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NAVY DEPARTMENT
BUREAU OF ENGINEERING

Report of Test
on
Bells, Navy Types B1 and B2,
Manufactured and Submitted by the
Portsmouth Navy Yard,
Portsmouth, New Hampshire.

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
Washington, D.C.

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Tested by: _____
J.R.Coomes, Sr.Engr. Aide.
Prepared by: _____
W.B.Roberts, Pr.Engr.Aide, Chief of Section.
Reviewed by: _____
R.A. Gano, Lieutenant, USN.
Approved by: _____
H.M.Cooley, Captain, USN, Director.
Distribution:
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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).

Reference: (a) BuEng.let. S65-4/L5(9-9-Ds) of 9 September 1938.
(b) Specifications 17S11(INT) of 15 February 1938.
(c) Portsmouth Navy Yard Dwg. #30122 - BuEng. file No. 11-T-1285-L-Alt.0.

OBJECT OF TEST

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

ABSTRACT OF TEST

3. The sample bells, as received, were set up at this Laboratory in suitable test circuits where their performance was carefully observed for compliance with the requirements. An inspection of the samples, to determine compliance with the specifications in the matter of materials, design, and workmanship, concluded the test.

CONCLUSIONS

- (a) These bells, manufactured by the Portsmouth Navy Yard as Navy types B1 and B2, are rugged in design and of good workmanship. They comply with the specifications, reference (b), except that no provision has been made to prevent the radiation of radio frequency.
- (b) Although the bells operated satisfactorily during the endurance test, the breaker arm, piece 22, of the type B2 bell, was found to be loose where riveted to armature, piece 20.

RECOMMENDATIONS

- (a) It is recommended that the subject bells be approved for Naval use as Navy types B1 and B2, subject to the incorporation of means to prevent the radiation of radio frequency and a better means of securing the breaker arm, piece 22, to armature, piece 20.

DESCRIPTION OF MATERIAL UNDER TEST

4. The subject bells were manufactured by the Portsmouth Navy Yard, Portsmouth, New Hampshire, and were submitted for type approval tests under the specifications, reference (b), as types B1 and B2.
5. The samples are identical, except that one is designed to operate on 115 volts, a.c., 60 cycles, and the other on 115 volts, direct current. The mechanism is mounted on a BE metal case cover which is secured to the cast aluminum case by four (4) fillister headed, cadmium plated, steel machine screws, used as through bolts.
6. The bells are of the vibratory type and the gongs are struck by means of a striker arm extending through the case cover. A packing gland is provided for the shaft of the striker arm. The striker bell is of steel, zinc plated.
7. The gong of each bell is secured to the case cover with a hexagon headed brass machine screw, nickel plated, provided with a flat washer. An irregular pentagonal hole in the gong prevents its turning and definitely locates it with respect to the striker arm.
8. The electromagnet of each bell is made up of laminated iron, "U" shaped, and employs a single formed winding. The armature is of iron, rectangular in shape, and clamps to the striker arm shaft at one end. A flat piece of phenolic material, secured to the armature by means of a brass right angle bracket, operates the contacts which interrupt the circuit when the winding is energized. The contact assembly is mounted on a piece of laminated phenolic material and is secured to the magnet assembly with two fillister headed machine screws.
9. The gongs are 2-1/2 inches in diameter, stamped from 0!057 sheet brass, and painted with gray "Glyptal" lacquer.
10. The case is of cast aluminum alloy and is provided with four (4) mounting lugs and two (2) external bosses, one tapped for a 3/4 inch Navy terminal tube.
11. A 3/16 inch square rubber gasket is recessed in the rim of the case. The cover has two (2) concentric grooves which contact the gasket when the cover is bolted down.
12. Further details in the design of the bells are given by photographs, Plates 1 and 2, and by drawing, reference (c).

METHOD OF TEST

13. The sample bells as received were first tested for power consumption at rated voltages and for sound pressure output in decibels. The sound pressure measurements were made in a soundproof room with the bells located 18 feet from a General Radio type 559-A noise meter, and on the axis thereof.
14. Then followed tests for ruggedness in design, determined by placing the bells on a standard Bureau of Engineering shock stand, and subjecting them to 20 shocks of 250 foot pounds each under the conditions

specified under paragraph F-2g of the specifications. Immediately following this, they were placed on a vibrating machine and subjected to shocks of 3 foot pounds each, at frequencies of 100, 150, 200, 250, 300 and 350 vibrations per minute for periods of 30 minutes each.

