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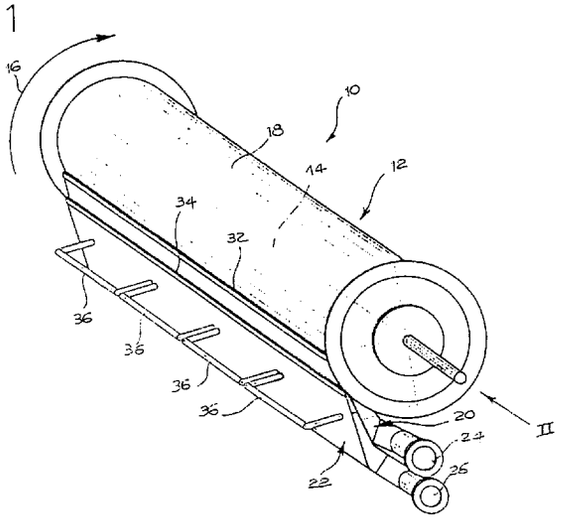
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(54) Entrainment assembly for fabric treatment machines

(57) An entrainment assembly for fabric treatment machines, comprising:

- at least a motor-driven entrainment cylinder (12) having an external surface (18) adapted to imparting a movement to at least a piece of fabric, and
- means for delivering an air flow comprising at least a slit (32, 34) for producing an air flow substantially planar and directed substantially tangent to the external surface (18) of the entrainment cylinder (12).

FIG. 1



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Description

The present invention relates to an entrainment assembly for fabric treatment machines.

The invention has been developed in particular for improving entrainment of pieces of fabric in endless strand form. During the treatment it is necessary to circulate one or more pieces of fabric at high speed within a treatment machine wherein the fabric can be subjected to treatments of various nature which are basically divided into wet treatments (dying, washing, bleaching, etc.) and dry treatments (drying, softening, ageing, etc.).

From EP-A-0718430 by the same Applicant is known a machine for treatment of fabrics in wet, humid or dry conditions, comprising a fabric entrainment assembly including a plurality of motor-driven cylinders which define a substantially rectilinear entrainment path which extends from a front portion to a rear portion of a treatment tank. A plurality of air delivery nozzles are associated with the entrainment cylinders in order to create traction conditions between the fabric and the cylinders which permit entrainment of both wet and dry fabric. In this document it is also disclosed a nozzle placed in correspondence with the last cylinder, having the purpose to facilitate the separation of the fabric from the surface of the cylinder.

From EP-A-0512189 also by the same Applicant it is known a machine for wet treatment of fabrics, typically for dying treatments, provided with an hydraulic device for entrainment of fabrics, including an entrainment pipe wherein a flow of entrainment liquid is conveyed. Upstream of the entrainment pipe it is provided a motor-driven cylinder which lifts the fabric from the bottom of the tank and sends it to the entrainment pipe. An air delivery inlet is arranged for investing with an air flow the fabric portion upstream of the entrainment cylinder, for inflating the fabric and creating a force on the fabric which tends to increase the winding angle on the entrainment cylinder.

In treatment machines of the type disclosed above there is the problem of the formation of bends on the fabric. In fact, the piece of fabric circulates in a strand form and repeatedly passes on the entrainment cylinders or within the hydraulic entrainment pipe. During this treatment there is the risk of formation of permanent marks on the fabric in correspondence with the zones which have been subjected to a bent in the same are a for a prolonged the period of time. For this reason, the fabrics more delicate and more sensible to the formation of permanent marks must be treated in open form instead of in rope form, in order to avoid damages to the fabric.

The object of the present invention is to provide an entrainment assembly for fabric treatment machines which overcomes the above drawback.

In accordance with the present invention, this object is achieved by an entrainment assembly having the characteristics forming the subject of the main claim.

The entrainment assembly according to the invention comprises a motor-driven entrainment cylinder associated with means for delivering an air flow which are realized in the form of at least a slit adapted to produce a substantially planar air flow directed substantially tangent to the outer surface of the entrainment cylinder. By virtue of this idea of solution, an air film is created which covers at least a part of the contact area between the fabric and the entrainment cylinder. This laminar air flow causes the fabric to move in a much more efficient way than other known arrangements and avoids the formation of repetitive bents on the fabric.

