

**TECHNICAL MANUAL**

**OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT  
AND GENERAL SUPPORT MAINTENANCE  
MANUAL INCLUDING REPAIR PARTS LIST  
FOR**

**DRILLING MACHINE, UPRIGHT, MODEL 22  
(NSN 3413-00-517-1061)**

**BUFFALO FORGE COMPANY  
MACHINE TOOL DIVISION**

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**HEADQUARTERS, DEPARTMENT OF THE ARMY**

**OCTOBER 1980**

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GENERAL SUPPORT MAINTENANCE MANUAL INCLUDING REPAIR PARTS ULST  
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**REPORTING OF ERRORS**

**You can help improve this manual if you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2, located in the back of this manual direct to: Commander, US Army Armament Materiel Readiness Command, ATTN: DRSAR-MAS, Rock Island, IL 61299. A reply will be furnished direct to you.**

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**NOTE**

**This manual is published for the purpose of identifying an authorized commercial manual for the use of the personnel to whom this drilling machine is used.**

**Manufactured by: Buffalo Forge Company  
Machine Tool Division  
490 Broadway  
Buffalo, New York 14204**

**Procured under Contract No. DAAA09-77-C-6267**

**This technical manual is an authentication of the manufacturers' commercial literature and does not conform with the format and content specified in AR 310-3, Military Publication This technical manual does, however, contain available information that is essential to the operation and maintenance of the equipment.**

## INSTRUCTIONS FOR REQUISITIONING PARTS

### NOT IDENTIFIED BY NSN

When requisitioning parts not identified by National Stock Number, it is mandatory that the following information be furnished the supply officer.

- 1 - Manufacturer's Federal Supply Code Number 09519
- 2 - Manufacturer's Part Number exactly as listed herein.
- 3 - Nomenclature exactly as listed herein, including dimensions, if necessary.
- 4 - Manufacturer's Model Number Model No. 22
- 5 - Manufacturer's Serial Number (End Item)
- 6 - Any other information such as Type, Frame Number, and Electrical Characteristics, if applicable.
- 7 - If DD Form 1348 is used, fill in all blocks except 4, 5, 6, and Remarks field in accordance with AR 725-50.

Complete Form as Follows:

- (a) In blocks 4, 5, 6, list manufacturer's Federal Supply Code Number 09519 followed by a colon and manufacturer's Part Number for the repair part.
- (b) Complete Remarks field as follows: Noun: (nomenclature of repair part) For: NSN: 3L13-00-517-1061  
Manufacturer: Buffalo Forge Co.

Model: No. 22

Serial: (of end item)

Any other pertinent information such as Frame Number, Type, Dimensions, etc.

## NO. 22 DRILL

### Round Column Floor Type

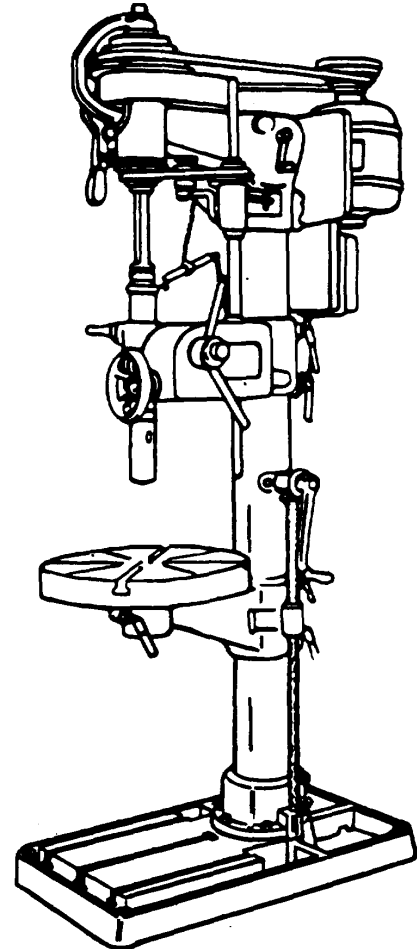
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#### DESCRIPTION

The No. 22 Drill is a motor driven, back.-geared, power-feed drilling machine, capable of drilling, reaming, spot-facing, boring, counter boring, counter sinking and tapping. With the use of special fixtures, certain types of milling can *also* be accomplished.

The rated capacity of the machine is 1¼" drilling in mild machinery steel with a 3 H.P. Motor, but in emergencies, larger holes can be drilled by reducing the feed or by drilling pilot holes.

It is a sliding head, upright type machine, powered by a direct drive from a motor mounted at the rear of the machine. Eight speeds and three feeds are provided; sufficient for drilling practically all materials within the capacity of the machine.



## DETAILED SPECIFICATIONS

### **Drive:**

A vertical motor is mounted on an adjustable bracket at the rear of the machine and drives the spindle pulley thru the V-belt in one of four steps with ample overload capacity at even the lowest speed.

The spindle pulley is mounted on ball bearings and drives thru a clutch direct to the sleeve or thru 6 to 1 ratio hardened steel back gearing.

Back gears are engaged after the direct clutch is disengaged by a single motion of the handle at the left side of the head. In reversing the shift, the gears are disengaged before the direct drive clutch engages.

The eight speeds are in geometrical progression from 65 to 1350 RPM.

The speed range provides for efficient use of drills from 3/16" to 2" and for spot facing. The quick shift from direct to back gear speeds is most convenient for tapping and reaming.

### **Spindle Assembly:**

The spindle is high carbon alloy steel, heat treated and ground. Least diameter 1.312". It runs in bronze bushings and is mounted between two ball thrust bearings. Rack teeth are cut integral in the sleeve.

### **Sliding Head:**

Sliding head is a single rigid casting. Quick, easy adjustment is assured by the rack in the column. The bearing of the rack sleeve is unusually long to reduce wear and also give accurate long life.

### **Feeding Mechanism and Control:**

Feed power is taken off the spindle by a V -belt drive, providing 3 rates of feed.

Feed is automatically released at proper depth by the lever on the left side of the head. Hand advance or return is accomplished by the swing levers at right side which also engage power feed in one motion. Clutches are positive, multiple tooth, guarded by an overload shear pin. Slow advance for spot facing is produced by the handwheel at the front.

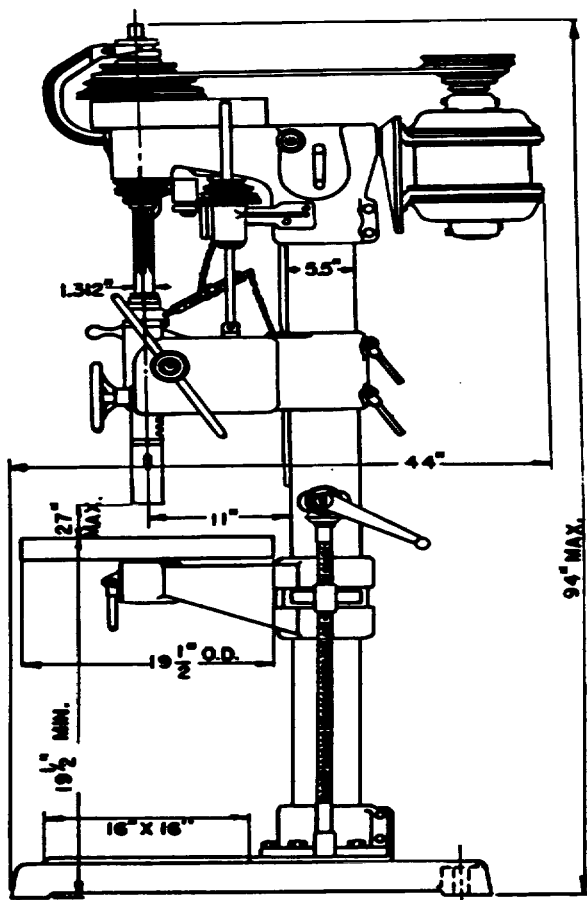
All feed gearing is in constant mesh, silent, and enclosed in the head. Gearing runs in a bath of oil. The rack and pinion ratio is such that for small drills, a direct hand feed by the swing lever makes this machine as convenient as a sensitive drill. The spindle is counter-balanced and may be adjusted to return after the feed is released.

### **Column:**

The column is steel, ideal for high strength and small deflection, ground to high finish and accuracy.

### **Table and Base:**

Tables are heavily ribbed, provided with T-slots, and carefully fitted and scraped to fine bearing on supporting members.



**GENERAL SPECIFICATIONS**

Capacity-center spindle to column .....	11"
Maximum distance, spindle nose to base .....	43"
Minimum distance, spindle nose to base .....	26"
Maximum distance, spindle nose to table .....	0 to 27"
Minimum distance, table to floor.....	19 1/2"
Range adjustment of sliding head .....	10"
Range adjustment of table .....	20"
Travel of spindle with depth stop .....	7 1/2"
Travel of spindle without depth stop.....	8 1/2"
Working surface of base .....	16" x 16"
Working surface of table .....	19.50" O.D.
Column diameter- (steel).....	5.5"
Feeds-standard-per rev.....	.004-.009-.014
Speed-standard .....	65-96-150-230-400-575-900-1350
Motor .....	1, 2 or 3 H.P., 1200 RPM
Spindle-least diameter.....	1.312"
Spindle-nose.....	2.50"
Spindle-sleeve .....	2.50"
Spindle nose bored for More Taper.....	No. 4
Height spindle in raised position.....	94"
Floor space including overhangs .....	23"x44"

## INSTALLATION

The weight of the No. 22 Drill and dimensions of its base are such that a floor load of approximately 275 pounds is created. While this load is well within the prescribed limits of safety codes, it is well to consider that the load cannot be considered wholly as a dead load because of vibration. If the machine is set on a ground floor, the customary concrete foundation should be used. Dimensions of such a foundation are totally dependent on the nature of soil and climatic conditions. In general, a foundation whose upper dimension measures six to eight inches larger, on all sides, than the base is sufficient. It may have vertical sides but tapered sides are preferable, so that they act as an anchor. Generally speaking, the depth of foundation for this machine should be in the neighborhood of 2 feet and should be steel reinforced. The foundation bolts may be set securely when the concrete is poured.

