

# **YCM-1½ VS**

**Operation, Maintenance, and Parts Manual**

**Turret Milling Machine**

*SUPERMAX*

**H. H. Roberts Machinery Ltd.**

~~1½ VS mill~~

**Mississauga, Ontario**

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**SUPERMAX®**

**DO NOT OPERATE  
WITHOUT  
EYE PROTECTION**

**DO NOT OPERATE  
WITHOUT GUARDS**

**CAUTION**  
KEEP HANDS OUT  
OF MACHINE

**CAUTION**  
**DISCONNECT  
POWER BEFORE  
SERVICING**

# 前 言 FOREWORD

## I 公司概況：

### Outline of Yeong Chin

1. 名稱：永進機械工業股份有限公司

Full Name: Yeong Chin Machinery Industries Co., Ltd.

2. 地址：台中縣神岡鄉新庄村和睦路639號 電話：(045)623211(10線)

Address: 639 Ho Mu Road, Hsin Kang, Shen Kang, Taichung, Taiwan.  
R.O.C. TEL:(045)623211(10 LINES)

3. 董事長：陳金森

Chairman: Chin-Shun Chen

4. 資本額：新台幣 2 億元

Capital: NT\$: 200,000,000.00

5. 產品項目：各式銑床

Products: Milling Machines

6. 廠房面積：42570方公尺

Floor Space: 42570m<sup>2</sup>

7. 廠區面積：158400方公尺

Land Space: 158400m<sup>2</sup>

8. 員工人數： 590人

Employees: 590人

9. 各地營業所：台北、高雄、豐原

Offices: Taipei, Kaoshung, Feng-Yuan

## II 公司沿革：

### History:

1. 民國43年本公司前身永進鐵工廠成立，製造包裝機。

In 1954, Yeong Chin Iron Works (Yeong Chin's Precedent Name) was founded.

2. 民國58年 4 月，改組成立永進機械工業股份有限公司，當時登記資本額新台幣320萬元，計劃專門生產高級精密銑床。

In April, 1969, Yeong Chin Machinery Industries Co., Ltd. was reorganized, its capital was NT\$3,200,000,- and planned to produce high class precision Milling Machines.

3. 民國59年遷至台中縣神岡鄉，增資登記資本額640萬元，擴建廠房。

In 1970, Our workshop was moved to Shen-Kang, Taichung for expanding plant space and capital was increased to NT\$6,400,000.

4. 民國61年，開拓東南亞市場外銷業務，鑄造廠遷移，更新設備，增資後資本額為1280萬元，為奠定外銷業務基礎，以品質為重，開始實施品質管制，使銑床精密度合於國際標準。

In 1972, export business was extended to South-East Asian countries. Casting workshop was expanded and increased new equipments. At this time, quality control was executed severely and proven to achieve international standard. Capital was also increased to NT\$12,800,000.

- 5 民國62~64年間，不斷地在擴充廠房及更新設備，資本額增至 7,000 萬元，並拓展美洲、歐洲、澳洲、南非外銷市場，開發P.C.程式控制 YCM-PV5 銑床成功，正式列入生產。
- From 1973 to 1975, Our Company's plant building and production equipment were expanded continuously. At the same time, the markets of America, Europe, Australia, South Africa were expanded, P.C. program Control YCM-PV5 Milling Machine was also developed successfully and produced. This time, capital was increased to NT\$ 70,000,000.-.
- 6 民國65年開發D.P.C.程式控制 YCM-3MAV 銑床成功，正式列入生產。
- In 1976, D.P.C. Program Control YCM-3MAV Milling Machine was developed successfully and produced.
- 7 民國66年開發D.P.C.程式控制 YCM-3MAH 銑床成功，正式列入生產。
- In 1977, D.P.C. Program Control YCM-3MAH Milling Machine was developed successfully and produced.
- 8 民國67年4月增資為 9,600 萬元，同時本公司產品榮獲經濟部商品檢驗局品管考核及輸出商品分等檢驗列為甲等，10月再增為 2 億元，擴建新廠及增購新設備。
- In April, 1978, capital was increased to NT\$ 96,000,000.-. At the same time, our products were evaluated by Bureau of Commodity Inspection & Quarantine under Ministry of Economic Affairs the First Class. In October, capital was increased again to NT\$ 200,000,000.- for expanding new factory building and increasing equipments.
- 9 民國69年本公司產品膝型立式、臥式銑床榮獲中央標準局<sup>正</sup>字標記，同時開發數值控制銑床YCM-MK5成功，並正式列入生產。
- In 1979, Our products of Horizontal Milling Machines and Vertical Milling Machines were granted to use the Mark "<sup>正</sup>", and N.C. Milling Machine YCM-MK5 was developed successfully and produced.
- 10 民國67年新廠第一期擴建完成，並進口歐美新式精密工作母機參加生產行列，同時推出無段變速銑床 YCM-1½VS, YCM-2GS 成功，並列入生產。
- In 1980, the first expanding project in our new factory building had been finished. Many newest European and American precision machine tools were imported and settled for production. At the same time, the infinitely variable speed turret milling machines Model YCM-1½VS and YCM-2GS were produced successfully.
- 11 民國70年新廠第二期擴建完成空調廠房，進口瑞士精密治具搪床及英國三次元檢驗機參加生產行列，同時開發 YCM-VMC-86A 床台型立式綜合加工中心機成功。電腦中心安裝 IBM 系統34之電腦，使管理科學化。
- In 1981, the second expanding project in air-conditioning shop was finished. We set up DIXI precision jig boring machine from Switzerland and Co-ordinate measuring machine from England, and developed Model YCM-VMC-86A bed type machining center successfully. By using IBM system 34 computer, Computer Center provided more scientific management.

12. 民國71年陸續推出YCM-20, YCM-60膝型綜合加工中心機，以及YCM-VMC-60A床台型綜合加工中心機成功，並正式列入生產。

In 1982, Model YCM-20 and YCM-60 knee type machining centers and Model YCM-VMC-60A bed type machining center have been developed and being produced successfully.

### III 本機(YCM-1½VS)特點：Features:

1. 立銑、斜銑、鑽孔、搪孔、刻模、模具搪孔等作業均可於此型式的銑床完成，頭部可左右45°旋轉。

► The model YCM-1½VS, turret milling machine is suitable for vertical milling, angular milling, drilling, boring, diesinking, jig boring etc.. The vertical head may be tilted to 45° from the vertical position as necessary.

2. YCM-1½VS主軸無段變速從60~4200r.p.m.能滿足不同材質和切削條件的需要。YCM-1½VS spindle speed is infinite variable from 60 to 4200 r.p.m. The model can fit the requirements of various materials and working conditions.

3. 主軸具有自動升降機構

The quill is provided with 3 rates of feed, which can be used for both up feed and down feed.

4. 主軸經平衡校正具最佳之靈敏性。

Counter balanced quill and spindle provides extreme sensitivity.

5. 具有昇降深度指示其精度達0.025mm(0.001")。

Micrometer depth stop graduated in 0.025 millimeters or 0.001 inches.

6. 機體結構強韌，滑動面寬大，穩定性特佳。

The machine has a very strong construction and extra wide slidway offering maximum rigidity and stability.

7. 附有工作台自動進給裝置。

An accessory of table power feed unit.

### IV 本書重要性 Purposes of this manual

機器在使用前，操作者應對機器之構造、各種操作方法、保養、潤滑要有深入的瞭解。本書即提供這方面的資料，請操作前詳讀本說明書，並遵照本書之說明，做正確之操作與保養，使機器能保持高精密度及延長使用壽命，而得以發揮最大工作效率。

We are greatly grateful to you for choosing our products, we are confident that our Milling Machines will satisfy your expectations for they have many outstanding features such as rigidity, high accuracy, versatility.....etc. In order to manifest thoroughly the performances of these Milling Machines, for it may be used for a long time without any trouble. We expect all operators and those who concerned with maintenance will READ THIS MANUAL CAREFULLY BEFORE STARTING THESE MACHINES for it describes operation, inspection, maintenance, lubrication and procedures of set up of these Machines. We hope all operators always consult this Manual, for these Machines long life.

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## IMPORTANT

Attention is drawn to the requirement of the Health and Safety at Work Act, should always be operated to conform with the appropriate regulations.

Other safety precautions are discussed in the American National Standards Institute Standard entitled Safety Requirements for the Construction, Care, and Use of Drilling, Milling, and Boring Machines (ANSI B11.8-1974).

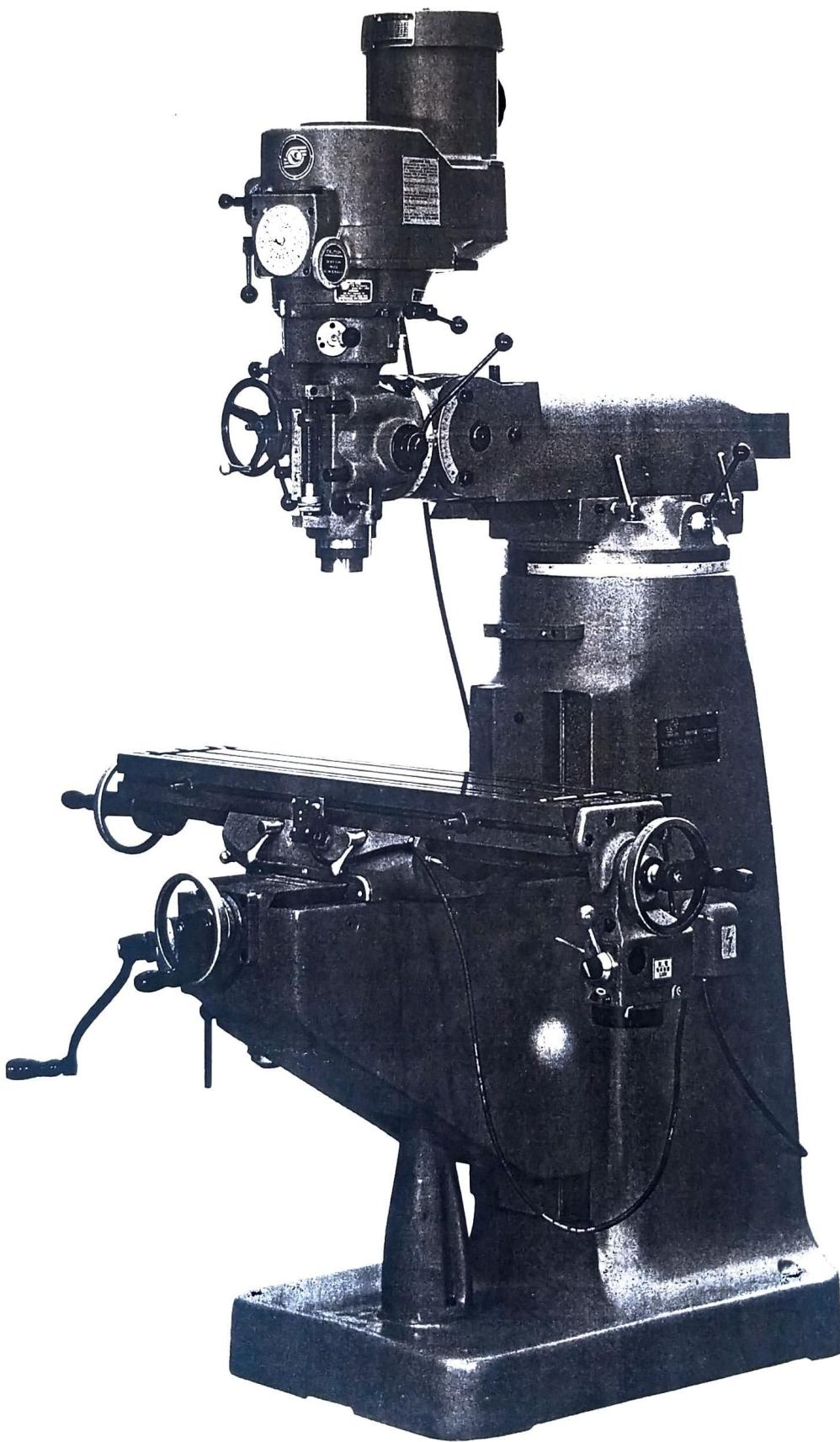
To assist machine users in designing point of operation safeguarding for their specific machine applications, the Occupational Safety and Health Administration has published a booklet entitled Concepts and Techniques of Machine Safeguarding (O.S.H.A. Publication Number 1910. 212).

General precautions for safe operation.

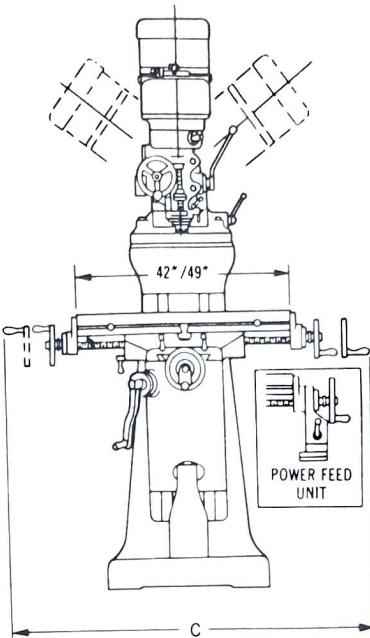
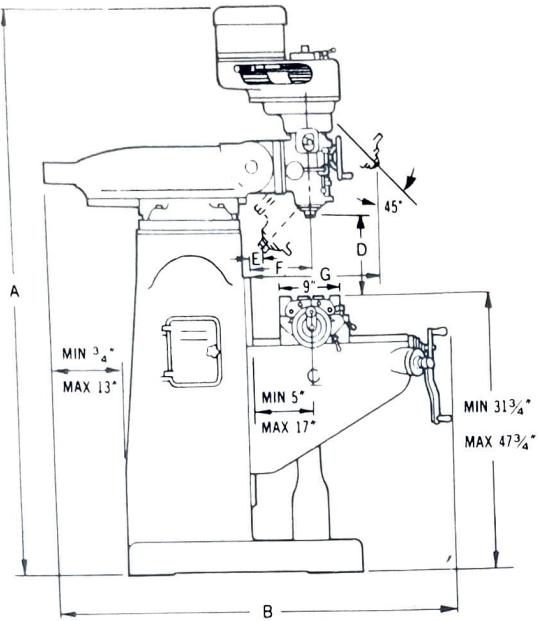
The general precautions to safety operate this machine are described below to supplement the operation technique and safety precautions explained by our engineer or dealer when the machine is installed. Our products are well designed to ensure the safety of all machine sections.

If the machine is used improperly, however, a serious accident may occur. The basic safety precautions are described below.

- (1) Safeguarding for protection at the point of operation can only be designed and constructed when the parameters of the particular operation have been determined. As a result, ANSI B11.8-1974.
  - (2) The machine should be operated by a trained operator familiar with the machine. Operators not familiar with the machine should be trained before operating the machine.
  - (3) The operator should not come close to, touch, or bring an object close to any rotation or moving part.
- \* Carefully read the manuals listed below to fully understand their contents.
- \* FOR SAFETY AND CORRECTION OPERATION, TO READ THIS MANUAL BEFORE OPERATING THIS MACHINE IS STRONGLY REQUESTED!



# 規格 Specification



## 規 格 SPECIFICATIONS

### 項 目 ITEM

|   | IN                             | MM         |
|---|--------------------------------|------------|
| 工作台長度 Table length . . . . .  | 42                             | 1067       |
| 工作台左右進給行程 Longitudinal travel(X) . . . . .                              | 29 $\frac{21}{64}$             | 745        |
| 工作台左右進給行程(附自動進給裝置) Longitudinal travel (with power feed unit) . . . . . | 26 $\frac{3}{16}$              | 665        |
| 工作台前後進給行程 Cross travel(Y) . . . . .                                     | 12                             | 305        |
| 工作台上下進給行程 Vertical travel of knee(Z) . . . . .                          | 16                             | 406        |
| A.全 高 A. Overall height . . . . .                                       | 80 $\frac{1}{2}$               | 2045       |
| B.全長(前後) B.Overall depth . . . . .                                      | 63 $\frac{3}{4}$               | 1620       |
| C.全寬(左右) C.Overall width . . . . .                                      | 87 $\frac{3}{4}$               | 2230       |
| D.工作台面至主軸端面距離(最小～最大) D. Spindle nose to table . . . . .                 | min 0<br>max 17 $\frac{9}{16}$ | 0<br>446   |
| E.頭部內傾45°與機身滑動面之距離(最小～最大) E. Head 45° inward . . . . .                  | min 0<br>max 11 $\frac{1}{4}$  | 0<br>285   |
| F.頭部正90°與機身滑動面之距離(最小～最大) F. Head 90° . . . . .                          | min 6 $\frac{3}{4}$<br>max 19  | 171<br>482 |
| G.頭部外仰45°與機身滑動面之距離(最小～最大) G. Head 45° outward . . . . .                 | min 9<br>max 21                | 228<br>533 |

Spindle speeds 80 135 210 325 660 1115 1750 2720 (R.P.M.) (60Hz)

Power feed per spindle revolution .0017" .0032" .0053" (.04 .08 .13mm)

Special Accessories: Coolant System

Power Longitudinal Feed

※We reserve the right to modify and improve our products.

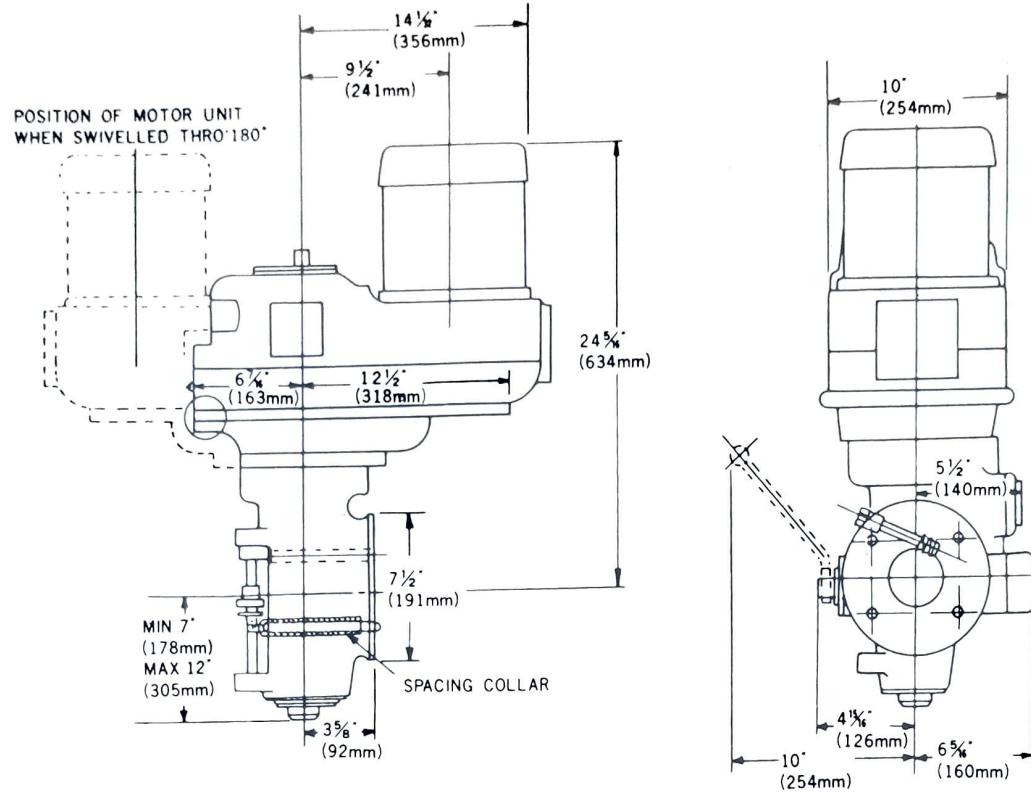
Spindle taper-R.8 or N.S.T. #30

Quill travel- 5" (127mm)

Motor- 2HP

Net weight: 2100 lbs (950 kgs)

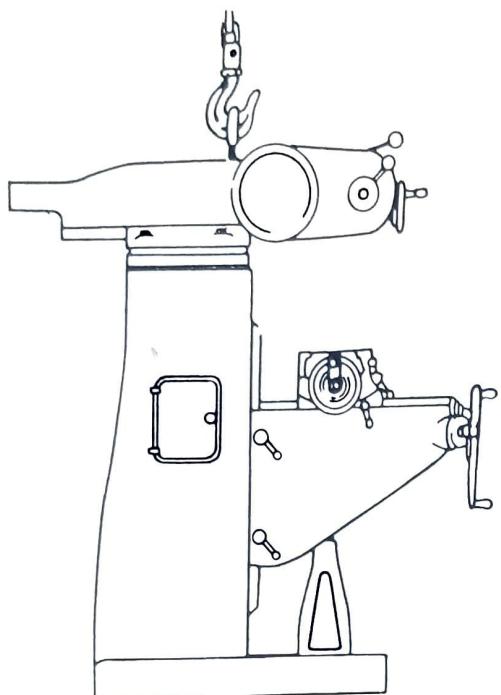
# 規格 Specification



## 頭部規格 Specification of head

|  |
|--|
| 主軸迴轉數(無段)(轉/每分) Spindle speeds R.P.M. (60 cycles)-60~4200 (Ininitely variable)     |
| 主軸一迴轉之自動進給量 Power feed per spindle revolution .0017" .0032" .0053" (.04 .08 .13mm) |
| 主軸端孔斜度 Spindle taper-R 8 or N. S. T. #30   |
| 主軸昇降套之進給行程 Quill travel-5" (127mm)   |
| 夾持範圍 Collet capacity $\frac{1}{8}$ " to $\frac{3}{4}$ " (3mm-19mm)                 |
| 馬達馬力數 H. P. of Motor - 2   |
| 重量 Weight-196 lbs. (89kgs)   |

# 安裝Installation



本機重量約為2200 lbs.(997kgs)

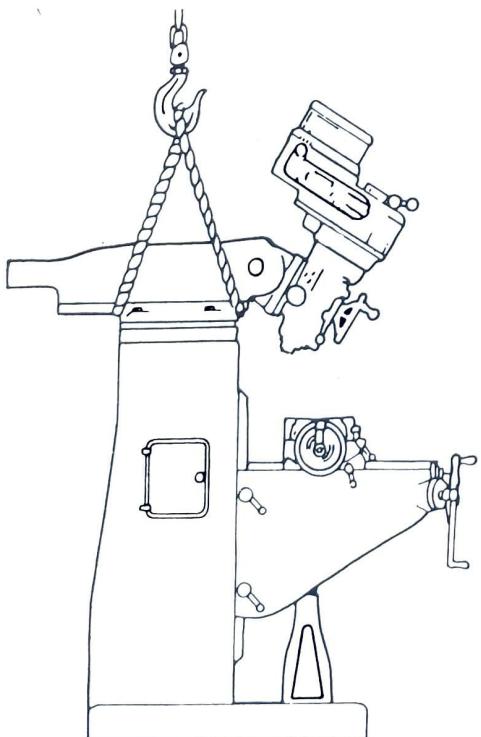
This machine approximately 2200  
lb (997kgs)

## 方法 1

如左圖所示：在吊起機器之前，先將頭部迴轉並固定，然後用  $\frac{5}{8}$ "-11UNC 環首螺栓將其確實鎖牢於伸出臂之螺紋孔內再行吊動。

## METHOD 1

Insert  $\frac{5}{8}$ "-11UNC Whitworth eye bolt in tapped hole. Ensure bolt is fully secured before lifting. It is advisable to swivel head before lifting machine



## 方法 2

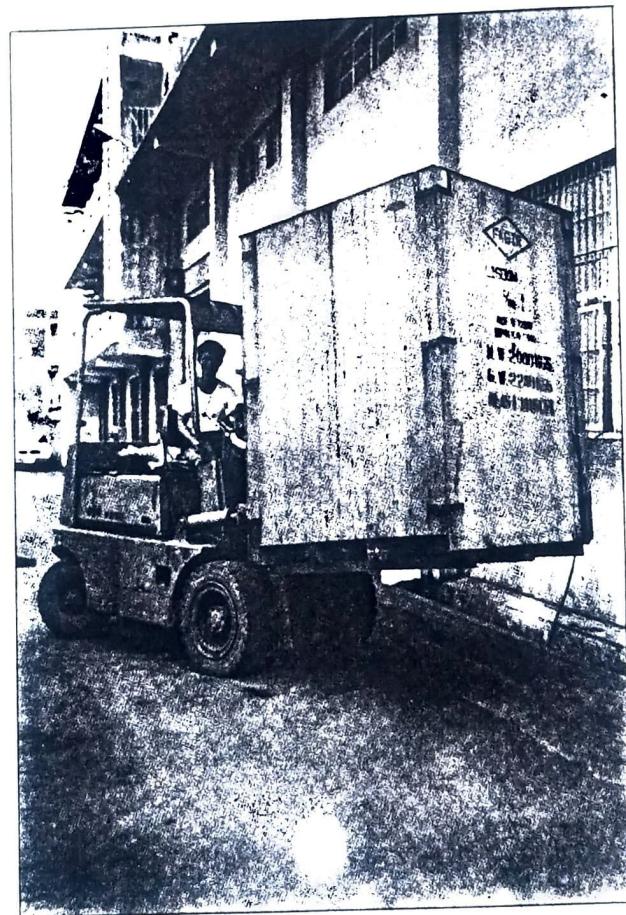
如左圖所示：在吊起機器之前，先將頭部前傾並固定，然後掛上適當的繩索，並在繩與機器接觸處墊上軟布墊，再行吊動。

## METHOD 2

Use rope sling as illustrated. Insert pads of soft cloth between rope and machined edges. It is advisable to tilt the head before lifting machine.

