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DUST FUSE FOR GERMAN SD10 BOMB

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DUST FUZE FOR GERMAN SD 10 BOMB

Reported By

Lt.(jg) R. L. GALLEIN, USNR
Nav Tec Mis Eu

CIOS Target No. 3a/174

BOMBS AND FUZES

July 1945

COMBINED INTELLIGENCE OBJECTIVES SUB-COMMITTEE
G-2 Division, SHAEF (Rear) APO 413

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Personnel of Team

Lt.(jg) R. L. GALLEIN, USNR
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DUST FUZE FOR GERMAN SD 10 BOMB

1. Introduction.

(a) The principle of charging a condensor electrostatically by means of a dust field was developed several years ago by the electrical fuze laboratory of Rheinmetall Borsig. It was decided early in 1943 to incorporate such a principle into fuzes for the projectiles and small bombs.

(b) The original tests on the feasibility of dust type arming fuzes for small bombs were carried out using the EI 224.02 37 mm projectile fuze especially adapted for the SD 4 anti personnel bomb. The test data resulting from the use of this equipment proved to be very inadequate.

(c) In order to further develop this principle for use in bombs, an impact nose fuze was developed for the SD 10 anti-personnel bomb which incorporated a larger static generator then which had previously been used.

2. Description.

This fuze was so designed that the static generator necessary for creating the required electrical charge could be installed in the base of the old A.Z.C. 10 mechanical impact fuze. For the sake of simplicity this fuze can be divided into two main parts: A - the upper half which consists of the static generator and one impact switch, and B - the lower half which consists the body of the fuze. A plexiglas (4) insulating ring separates the static generator from the main body of the fuze. See figures 1 and 2.

The constituent components for each part are as follows: (See Fig. 2 & 3)

A. Upper part (static generator)

1. Central shaft
1a. Nose impact switch
2. Outer generator cone
3. Inner generator cone
4. Plexiglas insulating ring

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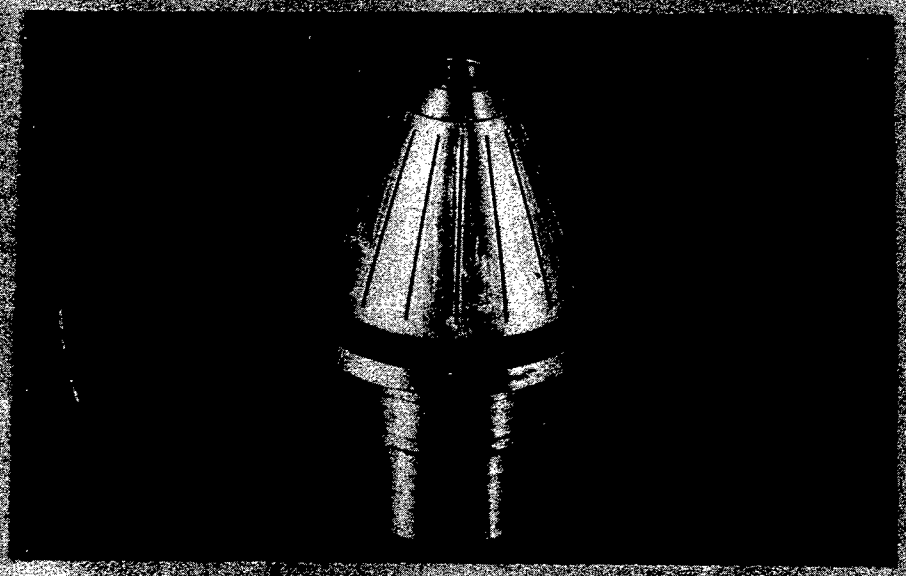


