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SUMMARY OF GERMAN (RHEINMETALL) ELECTRIC FUZES

With additions and amendments to August, 1942.

RESEARCH DEPARTMENT,  
WOOLWICH, S.E.18

Directorate of Explosives Research

MS (O.B./1) S1201-2260

GLOSSARY

	Abschlusskappe	transit cap
Bl C	Blitzlichtcylindrische (Bombe)	flashlight cylindrical (bomb)
	Dichtungsring	washer
El.A.Z.	Elektrischer Aufschlagz�nder	electric impact fuze
El.Zt.Z.	Elektrischer Zeitz�nder	electric time fuze
El.Z.	Elektrischer Z�nder	electric fuze
KC	Kampfstoffcylindrische (Bombe)	chemical cylindrical (bomb)
	Kappe	cap (e.g. transit cap)
	Kopfring	nose ring
L.Zt.	Langzeit	long time (delay)
m.V.	mit Verz�gerung	with delay
NC	Nebelcylindrische (Bombe)	smoke cylindrical
o.V.	ohne Verz�gerung	without delay
S Be	Splitter Beton (Bombe)	fragmentation concrete (bomb)
SC	Sprengcylindrische (Bombe)	H.E. cylindrical (bomb)
SD	Sprengdickwandige (Bombe)	H.E. thick-walled (bomb)
Sp	Splitter (Bombe)	fragmentation (anti-personnel bomb)
	vor Beladen entfernen	to be removed before loading
	Verzugszeit	safety time (see page 1 para. 5)
V.Z.	Verzugsz�ndung	safety fuzing
Z.	Z�nder	fuze
ZC	Zementcylindrische (Bombe)	cement cylindrical (bomb)
Zt.	Zeit	time
	Z�nderzwischenst�ck	fuze extension cap
Zus.	Zusatz	addition

	<u>Fuze</u>	
✓	El. A. Z. C 50	(5)
✓	El. Zt. Z. C 50	(9)
	El. Zt. Z. C 50	(9) *
	El. Zt. Z.	(9)
	El. A. Z. C 50	(15)
✓	El. A. Z.	(17)
✓	El. A. Z.	(17) A
	El. A. Z.	(17) B
	Unmarked	
	El. A. Z.	(25)
	El. A. Z.	(25) A
✓	El. A. Z.	(25) A *
✓	El. A. Z.	(25) B
	El. A. Z.	(26)
	El. A. Z. K.C. 250	(26)
✓	El. A. Z. C 50	(*) (28)
✓	El. A. Z.	(28) A

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14	✓ Zus. 40	27

## I. GENERAL PRINCIPLES OF OPERATION

These fuzes depend for their operation on a circuit consisting of an electrically-charged "reservoir" condenser, connected with one or more "firing" condensers through high resistances. After the release of the bomb from the aircraft, charge from the reservoir condenser is transferred slowly to the firing condenser. This condenser in turn is connected, through a suitable switch, to the bridge-wire in an igniter. The closing of the circuit by this switch causes the discharge current to flow and this fires the igniter.

The reservoir condenser is charged, while the bomb is leaving the aircraft, through one of the two plungers in the charging-head of the fuze. These are marked A and B in the drawings, A being the plunger adjacent to, and B the one remote from, the locating pin of the fuze. In some instances, one of these plungers is idle.

The fuzes usually contain two reservoir condensers, one of which may feed up to three firing condensers.

The time required to charge the firing condenser to the voltage necessary to fire the igniter is called the ARMING TIME. Its duration depends on the resistance and capacity values in the fuze and the voltage applied on release from the aircraft. It varies in general from 2 to 16 seconds and provides a period of safety for the aircraft after the bomb has been released.

The SAFETY TIMES (Verzugszeit) quoted in enemy sources refer to the time of burning of the longest pyrotechnic delays (5 seconds or more) which operate in certain fuzes when bombing from low altitudes. These times permit the aircraft to reach a safe distance before the bomb detonates.

If a bomb is released from such a low altitude that it reaches the ground before the firing condenser has become sufficiently charged, the partial charge is passed through the igniter bridge by means of the switch, which operates on impact; if this switch reopens and finally remains open, the firing condenser will receive from the reservoir condenser a further charge which may be sufficient to enable it to fire the igniter bridge, should the switch subsequently be closed by movement or vibration of the bomb. The condensers of the fuze should therefore be discharged before any attempt is made to move the bomb.

If artificial discharge is not employed, a charge may remain on the condensers for several weeks.

## II. SWITCHES. (See Fig. I)

Switches of the following types may be used in the firing circuits; in some instances two types of switch are included in the same fuze.

### A. Impact Switches

#### (1) Vibrator Type

This type has a metal part flexibly supported within a surrounding metal ring. On impact, the flexible support allows the central part to vibrate and touch the ring. This completes the firing circuit.

In Fuzes 50 and (50), completion of the firing circuit on impact even from high altitudes does not fire the igniter bridge, because at this stage the firing condensers are insufficiently charged. The requisite charge is not attained until 1 to 8 minutes after impact of the bomb. Subsequent to completion of charging, a very slight vibration or movement of the bomb containing such a fuze will again close the firing circuit and detonate the bomb.

The sensitive character of the switches in Fuzes 50 and (50) is evident from the fact that the displacement necessary to make contact is less than 3 hundredths of an inch when the vibrator is in its central position; this distance may be much reduced if the vibrator becomes permanently misplaced by impact or distortion.

In most instances, the constant acceleration of the vibrator which would cause it to make contact is about 50 times gravity. In Fuzes 50 and 50, however, this value may be as little as  $\frac{1}{2}$  gravity. This extreme sensitivity, coupled with the possibility of permanent misplacement, means that the switch will operate and cause detonation on the slightest movement or vibration of the bomb.

WARNING

A BOMB CONTAINING FUZE 50 or (50) WILL ALSO DETONATE IF ONE OF THE PLUNGERS IS DEPRESSED. THE TWO-PIN DISCHARGER MUST THEREFORE NOT BE APPLIED TO EITHER OF THESE FUZES.

(2) Inertia-bolt type

Fuzes (28) B contain, in addition to the vibratory type, a relatively insensitive non-vibratory type of switch, in which an inertia-bolt contact has to force its way through restricting jaws on to another contact. This switch is designed to detonate the bomb "instantaneously" should the impact be so violent that there is risk of break-up of the bomb before the operation of the short-delay circuit.

(3) Pressure-pulse type

Fuze (26) contains, in addition to a vibratory switch, a diaphragm switch, apparently operated by the pressure-pulse sent up a tube from the nose of the bomb on impact with a target which does not offer sufficient resistance to operate the impact switch.

(4) Glow-tube switch

Fuzes (9) contain a glow-discharge tube, similar in principle to those employed in neon signs. This functions as a switch since the resistance falls suddenly from a very high to a very low value when the voltage on the tube has exceeded a critical value ("striking voltage").

III. ADDITIONAL NOTES

(1) The cases of these fuzes are generally made of aluminium alloy. Fuzes (5) and \* 28 have been found with brass cases; Fuze (55) has a case of thin mild steel. The metal parts of impact switches are usually brass or phosphor-bronze; in Fuzes 50 and (50), the spring of the vibrator is steel.

(2) To enable the fuze to engage the charging apparatus when it is used with armour-piercing (SD) bombs, which are not parallel-sided, an "extension cap" is fitted. The plungers of the caps form a continuation of those of the fuze. The known types are illustrated in Fig. III.

(3) Fuzes (28) A, (28) B<sup>2</sup>, (28) B<sup>6</sup>, (28) B<sup>07</sup> and (35), and their extension caps have a yellow ring painted round the charging-head. This indicates that they must not be used in low-level attack because of the risk of detonation of the bomb before the aircraft is out of the danger zone.

(4) Fuzes are protected by a "transit cap" until immediately before the bomb is suspended in the bomb-rack. A transit cap recovered from a Fuze (50) is shown in Fig. II. The inscription on it means "Cap and washer; to be removed before loading".

(5) Fuzes 59 A, (59) A and (79) have no condenser circuits. The igniters are fired electrically at the instant of release of the munition.

ARMING TIMES AND DELAYS  
(From German Document)

FUZE	RELEASE FROM	FUZE ACTION	ARMING		ZSK SETTING	REMARKS
			TIME	HEIGHT		
(9)	1000	Time Fuze	According to setting of the ZZG		1/24	(Flares)
(15)	Level Flight 150 Volts	Long delay = 8.0 sec Short " = 0.05 " Inst.	1.5-3.0 sec 8.5-13.0 " 7.5-11.8 "	10-44 m 350-810 " 280-670 "	mV or oV mV oV	
	Diving Flight 240 Volts	Long delay = 8.0 sec Short " = 0.05 " Inst.	0.9-1.6 sec 5.7-8.7 " 3.7-5.6 "	*)	mV or oV mV oV	Unsuitable for 50° dive and release from 1000m from Ju.88.
(17)	Only above 300	Time Fuze	1.5-72 hours ± 10%		As desired	Only with Fuze 40 and Fuze 50.
(25) Position I	Level Flight 150 Volts	Long delay = 14.0 sec Short " = 0.08 " Inst.	0.8-1.3 sec 10.0-15.3 " 10.0-15.5 "	3-8 m 480-1120 " 480-1150 "	mV or oV mV oV	
	Diving Flight 240 Volts	Long delay = 14.0 sec Short " = 0.08 " Inst.	0.4-0.8 sec 6.8-10.2 " 5.5-8.5 "	*)	mV or oV mV oV	Unsuitable for 50° dive and release from 1000m from Ju.88.
(25) Position II	Level Flight 150 Volts	Long delay = - Short " = - Inst.	0.8-1.3 sec - 10.0-15.5 "	3-8 m - 480-1150 "	mV or oV - oV	
	Diving Flight 240 Volts	Long delay = 14.0 sec Short " = - Inst.	0.4-0.8 sec - 5.5-8.5 "	*)	mV or oV - oV	Unsuitable for 50° dive and release from 1000m from Ju.88.
(28)	Level Flight 150 Volts	Long delay = - Short " = 0.15 sec Inst.	- 1.5-3.3 sec 3.6-5.1 "	- 11-54 m 64-130 "	- mV oV	Not suitable for low- level attacks, as no long delay.
	Diving Flight 240 Volts	Long delay = - Short " = 0.15 sec Inst.	- 0.9-1.6 sec 2.0-2.9	*)	- mV oV	

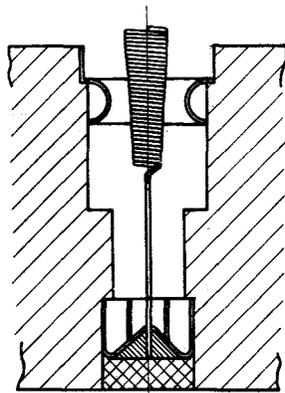
\*) In diving flight the arming height is dependent on the angle of dive and the speed  
(See L.Dv.20/3).

Translated and Traced 28/7/41 A.I.1(g) F.6.

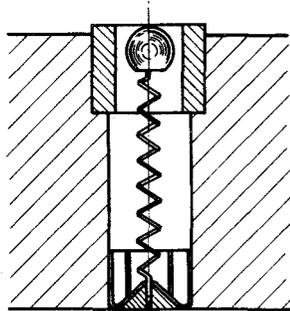
ARMING TIMES AND DELAYS  
(From German Document)

FUZE	RELEASE FROM	FUZE ACTION	ARMING		ZSK SETTING	REMARKS
			TIME	HEIGHT		
28 A	Level Flight 150 Volts	Long delay = 14.0 sec Short " = 0.15 " Inst.	0.7-1.3 sec 2.1-3.3 " 1.6-2.8 "	2.5-8 m 22-54 " 13-39 "	mV or oV mV oV	In spite of long delay not suitable for low-level release, because of danger to aircraft.
	Diving Flight 240 Volts	Long delay = 14.0 sec Short " = 0.15 " Inst.	0.3-0.7 sec 1.4-2.2 " 1.0-1.5 "	*)	mV or oV mV oV	
28 B	Level Flight 150 Volts	Long delay = - Short " = 0.06-0.08 Inst. = 0.01 sec. acts automatically as a fuze depending on the nature of the target at a deceleration of 5000 g	- 1.8-3.2 sec	- 16-50 m	- mV	Not suitable for low-level release, as no long delay.
	Diving Flight 240 Volts	Long delay = - Short " = 0.06-0.08 Inst. = 0.01 sec. acts automatically as a fuze depending on the nature of the target at a deceleration of 5000 g	- 1.4-2.2 sec	*)	mV	
35	Level Flight 150 Volts	Long delay = - Short " = 0.06-0.08 Inst. = -	- 2.1-3.0 sec 1.6-2.0 "	- 22-44 m 13-20 "	- mV oV	Not suitable for low-level release, as no long delay.
	Diving Flight 240 Volts	Long delay = - Short " = 0.06-0.08 Inst. = -	- 1.4-2.2 sec 1.0-1.5 "	*)	- mV oV	
38	Level Flight 150 Volts	Long delay = 5.0 sec Short 1 = 0.2 " " 2 = 0.05 "	1.2-2.0 sec 6.2-9.8 " 7.3-13.8 "	7-20 m 190-475 " 265-920 "	mV or oV mV oV	
	Diving Flight 240 Volts	Long delay = 5.0 sec Short " 1 = 0.2 " " " 2 = 0.05 "	0.6-1.0 sec 4.1-6.1 " 3.8-6.0 "	*)	mV or oV mV oV	
50	Only with Fuze 17 Vibration Fuze					
55	Level Flight 150 Volts	Long delay = 14.0 sec Short " = - Inst.	0.7-1.6 sec 3.0-7.0 "	2.5-12 m 44-190 "	mV or oV - oV	Concrete Bombs.
	Diving Flight 240 Volts	Long delay = 14.0 sec Short " = - Inst.	0.4-0.9 sec 1.7-3.6 "	*)	mV or oV - oV	

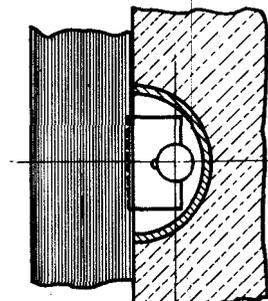
\*) In diving flight the arming height is dependent on the angle of dive and the speed  
(See L.Dv. 20/3).



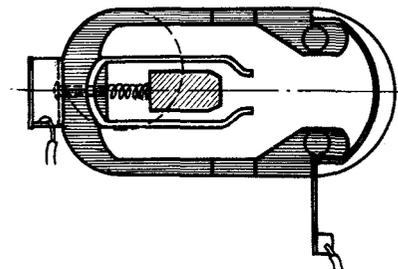
VIBRATORY, AS FOUND IN MOST FUZES.



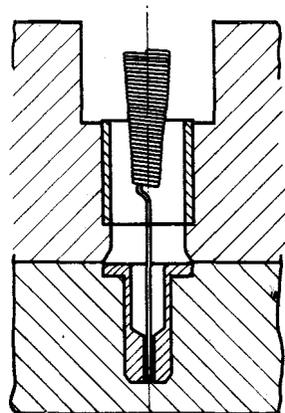
VIBRATORY FROM FUZE 50.



