

**NOS. 497A AND 497B TOOLS  
(PORTABLE PLUG CLEANING MACHINES)  
REQUIREMENTS AND ADJUSTING PROCEDURES**

**1. GENERAL**

**1.01** This section covers the Nos. 497A and 497B tools.

**1.02** This section is reissued to incorporate material from the addendum in its proper location. In this process marginal arrows have been omitted.

**1.03** Reference shall be made to Section 020-010-711 covering General Requirements and Definitions for additional information necessary for the proper application of the requirements listed herein.

**\*1.04 Asterisk:** Requirements are marked with an asterisk (\*) when to check for them would necessitate the dismantling or dismounting of apparatus, or would affect the adjustment involved or other adjustments. No check need be made for these requirements unless the apparatus or part is made accessible for other reasons or its performance indicates that such a check is advisable.

**1.05 One dip of lubricant** for the purpose of this section is the amount of lubricant retained on the KS-14164 No. 4 Artist's show card brush after being dipped into the lubricant to a depth of 3/8" and then scraped on the edge of the container to remove the surplus lubricant. There should not be sufficient lubricant adhering to the brush to form one drop on the end of the bristles.

**1.06 Successful commutation** for the purpose of this section may be said to have been attained if neither the brushes nor commutator are burned or injured in any acceptance test or in normal service to the extent that abnormal maintenance is required. The presence of visible sparking is not necessarily evidence of unsuccessful commutation.

**2. REQUIREMENTS**

**General Requirements**

**2.01 Cleaning:** The external surfaces of the motor and the exterior and interior surfaces of the plug cleaner shall be kept free of an excessive accumulation of oil and dust.

**2.02 Lubrication**

(a) The following parts shall be adequately lubricated with ball bearing grease.

- (1) Gears of Gear Reduction Unit
- (2) Motor Bearings
- (3) Toggle Switch Handle Bearing (in plunger)
- (4) Coupling — Fig. 1(A)
- (5) Cleaner Shaft — Fig. 1(B)
- (6) Teeth of Gear in Cleaner Housing — Fig. 1(C)
- (7) Teeth of Pinions in Cleaner Housing — Fig. 1(D)

When lubrication is necessary the parts mentioned in items (1) to (5) inclusive shall be packed with grease, but the amount used to lubricate the parts covered by items (1) and (2) shall not be sufficient to cause the lubricant to run or creep out of the part. In the case of the parts covered by items (6) and (7) the parts shall be coated with a film of grease.

(b) The following parts shall be adequately lubricated with 130-190S 100 oil. When lubrication is necessary the parts shall be lubricated with two drops of the lubricant from the 1/2 pint oil can.

- (1) Gear Reduction Shaft Bearings (through oil cups on gear reduction housing) — Fig. 1(E)
- (2) Cleaner Shaft Bearing (through oil cup at coupling end) — Fig. 1(F)

