Dec. 28, 1937. J. B. DECKER 2,103,936

MULTIPLE EFFECT PYROTECHNIC

Filed Oct. 9, 1935

FIG. 1.

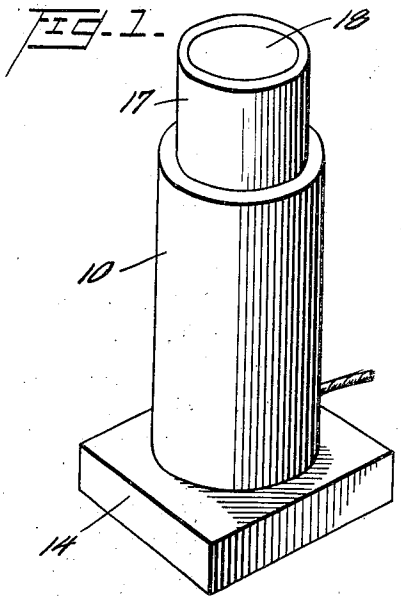


FIG. 2.

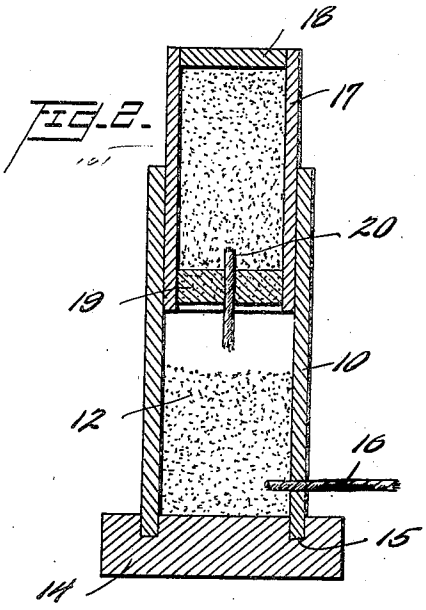


FIG. 3.

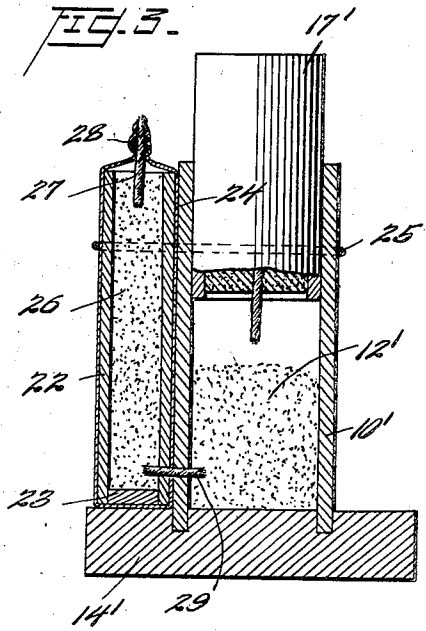
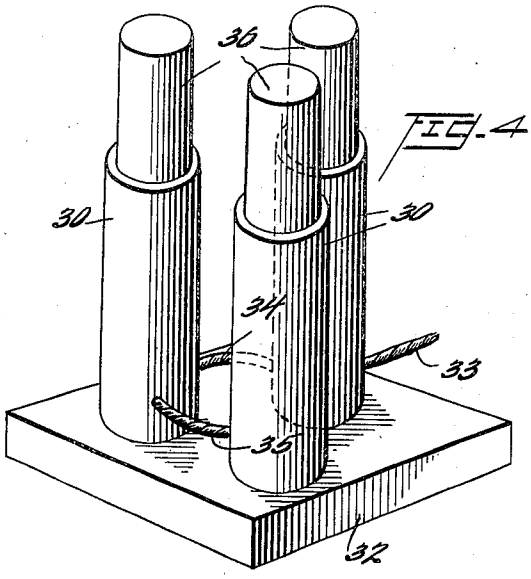


FIG. 4.



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MULTIPLE EFFECT PYROTECHNIC

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5 Claims. (Cl. 102—20)

This invention relates to pyrotechnic devices and more particularly to multiple effect pyrotechnic devices.

