

FR-1125

Test of Horns - Type H.

REPORT NO. B-1125

DATE 15 February 1935

SUBJECT

Test of Horns - Type H.

Federal Electric Company



BY

NAVAL RESEARCH LABORATORY

BELLEVUE, D. C.

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15 February 1935

NRL Report No.B-1125

NAVY DEPARTMENT
BUREAU OF ENGINEERING

Report on
Test of Horns - Type H
Federal Electric Company
Exhibitor

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON, D.C.

Number of Pages: Text - 5 Plates - 2
Authorization: BuEng ltr.S65-4/L5(12-13-Ds) of 29 Dec.1934.
Date of Test: January, February 1935.
Tested by:

J.S. Bryant, Sr.Eng.Aide

Prepared by:

W.B. Roberts, Sr.Eng.Aide,
Chief of Section.

Reviewed by:

W.M.Haynsworth, Jr., Lieutenant, USN

Approved by:

H. R. Greenlee, Captain, USN
Director.

- Distribution:
BuEng.(5)

nbc

TABLE OF CONTENTS

<u>SUBJECT</u>	<u>PAGE</u>
1. AUTHORIZATION.....	1
2. OBJECT OF TEST.....	1
3. ABSTRACT.....	1
(a) Conclusions.....	1a
(b) Recommendations.....	1a
4. DESCRIPTION OF MATERIAL UNDER TEST.....	2
5. METHOD OF TEST.....	2
6. RESULTS OF TEST.....	3
7. COMMENTS.....	4
8. CONCLUSIONS.....	5

Appendices

Photograph of assembled horn.....	Plate 1
Photograph of horn assembly removed from case.....	Plate 2

AUTHORIZATION

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

Reference: (a) BuEng. let. S65-4/L5(12-13-Ds) of
29 Dec. 1934.
(b) Navy Dept. Specifications 17S11a of
1 April 1931.

OBJECT OF TEST

2. The object of this test was to determine the suitability of the horns for use as type H (6 volts, direct current) and their conformance with Navy Department Specifications, ref. (b).

ABSTRACT OF TEST

3. The horns were set up at this Laboratory and supplied with their rated voltage and tested for endurance, operation at over and under voltage, temperature rise of the windings and shock integrity. Tests were also made to determine their insulation resistance, dielectric strength, watertight integrity, pitch of note and audibility range.

CONCLUSIONS

- (a) These horns as manufactured are unsatisfactory for the Naval Service.
- (b) The horns are rugged and appear to be of good design. It is believed that the manufacturer could modify them to meet the requirements of the specifications.

RECOMMENDATIONS

- (a) That type approval of the horns be held in abeyance until the manufacturer submits a horn incorporating the changes as outlined in paragraphs 16 to 24 inclusive, and which complies with the requirements of Navy Department Specifications SGS (65) 104 of 2 January 1935.

DESCRIPTION OF MATERIAL UNDER TEST

4. Two vibrating horns of the same type, designed for 6 volts, direct current, were submitted for test. The magnetic circuit of each horn consists of a "U" shaped laminated core and a solid armature. Each pole of the core supports a coil (0.223 ohms) wound on a form made of white fibre. The core, coil forms and protective coverings are painted with insulating varnish.

5. The entire mechanism is mounted on a cast aluminum alloy chassis. The electromagnet is suspended above the armature which is supported by two flat steel springs crossing under the armature. Attached to the armature is a brass strip projecting approximately 1" and containing a fibre button. This button supports a flat contact-carrying phosphorous bronze spring which is lifted from a similar contact-carrying spring when the armature is attracted to the core.

6. The contact gap is adjusted by a screw from the outside of the case. To reduce arcing at the contacts, a 0.25 mfd paper condenser is connected across them. The contacts are of coin silver and have a diameter of 0.125.

7. The windings are connected in series and have a total resistance of 0.447 ohms at ambient of 40°C. The line connections are made on an insulating strip provided with two terminal screws.

8. The diaphragm is of steel material and has a diameter of 4.50, a thickness of 0.018 and has a split sleeve riveted to its center. This sleeve contains a steel screw which is adjustable from the outside in order to contact the armature and cause the diaphragm to vibrate when the horn is energized.

