June 6, 1944. N. ESLINGER 2,350,549

FEED MECHANISM

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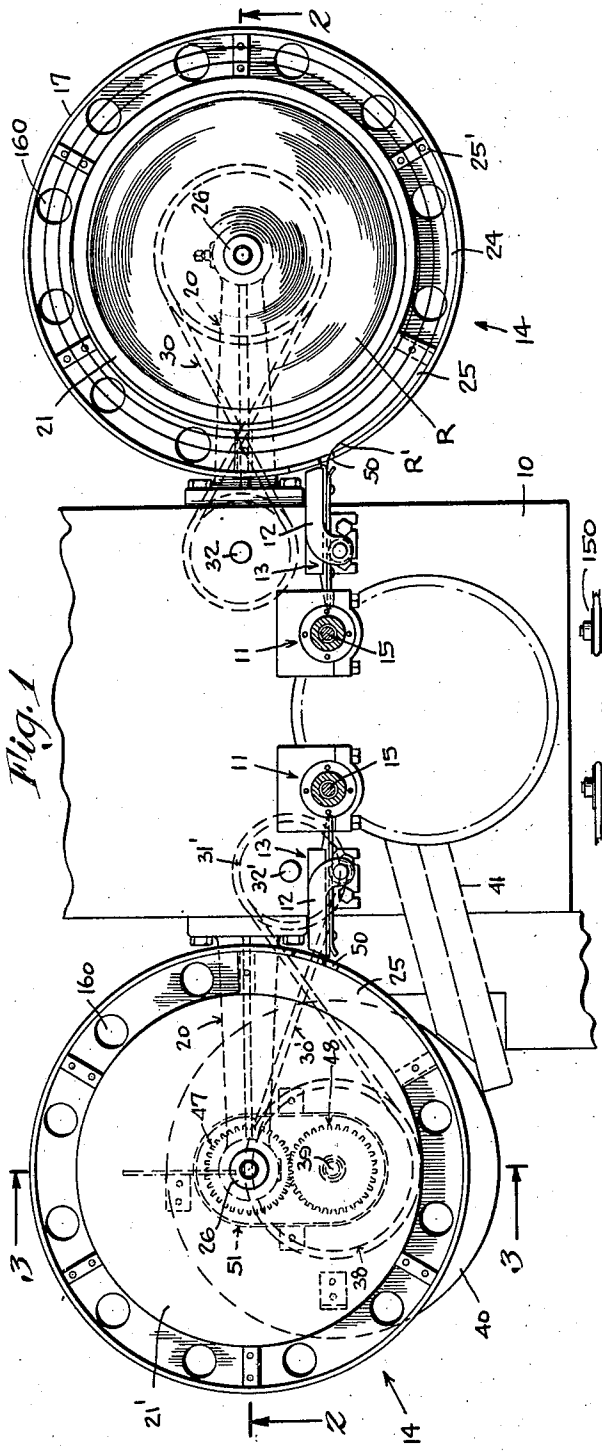


