United States Patent

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[54] **ANTENNA WIRE LAUNCHER AND BOBBIN PROJECTILE**
13 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **89/1,** 42/1, 89/1.816, 102/89
[51] **Int. Cl.** **F41f 3/04,** F42b 15/06
[50] **Field of Search** ..... 89/1.34, 1, 1.816; 42/1 (L); 244/3.23; 102/89; 244/3.12; 102/34.3, 48

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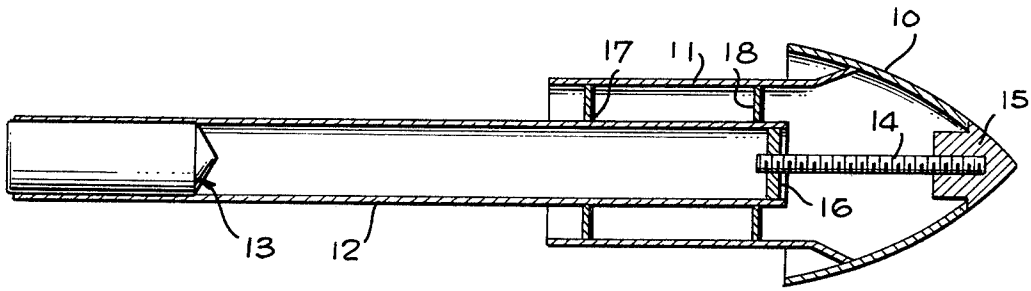
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ABSTRACT: A small launcher and bobbin projectile is disclosed for draping a thin copper wire across the top of a tree for use as an antenna in emergency radio communications. The bobbin projectile comprises a suitable bobbin of wire with a nose cone. The bobbin is fitted on one end of a metal tube. The other end contains a cartridge of solid grain rocket fuel having a conventional bullet primer as an igniter. An inertia-type firing pin in the launcher is propelled by a hammer into the primer against the projectile mass. The rocket propelled projectile is spin stabilized by means of canted exhaust ports. The loose end of the wire is anchored on the ground, and the wire is payed out as the projectile ascends.



