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(54) Self-destructive electronic fuse.

(57) The object of the present invention relates to a self-destructive electronic fuse that acts, by means of an inertia switch, when the ammunition hits the target and if there is no hit or such takes place at an inappropriate angle, after a set time, the fuse shall destroy itself and cause the ammunition to which it is attached to explode.

The fuse, light in weight, small in size, compact, capable of resisting a sharp acceleration, is specially designed to be used in subammunition using a projectile opening up in the air as a carrier vector.

This self-destructive fuse comprises mechanical and electronic elements acting together, a frame, a body and a printed circuit fitted with the electronic components.

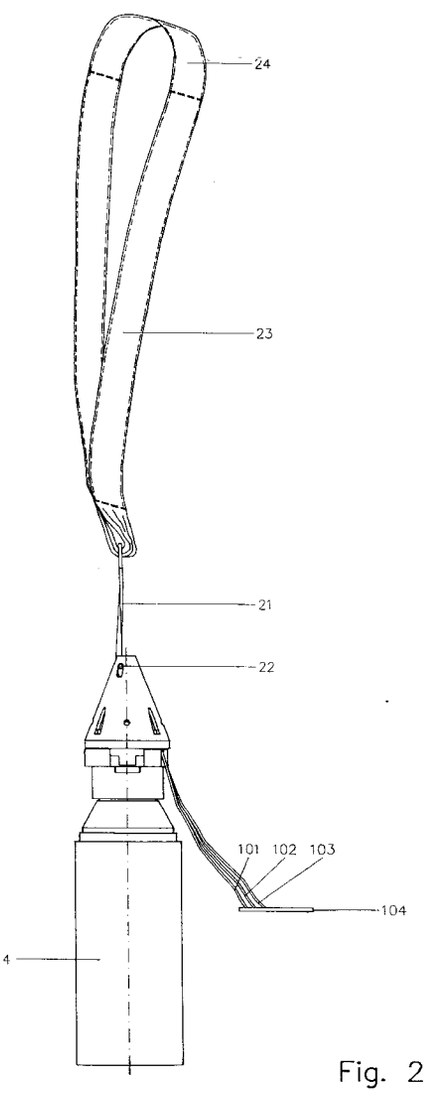

Fig. 2

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The object of the present invention relates to a self-destructive electronic fuse.

Ammunition abandoned in the battlefield without exploding can cause in one's own army the same effects that were designed for the enemy's army, which problem is ever more serious if the ammunition used is multiple.

Consequently, it is often wise for the ammunition to destroy itself if it fails to explode at the desired time.

This self-destructive electronic fuse acts, by means of an inertia switch when the ammunition hits the target or if there is no hit or such takes place at an inappropriate angle, after a set time, the fuse shall destroy itself and cause the ammunition to which it is attached to explode.

The fuse of the invention is light in weight, small in size, compact, capable of resisting a sharp acceleration and specially designed to be used in subammunition using a projectile opening up in the air as a carrier vector.

During ammunition storage and handling the fuse receives no electric power supply and the status of its electrical circuit is stable and disabled.

Upon firing, from the time the power supply is connected, the fuse receives an electric power supply that is stored. When the fuse is disconnected from the power supply, two timers are switched on, one of which works as a distance interrupter preventing the instantaneous actuation of the fuse and the other, in the event that the fuse should not act upon a hit, activates the elements causing the same to destroy itself.

Though self-destructive fuses already exist, the fuse in respect of which the present patent application is being made, contributes a number of improvements and original elements in respect of existing fuses that allow the following:

Its use, though not exclusively, is possible in subammunition using as the carrier vector a mortar grenade, an artillery grenade, a rocket or other projectile type opening up in the air and expelling the subammunition items.

Absolute safety to be achieved during carriage and handling, because the fuse cannot work until firing takes place and it is connected to and disconnected from the power supply.

It works when the ammunition hits the target.

It is self-destructive, for if the fuse does not act upon the hit, because the ammunition may be hanging from the branch of a tree, it may have been tipped by a nearby explosion or otherwise, after a preset time the fuse will destroy itself and with it the ammunition to which it is attached.

