Oct. 8, 1929. F. H. MEYER 1,730,675

MACHINE FOR ROLLING UP STRIP MATERIAL

Filed July 2, 1928 2 Sheets-Sheet 1

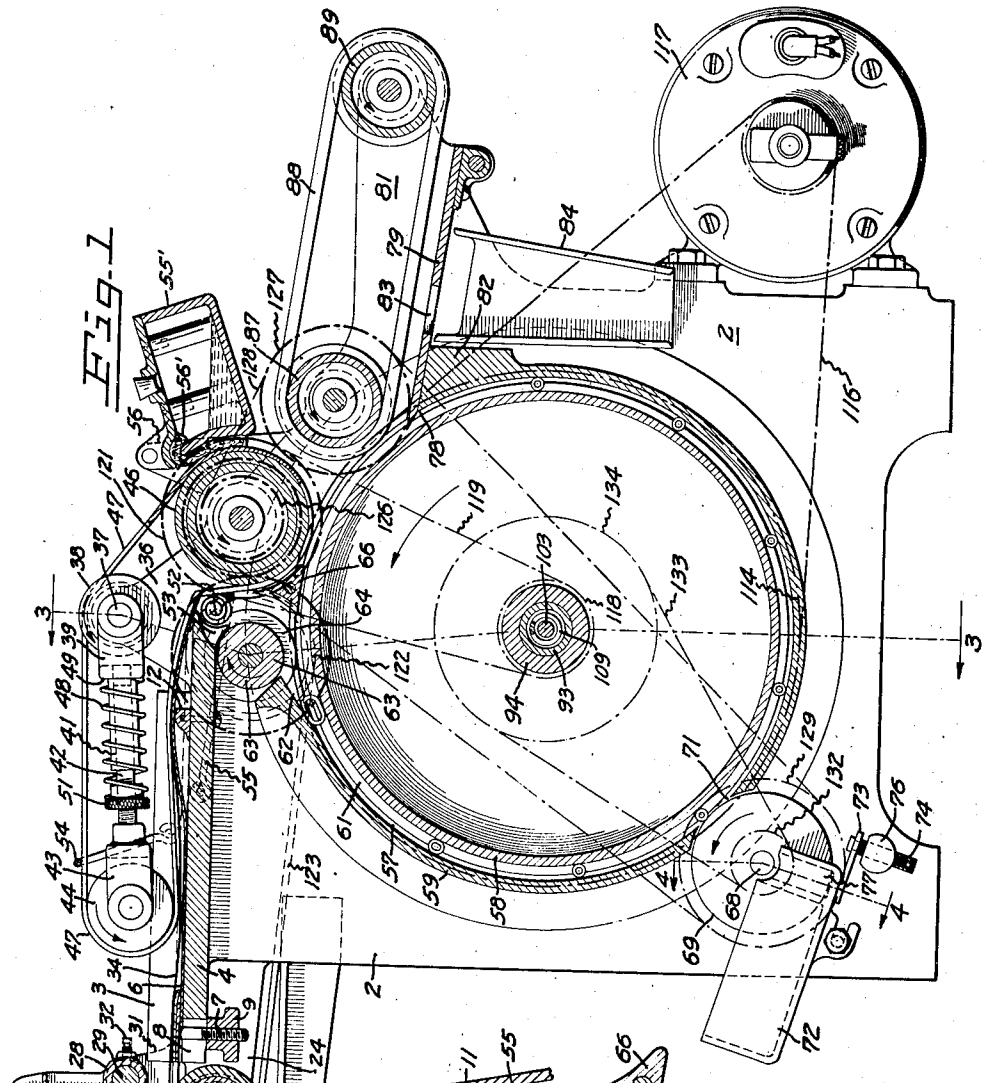


Fig. 1

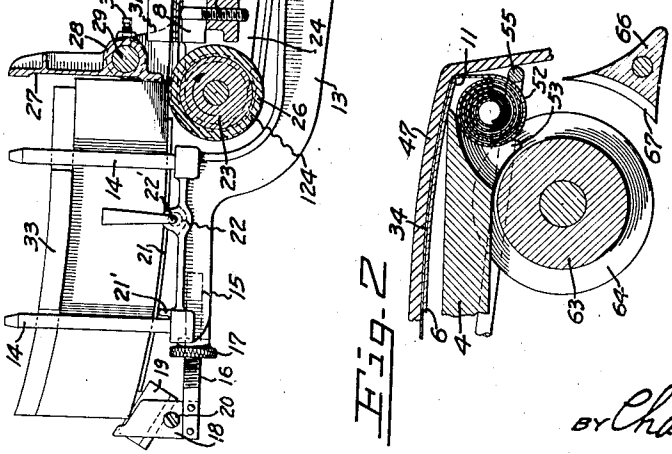


Fig. 2

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Fig. 3

