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## (54) IMPROVEMENTS IN AND RELATING TO PYROTECHNIC DEVICES

(71) We, PAINS-WESSEX LIMITED, a British Company of High Post, Salisbury, Wiltshire, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to signal devices, and especially to signal devices suitable for being fired from the hand.

The invention provides a signal device comprising a rocket housed in a discharge tube, means for igniting the rocket, closure means at the upper end of the discharge tube, and mechanical means for displacing the closure means, the mechanical displacing means including a member that is situated at or close to the lower end of the discharge tube and is coupled to the igniting means, the arrangement being such that the member is movable to effect displacement of the closure means and to operate the igniting means to ignite the rocket after displacement of the closure means.

The removal of the closure means at the upper end of the discharge tube before ignition of the rocket gives improved directional accuracy as compared with allowing the closure means to be displaced by the rocket itself as it leaves the discharge tube and, in the device of the invention, this is achieved without the operator having to do more than move the member that serves to ignite the rocket. It is to be understood that throughout this Specification, the term "upper end" of the discharge tube means the end of the discharge tube through which the rocket is to emerge and the "lower end" of the discharge tube means the opposite end, and that this terminology applies irrespective of the orientation of the discharge tube when the rocket is fired in use.

Advantageously, there is releasable engagement between the member and the discharge tube, and the movement of the member (which is preferably a rotational movement about the axis of the discharge tube) to release it from engagement, preferably screw-threaded engagement, with the discharge tube effects displacement of the closure means and such that, thereafter, movement of the member away from the discharge tube causes the igniting means to be operated. This arrangement provides a simple way of ensuring that the rocket is not ignited before the closure means at the upper end of the discharge tube has been displaced. The igniting means may comprise a percussion primer and a striker mechanism coupled to the member and arranged to operate in response to tensioning of the coupling.

Advantageously, the mechanical displacing means comprises means for imparting forward axial movement to a displacing member to effect displacement of the closure means in response to movement of the member. The displacing member may be a hollow cylinder surrounding the rocket in the discharge tube but is preferably the rocket itself. The means for imparting forward axial movement (that is to say, axial movement towards the upper end of the discharge tube) to the displacing member may comprise cam means. Preferably, the means for imparting forward axial movement is arranged to impart the forward axial movement in response to a rotational movement of the member about the axis of the discharge tube; the member may be in screw-threaded engagement with the discharge tube, and the said rotational movement may tend to disengage the member from engagement with the discharge tube: the means for imparting forward axial movement may then comprise rotary cam means with the axis of rotation coincident with the axis of the discharge tube. Preferably, the cam means is positioned in the lower end portion of the discharge tube.

The said member may have an extension arranged to extend into the lower end of the discharge tube and engage directly with the cam surface or the cam follower of the cam means, such that rotation of the member causes the required rotation of the cam or cam follower. For example, the extension may comprise a pair of opposed axially-extending projections which engage the cam or cam follower to cause the required rotary movement of the cam or cam follower while permitting axial movement between the member and the cam or cam follower.

Preferably, the rotary cam means has two inclined cam surfaces extending around the circumference of the discharge tube.

Advantageously, the discharge tube is closed at its lower end and the arrangement is such that movement of the said member to effect displacement of the closure means and ignite the rocket entails a vent being formed (other than at the upper end of the discharge tube) through which exhaust gases from the rocket in the discharge tube can reach the atmosphere. This arrangement enables the signal device to be sealed prior to use while ensuring that the rocket leaves the discharge tube substantially solely as a result of the momentum of its exhaust gases, thereby reducing or eliminating recoil and improving the stability of the rocket as it leaves the discharge tube, as compared with its being ejected, at least in part, by the build-up of pressure in the discharge tube. When the vent is formed, since its formation is effected by movement of the same member as is used to displace the closure means at the upper end of the discharge tube and to ignite the rocket, the simplicity of operation of the rocket is not impaired. For example, if the rocket is fired from the hand, the discharge tube can be held in one hand, and the rocket operated solely by movement of the said member by the other hand, the operation being carried out without the user having to change his grip. This is of particular advantage if the rocket is used by a person floating in the sea, and the fact that the rocket can be sealed prior to use and fires with little or no recoil are further advantages in such a case.

