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2,290,916

PACKING MACHINE

Filed May 12, 1939

2 Sheets-Sheet 1

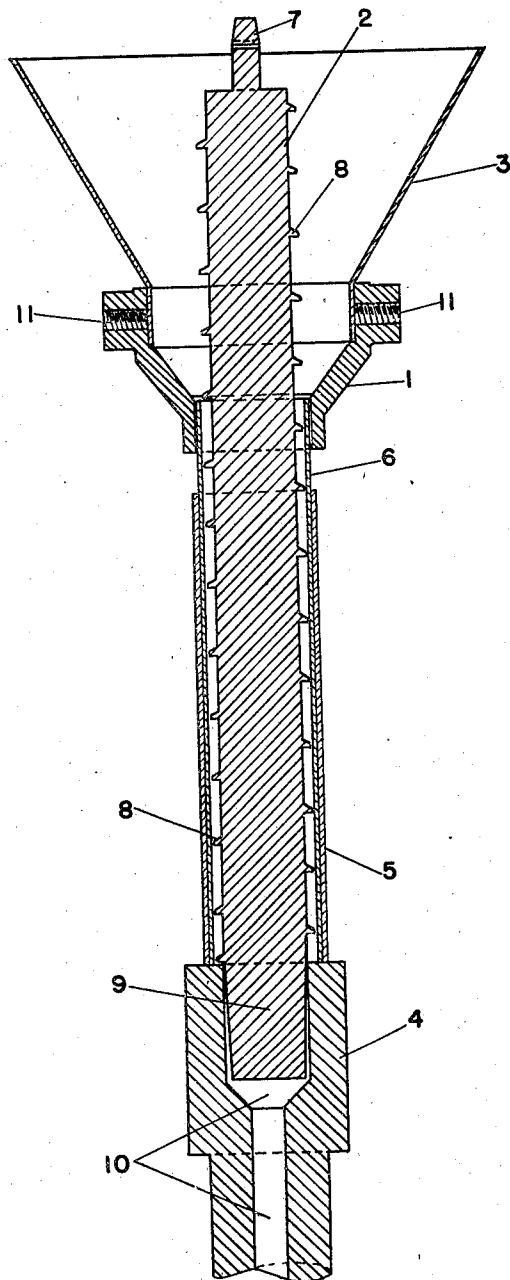


FIG-1

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2 Sheets-Sheet 2

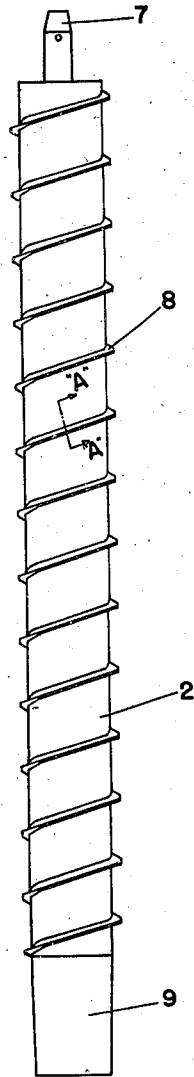


FIG-2

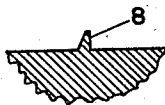


FIG-3

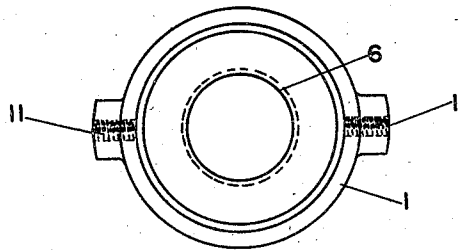


FIG-5

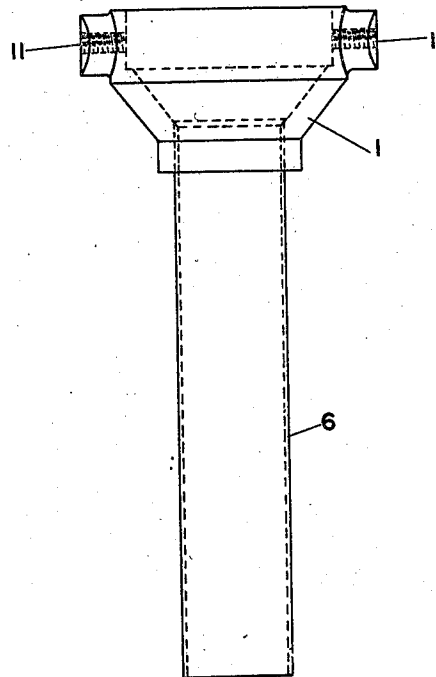


FIG-4

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PACKING MACHINE

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Application May 12, 1939, Serial No. 273,301