It is a general object of the present invention to provide novel and improved multiple effect pyrotechnic devices.

An important feature of the invention comprises the means of assembling the mortar and projectile parts of a multiple effect pyrotechnic device such, for instance, as those giving a loud report first on the ground and later in the air, whereby the use of additional parts or materials is eliminated and superior results both as to loudness of ground report and height of throw of the projectile are attained.

Another important feature of the invention resides in the combination of pyrotechnic devices producing different effects arranged to be operated successively so that desirable pyrotechnic displays may be had combining the successive operations of several devices resulting from the lighting of a single fuse.

Other and further features and objects of the invention will be more apparent to those skilled in the art upon a consideration of the accompanying drawing and following specification wherein are disclosed several exemplary embodiments of the invention with the understanding that such changes, modifications and additions may be made thereto as fall within the scope of the appended claims without departing from the spirit of the invention.

In said drawing:

Figure 1 is a perspective view of a pyrotechnic known as a repeating flash salute constructed according to the present invention;

Figure 2 is a vertical, central section thereof;

Figure 3 is a view of a device combining the multiple flash salute with a whistling element, both parts being shown in vertical section; and

Figure 4 is a perspective view of a multiple effect aerial type pyrotechnic.

It has heretofore been known to provide pyrotechnic toys having a mortar composed of a wooden base and a tube supported thereon containing a lifting charge and to loosely house in the upper end of this tube some form of bomb or projectile, the charge of which is ignited by a slow fuse which receives its ignition from the exploding lifting charge. With such devices, the lifting charge is small and the fit of the bomb is loose in the mortar tube so that while a fairly satisfactory height of throw is attained, there is practically no noise to the lifting explosion, although the bomb when exploded high in the air produces a loud report. Such devices require an additional closure for the top of the mortar tube to retain the projectile therein and usually have also a choke or plug to position the lifting charge in the bottom of the mortar tube.

In accordance with the present invention, superior results are attained by producing a loud report, combined with a flash if desired, from the lifting charge as well as the loud report, and combined flash if desired, from the aerial bomb. The apparatus for attaining this result is shown in Figures 1 and 2 and comprises essentially mortar tube 10 preferably formed from heavy gauge cardboard of sufficient thickness to resist the considerable gas pressure of lifting charge 12 therein, above some form of closure for the bottom of the tube. Conveniently wooden block 14 may comprise both the closure and the supporting base for the mortar tube, the lower end of which is received and secured in groove 15 in this base.

The charge 12 is preferably a quick-acting, smokeless explosive of the type which produces a brilliant flash when ignited. This effect may be attained by the admixture with the explosive composition of powdered magnesium, aluminum filings, powdered zirconium or the like. A suitable explosive mixture for this purpose may comprise appropriate proportions of potassium perchlorate, antimony sulphide and aluminum dust.

Any appropriate means are provided for igniting lifting charge 12, for instance, fuse 16 which extends from inside the mortar near the bottom thereof through the wall of tube 10 to the outside thereof where it may be readily ignited by the the user.

The projectile 17 in the present instance is conveniently formed also of a cardboard tube sealed at the upper end by means of a suitable choke or plug 18 which may be formed of clay, wood, or the like. The lower end of the projectile tube is closed by any suitable plug 19, for instance, of pressed dry clay which is formed about the slow fuse 20 extending from within the compartment of the projectile through this plug so that it extends, when the projectile is assembled in the mortar, as shown, down into the space containing the lifting charge.

For ease of construction the mortar tube and projectile tube are of circular cross section although this is not essential. However, they should be of the same configuration with the bore of the mortar tube slightly less than the outside diameter of the projectile tube. After the projectile has been completed and loaded and the

mortar tube has been mounted on its base, supplied with its fuse and charged with the lifting explosive, the lower end of the projectile is set on top of the upper end of the mortar tube and force is supplied with an appropriate press, or the like, to the upper end of the projectile tube and the same is forced into the mortar tube for approximately half of its length whereby it may be said to be partially housed in the mortar tube.

