

## ELECTRIC STOP CLOCK

### KS-14235

### REQUIREMENTS AND ADJUSTING PROCEDURES

#### 1. GENERAL

- 1.01 This section covers the KS-14235, List 1, List 2 and List 3 electric stop clocks.
- 1.02 This section is reissued to incorporate material from the addendum in its proper location.
- 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 dismantling of the apparatus, or would affect the adjustment involved or other adjustments. No check need be made for these requirements unless the part is made accessible for other reasons or its performance indicate that such a check is advisable.
- 1.05 One dip of oil for the purpose of this section is the amount of oil retained on a KS-14164 brush after being dipped into the oil to a depth of 3/8"

and then scraped on the edge of the container to remove the surplus oil. There should not be sufficient oil adhering to the brush to form a drop on the end of the bristles.

1.06 The normal (unoperated) position of the control knob of the KS-14249 switch is that position in which the white dot on the knob is toward the cord.

1.07 The operated position of the control knob of the KS-14249 switch is the position of the knob when it has been turned 90° in a clockwise direction from the normal position.

1.08 The reset position of the control knob of the KS-14249 switch is the position of the knob when it has been turned counterclockwise from the normal position as far as it will go.

#### 2. REQUIREMENTS

- 2.01 Cleaning: The electric stop clock shall be cleaned when necessary in accordance with approved procedures.

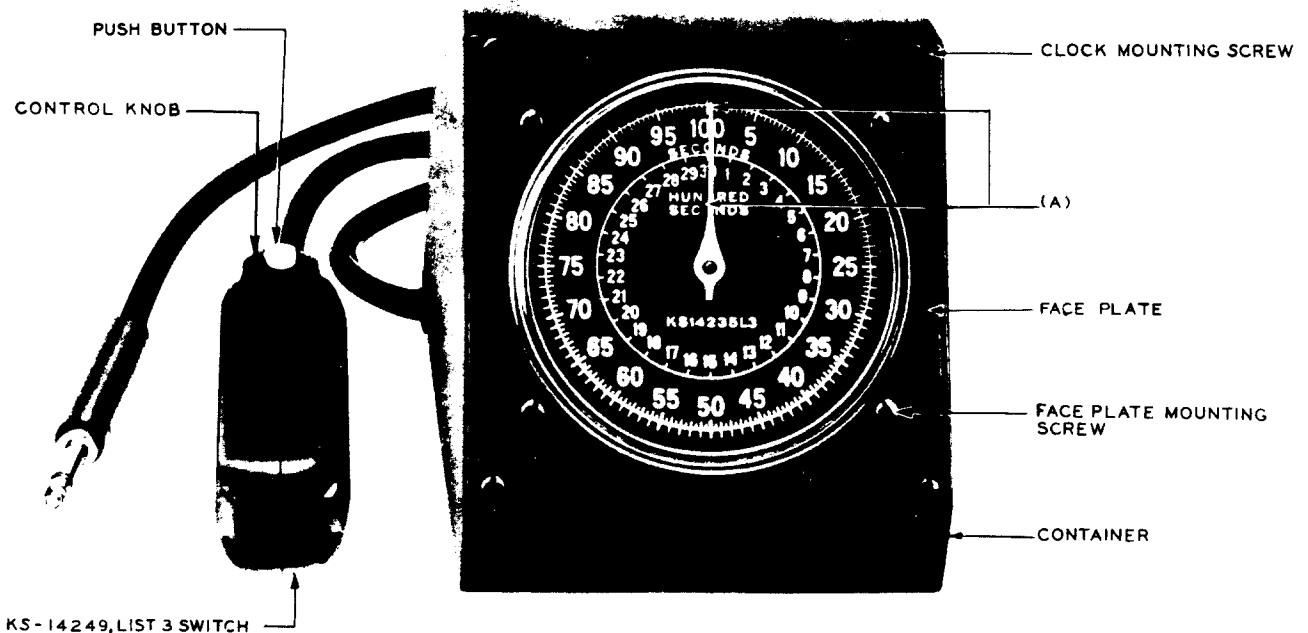


FIG. 1 - KS-14235 STOP CLOCK  
(LIST 3 ILLUSTRATED)

## 2.02 Lubrication

(a) The points listed below shall be adequately lubricated with KS-7470 oil. When lubrication is necessary, one dip shall be divided between 2 or 3 of the following points:

Hairpin Clutches - Fig. 2(A);  
apply to wires and clutch grooves.

