May 28, 1940. H. E. MURRAY ET AL 2,202,225

LIFE PRESERVER INFLATION MEANS

Filed Sept. 15, 1938

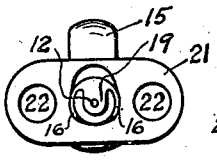


FIG. 2

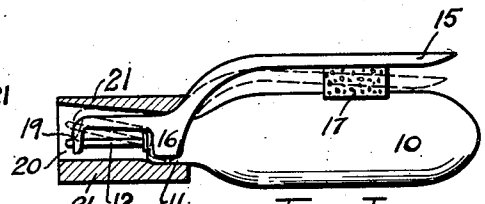


FIG. 1

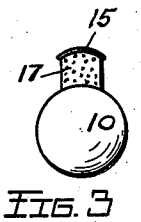


FIG. 3

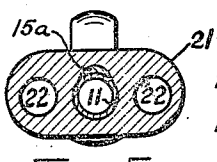


FIG. 5

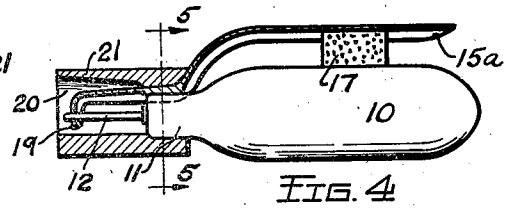


FIG. 4



FIG. 7

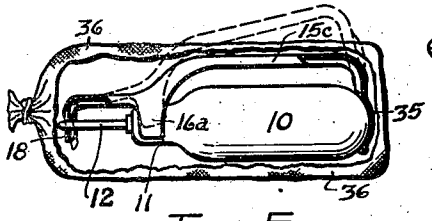


FIG. 6

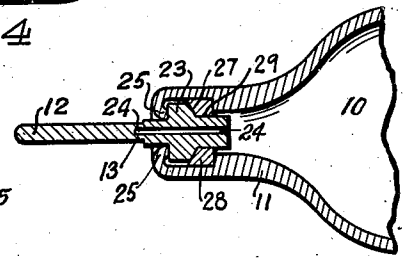


FIG. 8

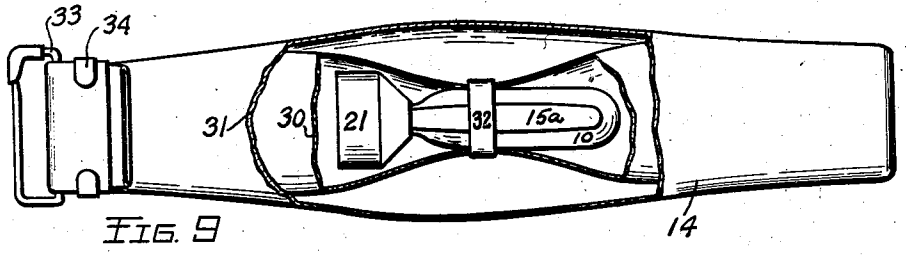


FIG. 9

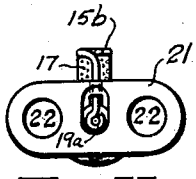


FIG. 11

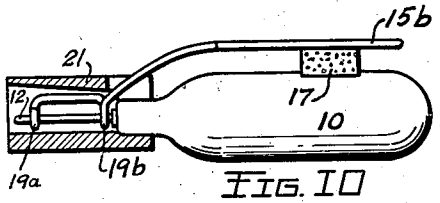


FIG. 10

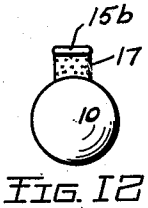


FIG. 12

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LIFE PRESERVER INFLATION MEANS

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Denver, Colo.

Application September 15, 1938, Serial No. 230,059

11 Claims. (Cl. 221—73.5)

This invention relates to life preservers of a type comprising an inflatable envelope containing a gas-charged capsule provided with a tip fracturable to release said gas and thereby inflate said envelope.

One of the objects of the invention is to provide a convenient and effective means to release the gas confined within said capsule.