## 安裝 Installation

木箱搬運 Transfer package



當機器裝箱後，其搬運方法如圖示(利用堆高機)。

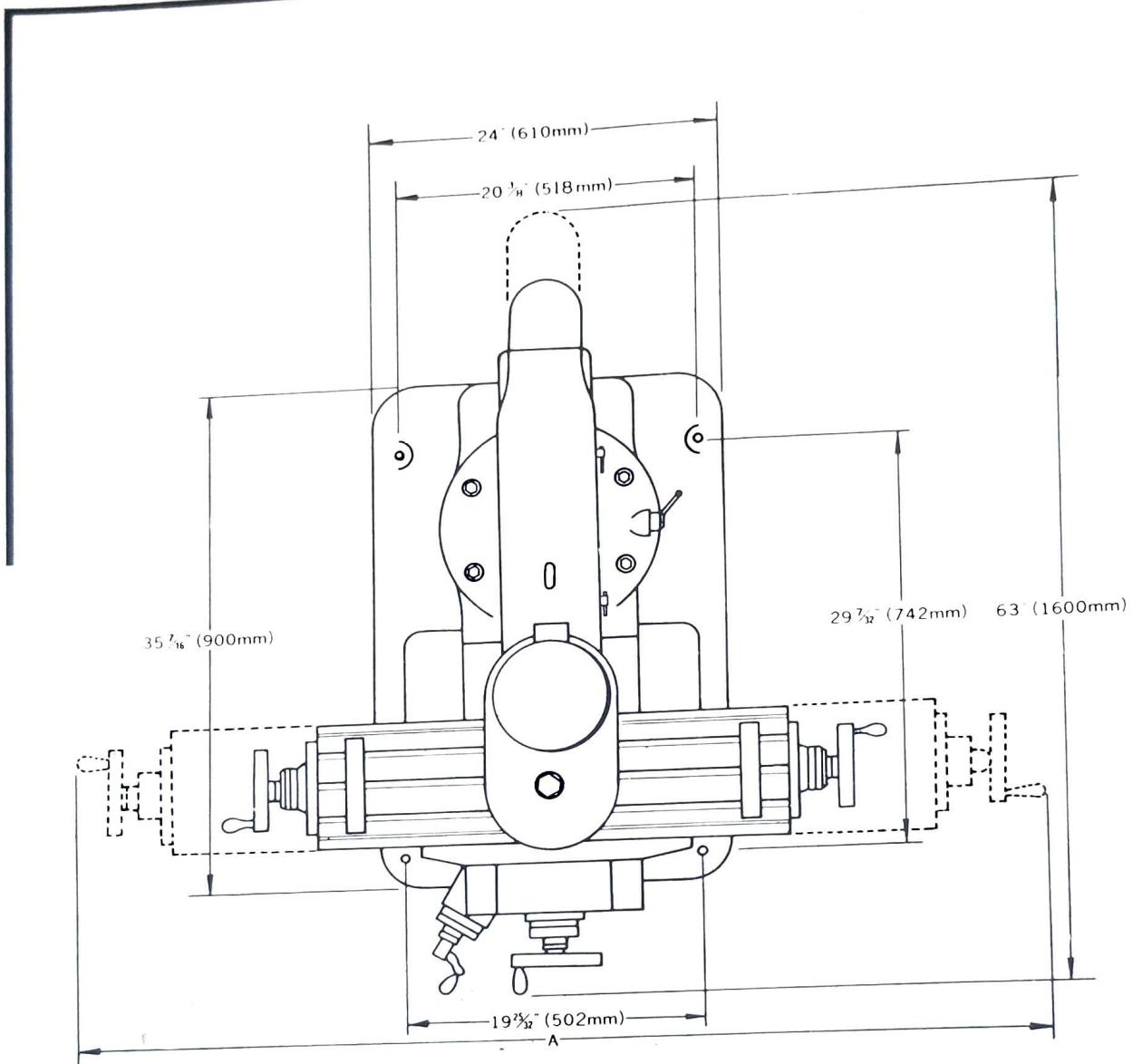
Using lift truck to transfer the package as picture.

機器之搬運 Handling

# 安裝Installation

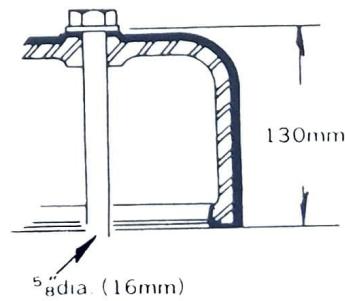
1. 移動任一滑道前先除去防锈劑。  
1. Remove rust preventative before moving any slideways.
2. 防護層最好以清潔刷沾石蠟油除去之，當護層軟化後以清潔  
破布擦乾淨。  
2. The coating is best removed by using paraffin applied  
with a clean brush. When the coating has softened, remove  
with clean rags.
3. 以油或黃油潤滑潤滑點，參考此說明書的潤滑部份。  
3. Oil or grease all lubrication points. Refer to the lubrication  
section of this manual P21. P22

安裝 Installation



'A' 尺寸 'A' DIMENSION

| 工作台長度<br>Table size | 機器長度<br>Plain machine |
|---------------------|-----------------------|
| 42"                 | 87 3/4" (2230mm)      |
| 49"                 | 94 3/4" (2408mm)      |

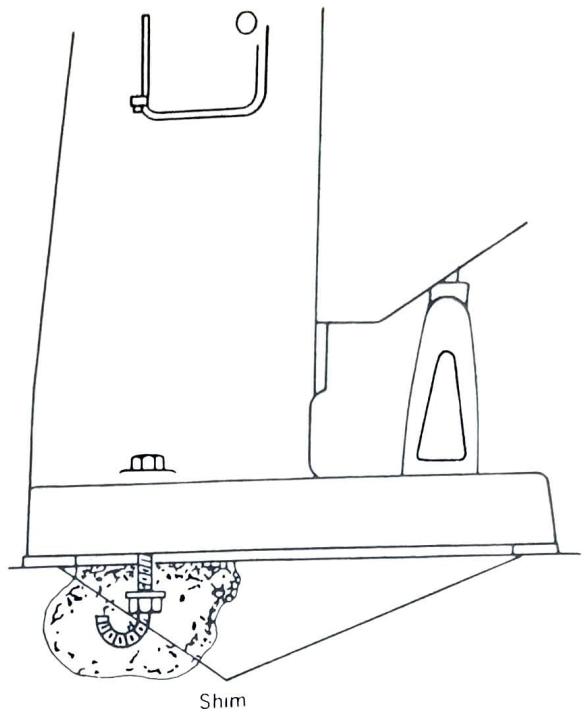


## 地 基 FOUNDATION

所有銑床應以螺栓鎖於一混凝土地基

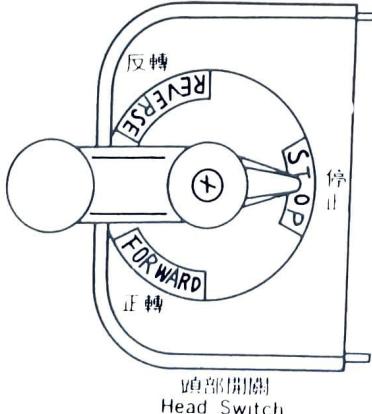
本機器應安裝於固體水平地板或防振墊片上以防止任何震動所產生的移動。

Ideally all milling machines should be bolted to a concrete foundation. The machines however should be placed on a solid level floor or anti-vibration pads to prevent any rocking movement.



## 電源供給 Power supply

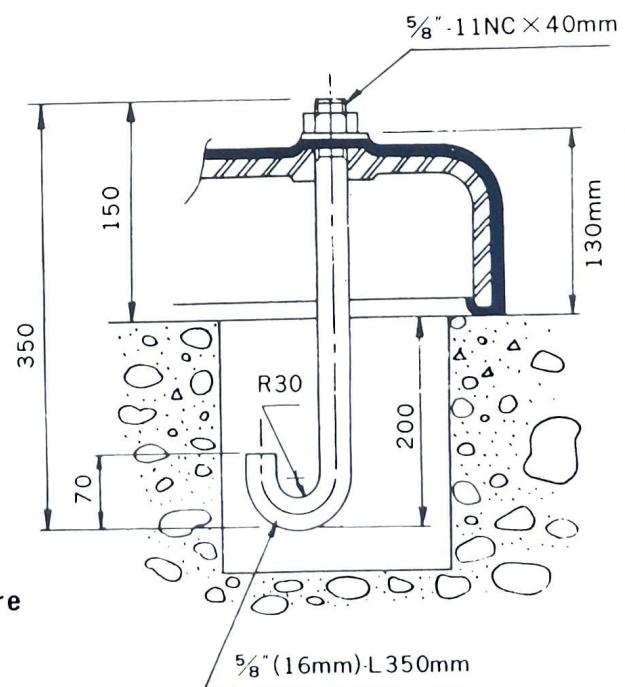
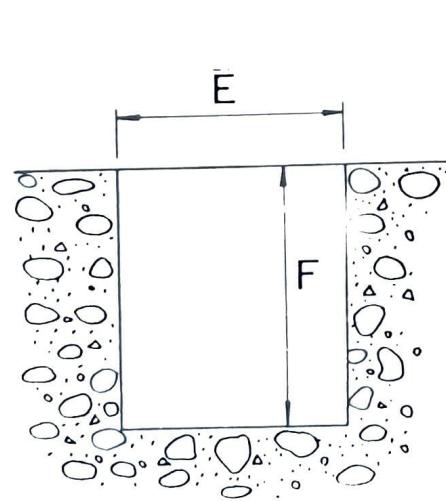
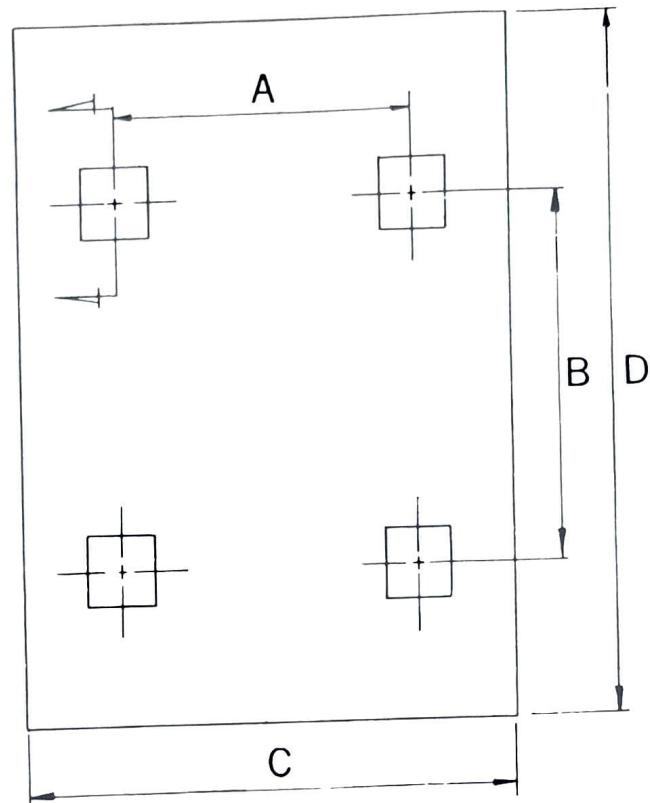
- a) 檢查馬達電源之電壓。
  - b) 確使電源連接符合當地安全規章。注意當未裝控制盤時，頭部開關無過負荷保護作用。
- a) Check motor voltages against supply.  
 b) Ensure that the supply is connected to comply with the local safety regulations. Note the Head switch has NO overload protection, when a control panel is not fitted.



# 安裝 Installation

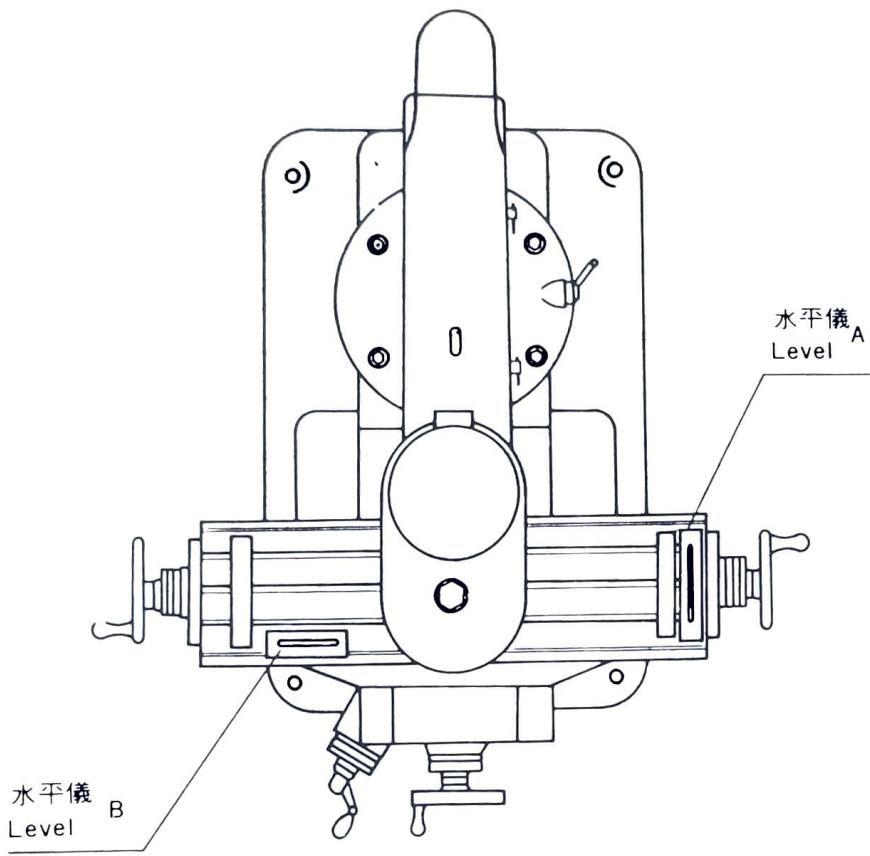
地基平面 Foundation plane

| 尺寸 |                              |
|----|------------------------------|
| A  | 518mm( $20\frac{3}{8}$ "")   |
| B  | 742mm( $24\frac{7}{32}$ "")  |
| C  | 1020mm( $40\frac{5}{16}$ "") |
| D  | 1242mm( $48\frac{7}{8}$ "")  |
| E  | 200mm( $7\frac{7}{8}$ "")    |
| F  | 250mm( $9\frac{27}{32}$ "")  |



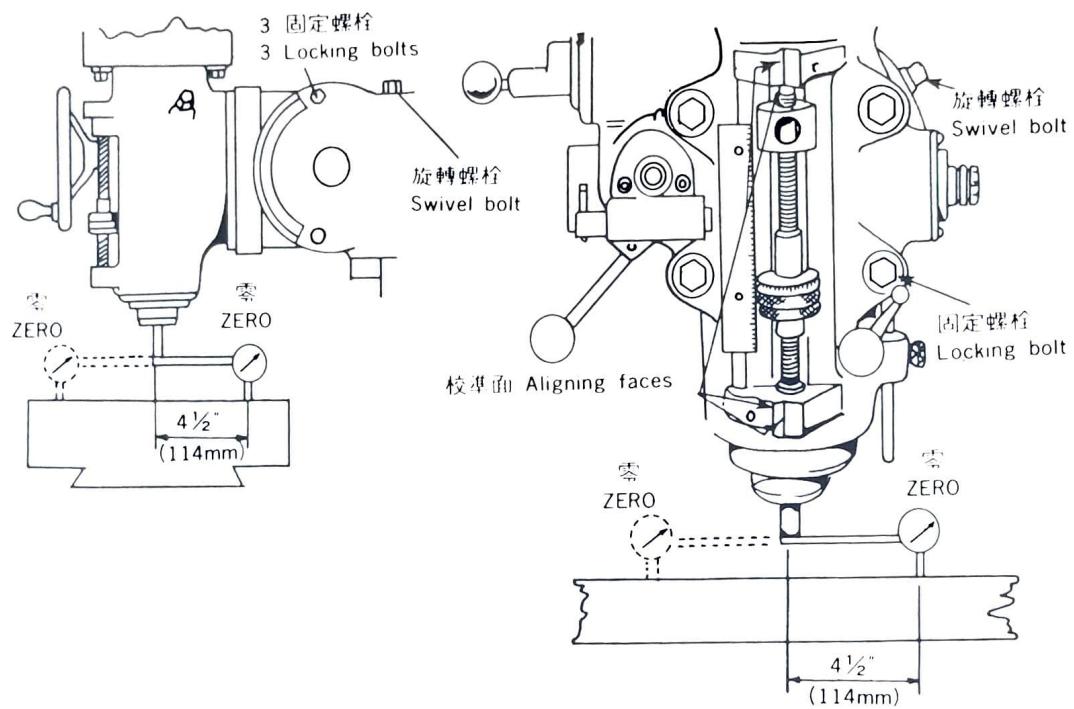
地基構築圖 Foundation Structure

## 地基 Foundation



1. 用水平儀放在工作台上，如上圖示。
2. 檢查水平儀 A.B 的水平，其允許值 $0.06\text{mm/M}$ .
3. 調整時用墊片墊入底床，調整畢鎖緊固定螺栓。

1. Putting levels on the table as illustrated.
2. Check the level A and B. The allowance approximate  $0.06\text{mm/M}$ .
3. Putting the shims under the bed if necessary, lock the anchor bolt.



機器安裝後要校正頭部與工作台的垂直度，有兩個方法：

I . 用一大90°角尺放在工作台上。以此校正頭部的校準面，如上圖示。

II . 用百分錶裝在主軸端面上，以4½"半徑之圓轉動，如上圖示。

校正後每個螺栓需鎖緊。

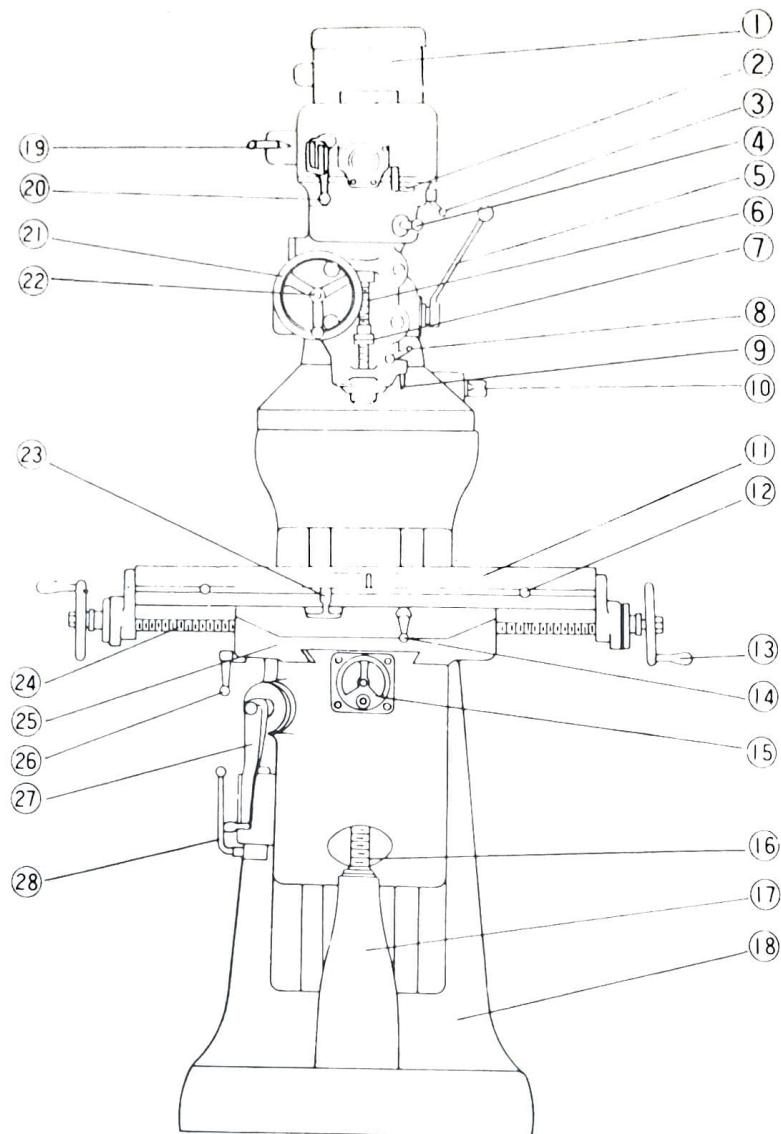
To set a milling head square to the table two methods are available:

I . Using a large 90° setsquare mounted on the table, align faces with square.

II . An indicator mounted in a spindle nose travelling in a 4½" radius.

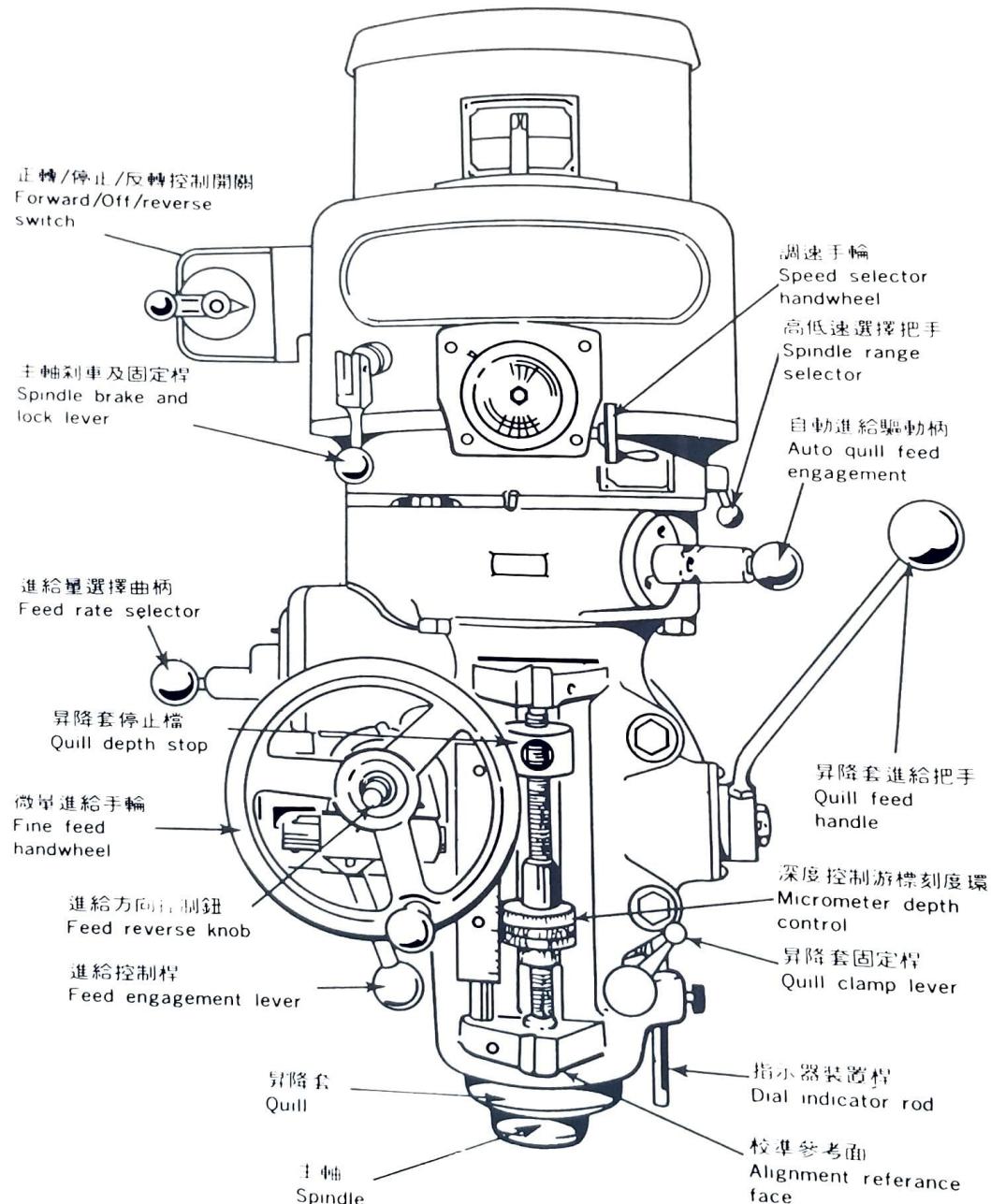
It is important that each axis is set separately and locked.

