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NAVY DEPARTMENT

BUREAU OF ENGINEERING

FR-1528

Report of Test

on

Buzzers, Navy Types Z-1 and Z-2

Manufactured and Submitted by

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WASHINGTON, D.C.

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Authorization: BuEng. ltr. S65-4(1-31-Ds) of 10 February 1939.

Date of Test: March and April, 1939.

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Distribution:
BuEng.(5)

jlh

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Appendices

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. ltr. S65-4(1-31-Ds) of 10 February 1939.
(b) Specifications 17S11(INT) of 15 February 1939.
(c) NRL Ltr. Report S65-4/L5, Serial No. 100, of 13 February 1939.

OBJECT OF TEST

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

ABSTRACT OF TEST

3. The sample buzzers were set up at this Laboratory in suitable test circuits where their performance was carefully observed for compliance with the requirements. At the conclusion of the test, the samples were carefully inspected to determine their conformance with the specifications, pertaining to design, materials and workmanship, and any defects resulting from the tests.

Conclusions

(a) The subject sample buzzers have complied with the major requirements of the specifications, and at no time was it necessary to make any adjustments. However, it will be noted that the allowable temperature rise of 45°C was exceeded on the type Z-2 pressureproof. In addition, it was necessary to repack the glands of the pressureproof types with three (3) turns of flax packing to prevent leakage of water into the cases. These samples, as received, had only 1-1/2 turns of flax packing. Also, the allowable weights of the types Z-1, Z-2 pressureproof and Z-2 watertight were exceeded.

Recommendations

(a) It is recommended that the subject buzzers be approved for Naval use following the correction of the deficiencies noted under "Conclusions".

DESCRIPTION OF MATERIAL UNDER TEST

4. The Z-1 buzzer is of the vibrating type, employing contacts for interrupting the circuit, and operates from a 115 volt direct current supply. The electromagnet core is made up of thin iron punchings of "U" shape. On this is located a single formed winding. The lead wires from this winding are soldered to terminals on each of the pieces of phenolic material which form spool ends for the winding. A phenolic block, equipped with terminals, is mounted on the electromagnet assembly. One end of the armature is hinged by a pin secured to two formed brass brackets mounted on the electromagnet assembly. A knurl headed screw, with a phenolic insert, is provided on the flat soft iron armature for adjusting the contacts and is held in position by a spring follower. The noise is produced by the armature striking the pole pieces and by an adjustable screw, threaded to the unhinged end of the armature, striking the case cover. A coiled steel spring, located on a pin at the hinged end of the armature, causes the armature to close the contacts each time the magnet coil is deenergized. The mechanism is mounted on the case cover with two (2) fillister headed No. 8-32 brass machine screws. Further details are given by photographs, Plates 1 and 2.

5. The Z-2 buzzer is identical in design except that it operates from a 115 V. A.C. 60 cycle supply, embodies no contacts, and has a flat phosphorus bronze armature spring. One end of the spring is attached to the terminal block, while the other presses against the armature. Further details are given by photographs, Plates 3 and 4.

6. The watertight cases and covers are of cast aluminum alloy, the cases being provided with four (4) mounting lugs and two bosses, one tapped for a 3/4 inch terminal tube. A 1/4 inch square rubber gasket, recessed in the rim of the case, insures watertightness when the cover, with two concentric rings, is held in place by four (4) No. 8-32 zinc plated fillister headed steel machine screws, used as through bolts. A base coat of zinc chromate paint is provided on the inside of the case and cover over which a coat of black insulating varnish is applied. The outside is finished with gray paint.

7. The pressureproof cases are of BE metal and are similar to the watertight cases in design except that a packing gland is provided, cast integral with the case, instead of a boss tapped for a terminal tube. Flax packing, 1/4 inch square, is used under the packing nut to insure watertightness..

METHOD OF TEST

8. The sample buzzers were first tested to determine their electrical characteristics, pitch of note, and sound pressure output.

9. They were then subjected to an endurance test of 1500 cycles of "one minute on" and "one minute off", the first half at an ambient temperature of 60°C and the second at 0°C. The temperature rises were determined by the resistance method during the first half of this test.

