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FLEXIBLE WINDING SPOOL

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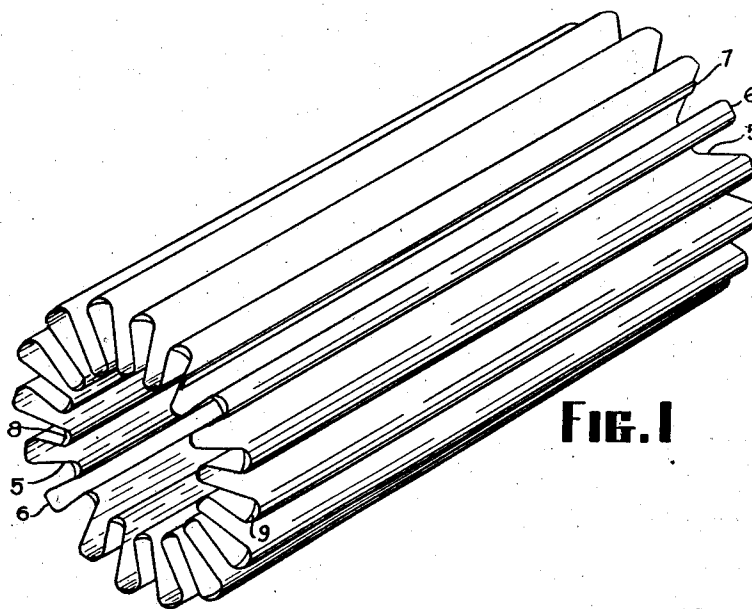


FIG. 1

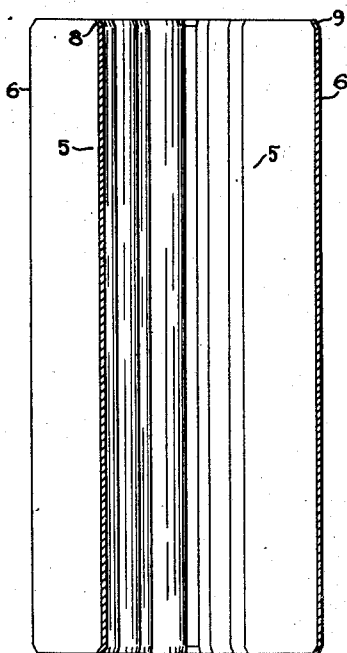


FIG. 3

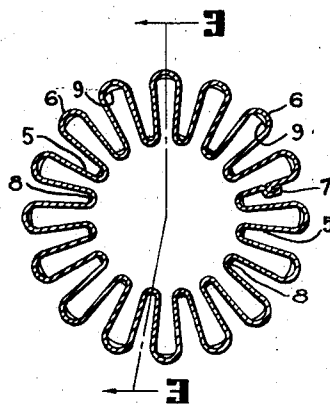


FIG. 2

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FLEXIBLE WINDING SPOOL

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8 Claims. (Cl. 242—121)

This invention relates to novel means for supporting thread packages; more particularly, it relates to a new type of flexible winding spool adapted for employment in the production, handling and treating of thread-like articles.

Although the flexible winding spool of the present invention is adapted for use in the manufacture, handling, or storage of any type of thread, it is especially applicable to use the production of multiple filament viscose artificial silk thread. In the course of its manufacture by the so-called spool spinning system, such thread is customarily wound upon a rigid, perforate spool upon which it is successively subjected to a series of wet treatments, after which it is dried. During the liquid-treating and drying operations, a rigid spool, even if perforated, tends to impede the thorough application of the processing fluids to the thread. It is also responsible for the introduction of a variety of discrepancies into the physical and physico-chemical characteristics of the thread.

Such discrepancies are for the most part traceable to the drying operation, in which, by reason of the use of a rigid spool, the thread shrinks unevenly. In a typical case, the layers of the thread package lying nearest the spool are entirely prevented from shrinking. The intermediate layers are caused to shrink in different degrees since to a certain extent they are cushioned by other layers as they are dried. The outermost layers, which dry first, are for the most part not free to shrink when they are dried. As might be expected, the resulting irregularities manifest themselves in various ways and render the product much less useful for certain purposes, such, for example, as in the weaving of cloth.

Obviously, if such processes could be adapted to produce a uniformly shrunk thread without the necessity of repackaging, their utility would be greatly increased; accordingly, the desideratum is a winding spool which is sufficiently rigid to retain its shape, yet flexible enough not to interfere unduly with the shrinkage of the thread.

