

Partner 04

Mechanical Manual

Milltronics Manufacturing Company

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R8 Drawbar - MA-171

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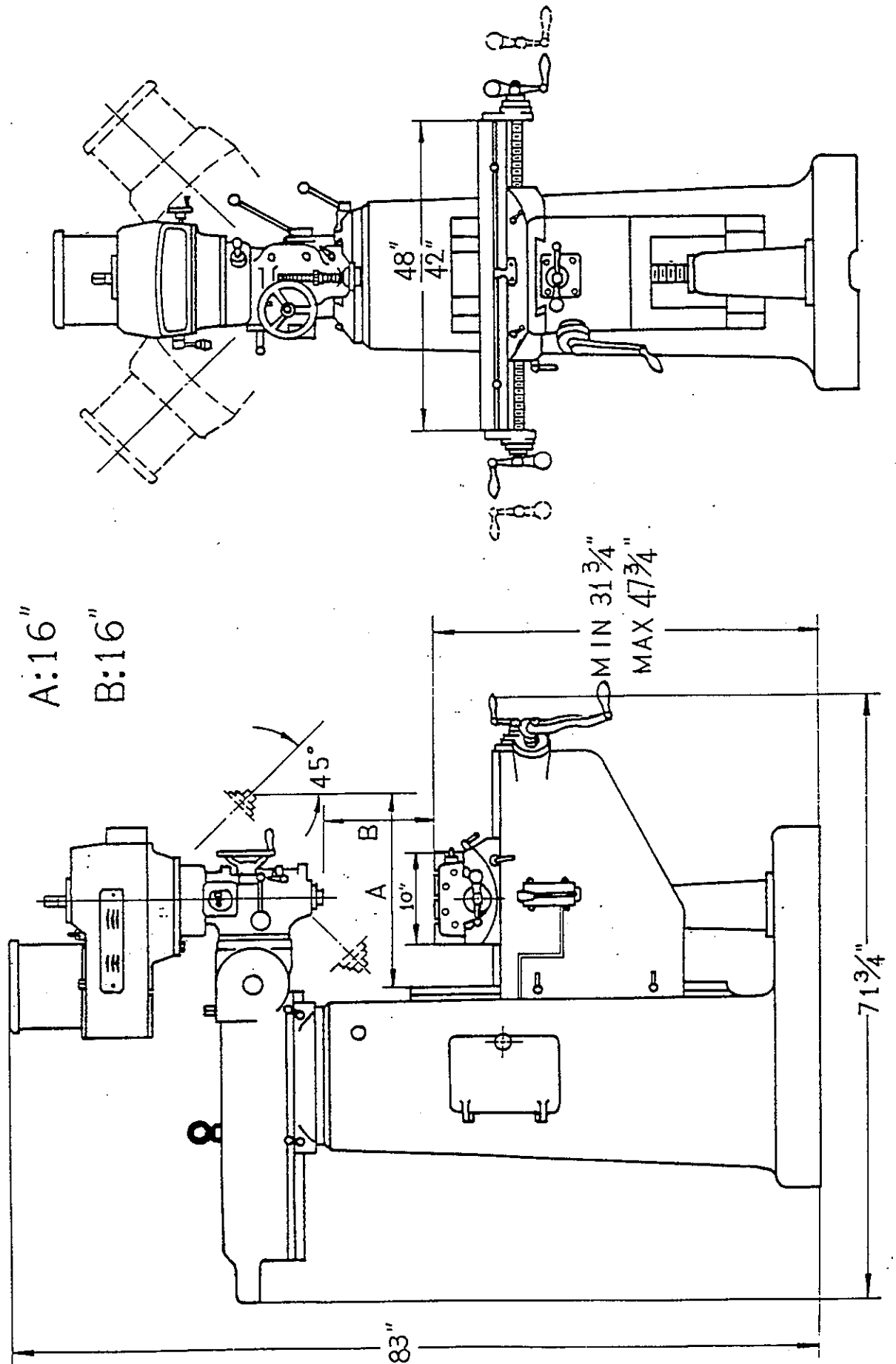
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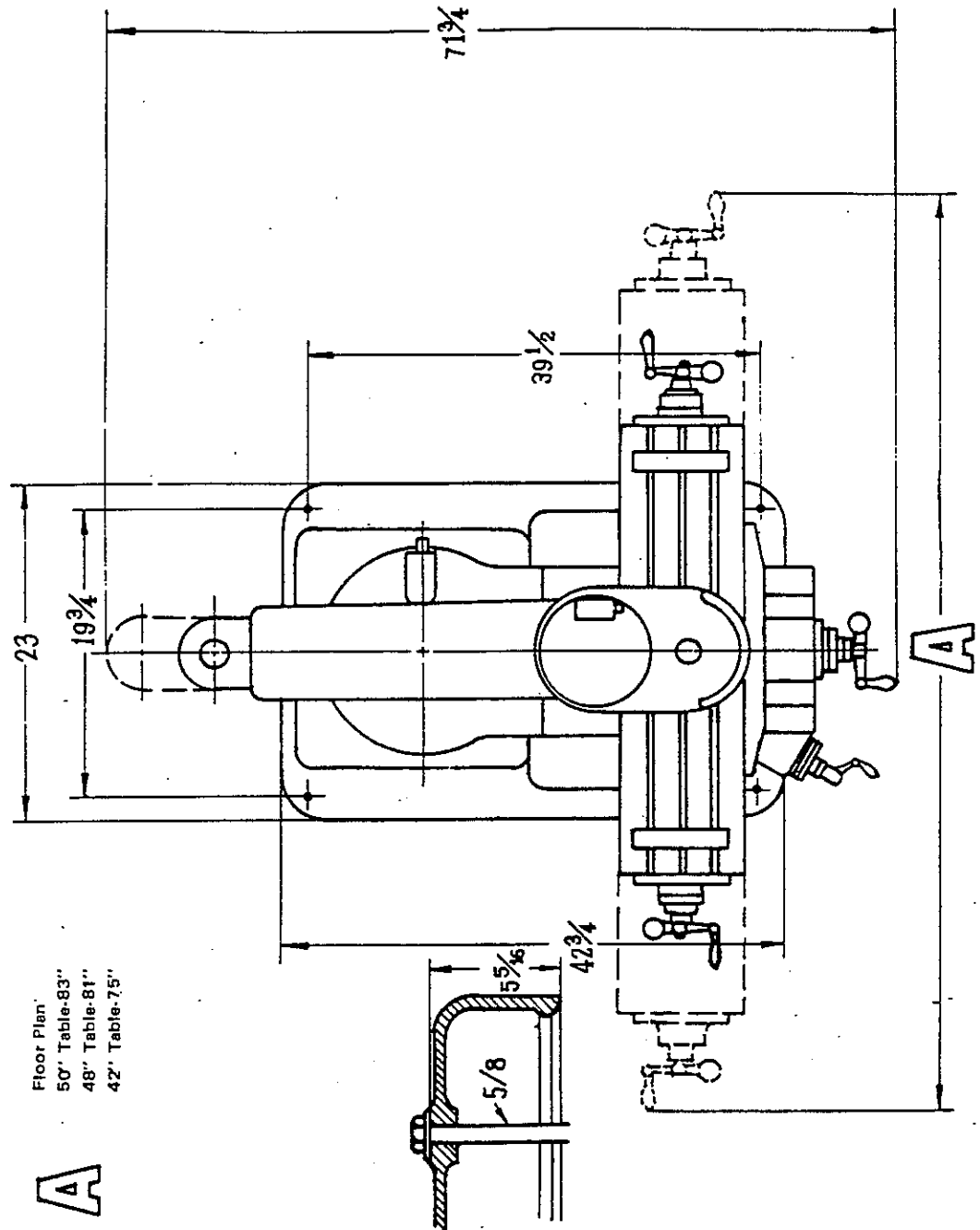
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INSTRUCTION MANUAL

Turret-Type Vertical Mill Variable Speed Head



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PRELIMINARY INFORMATION

UNCRATING:

Carefully remove the protective crating and skid so that the machine and parts are not marred, scratched or otherwise damaged. In the event of any damage in transit, notify our representative at once as well as the transportation company making final delivery. The machine should be lifted from the base of the crate by placing a sling under the overarm.

SHORTAGES:

Inspect the complete shipment carefully against the itemized packing list to make sure that all items are present. In the event damage or shortages are noticed they should be reported immediately to the delivering carrier and to the representative from whom the machine was purchased with a clear indication as to which parts have not been received.

CLEANING:

Thoroughly clean the rust preventive materials from the machine with mineral spirits, or other suitable solvents. Do not move the table, saddle, knee or other moving parts until all of the sliding way surfaces have been well cleaned and lubricated. After cleaning carefully move to a limit stop in one direction the table, saddle and knee, and clean and lubricate the exposed way surfaces. Then move each of these units to the opposite limit stop and similarly clean and lubricate the exposed way surfaces. Loosen the two locks to unlock the overarm and move this forward and backward to the extreme position in order to clean and lubricate.

FOUNDATION:

For best performance it is important that the machine be placed on a solid foundation and that it be level. A solid concrete floor is desirable, but a firm wooden floor, freed from vibration, may be suitable. If the machine is to be located on an upper floor or balcony it should be placed as close as possible to a strong supporting pillar or column.

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LEVELING:

The machine is provided with four bolt holes one at each corner of the base. Steel wedges or steel plates should be used for leveling. A good machinist's level should be used in the leveling process and the bubble should have adequate time to come to rest. The level should be placed both lengthwise and crosswise on the machine table.

VERTICAL HEAD ON OVERARM: (EXPORT ONLY)

When the machine leaves the factory the vertical head is positioned on the overarm with the spindle up and the motor down. Before operating the machine it is necessary that the head be returned to its normal operationing position by loosening the hexagonal units located at the head end of the overarm. It will then be possible to tilt the head into normal operating position by using a crank on the 1/2" stud located on the right side of the front end of the overarm. Because of the heavy overhung weight involved, the tilting of the head back to its normal position will be greatly facilitated if a second person can help push it into position. The head may then be trammed in as described.

VERTICAL HEAD ON OVERARM:

When the machine leaves the factory the vertical head is tilted back on the overarm. Before operating the machine it is necessary that the head be returned to its normal operating position and trammed in as described.

HANDLES:

When crating, the three ball crank handles are turned facing each other. The handles should be reversed during installation.

LUBRICATION:

Do not operate machine until properly lubricated. Follow the instructions given in fig. 3, Page 6, and Lubrication plate, Page 7.

INSPECTION:

Machine is carefully inspected and lined up before it leaves our factory. Figures # 1 and 2 shows the way your machine is lined up.

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ALIGNMENT OF HEAD

In case of precision boring or work of that nature, where it is necessary to have head perfectly square with the table, use method prescribed below. For normal milling, graduations on turret, and head are accurate enough. To set head perfectly square with table see Figures = 1 & = 2. This may be done with head and adapter on overarm, by adjusting adapter through worm gear on adapter. Loosen three binding bolts but leave drag on same for fine adjustment. Mount indicator in spindle nose as shown in Figure = 1 and 2, and indicate parallel.

NOTE: When indicating as in Figures 1, it should be noted that the table is fitted to be slightly high in front, usually about .0005.

TABLE SQUARE WITH SPINDLE THRU
TRANSVERSE AXIS

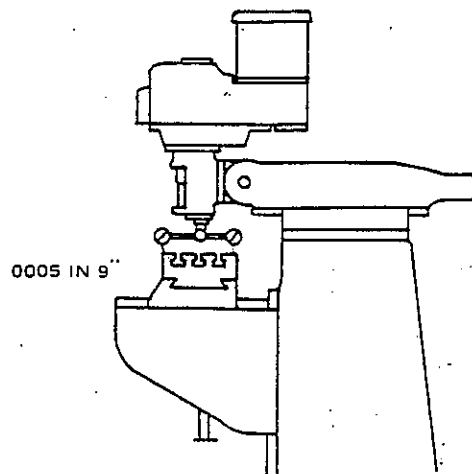


Fig. 1

TABLE SQUARE WITH SPINDLE THRU
LONGITUDINAL AXIS

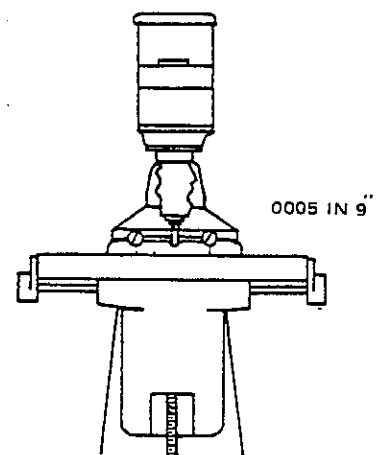
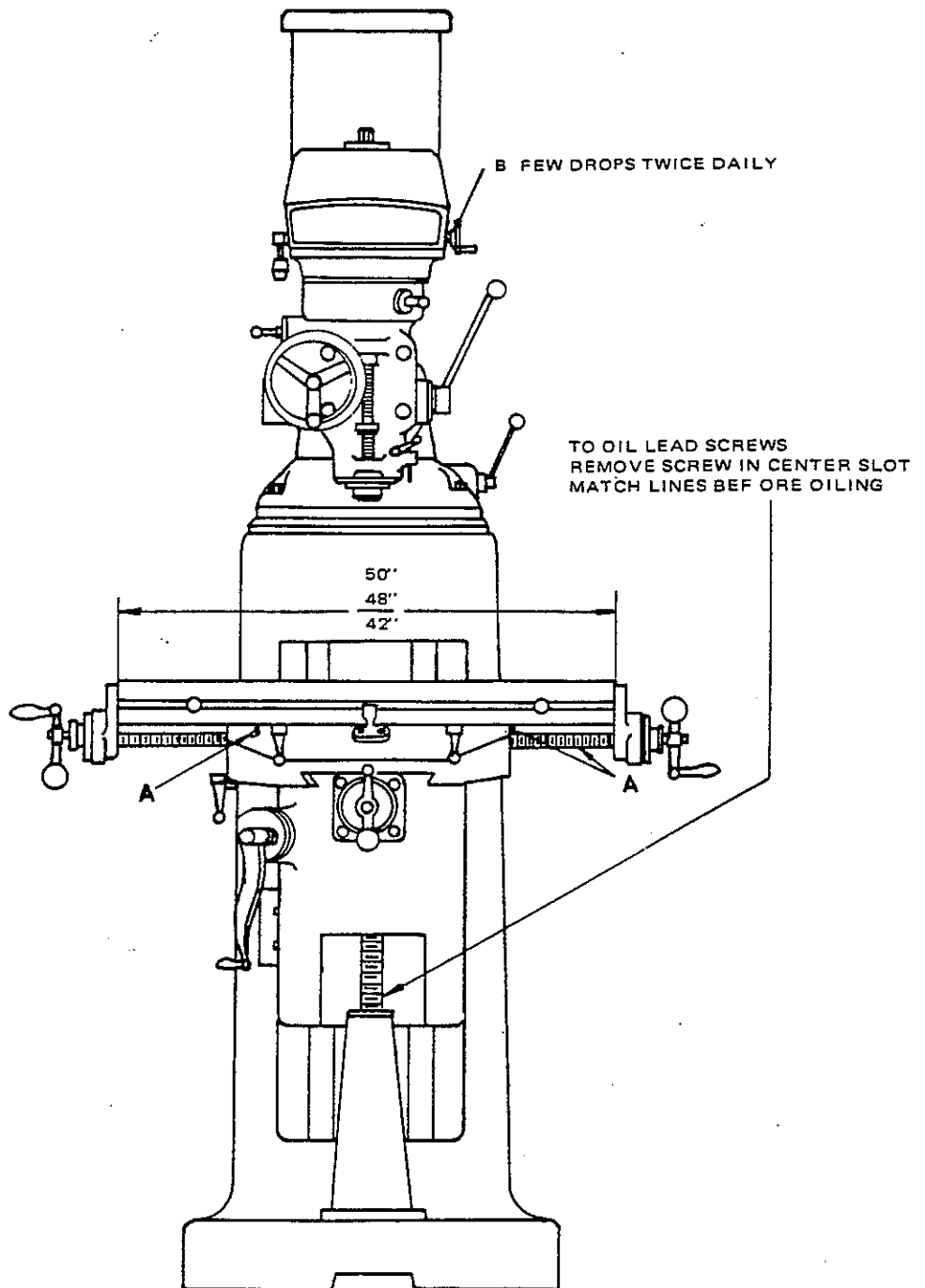


Fig. 2

INSTRUCTION MANUAL

RECOMMENDED LUBRICATION



- A. One Shot, Lube System
mobil VACTRA OIL No. 2
B. Milling Head
S.A.E. 10 or 10W Light Oil