The vent to the atmosphere for the exhaust gases from the rocket may comprise holes in the lower portion of the discharge tube, or holes in a closure member for the lower end of the discharge tube, the arrangement being such that the holes are uncovered by movement of the said member. Preferably, however, the member closes an opening in the lower end of the discharge tube, and the arrangement is such that the movement of the member to effect displacement of the closure means and rocket ignition requires that the member be removed from the opening to form the vent. Preferably, removal of the member from the opening is arranged to effect displacement of the closure means, and the arrangement is such that the member can only be moved to operate the igniting means after removal of the member from the opening. This arrangement ensures that the rocket is not ignited before a vent for its exhaust gases has been formed in the discharge tube.

A delay mechanism, for example, a fuse, may be incorporated in the igniting mechanism. This gives the user of the rocket time to hold the discharge tube with both hands before the rocket is discharged.

Advantageously, the member is secured to, or formed as part of, a tubular member in sliding engagement with the discharge tube, the arrangement being such that the tubular member remains in engagement with the discharge tube after movement to effect closure displacement and rocket ignition has been completed (although, of course, the member itself may become disengaged from the discharge tube during the movement). This enables the rocket to be held with both hands when firing, one on the discharge tube and the other on the tubular member, so that the user can aim the rocket more accurately. This is particularly advantageous if the rocket ignites as soon as it is fired, as opposed to when a delay mechanism is incorporated in the igniting mechanism, since there is then no time for the user to change his grip before the rocket leaves the discharge tube.

Advantageously, the lower end of the tubular member is closed. This safeguards the user from any flames from the rocket, while also eliminating, providing the material of the tubular member is opaque, any visual indication that the rocket has been fired. Sealing means may be provided to prevent the ingress of dust between the tubular member and the discharge tube. Preferably, a layer of priming material is provided at the surface of the propellant that is to be ignited. The presence of the priming material causes the propellant to ignite more quickly so that, if the discharge tube is closed at its lower end, the effect of the pressure build-up on the discharge of the rocket will be reduced, thereby improving the stability of the rocket as it leaves the discharge tube. Preferably, displacement of the closure means and release of the member from engagement with the discharge tube is arranged to be effected in response to a rotational movement of the member about the axis of the discharge tube, operation of the igniting means being arranged to take place in response to an axial movement of the member after release from engagement, and there is provided stop means for preventing rotational movement of the member in the same direction as the said

rotational movement, the stop means being arranged to come into operation after the closure means has been displaced and the member released from engagement. This serves to indicate to the user of the rocket when the member may be moved axially to ignite the rocket and this is valuable when the rocket is operated in darkness. Preferably, operation of the igniting means is arranged to take place in response to an axial movement of the member away from the discharge tube, and there is provided stop means for preventing axial movement of the member away from the discharge tube, the stop means being arranged to come into operation after the movement of the member to operate the igniting means has been completed.

The igniting means of the rocket may be formed as part of the rocket, but it is preferably arranged to remain in the discharge tube after the rocket has been fired. Thus, the igniting means may be housed in the lower part of the discharge tube.

Two signal devices, constructed in accordance with the invention will now be described in detail, by way of example, with reference to the accompanying drawings, in which,

Figure 1 is an axial cross-section of the first device; and

Figure 2 is an axial cross-section of the second device.

The same reference numerals are given to the same parts in each of the two Figures.

Referring to Figure 1, the first device, which is a signal flare device, comprises a generally tubular rocket, indicated generally by the reference numeral 1, slidably housed in a discharge tube 2, which tube is closed at its upper end by closure means in the form of a cap 2*a* sealed in position.

The rocket 1 comprises a generally tubular casing 3, which houses the flare composition 4 in its upper part, the rocket propellant 5 in its central part and means for igniting the propellant, indicated generally by the reference numeral 6, in its lower part. The lower part of the rocket casing 3 is formed with three rectangular ports equally spaced around the circumference of the rocket (not shown) to assist in stabilising the flight of the rocket.

