

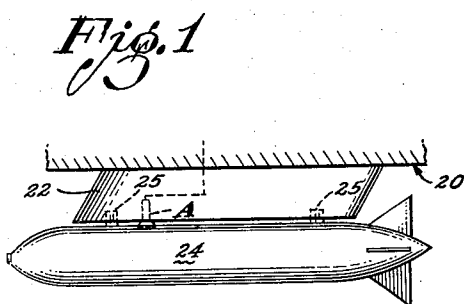
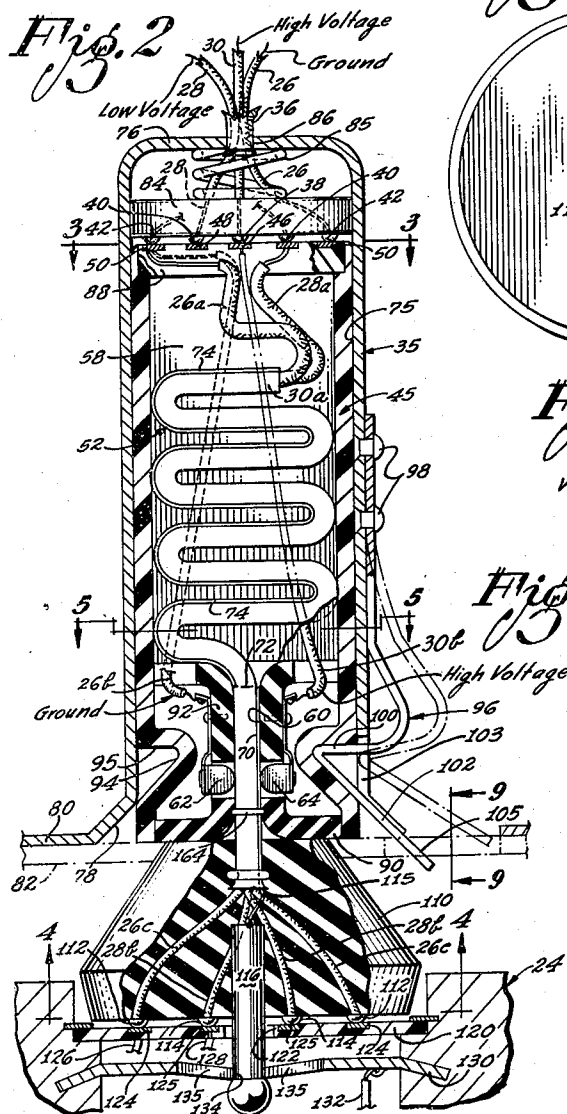
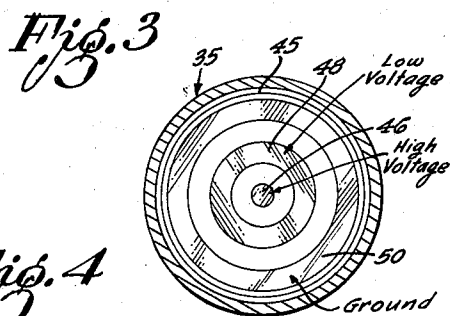
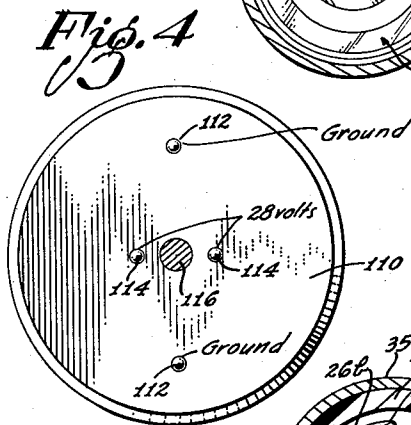
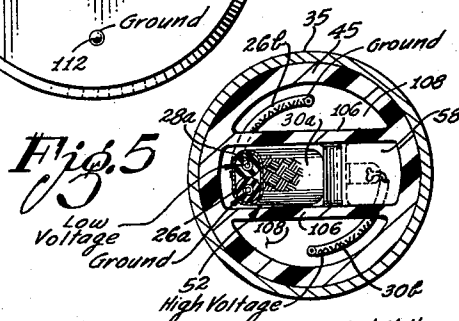
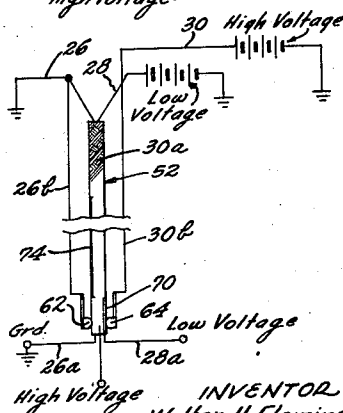
Dec. 29, 1959

