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(54) Rotary drum machine for the wet treatment of fabrics.

(57) The machine comprises an air-permeable hollow drum (5) within which stationary suction (11, optional 13) and possibly blowing sections (12, 14) are provided.

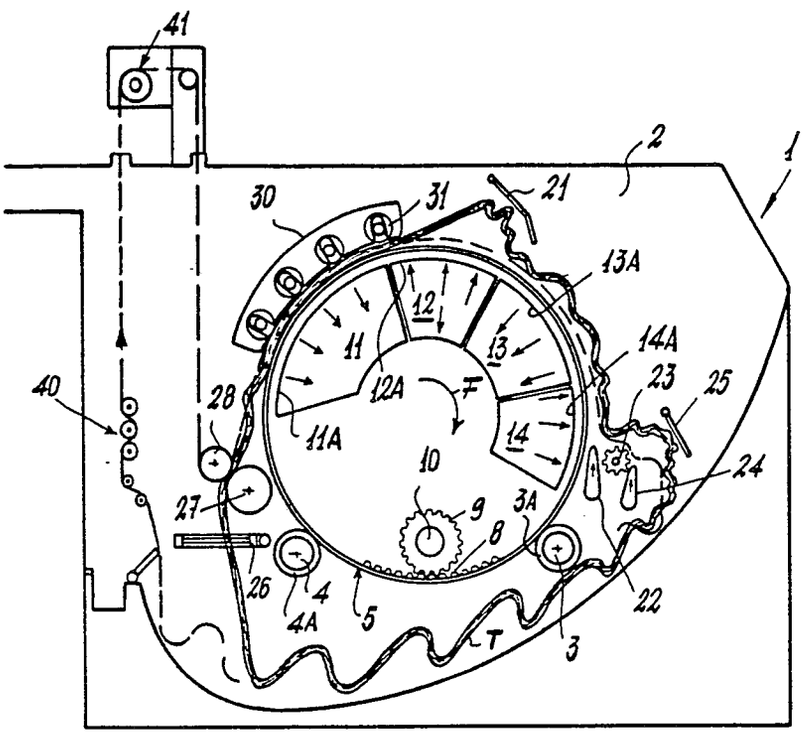

Fig. 1

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ROTARY DRUM MACHINE FOR THE WET TREATMENT OF FABRICS

The present invention relates to a machine for the wet treatment of fabrics in open width or in rope form, comprising a rotary drum for advancing the fabric. Such machines are used for example for fabric fulling and/or scouring.

Machines for the wet treatment of fabrics are known comprising a rotary drum. The treated fabric with its ends joined together to form an endless band is kept in contact with a variable area of said drum. In these machines the fabric is kept in contact with the drum by an applicator member which presses against the drum through the fabric.

Although such a machine has certain merits it does not satisfy the current requirements of every increasing productivity.

The main object of the present invention is therefore to provide a machine of the aforesaid type able to satisfy the increased productivity requirement.

This and further objects which will be apparent from the detailed description given hereinafter are attained by a machine characterised essentially in that the drum is permeable to air and comprises in its interior, in correspondence with a predetermined region of its periphery, at least one suction duct arranged to create a vacuum at said peripheral drum region so as to exert on the fabric an action which tends to keep it in contact with the drum.

The invention will be more apparent from the detailed description of a preferred embodiment thereof given by way of non-limiting example hereinafter with reference to the accompanying drawing in which:

Figure 1 is a diagrammatic vertical cut-away view of the machine;

Figure 2 is a side view of the drum;

Figure 3 is a view similar to Figure 1 of a further embodiment of the machine according to the invention with some parts omitted for greater clarity;

Figure 4 is a partly cut-away view of part of the machine of Figure 3;

Figure 5 is a partial section on the line V-V of Figure 4.

In the figures the reference numeral 1 indicates overall a stainless steel container or tank defining a working compartment 2. Within said compartment there extends two shafts 3 and 4 supported by the sides 1A of the tank 1. Said shafts can be idle or both be driven by any known motor means, or one can be idle and the other driven. Said shafts comprise conical reductions 3A, 4A in correspondence with points which are described hereinafter. The two shafts in question form the support cradle for a metal drum 5 which is open at at least one of its ends 6 and 6A and is provided at the ends of its cylindrical shell 5A with conical flanges 5B the taper of which corresponds to the taper of the conical reductions 3A, 4A of the shafts 3, 4 with which said flanges cooperate to keep the drum centered axially.

