APRIL 1980

DIRECTIONS

FOR

OPERATING AND MAINTAINING

THE

ROTTLER

MODEL DA-OC BORING MACHINE

MACHINE SERIAL NO._____

MANUFACTURED BY:

ROTTLER BORING BAR COMPANY
8029 SOUTH 200TH STREET
KENT, WASHINGTON 98031

NOTE: WHEN ORDERING REPLACEMENT PARTS, PLEASE GIVE MODEL AND SERIAL NUMBER. PLEASE ORDER BY PART NUMBER.

(MINIMUM ORDER CHARGE OF $25.00)

W A R N I N G

THE MODEL DA SERIES BORING MACHINES ARE NOT STANDARD EQUIPPED WITH MOTOR OVERLOAD OR LOW ELECTRICAL POWER PROTECTION.

THIS PROTECTION IS NOT BUILT INTO THE MACHINE BECAUSE THE ELECTRICAL CODE REQUIREMENTS VARY, AND IT IS MORE ECONOMICAL FOR THE PURCHASER TO BUY THESE DEVICES DIRECTLY FROM AN ELECTRICAL EQUIPMENT SUPPLIER.

OVERLOAD PROTECTION IS MOST IMPORTANT, AND IT IS A NECESSITY TO PASS ELECTRICAL CODE REQUIREMENTS.
MAKE SURE YOU INSTALL THIS EQUIPMENT WITH MOTOR PROTECTION IN ACCORDANCE WITH THE CURRENT REQUIREMENTS NOTED ON THE MOTOR NAME PLATE.

DESCRIPTION

THE MODEL DA-OC UNIVERSAL SMALL CYLINDER BORING CENTER IS A PRECISION SINGLE POINT TOOL BORING UNIT. IT PROVIDES TOOLING AND CLAMPING TO REBORE CYLINDERS, RANGING IN SIZE FROM THE HONDA 50 MOTORCYCLE BLOCK, UP THROUGH THE TYPICAL LIGHT FOUR CYLINDER SMALL CAR ENGINES.

AN AIR BEARING SPINDLE SYSTEM PROVIDES ACCURATE CENTERING AND A BUILT-IN CENTERING SYSTEM REQUIRES ONLY TWO SETS OF RACK OPERATED CENTERING FINGERS TO HANDLE THE COMPLETE DIAMETER RANGE.

FEEDS AND RAPID TRAVELS ARE POWER OPERATED AND CONTROLLED FROM THE UPPER GEAR HOUSING UNIT. AN AUXILIARY HAND TRAVEL IS LOCATED AT THE BASE OF THE FEED SCREW. A QUICK CHANGE LEVER SELECTS TWO SPINDLE SPEEDS.

POWER IS FURNISHED BY END MOUNTED AC SINGLE PHASE, 110-220 VOLT GENERAL ELECTRIC MOTOR OF 3/4 H.P. A THREE PHASE MOTOR IS ALSO AVAILABLE.

GUARANTEE

LIMITED

ROTTLER BORING BAR COMPANY MODEL DA-OC PARTS AND EQUIPMENT ARE GUARANTEED AS TO WORKMANSHIP AND MATERIAL. THIS LIMITED GUARANTEE REMAINS IN EFFECT FOR ONE YEAR FROM DATE OF DELIVERY, PROVIDED THE MACHINE IS OWNED AND OPERATED BY THE ORIGINAL PURCHASER.

STANDARD AIR AND ELECTRIC COMPONENTS ARE WARRANTEED BY THEIR RESPECTIVE MANUFACTURERS.

TOOLS PROVEN DEFECTIVE WITHIN THE TIME LIMIT WILL BE REMEDIED AT THE FACTORY'S OPTION, EITHER BY REPLACEMENT OF PARTS AND/OR SERVICE BY THE FACTORY.

WE ACCEPT NO RESPONSIBILITY FOR DEFECTS CAUSED BY EXTERNAL DAMAGE, WEAR ABUSE, OR MISUSE. NEITHER DO WE ACCEPT ANY OBLIGATION TO PROVIDE COMPENSATION FOR OTHER DIRECT OR INDIRECT COSTS IN CONNECTION WITH CASES COVERED BY THE WARRANTY.

GUARANTEE DOES NOT COVER SHIPPING OR FREIGHT CHARGES.

IMPORTANT

OPERATING SAFETY AND EMERGENCY PROCEDURES

ELECTRICAL POWER - MAKE SURE ALL ELECTRICAL EQUIPMENT HAVE THE PROPER ELECTRICAL OVERLOAD PROTECTION.

MACHINE OPERATOR - OPERATOR OF THIS BORING MACHINE SHOULD BE A SKILLED MACHINIST CRAFTSMAN, THAT IS, WELL VERSED IN THE CAUTION, CARE, AND KNOWLEDGE REQUIRED TO SAFELY OPERATE A METAL CUTTING TOOL.

IF THE OPERATOR IS NOT A SKILLED MACHINIST, THE OPERATOR MUST PAY STRICT ATTENTION TO THE OPERATING PROCEDURE OUTLINED IN THIS MANUAL, AND MUST GET INSTRUCTION FROM A QUALIFIED MACHINIST IN BOTH THE PRODUCTIVE AND SAFE OPERATION OF THIS BORING BAR.

ROTTLER BORING EQUIPMENT HAS THE FOLLOWING AREAS OF EXPOSED MOVING PARTS, THAT YOU MUST TRAIN YOURSELF TO RESPECT AND STAY AWAY FROM WHEN THEY ARE IN MOTION:

1. TOOL SHARPENING - MUST BE DONE WITH CARE AND DEXTERITY TO GET GOOD BORE RESULTS, BE ALERT TO THE LIGHT PRESSURE REQUIRED FOR SHARPENING.

CAUTION: EXPOSED DIAMOND WHEEL IS A POTENTIAL HAZARD TO YOUR HANDS, FINGERS, AND FACE. NOTE - EYE PROTECTION IS A NECESSITY WHEN WORKING IN THIS AREA.

BORING BAR WITH THE SHARPENING WHEEL LOCATED ON THE DRIVE MOTOR REQUIRE YOU TO KEEP ARMS AND FINGERS WELL AWAY FROM THE FEED SCREW.

2. CUTTING TOOL AREA - ANY OPERATION INVOLVING HAND IN THE CUTTER HEAD AREA, SUCH AS CENTERING, CHANGING CENTERING FINGERS, TOOL INSERTION AND REMOVAL, CUTTER HEAD CHANGES, SIZE CHECKING, ETC., REQUIRES THAT BOTH THE DRIVE MOTOR BE TURNED OFF AND THAT THE SPINDLE CLUTCH (SPINDLE ROTATION) LEVER BE DISENGAGED, IN IT'S FULL UP POSITION.

NOTE: PERIODICALLY CHECK THIS LEVER TO MAKE SURE THAT THE UPPER LEVER POSITION WILL LOCK OUT THE SPINDLE CLUTCH WHEN THE DETENT PIN IS ENGAGED. ON FA MACHINE, CHECK TO SEE IF THE UPPER INDENT WILL FIRMLY HOLD THE SPINDLE CLUTCH OUT OF ENGAGEMENT.

3. BORING - EYE PROTECTION MUST BE WORN DURING THIS OPERATION AND HAND MUST BE KEPT COMPLETELY AWAY FROM CUTTER HEAD.

4. UPPER HOUSING CONTROLS - LEARN TO IDENTIFY AND INDEPENDENTLY OPERATE THESE CONTROL FUNCTIONS BY HABIT WHILE DEVELOPING THE AWARNESS OF KEEPING YOUR FINGERS AND HANDS WELL CLEAR OF THE ROTATING FEED SCREW AND THE KNOBS, BOTH THE FEED SCREW AND THE SPINDLE.

5. WORK LOADING & UNLOADING - CAREFULLY DEVELOP HANDLING METHODS OF LOADING AND UNLOADING WORK PIECES, SO THAT NO INJURY CAN RESULT.

6. MACHINE MAINTENANCE - ANY MACHINE ADJUSTMENT, MAINTENANCE OR PART REPLACEMENT ABSOLUTELY REQUIRES A COMPLETE POWER DISCONNECT TO THE MACHINE. THIS MUST BE AN ABSOLUTE RULE.

EMERGENCY PROCEDURE

ASSUMING ONE OF THE FOLLOWING HAS OCCURRED - TOOL BIT IS SET COMPLETELY OFF SIZE, WORK OR BORING SPINDLE IS NOT CLAMPED, SPINDLE IS NOT PROPERLY CENTERED, THESE MISTAKES WILL BECOME OBVIOUS THE INSTANT THE CUT STARTS. TURN MOTOR OFF IMMEDIATELY.

NOTE: YOU CAN KEEP YOUR FINGERS ON THE STOP SWITCH, IF YOU WISH TO INSURE INSTANT SHUT DOWN, WHEN IT IS REQUIRED.

AFTER FINDING OUT WHAT THE PROBLEM IS, METHODICALLY ORGANIZE THE CONTROLS TO RETURN THE SPINDLE TO ITS UP POSITION, WITHOUT CAUSING MORE PROBLEMS.

BE ALERT TO QUICKLY STOP THE MOTOR IN THE EVENT OF A SERIOUS DISRUPTION OF THE BORING PROCESS EITHER AT THE TOP OR BOTTOM OF THE BORE.

"REMEMBER" METAL CUTTING TOOLS HAVE THE SPEED AND TORQUE TO SEVERLY INJURE ANY PART OF THE HUMAN BODY EXPOSED TO THEM.

UNPACKING

USE CARE IN REMOVING THE CRATE FROM THE MACHINE, BEING CAREFUL NOT TO USE FORCE ON ANY OF THE SPINDLE UNIT PARTS.

NOTE: WHEN BAR IS SHIPPED FROM THE FACTORY, THE MACHINED SURFACES ARE PROTECTED WITH RUST VETO. AFTER UNCRATING, USE A CLEAN CLOTH, DAMPENED WITH KEROSENE OR SOLVENT, AND REMOVE THE PROTECTIVE OIL. CARE SHOULD BE TAKEN TO AVOID FLUID ENTRY INTO CUTTER HEAD COUNTERWEIGHT AREA.

ASSEMBLY OF MACHINE COMPONENTS

PLACE BASE ON THE FLOOR WITH ITS FOUR WASHERS UNDER THE JACKING SCREWS.

CAUTION: MAKE SURE COLUMN THREAD IS THOROUGHLY SECURED TO THE TOP PLATE AND BASE.

NOTE: (ON SINGLE COLUMN STANDS ONLY, IF THE TOP PLATE IS NOT FACING TOWARDS THE FRONT, LOOSEN LOCK NUT ON TOP OF THE BASE AND TURN IT TO THE FRONT, RELOCK WITH THE NUT.)

NOW PLACE THE SPINDLE BORE UNIT IN POSITION ON THE TOP PLATE, THEN SECURE THE BORING UNIT TO THE TOP PLATE WITH ITS HOLD DOWN BOLT ASSEMBLY. ATTACH THE AIR REGULATOR LINE TO THE TEE IN THE BASE OF THE SPINDLE, NOW CAREFULLY LEVEL THE MACHINE'S TOP PLATE AND LOCK THE LOWER JACKING SCREWS (THE BASE MUST BE EQUALLY SUPPORTED AT FOUR POINTS ON THE FLOOR).

ATTACH AN AIR SUPPLY TO THE AIR REGULATOR ON THE RIGHT SIDE OF THE BASE (#100-28-12C). NOW LOOSEN THE HOLD DOWN BOLT JUST ENOUGH TO ALLOW EASY MOVEMENT OF THE BORE UNITS, SLIDE BORING UNIT FROM SIDE TO SIDE AND IN AND OUT TO MAKE SURE IT SLIDES FREELY. THE NECESSARY EFFORT TO SLIDE THE BORING UNIT WILL DECREASE WHEN SHIPPING OIL IS ENTIRELY REMOVED FROM THE MACHINE BASE. IF ADJUSTMENT

IS REQUIRED TO CONTROL EASE OF SPINDLE MOVEMENT, ADJUST THE AIR REGULATOR. NOW RETIGHTEN THE HOLD DOWN BOLT.

NOTE: AIR SUPPLY SHOULD BE MOISTURE FREE. WATER OR OIL TRANSPORTED IN THE AIR WILL REDUCE THE EFFECTIVENESS OF THE AIR SUPPORT AND WILL RESULT IN LOSS OF CENTERING ACCURACY.

CAUTION: DO NOT REMOVE HOLD DOWN BOLT (ONLY LOOSEN IT) WHEN AIR BEARING IS IN OPERATION.

CONTROLS

WE SUGGEST THAT BEFORE ATTEMPTING ANY CYLINDER BORING, THE OPERATOR SHOULD ACTUATE THE CONTROLS TO BECOME FAMILIAR WITH THE OPERATION OF THE MACHINE. NOTE ALL CONTROLS ARE ILLUSTRATED ON THE SPINDLE BORING UNIT PAGE AND ON THE CONTROL PLATE ATTACHED TO THE FRONT OF THE BORING UNIT, ITSELF.

CAUTION: WHEN OPERATING THE CONTROLS, MAKE SURE THAT THE SUPPORT BEAM PARALLELS AND CLAMP ARMS OR BLOCK SUPPORTS, WILL NOT INTERFERE WITH THE CUTTER HEAD OR SPINDLE. AND THAT THE CENTERING FINGERS ARE RETRACTED AND WILL CLEAR IF THEY ARE IN THE CUTTER HEAD.

NOW LOCATE THE SPINDLE IN THE CENTER OF THE HOLE IN THE TOP PLATE, THEN LOCK THE BORING UNIT TO THE TOP PLATE WITH ITS HOLD DOWN BOLT.

1. FEED LEVER

FEED LEVER IS THE LATCHING LEVER ON THE SIDE OF THE BAR. PRESS DOWN UNTIL THE LEVER LATCHES TO ENGAGE THE CUTTING FEED. TO DISENGAGE, PRESS THE FEED RELEASE ARM WHICH WILL UNLATCH THE LEVER AND ALLOW IT TO RETURN TO THE NEUTRAL POSITION. LIFT THE FEED LEVER UNTIL IT LATCHES TO ENGAGE THE RAPID RETURN TRAVEL. THE BAR WILL AUTOMATICALLY RETURN TO NEUTRAL UPON REACHING THE TOP OF THE TRAVEL. IF YOU WISH TO RETURN THE BAR TO NEUTRAL WHILE IT IS IN RAPID TRAVEL, AGAIN PRESS FEED RELEASE ARM WHICH WILL UNLATCH THE LEVER AND ALLOW IT TO RETURN TO NEUTRAL POSITION. AS A SAFETY PRECAUTION, WE RECOMMEND THAT THE MOTOR BE STOPPED WHEN CENTERING OR POSITIONING THE BAR. INADVERTANT SPINDLE ROTATION ENGAGEMENT COULD INJURE THE OPERATOR'S OTHER HAND OR DAMAGE THE CUTTER HEAD PARTS. YOU WILL NOTE THE STOP ROD THAT IS HELD IN THE HAND FEED CAP BY SET SCREW, HAS A ROUND SHAPED END WHICH WILL RELEASE CUTTING FEED WHEN IT CONTACTS LATCHING LEVER.

FEED LEVER, CON'T

THIS IS MOST CONVENIENTLY RAISED UP AND LOCKED BY A SET SCREW IN THE PROPER POSITION ON THE COMPLETION OF THE FIRST BORE CUTS. THIS ROD SHOULD NOT BE USED TO HOLD CLOSE TOLERANCE SHOULDERS.

2. FAST DOWN LEVERS

THE FAST DOWN TRAVEL LEVER IS LOCATED TO THE RIGHT OF THE FEED LEVER. CHECK FEED LEVER TO SEE THAT IT IS IN NEUTRAL POSITION BEFORE ACTUATING. LEVER SHOULD BE PULLED DOWN QUICKLY AND FIRMLY AND NOT ALLOWED TO RATCHET. CONTROL IS SPRING LOADED AND WILL RELEASE WHEN YOU RELEASE THE PRESSURE.

TO BECOME FAMILIAR WITH THE RAPID DOWN TRAVEL, WE SUGGEST THAT YOU PLACE A TOOL HOLDER INTO THE HOLDER SLOT AND PRACTICE RUNNING THIS TOOL HOLDER DOWN RAPIDLY (IN THE FAST SPINDLE SPEED) TO AN EXACT POINT, AND RETURNING IT TO THE UPPER POSITION. THIS CAN BE DONE RAPIDLY AND VERY ACCURATELY WITH A LITTLE PRACTICE.

3. SPINDLE CLUTCH CONTROL

SPINDLE CLUTCH CONTROL IS LOCATED TO THE LEFT SIDE OF THE FEED LEVER. A PULL RELEASE RAPID DOWN MOVEMENT WILL ENGAGE SPINDLE ROTATION AND A REVERSE ACTION WILL DISENGAGE. IN THAT THIS IS A JAW CLUTCH, WE RECOMMEND STOPPING THE MOTOR OR JOGGING THE MOTOR TO ENGAGE CLUTCH ON THE HIGH SPINDLE RPM. STANDARD PROCEDURE IS TO THROW OUT CLUTCH UPON COMPLETION OF THE BORE. TURN CUTTER HEAD AROUND TO INDEXING DETENT TO POSITION TOOL TO FRONT, THEN REVERSE THE TRAVEL. THE LOWER KNOB ON THE SPINDLE OF THE UPPER HOUSING MAY BE USED FOR MANUALLY TURNING THE SPINDLE WHEN NECESSARY.

4. MANUAL HAND FEED

A 2-3/16" MANUAL TRAVEL IS ACTUATED BY ROTATING HANDLE ATTACHED TO SPLINE AT TOP OF THE SPINDLE BASE.

MANUAL HAND FEED CON'T

CAUTION: THIS TRAVEL SHOULD ALWAYS BE LEFT IN FULL UP POSITION AFTER USING, BEFORE SPINDLE IS RETURNED TO FULL UP POSITION.

NORMAL PROCEDURE IS TO RAPID TRAVEL OR FEED BAR TO POINT REQUIRING MANUAL TRAVEL. IF BACK FEEDING IS NECESSARY, RUN HAND TRAVEL DOWN FIRST AND THEN RAPID TRAVEL DOWN TO WHERE TOOL CAN BE INSERTED.

THIS MANUAL HAND FEED TRAVEL IS AVAILABLE FOR FACING SLEEVES AND COUNTERBORING, ETC. IT IS COMPLETELY SEPARATE FROM THE POWER SPINDLE TRAVEL, AND SHOULD ALWAYS BE RETURNED TO THE FULL UP POSITION AFTER BEING USED, BEFORE THE POWER UP TRAVEL RETURNS THE SPINDLE TO THE TOP.

5. SPEED CONTROL

THE SPEED CONTROL IS CHANGED BY PULLING OUT AND RAISING OR LOWERING THE PLASTIC KNOB AT THE LOWER RIGHT OF THE SPINDLE UNIT. THIS MAY BE OPERATED WHEN THE MACHINE IS RUNNING OR BEING JOGGED, AND WILL NOT SUFFER ANY DAMAGE, BUT DO NOT SHIFT WHEN BORING. HIGH SPEED IS IN THE BOTTOM POSITION AND LOW SPEED IS IN THE UPPER POSITION.

6. CENTERING KNOB

THE CENTERING KNOB (UPPER KNOB) AT THE TOP OF THE UPPER SPINDLE HOUSING OPERATES THE CENTERING FINGERS WHEN TURNED CLOCKWISE. BE CAREFUL NOT TO OVER-EXTEND THESE FINGERS WHEN THE SPINDLE IS NOT IN THE CYLINDER OR THEY WILL COME COMPLETELY OUT OF THE PINION DRIVE.

CAUTION: MOTOR MUST BE STOPPED WHEN CENTERING, INADVERTANT SPINDLE ROTATION ENGAGEMENT COULD INJURE THE OPERATOR'S HANDS OR DAMAGE CUTTER HEAD PARTS.

OPERATING INSTRUCTIONS

WE RECOMMEND PARTICULARLY FOR OPERATORS UNFAMILIAR WITH THE BORING BAR, TO PRACTICE ON A JUNK BLOCK OR CYLINDER IN ORDER TO BECOME ACQUAINTED WITH ALL CONTROLS AND DETAILS CONNECTED WITH THE USE OF THE MACHINE.

CAUTION: FOR BORE DIAMETER OF 2.6" AND SMALLER, DO NOT BORE BEYOND 5" OF DEPTH.

BLOCK CLAMPING

1. CAREFULLY CLEAN AND FILE OFF HIGH SPOTS, THREAD BURRS, ETC., ON TOP OF CYLINDER BLOCK.
2. MEASURE EACH CYLINDER. DETERMINE THE AMOUNT OF METAL TO BE REMOVED FROM THE MEASUREMENT OF CYLINDER WHICH SHOWS THE MOST WEAR.
3. ATTACH BLOCK SUPPORT ARMS TO CLAMP BRACKET PLATE.
4. PLACE BLOCK ON SUPPORT ARMS - SPREAD ARMS TO GIVE ADEQUATE SUPPORT FOR BLOCK, BUT MAKE SURE THAT BLOCK SUPPORTS ARE NOT OBSTRUCTING THE BORE YOU ARE GOING TO MACHINE.
5. STEADY THE BLOCK AS YOU ROTATE THE SCREW JACK UP UNTIL IT IS ALMOST CONTACTING THE SUPPORT BEAM PARALLELS. CHECK FOR ANY DOWEL PIN, ETC., THAT MIGHT INTERFERE WITH THESE SUPPORT BEAM PARALLELS. NOW OPEN UP THE SUPPORT BEAM PARALLELS, SO THAT THEY JUST CLEAR THE DIAMETER OF BORE YOU ARE GOING TO CUT AND THAT THE BORE IS CENTERED IN THE TOP PLATE HOLE. STEADY BLOCK AS YOU ROTATE THE SCREW JACK INTO THE LOCK POSITION. USE CARE TO MAKE SURE THE BLOCK TOP IS PERFECTLY FLAT AGAINST THE SUPPORT BEAM PARALLEL. EXCESSIVE CLAMP PRESSURE WILL TEND TO EXPOSE A SLIGHT GAP AT THE FRONT. CHECK THIS CAREFULLY.

