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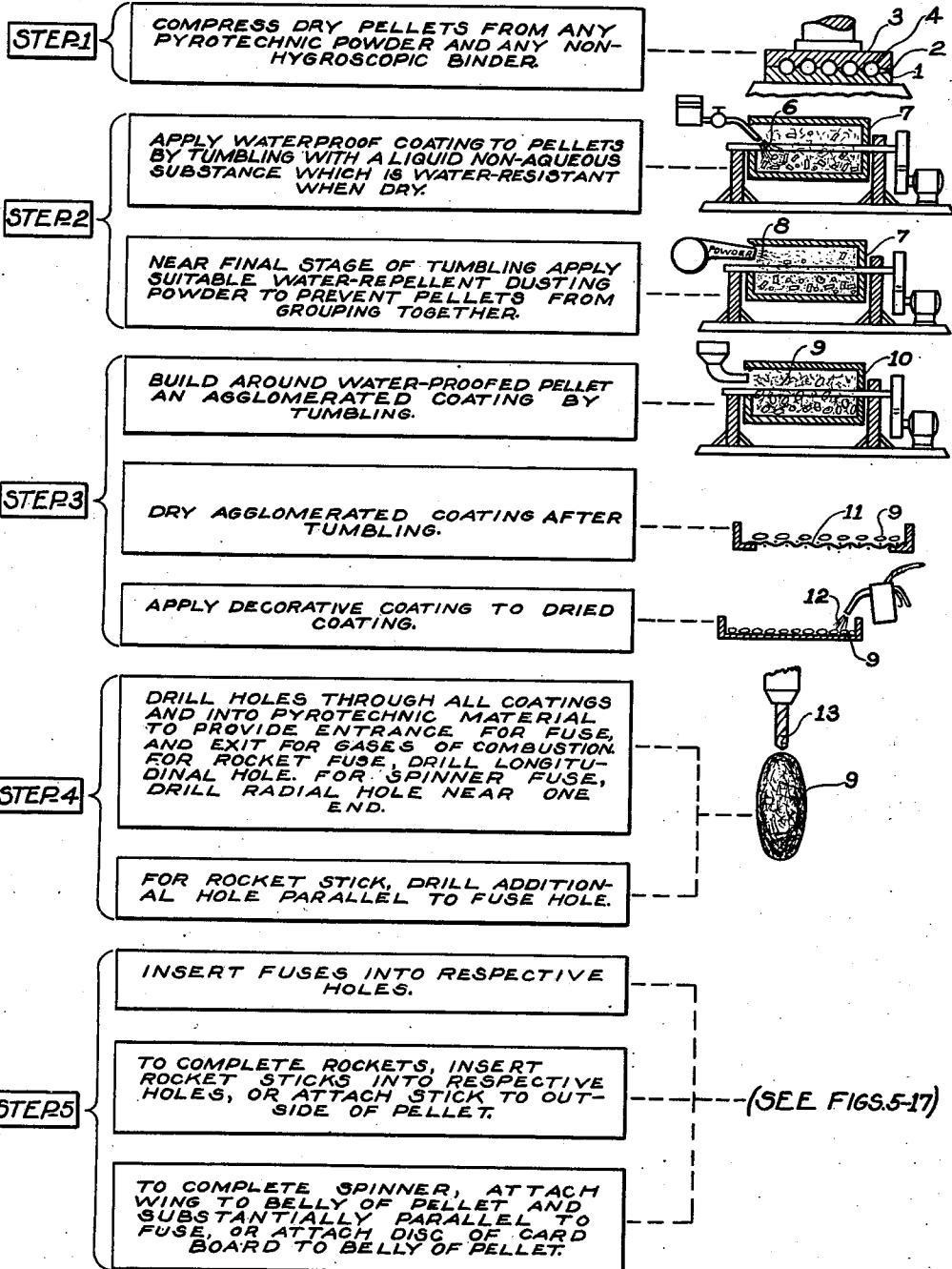
L. L. DRIGGS, JR

2,259,155

FIREWORKS

Filed Jan. 3, 1939

2 Sheets-Sheet 1



INVENTOR
LOUIS L. DRIGGS, JR.