10. They were next subjected to 20 shocks of 250 foot pounds each on a standard Bureau of Engineering shock stand as specified in paragraph F-2g. This was followed by the vibration test specified in paragraph F-2h.

11. Next followed tests for satisfactory operation at ±10% rated voltage and frequency, after which the samples were subjected to a dielectric test of twice the rated voltage plus 1250 volts and measurements for insulation resistance.

12. The watertight cases were submerged in 3 feet of standard sea water for 3 hours as specified in paragraph D-13e. The pressureproof cases were submerged in standard sea water for 12 hours at 150 pounds pressure as specified in paragraph D-13f.

13. The tests were concluded with an inspection of the sample buzzers to determine conformance with the specifications as to design, workmanship and materials, also any defects resulting from the tests.

RESULTS OF TEST

14. The test results which follow were obtained when the sample buzzers were tested in the order required by the specifications.

			Test Values	
Requirements	Z-1 W.T.	Z-1 P.P.	Z-2 W.T.	Z-2 P.P.
Voltage: 115	115 d.c.	115 d.c.	115 a.c.	115 a.c.
Frequency: 60 cycles.	- -	- -	60 cycle	60 cycle
Amperes: Not specified.	0.053	0.051	0.104	0.109
Watts: 7-1/2 watts maximum.	4.9	4.7	6.4	7.9
Power factor: Shall be not less than 40%.	- -	- -	53.2%	62.7%
Sound pressure output: Shall be not less than 40 db at 18 feet in a soundproof room.	59	55	50	56

Requirements	Test Values Z-1 W.T.	Z-1 P.P.	Z-2 W.T.	Z-2 P.P.
Pitch of note: 100 C.P.S. to 500 C.P.S.	200	225	240	240
Weight: Shall not exceed 22 ounces for type Z-1 and 16 ounces for type Z-2.	22 oz.	*3 lb.,12 oz.	*20 oz.	*3 lb.,10 oz.
Shock integrity: Shall withstand 20 blows of 250 ft. lbs. each on a standard Bu.Eng. shock stand.	Complied	Complied	Complied	Complied
Vibration test: Shall be subjected to 6 tests of 30 minutes each at 100, 150, 200, 250, 300 and 350 blows per minute on a standard Navy 3 ft. lb. vibration machine.	Complied	Complied	Complied	Complied
Endurance: Shall operate satisfactorily "one minute on" and "one minute off" for a period of 1500 cycles, the first half at 60°C and the second half at 0°C.	Complied, (See Note)	Complied	Complied	Complied
Temperature rise: Shall not exceed 45°C during the endurance test.	19.2°C	17.8°C	31.3°C	*60.1°C
Voltage and frequency variations: Alternating current types shall operate at ±10% in both voltage and frequency and direct current types at ±10% rated voltage.	Complied	Complied	Complied	Complied

Requirements	Test Values Z-1 W.T.	Z-1 P.P.	Z-2 W.T.	Z-2 P.P.
Dielectric test: Shall withstand twice the rated voltage plus 1250 volts, 60 cycles, for 1 minute between electrical circuits and ground.	Complied	Complied	Complied	Complied
Insulation resistance: Shall be not less than 5 megohms following dielectric test. Note: 1000 volt megger used.	200+ megohms	200+ megohms	200+ megohms	200+ megohms
Watertight integrity: Shall be submerged in 3 feet of standard sea water for 3 hours without any water entering the case.	Complied		Complied	
Pressureproof integrity: Shall be submerged in standard sea water under a pressure of 150 pounds per square inch for 12 hours without water entering the case.		*See comments.		*See comments.
Case material: Shall be of bronze or aluminum alloy as specified in paragraph D-3.	Complied, Cast aluminum alloy.	Complied, B-E metal.	Complied, cast aluminum alloy.	Complied, B-E metal.
Painting: Aluminum alloys shall be given a priming coat of zinc chromate paint, covered by 2 coats of aluminum paint and finished with gray paint. (Par. C-4g). Gray paint only required on B-E metal. (Par. E-3b(7)).	Complied	Complied	Complied	Complied

Requirements	Test Values Z-1 W.T.	Z-1 P.P.	Z-2 W.T.	Z-2 P.P.
Salt spray test: Para. F-2p.	Not conducted due to the use of bronze cases and a previous satisfactory test on aluminum alloy case, reported under reference (c).			

