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2,193,692

RELAY SWITCH FOR BLASTING

Filed July 19, 1937

2 Sheets-Sheet 1

Fig. 1.

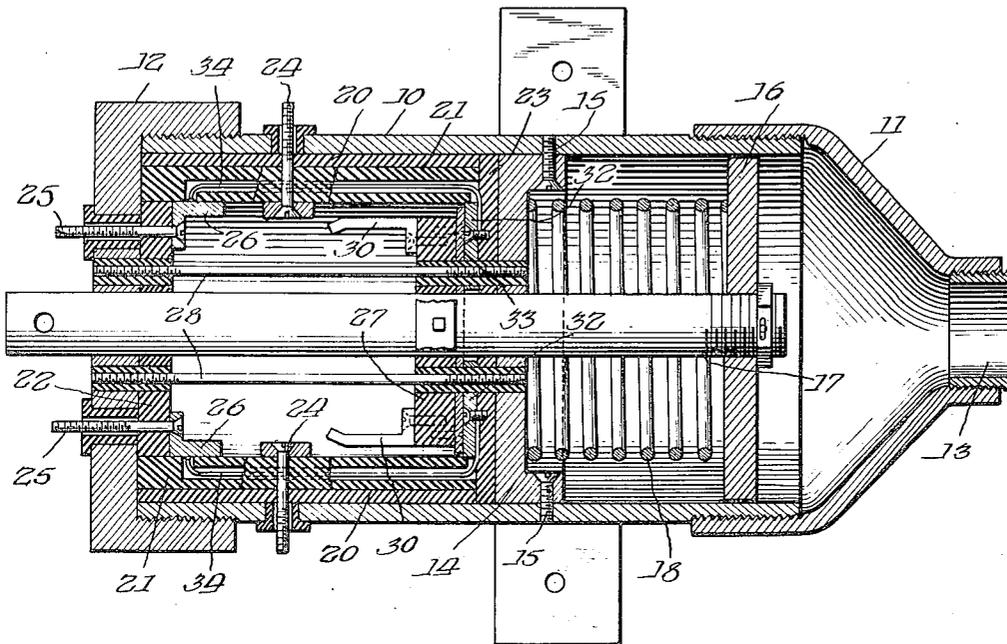
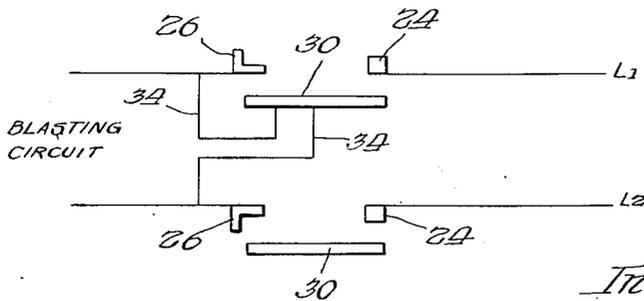


Fig. 2.