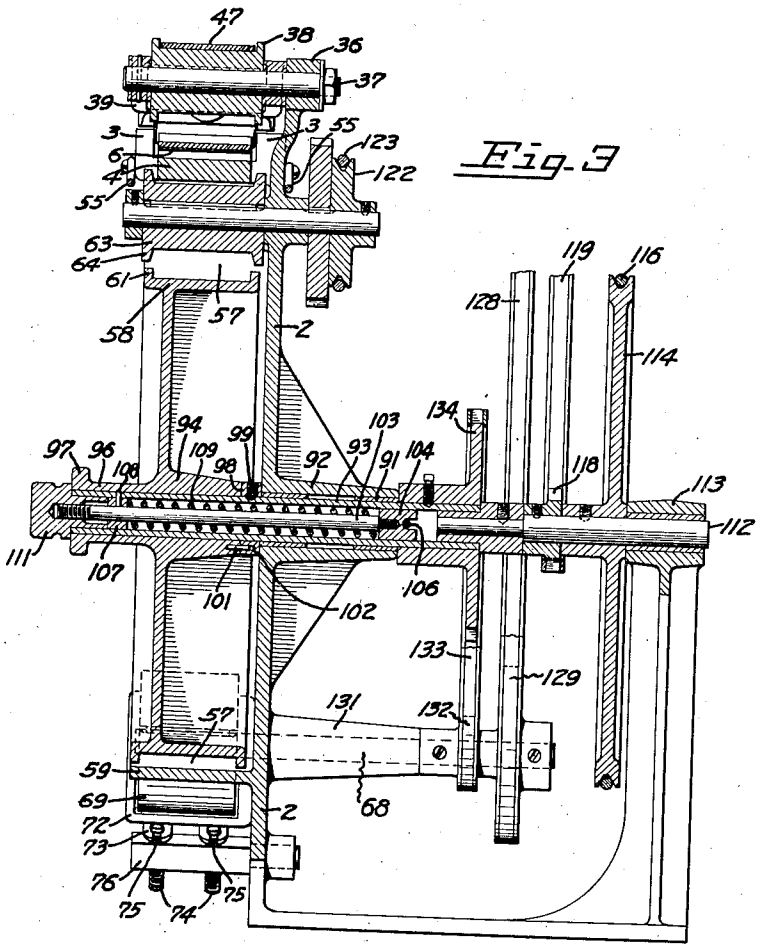
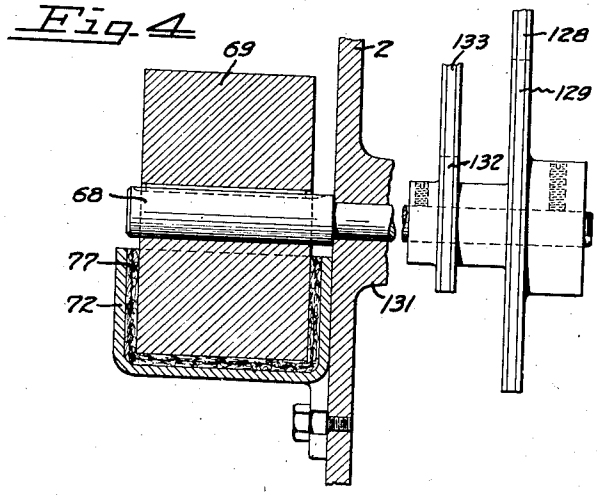


Fig. 4



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UNITED STATES PATENT OFFICE

FERD H. MEYER, OF OAKLAND, CALIFORNIA

MACHINE FOR ROLLING UP STRIP MATERIAL

Application filed July 2, 1928. Serial No. 289,825.

