March 18, 1969 D. M. WILLIS 3,433,432

YARN PACKAGE SUPPORT

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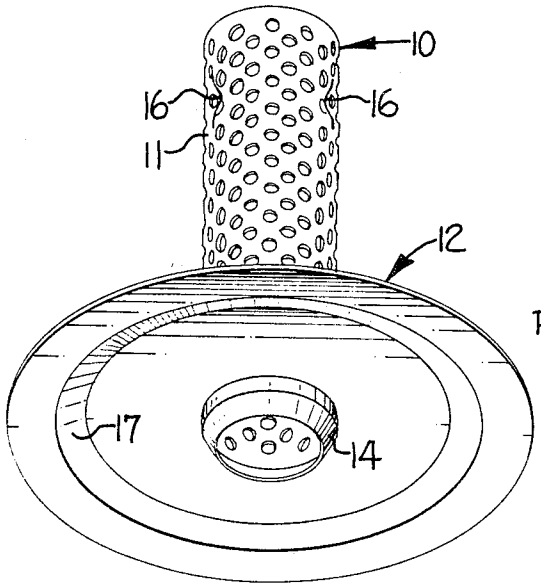


Fig-1

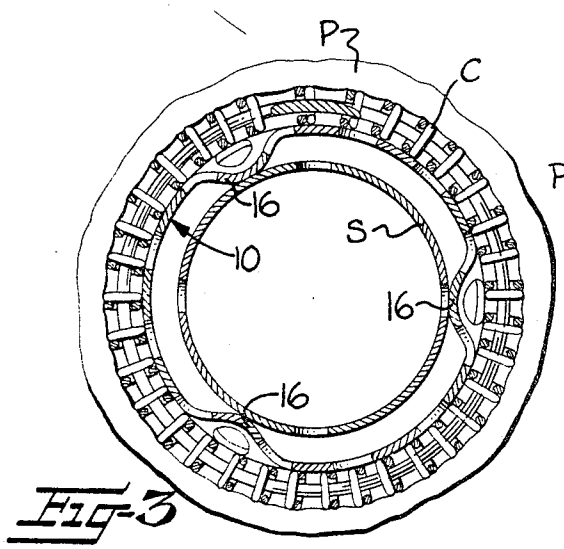


Fig-3

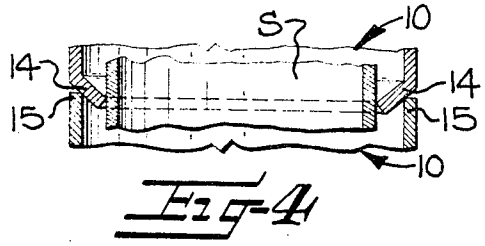


Fig-4

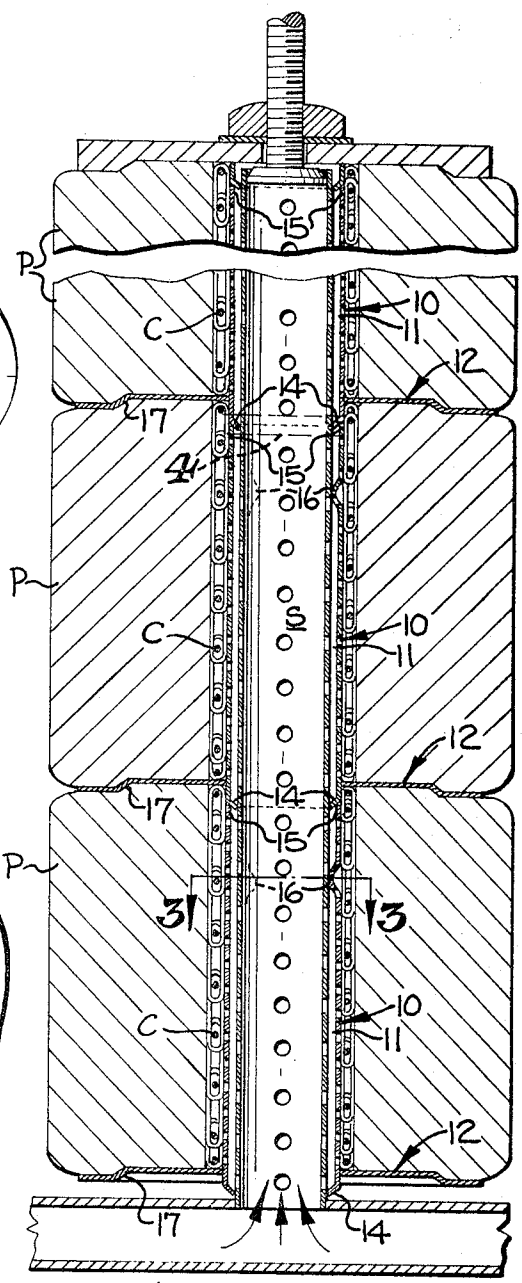


Fig-2

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# YARN PACKAGE SUPPORT

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## ABSTRACT OF THE DISCLOSURE

A yarn package support wherein a longitudinally rigid and foraminous elongate tubular portion includes male and female terminal extremities for mating engagement with adjacent like supports and a package abutment means carried by the tubular portion aids in limiting compression of a yarn package supported on the support.

In certain processes for the treatment of textile yarns, the yarns are formed into packages and are then subjected to the flow of liquids, such as dye liquor, through the package. In apparatus for flowing liquids through yarn packages, one conventional manner in which such liquid flows are obtained provides for columnar stacking of a plurality of yarn packages on a spindle, with liquid then being pumped in a flow path radially through the yarn packages and longitudinally along the spindle. In liquid treatment operations of this type, certain difficulties have heretofore been present which have resulted in less than optimum control over the proper flow of liquids through the yarn packages.

More particularly, where the yarn packages stacked in columnar relation on the spindle are of a type which is longitudinally compressible and a longitudinally compressing force is applied to the packages by the assembly of the liquid treatment apparatus, compression of the packages will vary along the height of the spindle. Those packages closer to the location at which the longitudinally compressing force is applied will be compressed to a greater extent. As the result of the greater compressing of packages in one portion of the column height, pumped liquid flows more freely through the less compressed packages and an even distribution of flow is not obtained.

A further difficulty arises with the "weeping" or cross-wicking of liquid between adjacent packages in the stacked columnar arrangement once the forced flow of liquids radially through the packages has ended. More particularly, cross-wicking of liquid from the upper packages in the columnar stack into the lower packages in the stack results in an uneven drying of the packages, as packages in the lower positions in the column receive and retain a greater concentration of the liquid.

As is apparent upon consideration of these flow pattern problems, particular difficulty develops where the liquid involved is a dye liquor, as occurrence of either difficulty alone will result in uneven appearance of the dyed yarn.