9. The entire mechanism is enclosed in a splashproof cast steel case having two mounting lugs and one 1/2" IPS tapped boss. The horn projector is of sheet steel and is crimped to a heavier steel case cover provided with 0.125 drain hole. The horn projector is 7.75 long and 5.0 in diameter at the outboard end. For waterproofing the horn, three flat rubber ring gaskets are used in its assembly.

METHOD OF TEST

10. Each horn was first connected in a 6 volt direct current circuit, then placed in a compartment having a constant temperature of 40°C and tested for endurance by operating it for periods of one minute every other minute for 48 hours. During this test the current consumption and temperature rise of the coil windings were obtained.

11. Next, each horn was tested for operating characteristics when inclined 30° from the vertical in any plane and supplied with current at voltages of 10% above and 20% below normal.

12. Each horn was then mounted on a Navy standard shock machine and given 20 - 150 foot pound blows in order to determine its ruggedness

and dependability while operating and under shock.

13. In concluding, each was tested for its audibility range, insulation resistance, dielectric strength and water-tight integrity.

14. For determining its construction and conformance of materials to Navy Department specifications, one of the subject horns was completely disassembled and carefully examined.

RESULTS OF TEST

15.

<u>Specifications</u>	<u>Requirements</u>	<u>Test Values</u>
Voltage	6 volts	6 volts
Current	Direct	Direct
Amperes	Not more than 8.33	2.0 amperes
Watts	Not more than 50	12 watts
Pitch of Note	250 to 650 CPS	*175 CPS
Endurance	Operation for periods of 1 minute every other minute for 48 hours	Both horns operated satisfactorily for periods of 1 minute every other minute for 48 hours.
Temperature rise of windings	Not more than 30°C at conclusion of endurance test at ambient of 40°C.	18.39°C rise (average)
Inclination at over under voltage	Satisfactory operation when inclined 30° from the vertical in any plane and supplied with current at voltages of 10% above and 20% below normal.	Satisfactory operation at 10% above normal voltage (6.6 volts) *Unsatisfactory operation at 20% below normal voltage (4.4 volts)
Audibility range.	Shall be audible, in still air in the open, 450 yards.	*Audible at 300 yards.
Shock test.	Shall operate without change of tone or other damage when subjected to 20 blows of 150 foot pounds on a Navy standard shock-testing machine.	Horns operated satisfactorily
Insulation	Not less than 1 megohm when measured by a 500 volt megger.	100 megohms
Dielectric	No breakdown shall occur when 500 volts, 60 cycle	No breakdowns occurred.

SpecificationsRequirementsTest Values

	a.c., is applied between all current carrying parts and ground for a period of 1 minute.	
Watertight integrity	Shall not leak when subjected to a stream of water 1 inch in diameter, under a head of approximately 35 feet, from a distance of 10 feet for a period of 5 minutes.	*One horn tested as required and leaked 15 cc
Contact protection	Not specified	0.25 mfd paper type condenser
Contact material	Silver or tungsten steel if required.	*Coin silver (badly pitted at conclusion of test)
Case material	Bronze or steel heavily copper plated.	*Cast steel painted black.
Weight	Not specified	5 lbs. 4 oz.
Dimensions	Not specified	Length 11"375 Width 6"75 Depth 5"50

*Notes failure of horns to comply with the requirements.

COMMENTS

16. The horns successfully withstood the required endurance test and the temperature rise was within the limits given by the specifications. However, the coin silver contacts were badly pitted at the end of the test. For long life and more dependable service, tungsten steel contacts of a suitable diameter and protected with a suitable condenser should be used.

17. When tested at 20% under normal voltage (4.4 volts) the sound emitted by the horns was very weak and unstable.

18. The horns failed to comply with the required audibility range (450 yards). The maximum distance that they could be heard in the open, in still air was 300 yards. This range could be increased by increasing the power consumption of the horns, not to exceed the allowable 50 watts.

19. When tested for watertight integrity, the horns leaked at the adjusting screws and case cover screws. To be suitable for the Naval Service they must be made splashproof.

20. The present horn cases and horn projectors are of steel, black Japan finish but are not protected with a heavy copper plating

as required by the specifications.