A further object is to provide a grip lever instantly operable by grasping the preserver in the hand, thereby to fracture said tip and release said gas.

A further object is to provide means for securely positioning such a grip lever in suitable position in relation to said capsule for convenient and instant use.

A further object is to provide effective sealing means against escape of the gas confined within said capsule, at the same time permitting great facility in causing the release thereof in case of an emergency wherein it is desired to inflate said envelope to render the assembly available for use as a life preserver.

A further object is to provide a form of construction of said capsule which readily permits the original filling of said capsule with a suitable gas, such as carbon dioxide in liquid form, and which thereafter avails of the pressure of said gas itself for the maintenance at all times of an effective seal to confine said gas within said capsule.

A further object is to provide a form of construction of said capsule which includes a tip readily fracturable to release the gas confined within said capsule.

A further object is to provide effective sealing means for said capsule, including a plug of integral construction and cooperable with other elements for effective sealing and which includes a readily fracturable tip for releasing the gas in said capsule.

A further object is to provide a form of construction and assembly which will obviate any deleterious effects which might otherwise result from the rapid escape, in the form of a jet, of the gas confined within said capsule, upon the fracture of said tip for the purpose of releasing said gas.

A further object is to provide a life preserver of great convenience in portability and ready availability in case of emergency.

A further object is to provide a life preserver of the type aforesaid, the operation of which is immediately obvious to the ordinary person and which under the stress of emergency is susceptible of being instantly and positively rendered available for effective use.

Our invention consists in the construction, arrangement, and combination of elements hereinafter set forth, pointed out in our claims and illustrated by the accompanying drawing, in which—

Figure 1 is a side elevation of an assembly comprising a charged capsule fitted with a fracturable tip, a grip lever to fracture said tip, and an apertured protector block receiving said tip and portions of said gripping lever and of the capsule neck, a portion of said protector block being cut away to exhibit elements otherwise concealed. Figure 2 is a front end elevation of the assembly of Figure 1. Figure 3 is a rear end elevation of the assembly of Figure 1, with the protector block omitted. Figure 4 is a side elevation of the assembly of Figure 1, with an alternative form of grip lever substituted for that shown in Figure 1. Figure 5 is a section taken along the line 5—5 of Figure 4. Figure 6 is a side elevation of an assembly employing another form of grip lever, partly cut away, and indicating a bag within which the assembly may be disposed. Figure 7 is a front elevation of an apertured ear forming a part of the grip lever shown in Figure 6, and through which the tip of the capsule is received. Figure 8 is a fragmentary, detail section, on an enlarged scale, of the neck portion of the capsule in cooperating relation with a tip assembly. Figure 9 is a plan view of the assembly of Figure 4 and a double-walled envelope within which said assembly is disposed for use, portions of the envelope walls being cut away. Figure 10 is a side elevation of an assembly employing still another form of grip lever, certain portions being cut away. Figure 11 is a front end elevation of the assembly of Figure 10. Figure 12 is a rear end elevation of the assembly of Figure 10, with the protector block omitted.

In the construction of life preservers of this type for sale to and use by the public generally, one of the important considerations is the provision of efficient sealing means for the capsule and at the same time to provide a readily fracturable tip, the fracture of which acts positively to release the gas confined in the capsule. To this end we utilize a plug fitting in the neck of the capsule, in association with other elements to effect positive sealing, said plug being provided in the rear portion with a passageway communicating with the interior of said capsule, said passageway being closed in the forward portion by a solid tip, adapted to be fractured and thereby open

said passageway in order that the gas confined within the capsule may escape therethrough. In order to prevent the accidental fracture of this tip the same is appropriately disposed within an apertured protector block, which also serves to positively prevent the tip rupturing the envelope within which the capsule and associated fittings are disposed.

