

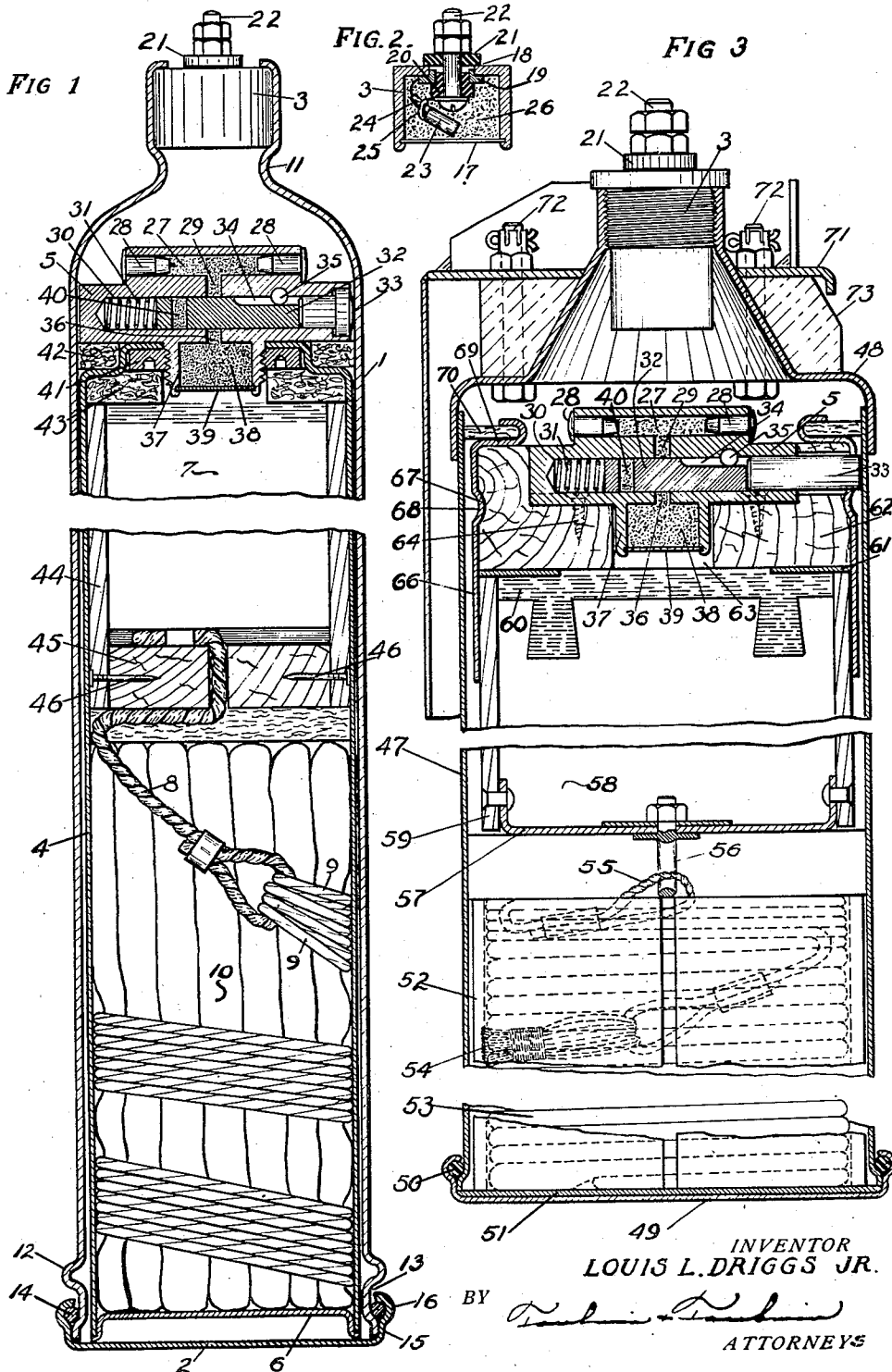
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FLARE

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FLARE

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12 Claims. (Cl. 102-24)

This invention relates to flares.

