PACKAGE OF FLEXIBLE MATERIAL FOR TWISTLESS PAYOUT AND METHOD OF MAKING SUCH PACKAGE

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Filed: Sept. 21, 1970

Appl. No.: 73,802

U.S. Cl. 242/163
Int. Cl. B65H 55/02
Field of Search 242/163, 43

References Cited

UNITED STATES PATENTS
2,634,918 4/1953 Taylor, Jr. et al. 242/43
2,634,922 4/1953 Taylor, Jr. 242/163
2,634,923 4/1953 Taylor, Jr. 242/163
2,767,938 10/1956 Taylor, Jr. 242/163

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ABSTRACT

A package of material wound in a universal wind with crossovers in successive layers progressing in opposite directions around the axis of the package through angles of less than 360° so as to leave a radial opening into the central core through which the free end of the material may be drawn out for payout has the coils in alternate layers spaced apart two to three times as far as those in the adjacent layers.

5 Claims, 1 Drawing Figure
3,666,200

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BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to the winding of flexible material, and more especially to a package of flexible material and to a method of producing this package.

2. The Prior Art

In the Taylor U.S. Pat. Nos. 2,634,922 and 2,634,923, there are described packages of flexible material in the form of layers of successive coils, each coil forming at least one figure 8, in which the crossovers of successive coils progress angularly around the axis of the package. Such coils are provided with a radial opening into an interstice space through which the inner free end of the material is drawn out, thus equalizing twist and preventing snarling and kinking of the material.

In those packages, the progression of crossovers continues around the axis of the package in the same direction from layer to layer, although this succession may be interrupted to form the opening.

In Taylor U.S. Pat. No. 2,767,938, there is described a package in which there is a set of crossovers progressing angularly around the package through an angle less than 360°, then a second progressing in the opposite direction through a similar angle, and so on. This arrangement both forms the opening through the body of the package and also prevents interference with payout since the length of material between successive crossovers near the opening need not cross the opening and will not be pulled against the tube.

The machine on which the package is wound is a modification of that disclosed in U.S. Pat. No. 2,634,918. That machine causes rotation of a spindle and oscillation of a guide out of phase so as to produce the angular progression of the crossovers, the direction of progression depending on whether the number of oscillations of the guide for the flexible material is slightly less or slightly greater than an integral multiple of one-half the number of rotations of the spindle, these being called "plus" and "minus" winds respectively. According to U.S. Pat. No. 2,767,938, the machine is so constructed as to wind with a plus wind during a given number of rotations of the spindle, less than enough to form a complete layer (that is, less than enough to produce a progression of crossovers through an angle of 360°), and then with a minus wind for a similar period. This will produce the type of package referred to above.

SUMMARY OF THE DISCLOSURE

The package described in U.S. Pat. No. 2,767,938 has certain disadvantages which it is the object of the present invention to overcome as far as possible.

This principle, unless modified, leaves a wind which has either a very open advance, or gain, to achieve a relatively small hole, or a very large hole with a close advance, or gain. In either case, the effect is detrimental to winding density and efficiency of payout through the hole. This efficiency of payout is adversely affected by the size of the extending "valleys" which have a tendency to protrude away from the inside wall of the wind during the payout process. The larger and more uniform the "valley," the greater the tendency to protrude.

The present invention modifies the plus-minus gain principle achieved as above by arranging the advance or gain throughout the wind so that on plus layers (or minus layers, as the case may be) there is a relatively open advance, or gain, and on minus (or plus) layers there is a relatively close advance, or gain. In this manner, the width of the hole that would come with a close gain is modified by the layers having an open gain, and the size of the hole and the extending "valleys" related thereto are reduced. The effect of this is not only to make the wind more compact and even, but also to prevent the tendency of wide "valleys" to force material loose on the inside wall during the payout process.

Another advantage of the invention is that the laying of the material in a continuous parallel fashion around a spindle is avoided, thus making it difficult for a pinching effect on any particular turn or a friction effect on the adjacent turn to take place.

According to the invention, then, an improved package is obtained through which the hole can be made quite small, and in which the gutters are not as noticeable and less likely to interfere with payout. The present invention proceeds in the same manner as described in U.S. Pat. No. 2,767,938, except that spacing between successive coils, or the advance, is substantially greater in one layer where the crossovers are progressing in one direction than in the adjacent layers where they are progressing in the other direction. The relationship of the spacing of the coils may be such that those in one layer are one-half to two and one-half times as far apart as those in adjacent layers, preferably about twice as far apart, but can be even more.

The package so produced also has a much less pronounced spiral rib formed on a flat end than the package produced by the plus-minus winding discussed above.

BRIEF DESCRIPTION OF THE DRAWING

The drawing shows the winding pattern for two successive layers of a package embodying the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The drawing shows a winding diagram of a package embodying the invention, representing two successive layers, the first shows in solid lines being wound with a negative advance and the second shown in broken lines being wound with a positive advance. The wind is a "one" wind, and for the positive and negative advances of a normal "one" wind the guide makes 29 and 31 complete oscillations, respectively, for each 30 revolutions of the spindle.

