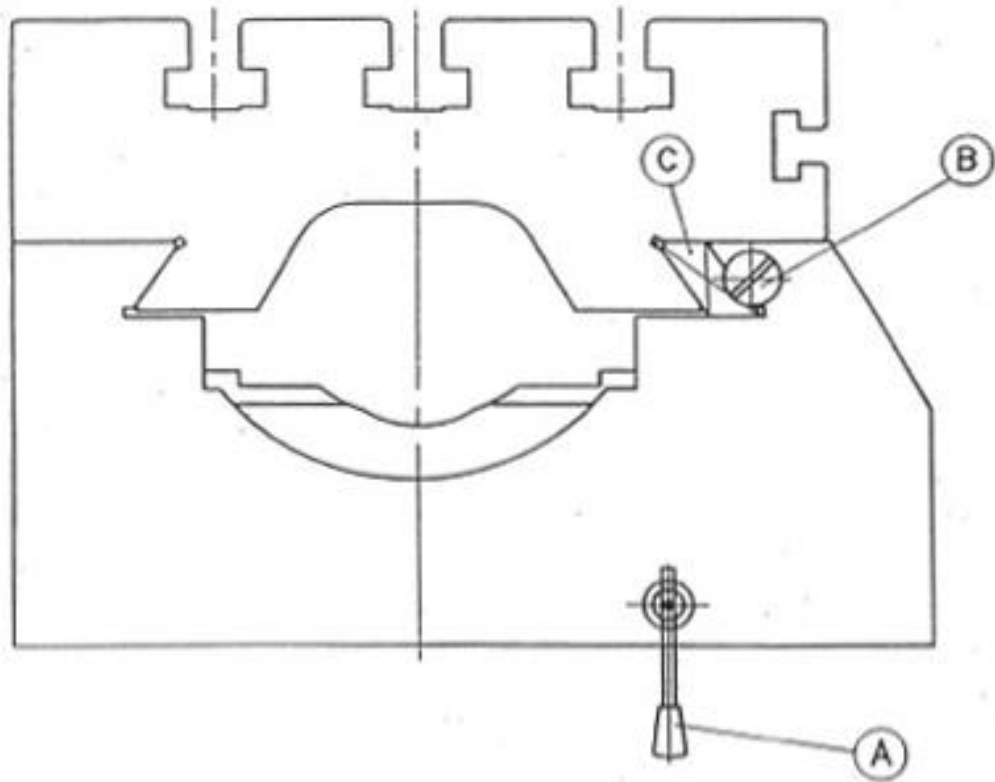
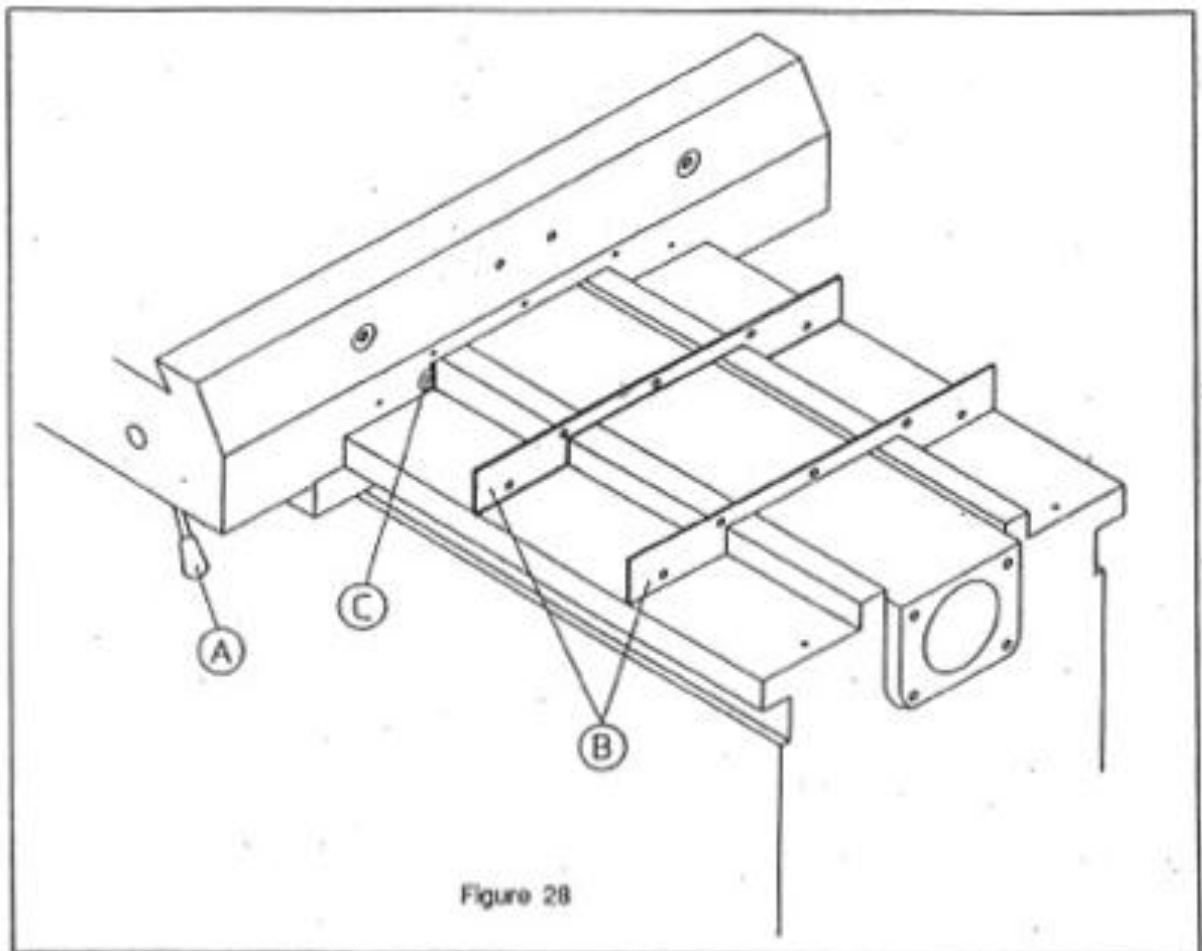


Figure 27

4. Adjustment of Saddle Gib (Figure 28):

Saddle gib is attached to the position between the left side of saddle and the knee.

- a. Loosen the saddle lock lever (A) (Vide Figure 28).
- b. Move the saddle to the front part of the knee.
- c. Take off the front and rear wiper holders (B) of saddles.
- d. Clean the slideway and add the lubricant.
- e. Use a screw driver to adjust the gib bolts (C) in the left front and rear parts of the saddle.
- f. Lock up the wiper holders (B) on the saddle.



5. Adjustment of Knee Gib on Machine Body (Vide Figure 29):

Knee gib is attached to the position between the side of knee and the column slideway.

- a. Loosen the lock bolt (A) by using hexagonal spanner.
- b. Take off the wiper holder (B).
- c. Clean the slideway and add the lubricant.
- d. Move the knee to the highest position.
- e. Use a screwdriver to adjust the gib bolts (C) in the left upward and bottom parts of the knee.
- f. Employ the same methods to adjust the gib bolts (D) and (E)
- g. Restore and lock up the wiper holder (B).

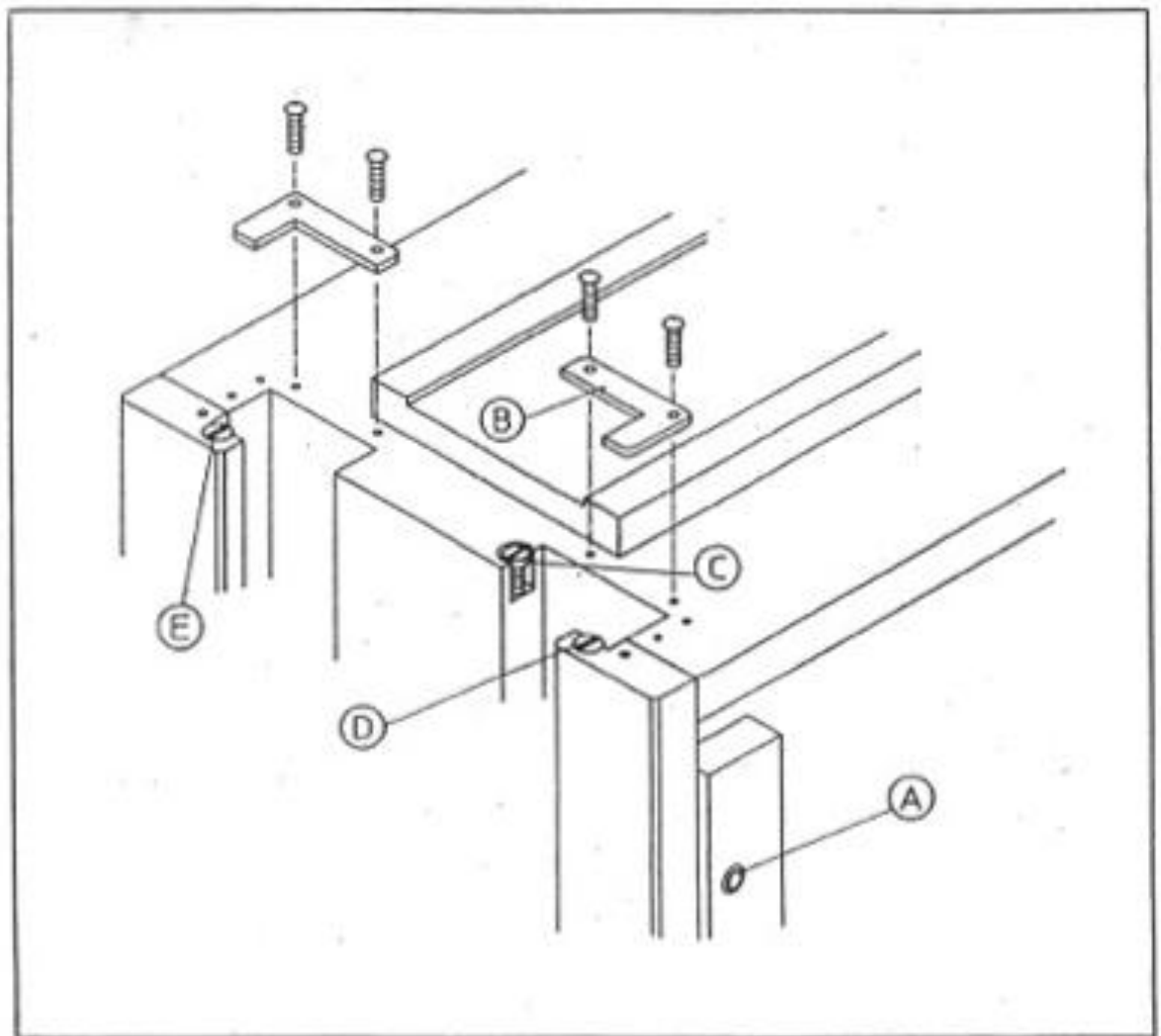


Figure 29

6. Adjustment of Ram Gib (Vide Figure 30):

Ram gib is attached to the position between the ram and the turret dovetail. Tightness of ram can be adjusted properly by gib bolts.

- a. Loosen the ram lock bolts (A).
- b. Clean the slideway and add the lubricant
- c. Loosen the nuts on gib bolts (B).
- d. Use a screwdriver to adjust the gib bolts until the ram sides smoothly.
- e. Lock up the nuts.

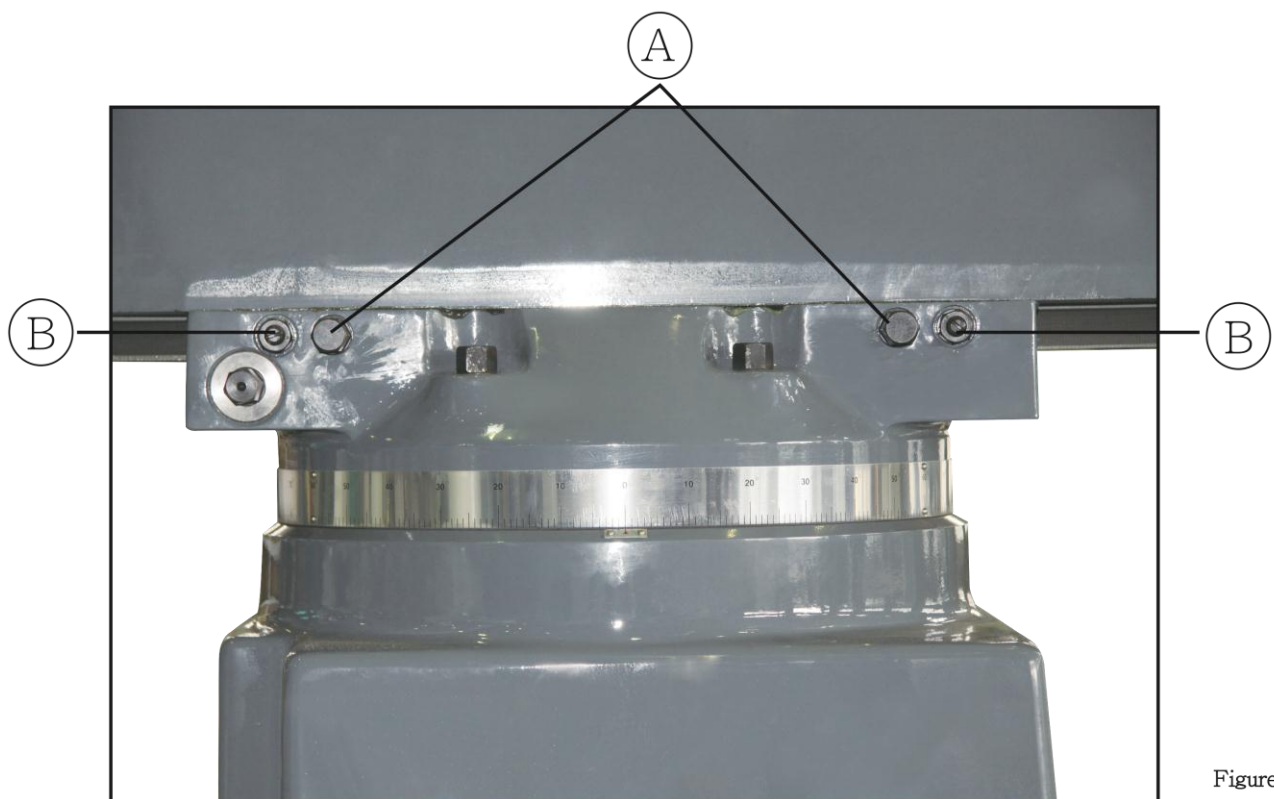


Figure 30

6. Maintenance:

"Maintenance is more important than repair, and repair is better than purchase".

Under long-term operations, if the machine has not been properly maintained and operated, its service life shall be greatly reduced. The work-piece quality is therefore affected, and the efficiency decreased. It is essential for an operator to know how to handle the machine and the concept of its maintenance and keep correctly.

Daily Maintenance:

- (1) Check and see if the oil level of hand crank pump is on the designed line.
- (2) The designated positions must be lubricated prior to operations.
- (3) Keep the machine idling for three to five minutes daily prior to operations.
- (4) At the close of each day, work table shall be cleaned and the unfinished workpiece must be removed. A little bit of lubricant is recommended.
- (5) At the close of each day, all setting levers shall be loosened, and all sliding parts

shall be moved to the proper position.

Then cutter must be dismantled.

- (6) At the close of each day, the headstock must be restored to its normal position if it is tilted.

Monthly Maintenance:

- (1) Check and see if all clamping rails of various sliding surfaces are normal.
- (2) Check and see if the backlash between leadscrew and its nut is normal.
- (3) Check and see if the quill lock and that of each and over sliding surface is normal.

Quarterly Maintenance:

- (1) Check and see if the brake functions and belt are normal.
- (2) Inspect the level of work table and erection status of headstock.
- (3) Test the machine again by the chart of test specifications.
- (4) Replace whatever parts worn-out.

| TROUBLE | CAUSE | CORRECTION |
|--|--|---|
| SPINDLE POWER FEED DISENGAGEMENT NOT WORK WELL | The two M4 set screws on disengage lever loosed | Tighten set screws |
| HAND MICRO-FEED NOT WORK | 1. Power feed rates selecting knob set on one of the three feed 2. Engage lever not operated. | 1. Rotate this knob to one of the two "DUMMY" positions. 2. Pull engage lever. |
| V-BELT SLIPS AT CUTTING | 1. V-belt too loose 2. V-belt worn 3. Wrong grooves | 1. Tight V-belt 2. Replace V-belt 3. Check grooves |
| RAPID TRAVERSE OF FEEDBOX NOT WORK | 1. Wrong motor rotating direction 2. Multi-disc clutch worn 3. Rapid traverse shifter worn | 1. Reconnect the power supply 2. Adjust clutch 3. Replace shifter |
| FEED STOPS SUDDENLY DURING MACHINING | 1. Overload makes the shear pin shear out | 1. Check the overload cause and replace shear pin |
| KNEE CAN'T BE POWER ELEVATED | 1. Knee is locked on column 2. Over weight of work piece, fixtures, etc. (Max. load capacity: 300 KGS) 3. Poor lubricating between knee and column | Release lock bolts Use hand elevating |
| CANNOT HOLD SIZE | 1. Cutting load too great 2. May be due to chip packing 3. Chips causing misalignment. | 1. Decrease number of teeth in contact with work piece. 2. Increase oil pressure in redirect flow so as to wash chips out of teeth. 3. Brush or blow all chips away before mounting new piece of work. |
| PREMATURE CUTTER DULLING | Cutting load too great | 1. Decrease number of teeth in contact with work piece 2. Add blending oil to lubricant |

| | | |
|------------------------------------|--|---|
| CUTTING "HOGSIN" | <ol style="list-style-type: none"> 1. Peripheral relief too great. 2. Rake, angle too large 3. Improper speed | <ol style="list-style-type: none"> 1. Use recommended angle. 2. Decrease rake angle. 3. Check and adjust. |
| VIBRATION | <ol style="list-style-type: none"> 1. Insufficient clearance rubbing 2. Machine at fault | <ol style="list-style-type: none"> 1. Use recommended clearance angle 2. Check machine, be sure arbor is at least $\frac{1}{3}$ diameters of cutter |
| CUTTER BURNS | <ol style="list-style-type: none"> 1. Insufficient lubricant 2. Speed too fast | <ol style="list-style-type: none"> 1. Add sulfur base oil 2. Decrease speed |
| HARD TO CHANGE SPEED OF HORIZONTAL | <ol style="list-style-type: none"> 1. Gears not meshed 2. Poor lubrication on spindle shaft and gears | <ol style="list-style-type: none"> 1. Use jog button 2. Check lubrication |
| POOR SURFACE FINISH | <ol style="list-style-type: none"> 1. Feed too high 2. Dull tool 3. Speed too low 4. Insufficient number of cutter teeth | <ol style="list-style-type: none"> 1. Decrease feed and increase speed 2. Resharpen 3. Increase surface speed 4. Use cutter with more closely spaced teeth |
| WORK BURNISHING | <ol style="list-style-type: none"> 1. Cut is too light 2. Insufficient peripheral relief 3. Land too wide | <ol style="list-style-type: none"> 1. Increase depth of cut 2. Increase peripheral relief angle 3. Decrease width of land |
| TEETH BREAKING | Feed too high | Decrease feed per teeth may be possible to maintain rate by increasing the number of teeth |
| CHATTER | <ol style="list-style-type: none"> 1. Lack of rigidity in the machine, fixtures arbor or work pie 2. Cutting load too great 3. Dull cutter 4. Poor lubrication 5. Straight tooth cutter 6. Peripheral relief angle too great | <ol style="list-style-type: none"> 1. Improve rigidity 2. Decrease number of teeth in contact with work piece 3. Resharpen 4. Improve lubrication 5. Decrease relief angle |

