United States Patent [19]

Biggs

[11] **3,808,941**

[45] **May 7, 1974**

[54] **DISPENSER FOR FLARES AND THE LIKE**

[75] Inventor: **Eugene S. Biggs**, Salt Lake City, Utah

[73] Assignee: **Dynapac Inc.**, Salt Lake City, Utah

[22] Filed: **Feb. 9, 1972**

[21] Appl. No.: **224,886**

[52] **U.S. Cl.** ..... **89/1.5 R**, 89/1.5 D

[51] **Int. Cl.** **B64d 1/04**

[58] **Field of Search** 89/1.5, 1.806; 244/137

[56] **References Cited**

UNITED STATES PATENTS

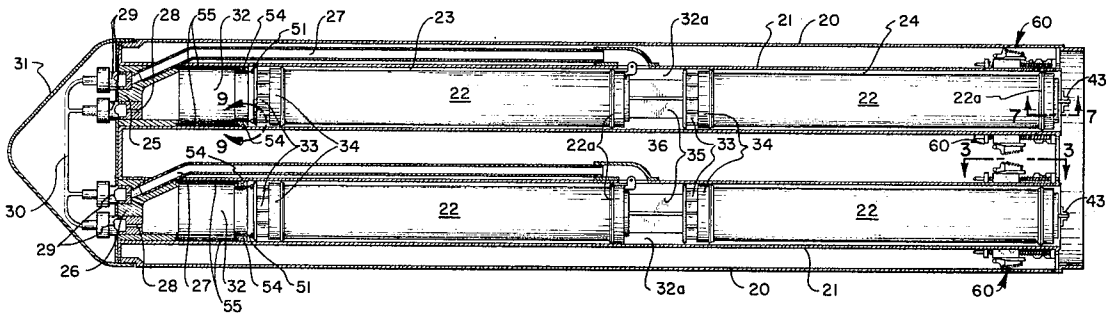
3,435,725	4/1969	Miller	89/1.5 R
3,481,246	12/1969	Snyder	89/1.806 X
2,422,660	6/1947	Elder et al.	89/1.806
2,723,093	11/1955	Price et al.	244/137
2,381,332	8/1945	Boldt	89/1.5 R
3,623,398	11/1971	Meier et al.	89/1.5 R
3,712,232	1/1973	Abel et al.	89/1.5 D

Primary Examiner—Samuel W. Engle

[57] **ABSTRACT**

A dispenser providing for selective single or plural flare, or other drop package, release from aircraft. The dispenser comprises a housing containing one or more flare tubes in which flares are aligned, a trip-type arming device in the outlet end of each flare tube and an arming cap on each flare arranged to engage the arming device and to pull loose from the flare, thereby pulling arming and safety pins on the flare as it is discharged from the flare tube. Explosive devices are used to provide the thrust necessary to drive the flares from the flare tube and gas ports in the housing direct the expanding gases to expansion chambers in the flare tubes at the rear of the flares.