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Fig. 1

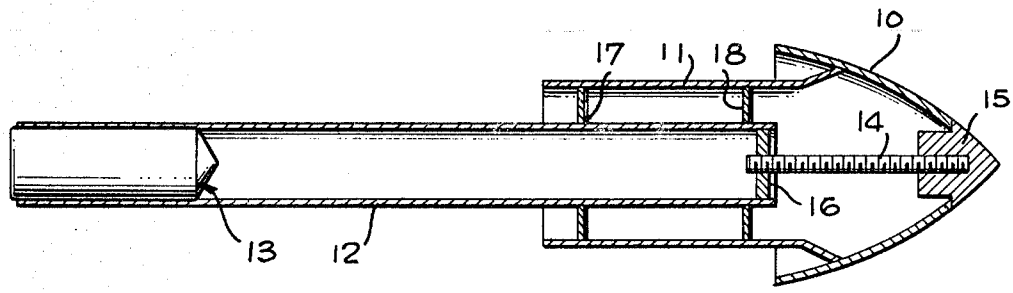


Fig. 2

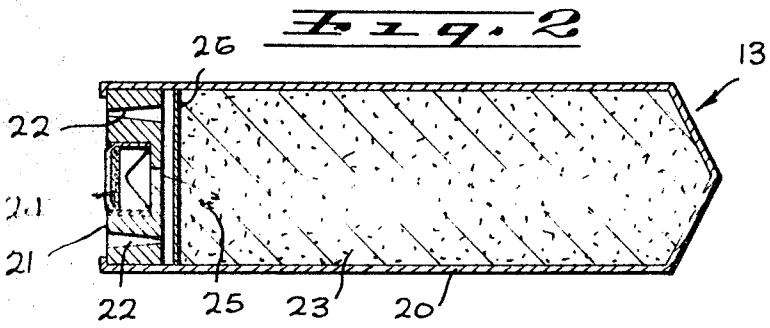
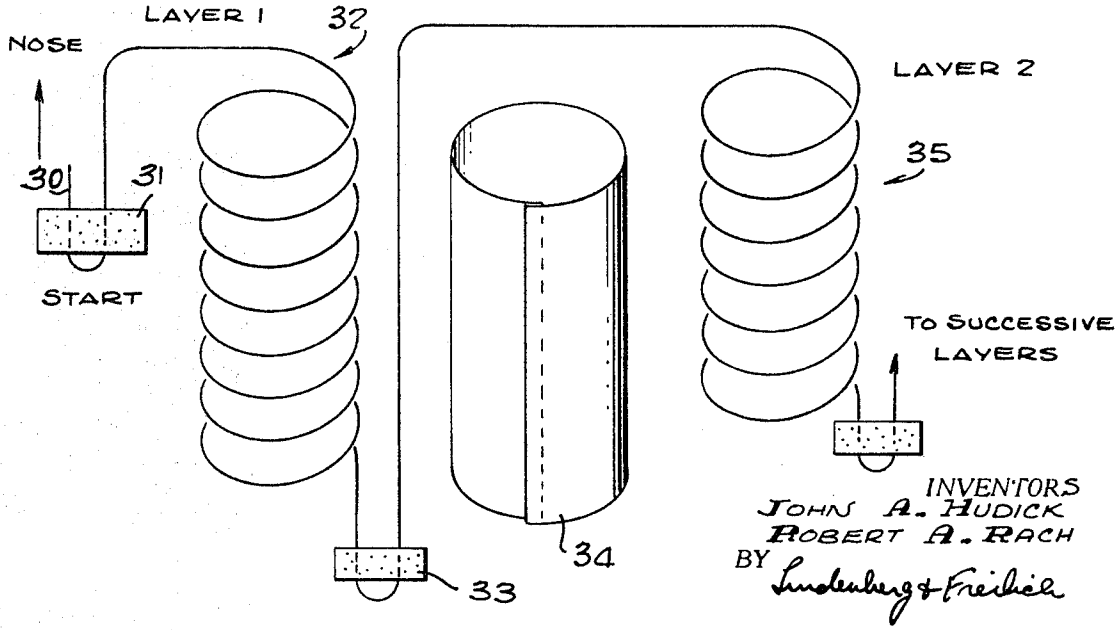