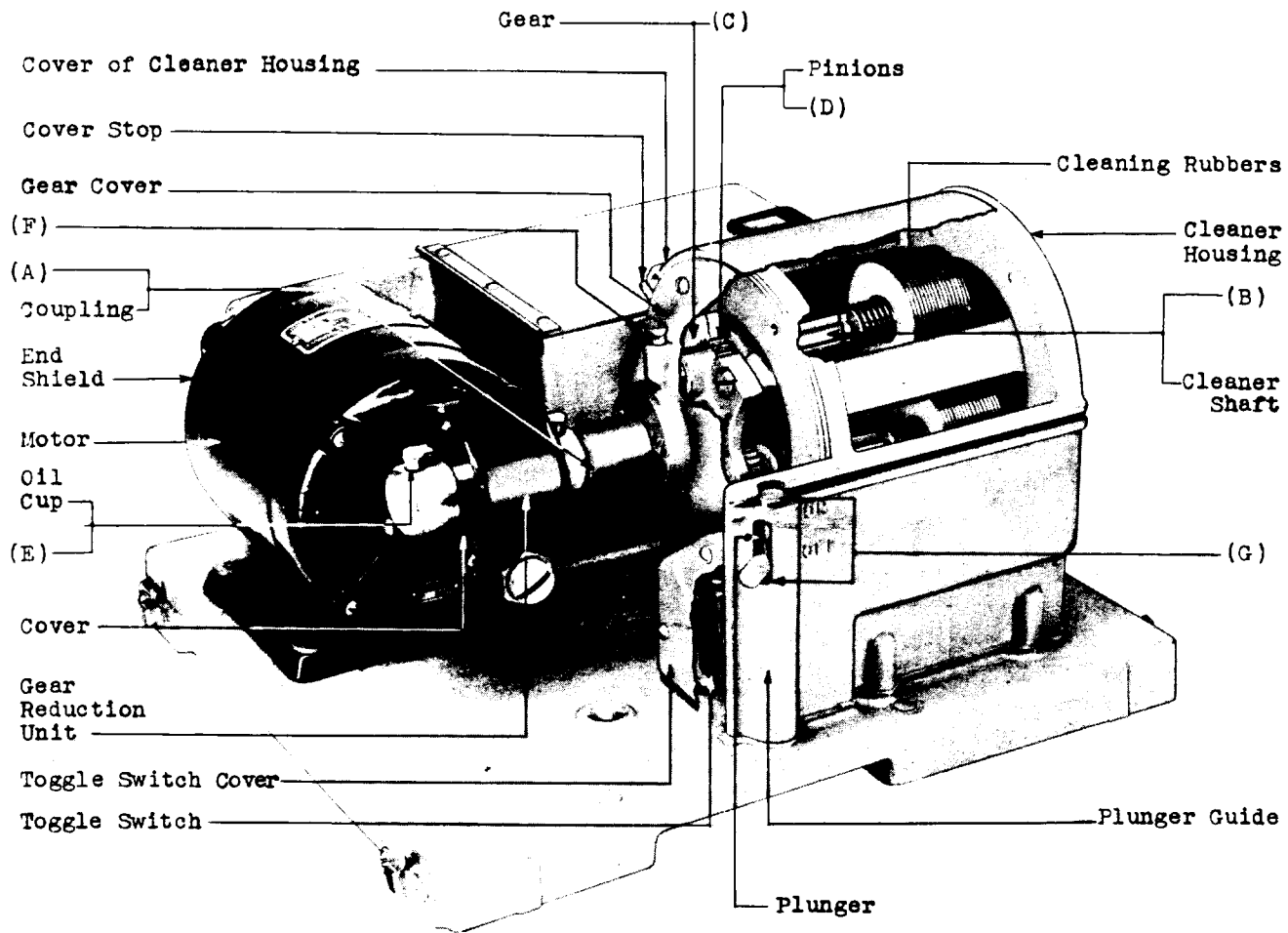


Fig. 1 - Portable Plug Cleaning Machine

(3) Cleaner Bearing (through oil cup at indicator end) — Fig. 2(A)

(c) Fig. 1(G) — The bearing surfaces of the plunger (at the top of the plunger guide and at the bottom of the slot) shall be adequately lubricated with KS-8496 lubricating compound. When lubrication is necessary the parts shall be lubricated with one dip of the lubricant.

(d) **Recommended Lubrication Intervals:** It is recommended that the parts listed in requirement (a) be cleaned and lubricated at intervals of 2 years, and the parts listed in requirement (a5) and (b) be lubricated each time a set of cleaning rubbers is changed, or if the machine is not subjected to much use, at

intervals of 1 month. The parts listed in requirement (c) shall be lubricated at intervals of 2 months. These intervals may be extended if periodic inspections have indicated that local conditions are such as to insure that the requirements will be met during the extended interval.

#### Requirements for Plug Cleaner

##### 2.03 Shaft Alignment

(a) The motor base and the cleaner housing shall be aligned with the lines scribed on the cleaner base.

Gauge by eye.

\*(b) The low speed motor shaft and the cleaner shaft shall be approximately parallel.

Gauge by eye.

\*(c) The distance from the centerline of the low speed shaft to the centerline of the cleaner shaft shall not exceed 1/64".

Gauge by eye.

**\*2.04 Freedom of Movement:** The cleaning mechanism shall move freely in its bearings.

Gauge by feel.