Fig. 3

INSTRUCTION MANUAL

FOR CORRECT LUBRICATION WE RECOMMEND THE FOLLOWING
MOBIL PRODUCTS OR THEIR EQUIVALENT

VERTICAL SPINDLE BEARINGS	MOBILTEMP SHC 32
VERTICAL SPINDLE POWER FEED GEAR BOX	MOBILPLEX 45
PULLEY BEARINGS, TABLE LEAD SCREW BEARINGS & KNEE ELEVATOR THRUST BEARINGS	MOBILUX EP 2
KNEE ELEVATOR BEVEL GEARS	MOBILUX EP 2
VERTICAL SPINDLE OIL CUP CRANKSHAFT BEARINGS, WAYS, SLIDES, SPINDLE QUILL TRIP MECHANISM & AUTOMATIC LUBRICATOR	MOBIL VACTRA OIL No. 2
ELEVATING SCREWS & SPINDLE SPLINES	MOBILUX EP 2
OVERARM ARBOR SUPPORT	MOBIL VACTRA OIL No. 4

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ADJUSTMENT OF TABLE GIB

The table is provided with a full length tapered gib in the saddle, with an adjusting screw on the left side. To take up gib, tighten large screw slightly and repeat until a slight drag is felt when moving the table by hand. (Fig. 4)

Fig. 4

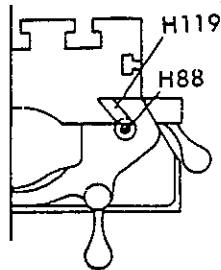
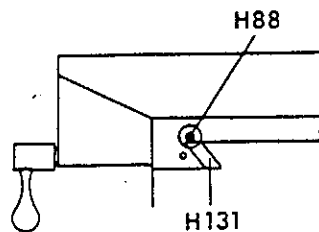


Table-saddle gib

ADJUSTMENT OF SADDLE AND KNEE GIBS

A tapered gib is used for adjusting the saddle bearing on the knee. This forms a guide for the saddle. To tighten gib same principal as described above is used; however, chip wiper must be removed first. (Fig. 5)

Fig. 5

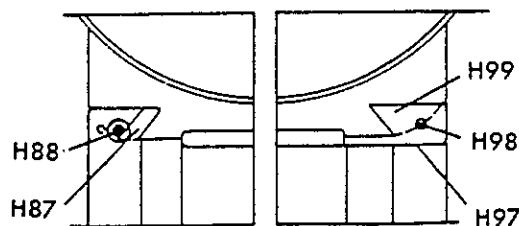


Saddle-knee gib

ADJUSTMENT OF KNEE GIB

Remove chip wiper and adjust screw until smooth movement is attained. (Fig. 6)

Fig. 6



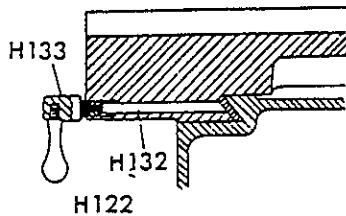
Knee-Column gib

INSTRUCTION MANUAL

CLAMPING TABLE SADDLE

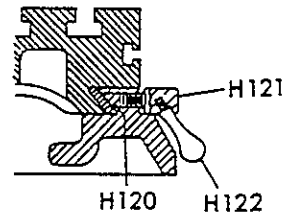
When milling with longitudinal table feed only, it is advisable to clamp the knee to the column and the saddle to the knee to add rigidity to these members and provide for heavier cuts with a minimum of vibration. The saddle locking lever is located on the left-hand side of saddle. (Fig. 7) Excessive Pressure can cause slight table bind. Use moderate clamping pressure, as this will hold saddle sufficiently.

Fig. 7



The table clamping levers are located on front of saddle and should always be clamped when longitudinal movement is not required. (Fig. 8)

Fig. 8



REMOVING OF TABLE

Remove as follows: Ball crank handles, dial holders, bearing brackets. Screw will then turn all the way so that it can be removed. When this is accomplished, the table can easily be taken off merely by sliding from saddle.

REMOVING OF SADDLE

Follows along the same lines as removing table; however, it is necessary to remove entire front bracket assembly completely. Then remove nut bracket which has become accessible after table has been removed.

INSTRUCTION MANUAL

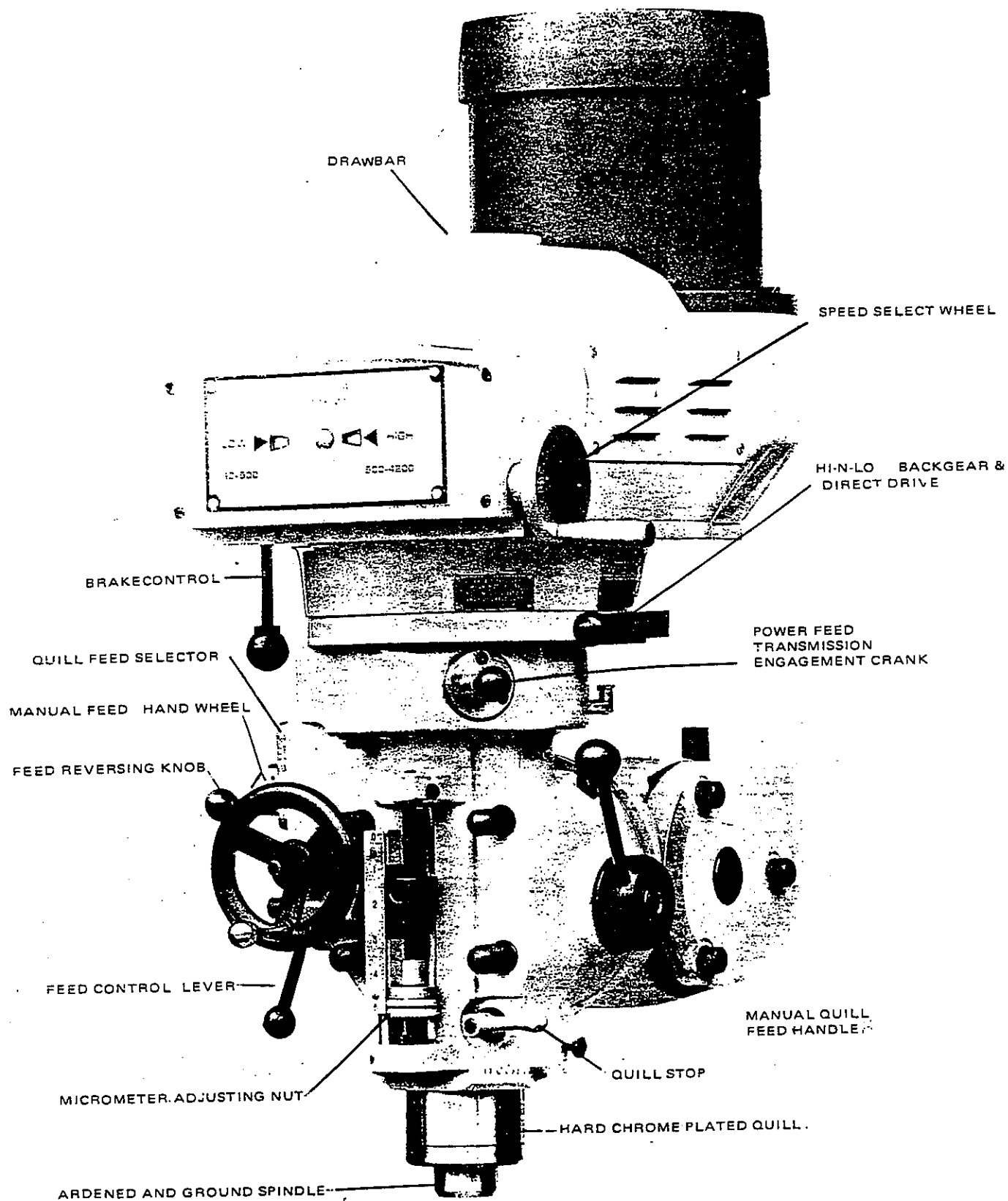


Fig. 9

INSTRUCTION MANUAL

INSTALLATION

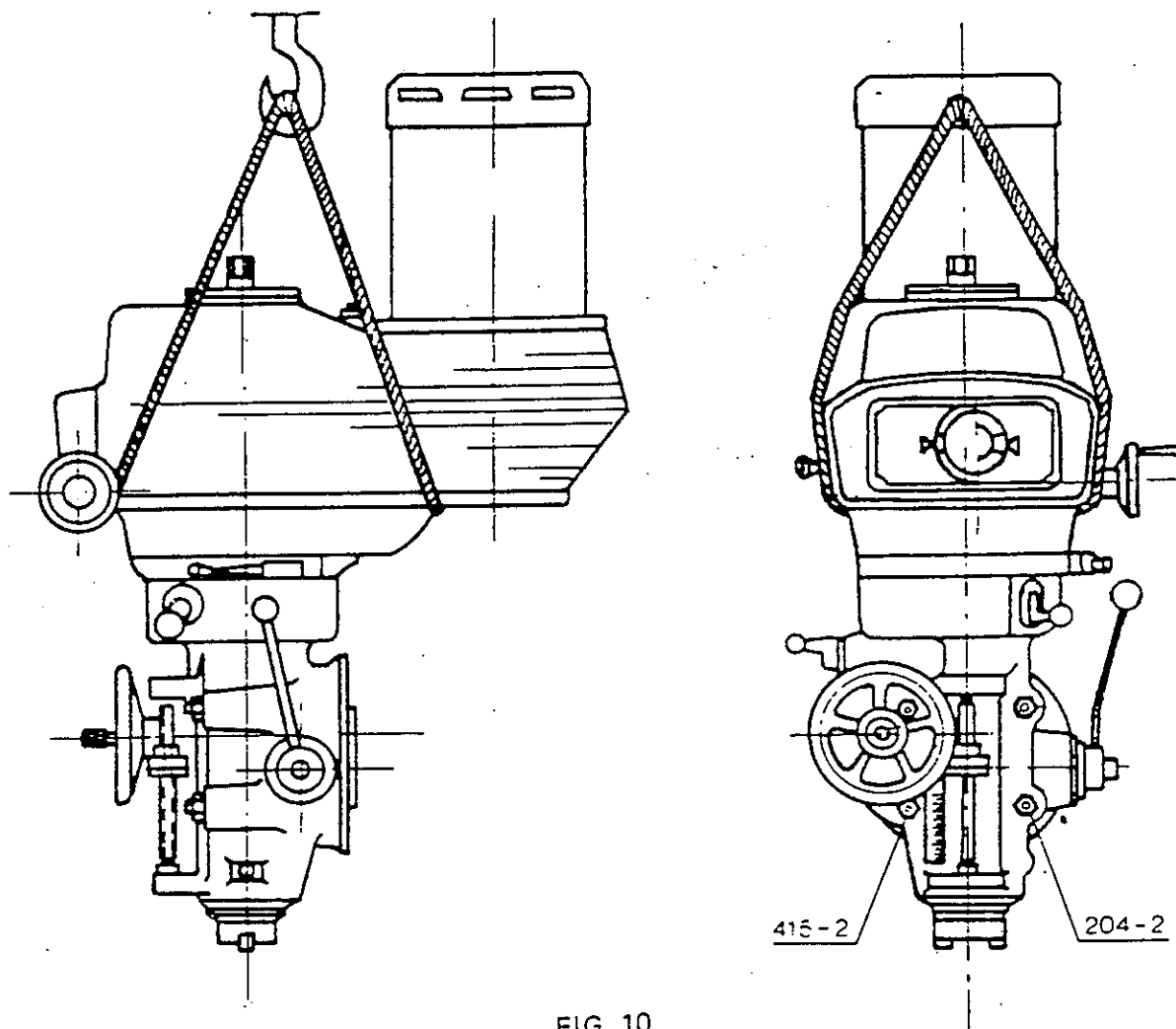


FIG. 10

HEAD REMOVAL/INSTALLATION

We recommend use of a nylon strap for transporting variable speed head, as shown above.

INSTALLATION

Place screws Nos. 204-2 and 415-2 into the four holes of head. Then, tighten by means of four nuts corresponding to screws mentioned above.

CAUTION: OVER TIGHTENING THE NUTS COULD CAUSE DAMAGE TO THE HEAD OR STRIP THE BOLTS.

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GENERAL DESCRIPTION OF VARIABLE SPEED HEAD

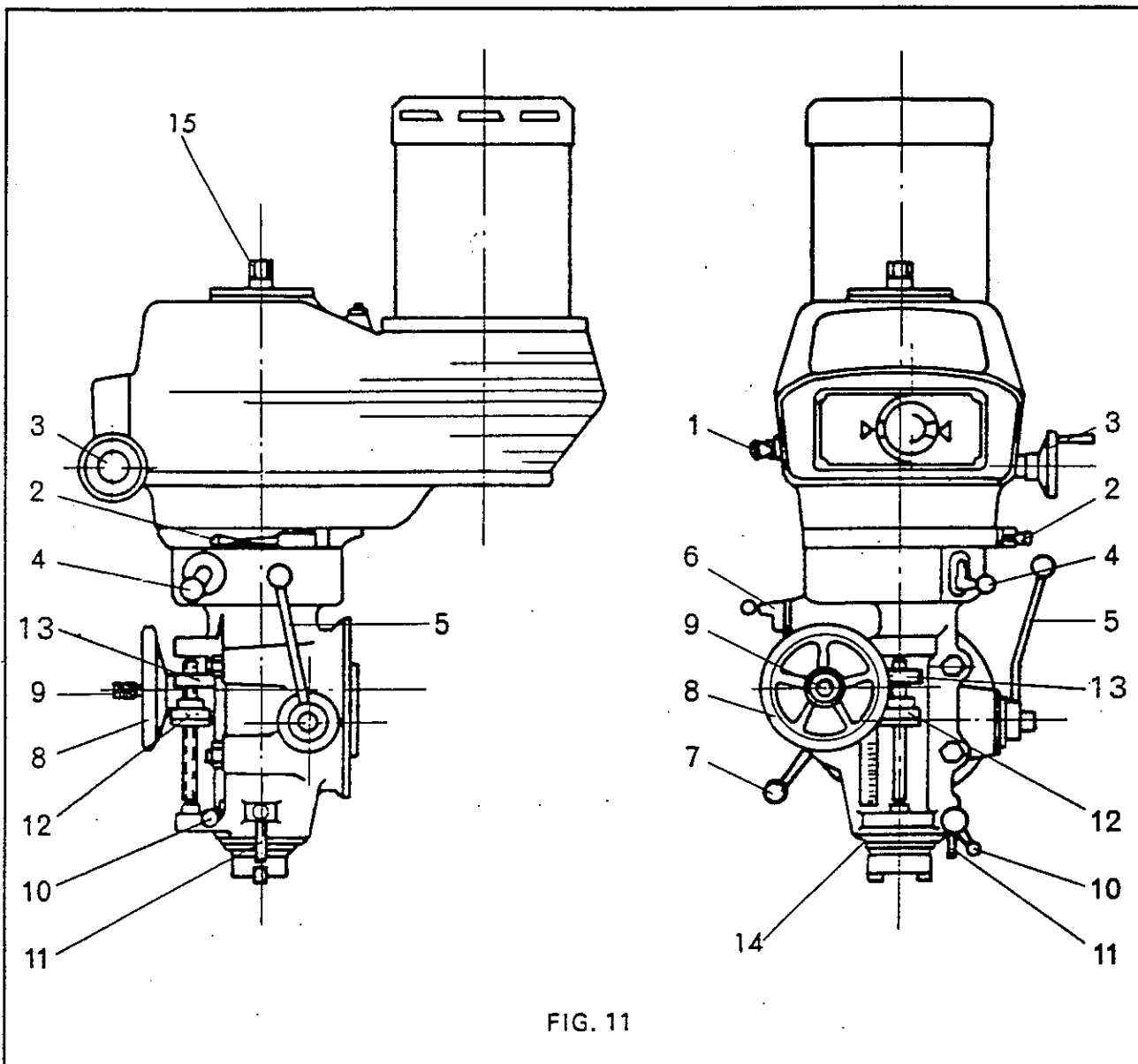


FIG. 11

1. Brake Control.
2. Speed Range Selection Lever.
3. Speed Selection Handwheel.
4. Power Feed Transmission Engagement Lever.
5. Quill Feed Handle.
6. Quill Feed Selector.
7. Quill Feed Control Lever.
8. Hand Wheel for Manual Feed (by hand) of Quill.
9. Quill Feed Reversing Knob.
10. Quill Lock
11. Indicator Mounting Rod.
12. Adjustable Micrometer Depth Stop.
13. Quill Stop.
14. Quill
15. Draw Bar

INSTRUCTION MANUAL

CAUTION: DO NOT ATTEMPT TO CHANGE (SPINDLE) R.P.M.'S WHILE SPINDLE MOTOR IS NOT RUNNING.

SPINDLE SPEEDS (R.P.M.'S) marked on the dial are approximate. Spindle speed (R.P.M.'S) are changed by turning handwheel (No. 3 fig. 11) located on the right side of head. Rotating this hand wheel in the clockwise direction will increase spindle speed (R.P.M.'S). Rotating this handwheel in the counter-clockwise direction will lower spindle speed (R.P.M.'S)

CAUTION: DO NOT ATTEMPT TO CHANGE SPINDLE SPEEDS (R.P.M.'S) UNLESS SPINDLE MOTOR IS RUNNING. THIS IS IMPORTANT AS ATTEMPTING TO CHANGE WHILE SPINDLE MOTOR IS NOT RUNNING WILL DAMAGE THE MECHANISM.

