June 3, 1952 H. N. HUSE 2,599,390

PREPARATION OF EXTENSIBLE THREAD FOR WINDING ABOUT OBJECTS

Filed Nov. 3, 1948 2 SHEETS—SHEET 1

Fig. 1

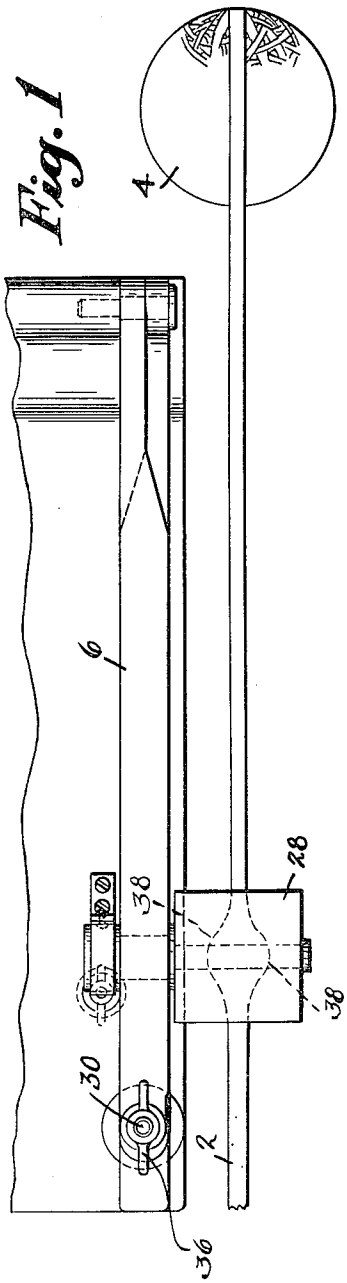
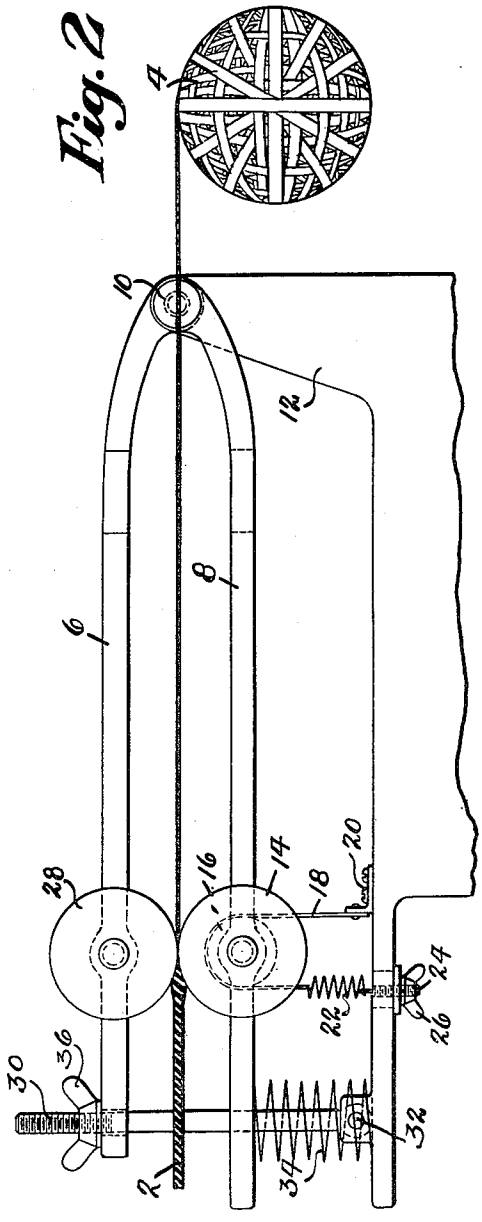