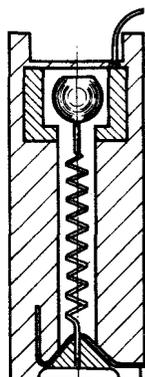
SECTION "XX."



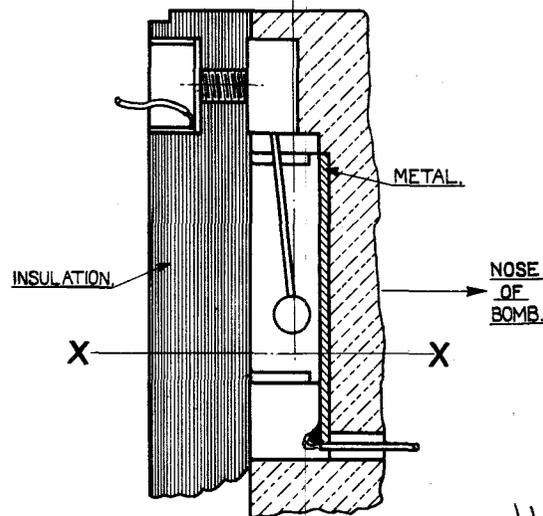
INERTIA BOLT SWITCH, FUZES (28) B SERIES.



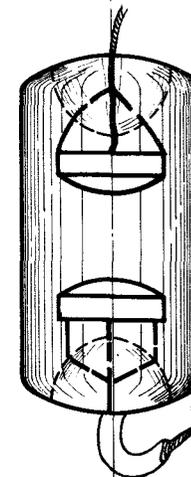
AXIAL VIBRATORY FROM FUZES (15) & EARLY (25)



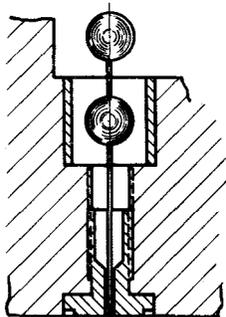
VIBRATORY FROM FUZE (50)



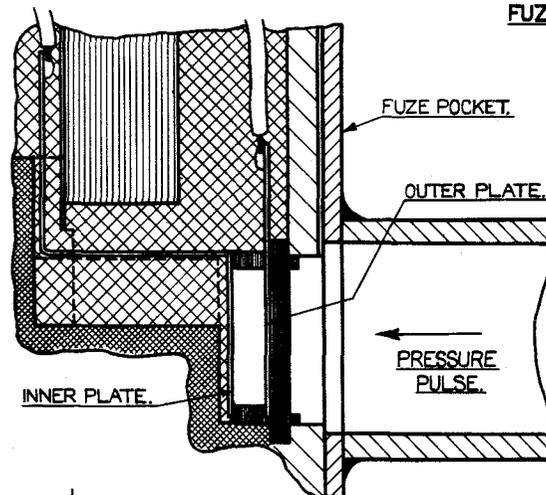
IMPACT SWITCH, FUZE (49) B III.



GLOW DISCHARGE TUBE, FUZE (9)



TRANSVERSE VIBRATORY FROM FUZES (5) AND EARLY (25)

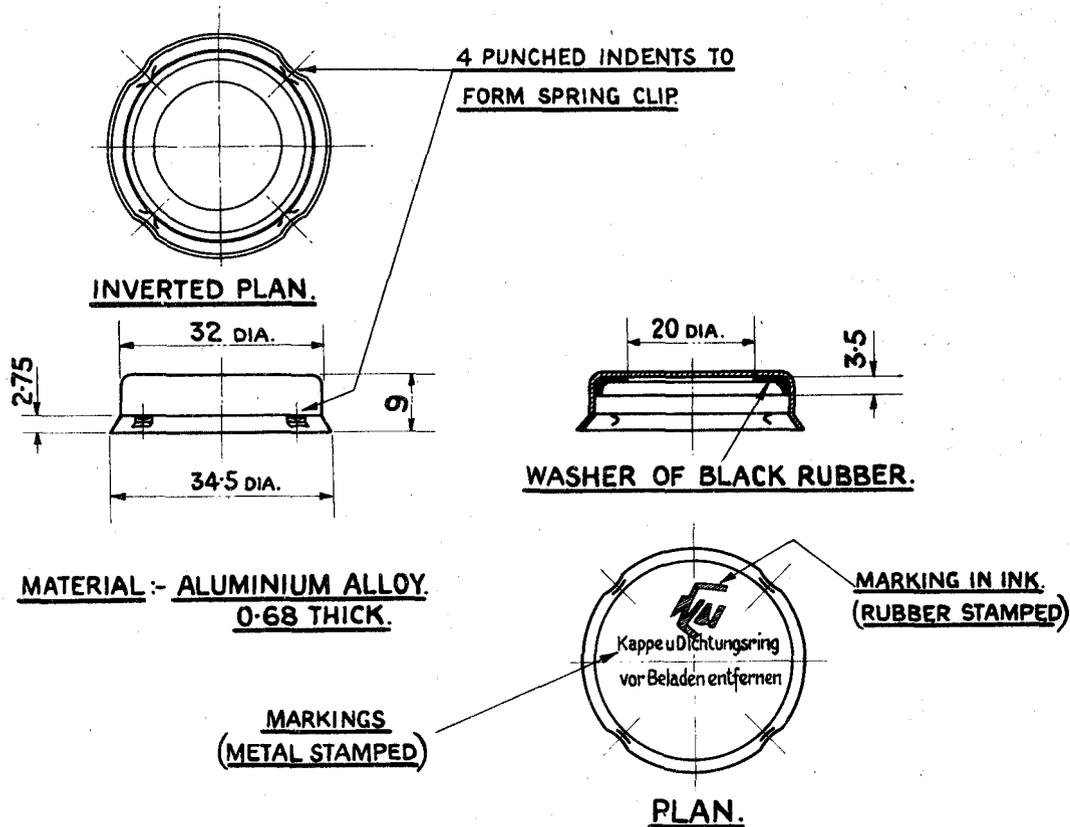


PRESSURE PULSE SWITCH, FUZE (26) (RECONSTRUCTION.)

GERMAN ELECTRIC FUZE SWITCHES.

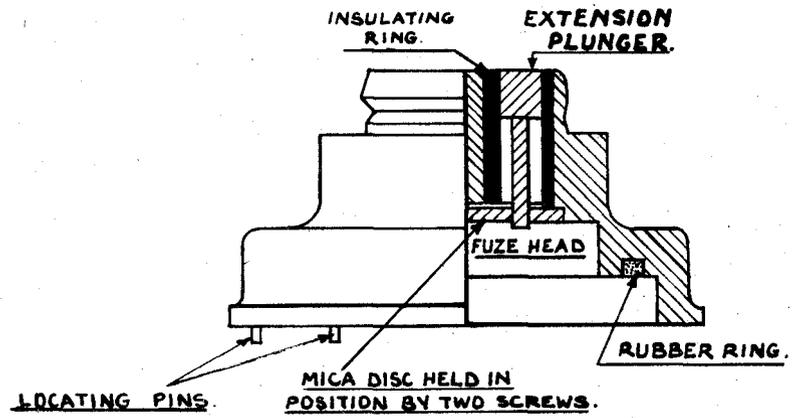
Fig. I



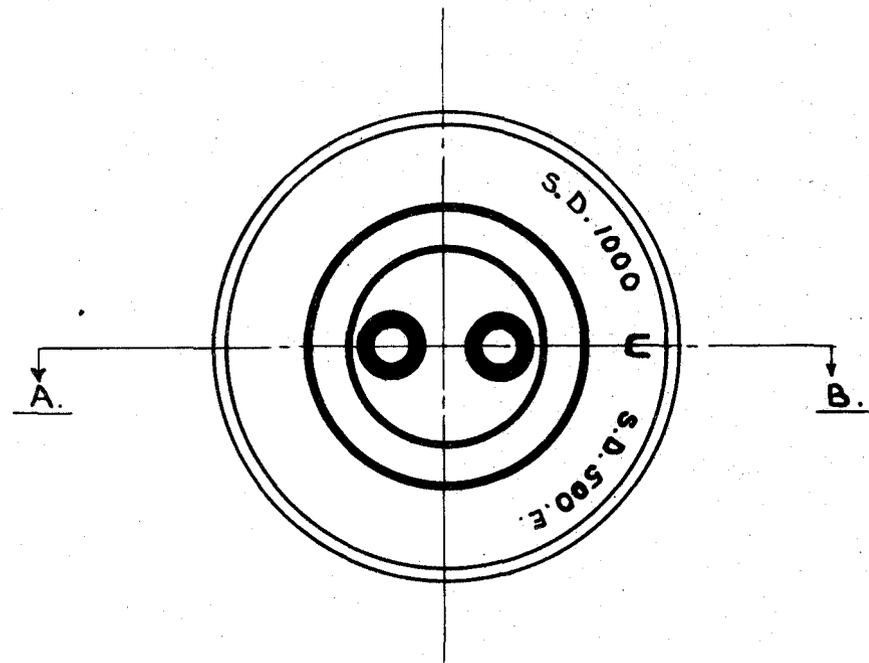


TYPICAL TRANSIT CAP FROM  
GERMAN ELECTRIC FUZES.

Fig. II

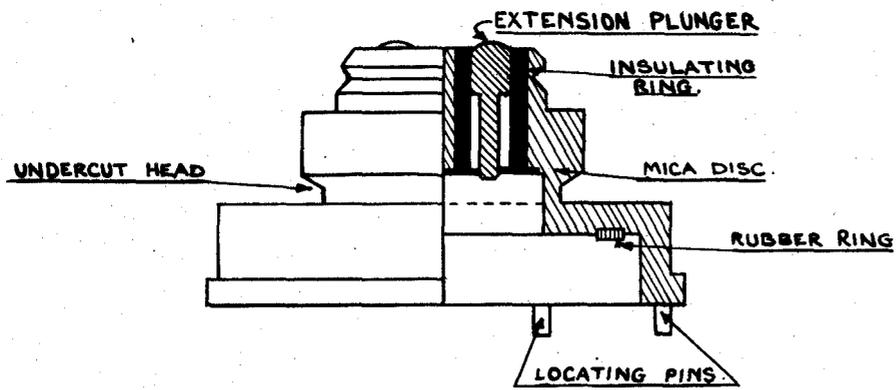


HALF SECTION A. B.

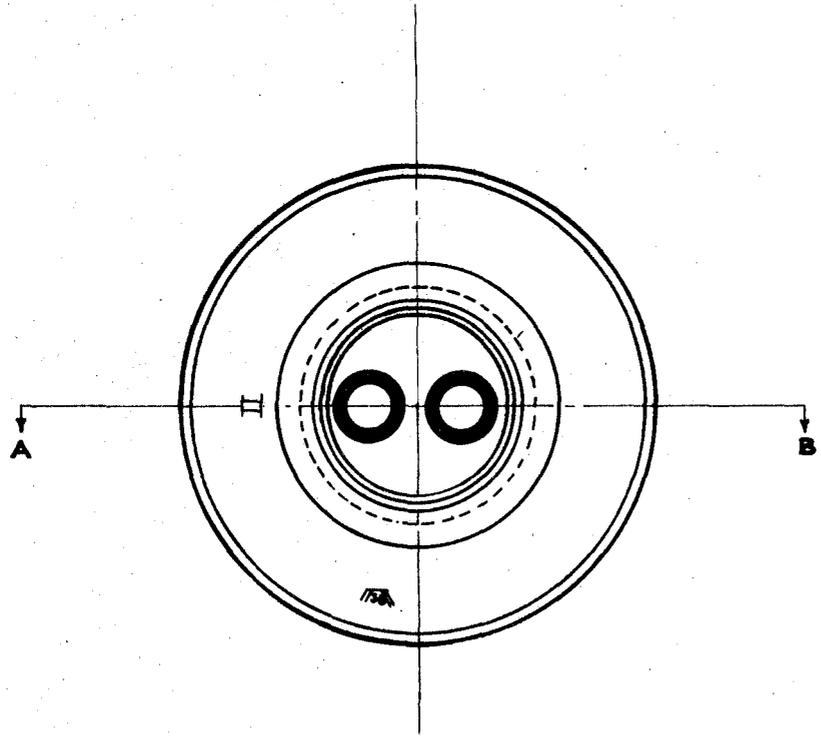


FUZE EXTENSION CAP. TYPE A

Fig. IIIa.

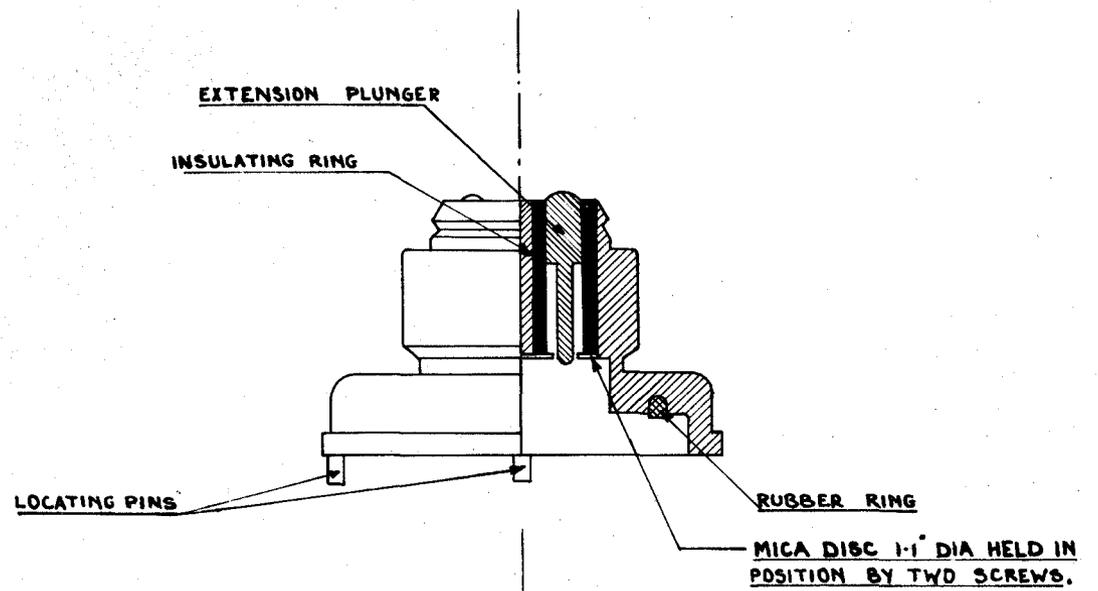


HALF SECTION A. B.

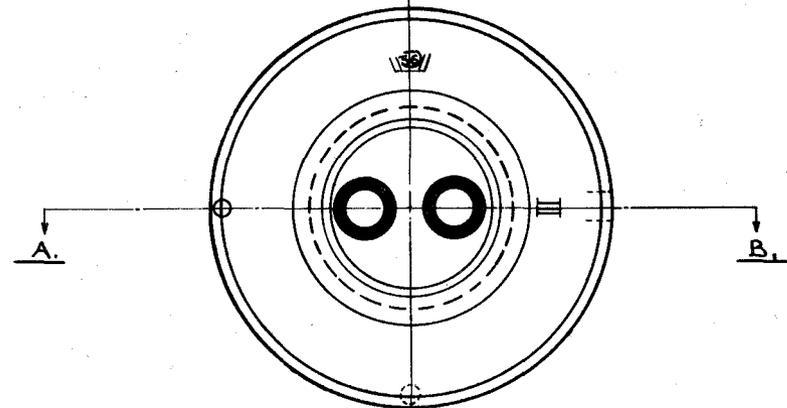


FUZE EXTENSION CAP. TYPE B.  
WITH UNDERCUT HEAD.