The description is illustrated with a set of drawings in which an embodiment has been shown, that is by no means restrictive and may consequently be changed to the extent that its characteristic objective is not essentially changed.

In the drawings:

Figure 1 shows the fuse and the subammunition together at rest.

Figure 2 shows the fuse and the subammunition together in flight.

Figure 3 shows the electronic fuse circuit.

Because the field of application of this fuse is so large, the description shall be considered using the same in a mortar projectile subammunition, without this description limiting the invention to this only embodiment, which can be extended to others for which it is equally suitable.

The self-destructive fuse (Fig. 1) comprises mechanical and electronic components working together.

We should essentially consider: a frame (1), a body (2) and a printed circuit (100) fitted with the electronic components.

These three elements are joined to each other by means of screws (3).

The body (2) is used to couple the fuse to the subammunition (4) and houses inside the centre stop (5) for the electric detonator (120).

By action of the spring (9) the guide (7), fitted with the stopper disc (8), slides along the centre stop (5) when it is released from the abutment that prevents it from moving, the abutment being in this case another subammunition (4).

When at rest, the stopper disc (8) provides a barrier between the electric detonator (120) welded to the printed circuit (100) and the subammunition (4), thereby preventing a chance detonation of the electric detonator (120) from causing the subammunition (4) to explode.

When the guide (7) slides with the stopper disc (8) its barrier effect is eliminated and the detonation of the electric detonator (120) causes the subammunition (4) to explode.

In order to enhance contact of the electric detonator (120) with the printed circuit (100) the electric detonator (100) is surrounded by and in contact with the spring (10).

Inside the frame (1) there are electronic components welded to the printed circuit (100) and there is a cavity (6) housing the contact disc (12) with a counterweight (11).

The contact disc (12) acts as an inertia switch (112) for when the subammunition (4) hits the target, the deceleration caused by such hit folds the contact disc (12) and when the contact (13) welded to the top printed circuit (121) simultaneously touches the washer (14) the electronic circuit is made and the detonator (120) detonates, thereby causing the subammunition (4) to explode.

In order to enable the subammunition (4) to arrive at the target vertically, the fuse, by means of the stay (21) and the pin (22), is coupled with a band (23), with

a curved reinforcement (24), that is rolled over the fuse body (2) before firing and after firing (Fig. 2) acts as a parachute causing the subammunition (4) to brake aerodynamically.

The cables, for positive (101) and negative (102) supply welded to the printed circuit (100) and the contact (104) connect the self-destructive fuse to an external electric power supply (200), that in the subject case is the carrier projectile fuse.

The short-circuit cable (103) also welded to the printed circuit (100) and the contact (104) holds the electric detonator (120) in short-circuit until it is disconnected.

The cable (101), (102) and (103) connections disappear when the subammunition items (4) are released from one another upon firing.

This connection system from the power supply to the self-destructive fuse is the subject of a new patent.

All the electronic components are welded to the printed circuit (100) and the circuit is shown in Fig. 3.

It has a storage condenser (105) storing the power received from the external electric power supply (200), which power returns to the circuit when the fuse is disconnected from the outer power supply (200).

When the circuit is powered by the power supply (200) the analogue switches (106) and (107) are powered through the diode (118).

When power is eliminated from the circuit, the resistor (114), resetting the control line, and the diode (119), preventing the storage condenser (105) from driving the positive power line, allow the analogue switches (106) and (107) to be turned off.

The analogue switch (106) through the condenser (108) and the resistor (115) acting as a timer, controls powering of the analogue switch (110). This timing takes place in order for there to be no premature explosion.

The analogue switch (107) through the condenser (109) and the resistor (116) acting as a timer, controls powering of the analogue switch (111). This timing takes place in order for there to be self-destruction after the fuse may have acted upon a hit in normal circumstances.

The analogue switch (110) controls powering of the inertia switch (112).

The inertia switch (112) or if it fails the analogue switch (111) govern powering of the drive transistor base (113).