NOTE:
WHEN ROTATING THE SCREW JACK, TO CLAMP THE BLOCK, TURN IT ONLY UNTIL THE TOP OF CLAMP ARM (100-28-31) COME INTO CONTACT WITH LOWER WASHER (100-28-18). THIS CLAMP PRESSURE SHOULD BE ENOUGH FOR MOST BORING OPERATIONS.

CLAMPING

WHEN CLAMPING TALL CYLINDER AND, OR CYLINDERS, WITH A SMALL CRANK CASE MOUNTING SURFACE, A BACK AND FORTH TWIST MOTION CAN BE APPLIED TO THE CYLINDER, AS YOU CLAMP IT, TO HELP INSURE THAT THERE IS FULL CONTACT WITH THE CRANKCASE MOUNTING SURFACE AND THE UPPER PARALLELS.

CENTERING WITH CENTERING FINGERS

MAKE SURE THE SPINDLE CLUTCH IS OUT (LEVER IN UP POSITION) AND THAT THE SPINDLE IS NEAR THE CENTER OF THE HOLE. OPERATE FAST DOWN TO TRAVEL THE CUTTER HEAD DOWN INTO THE BORE. (TURN OFF MOTOR.) THEN TURN CENTERING KNOB CLOCKWISE TO EXTEND CENTERING FINGERS. MAKE SURE THEY WILL EXTEND AND CONTACT THE CYLINDER WALL. CONTINUE TO HOLD A FIRM ROTARY PRESSURE ON THE CENTERING KNOB AND TIGHTEN THE HOLD DOWN BOLT.

NOTE: DO NOT PULL KNOB TOWARD YOU DURING CENTERING. THIS IS THE MOST COMMON CAUSE OF CENTERING ERROR.

TURN CENTERING KNOB COUNTER-CLOCKWISE TO RETURN FINGERS TO IN POSITION (TURN ON MOTOR).

LIFT FEED LEVER TO RETURN SPINDLE TO ITS UP POSITION.

DA-OC CENTERING

FOR MINIMUM STOCK REMOVAL

IMPORTANT CENTERING INFORMATION FOR MOTORCYCLE CYLINDERS AND OTHER REPAIR REQUIRING MINIMUM STOCK REMOVAL.

BEFORE SHIPMENT FROM THE FACTORY, THE MODEL DA-OC BORING MACHINES ARE REPETITIVELY TESTED ON A ROUND HOLE FOR A MAXIMUM CENTERING ERROR OF .002 TOTAL INDICATOR READING. THIS MEANS THAT IF ALL BORES WEAR PERFECTLY SQUARE, TO THE MOUNTING SURFACE, .003 ON A DIAMETER MATERIAL REMOVAL WOULD CLEAN OR COMPLETELY FINISH THE CYLINDER SURFACE.

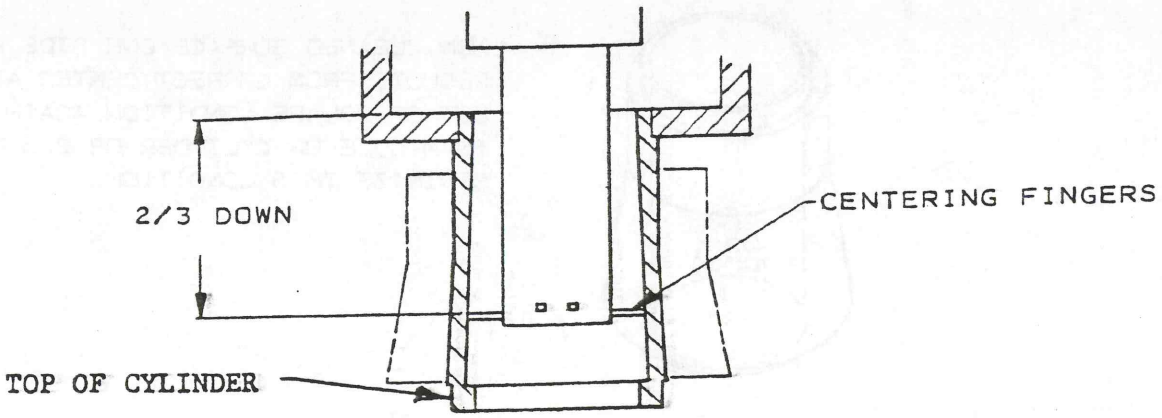
PRACTICALLY SPEAKING IT WILL BE NECESSARY TO BORE CYLINDERS .005'' OR .12MMS LARGER THAN THE MAXIMUM WEAR DIAMETER IN THE CYLINDER TO BE SURE OF CLEAN UP.

REMEMBER TOO, THE INNER SPINDLE MUST BE PROPERLY ADJUSTED FOR CORRECT CENTERING. (SEE PAGE 37 OF THE MANUAL)

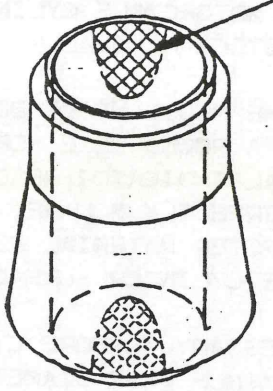
A SLIGHT OUT OF SQUARE CONDITION OF THE EXISTING CYLINDER BORE AND CRANKCASE MOUNT SURFACE WILL ALSO PREVENT CLEAN UP.

CRANKCASE MOUNTING SURFACES MUST BE FREE OF DAMAGE AND CLEAN TO PREVENT TILTING THE CYLINDER WHEN CLAMPING. (SEE INSTRUCTION ON CLAMPING)

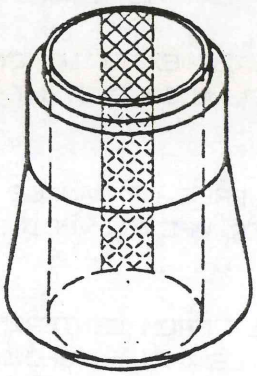
BEST CLEAN UP RELIABILITY WILL RESULT FROM CENTERING APPROXIMATELY 2/3 DOWN THE CYLINDER LENGTH AS SHOWN BELOW.



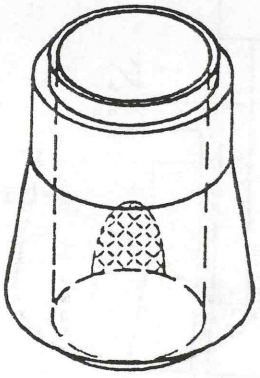
NOTE THE FOLLOWING EXAMPLES OF BORES
WHICH DID NOT FINISH COMPLETELY. (CLEANED UP)



NON CLEANED UP AREAS BOTTOM AND TOP OPPOSITE, INDICATES ORIGINAL BORE OUT OF SQUARE WITH MOUNT SURFACE OR CYLINDER WAS TILTED WHEN BORED.



NON CLEANED SURFACE TOP TO BOTTOM RESULTS FROM MACHINE NOT BEING EXACTLY CENTERED.



NON CLEANED SURFACE ONE SIDE AT BOTTOM RESULTS FROM CORRECT CENTER AT TOP BUT OUT OF SQUARE CONDITION AGAIN. CENTERING IN MIDDLE OF CYLINDER OR 2/3 DOWN WILL MINIMIZE THIS CONDITION.

BORING

1. DETERMINE THE CYLINDER BORE SIZE YOU WISH TO CUT. SELECT A TOOL HOLDER THAT WILL ALLOW MINIMUM TOOL BIT OVERHANG. WE RECOMMEND A MAXIMUM TOOL BIT OVERHANG OF 5/8" OUTSIDE OF TOOL HOLDER. PLACE TOOL BIT INTO THE TOOL HOLDER.

   NOTE: BEFORE SETTING, MAKE SURE TOOL BIT IS PROPERLY SHARPENED. (SEE TOOL SHARPENING REQUIREMENTS.)

   NOW PLACE TOOL BIT AND HOLDER IN MICROMETER. HOLD TOOL BIT LIGHTLY AGAINST MICROMETER ANVIL AND LOOSEN ALLEN SCREW WITH ROUND KNOB ALLEN WRENCH. GENTLY LET TOOL HOLDER SLIDE BACK TO MAKE CONTACT WITH MICROMETER SPINDLE. THIS PROCEDURE WILL PREVENT THE CHIPPING OF THE CARBIDE BIT OR PITTING OF THE MICROMETER ANVIL.

   THIS MICROMETER IS .050 TO A REVOLUTION RATHER THAN .025 AS ON A CONVENTIONAL MICROMETER. SET MIKE TO SIZE YOU WISH TO BORE, AND TIGHTEN SET SCREW LIGHTLY. BACK OFF MICROMETER AND TIGHTEN SET SCREW. HERE AGAIN, EXCESSIVE TIGHTENING ONLY TENDS TO NICK MIKE ANVIL AND MAKE FUTURE SETTING DIFFICULT. AFTER TIGHTENING, RECHECK SIZE.

2. MAKE SURE TOOL HOLDER AND TOOL HOLDER SLOT IN THE HEAD ARE FREE FROM DIRT. INSERT TOOL IN SLOT MAKING SURE IT IS COMPLETELY BACK AND LATCHED BY DETENT SPRING. THEN LIGHTLY LOCK SET SCREW WITH SOCKET TYPE SCREW DRIVER PROVIDED WITH TOOLS.

3. ENGAGE SPINDLE CLUTCH AND LATCH FEED LEVER IN DOWN POSITION. WHEN BAR HAS COMPLETED BORING, SET STOP ROD SO LEVER WILL BE THROWN INTO NEUTRAL POSITION, IF NEEDED FOR A SECOND CUT OF SAME DEPTH.

BORING, CONT'D

4. DISENGAGE SPINDLE CLUTCH. TURN CUTTER HEAD TO FRONT POSITION. LIFT FEED LEVER TO RAPID RETURN POSITION, ALLOWING SPINDLE TO RETURN TO ITS FULL UP POSITION. (REMOVE TOOL HOLDER AFTER BORING.)

IF BORE IS TO BE CHAMFERED WITH BAR, THIS SHOULD BE DONE BEFORE UNCLAMPING BLOCK. (SEE CHAMFERING) AND WHILE BAR IS STILL CENTERED IN HOLE.

CHAMFERING

A SPECIAL TOOL IS AVAILABLE FOR CHAMFERING. THIS TOOL MAY BE SET BY EITHER INSERTING IN HEAD AND APPROXIMATELY SETTING OR BY PLACING IN THE MICROMETER AND SETTING APPROXIMATELY .100 OVER BORE SIZE. CHAMFERING MAY BE DONE EITHER BY USING FEED AND RELEASING WHEN ADEQUATE CHAMFER HAS BEEN DEVELOPED OR BY USE OF THE HAND FEED.

COUNTERBORING

THE SLOW TRAVEL MANUAL FEED IS PROVIDED FOR USE IN COUNTER-BORING, FACING SLEEVES FLUSH, ETC.

NOTE: THE MANUAL HAND FEED SHOULD ALWAYS BE RETURNED TO THE FULL UP POSITION BEFORE RETURNING THE POWER TRAVEL TO THE TOP.

AN OPTIONAL DIAL DEPTH INDICATOR IS AVAILABLE FOR ACCURATE CONTROL OF COUNTERBORING.

CAUTION: IT IS VERY IMPORTANT THAT AFTER INSERTING TOOL HOLDER INTO THE STUB BORING CUTTER HEAD AND PUSHING IT FIRMLY BACK TO ITS INDEXING POINT, THAT YOU REMOVE ALL FINGER PRESSURE FROM THE TOOL HOLDER AND TOOL BIT, BEFORE LOCKING IT WITH ITS LOCKING SET SCREW, THIS IS ESPECIALLY IMPORTANT WHEN USING THE OFFSET BLIND HOLE TOOL BIT. FAILURE TO FOLLOW THE ABOVE INSTRUCTION WILL RESULT IN SIZE VARIATION.

SMALL CYLINDERS AND ODD SHAPE BLOCK CLAMPING

1. ATTACH CLAMP ARM ASS'Y, 100-27-5D, TO CLAMP BRACKET PLATE.

   THESE CLAMP ARMS ARE SUITED TO HOLD V-4 MARINE CYLINDERS AND A WIDE VARIETY OF SINGLE AND TWIN CYLINDER SMALL ENGINES. VERY LITTLE CLAMP PRESSURE IS REQUIRED. YOU MAY CHECK BLOCK TIGHTNESS FOR BORING, BY BUMPING BLOCK WITH YOUR HAND TO DETERMINE IF IT IS SECURE. THIS IS ADEQUATE CLAMPING PRESSURE UNLESS YOU ANTICIPATE HEAVY SLEEVING CUTS.

   THE ARMS CAN BE PLACED WITHIN INTEGRAL CRANKCASES' BLOCKS FOR HOLDING.

   AGAIN YOU MUST CHECK TO SEE THAT THE SURFACE AGAINST THE SUPPORT BEAM PARALLELS HAVE NO GAP.

2. IF THE CYLINDER HAS A SKIRT ABOVE THE CLAMP SURFACE MAKING IT IMPOSSIBLE TO INSERT THE TOOL HOLDER, SPACER PARALLELS, ARE PROVIDED TO LOWER THE CYLINDER. THEY CAN BE PLACED BETWEEN CLAMPING SURFACE AND THE SUPPORT BEAM PARALLELS.

DA-0C & DA-0B W/100-28A

V-6 MERCURY AND V-4 EVINRUDE OUTBOARD BLOCK CLAMPING

TO BORE V-6 MERCURY OR V-4 EVINRUDE BLOCK AN OPTIONAL SPECIAL CLAMP ARM ASSEMBLY 100-27-5B MUST BE INSTALLED ON YOUR BORING STAND.

TO INSTALL, REMOVE BLOCK SUPPORT CLAMPS FROM CLAMP BRACKET PLATE 100-28-2, THEN ATTACH CLAMP ARM ASSEMBLY 100-27-5B TO PLATE USING 3/8 x 3/4 LG. SHOULDER SCREW.

ON V-6 MERCURY OUTBOARD BLOCK THESE CLAMPS WILL BE USED ON THE TWO CENTER MAIN BEARING BORES.

SET CLAMP U-PADS SO THAT BOTH PADS ARE APPROXIMATELY AT THE SAME HEIGHT. CHECK THE DISTANCE BETWEEN THE CENTER MAINS AND SET THE TWO CLAMP ARMS TO THIS DISTANCE. SWING THE SUPPORT BEAM PARALLELS OUT TO CLEAR THE BLOCK.

CAREFULLY LOAD THE BLOCK INTO THE BORING STAND, SUPPORT IT ON THE CENTER MAIN BEARING BORES, WITH THE PADS OF THE CLAMP ARMS. SWING THE SUPPORT BEAM PARALLELS BACK INTO POSITION. CHECK TO MAKE SURE THAT BOTH PADS ARE SUPPORTING THE BLOCK, THEN TURN HAND WHEEL UP TILL BLOCK IS CLAMPED AGAINST SUPPORT BEAMS PARALLELS AND IS CENTERED. CHECK TO SEE IF BOTH SUPPORT BEAMS PARALLELS HAVE THE SAME CLAMP FORCE AGAINST THEM. DO THIS BY TRYING TO MOVE SUPPORT BEAMS OR BLOCK. IF ONE SIDE IS TIGHTER THAN THE OTHER, TURN UP THE CLAMP THAT IS LOOSE.

CHECK TO SEE IF THE BLOCK IS TIGHTLY CLAMPED FRONT AND BACK, CHECK BY PLACING A LIGHT BETWEEN THE SUPPORT BEAM PARALLELS AND SEEING IF ANY LIGHT COMES BETWEEN THE SUPPORT BEAM PARALLELS AND THE TOP OF THE BLOCK. USUALLY THE BLOCK WILL BE CLAMPED AT THE BACK AND NOT AT THE FRONT. IF YOU TAP THE BLOCK AT THE BOTTOM BACK SIDE WITH A MALLET,

IT WILL FORCE THE BOTTOM FORWARD TO CORRECT THIS.

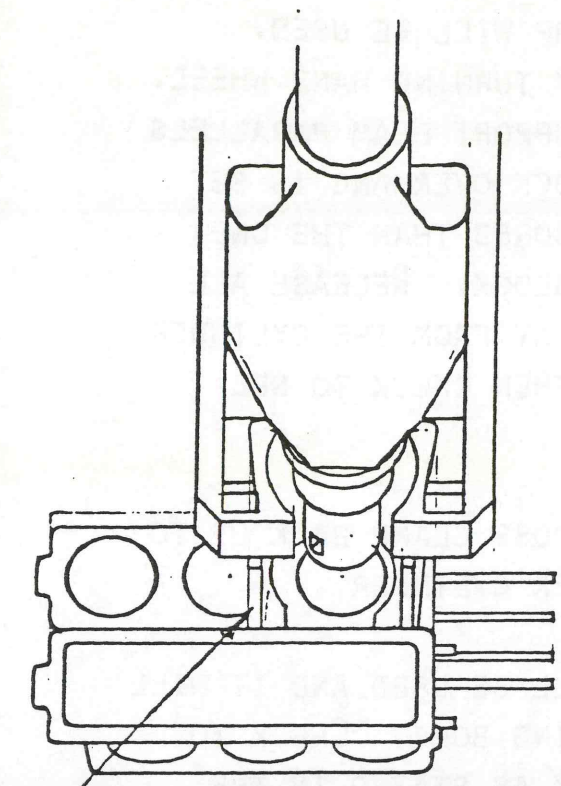
TO BORE OUTER CYLINDERS, ONLY ONE CLAMP WILL BE USED. PROCEED AS FOLLOWS - RELEASE CLAMPS BY TURNING HAND WHEEL. THEN MOVE BLOCK TO ONE SIDE AND SET SUPPORT BEAM PARALLELS SO THAT THE PARALLEL WITH THE MOST BLOCK OVERHANG IS SET FURTHER AWAY FROM THE CYLINDER TO BE BORED THAN THE ONE WITHOUT THE OVERHANG. TIGHTLY CLAMP BLOCK. RELEASE ALL FORCE ON THE CLAMP THAT IS FURTHEST AWAY FROM THE CYLINDER YOU ARE GOING TO BORE. CLAMP BLOCK, THEN CHECK TO SEE THAT BLOCK IS CLAMPED FRONT AND BACK.

AFTER BORING THE CYLINDER, TURN THE LOOSE CLAMP BACK UP TO SUPPORT THE BLOCK, THEN MOVE TO ANOTHER CYLINDER.

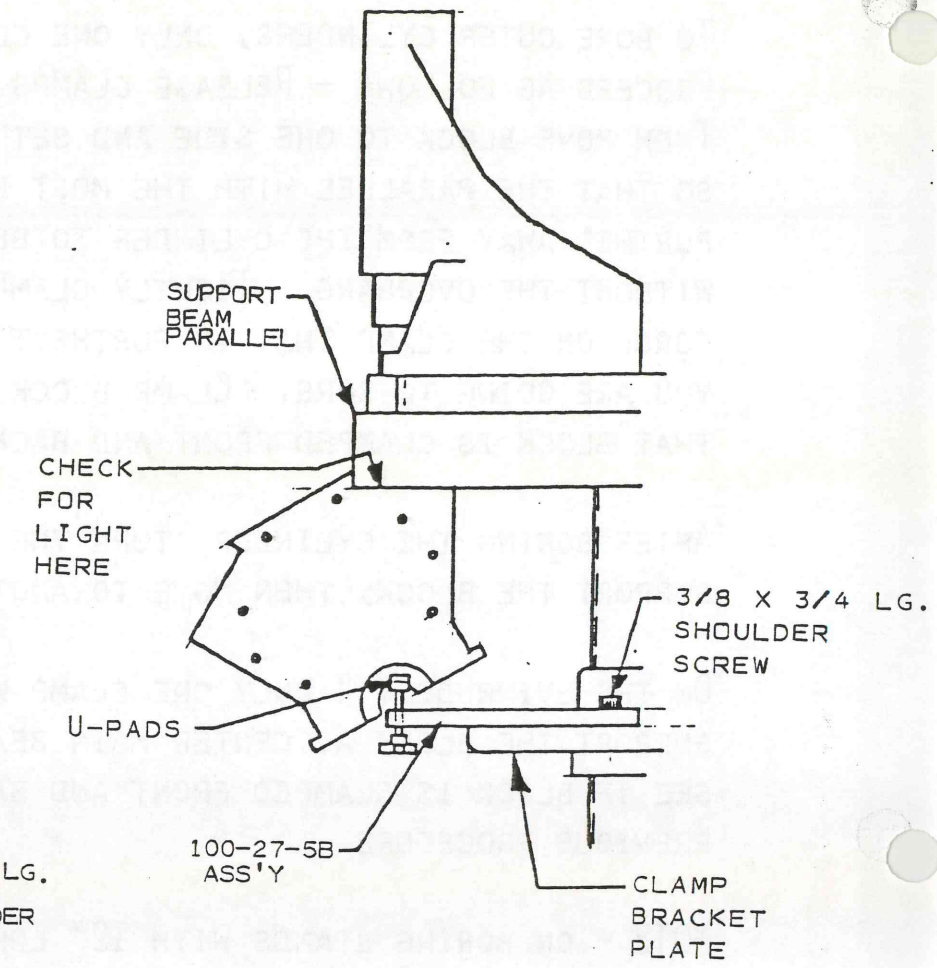
ON THE EVINRUDE V-4 ONLY ONE CLAMP WILL BE USED AND IT WILL SUPPORT THE BLOCK AT CENTER MAIN BEARING BORE. CHECK TO SEE IF BLOCK IS CLAMPED FRONT AND BACK AS STATED IN THE PREVIOUS PROCEDURE.