My invention relates to a machine for rolling up strip material, and which is especially adapted for use in rolling up short strips of paper into compacted tubular bodies for use as fire cracker shells.

One of the objects of my invention is the provision of a machine of the character described which is of economical and compact construction.

Another object of my invention is the provision of means, in a machine of the character described, for stretching a surface of the strip material to cause a loose coiling thereof.

Another object of my invention is the provision of means, in a machine of the character described, for tightening the convolutions of the loosely coiled strip into a compacted body.

Another object of my invention is the provision of means, in a machine of the character described, for applying a liquid to the coiled strip to paste the convolutions of the coil, and also to dye the coil.

Another object of my invention is the provision of means, in a machine of the character described, for discharging static electricity.

A further object of my invention is the provision, in a machine of the character described, of means for successively feeding strip material to the coil rolling means.

My invention possesses other objects and valuable features, some of which will be set forth in the following description of my invention which is illustrated in the drawings forming part of the specification. It is to be understood that I do not limit myself to the showing made by the said description and drawings, as I may adopt varying forms of my invention within the scope of the claims.

Referring to the drawings:

Figure 1 is a side sectional view, partly in elevation, of the machine of my invention.

Figure 2 is an enlarged sectional view of a portion of the device illustrated in Figure 1, showing in greater detail the construction of the coiling mechanism, guide means, and injector roll.

Figure 3 is a sectional view taken in planes indicated by the line 3—3 of Figure 1. A portion of the mechanism is shown in elevation to disclose more clearly the construction.

Figure 4 is a sectional view taken in planes indicated by the line 4—4 of Figure 1. A portion of the mechanism is shown in elevation to disclose more clearly the construction, and a portion of the construction is omitted to shorten the view.

In the manufacture of tubing, such as fire cracker or cartridge shells formed by rolling up relatively short strips of material such as paper sheets, it is rather difficult to coil the strips in the usual manner by means of a mandrel. Therefore, the present invention is primarily designed to provide a machine for rolling up such strips into compact tubular bodies. When a sheet of paper is drawn over the edge of a plate, the outer surface of the sheet is stretched, thereby causing the sheet to loosely curl or coil up. The above principle is employed in the construction of the machine of my invention.

Broadly my invention comprises a plate having an edge, and means are provided for drawing a strip of material over the edge to stretch the outer surface of the strip, thereby loosely coiling it. Preferably, the drawing means comprises an endless belt arranged to travel over the edge. Means are provided for tightening the loose convolutions of the coil into a compact body. For doing this, it is preferred to provide a pair of spaced members forming a passage into which the coil passes. Means are provided for moving one of the members relative to the other, thereby causing rolling of the coil which is tightened during the rolling. For holding together the convolutions of the compacted coil, a liquid is applied, preferably to the coil as it passes through the passage. The liquid may be an adhesive or an adhesive mixed with a dye, such as aniline red, whereby the pasting and dyeing operation is simultaneously performed. To complete the assembly means are provided for successively feeding strip material to the plate.

In greater detail the machine of my invention comprises a frame 2, the top of which is

formed with a channel having the sides 3 and bottom 4. Arranged in the channel is a plate 6, preferably of flexible sheet metal, clamped at one end thereof by means of a T headed bolt 7 adapted to fit in the notch 8 in the bottom of the channel and a nut 9 adapted to thread on the bolt at the underside of the channel, thereby rigidly fixing the plate 6 in position. An edge 11 of the plate projects beyond the other end of the channel, and near this free edge of the plate, a block 12 is fixed to the bottom 4 of the channel to elevate the plate and cause a flexing thereof when it is pressed downwardly.

