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NAVY DEPARTMENT
BUREAU OF ENGINEERING

FR-1465

Report of Test

on

Siren, Type S-3, S-4, submitted by

Federal Electric Company, Inc.
Chicago, Illinois

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON, D.C.

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Date of Test: July 1938.
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AUTHORIZATION FOR TEST

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

References: (a) Bueng. ltr. S65-4/L5(6-30-Ds) of 8 July 1938.
(b) Specifications 17-S-11 (INT) of 15 February 1938.
(c) Bueng. ltr. S65-4/L5 (4-2-Ds) of 22 April 1938
to Federal Electric Company.

OBJECT OF TEST

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

ABSTRACT OF TEST

3. The sample siren was set up at this Laboratory in suitable test circuits where its performance was carefully observed for compliance with the specifications. The usual inspection of the samples, to ascertain whether the materials, design, and workmanship, were in accordance with the requirements, concluded the test.

Conclusions

(a) The subject siren, manufactured by Federal Electric Company, and submitted for type approval as Navy types S-3 and S-4, complies with the specifications, reference (b), and is of good workmanship and design, except as follows:

(1) The feature to regulate the sound pressure output does not reduce it 20 decibels as required. It will be noted in the table that the greatest db reduction was with the ports opened 1/8 (12.5%) and the CPS had increased from 2100 to 2450 CPS. This exceeds the allowable 10 percent change.

(2) The weight allowed by the specifications is exceeded by 3 pounds, 6 ounces. However, this was waived by reference (c).

(3) It is noted that the stator ports have not been provided with guards as in previous samples.

(4) The stator locking screw does not appear to be of sufficient size.

Recommendations

(a) It is recommended that the subject siren be approved for Naval use subject to the correction of the discrepancies noted under "Conclusions" of this report.

DESCRIPTION OF MATERIAL UNDER TEST

4. The sample siren submitted by Federal Electric Company, Chicago, Illinois, is equipped with a universal series motor. It was submitted for type approval as Navy type S-3 (115 V. DC) and S-4 (115 V. AC).

5. The motor is housed in an aluminum alloy, splashproof case, having three (3) mounting lugs and a terminal box cast integral with the case. Two (2) bosses, tapped for 3/4 inch Navy terminal tubes, are located on the terminal box.

6. The motor is supported by an aluminum alloy casting, which also forms the stator for the siren. The casting is secured to the case with eight (8) steel fillister headed cadmium plated machine screws. Steel inserts are provided in the case for the securing screws.

7. A rubber gasket, 1/4 inch square, is provided between the stator and case to insure watertightness.

8. Ball bearings, packed with grease, are provided and can only be reached by disassembling the motor.

9. The area of the stator ports may be changed by rotating an outer concentric housing. This housing is cap shaped and also serves as an intake guard. A slot in its periphery is provided with a locking screw.

10. Located on the rotor, is a threaded split steel bushing and nut for securing the rotor to the armature shaft.

11. The armature and field cores of the motor are constructed of laminated material.

12. A terminal block of phenolic material, provided with lugs in accordance with Bureau of Engineering drawing 9-S-1841-L, is located in the terminal box. A flat rubber gasket is provided between the case and the box cover. Eight 10-32 steel fillister headed machine screws thread into steel inserts and secure the cover.

13. Further details in the construction of the siren are shown by photographs, Plates 1 and 2.

METHOD OF TEST

14. The siren, as received, was first tested to determine whether the electrical and acoustical characteristics were in conformance with the specifications.

15. It was next tested for shock integrity by placing it on

a Bureau of Engineering shock stand and subjecting it to 20 blows of 250 foot pounds each under the conditions specified under Paragraph F-2g of the specifications.

16. Then followed tests for resistance to vibration, conducted by placing it on a standard Navy 3 foot pound vibration machine and subjecting it to six periods of 30 minutes each, at frequencies of 100, 150, 200, 250, 300, and 350 blows per minute, as specified under paragraph F-2h of the specifications.

