

**PING JENG MACHINERY INDUSTRY CO., LTD**

**BM-2V-100V-U  
INSTALLATION, OPERATION, MAINTENANCE  
& SAFETY MANUAL**

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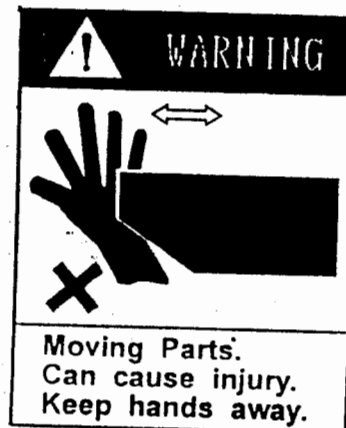
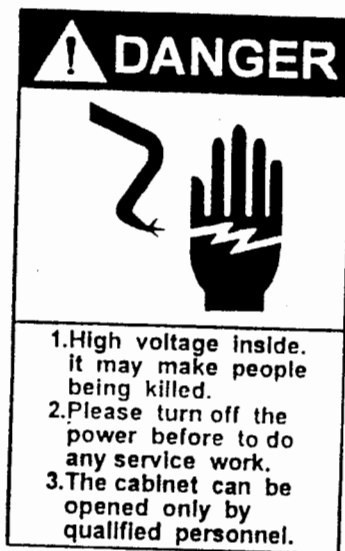
## Danger , Warning Labels and Notices as used in this manual

**Danger** - Immediate hazards which will result in severe personal injury or death.  
Danger labels on the machine are red in color.

**Warning** - Hazards or unsafe practices which could result in severe personal injury and / or damage to the equipment. Warning labels on the machine are orange in color.

**Caution** - Hazards or unsafe practices which could result in minor personal injury or equipment /product damage.

**Note** - Call attention to specific issues requiring special attention or understanding.



**Safety & Information Labels Used On The Machine**(If the machine is need)

## **Introduction**

**Congratulation! your BM-2V-100V-U is a unique traditional bed type milling machine that has been designed as it can provide an very efficient way to work on metal material very accuracy, and with an easy way to maintain it.**

**This manual should be studied and understood by each operator before they install, use, or, maintain this machine tool. It is solely the responsibility of the purchaser to properly train and educate each machine operator. And the employer has total responsibility to provide point of operation safeguarding**

**Please place this manual near the machine, and take care of it in any time. If you have any troubles or questions about the machine, please welcome to connect to us or to our appropriate overseas agent.**

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## **BM-2V-100V-U Installation Instructions & Checklist**

**Installer: Use for installation of the BM-2V-100V-U and leave with the customer when completed. Complete and check off each item in order. Do not continue until the current operation is completed and its box checked off.**

<input type="checkbox"/>	1	Shut off the power of the machine.
<input type="checkbox"/>	2	Visually inspect the power wiring going into the electrical panel. Visually verify the wiring is correct per our wiring diagram on the "BM-2V-100V-U Installation, Operation ,Maintenance and Safety Manual." Make sure a strain relief is being used where the wiring enters the cabinet. Have the CUSTOMER repair any wiring discrepancies.
<input type="checkbox"/>	3	Clean and machine if needed. Remove any remaining grease.
<input type="checkbox"/>	4	Check and make sure the Z axis upper way cover spacers are in place, otherwise the way cover will get caught up in the Z axis counterweight chain support sprockets
<input type="checkbox"/>	5	Install the manual Z axis hand crank.
<input type="checkbox"/>	6	Release the two (2) Z axis ram clamps.
<input type="checkbox"/>	7	Using the hand crank with manual, lower the hand until the counterweight is raised off of the counterweight support rods.
<input type="checkbox"/>	8	Remove the two(2) counterweight support rods.
<input type="checkbox"/>	9	Remove the manual hand crank mechanism.
<input type="checkbox"/>	10	Re-attach the lower end of the counterbalance rod guide to the bottom of the column using the two(2) Socket Head Cap Screws supplied.
<input type="checkbox"/>	11	Check the level of the machine and correct if needed, although it is the responsibility of the customer. Level the machine within 0.06mm per metre in both axis.
<input type="checkbox"/>	12	Mount the pendant and the switch box.
<input type="checkbox"/>	13	Switch power on to the machine and the pendant. Make sure the voltage.
<input type="checkbox"/>	14	Unlock both of the table and saddle gib locks.

<input type="checkbox"/> 15	<b>Fill all of the head oil cups.</b>
<input type="checkbox"/> 16	<b>Manually override the oilier and pump oil to lubricate all sliding surfaces.</b>
<input type="checkbox"/> 17	<b>Jog the table, saddle and ram back and forth until the ways are well lubricated. Oil should be visible on all the way surfaces.</b>
<input type="checkbox"/> 18	<b>Check to make sure the E-Stop button is working and functioning correctly.</b>
<input type="checkbox"/> 19	<b>Run the spindle through the high and low gears/speeds.</b>
<input type="checkbox"/> 20	<b>Check and use the quill power feed to make sure it works.</b>
<input type="checkbox"/> 21	<b>Install the Z axis lower way cover and its bracket.</b>
<input type="checkbox"/> 22	<b>Install the Y axis front and rear way covers.</b>
<input type="checkbox"/> 23	<b>Cut a Euclid block. Visually inspect block and make any machine adjustments if required.</b>
<input type="checkbox"/> 24	<b>Fill out an installation Summary Sheet. Take note of the machine's appearance, paint, and any problems with the installation process.</b>
<input type="checkbox"/> 25	<b>Wipe down the machine before leaving.</b>



## **1.0 Safety**

---

### **1.1 Safety Rules**

The safe operation of BM-2V-100V-U depends on its proper use and the precautions taken by each operator.

- \* Read and studied this manual. Be sure the operator should understand the operation & safety requirements of this machine before its use.
- \* Always wear safety glasses and safety shoes.
- \* Always stop spindle before changing or adjusting the tool or workpiece.
- \* Never wear gloves, rings, watches, long sleeves, neckties, jewelry, or other loose items when operating or around the machine.
- \* Use adequate point of operation safeguarding. It is the responsibility of the employer to provide and ensure point of operation safe guarding.

### **1.2 SAFETY PRECAUTIONS**

**I .Before connect the supply power. The following items are necessary to be checked and stand by:**

1. There are no any exterior objects on the machine.
2. The operating control box and the electric control box should be locked.
3. Check the switch of the operating control box, everyone will be easy to operate. Especial the Power OFF/ EMG switch.
4. The level of the oilier can not bellow the lowest limitation.

**II. Confirm the operating functions. Check the all basic functions of the manual.**

**III. In any damage or emergency cases. Press in the Power OFF/ EMG button ,then this machine will be stopped in instant.**

**IV. Accurately training for the operator to operate machine:**

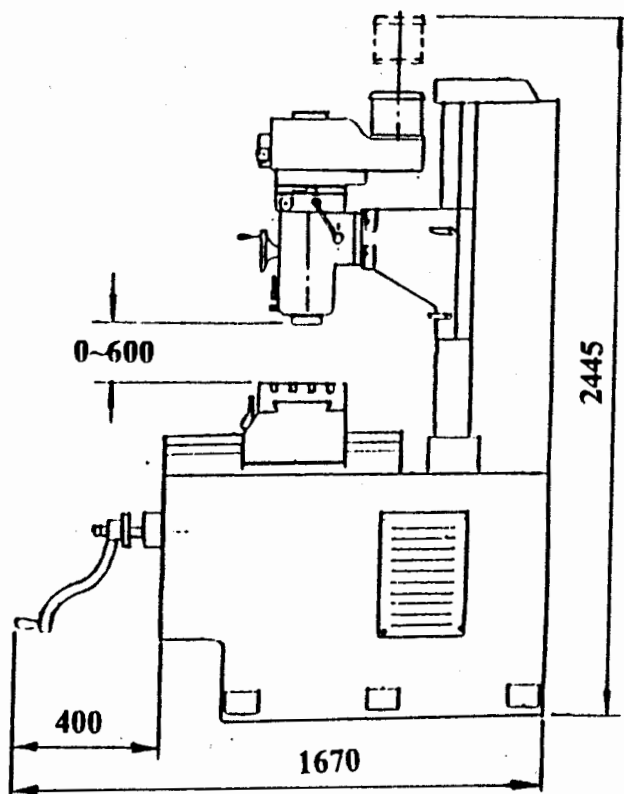
- 1. DO not operate this machine before the manuals have been studied and understood.**
- 2. Do not run this machine without knowing the function of every control key button, knob, or handle....etc.**
- 3. Ask your supervisor or a qualified instructor for help when needed.**
- 4. Do not use any oil or solution different to that has listed on the operation manual of this machine.**
- 5. Protect your eyes. Wear approved safety glasses(with side shields) at all times.**
- 6. Do not get caught in moving parts. Before operating this machine remove all jewelry including watches and rings, neckties, and any loose-fitting clothing.**
- 7. Keep your hair away from moving parts. Wear adequate safety head gear.**
- 8. Protect your feet. Wear safety shoes with oil-resistant, anti-skid soles, and steel toes.**

- 9. Take off gloves before you start the machine. Gloves are easily caught in moving parts.**
- 10. Remove all tools(wrenches, check keys, etc.)from the machine before you start. Loose items can become dangerous flying objects or ejection.**
- 11. The workpiece should be located properly and clamped securely on the vise, or in the fixture. Use stop blocks to prevent objects from flying loose. Use proper holding clamping attachments and position them clear of the tool path.**
- 12. Lock all the doors and check protection equipment before you start.**
- 13. Never operate a milling machine after drink alcoholic beverages, or taking strong medication, or while using non-prescription drugs.**
- 14. Do not lean on the machine while it is running.**
- 15. Protect your hands. Stop the machine spindle :**
  - \* Before changing tools**
  - \* Before changing parts**
  - \* Before you clear away the chips ,oil or coolant. Always use a chip scraper or brush.**
  - \* Before you make an adjustment to the part, fixture, coolant nozzle or take measurements.**
  - \* Before you open safeguards(protective shields, etc.). Never reach for the part, tool, or fixture around a safeguard.**
- 16. Protect your eyes and the machine as well. Do not use a compressed air hose to remove the chips or clean the machine(oil, coolant, etc.)**
- 17. Stop and disconnect the machine before you change belts, pulley, gears.**
- 18. Always keeping work area well lighted. Ask for additional light if needed.**
- 19. Prevent slippage. Keep the work area dry and clean. Remove the chips, oil, coolant and obstacles of any kind around the machine.**
- 20. Use correct cutting parameters(speed, feed, depth, and width of cut) in order to prevent tool breakage.**

- 21. Use proper cutting tools for the job. Pay attention to the rotation of the spindle: Left hand tool for counterclockwise rotation of spindle, and right hand tool for clockwise rotation of spindle.**
- 22. Prevent damage to the workpiece or the cutting tool. Never start the machine ( including the rotation of the spindle )if the tool is in contact with the part.**
- 23. Do not use dull or damaged cutting tools .They will be break easily and become airborne. Inspect the sharpness of the edges, and the integrity of cutting tools and their holders. Use proper length for the tool.**
- 24. Large overhang on cutting tools when not required result in accidents and damaged parts.**
- 25. Prevent fires. When machining certain materials(magnesium, etc.) the chips and dust are highly flammable. Obtain special instruction from your supervisor before machining these materials.**
- 26. Prevent fires. Keep flammable materials and fluids away from the machine specially hot, flying chips.**
- 27. Changing the speed of rotation of the spindle must be done while the rotation is on. It is recommended to stop and start the spindle at a low rate of speed.**
- 28. Do not operate the control box when your hands is wet. Accurately operate the control box switch.**
- 29. Clean this machine as routine job.**
- 30. Turn off the power before you replace the fuses. And do not use the higher current fuse than standard.**
- 31. The problems of electric control should be solved by electrician.**
- 32. Reference the any attentions in the manuals and the attentive label on this machine before you start.**

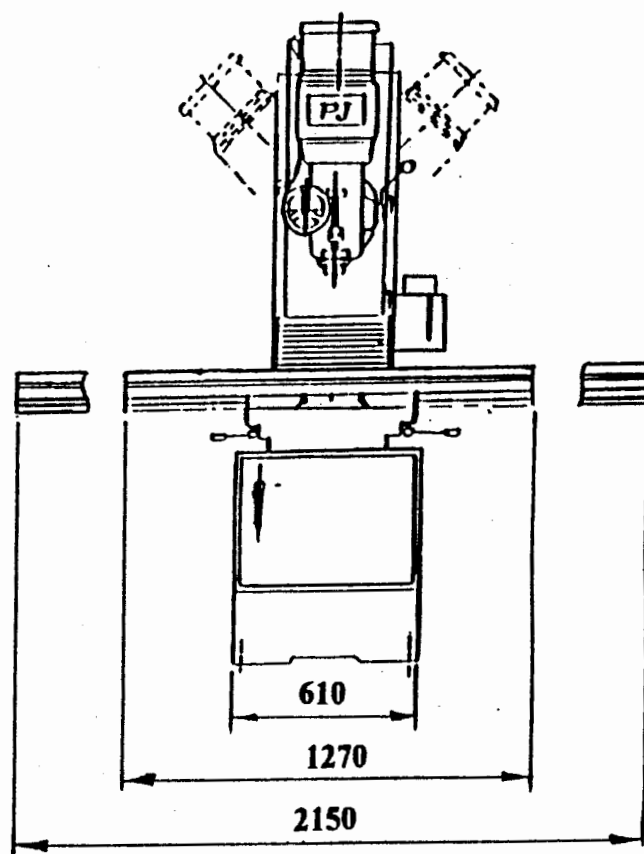
### 1.3 Dangerous Region

For this machine has free traveling, the min. space for the machine need is 2150 x 1670 x 2445mm(width x deep x height). For your safety, keep anything away the space, and we suggest you to keep 1 metre(min.) width around the machine space.



SIDE VIEW

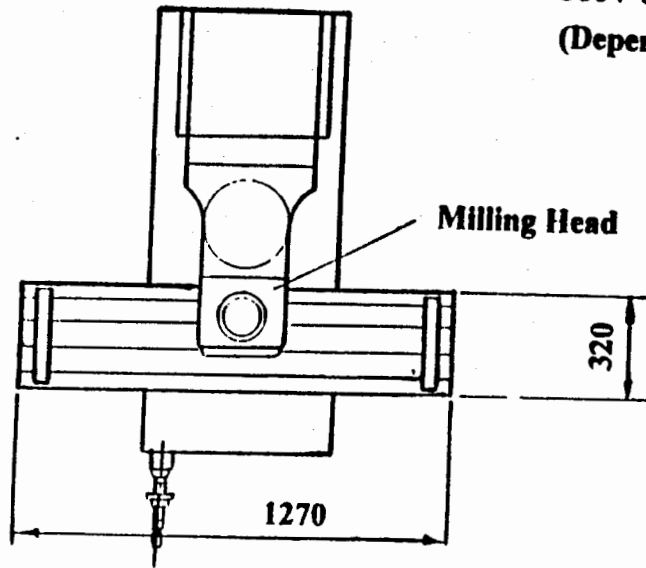
Figure 1.1A



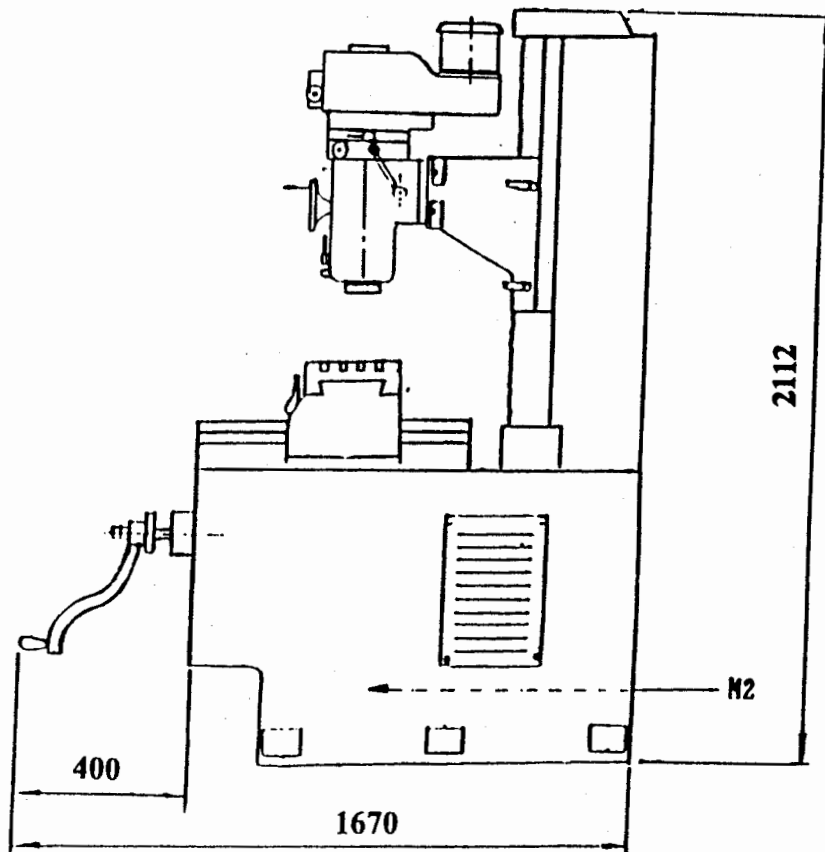
(UNIT:mm)

Figure 1.1B

POWER : 50 Hz 3~ + PE  
380V or 415V ...etc.  
(Depend on the order)



TOP VIEW



SIDE VIEW

Figure 1.2

(UNIT:mm)

