Sept. 4, 1962 I. S. ROBERTS 3,052,420

EXPANDABLE MANDREL

Original Filed Dec. 15, 1955

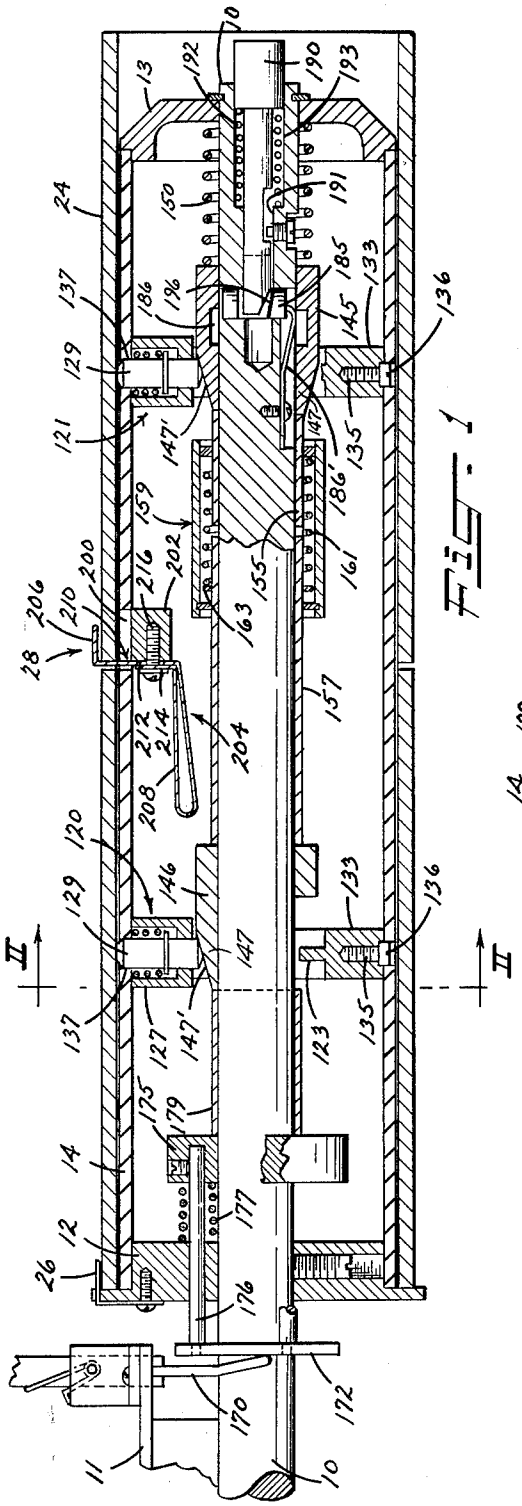


Fig. 1

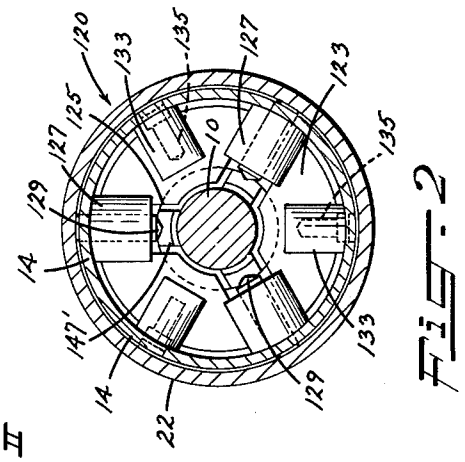


Fig. 2

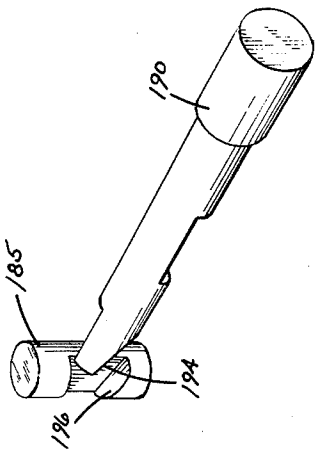


Fig. 3

United States Patent Office 3,052,420 Patented Sept. 4, 1962

3,052,420
EXPANDABLE MANDREL

Ingham S. Roberts, Ridley Park, Pa., assignor to American Viscose Corporation, Philadelphia, Pa., a corporation of Delaware