In view of the aforementioned difficulties heretofore encountered in liquid treatment processes for yarn packages, it is an object of the present invention to provide a yarn package support adapted to cooperate with a longitudinally compressible yarn package and a spindle on



which the package is supported in stacked columnar relation with other like packages and supports in such a manner that the difficulties heretofore present are avoided.

A more particular object of this invention is to provide a yarn package support including a longitudinally rigid and foraminous elongate tubular portion and a package abutment means which cooperate with a yarn package, when the package and support are arranged in stacked columnar relationship with other like packages and supports on a spindle for a liquid treatment process, by assuring more uniform compression of yarn packages, restricting the flow of liquid along undesirable flow paths, and diverting a downward flow of liquid within packages to preclude cross-wicking between packages.

Some of the objects and advantages of the invention having been stated, others will appear as the description proceeds, when taken in connection with the accompanying drawings, in which:

FIGURE 1 is a perspective view, from below, of a support in accordance with the present invention;

FIGURE 2 is an elevational view, in partial section, of a column of packages and supports arranged in stacked relation on a spindle for the flow of liquid longitudinally of the spindle and radially of the packages;

FIGURE 3 is a sectional view through a portion of a package and support, taken substantially along the line 3—3 in FIGURE 2; and

FIGURE 4 is an enlarged elevation, in partial section, of a portion of two adjacent supports and the spindle, taken as indicated in FIGURE 2.

Referring now more particularly to the application drawing, a yarn support **10** in accordance with the present invention is there shown in perspective from below (FIGURE 1), and the novel features thereof will hereinafter be described in conjunction with the illustrations. The yarn support **10** comprises a longitudinally rigid and foraminous elongate tubular portion **11**, such as may be formed from perforate wall stainless steel tubing, and a package abutment means, generally indicated at **12**, carried by the tubular portion **11**. Preferably, the package abutment means **12** comprises a generally planar flange, secured to the tubular portion **11** adjacent one terminal extremity thereof so as to be perpendicular to the longitudinal axis of the tubular portion **11**. As herein used, "foraminous" refers broadly to a construction of the tubular portion **11** which permits free radial flow of liquid while maintaining longitudinal rigidity.