**2.05 Location of Indicator:** The indicator shall be securely held in each of its detent positions.

Gauge by feel.

**Requirements for Motor and Gear Reduction Unit**

**2.06 Smooth and Uniform Operation:** The motor and associated gear reduction unit shall operate smoothly and uniformly.

Gauge by feel and ear.

**2.07 Brush Fit (D.C. Motor)**

(a) Brushes shall not bind in their holders, neither shall they be loose enough to cause poor commutation.

(b) Brushes shall be so fitted as to insure successful commutation.

**2.08 Brush Pressure (D.C. Motor):** The brush pressure shall be such that with the brush holder screw cap removed and the brush in its holder and resting against the commutator, the brush spring shall extend outside of its holder

Min 1/2 inch

Use the R-8550 steel scale.

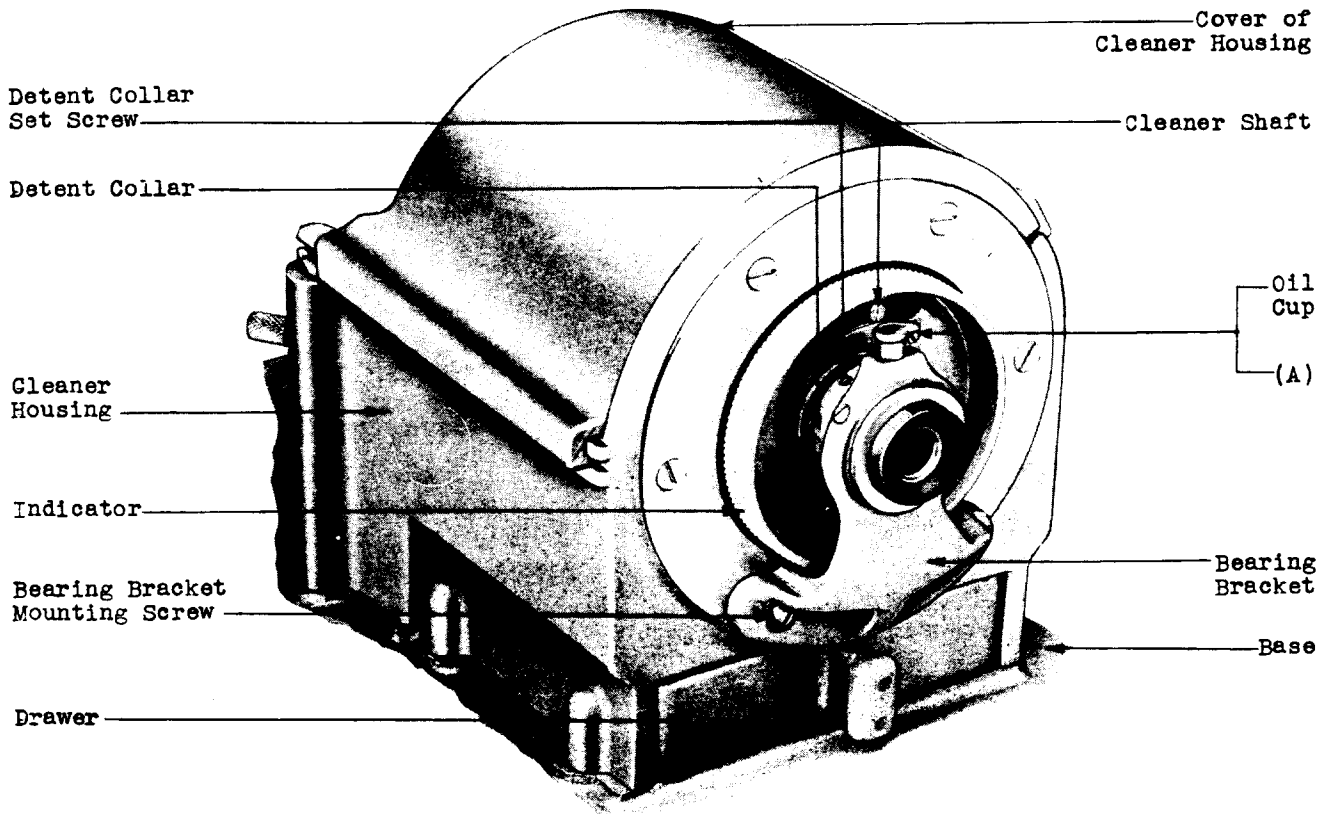


Fig. 2 - Plug Cleaner

**SECTION 075-125-701**

**2.09 Brush Length** (D.C. Motor): The overall length of the brush up to the spring shall be

Min 1/2 inch

Use R-8550 steel scale.

