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YARN COLLECTING APPARATUS

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7 Claims. (Cl. 242—18)

The invention is concerned with apparatus for collecting yarn. We are primarily interested in the collection and formation into packages of continuous filament yarns or synetheic polymers but the term "yarn" as used hereafter includes both continuous filament and staple fibre yarns, the fibres or filaments used in which are of natural or man-made origin.

It is usual to collect synthetic polymer yarns after spinning on spools or bobbins which are rotated. Modern developments, where more yarn take-up spools are used per spinning machine and where faster spinning speeds are used, have made the old process of having a plurality of individually driven spools clumsy and uneconomical. It has been desirable for some time that an apparatus could be devised whereby at least two spools could be driven together in a single assembly and be capable of withstanding the forces applied with high speed spinning techniques and yet in which the spools should be easily removable from the apparatus. We have invented such an apparatus. Previous attempts to make such an apparatus have been relatively clumsy and unpracticable and have relied on such things as internal expanding devices to grip the spools with consequent risks of the assembly being unbalanced during rotation.

According to this invention an apparatus for the collection of yarns comprises a frame, an axle secured to and projecting from the frame, a cylinder rotatably mounted coaxially on the projecting axle, a flange on the cylinder projecting radially outwards from the end of the cylinder adjacent to the frame, the cylinder being adapted to accommodate at least two like spools slidably mountable thereon, means for locking the spools when mounted on the cylinder whereby movement of the spools in the axial direction is prevented, the outer cylindrical surfaces of the spools being unimpeded for yarn collection, and means whereby the cylinder and spools when mounted thereon may be rotated about the axle. Means may be provided on the spools and on the cylinder for preventing relative rotation between any of them when in their operative relationship. Preferably the cylinder is of substantially the same length as the axle.

There are two basic methods of rotating spools used for forming yarns into packages; either the spools may be driven by frictional contact between the spool, or filaments thereon as they are wound, and a rotated roller or by driving the spindle on which the spools are mounted. We prefer to use the first method described as this may provide a constant yarn speed and the packages produced are, in general, superior to those produced by the second method described. Thus, in the apparatus of this invention, the frame is preferably pivoted about an axis parallel to the axis of the axle so that the whole axle, cylinder and spools assembly may be moved towards or away from a cylindrical roller which is positioned adjacent to the assembly and which also has its axis parallel to that of the assembly. The roller has provision for being rotated so that it may drive the winding assembly by frictional contact therewith.

The spools used with the apparatus may be of the plain cylinder type or, preferably, of a more complex, but stronger, shape. For example, a particularly suitable spool has an inner cylindrical sleeve, which is a sliding

fit over the cylinder described hereinbefore, and an outer cylindrical portion on which the yarn is collected. The two cylindrical parts are connected together by means of an annular rib extending from approximately midway along their lengths. It is important that the spools should be a close sliding fit over the cylinder to avoid any undue movement which could cause vibration at high speed. The means for locating the spools so that there is no relative rotational movement between adjacent spools and between the spool adjacent to the cylinder flange may, preferably, consist of castellations on the outer rims of the spools. The flange will, in this case, have projections or slots in the appropriate places to mate with the castellated outer rim of the adjacent end spool. The spools may, with advantage, be designed so that they will slide onto the cylinder either way around. This means that the castellations must be the same on both outer rims of each spool. Another method for preventing the relative rotational movement consists in making the outer surface of the cylinder non-circular in cross-section, for example, by making it a hexagonal shape or by machining splines on the cylinder. An advantage in the use of castellations on the rims of the spools is that they facilitate the putting up of the yarn onto the spools when starting to wind yarn packages.

Because of the high speeds encountered in modern spinning machines the spools need to be strong and manufactured to close limits of concentricity. These properties may be achieved by the use of high pressure plastic moulding techniques. We have found that a particularly useful material from which to mould spools is "Durestos," an asbestos-reinforced phenolic resin.