## 1.4 Safe Facility

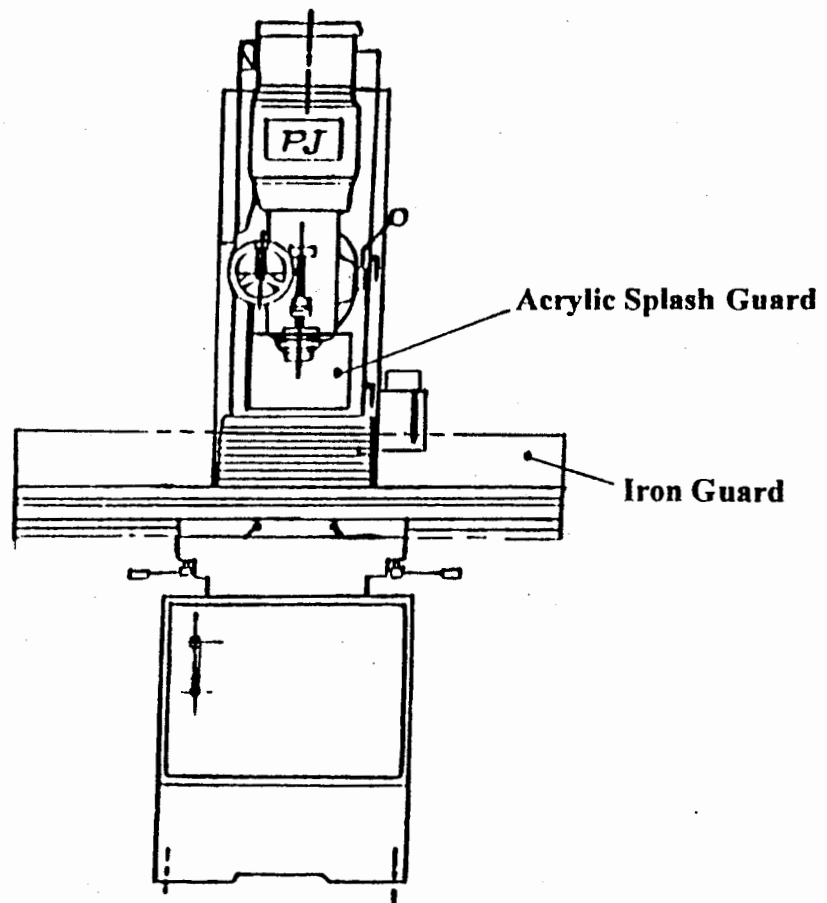
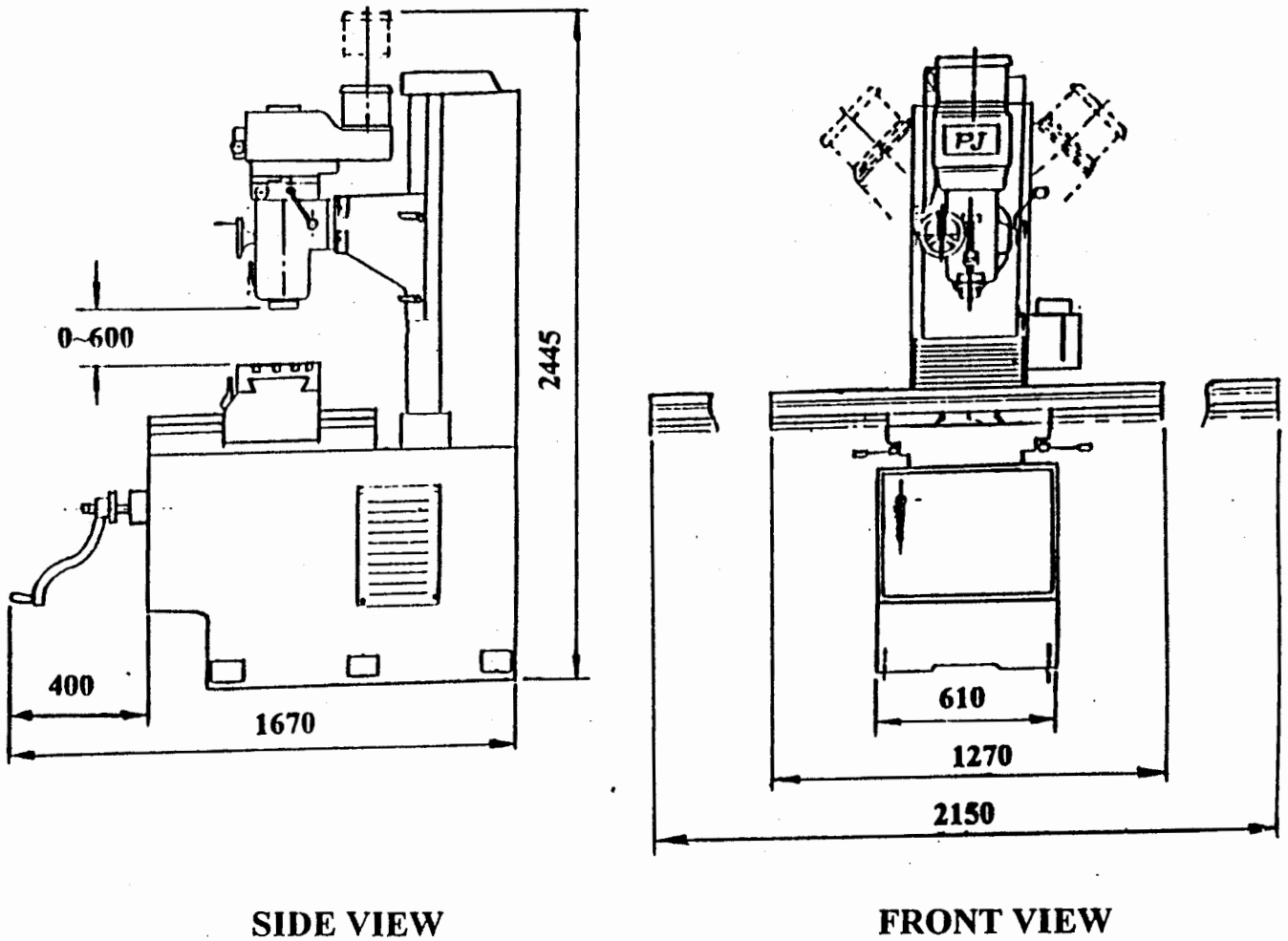


Figure 1.3

## 2.0 Machine Description

### 2.1 Machine Dimensions

(UNIT:mm)



SIDE VIEW

FRONT VIEW

Figure 2.1

Table Size	320 x 1270mm
T-Slots(number x width x pitch)	4 x 16 x 63mm
Footprint of Machine	610 x 1100mm
Weight(approximate) net	1900Kg
Weight(approximate)shipping	2000Kg



## 2.2 Machine Specifications

<b>Movement and ranges(Z axis)</b>	<b>600mm</b>
<b>Quill Travel(maximum)</b>	<b>120mm</b>
<b>Spindle Head</b>	
<b>Quill Diameter</b>	<b>100mm</b>
<b>Spindle Taper</b>	<b>#40 NST,NMTB</b>
<b>Speed Range</b>	<b>70-3800 RPM</b>
<b>Spindle Nose to Table (max. part height)</b>	<b>0-600mm</b>
<b>Spindle Center to Column Face</b>	<b>440mm</b>
<b>Quill feeds per Revolution of Spindle</b>	<b>0.04, 0.08, 0.15mm/rev</b>
<b>Head Swiveling(right and left)</b>	<b>45 ° and 90 °</b>
<b>Spindle Motor</b>	
<b>Power</b>	<b>3HP(2.2KW)</b>
<b>Voltage</b>	<b>380V or 415V ....etc.</b>
	<b>(Depend on the order)</b>
<b>Phase/cycle</b>	<b>3 phase/50Hz</b>
<b>Current</b>	<b>5.09 or 4.7amp</b>
<b>Maximum Weight of Workpiece</b>	<b>600Kg</b>

## 2.3 Maximum Machining capacities

<b>Drilling Mild Steel</b>	<b>40mm dia.</b>
<b>Tapping</b>	<b>M36</b>
<b>Boring</b>	<b>120mm</b>

## 2.4 Machine Description

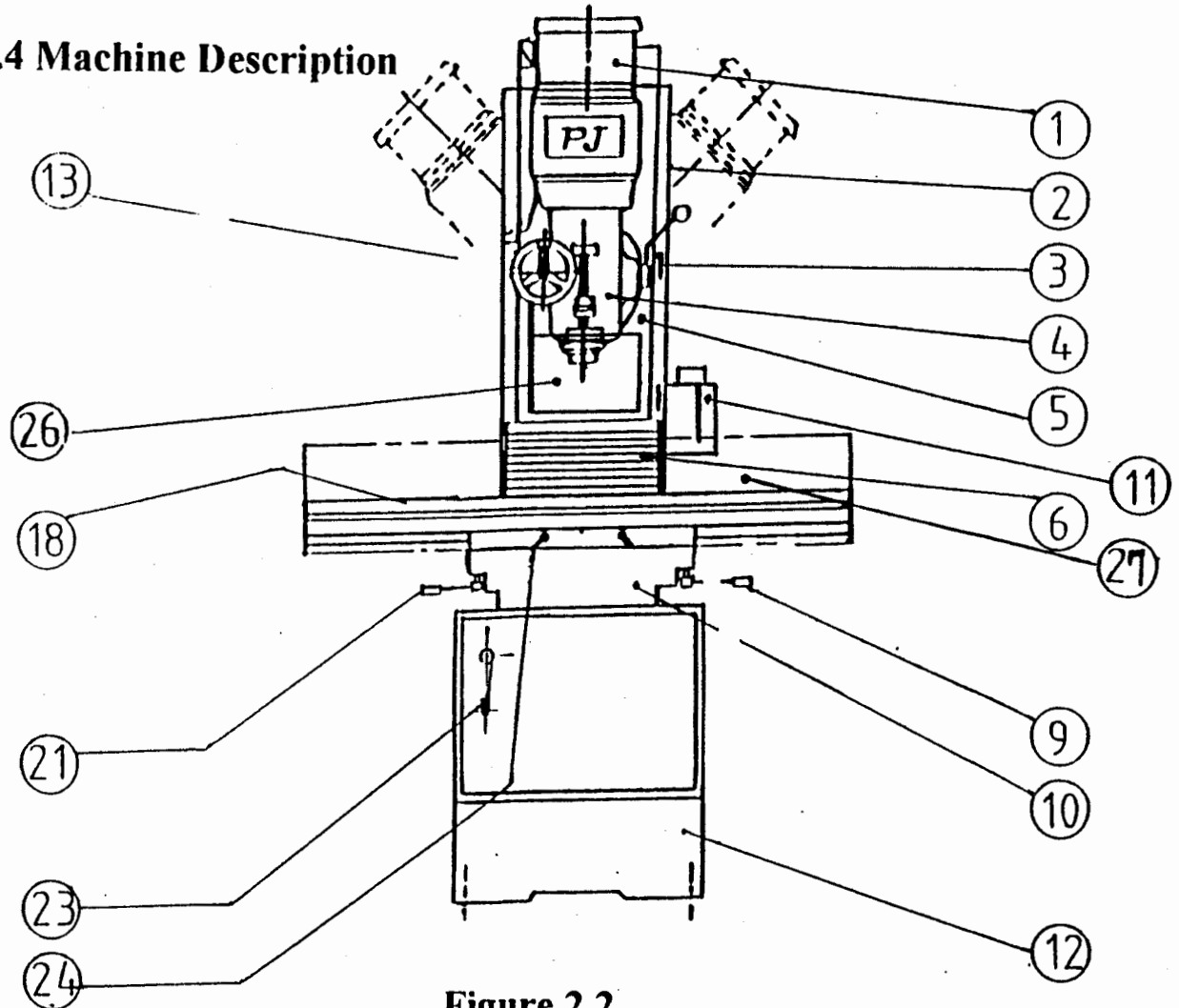


Figure 2.2

NO.	Name	NO.	Name
1	Motor		
2	Column		
3	Elevating Gib Locks		
4	Head		
5	Head Slideway	18	Table
6	Rubber Chip Guard		
		21	Cross Gib Locks
9	Cross Gib Locks		
10	Saddle	23	Elevating Crank
11	Lubricating Pump	24	Longitudinal Gib Locks
12	Base	26	Acrylic splash guard
13	Fine Feed Handwheel	27	Iron Guard

## 2.5 Requirement of Environment

For this machine has free traveling, the min. space for the machine need is 2150 x 1670 x 2445mm(width x deep x height). For your safety and work easily, we suggest the width around for the machine space as large as possible (Don't less than 1 metre).

The environment need well lighting, dry and no any kind of obstacles that around the machine. And keep flammable materials and fluids away from the machine, such as hot, flying chips.

## 2.6 Facility for lifting/moving machine

Lifter capacity	3 Ton
Lift truck capacity (Fork length Min. 5')	3 Ton
Steel cable (with protective sleeve)	3/4" dia.
/or Sling	3 Ton
Steel bar	φ 1" x1000mm

### 3.0 Installation

Read and understand this entire installation section before beginning the installation procedure.

### 3.1 Floor Plan, Layout and Space requirements

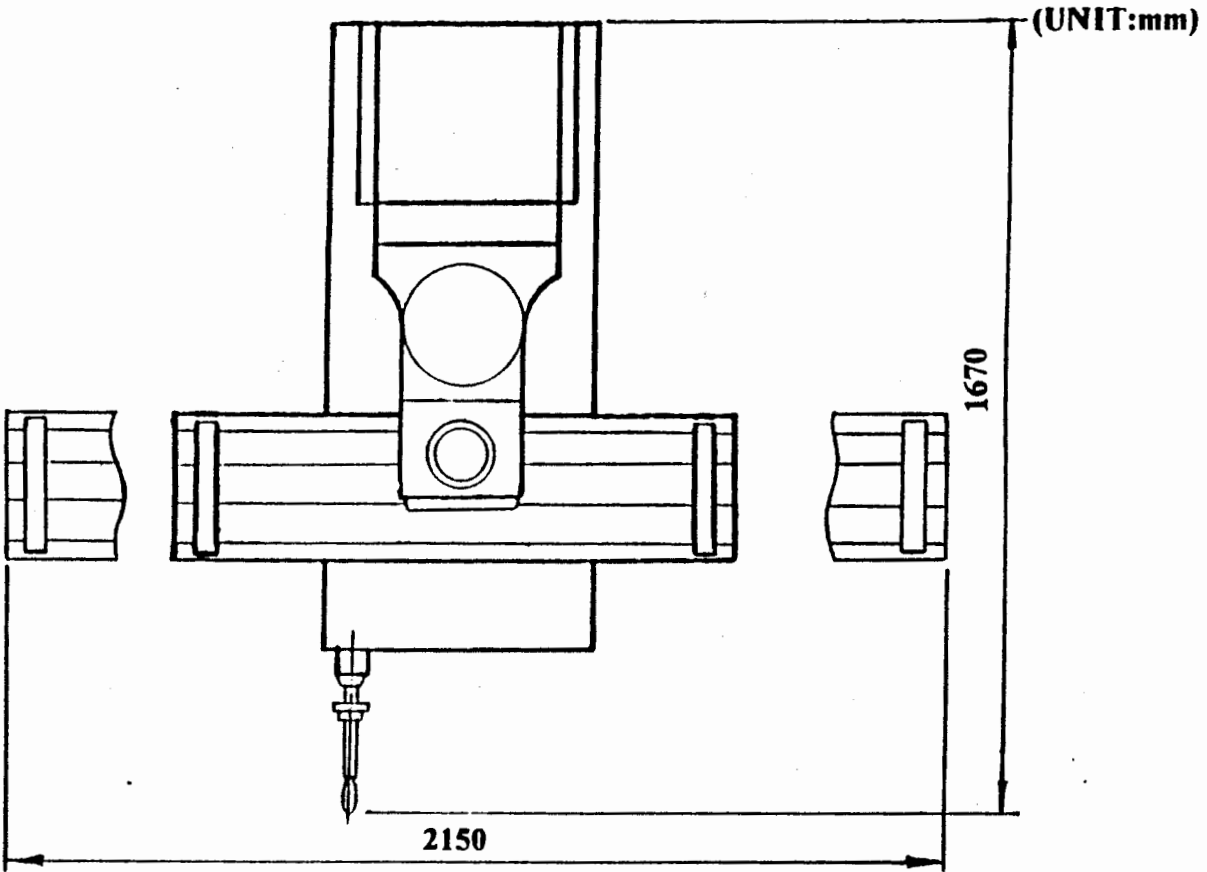


Figure 3.1A

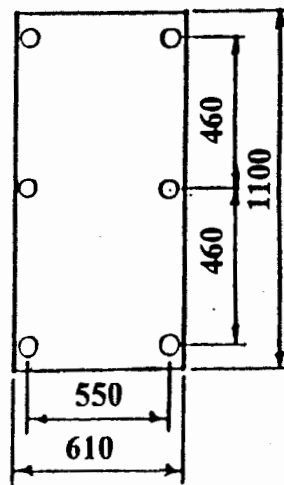


Figure 3.1B BED FOOTPRINT

## 3.2 Moving The Package

### WARNING !

The lift truck must have sufficient lifting capacity( 3 tons) and be equipped with suitably long forks.

### Method:

1. The driver of lift truck adjust the forks until suitable width.
2. Operate the forks through the space under the crate, Carefully the lift truck must from the front side /or back side of the crate (with the ↓ mark).
3. Lift the package up 4-6" from the ground and move it to suitable position.

### CAUTION !

The machine weights approximately 2000 kg. Proper equipment of sufficient capacity must be used when lifting and /or moving the machine.

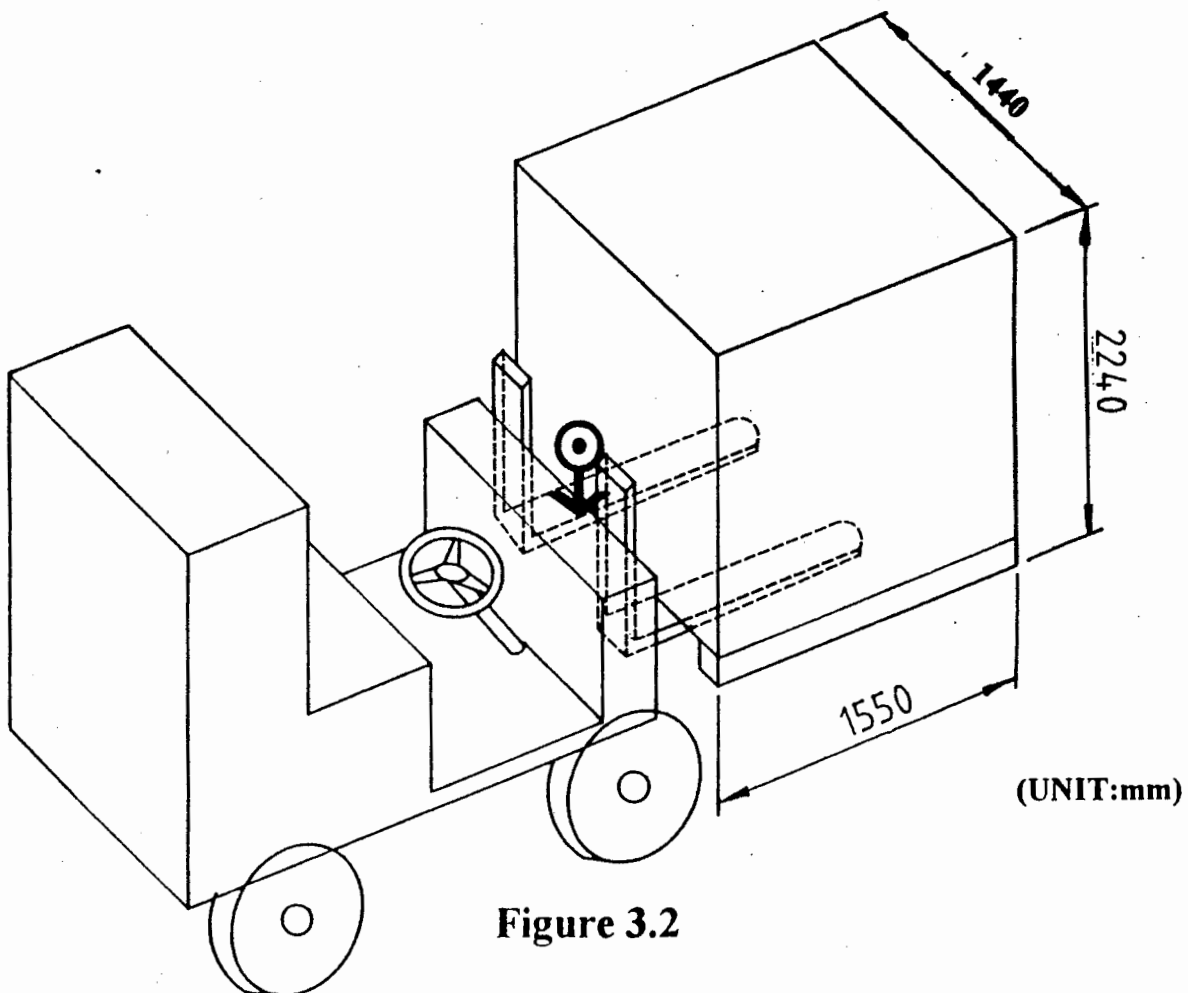


Figure 3.2

### 3.3 Packing & Uncrating

#### Method:

1. Place the wood skid on the ground, then drill the holes of the set screws at suitable position on it.
2. Insert the screws through the holes and put the PE bag on the wood skid. Then lift the machine on it, tighten the set screws and fasten the PE bag.
3. Place and nail the "A","B" side of the crate, then "C","D" side, the last nail the top and protective packaging.
4. When uncrating, carefully remove the crate and protective packaging from the top to side, paying attention to not scraping, damage, or mar any parts of the machine.
5. Open PE bag, then remove all of accessories on the wood skid or on the working table surface.
6. Loosen and remove four screws and nuts holding the machine to the wood skid.