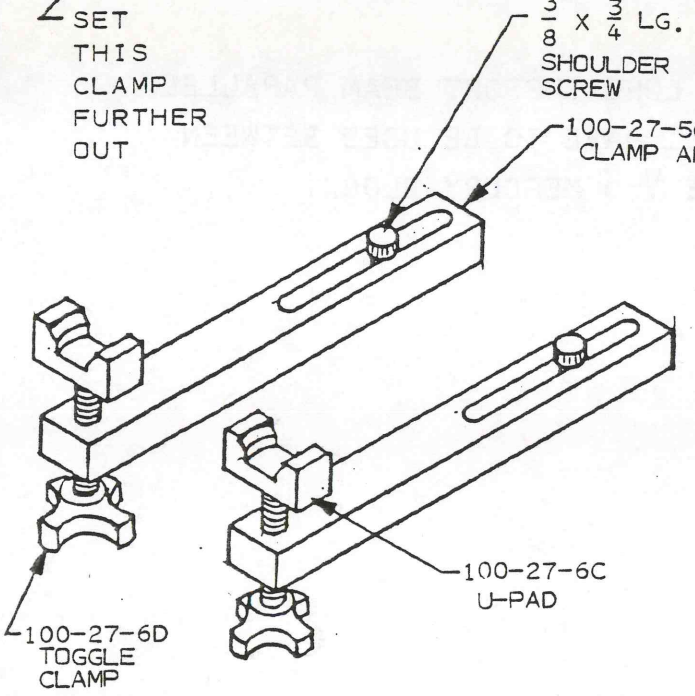
NOTE - ON BORING STANDS WITH 12" LONG SUPPORT BEAM PARALLEL THE 100-28-11 PARALLEL SPACER WILL HAVE TO BE USED BETWEEN THE SUPPORT BEAM PARALLEL AND THE V-6 MERCURY BLOCK.

DA-0C & DA-0B W/100-28-A

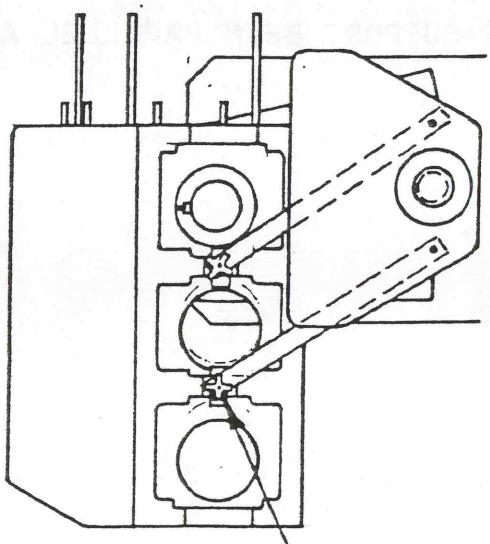


SET THIS CLAMP FURTHER OUT





100-27-5B
CLAMP ARM ASS'Y.



RELEASE PRESSURE FROM THIS CLAMP, WHEN BORING OUTER CYLINDER

MERCURY V-6
BLOCK
(SHOWN IN POSITION TO BORE OUTER CYL.)

IMPORTANT GENERAL INFORMATION FOR THE BEST USE OF THE MODEL OC BORING TOOLING

CAUTION: INNER SPINDLE ADJUSTMENT (SEE PAGE 37) MUST BE CORRECT FOR PRECISION USE OF STUB BORING HEADS.

SINCE THE EXTENDED STUB BORING HEAD DESIGN HAS CONSIDERABLE OVERHANG WITH A SMALL SHAFT DIAMETER, THE CUTTING TOOL "B" LAND MUST BE KEPT VERY NARROW (.005" TO .015")(.13MM TO .38MM WIDE). THIS WILL INSURE PRECISE RESULTS WITH NO CHATTER AT THE BOTTOM OF THE BORE.

THE SMALL HEAD WILL ALSO BE INCLINED TO DEFLECT WITH INCREASINGLY HEAVY CUTS. YOU MAY EXPECT, WITH PROPERLY SHARPENED TOOLS, THAT AFTER A .040" CUT (1.02MM) (ON DIAMETER), A SECOND PASS OF THE TOOL WILL REMOVE CLOSE TO .001" (.025MM) MATERIAL ON THE DIAMETER. A SECOND PASS FOLLOWING A LESSER FIRST CUT WILL REMOVE LESS METAL.

THE .040" (1.02MM) CUT WILL ALSO LEAVE A LIGHT DRAG BACK MARK IN THE CYLINDER THAT CAN IN TURN BE ELIMINATED BY THE SECOND PASS.

THE DRAG BACK MARK IS GENERALLY ELIMINATED IN ANY EVENT BY FINISH HONING. IT MAY ALSO BE ELIMINATED BY REPOSITIONING THE BORING SPINDLE AWAY FROM THE TOOL POSITION ON THE RETURN STROKE.

YOU CAN USE THE SECOND PASS PERFORMANCE (SECOND PASS MUST BE MADE WITHOUT RE-CENTERING) TO PROVIDE A MOST PRECISE BORE.

IN GENERAL SIZE VARIATIONS IN A TYPICAL CYCLE BORE WILL APPROXIMATE .0007" (.018MM). A SECOND PASS WILL REDUCE THESE VARIATIONS TO GENERALLY LESS THAN HALF AND PROVIDE A FINE FINISH. THIS FINISH WILL REQUIRE VERY LITTLE STOCK REMOVAL WITH A HONE IN ORDER TO CROSS HATCH FOR AN EXCELLENT RING SEATING CONDITION.

THE BORING HEAD ASSEMBLY AS NOTED IN SECTION B-B IS EQUIPPED WITH A DAMPENING WEIGHT, PART #600-8-2A. THIS REQUIRES LITTLE OR NO MAINTENANCE AS LONG AS LIQUIDS OR CONTAMINATION DO NOT ENTER THE WEIGHT CAVITY. SHOULD THIS OCCUR, THE OPERATOR WILL EXPERIENCE CHATTER PROBLEMS WITH THIS HEAD AND IT WILL HAVE TO BE DISASSEMBLED AND CLEANED.

PERFORMANCE OF THE STUB BORING BAR IS ALSO CLOSELY RELATED TO THE PROPER LUBRICATION AND ADJUSTMENT OF THE MACHINE INNER SPINDLE BEARING. CHECK THE INNER SPINDLE ADJUSTMENT TWO TO THREE TIMES PER YEAR TO MAKE SURE CLEARANCE IS CORRECT.

CUTTING TOOL DRAG BACK LINES

STANDARD 'F' & 'D' SERIES ROTTLER CYLINDER REBORING EQUIPMENT IS DESIGNED TO MINIMIZE TOOL RETURN DRAG BACK LINES BY BRINGING THE TOOL BIT TO THE FRONT OF THE MACHINE SO THAT THE OFFSET RETURN THRUST OF THE FEED SCREW CAN SLIGHTLY DEFLECT THE SPINDLE AWAY FROM THE CYLINDER WALL.

IT IS COMMON FOR MACHINES TO MAKE A FAINT WITHDRAWAL MARK PARTICULARLY AT THE BOTTOM OF THE CYLINDER. VERY LIGHT HONING (.0005") SHOULD REMOVE ALL TRACES OF THE MARK.

TOOL MARKS CAN, OF COURSE, BE COMPLETELY ELIMINATED BY OFF SETTING THE SPINDLE AWAY FROM TOOL BIT WHILE RETURNING THE SPINDLE.

HERE ARE THE MAINTENANCE STEPS YOU CAN TAKE TO MINIMIZE TOOL DRAG BACK:

1. CHECK TOOL BIT FOR SHARP FREE CUTTING ABILITY. A TOO WIDE B LAND AND NEGATIVE RAKES WILL CAUSE DRAG BACK PARTICULARLY ON STUB BORING HEADS.
2. CHECK INNER SPINDLE BEARING ADJUSTMENT IN ACCORDANCE WITH MANUAL.
3. CHECK OUTER SPINDLE BEARING ADJUSTMENT IN ACCORDANCE WITH MANUAL. A SLIGHTLY HEAVIER DRAG ON THE LOWER OUTER SPINDLE BEARING AND FREER UPPER ADJUSTMENT WILL IMPROVE TOOL DRAG MARKS. IT MAY BE NECESSARY, IF PROBLEMS PERSIST, TO ROTATE THE UPPER SLEEVE BEARING APPROXIMATELY 90 DEGREES IN ORDER TO RESEAT THE BEARING FOR BETTER UP STROKE RELIEF.

TOOL BIT SHARPENING

CAUTION: EYE PROTECTION MUST BE WORN WHEN SHARPENING TOOL BITS.

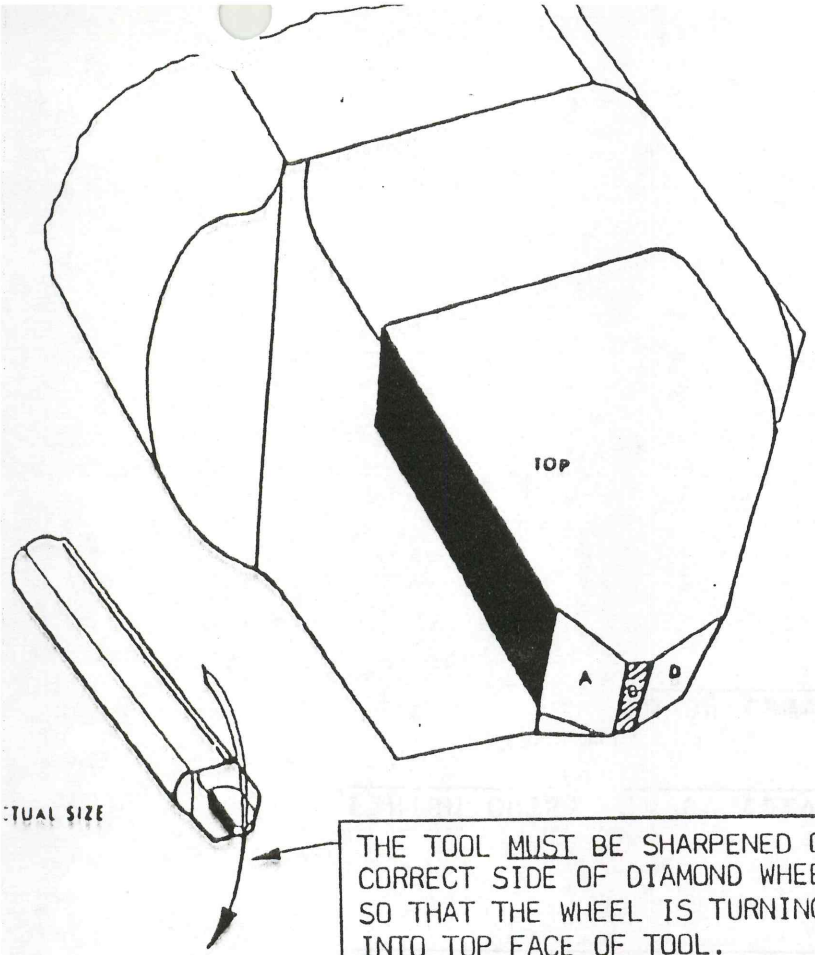
THE PERFORMANCE OF YOUR BORING BAR AND QUALITY OF WORK IT WILL DO, IS ALMOST ENTIRELY DEPENDENT OF THE CARE OF THE CUTTING TOOL. IT IS THE MOST FREQUENT CAUSE OF SIZE AND FINISH PROBLEMS IN BORING.

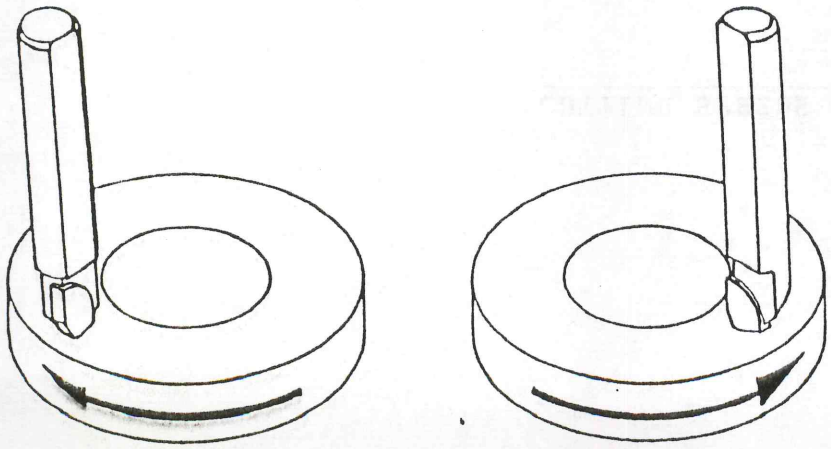
TO SHARPEN THE CARBIDE BIT, INSERT TOOL HOLDER IN THE SHARPENING JIG SLOT. PLACE THE JIG OVER THE PIN PROVIDED ON THE TOP OF THE MOTOR HOUSING AND SHARPEN BITS ON THE SMALL DIAMOND WHEEL PROVIDED ON THE MOTOR SHAFT. ALWAYS MAKE SURE YOU SHARPEN THE TOOL ON THE SIDE OF THE DIAMOND WHEEL THAT IS RUNNING TOWARD THE TOP FACE OF THE BIT. SHARPENING THE WRONG SIDE CAN READILY CHIP THE POINT. WHEN SHARPENING USE VERY LIGHT PRESSURE, MOVING THE TOOL BACK AND FORTH ACROSS THE DIAMOND WHEEL WHICH WILL IMPROVE CUTTING AND PREVENT GROOVING OF THE DIAMOND WHEEL. AFTER SHARPENING A NUMBER OF TIMES DRESS EXCESS STEEL AWAY FROM THE CARBIDE WITH A GRINDING WHEEL. CATUION: SEE SHEETS FOR TOOL SHARPENING REQUIREMENTS.

NOTE: THE TOP SURFACE WILL CRATER .010 TO .015 BACK OF THE TIP WITH CONSIDERABLE BORING, SO THE TIP SHOULD BE OCCASIONALLY DRESSED BACK .020 TO .025. A SILICON CARBIDE (GREEN) GRIT GRINDING WHEEL WILL REMOVE THE CARBIDE MATERIAL QUICKLY, WHICH WILL REDUCE WEAR ON DIAMOND WHEEL.

CAUTION: THE DIAMOND WHEEL IS NOT SUITABLE FOR RAPID STOCK REMOVAL AND IS DESIGNED FOR CARBIDE ONLY. STEEL TENDS TO LOAD IT. A TOOL BIT USED FOR ALUMINUM BORING SHOULD NEVER ALTERNATELY BE USED FOR CAST IRON OR STEEL. IRON WELD ON TOP OF THE BIT WILL CAUSE A ROUGH FINISH ON ALUMINUM WORK.

CAUTION: DO NOT ATTEMPT TO DRESS OR SHARPEN TOP OF THE TOOL BIT. GRIND OR DRESS FRONT AND SIDES ONLY.





The performance of your boring bar and the quality of work it will do is almost entirely dependent on the care of the cutting tool.

In the accompanying sketch, letters A,B,D, correspond to the letters indicated on your sharpening jig, in other words, when your jig is set in the A position it will sharpen the "A" land as shown in the sketch.

The most critical point of this sharpening is the width of the "B" land (as indicated by the diagonal line shading). This width should be maintained at about .015 to .025. This width is held by cutting back the "D" land as required. The "B" land must be reduced to .005 to .015 on all stub boring heads and long bore operations. See PAGE -28- for exact "B" land requirements.

In the event your bar chatters or bores a rough finish at the bottom of the cylinder, it is very probable the "B" land is tool wide.

The "A" cutting land is not critical to width but should be maintained in good condition to obtain free cutting, particularly on heavy cuts.

The top surface of the bit is finely finished at the factory and requires no further resurfacing. This also means no honing or in any way attempting to break off the chip that sometimes seems to be apparent. The practice of doing these things will inevitably result in poor surface finish and impair the accuracy of the machine.

The frequency of sharpening the bit will vary depending on the type of iron being bored.

TOOL SHARPENING REQUIREMENTS

CUTTING SPEEDS AND CUTTING DEPTH RECOMMENDATIONS

MODEL DA-OC

ROUGHING CUTS FOR SLEEVING: Maximum cut .125 on a diameter
Use low spindle speed only (207RPM)
above 3" diameter

FINISH CUTS:

To 5" travel depth: Maximum cut .040" on a diameter
Use .010" to .020" "B" land on bit

To 8" travel depth: Maximum cut .025" on a diameter
Use .005 to .015 "B" land

Bore diameters to 3-3/4"
Use high spindle speed (414 RPM)

Bore diameter above 3-3/4"
Use low spindle speed (207 RPM)

CARE OF DIAMOND WHEEL

IF THE DIAMOND DISK IS HANDLED WITH CARE IT WILL PROVIDE MANY YEARS OF SERVICE.

AN ABRASIVE STONE IS FURNISHED WITH YOUR DIAMOND WHEEL, FOR USE IN HONING THE FACE OF THE WHEEL. YOU SHOULD USE THIS STONE FREQUENTLY TO REMOVE THE PARTICLES THAT TEND TO LOAD THIS WHEEL, OTHERWISE YOU WILL NOT PRODUCE THE KEEN EDGE ON THE TOOL THAT ALLOWS THE MACHINE TO BORE ACCURATE HOLES WITH A FINE SURFACE FINISH.

TOOL LIFE

WITH TOOL SHARPENING TO PRECISION EDGE, IT SHOULD BE POSSIBLE TO BORE APPROXIMATELY TWENTY OVERSIZE CYLINDERS, PROVIDED THE CORRECT SPINDLE SPEED IS USED. THIS APPLIES TO MOST PASSENGER CAR BORES UNDER 4", PROVIDED NO HARD SPOTS OR FOREIGN MATERIALS ARE IN THE CYLINDERS. THE SAME NUMBER OF SLEEVING CUTS CAN BE MADE ON LOW SPEED WITHOUT FURTHER SHARPENING, PROVIDED THE TOOL HAS AN ORIGINAL KEEN EDGE.

CENTERING FINGERS

CHANGING OR INSTALLATION OF CENTERING FINGERS

CENTERING FINGERS CAN BE TAKEN OUT BY SIMPLY ROTATING THE CENTERING KNOB CLOCKWISE UNTIL FINGERS CAN BE REMOVED. WHEN THEY ARE REPLACED OR RESET IN THE CUTTER HEAD, THEY SHOULD BE REPLACED IN THE RESPECTIVE NUMBERED SLOTS AND THE CENTERING KNOB FIRST ROTATED CLOCKWISE AND THEN COUNTER-CLOCKWISE TO INSURE THAT FINGERS ENTER PINION TEETH SIMULTANEOUSLY.

CENTER ACCURACY CHECK

CENTERING FINGERS SHOULD BE KEPT ADEQUATELY ACCURATE TO CENTER THE NEW BORE WITHIN .002" OF THE CENTER OF THE WORN HOLE. CENTERING FINGERS CAN BE LAPPED PERIODICALLY TO OBTAIN NEAR PERFECT CENTERING.

PERIODICALLY CHECK THE CENTERING FINGERS BY BORING A HOLE AND THEN WITHOUT UNCLAMPING THE SPINDLE UNIT, EXTEND THE FINGERS AGAINST THE WALL, CHECKING TO SEE THAT EACH FINGER TIP WILL LOCK A .001" SHIM. IF THE FINGERS WILL NOT DO THIS THEY SHOULD BE LAPPED BY ROTATING THEM BACK AND FORTH IN THIS TEST BORE WHILE HOLDING THE FINGERS AGAINST THE WALL. IF THIS DOES NOT QUICKLY BRING CONTACT AND PRESSURE TO ALL THE FINGERS, IT WILL BE NECESSARY TO DRESS CAREFULLY THE HIGH FINGER OR FINGERS WITH A FILE AND REPEAT THE LAPPING PROCESS.

NOTE: IT IS NECESSARY TO HAVE THE INNER SPINDLE ADJUSTED PROPERLY IN ACCORDANCE WITH MANUAL PAGE 37 TO CENTER PRECISELY OR TO MAKE ACCURACY CHECKS.

MICROMETER

YOUR BORING MICROMETER, AS WITH ANY OTHER MEASURING TOOL, SHOULD BE USED DELICATELY AND WITH CARE TO BE ASSURED OF THE GREATEST ACCURACY. PARTICULAR ATTENTION SHOULD BE PAID TO INSERTING THE TOOL IN THE MICROMETER WITHOUT ALLOWING TOOL BIT TO SNAP INTO THE MICROMETER ANVIL. CARE SHOULD BE USED IN THE METHOD OF LIGHTLY LOCKING THE TOOL BIT BEFORE TIGHTENING.

AFTER A PERIOD OF USE, YOU WILL NOTE THAT THE TOOL BIT TIP WILL FORCE A DEPRESSION IN THE MIKE ANVIL. THIS, OF COURSE, WILL RESULT IN THE INCONSISTENT SIZES, PARTICULARLY AFTER RESHARPENING THE BIT. PERIODICALLY WE WOULD RECOMMEND TURNING THE ANVIL SLIGHTLY AND FINALLY END FOR END SO THAT A FLAT SURFACE IS EXPOSED TO THE TOOL BIT TIP.

SETTING MICROMETER

1. BORE A HOLE

2. REMOVE TOOL HOLDER AND BIT AND PLACE IN MICROMETER.

3. ADJUST MIKE SO THAT IT READS THE SAME SIZE AS THE HOLE YOU HAVE BORED. SMALL VARIATIONS MAY BE MADE BY TURNING THE MIKE SLEEVE WITH SPANNER WRENCH PROVIDED. LARGER CHANGES SHOULD BE MADE BY MOVING THE ANVIL.

IMPORTANT
MAINTENANCE

LUBRICATION
DA-OC STYLE

✳ THE DA-OC STYLE UPPER HOUSING UNIT SHOULD BE PACKED WITH UNION OIL -UNOBA F1 OR F2, OR LUBRICANT #930 AAA, OR ANY EQUIVALENT LITHUIM BARIUM GREASE, APPROXIMATELY EVERY 25,000 BORING CYCLES. WHEN THIS GREASE IS CHANGED, THE UPPER HOUSING LID SHOULD BE REMOVED AND THE ORIGINAL LUBRICANT ENTIRELY REMOVED.