It is an object of this invention to provide a flare having the utmost safety, positiveness of operation and protection from the elements.

It is a further object of this invention to provide flares wherein the accidental ignition of the flare candle or illuminant, prior to the complete discharge of the flare, is prevented.

It is a further object of this invention to provide a flare wherein an explosive charge is utilized to discharge the flare and to ignite a powder train connected with the flare candle, which powder train is prevented from igniting the candle until the flare has been completely discharged.

It is a further object of this invention to provide, in a flare, an ignition head comprising a powder train which, before complete discharge of the flare, is blocked and which is completed only after the complete discharge of the flare, the powder train being adapted to be ignited by the flare expelling charge and being adapted, when so ignited and completed, upon discharge of the flare, to ignite the candle or illuminant material of the flare.

It is a further object of this invention to provide flare constructions wherein utmost positiveness of operation is achieved due to the obviation of dependence upon frictional ignition means for illuminating the candle or illuminant material of the flare.

It is a further object of this invention to provide flare constructions wherein discharge of the flare is accomplished by the electrical ignition of an explosive expelling charge and wherein the ignition of the flare candle or illuminant is accomplished through the ignition of a second explosive charge through a powder train which is completed to ignite the second explosive charge only after the complete discharge of the flare.

These and other objects and advantages will appear from the following description taken in connection with the drawing.

In the drawing:

Figure 1 is a vertical longitudinal section through a flare constructed according to the principles of my invention;

Figure 2 is a vertical sectional view of the expelling means of the flare illustrated in Figure 1; and

Figure 3 is a vertical longitudinal section through a modified form of flare to which the principles of my invention have been applied.

Referring to the drawing in detail and particularly Figures 1 and 2, the flare illustrated therein comprises a flare casing, generally designated 1, having an open end provided with a hermetical seal and cap 2 and an expeller, generally designated 3. Within the flare casing 1 is disposed a cartridge case 4, to one end of which is rigidly secured an ignition head generally designated 5. The other end of the cartridge case 4 is closed by the loosely fitting cartridge cap 6. Within the end of the cartridge case 4, adjacent the ignition head 5, is the candle 7 which is composed of illuminant material. The candle has its carton or casing attached by means of the parachute cable 8 to the shrouds 9 of the parachute 10.

The flare casing is substantially cylindrical and has one end thereof reduced to form a neck 11 above the ignition head 5. Adjacent the neck 11, the casing is spun over to form shoulders to retain the expeller 3 in gas-proof relation. Adjacent the opposite end, the flare casing 1 is provided with a peripheral bead 12. A depression 13 is also provided which is adapted to provide a seat for an annular rubber ring or gasket 14. The cap 2 is substantially cup-shaped and has the skirt 15 thereof provided with a peripheral portion 16 spun over the rubber ring or gasket 14. The details of this hermetic seal are more fully disclosed in my application Serial No. 717,803, filed March 28, 1934.

The expeller is most clearly illustrated in Figure 2 and, as shown therein, comprises the cup member 3 having a disk 17 of hard paper or the like secured in its open end. The opposite end is provided with a circular aperture 18. A flanged conducting sleeve 19 is secured in engagement with the metallic cup 3 by means of insulating washers 20 and 21, through which extends a conducting bolt 22 of copper or the like. The bolt 22 is provided with suitable nuts for the attachment of an electric wire thereto.

Disposed within the cup 3 is a cylinder 23 which is filled with powder. Disposed within the powder in the cylinder 23 is a fine wire or filament which has its opposite ends attached to wires 24 and 25 which are attached respectively to the flanged conducting sleeve 19 and the conducting bolt 22. The interior of the cup 3 is filled with powder 26. The expelling charge 26 is exploded by means of an electric circuit having one terminal grounded and the other terminal connected to the conducting bolt 22. The cup 3 is preferably grounded and, when the circuit is closed, the path of current is through the conducting bolt 22 to and through wire 25 to and through the fine wire or filament in the cylinder 23 out through the wire 24 to and through the

flanged conducting sleeve 19 to the cup 3 which is grounded. The completion of this circuit causes the fine wire or filament in cylinder 23 to become heated and to glow, whereby to explode the powder within the cylinder 23 and thus explode the expelling charge 26 in the cup 3.