If the spindle and guide move in unison, with the speed of one being a multiple of half the speed of the other, in theory the successive coils would lie directly over each other. Of course this is impossible, and in the normal universal wind there is a sufficient deviation from this exact multiple ratio to cause the successive coils in a layer to lie next to one another, while the crossovers progress around the package.

In the plus-minus wind described in the Taylor U.S. Pat. No. 2,634,918, the deviation from an exact multiple ratio is the same in either direction, and, as a result, the spacing of the crossovers is the same in the plus and in the minus layers. Likewise, the spacing between the center lines of the successive coils of the layers is the same in all the layers. In the present case, this spacing is called the advance.

The distinguishing feature of the present invention over the disclosure of the Taylor U.S. Pat. No. 2,634,918 is that the deviation from an exact multiple ratio, and therefore the advance, is substantially different in the plus layers from that in the minus layers.

Referring now to the drawing, it will be understood that points at the top and bottom of the chart at the same distance from the sides are the same point and therefore bear the same reference characters.

With the machine set for a negative advance, with the spindle rotating in the direction shown by the arrow, and with the guide moving towards the right, the first layer starts at a, runs to a1, reverses to a2, to a3 and so on to a6. The crossovers are shown at c1, c2, c3 and so forth, that is, progressing around the package in the direction of rotation of the spindle indicated by the arrow.

Upon reaching the point a6, the change-speed mechanism of the machine on which the package is wound is changed, and the material runs from point b6 to b1, reverses to b2 and continues on, the crossovers such as c1, and c2 then progressing in the opposite direction, and the spaces between the crossovers being approximately twice that between crossovers c1, c2, and c3. As will be apparent, there are still gutters formed as in the prior patent although these are not as
prominent. Moreover, these gutters at h leave an opening through which the free interior end of the material may be drawn out of the package.

It will further be noted that in the example shown the distance 1' measured lengthwise of the package axis between successive coils of the second layer is approximately twice the distance 1 between successive coils of the first layer.

In the example shown in the drawing, there are approximately 22 oscillations of the guide for each 21 revolutions of the spindle in the solid line layer, and approximately 11 in the broken layer. While this condition may exist in the practise of the invention, the fact is that it is shown for purposes of clarification, since in practise the winds of both layers would be much closer than shown. The fact is that, if we start from a condition which will lay successive coils of a layer side by side, as for instance, with 179 reciprocations of the guide to each 360 revolutions of the spindle in either direction as the number necessary to lay successive coils side by side in each layer on the plus side, and correspondingly 181 reciprocations on the minus side, and if we maintain one of these figures unchanged (179) while changing the other by a relatively small amount, say to 186, we will have a spacing between the successive coils in the second layer which will be noticeably greater than in the first layer, while the package will be relatively compact and the valleys, with their harmful effects, will be substantially reduced.

The invention is applicable to both resilient or relatively rigid flexible materials, such as wire, cable and tubing, as well as to textiles such as yarn, thread, cord or rope.

We claim:

1. A package of flexible material comprising a series of layers of coils, each coil forming at least one figure eight, each such coil having a crossover, said coils providing a core space through the package, one layer of successive coils having its crossovers successively angularly spaced around the axis of the core space in one direction and the next layer having the crossovers successively angularly spaced around the axis of the core space in the other direction, the total angular extent of the crossovers of any layer of coils being less than 360°, and the crossovers being arranged to leave a transverse opening through the coils into the core space, whereby the inner free end of the material can be led out through such opening, the coils in one layer being spaced apart longitudinally of the package by a substantially greater distance than the coils in the adjacent layers.

2. A package as claimed in claim 1, in which the coils of the first layer are spaced apart by a distance substantially one and a half to two and a half times the distance between the coils of the adjacent layers.

3. In a method of winding flexible material which comprises producing such relative movement between a spindle and a source of flexible material as to cause the material to form around the spindle in coils each forming at least one figure eight with a deviation from an integral ratio between the movements of the spindle and the source whereby crossovers of successive coils progress angularly around the axis of the spindle, the step of varying the relative movement after periods less than those in which the crossovers progress through an angle of 360°, thereby causing the crossovers during each period to progress in the opposite direction from those in the preceding period; the step of making the deviation from an integral ratio between the relative movement of the source and spindle different during each period from that in adjacent periods, whereby the coils laid during one period are spaced apart longitudinally of the spindle by a distance substantially greater than the distance between the coils laid in the adjacent periods.

4. A method of winding a package of flexible material which comprises producing such relative movements between a spindle and a source of flexible material as to cause the material from said source to shift back and forth along the spindle and to lay around the spindle for one layer of successive coils in such a ratio that during a given number of laying movements along the spindle the spindle is rotated a number of times which is less than and different from an integral multiple of half the number of laying movements by a given amount, and for the next layer of successive coils in such ratio that during a given number of laying movements along the spindle the spindle is rotated a number of times which is more than an integral multiple of half the number of laying movements, by an amount different from such given amount, whereby to lay up successive helical coils on the spindle each crossing the next preceding coil and whereby the crossing points of one layer of coils progress angularly around the spindle in one direction and those of the other layer in the other direction, the angular extent of the crossing points of the coils of any set being less than 360°, and whereby the distance between the coils longitudinally of the spindle in any layer differs substantially from such distance in adjacent layers.

5. A method as claimed in claim 4, which comprises rotating the spindle about a fixed axis.