NAVY DEPARTMENT

BUREAU OF ENGINEERING

Report of Test

on

Buzzers, Navy Types B1 and A4,

submitted by

Federal Electric Company

Chicago, Illinois

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON, D. C.

Number of Pages: Text - 7 Plates - 4

Authorization: BuEng let.S65-4/L5(10-26-Ds) of 30 October 1936.

Date of Test: April and May 1937.

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Distribution: BuEng (5)

LP

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APPENDICES

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.S65-4/L5(10-26-Ds) of 30 Oct.1936.
(b) Specifications SGS (65)-103a of 1 June 1936.

OBJECT OF TEST

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

ABSTRACT OF TEST

3. The sample buzzers as received were set up at this Laboratory in suitable test circuits and the tests conducted in the order outlined under the specifications. The test was concluded with an inspection of the samples for suitability in design and quality of workmanship and materials.

Conclusions

(a) The sample type B1 and A4 buzzers were manufactured by Federal Electric Company, Chicago, Illinois. Under test for conformance with the specifications, reference (b), they complied, but for the following minor deficiencies.

(1) The breakdown under the dielectric test occurred between one of the coil lead wires and the chassis of the type B1 buzzer, due to insufficient insulation.

(2) The spaghetti used on the type B1 buzzer is not an approved insulation.

(3) The weight of the type A4 buzzer exceeds that allowable by 28 oz.

(4) Raised lettering, with blank spaces for stamping, is used on the cover of the type A4 buzzer. As this cover is of BE metal, it may be a satisfactory substitute for a nameplate.

(5) The condenser, shunting the type B1 buzzer contacts, leaked slightly and deposited some sealing compound in the bottom of the case.

(6) Although the amplitude of contact motion is less than that required, the type B1 buzzer successfully completed the required tests.

(b) The required salt spray tests were not conducted as the salt spraying machine is temporarily inoperative. However, it can be predicted that the test will have but little effect on the buzzers with the exception of the type B1 steel diaphragm. Corrosion of this part will depend upon the material and the method of applying the protective coating. The Bureau's attention is invited to the fact that the case and cover of the type B1 buzzer are identical to the manufacturer's type B2 buzzer, now approved for Naval use.

Recommendations

(a) In view of the subject buzzers having met the specifications with the exception of the minor deficiencies, noted under "Conclusions," their approval, following corrections, is recommended.

DESCRIPTION OF MATERIAL UNDER TEST

Type B1 Buzzer

4. The sample low pitch high intensity type B1 buzzer is shown by Plates 1 and 2 respectively. It is designed for 115 volts, direct current, and is of the vibrating type, employing a set of tungsten contacts for interrupting the current. The contacts are shunted with a 0.1 mfd condenser to reduce the arcing.

5. The magnetic circuit is made up of thick iron punchings of "U" shape and on one of its legs rests a form wound single winding.

6. The magnetic core assembly is supported by a cast aluminum alloy chassis which also supports the armature, contact assembly, and a phenolic terminal block. The chassis serves as a clamping ring for the diaphragm and diaphragm gasket, and is secured to the cover with six (6) round head steel machine screws which thread into tapped holes in the cover.

7. The case, of watertight construction, is of cast aluminum alloy, having two bosses tapped for 3/4" standard terminal tubes and two (2) mounting lugs. A 0".25 square rubber gasket, partly recessed into the rim of the case, insures a watertight joint between the cover and the case. The cover is secured to the case with six (6) fillister head steel screws equipped with steel nuts and lockwashers, and used as through bolts. Four (4) 0".185 holes are provided in the case cover to prevent the collection of water between the diaphragm and the cover. The horn projector is cast integral with the aluminum alloy cover.

8. The d.c. resistance of the winding is 173.5 ohms at an ambient temperature of 25.5° C.

9. The diaphragm is of steel, 0".018 thick and 4".50 in diameter, and is protected with a coat of clear lacquer.

10. A nameplate of corrosion-resisting steel, having etched markings, is secured to the side of the case with two (2) steel drive pins.

11. The total weight of the unit is 3.5 pounds.

Type A4 Buzzer

12. The sample buzzer, designated as Navy Low Pitch Type A4, and shown by Plates 3 and 4 respectively, is designed to operate from a supply of 115 volts, a.c. 60 cycles.