# 機器各部名稱Legend



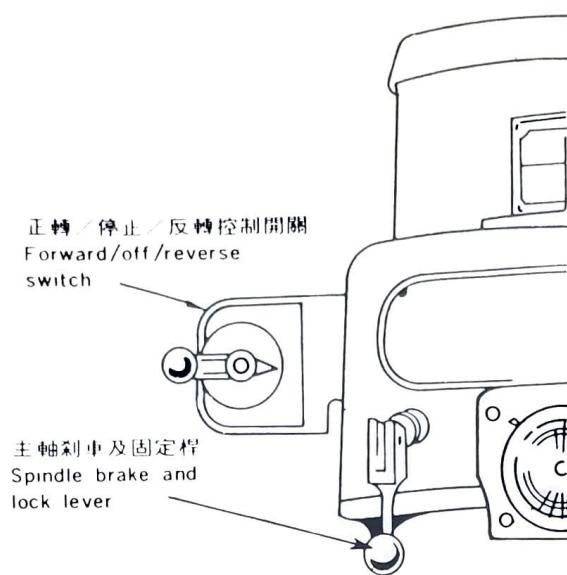
| 代號 | 名稱                                    | 編號 | 名稱                                    | 編號 |
|----|---------------------------------------|----|---------------------------------------|----|
| 1  | 馬達 Motor                              | 17 | 昇降螺程序 Elevating screw housing         |    |
| 2  | 調速手輪 Speed selector handwheel         | 18 | 機身 Basic                              |    |
| 3  | 高低速選擇把手 Spindle-range selector        | 19 | 控制開關 Control Switch                   |    |
| 4  | 自動進給裝動柄 Auto quill feed engagement    | 20 | 主軸剎車及固定桿 Spindle brake and lock lever |    |
| 5  | 昇降套進給把手 Quill feed handle             | 21 | 手動微量進給手輪 Finefeed handwheel           |    |
| 6  | 深度控制螺桿 Micrometer depth control screw | 22 | 進給方向控制扭 Feed reverse knob             |    |
| 7  | 深度控制游標刻度環 Micrometer depth control    | 23 | 橫向進給控制桿 Longitudinal feed control     |    |
| 8  | 昇降套固定桿 Quill clamp lever              | 24 | 橫向進給螺桿 Longitudinal feed screw        |    |
| 9  | 指小器裝置桿 Dial indicator rod             | 25 | 鞍座 Saddle                             |    |
| 10 | 伸出臂調整把手 Ram adjustment handle         | 26 | 鞍座固定把手 Saddle lock handle             |    |
| 11 | 工作台 Table                             | 27 | 昇降座進給把手 Elevating feed handle         |    |
| 12 | 工作台停止檔 Table stop                     | 28 | 給油把手 Oil feed lever                   |    |
| 13 | 橫向進給手輪 Longitudinal feed handwheel    | 29 |                                       |    |
| 14 | 工作台固定桿 Table lock lever               | 30 |                                       |    |
| 15 | 縱向進給手輪 Cross feed handwheel           | 31 |                                       |    |
| 16 | 昇降座進給螺桿 Elevating screw               | 32 |                                       |    |

# 機器各部名稱Legend



頭部 Head

# 操作 Operation



## 起動方法

- 1) 接通電源。
- 2) 扳動頭部左側的開關至  
所需之轉向(正轉或反轉)。

## Starting

- 1) Connect power.
- 2) Turn switch to required position  
(Forward or Reverse).

## 停車方法

- 1) 停止進行中的進給。
- 2) 關掉電源開關。
- 3) 扳動主軸剎車桿，直到主軸  
完全停止。

## Stopping

- 1) Stop feed.
- 2) Turn switch to "off".
- 3) Turn spindle brake lever to  
"brake" till spindle stop.

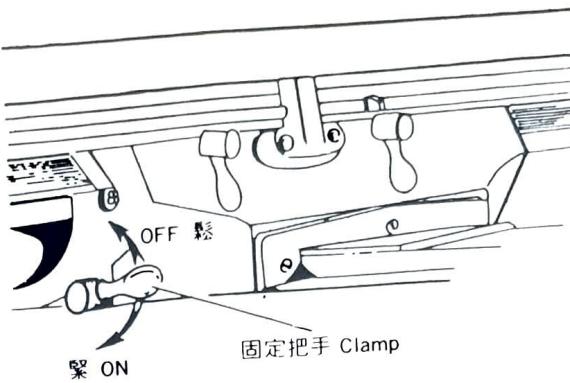
# 保養 Maintenance 操作 Operation

## 1. 固定鞍座與昇降座之滑動。

Clamping the saddle knee slide.

固定時，用適當的壓力即可，用力太大會使得工作台變形。

Moderate pressure is sufficient.  
Excess pressure will cause distortion and make the table stiff to wind.

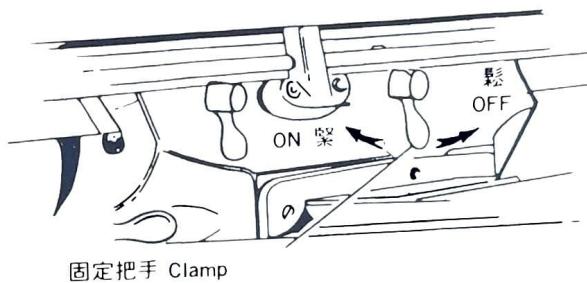


## 2. 固定工作台與鞍座間之滑動。

Clamping the table saddle slide.

固定時，用適當的壓力即可。

Moderate pressure is sufficient.

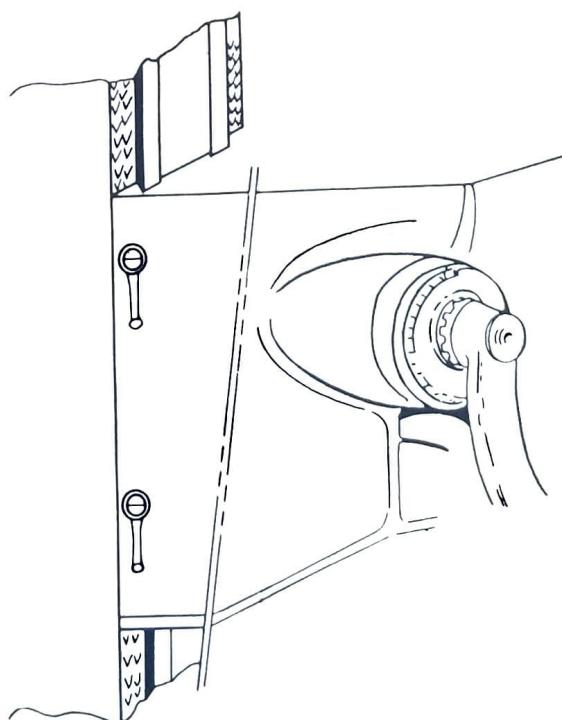


## 3. 固定昇降座與機身之滑動。

Clamping the knee column slide.

固定時，用適當的壓力即可。

Moderate pressure is sufficient.

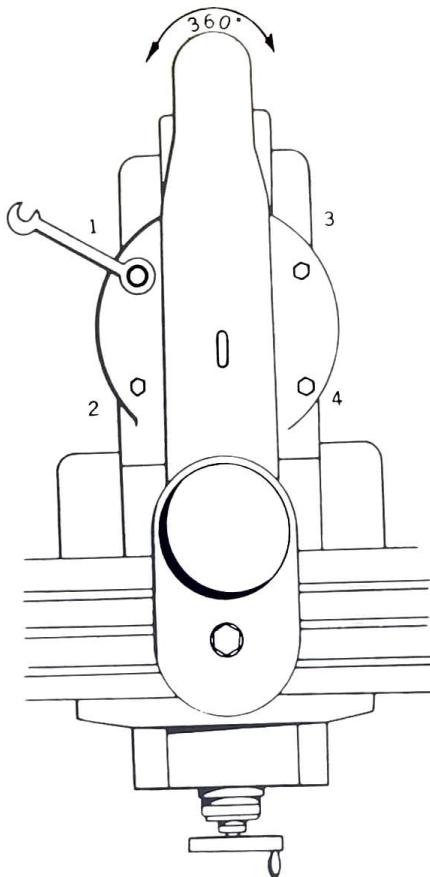


# 操作Operation

## 4. 轉塔之旋轉

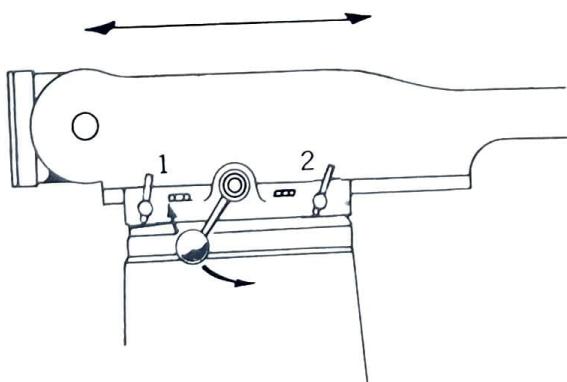
### SWIVEL TURRET

- a) 用固定板手，放鬆四個螺栓，
  - b) 旋轉至所需要的角度。
  - c) 鎖緊四個螺栓。
- a) Use spanner and unlock the 4 bolts.
- b) Index to the required setting.
- c) Lock the 4 bolts.



## 5. 伸出臂之移動

### MOVE RAM SLIDE



- a) 放鬆兩支固定把手桿。栓。
  - b) 轉動控制把手至所需要之位置。
  - c) 固定(先固定後面的把手桿)。
- a) Loosen two lock levers.
- b) Turn the handle to move the slide to the desired position.
- c) Tighten, tightening the rear lock lever first.

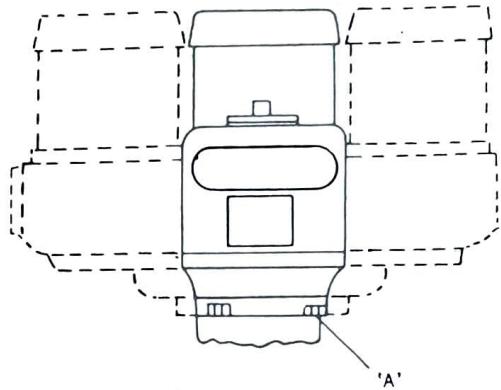
# 保養 Maintenance

## 操作 Operation

### 1. 皮帶箱旋轉

#### SWIVEL BELT HOUSING

- I. 放鬆三個固定螺帽'A' (完全地放鬆以避免束縛力存在)。
  - II. 旋轉至所需要之角度。
  - III. 鎖緊三個固定螺帽，最後鎖緊前轉動主軸使栓槽正確對準。
- I. Slacken 3 Locking Nuts 'A'  
(Retain sufficiently to stop binding).
- II. Swivel to required angular setting.
- III. Tighten 3 Locking Nuts;  
before finally securing, run spindle, to give correct spline alignment.

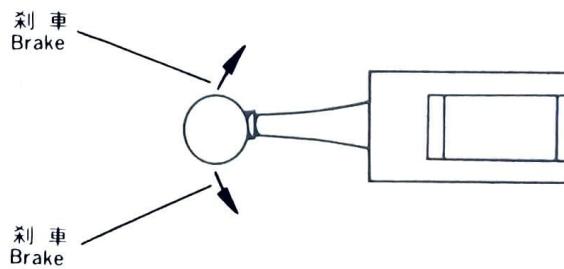


註：鎖固定螺帽時，若三個不均勻會使昇降套產生剛性變化，而造成昇降套內栓槽不正，使進給困難，此現象在操作昇降套進給時可感覺出來。

**NOTE:** Incorrect spline alignment can be caused by unequal tightening of the locking nuts 'A' causing varying stiffness of the quill feed which can be felt through the sensitive feed handle.

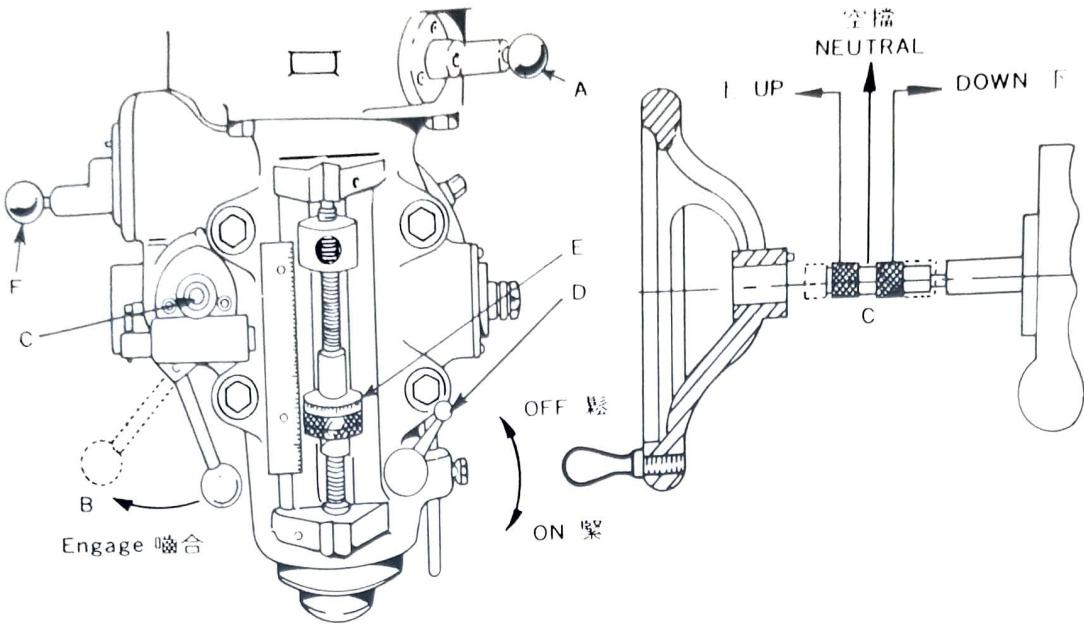
### 2. 主軸剎車

#### SPINDLE BRAKE



# 操作 Operation

## 3. 昇降套進給 3. QUILL FEED



### a) 手動微量進給操作步驟

- I. 鬆開自動進給驅動柄'A'
- II. 將'C'置於中央(空擋)位置
- III. 板動進給控制桿'B'使離合器嚙合
- IV. 此時昇降套之進給即可用手輪來控制

### a) FINE HAND FEED

- I. Disengage Auto Quill Feed 'A'
- II. Locate 'C' in mid (neutral) position.
- III. Engage Feed Trip Lever 'B'
- IV. The Quill is now under handwheel control.

### b) 自動進給操作步驟

最大鈑孔徑為 $\frac{3}{8}$ " (9.5mm)

(材料：銅)

- I. 放鬆昇降套固定桿'D'
- II. 調整游標指示環'E'至所需要之深度
- III. 板動自動進給驅動柄'A'
- (馬達要停止)
- IV. 由進給量選擇柄'F'選擇進給量
- V. 由進給方向控制鈕'C'選定進給方向
- VI. 板動進給控制桿'B'
- VII. 這時昇降套即可行自動進給

**注意：**(當主軸速度超過3000轉／每分鐘時勿使用自動進給)

### b) AUTOMATIC FEED

Maximum loading  $\frac{3}{8}$ " (9.5mm) dia. drill in steel.

- I. Ensure quill lock is off 'D'.
- II. Set micrometer dial to required depth 'E'.
- III. Engage auto quill feed 'A'. (when motor has stopped).
- IV. Select feed rate 'F'.
- V. Select feed direction 'C'.
- VI. Engage feed trip lever 'B'.
- VII. The Quill is now automatic feed.

**NOTE:** (Do not engage quill feed 'A' over 3,000 R.P.M.)

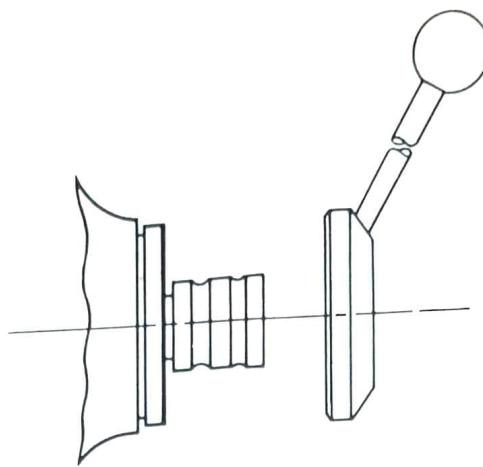
# 保養 Maintenance

## 操作 Operation

### 4. 昇降套快速手動進給 4. QUILL SENSITIVE HAND FEED

- I. 置手柄於輪轂上。
- II. 選擇適當之位置。
- III. 推動手柄直至定位銷喚合。

- I. Place the handle on the boss.
- II. Select the most suitable position.
- III. Push home until the locating pin engages.



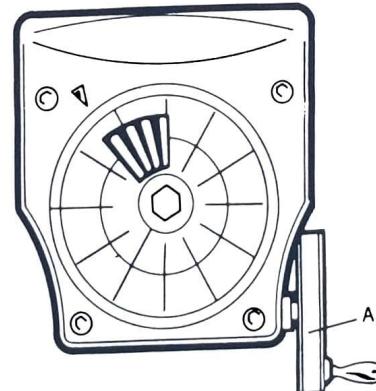
### 5. 主軸速度 (在主軸運轉時才可變速) 5. SPINDLE SPEED (Change only when spindle is running).

#### a) 範圍內之速度

- I. 啓動主軸。
- II. 轉動手輪'A'至選定所需速度。

#### a) Change Speed Within Range

- I. Start spindle.
- II. Turn handwheel 'A' to select required speed.  
change only when spindle is running.



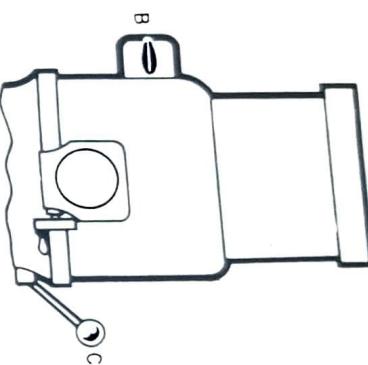
主軸停止時不可變速  
DO NOT CHANGE SPEED  
WHILST SPINDLE HAS STOPPED

# 保養 Maintenance

## 操作 Operation

- b) 變更速度 Change Range.

- I. 從直驅變至後列齒輪驅動：
  - I. 開關 'B' 扭至 off。
  - II. 移動桿 'C' 經過空擋至低速擋。  
(這時主軸轉向相反)
  - III. 開關 'B' 扭至低速。



主軸在運轉中勿變換把手'C'之位置!  
DO NOT CHANGE RANGE WHILE  
THE SPINDLE IS RUNNING

### 1. FROM DIRECT TO BACK GEAR DRIVE:

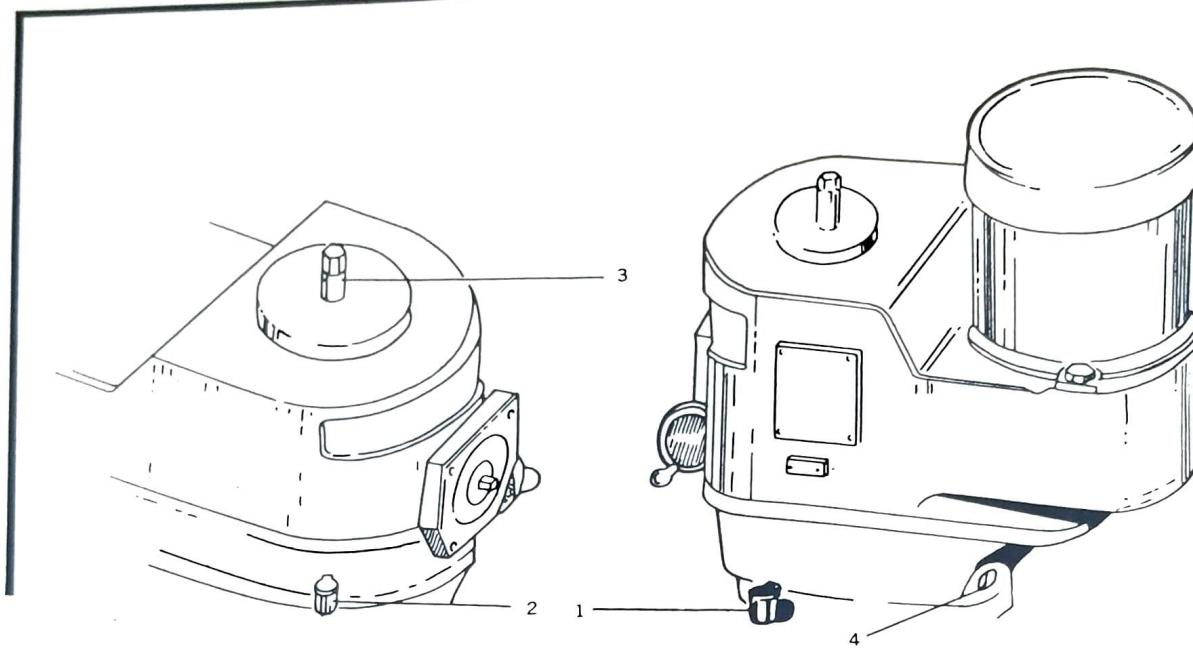
- I. Switch 'B' to OFF.
- II. Move lever 'C' through neutral to LOW. (This reverses the spindle rotation).
- III. Switch 'B' to LOW.

### 2. 從後列齒輪變至直驅動：

- I. 開關 'B' 扭至 off。
- II. 移動桿 'C' 經過空擋至高速擋。
- III. 用手轉動主軸直至感覺離合器 啟合為止。
- IV. 開關 'B' 扭至高速。

### 2. FROM BACK GEAR TO DIRECT DRIVE:

- I. Switch 'B' to OFF
- II. Move lever 'C' through neutral to HIGH.
- III. Rotate spindle by hand until the clutches are felt to engage.
- IV. Switch 'B' to HIGH.