Means are provided for successively feeding strip material, such as paper strips, over the plate 6 in the channel. Fixed to frame 2 is a bracket 13 upon which are vertically positioned side posts 14 to provide a frame for retaining strips of stacked paper. The bracket 13 is formed with a recess 15 in the outside edge thereof, and in which is loosely seated the threaded bolt 16. A knurled nut 17 is threaded on the bolt for positioning it end wise of the bracket. Fixed to the bolt at the outside end thereof is a clamp 18 which comprises two side members spaced from each other for holding a sharp edge cutter, such as a razor blade 19. The blade is held between the sides by tightening the set screw 20 threaded therein. The upper edge of the clamp is open at the inner side to present the cutting edge of the razor, while the outer side is covered to provide a guard. Preferably the razor is positioned at an angle, so as to provide a cutting surface sloping downwardly toward the posts 14, and upon which the outer portion of the stack can rest.

The middle part of the stack rests on a plate 21 supported adjacent its outer edge by the boss 21′ projecting upwardly from bracket 13, and supported adjacent its inner edge by the eccentric cam 22 fixed for rotation with the shaft 22′ journaled in the bracket 13. A suitable operating handle is provided for turning the shaft 22′. The plate 21 lies between the inner and outer edges of the stack to permit the outer portion of the stack to lie on the edge of the razor, as previously described, and the inner portion to lie on a feed roller 23 journaled in the bracket 24 fixed to the frame. The feed roller 23 is covered with a strip of rubber 26 to provide frictional engagement with the bottom strip of paper in the stack. Above the feed roller is a plate 27 having a boss 28 journaled on the shaft 29 fixed to the bracket 31 on the frame 2. The plate 27 provides a stop for all but the lower sheets of paper in the stack holding frame, and it can be adjustably positioned by means of the set screw 32 in the boss 28 and which is adapted to engage the shaft 29.

When feeding the paper strips onto the channel, a weight 33 is placed on top of the stack and positioned between the posts 14. Upon rotation of the feed roller 23 in a direction toward the channel, the bottom strip of the stack is drawn away, and the razor makes a clean cut in the edge of the strip. Since a portion of the stack rests upon the razor, the edge thereof will project into several of the lower strips. Therefore, only one strip at a time will be drawn away from the stack, since only the bottom strip thereof is in frictional engagement with the feed roller, while the other lower strips are held by the razor edge which cuts into them. The upper strips are held by the stop plate 27. If for any reason it is desired to stop the feeding of the strips, the eccentric cam 22 can be turned by means of the operating handle to elevate plate 21 and raise the stack off of the feed roller 23.

As each paper strip, indicated by line 34, is fed onto the channel, means are provided for drawing it over the free edge of plate 6. Above the edge of the plate and journaled in the bracket 36 fixed to the frame, is a shaft 37 upon which is journaled the roller 38. On the shaft is fixed the forked arm 39 which is pivotally mounted, since shaft 37 is journaled for rotation. The arm 39 has a stem portion with a cylindrical recess 41, in which the stem 42 of the forked arm 43 is adapted to slide. A roller 44 is journaled in the forked portion of arm 43 in a position above the plate, and a roller 46 is journaled on the frame adjacent the free edge of the plate. The roller 46 is so positioned that the lowest portion of its periphery is considerably below the plate, and an endless belt 47, preferably of cotton webbing but which can be of fabric such as canvas, or leather, is arranged to move over said rollers. For tensioning the belt, a spring 48 is placed over the stems of arms 43 and 39 respectively. One end of the spring abuts against the shoulder 49 provided by the forks of arm 39 while the other end abuts against the knurled tensioning nut 51 threaded on the stem 42.

It is thus seen that by adjusting the pressure on spring 48 by turning nut 51, the belt can be tensioned to press against the free edge 11 of plate 6. Therefore, when roller 46 is rotated in a direction to move the belt toward the free edge of the plate, the strips of material are drawn over the edge, and roll into a coil 52 of loose convolutions, as previously described. For governing the size of the coil, a pair of spaced, inwardly curved, thin-edge guides 53 are provided under the plate 6. Preferably, the guides are tongues formed in the end of the channel and adjacent the free edge of said plate. Since they are thin-edged and spaced, very little frictional resistance is offered to movement of the coil.