Fig. III b



HALF SECTION A. B.



PLAN.

FUZE EXTENSION CAP. TYPE C.  
WITH UNDERCUT HEAD.

Fig. III c.

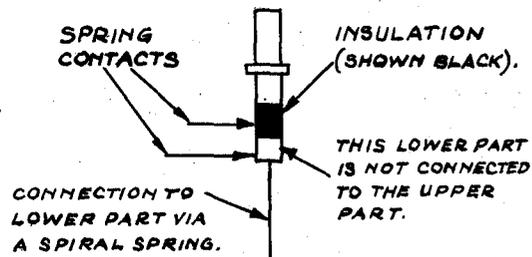
# KEY TO CIRCUIT DIAGRAMS.

## PLUNGERS.

SHOWN IN  
UNDEPRESSED  
POSITION.

MOVEMENT OF PLUNGERS  
BY DEPRESSION IS  
SUFFICIENT TO INTERCHANGE  
INSULATED AND CONTACT  
POSITIONS.

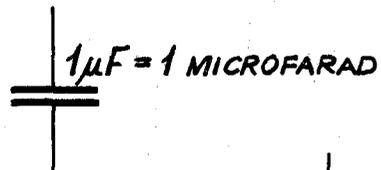
A = ADJACENT TO }  
B = REMOTE FROM } LOCATING PIN OF FUZE



RESISTANCE  $1 M\Omega = 1 \text{ MEGOHM} = 1,000,000 \text{ OHMS.}$



## CONDENSER

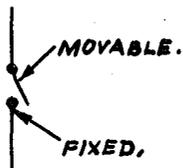


## IGNITER BRIDGE



## IMPACT SWITCH

VIBRATORY TYPE  
UNLESS OTHERWISE  
STATED



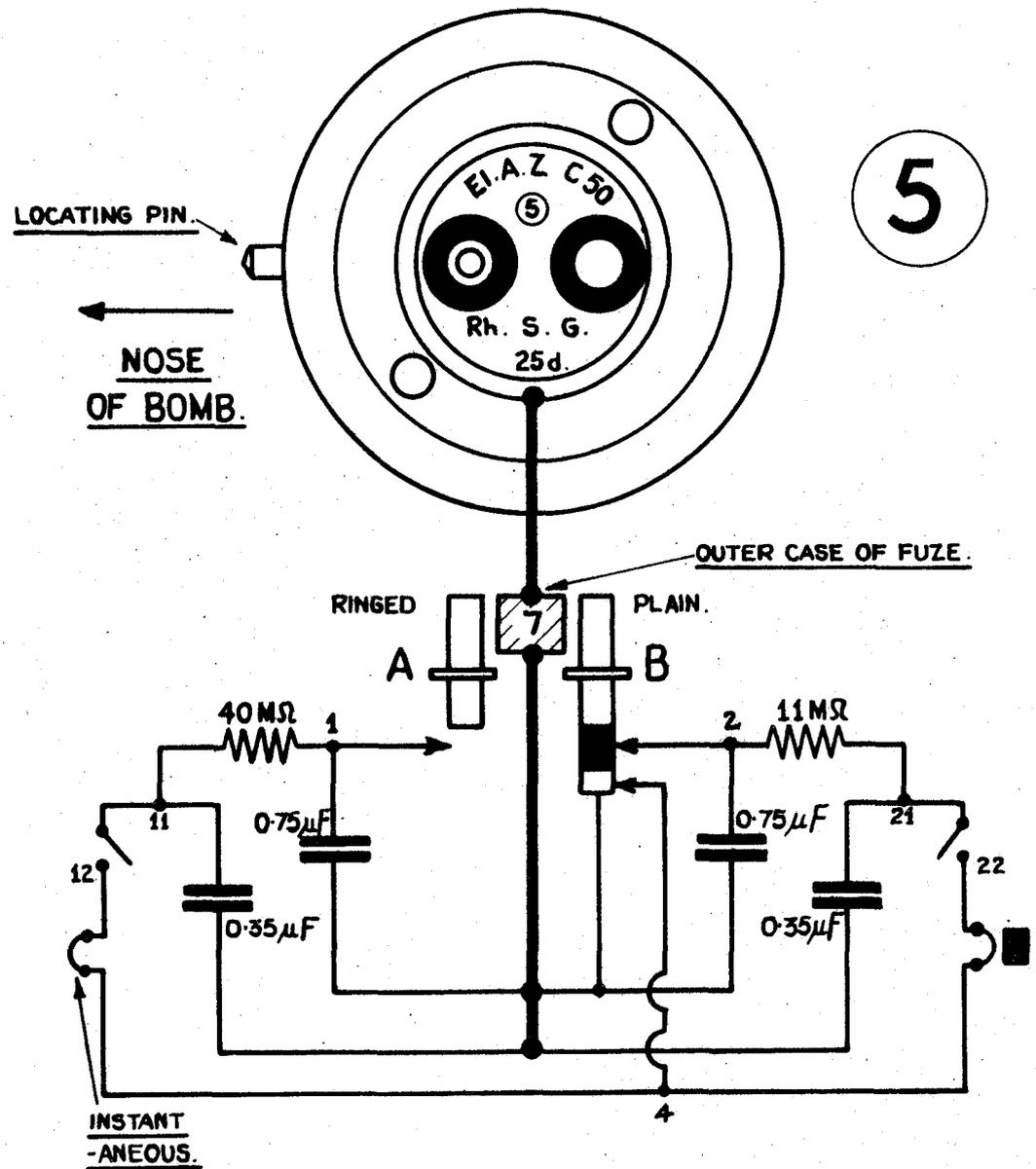
## PYROTECHNIC DELAYS

■ LESS THAN 1 SECOND ("SHORT")  
■ 1 SECOND OR MORE. ("LONG")

THE ELECTRICAL JUNCTION POINTS ARE NUMBERED CONSECUTIVELY  
IN EACH CIRCUIT e.g. 11, 12, ETC. TO FACILITATE REFERENCE, thus

12

THE NUMERICAL VALUES OF RESISTANCE, CAPACITY & DELAYS GIVEN  
IN THE DIAGRAMS SHOULD BE TAKEN AS APPROXIMATE.



ELECTRIC IMPACT FUZE

Marked:- El. A. Z. C 50 (5)

Additional markings such as:- Rh. S. G ..... 25d

Colour:- Aluminium, or brass with white ring surrounding charging-head.

Use:- H.E. bombs.

Electrical features:-

Two firing circuits, charged one from each plunger.

Safety switching: The plain plunger B, on depression, switches off the igniter bridges.

The circuit diagram is the same as for Fuze (\* 28).

Alternative actions:-

- (1) Instantaneous;
- (2) Short pyrotechnic delay (under 1 second).

Notes:-

The ringed plunger, connecting to the instantaneous circuit, is adjacent to the locating pin.

This Fuze is obsolete.

ELECTRIC TIME FUZE

Marked:- El. Zt. Z. C 50 (9)  
El. Zt. Z. C 50 (9) \*  
El. Zt. Z. (9)

Additional markings such as:- Rh. S. 1939 ..... 5a

Colour:- Red.

Use:- Parachute flares and photographic-flash bombs (BL C 50).

Electrical features:-

One firing circuit.

Safety switching: Each plunger disconnects one pole of the igniter bridge.

The reservoir condenser is charged through Plunger B as usual. Plunger A conveys an initial charge to the firing condenser, which determines the time elapsing before ignition.

The firing switch is a glow-tube, which passes current as soon as the voltage across it (which is the firing condenser voltage) rises above its "striking voltage".

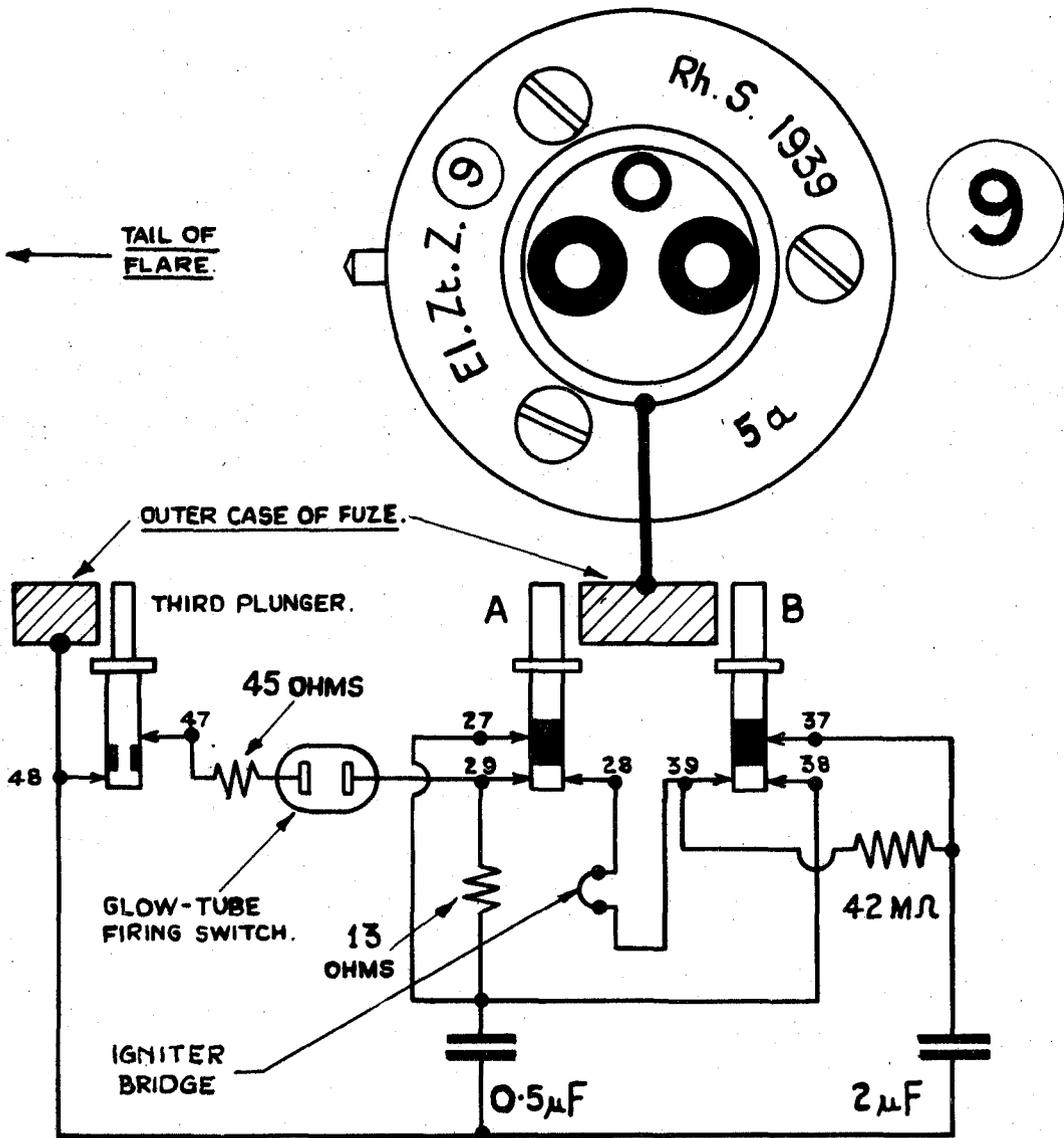
A third plunger, smaller and placed to the side of the others, is used for testing the glow-tube.

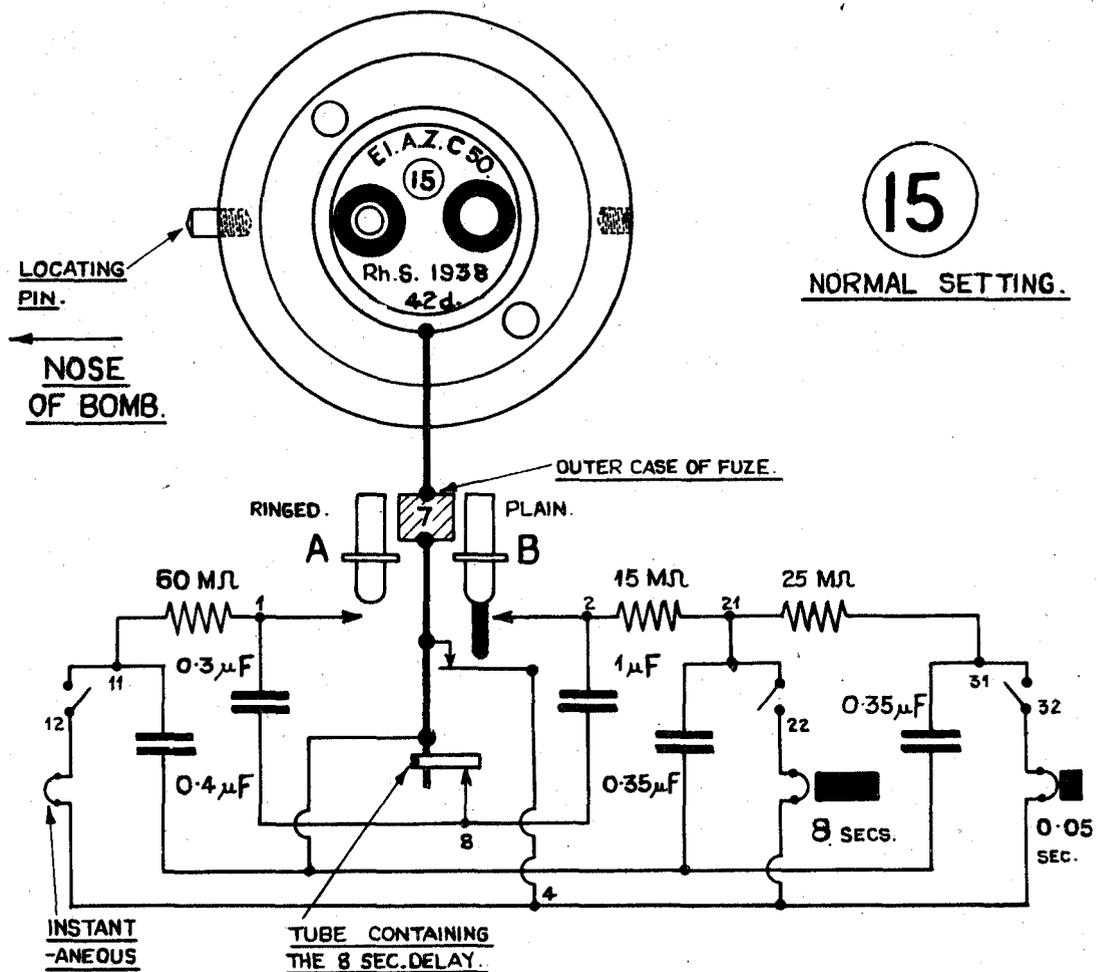
Time-setting

5 to 40 seconds, pre-selected on the aircraft by controlling the initial voltage applied to the firing condenser via Plunger A.