In order to assure proper liquid flow through a longitudinally compressible yarn package while the package and a support are mounted in columnar stacked relation on a spindle with other such packages and supports for the circulation of liquid longitudinally of the spindle and radially through the support and package, the support **10** is preferably so constructed that the tubular portion **11** thereof is of predetermined dimensions correlated to the dimensions of a yarn package and a spindle. More particularly, the predetermined dimensions of the tubular portion **11** are such that the outside diameter of the tubular portion is of uniform diameter at least throughout the major extent thereof and is smaller than the inside diameter of the yarn package to be supported thereon, and the inside diameter of the tubular portion is a pre-

determined amount larger than the outside diameter of the spindle on which the support and package are to be mounted. Due to these diametrical relationships, the tubular portion **11** is adapted to fit loosely within the central opening of a yarn package, such as the package P (FIGURE 2) and to fit loosely around a spindle, such as the spindle S. The length of the tubular portion **11** is a predetermined amount shorter than the free length of the package P when the same is in an uncompressed state so that, when initially assembled for mounting on the spindle S, the tubular portion **11** does not penetrate entirely the full height of the package P.

In order to restrict liquid flow radially between the terminal extremities of adjacent supports **10** when the same are positioned in stacked relation on the spindle S, and thereby present resistance to liquid flow radially of the supports adjacent the terminal extremities of the tubular portions **11**, the tubular portion has male and female terminal extremities for matingly engaging respective male and female extremities of adjacent supports when stacked therewith. More particularly, one terminal extremity of the tubular portion **11** (namely the lower extremity **14** in FIGURE 1) is beveled or turned inwardly so as to define a reduced diameter male portion. The opposite extremity of the tubular portion **11** (namely the upper extremity **15** in FIGURE 1) is formed to provide a female portion for receiving therewithin the reduced diameter male portion of an adjacent support **10** when the same are positioned in stacked relation on a spindle. As illustrated, the female extremity **15** is of the same diameter as the principal body portion of the tubular portion **11**, but it is to be understood that the female extremity **15** may be of larger or smaller diameter than the tubular portion **11**, so long as the mating engagement of the male extremity of an adjacent support **10** is maintained and proper cooperation with the packages P and the spindle S is obtained.

In order to further assure that proper mating engagement of male and female extremities of adjacent supports positioned in stacked relation on a spindle is obtained, this invention contemplates that the support **10** further include means for engaging a spindle and positioning the female extremity **15** of the tubular portion **11** substantially concentric with the spindle, so as to facilitate reception of a mating male extremity of an adjacent support. Also, the tubular portion **11** preferably further includes means for engaging a spindle and positioning the male extremity substantially concentric with the spindle so as to further facilitate mating engagement with the female extremity of an adjacent support. In the form illustrated, the means for positioning the female terminal extremity includes a plurality of dimples or inward projections **16** formed by pressing the material of the tubular portion **11** inwardly. Preferably, the inward projections **16** are three in number and the internal diameter of the circle defined by the inward projections **16** substantially corresponds to the external diameter of the spindle S. Accordingly, with a three point engagement of the spindle S, the female extremity **15** of the tubular portion **11** is positioned substantially concentrically with the spindle S. The means for positioning the male extremity **14** of the support **10**, in the illustrated embodiment, comprises the inner surface of the reduced diameter portion of the tubular portion **11**, which preferably has an internal diameter closely approximating the external diameter of the spindle S. Certain of these relationships become more clear from a sectional view of matingly engaged male and female terminal extremities of adjacent supports (FIGURE 4).

In order to prevent cross-wicking of liquid between adjacent packages P in columnar stacked relationship on the spindle S, this invention contemplates that the package abutment means **12** take the form of an imperforate flange having an outside diameter at least two and one-half times that of the tubular portion **11** and preferably approximating that of the packages P. When the package abutment means **12** is in such flange form, termination of radial flow of liquid through the packages P results in flow of liquid remaining in the yarn of the package downwardly until the liquid encounters the next lower flange. The flow of fluid is then diverted to the outside of the columnar stack of packages P, rather than being permitted to cross-wick into the next adjacent package below. Preferably, economy of manufacture of the support **10** is obtained by forming the flange form abutment means **12** from a relatively thin sheet material such as stainless steel. In such an instance, structural rigidity and strength of the flange are enhanced by forming the flange with a conical zone **17** intermediate the inner and outer peripheries of the planar circular member forming the flange.

