

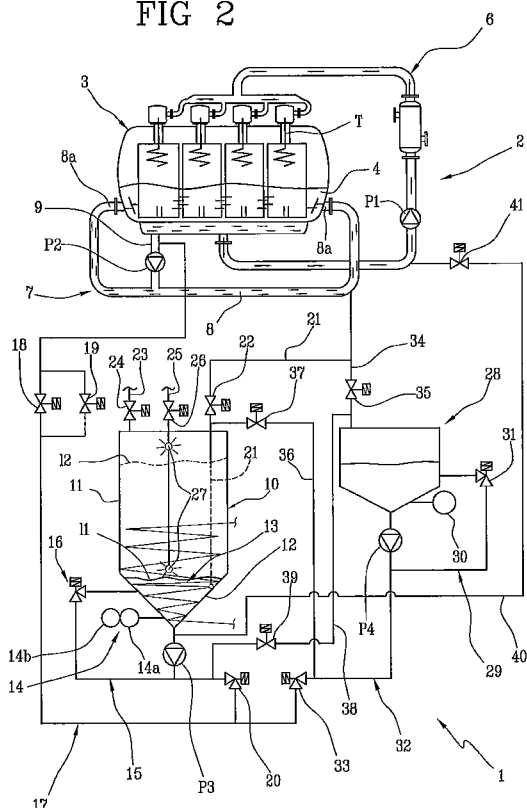


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(54) Title: PLANT FOR THE DISCONTINUOUS TREATMENT OF YARNS OR FABRICS

FIG 2



(57) Abstract: A plant for the treatment of yarns or fabrics comprises a main tank (3) for containing a treatment bath (4) and a preparation vat (10) which is connected to the main tank (3). The vat (10) comprises a double-precision level switch (14) acting on the lower portion (12) of the vat (10) for detecting when a fill level (li) is exceeded which delimits a volume of the vat (10) that is less than the volume of the treatment bath (4), and also acting on the upper portion (11) of the vat (10) for detecting a fill level (I2) delimiting a volume substantially equal to the treatment bath (4). The vat (10) comprises a mixing duct (15) with ends connected to different points of the lower portion (12) and provided with a pump (P3), allowing the vat (10) to be activated for preparation of the bath (4) or for preparation only of the dyeing products.

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GW, ML, MR, NE, SN, TD, TG).

PLANT FOR THE DISCONTINUOUS TREATMENT OF YARNS OR FABRICS

This invention relates to a plant for the discontinuous treatment of yarns or fabrics, of the type comprising the features described in the preamble to claim 1.

5 More particularly, the plant according to this invention is used during industrial processes relating to the production of yarns and fabrics and carries out various processing operations, such as dyeing, bleaching or washing.

10 For that purpose, for example, the fabric is twisted over itself in such a way that it takes on the shape of a rope and is immersed in a treatment bath. Prior art machines for this type of operation comprise a tank containing the treatment liquid bath and a motor-driven reel, able to rotate about its own axis of rotation, on
15 which the fabric rope to be treated rests, the fabric rope being closed in a loop and descending from the reel until it is in the bath and then rising from the bath on the opposite side of the reel. The fabric rope is circulated both by the rotation of the reel and because
20 the fabric is struck by a jet of treatment liquid sprayed by suitable nozzles. In the lower part of the tank, partly or completely immersed in the bath, there is a perforated basket able to move relative to the tank in a direction which is transversal to the direction of
25 feed of the fabric. The movement of the basket, in combination with fabric feed, allows the fabric to be zigzagged on the bottom of the basket in a regular fashion. The fabric rope which is closed in a loop is

made to rotate inside the machine for the time necessary for treatment optimisation.

Prior art plants also comprise a preparation vat having a volume substantially equal to the content of the machine treatment bath. The preparation vat is used for preparing treatment baths while the machine is operating. The content of the tank, previously prepared, is completely transferred from the vat to the machine tank before it begins a new operating cycle. The preparation vat can also be used to prepare the washing water which is transferred in a single action to the machine or which is sprayed inside the machine, by an adjusting valve which determines its flow rate, to provide continuous washing.

At the same time, in prior art discontinuous dyeing plants one or more auxiliary tanks are used, designed to contain dyes and other chemical and auxiliary products to be introduced into the machine and/or into the preparation vat. These auxiliary tanks are smaller than the preparation vat and comprise heating and mixing means designed to dilute and homogenise the chemical products before they are introduced into the bath. The prior art plants normally comprise one preparation vat and two tanks for chemical products.

