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NAVY DEPARTMENT
BUREAU OF ENGINEERING

Report of

Test on Relays for Operation of Pilot
Indicator Lamps in Truck and
Screened Speed Light Controllers.

Automatic Electric Company
Exhibitor.

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON, D. C.

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Prepared by:

W. B. Roberts, Sr. Engr. Aide,
Chief of Section

Reviewed by:

W. M. Haynsworth, Jr., Lieutenant, USN.

Approved by:

H. R. Greenlee, Captain, USN
Director

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CONCLUSIONS

(a) The subject relays are of good workmanship, rugged in construction and positive in operation on both alternating and direct currents.

(b) Satisfactory operation was also obtained when tested at minimum current (0.074 amps) caused by placing the 693 ohm dimmer resistance in series with one 15 watt, 115 volt lamp and reducing the line voltage to 103.5 volts.

(c) The relays will operate in all positions, 30° from the vertical plane at both minimum and maximum currents.

(d) The relays are small enough to be mounted in the present truck light controller case, if desired.

RECOMMENDATIONS

(a) In view of the satisfactory operation of the relays, it is recommended that they be approved for operation of pilot indicator lamps (Type VG-2) in truck and screened speed light controllers for both AC and DC ships subject to comments paragraphs 17 and 18.

AUTHORIZATION

1. This test was authorized by reference (a) and other additional reference pertinent to this problem is listed as reference (b).

Reference: (a) Bu.Eng. ltr. S64-5(1-2-Ds) of 4 Jan. 1935.
(b) Bu.Eng. ltr. S64-5(11-24-DK1) of 30 Nov. 1934
to Comdt., Portsmouth.

OBJECT OF TEST

2. The object of this test was to determine the suitability of two relays manufactured and submitted by the Automatic Electric Company, Chicago, Ill., for operation of pilot indicator lamps (Type VG-2) in truck and screened speed light controllers - Bureau of Engineering Drawing 9-S-4670-L.

ABSTRACT OF TEST

3. The subject relays were set up at this Laboratory in a circuit simulating service conditions and closely observed for dependability while operating at minimum and maximum currents (AC and DC). Tests were also made to determine their insulation resistance, dielectric strength, shock integrity and operating characteristics when inclined in all planes 30° from the vertical.

DESCRIPTION OF MATERIAL UNDER TEST

4. The subject relays are designed for AC-DC operation and for connection in series with any one of the truck or screened speed lights and dimmer resistance. The purpose of each relay is to light a pilot indicator lamp (type VG-2) located in the truck and screened speed light controller, each time an impulse of current is transmitted by the pulsator. The relay will function as long as one good lamp remains in the circuit.

5. The magnetic circuit consists of a "U" shape laminated core and a hinged type armature. The winding consists of 874 turns of No. 22 enameled wire, having a resistance of 3.14 ohms at ambient temperature of 28°C wound on a molded insulating bobbin. One of the pole pieces is slotted to accommodate a copper shading coil which helps to prevent chattering.

6. The relay is provided with double pole contacts actuated by two arms extending from the armature. These arms may be adjusted to limit the travel of the armature and of the lower contacts.

7. The air gap is also adjustable but the residual gap is fixed at 0.002 by the use of a brass insert in the armature. The force necessary to return the armature to its normal position, when the coil is de-energized, is furnished by the lower contact springs.

8. All of the parts are plated for protection against corrosion.

METHOD OF TEST

9. The relays were connected in a truck light circuit with a dimmer resistance and a pulsator. Each was enclosed in a compartment having an ambient temperature 40°C and tested for endurance by operating it at the rate of 90 operations per minute for 50,000 operations at maximum current and 50,000 operations at minimum current. The temperature rise of the windings was computed by the resistance method.

10. Tests were made, on both AC and DC, at maximum and minimum currents, with the relays inclined in all planes 30° from the vertical, to ascertain whether they would operate satisfactorily under the most adverse conditions.

11. At the conclusion of the endurance test, the relays were subjected to 20-150 foot pound blows for shock integrity and then tested for insulation resistance and dielectric strength.

RESULT OF TEST

12. Data obtained during endurance test.

Lamps in Truck Light (15w-115 volt)	Line 115 Volts A.C. Truck Light		Line 115 Volts D.C. Truck Light	
	Voltage	Current	Voltage	Current
No dimmer Resistance				
4	106.0	0.475	113.6	0.480
3	107.0	0.361	113.8	0.362
2	108.0	0.238	114.2	0.243
1	110.0	0.123	114.5	0.125

693 Ohms
Dimmer
Resistance

4	13.8	0.139	15.2	0.150
3	19.6	0.132	21.8	0.138
2	34.0	0.115	33.0	0.119
1	55.5	0.079	58.5	0.083

Resistance of coil 3.14 ohms at 28°C
874 turns (No. 22 enamel wire)
Air gap - 0.004
Residual gap - 0.002
Stop lever gap - 0.031
Contact gap - 0.022

13. The average temperature rise of the relay windings was 7.67°C at an ambient temperature of 40°C with maximum current flowing for a period of 4 hours.