Fig. 1

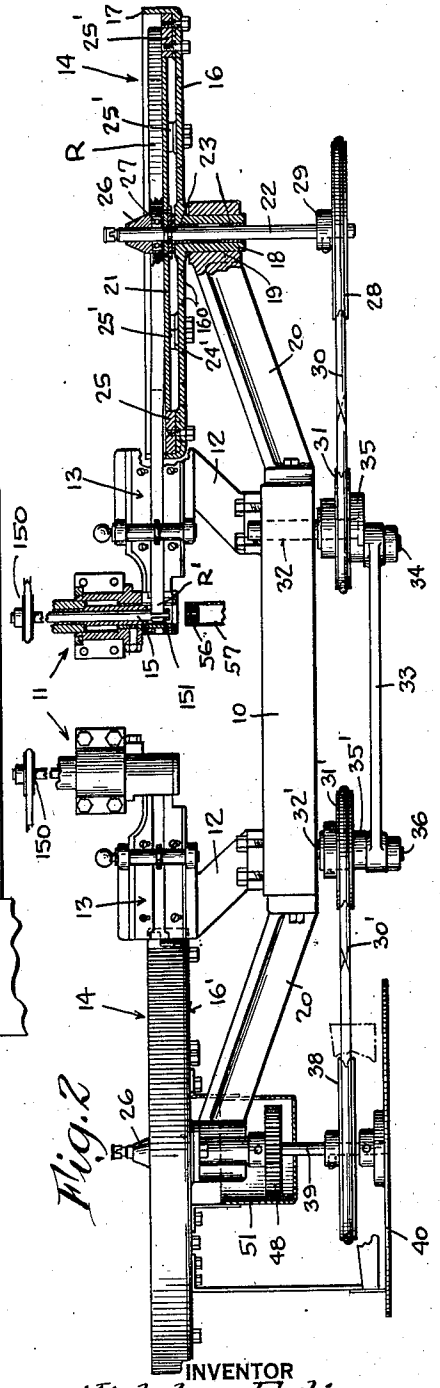


Fig. 2

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Fig. 3

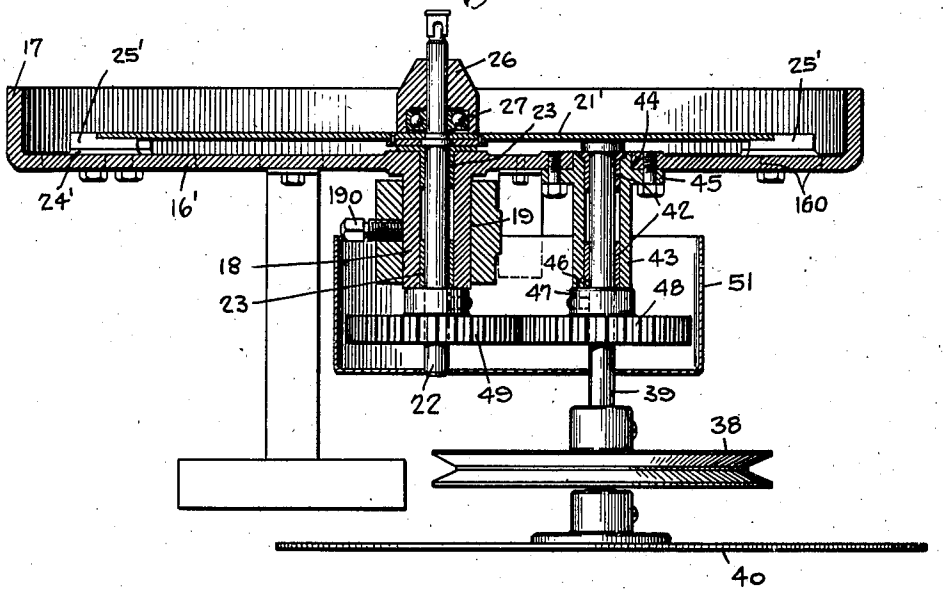
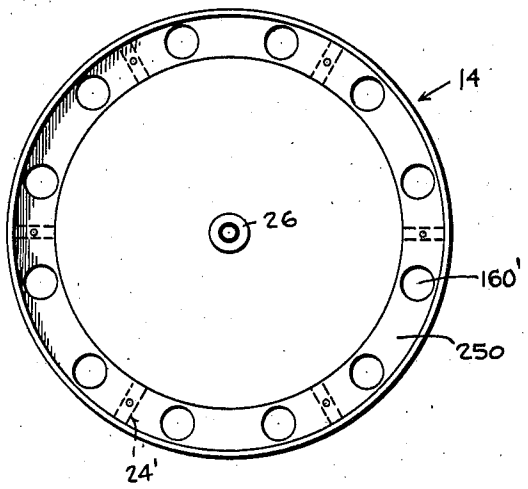



Fig. 4




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# UNITED STATES PATENT OFFICE

2,350,549

## FEED MECHANISM

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Application January 30, 1942, Serial No. 428,825

5 Claims. (Cl. 242—55)

The present invention relates to winding machines, and in particular to a machine for winding strips of paper for use as shot shell base wads.

A shot shell base wad is adapted both for the purpose of reinforcing the shell adjacent the end thereof where extremely high stresses occur due to the gas pressure developed by the rapidly burning powder; and for sealing the tube against the loss of pressure which would occur by leakage of gas between the metallic cap and the wall of the tube.