ATTORNEYS

FIG. 1

BY *John L. Driggs*

Oct. 14, 1941.

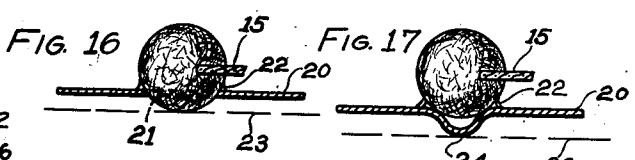
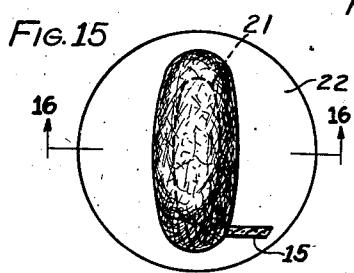
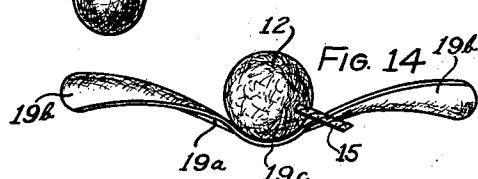
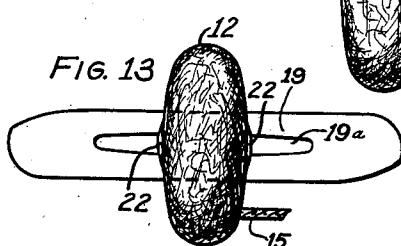
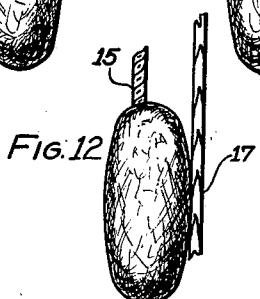
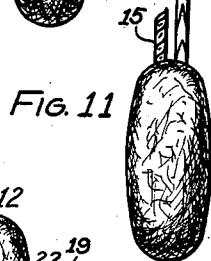
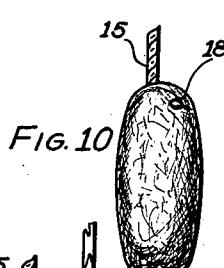
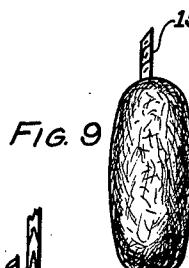
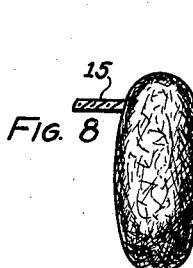
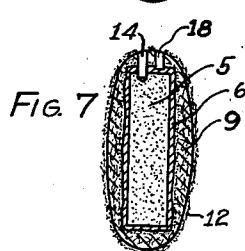
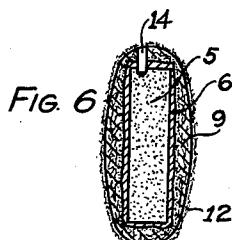
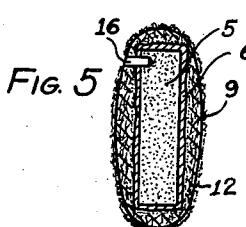
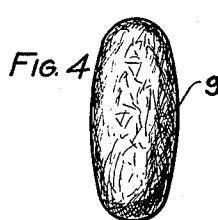
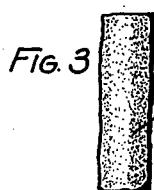
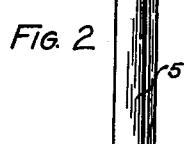
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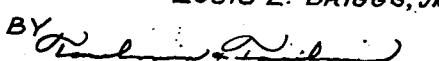
FIREWORKS

Filed Jan. 3, 1939

2 Sheets-Sheet 2



INVENTOR
LOUIS L. DRIGGS, JR.

