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NAVY DEPARTMENT
BUREAU OF ENGINEERING

Report of Test

on

Twin Buzzer

Submitted by

Bendix Marine Products Company

Brooklyn, New York.

FR-1365

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON, D.C.

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Date of Test: January and February 1937.

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AUTHORIZATION FOR TEST.

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

Reference: (a) Bu.Eng. ltr. S65-4/L5(1-19-Ds) of 29 January 1937.
(b) Specifications SGS(65)-103a, Buzzers, Interior
Communication, of 1 June 1936.
(c) Bendix Drwg. CAL-3235.

OBJECT OF TEST.

2. The object of this test was to determine how closely the subject buzzer complied with the specifications, reference (b), and its suitability for Naval use.

ABSTRACT OF TEST.

3. The sample unit as received was set up at this Laboratory in suitable test circuits and tests conducted in the order outlined under the specifications. The test was concluded with an inspection for suitability in design and quality of workmanship and materials.

CONCLUSIONS.

(a) This twin buzzer, manufactured and submitted by Bendix Marine Products Company, Brooklyn, New York, is not covered by the specifications, reference (b). However, it did comply with the greater portion of the specifications, namely, endurance, shock integrity, temperature rise, operation at over and under rated voltage, and watertight integrity requirements. In addition, there was no great damage to the unit at the close of the salt spray test, as shown by photographs, Plates 1 to 3 respectively, but the die-cast alloy was attacked and the paint was considerably deteriorated.

(b) The breakdowns, under the specified dielectric test, were due to the improper mounting of the fixed resistors shunting the contacts.

(c) The sound produced by the twin unit is very distinctive and differs from any of the audible signals now used aboard ship.

(d) The sound output of the twin unit was 85 decibels which is equivalent to an audibility range of 1450 yards.

RECOMMENDATIONS.

(a) In view of the sample twin buzzer having complied with the major requirements of the specifications, reference (b), and having an outstanding and distinctive note, it is recommended that the Bureau consider the modification of the specifications to include such an audible signal.

DESCRIPTION OF MATERIAL UNDER TEST.

4. The sample twin buzzer, shown by Plates 1 to 3 inclusive, was manufactured and submitted by Bendix Marine Products Company, Brooklyn, New York.

5. It is designed for 115 volts, d.c., and consists of two independent elements mounted in a single cast aluminum alloy watertight case designed for bulkhead mounting. Four mounting lugs and two external bosses, tapped for 3/4" (IPS) standard terminal tubes, are provided on the case.

6. Each of the buzzer units is tuned to vibrate at a different frequency, accomplished with the use of different types of trumpets, one having approximately 1-1/2 turns, the other 2. The contacts are shunted with a 2,000 ohm fixed resistor to reduce arcing.

7. The buzzer mechanism is mounted on a steel chassis, secured to a cast alloy case cover, incorporating a "V" edge, with six 10-32 fillister head steel screws which thread into steel inserts.

8. The unit is of watertight construction, employing 1/4" square rubber gaskets recessed into each end of the aluminum alloy case. Six 1/4" - 20 hex. head steel bolts, cadmium plated and equipped with nuts and lockwashers, secure the covers to the case. The covers are so designed that the compression of the gaskets is limited.

9. The trumpet is spiral in form and of commercial die cast material, and is made in two sections, one having a flange. A flat rubber gasket is clamped between this flange and the case covers by four external fillister head steel machine screws and two internal brass screws. The other section of the trumpet is secured to this section with nine oval head counter-sunk steel screws, cadmium plated.

10. The stationary part of the magnetic circuit is made up of a laminated core, "W" shaped, on which rests a single form wound coil. The armature is mounted on a supporting steel spring and linked to the formed steel diaphragm by means of a bolt.

11. The "W" shaped core assembly is supported by three studs riveted to the chassis. The studs are threaded, and with the use of two machine nuts, located on each of the studs, the air gap between the core and the armature is regulated.