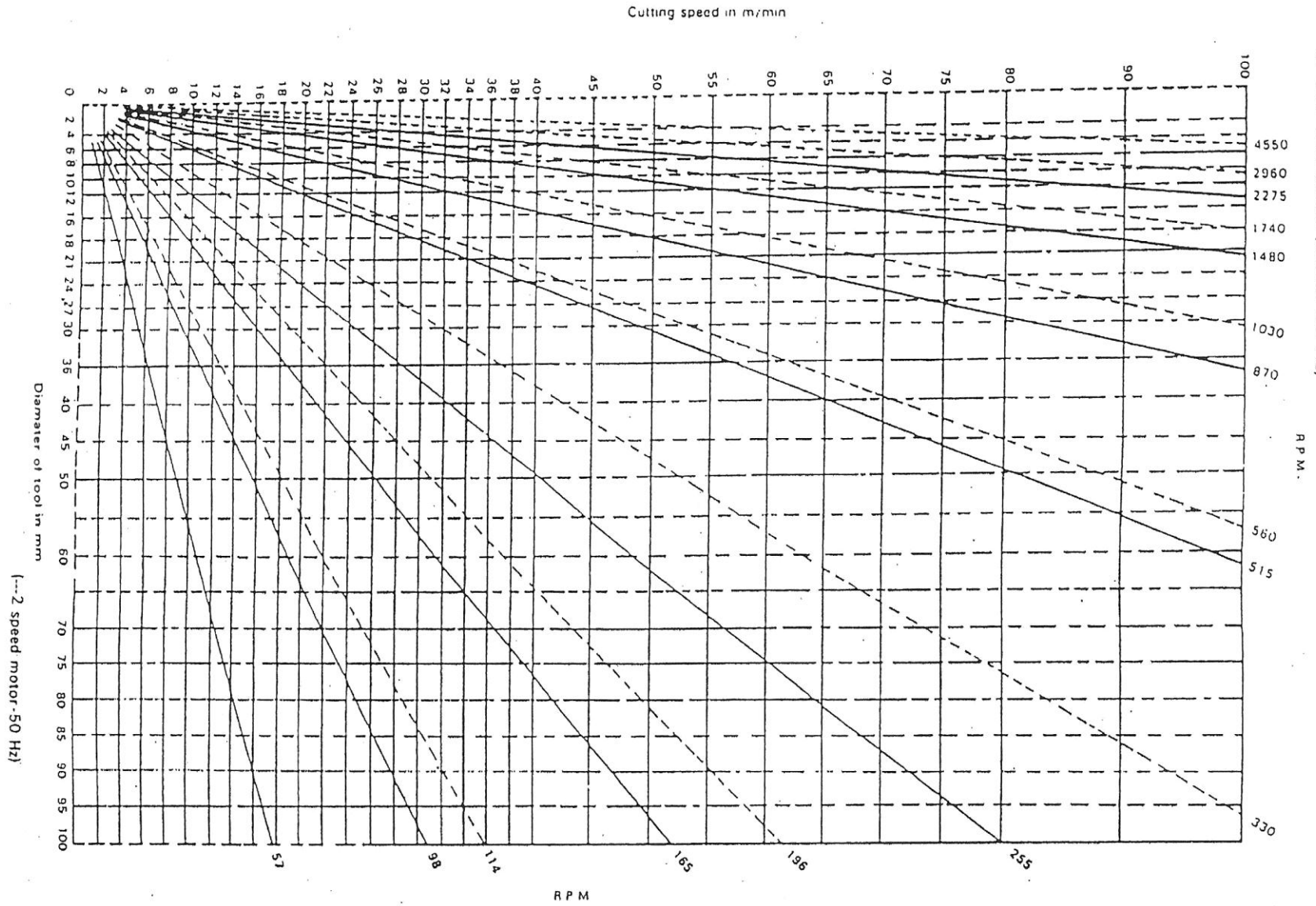
7. Cutting Condition Chart

| FEED- (in mm) PER TOOTH FOR HIGH SPEED STEEL AND HARD METAL CUTTERS, MILLING IN CONVENTIONAL FEED DIRECTION | | | | | | | | | | |
|---|----------|-------------------|-----------------------|----------------------|-----------------|-----------|-------------------------------|---------------|---------------------|------------|
| WORKPIECE | HARDNESS | ULTIMATE STRENGTH | PLAIN MILLING CUTTERS | FACE MILLING CUTTERS | SLOTING CUTTERS | END MILLS | FORM RELIEVED PROFILE CUTTERS | SLITTING SAWS | TIPPED CUTTER HEADS | |
| | | | | | | | | | HIGH SPEED STEEL | HARD METAL |
| GG 18-CAST IRON | 170 | 18 | 0.2 | 0.25 | 0.07 | 0.05 | 0.04 | 40-60 | 0.3 | 0.1 |
| GG 26-CAST IRON | 220 | 23 | 0.1 | 0.15 | 0.05 | 0.02 | 0.02 | 20-30 | 0.1 | 0.05 |
| ST 50-STEEL | 140 | 50 | 0.2 | 0.25 | 0.07 | 0.05 | 0.04 | 40-60 | 0.3 | 0.1 |
| ST 60-STEEL | 170 | 60 | 0.15 | 0.2 | 0.06 | 0.05 | 0.04 | 40-60 | 0.3 | 0.1 |
| ST 70-STEEL | 220 | 75 | 0.1 | 0.15 | 0.06 | 0.03 | 0.03 | 35-50 | 0.2 | 0.08 |
| F 144-STEEL | 180 | 65 | 0.15 | 0.2 | 0.07 | 0.03 | 0.04 | 40-60 | 0.3 | 0.1 |
| F 154-STEEL | 220 | 75 | 0.1 | 0.15 | 0.06 | 0.03 | 0.03 | 35-50 | 0.2 | 0.08 |
| F 155-STEEL | 220 | 75 | 0.1 | 0.15 | 0.06 | 0.03 | 0.03 | 35-50 | 0.2 | 0.02 |
| F 123-STEEL | 220 | 75 | 0.1 | 0.15 | 0.06 | 0.03 | 0.03 | 35-50 | 0.2 | 0.02 |
| F 125-STEEL | 220 | 75 | 0.1 | 0.15 | 0.06 | 0.03 | 0.03 | 35-50 | 0.2 | 0.02 |
| VC Mo 140-STEEL | 290 | 100 | 0.08 | 0.1 | 0.05 | 0.02 | 0.02 | 25-35 | 0.15 | 0.06 |
| VCN 35-HEAD TREATED STEEL | 290 | 100 | 0.08 | 0.1 | 0.05 | 0.02 | 0.02 | 25-35 | 0.15 | 0.06 |
| VCN 45-HEAD TREATED STEEL | — | 110 | 0.05 | 0.08 | 0.03 | 0.01 | 0.01 | 20-30 | 0.1 | 0.04 |
| GT 38 -CASE HARDENED STEEL | 150 | 38 | 0.2 | 0.25 | 0.07 | 0.05 | 0.04 | 40-60 | 0.3 | 0.1 |
| GS 52-CAST IRON | — | 52 | 0.15 | 0.2 | 0.06 | 0.04 | 0.03 | 35-50 | 0.2 | 0.08 |
| Ms 58-BRASS | 70 | 15 | 0.2 | 0.25 | 0.07 | 0.05 | 0.04 | 200-300 | 0.3 | 0.12 |
| Rg 10-BEARING BRONZE | — | 20 | 0.2 | 0.25 | 0.07 | 0.05 | 0.04 | 150-200 | 0.3 | 0.12 |
| GBz 14-CAST BRONZE | — | 28 | 0.15 | 0.2 | 0.06 | 0.04 | 0.03 | 80-150 | 0.2 | 0.01 |
| COPPER | — | — | 0.2 | 0.25 | 0.1 | 0.05 | 0.05 | 100-200 | 0.3 | 0.12 |
| DIN 1712-PURE ALUMINUM | 35 | 14 | 0.15 | 0.2 | 0.07 | 0.05 | 0.04 | 200-300 | 0. | 0 |
| AL DIN 1713-TOUGH LIGHT ALLOYS | 60 | 25 | 0.1 | 0.15 | 0.06 | 0.03 | 0.03 | 150-250 | 0.15 | |

CUTTING SPEEDS (IN m/min.) OF HIGH SPEED STEEL AND METAL CUTTERS, MILLING IN CONVENTIONAL FEED DIRECTION

| WORKPIECE | HARDNESS | ULTIMATE STRENGTH | PLAIN MILLING CUTTERS | FACE MILLING CUTTERS | SLOTING CUTTERS | END MILLS | FORM RELIEVED PROFILE CUTTERS | SLITTING SAWS | TIPPED CUTTER HEADS | |
|---------------------------------|----------|-------------------|-----------------------|----------------------|-----------------|-----------|-------------------------------|---------------|---------------------|------------|
| | | | | | | | | | HIGH SPEED STEEL | HARD METAL |
| GG 18-CAST IRON | 170 | 18 | 14-20 | 16-22 | 14-20 | 16-25 | 14-20 | 30-45 | 17-25 | 50-100 |
| GG 26-CAST IRON | 220 | 23 | 10-16 | 12-17 | 10-16 | 10-16 | 10-15 | 15-25 | 12-18 | 30-50 |
| ST 50-STEEL | 140 | 50 | 16-24 | 18-28 | 16-24 | 18-28 | 16-24 | 40-55 | 18-28 | 120-200 |
| ST 60-STEEL | 170 | 60 | 16-24 | 18-28 | 16-24 | 18-28 | 16-24 | 40-55 | 18-28 | 100-160 |
| ST 70-STEEL | 220 | 75 | 15-20 | 17-23 | 15-20 | 17-25 | 15-20 | 30-45 | 16-24 | 80-120 |
| F 144-STEEL | 180 | 65 | 16-22 | 18-25 | 16-22 | 18-26 | 16-22 | 40-55 | 18-28 | 100-160 |
| F 154-STEEL | 220 | 75 | 14-20 | 16-23 | 14-20 | 16-24 | 14-20 | 30-45 | 17-25 | 80-120 |
| F 155-STEEL | 220 | 75 | 14-20 | 16-23 | 14-20 | 16-24 | 14-20 | 30-45 | 17-25 | 80-120 |
| F 123-STEEL | 220 | 75 | 12-18 | 14-20 | 12-18 | 14-22 | 12-18 | 30-45 | 15-22 | 60-100 |
| F 125-STEEL | 220 | 75 | 12-18 | 14-20 | 12-18 | 14-22 | 12-18 | 30-45 | 15-22 | 60-100 |
| VC Mo 140-STEEL | 290 | 100 | 11-18 | 12-20 | 11-18 | 12-20 | 11-18 | 20-30 | 14-22 | 40 |
| VCN 35-HEAD TREATED STEEL | 290 | 100 | 11-18 | 12-20 | 11-18 | 12-20 | 11-18 | 20-30 | 14-22 | 40 |
| VCN 45-HEAD TREATED STEEL | — | 110 | 10-15 | 11-17 | 10-15 | 10-16 | 10-15 | 10-20 | 12-18 | 30-600 |
| GT 38 ·CASE HARDENED STEEL | 150 | 38 | 14-20 | 16-25 | 14-20 | 16-25 | 14-20 | 30-45 | 17-25 | 60-100 |
| GS 52-CAST IRON | — | 52 | 12-18 | 14-20 | 12-18 | 14-22 | 12-18 | 30-45 | 15-22 | 60-100 |
| Ms 58-BRASS | 70 | 15 | 30-50 | 40-60 | 30-50 | 40-60 | 30-50 | 100-200 | 50-70 | 150-200 |
| Rg 10-BEARING BRONZE | — | 20 | 30-50 | 40-60 | 30-50 | 40-60 | 30-50 | 100-200 | 50-70 | 150-200 |
| GBz 14-CAST BRONZE | — | 28 | 25-40 | 40-50 | 30-50 | 30-40 | 25-40 | 80-150 | 40-60 | 100-150 |
| COPPER | — | — | 30-50 | 40-50 | 30-50 | 30-50 | 25-40 | 100-200 | 40-60 | 100-200 |
| DIN 1712 ·PURE ALUMINUM | 35 | 14 | 250-300 | 300-400 | 300-400 | 300-400 | 300-400 | 200-400 | 400-500 | 800-1000 |
| AL DIN 1713 ·TOUGH LIGHT ALLOYS | 60 | 25 | 200-250 | 250-350 | 200-250 | 250-350 | 200-250 | 200-400 | 300-400 | 600-800 |

SPEED DIAGRAM (Motor 50 Hz)



8. Cautions

(1) Machine Operations:

- a. Check and ensure if the machine bottom and ground base are properly contacted before the anchor bolts are locked up.
- b. The machine must be installed upon a solid base.
- c. Check and see if the motor voltage and power source voltage are conformed.
- d. Cutters shall be far away from the workpieces when the motor is started or stopped.
- e. Switched off the power source before gear change.

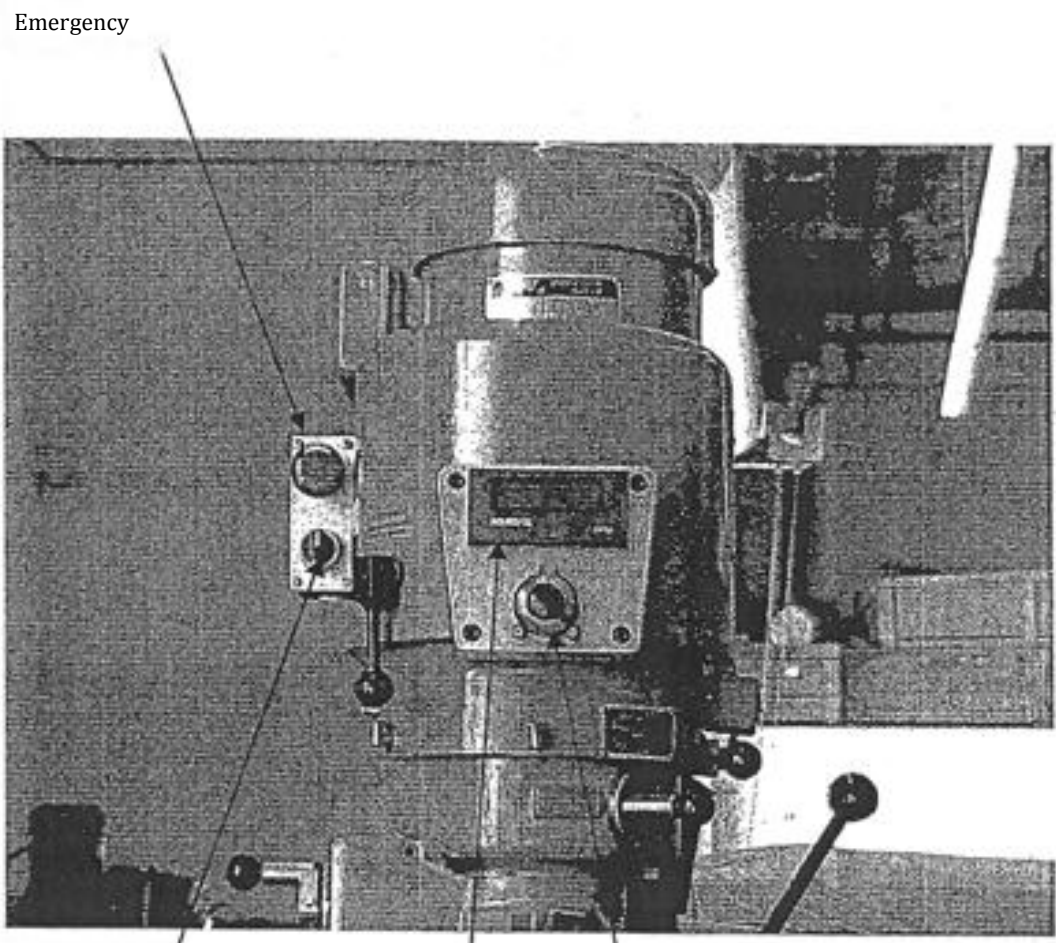
(2) Machine operator:

- a. The machine is to be started or operated by an authorized operator only.
- b. Immediate stop and repair are needed in case of troubles in operations.
- c. In installation, the machine shall be connected to earth.
- d. In stop motion, the feed lever shall be placed in neutral position.
- e. The machine should be stopped during the inspection on the workpieces.
- f. In clamping, check and ensure if the workpieces are firmly vised.
- g. The spindle must be kept clean and lubricated all the time.
- h. Do not place any tools on the work table to maintain its surface preciseness and smoothness_
- i. Prior to cutting, wait until the spindle is running steadily after the motor is started.
- j. Use a brush to clean off the iron fragments.

PARTS

LIST

Inverter Head Controls



Emergency

Forward/Neutral/Reverse Control

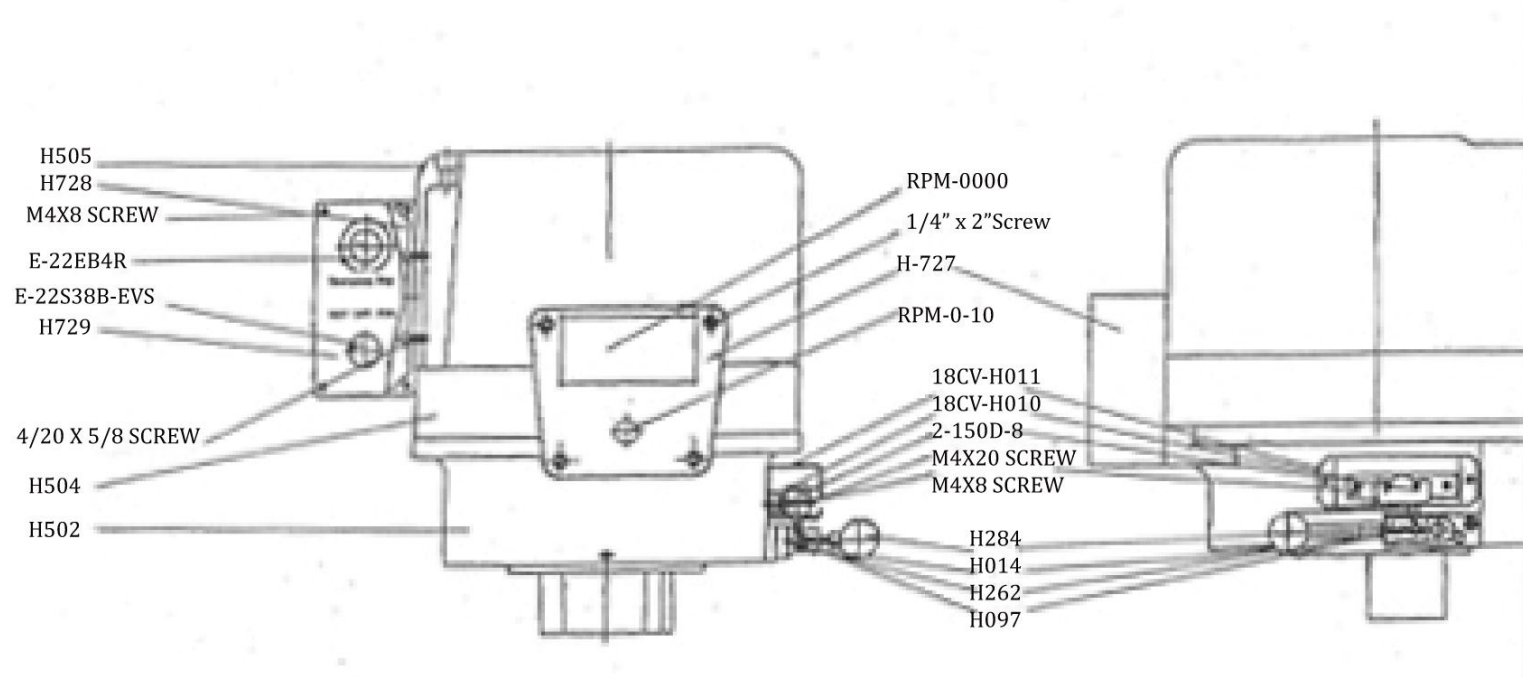
RPM Indicator

Speed Control

DVS HEAD PARTS 1

| KEY | PART NUMBER | DESCRIPTION | QUANTITY |
|-----|--------------|------------------------|----------|
| 1 | H-014 | SHIFT CRANK | 1 |
| 2 | H-097 | GEARSHIFT PLUNGER | 2 |
| 3 | H-262 | COMPRESSION SPRING | 2 |
| 4 | H-284 | BLACK PLASTIC BALL | 3 |
| 5 | H-502 | GEAR HOUSING | 1 |
| 6 | H-504 | BELT HOUSING (BOTTOM) | 1 |
| 7 | H-505 | BELT HOUSING (UPPER) | 1 |
| 8 | H-727 | RPM DISPLAY HOUSING | 1 |
| 9 | H-728 | SWITCH HOUSING | 1 |
| 10 | H-729 | HOUSING PLATE | 1 |
| 11 | | | |
| 12 | | | |
| 13 | E-22S38B-EVS | FORWARD REVERSE SWITCH | 1 |
| 14 | E-22EB4R | EMERGENCY STOP SWITCH | 1 |
| 15 | RPM-0000 | RPM DISPLAY INDICATOR | 1 |
| 16 | RPM-0-10 | RPM DIAL | 1 |
| 17 | 18CV-H011 | SWITCH HOUSING | 1 |
| 18 | 18CV-H011 | SWITCH PLATE | 1 |
| 19 | | | |
| 20 | | | |
| 21 | | | |
| 22 | | | |
| 23 | D-150D-B | LIMIT SWITCH | 1 |
| 24 | A-33 | "V" BELT | 1 |

