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EXPLOSIVE CARTRIDGE

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Fig. 3

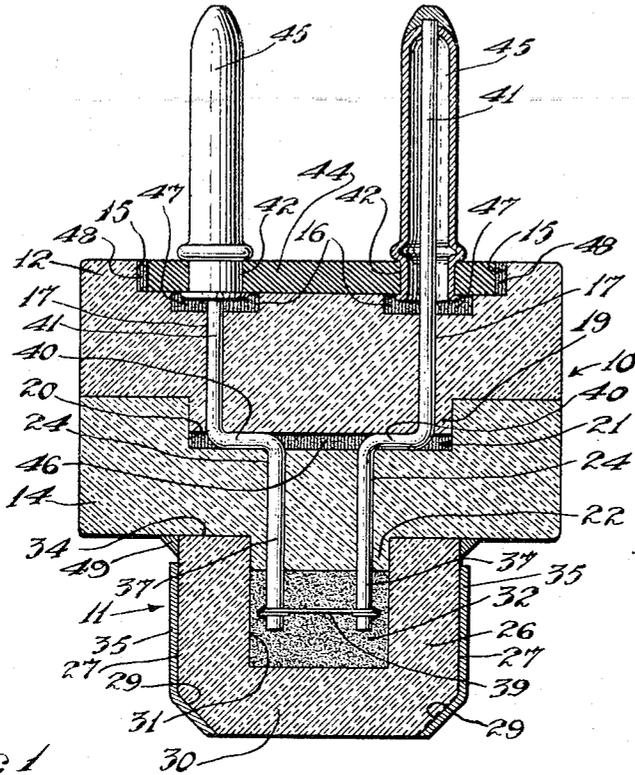


Fig. 1

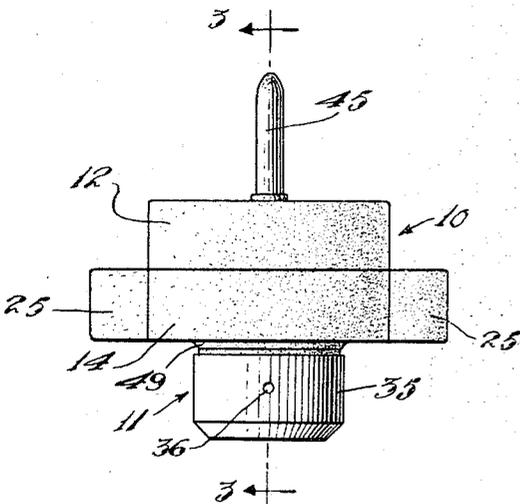
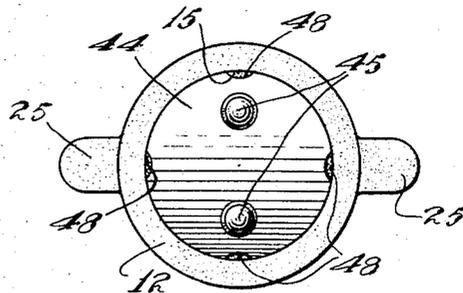


Fig. 2



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EXPLOSIVE CARTRIDGE

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11 Claims. (Cl. 102-46)

The present invention relates to explosive devices, and more particularly to an electrically actuated cartridge for creating pressure.

The present invention aims to provide an electrically actuated cartridge which, when fired, will generate a pressure suitable for actuating devices which in turn are adapted to control various operating mechanisms. For example, the pressure generated may be utilized for moving a piston which, directly or by connecting mechanism, causes a cutter to pierce the closure disc of a receptacle containing a medium under pressure, such as carbon dioxide, whereby the release of the medium is effected. A use of the cartridge for such a purpose may be in the operation of aircraft where emergencies may arise, against which protective measures may be taken, to eliminate or minimize the danger at hand. For example, it is desirable to provide airplanes with inflatable flotation bags to be filled with buoyant fluid to maintain the airplanes afloat on water. Another example, in airplane practice, is to utilize fire extinguishing apparatus which employs a fluid fire extinguishing medium under pressure.