The prior art plants, including the machine itself, the vat and the tanks, are therefore very bulky and expensive.

In this context, the technical purpose which forms the basis of this invention is to propose a plant for the discontinuous treatment of fabric ropes which allows a

reduction of the space needed for its installation compared with prior art plants.

The aim of this invention is also to propose a plant which is less expensive than the prior art plants.

5 This invention also has for an aim to propose a plant which allows simplification of the operations that must be performed by the operator, thus increasing its safety.

10 The technical purpose specified and the aims indicated are substantially achieved by a plant for the discontinuous treatment of yarns or fabrics in which one of the auxiliary tanks for the chemical products is integrated in the preparation vat.

15 More specifically, this invention relates to a plant for the discontinuous treatment of yarns or fabrics, comprising:

a main tank designed for treating yarns or fabrics, the main tank delimiting an inner volume for the containment of a treatment liquid bath for the yarns or fabrics;

20 a preparation vat in fluid communication with the main tank; the preparation vat delimiting an inner volume substantially equal to the volume of the treatment liquid bath;

25 characterised in that the preparation vat comprises a double-precision level switch acting on a lower portion of the preparation vat for detecting when a first, lower fill level is exceeded, which delimits a volume of the preparation vat that is less than the volume of the treatment liquid bath, and also acting on an upper
30 portion of the preparation vat for detecting a second, higher fill level, delimiting an inner volume

substantially equal to the treatment liquid bath;
and also being characterised in that the preparation vat
comprises a mixing duct whose opposite ends are
connected to different points of the lower portion and
5 which is provided with a pump, for allowing the
preparation vat to be activated as a preparation vat for
the bath, or as a preparation vat only for dissolving
and mixing dyes and chemical and auxiliary dyeing
products.

10 The total inner volume of the preparation vat is
preferably between 3 and around 6 times the load in kg
of yarn or fabric introduced into the machine. The
volume of the lower portion only is between around 0.4
and around 0.7 times the load in kg of yarn or fabric
15 introduced into the machine.

Therefore, the volume of the lower portion is between
around 1/4 and around 1/15 of the total volume of the
vat.

The integration of a tank for chemical products in the
20 preparation vat allows:

- a reduction in the plant construction cost,
- a reduction in the space occupied by the plant,
- simplification of the operations which must be
performed by the machine operator,
- 25 - increased operator safety (lower likelihood of
errors),
- rationalisation of operations for sending solid
products (pastes) if plants with the automatic
distribution of salts and sulphates are present.

30 The lower portion is preferably shaped in such a way

that it is tapered from top to bottom, preferably having the shape of a cone. The conicity allows level variations to be more easily appreciated when the vat is used as a tank for chemical products and the chemical products are only contained in the conical portion.

The double-precision level switch for detecting when the first, lower level and the second, higher level are exceeded preferably comprises a first pressure switch and a second pressure switch.

The first pressure switch (more precise) detects when a first, lower level has been exceeded, when the vat is used as a tank for chemical products. The second pressure switch (less precise) detects when a second, higher level has been exceeded, when the vat is used as a preparation vat.

The preparation vat preferably comprises heating means acting on the lower portion.

More preferably, the heating means comprise a coil through which a heating fluid flows, the coil being positioned at least in the lower portion, preferably arranged in a spiral against an inner wall of the lower portion, the diameter of the spiral increasing from the bottom up.

The coil allows heating of smaller quantities of liquids (chemical products only contained in the cone).

The plant preferably comprises a first delivery duct from the preparation vat to the main tank and a first return duct from the main tank to the preparation vat; the first delivery duct being in fluid communication with the mixing duct and the pump.

That structure allows the bath to recirculate between

the machine and the vat.

In a preferred embodiment, the plant also comprises an auxiliary tank delimiting an inner volume which is less than the volume of the treatment liquid bath and comprising an auxiliary mixing duct whose opposite ends are connected to different points of the auxiliary tank and which is provided with an auxiliary pump, for allowing the dissolving and mixing of dyes and chemical and auxiliary dyeing products; in which the auxiliary tank is in fluid communication with the preparation vat and with the main tank. The inner volume of the auxiliary tank is preferably between around 0.4 and around 0.7 times the load in kg of yarn or fabric introduced into the machine.

