Feb. 8, 1966 K. J. WINDHAUSEN 3,233,437

APPARATUS FOR TREATMENT OF WEBS OR YARNS

Filed Jan. 20, 1964 2 Sheets-Sheet 1

Fig. 2.

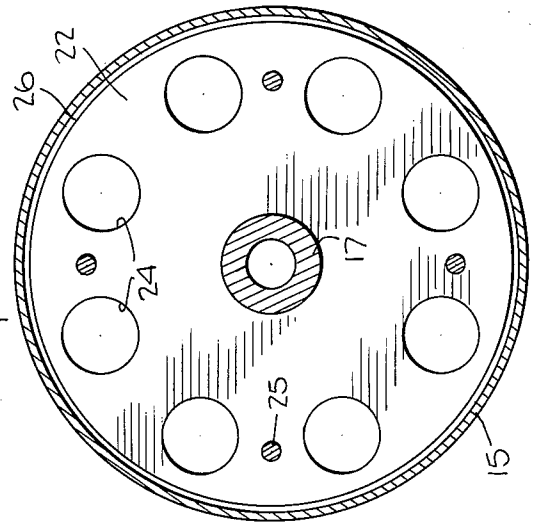
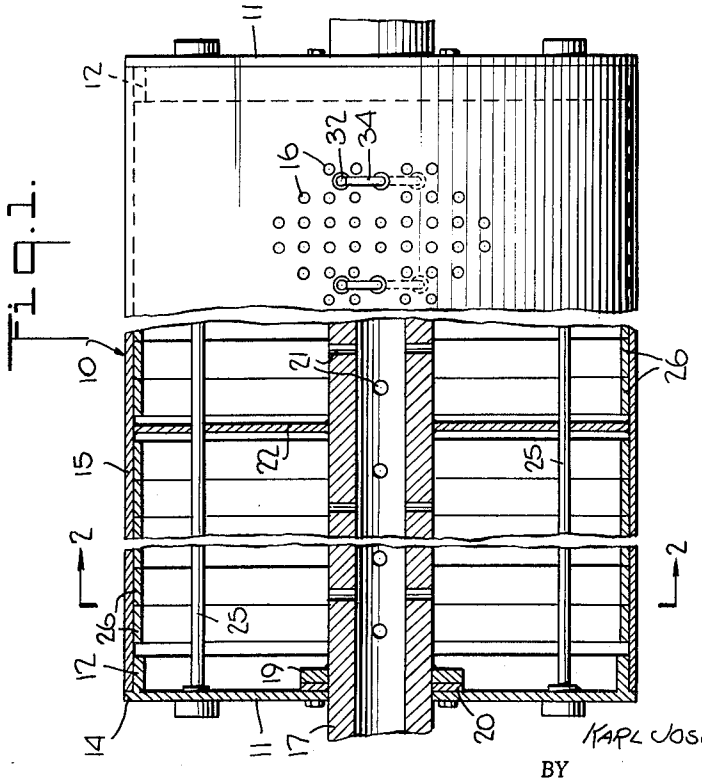


Fig. 1.



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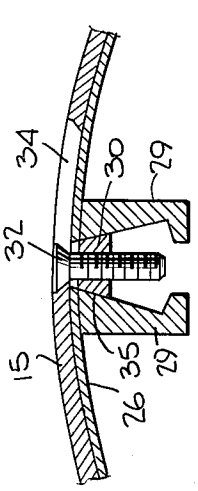

Fig. 4.

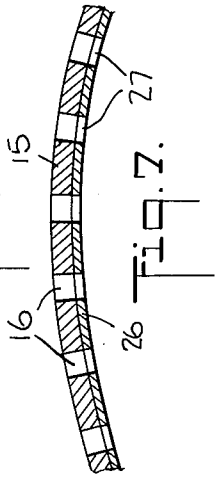

Fig. 7.

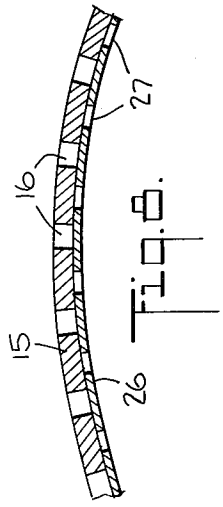

Fig. 8.

