Jan. 28, 1958 J. F. HORDECHUCK 2,821,602

TRIGGER MEANS

Filed March 23, 1955 4 Sheets-Sheet 1

Fig. 1

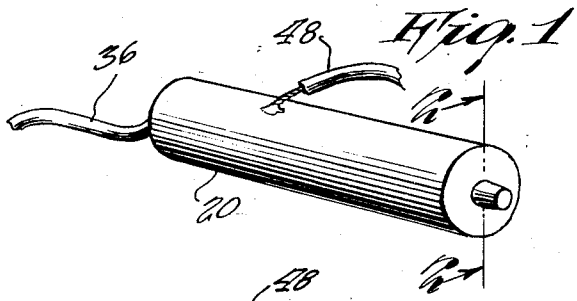



Fig. 2

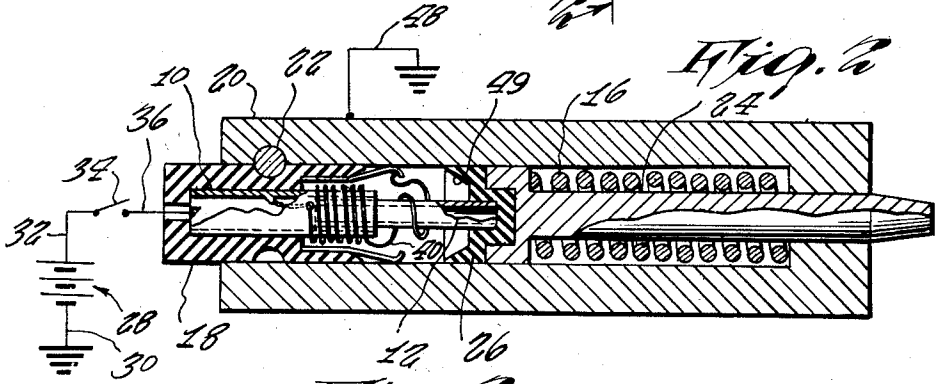



Fig. 3

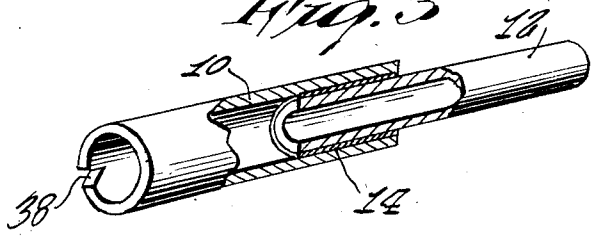



Fig. 4

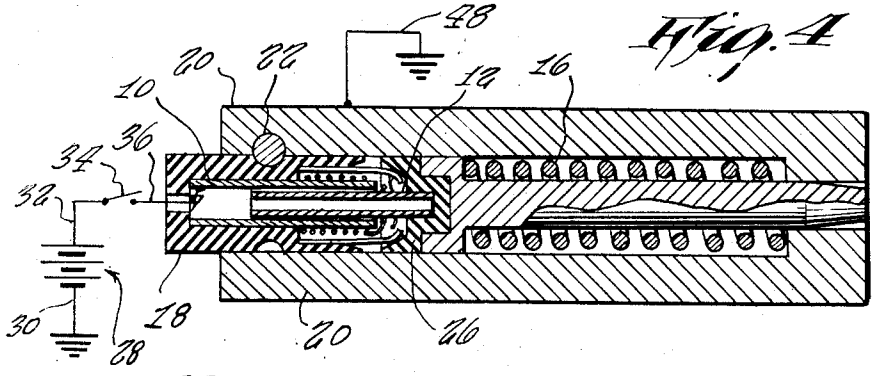
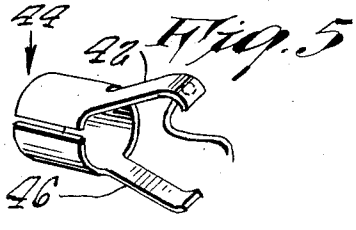