Bearings of Reset Mechanism Linkage - Fig. 3(A).

Bearings of Reset Mechanism Rollers - Fig. 3(B).

(b) Recommended Lubrication Intervals:

After turnover it is recommended that the parts listed above be lubricated at intervals of one year. This interval 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.

## 2.03 Freedom of Movement

\*(a) All moving parts shall be free from bind.

Gauge by eye and feel.

(b) The elapsed-time, split-second and totalizing hands shall not interfere with each other or with the face or crystal in any position.

Gauge by eye.

2.04 Accuracy of Clock Movement: The clock movement shall not gain or lose any time during an interval of 100 seconds.

Check the stop clock, after allowing it to operate for approximately 10 minutes, against an electric clock of known accuracy operating from the same frequency.

## 2.05 Movement of Elapsed-Time, Split-Second and Totalizing Hands

(a) With the control knob of the switch turned to the operated position, the elapsed-time and split-second hands shall rotate and the split-second hand shall be in alignment with the elapsed-time hand, when the clutch magnets are electrically operated on

Test - 30 MA  
Readjust - 28 MA

Gauge by eye.

To check, proceed as follows:

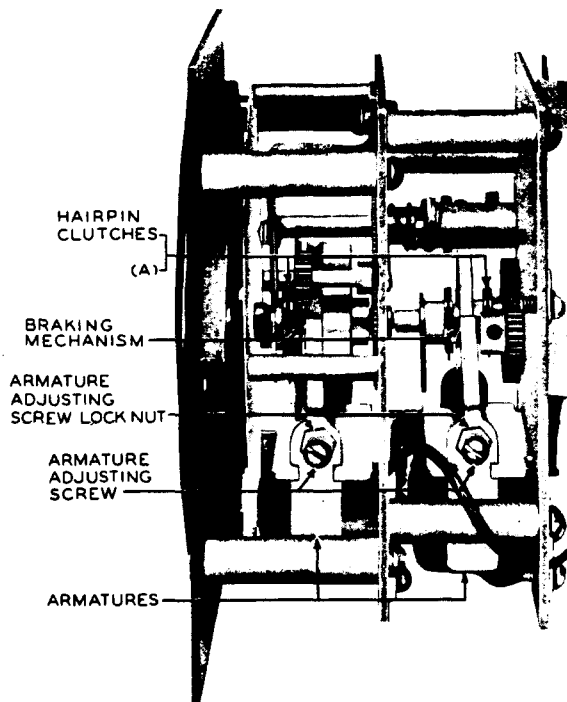