DRAWBAR (fig. 9) (Manual draw bar only)

Use spindle brake to restrict spindle rotation when Tightening or loosening drawbar.

1. To install collet or tool holder in spindle-first remove drawbar by pulling it out os spindle from top. Then place collet or tool holder into spindle. Put drawbar back into spindle and tighten into collet or tool holder, using discretion.

2. To remove tool from spindle-loosen draw bar 3 or 4 turns and tap on top of draw bar to free tool.

CAUTION: DO NOT LOOSEN DRAWBAR LESS THAN 3 TURNS OR MORE THAN 5 TURNS WHEN REMOVING TOOL. IF DRAWBAR IS TOO LOOSE THE THREADS MAY BE STRIPPED WHEN TAPPING ON END.

SPINDLE BRAKE

For Spindle Braking (Spindle motor in the off position only) use brake lever (No. 1 fig. 11) located on the left side of head moving Forward/Backward to stop a coasting spindle.

CAUTION: BE SURE THAT MANUAL BRAKE IS DISENGAGED BEFORE ATTEMPTING TO START SPINDLE MOTOR. This is very important, as failure to disengage brake may damage the motor on variable speed belt as well as other parts.

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SELECTION OF HIGH AND LOW RANGES (Direct Drive (High), Back gear (Low), (This lever has three position high, neutral, low) Range Selection (High or low) is obtained by lever (No. 2 fig. 11) located on the right side of head. Forward position of this lever is High range. (500 to 4200 R.P.M.'S) Rear position of this lever is low range (60 to 500 R.P.M.'S).

NOTE: 1 Because of back gear construction, when machine is running in low speed range spindle rotation is opposite to that of high speed range. Therefore, forward on reversing switch becomes reverse when in low speed range.

NOTE: 2 When shifting from NEUTRAL to HIGH or LOW, turn spindle by hand while pushing back gear lever into position. This allows gears to line up in low speed and dog clutch to line up in high speed.

NOTE: 3 The head has a neutral position to allow free rotation of the spindle for traming, positioning and inspection operations, etc.

CAUTION: DO NOT TO ATTEMPT TO CHANGE HIGH AND LOW RANGES WHILE SPINDLE MOTOR IS RUNNING.

NOTE: Do not change speed range (High-Low) when spindle automatic quill feed is engaged (No. 4 fig. 11).

POWER FEED TRANSMISSION ENGAGEMENT

The Power Feed Engagement lever (No. 4 fig. 11) is located directly below back gear lever. This lever has 2 positions; "IN", to engage spindle power feed transmission and "OUT" to disengage spindle power feed transmission.

CAUTION: ALWAYS BE SURE SPINDLE MOTOR IS STOPPED BEFORE ATTEMPTING TO MOVE THIS LEVER TO THE "IN" OR ENGAGED POSITION.

NOTE: Disengage spindle power feed transmission. When it is not being used. This will stop unnecessary wear on power feed worm gear.

CAUTION: DO NOT USE THE POWER FEED SYSTEM AT SPEEDS (R.P.M.'S) HIGHER THAN 3000 R.P.M.

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QUILL (NO. 14 fig. 11)

1. The quill may be locked in a given vertical location by turning the quill lock in a clockwise direction. Lever is located at the bottom of right side of head.

CAUTION: DO NOT ENGAGE QUILL FEED WITH QUILL-LOCK LEVER FULLY TIGHTENED.

2. The quill (or spindle) hand feed lever (No. 5 fig. 11) can be adjusted to any one of several operating positions by moving outwards (To the right on the lever hub and rotating to desired position. The hand feed lever can be pulled off when not in use.

3. Any one of three power feeds (in either an upward or downward direction) may be selected by moving the feed shift lever, located on right side of head, to the desired feed (.0015, .003, .0008) per spindle revolution. If power feed is not being used it is wise to place (NO. 4 fig. 11) in the disengagement position. It may be some what easier to change the position of (No. 6 fig. 11) Quill feed selector when the spindle is rotating.

4. The fine feed handwheel (No. 8 fig. 11) is placed in operation condition by locating the feed transmission engagement lever in the (No. 4 fig. 11) "OUT" (disengaged) position and engaging the feed control lever (No. 7 fig. 11) the fine feed handwheel is held on by a spring plunger and can be pulled off when not in use.

5. The knob on the shaft located in the center of the feed handwheel (NO. 8 fig. 11) is used to select downfeed (Pushed-in position), neutral (mid-position) or upfeed (pulled-out position) for either the power feed or the hand wheel feed.

6. Micrometer depth stop (No. 12 fig. 11) is used for setting of depths. Each graduation on nut indicates .001" of depth, it reads directly to scale mounted along side of it. Depths may be obtained by setting micrometer nut in conjunction with quill stop.

NOTE: Position noted are for clockwise rotation of spindle. Counter clockwise rotation reverses these position.

INSTRUCTION MANUAL

HEAD

1. Tilting of the head in a front to back plane is readily accomplished by loosening the three nuts at the right hand side of the head (at joint) and applying crank to Forward head tilting worm stud (top center of joint).

CAUTION: WHEN RETURNING HEAD TO VERTICAL POSITION, SWEEP THE TABLE WITH AN INDICATOR ATTACHED TO SPINDLE TO MAKE SURE HEAD IS SQUARE TO TABLE.

2. To tilt head from side to side, loosen the (4) hex nuts (front of head). Then tilt head the desired amount by applying crank to the sidewise tilting worm stud located at the right side of joint and to the rear of the spindle head.

CAUTION: WHEN RETURNING HEAD TO VERTICAL POSITION, SWEEP THE TABLE WITH AN INDICATOR ATTACHED TO SPINDLE TO MAKE SURE HEAD IS SQUARE TO TABLE.

OVERARM OR RAM

The back to front position of the head and overarm is readily changed by loosening the 2 overarm locks (located left side of turret). Move the overarm by adjustment handle (located on right side of turret). To desired position.

TURRET

To Index the entire turret-overarm-head assembly loosen the 4 hex nuts, 2 on either side of the overarm which clamp the turret to the top of the column. Then swing the turret to the desired position and reclamp.

NOTE: It is highly recommended that all clamping nuts bolts and locks (Turret to column, overarm to turret, head side-wise tilt and head forward-back tilt) be securely tightened before any machining cuts are taken. Always check these points before starting a cut. Also, when returning overarm to normal position attach an indicator to the overarm, and slide the overarm in and out, with the indicator riding against a square which has been squared to front of table to make sure overarm is square with table.

INSTRUCTION MANUAL

INSPECTIONS:

1. Inspect taper of spindle for cleanliness and freedom from chips of foreign matter. Frequency-Each time tool holder is inserted.

Inspection by machine operator.

No special equipment required.

2. Inspect and adjust gibs of slide ways.

Frequency-every 160 hours. Oftener if looseness is noted by operator. Inspection and adjustment by machine operator or machine maintenance man. No special equipment required other than allen wrench.

3. Inspect for general cleanliness of machine, paying particular attention to keep dirt and chips from slide ways. DO NOT USE AIR TO REMOVE SUCH DIRT AND CHIPS- BUT WIPE OFF WAYS OR KEEP THEM COVERED. Flood ways with light oil and work slide movements back and forth to wash out foreign matter. Then re-lubricate machine according to lubrication instructions.

Frequency-Constantly, as far as wiping off chips and dirt are concerned. Every 40 hours ways should be flooded with oil and cleaned as above. No special equipment required.

4. Inspect drive belts for wear, hard spots at splice etc.

Frequency-Every 40 hours.

Inspection by machine operator or machine maintenance man.

No special equipment required.

5. Inspect to see if vertical head is square with table, by mounting indicator on spindle and sweeping table.

Frequency-every 80-120 hours, or after head has been tilted.

Inspection by machine operator or machine maintenance man.

Special equipment required consists of (1) A short accurate arbor to insert in spindle. (2) A clamp for use in clamping a 6" bar to above arbor in a horizontal position. (3) 6" bar approximately 1/2" in diameter. (4) An accurate dial indicator to clamp to above 6" bar in position so when spindle is revolved by hand, nib of indicator in contact with table, sweeps table in a full circle and indicates out of squareness.

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NOTE: Table is intentionally left .0005" high in front. This will gradually decrease as machine is used.

6. Inspect electrical equipment.

Frequency-In accordance with standard plant policy.

Inspection by machine maintenance man.

No special equipment required.

PARTS REPLACEMENT:

None except as indicated by wear or malfunction.

Frequency or replacement only as above.

LUBRICATION - (See Lubrication Sheet Page 7)

TROUBLE SHOOTING

NOTE: Ordinarily trouble will not manifest itself except when actually working machine.

1. Slide ways working hard or binding.

- a. Cause-gibs out of adjustment, either too tight or too loose. in latter case causing gib to "wedge"..

Remedy-Adjust gibs.

- b. Cause-Dirt in slide ways.

Remedy-Wash out slide ways with light oil.

CHATTER OR VIBRATION WHEN CUTTING.

- a. Cause-Dirt in spindle taper, causing bad fit between tool holder shank and spindle taper.

Remedy-Clean spindle taper and shank of tool holder.

- b. Cause-Faulty shank on tool holder.

Remedy-Replace shank or dress off burrs, if due to nicks or burrs.

- c. Gibs poorly adjusted on slide ways, or dirty.

Remedy-Adjust gibs

- d. Work improperly clamped to table of machine.

Remedy-Check for rocking or movement, and correct by proper clamping.

- e. Improper grind on cutting tool.

Remedy-Replace or re-grind tool.

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- f. Hard spot at splice of drive belts or worm belts.

Remedy-Replace belts.

- g. Spindle quill worn in quill head lock slightly.

Remedy-Tighten quill head lock slightly.

- h. Incorrect spindle speed, table feed, or both.

Remedy-Ordinarily increase spindle speed and/or increase or decrease feed to break up vibration period. Experiment by using hand feed to feed table.

BORING OR MILLING OUT SQUARE OR AT AN ANGLE.

- a. Cause-Head not properly aligned with table.

Remedy-Check head for alignment and correct.

- b. Work improperly set up; i.e. not square and flat.

Remedy-Check and re-align work.

FAILURE TO HOLD CENTER DISTANCE WHEN LOCATING FOR BORING.

Cause-Failure to take back-off tension on lead screw after coming up to indicator reading, causing table to "creep", or failure to lock up slide ways with same amount of tension tension after moving table to new position.

SPARE PARTS RECOMMENDED.

SET OF DRIVE BELTS FOR ALL DRIVES: (See Parts List)

INSTRUCTION MANUAL

GENERAL SPEED RECOMMENDATIONS

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

TABLE OF CUTTING SPEEDS AND FEEDS

Feet Per Minute	15	20	25	30	40	50	60	70	80	90	100
Diameter, Inches	Revolutions Per Minute										
1/16"	917	1222	1528	1833	2445	3056	3667	4278	4889	5500	6112
1/8"	458	611	764	917	1222	1528	1833	2139	2445	2750	3056
3/16"	306	407	509	611	815	1019	1222	1426	1630	1833	2037
1/4"	229	306	382	458	611	764	917	1070	1375	1375	1528
5/16"	183	244	306	367	489	611	733	856	978	1100	1222
3/8"	153	204	255	306	407	509	611	713	815	917	1019
7/16"	131	175	218	262	349	437	524	611	698	786	873
1/2"	115	153	191	229	306	382	458	535	611	688	764
5/8"	91	122	153	183	244	306	367	428	489	550	611
3/4"	76	102	127	153	204	255	306	357	407	458	509
7/8"	65	87	109	131	175	218	262	306	349	393	437
1"	57	76	95	115	153	191	229	267	306	344	382
1 1/8"	50	67	84	102	136	170	204	238	272	306	340
1 1/4"	45	61	76	91	122	153	183	214	244	275	306
1 3/8"	41	55	69	83	111	139	167	194	222	250	278
1 1/2"	38	50	63	76	102	127	153	178	204	229	255
1 5/8"	35	47	58	70	94	118	141	165	188	212	235
1 3/4"	32	43	54	65	87	109	131	153	175	196	218
1 7/8"	30	40	50	61	81	102	122	143	163	183	204
2"	28	38	47	57	76	95	115	134	153	172	191

The foregoing should be regarded as approximate, as many factors control the efficient operation of end mills. Always keep cutters sharp, and a steady flow of oil or compound directly on the working point will allow much higher cutting speed. Keep rate of feed consistent with finish required.

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INSTRUCTIONS FOR REPLACEMENTS

Motor replacement

1. Set spindle speed at its lowest point, for high-speeds as well as for low-speed range. Motor pullies are in the most adequate position to dismantling of motor. Remove power from the lines.

2. Then, Unfasten lower back cover (No. 705) and take it off.

By means of screws (No. 847) lock sliding pulley of motor shaft (No. 709) with the spring holder washer. Fit those screws into washer holes and screw them to the pulley, until fastening elastic washer (No. 849) is free.

After performing previous operation, bring speed plate to the point of highest revolutions (according to range); this will loosen the belt and will make easier the subsequent operation.

3. Now, unfasten both screws (No. 839) fixing the motor to the framework, and take off the fastening elastic washer from the inside pulley-spring assembly (No. 849) Then take the motor out from the pulley guard.

To install in the new motor, reverse above operation.

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REPLACEMENT OF VARIABLE SPEED BELT

- (1) With spindle motor running set R.P.M. to 4200 (Turn Spindle motor off)
- (2) Remove four No 10 x 20 1½ hex head cap screws which hold the motor over the pulley guard.
- (3) Disassemble back cover below motor pulley.
- (4) Slide motor as far as possible toward the spindle and work the belt over the motor pulley.
- (5) Remove the motor from the pulley guard housing.
- (6) Dismantle upper cover of framework (No.725). Then, unfasten screws (No.833) fixing the balance beam No 718 and take out bushings (No.719.) Unfasten the six screws (No.876) fixing framework to check or gearbox. The framework is now fixed only by two locating pins, and it may come off with a light blow.
- (7) Change the variable transmission belt (No.830) for a new one, if possible of the same trademark.

IMPORTANT: The use of a defective or worn out belt may cause a vibration and an excessive temperature.

REPLACEMENT OF REDUCTION TIMING BELT (503)

1. Perform previous operations, as for changing the variable speed belt.
2. Take off the assembly formed by lower pulley and its support (No 703), by unfastening the six screws (No.853)

Once this assembly has been taken off, change the belt, we recommend that the belt should always be provided by BUFFALO MACHINERY.

IMPORTANT: All these replacement operations will be easier if the variable speed framework is separated from the head itself. For that purpose, unfasten the three nuts (No. 851) and remove variable speed framework.

INSTRUCTION MANUAL

FINAL RECOMMENDATIONS

LUBRICATION

Long life, accuracy and warranty of this variable speed head are conditioned by an adequate use and lubrication. Therefore, please follow strictly the greasing indications shown on lubrication. Therefore, please follow strictly the greasing indications shown on lubrication plate, and avoiding the use of different lubricants.

Bearings in this assembly are watertight and are greased for life.

WORK

The feeds can be used to drill holes up to a 3/8" dia. Use manual feeds for holes that are larger than the mentioned one.

The clutch is adjusted to approx. 200 Lbs. of downwards pressure on the quill which allows drilling of 3/8" dia. in mild steel.