12. The diaphragms are painted with a clear lacquer and the entire unit is painted gray internally and externally.

13. A right angle steel bracket secured to the chassis supports a terminal block of phenolic material equipped with 9-S-1841-L terminal lugs.

14. The total weight of the twin unit is 13 lbs. 9 oz. The unit requires a mounting space of 7"0 x 13"5.

METHOD OF TEST.

15. This unit as received was first tested for power consumption,

pitch of note and sound output of each section, separately and combined.

16. It was next placed on a Bureau of Engineering shock stand and given 20 blows of 250 foot pounds each while mounted in the positions outlined in paragraph F-2g(3) of reference (b).

17. Following this, without having made any adjustments, it was tested for endurance by operating it 1400 cycles of one minute duration every alternate minute. The first 700 cycles were conducted at an ambient temperature of 70° C. and the second 700 cycles at 0° C. During these tests the temperature rise of the windings was obtained by the resistance method.

18. The unit was next tested for operation when inclined 45 degrees from the vertical in all planes and energized at 10 percent over and 10 percent under rated voltage.

19. The insulation resistance was determined with the use of a 1000 volt megger and the unit was given a dielectric strength test of 1500 volts a.c., 60 cycles, applied for one minute between all electrical parts and ground.

20. The watertight integrity of the unit was determined by placing it in water to a depth of three feet for a period of 12 hours.

21. The entire unit was then subjected to a salt spray test conducted under the conditions specified under paragraph, F-2e of the specifications.

22. The usual inspection pertaining to the quality of workmanship and suitability of design and materials, concluded the test.

RESULTS OF TEST.

23. The test results obtained were as follows:

<u>Requirements</u>	<u>Test Values</u>
Volts: 115	115 volts.
Temperature rise: Not over 30° C. at ambient of 70° C. by resistance method.	No. 1 unit -- 27°47 C. No. 2 unit -- 30°06 C.
Inclination: Shall operate satisfactorily in any plane 45° from the vertical at 10% over and 10% under rated voltage.	Satisfactory operation under the specified test.
Endurance: Shall operate 700 cycles of one minute on every alternate minute at an ambient temperature of 70° C. and 700 cycles at 0° C.	Satisfactory operation under the specified test.
Shock integrity: Shall withstand 20 blows of 250 foot pounds each under the conditions specified under par. F-2g(3).	Satisfactory operation under the specified test.

Requirements

Test Values

Watertight integrity: No leaks shall occur when placed in water to a depth of 3 feet for a period of 12 hours.

Satisfactory, no leaks occurring.

Dielectric: Shall withstand 1500 volts a.c., 60 cycles, applied between any electrical point and ground for a period of one minute and 500 volts a.c., 60 cycles following the immersion test.

*Both units failed under test, the breakdowns occurring between the fixed resistors and ground.

Insulation resistance: Shall be not less than 10 megohms before dielectric test and 1 megohm following the immersion test.

*Zero resistance following the dielectric test.

Adjustment of contacts: Amplitude of motion of moving contact shall be not less than 3/32 inch.

*0.025 (approximately).

Salt spray test: Specified under para. F-2e.

Not entirely satisfactory, due to a slight deterioration of the paint and metal.

Terminal block: Shall be of molded phenolic material equipped with 9-S-1841-L terminals.

Material furnished as specified.

Nameplate: Corrosion resisting steel or phenolic material when approved.

*Corrosion resisting steel, raised lettering and engraved spaces.

Diaphragm material: Not specified.

Steel, painted with clear lacquer.

Windings: Shall be of double silk or cotton covered enamel wire.

Double silk magnet wire.

* Denotes failure to comply with the specifications.

24. The electrical characteristics, pitch of note, and sound output of the units, were as follows:

TEST VALUES

	<u>No. 1 Unit</u>	<u>No. 2 Unit</u>	<u>Both Units</u>
Volts	115	115	115
Amperes	0.29	0.25	0.50
Watts (El)	33.35	28.75	57.50
Pitch of note	270 CPS.	330 CPS.	320 CPS.
Sound output	75 db.	84 db.	85 db.