The ignition head comprises a body member 5 which is provided at its top portion with a transverse passage 27 which is closed at each end by a plug 28 of combustible material. Leading from the transverse passage 27 is a passage 29 which communicates with a transverse plunger cylinder 30. The passages 27 and 29 are filled with powder. At one end of the plunger cylinder 30 is a compression spring 31 which abuts the train plunger 32 and urges it away from the closed end of the plunger cylinder 30. In abutment with the opposite end of the train plunger 32 is the plunger release pin 33 which is provided with a head adapted for engagement with the inner cylindrical surface of the flare casing 1. The train plunger 32 is provided with a notch 34 which cooperates with a member 35 in the form of a pin or key to limit the outward movement of the train plunger 32 and the plunger cylinder 30, while preventing relative rotation between the plunger and the plunger cylinder. On the opposite side of the plunger cylinder 30 of the passage 29 and in alignment therewith is the short passage 36 which leads to the ignition chamber 37. The passage 36 is filled with powder, as is the ignition chamber 37. The ignition charge in the ignition chamber 37 is designated 38. The end of the ignition chamber 37 is closed by a plate or disk 39 of combustible material. The plunger 32 is provided with a plunger passage 40. The plunger passage 40 is filled with powder and is so disposed that, when the plunger 32 is in its outermost position due to the pressure of the spring 31 and the engagement of the shoulder of the notch 34 with the member 35, the plunger passage 40 connects the passage 29 with the short passage 36. This completes the powder train from the passage 27 through passage 29, through plunger passage 40 to and through short passage 36 to the ignition charge 38 in the ignition chamber 37.

Threads are provided on the outside wall of the ignition chamber 37 which cooperate with similar internal threads on the clamping nut 41. This clamping nut rigidly secures the flanged upper portion of the cartridge case 4 to the ignition head 5. A gas check ring 42 is disposed between the lower surface of the ignition head 5 and a suitable stepped portion provided on the attaching flange of the cartridge case 4. This gas check ring is formed of felt or other suitable material. The peripheral surface of the gas check ring is adapted to closely engage the inner cylindrical portion of the flare casing 1 to prevent the escape of gases from the ignition chamber between expeller 3 and ignition head 5 when the expelling charge is exploded. Within the end portion of the cartridge case 4, adjacent the ignition head 5, is a set-back wad 43 of felt or the like.

The candle 7 which is formed of suitable flare material or illuminant material is encased in a carton comprising a cylindrical tube 44 of pasteboard, cardboard or other suitable material having a block 45 of wood or the like suitably secured in one end by means of nails 46 or any other suitable means. This carton is adapted to have the open end thereof in engagement with the set-back wad 43. The parachute cable 8 is

suitably secured to the block 45 and is, as above stated, also secured to the shrouds 9 of the parachute 10.

### Operation

The operation of the flare is as follows: When the flare is in condition for use, the cartridge case 4 and attached ignition head 5 are disposed within the flare casing 1, as shown in Figure 1, and the cap 2 is secured by the hermetic seal on the end of the flare casing 1. The engagement of the plunger release pin 33 with the inner cylindrical surface of the flare casing 1 holds the plunger 32 to the left, as shown in Figure 1, against pressure of the compression spring 31. In that position of the plunger 32, the powder train passage 29 is blocked off from the short powder train passage 36 by the body of the plunger 32. The connecting plunger passage 40 is blocked off from the passage 29 and the short passage 36 by the walls of the plunger cylinder 30.

