

**Dec. 28, 1965**

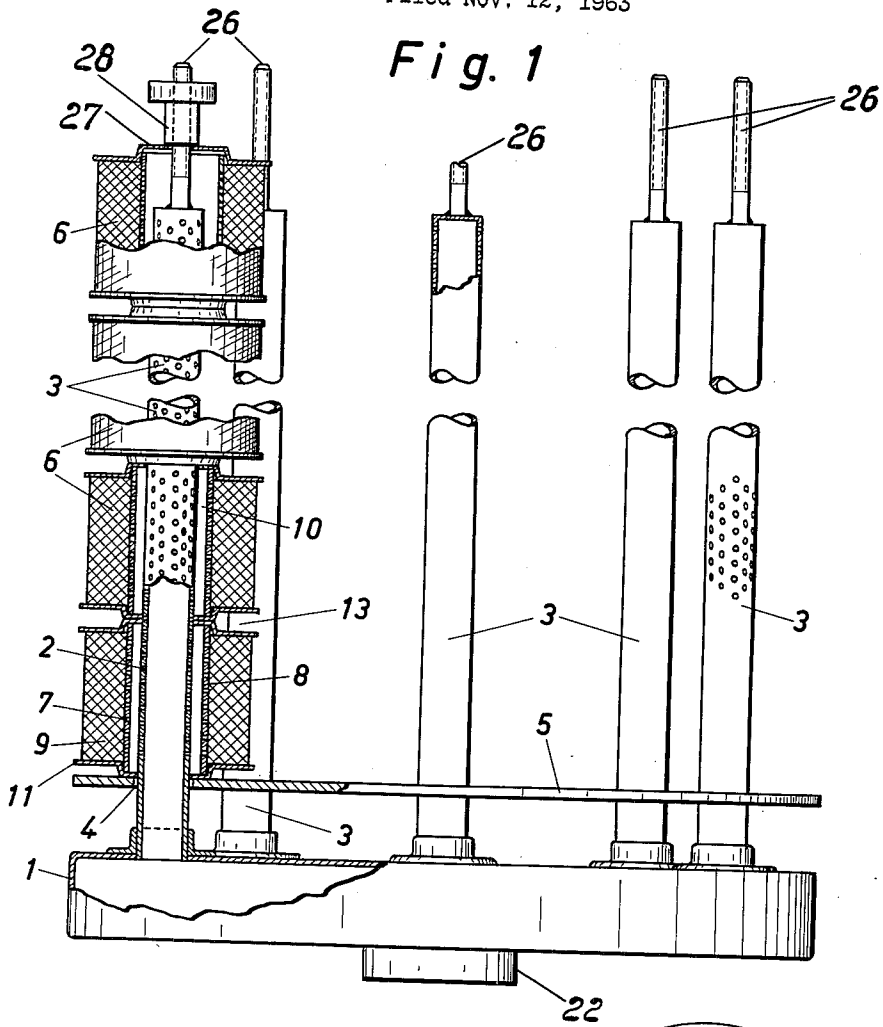
**A. JOHNELS**

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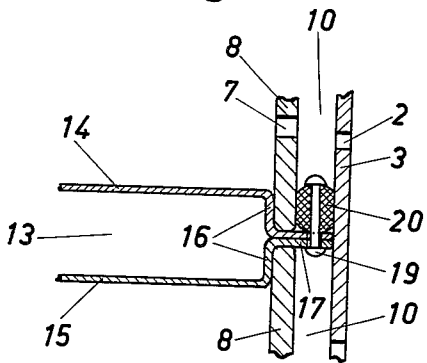
# YARN DYEING APPARATUS

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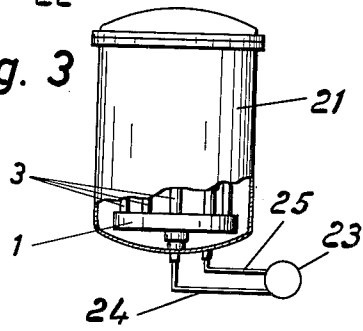
*Fig. 1*



*Fig. 2*



*Fig. 3*



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## YARN DYEING APPARATUS

Arne Johnels, 128 Goteborgsvagen, Boras, Sweden

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2 Claims. (Cl. 68—198)

The present invention relates to yarn dyeing apparatus of the kind wherein a number of perforated sleeves on which the yarn to be dyed is wound are disposed in a dye liquid tank and the dye liquid is caused by a pump to circulate through the tank and substantially radially through the spools of yarn.