The shell is made air-permeable by a plurality of perforations 7 suitably provided in correspondence with slight projections on said shell.

The drum 5 can also be rotated by gearing. Specifically, in proximity to each of its ends the drum can comprise an internal ring gear 8, with each of which there engages a gear 9 driven by any suitable motor means. The two gears 9 can be mounted on the same shaft 10 or on different but coaxial shafts. Stationary ducts, which in this example are four in number and are indicated by 11, 12, 13 and 14, penetrate into the drum. Said ducts have perforated outer surfaces 11A, 12A, 13A and 14A which are concentric with the drum shell 5A and are disposed a short distance therefrom. These ducts extend over an angular width of the shell which is equal to or greater than that through which the treated fabric T extends.

The drum 5 is rotated clockwise so that, starting from the left hand side, it firstly encounters the duct 11 which is connected by way of the side wall 1A of the tank 1 (see Figure 2) to the suction side of a conventional vacuum pump, not shown, located outside the tank 1. It then encounters the duct 12 which can be selectively connected either to the suction side or to the delivery side of said vacuum pump by any known valve means, not shown, and finally encounters the two ducts 13 and 14, the former connected to the suction side of the vacuum pump and the latter to its delivery side or to a blower.

An arcuate member 30 for applying the fabric T to the drum 1 is provided, comprising a plurality of elastically loaded idle rollers mobile in a direction perpendicular to their axis. Said member 30 is positioned to extend through at least part of the angular width of the ducts 11 and 12.

A deflector 21 is provided, against which the fabric is intended to collide when worked in rope form and no longer subject to the applicational action of the member 30.

Downstream of said deflector in correspondence with the blowing duct there are provided a first blow nozzle 22 which directs a jet or blade of air between the fabric and drum to separate or facilitate separation of the former from the latter, a grooved roller 23 rotating at an angular velocity greater than that of the drum, a blow nozzle 24

which directs a jet or blade of air between the fabric and grooved roller 23, and a deflector 25 against which the fabric collides after passing the grooved roller 23.

When the fabric is to be treated in rope form (see thick line) it is passed through a conventional creel 26. When it rises from the base of the tank 1 it passes about a roller 27 which can cooperate with a roller 28 which can be moved towards it and withdrawn from it, but which for treatment in rope form is withdrawn from it. The fabric in rope form passes onto the drum 1, between this latter and the applicator member 30, the action of which is facilitated by the suction exerted in that region by the duct 11. On leaving the applicator member 30 the fabric is subjected to the blowing action of the duct 12 and is compelled to collide against the deflector 21. Consequently it falls back onto the drum in the region in which the duct 13 exerts its suction effect, so that the fabric is caused to adhere to the drum. The fabric is subjected to the separating action of the duct 14 and blowing nozzle 22 and encounters the grooved rotating roller 23, to be then struck by the jet from the blowing nozzle 24 and blown against the deflector 25 before falling into the tank.

If working with the fabric in open width, the roller 28 is moved into contact with the roller 27 and suction is applied to the duct 12. The open-width fabric in rising from the bottom of the tank 1 does not pass through the creel 26 but instead is led (see dashed line) to centering and widening members 40, 41 (not forming part of the present invention and therefore not described in detail). The fabric then passes between the two rollers 27, 28 to reach the drum 1, where it passes under the applicator 30 and reaches the duct 12 (which now exerts suction) where it remains adhering to the drum without striking the deflector. The fabric movement then proceeds as indicated heretofore in relation to the fabric in rope form.

Figures 3 to 5 show a modification of the rotary drum machine for the wet treatment of fabrics. In said figures parts identical to those shown in Figures 1 and 2 are indicated by the same reference numerals plus 100.