FIG. 2 - BRAKING AND CLUTCH MECHANISM

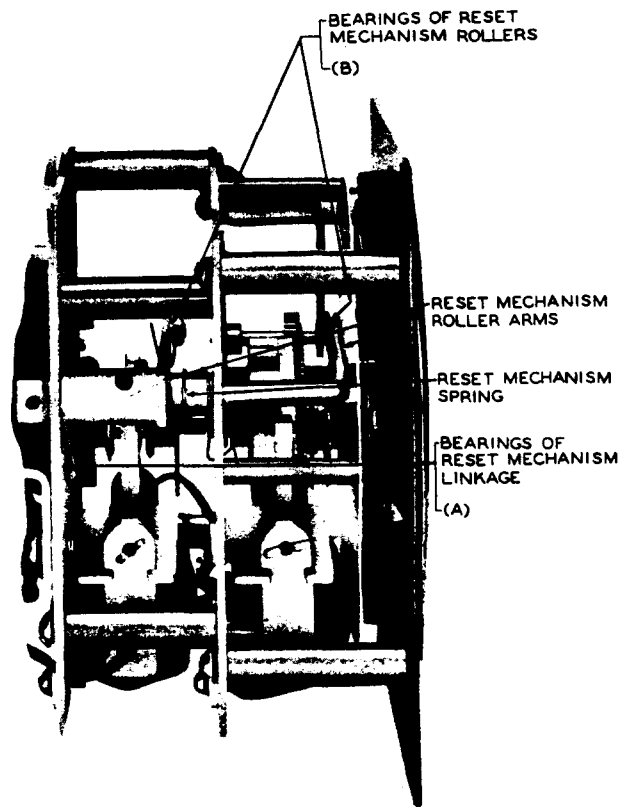


FIG. 3 - RESET MECHANISM

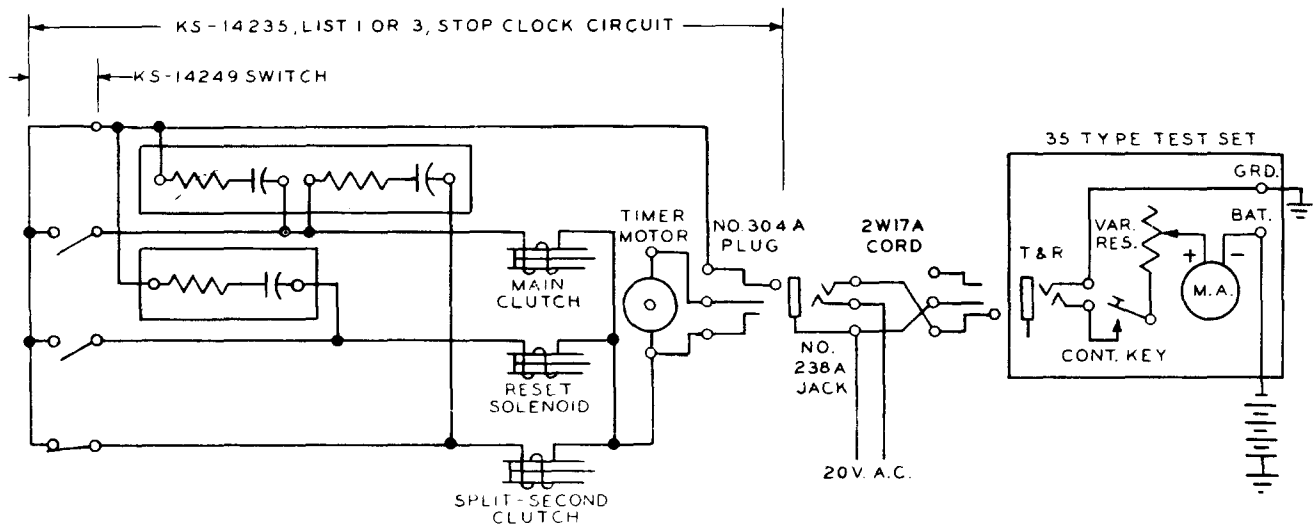


Fig. 4 - Arrangement for Testing Main Clutch and Split-second Clutch Magnets on KS-14235, Lists 1 and 3 Stop Clocks -

List 1 and 3 Clocks - Fig. 4: Connect a 2W17A cord to a No. 238A jack using KS-6278 connecting clips. Connect 48V battery and ground to the BAT and GRD terminals of the 35 type test set. Connect 20V AC to the No. 238A jack by means of KS-6278 connecting clips as shown in Fig. 4. Insert the 2W17A cord into the T & R Jack of the test set and the No. 304A plug of the clock into the No. 238A jack. To check the main clutch, depress the push button of the switch and rotate the control knob to the operated position. Adjust

the test set until the ammeter indicates the specified current value. Restore the knob to the normal position, with the push button still depressed, and then rotate the knob again to the operated position. Observe that the elapsed-time hand rotates. Restore the knob and button to normal. Check the split-second clutch with the switch normal. Adjust the test set until the ammeter indicates the specified value. Manually operate the main clutch and observe that the split-second hand rotates in alignment with the elapsed-time hand.

