9 November 1938

NRL Report No. B-1492

FR-1492

NAVY DEPARTMENT

BUREAU OF ENGINEERING

Report of Test

on

Sample of Type H-5 Motor Boat Horn
Control Instrument Co., Brooklyn, New York,
Exhibitor

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON, D.C.

Number of Pages: Text - 6 Plates - 2

Authorization: BuEng. ltr. S65-4/L5 (10-4-Ds) of 13 Oct. 1938.

Date of Test: October and November 1938.

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

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

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

Approved by: _____
H. M. Cooley, Captain, USN, Director

Distribution:
BuEng. (5)

bms

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APPENDICES

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 (10-4-Ds) of 13 October 1938.
(b) Specifications 17 S11 (INT) of 15 February 1938.

OBJECT OF TEST

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

ABSTRACT OF TEST

3. The sample 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 horn, to determine compliance with the specifications in the matter of materials, design, and workmanship, concluded the test.

Conclusions

(a) This sample motor-boat horn, manufactured by Control Instrument Company, Brooklyn, New York, complies with the specifications for type H-5, except as follows:

(1) A fracture occurred in the projector where crimped to the flange during the shock test.

(2) The coil lead wires are not of the approved type.

(3) The electromagnets are not wound with approved wire nor protected with approved covering. Single silk enameled and plain enameled wire have been used. Either double silk or double cotton covered enameled wire is permitted. An adhesive covering is used on the vibrator winding and a paraffin saturated tape covering is used on the main winding.

(4) The cover securing screws, washers and nuts rusted during the salt spray test. Copper-nickel alloy material should be used for these parts.

(5) The diaphragm is riveted to the chassis and cannot be replaced without the use of special tools, prohibited under paragraph D-12k.

(6) No nameplate is furhished.

(7) The core of the main electromagnet is not protected against corrosion.

(8) The steel parts of the vibrator appear to be cadmium plated. Zinc plating should be substituted.

(9) Drain holes are not provided in the projector flange.

(10) Solderless lugs are used.

(11) The terminal cover securing screws are steel and rusted during the salt spray test. Larger screws, of copper-nickel alloy, should be substituted. The cover gasket should be of one piece rubber instead of two pieces as furnished.

(12) The gap between the diaphragm button and the pole faces of the electromagnet is decreased by turning the external adjustment screw and bending the chassis. It was found possible to give the chassis a permanent set by turning the screw too far, making further adjustments impossible.

(b) This horn operated satisfactorily over the entire period of the test, requiring no adjustments, due to changes in ambient temperature, or the application of shock and vibration.

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 mechanical deficiencies, noted under "Conclusions" and a satisfactory check test.

(b) It is further recommended that the manufacturer be required to furnish a projector flange of cast bronze, mounting the diaphragm and chassis with machine screws, threaded into, but not penetrating the casting. Through bolts should be used for securing this assembly to the case. This change would increase the weight slightly above that allowed by the specifications, but it is believed to be justifiable in the interest of ruggedness. A chassis, similar to that commonly used on the Navy type H-2 horn, would prove suitable and would permit the gap between the diaphragm button and the pole faces to be adjusted while the mechanism is removed from the case. The external adjustment screw could be eliminated. As at present constructed, the horn cannot be completely adjusted when assembled or with the chassis removed from the case.

DESCRIPTION OF MATERIAL

4. This sample horn is of the separate vibrator type. The vibrator has the general appearance of a single pole telephone relay. It has two (2) tungsten contacts (1/8" diameter) and an adjusting screw for varying the tension on the armature lever. The winding is connected in series with the contacts in the manner of a conventional buzzer.

5. The main electromagnet has a laminated core of "U" shaped construction. It is mounted on a cast bronze mounting plate directly above a steel button riveted to the center of the diaphragm. As this magnet winding is connected in parallel with the vibrator winding, it receives current impulses at the same rate, causing it to alternately attract and release the diaphragm button.

6. The diaphragm is of copper-nickel alloy and is secured to the mounting plate with brass eyelets so that it is not removable. Some waterproof compound has apparently been applied to these surfaces before assembly.