An object of the present invention is to provide a simple inexpensive cartridge of the foregoing type.

Another object is to provide a cartridge of minimum size for creating a desired pressure.

Another object is to provide a cartridge which can be conveniently handled during manufacture, assembly, and use.

Another object is to provide a cartridge adapted to generate a pressure which can be fully utilized.

Another object is to provide a cartridge which will not shatter and consequently will not clog up passages in the firing chamber.

Another object is to provide a cartridge which, after being fired, can be readily removed from the firing chamber and will enable a succeeding cartridge to be inserted.

Another object is to provide an electrically actuated cartridge adapted to be readily connected to electrical connecting devices of a standard design.

A further object is to provide an improved cartridge constructed of a plastic molding compound.

Other and further objects, not specifically enumerated above, will be apparent when described in greater detail in connection with the accompanying drawing, wherein:

Figure 1 is an elevational view of a cartridge illustrating an embodiment of the invention.

Figure 2 is a top view of the cartridge shown in Figure 1.

Figure 3 is an enlarged sectional view taken substantially along the line 3-3 on Figure 1.

Referring more particularly to the drawing, there is shown an electrically actuated cartridge comprising a body 10 and a capsule 11 attached to the body for containing a charge of an inflammable pressure generating substance. The body preferably is constructed of an upper cylindrical member 12 and a lower cylindrical member 14 for purposes which will become apparent from the description hereinafter.

As shown in Figure 3, the upper body member 12 has a circular recess 15 at the upper surface thereof, and has a pair of spaced apart countersunk portions 16 in the recess 15, each of which registers with an aperture 17 extending downwardly through the member 12. The lower end of the member 12 is provided with a cylindrical plug portion 19 having a smaller diameter than the diameter of the upper body member 12.

The lower body member 14 has a circular recess 20 at the upper surface thereof adapted to receive the plug portion 19 of the upper body member 12.

If desired, the relative diameters of the recess 20 and the plug portion 19 may be such that a friction fit is provided. The recess 20 is deeper than the length of the plug portion 19 so that, when the upper and lower body members are assembled, a space or chamber 21 is provided at the interior of and intermediate the body members. It will be understood that the plug portion could be provided on the lower body member and fitted into a recess which could be provided in the upper body member.

The lower body member is further provided with a cylindrical plug portion 22 at the lower end thereof and has a pair of spaced apertures 24 extending from the recess 20 through to the lower end of the plug portion 22. The apertures 24 are spaced closer together than the apertures 17 of the upper body member 12.

As illustrated in the drawing, the body 10 is substantially cylindrical to provide a cartridge of maximum strength with a minimum amount of material. However, in order to insert the cap in predetermined position in the chamber formed by a cartridge holder or breech structure associated with a firing chamber, for example as referred to herein, either or both of the body members may be provided with one or more radially projecting portions, lugs or ears 25. For example, two diametrically opposite lugs 25 may be provided on the lower body member 14 which are adapted to fit into corresponding recesses in the cartridge holder.

The body members 12 and 14, illustrated herein, preferably, are formed of a plastic molding composition, such as cellulose acetate or any other similar molding compositions which are well known. Such compositions can be readily molded whereby the body members can be economically formed in any desired shape by simple and rapid operations. Furthermore, such molding compositions have good insulating properties, which are desirable in connection with the electrical actuating means of the cartridge which will be described hereinafter. If desired, the molding composition selected may be transparent to render the electrical actuating means visible, but in some cases a colored or tinted opaque or translucent material may be preferred. Molding compositions of the foregoing type are attractive in appearance and can be provided with surface ornamentation which enhances the cartridge.

Referring again to Figure 3, the charge containing capsule 11 illustrated may comprise a cup-shaped member or case 26 formed of any of the materials which may be used for forming the body members 12 and 14. The cup-shaped member 26, preferably, has substantially cylindrical outer side walls 27, which are provided with inwardly and downwardly tapered or curved portions 29 at the lower or closed end 30 of the member 26. At the upper end the cup-shaped member has a longitudinally extending cylindrical, or other suitably shaped, bore or cavity 31 formed therein for receiving a charge 32 of pressure generating material, such as smokeless powder or the like. The bore 31 is also adapted to receive the plug portion 22 of the body member 14, and the upper or open end of the member 26 is provided with a substantially flat annular surface 34 adapted to contact the under side of the body member 14.