The friction or force fit between the outer wall of the projectile tube and the inner wall of the mortar tube is sufficiently tight so that no glue or other adhesive material is required and it is such that substantially the full force of the lifting charge is required to separate the projectile from the mortar. This ensures the building up of a high gas pressure within the mortar which upon its release produces an extremely loud report and throws the projectile to great height. It also ensures that the projectile remain in position sufficient time for its fuse to be ignited by the burning of the lifting charge. The fit between the projectile and mortar tubes is preferably such that a slight splitting of the upper end of the mortar tube results from the explosion of the lifting charge and this splitting releases the projectile. It will be noted that there is an important relationship between the tightness of fit of the projectile in the mortar tube and the strength and quantity of explosive in the lifting charge whereby substantially the full effect of the lifting charge is necessary to separate the parts and thus produce a maximum report.

Any appropriate charge may be placed in the projectile. If it is merely desired to have a loud report so that the device can be considered an aerial salute, any well known pyrotechnic composition may be used. If a combined report and flash are desired the projectile may be charged with the same material as described for the lifting charge. Further pyrotechnic effects suggest themselves such as colored flares, stars or the like and even a parachute might be enclosed in the projectile and ejected by the use of a small bursting charge. Such parachute and other pyrotechnic effects are well known in the prior art and need not be described in detail here.

The manner of securing the projectile in the mortar tube is extremely simple and eliminates all chokes, plugs, caps and the like and absolutely ensures against leakage of the explosive composition and the resultant danger. In addition it does not require the use of troublesome adhesives.

In Figure 3 is shown a device for obtaining a combination of pyrotechnic effects. The base 14' as well as mortar tube 10' and projectile tube 17' are identical with the parts just previously described. Any type of projectile, as previously suggested, may be used and mounted in the mortar tube in the manner described in connection with Figures 1 and 2.

To one side of the mortar tube is arranged a smaller diameter tube 22 which may have its own bottom closure 23 of clay or the like or may be closed by the base 14' in the same manner as the mortar tube. This tube 22 which will hereafter be termed the whistling tube may be secured by adhesive 24 against the side of the mortar tube if desired and an encircling wire 25 may ensure its remaining in position. Preferably the whistling tube is about as high as the mortar tube and it is charged with a whistling composition 26 comprising a tightly packed pyrotechnic charge which burns with a series of extremely rapid small explosions producing the effect of a whistle. As the charge burns away and the length of the empty tube increases, the pitch of the whistle is reduced so that it may be said to operate with a descending pitch. If a smokeless whistling composition is desired appropriate proportions of gallic acid and potassium chlorate may be used, whereas for a whistling compound producing a black smoke, a mixture of picric acid and saltpeter is suitable.

A fuse 27 is inserted through the top of tube 22 and has its lower end embedded in the whistling composition. It may be held in position by a twist of paper 28 in the customary manner. From near the bottom of the whistling tube fuse 29 extends through its wall and through the wall of the mortar tube into lifting charge 12' so when substantially all of the whistling compound has burned away fuse 29 is ignited and the lifting charge is set off so that following the whistle there is a loud report and flash and then a subsequent loud aerial report and flash or whatever other pyrotechnic effect is arranged in the projectile 17'.

In Figure 4 is shown a device which comprises three of the multiple effect mortar and projectile combinations of Figures 1 and 2. Any appropriate number from two up may be used and each of the mortar and projectile tubes may be different in size and effect. In the three-mortar arrangement, for instance, the first projectile may contain red, white and blue fire with or without an explosive composition for making a loud noise; the second projectile may contain a parachute supporting a flag; and the third projectile merely a salute so that the effect is first the noise of the first lifting charge, then the red, white and blue aerial flash, then the second lifting charge, followed by the parachute display, and finally the third lifting charge and the aerial salute to the flag. Any other combinations desired may be used.