6 Claims, 11 Drawing Figures



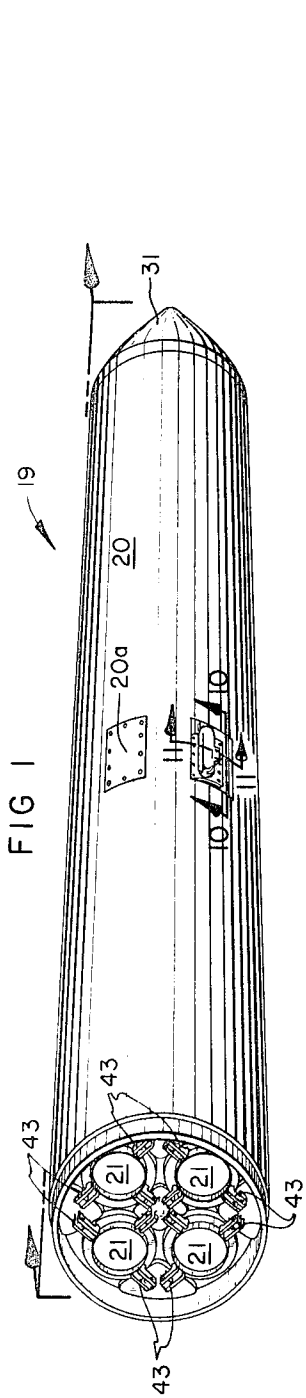


FIG 1

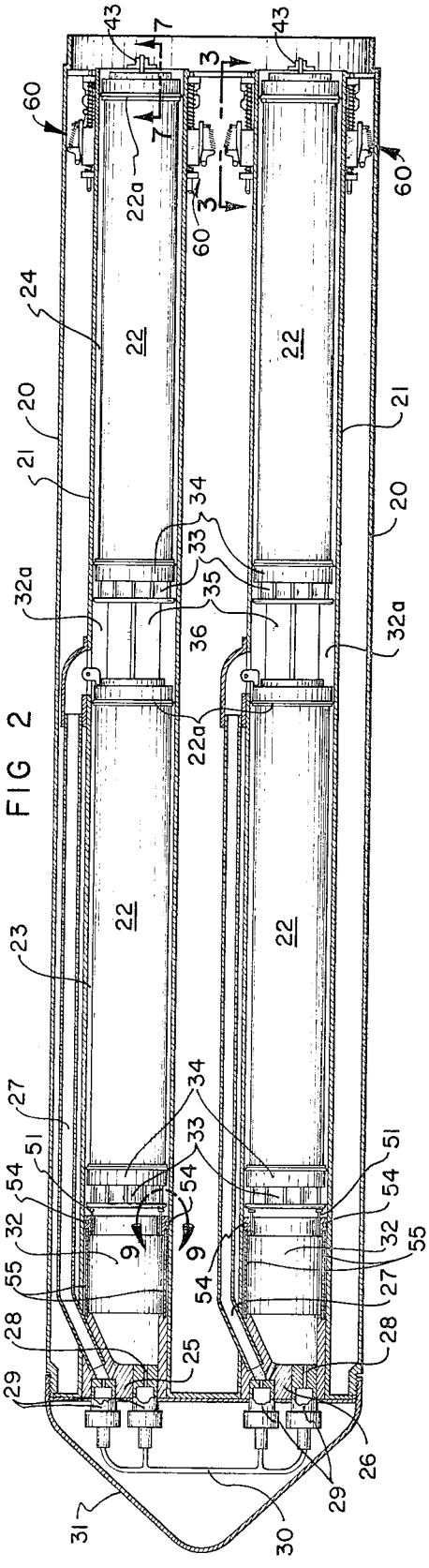


FIG 2

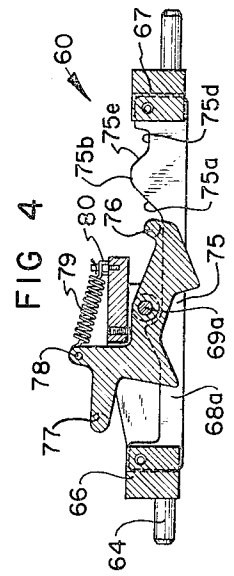


FIG 4

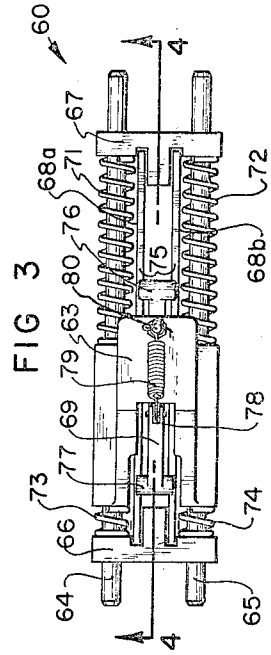


FIG 3

FIG 5

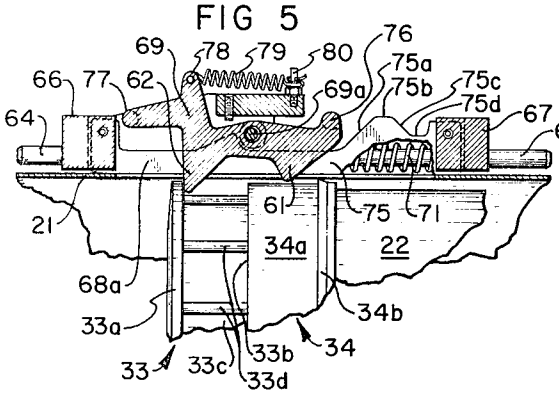


FIG 6

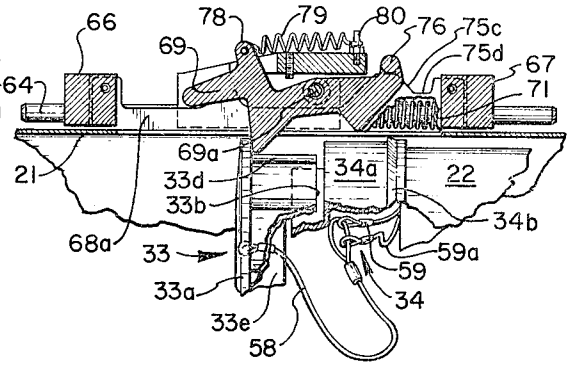


FIG 7

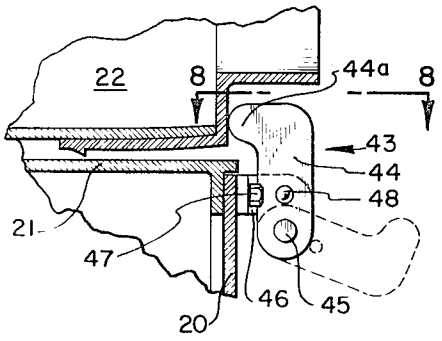


FIG 8

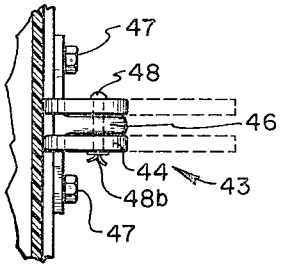


FIG 9

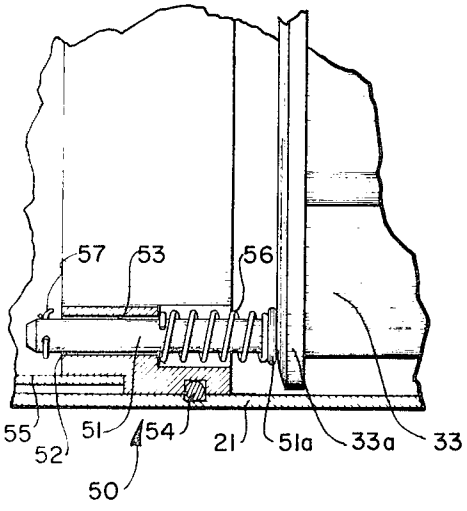


FIG 11

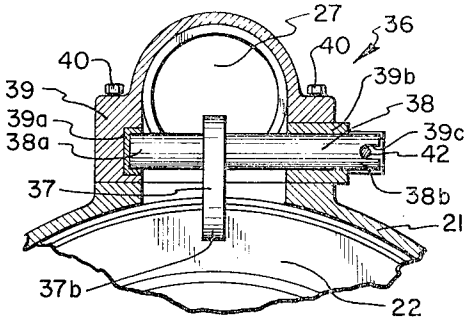
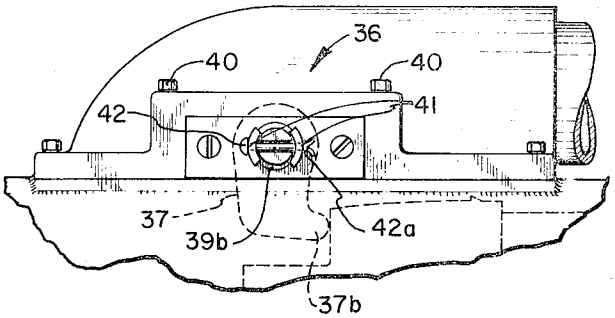


FIG 10



DISPENSER FOR FLARES AND THE LIKE

BRIEF DESCRIPTION OF THE INVENTION

1. Field of the Invention

This invention relates to delivery apparatus for flares and other such drop packages of the type released by aircraft and the like.

2. Prior Art

It has long been customary to drop parachute equipped flares from aircraft so that desired portions of the ground surface can be illuminated from above as the flares slowly float to the ground. The drop systems used in the past have generally involved a carrier housing and a means for simultaneously releasing a pair of flares having their activating rings tethered together. As the flares drop a tumbling action of the pair is relied upon to pull the activating rings, thereby igniting the flares. This commonly used system is unreliable, since the flares may not be ignited at the elevation desired or may not ignite at all. In addition, particularly when used with high speed jet aircraft, such dispensing systems are too slow. The arming of such flares has also been quite dangerous to personnel since it has been necessary to remove the safety pins of the flares prior to loading them into previous flare dispensers. Thus, if one or both of the tethered flares are accidently dropped and the activating pins inadvertantly pulled, the flares may be armed, and the incendiary portion of the flare may actuate.