BY 
ATTORNEYS

UNITED STATES PATENT OFFICE

2,259,155

FIREWORKS

Louis L. Driggs, Jr., Tipp City, Ohio, assignor to
The Kilgore Manufacturing Company, Wester-
ville, Ohio, a corporation of Ohio

Application January 3, 1939, Serial No. 249,018

6 Claims. (Cl. 102—20)

My invention relates to fireworks and a process of making.

It is the object of my invention to provide a fireworks of uniform characteristics so that the performance of all similar pieces of fireworks will be the same. Heretofore this has been a very difficult thing to secure and has resulted in many pieces of fireworks either performing improperly or not at all. As there was no way to check this condition, it was not discovered until the user endeavored to employ the fireworks.

It is the object of the present invention to provide a piece of fireworks and the method of making it which will insure uniformity of performance through having a uniform product as is made step by step and providing means of preserving the uniform character of the production as thus made so that it will not deteriorate from the time it is made until the time it reaches the hands of the consumer.

One of the main problems with fireworks has been the absorption of moisture into the material either from the surrounding air or from the material used in the successive stages, which brings about an irregular performance or complete deterioration of the fireworks.

It is the particular object of this invention to provide a process by which there is provided a dry compressed pellet of pyrotechnic material held together by a non-hygroscopic binder; a liquid non-aqueous coating dried thereon, which coating is water-resistant when it is dried; an agglomerated shell dried thereon; and drilled or formed holes pierced through the shells and coatings into the pyrotechnic material for sticks, fuses and other similar devices, which are sealed into position.

It is also an object to provide for the attachment of spinner vanes and the mounting of the fireworks thereon and therein in such a manner as to provide a bearing surface for the rotation of the spinner, and in some cases, means of causing the spinner to rise from the ground and fly.

The difficulty heretofore experienced with spinners has been that the irregularity of the fireworks has caused marked irregularity in performance. The present invention remedies such difficulty. The importance of this lies particularly in the fact that the spinner, whether it stays on the ground or whether it rises in the air, must travel at a very high rate of speed, amounting to some thousands of revolutions per minute, and do so customarily in order to ac-

complish the pyrotechnic and flight results desired.

Referring to the drawings:

Figure 1 is a diagrammatic view showing the five major steps of the process with parallel indications diagrammatically illustrated of some typical mechanism for performing each step.

Figure 2 is a side elevation of the compressed pellet of pyrotechnic material.

Figure 3 is the same pellet coated with a non-aqueous coating.

Figure 4 is the coated pellet having its agglomerated coating.

Figure 5 is a vertical section through Figure 4 showing the position of a lateral fuse hole.

Figure 6 is the same view showing a longitudinal fuse hole.

Figure 7 is a similar view showing a vertical fuse hole and a longitudinal stick hole.

Figure 8 is a side elevation of the coated pellet of Figure 5 with a fuse applied.

Figure 9 is a side elevation of the coated pellet of Figure 6 with a fuse applied.

Figure 10 is a side elevation of the coated pellet of Figure 7 with a fuse applied.

Figure 11 is a front elevation of the fireworks item showing the relationship of the stick to the fuse.

Figure 12 is a side elevation thereof. In Figures 11 and 12 the stick is glued to the side of the pellet.

Figure 13 is a top plan view of a spinner known in the trade as a "gyro-flyer."

Figure 14 is a front elevation thereof.

Figure 15 is a top plan view of a different form of spinner known in the trade as a "hummer."

Figure 16 is a section on the line 16—16 of Figure 15, looking in the direction of the arrows with the fireworks in full line position.

Figure 17 is a similar view showing a modification in which instead of the fireworks item projecting through an opening in the disc, the disc is bent to form a shoulder or projection upon which the spinning is performed.

Referring to the drawings in detail the several steps of the process are as follows:

Step 1

The first step is to compress a pellet or rod, or to extrude a rod consisting of a black powder and carnauba wax, 97 percent pulverized black gun powder and 3 percent carnauba wax. It will be understood that any non-hygroscopic binder may be impressed in the place of the wax with any suitable pyrotechnic powder. If sparks are

desired, then some powdered aluminum may be placed in the mixture. The essential idea is to have a dry compressed pellet of pyrotechnic material.