Installations on concrete or composition floors should place machinery either directly over, or as near to as possible, a steel supporting member so that vibration will be minimized and stress imposed will be direct. Lag screws and shields are sufficient to hold the machine securely.

Installation on wooden floors should, in general, follow the procedure outlined above as regards placing the machine. When not practical to do so, auxiliary members should be added to the floor structure so that the weight will be distributed over a larger number of floor beams.

The base has four 9/16" cored holes for receiving 1/2" foundation bolts or lag screws.

When installing the machine, care should be taken that sufficient clearance is left all around for maintenance and repair. The machine should be set level and the foundation shimmed if necessary to assure equal pressure being applied to all 4 bolts.

After the machine is installed certain precaution should be taken to insure proper operation. The machine has been coated with a rust preventative which must be carefully and completely removed. Special care should be taken to clean the spindle splines thoroughly, and the Morse taper socket of the spindle nose. Have the electrical connections checked by a competent electrician. Make certain that all grease is removed from pulleys and belts, and that the main drive belt is not too tight.

### **Starting and Stopping:**

A momentary contact push button station, which closes the magnetic control circuit, is mounted on the left hand side of the sliding head, within easy reach. Before starting the machine make sure that power feed is disengaged. Do not commence work until motor has come up to full speed.

The machine is stopped by pressing the "stop" button on the push button station. Except in emergencies, the machine should not be stopped with the tool still in the work. Always move the clutch lever and feed handle to "out" position when stopping the machine.

## **GENERAL OPERATING DETAILS**

The No. 22 Drill is designed to fulfill the requirements of a medium capacity machine and to give a maximum of service with a minimum of maintenance and repair. Simplicity of design and operation are evidenced, consistent with the best engineering principles.

The machine can be briefly described as follows: The motor, fitted with a 4-step pulley and mounted on an adjustable bracket, drives the spindle assembly through the medium of a V -belt. The spindle assembly can be either driven direct or through back gears. This change is made by the back gear shift lever, which when disengaging the back gears, engages a direct drive clutch and vice versa.

The power feed take-off pulley is mounted on the spindle pulley sleeve and through a V belt drives a second pulley which in turn is direct-connected to worm in the sliding head gear case.

This worm drives the main worm shaft which in turn drives the main worm gear, attached to the feed pinion through a hardened steel clutch.

The main worm shaft worm gear (driven by the first mentioned worm) is fitted with a hardened steel-toothed clutch, actuated by the knockout lever on the left side of the sliding head, and which is either actuated manually or can be tripped at a predetermined depth by the depth stop collar mounted on the spindle feed sleeve. The main feed worm revolves freely on the feed pinion shaft until engaged with the hardened steel clutch, which is moved into clutching position by feed handle. The handwheel at the front of the sliding head is used for fine feed, spot facing, etc., and is operated with the feed engaged at the feed handle, but disengaged at the knock-out lever clutch.

Before drilling with the machine, care should be taken to make sure that the spindle is running at the proper speed and the feed is correct. Set the depth stop for the proper feed depth and engage the power feed by raising the knock-out lever to its up position. Advance the drill to the work and engage the feed clutch by breaking the feed handle to the out position. The feed will automatically knock off when the stop collar strikes the knock-out lever or the feed can be interrupted at any part of its travel by disengaging the knock-out lever.



## SPECIAL OR SPECIFIC OPERATING INSTRUCTIONS

The spindle nose is fitted with a No. 4 Morse taper socket. To use twist drills having a No. 3, No. 2, or No. 1 shank, a sleeve must first be inserted into the spindle nose. Be sure both sockets are clean and free from dirt or they will not grip. When using straight shank drills, a chuck and arbor is used. Be especially careful that both spindle socket and arbor are clean before using chuck. Place chuck and arbor in socket and with chuck jaws drawn down inside of chuck body, strike chuck a smart blow with wooden block or babbitt hammer.

Before drilling any material, check to make sure the drill is correctly ground-the proper speed is set, and the work to be drilled is securely fastened.

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## TWIST DRILL FAILURES AND THEIR CAUSES

### 1. **Drill Breakage:**

Caused by-Lack of lip clearance.

- Speed too slow.
- Dull drill.
- Back lash in work or machine.
- Flutes clogged (usually found in brass and wood).

### 2. **Broken Tang:**

Caused by-Imperfect fit of taper shank. May be caused by nicks, dirt, burr or worn-out socket.

### 3. **Chipping of lip or cutting edge:**

Caused by-Too much pressure.

- Too much lip clearance.

### 4. **Oversize Hole:**

Caused by-Unequal angle of point.

- Unequal length of cutting edge.
- Loose spindle.

### 5. **Rough Hole:**

Caused by-Dull drill.

- Improper grind on drill.
- Wrong or lack of lubricant.
- Too much pressure.

## FEED AND SPEEDS FOR DRILLS OF HI-SPEED STEEL

The following table covers speeds for most materials and in sizes within the capacity of the machine. The ratings are based on the use of hi-speed drills. For carbon drills use speeds about one-half those listed.

Size of Drill, Inches	Feed per Revolution, Inches	Cast Steel	Alloy-Steel Drop-	Tool and Carbon-Steel Drop-	Hard Cast Iron	Malleable Iron	Mild Steel	Cast Iron	Bronze Brass
		Feet per Minute							
		40	50	60	80	90	100	110	200
		Revolutions per Minute							
1/16	0.003	2,445	3,056	3,667	4,889	5,500	6,112	6,724	12,224
3/32	0.0035	1,628	2,038	2,442	3,258	3,666	4,584	5,043	9,168
1/8	0.004	1,222	1,528	1,833	2,445	2,750	3,056	3,362	6,112
5/32	0.0045	976	1,221	1,465	1,954	2,198	2,546	2,802	5,092
3/16	0.005	815	1,019	1,222	1,630	1,833	2,036	2,242	4,072
7/32	0.0055	698	872	1,047	1,396	1,570	1,781	1,962	3,564
1/4	0.006	611	764	917	1,222	1,375	1,528	1,681	3,056
9/32	0.0065	542	678	814	1,084	1,222	1,375	1,513	2,750
5/16	0.007	489	611	733	978	1,100	1,222	1,344	2,444
11/32	0.0075	444	555	666	888	1,000	1,120	1,233	2,290
3/8	0.008	407	509	611	815	917	1,018	1,121	2,036
13/32	0.0085	376	469	563	752	846	946	971	1,892
7/16	0.009	349	437	524	698	786	874	921	1,748
15/32	0.0095	326	407	488	652	732	819	881	1,638
1/2	0.010	306	382	458	611	688	764	840	1,528
9/16	0.0105	271	339	407	543	611	679	747	1,358
5/8	0.011	244	306	367	489	550	612	673	1,224
11/16	0.0115	222	277	333	444	500	555	611	1,110
3/4	0.012	204	255	306	407	458	508	559	1,016
13/16	0.0125	188	234	281	376	423	474	521	948
7/8	0.013	175	218	262	349	393	438	482	876
15/16	0.0135	163	203	244	326	366	407	448	814
1	0.014	153	191	229	306	344	382	420	764

All materials can be drilled dry if care is taken not to force the drill. If a drill starts to smoke when dry drilling, it should not be forced further but eased until excess smoking stops. When drilling with lubricant, the smoke arising from the chip is that of the oil and (I doesn't indicate in- jury to the drill.

The following cutting oils are suitable under most conditions:

- |    |                      |                                  |
|----|----------------------|----------------------------------|
| 1. | Hard steel .....     | Turpentine, Kerosene-Soluble Oil |
| 2. | Soft steel .....     | Lard Oil, Soluble Oil            |
| 3. | Malleable iron ..... | Soluble Oil                      |
| 4. | Cast iron .....      | Dry-or air jet                   |
| 5. | Brass .....          | Dry                              |
| 6. | Aluminum .....       | Kerosene or Soluble Oil          |

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### OPERATION UNDER ABNORMAL CONDITIONS

If the machine is operated under extremely dusty conditions, it should be run at lowest possible speed. This will prevent, to some extent, rapid abrasive wear on exposed parts. At frequent intervals it may be necessary to clean exposed parts thoroughly.