21. Brass material is used in contact with aluminum in the assembly of the horns. Steel material, cadmium plated, should be substituted to prevent electrolytic action.

22. The present method of securing the fixed condenser is unsatisfactory. For Naval use, a sealed "can" type condenser is preferable.

23. The pitch of note of the subject horns is 175 CPS. The specifications require that the note be within the range of 250 to 650 CPS.

24. The locking device for the contact adjusting screw does not lock the screw as intended. A positive locking device is necessary in order for the horn to hold its adjustment.

CONCLUSIONS

25. These horns as manufactured are unsatisfactory for the Naval Service.

26. The horns are rugged and appear to be of good design. It is believed that the manufacturer could modify them to meet the requirements of the specifications.

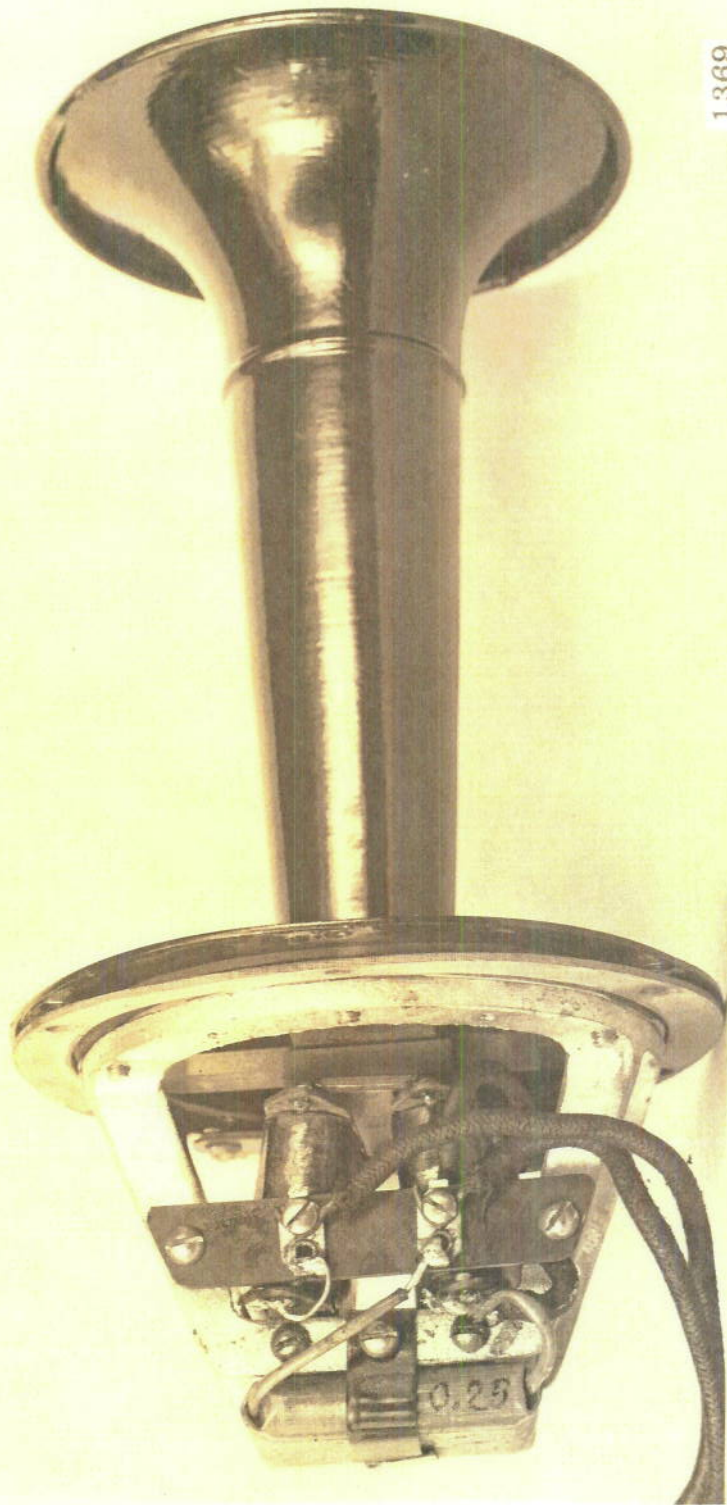


PLATE 2