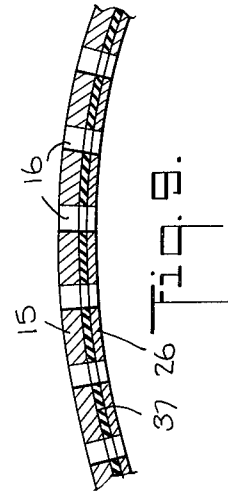

Fig. 9.

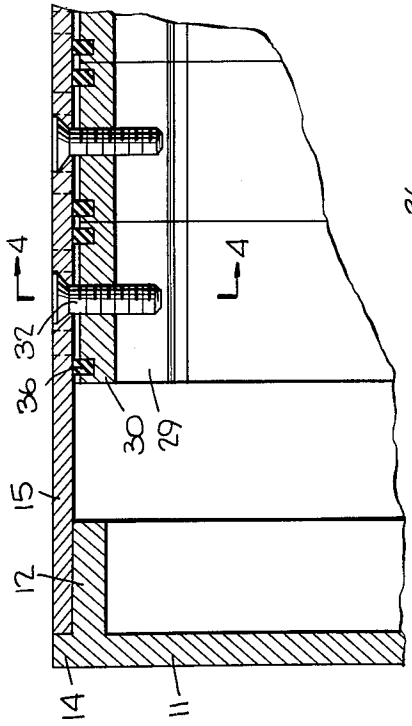

Fig. 1.

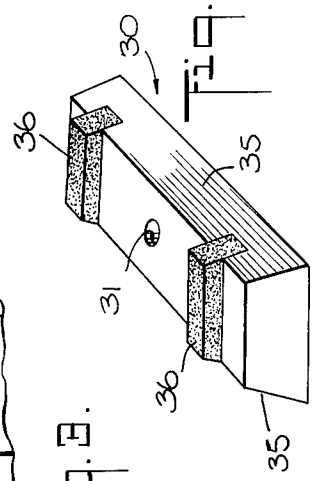

Fig. 5.

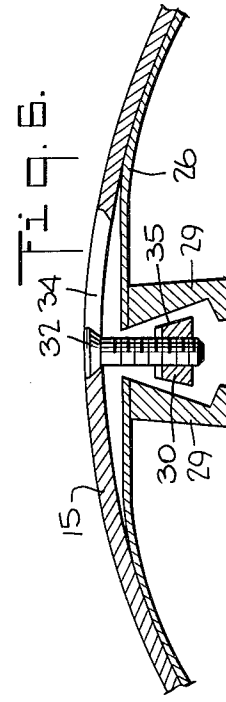

Fig. 6.

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APPARATUS FOR TREATMENT OF WEBS OR YARNS

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Claims priority, application Switzerland, Jan. 23, 1963, 790/63
7 Claims. (Cl. 68—150)

This invention relates to apparatus for the treatment of webs or yarns, and, more particularly, to apparatus which is adapted to treat lengths of such material having different lineal widths.

Heretofore, a variety of apparatuses have been known for treating materials such as textile materials, for example, in the form of webs as of woven or knitted goods, or yarns, with liquids for desizing, boiling, bleaching, or dyeing and the like, such materials being presented for treatment in a variety of widths. In one form of known apparatus, the material to be treated is wound up on the perforated jacket of a rotating drum, and the liquid is admitted to the drum and is forced through the perforations and the material by centrifugal force and pumping pressure. However, it will be appreciated, for example, that if a drum is provided with a wide perforated area and only a narrow length of material is wound upon the drum, then the liquid will find it easier to flow through the uncovered perforations and excessive quantities of liquid will be consumed before the treatment is completed.

In the known constructions, this difficulty was overcome by the costly expedient of providing a special perforated drum for each width of material to be treated, the drums being mountable interchangably on the machine.