*Denotes failure to comply with the specifications.

NOTE: One of the contacts of the type Z-1 came off near the end of the test.

Both types of buzzers are equipped with engraved name-plates of corrosion-resisting materials.

CONCLUSIONS

15. The subject sample buzzers have complied with the major requirements of the specifications, and at no time was it necessary to make any adjustments. However, it will be noted that the allowable temperature rise of 45°C was exceeded on the type Z-2 pressureproof. In addition, it was necessary to repack the glands of the pressureproof types with three (3) turns of flax packing to prevent leakage of water into the cases. These samples, as received, had only 1-1/2 turns of flax packing. Also, the allowable weights of the types Z-1, Z-2 pressureproof and Z-2 watertight were exceeded.

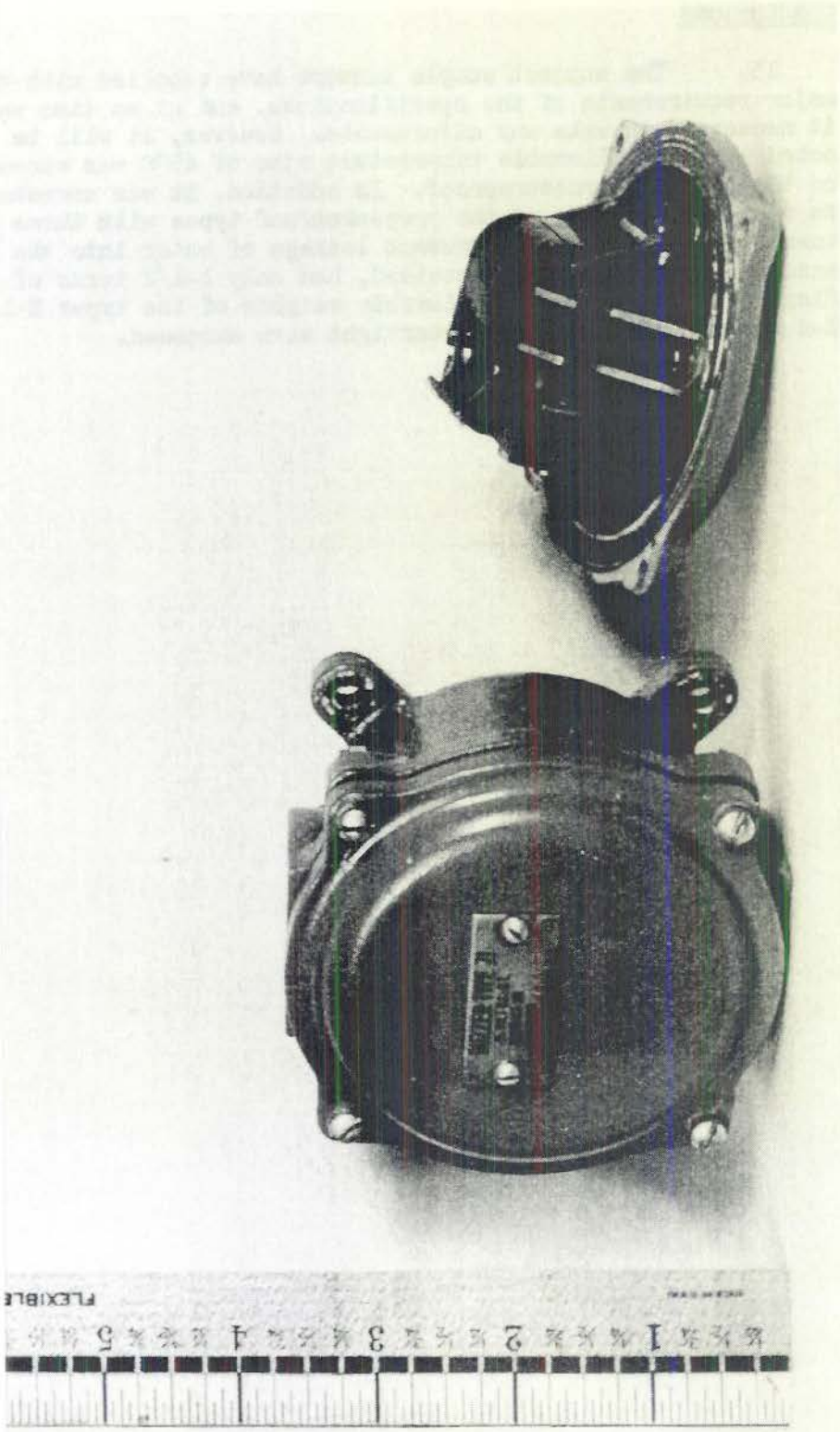

Plate 1

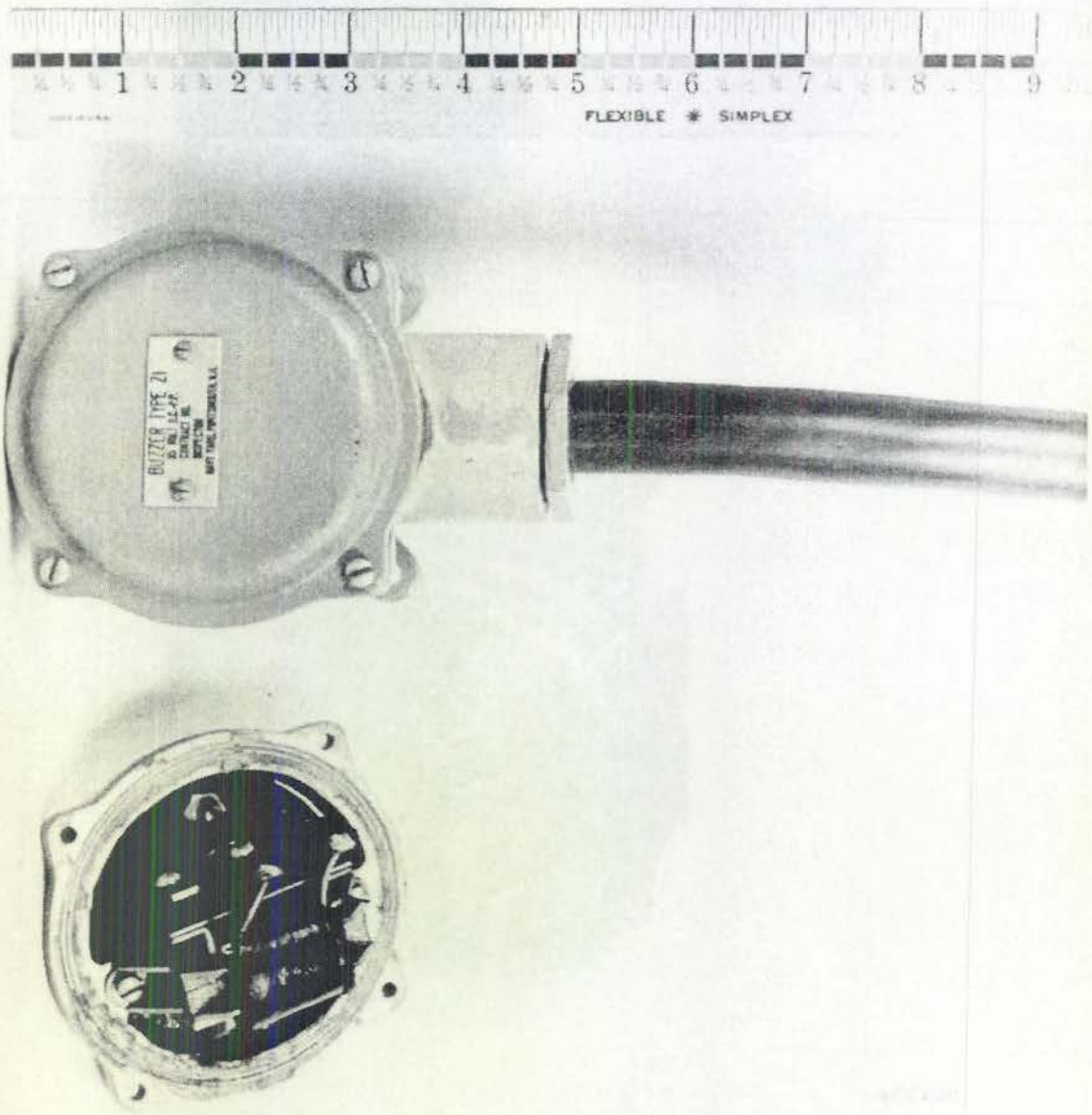

Plate 2

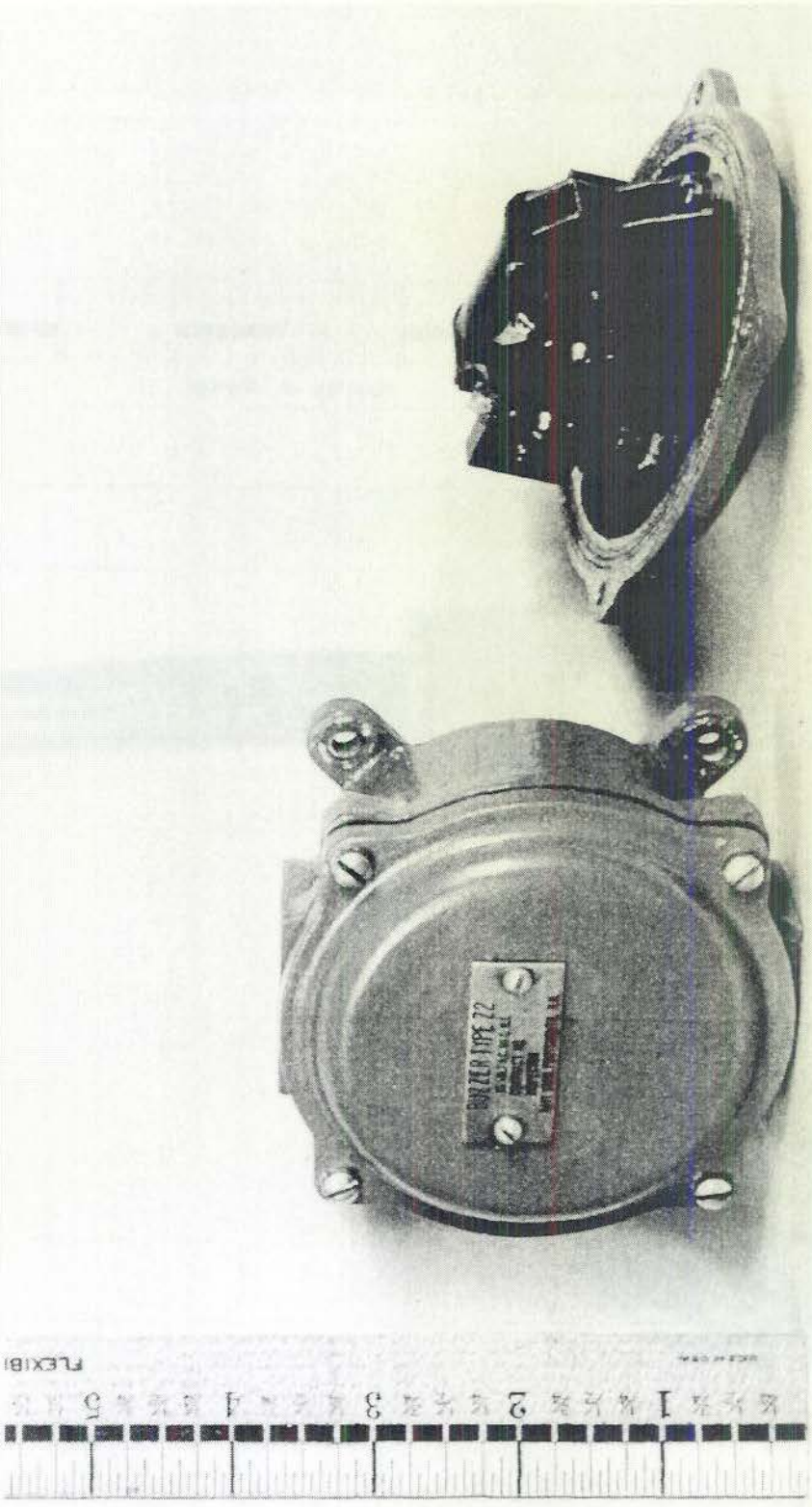

Plate 3

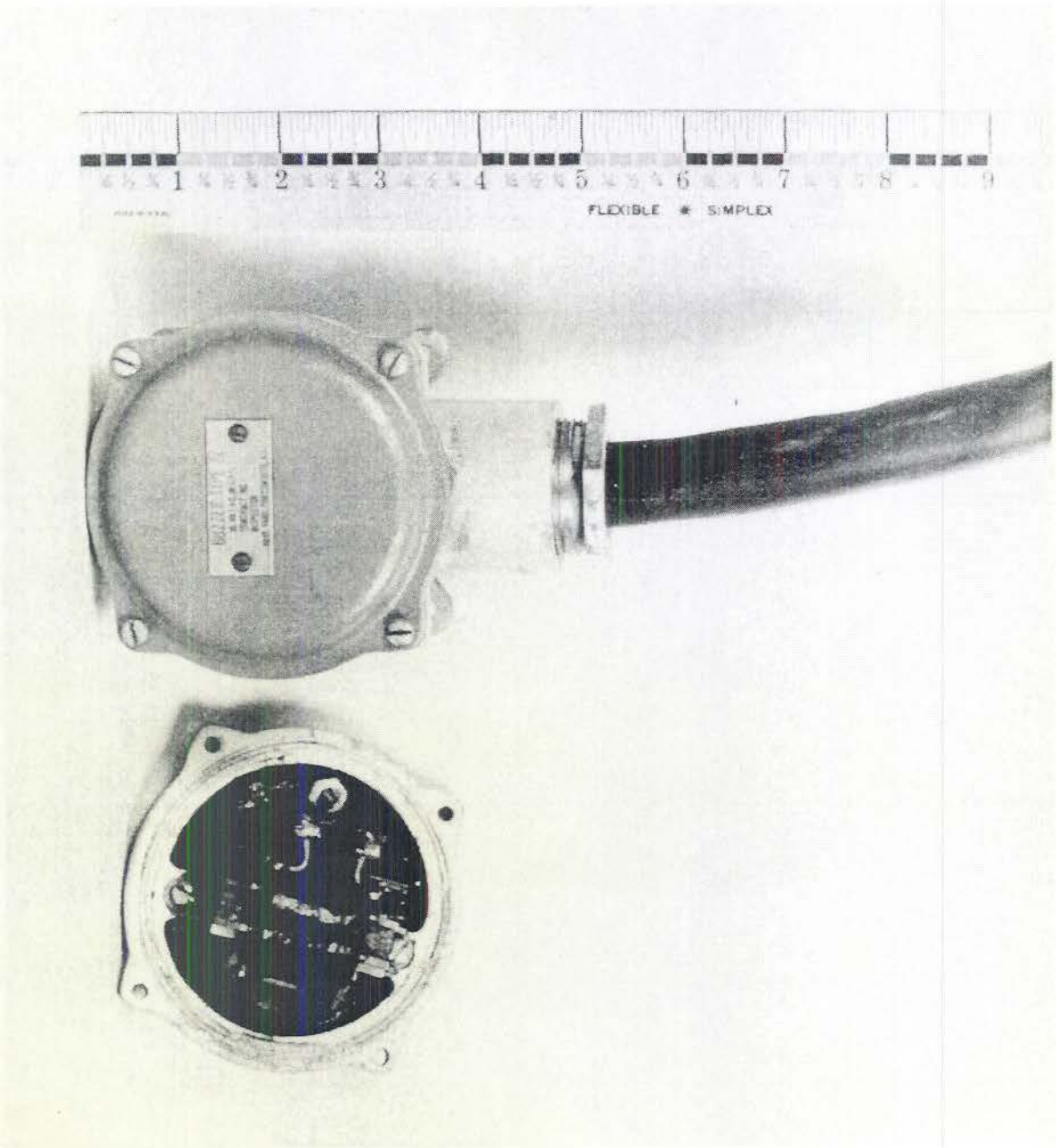

Plate 4