The experience carried out by the Applicant has shown that a laminar airflow tangent to the surface of the entrainment cylinder prevents the problems connected to the formation of permanent marks even on delicate, very beaten and twisted fabrics.

Further characteristics and advantages of the present invention will become evident in the course of detailed description which follows, given purely by way of non limiting example, with reference to the annexed drawings, wherein:

- figure **1** is a schematic perspective view of an entrainment assembly according to the present invention,
- figure **2** is a schematic lateral view along arrow II of figure 1,
- figure **3** is a perspective view showing a variant of the entrainment assembly according to the invention,
- figure **4** shows the use of an entrainment assembly according to the invention in a finishing machine,
- figures **5** and **6** show the use of an entrainment assembly according to the invention in two different dying machines, and
- figure **7** shows a variant of the part indicated by arrow VII in figure 6.

With reference to figures 1 and 2, a first embodiment of the entrainment assembly according to the present invention is indicated 10. This entrainment assembly comprises a motor-driven entrainment cylinder 12 turning about its own axis 14 in the direction indicated by arrow 16. The cylinder 12 has a substantially smooth external surface 18 which can be covered by a rubberised tape in order to increase the condition of adherence with the fabric.

The entrainment assembly 10 comprises one or more nozzles adapted to produce a planar air flow directed substantially tangent to the external surface 18 of the entrainment cylinder 10. In the example shown in figures 1 and 2, two nozzles indicated 20 and 22 are provided. Each nozzle 20, 22 has an air flow inlet section 24, 26 which communicates with a chamber 28, 30, which, in a plane orthogonal to the axis of rotation of the

cylinder 12, has a tapered profile which finishes with a slit 32, 34 directed parallel to the axis 14 of the cylinder 10. With reference to figure 2, the slits 32, 34 of the nozzles 20, 22 are spaced out from each other along a direction substantially tangent to the external surface 18 of the cylinder 10. The slits 32, 34 produce respective air flows with substantially planar shape, directed as much as possible tangent to the external surface 18 of the entrainment cylinder 10. As visible in figure 1, the slits 32, 34 have a width substantially equal to the width of the cylinder 12. The width of the cylinder 12 depends on the number of fabric strands which are treated at the same time in the machine in which the entrainment assembly 10 is incorporated.

The air flow coming out from the first nozzle 20 (the one closer to the entrainment cylinder 12) creates a real air cushion on the smooth surface 18 of the cylinder 12, which repeatedly shakes and swells the fabric preventing the formation of bends in repetitive positions on the fabric strands.

The nozzle 22 farther away from the cylinder 12 carries out a preliminary opening of the fabric and prepares the fabric to receive with greater effectiveness the air flow supplied by the first nozzle 20.

On the outer surface of the second nozzle 22 can be arranged a plurality of guiding elements 36 through which pass respective fabric strands which are intended to cooperate with the external surface 18 of the entrainment cylinder 12. The contrasting action of the guiding elements 36 permits a better opening of the fabric under the effect of the air flows supplied by the slits 32, 34.

As visible in figure 2, the nozzles 20, 22 are supplied by respective pipes 38, 40 on each of which it is arranged a control valve 42, 44 which permits to vary the rate of air flow forwarded to the respective nozzle. The control valves 42, 44 permit to adapt the shaking and opening effect of the fabric to different operative conditions. For example, with wet or humid fabric a greater rate of air flow can be set while for dry fabric a very small rate of air flow is sufficient to create the desired shaking effect. Depending on the type and on the humidity conditions of the fabric, it is also possible to control in different ways the rate of air flows intended to be forwarded to the first or to the second nozzle.