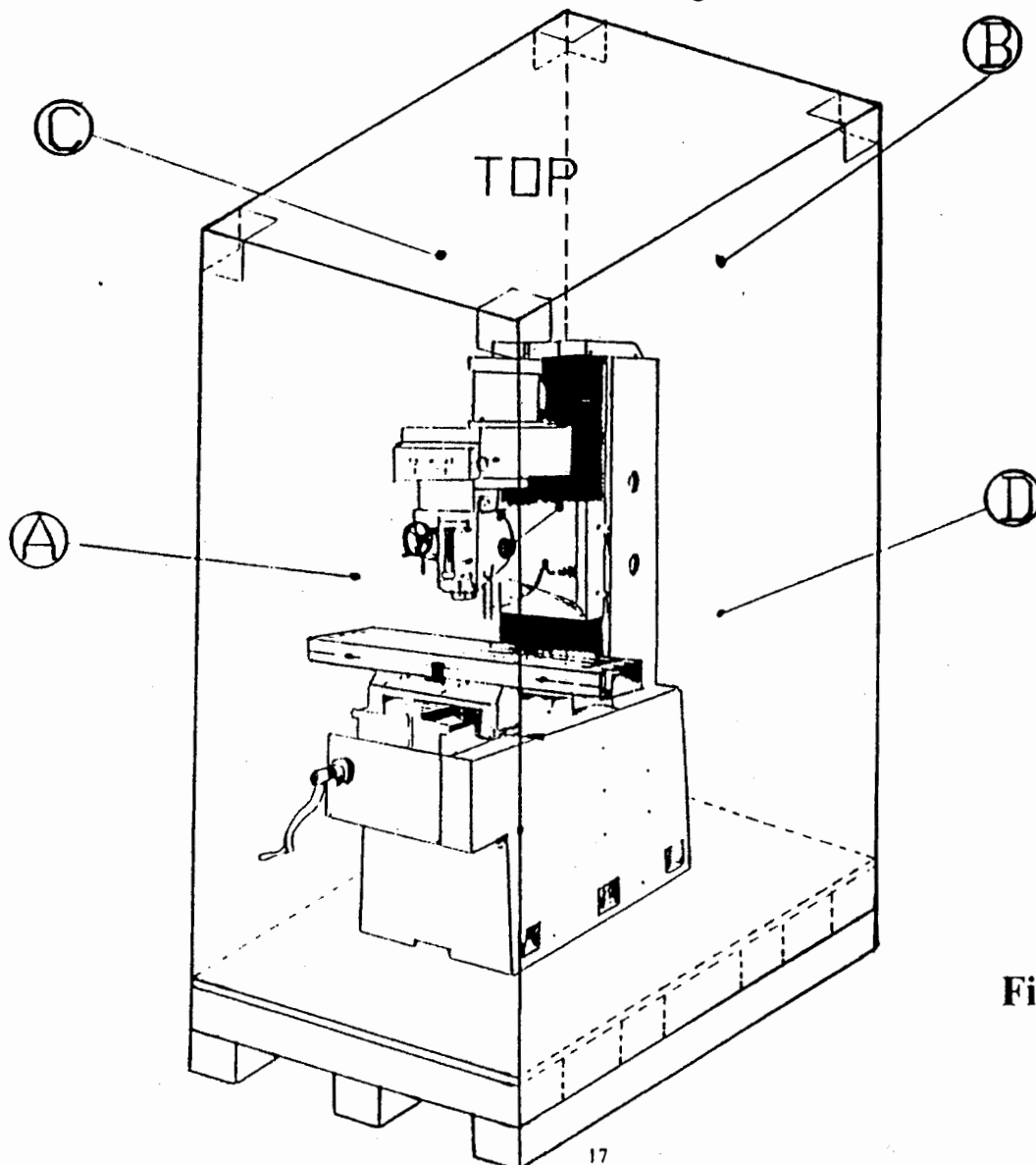


Figure 3.3

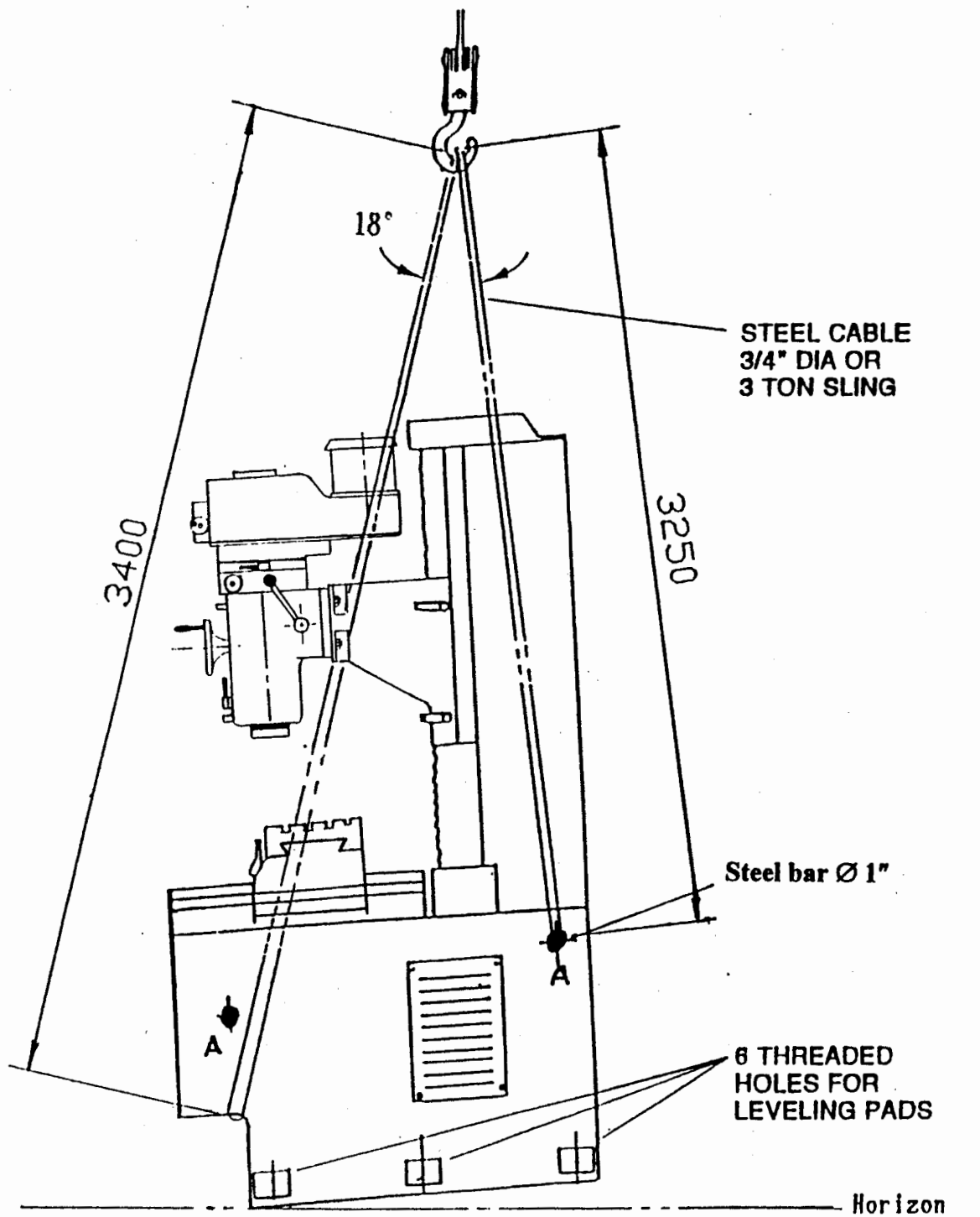
**NOTE:**

1. When the crate unravel, is necessary to remove the nails which beetle and on the wood plant. Then store the wood plant for reusing.
2. If you manage the crate as garbage, brake the crate to suitable size.

### **3.4 Lifting and/or Moving the Machine**

**Method :(Refer to Fig 3.4)**

1. Insert a steel bar  $\phi$  1" x1000mm long through the rear side holes of the bed(under column).
2. Use a steel cable(with protective sleeve) min. 3/4" dia. or a 3ton sling.
3. Use cardboard pieces or other suitable protective sheets on both side of the machine to prevent scratching.
4. Remove the four nuts and screws holding the machine to the wood skid.
5. Lift the machine (the front side of the machine should be lower than the back side).
6. Insert the six screws for leveling pads in their place in the bed.
7. Place the machine in its location (see floor plan and bed footprint drawing) carefully positioning each leveling pad under each leveling screw.
8. Remove the lifting cable or sling, the steel tube and all protective cardboard.



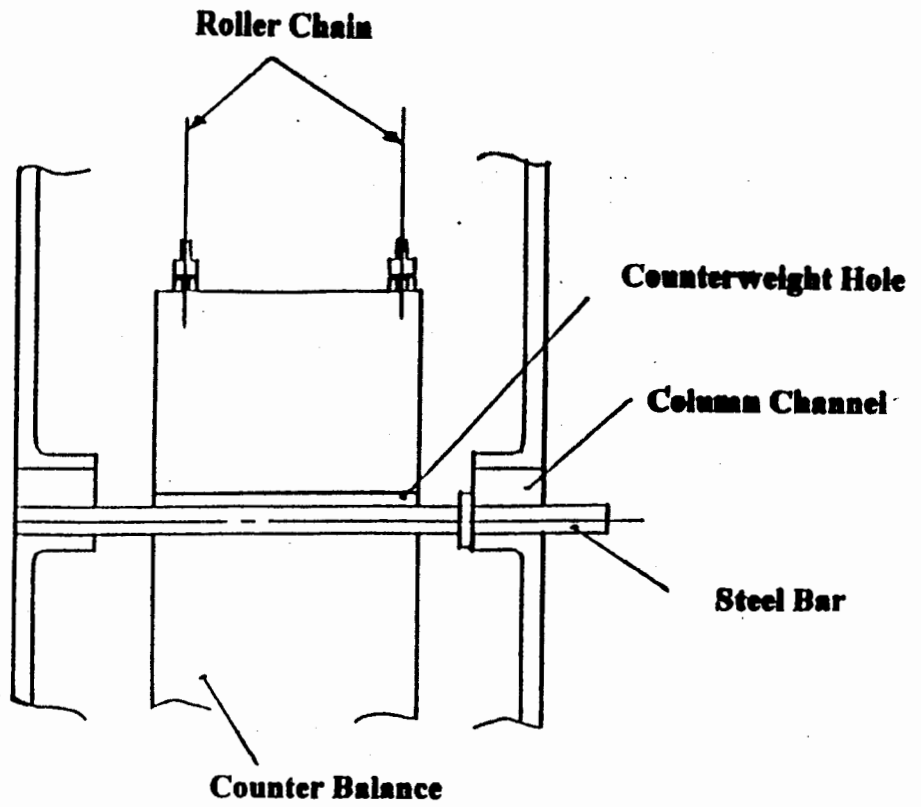
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Figure 3.4

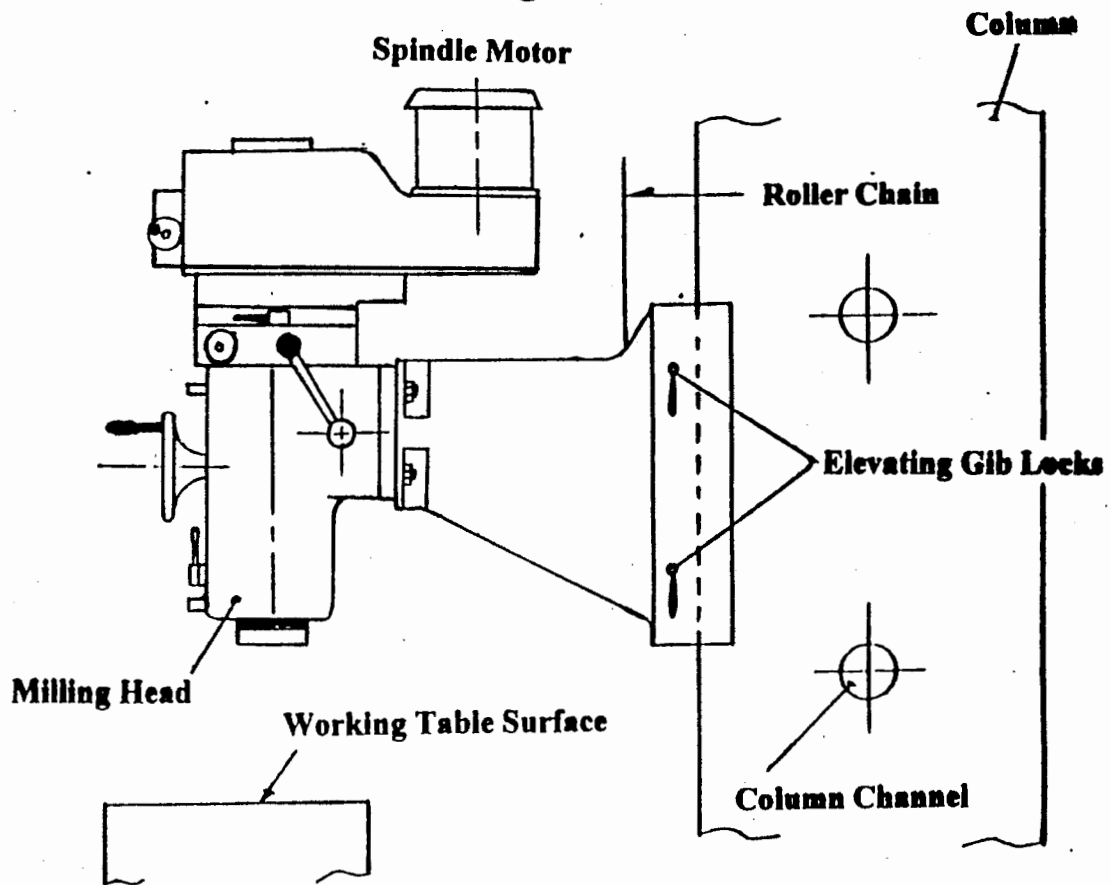


### **3.5 Method of fixing counterweight (Refer to Fig 3.5)**

- 1. Adjust the holes of counterweight to fit the column channels by turning the elevating screw bolts, then insert a steel bar through.**
- 2. Move head up until the roll chain loosening, then set on the elevating gib locks.**
- 3. When operating, please release the elevating gib locks.**
- 4. Lower the head slowly until the chain between the ram and counterweight is tight.**
- 5. Lower a little further until the two support steel rods are loose. Remove the two steel rods and store them for future when machine moves or transportation.**



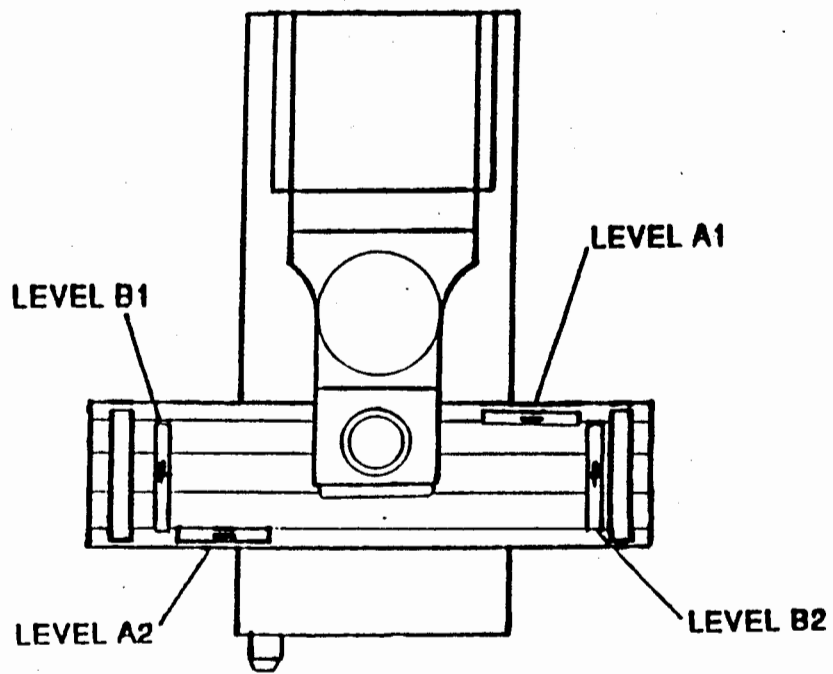
**Figure 3.5A**



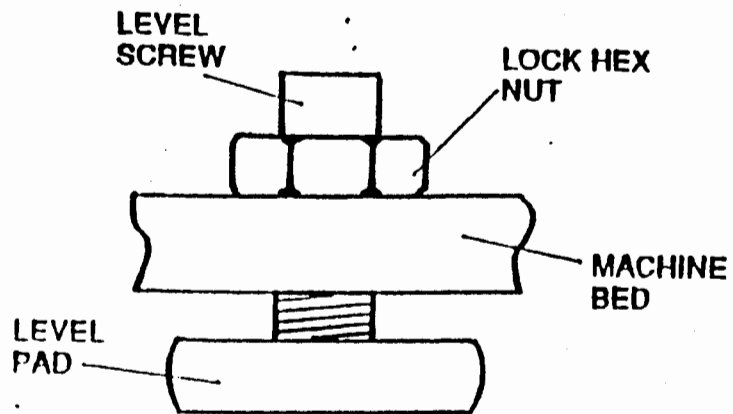
**Figure 3.5B**

### **3.6 Leveling-Leveling Tolerance for Machine (Refer to Fig 3.6)**

- 1. Set the machine on its six leveling pads on a solid, level floor prepared in accordance with the state and local rules for machine tool installation.**
- 2. Put one or two precision Spirit Levels or Electronic Levels on top of the table in the positions illustrated in A1 and B1.**
- 3. Adjust the four corner leveling screws on their pads until the machine is level to 0.06mm/1020mm. Snug and notice the two leveling screws on the middle to not affect the level.**
- 4. Check the level with the Spirit Levels at A2 and B2. Repeat the adjusting process as required(Refer to step 3).**
- 5. If the machine must be anchored to the floor, follow the general instruction for installing machine tools and use for leveling any of the well-known methods: shims, etc.**
- 6. If the machine must be installed on and with vibration mounts / pads(rubber, commercially available leveling and vibration mounts, etc.) follow the instructions delivered with the mounts/pads, ordering them to satisfy the load of the machine and the maximum weight of the workpiece(Don't less than 500 kg/pad).**
- 7. When the machine is correctly level, lock the adjusting screws in place with their hex nuts.**



**Figure 3.6A**



**Figure 3.6B**

## **4.0 Preparation before Running Test**

---

### **4.1 Cleaning**

- 1. Remove rust protective coating from the machine before moving any sideways (ram/spindle head, saddle, working table etc.)**
- 2. It is recommend that coating should be removed with kerosene. Do not use a cleaning solution which may damage the rubber way scrapers, plastic parts, or paint.**

#### **WARNING !**

**Do not use gasoline or other flammable cleaning agents for cleaning the machine.**

- 3. It may be necessary to move back and forward, left and right, and up and down the table, saddle and the ram. Always release the clamp levels(two in front of the table, one underneath the saddle on each side, and two on ram on the right side of the column) before attempting to move the above parts.**

#### **CAUTION !**

**Do not move anyone of the above parts(table, saddle, ram)over ways which were not previously cleaned. Serious damage to the surface of sideways can occur.**

- 4. Be sure the table ,saddle, head/ram, and spindle move freely and smoothly over their entire length(use the handwheel with manual).**
- 5. Remove the dehydrate and packing ...etc. And managing them depend the local laws to protect the environment.**

### **4.2 Checking Lubrication oil**

- 1. Check the level of oilier, and fill if necessary. Use the ISO-VG100 oil type.**
- 2. Fill all of head oil cups with ISO-VG100 oil.**

- 3. Manually override the oilier and pump oil to lubricate all sliding surfaces.**
- 4. Jog the table, saddle and ram back and forward until the ways are well lubricated.  
Oil should be visible on all the way surfaces.**
- 5. Apply Molycote grease through the grease fitting on the back of the head, and on the left side of the head.**

### **4.3 Grounding**

**According to the local electrical code for grounding**

#### **CAUTION !**

**Please check the grounding has been connected before running test.**

## 4.4 Checking

### Checklist of the preparation running test

<input type="checkbox"/>	1	There are no any exterior objects on the machine
<input type="checkbox"/>	2	Visually inspect the correct voltage wiring going into the electrical panel.
<input type="checkbox"/>	3	Clean the machine if needed. Remove any remaining grease.
<input type="checkbox"/>	4	Check and make sure the Z axis upper way cover spacers are in place, otherwise the way cover will get caught up the Z axis counterweight chain support sprockets.
<input type="checkbox"/>	5	Install the manual Z axis hand crank.
<input type="checkbox"/>	6	Release the two (2) Z axis ram clamps.
<input type="checkbox"/>	7	Using the hand crank with manual, lower the hand until the counterweight is raised off of the counterweight support rods.
<input type="checkbox"/>	8	Remove the two(2) counterweight support rods.
<input type="checkbox"/>	9	Remove the manual hand crank mechanism.
<input type="checkbox"/>	10	The operating control box and the electric control box was locked.
<input type="checkbox"/>	11	The level of oilier can not bellow the low limit. Manually override the oilier and pump oil to lubricate all sliding surfaces
<input type="checkbox"/>	12	Do not get caught in moving parts. Before operating this machine remove all jewelry including watches and rings, neckties, and any loose-fitting clothing.
<input type="checkbox"/>	13	Remove all tools(wrenches, check keys, etc.)from the machine before you start. Loosen items can become dangerous flying projectiles.
<input type="checkbox"/>	14	Jog the table, saddle and ram back and forth until the ways are well lubricated. Oil should be visible on all the way surfaces.
<input type="checkbox"/>	15	Check the head swivel direct at the correct position.

