United States Patent

Gordon et al.

[15] **3,655,140**

[45] **Apr. 11, 1972**

[54] MACHINE FOR WINDING FLEXIBLE MATERIAL

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[73] Assignee: **Windings, Inc.**

[22] Filed: **Mar. 2, 1970**

[21] Appl. No.: **18,780**

Related U.S. Application Data

[62] Division of Ser. No. 709,305, Feb. 29, 1968, abandoned.

[52] **U.S. Cl.** ..... **242/18 R,** 206/59 A, 242/47, 242/68, 242/163, 242/171

[51] **Int. Cl.** **B65h 54/00,** B65h 75/02

[58] **Field of Search** ..... 242/18 R, 26, 35, 43, 47, 50, 242/53, 54 R, 68–68.3, 159, 163, 174, 176, 7.13, 171, 178

[56] **References Cited**

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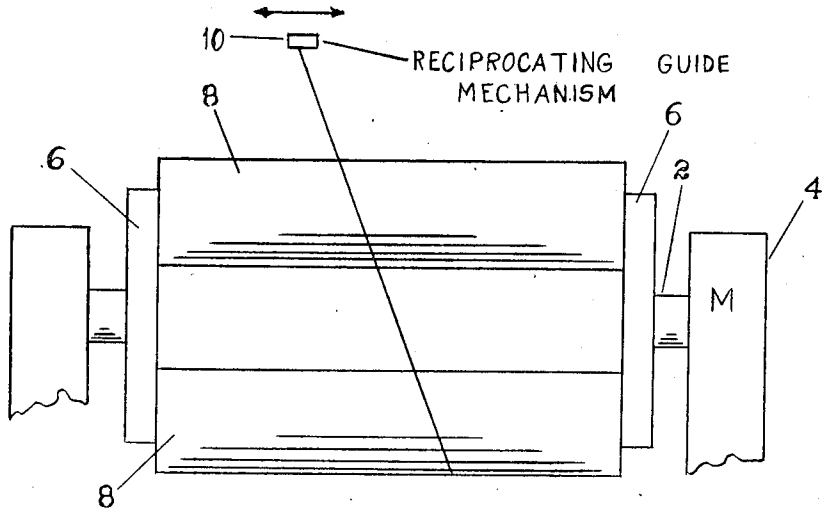
2,634,918	4/1953	Taylor, Jr.	242/43
2,634,922	4/1953	Taylor, Jr.	242/163
2,767,938	10/1956	Taylor, Jr.	242/163
3,178,130	4/1965	Taylor, Jr.	242/163
3,237,657	3/1966	Elvers et al.	242/7.13
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[57] **ABSTRACT**

A package of flexible, particularly springy material, is produced by a winding in the nature of a universal wind on a spindle having spaced curved ends and a cross section of oblong shape, a radial hole being built into the package substantially at the center of one of the sides of the oblong, and the flexible material being fed out from the interior of the package through this hole by means of a payout tube inserted in the hole and extending into the open central interior of the package where it flares outwardly. The completed package is thicker in the elongated sides than in the substantially semicylindrical end portions because the crossovers in the end portions are spaced further apart than in the side portions. Thus when one or both of the side walls are flattened, as by insertion in a package, the flattened side wall portions bulge inwardly so that the interior axial space within the package is substantially in the space of a dumb-bell or kidney with the interior walls closer together at the center than at the sides. A removable part inserted and held in the payout tube has a member engaging the opposite interior wall to stabilize the package during shipment and handling.