△ THE UPPER HOUSING SPINDLE DRIVE GEAR BEARING SHOULD BE LUBRICATED MONTHLY, BY ADDING A FEW DROPS OF THREE AND ONE OIL, OR UNION OIL - UNION 75, OR A VERY LIGHT SPINDLE OR SEWING MACHINE OIL (LESS THAN SAE 5) TO THE BEARING. ADD BY REMOVING THE SMALL COVER ON THE FRONT OF THE UPPER HOUSING AND ADD LUBRICANT TO THE TAKE UP NUT AREA BETWEEN THE CLUTCHING TEETH.

○ THE LOWER MOTOR HOUSING UNITS OIL LEVEL SHOULD BE CHECKED MONTHLY. CHECK BY REMOVING THE PIPE PLUG ON THE LEFT SIDE OF THE LOWER GEAR HOUSING, OIL LEVEL SHOULD BE JUST UP TO THE BOTTOM OF THIS HOLE.

CAUTION: WHEN ADDING OIL OR REFILLING, DO NOT OVER FILL.

CHANGE THIS GEAR LUBRICANT EVERY 40,000 BORING CYCLES. USE UNION SAE 90 MULTIPURPOSE GEAR LUBRICANT OR ANY EQUIVALENT SAE 90 GEAR LUBRICANT.

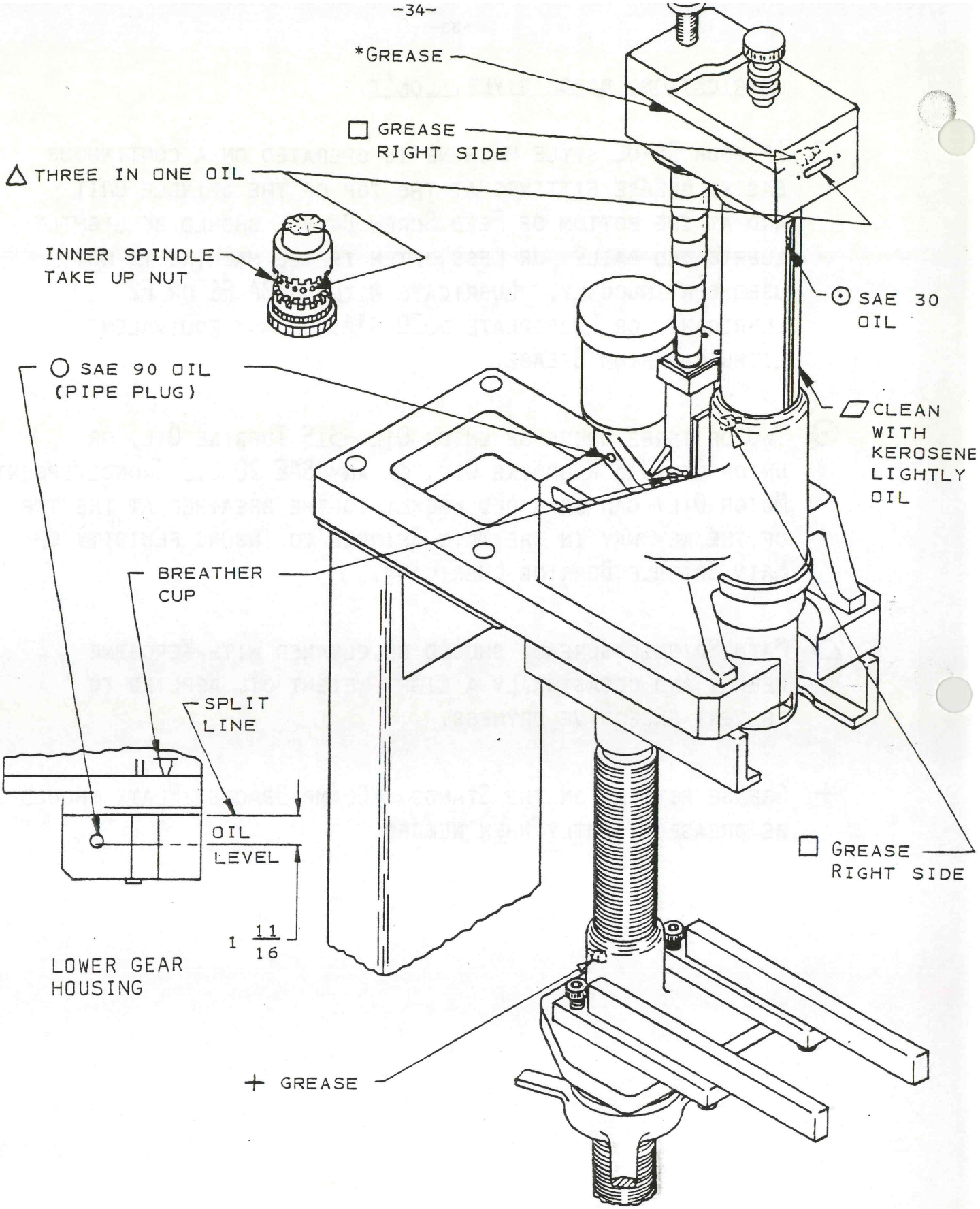
LUBRICATION, DA-OC STYLE, CON'T.

□ IF YOUR DA-OC STYLE MACHINE IS OPERATED ON A CONTINUOUS BASIS, GREASE FITTINGS AT THE TOP OF THE SPINDLE UNIT AND AT THE BOTTOM OF FEED SCREW DRIVE, SHOULD BE LIGHTLY LUBRICATED DAILY, OR LESS OFTEN IF THE MACHINE IS NOT USED CONTINUOUSLY. LUBRICATE WITH UNOBA F1 OR F2 LUBRICANT, OR LUBRIPLATE #930 AAA, OR ANY EQUIVALENT LITHUIM BARIUM GREASE.

⊙ TWO OR THREE DROPS OF UNION OIL -315 TURBINE OIL, OR UNION OIL 315 KLONDYKE OIL, OR ANY SAE 20 OIL (NONDETERGENT MOTOR OIL) CAN BE ADDED WEEKLY TO THE BREATHER AT THE TOP OF THE KEY WAY IN THE MAIN SPINDLE TO INSURE FLUIDITY OF MAIN SPINDLE BEARING LUBRICANT.

▱ MAIN SPINDLE SURFACE SHOULD BE CLEANED WITH KEROSENE WEEKLY AND OCCASIONALY A LIGHT WEIGHT OIL APPLIED TO PREVENT EXCESSIVE DRYNESS.

+ GREASE FITTING ON THE STANDS. CLAMP BRACKET PLATE SHOULD BE GREASED LIGHTLY WHEN NEEDED.



LUBRICATION

ADJUSTMENT OF OUTER SPINDLE

MAIN SPINDLE BEARINGS ARE TAPERED SPLIT CAST IRON RINGS HELD IN SEAT BY ADJUSTING NUT. TENSION ON BEARING IS NORMALLY ADEQUATE TO REQUIRE NO ADJUSTMENT FOR MANY BORING CYCLES. THE UPPER BEARING IS PRELOADED IN PLACE BY A BELLEVILLE SPRING BELOW THE ADJUSTING NUT.

CAUTION SHOULD BE USED IN ADJUSTING THESE BEARINGS IN ORDER TO AVOID A TOO TIGHT SPINDLE WHICH ONLY SERVES TO WEAR OUT MACHINE AND MAKE CONTROL OPERATION DIFFICULT. IF IT SHOULD BE NECESSARY TO ADJUST, PROCEED AS FOLLOWS:

UPPER BEARING IS ADJUSTED BY REMOVING FELT RETAINER NUT AT TOP OF BASE, FORCING FELT UP AND ADJUST NUT WITH PUNCH.

FOR LOWER BEARING, FIRST BACK OFF #8-32 SET SCREW AT BOTTOM SPINDLE BEARING. THEN REMOVE POSITION LIMITER AND FELT AT BOTTOM OF BASE AND TURN NUT WITH PUNCH.

ADJUSTING PROCEDURE:

1. RUN SPINDLE DOWN APPROXIMATELY 3" TO 5". LOOSEN SET SCREW AND BOTH ADJUSTING NUTS.

2. TIGHTEN UPPER BEARING UNTIL APPROXIMATELY 10 TO 15 LBS. OF EFFORT IS REQUIRED TO OPERATE HAND FEED HANDLE.

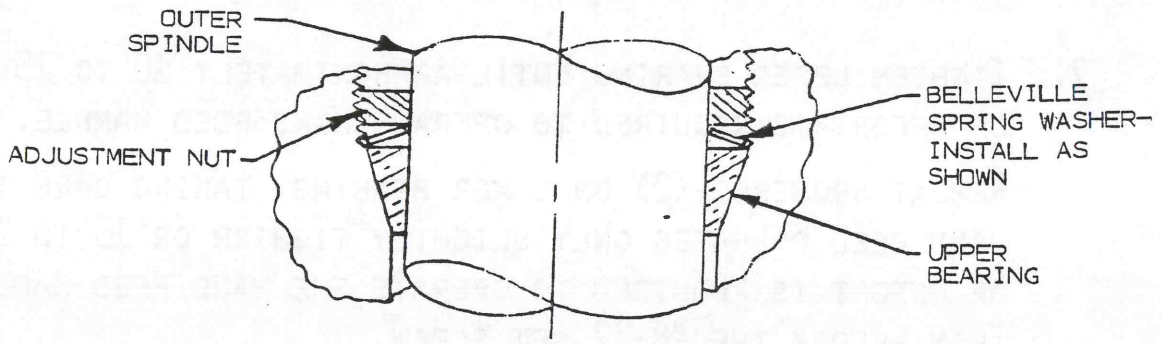
   REPEAT SEQUENCE (2) ON LOWER BEARING, TAKING CARE THAT HAND FEED OPERATES ONLY SLIGHTLY TIGHTER OR 15 TO 20 LBS. OF EFFORT IS REQUIRED TO OPERATE THE HAND FEED HANDLE. THEN RELOCK THE #8-32 SET SCREW.

3. TRAVERSE BAR AT ALL POINTS OF TRAVEL AND MAKE SURE HAND FEED WORKS EASILY. SPINDLES ARE GROUND SLIGHTLY TAPERED TO SECURE MAXIMUM RIGIDITY AT LOWER LIMITS OF TRAVEL WHERE IT IS MORE REQUIRED.

ADJUSTMENT OF OUTER SPINDLE

ADJUSTING PROCEDURE, CON'T

4. SPINDLE ADJUSTMENT MAY ALSO BE CHECKED BY FEEDING SPINDLE DOWN AND PULLING SLACK OUT OF FEED MECHANISM BY FORCING DOWN UPPER HOUSING. PRESSURE REQUIRED SHOULD BE 50 TO 75 LBS.



ADJUSTMENT OF INNER SPINDLE

REMOVE TWO SCREWS AND SMALL COVER ON FRONT OF UPPER HOUSING.

REMOVE STOP SET SCREW RESTRICTING UP TRAVEL OF SPINDLE CLUTCH LEVER AND MOVE LEVER TO FULL UP POSITION. ROTATE SPINDLE APPROXIMATELY 1/2 TURN AWAY FROM THE DETENT SPRING (WHICH WILL POSITION TOOL HOLDER SLOT TO REAR).

INSERT PIN (DIAMETER .180 OR LESS) IN ONE OF THE HOLES PROVIDED IN THE OUTER DIAMETER OF THE TAKE UP NUT. (SEE INNER SPINDLE NUT.) HOLD SPINDLE KNOB WITH ONE HAND AND TURN TAKE UP NUT TO LEFT (CLOCKWISE). YOU WILL NOTE THE NUT RATCHETS IN NOTCHES AS YOU TAKE UP. TAKE UP UNTIL THE SPINDLE IS TIGHT AND BACK OFF 3/4 TO 1-1/2 NOTCHES. RUN BAR ON HIGH SPEED MAKING SURE THERE IS ONLY SLIGHT HEATING AT THE BOTTOM OF THE SPINDLE. IF HEAT IS EXCESSIVE, BACK OFF ONE NOTCH FURTHER.

CAUTION: BE SURE DETENT IS IN A NOTCH, NOT MID-WAY BETWEEN NOTCHES.

REPLACE COVER, AND RESET SPINDLE CLUTCH STOP SCREW TO ALLOW CLUTCH LEVER TO STOP IN ITS UPPER DETENT.

CORRECTION OF TOOL CHATTER AT LOWER EXTREMETIES OF BORES

CHATTER AT LOWER END OF BORES LIKELY HAS NOTHING TO DO WITH SPINDLE ADJUSTMENTS.

IT IS PRIMARILY CAUSED BY TOOL SHARPENING THAT INADEQUATELY NARROWS THE TOOL "B" LAND. (SEE TOOL SHARPENING REQUIREMENTS.)

ALL DA-OC SPINDLES, ARE EQUIPPED WITH HEAVY METAL DAMPENER UNITS BUILD INTO THE SPINDLE NOSE OR CUTTER HEAD. THESE PRECISELY MACHINED WEIGHTS PREVENT CHATTER AT BORE EXTREMETIES. THEY MUST, HOWEVER, OCCASIONALLY BE CLEANED AND REASSEMBLED TO OPERATE PROPERLY.

RAPID RETURN TRAVERSE

IF THE BORING BAR SHOULD EVER FAIL OR HESITATE TO RETURN TO THE TOP OF TRAVEL WHEN SHIFT LEVER IS LIFTED AND LATCHED, THE FOLLOWING PROCEDURE MAY BE USED TO ADJUST RETURN TRAVERSE CLUTCHES.

1. RUN BAR DOWN INTO HOLE A FEW INCHES.

2. LOOSEN HORIZONTAL LOCKING SET SCREW AT THE UPPER REAR OF UPPER HOUSING (REFER TO SECTION A-A). USE A 1/8 ALLEN WRENCH.
   NOTE: THIS SET SCREW LOCKS TUMBLER ASSEMBLY (300-37)

3. AFTER LOOSENING THE HORIZONTAL SET SCREW, MOVE THE TUMBLER ASSEMBLY DOWN APPROXIMATELY 1/64, USING THE 1/4 VERTICLE SET SCREW IN THE TOP OF THE HOUSING - RELOCK WITH HORIZONTAL SET SCREW.

   STARTING WITH SHIFTING LEVER (500-38A DETAIL F) IN NEUTRAL, LIFT THIS LEVER UNTIL IT CONTACTS THE SPRING CARTRIDGE ASSEMBLY (500-40 VIEW F). IMMEDIATELY ON LIFTING THE PIN IN THE CARTRIDGE ASSEMBLY (500-40) APPROXIMATELY 1/32 THE RETURN TRAVEL CLUTCHES SHOULD START RATCHETING.

   IF THE CLUTCHES RATCHET BEFORE THE PIN IS RAISED 1/32, RESET THE TUMBLER ASSEMBLY HIGHER. DO THIS BY FIRST BACKING OFF BOTH SET SCREW IN THE TOP OF THE HOUSING, THEN FORCE THE TUMBLER UP WITH THE SHIFT LEVER. LOCK THE HORIZONTAL SCREW TIGHTLY AFTER THE ADJUSTMENT IS MADE PROPERLY.

   NOTE: PIN IN SPRING CARTRIDGE ASSEMBLY 500-40, SHOULD BE ADJUSTED SO THAT IT IS JUST TOUCHING THE SHIFT LEVER WHEN SHIFT LEVER IS IN NEUTRAL.

UPPER HOUSING BACK FEED ADJUSTMENT

TO ADJUST THE FEED SCREW PLAY IN THE UPPER HOUSING:

FIRST LOOSEN THE THREE ROUND HEAD SCREWS AROUND THE FEED SCREW, IN THE UPPER HOUSING. THEN LOOSEN THE THREE (3) ADJUSTING SCREW LOCK NUTS, THEN ADJUSTING SCREWS.

NOW, ALTERNATING BETWEEN EACH SCREW, TURN THE ADJUSTING SCREWS, EVENLY IN, UNTIL YOU HAVE COMPRESSED THE SPRING WASHER, (ALL SCREWS MUST BE TURNED IN THE SAME AMOUNT).

NOTE: A LIGHT TOUCH IS REQUIRED IN ADJUSTING THIS BEARING CLEARANCE. SPRING SHOULD BE FLAT, BUT NO PRESSURE ABOVE THAT WHICH IS REQUIRED TO FLATTEN SPRING, SHOULD BE USED.

NOW TURN ADJUSTING SCREW BACK 1/4 TURN TO ALLOW FOR RUNNING CLEARANCE. HOLD ADJUSTING SCREW WITH AN ALLEN WRENCH AND LOCK THEM WITH THE LOCK NUT.

NOW RUN MOTOR WITH LOWER GEAR BOX ENGAGED, SO THAT THE FEED SCREW IS TURNING, TO CENTER BEARING RETAINER. TURN OFF MOTOR, TIGHTEN EVENLY THE (3) UPPER ROUND HEAD SCREWS.

SPINDLE CONTROL LEVER ADJUSTMENT

TO RE-ADJUST THE SPINDLE CONTROL LEVER, FIRST LOOSEN THE STOP SCREW LOCK NUT, THEN THE STOP SCREW.

NOW RAISE THE CONTROL LEVER TO ITS NEUTRAL (UP) POSITION (DETENT PIN ENGAGED) ADJUST THE STOP SCREW SO THAT THE LEVER WILL NOT GO ANY HIGHER, LOCK WITH THE LOCK NUT.

SPINDLE STOP DETENT ADJUSTMENT

A SPRING LOADED BALL SCREW IS LOCATED IN THE UPPER GEAR HOUSING (SEE SECTION A-A) TO PREVENT THE SPINDLE FROM TURNING WHILE TRAVELING. THE BALL SCREW MAY BE ADJUSTED SLIGHTLY INWARD FOR ADDED RESISTANCE. CAUTION: DO NOT EXCEED 1/2 TURN OF DETENT SCREW FROM POINT OF CONTACT WITH CLUTCH PIN. OVER-ADJUSTING WILL DAMAGE THE BALL SCREW.

EXCESSIVE LOADS

NOTE: IF EXCESSIVE LOADS ARE IMPOSED ON YOUR BORING BAR THE FOLLOWING OCCURS:

1. THRUST LOADS

IF THE BAR IS FED OR RAPID TRAVELED INTO AN OBJECT THAT IMPOSES AN EXCESSIVE THRUST LOAD ON THE SPINDLE, THE BRASS THRUST NUT, PART NUMBER 500-41, WILL PROBABLY BE SHEARED AND REQUIRE REPLACING. THIS ACCIDENT COULD HAPPEN WITH SPINDLE EITHER ROTATING OR STATIONARY.

THE EFFECT OF THIS WILL BE FOR THE BAR TO CONTINUE TO RUN BUT WITH NO FEED OR DOWN TRAVEL WORKING. IF THE BAR IS LEFT IN FEED OR DOWN TRAVEL, DRIVE SPLINE WILL BE PULLED COMPLETELY OUT OF MESH AT WHICH POINT THE MOTOR WILL CONTINUE TO RUN BUT FEED SCREW WILL NOT TURN AT ALL. FOR REPLACEMENT OF THE BRASS THRUST NUT, 500-41, SEE REMOVAL OF FEED SLEEVE AND BEARING.

2. RADIAL LOADS

IF THE BAR HAS A TOOL IN THE CUTTER HEAD THAT TURNS INTO AN OBJECT, AN EXCESSIVE RADIAL SHOCK WILL BE IMPOSED ON THE SPINDLE AND WILL PROBABLY SHEAR MOTOR DRIVE KEY, #500-62. THIS WOULD LIKELY HAPPEN ONLY WHEN SPINDLE DRIVE CLUTCH IS IN.

THE IMMEDIATE EFFECT OF THIS WILL BE FOR THE MOTOR ONLY TO RUN WITHOUT TURNING ANY VISIBLE PARTS OF THE BORING BAR. A MOVEMENT OF THE SPEED CHANGE LEVER WILL INDICATE THE LOWER GEAR BOX IS ENTIRELY INOPERATIVE. FOR REPLACEMENT OF THE MOTOR DRIVE KEY, #500-62, SEE REMOVAL OF MOTOR FIELD ASSEMBLY.

REMOVAL OF MOTOR FIELD ASSEMBLY

CAUTION: DISCONNECT ALL ELECTRICAL POWER TO BORING BAR BEFORE MAKING ANY REPAIRS.

NOTE: THIS IS THE ONLY DISASSEMBLY REQUIRED TO REPLACE MICARTA MOTOR DRIVE KEY IN CASES OF EXCESSIVE RADIAL LOAD ON THE MACHINE SPINDLE.

SECTION B-B

REMOVE FAN SHROUD COVER AND SHROUD. HOLD FAN AND UNSCREW DIAMOND MOUNTING ADAPTOR. REMOVE (4) LONG MOTOR SCREWS AND LIFT OFF THE MOTOR FIELD ASSEMBLY. BE CAREFUL NOT TO LOSE SPRING WASHER ON TOP BEARING, AND REPLACE PROPERLY IN REASSEMBLY.

LAY BLOCKS OR SHIMS ON BOTTOM END BELL (FLAT SURFACE OF GEAR BOX) AND PRY UP ROTOR UNIT OF DRIVE TO REMOVE ROTOR.

DISASSEMBLY OF MOTOR HOUSING

NOTE: MOTOR AND GEAR BOX HOUSING MAY BE REMOVED WITHOUT DISASSEMBLY OF UPPER HOUSING AND FEED SCREW.

1. REMOVAL OF HAND FEED HOUSING

SECTION C-C

REMOVE (2) HEX SOCKET SCREWS ON BOTTOM OF #500-97-2, HAND FEED BRACKET AND (2) SCREWS HOLDING #500-96-9, PLATE TO #500-70-1, HOUSING. TURN OUT (COUNTER-CLOCKWISE) BEVEL GEAR.

