

[54] CORE ASSEMBLY

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[58] Field of Search. **242/68.5, 68.6, 118.61; 206/59 F, 59 R, 58**

[56] References Cited

UNITED STATES PATENTS

659,306	10/1900	Kingsland.....	242/68.6
1,919,769	7/1933	Brown et al.	242/68.6
1,137,470	4/1915	Elixman	242/68.6
2,269,939	1/1942	Janisch.....	242/68.6
2,336,161	12/1943	Blanchet	242/68.6

FOREIGN PATENTS OR APPLICATIONS

888,860	2/1958	Great Britain.....	242/68.6
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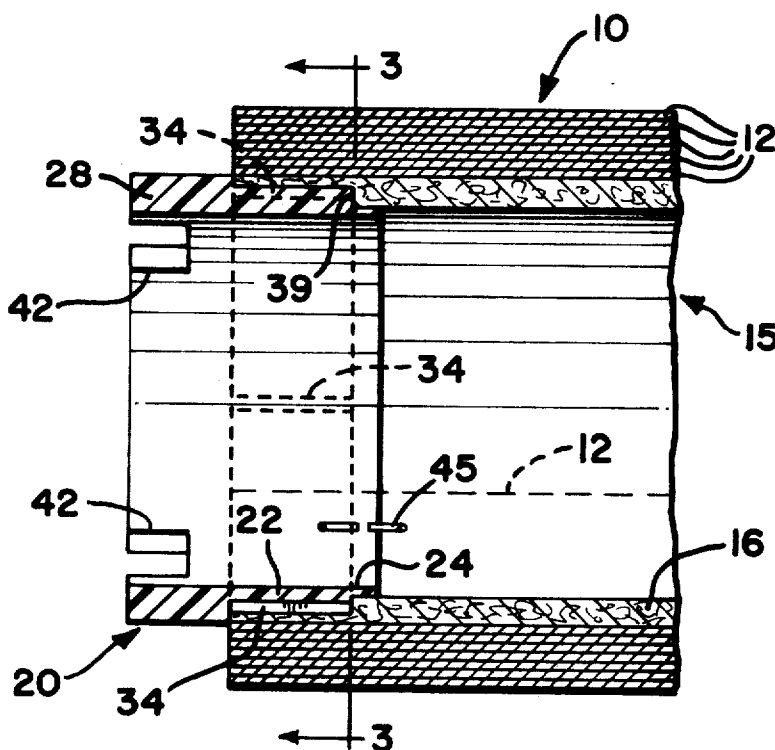
Primary Examiner—Stanley N. Gilreath