The flare composition 4 is contained in a tubular casing of pressed paper 7, which is slidable in the rocket casing 3. A layer of igniting composition 8 for the flare composition 4 is provided in the lower part of the tubular casing 7, which is partially closed at its lower end by an annular paper disc 9. The upper end of the tubular casing 7 is closed by a mill-board disc 10. Contained in the uppermost portion of the rocket casing 3, between the mill-board disc 10 and the top of the rocket casing, which is closed by a cap 11, is a parachute 12, the cords 13 of which are stapled to the mill-board disc 10. A paper washer 14 separates the mill-board disc 10 from the parachute 12.

The propellant 5 is contained in a cylindrical casing 15 which is located against axial movement in the rocket casing 3 by two waists 16 formed in the rocket casing. The upper end of the cylindrical casing 15 is formed with a short, hollow neck portion 17 of which the upper end abuts the paper disc 9, and the neck portion is filled with a slow-burning pyrotechnic composition 18 which transmits combustion from the propellant 5 to the flare-igniting composition 8. The bottom edge of the cylindrical casing 15 is turned inwardly to form a lip which supports a convergent-divergent nozzle member 19, the nozzle member being located against upward movement relative to the casing 15 by a waist 20 formed in the casing.

The upper surface of the nozzle member 19 is formed with a circular groove containing igniting material 21, which serves to aid ignition of the propellant 5 when a propellant igniter 22 combusts. The propellant igniter 22, the part of which below the nozzle member 19 is sleeved, is connected to a fuse 23, which imparts a delay to the ignition of the propellant 5 and which is supported in a ferrule 24, the ferrule itself being supported in a generally tubular casing 25. The casing 25 serves to house the rocket striker mechanism, indicated generally by the reference numeral 26, and a centre-fire percussion cap 27 which is situated immediately below the open end of the ferrule 24.

The rocket striker mechanism 26 comprises a polypropylene tube 28 which is held in position in the tubular casing 25 by means of a pin (not shown) which passes through the tubular casing 25, and a spring-loaded plunger indicated generally by the reference numeral 30. The head 31 of the plunger 30, which is formed with a firing pin 32 for striking the percussion cap 27 is integral with the shaft 33 of the plunger, both the head and the shaft being made of brass.

Towards the lower end of the shaft 33, a circumferential groove 34 is formed in the shaft which lies, when the plunger 30 is in its unretracted position, in a part 35 of the tube 28 of reduced internal diameter. The lower end portion 36 of the shaft 33 is contained in a socket in a member 37, which member is split, in the plane of the section, into two similar parts. The upper end portion of the member 37 is externally cylindrical and has a diameter slightly less than that of the narrower part 35 of the tube 28 so that, when the plunger 30 is in unretracted position, the parts of the member 37 are held

in engagement with the groove 34 in the plunger, but, when the member 37 is pulled downwardly, clear of the narrower part 35 of the tube 27, the two parts of the member 37 separate to release the plunger which then strikes the cap 27 under the action of a coil spring 38. The spring 38 acts in compression between the head 31 of the plunger and the shoulder formed by the reduction in the internal diameter of the tube 28. The narrow part 35 of the tube 28 is formed internally with axially-extending runners which facilitate smooth withdrawal of the member 37 from the tube. The lower end of the member 37, which is enlarged to prevent it from entering the narrow part 35 of the tube 28, is coupled by a lanyard 39 to a member 40 situated at the lower end of the discharge tube 2 by means of a cylindrical extension member 47 secured to the member 40.

The member 40, together with a collar 43 having rotary cam surfaces, and cam followers 42 formed on fins 41 which cooperate with the cylindrical extension member 47, form part of mechanical means for displacing the cap 2*a*. The member 40 is movable to effect displacement of the cap 2*a* and to operate the igniting means 6.