Fig. 2



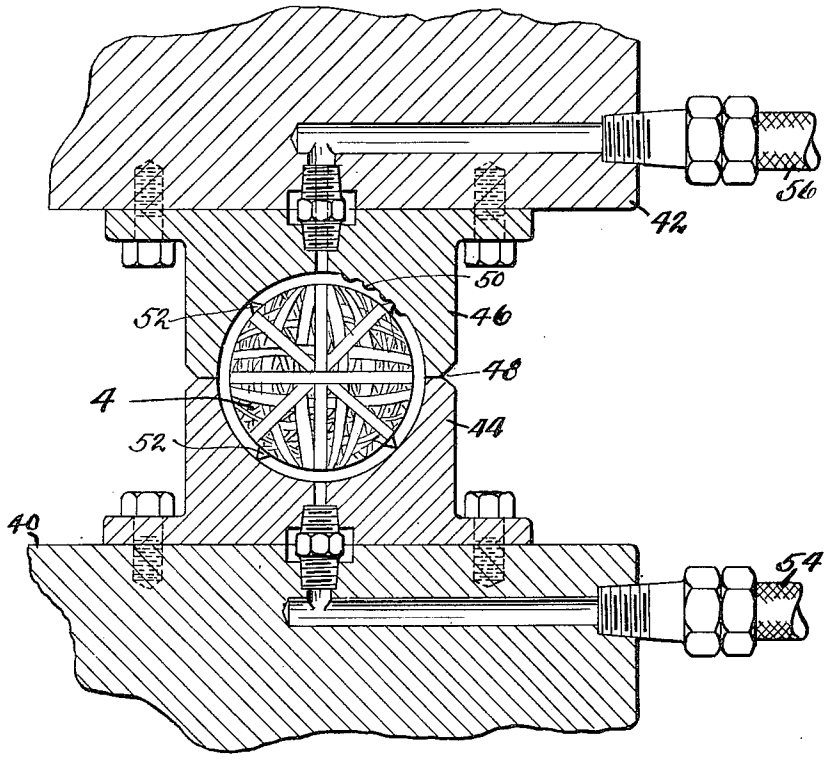
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PREPARATION OF EXTENSIBLE THREAD
FOR WINDING ABOUT OBJECTS

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Fig. 3



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PREPARATION OF EXTENSIBLE THREAD FOR WINDING ABOUT OBJECTS

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2 Claims. (Cl. 242—151)

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My invention relates generally to a method of preparing extensible thread for winding about an object, and to a method for applying a plastic cover about the wound object.

While my new method is usable in many connections as will be apparent from the description to follow, for purposes of illustration and clarity of description, but not by way of limitation, my invention will be discussed in connection with the making of balls, such as golf balls for example.

In the making of golf balls, the conventional practice is to wind an elastic thread under longitudinal tension about a core of some sort until the ball is built up to the desired diameter; the ball thus prepared is then covered with a moulded cover.

These balls are wound in automatic machines which are operated at high speed. The thread, which may be rubber, either natural or synthetic, nylon, or other suitable material, all hereinafter referred to as extensible thread, is stretched longitudinally substantially to its elastic limit while being wound. There are several reasons for this —the greater the tension the harder the ball, which, so far as golf balls are concerned, is an advantage—then again, it is very desirable to apply the thread in as thin and as fully tensioned condition as possible, and inasmuch as there is a limit to the thinness to which the thread can be manufactured commercially, by applying the thread under relatively high longitudinal tension the thread can be thinned out considerably.

While the longitudinal tension idea is universally used it has certain objections and limitations, one important objection being thread breakage during winding when the limit of such longitudinal tension is exceeded. This necessitates stoppage of the machine, which on high speed automatic machines is very objectionable. Breakage may necessitate discarding of the ball entirely.

The present invention provides a method whereby it is possible to produce thread tension laterally in addition to the tension produced by stretching the thread longitudinally in conventional fashion.

As applied to the windings of a golf ball this additional lateral tension provides corresponding value in accordance with the basic principle that the flight of a driven ball increases as the total tension of its thread windings are increased to provide a harder core winding.

Also, the present invention provides a method whereby it is possible to produce windings in

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which the thread is thinner and with more total stretch than can now be produced commercially and without necessitating applying any more tension longitudinally to the thread than is employed in present day commercial practice.

Generally speaking, the present invention provides for compressing the thread while under longitudinal tension to tension the thread laterally and effect a widening of the thread. This reduces the thickness of the thread as compared with the thickness resulting from merely placing the thread under longitudinal tension. I find that so long as the thread remains under longitudinal tension the relatively wide cross section mentioned produced by compressing the thread effects a lateral tension which is permanent. In other words, the material of the thread appears to take a permanent structural "set" during such tension and inasmuch as the thread is wound upon the ball under such tension, this "set" is retained with increased total tension of the wound ball.