Many types of flexible winding spools have been developed with a view to eliminating the rigid surface which, in actual practice, operates to prevent free shrinkage. Spools have been constructed of narrow sheet metal strips, of wire fabricated to provide a series of axially extending loops, in the form of so-called gapped cylinders made of springy metal and the like, but operations with such spools have not proven successful. Among other things, such flexible spools have been found to sag rather than to flex. They are prone to be damaged, even with ordinary han-

dling. In a short time, they become unusable as a result of fatigue. For these reasons, they have not displaced the conventional rigid spool, this in spite of the latter's numerous disadvantages.

The present application contemplates a novel type of spool which is compressible radially when subjected to uniform pressure, yet sufficiently rigid to withstand rough treatment. In the accompanying drawing, Figure 1 is an isometric projection of a flexible corrugated spool which embodies the novel features of the present invention. Figure 2 represents a transverse section of the spool shown in Figure 1 obtained by passing a plane perpendicular to the axis of said spool at a point intermediate the ends thereof. Figure 3 is a vertical sectional elevation of the spool as seen from line 3—3 of Figure 2.

The spool comprising the preferred embodiment of the invention is made from a comparatively thin gauge sheet metal in which have been formed a plurality of substantially parallel grooves 5 and ridges 6. The number and depth of corrugations to be employed will depend upon the diameter of the finished spool, as well as upon the intended use thereof; for example, if a highly flexible spool is desired, it is advantageous to form therein a smaller number of grooves and ridges, but of greater depth. On the other hand, if too many or too deep grooves are present, especially where the normal diameter of the finished spool is small, interference between the grooves may unduly limit the radial compressibility of the spool.

At both ends of each groove 5 and ridge 6 are provided stiffening means which, for the sake of convenience, are shown as taking the form of bevels 8 and 9. They serve, among other things, to strengthen the corrugations so that the spool as a whole readily resists lateral warping during use. Bevels 8 and 9 further operate to facilitate the insertion of the spool in the processing apparatus. All sharp edges or burrs which tend to damage or even break the thread as it is unwound from the spool are thus removed. In addition, the possibility of injury to the operator resulting from contact with the edges of such spools is eliminated.

In forming the sheet metal to give rise to a generally tubular member, the edges of the material extending parallel to the direction of said grooves 5 and ridges 6 are joined in any convenient manner, as by a soldered, folded or welded butt or lapped connection. A folded joint, such, for example, as that indicated in Figures 1 and 2 by reference character 7, is preferable inasmuch as it does not unduly affect the static and dy-

namic balance of the spool. The location at any one point upon the periphery of the spool of excess metal which results from the employment of certain types of joints produces harmful effects, especially when the filled spool is rotated at high speed, as in the operation of unwinding the thread therefrom.

Most materials after having been shaped mechanically assume a slightly different shape when subjected to ordinary use for a short period of time. After this change which the material undergoes, the article as a whole assumes a constant shape; that is, it takes a permanent "set." By virtue of this fact, certain allowances must necessarily be made in the course of manufacture of the spools in order that the resultant shape will conform to the requirements defined by its use. Such allowances are particularly necessary in the fabrication of corrugated spools.

For instance, it has been discovered that if the spool is mechanically formed out of certain materials exactly to the intended final dimension, it will, after one or two usings, reduce in size to such an extent that it cannot thereafter be used. For the reason that wrought aluminum alloys possess virtually all of the more desirable characteristics, such as workability, lightness, and flexibility without early fatigue, besides being somewhat more resistant to corrosion than most other materials, they are especially adapted to use in the present invention. However, deformation of this kind is particularly marked in wrought aluminum alloys, which must therefore be given especial attention.

In practice, it is desirable to employ a spool which has a constant $4\frac{1}{2}$ -inch outside diameter. In a typical case, therefore, the spool is formed mechanically to an outside diameter of 5 inches from a wrought aluminum alloy sheet material of .010-inch thickness (Brown & Sharp gauge) specified according to the handbook of the Aluminum Company of America as alloy 52S- $\frac{3}{4}$ H. This material has a composition of 2.5% magnesium, 0.25% chromium and 97.25% aluminum and normal impurities, and a Brinell hardness factor of 74 (500 kg., 10 mm. ball).

