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NAVY DEPARTMENT
BUREAU OF ENGINEERING

Report of Test
on

Horn, Navy Type H-5
Manufactured and Submitted by
Benjamin Electric Manufacturing Company
Des Plaines, Illinois

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON, D.C.

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Date of Test: February and March 1939.

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Photograph of sample horn assembled in watertight case . .	Plate 1
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AUTHORIZATION FOR TEST

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

Reference: (a) BuEng.ltr.S65-4/L5 (1-27-Ds) of 8 February 1939.
(b) Specification 17S11 of 15 February 1938.

OBJECT OF TEST

2. This test was conducted to determine conformance of the sample horn with the specifications, reference (b), and its suitability for Naval use as a motor boat horn.

ABSTRACT OF TEST

3. The sample horn was set up at this Laboratory and tested in the manner outlined by the specifications, reference (b). It was carefully observed during the endurance test to determine its ability to produce a stable note. The test was concluded with the usual inspection of materials, design, and workmanship.

Conclusions

(a) This sample horn, manufactured and submitted by Benjamin Electric Manufacturing Company, Des Plaines, Illinois, as a Navy type H-5 motor boat horn complies with the specifications except as noted under "Test Results" paragraph 17. The principal discrepancy is that the horn is 1-1/2 pounds overweight. The performance of the horn during all tests was very satisfactory.

(b) The contact assembly is not considered to be of the best design as it uses only one screw to clamp the insulating washers and contact springs and the required clearances to ground are not provided. The condenser mounting clamp is not satisfactory as it is of thin material and is sharply bent at a point where a hole reduces the cross section by more than half.

(c) It would be preferable to use fillister head machine screws instead of round head screws for securing the case cover.

Recommendations

(a) It is recommended that the sample type H-5 motor boat horn be approved for Naval use, subject to the correction of the deficiencies noted under "Conclusions" and a satisfactory check test.

DESCRIPTION OF MATERIAL UNDER TEST

4. The sample horn submitted as a Navy Type H-5 is designed to operate from a supply of 6 volts, direct current. It is of the vibratory type and is provided with a means of adjusting the contact gap as shown by photograph, Plate 2. A 1/2 mfd., 400 volt, d.c. condenser is connected across the contacts.

5. The electromagnet is made up of laminated iron of "U" shape and has a form wound coil on each of the pole pieces. The armature bar is of soft iron and is riveted to a flat steel spring, which is in turn riveted to a steel supporting plate secured to the chassis with three machine screws. The under side of the armature bar is provided with a steel button which strikes the diaphragm.

6. The electromagnet assembly and the terminal block and condenser are supported by aluminum brackets cast integral with the diaphragm clamping ring. A flat rubber gasket is used between the diaphragm and case cover.

7. The case and cover are of BE composition, the projector having been cast integral with the case cover. The case is provided with two bosses, one tapped for a 3/4 inch (IPS) standard Navy terminal tube, and a 1/4 inch square rubber gasket located in its rim. The cover is secured with six 10-32 round head machine screws which thread into steel inserts in the case.

8. The case and cover are finished in gray on both the interior and exterior. An etched and stamped nameplate is secured to the case with two steel drive pins.

9. Further details of the construction of this horn are shown by photographs, Plates 1 and 2.

METHOD OF TEST

10. The sample horn was first tested to determine its electrical characteristics, pitch of note, and sound pressure output.

11. It was then subjected to an endurance test of "one second on" and "one second off" for a period of 5 hours. The first 2-1/2 hour period was conducted at an ambient temperature of 60° C., and the second at 0° C. During the first period, the temperature rise of the windings was determined by the resistance method.

12. It was next placed on a standard Bureau of Engineering shock stand and subjected to 20 blows of 250 foot pounds each as specified in paragraph F-2g.

13. The horn was then subjected to the vibration test outlined under paragraph F-2h.

14. The sound pressure output and pitch of note were again measured to determine any change that might have resulted from the previous tests.

15. The horn was then tested for operation at +10% normal voltage after which tests for dielectric strength, insulation resistance and watertightness were made.

16. The test was concluded with an inspection to determine compliance with the specifications concerning design, workmanship and materials. Due to the several previous satisfactory tests on horns of similar materials and case design, the salt spray test was not conducted.