Upon explosion of the expelling charge 26, the plugs 28 are ignited while the gases in the ignition chamber between the expeller 3 and the ignition head 5 force the cartridge case 4 and ignition head 5, which are rigidly connected, against the cap 2 whereby to break the hermetic seal. The pressure of the gases forces the cartridge case 4 out of the flare casing 1. Simultaneously, the powder in passages 27 and 29 is burning. When the plunger release pin 33 reaches the opened end of the flare casing 1, it releases the plunger 32 whereby the pressure of the compression spring 31 forces the plunger outwardly whereby to engage the shoulder of the notch 34 with the member 35 and whereby to place the plunger passage 40 into registration with the powder train passageway 29 and the short train passageway 36. The flare will then be fully discharged from the flare casing 1 and the powder train will be completed between the transverse passage 27 and the ignition charge 38. The powder train will continue burning for a short interval until the ignition charge 38 is discharged, and the discharge of this ignition charge will ignite the candle 7 and at the same time drive the candle and its carton upwardly and out of the cartridge case 4. This will, naturally, force the parachute 10 out of the cartridge case 4. At the same time, the cartridge cap 6 will be forced out of the end of the cartridge case 4. The flare, in its container, will then be disposed below the parachute to which it is connected by the parachute cable 8 and, as it falls, the candle being ignited and burning, the parachute will open and the flare will perform its desired function in a manner which is well known. The above described flare is of the general type disclosed in my Letters Patent No. 1,937,220, granted November 28, 1933.

In Figure 3, I have illustrated a parachute flare of the general type disclosed in my Letters Patent No. 1,937,191, granted November 28, 1933, to which the principles of my invention have been applied. With reference particularly to Figure 3, the expeller 3 is of similar construction to that disclosed in Figure 2, the mode of attachment to the flare casing being different. This feature is fully illustrated in the above designated patent. The flare casing comprises the cylindrical portion 47 having the top thereof formed by a conical crown piece 48, secured thereto. Into the top of the conical crown piece 48, the expeller 3 is screw threadedly mounted. The opposite end of the cylindrical portion 47 is

closed by the cap 49, similar to the above described cap members 2, and the rubber ring 50. A circular plate 51 is disposed within the cap 49. Resting upon the plate 51 is the cylindrical parachute container 52 which may be in the form of a split cylinder or a plurality of strips of material adapted to prevent the parachute from engaging the inner cylindrical surfaces of the cylindrical portion 47. The parachute 53 is packed in the container 52 with the shrouds 54 thereof attached to one end of the parachute cable 55. The opposite end of the parachute cable 55 is attached by means of the eye member 56 to a flanged plate 57 which forms one end of the container for the candle 58.

The flanges of the plate 57 are secured to the cylinder 59 which constitutes the rim of the candle container. The cylinder 59 is preferably formed of pasteboard, cardboard, or other suitable material. The candle 58 which is formed of suitable flare or illuminant material is provided at the open end of the candle container or carton with a layer of powder 60.

In contact with the open end of the cylinder 59 is the flat ring or annular washer 61 which has one face thereof in contact with the powder 60 and the opposite face thereof in contact with the wooden block 62. The wooden block is provided with a central bore 63 which is adapted to accommodate the ignition chamber 37 of the ignition head 5 which is countersunk in the wooden block 62 and secured thereto by means of screws 64. The ignition head 5 is of substantially the same construction as that of the flare of Figures 1 and 2, described above, the diameter thereof being reduced, the threads being omitted from the ignition chamber 37 and the mode of attachment thereof being different from that described above. Likewise, the plunger release pin 33 is substantially longer, but the operation of the ignition head is identical with that described above.

The block 62 is provided with an annular groove 67 formed substantially centrally of its periphery. A cylindrical sleeve 66 is adapted to connect the block 62 with the candle cylinder 59 and has frictional engagement with the cylinder 59. The cylindrical sleeve 66 is rigidly secured to the block 62 by means of a peripheral bead 68 which engages the annular groove 67 in the block 62. The upper end of the cylindrical sleeve 66 is provided with a flange 69 which extends inwardly toward the center of the flare and is then bent over outwardly upon itself to form a seat for a sealing ring 70. The flare is supported by the bracket 71 which is attached by means of bolts 72 to the conical crown piece 48. A rubber ring 73 is interposed between the brackets 71 and the crown piece 48 in order to absorb shocks and vibration. The bracket 71 is suitably supported by the fuselage or other desired part of the aircraft.

