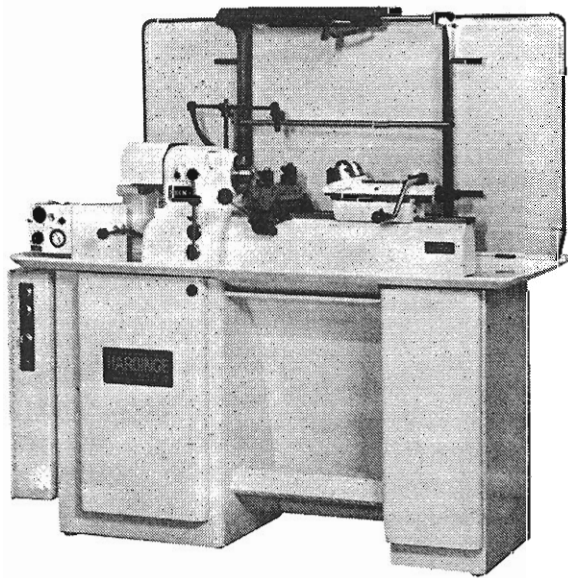
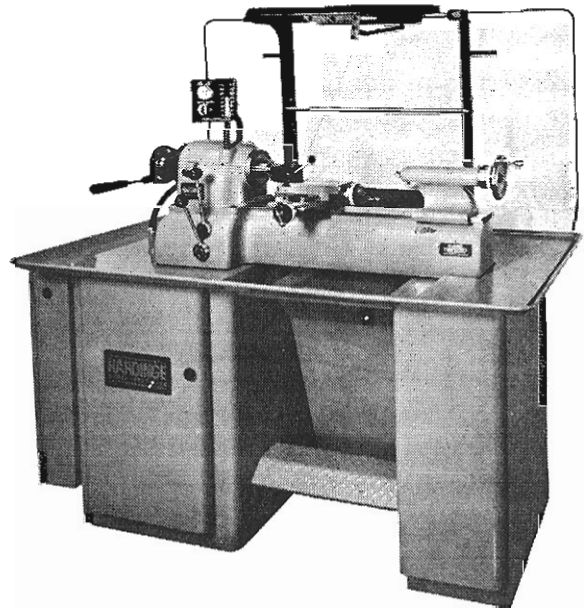




OPERATOR'S AND MAINTENANCE MANUALS

**SUPER-PRECISION[®]
DV FIVE-NINE[®] HIGH SPEED
MODEL SHOP LATHE**



**SUPER-PRECISION[®]
DSM FIVE-NINE,[®]
DSM FIVE-NINE R,
VBS^{T.M.} AND VBS-R
HIGH SPEED BAR AND
SECOND OPERATION MACHINES**

\$15.00

M-8C

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APRIL 1985

READ MANUAL CAREFULLY BEFORE OPERATING
THE SUPER-PRECISION MACHINE

Models:	DSM Five-Nine®	Bar & Second Operation Machine
	DSM Five-Nine-R	Fast Reversing Bar & Second Operation Machine
	DV Five-Nine®	Model Shop Lathe
	VBS ^{T.M.}	Bar & Second Operation Machine with Stationary Collet
	VBS-R	Fast Reversing Second Operation Machine with Stationary Collet

When this manual was printed, the information given was current. However, since we are constantly improving the design of our machine tools, it is possible that the illustrations and descriptions may vary from the Super-Precision® machine you received.

Instructions listed first pertain to general Super-Precision machines. Specific model information follows general information.

In no event will Hardinge Brothers, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of the equipment described in this manual.

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HARDINGE BROTHERS, INC.
ELMIRA, NY 14902

HARDINGE SAFETY RECOMMENDATIONS

Your Hardinge machine is designed and built for maximum ease and safety of operation. However, some previously accepted shop practices may not reflect current safety regulations and procedures, they should be re-examined to insure compliance with the current safety and health standards.

We recommend that all shop supervisors, maintenance personnel, machine and tool operators, be advised of the importance of safe maintenance, setup and operation of Hardinge-built equipment. Our recommendations are described below. **READ THESE SAFETY RECOMMENDATIONS BEFORE PROCEEDING ANY FURTHER.**

READ APPROPRIATE MANUAL OR INSTRUCTIONS before attempting operation or maintenance of machine. Make sure you understand all instructions.

CONSULT YOUR SUPERVISOR when in doubt as to the correct way to do a job.

DON'T OPERATE EQUIPMENT unless proper maintenance has been regularly performed and the equipment is known to be in good working order.

DON'T REMOVE any warning or instruction tags from machine.

DON'T OPERATE EQUIPMENT if unusual or excessive noise or vibration occurs. Report any excessive or unusual vibration, sounds, smoke, or heat as well as any damaged parts.

MAKE SURE EQUIPMENT is properly grounded. Consult National Electric Code and all local codes.

DISCONNECT MAIN ELECTRICAL POWER before attempting repair or maintenance.

DON'T TOUCH ELECTRICAL EQUIPMENT when hands are wet or when standing on a wet surface.

ALLOW ONLY AUTHORIZED PERSONNEL to have access to enclosures containing electrical equipment.

DON'T ALLOW the operation or repair of equipment by untrained personnel.

REPLACE BLOWN FUSES with fuses of the same size and type as originally furnished.

ASCERTAIN AND CORRECT cause of a shutdown caused by overloaded heaters before starting machine.

WEAR SAFETY GLASSES AND PROPER FOOT PROTECTION at all times. When necessary, wear respirator, helmet, gloves and ear muffs or plugs.

KEEP AREA AROUND MACHINE well lighted and dry.

KEEP CHEMICAL AND FLAMMABLE MATERIAL away from electrical or operating equipment.

HAVE CORRECT TYPE OF FIRE EXTINGUISHER handy when machining combustible material and keep chips clear of work area.

DON'T USE a toxic or flammable substance as a solvent cleaner or coolant.

MAKE SURE PROPER GUARDING is in place and all doors are closed and secured.

DON'T ALTER THE MACHINE to bypass any interlock, overload, disconnect or other safety device.

DON'T OPEN GUARD DOORS while any machine component is in motion.

MAKE SURE chucks, closer, fixture plates and all other spindle-mounted work-holding devices are properly mounted and secured before starting machine.

MAKE CERTAIN all tools are securely clamped in position before starting machine

REMOVE ANY LOOSE PARTS OR TOOLS left on machine or in the work area before operating machine. Always check machine and work area for loose tools and parts especially after work has been done by maintenance personnel.

REMOVE CHUCK WRENCHES before starting machine.

KNOW WHERE ALL stop pushbuttons are located in case of an emergency.

CHECK LUBE LEVEL and status of indicator lights before operating machine.

MAKE CERTAIN that all guards are in good condition and are functioning properly before operating machine.

INSPECT ALL SAFETY DEVICES AND GUARDS to make certain that they are in good condition and are functioning properly before cycle is started.

CHECK SETUP, TOOLING AND SECURITY OF WORKPIECE if machine has been off for any length of time.

MAKE CERTAIN you are clear of any "pinch point" created by moving slides before starting machine.

DON'T OPERATE any equipment while any part of the body is in the proximity of a potentially hazardous area.

DON'T REMOVE CHIPS with hands. Use a hook or similar device and make certain that all machine movements have ceased.

BE CAREFUL of sharp edges when handling newly machined workpieces.

DON'T REMOVE OR LOAD workpiece while any part of the machine is in motion.

DON'T OPERATE ANY MACHINE with rings, watches, jewelry, loose clothing, neckties or long hair not contained by a net or shop cap.

DON'T ADJUST TOOLING or coolant hoses while machine is running.

DON'T LEAVE tools, workpieces or other loose items where they can come in contact with moving component of the machine

DON'T CHECK finishes or dimension of workpiece near running spindle or moving slides.

DON'T JOG SPINDLE in either direction when checking threads with a thread gage.

DON'T ATTEMPT to brake or slow the machine with hands or any makeshift device.

ANY ATTACHMENT, TOOL OR MACHINE MODIFICATION not obtained from Hardinge Brothers, Inc., must be reviewed by a qualified safety engineer before installation.

USE CAUTION around exposed mechanisms and tooling, especially when setting up. Be careful of sharp edges on tools.

DON'T USE worn or defective hand tools. Use proper size and type for job being performed.

USE ONLY a soft-faced hammer on turret tools and fixtures.

MAKE CERTAIN that all tool mounting surfaces are clean before mounting tools.

INSPECT ALL CHUCKING DEVICES daily to make sure they are in good operating condition. Replace defective chuck before starting machine.

USE MAXIMUM ALLOWABLE gripping pressure on chuck. Consider weight, shape, and balance of workpiece.

USE LIGHTER THAN NORMAL feedrates and depth of cut when machining a workpiece diameter that is larger than the gripping diameter.

DON'T EXCEED rated capacity of machine.

DON'T LEAVE MACHINE unattended while it is operating.

DON'T CLEAN machine with an air hose.

DON'T OVERFILL tote pans.

KEEP TOTE PANS a safe distance from machine.

DON'T LET STOCK project past back end of collet closer or machine spindle without being adequately covered.

USE FEED TUBE BUSHINGS when using bar feed.

MAKE CERTAIN that any bar feed mechanism is properly aligned with spindle. If floor-mounted type, it must be securely bolted to floor.

FOR YOUR PROTECTION - WORK SAFELY

It is assumed those who use this manual will have a general knowledge of machine maintenance and repair. This general knowledge along with the information in this manual, will greatly reduce or eliminate machine down time to allow you to receive maximum production from your Hardinge machine.

PREVENTIVE MAINTENANCE

DAILY

Oil Brake Insert	2-5
Run Drive Through Complete Speed Range	2-2

WEEKLY

Remove, Clean and Lubricate Collet Closer	3-1
---	-----

MONTHLY

Check Drive Belt Tension	2-3
Lubricate Drive	2-3
Clean and Lubricate Compound Slide Rest	8-2
Clean and Lubricate Double Tool Cross Slide	6-1

DEPENDING ON USE

Clean Coolant Sump	4-1
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NOTE: Coolant reservoir should also be cleaned whenever changing type or brand of coolant.

NOTE: Preventive maintenance frequency is for single shift and should be increased proportionally for two or three shifts per day.

LUBRICANTS

(USE RECOMMENDED PRODUCT OR EQUIVALENT)

<u>PRODUCT</u>	<u>VENDOR</u>
Vactra Oil #2	Mobil Oil Corporation
Velocite #6	Mobil Oil Corporation
Die Maker's Grease	Standard Die Set Company
Nevamelt Grease	Magnus Chemical
Alvania #3	Shell Oil Company
Cosmolube #2	E.F. Houghton & Company

ADHESIVES AND SEALERS

Permatex #2 Sealer	Permatex Company, Inc.
Sealing Adhesive RTV-108	General Electric
Loctite #222, #242 and #262	Loctite Corporation
Loctite Pipe Sealant with Teflon (Item #59241)	Loctite Corporation

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Loctite is a registered trademark of Loctite Corporation.

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CHAPTER 1 - INSTALLATION	
Machine Serial Number	1-1
Foundation for Machine	1-1
Installation	1-1
Power Connction (DV/DSM Five-Nine)	1-2
System Grounding	1-4
Cleaning Machine	1-4
CHAPTER 2 - SPINDLE DRIVE (DV/DSM FIVE-NINE)	
Free Spindle	2-1
Spindle Lock Pin	2-1
Starting Spindle	2-1
Changing Spindle Speed	2-2
Applying and Removing Spindle Nose Tooling	2-2
Drive Lubrication	2-3
Spindle Bearing Lubrication	2-3
Drive Belt Adjustment	2-3
Drive Belt Replacement	2-4
Motor Brake	2-5
Spindle Collet Key	2-6
CHAPTER 3 - COLLET CLOSER	
To Adjust Collet Closer	3-1
Collet Closer Removal	3-1
Collet Closer Replacement	3-2
CHAPTER 4 - COOLANT FACILITIES	
CHAPTER 5 - TURRET	
CHAPTER 6 - DOUBLE TOOL CROSS SLIDE	
CHAPTER 7 - TAILSTOCK	
CHAPTER 8 - COMPOUND SLIDE REST	
Cleaning and Lubricating Slide Rest	8-2
CHAPTER 9 - DSM FIVE-NINE-R BAR & SECOND OPERATION MACHINE	
Power Connections	9-1
Electric Countershaft Brake	9-2
Spindle Control Levers	9-2
Free Spindle	9-3
Spindle Driving Unit	9-3
Speed Changing	9-3
Spindle Belt Replacement	9-4
CHAPTER 10 - VBS SECOND OPERATION MACHINE	
Changing and Adjusting Collet	10-1
Collet Closer Removal	10-2
Collet Closer Replacement	10-2

CHAPTER 1 - INSTALLATION

MACHINE SERIAL NUMBER

The machine serial number is located at the rear of the headstock frame on the mounting pad for the collet closer. See "A", Figure 1.1. This serial number should be included in all correspondence regarding this machine.

FOUNDATION FOR MACHINE

The machine will operate without the need of a special foundation. A substantial wood or concrete floor, fairly flat and of sufficient strength to support machine properly, is satisfactory. Do not locate machine near equipment that causes vibration which will transmit to the machine. Poor work finish or damage to the control may result.

INSTALLATION

DO NOT REMOVE MACHINE FROM SKID before moving machine to the location where it is to be used. Remove crating. Remove four bolts which hold machine to the shipping skid. There are two bolts at the extreme left-hand end inside pedestal and two at the right-hand end.

The machine may be removed from the skid by either a crane or fork lift truck. When lifting with a crane, the rope or cable sling should be arranged as shown, Figure 1.2. **NEVER LIFT MACHINE WITH ROPE OR CABLE AROUND SPINDLE, BED, TAILSTOCK, OR TURRET.** The rope or cable must be capable of withstanding a weight of 1,500 pounds.

When using a lift truck, adjust forks to go in between top planks of skid and bottom of pedestal base. Lift machine slowly, checking to see that the correct balance is obtained. Use caution, as machine has more weight at the front and is more easily tipped using the lift truck than the crane and sling method.

After skid has been removed, place machine directly on location where it is to be used.

