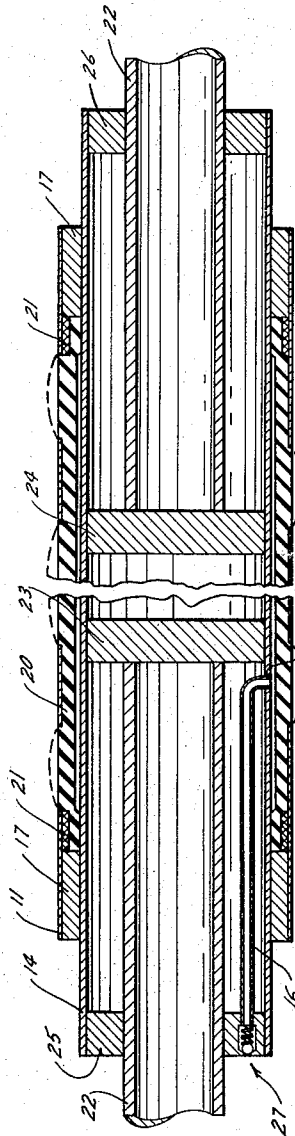
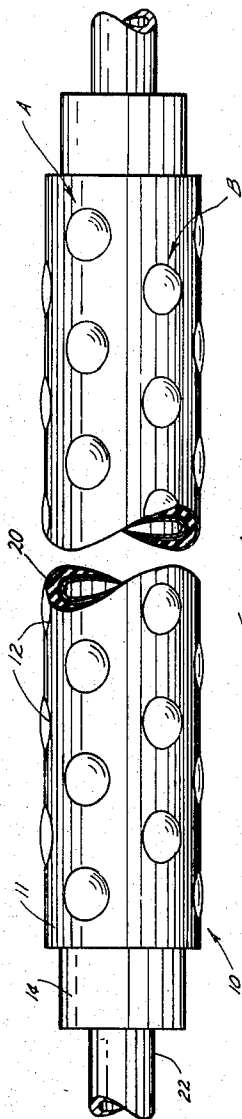


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CORE ENGAGING SHAFT
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CORE ENGAGING SHAFT

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1 Claim. (Cl. 242—72)

This invention relates to an expandable and contractible shaft and, more particularly, relates to a shaft utilizing an expandable diaphragm capable of gripping the core on which an operation, such as winding a roll of paper, is to be performed.

In winding rolls of sheet material, such as paper, it is the general practice to provide a core or roll on which the paper is wound. A shaft is provided to support the core during the winding operation, which shaft must be expandable so that it may be slid within the core, expanded to grip the core for support thereof during the winding operation, then contracted and removed therefrom at the end of the winding operation.

It has been suggested to provide shafts having flexible diaphragms for this particular purpose. However, these prior constructions have required large amounts of air to expand the diaphragm into gripping engagement with the core. This is unsatisfactory because it unduly prolongs the mounting of the core on the shaft. Prior constructions have also been unsatisfactory because of the rapid wear and deterioration of the diaphragm.

Accordingly, it is an object of this invention to provide an improved shaft utilizing an expandable diaphragm.

It is a further object of this invention to provide a shaft utilizing an expandable diaphragm in which a relatively small amount of air will cause the diaphragm to expand and grip the core mounted thereon.

It is a further object of this invention to provide a shaft having an expandable diaphragm, as aforesaid, in which the diaphragm may be shifted a number of times within the shaft so that wear of the diaphragm may be evenly distributed about the periphery thereof.

Other objects and advantages will become apparent to those acquainted with equipment of this type upon reading the following description and inspecting the accompanying drawings, in which:

Figure 1 is a broken side elevation view of the shaft, with the diaphragm expanded.

Figure 2 is a broken central longitudinal sectional view of the shaft, showing in broken lines the expanded position of the diaphragm.

General construction

In general, the invention provides a shaft which includes an inner casing and a perforated outer cylindrical casing, with a diaphragm therebetween. Air supply means are provided so that the diaphragm may be expanded through the perforations in the outer casing.

Detailed description

The shaft 10 includes an elongated, cylindrical outer casing 11. The casing 11 has a series of perforations, herein circular openings, 12, therethrough. The perforations are also arranged in circumferentially spaced, longitudinally extending rows. Alternate rows, here rows A and B, are offset axially of each other, preferably a distance equal to half of the spacing between adjacent perforations. The circumferential spacing of adjacent

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axial rows is about twice the diameter of the openings, so that the circumferential spacing of perforations in any given circumferential row is about four times the diameter of the openings.