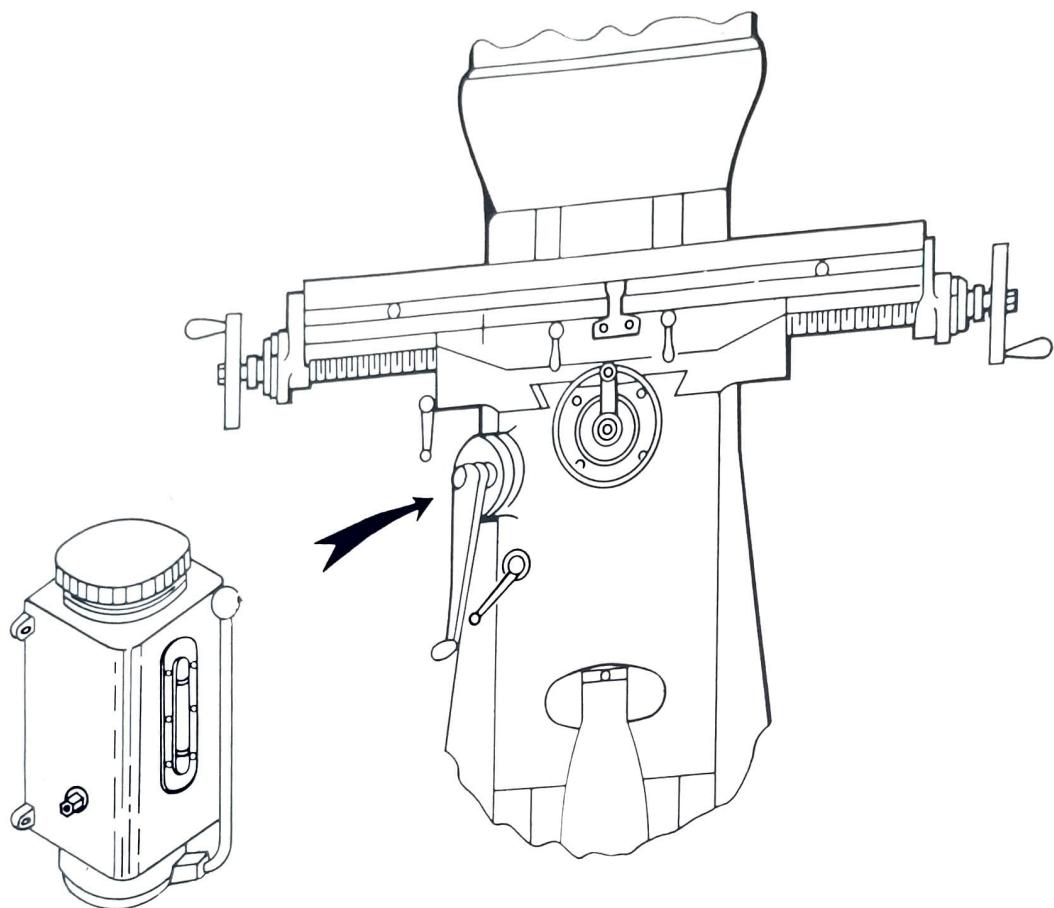


| 週期<br>FREQUENCY  | 潤滑<br>LUBRICATE  | 潤滑劑<br>LUBRICANT  | 數量<br>QUANTITY      | 潤滑代號<br>LUB. AT. |
|--|--|---|---------------------|------------------|
| 每天兩次<br>Twice Daily                                      | 昇降套軸承<br>Quill bearings                                | 中國石油 R53<br>Vactra Heavy Medium<br>S.A.E. 10 or 10W Light | 5-10滴<br>5-10 drops | 1                |
| 每天兩次<br>(當操作進給時)<br>Twice Daily<br>(When feed is in use) | 主軸向下進給<br>Spindle Down Feed                            | 中國石油 R53<br>Vactra Heavy Medium<br>S.A.E. 10 or 10W Light | 加滿<br>Top-Up        | 2                |
| 每週一次<br>Weekly   | 拉桿栓軸(將昇降套降下 2")<br>Drawbar splines(move quill down 2") | 中國石油 R53<br>Vactra Heavy Medium<br>S.A.E. 10 or 10W Light | 5 滴<br>5 drops      | 3                |

註：錯誤潤滑 1 “昇降套軸承” 會使昇降套太緊且使昇降套部份束縛於座內。

NOTE: Failure to lubricate "Quill bearings" at 1 can result in tight quills and partial seizure of quill in housing.

| 週期<br>FREQUENCY  | 潤滑<br>LUBRICATE   | 潤滑劑<br>LUBRICANT | 數量<br>QUANTITY                           | 潤滑代號<br>LUBRICATE AT.  |
|--|-------------------|------------------|--|--|
| 每二個月一次<br>(正常使用下)<br>Every 2 months<br>(of normal use) | 後列齒輪<br>Back gear | 黃油<br>Grease     | 相當於一茶匙<br>Equivalent of<br>1 teaspoonful | 4. 註：加黃油前將齒輪桿退向 'LO' 處並保持主軸停止。<br>NOTE: Before greasing put gear lever back to 'LO' & keep spindle stationary. |



| 週期<br>FREQUENCY                           | 潤滑<br>LUBERICATE              | 潤滑劑<br>LUBERICANT  | 數量<br>QUANTITY              |
|---|-------------------------------|--|-----------------------------|
| 每天注滿潤滑泵<br>Centralized Lub.<br>Pump Daily | 導螺桿<br>Lead Screw             | Shell Cornea Oil 41<br>MOBIL X2<br>Socony Gargoyle Vactra No.2 | 一分浦<br>One Pump             |
| 每週檢查油面高<br>Check Level<br>Weekly          | 鞍座 工作台滑道<br>Saddle-Table Ways | "Sunoco" Waylube #80<br>MOBIL X2                               | 一分浦<br>One Pump             |
|   | 鞍座 升降座滑道<br>Saddle-Knee Ways  | "Sunoco" Waylube #80<br>MOBIL X2                               | 一分浦<br>One Pump             |
|   | 升降座機身滑道<br>Knee Colum Ways    | "Sunoco" Waylube #80<br>MOBIL X2                               | 一分浦<br>One Pump             |
| 每週兩次<br>Twice Weekly                      | 升降螺桿<br>Elevating Screw       | Shell Cornea Oil 41<br>MOBIL X2<br>Socony Gargoyle Vactra No.2 | 油槍打 5 次<br>5 Shots(Oil Gun) |

# 保養 Maintenance

## 預防保養 Preventive Maintenance

為了確保機器之精密與增加使用壽命，我們提供下列預防保養表給操作者。  
For securing the accuracy and life of the machine, we offer the following  
preventive maintenance charts.

| 週期<br>Frequency  | 項目 Item  |
|------------------|--|
| 每 日<br>Daily     | <ol style="list-style-type: none"><li>操作前必須依照潤滑說明把各部位加油。<br/>It is necessary to oil each lubrication point before operation.</li><li>檢查手動油泵的油量，不足須補充。<br/>Check the level of the oil lubricator and fill if necessary.</li><li>操作完畢，所有固定桿應放鬆，工作台面須清除乾淨並潤滑少許的油，以保護工作台面。<br/>It is necessary to release the clamps, clean and lubricate the table after operation.</li></ol> |
| 每 月<br>Monthly   | <ol style="list-style-type: none"><li>檢查各部調整楔之鬆緊情形，並作適當的調整。<br/>Check all the gib and adjust if necessary.</li><li>檢查所有螺桿與螺帽間之間隙，並作適當的調整。<br/>Check all the backlash between screws and nuts, and adjust if necessary.</li></ol>   |
| 每 季<br>Quarterly | <ol style="list-style-type: none"><li>根據精度檢查表核對各部精度，(看本說明書39頁到41頁並作調整)。<br/>Check and adjust the machine accuracy.<br/>(manual P. 39 to P. 41).</li></ol>  |

敝公司真誠的向您建議：

當您欲保養機械前，為了您的安全，  
請關掉機器之電源，且為了迅速之保  
養請閱讀此手冊之相關部份。

May We Suggest That.

Before attempting any maintenance  
in the interests of safety you isolate  
the machine electrically and in the  
interests of efficiency you read the  
relevant section of this manual.

當訂購更換零件時請說明：

- 機器系列號碼。  
註於機身左側門之上方。
- 頭部系列號碼。  
於皮帶箱前方。
- 項目號碼。
- 零件號碼。
- 數量。
- 概述。

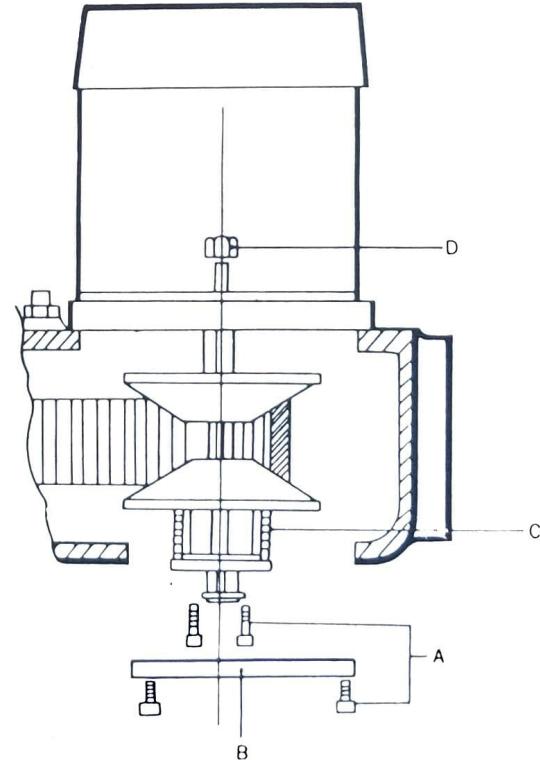
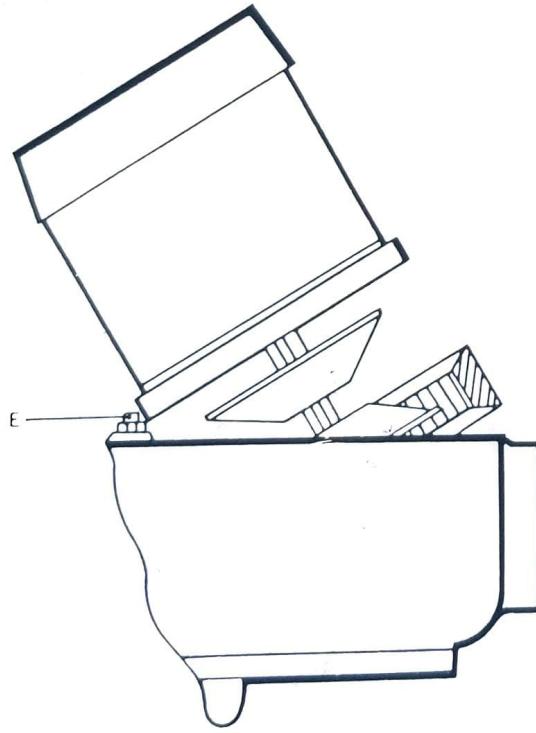
When ordering replacement parts  
please quote:

- THE MACHINE SERIAL No.  
situated above the door on the  
left hand side of the column.
- THE HEAD SERIAL No.  
found on the front of the Belt  
Housing.
- ITEM NUMBER.
- PART NUMBER.
- QUANTITY.
- DESCRIPTION.

## 馬達拆卸步驟 MOTOR REMOVAL

1. 轉動頭部調整至最低速。
2. 關掉電源。
3. 取下三個螺絲'A'及蓋'B'。
4. 用兩個螺絲'A'壓住彈簧'C'。
5. 轉動變速器至最高速。
6. 從皮帶箱取下開關。
7. 取下兩個固定螺帽'D'。
8. 提起馬達，將馬達箱放在螺栓'E'上。
9. 放鬆皮帶，並繞過驅動盤，即可取下馬達。

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

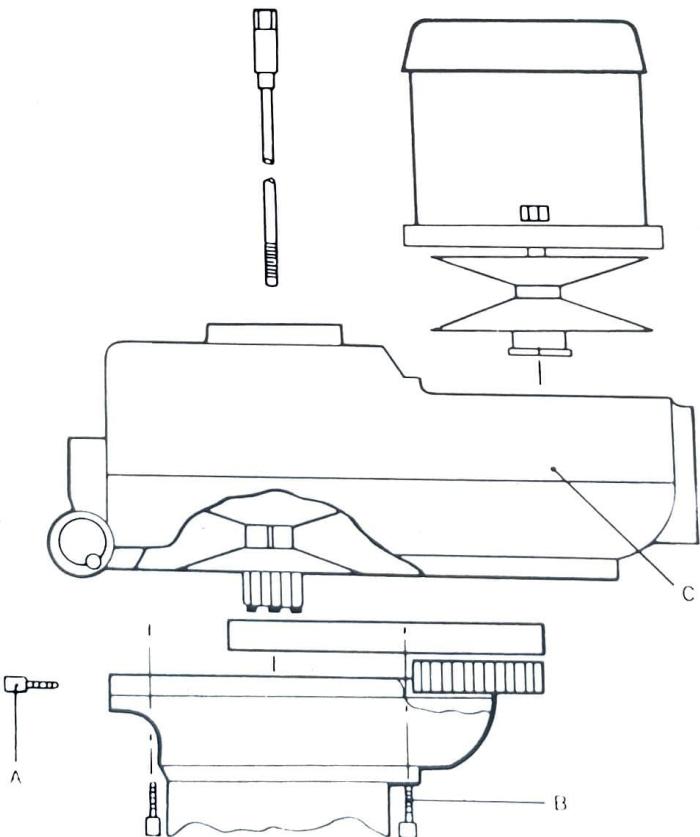


頭部頂座 Head top housing

齒型皮帶更換法  
TIMING BELT REPLACEMENT

1. 如前頁所述取下馬達
2. 昇降套降至最低位置。
3. 從變速箱下方取出兩個螺絲'A'
4. 取下四個螺絲'B'。
5. 退出連結銷，使上部份'C'分離。
6. 此時即可更換皮帶。

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

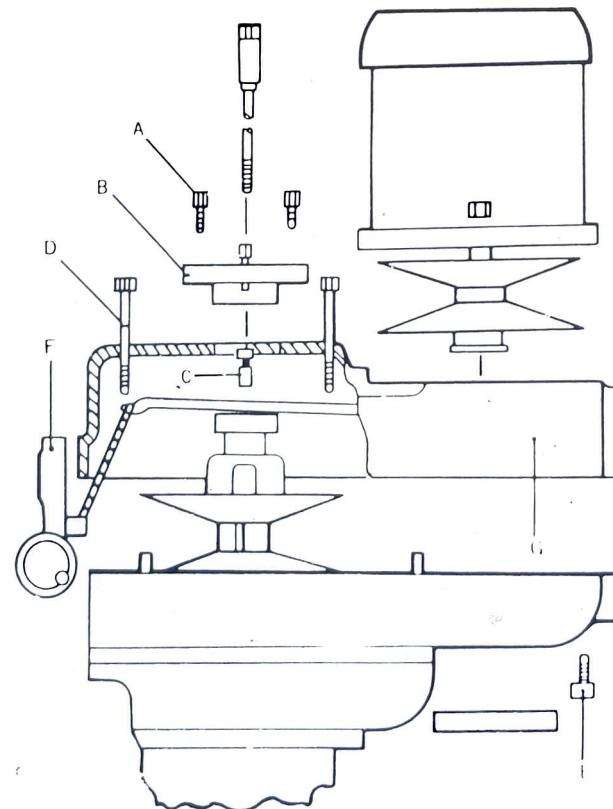


頭部頂座 Head top housing

## 驅動皮帶更換法 DRIVE BELT REPLACEMENT

1. 如25頁所述取下馬達。
2. 取下三個螺絲'A'，鎖進附近之牙孔，退出軸承座'B'。
3. 取下兩個螺絲及襯套'C'。
4. 取出四個螺絲'D'與一個螺絲'E'。
5. 取下四個固定變速器之螺絲'F'。
6. 退出連結銷，並移開頂座'G'。
7. 此時即可更換皮帶。

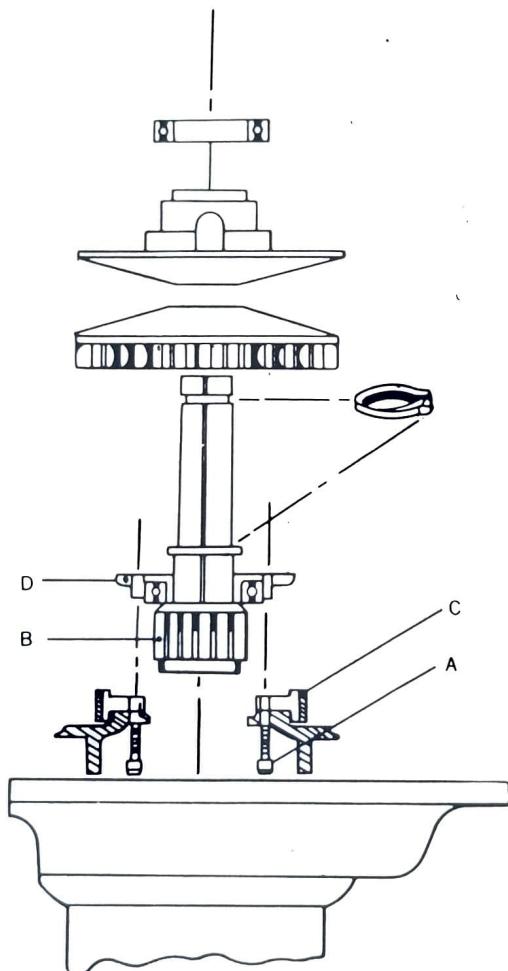
1. Remove the motor as described on page 25.
2. Remove the three screws 'A'; insert into the adjacent tapped holes and withdraw bearing housing 'B'.
3. Remove the two screws and the bushes 'C'.
4. Remove four screws 'D' and one screw 'E'.
5. Remove four screws securing the speed changer 'F'.
6. Remove top housing 'G'; tap to clear the dowels.
7. Replace the belt.



頭部頂座 Head top housing

## 剎車環更換步驟 BRAKE SHOE REPLACEMENT

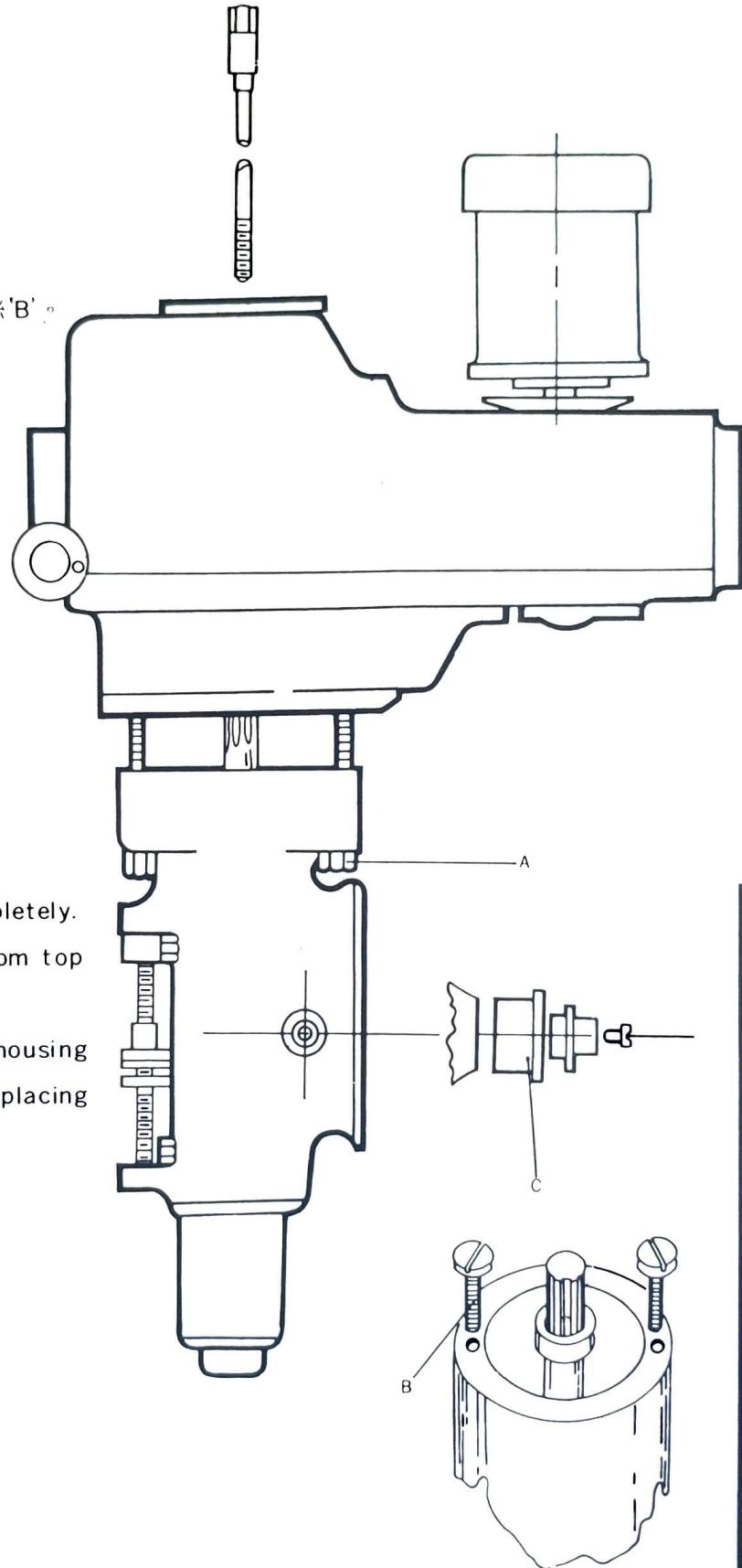
1. 拆下頂部。
  2. 取下兩個螺絲'A'。
  3. 取出離合器轂組件'B'和'D'。
  4. 更換剎車環'C'。
1. Remove the top section.
  2. Remove the two screws 'A'.
  3. Remove the clutch hub assembly 'B' & 'D'.
  4. Replace the brake shoes 'C'.



昇降套拆卸法 QUILL REMOVAL

1. 關掉電源。
2. 拆下馬達。
3. 取出拉桿。
4. 昇降套降至最低。
5. 取下三個螺帽'A'。
6. 頂部完全地拆出。
7. 取出昇降套頂部兩個螺絲'B'。
8. 拆下彈簧座'C'。

參看 31 頁更換彈簧說明。



9. 取下螺絲'D'與球形槓桿'E'。

10. 取下C形環'F'、螺絲'G'及臂'H'。

11. 將螺桿軸'J'旋出微動螺帽，並取下。

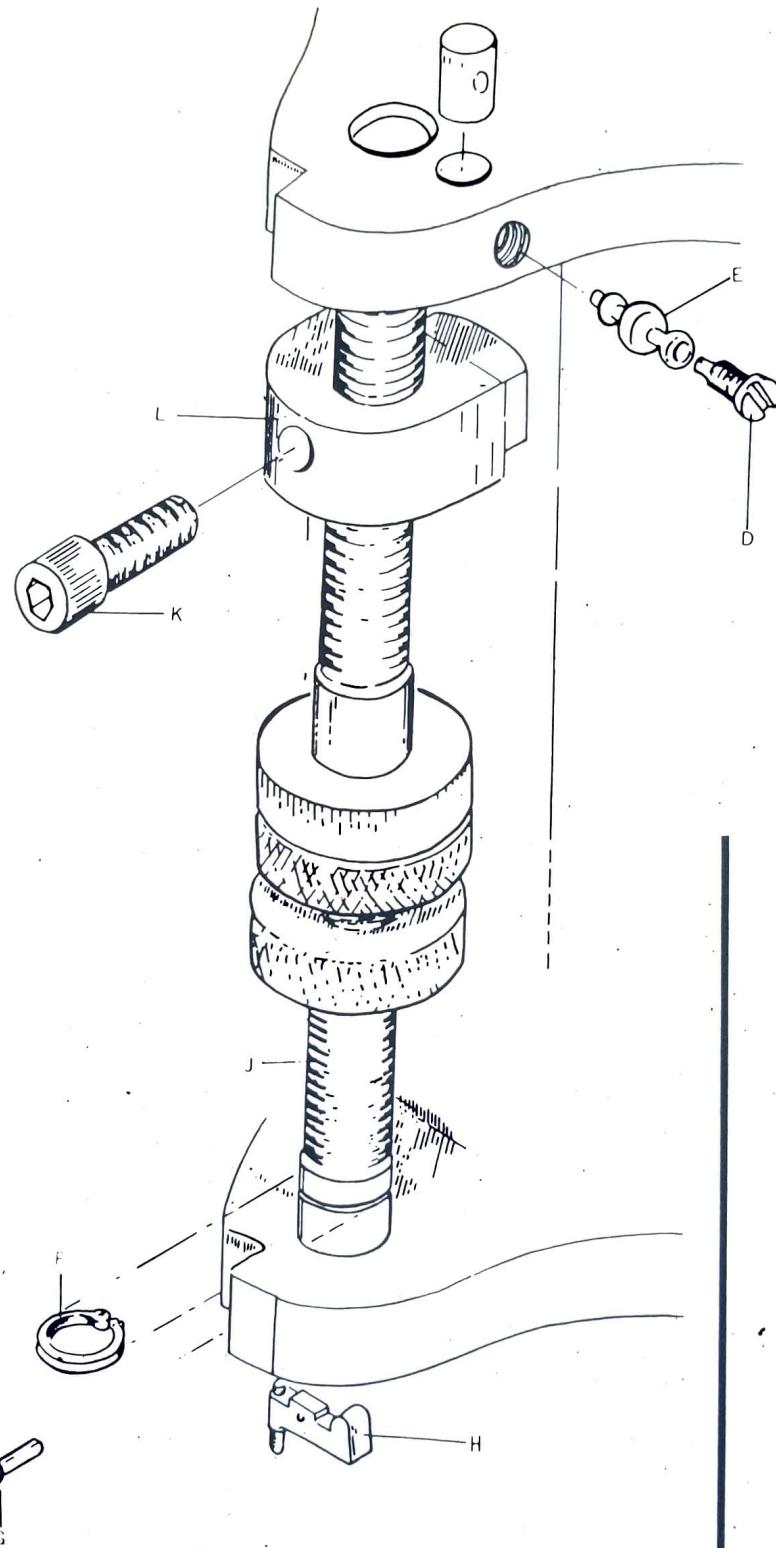
12. 取下螺絲'K'與停止板'L'。

13. 拆下昇降套。

14. 清潔所有表面，加油，並重新組合。

15. 檢查進給控制桿是否正確，看32頁之說明。

組合後栓槽之校準參看17  
頁說明。



9. Remove screw 'D' and ball reverse lever 'E'.

10. Remove circlip 'F', screw 'G' and arm 'H'.

11. Thread shaft 'J' through micro nuts and remove.

12. Remove screw 'K' and stop 'L'.

13. Remove quill.

14. Clean all areas, oil liberal-  
ly and reassemble.

15. Check correct operation  
of feed trip linkage.

See instruction on page

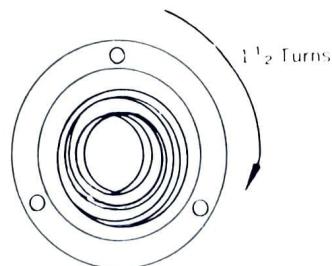
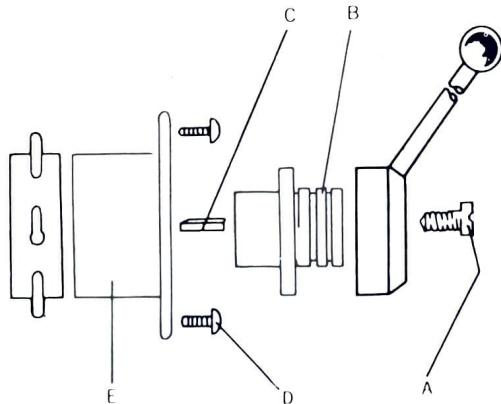
32.