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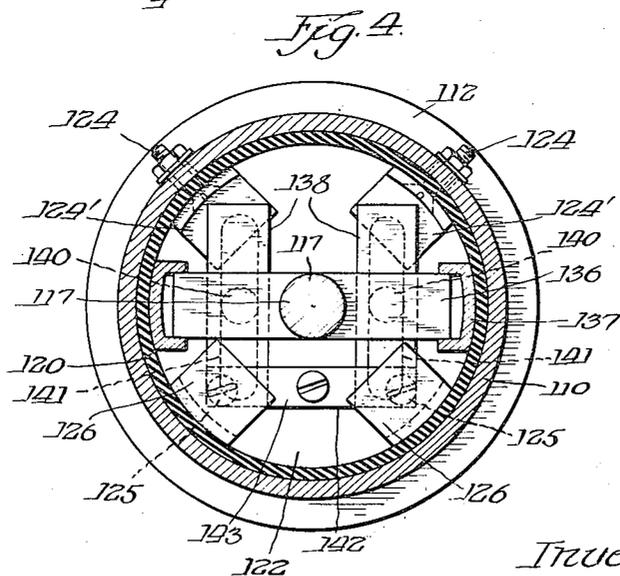
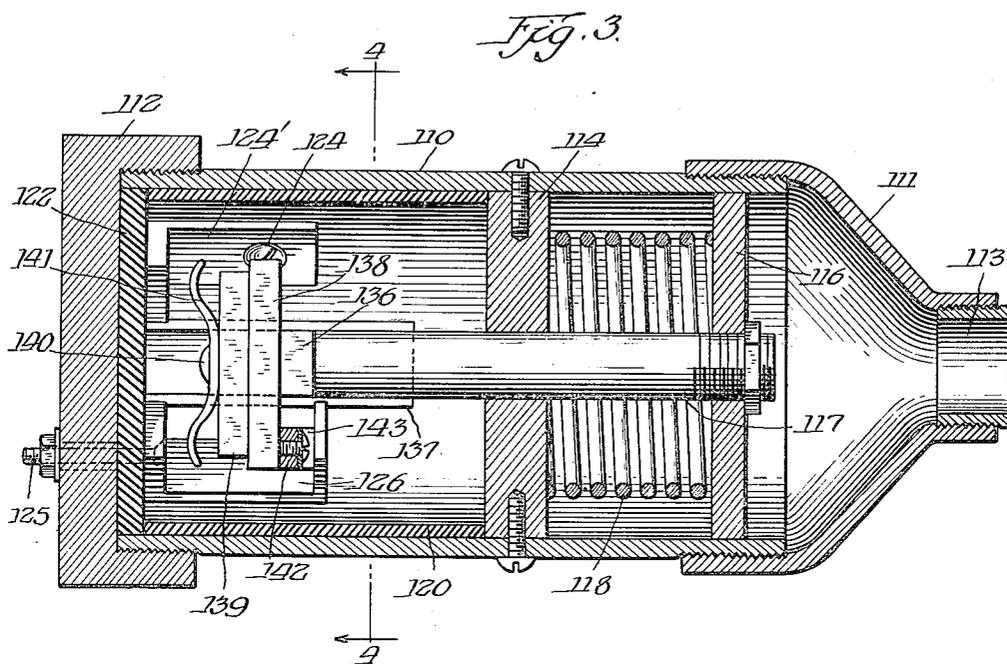
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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RELAY SWITCH FOR BLASTING

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Application July 19, 1937, Serial No. 154,521

5 Claims. (Cl. 200—82)

The invention relates to safety equipment for blasting circuits to prevent premature explosion of the charge by stray currents.

5 An object of the invention is to provide a relay switch for use in electrical circuits connecting with a blasting charge which will hold at least the blasting circuit shorted up to the very moment the switch is closed to thus protect against premature firing by stray currents.

10 A further object is to provide a relay switch of rugged construction which will withstand the shock of the blast, since to be effective the switch must be placed close to the location of the blasting charge, which will keep the blasting circuit 15 open from the power side until the switch is energized by the operator to cause firing of the blast and which will also operate to maintain a short circuit in the opposite or blasting side of the circuit up to the moment the blast is to be 20 detonated.

With these and various other objects in view, the invention may consist of certain novel features of construction and operation, as will be more fully described and particularly pointed out 25 in the specification, drawings and claims appended hereto.

In the drawings which illustrate an embodiment of the device and wherein like reference characters are used to designate like parts—

30 Figure 1 is a longitudinal sectional view of a relay blasting switch operated by pressure means;

Figure 2 is a wiring diagram showing the manner of connecting the switch to the power line and blasting circuit;

35 Figure 3 is a longitudinal sectional view illustrating the modified form of relay blasting switch also operated by pressure means; and

Figure 4 is a sectional view taken substantially along line 4—4 of Figure 3.

40 The embodiment of the invention shown in Figure 1 comprises a hollow cylindrical body member 10 preferably formed by providing a short length of steel tube threaded at its ends for receiving a reducer 11 and a closure 12, the reducer having connection with pipe 13 which supplies compressed air or other suitable fluid pressure to the device. The interior of the body member is provided with a partition 14 of steel or other suitable material secured to the member by 45 screws 15 and which divides the interior into a piston or pneumatic cylinder compartment and a switch compartment. The former receives piston 16 fixedly secured to the piston rod 17 extending through openings in the partition and closure member. The piston is urged in a direc-

tion toward the right by a coil spring 18 confined between the partition and the piston.

The interior of the body member on the side of the partition comprising the switch compartment is insulated by means of an insulating tube 5 20, a second insulating tube 21, and insulating discs 22 and 23, the latter being located at the respective ends of the compartment. On opposite sides of the body member are located terminals 24 to which are electrically connected 10 the conductors leading from the source of current supply. In a similar manner the closure 12 and insulating disc 22 receive terminals 25 which securely position within the switch compartment contacts 26 electrically connected by 15 the terminals with the respective leads of the blasting circuit. Fixedly secured to piston 16 within the switch compartment is an insulating member 27, which member is held against rotation during longitudinal movement by rods 28 20 secured at their ends to the closure 12 and partition member 14, respectively.