When the base is not powered, the drive transistor (113) stays set by the bias resistor (117) and when its base is powered, it drives the electric detonator (120) causing it to detonate, which in turn causes the subammunition (4) to explode.

OPERATION

Before firing, the subammunition items (4) are at rest, supported by and fitted to each other and with their self-destructive fuses all connected to each other, and further with the short-circuit cable connected to the negative power cable.

In this original position, the circuit is disabled and stable, for there is no circuit powering and through the short-circuit cable (103) the detonator (120) remains short-circuited.

The loading stage begins upon firing and when the power supply (200) is triggered, powering the fuse though the contact (104) and the power cables (101) and (102).

When the fuse is powered, the storage condenser (105) is charged, storing energy.

In this position, the analogue switches (106) and (107) stay on because they are powered through the diode (118).

Since all the analogue switches (106) and (107) are on, the delay condensers (108) and (109) remain unloaded and hence the analogue switches (110) and (111) stay off, leaving the inertia switch (112) and the drive transistor base (113) powerless.

The load condition is stable while there is a powering and the detonator (120) remains short-circuited through the short-circuit cable (103).

The tripping state begins when the fuse is disconnected from the storage condenser (105) charged from the power supply and occurs when the subammunition (4) is sent off.

When the subammunition (4) is sent off the connector (104) is disconnected from the power supply (200), the band (23) unwinds and the guide (7) with the stopper disc (8) moves along the centre stop (5) to render the electric detonator (120) communicated with the subammunition explosive (4).

When the connector (104) is disconnected, system powering is eliminated and the electric detonator (120) short-circuit is disabled.

When powering is eliminated, the analogue switches (106) and (107) are turned off for their control line is reset through the resistor (114) and the diode (119) prevents the storage condenser (105) from driving the line.

When the analogue switches (106) and (107) are turned off, the power stored in the storage condenser (105) is used to begin charging the delay condensers (108) and (109) through the delay resistors (115) and (116) calculated for the charge level in the delay condensers (108) and (109) to cause the analogue switches (110) and (111) to be switched over with different timings.

The delay resistor (115) and the condenser (108) act as a distance interrupter and are calculated for the analogue switch (110) to be turned on when the flight of the subammunition (4) is already stable.

When the analogue switch (110) is turned on, the inertia switch (112) is powered, and hence when the ammunition hits the target, due to the deceleration effect there is, the contact disc (12) folds and turns the inertia switch (112) on.

When the inertia switch (112) is turned on, the drive transistor base (113), that remained set by action of the bias resistor (117), is powered, and the electric detonator (120) detonates and causes the subammunition (4) to explode.

If the fuse is not actuated upon a hit, because the ammunition may be hanging from the branch of a tree, it may have been tipped by a nearby explosion or otherwise, after a preset time controlled by the resistor (116) and the condenser (109), sufficient for the subammunition (4) to have already arrived at the target, the analogue switch (111) shall be turned on.

When the analogue switch (111) is turned on, the drive transistor base (113) will be powered and the electric detonator (120) detonated and the fuse will destroy itself and with it the subammunition (4) to which it is attached.

Claims

1.- A self-destructive electronic fuse, characterised in comprising mechanical and electronic elements coupled to each other so as to allow their operation upon a hit and by self-destruction.

2.- A self-destructive electronic fuse, as in claim 1, characterised in that its mechanical elements include a frame, body, stop, centre, guide, contact disc and band, allowing the electronic components to be coupled and the fuse to work upon an impact.

3.- A self-destructive electronic fuse, as in claims 1 and 2, characterised in having an electronic circuit, fitted with a printed circuit, comprising diodes, condensers, resistors, analogue switches, an analogue transistor and a detonator, which circuit allows the fuse to work by a hit or self-destruction.

4.- A self-destructive electronic fuse, as in claims 1, 2 and 3, characterised in that the electronic circuit has a double timing preventing instantaneous operation of the fuse and ensuring that operation by self-destruction will only take place if operation by a hit fails.