It is important that the seal between the aforesaid plug and the walls of the neck of said capsule be and remain thoroughly effective, as the escape of gas into the surrounding envelope, even in small quantities, would diminish convenience in portability and would cause a risk of puncture of said element by external objects. In order to maintain the effectiveness of this seal we take advantage of the pressure of the confined gas itself. We have found that a very effective seal operating on this principle consists of a rubber gasket seated against an annular beveled shoulder, the slope of the bevel being at an angle of approximately sixty-two degrees. Such gasket may consist of rubber or other distensible material, and the pressure of the confined gas constantly forces said gasket forward against said bevel, also causing a slight distention of said gasket toward the walls of the neck of the capsule. This particular arrangement and combination of the elements of said sealing means produces a seal which is highly effective and remains so.

Another problem in the manufacture and assembly of life preservers of this type is to provide an arrangement which will permit the rapid discharge of gas from the capsule immediately upon the fracture of the tip closing the passageway for such discharge, yet prevent such gas discharge in the form of a jet directly against the wall of the surrounding envelope. As is well known, when a gas which is confined under great pressure in a container is allowed to escape and expand, the expansion of such gas may produce a very low temperature. In the case of the escape of liquid carbon dioxide under certain circumstances, and its change of form into a gas, such great cold may be produced that a portion of the liquid carbon dioxide freezes to a snowy solid, and said solid itself evaporates so rapidly that it maintains a very low temperature so long as it lasts. In order that the capsule used may be charged in the most efficient manner for the purpose contemplated, that is to say, in the preferred embodiment of the invention, with carbon dioxide, and in order that no direct jet of escaping gas may impinge on the surrounding envelope wall, we have adopted a method of disposing the neck of the charged capsule in such manner as to provide for the retardation of the dispersion of the cold gas escaping in jet form from the capsule.

Another problem which must necessarily be taken into consideration in the design of a life preserver of this type intended for general use, is the fact that its mode of operation must be instantly obvious to the ordinary person, and that elaborate directions for its use may be eliminated, to the end that in case of an emergency requiring immediate action no study, deliberation, or reading of directions is necessary. To this end we have provided an arrangement for the fracture of the closing tip confining the gas within the capsule, by means of a lever arrangement comprising a grip adjacent the wall of the charged capsule. This arrangement provides an obvious and natural method of operation, and at the same time has the advantage of furnishing great leverage in applying the necessary force to fracture the closure tip, thus insuring a quick, sharp fracture, even when the device is operated by a woman or child or person of small strength.

Another problem involved in the design of life preservers of this type is the provision of efficient means for carrying out the principles involved, and in arranging such means in such manner as will provide great convenience in portability and availability. Thus, as will be seen from the detailed description which is to follow, the arrangement and assembly of parts is such that the life preserver may be folded and carried in a handbag, or may be pinned to a garment, or to the curtain of a berth, or may be, when in use, securely fastened to a belt or garment.

Having the foregoing objects and problems in view, we have provided for use in fracturing the closure tip a grip lever which may be of several optional forms, varying in detail, such forms being shown in Figures 1, 4, 6, and 10, of the accompanying drawing. Referring to the drawing and more particularly to Figure 1 thereof, the reference numeral **10** designates a capsule charged with a gas such as carbon dioxide under sufficient pressure that the gas, when released, will furnish sufficient buoyancy to render the envelope within which the various elements are disposed effective as a life preserver. The capsule is preferably formed with a neck **11**, forward from which extends a tip **12** closing a passageway communicating with the interior of the capsule **10** and adapted to be fractured by the operation of a grip lever **15**. This grip lever in the embodiment of the invention shown in Figure 1 is fulcrumed on the neck **11**, for which purpose a portion of said lever is formed into fingers **16** which constitute a yoke loosely embracing neck **11**. The rear portion of the grip lever **15** is normally thrust away from the wall of the capsule **10** by the spacer **17**, which may consist of sponge rubber or other suitable resilient material.

The tip **12**, the forward portion of said grip lever, and a portion of the neck **11** are embracingly received within an apertured block **21**, which may consist of rubber or other suitable resilient material, one of the purposes served by which is to maintain the grip lever **15** in suitable position relative to the capsule **10**.