SUMMARY OF THE INVENTION

Principal objects of the present invention are to provide a reliable, safe and positive delivery system particularly adaptable for dispensing flares, but also useful for dispensing other air dropped packages.

Other objects are to provide a dispenser that is safely and easily handled, that will positively eject flares or other drop packages, either individually or in pairs or groups and that will arm and activate dispensed flares individually as they are discharged, thereby eliminating any need to remove the safety pin of the flare prior to its installation into the dispenser.

Principal features of the invention include a housing having aligned flare receiving chambers in one or more tubes and individual gas ports connecting gas expansion portions of the chambers with individual firing chambers. Latch means are provided to positively hold the flares in the receiving chambers until they are dispensed by firing of charges in the firing chambers and the fracture of shear pins associated with the latch means.

Other features include the use of a flare sealing cap on the rear end of each flare, arming hooks on the open end of each flare tube to be actuated by the flare sealing cap as the flare moves past and an arming cap that is connected by a lanyard to, and moves with, the flare and flare sealing cap until it is caught by the arming hooks, activating the flare arming and ignition system and then tumbling from the open end of the tube through which the flare was ejected.

The arming hooks are arranged at the open discharge ends of the flare tubes such that, as they are engaged by a flare sealing cap on the rear end of a dispensed flare, they are pivoted into position to catch and hold a trailing arming cap, thereby separating it from the flare. As the arming cap pulls free from the flare it pulls

the arming lanyard of the flare and attached safety pin clip, from the flare, thereby arming the flare as it exits the tube.

Other objects and features of the invention will be apparent from the following detailed description and claims taken in conjunction with the accompanying drawings.

THE DRAWINGS

In the drawings:

FIG. **1** is a perspective view taken from the rear and one side of the dispenser of the invention;

FIG. **2**, an enlarged longitudinal section, taken on the line **2—2** of FIG. **1**;

FIG. **3**, further enlarged top plan view of the arming mechanism, taken from the line **3—3** of FIG. **2**;

FIG. **4**, a vertical section, taken on the line **4—4** of FIG. **3**;

FIG. **5**, a view like that of FIG. **4**, but with the arming hook positioned to engage an arming cap, shown fragmentarily on a flare, which is also shown fragmentarily;

FIG. **6**, a similar view with the arming hook moved to its camming position;

FIG. **7**, an enlarged fragmentary vertical section taken on the line **7—7** of FIG. **2**;

FIG. **8**, a horizontal section, taken on the line **8—8** of FIG. **7**;

FIG. **9**, an enlarged view, taken within the line **9—9** of FIG. **2**;

FIG. **10**, an enlarged fragmentary horizontal view taken on the line **10—10** of FIG. **1**, with the outer dispenser housing removed for clarity; and

FIG. **11**, an enlarged, fragmentary, vertical section, taken on the line **10—10** of FIG. **1** and rotated 90°.

DETAILED DESCRIPTION

Referring now to the drawings:

In the illustrated preferred embodiment the flare dispenser of the invention **19** comprises an elongate outer housing **20** containing four identical flare tubes **21**. Connection means are provided, not shown, for joining the dispenser **19** to the body or wing of a carrying vehicle. Each flare tube **21** is adapted to receive, hold and dispense two air drop flares **22** from aligned forward and aft subchambers **23** and **24**. The firing end of each tube **21** has a pair of breech blocks **25** and **26**, respectively connected by ports **27** and **28** with the forward and aft subchambers **23** and **24**.

A cap **29** is threaded onto the forward end of each breech block and when the cap is removed impulse ejection cartridge can be inserted therein. Thereafter, when an electrical circuit is completed through electrical lines **30** connected into each cap **29** the cartridge within the connected breech block is fired. An electrical stepping mechanism, not shown, can be used to insure sequential firing of the cartridges, with the aft flare being dispensed from each tube first. However, as will be hereinafter described, in the event an aft flare should fail to properly ejects, it will be forced out of its tube with ejection of the forward flare. An outer cover **31** encloses the forward end of the dispenser and covers the breech block assemblies. The breech block assemblies and electrical operating mechanism for firing the ejection cartridges are conventionally available and any unit suitable for the purpose can be used.