6 Claims. (Cl. 18—13)

This invention relates to an improved packing machine for tubular containers and more particularly to an improved machine for producing tubular containers for use in sheathing explosive cartridges.

In the coal mining industry the use of sheathed explosives is increasing because of the increased amount of lump material such as an explosive will produce and because of the flame quenching ability of the sheathing. A sheathed explosive usually comprises a cartridge of explosive surrounded by a sheathing made from a compressible material, a flame quenching material and in some cases a binder. The entire sheathing acts to absorb some of the initial shattering shock produced upon detonation and the flame quenching material cools or quenches the hot gases and flame produced. The binder is added to aid in forming the sheathing.

The sheathing used in the explosive industry may be produced from compressible material such as, for example, mica, balsa, bagasse, cork, etc. in admixture with a flame quenching salt such as, for example, sodium bicarbonate, plaster of Paris, borax, calcium fluoride, etc. and a binding agent such as, for example, sodium silicate, clay, or glue.

In normal use, the sheathing may include from about 10 to 30% compressible material, about 40 to 90% flame quenching material, and a small amount of a binder. This type of sheathing is produced by molding, extruding or packing wet or dry materials into the desired tubular form. There are usually considerable difficulties encountered in forming the sheathing material into a usable form in an efficient and economical manner.

It is the object of this invention to provide a machine that will produce sheathing. A further object is the production of sheathing of the desired shape efficiently and economically. A still further object is to provide a machine that will produce a sheathing having a smooth interior surface and of sufficient strength to withstand commercial handling. Other objects will appear hereinafter.

Now in accordance with this invention there has been produced a packing machine for preparing tubular sheathings for explosive cartridge. This machine packs a sheathing composition composed of a compressible material and a flame quenching material into a paper tube or form, leaving a smooth internal bore and produces a tubular sheath that may be readily handled and easily used to inclose explosive cartridges.

Having now indicated in a general way the nature and purpose of this invention there follows a more detailed description of preferred embodiments thereof, with reference to the accompanying drawings in which:

Figure 1 is a cross section of the assembled packing machine. Figure 2 is an elevation view of the packing worm. Figure 3 is a cross section along line AA of Figure 2. Figure 4 is an elevation view of the feed tube and worm guide, and Figure 5 is the top view of the feed tube and worm guide.

The assembly view of the packing machine of this invention as shown in Figure 1 includes a stationary feed tube and worm guide 1, also shown by Figures 4 and 5, the packing worm 2, also shown by Figures 2 and 3, a feed hopper 3, a movable base 4, and a paper tube 5. The general means of operation of the packing machine proceeds as follows: A tube 5 of paper, cardboard, plaster, fiber, metal, or similar material is slipped on an extension 6 of the feed tube and worm guide 1, while the base 4, is in the lowered position. The base 4 is then brought into contact with the bottom end and the feed tube extension 6 and the tube 5 is rested upon this base 4. The packing material, not shown, is fed into hopper 3 and the worm 2 revolved by suitable means attached to worm 2 at point 7. The spaces between the worm spiral 8 will be filled with packing material which gradually forces the base 4 downwards at which time the tube 5 resting on base 4 works downward and receives a layer of packing material deposited around its inside surface. The shank 9 which is slightly tapered absorbs the stresses which the worm 4 places on the layer of packing material until the amount of material packed is sufficient in height to maintain itself in position. This shank 9 makes the packing of a tube sheathing possible by causing the packing material to form a bore having a smooth interior and by preventing the packing material, forming the bore, from crumbling during the packing operation. The base 4 contains a hollow 10 to receive the shank 9 and to allow the removal of any packing material which might drop into the hollow 10 during the removal of the packed sheathing. The feed tube and worm guide 1 is equipped with set screws 11 to hold the hopper 3 in position and is further rigidly mounted in proper relation to the worm 2 and movable base 4. The movable base 4 is so geared or counterweighted that a predetermined definite pressure exerted by the packed material inside the tube 5 forces it downward. It will be

apparent that the gearing or weighting may be so regulated as to give the desired density or hardness of packing.