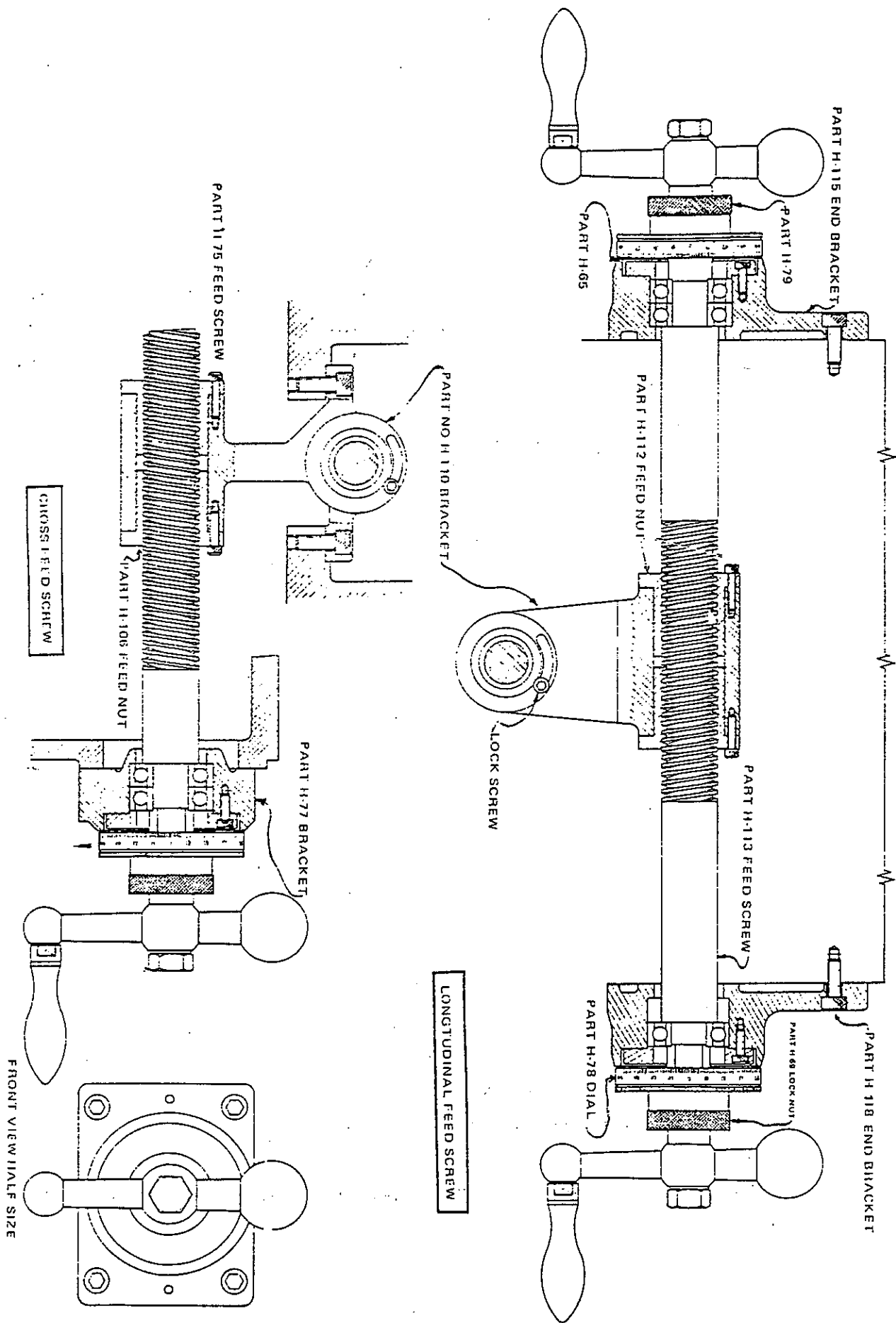
CAUTION: THIS CLUTCH IS TO BE USED ONLY WHEN IT IS ABSOLUTELY NECESSARY.

WARNING: IN HEAVY DUTY MILLING OPERATIONS, HOLD THE HEAD AS CLOSE TO THE COLUMN FACE AS POSSIBLE, IN ORDER TO OBTAIN A MAXIMUM RIGIDITY.

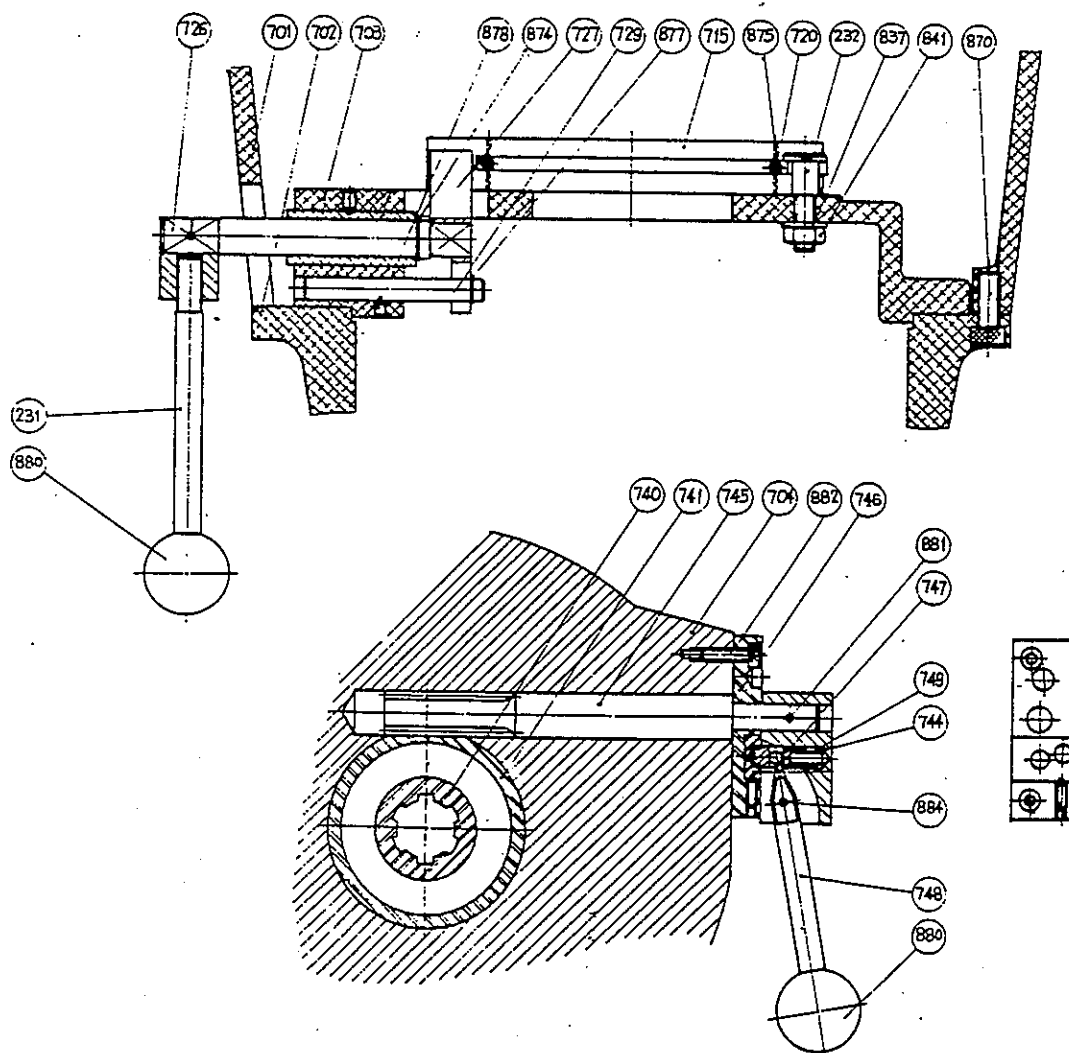
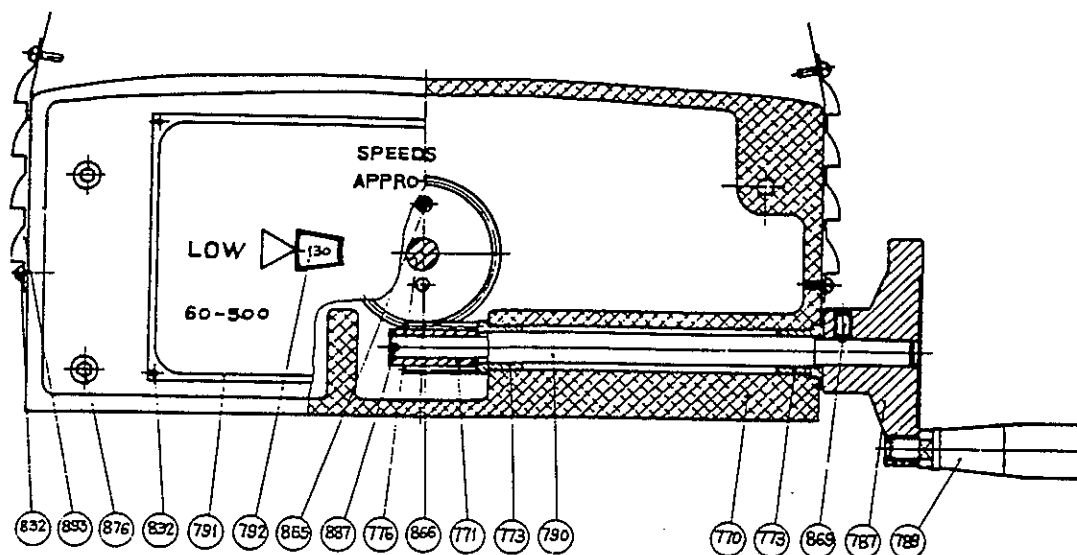
HIGH SPEED

In high speed position, spindle is directly driven by means of a tapered tooth drive. If this clutch is not tightened enough, a light noise may be produced: this can be corrected by changing position of position plate No. 718 upwards, until noise disappears. When positioning plate has a long displacement, this operation needs to reverse this plate.

CAUTION. Do not change high and low speeds direct drive/BACKAGEAR WHEN MOTOR IS RUNNING.