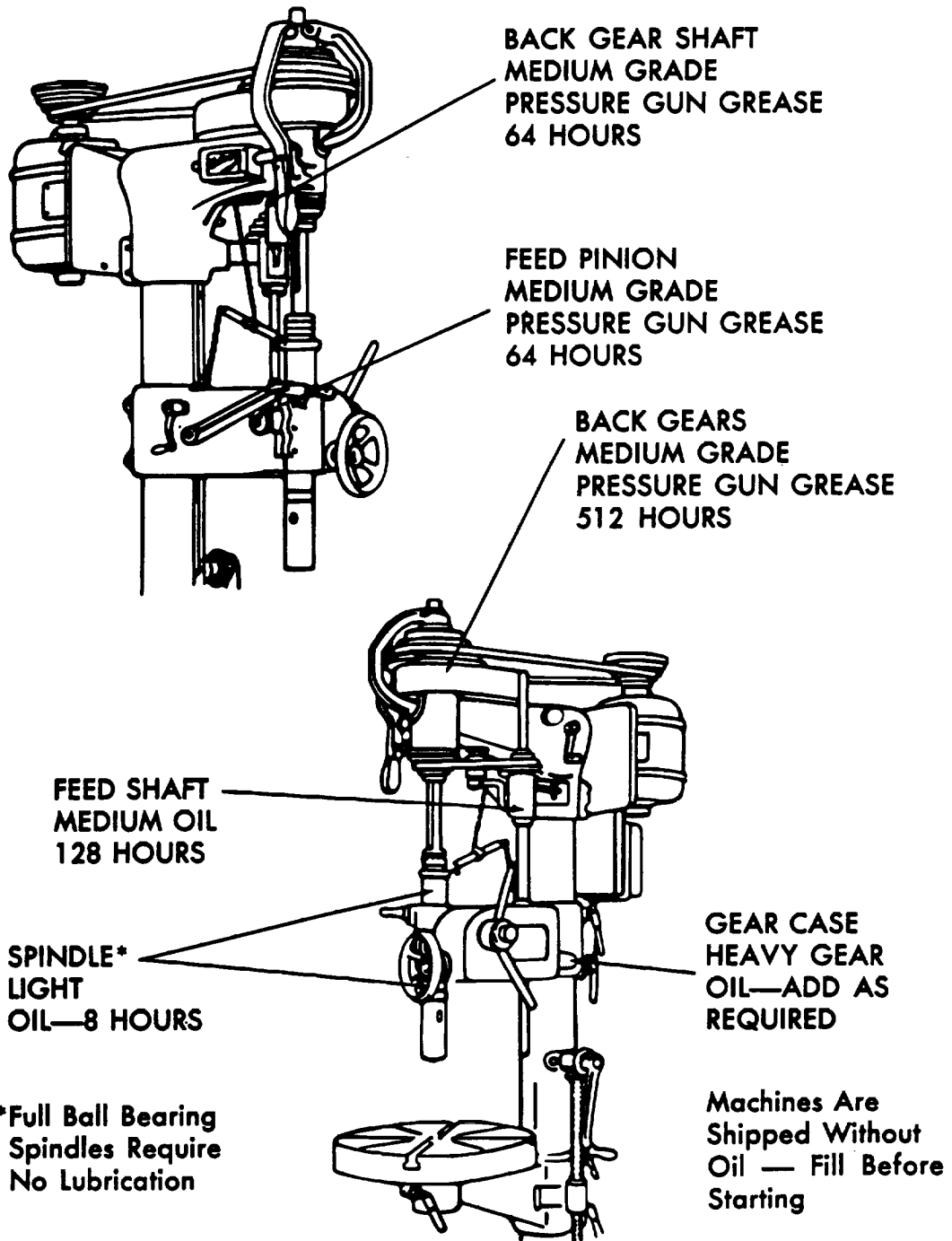
Operation under extreme cold conditions requires no other precautions than to start the machine on lowest speed and increase the speed as the operation parts become warmer and grease is unfrozen. Care should be taken to prevent shock loads which might break extremely cold steel members.

Operation in extreme heat will not affect the machine, but extreme heat may cause the motor to overheat. The only remedy for this condition is to allow the motor to cool off whenever possible.

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### SHIPPING

Whenever possible, the machine should be shipped in an upright position so that oil in the power feed gear box and grease in back gear case will not leak out; if shipped in any other position it is advisable to drain oil and grease from both power feed and back gear cases. When preparing the machine for shipment, lower the sliding head to its lowest position. Lower the spindle to lowest position and lock it with clutch lever and feed handle. With the sliding head and spindle in this position, the counterweight will be on the shortest possible length, thus preventing the weight from dropping, due to slack chain. The crating or boxing should have a cross member on top of the sliding head and across the clutch lever. The table should be raised until even with the bottom of the spindle nose.



**Daily Adjustments or Maintenance**

It is considered good practice to clean and inspect the machine daily. This practice may lead to detection of minor matters which if not corrected may result in major maintenance or repair.

## NO. 22 DRILL DISASSEMBLY

### A. To Disassemble Back Gear Clutch

Loosen adjusting screws # 10890 on each side of yoke of lever # 10911, that hold the bronze shoes # 10912 in place. The clutch spool # 10909 can now be lifted off the spindle pulley sleeve # 10897-A 1. Remove clutch bracket # 10910 from front of frame, and rack housing # 10914 from left side of frame. Remove the 2 keys # 10972-A from spindle sleeve.

### B. To Remove Drive Belt and Spindle Pulley.

Remove back gear clutch per paragraph A. Loosen locking screw # 11828-1 and rack motor bracket back to frame by turning crank # 10981. Remove drive belt from pulleys. Raise spindle pulley #10906 off of spindle pulley sleeve #10897-A1 and remove drive gear #10901 and #10902 from bottom of pulley which is fastened with 41/4" fillister head cap screws. The ball bearings and ball bearing spacer #3D-1107-2 can now be pressed out of the spindle pulley.

### C. To Remove Back Gears

Remove back gear clutch per paragraph A and spindle pulley per paragraph B. Remove cover plate # 10920. Remove gear and pinion #10903-1 and 10904-1 from eccentric shaft #10917. Press bronze bushing # 10905 out of pinion # 10903-1. Remove engaging rack housing from left side of frame. Lift eccentric shaft #10917 out of frame. Remove gear #10900 from spindle pulley sleeve # 10897-A1. Back gear guard #4D-2201 can now be removed from top of frame.

### D. To Remove Spindle

Raise sliding head to its highest position. Swing table # 10510 to left to clear spindle. Loosen set screw in collar #3D-3681-1, holding spindle to prevent it from falling when set screw is loosened. Spindle may now be lowered out of the spindle pulley sleeve # 10897-A1 and out of spindle sleeve #10934.

### E. To Remove Spindle Pulley Sleeve and Bearings

Remove back gear clutch per paragraph A, spindle pulley per paragraph B, back gears per paragraph C and spindle per paragraph D. Remove power feed belt. Remove nut # 10899 and pulley # 10494 from end of sleeve. Take off spacer #3D-I 106-2. Take off bearing cap #3D-1104PI from top of frame. The spindle pulley sleeve # 10897-A1 and ball bearings can now be removed from frame.

### F. To Disassemble Power Feed Take-Off Mechanism

Remove spindle as per paragraph D. Lower sliding head to its lowest position. Remove feed belt from step pulleys. Remove nut # 10899, pulley # 10494 and spacer #3D-1106-2 from lower end of spindle pulley sleeve # 10897-A1. Remove pulley bracket # 10921-P1 from frame and lift over feed shaft.

Remove idler pulley #3D-3946-1 by taking off nut from stud #10928-1 and removing stud bracket # 10925. Take out wire ring and remove ball bearing and stud from pulley #3D-3946-1. Take off collar #10922 from bracket. Take out wire ring #10962 from pulley # 10493 and remove sleeve and bearing from pulley. Idler pulley bracket #10925 can now be taken off of the main bracket # 10921 -P 1.

#### **G. To Remove Spindle Sleeve**

Lower sliding head to its lowest position and insert a 3/16" drill rod pin through the counterweight chain to prevent the counterweight from dropping. Remove pin from counterbalance bar #10554. Remove hook #3D-4605-1 from sleeve. Remove screw #10942 from depth stop collar : 10941 and take collar off sleeve. Remove collar # 10562 from feed pinion # 10955. Hold sleeve to prevent it from dropping and remove feed pinion assembly from right hand side of sliding head. Bushings # 10935 can now be removed from spindle sleeve if necessary.

#### **H. To Remove Feed Pinion and Disassemble Power Feed Clutch (Without removing spindle or spindle sleeve)**

Remove nut # 10571 from right hand side of feed pinion # 10955. Lever block # 10568 can now be removed from shaft. Levers # 10959-A can be removed from block by driving out the 25/16" pins on each side of block. Remove cover #10960 from gear case. Remove clutch spool # 10567-A, spring # 10634, worm gear # 10957-B and washer # 10958 from shaft. Insert a 3/16" drill rod through counterweight chain close to underside of frame. Remove collar #10562 from left side of feed pinion and remove feed pinion from right hand side.

#### **I. To Remove Power Feed Gearing**

Remove nut # 10571 from feed pinion on right side of sliding head. Remove block # 10568 and spool #10567-A from feed pinion. Remove cover #10960 from sliding head, and cover # 10954 from back of sliding head. Remove spring # 10634, worm wheel #10957-B and washer #10956 from feed pinion shaft. Loosen setscrew on lever # 10949 then remove knockout lever #10951 and shaft #10950-1 from left side of sliding head; Take out pin #10952 and spring #10649 from hole under knockout plate. Remove small worm #10946 by loosening setscrew in worm and raising feed shaft #3D-4404-1. Loosen setscrews in worm gear #10947 and worm #11329 then remove handwheel #10973 and shaft #10948 from front of sliding head.