<input type="checkbox"/> 16	<b>Check to make sure the EMG.-Stop button is working and functioning correctly.</b>
<input type="checkbox"/> 17	<b>Keep work area well lighting. Ask for additional light if needed.</b>
<input type="checkbox"/> 18	<b>Prevent slippage. Keep the work area dry and clean. Remove the chips, oil, coolant and obstacles of any kind around the machine.</b>
<input type="checkbox"/> 19	<b>Run the spindle through the high and low gears/speeds.</b>
<input type="checkbox"/> 20	<b>Check and use the quill power feed to make sure it works.</b>
<input type="checkbox"/> 21	<b>Install the Z axis lower way cover and its bracket.</b>
<input type="checkbox"/> 22	<b>The acrylic splash guard has locked and should been on suitable position.</b>
<input type="checkbox"/> 23	<b>Use correct cutting parameters(speed, feed, depth, and width of cut) in order to prevent tool breakage.</b>
<input type="checkbox"/> 24	<b>Prevent fires. Keep flammable materials and fluids away from the machine and hot, flying chips.</b>
<input type="checkbox"/> 25	<b>Reference the any attentions in the manuals and the attentive label on this machine before you start.</b>
<input type="checkbox"/> 26	<b>Wear safety glasses and safety shoes, and make sure the voltage.</b>



## **5.0 Operation**

---

### **5.1 Table, Saddle, Ram/Clamps**

The table clamp are located on the front of the saddle. Rotate them clockwise until snug-overtightening is not necessary.

The saddle clamp is located on both sides of the saddle. Pull it forward to clamp the table until snug-overtightening not necessary.

The Ram/Clamps are located on the right side of the ram. Rotate them clockwise to clamp the ram-overtightening is not necessary.

#### **CAUTION !**

Do not run unless the table, saddle ,and ram clamps are free.

### **5.2 Raising/Lowering the Ram/Head**

The ram/head is primarily raised or lowered through the operation of the operation control box. It should be removed the hand crank for running machine, and pull-out the riser transfer shaft, then tighten the manual gib lock.

In an emergency the ram/head may also be raised or lowered using the hand crank and drive shaft with bevel gear located in the tool box. Insert the drive shaft to mate with the bevel gear on the column ballscrew and crank by hand.

Be sure the ram is unclamped before raising and lowering.

### **5.3 Spindle Brake (Item 1, Fig 5.2)**

The mechanical spindle brake is activated by pushing it down or up. When the lever arm is in the horizontal position, the brake is off.

#### **CAUTION !**

Be certain that the spindle brake is released before starting the motor.  
Never attempt to activate the spindle brake when the motor is on.

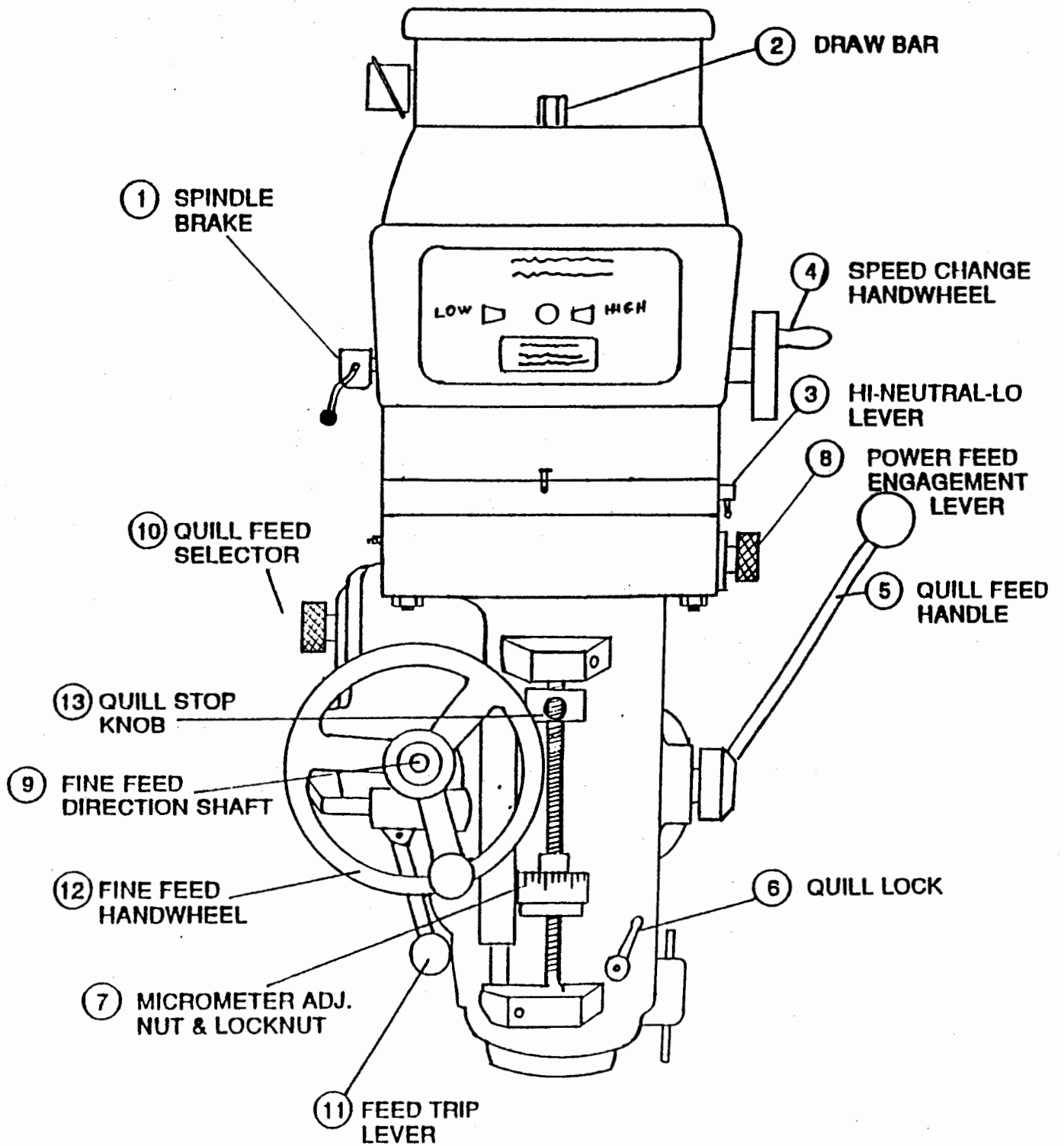


Figure 5.2

## 5.4 Draw Bar (Item 2, Fig 5.2)

The draw bar holds the #40 NST tool holders into the spindle taper.

The bar has a M16 right hand thread and should be tightened with a 21mm wrench from the top of the head. When tightening, it is necessary to activate the spindle brake(see 5.5 above). If the tool holder dose not release from the spindle, lightly tap on the top of the bar to dislodge the tool.

Holes have been drilled and tapped on the plate on the top of the head to accommodate common power draw bar design—for example, the Kurt MDB Kit-40.

## 5.5 Changing Speeding: High-low-Neutral Lever (Item 3, Fig 5.2)

The spindle speed may be varied within a low range(70 - 500 RPM)or high range (600 to 3800 RPM).

The range selection is made through the High-Low-Neutral Lever.

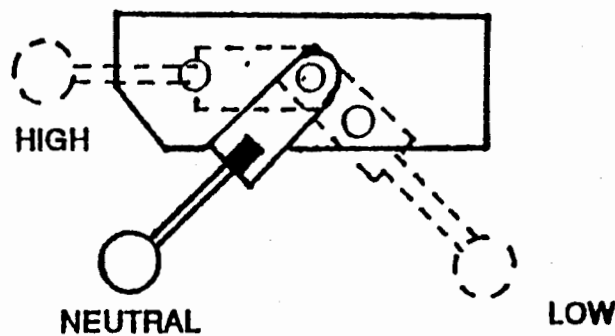


Figure 5.7

### CAUTION !

Never attempt to change the range selection through the High-Low-Neutral lever when the spindle is rotating. Be certain the spindle ON/OFF switch is in the Off position.

Rotate the spindle by hand to help engage the lever into the high or low position.(Refer to Fig 5.3)

***NOTE*** : Shifting from the high to low range, or low to high range changes the direction of rotation for the ON/OFF switch (see Section 5.1)

## **5.6 Changing Speeds - Variable Speed (Item 4, Fig 5.2)**

Within each speed range the spindle speed may be varied by rotating the variable speed crank.

### **CAUTION !**

Do not rotate the variable speed crank when the spindle is stationary.

## **5.7 Operating the Quill (Item 5 & 6, Fig 5.2)**

The quill may be moved up and down through its range with the quill feed handle.

The quill may be locked into position by rotating the quill lock clockwise. Pull the handle out slightly to rotate it freely to a new position.

## **5.8 Adjusting the Quill Stop (Item 7, Fig 5.2)**

The quill stop may be adjusted by rotating the micrometer dial nut. It is locked in place with the knurled nut.

## 5.9 Quill Feed

Several devices are used in controlling the fine quill feed process. Each of these devices are described in the 5.9.1 through 5.9.4 subsections below. Subsections 5.9.5 and 5.9.6 describe the hand and automatic feed procedures.

### 5.9.1 Power Feed Engagement Lever (Item 8, Fig 5.2)

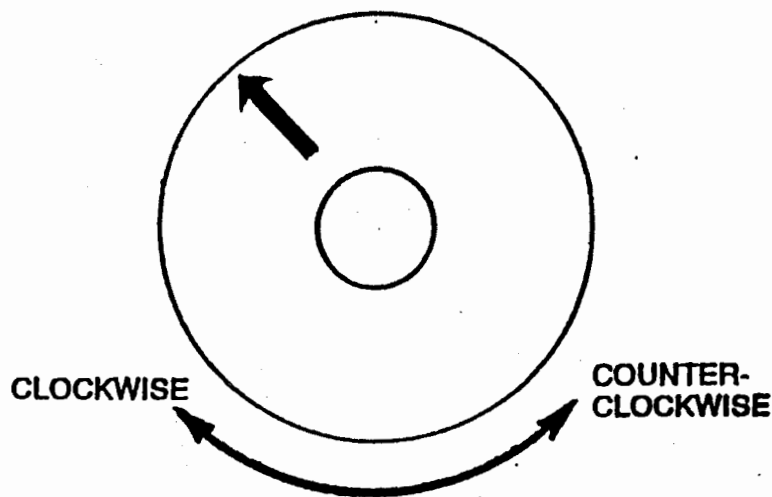


Figure 5.9.1

The power feed is engaged or disengaged with this selector. Rotate it clockwise to disengage power feed. Rotate it counterclockwise to engage power feed.

### CAUTION!

It is recommended that the selector be engaged when the spindle is not running. Never have the feed engaged when the spindle RPM is over 3000. Always leave the selector in the disengaged position unless the feed function is being used.

### 5.9.2 Fine Feed Direction Shaft (Item 9, Fig 5.2)

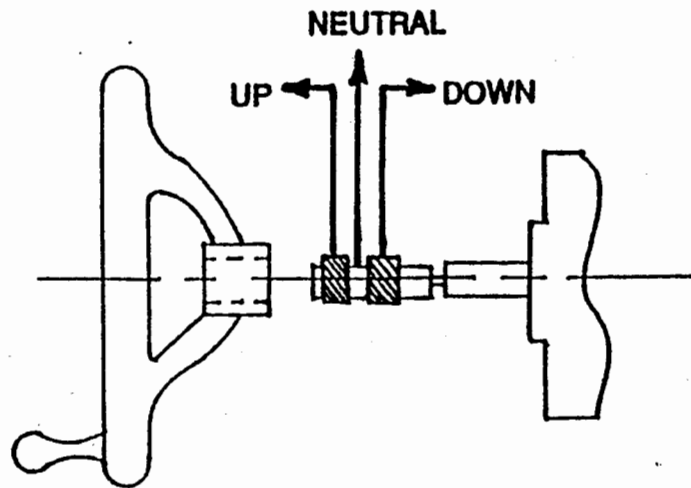


Figure 5.9.2

The direction of the fine feed is set by the position of the fine feed direction shaft. **IN** sets the direction down, **OUT** sets the direction up, and **NEUTRAL** in the middle.

### 5.9.3 Quill Feed Selector (Item 10, Fig 5.2)

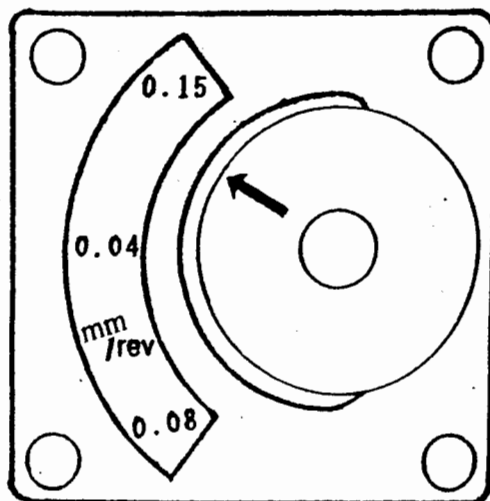


Figure 5.9.3

The selector is used to set the quill feed speed. The options are **0.04 mm per revolution** of the spindle, **0.08mm per revolution**, and **0.15mm per revolution**.

To change speeds, rotate the selector to the proper position. It is generally easier to change speeds with the spindle running or rotated by hand. Do not force the lever.

#### **5.9.4 Feed Trip Lever (Item 11, Fig 5.2)**

The Feed Trip Lever stops the quill feed motion when the quill stop knob (Item 13, Fig 5.2) reaches the quill micrometer dial.

Move the lever to the left to engage, or to the right to disengage.

#### **5.9.5 Fine Hand Quill Feed**

- 1. Disengage the Power Feed Engagement Lever (see 5.9.1).**
- 2. Set the fine feed Direction shaft to the neutral position (see 5.9.2).**
- 3. Rotate the Fine Feed handwheel (Item 12, Fig 5.2)**

#### **5.9.6 Fine Automatic Quill Feed**

- 1. Be certain the quill lock is off.**
- 2. Set the quill micrometer dial to the proper depth (see 5.9.4).**
- 3. Engage the Power Feed Engagement lever when the motor is stopped (see 5.9.1).**
- 4. Select proper quill feed (see 5.9.3).**
- 5. Select the feed direction (see 5.9.2).**
- 6. Start the spindle and set the correct RPM.**
- 7. Engage the Feed Trip lever.**
- 8. Use fine hand quill feed (see 5.9.5) for final precise depths.**

## 5.10 Pre-Check before starting machine

<input type="checkbox"/>	<b>1</b>	<b>There are no any exterior objects on the machine.</b>
<input type="checkbox"/>	<b>2</b>	<b>Clean the machine if needed.</b>
<input type="checkbox"/>	<b>3</b>	<b>Unlock the table and saddle gib locks.</b>
<input type="checkbox"/>	<b>4</b>	<b>Release the two (2) Z axis ram clamps.</b>
<input type="checkbox"/>	<b>5</b>	<b>Remove the manual hand crank mechanism.</b>
<input type="checkbox"/>	<b>6</b>	<b>The operating control box and the electric control box has locked.</b>
<input type="checkbox"/>	<b>7</b>	<b>The level of oilier does not bellow the low limit.</b>
<input type="checkbox"/>	<b>8</b>	<b>Manually override the oilier and pump oil to lubricate all sliding surfaces.</b>
<input type="checkbox"/>	<b>9</b>	<b>Before you start. Loose items can become dangerous flying ejection object.</b>
<input type="checkbox"/>	<b>10</b>	<b>Jog the table, saddle and ram back and forth until the ways are well lubricated. Lubricate Oil should be visible on all the way surfaces.</b>
<input type="checkbox"/>	<b>11</b>	<b>Check and make sure the EMG-Stop button is working and functioning correctly.</b>
<input type="checkbox"/>	<b>12</b>	<b>The acrylic splash guard has locked and should been on suitable position.</b>
<input type="checkbox"/>	<b>13</b>	<b>Keep work area well lighting.</b>
<input type="checkbox"/>	<b>14</b>	<b>Keep the work area dry and clean. Remove any kind of the chips, oil, coolant and obstacles around the machine.</b>
<input type="checkbox"/>	<b>15</b>	<b>Check and use the quill power feed to make sure it works.</b>
<input type="checkbox"/>	<b>16</b>	<b>Use correct cutting parameters(speed, feed, depth, and width of cut) in order to prevent tool breakage.</b>
<input type="checkbox"/>	<b>17</b>	<b>Prevent fires. Keep flammable materials and fluids away from the machine and hot, flying chips.</b>
<input type="checkbox"/>	<b>18</b>	<b>Reference the any attentions in the manuals and the attentive label on this machine before you start.</b>
<input type="checkbox"/>	<b>19</b>	<b>Wear safety glasses and safety shoes, and make sure the voltage.</b>



## **5.11 Checking of safety facility (Refer to Fig 2.2)**

**For protecting yourself and keep the machine on the well performance. We suggest to check the safety facilities everyday.**

- 1. Press in the EMG-Stop button, and check the control box which is on "OFF" status.**
- 2. Securely clamp the cutting tool and use the wrench to re-check.**
- 3. The acrylic splash guard should be closed and locked which turn from the left side of the head to right side, so it can be used to resist the ejection of machining . If it is necessary to adjust the position of the acrylic splash guard, it could be adjusted the acrylic splash guard's flat which on the left side of the ram.**

### **WARNING !**

**The acrylic splash guard should be adjusted to the suitable position for resisting the ejection. It should be sure the acrylic splash guard which has locked, and the iron quard should be closed before starting machine.**

## 6.0 Maintenance

---

### 6.1 Daily Preventive Maintenance & Checking

For securing the accuracy and the life of this machine. We suggest the following preventive maintenance and checking.

#### I . Before starting machine:

Check the level of oil and coolant. Confirm all of the switches on the control box should be in "OFF". Tighten the cutting tool. And reference the **SAFETY PRECAUTIONS** in this manual.

#### II . Among the operating:

Attend the lubricant condition on suitable status. Using suitable coolant for cooling. Follow the operation safety rules on this manual.

#### III. After operation :

Turn off the switches, and clean the surface of this machine. Dry the surface of working table and wipe oil to prevent dust. Moving the table to suitable position.

#### IV. Preventive maintenance chart:

Frequency	Items
Daily	1. Check the oil level of lube system.(Refer Section 6.2)
Weekly	1. Fill up the two small oil cups on the head. 2. Squirt a little oil into the ball oilier located on the speed change housing. (Refer Section 6.2)
Monthly	1. Check all the gibs and adjust if necessary. 2. Replace the coolant.(Refer Section 6.0)
Half yearly	1. Apply Molycote grease through the grease fittings on the head.(Refer Section 6.2)

## 6.2 Lubrication

The BM-2V-100V-U X,Y,Z,way surface and ballscrews are lubricated by the Auto Pump Lube system located on the right side of the bed and the lift side of the head. The Lube system should be discharged oil about 4ml every 30 minutes of spindle operation. The amount of oil discharged may be altered by recoating the snap ring on the plunge located under the clean plastic cylindrical cover.

### Once each day:

1. At the beginning of each day, the plunger of the Auto pump should be dragged 3 to 5 times to fill oil on the way.
2. Check the oil level in the lube system. If lower than standard, fill with ISO-VG100 oil. Pump oil every half-hour of spindle operation.