The cup-shaped member 26 may be, and preferably, is provided with a reinforcing member 35 formed of sheet metal or the like. The reinforcing member may be a substantially annular cylindrical ring or band extending about and contiguous with the cylindrical side walls 27. The band has radially inwardly facing portions extending beneath the tapered portions 29 of the member 26. The bottom 30 of the cup-shaped member 26 preferably is left clear to render the charge 32 visible, and, if desired, the reinforcing band 35 may have one or more apertures 36 therein (Figure 1) for viewing the charge. As shown in the drawing, the band 35 terminates at a point adjacent but spaced from the upper end of the cup-shaped member 26 to leave the upper end slightly weaker by not being reinforced. The band 35 may be secured to the member 26 in any suitable manner, for example, by spinning it into engagement with the member 26, by swaging it about the member 26, by forcing the member 26 into the band, or by molding the member in the band.

In order to ignite the charge 32 suitable electrical actuating means are provided, which may comprise a pair of electrical conductors each having a leg portion 37 extending through one of the apertures 24 in the body member 14 and into the charge of powder 32. The free ends of the leg portions 37 are electrically connected by a high resistance wire or bridge wire 38 adapted to be electrically heated to ignite the charge 32. The conductors have offset portions 40 above the leg portions, which extend substantially radially outwardly in the space 21 within the body, and have upper ends 41 which extend upwardly from the

portions 40 and outwardly through the apertures 17 of the upper body member 12.

The upper ends 41 of the conductors also extend through apertures 42 on a disc 44 of insulating material seated in the recess 15 of the body member 12 and have suitable plugs or connectors 45 secured thereto. The plugs 45 are spaced a suitable distance apart and are designed to fit into an electrical connecting socket of standard design and known under the trade name of "Cannon" connectors. By providing a two piece body, the ends 41 of the conductors carrying the plugs may be spaced to fit electrical connectors of a suitable design while the ends 37 carrying the bridge wire 38 are spaced closely together to enable them to fit into the relatively small charge containing bore. The space 21 serves for adapting the conductors to be spaced apart a desired distance at their ends.

In assembling the cartridge the leg portions or lower ends 37 are inserted through the apertures 24 of the lower body member 14 and the bridge wire 38 is secured adjacent the free ends of the leg portions 37. The space provided by the recess 20 in the upper surface of the body member 14 is partially filled with an adhesive substance 46, such as semi-liquid cellulose acetate, or the like, and the upper ends 41 of the conductors are inserted through the apertures 17 of the upper body member 12. The body member 12 is then moved towards the body member 14 to fit the plug portion 19 into recess 20 and to contact the adhesive 46. Upon setting of the adhesive 46, the body members 12 and 14 are secured together and the upper ends of the apertures 24 in the lower body member 14 are sealed.

Thereafter an adhesive 47, such as semi-liquid cellulose acetate, is placed in the countersunk portions 16 and the disc 44 is placed in the recess 15 and may be held in place by an adhesive 48. The connectors or plugs 45 may then be secured to the ends 41 of the conductors.

The cartridge as thus assembled is now ready to have the charge containing capsule 11 connected thereto. To accomplish this, an adhesive is applied to the annular surface 34 of the cup-shaped member 26 and to the surface of the body member adapted to be contacted by the aforesaid surface. Preferably, the adhesive used is a compound adapted to slightly soften the material of which the members 14 and 26 are formed. For example, the adhesive may comprise a mixture of cellulose acetate and acetone. The plug portion 22 is then inserted into the bore 31, and the members 14 and 26 are firmly pressed together. When the adhesive sets, a bond or hermetic seal is provided at 49 which cooperates with the seal formed by the adhesive 46 to prevent the charge of explosive material from absorbing moisture.

