# United States Patent

**Vorderbruegge et al.**

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## [54] APPARATUS FOR THE TREATMENT OF WEBS OR YARNS


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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.**.....**68/150**

[51] **Int. Cl.**.....**B05c 8/02**

[58] **Field of Search**.....68/150, 208, 189; 8/155



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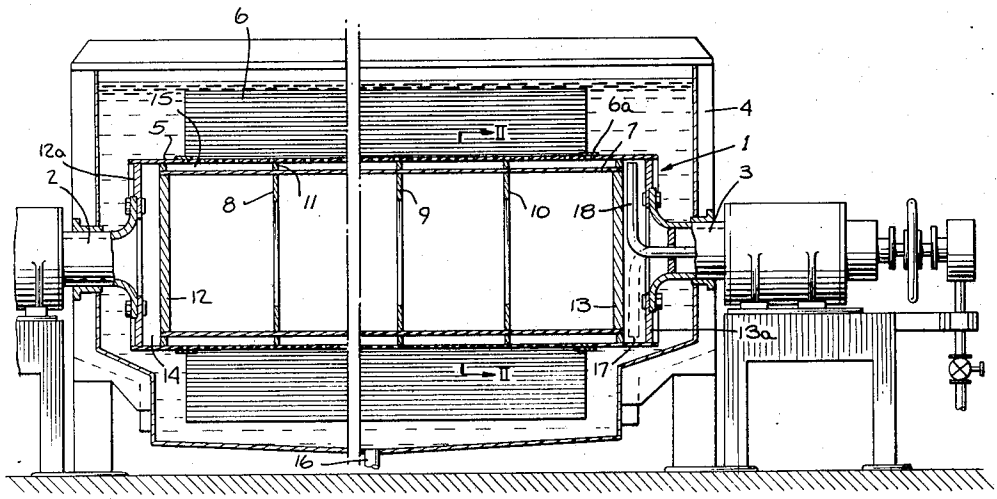
[57] **ABSTRACT**

Apparatus for the fluid treatment of thread or sheet-like material with fluids comprising, a perforated drum about which the material to be treated is wrapped, and characterized in that a member is arranged within the drum to reduce the space therein to be occupied by the fluid so that efficient treatment may be effected with a relatively small amount of fluid.


**8 Claims, 4 Drawing Figures**



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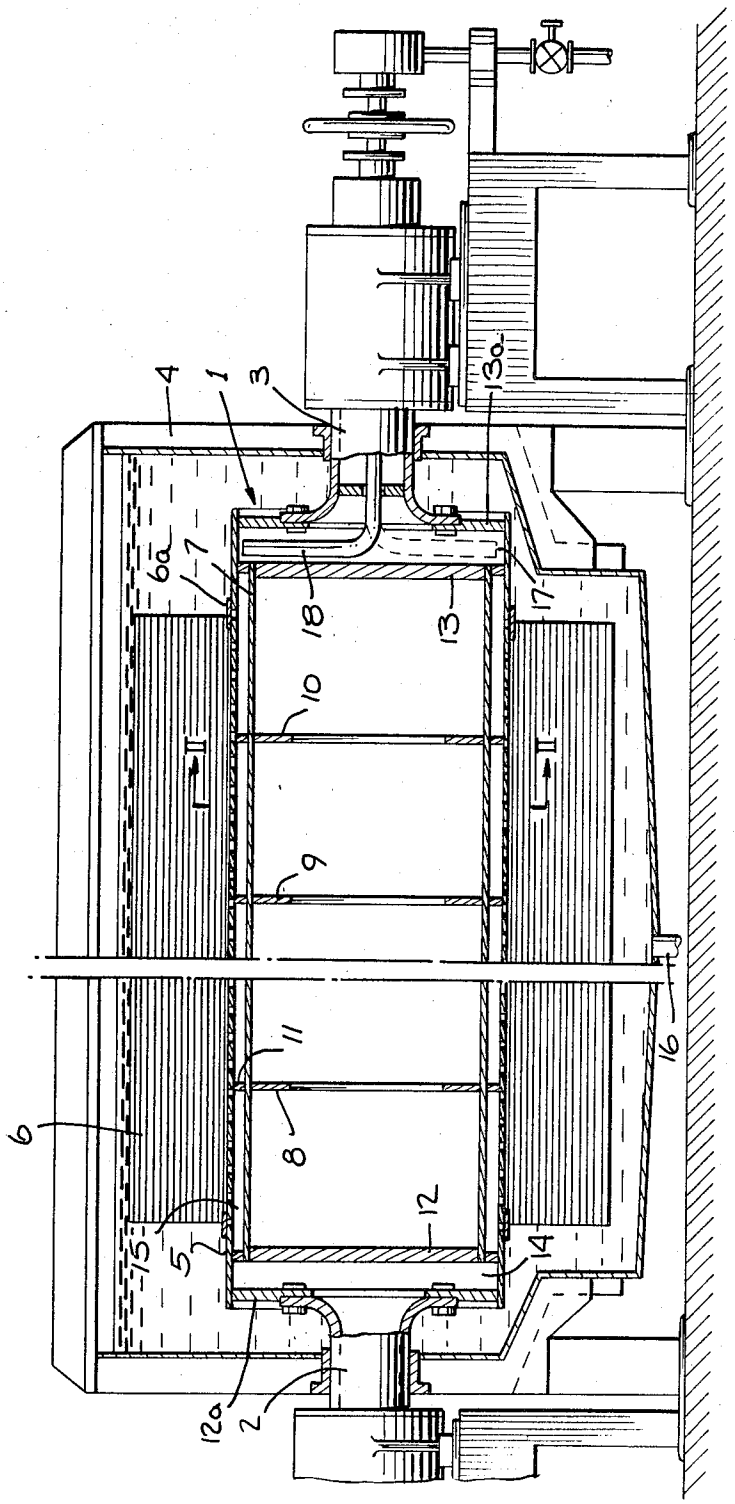