Note:-

The third plunger is sometimes replaced by a contact screw, which is removed for testing.





**15**

NORMAL SETTING.

ELECTRIC IMPACT FUZE

Marked:- El. A. Z. C 50 (15)

Additional markings such as:- Rh. S. 1938 ..... 42d

Colour:- Aluminium.

Use:- H.E. bombs.

Electrical features:-

Three firing circuits.

Safety switching: The plain plunger B, on depression, switches off the igniter bridges (via a separate switch).

Settings:-

In addition to the usual or "Normal" setting, this Fuze may be reversed in the fuze pocket, i.e. rotated through half a turn, the locating pin being removed and fixed in an alternative hole diametrically opposite. In the reversed setting, a stopping-off plug is inserted in the foot of the fuze to divert the flash of the instantaneous igniter to a 1-second delay pellet.

Alternative actions:-

NORMAL SETTING

- (1) Instantaneous;
- (2) Short pyrotechnic delay, 0.05 second;
- (3) Long " " 8 seconds.

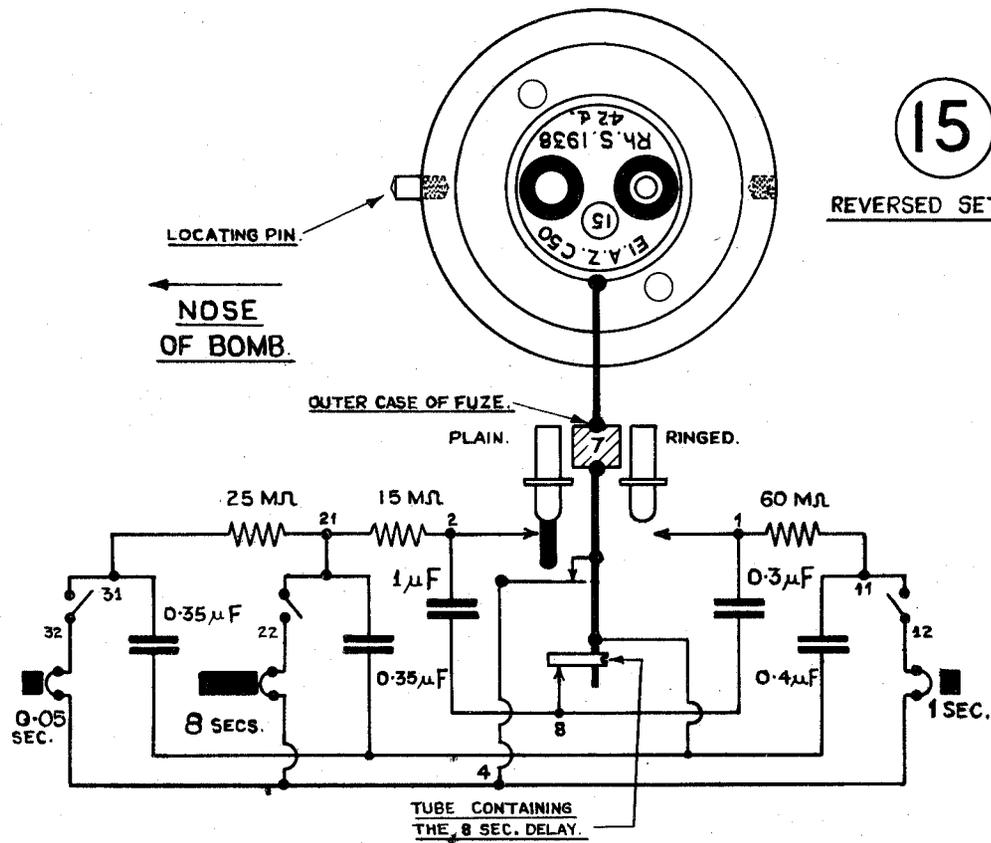
REVERSED SETTING

- (1) Short pyrotechnic delay, 1 second;
- (2) Short " " 0.05 second;
- (3) Long " " 8 seconds.

Note:-

The ringed plunger, connecting to the instantaneous circuit, is adjacent to the locating pin, in normal setting.

This fuze is obsolescent.

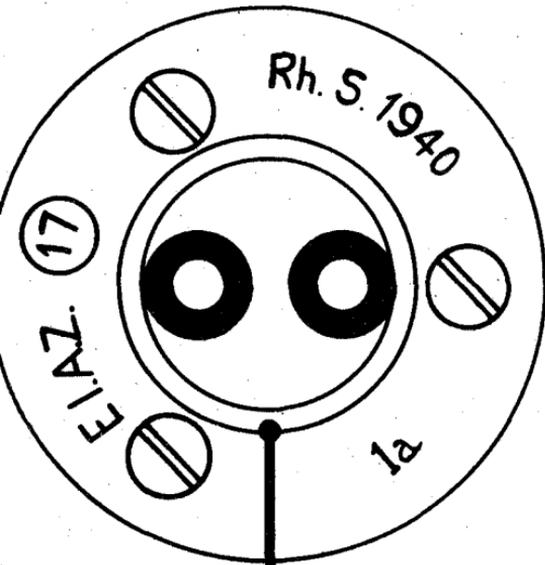


**15**  
REVERSED SETTING.

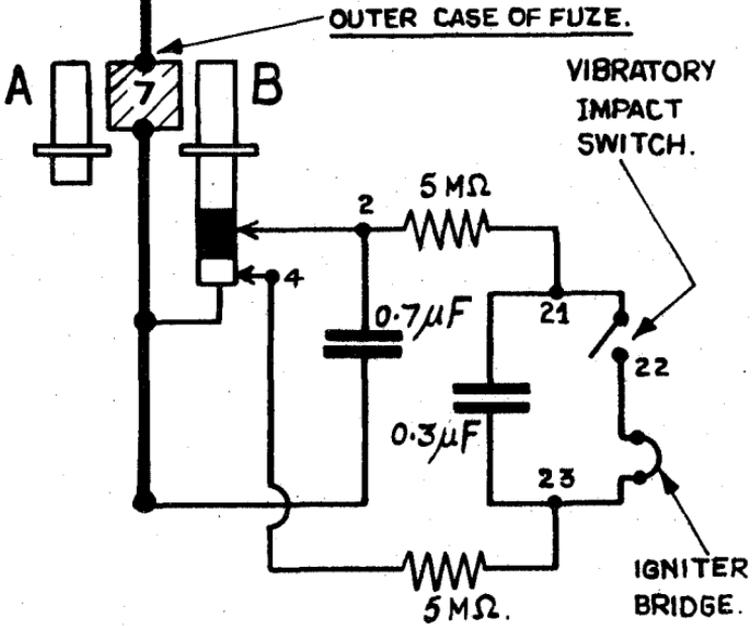
LOCATING PIN.



NOSE  
OF BOMB.



17



ELECTRIC IMPACT, LONG DELAY FUZES

Marked:- El. A. Z. (17)  
El. A. Z. (17) A  
El. A. Z. (17) B

A fuze with all the essential features of El. A. Z. (17) A has been found with no markings on the head.

Additional markings such as:- Rh. S. 1940 ... la

Colour:- Aluminium or dark grey.

Use:- H.E. bombs.

Fuzes (17) and (17) A have frequently been found in the same bomb as Fuze 50 or (50), and Anti-withdrawal Device Zus. 40.

It is possible that Fuze (17) B may be used in the same way.

Electrical features:-

One firing circuit, controlled by a single vibratory impact switch.

Safety switching: Plunger B, on depression, switches off the firing circuit.

Plunger A is idle.

Action:-

These electric fuzes on impact start an associated clock mechanism. The clocks give the following range of delays before detonation:-

Fuzes (17) and (17) A ..... 1½ to 72 hours } within 10 per cent.  
Fuze (17) B ..... 4 minutes to 2 hours }

Differences:-

Fuze (17) A differs from Fuze (17) in the following respects:-

In Fuze (17) A

- (1) The idle plunger A is omitted.
- (2) The clock is reversed, end for end.
- (3) The clock is fitted with a second detent; this prevents premature firing.
- (4) The two detents are released by the softening of thermoplastic pellets, and not pyrotechnically.

Notes:-

- (1) Fuze (17) B is believed to be the same as Fuze (17) A, except for delay.
- (2) In Fuze (17), the layers of material between the clock and the fuze-pocket are aluminium alloy and rubber.

In Fuze (17) A, they may be:-

- (a) aluminium alloy, steel and rubber;
  - (b) transparent plastic and aluminium alloy;
- or (c) aluminium alloy only.

ELECTRIC IMPACT FUZES

Marked:- El. A. Z. (25)  
El. A. Z. (25) A  
El. A. Z. (25) A \*

Additional markings such as:- Rh. S. 195. 1940 ... 2b

Colour:- Dark grey.

Use:- H.E. bombs.

Electrical features:-

Three firing circuits.

Safety switching: Each plunger, on depression, switches off the opposite firing circuits.

A screw in the head operates a switch, which cuts out the third firing circuit, leaving only one under Plunger B.

Settings:-

With the screw set at position I, these Fuzes have three alternative actions, but with the screw set at position II, they become two-circuit fuzes with only two alternative actions.

Alternative actions:-

Setting I

- (1) Instantaneous;
- (2) Short pyrotechnic delay (0.08 second for Fuze (25) );
- (3) Long " " (14 seconds for Fuze (25) ).

Setting II

- (1) Instantaneous;
- (3) Long pyrotechnic delay (14 seconds for Fuze (25) ).

Differences:-

Fuze (25) A differs from Fuze (25) in the following respects:-

In Fuze (25) A,

(1) The delay resistor of the instantaneous circuit is 60 MΩ instead of 200 MΩ, reducing the arming time to about one-third of that of Fuze (25) .

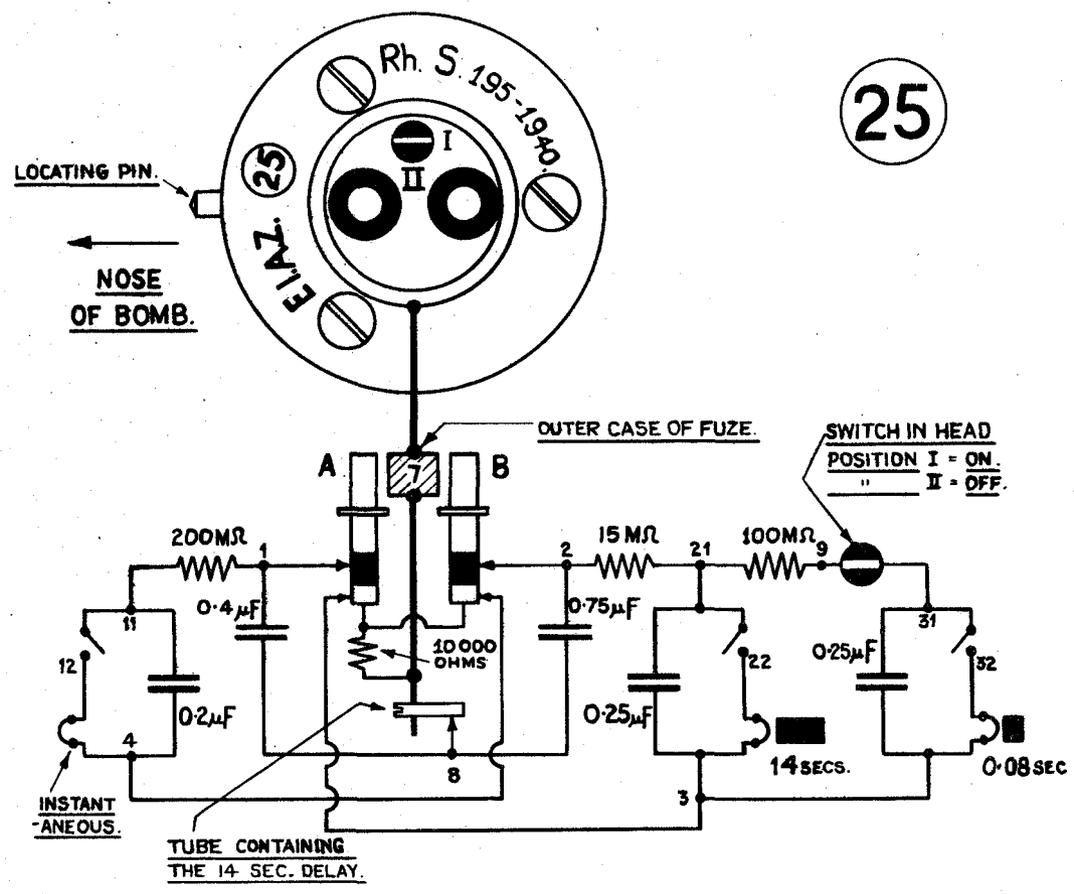
(2) The firing circuits are earthed to the case of the Fuze directly instead of through a 10,000 ohm safety resistor.

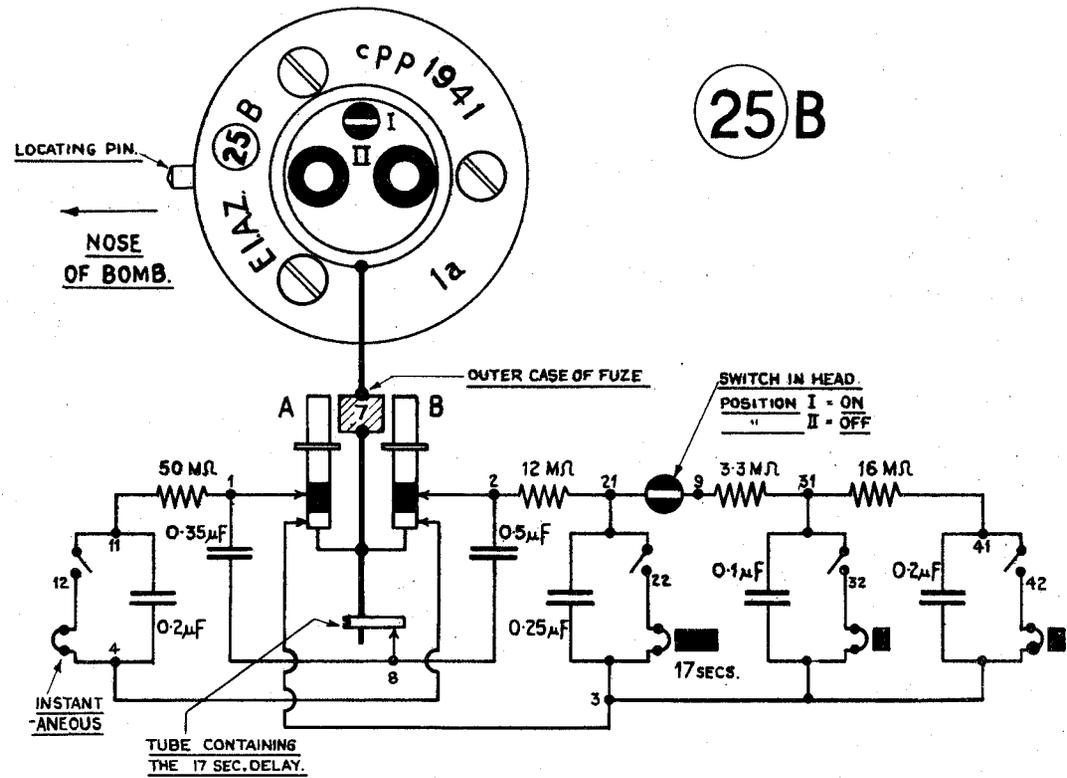
Fuze (25) A \* differs from Fuze (25) A only in wiring connections.