The forward portion of grip lever **15** consists of an apertured ear **19**, the construction of which more clearly appears in Figure 2. The grip lever **15** and capsule **10** and associated elements are so positioned and assembled that when said grip lever is fulcrumed on the neck of said capsule the closure tip **12** extends through the eye of apertured ear **19**, the forward portion of the assembly resting within the aperture **20** of the protector block **21**. With the various parts so assembled and arranged, it is obvious that if capsule **10** and adjacent portion of the grip lever **15** be grasped firmly in the hand, the ear **19** will be moved in a direction transverse to the axis of the tip **12**, thereby fracturing said tip at a point indicated at **13** in the enlarged view shown in Figure 8, thereby permitting the gas confined in the capsule **10** to escape through the passageway **24**.

Protector block **21**, while suitable to maintain the position of grip lever **15** in relation to capsule **10** as above pointed out, is of course sufficiently flexible to permit ready operation of the handle of said grip lever. Said protector block may be provided with additional apertures **22** for the

purpose of diminishing weight. Protector block 21 also serves to prevent the forward part of the lever 15 and tip 12 coming in contact with the surrounding wall of the envelope within which the assembly is disposed, as clearly shown in Figure 9, thereby insuring against puncture of the surrounding envelope wall. Protector block 21, in cooperation with ear 19, and the disposition of the forward part of the assembly within aperture 20 of said block, also serves a further purpose in this: As pointed out above, the outrush of gas from capsule 10 in the form of a jet upon the fracture of tip 12 produces great cold, and perhaps some solid material. The disposition of the elements shown within aperture 20 of block 21, in the obstructing relation, clearly shown in Figure 1, tends to retard the dispersion of the cold gas outflowing upon the fracture of tip 12, and also confines any solid matter produced until its complete evaporation; thus such disposition, in connection with block 21, aids in insulating against any freezing effects and in keeping same localized within aperture 20, preventing any injury which might otherwise tend to occur to the surrounding envelope wall clearly shown in Figure 9.

Optional forms of grip levers are shown in Figures 4, 6, and 10, said levers being suitably fulcrumed for the fracture of tip 12 as described in connection with the assembly shown in Figure 1. Thus, the grip lever shown in Figure 4 is likewise fulcrumed on the neck 11 of the capsule 12, and is firmly held in place by protector block 21, the fingers 16 of the arrangement shown in Figure 1 being eliminated in the grip lever 15*a* shown in Figure 4.

In the assembly shown in Figure 6, the grip lever 15*c* is likewise fulcrumed on neck 11 of capsule 10, two fingers forming a yoke similar to that clearly shown in Figure 2, embracing neck 11, only one of said fingers being shown in Figure 6 and being therein designated as 16*a*. In the assembly shown in Figure 6 the yoke forming a part of grip lever 15*c* is suitably formed so as to be slidable rearwardly on neck 11. Maintenance of position of the grip lever in this particular embodiment of the invention is secured by forming a portion of said grip lever of such material and in such manner as to be flexible; thus fingers 16*a*, or the rear portion of grip lever 15*c* adjacent contoured portion 35, or both, are sufficiently flexible to permit ready positioning of said lever, and to permit movement of the handle of said lever in a direction toward the axis of capsule 11 when said handle and said capsule are gripped, whereupon lever 15*c* fulcrums on neck 11. Lever 15*c* and capsule 10 are so formed as to permit interengagement for the purpose of securing lever 15*c* relative to capsule 10 for ready operation, one means of providing such interengagement consisting, as shown in Figure 6, of forming a portion of lever 15*c* with proper contour, indicated at 35, to fit the rear portion of capsule 10; said contoured portion, in cooperation with the yoke formed by fingers 16*a*, at all times holds lever 15*c* in proper normal position relative to capsule 10. In the embodiment illustrated in Figure 6, the grip lever is provided with an apertured ear 18, serving the same purpose as in the embodiments previously referred to; however, in the embodiment illustrated in Figure 6 the aperture in ear 18 is elongated, as shown in Figure 7, to permit the ready positioning of lever 15*c*. The position of said gripping lever while same is being initially fitted in place in reference to tip 12, neck 11, and capsule 10 is indicated by the broken lines in Figure 6; thereafter said lever is moved into the position shown by the solid lines of said figure, and thereafter remains in said position until it is desired to fracture tip 12. Tip 12 extends through the eye of ear 18 for the same purpose as described in reference to the embodiments of the invention previously mentioned; thus when lever 15*c* and capsule 10 are grasped, said lever fulcrums on neck 11 and ear 18 is moved transversely of tip 12, opening the passageway communicating with the interior of capsule 10 and permitting an outflow of gas therefrom.