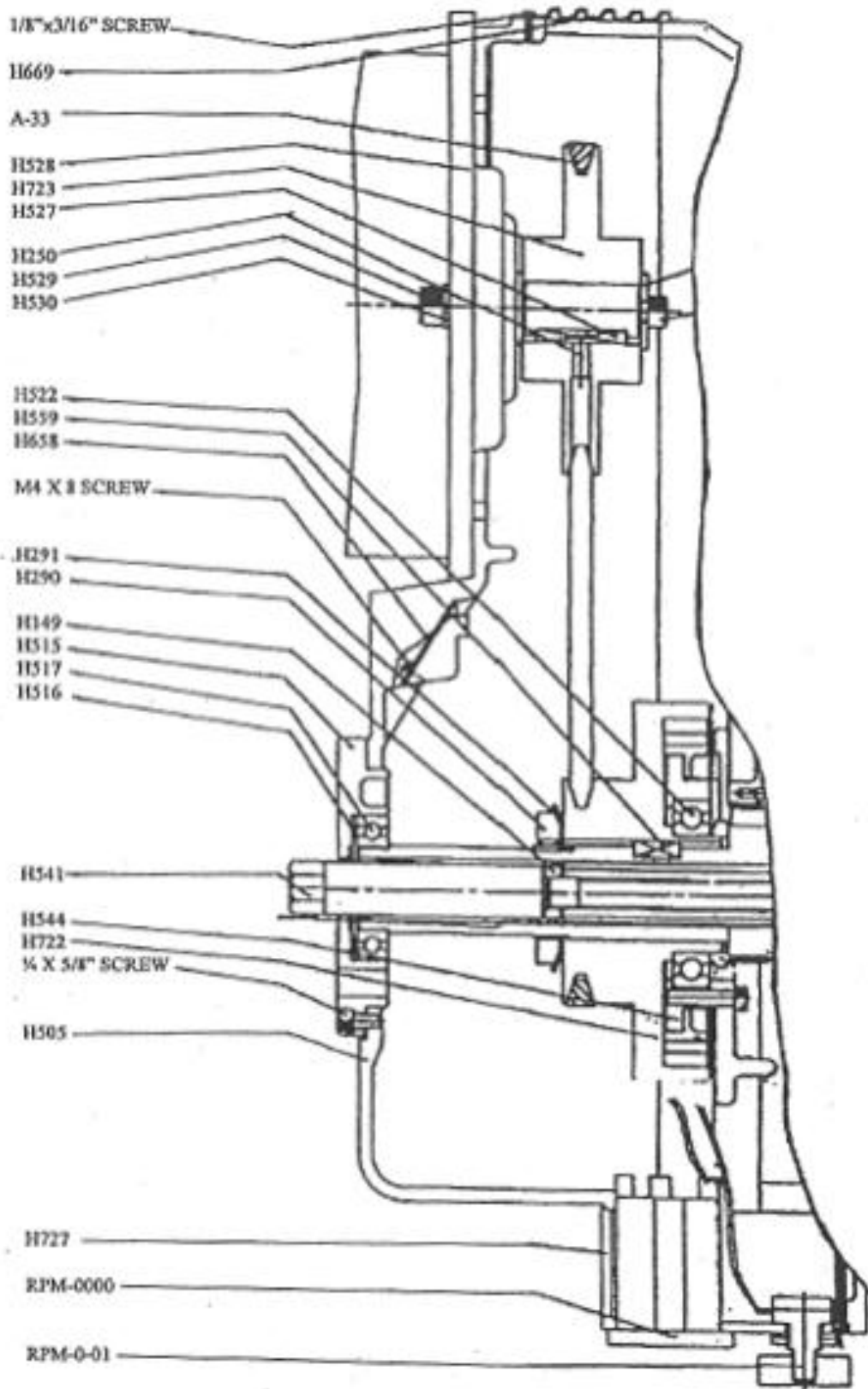
DVS HEAD PARTS 1



DVS HEAD PARTS 2

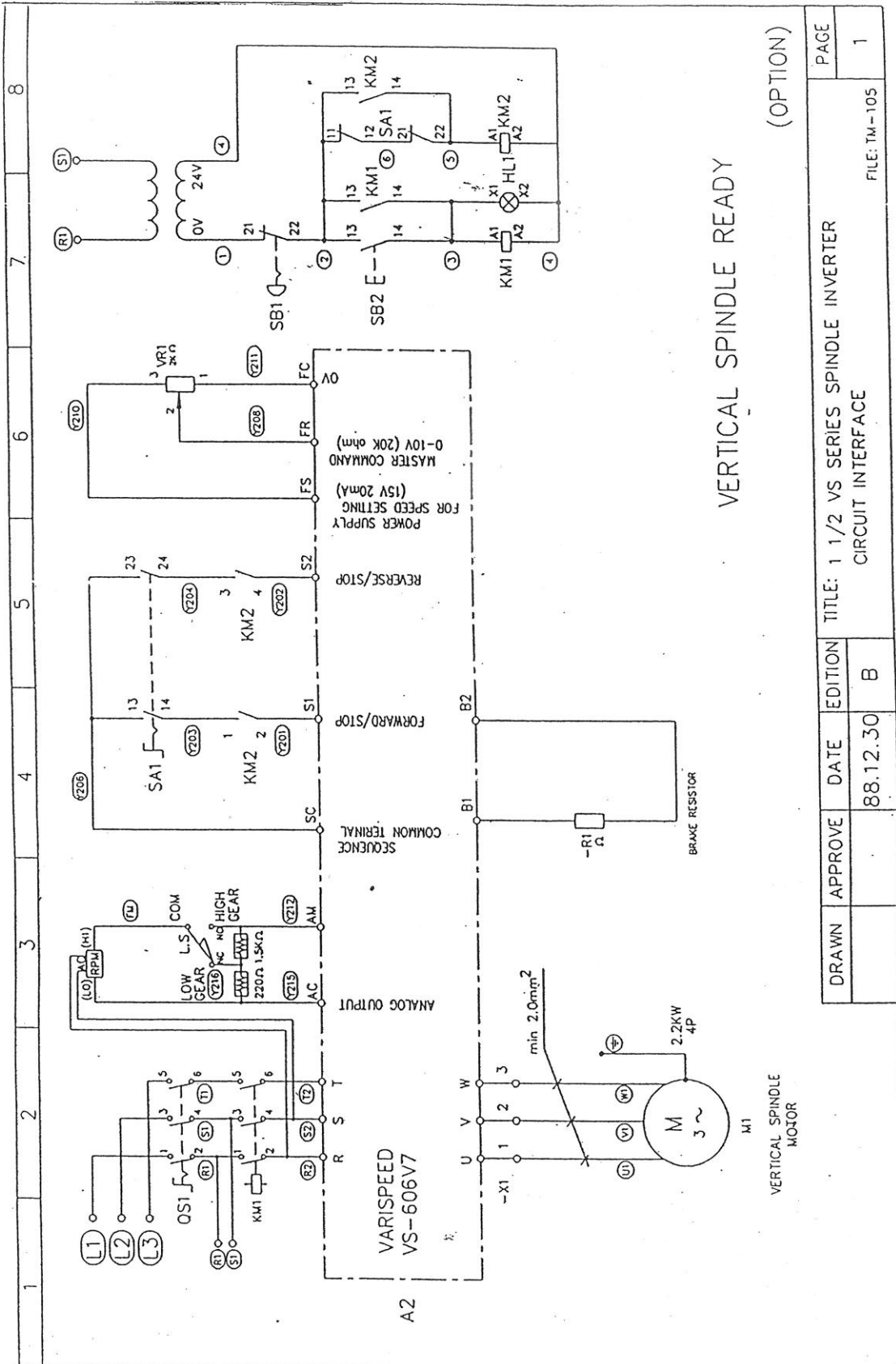
| KEY | PART NUMBER | DESCRIPTION | | QUANTITY |
|-----|-------------|-----------------------|--------------|----------|
| 1 | H-149 | DRAW BAR WASHER | | 1 |
| 2 | H-250 | SOCKET SET SCREW | 1/2" x 5/16" | 1 |
| 3 | H-290 | BEARING LOCK NUT | | 1 |
| 4 | H-291 | LOCK WASHER | | 1 |
| 5 | H-505 | BELT HOUSING (UPPER) | | 1 |
| 6 | H-515 | TOP BEARING CAP | | 1 |
| 7 | H-516 | WAVE WASHER | | 1 |
| 8 | H-517 | BALL BEARING | 6007ZZ | 1 |
| 9 | H-522 | BALL BEARING | 6010ZZ | 1 |
| 10 | H-527 | KEY | 7 x 7 x 25 | 1 |
| 11 | H-528 | MOTOR | | 1 |
| 12 | H-529 | HEX HEAD SCREW | 3/8" x 1" | 2 |
| 13 | H-530 | SPRING WASHER | | 1 |
| 14 | H-541 | DRAW BAR | | 1 |
| 15 | H-544 | BRAKE BEARING CAP | | 1 |
| 16 | H-559 | KEY | 7 x 7 x 20 | 1 |
| 17 | H-658 | COVER | | 2 |
| 18 | H-669 | REAR COVER | | 1 |
| 19 | H-722 | SPINDLE PULLEY | | 1 |
| 20 | H-723 | MOTOR PULLEY | | 1 |
| 21 | H-727 | RPM DISPLAY HOUSING | | 1 |
| 22 | RPM-0000 | RPM DISPLAY INDICATOR | | 1 |
| 23 | | | | |
| 24 | | | | |
| 25 | RPM-0-10 | RPM DIAL | | 1 |
| 26 | A-33 | "V" BELT | | 1 |

DVS HEAD PARTS 2



DVS Parameters

| No. | Initial Setting | Current Setting | No. | Initial Setting | Current Setting |
|-----|-----------------|-----------------|-----|-----------------|-----------------|
| 1 | 1 | 4 | 32 | 6 | |
| 2 | 0 | 1 | 33 | 100 | |
| 3 | 0 | 1 | 34 | 0 | 10 |
| 4 | 0 | 2 | 35 | 0 | |
| 5 | 0 | | 36 | 3 | 8 |
| 6 | 0 | | 37 | 0 | 1 |
| 7 | 0 | | 38 | 8 | |
| 8 | 0 | | 50 | 1 | |
| 9 | 0 | | 51 | 2 | |
| 10 | 0 | | 52 | 3 | |
| 11 | 60 | 102.0 | 53 | 5 | |
| 12 | 200 | 220 | 54 | 6 | |
| 13 | 60 | 60 | 55 | 7 | |
| 14 | 1.5 | | 56 | 10 | |
| 15 | 12 | | 57 | 0 | |
| 16 | 1.5 | | 58 | 1 | |
| 17 | 12 | | 59 | 2 | |
| 18 | 0 | | 60 | 100 | |
| 19 | 10 | 2 | 61 | 0 | |
| 20 | 10 | 3 | 62 | 0.1 | |
| 21 | 10 | | 65 | 0 | |
| 22 | 10 | | 66 | 0 | |
| 23 | 0 | | 67 | 1 | 1.03 |
| 24 | 6 | | 68 | 100 | |
| 25 | 0 | | 69 | 0 | |
| 26 | 0 | | 99 | 0 | |
| 27 | 0 | | 100 | 1.0 | 1.2 |
| 28 | 0 | | 103 | 3 | |
| 29 | 0 | | 105 | 3 | |
| 30 | 0 | | 106 | 3 | |
| 31 | 0 | | 107 | 3 | |



VERTICAL SPINDLE READY (OPTION)

| DRAWN | APPROVE | DATE | EDITION |
|-------|---------|----------|---------|
| | | 88.12.30 | B |

| TITLE: 1 1/2 VS SERIES SPINDLE INVERTER CIRCUIT INTERFACE | |
|--|---|
| PAGE | 1 |

FILE: TM-105

| PARTS NO. | | PC | DESCRIPTION | REMARKS |
|-----------|-----------|----|---------------------------|---------|
| 1 | VH-H594 | 2 | PIVOT SLEEVE | |
| 2 | VH-H596 | 1 | SPEED CHANGE PLATE | |
| 3 | VH-H607 | 1 | WORM GEAR SHAFT SUPPORTER | |
| 4 | VH-H613 | 1 | SPEED CHANGE HOUSING | |
| 5 | VH-H616 | 1 | WORM | |
| 6 | VH-H617 | 1 | SPEED CONTROL SHAFT | |
| 7 | VH-H621 | 1 | BRONZE BEARING | |
| 8 | VH-H622 | 1 | SPEED CHANGE HAND WHEEL | |
| 9 | VH-H623 | 1 | SPEED CHANGE WARING PLATE | |
| 10 | VH-H624 | 1 | HANDLE | |
| 11 | VH-H666 | 1 | DRAWBAR | |
| 12 | | | | |
| 13 | TM-H092 | 1 | BRAKE LOCK HANDLE | |
| 14 | TM-H093 | 1 | BRAKE LOCK PIN | |
| 15 | TM-H284 | 8 | BLACK PLASTIC BALL | |
| 16 | | | | |
| 17 | 18VH-H094 | 1 | BRAWBAR (NT40) | |
| 18 | 18VH-H249 | 1 | BRAWBAR (NT40 5/8" x W11) | |
| 19 | 18VH-H251 | 1 | BRAWBAR (NT40 M16 x P2.0) | |
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FILE NAME: VS-06

| | PARTS NO. | PC | DESCRIPTION | REMARKS |
|----|-----------|----|--------------------------------|---------|
| 1 | TM-H001 | 1 | QUILL HOUSING | |
| 2 | TM-H002 | 1 | GEAR HOUSING | |
| 3 | TM-H003 | 1 | GEAR HOUSING COVER | |
| 4 | TM-H004 | 1 | BELT HOUSING | |
| 5 | TM-H005 | 1 | SPINDLE PULLEY | |
| 6 | TM-H006 | 1 | MOTOR PULLEY | |
| 7 | TM-H007 | 1 | TIMING BELT PULLEY | |
| 8 | TM-H008 | 2 | TIMING BELT PULLEY FLANGE | |
| 9 | TM-H012 | 1 | BACK GEAR SHIFTER FORK | |
| 10 | TM-H013 | 1 | SPINDLE PULLEY BEARING SLEEVE | |
| 11 | TM-H019 | 1 | MOTOR PULLEY WASHER | |
| 12 | TM-H030 | 1 | DRAWER KNOW (NT30 ½" x W12) | |
| 13 | TM-H031 | 1 | DRAWER KNOW (NT30 M12 x P1.75) | |
| 14 | TM-H032 | 1 | DRAWER KNOW (R8 6/17" x 20UNF) | |
| 15 | TM-H035 | 1 | QUILL SKIRT | |
| 16 | TM-H036 | 1 | QUILL STOP KNOB | |
| 17 | TM-H037 | 1 | QUILL STOP MICRO SCREW (IN) | |
| 18 | TM-H038 | 1 | MICROMETER NUT (IN) | |
| 19 | TM-H070 | 3 | VERTICAL TEE BOLT | |
| 20 | TM-H071 | 3 | VERTICAL TEE BOLT WASHER | |
| 21 | TM-H072 | 1 | SPINDLE GEAR HUB | |
| 22 | TM-H074 | 1 | SPINDLE BULL GEAR | |
| 23 | TM-H075 | 1 | SPINDLE PULLEY HUB | |
| 24 | TM-H076 | 1 | PULLEY COLLAR | |
| 25 | TM-H080 | 1 | UPPER BEARING SPACER | |
| 26 | TM-H081 | 1 | BEARING SPACER | |
| 27 | TM-H082 | 1 | BEARING SLEEVE LOCK NUT | |
| 28 | TM-H083 | 1 | UPPER BEARING LOCK NUT | |
| 29 | TM-H084 | 1 | CAM RING | |
| 30 | TM-H085 | 1 | SPINDLE CLUTCH LEVER | |
| 31 | TM-H087 | 1 | BRAKE BLOCK | |
| 32 | TM-H095 | 1 | COUNTER SHAFT | |
| 33 | TM-H096 | 1 | COUNTER SHAFT GEAR | |
| 34 | TM-H126 | 1 | FEED DRIVE WORM GEAR | |

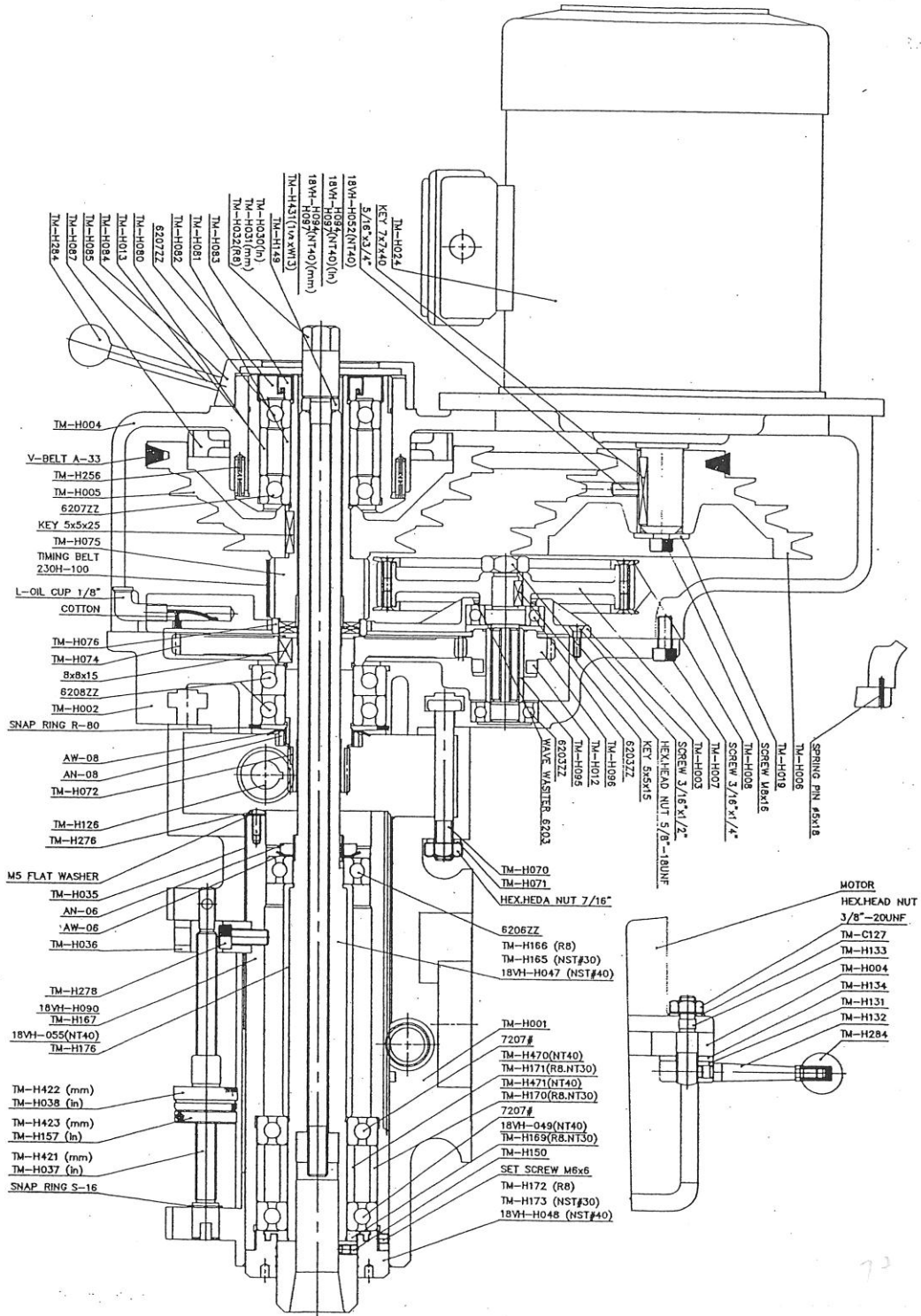
FILE NAME: TM-01

| PARTS NO. | PC | DESCRIPTION | REMARKS | |
|-----------|-----------|-------------|--------------------------------|-------------|
| 35 | TM-H131 | 2 | MOTOR LOCK NUT | |
| 36 | TM-H132 | 2 | MOTOR LOCK NUT HANDLE | |
| 37 | TM-H133 | 2 | MOTOR MOUNTING STUDS | |
| 38 | TM-H134 | 2 | MOTOR MOUNTING STUDS WASHER | |
| 39 | TM-H149 | 1 | DRAWBAR WASHER (R8) | |
| 40 | TM-H150 | 2 | SOCKET SET SCREW | |
| 41 | TM-H157 | 1 | QUILL MICRO STOP NUT (IN) | |
| 42 | TM-H165 | 2 | SPINDLE (NT30) | |
| 43 | TM-H166 | 1 | SPINDLE (R8) | |
| 44 | TM-H167 | 1 | QUILL (R8 NT30) | |
| 45 | TM-H169 | 1 | SPINDLE DIRT SHIELD (R8 NT30) | |
| 46 | TM-H170 | 1 | BEARING SPACER (R8 NT30) | |
| 47 | TM-H171 | 1 | BEARING SPACER (R8 NT30) | |
| 48 | TM-H172 | 1 | NOSE PIECE (R8) | |
| 49 | TM-H173 | 1 | NOSE PIECE (NT30) | |
| 50 | TM-H176 | 1 | SLEEVE | |
| 51 | TM-H256 | 4 | SPRING | |
| 52 | TM-H276 | 2 | ROUND HD MACHINE SCREW | M5X12 |
| 53 | TM-H278 | 1 | SCREW | 3/8" x 5/8" |
| 54 | TM-H284 | 8 | BLACK PLASTIC BALL | |
| 55 | TM-H421 | 1 | QUILL STOP MICRO SCREW (mm) | |
| 56 | TM-H422 | 1 | MICRO METER NUT (mm) | |
| 57 | TM-H423 | 1 | QUILL MICRO STOP NUT (mm) | |
| 58 | TM-H431 | 1 | DRAWBAR KNOW (NT30 1/2" x W13) | |
| 59 | TM-H470 | 1 | BEARING SPACER (NT40) | |
| 60 | TM-H471 | 1 | BEARING SPACER (NT40) | |
| 61 | | | | |
| 62 | TM-C127 | 4 | WASHER | |
| 63 | | | | |
| 64 | 18VH-H047 | 1 | SPINDLE (NT40) | |
| 65 | 18VH-H048 | 1 | NOSE PIECE (NT40) | |
| 66 | 18VH-H049 | 1 | SPINDLE DIRT SHIELD (NT40) | |
| 67 | 18VH-H052 | 1 | DRAWBAR WASHER (NT40) | |
| 68 | 18VH-H055 | 1 | BEARING SPACER (NT40) | |