## INSPECTION OF PARTS

Part No.	Name of Part	Inspect For
10566-1	Clutch disc.....	Worn or broken clutch teeth
10567-A	Clutch spool.....	Worn or broken clutch teeth
10568	Clutch block.....	Excessive wear in bushings # 10959-A
10576	Feed clutch.....	Worn or broken clutch teeth or worm splines
10578	Shifter fork.....	Excessive wear on fingers
10649	Spring.....	Broken or lost compression
10890	Screws.....	Good fit of dog point in bronze shoes #10912
10897-A1	Spindle pulley sleeve.....	Worn or broken edges of internal spline
10900	Spindle gear.....	Worn or broken teeth
10902-1	Drive gear.....	Worn or broken teeth
10903-1	Combination gear.....	Worn or broken teeth
10904-1	Pinion.....	Worn or broken teeth
10905	Bushing.....	Good running fit on 1 1/4" shaft
10908-1	Clutch.....	Broken edges on clutch teeth
10909	Clutch spool.....	Broken edges on clutch teeth
10912	Bronze shoes.....	Worn less than 9/16" thick
10913-1	Engaging rack.....	Worn or broken rack teeth
10914	Rack housing.....	Excessive wear in holes for rack #10913
10916	Gear.....	Worn or broken teeth
10917	Eccentric.....	Worn or broken gear teeth, scored or excessive wear on 1.248" dia.
DO204.2-D5	Fiber washer.....	Excessive wear beyond 1/8" thick
10921-P1	Bracket.....	Excessive wear in 1.5625" bored hole
10922-1	Sleeve.....	Wear on 1.561", 1.563", or 1.1807" Diameters
10926	Spring.....	Broken ends
3D-39461	Idler pulley.....	Worn or loose ball bearing fit
4D-4576-2	Mounting for motor.....	Broken rack teeth
3D-3720-1	Spindle.....	Straightness, worn splines, scored Morse Taper socket
10934	Spindle sleeve.....	Worn bronze bushings # 10935
10946	Worm.....	Worn threads
10947	Worm wheel.....	Worn or broken teeth
10949	Lever for fork.....	Excessive wear in .500" hole
10952	Pin.....	Worn dog point
4D-4581-1	Pinion.....	Worn or broken teeth
10955	Feed pinion.....	Worn or broken teeth, worn spline, excessive wear on .998" diameter
10957-B1	Worm wheel.....	Worn or broken teeth
10966-1	Knockout lever.....	Broken knife edge
10968	Locking pin.....	Worn edges on dog point
10969	Spring.....	Broken or lost compression
10974	Clutch disc.....	Worn or broken clutch teeth
4D-4581-2	Pinion.....	Worn or broken teeth
11069-1	Gear.....	Worn or broken teeth
11080	Miter gear.....	Worn or broken teeth
11329-1	Worm.....	Worn threads
3D-1259	Loading spring.....	40 lbs. Compression

## NO. 22 DRILL ASSEMBLY

### A. To Assemble Power Feed Gearing

Insert spring #10649-A and pin #10952 in hole in left side of sliding head. Insert knockout lever shaft # 10951 through hole from left side of sliding head, with lever in its low position.

Insert worm gear shaft #10948 through hole in front of sliding head holding worm gear #10947, worm #11329 and keys in place. Fasten handwheel #10973 on shaft in front of sliding head. Fasten small worm wheel # 10947 in place on shaft. Assemble lever #10949 on shaft # 10950-1 with clutch # 10576 and fork # 10578 in place. Fasten lever # 10949 on shaft # 109501 and tighten setscrew. Replace cover #10954 over hole in back of sliding head using a new gasket. Hold worm #10946 in place, with OAK thrust bearing and spacer. Lower shaft #3D-1257 through worm.

Hold spindle sleeve #10934 in place and insert feed pinion through right side of sliding head. Adjust collar # 10562-1 on feed pinion to prevent end play of shaft. Washer # 10958, large worm gear #10957-B1, spring #10634 and clutch spool # 10567-A should then be put on feed pinion shaft in the order written. Replace gear case cover # 10960 using a new gasket with shellac. Put lever block #10568 on shaft and adjust with nut # 10571 so that clutch teeth do not strike when levers #10959-A are in their neutral position (90° from shaft). After assembling and testing, fill gear case to level of hole in cover # 10960 with the correct grade of grease. (Refer to lubrication.)

### B. To Assemble Spindle Pulley Sleeve and Bearings

Fasten bearing retainer #3D-1104-Pi to bottom of frame. Assemble (2) #WC-88510 ball bearings and spacer #3D-1105-2 on threaded end of spindle, and insert through top of frame having a loading spring #3D-1259 between lower bearing retainer and bearing. Fasten bearing retainer #3D-1104-P1 to top of frame having a loading spring between bearing and retainer.

### C. To Install Power Feed Take-Off Mechanism

Place bearing spacer #3D-1106-2 over spindle sleeve having the tapered end of spacer next to the bearing. With the key in place put take-off pulley # 10494, with the large step up, on sleeve. Tighten nut # 10899 on end of sleeve # 10897-A 1. Press ball bearing # 88506 into pulley # 10493 and insert snap ring #10962 in place. Press sleeve #10922-1 into bracket #10921-P1 and press pulley and bearing on top of sleeve.

With the sliding head in its lowest position slide the bracket and sleeve over the feed shaft #3D4404-1 being sure that key #10963 is in place in the pulley. Fasten bracket #10921-P1 to frame.

Insert ends of spring # 10926 into holes provided in brackets # 10921-P1 and # 10925. Assemble brackets together and fasten collar # 10923 on end of sleeve. Press bearing #5503 on stud #10928-1, then press bearing into pulley #3D-3946-1, pack pulley with grease, and insert snap ring in pulley. Place washer # 10929-A on stud with the small diameter next to the bearing and fasten stud in bracket # 10925.



Place take-off belt on pulleys so that the idler pulley is on the left hand side of drive.

**D. To Install Spindle**

Raise sliding head to its highest position and have table swung to the left of column. Press ball bearing #10999 on spindle and insert spindle through sleeve #10934. Place bearing #10936 over end of spindle, and collar #3D-3681-1 over spindle, and raise spindle through frame. Adjust collar #3D-3681-1 so that spindle turns freely with no end play in spindle sleeve #10934.

**E. To Assemble Back Gears**

Insert eccentric # 10917 through top of frame. Fasten gear guard #4D-2201 to top of frame. Key gear # 10900 to spindle sleeve # 10897-A1, being sure that hub of gear is down on shoulder of sleeve. Assemble gear # 10903-1 and pinion # 10904-1 on bushing # 10905. Press in place on eccentric # 10917 having thrust washer #DO204.2-D5 between pinion and shoulder of eccentric. Fasten cover #10920 to top of gear guard #4D-2201.

**F. To Assemble Spindle Pulley**

Fasten and dowel clutch #10908-1 to top of spindle pulley #10906. Press two ball bearings #88509 into pulley with spacer #3D-1107-2 between them. Fasten gear and adaptor #10901-1 and # 10902-1 on bottom of pulley and dowel. Press assembled pulley over spindle pulley sleeve # 10897-A1 until inner race of ball bearing is against the shoulder on the sleeve. Place drive belt over motor and spindle pulleys.

**G. To Install Back Gear Clutch**

Fasten bracket #10910-1 to front of frame. Press pin #10915 in housing #10914, insert rack # 10913-1 through hole in housing and place gear # 10916 on pin. Fasten rack # 10913-1 to lever # 10911-1 with screw # 10890. Adjust eccentric #10917 so back gears are in mesh and fasten housing #10914 to frame so that lever #10911-1 is in the back position. Insert locking pin #10968 and spring #10969 into hole in lever #10911-1, then fasten lever #10967 to lever #10911-1. Place clutch spool #10909 over spindle pulley sleeve #10897-A1 having the keys # 10972-A fastened to sleeve. Fasten the two bronze shoes # 10912, around clutch spool # 10909, to lever #10911-1 with screws #10890 and adjust screws so that spool turns freely in the shoes, then tighten locknuts on screws #10890.

## NO. 22 DRILL ADJUSTMENT

### Drive Belt

Loosen knob # 11828-1 on right side of frame and rack motor bracket out with crank # 10981 to take up slack in belt. (DO NOT RUN V -BELT TIGHT.)

### Spindle Return to Normal Position After Drilling

Loosen nuts #10555 on counter-balance bar #10554-1 and move hook # 10556-1 nearer to spindle for faster return or farther from spindle for slower return of spindle.

### End Play of Spindle in Spindle Sleeve

Loosen setscrew in nut #3D-3479-1 and take up end play but be sure spindle turns freely in spindle sleeve.

### Wear of Spindle Sleeve in Sliding Head

On the left side of the sliding head a split is provided in the spindle sleeve bearing for taking up wear. Loosen the two 3/8" setscrews and tighten the two 3/8" fillister head. capscrews. Spindle sleeve must slide freely with a minimum amount of shake. After adjusting lightly tighten the two s/8" setscrews.

### End Play in Feed Pinion Shaft

Tighten collar #10562-1 on left side of sliding head.

