

July 16, 1963

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3,097,515

SEAL FOR YARN PACKAGE TREATING APPARATUS

Filed Jan. 18, 1962

2 Sheets-Sheet 1

Fig. 1.

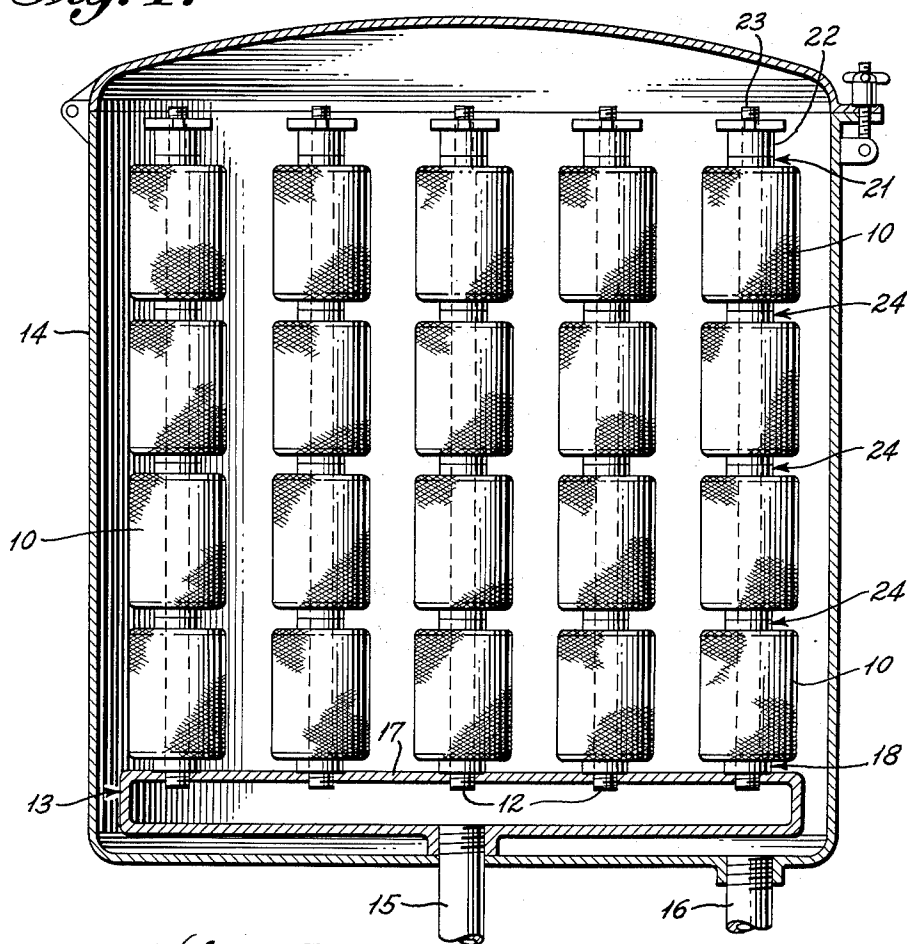


Fig. 4.

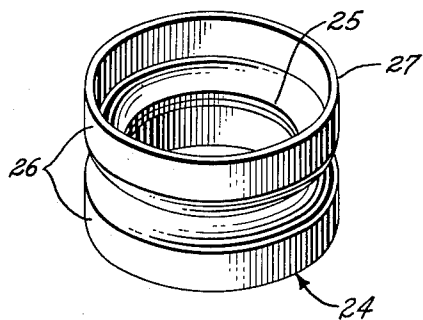
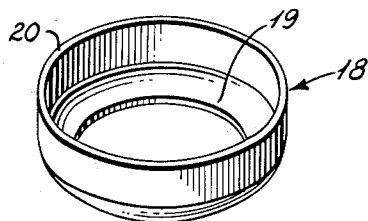


Fig. 3.