Figure 1
Dust Arming Impact Fuze for SD-10 Anti Personnel Bomb

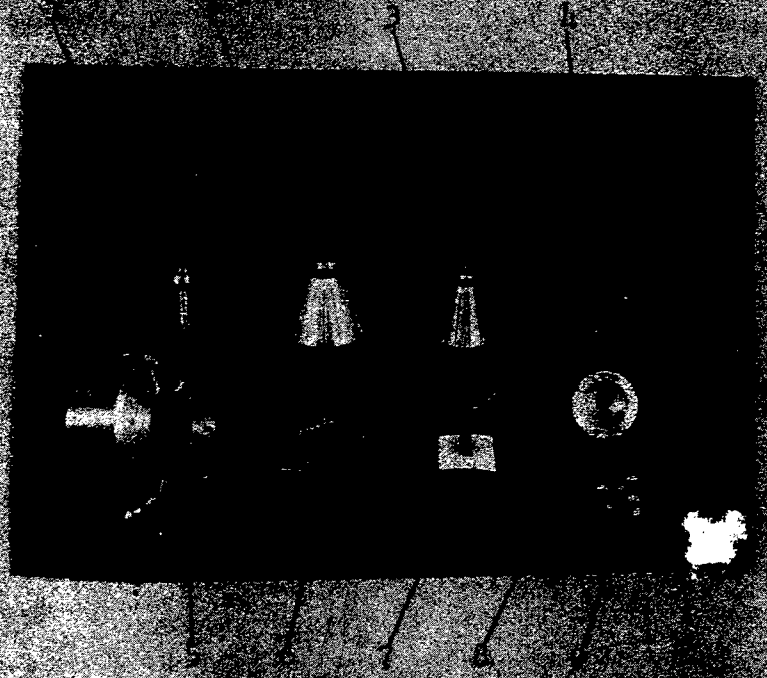


Figure 2

2. Description (cont'd).

B. Lower half (fuze body)

5. Fuze body
6. Plastic circuit housing
6a. Tumbler switches
6b. Condensor
7. Squib
8. Tracer cup
9. Tracer cup cover

The overall dimensions of the fuze are as follows:

Height..... 4 "
Diameter..... 2.7"

The overall height does not include the gaine or booster which normally threads into the base of the fuze.

(a) Static Generator.

The static generator is made up of four parts:

(1) Central shaft including one impact switch and insulated tube.

(2) The outer generating cone.

(3) Inner generating cone.

(4) And the plexiglas insulating ring.

See Figure 2.

The central shaft (1) performs two functions. Its primary function is to hold the static generator together (See Figure 3). This is accomplished by threading the lower end of the shaft into the plastic housing within the fuze body itself. By this means the two generating cones are forced down on the insulating ring (4) and held fast. The secondary function of the shaft is to house one impact switch of the firing circuit and the insulated tube for the electric lead to the switch.