To facilitate the detail description of the worm, an elevation view is shown in Figure 2 and a cross section of the worm spiral taken along line AA is shown in Figure 3. The worm 2 may be of any desired length, diameter, pitch and spacing depending entirely upon the type and use of sheathing that is to be packed. For packing sheathing to be used with $1\frac{1}{4}$ " x 8" dynamite cartridges, we have found that a worm having an overall diameter of about $1\frac{19}{32}$ " with a worm spiral pitch of about 1" produced very good results. The thickness of the sheathing packed is determined by the diameter of the shank and the inside diameter of the tube used. The shank for $1\frac{1}{4}$ " x 8" cartridges was found to give good results if it was between 1" and 3" long and $\frac{15}{16}$ " in diameter with the smoothest finished bore and least crumbling produced when the shank was 2" long. There are many means of revolving the worm and such are well known to the art.

The packing operation is variable depending upon the type sheathing being packed and upon the type material being used for the sheathing. Thus we have found that, to facilitate the packing procedure, we may vary the design of the packing auger by tapering the shaft so that the shaft diameter is smallest at the shank or delivery end. An alternative which consists of tapering the outside diameter of the spiral so that the shank or delivery end is largest also gives the same improved results. Still another alternative that well effects the desired result consists of reducing the width of the spiral within the hopper. It will be understood that each of the above alternative embodiments must be properly coordinated with the various types of packing material to effect the best operating results.

To increase the speed of packing the width of the worm spiral may be increased or the shaft between the spiral may be formed in a concave shape. It will be appreciated that the above variable methods can also be adapted to pack sheathing of various thickness. The diameter and taper of the solid shank must also be coordinated with the variations made in the packing speed or sheath wall thickness to insure smooth bore products. As illustrated Figure 1, shank 9 is in the form of a truncated cone.

The feed tube and worm guide 1 as shown in Figures 4 and 5 must, of necessity, be constructed of fairly heavy material around the upper part to allow positive fastening of the hopper by set screws 11 and also to provide a means of rigidly affixing the guide and feed tube to prevent binding of the worm. The tubular extension, we find, should preferably be made of thin material to prevent loss of packing efficiency.

The packing materials which may be used are varied but compositions containing about one part of compressible material such as mica, balsa, bagasse, cork, or the like and about 3 to 4 parts of a flame quenching salt such as for example sodium bicarbonate, plaster of Paris, borax, calcium fluoride or the like, and, if necessary, a minor amount of a binder such as sodium silicate, clay or the like have been found to give excellent results in the machine of this invention. Depending upon the individual physical characteristics of different mixtures, various percentages of water may be used in the mixtures to facilitate packing.

The capacity of the packing machine in regard

to the number of cartridges packed is limited by the speed, pitch and taper of the shaft diameter of the worm, but we have found that when running a worm having a 1-inch pitch at 700 R. P. M., the machine will produce approximately 500 $1\frac{1}{4}$ " x 8" tubes an hour. The machine as described is designed to produce sheathing for $1\frac{1}{4}$ " x 8" cartridges and to run semi-automatic, the machine stopping when the base plate is in the low position at which point the sheath is removed and a new tube placed on the feed tube. The worm starts again when the base plate is raised into contact with the bottom of the feed tube. It will be apparent to those skilled in the art that there are many various means of semi-automatically operating this machine and these various means are to be understood to be within the scope of this invention.

The shank extending from the end of the worm allows a hollow sheathing to be packed without any crumbling of the packing material, but the length of this shank must be so adapted in relation to the diameter of the sheath packed that the pressure of the packing material will not cause crumbling or collapsing of the packed part of the sheathing when the support provided by the shank is removed. The shank which supports and smooths the sheathing wall may be slightly tapered to allow the packed material to swell slightly as the pressure of the worm is lessened with the lowering of the base plate. Control of the interior surface of the sheath centers in the design of the shank and for each diameter cartridge the length may vary, but the optimum length is easily determined experimentally.