The number of spools that may be accommodated on a cylinder is dependent on the length of each spool and on the length of the cylinder. Normally a cylinder would not to be more than about 20 inches long, as at greater lengths, when operating at high speeds, the problem of keeping vibration down within tolerable limits becomes very difficult. We prefer to have a cylinder of about 16 inches in length operating with four spools, each approximately 4 inches long.

The means for axially clamping the spools on the cylinder will normally comprise a threaded device such as a wing nut. However, we prefer to use a captive threaded device so that the machine operator has the least possible trouble during the operation of doffing the packages. This may conveniently be done by using a form of expanding nut which, when unscrewed to the limit of its movement, allows the spools to be slid onto or off the cylinder but which clamps the spools up against the cylinder flange when screwed up tight. A braking-device may be fitted onto the frame in such a way as to decelerate the rotating cylinder when the packages of yarn have been fully wound and the rotational force discontinued, if desired.

A preferred embodiment of the invention is illustrated by means of the accompanying drawings in which:

FIGURE 1 is a sectional side elevation of an assembled apparatus carrying four spools,

FIGURE 2 is a sectional side elevation, on a reduced scale, of the lower part of the frame used in FIGURE 1 and a spindle and counterbalance used for constant yarn speed winding,

FIGURE 3 is a sectional side elevation, on a reduced scale, of a spool as used in FIGURE 1,

FIGURE 4 is an end elevation of the spool illustrated in FIGURE 3, and

FIGURE 5 is an end elevation, on the scale of FIGURE 2, of the apparatus shown in FIGURES 1 and 2, when viewed in the direction of the arrows A in the figures, showing in addition a driving roller contacting the surface of the spools of FIGURE 1.

In FIGURES 1 and 5, a tapered axle **1** is fixedly attached to a frame **2** by means of a nut **3**, and a cylinder **4** is rotatably mounted on the axle **1** by means of bearings **5** and **6**. At the end of the cylinder adjacent to the frame there is a flange **7** integral with the cylinder itself, and at the opposite end of the cylinder there is a screw-threaded shank **8** with radial flange **9** attached to the cylinder by means of counter-sunk set-screws **10**. Around the shank there is a thick bevelled round washer **11** with an annular recess **11***a* in its outwardly directed, bevelled surface. Threaded onto the shank is an expanding captive nut which is shown in two positions; one in full line, numbered **12***a* shows the nut where it is screwed up to clamp spools on the cylinder against axial movement and the other in dotted line, numbered **12***b* shows the nut unscrewed to the limit of its movement allowed by a circlip **13**. With the nut in position **12***b*, spools may readily be removed from the cylinder.

Four spools **14** may be fitted on to the cylinder.

In FIGURES 2 and 5, the whole of the axle and cylinder assembly attached to the frame **2** is shown pivoted about a spindle **15** which is rotatably held by a second frame **16**. A counterweight **17** is attached to the first frame **2** in a position diametrically opposite to the axle and cylinder assembly.

In FIGURES 3 and 4, a spool is shown which consists essentially of three parts, an inner cylindrical sleeve **20**, an outer cylindrical portion **21** on which the yarn is wound and an annular rib **22** joining the two cylindrical parts. The outer cylindrical portion is castellated at both ends to give six projections **23**, alternating with six spaces, all of which are the same size. A bead **24** is provided around the inner sleeve to aid the removal of the spools by providing a convenient finger-grip and the outer edges of the internal wall of the sleeve are chamfered to facilitate fitting the spools on to the cylinder.

In operation the expanding captive nut is unscrewed to the limit of its movement to position **12***b* and, in the case illustrated, four spools are slid onto the cylinder. The nut is tightened to clamp the spools up against the end flange and the assembly is allowed by its weight to rest against a roller **25** (shown in FIGURE 5) rotating in the direction of the arrow B, thereby rotating the spools in the direction of arrow C. Yarn **26** being fed towards the assembly is thrown into the nip between the spools and the drum to start the formation of the packages. In FIGURE 5 the assembly is shown in full line in the position it adopts at the commencement of winding. As the yarn packages are formed the assembly moves away from the drum **25** until, at the termination of winding, the spools carry yarn packages **27**. The assembly is shown in chain-dotted line at its position towards the termination of winding. Normal traversing mechanisms (not shown) are used to form the packages onto the individual spools. After the packages have been completely formed, the clamping nut is unscrewed and the spools removed from the assembly.

