

[54] EQUIPMENT FOR WET PROCESSING A TEXTILE SAMPLE

[75] Inventor: **Roland Dietrich**, Liestal, Switzerland
[73] Assignee: **Ahiba AG.**, Basel-Campagne, Switzerland
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[56]

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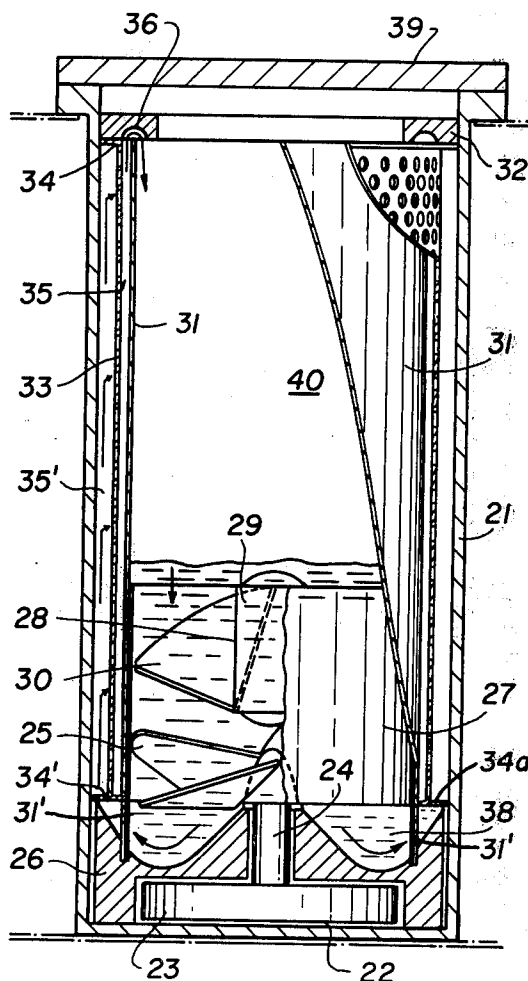
Primary Examiner—Harvey C. Hornsby
Assistant Examiner—C. K. Moore
Attorney, Agent, or Firm—Kurt Kelman