The machine of this invention is described above is used to pack sheaths for $1\frac{1}{4}$ " x 8" dynamite but the machine may also be used to pack sheathing for cartridges varying from about $\frac{1}{2}$ " to 7" in diameter and from about 4 inches to 24 inches in length. In the production of the short length sheathing long lengths may be packed and cut to length as desired.

It will be understood that the details and examples hereinbefore set forth are illustrative only, and that the invention as herein broadly described and claimed is in no way limited thereby.

What we claim and desire to protect by Letters Patent is:

1. A machine, for packing tubular sheathing comprising an annular layer of compressible material supported by a substantially rigid tube, which includes a tubular guiding means for receiving said tube, a rotatable shank having a spiral packing worm mounted thereon within said guiding means, a movable base having a central bore, said base capable of contacting the bottom of said guiding means and supporting the said tube, the said shank extending beyond the spiral packing worm a distance at least equal to the diameter of the shank, and said extending portion decreasing in diameter from the shank diameter at the end of the spiral to a substantially smaller diameter at the end of said portion whereby the packed sheath is supported without additional compression.

2. A machine for packing tubular sheathing comprising an annular layer of sheathing material supported by a substantially rigid tube, which includes a movable base, having a central bore, a tubular guiding means, and a rotatable shank having a spiral screw thereon extending through said guiding means, said shank extend-

ing a distance at least equal to the diameter of the said shank below the spiral, said shank extending portion at the end adjacent the spiral having a diameter equal to the diameter of the shank and decreasing in diameter throughout its entire length wherey the packed sheath is supported without additional compression.

3. A machine for packing tubular sheathing comprising an annular layer of cushioning material supported by a substantially rigid tube which includes a movable base, having a central bore, a tubular guiding means, and a rotatable shank having a spiral screw thereon extending through said guiding means, said shank extending a distance at least equal to the diameter of the said shank below the spiral, said extension being tapered from a point adjacent the end of said spiral throughout the length of said extension whereby the end of the extension is of substantially smaller diameter than the shank diameter and the packed sheath is supported without further compression.

4. A machine, for packing tubular sheathing comprising an annular layer of compressible material supported by a substantially rigid tube, which includes a tubular guiding means for receiving said tube, a rotatable shank having a spiral packing worm mounted thereon within said guiding means, a vertically movable base having a central bore, said base capable of contacting the bottom of said guiding means and supporting the said tube, the said shank extending beyond the spiral packing worm a distance at least equal to the diameter of the shank, said extending portion of the shank decreasing in diameter from a point adjacent the end of the

spiral to the end of said portion whereby the packed sheath is supported without additional compression.

5. A machine for packing tubular sheathing comprising an annular layer of sheathing material supported by a substantially rigid tube, which includes a vertically movable base, having a central bore, a stationary tubular guiding means, and a rotatable shank having a spiral screw thereon extending through said guiding means, said shank extending a distance at least equal to the diameter of the said shank below the spiral, and said extending portion of the shank being constantly tapered from the shank diameter at the end adjacent the spiral screw to a diameter substantially smaller than the said shank diameter at the end of said shank, whereby the packed sheath is supported without additional compression.

6. A machine for packing tubular sheathing comprising an annular layer of cushioning material supported by a substantially rigid tube which includes a vertically movable base, having a central bore, a stationary tubular guiding means, and a rotatable shank having a spiral screw thereon extending through said guiding means, said shank extending a distance at least equal to the diameter of the said shank below the spiral in the form of a truncated cone, decreasing diameter from a point adjacent the spiral throughout the entire length of said extending portion of the shank whereby the packed sheath is supported without additional compression.

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CERTIFICATE OF CORRECTION.

Patent No. 2,290,916.

July 28, 1942.

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It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, first column, line 19, for "15/16" read --1 5/16--; page 3, first column, line 6, claim 2, for "wherey" read --whereby--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 1st day of September, A. D. 1942.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.