The auxiliary tank allows the preparation in it of chemical products which are then introduced into the preparation vat for the bath to be used in the next machine cycle, or allows the products to be introduced into the machine while the vat already contains the bath ready for the next cycle.

The plant preferably comprises a second delivery duct from the auxiliary tank to the first delivery duct and a second return duct from the main tank to the auxiliary tank. The second delivery duct is in fluid communication with the auxiliary mixing duct and with the auxiliary pump.

That structure allows the bath to recirculate between the machine and the auxiliary tank.

The plant preferably comprises a first connecting duct extending between the second delivery duct and the first return duct.

The plant preferably comprises a second connecting duct extending between the first delivery duct and the second return duct.

5 That structure allows recirculation between the vat and the auxiliary tank.

Further features and advantages of this invention are more apparent from the non-limiting description which follows of a preferred, non-limiting embodiment of a plant for the discontinuous treatment of yarns or
10 fabrics as illustrated in the accompanying drawings, in which:

- 15 - Figure 1 is a schematic side and transparent view of a machine for the discontinuous treatment of fabric ropes belonging to a plant in accordance with this invention;
- Figure 2 is a schematic front and transparent view of the machine of Figure 1 associated with other elements of the plant in accordance with this invention.

20 In the accompanying drawings, the numeral 1 denotes in its entirety a plant for the discontinuous treatment of fabric ropes in accordance with this invention.

The plant 1 comprises a machine 2, which in turn comprises a main tank 3 designed to receive, in its
25 internally delimited volume, a treatment liquid, which may for example be a dye for dyeing the fabric rope "T", or a detergent for subjecting the fabric "T" to a washing cycle. The liquid forms a bath 4 which occupies the lower part of the main tank 3.

30 Suitable means support and guide the fabric rope "T" along a closed treatment path inside the main tank 3.

In more detail, in the upper part of the machine 2 there is a motor-driven reel 5 able to rotate about its own axis of rotation which is preferably horizontal (shown only in Figure 1). The reel 5 supports and guides the rope formed by the fabric "T". In the known way, therefore, not illustrated in detail, inserted in a tubular portion close to the motor-driven reel 5 there is at least one movement nozzle angled at an acute angle to the direction of feed of the rope "T", for dispensing against the fabric rope "T" a pressurised jet of the treatment liquid drawn from the bottom of the main tank 3 through a suitable main circuit 6 equipped with a main pump "P₁" (Figure 2). Said nozzle performs the dual function of wetting the fabric "T", before immersion, and providing the thrust to make it advance towards the bath 4.

The machine 2 in the non-limiting example illustrated also comprises a mixing circuit 7 (Figure 2), comprising a mixing pipe 8 whose opposite ends 8a are connected to opposite zones of the lower portion of the main tank 3, and a mixing duct 9 extending from the bottom of the main tank 3 and connected to the pipe 8. A mixing pump "P₂" is positioned on the mixing duct 9.

The above-mentioned machine 1 is only described by way of example, but this invention also relates to other types of machines for discontinuous treatment, for example open-width or rope, in which the fabrics and/or yarns are immersed in a bath.

The plant 1 also comprises a preparation vat 10, comprising an upper portion 11 having the shape of a cylinder with a vertical axis and a lower portion 12

having the shape of a cone which narrows downwards. The two portions 11, 12 inside them delimit a single volume which is substantially equal to the volume occupied by the treatment fluid in the main tank 3, in the main circuit 6 and in the mixing circuit 7. Said total volume of the vat 10 is, for example, around 5 times the load in kg of yarn or fabric introduced into the machine. The volume of the lower portion 12 only is around 0.5 times the load in kg of yarn or fabric introduced into the machine.

It should be noticed that the upper portion 11 and the lower portion 12 of the treatment vat 10 are not physically separate. That is to say, the treatment vat 10 does not comprise any partition or separator for physically dividing the upper portion 11 from the lower portion 12.

The preparation vat 10 comprises heating means 13 which act on the lower portion 12 of the vat 10 and, preferably, also on the upper portion 11. In the embodiment illustrated, the heating means 13 comprise a coil through which steam flows, located in the lower portion 12 and also partly in the upper portion 11. The coil is wound in a spiral and follows the inner surface of the lower portion 12, the coil also adopting the shape of a cone whose axis coincides with the main axis of the preparation vat 10. The diameter of each loop of the coil increases from the lower tip of the cone towards the upper portion 11.

