Sept. 13, 1966 A. L. EWING ET AL 3,272,447

CHUCK FOR TUBULAR CORES

Filed June 23, 1964 3 Sheets-Sheet 1

Fig. 1.

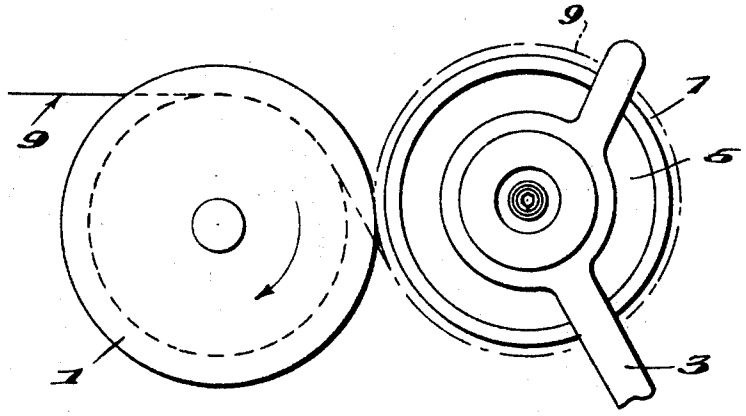


Fig. 3.

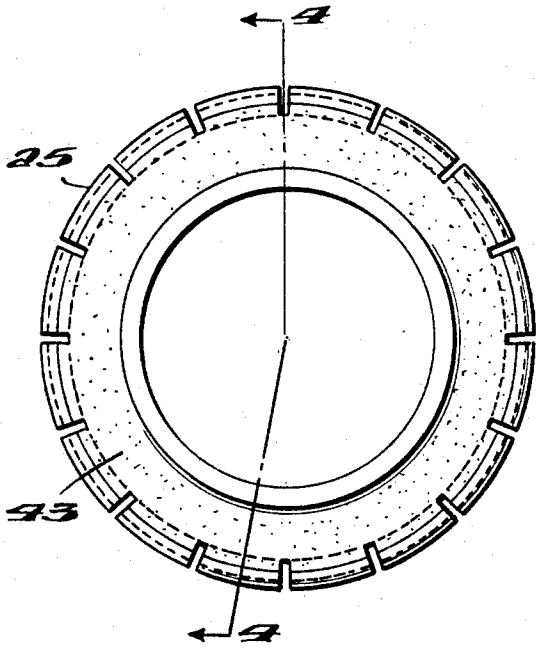
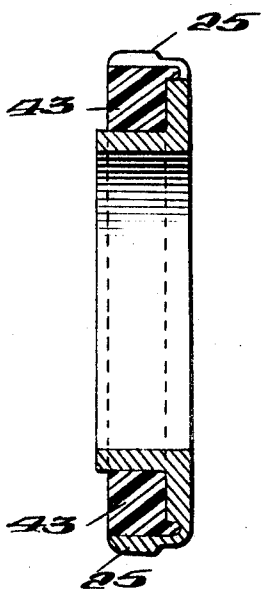


Fig. 4.