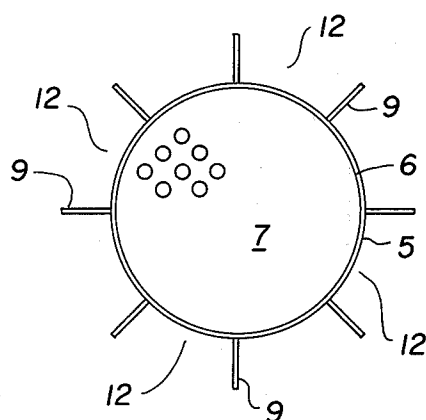
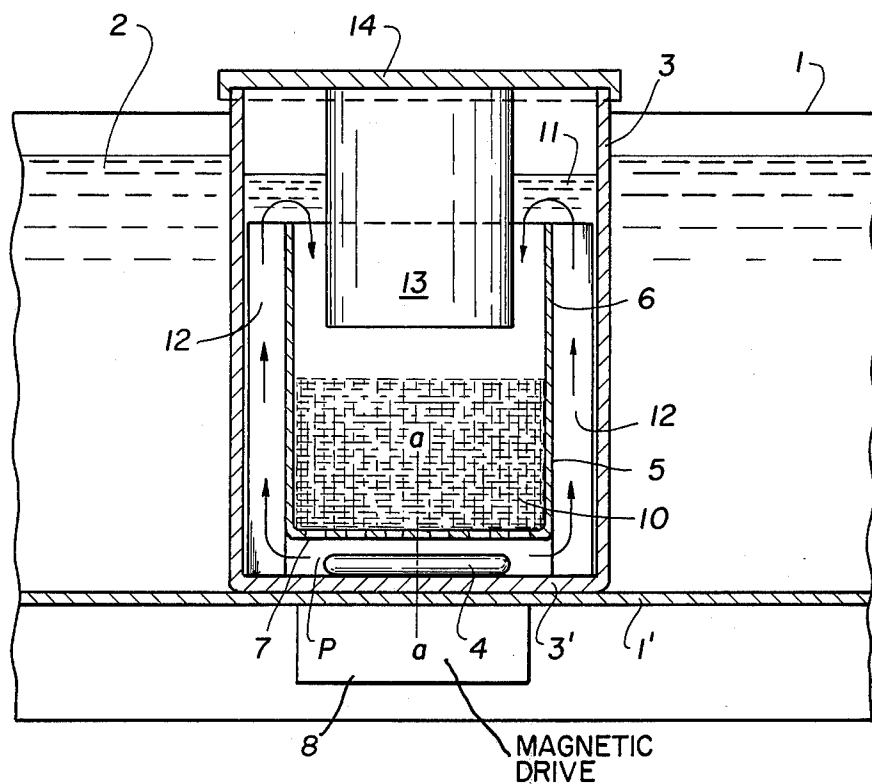
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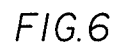
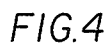
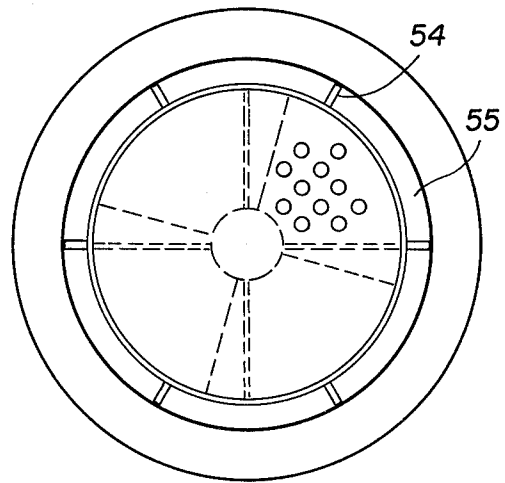
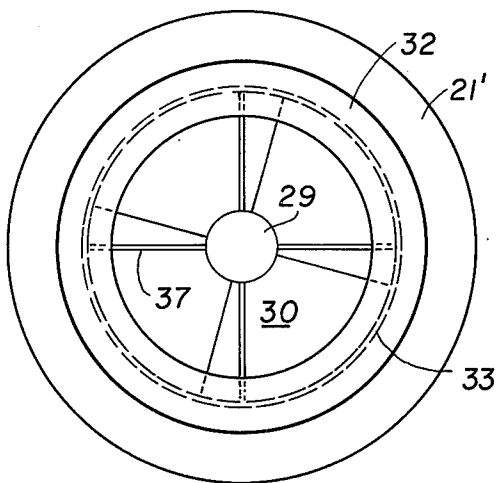
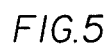
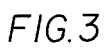
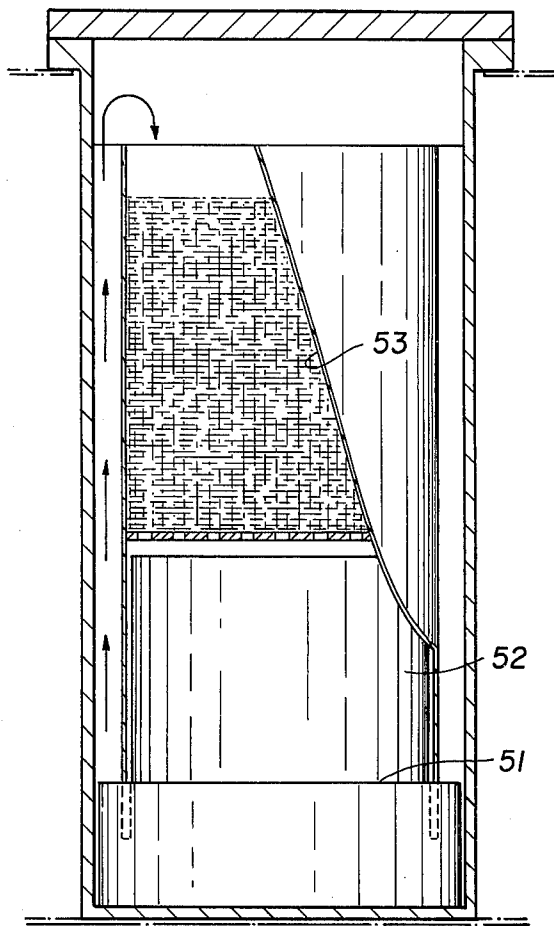
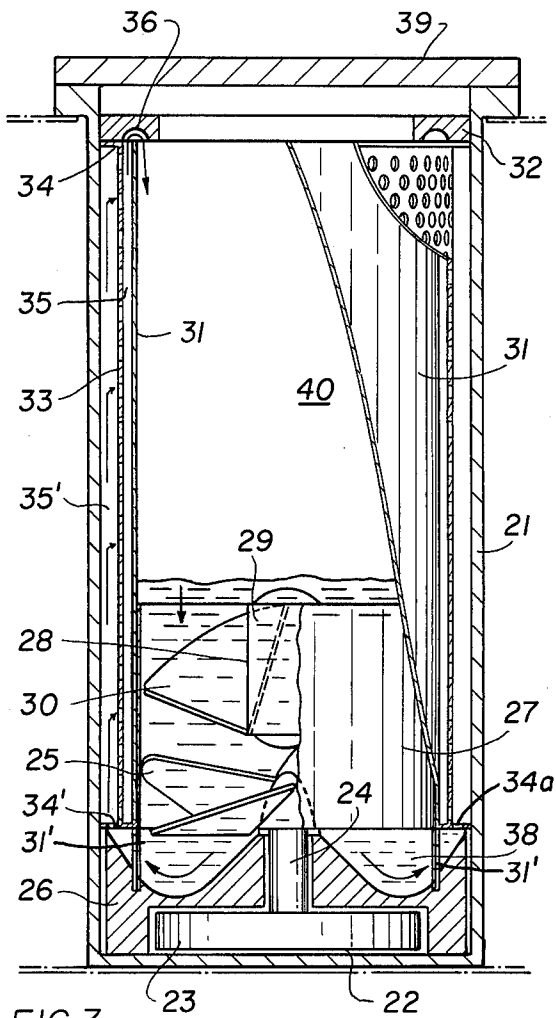
ABSTRACT