During the operation as above described, a large amount of static charge accumulates. This tends to prevent proper formation of the coil; therefore, means are provided for

discharging the static. Belt 47 is preferably covered with a conducting surface, such as metallic flakes or graphite adhesively secured thereto, and a U-shaped discharge wire 54 is fixed to the frame and rests against the belt; thereby grounding the static charges on the belt. Static charges are also discharged from the coil 52 by means of a U-shaped wire 55 fixed to the frame and against which the coil strikes upon rolling up.

It is preferred to apply a belt dressing to the belt to insure frictional contact between it and the successive strips of paper. For doing this, a box 55′ is pivotally mounted at an upper corner on the bracket 56 fixed to the frame. The box is positioned to abut against the portion of the belt 47 passing over roller 46, and the inner side of the box is curved inwardly to conform to the contour of the roller. Although an open box may be employed, it is preferred to use a closed box having an opening in the top thereof which can be closed by means of any suitable stopper and thru which the belt dressing can be poured. A felt wick 56′ is positioned against the curved side of the box in contact with the belt 47. The upper part of the wick projects only a short distance into the box and does not project into the dressing in the box, since the dressing is maintained at a level below the wick. When it is desired to apply dressing to the belt, the box is tipped upwardly; therefore, only the upper portion of the wick applies the dressing, while the lower portion is kept comparatively dry and consequently acts as a brush to clean the belt of excess dressing fluid. It is preferred to use a thin fluid belt dressing.

The coil 52, in the position shown in Figure 1, is loosely coiled; therefore, means are provided for tightening the coil into a compact body. Below the free edge of plate 6, is a circular passage 57 formed by a pair of spaced members comprising a plate or drum 58 journaled for rotation in the frame and a plate 59, preferably a flange integral with the frame, and partially surrounding and concentric with the drum. The passage 57 is partially closed at the sides by means of the guide flanges 61 on the sides of the drum. An end portion 62 of the fixed plate 59 slopes slightly away from the drum to increase the width of the passage, and is flattened at the edge. Adjacent the flattened edge is an injector roller 63 journaled in the frame and having the side flanges 64 to act as guides for the coil. The injector roller is also positioned adjacent to and under the free edge of the plate 6; so that the loose paper coil 52 is first carried downwardly by the belt 47 until it strikes the roller which is driven in a direction to inject the coil into the passage. To facilitate the guiding of the loose coil into the passage, a triangular shaped guide block 66 formed with spaced, inwardly curved, thin-edge tongues 67, is positioned under the plate and adjacent to but spaced from the injector roller to permit passing of the coil between the roller and guides. The function of the spaced thin-edge guides is to eliminate, to a great extent, frictional contact between them and the coil.

When the loose coil is injected into the passage, it assumes an egg like shape at the portion of the fixed plate sloped away from the drum, but due to the rolling action caused by the rotation of the drum and narrowing of the passage, the convolutions of the coil tighten up into a compact tubular body. About half way through the passage the coil is firmly compacted. At this point, it is preferred to apply a liquid such as an adhesive or dye, or both together, to the coil to hold it in compacted form. Upon the frame and near the lower portion of the fixed plate is journaled a stub shaft 68 upon which is keyed the liquid applying roller 69 projecting through an opening 71 in the fixed plate 59, and in a position substantially tangent to a line defined by the inner periphery of the plate. The roller 69 is also partially positioned in the liquid container 72 pivotally supported on the frame and which can be adjustably positioned by means of the finger-stops 73 fixed to the bottom of the container, and the set screws 74 having grooved heads resting in the notched edges 75 of the stops. The set screws are threaded in the boss 76 fixed to the frame. One end of the container is open and the roller 69 closes this end, except for a space filled with a felt pad 77 to prevent the leakage of material from the container and also to remove excess liquid from the roller.