Fig. 1.

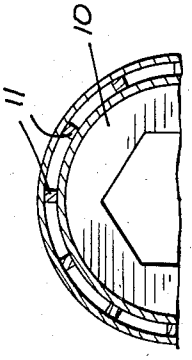


Fig. 2.

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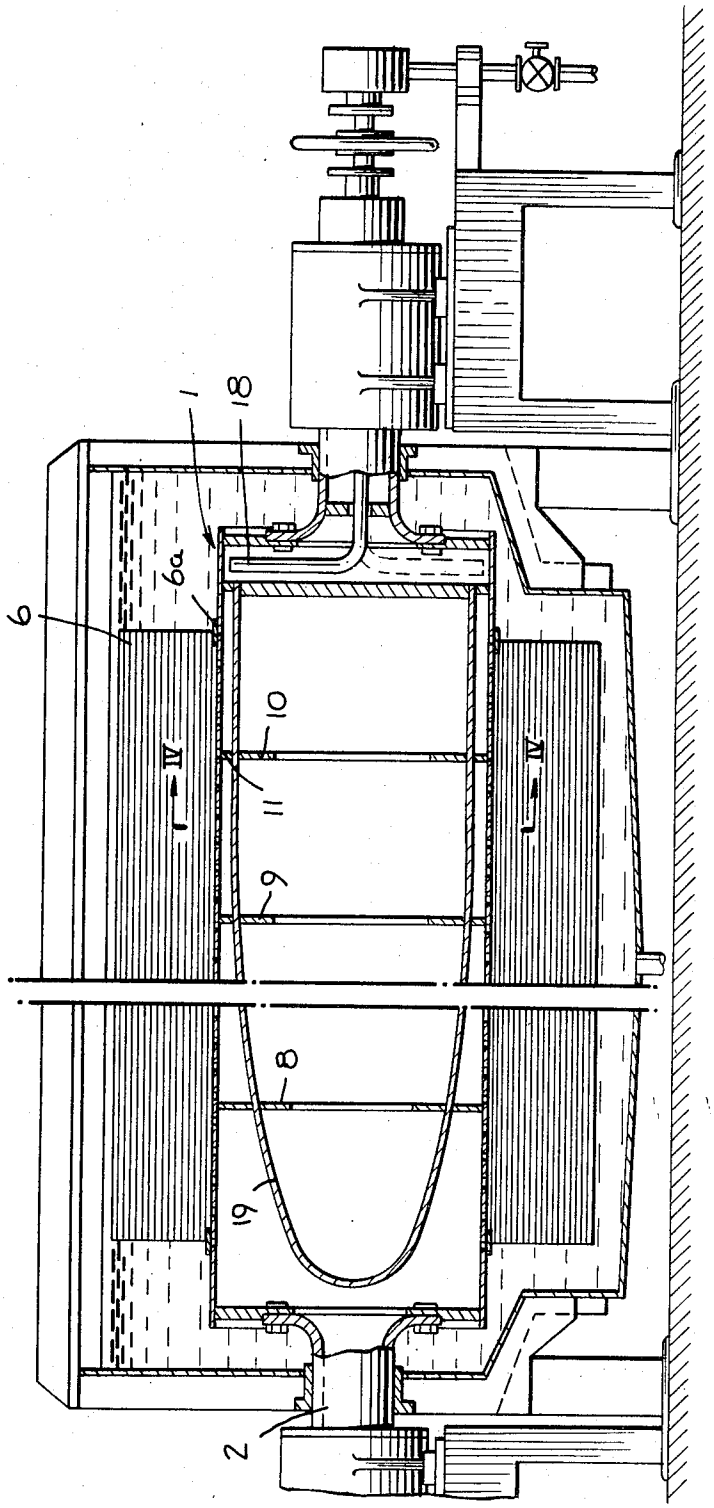


Fig. 3.