W. H. FLEMING
ELECTRIC ARMING DEVICE

2,918,845

Filed Nov. 8, 1957

3 Sheets-Sheet 1



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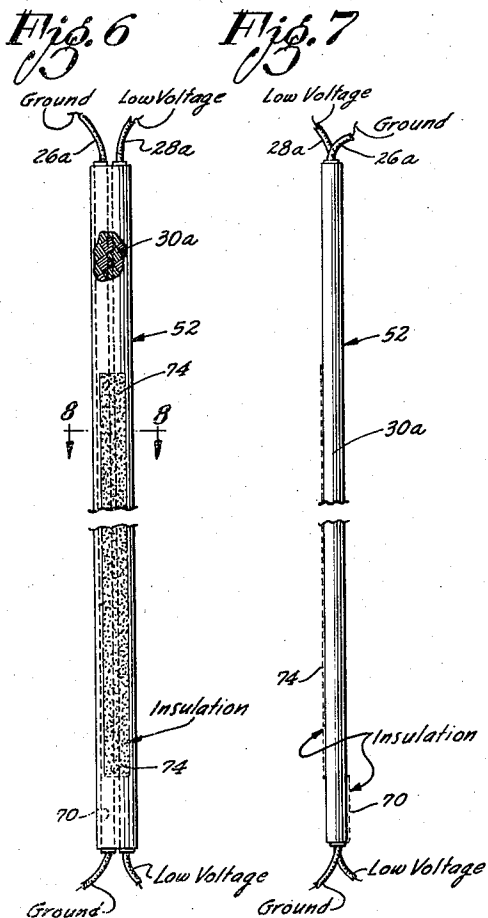
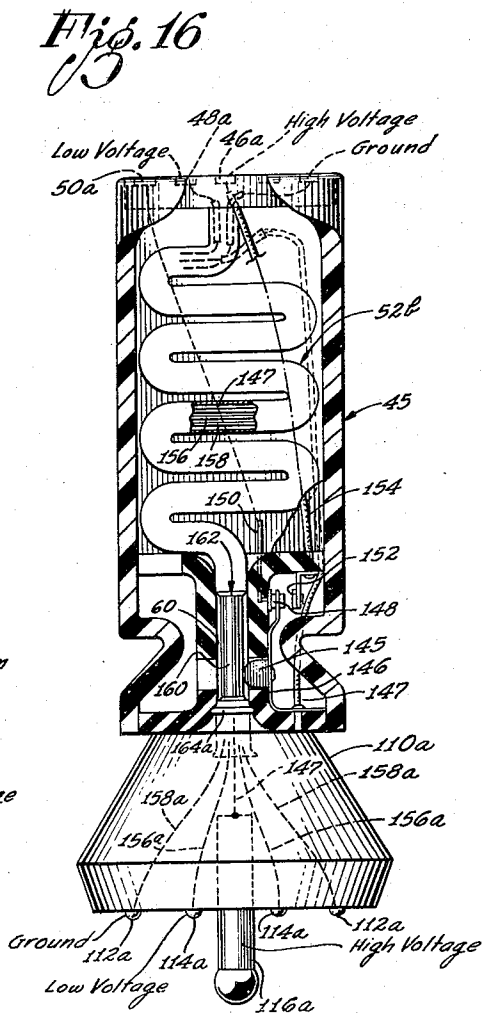
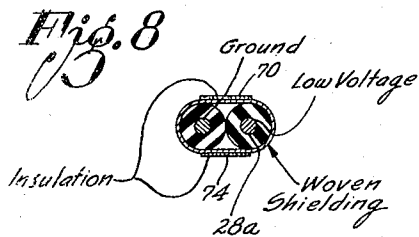
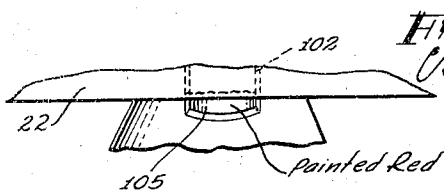
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3 Sheets-Sheet 2



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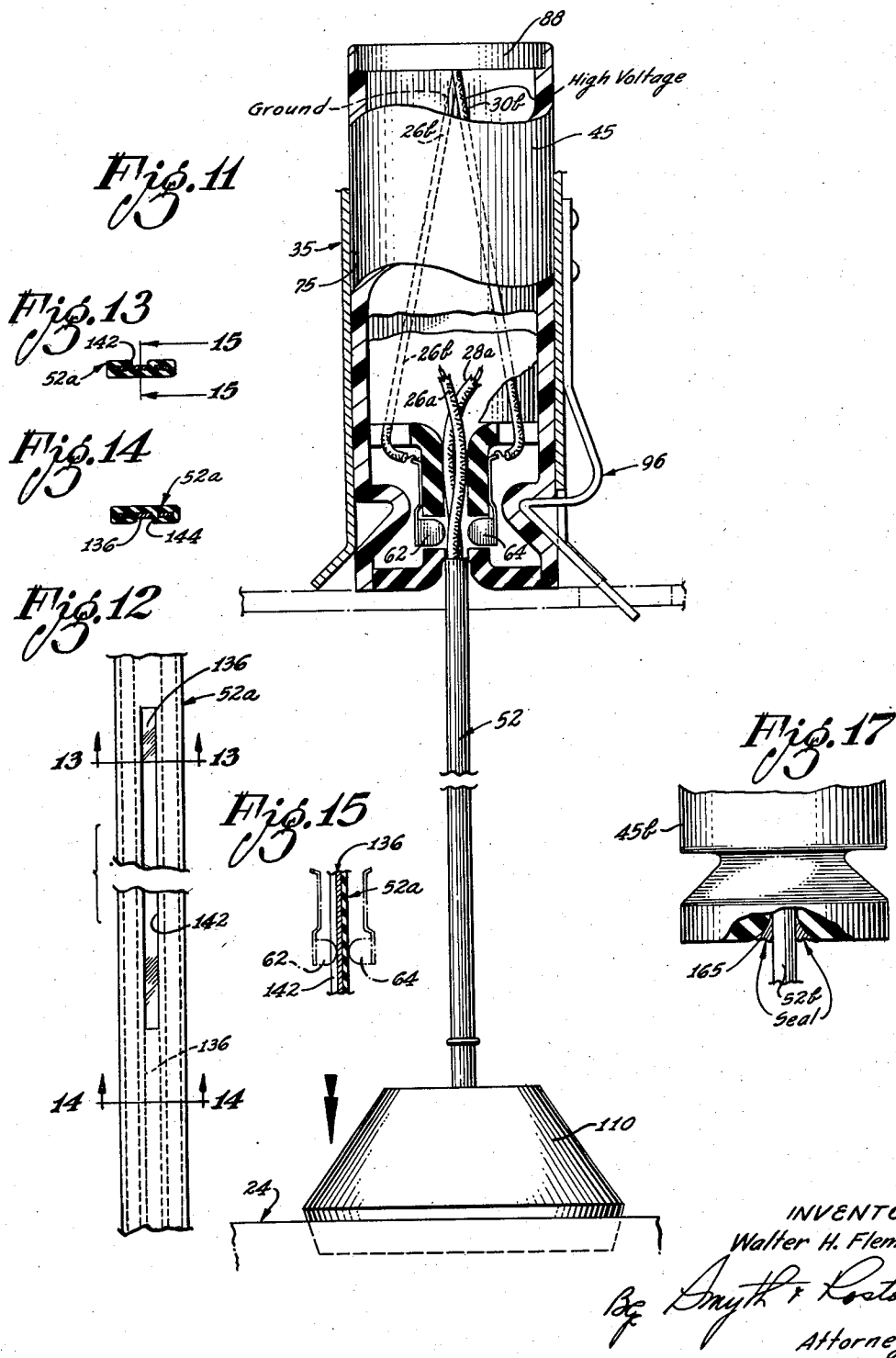
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3 Sheets-Sheet 3