In operation, the cartridge is placed into a suitable holder with the capsule 11 extending into a firing chamber for receiving the pressure generated by the charge. When an actuating pressure is desired, the conductors through their electrical connections are connected manually or automatically to a source of electrical energy.

The current passing through the conductors and the bridge wire 38 causes the latter to be heated and ignite the powder, or the explosive or pressure generating medium 32 contained in the capsule 11. As the powder burns it creates a pressure which ruptures the seal or bond 49 between the members 14 and 26 and separates these members. The pressure generated then escapes

and can be utilized as a source of actuating power.

During the burning of the powder within the member 26, the band or ferrule 35 prevents bursting or shattering of the cup-shaped member. Also, separation of the members 14 and 26 is delayed until all of the powder has been ignited, thereby insuring a maximum pressure for a given charge of powder. When the members 14 and 26 are moved apart there is no violent shattering effect which tends to disintegrate portions of the cartridge.

From the foregoing description it will be seen that the present invention provides a new and improved cartridge for generating a pressure or for similar purposes. The cartridge is simple in design and can be economically manufactured. The parts of the cartridge can be readily assembled, without special tools or machinery, in a minimum amount of time. By utilizing a plastic molding composition, the explosive charge is insulated from heat which over a prolonged period may accidentally ignite the charge. Also, the charge is adapted to be sealed against moisture which might interfere with or prevent the ignition thereof.

While my invention resides in certain principles of construction and operation which have been illustrated and described in connection with the accompanying drawing, it will be apparent to those skilled in the art that the invention may be embodied in other forms of construction without departing in any manner from the spirit and scope of the invention, and I therefore do not wish to be strictly limited to the disclosure, but rather to the scope of the appended claims.

I claim:

1. In a cartridge of the class described, the combination of a cup-shaped member for containing a charge of powder, a body member secured to said cup-shaped member and having a pair of apertures extending therethrough in substantially uniformly spaced relationship, and a second body member secured to said first body member and having a pair of apertures extending therethrough in substantially uniformly spaced relationship and spaced apart a greater distance than the apertures in said first body member, one of said body members having a recess at the interior of and between said body members, said recess providing communication between the first and second pair of apertures.

2. A cartridge of the class described comprising a cup-shaped member for containing a charge of powder, a body member secured to said cup-shaped member and having a pair of apertures extending therethrough in substantially uniformly spaced relationship, a second body member secured to said first body member and having a pair of apertures extending therethrough in substantially uniformly spaced relationship and spaced apart a greater distance than the apertures in said first body member, one of said body members having a recess as the interior of and between said body members, and electrical actuating means extending into said cup-shaped member, said means including a pair of electrical conductors each adapted to extend through one of the apertures of the first and second body members and adapted to pass through the recess between said body members.

3. A cartridge of the class described comprising a cup-shaped member for containing a charge of powder, a body member secured to said cup-shaped member and having a pair of spaced apertures extending therethrough, a second body

member secured to said first body member and having a pair of apertures extending therethrough and spaced apart a greater distance than the apertures in said first body member, one of said body members having a recess at the interior of and between said body members, electrical actuating means extending into said cup-shaped member, said means including a pair of electrical conductors each adapted to extend through one of the apertures of the first and second body members and adapted to pass through the recess between said body members and projecting outwardly from said second body member, and electrical connecting means on the outwardly projecting ends of said conductors adapted to fit an electrical connecting device of standard design.

4. A cartridge of the class described comprising a member for containing a charge of powder, a body secured to said member, electrical actuating means carried by said body, and outwardly projecting means on said body adapted to fit into corresponding recesses of a cartridge holder associated with a firing chamber, whereby the cartridge is adapted to be inserted into the holder in a predetermined position.

5. In a cartridge of the class described, the combination of a cup-shaped member for containing a charge of powder, a reinforcing member extending about the side walls of said cup-shaped member, a body member having a pair of spaced apertures extending therethrough, means for securing said members adapted to be rendered ineffective when the powder is ignited, and a second body member secured to said first body member and having a pair of apertures spaced apart a greater distance than said apertures in said first body member.