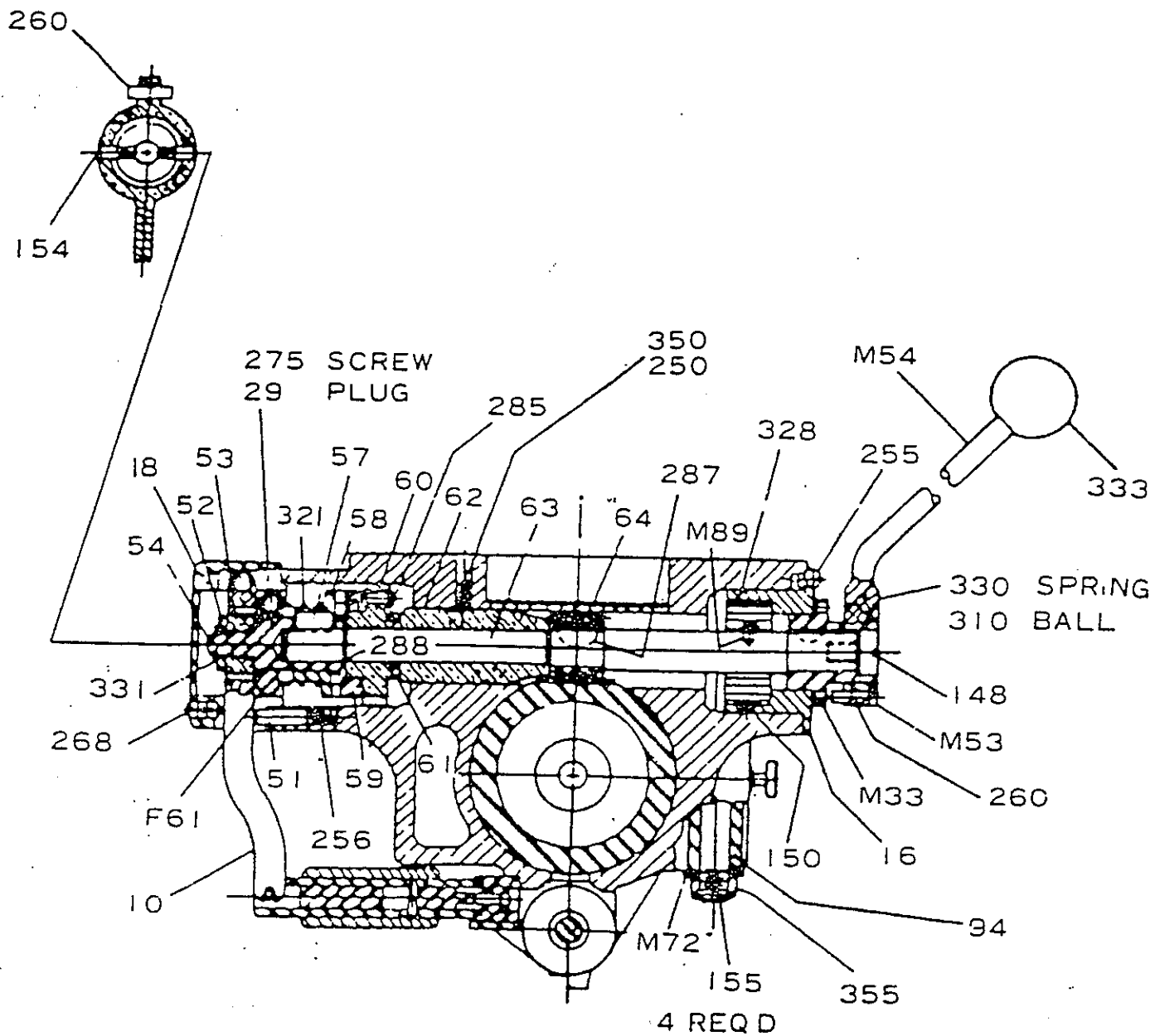


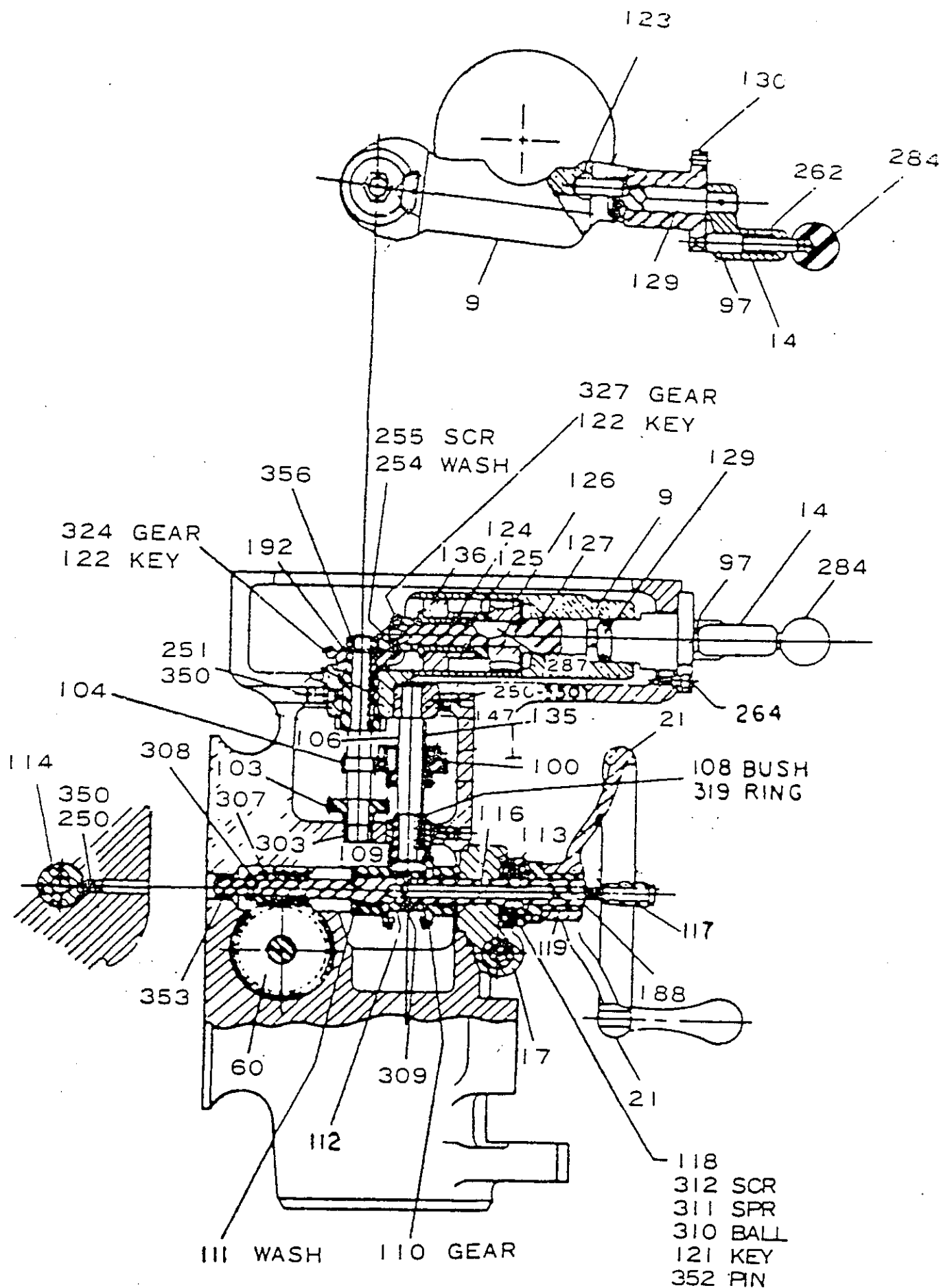


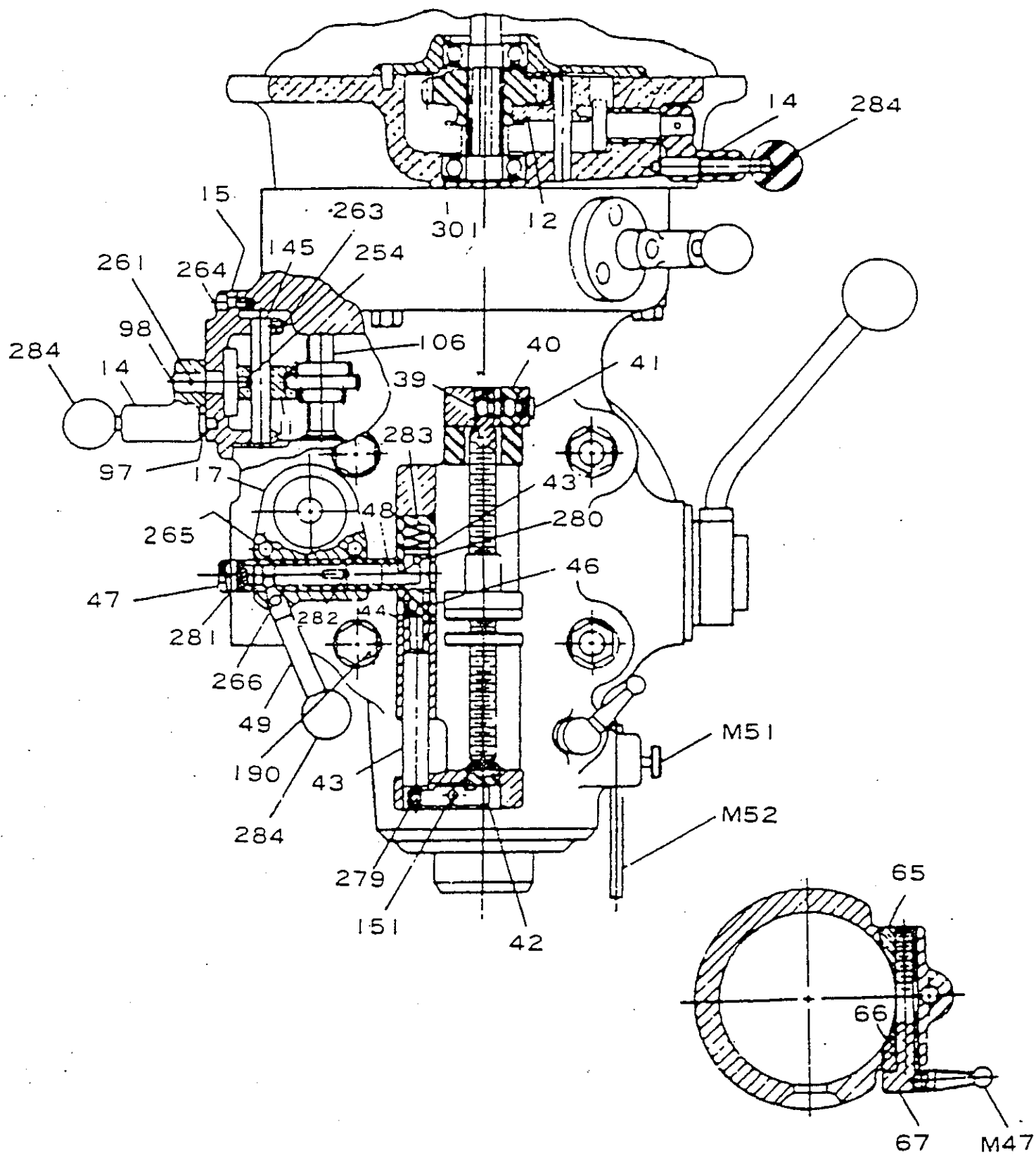


JV-210 SPINDLE BULL GEAR
 JV-213 TIMING BELT PULLEY
 JV-231 BRAKE LOCK & HANDLE
 JV-232 BRAKE RING SCREW
 JV-236 BULL GEAR KEY
 JV-298 SET SCREW
 JV-456 LEVER SHAFT
 JV-467 DRAWBAR WASHER
 JV-949 KEY
 JV-503 TIMING BELT
 JV-504 GIGS OIL CUP
 JV-565 ALUMINUM ELBOW
 JV-701 BELTS COVER
 JV-702 GEARBOX
 JV-703 MAIN SPINDLE SUPPORT
 JV-704 SUPPORT PLATE
 JV-705 DOWN COVER OF FRAMEWORK
 JV-706 PULLEY SHAFT CLUTCH
 JV-707 MAIN SPINDLE PULLEY
 JV-708 MAIN SLIDING PULLEY
 JV-709 SLIDING MOTOR PULLEY
 JV-710 FIXED MOTOR PULLEY
 JV-711 MAIN PULLEY BUSHING
 JV-712 MOTOR PULLEY BUSHING
 JV-713 MOTOR SHAFT COTTER
 JV-714 MAIN SPINDLE COTTER
 JV-715 MAIN SPINDLE BRACKET
 JV-717 DRIVE PAN
 JV-718 BALANCING BEAM
 JV-718 BALANCING BEAM BUSHING
 JV-720 TRACTION SPRINGS
 JV-722 PULLEY FASTENING
 JV-723 COVE FOR MAIN SPINDLE BEARING
 JV-724 CLUTCH RING
 JV-725 UPPER COVER OF FRAMEWORK
 JV-726 SHAFT FOR BRAKE OPERATION
 JV-727 BRAKE CAMS
 JV-729 BRAKE ROTATION BOLT
 JV-730 BRAKE BUSHING
 JV-731 BRAKE SHAFT BUSHING
 JV-732 FASTENING DRAW BAR
 JV-740 TWO-ADMISSION CLUTCH
 JV-741 SLIDING BEARING BOX
 JV-742 BUSHING
 JV-743 SPACING BUSHING
 JV-744 LEVER HUB
 JV-745 TOOTH CHANGE SHAFT
 JV-746 ROTATION PLATE
 JV-747 LOCKING NOZZLE
 JV-748 CONTROL LEVER
 JV-749 SPRING
 JV-750 CLUTCH SPRING
 JV-751 GUIDEWAY FLANGES
 JV-752 DRIVE RING
 JV-753 PINS
 JV-754 PROTECTING SHEET
 JV-755 DRIVING GEAR
 JV-756 SQUARE-HEAD SCREWS
 JV-757 COVER
 JV-758 GEAR SHAFT
 JV-760 MAIN MOTOR
 JV-761 MOTOR BUSHING
 JV-762 SPRING REST
 JV-763 OPERATING SPRING
 JV-764 SAFETY NUT
 JV-770 OPERATING SUPPORT
 JV-771 WORMGEAR
 JV-772 GEAR
 JV-773 BUSHING
 JV-774 BUSHING
 JV-775 OPERATING SHAFT BUSHING
 JV-776 OPERATING SHAFT
 JV-777 BUSHING
 JV-778 RING
 JV-779 ADJUSTING SPINDLE
 JV-780 METAL SHEET FOR AIR PIPING
 JV-781 PIN

JV-782 REGULATING NUT
 JV-783 CHAIN
 JV-784 REGULATING SPINDLE
 JV-786 FIRM PLATE
 JV-787 HANDWHEEL
 JV-788 HANDWHEEL HUB
 JV-789 CONTROL HANDLE
 JV-790 OPERATING SHAFT
 JV-791 SPEED PLATE
 JV-792 SPEED DISK
 JV-825 BEARING
 JV-826 BEARING
 JV-827 BEARING
 JV-828 BEARING
 JV-829 BEARING
 JV-830 CONTINEN BELT
 JV-831 ELASTIC PIN
 JV-832 PHILIPS SCREWS
 JV-833 ALLEN SCREWS
 JV-834 ALLEN SCREWS
 JV-835 ELASTIC RING
 JV-836 WAY WASHER
 JV-837 WASHER
 JV-838 NUT
 JV-839 WASHER
 JV-840 WASHER
 JV-841 NUT
 JV-842 COTTER PIN
 JV-843 COTTER
 JV-844 ALLEN SETSCREW
 JV-845 ALLEN SCREWS
 JV-846 NUTS
 JV-847 ALLEN SCREWS
 JV-848 WAVY WASHER
 JV-849 RING
 JV-850 WASHER
 JV-851 NUT
 JV-852 ELASTIC RING
 JV-853 ALLEN SCREWS
 JV-854 ELASTIC PIN
 JV-855 ELASTIC PIN
 JV-856 ELASTIC
 JV-857 COTTER
 JV-858 WAVY WASHER
 JV-859 NUT
 JV-860 WASHER
 JV-861 HEXAGON-HEAD SCREWS
 JV-862 ALLEN SETSCREWS
 JV-863 COTTER
 JV-865 ELASTIC PIN
 JV-866 COTTER (KEY)
 JV-867 ALLEN SCREWS
 JV-868 ELASTIC PIN
 JV-869 ALLEN SETSCREW
 JV-870 ALLEN SETSCREW
 JV-871 SPERING
 JV-872 STEEL BALL
 JV-873 ALLEN SETSCREW
 JV-874 ELASTIC RING
 JV-875 ELASTIC PINS
 JV-876 ALLEN SCREWS
 JV-877 ELASTIC
 JV-878 ALLEN SETSCREW
 JV-879 SAFETY JOINT
 JV-880 KNOB
 JV-881 TAPERED PIN
 JV-882 ALLEN SCREWS
 JV-884 CYLINDRICAL PIN
 JV-885 BLIND NUT
 JV-886 SCREW
 JV-887 ELASTIC PIN
 JV-888 ALLEN SETSCREW
 JV-889 ALLEN SCREWS
 JV-890 SHAFT
 JV-891 WASHER
 JV-893 SCREW
 JV-894 KEY
 JV-895 BEARING SPACER

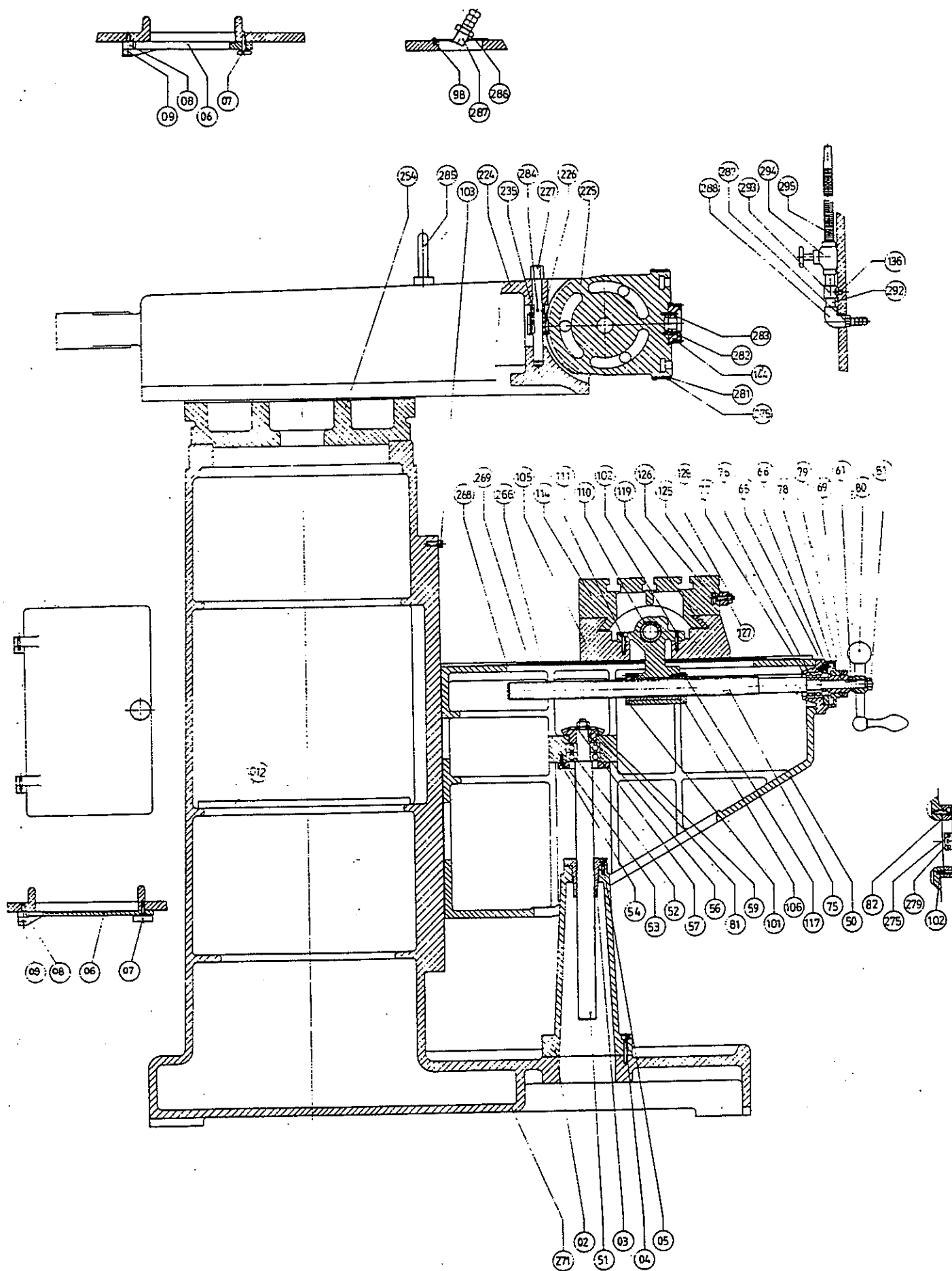






J-1	QUILL HOUSING	J-65	QUILL LOCK SLEEVE	J-136	WORM CRADLE BUSHING
J-2	GEAR HOUSING	J-66	QUILL LOCK SLEEVE	J-138	PIN
J-3	GEAR HOUSING COVER	J-67	QUILL LOCK BOLT	J-139	COLLET ALIGNING SCREW
J-4	BELT HOUSING	J-70	VERTICAL TEE BOLT	J-140	WORM GEAR
J-5	SPINDLE PULLEY	J-71	VERTICAL TEE BOLT WASHER	J-141	SHAFT, TILTING WORM
J-6	MOTOR PULLEY	J-72	SPLINED GEAR HUB	J-142	KEY
J-7	TIMING BELT PULLEY	J-73	BULL GEAR KEY	J-143	SOCKET SET SCREW
J-8	TIMING BELT PULLEY FLANGE	J-74	SPINDLE BULL GEAR	J-144	GEAR
J-9	WORM GEAR CRADLE	J-75	SPINDLE PULLEY HUB	J-145	FEED SHIFT ROD
J-10	OVERLOAD CLUTCH TRIP LEVER	J-76	PULLEY COLLAR	J-147	CLUSTER GEAR SHAFT UPPER BEARING
J-11	FEED GEAR SHIFTER FORK	J-77	QUILER TUBE	J-148	PINION SHAFT HUB SCREW
J-12	BACK GEAR SHIFTER FORK	J-78	OIL PLUG	J-149	DRAWBAR WASHER
J-13	SPINDLE PULLEY BEARING SLEEVE	J-79	SPINDLE PULLEY KEY	J-150	OUTSIDE CLOCK SPRING PIN
J-14	SHIFT CRANK	J-80	UPPER BEARING SPACER (LARGE)	J-151	TRIP LEVER PIN
J-15	CLUSTER GEAR COVER	J-81	UPPER BEARING SPACER (SMALL)	J-152	BACKGEAR SHIFT BUSHING
J-16	SPRING COVER	J-82	BEARING SLEEVE LOCKNUT	J-153	BACKGEAR SHIFT CRANK
J-17	FEED TRIP BRACKET	J-83	UPPER BEARING LOCKNUT	J-154	CLUTCH RING PIN
J-18	CLUTCH ARM COVER	J-84	CAM RING	J-155	BOLT
J-19	KEY	J-85	SPINDLE CLUTCH LEVER	J-157	QUILL MICRO STOP NUT
J-20	MOTOR SWITCH BRACKET	J-86	SPINDLE CLUTCH CAM RING PIN	J-159	KEY FOR ∇ 30 STD TAPER SPINDLE
J-21	HANDWHEEL	J-87	BRAKE BLOCK	J-166	SPINDLE
J-23	FELT RETAINER RING	J-88	BRAKE RING SCREW	J-167	QUILL SET SCREW
J-24	MICRO SCREW JAM NUT	J-89	BRAKE LOCK STUD	J-169	SPINDLE DIRT SHIELD
J-27	BEARING SPACER	M-89	CLOCKSPRING STUD	J-170	BEARING SPACER LARGE
J-29	SPINDLE LOCKNUT BINDING	J-91	BRAKE LOCK WASHER	J-171	BEARING SPACER SMALL
J-33	PINION SHAFT HUB SLEEVE	J-92	BRAKE LOCK & HANDLE	J-172	NOSEPIECE
J-34	QUILL NOSEPIECE	M-72	NUT	J-176	SLEEVE
J-35	QUILL SKIRT	J-93	BRAKE LOCK PIN	J-188	FEED WORM SHAFT SHARTED WITH SERIAL NO. 5500
J-36	QUILL STOP KNOB	J-94	LOWER CLAMPING BOLT SPACER	J-190	SPECIAL HEX NUT OPTIONAL EQUIP
J-37	QUILL STOP MICRO SCREW	J-95	COUNTERSHAFT	J-192	WASHER
J-38	MICROMETER NUT	J-96	COUNTERSHAFT GEAR	J-193	PLUG FOR 5/8 HOLE
J-39	REVERSE TRIP BALL LEVER	J-97	GEARSHIFT PLUNGER	J-250	SOCKET SET SCREW KP
J-40	FEED REVERSE TRIP PLUNGER	J-98	CLUSTER GEAR SHIFT CRANK	J-251	SOCKET CAP SCREW
J-41	REVERSE TRIP BALL LEVER SCREW	J-100	FEED DRIVE CLUSTER GEAR (CENTER)	J-252	SOCKET CAP SCREWS
J-42	FEED TRIP LEVER	J-103	FEED DRIVE GEAR	J-253	SNAP RING
J-43	FEED TRIP PLUNCER	J-104	CLUSTER GEAR INPUT SHAFT	J-254	WASHER
J-44	TRIP PLUNGER BUSHING	J-106	CLUSTER GEAR SHAFT	J-255	R. HEAD SCREW
J-45	TRIP PLUNGER	J-108	BEVEL GEAR BEARING	J-256	COMPRESSION SPRING
J-46	FEED TRIP PLUNGER BUSHING	J-109	BEVEL GEAR THRUST SPACER	J-257	K.P. SOCKET SET SCREWS
J-47	CAM ROD SLEEVE ASSEMBLY	J-110	FEED REVERSE BEVEL GEAR	J-258	V BELT
J-48	CAM ROD	J-111	FEED WORM SHAFT THRUST WASHER	J-259	FLAT HEAD SCREWS
J-49	TRIP HAND	J-112	FEED REVERSE CLUTCH	J-261	ROLL PIN
J-50	LOCKNUT BINDING PLUG	J-113	HANDWHEEL CLUTCH SPRING SCREW	J-262	COMPRESSION SPRING
J-51	OVERLOAD CLUTCH LEVER SPRING PLUNGER	J-114	FEED WORM SHAFT BUSHING	J-263	SET SCREW
M-51	INDICATOR ROD SCREW	J-116	REVERSE CLUTCH ROD	J-264	CAP SCREW
J-52	OVERLOAD CLUTCH WASHER	J-117	REVERSE KNOB	J-265	CAP SCREW
M-52	INDICATOR ROD	J-118	HANDWHEEL CLUTCH	J-166	PIN
J-53	CLUTCH RING	J-119	HANDWHEEL BUSHING	J-163	SCREW
M-53	PINION SHAFT HUB	J-121	WORM SHAFT KEY	J-267	CAP SCREW
J-54	OVERLOAD CLUTCH SLEEVE	J-122	FEED DRIVING GEAR KEY	J-268	SOCKET SET SCREWS
M-54	PINION SHAFT HUB WANDLE	J-124	FEED WORM GEAR SHAFT SLEEVE	J-269	SOCKET HEAD CAP SCREW
J-57	OVERLOAD CLUTCH SLEEVE KEY	J-125	WORM GEAR SPACER	J-272	LOCK NUT
J-58	OVERLOAD CLUTCH	J-126	FEED DRIVE WORM GEAR	J-273	LOCKWASHER
J-59	OVERLOAD CLUTCH RING	J-127	FEED DRIVE WORM GEAR SHAFT	J-274	LOCKWASHER
J-60	OVERLOAD CLUTCH WORM GEAR	J-128	FEED ENGAGE PIN	J-274	SOCKET SET SCREW KP
J-61	PINION SHAFT WORM GEAR SPACER	J-129	WORM GEAR CRADLE THROW OUT		
J-61	OVERLOAD CLUTCH LOCKNUT	J-130	SHIFTS SLEEVE		
J-62	QUILL PINION SHAFT BUSHING	J-131	MOTOR LOCKNUT		
J-63	QUILL PINION SHAFT	J-132	MOTOR LOCKNUT HANDLE		
J-64	QUILL PINION	J-133	MOTOR MOUNING STUDS		
		J-134	MOTOR MOUNINT STUD WASHER		
		J-135	CLUSTER GEAR KEY		