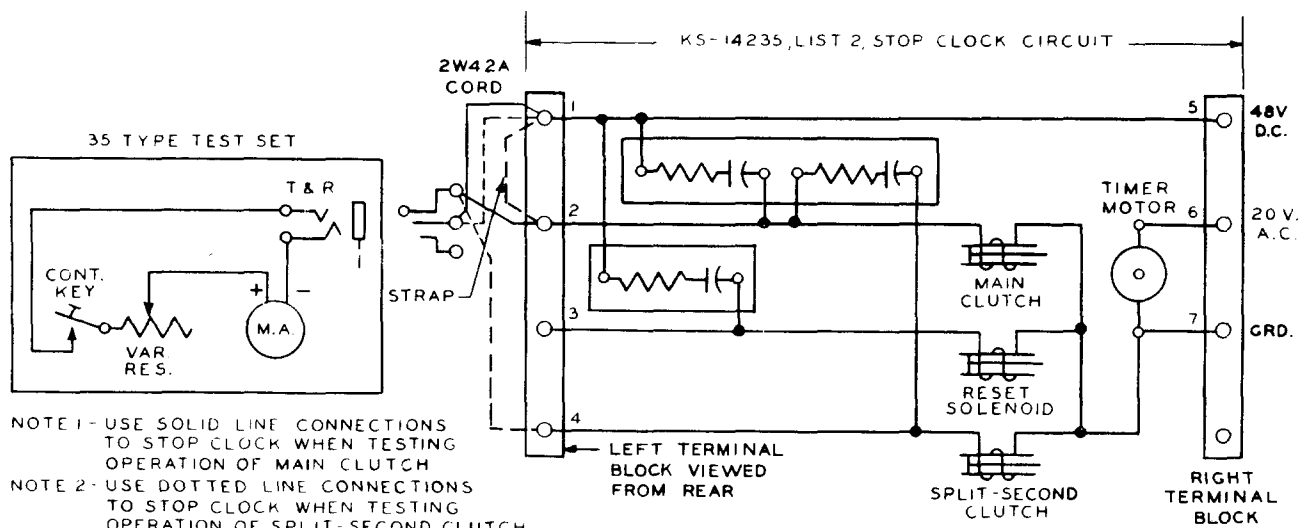


Fig. 5 - Arrangement for Testing Main Clutch and Split-second Clutch Magnets on KS-14235, List 2 Stop Clocks

List 2 Clocks - Fig. 5: Connect the 35 type test set to the specified terminal block on the clock frame using a 2W42A cord and connecting the cord as shown by the solid or dotted lines depending on the clutch being checked. Then connect the specified AC and DC voltages to the other terminal block. Adjust the test set until the ammeter indicates the specified current value. Open the circuit to stop the clock hand or hands; then close it again. If checking the main clutch, observe that the elapsed-time hand rotates and if checking the split-second clutch, observe that the split-second hand rotates in alignment with the elapsed-time hand.

(b) Fig. 6(A): When the control knob of the switch shown in Fig. 7 is depressed from its operated position or when the button of the switch shown in Fig. 8 is depressed while the control knob is in the operated position, the split-second hand shall stop without interrupting the travel of the elapsed-time hand. When the control knob or the button is released, the split-second hand shall realign itself with the elapsed-time hand. This requirement shall apply when the clutch magnets are electrically operated on

Test - 30 MA  
Readjust - 28 MA

To check the magnets, proceed as covered in (a).

This requirement shall be checked within the first 50 seconds of the movement of the hands from the normal position and again within 50 to 100 seconds of the movement of the hands from the normal position.

Note: The split-second hand may not realign itself with the elapsed-time hand if it is released when it is 180° from the elapsed-time hand. In this case, stop the split-second hand and allow the elapsed-time hand to rotate further before releasing the split-second hand again.

(c) When the control knob of the switch is turned to the reset position, the hands shall restore to the normal position.

Note: The hands may not restore to normal when the elapsed-time hand is between 48-52 on the seconds dial. In this case start the clock and allow the elapsed-time hand to rotate

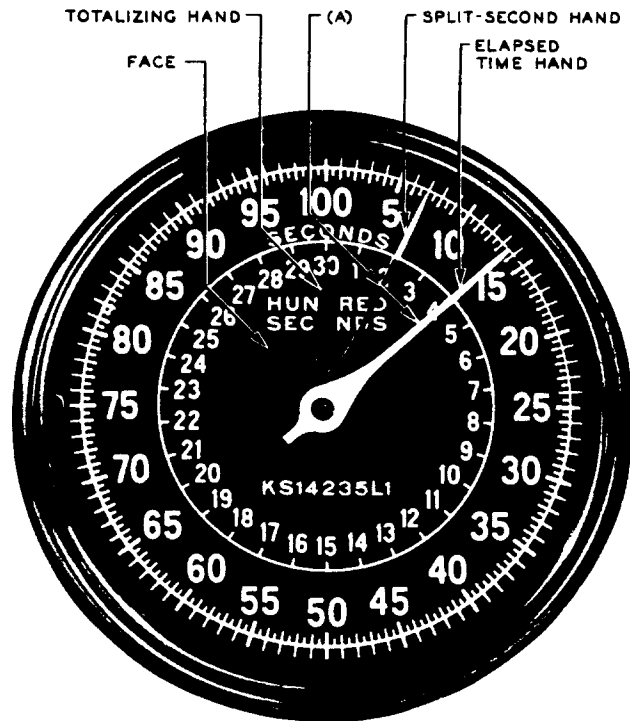


FIG. 6 - POSITION OF HANDS

beyond 52 before operating the control knob of the switch to reset the hands.