Each flare tube **21** has gas expansion chambers **32** and **32***a* in subchambers **23** and **24**, respectively, to receive gas generated by the firing of the impulse ejection cartridge and flowing thereto through ports **27** and **28**. Expansion chambers **32** and **32***a* are each exposed to a rear face of an arming cap **33** of a flare inserted into the subchambers **23** and **24** and the forward portion **33***b* of each arming cap telescopes onto a rearwardly projecting sleeve **34***a* of a sealing cap **34**. The other end of each cap **34** is telescoped onto the rear end of one of the flares **22** placed in subchambers **23** and **24**. The two flares **22** are loaded in tandem alignment in subchambers **23** and **24** and have a spacer **35** inserted between the front end of the aft flare **22** and the rear face of arming cap **33** on the forward flare **22**. Spacer **35** holds the two flares apart and provides sufficient open area within chamber **32***a* for gas entering therein to act uniformly over the rear face **33***a* of arming cap **33**.

The arrangement and functions of the coupled arming cap **33** and sealing cap **34** installed on the rear end of each flare are best shown in FIGS. **5** and **6**. Assuming a normal firing where the aft flare in flare tube **21** is dispensed first, gas expansion into chamber **32***a* acts against the rear face **33***a* of the arming cap to push the connected flare out of flare tube **21**. As shown in FIG. **6**, rear face **33***a* is reinforced against buckling by an arrangement of webbing members **33***e* that radiate outwardly from the center of the arming cap **33** to the inner wall of the cap body **33***c*. Ribs **33***d* are formed in spaced arrangement around the outside of the cap body **33***c* to provide additional structural reinforcement against buckling.

A flexible sealing ring **34***b* is formed around the periphery of the body **34***a* of the sealing cap **34** and maintains a wiping engagement with the bore wall of the flare tube. Sealing ring **34***b* expands when gas pressure accumulates within the expansion chamber, behind the ring to provide a sealing contact with the bore wall of flare tube **21** thereby preventing the gas from leaking around the sides of flare **22**. The accumulated gas forces flare **22** out of the end of flare tube **21** as it escapes to atmosphere.

Most frequently, the flares in each flare tube will be separately dispensed, with the aft flare being dispensed upon introduction of expanding gases into expansion chamber **32a** and the forward flare thereafter being dispensed by introduction of expanding gases into expansion chamber **32**. It should be obvious, however, that ejection of the forward flare, by introducing gas into expansion chamber **32**, will also force the aft flare from the tube if it has not been previously dispensed. The sequential arming of the flares when they are simultaneously ejected from the tube will be hereinafter explained in detail.

Forward and aft retaining locks are incorporated into the dispenser to retain the individual flares within the dispenser until they are properly ejected. Each flare tube **21** is equipped with a pivoted forward retaining lock **36**, FIGS. **2**, **10** and **11**, that is installed within the dispenser beneath an access door **20***a* shown in FIG. **1**. Retaining lock **36** consists of a hook **37** fixed on an axle **38** that is journaled within a mounting **39** such that a pointed end **37***b* of hook **37** can be rotated against the forward end of a flare **22**, positioned therebelow in the flare tube **21**. End **38***a* of axle **38** is arranged to rotate within a bushing **39***a* in one side of mounting **39**, while the other end **38***b* extends through and beyond a bushing **39***b* in the other side of mounting **39**. Mounting **39** is connected to flare tube **21** by bolts **40**. End **38***b* of axle **38** extends through mounting **39** and between a pair of shear pin posts **41** that are fixed to the side of mounting **39**. When hook **37** and axle **38** are rotated to bring hook end **37***b* into contact with the forward end of a flare **22** within the appropriate flare tube **21** a notch **39***c* in the end **38***b* of axle **38** is aligned with holes in shear pin posts **41** and a shear pin **42** is inserted therethrough. The ends **42***a* of the shear pin are then spread to retain the pin in place. The shear pin is broken, releasing hook **37** to rotate out of the bore of the flare tube and out of the path of travel of the flare when the propelled flare **22** is ejected by firing of an appropriate ejection cartridge. However, the shear pin will hold the hook **37** in place, preventing accidental discharge of the flare, until such time as the ejection cartridge has been fired.