Fig. 5




INVENTOR.
JOHN F. HORDECHUCK
BY
Thomas, Holte Evans & Berry
ATTORNEYS

Jan. 28, 1958 J. F. HORDECHUCK 2,821,602

TRIGGER MEANS

Filed March 23, 1955 4 Sheets-Sheet 2

Fig. 6

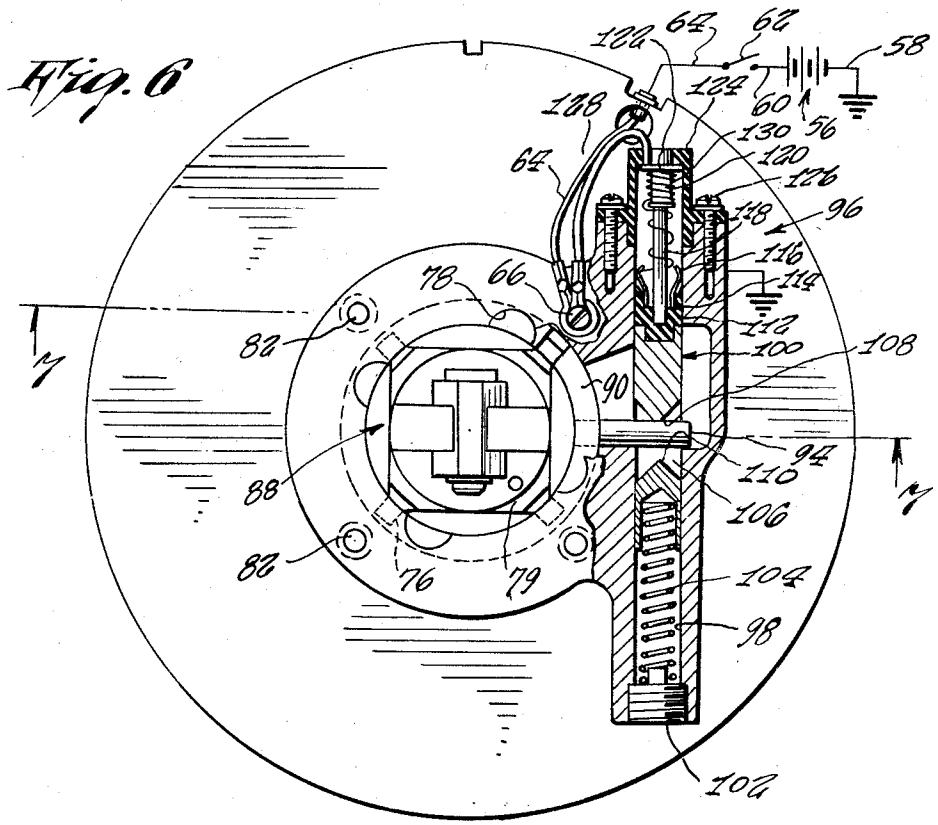
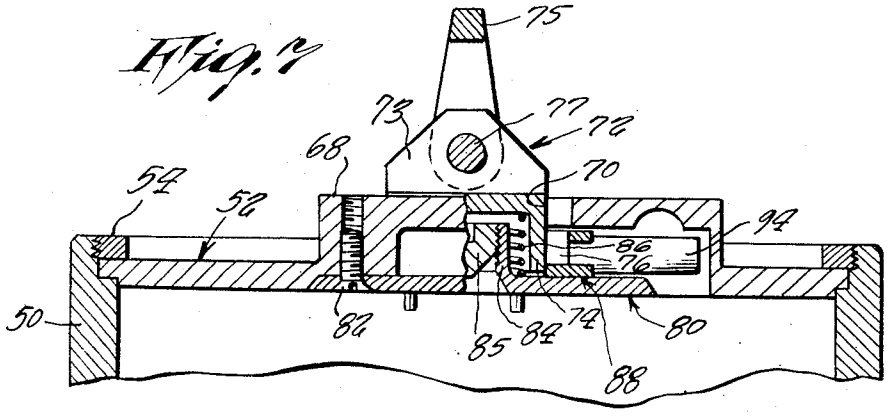