The pellet is formed in a press of any desired character such as the press having a bed 1 with semi-circular depressions 2 therein which is engaged with a press platen 3 having corresponding recesses 4. The resulting product is shown in Figure 2, as at 5.

Step 2

The second step is to coat this pellet 5 with a liquid, non-aqueous coating 6 and dry it. This coating is also water-resisting when it is dry. A satisfactory coating consists of orange shellac dissolved in alcohol of approximately four pound cut consisting of four pounds of flake shellac to a gallon of alcohol. It is preferred to tumble the pellets with a small amount of the coating material in a tumbling barrel 7. Near the final stage of the tumbling operation, the coating of shellac on the surface of the pellet will become so "tacky" that the pellets will tend to adhere, one to the other. In this stage, it is necessary to introduce some suitable dusting powder 8 to prevent the pellets grouping together. A suitable dusting powder is zinc stearate. This has been found to be entirely satisfactory in preventing the sticking together of the pellets, and at the same time it is by nature water-repellent. Pellets coated in this manner have been submerged in water for three days and have been found to be entirely unaffected by the water at the end of this time.

It will be understood that these several phases of this step can be practiced in the same tumbling barrel, but I have illustrated it showing different barrels to make the steps of the process perfectly clear. The resulting product is shown in Figure 3 with its non-aqueous coating 6.

Step 3

The next step is to build around the water-proofed pellet the agglomerated shell 9. The agglomeration consists of sodium silicate and fine sawdust. This is applied by tumbling in the tumbler 10. The decorative finish 12 is thereafter applied after the agglomerative coating is dried as described, as on screen 11.

Step 4

The fourth step is to drill through the agglomerated coating by a drill 13, the water-proof coating and into the pyrotechnic material. In the case of a rocket, the hole is drilled longitudinally, as at 14, into the pellet. The purpose of the hole is to provide an entrance for a fuse 15 to ignite the pellet and an exit for the gases of combustion of the pellet.

Step 5

Two types of drilling are used. One, a longitudinal hole 14, if the pellet is desired for use as a part of a rocket, and a transverse hole 16 part way through the pellet near one end, if the pellet is desired for a "spinner" item. If a rocket is desired, a stick is attached to the pellet with its axis parallel to the longitudinal axis of the pellet. Two methods of attachment of the stick can be used. The stick can be attached by gluing to the outside surface of the pellet, as at 17, but a better mechanical arrangement can be secured if another hole 18 is drilled parallel to the fuse hole and the stick is inserted therein.

If a spinner is desired, a wing 19 is pasted un-

der the bottom of the pellet as completed with the fuse placed at an angle to the pellet, with the axis of the fuse substantially horizontal or substantially parallel to the plane of the wing. If the fuse is directed slightly downwardly, the exit to the gas gives slight additional lift to the normal lift of the wings.

There are two spinner items: one of which has the pellet attached to a small paper propeller 19 in such a manner that the exit of the gases of combustion from the pellet will impart rotation to the propeller and thereby cause the wing to lift and the entire device to leave the ground. The other item is made by gluing a pellet body to a disc 20 of card board. This device does not fly, but due to the reduced resistance, a very high speed rotation is imparted to the device so that while it rotates a humming or buzzing noise is produced. The type with wings is the "gyro-flyer" and the type with the disc is known as the "hummer."

It will be noted in Figure 16 that the fireworks pellet projects through an opening 21 in the disc 20, to which it is attached by the glue 22. The rotation therefore is upon the underside of the fireworks, while the disc is held slightly above the ground, as indicated by the ground line 23.

The form shown in Figure 17 is one in which the disc is bent downwardly into a projecting portion 24 which rests upon the ground 23. The fireworks is mounted partly within the depression formed by the part 24 and is attached to the disc 20 by the glue 22.

