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22 September 1937

NRL Report No. B-1399

NAVY DEPARTMENT
BUREAU OF ENGINEERING

Report of Test

on

Sirens - Type A-1

submitted by

Clark Cooper Company
153-159 Jefferson Street
Philadelphia, Pennsylvania

FR-1399

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON, D. C.

Number of Pages: Text - 6 Plates - 2

Authorization: BuEng let. S65-5/L5-(7-13-Ds) of 24 July 1937.

Date of Test: August and September, 1937.

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Distribution: BuEng (5)

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AUTHORIZATION FOR TEST

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

Reference: (a) BuEng let.S65-5/L5(7-13-Ds) of 24 July 1937.
(b) Specifications SGS(65)-105 Sirens, Interior
Communication, of 15 February 1936.

OBJECT OF TEST

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

ABSTRACT OF TEST

3. The subject sirens were set up at this Laboratory and tested in strict accordance with the specifications, reference (b), after which they were carefully inspected for quality of workmanship and materials, and suitability of design.

Conclusions

(a) The subject sirens, under test for conformance with the specifications, reference (b), failed to meet the following requirements:

- (1) One of the samples failed at the eighteenth hour of the required forty-eight hours of endurance. The failure was due to the development of trouble in one of the ball bearings, probably because of insufficient lubrication. A better method would be to pack the ball bearings with grease and seal to prevent leakage. The temperature rise of the motor up to this time was 65° C, above an ambient temperature of 65° C, using the resistance method.
- (2) The remaining sample, although completing the required endurance test, had a temperature rise of 60.3° C, above an ambient temperature of 65° C, using the resistance method. That allowable is 35° C, above an ambient temperature of 65° C. The temperature rises, obtained by the thermometer and thermocouple methods, are given under "Test Values," paragraph 21, as additional information. To these values, the usual correction value should be added.
- (3) Following the endurance test, the siren failed to withstand the required dielectric test, a breakdown occurring between the field and case. The insulation resistance following this test was zero by 1,000 volt megger.
- (4) The case cover for the terminal box has raised lettering. The usual custom is to provide a nameplate of non-corrosive material, such as monel, or its equivalent.

Recommendations

(a) It is recommended that approval of these sirens be withheld until such time as the manufacturer submits modified samples which will pass satisfactory endurance and temperature rise tests.

DESCRIPTION OF MATERIAL UNDER TEST

4. Two sirens, identical in construction and design, were submitted by the Clark Cooper Company, as Navy Type A-1, for type approval test.
5. The motor is bipolar, series wound, and designed to operate on a potential of 115 volts, a.c. or d.c. The speed of the motor, when producing a note of 1810 c.p.s., is 7,757 r.p.m. The motor is equipped with ball bearings.
6. The magnetic circuit is made up of thin laminated iron punchings, each pole piece supporting a form-wound coil, having a d-c resistance of approximately 3.96 ohms, at a temperature of 26° C.
7. The motor is housed in a cast aluminum alloy case, having four (4) mounting lugs drilled for 1/4 inch bolts, and a terminal box, provided with two (2) bosses tapped for 3/4 inch (IPS) standard terminal tubes. A terminal block of phenolic material is located in the terminal box, cast integral with the case.
8. The rotor is of aluminum alloy, cast in one piece, and has fourteen (14) apertures in its periphery. It is clamped to the armature shaft when a hexagon steel nut is screwed downward on a steel split sleeve, secured to the rotor by a force fit and with steel drive pins.
9. The rotor housing, or cylinder, also has fourteen (14) apertures in its periphery. Four (4) flat head steel machine screws, cadmium plated, extend through a flanged housing, a field assembly, and a cast-iron end bell, thus securing the motor assembly. The flange serves as one of the motor end bells and is cast integral with the aluminum alloy motor housing. Both of the end bells are equipped with ball bearings and oil wells.
10. The motor is assembled into the watertight case with four (4) fillister head steel machine screws, cadmium plated, extending through the rotor housing, motor flange, and flange of the case. The screws are equipped with steel nuts and steel lockwashers, cadmium plated.
11. Two steel wires, slightly recessed in the rotor housing, prevent injury to personnel.
12. The case is made splashproof by a flat rubber gasket, located between the motor flange and case flange. Felt washers are provided where the motor shaft extends through the flange.
13. Further details in the construction of the siren are given on Plates 1 and 2.