FILE NAME: TM-02

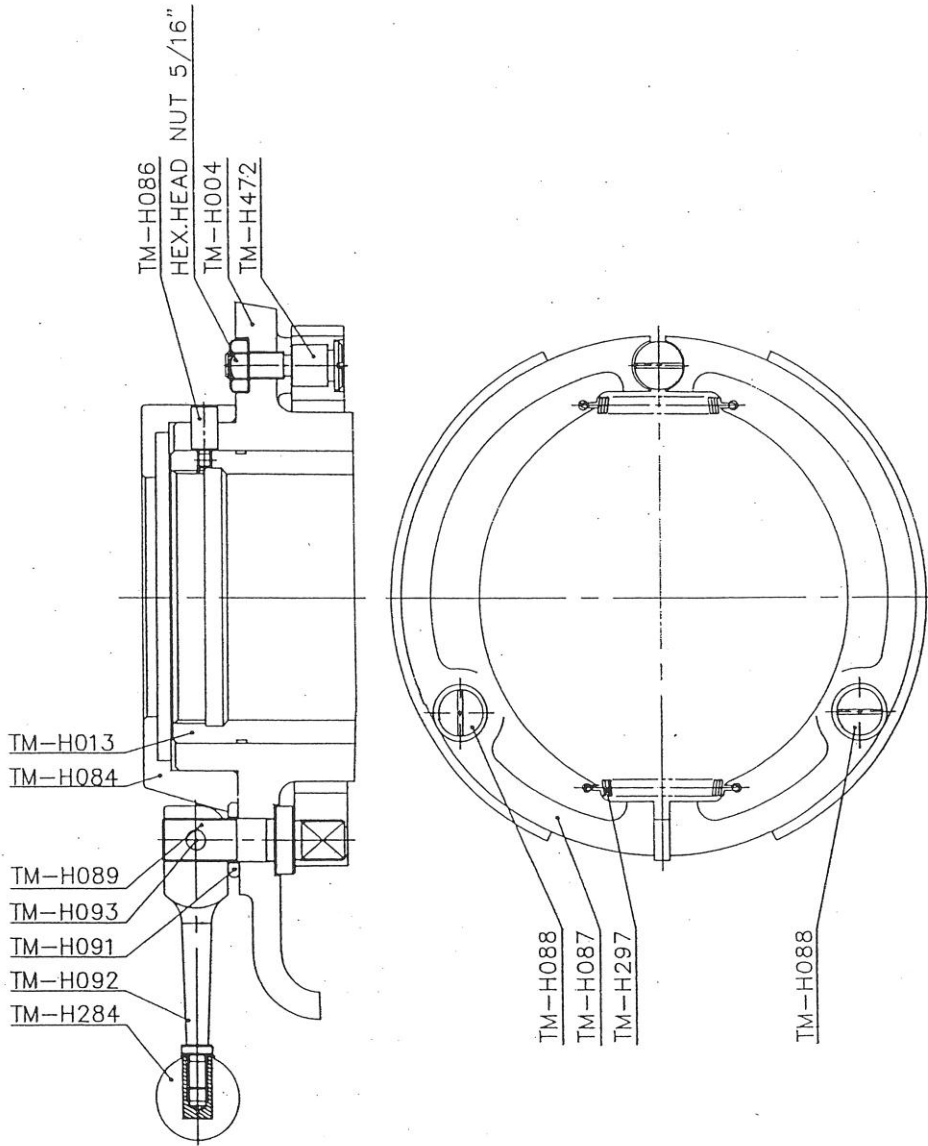
| PARTS NO. | | PC | DESCRIPTION | REMARKS |
|-----------|-----------|----|-------------------------|---------|
| 69 | 18VH-H090 | 1 | QUILL (NT40) | |
| 70 | 18VH-H094 | 1 | DRAWBAR KNOW NUT (NT40) | |
| 71 | 18VH-H096 | 1 | DRAWBAR (NT40) | |
| 72 | 18VH-H097 | 1 | DRAWBAR (NT40) | |
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FILE NAME: TM-03



| PARTS NO. | | PC | DESCRIPTION | REMARKS |
|-----------|---------|----|-------------------------------|---------|
| 1 | TM-H004 | 1 | BELT HOUSING | |
| 2 | TM-H013 | 1 | SPINDLE PULLEY BEARING SLEEVE | |
| 3 | TM-H084 | 1 | CAM RING | |
| 4 | TM-H086 | 2 | SPINDLE CLUTCH CAM RING PIN | |
| 5 | TM-H087 | 1 | BRAKE BLOCK | |
| 6 | TM-H088 | 2 | BRAKE RING SCREW | |
| 7 | TM-H089 | 1 | BRAKE LOCK STUD | |
| 8 | TM-H091 | 1 | BRAKE LOCK WASHER | |
| 9 | TM-H092 | 1 | BRAKE LOCK HANDLE | |
| 10 | TM-H093 | 1 | BRAKE LOCK PIN | |
| 11 | TM-H284 | 1 | BLACK PLASTIC BALL | |
| 12 | TM-H297 | 2 | SPRING | |
| 13 | TM-H472 | 1 | BRAKE RING SCREW | |
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FILE NAME: TM-05



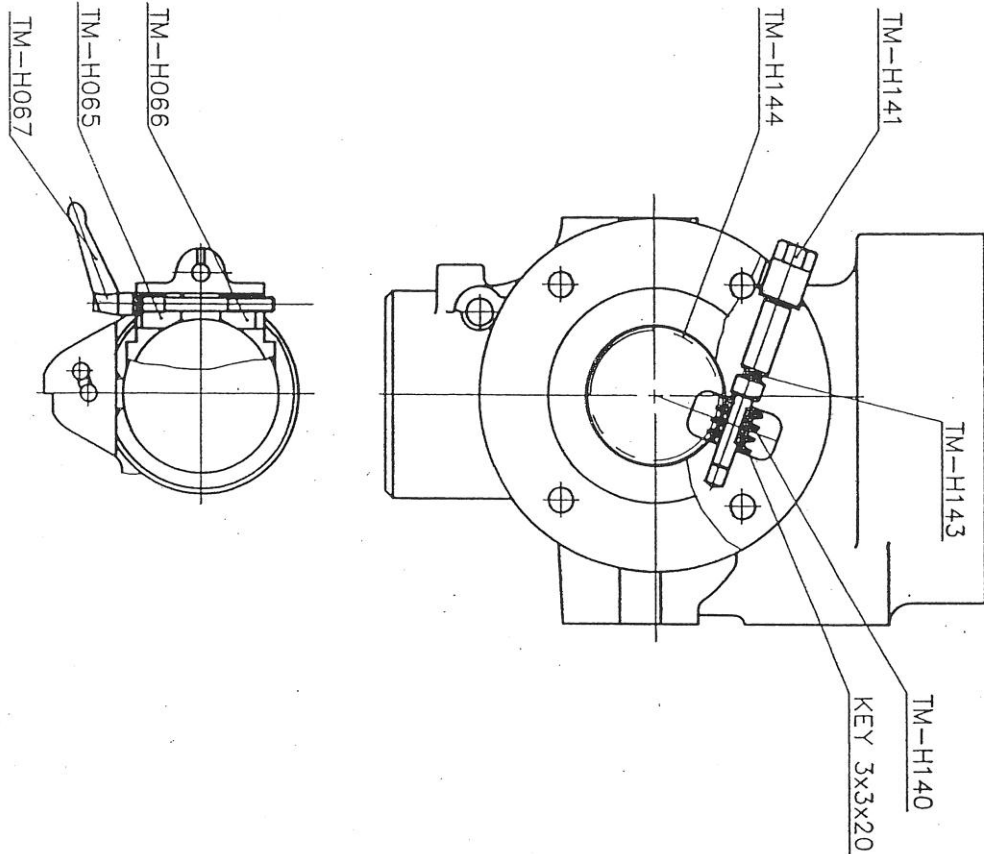
FILE NAME: TM-06

| PARTS NO. | | PC | DESCRIPTION | REMARKS |
|-----------|---------|----|-------------------------|---------|
| 1 | TM-H002 | 1 | GEAR HOUSING | |
| 2 | TM-H003 | 1 | GEAR HOUSING COVER | |
| 3 | TM-H004 | 1 | BELT HOUSING | |
| 4 | TM-H012 | 1 | BLACK GEAR SHIFTER FORK | |
| 5 | TM-H014 | 1 | SHIFT CRANK | |
| 6 | TM-H095 | 1 | COUNTER SHAFT | |
| 7 | TM-H096 | 1 | COUNTER SHAFT GEAR | |
| 8 | TM-H097 | 1 | GEAR SHAFT PLUNGER | |
| 9 | TM-H152 | 1 | BACK GEAR SHAFT BUSHING | |
| 10 | TM-H153 | 1 | BACK GEAR SHAFT CRANK | |
| 11 | TM-H284 | 1 | BLACK PLASTIC BALL | |
| 12 | TM-H334 | 1 | SUB GEAR SHAFT | |
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FILE NAME: TM-07

| PARTS NO. | | PC | DESCRIPTION | REMARKS |
|-----------|---------|----|-------------------|---------|
| 1 | TM-H001 | 1 | QUILL LOCK SLEEVE | |
| 2 | TM-H010 | 1 | QUILL LOCK SLEEVE | |
| 3 | TM-H011 | 1 | QUILL LOCK BOLT | |
| 4 | TM-H014 | 1 | WORM GEAR | |
| 5 | TM-H015 | 1 | WORM SHAFT | |
| 6 | TM-H016 | 1 | SOCKET SET SCREW | |
| 7 | TM-H017 | 1 | GEAR | |
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FILE NAME: TM/VS-08



FILE NAME: TM/VS-09

| PARTS NO. | | PC | DESCRIPTION | REMARKS |
|-----------|---------|----|-----------------------------|-------------|
| 1 | TM-H001 | 1 | QUILL HOUSING | |
| 2 | TM-H008 | 2 | TIMING BELT PUULEY FLANGE | |
| 3 | TM-H035 | 1 | QUILL SKIRT | |
| 4 | TM-H036 | 1 | QUILL STOP KNOB | |
| 5 | TM-H037 | 1 | QUILL STOP MICRO SCREW (IN) | |
| 6 | TM-H038 | 1 | MICROMETER NUT (IN) | |
| 7 | TM-H071 | 3 | VERTICAL TEE BOLT WASHER | |
| 8 | TM-H126 | 1 | FEED DRIVE WORM GEAR | |
| 9 | TM-H149 | 1 | DRAWER WASHER (R8) | |
| 10 | TM-H150 | 2 | SOCKET SET SCREW | |
| 11 | TM-H157 | 1 | QUILL MICRO STOP NUT (IN) | |
| 12 | TM-H165 | 1 | SPINDLE (NT30) | |
| 13 | TM-H166 | 1 | SPINDLE (R8) | |
| 14 | TM-H167 | 1 | QUILL (R8 NT30) | |
| 15 | TM-H169 | 1 | SPINDLE DIRT SHIELD | |
| 16 | TM-H170 | 1 | BEARING SPACER (R8 NT30) | |
| 17 | TM-H171 | 1 | BEARING SPACER (R8 NT30) | |
| 18 | TM-H172 | 1 | NOSE PIECE (R8) | |
| 19 | TM-H173 | 1 | NOSE PIECE (NT30) | |
| 20 | TM-H176 | 1 | SLEEVE (R8 NT30) | |
| 21 | TM-H276 | 1 | ROUND HD MACHINE SCREW | M5x12 |
| 22 | TM-H278 | 1 | SOCKET HD CAP SCREW | 3/8" x 5/8" |
| 23 | TM-H421 | 1 | QUILL STOP MICRO SCREW | |
| 24 | TM-H422 | 1 | MICROMETER NUT | |
| 25 | TM-H423 | 1 | QUILL MICRO STOP NUT | |
| 26 | | | | |
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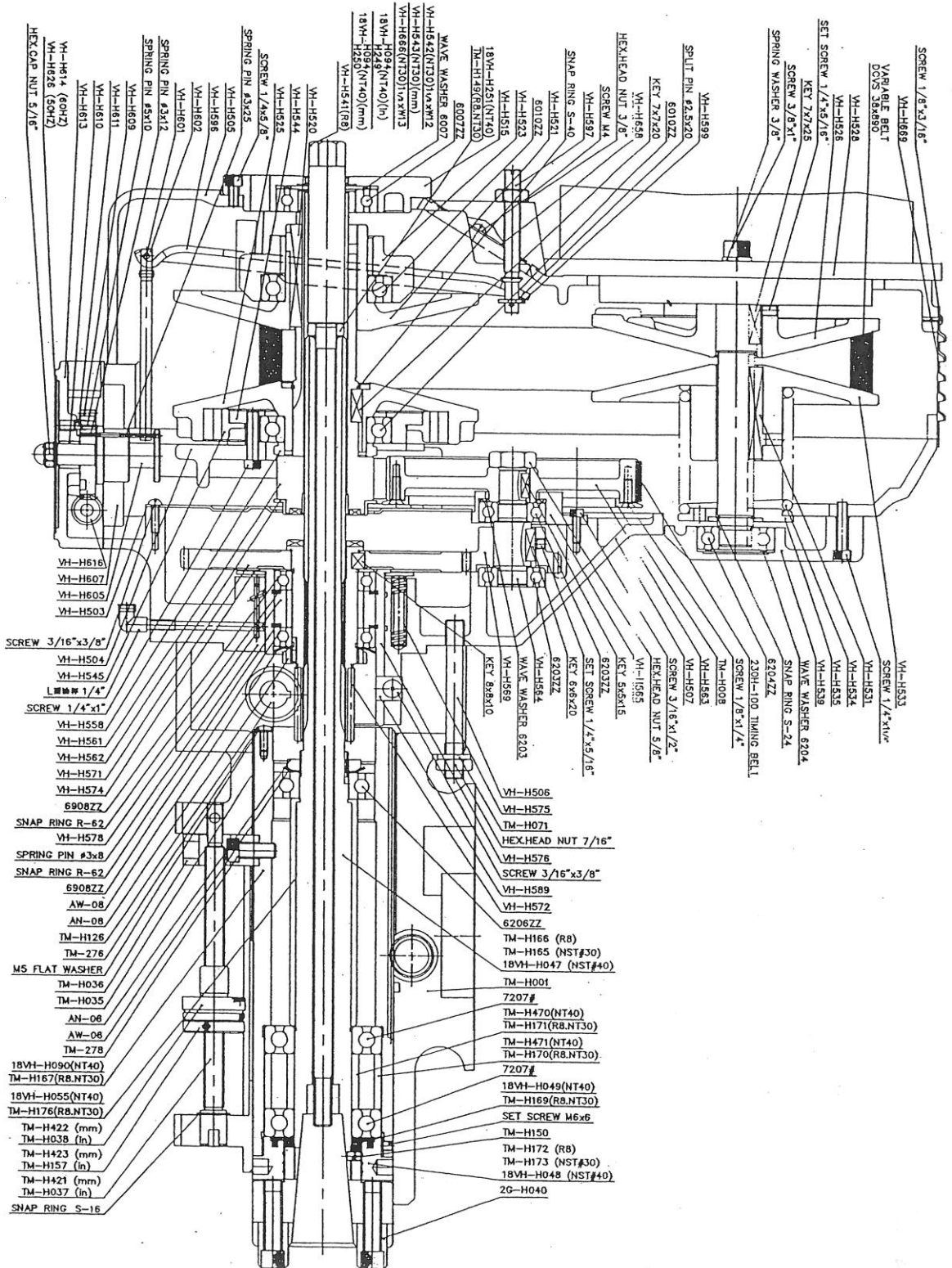
FILE NAME: VS-01

| | PARTS NO. | PC | DESCRIPTION | REMARKS |
|----|-----------|----|------------------------------------|---------|
| 1 | VH-H503 | 1 | GEAR HOUSING PLATE | |
| 2 | VH-H504 | 1 | BELT HOUSING (BOTTOM) | |
| 3 | VH-H505 | 1 | BELT HOUSING (UP) | |
| 4 | VH-H056 | 3 | STUDS | |
| 5 | VH-H057 | 1 | GEAR HOUSING | |
| 6 | VH-H515 | 1 | TOP BEARING CAP | |
| 7 | VH-H520 | 1 | KEY | |
| 8 | VH-H521 | 1 | ADJ DRIVEN BARI-DISC ASSEMBLY | |
| 9 | VH-H523 | 1 | SLIDING HOUSING | |
| 10 | VH-H525 | 1 | STATIONARY DRIVEN VARI-DISC | |
| 11 | VH-H526 | 1 | STATIONARY MOTOR VARI-DISC | |
| 12 | VH-H531 | 1 | SLIDING KEY | |
| 13 | VH-H533 | 1 | ADJ MOTOR VARI-DISC | |
| 14 | VH-H534 | 1 | SPRING | |
| 15 | VH-H535 | 1 | SPRING WASHER | |
| 16 | VH-H539 | 1 | MOTOR PULLEY COVER | |
| 17 | VH-H541 | 1 | DRAWBAR (R8 6/17" x 20UNF) | |
| 18 | VH-H542 | 1 | DRAWBAR (NT30 1/2" x W12) | |
| 19 | VH-H543 | 1 | DRAWBAR (NT30 M12 x P1.75) | |
| 20 | VH-H544 | 1 | BRAKE BRG CAP | |
| 21 | VH-H545 | 1 | BRAKE SHOE | |
| 22 | VH-H558 | 1 | SPINDLE PULLEY SPACER | |
| 23 | VH-H561 | 1 | SPINDLE PULLEY HUB | |
| 24 | VH-H562 | 1 | TIMING PULLEY CLOTCH SLEEVE | |
| 25 | VH-H563 | 1 | TIMING BELT PULLEY | |
| 26 | VH-H564 | 1 | BULL GEAR PINION COUNTER SHAFT | |
| 27 | VH-H565 | 1 | BEARING CAP | |
| 28 | VH-H569 | 1 | COUNTER SHAFT GEAR | |
| 29 | VH-H571 | 1 | SPINDLE BULL GEAR ASSEMBLY | |
| 30 | VH-H572 | 1 | SPINDLE GEAR HUB | |
| 31 | VH-H574 | 1 | BULL GEAR BEARING SLEEVE WASHER | |
| 32 | VH-H575 | 3 | SPRING | |
| 33 | VH-H576 | 1 | BULL GEAR BEARING SLEEVE | |
| 34 | VH-H578 | 1 | BULL GEAR BEARING SPACER | |