REMOVE (4) SOCKET HEAD CAP SCREWS IN #500-70-1, HOUSING LIFT OUT FEED SCREW, OR IF UPPER HOUSING IS STILL INTACT, HOLD IN RAPID DOWN LEVER #502-27-11, AND ROTATE FEED SCREW COUNTER-CLOCKWISE UNTIL FEED SCREW IS CLEAR OF MOTOR UNIT. ON REASSEMBLY, IT MAY BE NECESSARY TO ROTATE MOTOR AND FEED SCREW, USING CARE IN ALIGNING SPLINE IN FEED GEAR, TO MATCH FEED SCREW SPLINE. MAKE SURE HAND FEED PINION THREADED SHAFT AND THREADED BOSS OF FEED SLEEVE DO NOT JAM IN ENTERING SLOT OF MOTOR HOUSING.

DISASSEMBLY OF MOTOR HOUSING, CON'T.

2. REMOVAL OF FEED SLEEVE AND BEARING

NOTE: FOR REMOVAL OF BRASS NUT ONLY. (THIS DISASSEMBLY IS NOT NECESSARY TO REMOVE MOTOR HOUSING.)

SECTION C-C

REMOVE SNAP RING, #506-10, AND PRESS SLEEVE ASSEMBLY, #500-73, OFF BEARING. BACK OUT SOCKET SET SCREW FROM BRASS THRUST NUT AND SCREW OFF NUT. BEARING MAY NOW BE REMOVED FROM SHAFT.

3. REMOVAL OF MOTOR HOUSING

TO REMOVE MOTOR HOUSING, REMOVE (2) SIDE SCREWS IN THE SPINDLE BASE, THEN TAKE OUT (4) BOLTS IN HOUSING FLANGE.

NOTE: IN REASSEMBLING, MOTOR ALIGNMENT MUST BE CHECKED AFTER FEED SCREW BEARING HOUSING IS IN PLACE BEFORE FLANGE BOLTS ARE PERMANENTLY LOCKED. USE SURFACE PLATE OVER FEED SCREW AND SPINDLE.

4. MOTOR HOUSING DISASSEMBLY

TO DISASSEMBLE MOTOR HOUSING, REMOVE SPEED SHIFTER LEVER BY REMOVING ITS ROLL PIN AND SET SCREWS, THEN REMOVE (2) PINS AND (6) SCREWS AND BOTTOM SCREW IN THE MIDDLE OF BOTTOM OF GEAR POT.

TAP LIGHTLY WITH MALLET ON MOTOR PINION, #500-64, AND SCREW DRIVE GEAR, #501-20, AND HOUSING WILL COME APART. PINION SHAFT, #501-6, WITH CLUTCH AND GEARS MAY BE TAPPED OUT WITH SMALL PUNCH THROUGH CENTER HOLE IN BOTTOM OF THE GEAR POT.

GENERAL MAINTENANCE AND TROUBLE SHOOTING

MOST PROBLEMS POSSIBLE WITH BORING BARS WILL BE READILY OVERCOME IF CAREFULL ATTENTION IS GIVEN TO THE PROPER TOOL DRESSING.

SIZE PROBLEMS WILL RELATE LARGELY TO THE CAREFUL USE OF THE CUTTING TOOL, TOOL HOLDERS, AND MICROMETER. THESE PARTS MUST BE MAINTAINED IN GOOD ORDER.

AT LEAST A YEARLY INSPECTION SHOULD BE MADE OF BOTH THE INNER AND OUTER SPINDLE ADJUSTMENT AS NOTED IN THIS MANUAL.

SHOULD THERE BE A TENDENCY FOR THE MACHINE TO CHATTER, AT THE BOTTOM OF THE BORE AND THE TOOL BIT IS IN PROPER ORDER, IT WILL BE NECESSARY TO CLEAN THE DAMPENING COUNTERWEIGHT, #600-8-2A, IN THE CUTTER HEAD. (SEE SECTION B-B) REMOVE THE LOWER BODY AND THE CUTTER HEAD, BY UNSCREWING IT, CAREFULLY CLEAN THE COUNTERWEIGHT AND CAVITY, MAKING SURE IT FITS FREELY BACK INTO PLACE.

DISASSEMBLY OF UPPER HOUSING AND SPINDLE REMOVAL

Loosen set screws in lower spindle knob, #500-17, and lift centering rod and knob assembly out of spindle.

Remove #502-27-22, knob by releasing its socket set screw. Unscrew spindle clutch lever stop screw #500-30-4. Raise lever to extreme top, which will allow removal of countersunk screw and lever assembly. Remove cap screw to disassemble trip lever, #500-35A.

CAUTION: Do not lose trip spring.

Remove (6) screws holding upper housing sections together, and lift off upper lid, #500-22.

Now shifting lever, #500-38-A, with spring may be removed along with #500-25 upper fast return gear with plunger and spring, spindle clutch (and key) #500-3.

NOTE: When reassembling clutch, place key in the same slot in the inner spindle.

Remove ball bearing (with take up spring) #500-18, (be sure spring is reassembled properly), sleeve gear, #500-1, feed nut #500-2, thrust washer #500-15, and feed gear #500-9.

If the bar is in a vertical spindle position, we suggest you place something under the spindle nose to prevent inner spindle from falling out and then remove #500-5 spindle nut. Nut can be started off through adjusting access hole and then hand turned. Now drive gear assembly, #500-6C, may be worked off along with #500-4 spacer, and woodruff key.

Inner spindle may now be removed.

CAUTION: Lubrication will run out when spindle is removed.

DISASSEMBLY OF UPPER HOUSING AND SPINDLE REMOVAL, CON'T

IF UPPER HOUSING IS TO BE REMOVED FROM SPINDLE, THE (2) HEX CAP SCREWS IN UPPER HOUSING SHOULD BE REMOVED AND HOUSING MAY BE DRIVEN OFF SPINDLE. HEAT ON HOUSING WILL SIMPLIFY REMOVAL OF THIS SWEAT FIT.

LIFT OFF OF FEED SCREW.

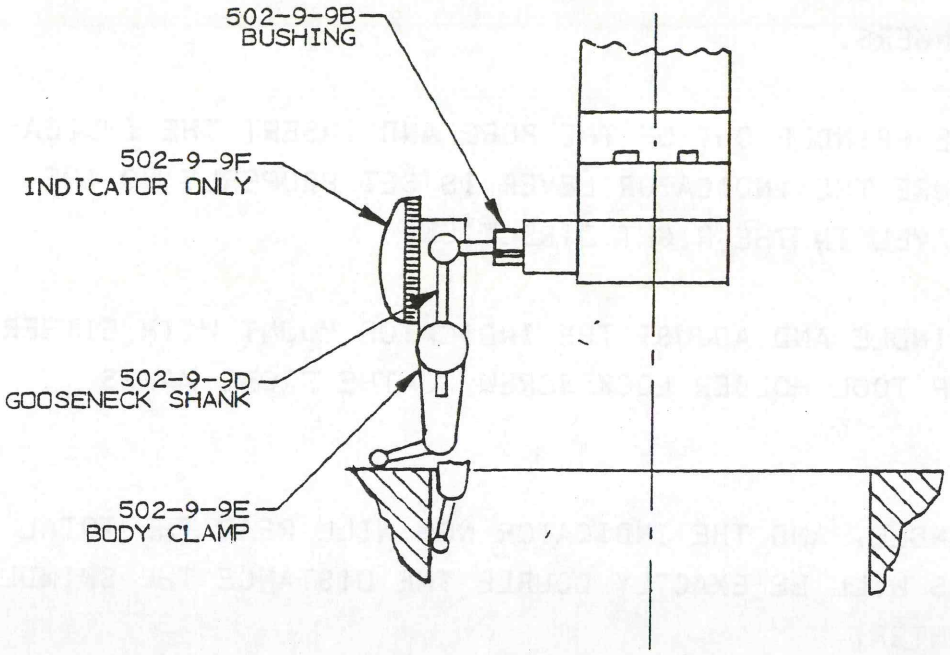
NUT SHOULD BE REMOVED FROM #500-29 SHAFT, AND SHAFT MAY BE PRESSED OUT WITH GEAR.

#500-7 LONG GEAR WITH RADIAL AND THRUST BEARINGS MAY BE REMOVED ALONG WITH OIL SEAL.

NOTE: ON REASSEMBLY, THRUST BEARING HAS ONE RACE WITH A SMALL I.D. WHICH IS MOUNTED 'UP' IN GEAR HOUSING.

EXTREME CARE SHOULD BE TAKEN WHEN REMOVING LONG GEAR OUT OF SEAL OR SEAL OUT OF HOUSING. SEAL IS FRAGIL AND GARTER SPRING WILL COME OUT EASILY. WHEN REASSEMBLING, OPEN SEAL AS LONG GEAR IS PUSHED IN TO PREVENT GARTER SPRING FROM SNAPPING OUT.

INSTRUCTIONS FOR USE OF OPTIONAL MECHANICAL DIAL RUNOUT INDICATOR (#502-9-9A)



502-9-9A
DIAL RUNOUT INDICATOR ASS'Y

THE #502-9-9A MECHANICAL DIAL RUNOUT INDICATOR MAY BE USED FOR CHECKING AND IF NECESSARY CORRECTING THE CENTERING OR BORE CONCENTRICITY. IT MAY ALSO BE USED FOR CHECKING FACE SQUARENESS OF THE WORK PIECE TO THE BORING SPINDLE.

THE PRINCIPAL USE IN CHECKING CENTERING WILL BE FOR THE SMALL ENGINES REQUIRING AN ABSOLUTE MINIMUM OVERSIZE, PARTICULARLY WHEN IRREGULAR WEAR AND SCORE AREAS CAN BE FOUND.

TO USE THE INDICATOR, SIMPLY PLACE THE GOOSENECK SHANK IN THE SPLIT BUSHING PROVIDED AND INSERT IN THE APPROPRIATE SIZE TOOL HOLDER. THE INDICATOR MAY BE USED ON ANY STYLE OF CUTTER HEAD.

INSTRUCTIONS FOR USE OF OPTIONAL MECHANICAL DIAL RUNOUT INDICATOR, CON'T.

TURN OFF FLOAT AIR TO SPINDLE BASE.

PROCEED THEN TO CENTER THE SPINDLE BY NORMAL USE OF THE CENTERING FINGERS.

NOW RAISE THE SPINDLE OUT OF THE BORE AND INSERT THE INDICATOR. MAKE SURE THE INDICATOR LEVER IS SET PROPERLY SO THE DIAL WILL TRAVEL IN THE RIGHT DIRECTION.

LOWER THE SPINDLE AND ADJUST THE INDICATOR MOUNT WITH EITHER GOOSENECK, OR TOOL HOLDER LOCK SCREW SO THE PROBE MAKES CONTACT.

TURN THE SPINDLE, AND THE INDICATOR NOW WILL READ THE TOTAL RUNOUT. THIS WILL BE EXACTLY DOUBLE THE DISTANCE THE SPINDLE IS OUT OF CENTER.

TO CLEAN UP A BORE, IT WILL BE NECESSARY TO SET THE TOOL ABOUT THE AMOUNT OF THIS RUNOUT IN ADDITION TO THE BASIC BORE SIZE YOU MEASURE. IF YOU BUMP THE SPINDLE UNIT LIGHTLY WITH YOUR HAND YOU WILL FIND YOU CAN EASILY REDUCE THE READING TO NEAR 0 FOR MINIMUM STOCK REMOVAL.

SIMILARLY IF THE BORE IS SUBSTANTIALLY OUT OF ROUND OR HAS SCORED WEAR GROOVES, YOU MAY MOVE THE SPINDLE SO THAT YOU GET TWO MAXIMUM EQUAL DIAL READINGS AT THE OPPOSED LARGE PORTION OF THE OUT OF ROUND.

ACHIEVING THIS YOU WILL FIND THE BORE WILL CLEAN UP ON A SLIGHTLY LARGER DIAMETER THAN YOU MEASURE AT THE MAXIMUM OUT OF ROUND AREA.

INSTRUCTIONS FOR USE OF OPTIONAL MECHANICAL DIAL RUNOUT INDICATOR, CON'T

TIGHTEN HOLD DOWN WHEN YOU HAVE THE PROPER DIAL READING, REMOVE THE INDICATOR, AND PROCEED WITH THE BORING AS USUAL.

IF YOU WISH TO CHECK THE SQUARENESS OF THE BORE FACE, RESET THE DIAL INDICATOR LEVER FOR THE PROPER TRAVEL DIRECTION AND ADJUST THE SPINDLE AND INDICATOR TO CONTACT THE SURFACE ABOVE THE BORE. ROTATE THE SPINDLE THEN TO CHECK OUT OF SQUARE.

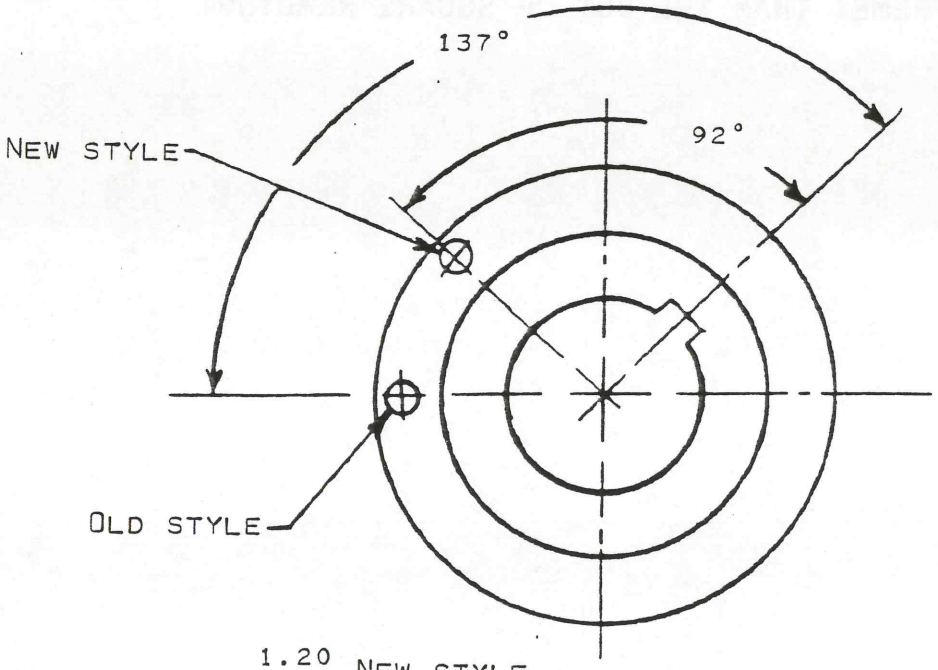
REMEMBER, IF YOU WISH TO CORRECT OUT OF SQUARE WITH SHIMS UNDER THE WORK PIECE, YOU WILL HAVE TO USE A SHIM PROPORTIONATELY LARGER (AS THE SUPPORT POINTS ARE TO THE INDICATOR TRAVEL EXTREME) THAN THE OUT OF SQUARE READING.

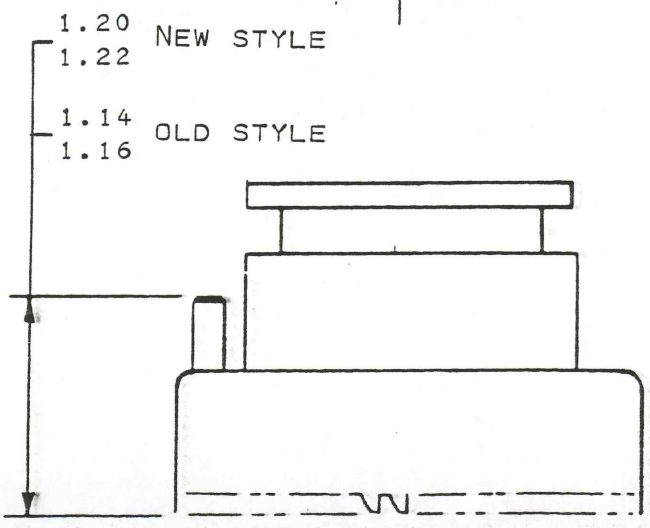
STOP PIN ASSEMBLY IN #500-3 CLUTCH SLEEVE
FOR (OLD AND NEW STYLE BALL DETENT)

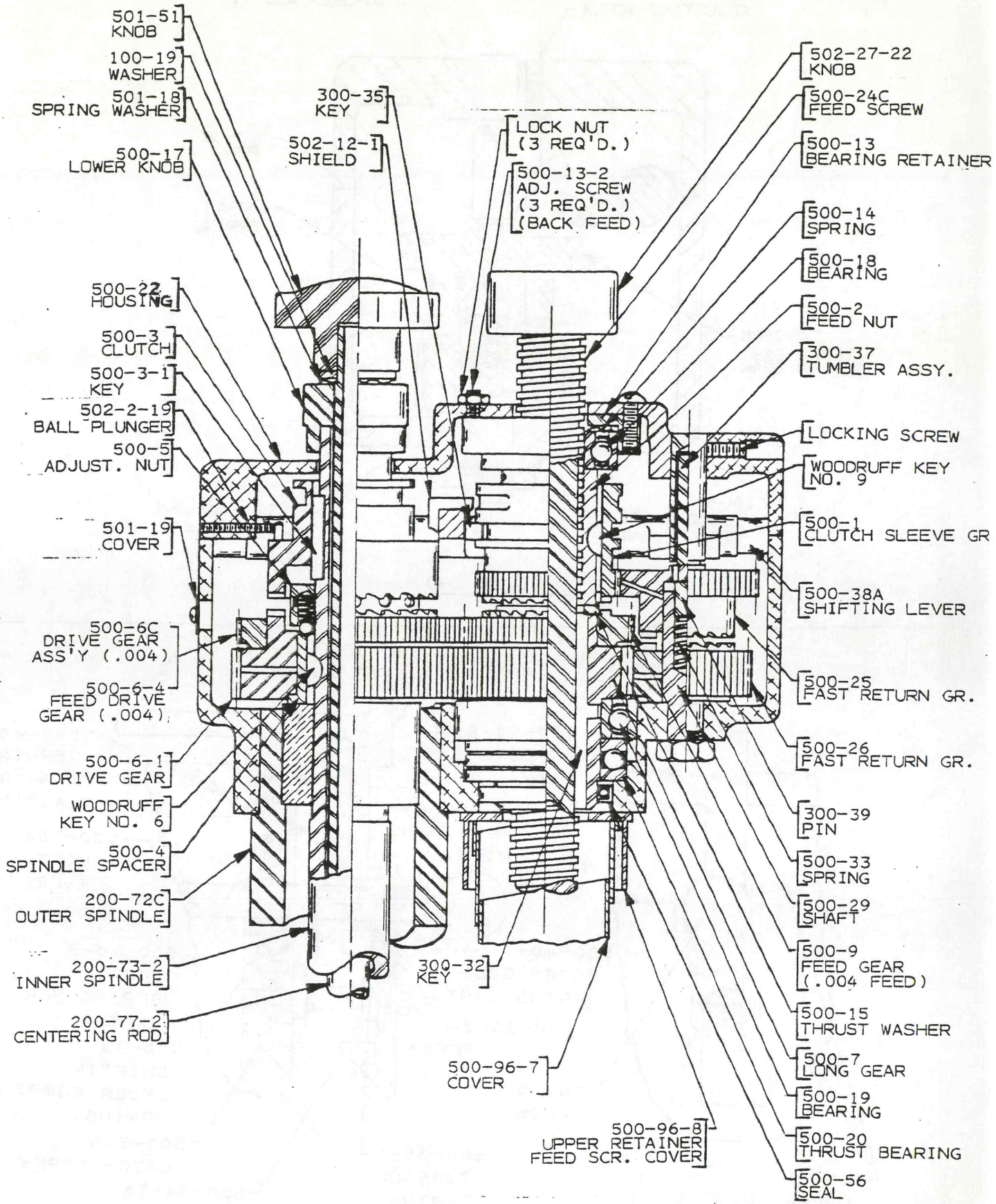
REFER TO THE UPPER HOUSING DRAWING FOR THE OLD AND NEW BALL DETENT STYLES. PRESS PIN INTO CORRECT CLUTCH SLEEVE HOLE TO THE HEIGHT SHOWN BELOW.

THE PURPOSE OF THE BALL DETENT IS TO STOP THE SPINDLE FROM TURNING WITH THE TOOL BIT FACING THE MACHINE OPERATOR. THE NEW STYLE HAS THE ADVANTAGE OF BEING ABLE TO ADJUST THE BALL DETENT PLUNGER, #502-2-19, FROM THE OUTSIDE WHILE THE OLD STYLE HAD TO BE TAKEN OUT OF THE UPPER HOUSING CASE TO BE ADJUSTED.

ASSEMBLE CLUTCH IN UPPER HOUSING AND ADJUST THE BALL DETENT PLUNGER SO THAT WHEN THE MACHINE IS IDLING AND THE SPINDLE CLUTCH IS DISENGAGED, THE SPINDLE WILL STOP TURNING WITH THE TOOL BIT FACING THE MACHINE OPERATOR.