Note:-

Fuze (25) is obsolescent.

25





ELECTRIC IMPACT FUZE

Marked:- El. A. Z. (25) B

Additional markings such as:- cpp 1941 ... 1a

Colour:- Dark grey.

Use:- H.E. bombs.

Electrical features:-

Four firing circuits (three under Plunger B).

Safety switching: Each plunger, on depression, switches off the opposite firing circuits.

A screw in the head operates a switch, which cuts out the third and fourth firing circuits, leaving only one under Plunger B.

Settings:-

With the screw set at position I, this Fuze has four alternative actions, but with the screw set at position II, it becomes a two-circuit fuze with only two alternative actions.

Alternative actions:-

Setting I

- (1) Instantaneous;
- (2) Short pyrotechnic delay (under 1 second);
- (3) Short " " (under 1 second);
- (4) Long " " 17 seconds.

Setting II

- (1) Instantaneous;
- (4) Long pyrotechnic delay, 17 seconds.

ELECTRIC IMPACT FUZE

Marked:- El. A. Z. (26)  
El. A. Z. K.C. 250 (26)

Additional markings such as:- Rh. S. 1939 ... 15b

Colour:- Green.

Use:- Oil-incendiary bombs.

Electrical features:-

One firing circuit.

Safety switching: Plunger B, on depression, switches off the firing circuit.

Plunger A is idle.

Special Firing Switch:-

In addition to one vibratory switch in the switch-block, this Fuze has a pressure-pulse switch in its side, which registers with a tube leading from the nose of the bomb.

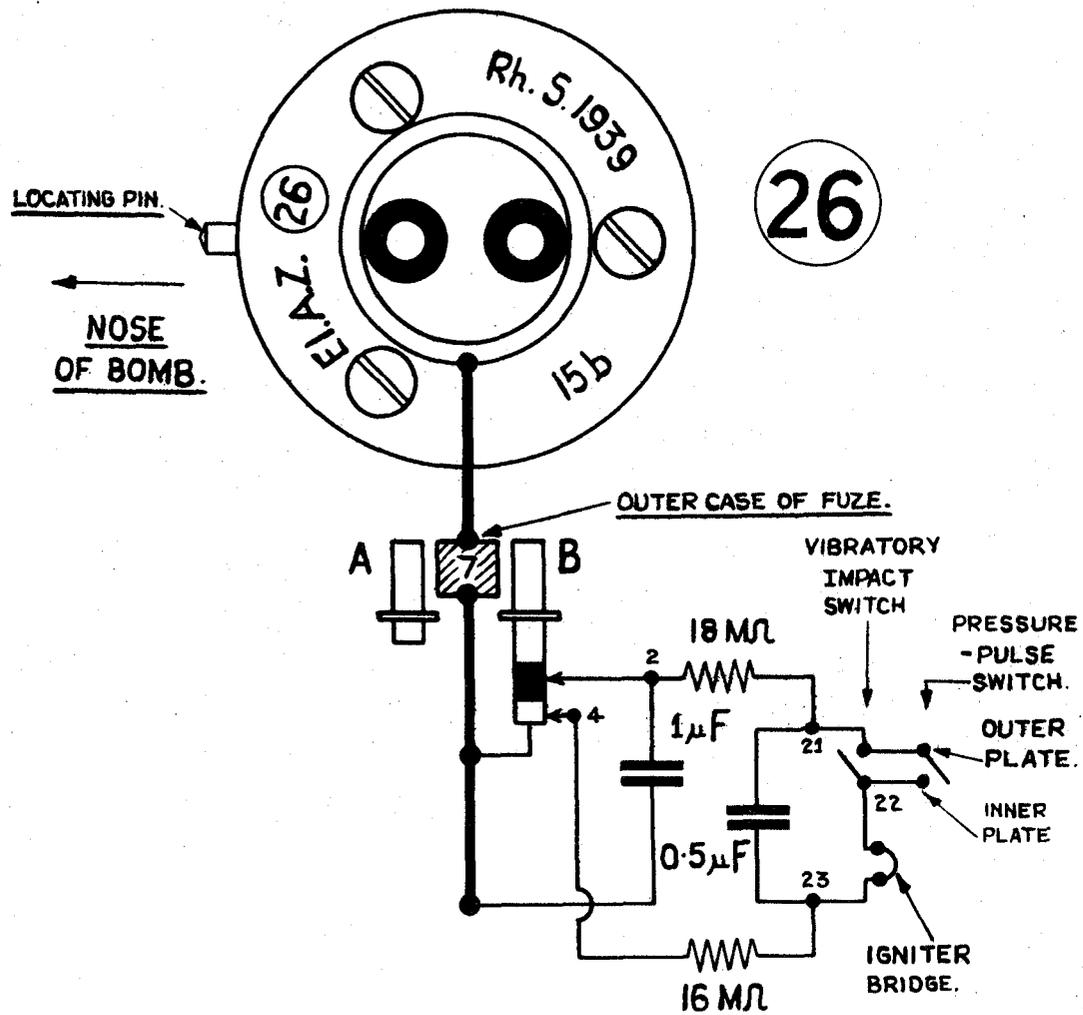
This switch consists of a thin metal outer plate mounted less than 1/10th inch in front of a fixed inner plate.

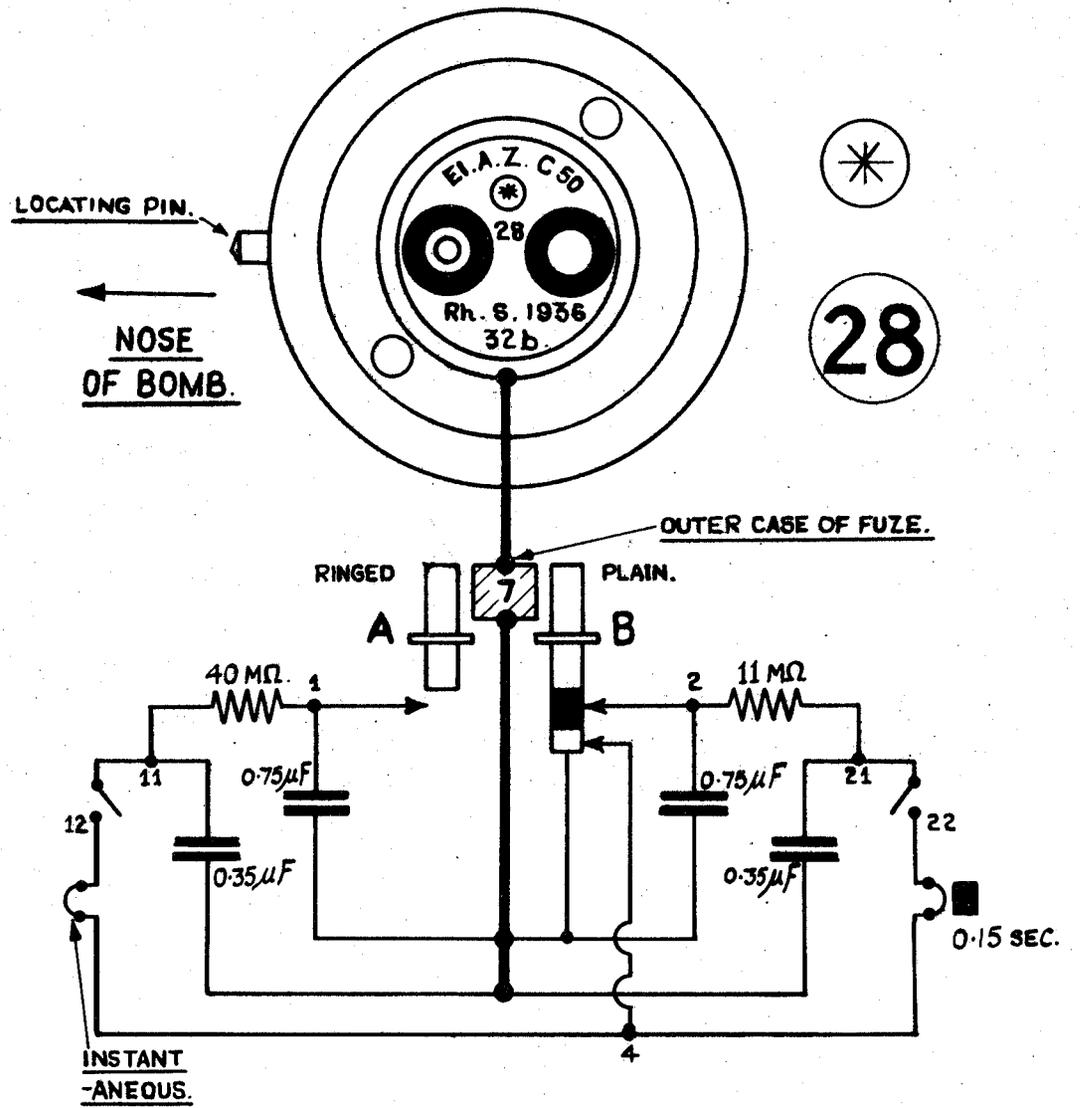
It is apparently intended that the outer plate should be forced into contact with the inner plate by the pressure-pulse sent up the tube on impact.

If the target, e.g. a light roof, is too flimsy to operate the vibratory switch, the pulse may still be enough to operate the pressure-pulse switch.

Action:-

The Fuze acts instantaneously.





ELECTRIC IMPACT FUZE

Marked:- El. A. Z. C 50 \* 28

Additional markings such as:- Rh. S. 1936 ... 32b

Colour:- Dark grey (aluminium alloy or brass case).

Use:- H.E. bombs.

Electrical features:-

Two firing circuits, charged one from each plunger.

Safety switching: The plain plunger B, on depression, switches off the igniter bridges.

The circuit diagram is the same as for Fuze 5 .

Alternative actions:-

- (1) Instantaneous;
- (2) Short pyrotechnic delay, 0.15 second.

Notes:-

The asterisk in the title marking is an obliteration of a figure 5.

The ringed plunger, connecting to the instantaneous circuit, is adjacent to the locating pin.

This Fuze is probably obsolete.

ELECTRIC IMPACT FUZE

Marked:- El. A. Z. (28) A

Additional markings such as:- Rh. S. 1940 ... 6b.

Colour:- Dark grey, with yellow ring surrounding charging-head.

Use:- H.E. bombs.

Electrical features:-

Three firing circuits.

Safety switching: Each plunger, on depression, switches off the opposite firing circuits.

The circuit is the same as for Fuze (38) .

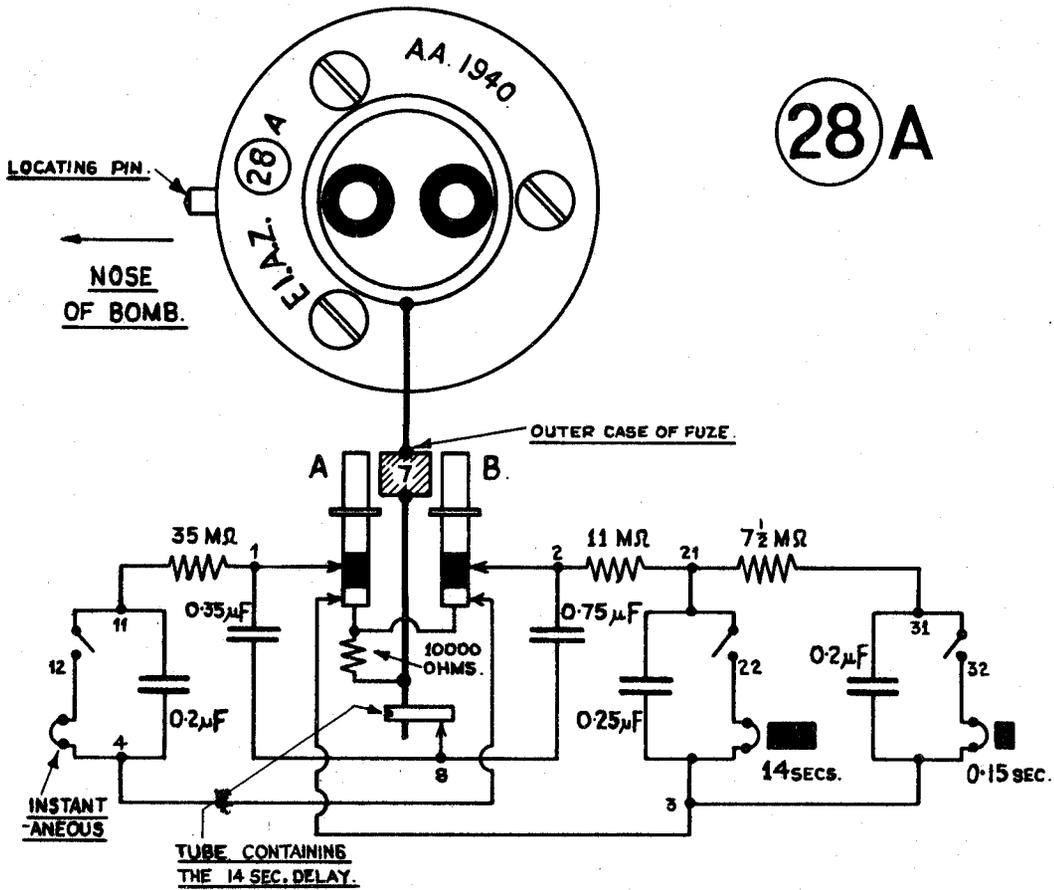
Alternative actions:-

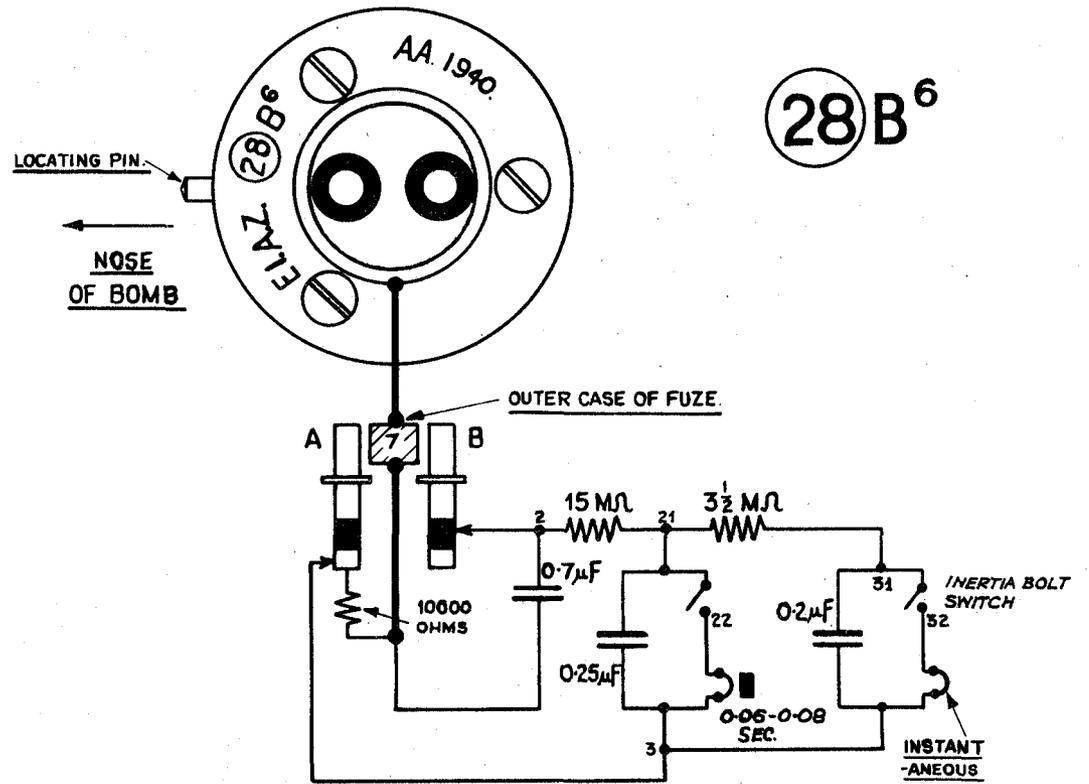
- (1) Instantaneous;
- (2) Short pyrotechnic delay, 0.15 second;
- (3) Long " " 14 seconds.