Equipment for wet processing a textile sample is described in which the sample is located in a container and the treatment liquid is made to flow past the sample by a magnetic agitator rotatably driven from outside the container by a magnetic field producing mechanism.

6 Claims, 6 Drawing Figures







EQUIPMENT FOR WET PROCESSING A TEXTILE SAMPLE

This invention relates to equipment for the wet processing of a textile sample such as a sample length, sample hank, fibres and flocks.

Known equipment of this type mostly consists of bucket-type mechanisms in which the sample material is mechanically moved up and down in the processing liquid. The sample material may also be subjected to an additional rotary movement without however emerging from the liquid. For processing purposes, the sample material is placed loosely in the bucket mechanism on spiked rods, in sieve-type baskets or on coiled wires, depending on the type of material concerned, in order to make the action of the mixture upon the material as uniform and intensive as possible.

During the up and down movement and the accompanying rotary movement it is virtually impossible to avoid coagulation which prevents universally uniform contact with the liquid, especially in the case of fibrous and flocculent material. Similar phenomena are also observed with other sample materials, especially at the points of suspension where even the normal bearing pressures partly impair the access of the liquid.

The present invention seeks to provide new equipment for processing a textile sample in which, due to the forced circulation of the liquid mixture, irregularities on the processed material caused by bearing pressure or at points of suspension can be avoided and in which fibrous and flocculent material, above all, can be exposed to intensive contact with the liquid, there being virtually no mechanical action upon the processed material.