Aft retaining locks **43**, shown best in FIGS. **7** and **8**, are used to secure the aft flares **22** against undesired ejection. Each aft retaining lock **43** consists of a hook **44**, pivoted at **45** to a mounting bracket **46** that is fixed by bolts **47** to the aft end of dispenser body **20** out of the path of travel of the flare. As shown in solid lines in FIG. **7**, hook **44** is rotated into contact with the end of the flare to hold the flare in the tube. In this position, holes in the body of hook **44** and a hole in bracket **46** are aligned so that a shear pin **48** can be inserted therethrough. The ends **48***a* of pin **48** are then spread to retain the pin within the aligned holes. The hook is thus held against flare **22** cartridge initiated ejection of the flare shear pin **48**, and rotates end **44***a* of hook **44** out of the path of travel of the flare.

A buffer assembly **50**, FIGS. **1** and **9**, is provided in the forward end of each flare tube **21**, to provide a cushioned limit stop for the forward flares. Buffer assembly **50** consists of a plunger **51** inserted through a hole **52** formed through a collar **53** that is maintained in the forward end of flare tube **21** by a snap ring **54**. A sleeve **55** provides a positioning and backing member for collar **53**.

Plunger **51** has a head **51***a* and a spring **56** extends between collar **53** and head **51***a* to bias the plunger towards the aft end of the tube. A cotter pin **57** inserted through the other end of plunger **51** holds the plunger in the collar **53**. Spring **56** allows some cushioned movement of the loaded flares within flare tube **21**, thereby avoiding shock damage to the flares during movement and when airborne, but is not sufficiently strong to overcome or fracture the shear pins installed in the forward and aft retaining locks.

As has been explained, when the appropriate impulse ejection cartridge is fired to inject gas into expansion chamber **32***a*, the expanding gas acting against the rear face **33***a* of arming cap **33**, pushes the flare from the flare tube **21**. Rearward movement of expanding gas acting against the rear face **33***a* of arming cap **33**, pushes the flare from the flare tube **21**. Rearward movement of flare **22** shears pin **48** and rotates hook end **44***a* out of the path of flare travel. The outward passage of flare **22** is guided by sealing ring **34***b* and a guide ring **22***a*, which is installed on the forward end of the flare. Similarly, the introduction of gas into expansion chamber **32** forces flare **22** against the forward retaining lock **36**, shearing pin **42**, and rotating hook **37** out of contact with the flare, allowing the flare, guided by sealing ring **34***b* and guide ring **22***a*, to exit the flare

tube 21 past the already displaced aft retaining lock 43.

As each flare is fired from flare tube 21, the sealing cap 34, fitted over its rear end, comes into contact with a pivoted forward or trigger hook 61 of an arming assembly shown generally at 60. The forward hook 61, acts as a trigger, which when rotated by the outward passage of sealing cap 34, pivots a second or arming hook 62 into position to be engaged by the leading edge of the rapidly traveling rear face 33*a* of arming cap 33. Arming cap 33 is thus caught and held within the flare tube 21, and is separated from the flare as the flare moves out of the tube.

As best seen in FIG. 6, one end of a lanyard 58 is anchored to arming cap 33 and the lanyard is connected to a flare safety pin tether 59 and to an arming ring 59*a*. When arming cap 33 is separated from the flare, as has been heretofore explained, the attached cable first pulls on the tether 59 to thereby pull the safety pin from the flare and then pulls on ring 59*a* to fully arm the flare. After the flare is armed, and pressure on the arming hook 62 is released, the arming cap 33 can fall freely from the tube 21. This firing arrangement allows the flare to remain unarmed, retaining the safety pin in position until the flare is actually ejected. Also, flare loading operations are much safer than if the safety pin must be pulled prior to loading of the flares.

After the flare ejection and arming cap separation, hook 62 is spring biased to move out of contact with the edge of arming cap 33, which then tumbles from flare tube 21. Should arming cap 33 remain in the end of flare tube 21, the next dispensed flare will force it from the dispenser. Once the aft flare in tube 21 has been ejected the arming assembly is automatically positioned to actuate the forward flare should it subsequently be ejected.