15. Next followed tests for endurance by operating them "one minute on", and "one minute off" for a period of 1500 cycles, the first half of this period at an ambient temperature of 60°C., and the second half at 0°C. During the first half of this test, the temperature rises of the windings were obtained using the resistance method.

16. They were next tested for operation at ± 10 percent in voltage when inclined in all planes. The B2 bell was also tested for operation at ± 10 percent in frequency.

17. The bells were next checked for splashproofness by splashing them with a stream of water one inch diameter, under a pressure head of 35 feet, played from a hose at a distance of 5 feet for 5 minutes.

18. Then followed tests for corrosion resistance, determined by placing one of the samples in a salt spraying machine and subjecting it to a hot 55°C., 20 percent salt spray for 3 minutes, followed by a hot 55°C. air blast for 3 minutes. This test was continuous for 100 hours, during which time it was exposed to ultra-violet rays emitted from a sun lamp.

19. The test was concluded with the usual tests for insulation resistance and dielectric strength, and an inspection of the samples to determine conformance with the specifications pertaining to materials, design, and workmanship.

RESULTS OF TESTS

20. The test results obtained were as follows:

<u>Requirements</u>	<u>Test Values</u>	
	<u>Type B1</u>	<u>Type B2</u>
Voltage: 115 volts.	115 volts	115 volts
Current:	Direct	Alternating
Amperes: Not specified.	0.05 amps.	0.112 amps.
Watts: Not over 7-1/2.	4.6	6.8
Power factor: Not less than 50%.	--	52.8%
Weight: Not over 2 pounds.	1 pound, 15 ounces.	1 pound, 15 oz.
Sound pressure output: Shall be not less than 40 decibels, at 18 feet in a soundproof room.	51 db	48 db
Shock integrity: Shall withstand 20 blows of 250 foot pounds each, under conditions specified under paragraph F-2g.	Complied.	Complied..

RequirementsTest Values

	<u>Type B1</u>	<u>Type B2</u>
Vibration Tests: Shall be mounted on a standard Navy 3 foot pound vibration machine and subjected to six tests of 30 minutes each at 100, 150, 200, 250, 300 and 350 blows per minute.	Complied.	Complied.
Endurance: Shall be operated "one minute on" and "one minute off" for a period of 1500 cycles, the first half at an ambient temperature of 60°C. and the second half at 0°C.	Complied.	Complied.
Temperature Rise: Shall not exceed 45°C. at any time during the endurance test.	32.0°C.	42.8°C.
Dielectric test: Shall withstand a dielectric test of twice the rated voltage plus 1250 volts, at 60 cycles, for a period of one minute.	Complied.	Complied.
Insulation resistance: Shall be not less than 5 megohms, with a 500 volt megger, after the dielectric test.	100 megohms.	100 megohms.
Dissimilar materials: Brass shall not be in contact with aluminum.	Complied.	Complied.
Wire: Type SICP shall be used.	Complied.	Complied.
Inclination: Shall operate in any position when supplied with $\pm 10\%$ rated voltage and frequency.	Complied.	Complied.
Splashproof integrity: Shall be splashed with a 1-inch stream of water, under a pressure head of 35 feet, played from a hose from a distance of 5 feet, for 5 minutes without any water entering the case.	Complied.	Complied.
Salt spray test: Shall be subjected under ultra-violet light, to a 20% salt spray at 55°C. for a period of 3 minutes, followed by an air blast at 55°C. for 3 minutes, the cycle being repeated for a period of 100 hours. Shall show no serious corrosion and shall operate satisfactorily at the end of the test.	Complied. Showed no corrosion and operated satisfactorily after test.	Not tested.

Requirements

Nameplates: Shall be in accordance with N.D. specification 42N2.

Case Material: Shall be of bronze or aluminum alloy as specified in paragraph D-3.

Terminal block: Shall be of approved material, equipped with terminal lugs in accordance with BuEng.Drwg. 9-S-1841-L.

Finish: Aluminum castings shall be painted with one coat of zinc chromate paint, followed by two coats of aluminum paint, and final coat of gray paint.

Prevention of radio frequency radiation:

Test ValuesType B1

Complied.
(Brass with polished nickel finish)

Complied.
Cover - Composition BE.
Case - Cast aluminum alloy.

Complied.
(Laminated phenolic material used.)

Complied.

* No provision made.

Type B2

Complied.

Complied.

Complied.

Complied.

* Denotes failure to comply with paragraph D8 of the specifications.