Note:-

This Fuze must not be confused with Fuze (28) B.

28 A





ELECTRIC IMPACT FUZE

Marked:- El. A. Z. (28) (B) 2  
El. A. Z. (28) B 2  
El. A. Z. (28) B 6

Additional markings such as:- A A 1940

Colour:- Dark grey, with yellow ring surrounding charging-head.

Use:- H.E. bombs.

Electrical features:-

Two firing circuits, both charged from one plunger, B.

Safety switching: Plunger A, on depression, switches off the firing circuits.

The circuit is the same as for Fuze (35) .

In a recent example of Fuze (28) B<sup>2</sup>, the reservoir condenser is connected to Plunger A also, in the same manner as to Plunger B.

Special Impact Switch:-

The impact switch initiating the instantaneous action is an inertia-bolt switch, which acts only on resistant targets.

Alternative actions:-

- (1) "Instantaneous", 0.01 second (on resistant targets);
- (2) Short pyrotechnic delay (0.06 - 0.08 second).

Note:-

These Fuzes must not be confused with Fuze (28) A.

ELECTRIC IMPACT FUZE

Marked:- El. A. Z. (28) B 07

Additional markings such as:- b m v 1941 ... 1e

Colour:- Dark grey, with yellow ring surrounding charging-head.

Use:- H.E. bombs.

Electrical features:-

Three firing circuits.

Safety-switching: Plunger A, on depression, switches off the firing circuits.

Two of the firing circuits are closed by vibratory impact switches and have the same arming time.

Special Impact Switch:-

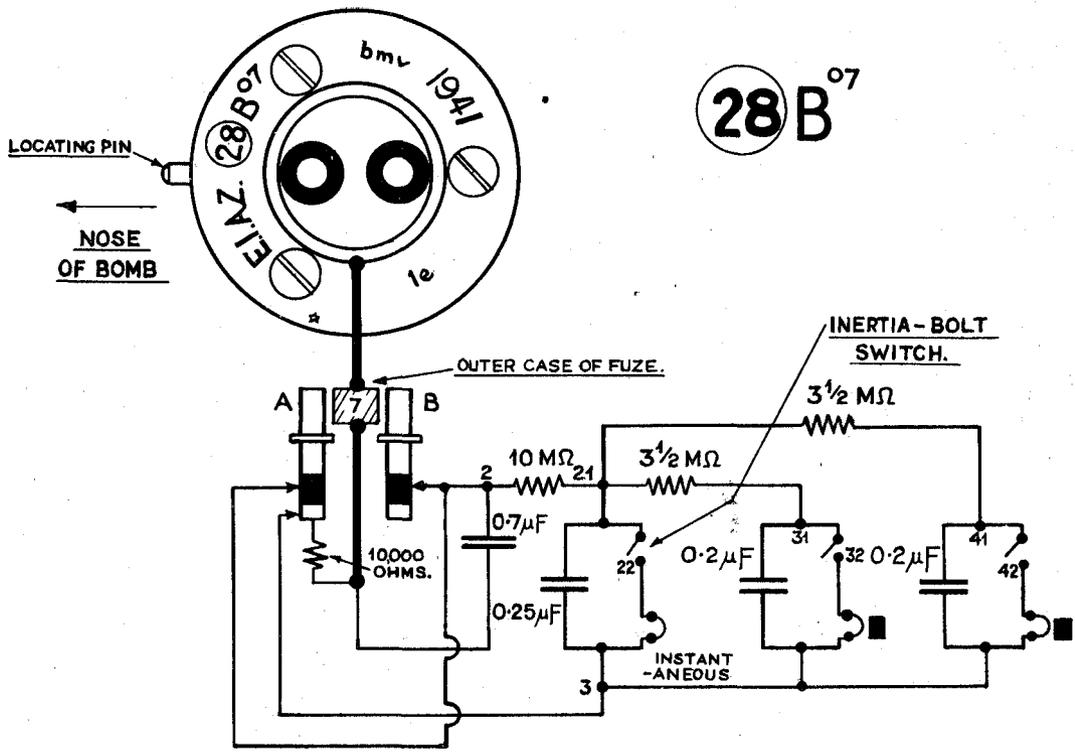
The other circuit is closed by an inertia-bolt switch, which acts only on resistant targets and gives "instantaneous" firing of the bomb.

Alternative actions:-

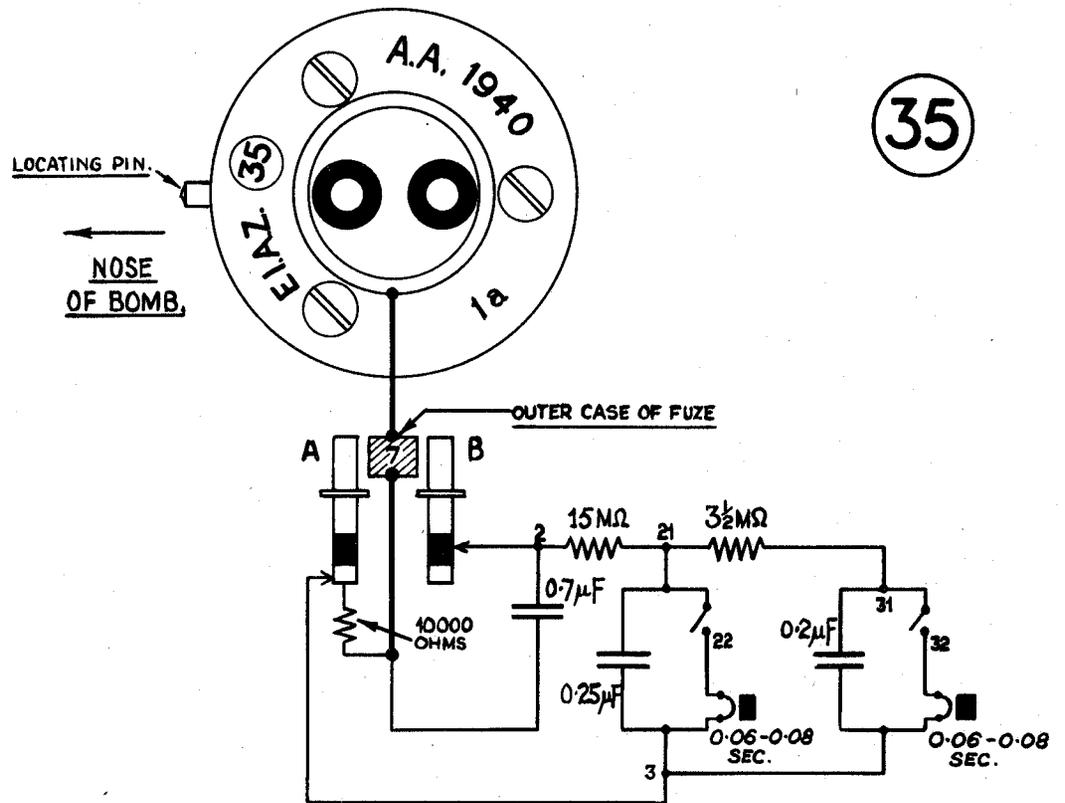
- (1) "Instantaneous", on resistant targets;
- (2) Short pyrotechnic delay, probably less than 1 second.

Note:-

This Fuze differs from Fuzes (28) B<sup>2</sup> and (28) B<sup>6</sup>.



28 B<sup>07</sup>



35

ELECTRIC IMPACT FUZE

Marked:- El. A. Z. (35)

Additional markings such as:- A A 1940 ... la

Colour:- Dark grey, with yellow ring surrounding charging-head.

Use:- H.E. bombs.

Electrical features:-

Two firing circuits, both charged from one plunger, B.

Safety switching: Plunger A, on depression, switches off the firing circuits.

The circuit is the same as for Fuze (28) B.

Alternative actions:-

Two short pyrotechnic delays (0.06 - 0.08 second).

ELECTRIC IMPACT FUZE

Marked:- El. A. Z. (38)

Additional markings such as:- Rh. S. 1940 ... 2c.

Colour:- Dark grey.

Use:- H.E. bombs.

Electrical features:-

Three firing circuits.

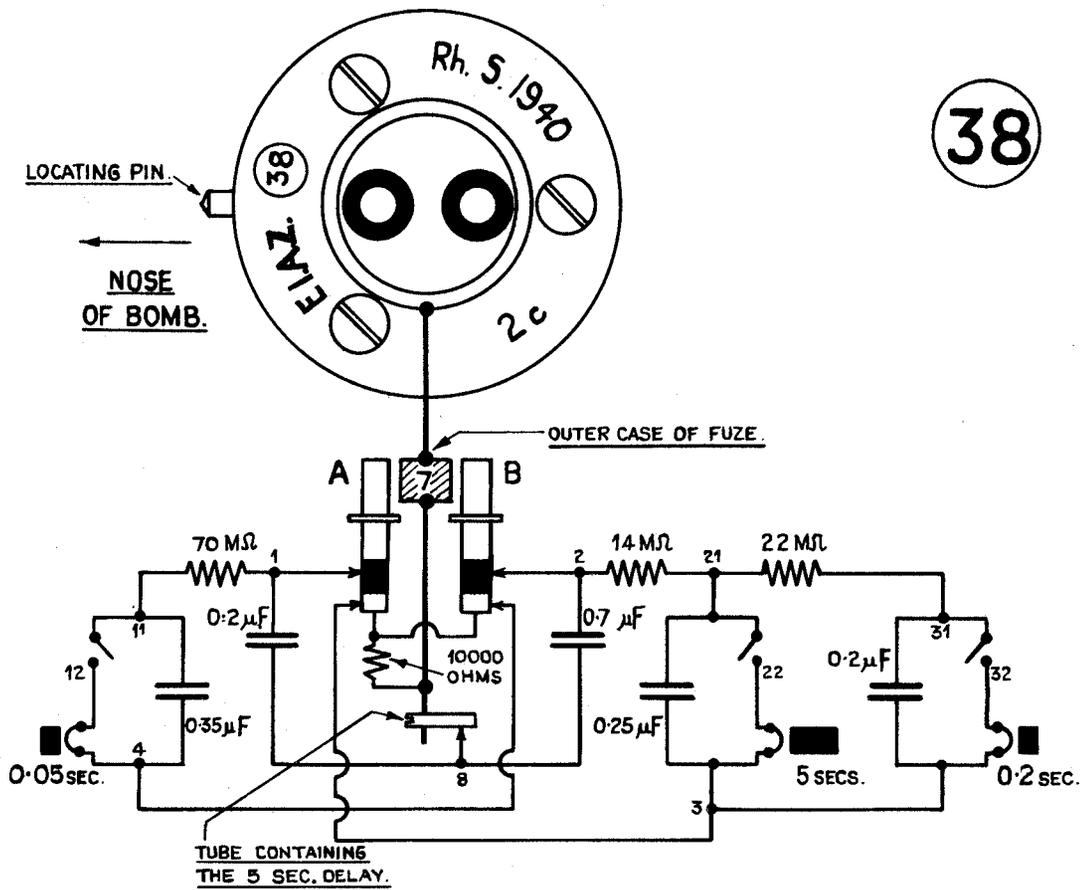
Safety switching: Each plunger, on depression, switches off the opposite firing circuits.

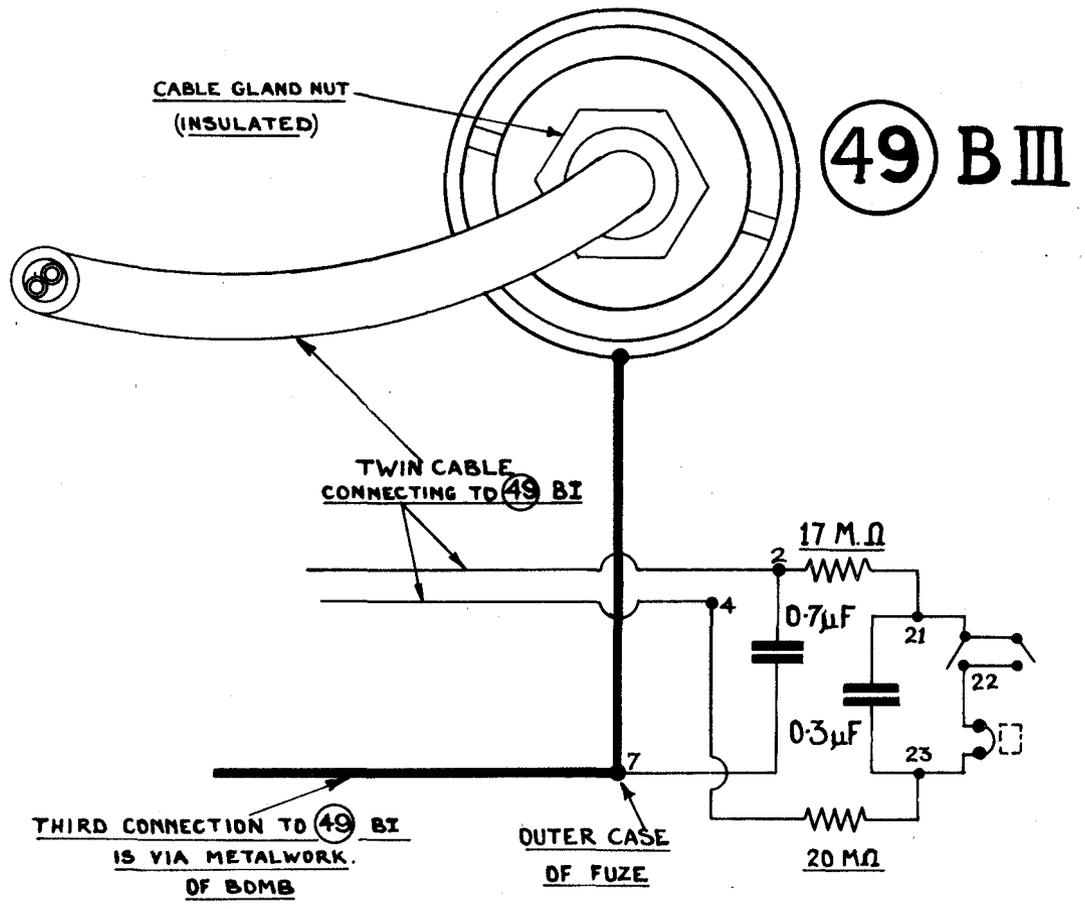
The circuit is the same as for Fuze (28) A.