FILE NAME: VS-02

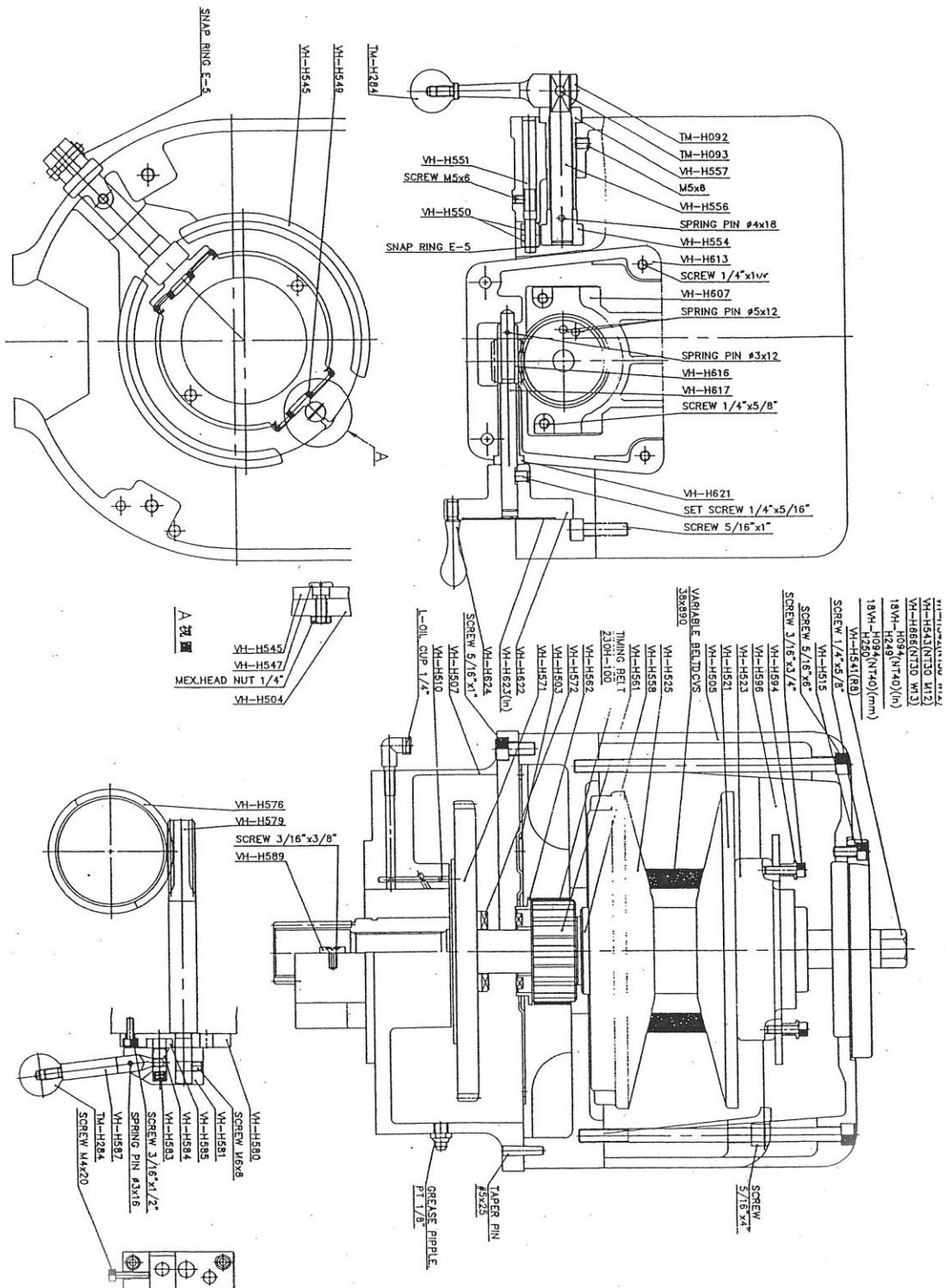
| PARTS NO. | | PC | DESCRIPTION | REMARKS |
|-----------|-----------|----|-------------------------------|---------|
| 1 | VH-H589 | 2 | GEAR HOUSING PLATE | |
| 2 | VH-H596 | 1 | BELT HOUSING (BOTTOM) | |
| 3 | VH-H597 | 1 | BELT HOUSING (UP) | |
| 4 | VH-H099 | 1 | STUDS | |
| 5 | VH-H601 | 1 | GEAR HOUSING | |
| 6 | VH-H602 | 1 | TOP BEARING CAP | |
| 7 | VH-H605 | 1 | KEY | |
| 8 | VH-H607 | 1 | ADJ DRIVEN BARI-DISC ASSEMBLY | |
| 9 | VH-H609 | 1 | SLIDING HOUSING | |
| 10 | VH-H610 | 1 | STATIONARY DRIVEN VARI-DISC | |
| 11 | VH-H611 | 1 | STATIONARY MOTOR VARI-DISC | |
| 12 | VH-H613 | 1 | SLIDING KEY | |
| 13 | VH-H614 | 1 | ADJ MOTOR VARI-DISC | |
| 14 | VH-H616 | 1 | SPRING | |
| 15 | VH-H626 | 1 | SPRING WASHER | |
| 16 | VH-H658 | 2 | MOTOR PULLEY COVER | |
| 17 | VH-H666 | 1 | DRAWBAR (R8 6/17" x 20UNF) | |
| 18 | VH-H669 | 1 | DRAWBAR (NT30 1/2" x W12) | |
| 19 | | | | |
| 20 | 18VH-H047 | 1 | SPINDLE (NT40) | |
| 21 | 18VH-H048 | 1 | NOSE PIECE (NT40) | |
| 22 | 18VH-H049 | 1 | SPINDLE DIRT SHIELD (NT40) | |
| 23 | 18VH-H055 | 1 | BEARING SPACER (NT40) | |
| 24 | 18VH-H090 | 1 | QUILL (NT40) | |
| 25 | 18VH-H094 | 1 | DRAWBAR NUT (NT40) | |
| 26 | 18VH-H249 | 1 | DRAWBAR (NT40 5/8" x W11) | |
| 27 | 18VH-H250 | 1 | DRAWBAR (NT40 M16 x P2.0) | |
| 28 | 18VH-H251 | 1 | DRAWBAR WASHER (NT40) | |
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FILE NAME: VS-03



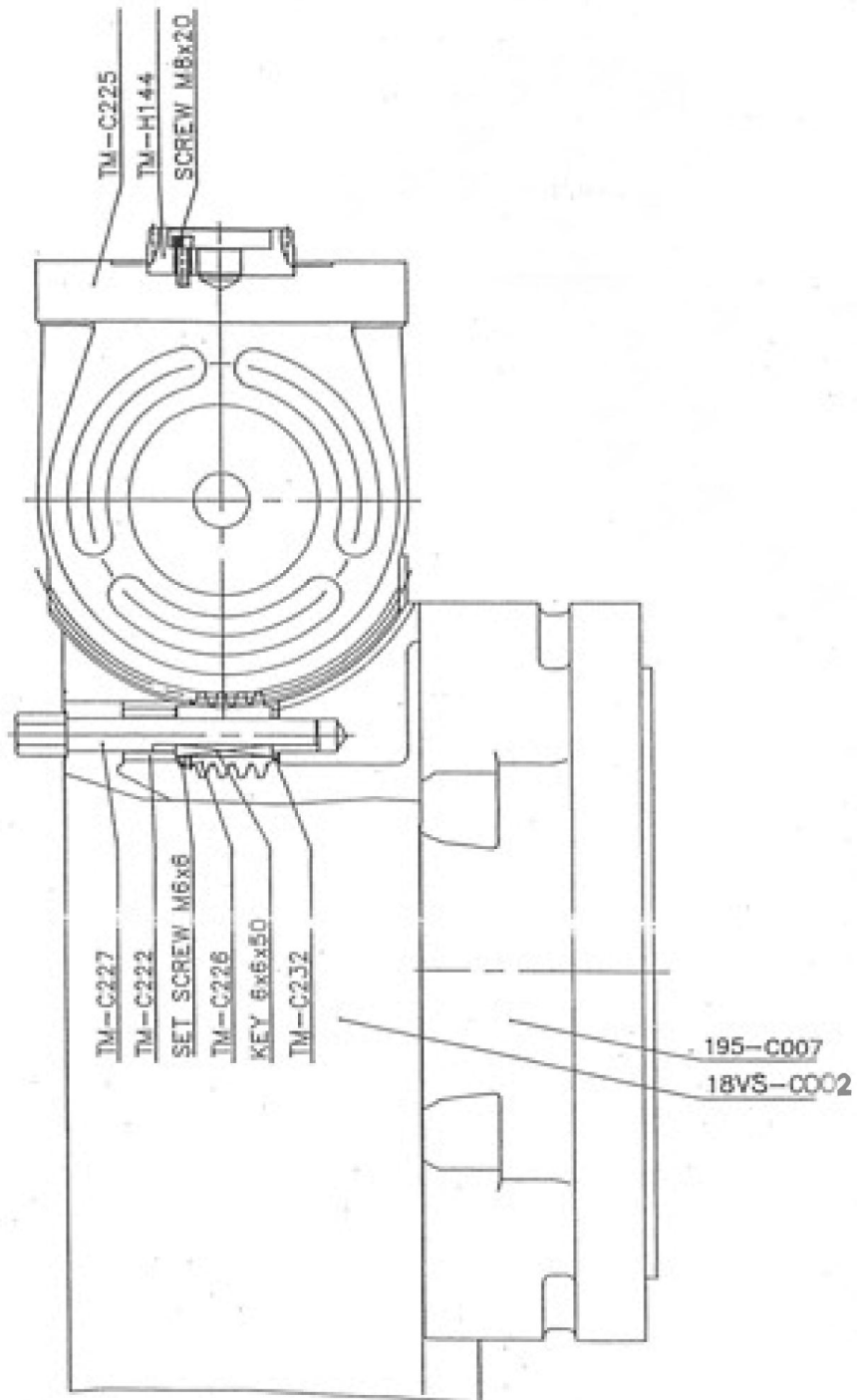
| PARTS NO. | | PC | DESCRIPTION | REMARKS |
|-----------|---------|----|-------------------------------|---------|
| 1 | VH-H503 | 1 | GEAR HOUSING PLATE | |
| 2 | VH-H504 | 1 | BELT HOUSING (BOTTOM) | |
| 3 | VH-H505 | 1 | BELT HOUSING (UP) | |
| 4 | VH-H507 | 1 | GEAR HOUSING | |
| 5 | VH-H510 | 1 | OIL PLUG | |
| 6 | VH-H515 | 1 | TOP BEARING CAP | |
| 7 | VH-H521 | 1 | ADJ DRIVEN BARI-DISC ASSEMBLY | |
| 8 | VH-H523 | 1 | SLIDING HOUSING | |
| 9 | VH-H525 | 1 | STATIONARY DRIVEN VARI-DISC | |
| 10 | VH-H541 | 1 | DRAWBAR (R8 6/17" x 20UNF) | |
| 11 | VH-H542 | 1 | DRAWBAR (NT30 1/2" x W12) | |
| 12 | VH-H543 | 1 | DRAWBAR (NT30 M12 x P1.75) | |
| 13 | VH-H545 | 1 | BRAKE SHOE | |
| 14 | VH-H547 | 1 | BRAKE RING SCREW | |
| 15 | VH-H549 | 2 | BRAKE SPRING | |
| 16 | VH-H550 | 2 | BRAKE OPERATING FINGER | |
| 17 | VH-H551 | 1 | BRAKE FINGER PIVOT STUD | |
| 18 | VH-H554 | 1 | BRAKE LOCK CAM | |
| 19 | VH-H556 | 1 | BRAKELock SHAFT | |
| 20 | VH-H557 | 1 | SLEEVE FOR BRAKE | |
| 21 | VH-H558 | 1 | SPINDLE PULLEY SPACER | |
| 22 | VH-H561 | 1 | SPINDLE PULLEY HUB | |
| 23 | VH-H562 | 1 | TIMING PULLEY CLUTCH SLEEVE | |
| 24 | VH-H571 | 1 | SPINDLE BULL GEAR ASSEMBLY | |
| 25 | VH-H572 | 1 | SPINDLE GEAR HUB | |
| 26 | VH-H576 | 1 | BULL GEAR BEARING SLEEVE | |
| 27 | VH-H579 | 1 | BULL GEAR SHIFTER PINION | |
| 28 | VH-H580 | 1 | HI-LOW DETENT PLATE | |
| 29 | VH-H581 | 1 | HI-LOW PINION BLOCK | |
| 30 | VH-H583 | 1 | SPRING | |
| 31 | VH-H584 | 1 | HI-LOW DETENT PLUNGER | |
| 32 | VH-H585 | 1 | ADJ PLATE | |
| 33 | VH-H587 | 1 | HI-LOW SHIFT CRANK | |
| 34 | VH-H589 | 2 | GUIDE | |

FILE NAME: VS-05



| | PARTS NO. | PC | DESCRIPTION | REMARKS |
|----|-----------|----|-------------------------------|---------|
| 1 | TM-C222 | 1 | UPPER WORM SPACER | |
| 2 | 18VS-C002 | 1 | RAM | |
| 3 | TM-C225 | 1 | RAM ADAPTER | |
| 4 | TM-C226 | 1 | VERTICAL ADJUSTING WORM | |
| 5 | TM-C227 | 1 | VERTICAL ADJUSTING WORM SHAFT | |
| 6 | TM-C232 | 1 | WORM THRUST WASHER | |
| 7 | TM-C007 | 1 | TURRET | |
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| 11 | TM-H144 | 1 | GEAR | |
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FILE NAME: 195-01 (TM/VS HEAD)

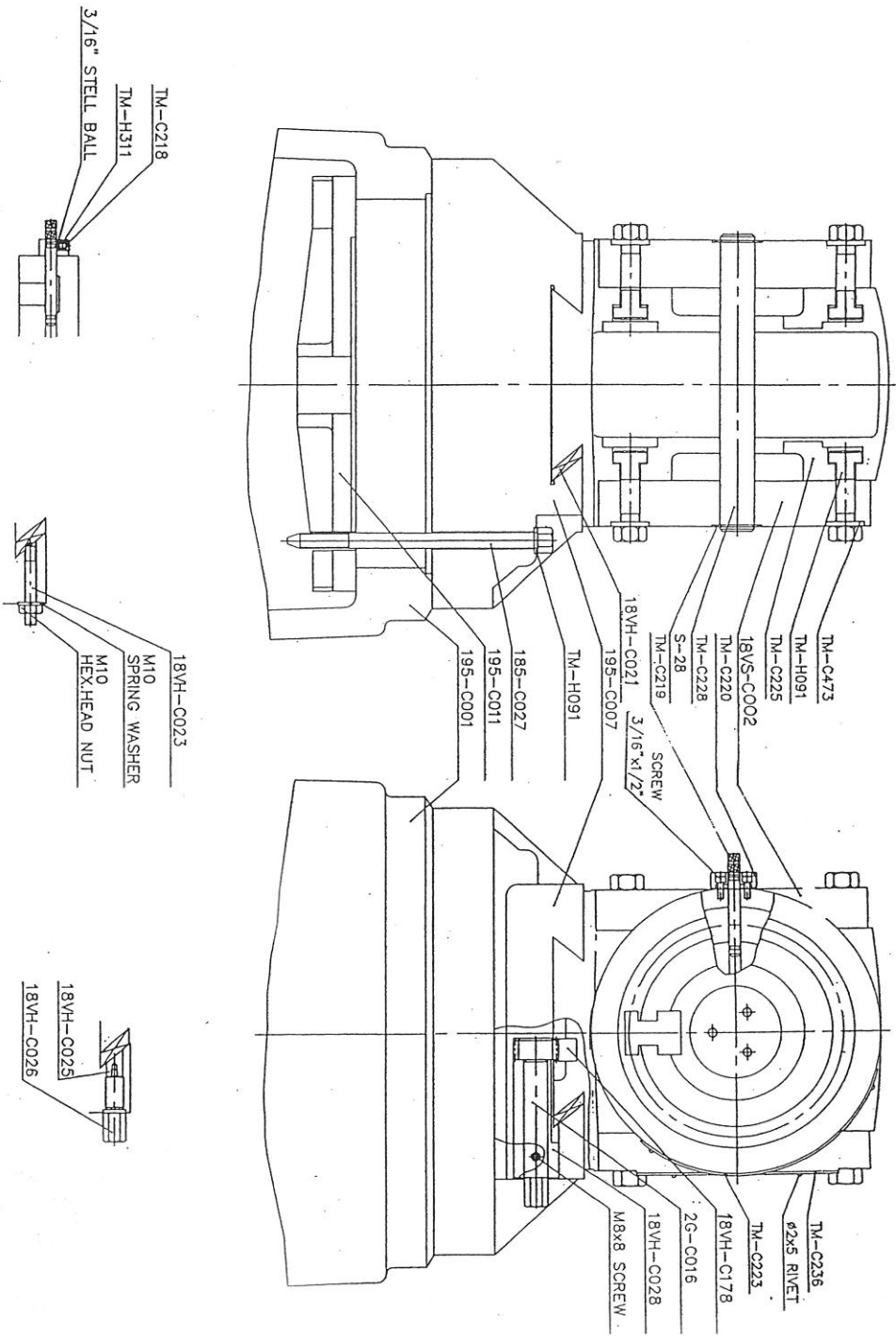


FILE NAME: 195-02 (TM/VS HEAD)

| | PARTS NO. | PC | DESCRIPTION | REMARKS |
|----|-----------|----|------------------------|---------|
| 1 | 18VH-C021 | 1 | OVERARM-TURRET GIB | |
| 2 | 195-C007 | 1 | TURRET | |
| 3 | 18VH-C023 | 1 | GIB STATIONARY BOLT | |
| 4 | 18VH-C025 | 1 | OVERARM LOCK PLUNGER | |
| 5 | 18VH-C026 | 1 | OVERARM LOCK BOLT | |
| 6 | 18VH-C028 | 1 | PINION BUSHING | |
| 7 | TM-C473 | 6 | T-BOLT | |
| 8 | TM-H091 | 6 | BRAKE LOCK WASHER | |
| 9 | 18VH-C178 | 1 | OVERARM RACK | |
| 10 | TM-C219 | 1 | HEAD ROTATION STOP PIN | |
| 11 | TM-C228 | 1 | ADAPTER PIVOT STUD | |
| 12 | TM-C236 | 1 | SCALE | |
| 13 | TM-C225 | 1 | RAM ADAPTER | |
| 14 | 18VH-C252 | 1 | OVERARM | |
| 15 | TM-C223 | 1 | SCALE | |
| 16 | TM-H311 | 1 | SPRING | |
| 17 | TM-C218 | 1 | SCREW | |
| 18 | TM-C220 | 1 | STOP PIN BASE | |
| 19 | TM-H091 | 2 | BRAKE LOCK WASHER | |
| 20 | 2G-C016 | 1 | OVERARM MOVING PINION | |
| 21 | 185-C027 | 1 | TURRET CLAMP BOLTS | |
| 22 | 195-C011 | 1 | SPIDER | |
| 23 | 195-C001 | 1 | COLUMN | |
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FILE NAME: 195-03 (TM/VS HEAD)

