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8 January 1941

NAVY DEPARTMENT

Report of Test

on

Navy Type H-1 Horns

Submitted by

Benjamin Electric Manufacturing Company,
Des Plaines, Illinois.

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON, D. C.

Number of Pages: Text - 8 Plates - 2

Authorization: BuShips ltr. S65-4(Dy_S-3) of 13 December 1940

Date of Test: December, 1940.

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AUTHORIZATION FOR TEST

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

Reference: (a) BuShips Ltr. S65-4(Dys-3) of 13 December 1940.
(b) Specification 17S11_c of 1 May 1940.
(c) Benjamin Drwg. 191502 (BuEng. File No. 11-T-1470-L-Alt 0).

OBJECT OF TEST

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

ABSTRACT OF TEST

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

CONCLUSIONS

(a) Both samples failed during the early part of the endurance test due to breaking of upper contact springs, piece 15. One failed after 1.5 hours, the other after 3.5 hours. Diaphragm, piece 22, was found fractured in one of the horns.

(b) Due to these failures, several important tests could not be conducted.

RECOMMENDATIONS

(a) In view of the failure of these samples to comply with the endurance requirement, they are not recommended for Naval use.

(b) In the event that the manufacturer requests further tests, it is recommended that he be allowed to substitute spring steel for beryllium copper on pc. 15. It is believed that the use of steel for this piece will result in a longer life for the unit.

DESCRIPTION OF MATERIAL UNDER TEST

4. The two samples, submitted by Benjamin Electric Manufacturing Company as Navy type H-1 horns, are identical in design and operate from a supply of 115 volts, direct potential. Contacts, protected by a 0.1 mfd. condenser, are employed for interrupting the circuit.

5. The mechanism is enclosed in a watertight cast aluminum alloy case having two bosses, tapped for 3/4 inch (IPS) terminal tubes, and two mounting lugs cast integral with the case.

6. Further details are shown by drawing, reference (c), and photograph, Plate 2.

METHOD OF TEST

7. The sample horns, following tests to determine their electrical and acoustical characteristics at rated voltage, were subjected to further tests in the following order:

- (a) Inclination
- (b) Endurance
- (c) Dielectric
- (d) Insulation resistance
- (e) Watertight

8. The tests were concluded with a careful examination of the samples to determine compliance with the specifications pertaining to design, quality of workmanship and materials, and any defects resulting from the tests. The usual tests for temperature rise, acoustical analysis following endurance, shock, and vibration, were not conducted, due to the early failure of the horns under the endurance test.

RESULTS OF TEST

9. The test results obtained were as follows:

Requirements

Test Values

	<u>Sample No. 1</u>	<u>Sample No. 2</u>
Voltage: 115 volts, direct potential	115	115
Amperes: Not specified	0.197	0.211
Watts: Shall not exceed 25 watts	22.6	24.3
Sound pressure output: Shall be not less than 75 decibels at 18 feet in a soundproof room.	Complied 96 db total noise	Complied 95 db total noise
Pitch of note: 100 to 600 C.P.S.	Complied. See Plate 1	Complied See Plate 1
Inclination: Shall operate in any position when supplied with rated voltage \pm 10 per cent.	Complied	Complied
Endurance test: Shall operate 1500 cycles of "one minute on" and "one minute off," the first 750 cycles at 60° C. and the second at 0° C. ambient temperatures.	*Unsatisfactory. See "Conclusions"	*Unsatisfactory See "Conclusions"
Temperature rise: Maximum temperature shall not exceed 115° C. during the endurance test. (55° C. rise at 60° C. ambient temperature.	Not determined due to early failure under endurance.	Not determined due to early failure under endurance.
Shock test: Shall withstand 20 shocks of 250 foot pounds each as specified in paragraph F-2g.	Not conducted due to failure under endurance	Not conducted due to failure under endurance.
Vibration test: 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 shocks per minute.	Not conducted due to failure under endurance	Not conducted due to failure under endurance

Requirements

Dielectric test: Shall withstand twice the rated voltage plus 1250 volts, 60 cycles, for one minute between electrical circuits and between electrical circuits and ground.