Fig. 3



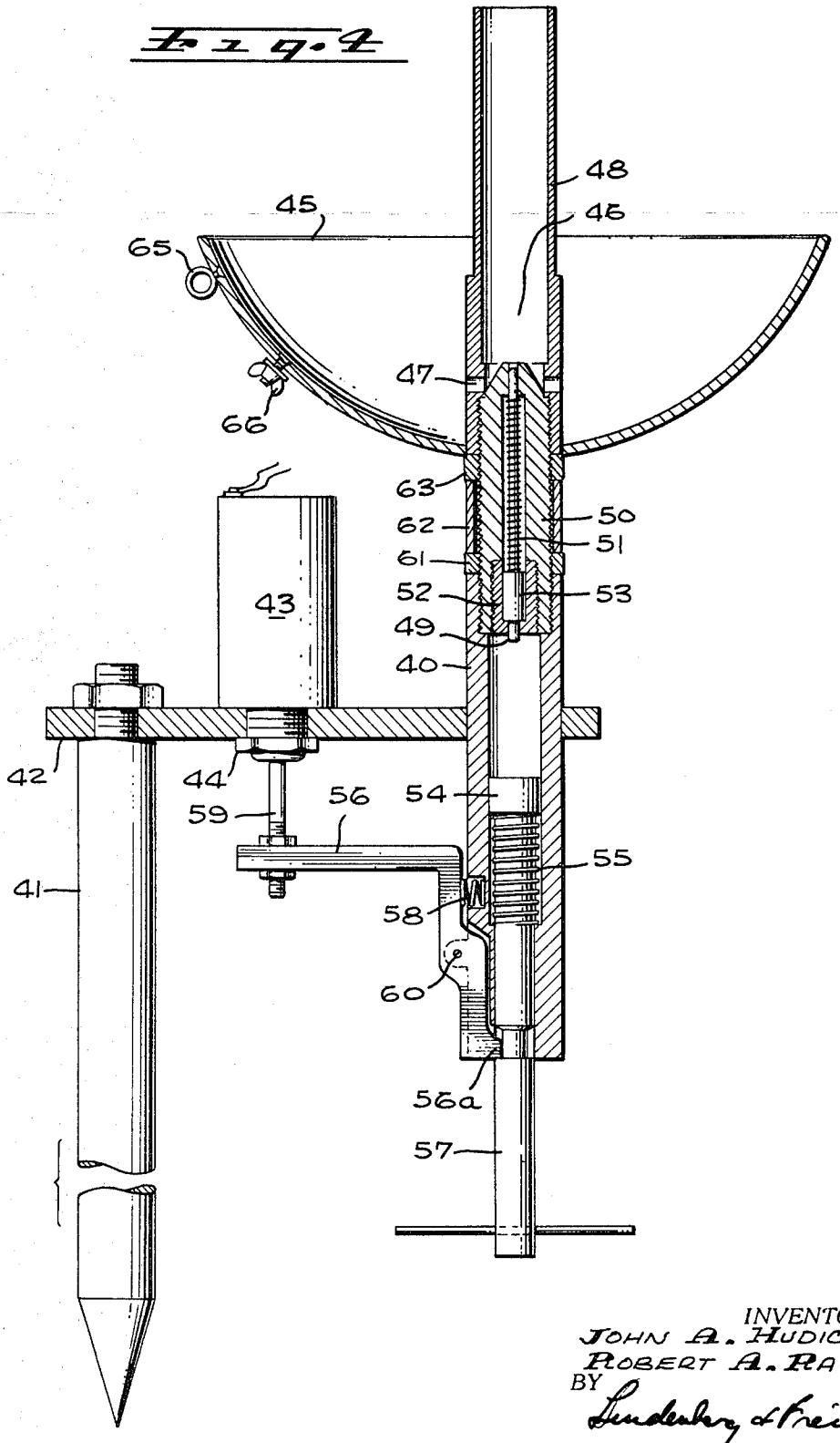
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2 Sheets-Sheet 2

Fig. 4



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ANTENNA WIRE LAUNCHER AND BOBBIN PROJECTILE

BACKGROUND OF THE INVENTION

This invention relates to a system for laying a line over an object, such as an antenna wire over a tall tree for use in emergency radio communications, and particularly to a bobbin projectile that can lift a supply of line over the object as the line is being payed out therefrom.

Projectiles have been used to extend a line from one point to another by anchoring the tail end of the line at the one point and firing the projectile in the direction of the other point with the loose end of the line attached to it. This method of employing a projectile to pull the loose end of a line from a supply coil is satisfactory for heavy lines, such as from one naval vessel to another to establish a communication line for transfer of mail, or in emergencies, personnel. However this method is not always successful with small lines. With the coiled line supply on the ground and a high velocity projectile pulling the loose end, a small line tends to snap soon after the projectile leaves the launcher due to high initial acceleration of the projectile.

SUMMARY OF THE INVENTION

In contrast to the technique of pulling the loose end of a coiled line the present invention is based on the recognition that if the line supply is carried by the projectile and the loose end is anchored to the ground, the weighted projectile will have a reduced initial velocity, thereby greatly reducing the possibility of the line snapping soon after firing the projectile. The projectile is rocket propelled and the line is payed out from a suitable bobbin mounted on the nose of the projectile.

In accordance with a further feature of the present invention, the projectile is spin-stabilized by means of canted exhaust ports in the rocket cartridge and the line is wound to pull off the bobbin in a direction opposite to the direction of spin viewing the bobbin from the tail of the projectile.

The embodiment of the invention specifically disclosed herein employs commercial components where possible, as will be noted. However, it should be understood that the teachings of the invention are not limited thereto and that, while the primary use to be made of a line payed out from the bobbin projectile is for an antenna in emergency communications, this invention is applicable for draping a thin small line between two points for any other purpose.