It is contemplated that the length relationship between the longitudinally rigid tubular portion **11** and the free length of the uncompressed yarn packages P impart a further advantage to the support **10** of the present invention. More particularly, it is desirable to obtain uniform compression of the yarn in the packages P in columnar stacked relationship on the spindle S. Inasmuch as the same are secured to the spindle S for the liquid treatment by applying a longitudinal force to the packages, obtaining uniform compression thereof can be difficult, particularly where a longitudinally compressible core C such as that shown, for example, in Annicq Patent No. 2,614,764 is used in the package. Such longitudinally compressible cores have a natural free length and tend to cause high compression of packages in one portion of the column, adjacent the location at which compressive force is applied, while permitting little or no package compression at portions of the column remote from the location of force application. A predetermined relationship of length for the supports **10** used with such packages permits obtaining uniform distribution of package compression by bringing all of the supports **10** in a particular column into end abutting and mating engagement. As this occurs, the compressed length of the column is determined solely by the total of the length of the engaged supports **10**, and each package P is subjected to substantially the same compressive force as all other packages in the same column, provided that the packages are of substantially uniform free length and compressibility when in the uncompressed state.

In brief summary, it is believed apparent that the support **10** of the present invention provides advantages by restricting radial flow of liquid between matingly engaged terminal extremities of adjacent stacked supports so as to assure more uniform liquid flow, diverting free vertical flow of liquid retained within packages P so as to avoid the effects of cross-wicking between packages, and controlling the degree of compression of a plurality of packages P in a stacked columnar relationship on a spindle S. These advantages are obtained through the provisions of male and female terminal extremities for the tubular portion of the support, an imperforate flange package abutment means carried by and extending from the tubular portion and the relationship of these and other subsidiary features as described hereinabove.

In the drawings and specification, there has been set forth a preferred embodiment of the invention, and although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation.

I claim:

**1.** A yarn package support adapted to be arranged in columnar stacked relation with other like supports on a spindle in a liquid treating vessel to support a series of longitudinally compressible yarn packages in compressed condition for aiding in proper flow of a treatment liquid radially therethrough, said yarn package support comprising a longitudinally rigid and foraminous elongate tubular portion of uniform external diameter at least throughout the major extent thereof and being of predetermined

length adapted to be surrounded by a compressed yarn package, said tubular portion being internally unobstructed for positioning on the spindle, said tubular portion also having its opposite ends constructed to define male and female terminal extremities, respectively, for mating engagement with the ends of adjacent supports when stacked with such supports and compressed yarn packages on a spindle, and package end abutment means carried by said tubular portion and extending radially outwardly therefrom at a predetermined location adjacent one end thereof and adapted to abuttingly engage an end face of a yarn package, said abutment means on adjacent supports when in said columnar stacked mating relation being positioned and maintained in a predetermined spaced relationship for aiding in limiting the compression of the yarn package.

2. A yarn package support according to claim 1 wherein said male terminal extremity on said tubular portion is inwardly beveled.

3. A yarn package support according to claim 1 wherein said tubular portion further includes means for engaging a spindle and positioning said tubular portion substantially



concentric with said spindle so as to facilitate mating engagement of the support with an adjacent support.

4. A yarn package support according to claim 1 wherein said tubular portion has a plurality of inward projections arranged for engaging a spindle to facilitate mating engagement of the support with an adjacent support.

**References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 2,153,420 | 4/1939 | Huttinger | 68—198 |
| 2,439,314 | 4/1948 | Mulligan et al. | 68—189 |
| 2,853,253 | 9/1958 | Tigges | 242—118.11 |
| 2,936,964 | 5/1960 | Tigges | 242—118.1 |
| 2,942,801 | 6/1960 | Cederberg. | |

FOREIGN PATENTS

| | | |
|---|---|---|
| 695,151 | 8/1953 | Great Britain. |

GEORGE F. MAUTZ, *Primary Examiner.*

U.S. Cl. X.R.

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