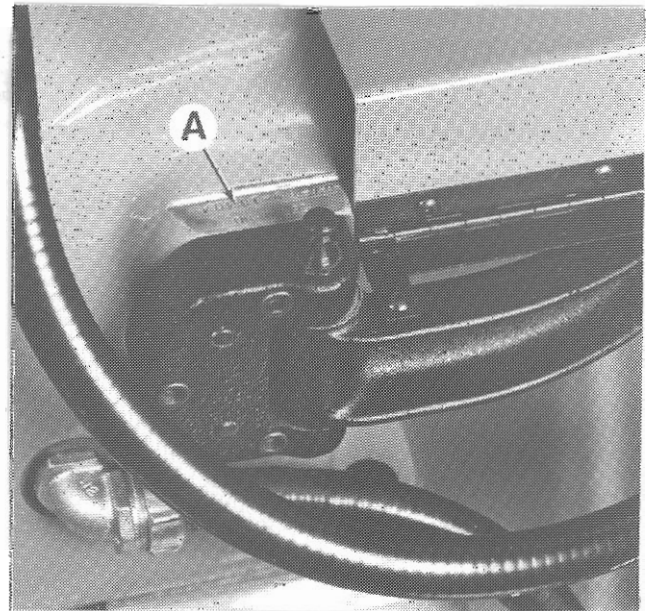


Figure 1.1 - Machine Serial Number

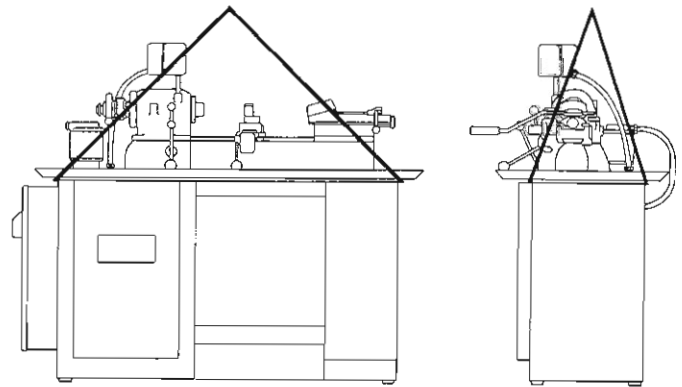


Figure 1.2 - Lifting Machine With Sling

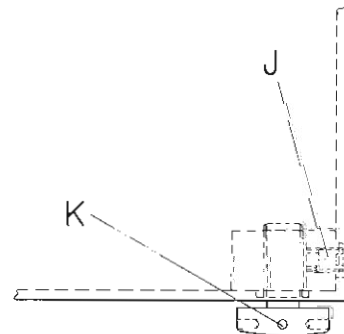


Figure 1.3 - Adjustable Foot

Leveling Machine:

The machine has a three-point arrangement between bed and pedestal base that makes accurate leveling unnecessary. Leveling should be reasonable so that when coolant is used, it will drain back into sump from ends of pan.

There is an adjustable foot "K", Figure 1.3. at the right rear corner of the pedestal to compensate for uneven floor conditions. To adjust foot, loosen socket set-screw "J" and raise or lower foot "K" with a pin wrench until all four feet rest firmly on the floor. Tighten socket set-screw "J" to retain setting.

Should floor conditions be such that adjustable foot is inadequate for leveling, it may be necessary to use shims under pedestal feet.

REMOVE THE RED CLAMP which is located inside the motor compartment under the headstock. The clamp was installed to make a rigid connection between the bed and pedestal base FOR SHIPPING ONLY. Remove cloth wrap and rust-proof paper from variable speed drive assembly. Remove two styrofoam blocks from pulley assembly.

POWER CONNECTION

(DV Five-Nine Model Shop Lathe)
(DSM Five-Nine Bar & Second Operation Machine)

NOTE: For power connections to the DSM Five-Nine R Second Operation Machine, see Chapter 9. Figure 1.4, is the DSM Five-Nine Bar and Second Operation Machine power case or the DV Five-Nine Model Shop Lathe. Power connections for both machines are the same.

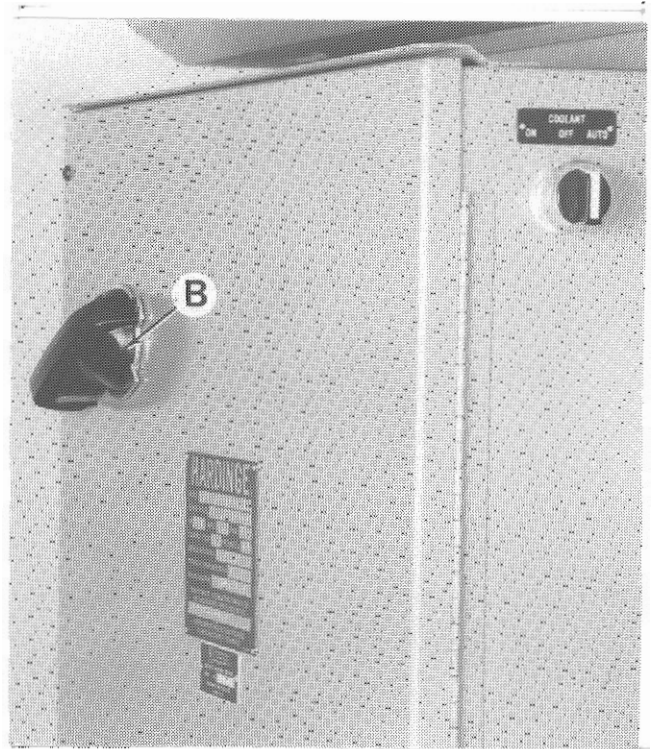


Figure 1.4 - External Power Case

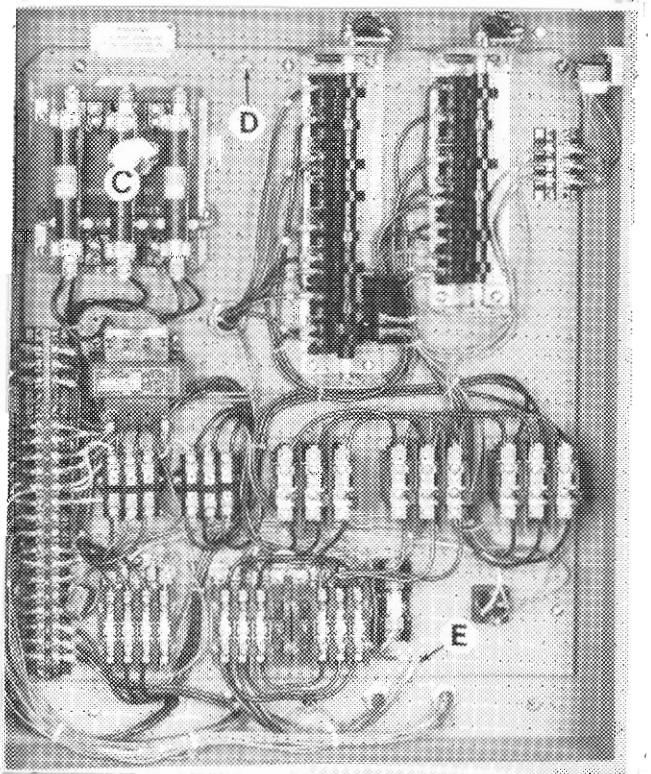


Figure 1.5 - Internal Power Case

200V/50Hz
 208V/60Hz
 230V/50Hz
 230V/60Hz

Minimum AC Service = 30 AMP
 Minimum Wire Size for Electrical Supply = No. 14 AWG
 Minimum Wire Size for Grounding = No. 14 AWG

380V/50Hz
 415V/50Hz
 440V/50Hz
 460V/60Hz
 575V/60Hz

Minimum AC Service = 30 AMP
 Minimum Wire Size for Electrical Supply = No. 14 AWG
 Minimum Wire Size for Grounding = No. 14 AWG

Machines are shipped completely wired and assembled.

Turn disconnect switch "B", Figure 1.4, "OFF" and loosen captive screws in corners of power case. Open power case door.

Power entrance to case must comply with local codes. A suggested entrance point is near disconnect switch "C", Figure 1.5. Remove protective fiberboard guard and connect electrical power line side of disconnect switch "C". Make ground connection at stud "D". **DO NOT OPERATE SPEED CHANGE MECHANISM UNTIL SPINDLE ROTATION HAS BEEN CHECKED.**

TO CHECK SPINDLE ROTATION, apply a collet to machine spindle to anchor collet closer. A SCE collet is shipped with the machine. Close switch case door and turn disconnect switch to "ON". Pull out spindle lock pin "F", Figure 1.6, and pull "Start/Stop" pushbutton "L", Figure 1.7. Place lever "H", Figure 1.6, in "Forward" position and lever "G" in "Low" position. Spindle should rotate counterclockwise when viewed from tailstock (turret) end of machine. If spindle does not rotate in correct direction, disconnect external power source. Turn disconnect switch to "OFF". Open door and interchange any two leads at line side of disconnect switch.

NOTE: Make certain fiberboard guard is replaced on main disconnect switch.

Close power case, retighten captive screws and turn disconnect switch "ON".

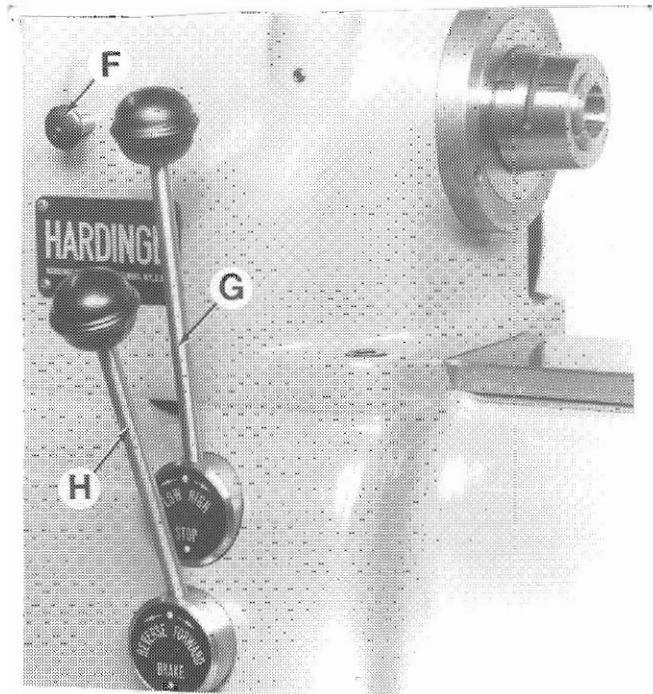


Figure 1.6 - Control Levers

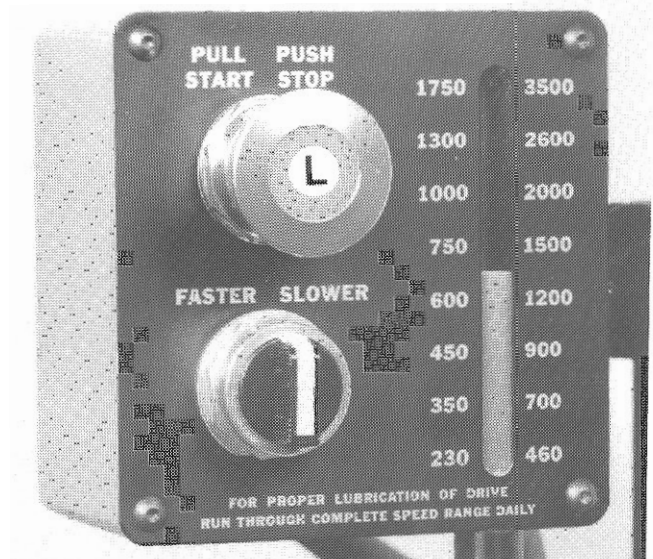


Figure 1.7 - Control Head

SYSTEM GROUNDING

WARNING: Improper grounding of the Hardinge DV Five-Nine Model Shop Lathe and DSM Five-Nine Bar and Second Operation Machine could result in damage to the control and severe electrical shock to personnel in the event of an electrical fault.

A proper grounding arrangement prevents equipment damage and personal injury caused by an electrical fault such as a short circuit. To accomplish this, the grounding setup must assure that all voltages have the same reference base and that, in the event of an electrical fault, the voltage potential is limited. The National Electrical Code* recommends that:

The path to ground from circuits, equipment and conductor enclosures shall (a) be permanent and continuous, (b) have capacity to conduct safely the fault current likely to be imposed on it, and (c) have sufficiently low impedance to limit the voltage to ground and to facilitate the operation of the circuit protective devices in the circuit.

On the DV Five-Nine Model Shop Lathe and DSM Five-Nine Bar and Second Operation Machine all electrical circuits and components are interconnected by a series of ground wires attached to the machine ground stud "E", Figure 1.5. The power supply ground wire should be a minimum 14 AWG and is to be connected to grounding stud "D".

*National Fire Protection Association, National Electrical Code 1982 (New York: National Fire Protection Association, 1980), Page 91.

CLEANING MACHINE

CAUTION: NEVER CLEAN CHIPS FROM MACHINE WITH COMPRESSED AIR. Air pressure forces dirt particles and other foreign matter past seals and wipers into slides and bearings. This reduces the life and precision of the machine.

After machine has been properly located, leveled, AND SHIPPING CLAMP REMOVED, wash off all shipping grease, oil and dirt accumulated in transit. Use a cloth or brush with a good grade of oil-base grease solvent to clean the machine.

Insert the corner of a sheet of paper or a .004-.005 plastic shim between head-stock front cap and spindle seal. Run paper completely around spindle to remove shipping grease. If this grease is not removed spindle may run hot.

Clean motor compartment. Remove all grease from pulleys and brake drum and wipe dry. Rotate pulleys by hand to see that all grease has been removed. DO NOT REMOVE LUBRICANT FROM COUNTERSHAFT.

Remove all shipping grease from variable speed vertical screw "M", Figure 1.8. Lubricate nut at fitting "N", with Houghton Cosmolube No. 2 or equivalent and oil vertical screw with Mobil Velocity[®] Oil No. 6 or equivalent for first "Run-In" only.

Clean tool storage compartment and put bottom tool shelf in place.

CAUTION: Use Clorox 409[®] cleaner to clean guards. Do not use abrasives, benzene, leaded gasoline, acetone or chlorinated solvents.