Re-assemble of spline  
alignment. See page 17.

## 回覆彈簧更換法 BALANCE SPRING REPLACEMENT

1. 移動昇降套於頂部，並固定住。
2. 拆下螺絲'A'，轂'B'及鍵'C'。
3. 拆下螺絲'D'，慢慢轉動座'E'使彈簧張力得以釋放。
4. 將彈簧之一端從小齒輪軸的釘上提出。
5. 逆時針轉動座'E'（從頭部鑄件來看）。
6. 從座內取出彈簧並更換之。
7. 重新將彈簧組合於座之鑄件上，並應順時針轉動座，直到彈簧進入小齒輪軸之釘上。

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

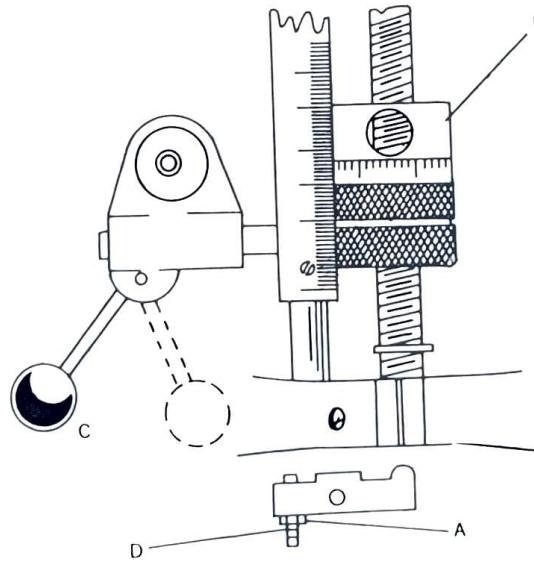


# 保養 Maintenance

## 進給控制調整法 FEED TRIP ADJUSTMENT

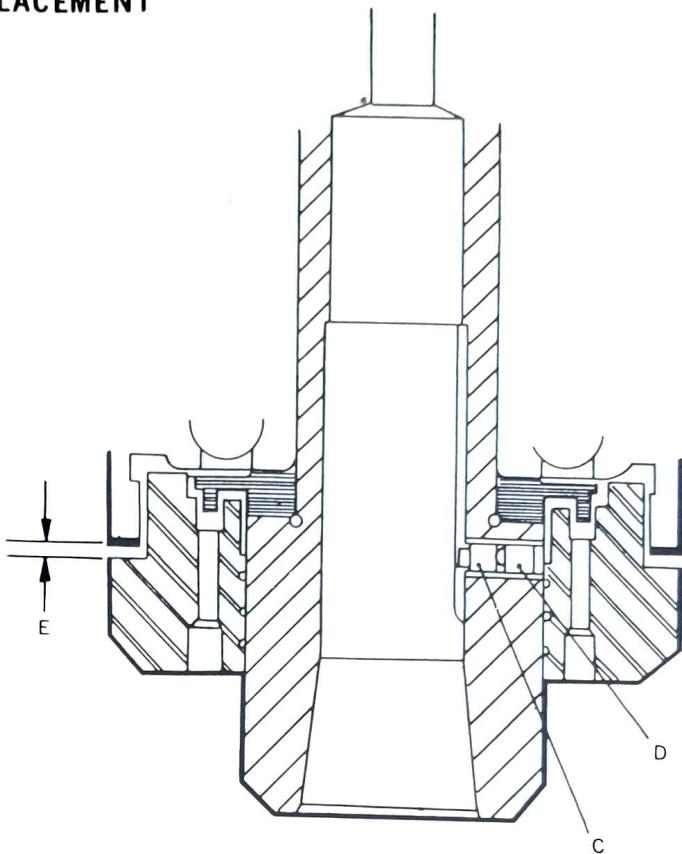
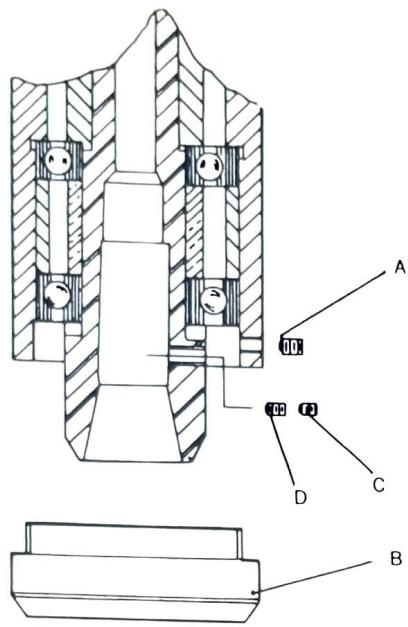
1. 放鬆固定螺帽'A'。
2. 嘴合把手'C'。
3. 調整微調螺帽至碰到昇降套停止塊'B'。
4. 慢慢轉動調整螺絲'D'直到桿'C'跳離。
5. 在此點鎖緊固定螺帽
6. 檢查跳動的動作是否正確。

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



## 筒夾校準螺絲更換法

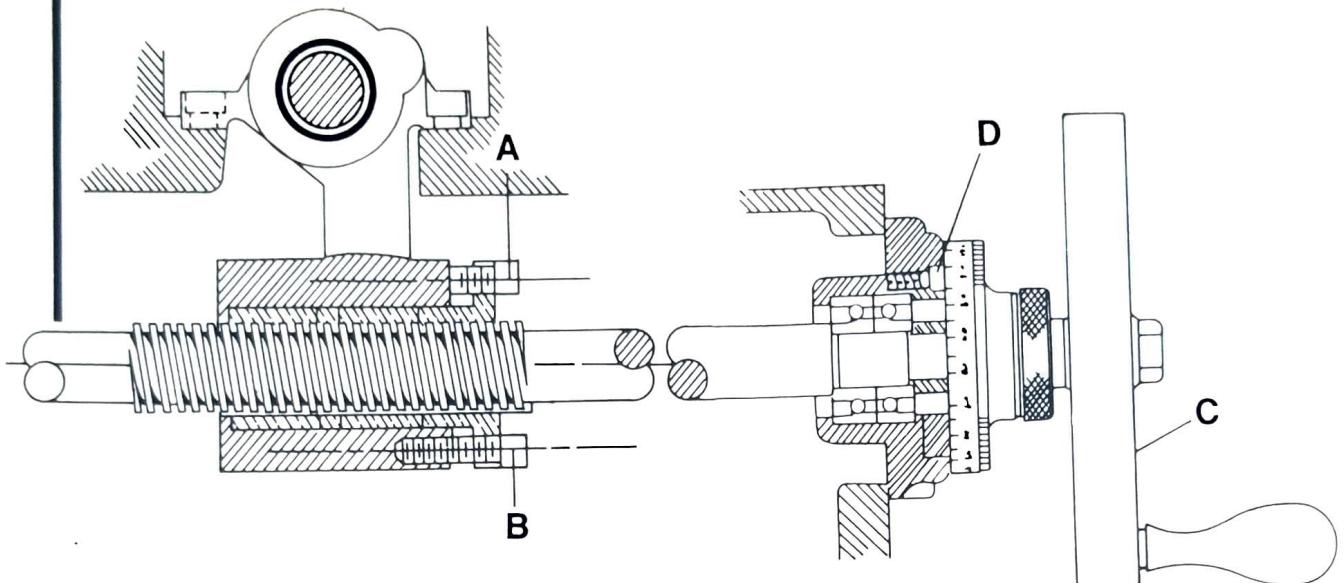
### COLLET ALIGNING SCREW REPLACEMENT



1. 用氈筆在昇降套和主軸端蓋'B'劃一參考線。
2. 拆下固定螺絲'A'。
3. 取下端蓋'B'。
4. 取下固定螺絲'C'與筒夾校準螺絲'D'。
5. 更換'D'套入R.8筒夾，並檢查，勿使螺絲末端碰到導槽之底部。
6. 更換固定螺絲'C'。
7. 重新裝上'B'，檢查參考線是否對準。
8. 裝上固定螺絲'A'。  
注意：不可鎖太緊免造成變型。
9. 檢查間隙'E'(0.003" = .08mm)

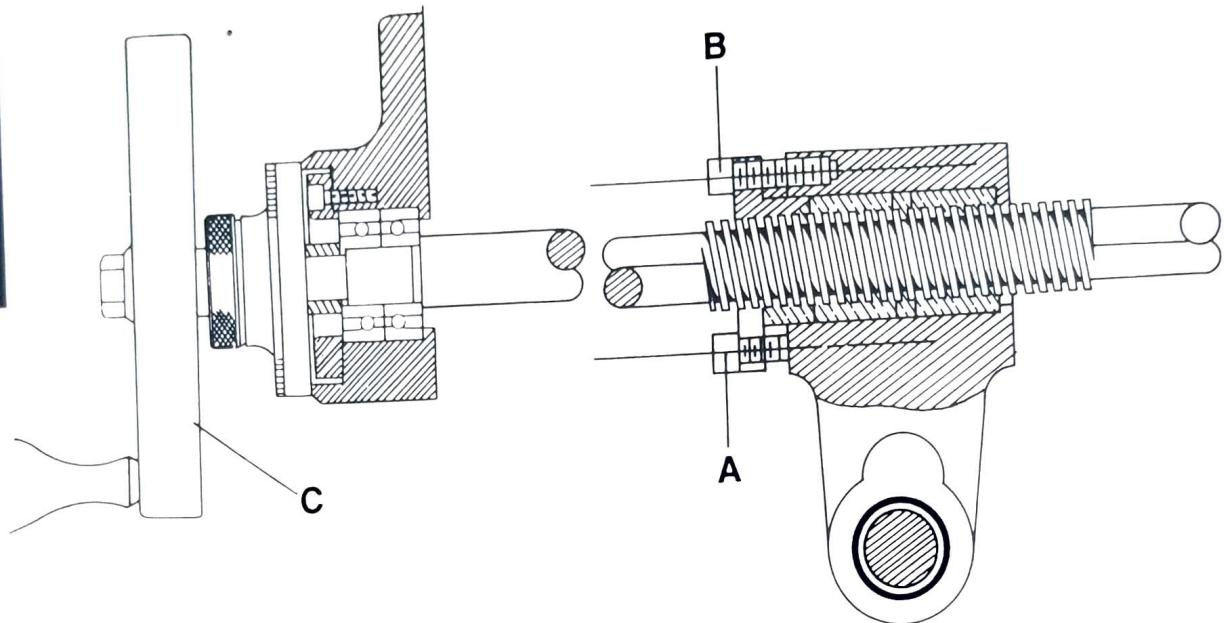
1. Use felt pen, mark reference line on quill and nose cap 'B'.
2. Remove set screw 'A'.
3. Unscrew nose cap 'B'.
4. Remove lock screw 'C' and collet aligning screw 'D'.
5. Replace 'D'; insert R.8 collet and check that the dog on the end of the screw does not foul on the bottom of the guide slot.
6. Replace lock screw 'C'.
7. Replace nose cap 'B'; check felt pen markings for correct alignment.
8. Replace set screw 'A'.  
Caution: do not overtighten as this will cause distortion.
9. Check gap 'E'. (0.003" = .08mm)

前後進給螺桿間隙調整法  
CROSS SCREW BACKLASH ADJUSTMENT



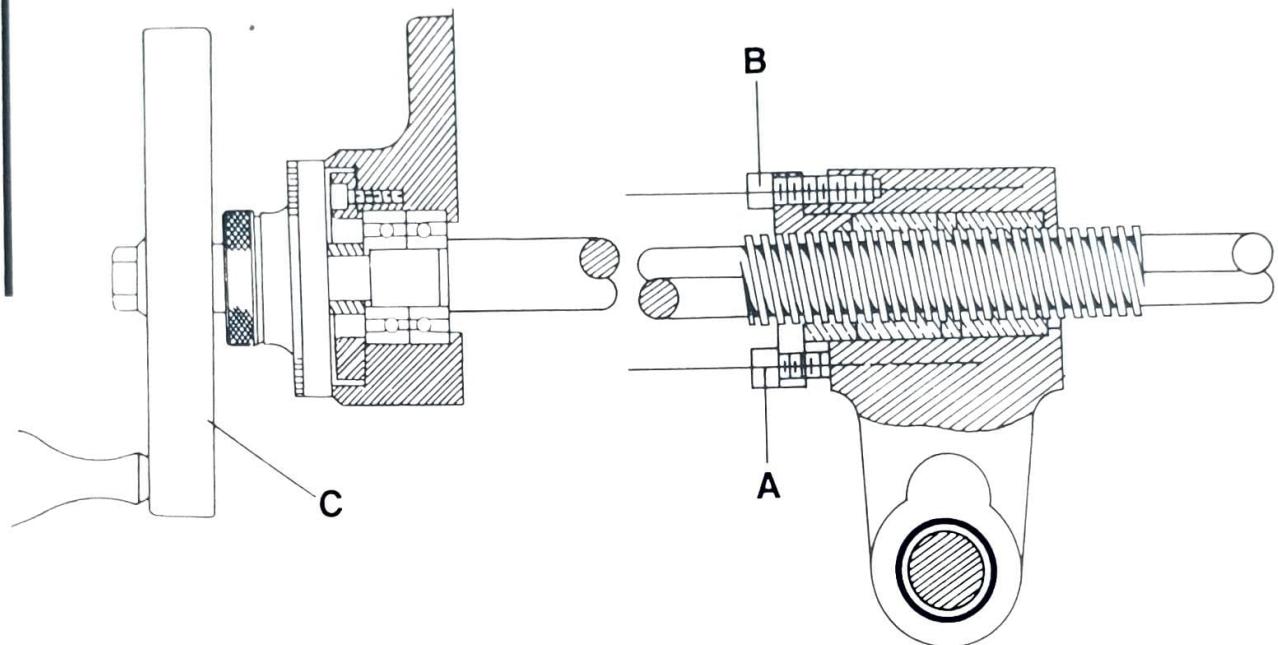
1. 轉動曲柄'C'使鞍座至中間位置
  2. 旋出四個螺絲'D'
  3. 將鞍座拉向前，以露出螺絲'A'與'B'
  4. 慢慢轉動手輪'C'，並鎖緊螺絲'B'直到間隙為0.004"或0.005"為止
  5. 鎖緊螺絲'A'
  6. 最後將鞍座移至昇降座之前方，重新組合四個螺絲'D'
- 
1. Crank the saddle to mid position.
  2. Withdraw four screws "D".
  3. Pull the saddle forward to expose screws "A" and "B".
  4. Slowly turning handle "C", tighten screws "B" until 0.004" or 0.005" backlash is obtained.
  5. Lock screws "A".
  6. Finally crank the saddle to the front of the knee and replace four screws "D".

左右進給螺桿間隙調整法  
TABLE SCREW BACKLASH ADJUSTMENT



1. 工作台移至左方
  2. 拆除右邊軸承座組
  3. 慢慢旋轉手輪'C'，並鎖緊螺絲'B'  
，直到間隙0.004"或0.005"為止
  4. 鎖緊螺絲'A'
  5. 最後組合右邊軸承座組
- 
1. Crank the table to the left.
  2. Remove the right side bearing support assembly.
  3. Slowly turning handle "C", while tightening screws "B"  
until 0.004" or 0.005" backlash is obtained.
  4. Lock screws "A".
  5. Finally assemble the right side bearing support  
assembly.

左右進給螺桿間隙調整法  
TABLE SCREW BACKLASH ADJUSTMENT



1. 工作台移至左方
2. 拆除右邊軸承座組
3. 慢慢旋轉手輪'C'，並鎖緊螺絲'B'  
，直到間隙0.004"或0.005"為止
4. 鎖緊螺絲'A'
5. 最後組合右邊軸承座組

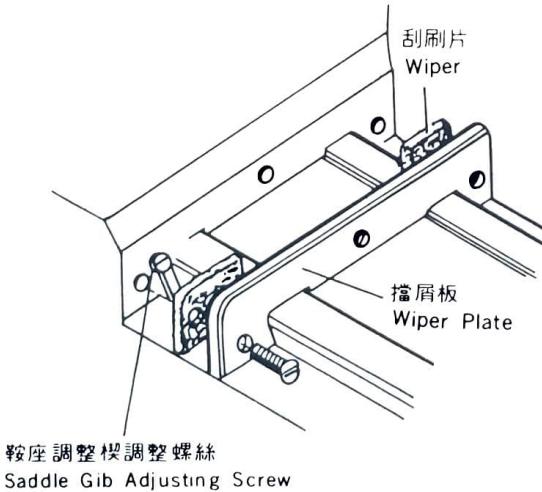
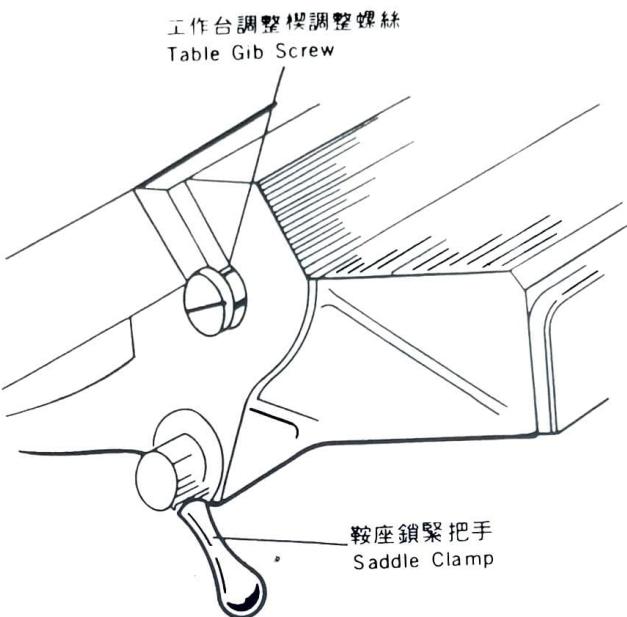
1. Crank the table to the left.
2. Remove the right side bearing support assembly.
3. Slowly turning handle "C", while tightening screws "B"  
until 0.004" or 0.005" backlash is obtained.
4. Lock screws "A".
5. Finally assemble the right side bearing support  
assembly.

## a) 工作台鞍座滑道

1. 清除所有的切削屑。
2. 移動工作台時，順時針轉動工作台調整楔調整螺絲，直到感覺輕微阻力即可。

## a) Table Saddle Ways

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



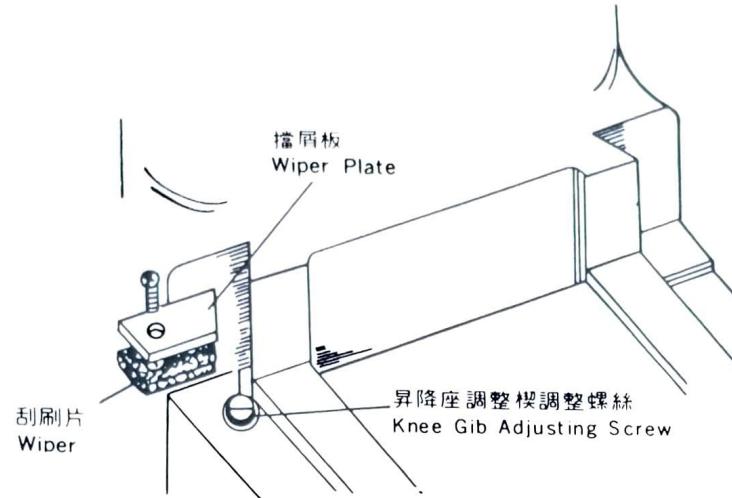
## b) 鞍座、昇降座滑道

1. 清除所有切削屑。
2. 拆下擋屑板和刮刷片。
3. 移動鞍座時，順時針轉動調整楔螺絲，直至感覺輕微阻力為止。
4. 重新裝上擋屑板與刮刷片。

## b) Saddle Knee Ways

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

C) 昇降座機身滑道  
C) Knee Column Ways



1. 清除所有切削屑。
2. 拆下擋屑板。
3. 拆下刮刷片。
4. 移動昇降座時，順時針轉動調整楔螺絲直至感覺輕微阻力為止。
5. 重新裝上擋屑板與刮刷片。

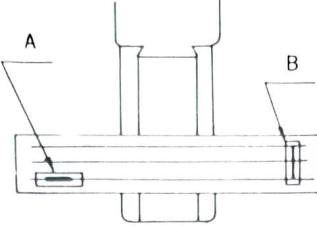
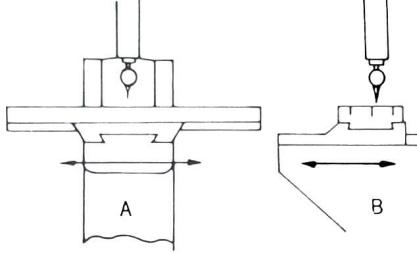
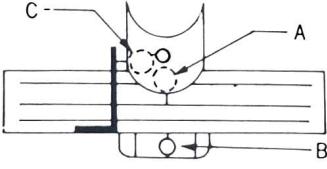
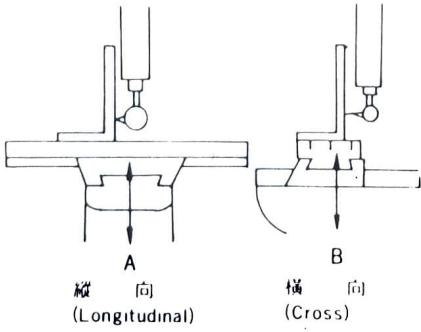
1. Remove all swarf from area.
2. Remove chip wiper plate .
3. Remove wiper
4. Turn gib adjusting screw clockwise while moving knee until slight drag is felt.
5. Ensure wiper plate and wiper are replaced.

