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NAVY DEPARTMENT

BUREAU OF ENGINEERING

Report of Test

on

Horns, Type A,
Submitted by Clark Cooper Company,
Philadelphia, Pa.

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON,D.C.

Number of Pages: Text - 5 Plates - 2

Authorization: Bu.Eng.let.L5/NP14(9-7-Ds) of 10 October 1935.

Date of Test: October-November, 1935.

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

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

Distribution:
Bu.Eng.(5)

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Appendices

AUTHORIZATION

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

References: (a) Bu.Eng.let.L5/NP14(9-7-Ds) of 10 Oct.1935.
(b) Navy Department Specifications SGS(65)104 - Horns, Interior Communication, dated 2 January 1935.

OBJECT OF TEST

2. The object of this test was to determine how closely the subject horns comply with the specifications, reference (b), and their suitability for use in the Naval service.

ABSTRACT OF TEST

3. The two (2) sample horns, without making any adjustments or servicing, were set up in test circuits at this Laboratory and tested for conformance with the specifications, reference (b). Particular attention was given the horns, while under test for endurance, to note any change in the pitch of note resulting from fractured diaphragms or change of motor speeds. Throughout the period of the endurance and temperature rise tests, a constant voltage of 115 volts, 60 cycles, was maintained. The usual inspection of materials, design and workmanship was made.

CONCLUSION

(a) The design of these horns is good and if minor changes were made, in accordance with "Comments" paragraphs 24 to 30 inclusive, they should prove suitable for Naval use as Type "A" horns. The test results were, in general, satisfactory.

RECOMMENDATIONS

(a) It is recommended that the manufacturer be given type approval on these horns, subject to compliance with "Comments" of this report.

(b) It is further recommended that a sample horn, embodying changes considered necessary by the Bureau, be submitted to this Laboratory for examination before any are placed in the Naval service.

DESCRIPTION OF MATERIAL UNDER TEST

4. The two (2) motor-driven horns submitted for test are identical and designed to operate from a supply of 115 volts a.c., 60 cycle.

5. The motor is housed in a cast bronze splashproof case, finished in gray, having three (3) mounting lugs and a connection box cast integral with the case. The connection box is tapped for two 3/4" Navy terminal tubes.

6. Located in the connection box, reached by removing a cast bronze cover, is a terminal block of phenolic insulating material for making line connections.

7. The motor is equipped with a sleeve bearing at the commutator end and a roller bearing at the outboard end. To oil, it is necessary to remove the motor from the case.

8. Attached to the outboard shaft, by means of a steel hexagon nut and lockwasher, is a hardened steel cam having seven (7) lifts.

9. The noise is produced by the cam striking the hardened steel button riveted to a stainless steel diaphragm with stainless steel rivets.

10. The diaphragm is located between two (2) flat rubber gaskets and is secured to the case with eight (8) 8-32 round head machine screws passing through the projector ring and threaded into the case.

11. The projector is of spun brass and is attached to the projector ring by crimping.

12. The motor is provided with three (3) mounting lugs cast as part of the outboard end bell. It is secured to the case with three (3) 10-24 round head brass machine screws.

13. Threaded into the bottom of the case is a hex. head steel adjusting screw having a freely rotating steel ball retained in its end. The ball normally presses against the inboard end of the armature shaft and when the screw is threaded further into the case, the shaft is forced forward, causing the cam to strike the diaphragm button. Forward movement of the shaft is resisted by a flat spring located in the outboard motor end bell. A locknut is provided on the adjusting screw.

14. The field and armature cores are made of laminated material and the motor housing is of cast iron and cast bronze.

15. Further details of design and construction are shown on Plates 1 and 2.

METHOD OF TEST

16. The horns were first connected in a test circuit, energized from a supply of 115 volts, a.c., 60 cycles and the current, watts, power factor and pitch of note were obtained.