What we claim is:

1. Apparatus for the production of yarn packages comprising a frame, an axle secured to and projecting from the frame, a cylinder rotatably mounted coaxially on the projecting axle, a flange on the cylinder projecting radially outwards from the end of the cylinder adjacent to the frame, at least two like spools mounted upon the cylinder, the spools being a sliding fit over the cylinder, an expanding nut on the end of the cylinder remote from the frame for locking the spools on the cylinder whereby movement of the spools in the axial direction is prevented, the outer cylindrical surface of the spools being unimpeded for yarn collection, complementary castellations on the spools and on the flange of the cylinder for preventing relative rotational movement between any of the spools and the cylinder, the frame being pivoted about an axis substantially parallel to the axis of rotation of the cylinder, whereby the axle, cylinder and spools assembly may be moved to contact a roller positioned adjacent to the assembly and which is drivable about its axis substantially parallel to the axis of rotation of the cylinder, whereby the spools mounted on the cylinder may be rotated about the axle.

2. Apparatus according to claim **1** wherein four spools are mounted on the cylinder.

3. Apparatus according to claim **1**, wherein each said spool comprises an inner cylindrical member, an outer cylindrical member and an annular rib extending from the inner cylindrical member to the outer cylindrical member and fixedly attached to both the inner and outer cylindrical members.

4. Apparatus according to claim **3** wherein the annular rib is fixedly attached to the inner and outer cylindrical members at points substantially midway along their lengths.

5. Apparatus according to claim **3** wherein the ends of the outer cylindrical member have complementary castellations for preventing relative rotational movement between the spool and a like spool in operative relationship thereto, with the castellations on one spool mating with the gaps between the castellations on the other spool.