The roller is caused to rotate at a faster peripheral speed than the drum, and in a direction so that the surface of the roller turns in an opposite direction to that of the drum. As a result, the compacted coil is momentarily held against the liquid applying roller, and the adhesive and dye thoroughly impregnate the compacted coil at this point. After the liquid is applied, the compacted coil continues through the passage, at the far end of which means are provided for ejecting the coil therefrom. Adjacent the discharge end 78 of the fixed plate, is pivotally mounted the guide plate 79 which is journaled at its outer edge on the bracket 81 fixed to the frame. The inner edge of the plate is beveled and projects slightly into the passage, while a boss 82 integral with the fixed plate 59 provides a stable support for the free end of the plate. A slot 83 is cut in the plate beyond the boss, and and below the slot, the conveyor chute 84 is placed.

Spaced from and above the guide plate 79, an ejector roller 87 is journaled, and the roller is driven so that its periphery rotates

in a direction opposite to that of the drum. An endless ejector belt 88 is wound around the roller 87, and also about the roller 89 journaled in the end portion of the bracket arm 81. The lower stretch of the ejector belt is parallel to and spaced from the guide plate, while the lower portion of the belt adjacent the passage forms a continuation thereof. It is thus seen that the movement of a rolled tube, upon striking the end of the guide plate, is momentarily arrested. The plate, being pivotally mounted, yields and permits the drum to carry the tube by the plate, and when the tube strikes the ejector belt, it is carried by the belt over the plate and falls thru slot 83 onto the chute 84 which discharges the tube into any suitable container.

As previously described, an adhesive is applied to the compacted tubes during movement thru the passage. As a result, the liquid tends to collect on the drum and fixed plate; therefore, it is preferred to mount the drum so that it can be readily removed for cleaning. Also means are provided for resiliently holding the drum in position, so that it can be removed for cleaning and then automatically snapped back into position.

Journaled in the bearing bushings 91 positioned in the boss 92 on the frame 2, is a hollow drive shaft 93, one end of which extends beyond the boss for a purpose to be later described, and the other end of which extends thru the hub 94 of the drum. The hub 94 is provided with an extension 96 which has a flange 97 at the end thereof, and the outer surface of which is preferably flush with the corresponding end of the drive shaft. A collar 98 is fixed to the drive shaft by means of a set screw 99, while the hub of the drum is keyed to the collar by means of a pin 101 fixed to the drum hub and adapted to engage the keyway 102 in the collar. Within the drive shaft is slidably mounted a plunger 103 one end of which is fixed to forked block 104 slidably mounted in the shaft and adapted to engage a pin 106 diametrically fixed across the shaft. A bushing 107 is fixed near the outer end of the drive shaft by means of a pin 108, and the plunger is adapted to slide thru the bushing 107. A coiled spring 109 surrounds the plunger and abuts against the bushing 107 and block 104. The assembly is held in position by means of a cap nut 111 adapted to thread onto the plunger and abut against the flange 97.

From the above description it is apparent that if the cap nut is taken off, the drum can be slipped off the drive shaft for cleaning. However, if merely a temporary cleaning is desired while the drive shaft is moving, the drum can be withdrawn by pulling on the hub extension 96. In the latter case, the hub is disconnected from the drive shaft and the consequent movement of the plunger will compress the spring. Therefore, upon releasing the drum, the spring will snap it back into position.

It is preferred to provide a single drive for the machine of my invention. Journaled in the projecting end of drive shaft 93 is a stub shaft 112 which is also journaled at the other end in the vertically positioned bearing support 113 fixed to the frame. Adjacent the bearing support and keyed to the stub shaft 112 is a large pulley 114 connected by means of belt 116 to suitable drive means such as an electric motor 117. Referring to Figure 1, the pulley 114 is rotated in a counter-clockwise direction; therefore, the stub shaft is also turned in the same direction. Keyed to the stub shaft, is a sprocket wheel 118 connected, by means of the chain 119, to the sprocket wheel 121 fixed for rotation with the roller 46. Since the sprocket wheel 118 rotates in a counter-clockwise direction, the roller 46 will also turn in that direction, thereby causing belt 47 to draw the paper strips toward the passage.