According to the present invention equipment for wet processing a textile sample comprising a bucket which contains the processing liquid, and, located outside the bucket, drive means for propelling the processing liquid, is characterised by an inset which comprises at least one cylindrical wall portion and can be introduced substantially centrally in the said bucket, to leave a flow path therearound, a pump element rotatably arranged below the inset in a position coaxial with the wall portion thereof, and a flow guide assembly situated within the liquid flow path for obtaining a liquid current substantially parallel with the longitudinal axis of the wall portion of the inset at least over part of the liquid flow path, the whole assembly being such that a suction zone can form above the rotating pump element and the processing liquid, conveyed outwards by centrifugal forces, generated by the pump element, is deflected upwards.

Some embodiments of equipment in accordance with the invention will now be described in further detail with reference to the accompanying drawings, in which:

FIG. 1 is a first embodiment of equipment in vertical section, placed in a temperature-controlled trough, with drive means for a pump element arranged below the bottom of the trough;

FIG. 2 is a plan view of the flow guide inset which forms part of the equipment according to FIG. 1,

FIG. 3 is a second embodiment of equipment with an inset suitable for receiving flat textile fabrics;

FIG. 4 is the equipment of FIG. 3 viewed in plan;

FIG. 5 is a third embodiment of equipment combining the embodiments of FIGS. 1 and 3; and

FIG. 6 shows the equipment of FIG. 5 in plan.

In FIG. 1, the reference numeral 1 generally refers to a trough which contains a heating fluid 2, e.g. water, kept at a predetermined working temperature by means of heating and temperature control elements not shown here. Resting on the bottom 1' of this trough, surrounded by the heating fluid, is a bucket 3 with a freely moving permanent magnet bar 4 on its bottom 3'. This permanent magnet bar is preferably provided with a plastic coating resistant to the processing agents employed and to the liquid mixture. This bar is moved by a magnetic drive 8 arranged below the trough bottom 1' and rotates about a vertical axis $a-a$. To allow this rotary movement to take place with as little friction as possible, it is advisable to design the bottom portion 3' of the bucket with a slight upward curvature.

The bucket 3 contains an inset, generally referred to by the reference numeral 5 and shown in plan view in FIG. 2, which consists of a cylindrical vessel 6 with a perforated bottom 7 and a number of flow guide vanes 9, radially protruding from the cylindrical wall portion. In the illustrated example, these guide vanes form partitions extending in planes parallel to the axis of the vessel 6 and separating channels 12. The vessel 6 receives a textile sample 10 which is to be dyed or otherwise processed.

To carry out the treatment of a textile sample, e.g. a dyeing test, a dye solution 11 is prepared either in the bucket 3 or subsequently introduced therein. Then the permanent magnet bar 4, which acts as an impeller, is placed on the bottom of the bucket 3 and the latter is deposited on a point of the trough bottom 1' situated exactly in the centre above the magnetic drive 8. Then the inset 5 with the vessel 6 in which the textile sample to be dyed has already been placed is inserted in the bucket 3 containing the dye solution. When the magnetic drive 8 is started, the permanent magnet bar 4, which acts as impeller, begins to rotate about the axis $a-a$ and, due to the centrifugal force, conveys liquid mixture radially outwards in the direction of the lower curved arrows and towards the inner wall surface of the bucket, where the liquid is deflected in the upward direction. The space P between the perforated bottom 7 of the inset 6 and the bottom 3' of the bucket 3 is high enough for a suction zone to develop above the permanent magnet bar 4 which operates as an impeller when rotated. The flow guides 9 prevent a rotary movement of the liquid mixture during its upward travel along the cylindrical wall of the bucket and ensure that the upward current in the channels 12 is practically rectilinear. Because of the continuous equalisation of pressure in the vessel 6, the processing liquid permeates the sample material 10 in the vessel continuously, the flow velocity of the liquid being regulatable by controlling the rotational speed of the permanent magnet bar 4.