In further reference to the embodiment illustrated in Figure 6, it will be noted that capsule 10 and lever 15*c* are enclosed in a bag 36. This bag is permeable to gas but retards the dispersion of said gas during its rapid outflow from capsule 10, thus preventing any injury which might otherwise tend to occur on account of the low temperature effects accompanying the rapid expansion of said gas, as hereinabove more fully referred to. It is to be further noted that in the embodiment of the invention illustrated in Figure 6 the protector block 21 employed in the embodiments illustrated in Figures 1, 4, and 10 is unnecessary, its function of maintaining the position of the grip lever relative to the capsule 10 as shown in said three latter figures being supplanted in the embodiment illustrated in Figure 6 by the positive interengagement of lever 15*c* and capsule 10, and its function in retarding dispersion of the cold gas upon fracture of tip 12, as mentioned in reference to Figures 1, 4, and 10, being supplanted by the bag 36 indicated in Figure 6.

In Figures 10 and 11 is shown a still further optional assembly wherein grip lever 15*b* may consist of stiff wire bent to form a handle adjacent the body of capsule 10 and extending forward through an aperture in block 21, the forward portion of said lever 15*b* being formed into spaced, integral loops 19*a* and 19*b* to receive tip 12. In this embodiment it will be observed that lever 15*b* may be made to fulcrum upon tip 12 itself, rather than upon the neck of capsule 12, the same purpose however being accomplished by gripping capsule 10 and lever 15, causing a fracture of tip 12 for the purpose referred to in previous descriptions of embodiments of the invention as illustrated in other figures.

We will now refer more in detail to the manner in which capsule 10 is sealed, and to the manner in which the fracture of tip 12 in any of the cases mentioned releases the gas confined in capsule 10, and in this connection will refer to the detailed section of the neck portion of capsule 10 in cooperating relation with the tip assembly, as shown in Figure 8, the assembly shown in the latter figure being adapted for use in connection with any of the forms of grip lever hereinbefore mentioned. A plug 29 is disposed partially within and extends forward from neck 11, and contains a passageway 24 communicating with the interior of capsule 10 and closed by tip 12. Neck 11 of the capsule is formed with an inturn 25, after insertion of plug 29; inturn 25 encircles the stem of plug 29 and abuts a shoulder on said stem formed by an annular boss 23 preventing said plug being thrust out of neck 11; the rear portion of said boss is in the form of a bevel 27 preferably having an inclination of sixty-two degrees from the axis of plug 29.

Gasket 28 seats against bevel 27 and encircles the rearward adjacent portion of plug 29 and extends to and fits against the adjacent wall portion of neck 11 to form a seal between plug 29 and the wall of neck 11, said gasket being of rubber or other suitable distensible material. When said gasket 28 is properly seated all means of communication from the interior of capsule 10 are closed, passageway 24 being closed by solid tip 12. When capsule 10 is charged with gas the pressure of said gas forces plug 29 forward, but its movement is limited by the abutment formed by inturn 25. The said gas pressure also compresses and distends gasket 28, forcing same forward against bevel 27 and also causing a slight distension of said gasket toward the walls of the neck of capsule 10, thus forming and maintaining a tight seal preventing the escape of gas from said capsule until such time as tip 12 is intentionally fractured for the purpose of inflating the surrounding envelope within which the assembly is disposed as shown in Figure 9.

