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PRESSURIZING CARTRIDGE AND PYROTECHNIC CHARGE THEREFOR

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Fig. 1.

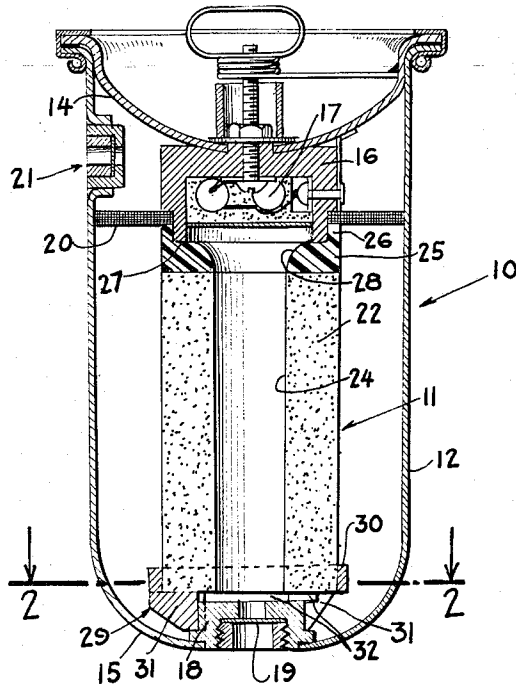
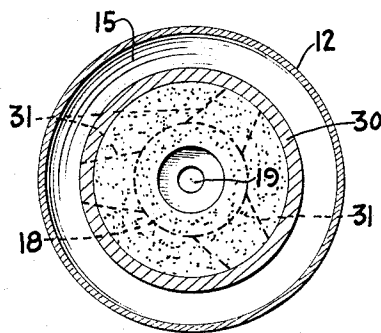


Fig. 2.



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PRESSURIZING CARTRIDGE AND PYROTECHNIC CHARGE THEREFOR

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9 Claims. (Cl. 169—6)

The present invention relates to apparatus which utilizes a source of pressure for doing work, for example, discharging fluid material such as liquid or dry powder or propelling a motor, and more particularly, to a pressurizing cartridge for such apparatus which contains a charge of pyrotechnic pressure developing substance.

Such pressurizing cartridges generally comprise a casing having a rupturable outlet in communication with a receptacle containing the material to be discharged, one or more cakes formed of a pyrotechnic pressure developing substance in the casing, and a pyrotechnic igniter adjacent one end of the cakes or the stack of cakes. Examples of such cartridges and the apparatus with which they are used are disclosed in United States Patents 2,631,675 and 2,786,536.

It has been found that under certain conditions the igniter failed to ignite the pressure developing charge, and that in some cases the pressure developing charge did not burn out entirely, whereby adequate pressure was not sustained in the apparatus for a sufficient duration to effect complete discharge of the fluid material. These difficulties are experienced in particular at sub-zero temperature conditions. Since such cartridges in certain applications are used for propelling a fire extinguishing medium or operating emergency gear, failure or incomplete functioning could not be tolerated.

It has been proposed to overcome these difficulties by greatly increasing the igniter charge and/or increasing the amount of propellant charge whereby partial burning thereof might give the desired propelling pressure. The use of excessive amounts of an igniter charge is prohibitive because of the intense heat developed thereby and the danger of a more violent explosion tending to rupture the cartridge. This would necessitate a more costly cartridge to safely confine the igniter charge. The use of larger amounts of propellant charge than actually required is poor economy and would necessitate a larger cartridge which again would increase the cost thereof.

Accordingly, an object of the present invention is to overcome the foregoing difficulties and objections by providing an improved charge of pyrotechnic pressure developing substance and a cartridge adapted to accommodate the charge.

Another object is to accomplish the foregoing by simplifying both the charge and the cartridge construction to reduce the number of parts and cost thereof and to facilitate assembly of the charge in the cartridge casing.

Another object is to insure proper ignition of the propellant charge and complete burning thereof in all instances without increasing the amount of the igniter charge.

