

30 August 1938

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FR-1472

NAVY DEPARTMENT
BUREAU OF ENGINEERING

Report of
Test on

Low Pressure Alarm Contact Maker
Type L - Class I

Bendix Marine Products Company
Manufacturer and Exhibitor

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON, D.C.

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UNLIMITED

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Authorization: BuEng. ltr. S65-5/L5(7-11-Ds) of 20 July 1938.
Date of Test: August 1938
Tested by: _____
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Prepared by: _____
W. B. Roberts, Pr. Engineering Aide,
Chief of Section.
Reviewed by: _____
R. A. Gano, Lieutenant, U.S.N.
Approved by: _____
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Distribution:
BuEng. (5)

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AUTHORIZATION FOR TEST

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

Reference: (a) Bueng.ltr. S65-5/L5(7-11-Ds) of 20 July 1938.
(b) Specifications 17C 16(INT) of 15 June 1938.
(c) Manufacturer's Drwg. CA-4816 of Low Pressure Alarm Contact Maker, Type L, Class I.

OBJECT OF TEST

2. The object in conducting this test was to determine how closely the subject contact maker conforms with the specifications, reference (b), and its suitability for Naval use.

ABSTRACT OF TEST

3. The subject contact maker was set up at this Laboratory in the usual test equipment for low pressure alarm contact makers and its performance was carefully observed and checked for compliance with the specifications. An inspection of the sample to determine its compliance in the matter of materials, design and workmanship, and a check for comparison with reference (c), concluded the test.

Conclusions

(a) The sample type L, Class I, contact maker, manufactured by Bendix Marine Products Corporation, Brooklyn, New York, under test for conformance with the specifications, reference (b), failed to meet the following requirements:

- (1) Shock integrity. The contact maker was very unstable and would not maintain an operating point.
- (2) Vibration. The contact maker was sensitive to vibration, closing the alarm contacts upon the application of each blow.
- (3) Hydrostatic test. The operating point was lowered 1/2 pound as a result of this test.
- (4) Dielectric strength between open contacts. A breakdown occurred at the specified 1500 volts, after which the contacts were found shorted.
- (5) Voltage drop at contacts. The drop at the end of the test was 25 millivolts. After cleaning the contacts, it was 2.7 millivolts.

(b) The adjustment screw is not provided with a satisfactory locking device.

Recommendations

(a) It is recommended that the subject contact maker in its present form be not approved for Naval use.

(b) It is further recommended that the Bureau consider waiving the failure of the switch to withstand the required 1500 V. a.c., 60 cycles, placed across the open contacts. This type of switch is unusually satisfactory for this application, having a quick make and break, and is capable of withstanding a dielectric test of 1000 V. a.c., 60 cycles across its contacts.

DESCRIPTION OF MATERIAL

4. This contact maker is manufactured by Bendix Marine Products Corporation, 754 Lexington Avenue, Brooklyn, New York, as a Navy type L, Class I, low pressure alarm contactor.

5. It comprises a pressure chamber, a sylphon unit with plunger, a type WZ "micro-switch" in a hinged mounting, and two terminal blocks of phenolic material each equipped with a 9-S - 1841-L terminal lug. An adjustment screw is provided to vary the gap between the "micro-switch" button and the sylphon plunger. It is in contact with a bi-metallic strip which serves as a temperature compensator.

6. The entire mechanism is housed in a cast case of composition BE metal, having a brass cover. A 1/16 inch flat rubber gasket is located between the cover and the case, the cover being secured with four (4) #10-24 brass fillister headed machine screws. A copper-nickel alloy nameplate is secured to the cover.

7. The "micro-switch" and hinged mounting, terminal blocks and sylphon unit, are located on a brass plate which seals the pressure chamber. Four (4) #10-24 brass screws secure this plate to the case. A "Vellumoid" gasket is located between the plate and case to prevent leakage from the pressure chamber.