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2,918,845

ELECTRIC ARMING DEVICE

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Application November 8, 1957, Serial No. 695,447

16 Claims. (Cl. 89—1.5)

This invention relates to means for transmitting electric current between two relatively moving devices. While the invention is broadly applicable for its basic purpose, it has special utility for electrically connecting a military device with a source of E.M.F. at a support device for a brief time period when the military device is being launched from the support device. For example, the invention may be used to arm a bomb as the bomb makes its initial movement in being launched from an aircraft. This particular practice of the invention has been selected for the present disclosure and will provide adequate guidance for those skilled in the art who may have occasion to apply the same principles to other particular purposes.

The selected embodiment of the invention is constructed specifically to meet the following set of requirements: a low voltage circuit must be established between the bomb and a low voltage source on the airplane prior to the launching period; the high voltage arming circuit components on the bomb must be connected to the aircraft electrical ground prior to the launching and until the bomb completes a small predetermined initial movement of sufficient extent to assure complete separation of the bomb from the airplane; when this initial separation movement is completed, the high voltage circuit components must be incorporated for a predetermined short period of time in a high voltage arming circuit energized by a high voltage source on the aircraft.

The invention has certain special features that increase its utility for its purpose. One of these special features is the concept of employing a flexible circuit control means to connect the military device with the support device, a substantial portion of this flexible means being stowed on one of the two devices and this stowed portion being formed with numerous bends to occupy a stowage space substantially shorter than the straight length of the stowed portion. The stowage space has a narrow exit for the flexible control means to cause unbending of the flexible means and progressive lengthwise travel of the flexible means through this exit when the military device is launched.

What may be termed a sensing station is provided at this exit for arming circuit control in response to the passage of the flexible means through the exit, there being what may be termed a control point on the flexible means which reaches the sensing station when the previously mentioned predetermined initial separation movement of the military device is completed. When this control point on the flexible means reaches the sensing station in the launching of a bomb, the high voltage circuit components on the bomb are automatically switched from being connected to the aircraft electrical ground being energized by the high voltage source, and energization by the high voltage source is maintained as the flexible means continues its travel past the sensing station. The flexible means incorporates a plurality of longitudinal conductors for completing the required circuit and when the relatively moving

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bomb reaches the distance afforded by the length of the flexible means, the flexible means breaks to sever all connections between the bomb and the aircraft.

To meet the above set of requirements, the flexible control means incorporates a low voltage conductor, a high voltage conductor and a ground conductor. During the initial passage of the flexible means past the sensing station at the exit of the stowage space, the high voltage conductor of the flexible means is connected to the aircraft electrical ground. When the previously mentioned control point on the flexible means reaches the sensing station, the high voltage conductor of the flexible means is automatically switched to the high voltage source. It is apparent that this sequence of steps requires a change in the character of the flexible means at the above mentioned control point thereon.

In the preferred practice of the invention, brushes or wipers are provided at the sensing station for contact with the conductors of the flexible means and the pattern of conducting and nonconducting material of the flexible means changes at the control point. Thus, a grounded wiper at the sensing station contacts conducting material on the surface of the flexible means to ground the bomb until the change in pattern of the traveling flexible means isolates the grounded wiper from the high voltage conductor and a second wiper at the sensing station energized by the high voltage source makes contact with conducting material on the flexible means to energize the arming circuit of the bomb. A special advantage of employing a flexible control means of nonconducting material with longitudinal conductors incorporated therein for cooperation with the stationary brushes is that the longitudinal conductors may extend along longitudinal grooves in the nonconducting material with the conductors spaced inwardly from the periphery of the flexible means. Thus, the longitudinal conductors are protected by adjacent nonconducting shoulders and the flexible means may strike a metal surface such as the surface of the bomb without any possibility of the recessed conductors being short-circuited.

In a second practice of the invention, the change in configuration of the flexible means at its control point is a change in cross-sectional dimension of the flexible means. Suitable switch means positioned at the sensing station for arming the bomb makes yielding contact with the flexible means and is actuated mechanically by the change in cross-sectional configuration of the flexible means.