Insulation resistance: Shall be not less than 5 megohms at not less than 500 volts d.c.

Watertight integrity: Shall be submerged under 3 feet of standard sea water for a period of 3 hours without the entry of water into the case.

Salt spray test: Shall be subjected, under ultra-violet light, to a 20 per cent 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 continuously for 100 hours.

Weight: Shall not exceed 6 pounds.

Nameplate: Shall be in accordance with N.D. Specification 42N2.

Dissimilar metals: Contact of dissimilar metals, except steel, with aluminum alloys shall be avoided as much as practicable in the assembly of parts. Where contact cannot be avoided, an approved spar varnish or other approved material shall be used between the faying surfaces.

Protection against corrosion: All aluminum surfaces shall be protected with one coat of zinc chromate paint, or an approved anodic treatment, over which finishing coats of approved gray paint shall be applied.

Test Values

<u>Sample No. 1</u>	<u>Sample No. 2</u>
Complied	Complied

Complied. Greater than 200 megohms by 1000 volt "megger"	Complied. Greater than 200 megohms by 1000 volt "megger"
--	--

Not conducted due to cracked diaphragm.	Complied.
---	-----------

Not conducted due to previous tests on similar equipment.	Not conducted due to pre- vious satis- factory tests on similar equipment.
--	--

Complied. 3 pounds, 4 ounces.	Complied. 3 pounds, 4 ounces.
----------------------------------	-------------------------------------

Complied. Cop- per-nickel alloy.	Complied. Copper- nickel alloy
-------------------------------------	--------------------------------------

Complied.	Complied.
-----------	-----------

Complied. Zinc chromate base coat.	Complied. Zinc chro- mate base coat.
--	---

Requirements

Test Values

Protection of exterior surfaces:
Exterior surfaces of all equipment, except nameplates, diaphragms, gongs, and strikers, shall be finished with two coats of gray paint specifically approved by the bureau concerned.

Sample No. 1
Complied.

Sample No. 2
Complied.

Clearances: Clearances between any two electrical circuits or between any electrical circuit and ground, where not separated by at least 1/16-inch of approved insulating material, shall be not less than 1/8-inch, unless otherwise approved.

Complied.

Complied.

Wiring: All wiring shall be in accordance with the requirements of N. D. Specification 15C1, unless otherwise approved.

Complied.

Complied.

Coil windings: May be either single or double silk or cotton covered enameled copper wire.

Complied.

Complied.

Single silk enameled copper wire.

Single silk enameled copper wire.

Protective covering for coils: Shall be nonhygroscopic, not glued or cemented to the coils, but shall be overlapped and cemented in the lap.

Complied.

Complied.

Spun cotton covered.

Spun cotton covered.

Waterproofing of coils: All coils shall be impregnated with an approved synthetic resinous material or other suitable and approved waterproofing and insulating compound.

Complied.

Complied.

Magnetic circuits; Shall be of laminated punchings of the best available grade for the purpose and shall be protected against corrosion.

Complied.

Complied.

Terminal block: Shall be of approved material and readily accessible.

Complied.

Complied.

Terminal lugs: Shall be in accordance with Bureau of Engineering drawing 9-S-1841-L, unless otherwise specified by the bureau concerned.

Complied.

Complied.

Requirements

Test Values

	<u>Sample No. 1</u>	<u>Sample No. 2</u>
Supply leads: Shall enter through the casing attached to the mounting bulk-head and not through any removable part.	Complied.	Complied.
Terminal wiring: Shall be lead in through a boss drilled and tapped for a Navy standard terminal tube. The case shall be provided with two bosses, one located at the top and the other at the bottom of the case, unless otherwise approved by the bureau concerned.	Complied.	Complied.
Springs: All springs which form a part of the electrical circuit shall be of beryllium copper, phosphor bronze, or their approved equivalent.	Complied. Spring (pc.15) beryllium- copper Spring (pc.35) bronze.	Complied. Spring(pc.15) beryllium- copper. Spring (pc. 35) bronze.
Contacts: All contacts for making and breaking an electrical circuit shall be of tungsten.	Complied.	Complied.
Agreement with test plans: Blueprint plans of sufficient detail to show all essential components of the equipment to be tested shall be furnished and shall check with the equipment.	Complied.	Complied.