In order to save processing liquid and especially in order to achieve a favourable weight ratio between liquid and sample, a displacement body 13 is suspended from the cover 14 of the vessel 6 in such a manner that it does not touch the cylindrical wall portion or the perforated bottom 7 of the inset and, above all, does not impair the free flow of the liquid mixture through the textile sample.

If instead of the virtually laminar flow dictated by the axially extending vanes 9 it is desired to achieve a slightly rotary or more turbulent flow, it is possible to use flow guides between the inset and the cylindrical

wall portion which are inclined (helically upward in the rotary sense) so that a rotary movement is imparted to the liquid mixture above the magnet bar.

FIG. 3 illustrates another embodiment of the apparatus of the invention without the heated trough, in which a pump assembly, generally referred to by the reference numeral 22, is provided at the bottom of a bucket 21, which assembly includes a permanent magnet flange 23, a drive shaft 24 and an impeller 25. The flange 23 and the shaft 24 are situated in recesses of a flow guide element 26, likewise resting on the bottom of the bucket 21. A suction tube 27 is provided above the flow guide element 26, in a central position relative thereto, a flow guide assembly generally referred to by the reference numeral 28 being incorporated in the tube 27. In the present example, this assembly consists of a central core 29 on which vanes 30 are anchored which extend radially outward to the inner wall surface of the suction tube 27 and are connected to this surface so as to suspend the flow guide assembly. Together the parts 23-30 form the pump assembly 22 components of which may be detachable, for example by plug-in or screw connection, for cleaning purposes.

The outer surface of the suction tube 27 is preferably shaped as a guide and as shown in FIG. 3, serves for centering a pressure tube 31 which is supported at the lower end of the suction tube 27 and extends to the underside of a pressure ring 32 inserted in the upper end region of the bucket 21. This pressure tube radially seals an inner chamber 40 and separates the chamber 40 from an outer chamber between the tube 31 and the upright bucket wall.

In a substantially coaxial position relative to the pressure tube 31, a material carrier 33 which consists of perforated stainless steel is mounted in the outer chamber between the tube 31 and the bucket 21 by means of an upper and a lower collar 34, 34' respectively. Between the inner surface of the perforated material carrier 33 and the outer surface of the pressure tube 31 is an inner annular gap 35 of approximately 2-4 mm width, and between the outer surface of the material carrier 33 and the inner surface of the bucket 21 an outer annular gap 35' of 4-8 mm width.

The above-mentioned pressure ring 32 is provided with a groove 36 of substantially semi-circular cross-section the outer edge of which virtually coincides with the inner surface of the material carrier 33. The groove 36 is a means for deflecting the process mixture in a manner now described. The pressure ring 32 cooperates with the cylindrical parts 31, 33 which act as a guide assembly for the liquid mixture and is preferably an elastic member pressed into the open top of the bucket 21 against the collar 34 of the material carrier 33.

In FIG. 4, the reference numeral 21' refers to the upper rim of the bucket 21, the reference numeral 32 to the pressure ring and the reference numeral 33 to the material carrier, the latter being centred in the bucket 21 (FIG. 3), as has already been mentioned. The numeral 29 refers to the central core of the flow guide assembly 28 (FIG. 3) and the numeral 30 to one of the flow guide vanes. Finally, the numeral 37 refer to one of four partitions in the liquid deflection chamber 38 (FIG. 3) within the flow guide element 26.

The embodiment illustrated in FIG. 3 is especially useful for dying or other tests on flat sample lengths which are placed on the outer surface of the perforated

material carrier 33 for processing. To carry out the test, the equipment is prepared in the manner already described and the pump assembly 22 and the pressure tube 31 are inserted in the bucket 21 holding the processing liquid. Then the material carrier 33 with a sample length and the pressure ring 32 are introduced in the bucket, which latter may be sealed with a lid 39.