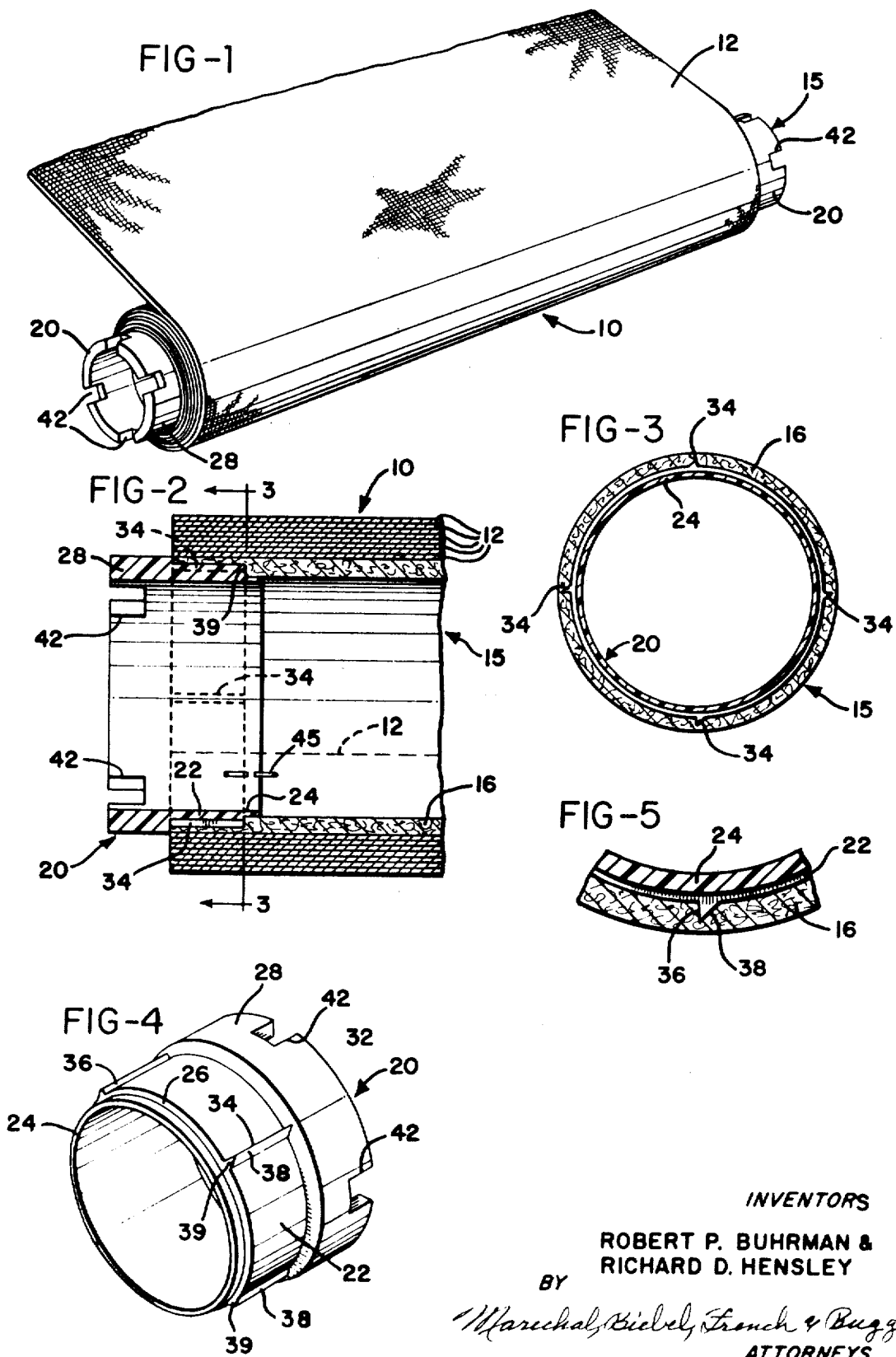
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[57] ABSTRACT

A hollow cylindrical fibrous core is reinforced on each end by a plastic bushing including an inner cylindrical portion having an outer diameter slightly greater than the inner diameter of the core and supporting a plurality of circumferentially spaced and axially extending teeth each of which pierces the inner surface of the fibrous core when the bushing is pressed axially into the core. The teeth have radial surfaces facing circumferentially in opposite directions to form a positive non-slip connection for driving the core assembly in either direction through one of the bushings. Each bushing also includes an outer cylindrical portion having an external diameter the same as the core and defining a plurality of slots or recesses for receiving a driving projection extending from a supporting mandrel.

2 Claims, 5 Drawing Figures





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CORE ASSEMBLY

BACKGROUND OF THE INVENTION

In a computer printout machine, it is common to support a fabric ink ribbon roll on a cardboard or fibrous core having one or more notches within each end portion for receiving a drive pin projecting radially outwardly from a supporting shaft or spindle. Due to the fact that the core is driven in both directions for winding and unwinding of the ribbon and that substantial driving torque is transmitted from the drive pin to the core through one of the notches, frequently the fibrous core wears down or breaks down adjacent the notch which receives the drive pin. This requires that the ink ribbon be rewound on a new fibrous core so that the full service life of the ink ribbon can be utilized.

One solution which has been employed to solve the above problem is to form the cores from aluminum or plastic tubular extrusions. However, to prevent breakdown of the cores adjacent the notches, it has been found necessary to provide the extrusions with a substantial wall thickness which significantly increases the cost of the core relative to a fibrous core.

In the prior art relating to the use of reinforcing caps or bushings on the ends of cores, it has been proposed to form end caps from sheet metal, for example, as disclosed in U.S. Pats. Nos. 1,137,470, 1,929,037 and 2,760,732. In each of these patents, the metal cap is provided with a notch or recess for receiving a drive pin, and the end portion of the core is also notched for receiving the recess or pin. A similar structure is shown in U.S. Pat. No. 411,140 wherein the end portion of the core is prenotched to receive the notch portion of a reinforcing bushing which is secured to the core by a plurality of circumferentially spaced rivets in a manner similar to that shown in above U.S. Pat. No. 1,137,470. It has also been proposed to cement a reinforcing drive bushing within the end portion of a core, for example, as disclosed in U.S. Pat. No. 659,306.