### **CAUTION !**

Failure to manually activate the pump at the beginning of each day ,or allowing the Lube system to run dry may cause severe damage to the BM-2V-100V-U way surfaces and ballscrews.

### Once each week:

1. Fill the small oil cup on the front of the head with ISO-VG100 oil.
2. Fill the small oil cup on the right side of the head with ISO-VG100 oil with the quill in the full up position.
3. Squirt a little oil into the ball oilier located on the lower right of the front of the speed charger housing.

### Twice each year:

1. Apply Molycote grease through the grease fitting on the back of the head, and on the left side of the head.

## Oil for Lubrication System

### Europe

Brand	Description
Mobil	DTE 27 ISO-VG 100
Shell	Tellus Oil ISO-VG 100
B P	Energol HLP ISO-VG 100
ELF	Elfolna DS ISO-VG 100
Fina	Hydrant ISO-VG 100
Texaco	Rando HD ISO-VG 100

### U.S.A

Brand	Description
Mobil	DTE 27 ISO-VG 100
Shell	Tellus Oil ISO-VG 100
ESSO	Nuto H ISO-VG 100
Texaco	Rando HD ISO-VG 100

### Asia

Brand	Description
Mobil	DTE 27 ISO-VG 100
Shell	Tellus Oil ISO-VG 100
ESSO	Nuto H ISO-VG 100
Texaco	Rando HD ISO-VG 100

### Australia

Brand	Description
Mobil	DTE 27 ISO-VG 100
Shell	Tellus Oil ISO-VG 100
ESSO	Nuto H ISO-VG 100
Texaco	Rando HD ISO-VG 100

## 6.3 Head Rotational and Alignment

The BM-2V-100V-U head is free to rotate up to 45 degrees to the left or 90 degrees to the right.

To rotate the head:

1. Loosen the four locknuts.
2. Rotate the head with the adjusting worm shaft.
3. Tighten the locknuts. Sung each locknut, then lightly tighten each locknut, then fully tighten each locknut in a crisscross pattern.
4. Use the method shown in the figure below and a parallel bar to square the head to the table.

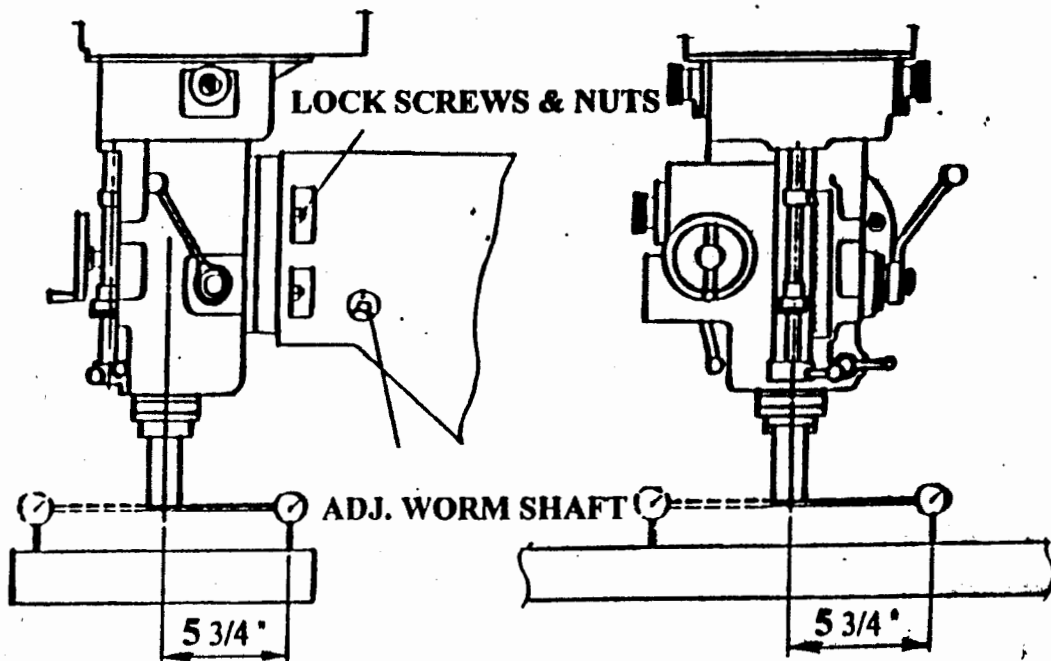


Figure 6.1A

Figure 6.1B

## 6.4 Table Gib Adjustment

The table should move through the saddle snugly and smoothly, but never tight. To adjust the gib.

1. Clean all chips, dirt and excess oil from the table and saddle.
2. Release the slotted head adjusting screw under the right side of the table.
3. Tighten the adjusting screw under the left side of the table while moving the table by the hand crank. Tighten until a slight drag is felt—do not over tighten.
4. Re-tighten the adjusting screw under the right side of the table.

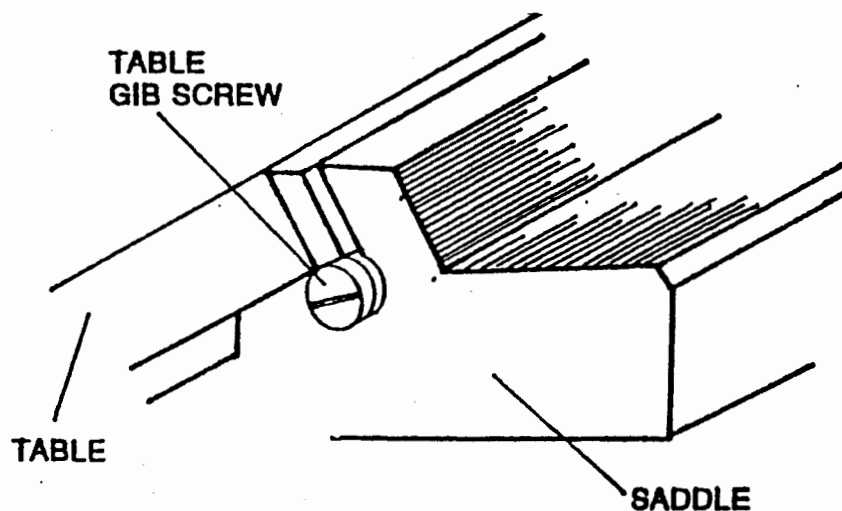


Figure 6.2

## 6.5 Saddle Gib Adjustment

The saddle should move through the bed snugly and smoothly, but never tight. To adjust the gib.

1. Clean all chips, dirt and excess oil from the table and saddle, and top bed area.
2. Remove the front and back, left side chip wipers(metal plate and rubber insert). Clean them.
3. Release the two slotted head adjusting screws in the back of the saddle(left side).
4. Tighten the two adjusting screws in the front while moving the saddle in and out with the hand crank. Tighten until a slight drag is felt--do not over tighten.
5. Re-tighten the two adjusting screws on the back and replace the chip wipers.

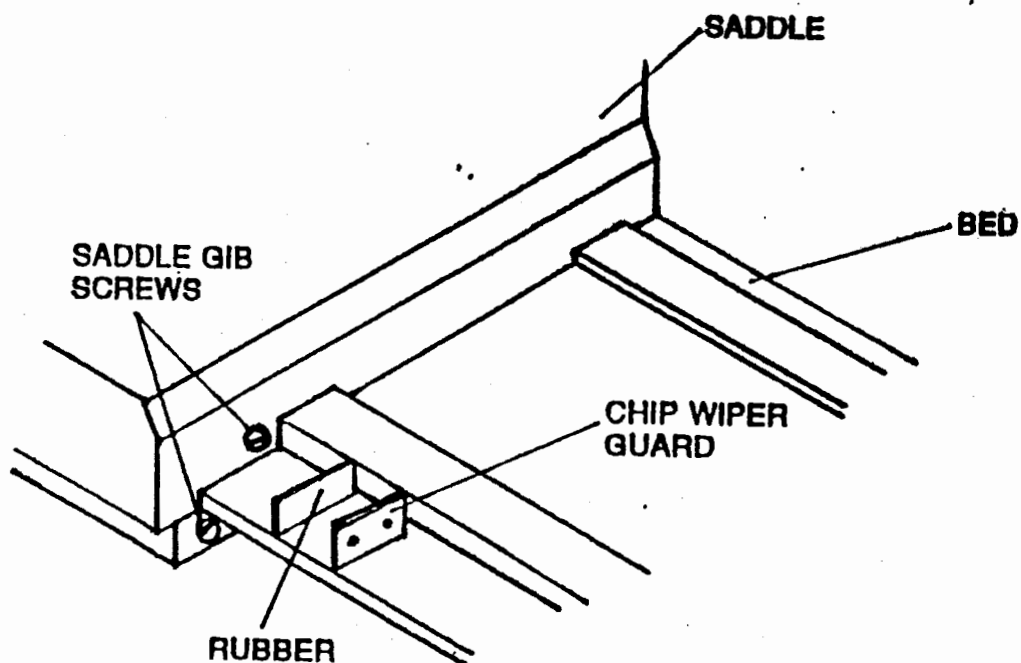


Figure 6.3

## 6.6 Ram Gib Adjustment

1. Remove all swerve from area.
2. Remove the telescopic rubber chip guard.
3. Remove the lubricating oil pipe.
4. Turn gib adjusting screw clockwise while moving the adapter until slight drag is felt.
5. Replace the rubber chip wiper, oil pipe and telescopic rubber chip guard.

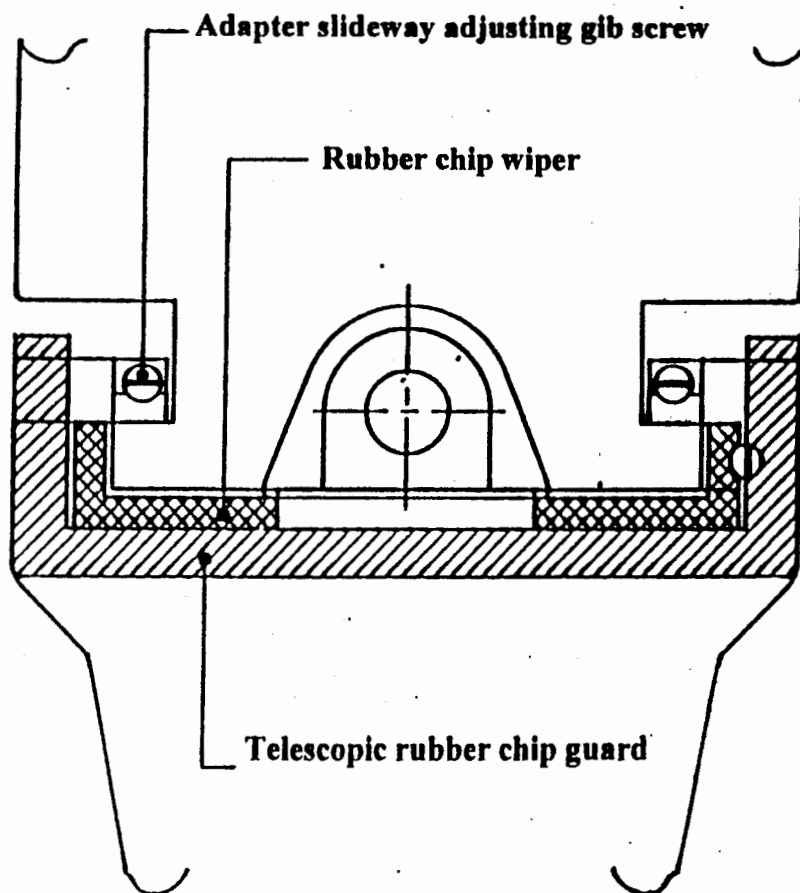


Figure 6.4



## 6.7 Feed Trip Adjustment

If the feed trip is adjusted too light it will inadvertently trip when drilling. If too heavy, it will not trip accurately and stress the mechanism. The correct adjustment depends on the operation to be performed. To adjust:

1. Release the lock nut.
2. Engage the trip handle--move it left.
3. Adjust the micrometer nut against the quill stop knob.
4. Slowly turn the adjusting screw until the handle trips.
5. Tighten the lock nut.
6. Check the reaction. If too sensitive, lower the adjusting screw slightly. If too heavy, raise it.

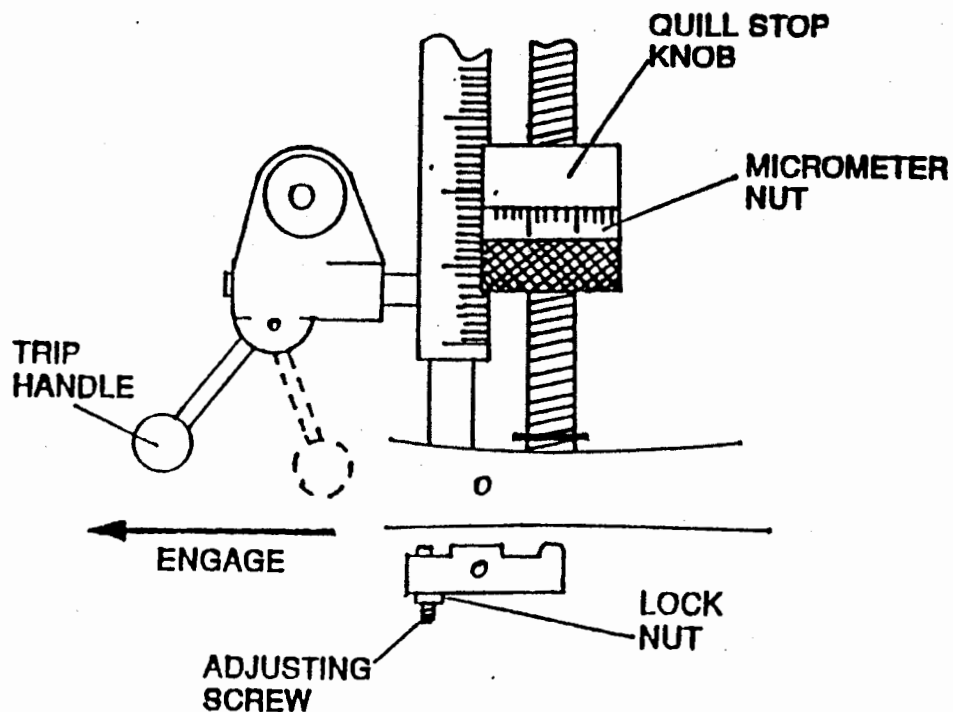


Figure 6.5

## 6.8 Quill Clock Spring Replacement and Adjustment

The quill Clock Spring counter balances the weight of the quill and tool.

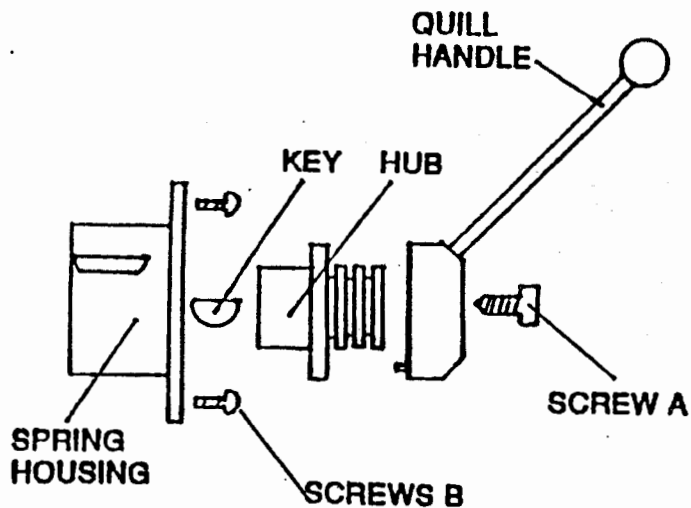


Figure 6.6A

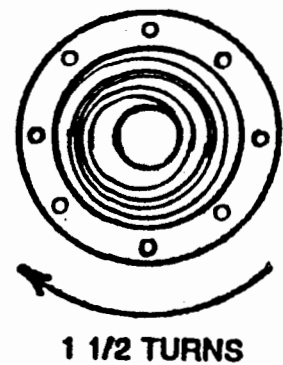


Figure 6.6B

1. Move the quill to its top position and lock it in place.
2. Remove the quill handle, hub (by removing screw A) and key.
3. Remove screws B and allow the spring housing to unwind.
4. Remove the spring. It is held by a pin on the shaft and slot in the housing.
5. Replace the spring. Rotate the housing clockwise until the spring catches the shaft pin.
6. Rotate (wind up) the housing 1 1/2 turns, replace screws B, key hub ,screw A, and handle.

## 6.9 Spindle Motor Removal and Replacement

1. While the spindle is running, change the RPM to its lowest value.
2. Disconnect the power to the motor. It is recommended that the power disconnect be made from the shop feeder box.
3. Remove the cover. Remove the cap screws and then use three M6x35mm long screws in the tapped holes of the cover to pull it away from the housing.
4. Disconnect the electrical connection in the conduit box attached to the motor.
5. Crank the speed change to the highest RPM value.
6. Remove the two screws that fasten the motor to the top of the housing.

### CAUTION !

The motor is heavy-about 75 pounds. Be certain you have the proper equipment or assistance.

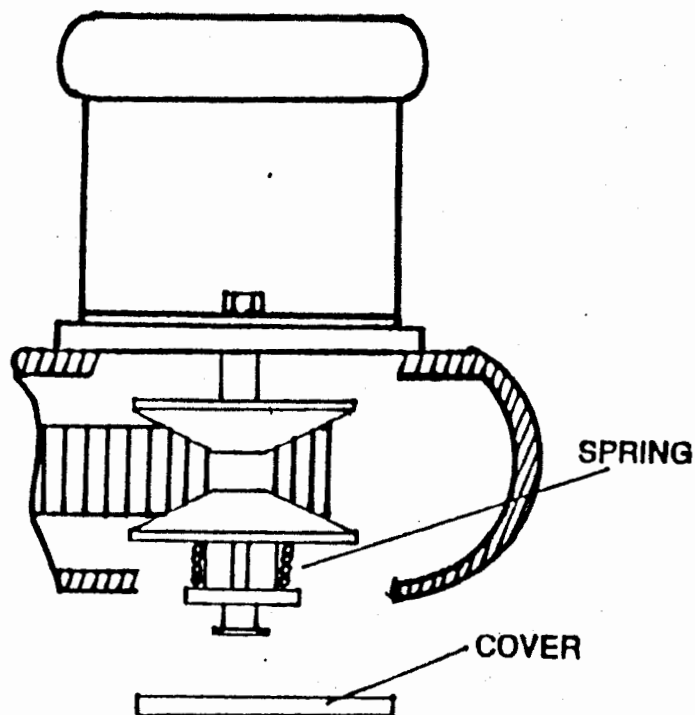


Figure 6.7

7. Tilt the motor forward and remove the belt from the motor pulley. Remove the motor.
8. If the motor is to be replaced, remove the M8 socket head cap screw at the end of the motor shaft. Slide the pulley assembly off the motor shaft and onto the new motor.

## 6.10 Drive Belt Replacement

1. Remove the motor (see Section 5.8)
2. Remove the draw bar and its bushing.
3. Remove the three screws A and use M6x35mm screw in the adjacent tapped holes to remove the Bearing Cap.