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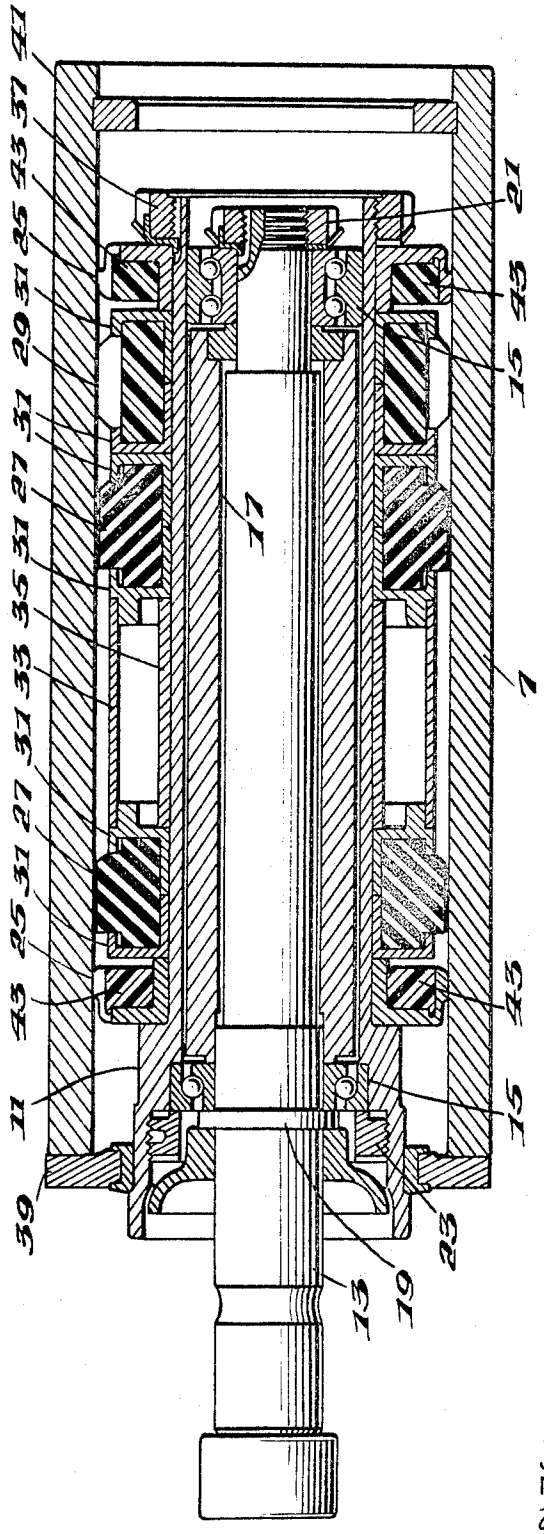
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Sept. 13, 1966 A. L. EWING ET AL 3,272,447

CHUCK FOR TUBULAR CORES

Filed June 23, 1964 3 Sheets-Sheet 2

Fig. 2.



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Sept. 13, 1966 A. L. EWING ET AL 3,272,447

CHUCK FOR TUBULAR CORES

Filed June 23, 1964 3 Sheets-Sheet 3

Fig. 5.

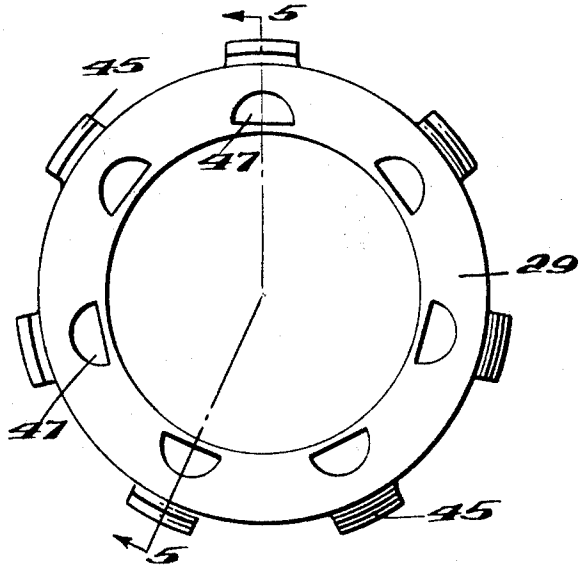


Fig. 6.

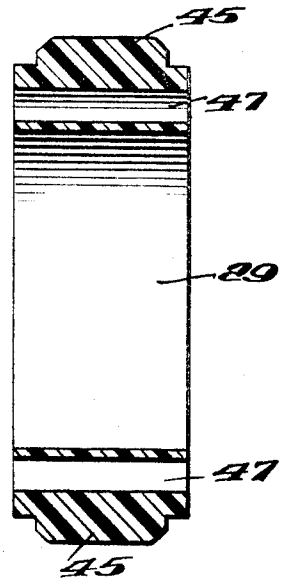


Fig. 7.