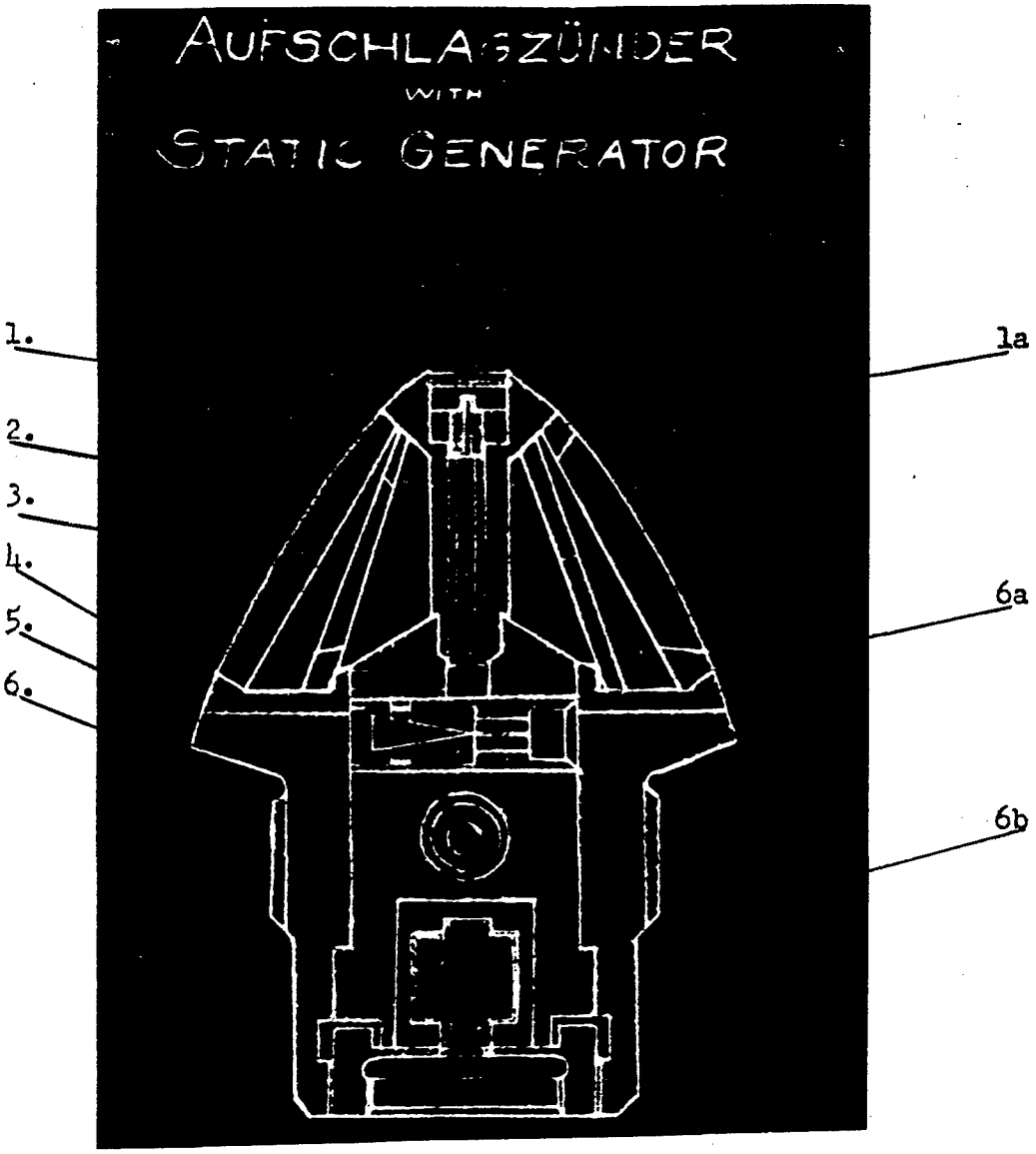


Figure 3.

2. Description (a)(cont'd).

The outer generator cone dimensions are as follows:

Overall height	1 1/2 inches
Outside diameter at base	2 9/16 inches
Outside diameter at top	1 5/16 "
Overall thickness of cone wall	7/32 "
Number of slits	17 or 19
Length of slits	1 1/2" approx.
Width of slits	1/32"

The inner generator cone dimentions are as follows:

Overall height	1 3/8"
Outside dia. at base	1 11/16"
Outside dia. at top	3/4
Overall thickness of cone wall	3/32"
Number of slits	13 to 15
Length of slits	11/16" approx.
Width of slits	1/32"

The insulating dimentions are as follows:

Outside diameter	2 23/32"
Inside diameter	1 3/16"
General thickness	3/32"
Built up thickness at outside perimeter	7/32"

(b) Firing Circuit.

The firing circuit is set up along the lines of all standard fuze firing circuits. The generator is connected to the condensor by a wire lead which runs up through the plastic housing (6) (see Figures 2 and 3), across the upper side of the plexiglas insulating ring and makes contact with the outer generating cone. The other lead from the condensor is grounded to the lower fuze body. A lead from the nose switch is connected in series with the two spring type trembler switches and the squib and then grounded. See wiring diagram, Figure 4.