J-275 SOCKET SET SCREW	J-358 SOCKET SET SCREW
J-276 SCREW	J-359 JAM NUT
J-278 SCREW	J-362 JAM NUT
J-279 SOCKET SET SCREW	J-363 EXTERNAL LOCK WASHER
J-280 ROLL PIN	J-365 ROLL PINS
J-281 DOWEL PIN	J-366 NAME PLAT
J-282 ROLL PIN	J-368 OIL STRAINER FOR QUILL
J-283 ROLL PIN	BRG
J-283 COMPRESSION SPRING	J-389 SWITCH BRACKET
J-284 BLACK PLASTIC BALL	M-72 WASHER
HANDLES DIM	J-369 SHAFT
J-285 SCREW	J-313 SCREW
J-286 WOODRUFF KEY	J-401 MOTOR
J-287 WOODRUFF KEY	J-408 COVER
J-288 SNAP RING	J-369 SHAFT
J-289 HEX NUT HARDENED	
(AMERICAN STD REGULAR)	
J-290 BEARING LOCKNUT	
J-291 LOCKWASHER	
J-292 BEARING	
J-293 BEARING	
J-294 WICK	
J-295 GITS OIL CUP	
J-296 ROLL PIN	
J-197 SPRING	
J-298 SOCKET SET SCREWS	
J-299 WOODRUFF KEY	
J-300 HEX JAM	
J-301 DOUBLE SEAL BEARING	
J-303 NEEDLE BEARING	
J-304 HEX JAM NUT	
J-305 QUILL BEARING	
J-308 PIN	
J-307 BOSTON WORM	
J-308 PIN	
J-309 ROLL PIN	
J-310 STEEL BALL	
J-311 COMPRESSION SPRING	
J-312 SET SCREW	
J-313 SEW SCREW	
J-318 LOCKWASHER	
J-319 WALDES SNAP RING	
J-321 SAFETY CLUTCH SPRING	
J-322 MICROMETER SCALE	
J-323 SCREW	
J-324 FEED REVERSE BEVEL GEAR	
J326 WRENCH	
J327 STEEL PINION	
J-328 CLOCK SPRING	
J-330 COMPRESSION SPRING	
J-331 KOHINOOR SNAP RING	
J-333 BLACK PLASTIC BALL	
HANDLES	
J-334 DOWEL PIN	
J-335 SPLIT LOCKWASHER	
J-338 GITS OIL CUP	
J-339 SPINDLE SPEED PLATE	
J-340 OPERATING INSTRUCTION	
PLATE	
J-345 SOCKET SET SCREWS	
J-348 BEARING	
J-349 BEARING	
J-350 LOCKSCREW	
J-351 LOCKSCREW	
J-352 DOWEL PINS	
J-353 BUSHING	
J-355 STD. HEX NUT	
J-356 FLOPLOC STOP & LOCKNUT	



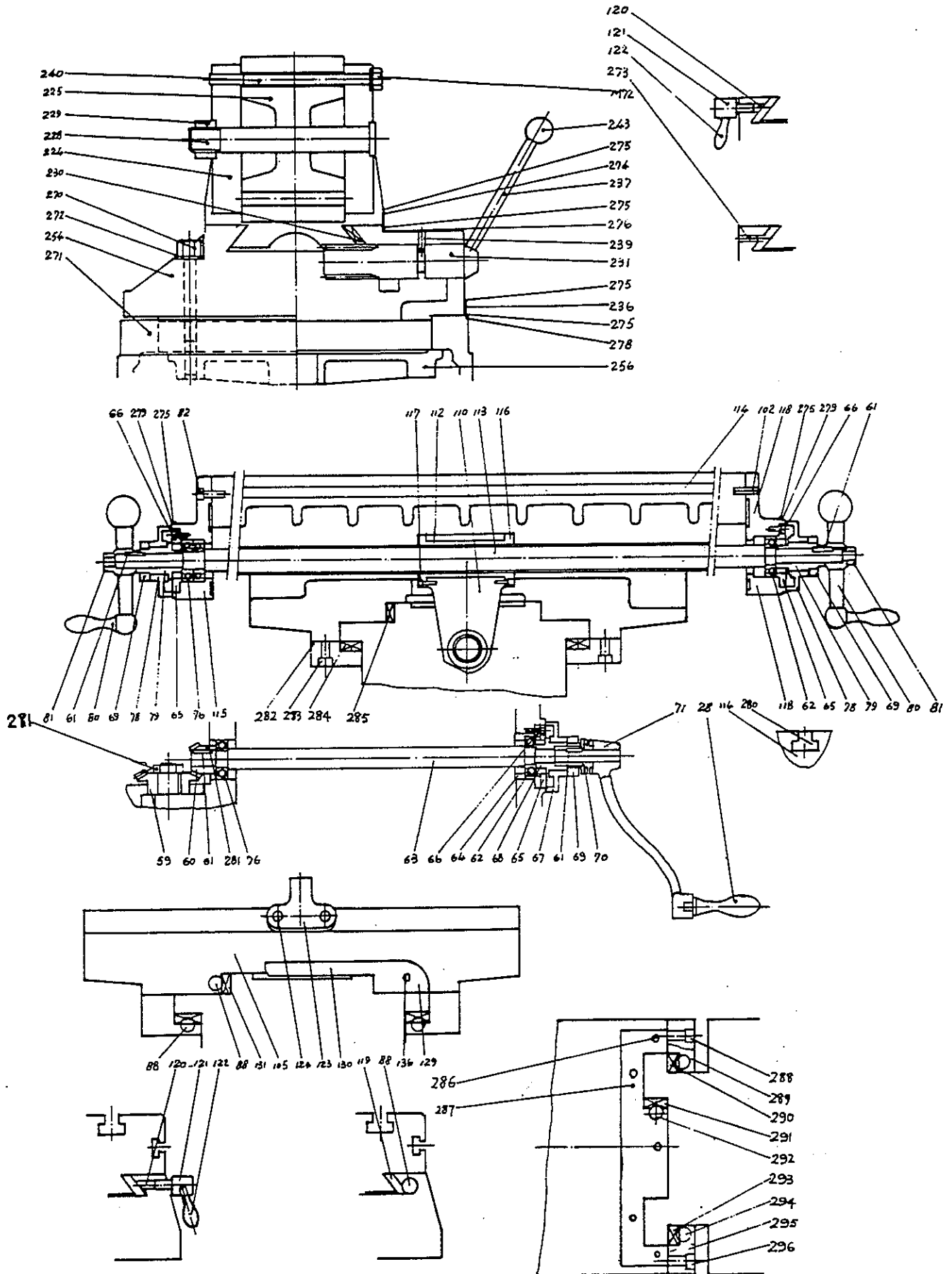
DOVETAIL WAYS

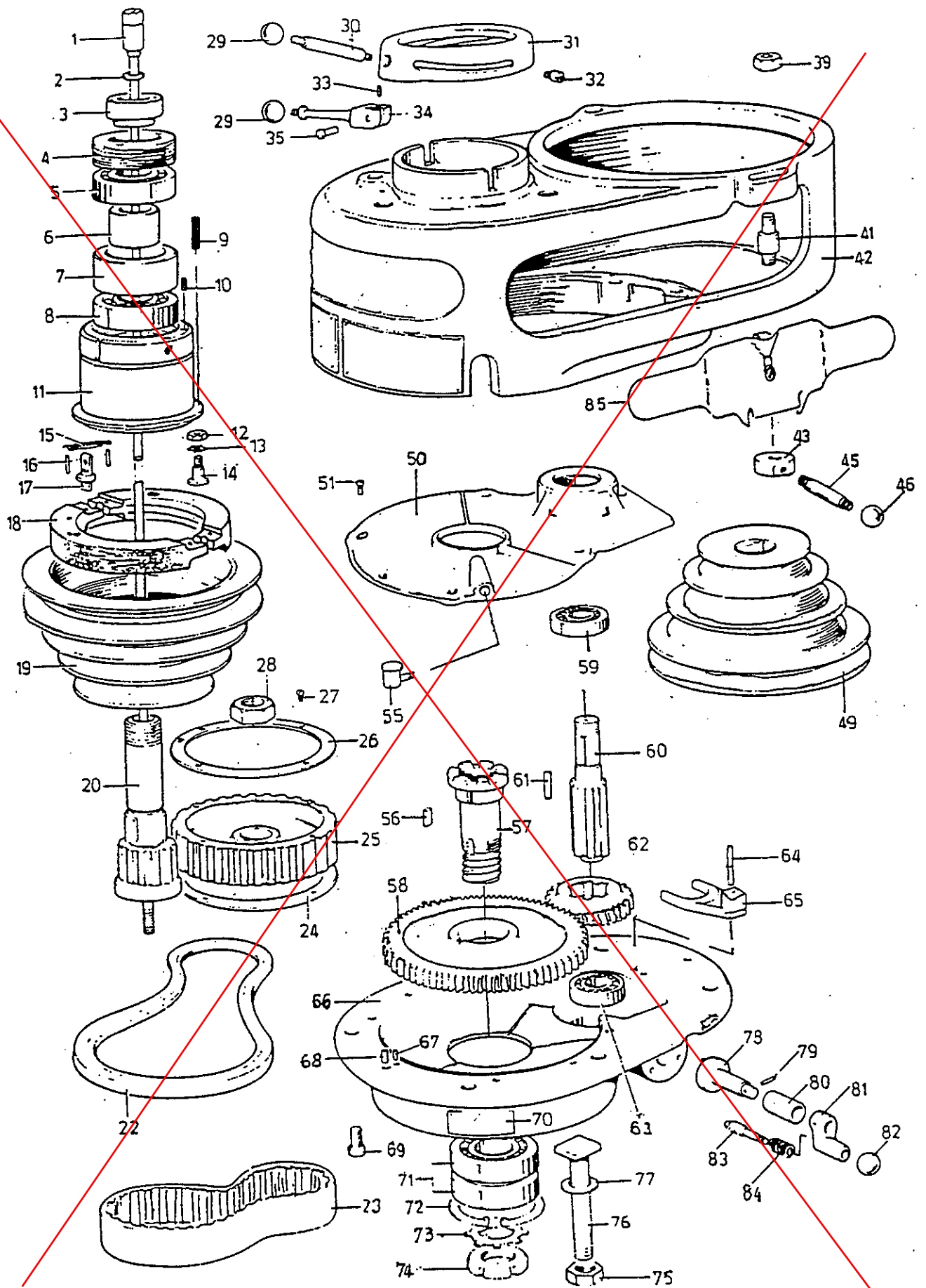
H-2	ELEVATING SCREW HOUSING	H-122	TABLE LOCK BOLT HANDLE (2 REQUIRED)
H-3	ELEVATING SCREW NUT	H-123	TABLE STOP BRACKET
H-4	HOLLOW HEAD CAP SCREW (2 REQUIRED)	H-124	HOLLOW HEAD CAP SCREW (2 REQUIRED)
H-5	HOLLOW HEAD CAP SCREW (3 REQUIRED)	H-125	TABLE STOP PIECE (2 REQUIRED)
H-6	DOOR	H-126	STOP PIECE T BOLT (2 REQUIRED)
H-7	SCREW & RING	H-127	WASHER (2 REQUIRED)
H-12	WOOD PLATE	H-128	HEXAGON NUT (2 REQUIRED)
H-28	HANDLE	H-129	SADDLE KNEE WIPER PLATE (2 REQUIRED)
H-50	KNEE	H-130	FELT WIPER (4 REQUIRED)
H-263	KNEE	H-131	SADDLE KNEE GIB
H-51	ELEVATING SCREW	H-132	SADDLE LOCK PLUNGER
H-52	GREASE SEALED BALL BEARING (2 REQUIRED)	H-133	SADDLE LOCK BOLT
H-53	BEARING RETAINER RING	H-135	SCREW
H-54	HOLLOW HEAD CAP SCREW (3 REQUIRED)	H-136	OVAL HEAD SCREW (6 REQUIRED)
H-56	KEY	H-140	OPEN END AND BOX END WRENCH
H-47	WASHER	H-141	GREASE GUN
H-58	JAM NUT (2 REQUIRED)	H-223	TURRET
H-59	BEVEL GEAR	H-224	RAM
H-60	BEVEL PINION	H-225	RAM ADAPTER
H-61	WOODRUFF KEY	H-226	VERTICAL ADJUSTING WORM
H-62	GREASE SEALED BALL BEARING (5 REQUIRED)	H-227	VERTICAL ADJUSTING WORM SHAFT
H-63	GEAR SHAFT	H-228	ADAPTER PIVOT STUD
H-64	BEARING CUP	H-229	WASHER
H-65	BEARING RETAINER RING (3 REQUIRED)	H-230	OVERARM GIB
H-66	HOLLOW HEAD CAP SCREW (9 REQUIRED)	H-231	RAM PINION
H-67	DIAL WITH 100 GRADUATIONS	H-232	WORM THRUST WASHER
H-68	DIAL HOLDER	H-234	RAM CLAMP BAR
H-69	DIAL LOCK NUT (4 REQUIRED)	H-235	WORM KEY
H-70	GEARSHAFT CLUTCH INSERT	H-236	ANGLE PLATE
H-71	ELEVATING CRANK	H-237	RAM PINION HANDLE
H-75	CROSS FEED SCREW	H-238	RAM PINION SCREW
H-76	GREASE SEALED BALL BEARING (2 PAIRS REQUIRED)	H-240	ADAPTER LOCKING BOLT (2 REQUIRED)
H-77	CROSS FEED BEARING BRACKET	H-243	BALL
H-78	DIA WITH 200 GRADUATIONS (3 REQUIRED)	H-254	TURRET
H-79	DIAL HOLDER (3 REQUIRED)	H-256	SPIDER
H-80	BALL CRANK HANDLE (3 REQUIRED)	H-266	CHIP GUARD COVER PLATE
H-81	JAM NUT (3 REQUIRED)	H-72	WASHER
H-82	HOLLOW HEAD CAP SCREW (12 REQUIRED)	H-268	CHIP GUARD COVER PLATES
H-83	CHIP GUARD	H-269	CHIP GUARD COVER PLATE
H-84	STOP SCREW	H-270	TURRET CLAMP BOLTS
H-86	HEXAGON NUT	H-271	COLUMN
H-87	KNEE COLUMN GIB	H-272	WASHER
H-93	BRONZE	H-274	SCALE
H-94	CLAMP SCREW	H-275	RIVET
H-95	HANDLE	H-276	SCALE
H-264	KNEE COLUMN GIB	H-277	SCALE
H-88	GIB SCREW (3 REQUIRED)	H-278	SCALE
H-96	LEFT HAND KNEE COLUMN WIPER HOLDER	H-280	T-SLOT
H-97	RIGHT HAND KNEE COLUMN WIPER HOLDER	H-281	SET SCREW
H-98	HOLLOW HEAD CAP SCREW (2 REQUIRED)	H-279	REFERENCE LINE PLATE
H-99	FELT WIPER (2 REQUIRED)	H-285	HOISTING RING
H-101	CROSS FEED NUT	H-286	SCREEN
H103	STOP SCREW	H-282	SCREW
H-104	KEY PIN	H-283	PIN
H-105	SADDLE	H-284	PIN
H-106	CROSS FEED NUT	H-281	DEGREE PLATE
H-8	DOOR STUD	H-292	PIPE
H-9	PIN	H-294	VALUE
H-107	KEY (2 REQUIRED)	H-295	SPRAY HOSE
H-108	CROSS FEED NUT RETAINING SCREW (2 REQUIRED)	H-293	C CLAMP
H-109	WASHER HEAD SCREW (2 REQUIRED)	H-287	NUT
H-110	FEED NUT BRACKET	H-288	PIPE FITTING
H-111	HOLLOW HEAD CAP SCREW (12 REQUIRED)	H-289	HOSE
H-112	LONGITUDINAL FEED UNIT	H-290	PUMP
H-113	LONGITUDINAL FEED SCREW	H-291	CLAMPER
H-114	TABLE	H-296	MOUNTING PLATE
H-115	LEFT BEARING BRACKET	H-297	SCREW
H-116	LONG. NUT	H-209	NUT
H-117	SCREW	H-299	SCREW
H-118	RIGHT BEARING BRACKET	H-300	CONNECT BOX
H-119	SADDLE TABLE GIB	H-301	SCREW
H120	TABLE LOCK PLUNGER	H-303	CONTROL BOX
		H-304	FOR. REV. SWITCH
		H-305	COOLANT PUMP SWITCH
		H-306	SCREW
		H-307	SCREW