A further object is to effect these improvements in connection with cartridge casings already in use.

A still further object is to provide an improved manner of utilizing the flame of the igniter.

Other and further objects of the invention will be obvious upon an understanding of the illustrative em-

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bodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

In accordance with the present invention, the foregoing objects are generally accomplished by providing a pyrotechnic pressure developing charge having a bore extending therethrough and directing the flame of the igniter directly through the bore and then along the exterior of the charge.

A preferred embodiment of the invention has been chosen for purposes of illustration and description, and is shown in the accompanying drawing, forming a part of the specification, wherein:

Fig. 1 is a longitudinal sectional view of a cartridge containing a propellant charge in accordance with the present invention.

Fig. 2 is a sectional view taken along the line 2—2 on Fig. 1 illustrating in greater detail a spacer for mounting the end of the propellant charge remote to the igniter.

Referring to the drawing in detail and more particularly to Fig. 1 thereof, there is shown a cartridge 10, and a propellant charge 11 formed of a conventional pyrotechnic pressure developing substance and assembled in the casing and spaced from the side walls thereof.

The cartridge 10, by way of example, is substantially in accordance with the cartridge shown in Patent No. 2,786,536 and is used in the same manner in place thereof for effecting discharge of fluid material from the apparatus. Generally described, this cartridge comprises a tubular casing 12 having opposed end walls 14 and 15, an inwardly facing protuberance 16 supported by the wall 14 and housing a conventional igniter 17, an inwardly facing protuberance or spud 18 on the wall 15 in alignment with the protuberance 16 and housing a safety disc 19, a screen 20 which may be supported by the protuberance 16, and a rupturable outlet closure 21 on the side wall of the casing 12 located between the end wall 14 and the screen 20.

The charge 11 comprises a tubular body portion 22, herein shown as being cylindrical and having a circular bore 24 extending therethrough, and a socket 25 at one end of the body portion adapted for attachment to the free end of the protuberance 16 extending through the screen.

The thickness of wall of the body portion 22 for a given mass of a particular substance and the pressure developed in the cartridge determines the length of time the charge will burn.

Preferably, the socket 25 is provided by an annular member adhesively secured to the end of the charge and having a collar 26 for receiving the protuberance 16, and having a shoulder 27 in abutment with the end wall of the protuberance. This member has an opening 28, herein shown as a converging passageway extending from the collar 26 to the bore 24 of the charge in registry therewith. This passageway conducts the flame of the igniter directly into the bore of the propellant charge and all of this flame's radiant energy is absorbed by the charge to thereby cause the charge to be internally ignited.

By covering the upper end of the body portion 22 with the adhesively attached member 25, ignition thereof at this point is inhibited and burning can take place only on the side surfaces of the bore, the lower end of the charge and the outer wall surface of the charge in the manner about to be described. Also, the member 25 is not ignited within the time in which the charge is consumed, whereby charred particles are not produced and the screen may be omitted, if desired.

In order to conduct the flame of the igniter and the

pressure medium produced by the burning of the propellant charge to the space between the charge and the inner wall of the cartridge, the lower end of the charge is spaced from the protuberance 18 to thereby enable the flame leaving the lower end of the bore to envelop the exterior of the charge and ignite the same. In this manner, the charge is caused to burn both interiorly and exteriorly and at the lower end to thereby rapidly build up a pressure within the casing sufficient to burst the outlet closure 21 and supply the pressure medium to its point of use. Also, the charge by burning in this manner consumes itself entirely thereby giving assurance that the sufficient pressure medium is produced to accomplish the work to be done.

Preferably, the lower end of the charge is attached to the protuberance 18 to rigidly mount the charge between the ends of the casing. As shown in Fig. 2, this is accomplished by a non-combustible spacer such as an annular metallic member 29 having a ring or socket 30 for receiving the lower end of the charge and having feet 31 for gripping the protuberance and spacing the socket from the protuberance to partially expose the lower end of the charge and to provide passageways 32 from the bore of the charge to the space within the casing about the charge prior to initial burning of the charge.