Metal rings having an inside diameter of $3\frac{3}{8}$ inches are applied to either end of the 5-inch spool so that it remains compressed to an outside diameter of $3\frac{3}{8}$ inches. The spool is then placed in a heating chamber and subjected for a period of 45 hours to a constant temperature in excess of 130° F., preferably approximately 150° F. After cooling, the rings are removed, whereupon the spool will be found to have assumed a permanent set with a $4\frac{1}{2}$ -inch outside diameter. After use under circumstances involving an indefinite number of flexings, the spool continues to return to normal at the assumed permanent set.

Other wrought aluminum alloys have been found to display properties similar to those of the alloy referred to in the foregoing example, varying principally in the degree of shrinkage which results from the setting operation. Such alloys are, for example, those designated in the handbook of the Aluminum Company of America as 51S-T, 53S-T and 61S-T, all of which have approximately the same composition as 52S- $\frac{3}{4}$ H. It will be understood that with such alloys the temperature employed in the setting operation may be greater or less than that above indicated, but is advantageously as high as practicable in order that the period of time required to size the spool may be reduced as much as possible.

A wide variety of other materials may be used in the fabrication of the spool of the present invention; for example, stainless steel, spring steel, sheet iron, sheet aluminum, etc. Obviously, the material employed must possess a certain degree of springiness and yet should maintain its shape under all sorts of conditions. It must resist not only fatigue but also the corrosive action of reagents employed in the processing of thread. The latter factor is of very great importance in the manufacture of artificial silk thread according to a wet process, for instance, the viscose process.

Materials which are readily attacked by corrosive liquids when employed in spin spools may, however, be treated to prevent decomposition and weakening of the spool structure. Paints and various types of plastic coatings such as hard rubber, Bakelite, Heresite and the like which possess a certain amount of elasticity and resistance to chipping or cracking have been found to retard the corrosive action of the coagulating bath upon the spools. Accordingly, such a coating, while often not strictly necessary, may usually be employed to advantage.

Modifications in the method or the character of the article may readily be made without departing in any way from the spirit of the present invention. Under certain circumstances, it may be found to be advantageous to combine the operation of setting the spool with that of heat-treating or tempering the material. Moreover, the spool may be formed with flat edges extending longitudinally of the ridges in place of curved surfaces for the purpose of providing greater surface contact for the thread turns. Many other substances than those already indicated such, for example, as Micarta, Bakelite and other synthetic plastics may be employed in the fabrication of the spool.

The method of fabricating the spool of the present invention is not being claimed in this application but represents the subject matter of a divisional application Serial No. 428,730, filed January 29, 1942, by Louis S. Fryer and Wayne J. Jokilehto.

It is intended that the patent shall cover, by suitable expression in the appended claims, whatever features of patentable novelty reside in the invention.

What is claimed is:

1. A radially compressible spin spool of generally tubular form comprising a plurality of axially extending alternately disposed grooves and ridges, each of said ridges being provided at the extremities thereof with a beveled edge which extends from a point in the crown of the ridge proximate to the end thereof to the corresponding end of the spool.

2. A radially compressible spin spool of generally tubular form comprising a plurality of axially extending alternately disposed grooves and ridges the extremities of each of which are characterized by beveled edges extending from points in the troughs of the grooves and the crowns of the ridges proximate to the ends thereof to the corresponding ends of the spool.

3. A radially compressible spin spool of generally tubular form comprising a plurality of axially extending corrugations the extremities of each of which are characterized by means for stiffening said corrugations against lateral warping and for simultaneously facilitating the withdrawal of thread from the spool.

4. A flexible winding spool of generally tubular

form the thread-bearing periphery of which comprises a plurality of axially extending ridges the extremities of which are characterized by means for resisting lateral warping of said ridges and, in addition, for facilitating the withdrawal of thread from the spool and, alternately disposed with respect to said ridges, an equal number of axially extending grooves.

5. A flexible winding spool of generally tubular form characterized by its ability to be radially compressed and to resume its normal shape in spite of innumerable flexings comprising a plurality of axially extending grooves and ridges each of said grooves being provided adjacent the ends thereof with individual means for strengthening the spool as a whole against lateral warping.

6. A flexible winding spool of generally tubular

form characterized by its ability to be radially compressed and to resume its normal shape in spite of innumerable flexings comprising a plurality of axially extending grooves and ridges which are provided with individual means disposed adjacent the ends thereof for strengthening the spool as a whole against lateral warping.

7. A flexible winding spool of generally tubular form according to claim 5 in which the individual strengthening means are formed integrally with said grooves.

8. A flexible winding spool of generally tubular form according to claim 6 in which the individual strengthening means are formed integrally with said grooves and ridges.

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