RELAYS AND FLASHING CIRCUITS USED IN AIR NAVIGATION OBSTRUCTION LIGHTING CIRCUITS REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers KS-14566 thermal relay and other relays and flashing switches not having KS designations. Refer to SD-81114-01 and SD-81506-01 and the associated circuit descriptions.

1.02 This section is reissued to change the number of the cam lubricant and to make minor changes as required.

1.03 For information on Struthers-Dunn relays, see Section 040-810-701. For information on Ward Leonard relays, see Section 040-811-701.

1.04 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.

1.05 Requirements 2.01 and 2.03 apply to the T.A. Edison B1642 Model 501 115-NC-10, the KS-14566 thermal relay, and the Adams & Westlake 1140-45-MM relay. They are completely enclosed and should be replaced if they fail to meet requirements in the circuit requirements table or are otherwise defective. (See Fig. 1 and 2.)

1.06 Requirements 2.01 and 2.02 apply to the Crouse-Hinds Company and Hughey & Phillips, Incorporated flashing switches.

1.07 The Crouse-Hinds Company 46777AT single-circuit flashing switch is shown in Fig. 3; the 46779AT 2-circuit flashing switch is shown in Fig. 4; the TL1941 3-circuit flashing switch is shown in Fig. 5; and the Hughey & Phillips, Incorporated 3-circuit flashing switch is shown in Fig. 6. The switches contain a motor which, through appropriate gearing, drives a cam that rocks a mercury tube carrier up and down, thereby operating the mercury tube switch or switches on and off as the motor rotates.

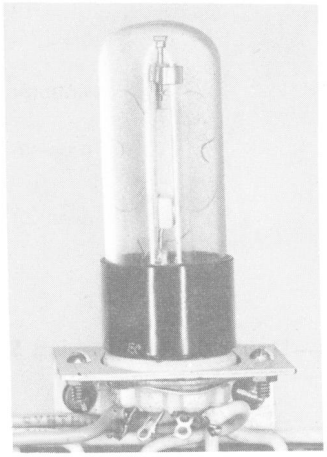

Fig. 1—Thermal Relay

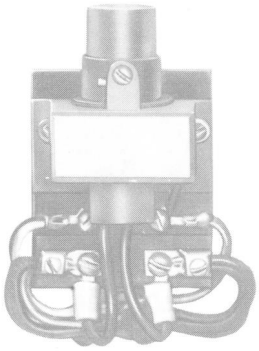

Fig. 2—Adams & Westlake Relay

2. REQUIREMENTS

2.01 ***Mounting:*** The relay or switch shall be fastened securely to its mounting. The component parts shall be held together securely.