SQUARE WAYS

59	BEVEL GEAR	291	GIB
60	BEVEL PINION	292	GIB
61	WOODRUFF KEY	293	SCREW
62	GREASE SEALED BALL BEARING (5 REQUIRED)	294	SCREW
63	GEAR SHAFT	295	GIB
64	BEARING CUP	296	SCREW
65	BEARING RETAINER RING (3 REQUIRED)		
66	HOLLOW HEAD CAP SCREW (9 REQUIRED)		
67	DIAL WITH 100 GRADUATIONS		
68	DIAL HOLDER		
69	DIAL LOCK NUT (4 REQUIRED)		
70	GEARSHAFT CLUTCH INSERT		
75	CROSS FEED SCREW		
76	GREASE SEALED BALL BEARING (2 PAIRS REQUIRED)		
78	DIAL WITH 200 GRADUATIONS (3 REQUIRED)		
79	DIAL HOLDER (3 REQUIRED)		
80	BALL CRANK HANDLE (3 REQUIRED)		
81	JAM NUT (3 REQUIRED)		
82	HOLLOW HEAD CAP SCREW (12 REQUIRED)		
88	GIB SCREW (3 REQUIRED)		
102	PIN		
105	SADDLE		
110	FEED NUT BRACKET		
112	LONGITUDINAL FEED UNIT		
113	LONGITUDINAL FEED SCREW		
114	TABLE		
115	LEFT BEARING BRACKET		
116	LONG. NUT		
117	SCREW		
118	RIGHT BEARING BRACKET		
119	SADDLE TABLE GIB		
120	TABLE LOCK PLUNGER		
121	TABLE LOCK BOLT		
122	TABLE LOCK BOLT HANDLE (2 REQUIRED)		
123	TABLE STOP BRACKET		
124	HOLLOW HEAD CAP SCREW (2 REQUIRED)		
129	SADDLE KNEE WIPER PLATE (2 REQUIRED)		
130	FELT WIPER (4 REQUIRED)		
131	SADDLE KNEE GIB		
136	OVAL HEAD SCREW (6 REQUIRED)		
224	RAM		
225	RAM ADAPTER		
228	ADAPTER PIVOT STUD		
229	ADAPTER PIVOT STUD LOCKNUT		
230	OVERARM GIB		
231	RAM PINION		
236	ANGLE PLATE		
237	RAM PINION HANDLE		
239	SET SCREW		
240	ADAPTER LOCKING BOLT (2 REQUIRED)		
243	BALL		
254	TURRET		
256	SPIDER		
270	TURRET CLAMP BOLTS		
271	COLUMN		
272	WASHER		
273	SCREW		
274	SCALE		
275	RIVET		
276	SCALE		
278	SCALE		
279	REFERENCE LINE PLATE		
281	SET SCREW		
82	SCREW		
283	PIN		
284	PIN		
285	HOISTING RING		
286	SCREW		
287	SADDLE KNEE WIPER (2 REQUIRED)		
288	SCREW		
289	GIB (FOR RUBBER)		
290	GIB		

SQUARE WAYS



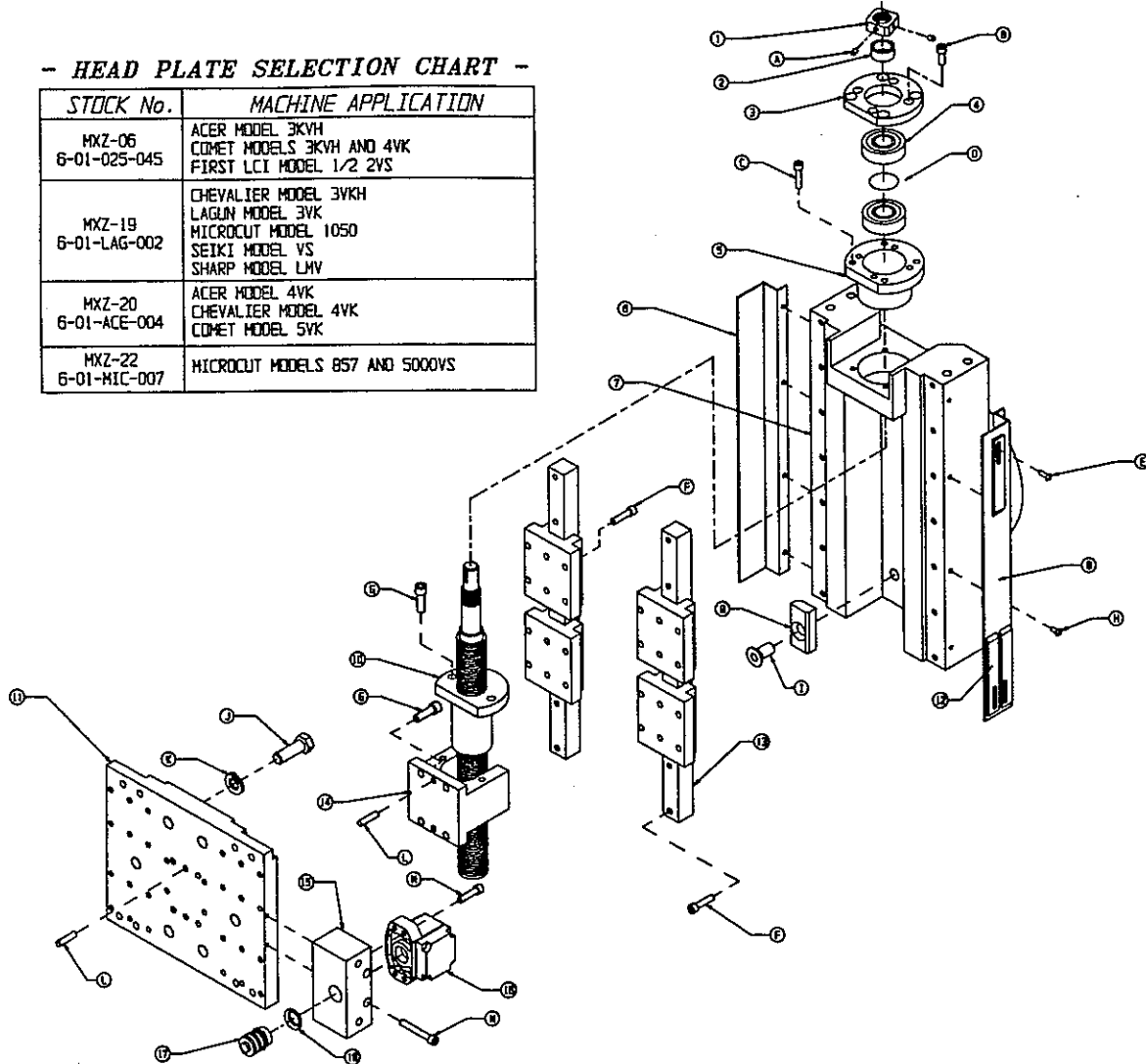


2H HEAD TOP HOUSING

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	Drawbar for R.8 Collet	43	Motor Locknut (2 Req.)
2	Drawbar Washer	45	Motor Locknut Handle (2 Req.)
3	Upper Bearing Locknut	46	Black Plastic Ball (2 Req.)
4	Bearing Sleeve Locknut	49	Motor Pulley
5	Ball Bearing	50	Gear Housing Cover
6	Upper Bearing Spacer (small)	51	Round HD Screw (5 Req.)
7	Upper Bearing Spacer (large)	55	Oil Cup
8	Ball Bearing	56	Bull Gear Key
9	Compression Spring (4 Req.)	57	Splined Gear Hub
10	Socket Set Screw (2 Req.)	58	Spindle Bull Gear Assembly
11	Spindle Pulley Bearing Sleeve	59	Bearing
12	Jam Nut	60	Countershaft
13	External Lock Washer	61	Key
14	Brake Ring Screw (3 Req.)	62	Countershaft Gear
15	Spring (2 Req.)	63	Bearing
16	Machine Screw (4 Req.)	64	Dowel Pin
17	Brake Lock Stud	65	Back Gear Shifter Fork
18	Brake Assembly	66	Gear Housing
19	Spindle Pulley	67	Dowel Pin (2 Req.)
20	Spindle Pulley Hub	68	Roll Pins (2 Req.)
22	'V' Belt	69	Socket Cap Screw (6 Req.)
23	Timing Belt	71	Ball Bearing
24	Timing Belt Pulley Flange	72	Snap Ring
25	Timing Belt Pulley	73	Lockwasher
26	Timing Belt Pulley Flange	74	Bearing Locknut
27	Flat Head Screw	75	Hex Nut Hardened (3 Req.)
28	Hex Jam Nut	76	Vertical Tee Bolt (3 Req.)
29	Black Plastic Ball Handle (2 Req.)	77	Vertical Bolt Washer (3 Req.)
30	Spindle Clutch Lever	78	Back Gear Shift Crank
31	Cam Ring	79	Roll Pin
32	Cam Ring Pin (2 Req.)	80	Back Gear Shift Bushing
33	Socket Set Screw	81	Shift Crank
34	Brake Lock Handle	82	Black Plastic Ball 1" Dia.
35	Brake Lock Pin	83	Gearshift Plunger
39	Hex Jam Nut (2 Req.)	84	Compression Spring
41	Motor Mounting Studs (2 Req.)	85	Belt Guard Assembly
42	Belt Housing		

- HEAD PLATE SELECTION CHART -

STOCK No.	MACHINE APPLICATION
MXZ-06 6-01-025-045	ACER MODEL 3KVH COMET MODELS 3KVH AND 4VK FIRST LCI MODEL 1/2 2VS
MXZ-19 6-01-LAG-002	CHEVALIER MODEL 3KVH LAGUN MODEL 3VK MICROCUT MODEL 1050 SEIKI MODEL VS SHARP MODEL LMV
MXZ-20 6-01-ACE-004	ACER MODEL 4VK CHEVALIER MODEL 4VK COMET MODEL 5VK
MXZ-22 6-01-MIC-007	MICROCUT MODELS 857 AND 5000VS



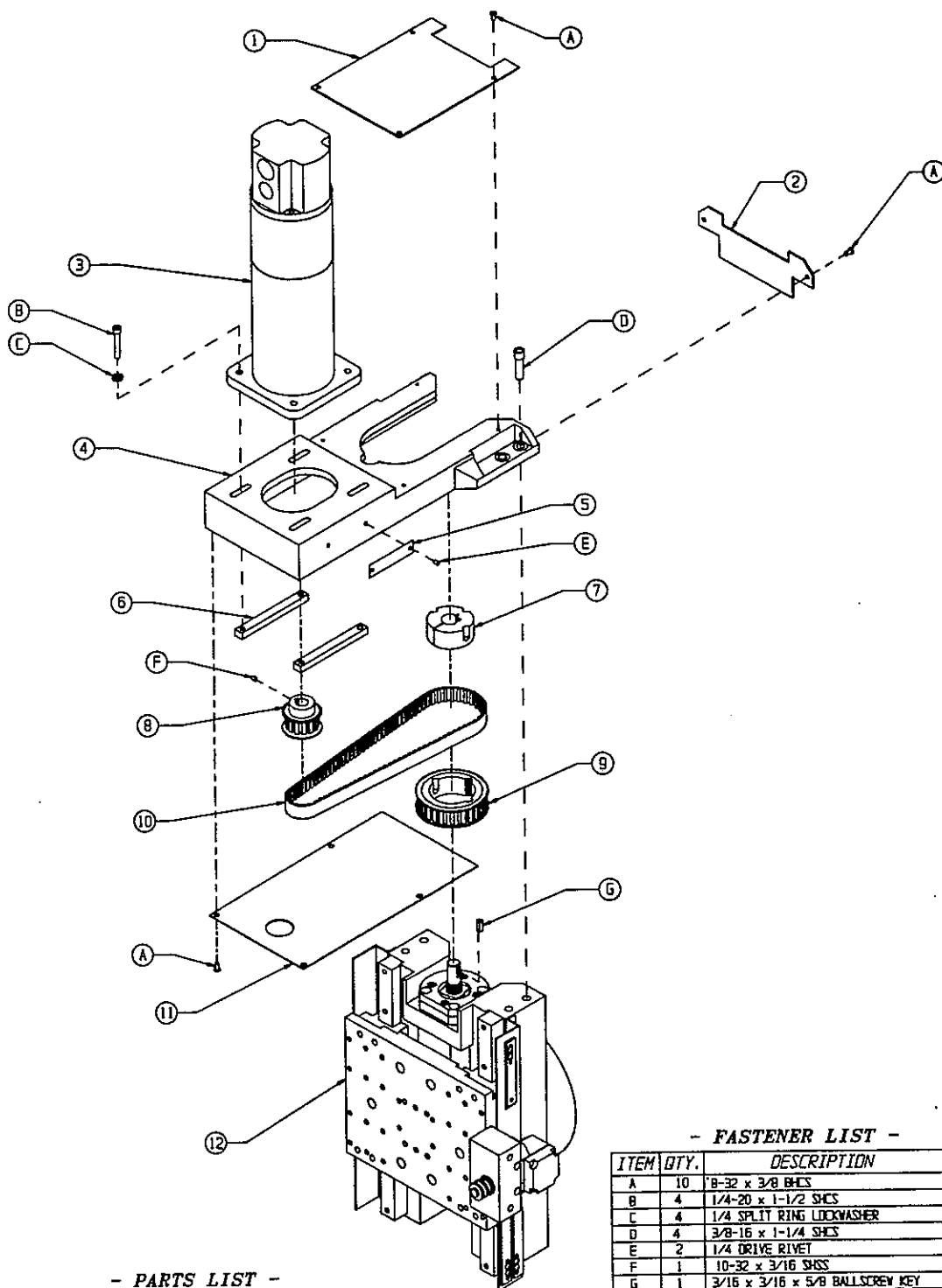
- PARTS LIST -

ITEM	QTY.	STOCK No.	DESCRIPTION
1	1	MP1-94	BALLSCREW LOCKNUT 6-01-008-123
2	1	MP1-107	BALLSCREW LOCKNUT SPACER 6-01-008-137
3	1	MP1-88	BALLSCREW BEARING CAP 6-01-008-117
4	2	BG-01	ANGULAR CONTACT BEARING NSK No. 7204B
5	1	MP1-89	BALL SCREW BEARING BLOCK 6-01-008-116
6	1	MPZ-45	HEAD PLATE COVER - RIGHT 6-01-025-036
7	1	HEAD PLATE & SPUD - MACHINED SEE TABLE FOR PART SELECTION	
8	1	MPZ-96	HEAD PLATE COVER - LEFT 6-01-025-075
9	1	MPZ-70	Z-AXIS BOTTOM HARD STOP 6-01-025-057
10	1	MP1-145	4-TURN Z AXIS BALL SCREW (CUT TO LENGTH)
11	1	MPZ-26	RAM PLATE 6-01-025-024
12	3	MP1-111	LIMIT & GRID SWITCH DOGS 6-01-008-139
13	2	MPZ-41	LINEAR RAILS (CUT TO LENGTH) TYPE HSR25CB2SSC0460L
14	1	MX1-13	X-AXIS BALLSCREW CARRIER - MACH. 6-01-008-162
15	1	MPZ-79	MILLSLIDE BLOCK SWITCH MOUNT 6-01-025-062
16	1	SW-80	AXIS LIMIT SWITCH/GRID SWITCH LOS-5200KS
17	1	WX-23	1/2 INCH CORD GRIP 08-3
18	1	WX-38	1/2 IN. O-RING STG50