Fig. 7




INVENTOR.
JOHN F. HORDECHUCK
BY
Mosser, Kolle, Cowie & Berry
ATTORNEYS

Jan. 28, 1958 J. F. HORDECHUCK 2,821,602

TRIGGER MEANS

Filed March 23, 1955 4 Sheets-Sheet 3

Fig. 8

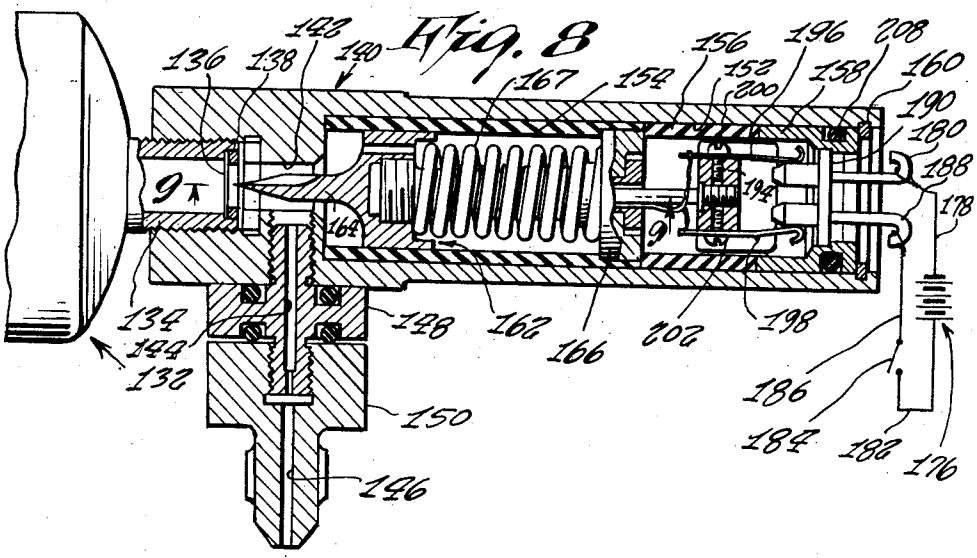



Fig. 9

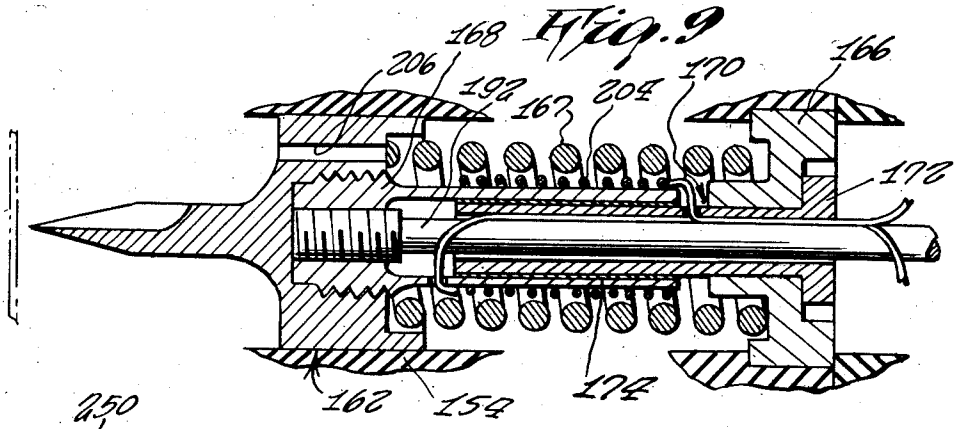
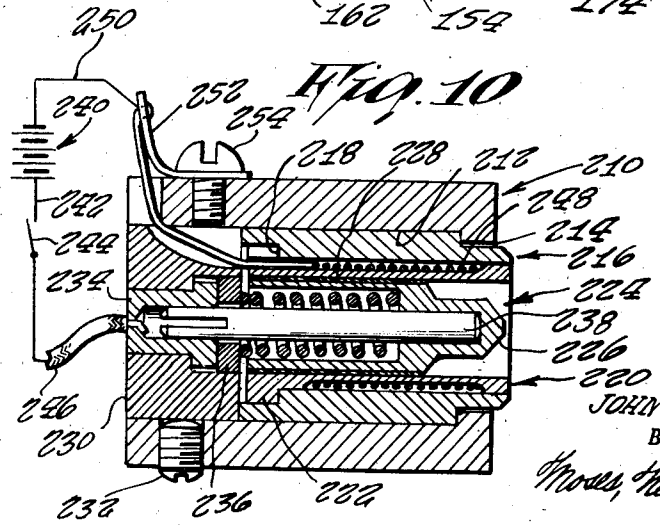



Fig. 10

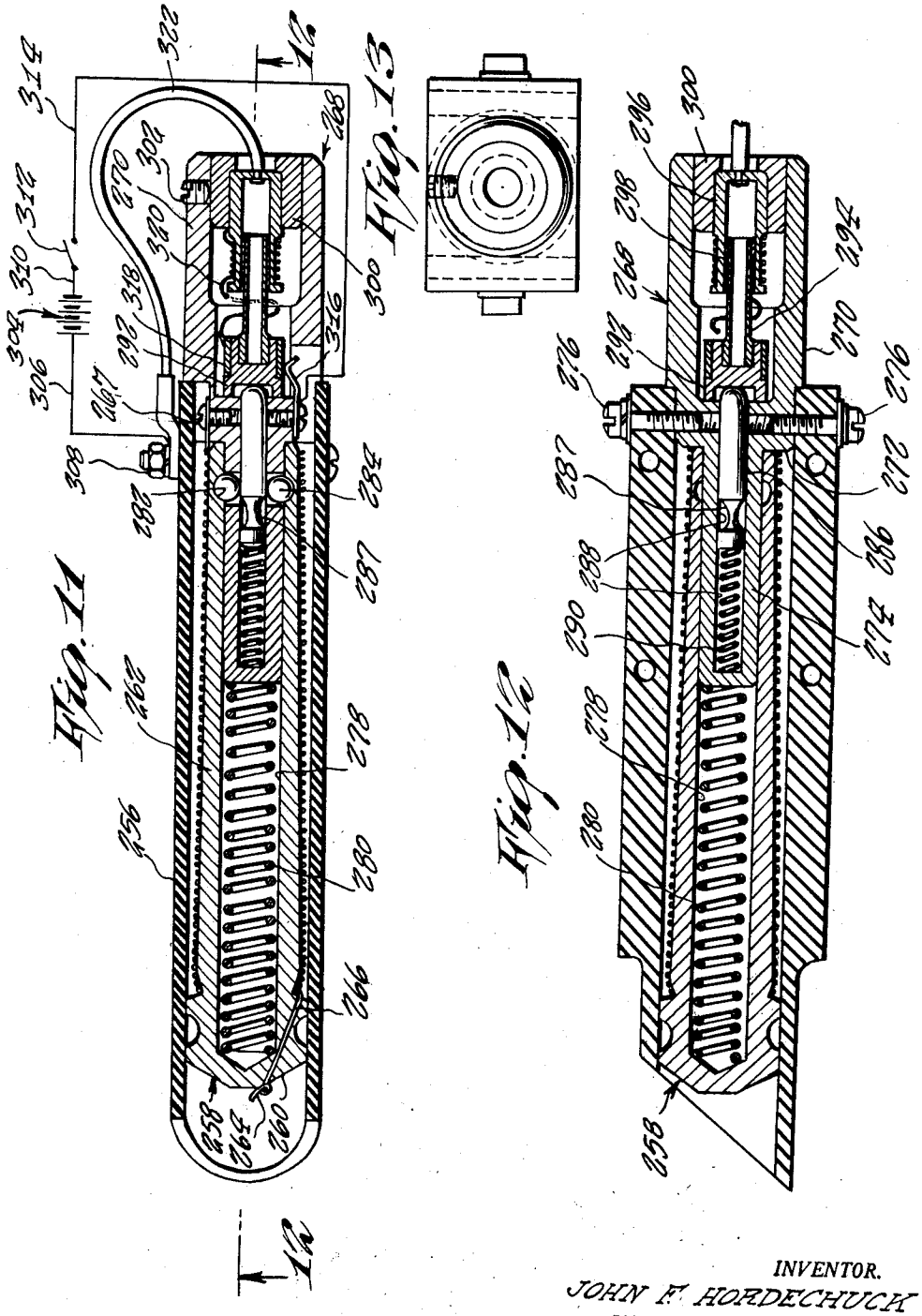



INVENTOR.
JOHN F. HORDECHUCK
BY
Moses, Holte, Crews & Berry
ATTORNEYS

Jan. 28, 1958 J. F. HORDECHUCK 2,821,602

TRIGGER MEANS

Filed March 23, 1955 4 Sheets-Sheet 4



INVENTOR.
JOHN F. HORDECHUCK
BY
Mosser, Kolle, Cross & Berry
ATTORNEYS

United States Patent Office 2,821,602 Patented Jan. 28, 1958



2,821,602

# TRIGGER MEANS

John F. Hordechuck, Forest Hills, N. Y., assignor to The W. L. Maxson Corporation, New York, N. Y., a corporation of New York

Application March 23, 1955, Serial No. 496,246

12 Claims. (Cl. 200—123)

This invention relates to trigger means for dependably storing mechanical energy and for releasing it on demand in response to the application of a very light actuating or tripping force.