I have conceived a completely new and different combination of elements that yield extraordinarily good results while avoiding the foregoing difficulties and disadvantages. Thus, as a result of my concept, I am able to adjust the annular area or band of effective perforations in a drum to correspond in width to the width of the material being treated, and thereby to achieve a precise regulation of the supply of liquid, steam or other vapour utilized in the treatment with a single drum regardless of the width of the material being treated.

In essence, my invention comprises a drum rotatable about its longitudinal axis and formed with a series of perforations in its cylindrical surface, means for introducing fluid into the drum, a number of perforated flexible bands adjacent the inner cylindrical surface of the drum, and means selectively positioning the bands individually to locate the perforations therein out of registry or in various degrees of registry with the perforations in the drum.

As a feature of my invention, I form in the drum a number of slits spaced longitudinally of the drum and each extending in a direction circumferentially of the drum, and I provide a bolt extending through each slit and rotatable from the outside of the drum to cooperate with the parts of the drum forming the sides of the slit and with a band within the drum to loosen the band, adjust its position as desired, and tighten it against the inner wall of the drum. It will be understood by those persons skilled in the art that only one slit and tightening means is necessary for each band, but if desired, two or more sets of cooperating slits and tightening means may be spaced circumferentially of the drum for each band, in which case, each band will actually consist of several arcuate pieces.

As another feature of my invention, I provide means to assure that the bands are pressed tightly against the inner surface of the drum when in any desired position of adjustment. These means may comprise wedges that cooperate with the ends of the band when acted upon by tightening means, or bolts operable from without the drum effectively to press the bands against the drum wall. Actually, for this purpose I prefer to employ the same bolts that I have already mentioned as securing the bands in position circumferentially relatively to the drum so that the respective apertures in the drum and bands will be in the selected relative positions.

A further feature of my invention resides in the provision of a layer of sealing material such as rubber on the outer surface of the bands. Of course the layer of sealing material has perforations corresponding to those in the bands themselves.

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.

A specific embodiment of the invention has been chosen for purposes of illustration and description, and is shown in the accompanying drawings, forming a part of the specification, wherein:

FIG. 1 is an elevational view, partly broken away, illustrating apparatus according to the present invention;

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

FIG. 3 is a fragmentary elevational view illustrating details of the apparatus of FIGS. 1 and 2;

FIG. 4 is a cross-sectional view taken along the lines 4—4 of FIG. 3 and illustrating a band in tightened position relatively to the drum;

FIG. 5 is a detail view in perspective of a part of the tightening means;

FIG. 6 is a view similar to FIG. 4, but illustrating the band in loosened condition;

FIG. 7 is a detail view in cross-section illustrating the relationship of band and drum with the respective perforations thereof in full registry;

FIG. 8 is a view similar to FIG. 7, but showing the respective perforations of the band and drum out of registry; and

FIG. 9 is a view similar to FIG. 7, but illustrating a modification of the invention.

Referring now to the drawings, and, more particularly, to FIGS. 1 and 2 thereof, there is shown a drum **10** comprising end plates **11** formed with annular flanges **12** set radially inwardly of the perimeters of the plates to provide shoulders **14** for supporting between them a cylindrical jacket **15** in sealed relation to the end plates. This jacket **15** is formed with a series of longitudinal rows of perforations **16** spaced circumferentially therearound, each row extending between points spaced inwardly of the end plates. These perforations are preferably of the order of 8 mm. in diameter and about 24 mm. on centers circumferentially and longitudinally.

A hollow axle **17** passes through the end plates **11** and extends centrally through the drum **10**. Annular plates **19** (only one of which is shown) are welded to the axle **17** just inwardly of the end plates **11**, and the openings in end plates are sealed by bolting the plates **19** to the adjacent plates **11** with sealing discs **20** positioned between

the two. That portion of the axle extending between the end plates, i.e. the portion within the drum **10**, is formed with a series of spaced, radial apertures **21** for a purpose later to be described.

To further secure the drum to the axle, I provide several spaced partitions **22** parallel to the end plates and extending radially between the drum jacket **15** and the axle **17** to each of which they are secured as by welding. Each of these partitions has a number of relatively large holes **24** (FIG. 2) to permit free communication between adjacent compartments formed thereby. A number of tie rods **25** extend between the end plates **11**, passing through the partitions **22** to which they may be welded, to contribute longitudinal rigidity and tightness to the assembly.