In said modification the hollow metal drum 105 comprises spokes 200 in proximity to that end 106A distant from the open end 106 where an annular member 203 is fixed to the shell 105A to act as a rolling track for support members 204 for the drum 105. The members 204 comprise at least three wheels 205 disposed 120° apart, their shafts being supported elastically by fork-shaped ends 206 of brackets 207 connected to a fixed structure 208. By virtue of the elastic supporting of the wheel shafts the support members 204 are able to absorb the small displacements of the drum 105 in the direction orthogonal to its axis W. Said elastic support can be obtained for example by compression springs (not shown) preloaded for example by screws 210.

The drum 105 rests at its other end 106A, for example by means of normal rolling bearings 211, on a shaft 212 driven by a motor (not shown) located outside the tank 101. Said motor rotates the drum 105 by way of the shaft 212. The drive shaft 212 passes through the tank 101 by way of normal seal and rolling members 213 disposed thereat.

The drive shaft 212 is hollow and within it there is disposed a further drive shaft 214 driven by its own motor (not shown) and operating a blower 215, advantageously tangential, located within the drum 105.

The drive shaft 214 of the blower 215 is supported at one end 216 outside the tank 101 in any known manner, whereas at its other end 217 it terminates in a support 218 connected to the fixed structure 208 and provided with usual rolling bearings (not shown) to allow the shaft 214 to rotate.

The blower 215 comprises a casing 220 to which there are connected a stationary suction duct 111 and a stationary delivery duct 112.

Specifically, said suction duct 111 is connected at 222 and 223 to the ends 215A and 215B of the blower 215 in proximity to the drive shaft 214, whereas the delivery duct 112 opens directly into the casing 220 of the blower 215.

The suction duct 111 and delivery duct 112 are supported respectively by arms 230 and 240 fixed to a support 250 secured at one end 251 to said bearings 211 and at its other end 252 to the fixed structure 208.

The machine shown in Figures 3, 4 and 5 also comprises a suction duct 260 and a delivery duct 261 connected to the top of the tank 101. Said ducts are both provided with a valve 263, for example of the butterfly type. The suction duct 260 is also provided internally with heating elements 264 (such as normal resistance elements) for heating the air entering the tank 101, and terminates in a hood 262 facing the drum 105.

The operation of the machine shown in Figures 3 to 5 is as follows: the drive shaft 212 rotates the drum 105 and at the same time the drive shaft 214 rotates the blower 215. From the duct 260 the blower draws hot air which after acting on the fabric in the aforesaid manner enters the suction duct 111 and then enters the casing 220 of the blower 215. The blower 215 then feeds the air through the delivery duct 112 to the shell 105A of the drum 105 where it encounters the fabric T which is therefore forced to separate from said drum 105. The fabric T, as stated, is compelled to encounter the deflector 121 and thus falls into the tank 101. The air from the delivery duct 112 finally

enters the delivery duct 261 and leaves the tank 101.

The present invention also includes an embodiment in which the drive members for the drum 5 are in the form of one or more coaxial pneumatic wheels (for example of the type used for motor vehicles) driven by a motor located outside the tank 1. The wheel or wheels act on for example metal rings positioned about the drum 5 or on the inner wall of this latter.

Pneumatic wheels can also be provided which act not as drive members but as presser members against the inner wall of the drum to prevent the drum jolting.

In addition, the outer surface of the drum 5 can be provided with projections, such as bosses or relief formations, the air passage perforations being located between one projection and the next, in order to increase the drive surface for the fabric.

Claims

1. A rotary drum machine for the wet treatment of fabrics in open width and/or in rope form, characterised in that the drum (5, 105) is permeable to air and comprises in its interior, in correspondence with a predetermined region of its shell (5A, 105A), at least one suction duct (11, 111) arranged to create a vacuum in correspondence with said region so as to exert on the fabric an action which tends to keep it in contact with the shell (5A, 105A) of the drum (5, 105).

2. A machine as claimed in claim 1, characterised in that an applicator member (30) acts on the fabric over at least part of the region associated with the suction duct (11).

3. A machine as claimed in claim 1, characterised in that the suction duct (11, 111) is followed angularly by at least one duct (12, 13, 14; 112) arranged to create an air blast.

4. A machine as claimed in claim 3, characterised in that the suction duct (11) is followed angularly by ducts (12, 13, 14) arranged to create an air suction and/or blast.