The novel features that are considered characteristic of this invention are set forth with particularity in the appended claims. The invention will best be understood from the following description when read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a longitudinal section through the axis of a spin-stabilized, rocket-propelled bobbin projectile illustrating rather schematically one embodiment of the invention.

FIG. 2 is a longitudinal section through the axis of a rocket cartridge employed in the bobbin projectile of FIG. 1.

FIG. 3 illustrates rather schematically a preferred manner of winding a line on the bobbin projectile of FIG. 1.

FIG. 4 shows diagrammatically, and partly in longitudinal section, one form of a launcher for the bobbin projectile of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 illustrates an exemplary rocket-propelled bobbin projectile comprising a nose section **10**, a bobbin section **11**, and a body section **12**. The latter consists of a hollow shaft or tube which provides initial guidance in the launcher to be described with reference to FIG. 4, balances the projectile during flight, and contains a rocket cartridge **13** shown in greater detail in FIG. 2.

The bobbin section **11** comprises a hollow cylinder having a flared forward end against which the nose section **10** is suitably secured, as by a bolt **14** and a threaded nose plug **15**. The bolt **14** is threaded into a disc **16** in the body section **12** while the bobbin section **11** is secured to the body section **12** by discs **17** and **18**.

The body section **12**, bobbin section **11** and nose section **10** are hollow in order to minimize the weight of the projectile which, when wound with 150 feet of number 24 AWG wire, has a total weight of approximately 6 ounces. The body section **12** is preferably a tube of hard aluminum 3 inches long with a nine-sixteenths inch outside diameter and approximately one-half inch inside diameter. The tail end is reamed to an inside diameter of 0.511 inch to a depth of 1.25 inch to allow a rocket cartridge of 13 mm. diameter to be inserted with a snug fit. The bobbin section **11** is preferably made of soft aluminum tubing. The total weight of the projectile without wire is about 65 grams. The wire may be jumble-wound on the bobbin, but a preferred method is as will be described with reference to FIG. 3.

Referring now to FIG. 2, a longitudinal section of the rocket cartridge **13** is shown. A suitable cartridge is commercially available under the trade name Gyrojet. One such cartridge successfully used has a 13 mm. diameter and has a total burning time of 100 milliseconds when fired in a commercial hand gun. When so fired the cartridge reaches a velocity of 1,250 feet per second at burn out.

The cartridge consists essentially of a hollow shell **20**, a rear plug **21** and canted exhaust ports, such as port **22**, for spin stabilization. Solid grain rocket fuel **23** in the shell **20** is ignited by a conventional bullet-type primer **24** which upon being struck by a firing pin detonates and ignites the solid grain rocket fuel through flash hole **25** and protective foil covering **26**. The solid grain fuel burns progressively, exhausting gases rearwardly through the canted exhaust ports thus propelling and spinning the projectile. When fired, the entire cartridge is expended, leaving no casing behind. Thus, when fitted to the bobbin unit the cartridge supplies the necessary propulsion to lift the bobbin skyward.

Referring now to FIG. 3, the preferred method for winding wire on the bobbin section **11** of the projectile consists of securing one end **30** to the bobbin section **11** with a strip of tape **31** and winding a first layer **32** so as to pulloff clockwise as viewed from the tail, i.e. to pulloff in a direction opposite to the direction that the projectile will spin in flight. The end of the first close-wound layer is then secured with another strip of tape **33**. The wire is then brought straight back from the finish point to the starting point. Thereafter, the first layer and the flyback section of the wire is covered with a sheet **34** of celluloid with an overlap in the direction of the winding before the next layer **35** is similarly wound. The celluloid sheet **34** covering the first layer is temporarily fastened in place with tape or a rubber band. When the second layer is half-wound, the tape or rubber band holding the celluloid is removed. Successive layers are then wound in the same manner.