With previously known yarn dyeing apparatus of the kind set forth above it has been difficult to obtain the desired uniformity of the dyeing due to individual variations in the flow resistance presented by the yarn spools or bobbins causing a smaller volume of dye liquid to pass through some of the spools than through the others.

The invention has for its object to overcome this inconvenience by providing a dyeing apparatus wherein all of the yarn spools or bobbins will be subjected to the through-flow of substantially equal amounts of dye liquid.

The invention is a yarn dyeing apparatus of the kind hereinbefore described and is characterised in that each of said sleeves encloses a separate limited space communicating with the perforations of the sleeve and with the dye liquid supply, the resistance to flow between said supply and said space being considerably higher than the resistance to flow through the perforations of the sleeve.

In one type of dyeing apparatus the spools or bobbins are disposed in the tank in a number of stacks with the spools in each stack being disposed co-axially relative to one another. According to the invention, in such an apparatus there may be provided, for receiving each stack of spools, a tube of preferably cylindrical shape which is closed at one end and has its other end connected to a distribution chamber for the dye liquid and which is provided with openings in its wall evenly distributed along the length of the tube, the outer diameter of said tube being so much smaller than the inner diameter of the yarn-carrying sleeves placed thereon that between the tube and the sleeves there will be formed a space of annular cross section. Such an embodiment of the invention is also characterised in that the sum of the areas of the openings or perforations in all of the sleeves in one stack of spools is larger than the sum of the areas of said side openings in the tube carrying said stack and the last-mentioned sum is smaller than the internal cross-sectional area of the tube, said space formed between the tube and the sleeves being divided to form said separate limited spaces by means of sealing means provided at the abutting ends of each pair of sleeves.

Between each pair of adjacent spools in a stack there may be provided a circular plate or similar spacer member provided with an opening for the tube which carries the stack of spools, and according to the invention said sealing means may then comprise a ring of elastic material attached to one side of each spacer element adjacent its opening, each of said sealing rings, when not compressed, having an inner diameter slightly smaller than the outer diameter of the tube and an outer diameter slightly larger than the inner diameter of said sleeves.

One embodiment of the invention is illustrated in the accompanying drawing wherein:

FIGURE 1 is a side elevation, with parts broken away and partly in section, of certain parts of a yarn dyeing apparatus according to the invention,

FIGURE 2 is a section to a larger scale through a portion of FIGURE 1, and

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FIGURE 3 is a side elevation to a smaller scale of the dye liquid tank with a portion of the tank wall broken away.

In the drawing, numeral 1 indicates a distribution chamber which is provided at the lower end of a dye liquid tank 21. At the under side of the distribution chamber 1 there is provided a connection sleeve 22 for connecting the interior of the distribution chamber to the pressure side of a circulation pump 23 (FIG. 3) by means of a pipe 24. The suction side of the pump is connected to the tank 21 at the bottom thereof by means of a pipe 25. A number of tubes 3 projecting upwardly from the distribution chamber are closed at their upper ends and are provided with a number of openings 2 in its wall evenly distributed along each tube. A plate 5 disposed on top of the distribution chamber is provided with openings 4 through which the tubes 3 extend. The plate 5 is intended to support a number of cheese-wound yarn spools 6 and is adapted to be raised and lowered in the tank for removing dyed cheeses therefrom and for inserting a new batch of cheeses, respectively. Each cheese comprises a sleeve 8 which is perforated by holes 7 and on which the yarn to be dyed is wound up into the form of spools 9, the inner diameter of the sleeves 8 being so much larger than the outer diameter of the tube 3 that there will be formed a space 10 of annular cross section between the sleeves 8 and the tube. At the lower end this space is sealingly closed by means of an annular plate or washer 11 which is placed on the tube 3 and supports the lowermost cheese.