RESULTS OF TESTS

17. The test results obtained were as follows:

<u>Requirements</u>	<u>Test Values</u>
Voltage: 6 volts	6 volts
Current: Direct	Direct
Ampores: Not specified.	2.6 amps
Watts: Not over 50.	15.6 volt amps.
Weight: Not over 7 pounds.	* 8.5 lbs.
Pitch of note: 100 to 600 C.P.S.	270 C.P.S.
Sound pressure output: Shall be not less than 85 decibels, at 18 feet in a sound proof room.	88 db.
Shock integrity: Shall withstand 20 blows of 250 foot pounds each, under conditions specified under paragraph F-2g.	Complied
Vibration Tests: Shall be mounted on a standard Navy 3 foot pound vibration machine and subjected to six tests of 30 minutes each at 100, 150, 200, 250, 300 and 350 blows per minute.	Complied
Endurance: Shall be operated "one second on" and "one second off" for a period of 9000 cycles, the first half at an ambient temperature of 60° C. and the second half at 0° C.	Complied

Requirements

Test Values

Temperature rise: Shall not exceed 45° C. at any time during the endurance test.

17.5° C.

Dielectric test: Shall withstand a dielectric test of 500 volts 60 cycles, for a period of one minute.

Complied

Insulation resistance: Shall be not less than 5 megohms, with a 500 volt megger, after the dielectric test.

200 megohms by 1000 volt megger.

Dissimilar materials: Brass shall not be in contact with aluminum.

Complied

Wire: Type SICP shall be used.

* Condenser provided with solid lead wires in insulating sleeving.

Inclination: Shall operate in any position when supplied with $\pm 10\%$ rated voltage.

Complied.

86 db output at -10% voltage.
84 db output at -33% voltage.

Watertight integrity: Shall be submerged under 3 feet of standard sea water for 3 hours without water entering the case.

Complied.

Sound pressure output: Shall be not less than 85 db at 18 feet in a sound proof room after endurance test.

86 db (425 C.P.S.)

Nameplates: Shall be in accordance with N.D. specification 42N2.

Complied.

Case material: Shall be of bronze.

Bronze.

Terminal block: Shall be of approved material, equipped with terminal lugs in accordance with BuEng. Drwg. 9-S-1841-L.

Complied.

Materials: No aluminum or aluminum alloy shall be used, para. E-4d(7).

* Aluminum alloy chassis.

Diaphragm: Shall be of nickel-chromium alloy.

Complied.

Requirements

Test Values

Magnet cores: Shall be protected against corrosion.

Complied, core and chassis coated with insulating varnish.

Protective covering for coils: Shall be non-hygroscopic.

Complied, spun thread, varnish impregnated.

* Denotes failure to comply with the specifications.

CONCLUSIONS

18. This sample horn, manufactured and submitted by Benjamin Electric Manufacturing Company, Des Plaines, Illinois, as a Navy type H-5 motor boat horn complies with the specifications except as noted under "Test Results" paragraph 17. The principal discrepancy is that the horn is 1-1/2 pounds overweight. The performance of the horn during all tests was very satisfactory.

19. The contact assembly is not considered to be of the best design as it uses only one screw to clamp the insulating washers and contact springs and the required clearances to ground are not provided. The condenser mounting clamp is not satisfactory as it is of thin material and is sharply bent at a point where a hole reduces the cross section by more than half.

20. It would be preferable to use fillister head machine screws instead of round head screws for securing the case cover.