It has been found that wads quite satisfactory for these purposes could be wound from strips of paper of various widths depending upon the desired thickness of the finished wad. As now practiced, the paper strip material is fed from relatively heavy wad rolls in substantially continuous lengths to suitable winding spindles which are intermittently rotated at relatively high speeds for a predetermined number of revolutions so as to wind up a tight roll of paper of predetermined diameter which is subsequently inserted into the open end of a paper tube. However, inasmuch as the winding and inserting processess are intermittent, the difficulty has arisen as to suitable means for unwinding a substantially continuous length of strip material from the relatively heavy supply rolls and supplying the material to the intermittently rotating winding spindle without producing excessive strains such as to break the strip.

At least two methods of unwinding the material have been followed in the prior art, namely, jerking the strip of material immediately prior to being rewound so as to overcome the inertia of the supply roll and initiate its unwinding which is furthered by the draft of the rewinding spindle; and secondly, the use of a revolving type feed dial for positively unwinding the roll of material.

Neither process has been entirely satisfactory in that either the strip of paper is frequently broken by the jerking motion; or the rate at which the material is supplied to the winding spindle varies, decreasing from an excessive amount of unwound material to an inadequate amount with the constantly diminishing circumferential speed of the roll. In order to minimize this latter effect, supply rolls of relatively small diameter have been resorted to which require frequent replenishing.

It is an object of this invention to supply unwound material to an intermittently rotating rewinding element at a substantially uniform average linear speed. A further object is to unwind material to be rewound at a substantially uniform rotational speed, and to provide means for supporting the unwound material accumulated due to the differences in speed of unwinding and rewinding. A still further object is to convert the constantly diminishing circumferential speed of the material being unwound to a substantially uniform average delivery speed.

Other objects, features and advantages of the invention will be expressed in the description which follows.

In the drawings:

Fig. 1 is a plan view of the machine showing two winding units.

Fig. 2 is a front elevation on line 2—2 of Fig. 1.

Fig. 3 is an end elevation on line 3—3 of Fig. 1.

Fig. 4 is a modification of the segmental material supporting elements of Fig. 1.

The machine of this invention is shown as comprising two inter-connected winding units, but it will be understood that either unit alone embodies the spirit of the invention.

Referring to Fig. 1, the machine has a base 10 on which the winding units are mounted, which comprise a pair of winding elements, indicated generally at 11, 11; and a pair of material-supporting elements 14, 14. Each winding element 11 is supported on the base 10 by an arm 12 which may include any suitable well known form of guide element 13 for guiding the material from its respective supporting device 14, hereinafter described, to its respective winding spindle 15. The latter is rotated by suitable drive means, as indicated generally at 150. No claim is hereinafter made to the particular winding spindle and guide means shown, it being clear that modifications thereof may be used within the scope of the invention.

Since each element for supporting the material R to be unwound and for supplying it to one of the winding spindles 15 is substantially identical, the following description will be given with respect to the single element 14 shown partly in section in Fig. 2, unless otherwise specified. The supporting structure of this element comprises a circular platform 16 having a rim portion 17 and a concentric vertically drilled hub 18 which is fixedly secured by a screw 190 (see Fig. 3) in a vertically drilled hole 19 in the upper end of a supporting arm 20. The arm 20 is bolted at its lower end to the base 10 and extends upwardly at an angle to the horizontal to suitably elevate the platform 16 with respect to the aforesaid winding and guiding elements 11

and 13 respectively. The numerals 160 are a plurality of holes drilled through the bottom of the platform 16 adjacent the rim thereof for permitting the escape of dust, lint, paper particles, etc. tending to accumulate in the platform. 21 is a relatively thin disk-like table or unwinding means concentrically mounted within the rimmed platform 16 and fixedly secured on the upper end of a vertical spindle 22 rotatably supported in the hub 18 by bushings 23, 23.

The outside diameter of the disk 21 is substantially less than the inside diameter of the rimmed platform 16, in consequence of which an annular space 24 is formed between the outer edge of the disk 21 and the inner wall of the rim 17. A relatively long segment 25 and a plurality of short segments 25', or radially disposed supporting blocks, substantially equal in width to the width of the space 24 are bolted to suitable ribs 24' of the platform 16 at spaced points around the annulus 24, the upper surfaces of the segments 25 and 25' lying in substantially the same plane as the upper surface of the unwinding disk 21. Although annularly spaced segments are shown, it will be understood that the number and/or length of the segments may be increased (as shown in Fig. 4) to form a substantially closed ring or platform 250, in which event drilled holes 160' may be formed in the ring to permit paper lint, dust, etc. to fall through to the fixed platform 16 and to escape through its holes 160.