Purely mechanical tripping or trigger devices are subject to several drawbacks. A very important drawback is that the force to be held in check is restrained by the action of relatively movable surfaces which have frictional engagement with one another. The restrained force presses the surfaces together, introducing frictional resistance to the relative movement of the surfaces which is proportional to the restrained force.

A second drawback is that rust and dirt sometimes cause sticking of metallic trigger parts which remain in fixed contact with one another for protracted periods, causing the parts not to respond when operation is desired.

Still another drawback is the susceptibility of mechanica trigger mechanism to premature tripping in response to jolting of the trigger control mechanism.

An alternative to simple mechanical trigger control is switch controlled trigger mechanism. In such mechanism the switch itself may be made easily and dependably responsive to very light operating force, but the locking means is still subject to frictional resistance, to sticking, and to premature accidental tripping when a blow is sustained. Electrical tripping, moreover, involves the employment of an electromagnet and this adds to the weight and expense of the equipment.

In accordance with the present invention these drawbacks are overcome and a very simple, economical and dependable trigger means is provided in the form of a fusible release. Two relative movable members, spring urged toward or from one another, have a solder joint formed between them, and are restrained against relative movement by the solder. An electrical heating coil is provided in proximity to the solder, being connected in circuit with a suitable source of electrical energy and with a simple, easily actuated switch. Upon closing of the switch the solder is melted and the parts are moved relative to one another by the spring to bring about a desired operation.

The switch is desirably of a kind which remains closed, once it has been closed, in order to assure the melting of the solder. It is important, however, that means be provided for automatically cutting off the flow of current once the desired tripping action has been achieved, and means are accordingly provided, responsive to the tripping action, for breaking the electrical circuit independently of the switch which was operated to close the circuit.

Other objects and advantages will hereinafter appear.

In the drawing forming part of this specification:

Figure 1 is a perspective view of a fusible release device with automatic cut-off embodying features of the invention;

Figure 2 is a longitudinal sectional view of the device



of Fig. 1, the section being taken upon the line 2—2 of Figure 1, looking in the direction of the arrows;

Figure 3 is a perspective detail view of the solder connected members of Figs. 1 and 2;

Figure 4 is a view similar to Fig. 2 but showing the parts in the relative positions occupied by them after the tripping action has occurred;

Figure 5 is a perspective detail view showing a spring contact device employed in the fusible release mechanism of Figs. 1 to 4;

Figure 6 is an end view, partly in section, showing a locking mechanism controlled by a fusible release device with automatic cut-off;

Figure 7 is a sectional view taken on the line 7—7 of Fig. 6, looking in the direction of the arrows;

Figure 8 is a fragmentary sectional view showing a diaphragm piercing mechanism which embodies the fusible release and automatic cut-off features of the invention;

Figure 9 is a fragmentary enlarged sectional view showing certain features not fully shown in Fig. 8;

Figure 10 is a sectional view showing a further modified fusible release and automatic cut-off device;

Figure 11 is a sectional view of a further modified structure involving a fusible release with automatic cut-off;

Figure 12 is a sectional view taken on the line 12—12 of Fig. 11, in the direction of the arrows; and

Figure 13 is an end view of the device of Figs. 11 and 12 as seen from the right end of Fig. 11.

In Figs. 1 to 5 disclosure is made of a fusible release device whose characteristic action is to retract a plunger. The plunger itself may serve before retraction as a detent or trigger for a powerful catapult.

The device of Figs. 1 to 5 comprises two metallic tubes **10** and **12** which are overlapped and secured against relative movement by solder **14** to form a rigid unitary member This member is used to restrain a compression coil spring **16**. The amount of force which can be restrained is determined by the area of the solder joint.

The tube **10** fits into an insulated housing **18** which, in turn, is housed within a metallic cylinder **20**. The housing **18** is positively fixed against movement relative to the cylinder **20** by a cross pin **22**. The spring **16** is lodged in the right end of the cylinder **20** and surrounds the shank of a headed plunger pin **24**, bearing at one end against the right end of the cylinder and at the opposite end against the head of the pin **24**. An insulating camming cap **26** is secured on the left end of the plunger pin **24**, and is formed with a recess in which the right end of the tube **12** is fitted. It will be seen that the force of the spring **16** is applied through the head of the pin **24**, the cap **26**, and the tube **12** to the solder joint, the thrust of the spring being fully sustained by the solder.

Provision is made of means for electrically melting the solder when it is desired to retract the plunger pin **24**. A suitable source of electrical energy, for example a battery **28**, has one of its terminals connected through a conductor **30** to ground. The opposite battery terminal is connected through a conductor **32**, switch **34** and conductor **36** to the tube **10**. The tip of conductor **36** is inserted in a notch **38** formed in an end of the tube **10** and soldered in place.

The tube **10** is itself conductive, and has one end of an insulated electrical heating coil **40** soldered to it. The opposite end of the coil **40** is connected to an arm **42** of a spring contact device **44**. The device **44** is in the form of a split sleeve having contact fingers **42** and **46** integral with it. The sleeve portion of the contact device **44** is fitted in an enlarged, bored portion of the housing member **18**, and the arms **42** and **46** extend out of the bore and into contact with the cylinder **20**, the

latter being composed of conductive material. The cylinder 20 is connected to ground through a conductor 48.