With further reference to the preferred practice of the invention, another special feature is the employment of a flexible means of the character described which is in the form of a ribbon. When such a ribbon is folded flat between parallel walls in the stowage space it may be rapidly withdrawn without any tendency whatsoever to twist. Such a ribbon-like flexible means may incorporate a plurality of ribbon like conductors positioned for cooperation with corresponding wipers at the sensing station.

Still another special feature of the preferred practice of the invention is the stowage of the bent or folded portions of the flexible means in a casing or cartridge that is adapted to be removably mounted on one of the two devices. Preferably, the support device, in this instance the aircraft, is provided with a cylindrical socket and a cylindrically shaped stowage cartridge is retractably inserted into the socket. The socket may be advantageously formed with a bell mouth to facilitate insertion of the stowage cartridge.

A first set of contacts in the socket abuts a second set of contacts on the stowage cartridge when the cartridge is fully seated in the socket. Preferably, at least one of

these sets of contacts comprises concentric circular contacts so that the cartridge may be inserted at random rotary positions relative to the socket. It is contemplated that the stowed portion of the flexible means will be protected from extraneous electromagnetic radiations. A shield for this purpose may be incorporated in the construction of the cartridge but, preferably, is incorporated in the construction of the socket.

One end of the stowed flexible means is connected to the set of contacts that is carried by the stowage cartridge and the other end of the flexible means is connected to the military device. Preferably this second end of the flexible means is releasably connected to the military device so that the stowage cartridge may be readily separated from both the military device and the support device. In the preferred practice of the invention, a plug means at the second end of the flexible means mates with a receptacle means on the military device. Thus, in mounting the military device in preparation for launching, it is merely necessary to plug the flexible means into the military device and to insert the stowage cartridge into the socket in the support device.

A further special feature of the preferred practice of the invention is the provision of a manually releasable latch to retain the stowage cartridge in the socket. Preferably, a suitable spring means is provided in the socket to expel the cartridge automatically when the cartridge is released by the latch means. The preferred practice is further characterized by what may be termed warning means to indicate when the cartridge is not completely seated in the socket.

One advantage of using a stowage cartridge latched against withdrawal is that the cartridge may be salvaged for reuse if desired. Another advantage is that a used cartridge may be subsequently employed in a socket as a dummy to protect the socket between launching operations.

An important advantage of the use of a cartridge for stowage of the flexible means is that a seal may be provided around the flexible means at the exit of the stowage space to make the interior of the cartridge substantially fluid-tight. Such an arrangement provides full protection for the components inside the cartridge and is especially desirable for protection against moisture and fungus in the tropics.

The various features and advantages of the invention will be apparent from the following detailed description considered with the accompanying drawings.

In the drawings which are to be regarded as merely illustrative:

Figure 1 is a side elevational view of a bomb being carried by an aircraft with a selected embodiment of the present invention linking the bomb with the aircraft;

Figure 2 is a longitudinal sectional view of the embodiment of the invention employed in Figure 1, the parts being shown as positioned prior to launching of the bomb;

Figure 3 is a transverse section taken as indicated by the line 3—3 of Figure 2 showing the concentric set of contacts at the inner end of the cartridge;

Figure 4 is a transverse section taken as indicated by the line 4—4 of Figure 2 and showing the arrangement of the set of contacts on the plug means that mates with receptacle means on the bomb;

Figure 5 is a transverse section, taken as indicated by the line 5—5 of Figure 2, showing how the interior of the cartridge is divided by walls to provide a central longitudinal chamber for stowage of the flexible means;

Figure 6 is a side elevation of the flexible means shown in Figure 2;

Figure 7 is another side elevation of the flexible means at 90 degrees from the side elevation in Figure 6;

Figure 8 is an enlarged section through the flexible means taken as indicated by the line 8—8 of Figure 6;

Figure 9 is a fragmentary elevational view as seen along the line 9—9 of Figure 2, showing an indicator to

provide warning when the cartridge is inserted into the socket in a faulty manner;

Figure 10 is a wiring diagram of the circuit components employed in this first embodiment of the invention;

Figure 11 is a fragmentary view partly in section and partly in side elevation showing the stage in the launching operation at which the flexible means breaks from its anchorage in the cartridge;

Figure 12 is a fragmentary side elevation of a modified form of flexible control means that may be substituted for the flexible means used in Figures 1 to 11;

Figures 13 and 14 are cross sections of the modified flexible means taken as indicated by the lines 13—13 and 14—14, respectively, of Figure 12 and showing how the exposed conductors of the flexible means are positioned in protective grooves formed in nonconductive material;

Figure 15 is a fragmentary longitudinal section taken as indicated by the line 15—15 of Figure 13, showing the pair of brushes or wipers at a sensing station adjacent the modified flexible means for switching cooperation therewith;

Figure 16 is a view, partly in longitudinal section and partly in side elevation, showing a second embodiment of the invention; and

Figure 17 is a fragmentary view of the lower end of a cartridge, partly in elevation and partly in section, showing how the interior of the cartridge may be hermetically sealed if desired.

Figure 1 shows an aircraft 20 having a bomb rack 22 with a bomb 24 mounted thereon in a releasable manner by the usual shackles 25. Arming means, designated by letter A, constructed in accord with the present invention is provided to arm the bomb after the bomb is released by the shackles 25.

As shown in Figure 2 and indicated diagrammatically in Figure 10, the arming circuit on the aircraft includes: a wire 26 connected to the aircraft electrical ground; a wire 28 connected to a low voltage source, and a wire 30 connected to a high voltage source. The requirements for the arming operation to be performed by the arming device A are: first, that the high voltage arming circuit components of the bomb be connected to the aircraft electrical ground by the wire 26 until the moment the bomb is to be released; second, that the high voltage arming circuit components continue to be connected to the aircraft electrical ground until the launched bomb moves a minimum of one half inch away from the pylon to make sure that the bomb is not armed until it is completely disconnected from the aircraft; third, that after the initial bomb movement of one half inch, the high voltage arming circuit of the bomb be energized by the high voltage wire 30 for a requisite short period of time; and fourth, that the low voltage wire 28 be in communication with the low voltage arming circuit of the bomb prior to these various stages.