Original application Dec. 15, 1955, Ser. No. 553,305. Divided and this application Mar. 9, 1961, Ser. No. 94,602

5 Claims. (Cl. 242—46.3)

This invention relates to an expandable mandrel for supporting a plurality of winding cores in end-to-end relationship and more particularly to such a mandrel having means for simultaneously gripping a plurality of winding cores which may have different internal diameters. The present application is a division of application Serial No. 553,305, filed December 15, 1955.

Various strand materials such as yarn are commonly packaged by winding around a hollow core or tube. It is not unusual to wind two or more strands simultaneously on individual cores which are mounted in end-to-end relationship on a common mandrel which is provided with means for gripping the cores so that they will turn with the mandrel. The cores used for winding yarn are generally formed of a very hard, dense paper or plastic material whereby the cores strictly limit the movement of the expansible gripping elements of the mandrel. If all cores to be used on a particular mandrel had the identical internal diameter it would be a relatively simple matter to design the mandrel so that the core gripping elements could be moved to the exact extent necessary to grip all the cores. However, as a practical matter, cores of a particular designated size in fact have internal, and external, diameters which are of somewhat different dimensions, particularly so when they are supplied by different manufacturers. Thus it is desirable for the gripping elements of the mandrel to be capable of moving more or less independently to the extent necessary to grip the particular core with which they are associated.

With the above in mind, it is an object of this invention to provide an expandable mandrel adapted to support a plurality of winding cores in end-to-end relationship in such a manner as to effect a secure driving connection with each core even when the cores have different internal diameters.

Other objects, features and advantages of the invention will become apparent as the description of a preferred embodiment thereof proceeds.

Referring now to the drawing:

FIGURE 1 is a sectional view taken along the longitudinal axis of the mandrel and showing a pair of winding cores positioned thereon;

FIGURE 2 is a section taken along the line II—II of FIGURE 1; and

FIGURE 3 is a perspective view of a portion of the apparatus shown in FIGURE 1.

A spindle **10** rotatable from a suitable source of power, not shown, extends cantilever style from a supporting structure **11**. Circular, flanged end members **12** and **13** are secured to spindle **10** and support the opposite ends of a sleeve **14** which forms the surface of the mandrel. A pair of locking pin supporting assemblies of identical construction and generally designated at **120** and **121** are mounted internally of sleeve **14**. As shown in FIGURE 2, the assembly **120** comprises a web **123** supporting a plurality, three in the present instance, of cylindrical housings **127**. Housings **127** are equally spaced from one another and between the housings, web **123** has secured thereto fastening blocks **133**. Headed screws **135** are screwed into fastening blocks **133** through aligned openings **136** provided in sleeve **14** and the heads of said screws in cooperation with said openings serve to retain the supporting

assembly in the position shown in the drawing. Spring loaded locking pins **129** are mounted in housings **127** and the outer ends of said pins are adapted to be extended, as will presently be described, through aligned openings **137** in sleeve **14**.

A pair of winding cores **22** and **24** are positioned end-to-end on mandrel sleeve **14**, being slipped thereon over the free end of the mandrel. Locking pins **129** of assembly **120** cooperate with core **22** and the locking pins of assembly **121** cooperate with core **24**, the locking pins of both assemblies being shown in core locking position in FIGURE 1.

The lock and unlock position of the locking pins **129** for both the inboard and outboard support assemblies **120** and **121** are controlled by expanders or spiders **145** and **146** which are slidably positioned on the spindle **10** and are capable of moving axially along the spindle to contact the base end of the pins **129** to urge the pins outwardly through the openings **137** of sleeve **14**. Spiders **145** and **146** are in the form of rings having axially extending fingers **147** which fit within openings **125** (see FIGURE 2) provided in the webs **123** of the pin supporting assemblies **120** and **121**. Fingers **147** have cam surfaces **147'** which cooperate with the pins **129**.