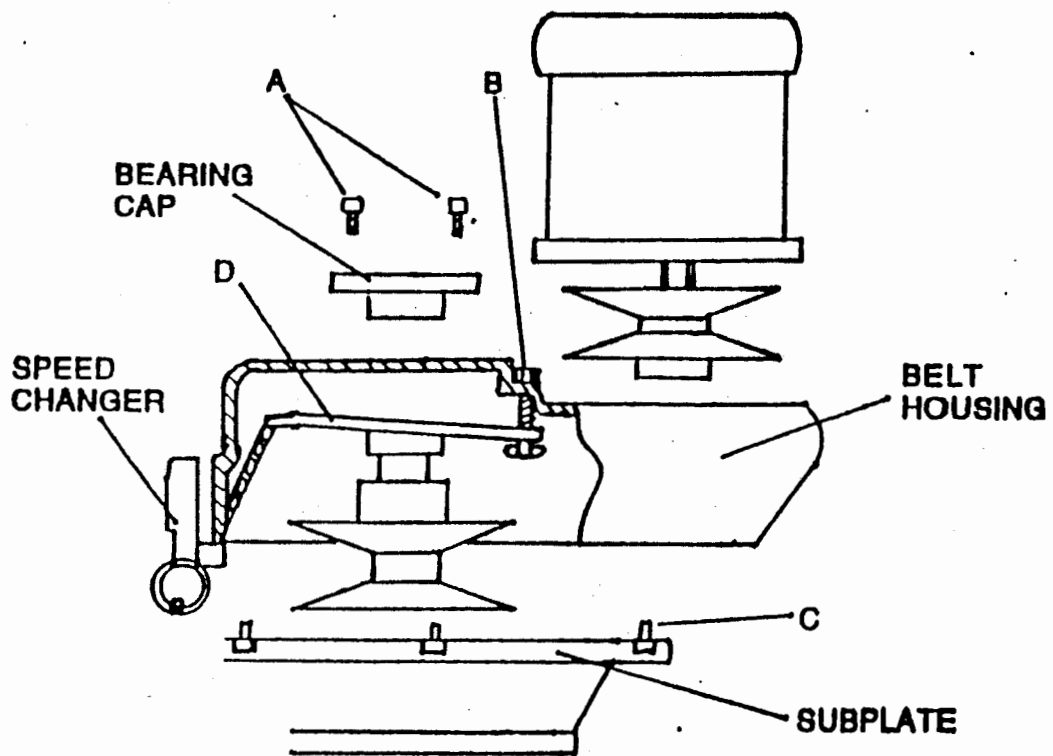


Figure 6.8

- 4. Remove the nut from the fine speed adjustment screw B and turn the screw all the way down through the casting. Catch it from the motor hole.**
- 5. Remove six screws C holding the belt housing to the subplate.**
- 6. Remove the four screws holding the speed change.**
- 7. Remove the belt housing.**
- 8. Replace the belt by sliding it over the speed change.**
- 9. In reassemble be certain the fine speed adjustment screw B goes into the slot of the Speed Change Plate D in the area in which the screw is not threaded.**

## **6.11 Timing Belt Replacement**

- 1. Remove the motor (see Section 5.8) and drive belt (see Section 5.9)**
- 2. Slide the top or adjustable varidisc pulley assembly off the shaft.**
- 3. Remove the three M8 screws holding the belt housing base to the gear housing.**
- 4. Lower the quill about 4 inches.**
- 5. Remove the belt housing base and lower or stationary varidisc pulley assembly.**
- 6. Replace the timing belt.**

## 6.12 Brake Shoe Replacement

1. Remove the motor (see Section 5.8), drive belt (see Section 5.9) and complete Steps 1-5 of the timing belt replacement procedure (see Section 5.10)
2. Remove the two M6 cap screws from the bottom of the belt housing base.
3. Separate the belt housing base from the lower or stationary varidisc pulley. this is a slight press fit.
4. Remove the 2 springs.
5. Replace the brake shoes.

## 6.13 Spindle Replacement

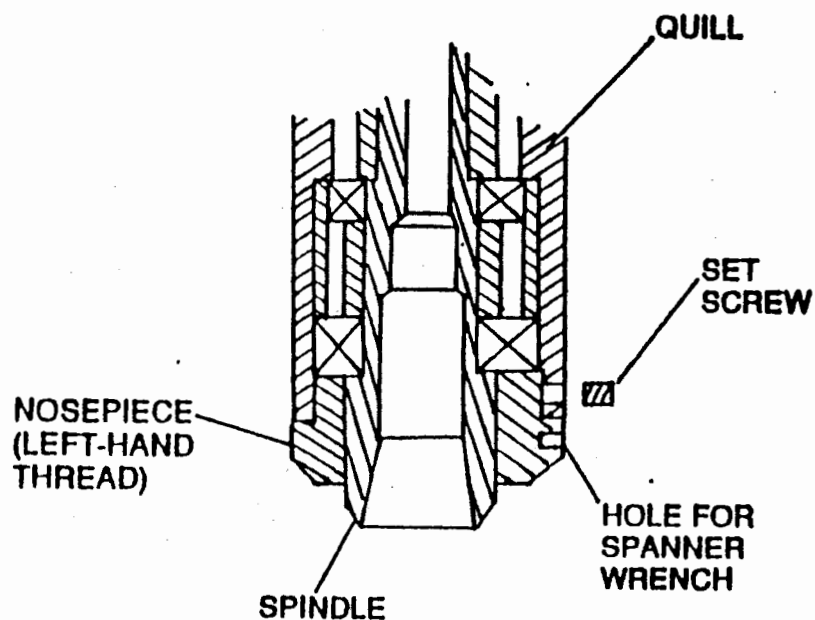


Figure 6.9

1. Remove the draw bar and its bushing.

2. Lower the quill about 1 inch and lock.
3. Remove the set screw from the back of the spindle.
4. Loosen (unscrew) the large black ring (nosepiece) with a spanner wrench.

**NOTE** : The nosepiece has a left thread--rotate counterclockwise to loosen.

5. Using a soft bar about 12 inches long, alternately tap on the top of the spindle and loosen a few threads on the nosepiece until fully unscrewed(the nosepiece will remain attached to the spindle).
6. Continue to tap the spindle out of the quill. The spindle bearings will come out with the spindle.

#### **6.14 Leveling-Leveling Tolerance for Machine (Refer to Fig 6.10)**

1. Set the machine on its six leveling pads on a solid, level floor prepared in accordance with the state and local rules for machine tool installation.
2. Put one or two precision Spirit Levels or Electronic Levels on top of the table in the positions illustrated in A1 and B1.
3. Adjust the four corner leveling screws on their pads until the machine is level to 0.06mm/1020mm. Snug and notice the two leveling screws on the middle to not affect the level.
4. Check the level with the Spirit Levels at A2 and B2. Repeat the adjusting process as required(Refer to step 3).
5. If the machine must be anchored to the floor, follow the general instruction for installing machine tools and use for leveling any of the well-known methods: shims, etc.
6. If the machine must be installed on vibration mounts/pads(rubber, commercially available leveling and vibration mounts, etc.) follow the instructions delivered with the mounts/pads, ordering them to satisfy the load of the machine and the maximum weight of the workpiece(Don't less than 500 kg/pad).

7. When the machine is correctly level, lock the adjusting screws in place with their hex nuts. paped in accordance with the state and local rules for machine tool installation.

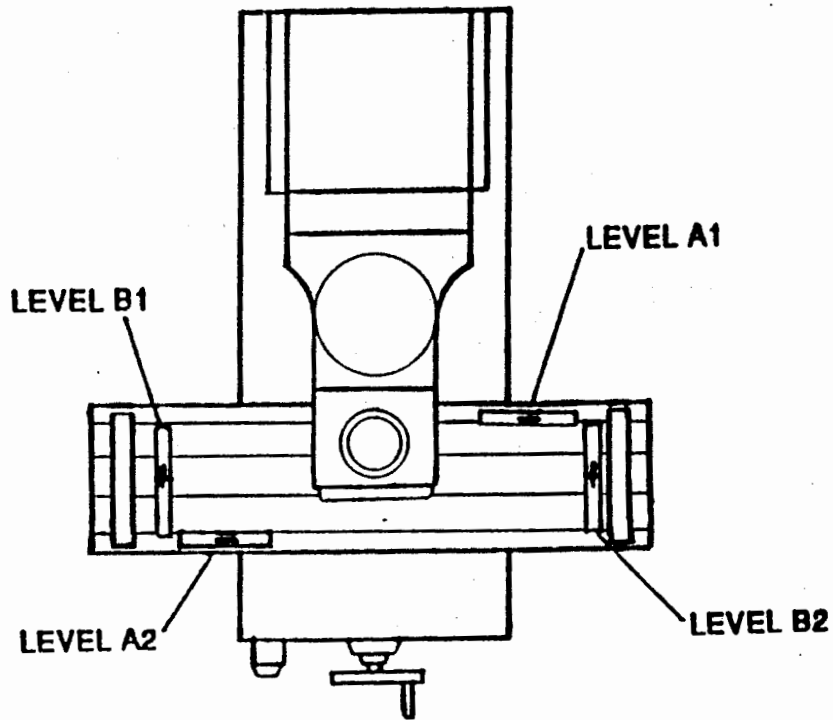


Figure 6.10A

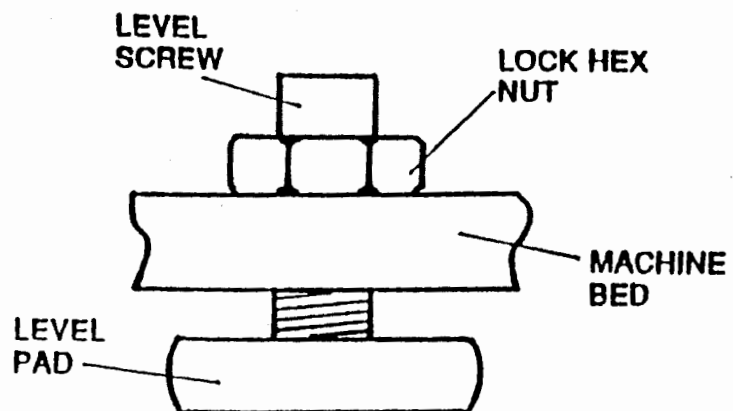


Figure 6.10B



## **6.15.1 Replace the coolant**

The receivers of coolant are located inside the bed. It is suggested to replace the coolant once each month, and discharge the waste oil. Take the containers near to the outlet. Remove the  $\phi$  1" socket set screw on the low right side of bed for discharging the coolant. Then tighten the screw and fill the fresh coolant. Remove the  $\phi$  1/2" socket set screw on the low right side of bed for discharging the waste oil. Tighten the screw when the waste oil has discharged.

### **CAUTION !**

**For environmental protection don't mix the waste oil and waste coolant. Don't leak the waste oil and coolant on the work area for preventing slippage.**

## **6.15.2 The treatment of the waste**

For the environment protection, please obey the local laws of the waste treatment to treat the waste oil and oil ...etc.

## 7.0 Troubleshooting

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### 7.1 Troubleshooting

The following chart contains some typical probable troubles while the machine is operated, along with the possible causes and remedies ways for each Item.

TROUBLE	POSSIBLE CAUSES	REMEDY
Spindle feed abnormal	Quill clamp level unreleased	Release clamp level.
Spindle brake breakdown	Brake shoe worn out	Replace
Spindle unrotate	1.Poor contact on the switch 2.Drive belt too slack 3.Poor motor	1. Check the switch. 2. Adjust or replace 3. Repair or renew
Incorrect rotation	The switch knob indicated at wrong position	Change to correct position.
Table vertical, cross, Longitudinal feed unsmooth.	1. Gib strip too tight 2. No lubricating to lubrication point	1. Release 2. Check lubrication
Vibrate when machining	1. Machine unstable 2.Unstable cutting condition	1. Reclamp 2. Select proper cutting parameter
Poor finish	1. Dull tool 2. Wrong speed and feed 3. Gibs out of adjustment 4. Worn gibs 5. Defective gibs 6. Worn spindle bearings 7. Fault in drive train	1. Replace tool 2. Check and adjust 3. Adjust gibs until slight drag is felt 4. Adjust or replace as necessary 5. Check if gibs are bowed or have high spots. Stone or scrape as necessary 6. Check or replace 7. Check the drive belt. Check that the nuts holding the drive mechanism in place is tight.

It is recommend to contact our agent or us, if the abnormal condition which is not list on above items.

# SERVICE

Please fill the following information when calling for the services from the agent for the BM-2V-100V-U

\* Contact person \_\_\_\_\_

\*Company name and address \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\*Telephone number \_\_\_\_\_

\*When did you purchased this machine \_\_\_\_\_

\*BM-2V-100V-U serial NO. \_\_\_\_\_  
(Information can be found on the name plane mounted on the column)

\*The problem \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## **8.0 ELECTRICAL**

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### **8.1 ELECTRICAL SAFETY**

- 1. All electrical/electronic troubleshooting and repair should be undertaken only by personal who are properly trained and have adequate knowledge and skill.**
- 2. Always assume the electrical power is "ON" & treat circuits as live this practice develops a caution that may prevent an accident.**
- 3. Don't alter or bypass protective interlocks.**
- 4. Read and observe all warning labels and marking such as nameplates and identification plates before starting.**
- 5. Use proper test equipment to make certain you have an open circuit.**
- 6. Before applying power to any equipment, it must be established, without a doubt, that all persons are clear.**
- 7. Don't operate the control box when your hands is wet.**
- 8. The control panel doors shall be open only when it is necessary to check out the electrical equipment or wiring. After closing the door, make certain the disconnecting means are operating properly with the disconnect handle mechanism in its proper position.**
- 9. Don't alter circuits unless authorized to do so by the manufacturer.**
- 10. Don't place jumper wires across fuses.**
- 11. Don't alter overcurrent protective devices.**
- 12. Avoid wearing metal frame glasses or wearing a metallic necklace or chain and never work on electrical equipment whine wearing any rings, watches or bracelets.**
- 13. Before replacing a fuse or electric part, switch off the machine, and be sure it is the proper specifications.**

## 8.2 ELECTRICAL PARTS LIST

PARTS	DESCRIPTION	TECHNICAL DATA	Q.T.Y	SUPPLIER	REMARKS
M1	Induction motor 220/380V or 415V ,50HZ	2.2KW 1430RPM 8.8A / 5.09A 4.7A	1	JIN SHIN	
M2	Induction motor 220/380V 50HZ 220/110V 50HZ	93 W 2850RPM 0.18A 0.5A	1	FENG TA	



# Head Back Gear

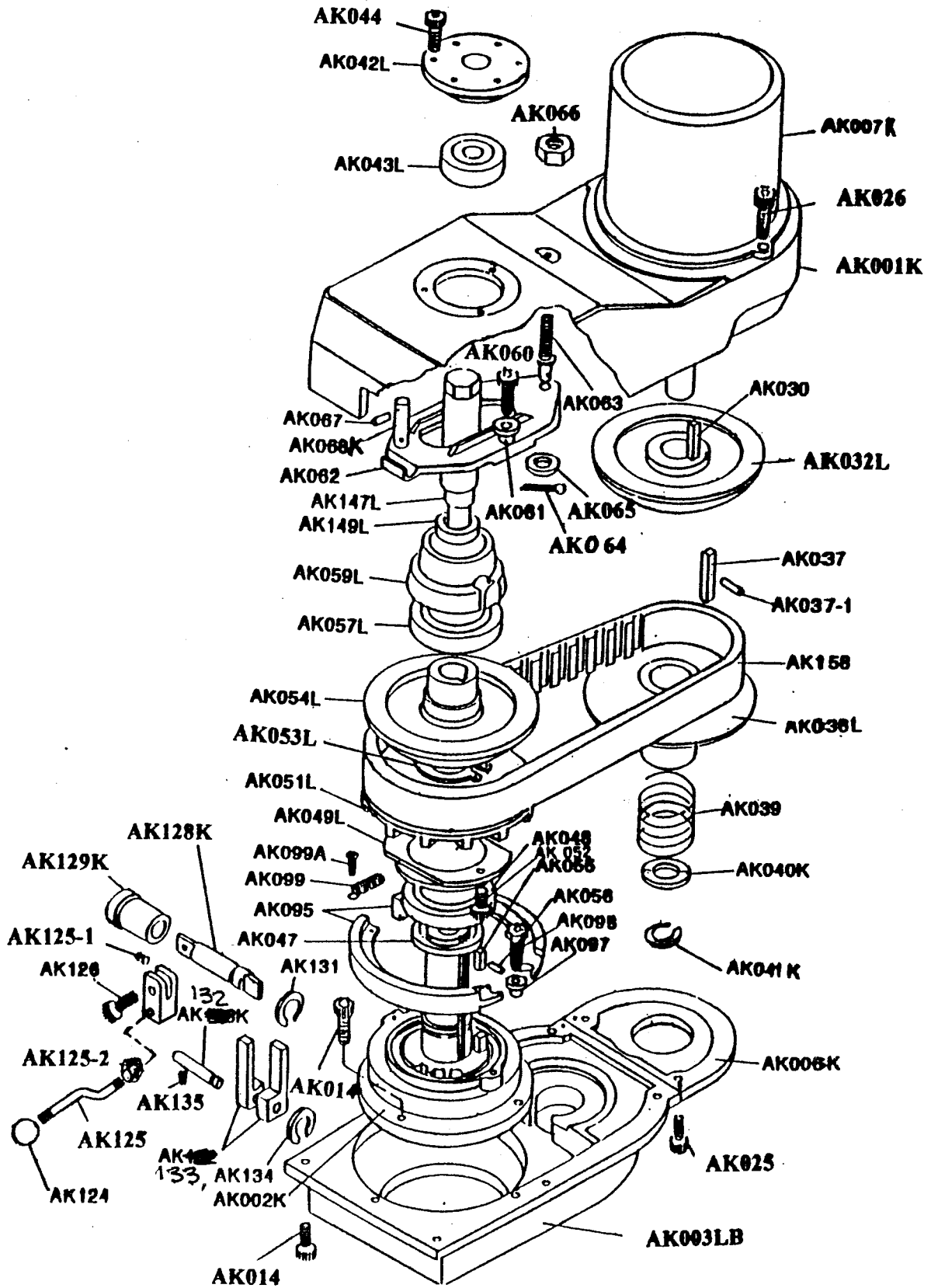


Figure 9.2

**Parts list**  
**Head Top Housing & Head Back Gear**

<b>PART NO</b>	<b>DESCRIPTION</b>	<b>Q.T.Y</b>
AK001K	BELT HOUSING ASSEMBLY	1
AK002K	BELT HOUSING BASE	1
AK003LB	GEAR HOUSING	1
AK004L	FIXED CLUTCH BRACKET	1
AK005K	SPEED CHANGE HOUSING	1
AK006K	MOTOR PULLEY COVER	1
AK007K	MOTOR 3HP 4P 3PH	1
AK014	SOCKET CAP SCREW	9
AK014-1	GREASE CAP	1
AK016	VERT.TEE BOLTS	3
AK017	STEEL WASHER	3
AK018	HEX JAM NUT	3
AK019	STUDS	4
AK020	LOCK WASHER	4
AK020-1	SPRING WASHER	4
AK021	HEX NUT	4
AK022	OIL CUP	1
AK024K	SOCKET CAP SCREW	4
AK025	SOCKET CAP SCREW	3
AK026	SOCKET CAP SCREW	2
AK030	KEY FOR ADJ. VARIDISC MOTOR SHAFT	1
AK032L	STATIONARY VARIDISC FOR MOTOR	1
AK036L	ADJUSTABLE VARIDISC ASSEMBLY	1
AK037	KEY	1
AK037-1	ROLL PIN	1
AK039	SPRING	1
AK040K	ADJUSTABLE VARIDISC SPRING COLLAR	1
AK041K	SNAP RING	1
AK042L	TOP BEARING CAP	1
AK043L	BALL BEARING 6009 (3080)	1
AK044	SOCKET CAP SCREW	6
AK045L	SPINDLE PULLEY HUB	1
AK046L	CLUTCH SLEEVE	1
AK047	SPINDLE PULLEY SPACER	1



PART NO	DESCRIPTION	Q.T.Y
AK048	BALL BEARING 6912 (9276)	1
AK049L	BRAKE BEARING CAP	1
AK051L	STATIONARY DRIVEN VARIDISC	1
AK052	SOCKET SET SCREW	2
AK053L	SNAP RING	1
AK054L	ADJUSTABLE-DRIVE VARIDISC	1
AK055	PLASTIC KEY	1
AK056	SCREW	1
AK057L	BALL BEARING 6013 ZRS. (2908)	1
AK059L	SPINDLE PULLEY BEARING SLIDING HOUSING	1
AK060	SOCKET CAP SCREW	2
AK061	PIVOT SLEEVE	2
AK062	SPEED CHANGE PLATE	1
AK063	SPEED CHANGE PLATE PIVOT STUD	1
AK064	SPLIT PIN	1
AK065	WASHER	1
AK066	HEX JAM NUT	1
AK067	ROLL PIN	1
AK068K	SPEED CHANGE CHAIN STUD	1
AK069K	SPEED CHANGE CHAIN	1
AK071	WORM GEAR	1
AK072	ROLL PIN	1
AK073K	SPEED CHANGE SHAFT	1
AK075	SET SCREW	1
AK076	SPEED CHANGE HANDWHEEL	1
AK080	HANDLE	1
AK082	PIN	1
AK083	SPEED CHANGE CHAIN DRUM	1
AK084	SPEED CHANGE SPUR GEAR	1
AK085	KEY	1
AK086	PIN	1
AK087	HEX CAP NUT	1
AK088	CAUTION PLATE	1
AK092	SET SCREW	1
AK095	BRAKE SHOE ASSEMBLY - 2916.	2
AK096	HEX HD SCREW	1
AK097	BRAKE PIVOT SLEEVE	1