It has been found desirable to provide for assembling or mounting a reinforcing bushing on the end of a fibrous core simply by pressing the bushing axially into the core and without requiring prenotching or other preforming of the core so that the assembly operation can be performed rapidly and efficiently with automatic or semi-automatic machinery. It is also desirable to form a positive and rigid driving connection between the bushing and the fibrous core merely as a result of pressing the bushing into the core. After carefully reviewing the above patents, it is apparent that each of the core assemblies disclosed in the above patents is lacking in providing one or more of the above desirable features.

SUMMARY OF THE INVENTION

The present invention is directed to an improved core assembly which includes a hollow cylindrical fibrous core reinforced on each end by a molded thermoplastic bushing. Each bushing provides the important advantage of forming a rigid and positive connection with the core when the bushing is pressed axially into the core and thus is ideally suited for high volume production of core assemblies on an automatic or semi-automatic assembling machine. The core assembly of the invention also provides the feature of enabling a number of core assemblies to be conveniently color

coded according to the weight of ribbon fabric or type of ink, simply by molding the corresponding bushings of different preselected colors.

In accordance with a preferred embodiment of the invention, each molded plastic bushing includes an inner cylindrical portion having an external diameter slightly greater than the internal diameter of the fibrous core and which joins a cylindrical pilot portion having an external diameter slightly less than the internal diameter of the core. Each bushing also includes an outer cylindrical portion having an external diameter the same as that of the core and defining a plurality of circumferentially spaced notches or recesses for receiving a drive pin or projection extending from a supporting spindle.

A series of circumferentially spaced and axially extending teeth are molded as an integral part of each bushing and project outwardly from the inner cylindrical portion for piercing the inner surface of the fibrous core by shearing into the core when the inner portion of the bushing is pressed into the core. Each tooth has a radial longitudinal surface, and these surfaces of alternate teeth face circumferentially in opposite directions to assure a positive drive connection between the bushing and the core regardless of the direction in which the core is driven.

Other features and advantages of the invention will be apparent from the following description, the accompanying drawing and the appended claims.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of an ink ribbon fabric roll supported by a core assembly constructed in accordance with the invention;

FIG. 2 is an axial section of one end portion of the core assembly and roll shown in FIG. 1;

FIG. 3 is a section of the core assembly taken generally on the line 3—3 of FIG. 2;

FIG. 4 is a perspective view of one of the bushings shown in FIGS. 1 and 2; and

FIG. 5 is an enlarged fragmentary section of a portion of the assembly shown in FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 shows a ribbon roll 10 which is adapted to be used in a printout machine for a computer and which commonly consists of an ink impregnated fabric 12 normally referred to as a ribbon. The width of the fabric 12 usually ranges between 13 inches and 17 inches depending upon the particular make of the printout machine. The fabric 12 is wound into the roll 10 on a core assembly 15 including a hollow cylindrical fibrous core 16 which consists of overlapping layers of spirally wound cardboard strips and having a wax coating on its outer surface. While the fibrous core 16 will vary in size, a typical core might have an external diameter of 2 5/16 inches, a wall thickness of 3/32 inch and a length corresponding precisely to the width of the fabric 12.

In accordance with the present invention, a molded thermoplastic tubular hub member or bushing 20 is pressed into each end portion of the fibrous core 16 and cooperates therewith to form a core assembly 15. Each of the plastic tubular bushings 20 includes a cylin-

drical inner portion 22 (FIG. 4) having an external diameter slightly greater than the internal diameter of the fibrous core 16 by a few thousandths of an inch. An integrally formed cylindrical pilot portion 24 projects axially inwardly from the inner portion 22 and has an external diameter slightly less than the internal diameter of the fibrous core 16 by a few thousandths of an inch to form an annular radial shoulder 26 which is exaggerated in FIGS. 2-4 for purposes of illustration.

Each of the tubular plastic bushings 20 also includes an outer cylindrical portion 28 formed integrally with the inner portion 22 and having an external diameter precisely the same as that of the fibrous core 16. Thus the outer cylindrical surface of the inner portion 22 and the outer cylindrical surface of the outer portion 28 cooperate to define an annular radial shoulder 32 having a radial depth slightly less than the wall thickness of the fibrous core 16.

A plurality of elongated teeth 34 are formed integrally with the inner portion 22 and the outer portion 28 of each tubular plastic bushing 20 and extend axially from the shoulder 26 to the shoulder 32. The teeth 34 are uniformly spaced at 90° intervals, and each tooth has a radially extending longitudinal surface 36 converging with an angularly related sloping surface 38 to form a sharp outer edge. The end surface 39 of each tooth 34 extend radially flush with the shoulder 26. A series of four uniformly spaced rectangular notches or recesses are formed within the outer portion 28 of each bushing 20 and are adapted to receive a drive pin or stud projecting from a supporting spindle (not shown) in a manner as mentioned above.