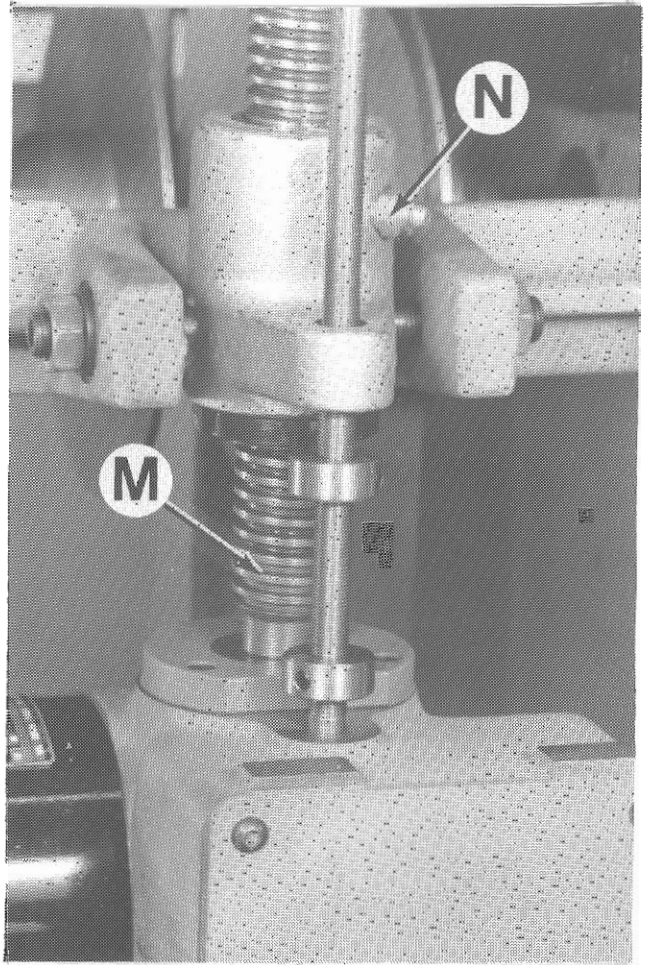


Figure 1.8 - Vertical Screw and Nut

NOTES

CHAPTER 2 - SPINDLE DRIVE (DV/DSM FIVE-NINE)

FREE SPINDLE

To obtain a "Free Spindle", for turning spindle by hand, pull out lock pin "A", Figure 2.1. Place lever "B", Figure 2.1, in "Stop" position, lever "C" in "Forward" or "Reverse" and pull "Start/Stop" pushbutton "D", Figure 2.2. Use handwheel "V", Figure 2.12, to turn spindle. The spindle will rotate more freely after machine has been run at any speed above 100 RPM.

SPINDLE LOCK PIN

The spindle lock pin "A", Figure 2.1, is used to hold the headstock spindle stationary when applying or removing spindle nose attachments, adjusting collet closer, or when applying and removing work from fixtures or a threaded arbor. To engage lock pin, set machine for "Free Spindle" and push in on pin while turning spindle by hand until pin enters one of the spindle pulley notches. **THE LOCK PIN IS ELECTRICALLY INTERLOCKED WITH THE MAIN DRIVE MOTOR AND MUST BE WITHDRAWN BEFORE MACHINE WILL START.**

STARTING SPINDLE

The driving unit provides infinitely variable spindle speeds from 230 to 3500 RPM, both forward and reverse.

The Hardinge DV Five-Nine Model Shop Lathe, and DSM Five-Nine Bar and Second Operation Machine are designed for rapid acceleration to high speeds. BEFORE mounting large fixture work or a heavy jaw chuck, set lever "B", Figure 2.1, in "Low" position. Usually large or heavy work, or work not properly balanced, will cause excessive vibration at high speeds.

To start spindle, pull out spindle lock pin "A", Figure 2.1, and turn main disconnect switch "ON". Move lever "B", Figure 2.1, to "Low" or "High" position and control lever "C" to "Forward" or "Reverse" position. Pull "Start/Stop" pushbutton "D", Figure 2.2.

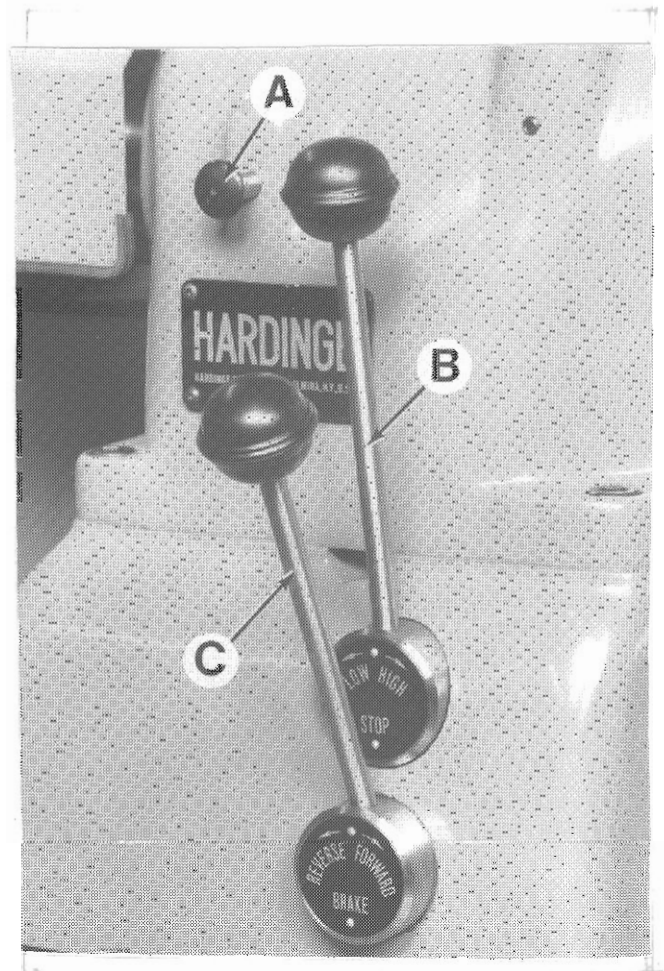


Figure 2.1 - Spindle Lock Pin and Levers

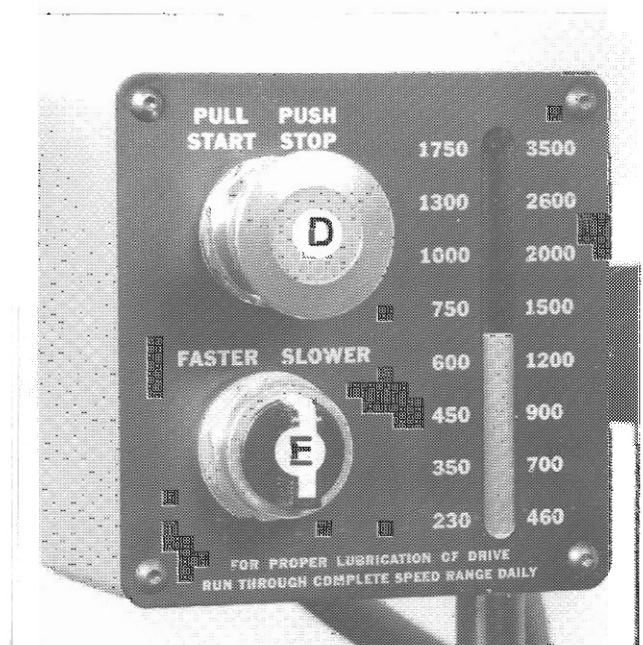


Figure 2.2 - Control Box

Control lever "B", Figure 2.1, controls the spindle speed change. The spindle speed range, which is accomplished through the 2:1 ratio motor, can be changed from "High" to "Low".

Control lever "C" controls direction of headstock spindle rotation. The solenoid operated brake will be automatically applied when lever "C" is in center position.

CHANGING SPINDLE SPEED

To change spindle speed, start spindle and turn switch "E", Figure 2.2, counterclockwise to increase speed and clockwise to decrease speed. Hold switch until desired speed is indicated in sight window. Speeds in left-hand column are obtained with lever "B", Figure 2.1, in "Low" position, and speeds in right-hand column are obtained with lever "B" in "High" position. The spindle speed should be selected to suit each particular job, depending on material, type of cut and tool to be used.

In general, when spindle speed is above 700-800 RPM heavier cuts can be taken if the high range is used. Within this spindle speed range and lower, heavier cuts can be taken if the low range is used.

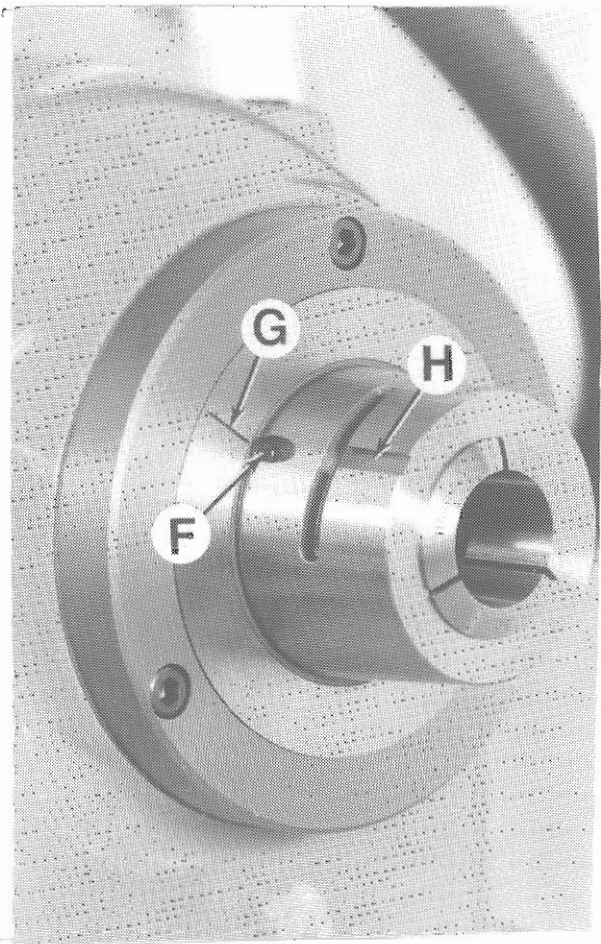


Figure 2.3 - Bayonet Slot

APPLYING AND REMOVING SPINDLE NOSE TOOLING

The Hardinge taper nose spindle construction is time-proven for accuracy, durability and for fast, easy application and removal of spindle nose tooling. The precision ground taper holds and aligns all tooling.

To apply spindle nose tooling, engage lock pin "A", Figure 2.1. Align key "J", Figure 2.4, with bayonet slot "H", Figure 2.3, slide tooling on spindle nose. To lock in place, turn clockwise or counterclockwise, depending on spindle rotation. Once securely drawn up, the spindle nose tooling is actually driven by the locking action of tapered surfaces. Final tightening should be done with a standard pin type spanner wrench. (Use Williams or Armstrong spanner wrench No. 460.) DO NOT USE HAMMER AND PUNCH.

To remove spindle nose tooling, turn with spanner wrench until key "J", Figure 2.4, is in line with reference mark "G", Figure 2.3, on spindle. DO NOT LOOSEN OR REMOVE KEY "J", FIGURE 2.4, TO REMOVE SPINDLE NOSE TOOLING.

LUBRICATION

Drive Lubrication:

Lubricate the speed change vertical screw at grease fitting "K", Figure 2.5, monthly or more often if necessary. Use Houghton Cosmolube No. 2 or equivalent. Grease is sufficient when forced out of slot in fitting "K". FOR PROPER LUBRICATION OF DRIVE, RUN THROUGH COMPLETE SPEED RANGE DAILY.

Lubricate bearing surfaces of countershaft with anti-seize Molyube every three months.

Oil brake drum daily. Use Mobil Velocite Oil No. 6 or equivalent. Infrequent braking will require less oiling. Do not allow cork to become dry as this will reduce belt life excessively.

Lubrication of Spindle Bearings:

The headstock spindle is mounted on precision, preloaded ball bearings. The preloading and resulting load-carrying capacity is engineered to take radial or end thrust, or a combination of both.

The precision preloaded ball bearings are grease-packed for life and require no further lubrication. The entire bearing assembly is housed as a unit and is properly sealed to exclude dirt and foreign matter. The spindle bearing seals are designed to operate at high speed without wear or friction.

There are occasions on a new machine when some of the excess grease in the spindle bearings will work its way out of the opening at the bottom of the front bearing cap. The appearance of this excess grease does not effect the spindle bearing nor the fact that they are grease-packed for life.

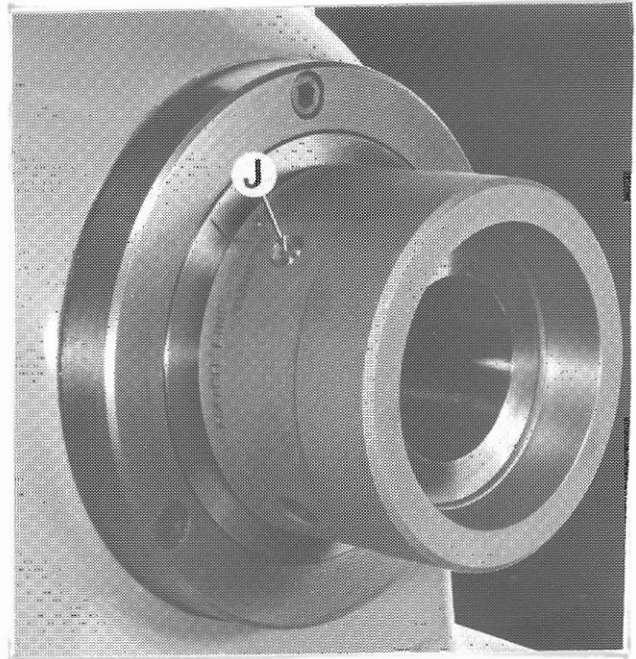


Figure 2.4 - Step Chuck Closer

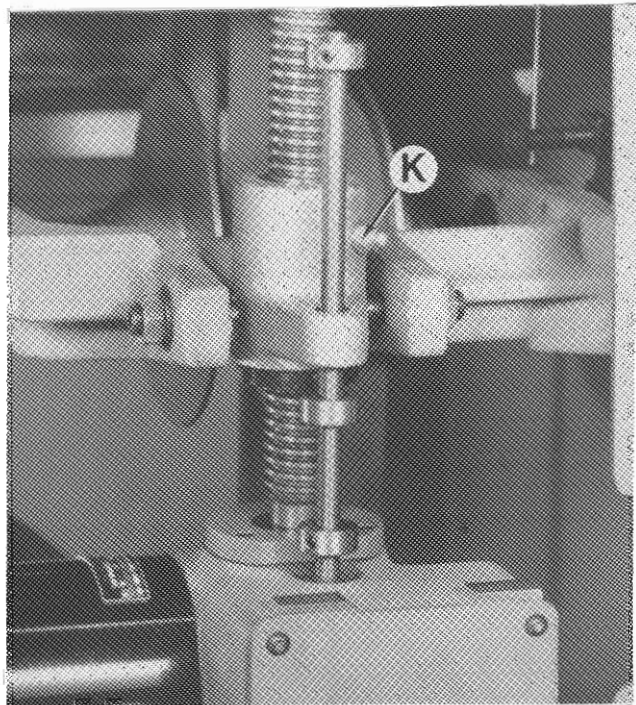


Figure 2.5 - Vertical Screw and Nut

BELT ADJUSTMENT

To check belt tension, run machine at approximately 1,000 RPM and allow machine to coast to a stop by stopping machine with lever "B", Figure 2.1, only. Open pedestal drive compartment door and check belt tension. Belts should not be "drum" tight but should be adjusted so there is no slippage. Although there are several belt tension measuring instruments on the market, an experienced mechanic can usually judge by "feel" when a drive is properly tensioned.