The tubular casing 25 is formed integrally on the outside with two alignment fins (not shown), which extend in opposite radial directions at right angles to the plane of the section and of which the outer ends make a sliding fit within the rocket casing 3. Below the alignment fins, the tubular casing 25 is formed integrally with the two fins 41 which extend in opposite radial directions in the plane of the section.

The outer part 42 of each of the fins 41 forms a cam follower of which the lower surface runs on one of two similar rotary cam surfaces formed at the top of the collar 43. The upper surfaces of the cam followers 42 bear against the lower end of a polypropylene ring 44 the outer portion of the upper surface of which bears against the lower end of the rocket casing 3 so that the ring serves to distribute the thrust from the cam followers evenly around the circumference of the rocket casing. The collar 43 is located axially in the bottom end portion of the discharge tube 2 between the turned-in end portions of the wall of the discharge tube and a waist 45 formed in the wall of the discharge tube. Further, the under surface of the collar 43 and the upper surface of the inwardly-turned end portion of the wall of the discharge tube 2 are each serrated to prevent relative rotation between the collar and the discharge tube.

The cam surfaces, the lowest parts of which are shown in the drawing, each extend around half the circumference of the collar 43, and the height of each cam surface from the collar varies smoothly along its length from zero at one end to full height at the other end. The angle of inclination of each cam surface varies in a circumferential direction so that, starting from the lowest position on the cam surface, a rotation of the associated cam follower 42 through 90° imparts to the cam follower a lift of only one third of the total lift imparted when the cam follower is rotated through the maximum angle of 180°. When the device is assembled ready for use, care is taken to ensure that the cam followers 42 are situated at the lowest parts of the respective cam surfaces.

The member 40 is in releasable screw-threaded engagement with the discharge tube 2, the upper portion of the member 40 being externally screw-threaded and engaging with internal screw-threads on the collar 43 which is located against movement relative to the discharge tube 2. A sealing member, which may be in the form of an O-ring 46 or in the form of a flat washer, that is interposed between the member 40 and the lower end of the discharge tube 2 serves to seal that end of the discharge tube.

The member 40 is formed with a central hollow recess into which fits the hollow cylindrical extension member 47, the inner wall of the recess and the outer wall of the cylindrical member in contact with it being formed with axial splines to prevent relative rotation between the member 40 and the cylindrical member 47. The cylindrical member 47 is secured to the member 40 by a screw 48 which is received by a central bore 49 formed in the cylindrical member, and the tapered lower end portion of the cylindrical member forms a water-tight seal with the member 40. As an additional precaution against the entry of water, a washer may be interposed between the cylindrical member 47 and the member 40, as shown in Figure 2. The upper part of the cylindrical member 47 is formed with two diametrically opposite radially extending slots into which the fins 42 are received, so that the casing 25 can be rotated by rotation of the member 40, the depth of the slots being sufficient to ensure that the fins remain in engagement with the member 40 as the latter is unscrewed.

In operation, the rocket is held in one hand and the member 40 is rotated with the other to unscrew it from the discharge tube 2, thereby rotating the fins 42 on the tubular casing 25. The sense of the screw-thread on the member 40 and the direction of inclination of the rotary cam surfaces is such that the unscrewing of the member causes the cam followers 42 to move along the cam surfaces in the direction of increasing height. The resulting thrust applied to

the rocket 1 through the ring 44 causes forward axial movement to be imparted to the rocket, which in turn imparts axial movement to the cap 2*a* at the top of the discharge tube and displaces it. Further unscrewing of the member 40 releases it from engagement with the discharge tube 2 and movement of the member 40 away from the discharge tube, imparting a tension to the lanyard 39, causes the rocket striker mechanism 26 to be operated in the manner described hereinbefore and the rocket 1 to be ignited. The removal of the member 40 uncovers an opening at the lower end of the discharge tube 2 to provide a vent, and the rocket leaves the discharge tube substantially solely as a result of the momentum of its exhaust gases. The ignition means 6 remains in the discharge tube 2.