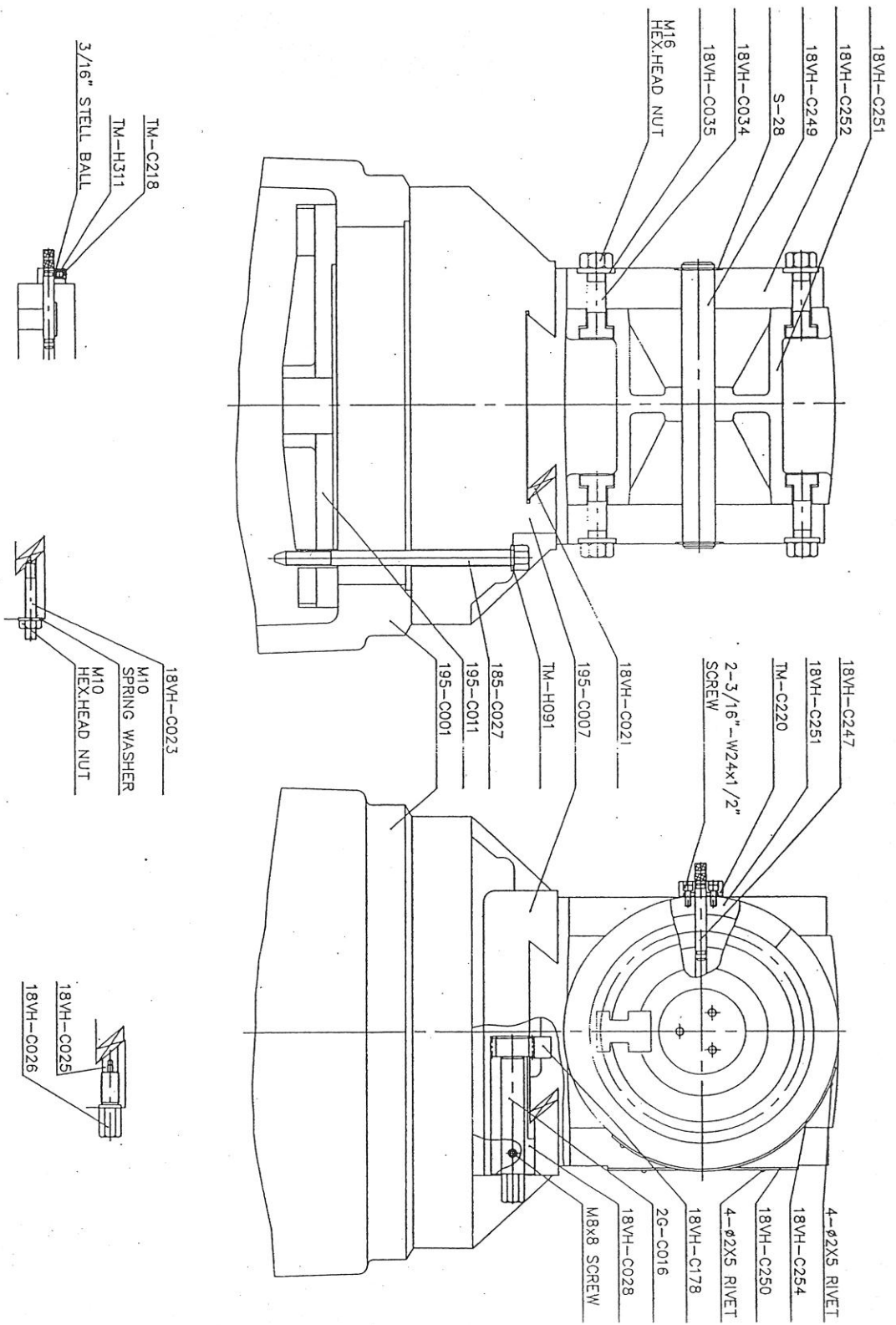
FILE NAME: 195-0-4 (TM/VS HEAD)



| | PARTS NO. | PC | DESCRIPTION | REMARKS |
|----|-----------|----|------------------------|---------|
| 1 | 18VH-C021 | 1 | OVERARM-TURRET GIB | |
| 2 | 195-C007 | 1 | TURRET | |
| 3 | 18VH-C023 | 1 | GIB STATIONARY BOLT | |
| 4 | 18VH-C025 | 1 | OVERARM LOCK PLUNGER | |
| 5 | 18VH-C026 | 1 | OVERARM LOCK BOLT | |
| 6 | 18VH-C028 | 1 | PINION BUSHING | |
| 7 | 18VH-C034 | 12 | T-BOLT | |
| 8 | 18VH-C035 | 12 | FALT WASHER | |
| 9 | 18VH-C178 | 1 | OVERARM RACK | |
| 10 | 18VH-C247 | 1 | HEAD ROTATION STOP PIN | |
| 11 | 18VH-C249 | 1 | ADAPTER PIVOT STUD | |
| 12 | 18VH-C250 | 1 | SCALE | |
| 13 | 18VH-C251 | 1 | RAM ADAPTER | |
| 14 | 18VH-C252 | 1 | OVERARM | |
| 15 | 18VH-C254 | 1 | SCALE | |
| 16 | TM-H311 | 1 | SPRING | |
| 17 | TM-C218 | 1 | SCREW | |
| 18 | TM-C220 | 1 | STOP PIN BASE | |
| 19 | TM-H091 | 2 | BRAKE LOCK WASHER | |
| 20 | 2G-C016 | 1 | OVERARM MOVING PINION | |
| 21 | 185-C027 | 1 | TURRET CLAMP BOLTS | |
| 22 | 195-C011 | 1 | SPIDER | |
| 23 | 195-C001 | 1 | COLUMN | |
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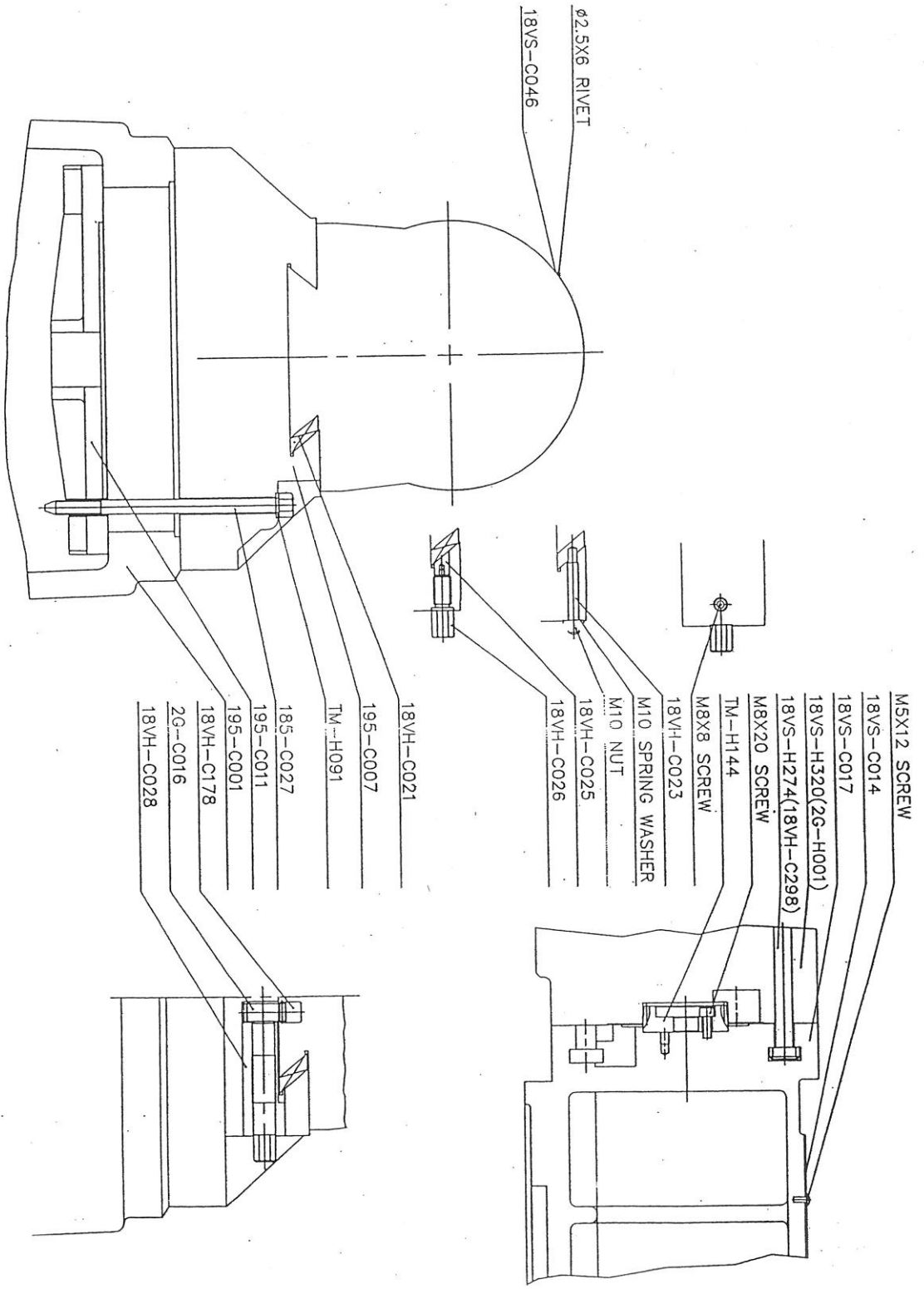
FILE NAME: 195-05 (20 HEAD)

FILE NAME: 195-06 (20 HEAD)



| PARTS NO. | | PC | DESCRIPTION | REMARKS |
|-----------|-----------|----|-----------------------|---------|
| 1 | 18VS-H274 | 4 | T-BOLT | |
| 2 | 18VS-C | 2 | COVER | |
| 3 | 18VS-C | 1 | OVERARM | |
| 4 | 18VS-C | 1 | SCALE | |
| 5 | 18VH-C | 1 | OVERARM-TURRET GIB | |
| 6 | 195-C007 | 1 | TURRET | |
| 7 | 18VH-C | 2 | GIB STATIONARY BOLT | |
| 8 | 18VH-C | 2 | OVERARM LOCK PLUNGER | |
| 9 | 18VH-C | 2 | OVERARM LOCK BOLT | |
| 10 | 18VH-C | 1 | PINION BUSHING | |
| 11 | 18VH-C | 1 | OVERARM MOVING RACK | |
| 12 | 2G-C016 | 1 | OVERARM MOVING PINION | |
| 13 | 18VS-H | 1 | QUILL HOUSING | |
| 14 | TM-H144 | 1 | GEAR | |
| 15 | TM-H091 | 1 | BRAKE LOCK WASHER | |
| 16 | 185-C027 | 1 | TURRET CLAMP BOLTS | |
| 17 | 195-C011 | 1 | SPIDER | |
| 18 | 195-C001 | 1 | COLUMN | |
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FILE NAME: 195-07 (20 HEAD)

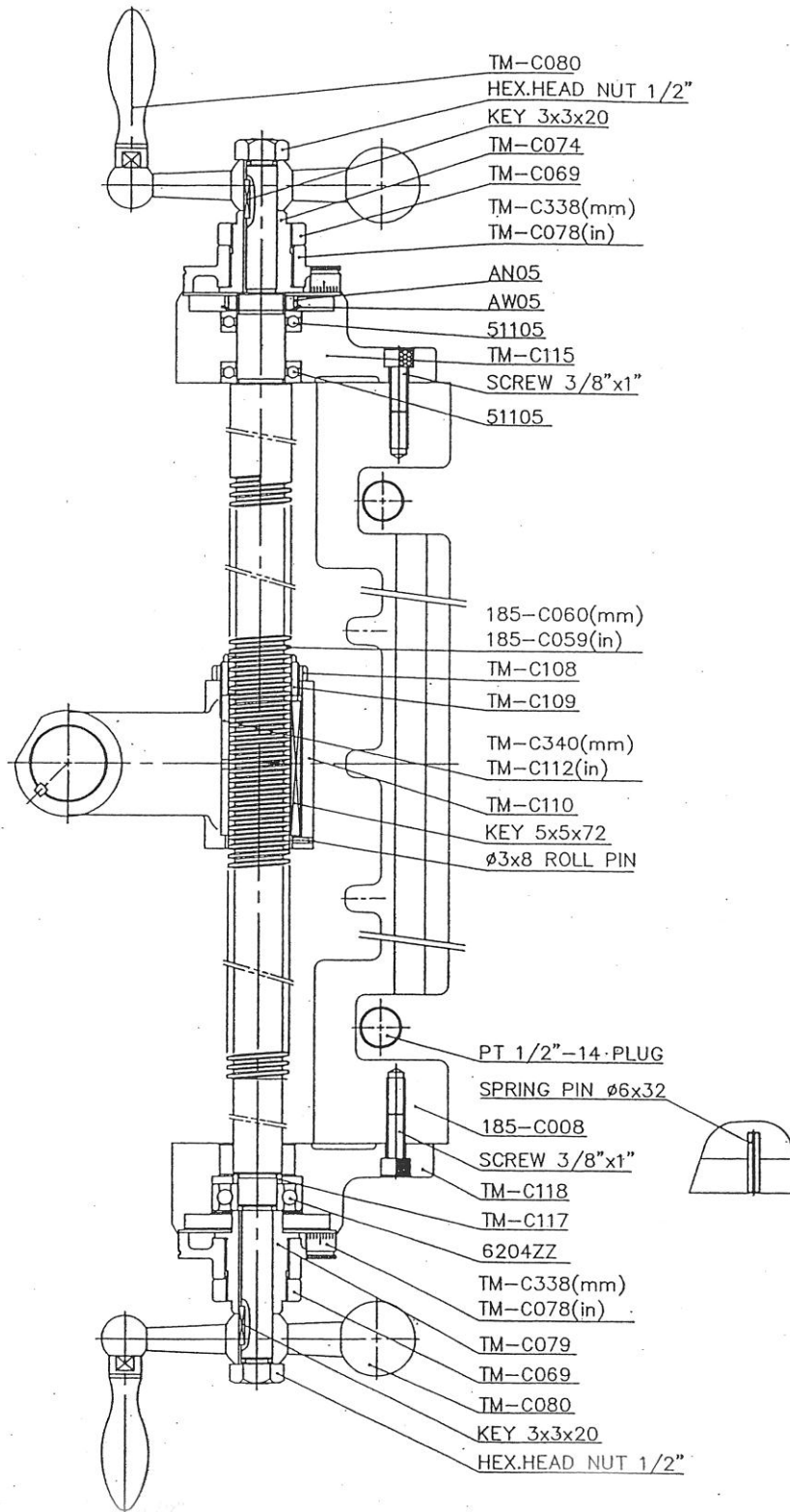


FILE NAME: 195-08 (20 HEAD)

| PARTS NO. | | PC | DESCRIPTION | REMARKS |
|-----------|----------|----|--------------------------|---------|
| 1 | TM-C069 | 2 | DIAL LOCK NUT | |
| 2 | TM-C074 | 1 | DIAL HOLDER | |
| 3 | TM-C338 | 2 | DIAL WITH 200 GRADUATION | |
| 4 | TM-C079 | 1 | DIAL HOLDER | |
| 5 | TM-C080 | 2 | HAND WHEEL | |
| 6 | TM-C108 | 1 | LOCK SCREW | |
| 7 | TM-C109 | 1 | SCREW ADJUSTING NUT | |
| 8 | TM-C110 | 1 | FEED NUT BRACKET | |
| 9 | TM-C340 | 1 | LONGITUDINAL FEED NUT | |
| 10 | TM-C115 | 1 | LEFT BEARING BRACKET | |
| 11 | TM-C117 | 1 | BEARING SPACER | |
| 12 | TM-C118 | 1 | RIGHT BEARING BRACKET | |
| 13 | 185-C060 | 1 | LONGITUDINAL FEED SCREW | |
| 14 | 185-C008 | 1 | TABLE | |
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FILE NAME: 195-09