The upper end of the spindle 22 projects above the surface of the disk 21 and supports a hub 26 rotatably mounted on the spindle by a ball bearing 27.

The lower end of the spindle 22 carries a pulley 28 which is keyed thereto at its hub portion 29 and which is connected by a V-belt 30 to a second pulley 31. The latter is freely rotatable on the lower end of a stud shaft 32 fixed at its upper end in the base 10.

Rotation is transmitted to the pulley 31 by a suitable oscillating link 33 connected at one end to an eccentric pin 34 which is carried on a crank 35 of the pulley 31. The opposite end of the oscillating link 33 is connected to a pulley 31' by a crank 35' and eccentric pin 36, the latter being located substantially 90° in advance of the eccentric pin 34. The pulley 31 is similarly freely rotatable on the lower end of a stud shaft 32' secured in the base 10, and is connected by a V-belt 30' to a pulley 38. The latter is keyed to the lower portion of a vertical arbor 39, which is supported from the platform 16' and which rotatively supports an article discharging disk 40 at its lower end. The articles, or shot shells having a wound wad inserted in one end thereof, are conveyed from the winding spindles onto the discharging disk 40 by a suitable trough indicated by the dotted lines 41. Referring to Fig. 3, the upper end of the arbor 39 is shown journaled in bushings 42—42 in a substantially vertical sleeve bearing 43, the upper end of which is fitted in a drilled hole 44 in the bottom of the platform 16'. A suitable flange 45 of the sleeve 43 is bolted to the underside of the platform 16' to hold the sleeve bearing 43 securely in place.

The lower end 46 of the sleeve 43 forms a bearing face for the adjacent face of the hub 47 of a spur gear 48 which is rotatively supported on the arbor 39. The gear 48 is in mesh with a second spur gear 49 which is fastened to the lower end of the spindle 22'. 51 is a suitable sheet metal shield arranged to enclose the gears 48 and 49.

Power is transmitted to the pulley 38 by suitable means not shown; rotation of the pulley 38 and arbor 39 is transmitted by the gear 48 to the intermeshing gear 49 which in turn rotates the spindle 22' and material unwinding disk 21' with respect to the stationary rimmed platform 16'. Simultaneously the V-belt 30' of pulley 38 (see Fig. 2) drives the pulleys 31' and 31 through the connecting crank link 33, thus transmitting rotation to the spindle pulley 28 and to the second material unwinding disk 21.

In operation a relatively large wound roll R of paper strip is laid on the rotating unwinding disk or table 21, being concentrically located with respect thereto by the freely rotating hub 26. An end R' of the paper strip is led through a slot 50 in the rim 17 of the stationary platform 16 and threaded through the guide means 13 into an eye 151 of the winding spindle 15. The roll supporting disk 21 is rotated at a uniform speed by the above described pulley and belt drive, thereby unwinding a continuous strip of paper at a continuously diminishing circumferential speed in accordance with the decreasing diameter of the roll. The winding spindle 15 is rotated intermittently at a relatively high speed and for a predetermined number of revolutions so as to rewind the strip of paper supplied from the unwinding roll into a tightly wound paper wad 56 (Fig. 2) substantially equal in outside diameter to the inside diameter of the body or tube 57 of a shot shell. Suitable means, not forming a part of this invention, are provided for removing the wound wad from the spindle 15 and inserting the wad into the shot shell tube 57.

It will be evident that each predetermined length of paper intermittently drawn into the winding spindle travels at a substantially uniform linear speed and that the summation of such predetermined lengths of paper, or the continuous strip of material, is advanced at a uniform average linear speed.