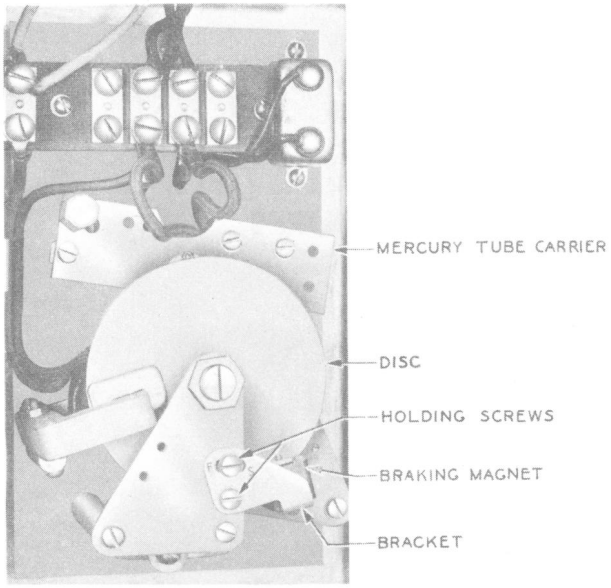

Fig. 3—Single-Circuit Flashing Switch

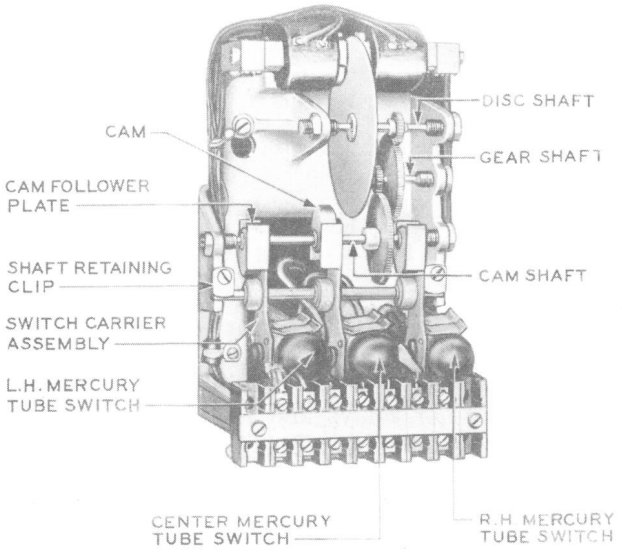

Fig. 5—3-Circuit Flashing Switch (Crouse-Hinds Company)

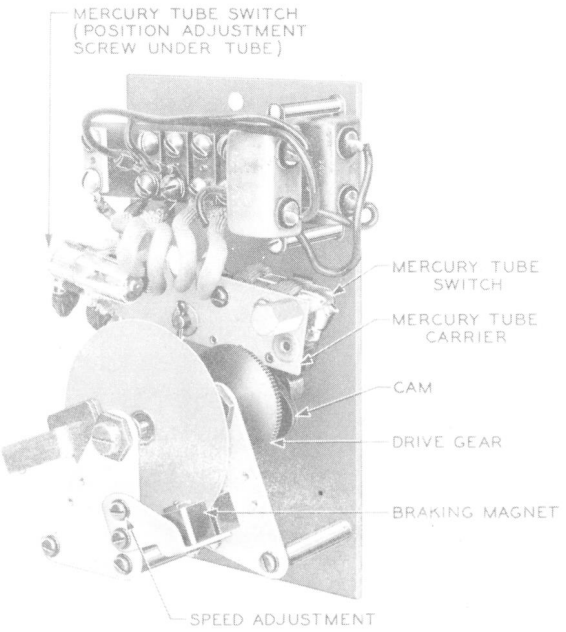

Fig. 4—2-Circuit Flashing Switch

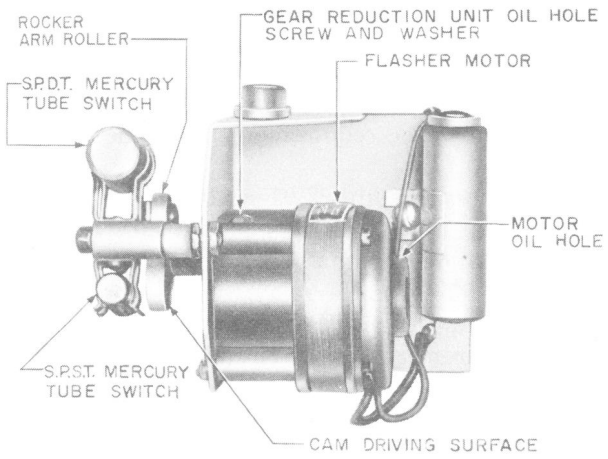

Fig. 6—3-Circuit Flashing Switch (Hughey & Phillips Incorporated)

Gauge by feel.

2.02 *Flashing Switches*

(a) ***Single- and 2-Circuit Switches (Fig. 3 and 4)***

(1) Lubricate the bearings of the disc shaft, camshaft, cam roller shaft, and mercury tube carrier shaft with one drop of KS-6232 light mineral oil at each bearing every 6 months.

(2) It is recommended that the gears be operated without lubrication.