In figure 2 the nozzles 20, 22 are arranged upstream of the entrainment cylinder 12, with reference to the fabric circulating direction. This permits to shake the fabric before it contacts the entrainment surface. In the variant of figure 3 it is shown the case wherein the nozzles 20, 22 are arranged downstream of the entrainment cylinder 22 with reference to the fabric circulating direction. The solution of figure 3 can be adopted for example on the last cylinder of an entrainment system composed by a plurality of adjacent cylinders and has the purpose to make easier the separation of the fabric from the cylinder, in addition to causing shaking and swelling of the fabric which prevent the formation of repetitive bends.

For the purposes of the present invention, it is not indispensable to provide two supply nozzles arranged as shown in figures 1 and 3. The effects of shaking and movements of the fabric can equally be obtained with a single nozzle provided with a slit adapted to produce a laminar air flow tangent and as much as possible close to the cylinder surface.

Figure 4 shows the operating scheme of a finishing machine which incorporates two entrainment assemblies according to the present invention. The finishing machine shown in figure 4 comprises a tank 48 having a front section 50 and a rear section 52. An entrainment system 54 lifts one or more pieces of fabric in the front portion 50 and entrains them at high speed towards the rear portion 52 wherein the pieces of fabric fall on the tank bottom forming a series of laps. The entrainment system 54 comprises a plurality of motor-driven cylinders 56-66. The end cylinders 56, 66 are smooth and are associated with supply nozzles 68, 70 and 72 arranged as previously described with reference to figures 1 to 3. The intermediate entrainment cylinders 58-64, as opposed to the end cylinders 56, 58, present on their external surfaces a plurality of strips adapted to increase the adhering conditions with the fabric 56. In case, the machine can be provided with an idle cylinder 74 for preventing that the fabric moves excessively away from the entrainment cylinder 56 and for maintaining optimal adherence conditions.

In figure 5 it is shown a machine for wet treatments of fabrics in strand form, comprising a tank 76 with circular cross section wherein a piece of fabric 78 is entrained in circulation by a dying and hydraulic transportation nozzle 80. Upstream of the nozzle 80 it is arranged an entrainment assembly 10 of the type shown in figures 1 and 2, whose components are indicated with the same reference numbers. With 82 it is schematically shown a fan assembly for producing the air flow for supplying the nozzles 20, 22.

Figure 6 shows the operating scheme of a dying machine conceptually similar to the one of figure 5 but having a different geometrical structure. The machine shown in figure 6 comprises an elongated tank 34 in which it is defined a lapping chamber 96. An entrainment assembly 10 of the type previously disclosed lifts and forwards the fabric to a dying nozzle 88 connected to a strand hydraulic transport pipe 90. Outside the tank 84 it is arranged a fan 92 for supplying the air flow to the nozzles 20, 22.

As an alternative, as shown in figure 7, the entrainment assembly 10 can be provided with a single supply nozzle 20, upstream of which could be advantageously arranged a supply opening 94 which produces a diffused air flow directed orthogonal to the fabric strand.

Claims

1. An entrainment assembly for fabric treatment machines, comprising:

- at least a motor-driven entrainment cylinder (12, 56, 66) having an external surface (18) adapted to impart a movement to at least a piece of fabric, and
- means for delivering an air flow associated with said entrainment cylinder,

characterized in that said delivering means comprise at least a slit (32, 34) for producing a substantially planar air flow directed substantially tangent to the external surface (18) of the entrainment cylinder (12).

2. An entrainment assembly according to claim 1, characterized in that said air flow has a width substantially equal to the width of the entrainment cylinder (12).

3. An entrainment assembly according to claim 1, characterized in that said slit (32, 34) is arranged so as to forward the air flow in a direction concordant with the direction of rotation of the cylinder (12).

4. An entrainment assembly according to claim 1, characterized in that said slit (32, 34) is arranged for forwarding the air flow in a direction opposite to the direction of rotation of the cylinder (12).

5. An entrainment assembly according to claim 1, characterized in that it comprises a first and a second nozzle (20, 22) provided with respective slits (32, 34) for supplying an air flow, said slits being spaced out from each other along a direction substantially tangent to the surface of the cylinder (18).