From the foregoing it will be understood that the contacts 30 carried by the piston rod 17 through the instrumentalities of the insulating member 27 have longitudinal movement toward 25 the left as pressure is admitted to the right side of the piston 16, causing movement of said piston and compression of spring 18. The contacts 30 are of a length to bridge the gap between terminals 24 and contacts 26 to thus electrically connect the power lines L1 and L2, Figure 2, with the blasting circuit. Actuation of the piston 16 as described will cause detonation of the charge. The piston rod can also be actuated by a cable 35 fastened to the rod by opening 31. The piston returns to initial position when the pressure in pipe 13 is exhausted, since the piston is urged toward the right by the coil spring 18.

40 For short circuiting the blasting circuit during the time the switch is inoperative, that is while the parts assume the position shown in Figure 1, the invention provides a pair of metal discs 32 electrically separated from each other and secured in spaced relation on the end insulating 45 disc 23. A metal strip 33 is suitably secured to the back of insulating member 27 and is adapted to engage with said spaced metal discs 32. It will be noted that the metal strip is carried by the insulating member, which in 50 turn has movement with the piston rod 17. When the switch is inoperative the metal strip contacts the pair of discs which by means of the wires 34 electrically connect with the contacts 26. The blasting circuit is therefore shorted by the 55

metal strip when the switch is inoperative, which short is automatically broken the instant member 27 begins its movement toward the left to electrically connect the power line with the blasting circuit.

The modified form of relay blasting switch shown in Figure 3 likewise comprises a body member 110 having threaded thereto at one end a reducer 111 connecting with a supply pipe 113 and having threaded to its other end the closure 112. The metal partition 114 divides the interior of the body member into a piston compartment and a switch compartment, the former receiving the piston 116 fixedly secured to the piston rod 117 which in this modification extends through the partition 114 only. The piston and rod is urged in a direction toward the right by the coil spring 118 confined between the partition and the piston.

The interior of the body member within the switch compartment is insulated by an insulating tube 120 and an insulating disc 122 having contact with the closure 112. At spaced points the body member is provided with terminals 124 which securely fasten to the insulating tube 120 within the switch compartment the contacts 124' generally L-shaped and which electrically connect with the power line. In a similar manner the closure 112 and insulating disc 122 receive terminals 125 which securely position within the switch compartment the contacts 126 generally U-shaped in longitudinal cross section and having electrical connection with the leads of the blasting circuit.

Fixedly secured to the end of the piston rod 117 within the switch compartment is a metal member 135, the ends of which have location within the channel members 137 which guide said member in its reciprocating movements. Secured to the underside of the metal member 136 to the respective sides of the piston rod are metal bars 138, each bar carrying an insulating strip 139 to which strip is suitably secured as by a threaded screw 140 a contact spring 141. It will be observed that when said piston rod 117 is reciprocated in a direction toward the left the contact springs 141 will engage with and electrically connect the power line with the blasting circuit.

Secured to the metal bars 138 is a metal strip 142, said strip being located under the upper ends of the U-shaped contacts 126 and carrying a short circuiting contact spring 143 which thereby engages the said spaced contacts 126, electrically connecting said contacts and short circuiting the blasting circuit. Engagement between the short circuiting contact spring 143 and said contacts 126 occurs when the piston rod 117 is located in its extreme right hand position. Therefore during the time the switch is inoperative, that is, while the parts assume the position shown in Figure 3, the said contact spring 143 will maintain the blasting circuit shorted and which short is automatically broken the instant the piston rod 117 moves toward the left, which, upon completion of said movement will electrically connect the terminals 124 of the power lines with terminals 125 of the blasting circuit.

The relay switch of the invention is encased within a metal housing constructed to withstand the shock of the blast since to make the device an absolute safeguard against premature firing of the blasting charge the same must be located relatively close to said charge. Also the elements of the switch are constructed so that the device can be readily transported from one place to another.

In operation the safety switch of the invention automatically maintains the blasting circuit shorted up to the moment the blast is to be detonated, actuation of the switch to accomplish this function automatically opening the blasting circuit and immediately thereafter electrically connecting the circuit to the source of electric power to cause firing of the blast.

The invention is not to be limited to or by details of construction of the particular embodiment thereof illustrated by the drawings, as various other forms of the device will of course be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claims.