13. The buzzer is of the contactless type, employing a single form wound coil located on a laminated core of "U" shape. The armature, made of flat cold roll steel, secured to a phosphorous bronze spring, completes the magnetic circuit. The armature supporting spring is secured at one end with two (2) steel machine screws which thread into tapped holes in a boss, cast integral with the case cover. Under the heads of the screws, is a flat

steel plate for supporting a screw, which may be adjusted for regulation of the armature air gap.

14. Two projections, cast integral with the case cover, support a phenolic terminal block equipped with 9-S-1841-L terminals.

15. The noise is produced by the armature striking against the pole piece and the adjusting screw. The buzzer armature vibrates at a rate of 120 cycles per second when the buzzer is energized from a 60 cycle source.

16. The buzzer case is of cast aluminum alloy having two (2) bosses tapped for 3/4" standard terminal tubes and two (2) mounting lugs. Located in the rim of the case, partly recessed, is a 1/4" square rubber gasket, to insure a watertight joint between the BE metal cover and the aluminum alloy case. The cover is secured to the case with four (4) fillister head steel machine screws equipped with steel nuts and lockwashers, and used as through bolts.

17. The d.c. resistance of the single winding is 605.2 ohms at an ambient temperature of 25.5° C.

18. The buzzer is identified by raised lettering on the cast BE metal cover.

19. The total weight of the buzzer is 2.5 pounds.

METHOD OF TEST

20. The sample buzzers as received, were first tested for power consumption, pitch of note, and sound output in decibels at rated voltage.

21. They were next tested for shock integrity by placing them on a standard Bureau of Engineering shock stand and giving them 20 shocks of 250 foot pounds each while mounted in the positions described in par.F-2g(3).

22. Next followed test for endurance by operating them 1400 cycles of one minute of operation, every alternate minute. The first 700 cycles were conducted at an ambient temperature of 70° C. and the second 700 cycles at 0° C. The temperature rise of each of the buzzer windings was determined during this test by the resistance method.

23. Each unit was then tested to determine their operating characteristics when energized at 10% under voltage and 10% over voltage when inclined 45° from the vertical in all planes. The a.c. buzzer was tested for operation at 55 cycles, 126.5 volts and 65 cycles, 103.5 volts.

24. The insulation resistance of each buzzer was determined by a 1000 volt megger following a dielectric test of 1500 volts, a.c. 60 cycles, applied for one minute between the windings and ground.

25. The buzzers were next tested for watertightness by placing them in water to a depth of 3 feet for a period of 12 hours.

26. An inspection of each buzzer, to determine whether the materials, design and workmanship conformed with the specifications, concluded the test.

RESULTS OF TEST

27. The test results obtained were as follows:

Requirements	Test Values	
	Type B1 Buzzer	Type A4 Buzzer
Voltage: 115 volts	115 volts	115 volts
Current: Type B1 - direct Type A4 - alternating	Direct	Alternating
Frequency: 60 cycles for Type A4	--	60 cycles
Watts: Type B1 - Not over 15 Type A4 - Not over 5	6.8 watts	4.4 watts
Power Factor: Not less than 30% for Type A4.	--	70.8%
Amperes: Not specified.	0.085 amps.	0.054 amps.
Temperature rise: Not more than 30° C. at ambient temperature of 70° C.	9.9° C. rise	10.69° C. rise
Sound output: Type B1 - not less than 75 decibels. Type A4 - not less than 35 decibels.	79 db. NOTE: Measured 18 ft. from the buzzers and on the axis thereof in a soundproof room.	53 db.
Pitch of note: 60 to 500 cps.	425 cps	120 cps
Inclination: Shall operate satisfactorily in any plane 45° from vertical at 10% over and 10% under voltage.	Complied.	Complied, buzzer operating satisfactorily at 55 cycles, 126.5 volts and 65 cycles 103.5 volts.
Endurance: Shall operate 700 cycles of one minute on, every alternate minute, at ambient temperature of 70° C. and 700 cycles at 0° C.	Complied NOTE: Both buzzers also operated satisfactorily for periods of 1 hour each under the tests specified in par. F-2h(2).	Complied