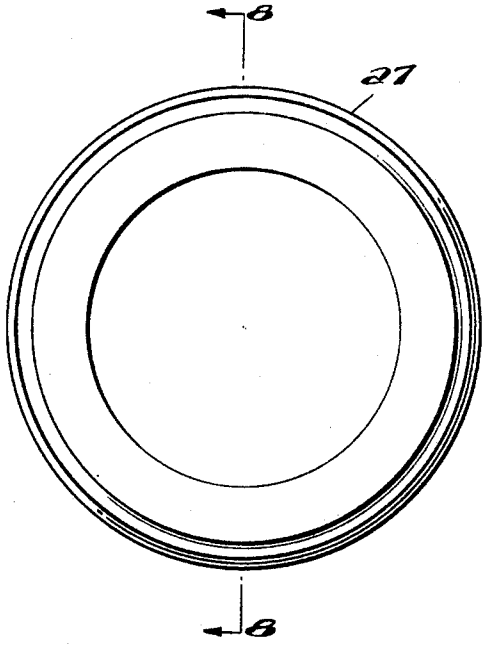
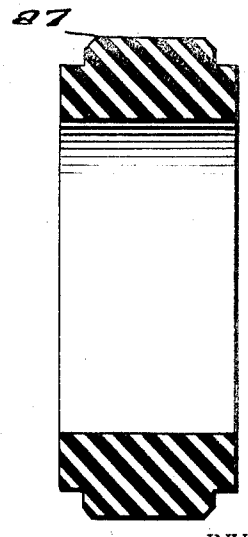


Fig. 8.



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3,272,447

CHUCK FOR TUBULAR CORES

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Filed June 23, 1964, Ser. No. 377,291
4 Claims. (Cl. 242—46.5)

This invention relates to the winding of strands, threads, and the like into packages and more particularly to an improved apparatus for holding a tubular yarn core while a filament or yarn is wound on at high speeds.

In the textile industry, yarns are often wound on tubular cores which are supported on rotatable chucks driven by rolling contact with a drive roll. Several considerations enter in to the problem of designing a commercially suitable chuck. The rotatable chuck should be designed to permit easy placement and removal of the core upon which the yarn is wound. Furthermore, the chuck must be so constructed to insure firm securance of the tubular core during all phases of the winding operation, i.e., at various wind-up speeds and at various stages of yarn build-up on the core. Centrifugal forces acting on the core package, particularly at higher rotational speeds, become a significant problem in the attainment of commercially suitable yarn packaging equipment. Maintaining concentricity of the core about the spindle at higher speeds becomes a significant problem as does balancing of the winding assembly.

It is therefore an object of this invention to provide a rotatable chuck having the desired characteristics mentioned above.

The present invention provides a chuck adapted to receive a tubular core, the chuck comprising a spindle, a tubular housing rotatably mounted on the spindle, retainer means for holding the rotatable housing on the spindle, and certain types of annular rings mounted on the tubular housing including: (1) a first type being made of a relatively rigid but slightly depressible material and having an outside diameter substantially the same as the inside diameter of the tubular core; (2) a second type being made of a relatively compressible material having a relatively high coefficient of friction and having an outside diameter slightly greater than the inside diameter of the tubular core; and (3) a third type being made of a material capable of radial expansion due to centrifugal forces and having an outside diameter slightly less than the inside diameter of the tubular core.