2 Claims, 9 Drawing Figures



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3 Sheets-Sheet 1

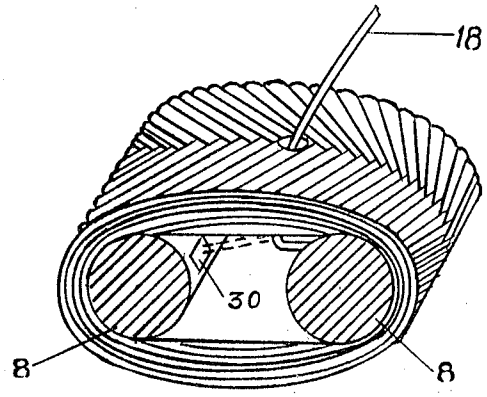


Fig. 1

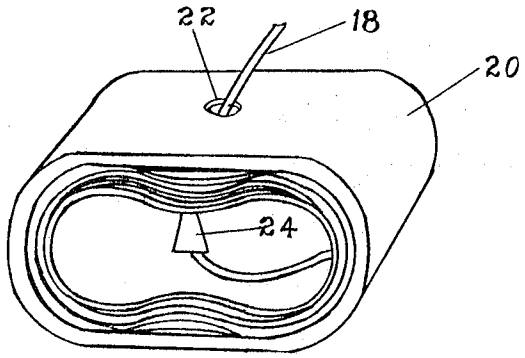


Fig. 2

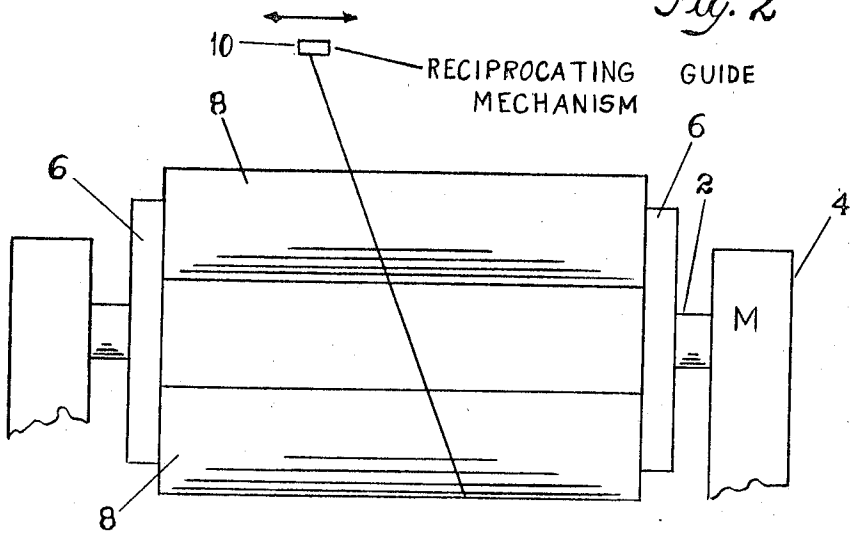


Fig. 3