Between the cheeses there are provided spacer elements indicated generally by the reference 13 placed on the tube, each spacer element being composed of two interconnected annular and substantially flat plates 14, 15, each having a central opening surrounded by a short cylindrical portion 16 from which a flat annular flange portion 17 extends to adjacent the tube 3 (see FIGURE 2). The two plates 14, 15 have their flat annular portions 17 lying flat against one another and interconnected by means of pins 19 by means of which a sealing ring 20 of elastic material is secured to each pair of plates 14, 15 around their inner opening and spaced from the cylindrical portion 16 of the plate 14. The inner diameter of said sealing ring is slightly smaller than the outer diameter of the tube 3 and the outer diameter of the ring is slightly larger than the inner diameter of the sleeves 8 so that, when the spacers 13 and the cheeses 6 are placed on the tube 3, the sealing ring 20 will sealingly press against both the outer side of the tube 3 and the inner side of the sleeves 8 which have their lower edge portions inserted in the annular spaces between the rings 20 and the cylindrical portions 16 of the plates 14.

As shown in FIG. 1, each tube 3 is extended at its upper closed end by a stud 26. After a full stack of cheeses 6 has been placed on a tube 3, a washer plate 27 is placed on the stud 26 on top of the uppermost cheese, and a nut 28 is placed on the stud end and tightened against the washer 27 for pressing the lower ends of the sleeves 8 firmly into the annular spaces between the cylindrical portions 16 of the spacer plates 14 and the sealing rings 20, as illustrated in FIG. 2.

By means of the sealing rings 20 at the abutting ends of each pair of cheeses 6 the space 10 between the sleeves and the tube will be sealingly divided into smaller compartments, one for each of the cheeses 6 and each surrounded by the sleeve 8 of the corresponding cheese. The openings 7 in the sleeves 8 and the openings 2 in the tube 3 have such dimensions that the sum of the areas of the openings 7 in all of the sleeves 8 placed on a tube 3 will be larger than the sum of the areas of all of the openings 2 in the tube 3, the last-mentioned sum in turn

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being smaller than the internal cross-sectional area of the tube 3.

By virtue of the above-described arrangement substantially the same pressure may be maintained in the separate spaces between the sleeves 8 and the tube 3 by means of a circulation pump of reasonable capacity, so that all of the yarn spools 9 will be subjected to substantially the same rate of through-flow of dye liquid.

The invention is not limited to the embodiment which has been described hereinbefore and shown in the drawing as an example only, said embodiment being capable of modifications with respect to its details without departing from the following claims. The seals between the spacer elements 13 and the tube 3 may for instance be made in the form of labyrinth packings.

What I claim is:

1. A yarn dyeing apparatus comprising a tank, a distribution chamber positioned in said tank, means for circulating dye liquid through said distribution chamber and from said tank, perforated tubes coaxially arranged in said tank, each being of a cylindrical configuration closed at one end, connected at its opposite open end to said distribution chamber and provided with openings in its side wall evenly distributed along the length of its tube, a plurality of perforated sleeves on which the yarn to be dyed is wound and which sleeves are stacked on said tubes, each of said tubes having an outer diameter which is smaller than the inner diameter of the sleeves stacked thereon providing an area of annular cross-section therebetween, the sleeves stacked on each tube having the sum of the

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areas of all their perforations being larger than the sum of the areas of said wall openings in the tube carrying said stack and the last mentioned sum being smaller than the internal cross-sectional area of said tube and sealing means provided between each pair of sleeves on a tube and their respective tube separating said area of annular cross-section therebetween into separate spaces each alongside one of said sleeves.

2. A yarn dyeing apparatus as claimed in claim 1, wherein said sealing means each consists of plates each having an opening with one of said tubes extending there-through and each pair of plates extending between an adjacent pair of sleeves on their tubes, rings of elastic material each attached to one pair of said plates adjacent their opening and each of said rings, when not compressed, having an inner diameter slightly smaller than the outer diameter of their respective tube and an outer diameter slightly larger than the inner diameter of said sleeves.

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IRVING BUNEVICH, *Primary Examiner.*