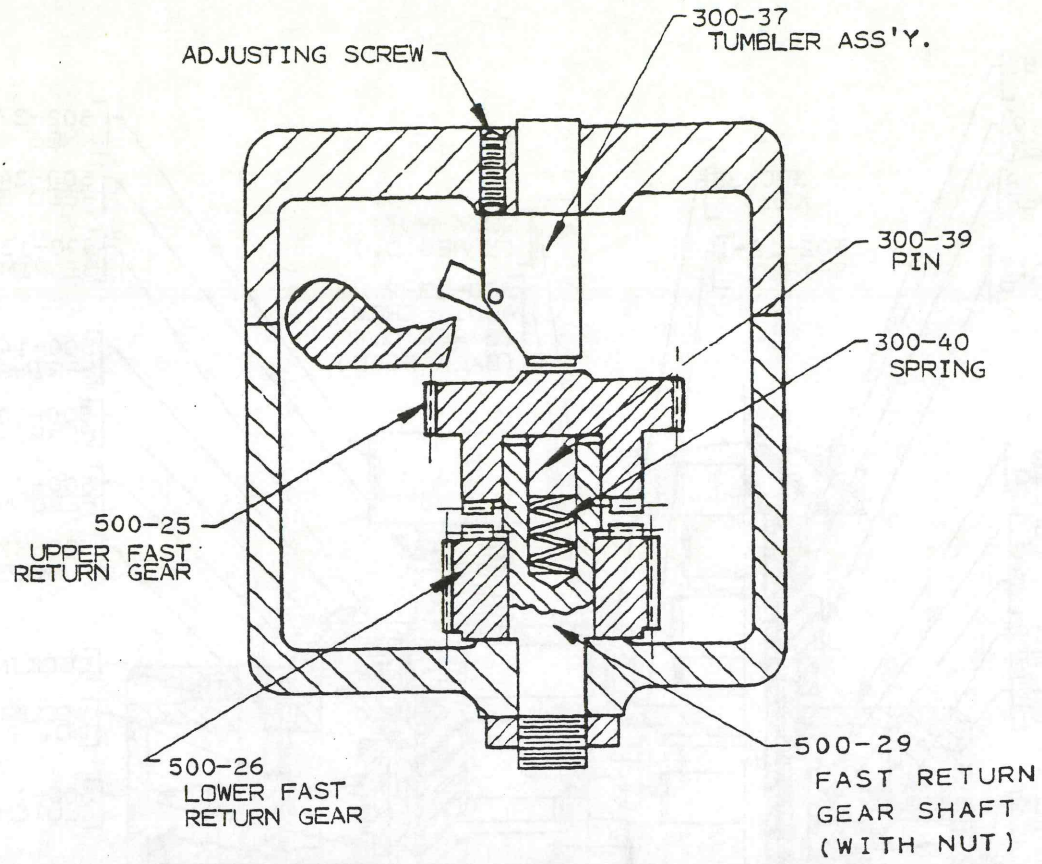




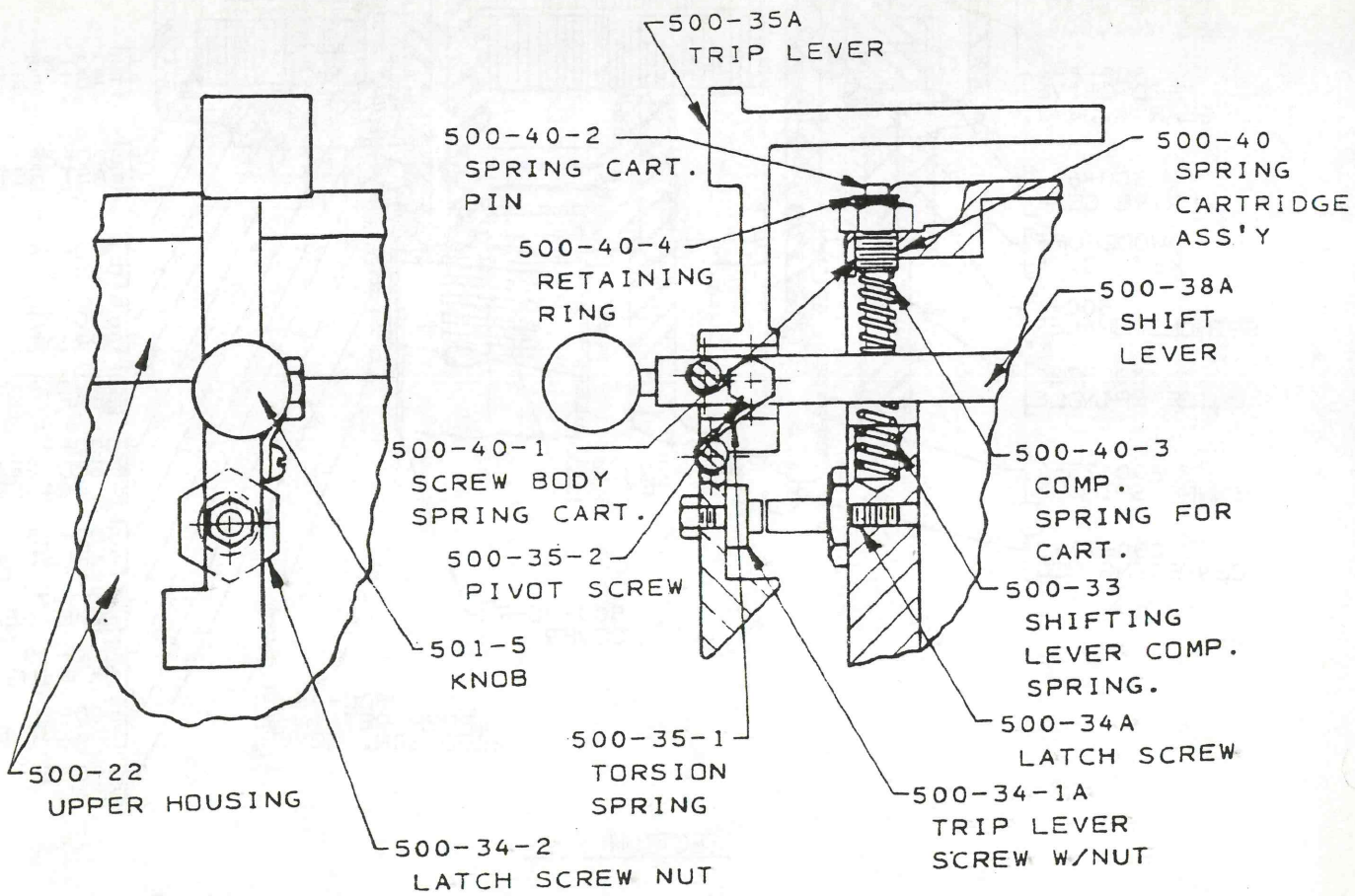
SECTION A-A

UPPER HOUSING

DA-OC

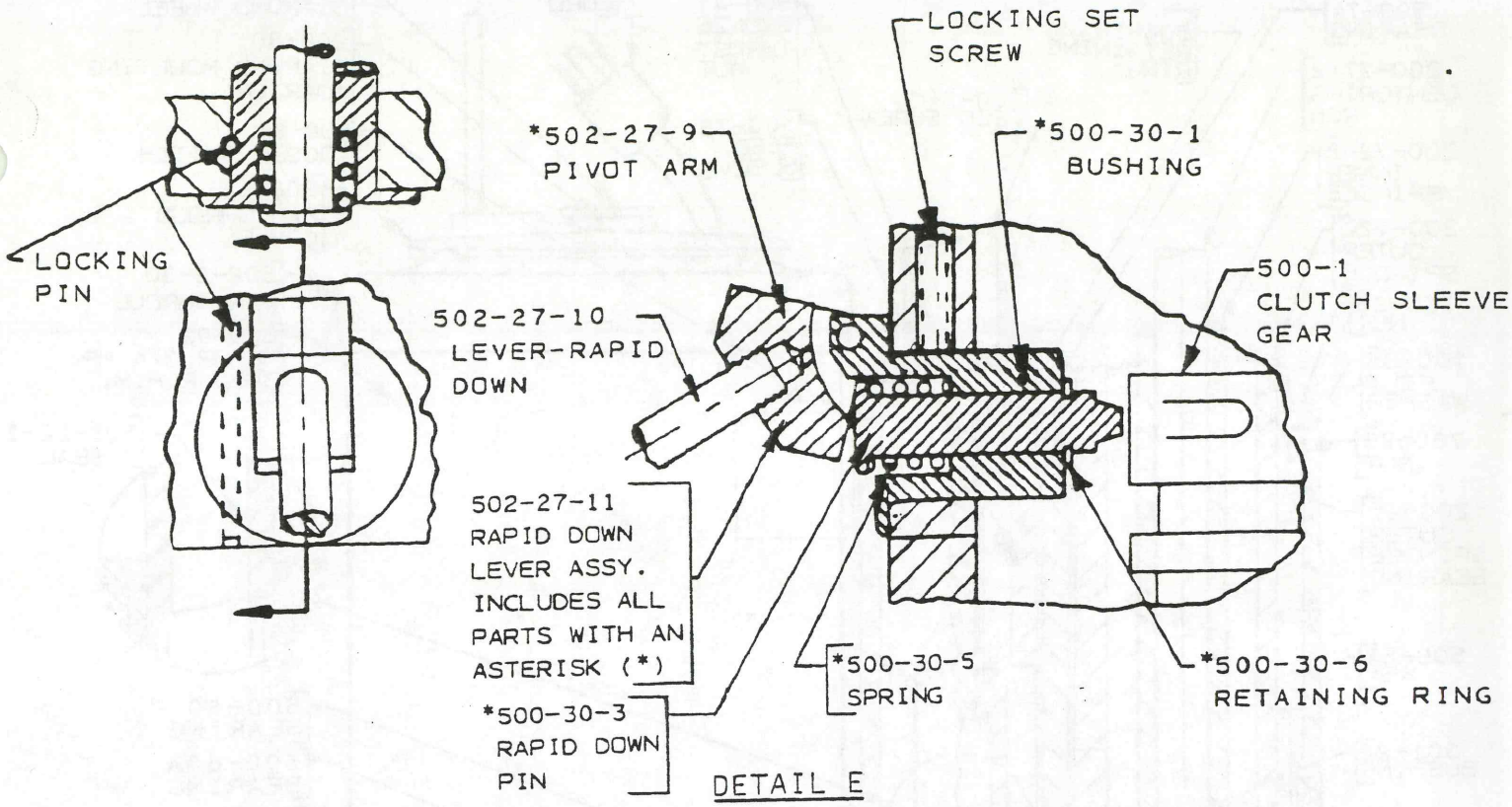


SECTION D-D

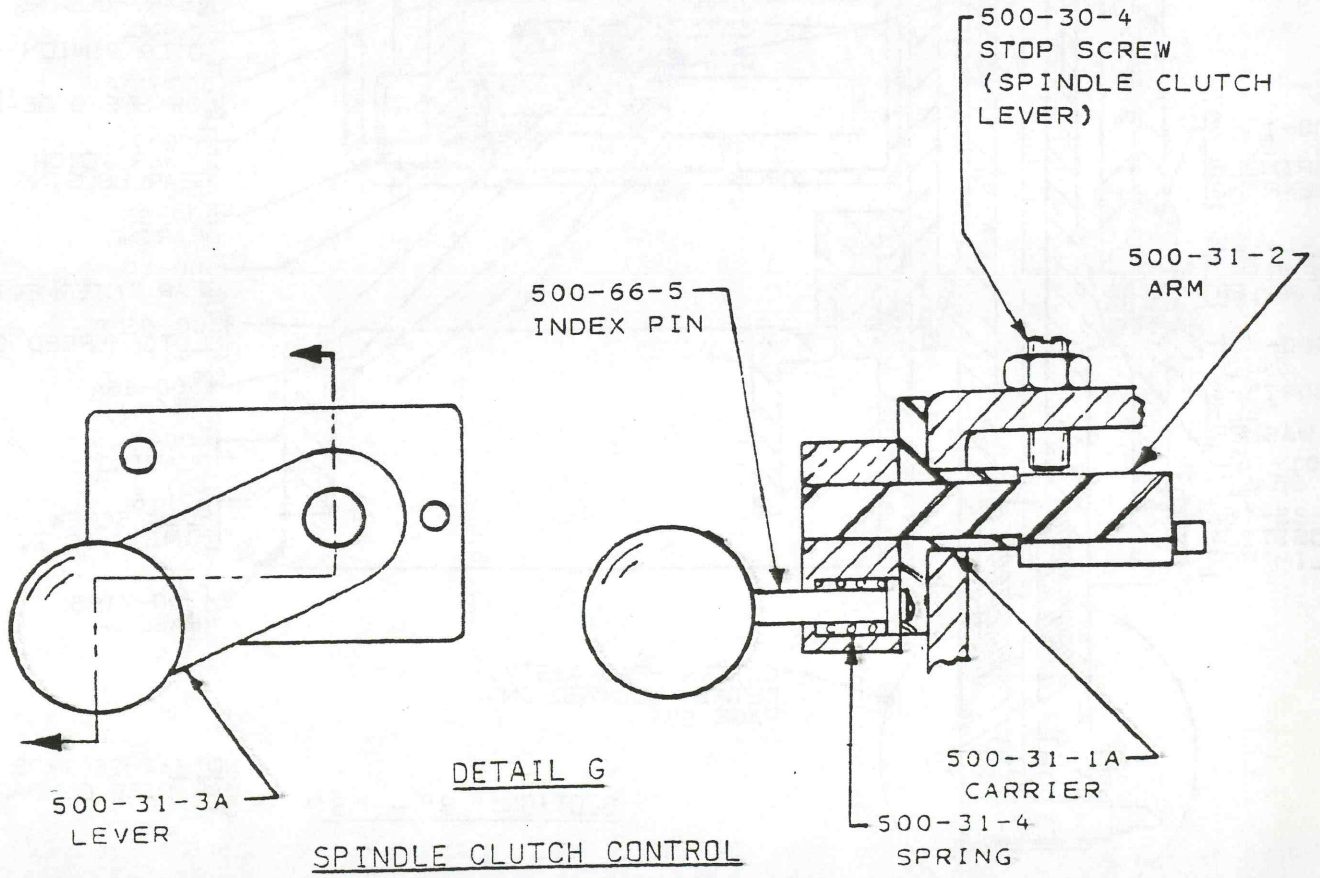


DETAIL F

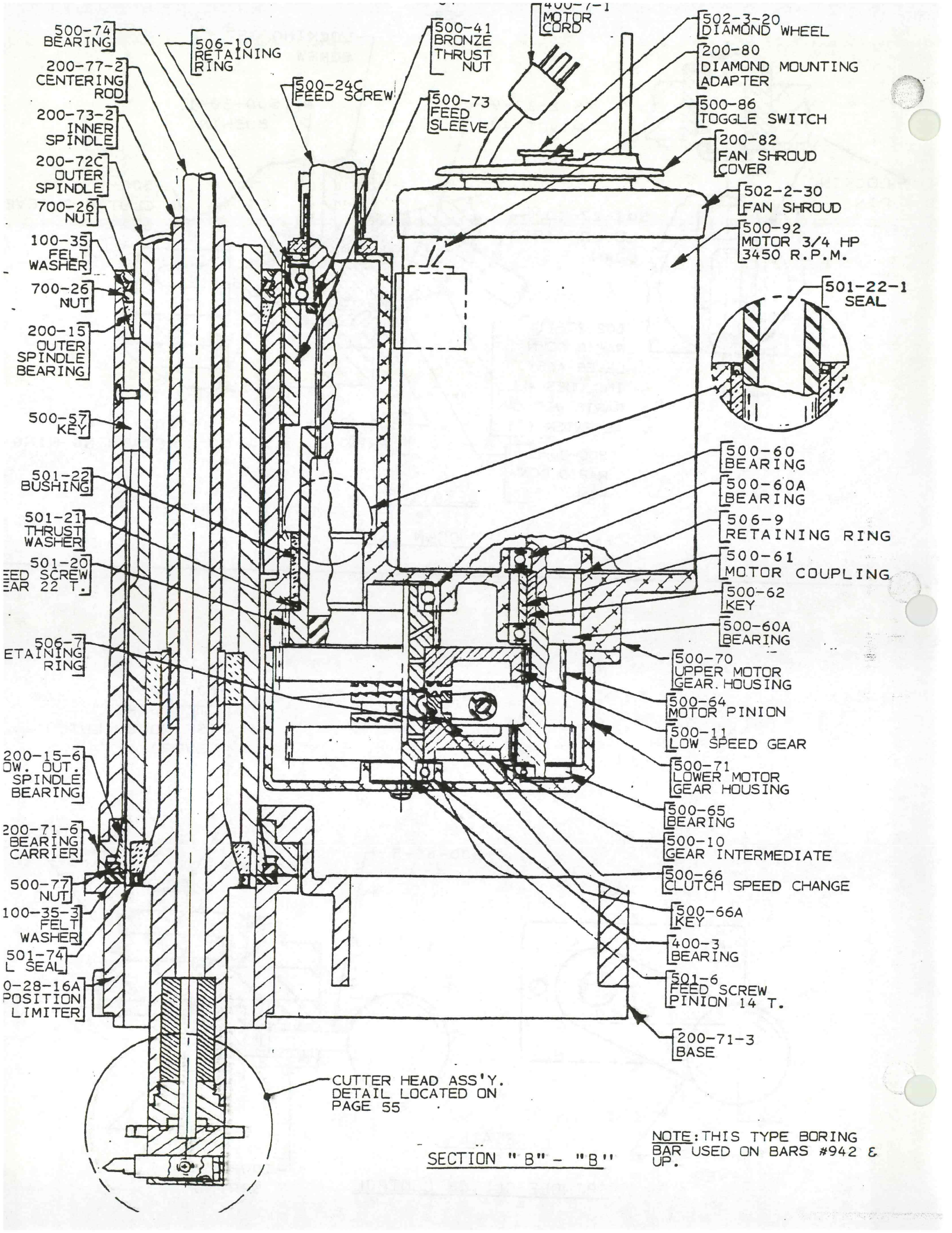
(FEED LEVER)



FAST DOWN LEVER



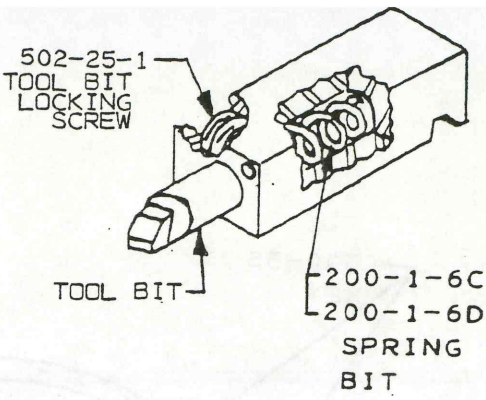
SPINDLE CLUTCH CONTROL



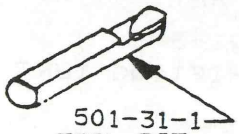
SECTION "B" - "B"

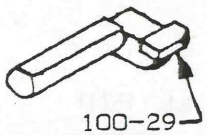
NOTE: THIS TYPE BORING BAR USED ON BARS #942 & UP.

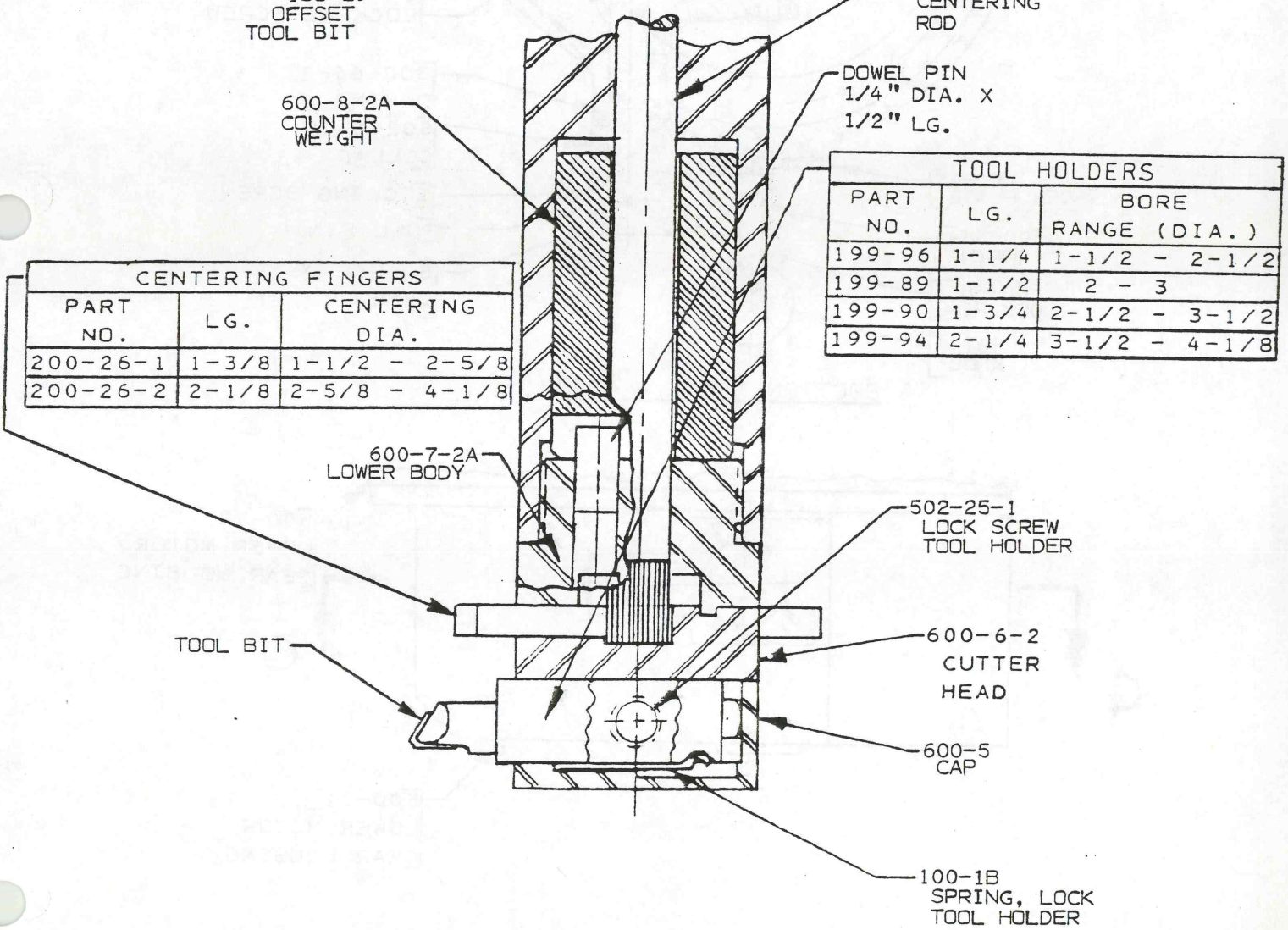
NOTE: USE WITH MICROMETER ASSEMBLY 900-2-11