5. A machine as claimed in claim 1, characterised in that the drum (5) is supported on a cradle (3, 4).

6. A machine as claimed in claim 5, characterised in that the drum (5) comprises centering means (5B) cooperating with counter-means (3A, 4A) on the support cradle (3, 4).

7. A machine as claimed in claim 6, characterised in that the support cradle (3, 4) is formed from a pair of shafts.

8. A machine as claimed in claim 7, characterised in that at least one of the support shafts (3, 4) is driven.

9. A machine as claimed in claim 7, characterised in that at least one of the support shafts (3, 4) is idle.

10. A machine as claimed in claim 1, characterised in that the drum (5) comprises at least one internal ring gear (8) cooperating with a gear (9) driven by motor means.

11. A machine as claimed in claim 1, characterised by comprising at least one deflector member (21, 25; 121).

12. A machine as claimed in claim 1, characterised by comprising at least one blowing nozzle (22) to facilitate separation of the fabric from the drum.

13. A machine as claimed in claim 1, characterised in that in correspondence with the region in which the fabric separates from the drum (5) there is provided a rotary member (23) which acts on the fabric.

14. A machine as claimed in claim 13, characterised by comprising a blowing nozzle (24) acting between the rotary member (23) and the fabric.

15. A machine as claimed in claim 1, characterised by comprising as drive members for the drum (5) one or more coaxial pneumatic wheels which are driven by a motor external to the tank (1) in which said drum (5) is located and which act either on metal rings applied to the interior of the drum (5) or on the inner wall of the drum.

16. A machine as claimed in claim 1, characterised in that the pneumatic wheels act as presser members to prevent jolting of the drum.

17. A machine as claimed in claim 1, characterised in that the outer surface of the drum is provided with projections, the suction perforations being interposed between the projections in such a manner as to increase the fabric dragging surface.

18. A machine as claimed in claim 1, characterised in that the vacuum is generated by a blower (215) housed within the drum (105).

19. A machine as claimed in claims 1 and 18, characterised in that the suction duct (111) is followed angularly by at least one duct (112) arranged to create an air blast, which is generated by said blower (215) housed within the drum (105).

20. A machine as claimed in claim 1, characterised in that the drum (105) is supported at one end (106A) on a drive shaft (212) which rotates it, the other end (106) being open and comprising internally an annular member (203) on which there act support members (204) connected to a fixed structure (208).

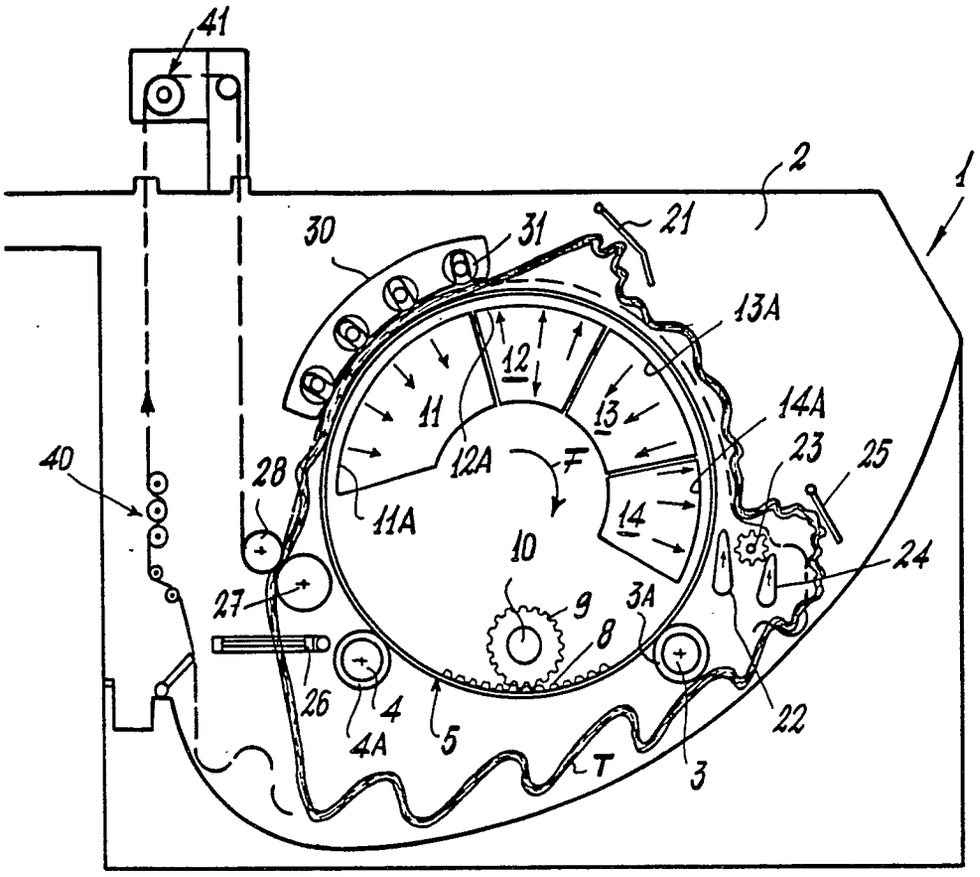
21. A machine as claimed in claim 20, characterised in that the support members (204) are disposed 120° apart and each comprises a rotary member (205) the shaft of which is supported elastically by a fork-shaped end (206) of a bracket (207) secured to the fixed structure (208).