The preparation vat 10 comprises a double-precision level switch 14 able to indicate when two separate thresholds have been exceeded, corresponding to two fill

levels in the vat 10. The double-precision level switch 14 acts on the lower portion 12 of the preparation vat 10 to detect a first, lower level l_1 , substantially corresponding only to filling of the lower portion 12.

5 The double-precision level switch 14 also acts on the upper portion 11 of the preparation vat 10 to detect a second, higher level l_2 , substantially corresponding to filling of the upper portion 11 as well. The level switch 14 used preferably comprises a first pressure switch 14a and a second pressure switch 14b.

10 Connected to the preparation vat 10 there is a mixing duct 15 whose first end comes out of a lower tip of the lower portion 12 and whose second end goes into a lateral wall of the lower portion 12. On the mixing duct 15 there is a first valve 16 and a pump P_3 located between the first valve 16 and said lower tip of the lower portion.

The preparation vat 10 is connected to the main tank 3 by means of a first delivery duct 17 extending, with a branch located between the pump " P_3 " and the first valve 16, from the mixing duct 15 and terminating in the mixing duct 9, upstream of the mixing pump " P_2 ". On the first delivery duct 17 there is a second valve 18 for metering the chemical/dyeing products and a third, bypass valve 19 for the rapid introduction of said chemical/dyeing products. On the first delivery duct 17 there is also a fourth valve 20 close to the pump " P_3 ".

25 The main tank 3 is also connected to the preparation vat 10 by means of a first return duct 21 extending from the mixing pipe 8 and terminating in the lower portion 12 of

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the vat 10. A fifth valve 22 acts on the first return duct 21.

A water feed duct 23 provided with a sixth valve 24 and a washing water duct 25 provided with a seventh valve 26
5 and two nozzles 27 inserted in the tank 10 (one upper and one lower) also terminate in the upper portion 11.

The plant 1 also comprises an auxiliary tank 28 for chemical products. The auxiliary tank 28 delimits an inner volume which is much less than that of the vat 10.

10 Indicatively, said volume is around 0.5 times the load in kg of yarn or fabric introduced into the machine.

Connected to the auxiliary tank 28 there is a mixing duct 29 whose first end comes out of the bottom of the auxiliary tank 28 and whose second end goes into a
15 lateral wall of the auxiliary tank 28. The auxiliary tank 29 has a known structure and comprises heating means, not illustrated, and a level switch 30. On the mixing duct 29 there is an eighth valve 31 and an auxiliary pump P₄ positioned between the eighth valve 31

20 and the bottom of the auxiliary tank 28.

The auxiliary tank 29 is connected to the main tank 3 by means of a second delivery duct 32 extending, with a branch located between the pump "P₄" and the eighth valve 31, from the mixing duct 29 and terminating in the first
25 delivery duct 17, upstream of the second valve 18 for metering the products. There is also a ninth valve 33 on the second delivery duct 32.

The main tank 3 is also connected to the auxiliary tank 28 by means of a second return duct 34 extending from
30 the mixing pipe 8 and terminating in an upper portion of the auxiliary tank 28. In particular, the second return

duct 34 is a branch of the first return duct 21. A tenth valve 35 acts on the second return duct 34.

The plant 1 comprises a first connecting duct 36 extending between the second delivery duct 32 and the first return duct 21. In particular, the first connecting duct 36 branches from the second delivery duct 32 upstream of the ninth valve 33 and terminates in the first return duct 21 downstream of the fifth valve 22. An eleventh valve 37 acts on the first connecting duct 36.

The plant 1 comprises a second connecting duct 38 extending between the first delivery duct 17 and the second return duct 34. In particular, the second connecting duct 38 branches from the first delivery duct 17 upstream of the fourth valve 20 and terminates in the second return duct 34 downstream of the tenth valve 35. A twelfth valve 39 acts on the second connecting duct 38.

The plant 1 also comprises a third delivery duct 40 extending between the lower portion 12 and the main circuit 6. In particular, the third delivery duct 40 branches from the mixing duct 15, upstream of the pump P_3 , and terminates in the main circuit 6 upstream of the main pump P_1 . A thirteenth valve 41 is positioned on the third delivery duct 40.

In practice, while the machine 2 is performing an operating cycle, a treatment bath is simultaneously prepared in the preparation vat 10, which is therefore filled with water (from the water feed duct 23) and chemical substances (introduced from the auxiliary tank

28 through the first connecting duct 36) up to the second level l_2 .