8. The plunger for operating the "micro-switch" is so designed that the compression of the sylphon unit is limited. This feature is intended to prevent injury to the equipment as a result of high pressures.

9. The case has two (2) mounting lugs and one (1) boss tapped for a 3/4 inch (IPS) standard terminal tube. The pressure chamber has two (2) holes, both tapped for 3/8 inch (IPS), one for connecting in the lubricating oil system, the other for a drain plug. It is painted gray both inside and outside, except for the interior of the pressure chamber.

THEORY OF OPERATION

10. At any pressure above a pre-determined operating point, the sylphon unit has been compressed due to the pressure on its end plate. In this condition, the plunger has taken a position against an adjustable stop and has depressed the button of a normally closed "micro-switch", thus keeping the alarm circuit open.

11. When the pressure in the system has fallen to the operating point, the sylphon unit recedes into the pressure chamber, carrying the plunger, and allows the "micro-switch" to close the alarm circuit. The adjustment screw rests on a bi-metallic strip which serves as a temperature compensator. A coil spring is provided to hold the adjustment screw in contact with the strip.

12. Further details in the construction of the contact maker are given by Plates 1, 2, and 3.

METHOD OF TEST

13. The contact maker was first connected in a pressure system and adjusted to operate an alarm circuit at 3.1 lbs. per sq. in.

14. It was next tested for endurance by operating it for 48 hours at the rate of "2 seconds on" and "2 seconds off" while the switch contacts broke a load of 1 ampere at a potential of 115 volts, a.c., 60 cycles, 50 percent power factor. The first 24 hours were at an ambient temperature of 10° C. and the final 24 hours at 70° C.

15. The unit was then placed on a Bureau of Engineering shock machine and, while operating as under endurance, subjected to 20 shocks of 250 foot pounds each.

16. It was next transferred to a vibrating machine and, while operating as under endurance, subjected to 3 foot-pound shocks at frequencies of 100, 150, 200, 250, 300 and 350 blows per minute.

17. The operating point of the contact maker was checked frequently during the shock and vibration tests.

18. It was next subjected to a hydrostatic test of 15 pressure cycles of 10 seconds each at 200 lbs. per sq. in. This was followed by a check to note any changes in the operating point.

19. The usual tests for watertightness, dielectric strength and insulation resistance, and voltage drop across contacts at rated load, preceded an inspection to determine its conformance with drawing, reference (c), and specifications, reference (b), in the matter of materials, design, and workmanship.

RESULTS OF TEST

20. The test results which follow were obtained when the contact maker was tested in the order outlined under "Method of Test."

Requirements

Operating point: Shall be adjustable over a range of 2 to 10 lbs. per sq.in.

Endurance: Conducted as outlined in paragraph 14.

Test Values

Complied, set at 3.1 lbs. for test purposes.

Satisfactory, breaking a 1 ampere, 115 V., a.c., 60 cycle, 50% power factor load. No observable change in its operating points due to change in ambient temperature.

Requirements

Test Values

Shock integrity: Shall withstand 20 shocks of 250 foot-pounds each.

* Operating point changed upon each impact.

Vibration test: Conducted as outlined in paragraph 16.

* Contact maker sensitive to vibration, closing contacts upon each impact.

Hydrostatic test: Shall withstand 15 pressure cycles of 10 seconds each at 200 lbs. per sq.in.

* Operating point was lowered 1/2 lb. per sq.in.

Watertightness: Shall not leak when immersed in water to a depth of 3 feet for a period of 1 hour.

Complied.

Dielectric strength: Shall withstand 1500 V. a.c., 60 cycles, applied between all current carrying parts and ground and between open contacts, for a period of 1 minute.

Satisfactory between live parts and ground.

* Unsatisfactory between open contacts.

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

10 megohms between line parts and ground.

* Contacts found shorted following dielectric test.

Voltage drop at contacts at rated load: Shall not exceed 10 millivolts.

* 25 millivolts at end of test.

Current density at contacts: Shall not exceed 75 amperes per sq.in.