Within the drum and distributed along its length in side by side adjacent disposition in each compartment formed by the partitions **22**, I provide a number of bands **26** formed with perforations **27** (FIGS. 7 and 8) of the same size and shape and the same distance apart as the perforations in the jacket **15**.

Referring now to FIGS. 3 to 6, it will be seen that the ends of each band have opposed tong-like legs **29**, the facing surfaces of which diverge downwardly, as viewed in FIGS. 4 and 6, each to merge with an inwardly directed surface forming part of a foot at the base of each leg. Positioned between each pair of legs **29** is a wedge block **30** (FIG. 5) having a central threaded bore **31** for reception of a bolt **32** that passes through a slit **34** in the jacket **15**, as shown in FIGS. 3, 4 and 6. The wedge block also has inclined side surfaces **35** for cooperation with the divergent surfaces of the legs **29**. Thus, it will be appreciated that when the bolt is tightened from outside the drum, the wedge block surfaces **35** will bear against the facing surfaces of the legs **29** to force the legs and attached ends of the respective band **26** apart and the band itself tightly against the jacket **15**. To assist in tightening the wedge block against the jacket, a pair of resilient strips **36** of rubber or the like may be fixed in suitable recesses in the outer face of each such block. On the other hand, as shown in FIG. 6, when the bolt is loosened the wedge block **30** moves away from the jacket releasing the legs **29** and the band ends.

As has already been stated, the jacket has a slit **34** for each bolt **32**. Each slit extends in a direction circumferentially of the jacket (FIG. 1) and is preferably at least as long as the distance between centers of corresponding perforations **16** in the jacket. The edges of the slits converge towards the inside of the drum to carry the bolt heads which are correspondingly shaped for the purpose in recessed disposition relatively to the jacket. It is important here to realize that when the bolts and wedge blocks are loosened, the bands **26** can be shifted circumferentially so that their perforations **27** can be positioned opposite the space between the perforations **16** in the jacket **15** (FIG. 8) or in varying degrees of registration with the perforations **16** and to full registration therewith (FIG. 7). Each band can be individually adjusted in this way to control the location and degree of openings in the jacket. Thus, the effective perforations through the drum can be varied as desired with regard to the width of the material being treated and to regulate the flow of fluid according to the characteristics of the material and the nature of the particular process or treatment.

While I prefer to form the bands **26** of stainless steel, they may consist of any material having the necessary flexibility and resistance to heat and the chemicals to be used in the treating processes. Additionally, as shown in FIG. 9, strips **37** of a suitable sealing material, such as rubber, may be bonded or otherwise fixed to the outer surface of the strips **26**. Such strips will, of course, be perforated correspondingly with the bands themselves.

In operation, I position each of the bands **26** so as selectively to control the number, location and effective

size of the perforations in the jacket **15** according to the width and nature of the material to be treated and the particular treatment to be undertaken. The material is then wound upon the drum layer upon layer to form a roll thereon, the drum axle preferably extending in a horizontal plane. Any perforations beyond the ends of the roll will, of course, have been closed. The treating fluid is then admitted through the hollow axle **17** and passes through the apertures **21** into the compartments between the partitions **22**, and the axle and drum are rotated so that centrifugal force directs the fluid outwardly through the area of perforations uncovered by the bands and into the material roll. Fluid may, of course, pass between compartments through the openings **24** therein.

From the foregoing description it will be seen that I contribute by my invention, a novel construtcion of the class described by which I am able selectively to locate and adjust the total effective area of perforations in the drum economically to regulate the quantity of fluid used in a particular process and to permit the use of a single drum for all treatments regardless of the width or nature of the material.