6. Apparatus according to claim **3** wherein the inner and outer cylindrical members and the annular rib are integral.

7. Apparatus according to claim **1** wherein the expanding nut is a captive expanding nut.

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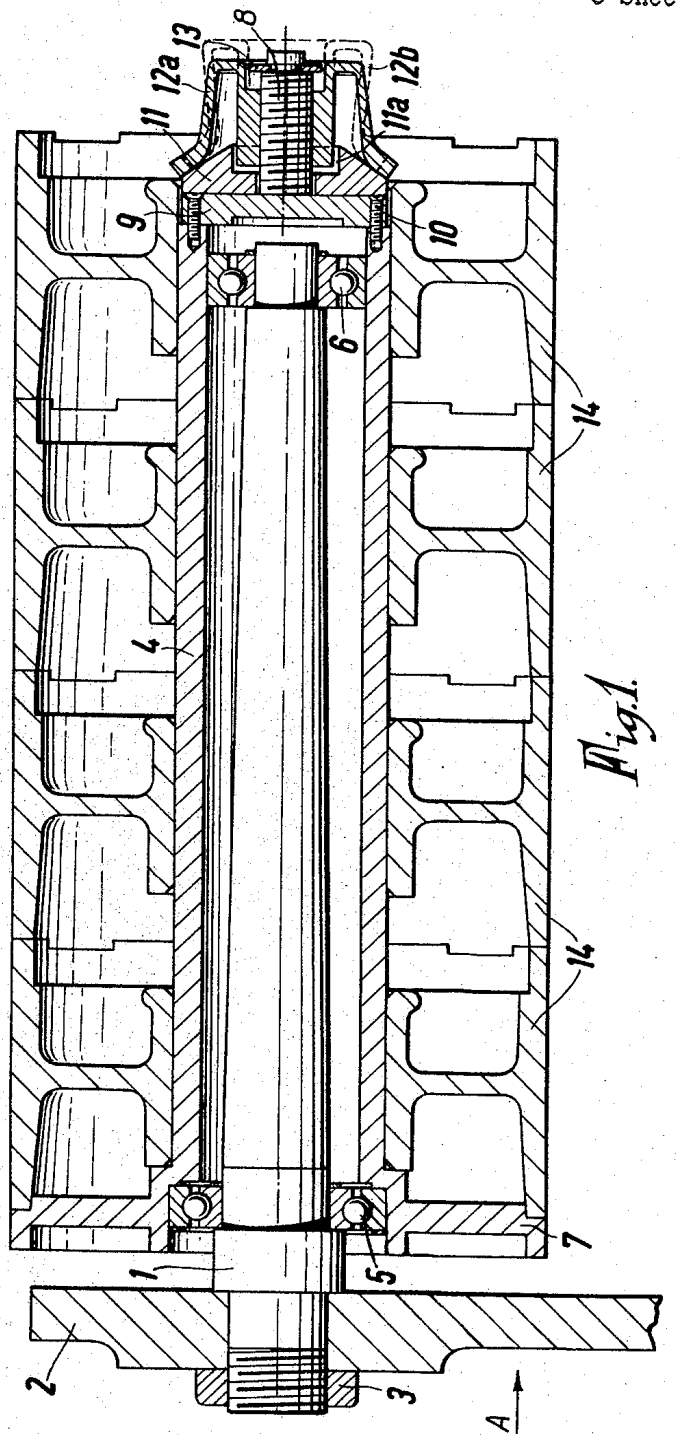

Fig. 1.

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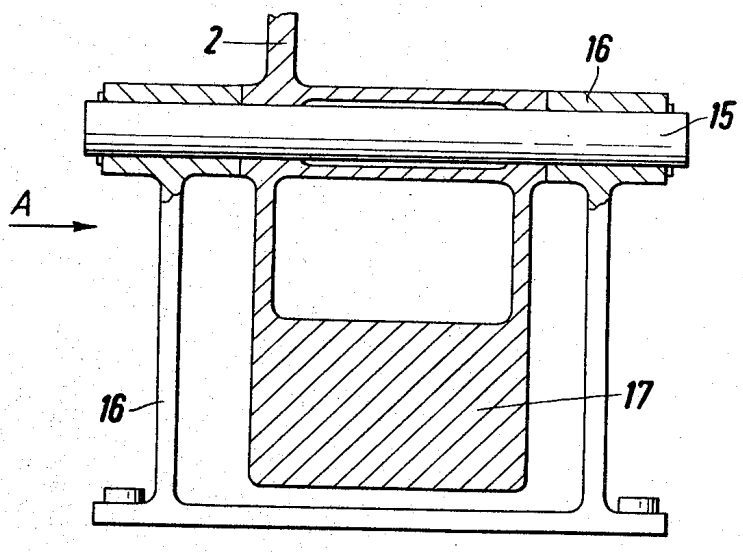

Fig. 2.

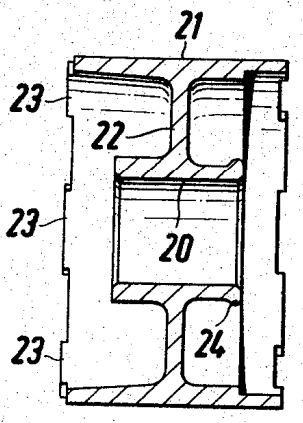

Fig. 3.

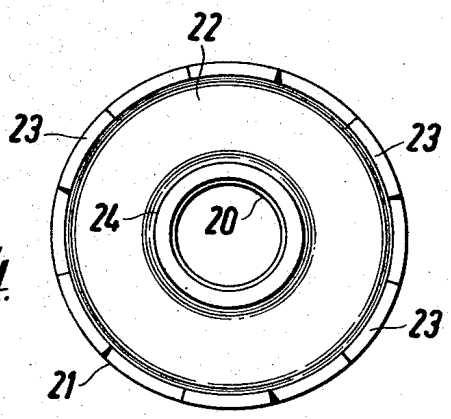

Fig. 4.