When the switch 34 is closed, current flows from the battery through the heating element 40. The element 40 closely surrounds the solder joint and quickly melts the solder. When this occurs the solder suddenly gives way and the spring 16 is immediately effective to project the pin 24, the cap 26, and the tube 12 toward the left hand position illustrated in Fig. 4. In that position the pin 24 has been drawn completely into the cylinder 20.

Although the switch 34 is designedly of a type which remains closed when moved to a closed position, it is not desirable that the current be wasted after the desired operation of the pin 24 has been effected. Provision is therefore made for the cap 26 to engage the arms 42 and 46 and cam them inward away from the cylinder 20 as the cap moves from the position of Fig. 2 to the position of Fig. 4. The cap is accordingly formed with a conical inner surface 49, and fingers 42 and 46 are formed with inturned ends engageable by such surface and adapted to be cammed inward by it to break the circuit. Since the parts remain in the Fig. 4 relationship at the conclusion of an operation, the current flow which is terminated by the camming action cannot be resumed.

Figs. 6 and 7 disclose another form of the invention employed for holding two connected bodies together but operable to detach them from one another. Specifically, it may be assumed for illustrative purposes that the intention is to drop a device by parachute and automatically to detach the parachute after the device has landed on the ground.

The device to be dropped comprises a cylinder 50 which includes an end closure member 52 and a retaining ring 54 threaded into an end of cylinder 50. The cylinder may contain various mechanisms of no specific concern here. It contains among other things, however, a battery 56 which has one terminal connected to ground through a conductor 58 and the opposite terminal connected through a conductor 60, a switch 62 and a conductor 64 to an insulated terminal screw 66 which is provided on a central circular raised portion 68 of the closure member 52.

The raised portion 68 is formed with a central opening 70 in which a circular block 72 is received. The block 72 includes a rib member 73 to which a parachute ring 75 is pivotally connected through a pivot pin 77. The block 72 is hollow, being formed with a circular skirt portion 74 and with a generally square flange 79 which surrounds the skirt, from the corner portions of which integral lugs 76 project outward at quadrangularly related points. Notches 78 are provided in the raised portion 68 of the closure member at quadrangularly related points, through which notches the lugs 76 may pass inward or outward when the lugs are aligned with the notches.

An abutment plate 80 is secured to the closure member 52 by screws 82, the plate being formed with a circular neck 84 which extends upward within the skirt 74, and into which a plug 85 is threaded. A compression coil spring 86 surrounds the neck 84 within the skirt 74, bearing at its lower end against the plate 80 and at its upper end against the block 72. The spring 86 is capable of separating the block 72 completely from the closure member 52 when the lugs 76 are aligned with the notches 78, but until such separation is desired the lugs are maintained out of alignment with the notches.

An operating and controlling disc 88 rests upon the plate 80 in surrounding relation to the lower extremity of the main body of the block 72. The disc 88 is formed with four raised arcuate flange segments 90, each of which extends between two adjacent lugs 76, thereby controlling the angular position of the block 72. The flange 79 of the block 72 rests longitudinally upon the disc 88 with the lugs 76 located in the notches between adjacent flange segments 90 of the disc 88. One of the segments 90 has a control handle 94 secured to it. The handle is normally maintained in the angular position indicated in Fig. 6 by a fusible release device 96 which is housed in the raised portion 68 of the closure member 52.

The member 68 is formed with a bore 98 in which a slide 100 is mounted. One end of the bore is closed by a threaded plug 102. A compression coil spring 104 bears at one end against the plug 102 and at the opposite end against the slide 100, being received in a hollow portion at the end of the slide. The slide 100 has a transverse passage 106 formed through it which receives the handle 94. At opposite sides of the handle the slide is tapered to provide edges 108 and 110 for engaging the handle. The edges 108 and 110 are spaced apart by a distance considerably greater than the thickness of the handle to provide a desired amount of lost motion. As seen in Fig. 6 the handle is detained by the edge 108 in position to maintain the lugs 76 out of alignment with the notches 78.

At the end opposite the spring 104 the slide bar is provided with an insulating cap 112 in which a conductive ring 114 having contact fingers 116 is secured. A tube 118 abuts the cap and extends into a tube 120, being soldered to the tube 120 to make the two tubes unitary. The tube 120 is of conductive material and is provided with a conductive collar 122 which bears against an insulating cap 124. The cap 124 is secured by screws 126 in position to cover the second end of the bore 98. With the parts as described and shown the thrust of the spring 104 is transmitted through the slide rod 100, the cap 112, the tubes 118 and 120 including the solder joint between them, and the collar 122 to the insulating cap 124.

The conductor 64 is connected through a conductor 128, collar 122 and tube 120 to a heating coil 130 which surrounds the solder joint. The opposite end of the coil 130 is connected to one of the fingers 116 of the ring 114. As shown in Fig. 6, both fingers 116 are grounded through engagement with the conductive member 68.

When the switch 62 is closed a circuit from the battery 56 through the heating coil 130 is completed. When the solder joint is melted the solder gives way and the slide bar 100, impelled by the spring 104, forces the arm 94 in a counter-clockwise direction. This causes the ring 88 to turn the block 72 counter-clockwise for aligning the lugs 76 with the notches 78. As soon as the lugs move into alignment with the notches the block 72 is freed from the restraint exercised by the member 68. The block 72 is therefore hurled clear of the closure member 52 by the action of the spring 86, causing the parachute to be detached from the closure member.

With the yielding of the solder point the contact arms 116 are caused to slide beyond the end of the conductive surface of the bore 98 and into engagement with the insulating cap 124. This breaks the circuit, putting an end to the consumption of electrical energy even though the switch 62 remains closed.