When the rocket propellant 5 has burned out, the flare-igniting composition 8 is ignited by the slow-burning pyrotechnic composition 18, and the tubular casing 7, which is attached to the parachute 12 and which contains the flare composition 4 is ejected from the rocket casing 3. The flare casing 7 containing the burning flare composition 4 then falls under the control of the parachute 12.

Referring to Figure 2, the second signal device, which is also a signal flare device, is the same as the first signal device other than in the following respects.

The member 40 is secured by the screw 48 to a tubular member 50 of black polypropylene which is closed at its lower end and which is in sliding engagement with the discharge tube 2. Projections (not shown) in the member 40 engage in recesses (not shown) in the tubular member 50 and prevent relative rotation between the two parts. The mechanical means for displacing the cap 53 includes the tubular member 50, in addition to the same parts as in the first device.

A wire limit stop 51, which consists of a circular upper portion co-axial with the axis of the rocket secured by two axially-extending leg portions to the cylindrical member 47, prevents the tubular member 50 from being removed completely from the discharge tube 2, the circular portion of the limit stop abutting the upper ends of the fins 41. The limit stop 51 does not prevent relative rotation between the tubular member 50 and the discharge tube 2.

An outwardly-projecting lug (not shown) is formed on the upper part of the cylindrical member 47, and an inwardly-projecting lug (also not shown) is formed on the inside wall of one of the semi-circular cams towards its highest part. The two lugs are so positioned that, in operation, after the member 40 (and hence the tubular member 50) has been rotated sufficiently to cause the upper closure means to be displaced and to become itself (the member 40) disengaged from the discharge tube 2, the lugs abut each other and prevent rotation of the member 40 in the same direction, thus indicating to the user that the tubular member 50 may be moved axially downwards to operate the ignition means.

The fuse 23 of the first device is omitted in the second device, and the igniting material 21 of the first device is also omitted in the second device, a layer of priming material 52 being formed on the lower surface of the propellant 5.

The other differences between the first and second devices are that the cap 2*a* of the first device has been replaced by a cap 53 surrounded by an O-ring, the O-ring 46 at the base of the discharge tube 2 of the first device has been replaced by a washer 54, and alignment fins on the tubular casing 25 of the first device are omitted in the second device, the casing 25 being surrounded by a tube 55, the upper end of which is formed with an opening which receives a convergent-divergent nozzle 56. The tube 55 serves to retain the rocket in position in the discharge tube 2 even when the discharge tube is pointed downwards. When the rocket is ignited, the nozzle 56 disengages easily from the tube 55, the tube being made of polythene which is melted by the flames at ignition, and the upper end of which being formed with radial cuts. The discharge tube may thus be pointed downwards to fire the rocket if desired.

The operation of the second signal rocket is similar to that of the first. The discharge tube 2 is held in one hand and the tubular member 50 in the other, and the latter is rotated relatively to the former to effect, in the same way as in the first device, the displacement of the cap 53 and the disengagement of the member 40 from the discharge tube 2. After this rotation has been completed, no further rotation between the tubular member 50 and the discharge tube 2 in the same direction can take place since the two lugs (not shown) abut each other.

The tubular member 50 is then pulled in an axial direction away from the discharge tube 2 thereby operating the striker mechanism 26 in the same way as in the first device, but is prevented from becoming disengaged from the discharge tube by the limit stop 51 which abuts the upper ends of the fins 41. The rocket propellant is ignited by the rocket igniter 22 as soon as the striker mechanism 26 is operated because the fuse of the first device is omitted and because of the layer of priming material 52, and the rocket leaves the discharge tube with the user still holding the rocket with both hands, the discharge tube 2 in one hand and the tubular member 50 in the other.

The flame from the rocket at ignition is masked by the tubular member 50 and, furthermore, the flames from the burning propellant are not visible from positions to which the rocket is heading because of the shielding of the rocket tube 3, and consequently there is no warning that the rocket is approaching until the signal flare composition 4 combusts.