TOOL HOLDER
(DA STYLE)



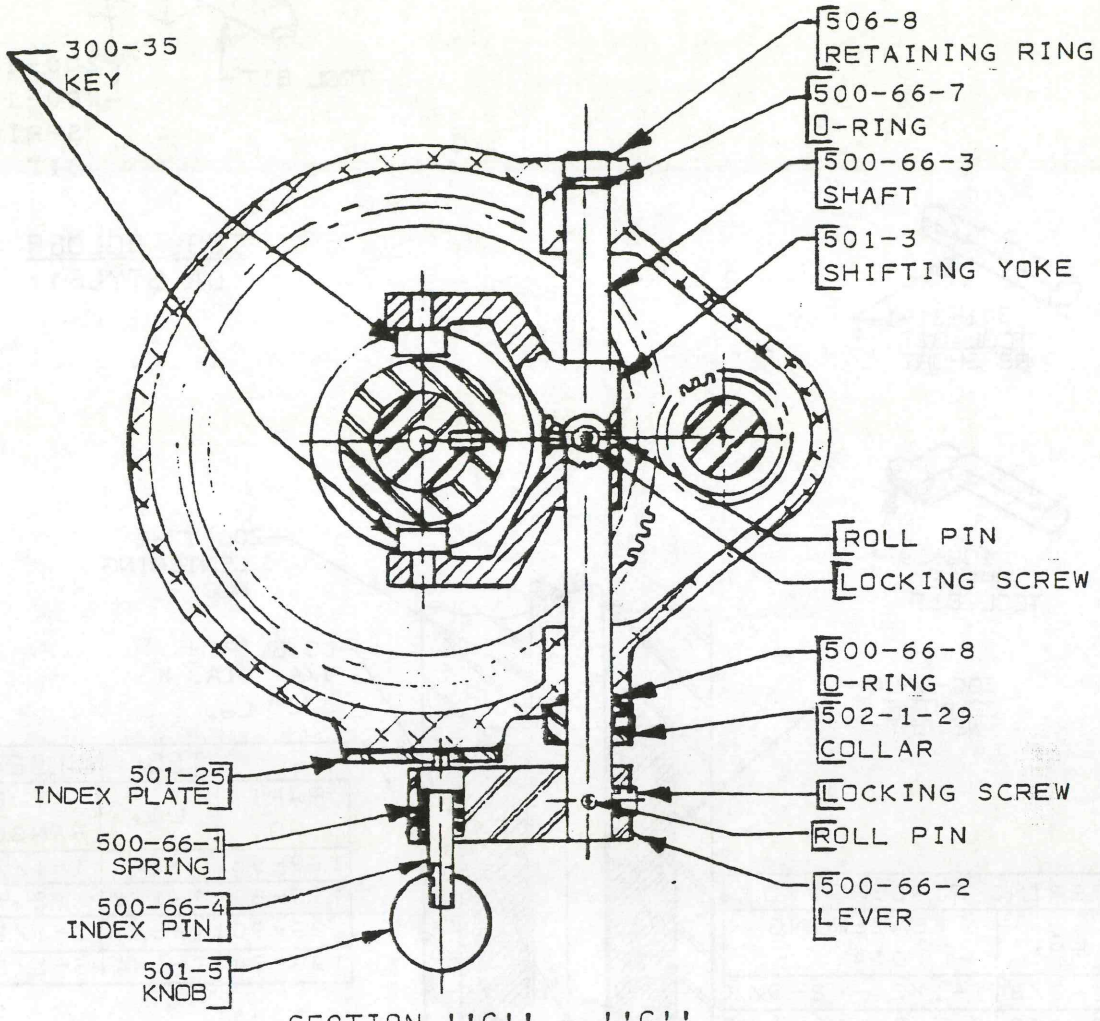




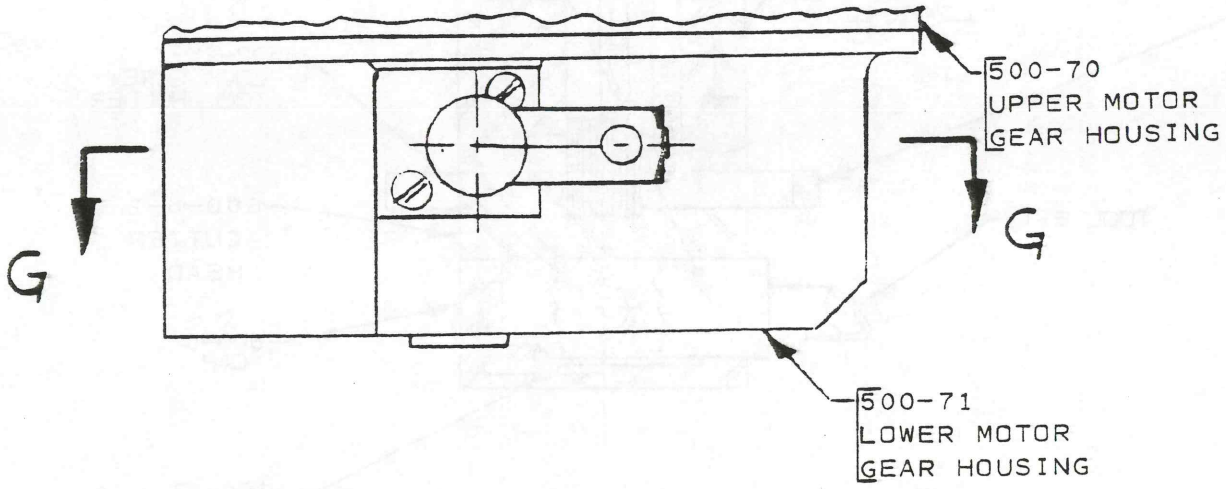
CENTERING FINGERS		
PART NO.	LG.	CENTERING DIA.
200-26-1	1-3/8	1-1/2 - 2-5/8
200-26-2	2-1/8	2-5/8 - 4-1/8

TOOL HOLDERS		
PART NO.	LG.	BORE RANGE (DIA.)
199-96	1-1/4	1-1/2 - 2-1/2
199-89	1-1/2	2 - 3
199-90	1-3/4	2-1/2 - 3-1/2
199-94	2-1/4	3-1/2 - 4-1/8

DA-OC CUTTER HEAD
1.5 DIA.

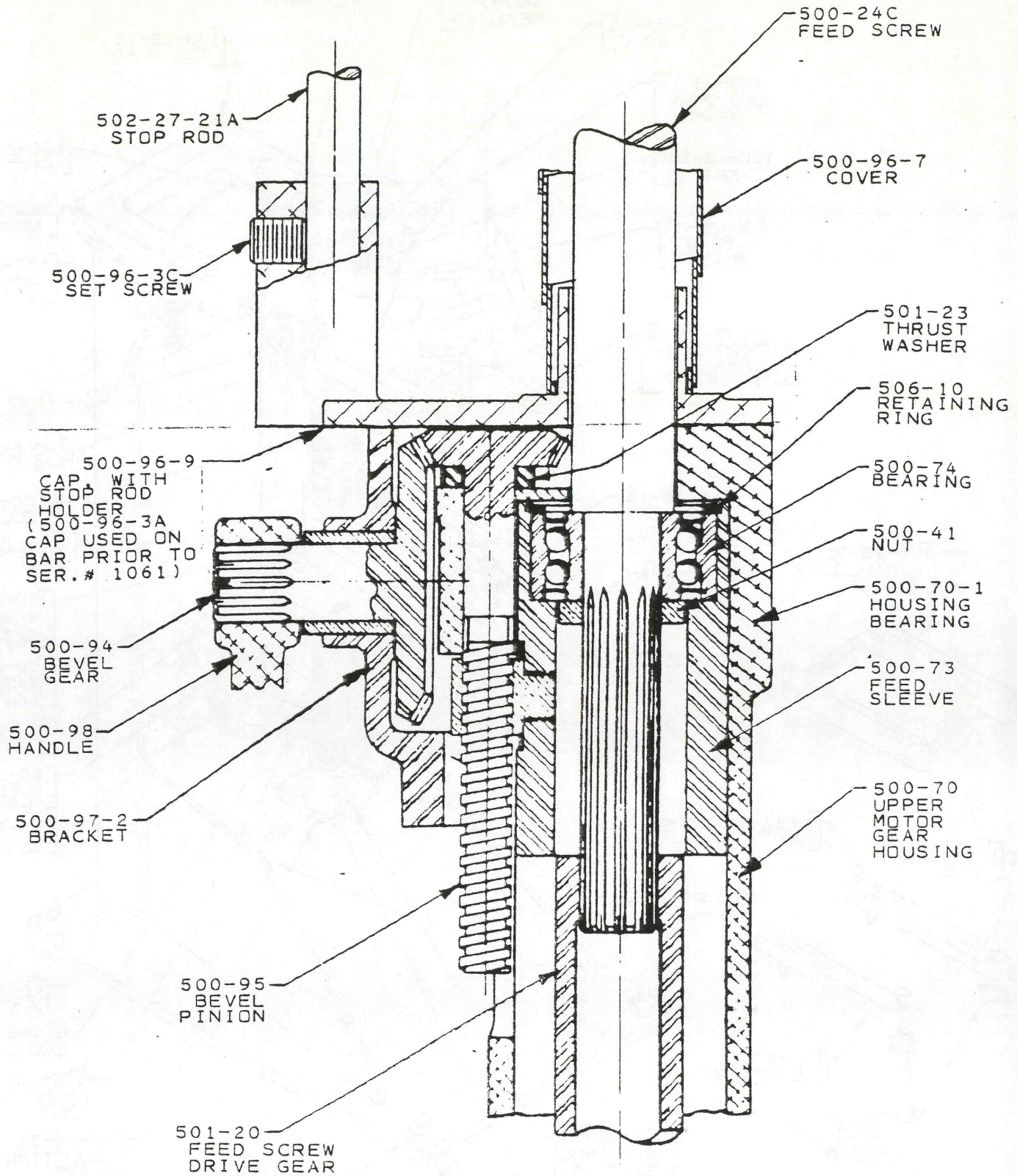


SECTION ''G'' - ''G''



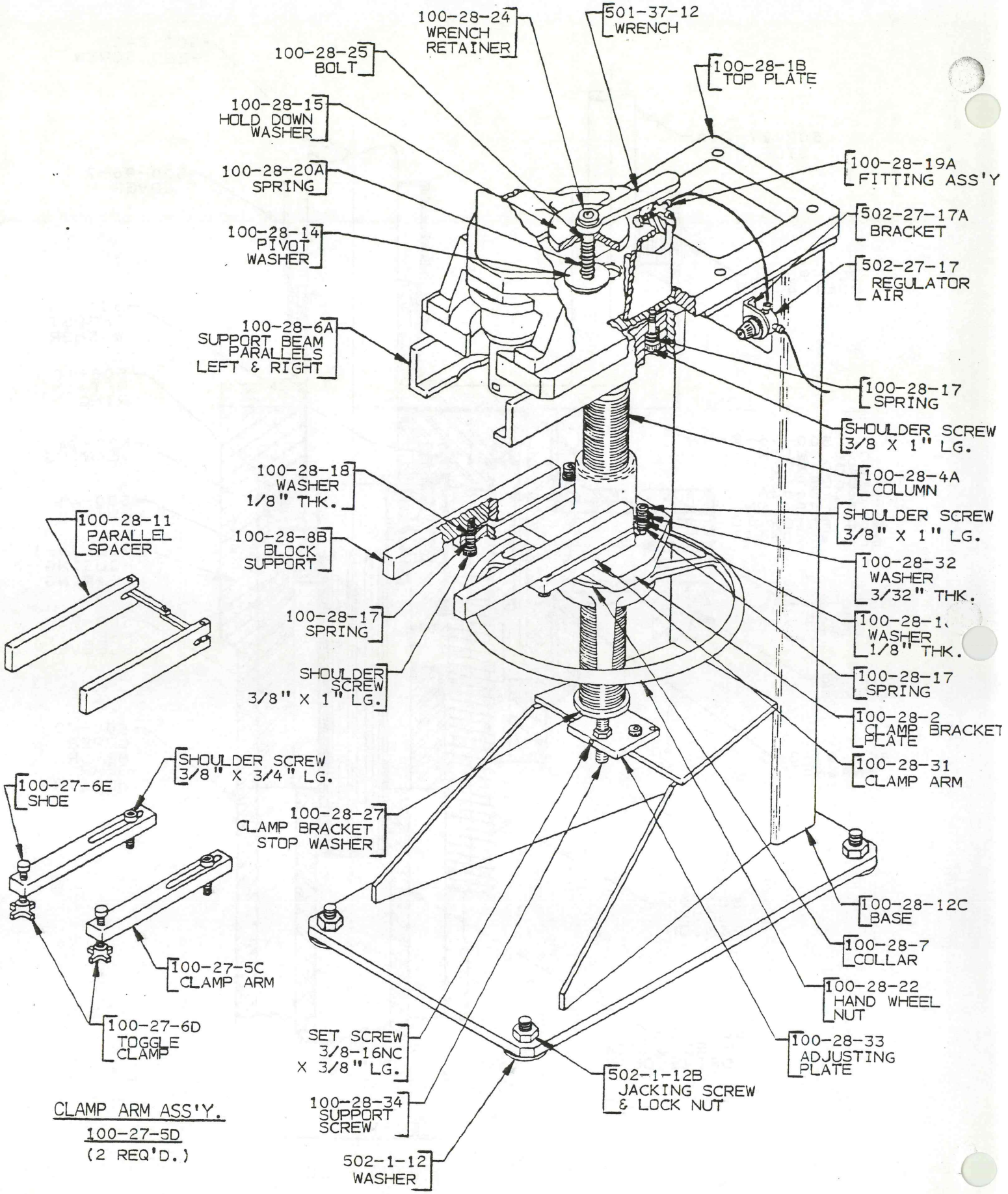
SHIFTING CONTROL

LOWER MOTOR HOUSING



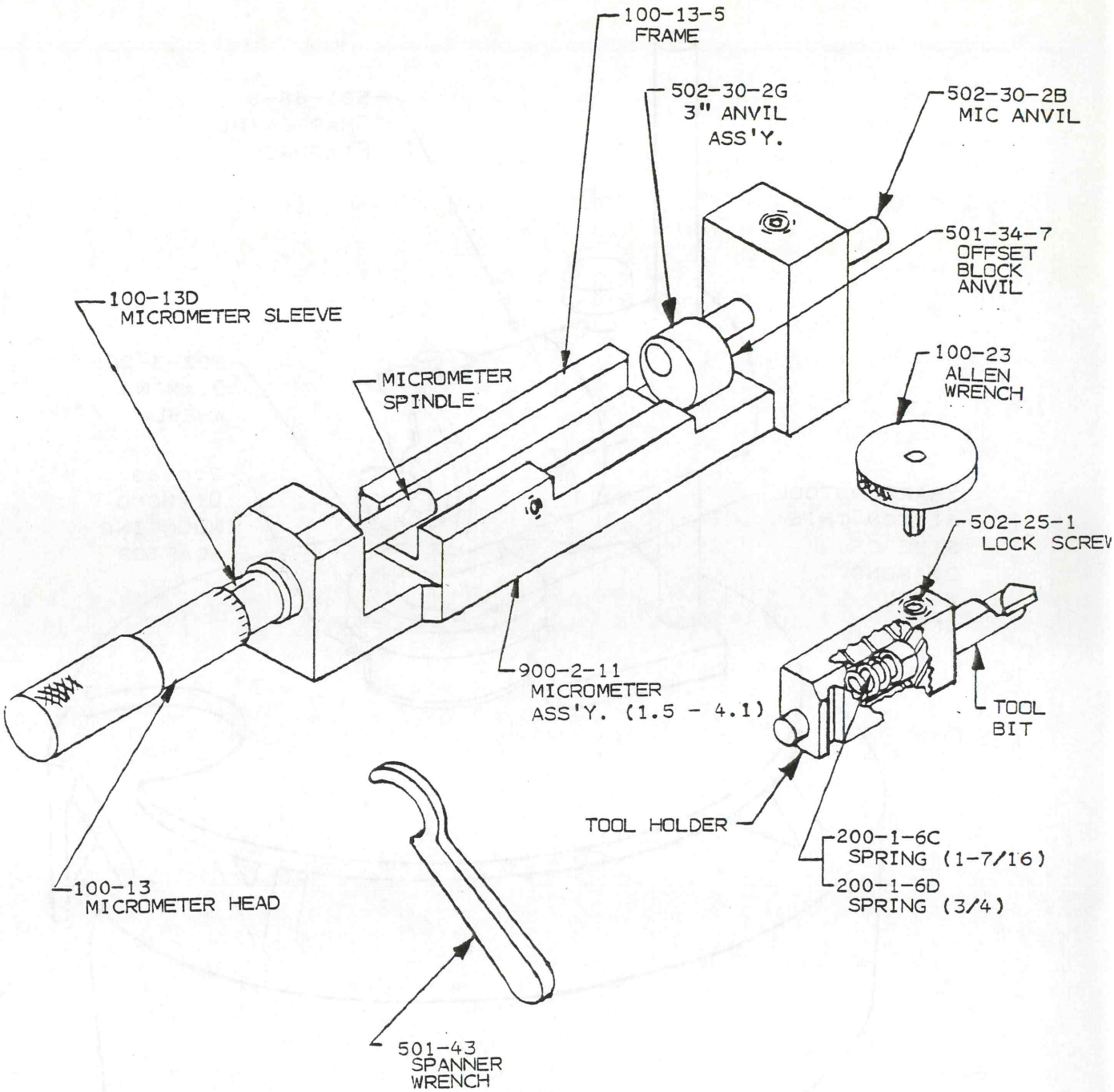
SECTION C-C

HAND FEED

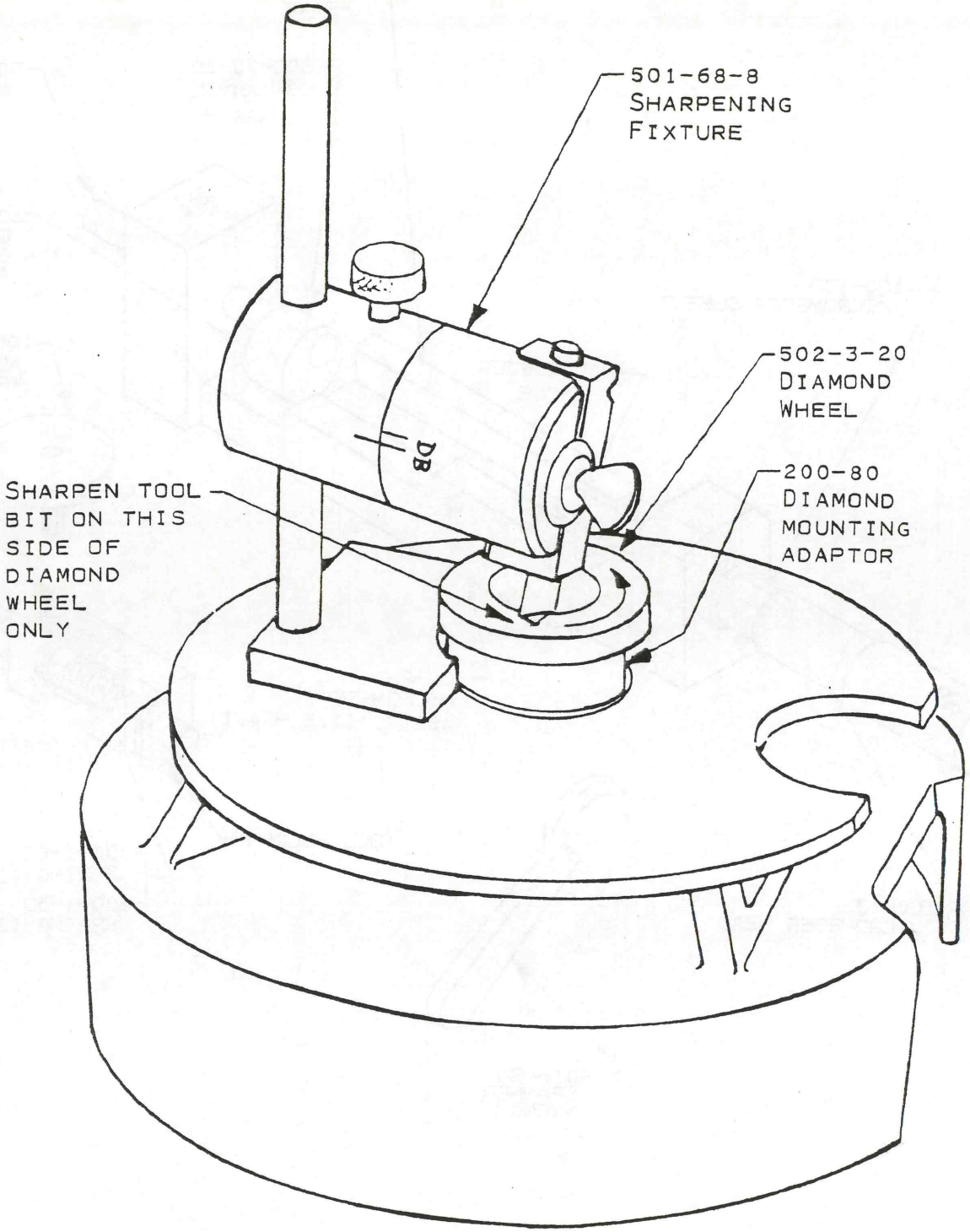


CLAMP ARM ASS'Y.
100-27-5D
(2 REQ'D.)