To assemble each of the plastic bushings 20 on the fibrous core 16, the inner cylindrical pilot portion 24 is inserted into the corresponding end portion of the core 16 thereby aligning the bushing axially with the core. The bushing 20 is then pressed axially inwardly with a substantial force to cause the inner cylindrical surface of the fibrous core 16 to expand slightly onto the outer cylindrical surface of the inner portion 22 and to cause the teeth 34 to pierce the fibrous core 16 by shearing into the fibrous material. The pressing of each bushing 20 is continued until the shoulder 32 of the bushing engages the corresponding end surface of the core 16 as shown in FIG. 2.

While each bushing 20 may be inserted or pressed separately into the fibrous core 16, preferably both end bushings 20 are pressed simultaneously at an assembly station by opposing rams of a pair of pneumatic cylinders forming part of a semi-automatic assembly machine. In this machine, a plurality of fibrous cores 16 and plastic bushings 20 are automatically and successively fed to the assembly station by corresponding sloping magazines which receive supplies of corresponding bushings 20 or fibrous cores 16. As shown in FIG. 2, it is desirable for the length of the fibrous core 16 to be precisely the same as the width of the fabric 12 to facilitate alignment of the fabric 12 on the core 16 when the inner portion of the fabric 12 is attached to the core by a series of axially spaced staples 45 (FIG. 2).

From the drawing and the above description, it is apparent that a core assembly constructed in accordance with the invention provides desirable features and advantages. For example, the tubular bushings 20 are

economically molded from a thermoplastic material so that the cost of producing the bushings is minimized. In addition, the reinforcement strength and rigidity provided by the bushings 20 enables the wall thickness of the fibrous core 16 to be reduced from that of previously used fibrous cores to provide a significant cost savings.

Another important advantage is provided by the positive and rigid connection obtained between each of the tubular bushings 20 and the fibrous core 16 simply by pressing the bushing axially into the core. That is, by forming the inner portion 22 of each bushing so that its external diameter is a few thousandths greater than the internal diameter of the core 16 and by providing the axially extending teeth 34 on the inner portion 22 of the bushing 20, an extremely rigid and positive connection is formed between each bushing 20 and the fibrous core 16 when the inner portion 22 is pressed into the core. Furthermore, the teeth 34 shear into the inner surface of the fibrous core 16 to assure that there will be no relative rotation between each of the bushings 20 and the core 16. Moreover, by arranging the radial surfaces 36 of the teeth 34 so that the surfaces 36 face circumferentially in opposite directions, the core 16 can be repeatedly driven in opposite directions without any danger of slippage between the core 16 and the driving bushing 20.

The plastic material forming each bushing 20 can also be punctured by the end staples 45 when the leading end of the fabric 12 is attached to the core 16 as shown in FIG. 2. As also mentioned above, the plastic construction of each bushing 20 is also highly desirable from the standpoint of color coding the core assembly 15 according to the weight of fabric 12 or according to the type of ink impregnated within the fabric. For example, the tubular bushings 20 might be molded in red thermoplastic material for a core assembly which supports a four mill fabric 12 and may be molded in blue plastic material for a core assembly which supports a roll of five mill fabric 12.

While the article herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of article, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. For use in a core assembly including an elongated tubular fibrous core, an integral plastic reinforcing bushing adapted to be mounted on an end portion of said core, said bushing comprising a generally cylindrical inner portion adapted to extend into the end portion of said core and having a diameter slightly greater than the inner diameter of the core, a generally cylindrical outer portion projecting from said inner portion and having an outer diameter greater than the outer diameter of said inner portion to define an annular shoulder for engaging the end of the core, means defining at least one recess within said outer portion of said bushing for receiving a driving projection, and a plurality of axially extending radially projecting teeth on said inner portion, said teeth including one face extending angularly from said inner portion and another face extending radially from said inner portion and intersecting said one face along a sharp edge adapted to

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pierce said fibrous core during insertion of said inner portion of said bushing axially into said core to form a positive driving connection between said bushing and said core, at least two of said teeth having their respective said radially extending faces oriented in opposite directions around the periphery of said bushing.

2. A bushing as defined in claim 1 including a con-

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centric cylindrical pilot portion projecting axially from said inner portion of said bushing and having an outer diameter slightly less than said outer diameter of said inner portion of said bushing to facilitate axial alignment of said bushing with said core before said bushing is pressed into said core.

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