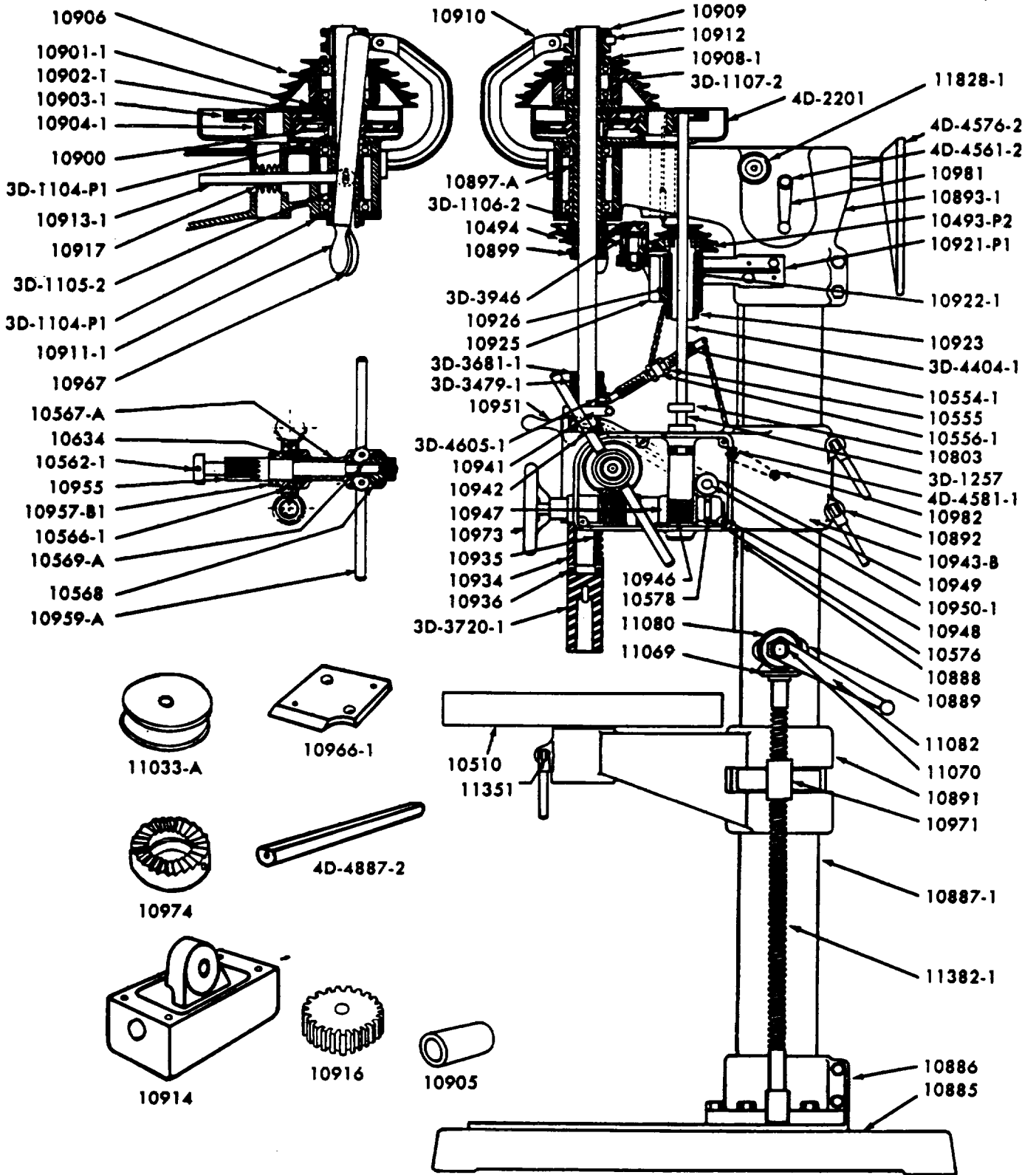
### To Adjust Power Feed Clutch

Engage clutch by pulling out on levers #10959-A. Tighten adjusting nut #10571. After releasing the clutch levers # 10959-A, the nut # 10571 should then be backed off if necessary to provide clearance between the clutch teeth. Lock collar in place with setscrew. Refer to "**OPERATION SECTION**" for lubrication.

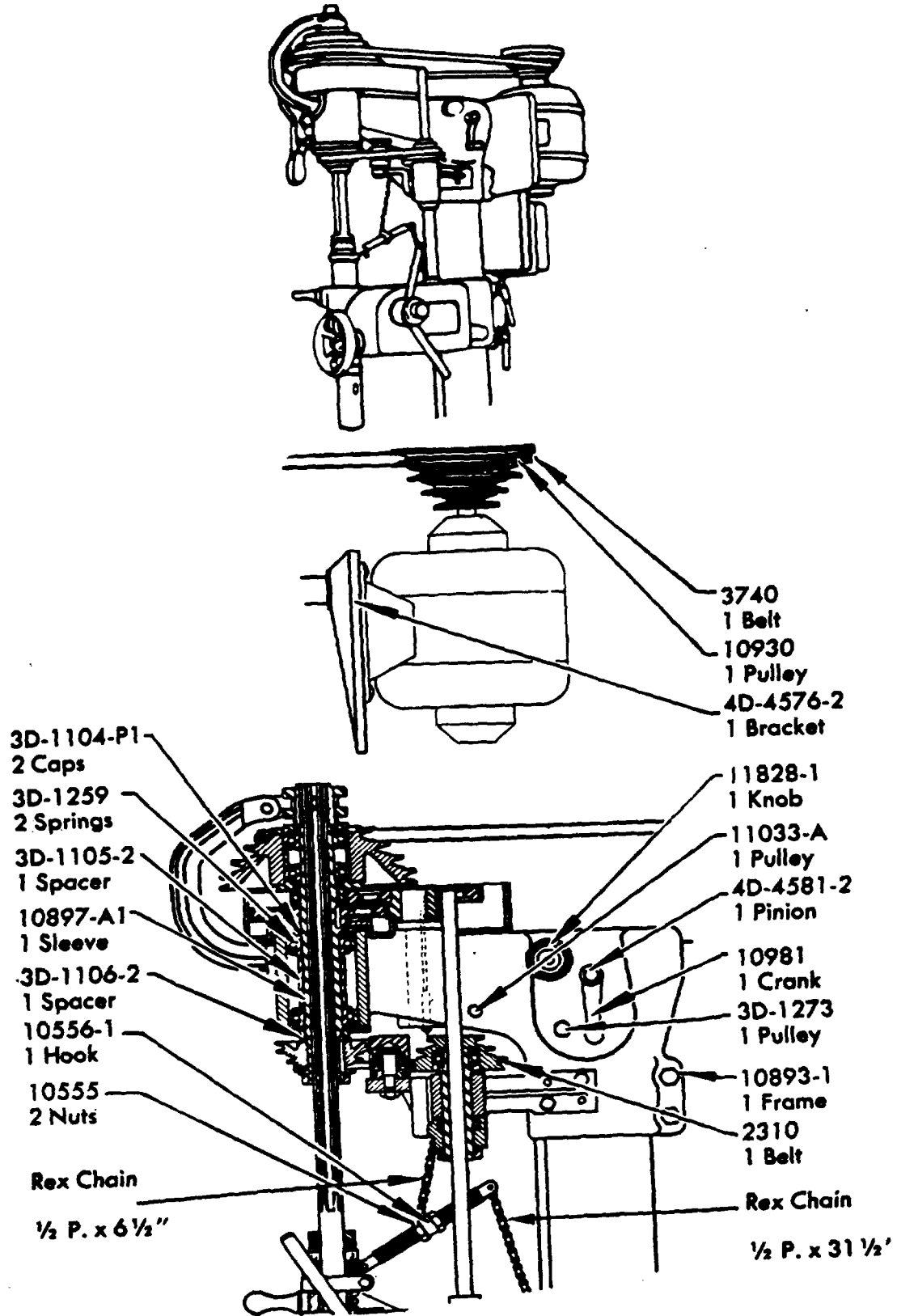
## ASSEMBLING TOLERANCES and CLEARANCES

Spindle sleeve in sliding head-.0005" to .0015" sliding fit.  
Feed pinion in sliding head-.001" to .003" running fit.  
Spindle in spindle sleeve bearings-.0005" to .0018" running fit.  
Bronze bushings in spindle sleeve-size to size to .001" tight press fit.  
Sliding head on column-.001" to .003" sliding fit.  
Shaft #10948 in sliding head-.001" to .003" running fit.  
Shaft # 10950-1 in sliding head-.001" to .003" running fit.  
Bearings #WC-88510 in frame-.0007" to .001" loose fit.  
Spindle pulley sleeve in bearings WC-88510-.0003" tight to .0004" loose.  
Bearings #88509 in spindle pulley-.0002" to .0003" loose.  
Spindle sleeve in bearings #88509-.0003" tight to .0004" loose.  
Eccentric shaft #10917 in frame-.002" to .004" loose.  
Bearing #5503 in pulley #10927-B-.0003" tight to .0007" loose.  
Bearing #5503 on stud # 10928-A-.0002" tight to .0004" loose.  
Bearing #88506 in pulley # 10493-P2-.0003" tight to .0004" loose.  
Sleeve #10922-1 in bearing #88506-.0003" tight to .0004" loose.