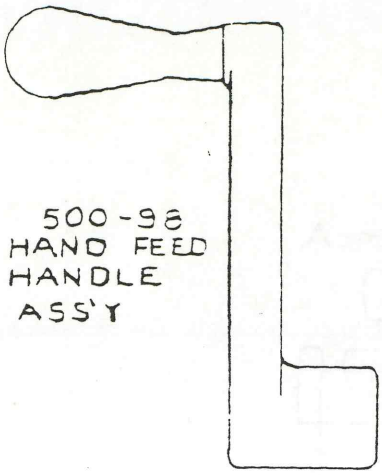
100-28A
BORING STAND


100-13-5
FRAME
502-30-2G
3" ANVIL
ASS'Y.
502-30-2B
MIC ANVIL
501-34-7
OFFSET
BLOCK
ANVIL
100-13D
MICROMETER SLEEVE
MICROMETER
SPINDLE
100-23
ALLEN
WRENCH
502-25-1
LOCK SCREW
900-2-11
MICROMETER
ASS'Y. (1.5 - 4.1)
TOOL
BIT
TOOL HOLDER
200-1-6C
SPRING (1-7/16)
200-1-6D
SPRING (3/4)
100-13
MICROMETER HEAD
501-43
SPANNER
WRENCH

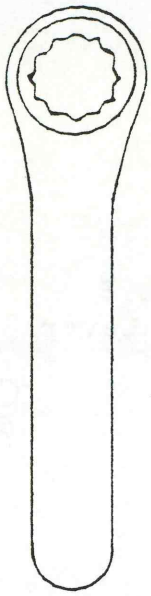
MICROMETER



TOOL BIT SHARPENING



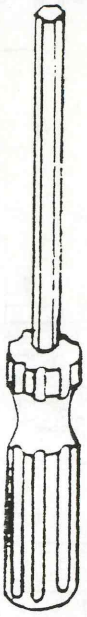
500-98
HAND FEED
HANDLE
ASS'Y



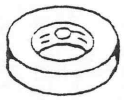
501-37-12
WRENCH

100-24
TOOL
PULLER

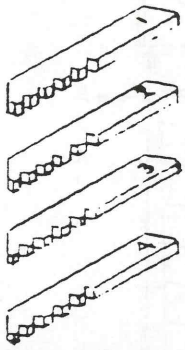
500-62
KEY
MICARTA



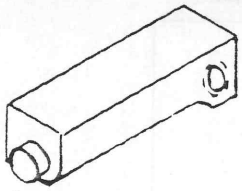
HEX
DRIVER
501-72A $(\frac{5}{32})$
501-72 $(\frac{7}{32})$



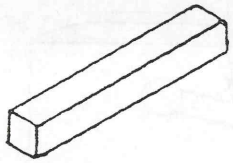
500-41
LOCK NUT
FEED SCREW



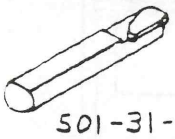
CENTERING
FINGER SET
200-26-1 $(1\frac{3}{8})$
200-26-2 $(2\frac{1}{8})$



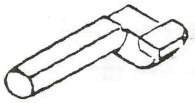
TOOL HOLDER
199-96 $(1\frac{1}{4})$
199-89 $(1\frac{1}{2})$
199-90 $(1\frac{3}{4})$
199-94 $(2\frac{1}{4})$



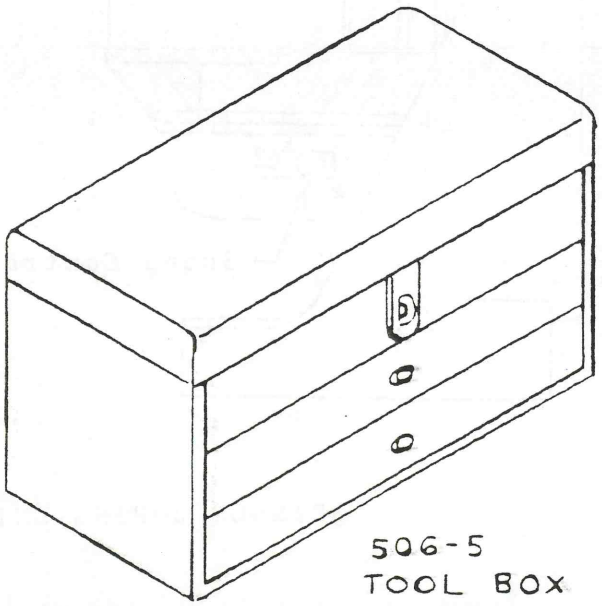
502-3-20A
DRESSING
STICK



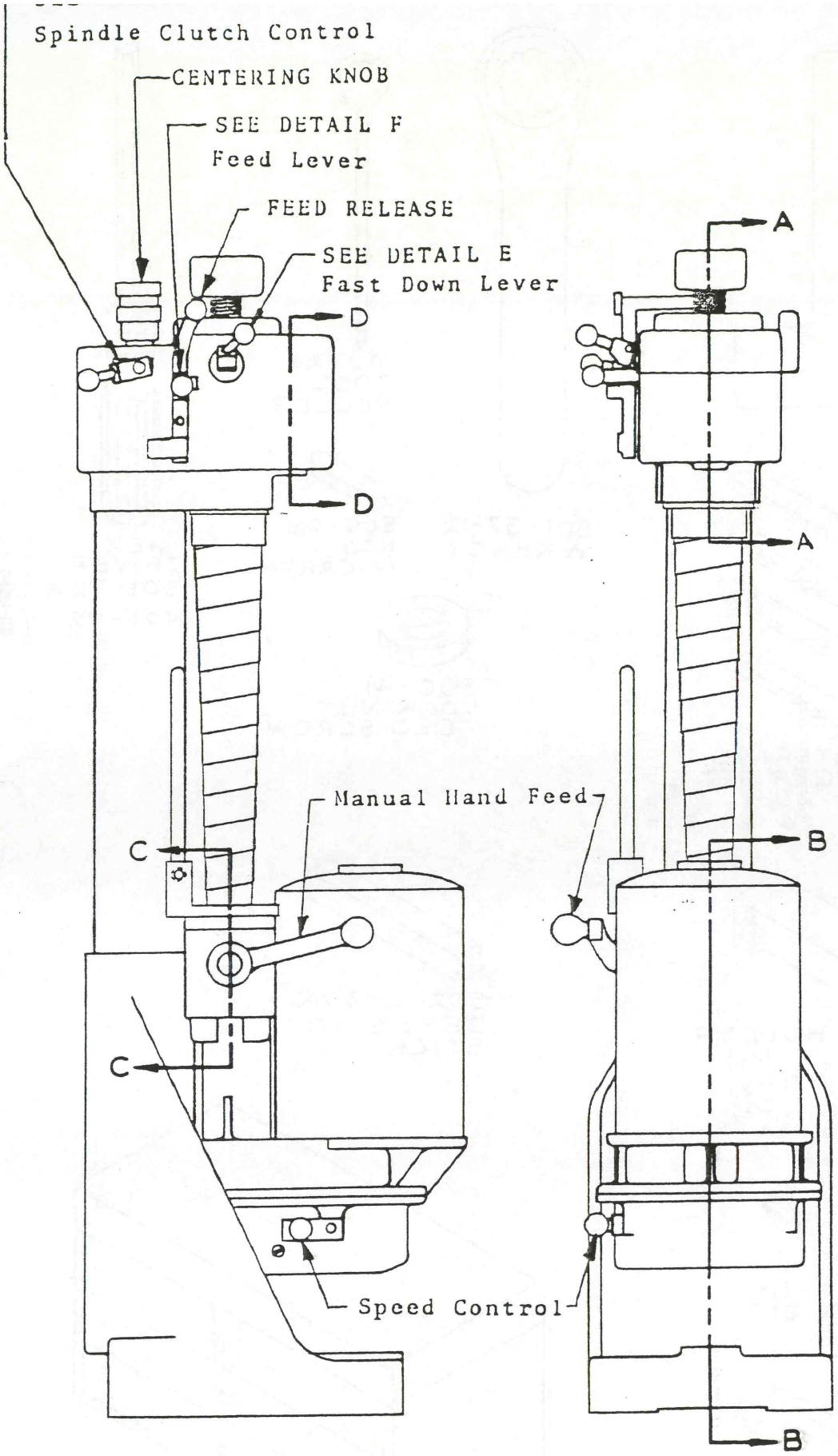
501-31-1
TOOL BIT
R8



100-29
OFFSET
TOOL BIT



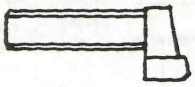
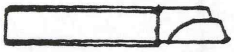
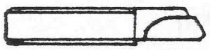
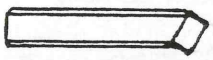
506-5
TOOL BOX

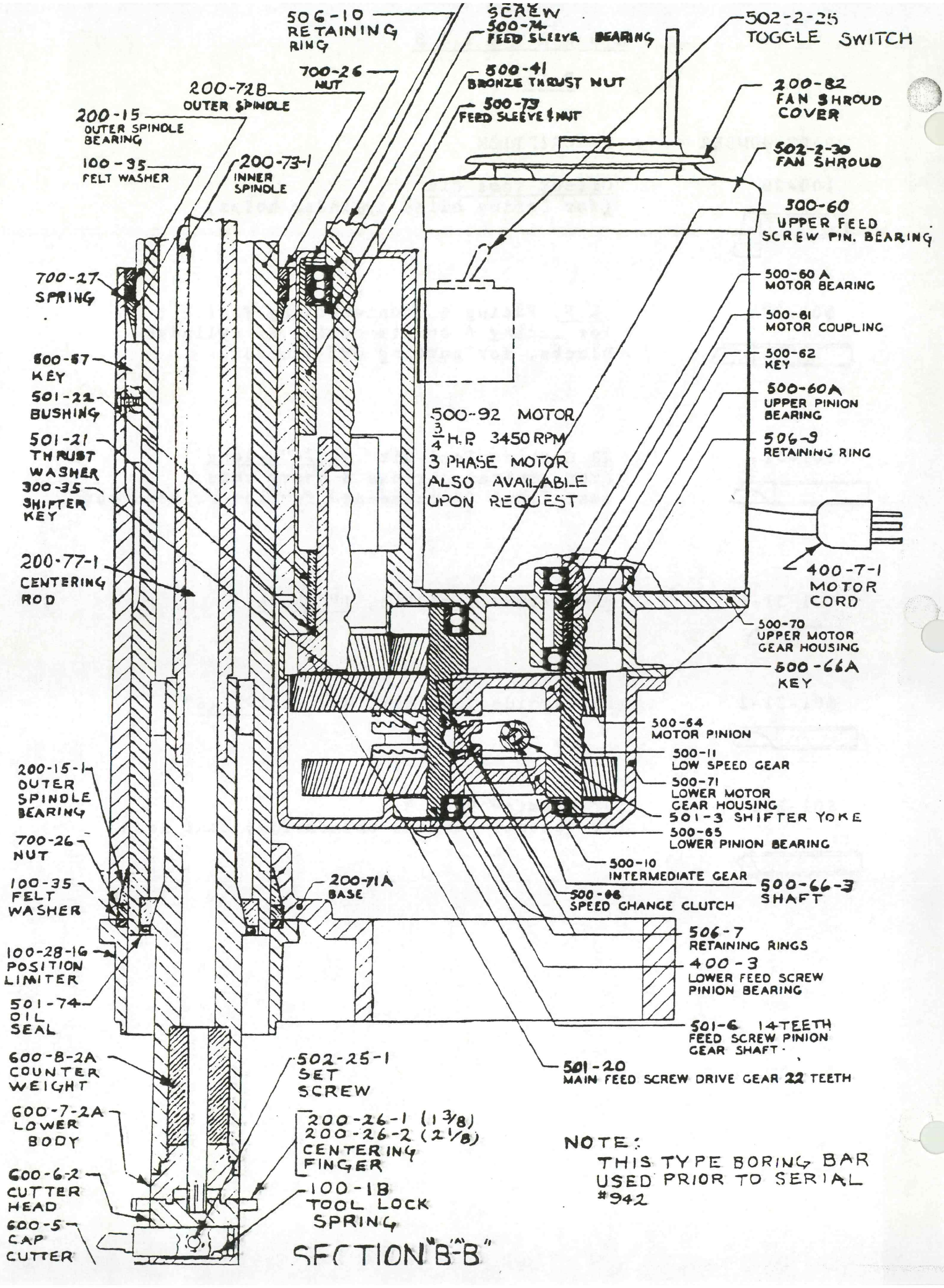


SPINDLE BORING UNIT

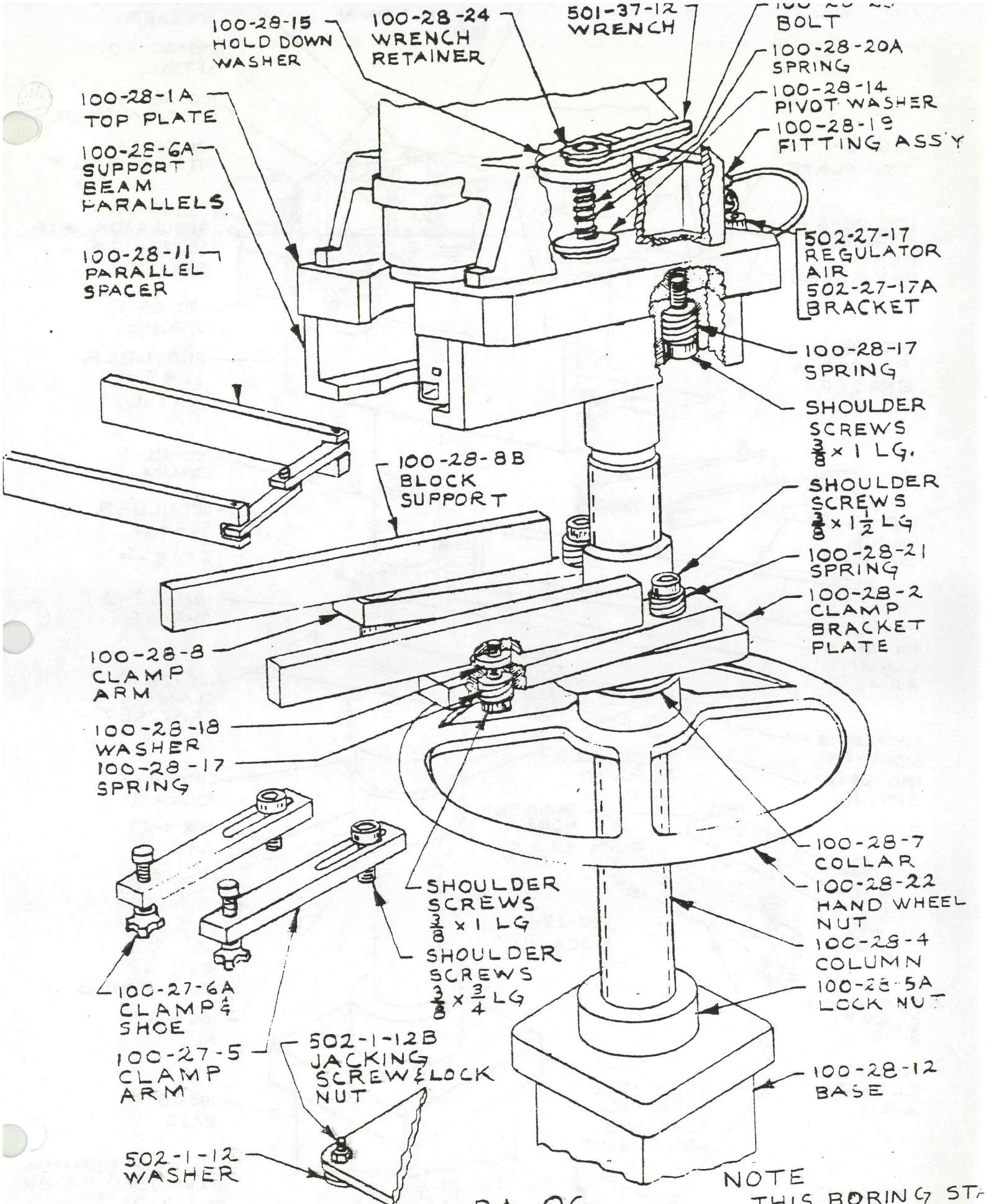
TOOL BITS

D A-

PART NUMBER	DESCRIPTION
100-29 	Offset Tool Bit (for boring blind cylinder holes)
501-29A 	R.F. Facing & Counterboring Tool Bit for facing & counterboring of cylinder blocks, for cutting off sleeve
501-31 	R8 Carbide Tool Bit 1-3/4" long (for general purpose & heavy cuts, cast iron) (Recommended for interrupted cuts)
501-31-1 	R8 Carbide Tool Bit, 1" short
501-31-2 	R8 Carbide Tool Bit, Medium 1-5/16"
501-33D 	30° Chamfer Tool Bit for general purpose chamfering, cast iron



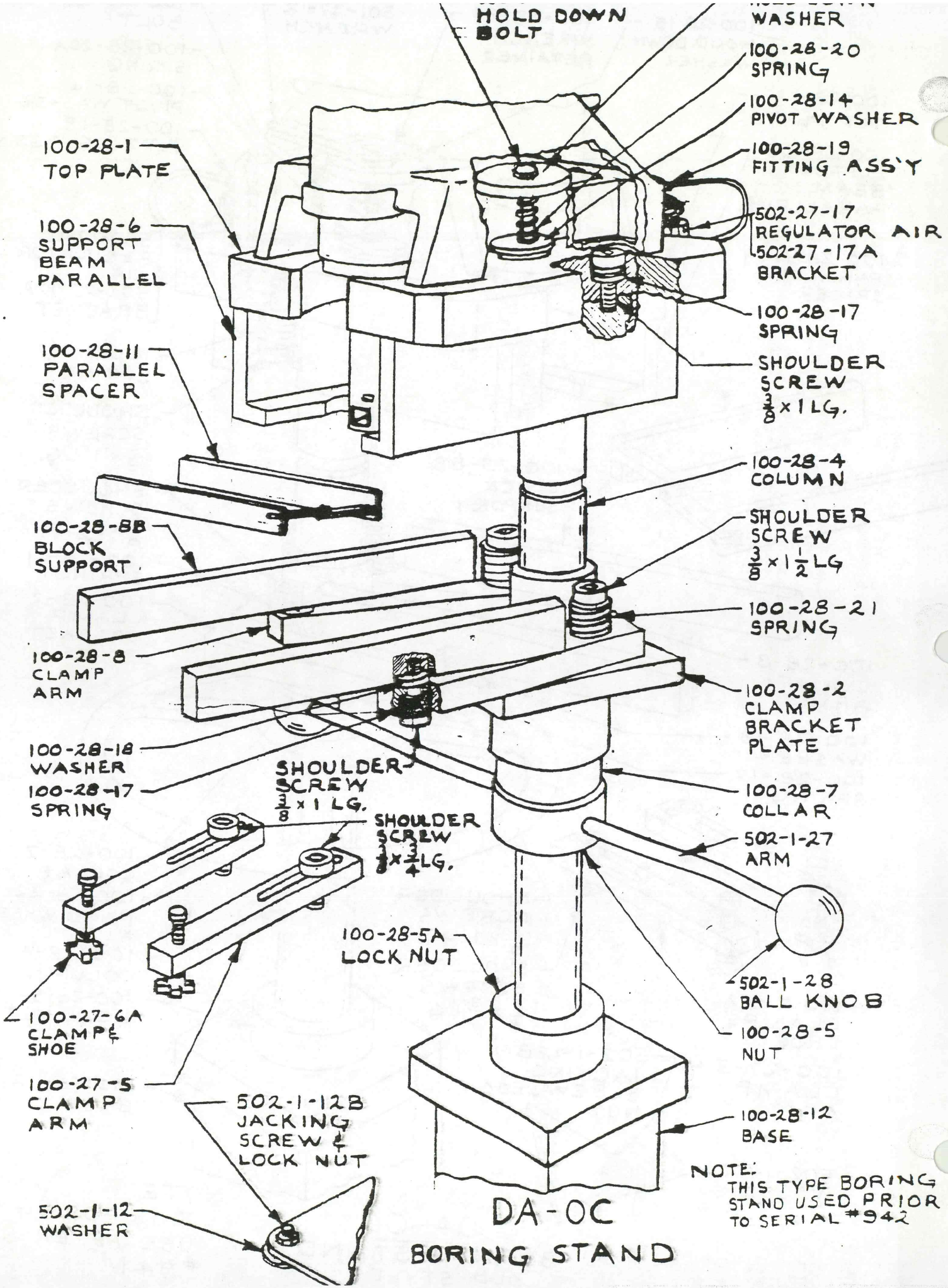
NOTE:
THIS TYPE BORING BAR USED PRIOR TO SERIAL #942



DA-OC

BORING STAND

OLD STYLE


HOLD DOWN BOLT
WASHER
100-28-20 SPRING
100-28-14 PIVOT WASHER
100-28-19 FITTING ASS'Y
100-28-1 TOP PLATE
502-27-17 REGULATOR AIR
502-27-17A BRACKET
100-28-6 SUPPORT BEAM PARALLEL
100-28-17 SPRING
SHOULDER SCREW 3/8 x 1 LG.
100-28-11 PARALLEL SPACER
100-28-4 COLUMN
SHOULDER SCREW 3/8 x 1 1/2 LG
100-28-8B BLOCK SUPPORT
100-28-21 SPRING
100-28-8 CLAMP ARM
100-28-2 CLAMP BRACKET PLATE
100-28-18 WASHER
100-28-17 SPRING
SHOULDER SCREW 3/8 x 1 LG.
100-28-7 COLLAR
SHOULDER SCREW 3/8 x 3/4 LG.
502-1-27 ARM
100-28-5A LOCK NUT
502-1-28 BALL KNOB
100-27-6A CLAMP & SHOE
100-28-5 NUT
100-27-5 CLAMP ARM
502-1-12B JACKING SCREW & LOCK NUT
100-28-12 BASE
502-1-12 WASHER
NOTE: THIS TYPE BORING STAND USED PRIOR TO SERIAL #942
DA-0C
BORING STAND