The injector roller 63 is directly geared to the roller 46; therefore, it will turn in a clockwise direction to pass the loosely coiled strips into the passage. A pulley 122 is fixed for rotation with the injector roll and an endless belt 123 connected to pulley 122, is also connected to pulley 124 fixed for rotation with the strip feed roll 23. Therefore, the strip feed roll will turn in a clockwise direction to draw strips onto the channel and over plate 6.

About sprocket wheel 126 fixed for rotation with the roller 46 and also about the sprocket wheel 127 fixed for rotation with the ejector roller 87 is an endless chain 128, which is also connected to sprocket wheel 129 fixed to the shaft 68 upon which the roller 69 is keyed. The shaft 68 is journaled in a boss 131 integral with frame 2. It is thus seen that since the roller 46 turns in a counter-clockwise direction, the ejector roller 87 will also turn in the same direction, thereby forcing the tubes out of passage 57; and the roller 69 will also turn in a counter-clockwise direction. For rotating the drum 58, a sprocket wheel 132 is also fixed to the shaft 68, and it is connected by means of an endless chain 133 to the sprocket wheel 134 fixed to the drum drive shaft 93. The drum will, therefore, turn in a counter-clockwise direction, but since the periphery of the roller 69 is positioned adjacent the periphery of the drum, the peripheries thereof move in opposite directions to perform the functions previously described.

In making fire crackers from the compacted tubular bodies, one end of the tube is filled with clay which is tightly tamped, powder is then added into the tube, and a fuse is embedded in the powder to project out of the open end of the tube. Clay is then tamped over the powder and about the fuse.

I claim:

1. In a machine for rolling up a strip of material, a plate having an edge, means for drawing the strip over the edge to loosely coil the strip, and means for tightening the loose convolutions of the coil.

2. In a machine for rolling up a strip of material, a plate having an edge, means for drawing the strip over the edge to loosely coil the strip, and means for rolling the coil to compact the convolutions.

3. In a machine for rolling up a strip of material, a plate having an edge, means for drawing the strip over the edge to loosely coil the strip, spaced members providing a passage into which the coil passes, and means for moving one of said members relative to the other to roll the coil therebetween.

4. In a machine for rolling up a strip of material, a plate having an edge, means for drawing the strip over the edge to loosely coil the strip, a fixed plate and a movable plate spaced therefrom to provide a passage into which the coil passes, and means for moving the movable plate to roll the coil between the plates.

5. In a machine for rolling up a strip of material, a plate having an edge, means for drawing the strip over the edge to loosely coil the strip, a drum, a plate adjacent the drum to provide a passage therebetween into which the coil passes, and means for effecting relative rotation between drum and plate to roll the coil therebetween.

6. In a machine for rolling up a strip of material, a plate having an edge, means for drawing the strip over the edge to loosely coil the strip, a drum, a plate fixed concentric with the drum to provide a passage therebetween into which the coil passes, and means for rotating the drum to roll the coil between the drum and plate.

7. In a machine for rolling up a strip of material, a plate having an edge, means for drawing the strip over the edge to loosely coil the strip, a drum, means for yieldingly holding the drum in position, a plate fixed concentric with the drum to provide a passage therebetween into which the coil passes, and means for rotating the drum to roll the coil between the drum and plate.

8. In a machine for rolling up a strip of material, a plate having an edge, means for drawing the strip over the edge to loosely coil the strip, spaced members providing a passage into which the coil passes, means for moving one of said members relative to the other to roll the coil therebetween, and means for applying a liquid to said coil.

9. In a machine for rolling up a strip of material, a plate having an edge, means for drawing the strip over the edge to loosely coil the strip, spaced members providing a passage into which the coil passes, means for moving one of said members relative to the other to roll the coil therebetween, and means for applying a liquid to said coil during the rolling thereof.

10. In a machine for rolling up a strip of material, a plate having an edge, means for drawing the strip over the edge to loosely coil the strip, spaced members providing a passage into which the coil passes, means for moving one of said members relative to the other to roll the coil therebetween and compact the convolutions, and means for applying an adhesive liquid to said coil after the convolutions are compacted.