In Figs. 8 and 9 disclosure is made of a fusible release mechanism which controls a piercing plunger designed to pierce a confining diaphragm and thereby to release a compressed gas, such as carbon dioxide, from a container, causing it to be delivered to a desired destination.

A compressed gas container 132, filled with a compresed gas such as carbon dioxide, is provided with an externally threaded neck 134. A closure diaphragm 136 is secured in the neck across the mouth of the container by a retaining ring 138. A cylindrical fitting 140 is threaded onto the bottle neck and carries a piercing plunger and fusible release mechanism therefor, which will be described.

As the parts are shown the diaphragm has not been perforated, and hence the gas under pressure is confined in the container 132, but provision is made for delivering the gas to any desired destination when the diaphragm is punctured. Upon puncturing of the diaphragm the gas flows through a passage 142 of the fitting 140 and thence

through passages 144 and 146 of fittings 148 and 150, respectively. From the latter fitting the gas may be conducted to any destination desired.

The fitting 140 is formed with a cylindrical bore 152. The bore contains successively from left to right, an insulating sleeve 154 which has an internal rabbet at its right hand end, a second insulating sleeve 156, and a retaining sleeve 158, all pressed together and held in place by a retaining ring 160.

A plunger 162, having a piercing point 164 directed toward the diaphragm 136 is slidably mounted in the sleeve 154. An abutment member 166 is fixed in place intermediate the length of the bore 152, being fitted into the rabbet of the sleeve 154 and against the left end of the sleeve 156. A compression coil spring 167 is interposed between the abutment member 166 and the plunger 162, and applies pressure to the plunger which tends to drive it toward the left. The plunger is normally restrained against movement toward the left by a solder joint.

A tube 168 is threaded into the plunger 162 and extends toward the right from it. A tube 170 having a collar 172 is carried in the abutment member 166 and extends toward the left in surrounding relation to the tube 168. A solder joint 174 is provided between the tubes 168 and 170 to hold them against relative movement, and thus to hold the plunger 162 against movement in response to pressure exerted by the spring 167.

Provision is made for melting the solder joint when the diaphragm 136 is to be punctured. One terminal of a battery 176 is connected through a conductor 178 to a conductive terminal 180. The opposite battery terminal is connected through a conductor 182, a switch 184 and a conductor 186 to a conductive terminal 188. The terminals 180 and 188 are mounted in spaced relation upon an insulating plate 190 which is soldered in a rabbet of the sleeve 158.

A rod 192 is threaded at its left end into the sleeve 168, being thereby constrained to move in unison with the plunger 162. The rod 192 extends toward the right through sleeve 172 and has threaded on its right hand end an insulating block 194. The block 194 has conductive spring fingers 196 and 198 secured to it by screws 200 and 202. In the Fig. 8 position the fingers 196 and 198 bear respectively against the conductive members 180 and 188. A heating coil 204 is wrapped around the sleeve 168 throughout the length of the solder joint, and has its opposite ends connected respectively to the fingers 196 and 198.

When the switch 184 is closed a circuit is closed through the heating coil, causing the solder to melt. When the solder joint is sufficiently weakened through melting to give way, the plunger 162 is driven toward the left by the spring 167, causing the point 164 to be driven through the diaphragm 136. As the compressed gas flows out of the container 132 into the fitting 140 it is not desirable that the gas be confined by the plunger 162, because that would cause the full pressure of the gas to be applied to the plunger 162 in opposition to the spring 167, and would possibly impair the effectiveness of the spring. A passage 206 is accordingly provided through plunger 162. The gas is also allowed to escape through the tube 170 past the abutment member 166. It is not, however, desirable that the gas shall leak away, and for that reason the sleeve 158 is surrounded by a sealing ring 208, the plate 190 is sealed in the sleeve 158, and the conductive members 180 and 188 form sealed joints with the plate 190.

As the plunger 162 moves toward the left under the force of the spring 167 it carries with it the rod 192, and this, in turn, causes the fingers 196 and 198 to be carried out of engagement with the conductive members 180 and 188. The electrical circuit is therefore broken even though the switch 184 remains closed.

In Fig. 10 a fusible release device is made to control a normally inactive plunger which is to be thrust forward when released and to serve as a locking member for certain extraneous mechanism (not shown).

In Fig. 10 a sleeve 210 is formed with a bore 212 and includes an internal flange 214 at its right hand end. Within the sleeve 210 there is provided a further sleeve 216 which has a reduced right end portion adapted to pass inside the flange 214 and an external shoulder engaged with the inner face of the flange 214. The sleeve 216 is formed with an internal rabbet 218 at its left end. A still further sleeve 220 having a circumferential flange 222 at its rear end is disposed within the sleeve 216, the flange 222 being disposed within the rabbet 218. The arrangement is such that the sleeves 220 and 216 are permanently prevented from moving toward the right relative to the sleeve 210.

A slide bolt 224 having a reduced tip portion 226 is lodged within the sleeve 220 and is held against movement relative to the sleeve 220 by a solder joint 228. A retaining block 230 is secured in the left end of the sleeve 210 by means of a set screw 232 and holds in place the parts which have thus far been described. The block 230 carries a flanged conductive block 234 and an insulating washer 236. A conductive rod 238 is carried by the slide bolt 224 and projects beyond the left end of the bolt through the washer 236 and into the conductive plug 234. The rod 238 is beveled at its left hand extremity and is slotted so that it may be compressed slightly as it enters the plug 234.

A battery 240 has one of its terminals connected through a conductor 242, a switch 244 and a conductor 246 to the conductive plug 234. The current flows through the rod 238, the slide bolt 226, the solder joint 228 and the sleeve 220 to one end of a heating coil 248. The opposite end of the coil 248 is connected by solder to a conductor 250 which leads to the second terminal of the battery 240. The conductors 246 and 250 are both soldered to a conductive bracket 252, which is supported by washers on the shank of a headed screw 254.