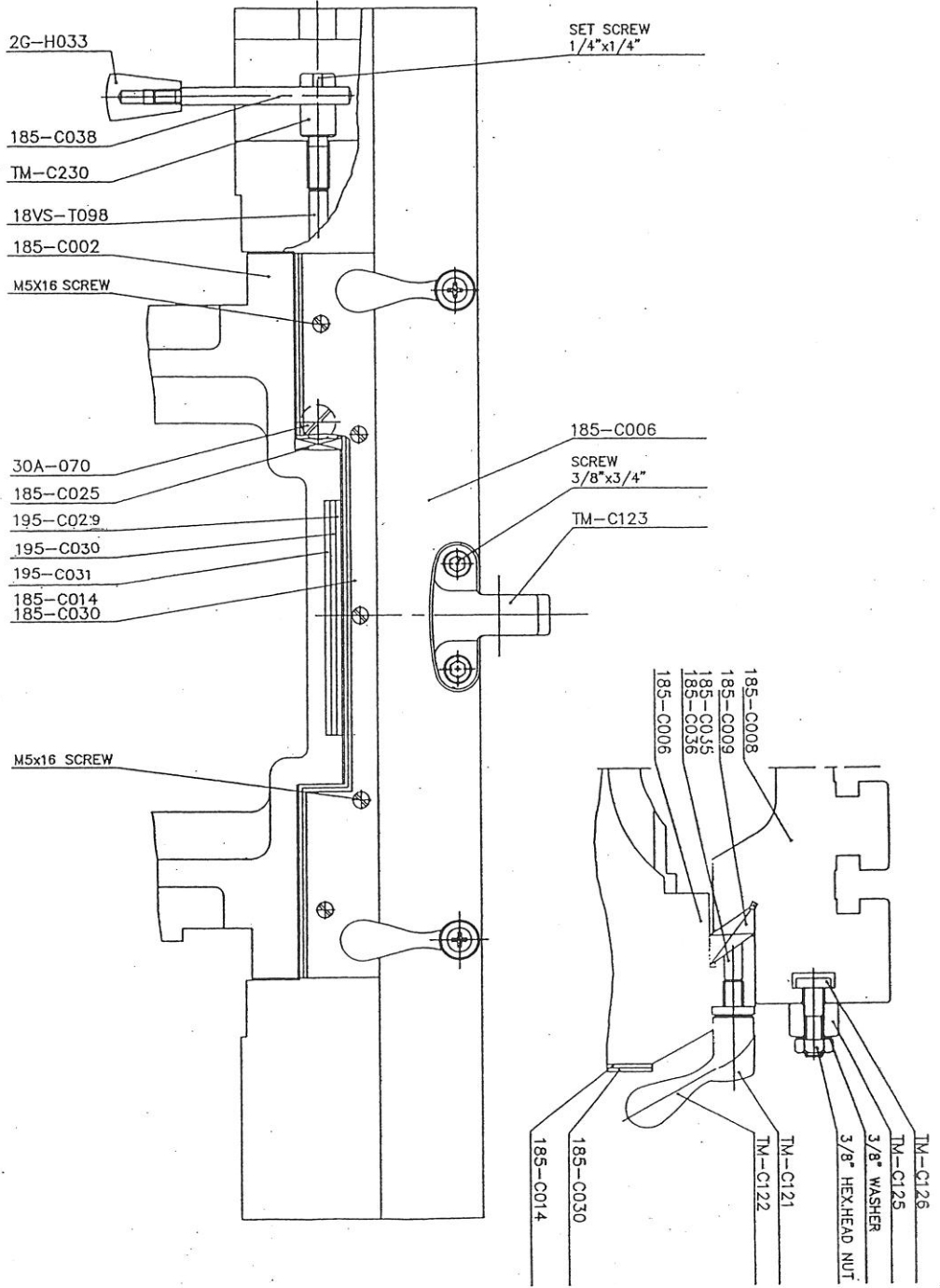
FILE NAME: 195-10



| PARTS NO. | | PC | DESCRIPTION | REMARKS |
|-----------|-----------|----|-------------------------|---------|
| 1 | TM-C121 | 1 | TABLE LOCK BOLT | |
| 2 | TM-C122 | 1 | TABLE LOCK BOLT HANDLE | |
| 3 | TM-C123 | 1 | TABLE STOP BRACKET | |
| 4 | TM-C125 | 1 | TABLE STOP PIECE | |
| 5 | TM-C126 | 1 | STOP PIECE T-BOLT | |
| 6 | TM-C230 | 1 | RAM LOCK BOLT | |
| 7 | 185-C002 | 1 | KNEE | |
| 8 | 185-C006 | 1 | SADDLE | |
| 9 | 185-C008 | 1 | TABLE | |
| 10 | 185-C009 | 1 | SADDLE KNEE GIB | |
| 11 | 185-C014 | 1 | SADDLE KNEE WIPER | |
| 12 | 185-C025 | 1 | SADDLE KNEE GIB | |
| 13 | 185-C030 | 1 | CHIP COVER PLATES | |
| 14 | 185-C035 | 1 | TABLE LOCK PLUNGER (S) | |
| 15 | 185-C036 | 1 | TABLE LOCK PLUNGER (L) | |
| 16 | 185-C038 | 1 | RAM PINION HANDLE | |
| 17 | | | | |
| 18 | | | | |
| 19 | 30A-070 | 1 | GIB ADJUSTING SCREW | |
| 20 | 2G-H033 | 1 | GRIP | |
| 21 | 195-C029 | 1 | CHIP GUARD COVER PLATES | |
| 22 | 195-C030 | 1 | CHIP GUARD COVER PLATES | |
| 23 | 195-C031 | 1 | CHIP GUARD COVER PLATES | |
| 24 | 18VS-T098 | 1 | SADDLE LOCK PLUNGER | |
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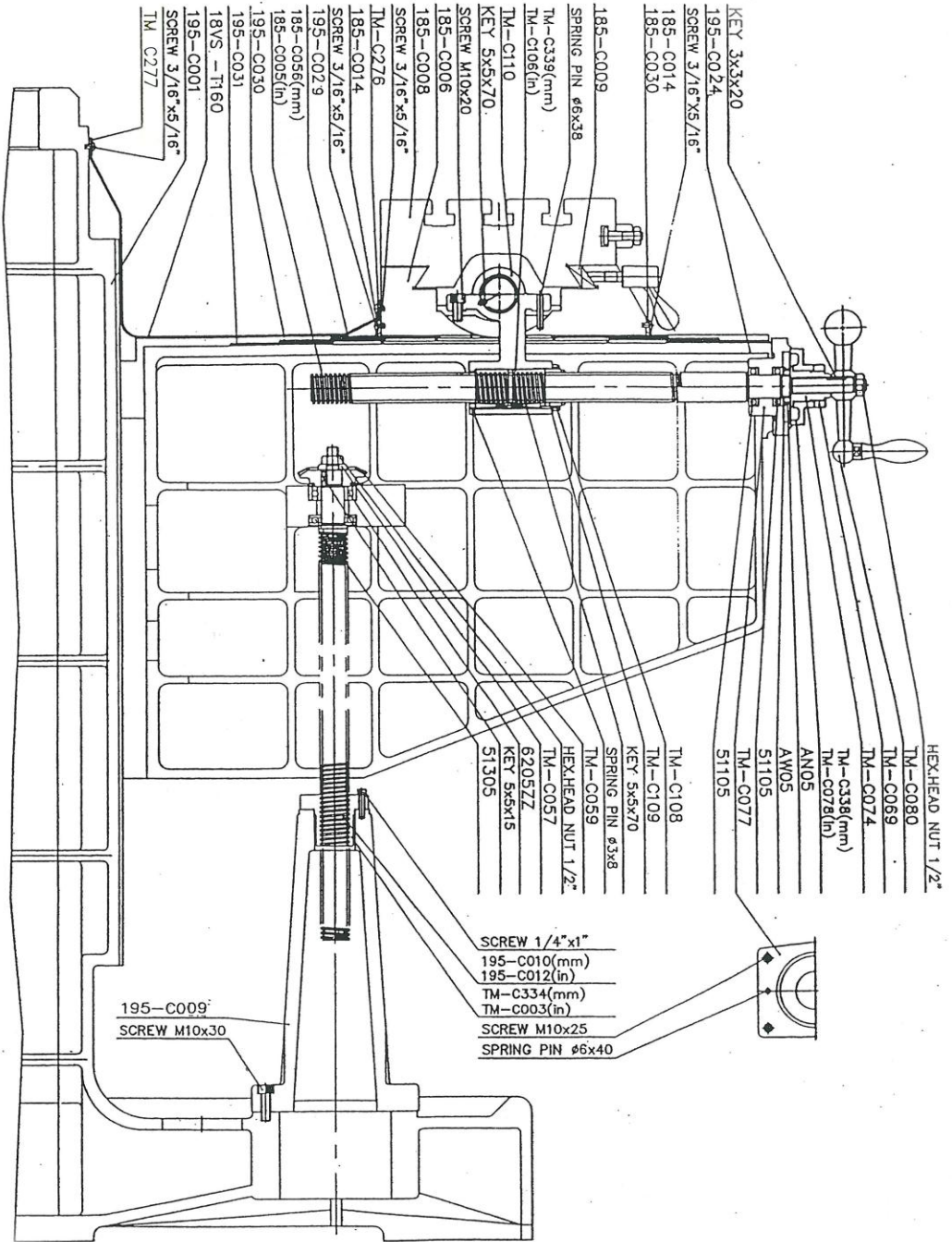
FILE NAME: 195-11

FILE NAME: 195-12



| PARTS NO. | | PC | DESCRIPTION | REMARKS |
|-----------|-----------|----|----------------------------|---------|
| 1 | TM-C334 | 1 | ELEVATING SCREW HOUSING | |
| 2 | TM-C057 | 1 | WASHER | |
| 3 | TM-C059 | 1 | BEVEL GEAR | |
| 4 | TM-C069 | 1 | DIAL LOCK NUT | |
| 5 | TM-C074 | 1 | DIAL HOLDER | |
| 6 | TM-C077 | 1 | CROSS FEED BEARING BRACKET | |
| 7 | TM-C338 | 1 | DIAL WITH 200 GRADUATIONS | |
| 8 | TM-C080 | 1 | HAND WHEEL | |
| 9 | TM-C339 | 1 | CROSS FEED NUT | |
| 10 | TM-C108 | 1 | LOCK SCREW | |
| 11 | TM-C109 | 1 | SCREW ADJUSTING NUT | |
| 12 | TM-C110 | 1 | FEED NUT BRACKET | |
| 13 | TM-C276 | 1 | CHIP COVER PLATE | |
| 14 | TM-C277 | 1 | CHIP COVER PLATES | |
| 15 | 195-C009 | 1 | COLUMN | |
| 16 | 195-C024 | 1 | KNEE | |
| 17 | 185-C056 | 1 | CROSS FEED SCREW | |
| 18 | 185-C006 | 1 | SADDLE | |
| 19 | 185-C007 | 1 | ELEVATING SCREW HOUSING | |
| 20 | 185-C008 | 1 | TABLE | |
| 21 | 185-C009 | 1 | SADDLE-TABLE GIB | |
| 22 | 185-C014 | 2 | SADDLE KNEE WIPER | |
| 23 | 185-C030 | 2 | CHIP COVER PLATES | |
| 24 | | | | |
| 25 | 195-C029 | 1 | CHIP GUARD COVER PLATES | |
| 26 | 195-C030 | 1 | CHIP GUARD COVER PLATES | |
| 27 | 195-C031 | 1 | CHIP GUARD COVER PLATES | |
| 28 | 195-C010 | 1 | SOCKET HD CAP SCREW | |
| 29 | 18VS-T160 | 1 | CHIP GUARD RUBBER | |
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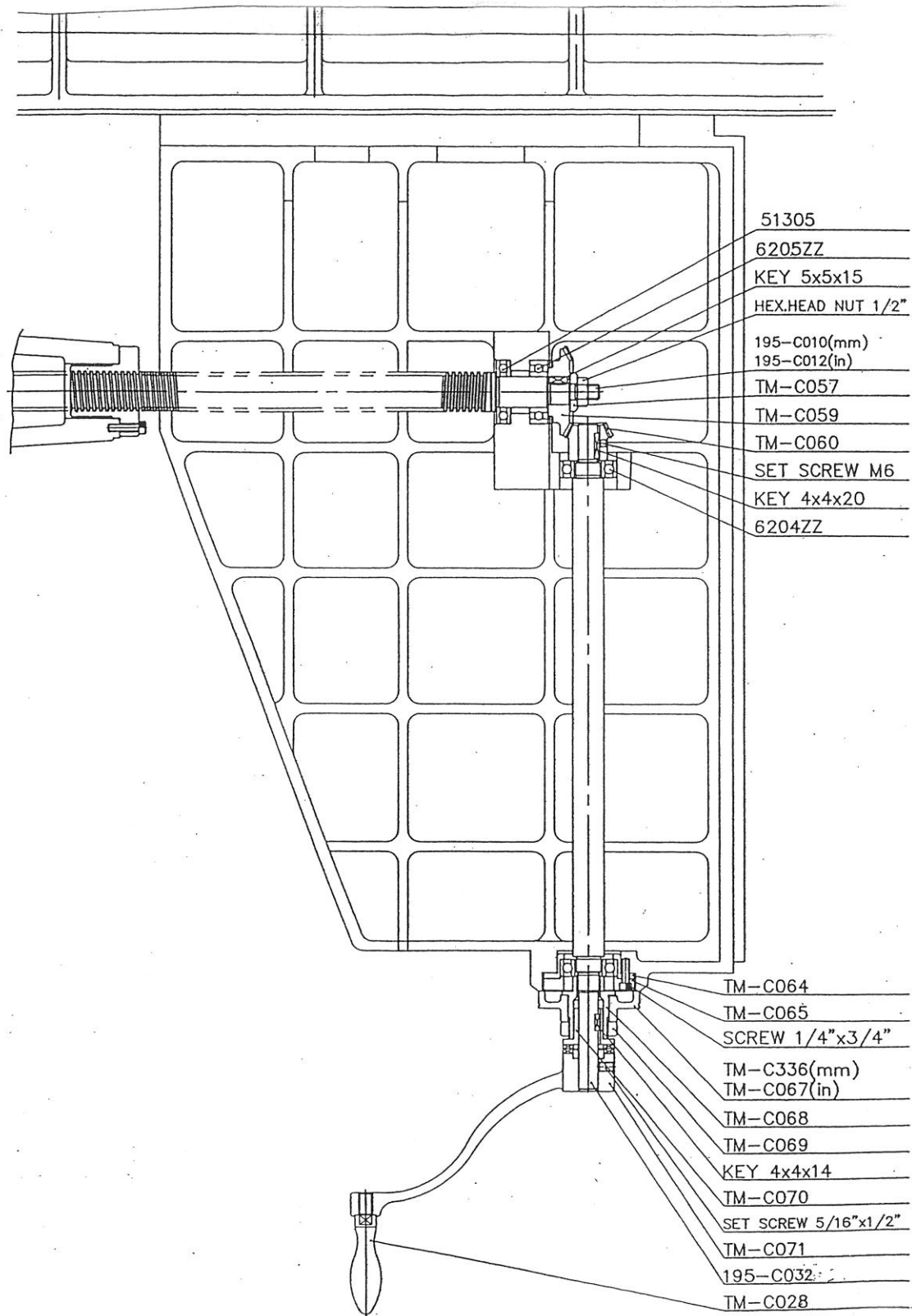
FILE NAME: 195-13



| PARTS NO. | | PC | DESCRIPTION | REMARKS |
|-----------|----------|----|---------------------------|---------|
| 1 | TM-C028 | 1 | HANDLE | |
| 2 | TM-C057 | 1 | WASHER | |
| 3 | TM-C059 | 1 | BEVEL GEAR | |
| 4 | TM-C060 | 1 | BEVEL PINION | |
| 5 | TM-C064 | 1 | BEARING CUP | |
| 6 | TM-C065 | 1 | BEARING RETAINING RING | |
| 7 | TM-C038 | 1 | DIAL HOLDER | |
| 8 | TM-C069 | 1 | DIAL LOCK NUT | |
| 9 | TM-C070 | 1 | GEAR SHAFT CLUTCH INSERT | |
| 10 | TM-C071 | 1 | ELEVATING CRANK | |
| 11 | TM-C336 | 1 | DIAL WITH 100 GRADUATIONS | |
| 12 | | | | |
| 13 | 195-C032 | 1 | GEAR SHAFT FOR KNEE | |
| 14 | 195-C010 | 1 | SOCKET HD CAP SCREW | |
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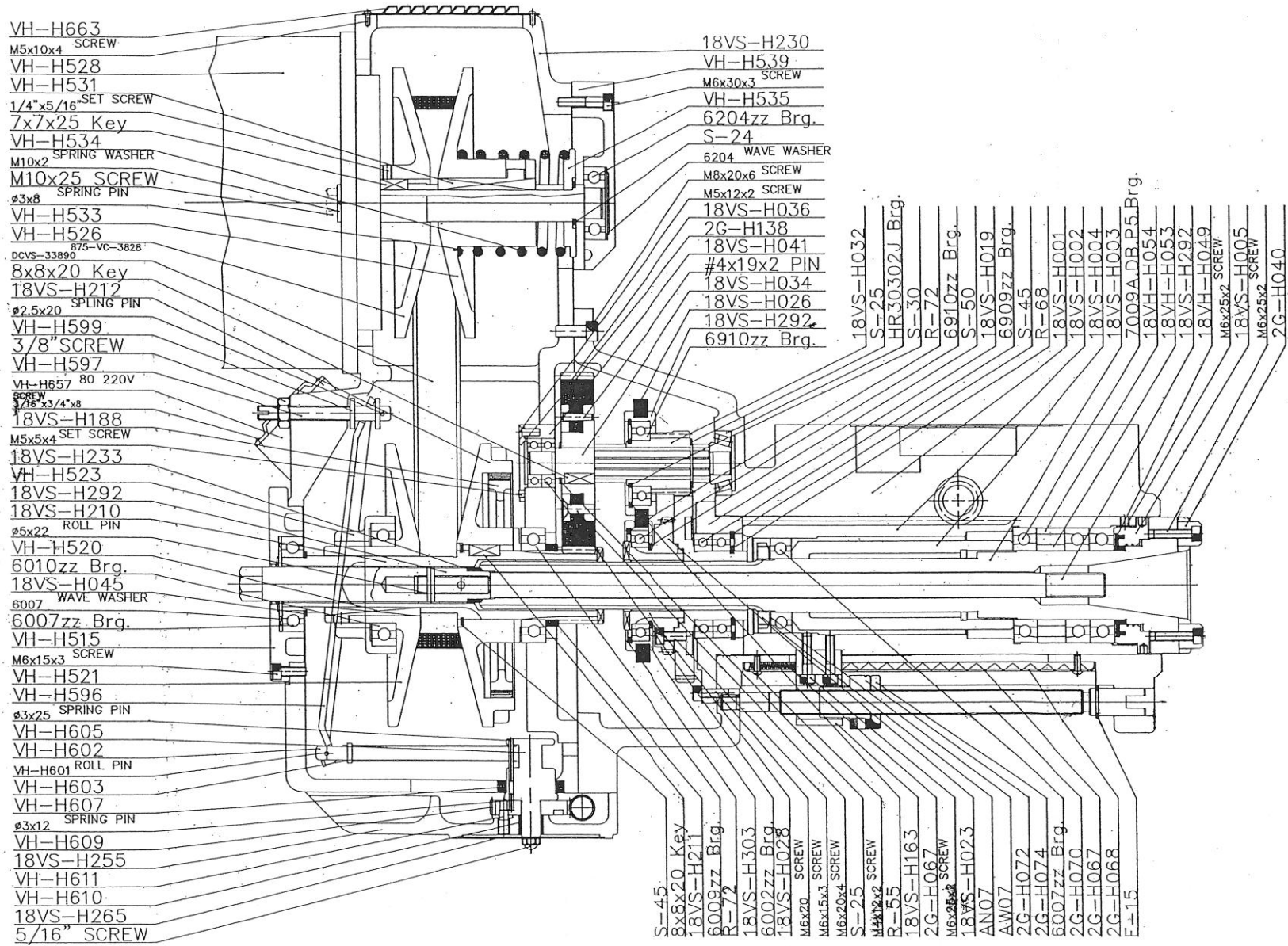
FILE NAME: 195-15

FILE NAME: 195-16



| | PARTS NO. | PC | DESCRIPTION | REMARKS |
|----|-----------|----|-------------------------------|---------|
| 1 | VH-H515 | 1 | BEARING HOUSING | |
| 2 | VH-H520 | 1 | SLIDING KEY | |
| 3 | VH-H521 | 1 | ADJ DRIVEN VARI-DISC | |
| 4 | VH-H523 | 1 | BEARING BRACKET | |
| 5 | VH-H526 | 1 | MOTOR STATIONARY VARI-DISC | |
| 6 | VH-H528 | 1 | MOTOR | |
| 7 | VH-H531 | 1 | SLIDING KEY | |
| 8 | VH-H533 | 1 | ADJ MOTOR VARI-DISC | |
| 9 | VH-H534 | 1 | SPRING | |
| 10 | VH-H535 | 1 | SPRING-WASHER | |
| 11 | VH-H539 | 1 | BOTTOM BEARING CAP | |
| 12 | VH-H596 | 1 | SPEED CHANGE PLATE | |
| 13 | VH-H597 | 1 | SPEED CHANGE PLATE PIVOT STUD | |
| 14 | VH-H601 | 1 | ROLL PIN | |
| 15 | VH-H602 | 1 | SPEED CHANGE CHAIN STUD | |
| 16 | VH-H603 | 1 | CHAIN | |
| 17 | VH-H605 | 1 | PINION SHAFT | |
| 18 | VH-H607 | 1 | WORM GEAR SHAFT SUPPORTER | |
| 19 | VH-H609 | 1 | SPEED CHANGER WORM GEAR | |
| 20 | VH-H610 | 1 | BRONZE BUSHING | |
| 21 | VH-H611 | 1 | ORIENTATION SCREW | |
| 22 | VH-H657 | 1 | COVER | |
| 23 | VH-H663 | 1 | REAR COVER | |
| 24 | 18VH-H049 | 1 | SPINDLE DUST SHIELD | |
| 25 | 18VH-H053 | 1 | BEARING SPACER | |
| 26 | 18VH-H054 | 1 | BEARING SPACER | |
| 27 | 18VS-H001 | 1 | QUILL HOUSING | |
| 28 | 18VS-H002 | 1 | QUILL | |
| 29 | 18VS-H003 | 1 | SPINDLE | |
| 30 | 18VS-H004 | 1 | BEARING SPACER | |
| 31 | 18VS-H005 | 1 | NOSE PIECE | |
| 32 | 18VS-H019 | 1 | BEARING BRACKET | |
| 33 | 18VS-H023 | 1 | SPINDLE FEED GEAR | |
| 34 | 18VS-H026 | 1 | BACK GEAR SHIFTER FORK | |