# 故障排除 Trouble-shooting

下表所列的是關於在操作時可能發生的故障，及其可能的原因與處理方法。  
 The following chart contains some typical probable troubles of operation,  
 along with the possible cause(s) and remedies for each.

| 故障 TROUBLE   | 可能的原因 POSSIBLE CAUSES  | 處理方法 REMEDY  |
|--|--|--|
| 主軸進給不順<br>Spindle feed un normal                                       | 昇降套固定桿未放鬆<br>Quill clamp lever unreleas.   | 放鬆固定桿<br>Release clamp lever.  |
| 主軸剎車失靈<br>Spindle brake<br>brake down.                                 | 剎車環磨損<br>Brake shoe worn out   | 更換<br>Replace  |
| 主軸不轉<br>Spindle unrotate.  | 1. 開關接觸不良<br>Poor contact on the switch.<br>2. 皮帶太鬆<br>Drive belt too slack.<br>3. 馬達出毛病<br>Poor, motor.   | 1. 檢查電源開關<br>Check the switch.<br>2. 調整或更換<br>Adjust or replace.<br>3. 修理或更新<br>Repair or renew.       |
| 轉向錯誤<br>Incorrect rotation.  | 電源開關扭轉位置不對<br>The switch knob indicated at wrong position.   | 轉變開關指示位置<br>Change to correct position.  |
| 工作台上下、前後、左右進給不順。<br>Table vertical, cross, Longitudinal feed unsmooth. | 1. 調整桿太緊<br>Gib strip too tight.<br>2. 螺帽與螺桿間隙不當<br>Unproper backlash between nut and screws.<br>3. 潤滑油未到達潤滑面<br>The lubricant not to lubrication point. | 放鬆調整桿<br>Release<br>調整間隙<br>Adjust<br>檢查潤滑油路<br>Check lubrication.                                     |
| 切削時震動<br>Vibrative when machining.                                     | 1. 機械不穩固<br>Machine unstable.<br>2. 切削條件不適當<br>unsuitable cutting condition.   | 重新固定機械<br>Reclamp<br>依材質和銑刀大小選適當切削速度<br>Select proper cutting speed according to materials and cutter. |

# 檢驗規格表 Inspection Chart

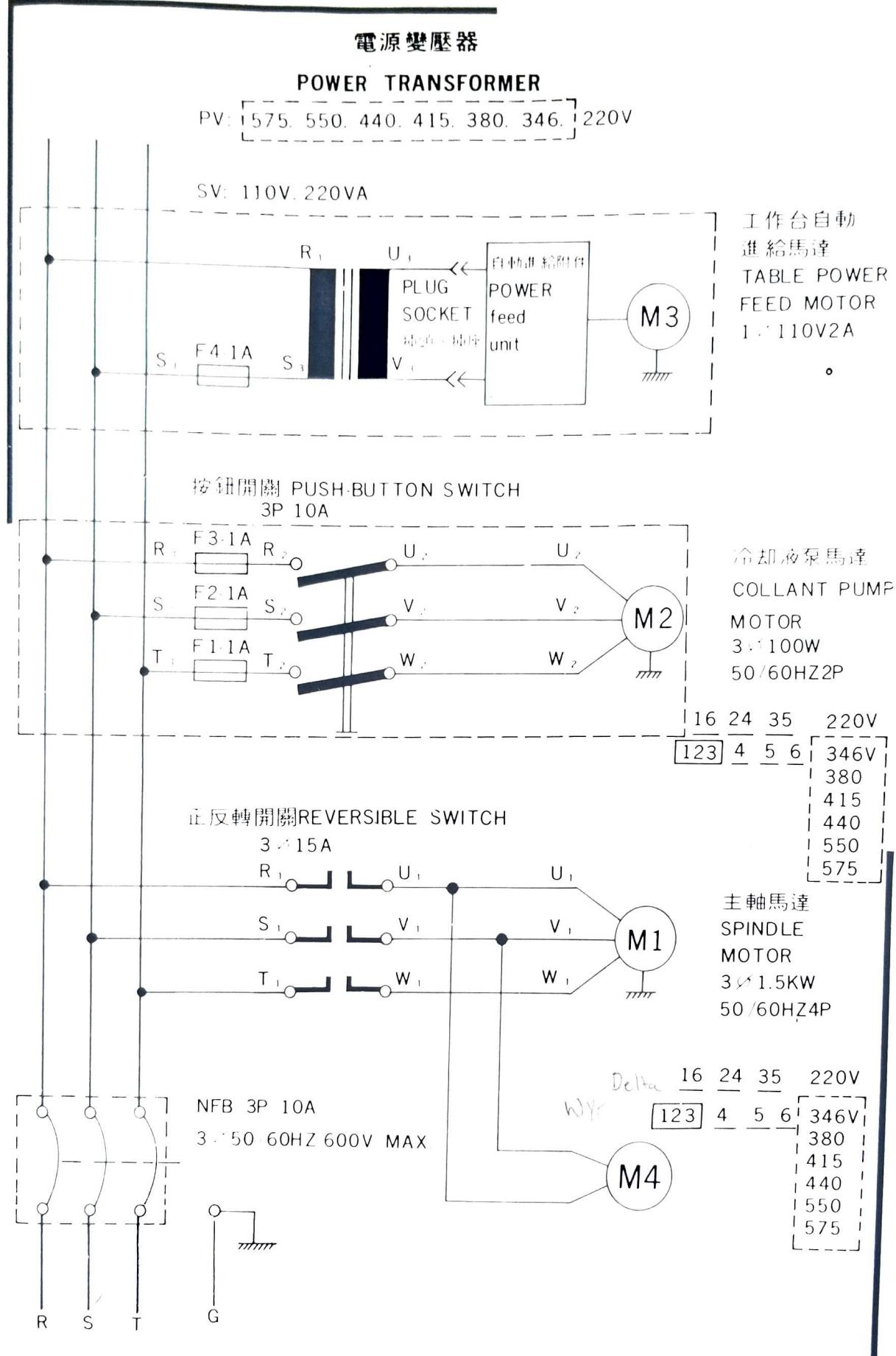
| 番號<br>No | 檢查項目<br>Inspection Items   | 圖示<br>Illustrations  | 容許差<br>Tolerances  | 測定值<br>Measurements   |
|----------|--|--|--|---|
| 1        | 工作台面水平<br>Plane of Surface Even Level.   |    | Approx. Level<br>0.06mm/m<br><br>0.06mm/m                              | A. _____<br><br>B. _____  |
| 2        | 工作台移動平行度<br>Surface Parallel to its Movements.   |   | A.<br>0.02mm/500mm (.0008°/20°)<br><br>B.<br>0.02mm/300mm (.0008°/12°) | A. _____<br><br>B. _____  |
| 3        | T 槽側面與縱向移動的平行度。與橫向移動的垂直度。<br>T-slots, Front Edge Parallel to Longitudinal Travel, Perpendicular to Cross Travel. |   | 0.02mm/300mm (.0008°/12°)  | T槽<br>A. T-Slots _____<br><br>縱向<br>B. Front Edge _____<br><br>橫向<br>C. Cross _____ |
| 4        | 昇降座上、下移動與工作台的垂直度。<br>Vertical Movement of Knee Square to Table Surface.  |  | 0.02mm/300mm (.0008°/12°)  | A. _____<br><br>B. _____  |

| 番號<br>No. | 檢査項目<br>Inspection Items  | 圖示<br>Illustrations | 容許差<br>Tolerances  | 測定值<br>Measurements            |
|-----------|---|---------------------|--|--------------------------------|
| 5         | 工作台面與主軸的直角度。<br>Table Sweep-Knee not Level, Spindle Perpendicular to top of table |                     | 0.02mm/300mm<br>(.0008°/12')                                       | A.<br>_____<br><br>B.<br>_____ |
| 6         | 伸出臂與工作台面平行度。<br>Ram Slide Parallel with Table Top.                                |                     | 0.02mm/300mm<br>(.0008°/12')                                       | _____                          |
| 7         | 主軸、主軸端面振幅。<br>Spindle Nose and Face True.   |                     | A. 0.01mm<br>(.0004°)<br>MAX.<br>B. 0.01mm<br>(.0004°)<br>MAX.     | A.<br>_____<br><br>B.<br>_____ |
| 8         | 主軸孔偏轉。<br>Spindle Bore Runout.  |                     | A. 0.01mm<br>(.0004°)<br>MAX.<br>B. 0.02mm<br>(.0008°)<br>MAX.     | A.<br>_____<br><br>B.<br>_____ |
| 9         | 昇降套上、下與工作台垂直度。<br>Quill Travel Square to Table Surface.                           |                     | A. 0.02mm/300mm<br>(.0008°/12')<br>B. 0.02mm/300mm<br>(.0008°/12') | A.<br>_____<br><br>B.<br>_____ |

# 檢驗規格表Inspection chart

| No. | 項 目 Items  |
|-----|--|
| 10  | 在刻度環讀出齒隙。<br>Backlash Read on Dials.   |
|     | 允許最大值 0.127mm(0.005") MAX. 0.127mm (0.005")<br>測定讀數：<br>A. 縱向導螺桿<br>B. 橫向導螺桿   |
|     | Test Readings:<br>A. Long. Lead Screw A. _____<br>B. Cross Lead Screw B. _____   |
| 11  | 導螺桿 : Leadscrews:  |
|     | 最大誤差 Maximum Error:<br>0.02mm/300mm 0.02mm Per 300mm<br>或 0.0008"/12" or 0.0008" Per 12"<br>0.04mm 或 0.0016" 總工作長度 0.04mm or 0.0016" Total Overall<br>A. 縱向：在 300mm(12") A. Longitudinal: At 300mm(12") _____<br>總工作長度 Overall _____<br>B. 橫向：在 300mm(12") B. Transverse: At 300mm(12") _____<br>總工作長度 Overall _____ |
| 12  | 手動操作 Manual  |
|     | 1) 楔的調整 1) Gibs Adjusted _____<br>2) 升降套昇降的鬆緊度 2) Quill Tight _____<br>3) 主軸的齒隙 3) Spindle Backlash _____<br>4) 所有移動體移動時的平穩性 4) All Movements Smooth _____<br>5) 刀具夾頭裝置情形 5) Collet Fit _____  |
| 13  | 動態試驗 Power   |
|     | 速度 SPEEDS<br>低 LOW 高 HIGH<br>1) 自動進給的動作 1) Powerfeed Kickouts _____<br>2) 所有移動體移動時的平穩性 2) All Movements Smooth _____<br>3) 震動 3) Vibration _____<br>4) 噪音(最大 73DB) 4) Sound (73DB Max.) _____<br>5) 切削試驗 5) Test Cuts<br>A. 面銑 A. Face _____<br>B. 側銑 B. Side _____  |
| 14  | 外 觀 Visual   |
|     | 1) 表面處理 1) Finishes<br>A. 噴漆部份 A. Paint _____<br>B. 機械加工部份 B. Machined _____<br>C. 電鍍部份 C. Chrome _____<br>D. 塑膠部份 D. Plastic _____<br>E. 染黑部份 E. Black Oxide _____<br>2) 防锈處理 2) Rustproofing _____   |
| 15  | 電氣方面 Electrical  |
|     | 馬達電壓 Voltage for which Motors. _____ Volts<br>接頭 connected _____<br>頭部 Head _____<br>自動進給附件 Powerfeed _____<br>冷卻油泵 Coolant Pump _____   |

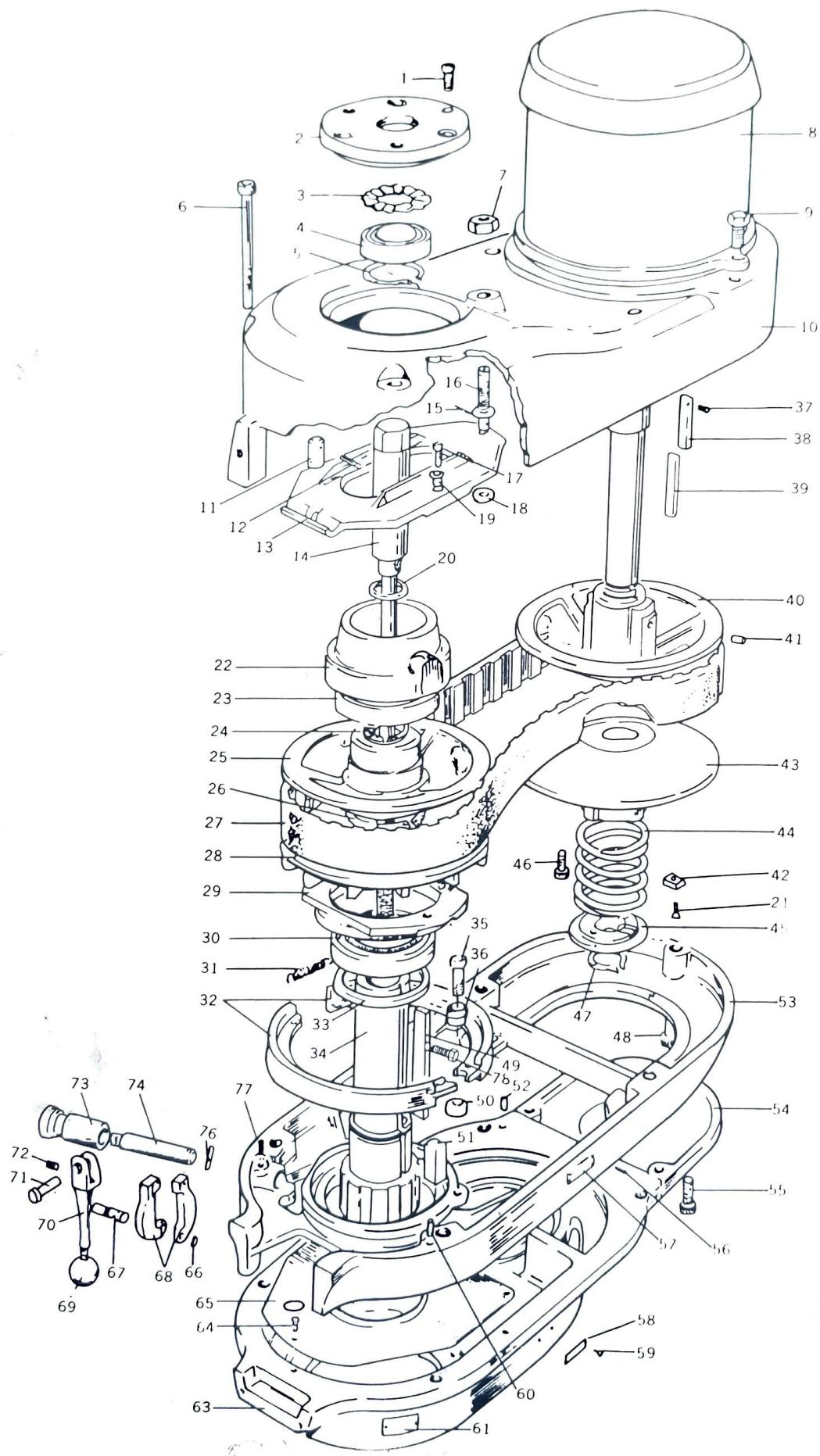
# 電氣回路圖 Electric circuit diagram



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| 6. LUBRICATION SYSTEM.....           | 69 |

# Spare parts HEAD TOP HOUSING



# PARTS LIST

## HEAD TOP HOUSING

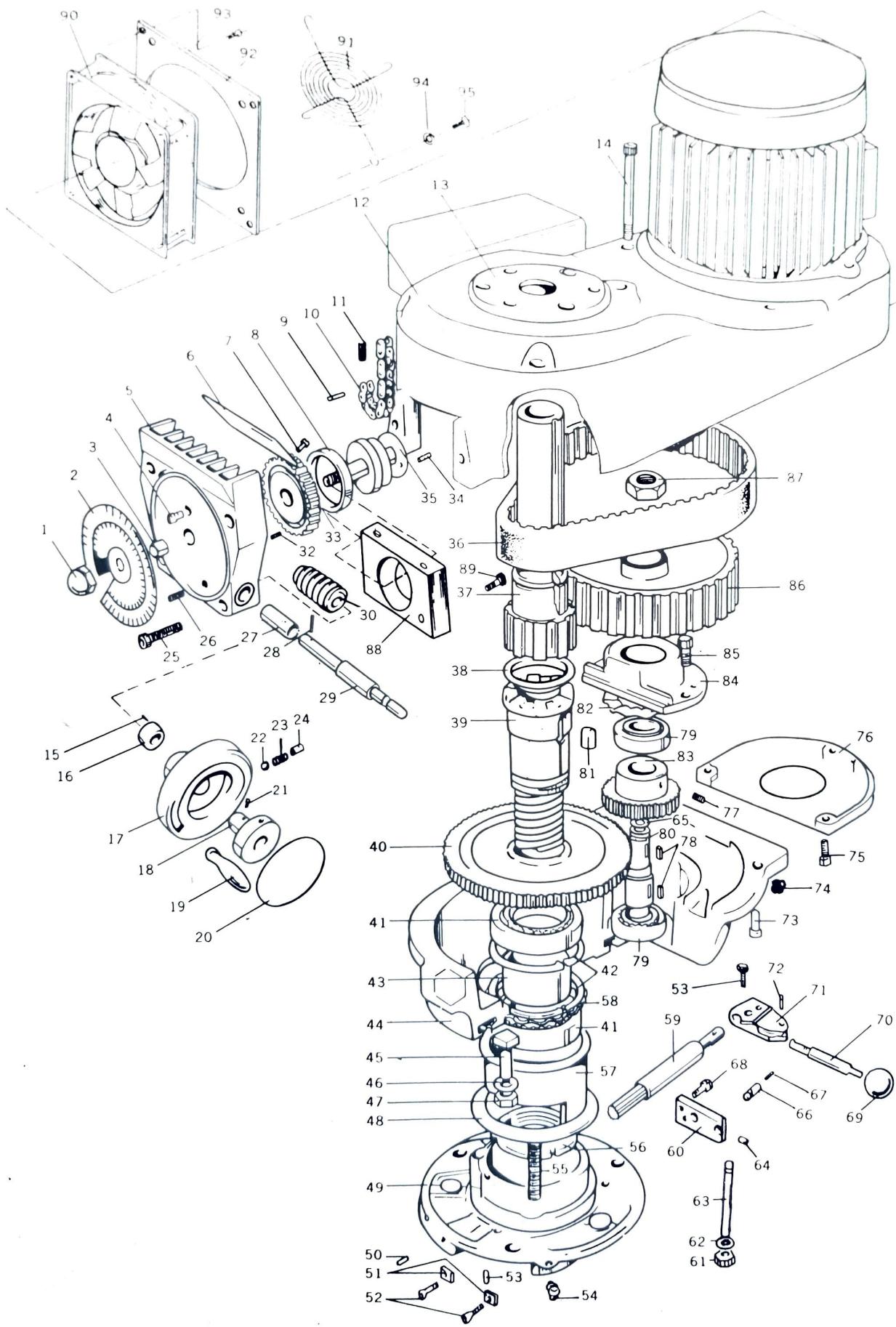
| ITEM NO. | PART NO.     | DESCRIPTION                            | Q. T. Y. |
|----------|--------------|--|----------|
| 1        | 600060200    | M6X20 Hex-Socket Head Cap Screw        | 3        |
| 2        | FB-006       | Top Bearing Cap                        | 1        |
| 3        | FB-028       | Wave Spring                            | 1        |
| 4        | 701060072    | Ball Bearing #6007 2Z                  | 1        |
| 5        | 665035000    | Snap Ring A-35mm(Outer Retaining Ring) | 1        |
| 6        | FB-078A      | Socket Head Cap Screw                  | 2        |
| 7        | 615038001    | 3/8"-16 UNC Nut                        | 1        |
| 8        | 413012010    | Motor 2HP 4P                           | 1        |
| 9        | 602381041    | 3/8"-16 UNC x 1 1/4" Hex-Head Bolts    | 2        |
| 10       | FB-001       | Belt Housing                           | 1        |
| 11       | FB-059       | Speed Change Chain Stud                | 1        |
| 12       | 622040030    | 4 1/2 X30 Spring Pin                   | 1        |
| 13       | FB-057       | Speed Change Plate                     | 1        |
| 14       | FA-213A,213B | Drawbar 213A for #30, 213B for R8      | 1        |
| 15       | 633061001    | (1/16" X 1" Split Pins)                | 1        |
| 16       | FB-060       | Speed Change Plate Pivot Stud          | 1        |
| 17       | 600050200    | M5X20 Hex-Socket Head Cap Screw        | 2        |
| 18       | FB-084       | Washer for FB-060                      | 1        |
| 19       | FB-058       | Pivot Sleeve                           | 2        |
| 20       | FA-212       | Drawbar Washer                         | 1        |
| 21       | 600080001    | W 1/8"-40 NC Socket Cap Screw          | 1        |
| 22       | FB-014       | Spindle Pulley Bearing Sliding Housing | 1        |
| 23       | 701060104    | Ball Bearing #6010 2RS                 | 1        |
| 24       | FB-009       | Bushing                                | 1        |
| 25       | FB-008       | Adjustable-Driven Varidisc             | 1        |
| 26       | 665040000    | A-40mm (Outer Retaining Ring)          | 1        |
| 27       | FB-082       | Belt                                   | 1        |
| 28       | FB-012       | Stationary Driven Varidisc             | 1        |
| 29       | FB-007       | Brake Bearing Cap                      | 1        |
| 30       | 701060104    | Ball Bearing #6010 2RS                 | 1        |
| 31       | FB-063       | Brake Spring                           | 2        |
| 32       | FB-062       | Brake Shoes                            | 2        |
| 33       | FB-016       | Spindle Pulley Spacer                  | 1        |
| 34       | FB-015       | Spindle Pulley Hub                     | 1        |
| 35       | 602041001    | 1/4"-20 UNC X 1" Hex. Head Bolt        | 1        |
| 36       | FB-069       | Brake Shoe Pivot Sleeve                | 1        |
| 37       | 522016012    | 1.6 1/2 X12 Spring Pin                 | 1        |
| 38       | FB-033       | Drive Key                              | 1        |
| 39       | FB-034       | Key for ADJ Varidisc Motor Shaft       | 1        |
| 40       | FB-030       | Stationary Motor Varidisc              | 1        |
| 41       | 604060100    | M6X10 Set Screw                        | 1        |
| 42       | FB-036A      | Key for FB-036                         | 1        |
| 43       | FB-029       | Adjustable Motor Varidisc              | 1        |
| 44       | FB-035       | Spring for Varidisc Motor Shaft        | 1        |
| 45       | FB-036       | Adjustable Varidisc Spring Collar      | 1        |
| 46       | 600050500    | M5X50 Hex-Socket Head Cap Screw        | 2        |
| 47       | 665024000    | A-24mm(Outer Retaining Ring)           | 1        |
| 48       | 600080200    | M8X20 Hex-Socket Head Cap Screw        | 1        |
| 49       | FB-010       | Key for FB-008                         | 1        |
| 50       | 615004001    | Bracket Locknut 1/4"-20 UNC            | 1        |

# PARTS LIST

## HEAD TOP HOUSING

| ITEM NO. | PART NO.  | DESCRIPTION   | Q. T. Y. |
|----------|-----------|---|----------|
| 51       | FB-013    | Key for FB-015, FB 012  | 1        |
| 52       | FB-079    | Taper Pin   | 2        |
| 53       | FB-002    | Belt Housing  | 1        |
| 54       | FB-037    | Motor Pulley Cover  | 1        |
| 55       | 600050200 | M5X20 Hex-Socket Head Cap Screw                                 | 3        |
| 56       | 625020006 | Rivets  | 4        |
| 57       | 403012040 | Lubrication Nameplate   | 1        |
| 58       | 403012030 | HI-LOW Range Nameplate  | 2        |
| 59       | 625020006 | Rivets  | 2        |
| 60       | 623040250 | Taper Pin   | 2        |
| 61       | 403012050 | Quill Feed Nameplate  | 1        |
| 62       | 625020006 | Rivets  | 4        |
| 63       | FB-003    | Gear Housing  | 1        |
| 64       | 605360581 | 3 $\frac{1}{16}$ " X 5 $\frac{1}{8}$ " Round Head Machine Screw | 3        |
| 65       | FB-022    | Gear Housing Plate  | 1        |
| 66       | 665006000 | A-6mm (Outer Retaining Ring)                                    | 1        |
| 67       | FB-068    | Brake Finger Pivot Stud   | 1        |
| 68       | FB-067A   | Brake Operating Finger  | 2        |
| 69       | EB-047    | Ball Handle   | 1        |
| 70       | FA-039    | Brake Lock Handle   | 1        |
| 71       | FA-038    | Brake Lock Pin  | 1        |
| 72       | 604040060 | M4X6 Socket Set Screw   | 1        |
| 73       | FB-065    | Sleeve for Brake Lock Shaft                                     | 1        |
| 74       | FB-066A   | Brake Lock Shaft  | 1        |
| 76       | 665012000 | 4 $\times$ X25 Spring Pin                                       | 1        |
| 77       | 604060060 | M6X6 Socket Set Screw   | 1        |
| 78       | 606530041 | 5 $\frac{1}{32}$ ~ 1 $\frac{1}{4}$ Pan Head Screw               | 1        |