(d) Fig. 1(A): When the hands restore to the normal position, the elapsed-time and split-second hands shall point to the graduated line indicating 100 on the seconds dial and the totalizing hand shall point to the graduated line indicating 30 on the 100 seconds dial.

#### 2.06 Position of Reset Mechanism - Fig. 3:

The reset mechanism roller arms shall restore to their uppermost position when the control knob of the KS-14249 switch has been turned to the reset position and then released.

This requirement is met if the hands of the clock restore to normal.

#### 2.07 Operation of Braking Mechanism -

Fig. 2: The braking mechanism shall stop the associated disc from revolving when the associated armatures are released.

This requirement is met if the motion of the split-second hand is stopped when the control knob of the switch shown in Fig. 7 or the button of the switch shown in Fig. 8 is depressed while the knob is in the operated position, and if the motion of

both the split-second and elapsed-time hands is stopped when the control knob is restored to the normal position.

KS-14249 Switch - Fig. 7

**\*2.08 Contact Make**

- (a) Contact springs 3 and 4 shall make when the control knob is turned to the operated position.

Gauge by eye.

- (b) Contact springs 1 and 2 shall make when the knob is turned to the reset position.

Gauge by eye.

**\*2.09 Contact Break:** Contact springs 5 and 6 shall break before the control knob, when depressed, reaches the limit of the stroke.

Gauge by eye.

**\*2.10 Contact Spring Tension**

- (a) There shall be pressure between all closed contacts of

Test - Min. 25 grams  
Readjust - Min. 30 grams

Use the No. 70D gauge.

- (b) With the control knob turned to the operated position and depressed to the limit of the stroke, the tension of spring 6 shall be sufficient to restore the knob to the operated position and close the contacts of springs 5 and 6 while the knob is lightly retarded by hand.

Gauge by eye.

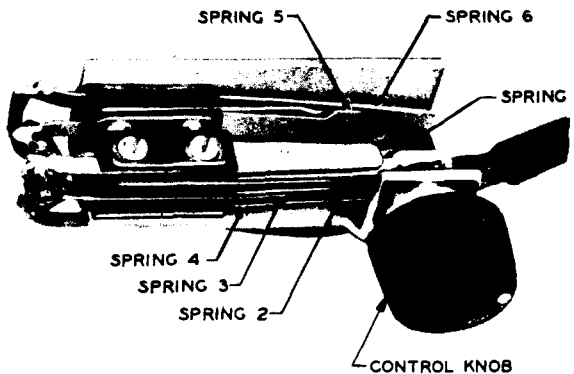


FIG. 7- KS-14249 SWITCH

KS-14249, List 2 or 3 Switch - Fig. 8

**\*2.11 Spring Clearance**

- (a) With the control knob in the normal position, the clearance between spring 2 and the outer corner of the cam shall be

Max 0.012 inch

Gauge by eye.

- (b) With the control knob pushed down to take up end play and the push button pulled up, the end of the plunger shall not touch spring 6.

Gauge by eye.

**\*2.12 Spring Tension**

- (a) With the control knob in the normal position, the pressure of spring 3 against its associated cam surface shall be

Min. 25 grams  
Max. 75 grams

Use the No. 70J gauge applied at the end of the spring.

- (b) With the control knob in the normal position, the pressure of spring 2 against its associated cam surface shall be

Min. 75 grams  
Max. 125 grams

Use the No. 70J gauge applied at the end of the spring.

**\*2.13 Contact Separation:**

- (a) With the control knob in the normal position, the separation between the contacts of springs 1 and 2 and between the contacts of springs 3 and 4 shall be

Min. .020"

Gauge by eye.

- (b) With the push button in the control knob fully depressed, the separation between the contacts of springs 5 and 6 shall be

Min 0.015 inch

Gauge by eye.

**\*2.14 Contact Pressure**

(a) With the push button in the control knob in the undepressed position, springs 5 and 6 shall not break contact when a pressure of

Min 75 grams

is applied to spring 6.