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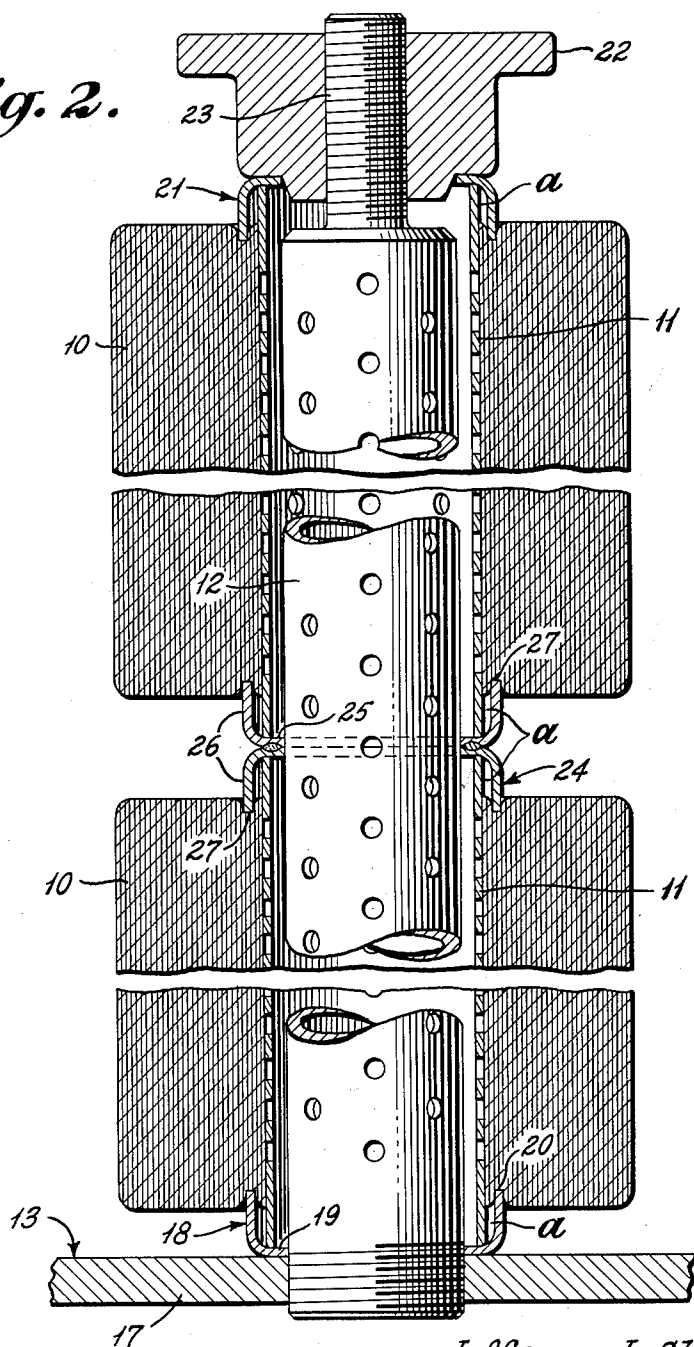
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Fig. 2.



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SEAL FOR YARN PACKAGE TREATING APPARATUS

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1 Claim. (Cl. 68—198)

This invention relates to the liquid treatment of cotton yarn and more particularly to the liquid treatment of cotton yarns in package form.

In the liquid treatment of yarns, both synthetic and natural, it has long been the practice to wind the yarns to be treated into package form, the winding being controlled in such a way as to produce a package of substantially uniform permeability. These permeable packages are wound upon supporting tubes which are hollow and perforated so that liquid may be forced radially through the tube and through the package to accomplish the desired treatment. It is not economically feasible to treat one package at a time, and for this reason the packages are arranged in vertical stacks, and are connected together with their hollow tubes in end to end registry, mutually interconnected, so that the treating liquid may be supplied in common to a vertical stack of packages.

In interconnecting the tubes in vertical stacks it has heretofore been the practice to use a ring having a projecting flange extending radially outwardly between two tapered portions intended to fit into the adjacent ends of the tubes of adjacent packages, the actual ends of the tubes resting upon opposite sides of the outwardly projecting flange. While this arrangement has been widely used for a number of years, it has been found that it does not, in fact, seal properly with the result that there is leakage around the seal resulting in inadequate pressure and flow. Inadequate sealing causes gradated flow in each package and from package to package which results in non-uniform treatment and yarn damage due to impingement of high velocity fluids on the end of the package. The loss also reduces the efficiency of the pumps.

Attempts have been made to improve these interconnectors by making them of sealing materials such as synthetic rubbers, plastics and the like. Gaskets have been tried but all of these attempts have not been successful because the softer materials do not wear well under compression and are not as resistant to processing chemicals as would be desirable. Furthermore, seals of such materials are more costly than the metal ones. Accordingly, the problem of leakage in package processing of yarns has existed up to the present.

It is an object of this invention to interconnect stacked packages of wound yarn in a leak-proof fashion such that the liquid treatment is uniform for the entire length of the stack and for the entire length of each package in the stack and for each stack.

According to the present invention there is provided an economical interconnector for hollow tubes which is wear resistant and resistant to processing chemicals and dyes and which is capable of maintaining an excellent seal between adjacent coaxially arranged yarn packages.

Other objects and advantages of this invention will be apparent upon consideration of the following detailed description of a preferred embodiment thereof in conjunction with the annexed drawings:

FIGURE 1 is a view in vertical section showing a dye vessel having mounted therein cotton yarn packages arranged in vertically stacked groups for dyeing;

FIGURE 2 is a vertical sectional view through one of the stacks of packages shown in FIGURE 1 in order to illustrate the seals of the present invention as they are

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used at the top and bottom of a stack as well as between adjacent packages of a stack;

FIGURE 3 is an isometric view to an enlarged scale of and end seal constructed according to the teachings of the present invention; and

FIGURE 4 is a view similar to FIGURE 3 but showing the seal which is used between adjacent packages.

Referring now in greater detail to FIGURES 1 and 2 of the drawings, it can be seen that the packages 10 of yarn are wound on perforated, hollow cylindrical tubes 11 and are arranged in vertical stacks over vertically extending perforate conduits 12 supplied with liquid from a manifold 13. The stacks of packages are enclosed in a liquid-proof vessel 14 having a hinged cover held in place, pressure tight, by one or more hand nuts.