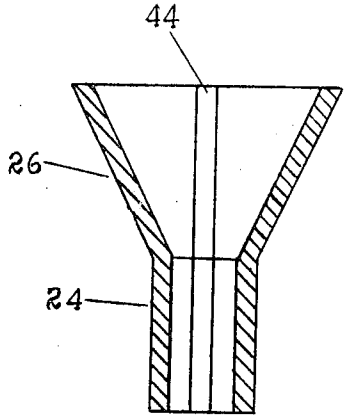


Fig. 4

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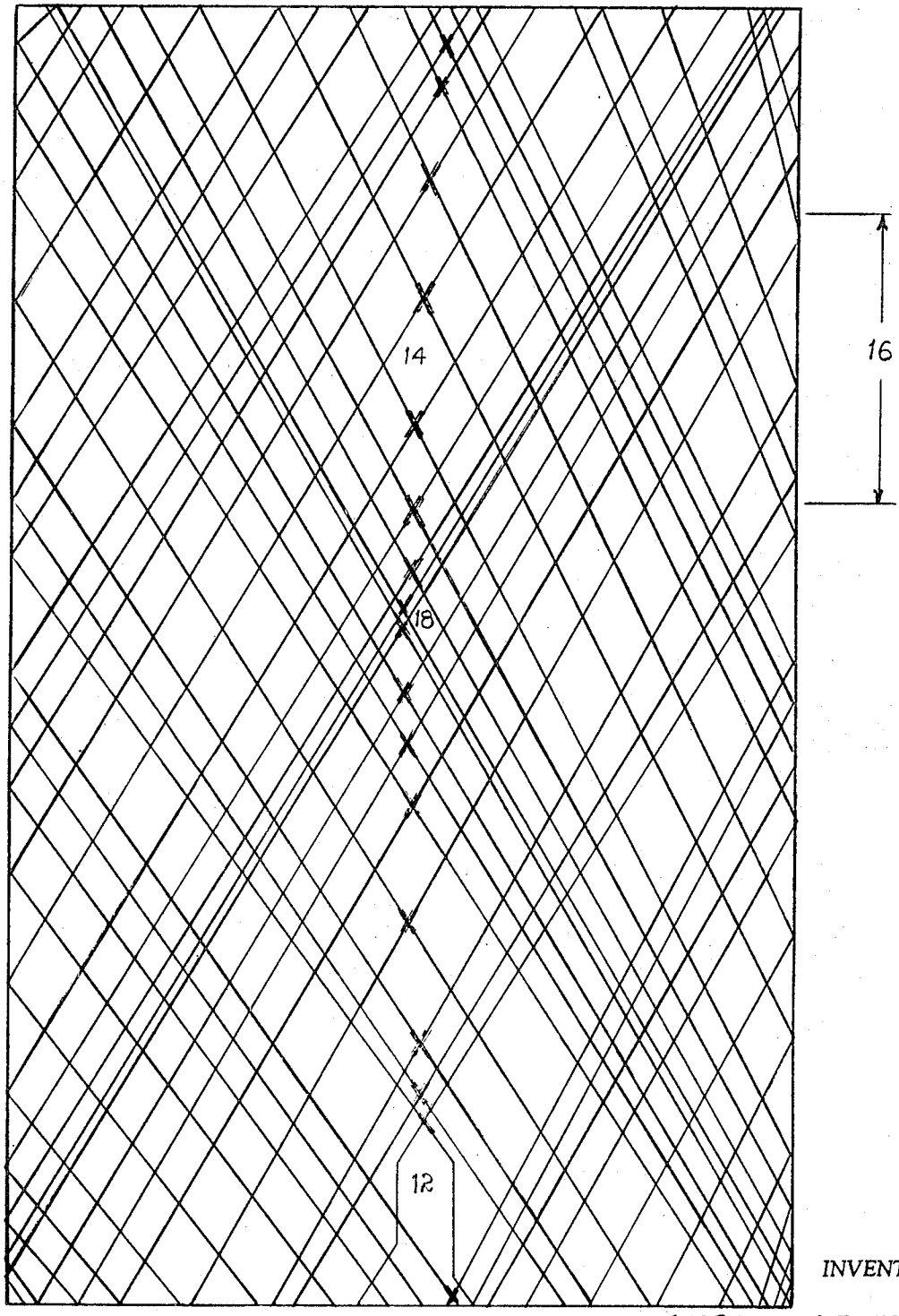


Fig. 5

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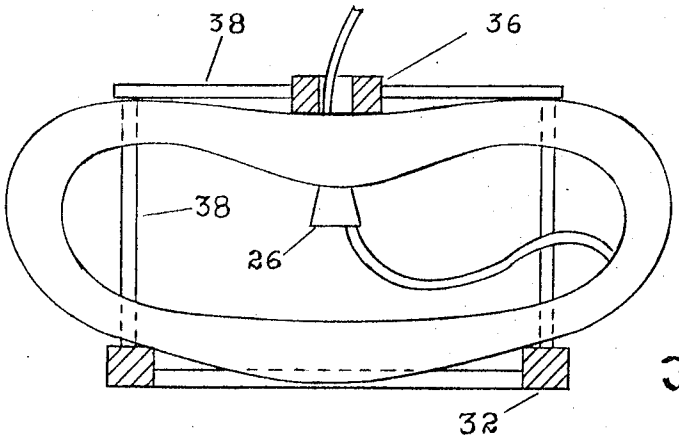