Alternative actions:-

- (1) Short pyrotechnic delay, 0.05 second;
- (2) Short " " 0.2 second;
- (3) Long " " 5 seconds.

38





ELECTRIC IMPACT FUZE

Marked:- (49) B III

This marking is found on the side of the case.

There are no markings on the visible end of the Fuze. The centre is occupied by a cable and gland, set in a block of brown insulation; there are no plungers.

Colour:- Aluminium.

Use:- Base fuze of armour-piercing bomb with rocket attachment.

In combination with Fuze Charging-head (49) B I and Fuze (49) B II, which operates the rocket attachment.

Electrical features:-

One firing circuit.

Safety switching: The three electrical connections (via cable and metal-work) between this Fuze and the Fuze Charging-head (49) B I presumably allow the latter to effect the usual safety switching, viz. isolation of the firing circuit during charging. If so, the circuit is the same as that of Fuze 26.

Firing Switches:-

There are two vibratory impact switches, both transverse to the axis of the bomb; they are operated by deceleration but not by acceleration.

Action:-

Short delay.

## ELECTRIC FUZES

- (1) Marked:- 50  
Additional markings:- None.
- (2) Marked:- El. Z. 50  
Additional markings such as:- A A 1940 ... 1a

Colour:- Green.

Use:- H.E. bombs.

Either of these Fuzes is frequently used in the same bomb with a Long-Delay Fuze 17 or 17 A and may be used with Fuze 17 B.

Special electrical features (common to both Fuzes):-

**ARMED AFTER IMPACT.** These Fuzes have resistors of very high value, so that they do not become armed till after landing, even when released from high altitudes.

**LONG LIFE.** Certain design features are intended to increase the time for which the fuze can remain armed (by retaining its electrical charge).

**BOOBY TRAP - SENSITIVE IMPACT SWITCHES.** The vibratory impact switches are very many times more sensitive than in other Fuzes, so that the slightest movement of the bomb will cause detonation.

**BOOBY TRAP - PLUNGER DEPRESSION.** Electrical connections are provided whereby depressing Plunger B short-circuits one or both of the vibratory impact switches; therefore it is impossible, without detonating the bomb, to discharge an armed Fuze by any method involving depressing the plungers.

Electrical features of Fuze 50:-

One firing circuit - but two vibratory impact switches, connected in parallel, and placed at right angles. Both switches are short-circuited by depressing Plunger B.

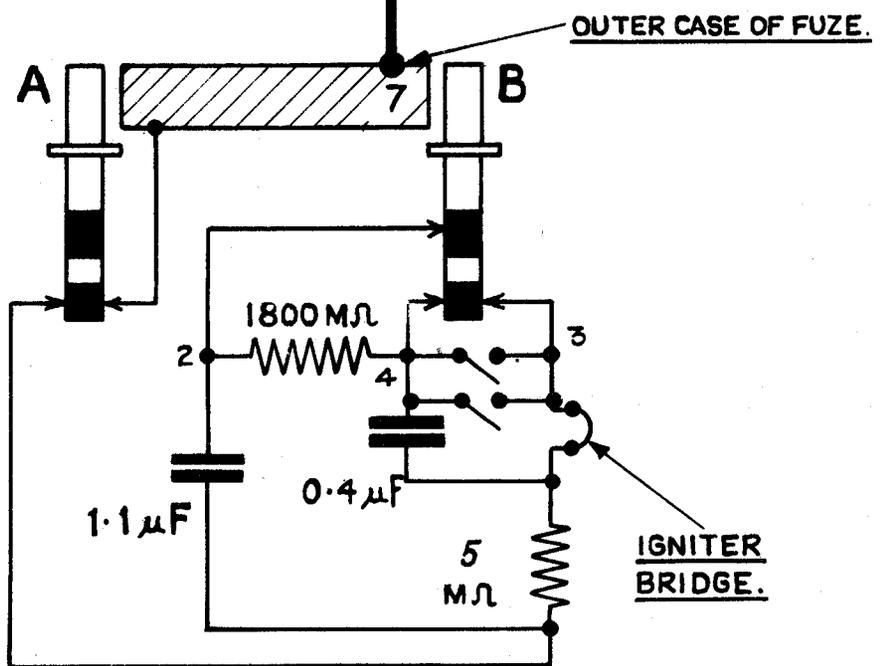
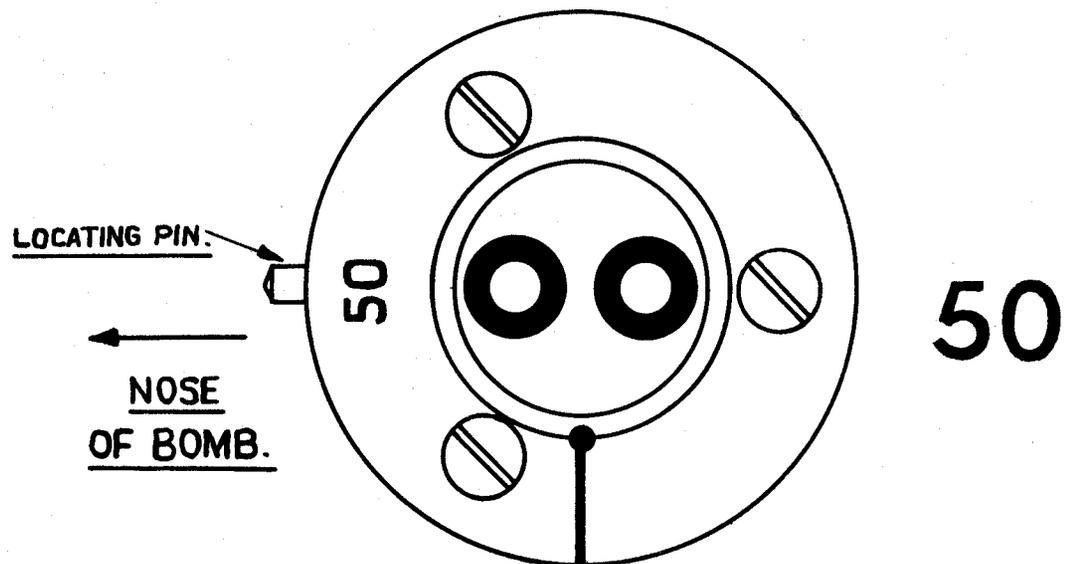
Electrical features of Fuze 50 :-

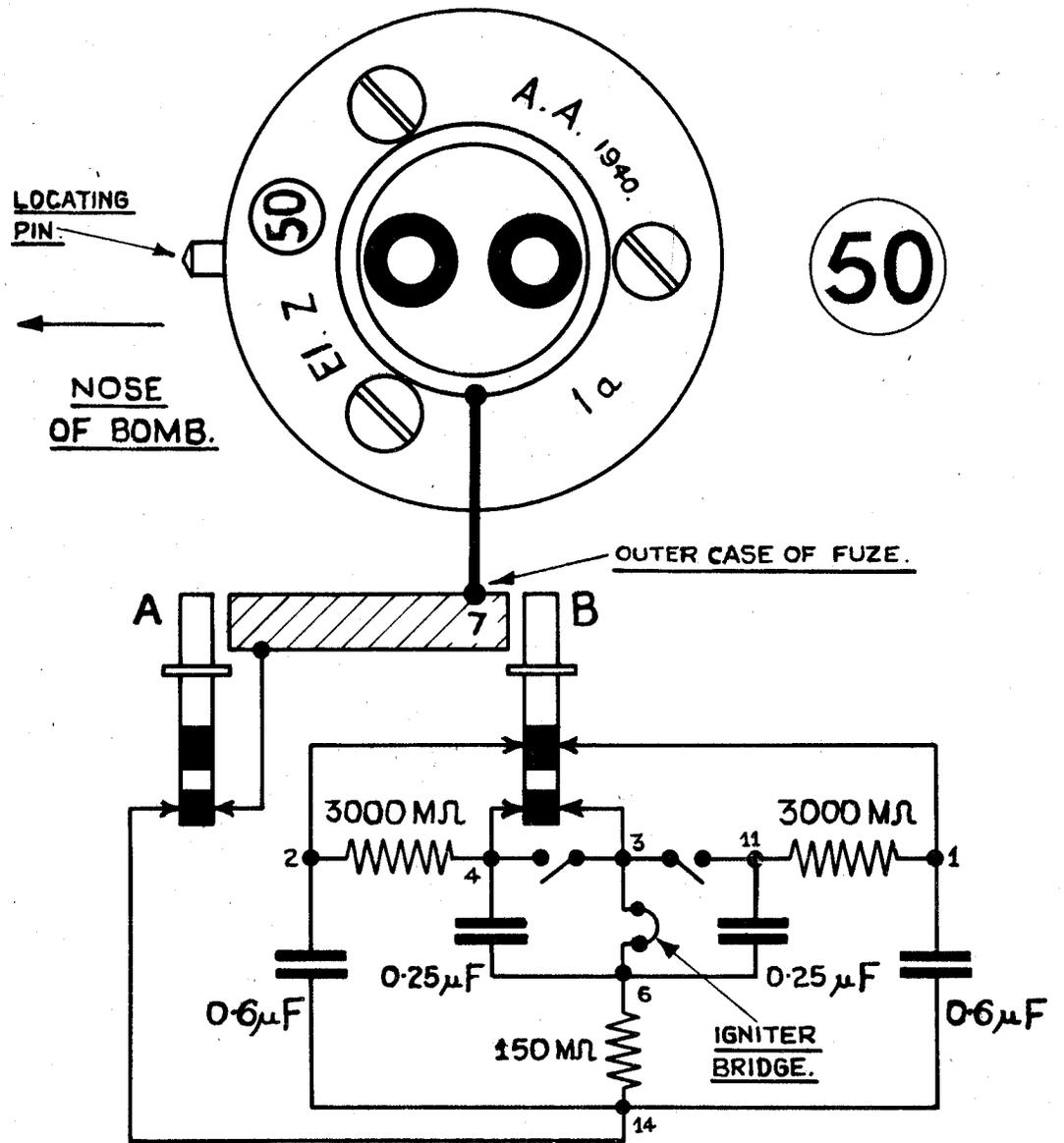
Two firing circuits, operating on the same igniter bridge. Each circuit has one vibratory impact switch; the two switches are placed at right angles.

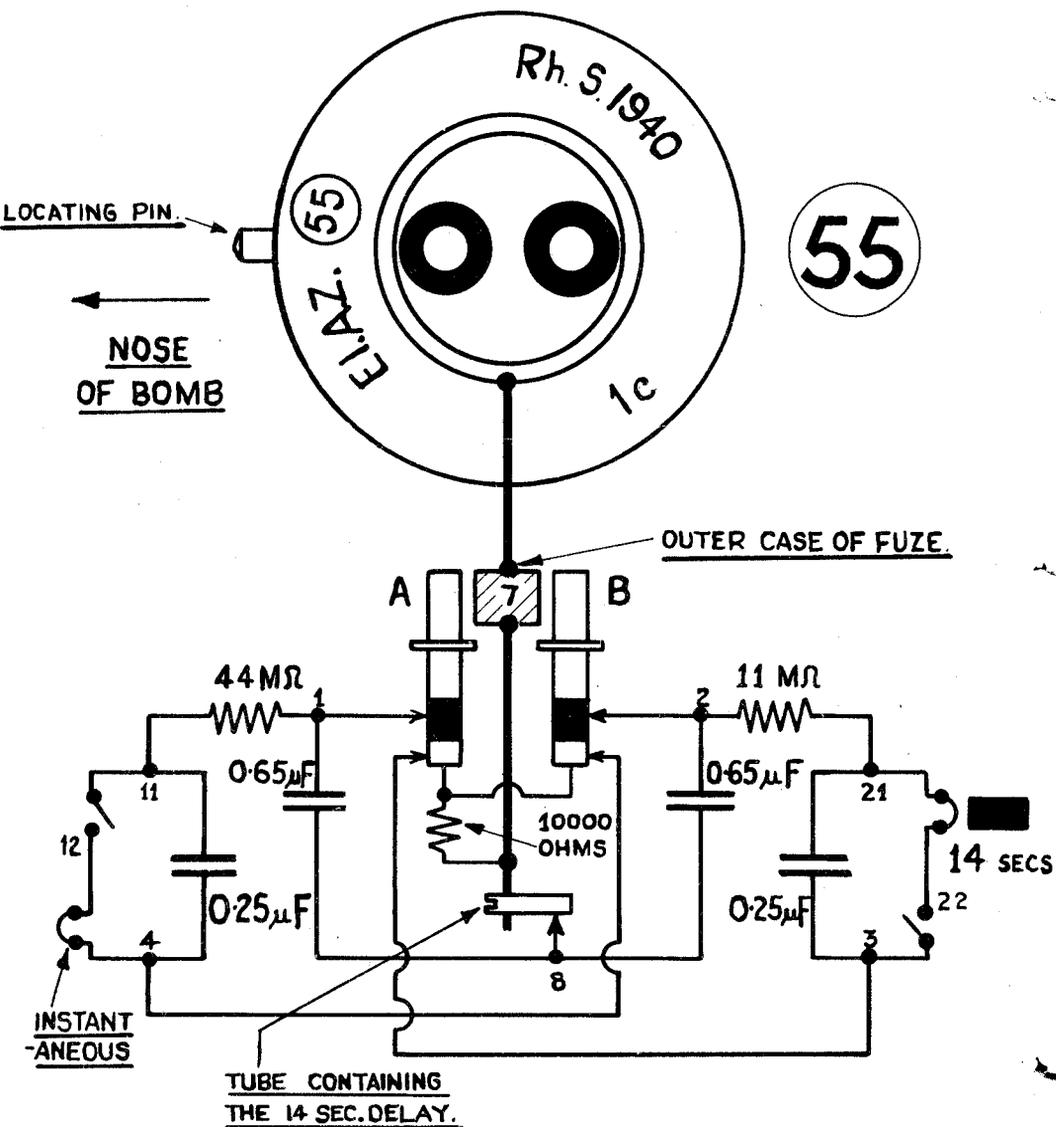
Only one of the vibratory impact switches is short-circuited by Plunger B.

**WARNING.** These Fuzes are BOOBY TRAPS - they will detonate the bomb instantaneously if the bomb is moved or a plunger is depressed.

THE TWO-PIN DISCHARGER MUST NOT BE USED.







ELECTRIC IMPACT FUZE

Marked:- El. A. Z. (55)

Additional markings such as:- Rh. S. 1940 ... 1c.

Colour:- Dark grey.

Use:- H.E. bombs.