The aligned flares are normally fired singly. However, should the operator desire to simultaneously eject both flares, one after another, or should a malfunction in the system result in the aft flare not being previously ejected, then the impulse ejection cartridge connected through port 28 to expansion chamber 32 can be fired to simultaneously push both flares from the dispenser tube. When the two flares are simultaneously ejected, the arming cap of the aft flare is first removed as has been disclosed, thereby arming the first flare. However, the spacer 35 acts against the cap 33 on the aft flare and continues to force it from the tube since a cam unit of the arming assembly 60 allows arming hook 62 to momentarily move into a neutral position of contact with the edge of arming cap 33 of the aft flare. This allows spacer 35 to push the aft cap 33 from the dispenser, and the second or forward flare to then be armed by the arming hook 62 after the arming hook has moved out of its neutral position.

The arming assembly, shown best in FIGS. 3–6, consists of a block 63 which is arranged to slide on spaced parallel guide rods 64 and 65 that are fixed in mountings 66 and 67 at the discharge end of each flare tube 21. Spaced guide rails 68*a* and 68*b* are connected at their ends to mountings 66 and 67, and an arming unit 69 is mounted to pivot about a pivot pin 69*a* between and to travel between the guide rails. Block 63 is biased by springs 71 and 72 against movement towards mounting 67 and by heavier springs 73 and 74 against movement towards mounting 66. A track 75 is provided on the upper edge of each of the guide rails 68*a* and 68*b* to provide camming surfaces for slide lugs 76, that are formed on the end of arming unit 69. Additional slide lugs 77 are formed on the opposite end of arming unit 69 to provide a stop which contacts and slides on the top edge of guide rails 68*a* and 68*b*. The extent of rotation of arming unit 69 is therefore limited by lugs 76 and 77. As has been previously noted, arming unit 69 has the hooks 61 and 62 formed thereon and projecting therebeneath. An ear 78 on arming unit 69, extends upwardly, opposite to hooks 61 and 62, and has its end connected by a spring 79 to a post 80 that projects above block 63. Spring 79 biases ear 78 towards post 80 thereby elevating slide lugs 77 and depressing slide lugs 76 into contact with the tracks 75. Trigger hook 61 is normally biased by the spring 79 to extend below guide rails 68*a* and 68*b* and into flare tube 21. As has been previously explained, ejection of the aft flare moves the sealing cap 34 into contact with hook 61, and pivots the hook against the biasing of spring 79 until arming hook 62 is positioned to catch the leading edge of the following arming cap 33, as shown in FIGS. 5 and 6. The force of the ejecting flare tends to drive the arming hook towards the rear ejection end of the flare tube but it has been found that the pressure application of the arming cap on the arming hook is not uniformly continuous. Thus, the tracks 75 and slide lugs 76 are provided as a means of insuring continued positioning of the arming hook within the flare tube, even though pressure surges might otherwise allow spring 79 to bias the arming hook out of the path of travel of the arming cap, before the arming cap is separated from the flare and the flare is fully armed. Tracks 75 include outwardly inclined surfaces 75*a* that are engaged by the lugs 76 almost simultaneously with initial travel of the block 63, outer straight sections 75*b* on which the lugs 76 travel during continued movement of block 63, inwardly inclined surfaces 75*c* and inner straight surfaces 75*d* to which the lugs 76 move as the trigger and arming hooks are moved into neutral positions allowing clear travel of the flares from the flare tubes, as will be hereinafter explained, in the event the arming cap will not properly separate from the flare.

In operation, the aft flare is normally fired first and as the peripheral edge of its sealing cap 34 engages trigger hook 61 the trigger hook is pivoted out of flare tube 21 and arming hook 62 is pivoted into the flare tube. The peripheral edge of arming cap 33 on the rear of the flare engages arming hook 62 and the continued travel of the flare tends to separate the flare from the arming and sealing cap. The dynamic force of the traveling arming cap tends to drive the block 63 against the biasing effect of springs 71 and 72 and lugs 76 against tracks 75 such that the arming hook is held in position extending into the flare tube. The arming hook is thus held in position to be repeatedly contacted by the arming cap should surging of the flare and/or arming cap occur and the arming hook will not be biased out of the flare tube by spring 79. However, if for some reason, the arming cap cannot be separated from the flare, thereby pulling the safety pin and arming ring on the flare, the flare will still eject, since continued movement of the block 63 moves slide lugs 76, under the bias of spring 72 against surface 75*d*, at which time the trigger and arming hooks are both sufficiently out of the flare tube that the flare and sealing and arming caps are able to move freely out of the tube. With the structure described, it is not possible for a flare to be caught

by its arming cap and to be only partially ejected, thereafter remaining in an unsafe condition. Once the arming cap **33** has moved past the arming hook springs **71** and **72** move block **63** to its starting position and spring **79** moves the trigger hook back into position to engage a sealing cap of the next flare ejected from the flare tube.