5.- A self-destructive electronic fuse, as in claims 1, 2, 3 and 4, characterised in that the electronic circuit detonator is short-circuited thereby to prevent operation of the fuse during transport and handling of the ammunition.

6.- A self-destructive electronic fuse, as in claims 1, 2, 3, 4 and 5, characterised in that a spring is provided to improve the electric connection of the connector.

7.- A self-destructive electronic fuse, as in claims 1, 2, 3, 4, 5 and 6, characterised in that a guide is provided having a stopper disc preventing the operation thereof until the guide moves.

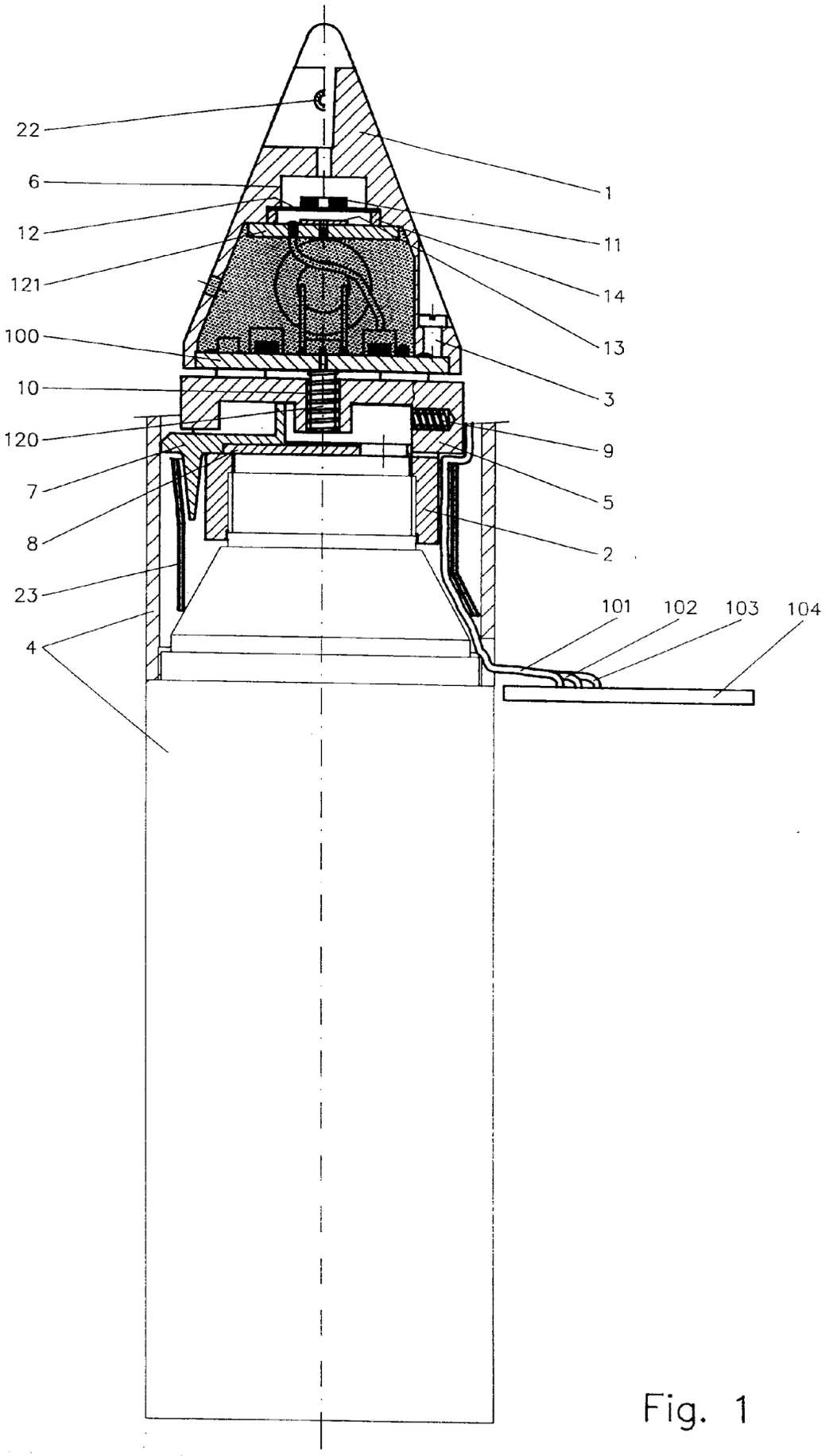

Fig. 1

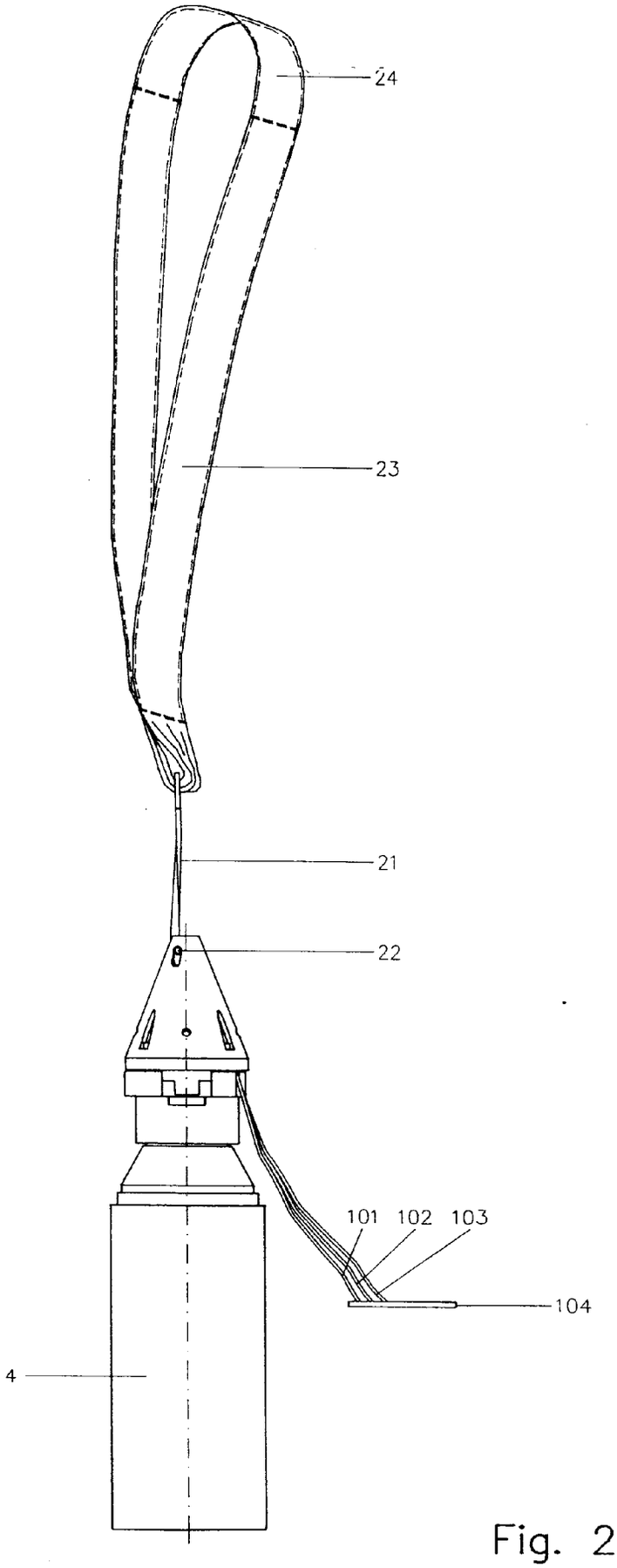

Fig. 2

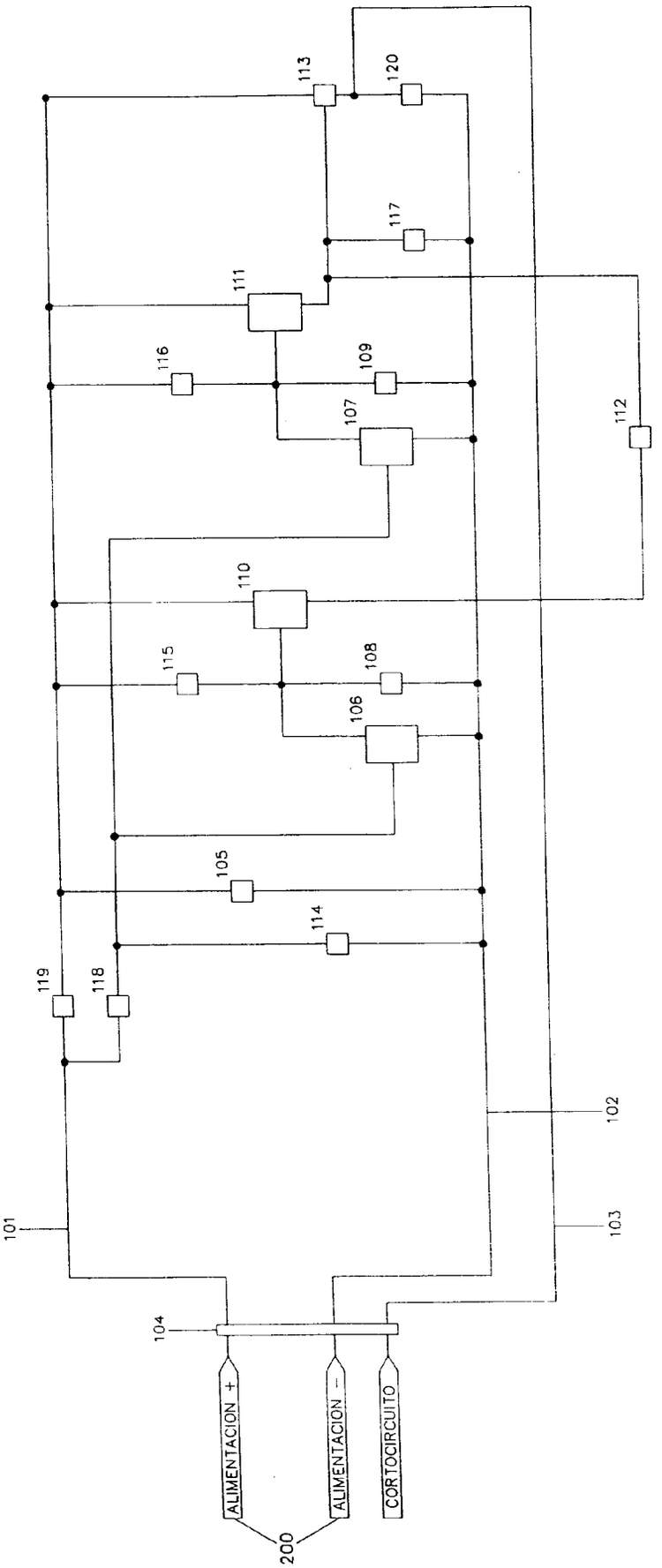
113
120
117
111
116
109
107
112
110
115
108
106
105
114
119
118
102
101
103
104
ALIMENTACION +
ALIMENTACION -
CORTOCIRCUITO
200

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 93 50 0177

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X	CH-A-534 860 (LICENTIA PATENT VERWALTUNGS GMBH) * the whole document *	1	F42C9/14
A	US-A-3 815 505 (ROH ET AL.) * abstract * * column 2, line 58 - column 4, line 53; figures 1-3 *	1	
A	US-H-136 (FIELD) * abstract * * column 2, line 28 - column 4, line 16; figures 1-5 *	1	
A	FR-A-2 528 969 (TALLERES BIABI SA) * page 3, line 11 - page 5, line 22; figures 1,2 *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.5) F42C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	8 March 1994	Blondel, F

CATEGORY OF CITED DOCUMENTS

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