It will be understood that as a result of having the non-hygroscopic pellet of dry compressed pyrotechnic material coated and protected with a liquid non-aqueous coating and optionally further protected by a water-repelling coating of zinc stearate, it is possible to use such material as sodium silicate for the agglomerated shell without contaminating the pyrotechnic pellet with the water from the sodium silicate. When the sodium silicate is finally dried, it then becomes an additional water-repelling coating for protecting the pellet.

It will be understood that the drilled hole 18 may be optionally drilled into the pellet 5.

With special reference to Figures 13 and 14, the wings of pasteboard 19 are grooved, as at 19a, to maintain the wings in position with their predetermined warp, as indicated at 19b. These grooves also form means of holding the cradle 19c in its predetermined form for receiving the fireworks. The twist of these wings gives the vertical movement while the discharge of the gas through the fuse hole gives the rotary movement. The discharge of the gas from the fuse hole 16 is not relied upon to elevate the fireworks.

It will be understood that I desire to comprehend within my invention such modifications as may be necessary to adapt it to varying conditions and uses.

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

1. In a method of manufacturing a fireworks, compressing dry pyrotechnic powder and a water-free wax binder therefor to form a pellet of dry compressed pyrotechnic material; thereafter applying an alcoholic non-aqueous shellac coating and drying it until tacky; thereafter applying a water-repellent zinc stearate coating while the shellac coating is tacky; and then applying an agglomerated shell of sodium silicate and sawdust and drying said shell.

2. A new article of manufacture for use as a fireworks comprising a fireworks body consisting of a compressed non-hygrosopic pyrotechnic pellet, a water-proof coating over said pellet, an agglomerated coating enclosing said pellet and a fuse mounted in said coatings, said fuse being mounted in a single hole extending into said pellet angular to the axis of the pellet, and a pasteboard wing structure attached to the bottom of said pellet at right angles thereto, said wings being curved upwardly and, reversely warped, said upward curvature providing a substantially friction-free base for said fireworks to permit the fireworks to rotate due to the expulsion of gas through the fuse hole, said warped wings causing it to rise.

3. A new article of manufacture for use as a fireworks comprising a fireworks body consisting of a pyrotechnic pellet, an agglomerated coating and a fuse mounted in said coating and extending into said pellet angular to the axis of the pellet, a pasteboard wing structure attached to the bottom of said pellet at right angles thereto, said wings being curved upwardly reversely warped, whereby the fireworks is provided with a substantially friction-free base to permit rotation due to the expulsion of gas through the fuse hole, said warped wings causing it to rise, and means of reinforcing said wings and of supporting said fireworks comprising a depressed rib intermediate the ends of said wings and an arcuate socket portion for receiving said fireworks.

4. In combination, a fireworks item comprising an elongated body consisting of a pyrotechnic body capable of producing a large volume of gas, 35

5 a fuse extending into said pyrotechnic body through which said gas can escape and arranged angular to the axis of said body, a wing-like member attached to the underside of said body at right angles to the longitudinal axis thereof, said wing being curved upwardly from said body and reversely warped, the arcuate socket formed by the curvature intermediate the ends of the wing supporting the body and providing a substantially friction-free base upon which the fireworks can rotate, the warp of the wing causing it to rise upon rotation.

10 15 20 25 30 35 5. A fireworks comprising, a disc having a central opening therein, a compressed non-hygrosopic pyrotechnic pellet having an enclosing water-proof coating and an agglomerated coating surrounding said coated pellet, said pellet extending partially through said opening in said disc and having a curved bottom upon which said fireworks is supported, and a fuse extending into said pyrotechnic material tangentially with respect said disc through which gas developed by the pyrotechnic material can escape to cause rotation of said fireworks.

6. A fireworks comprising, a disc having a depressed portion centrally located therein, a pyrotechnic pellet mounted upon said disc on the upper face thereof, the central axis of the pyrotechnic pellet being aligned with the axis of the depressed portion of said disc, and a fuse extending into said pyrotechnic material tangentially with respect said disc through which gas developed by the pyrotechnic material can escape to cause rotation of said fireworks.

LOUIS L. DRIGGS, JR.