*Denotes failure to comply with the specifications.

CONCLUSIONS

10. Both samples failed during the early part of the endurance test due to breaking of upper contact springs, piece 15. One failed after 1.5 hours, the other after 3.5 hours. Diaphragm, piece 22, was found fractured in one of the horns.

11. Due to these failures, several important tests could not be conducted.



Navy Type H-1 Horn
Benjamin Electric Mfg. Co., Exhibitor

BENJAMIN ELECTRIC MFG. CO.

TYPE H-1 HORN

S.P. NO. 34

500~



600~

700~



800~

900~



1000~

S.P. NO. 34



5000~



6000~



7000~



8000~



9000~

9000~

S.P. NO. 35

500~

600~

700~



800~

900~



1000~

S.P. NO. 35



5000~



6000~



7000~



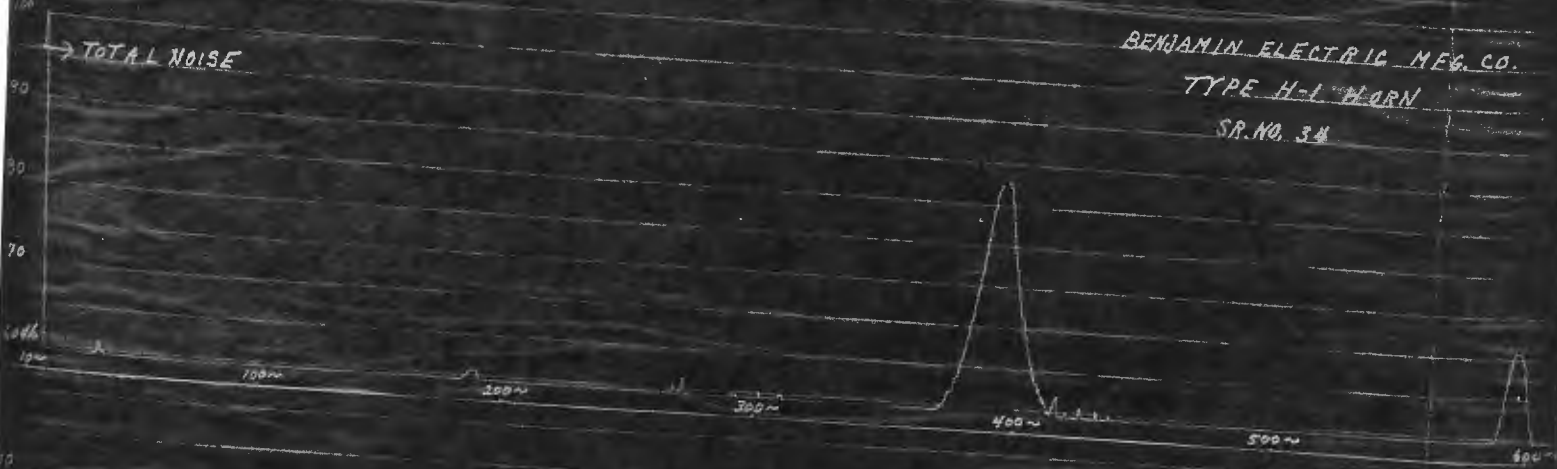
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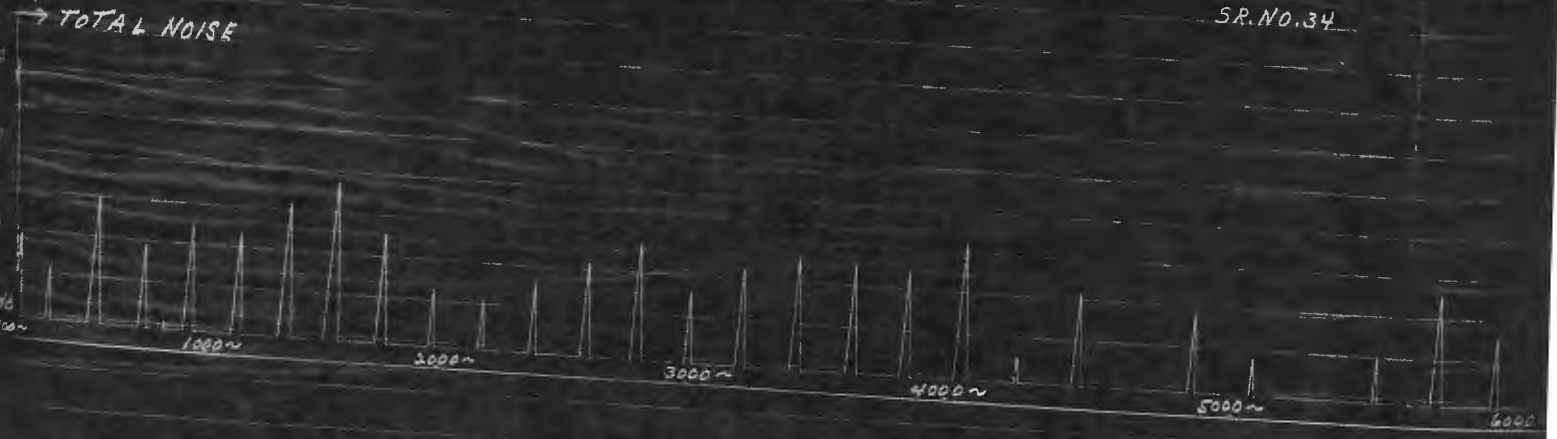
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PLATE 1