These advantages of my apparatus, in comparison with the known constructions already referred to, is expressed with particular clarity in the following comparative example:

A cotton imitation poplin web, pre-treated with caustic soda lye of 6° Bé., with a weight of 150 g./sq. m., a woven width of 95 cm. and a length of 6,000 m., was wound on a drum with an external diameter of 50 cm., the outer diameter of the web roll being 140 cm. This fabric roll was subjected to a wash treatment with boiling water, the perforations of the drum jacket being uncovered along a distance longitudinally of the drum of 85 cm. beneath the web roll which thus overextended the area of uncovered perforations by 5 cm. at each end thereof. The drum was operated at a rotation speed of 300 revolutions per minute. It was observed that 60 minutes was required for the outer surface of the roll to react neutral, i.e. to be fully washed. The same experiment was then carried out again, except that this time the drum perforations were covered and uncovered in alternating circumferential rows by properly positioning the flexible bands **11** within the jacket. The upper surface of the web roll was also neutral after 60 minutes of washing treatment, however, in this case the consumption of washing fluid was reduced by 25%.

I believe that the construction and operation of my invention will now be understood, and that the advantages thereof will be fully appreciated by those persons skilled in the art.

I claim:

1. Apparatus of the class described comprising, a drum formed with a series of perforations in its cylindrical surface, means mounting said drum for rotation about its longitudinal axis, means for introducing fluid into the drum, a plurality of perforated flexible bands adjacent the inner cylindrical surface of the drum, and means selectively positioning the bands individually to locate the perforations therein relatively to the perforations in said drum.

2. Apparatus of the class described comprising, a drum formed with a series of perforations in its cylindrical surface, means mounting said drum for rotation about its longitudinal axis, means for introducing fluid into the drum, a plurality of perforated flexible bands adjacent the inner cylindrical surface of the drum, slit means formed in said cylindrical surface of said drum, and means extending from exteriorly of said drum through said slits and shiftable therealong each to engage opposite ends of said bands and selectively to position said bands individually to locate the perforations therein relatively to the perforations in said drum and to retain said bands and drum in the selected relationship.

3. Apparatus of the class described comprising, a drum formed with a series of perforations in its cylindrical surface, means mounting said drum for rotation about its longitudinal axis, means for introducing fluid into the drum, a plurality of perforated flexible bands adjacent the inner cylindrical surface of the drum, slit means formed in said cylindrical surface of said drum, tightening means extending from exteriorly of said drum through said slits and shiftable therealong selectively to position said bands individually to locate the perforations therein relatively to the perforations in said drum, and wedge surfaces on ends of said bands and said tightening means cooperating to spread the band ends and press said bands against the inner cylindrical surface of said drum to retain said bands each in its selected position upon actuation of said tightening means.

4. Apparatus of the class described comprising a drum formed with a series of perforations in its cylindrical surface, means mounting said drum for rotation about its longitudinal axis, means for introducing fluid into the drum, a plurality of perforated flexible bands adjacent the inner cylindrical surface of the drum, slit means formed in said cylindrical surface of said drum, tightening means including wedge blocks within said drum and bolts extending from exteriorly of said drum through said slits and shiftable therealong selectively to position said bands individually to locate the perforations therein relatively to the perforations in said drum, and wedge surfaces on ends of said bands and said wedge blocks cooperating to spread the band ends and press said bands against the inner cylindrical surface of said drum to retain said bands each in its selected position upon actuation of said bolts.

5. Apparatus according to claim 4, wherein sealing means are fixed to said wedge blocks facing the adjacent inner surface of said drum.

6. Apparatus of the class described comprising, a drum formed with a series of perforations in its cylindrical surface, means mounting said drum for rotation about its longitudinal axis, including an axle passing through said drum, means for introducing fluid into the drum, perforated partitions extending radially between said axle and drum and secured to same, a plurality of perforated flexible bands adjacent the inner cylindrical surface of the drum, and means selectively positioning the bands individually to locate the perforations therein relatively to the perforations in said drum.

7. Apparatus of the class described comprising, a drum formed with perforations in its cylindrical surface, means mounting said drum for rotation about its longitudinal axis, means for introducing fluid into the drum, a plurality of perforated flexible bands adjacent the inner cylindrical surface of the drum, sealing means coextensive with the respective bands and having corresponding apertures therein, said sealing means being secured to the outer surface of each band, and means selectively positioning the bands individually to locate the perforations therein relatively to the perforations in said drum.

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IRVING BUNEVICH, *Primary Examiner.*