WHAT WE CLAIM IS:—

1. A signal device which comprises a rocket housed in a discharge tube, means for igniting the rocket, closure means at the upper end of the discharge tube, and mechanical means for displacing the closure means, the mechanical displacing means including a member that is situated at or close to the lower end of the discharge tube and is coupled to the igniting means, the arrangement being such that the member is movable to effect displacement of the closure means and to operate the igniting means to ignite the rocket after displacement of the closure means.

2. A signal device as claimed in claim 1, in which there is releasable engagement between the member and the discharge tube, and the arrangement is such that movement of the member to release it from engagement with the discharge tube effects displacement of the closure means and such that, thereafter, movement of the member away from the discharge tube causes the igniting means to be operated.

3. A signal device as claimed in claim 2, in which the igniting means comprises a percussion primer and a striker mechanism coupled to the member and arranged to operate in response to tensioning of the coupling.

4. A signal device as claimed in claim 2 or claim 3, in which the movement of the member to release it from engagement with the discharge tube is a rotational movement about the axis of the discharge tube.

5. A signal device as claimed in any one of claims 2 to 4, in which the engagement between the member and the discharge tube is screw-threaded engagement.

6. A signal device as claimed in any one of claims 1 to 5, in which the mechanical displacing means comprises means for imparting forward axial movement to a displacing member to effect displacement of the closure means in response to movement of the member.

7. A signal device as claimed in claim 6, in which the means for imparting the forward axial movement to the displacing member comprises cam means.

8. A signal device as claimed in claim 6 or claim 7, in which the displacing member is the rocket.

9. A signal device as claimed in any one of claims 6 to 8, in which the means for imparting forward axial movement is arranged to impart the forward axial movement in response to a rotational movement of the member about the axis of the discharge tube.

10. A signal device as claimed in claim 9, in which the member is in screw-threaded engagement with the discharge tube, and the said rotational movement tends to disengage the member from engagement with the discharge tube.

11. A signal device as claimed in claim 9 or claim 10, in which the means for imparting forward axial movement comprises rotary cam means with the axis of rotation coincident with the axis of the discharge tube.

12. A signal device as claimed in claim 11, in which the rotary cam means has two inclined cam surfaces extending around the circumference of the discharge tube.

13. A signal device as claimed in any one of claims 1 to 12, in which the discharge tube is closed at its lower end and the arrangement is such that movement of the said member to effect displacement of the closure means and ignite the rocket entails a vent being formed through which exhaust gases from the rocket can reach the atmosphere.

14. A signal device as claimed in claim 13, in which the member closes an opening in the lower end of the discharge tube, and the arrangement is such that the movement of the member to effect displacement of the closure means and rocket ignition requires that the member be removed from the opening to form the vent.

15. A signal device as claimed in claim 14, in which removal of the member from the opening is arranged to effect displacement of the closure means, and the arrangement is such that the member can only be moved to operate the igniting means after removal of the member from the opening.

16. A signal device as claimed in any one of claims 1 to 15, in which the member is secured to, or formed as part of, a tubular member in sliding engagement with the discharge tube, the arrangement being such that the tubular member remains in engagement with the discharge tube after movement of the member to effect closure displacement and rocket ignition has been completed.

17. A signal device as claimed in claim 16, in which the lower end of the tubular member is closed.

18. A signal device as claimed in claim 16 or claim 17, in which a layer of priming material is provided at the surface of the propellant that is to be ignited.

19. A signal device as claimed in any one of claims 16 to 18, in which displace-

The flame from the rocket at ignition is masked by the tubular member 50 and, furthermore, the flames from the burning propellant are not visible from positions to which the rocket is heading because of the shielding of the rocket tube 3, and consequently there is no warning that the rocket is approaching until the signal flare composition 4 combusts.

WHAT WE CLAIM IS:—

1. A signal device which comprises a rocket housed in a discharge tube, means for igniting the rocket, closure means at the upper end of the discharge tube, and mechanical means for displacing the closure means, the mechanical displacing means including a member that is situated at or close to the lower end of the discharge tube and is coupled to the igniting means, the arrangement being such that the member is movable to effect displacement of the closure means and to operate the igniting means to ignite the rocket after displacement of the closure means.

