Dec. 8, 1964 R. C. JACKSON ET AL 3,160,357

FILAMENT YARN WINDING APPARATUS

Filed June 18, 1963

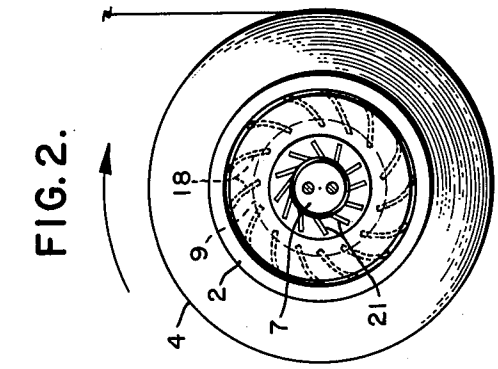


FIG. 2.

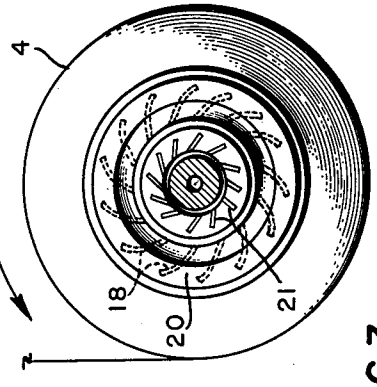


FIG. 3.

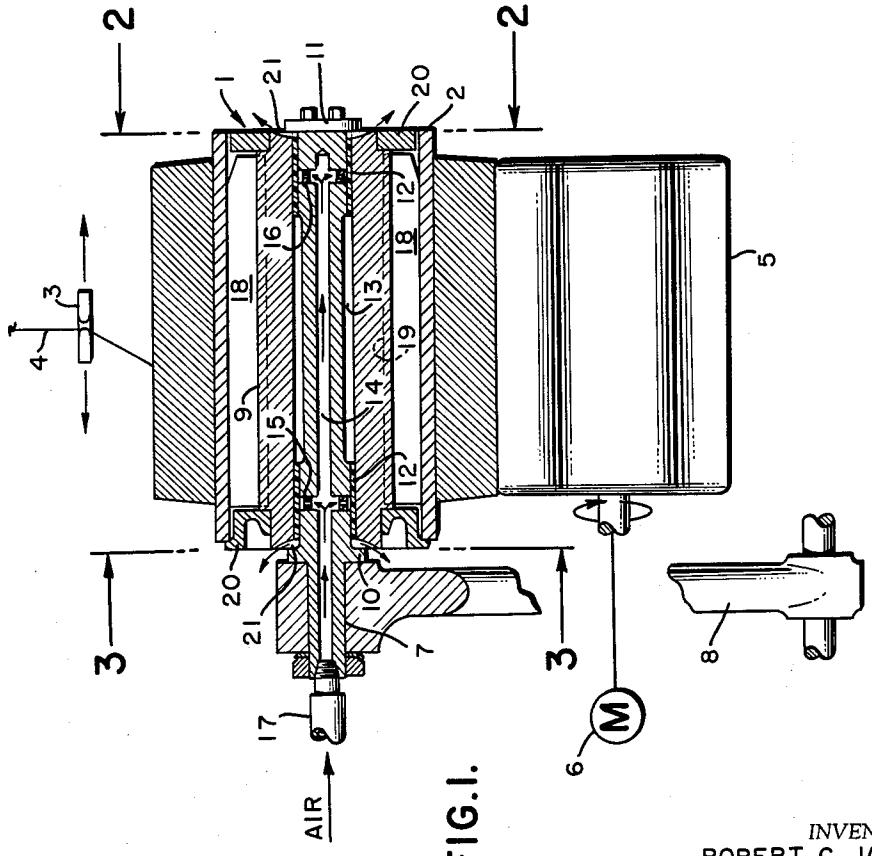


FIG. 1.

INVENTORS
ROBERT C. JACKSON
D. J. LAMB

BY Stanley M. Tarter

ATTORNEY

United States Patent Office 3,160,357 Patented Dec. 8, 1964

3,160,357

FILAMENT YARN WINDING APPARATUS

Robert C. Jackson, Raleigh, N.C., and Douglas J. Lamb, Gulf Breeze, Fla., assignors to Monsanto Company, a corporation of Delaware

Filed June 18, 1963, Ser. No. 288,746
5 Claims. (Cl. 242—18)

This invention relates to filament yarn winding apparatus and more particularly to a high speed textile bobbin chuck device including means adapted to assist in the transfer of torque forces thereto.

In a typical textile yarn winding practice, a package of yarn is formed on a bobbin clutched about a rotating chuck device driven by a powered drive roll that surfacely contacts the yarn being collected or wound on the bobbin. The speed of windup of the yarn on the bobbin is limited principally by factors relating to bearing friction, air drag, and the tension of the yarn being packaged. When the total bearing friction, air drag and yarn tension load is high, the drive roll must be driven at a comparable higher torque force to overcome the total load. Because the torque transfer between the drive roll and bobbin is through friction, high retarding torque forces applied to the bobbin cause the drive roll to slip relative to the yarn on the bobbin resulting in scuffing and damaging of the yarn and further limits the size of the packages which could be formed as well as the speed of windup of the yarn.