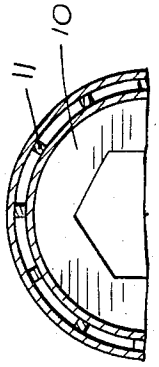


Fig. 4.

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# APPARATUS FOR THE TREATMENT OF WEBS OR YARNS

This invention relates to apparatus for the treatment of yarns or webs of material, especially textile material, and more particularly, to apparatus adapted to treat lengths of such material with various fluids such as liquids, steam or gas. The invention contemplates a drum having a perforated jacket and into the interior of which the treatment material is placed and about the exterior of which the material to be treated is wrapped so that upon rotation of the drum, the fluid is forced outwardly through the perforations and into the material.

The fluid may be forced into the interior of the drum through a hollow journal by which the drum is mounted for rotation; and upon passing through the material being treated, the fluid flows into a container in which the entire drum is enclosed so that it may then be extracted by a pump, and re-circulated back into the interior of the drum. Examples of apparatus of the class described will be found in U. S. Pat. Nos. 3,296,841 and 3,413,080. In addition to the teachings of these patents, it is also known to force the fluid through the apparatus in reverse direction, whereby the fluid travels from the container through the wound-up material into the interior of the drum and is extracted therefrom through a hollow journal and returned back to the container.

It will be appreciated that in the known prior art devices, a large amount of treating material must be employed since substantially the entire drum must be filled. Thus, in addition to the relatively large expense necessitated by the large volume of fluid, the weight of the fluid, particularly where a liquid is used, becomes an important consideration vis-a-vis the forces exerted upon the structure during rotation. Additionally, where the treatment fluid is a liquid, the air present in the interior of the drum is compressed during filling and must be squeezed out through the wound-up fabric, thus limiting the rate of filling and increasing the length of a treatment operation.

Accordingly, the present invention contributes apparatus of the class described which obviates the foregoing difficulties and disadvantages by reducing the space available for the fluid in the interior of the drum so that the apparatus can be operated with a smaller quantity of fluid treatment medium than has heretofore been the case. Accordingly, we have conceived by our invention, a novel construction according to which we provide, within the cylindrical interior of the drum, a displacement member which reduces the volume within the drum which can be occupied by the fluid. By this means, it is also possible to reduce the dilution of chemical products or dyes introduced by means of the pump which maintains the circulation of the fluid. In a preferred embodiment of the invention, the displacement member is arranged coaxial with the drum and is connected with the perforated jacket of the drum by means of spacers.

In a further embodiment of the invention, we provide a displacement member of somewhat streamlined configuration so that the treatment medium is fed from the interior of the drum through the perforated jacket and to the material to be treated with a uniform velocity over the entire length of the drum, thus assuring a high degree of regularity of treatment of the material. It is also possible to provide a displacement member which floats within the drum and which tends to move upwardly as the liquid level rises.



It will be appreciated that the reduction of volume available for the fluid medium within the drum also contributes a reduction of the quantity of air which must be removed while the medium is being fed into the drum. In this connection, a further aspect of the invention contemplates the provision of a tube extending into the drum and which may be adjusted to extract air or to evacuate the treatment fluid when emptying the treatment container.

There has thus been outlined rather broadly the more important features of the invention in order that the detailed description thereof that follows may be better understood, and in order that the present contribution to the art may be better appreciated. There are, of course, additional features of the invention that will be described hereinafter and which will form the subject of the claims appended hereto. Those skilled in the art will appreciate that the conception upon which this disclosure is based may readily be utilized as a basis for the designing of other structures for carrying out the several purposes of the invention. It is important, therefore, that the claims be regarded as including such equivalent construction as do not depart from the spirit and scope of the invention.

Specific embodiments of the invention have been chosen for purposes of illustration and description, and are shown in the accompanying drawings, forming a part of the specification, wherein:

FIG. 1 is a longitudinal sectional view of apparatus in accordance with the present invention;

FIG. 2 is a cross-sectional view taken along the lines of II—II of FIG. 1;

FIG. 3 is a view similar to FIG. 1, but illustrating a modification of the invention; and

FIG. 4 is a sectional view taken along the lines IV—IV of FIG. 3.