# Spare parts HEAD BACK GEAR



# PARTS LIST

## HEAD BACK GEAR

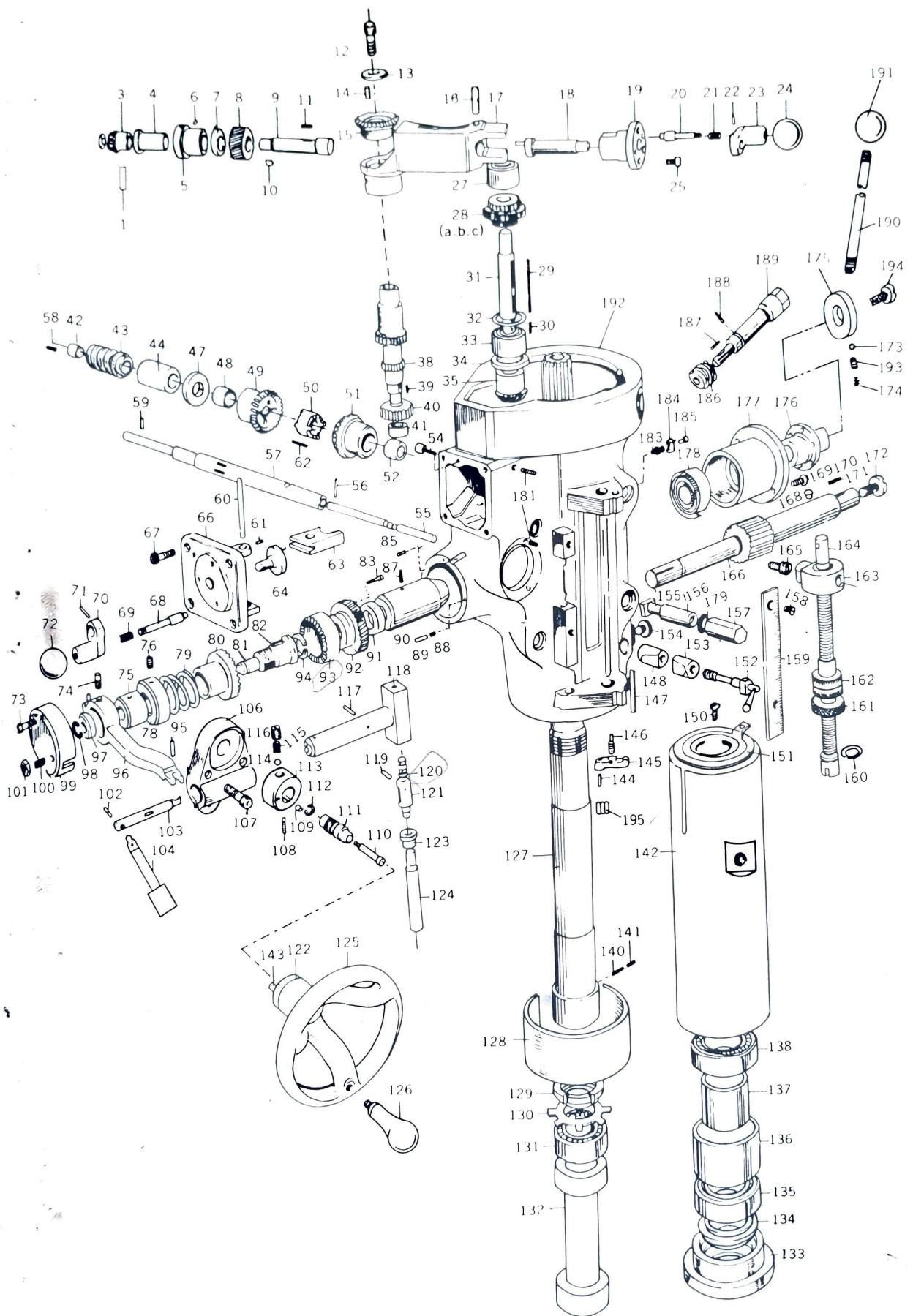
| ITEM NO. | PART NO.  | DESCRIPTION  | Q. T. Y. |
|----------|-----------|--|----------|
| 1        | FB-056    | Hex. Cap Nut   | 1        |
| 2        | 403012020 | Vari-Speed Dial  | 1        |
| 3        | FB-047    | Bushing  | 1        |
| 4        | FB-085    | Full Dog   | 1        |
| 5        | FB-005    | Speed Changer Housing                                      | 1        |
| 6        | FB-046    | Speed Changer Chip Shield                                  | 1        |
| 7        | 606360041 | W $\frac{3}{16}$ " .24 NC X $\frac{1}{4}$ " Machine Screws | 2        |
| 8        | FB-045    | Bushing  | 1        |
| 9        |           | Chain Pin  | 1        |
| 10       | FB-061    | Speed Changer Chain  | 1        |
| 11       |           | Split Link Supplied with FB-061                            | 1        |
| 12       | FB-001    | Belt Housing   | 1        |
| 13       | FB-006    | Top Bearing Cap  | 1        |
| 14       | FB-078B   | Socket Head Cap Screw                                      | 2        |
| 15       | 622016008 | 1.6 $\times$ 8 Spring Pin                                  | 1        |
| 16       | FB-054    | Washer   | 1        |
| 17       | FB-052    | Speed Change Hand Knob                                     | 1        |
| 18       | FB-050    | Flange Sleeve  | 1        |
| 19       | FB-053    | Machine Handle   | 1        |
| 20       | 403012010 | Vari-Speed Dial  | 1        |
| 21       | 604050050 | M 5X5 Socket Set Screw                                     | 1        |
| 22       | 035036000 | $\frac{3}{16}$ " Steel Ball                                | 1        |
| 23       | FB-051    | Spring   | 1        |
| 24       | 604060060 | M6X6 Socket Set Screw                                      | 1        |
| 25       | 600060400 | M6X40 Hex-Socket Head Cap Screw                            | 4        |
| 26       | 604060080 | M6X8 Socket Set Screw                                      | 1        |
| 27       | FB-042    | Bushing  | 1        |
| 28       | 622025012 | 2.5 $\times$ 12 Spring Pin                                 | 1        |
| 29       | FB-043    | Speed Control Shaft  | 1        |
| 30       | FA-139    | Worm Gear  | 1        |
| 31       |           |  |          |
| 32       | 622030020 | 3 $\times$ 20 Spring Pin                                   | 1        |
| 33       | FB-049    | Speed Changer Spur Gear                                    | 1        |
| 34       | 622030024 | 3 $\times$ 24 Spring Pin                                   | 1        |
| 35       | FB-048    | Speed Change Chain Drum                                    | 1        |
| 36       | 066225110 | Timing Belt  | 1        |
| 37       | FB-015    | Spindle Pulley Hub   | 1        |
| 38       | FB-017    | Timing Pulley Clutch Sleeve                                | 1        |
| 39       | FB-018    | Spindle Gear Hub   | 1        |
| 40       | FB-021    | Spindle Bull Gear  | 1        |
| 41       | 701069084 | Ball Bearing #6908 2RS                                     | 2        |
| 42       | 666062000 | B-62mm (Inner Retaining Rings)                             | 2        |
| 43       | FB-027    | Bull Gear Bearing Spacer                                   | 1        |
| 44       | FB-003    | Gear Housing   | 1        |
| 45       | FB-080    | Vert. Tee Bolts  | 3        |
| 46       | 652076001 | $\frac{7}{16}$ " Spring Washer                             | 3        |
| 47       | 615076001 | $\frac{7}{16}$ " Nut                                       | 3        |
| 48       | FB-025    | Ball Bearing Gear Sleeve Washer                            | 1        |
| 49       | FB-004    | Fixed Clutch Bracket                                       | 1        |
| 50       | 604080140 | M8 $\times$ 14 Socket Set Screw                            | 1        |

# PARTS LIST

## HEAD BACK GEAR

| ITEM NO. | PART NO.  | DESCRIPTION                           | Q. T. Y. |
|----------|-----------|---------------------------------------|----------|
| 51       | FB-026    | Guide                                 | 2        |
| 52       | 606360001 | 3/16" 24NC Flat Head Socket Cap Screw | 2        |
| 53       | 600050100 | M5X10 Hex Socket Head Cap Screw       | 2        |
| 54       | 075008000 | Oil Cup 1/8"-28PT                     | 1        |
| 55       | FB-024    | Spring                                | 3        |
| 56       | FB-019    | Bearing Locknut                       | 1        |
| 57       | FB-023    | Bearing Sleeve                        | 1        |
| 58       | FB-028    | Wave Spring Washer                    | 1        |
| 59       | FB-076    | Bull Gear Shift Pinion                | 1        |
| 60       | FB-073    | HI-LOW Detent Plate                   | 1        |
| 61       | 615038001 | 3/8" 16UNC Hex Nut                    | 3        |
| 62       | 650038001 | 3/8" Lock Washer                      | 3        |
| 63       | FB-077    | Studs                                 | 3        |
| 64       | 604050080 | M5X8 Socket Set Screw                 | 1        |
| 65       | FB-090    | Washer                                | 1        |
| 66       | FB-071    | HI-Low Detent Plunger                 | 1        |
| 67       | FB-072    | Spring                                | 1        |
| 68       | 600050100 | M5X10 Hex. Socket Head Cap Screw      | 2        |
| 69       | FA-006    | Bakelite Ball Handle                  | 1        |
| 70       | FB-070    | HI-LOW Shift Crank                    | 1        |
| 71       | FB-075    | HI-LOW Pinion Block                   | 1        |
| 72       | 622030014 | 3/16" X 14 Spring Pin                 | 1        |
| 73       | 600080200 | M8X20 Hex. Socket Head Cap Screw      | 4        |
| 74       | 077004000 | 1/8"-28 PT Nipple                     | 1        |
| 75       | 600050200 | M5X20 Hex. Socket Head Cap Screw      | 3        |
| 76       | FB-037    | Motor Pulley Cover                    | 1        |
| 77       | 604060060 | M6X6 Socket Set Screw                 | 1        |
| 78       | 630050180 | 5X5X18 Square Parallel Key.           | 2        |
| 79       | 701062034 | Ball Bearing #6203 2RS                | 2        |
| 80       | FB-039    | Pinion Shaft                          | 1        |
| 81       | FB-020    | Key for FB-018, FB-021                | 1        |
| 82       | FB-038    | Wave Spring Washer                    | 1        |
| 83       | FB-040    | Pinion                                | 1        |
| 84       | FB-031    | Pinion Bearing Cap                    | 1        |
| 85       | 600050100 | M5X10 Hex. Socket Head Cap Screw      | 2        |
| 86       | FB-041    | Timing Belt Pulley                    | 1        |
| 87       | 615058001 | 5/8" Nut                              | 1        |
| 88       | FB-044    | Bracket for FB-045, FB-048            | 1        |
| 89       | 600060200 | M6X20 Hex. Socket Head Cap Screw      | 2        |
| 90       | FB-089    | FAN                                   | 1        |
| 91       | FB-088    | SAFETY NET                            | 1        |
| 92       | FB-091    | FAN PLATE                             | 1        |
| 93       | 600050100 | M5X10 Hex. Socket Head Cap Screw      | 1        |
| 94       |           | Ø4XØ8 Washer                          | 1        |
| 95       |           | 1/8"-40NC Flat driver Screw           | 1        |

# Spare parts HEAD ASSEMBLY



# PARTS LIST

## HEAD ASSEMBLY

| ITEM NO. | PART NO.  | DESCRIPTION                      | Q. T. Y. |
|----------|-----------|----------------------------------|----------|
| 1        | 622030016 | Φ 3 X 16, spring pinead Screw    | 1        |
| 3        | FA-160    | Feed Bevel Pinion                | 1        |
| 4        | FA-161    | Feed Worm Gear Shaft Sleeve      | 1        |
| 5        | FA-162    | Worm Cradle Bushing              | 1        |
| 6        | 604060060 | M6X6 Socket Set Screw            | 1        |
| 7        | FA-163    | Worm Gear Spacer                 | 1        |
| 8        | FA-164    | Feed Drive Worm Gear             | 1        |
| 9        | FA-165    | Feed Drive Worm Gear Shaft       | 1        |
| 10       | 630030080 | 3X3X8 Square Parallel Key        | 1        |
| 11       | 630030200 | 3X3X20 Square Parallel Key       | 1        |
| 12       | 600080160 | M8×16 Hex. Socket Head Cap Screw | 1        |
| 13       | FA-153    | Washer                           | 1        |
| 14       | 630030080 | 3X3X8.5 Square Parallel Key      | 1        |
| 15       | FA-154    | Feed Reverse Bevel Gear          | 1        |
| 16       | FA-167    | Feed Engage Pin                  | 1        |
| 17       | FA-166    | Worm Gear Cradle                 | 1        |
| 18       | FA-001    | Worm Gear Cradle Throw-out       | 1        |
| 19       | FA-002    | Shift Sleeve                     | 1        |
| 20       | FA-004    | Gear Shift Plunger               | 1        |
| 21       | FA-005    | Compression Spring               | 1        |
| 22       | 622030020 | Spring Pin 3/8X22                | 1        |
| 23       | FA-003    | Shift Crank                      | 1        |
| 24       | FA-006    | Black Plastic Ball 1" Dia        | 1        |
| 25       | 600050100 | M5X10 Hex.Socket Head Cap Screw  | 3        |
| 27       | FA-147    | Cluster Gear Shaft upper Bushing | 1        |
| 28a      | FA-146    | Cluster Gear (Upper)             | 1        |

# PARTS LIST

## HEAD ASSEMBLY

| ITEM NO. | PART NO.  | DESCRIPTION                     | Q. T. Y. |
|----------|-----------|---------------------------------|----------|
| 28b      | FA-145    | Cluster Gear (Middle)           | 1        |
| 28c      | FA-144    | Cluster Gear (low)              | 1        |
| 29       | 630030460 | Cluster Gear Key 3X3X46         | 1        |
| 30       | 630030150 | Key 3X3X15                      | 1        |
| 31       | FA-143    | Cluster Gear Shaft              | 1        |
| 32       | 665016000 | Outer Retaining Ring (A-16)     | 1        |
| 33       | FA-142    | Bevel Gear Bushing              | 1        |
| 34       | FA-141    | Bevel Gear Thrust Spacer        | 1        |
| 35       | FA-140    | Feed Reverse Bevel Pinion       | 1        |
| 38       | FA-156A   | Cluster Gear Input Shaft        | 1        |
| 39       | 630030100 | Key 3X3X10                      | 1        |
| 40       | FA-157    | Feed Drive Gear                 | 1        |
| 41       | 735000660 | IKO BA-66 Needle Bearing        | 1        |
| 42       | FA-168    | Bushing                         | 1        |
| 43       | FA-139    | Worm                            | 1        |
| 44       | FA-138    | Feed Worm Shaft Bushing         | 1        |
| 47       | FA-137    | Feed Worm Shaft Thrust Washer   | 1        |
| 48       | FA-134    | Feed Reverse Bevel Gear Bushing | 1        |
| 49       | FA-135    | Feed Reverse Bevel Gear         | 1        |
| 50       | FA-136    | Feed Reverse Clutch             | 1        |
| 51       | FA-135    | Feed Reverse Bevel Gear         | 1        |
| 52       | FA-134    | Feed Reverse Bevel Bushing      | 1        |
| 54       | FA-171    | Set Screw                       | 1        |
| 55       | FA-132    | Reverse Clutch Rod              | 1        |
| 56       | 622025020 | Spring Pin 2.5X20               | 1        |

# PARTS LIST

## HEAD ASSEMBLY

| ITEM NO. | PART NO.   | DESCRIPTION                          | Q. T. Y. |
|----------|------------|--------------------------------------|----------|
| 57       | FA-133     | Feed Worm Shaft                      | 1        |
| 58       | 6040600060 | Set Screw M6X6                       | 1        |
| 59       | 622025012  | Spring Pin 2.5 $\times$ 12           | 1        |
| 60       | FA-150     | Feed Shift Rod                       | 1        |
| 61       | 604050100  | Set Screw M5X10                      | 1        |
| 62       | 630030150  | Key 3X3X15                           | 1        |
| 63       | FA-149     | Feed Gear Shift Fork                 | 1        |
| 64       | FA-151     | Cluster Gear Shift Crank             | 1        |
| 66       | FA-148     | Cluster Gear Cover                   | 1        |
| 67       | 600050100  | M5X10 Hex.Socket Head Cap Screw      | 4        |
| 68       | FA-004     | Gear Shift Plunger                   | 1        |
| 69       | FA-005     | Compression Spring                   | 1        |
| 70       | FA-003     | Shift Crank                          | 1        |
| 71       | 622030020  | Spring Pin 3 $\times$ 20             | 1        |
| 72       | FA-006     | Black Plastic Ball 1" Dia            | 1        |
| 73       | 600050350  | M5X35 Hex.Socket Head Cap Screw      | 2        |
| 74       | FA-081     | Clutch Ring Pin                      | 2        |
| 75       | FA-080     | Clutch Ring                          | 1        |
| 76       | 604060080  | Set Screw M6X8                       | 1        |
| 78       | FA-082     | Overload Clutch Locknut              | 1        |
| 79       | FA-083     | Safety Clutch Spring                 | 1        |
| 80       | FA-084     | Overload Clutch                      | 1        |
| 81       | FA-085     | Overload Clutch Sleeve               | 1        |
| 82       | FA-085A    | Key (5x5x15)                         | 1        |
| 83       | 600040160  | M4X15 Hex.Socket Head Cap Screw      | 3        |
| 85       | 604060200  | Set Screw M6X20                      | 1        |
| 87       | 604060120  | Set Screw M6X12                      | 1        |
| 88       | FA-090     | Compression Spring                   | 1        |
| 89       | FA-089     | Overload Clutch lever Spring Plunger | 1        |

# PARTS LIST

## HEAD ASSEMBLY

| ITEM NO. | PART NO.   | DESCRIPTION                   | Q.T.Y. |
|----------|------------|-------------------------------|--------|
| 90       | FA-123     | Quill Pinion Shaft Bushing    | 1      |
| 91       | FA-122     | Pinton Shaft Worm Gear Spacer | 1      |
| 92       | FA-087     | Overload Clutch Worm Gear     | 1      |
| 93       | FA-086     | Overload Clutch Ring          | 1      |
| 94       | 6650015000 | Outer Retaining Ring A-15     | 1      |
| 95       | FA-077     | Dowel Pin                     | 1      |
| 96       | FA-079     | Overload Clutch Trip Lever    | 1      |
| 97       | FA-078     | Overload Clutch Washer        | 1      |
| 98       | 6650090000 | Outer Retaining Ring A-9      | 1      |
| 99       | FA-076     | Clutch Arm Cover              | 1      |
| 100      | 600060160  | Hex Socket Set Screw M6X16    | 1      |
| 101      | 6150060000 | Locknut M6X1P                 | 1      |
| 102      | FA-077     | Dowel Pin                     | 1      |
| 103      | FA-091     | Cam Rod                       | 1      |
| 104      | FA-328     | Trip Handle                   | 1      |
| 106      | FA-092     | Feed Trip Bracket             | 1      |
| 107      | 600060200  | M6X20 Cap Screw               | 2      |
| 108      | 604060100  | Set Screw M6X10               | 1      |
| 109      | 630030100  | Key 3X3X10                    | 1      |
| 110      | FA-130     | Feed Reverse Knob Stud        | 1      |
| 111      | FA-131     | Reverse Knob                  | 1      |
| 112      | 6650060000 | Outer Retaining Ring A-6      | 1      |
| 113      | FA-129     | Handwheel Clutch              | 1      |
| 114      | 035036000  | 3/16" Steel Ball              | 1      |
| 115      | FA-129B    | Compression Spring            | 1      |
| 116      | FA-129A    | Handwheel Clutch Spring Screw | 1      |
| 117      | 622030014  | Spring Pin 3/4X14             | 1      |

# PARTS LIST

## HEAD ASSEMBLY

| ITEM NO. | PART NO.  | DESCRIPTION                 | Q. T. Y. |
|----------|-----------|-----------------------------|----------|
| 118      | FA-093    | Cam Rod Sleeve Assembly     | 1        |
| 119      | 622030012 | Spring Pin 3/16X12          | 1        |
| 120      | FA-094    | Compression Spring          | 1        |
| 121      | FA-095    | Trip Plunger                | 1        |
| 122      | FA-127    | Handwheel Bushing           | 1        |
| 123      | FA-121    | Trip Plunger Bushing        | 1        |
| 124      | FA-097    | Feed Trip Plunger           | 1        |
| 125      | FA-126    | Handwheel                   | 1        |
| 126      | FA-125    | Handwheel Handle            | 1        |
| 127      | FA-50A    | Spindle (Taper 30 #)        | 1        |
|          | FA-50B    | Spindle (R8)                | 1        |
| 128      | FA-060    | Quill Skirt                 | 1        |
| 129      | 617030000 | Locknut Washer              | 1        |
| 130      | 653030000 | Locknut Washer              | 1        |
| 131      | 726002060 | (M206KDD) Bearing           | 1        |
| 132      | FA-055    | Sleeve                      | 1        |
| 133      | FA-051B   | Nose-Piece                  | 1        |
| 134      | FA-052    | Spindle Dirt Shield         | 1        |
| 135      | 762002070 | JM207PP PRB DB Bearing      | 1        |
| 136      | FA-054    | Bearing Spacer (large)      | 1        |
| 137      | FA-053    | Bearing Spacer (small)      | 1        |
| 138      | 726002070 | JM207PP PRB DB Bearing      | 1        |
| 140      | FA-172    | Special Socket Set Screw    | 1        |
| 141      | 604060060 | M6X6 Collet Alignment Screw | 1        |
| 142      | FA-058    | Quill                       | 1        |
| 143      | 622030012 | Spring Pin 3/16X12          | 1        |
| 144      | 604040200 | Set Screw M4X20             | 1        |