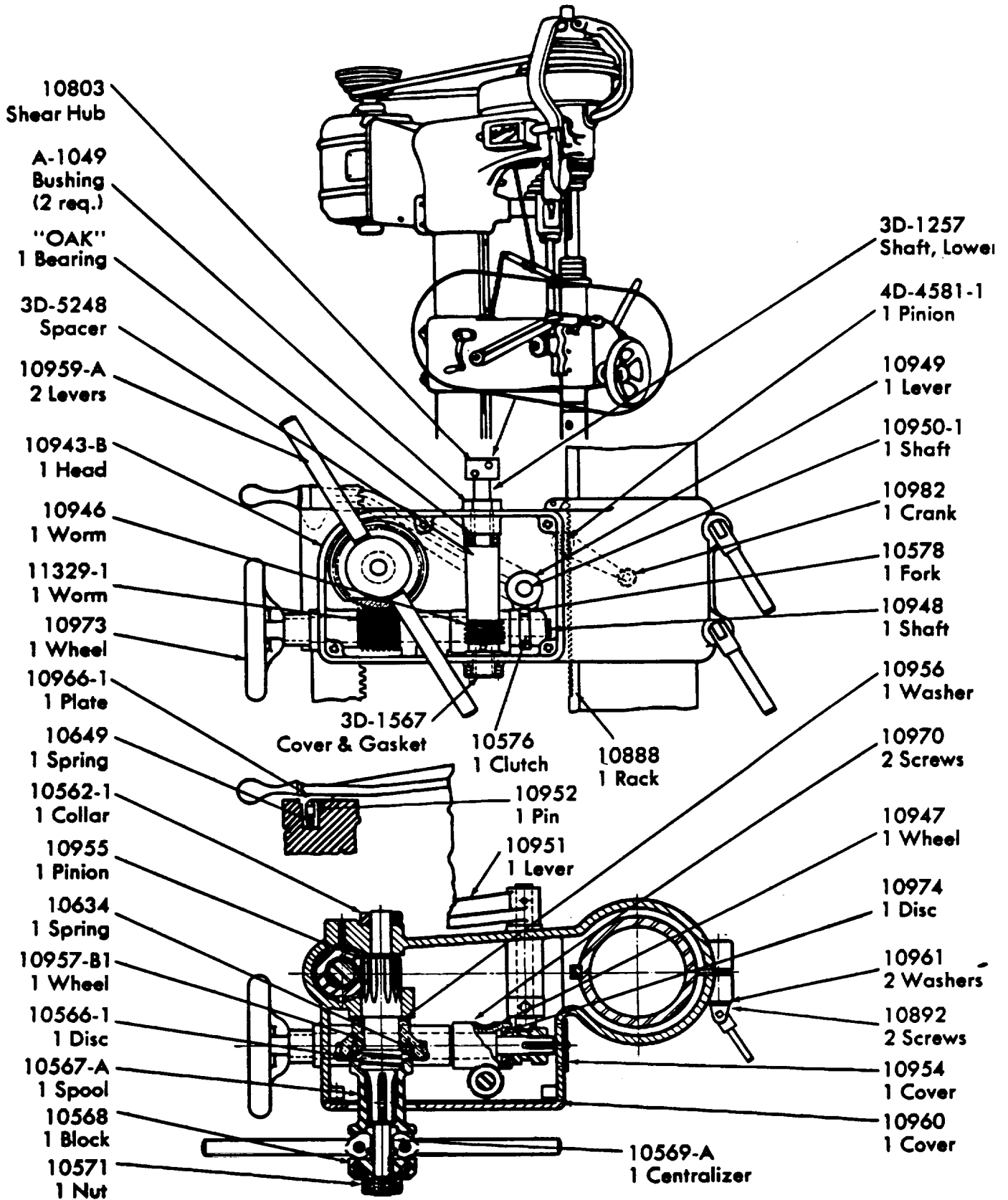
REPAIR PARTS-NO. 22 DRILL



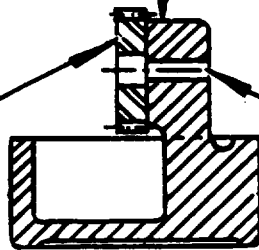
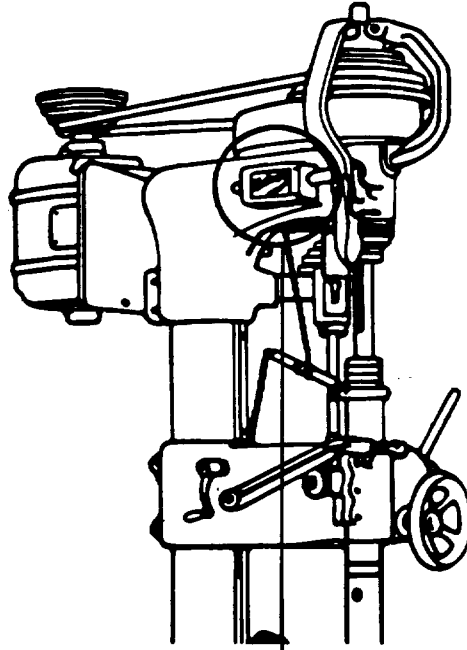
REPAIR PARTS - NO. 22 DRILL



REPAIR PARTS - NO 22 DRILL

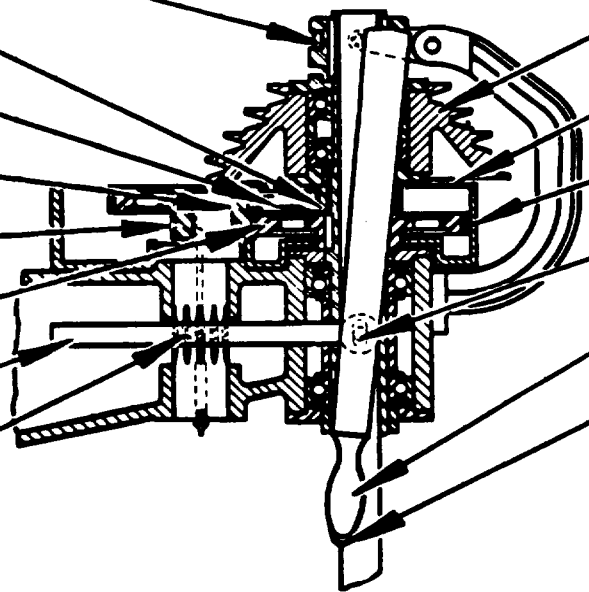


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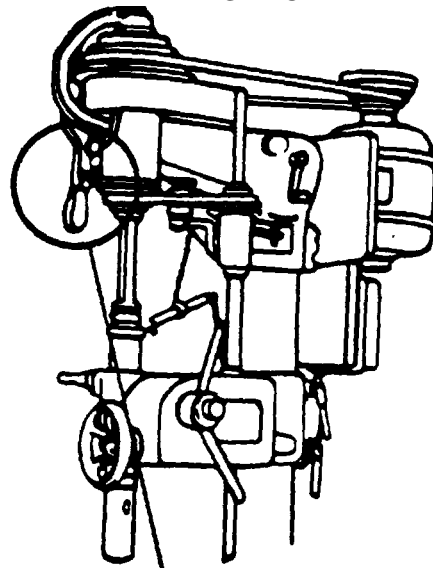


- 10916
- 1 Gear
- 10912
- 2 Shoes
- 10902-1
- 1 Gear
- 10903-1
- 1 Gear
- 10905
- 1 Bushing
- 10904-1
- 1 Pinion
- 10900
- 1 Gear
- 10913-1
- 1 Rack
- 10917
- 1 Eccentric

- 10915
- 1 Pin
- 10914
- 1 Housing
- 10906
- 1 Pulley
- 10920
- 1 Cover
- 4D-2201
- 1 Gear Case
- 10965
- 1 Screw
- 10911-1
- 1 Lever
- 10967
- 1 Lever