If belts are properly tensioned, close and secure pedestal door. If belts require adjusting proceed as follows:

To Adjust Belts:

1. Loosen nut "M", Figure 2.6.
2. Turn screw "L" clockwise to lower motor plate and tighten belts, turn counterclockwise to raise motor plate and loosen belts. Each time after adjusting, start machine spindle and allow to COAST to a stop so belts will equalize their tension.
3. When correct belt tension is obtained, retighten nut "M", close and secure pedestal door.

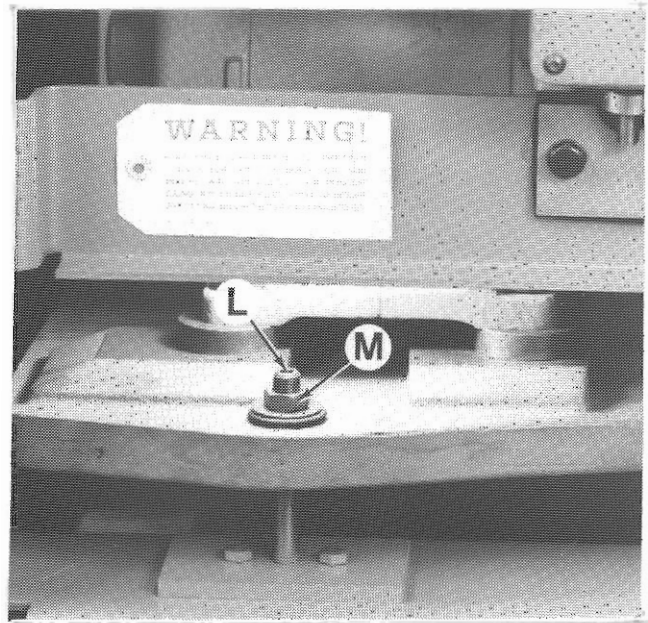


Figure 2.6 - Motor Plate Nut

DRIVE BELT REPLACEMENT

1. Run carrier "N", Figure 2.7, to down position (slow spindle speed).
2. Remove pedestal rear louvered cover to prevent damage when motor mounting plate is raised.
3. Remove nut from motor plate hold down stud "P", Figure 2.8.
4. Raise motor plate approximately 2 inches at machine front and block in position, Figure 2.9.
5. Roll motor belt to right, off countershaft pulley and onto pulley hub.
6. Loosen screws "T", Figure 2.10 and move brake assembly away from brake drum.
7. Roll motor belt off motor pulley and over brake drum.
8. Pull "Start/Stop" pushbutton "D", Figure 2.2. Run pulley carrier "N", Figure 2.7, to top position (high spindle speed). Push "Start/Stop" pushbutton.
9. Slide countershaft to extreme left, as viewed from machine front, and remove belts over end of countershaft, Figure 2.11.
10. Remove cotter key on switch pull rod for "High-Low" lever which passes through spindle belt. Move spindle belt around end of pull rod.

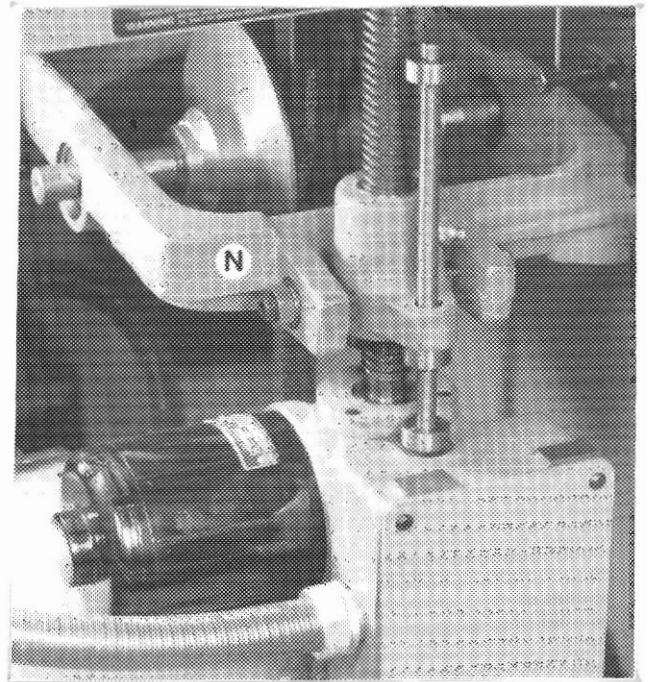


Figure 2.7 - Countershaft Pulley Carrier

11. Remove collet closer. See "Collet Closer Removal", Chapter 3.
12. Remove three screws "U", Figure 2.12, and remove handwheel "V".
13. Lift spindle belt from spindle pulley and remove through opening in headstock, Figure 2.13.
14. Reverse procedure to reassemble with new belts. Follow instructions under "Belt Adjustment" in preceding section.

MOTOR BRAKE

The motor brake is built for rapid but gradual stopping of the precision headstock spindle at all speeds. The brake is automatically applied when lever "C", Figure 2.1, is placed in center position.

Brake drum "Q", Figure 2.10, is located directly on the drive motor shaft. The brake insert is spring actuated and solenoid released. The spring automatically compensates for brake wear. DO NOT ALLOW CORK INSERT TO BECOME DRY Oil daily with a few drops of Mobil Velocite Oil No. 6 or equivalent. Allowing cork to become dry will reduce belt life excessively.

Brake Adjustment:

With lever "C", Figure 2.1, in center position ("Stop"), pull "Start/Stop" pushbutton "D", Figure 2.2, and place lever "C" in "Forward" or "Reverse" position. Turn adjusting screw "E", Figure 2.14, counterclockwise until there is .010" to .013" clearance between cork insert and brake drum.

Brake Cork Replacement:

Loosen two bolts "T", Figure 2.10, and remove brake for easy access to cork. Loosen locknut "R" and keyway guide screw "S". Turn adjusting screw "S" counterclockwise until cork housing is free from brake. Push cork out by means of threaded hole in bottom of housing. Insert new cork, making certain it bottoms in housing. Replace housing in brake. Bottom screw "S", Figure 2.10, in keyway of brake housing. Back screw "S" out 1/4 turn and relock nut "R". When brake is securely bolted in place, follow instructions under "Brake Adjustment".

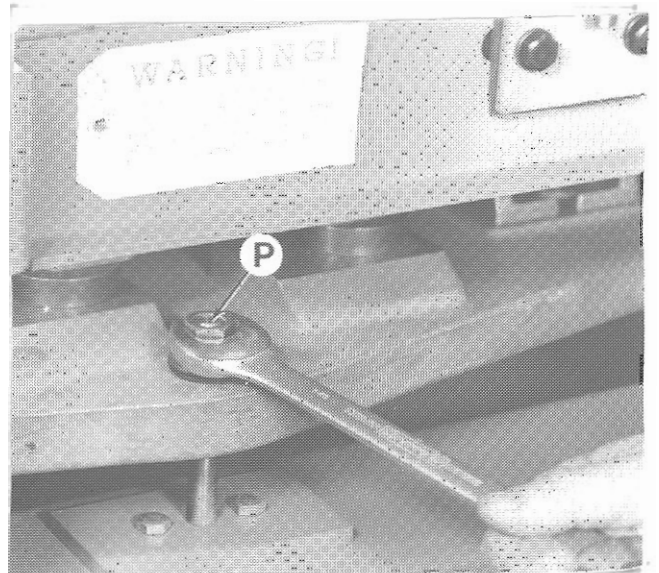


Figure 2.8 - Removing Motor Plate Nut

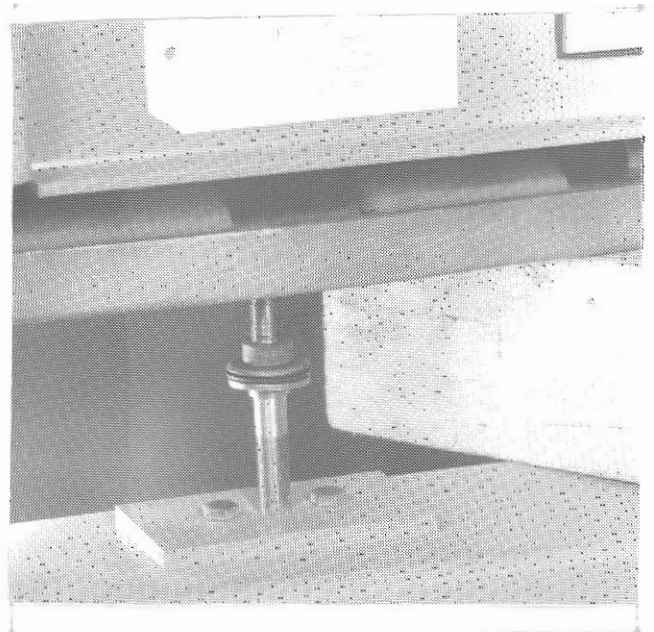


Figure 2.9 - Motor Plate Blocked

SPINDLE COLLET KEY

The spindle collet key "F", Figure 2.3, is threaded into the spindle and can be replaced in the event of wear or damage. Using a 3/32" hex pin wrench, remove lock screw and collet key screw.

Turn new key in until it mates with keyway in a collet. Continue to turn key in 360 degrees at a time until collet will not mate with key. Back key out 360 degrees, mount collet and replace lock screw.