The construction of Figure 4 includes the plurality of mortar tubes 30 of any desired construction, in the present instance shown as mounted on a suitable wooden base 32 for supporting the same at spaced intervals thereon. One of the mortar tubes is provided with a fuse 33 whereby its charge may be ignited by the user. One of the adjacent mortar tubes has its lifting charge connected to the lifting charge of the first tube by a fuse 34 and the third mortar tube has its lifting charge connected to the lifting charge of the second mortar tube by the fuse 35 so that the lifting charges of the mortars may be said to be connected for successive delayed operation since the fuses are not instantaneous but are of the slow acting type somewhat similar to the fuses used in the projectiles to ensure their explosion about the time they reach the top of their path.

By suitably timing the various fuses, each mortar can be arranged to complete its own and its projectile effect before the next mortar is operated or the second mortar can have its lifting charge fired prior to the operation of the projectile from the first mortar and so on, however the effects are desired. The important feature of this third form of the device is the use of different effects in the various projectiles and the arrangement of the spaced tubes on the base with the connecting fuses for the several lifting charges. It will be appreciated, of course, that the projectiles 36 in the construction shown in Figure 4 and the projectile 17' in the construction shown in Figure 3 are frictionally secured

in their mortar tubes in the manner described in connection with Figures 1 and 2.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A pyrotechnic device of the type described including, in combination, a cardboard mortar tube, a base therefor, a lifting and salute charge therein, a cardboard projectile tube containing a bursting charge, means to ignite the flame of the first charge, delay means to communicate the flame of the ignited first charge to the second charge, the mortar tube housing a large portion of the lower end of the projectile tube and being initially of less internal diameter than the external diameter of the projectile tube whereby it fits the same with sufficient friction to develop the full lifting and salute effects of the first charge.

2. In a pyrotechnic of the type described, in combination, a mortar tube closed at the bottom, a base thereon, a projectile tube partially housed in the upper end of the mortar tube and having an external diameter initially greater than the bore of the mortar tube, a charge in the mortar tube below the projectile adapted to dislodge and elevate the projectile and make a loud report, the said tubes being forced together until the fit is so tight that slight splitting of the mortar tube occurs when the charge is exploded.

3. In a pyrotechnic device of the type described, in combination, a mortar tube closed at the bottom, a charge of explosive in said tube, a fuse for igniting said charge extending to the outside of the tube, a projectile tube partially housed in the upper end of the mortar tube and forming the sole closure therefor, a pyrotechnic charge in the projectile tube, a fuse extending from said last mentioned charge into the mortar tube, the external diameter of the projectile tube being initially greater than the bore of the mortar tube whereby the connection between the two tubes is of such tightness that substantially full gas pressure of the mortar charge must be built up to separate them and comprising solely a frictional engagement between the cooperating walls of the tubes.

4. In a multiple-effect pyrotechnic, in combination, a plurality of individual mortar tubes having closed bottoms and secured in close spaced arrangement for vertical mounting, a charge in each mortar tube, means extending outside of said tubes for lighting the charge in one of them, delay means for successively lighting the remaining charges from the first charge, a projectile tube frictionally closing the upper end of each mortar tube and initially having a greater diameter than the bore thereof and only partially housed therein, a charge in each projectile tube, each giving a pyrotechnic effect when fired, a fuse connecting each projectile charge to its mortar charge, each mortar tube being of such strength in respect to its charge that no serious disruption takes place which might destroy succeeding mortars.

5. In a multiple-effect pyrotechnic, in combination, a plurality of individual mortar tubes having closed bottoms and secured in spaced arrangement for vertical mounting, a charge in each mortar tube, means extending outside of said tubes for lighting the charge in one of them, delay means for successively lighting the remaining charges from the first charge, a projectile tube closing the upper end of each mortar tube and initially having a greater diameter than the bore thereof and only partially housed therein, a charge in each projectile tube, each giving a different pyrotechnic effect when fired, and a fuse connecting each projectile charge to its mortar charge, the projectile tubes being forced so tightly into the mortar tubes that there may be only slight disruption of the mortar tubes on firing the mortar charges, thus producing loud reports and throwing the projectiles to great height.

JOSEF B. DECKER.