When the switch 244 is closed the solder joint is melted and gives way. The spring then projects the bolt 224 toward the right with its tip engaged in the member (not shown) which it is designed to detain. The bolt 224 carries the rod 238 toward the right with it, carrying the rod out of engagement with the conductive plug 234 and breaking the electrical circuit. The consumption of electrical energy is thus brought to an end even though the switch 244 remains closed.

In Figs. 11 to 13 a fusible release is caused to control the throwing out of a ground wire for a radio transmitter.

A sleeve 256 of insulating material slidably contains a hollow, projectable rod 258. The rod 258 includes a head 260 which slidably fits the bore of the sleeve 256, and a shank 262 of reduced diameter. A long bare conductive radio ground wire 264 is connected to the head 260 at the forward end thereof, is led through a passage 266 formed in the head, and is wrapped around the shank of the rod 258 from end to end thereof, being then attached to a screw 267 in a rear hollow housing 268.

The housing member 268, comprising a main body member 270, a reduced cylindrical portion 272 and a further reduced, hollow stem portion 274, is secured to the right end of the sleeve 256 by screws 276 with the shouldered left end of the body part 270 abutting the sleeve. The reduced portion 272 fits the interior bore of the sleeve 256 at the right end thereof, and the hollow stem portion fits in the right end of the bore 278 of the rod 258. A compression coil spring 280 is lodged in the bore 278, bearing at its left end against the interior of the head of the rod 258 and at its right end against the stem 274. The spring tends to drive the rod 258 out of the sleeve 256, but the rod is normally restrained against such movement.

Near its rear end the rod 258 is formed with an angular

groove 282. The stem 274 is formed with diametrically opposed openings in which balls 284 are lodged. A plunger pin 286 slidably fits in a bore 288 which is formed in the stem 274 and normally prevents the balls from entering the bore. The balls when excluded from the bore 288 project into the groove 282 and lock the rod 258 against movement toward the left. The rod 286 is formed with a circumferential groove 287 which is adapted to be moved into alignment with the balls 284, and partially to receive the balls when it has been so moved. Such inward movement of the balls 284 permits them to clear the groove 282 of the rod 258 and thereby permits the rod to be hurled leftward out of the sleeve 256.

A compression coil spring 290 is lodged in the bore 288 to the left of the plunger rod 286 and tends constantly to urge the rod 286 toward the right. Normally, however, the rod 286 is detained in the Fig. 12 position, causing the groove 287 to be retained out of alignment with the balls 284. Motion of the rod 286 toward the right is restrained by engagement of the rod with an insulating block 292 which is made fast upon a metallic tube 294. The right end of the tube 294 extends for a substantial distance into the bore of a fixed metallic tube 296 and is made unitary with the latter tube by a solder joint 298. The tube 296 is received within, and shouldered against, an insulating plug 300. The plug 300 is fixed in the right end of the housing member 268 by means of a set screw 302.

A battery 304 has one of its terminals connected through a conductor 306 to a terminal 308 which is mounted on the sleeve 256. The opposite battery terminal is connected through a conductor 310, a switch 312, and a conductor 314 to a spring contact 316. The spring contact 316 bears against a conductive ring 318 on the block 292. An insulated resistance wire 320 has one end soldered to the ring 318 and is wound around the tube 296 to surround the solder joint 298 throughout the length thereof. The resistance wire thus forms a heating coil. The opposite end of the wire 320 is soldered to the tube 296. A conductor 322 connects the tube 296 to the terminal 308 and the conductor 306.

When the switch 312 is closed the heating coil melts the solder joint, causing it to give way. The spring 290 thereupon thrusts the rod 286 to the right to align the groove 287 with the balls 284. Since this frees the balls to move inward, the rod 258, impelled by the powerful spring 280, cams the balls inward and is, itself, hurled violently outward by the spring. As the rod 258 is hurled away it tends to take with it the radio ground wire 264. The rear end of the ground wire is anchored to the housing member 268 by means of a screw 267, so that a considerable part of the wire, at least, is pulled off the rod 262 and caused to trail along the ground when the rod 258 has spent its kinetic energy and comes to rest.

As the insulating block 292 is thrust toward the right by the plunger rod 286, the conductive ring 318 is carried out of engagement with the contact 316, breaking the electrical circuit even though the switch 312 remains closed.

I have described what I believe to be the best embodiments of my invention. I do not wish, however, to be confined to the embodiments shown, but what I desire to cover by Letters Patent is set forth in the appended claims.

I claim:

1. A fusible release mechanism comprising, in combination, a fixed body member, a movable member guided for movement relative to the body member, a spring stressed to urge such movement of the movable member relative to the body member, detaining means acting in opposition to the spring for holding the movable member against movement, comprising a conductive first detaining member permanently fixed against movement relative to the body member, a second detaining member movable by and with and parallel to the aforesaid movable member, said first detaining member and second detaining member being capable of being telescoped with respect to each other, a solder joint uniting the detaining members to secure them against relative movement, electrical means for melting the solder including a circuit which comprises a source of electrical energy, a heating element located in proximity to the solder joint surrounding the outer surface of said first detaining member adapted to transfer heat to said first detaining member to melt said solder joint, and a circuit closing switch, and means responsive to movement of said movable member which occurs when the solder joint gives way, to break the circuit and thereby avoid the wasting of electrical energy.