22. A machine as claimed in claim 21, characterised in that the shaft of the rotary member (205) is subjected to the elastic action of pre-loadable springs.

23. A machine as claimed in claim 18, characterised in that the blower 215 is tangential, the suction duct (111) and delivery duct (112) being connected to the casing (220) of said blower (215), the drive shaft (214) of said blower being contained coaxially within the drive shaft (212) of the drum (105).

24. A machine as claimed in claims 20 and 23, characterised in that the suction duct (111) and delivery duct (112) are fixed to at least one support (250) which is disposed within the drum (105) and is secured at one end to a rolling member disposed on the drive shaft (212) of the drum (105) and at its other end (252) to the fixed structure (208).

25. A machine as claimed in claims 1 and 15, characterised in that a suction duct (260) and a delivery duct (261) both provided with valve members (263), advantageously butterfly valves, are disposed on the top of the tank (101) which houses the drum (105), the suction duct (260) comprising electrical resistance elements (264) in its interior in a position corresponding with the tank (101), said suction duct (260) terminating in a hood (262) disposed in correspondence with the suction duct (111) provided in the drum (105).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F
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24
27
9
3A
8
26
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22

Fig. 1

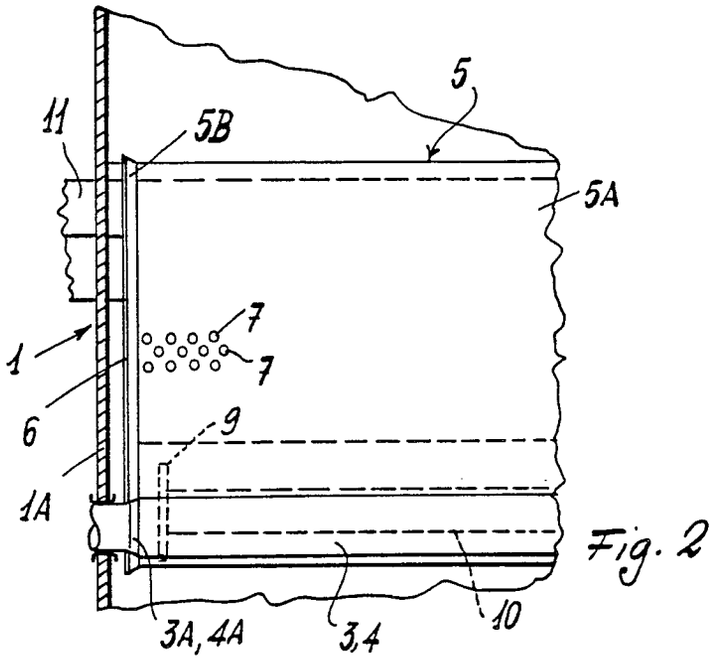
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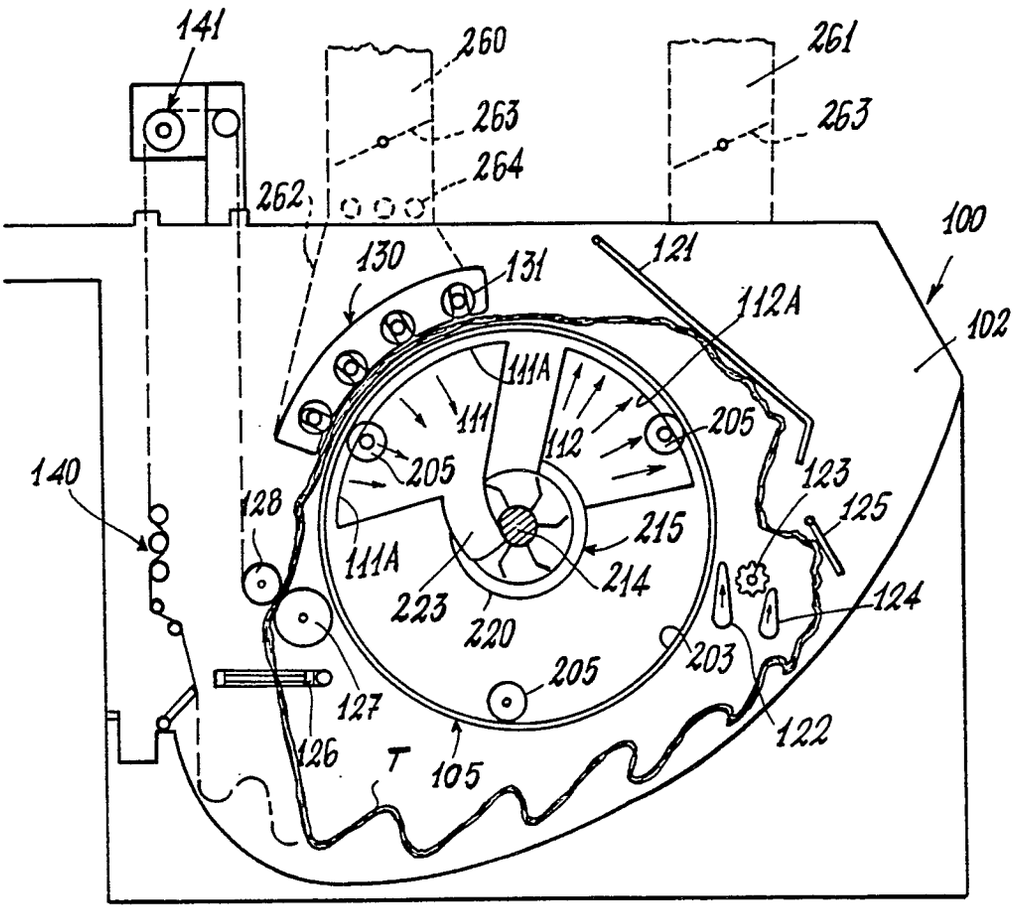
Fig. 2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111A
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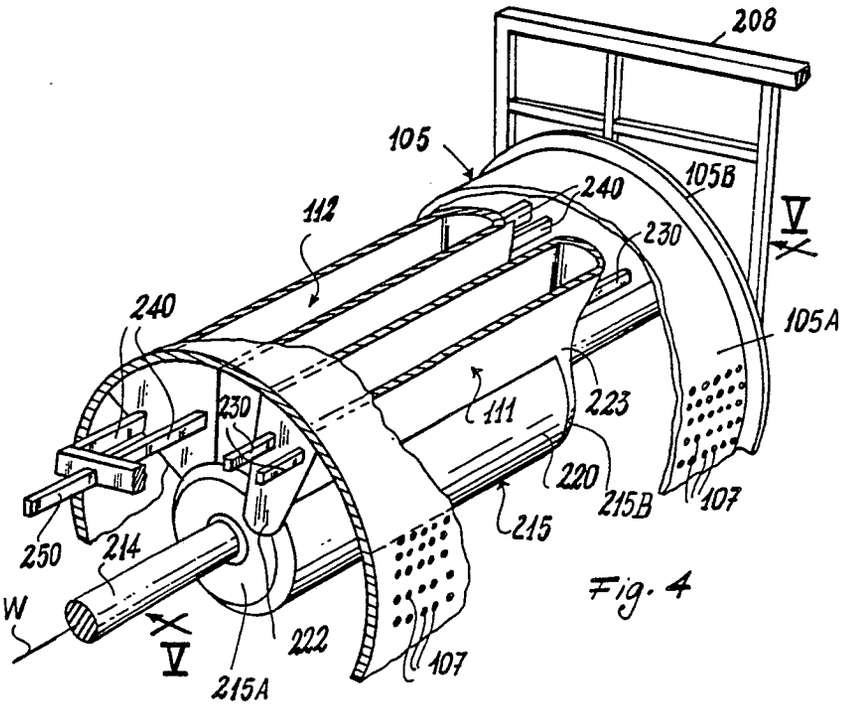
T
105