Requirements	Test Values	
	Type B1 Buzzer	Type A4 Buzzer
Shock integrity: Shall withstand 20 blows of 250 foot pounds each under conditions specified under par. F-2g(3).	Complied	Complied
Watertight integrity: No leaks shall occur when placed in water to a depth of 3 feet for a period of 12 hours.	Complied	Complied
Dielectric: Shall withstand 1500 volts a.c. 60 cycles, applied between any electrical point and ground for one minute and 500 volts a.c. 60 cycles following the immersion test.	*See remarks under "CONCLUSIONS."	Complied
Insulation resistance: Shall be not less than 10 megohms between any electrical point and ground following the dielectric test and 1 megohm following the immersion test.	200 megohms by 1000 volt megger following the dielectric and immersion tests.	200 megohms by 1000 volt megger following the dielectric and immersion tests.
Total Weight: Type B1-Not over 5 lbs. Type A4-Not over 12 oz.	3.5 lbs.	*2.5 lbs.
Windings: shall be of double silk or cotton covered enameled copper wire.	Silk covered enameled copper wire	Silk covered enameled copper wire.
Terminal block: Shall be of phenolic material equipped with 9-S-1841 terminals.	Complied	Complied
Nameplate: Corrosion resisting steel or phenolic material when specifically approved.	Corrosion resisting steel, etched lettering.	*Raised lettering on cast BE metal cover.
Painting: Priming coat of zinc chromate paint followed with two coats of aluminum paint prior to finishing coat.	Complied	Complied
Electrical contacts: Shall be of tungsten.	Tungsten	None used.

Requirements	Test Values	
	Type B1 Buzzer	Type A4 Buzzer
Adjustment of contacts: Amplitude of motion of moving contact shall be not less than 0".093.	*0".04 (approx.) at end of test, armature against pole pieces.	None used.
Salt spray test: Specified under par. F-2e.	Tests omitted on both buzzers, for reasons stated under "CONCLUSIONS."	
Diaphragm material: Not specified.	Steel blued 0".018 in thickness and 4".5 in diameter. Painted with clear lacquer.	None used.
Case material: Case - Aluminum alloy. Cover - BE metal.	Case - aluminum. Cover - aluminum.	Case - aluminum. Cover - BE metal.

* Denotes failure to comply with the specifications.

CONCLUSIONS

28. The sample type B1 and A4 buzzers were manufactured by Federal Electric Company, Chicago, Illinois. Under test for conformance with the specifications, reference (b), they complied, but for the following minor deficiencies.

(a) The breakdown under the dielectric test occurred between one of the coil lead wires and the chassis of the type B1 buzzer, due to insufficient insulation.

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29. The required salt spray tests were not conducted as the salt spraying machine is temporarily inoperative. However, it can be predicted that the test will have but little effect on the buzzers with the exception of the type B1 steel diaphragm. Corrosion of this part will depend upon the material and the method of applying the protective coating. The Bureau's attention is invited to the fact that the case and cover of the type B1 buzzer are identical to the manufacturer's type B2 buzzer, now approved for Naval use.