It is an object of this invention to provide filament winding apparatus adapted to wind larger filament packages at high speeds than heretofore and provided with means to assist in the transfer of torque thereto.

Another object of this invention is to provide a bobbin chuck device having means for lockingly gripping a bobbin and turbine means.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

According to the invention, the novel filament yarn winding apparatus comprises a chuck device adapted to carry a yarn holder or bobbin lockingly therewith, an operatively powered drive roll for driving the bobbin and chuck device by surface contact with the yarn package being wound on the bobbin, and a traverse means for reciprocably delivering yarn to the bobbin.

The chuck device has a bearing formed by gas such as air under pressure introduced into a bearing space provided between a shaft and bobbin gripping means journaled thereon. Air exhausting from the bearing space reacts against turbine means provided on the bobbin gripping means to furnish a supplemental driving force for assisting in the transfer of torque from the drive roll thereby reducing the torque force required to drive the chuck device and bobbin. The novel winding apparatus of the above type provides higher than conventional winding speeds and permits winding of larger yarn packages.

A better understanding of the invention will be gained by reference to the accompanying drawing and the detailed description which follows.

In the drawing:

FIGURE 1 is a cross-section view of the bobbin chuck device embodying the invention shown associated with a drive roll powered by conventional motor means;

FIGURE 2 is a cross-section view taken through 2—2 of FIGURE 1;

FIGURE 3 is a cross-section view taken through 3—3 of FIGURE 1.

The construction of the bobbin chuck device as illustrated in FIGURE 1 is symmetrical and for convenience reasons a cross-section only is shown.

Referring to the drawing, the novel winding apparatus comprises a chuck device 1 having a tubular bobbin 2 mounted thereon, a reciprocating traverse guide 3 for displacingly guiding a yarn 4 from a source thereof to device 1, and a drive roll 5 powered by conventional motor means 6.

Chuck device 1 has a mandrel or shaft 7 fixedly mounted at one end thereof on a pivotal swing arm 8 and has a cylindrical sleeve member 9 coaxially arranged and retained on shaft 7 by an annular shoulder 10 formed at one end of the shaft and a retainer disc 11 clamped by bolts to shaft 7 at its opposite end. Member 9 is spaced from shaft 7 by journal sleeves 12 secured to the wall of the bore of member 9 and positioned adjacent corresponding spaced lands on shaft 7. The diameter of the bore of journal sleeves 12 is slightly larger than the diameter of the lands on shaft 7 so as to provide a slight clearance or bearing space to permit air to flow therebetween forming a fluid pressure bearing. Shaft 7 is relieved between the lands to form an annular volume 13 which is open to the bearing spaces.

Shaft 7 has a central passage 14 extending inwardly from its fixed end thereof and substantially therethrough which is open to the bearing spaces and volume 13 between shaft 7 and journal sleeves 12 via a plurality of radial ports 15. Preferably, radial ports 15 have orifice plugs 16 inserted therein to meter the flow of the air passing therethrough. Air under pressure is delivered from a source thereof to passage 14 by a flexible hose 17 having an adapter screw threadingly engaging a threaded end portion of passage 14.

A plurality of spaced flexible fins 18 made of a spring material are mounted within corresponding spaced longitudinal slots 19 that extend inwardly of the outer periphery of member 9 and are angularly arranged in relation to respective radial planes projected from the axis thereof. Fins 18 are of such a width that a circle circumscribed about the outer edges thereof is larger in diameter than the diameter of the bore of bobbin 2. Retainer rings 20 secured on the ends of member 9 limit radial displacement of bobbin 2. One of the rings 20 nearest the fixed end of shaft 7 is flanged for positioning bobbin 2 on device 1.

Member 9 at each end thereof is provided with a turbine having a plurality of vanes 21 preferably formed integrally therewith. Vanes 21 of one turbine are angled in one direction while those of the other are angled in an opposite direction when viewed from respective ends thereof so as to apply a rotational force in the same direction to member 9 when vanes 21 are reacted upon by air exhausting from the bearing spaces. The air flowing from the bearing spaces is diverted into each turbine substantially at right angles to the surfaces of vanes 21 by shoulder 10 and retainer disc 11, respectively.

In operation drive roll 5 is driven by motor 6 while traverse guide 3 is reciprocably operated by conventional means not shown. Bobbin 2 is coaxially aligned with chuck device 1 and mounted slidingly over the flexible, springy fins 18 of device 1. The ends of fins 18 are cut taperingly to facilitate the mounting of bobbin 2 thereon; and since the bobbin bore is smaller in diameter than the diameter of the circle circumscribed about fins 18, the latter are pressed into the bobbin bore by twisting the bobbin when it is slipped over fins 18 to a position where bobbin 2 engages the flange of retainer ring 20 nearest swing arm 8. Fins 18 securely grip bobbin 2 by springing outwardly exerting a gripping force against the wall of the bobbin bore.