The invention will be more readily apparent from the following detailed discussion of the embodiments thereof when taken together with the accompanying drawings wherein:

FIGURE 1 is a fragmentary end view of a traverse winding apparatus incorporating the chuck construction of the present invention;

FIGURE 2 is a longitudinal section of the chuck with a tubular core in place;

FIGURE 3 is a side elevation of a centering ring;

FIGURE 4 is a line on 4—4 of FIGURE 3;

FIGURE 5 is a side elevation of the compressible ring;

FIGURE 6 is a line on 6—6 of FIGURE 5;

FIGURE 7 is a side elevation of the expendable rubber ring; and

FIGURE 8 is a line on 8—8 of FIGURE 7.

The traverse winding apparatus shown in FIGURE 1 includes as components thereof a drive roll 1 and a swing arm 3 on which a chuck 5 is freely rotatable. The chuck has a tubular core 7 telescoped thereon and is driven by rolling engagement with the drive roll. In this manner a filamentary structure 9 is wound onto each core to form a yarn package.

Referring to FIGURE 2, housing 11 is rotatably mounted on spindle 13 by means of bearings 15. These bearings are held in position on the spindle by tubular bearing spacer 17, spindle shoulder 19 and lock nut 21. Housing 11 is held in position by threaded retainer ring 23. Mounted on the housing are core centering rings 25, expandable rings 27, preferably made of rubber, and compressible, gripping ring 29. Expandable rings 27 and compressible ring 29 are held in retainers 31. The retainers holding rings 27 are held in spaced relationship by tubular spacers 33 and 35. A clearance between retainers 31 and rings 27 is provided for radial expansion of the rings. The entire ring and spacer assembly is held in position by lock nut 37. A circumferential stop 39 extending out radially is provided on the tubular housing 11 to abut one end of tubular core 41.

Referring to FIGURE 3, centering rings 25, although constructed of relatively rigid material, are designed to depress slightly when the core is placed on the chuck. The centering rings may suitably be constructed of spring steel, but are more economically fabricated from plastic material such as nylon, polycarbonates, polyethylene or polyformaldehyde. Particularly suitable materials are polyhexamethylene adipamide (6–6 nylon) and polyhexamethylene sebacamide (6–10 nylon). Preferably, a resilient support 43 (shown in FIGURE 2) is provided for the depressible part of the ring. This resilient support, which may suitably consist of a ring of elastomeric material such as a natural or synthetic rubber or a flexible foam such as a flexible polyurethane foam, is fitted snugly against the underside of the depressible portion of the centering ring, and serves to prevent the centering ring from acquiring a permanent set under the tubular core pressure. GR-S cold rubber, having a specific gravity of 1.15 and a modulus of elasticity of about 1400, is satisfactory for this purpose.

Since the relatively rigid material required for construction of centering rings 25 does not provide sufficient gripping force to hold the core 7 firmly in place in the initial stages of the winding operation, ring 29 is provided for this purpose. The outside diameter of ring 29 is slightly greater than the inside diameter of the tubular core 7 and the ring is composed of a readily compressible material having a high coefficient of friction. A foamed structure such as flexible polyurethane foam is particularly suitable for this purpose. As illustrated in FIGURE 5 and 6, in a preferred design, a number of cleats 45 for contacting the tubular core 7 are provided around the outer periphery of ring 29 to facilitate compression of the ring when the core is put in place. For the same reason, semi-circular cavities 47 are preferably provided below each of the cleats. Preferably this material should have a durometer hardness of 25–35.

Expandable gripping rings 27, one of which is shown in FIGURES 7 and 8 are suitably made of relatively high density elastomeric material such as synthetic or natural rubber. These rings expand under the action of the centrifugal force generated at high winding speeds and serve to grip the core tightly under the conditions of high stress imposed by the high speeds and accumulation of yarn.

Spacers 33 and 35 may be made of metal but are more economically fabricated from resin-impregnated paper or similar laminated materials.

Bearing spacer 17 and housing 11 are suitably made of steel or other appropriate metal. The ring retainers 31 may be made of metal, but are more economically constructed from a plastic material such as 6–6 nylon.