11. In a machine for rolling up a strip of material, a plate having an edge, means for drawing the strip over the edge to loosely coil the strip, spaced members providing a passage into which the coil passes, means for moving one of said members relative to the other to roll the coil therebetween, and means for feeding a succession of strips to the strip drawing means.

12. In a machine for rolling up a strip of material, a plate having an edge, means for drawing the strip over the edge to loosely coil the strip, spaced members providing a passage into which the coil passes, means for moving one of said members relative to the other to roll the coil therebetween, and means for removing the coil from said passage.

13. In a machine for rolling up a strip of material, a plate having an edge, means for drawing the strip over the edge to loosely coil the strip, means for tightening the loose convolutions of the coil to compact them, and means for applying adhesive to the compacted coil.

14. In a machine for rolling up a strip of material, a plate having an edge, means for drawing the strip over the edge to loosely coil the strip, means for tightening the loose convolutions of the coil to compact them, and means for feeding a succession of strips to the strip drawing means.

15. In a machine for rolling up a strip of material, a plate having an edge, an endless belt arranged to move over said edge, spaced members providing a passage opening under said edge, and means for moving one of said members relative to the other.

16. In a machine for rolling up a strip of material, a plate having an edge, an endless belt arranged to move over said edge, means for tensioning the belt, spaced members providing a passage opening under said edge, and means for moving one of said members relative to the other.

17. In a machine for rolling up a strip of material, a plate having an edge, an endless belt arranged to move over said edge for drawing the strip thereover to loosely coil the strip, and means for tightening the loose convolutions of the coil.

18. In a machine for rolling up a strip of material, a plate having an edge, an endless

belt arranged to move over said edge for drawing the strip thereover to loosely coil the strip, means for discharging static from said belt, and means for tightening the loose convolutions of the coil.

19. In a machine for rolling up a strip of material, a plate having an edge, an endless belt arranged to move over said edge for drawing the strip thereover to loosely coil the strip, means for discharging static from said coil, and means for tightening the loose convolutions of the coil.

20. In a machine for rolling up a strip of material, a plate having an edge, means for drawing the strip over the edge to loosely coil the strip, spaced members providing a passage opening under said edge, spaced knife edge guides under the plate for guiding the coil into the passage, and means for moving one of said members relative to the other.

21. In a machine for rolling up a strip of material, a plate having an edge, means for drawing the strip over the edge to loosely coil the strip, spaced members providing a passage opening under said edge, an injector roll for introducing the coil into the passage, and means for moving one of said members relative to the other.

22. In a machine for rolling up a strip of material, a plate having an edge, means for drawing the strip over the edge to loosely coil the strip, spaced members providing a passage opening under said edge, an injector roll for introducing the coil into the passage, means for moving one of said members relative to the other, and means for ejecting the coil from the passage.

23. In a machine for rolling up a strip of material, a plate having an edge, means for fixing the plate in position, an endless belt arranged to move over the edge for drawing the strip thereover to loosely coil the strip, and means for tightening the loose convolutions of the coil.

24. In a machine for rolling up a strip of material, a plate having an edge, means for fixing the plate in position, means for flexing the plate, an endless belt arranged to move over the edge for drawing the strip thereover to loosely coil the strip, and means for tightening the loose convolutions of the coil.

25. In a machine for rolling up a strip of material, a plate having an edge, means for fixing the plate in position, means for flexing the plate, an endless belt arranged to move over the edge for drawing the strip thereover to loosely coil the strip, means for tensioning the belt, and means for tightening the loose convolutions of the coil.

26. In a machine for rolling up a strip of material, a plate having an edge, an endless belt arranged to move over said edge for drawing the strip thereover to loosely coil the strip, means for applying a dressing to the belt, and means for tightening the loose convolutions of the coil.

27. The combination with a machine for rolling up a strip of material, of means for successively feeding strips to said machine comprising a frame for holding the strips in stacked position, a sharp edge upon which the stack is adapted to rest, and a rotatably mounted feed roller upon which the stack is adapted to rest.

In testimony whereof, I have hereunto set my hand.

FERD H. MEYER.