Fig. 3


208
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105B
240
112
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V
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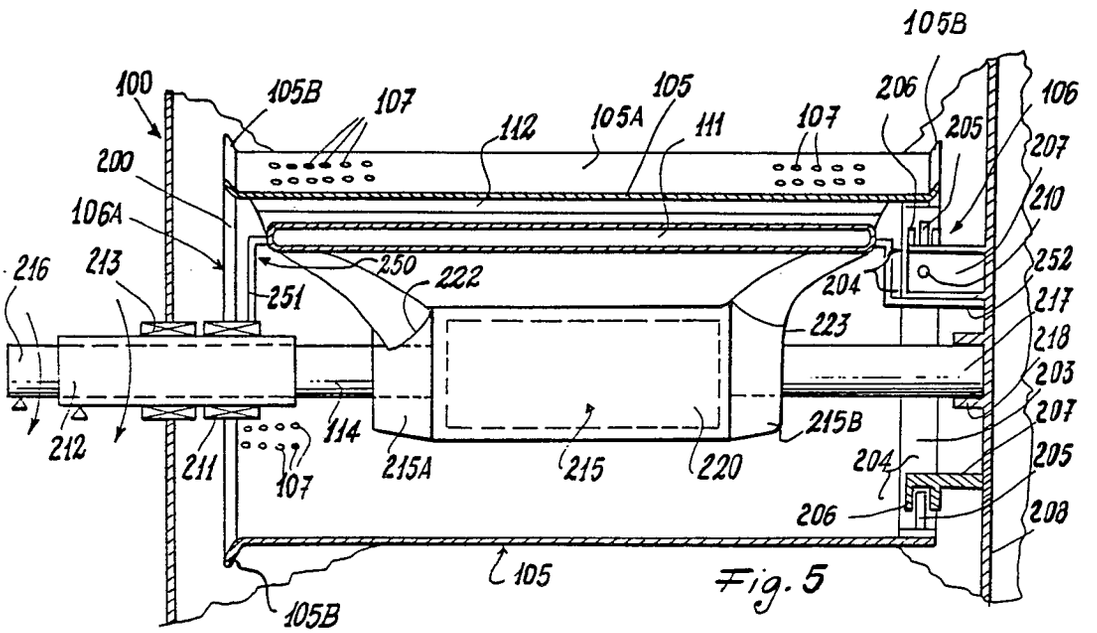
215A
107

Fig. 4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212
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114
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215B
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205
206
208
105
105B

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number

EP 88 12 1710

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	BE-A-642495 (FIRMA ESTABLISHMENT FOR AUTOMATION) * the whole document *	1-4	D06B3/26 D06B5/08
X	FR-A-2119149 (GUERRA) * the whole document *	1, 3	
X	FR-A-2489857 (TEINTURERIE DE CHAMPAGNE) * page 7, line 5 - line 29; figures 3, 4 *	1, 2, 5, 11	
A	FR-A-2327348 (C.D.B. EUROP)		
A	DE-C-830040 (SCHROERS & CO)		
A	DE-A-3201590 (BERTOLDI)		

TECHNICAL FIELDS SEARCHED (Int. Cl.4)
D06B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	28 APRIL 89	PETIT J.P.

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