METHOD OF TEST

14. The sirens, as received, were first tested for shock integrity by placing them on a Bureau of Engineering shock stand and applying the required number of shocks, specified under par. F-2h(3) of reference (b).

15. They were next tested for endurance by placing them in a compartment, having an ambient temperature of 65° C, and operating them one minute, every alternate minute, for 24 hours. During this test, the temperature rise of the motors was obtained by the resistance, thermometer, and thermocouple methods. The temperature was then lowered to 40° C and the sirens were operated for 24 hours, at intervals of one minute, every alternate minute.

16. Next, they were tested for operating characteristics when inclined 30° from the vertical in any plane and supplied with current at voltages between 20% and 10% over normal operating voltage. They were also tested for operation over a frequency range of 55 to 65 cycles.

17. The pitch of note was obtained by beating against a General Radio beat frequency oscillator, type 513-B. During this test, the voltage to the sirens was maintained at 115 volts.

18. Prior to conducting the splash test, 1500 volts, a.c., 60 cycles was applied between all current carrying parts and ground for a period of one (1) minute. Upon conclusion, the insulation resistance was measured.

19. The sound output of the sirens was measured in a sound-proof room by a General Radio noise meter, type 559-A, located 18 feet from and on the axis of the siren. The rated voltage (115 volts) was maintained during this test.

20. The watertight integrity was determined by spraying them with a stream of water of one inch diameter, under a pressure-head of approximately 30 feet, played from a hose at a distance of 20 feet, for a period of 5 minutes.

21. Then followed the usual power consumption measurement at rated voltage and frequency, and an inspection to note any defects resulting from tests. They were also checked for conformance with the specifications relative to materials, design, and workmanship.

22. Operation of the sirens at -30° C concluded the test.

RESULTS OF TEST

23. The test results obtained were as follows, but no values are given for the siren failing under the endurance test.

<u>Requirements</u>	<u>Test Values</u>
Voltage: 115 volts.	115
Amperes: Not specified.	2.2
Frequency: 60 cycles.	60 cycles
Watts: Not over 200 watts.	*202
Power Factor: Not less than 60%.	79.84%
Endurance: Shall operate one minute, every alternate minute, for 24 hours at ambient temperature of 65° C, and one minute, every alternate minute, for 24 hours, at ambient temperature of 30° C.	*Unsatisfactory, see remarks under "Conclusions."
Inclination: Shall operate satisfactorily when inclined 30° from the vertical in any plane and supplied with current at voltages between 20% under and 10% over normal operating voltage.	Satisfactory operation under conditions as specified.
Frequency range: Shall operate satisfactorily over a frequency range of 55 to 65 cycles.	Satisfactory operation under conditions as specified.
Dielectric strength: Shall withstand 1500 volts, a.c., 60 cycles, applied between all current carrying parts and ground for a period of one minute, prior to a splash test, and 500 volts a.c., 60 cycles, following, for a period of one minute.	*Unsatisfactory, breakdown occurring between field and case.
Insulation resistance: Shall be not less than 10 megohms by 500 volt megger prior to splash test and 1 megohm by 500 volt megger following the splash test.	*Zero following dielectric test.
Splash test: Shall not leak when sprayed with a stream of water of 1 inch diameter, under a pressure-head of 30 feet, from a distance of 20 feet, for a period of 5 minutes.	No leaks occurred.