17. Next followed tests for endurance, during which it was placed in a compartment, having an ambient temperature of 60° C., and operated 750 cycles of "one minute on" and "one minute off". During this test the temperature rise was obtained by the resistance method. It was next operated for 750 cycles of "one minute on" and "one minute off" at an ambient temperature of 0° C.

18. It was next tested for ability to operate when inclined in all planes and supplied from a source varying $\pm 10\%$ in both voltage and frequency as specified in Paragraph B-3 and D-12i.

19. Prior to conducting the splash test, the siren was tested for dielectric strength by subjecting it to 1480 volts, at 60 cycles, for 1 minute, after which the insulation resistance was determined by a 500 volt megger.

20. The watertight integrity was determined by spraying the siren with a stream of water, 1 inch in diameter, under a pressure head of 35 feet, for a period of 5 minutes.

21. An inspection of the siren to determine its conformance with the specifications relative to design, quality of materials and workmanship, concluded the test.

RESULTS OF TEST

22. The following test results are tabulated as for two separate sirens.

<u>Requirements</u>	<u>Test Values</u>	
	Type S-3	Type S-4
Voltage: 115 volts	115 volts	115 volts.
Current: Alternating and direct.	Direct	Alternating
Amperes: Not specified	1.59 amps.	1.7 amps.
Frequency	- - - -	60 cycles
Watts: Not over 200	180 watts	176 watts
Power Factor: Not less than 60%.	- - - -	90%
Endurance: Shall operate 1500 cycles of "one minute on" and "one minute off", the first		

Requirements

half at an ambient temperature of 60°C. and the second half at 0°C.

Inclination: Shall operate satisfactorily in any position at $\pm 10\%$ in both voltage and frequency.

Dielectric strength: Shall withstand twice the rated voltage plus 1250, at 60 cycles, for 1 minute.

Insulation resistance: Shall be not less than 5 megohms following the dielectric test.

Splash test: Shall be splashed with a 1-inch stream of water under a pressure head of 35 feet for 5 minutes without any water entering the case.

Motor bearings: Ball bearings.

Temperature rise: Shall not exceed 45°C. at any time during the endurance test.

Pitch of note: 1750 to 2500 CPS.

Sound pressure output: Shall not be less than 95 decibels and capable of being reduced 20 db without changing pitch of note more than 10%.

Weight: Shall not exceed 9 lbs.

Dimensions: Not specified.

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

Terminal block: Phenolic material equipped with wire terminal lugs, drwg. 9-S-1841-L.

Test Values

Type S-3

Type S-4

Complied

Complied

Complied

Complied

Complied

Complied

100 megohms
by 500 volt
megger.

100 megohms
by 500 volt
megger.

Complied

Complied

Complied

Complied

36.2° C.

39.1° C.

2130 C.P.S.
(Before endurance test)

1950 C.P.S.
See table.

95 db.

96 db.

(Before endurance test.)

See table.

* 12 pounds, 6 ounces.

6-7/8" in diameter and 9-5/8" in length.

Corrosion-resisting steel.

Phenolic block equipped with required terminal lugs.

Requirements

Salt Spray Test: Shall be 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 100 hours.

Test Values

Not conducted due to a satisfactory previous test on a similar siren.

* Denotes failure to comply with the specifications.

NOTE: Excess weight allowed by reference (c).

CONCLUSIONS

23. The subject siren, manufactured by Federal Electric Company, and submitted for type approval as Navy types S-3 and S-4, complies with the specifications, reference (b), and is of good workmanship and design, except as follows:

- (1) The feature to regulate the sound pressure output does not reduce it 20 decibels as required. It will be noted in the table that the greatest db reduction was with the ports opened 1/8 (12.5%) and the CPS had increased from 2100 to 2450 CPS. This exceeds the allowable 10 percent change.
- (2) The weight allowed by the specifications is exceeded by 3 pounds, 6 ounces. However, this was waived by reference (c).
- (3) It is noted that the stator ports have not been provided with guards as in previous samples.
- (4) The stator locking screw does not appear to be of sufficient size.