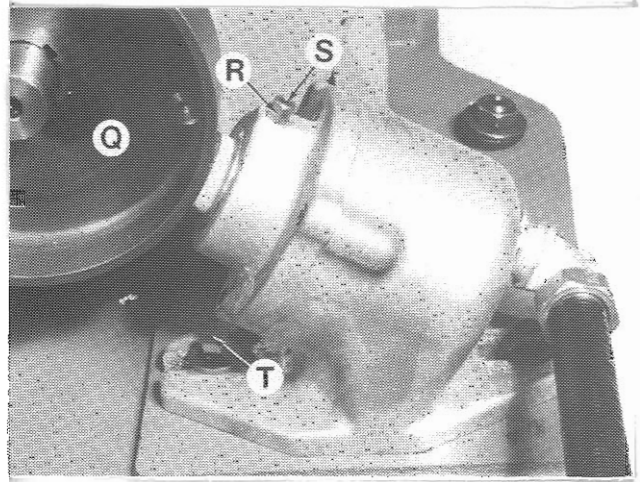


Figure 2.10 - Brake Mounting

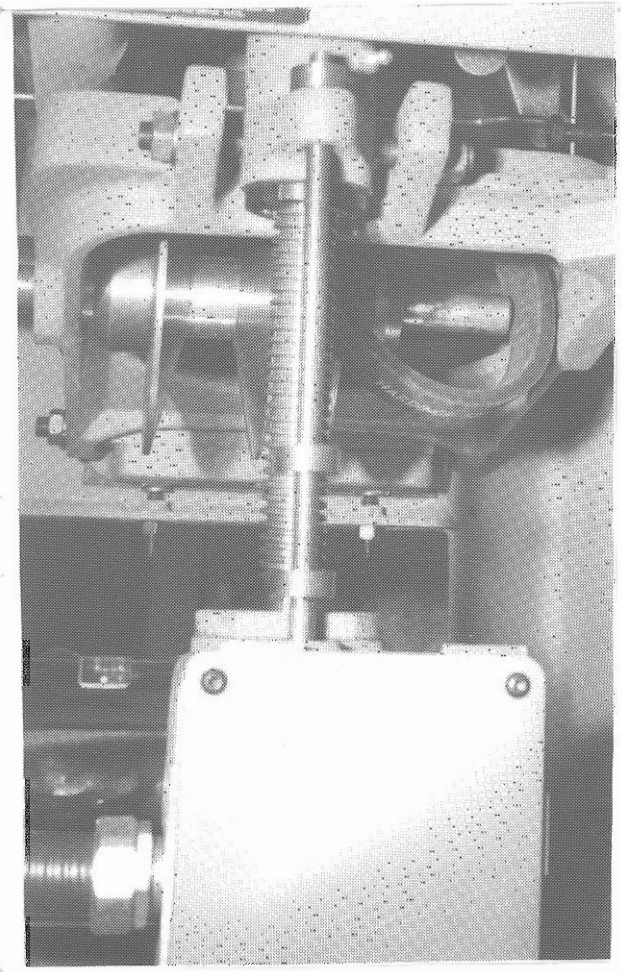


Figure 2.11 - Removing Belts

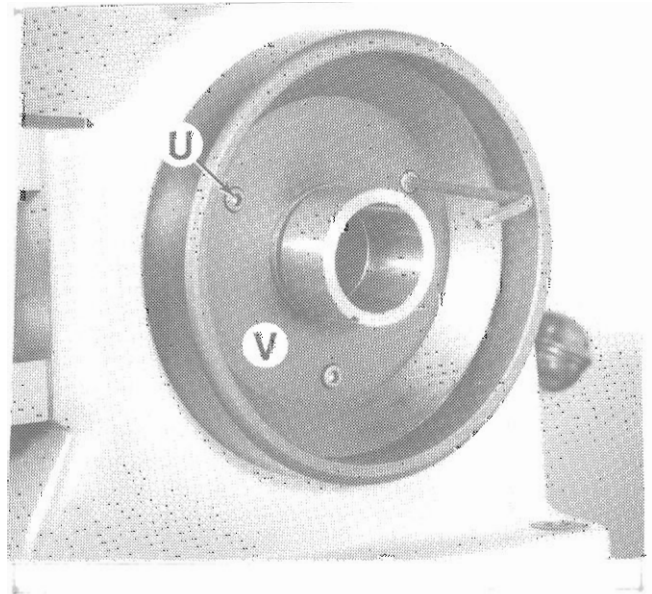


Figure 2.12 - Handwheel

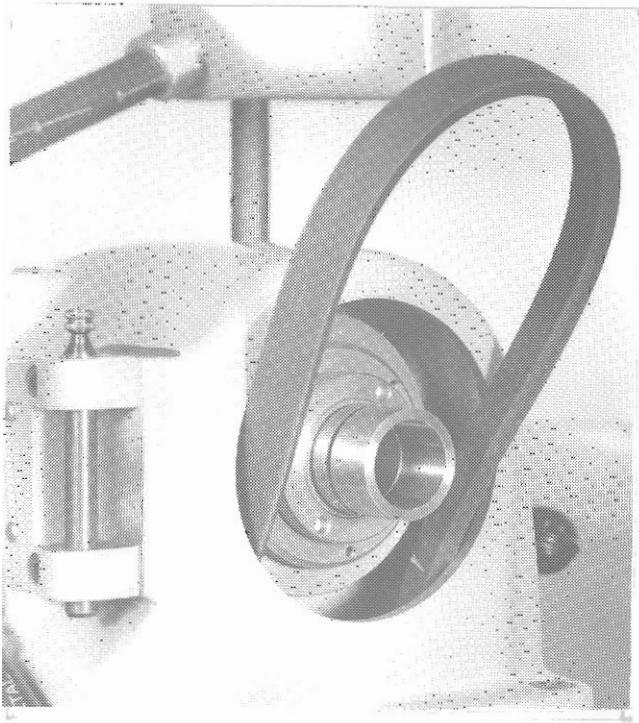


Figure 2.13 - Belt Removal

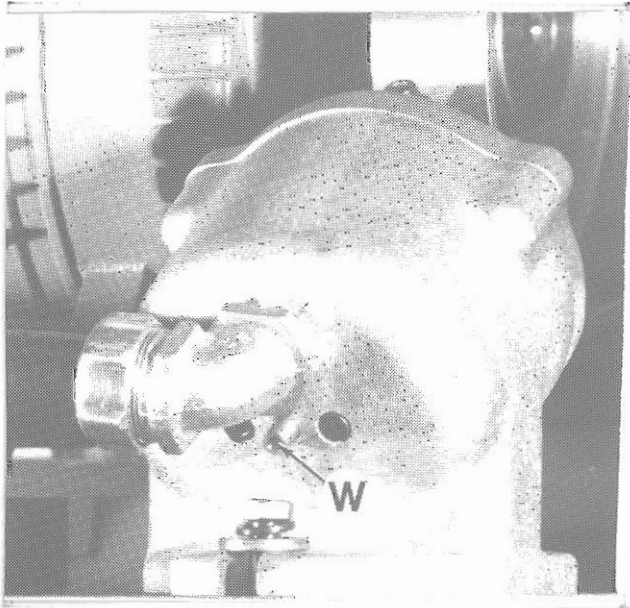


Figure 2.14 - Spindle Brake Adjustment

NOTES

CHAPTER 3 - COLLET CLOSER

TO ADJUST COLLET CLOSER

1. Apply desired collet or step chuck and closer to machine spindle. Collet, or step chuck and spindle MUST BE CLEAN.
2. Open latch by pressing down at "C", Figure 3.1.
3. Engage collet closer draw tube with collet by turning black shell guard "D". forward with left hand while holding collet (step chuck) with right hand. Engage about two threads (two turns).
4. Place work piece in collet or step chuck.
5. Move lever "E". Figure 3.1, to extreme left (closed position). Set machine for "Free Spindle" and turn spindle handwheel "A", Figure 3.1, while pushing in on spindle lock pin "B" until pin enters a pulley notch. Turn shell guard "D" toward operator until collet is drawn up as far as it will go without forcing.
6. Move lever "E" forward to the released position and turn shell guard "D" toward operator an additional two notches on adjusting nut.
7. Close latch "C" and test collet for tension on workpiece. Should additional gripping pressure be required, open latch and turn shell guard toward operator. For less gripping pressure turn shell guard away from operator. Relatch "C".

NOTE: Make certain latch has entered a notch in adjusting nut before machining workpiece.

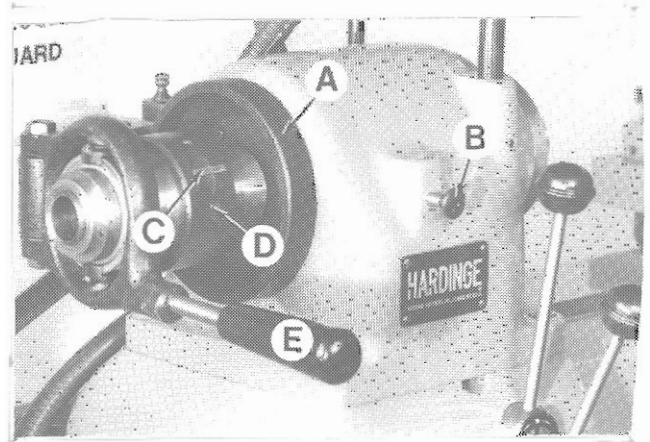


Figure 3.1 - Collet Closer

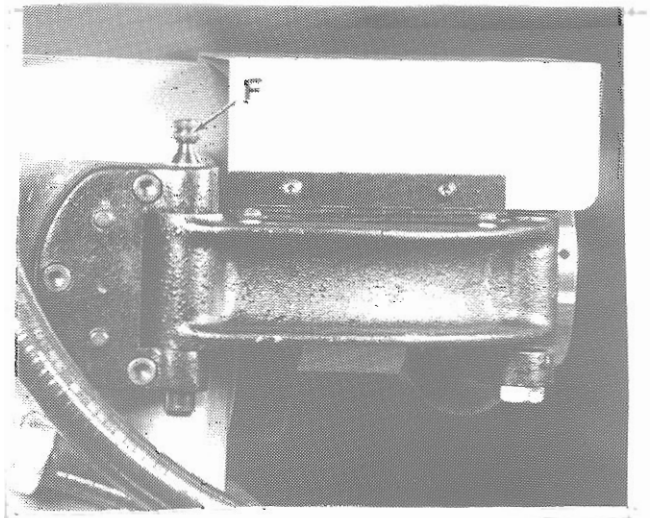


Figure 3.2 - Link Pin

COLLET CLOSER REMOVAL

The collet closer should be removed weekly and between setups for cleaning and removal of chips lodged between inside of spindle and closer draw tube.

Remove collet closer when using jaw chucks, faceplates, fixture plates or other spindle mounted fixtures.

Running the machine with the collet closer in place without a collet may cause damage to the collet closer.

DO NOT REMOVE COLLET CLOSER BY REMOVING SCREWS "J", Figure 3.4. These screws are factory adjusted for proper operation of collet closer.

1. Remove link pin "F", Figure 3.2, by pulling straight up.
2. Remove collet closer as shown, Figure 3.3. ALWAYS REMOVE ADJUSTING NUT "H", pulling straight off end of spindle. DO NOT TURN ADJUSTING NUT. IT IS NOT THREADED TO SPINDLE.

COLLET CLOSER REPLACEMENT

1. Clean inside of headstock spindle before applying collet closer. Also clean outside diameter at rear of spindle where adjusting nut locates. Clean collet closer tube inside and out.
2. Apply a film of Mobile Velocite Oil No. 6 or equivalent on rear of headstock spindle and replace adjusting nut "H", Figure 3.3. DO NOT FORCE ADJUSTING NUT ON SPINDLE. If adjusting nut goes on tight, remove and examine for burrs or scratches. Apply a film of Mobile Velocite Oil No. 6 or equivalent on bearing section "G" of collet closer tube, replace closer and insert link pin "F", Figure 3.2.

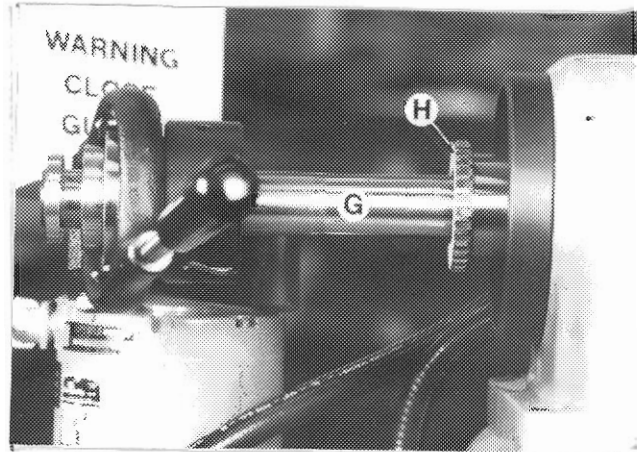


Figure 3.3 - Collet Closer Removal

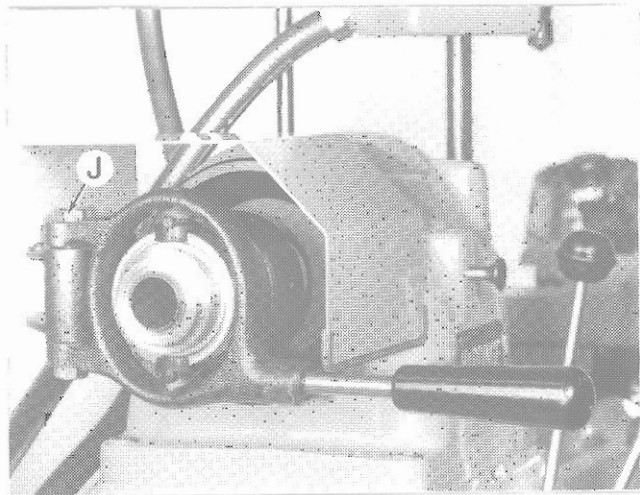


Figure 3.4 - Collet Closer Screws

CHAPTER 4 - COOLANT FACILITIES

Coolant facilities are standard equipment on the DV Five-Nine, DSM Five-Nine and DSM Five-Nine R Bar and Second Operation Machines. If not supplied with machine, coolant facilities can be ordered and installed by user.

OIL BASE CUTTING FLUIDS ARE RECOMMENDED FOR MAXIMUM MACHINE LIFE.

Fill coolant reservoir with desired oil-based coolant by pouring directly into pan.

An adjustable nozzle directs the coolant to the workpiece. Flow is controlled by the nozzle knob.

Coolant pump switch "A", Figure 4.1, should be set at "OFF" when not using coolant. When switch is set at "ON", coolant pump runs continuously. When set at "AUTO", pump runs only when a spindle speed is active.

Clean sump regularly, depending upon type of material being machined. When machining cast iron or other powdery material without coolant, close sump screen cover to prevent material from mixing with coolant. Also clean sump whenever changing type or brand of coolant. To clean sump, remove the screw in each corner of the screen cover and remove cover from sump. Rinse out and drain sump by removing pipe plug from drain at back of machine.

When coolant is used while machining a part with a through hole, apply a cork to the end of the collet closer tube as shown, Figure 4.2. This will prevent coolant from running out end of spindle.



Figure 4.1 - Coolant Switch

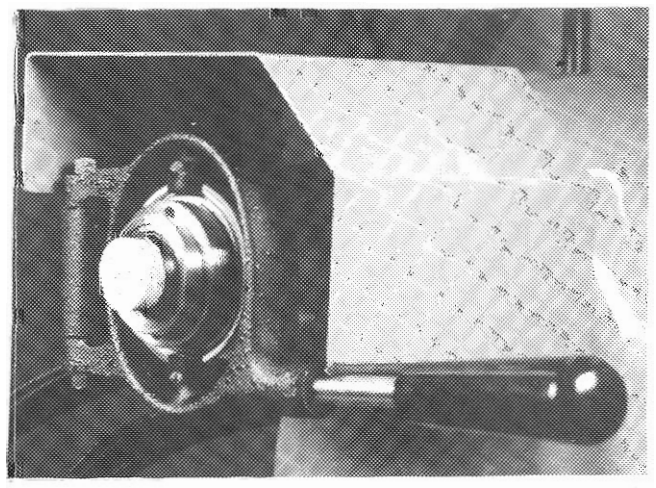


Figure 4.2 - Cork Applied to Collet Closer Tube

NOTES

CHAPTER 5 - TURRET

The preloaded ball bearing turret is easily tooled to handle operations such as turning, drilling, reaming, counter-boring, threading, knurling, etc. See Turret Tooling Bulletin C-226.

The turret head is automatically unlocked, indexed to the next station, and locked by operation of feed lever "A", Figure 5.1. The turret head takes standard tooling with 5/8" diameter shanks.

Turret slide travel is governed by stop screws "C", Figure 5.2. There is one screw for each station. The stop screw in position "C" is the stop for the turret station in the machining position. To limit travel for each turret station, loosen set-screw "B", Figure 5.2, and turn stop screw "C" to desired stop location. Retighten set-screw "B".

Oil turret daily at four points "E", "F", "H", and "J", Figure 5.3, with Mobile Velocite Oil No. 6 or equivalent.

To relocate turret on bed, loosen clamp screw "K", Figure 5.4, and move turret to desired location. Turret clamp must locate in a bed notch to prevent turret end movement.

Turret feed lever "A", Figure 5.1, is adjustable for height and length. Loosen clamp screw "G", Figure 5.3, to move lever in or out, or rotate to desired position.

To bypass vacant stations, place lever "A", Figure 5.1, in the central-neutral position. The turret head can then be hand rotated past stations which are not tooled. To hold turret on one station, for repeat single operation work, remove set-screw "D", Figure 5.2, and the spring underneath. Replace set-screw. Store spring for replacement when indexing is again required.

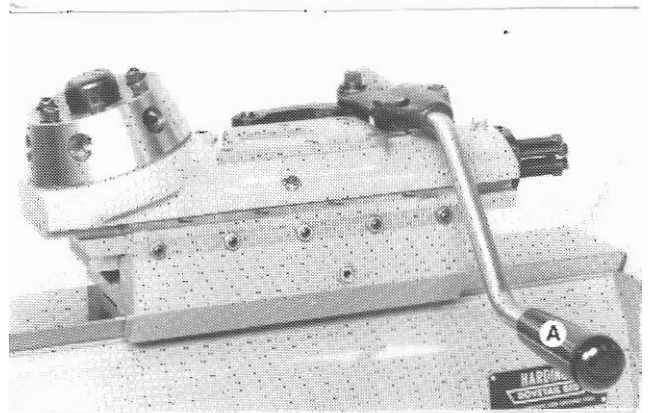


Figure 5.1 - Overall View of Turret

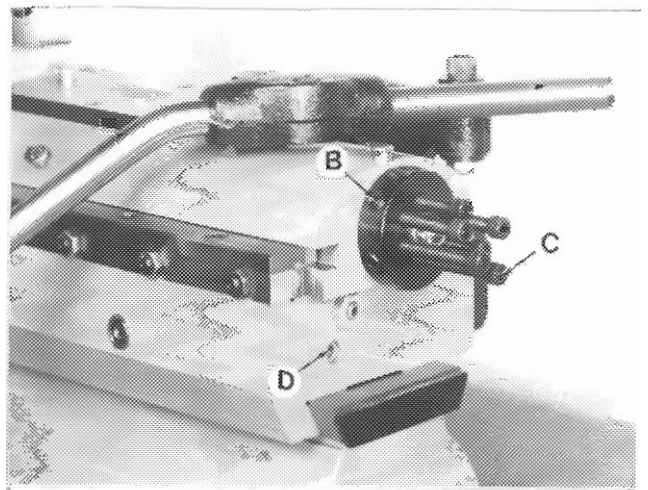


Figure 5.2 - Stop Screws

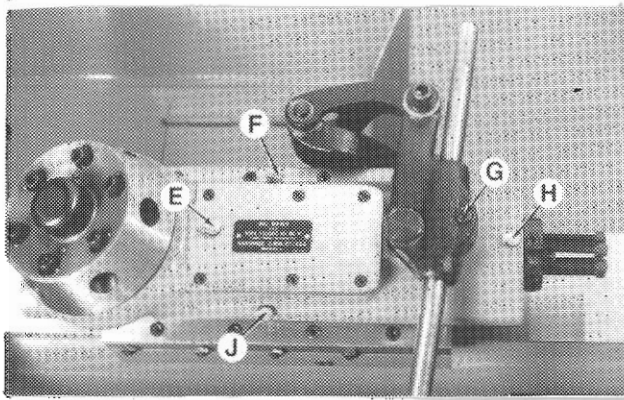


Figure 5.3 - Lubrication Points

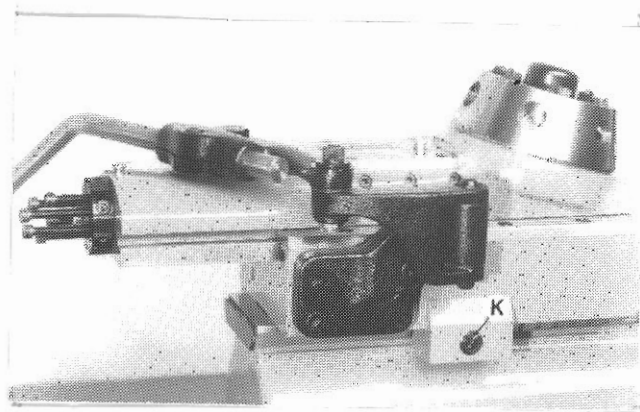


Figure 5.4 - Clamp Screw

CHAPTER 6 - DOUBLE TOOL CROSS SLIDE

The double tool cross slide can be locked at any location on the bed. To relocate cross slide, loosen clamp screw "C", Figure 6.1. Move cross slide to desired location on bed and relock clamp screw.