PART NO	DESCRIPTION	Q.T.Y
AK099	BRAKE SPRING - 2917	2
AK099A	SET SCREW FOR SPRING	4
AK100L	SPINDLE BULL GEAR ASSEMBLY	1
AK101L	SPLINE GEAR HUB	1
AK102	KEY	1
AK103L	LOCK WASHER	1
AK103L-1	COLLAR	1
AK104	NUT	1
AK105L	BEARING SLEEVE	1
AK106L	BALL BEARING GEAR SLEEVE WASHER	1
AK109L	BALL BEARING	2
AK110L	BALL GEAR BEARING SPACER	1
AK111L	SLEEVE	1
AK112	SNAP RING	1
AK113	COMPRESSION SPRING	3
AK114	BULL GEAR PINION COUNTER SHAFT	1
AK115	KEY	1
AK116	KEY	1
AK117	BULL GEAR PINION	1
AK117A	SET SCREW	1
AK118	BALL BEARING	2
AK119	BELT PULLEY	1
AK120	JAM NUT	1
AK121	BELT	1
AK122	BULL GEAR PINION BEARING CAP	1
AK123	SOCKET HD CAP SCREW	2
AK124	BAKELITE BALL HANDLE	1
AK125	BRAKE LOCK HANDLE	1
AK125-1	SOCKET SET SCREW	1
AK125-2	HEX JAM NUT	1
AK126	BRAKE LOCK SCREW	1
AK128K	BRAKE LOCK SHAFT - 2924	1
AK129K	SLEEVE FOR BRAKE LOCK SHAFT	1
AK131	SNAP RING	1
AK132	BRAKE FINGER PIVOT STUD - 1601	2
AK133K	BRAKE OPERATING FINGER - 1599	1
AK134	SNAP RING	1
AK135	SOCKET SET SCREW	1

PART NO	DESCRIPTION	Q.T.Y
AK136	BULL GEAR SHIFT PINION	1
AK137	HI-LOW DETENT PLATE	1
AK139-1	SET SCREW	1
AK139-2	SOCKET CAP SCREW	2
AK140	SOCKET CAP SCREW	2
AK141	HI-LOW PINION BLOCK	1
AK142	ROLL PIN	2
AK143	SPRING	1
AK144	HI-LOW DETENT PLUNGER	1
AK145	HI-LOW SHIFT CRANK	1
AK146	BAKELITE BALL HANDLE	1
AK147L	DRAWBAR	1
AK149L	SLEEVE	1
AK157L	VARI-SPEED DIAL	1
AK158	BELT	1
AK162K-1	NAME PLATE	1

(2935)



**Parts list**  
**Head Lower Housing**

<b>PART NO</b>	<b>DESCRIPTION</b>	<b>Q.T.Y</b>
A012L-B	QUILL HOUSING	1
A042H	SHIFT CRANK	1
A042H-1	PLUNGER	1
A042H-3	SET SCREW	1
A042H-4	COMPRESSION SPRING	1
A042H-5	BALL	1
A042H-6	ROLL PIN	1
A044	SET SCREW	1
A045	CLUSTER GEAR SHIFT CRANK	1
A047	FEED GEAR SHIFT FORK	1
A048	CLUSTER GEAR COVER	1
A049	FEED SHIFT ROD	1
A050	CAP SCREW	4
A051	SET SCREW	1
A053	BEVEL GEAR SHAFT	1
A054	BEVEL GEAR BEARING	1
A054A	SCREW	3
A055	BEVEL GEAR THRUST SPACER	1
A056	SNAP RING	1
A057	CLUSTER GEAR (UP)	1
A058	CLUSTER GEAR (MIDDLE)	1
A059	CLUSTER GEAR (DOWN)	1
A060	CLUSTER GEAR KEY	1
A062	CLUSTER GEAR SHAFT UPPER BEARING	1
A062B	SET SCREW	1
A062L	SET SCREW	1
A063	SET SCREW	1
A064	SCREW	1
A065	QUILL STOP KNOB	1
A066	REVERSE TRIP BALL LEVER SCREW	1
A067	REVERSE TRIP BALL LEVER	1
A068	QUILL STOP MICRO-SCREW	1
A072	CHEM. BLACK RD.HD. SCREW	2
A073	MICROMETER SCALE	1
A074	MICROMETER NUT	1

PART NO	DESCRIPTION	Q.T.Y
A075	QUILL MICRO-STOP NUT	1
A076	SNAP RING	1
A077	SOCKET SET SCREW	1
A078	TRIP LEVER PIN	1
A079	FEED TRIP LEVER	1
A080	FEED TRIP PLUNGER	1
A082	TRIP PLUNGER	1
A083	ROLL PIN	1
A084	COMPRESSION SPRING	1
A085L	CAM ROD SLEEVE ASSEMBLY	1
A086	ROLL PIN	1
A087L	CAM ROD	1
A089	TRIP HANDLE	1
A090	PIN	1
A091	CAP SCREW	2
A092	FEED TRIP BRACKET	1
A092L	BRASS SLEEVE	1
A093	CAP SCREW	2
A094	CLUTCH ARM COVER	1
A096L	OVERLOAD CLUTCH TRIP LEVER	1
A097	SCREW	2
A097A	HEX JAM NUT	2
A098	DOWEL PIN	1
A098-1	BLACK PLASTIC BALL	1
A100	FELT WASHER	2
A101	SCREW	2
A101L	SCREW	2
A101-A-A	QUILL LOCK	2
A102L	NOSE-PIECE	1
A102L-3	SET SCREW	1
A103L	SPINDLE DIRT SHIELD	1
A104L	QUILL SKIRT	1
A105L	BEARING	1
A106L	BEARING SPACER(LARGE)	1
A107L	BEARING SPACER (SMALL)	1
A108L	BEARING	1
A109L	QUILL	1
A110L	SPINDLE	1

Pair  
7010-A4

PART NO	DESCRIPTION	Q.T.Y
A112L	BEARING - 6008 (2RS)	1
A113L	SNAP RING	1
A114L	LOCKNUT	1
A114A	SPECIAL SOCKET SET SCREW	1
A114A-1	PLUNGER	1
A164	BLACK PLASTIC BALL HANDLE	1
A165	ADJ. WORM SHAFT	1
A166	BACK FEED HANDLE HUB	1
A167	PINION SHAFT HUB SCREW	1
A168	PINION SHAFT HUB SLEEVE	1
A169	KEY	1
A170	BALL	1
A170A	COMPRESSION SPRING	1
A170B	SET SCREW	1
A171	ROLL PIN	1
A172	SCREW	8
A173L	CLOCK SPRING	1
A174L	SPRING COVER	1
A175	SET SCREW	1
A176	QUILL PINION SHAFT BUSHING	1
A177	PINION SHAFT WORM GEAR SPACER	1
A178	OVERLOAD CLUTCH WORM GEAR	1
A179	ROUND HEAD SCREW	4
A180	OVERLOAD CLUTCH	1
A181	OVERLOAD CLUTCH	1
A182A	SPRING PIN	1
A182L	QUILL PINION SHAFT	1
A183	SAFETY CLUTCH SPRING	1
A184	SOCKET SET SCREW	1
A185	BRASS PLUG	1
A186	OVERLOAD CLUTCH LOCKNUT	1
A187	CLUTCH RING	1
A188	CLUTCH RING PIN	1
A189	SNAP RING	1
A190	OVERLOAD CLUTCH SLEEVE	1
A190-1	KEY	1
A190-2	BALL	1
A192-1	SCREW	1

PART NO	DESCRIPTION	Q.T.Y
A192L	WASHER	1
A193L	FEED DRIVE WORM GEAR SHAFT	1
A195	SET SCREW	1
A196L	FEED WORM GEAR SHAFT SLEEVE	1
A197	WORM CRADLE BUSHING	1
A198L	WORM GEAR SPACER	1
A199L	FEED DRIVE WORM GEAR	1
A200	WORM SHAFT KEY	1
A202L	WORM GEAR CRADLE	1
A203	FEED ENGAGE PIN	1
A206H	WORM GEAR CRADLE THROW-OUT	1
A208H	SHIFT SLEEVE	1
A210H	SHIFT CRANK	1
A210H-1	SET SCREW	1
A210H-2	CAP SCREW	4
A210H-3	BALL	1
A210H-4	COMPRESSION SPRING	1
A210H-5	ADJUST SCREW	1
A210H-6	PLUNGER	1
A215.	SCREW	1
A216	WASHER	1
A217	FEED REVERSE BEVEL GEAR	1
A217A	CLUSTER GEAR KEY	1
A218	FEED DRIVE GEAR	1
A220	SOCKET SET SCREW	4
A220A	MOCKIT LOCKSCREW	4
A221	FEED DRIVE GEAR	1
A222	KEY	1
A223	NEEDLE BEARING	1
A224	HANDLE	1
A225	HANDWHEEL	1
A226	FEED REVERSE KNOB STUD	1
A227	REVERSE KNOB	1
A228	SNAP RING	1
A230	KEY	1
A231L	REVERSE CLUTCH ROD	1
A232L	FEED WORM SHAFT	1
A233	HANDWHEEL CLUTCH	1



PART NO	DESCRIPTION	Q.T.Y
A234	SOCKET SET SCREW	1
A235L	BUSHING	1
A236	FEED WORM SHAFT BUSHING	1
A236A	LOCKSCREW	1
A236B	SET SCREW	1
A237	WORM GEAR	1
A238	PIN	1
A239	BUSHING	1
A240	PIN	1
A241	FEED REVERSE BEVEL GEAR	1
A242	KEY	1
A243	ROLL PIN	1
A244	FEED REVERSE CLUTCH	1
A245	FEED REVERSE BEVEL GEAR	1
A246L	LOCK HANDLE	1
A247L	QUICK LOCK SLEEVE	1
A248L	QUICK LOCK BOLT	1
A267	COMPRESSION SPRING	1
A268	HANDWHEEL CLUTCH SPRING SCREW	1
A269.	STEEL BALL	1
A270	OVERLOAD CLUTCH WASHER	1
A273	SNAP RING	1
A274	FEED REVERSE TRIP PLUNGER	1
A276	TRIP PLUNGER BUSHING	1
A277	OVERLOAD CLUTCH LEVER SPRING PLUNGER	1
A278	COMPRESSION SPRING	1

## HEAD SWIVELING

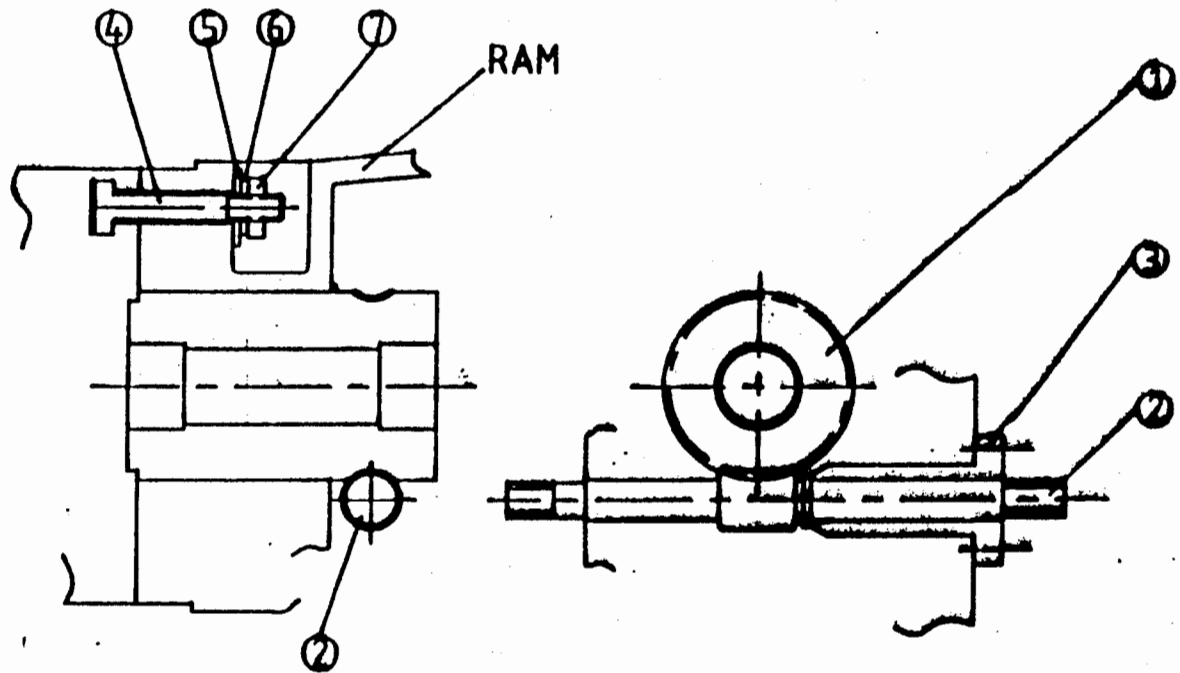
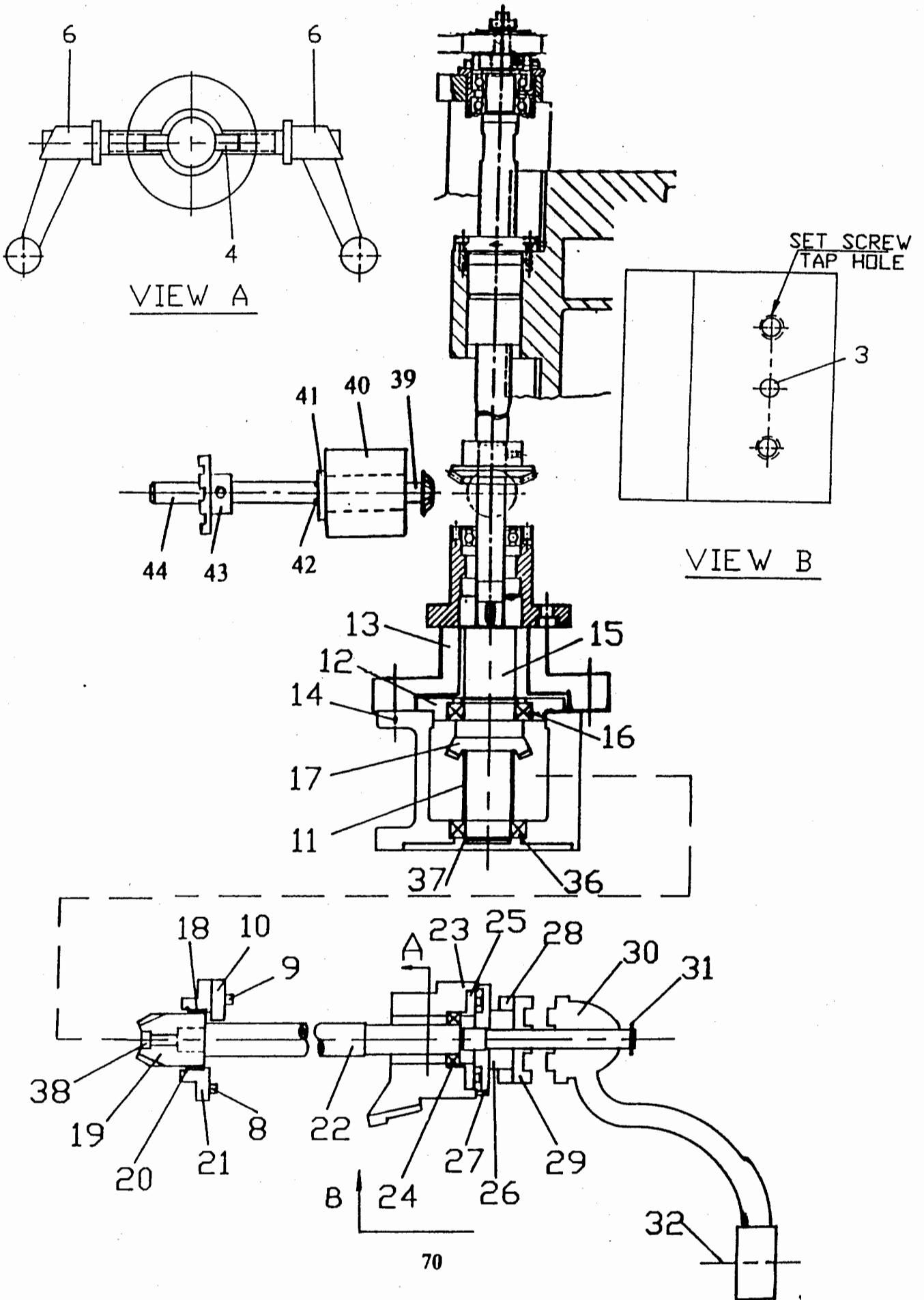


Figure 9.4

ITEM	PART NO.	DESCRIPTION	Q.T.Y
1	542001-1	WORM GEAR	1
2	542004	WORM SHAFT	1
3	542003	SLEEVE	1
4	542002-1	SET SCREW	4
5	542012	WASHER	4
6		SPRING WASHER $\phi$ 5/8"	4
7		NUT $\phi$ 5/8" x 11 UNC	4