6. An entrainment assembly according to any of the preceding claims, characterized in that it comprises means for controlling the rate of air flow supplied to said slits (32, 34).

FIG. 1

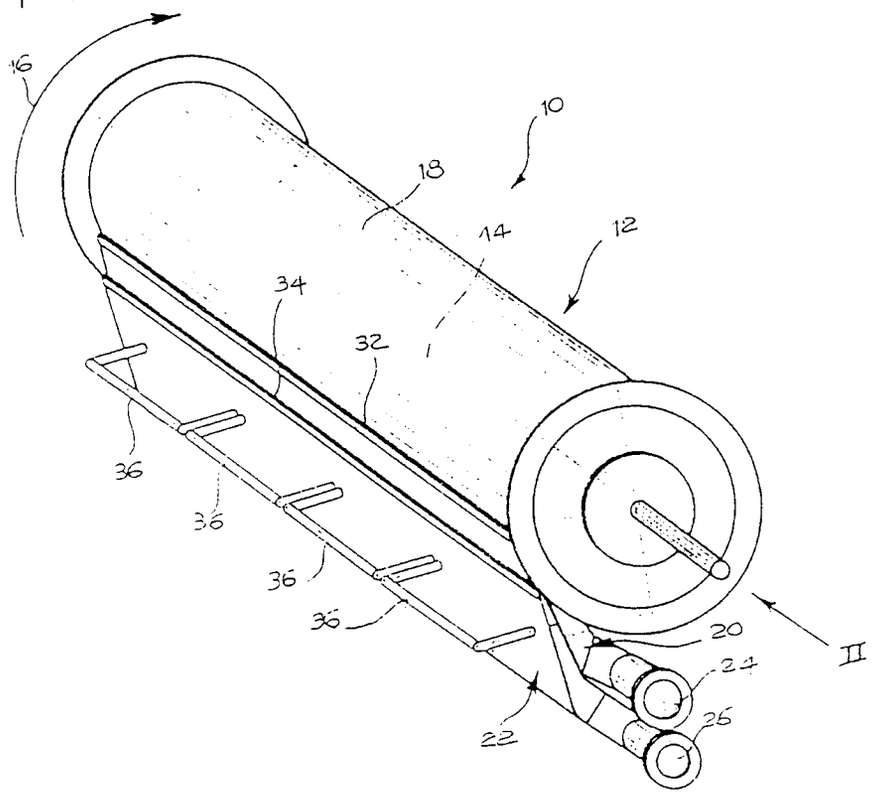


FIG. 3

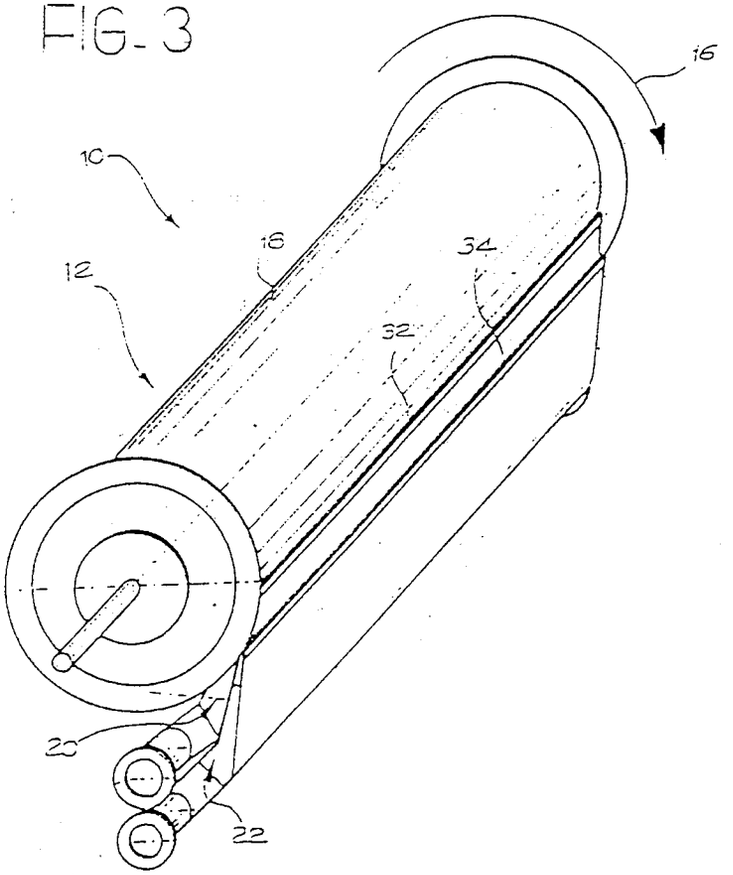
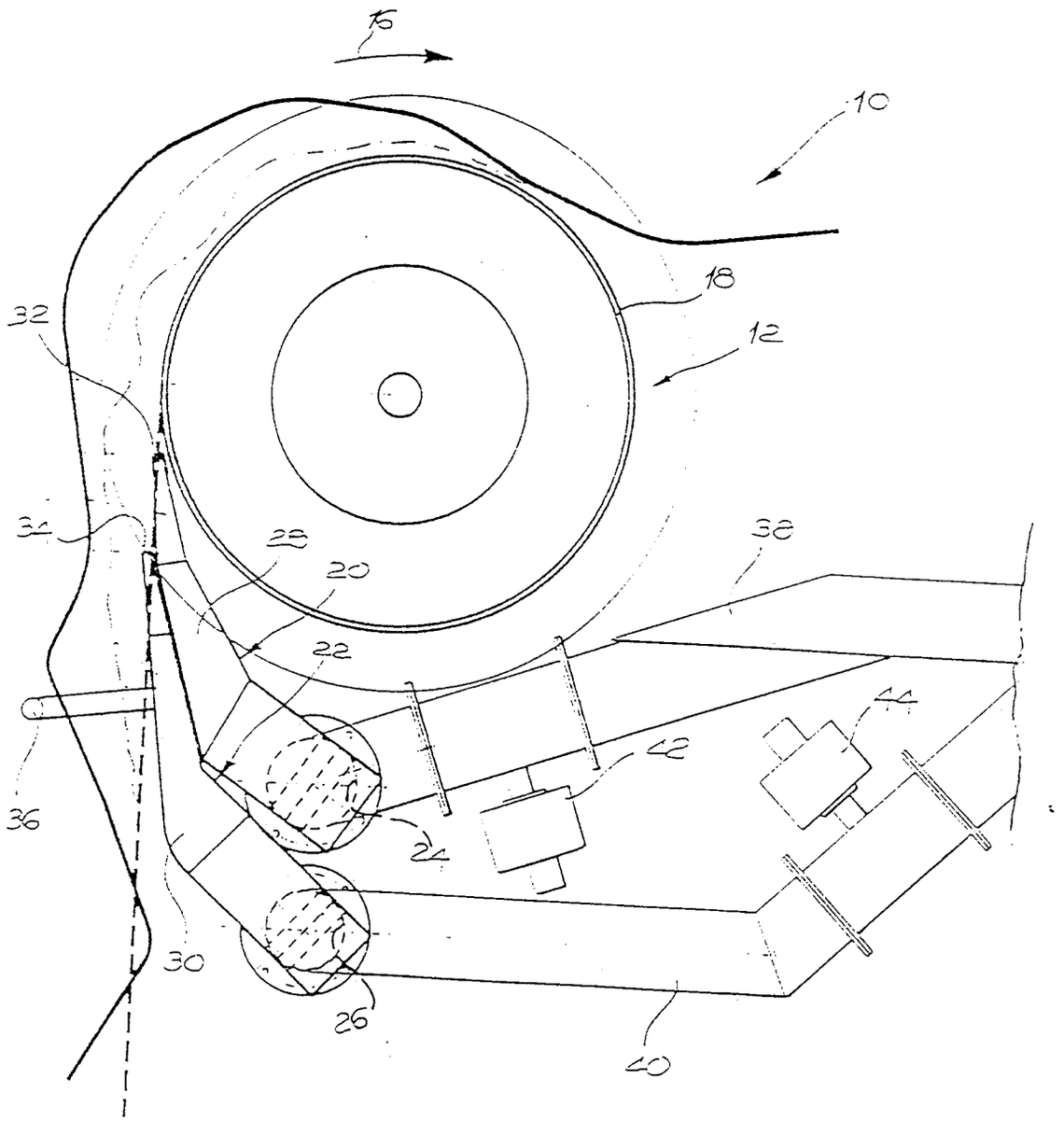