One embodiment of such an arming means to meet these requirements is illustrated in Figures 1 to 11 and a second embodiment is illustrated by Figure 16.

General arrangement and operation of the first embodiment

As best shown in Figure 2, the principal parts of the first embodiment of the invention include: a socket structure 35 incorporated in the pylon 22; a multiple-conductor cable 36 that includes the previously mentioned wires 26, 28 and 30; a first set of contacts at the inner end of the socket structure, including a central contact 38 connected to the high voltage wire 30, a pair of intermediate contacts 40 connected to the low voltage wire 28 and a pair of outer grounding contacts 42 connected to the grounded wire 26; a cartridge or casing 45 that is removably telescoped into the socket structure 35; a second set of contacts on the inner end of the cartridge 45, including a central high voltage contact 46

for cooperation with the previously mentioned central high voltage contact 38, a low voltage ring contact 48 for cooperation with the pair of low voltage contacts 40 and a grounding ring contact 50 for cooperation with the pair of grounding contacts 42; a multiple-conductor flexible control means, generally designated by numeral 52, including a ground wire 26a connected to the grounding ring contact 50, a low voltage wire 28a connected to the low voltage ring contact 48, and a flexible sheath 30a of conducting material, in this instance, fine woven wire, the function of which is to transmit high voltage current to the bomb; a longitudinal chamber 58 in the cartridge 45 serving as a stowage space for the flexible control means 52, with the flexible means stowed in a serpentine configuration as shown; an exit passage 60 from the stowage chamber 58 to the bottom end of the cartridge, the exit passage being only slightly larger in cross section than the flexible means to cause the flexible means to unbend; a pair of wipers or brushes 62 and 64 on opposite sides of the flexible means 52 at what may be termed a sensing station in the exit passage; a ground wire 26b connecting the wiper 62 with the grounding ring contact 50; and a high voltage wire 30b connecting the wiper 64 with the high voltage contact 46.

The flexible control means 52 is adapted at its lower end for connection to the bomb and is provided with certain areas of insulating coating on its conducting sheath to cause the two wipers 62 and 64 to function as switches for carrying out the desired predetermined sequence of operations. For this purpose a layer 70 of insulating material extends along the side of the conducting sheath 30a to electrically isolate the high voltage wiper 64. This layer 70 of insulating material terminates at the point 72, this point being the previously mentioned control point on the flexible means. This control point 72 reaches the pair of wipers 62 and 64 when the initial one half inch of travel of the bomb is completed. Beyond the control point 72, a second layer 74 of insulating material extends on the other side of the flexible means for electrically isolating the grounding wiper 62 from the conducting sheath 30a. Thus, at the control point 72, the traveling conducting sheath 30a is switched automatically from connection to ground to connection with the high voltage source.

The manner in which this first embodiment of the invention functions for its purpose may best be understood by reference to the diagram in Figure 10. While the bomb is supported by the pylon 22, the high voltage components of the arming circuit on the bomb are grounded, since these components are connected to the conducting sheath 30a, and the wiper 62 is in contact with the conducting sheath for connection to ground through the wires 26b and 26. The low voltage components of the arming circuit of the bomb are in communication with the low voltage source on the aircraft through wires 28a and 28.

When the bomb is released by the shackles 25 and travels one half inch from the pylon, the grounding wiper 62 remains in contact with the conducting sheath 30a to keep the high voltage arming circuit components of the bomb grounded. During this interval, the insulating layer 70 keeps the high voltage wiper 64 from making contact with the conducting sheath 30a.

At the completion of the initial one half inch of bomb travel the control point 72 of the flexible means 52 reaches the sensing station represented by two wipers 62 and 64, whereupon the second insulating layer 74 on the conducting sheath 30a electrically isolates the grounding contact 62 from the sheath and an instant later the high voltage wiper 64 makes contact with the sheath to complete the high voltage circuit to the bomb through wires 30b and 30 on one side of the circuit and through a grounding wire 26a on the other side of the circuit. This high voltage circuit remains effective until the flexible means 52 is pulled taut and the two wires 26a, 28a at the upper end of the flexible means break away

from the corresponding ring contacts 50 and 48 at the upper end of the cartridge 45. The flexible means 52 then completely withdraws from the cartridge 45 to follow the launched bomb as shown in Figure 11.

Structural details of the first embodiment of the invention

The socket structure 35 is in the form of a metal cylinder forming a cylindrical socket 75, the metal cylinder having an end wall 76 at its inner end. The outer end of the socket cylinder 35 is flared to form a bell mouth 78 and is further formed with a radial end flange 80 by means of which it is attached to the inner side of the bottom wall 82 of the pylon.

The previously mentioned first set of contacts comprising the contacts 38, 40 and 42 are mounted on a disc 84 of nonconducting material and, preferably, this disc is movable in the upper end of the socket 75 and is urged downward by suitable spring means thereby to exert downward force on the cartridge 45. For this purpose, a suitable coil spring 85 is confined between the upper side of the disc 84 and the end wall 76 of the socket cylinder. The wires of the cable 36 are bonded to the end wall 76, preferably in a sealed manner and are bowed between the end wall 76 and the disc 84 to follow the changes in position of the disc 84. This arrangement provides dimensional tolerance in that the disc 84 has a range of positions for mating with the concentric contact 46, 48 and 50.