To change location of tool post blocks on cross slide, loosen eccentric locks "E", Figure 6.2, and slide blocks to desired position. Retighten eccentric locks "E".

To relocate tool posts in the T-slot of their respective bases, loosen nut "D", move tool post to desired position and retighten nut "D".

Tool posts take standard 3/8" square tool bits. To adjust tool bits to spindle centerline, loosen clamp screws "A", Figure 6.1, and turn adjusting screw "B" to raise or lower cutting tool.

The cross slide travel is limited by adjustable stop screws "H", Figure 6.2. To adjust travel, loosen lock screw "K" and turn screw "H" to desired stop location.

To adjust lever feed handle to a more convenient position, loosen nut "J", Figure 6.2, and tap shaft at same end with plastic hammer to loosen the taper lock. Hold handle in desired position and retighten nut "J".

The double tool cross slide should be cleaned and lubricated every three months. Remove screw "G", Figure 6.2, and bracket "F". Move top slide toward operator with lever feed handle to full gear travel. Loosen nut "J", Figure 6.2, and tap shaft at same end with plastic hammer to loosen the handle taper lock. Pull top slide off bottom slide.

Clean top and bottom slides. Grease gear with Die Maker's Grease and lubricate mating dovetail slides with Mobile Vactra Oil No. 2 or equivalent.

To grease lever feed shaft needle bearings, remove nut and washer "J", Figure 6.2, and tap shaft at same end with plastic hammer to loosen taper lock. Remove shaft and bearing liner to grease bearings. Use Shell Alvania No. 3 grease or equivalent.

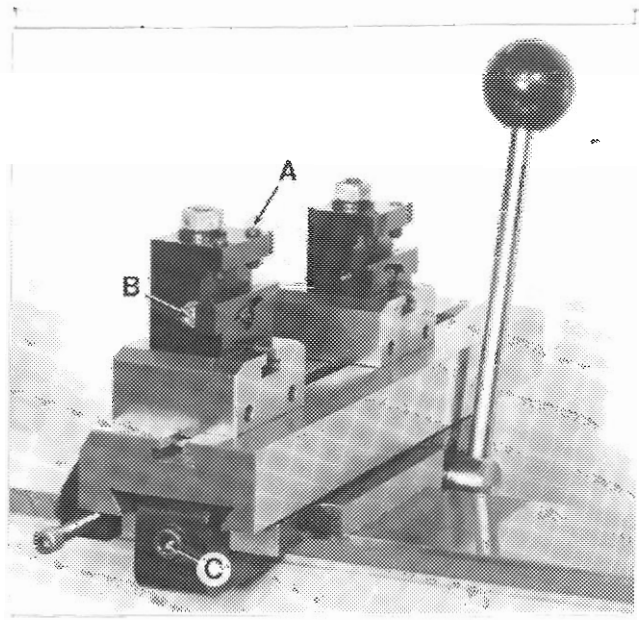


Figure 6.1 - Bed Clamp

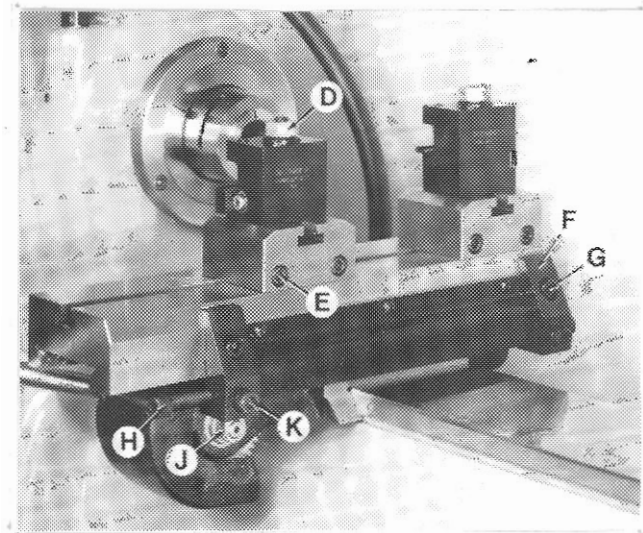


Figure 6.2 - Tool Block Locks

NOTES

CHAPTER 7 - TAILSTOCK

The tailstock is securely anchored to the dovetail bed with locking lever "B". Figure 7.1. To properly lock tailstock on center, lever "B" should be against stop pin "C". Position of lever "B" can be adjusted by removing screw and washer "D" and relocating lever "B" on its splined shaft. Replace screw and washer "D".

The hardened and ground tailstock spindle is graduated in 1/8" increments for the full 3-1/2" travel. The handwheel has a black and white friction adjustable dial reading in .001" increments. To adjust dial for zero reading, hold handwheel and turn dial with fingers.

The spindle takes standard No. 2 Morse taper shank centers and other tailstock tooling.

To lock spindle in position, move lever "A" clockwise as viewed from machine rear.

Standard shank tooling is automatically ejected when spindle is returned beyond zero reading on spindle.

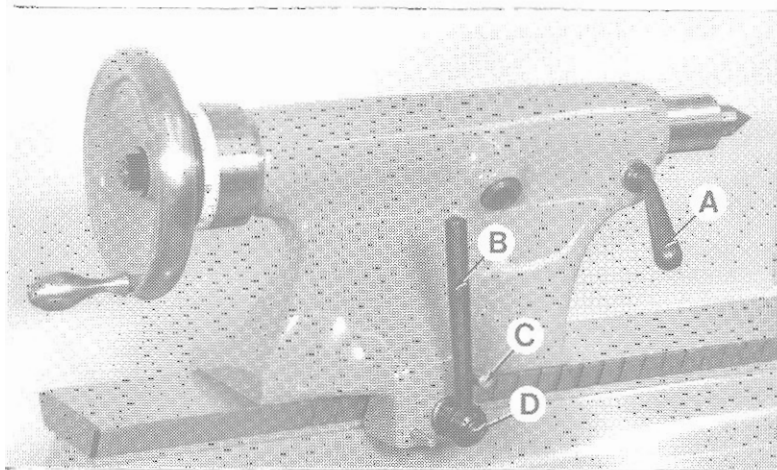


Figure 7.1 - Tailstock

NOTES

CHAPTER 8 - COMPOUND SLIDE REST

The Hardinge compound slide rest features easy reading black and white dials and completely covered feed screws. The rigid tool holder "B", Figure 8.1, takes standard 3/8" square tool bits. See Bulletin C-195 for specifications and prices on Hardinge engineered carbide cutting tools.

The tool holder has a screw feed wedge arrangement for fast, accurate, and rigid use. The wedge adjustment maintains proper cutting edge clearance by keeping the cutting tool in a horizontal plane at all points of adjustment.

To raise or lower cutting tool, loosen lock screws "A", Figure 8.1, and turn feed screw "D" accordingly.

To make precision angular setting of the index slide, loosen eccentric lock "E", Figure 8.1, and eccentric lock "J", Figure 8.2, to permit swiveling of top slide. Angular setting is visible through magnifier "M", Figure 8.3, which provides greater accuracy when setting the slide. Magnifier "C" is shown in Figure 8.1, with protective cover in place. The cover protects the lens when not in use.

To move slide rest along bed, move handle "L", Figure 8.2, toward back of machine.

NOTE: IF LOCK "K" IS NOT IN PLACE, as shown in Figure 8.2, SLIDE REST WILL TIP OFF BED.

To remove slide rest from bed, lift latch as shown, Figure 8.4.

The black and white feed screw dials are direct reading and adjustable for zero setting with positive locks "G", Figure 8.1. Each dial graduation is equal to .001". That is, for each graduation the top slide will move .001" along the bed and the bottom slide will cause a change of .001" on diameter.

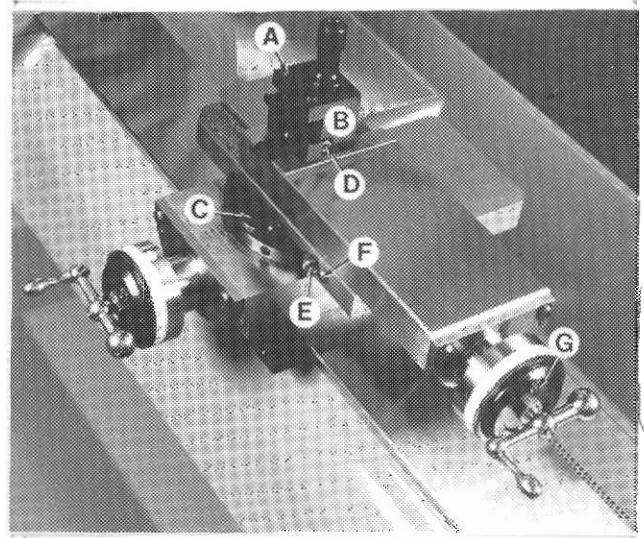


Figure 8.1 - Front of Compound

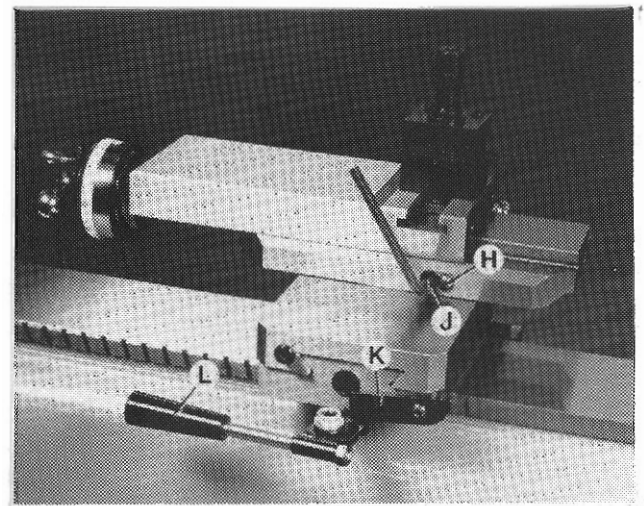


Figure 8.2 - Rear of Compound



Figure 8.3 - Setting Angular Magnifier

CLEANING AND LUBRICATING SLIDE REST

Remove tool holder or other slide rest tooling. Remove slide rest assembly from machine bed as shown in Figure 8.5. Use 1/8" hex pin wrench to loosen stop screw "N", Figure 8.5, in top slide and stop screw "P" in bottom slide.

Using a 3/32" hex pin wrench, remove button head screws "F", Figure 8.1, and "H", Figure 8.2. Use a 7/32" hex pin wrench to loosen and remove eccentric lock "E", Figure 8.1, and eccentric lock "J", Figure 8.2. Eccentric locks are not threaded and will pull straight out after loosening. Lift top half of slide rest from bottom half.

Turn handwheels counterclockwise until feed screws clear feed screw nuts and permit removal of top and bottom slides from mating dovetail ways.

Clean dial and swivel area, feed screws, feed screw nut and mating dovetails. Lubricate same areas with Mobil Velocite Oil No. 6 or equivalent. Wipe oil from dials. Reassemble all parts. When assembling, turn stop screws "N" and "P", Figure 8.5, until they bottom. Back off one turn to eliminate drag. It is recommended that the slide rest be cleaned and lubricated once a month.

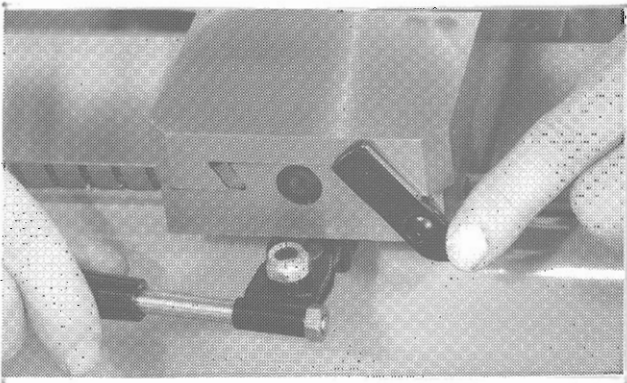


Figure 8.4 - Bed Lock

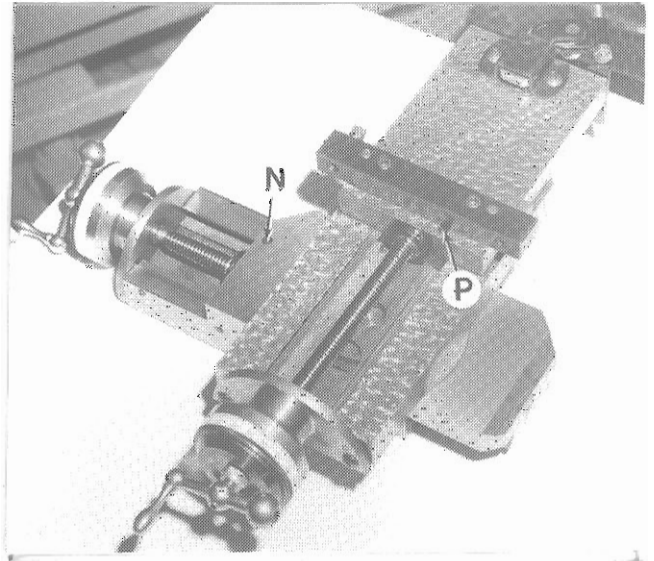


Figure 8.5 - Bottom of Compound

CHAPTER 9 - DSM FIVE-NINE R BAR AND SECOND OPERATION MACHINE

NOTE: Refer to preceding sections for information concerning the DSM Five-Nine R Second Operation Machine that is not covered in this section.