FIG. 2



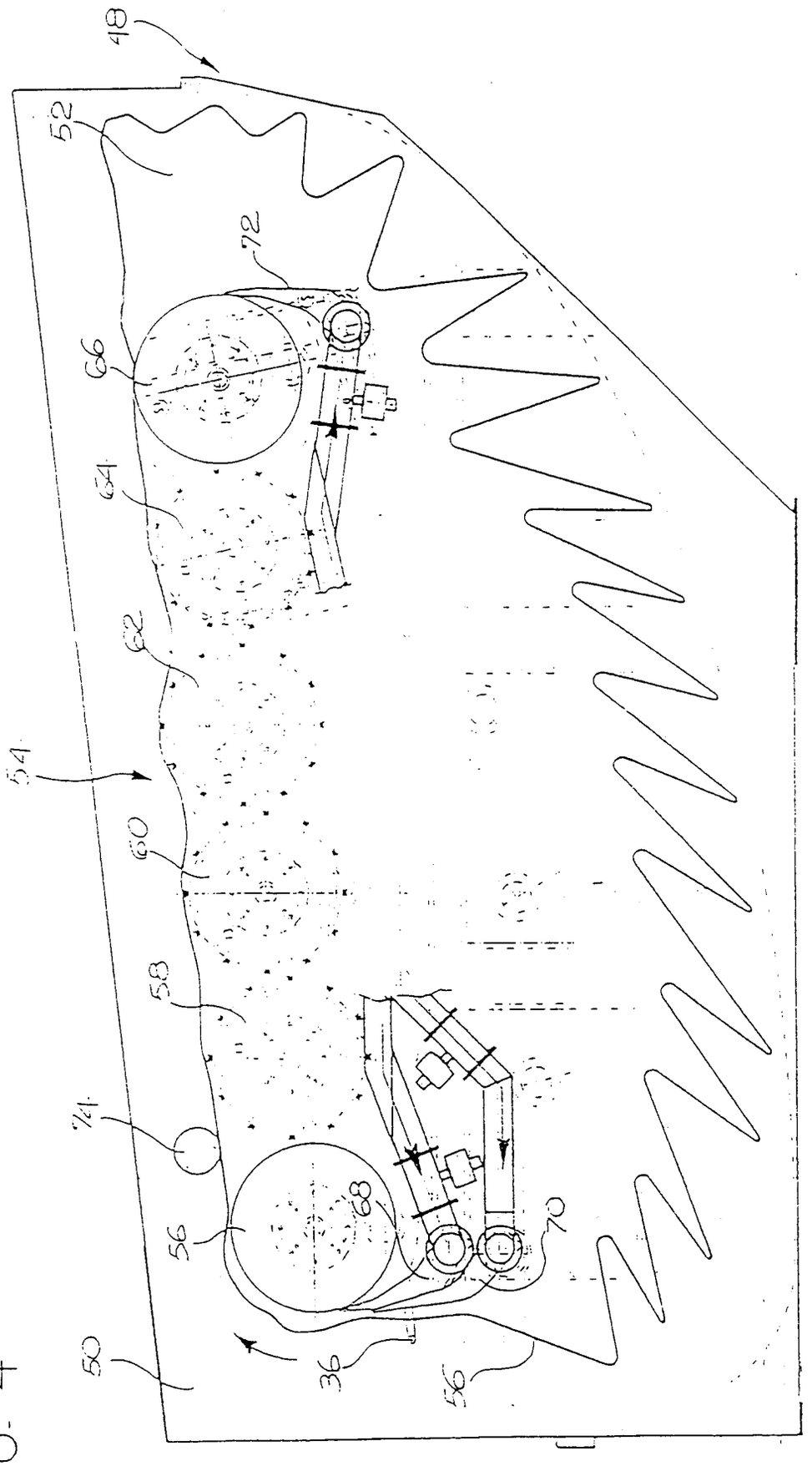


FIG. 4

FIG. 5

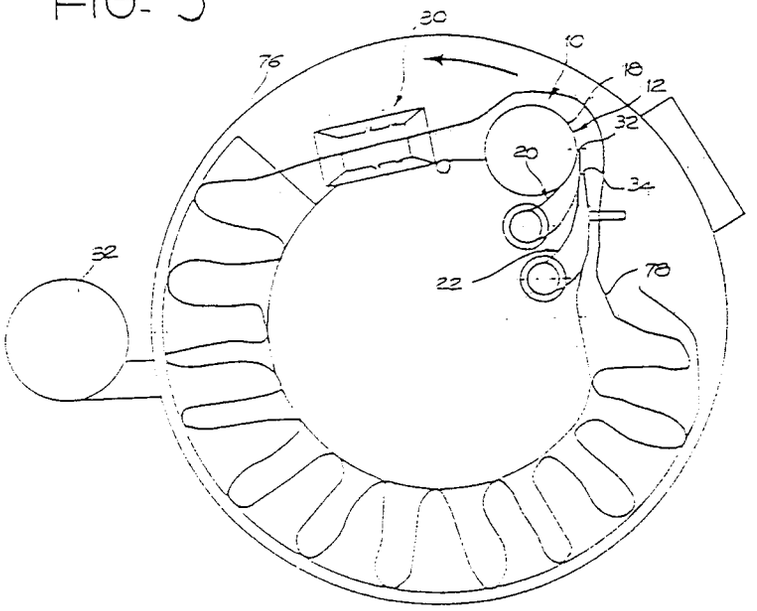


FIG. 7

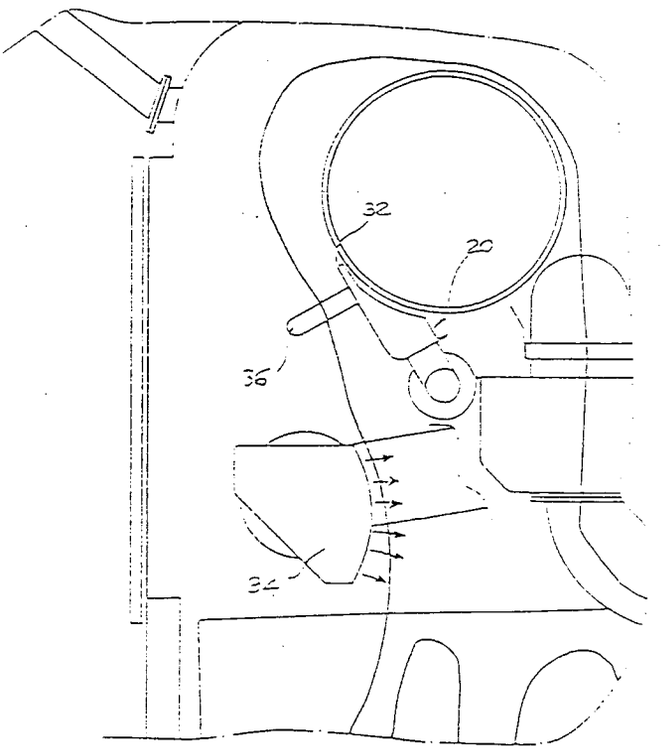
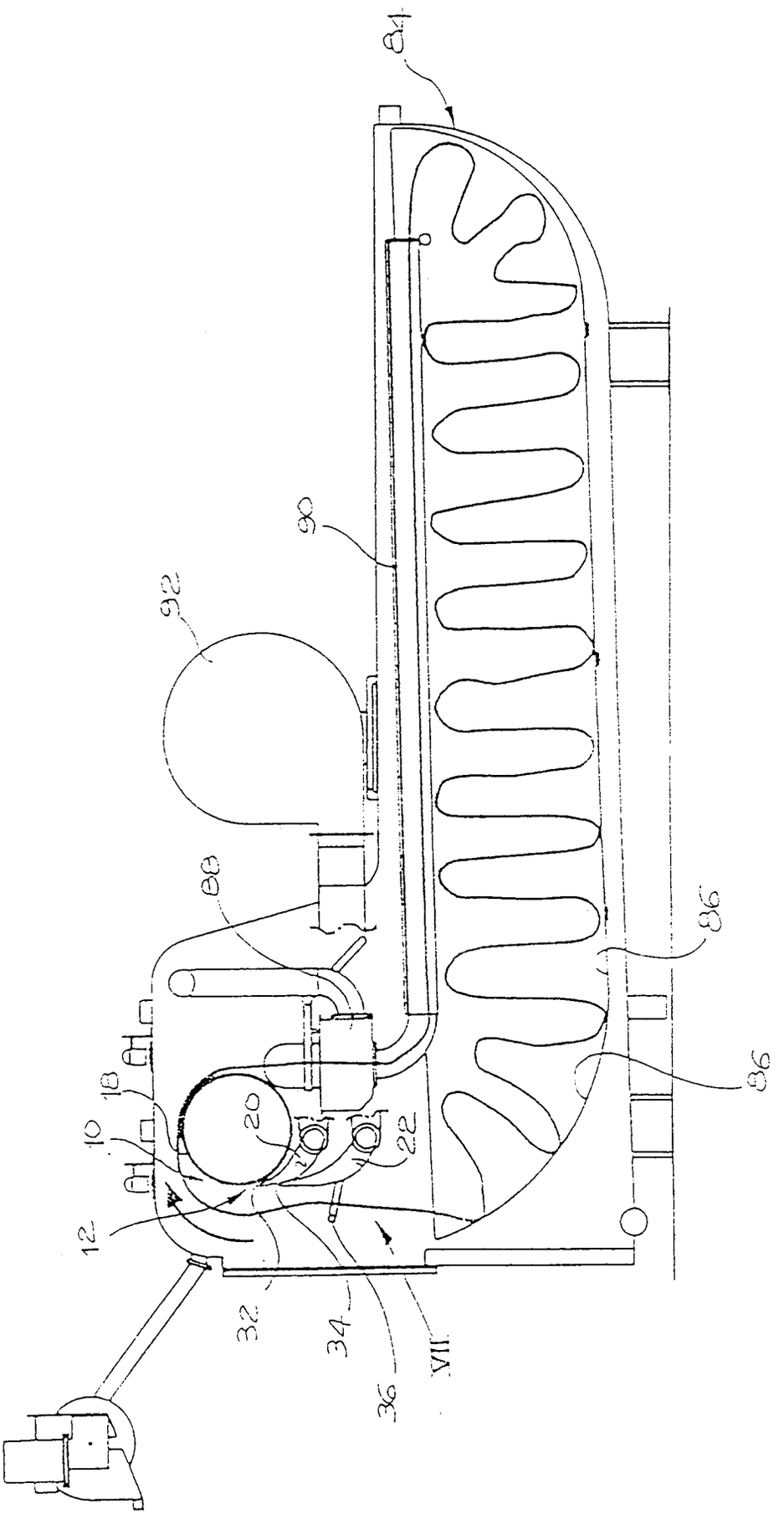


FIG. 6



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EUROPEAN SEARCH REPORT

Application Number
EP 97 12 2124

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.6)
D,A	EP 0 512 189 A (FLAINOX S.R.L.) * column 3, line 32 - line 52 *	1,3,6	D06B23/04 D06B3/10
A	EP 0 496 176 A (TEINTURERIE DE CHAMPAGNE) * column 3, line 10 - line 35 *	1,2,4,6	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)
D06B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	27 March 1998	Goodall, C

CATEGORY OF CITED DOCUMENTS

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