6. A cartridge of the class described comprising a cup-shaped member for containing a charge of powder, a reinforcing band extending about said cup-shaped member, a body member having a pair of apertures extending therethrough, means for securing said cup-shaped member and body member adapted to be rendered ineffective when the charge is ignited, a second body member secured to said first body member and having a pair of apertures spaced apart a greater distance than the apertures in said first body member, one of said body members having a recess providing a space at the interior of and between said body members, and electrical actuating means extending into said cup-shaped member, said means including a pair of electrical conductors each adapted to extend through one of the apertures of the first and second body members and adapted to pass through the space between said body members.

7. A cartridge of the class described comprising a cup-shaped member formed of a plastic molding compound and adapted to contain a charge of powder, an annular metal reinforcing member extending about the side walls of said cup-shaped member, a body member having a pair of spaced apertures extending therethrough, adhesive means for securing said cup-shaped member and said body member, a second body member secured to said first body member and having a pair of apertures spaced apart a greater distance than the apertures in said first body member, said body members being formed of a plastic molding compound and one of said body members having outwardly projecting means thereon, one of said body members having a recess providing a space at the interior of and between said body members, electrical actuating means extend-

ing into said cup-shaped member, said means including a pair of electrical conductors each adapted to extend through one of the apertures of said first and second body members and adapted to pass through the space between said body members and projecting outwardly from said second body member, and electrical connecting plugs on the outwardly projecting ends of said conductors adapted to fit an electrical connecting device of standard design.

8. A cartridge of the class described comprising a cup-shaped member for containing a charge of powder; a body member secured to said cup-shaped member and having a pair of apertures extending therethrough in substantially uniformly spaced relationship; a second body member secured to said first body member and having a pair of apertures extending therethrough in substantially uniformly spaced relationship, spaced apart a greater distance than the apertures in said first body member, and offset with respect to the apertures in said first body member; one of said body members having a recess at the interior of and between said body members; electrical actuating means extending into said cup-shaped member, said means including a pair of electrical conductors each adapted to extend through one of the apertures of the first and second body members and adapted to pass through the recess between said body members; and means in said recess providing a seal between said pairs of apertures.

9. A pressure creating cartridge of the class described comprising a body adapted to be seated in a cartridge holder, a member having a space adapted to contain a charge of an inflammable pressure creating substance, electrical charge igniting means on said body and having portions extending into said member, a reinforcing member extending about and united with said first member, and means connecting said first member and said reinforcing member as a unit to said body, said connecting means being adapted to be rendered ineffective when the charge is ignited and creates pressure, whereby said first mentioned member and said reinforcing member are adapted to separate from said body as a unit and release

the pressure created without shattering of said first member.

10. A pressure creating cartridge of the class described comprising a body adapted to be seated in a cartridge holder, a cup-shaped member having a space adapted to contain a charge of an inflammable pressure creating substance, electrical charge igniting means on said body and having portions extending into said member, a metallic band-shaped reinforcing member extending about the side wall of and permanently united with said cup-shaped member, and means connecting said cup-shaped member and said reinforcing member as a unit to said body, said connecting means being adapted to be rendered ineffective when the charge is ignited and creates pressure, whereby said cup-shaped member and said reinforcing member are adapted to separate from said body as a unit and release the pressure created without shattering of said cup-shaped member.

11. A pressure creating cartridge of the class described comprising a body adapted to be seated in a cartridge holder, a transparent substantially cylindrical cup-shaped member having a space adapted to contain a charge of an inflammable pressure creating substance, electrical charge igniting means on said body and having portions extending into said member, a metallic reinforcing member having a substantially cylindrical wall extending about and united with the side wall of said cup-shaped member and having a radially inwardly extending portion reinforcing the closed end of said cup-shaped member and providing a sight opening for viewing the charge through the lower end of said cup-shaped member, said members being permanently secured to each other as a unit, and means connecting said members as a unit to said body, said connecting means being adapted to be rendered ineffective when the charge is ignited and creates pressure, whereby said cup-shaped member and said reinforcing member are adapted to separate from said body as a unit and release the pressure created without shattering of said cup-shaped member.

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