The cartridge or casing 45 is of a cylindrical configuration to fit snugly in the cylindrical socket 75. The cartridge may be made of any suitable material, since the metal of the socket cylinder 35 serves as an effective shield to protect the components in the cartridge from extraneous electromagnetic radiations. The cartridge 45 is provided with an upper end wall 88 in which the second set of contacts 46, 48 and 50 are embedded. The cartridge 45 has a bottom end wall 95 which has an inwardly extending axial tubular portion 92 that forms the previously mentioned exit passage 60. The inner end of the tubular portion 92 is flared as shown.

The cartridge 45 may be secured in the socket 75 in any suitable manner, but preferably is retained by a manually releasable latch. For this purpose, the cartridge is restricted in diameter near its lower end to form a neck 94 that provides a downwardly directed annular shoulder 95 for releasable engagement by a latch 96. The latch 96 may be in the form of a bowed leaf spring member that is attached to the socket cylinder 35 by suitable rivets 98. The latch 96 is formed with a hook portion 100 to engage the annular shoulder 95 of the cartridge 45 and terminates in an outwardly inclined handle portion 102. The hook portion extends through a slot 103 in the socket cylinder 35 and the handle portion extends through a slot 104 in the pylon bottom wall 82 and the mounting flange 80 of the socket cylinder 35.

When the cartridge 45 is inserted into the socket 75, the bell mouth 78 guides the cartridge into the socket and the cartridge moving against the inclined handle 102 of the latch 96 forces the latch to flex outward to the position shown in broken lines 5 in Figure 2. When the cartridge is fully seated in the socket 75 with the two sets of contacts in mutual abutment, the hook portion 100 of the latch automatically snaps into position in engagement with the shoulder 95 of the cartridge. The tip portion 105 of the latch handle 102 is preferably painted red to serve as an indicator that is responsive to complete insertion of the cartridge 45 into the socket 75. If the cartridge 45 is only partially inserted into the socket 75, the latch 96 is flexed to the position shown in broken lines in Figure 2 so that the latch is completely concealed inside the pylon; when the cartridge is fully inserted however, the latch 96 assumes its normal position in engagement with the cartridge shoulder 95 as shown.

in solid lines in Figure 2, and the tip portion 105 of the latch handle is visible below the pylon below the bottom of the bomb rack as shown in Figure 9.

It is to be noted that when the cartridge 45 is in its completely inserted position shown in Figure 2, the coiled spring 85 is in substantial compression between the disc 84 and the inner end wall 76 of the socket cylinder 35. Consequently, when the handle 102 is subsequently manipulated to move the latch 96 to its release position, the coil spring 85 expands to expel the cartridge 45 from the socket 75.

The cylindrical cartridge 45 has two parallel interior longitudinal walls 106, as best shown in Figure 5, which divide the interior of the cartridge into the previously mentioned longitudinal chamber 58 and two longitudinal compartments 108 on opposite sides of the chamber. The two parallel walls 106 are spaced apart only slightly more than the width of the flexible control means 52. It has been found that if the flexible means 52 is of a ribbon-like configuration and is folded back on itself in a serpentine manner as shown in Figures 2 and 5, and if the serpentine portion of the flexible member is confined between the parallel walls 106, there will be no tendency for the flexible means to twist as it unfolds and slips downward through the exit passage 60. The two compartments 108 provide space for the two wires 26b and 30b so that these wires do not interfere with the flexible means 52.

Preferably, the lower end of the flexible control means 52 is adapted for manual attachment to the bomb 24. In the present embodiment of the invention, the flexible control means 52 terminates at its lower end in a plug means 110 that is insertable into complementary receptacle means in the bomb 24.

As indicated in Figure 1, the plug means 110 may comprise a body of nonconducting material, such as a suitable synthetic resin, with the lower end of the flexible means 52 embedded therein. The ground wire 26a of the flexible control means 52 has two branches 26c that are embedded in the plug means 110 and terminate at a pair of ground contacts 112 on the lower face of the plug means. In like manner, the low voltage wire 28a of the flexible control means 52 has a pair of branches 28b that connect with a pair of contacts 114 on the bottom face of the plug means 110. The conducting sheath 30a of the flexible control means 52 is connected by an embedded wire 115 with a partially embedded metal pin 116 which has a ball end.

The complementary receptacle means on the bomb 24 to receive the plug means 110 may be of the construction shown in Figure 2. The receptacle means includes a disc 120 of nonconducting material having a central bore 122 to clear the plug pin 116 and having two embedded ring contacts 124 and 125. The ring contact 124 is positioned to abut the pair of ground contacts 112 and the ring contact 125 is positioned to abut the pair of low voltage contacts 114. The two ring contacts 124 and 125 are connected to the arming circuit of the bomb by suitable wires 126 and 128 respectively.

The receptacle means of the bomb 24 is also provided with additional high voltage contact means for engagement with the ball end of the metal pin 116 and in this particular practice of the invention it is contemplated that the engagement with the metal pin will be effective to cause the flexible control means 52 to break away from its anchorage at its upper end in the cartridge 45. As best shown in Figure 2, a contact means for this purpose may comprise a metal disc 130 which is connected to the arming circuit of the bomb by a wire 132. The metal disc 130 has a central aperture 134 which is ringed by inwardly directly flexible tongues 135. When the plug means 110 is inserted into the receptacle means of the bomb, the metal pin 116 enters the central aperture 134 and the flexible tongues 135 first flex to pass the ball end of the pin and then return to their normal positions for engag-

ing the ball end in the manner shown in Figure 2. It will be noted that the flexible tongues 135 are slightly bent downward to engage back of the ball end so that the flexible tongues engage the pin 116 in a positive manner to afford relatively high resistance to withdrawal of the plug means from the receptacle means.