From the foregoing description, it will be seen that the present invention provides an improved unitary charge for pressurizing devices and an improved pressurizing cartridge. The charge can be manufactured in a simple and economical manner and is readily assembled in the cartridge casing. The construction and arrangement of the cartridge is also simplified by the use of the improved charge. Furthermore, the charge is positive and reliable in operation at temperatures of about -65° F.

As various changes may be made in the form, construction and arrangement of the parts herein, without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in any limiting sense.

I claim:

1. A pressurizing cartridge comprising a tubular casing having opposed ends, an igniter adjacent one of said ends, an inwardly facing spud at the other of said ends, a tubular charge of pyrotechnic pressure developing substance in said casing spaced from the inner side wall thereof, means for attaching one end of said charge adjacent said igniter, and a spacer including means for gripping said spud and a socket for receiving the other end of said charge said casing having an outlet at its end adjacent said igniter, whereby said igniter is adapted to direct a flame through said tubular charge in one direction and the flame is redirected in the opposite direction along the exterior of said charge.

2. A pressurizing cartridge comprising a tubular casing having opposed ends, an inwardly facing protuberance adjacent one of said ends, an igniter housed in said protuberance, a tubular charge of pyrotechnic pressure developing substance in said casing, said charge having a socket integral therewith at one end for receiving said protuberance to attach the same thereto, and a socket connected to said casing at the end opposite said igniter for attaching the other end of said charge to said casing.

3. A pressurizing cartridge comprising a tubular casing having opposed ends, an inwardly facing cylindrical pro-

tuberance adjacent one of said ends, an igniter housed in said protuberance, a cylindrical charge of pyrotechnic pressure developing substance in said casing having a bore extending therethrough, a connector inseparably secured at one end of said charge having a collar attached to said protuberance and having a passageway for providing communication between said igniter and the bore of said charge, and a socket connected to said casing at the end opposite said igniter for attaching the other end of said charge to said casing.

4. A unitary charge for a pressurizing device comprising a tubular body portion formed of a pyrotechnic pressure developing substance having a ring formed with a socket inseparably secured thereto at one end thereof.

5. A unitary charge for a pressurizing device comprising a tubular body member formed of a pyrotechnic pressure developing substance and having a bore extending therethrough, and a socket member inseparably secured to one end of said body member having an opening communicating and in registry with the bore.

6. A unitary charge for a pressurizing device comprising a tubular body member formed of a pyrotechnic pressure developing substance and having a bore extending therethrough, and a socket member inseparably secured to one end of said body member having an opening in registry with the bore and diverging outwardly therefrom.

7. A unitary charge for a pressurizing device comprising a cylindrical body member formed of a pyrotechnic pressure developing substance and having a bore extending therethrough, and an annular member inseparably secured to one end of said body member having a collar portion and a converging passageway extending from the collar to the bore.

8. A pressurizing cartridge comprising a tubular casing, a charge of pyrotechnic pressure developing substance in said casing having a bore extending therethrough, means for directing an igniting flame directly through said bore in one direction, and a spacer for then directing the flame along the exterior of said charge in the opposite direction.

9. A pressurizing cartridge comprising a tubular casing having opposed ends, an igniter adjacent one of said ends, a charge of pyrotechnic pressure developing substance in said casing having a substantially smaller cross-sectional area than said casing and having a bore extending therethrough, means for attaching one end of said charge adjacent said igniter with the bore in registry with the igniter, and means for attaching the other end of said charge to the end of said casing opposite said igniter, said last mentioned means having an opening providing fluid flow communication between the bore of said charge and the space in said casing about said charge, said casing having outlet means adjacent its end where said igniter is located, whereby said igniter is adapted to direct a flame through said bore in one direction and the flame is adapted to pass through said opening and be redirected in the opposite direction along the exterior of said charge.

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