#### Operation

The operation of the flare illustrated in Figure 3 is as follows: Upon the explosion of the expelling charge of the expeller 3 by completion of an electric circuit connected to the flare in the above explained manner, the combustible plugs 28 of the ignition head 5 are ignited and the gases in the ignition chamber between the expeller 3 and the ignition head 5, which is closed by the sealing ring 70, expand and drive the block 62 with the attached ignition head 5, which is then burning, away from the crown piece 48. This pushes the

candle 58 and its container against the parachute 53 and its container and breaks the seal between the cap 49 and the cylindrical portion 47, whereby to remove the cap 49 and discharge the parachute 53, the candle 58 and the block 62 from the open end of the cylindrical portion 47.

When the pin 33 passes the end of the cylindrical portion 47, it releases the plunger 32 which moves to the right until the plunger passage 40 registers with the passageways 29 and 36. The burning of the powder train may then continue. The continuance of burning of the powder train will explode the charge 38, whereby to release the block 62 and rigidly attached parts from the flare container. Simultaneously, the explosion of the charge 38 will ignite the powder 60, whereby to ignite the flare candle 58. The parachute will then continue operation in a manner which will be clearly understood.

It will be understood that the above described structure is merely illustrative of the application of the principles of my invention and that I desire to comprehend within my invention such modifications as come within the scope of the claims and the invention.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a flare device, an unrifled flare-expelling casing, a flare container having a flare candle and a parachute connected thereto located within said casing, explosive means within said casing for expelling said flare container from said casing, a flare candle-igniting charge in said casing and in ignition relationship with said candle and having an igniting train with a fixed portion and a portion movable into and out of communication with said fixed portion, one of said train portions communicating with said expelling means and the other with said igniting charge, a movable carrier carrying said movable train portion, yielding means for urging said carrier into engagement with said casing with said movable train portion out of communication with said fixed train portion and responsive to the expulsion of said flare container from said casing for moving said carrier to shift said movable train portion into communication with said fixed train portion, and means for igniting one of said train portions.

2. In a flare device, an unrifled flare-expelling casing, a flare container in said casing having a flare candle and a parachute connected thereto, an explosive expelling charge in said casing for expelling said flare container from said casing, a flare candle-igniting charge in said casing having an igniting train with a fixed portion and a portion movable into and out of communication with said fixed portion, one of said train portions communicating with said expelling charge and the other with said igniting charge, a movable carrier carrying said movable train portion, yielding means for urging said carrier into engagement with said casing with said movable train portion out of communication with said fixed train portion and responsive to the expulsion of said flare container from said casing for moving said carrier to shift said movable train portion into communication with said fixed train portion, and means responsive to the burning of said explosive charge for igniting one of said train portions.

3. In a flare device, an unrifled flare-expelling casing, a flare container in said casing having a flare candle and a parachute connected thereto,

an explosive expelling charge in said casing for expelling said flare container from said casing, a flare candle-igniting charge in said casing having an igniting train with a fixed portion and a portion movable into and out of communication with said fixed portion, one of said train portions communicating with said expelling charge and the other with said igniting charge, a movable carrier carrying said movable train portion, and yielding means for urging said carrier into engagement with said casing with said movable train portion out of communication with said fixed train portion and responsive to the expulsion of said flare container from said casing for moving said carrier to shift said movable train portion into communication with said fixed train portion, one of said train portions having one end in communication with said explosive charge and ignitable in response to the burning of said explosive charge.

4. In a flare device, an unrifled flare-expelling casing, a flare container in said casing having a flare candle and a parachute connected thereto, an explosive expelling charge located above said candle and parachute for expelling said flare container from said casing, a flare candle igniting charge in said casing having an igniting train with a pair of fixed portions and a portion located between and movable into and out of communication with said fixed portions, one of said train portions communicating with said expelling charge and the other with said igniting charge, a movable carrier carrying said movable train portion, and yielding means for urging said carrier into engagement with said casing with said movable train portion out of communication with said fixed train portions and responsive to the expulsion of said flare container from said casing for moving said carrier to shift said movable train portion into communication with said fixed train portion.