When the machine 2 operating cycle is complete, the machine is emptied, washed if necessary, and again
5 filled using the treatment liquid previously prepared in the vat 10, through the third delivery duct 40 and the thirteenth valve 41.

The auxiliary tank 28 mixes chemical products, auxiliary products and dyes to be introduced into the main tank 3
10 or into the vat 10. For that purpose, said substances are introduced into the auxiliary tank 28 and heated there (by means of devices which are not illustrated) and mixed by recirculation in the mixing duct 29. The substances are then introduced into the main tank 3
15 directly through the first delivery duct 17 and the third, bypass valve 19, or by metering them through the second valve 18.

Alternatively, the preparation vat 10 can be used to mix the chemical products, auxiliary products and dyes to be
20 introduced into the main tank 3, in a similar way to the auxiliary tank 28. For that purpose, said substances, which are required in much smaller quantities than the volume of the treatment bath, are introduced into the preparation vat until only the lower portion 12 is
25 substantially filled (first level l_1) and then they are heated by the coil 13 and mixed by recirculation in the mixing duct 15. The substances are then introduced into the main tank 3 directly through the first delivery duct 17 and the third, bypass valve 19, or by metering them
30 through the second valve 18.

The machine 2 bath may also be made to recirculate in the preparation vat 10 through the first return duct 21 and the first delivery duct 17 and/or in the auxiliary tank 28 through the second return duct 34, the second
5 delivery duct 32 and the first delivery duct 17.

The bath can also be made to recirculate from the preparation vat 10 to the auxiliary tank 28, or vice versa, through the first connecting duct 36 and the second connecting duct 38.

CLAIMS

1. A plant for the discontinuous treatment of yarns or fabrics, comprising:

5 a main tank (3) designed for treating yarns or fabrics, the main tank (3) delimiting an inner volume for the containment of a treatment liquid bath (4) for the yarns or fabrics;

10 a preparation vat (10) in fluid communication with the main tank (3); the preparation vat (10) delimiting an inner volume substantially equal to the volume of the treatment liquid bath (4);

15 characterised in that the preparation vat (10) comprises a double-precision level switch (14) acting on a lower portion (12) of the preparation vat (10) for detecting when a first, lower fill level (l_1) is exceeded, delimiting a volume of the preparation vat (10) which is less than the volume of the treatment liquid bath (4), and also acting on an upper portion (11) of the preparation vat (10) for detecting a second, higher fill level (l_2), delimiting an inner volume substantially equal to the treatment liquid bath (4); and also being characterised in that the preparation vat (10) comprises a mixing duct (15) whose opposite ends are connected to different points of the lower portion (12) and provided with a pump (P_3), for allowing the preparation vat (10) to be activated as a preparation vat for the bath (4) or as a preparation vat only for the dissolving and mixing of dyes and chemical and auxiliary dyeing products.

20 2. The plant according to claim 1, wherein the lower portion (12) has a shape which is tapered from the top down, preferably having the shape of a cone.

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3. The plant according to claim 1 or 2, wherein the upper portion (11) and the lower portion (12) of the preparation vat (10) are not physically separate from each other.

5 4. The plant according to claim 1, wherein the preparation vat (10) comprises heating means (13) acting on the lower portion (12).

10 5. The plant according to claim 4, wherein the heating means (13) comprise a coil through which a heating fluid flows, the coil being positioned at least in the lower portion (12), preferably arranged in a spiral against an inner wall of the lower portion (12), the diameter of the spiral increasing from the bottom up.

15 6. The plant according to claim 1, comprising a first delivery duct (17) from the preparation vat (10) to the main tank (3) and a first return duct (21) from the main tank (3) to the preparation vat (10); the first delivery duct (17) being in fluid communication with the mixing duct (15) and with the pump (P₃).

20 7. The plant according to claim 1, also comprising an auxiliary tank (28) delimiting an inner volume which is less than the volume of the treatment liquid bath (4) and also comprising an auxiliary mixing duct (29) whose opposite ends are connected to different points of the auxiliary tank (28) and which is provided with an auxiliary pump (P₄), for allowing the dissolving and mixing of dyes and chemical and auxiliary dyeing products; wherein the auxiliary tank (28) is in fluid communication with the preparation vat (10) and with the main tank (3).