Satisfactory, 37 amperes per sq.in. (Contact dia. 0.185)

Weight: Not specified.

4.5 pounds.

Dimensions: Not specified.

Height - 3-7/8 inches
Width - 4-9/16 inches
Depth - 3-3/8 inches.

* Denotes failure to comply with the specifications.

CONCLUSIONS

21. The sample type L, Class I, contact maker, manufactured by Bendix Marine Products Corporation, Brooklyn, New York, under test for conformance with the specifications, reference (b), failed to meet the following requirements:

- (a) Shock integrity. The contact maker was very unstable and would not maintain an operating point.
- (b) Vibration. The contact maker was sensitive to vibration, closing the alarm contacts upon the application of each blow.
- (c) Hydrostatic test. The operating point was lowered 1/2 pound as a result of this test.
- (d) Dielectric strength between open contacts. A breakdown occurred at the specified 1500 volts, after which the contacts were found shorted.
- (e) Voltage drop at contacts. The drop at the end of the test was 25 millivolts. After cleaning the contacts, it was 2.7 millivolts.

22. The adjustment screw is not provided with a satisfactory locking device.

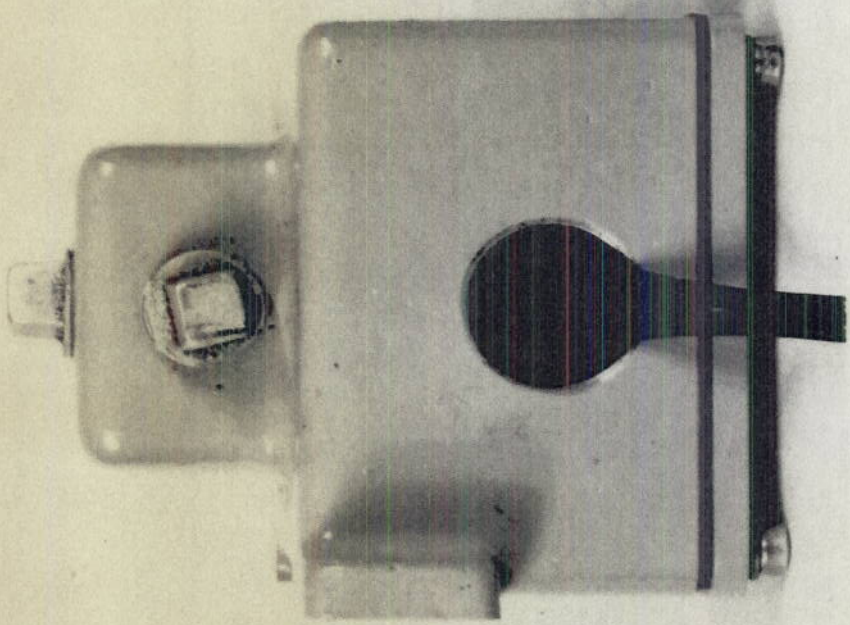
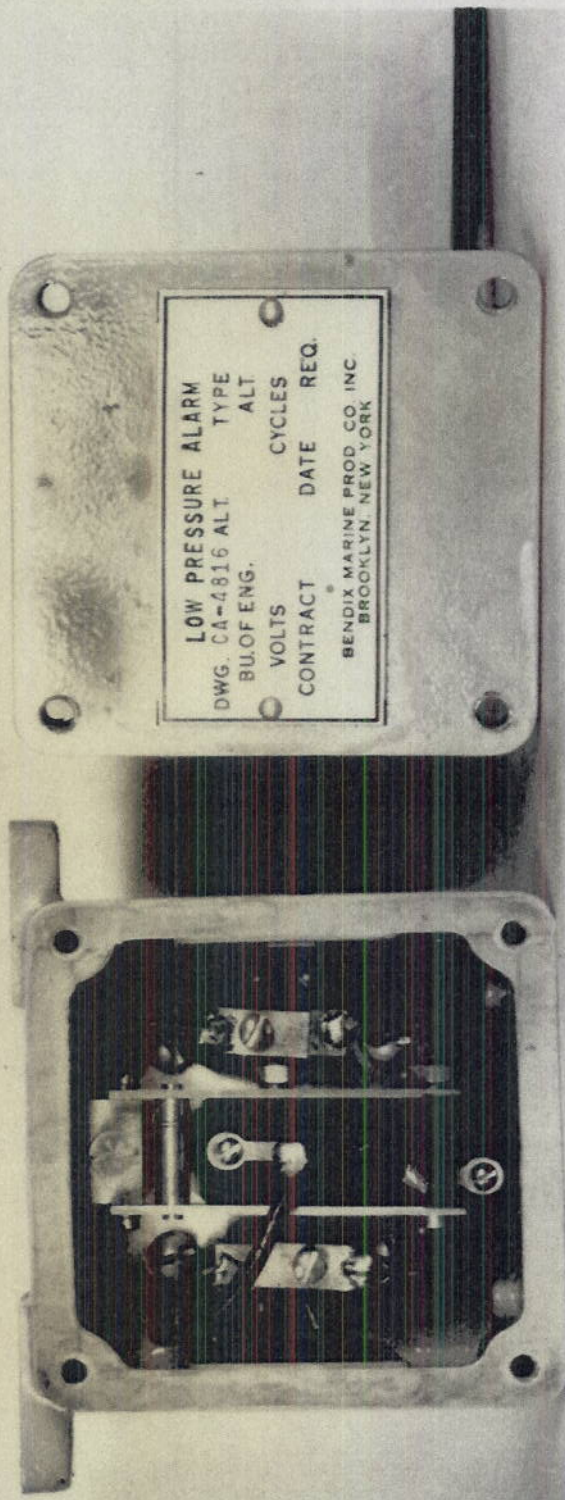
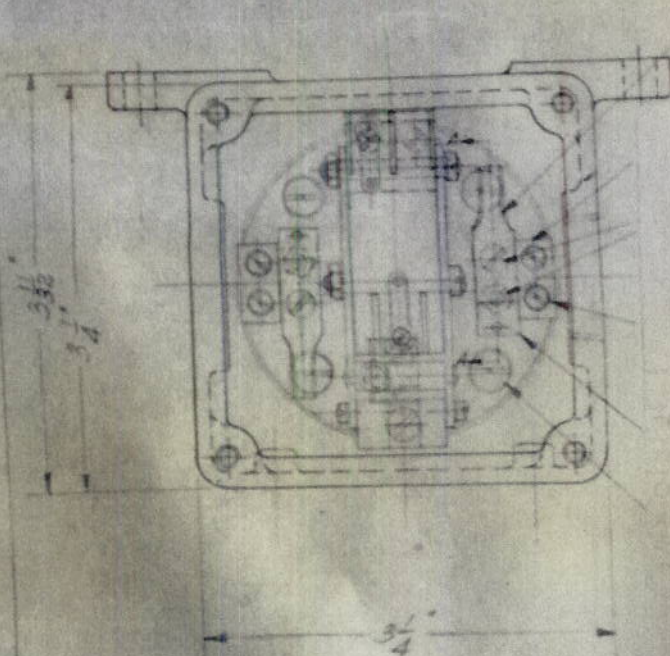


Plate 1



LOW PRESSURE ALARM
DWG. CA-4816 ALT. TYPE
BU.OF ENG. ALT.
VOLTS CYCLES
CONTRACT DATE REQ.
BENDIX MARINE PROD. CO. INC.
BROOKLYN, NEW YORK