If the layers of wire are wound in this fashion, the wire will always be pulled from the tail end, i.e., from the end of the bobbin section **11** away from the nose section **10**. When one layer has been completely pulled off, the wire will fly back to the start of the next layer below. The celluloid sheet **34** will fall away as the wire begins pulling on the windings of the next layer. The purpose of the celluloid sheet **34** is to insure successive, evenly wound layers, and to reduce friction between layers as wire is payed out while the projectile ascends in flight. The tape **33** at the end of each layer prevents "bunch" pulloff and tangling of the next layer beneath as the flyback portion of the wire between layers is being payed out. To minimize the tendency of wire tangling on the bobbin during ascent, it is preferred to have the bobbin section **11** as shown in FIG. 1, i.e., without any flare in the tail end.

A preferred bobbin projectile launcher will now be described with reference to FIG. 4. The launcher consists of a main body **40** secured to a stake **41** by a bracket **42** in order

that the launcher may be securely staked at the desired takeoff angle for the projectile. However, it should be understood it is perfectly safe to hand hold the launcher during firing, as there is no appreciable recoil. A solenoid 43 is secured to the bracket 42 by a nut 44 in order that a bobbin projectile may be fired from a remote position. A shield 45 protects the solenoid 43 and other parts of the launcher from projectile exhaust gases which escape from a firing chamber 46 through eight exhaust ports, such as exhaust port 47. A barrel 48 is provided as an integral port of the firing chamber 46 to initially guide the projectile (not shown in FIG. 4) when it is fired.

A firing pin 49 is normally held in a retracted position within a housing 50 by a spring 51 as shown. A firing pin retainer 52 holds the firing pin 49 in the housing 50 owing to a large diameter portion 53 of the pin 49 bearing against a shoulder of the firing pin retainer 52. The firing pin 49 extends rearwardly through the firing pin retainer 52 until a firing ram 54 (shown in the cocked position) is propelled against it by a mainspring 55. The ram 54 is held in its cocked position by a conventional small arms trigger 56 having a sear 56*a* engaging a notch around the ram arm 57. The trigger 56 is held in the cocked position shown by a spring 58 until the solenoid 43 is energized, at which time its armature 59 is pulled in, causing the trigger 56 to pivot about a pin 60 and thereby disengaging the sear 56*a* from the ram arm 57. That allows the mainspring 55 to propel the ram 54 against the firing pin 49. Thereafter, the launcher may be again cocked by pulling the ram arm 57 back against the mainspring 55 until the sear 56*a* of the trigger 56 again engages the notch around the ram arm 57.

A locknut 61 secures the firing pin housing 50 in proper position on the main body 40. A spacing collar 62 is then placed over the housing 50 and secured in position by a locknut 63. Before threading the integral firing chamber 46 and barrel 48 on the end of the firing pin housing 50, the shield 45 is slipped over the housing 50 against the locknut 63.

Once the launcher has been assembled and cocked as shown in FIG. 4, a bobbin projectile may be placed in position for firing by inserting the tubular body portion 12 into the integral firing chamber 46 and barrel 48 with the primer 24 (FIG. 2) resting against the housing 50.

The length of the firing pin 49 is shorter than the housing 50 in which it is contained so that even if the ram 54 is resting against the firing pin 49, the forward end of the firing pin 49 does not project beyond the face of the housing 50 and does not contact the primer 24 (FIG. 2) of the cartridge 13 in the bobbin projectile. However, once the firing mechanism is cocked as shown in FIG. 4, the pin 49 will project through the retainer 52 at the rear of the housing 50, and when the ram 54 strikes the pin 49, driving it forward, the inertia of the pin 49 will carry it beyond the face of the housing 50 against the force of the spring 51. This inertia-type firing pin is the same as is used in the U.S. Pistol, Caliber 45 Automatic, Model 1911, and is preferred because an uncocked ram can not move it even if the ram is struck sharply.

Before a bobbin projectile with wire wound thereon is fired, the free end of the wire is passed through a suitable guiding device, such as a ring 65, and secured to the flash shield 45 by a wing nut 66. The bobbin is wound with 150 feet of No. 24 or 25 wire for a total weight of about 6 ounces. The maximum range of the bobbin assembly with a 13 millimeter Gyrojet rocket cartridge for propulsion is then approximately 120 feet when fired vertically to payout line, but when fired at a takeoff angle of approximately 60°, such a bobbin projectile has been successfully used to pay out the entire 150 feet of wire, snap the connection between the wire and bobbin, and continue on a trajectory to a distance of about 250 feet from the point of launch.