# PARTS LIST

## HEAD ASSEMBLY

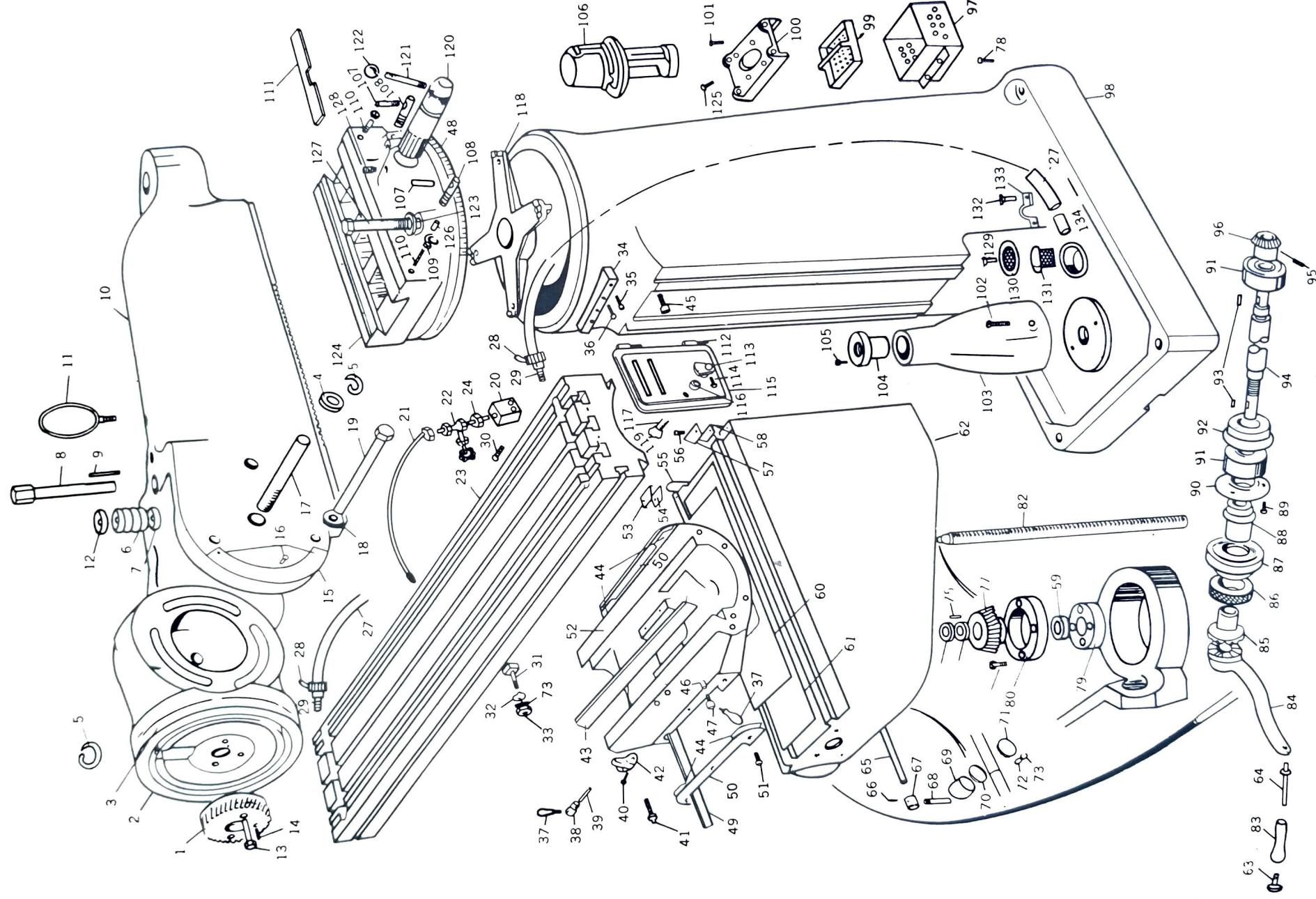
| ITEM NO. | PART NO.   | DESCRIPTION                      | Q. T. Y. |
|----------|------------|----------------------------------|----------|
| 145      | FA-098     | Feed Trip Lever                  | 1        |
| 146      | FA-099     | Trip Lever Pin                   | 1        |
| 147      | FA-119     | Indicator Rod                    | 1        |
| 148      | FA-111     | Quill Lock Sleeve                | 1        |
| 150      | .605050100 | M5x10 Round Head Screw           | 2        |
| 151      | FA-057     | Oil Strainer for Quill Bearing   | 1        |
| 152      | FA-088     | Quill Lock Bolt                  | 1        |
| 153      | FA-110     | Quill Lock Sleeve Tapped         | 1        |
| 154      | FA-120     | Indicator Rod Screw              | 1        |
| 155      | FA 043     | ½"-12 NC Tee Bolt                | 4        |
| 156      | FA-046     | Lower Clamping Bolt Spacer       | 2        |
| 157      | FA-040     | ½"-12 NC Adaptor Nut             | 4        |
| 158      | 605360381  | W 3/16" X 1 ¼" Round Head Screw  | 2        |
| 159      | 403011050  | Micrometer Scale (Metric)        | 1        |
|          | FA-118B    | Micrometer Scale (Inch)          | 1        |
| 160      | 665016000  | Outer Retaining Rings A-16       | 1        |
| 161      | FA-115A    | Quill Micro-Stop Nut (Metric)    | 1        |
|          | FA-115B    | Quill Micro-Stop Nut (Inch)      | 1        |
| 162      | FA-116A    | Micro meter Nut (Metric)         | 1        |
|          | FA-116B    | Micro meter Nut (Inch)           | 1        |
| 163      | FA-117     | Quill Stop Knob                  | 1        |
| 164      | FA-112A    | Quill Stop Micro-Screw (Metric)  | 1        |
|          | FA-112B    | Quill Stop Micro-Screw (Inch)    | 1        |
| 165      | 600100140  | M10X14 Hex-Socket Head Cap Screw | 1        |
| 166      | FA-101     | Quill Pinion Shaft               | 1        |
| 168      | FA-101A    | Pin                              | 1        |
| 169      | 600050120  | M5X12 Hex Socket Head Cap Screw  | 8        |
| 170      | 622050016  | 5/18" Spring Pin                 | 1        |

# PARTS LIST

## HEAD ASSEMBLY

| ITEM NO. | PART NO.  | DESCRIPTION                   | Q. T. Y. |
|----------|-----------|-------------------------------|----------|
| 171      | 630040180 | Key 4X4X18                    | 1        |
| 172      | FA-107    | Pinion Shaft Hub Screw        | 1        |
| 173      | 035040000 | 4 <del>✓</del> Steel Ball     | 1        |
| 174      | FA-105A   | Compression Spring            | 1        |
| 175      | FA-106    | Back Feed Handle Hub          | 1        |
| 176      | FA-104    | Pinion Shaft Hub Sleeve       | 1        |
| 177      | FA-103    | Spring Cover                  | 1        |
| 178      | FA-102    | Clock Spring                  | 1        |
| 179      | FA-042    | Washer                        | 4        |
| 181      | 604060120 | Set Screw M6X12               | 2        |
| 183      | FA-113    | Reverse Trip Ball Lever       | 1        |
| 184      | FA-114    | Feed Reverse Trip plunger     | 1        |
| 185      | FA-124    | Reverse Trip Ball Lever Screw | 1        |
| 186      | FA-018    | Worm Gear                     | 1        |
| 187      | 630040180 | Key 4X4X18                    | 1        |
| 188      | FA-173    | Socket Set Screw              | 1        |
| 189      | FA-017    | ADJ Worm Shaft                | 1        |
| 190      | FA-106B   | Pinion Shaft Hub Handle       | 1        |
| 191      | FA-106A   | Black Plastic Ball            | 1        |
| 192      | FA-016    | Quill Housing                 | 1        |
| 193      | FA-105B   | Set Screw                     | 1        |
| 194      | FA-107    | Set Screw                     | 1        |
| 195      | 615004000 | M4 Nut                        | 1        |

Spare parts BASIC MACHINE



## PARTS LIST BASIC MACHINE

| ITEM NO. | COMP. NO. | DESCRIPTION                     | Q. T. Y. |
|----------|-----------|---------------------------------|----------|
| 1        | FD-001    | Quill Housing Adjusting Gear    | 1        |
| 2        | FD-002    | Ram Adaptor                     | 1        |
| 3        | 403011030 | Adaptor Scale                   | 1        |
| 4        | FD-006    | Washer Pivot Stud Locknut       | 1        |
| 5        | 665030000 | Outer Retaining Ring A-30       | 2        |
| 6        | FD-011    | Vertical Adjusting Worm         | 1        |
| 7        | FD-012    | Worm Thrust Washer              | 1        |
| 8        | FD-009    | Vertical Adjusting Worm Shaft   | 1        |
| 9        | 637050480 | Key 5X5X48                      | 1        |
| 10       | FD-004    | Ram                             | 1        |
| 11       | FD-004B   | Hook                            | 1        |
| 12       | FD-010    | Worm Thrust Washer              | 1        |
| 13       | 600060250 | M6X25 Hex Socket Head Cap Screw | 2        |
| 14       | 622060030 | 6.5X30 Spring Pin               | 1        |
| 15       | 403013090 | Angle Plate                     | 1        |
| 16       | 625020006 | 2.5X6 Rivet                     | 17       |
| 17       | FD-005    | Adaptor Pivot Stud              | 1        |
| 18       | FD-008    | Washer                          | 3        |
| 19       | FD-007    | Adaptor Locking Bolt            | 3        |
| 20       | FD-039    | Tap Bracket                     | 1        |
| 21       | AD-036    | Coolant Pipe                    | 1        |
| 22       | AD-035    | Oil Valve                       | 1        |
| 23       | FC-009    | Table (42")                     | 1        |
|          | FC-009B   | Table (49")                     | 1        |
| 24       | AD-031    | Valve Adaptor                   | 1        |
| 27       | 043034001 | Plastic Hose                    | 1        |
| 28       | AD-028    | Hose Clip                       | 1        |
| 29       | AD-027A   | Hose Adaptor                    | 1        |

# PARTS LIST

## BASIC MACHINE

| ITEM NO. | COMP. NO. | DESCRIPTION  | Q. T. Y. |
|----------|-----------|--|----------|
| 30       | 600050450 | M5X45 Hex-Socket Head Cap Screw  | 2        |
| 31       | FC-010    | Stop Piece T-Bolt  | 2        |
| 32       | FC-011    | Table Stop Piece   | 2        |
| 33       | 615038001 | 3/8"-16NC Hexagon Nut  | 2        |
| 34       | FD-063    | Bracket for Neoprene Rearway Cover                                       | 1        |
| 35       | 600060300 | M6X30 Hex-Socket Head Cap Screw  | 2        |
| 36       | 605360381 | W <sup>3/16</sup> " X <sup>3/8</sup> " Cross-Recessed Head Machine Screw | 4        |
| 37       | FA-125    | Table Lock Bolt Handle   | 3        |
| 38       | FC-014    | Saddle Lock Bolt   | 1        |
| 39       | FC-015    | Saddle Lock Plunger  | 1        |
| 40       | 600100200 | M10X20 Hex-Socket Head Cap Screw   | 2        |
| 41       | AC-90     | Adjusting Screw  | 6        |
| 42       | FC-016    | Table Stop Bracket (Table 42")   | 1        |
|          | FC-016A   | Table Stop Bracket (Table 49")   | 1        |
| 43       | FC-013A   | Saddle Table Gib (Table 42")   | 1        |
|          | FC-013B   | Saddle Table Gib (Table 49")   | 1        |
| 44       | FC-021A   | Left Felt Wipers   | 2        |
|          | FC-021B   | Right Felt Wipers  | 2        |
| 45       | FE-034    | Cap Screw  | 1        |
| 46       | FC-019    | Table Lock Plunger   | 2        |
| 47       | FC-014A   | Table Lock Bolt (Table 42")  | 2        |
|          | FC-014B   | Table Lock Bolt (Table 49")  | 2        |
| 48       | 403013070 | Turret Scale   | 1        |
| 49       | FC-020A   | Saddle Knee Gib (Table 42")  | 1        |
|          | FC-020B   | Saddle Knee Gib (Table 49")  | 1        |
| 50       | FC-022    | Saddle Knee Wiper Plate  | 2        |
| 51       | 605360381 | W <sup>3/16</sup> " X <sup>3/8</sup> " Cross-Recessed Head Machine Screw | 6        |

# PARTS LIST

## BASIC MACHINE

| ITEM NO. | COMP. NO.  | DESCRIPTION   | Q. T. Y. |
|----------|------------|---|----------|
| 52       | FC-017     | Saddle (Table 42")  | 1        |
|          | FC-017B    | Saddle (Table 49")  | 1        |
| 53       | FE-001B    | Wiper Holder (L)  | 1        |
| 54       | FE-002B    | Knee Wiper Felt   | 1        |
| 55       | FE-003     | Knee Column Gb  | 1        |
| 56       | 605040581  | W $\frac{1}{4}$ " X $\frac{5}{8}$ " Cross-Recessed Head Machine Screw | 2        |
| 57       | FE-001A    | Wiper Holder (R)  | 1        |
| 58       | FE-002A    | Knee Wiper Felt   | 1        |
| 59       | FE-025     | Sleeve  | 1        |
| 60       | FE-004     | Chip Guard (up)   | 1        |
| 61       | FE-005     | Chip Guard (down)   | 1        |
| 62       | FE-006     | Knee  | 1        |
| 63       | AA-029     | Set Screw   | 1        |
| 64       | FC-002A    | Handle Shaft  | 1        |
| 65       | FE-012     | Knee Lock Shaft   | 1        |
| 66       | 6220500025 | 5/8X25 Pin  | 2        |
| 67       | FE-014     | Lock Shaft boss   | 1        |
| 68       | FE-013     | Lock Shaft Handle   | 1        |
| 69       | FE-009     | Knee Lock Plunger   | 1        |
| 70       | FE-010     | Washer Distance/Spacer  | 1        |
| 71       | FE-030     | Knee Binder Plug (Plastic)  | 1        |
| 72       | FE-011     | Knee Binder Set Screw   | 1        |
| 73       | FC-011A    | Washer  | 2        |
| 74       | 615002003  | 1/2-20NF NUT  | 1        |
| 75       | 635050250  | Key 5X5X25  | 1        |
| 76       | FE-023     | Washer  | 1        |
| 77       | FE-024     | Bevel Gear  | 1        |

# PARTS LIST

## BASIC MACHINE

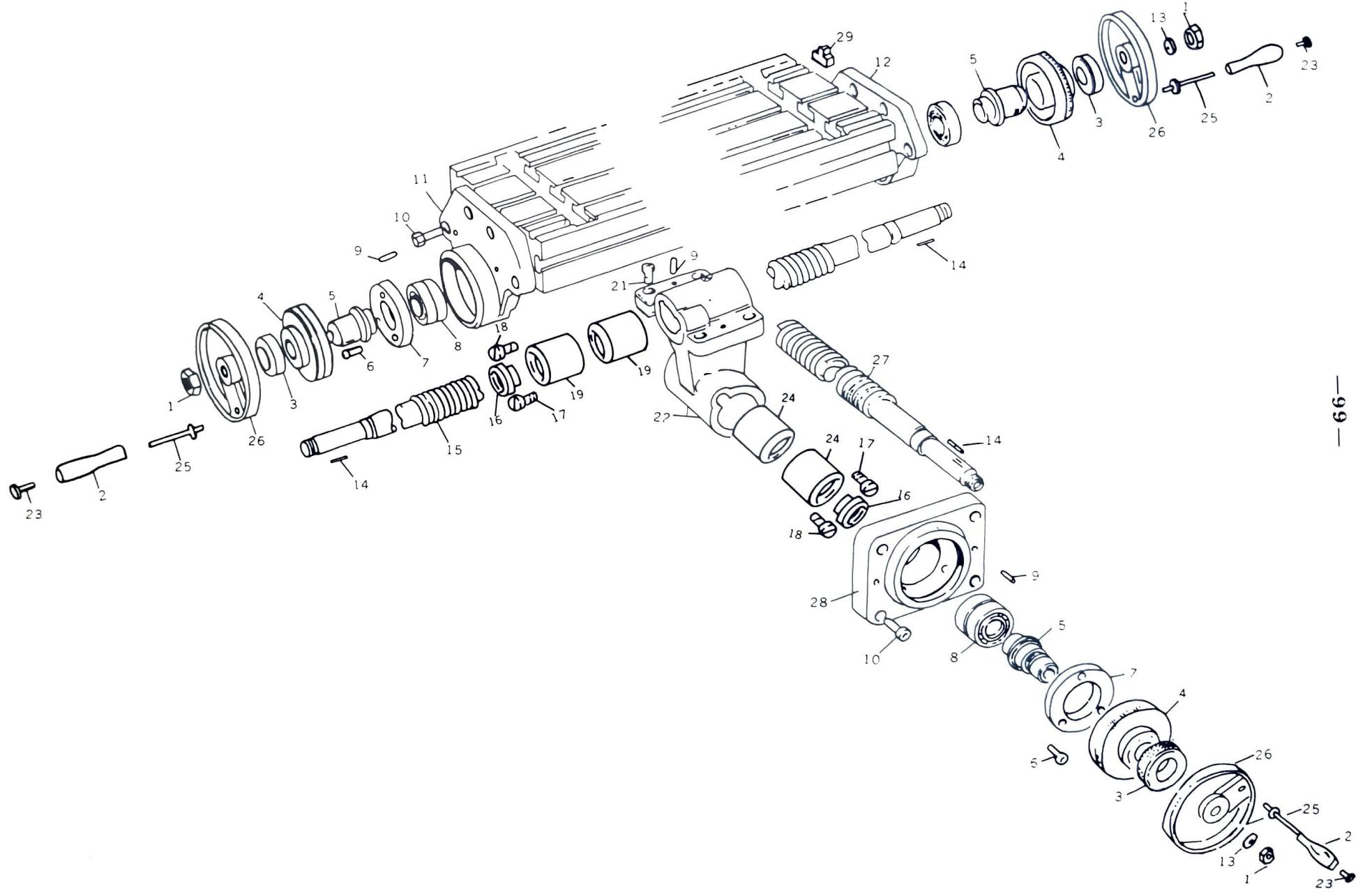
| ITEM NO. | COMP. NO. | DESCRIPTION                      | Q. T. Y. |
|----------|-----------|----------------------------------|----------|
| 78       | 600080120 | M8X12 Hex-Socket Head Cap Screw  | 2        |
| 79       | 711073054 | #3305 Bearing                    | 1        |
| 80       | FE-026    | Bearing Retainer Ring            | 1        |
| 81       | 600100160 | M10X14 Hex-Socket Head Cap Screw | 3        |
| 82       | FE-027A   | Elevating Screw (Metric)         | 1        |
|          | FE-027B   | Elevating Screw (inch)           | 1        |
| 83       | AC-053    | Black Plastic Handle             | 1        |
| 84       | FE-021    | Elevating Crank                  | 1        |
| 85       | FE-020    | Gear Shaft Clutch Insert         | 1        |
| 86       | FC-002    | Dial Lock Nut                    | 1        |
| 87       | FE-19A    | Dial With 125 Graduation         | 1        |
|          | FE-19B    | Dial With 100 Graduation         | 1        |
| 88       | FE-018    | Dial Holder                      | 1        |
| 89       | 600060200 | M6X20 Hex-Socket Head Cap Screw  | 3        |
| 90       | FC-005    | Bearing Retainer Ring            | 1        |
| 91       | 701062044 | #6204 2RS Bearing                | 2        |
| 92       | FE-016    | Bearing Cap                      | 1        |
| 93       | 630040180 | Key 4X4X18                       | 2        |
| 94       | FE-017    | Elevating Shaft                  | 1        |
| 95       | 604060060 | M6X6 Socket Set Screw            | 1        |
| 96       | FE-015    | Bevel Pinion                     | 1        |
| 97       | FD-032    | Strainer Case                    | 1        |
| 98       | FD-024    | Column                           | 1        |
| 99       | FD-033    | Strainer                         | 1        |
| 100      | FD-034    | Coolant Pump Motor Set           | 1        |
| 101      | 600060200 | M6X20 Hex-Socket Head Cap Screw  | 4        |
| 102      | 600100350 | M10X35 Hex-Socket Head Cap Screw | 2        |
| 103      | FE-029    | Elevating Screw Housing          | 1        |
| 104      | FE-028A   | Elevating Screw Nut (Metric)     | 1        |

# PARTS LIST

## BASIC MACHINE

| ITEM NO. | COMP. NO.  | DESCRIPTION                     | Q. T. Y. |
|----------|------------|---------------------------------|----------|
| 105      | 600060250  | M6X25 Hex-Socket Head Cap Screw | 3        |
| 106      |            | Coolant Pump Motor              | 1        |
| 107      | AC-024     | Ram Lock Screw Handle           | 2        |
| 108      | AC-040     | Ram Lock Screw                  | 2        |
| 109      | 6150100000 | Gib Lock Nut M10                | 2        |
| 110      | FD-038     | Gib Lock Screw                  | 2        |
| 111      | FD-036     | Turret-Ram Gib                  | 1        |
| 112      | 6220500040 | 5/16"X40 Spring Pin             | 2        |
| 113      | FD-025     | Door Locking Cam                | 1        |
| 114      | 6040600060 | M6X6 Grub Screw                 | 1        |
| 115      | FD-027     | Door                            | 1        |
| 116      | FD-026     | Spring                          | 1        |
| 117      | FD-028     | Door Knob Shaft                 | 1        |
| 118      | FD-023     | Spider                          | 1        |
| 119      | FD-029     | Door Knob                       | 1        |
| 120      | FD-017     | Ram Pinion                      | 1        |
| 121      | FD-016     | Ram Pinion Handle               | 1        |
| 122      | AA-39      | 35/64" Ball 3/8" X 16NC         | 1        |
| 123      | FD-008     | Spring Washer                   | 4        |
| 124      | FD-013     | Turret                          | 1        |
| 125      | 602382021  | 3/8" -16NC Hexagon Head Bolt    | 4        |
| 126      | EA-111     | Ram Lock Plunger                | 2        |
| 127      | FD-022     | Locking Bolt                    | 4        |
| 128      | FD-014     | Ram Pinion Set Screw            | 1        |
| 129      | 606360381  | W3/16"X3/8" Screw               | 6        |
| 130      | FD-030     | Strainer                        | 2        |
| 131      | FD-031     | Strainer can                    | 2        |
| 132      | 606360381  | W3/16"X3/8" Screw               | 4        |
| 133      | FD-042     | Hose clip                       | 2        |
| 134      | FD-043     | Pipe                            | 2        |

Spare parts LEADSCREW ASSEMBLY



# PARTS LIST

## LEADSCREW ASSEMBLY

| ITEM NO. | COMP. NO. | DESCRIPTION                                | Q. T. Y. |
|----------|-----------|--|----------|
| 1        | 615002003 | ½" -20 NF Jam Nut                          | 3        |
| 2        | AC-53     | Black Plastic Handle                       | 3        |
| 3        | FC-002    | Dial Lock Nut                              | 3        |
| 4        | FC-003A   | Dial With 250 Graduation (Metric)          | 3        |
|          | FC-003B   | Dial With 200 Graduation (Inch)            | 3        |
| 5        | FC-004    | Dial Holder                                | 3        |
| 6        | 600060200 | M6X20 Hex-Socket Head Cap Screw            | 6        |
| 7        | FC-005    | Bearing Retainer Ring                      | 3        |
| 8        | 701062044 | #6204 2RS Ball Bearing                     | 5        |
| 9        | 622050040 | 5/8X40 Spring Pin                          | 8        |
| 10       | 600100250 | M10X25 Hex-Socket Head Cap Screw           | 12       |
| 11       | FC-006    | Left Bearing Bracket                       | 1        |
| 12       | FC-006    | Right Bearing Bracket                      | 1        |
| 13       | FC-01d    | Washer                                     | 3        |
| 14       | 630040250 | Key 4X4X25                                 | 3        |
| 15       | FC-007A   | Longitudinal Feed Screw (Metric Table 49") | 1        |
|          | FC-007B   | Longitudinal Feed Screw (Inch Table 49")   | 1        |
|          | FC-008A   | Longitudinal Feed Screw (Metric Table 42") | 1        |
|          | FC-008B   | Longitudinal Feed Screw (Inch Table 42")   | 1        |
| 16       | FE-322    | Feed Nut Bracket Ring                      | 2        |
| 17       | 600050200 | M5X20 Hex-Socket Head Cap Screws           | 6        |
| 18       | 600060200 | M6X20 Hex-Socket Head Cap Screws           | 6        |
| 19       | FC-321A   | Longitudinal Feed Nut (Metric)             | 2        |
|          | FC-321B   | Longitudinal Feed Nut (Inch)               | 2        |
| 21       | 600100250 | M10X25 Hex-Socket Head Cap Screw           | 4        |
| 22       | FE-320    | Feed Nut Bracket                           | 1        |
| 23       | AA-029    | Set Screw                                  | 3        |

# PARTS LIST

## LEADSCREW ASSEMBLY

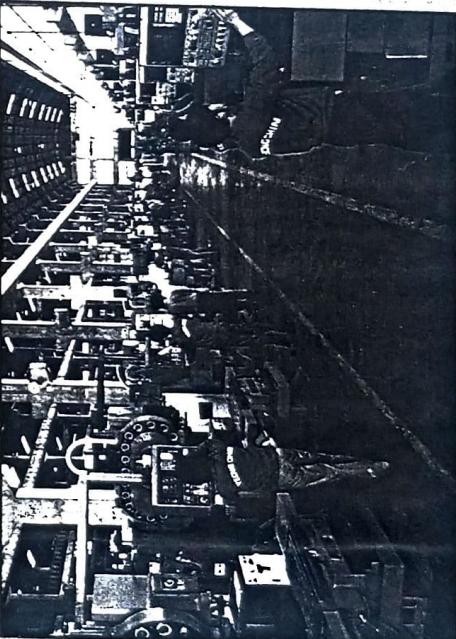
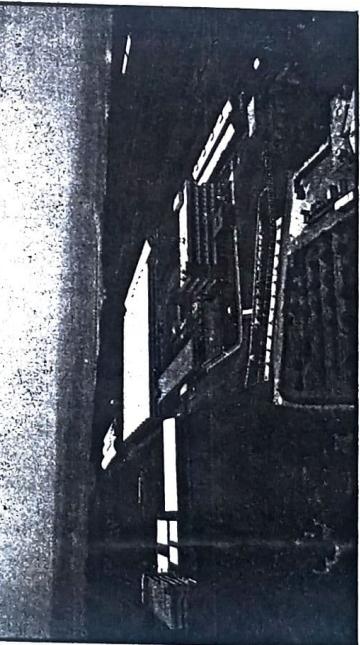
| ITEM NO. | COMP. NO. | DESCRIPTION                | Q. T. | Y. |
|----------|-----------|----------------------------|-------|----|
| 24       | FE-321A   | Cross Feed Nut (Metric)    | 2     |    |
|          | FE-321B   | Cross Feed Nut (Inch)      | 2     |    |
| 25       | FC-002A   | Handle Shaft               | 3     |    |
| 26       | FC-001b   | Handle Wheel               | 3     |    |
| 27       | FE-007A   | Cross Feed Screw (Metric)  | 1     |    |
|          | FE-007B   | Cross Feed Screw (Inch)    | 1     |    |
| 28       | FE-008    | Cross Feed Bearing Bracket | 1     |    |
| 29       | FC-028    | T-Slot Plug                | 6     |    |

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