Figure 9 shows a life preserver in assembled form, with capsule 10, grip lever 15*a* and protector block 21 disposed in place within a double-walled gas-tight envelope 14, portions of inner wall 30 and outer wall 31 being cut away. The central portion of inner envelope 30 is normally constricted by an elastic band 32 encircling wall 30 and capsule 10, whereby said capsule is held in a desirable position in relation to the interior of envelope 14. It is obvious that if capsule 10 and associated grip lever 15*a* be firmly grasped with the hand while positioned as shown in Figure 9, the movement of said lever 15*a* will fracture the tip of capsule 10, as hereinabove more fully referred to, permitting an outflow of gas from capsule 10, through passageway 24 as shown in Figure 8, thus inflating both the inner wall 30 and outer wall 31 of envelope 14 and converting envelope 14 into a light and serviceable life preserver. While in Figure 9 the assembly of capsule 10 and associated elements as shown in Figure 4 is indicated, it is obvious that the assemblies shown in Figures 1, 6, and 10, are equally available for utilization in this connection.

It will be obvious that the inner wall 30 and outer wall 31 of envelope 14 are first formed with one open end for the purpose of assembly in the form hereinabove described; after the elements hereinabove mentioned are suitably disposed within said envelope 14 the open ends of said inner wall 30 and said outer wall 31 are cemented so as to accomplish a complete closure of each thereof, thus providing double protection for inflatability and retention of released gas within envelope 14. The cement used is, of course, of a nature which will be unaffected by water while said assembly is being used as a life preserver.

In its assembled form the life preserver may be provided with a suitable hanging or fastening means, for convenience in attaching to a garment when carried on the person in readiness for use, or to otherwise hang or fasten the same, or for attaching to a belt or garment to prevent displacement while the body of the user is in the water. In the form illustrated in Figure 9, such fastening means consists of a safety-pin, the forward end of envelope 14 being looped around stay 33 thereof, the end of said envelope being held in such looped position by clamp 34. A similar loop and fastener may, if desired, be provided at the rear of envelope 14, to provide double fastening means.

Since many changes, variations, and modifications in the specific form, construction, and arrangement of the elements shown and described may be had without departing from the spirit of our invention, we wish to be understood as being limited solely by the scope of the appended claims, rather than by any details of the illustrative showing and foregoing description.

We claim as our invention—

1. In a device of the character described, a charged capsule, a passageway communicating with the interior of said capsule, a tip closing said passageway and adapted to be fractured and thereby to open said passageway and release the gas confined within said capsule, a grip lever extending rearward of said neck and overlying said capsule, a fulcrum about which said grip lever is adapted to move, and a connection between said grip lever and said tip such that the movement of said lever about said fulcrum and toward said capsule will fracture said tip.

2. In a device of the character described, a charged capsule, a passageway communicating with the interior of said capsule, a tip closing said passageway and adapted to be fractured and thereby to open said passageway and release the gas confined within said capsule, a grip lever extending rearward of said neck and overlying said capsule, a fulcrum about which said grip lever is adapted to move, a connection between said grip lever and said tip such that the movement of said lever about said fulcrum and toward said capsule will fracture said tip, and a yieldable spacer intermediate the rearward portion of said grip lever and said capsule opposing the movement of said lever about its fulcrum.

3. In a device of the character described, a charged capsule formed with a neck, a passageway communicating with the interior of said capsule, a tip lesser in cross section than said neck and extending forward therefrom and closing said passageway and adapted to be fractured and thereby to open said passageway and release the gas confined within said capsule, a grip lever extending rearward of said neck and overlying said capsule, a portion of said lever in contact with said neck, a fulcrum formed by said portion of said lever in contact with said neck and about which said grip lever is adapted to move, and a connection between said grip lever and said tip such that the movement of said lever about said fulcrum and toward said capsule is adapted to fracture said tip.

4. In a device of the character described, a charged capsule formed with a neck, a passageway communicating with the interior of said capsule, a tip lesser in cross section than said neck and extending forward therefrom and closing said passageway and adapted to be fractured and thereby to open said passageway and release the gas confined within said capsule, a grip lever extending rearward of said neck and overlying said capsule, a portion of said lever in contact with said neck, a fulcrum formed by said portion of said lever in contact with said neck and about which said grip lever is adapted to move, a connection between said grip lever and said tip such that the movement of said lever about said fulcrum and toward said capsule is adapted to fracture said tip and a yieldable spacer intermediate the rearward portion of said grip lever and said capsule opposing the movement of said lever about its fulcrum.