REPAIR PARTS - NO. 22 DRILL



10968  
1 Pin

10969  
1 Spring

10972-A  
2 Keys

10910-1  
1 Bracket

10890  
2 Screws

88509  
2 Bearings

10909  
1 Spool

10901-1  
1 Adapter

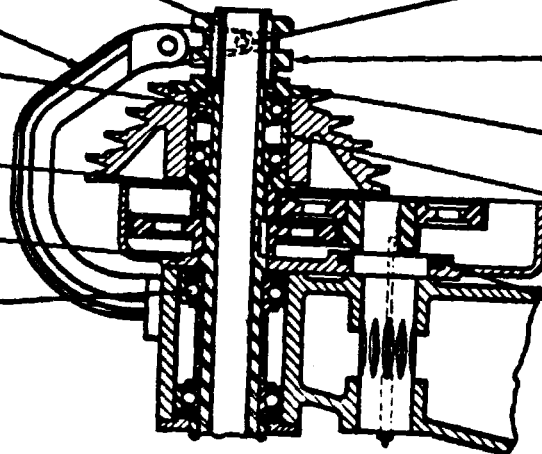
10908-1  
1 Clutch

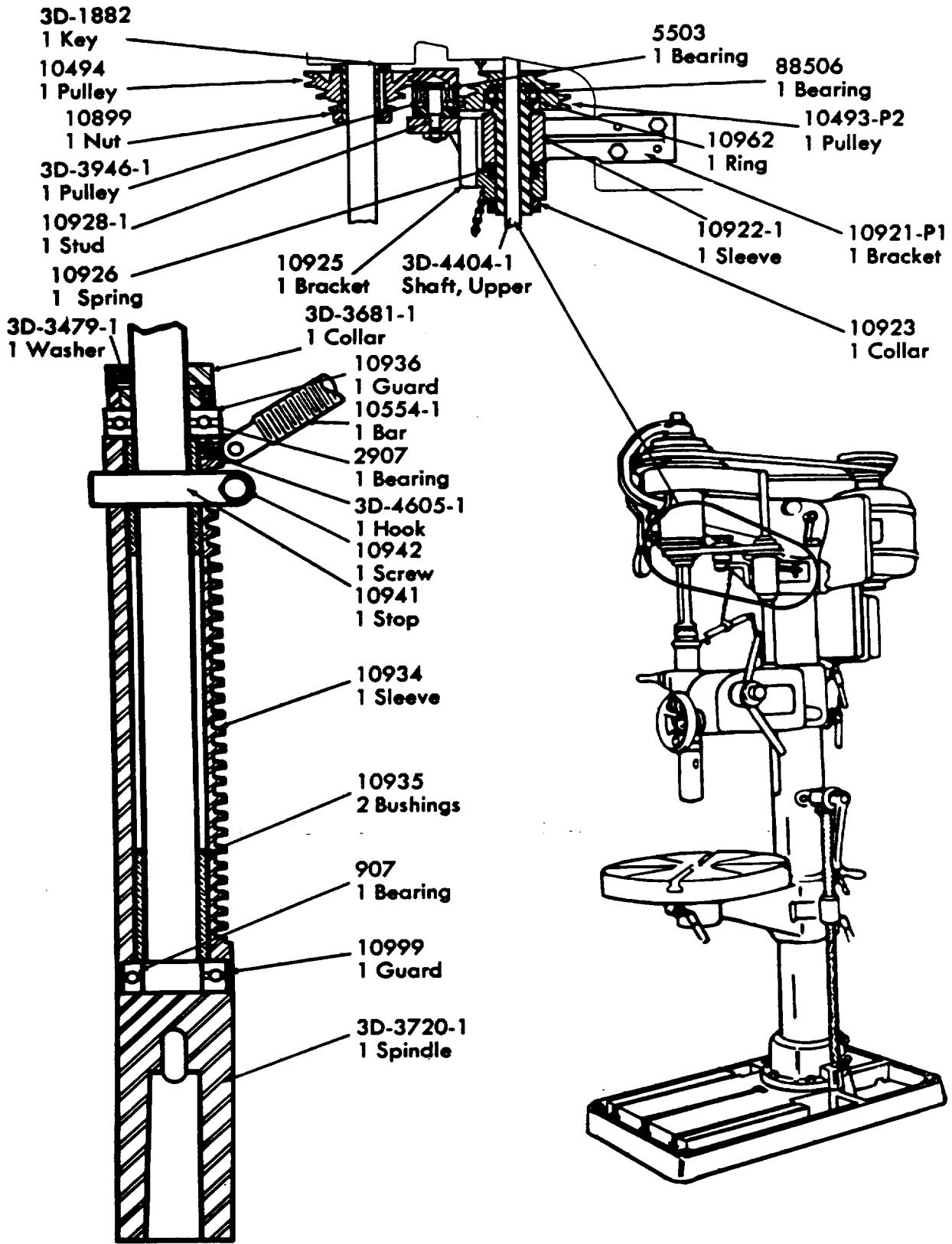
2035  
Seal

3D-1107-2  
1 Spacer

VC-88510  
Bearings

DO-204.2—D5  
1 Washer







REPAIR PARTS - NO. 22 DRILL

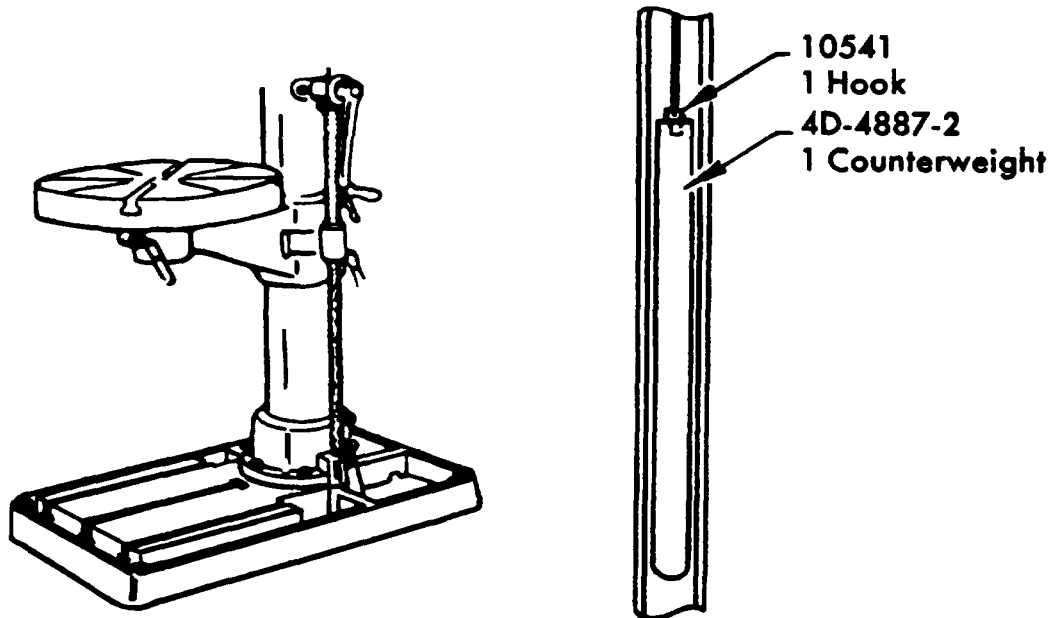
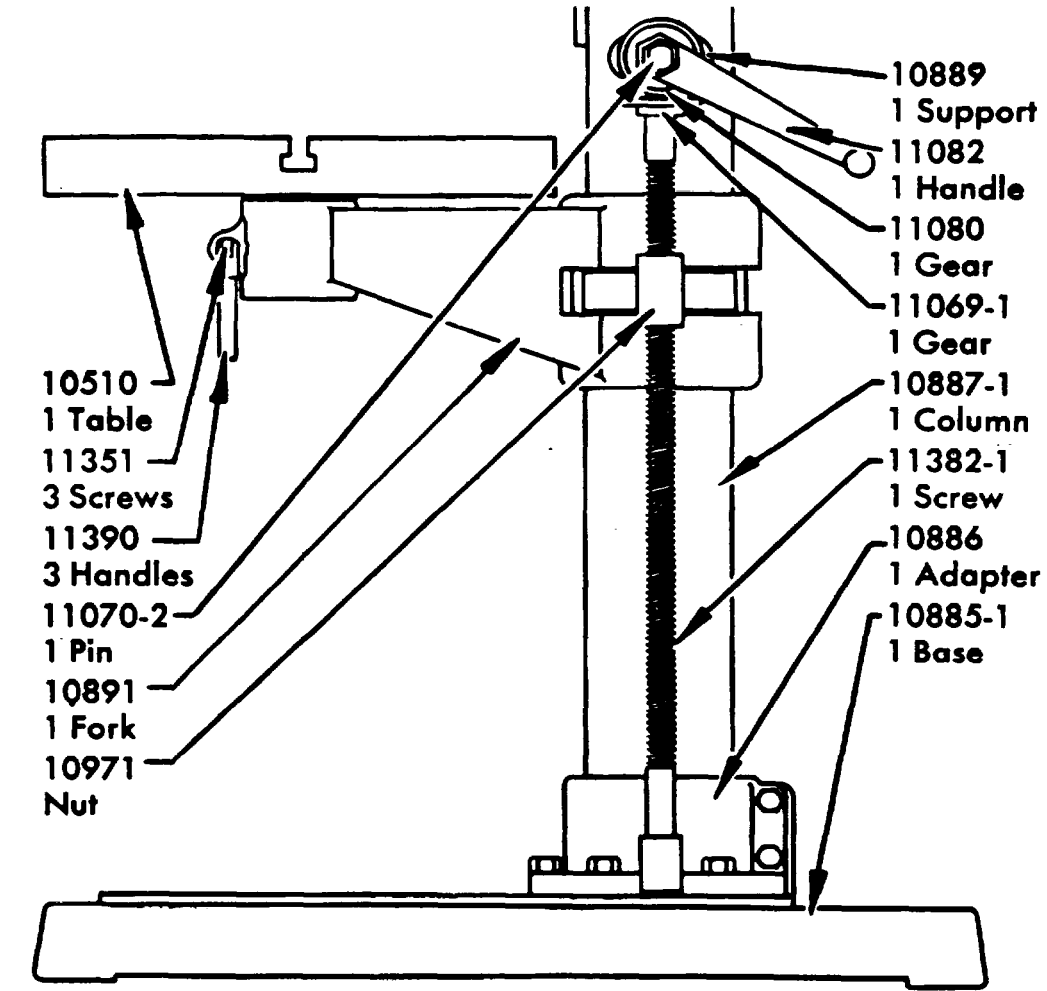
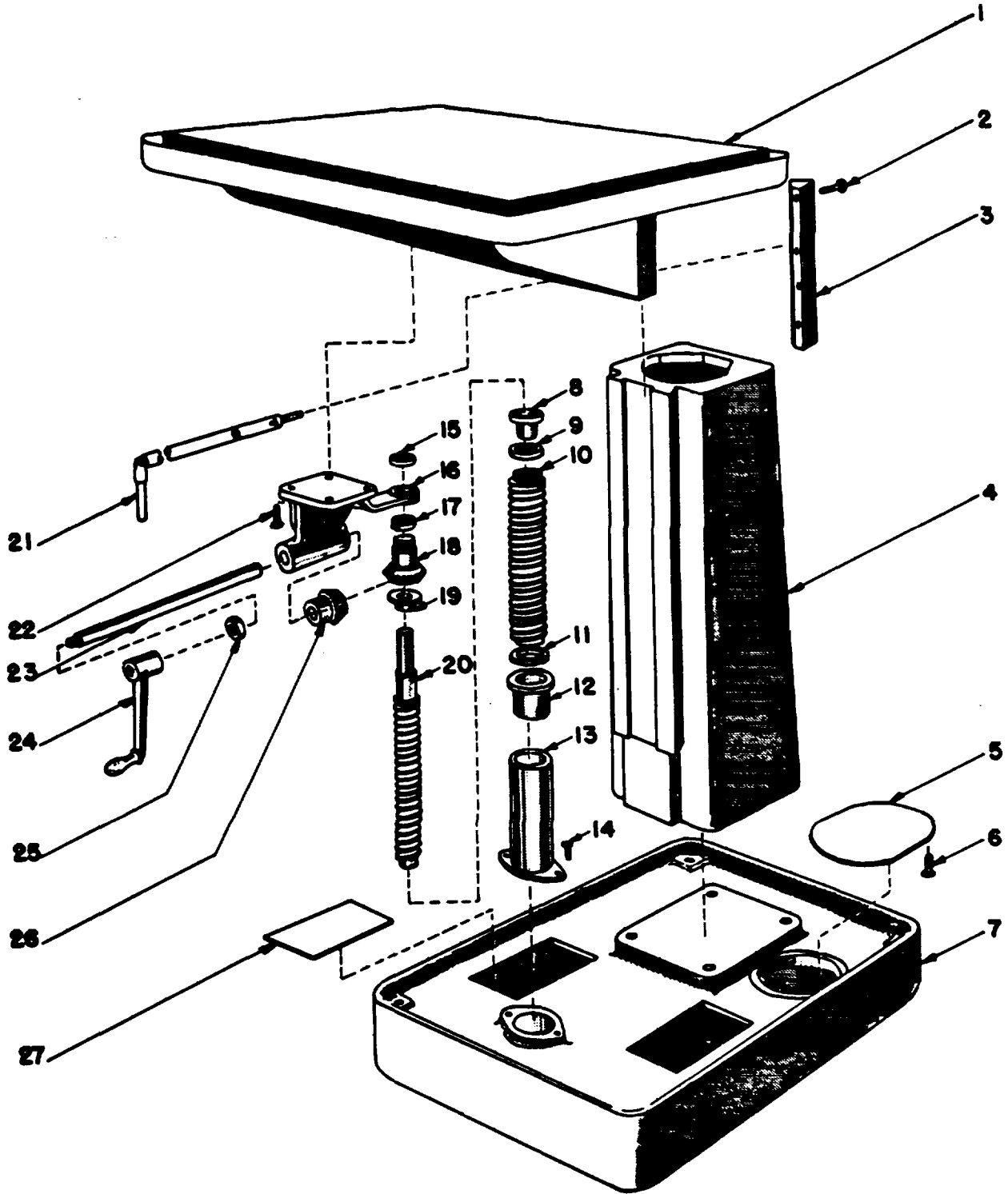