TABLE 1
 Characteristics of Siren with Various Port
 Openings

Area of Port Opening	Sound Output in db.	C.P.S.	Watts	Coasting time in seconds
0	90	2700	140	14.5
1/8	84	2450	150	14.0
1/4	87	2400	158	12.5
3/8	95	2350	160	12.2
1/2	95	2300	163	12.0
5/8	91	2200	170	11.5
3/4	88	2150	174	11.0
7/8	93	2125	176	10.7
Full	98	2100	180	10.5

NOTE: The sound pressure output measurements were obtained with the siren located in a sound-proof room, 18 feet from the noise meter and supplied with 115 volts, a.c., following the endurance test.

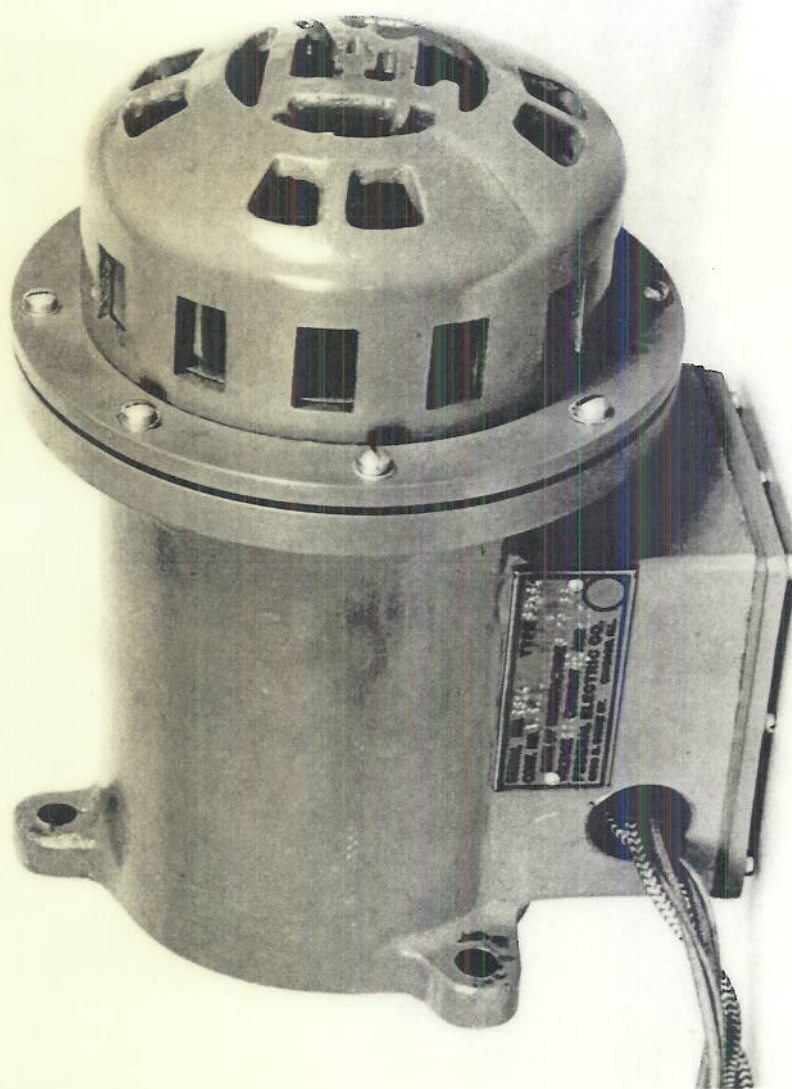
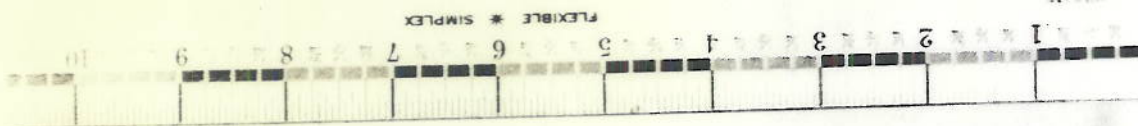


Plate 1

Stator locking
screw