**\*2.10 Brush Holder** (D.C. Motor): The distance from the edge of the brush holder (adjacent to the commutator) to the commutator shall be

Min 1/16"

Max 5/32"

Use R-8550 steel scale.

**2.11 Commutator Surface** (D.C. Motor): The surface of the commutator shall be clean and free from scoring, pitting or other deformation of the surface or structure save that caused by normal wear.

Gauge by eye or by feel.

**2.12 Temperature:** When the machine is operating continuously within its voltage range, the temperature rises above an ambient temperature within the limits of 10° and 40°C., and shall not exceed the following values

Machine Frame and Windings 50°C.  
(A.C. and D.C. Motors)

Commutator (D.C. Motor) 65°C.

Use the R-1032 centigrade thermometer.

**2.13 Conditioning Motor:** It is recommended that at two year intervals, the motor shall be removed from the plug cleaning machine and reconditioned.

**3. ADJUSTING PROCEDURES**

**3.001 List of Tools, Gauges and Materials**

CODE OR SPEC NO.	DESCRIPTION
<b>TOOLS</b>	
353B	Oil Gun
—	KS-7782 Parallel Jaw Pliers
—	KS-14164 No. 4 Artist's Show Card Brush
—	R-2959 Allen Setscrew Wrench
—	No. 5 Sash Brush

CODE OR SPEC NO.	DESCRIPTION
<b>TOOLS</b>	
—	1/4" Round Brush
—	1/2 Pint Oiler
—	3-1/2" Cabinet Screwdriver
—	4" Regular Screwdriver
—	No. 6 Bristo Set Screw Wrench
<b>GAUGES</b>	
—	R-8550 — 6" Steel Scale
—	R-1032 Thermometer, 0° to 200° C in 5° graduations
<b>MATERIALS</b>	
—	KS-2423 Cloth or KS-14666 Cloth
—	KS-6232 Oil
—	KS-7860 Petroleum Spirits
—	KS-8496 Lubricating Compound
—	Piece of Felt (for checking temperatures)
—	Ball Bearing Grease (See BSP Section 065-330-101)
—	130-190S 100 Oil
—	Sandpaper, or Abrasive Cloth, No. 0000

**General Procedures**

**3.01 Cleaning** (Reqt 2.01)

(1) Remove oil and dust from the external surfaces of the motor and the cleaner housing with a KS-14666 cloth moistened with petroleum spirits.

(2) Remove the cover stop with the 3-1/2" cabinet screwdriver. Depress the punger to the limit of its stroke and slide the cover off the housing. Brush the dust particles from the interior of the housing and the rotating elements with the No. 5 sash brush. The dust will drop into the drawer in the bottom of the housing. Remove the drawer and dispose of the dust. Remove any dust that may have collected at the sides or bottom of the housing.

(3) Remove dust and abrasive particles from the bearing mounted in the bearing bracket as follows. Remove the 498-type tool from the bracket by turning it in a clockwise direction. (It has left-hand threads.) Remove the bearing setscrew with the 3-inch cabinet screwdriver and remove the bearing. Clean the bearing with the KS-2423 cloth moistened with KS-7860 petroleum spirits. Remount parts in reverse order and relubricate the bearing as covered in 3.02.

### 3.02 Lubrication (Reqt 2.02)

(1) **General:** To gain access to the motor bearings, gears of gear reduction unit, coupling or teeth of gear and pinions in the cleaner housing, remove the motor and cleaner housing from the base as outlined in (5). Proceed to clean and lubricate these parts as outlined in (6) to (12) inclusive. After cleaning and lubricating the parts, remount the motor and cleaner housing as outlined in (13).