In addition to the foregoing, the present invention provides for applying a cover to the ball or other object being wound, by injection moulding, my invention providing for pretreating the wound article to which a cover is to be applied to prevent the heat of the hot fluid plastic cover stock from deleteriously effecting the windings. The pretreatment of the wound article consists in cooling the thread wound core to approximately the temperature of Dry Ice (CO_2) or approximately $-90°$ F. before it is placed in the mold. Not only does this prevent heating of the windings to a detrimental degree during the moulding operation, but it accelerates the cooling of the cover stock and centralizes the position of the core due to evenly distributed minute explosive pressures caused by the heat expansion differential between the core and the cover stock.

In the accompanying drawings I have illustrated an apparatus suitable for the practice of my invention so far as compressing the winding thread is concerned to tension the thread laterally while it is being stretched and held in longitudinal tension.

Fig. 1 is a plan view;

Fig. 2 is an elevational view, and

Fig. 3 is a fragmentary sectional view of equipment for applying a cover to the wound object.

As above pointed out, the invention will be described as preparing and serving tensioned thread in connection with the winding of golf balls. This is a well known industry and for the purposes of this application and for clarity of description I

have deemed it unnecessary to show a winding machine. It is to be understood that while this invention is not an improvement on any existing winding machine, it prepares the thread for an improved ball construction as described when such prepared thread is wound into a ball on any suitable winding machine as for example, the machine of my United States Patent 1,959,760 dated May 22, 1934, or the machine of my United States Patent 2,076,565 of April 13, 1937.

Referring to the drawings in detail;

2 designates the winding thread which is drawn from a suitable supply roll (not shown) and passed through thread-compressing and lateral tensioning apparatus and wound under lateral and longitudinal tension upon a core illustrated at 4.

The thread compressing and lateral tensioning apparatus comprises a pair of arms 6 and 8 which are curved or bent toward each other at their forward end so as to be pivoted together at 10 to a fixed mount 12.

The arm 8 adjacent its rear end is provided with a roller 14, which is one of the thread compressing and lateral tensioning rollers, this roller being equipped with a tension or brake drum 16. Passing over the tension or brake drum 16 is a friction band 18. One end of this friction band is anchored to the fixed support 12 as illustrated at 20, while the other end of the band is attached to a spring 22, which in turn is attached to a bolt 24 passing through the fixed support 12 and carrying a wing nut 26. By manipulating the nut 26 the tension of the band 18 and hence the braking effect on the drum 16 and roller 14 can be readily adjusted. If desired, the elements 18, 20, 22, 24 and 26 may be mounted on an arm affixed to or integral with arm 8.

The upper arm 6 of the thread compressing and lateral tensioning apparatus is equipped with a thread compressing and lateral tensioning roller 28, the pivoted arm 6 thus providing a floating mount for the roller.

The rollers 14 and 28 are both mounted in antifriction bearings and are preferably of metal. They may be rubber covered if desired.

A rod 30 is pivoted at 32 to the fixed support 12 and passes up through the arms 6 and 8 to the rear of the rollers 14 and 28. Between the fixed support 12 and the lower arm 8 the rod 30 carries a coil spring 34. The upper end of the rod 30 carries a wing nut 36.

At the start of the winding operation some of the thread 2 is drawn from the supply spool and several turns made by hand about the ball core 4, in much the same fashion as is done commercially when using the machines of my two patents above referred to. The core is then placed in the winding machine, which, for example, may be a machine such as disclosed in my prior Patent 1,959,760 above referred to. In passing the thread to the ball core it is led between the rollers 14 and 28. With the wing nuts 26 and 36 properly adjusted so as to place the desired drag on the roller 14 and the desired compression upon the thread, the winding machine may be started up continuously to rotate the ball core as explained in my prior patents above referred to and as understood by those skilled in this art. It will be appreciated that, as the ball core is rotated by the winding machine, the thread 2 will be tensioned longitudinally.

The rollers 14 and 28 are not driven rollers, but are simply caused to rotate by the tension produced in the thread by rotation of the ball in the winding machine. By proper adjustment of the friction band 18 and by proper adjustment of the compression roller 28 through the setting of the wing nut 36, the thread 2 is compressed and tensioned laterally as it passes between the rollers 14 and 28, as illustrated at 38 in Fig. 1 and from the rollers to the ball is under longitudinal tension. It will be understood that from the supply roll to the rollers 14 and 28 the thread is not under tension.