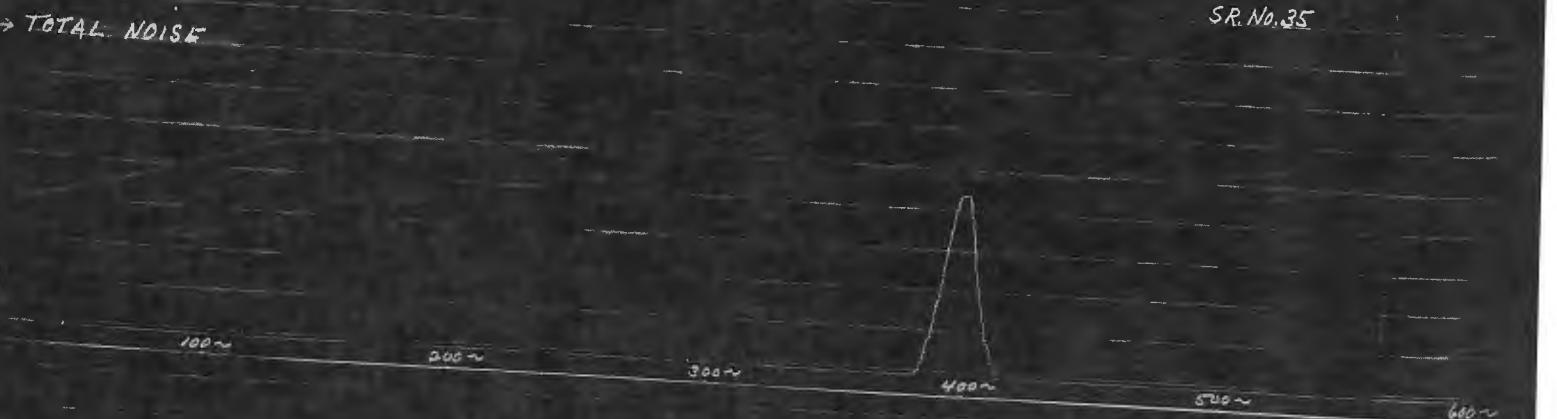
BENJAMIN ELECTRIC MFG. CO.
TYPE H-1 HORN
SR. NO. 34



SR. NO. 34



SR. NO. 35



SR. NO. 35