(2) **Toggle Switch Handle Bearing:** To lubricate the toggle switch handle bearing, fill the No. 353B grease gun with ball bearing grease as outlined in the Division 075 section covering lubricators, oil and grease guns. Remove the toggle switch cover mounting screws with the 3-1/2" cabinet screwdriver and remove the cover. Insert the nozzle of the No. 353B oil gun in the bearing hole in the plunger and lubricate as required. After the bearing is satisfactorily lubricated, remount the cover securely in place.

(3) **Bearing Surfaces of Plunger:** Operate the plunger to the "ON" position and apply one dip of the KS-8496 lubricating compound to the plunger at the upper surface of the casting and at the bottom of the slot in which the handle rides. Wipe off any of the compound that may have been spilled on the casting, using a KS-14666 cloth moistened with petroleum spirits.

(4) **Gear Reduction Shaft Bearings, Cleaner Shaft Bearing and Cleaner Bearing:** To lubricate these parts, raise the particular cap and insert the nozzle of the 1/2 pint oiler in the oil cap and lubricate as specified. Remove the oiler and wipe off any oil that may have been spilled with a KS-14666 cloth moistened with petroleum spirits.

(5) **Removal of Motor and Cleaner Housing from Base:** Remove the drawer from the cleaner housing. Remove the base plate mounting screws with the 3-1/2" cabinet screwdriver and remove the base plate. Disconnect the wiring. Remove the motor or the cleaner housing mounting screws as required with the 4" regular screwdriver and remove the part from the base. Remove the coupling and coupling pins.

(6) **Motor Bearings and Gears of Gear Reduction Unit:** On the D.C. motor, remove the brush caps and brushes. Mark each brush so that it may be remounted in the same position and in the same brush holder from which it was removed. Remove the end plate mounting screws with the 3-1/2" cabinet screwdriver and remove the end plate, thrust cap and thrust washers. Remove the end shield mounting screws with the 4" regular screwdriver from the end of the motor further away from the gear reduction unit and remove the end shield. Remove the cover mounting screws from the ends of the gear reduction unit with the 4" regular screwdriver and remove the covers. The worm wheel in the gear reduction unit will very likely be removed with one of the covers. If it is not, remove it. Remove the end shield mounting screws from the remaining end shield and remove the end shield from the motor. The rotor assembly will be removed when this end shield is removed. Then disassemble the rotor assembly and end shield.

(7) Remove all grease from the motor and gear reduction unit. This operation may be facilitated if the parts are wiped with a KS-14666 cloth moistened with petroleum spirits.

(8) On the D.C. motor, note the condition of the commutator and if it is dirty, clean it as outlined in 3.11.

(9) On the A.C. motor, note the condition of the centrifugal throw-out switch and if it is dirty, clean the bearings with a KS-14666 cloth moistened with petroleum spirits. At this time also clean the contacts in accordance with the Division 069 section covering cleaning of relay contacts and parts.

(10) Fill the spaces between the inner and outer races of the ball bearings with ball bearing grease. Remount the rotor assembly in the proper end shield and gear reduction

unit housing and remount the assembly on the motor. Insert and securely tighten the end shield mounting screws. Remount one gear reduction unit cover and insert and securely tighten the mounting screws. Pack the housing with ball bearing grease. Remount the other cover securely in place.

**(11) Gear and Pinions of Cleaner Housing:**

To lubricate the gear and pinions, proceed as follows. Remove the mounting screws that secure the toggle switch cover and toggle switch mounting plate in place with the 3-1/2" cabinet screwdriver. Remove the mounting plate. Remove the cover mounting screws with the 4" regular screwdriver and remove the cover and washers. Remove the grease from the teeth of the gear and pinions and adjacent parts with a clean KS-14666 cloth moistened with petroleum spirits. Then clean these parts further, if necessary, with a 1/4" round brush moistened with petroleum spirits. When the parts are clean, coat the teeth with ball bearing grease. Wipe off any excess grease that may be on the gear and pinions and adjacent surfaces with a KS-14666 cloth moistened with petroleum spirits. Reassemble the parts in the reverse order from which they were removed.

