

REPORT NO. B-2002

DATE 13 March 1943

SUBJECT

FR-2002

Contact Maker, Type L

Submitted by

United Electric Controls Co.

NAVAL RESEARCH LABORATORY

BELLEVUE, D. C.

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13 March 1943

NRL Report No. B-2002

NAVY DEPARTMENT

Report of Test

on

Contact Maker - Type L

Submitted by

United Electric Controls Company
Boston, Massachusetts

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON, D.C.

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Authorization: BuShips Ltr. S62-2(350) of 29 October 1942.

Date of Test: January - February 1943.

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AUTHORIZATION FOR TEST

1. This problem was authorized by reference (a), and other references pertinent to this problem are listed as references (b) and (c).

- References: (a) BuShips Ltr. S62-2(350) of 29 October 1942.
(b) Specification 17C16 of 1 August 1941, 17C16a of 2 March 1942, and Amendment 2 of 1 August 1942.
(c) United Electric Controls Company Plan No. 148.

OBJECT OF TEST

2. The object of this test was to determine conformance of the sample contact maker with specification, reference (b), and its suitability for Naval use.

ABSTRACT OF TEST

3. The sample contact maker was set up at this Laboratory in suitable test equipment where its performance was carefully observed for compliance with the specification. An inspection to determine compliance in the matter of materials, design, and workmanship, concluded the test.

CONCLUSIONS

(a) The subject contact maker is of simple design and good workmanship, but it failed to comply with the specification, reference (b), in the following respects:

- (1) Under the endurance test, it was found that in order to open the contacts of the "micro-switch" (following a closing operation while carrying rated current), it was sometimes necessary to use more force. Even when the pressure was increased to a high value, the travel of the actuating arm was not sufficient to open the switch. This failure might be remedied by using a "micro-switch" of somewhat different characteristics.
- (2) The pressure chamber should be cast of ornamental bronze and should have a 3/8-inch female drainage connection as well as a 3/8-inch male pressure connection.
- (3) The nameplate furnished is of steel in lieu of satisfactory plastic material and has commercial type data rather than Navy type data and ratings.
- (4) The unimpregnated fiber insulation used is not approved for this use and is not required by the specification.
- (5) The use of brass composition for the housing appears to be a violation of the critical material requirements.

(b) The adequacy of the two mounting lugs is questionable in view of the recent emphasis on HI shock resistance.

(c) If resubmitted, it is suggested that the unit be built into a steel case and be provided with the required cast pressure chamber, fitted with a 3/8-inch drainage plug and a 3/8-inch male pressure connection.

RECOMMENDATIONS

(a) That the subject contact maker be NOT approved for Naval use in its present form in view of the deficiencies noted under "Conclusions".

(b) That the manufacturer be advised to investigate thoroughly the cause of the "micro-switch" failure before submitting any further samples for test.

DESCRIPTION OF MATERIAL UNDER TEST

4. The sample Type I contact maker is designed to close a circuit upon falling pressure.

5. The mechanism incorporates a bellows assembly which is responsive to a change in pressure. A brass guide cape and screw at the top of the bellows assembly is soldered to one end of a brass actuating arm pivoted in the center. A brass stud extending from the guide cap through the actuating arm operates the plunger of a red and black "Kalper Switch" type "micro-switch". As pressure decreases, this stud releases the plunger on the "micro-switch", and the circuit is closed. A loading spring, at the opposite end of the actuating arm from the bellows, is provided to oppose the expansion of the bellows. The operating pressure is adjustable from 1/2 p.s.i. to 50 p.s.i. by varying the compression of the loading spring.

6. The "micro-switch" is secured to the housing by means of two No. 6-32 brass screws threaded into two raised bosses on the back of the housing. Two brass terminals are secured to the "micro-switch". Unimpregnated fiber, of 1/32-inch thickness, is provided for additional insulation between the switch terminals and the inner surface of the housing.

7. A flat rubber gasket, 1/16-inch thick, is provided between the housing cover (steel) and housing (brass) to insure watertightness when the cover is secured to the housing by four No. 10-32 fillister-headed steel screws. A boss, suitable for a 3/4-inch I.P.S. tap, is provided in the side of the housing for the installation of a terminal tube. The female pressure fitting is 1/4-inch I.P.S. Two extending lugs, cast integral with the case, are drilled for 1/4-inch mounting screws.

8. Further details are shown in drawing, reference (c), and photographs, plates 1 and 2.

METHOD OF TEST

9. The sample contact maker was set up in the usual test equipment, and the operating range was determined. It was then set at a particular (reference) operating pressure and subjected to further tests. Due to its failure under endurance, no further accuracy checks could be obtained.