To control the movement of the expanders **145** and **146** along the spindle **10**, there are provided a series of elements positioned slidably on the spindle which also move axially of the spindle. These elements include a compressible main spring **150** positioned over the spindle **10** between expander **145** and the sleeve support **13**. Positioned beyond the opposite end of the outboard expander **145** and to the inboard side of the pin supporting assembly **121** is a short sleeve section **155** which is adapted to be contacted by the axially extending fingers of the expander **145** as the expander moves under the base ends of the locking pins **129** to urge them into engagement with the outboard core **22**. A longer sleeve section **157** abuts the shorter sleeve section and lies between the shorter sleeve section **155** and the inboard expander **146**. The adjacent ends of the sleeve sections **155** and **157** are coupled together by spring coupling assembly **159**.

After the cores **22** and **24** are positioned over the sleeve **14**, the expander **145** is released from its locked position on the spindle **10** (as will be explained later) after which the main spring **150**, which is already cocked or compressed, will urge the expander **145** inwardly of the spindle whereby the axially extending fingers of the expander will contact and urge the locking pins **129** housed in the outboard supporting assembly **121** upwardly into engagement with the inner surface of the outboard core **24**. As the fingers **147** of expander **145** pass under the base ends of the locking pins **129**, the ends thereof contact the shorter sleeve section **155** on the opposite side of the assembly **121** thereby moving the shorter sleeve section to the left or inwardly of the spindle **10**. The spring **161** of the shaft coupling **159** is thereby compressed against a spacing ring **163** positioned around the longer sleeve section **157** which urges the longer sleeve **157** inwardly of the spindle **10** to contact and urge the inboard expander **146** against the base ends of the locking pins **129** of the inboard pin supporting assembly **120** to urge the lock pins outwardly against the inner surface of the inboard core **22** to firmly hold this core in place on the sleeve **14**. The purpose of the spring coupling **159** is to permit the expanders **145**, **146** and the pins of each assembly **120** and **121** to operate independently of one another. This feature is important since, as previously mentioned, the diameter of the cores usually varies a slight amount. With this arrangement, the outboard expander **145** may be moved inwardly of the spindle as far as is necessary to urge the locking pins into locking engagement with the outboard core **24**. The spring coupling **159** also per-

mits the inboard expander **146** to move against the locking pins **129** of the inboard assembly **120** as far as is necessary to urge the locking pins into locking engagement with the inboard core **22**.

The release mechanism for moving the expanders **145** and **146** outwardly of the spindle **10** to release the locking pins **129** from their lock position will now be described. As seen in FIGURE 1, a lever **170** is mounted to the supporting structure **11** adjacent the inboard end of the spindle **10**. A release ring **172** is slidably positioned over the inboard end of the spindle **10** externally of the core supporting assembly. The ring **172** is connected with a collar **175** which is also slidably positioned on the spindle **10** at a point within the core supporting assembly but adjacent the inboard end thereof. A plurality of pins **176** secured to both the collar **175** and the rellease ring **172** connect these two elements. A spring **177** is positioned over each connecting pin **176** to lie between the collar **175** and a stop or positioning member **179** at the inboard end of the core supporting assembly. On the spindle and between the collar **175** and the inboard expander **146** lies a short sleeve section **179**. To release the locking pins from their lock position, the lower end of release lever **170** is moved toward the outboard end of the spindle to contact the release ring **172** which also moves toward the outboard end of the spindle to urge in turn the collar **175**, the short sleeve section **179**, the inboard expander **146**, the sleeve sections **157** and **155**, the outboard expander **145** and the main spring **150** toward the outboard end of the spindle. As the outboard expander **145** moves to the right or outwardly of the spindle **10**, a holding pin **185** positioned within a hole drilled through the spindle at right angles to the spindle axis is urged by a spring strip **186'**, positioned and anchored within a slot cut into the spindle, into an offset **186** in the outboard expander **145**. With this arrangement, the expanders **145** and **146** remain out of contact with the locking pins **129** and the main spring **150** is maintained in cocked or compressed condition.