**(12) Coupling:** Remove the grease from the coupling with a KS-14666 cloth moistened with petroleum spirits. Pack the coupling with fresh ball bearing grease.

**(13) Remounting Motor and Cleaner Housing:** Place the cleaner housing in approximately its correct position on the base, connect the wiring to the proper terminals and insert and secure the housing mounting screws finger tight. Shift the housing until it is aligned with the scribed lines on the base, then tighten the mounting screws securely. Insert the coupling pin in place on housing shaft and place the coupling in position over the pin. Mount the motor in its approximately correct position engaging the shaft of the motor with the coupling. Insert and tighten the motor mounting screws finger tight. Align the motor with the scribed lines and tighten the mounting screws securely. Remove any excess grease from any of the parts with a KS-14666 cloth moistened with petroleum spirits. Remount the base plate securely in place.

**Plug Cleaner Procedures**

**3.03 Shaft Alignment** (Reqt 2.03)

**3.04 Freedom of Movement** (Reqt 2.04)

(1) If with the indicator set so that there is a clearance between the cleaning rubbers, it is noted that the cleaning mechanism binds, the trouble may be due to a misalignment between the shafts of the motor and cleaner, in which case check and realign as outlined in (2), or it may be due to dirt collecting around the frame.

(2) Check whether the parts are satisfactorily aligned with the lines scribed on the cleaner base at the motor and cleaner housing. If they are not, remove the base plate mounting screws with the 3-1/2" cabinet screwdriver and remove the base, loosen the mounting screws of the part not in alignment and shift the position of the part as required. Then tighten the mounting screws securely. If lines have been scribed on the base but a new motor or cleaner housing has been substituted for a defective part, proceed as follows. Loosen the motor mounting screws and remove the cleaner housing mounting screws with the 4" regular screwdriver and remove the housing. Remove the coupling. Obliterate the earlier scribed lines. Remount the housing in place and secure the screws finger tight. Align the parts and tighten the mounting screws securely and scribe new lines on the base to locate the parts. Remove the housing mounting screws and remove the housing. Mount the coupling in place and remount the housing securely in place, aligning it with the newly scribed lines on the base. Remount and securely tighten the base plate.

(3) If, after checking the alignment of the shafts, the mechanism still binds, remove the cover at the end of the cleaner housing as outlined in 3.02 and clean the shaft bearings at each end of the frame with a KS-14666 cloth moistened with petroleum spirits. After cleaning the parts, lubricate them if necessary then reassemble the apparatus as outlined in 3.02.

**3.05 Location of Indicator** (Reqt 2.05)

(1) If the indicator is not held in its detent position, the detent spring or ball bearing is defective. To check, proceed as follows. Re-

move the bearing bracket mounting screws with the 4" regular screwdriver and remove the bearing bracket. Remove the detent setscrews in the detent collar with the R-2959 wrench or the No. 6 Bristo setscrew wrench, as required, and remove the collar. Remove the indicator. Remove the detent spring and ball bearing and substitute the required part. Remount the parts in the reverse order.

### **Motor and Gear Reduction Unit Procedures**

#### **3.06 *Smooth and Uniform Operation*** (Reqt 2.06)

- (1) If in attempting to start the motor, the motor fails to start, or fuses are blown, the trouble may be due to power failure, defective wiring, improperly operating centrifugal switch, binding of the rotating element or unsatisfactory alignment between the gear reduction unit and the cleaner housing, proceed as follows.
- (2) If fuses are blown in starting the D.C. motor, the centrifugal switch may be defective. To check the switch, remove the end shield mounting screws from the end shield further from the gear reduction unit with the 4" regular screwdriver and remove the end shield. Take care in doing this not to damage the centrifugal switch or the internal connections in the motor.
- (3) The stationary contact in the end shield should open approximately .025" when the end shield is removed. If the contacts are rough or pitted, clean them as outlined in the Division 069 section covering cleaning procedures for relay contacts and parts.
- (4) If the contact springs of the actuating mechanism of this type of switch are distorted or bent, adjust them with the KS-7782 pliers.
- (5) If the centrifugal switch mechanism binds, operate the arms manually several times. If bind still persists, distribute one dip of KS-6232 oil to the arms.
- (6) If the rotating element appears to bind, remove the end shield as outlined above and remove any foreign particles that may interfere with the operation of the motor. If the

bearings are worn, give consideration to replacing them. Remount the end shield as outlined above.