17. The horns were then tested for endurance at an ambient temperature of 65°C for a period of 24 hours and 40°C for the remaining 24 hours. During this test, the horns were operated one minute, every alternate minute, at rated voltage and frequency. The temperature rises were also obtained during this test.

18. Each horn was then tested for operation when inclined 30° from the vertical in any plane and energized at 10% over voltage at 65 cycles and 10% under voltage at 55 cycles.

19. Following this, the shock integrity of the horns was determined by mounting each on a Bureau of Engineering shock stand and tested in accordance with the specifications, reference (b).

20. Next, the audibility range, insulation resistance, dielectric strength and watertight integrity tests were conducted.

21. The test was concluded with an inspection of the horns to discover any defects that might have been brought out during the test. An inspection of the materials, design and workmanship was also made.

RESULTS OF TEST

22. Requirements	Test Values No. 1 Horn	Test Values No. 2 Horn
Voltage: 115 volts	115 volts	115 volts
Frequency: 60 cycles	60 cycles	60 cycles
Watts: Not over 75 watts	74 watts	77 watts
Power Factor: Not less than 30%	74%	78%
Endurance: One minute, every alternate minute, for 24 hours at ambient of 65°C and 24 hours at ambient of 40°C.	Required one adjustment during the test.	Required two adjustments during the test.
Temperature rise: Not over 30°C at ambient of 40°C.	18.7°C	19.8°C
Pitch of note: Not less than 350 CPS.	375 CPS	375 CPS
Audibility: Not less than 1000 yards, measured in open still air.	1475 yards	Not tested.
Decible output, measured at 18 feet in soundproof room, using General Radio, Type 559-A Noise Meter, not specified.	86 decibels	88 decibels
Inclination: Shall operate in any plane, 30° from the vertical, when energized at 10% over voltage, 65 cycles, and 10% under voltage at 55 cycles.	Satisfactory	Satisfactory

Requirements	Test Values No.1 Horn	No. 2 Horn
Insulation resistance: Not less than 5 megohms after dielectric test, by 1000 volt megger.	*Zero See "Comments"	100 megohms
Dielectric Test: Shall withstand 1230 V. a.c., 60 cycles, applied for one minute between all current carrying parts to case without breakdown.	*See "Comments"	Satisfactory
Watertightness: Shall not leak when sprayed with a one-inch stream of water, 30 ft. head, from a distance of 20 feet for 5 minutes.	Satisfactory	Satisfactory
Shock integrity: Shall withstand shocks of 250 foot pounds, applied as specified.	Satisfactory	Satisfactory
Case Material: Bronze permitted	Bronze	Bronze
Diaphragm material: Stainless steel permitted.	Stainless steel	Stainless steel

23. Weight and Dimensions

Weight	12 lb.2oz.
Length	11"50
Overall dia.	6"25

COMMENTS ON RESULTS OF TEST

24. Under endurance, one horn required one adjustment and the other two adjustments. This was attributed to slight wear of the diaphragm buttons. Possibly the buttons could be made harder, resulting in less wear.

25. One of the horns, under test for dielectric strength, failed due to poor commutator insulation. This appears to be a defect in manufacture rather than design, as the other was satisfactory.

26. The holes for the three (3) brass screws, securing the motor, extend through the case. Small external bosses would provide more metal for the tapped hole and increase the watertight integrity of the horn.

27. The horn projector ring is provided with but one drain hole, approximately 1/16" diameter. To insure proper drainage, four equally spaced holes, at least 1/8" diameter, should be provided.

28. The gasket rubber is of a poor grade, adhering to the metal and tearing easily when removing the terminal box cover or projector ring.

29. The terminal block and terminal lugs furnished are not in accordance with specifications, D-6b and D-6m.

30. All securing screws should be oval, fillister head, as required by paragraph D-6o specifications.

CONCLUSIONS

31. The design of these horns is good and if minor changes were made, in accordance with "Comments" paragraphs 24 to 30 inclusive, they should prove suitable for Naval use as Type "A" horns. The test results were, in general, satisfactory.