CONCLUSIONS.

25. This twin buzzer, manufactured and submitted by Bendix Marine Products Company, Brooklyn, New York, is not covered by the specifications, reference (b). However, it did comply with the greater portion of the specifications, namely, endurance, shock integrity, temperature rise, operation at over and under rated voltage, and watertight integrity requirements. In addition, there was no great damage to the unit at the close of the salt spray test, as shown by photographs, Plates 1 to 3 respectively, but the die-cast alloy was attacked and the paint was considerably deteriorated.

26. The breakdowns, under the specified dielectric test, were due to the improper mounting of the fixed resistors shunting the contacts.

27. The sound produced by the twin unit is very distinctive and differs from any of the audible signals now used aboard ship.

28. The sound output of the twin unit was 85 decibels which is equivalent to an audibility range of 1450 yards.

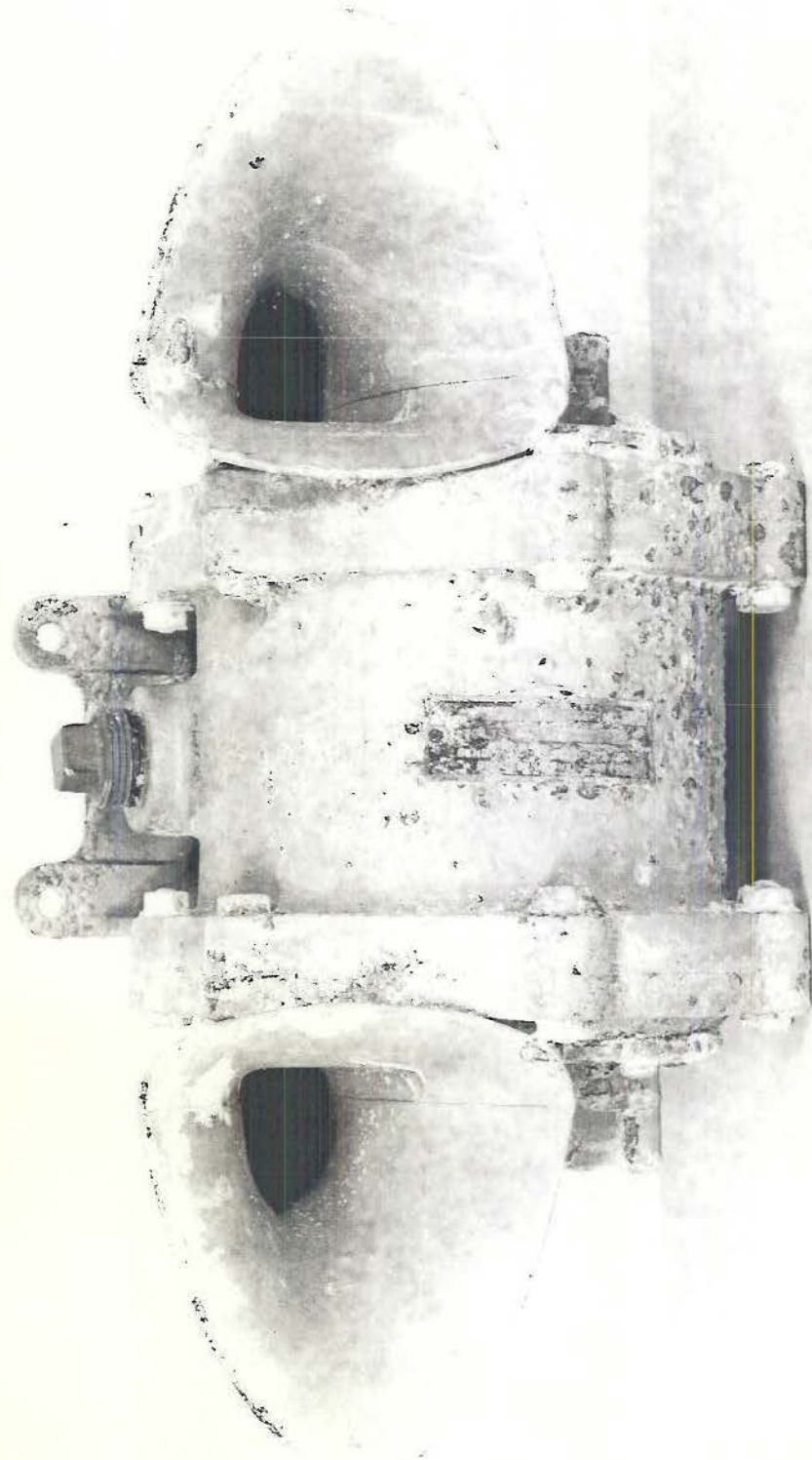


Plate 1

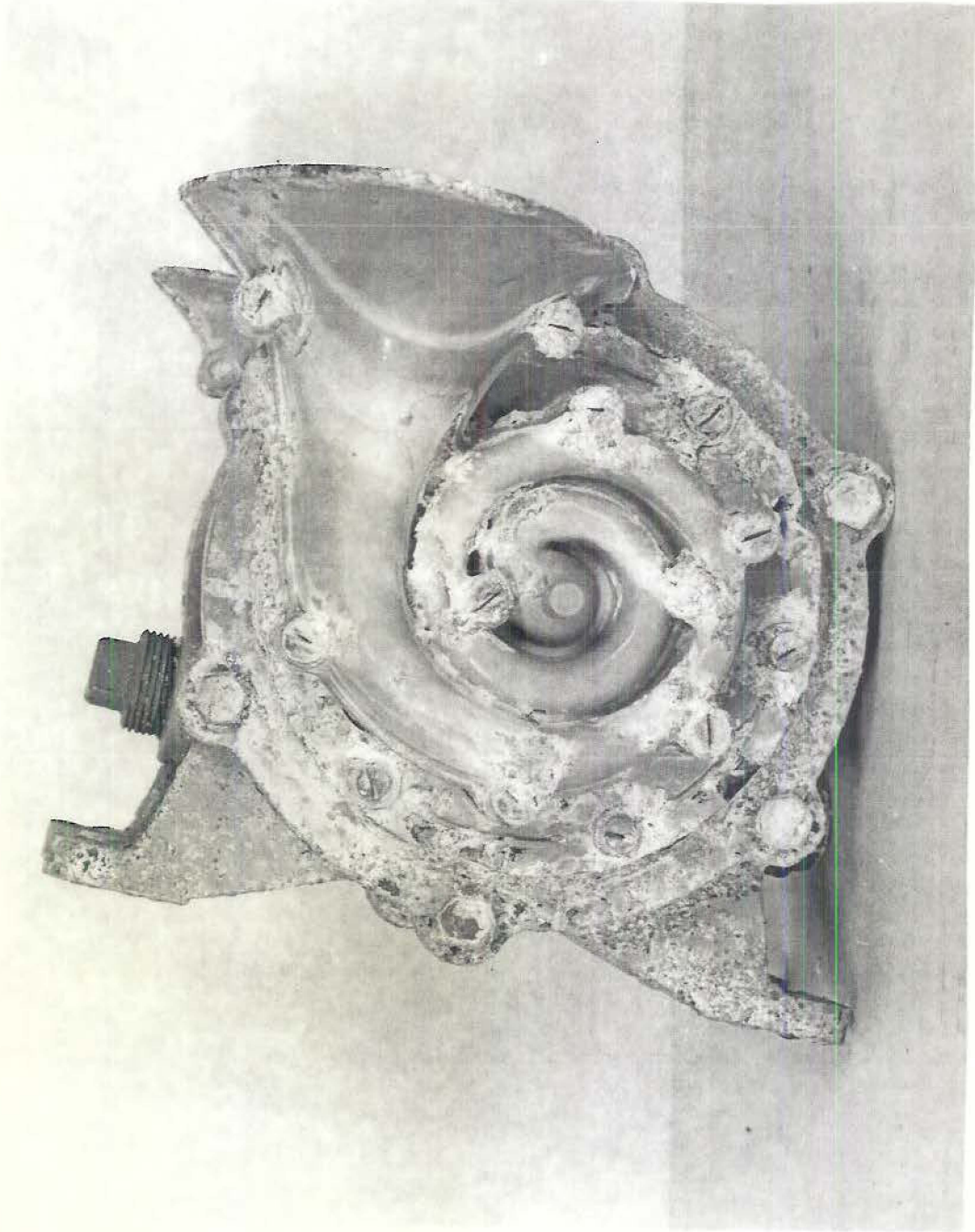


Plate 2

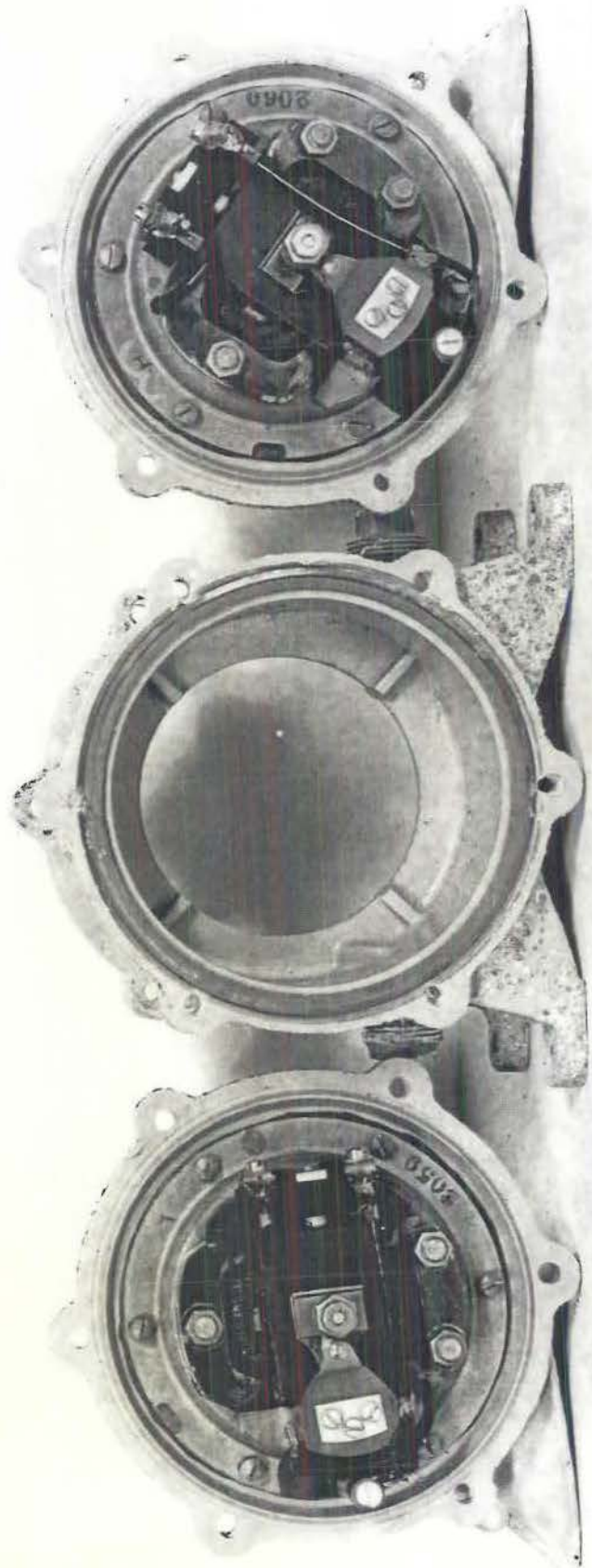


Plate 3