CONCLUSIONS

24. The subject sirens, under test for conformance with the specifications, reference (b), failed to meet the following requirements:

- (a) One of the samples failed at the eighteenth hour of the required forty-eight hours of endurance. The failure was due to the development of trouble in one of the ball bearings, probably because of insufficient lubrication. A better method would be to pack the ball bearings with grease and seal to prevent leakage. The temperature rise of the motor up to this time was 65° C, above an ambient temperature of 65° C, using the resistance method.
- (b) The remaining sample, although completing the required endurance test, had a temperature rise of 60.3° C, above an ambient temperature of 65° C, using the resistance method. That allowable is 35° C, above an ambient temperature of 65° C. The temperature rises, obtained by the thermometer and thermocouple methods, are given under "Test Values," paragraph 21, as additional information. To these values, the usual correction value should be added.
- (c) Following the endurance test, the siren failed to withstand the required dielectric test, a breakdown occurring between the field and case. The insulation resistance following this test was zero by 1,000 volt megger.
- (d) The case cover for the terminal box has raised lettering. The usual custom is to provide a nameplate of non-corrosive material, such as monel, or its equivalent.

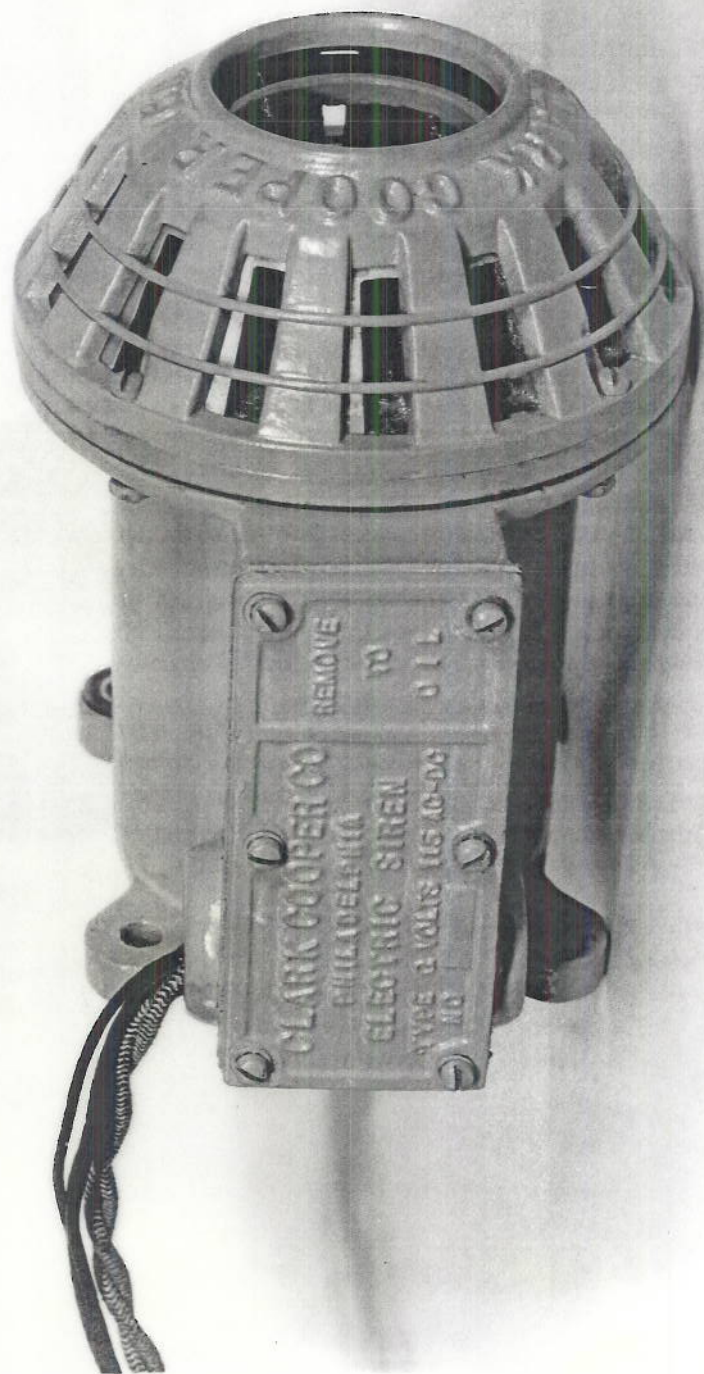


Plate 1