Referring now to the drawings and more particularly to FIGS. 1 and 2 thereof, there is shown a drum 1 supported for rotation by hollow journals 2 and 3 in a stationary container 4. It is also possible to arrange the drum within the container or an autoclave in a manner whereby rotation cannot take place. The drum is provided with a perforated outer jacket 5 upon which the material 6 to be treated may be wound. It will be noted that those perforations lying beneath the marginal zone of the material 6 are covered by metal straps 6*a* which may vary in width, depending upon the width of the material 6, so as to prevent the loss of treatment medium through those perforations in the jacket which would otherwise be uncovered.

Within the interior of the drum, we provide a displacement member 7 which may take the form of a hollow cylinder, and this member 7 may be rigidified by the use of discs 8, 9 and 10, the planes of which are perpendicular to the longitudinal axis of the drum. Spacers 11 are provided between the outer surface of the displacement member 7 and the inner surface of the jacket 5, preferably in the planes of the discs 8, 9 and 10, so as to assure the maintenance of the displacement member 7 in proper position within the jacket. Closures 12 and 13 located at the respective ends of the

displacement member 7, as well as the perforated jacket 5, determine the volume available for occupation by the fluid medium.

The treatment fluid is introduced into the interior of the drum 1 through the hollow journal 2, and passes through the space 14 between the displacement member closures 12 and 13 and jacket closures 12a and 13a and into the space 15 between the cylindrical walls of the jacket and the displacement member 7 and thence through the perforations in the jacket and into the material 6 to be treated. Thereafter, the treatment fluid flows into the container 4, is evacuated therefrom through a pipe 16 opening into the container 4 from its bottom, and is again brought into the interior of the drum 1 through the hollow journal 2 by means of a suitable pumping device (not shown).

Within the chamber 17, lying opposite the chamber 14 of the drum 1, we provide a bent tube 18 mounted to swivel between the solid and broken line positions shown in FIG. 1. In the solid line position, air is evacuated through the tube 18 as fluid medium enters the chamber; while in the broken line position, the tube 18 serves to evacuate the liquid from the interior of the jacket 5. If desired, a similar tube may, of course, be provided in the chamber 14 or separate tubes may be provided for evacuation of air and treatment fluid, respectively.

Referring now to FIGS. 3 and 4, the construction is generally similar to that illustrated in FIGS. 1 and 2; however, in this case, the displacement member 19 is configured to taper inwardly so as to present a somewhat bullet-shaped configuration facing the medium inlet to favor circulation of the fluid so that as it enters the jacket 5 through the hollow journal 2, it can circulate through the entire drum 1 at a substantially uniform rate. In this embodiment, the diameters of the discs 8, 9 and 10 are, of course, arranged as necessary to support the displacement member 19 according to its configuration; and the spacers 11 vary in length as required.

From the foregoing description, it will be seen that we contribute a novel apparatus for the treatment of yarns, or sheet or web-like material according to which the volume of treating fluid required for treatment is substantially reduced over that required in apparatus heretofore known in the art. We are also able to evacuate air and fluid from within the perforated jacket in order to reduce the overall treatment time; and we provide means contributing a substantially uniform rate of flow of treatment medium into the material to be treated.

We believe that the construction and operation of our novel apparatus will now be understood, and that the advantages of our invention will be fully appreciated by those persons skilled in the art.

We claim:

1. Apparatus of the class described comprising a drum having a perforated jacket for the treatment of thread or sheet-like material with fluid, and through the interior of which the treatment medium circulates, characterized in that a hollow displacement body (7, 19) is arranged in the interior of the drum and cooperates with same to reduce the spatial volume therebetween.

2. Apparatus according to claim 1, characterized in that the displacement member (7, 19) is in coaxial relationship with the drum and is supported relatively to the jacket by means of spacers (11).

3. Apparatus according to claim 2, characterized in that rigidifying discs (8, 9, 10) are provided in the interior of the body in the planes of the spacers (11).

4. Apparatus according to claim 1, characterized in that the displacement member (19) is of streamline shape and in that the flow space is gradually reduced from the fluid introduction end of the drum to the opposite end thereof.

5. Apparatus according to claim 1, characterized in that a bent tube (18), mounted to swivel between several positions is provided in the drum to evacuate air or treatment fluid therefrom.

6. Apparatus according to claim 1, characterized in that two tubes are provided in the drum, one of which serves to evacuate air and the other of which serves to evacuate treatment fluid therefrom.

7. Material drum according to claim 1, characterized in that the displacement member is arranged to be buoyant in a fluid in the interior of the drum.

8. Apparatus of the class described comprising a drum having a perforated jacket for treatment of thread of sheet-like material with fluid, and through the interior of which the treatment medium circulates, a hollow displacement body (7, 19) being mounted in the interior of the drum in co-axial relationship, said body being supported relatively to the jacket by means of spacers (11) and rigidifying discs (8, 9, 10) being provided in the interior of said body in the planes of the spacers (11).

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