Electrical features:-

Two firing circuits, charged one from each plunger.

Safety switching: Each plunger, on depression, switches off the opposite firing circuit.

Alternative actions:-

- (1) Instantaneous;
- (2) Long pyrotechnic delay, 14 seconds.

Note:-

Different makes of this Fuze have appeared with the title marking in different sized letters, etc.

In one of these the long-delay circuit is earthed directly to the case of the Fuze, whereas for the instantaneous circuit the 10,000 ohm resistor is retained.

ELECTRIC TIME FUZES

Marked:- El. Zt. Z. 59 A

El. Zt. Z. (59) A

El. Zt. Z. (79)

Additional markings such as:- b m v 1941 ... la.

Colour:- Aluminium or red.

Use:- Parachute flares and incendiary bomb containers.

Electrical features:-

Two igniter bridges are the only electrical components present. These are fired, through the plungers, on release of the munition.

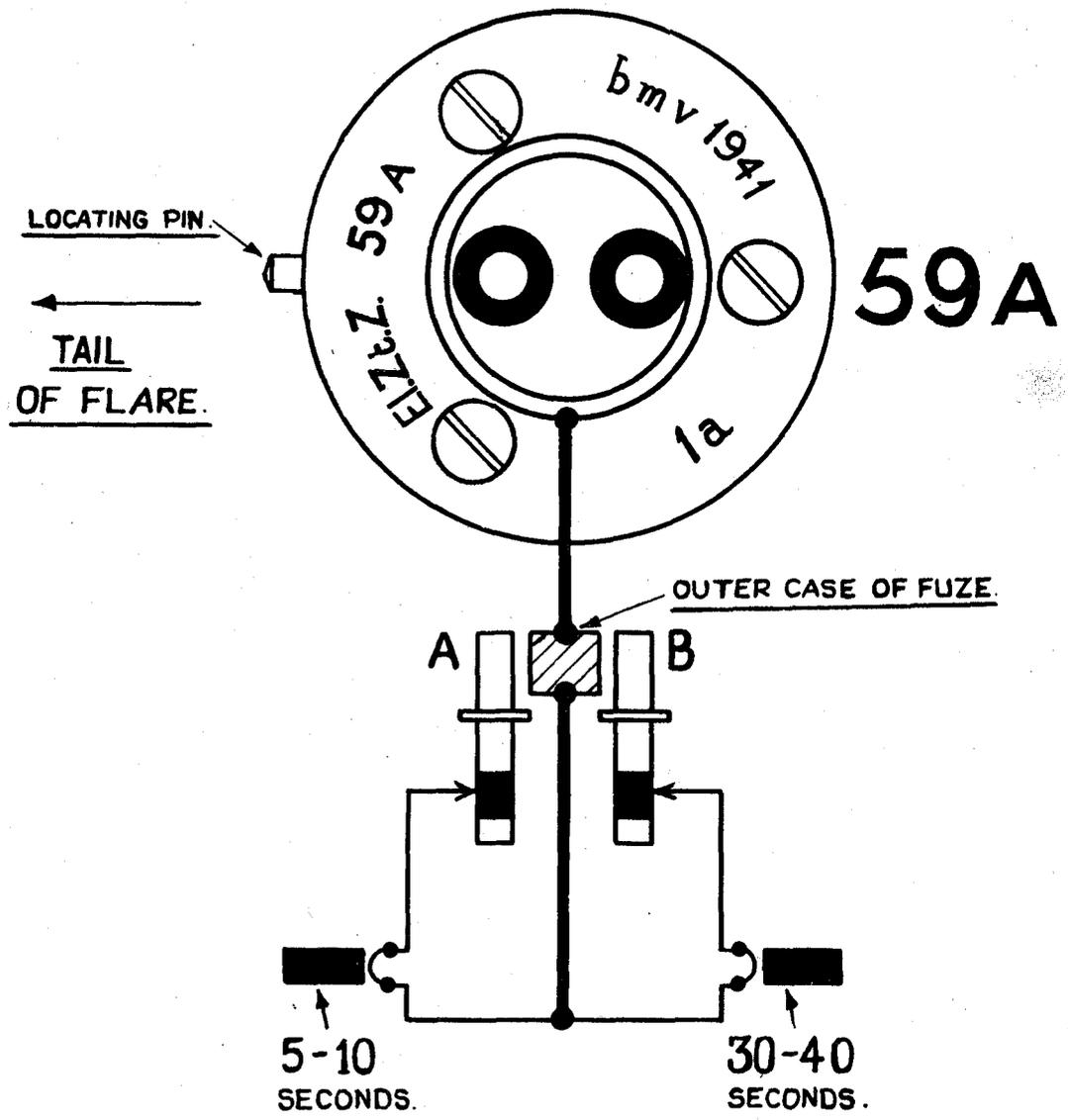
Time setting:-

There are two pyrotechnic time rings, one or both of which are fired, giving delays, for Fuze 59 A, of the following order:-

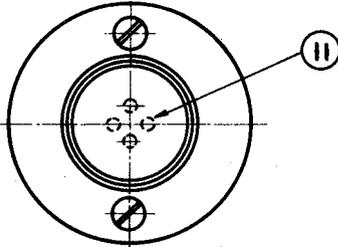
- (1) 5 to 10 seconds, if the Fuze is fired through both plungers;
- (2) 30 to 40 seconds, if the Fuze is fired through Plunger B only.

Differences:-

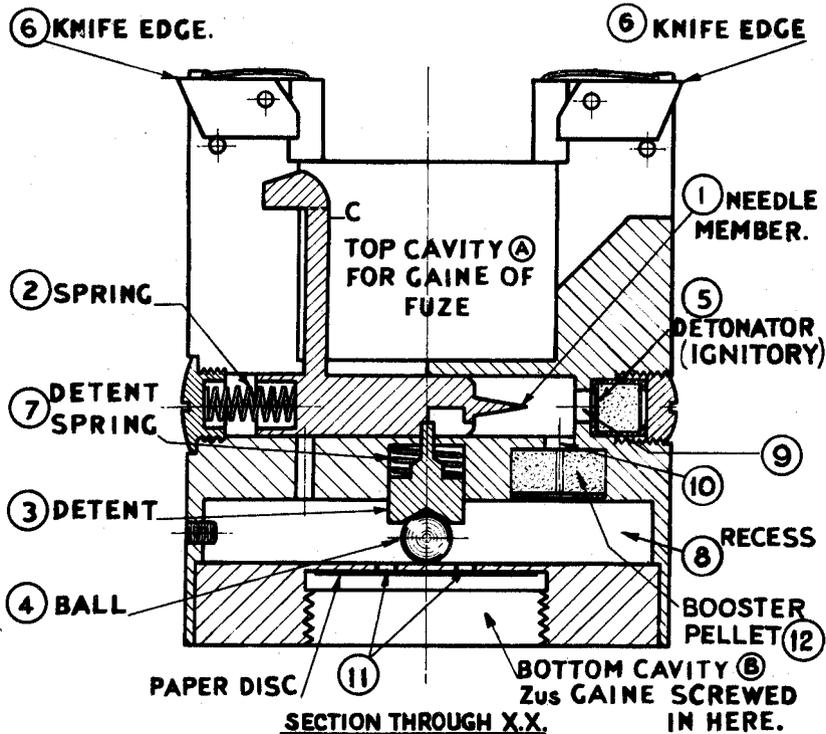
These fuzes differ only in certain details of mechanical construction and possibly in delays given.



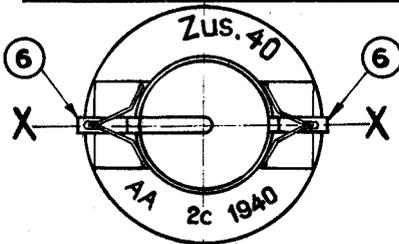
Zus. 40



PLAN OF BASE.



SECTION THROUGH X.X.  
BEFORE INSERTION OF FUZE GAIN.



PLAN OF TOP.

Fig. IVa.

GERMAN ANTI-WITHDRAWAL DEVICE ZUS. 40

This device can be fitted to any Rheinmetall Fuze in German H.E. bombs above 50 Kg. and is designed to cause detonation of the bomb if the fuze is withdrawn. It <sup>is used</sup> has so far been found only in conjunction with the Long Delay Fuzes (17) and (17) A.

Figure IVa shows the position of the components before insertion of the fuze gaine, Figure IVb after insertion of the fuze gaine but before the device is armed, and Figure IVc after arming has occurred.

There are two gaine to be considered. The gaine of the fuze is pushed into the top cavity A (Fig. IVa) of the Zus.; the gaine of the Zus. itself is screwed into the bottom of the device at B (Fig. IVa).

The needle-member (1) is pressed inwards by the spring (2), but it is kept away from the detonator (5) by a detent (3). Before the gaine of the fuze is inserted, this detent is located by the ball (4) and held firmly against the shoulder of the needle-member.

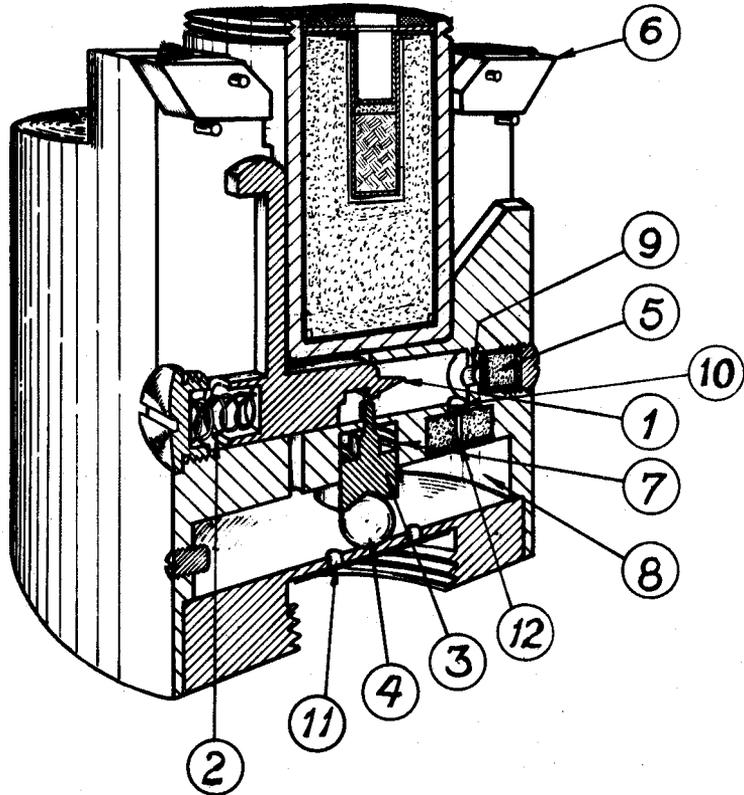
When the gaine of the fuze is pushed into the Zus. at A, the needle-member is moved outwards against the pressure of the spring (2). The constraint due to the needle-member is thus removed from the detent (3). This is still held in position by the joint action of the ball (4) and detent-spring (7), as shown in Figure IVb.

When impact takes place, the ball is shaken out of the conical recess in the detent, which is then pushed clear of the path of the needle by the spring (7). The device is thus armed, as shown in Figure IVc.

If an attempt is now made to withdraw the fuze from the bomb, an upward pull is exerted on the Zus. owing to the friction between the needle-member and the fuze gaine. Movement of the device is prevented, however, by the two pivoted knife-edges (6) which bite into the wall of the fuze-pocket. The fuze gaine is consequently withdrawn from the device. After a movement of about 0.6 inch, the rounded end of the gaine reaches the curved surface of the upstand at C. The withdrawal is now assisted by the pressure of the spring (2) forcing the gaine past the end of the needle-member. The latter is thus freed and is driven into the detonator (5).

The flash from the detonator passes through the channels (9) and (10), the space (8) and the flash holes (11) to the gaine of the Zus. and the bomb is detonated.

Note: An annular booster pellet of black powder (12), faced and backed with a paper disc and retained in position by a stabbed-in metal washer, may be present.

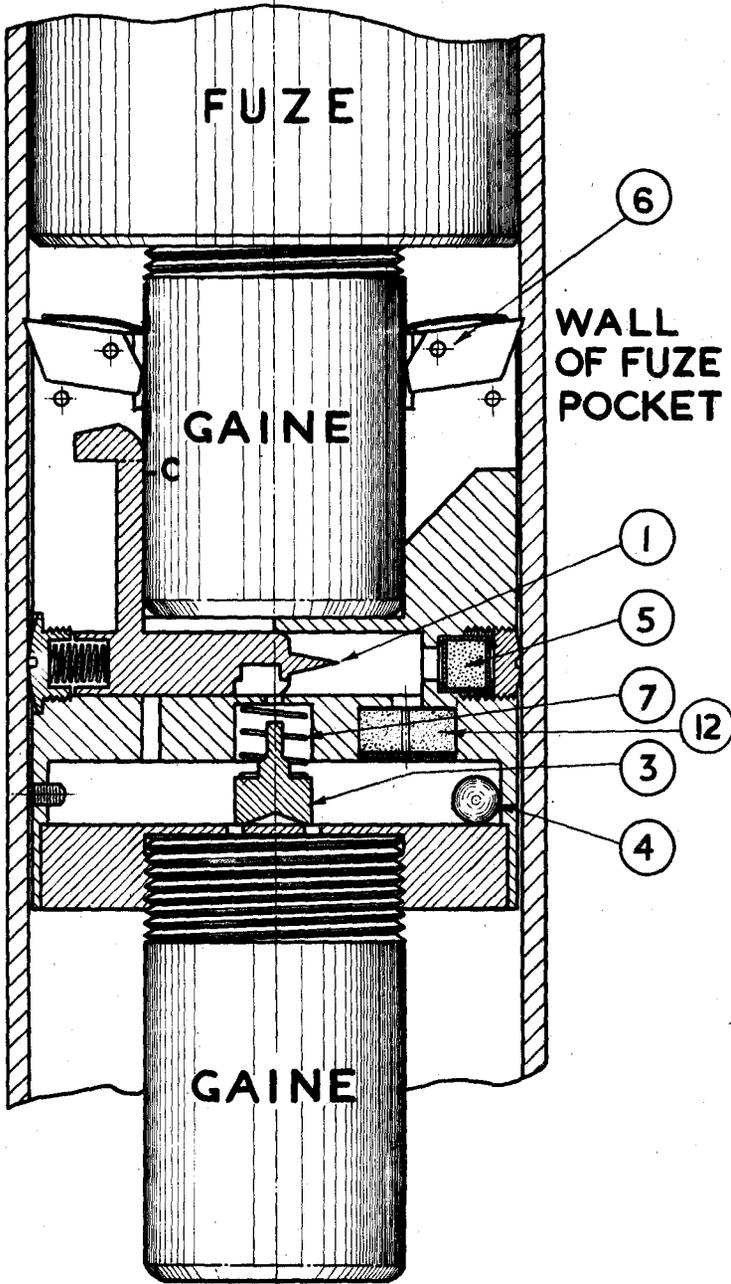


**AFTER INSERTION OF FUZE GAINE**

**(ZUS GAINE OMITTED FROM DRAWING)**

Fig. IV b.

Zus. 40.



ARMED

Fig. IV.c