What is claimed is:

1. A safety device for detonating a blasting cartridge, including a switch for electrically connecting said blasting cartridge with a source of current, said switch comprising a body member formed by a metal tube connecting at one end with a source of fluid pressure, a piston rod mounted for movement in said body member and having a piston adapted for actuation by said fluid pressure, a plurality of terminals secured to said body member, certain of said terminals electrically connecting with the source of current and other of said terminals being connected to the blasting cartridge, contacts carried by said piston rod and adapted to electrically connect certain terminals to complete the circuit from the source of current to the blasting cartridge upon movement of said piston rod, a partition secured to the interior walls of said body member and having an opening receiving the piston rod, resilient means confined between said partition and the piston to maintain the contacts in inoperative position, means carried by said piston rod for short circuiting at least the terminals connecting with the blasting cartridge during the time said contacts are held in inoperative position, and means preventing rotation of said contacts during longitudinal movement thereof.

2. A safety device for detonating a blasting cartridge, including a switch for electrically connecting said blasting cartridge with a source of current, said switch comprising a body member formed by a metal tube connecting at one end with a source of fluid pressure, a piston rod mounted for movement in said body member and having a piston adapted for actuation by said fluid pressure, a plurality of terminals secured to said body member, certain of said terminals electrically connecting with the source of current and other of said terminals being connected to the blasting cartridge, contacts carried by said piston rod and adapted to have movement to electrically connect certain terminals to complete the circuit from the source of current to the blasting cartridge, resilient means biasing said contacts to hold the same in inoperative position, and means carried by and movable by said piston rod for short circuiting the terminals connecting with the blasting cartridge during the time said contacts are held in inoperative position.

3. A safety device for detonating a blasting cartridge, including a switch for electrically connecting said blasting cartridge with a source of current, said switch comprising a body member formed by a metal tube connecting at one end with a source of fluid pressure, a piston rod mounted for movement in said body member and having a piston adapted for actuation by said fluid pressure, a plurality of terminals secured to said body member, certain of said terminals

electrically connecting with the source of current and other of said terminals being connected to the blasting cartridge, contacts carried by said piston rod and adapted to have movement to electrically connect certain terminals to complete the circuit from the source of current to the blasting cartridge, a partition secured to the interior walls of said body member and having an opening receiving the piston rod, resilient means confined between said partition and the piston to maintain the contacts in inoperative position, an insulating plate located to the opposite side of said partition, spaced metal discs secured to said insulating plate and having connection respectively with the terminals connected with the blasting cartridge, said spaced metal discs providing a stop maintaining the contacts in inoperative position, and means carried by the piston rod adapted to electrically connect said spaced discs during the time said contacts are in inoperative position, whereby the blasting cartridge circuit is shorted.

4. A safety device for detonating a blasting cartridge, including a switch for electrically connecting said blasting cartridge with a source of current, said switch comprising a body member, a pneumatic cylinder arranged at one end of said body member, a longitudinally extending piston rod having a piston arranged on one end thereof disposed in said pneumatic cylinder and adapted for actuation by fluid pressure therein with the opposite free end thereof extending outwardly beyond said pneumatic cylinder, a plurality of terminal members securely arranged adjacent the free end of the piston rod and extending beyond the cylinder with part of said terminal members being electrically connected to the source of current supply and part being connected to the blasting cartridge, contact members arranged on the free end of said piston rod which are adapted to electrically connect certain terminal members to complete the circuit from the source of current to the blasting cartridge upon movement of said piston rod, resilient means for normally holding said

piston in a position so that the contact members carried thereby are out of contact with said terminal members, and means carried by said piston rod for short circuiting at least the terminal members connecting with the blasting cartridge during the time said contact members are held out of contact with said terminal members.

5. A safety device for detonating a blasting cartridge, including a switch for electrically connecting said blasting cartridge with a source of current, said switch comprising a hollow cylindrical body member being constructed and arranged so as to provide a pneumatic cylinder compartment in one end thereof and a switch compartment in the other end thereof, a longitudinally extending piston rod mounted for movement in said body member extending through both said pneumatic cylinder compartment and said switch compartment and having a piston on one end thereof positioned in said pneumatic cylinder compartment and adapted for actuation by fluid pressure therein, means for introducing a fluid under pressure into said pneumatic cylinder compartment, a plurality of terminal members arranged in and secured to said body member in said switch compartment with part of said terminal members being electrically connected to the source of current supply and part of said terminal members being connected to the blasting cartridge, contact members arranged on the end of said piston rod disposed in the switch compartment which are adapted to electrically connect certain terminal members to complete the circuit from the source of current to the blasting cartridge upon movement of said piston rod, resilient means for normally holding said piston in a position so that the contact members carried thereby are out of contact with said terminal members, and means carried by said piston rod for short circuiting at least the terminal members connecting with the blasting cartridge during the time said contact members are held out of contact with said terminal members.

WILLIAM JONES.