POWER CONNECTIONS

Electrical requirements for the DSM Five-Nine R Second Operation Machine are as follows:

200V/50Hz
208V/60Hz
230V/50Hz
230V/60Hz

Minimum AC Service = 30 AMP
Minimum Wire Size for Electrical Supply = No. 14 AWG
Minimum Wire Size for Grounding = No. 14 AWG

380V/50Hz
415V/50Hz
440V/50Hz
460V/60Hz
575V/60Hz

Minimum AC Service = 30 AMP
Minimum Wire Size for Electrical Supply = No. 14 AWG
Minimum Wire Size for Grounding = No. 14 AWG

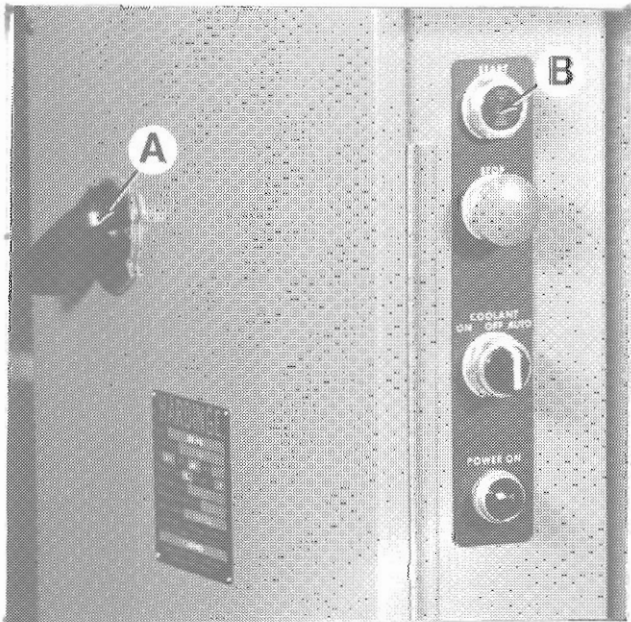


Figure 9.1 - External Power Case

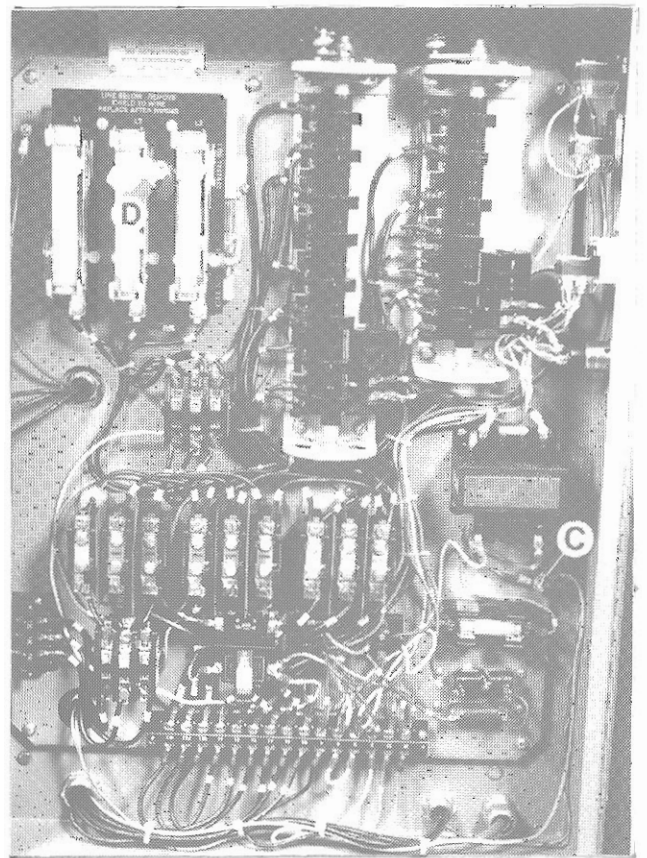


Figure 9.2 - Internal Power Case

Machines are shipped completely wired and assembled.

Turn disconnect switch "A", Figure 9.1, "OFF" and loosen captive screws in corners of power case. Open power case door.

Power entrance to case must comply with local codes. A suggested entrance point is near disconnect switch "D", Figure 9.2. Remove protective fiberboard guard and connect electrical power to line side of disconnect switch "D". Make ground at stud "C".

TO CHECK SPINDLE ROTATION, apply a collet to machine spindle to anchor collet closer. A 5CE collet is shipped with machine. Close switch case door and turn disconnect switch to "ON". Pull out spindle lock pin "E", Figure 9.3, and push "Start" pushbutton "B", Figure 9.1. Place lever "F", Figure 9.3, in "Low" position. Spindle should rotate counterclockwise when viewed from turret end of machine. If spindle does not turn in correct direction, DISCONNECT EXTERNAL POWER SOURCE. Turn disconnect switch to "OFF". Open power case door and interchange any two leads at line side of disconnect switch.

NOTE: Make certain fiberboard guard is replaced on main disconnect switch.

Close power case door, retighten captive screws and turn disconnect switch to "ON".

ELECTRIC COUNTERSHAFT BRAKE

The DSM Five-Nine R Second Operation Machine is equipped with an electric countershaft brake "H", Figure 9.4, which does not require adjustment for wear.

Grooving or scoring of friction surface is normal. DO NOT MACHINE, REFACE, OR LUBRICATE FRICTION SURFACES.

SPINDLE CONTROL LEVERS

Control lever "F", Figure 9.3, is connected to a cam switch on the electric control panel. Speeds in "Low" and "High" ranges are obtained through the use of a 2:1 ratio motor.

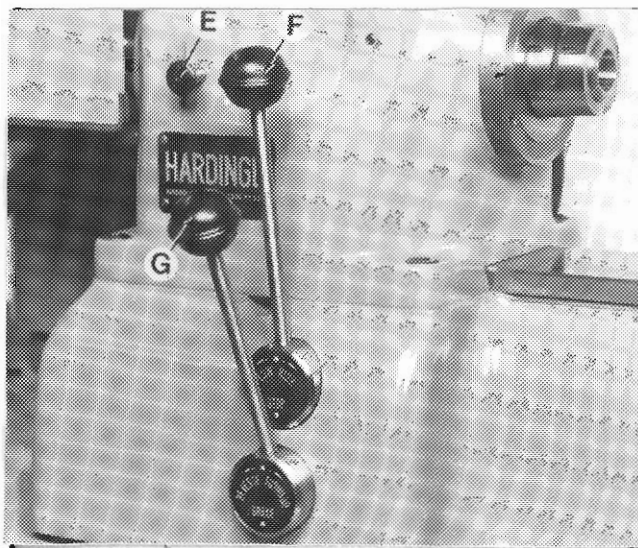


Figure 9.3 - Spindle Lock Pin and Levers

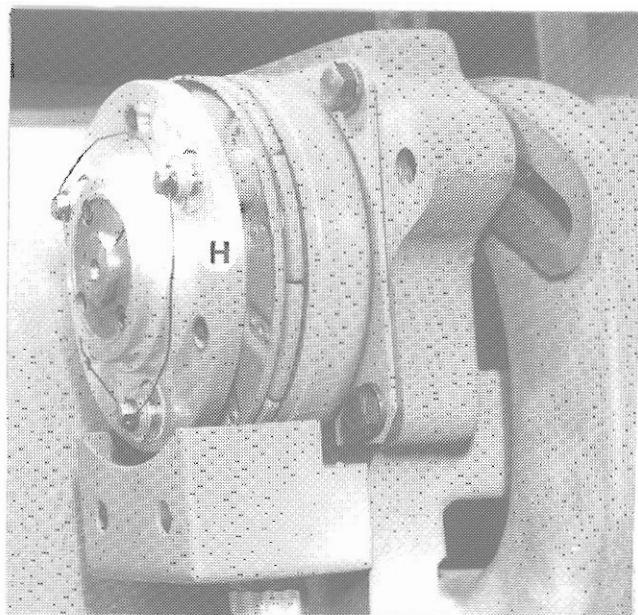


Figure 9.4 - Countershaft Brake

Lever "G" controls the direction of spindle rotation. To start and stop spindle, pull out lock pin "E", Figure 9.3, and press "Start" pushbutton "B", Figure 9.1. Move control lever "G" to "Forward" or "Reverse" position and place lever "F" in "Low" or "High" position. Brake will automatically be applied when lever "G" is placed in center position.

The DSM Five-Nine R Second Operation Machine is designed for instant acceleration to high speeds and is basically intended for small diameter production work held in a collet.

The machine is designed for continuous starting and stopping or full reversing cycles. The two speed motor is force-cooled by a fan which is driven by an auxiliary motor.

The spindle of the machine will go from full speed forward to full speed reverse in approximately two seconds.

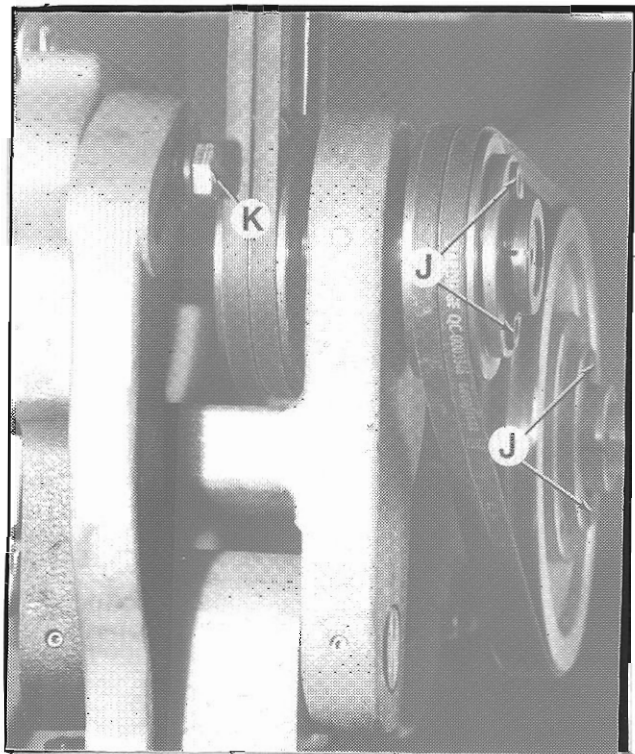


Figure 9.5 - Countershaft Assembly

FREE SPINDLE

To permit turning of spindle by hand, place lever "F", Figure 9.3, in "Stop" position and lever "G" in either "Forward" or "Reverse" position. Pull spindle lock pin "E" out. Push "Start" button "B", Figure 9.1.

SPINDLE DRIVING UNIT

Ten spindle speeds from 450 to 4000 RPM are provided, see Figure 9.6. Six interchangeable pulleys are supplied with the machine. Spare pulleys are stored inside motor compartment door.

EXAMPLE: With pulley No. 6 mounted on motor shaft, and pulley No. 5 mounted on countershaft, speeds of 2000 and 4000 RPM are available, depending on setting of control lever "F", Figure 9.3.

The spindle speeds should be selected to suit each particular job depending on material, diameter, type of cut, and tool to be used.

SPEED CHANGING

1. With brake "ON", turn lock bolts, "J", Figure 9.5, in motor pulley and countershaft pulley counterclockwise to loosen.
2. In each pulley, alternately turn lock bolts "J" counterclockwise to release taper lock and remove pulleys.

3. Unlock countershaft swivel bolt "K", swing assembly toward motor and remove motor belts.
4. Mount pulleys for desired speed on motor shaft and countershaft. With pulley against stop collar, tighten lock bolts.
5. Replace motor belts.
6. Swing countershaft assembly away from motor to hold belts tight. Tighten swivel bolt "K".

* MOTOR PULLEY NUMBER	CO'SHAFT PULLEY NUMBER	SPINDLE SPEEDS*	
		LOW	HIGH
6	5	2000	4000
4	1	1500	3000
3	2	1050	2100
2	3	700	1400
* 5	6	450	900*

Figure 9.6 - DSM-59-R Speed Plate

SPINDLE BELT REPLACEMENT

1. Turn disconnect switch "A", Figure 9.1, "OFF".
 2. Loosen bolt "E", Figure 9.7, swing countershaft toward motor. Loosen lock bolts at front sides of motor plate and raise motor mounting plate to limit, using adjusting screw at center front.
 3. Remove two screws "U".
 4. Loosen two set-screws "D". Insert a 3/8-16 bolt in hole "B" and tighten to release taper lock bushing "C". Remove bolt and armature "F".
 5. Remove four bolts "A" and brake field "G".
 6. Remove three splined socket setscrews "P", retaining ring "H", and washer "Q".
 7. Alternately turn two lock bolts "O" counterclockwise until taper lock bushing holding pulley "N" is released. Remove pulley.
 8. Loosen set-screw "K". Hold nut "R" with a spanner wrench and remove lock nut "W" with a second spanner wrench.
- NOTE: Do not lose nylon plug under set-screw "K".
9. To Remove Countershaft from Support:
 - (a) Insert a block of wood 1-1/2" thick in area of "Y".
 - (b) Using a plastic mallet, tap against right end of pulley shaft until wood block forces pulley "J" off tapered section of shaft.
 - (c) Move pulley shaft toward left until spacer "V" and pulley "J" are free of shaft. Remove belts from pulley.
 10. Remove collet closer from machine. See "Collet Closer Removal", Chapter 3, if machine is a DSM Five-Nine R Second Operation Machine or Chapter 10 if machine is a VBS R Second Operation Machine.
 11. Remove handwheel "V", Figure 2.12.