Air under pressure is supplied to hose 17 from a source thereof and flows therefrom into passage 14 and into the bearing area between shaft 7 and journaling sleeves 12 via ports 15 and plugs 16. From the bearing area the air flows to the wall of shoulder 10 at one end and to the side of retainer disc 11 where the air is diverted at right angles to flow to the surfaces of vanes 21 of the

turbines on member 9. The air reacts against vanes 21 imparting a rotational force to member 9 in a clockwise direction as shown in FIG. 2.

Chuck device 1 is then pivoted by swing arm 8 so that the face of bobbin 2 contacts the face of drive roll 5 for operatively driving bobbin 2 and member 9. After bobbin 2 reaches a predetermined speed the chuck device 1 is pivoted away from roll 5 momentarily to permit yarn 4 to be laced around the bobbin. The chuck device is then pivoted back into operating position in contact with drive roll 5. Air under pressure supplied between shaft 7 and member 9 forms a fluid pressure bearing yielding low frictional resistance. The air exhausting from the bearing space reacts against vanes 21 and assists in driving bobbin 2 as well as in the transfer of torque to the bobbin 2 preventing scuffing of yarn being wound thereon. By reducing the torque force it is possible to wind yarn at higher speeds and to wind larger packages of yarn. Fins 18 being springy and bendable permit bobbin 2 packaged with yarn to adjust to forces causing rotational unbalance.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained. Variations and modifications in the specific construction described are contemplated within the scope of the invention and it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and only be limited by the scope of the following claims.

We claim:

1. Filament winding apparatus comprising in combination:

(*a*) shaft means having a passage therein for receiving fluid under pressure from a source thereof and discharging the fluid under pressure peripherally of said shaft means,

(*b*) a member journaled about said shaft with a space formed therebetween to receive fluid under pressure discharge from said shaft establishing fluid-bearing means,

(*c*) fluid responsive means at each end of said member adapted to respond to fluid under pressure flowing from said space to impart rotation to said member,

(*d*) gripping means provided about the periphery of said member,

(*e*) a filament package holder mounted lockingly about said gripping means,

(*f*) traverse means located adjacent said filament package holder for displacingly guiding a filament to said filament package holder,

(*g*) drive means surfacely contacting and rotating said filament package holder in the direction of rotation of said member, and

(*h*) means for operatively driving said drive means.

2. Filament winding apparatus comprising in combination:

(*a*) a shaft,

(*b*) an elongated sleeve journaled coaxially about said shaft with a space provided therebetween,

(*c*) turbine means at each end of said elongated sleeve,

(*d*) passage means defined within said shaft and adapted to be pressurized with a gas under pressure from a source thereof and to discharge the gas into said space for establishing a bearing between said shaft and said sleeve, the gas from said space flowing to said turbine means for reacting thereagainst to impart rotation to said elongated sleeve,

(*e*) gripping means arranged linearly along the periphery of said elongated sleeve,

(*f*) a tubular bobbin for packaging filaments thereon mounted in clutched relation about said gripping means,

(*g*) traverse means positioned near said tubular bobbin for displacingly guiding a filament thereto,

(*h*) a roll arranged in surface contact with the filament package being wound on said tubular bobbin for imparting rotation thereto, in the direction of rotation of said elongated sleeve, and

(*i*) drive means for operatively driving said roll.

3. Filament winding apparatus as claimed in claim 2 wherein said shaft is fixedly mounted at one end thereof between the ends of a pivotal lever for actuating said tubular bobbin into and out of surface engagement with said roll.

4. Filament winding apparatus as claimed in claim 2 wherein said gripping means comprises a plurality of spaced springy fins each extending outwardly from the periphery of said elongated sleeve, and wherein a circle circumscribed about the outer free ends of said plurality of springy fins has a diameter larger than the inside diameter of said tubular bobbin.

5. Filament winding apparatus comprising in combination:

(*a*) a shaft having passage means adapted to be pressurized with air under pressure and to discharge the air peripherally thereof,

(*b*) an elongated sleeve mounted coaxially and in spaced relation about said shaft forming an annular space for receiving the flow of air under pressure from said passage means for establishing an air bearing between said sleeve and shaft,

(*c*) turbine means provided at each end of said elongated sleeve,

(*d*) spaced shoulders on said shaft for diverting the air flowing from said annular space to said turbine means for reacting thereagainst to impart rotation to said elongated sleeve,

(*e*) gripping means arranged linearly along the periphery of said elongated sleeve,

(*f*) a tubular bobbin for packaging filaments thereon mounted in clutched relation about said gripping means,

(*g*) traverse means positioned near said bobbin for displacingly guiding a filament to said tubular bobbin,

(*h*) a roll positioned in surface contact with said filament package being formed on said tubular bobbin for rotating said filament package and tubular bobbin in the direction of rotation of said member, and

(*i*) drive means for driving said roll.

References Cited in the file of this patent

UNITED STATES PATENTS

2,670,146	Heizer	Feb. 23, 1954
2,947,489	Russell	Aug. 2, 1960
2,950,067	Keith	Aug. 23, 1960
3,093,332	Jackson	June 11, 1963

FOREIGN PATENTS

1,008,696	France	Feb. 27, 1952
726,457	Great Britain	Mar. 16, 1955