ILLUSTRATION OF PEDESTAL, BASE & TABLE PARTS



**PEDESTAL, BASE & TABLE PARTS**  
**(Refer to Page 23 for Illustration)**

ITEM NO.	PART NO.	DESCRIPTION	NO. REQ'D	REMARKS
1	10272-A	Table .....	1	-----
2		Hex .Hd. Capscrews ½"-13x1 ½ .....	3	-----
3	9935	Gib.....	1	-----
4	10616	Pedestal .....	1	-----
5	10978	Cover for Pump .....	1	-----
6		Hex .Hd. Capscrews 5/8"-13x1 ½ .....	4	-----
7	10976	Base .....	1	-----
8	9841-1 Item 2	Small table raising nut.....	1	-----
9	9843 Item 2	Nut for large screw .....	1	-----
10	9841-1	Large table raising screw .....	1	-----
11	9843 Item 1	Nut for large screw .....	1	-----
12	9844	Large table raising nut.....	1	-----
13	9845-1	Screw support .....	1	-----
14		Hex .Hd. Capscrews 3/8"-16x1 ½ .....	2	-----
15	11872	Nut for . gear .....	1	-----
16	11871	Bracket .....	1	-----
17	4975	Ball Bearing.....	1	-----
18	11873-A	Crown Gear.....	1	-----
19	3D-1178-1	Set collar .....	1	-----
20	9840	Small table raising screw .....	1	-----
21	4D-3119-3	Locking Screw Assem.....	1	-----
22		Hex .Hd. Capscrews 3/8"-16x1 7/8 .....	4	-----
23	11879 Item 6	Operating Rod. ....	1	-----
24	11867A	Crank handle .....	1	-----
25	10945	Collar for rod .....	1	-----
26	11268-A	Crown pinion .....	1	-----
27	10977-1	Covers for drain.....	2	-----

**NO. 22 DRILL REPAIR PARTS LIST**

Part No.	Title	No. Req.	Weight Lbs.	Price Each
3D-1104P1	Cap.....	2	2.00	
3D-1105-2	Spacer .....	1	.60	
3D-1106-2	Spacer .....	1	.60	
3D-1107-2	Spacer .....	1	.60	
3D-1257	Lower shaft .....	1	.80	
3D-1259	Spring .....	2	.008	
3D-1273	Pulley .....	1	3.20	
3D-1567	Cover and gasket .....	1 ea.	--	
3D-1882	Key .....	1	--	
4D-2201	Gear guard .....	1	16.00	
3D-3479-1	Washer a.....	1	1.00	
3D-3681-1	Collar .....	1	1.70	
3D-3720-1	Spindle .....	1	26.00	
3D-3946-1	Pulley.....	1	2.30	
3D-4404-1	Upper shaft.....	1	1.80	
4D-4576-2	Bracket .....	1	30.00	
4D-4581-1	Pinion .....	1	.80	
4D-4581-2	Pinion .....	1	.80	
3D-4605-1	Hook .....	1	.07	
4D-4887-2	Counter-weight .....	1	116.00	
3D-5248	Spacer .....	1	.50	
10493-P2	Pulley .....	1	6.00	
10494	Pulley .....	1	7.00	
10510	Table .....	1	115.00	
10541	Hook .....	1	.20	
10554-1	Bar.....	1	1.00	
10555	Nut .....	2	.03	
10556-1	Hook.....	1	.50	
10562-1	Collar .....	1	.70	
10566-1	Disc .....	1	1.70	
10567-A	Spool .....	1	7.60	
10568	Block .....	1	5.00	
10569-A	Centralizer .....	1	.50	
10571	Nut .....	1	16.00	
10576	Clutch .....	1	1.50	
10578	Fork .....	1	.40	
10634	Spring .....	1	.70	
10649-A	Spring .....	1	.02	
10803	Shear hub .....	1	--	
10885-1	Base .....	1	230.00	
10886	Adapter.....	1	35.00	
10887-1	Column.....	1	114.00	
10888	Rack .....	1	2.00	
10889	Support .....	1	2.00	
10890	Screw .....	2	.04	
10891	Fork .....	1	63.00	
10892	Screw .....	4	1.00	
10893-1	Frame .....	1	79.00	

Part No.	Title	No. Req.	Weight Lbs	Price Each
10897-A1	Sleeve .....	1	20.00	
10899	Nut.....	1	1.00	
10900	Gear .....	1	8.00	
10901-1	Adapter.....	1	4.00	
10902-1	Gear .....	1	1.50	
10903-1	Gear .....	1	7.00	
10904-1	Pinion .....	1	4.00	
10903	Bushing .....	1	22.0	
10906	Pulley.....	1	22.0	
10908-1	Clutch .....	1	3.40	
10909	Spool .....	1	5.60	
10910-1	Bracket .....	1	6.00	
10911-1	Lever .....	1	9.00	
10912	Shoe.....	2	.70	
10913-1	Rack .....	1	2.00	
10914	Housing .....	1	3.50	
10915	Pin .....	1	.07	
10916	Gear .....	1	.70	
10917	Eccentric .....	1	13.00	
10920	Cover and gasket.....	1	2.00	
10921-P1	Bracket .....	1	6.00	
10922-1	Sleeve .....	1	4.30	
10923	Collar.....	1	.90	
10925	Bracket .....	1	4.00	
10926	Spring.....	1	1.00	
10928-1	Stud.....	1	6.00	
10930	Pulley.....	1	11.00	
10934	Sleeve .....	1	19.00	
10935	Bushing .....	2	1.00	
10936	Guard .....	1	.04	
10941	Stop and screw.....	1	1.20	
10942	Screw .....	1	.20	
10943-B	Head.....	1	80.00	
10946	Worm .....	1	.50	
10947	Wheel .....	1	3.60	
10948	Shaft.....	1	4.40	
10949	Lever .....	1	1.30	
10950-1	Shaft.....	1	.80	
10951	Lever .....	1	4.40	
10952	Pin .....	1	.05	
10954	Cover.....	1	.009	
10955	Pinion .....	1	10.00	
10956	Washer .....	1	.90	
10957-B1	Wheel .....	1	6.00	
10959-A	Lever .....	2	2.50	
10960	Cover.....	1	5.50	
10961	Washer .....	5	.10	
10962	Ring.....	1	.02	
10965	Screw .....	1	.10	
10966-1	Plate .....	1	.30	

Part No.	Title	No. Req.	Weight Lbs.	Price Each
10967	Lever .....	1	.10	
10968	Pin .....	1	.10	
10969	Spring .....	1	.03	
10970	Screw .....	2	.01	
10971	Nut.....	1	3.00	
10972-A	Key .....	2	.005	
10973	Wheel .....	1	5.00	
10974	Disc .....	1	.50	
10981	Crank.....	4	4.00	
10982	Crank.....	1	4.00	
10999	Guard .....	1	.04	
11033-A	Pulley.....	1	.90	
11069-1	Gear .....	1	1.00	
11070-2	Pin .....	1	1.00	
11080	Gear .....	1	1.00	
11082	Handle .....	1	3.00	
11329-1	Worm .....	1	2.50	
11351	Screw .....	2	1.00	
11382-1	Screw .....	1	8.00	
11390	Handle .....	3	.70	
11828-1	Knob.....	1	2.60	
5503	Ball Bearing .....	1	.23	
88506	Ball Bearing .....	1	.63	
907	Ball Bearing .....	1	.63	
2907	Ball Bearing .....	1	.42	
88509	Ball Bearing .....	2	1.00	
WC-88510	Ball Bearing .....	2	1.30	
OAK	Thrust Bearing .	1	.30	
A-1049	Bushing .....	2	--	
2310	Belt.....	1	.20	
3740	Belt .....	1	.60	
2035	Garlock Klosure .....	1	--	
½ Pitch x 6 ½"	Rex chain .....	1	--	
½ Pitch x 31 1/2"	Rex chain .....	1	--	

**By Order of the Secretary of the Army:**

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**The Adjutant General**

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