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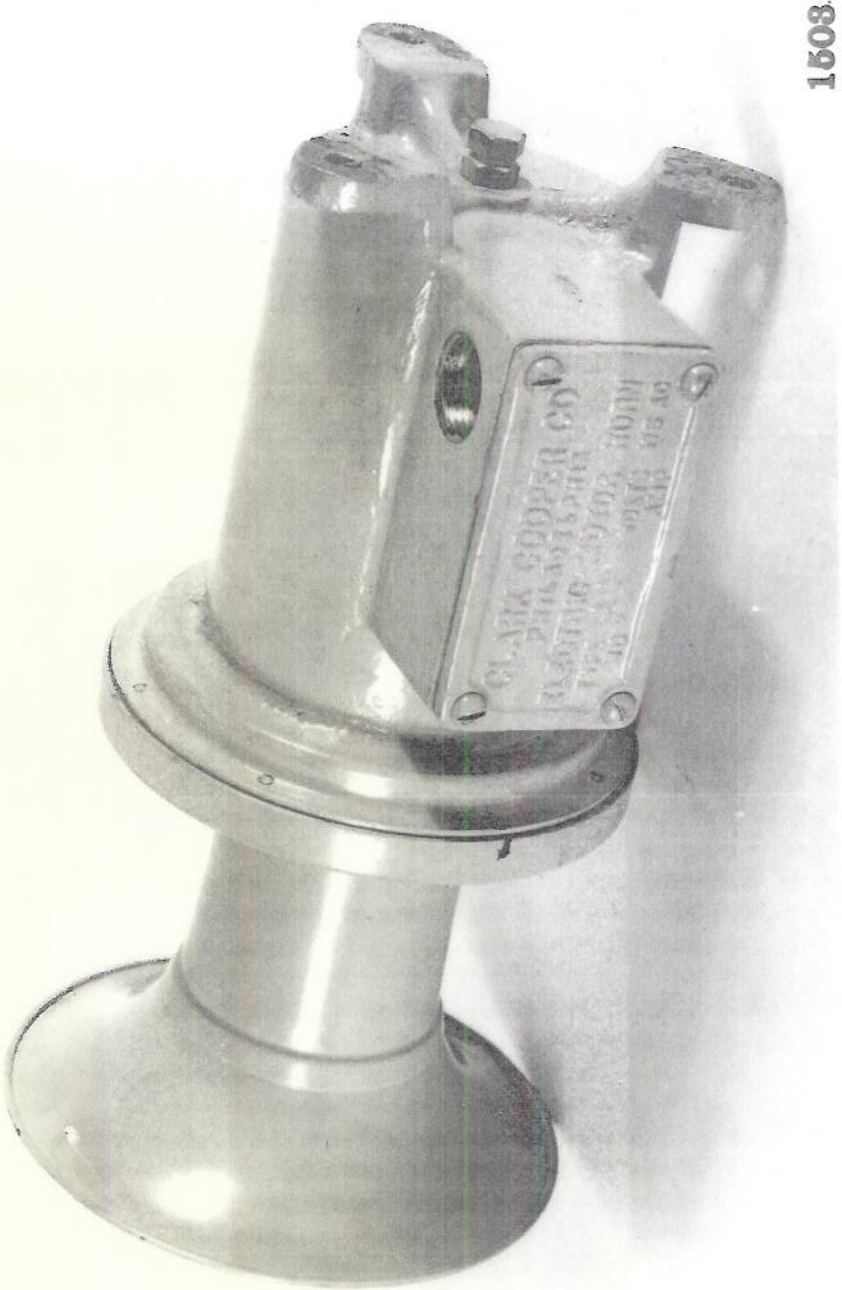