(3) The switch shall operate at the rate of:

FLASHES PER MINUTE	
MIN	MAX
27	33

Use ▶KS-3008 stopwatch.◀

(4) Only where 2-circuit flashing switches are used, the make of the left-hand mercury tube switch shall occur simultaneously with the break of the right-hand mercury switch. Adjust as close as possible but avoid a make before break.

Note: Make or break can be determined by observation of series pilot lamps in the associated circuit. For proper operation, flashing switch mounting panels should be mounted plumb. Unless positioned approximately as shown in Fig. 4, the four flexible leads running from the mercury tube carrier may prevent the carrier from completing its full motion. Rearrange leads as necessary.

(b) ***3-Circuit Switch (Fig. 5)***

(1) Lubricate the bearings of the disc shaft, gear shaft, camshaft, and the switch carrier shaft with one drop of KS-6232 light mineral oil at each bearing. Apply a light coat of cam lubricant ▶KS-7471◀ to the driving surfaces of the cams. This should be done every 3 to 6 months.

(2) It is recommended that the gears be operated without lubrication.

(3) The switch shall operate at the rate of:

FLASHES PER MINUTE	
MIN	MAX
27	33

Use ▶KS-3008 stopwatch.◀

(4) The make of the left-hand mercury tube switch shall follow instantaneously the break of the center mercury tube switch with no gap or overlap. The right-hand mercury tube switch operates in unison with the left-hand mercury tube switch.

Note: Make or break can be determined by observation of series pilot lamps in the associated circuit. For proper operation, the flashing switch mounting panel should be mounted in a strict vertical position.

(c) ***3-Circuit Switch (Fig. 6)***

(1) Lubricate the flasher motor and the gear reduction unit every 3 to 6 months with KS-6232 light mineral oil.

(2) Apply a light coat of cam lubricant ▶KS-7471◀ to the driving surfaces of the cam. This should be done every 3 to 6 months.

(3) It is recommended that the rocker arm roller and the rocker arm shaft be operated without lubrication.

(4) The switch shall operate at approximately 27 flashes per minute.

Use ▶KS-3008 stopwatch.◀

(5) One make of the SPDT switch operates in unison with the make of the SPST switch and 180 degrees out of phase with the ***other*** make of the SPDT switch.

Note: Make or break can be determined by observation of series pilot lamps in the associated circuit. However, no field adjustment is possible. For proper operation, the flashing switch mounting panel should be mounted in a strict vertical position.

2.03 ***Electrical Requirements***

(a) The relays shall meet the electrical requirements specified in the circuit requirements table or other job information.

(b) Check of electrical requirements may be made at the temperature at which the relay is found, unless H (hot) or C (cold) is specified in the circuit requirements table.

3. ADJUSTING PROCEDURES

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

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
—	3-inch C screwdriver
GAUGES	
KS-3008	Stopwatch
MATERIALS	
KS-6232	Light mineral oil (90-110S-100)
KS-7860	Petroleum spirits
KS-14666	Cleaning cloth
KS-7471	◗Cam lubricant◖
TEST APPARATUS	
KS-6780	Connecting clips
—	Autotransformer, continuously tapped, (Variac 7.5-ampere 115-volt input, V-5MT type or equivalent: General Radio Company, Cambridge, Mass. suggested)
—	2-conductor Tirex cord (or equivalent)
—	AC voltmeter, Weston Model ◗904, range 300/150V or the replaced Weston Model 528.◖

3.002 In view of the fact this apparatus is connected to circuits having a nominal voltage of 115 volts to ground, it is recommended that all requirements except the electrical requirements be checked, and all adjusting procedures carried out with the power supply disconnected.

Caution: Use care when working in close quarter with live parts.

3.01 ***Mounting:*** (Reqt 2.01)—Tighten loose mounting screws and terminal nuts.

3.02 ***Flashing Swtiches:*** (Reqt 2.02)

(a) ***Single- and 2-Circuit Switches***

(1) To lubricate, apply oil with a clean toothpick or a piece of bare wire.

(2) To decrease the speed, loosen the holding screws to rotate the bracket to bring the breaking magnet nearer the center of the disc.