Use the No. 70J gauge applied adjacent to the point where the plunger touches the spring.

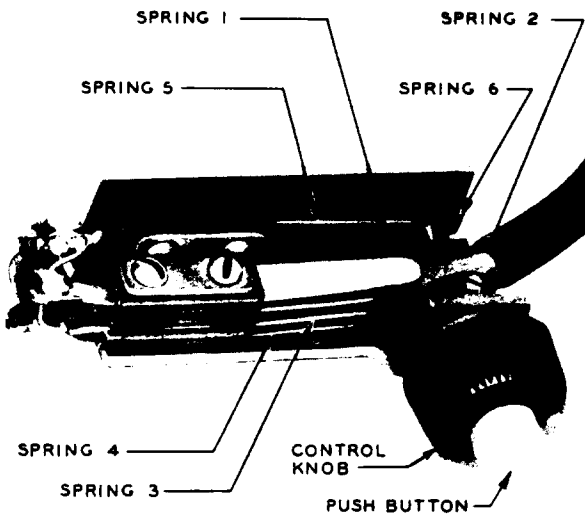


FIG. 8 - KS-14249, LIST 2 OR 3 SWITCH

(b) With the control knob in the operated position, springs 3 and 4 shall not break contact when a pressure of

Min. 65 grams

is applied to spring 4.

Use the No. 70J gauge.

(c) With the control knob in the reset position, springs 1 and 2 shall not break contact when a pressure of

Min. 65 grams

is applied to spring 1.

Use the No. 70J gauge.

**2.15 Freedom of Movement of Control Knob:**

The control knob shall restore freely to the normal position from the reset position.

**3. ADJUSTING PROCEDURES**

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

Code or Spec. No.	Description
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**Tools**

417A	1/4" and 3/8" Hex. Open Double-End Flat Wrench
485A	Smooth Jaw Pliers
KS-2993	Flat Brush
KS-7782	Parallel Jaw Pliers
KS-14164	No. 4 Artists Show Card Brush
-	3" Cabinet Screwdriver

**Gauges**

70D	50-0-50 Gram Gauge
70J	0-150 Gram Gauge

**Materials**

KS-2423	Cloth
KS-7470	Oil
KS-7860	Petroleum Spirits

**Test Apparatus**

-	Test Equipment in accordance with Fig. 4 or Fig. 5
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3.002 It will be necessary to remove the clock from the container and the switch from the case to make most of the adjustments involved. To remove a List 1 or List 3 clock from the container, remove the clock mounting screws using the 3" cabinet screwdriver. Remove the clock, pulling the cords through the container far enough to make the adjustments. To remove a List 2 clock from the container, remove the clock mounting screws, the screws on each side of the container near the rear and the mounting screws of each terminal block, using the 3" cabinet screwdriver. Note the positions of the terminal blocks on the clock mounting. Remove the clock mechanism through the rear of the container. To gain access to the switch, remove the screws of the switch case using the 3" cabinet screwdriver and remove the switch from the case. After the adjustments have been made, securely remount the clock in the container and the switch in the case.

3.01 Cleaning (Rq. 2.01)

- (1) Clean the external parts of the stop clock with a dry KS-2423 cloth.
- (2) To clean the face of a List 1 or List 3 clock, remove the face plate by removing the face plate mounting screws, using the 3" cabinet screwdriver. Removal of a List 2 clock from its container, as outlined in 3.002, exposes the face. Clean the face with the KS-2993 brush taking care not to bend the hands or disturb their setting. Remount the face plate on a List 1 or List 3 clock.

3.02 Lubrication (Rq. 2.02)

- (1) Lubricate the various parts with the specified lubricant applied with the KS-14164 brush.

3.03 Freedom of Movement (Rq. 2.03)

- (1) If parts of the clock appear to bind, refer the matter to the supervisor.
- (2) If the hands bind on each other, on the crystal or on the face, remove the face plate of a List 1 or List 3 clock. Removal of a List 2 clock from its container exposes the face. Adjust the hands as required with the No. 485A pliers. Remount the face plate on a List 1 or List 3 clock.

3.04 Accuracy of Clock Movement (Rq. 2.04)

- (1) If the clock movement fails to keep accurate time, refer the matter to the supervisor.