It should be appreciated that many modifications may be made in the launcher or the bobbin projectile. For instance, the bobbin may be of the type normally used in spin-cast fishing reels and the nose cone may take any form or shape that will improve the aerodynamic characteristics of the projectile by decreasing wind resistance. The appended claims are therefore intended to cover and embrace any such modifications, within the limits only of the true spirit and scope of the invention.

We claim:

1. A system for quickly laying out a small line over substantial distances or over tall objects, the combination comprising a bobbin projectile and projectile launcher, said launcher having means for securing thereto a free end of said line wound on said bobbin projectile, and said bobbin projectile comprising:
   - a cylindrical shaft;
   - a bobbin having a cylindrical body on which said line is wound, said bobbin being coaxially secured to one end of said shaft and said cylindrical body having a diameter greater than the diameter of said shaft; and
   - a rocket fuel cartridge coaxially contained within and secured by said shaft at the end thereof remote from said bobbin, said cartridge having ports for exhausting combustion gases away from said one end of said shaft, whereby said shaft and bobbin are rocket propelled axially to pay out said line when said fuel is ignited.

2. A system as defined in claim 1 wherein at least some of said ports are canted to impart spin to said shaft about its axis, and wherein said line is helically wound starting at the end of said bobbin remote from said cartridge and wound in a direction opposite the direction of said spin, whereby said line so wound on said bobbin is pulled off in a direction opposite to the direction of spin of said shaft.

3. A system as defined in claim 2 wherein said line is wound in layers, each layer starting at the end of said bobbin remote from said cartridge, whereby said line is payed out from each layer starting at the end nearest said cartridge.

4. A system as defined in claim 3 including substantially rectangular sheets of material wrapped between layers, one sheet between every two successive layers.

5. A system as defined in claim 3 including means for lightly securing in position the finish end of each layer, whereby as one layer is pulled off by the flight of said bobbin as said shaft is propelled, the next layer will remain in position until the secured end is pulled free by pull of the payed out line.

6. A system as defined in claim 5 including substantially rectangular sheets of material wrapped between layers, one sheet between every two successive layers.

7. A system as defined in claim 6 wherein said line is a conductive wire for use as an antenna in radio communications.

8. A bobbin projectile for quickly laying out a small line over substantial distances or over tall objects from a given point at which one end of said line is secured comprising:
   - a cylindrical shaft;
   - a cylindrical bobbin having a diameter greater than the diameter of said shaft on which said line is wound, said bobbin being coaxially attached to one end of said shaft; and
   - a rocket fuel cartridge coaxially inserted into and secured by the other end of said shaft remote from said bobbin, said cartridge having ports for exhausting combustion gases away from said one end of said shaft, whereby said shaft and bobbin are rocket propelled axially to pay out said line when said rocket cartridge is ignited.

9. A bobbin projectile as defined in claim 8 wherein at least some of said ports are canted to impart spin to said bobbin about its axis, and wherein said line is helically wound starting at the end of said bobbin remote from said cartridge and wound in a direction opposite the direction of said spin, whereby said line so wound on said bobbin is pulled off in a direction opposite to the direction of spin of said bobbin.

10. A bobbin projectile as defined in claim 9 wherein said line is wound in layers, each layer starting at the end of said bobbin remote from said cartridge, whereby said line is payed out from each layer starting at the end nearest said cartridge.

11. A bobbin projectile as defined in claim 10 including substantially rectangular sheets of material wrapped between layers, one sheet between every two successive layers.

12. A bobbin projectile as defined in claim 11 including means for lightly securing in position the finish end of each layer, whereby as one layer is pulled off by the flight of said bobbin as said shaft is propelled, the next layer will remain in position until the secured end is pulled free by pull of the payed-out line.

13. A bobbin projectile as defined in claim 12 including a substantially rectangular sheet of material wrapped between layers, one sheet between every two successive layers.