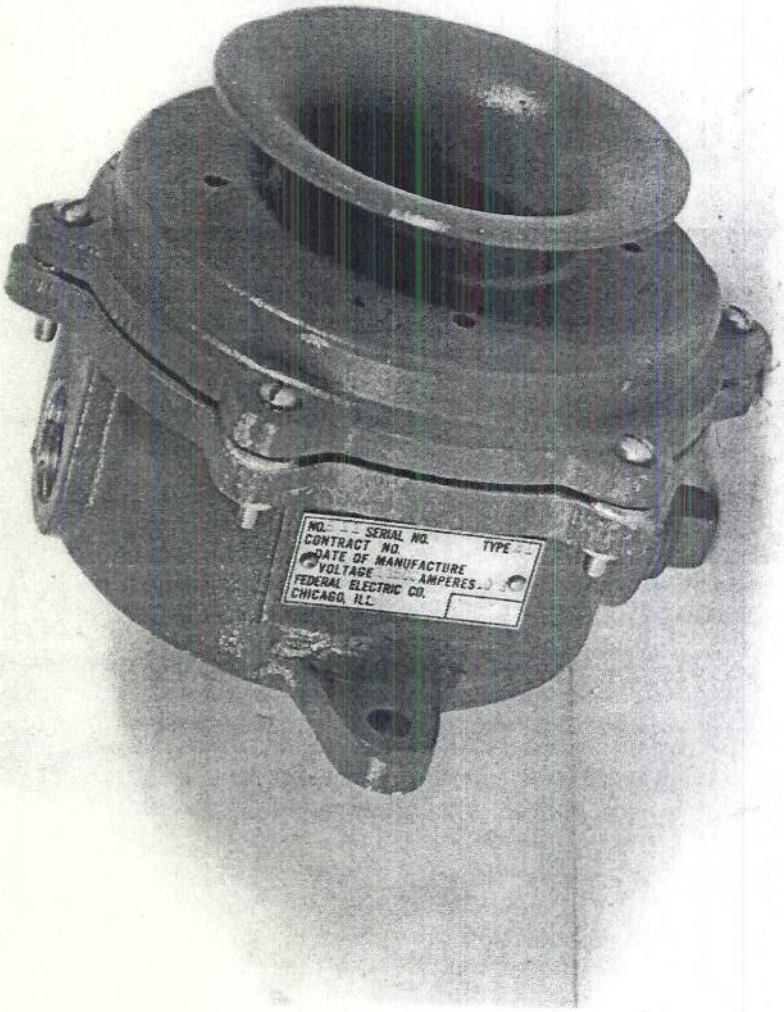
NO. SERIAL NO. TYPE
CONTRACT NO.
DATE OF MANUFACTURE
VOLTAGE AMPERES
FEDERAL ELECTRIC CO.
CHICAGO, ILL.

