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NAVY DEPARTMENT
BUREAU OF ENGINEERING

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Report of Test

on

Horn, Navy Type H-2

Manufactured and Submitted

by

Federal Electric Company
Chicago, Illinois

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON, D. C.

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Authorization: BuEng let. S65-4/L5(3-22-Ds) of 3 April 1939.

Date of Test: April 1939.

Tested by: _____
G. K. C. Hardesty, Sr. Eng. Aide

Prepared by: _____
W. B. Roberts, Chief Engineering Aide
Chief of Section

Reviewed by: _____
R. A. Gano, Lieutenant, U.S.N.

Approved by: _____
H. M. Cooley, Captain, U.S.N.
Director.

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 (b), (c), and (d).

Reference: (a) BuEng let. S65-4/L5(3-22-Ds) of 3 April 1939.
(b) Specifications 17S11 (INT) of 15 February 1938.
(c) NRL Report No. B-1290 of 30 July 1936.
(d) Federal Electric Drawing B-10-1a.

OBJECT OF TEST

2. The object of this test was to determine conformance of the sample with the specifications, reference (b), and its suitability for Naval use as a type H-2 horn.

ABSTRACT OF TEST

3. The horn was set up at this Laboratory in suitable test circuits where its performance was carefully observed for compliance with the requirements. An inspection of the sample to determine compliance with the specifications, in the matter of design, quality of workmanship and materials, concluded the test.

Conclusions

(a) The subject horn is of good design and workmanship and it complies with the specifications except for the case material which is zinc alloy and subject to specific approval by the Bureau. The Laboratory tests disclosed no objectionable features regarding this material.

Recommendations

(a) It is recommended that the subject horn be approved for Naval use, providing the case material is satisfactory.

DESCRIPTION OF MATERIAL UNDER TEST

4. The sample horn, submitted as a Navy type H-2, is of the vibrating type, employs no contacts, and is designed to operate from a supply of 115 volts, a.c., 60 cycles.

5. The electromagnet is made up of laminated magnetic iron of "U" shape and has a single formed winding on one of the pole pieces. The magnetic circuit is completed by a formed armature of spring steel, secured at one end to the chassis. The chassis serves as a clamping ring for the nickel-chromium diaphragm and diaphragm gasket and is secured to a zinc-alloy cover with six number 8-32 machine screws. It also supports a terminal block of phenolic material equipped with standard Navy terminals.

6. A 120 cycle note is produced by the armature striking at the center of the diaphragm when the horn is supplied with 115 volts, a.c., 60 cycles.

7. The case is of a die-cast zinc-base alloy material known as "Zamak." Two bosses, tapped for 3/4-inch terminal tubes, and two mounting lugs, which accommodate 3/8-inch mounting bolts, are provided.

8. A 1/4-inch square rubber gasket is recessed in the rim of the case.

9. The cover is of the same material, has a grille front and is secured to the case with six number 10-32 round head steel machine screws. The tapped holes for the cover screws are provided with bosses to limit the compression of the gasket. The bosses provide additional threads.

10. A nameplate of corrosion-resisting material is secured to the side of the case with two steel drive pins.

11. The case and cover are finished with gray paint over zinc chromate and aluminum paints on the outside and with aluminum paint over zinc chromate paint on the inside. The chassis and core are protected with an insulating varnish.

12. Further details in the design are given by photographs, Plates 1 and 2, and by drawing, reference (c).

METHOD OF TEST

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

14. It was next tested for satisfactory operation when placed in any position and supplied with $\pm 10\%$ rated voltage and frequency as specified in paragraphs B-3 and D-121.

15. This was followed by an endurance test, operating the horn 1500 cycles of "one minute on" and "one minute off," the first 750 cycles at an ambient temperature of 60° C and the second at 0° C. During the first half of this test the temperature rise was obtained by the resistance method,

16. The sound pressure output of the horn was again checked to determine the effect of the endurance test as specified in paragraph F-2n.