A cylindrical inner casing 14 is disposed within and coaxial with the outer casing 11. The inner casing is imperforate, except for the openings for the compressed fluid as hereinafter described, and is preferably formed of seamless tubing of proper strength. The inner casing 14 extends along the entire longitudinal extent of the outer casing and has end portions extending beyond the end of the outer casing. At least one opening 15 is formed through the inner casing for reception of a pipe 16 which communicates with a source of pressure fluid, e. g. compressed air. It is apparent that additional openings 15 could be provided in the casing 14 if found necessary or desirable.

Annular spacers 17 are provided between the outer casing 11 and the inner casing 14 adjacent the ends of the outer casing. The spacer maintains the casings in predetermined, radially spaced relationship.

An expandable diaphragm 20, which in this embodiment is a thick rubber tube, is mounted in the space between the inner and outer casings 14 and 11, respectively. The diaphragm must also be of a quality and character of material capable of frictionally gripping the core mounted about the shaft when expanded. An annular steel band 21 surrounds either end of the diaphragm and fastens the diaphragm in fluid tight relationship to the inner casing 14. The diaphragm preferably is of sufficient thickness to occupy most all of the space between the inner and outer casings.

A pair of jack shafts 22 are mountable on a convenient bearing structure (not shown) for rotation. The jack shafts extend part way through the inner casing 14 and are connected thereto by disks 23 and 24 and annular spacers 25 and 26.

The pipe 16 extends through the opening 15 and through an additional spacer 25. A check valve 27 of any convenient construction, here a spring urged ball valve, is provided in the spacer 25. A source of fluid under pressure, e. g. compressed air (not shown) is provided for admitting pressure fluid through the check valve to expand the diaphragm.

Operation

In operation a core is slipped onto the shaft when the diaphragm 20 is in its normal unexpanded condition. Fluid pressure is then applied through the pipe 16 to expand the diaphragm and bulge it outwardly through the perforations in the spindle against the core, whereby the core is firmly gripped and retained on the shaft. The check valve 27 prevents escape of the fluid pressure during rotation of the shaft. After the web is wound on the core, the fluid pressure is relieved and the core and web wound therearound are removed.

In the preferred construction, six circumferentially spaced, longitudinally extending rows of perforations are provided with alternate rows being offset as discussed previously. In steady use the diaphragm will become worn, particularly at the portions thereof which move through the perforations in the outer casing 11. To equalize the wear on the diaphragm and to prevent premature rupture thereof, the diaphragm may be rotated at selected intervals to present the previously unworn portions of the diaphragm for movement through the perforations and contact with the core. The perforations in adjacent rows are offset and the size of the perforations and their spacing is such that substantially the entire surface of the diaphragm will be utilized at one time or another to frictionally grip the core. This

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construction therefore insures maximum life from the diaphragm.

While the foregoing description has referred primarily to the winding of paper on the core, it is to be understood that the core engaging shaft described above has many other uses. For example, it may be used to engage cores on which webs of other materials, such as textiles are to be wound. Also, in some instances, the core engaging can be utilized where the core alone is to be worked on, as with a lathe.

While specific examples of my invention have been herewith utilized for illustrative purposes, it will be understood that modifications or variations may be made without departing from the scope of the hereinafter appended claim, excepting as said claim by its own terms expressly requires otherwise.

I claim:

A hollow shaft for supporting a cylindrical core, comprising: an elongated cylindrical inner casing of substantially rigid construction; a pair of elongated elements extending into the opposite ends of, and concentric with, said inner casing, said elements being spaced from each other and from said inner casing; spaced members rigidly securing each of said elements with respect to said in-

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ner casing; a cylindrical, resilient sleeve closely surrounding said inner casing and extending substantially the full length thereof; means securing the axial end portions of said sleeve in fluid-tight relationship with said inner casing; a cylindrical outer casing closely surrounding said sleeve, said outer casing being of substantially the same axial length as said sleeve and having a plurality of spaced openings through which the adjacent portions of said sleeve can project; means supporting said outer casing upon, and coaxial with, said inner casing, the distance between said inner and outer casings being slightly larger than the thickness of said sleeve; and conduit means extending through said inner casing and communicating between a point near one end of said inner casing and a point between said inner casing and said sleeve.

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