To release the expanders **145** and **146** from their unlocked position whereby the main spring **150** may urge the expanders toward the drive end of the spindle to move the locking pins **129** into lock position, the following release mechanism is provided. A release pin **190** is positioned within a bored hole **191** in the outboard end of the spindle **10** and a spring **192** is positioned around the release pin **190**, the spring being confined within a counterbored section **193** of the channel at the extreme outboard end of the spindle. The end of the release pin **190** extending within the spindle channel is tapered as at **194**. As seen more clearly in FIGURE 3, the holding pin **185** is slotted transversely of its length and the bottom wall **196** of the slot is also tapered. To depress the lock pin **185** out of position within the offset **186** of the expander **145**, the release pin **190** is pressed inwardly of the bored channel **191** whereby the tapered surface **194** of the release pin **190** will move into contact with the tapered wall **196** of the slotted lock pin **185** to gradually depress the holding pin **185** out of the offset **186** of expander **145**.

As soon as the end of the holding pin **185** is depressed out of the offset **186** of the expander **145**, the cocked or compressed main spring **150** is released and urges, as explained before, the expanders **145** and **146** in addition to the release mechanism toward the inboard or drive end of the spindle whereby the locking pins **129** will again be urged into locking engagement with the yarn winding cores **22** and **24**.

In devices for winding yarn or other strands which are wound at high speed it is customary to provide what is known as a tailing guide to facilitate connection of the end of the strand to the core and the present mandrel is equipped with a tailing guide for each of the cores. The tailing guide for the inboard core is simply an element **26** fixedly secured to the sleeve support **12**. The tailing guide for the outboard core **24** is generally indicated at

28 and is so arranged as to facilitate the placement and removal of the inboard core **22**, as will now be described.

As seen in FIGURE 1, a slot **200** is cut through the sleeve **14** near the center thereof and a support block **202** is secured to the inner wall of the sleeve adjacent the outboard edge of the slot **200**. A spring strip **204** extends through the sleeve slot **200** and has a short leg **206** formed therein which lies above the sleeve **14** and constitutes the tailing guide for the outboard tube **24**. A longer leg **208** is formed in the opposite end of the strip **204** and lies in a direction opposite to that of the short leg **206** whereby a neck section **210** is formed in the strip **204**. Extending the length of and through the neck section of the strip **204** is a slot **212**. To provide a springing action within the strip **204**, a loop is formed in the longer leg **208** by doubling back the longer leg section of the strip **204**. A short bend is incorporated in the extreme end of the doubled back or looped portion of the longer leg **208** to provide a short length section **214** which lies flush with the neck section **210**. A screw **216** extends through the short length section **214** and the slot **212** of the neck section of the spring strip which screw is lodged in the support block **202**. With this arrangement, the tailing guide or leg **206** may be depressed against the sleeve **14** when the operator applies pressure to the leg **206**, the slotted neck portion sliding inwardly over the screw **216**. The inboard tube **22** may then be moved into or out of position over the leg **206**. When the pressure applied by the tube **22** is released (after the tube has passed over the leg **206**), the leg **206** will return to its operative position ready for use with the outboard tube **24** when moved into position on the sleeve **14**.

Having thus described a preferred embodiment of the invention, what is claimed is:

1. An expandable mandrel adapted to support a plurality of strand receiving cores in end-to-end relationship wherein said cores may have different internal diameters, comprising a rotatable shaft, a core receiving sleeve secured to said shaft for rotation therewith, a plurality of core engaging means mounted on said sleeve and movable radially between retracted positions and core engaging positions, said core engaging means being spaced apart longitudinally of said sleeve whereby each of said means is adapted to engage a separate one of a plurality of cores positioned on said sleeve, a separate device mounted on said shaft for engaging each of said core engaging means and moving same to core engaging position, pressure applying means for moving an end one of said devices to position for causing its associated core engaging means to engage its core, and resilient pressure transmitting means located between said devices for transmitting the pressure applied to said end one of said devices to another of said devices whereby said devices are each operated to the extent necessary to move their associated core engaging means into holding relation with their respective cores, said devices moving in the same direction to operate their respective core engaging means.