10. Tests for dielectric strength, insulation resistance, and watertight integrity, and a careful examination to determine compliance in the matter of materials, design, and workmanship, concluded the tests.

RESULTS OF TEST

II. The test results obtained were as follows:

Requirements

Operating range: Shall be capable of adjustment over a range of 0 to 50 pounds per square inch.

Test Values

Complied.
1/2 lb. to 50 lbs.

RESULTS OF TEST (Cont'd)

Requirements

Contact load: Switch shall be capable of breaking a load of 4 amperes, 0.5 P.F., 115 volts, 60 cycles.

Endurance: Shall operate 48 hours, "on" two seconds, "off" two seconds, with contacts carrying rated current; the first 24 hours at an ambient temperature of 50° F. and the final 24 hours at 158° F.

Dielectric: Shall withstand 1250 volts, 60 cycles, for one minute between open contacts and to ground.

Insulation resistance: Shall be not less than 10 megohms at 500 volts.

Watertight integrity: Shall be submerged in 3 feet of water for 1 hour without the entry of water into the case.

Clearance: Shall not be less than 1/4-inch between electrical circuits and ground unless separated by at least 1/8-inch of approved insulating material.

Weight and Dimensions: Not specified.

Pressure chamber: Shall be of ornamental bronze castings, and shall be provided with one 3/8-inch I.P.S. male connection for pressure supply, and one 3/8-inch I.P.S. female top for drainage connection.

Nameplate: Shall be of a satisfactory plastic material.

Test plans: Para. H-3b.

Test Values

*Endurance failure attributed to welding and sticking of switch contacts.

*Circuit did not open during some "off" periods. See "Conclusions".

Complied.

Complied.
Greater than 100 megohms at 500 volts.

Complied.

Complied.

Width: 3-5/8 inches.
Depth: 1-5/8 inches.
Length: 3-1/2 inches.
Weight: 2 lbs., 5 oz.

*Brass pressure fitting provided, with 1/4-inch I.P.S. female top. No method of drainage is provided.

*Nameplate furnished is of steel.

Complied.

*Denotes failure to comply with the specification.