17. The horn was next placed on a standard Bureau of Engineering shock stand and subjected to 20 shocks of 250 foot pounds each, as specified in paragraph F-2g, followed by the test for resistance to vibration, specified in paragraph F-2h of the specifications.

18. Tests to determine compliance with the requirements for dielectric strength were next conducted by subjecting the horn to twice its rated voltage plus 1250 volts for 1 minute between its electrical circuit and ground, after which the insulation resistance was determined with a 1,000 volt megger.

19. The watertight integrity was next determined by submerging the horn under 3 feet of standard sea water (sp.gr. 1.025) for a period of 3 hours.

20. This was followed by the salt spray test to determine resistance to corrosion, by subjecting the sample horn, under ultra-violet light, to a 20% salt spray at 55° C for 3 minutes, followed by an air blast at 55° C for 3 minutes, the cycle being repeated for an uninterrupted period of 100 hours.

21. The test was concluded with a careful examination of the horn to determine compliance with the specifications as to design and quality of workmanship and materials.

RESULTS OF TEST

22. The test results obtained, when the sample horn was subjected to the tests in the specified order, were as follows:

<u>Requirements</u>	<u>Test Values</u>
Voltage: 115 volts	115 volts
Current: Alternating, 60 cycles.	A.C., 60 cycles.
Amperes: Not specified.	0.104 ampere.
Watts: Not over 25.	7.7 watts.
Power factor: Not less than 40%.	64.3%
Weight: Not over 6 pounds.	3 pounds, 15 ounces.

<u>Requirements</u>	<u>Test Values</u>
Pitch of note: 100 to 600 c.p.s.	120 c.p.s.
Sound pressure output: Shall be not less than 75 decibels, at 18 feet in a soundproof room.	79 db
Shock integrity: Shall withstand 20 shocks of 250 foot pounds each, under conditions specified in 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 minute on" and "one minute off" for a period of 1500 cycles, the first half at an ambient temperature of 60° C and the second half at 0° C.	Complied.
Temperature rise: Shall not exceed 45° C at any time during the endurance test.	26.2° C at 60° C ambient.
Retest of sound pressure output after the endurance test as specified in paragraph F-2n.	Complied.
Dielectric test: Shall withstand twice the rated voltage plus 1250 volts, at 60 cycles, for a period of 1 minute.	Complied.
Insulation resistance: Shall be not less than 5 megohms, after the dielectric test with a 500 volt megger.	100+ megohms.
Wire: Type SICP shall be used.	Complied.
Inclination: Shall operate in any position when supplied with $\pm 10\%$ rated voltage and frequency.	Complied.
Watertight integrity: Shall be submerged under 3 feet of standard sea water without any water entering the case.	Complied.

Requirements

Test Values

Salt spray test: Shall be subjected, under ultra-violet light, to a 20% salt spray at 55° C for 3 minutes; followed by an air blast at 55° C for 3 minutes, the cycle being repeated for a period of 100 hours. Shall show no serious corrosion and shall operate satisfactorily at the end of the test.

Complied, no indication of corrosion.

Nameplates: Shall be in accordance with N.D. specification 42 N 2.

Corrosion resisting material.

Case material: Shall be of bronze or cast aluminum alloy as specified in paragraph D-3.

*Die-cast zinc base alloy material.

Painting: One coat of zinc chromate paint, followed by two coats aluminum paint prior to finishing coat of gray paint.

Complied.

Diaphragm: Shall be of nickel-chromium alloy.

Complied.

Magnet cores: Shall be protected against corrosion.

Complied. Magnet core and chassis protected with insulating varnish.