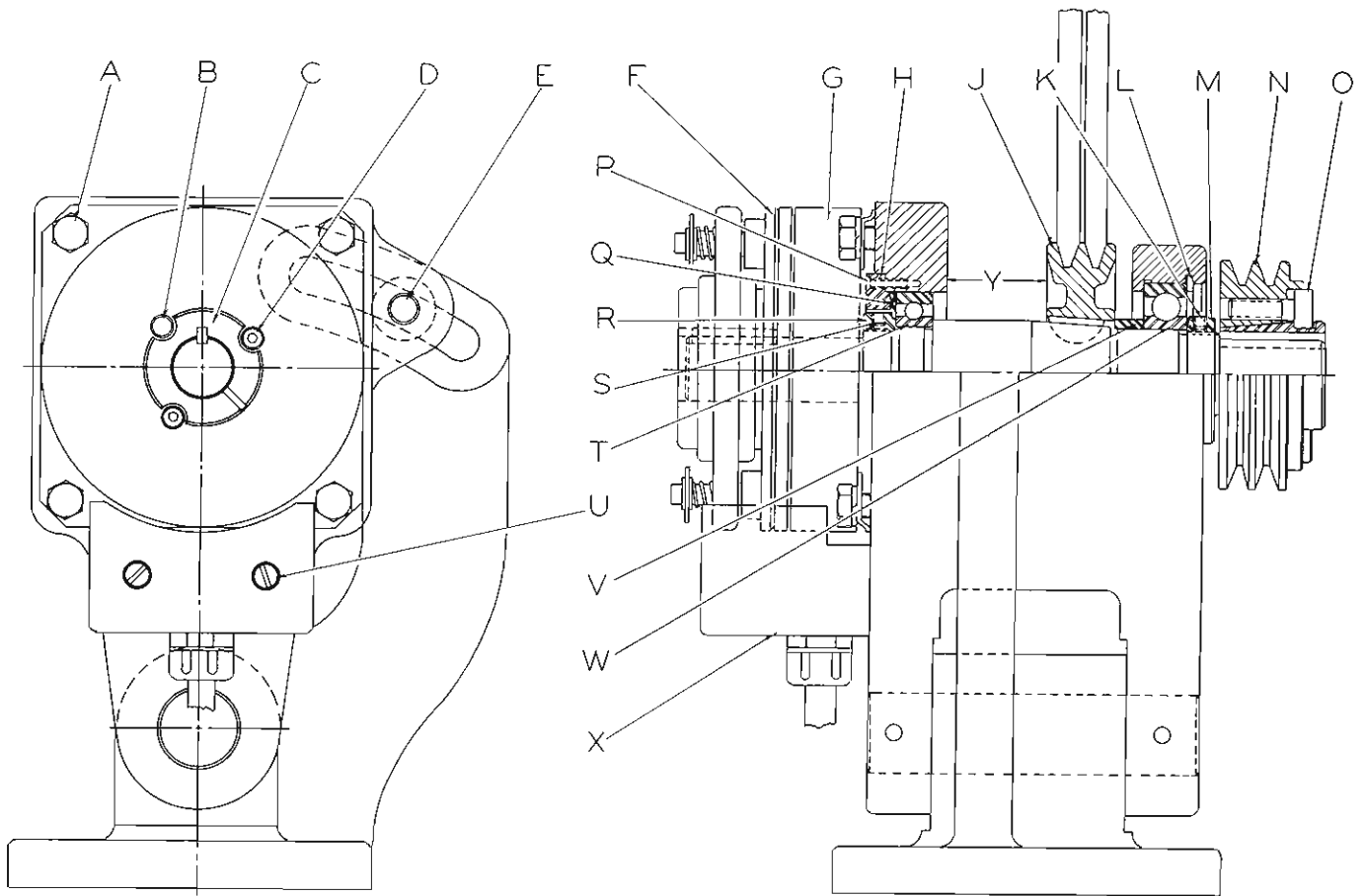


Figure 9.7 - Spindle Driving Unit

12. Remove cotter key from pull rod that passes through belts and remove pull rod from bed lever.
13. Remove belts through headstock opening.
14. Place new belts on spindle pulley and pull downward into motor compartment.
15. Replace handwheel, collet closer, pull rod, and cotter pin.
16. Replace pulley "J", Figure 9.7, on countershaft. Slip belts over pulley and replace spacer "V".
17. Align pulley "J" keyway with Woodruff key in countershaft and move countershaft toward assembled position.
18. To avoid damage to sealed ball bearings, use a plastic mallet to tap lightly on left end of countershaft until pulley "J", spacer "V", and bearing "W" are tight against retaining ring "L".
19. Make certain nylon plug is under set-screw "K" and replace lock nut "M". Hold lock nut "R" stationary with a spanner wrench and tighten lock "M" with a second spanner wrench. Tighten set-screw "K".
20. Replace wave washer "Q", retaining ring "H" and three screws "P". Tighten screws "P" securely.

21. Replace brake field "G" and four bolts "A".
22. To Replace Armature "F".
 - (a) Remove set-screws "D", oil threads and points of screws.
 - (b) Clean shaft, bore of armature "F", and bore and O.D. of bushing "C".
 - (c) Place bushing "C" in armature "F", thread in set-screws "D", and slide on shaft.
 - (d) Place .050" shim between brake field "G" and armature "F". Use a torque wrench to tighten screws "D" alternately and evenly. To maintain the .050" clearance, tap against end of tapered bushing "C" with a hammer and wooden block. Alternately repeat tapping and screw tightening until screws "D" cannot be turned with a torque setting of 175 inch-pounds.
 - (e) Remove .050" shim between field and armature.
23. Replace cover "X", and screws "U".
24. Slide pulley "N" on countershaft until it stops against shoulder. Tighten lock bolts "O" alternately and evenly. Replace motor belts.
25. Swing countershaft assembly away from motor to hold belts tight. Tighten lock bolt "E". Lower motor mounting plate assembly to tighten spindle belts.
26. Close and secure motor compartment door.

CHAPTER 10 - VBS SECOND OPERATION MACHINE

VBS SECOND OPERATION MACHINE

Models VBS and VBS R Second Operation Machines combine all the features of the Model DSM Five-Nine and DSM Five-Nine R Second Operation Machines, with the addition of the stationary collet feature for length holding.

The VBS and VBS R Second Operation Machines adapt a No. 21 Hardinge collet (B&S type) that is closed by actuating an independent adapter against the collet head angle in the forward direction (toward the right). The collet is held stationary by a cap screwed against the spindle face.

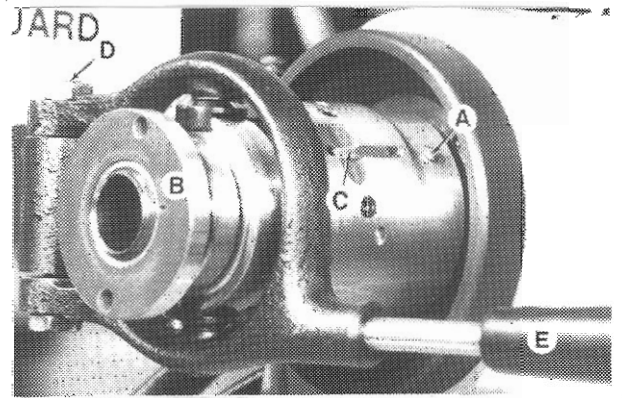


Figure 10.1 ♂ #21 Collet Closer

Operation of the VBS collet closer is the reverse of the draw-in 5C closer. That is, closing is accomplished by moving the lever-handle to the right, and opening by moving the lever-handle to the left.

CHANGING AND ADJUSTING COLLET

1. Open latch, Figure 10.1, by pressing down at "C".
2. Move lever to the left (open position).
3. Turn ring "B" one or two revolutions toward operator.
4. Use spanner wrench supplied with machine to remove nose cap "F", Figure 10.2. DO NOT USE A HAMMER AND PUNCH.
5. Remove collet.
6. Insert nose of new collet into hole of nose cap.
7. Make certain collet and adapter are clean. Use spanner wrench supplied with machine to screw cap firmly against spindle face. DO NOT USE A HAMMER AND PUNCH.
8. Place correct size workpiece in collet.
9. Move lever "E", Figure 10.1, to the extreme right (closed position). Set machine for "Free Spindle" and turn spindle by hand while pressing in on spindle lock pin until it enters a pulley notch. Turn ring away from operator until adapter is pushed forward as far as it will go without forcing.
10. Move lever "E" to the left and turn ring "B" toward operator an additional two notches on adjusting nut.
11. Close latch "C" and test collet for tension on workpiece. Should additional gripping pressure be required, open latch and turn ring away from operator. For less gripping pressure, turn ring "B" toward operator.

NOTE: Make certain latch has entered a notch in adjusting nut before machining workpiece.

COLLET CLOSER REMOVAL

The collet closer should be removed weekly and between setups for cleaning to prevent loading of chips between closer tube, inside of spindle and adapter threads.

Running the machine with the collet closer in place without a collet may cause damage to the collet closer.

DO NOT REMOVE COLLET CLOSER BY REMOVING SCREWS "D", FIGURE 10.1. These screws are factory adjusted for proper operation of collet closer.

1. Remove spindle nose cap and collet. Use spanner wrench supplied with machine. DO NOT USE A HAMMER AND PUNCH.
2. Turn ring "B", Figure 10.1, away from operator to disconnect draw tube from adapter.
3. Remove adapter "G", Figure 10.3.
4. Remove pin "H", Figure 10.4.
5. Remove two screws "A". Figure 10.1.
6. Unscrew shell guard "J", Figure 10.5, from mounting ring "L". Shell guard has a right hand thread. Remove draw tube and collet closer from headstock.
7. If necessary, remove retaining ring "K", Figure 10.5, and pull mounting ring "L" off end of spindle. Do not misplace square key.

COLLET CLOSER REPLACEMENT

Clean inside of headstock spindle before applying collet closer. Also clean draw tube inside and out.

1. If mounting ring "L", Figure 10.5, was removed, make certain square key is in position and replace mounting

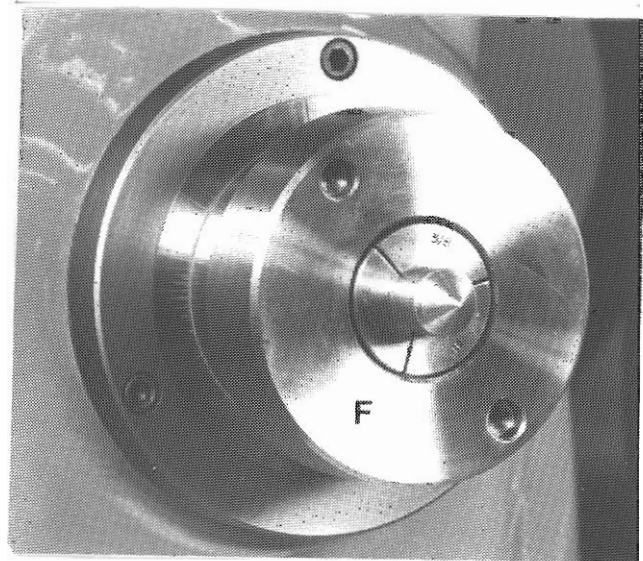


Figure 10.2 - #21 Collet Nose Cap

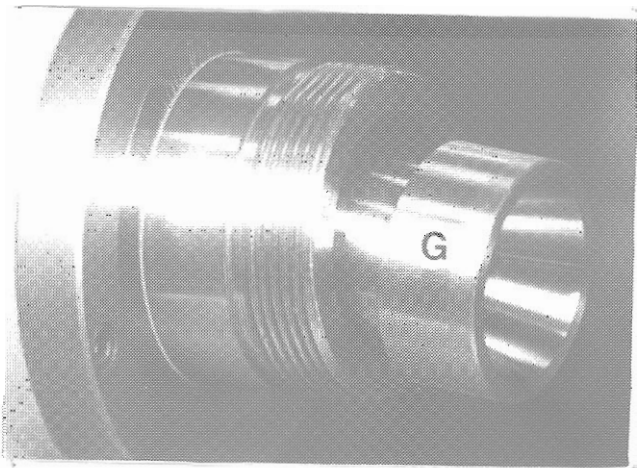


Figure 10.3 - Adapter Removal

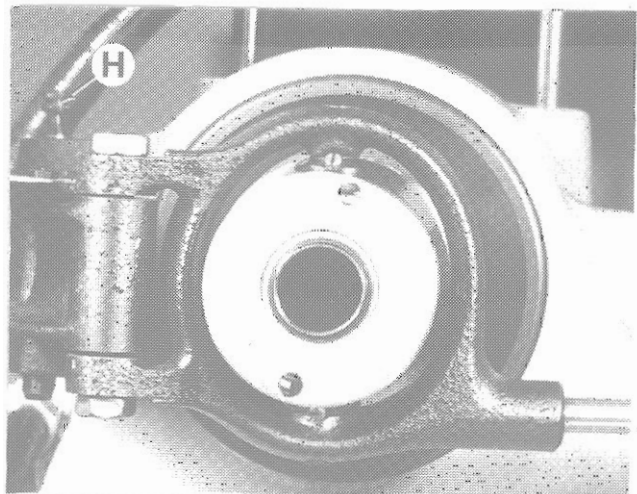


Figure 10.4 - #21 Collet Closer

ring and retaining ring "K" on machine spindle.

2. Apply a light film of Mobile Velocite Oil No. 6 or equivalent to bearing surface "M", Figure 10.6, and replace collet closer on spindle.
3. Screw shell guard "J", Figure 10.5, onto mounting ring "L".
4. Replace pin "H", Figure 10.4.
5. Align holes and replace two screws "A", Figure 10.1.
6. Clean adapter thoroughly, apply a light film of Mobil Velocite Oil No. 6 or equivalent to bearing surfaces and replace in machine spindle.
7. Engage draw tube threads with adapter threads by turning ring "B", Figure 10.1, toward operator.
8. Follow steps 6 through 11 under "To Change and Adjust Collet".

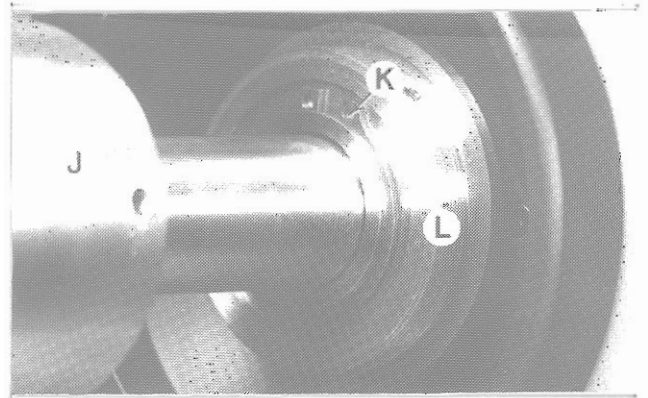


Figure 10.5 - Shell Guard Removal

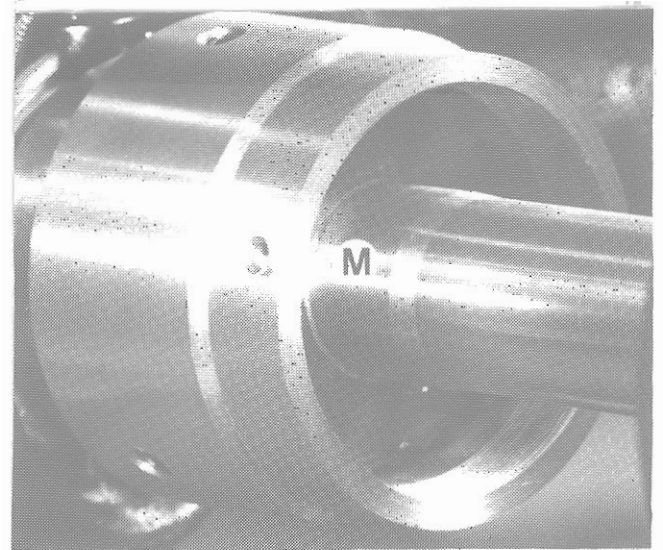


Figure 10.6 - #21 Collet Closer Removal

NOTES