It is contemplated that the arming unit comprising the cartridge 45, the flexible control means 52 and the plug means 110 will constitute a separate piece of equipment for installation only when a bomb is mounted on an aircraft for a military mission. This unit may be initially connected either to the airplane or to the bomb. In one procedure, for example, the unit is first mounted on the aircraft by inserting a cartridge 45 into the socket 75 to cause the cartridge to be automatically engaged by the latch 96. The bomb is then maneuvered into its shackled position in such manner as to cause the metal pin 116 of the plug means 110 to make positive engagement with the flexible contact tongues 135 thereby to cause mating of the other contacts of the plug and receptacle. An alternate procedure may be followed in which the unit is first mounted on the bomb by forcing the plug means 110 into engagement with the receptacle means of the bomb 24 and then maneuvering the bomb into its shackled position in such manner as to cause the cartridge 45 to be inserted into the socket 75. In either procedure care is taken to observe the red tip 105 of the latch handle 102 to make sure that the cartridge is fully seated with the two sets of contacts in cooperating abutment at the inner end of the cartridge.

In the preferred practice of the invention, the latch 96 engages the cartridge 45 with sufficient effectiveness to cause the inner end of the flexible control means 52 to break away from the cartridge and leave the cartridge in the socket 75. Thus, the cartridge may be salvaged for reuse if desired and a used cartridge may be employed as a dummy inserted into the socket 75 to protect the socket for future service.

Figures 12 to 15 illustrate a flexible control means 52a of ribbon-like configuration that may be substituted for the above described flexible control means 52. The flexible control means 52a comprises a ribbon of nonconducting material, preferably a suitable synthetic resin, in which are embedded three small ribbon-like conductors, namely, a central high voltage conductor 136 which corresponds in function to the conducting sheath 30a of the flexible means 52, a low voltage conductor 138 corresponding to the previously mentioned low voltage wire 28a, and a grounding conductor 140 corresponding to the grounding wire 26a. A longitudinal groove 142 of the same length as the previously mentioned insulating layer 74 on the flexible means 52 is provided in the flexible means 52a to expose a corresponding portion of the high voltage conductor 136. On the other side of the flexible means 52a, a second similar longitudinal slot 144 (Figure 14) is provided to expose a lower portion of the high voltage conductor 136 on the other side of the flexible means.

When the bomb is in its shackled position, the previously mentioned grounding wiper 62 extends into the slot 144 into contact with the high voltage conductor 136 and at this time the high voltage wiper 64 is electrically isolated from the high voltage conductor 136 as may be seen in Figure 15. When the control point of the longitudinally traveling flexible control means 52a reaches the two wipers 62 and 64, the grounding wiper 62a is electrically isolated from the high voltage conductor 136 and an instant later the high voltage wiper 64 enters the groove 142 to make contact with the high voltage conductor. Thus, the flexible means 52a functions in the same manner as the previously described flexible means 52 and may be substituted for the flexible means 52.

An important advantage of the flexible means 52a is that the high voltage conductor 136 is spaced inwardly from the peripheral surface of the flexible means. With

the high voltage conductor 136 protected in this manner, the flexible means 52a may flap against the metal surface of the bomb without any possibility of the high voltage conductor 136 being shorted to the metal surface of the bomb.

The second embodiment of the invention shown in Figures 16 and 17

The second embodiment of the invention is largely similar to the first described embodiment as indicated by the use of corresponding numerals to indicate corresponding parts. The cartridge 45a is of the same general construction as the previously described cartridge 45 and is provided at its upper end with the usual set of contacts comprising a central high voltage contact 46a, an intermediate low voltage contact ring 48a and an outer grounding contact ring 50a.

Instead of the two previously described wipers 62 and 64, the sensing station in the exit passage 60 is provided with a single wiper element 145 which functions as a cam follower to respond to the changes in cross-sectional configuration or dimension of a flexible control means 52b. The wiper element 145 is mounted on a flexible switch arm 146 which resiliently urges the wiper element against the peripheral surface of the flexible control means 52b and this switch arm is connected to the pin 116a by a wire 147. When the portion of the flexible control means 52b adjacent the wiper element 145 is reduced in cross section, the switch arm 146 rests against a switch contact 148 which is connected to the grounding ring contact 50a by a grounding wire 150. When a portion of the flexible means 52b of larger cross-sectional dimension is opposite the wiper element 145, the switch arm 146 rests against a second high voltage switch contact 152 which is connected to the high voltage contact 46a by a high voltage wire 154.

The flexible control means 52b has three longitudinal conductors incorporated therein, namely: the previously mentioned high voltage wire 147 that connects the flexible switch arm 146 with a high voltage pin 116a of the plug means 110a; a low voltage conductor 156 that is connected to the low voltage ring contact 48a and has two branches 156a to a pair of low voltage contacts 114a on the plug means 110a; and a third grounding conductor 158 that is connected to the grounding ring contact 50a and has two branches 158a to a pair of grounding contacts 112a on the plug means 110a.

The flexible control means 52b is stowed in the cartridge 45a in the manner heretofore described. A lower portion 160 of the flexible control means 52b is relatively small in cross section and terminates at a control point 162 where the cross-sectional dimension of the flexible means increases to what may be termed its full thickness. The remaining portion of the flexible control means 52b may be of this full thickness.