The flares can be safely down-loaded, i.e., removed from tubes **22**, if they are not fired. The safety pin and arming ring are not pulled if the flare has not been fired and once the shear pins of the forward and aft retaining locks are removed the locks can be manually pivoted out of the path of travel of the flares. As each flare is pulled slowly from the tube the sealing cap **34** engages trigger hook **61** and pivots arming hook into the path of travel of the outer edge of arming cap **33**. However, since the flare is being pulled out of the tube slowly trigger hook **61** is released and arming hook **62** is biased back out of the path of travel of the arming cap before any actual engagement of the arming hook and arming cap can occur. Consequently, the flare is not armed as it is removed slowly during down-loading procedures.

Although a preferred form of my invention has been herein disclosed, it is to be understood that the present disclosure is made by way of example and that variations are possible without departing from the scope of the hereinafter claimed subject matter, which subject matter I regard as my invention.

I claim:

1. A dispenser for flares and the like comprising

a housing adapted to be connected to a carrying vehicle;

a tube within said housing adapted to receive a flare having forward and aft ends;

means mounted on said tube for releasably holding said flare within said tube;

an expansion chamber within said tube at the aft end of a flare in the tube;

means for creating a gas expansion within the expansion chamber to thereby force the flare from the tube;

an opening through the wall of the tube at the aft end thereof;

flare arming means including an arming hook pivotally mounted on the wall of the tube to move into and out of the tube through the said opening, said arming hook being movable into a position in said tube whereby it will engage said flare to remove a safety pin and an arming ring from said flare as said flare is ejected from said tube;

spring means having one end fixed to the tube and the other end fixed to the arming hook, whereby the arming hook is normally biased out of said tube; and a trigger hook connected to the arming hook and normally biased into said tube by said spring means to be engaged by the flare during the ejection thereof to thereby move the arming hook into the tube and to hold the arming hook therein during removal of the safety pin and the arming ring.

2. A dispenser for flares and the like as set forth in claim **1**, wherein the means for holding the flare within the tube consists of

a hook rotatably connected to said tube such that the end of said hook can be moved into blocking engagement with said flare within said tube, and a shear pin inserted through said hook and said housing, said shear pin being arranged to shear when subjected to a predetermined force, thereby allowing said hook to rotate out of the path of travel of said flare.

3. A dispenser for flares and the like as set forth in claim **1**, wherein the means for creating a gas expansion consists of

a breechblock arrangement within the housing for containing and firing a gas generating cartridge therein; and

a port connecting a gas output portal of the breechblock with the expansion chamber.

4. A dispenser for flares and the like as set forth in claim **1**, wherein the flare arming means further consists of

a sealing cap connected to the end of the flare when loaded and forming a seal with the interior of the tube;

an arming cap releasably connected to said sealing cap and separate from said flare; and

means for connecting said arming cap with the arming ring and safety pin of said flare.

5. A dispenser for flares and the like as set forth in claim **4**, wherein

the arming hook is connected to said trigger hook such that when said trigger hook is rotated fully out of said flare tube by contact with the sealing cap the arming hook is rotated into the path of the following arming cap to obtain said arming cap within said flare tube.

6. A dispenser for air drop items as recited in claim **5**, wherein the trigger and arming hooks have slide lugs thereon and are pivotally connected to a block arranged to slide on at least one guide member fixed to the tube;

means biasing said block towards the forward end of the flare tube; and

guide tracks arranged to be engaged by the slide lugs when said block is moved against the biasing effect of the means biasing the block towards the forward end of the flare tube said guide tracks having a portion preventing rotation of the arming hook out of the flare tube and a portion wherein both the arming hook and the trigger hook are out of the path of travel of the sealing and arming caps on a flare ejected from the flare tube.

* * * * *