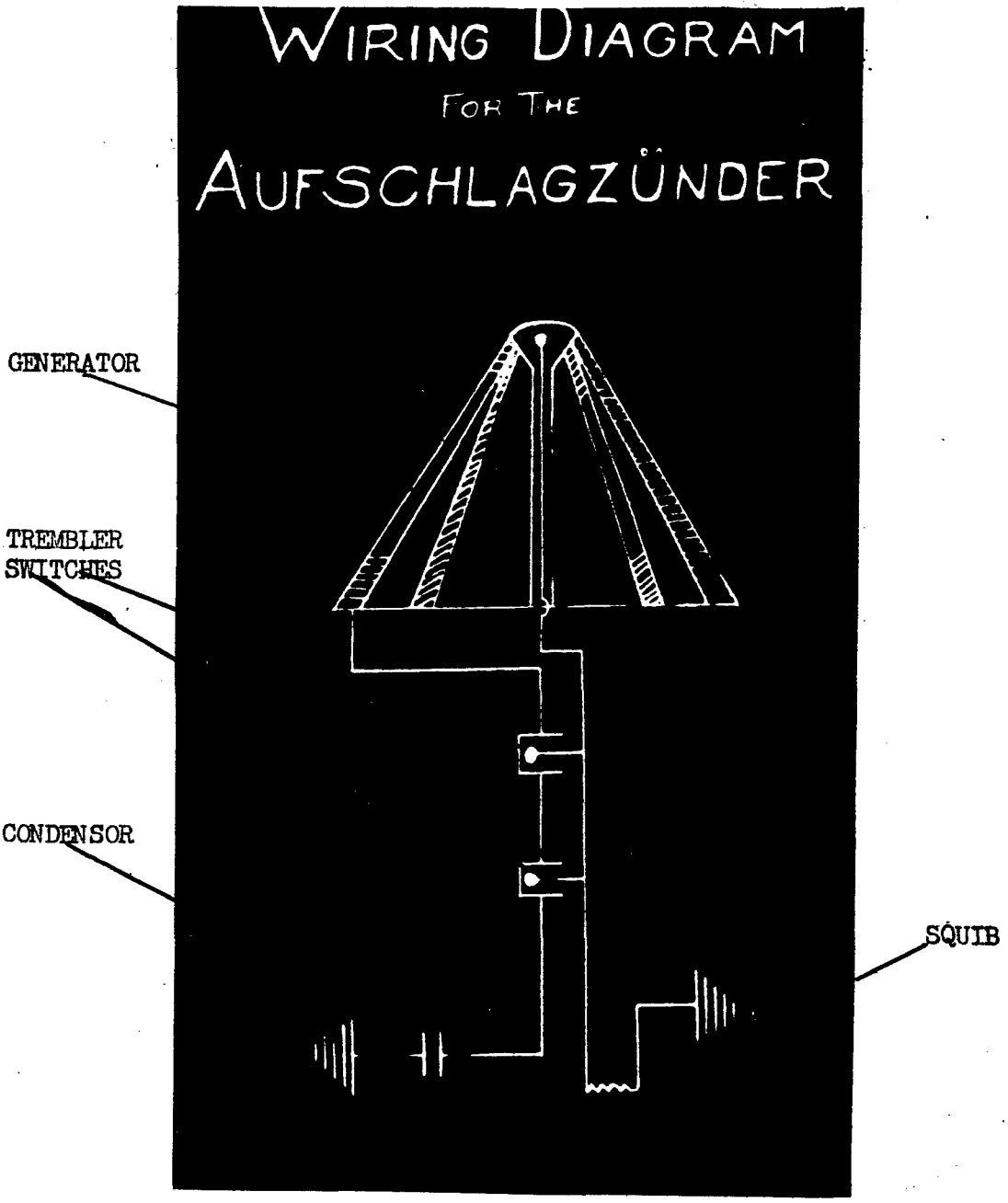

WIRING DIAGRAM
FOR THE
AUFSCHLAGZÜNDER
GENERATOR
TREMBLER SWITCHES
CONDENSOR
SQUIB

Figure 4

3. Principle of Operation.

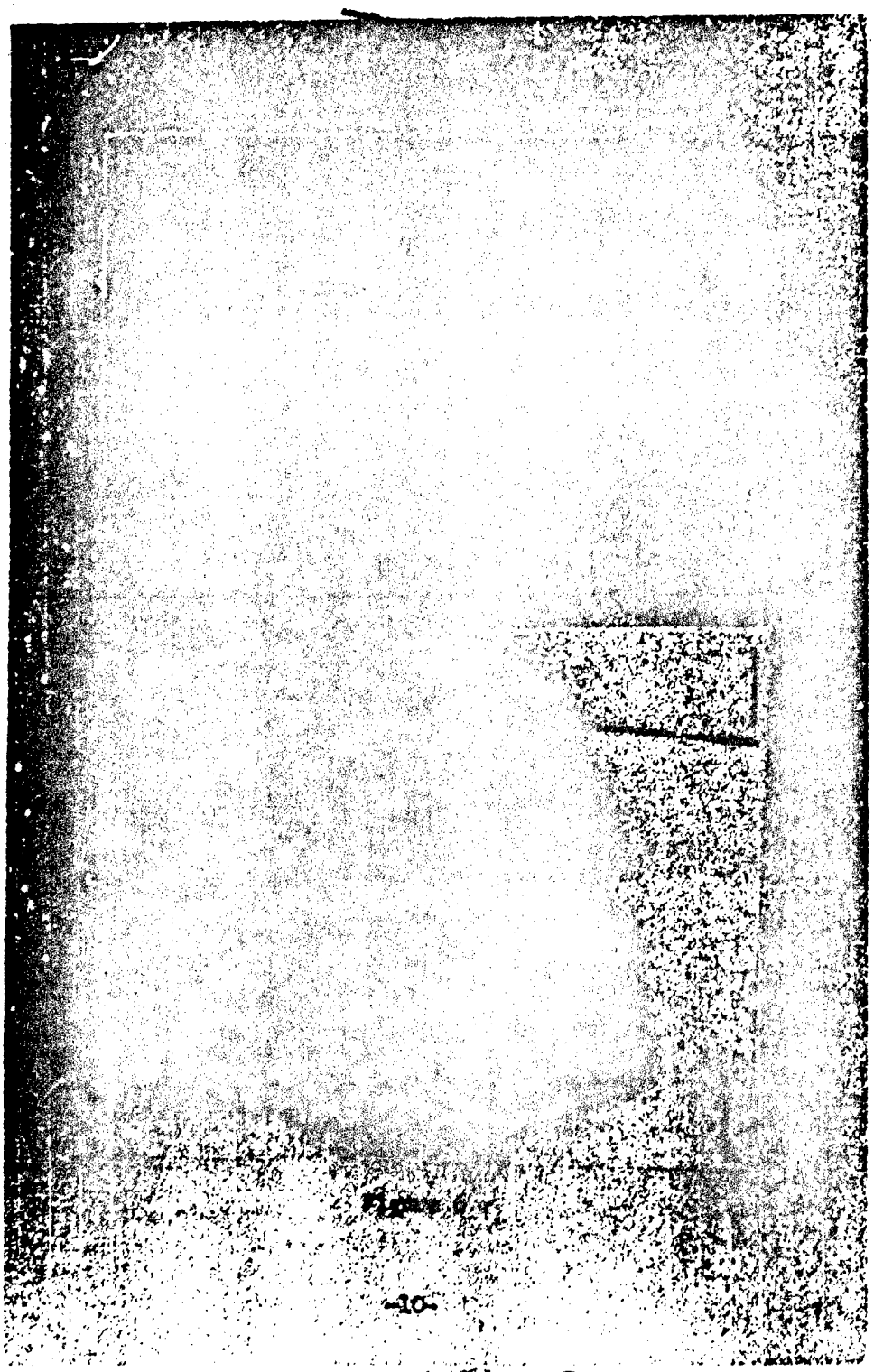
In the process of developing the dust fuze it was found that there were two methods of developing the required electrostatic field. (a) The first experiments were made with fine sand and the following results were obtained: The electrostatic field was built up due to the collision of the individual sand particles. The charge was at its greatest tension almost immediately and tapered off to zero as the last of the sand was blown out of the generator. The polarity of this charge was minus (-) in the generator and plus (+) on the fuze body. (b) The second series of experiments along this line were carried out using talcum powder. Here the tension was built up due to the friction of separation and tearing apart of the talcum particles. The charge was built up slowly and seemed to be greatest when the last of the talcum was blown out of the generator. The polarity of the charge developed by this method was opposite to the charge developed through the use of the sand. The polarity was plus in the generator and minus in the fuze body. Several other powders were tested such as zinc sulfide and barium sulfide but nothing definite had been found to date on their properties for this type of work.

4. Field tests:

The field tests on this fuze were carried out with inert SD 10 anti-personnel bombs. To accurately determine how many fuzes functioned properly the squib was placed in a tracer pot which was secured to the tail fin of the bomb. (See figure 5 and 6) The leads from the squib were then run through the explosive cavity and connected to the firing circuit. If the fuze functions properly the squib ignited the tracer element and the resultant flash could be clearly seen from observation points.

5. Problems.

(a) The field tests to date have not been too satisfactory. The most important problem existed around the bomb's unstabilized portion of flight immediately after release. The cross currents developed due to this unstabilized flight tend to force a certain amount of the dust out of the generator in such a manner that no electrostatic field is set up. The amount of powder left in the generator after a stabilized trajectory was obtained was not enough to generate the required amount of tension to charge the condensor properly.



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5. Problems (cont'd).

(b) Other problems such as effect of weather on the operation of the fuze, storage of fuzes over long periods of time, the type of dust to use, the size of the dust particles, and the size and shape for the generating cone slits are yet to be satisfactorly answered.

(c) Work was going ahead on this type of fuze for small bomb work up until the end of the war in Europe. Even though work had continued up until the last minute, Herr Ruhlemann, director of the electrical fuze laboratory of Rheinmetall Borsig, made the statement that he did not believe dust charging fuzes were practicable for bombs of any sort.

6. Shipments.

Two samples of this fuze and 2 SD 10 bombs (inert) with the tracer cup test set up included were shipped to the Ordnance Investigation Laboratory, Indianhead, Maryland under Consignment Tag number 5921.

Prepared by:

R.L. GALLEIN,
Lt.(jg), USNR.

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