The manner in which this second embodiment of the invention operates may be understood from the foregoing description. When the bomb is shackled to the pylon of the aircraft, the parts are in the position shown in Figure 16 with the wiper element 145 resting against the lower portion 160 of reduced thickness of the flexible control means 52b. At this time, the high voltage contact 116a of the plug means 110a is grounded, the path to ground including the wire 147 of the flexible control means 52b, the grounding switch contact 148, and the grounding wire 150 from the switch contact 148 to the grounding ring contact 50a.

When the released bomb completes its first half inch of travel, the control point 162 of the flexible control means 52b reaches the wiper element 145 and the increased cross-sectional dimension of the flexible control means causes the switch arm 146 to swing away from the grounding switch contact 148 to the high voltage switch contact 152. The high voltage pin 116a of the plug means 110a is then energized from the high voltage source, the path of current flow including high voltage contact 46a,

high voltage wire 154, high voltage switch contact 152, switch arm 146, and wire 147 from the switch arm to the pin.

The stowage cartridge may be hermetically sealed, if desired. For this purpose, the flexible means 52 in Figure 2 may be provided with a sealing O-ring 164 and the flexible means 52a in Figure 16 may be provided with a similar O-ring 164a. Figure 17 shows how a cartridge 45b may be sealed instead by a suitable adhesive or sealant 165 surrounding a flexible control means 52b.

My description in specific detail of the selected embodiments of the invention will suggest various changes, substitutions and other departures from my disclosure within the spirit and scope of the appended claims.

What is claimed is:

1. Means for arming a device by means of an E.M.F. source as the device is separated from a support means that temporarily supports the device and then releases the device, said E.M.F. source being associated with the support device, said arming means comprising: an elongated flexible control means having one end anchored to said device; means on said support means providing a stowage space for a portion of the flexible control means, said stowage space having a restricted exit, the other end of the control means being anchored in said stowage space, said portion of the control means being of a length substantially greater than the length of the stowage space and having numerous bends to occupy the stowage space whereby withdrawal of said portion from the stowage space through said restricted exit causes unbending of said portion of the control means and progressive lengthwise passage of the flexible means through the exit when said device is separated from the support means; a conductor carried by said flexible means longitudinally thereof; and means carried by said support means at a sensing station in the region of said exit to connect said device to said source through said conductor to complete a circuit in response to a predetermined extent of initial passage of said portion of the control means through said exit.

2. A combination as set forth in claim 1, in which said conductor of the flexible control means is exposed at the surface of the flexible means and is electrically connected with said device; and which includes two wipers in the region of said exit, one of said wipers being grounded for initial grounding of said conductor, the other wiper being connected with said source to energize said conductor at the end of said initial passage of the flexible means.

3. A combination as set forth in claim 1, in which the cross-sectional dimension of said flexible means changes at a predetermined control point along its length; and in which said means at the sensing station makes predetermined changes in said circuit means in response to said change in the cross-sectional dimension of the flexible means.

4. A combination as set forth in claim 3, in which said responsive means at said sensing station is in yielding contact with the flexible means for mechanical actuation thereby in response to the cross-sectional change of the flexible means as the flexible means passes the sensing station.

5. A combination as set forth in claim 1, which includes a shield to surround the stowed portion of said flexible means for protection of said conductor against extraneous electromagnetic radiations.

6. A combination as set forth in claim 1 in which said exit is restricted to substantially the thickness of said flexible control means.

7. A combination as set forth in claim 1 in which said flexible control means is in the form of a ribbon and said exit is restricted to substantially the thickness of said ribbon with at least a portion of said conductor exposed on one face of said ribbon.

8. A combination as set forth in claim 7 in which the portion of the ribbon-shaped flexible conductor means

that is stowed in said stowage space is of serpentine configuration.

9. Means for arming a device by means of an E.M.F. source associated with a support means as the device is separated from the support means, comprising: a first set of contacts on said support means; a casing removably mounted on said support means adjacent said first set of contacts; a second set of contacts on said casing for cooperation with said first set, said two sets including cooperating contacts to connect said source with said device; an elongated flexible control means for connection at one end thereof with said device, said flexible means incorporating a plurality of longitudinal conductors connected with corresponding contacts of said second set, said flexible means being stowed in said casing and having numerous bends therein to occupy a stowage space substantially shorter than a straight length of the stowed portion of the flexible means, said casing having a narrowed exit for said flexible means to cause unbending of the flexible means and progressive lengthwise passage of the flexible means through the exit when the device is separated from said support means; and means carried by said casing in the region of said exit to connect said device to said source through said conductors in response to a predetermined extent of initial passage of said flexible means through the exit.

10. A combination as set forth in claim 9 which includes latch means to releasably retain said casing and, in which said latch means includes warning means to indicate when the casing is incorrectly mounted with the two sets of contacts out of mutual abutment.

11. A combination as set forth in claim 9 in which said casing is of circular cross section; and in which at least one of said sets of contacts comprises concentric

circular contacts to permit random circular positioning of the casing in the socket.

12. A combination as set forth in claim 9 which includes a socket on said support means to receive said casing and in which said socket is surrounded by shield means to protect said conductors from extraneous electromagnetic radiations.

13. A combination as set forth in claim 9 which includes a socket on said support means to receive said casing and in which said socket has a bell mouth to facilitate insertion of said casing.

14. A combination as set forth in claim 9 in which said support means has a socket opening onto its exterior with said first set of contacts in the socket; and in which said casing is insertable into said socket for retention therein.

15. A combination as set forth in claim 14, in which said socket and casing are of circular cross section; and in which at least one of said sets of contacts comprises concentric circular contacts to permit random circular positioning of the casing in the socket.

16. A combination as set forth in claim 14, which includes spring means in said socket to eject said casing therefrom; and which includes a manually releasable latch to retain the casing in the socket.

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