- FASTENER LIST -

ITEM	QTY.	DESCRIPTION
A	2	10-32 x 3/16 BRASS TIPPED SHSS
B	4	1/4-20 x 5/8 SHCS
C	4	1/4-20 x 1 SHCS
D	1	BEARING SHIM 1-3/4 x 1-1/4 x .002
E	6	8-32 x 1/4 BHCS
F	38	M6-1 x 25mm SHCS
G	6	5/16-18 x 1 SHCS
H	8	8-32 x 3/8 BHCS
I	1	1/2-13 x 1 FHCS
J	6	1/2-13 x 1-1/2 HHCS
K	6	1/2 IN. LOCK WASHER
L	6	1/4 x 1 DOWEL PIN
M	4	10-32 x 5/8 SHCS
N	2	10-32 x 2 SHCS

B	DRAWING PARTS UPDATE	1869	MM	3/95
A	DRAWING CORRECTIONS	1423	C.L.F.	8/93
REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH		MILLTRONICS MANUFACTURING 7870 PARK DRIVE (612) 474-8100 CHANEASSEN, MN 55317		
STOCK/ASSY No.		TITLE Z-AXIS MILLSLIDE ASSY. - RIGID MOUNTED		
TOLERANCE UNLESS SPECIFIED		APPLICATION PARTNER O		
X.XXX	+/- .005	SCALE 3:1	ENG No 6-10-025-000	SIZE C
X.XX	+/- .010	DATE 6 AUG 93	DRAWN BY REUTER	SHEET NO. 1 OF 2
X.X	+/- .030			
ANGLE	+/- 1.0°			



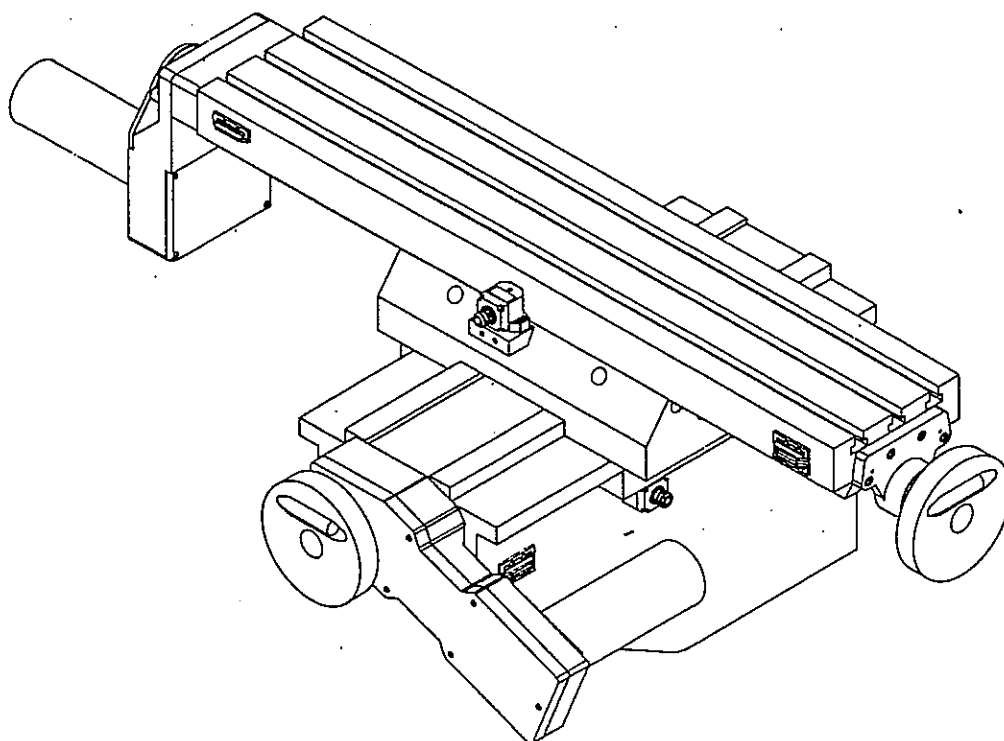
- PARTS LIST -

ITEM	QTY.	STOCK No.	DESCRIPTION
1	1	MPZ-98	Z-AXIS MOTOR MOUNT TOP PLATE 6-01-025-077
2	1	MPZ-99	Z-AXIS MOTOR MOUNT END PLATE 6-01-025-078
3	1	MD-52	MOTOR, DC SERVO, 26 IN/LB WITH BRAKE SER No. MT30M4-38
4	1	MOZ-07	Z-AXIS MOTOR MOUNT - MACHINED 6-01-025-046
5	1	LD-59	MILLSLIDE PATENT No. TAG 6-08-025-009
6	2	MP-68	MOTOR MOUNTING BRACKET 6-01-018-073
7	1	PY-32	BUSHING, TIMING PULLEY TYPE 1210, 5/8 I.D.
8	1	PY-21	PULLEY, TIMING TYPE 1210
9	1	PY-31	PULLEY, TIMING TYPE 1824
10	1	BT-16	BELT, TIMING TYPE 270
11	1	MPZ-47	Z-AXIS BELT & PULLEY COVER 6-01-025-040
12			Z-AXIS MILLSLIDE ASSEMBLY SEE PAGE 1 OF 2

- FASTENER LIST -

ITEM	QTY.	DESCRIPTION
A	10	#8-32 x 3/8 SHCS
B	4	1/4-20 x 1-1/2 SHCS
C	4	1/4 SPLIT RING LOCKWASHER
D	4	3/8-16 x 1-1/4 SHCS
E	2	1/4 DRIVE RIVET
F	1	10-32 x 3/16 SHSS
G	1	3/16 x 3/16 x 5/8 BALLSCREW KEY

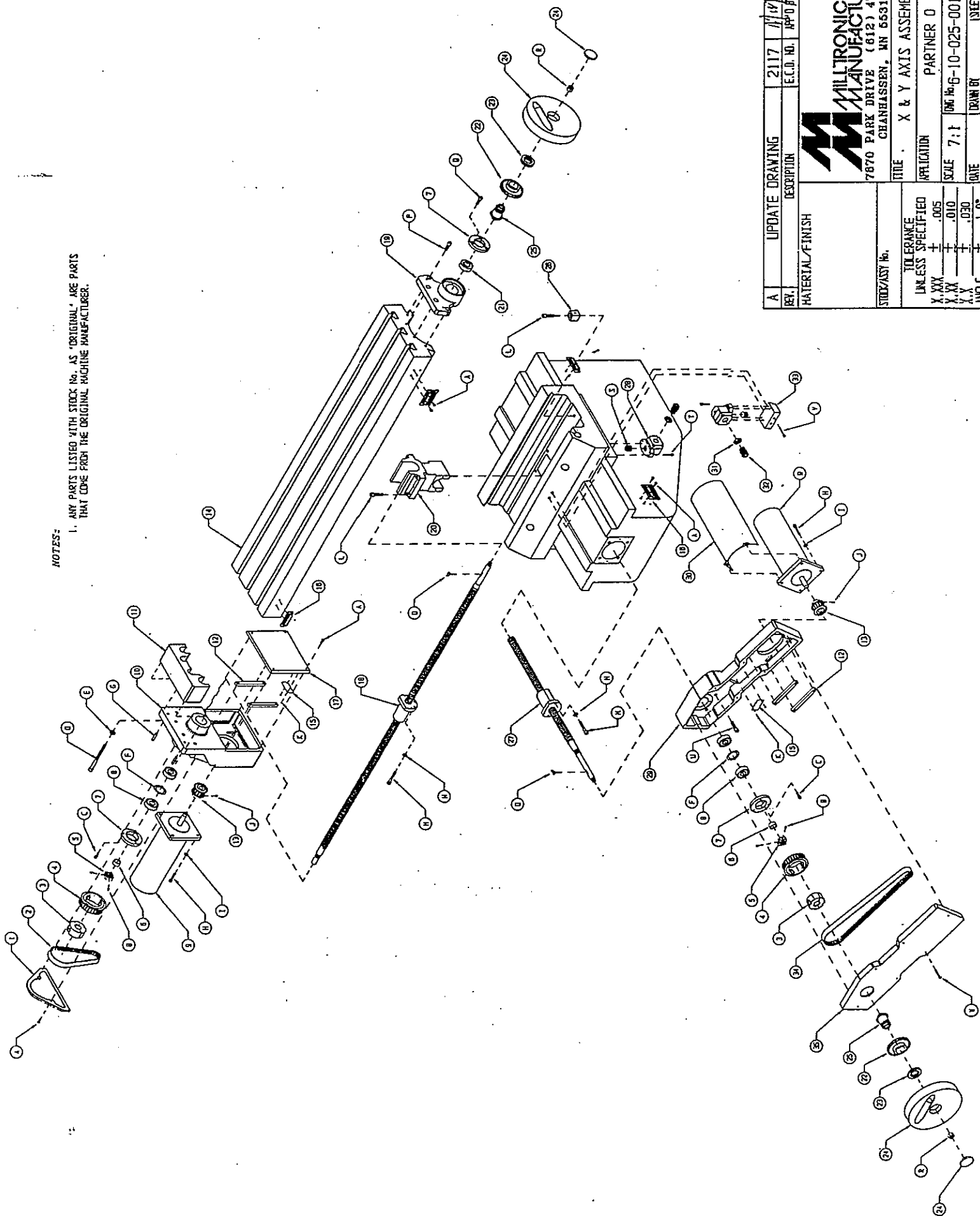
B	DRAWING PARTS UPDATE	1869	M/K	3/95
A	DRAWING CORRECTIONS	1423	C.L.P.	8/93
REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH		 MILLTRONICS MANUFACTURING 7870 PARK DRIVE (612) 474-8100 CHANHASSEN, MN 56317		
STOCK/ASSY No.		TITLE Z-AXIS MILLSLIDE ASSEMBLY		
TOLERANCE UNLESS SPECIFIED		APPLICATION PARTNER 0		
X.XXX	+/- .005	SCALE 4:1		
X.XX	+/- .010	DWG No 6-10-025-000		
X.X	+/- .030	SIZE C		
ANGLE	+/- 1.0°	DATE 6 AUG 93		
		DRAWN BY REUTER		SHEET NO. 2 OF 2



PARTS LIST			
No.	QTY	STOCK No.	DESCRIPTION
1	1	MXZ-09	X-AXIS BRACKET COVER - MACHINED
2	1	BT-09	187L075 TIMING BELT
3	2	PY-32	1210 5/8 I.D. BUSHING
4	2	PY-31	T824L075 TAPERLOCK PULLEY
5	2	MP1-94	BALL SCREW LOCK NUT
6	2	MP1-107	BEARING LOCK NUT SPACER
7	3	BR-46	BEARING RETAINER CAP
8	4	BG-01	BEARING NSK 7204BYG
9	2	MD-02	MT30M4-38 26" LB.
10	1	MXZ-01	X-AXIS MOTOR MOUNT - MACHINED
11	1	MPZ-95	X-AXIS MOTOR MOUNT SPACER
12	4	MP-68	MOTOR MOUNT BRACKETS
13	2	PY-21	12L075 MOTOR PULLEY
14	1	ORIGINAL	MACHINE TABLE
15	2	LB-27	PULLEY MOTOR WARNING LABEL
16	6	MP-45	OVERTRAVEL/GRID DOGS X&Y AXIS
17	1	MXZ-02	X-AXIS MOTOR MOUNT COVER - MACHINED
18	1	MPZ-87	1 1/4 DIA. 33" TRAVEL X-AXIS BALL SCREW
19	1	ORIGINAL	X-AXIS RADIAL SUPPORT
20	1	MXZ-16	1 1/4 BALL SCREW YOKE - MACHINED
21	1	BG-02	6204 BEARING
22	2	ORIGINAL	GRADUATED DIAL
23	2	ORIGINAL	GRADUATED DIAL LOCKING KNOB
24	2	MPZ-03	29968 8" AXIS HANDLES
25	2	ORIGINAL	GRADUATED DIAL HOLDER
26	1	MP1-76	HARD STOP
27	1	MPZ-88	1 1/4 Y-AXIS BALL SCREW
28	2	SW-80	LIMIT & GRID SWITCH LOS-S200KS
29	1	MXZ-03	Y-AXIS MOTOR MOUNT - MACHINED
30	1	MM-16	MOTOR DRIP COVER
31	2	WX-38	O-RING 1/2" STG50
32	2	WX-23	CORD GRIP 1/2" OB-3
33	1	MPZ-54	X-AXIS SWITCH MOUNT
34	1	BT-16	270L075 BELT TIMING
35	1	MXZ-04	Y-AXIS MOTOR MOUNT COVER

HARDWARE LIST		
No.	QTY	DESCRIPTION
A	20	10-24 x 1/2 BHCS
B	4	10-32 x 3/16 BRASS TIPPED SHSS
C	6	1/4-20 x 5/8 SHCS
D	4	M10-1.5 x 120 nn. SHCS
E	4	10 nn. LOCK WASHER
F	2	1 3/4 x 1 1/4 x .002 SHIM
G	2	1/4 x 1 1/4 DOWEL PIN
H	8	1/4-20 x 1 1/2 SHCS
I	8	1/4 LOCK WASHER
J	2	10-32 x 3/16 SHSS.
K	4	1/4 DRIVE RIVET
L	5	3/8-16 x 1 1/4 SHCS
M	4	5/16-18 x 1 1/4 SHCS
N	4	5/16 LOCK WASHER
O	2	1/8 x 3/4 WOODRUFF KEY
P	4	M10 - 1.5 x 20 nn SHCS
Q	3	M6 - 1 x 20 MM SHCS
R	2	1/2-20 NYLOCK NUT
S	2	1/2-14 SHPP
T	8	10-24 x 5/8 SHCS
U	4	M10-1.5 x 40 nn. SHCS
V	2	10-24 x 1 3/4 SHCS
W	6	10-32 x 1 1/2 BHCS

A	UPDATE DRAWING	2117	H/W	2/95
REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE
MATERIAL/FINISH		 MILLTRONICS MANUFACTURING 7870 PARK DRIVE (812) 474-8100 CHANHASSEN, MN 55317		
STOCK/ASSY No.		TITLE X & Y AXIS ASSEMBLY		
TOLERANCE UNLESS SPECIFIED		APPLICATION PARTNER 0		
X.XXX	± .005	SCALE 7:1	DWG No. 6-10-025-001	SIZE 0
X.XX	± .010	DATE 29 AUG 94	DRWN BY THOMPSON	SHEET NO. 1 OF 1
X.X	± .030			
ANGLE	± 1.0°			



NOTES:

1. ANY PARTS LISTED WITH STOCK NO. AS "ORIGINAL" ARE PARTS THAT CAME FROM THE ORIGINAL MACHINE MANUFACTURER.

A		UPDATE DRAWING	2117	1/14	2/95
REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE	
MATERIAL/FINISH					
STOCK/ASY No.					
TOLERANCE					
UNLESS SPECIFIED					
X .XX		± .005			
Y .XX		± .010			
Z .XX		± .030			
ANGLES		± 1.0°			
TITLE		X & Y AXIS ASSEMBLY			
APPLICATION		PARTNER D			
SCALE		7:1 (INC No 6-10-025-001) SIZE D			
DATE		29 AUG 94			
DRAWN BY		THOMPSON			
SHEET NO.		1 OF 1			

MILLITRONICS MANUFACTURING
 7870 PARK DRIVE (812) 474-8100
 CHANHASSEN, MN 55317