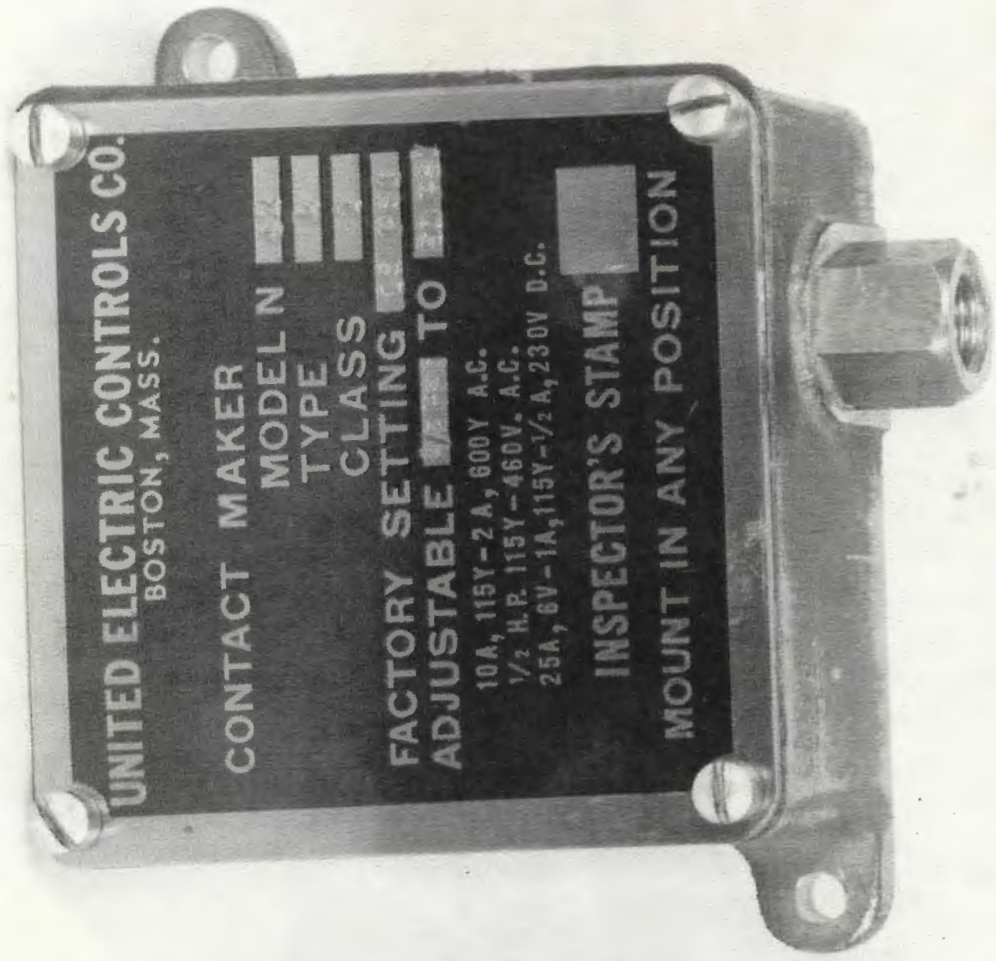
CONCLUSIONS

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- (5) The use of brass composition for the housing appears to be a violation of the critical material requirements.

13. The adequacy of the two mounting lugs is questionable in view of the recent emphasis on HI shock resistance.

14. If resubmitted, it is suggested that the unit be built into a steel case and be provided with the required cast pressure chamber, fitted with a 3/8-inch drainage plug and a 3/8-inch male pressure connection.



UNITED ELECTRIC CONTROLS CO.
BOSTON, MASS.

CONTACT MAKER

MODEL N
TYPE
CLASS

FACTORY SETTING
ADJUSTABLE TO

10A, 115Y-2A, 600Y A.C.
1/2 H.P. 115Y-460V. A.C.
25A, 6V-1A, 115Y-1/2A, 230V D.C.

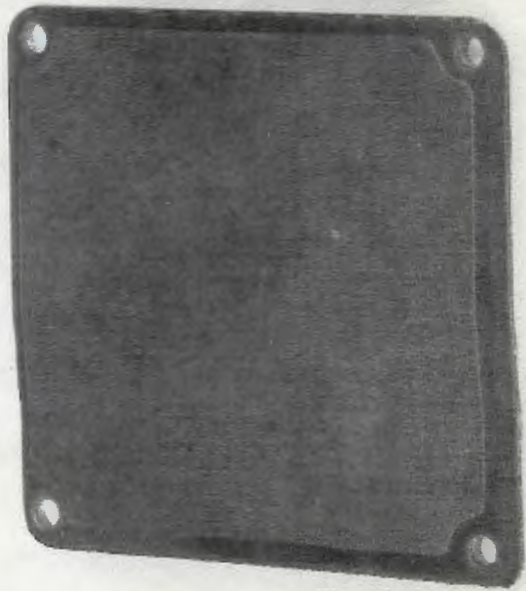
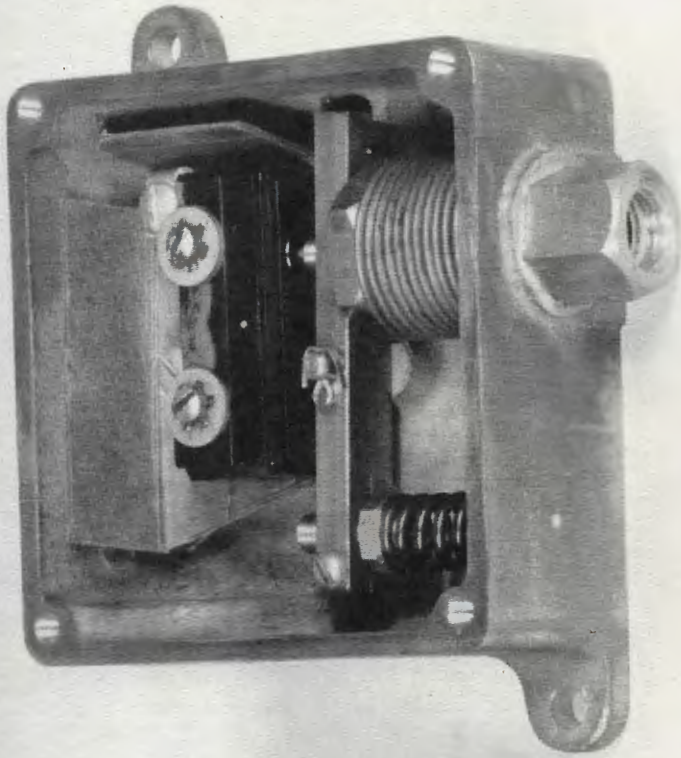
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MOUNT IN ANY POSITION

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