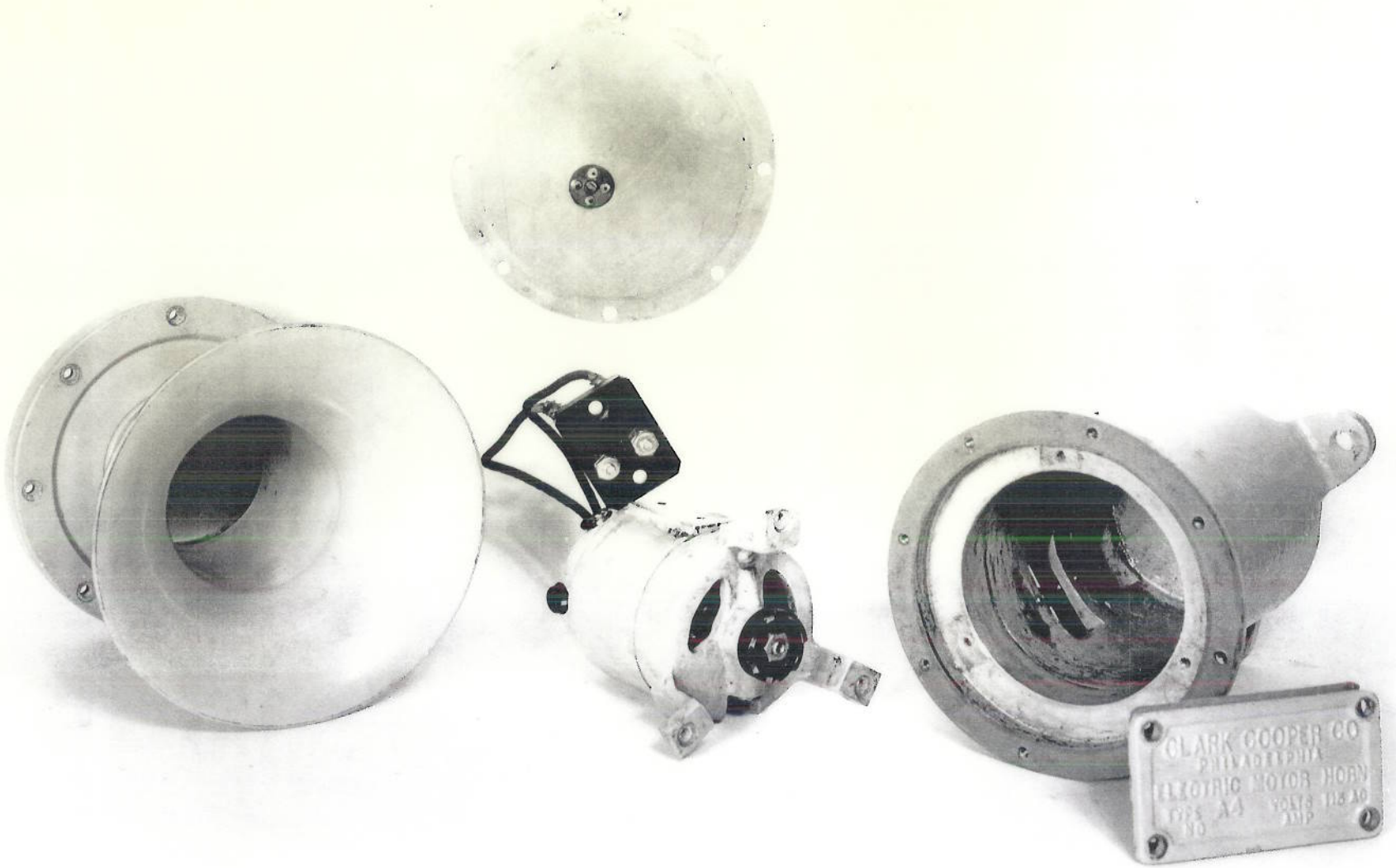


PLATE I

PLATE 2



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