If the supply roll is a full one the material of the roll is initially unwound at a circumferential speed greater than the average linear speed of rewinding due to the relatively large diameter of the roll. Consequently an excess amount of unwound material is produced which spreads outwardly or radially with respect to the roll and accumulates on the supporting segment 25 and the blocks 25' of the rimmed platform 16. The accumulation of the excess material continues, although at a steadily decreasing rate, until the circumferential speed of the material being unwound substantially equals the average linear speed of rewinding. Thereafter the excess material accumulated on the segments is gradually used up by the winding spindle 15, thus compensating for the steady decrease in amount of material being unwound. Hence it is clear that the annularly disposed segment 25 and segmental blocks 25' constitute means for supporting the excess material produced by the relative speeds of unwinding and rewinding, and in so doing convert the constantly decreasing circumferential or linear speed of the material being unwound to a substantially uniform average linear speed at which the strip is drawn into or rewound on the winding spindle.

It is evident, therefore, that by the machine of this invention the paper strip is fed to the rewinding spindles without jerking or otherwise creating excessive tension in the strip, and that

the size of the supply rolls used may be considerably greater than the size of the rolls previously used, thereby necessitating less frequent replenishment and effecting greater efficiency in operation.

Although the above description relates to the particular application of the invention to winding shot shell paper base wads, it will be understood that the invention is not so limited and that it shall have other applications within the spirit and scope of the appended claims.

What is claimed is:

1. In a wad winding machine, the combination with a winding spindle and means for intermittently rotating the spindle, of means for supplying a continuous strip of wad material to said winding spindle at a substantially uniform average rate comprising a rotatable disk for supporting a roll of wad material in a substantially horizontal plane, drive means for uniformly rotating said disk for unwinding a continuous strip from said roll at a linear speed which varies in accordance with the decrease in diameter of said roll, a fixed platform having a rim portion circumscribing said disk, and a plurality of segments spaced about the periphery of said disk and fixedly disposed between said disk and said rim, the surface of each segment being flush with the surface of said disk for accumulating unwound strip material spreading outwardly from said disk and converting the variable unwinding speed of the unwound strip to a substantially uniform average supply speed.

2. In a wad winding machine, the combination with a winding spindle and means for intermittently rotating the spindle, of means for supplying a continuous strip of wad material to said winding spindle at a substantially uniform average rate comprising a rotatable disk for supporting a roll of wad material in a substantially horizontal plane, drive means for uniformly rotating said disk for unwinding a continuous strip from said roll at a linear speed which varies in accordance with the decrease in diameter of said roll, a fixed platform having a rim portion circumscribing said disk, said platform having holes therein, and an annular platform interposed between said disk and said rim, the surface of said platform being flush with the surface of said disk for supporting unwound material spreading outwardly from said disk and converting the variable unwinding speed of said unwound material to a substantially uniform average supply speed, said annular platform having holes therein for permitting lint from said roll of material to drop from said annular platform and to escape through the holes of said fixed platform.

3. In a winding machine, the combination with a winding spindle and means for rotating the spindle; of means for supplying material to said winding spindle comprising a rotatable table for unwinding the material, said table having a substantially vertical axis of rotation; members in the plane of said table for supporting an excess of unwound material produced by a difference between the speed of unwinding and rewinding of said material; and an element circumscribing the supporting members constructed and arranged to limit the radial expansion of said excess unwound material.

4. In a winding machine, the combination with a winding spindle and means for rotating the spindle; of means for supplying material to said winding spindle comprising a material supporting disk having a substantially vertical axis of rotation and rotatable in a substantially horizontal plane for unwinding the material; a rim circumscribing said disk and spaced radially from the periphery thereof; and segments spaced circumferentially about the periphery of said disk in the horizontal plane thereof and between the periphery of said disk and said rim for supporting an excess of unwound material produced by a difference between the speed of unwinding and rewinding of said material.

5. In a winding machine, the combination with a winding spindle and means for intermittently rotating the spindle; of means for supplying material to said winding spindle comprising a material supporting disk having a substantially vertical axis of rotation and rotatable in a substantially horizontal plane for unwinding the material; drive means for rotating said disk at a substantially uniform speed whereby the speed of unwinding of said material exceeds the speed of rewinding by said winding spindle; and a stationary ring having a planar surface partially circumscribing said disk in the horizontal plane thereof for accumulating the radially expanding unwound material produced by the speed differential between said unwinding and rewinding speeds, the surface of said ring having apertures therein to enable the escape of lint from said rim.

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