# Head/Ram Riser Drive System



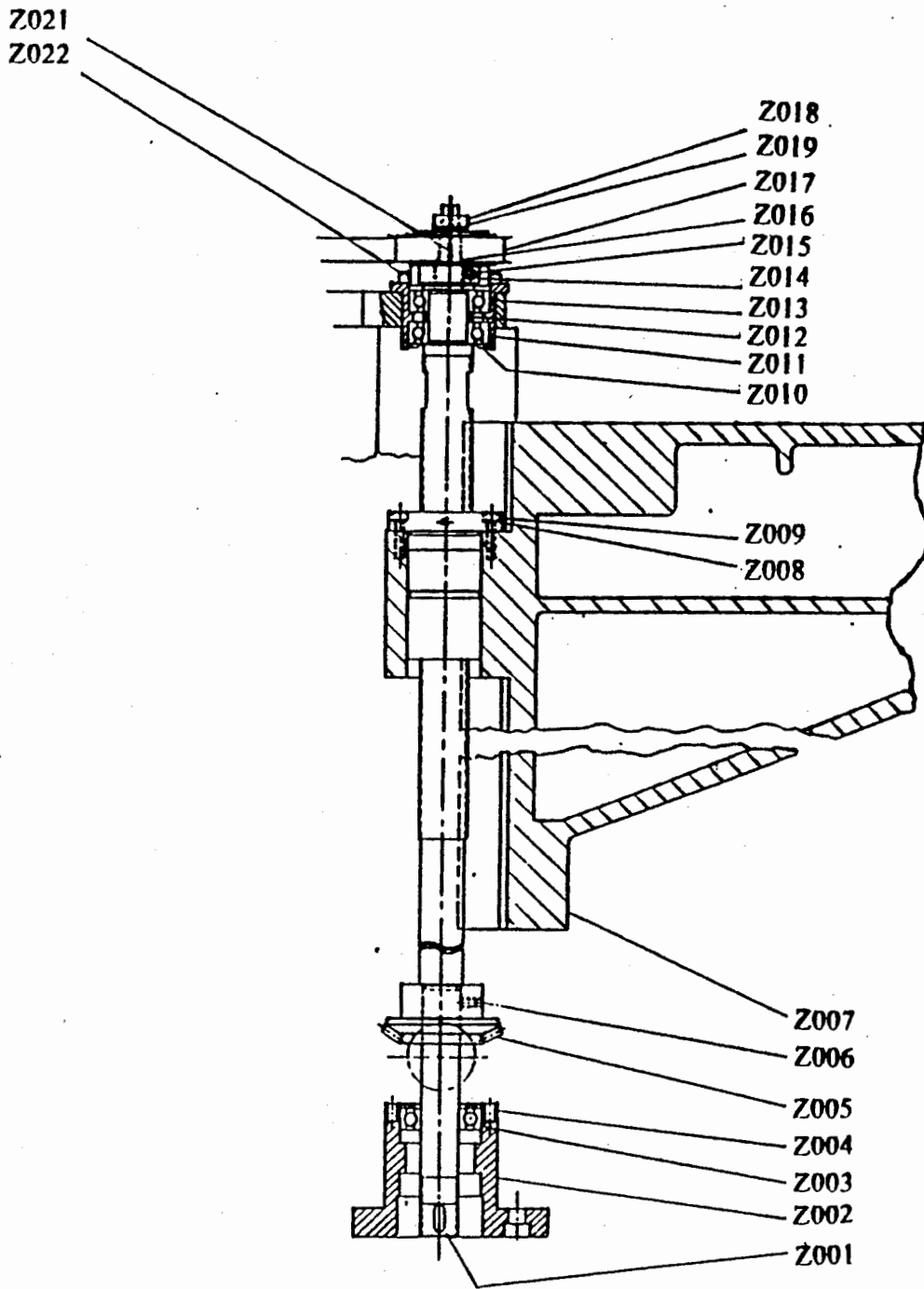


Figure 9.5B

## Head/Ram Riser Drive System

ITEM	PART NO.	DESCRIPTION	Q.T.Y
3		# 4 TAPER PIN	1
4	MS0026	BRAKE (BRASS)	2
6	502032	MANUAL GIB LOCK	2
8		SCREW	4
9		SCREW	2
10	MS0025	STOPPER	1
11	MS0022	SLEEVE	1
12	508023	BEARING COVER	1
13	508021	DC MOTOR SEAT	1
14	MS0019	GEAR BOX	1
15	MS0021	SCREW GEAR SHAFT	1
16		BEARING-6009Z	1
17	MS0020	BEVEL GEAR	1
18		NEEDLE BEARING-HK4516	1
19	MS0023	BEVEL GEAR	1
20		SNAP RING	1
21	MS0024	BEARING COVER	1
22	508029-2	RISER TRANSFER SHAFT	1
23	508028-2	RISER TRANSFER SHAFT BRACKET	1
24		BEARING-6005Z	1
25	500023	BEARING COVER	1
26	500020	DIAL HOLDER	1
27	500021	DIAL	1
28	500022	SCREW NUT BUSH	1
29	500024	CLUTCH	1
30	508031	RAM RISER CRANK	1
31		SNAP RING	1
32	502024	HANDLE GRIP	1
36		BEARING-6008Z	1
37		SNAP RING	1
38		SCREW	1
39	SW0002	BEVEL GEAR	1
40	SW0005	HOUSING	1
41	SW0004	SLEEVE	1
42		SNAP RING	1
43	SW0029	CLUTCH	1

ITEM	PART NO.	DESCRIPTION	Q.T.Y
44	SW0003	HANDLE SHAFT	1

PART NO.	DESCRIPTION	Q.T.Y
Z001	BALLSCREW ASSEMBLY, Z AXIS	1
Z002	BRACKET - LOWER, ELEVATING BALLSCREW	1
Z003	SELF ALIGNING BEARING	1
Z004	BEARING PROTECTOR	1
Z005	BEVEL GAER	1
Z006	SOCKET SET SCREW	1
Z007	RAM	1
Z008	LOCK WASHER	6
Z009	SOCKET HD. CAP SCREW	6
Z010	RING	1
Z011	BEARING HOUSING	1
Z012	RING	1
Z013	ANGULAR CONTACT BAERING	2
Z014	CLAMP NUT	1
Z015	SOCKET HD. CAP SCREW	1
Z016	FERRULE	1
Z017	PULLEY	1
Z018	LOCK NUT	1
Z019	LOCK WASHER	1
Z021	KEY	1
Z022	SOCKET HD. CAP SCREW	4

# Counter Balance

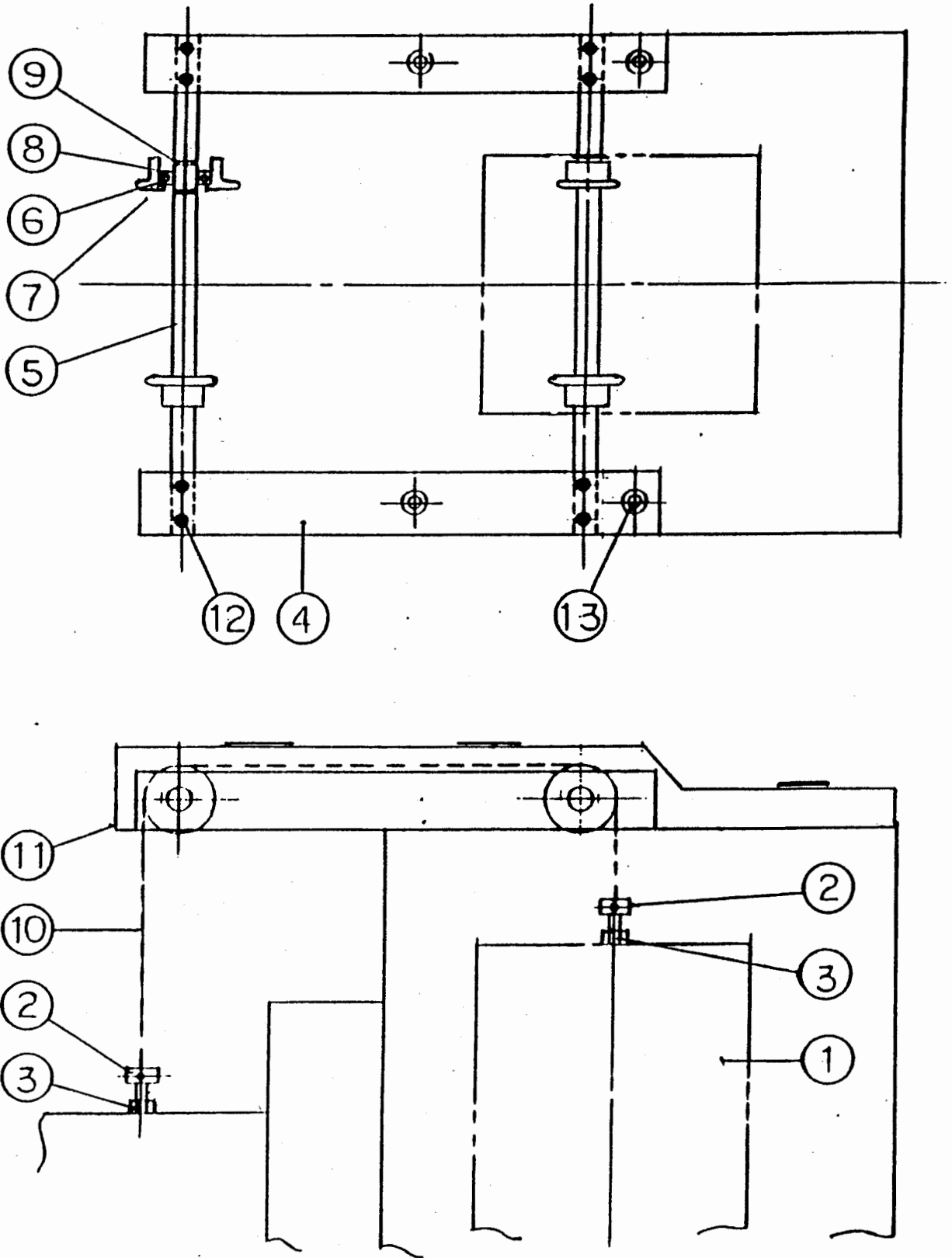


Figure 9.6

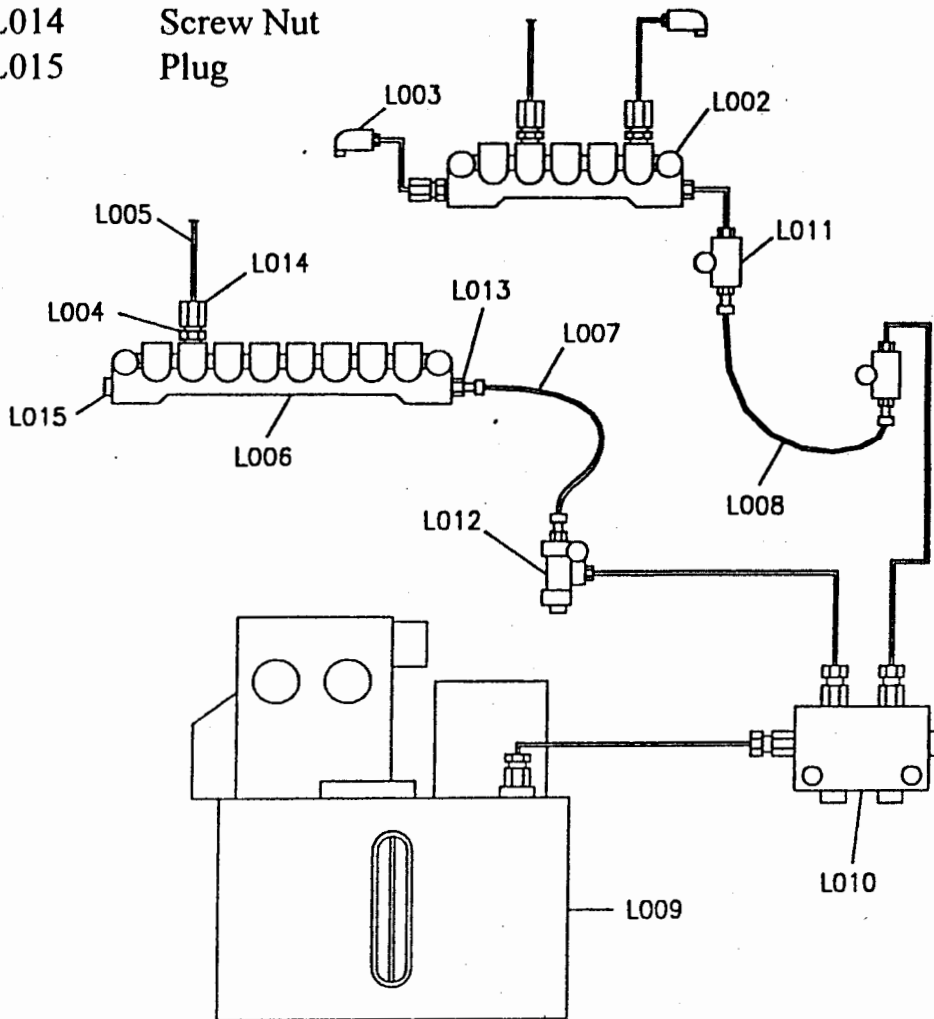
## Counter balance

ITEM	PART NO.	DESCRIPTION	Q.T.Y
1	500018	COUNTER BALANCE	1
2	500030	CHAIN BOLT	4
3		M10 SCREW NUT	4
4	500019	CHAIN GEAR SEAT	2
5	500025	CHAIN WHEEL SHAFT	2
6		#6004ZZ BEARING	4
7	500029	CHAIN WHEEL	4
8		R-42 SNAP RING	4
9		S-20 SNAP RING	8
10		RS-40 CHAIN	2
11	520025	COLUMN TOP COVER	1
12		SET SCREW	8
13		SOCKET CAP SCREW	4



## Lubrication system

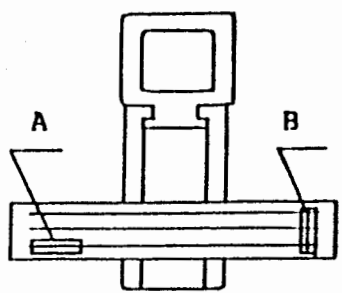
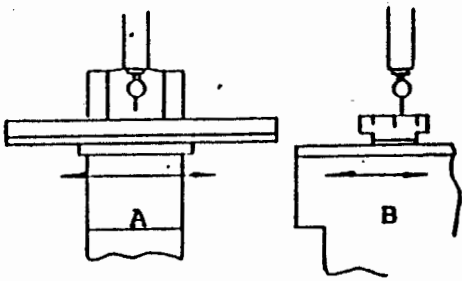
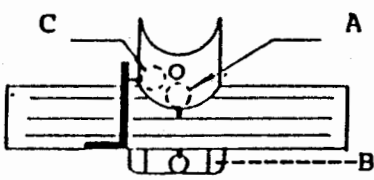
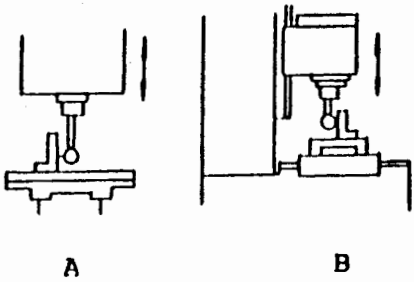
PART NO.	DESCRIPTION	Q.T.Y
L002	Ram Minifold	1
L003	Lub Machine Coupling Set	2
L004	Lub Minifold Coupling	14
L005	Lub Tubing	--
L006	Saddle Manifold	1
L007	Flexible Lub Hose	1
L008	Flexible Lub Hose - Ram	1
L009	Oil Feeding System	1
L010	Oil Regulating Distributor	1
L011	Twin joint Set	2
L012	T--Joint Set	1
L013	Thimble Set	15
L014	Screw Nut	14
L015	Plug	2



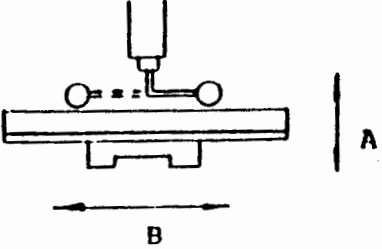
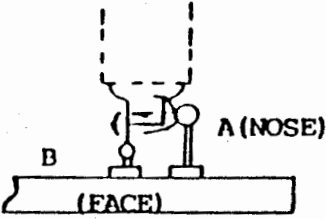
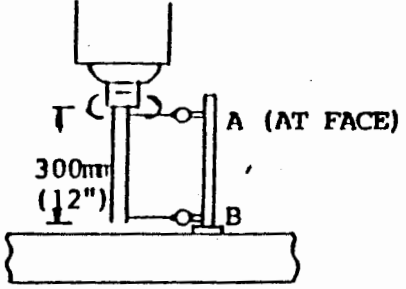
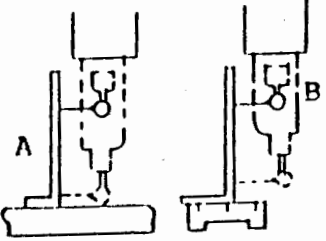
**Figure 9.7**

# Reference

## INSPECTION CHART -1

NO	INSPECTION ITEMS	ILLUSTRATIONS	TOLERANCES	MEASUREMENT
1	PLANE OF SURFACE EVEN LEVEL.		APPROX. LEVEL A. 0.06mm/M B. 0.06mm/M	A. <u>0.016</u> B. <u>0.046</u>
2	SURFACE PARALLEL TO ITS MOVEMENTS		A. 0.02/500mm (0.0008"/20") B. 0.02/300mm (0.0008"/12")	A. <u>0.008</u> B. <u>0.008</u>
3	T-SLOTS FRONT EDGE PARALLEL TO LONGITUDINAL TRAVEL PERPENDICULAR TO CROSS TRAVEL		A. B. C. 0.02/300mm (0.0008"/12")	A. T-SLOTS <u>0.002</u> B. FRONTEGE <u>0.002</u> C. CROSS <u>0.002</u>
4	VERTICAL MOVEMENT OF ADAPTER SQUARE TO TABLE SURFACE		A. 0.02/300mm (0.0008"/12") B. 0.02/300mm (0.0008"/12")	A. <u>0.002</u> B. <u>0.008</u>

## INSPECTION CHART -2

NO	INSPECTION ITEMS	ILLUSTRATIONS	TOLERANCES	MEASUREMENT
5	TABLE ADAPTER NOT LEVEL SPINDLE PERPENDICULAR TO TOP OF TABLE		A. 0.02/300mm (0.0008"/12")  B. 0.02/300mm (0.0008"/12")	A. 0.004 <hr style="border-top: 1px dashed black;"/>  B. 0.001 <hr style="border-top: 1px dashed black;"/>
6	SPINDLE NOSE AND FACE TRUE		A. 0.01mm MAX (0.0004")  B. 0.01mm MAX (0.0004")	A. 0.005 <hr style="border-top: 1px dashed black;"/>  B. 0.002 <hr style="border-top: 1px dashed black;"/>
7	SPINDLE BORE RUNABOUT		A. 0.01mm MAX (0.0004")  B. 0.03mm MAX (0.0012")	A. 0.002 <hr style="border-top: 1px dashed black;"/>  B. 0.012 <hr style="border-top: 1px dashed black;"/>
8	QUILL TRAVEL SQUARE TO TABLE SURFACE		A. 0.02/300mm (0.0008"/12")  B. 0.02/300mm (0.0008"/12")	A. 0.02 <hr style="border-top: 1px dashed black;"/>  B. 0.012 <hr style="border-top: 1px dashed black;"/>

## INSPECTION CHART

NO.	INSPECTION ITEMS	DESCRIPTION																								
1	<b>BACKLASH READ ON DIALS</b>	<b>MAX. 0.127mm (0.005")</b> <b>Test Readings:</b> A. Long Lead Screw      A. ----- <i>ND</i> B. Cross Lead Screw      B. ----- <i>ND</i>																								
2	<b>MANUAL</b>	1. Gibs Adjusted      ----- <i>D.O.I.3</i> 2. Quill Tight      ----- <i>D.O.I.4</i> 3. Spindle Backlash      ----- <i>D.O.I.2</i> 4. All Movements Smooth      ----- <i>OK</i> 5. Collet Fit      ----- <i>OK</i>																								
3	<b>POWER</b>	<div style="text-align: right; margin-bottom: 5px;"><b>Speeds</b></div> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="width: 20%; text-align: center;">Low</th> <th style="width: 20%; text-align: center;">High</th> </tr> </thead> <tbody> <tr> <td>1. Powerfeed</td> <td style="text-align: center;">----- <i>OK</i></td> <td style="text-align: center;">-----</td> </tr> <tr> <td>2. All Movements Smooth</td> <td style="text-align: center;">----- <i>OK</i></td> <td style="text-align: center;">-----</td> </tr> <tr> <td>3. Vibration</td> <td style="text-align: center;">----- <i>OK</i></td> <td style="text-align: center;">-----</td> </tr> <tr> <td>4. Sound (73 dB Max.)</td> <td style="text-align: center;">----- <i>90dB</i></td> <td style="text-align: center;">-----</td> </tr> <tr> <td>5. Test Cuts:</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 40px;">A. Face</td> <td style="text-align: center;">----- <i>OK</i></td> <td style="text-align: center;">-----</td> </tr> <tr> <td style="padding-left: 40px;">B. Side</td> <td style="text-align: center;">----- <i>OK</i></td> <td style="text-align: center;">-----</td> </tr> </tbody> </table>		Low	High	1. Powerfeed	----- <i>OK</i>	-----	2. All Movements Smooth	----- <i>OK</i>	-----	3. Vibration	----- <i>OK</i>	-----	4. Sound (73 dB Max.)	----- <i>90dB</i>	-----	5. Test Cuts:			A. Face	----- <i>OK</i>	-----	B. Side	----- <i>OK</i>	-----
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4	<b>VISUAL</b>	1. Finishes A. Paint      ----- <i>OK</i> B. Machinery      ----- <i>OK</i> C. Chrome      ----- <i>OK</i> D. Plastic      ----- <i>OK</i> E. Black Oxide      ----- <i>OK</i> 2. Rustproofing      ----- <i>OK</i>																								
5	<b>ELECTRICAL</b>	1. Voltage for Motors:      ----- <i>415</i> V 2. Connected      ----- <i>OK</i> 3. Head      ----- <i>OK</i> 4. Powerfeed      ----- <i>OK</i> 5. Coolant Pump      ----- <i>220V - 1/2 HP - IP</i>																								