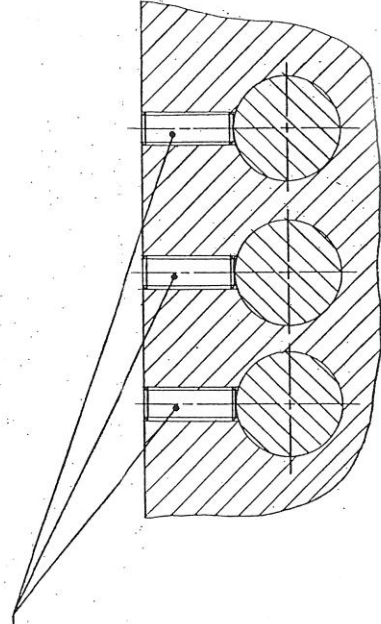
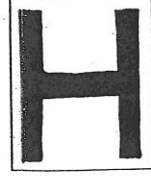
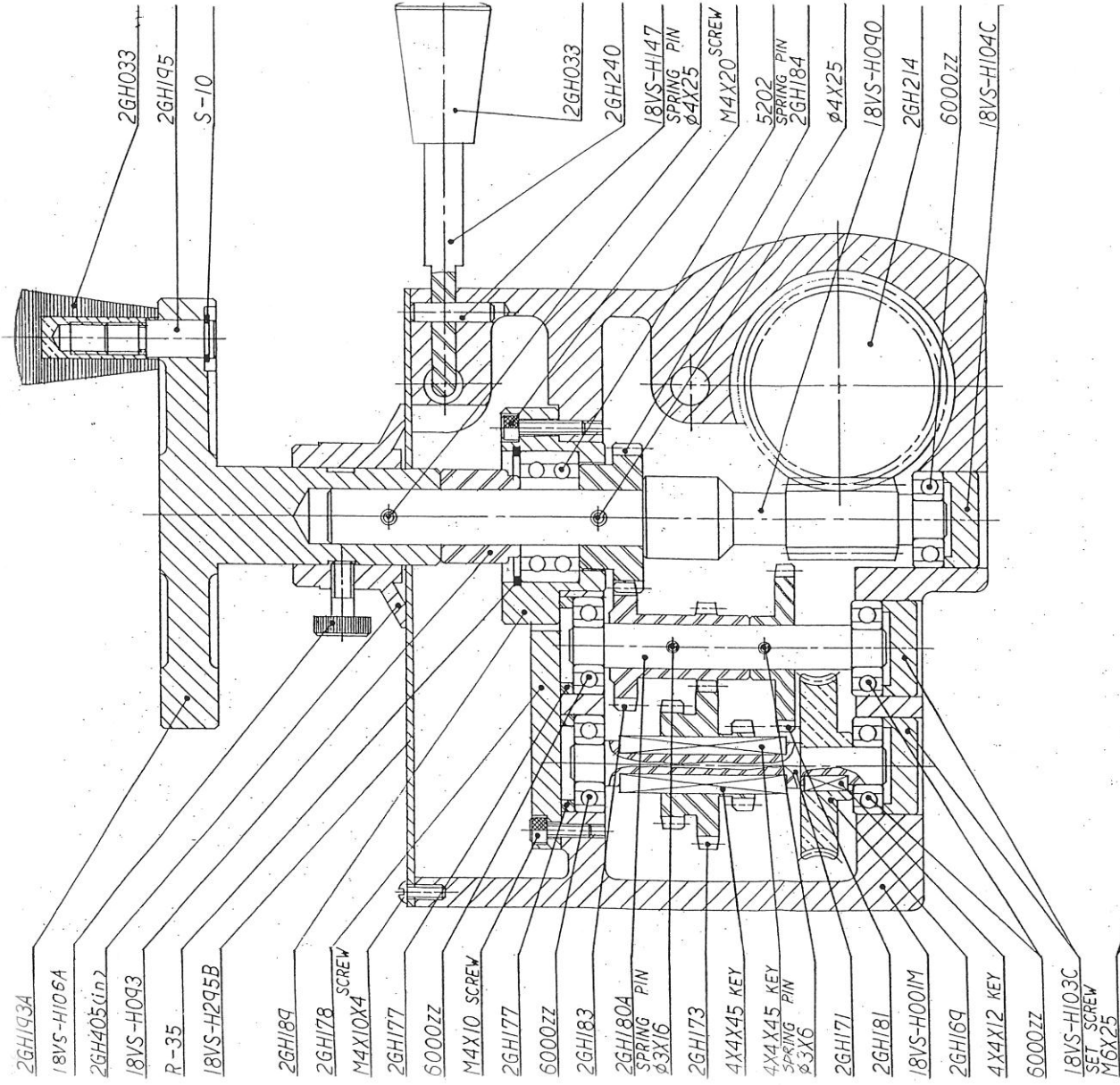
| PARTS NO. | | PC | DESCRIPTION | REMARKS |
|-----------|-----------|----|-----------------------------|---------|
| 1 | 18VS-H028 | 1 | SPINDLE CLUTCH | |
| 2 | 18VS-H032 | 1 | SPEED CHANGE GEAR | |
| 3 | 18VS-H034 | 1 | SPEED CHANGE GEAR SHAFT | |
| 4 | 18VS-H036 | 1 | BACK GEAR | |
| 5 | 18VS-H041 | 1 | BEARING BRACKET | |
| 6 | 18VS-H045 | 1 | BEARING SPACER | |
| 7 | 18VS-H163 | 1 | QUILL STOP KNOB | |
| 8 | 18VS-H188 | 1 | BRAKE SHOE | |
| 9 | 18VS-H210 | 1 | SPINDLE PULLEY HUB | |
| 10 | 18VS-H211 | 1 | SPACER | |
| 11 | 18VS-H212 | 1 | STATIONARY DRIVEN VARI-DISC | |
| 12 | 18VS-H230 | 1 | BELT HOUSING | |
| 13 | 18VS-H233 | 1 | DRAWBAR WASHER | |
| 14 | 18VS-H255 | 1 | SPEED CHANGE HOUSING | |
| 15 | 18VS-H265 | 1 | VARI SPEED DIAL | |
| 16 | 18VS-H290 | 1 | BEARING BRACKET | |
| 17 | 18VS-H292 | 1 | DRAWBAR | |
| 18 | 18VS-H303 | 1 | BEARING BRACKET | |
| 19 | 2G-H040 | 2 | ARBOR DRIVER | |
| 20 | 2G-H067 | 1 | BELLOWS | |
| 21 | 2G-H068 | 1 | COVER FOR QUILL | |
| 22 | 2G-H070 | 1 | QUILL STOP MICRO SCREW | |
| 23 | 2G-H072 | 1 | MICROMETER NUT | |
| 24 | 2G-H074 | 1 | QUIL MICRO STOP NUT | |
| 25 | 2G-H138 | 1 | COVER | |
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| PARTS NO. | PC | DESCRIPTION | REMARKS | PARIS NO. | PC | DESCRIPTION | REMARKS |
|------------|----|----------------------------------|---------|-----------|----|-------------------------|---------|
| 18VS-H001E | 1 | QUILL HOUSING | | -244 | 1 | TRIP PIN | |
| -H041B | 1 | BEARING BRACKET | | TM-H090 | 1 | CLOCK SPRING STUD | |
| -H045 | 1 | SHIETER FORK SHAFT | | -H091 | 4 | FLAT WASHER | |
| -H046A | 1 | SHIETER CRANK | | -H284 | 1 | BLACK PLASTIC BALL GRIP | |
| -H047A | 1 | COVER | | VH-H681A | 1 | SHIFTER CRANK HUB | |
| -H049 | 1 | H-L/W SPEED PLATE | | -H583 | 1 | COMPRESSION SPRING | |
| -H060 | 1 | UP FEED WORM | | -584 | 1 | ORIENTATION PIN | |
| -H061 | 1 | BEARING CUP | | -587 | 1 | SHIFTER HANDLE | |
| -H065 | 1 | BEARING CUP | | | | | |
| -H068 | 1 | UP FEED DRIVING GEAR | | | | | |
| -H116 | 1 | QUILL PINION SHAFT | | | | | |
| -H146 | 1 | OVERLOAD CLUTCH TRIP LEVER | | | | | |
| -H147A | 1 | ROLL PIN | | | | | |
| -H155 | 1 | TRIP PLUNGER | | | | | |
| -H160A | 1 | CLUSTER GEAR COVER | | | | | |
| -H163A | 1 | QUILL STOP KNOB | | | | | |
| -H169 | 1 | FLAT WASHER | | | | | |
| -H179 | 1 | QUILL LOCK SLEEVE | | | | | |
| -H180A | 1 | QUILL LOCK SLEEVE | | | | | |
| -H181 | 1 | QUILL LOCK BOLT | | | | | |
| -H183 | 1 | MICROMETER SCALE | | | | | |
| -H274B | 4 | T-BOLT | | | | | |
| -H275 | 2 | SLEEVE | | | | | |
| -H282 | 1 | FEED SPEED PLATE | | | | | |
| -H306 | 1 | COMPRESSION SPRING | | | | | |
| | | | | | | | |
| 2GH-032 | 1 | GRIP ROD | | | | | |
| -033 | 3 | GRIP | | | | | |
| -065 | 1 | CHIP GUARD PLATE | | | | | |
| -070 | 1 | QUILL STOP MICRO SCREW | | | | | |
| -072 | 1 | MICROMETER NUT | | | | | |
| -074 | 1 | QUILL MICOR STOP NUT | | | | | |
| -095 | 2 | SPRING | | | | | |
| -100 | 2 | ARROW HEAD PLATE | | | | | |
| -143 | 1 | COVER | | | | | |
| -145 | 2 | SHIFTER HANDWHEEL | | | | | |
| -147 | 1 | FEED PLATE | | | | | |
| -154B | 1 | BEARING COVER | | | | | |
| -160 | 1 | FEED GEAR SHIFTER FORK | | | | | |
| -163 | 1 | SHIFTING CRANK | | | | | |
| -165 | 1 | CRANK STUD | | | | | |
| -167 | 1 | CLUSTER GEAR CRANK | | | | | |
| -203A | 1 | PINION SHAFT HUB & HANDLE | | | | | |
| -206 | 1 | PINION SHAFT HUB SLEEVE | | | | | |
| -209A | 1 | SPRING COVER | | | | | |
| -211 | 1 | CLOCK SPRING | | | | | |
| -213 | 1 | QUILL PINION SHAFT BUSHING | | | | | |
| -214A | 1 | WORM GEAR | | | | | |
| -216A | 1 | OVERLOAD CLUTCH RING | | | | | |
| -217A | 1 | OVERLOAD CLUTCH | | | | | |
| -219 | 1 | OVERLOAD CLUTCH SLEEVE | | | | | |
| -221 | 1 | SAFETY CLUTCH SPRING | | | | | |
| -222 | 1 | RVERLOAD CLUTCH LOCK NUT | | | | | |
| -224 | 1 | CLUTCH BRONZE RING | | | | | |
| -225 | 2 | TRIP LEVER SCREW | | | | | |
| -227A | 1 | OVERLOAD CLUTCH TRIP LEVER STRUT | | | | | |
| -234 | 1 | COMPRESSION SPRING | | | | | |
| -235 | 1 | SPRING PLUNGER | | | | | |
| -237 | 1 | ROLL PIN | | | | | |
| -239 | 1 | CAM ROD | | | | | |
| -240 | 1 | TRIP HANDLE | | | | | |
| -241 | 1 | COMPRESSION SPRING | | | | | |
| -243 | 1 | TRIP HANDLE | | | | | |

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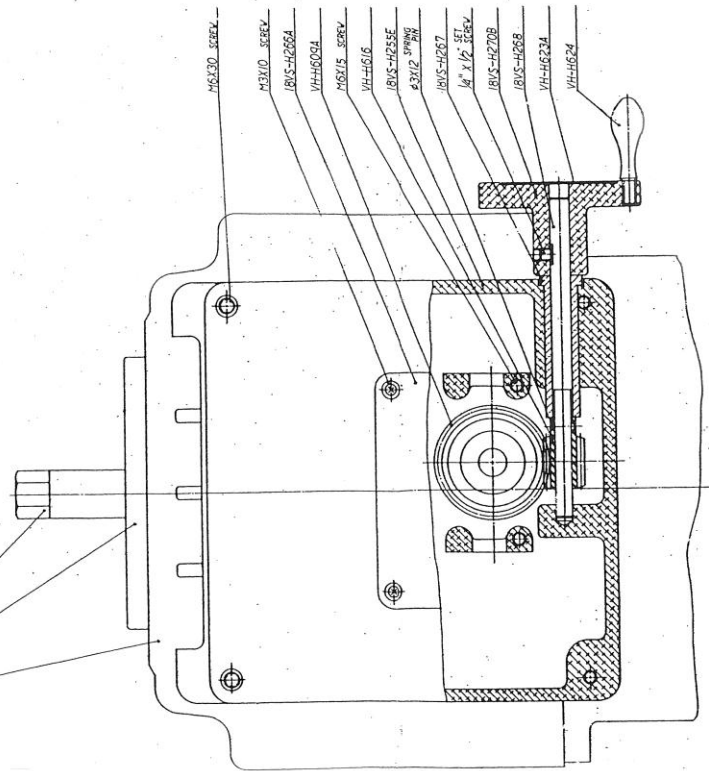
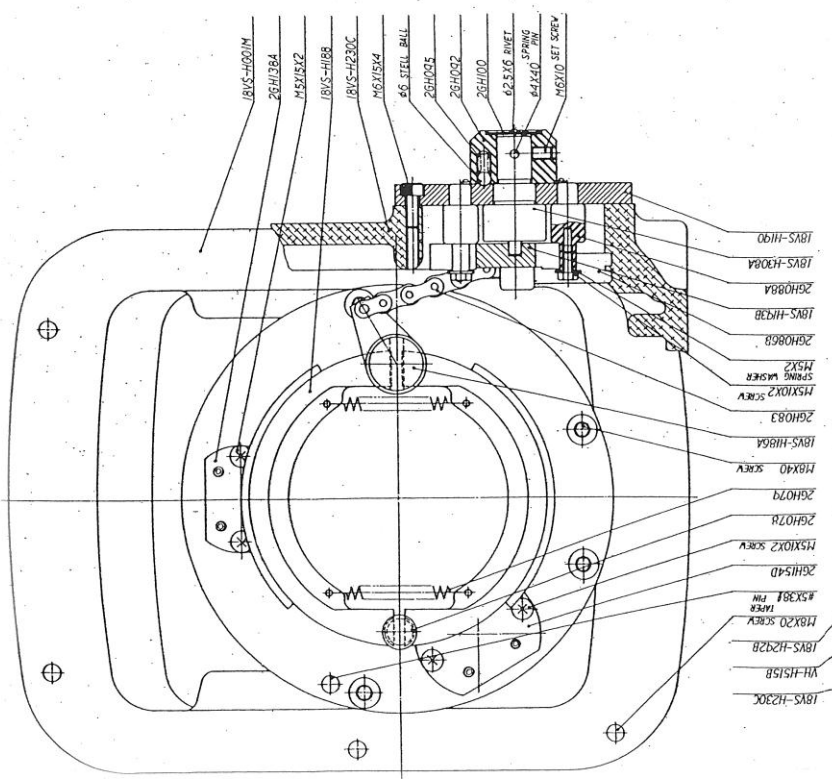
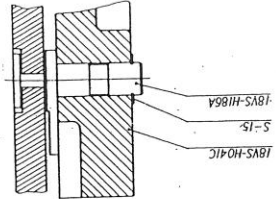
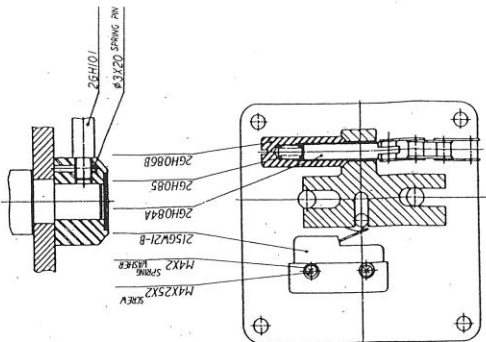
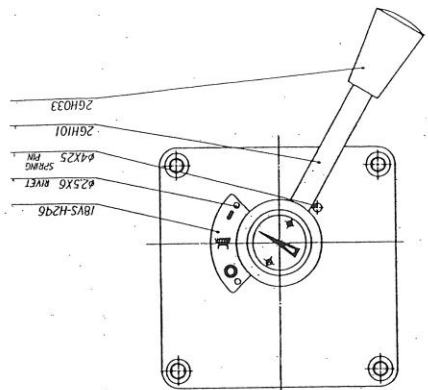
| PARTS NO. | PC | DESCRIPTION | REMARKS |
|------------|----|---------------------------------|---------|
| 18VS-H001E | 1 | QUILL HOUSING | |
| -H090 | 1 | DOWN FEED WORM | |
| -H093 | 1 | BEARING SPACER | |
| -H103B | 2 | BEARING PLUNGER | |
| -H104B | 1 | BEARING PLUNGER | |
| -H106A | 1 | DIAL SCREW | |
| -H295B | 1 | PLATE | |
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| 2GH-033 | 2 | GRIP | |
| -169 | 1 | UP FEED WORM GEAR | |
| -171 | 1 | SPEED CHANGE GEAR CLUSTER SHAFT | |
| -173 | 1 | SPEED CHANGE CLUSTER | |
| -177 | 2 | BEARING SPACER | |
| -178 | 1 | BEARING COVER | |
| -180 | 1 | COUNTERSHAFT | |
| -181 | 1 | SINGLE-DRIVING GEAR | |
| -183 | 1 | MULTIPLE-DRIVING GEAR | |
| -184 | 1 | DOWN FEED DRIVING GEAR | |
| -189 | 1 | BEARING BRACKET | |
| -193 | 1 | HANDWHEEL | |
| -195 | 1 | GRIP STUD | |
| -197 | 1 | DIAL | |
| -240 | 1 | TRIP HANDLE | |
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| PARTS NO. | PC | DESCRIPTION | REMARKS |
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| 18VS-H001E | 1 | QUILL HOUSING | |
| -H041B | 1 | BEARING BRACKET | |
| -H186A | 1 | BRAKE LOCK STUD | |
| -H188 | 1 | BRAKE SHOE | |
| -H190B | 1 | LIMIT SWITCH HOLDER | |
| -H193A | 1 | SHIFTER PLATE | |
| -H230B | 1 | BELT HOUSING | |
| -H255B | 1 | SPEED CHANGE HOUSING | |
| -H266A | 1 | HI-LOW SPEED PLATE | |
| -H267A | 1 | WORM SHAFT SLEEVE | |
| -H268 | 1 | SPEED CHANGE WORM SHAFT | |
| -H270A | 1 | SPEED CHANGE HANDWHEEL | |
| -H292A | 1 | DRAWBAR | |
| -H296 | 1 | PLATE | |
| -H308 | 1 | CRANK | |
| | | | |
| | | | |
| 2GH-033 | 1 | GRIP | |
| -078 | 1 | STRUT | |
| -079 | 2 | TENSION SPRING | |
| -083 | 1 | CHAIN | |
| -084 | 1 | CHAIN PULISTUD | |
| -085 | 1 | COMPRESSION SPRING | |
| -086 | 1 | PULISTUD NUT | |
| -088 | 1 | SHIFTER PLATE STRUT | |
| | | | |
| -092 | 1 | CRANK HUB | |
| -095 | 1 | COMPRESSION SPRING | |
| -100 | 1 | ARROW HEAD PLATE | |
| -101 | 1 | GRIP ROD | |
| -138A | 1 | BEARING COVER | |
| -154B | 1 | BEARING COVER | |
| VH -H515A | 1 | BEARING HOUSING | |
| -609B | 1 | SPEED CHANGE WORM GEAR | |
| -616 | 1 | SPEED CHANGE WORM SHAFT | |
| -623A | 1 | SPEED CHANGE WARNING PLATE | |
| -624 | 1 | HANDLE | |
| | | | |

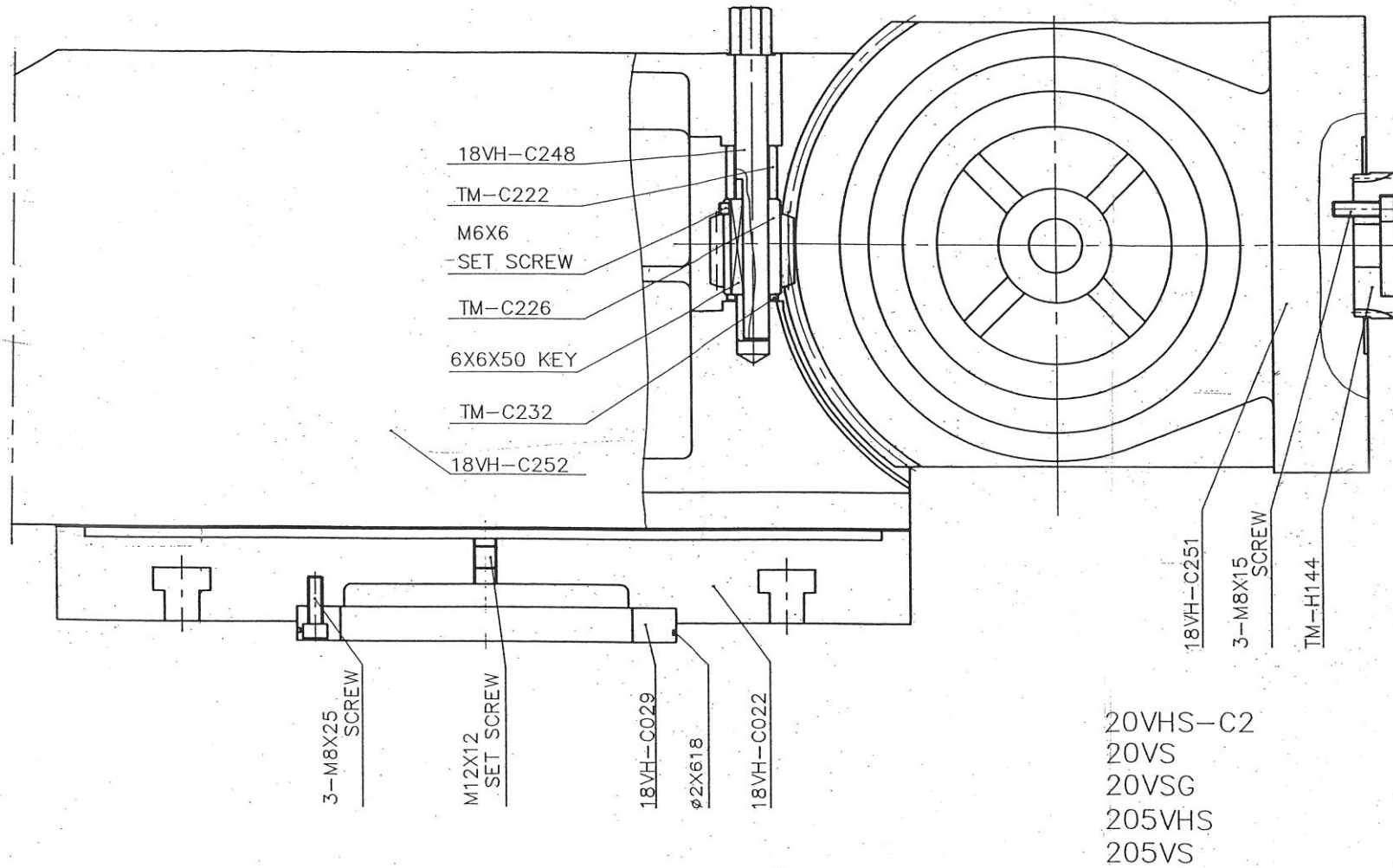
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| PARTS NO. | | PC | DESCRIPTION | REMARKS |
|-----------|-----------|----|---------------------------|---------|
| 1 | 18VH-C022 | 1 | TURRET | |
| 2 | 18VH-C029 | 1 | TURRET ROTARY RING | |
| 3 | 18VH-C248 | 1 | WORM SHAFT | |
| 4 | 18VH-C251 | 1 | RAM ADAPTER | |
| 5 | 18VH-C252 | 1 | OVERARM | |
| 6 | TM-H144 | 1 | HORIZONTAL ADJUSTING WORM | |
| 7 | TM-C222 | 1 | WORM SPACER | |
| 8 | TM-C226 | 1 | VERTICAL ADJUSTING WORM | |
| 9 | TM-C232 | 1 | WORM THRUST WASHER | |
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