3.05 Movement of Elapsed-Time, Split-Second and Totalizing Hands (Rq. 2.05)

- (1) If the movement of the elapsed-time, split-second and totalizing hands is not satisfactory, the trouble may be due to faulty electrical connections, to excessive tension on either or both armature retractile springs, to a defective KS-14249 switch or defective stop clock mechanism.
- (2) If the electrical connections are faulty, correct them as required.
- (3) If the hands do not rotate as specified, when the proper current is applied to each clutch magnet, there may be excessive tension on either or both of the armature retractile springs. If the elapsed-time

hand does not rotate, decrease the tension on the rear spring by backing off the associated armature adjusting screw locknut with the No. 417A wrench, and turn the armature adjusting screw in, as required, with the 3" cabinet screwdriver. Then while holding the screw in place, tighten the locknut. If, after this adjustment has been made, the split-second hand does not rotate in alignment with the elapsed-time hand, decrease the tension on the front armature retractile spring in the same way.

- (4) If the stop clock still does not operate satisfactorily, check requirements 2.08 to 2.10 inclusive if the switch is like the one shown in Fig. 7 or requirements 2.11 to 2.15 inclusive if the switch is like the one shown in Fig. 8.

- (5) If the stop clock hands do not reset properly to zero but are not more than 1/2 second off, the hands may be adjusted with the fingers by bending the tip of the hand, using extreme care, while holding the clock hand steady near its base.

- (6) If the hands when reset are more than 1/2 second off from zero, if the degree of misalignment varies from time to time or if the movement of the hands is otherwise faulty, refer the matter to the supervisor.

3.06 Position of Reset Mechanism (Rq. 2.06)

- (1) If the reset mechanism roller arms do not restore to their uppermost position after being operated and then released, the trouble may be due to bind of the lever shaft in its bearings or to a weak or defective reset mechanism spring. If binding of the mechanism is due to dirt or a gummy substance collecting in the bearings, flush the bearings with KS-7860 petroleum spirits applied with a KS-14164 brush. Lubricate as covered in 3.02. If the movement of the mechanism is still unsatisfactory, refer the matter to the supervisor.

3.07 Operation of Braking Mechanism (Rq. 2.07)

- (1) If the braking mechanism does not stop the associated disc from rotating, adjust the armature adjusting screw out as required with the 3" cabinet screwdriver while holding the armature adjusting screw lock nut in place with the No. 417A wrench.

KS-14249 Switch - Fig. 7

- 3.08 Contact Make (Rq. 2.08)
- 3.09 Contact Break (Rq. 2.09)
- 3.10 Contact Spring Tension (Rq. 2.10)

- (1) If the contact make or break or the contact pressure is not satisfactory, check that the spring clamping screws are tightened securely. If tightening the screws does not correct the condition, adjust the stationary contact springs as required with the KS-7782 pliers. Apply the pliers to the springs as close to the insulators as possible.
- (2) If the knob does not restore properly to its operated position, after having been depressed, clean the knob shaft with a KS-2423 cloth moistened with KS-7860 petroleum spirits. If this does not correct the condition, reduce the tension of springs 2 and 3 or increase the tension of spring 6 against the plunger with the KS-7782 pliers, taking care that requirement 2.10 is met. Apply the pliers to the springs as close to the insulators as possible.
- (3) If the switch still does not operate satisfactorily, replace it with a KS-14249, List 3 switch.

KS-14249, List 2 or 3 Switch - Fig. 8

- 3.11 Spring Clearance (Rq. 2.11)
- 3.12 Spring Tension (Rq. 2.12)
- 3.13 Contact Separation (Rq. 2.13)
- 3.14 Contact Pressure (Rq. 2.14)
- 3.15 Freedom of Movement of Control Knob (Rq. 2.15)

- (1) If any of the switch requirements are not met, check that the spring clamping screws are tightened securely.
- (2) Check that the cam shaft of the knob is free from foreign matter. If necessary, clean the cam shaft with a KS-2423 cloth moistened with KS-7860 petroleum spirits.
- (3) If any of the requirements still are not met, adjust the contact springs as required with the KS-7782 pliers. When adjusting spring 2 for proper clearance at the outer corner of its associated cam, apply the pliers to the spring so that the tip of the spring may be bent at a point 5/16" from its end. For all other spring adjustments, apply the pliers to the springs as close to the insulators as possible.