Preferably, stop 39 is designed in such a manner as to serve the dual purpose of a stop for the core and as a driving wheel to prevent the drive roller from contacting the empty core at the beginning of the winding operation.

For the latter purpose, the diameter of element **39** is made slightly greater than the diameter of the core **7** upon which the yarn is to be wound so that the drive roller **1** bears gainst this part rather than against the core until a small amount of yarn **9** is wound on the core to increase the diameter sufficiently to disengage the drive wheel. As illustrated in FIGURE 2, the drive wheel may suitably be constructed in two parts consisting of a steel ring which is press fit onto the housing **11** and an outer ring which may consist of a laminated plastic material. A suitable material for the outer part of the drive wheel is fabric-reinforced phenolic resin.

When the illustrated apparatus is placed in operation, there is initially a rolling contact between drive roll **1** and stop **39**. As filamentary structure **9** is wound on tubular core **7**, the diameter of the core package is increased sufficiently to engage the drive wheel. The tubular core **7**, fitted onto rotatable chuck **5**, is held in place initially and during the lower rotational wind-up speeds by centering rings **25** and particularly by ring **29**. As the rotational speed of the chuck-core assembly increases, rings **27** expand radially to come into contact with tubular core **7**, thereby providing gripping means particularly adapted to secure the core while it is turning at higher rotational speeds. Centering rings **25**, being made of a relatively rigid material, provide for the maintenance of core concentricity at all windup speeds.

The chuck of this invention possesses the characteristics required for an efficient high speed winding operation. It is simple to construct and assemble, and the parts which require replacement in use may be molded or machined from relatively inexpensive materials. The cores upon which the yarn is wound are easily put in place and the final yarn package is readily removed from the chuck without the use of special tools or other devices. At the same time, the core is held firmly in place during the entire winding operation and the core and yarn package remain concentric about the spindle.

As many widely different embodiments of this invention may be made without departing from the spirit and scope thereof, it is to be understood that this invention is not limited to the specific embodiments thereof except as defined in the appended claims.

What is claimed is:

1. An apparatus comprising a chuck adapted to receive a tubular core, said chuck comprising a spindle, a tubular housing rotatably mounted on said spindle, retainer means for holding the rotatable housing on the spindle, and certain types of annular rings mounted on said tubular housing including: (1) a first type being made of a relatively rigid but slightly depressible material and having an outside diameter substantially the same as the inside diameter of said tubular core; (2) a second type being made of a relatively compressible material having a relatively high coefficient of friction and having an outside diameter slightly greater than the inside diameter of said tubular core; and (3) a third type being made of a material capable of radial expansion due to centrifugal forces and having an outside diameter slightly less than the inside diameter of said tubular core.

2. The apparatus of claim **1** wherein said first type of annular ring is made of nylon, said second type is made of a flexible foamed structure, and said third type is made of a relatively high density elastomeric material.

3. An apparatus comprising a chuck adapted to receive a tubular core, said chuck comprising a spindle, a tubular housing rotatably mounted on said spindle, retainer means for holding the rotatable housing on the spindle, and certain types of annular rings mounted on said tubular housing including: (1) a first type having two portions, the first portion being a tubular core contacting portion made of a relatively rigid but slightly depressible material and the second portion providing a resilient support for said first portion in order to inhibit this first type of annular ring from acquiring a permanent set under the pressure of said tubular core, said first type having an outside diameter substantially the same as the inside diameter of said tubular core; (2) a second type being made of a relatively compressible material having a relatively high coefficient of friction and having an outside diameter slightly greater than the inside diameter of said tubular core; and (3) a third type being made of a material capable of radial expansion due to centrifugal forces and having an outsile diameter slightly less than the inside diameter of said tubular core.

4. The apparatus of claim **3** wherein the first and second portions of said first type of annular ring are made of nylon and a relatively high density elastomeric material, respectively; said second type is made of a flexible foamed structure, and said third type is made of a relatively high density elastomeric material.

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