Fig. 6

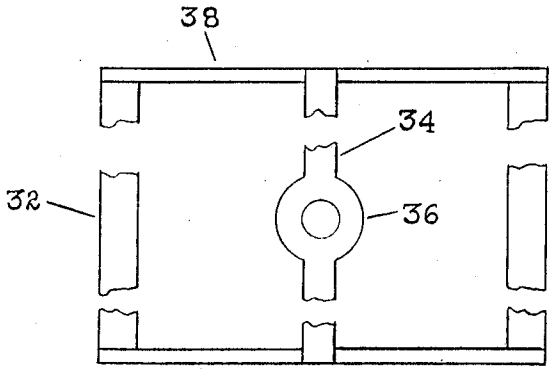


Fig. 7

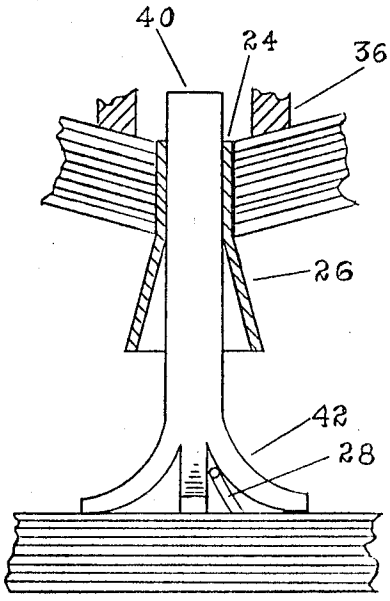


Fig. 8

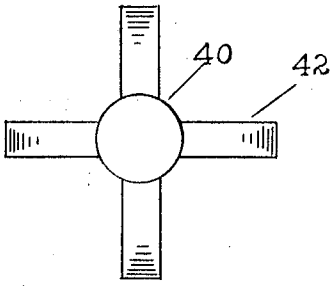


Fig. 9

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MACHINE FOR WINDING FLEXIBLE MATERIAL

RELATED APPLICATIONS

This application is a division of application Ser. No. 709,305, filed Feb. 29, 1968, now abandoned in favor of application Ser. No. 55,407 filed as a continuation in part thereof on July 16, 1970.

THE PRIOR ART

Packages of flexible material wound in a universal wind and having a built-in radial hole are well known for example from Taylor U.S. Pat. No. 2,634,922. These packages are cylindrical in cross section. Taylor U.S. Pat. No. 3,178,130 suggests that such packages can be collapsed in various ways, including circumferentially. However, with all of these packages there is a tendency for the material being drawn out from the inside of the package to "birds-nest," that is, for a plurality of loops to come loose from the inner wall of the package at the same time which may become caught on each other and thus prevent positive payout from the interior of the package.

SUMMARY OF THE INVENTION

According to the present invention, the likelihood of "birds-nesting" is greatly reduced by forming the package with an axial opening having a cross-section substantially in the shape of a dumb-bell or a kidney, that is, with a narrow central portion.

A further feature of the invention is the use of such a package of a payout tube which is secured in the payout opening and which has a portion extending inwardly substantially to the central plane of the package, this portion flaring outwardly from the interior wall of the package its free end at an angle of around 30°.

A further feature of the invention lies in the winding of the package on a spindle composed of two shafts or rolls which are mounted on a common frame in parallel spaced relation, which spindle is rotated about a line equidistant between the rolls while a guide is reciprocated along the length of the rolls, the flexible material being fed in by this guide.

As a result of this arrangement, and because the curved ends of the rolls will be moving more rapidly across the guide than the central portions, the substantially flat central portions of the package so wound will have their crossovers spaced apart by a less distance than the crossovers of the substantially cylindrical end parts. The result of this will be that the flat side portions as the layers build up will be thicker than the end portions. If then the resulting package is enclosed in a simple container of oval cross section with flat sides, the thicker side portions will be caused to bulge inwardly so as to produce the dumb-bell shaped interior space referred to above, whereas if pressure is exerted on the central part of only one of the side walls the interior axial space will be kidney shaped.

A further feature of the invention, of general application, is the provision of a removable part in the payout tube having a member thereon engaging the opposite interior wall of the package to give stability during handling and shipping.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be more fully understood from the accompanying drawings in which:

FIG. 1 shows a package produced according to the invention while still supported by the spindle on which it is wound;

FIG. 2 shows the same package removed from the spindle and enclosed in a container;

FIG. 3 shows diagrammatically a machine for producing a package according to the invention;

FIG. 4 shows the payout tube;

FIG. 5 shows a diagram of the winding of one layer of the package according to the invention;

FIG. 6 shows a modified form of package;

FIG. 7 shows in plain view the holder of FIG. 6;

FIG. 8 shows a part of package with a stabilizing member secured in the payout tube; and

FIG. 9 shows the stabilizing member in plain view.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIGS. 1 and 3, there is shown a spindle 2 driven by a motor 4 and carrying brackets 6 which support rolls 8. A guide 10 is reciprocated along the rolls in conjunction with the rotation of the spindle formed by the rolls 8, the drive mechanism for example being of the type shown in Taylor et al. U.S. Pat. No. 2,634,918 or Taylor U.S. Pat. No. 2,767,938.