I have found from tests which I have conducted that if the thread be compressed and laterally tensioned, as above described, and the thread be maintained under longitudinal tension, the material of the thread apparently takes a permanent "set" so far as its width is concerned with the result that inasmuch as the thread is wound upon the core under tension, an added lateral tension is maintained and the thread as it lies about the core will be wider and thinner than would be the case if the same thread were simply wound upon the core under longitudinal tension in the usual fashion.

It will be apparent, therefore, that in the practice of my invention I compress and tension the thread laterally while tensioning the thread longitudinally thereby producing a thinner and denser thread than is possible by the existing universal practice of merely placing the thread under longitudinal tension, assuming in both cases that the same amount of longitudinal tension is applied to the thread.

This is of importance in the manufacture of golf balls, for example, it being a well known fact, as above noted, that the hardness of the tensioned ball windings determines the values of the ball so far as flight is concerned.

After the winding of the ball has been completed, as above outlined, I may apply a cover thereto in the usual way; however, I prefer to apply the cover by the well-known injection molding process employing any suitable hot plastic fluid, nylon, for example, for the cover stock. When employing the injection mold method I prefer to chill the ball before placing it in the mold. This is to prevent injury to the windings due to the molding heats. The wound but coverless ball may be cooled to any extent desired but preferably to about —90° F. Not only will this prevent injury to the windings by overheating the same but it will expedite the solidifying of the fluid plastic cover stock.

Apparatus suitable for the practice of this feature of my invention has been illustrated more or less diagrammatically in Fig. 3. Referring to this figure of the drawings, 40 and 42 designate the stationary platen and the movable platen, respectively, of a hydraulic press. Secured to the upper face of the stationary platen 40 is one half, 44, of the ball mold, while the other half, 46, of a ball mold is secured to the lower face of the movable platen 42. The mold opens along the flash line 48.

The mold halves are provided with suitable markings 50, which are to be transferred to the surface of the covered ball.

Prior to applying the cover to the ball core, but after the core has been wound as above explained, I mold cover stock pins 52 to the surface of the core windings. These pins are preferably conical, with the base at the windings, and they are evenly distributed on the winding surface. These are centering pins for supporting or maintaining the core centrally of the mold cavity.

Prior to placing the core in the mold, I cool

the core to a very low temperature, even as low as −90° F. This may be done in any convenient way, as by the use of Dry Ice or by using a deep-freezing unit.

The purpose of thus cooling the core is, as above explained, to prevent injury to the core windings due to molding heats.

After the chilled core has been placed in the mold, the plastic cover stock, nylon, for example, or other suitable plastic in a heated condition so that it is semi-fluid, is injected into the two mold halves through flexible connections **54** and **56**. These connections, it will be understood, are connected to a suitable source of hot semi-fluid plastic cover stock under pressure.

The mold is kept closed until the cover stock has cooled and solidified.

It is to be understood that changes may be made in the details of construction and arrangement of parts hereinabove described without departing from the spirit and scope of the invention.

What I claim is:

1. Apparatus for treating extensible thread in its passage from a supply source to an object about which it is wound by rotation of the object, said apparatus comprising, in combination, a pair of arms pivoted at one end to a fixed support and extending away from said pivoted connection in the same general direction in spaced relation to each other; a roller mounted on each arm, said rollers being positioned abreast of each other and rotatable about parallel axes which are transverse of the arms; means for adjusting one roller relatively to the other, to adjust the gap between their peripheries to less than the thickness of the thread being treated, whereby, as the thread being treated passes between the rollers in its passage to the rotating object about which it is being wound, it will be stretched laterally; and a brake for one of said rollers so set that the thread must be stretched longitudinally to draw it from between the rollers to the object being wound.

2. Apparatus for treating extensible thread in its passage from a supply source to an object about which it is wound by rotation of the object, said apparatus comprising, in combination, a pair of arms pivoted at one end to a fixed support and extending away from said pivoted connection in the same general direction in spaced relation to each other; a roller mounted on each arm, said rollers being positioned abreast of each other and rotatable about parallel axes which are transverse of the arms; means for adjusting one roller relatively to the other, to adjust the gap between their peripheries to less than the thickness of the thread being treated, whereby, as the thread being treated passes between the rollers in its passage to the rotating object about which it is being wound, it will be stretched laterally; and a brake for one of said rollers so set that the thread must be stretched longitudinally to substantially its elastic limit.

HIRAM N. HUSE.

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