Plate 1

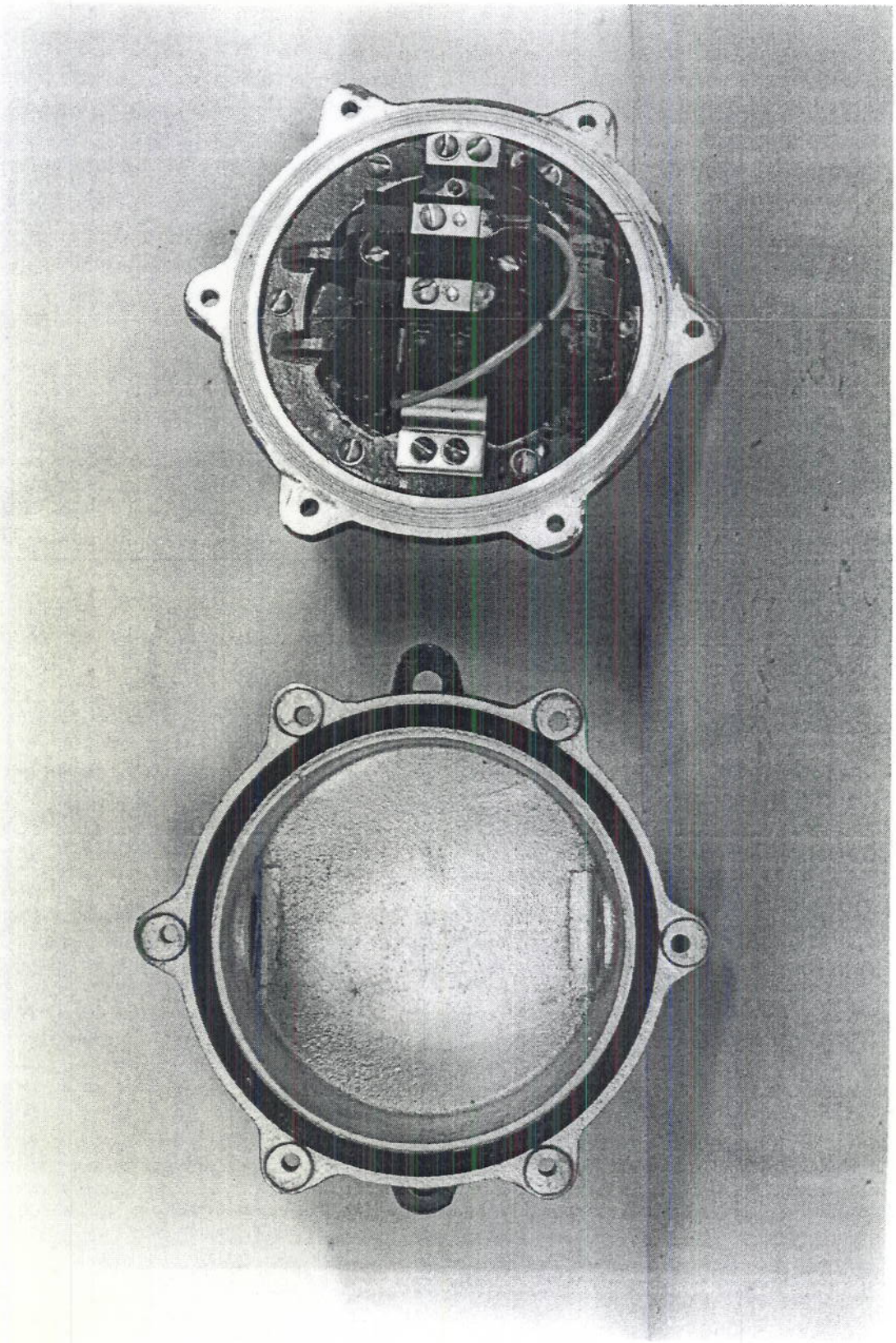

Plate 2


FEDERAL ELECTRIC CO. CHICAGO
BUZZER
DRG NO 8-14
SERIAL NO.
CONTRACT NO.
MANUFACTURED
VOLTS 16 A.C.
AMPERES .05
TYPE A-11

Plate 3

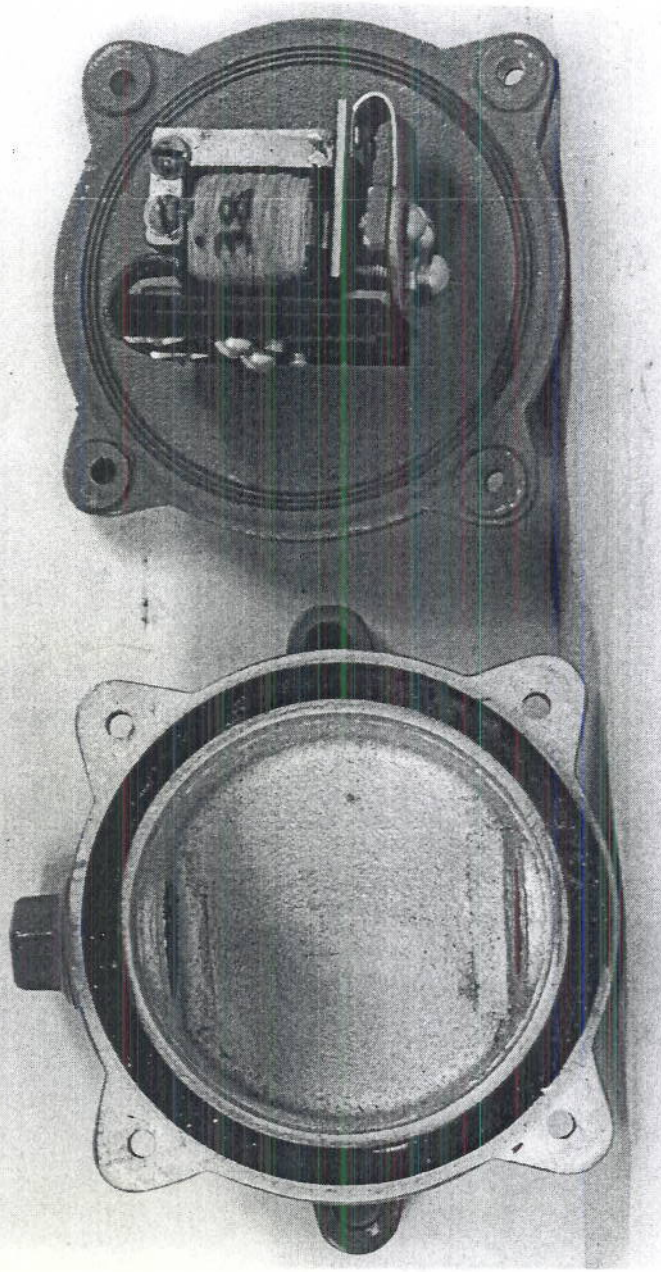

Plate 4