5. In a device of the character described, a charged capsule formed with a neck, a passageway communicating with the interior of said

capsule, a tip lesser in cross section than said capsule and extending forward therefrom and closing said passageway and adapted to be fractured and thereby to open said passageway and release the gas confined within said capsule, a grip lever, a portion of said lever in loose contact with said neck and freely movable transversely thereof, a fulcrum formed by said portion of said lever in contact with said neck and about which said grip lever is adapted to move, a connection between said grip lever and said tip such that the movement of said lever about said fulcrum is adapted to fracture said tip, and an apertured block yieldably embracing a portion of said lever and a portion of said neck to normally secure said lever in position.

6. In a device of the character described, a charged capsule formed with a neck, a passageway communicating with the interior of said capsule, a tip closing said passageway and adapted to be fractured and thereby to open said passageway and release the gas confined within said capsule, a grip lever, a portion of said lever in contact with said neck, a fulcrum formed by said portion of said lever in contact with said neck and about which said grip lever is adapted to move, a connection between said grip lever and said tip such that the movement of said lever about said fulcrum is adapted to fracture said tip, a portion of said lever formed into a yoke embracing a portion of said neck, and another portion of said lever yieldably engaging the body of said capsule rearward of said neck to normally secure said lever in position.

7. In a device of the character described, a charged capsule, a passageway communicating with the interior of said capsule, a tip lesser in cross section than said capsule extending forward therefrom and closing said passageway and adapted to be fractured and thereby to open said passageway and release the gas confined within said capsule, a grip lever extending rearward from said tip and overlying said capsule, means associating said grip lever and said tip to form a fulcrum on the latter, and a connection between said grip lever and said tip such that the movement of said lever about said fulcrum and toward said capsule will fracture said tip, said fulcrum and said connection comprising two loops formed in said lever and embracing said tip in spaced relation longitudinally thereof.

8. In a charged capsule of the character described, sealing means comprising a plug, a passageway in said plug communicating with the interior of said capsule, a tip closing said passageway and extending exteriorly of said capsule and adapted to be fractured by force applied externally of said capsule and thereby to open said passageway, a seat, and a gasket engageable with said seat to seal said capsule and suitably disposed to be urged against said seat by gas pressure within said capsule.

9. In a charged capsule of the character described, sealing means comprising a plug, a passageway in said plug communicating with the interior of said capsule, a tip closing said passageway and extending exteriorly of said capsule and adapted to be fractured by force applied externally of said capsule and thereby to open said passageway, a conical seat on said plug converging inwardly of said capsule, and a distensible gasket engageable with said seat to seal said capsule and suitably disposed to be urged against said seat by gas pressure within said capsule.

10. In a charged capsule of the character described, sealing means comprising a plug including a stem partially within and terminating in a fracturable tip forward and exteriorly of said capsule, a passageway in said plug communicating with the interior of said capsule and closed by said tip, an annular shoulder on said stem, an inturn of the forward portion of the wall of said capsule to abut said shoulder, an annular bevel rearward of said shoulder and having an upward and forward slope, a distensible gasket seated against said bevel and surrounding the rearwardly adjacent portion of said stem and extending to and fitting against the interior wall of said capsule and adapted to be distended by gas pressure within said capsule to form a tight seal between said plug and the interior wall of said capsule.

11. In a device of the character described, including a charged capsule within an inflatable envelope, a passageway communicating with the interior of said capsule, a tip closing said passageway and adapted to be fractured and thereby to open said passageway and release the gas confined within said capsule, a grip lever, a fulcrum about which said grip lever is adapted to move, and a connection between said grip lever and said tip such that the movement of said lever about said fulcrum will fracture said tip, means to diffuse the jet action of the escaping gas, comprising a second and gas-permeable envelope completely enclosing said capsule, tip and grip lever assembly and completely enclosed by said first mentioned envelope.

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