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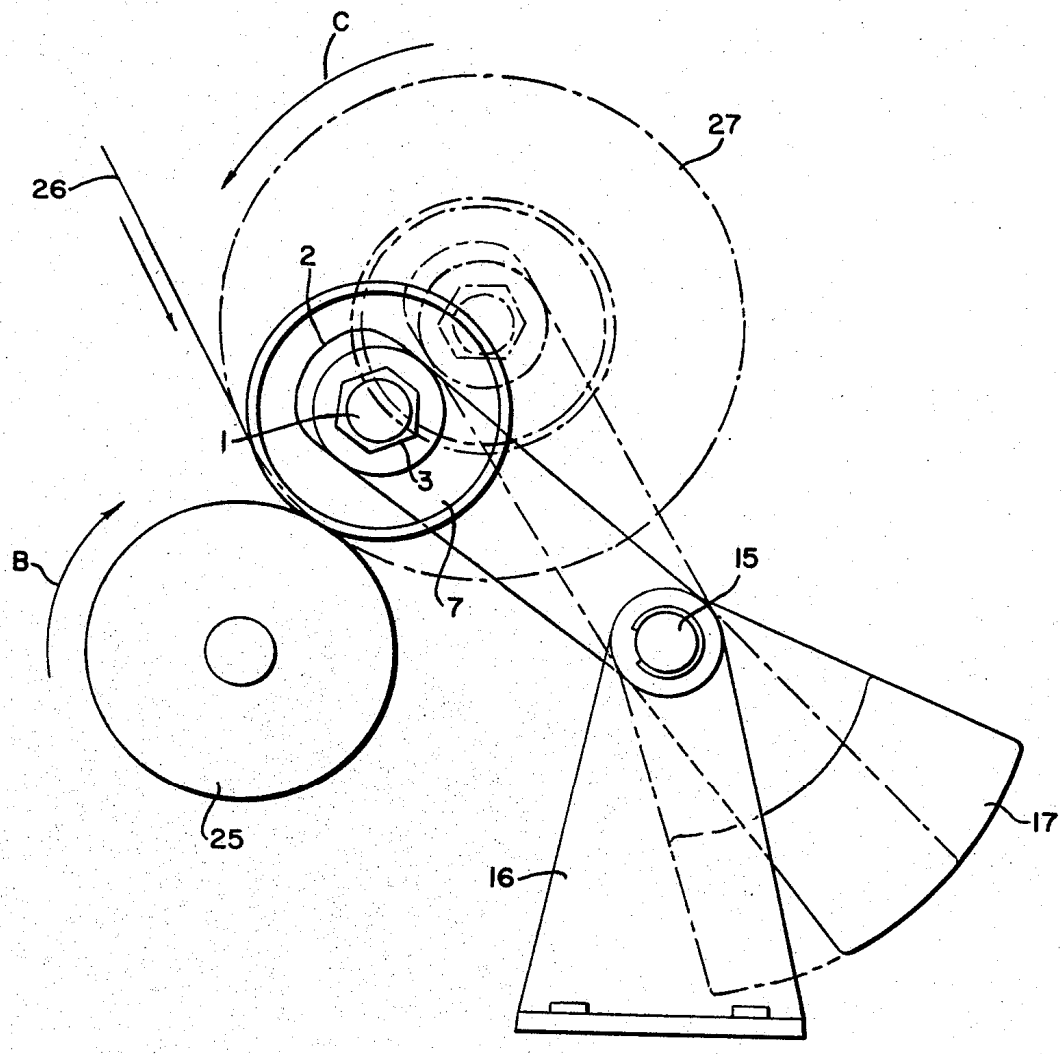

FIG. 5

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