2. An expandable mandrel adapted to support a plurality of strand receiving cores in end-to-end relationship wherein said cores may have different internal diameters comprising a rotatable shaft, a core receiving sleeve secured to said shaft for rotation therewith, a plurality of core engaging means mounted on said sleeve and movable radially between retracted positions and core engaging positions, said core engaging means being spaced apart longitudinally of said sleeve whereby each of said means is adapted to engage a separate one of a plurality of cores positioned on said sleeve, a separate device mounted on said shaft for engaging each of said core engaging means and moving same to core engaging position, spring means for moving an end one of said devices to position for causing its associated core engaging means to engage its core, resilient pressure transmitting means located between said devices for transmitting the pressure applied by said spring means to said end one of

said devices to another of said devices whereby said devices are each operated only to the extent necessary to move their associated core engaging means into holding relation with their respective cores, latch means for holding said spring means in a compressed condition, and manually operable means for releasing said latch means.

3. An expandable mandrel adapted to support a plurality of strand receiving cores in end-to-end relationship wherein said cores may have different internal diameters, comprising a rotatable shaft, a core supporting sleeve secured to said shaft for rotation therewith, a plurality of sets of core engaging pins mounted on said sleeve internally thereof, said sets of pins being spaced longitudinally of said sleeve whereby each set may cooperate with a separate core, resilient means urging said pins to inactive positions internally of said sleeve, openings in said sleeve through which said pins are adapted to be projected to engage the cores, camming means mounted on said shaft for cooperating with each set of pins and projecting same to core engaging position, pressure applying means for moving an end one of said camming means to pin projecting position, and resilient means between said end one of said camming means and the camming means next in line thereto for transmitting pressure from the one to the other whereby the different camming means may be moved to different extents by said pressure applying means to project the respective sets of pins to different extents as may be required by different diameter cores.

4. An expandable mandrel adapted to support a plurality of strand receiving cores in end-to-end relationship wherein said cores may have different internal diameters, comprising a rotatable shaft, a core supporting sleeve secured to said shaft for rotation therewith, a plurality of sets of core engaging pins mounted on said sleeve internally thereof, said sets of pins being spaced longitudinally of said sleeve whereby each set may cooperate with a separate core, resilient means urging said pins to inactive positions internally of said sleeve, openings in said sleeve through which said pins are adapted to be projected to engage the cores, camming means slidably mounted on said shaft for cooperating with each set of pins and projecting same to core engaging position,

pressure applying means for moving an end one of said camming means to pin projecting position, locking means for locking said pressure applying means in an inactive condition, manually operable means for releasing said locking means, and resilient means between said end one of said camming means and the camming means next in line thereto for transmitting pressure from the one to the other whereby the different camming means may be moved to different extents by said pressure applying means to project the respective sets of pins to different extents as may be required by different diameter cores.

5. An expandable mandrel adapted to support a plurality of strand receiving cores in end-to-end relationship wherein said cores may have different internal diameters comprising a rotatable shaft, a core supporting sleeve secured to said shaft for rotation therewith, a plurality of sets of core engaging pins mounted on said sleeve internally thereof, said sets of pins being spaced longitudinally of said sleeve whereby each set may cooperate with a separate core, resilient means urging said pins to inactive positions internally of said sleeve, openings in said sleeve through which said pins are adapted to be projected to engage the cores, camming means slidably mounted on said shaft for cooperating with each set of pins and projecting same to core engaging position, spring means for moving an end one of said camming means to pin projecting position, resilient means between said end one of said camming means and the camming means next in line thereto for transmitting pressure from the one to the other whereby the different camming means may be moved to different extents by said spring means to project the respective sets of pins to different extents, means for moving said camming means to inactive position, latching means for preventing operation of said spring means, and manually operable means for releasing said latching means.

References Cited in the file of this patent

UNITED STATES PATENTS

1,192,063	Hoberg	July 25, 1916
2,705,111	Bruestle	Mar. 29, 1955