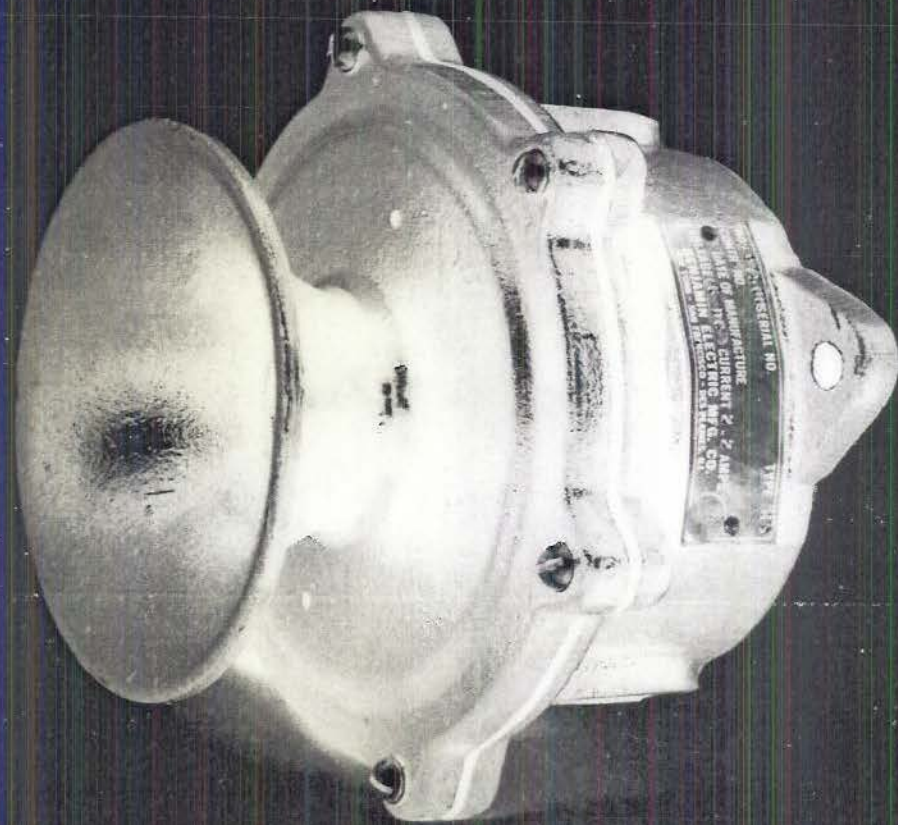


Plate 1

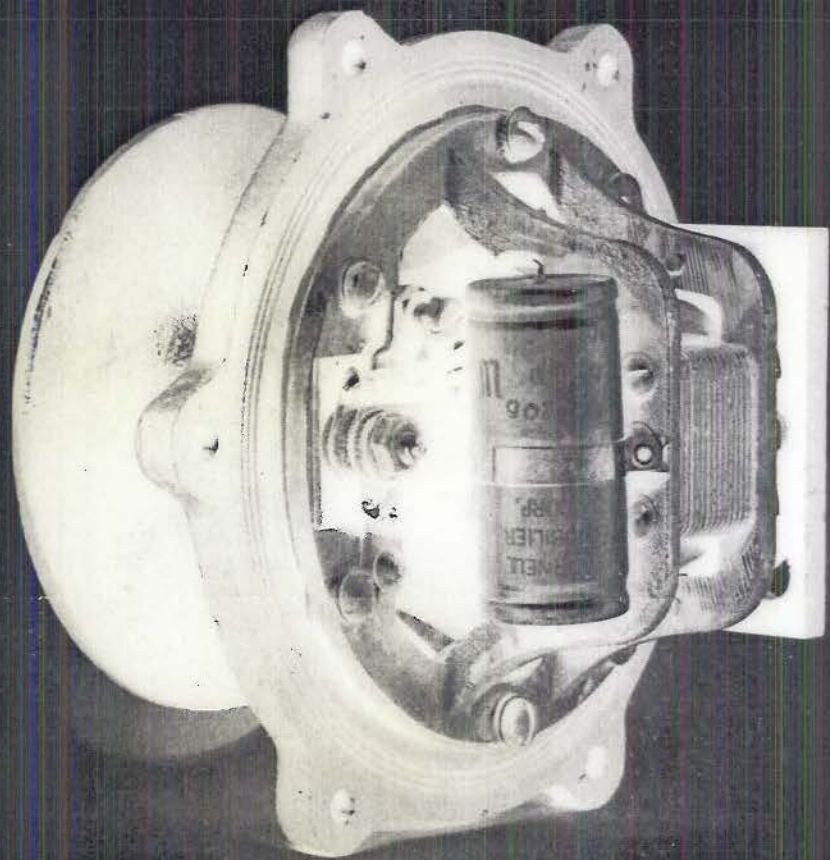


Plate 2