2. A fusible release mechanism comprising in combination, a stationary body member, a movable member, a spring under stress disposed to urge movement of said movable member, detaining mechanism including a solder joint and dependent on said joint for opposing the spring and preventing movement of the movable member by the spring, electrical circuit means including a switch, adapted to be closed and then remain closed, a source of electrical energy and a heating element energizable by said source to melt the solder and thereby release the movable member for movement, means for causing disconnection of the heating element from the source in response to such movement of the movable member, said circuit means including the body member itself and a conductive finger normally engaged with the body member, and in which the means for effecting disconnection of the heating element from the source consists of an insulating cap carried by and movable with the movable member and having a cam surface engageable with the conductive arm when the solder joint gives way to move the conductive finger out of engagement with the body member.

3. A fusible release mechanism as set forth in claim 1 in which a latch member having a handle is controlled by the movable member, said movable member having a transverse opening through which the handle passes, and said handle being detained in latching position by the movable member until the solder is melted, whereupon the movable member acts to swing the arm to unlatching position.

4. A fusible release mechanism as set forth in claim 1 in which the body is conductive and has a bore which is closed at one end by an insulating cap, and in which the movable member includes an insulating cap, the electrical circuit means including a spring arm carried by the movable member and bearing normally against the body member, said spring arm being carried out of engagement with the body member and into engagement with the insulating cap by movement of the body member which occurs upon melting of the solder.

5. A fusible release mechanism as set forth in claim 1 in which the movable member is a plunger and the spring is disposed to project the plunger outward upon melting of the solder, the detaining means including a forwardly extending sleeve fixed in position relative to the body member and a surrounding rearwardly extending sleeve affixed to the plunger, the solder joint being provided between said sleeve, and the heating element being wrapped around the outer sleeve but within the spring.

6. A fusible release mechanism as set forth in claim 1 in which the movable member is a plunger and the spring is disposed to project the plunger outward upon melting of the solder, the detaining means including a forwardly extending sleeve fixed in position relative to the body member and a surrounding rearwardly extending sleeve affixed to the plunger, the solder joint being provided between said sleeve, the means for causing disconnection of the heating element comprising a rod connected to the

plunger and extending rearward completely through the inner tube of the detaining means, a pair of conductive contacts carried by the rod and connected respectively to the opposite ends of the heating element, and a pair of stationary contacts slidably engaged by the respective movable contacts, said stationary and movable contacts forming essential parts of the circuit means, the movable contacts being movable out of engagement with the stationary contacts by the rod when the rod is moved forward with the plunger upon the melting of the solder.

7. A fusible release mechanism as set forth in claim 1 in which the movable member is in the form of a plunger having a hollow body in which the spring is lodged, and the means for causing disconnection of the heating element comprises a conductive tube carried by the movable member at the forward end thereof and extending back through and beyond the spring, a conductive plug secured in fixed relation to the body having a bore in which the rear end of the rod normally fits, the rod and plug forming essential elements of the circuit means, and the rod being separable from the plug by the movable member, upon melting of the solder.

8. A fusible release mechanism as set forth in claim 1 in which the movable member is in the form of a hollow plunger and has the spring lodged substantially within it, and a sleeve member secured in fixed relation to the body member surrounds and guides the plunger, the solder joint being provided directly between the plunger body and said sleeve member.

9. A fusible release device as set forth in claim 1 in which the movable member is in the form of a plunger pin having a circumferential groove, and which further includes a sleeve surrounding the movable member and enclosing the spring, a hollow projectable member surrounding said sleeve, a powerful catapulting spring in said member, the projectable member having an inner circumferential groove and the sleeve having radial holes through it, locking balls lodged in the holes and being of greater diameter than the wall thickness of the sleeve, said balls being normally forced outward to project beyond the sleeve circumference and into the groove of the projectable member by the ungrooved circumferential portion of the plunger pin, to lock the projectable member against escape, the plunger pin being movable upon melting of the solder to carry its circumferential groove into line with the locking balls for freeing the balls to move inward, thereby to release the projectable member.



10. A fusible release device as set forth in claim 1 in which the detaining means comprises movable and stationary telescoping sleeves connected through the solder joint, the circuit means includes a stationary contact and a movable conductive ring slidably engaged thereby, the stationary contact and the ring being normally in circuit with the heating element, and the means for causing disconnection of the heating element comprising a block fast on the movable telescoping sleeve and serving as a carrier for the conductive sleeve, said block being movable with the movable sleeve upon melting of the solder to carry the conductive sleeve out of engagement with the stationary contact.

11. A fusible release mechanism comprising, in combination, a stationary cylindrical body member, a movable plunger pin slidably supported in said body member with its tip projecting beyond the end of said body member, a spring biased against said plunger pin in a direction to urge retraction of said plunger pin tip relative to said cylindrical body member, detaining mechanism including a solder joint and dependent on said joint for opposing said spring and preventing movement of said plunger by said spring, an electrical circuit means including a switch, adapted to be closed and then to remain closed, a source of electrical energy and a heating element energizable by said source to melt the solder and thereby release the movable member for movement, and means for causing disconnection of the heating element from the source in response to such movement of the movable member.

12. A fusible release mechanism as set forth in claim 11 in which the detaining mechanism includes a pair of tubes disposed in telescoping relation and the solder joint is provided between juxtaposed surfaces of overlapping ends of the tubes.

**References Cited in the file of this patent**

UNITED STATES PATENTS

| | | |
|---|---|---|
| 1,439,707 | Newell | Dec. 26, 1922 |
| 1,511,369 | Sandin | Oct. 14, 1924 |
| 1,974,257 | Brandt | Sept. 18, 1934 |
| 2,127,319 | Zahradnik | Aug. 16, 1938 |
| 2, 683,201 | Miller et al. | July 6, 1954 |

FOREIGN PATENTS

| | | |
|---|---|---|
| 142,505 | Austria | Aug. 10, 1935 |