When the drive unit (which is not shown here) is started the pump assembly 22 rotates and conveys processing liquid in the direction of the arrows through the deflection chamber 38 in the flow guide element 26 through passages 31' in the pressure tube 31 towards the outer annular gap 35'. The liquid passes through the sample placed upon the material carrier 33 and through the holes in the carrier towards the inner annular gap 35. Due to the fact that the pressure tube 31 sealingly bears on its support at the lower end and the processing liquid derived from the deflection chamber 38 can pass through ducts 34a in the lower collar 34' of the material carrier 33 only into the outer annular gap 35', and further due to the fact that the outer annular gap is terminated at its upper end by the collar 35 and the pressure ring 32 and the processing liquid can therefore discharge only from the inner annular gap 35 via the groove 36 in the pressure ring 32, there results a virtually uniform distribution of pressure over the entire height or length of the annular gaps 35 and 35', so that the sample length placed upon the material carrier 33 is practically everywhere exposed to uniform wetting by the processing liquid.

The processing liquid flows in arrow direction from the groove 36 of the pressure ring 32 back into the inner chamber 40 situated above the flow guide assembly 28, in order to be recirculated by the pump element 22 until the processing operation has been concluded.

FIG. 5 illustrates an embodiment of the invention where a liquid conveying assembly in the shape of a pump unit 51 is employed which consists of parts 23-30 shown in FIG. 3 and in which a processing inset 52 is employed which is basically designed in the same way as the inset 5 of FIGS. 1 and 2. The difference is that the cylindrical wall 53 of the inset 52 extends down to the same length as the pressure tube 31 of FIG. 3 and the same applies to the flow guide vanes 54 (FIG. 6) which are provided in order to obtain a liquid flow in the direction of the arrows on the left of FIG. 5, virtually parallel with the axis of the device. The spaces enclosed by the guide vanes 54 correspond to those designated by the reference numeral 12 in FIG. 1. In all other respects, all that has been stated with regard to the construction and the operation of the various parts described in detail for any of the examples according to FIGS. 1 and 3 applies also with respect to the present embodiment.

The bucket may be provided with a pressure lid to carry out the so-called HT-dying process. On such a lid, pressure or vacuum connections may be provided in known manner or pressure locks and/or dosing devices and valves may be provided integrally or fitted to the lid. In the embodiments according to FIGS. 1 and 5, this lid may also be used for mounting a displacement body 13 (FIG. 1), if such a device is employed, unless special provisions either on this body itself or on other parts of the assembly are preferred.

From the above description of three embodiments of the invention it can be gathered that the equipment proposed by the invention enables the sample material

to be processed virtually without mechanical stress, providing optimum wetting conditions for the samples to be processed. In addition, the equipment offers the same facilities for influencing the mixture as any of the conventional devices for the treatment of textile samples. An important feature is the fact that neither external pumping means nor shaft lead-in bushings which require sealing are needed for the propulsion of the processing liquid.

What is claimed is:

1. Apparatus for treating textile material with a liquid comprising:

- a. an upright container adapted to hold said liquid;
- b. a tubular member in said container having an upright axis,
 1. said member radially sealing a chamber therein,
 2. said member and said container radially bounding an outer chamber therebetween,
 3. respective axially terminal portions of said chambers communicating with each other;
- c. pump means for sequentially moving said liquid in a closed circuit through said chambers in opposite axial directions; and
- d. an apertured carrier for said textile material to be

treated with said liquid,

1. said carrier being arranged in one of said chambers and dividing the same into two parts, each part including a respective one of said axially terminal portions of said one chamber,

2. said parts communicating with each other only through the apertures in said carrier.

2. Apparatus according to claim 1, wherein said pump means include a magnetic drive member, an impeller, and a shaft drivingly connecting said drive member to said impeller.

3. Apparatus according to claim 1 wherein said carrier radially separates said parts from each other.

4. Apparatus according to claim 3, wherein said carrier is a perforated tube coaxial with said tubular member.

5. Apparatus according to claim 4, wherein said one chamber is bounded radially by said tubular member and said container.

6. Apparatus according to claim 5, wherein said pump means move said liquid under pressure into said one chamber and draw said liquid by suction from said other chamber.

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