7. The entire chassis is housed in a cast bronze case, provided with a formed brass projector. A flat rubber gasket is located in a shallow recess in the rim of the case. It is clamped between the chassis and the case by eight 8-32 fillister head nickel plated steel machine screws provided with flat washers and nuts. These screws also secure the projector flange.

8. An external adjusting screw is threaded into the rear of the case and may be used to adjust the gap between the diaphragm button and the electromagnet. This distance is varied by deforming the electromagnet supports.

9. The terminal strip is of phenolized fabric and may be reached by removing a curved plate from the side of the case. Two mounting lugs are provided and the case is tapped for two 3/4"(IPS) standard Navy terminal tubes.

10. The case is finished in a gray paint both inside and outside.

11. The sample horn is shown by photographs, Plates 1 and 2.

METHOD OF TEST

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

13. It was then subjected to an endurance test of "one second on" and "one second off" for an uninterrupted period of 9000 cycles, the first half of which was conducted at an ambient temperature of

60° C., and the second half at 0°C. During the first half of the test the temperature rise was determined by the resistance method.

14. 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.

15. Then followed a test for resistance to vibration conducted by subjecting it to 3 foot pound blows at the rate of 100, 150, 200, 250 300, and 350 blows per minute, for 30 minutes each, on a standard Bureau of Engineering vibration machine.

16. The sound pressure output and pitch of note were then checked to determine compliance with paragraph F-2n.

17. Next followed tests for dielectric strength, insulation resistance and waterrightness.

18. The tests were concluded with the salt spray test, under which the sample horn was 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 an uninterrupted period of 100 hours. A careful examination of the sample, to determine compliance with the specifications as to design, quality of workmanship and materials, concluded the tests.

RESULTS OF TESTS

19. The test results obtained were as follows:

Requirements	Test Values Type H-5
Voltage: 6 volts.	6 volts.
Current: Direct	Direct.
Amperes: Not specified.	2.4 amps
Watts: Not over 50.	14.4 volt amps.
Weight: Not over 7 pounds.	6.75 lbs.
Pitch of note: 100 to 600 C.P.S.	250 C.P.S.
Sound pressure output: Shall be not less than 85 decibels, at 18 feet in a sound proof room.	85 db
Shock integrity: Shall withstand 20 blows of 250 foot pounds each, under conditions specified under paragraph F-2g.	* Small fracture in projector crimp at flange after test.

Requirements		Test Values Type H-5
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
Temperature rise: Shall not exceed 45° C. at any time during the endurance test.		17.3° C.
Retest of acoustical output as specified in paragraph F-2n.		Complied
Dielectric test: Shall withstand a dielectric test of 500 volts, at 60 cycles, for a period of one minute.		Complied
Insulation resistance: Shall be not less than 1 megohm, with a 500 volt megger, after the dielectric test.		100 megohms
Materials: Aluminum shall not be used.		Complied
Wire: Type SICP shall be used.	*	Not used throughout.
Inclination: Shall operate in any position when supplied with ±10% rated voltage.		Complied
Watertight integrity: Shall be submerged under 3 feet of standard sea water for 3 hours without water entering the case.		Complied

Requirements	Test Values Type H-5
Salt spray test: Shall be subjected under ultra-violet light, to a 20% salt spray at 55°C. for a period of 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.	* Screws, washers and nuts rusted.
Nameplates: Shall be in accordance with N.D. specification 42N2.	* None furnished.
Cast 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.	Terminal block satisfactory. * Solderless lugs used.

* Denotes failure to comply with the specifications.

CONCLUSIONS

20. This sample motor-boat horn, manufactured by Control Instrument Company, Brooklyn, New York, complies with the specifications for type H-5, except as follows:

(a) A fracture occurred in the projector where crimped to the flange during the shock test.

(b) The coil lead wires are not of the approved type.

(c) The electromagnets are not wound with approved wire nor protected with approved covering. Single silk enameled and plain enameled wire have been used. Either double silk or double cotton covered enameled wire is permitted. An adhesive covering is used on the vibrator winding and a paraffin saturated tape covering is used on the main winding.

(d) The cover securing screws, washers and nuts rusted during the salt spray test. Copper-nickel alloy material should be used for these parts.

(e) The diaphragm is riveted to the chassis and cannot be replaced without the use of special tools, prohibited under paragraph D-12k.

(f) No nameplate is furnished.