2. A signal device as claimed in claim 1, in which there is releasable engagement between the member and the discharge tube, and the arrangement is such that movement of the member to release it from engagement with the discharge tube effects displacement of the closure means and such that, thereafter, movement of the member away from the discharge tube causes the igniting means to be operated.

3. A signal device as claimed in claim 2, in which the igniting means comprises a percussion primer and a striker mechanism coupled to the member and arranged to operate in response to tensioning of the coupling.

4. A signal device as claimed in claim 2 or claim 3, in which the movement of the member to release it from engagement with the discharge tube is a rotational movement about the axis of the discharge tube.

5. A signal device as claimed in any one of claims 2 to 4, in which the engagement between the member and the discharge tube is screw-threaded engagement.

6. A signal device as claimed in any one of claims 1 to 5, in which the mechanical displacing means comprises means for imparting forward axial movement to a displacing member to effect displacement of the closure means in response to movement of the member.

7. A signal device as claimed in claim 6, in which the means for imparting the forward axial movement to the displacing member comprises cam means.

8. A signal device as claimed in claim 6 or claim 7, in which the displacing member is the rocket.

9. A signal device as claimed in any one of claims 6 to 8, in which the means for imparting forward axial movement is arranged to impart the forward axial movement in response to a rotational movement of the member about the axis of the discharge tube.

10. A signal device as claimed in claim 9, in which the member is in screw-threaded engagement with the discharge tube, and the said rotational movement tends to disengage the member from engagement with the discharge tube.

11. A signal device as claimed in claim 9 or claim 10, in which the means for imparting forward axial movement comprises rotary cam means with the axis of rotation coincident with the axis of the discharge tube.

12. A signal device as claimed in claim 11, in which the rotary cam means has two inclined cam surfaces extending around the circumference of the discharge tube.

13. A signal device as claimed in any one of claims 1 to 12, in which the discharge tube is closed at its lower end and the arrangement is such that movement of the said member to effect displacement of the closure means and ignite the rocket entails a vent being formed through which exhaust gases from the rocket can reach the atmosphere.

14. A signal device as claimed in claim 13, in which the member closes an opening in the lower end of the discharge tube, and the arrangement is such that the movement of the member to effect displacement of the closure means and rocket ignition requires that the member be removed from the opening to form the vent.

15. A signal device as claimed in claim 14, in which removal of the member from the opening is arranged to effect displacement of the closure means, and the arrangement is such that the member can only be moved to operate the igniting means after removal of the member from the opening.

16. A signal device as claimed in any one of claims 1 to 15, in which the member is secured to, or formed as part of, a tubular member in sliding engagement with the discharge tube, the arrangement being such that the tubular member remains in engagement with the discharge tube after movement of the member to effect closure displacement and rocket ignition has been completed.

17. A signal device as claimed in claim 16, in which the lower end of the tubular member is closed.

18. A signal device as claimed in claim 16 or claim 17, in which a layer of priming material is provided at the surface of the propellant that is to be ignited.

19. A signal device as claimed in any one of claims 16 to 18, in which displace-

ment of the closure means and release of the member from engagement with the discharge tube is arranged to be effected in response to a rotational movement of the member about the axis of the discharge tube, operation of the igniting means being arranged to take place in response to an axial movement of the member after release from engagement, and there is provided stop means for preventing rotational movement of the member in the same direction as the said rotational movement, the stop means being arranged to come into operation after the closure means has been displaced and the member released from engagement.

20. A signal device as claimed in any one of claims 16 to 19, in which operation of the igniting means is arranged to take place in response to an axial movement of the member away from the discharge tube, and there is provided stop means for preventing axial movement of the member away from the discharge tube, the stop means being arranged to come into operation after the movement of the member to operate the igniting means has been completed.

21. A signal device as claimed in any one of claims 1 to 20, in which the igniting means is arranged to remain in the discharge tube after the rocket has been fired.

22. A signal device substantially as hereinbefore described with reference to, and as shown in, Figure 1 or Figure 2 of the accompanying drawings.

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