The guide makes substantially one complete reciprocation for every two turns of the spindle, but is slightly out of phase therewith so that the crossovers progress around the spindle. This builds up a package of flexible material a typical layer of which is shown in FIG. 5, this layer being composed of a plurality of figure eights. In this figure there is shown the production of a hole 12 by stopping the movement of the guide temporarily while the spindle continues to turn as described in the patents above referred to. It will be noted also that the spacing 14 between the crossovers in the portions of the package going around the rollers, one of such portions for example being located between lines 16 located at the left hand side of FIG. 5, are spaced substantially further apart than the crossovers as at 18 in the flat side wall sections of the package. As a result, as is seen in FIG. 1, the side walls of the package build up to a greater thickness than the substantially cylindrical end wall portions.

FIG. 2 shows the package of FIG. 1 enclosed in a substantially rigid container 20 having a flat side wall and provided with a hole 22 opposite the hole 12 in the package. It will be noted from this figure that the resulting package has a dumb-bell shaped interior.

It is also desirable to use a payout tube such as shown in FIG. 4 which has a portion 24 for fitting in the hole 12 and a flaring portion 26 of funnel shape which begins at the interior wall of the original package and extends substantially to the center of the dumb-bell shaped opening. The angle between the wall and the radius of the package is preferably within the range of 15° to 40°, preferably around b 30°. This flaring shape helps to lift the coils one by one away from the package wall, the portions of the coils nearest the hole being guided outwardly by contact with the sloping surface. The interior free end 28 of the flexible material is brought out through this funnel with a result that, as shown in the previously identified Taylor patents, the material is fed out substantially without twist.

FIG. 1 shows a clip 30 attached to one of the rolls 8 for the attachment of the starting end of the material (indicated in broken lines in FIG. 1) during winding.

While a single figure-eight wind is shown in the drawing, it is to be understood that multiple figure-eight winds are not excluded from the scope of the invention in its broadest aspect.

FIG. 6 shows a similar coil held by a frame (see also FIG. 7) so that the interior axial opening is kidney shaped. The frame is composed of one side of two bars 32 spaced apart and engaging the package near the ends of one of the long sides, while a second bar 34 with a central ring 36 for payout engages the central part of the other longer side. These bars are connected by frame members 38.

FIG. 8 shows, in combination with the payout tube, a rod 40 of plastic material which fits fairly tightly within the payout tube part 24 and has at its end normally spreading resilient fingers 42. If the fingers are held together and the rod is inserted in the payout tube with the fingers in front, the fingers will spread apart and can engage the opposite interior wall so as to stabilize the package during shipping and handling. When the package is to be paid out, the rod 40 is withdrawn and the fingers 42 will be compressed and come out through the tube.

The inner end 28 of the material may be attached to rod 40, so that it is drawn out as the rod is removed.

Where a number of packages are to be "cascaded," that is, connected in series, the payout tubes can be dropped off as each coil is paid out if the outer end of the material is led in-

wardly through the radial hole on the outside of the tube and then out through the tube. To permit this without interfering with the normal payout, the tube can be provided with a groove **44** in which the outer end portion can lie during the withdrawal.

We claim:

1. A machine for winding flexible material comprising a spindle, means to rotate the spindle, a guide for flexible material and means to reciprocate the guide with respect to the spindle through at least about one complete reciprocation for each two revolutions of the spindle and slightly out of phase therewith, characterized in that said spindle is substantially oval in cross-section.

2. A machine as claimed in claim **1**, characterized in the spindle comprises spaced elongated end members having substantially semi-cylindrical outer end surfaces.

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