(g) The core of the main electromagnet is not protected against corrosion.

(h) The steel parts of the vibrator appear to be cadmium plated. Zinc plating should be substituted.

(i) Drain holes are not provided in the projector flange.

(j) Solderless lugs are used.

(k) The terminal cover securing screws are steel and rusted during the salt spray test. Larger screws, of copper-nickel alloy, should be substituted. The cover gasket should be of one piece rubber instead of two pieces as furnished.

(l) The gap between the diaphragm button and the pole faces of the electromagnet is decreased by turning the external adjustment screw and bending the chassis. It was found possible to give the chassis a permanent set by turning the screw too far, making further adjustments impossible.

21. This horn operated satisfactorily over the entire period of the test, requiring no adjustments, due to changes in ambient temperature, or the application of shock and vibration.

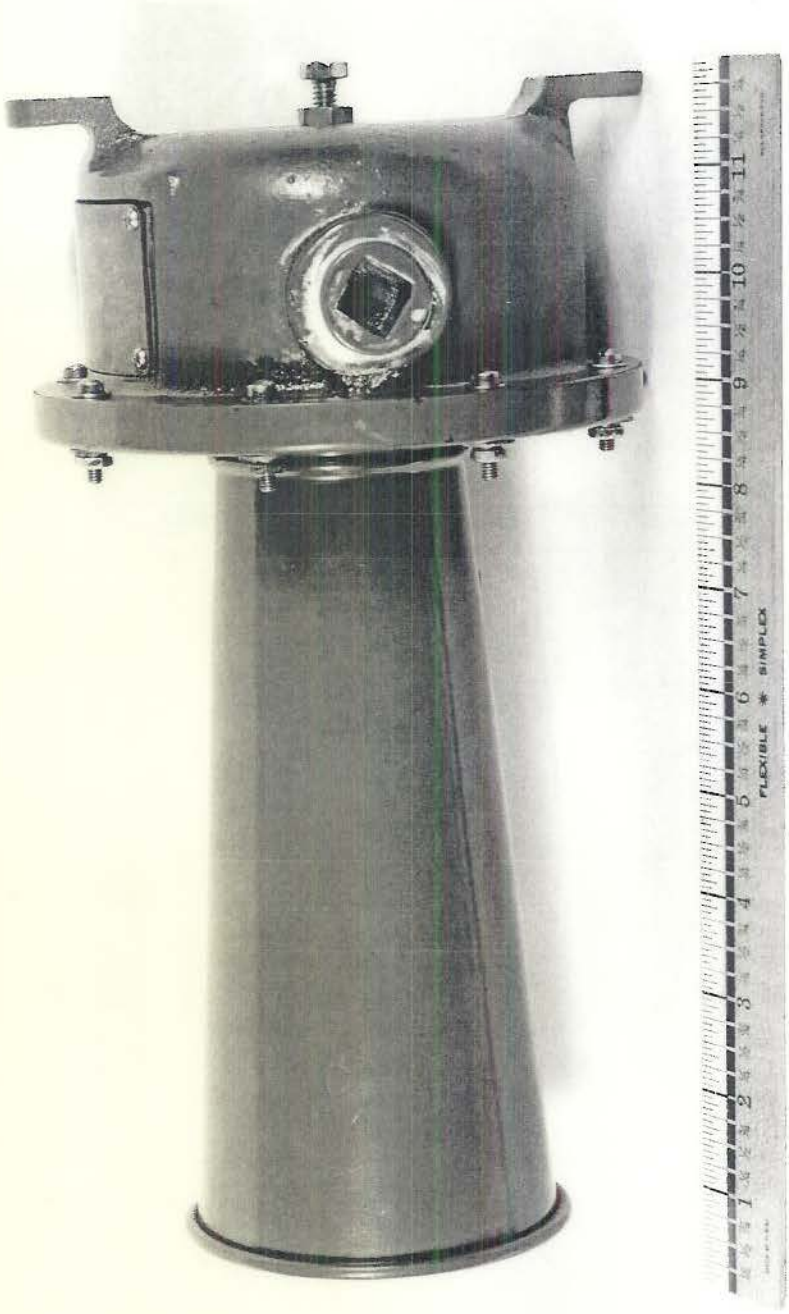

Plate 1

Plate 2