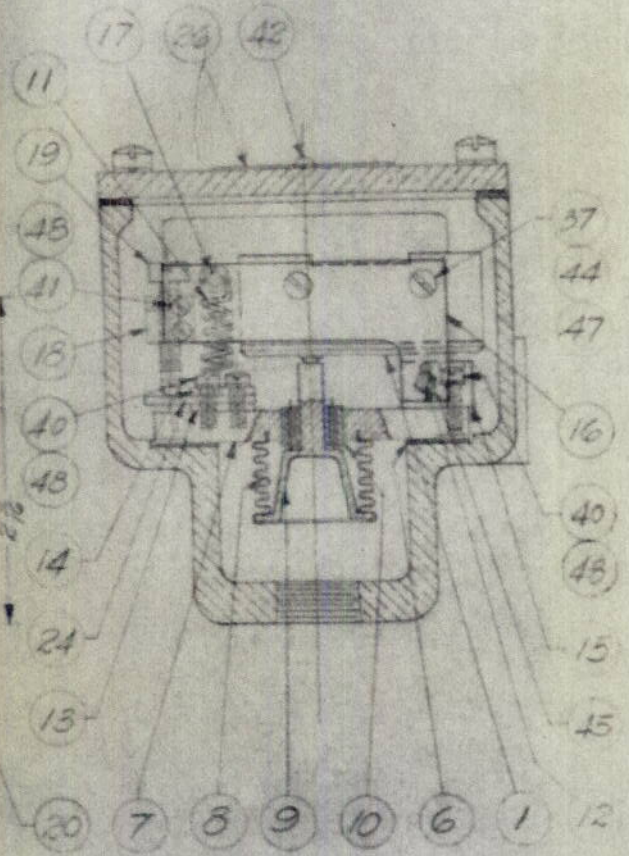
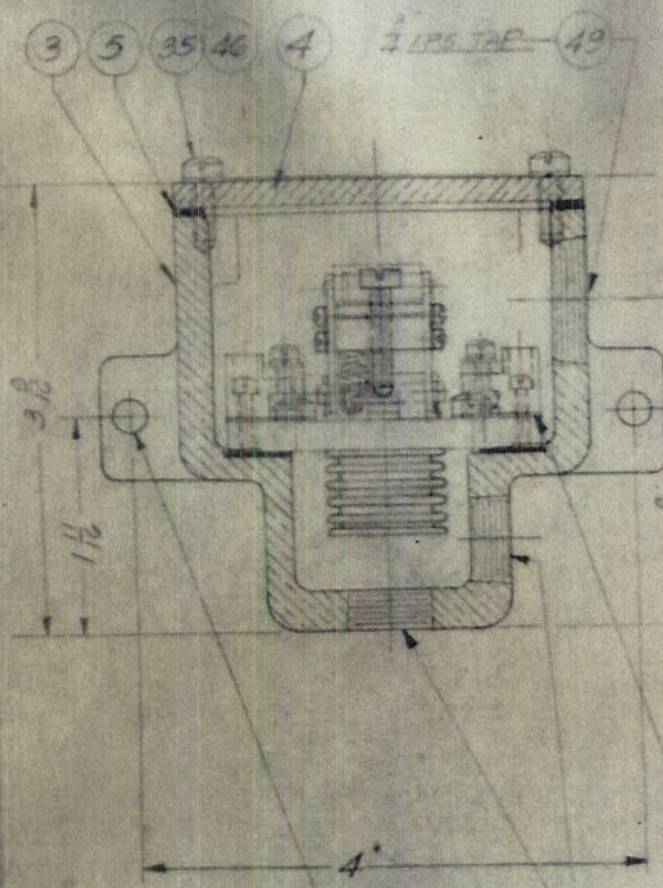
LOW PRESSURE ALARM
 115 VOLTS AC 60 CYCLES
 NAVY TYPE SINGLE PHASE
 BULKHEAD MOUNTING

SCALE - 12 INCHES = 1 FOOT
 BENDIX MARINE PRODUCTS DIVISION
 OF BENDIX AVIATION CORPORATION
 BROOKLYN, N.Y.

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APPROVAL LETTER		

U.S. NAVY BUREAU OF ENGINEERING FILE NUMBER

INDEX GROUP FILE NUMBER
 CA 4816



2 - 17/64 DIA. MTS HOLES

3/8 IPS TAP