- (7) If the motor mounting bolts or the cleaner housing mounting screws are loose, tighten them securely. Take care in doing this that the motor and the housing are satisfactorily aligned.

#### **3.07 *Brush Fit*** (Reqt 2.07)

- (1) If the brushes bind in the brush holders, remove the brushes from their holders, marking their position in the holders, and wipe them with a KS-14666 cloth moistened with petroleum spirits. If there are any rough portions, the edges of the brush may be smoothed with fine sandpaper or abrasive cloth before wiping.
- (2) In replacing the brushes see that they are put back in the same holders and in the same position in which they were originally. Replace brushes which are too loose in their holders.
- (3) Brushes are generally furnished with their faces curved to the approximate curvature of the commutator. Final fitting of the brushes should be done by running the machine without load for a few hours if possible.

#### **3.08 *Brush Pressure*** (Reqt 2.08)

- (1) Examine the brush springs and pigtailed to see that the pigtailed are not twisted. Untwist as required. If the spring does not extend beyond the brush holder at least the minimum amount, replace the brush and spring. A temporary adjustment may be made by stretching the spring, but that should be done only until such time as a new brush and spring can be obtained.

#### **3.09 *Brush Length*** (Reqt 2.09)

- (1) Replace any short brushes.

#### **3.10 *Brush Holder*** (Reqt 2.10)

- (1) To change the position of the brush holders, remove the end shield further away from the gear reduction unit as outlined in 3.02 and loosen the brush holder mounting screw with the 3-1/2" cabinet screwdriver.

Shift the position of the brush holder toward or away from the center of the end shield as required. Tighten the mounting screw securely. Remount and securely fasten the end shield.

**3.11 Commutator Surface** (Reqt 2.11)

(1) Remove the brush caps and remove the brushes, marking them so that they will be remounted in the same position in the same holders from which they were removed. Clean the brushes as outlined in 3.07. To do this remove the end shield mounting screws and remove the end shield as outlined in 3.02. Slightly rough commutator surfaces may be smoothed with fine sandpaper before being wiped with a KS-14666 cloth. Excessively rough commutator surfaces will necessitate resurfacing. If this condition exists, give consideration to returning the motor to the manufacturer for refinishing.

**Note:** A bronze-colored, highly polished commutator is very desirable and it should not be mistaken for a burned commutator. If a commutator presents this condition, is smooth and commutator is satisfactory, leave it alone.

- (2) If the commutator becomes smutted from oil, clean with a KS-14666 cloth moistened with petroleum spirits.
- (3) Before remounting the end shield, remove all dirt from the inner surface of the shield with a KS-14666 cloth moistened with

petroleum spirits. Then remount the end shield as outlined in 3.02.

**3.12 Temperature** (Reqt 2.12)

(1) To check the temperature hold the bulb of the R-1032 thermometer against the hottest spot on the outside of the bearing housing as near as possible to where the bearing is located, covering that part of the bulb which is not in contact with the housing with a piece of felt or the equivalent and observe the highest temperature indicated.

(2) The machine frame may be measured for temperature rise in a similar manner. If the temperature exceeds the specified limits, see that requirement 2.06 is met. If this requirement is met and the temperature is still outside the specified limits, refer the matter to the supervisor as the motor may have to be replaced.

(3) Check the temperature of the commutator by holding the bulb of the R-1032 thermometer against the commutator as soon as possible after stopping the motor. To do this, remove a brush cap and remove the brush. Insert the thermometer through the brush holder and rest the bulb against the commutator.

**3.13 Conditioning Motor** (Reqt 2.13)

(1) To remove the motor for conditioning, remove the motor mounting screws with the 4" regular screwdriver and remove the motor.