The liquid treatment is effected by supplying the treating liquid, for example a dye, under pressure. Thus the liquid is delivered by pumps, not shown, to conduit 15 leading to manifold or header 13. The liquid fills the perforated riser conduits or tubes 12 and passes through the perforations of tubes 12 and the perforations of tubes 11. The pressure of the treating liquid is such as to cause it to pass radially through the convolutions of yarn forming each package 10. The yarn is, of course, wound by means known to the art in such fashion that the package is permeable to the treating liquid passing radially therethrough. After the treating liquid has passed through the packages it enters the container 14. Once the container 14 is filled, circulation of liquid is in through conduit 15 and out through conduit 16. This flow direction may be reversed and alternated as desired. It is continued until the liquid treatment is complete. Where soaking is required, the circulation may, of course, be interrupted.

In effecting a liquid treatment of the type described, it is very important that the tubes be connected together in such fashion as to prevent leakage between the packages or at the ends of the stacks. It is to the prevention of this leakage that the present invention is addressed.

Above the tube sheet 17 forming the top of header or manifold 13 there is placed an annular seal 18. The shape of this seal is apparent from FIGURES 2 and 3. The seal is an integral generally cylindrical body of stainless steel and includes a flange 19 extending radially inwardly and an annular sealing surface 20 axially spaced from the flange 19 parallel to it but having a greater diameter than flange 19 so that it may contact the yarn. One end of the lowermost tube of the stack rests on the upper surface of flange 19 while the lower surface of flange 19 rests against tube sheet 17.

A seal 21 structurally identical to seal 18 but inverted relative thereto is located at the top of each stack. The lower surface of the inwardly projecting flange of the seal 21 engages the upper end of the uppermost tube of the stack while the opposite surface of the flange of the seal 21 engages the under surface of a nut 22. The nut 22 fits over a threaded stud 23 projecting from the upper end of the conduit 12. The lower end of the tube is threaded into tube sheet 17. Thus it is that by turning nut 22 the packages of any given stack may be placed in axial compression.

Between adjacent packages of each stack there is located a seal 24 designed according to the present invention and illustrated in FIGURES 2 and 4. Seal 24 is made by welding together two seals such as 18 or 21 with the outside surfaces of the radially inwardly extending flanges in abutting relationship. Thus, seal 24 has a centrally located flange 25 which extends radially inwardly of the body. Projecting axially from the flange 25 in opposite directions are cylindrical walls 26 terminating

in end faces 27 parallel to flange 25 but of greater diameter to contact the yarn.

The manner of functioning of the seals 18, 21 and 24 can be understood by reference to FIGURE 2. When nut 22 is drawn down (toward tube sheet 17) axial pressure is exerted on the tubes 11. Their ends bear against the respective surface of the inwardly projecting flanges of the seals 18, 21 and 24 preventing, in considerable measure, escape of liquid from the ends of the tubes 11. A still greater sealing function is effected by the end surfaces such as 20 and 27 and the equivalent part of seals 21. These surfaces actually bear against the ends of the package itself and, as the package becomes distended, the seal becomes so tight that liquid escaping between the flange of the seals and the tube ends, reenters the package from the annular areas designated *a* in FIGURE 2. The flow is necessary and the internal pressure is equalized by the pressure in the package.

Of course, the utility for such seals is that the liquid treatment does not vary lengthwise of the package or of the stack resulting, in the case of dyeing, in high dye uniformity of the finished product.

While the seals of the present invention have been described as virtually hollow cylindrical bodies with inwardly projecting flanges, this body may be bell-shaped or may flare out from the region of the flange in any convenient manner so long as the surface which seals against the package has a diameter greater than that of the flange. It may incorporate configurations which have greater or less control over flow in this area. While the surfaces 20 and 27 have been described as being flat and parallel to flanges 19 and 25, respectively, these surfaces may be rounded or pointed if this suits manufacturing convenience. Further, while it is preferred to construct the seals of the present invention out of stainless

steel, plastics may be used in the present case much more advantageously than with the prior art due to the fact that the compression of the bobbin ends against the flange need not be excessive since it is not this pressure which produces major sealing but rather the engagement of the annular ends of the seal with the end convolutions of the package; and this seal is promoted by the distension of the package which occurs as the liquor is pumped through it.

What is claimed is:

In apparatus for the liquid treatment of packages of yarn including a plurality of yarn packages, a perforated bobbin extending axially through each package and means to axially compress a group of said packages in a stack with the ends of their respective bobbins in registry, the improvement that comprises a seal for sealing the ends of said packages having a substantially cup-shaped body associated with each end of each yarn package, the bottom wall of said body defining an opening of a diameter less than that of said bobbin, said bottom wall forming a bearing surface for receiving the end of one of said bobbins, the side wall of said body having an annular edge at its periphery of a diameter slightly greater than that of said bobbin to dig into and form a seal against the respective yarn package under the bias of said compression means.

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