(3) On 2-circuit flashing switches, the time interval between the break of the right-hand mercury tube switch and the make of the left-hand mercury tube switch may be adjusted by shifting the position of the left-hand mercury tube switch clip mounting on the mercury tube carrier. To change position, loosen the two screws which fasten the clip mounting to the carrier, shift the mounting to the desired position, and tighten the two screws.

(b) ***3-Circuit Switches (Crouse-Hinds Company)***

(1) To lubricate bearings, apply oil with a clean toothpick or a piece of bare wire. Apply a very thin coating of cam lubricant to the cam driving surface.

(2) Adjustments of the mercury tube flasher switches are not usually necessary since they are carefully adjusted at the factory. However, should it be apparent that a gap or overlap exists between the left-hand and center mercury tube switches, the following table may be of assistance in adjusting the switches.

(3) To increase the ON period of the center mercury tube switch, remove the shaft retaining clips and remove the switch carrier assembly. Remove the center mercury tube switch from its holding clip on the switch

TABLE A

BETWEEN THE BREAK OF THE LEFT-HAND SWITCH AND MAKE OF CENTER SWITCH	BETWEEN THE BREAK OF THE CENTER SWITCH AND MAKE OF LEFT-HAND SWITCH	CAUSE OF FAULT	ADJUSTMENTS
Gap	Gap	Center switch ON period too short	3.02(3)
Overlap	Overlap	Center switch ON period too long	3.02(4)
Gap	Overlap	Center switch closes too late in flash cycle	3.02(5)
Overlap	Gap	Center switch closes too early in flash cycle	3.02(6)

carrier assembly. Loosen the screws mounting the switch holding clip. Adjust the angle of the switch holding clip in the direction that will make the large end of the switch (when mounted) lower. Retighten screws and reassemble in the reverse order. (See Notes.)

(4) To decrease the ON period of the center mercury tube switch, remove the shaft retaining clip and remove the switch carrier assembly. Remove the center mercury tube switch from its holding clip on the switch carrier assembly. Loosen the screws mounting the switch holding clip. Adjust the angle of the switch holding clip in the direction that will make the large end of the switch (when mounted) higher. Retighten screws and reassemble in the reverse order. (See Notes.)

Note: If the limit of adjustment referred to above is reached without fully correcting the difficulty, the left-hand mercury tube switch may be adjusted in a similar manner to further improve the adjustment.

(5) To adjust the center mercury tube switch to close earlier, connect the flashing switch to the power supply and note the direction of the cam rotation. Disconnect the flashing switch, loosen the cam setscrew holding the cam to the cam shaft, rotate the cam a few degrees in the direction of normal rotation, and retighten the cam setscrew. Repeat as necessary.

(6) To adjust the center mercury tube switch to close later, connect the flashing switch to the power supply and note the direction of the cam rotation. Disconnect the flashing switch and loosen the cam setscrew. Holding the cam to the cam shaft, rotate the cam a few degrees in the opposite to normal rotation and retighten the cam setscrew. Repeat as necessary.

Note: In making the above adjustments, use may be made of the pilot lamps in the associated circuit.

(c) ***3-Circuit Switches (Hughey & Phillips, Incorporated)***

(1) To lubricate the motor and the gear reduction unit, apply oil to the motor oil hole; and on the gear reduction unit, remove the round head screw and washer (Fig. 6) and apply oil in the screw hole. Apply a thin coat of cam lubricant ▶KS-7471◀ to the cam driving surface.

(2) No provisions are made for the adjustment of the tilt switches. Replacement tilt switches are premarked for installation in a properly level unit.

3.03 ***Electrical Requirements:*** (Reqt 2.03)—Connect the ac supply to the input of a continuously tapped autotransformer protected by a 10-ampere fuse. Connect the output of the autotransformer as covered in the circuit requirements table and adjust to the specified values (use voltmeter). For the test connections, use flexible cord (of the type used with small electrical appliances) with KS-6780 clips for connecting to the apparatus under test.