5. An aerial device adapted to be discharged from a relatively high elevation, gravitational retarding means connected to said device, ignition means for said device, timing means for operation of said gravitational retarding means and said ignition means during the gravitation of said device, a discharge tube containing said device and all said means and means associated with said timing means forming an interruption to said operation, engageable with the inside of said tube and automatically operative upon release of said device from said discharge tube to remove said interruption.

6. An aerial device adapted to be discharged from a relatively high altitude comprising, a casing, gravitational retarding means carried by said casing, a timing means in said casing for placing into operation said retarding means during gravitation of said device and including an operating member supported by said casing and constituting an interruption to said timing means, a discharge tube containing said casing and engageable with said member for holding said timing means interrupted, whereby on ejection of said device from said tube said member will be released to automatically remove said interruption.

7. An aerial device adapted to be discharged from a relatively high elevation, gravitational retarding means connected to said device, ignition means for said device, timing means for operation of said gravitational retarding means and said ignition means during the gravitation of said device, a discharge tube containing said

device and all said means, and means associated with said timing means forming an interruption to said operation, engageable with the inside of said tube and automatically operative upon release of said device from said discharge tube to remove said interruption, and means for hermetically sealing the discharge end of said discharge tube and adapted to be stripped from said tube when said aerial device is discharged from said tube.

8. In a flare, a hermetically sealed tubular casing comprising a cap adapted to be stripped therefrom, a projectile disposed in said tubular casing having a flare candle and attached parachute therein, means for forcibly ejecting said projectile from said tubular casing, a powder train on one end of said projectile for expelling the contents thereof and lighting the flare candle, said powder train being adapted to be initially ignited by said ejecting means, and means in the projectile and slidable outwardly thereof, said means being in resiliently forced engagement with the inside of said tubular casing and interrupting the powder train, while the projectile is in the casing.

9. In a flare, a hermetically sealed tubular casing comprising a cap adapted to be stripped therefrom, a projectile arranged in said casing comprising a flare candle and attached parachute, a powder charge for forcibly ejecting said projectile from said tubular casing, a powder train on one end of said projectile adapted to be initially ignited by said powder charge for expelling the contents of said projectile and lighting the flare candle, and means in the projectile and slidable outwardly thereof, said means being in resiliently forced engagement with the inside of said tubular casing and interrupting the burning of the powder train, while the projectile is in the casing.

10. In a flare, a hermetically sealed tubular casing comprising a cap adapted to be stripped therefrom, a projectile arranged in said casing comprising a flare candle and attached parachute, a powder charge for forcibly ejecting said projectile from said tubular casing, a divided powder train on one end of said projectile adapted to be initially ignited by said ejecting means for expelling the contents of said projectile and lighting the flare candle, and means located between the component parts of said powder train for interrupting the burning of the powder train so that the lighting of the candle and expelling of the same from the projectile is prevented until after said projectile has been expelled from said tubular casing, said interrupting means comprising a member in the projectile, said member being in resiliently forced engagement with said tubular casing and adapted to slide outwardly of the projectile when out of the casing.

11. In a flare, a hermetically sealed tubular casing, a projectile in said casing comprising a flare candle and attached parachute, two separate charges of ignitable explosive material disposed at one end of said projectile, one of said charges being ignited by the other after its ignition by placing the charges in communication with each other, and a member in the projectile slidable outwardly thereof, said member being in resiliently forced engagement with the side wall of said tubular casing and thereby held in communication-preventing relationship between said charges by said casing.

12. The combination in a flare comprising an outer tubular casing confining a projectile hav-

5 ing a flare candle with attached parachute therein, of three separate explosive charges arranged in said tubular casing adjacent one end of said projectile, one of said explosive charges being actuated to bring about discharge of the projectile, the second charge being in igniting relationship with said first charge, and the third charge being located beyond said second charge, and adapted to ignite the flare, and means com-

prising a member in the projectile, slidable outwardly thereof, said member being in resiliently forced engagement with the side of the casing and preventing communication between said second and third explosive charges to prevent ignition of the latter and the lighting of the flare until said projectile separates from said tubular casing. 5

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