14. The insulation resistance between all current carrying parts and ground was 200 megohms when measured with a 1000 volt megger.

15. The relays successfully withstood a dielectric test of 1240 volts, 60 cycle, alternating current when applied between all current carrying parts and ground for a period of one minute.

COMMENTS

16. The present relay coils should be protected against the absorption of moisture by the use of insulating varnish after completion of winding.

17. In order to gain positive operation without chattering at

minimum current, it was necessary to increase the contact gaps slightly. The correct value is given in paragraph 13.

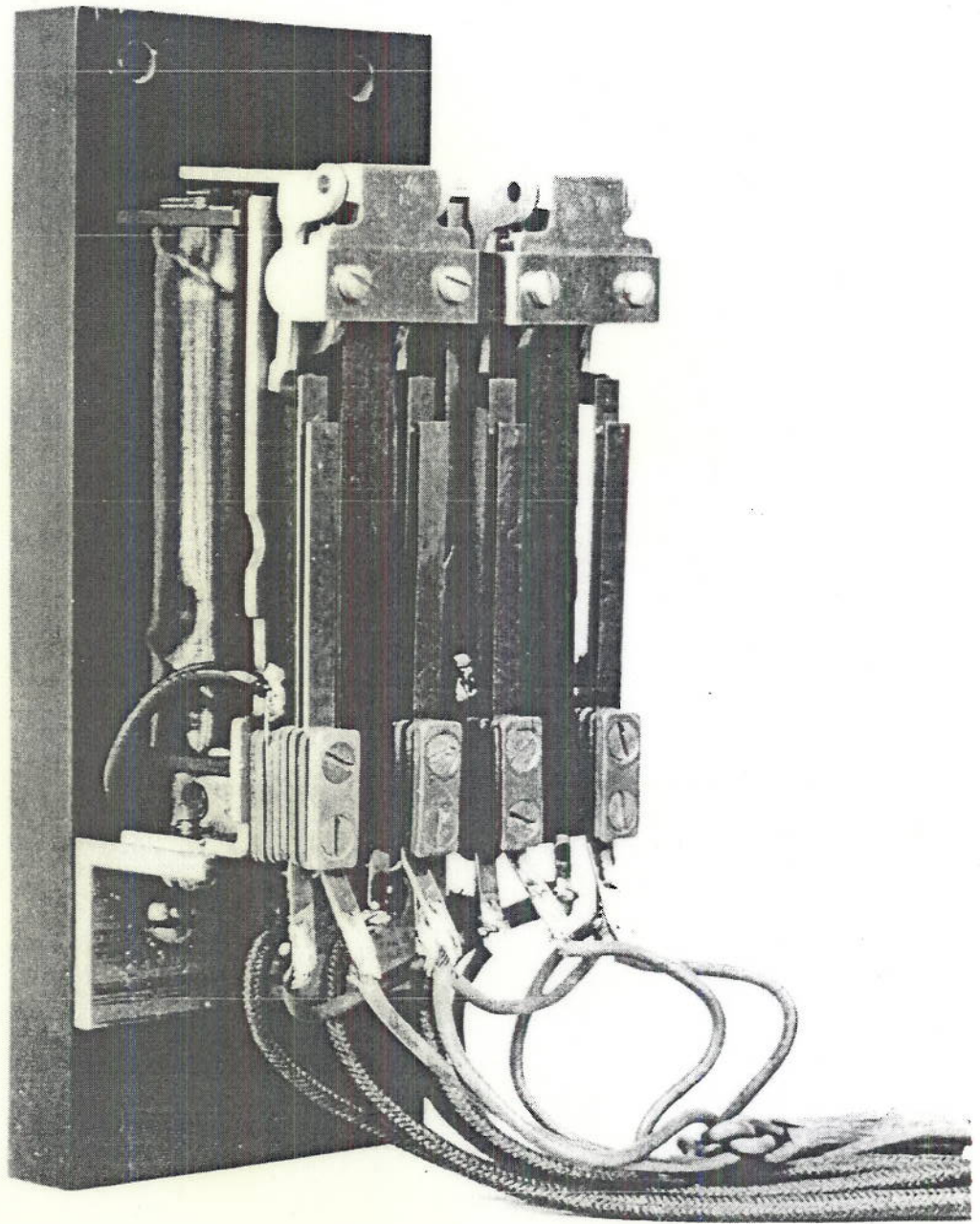
CONCLUSIONS

18. The subject relays are of good workmanship, rugged in construction and positive in operation on both alternating and direct currents.

19. Satisfactory operation was also obtained when tested at minimum current (0.074 amps) caused by placing the 693 ohm dimmer resistance in series with one 15 watt, 115 volt lamp and reducing the line voltage to 103.5 volts.

20. The relays will operate in all positions, 30° from the vertical plane at both minimum and maximum currents.

21. The relays are small enough to be mounted in the present truck light controller case, if desired.



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