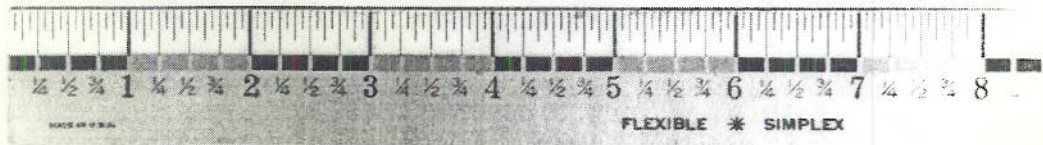
* Denotes failure to comply with the specifications.

CONCLUSIONS

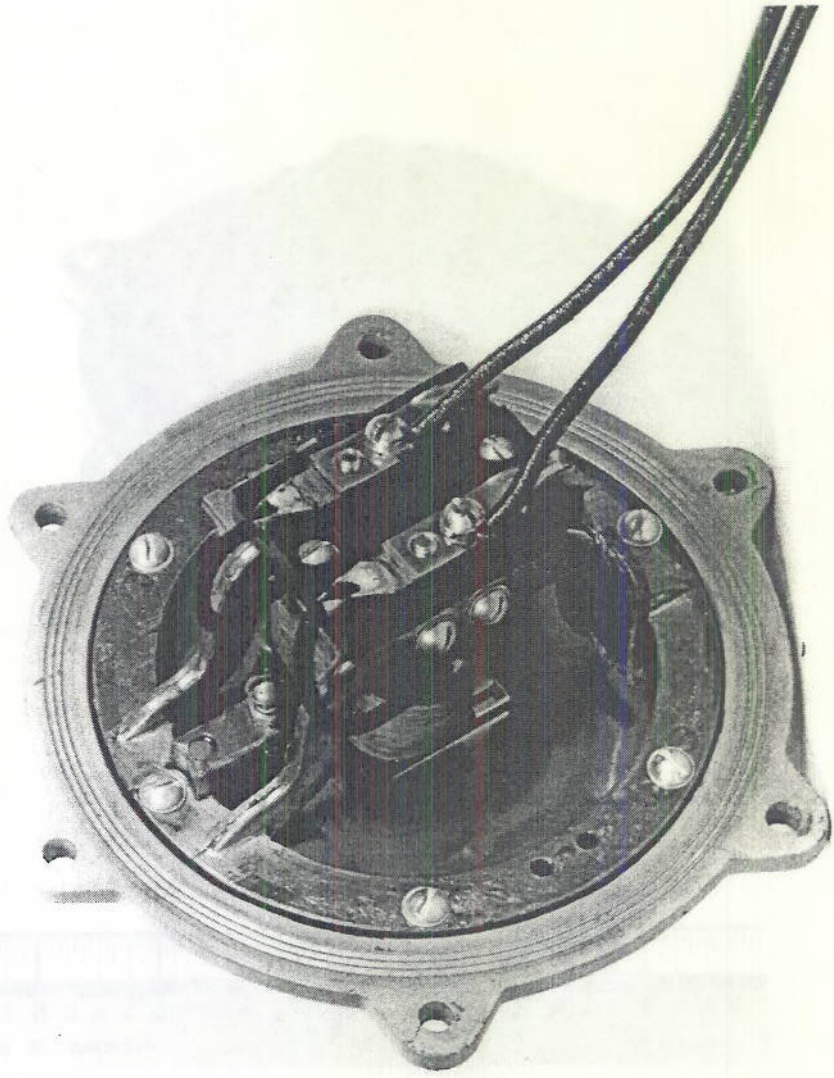
23. The subject horn is of good design and workmanship and it complies with the specifications except for the case material which is zinc alloy and subject to specific approval by the Bureau. The Laboratory tests disclosed no objectionable features regarding this material.



NO. SERIAL TYPE
CONTRACT NO. DATE OF MANUFACTURE
VOLTAGE AMPS
FEDERAL ELECTRIC CO.
CHICAGO, ILL.



Type H-2 Horn
115 volts-AC-60 cycles



Type H-2 Horn
115 volts-AC-60 cycles