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8. The plant according to claim 7, comprising a second

delivery duct (32) from the auxiliary tank (28) to the first delivery duct (17) and a second return duct (34) from the main tank (3) to the auxiliary tank (28); the second delivery duct (32) being in fluid communication with the auxiliary mixing duct (29) and with the auxiliary pump (P₄).

9. The plant according to claim 8, comprising a first connecting duct (36) extending between the second delivery duct (32) and the first return duct (21).

10. The plant according to claim 8 or 9, comprising a second connecting duct (38) extending between the first delivery duct (17) and the second return duct (34).

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FIG 1

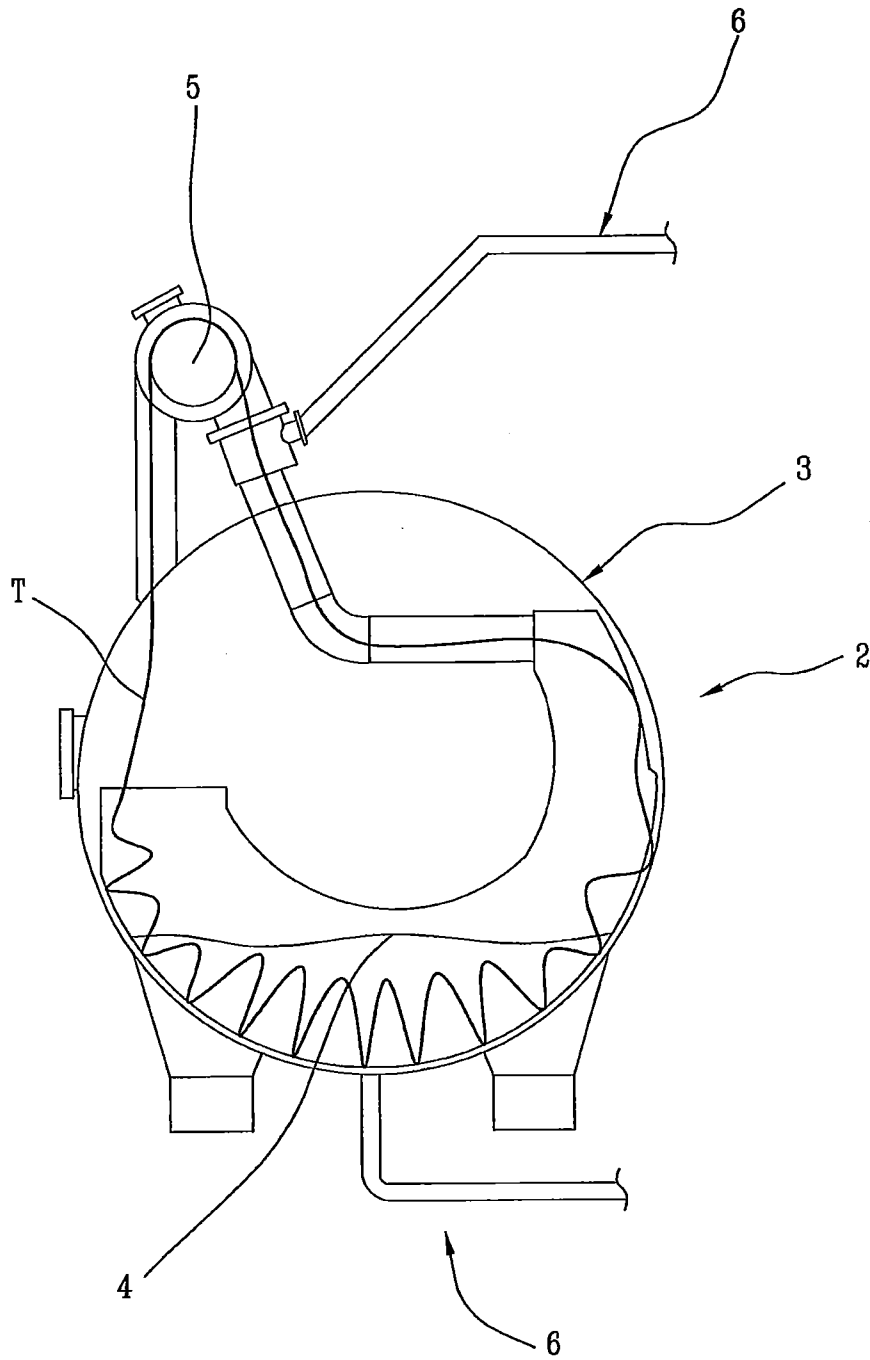
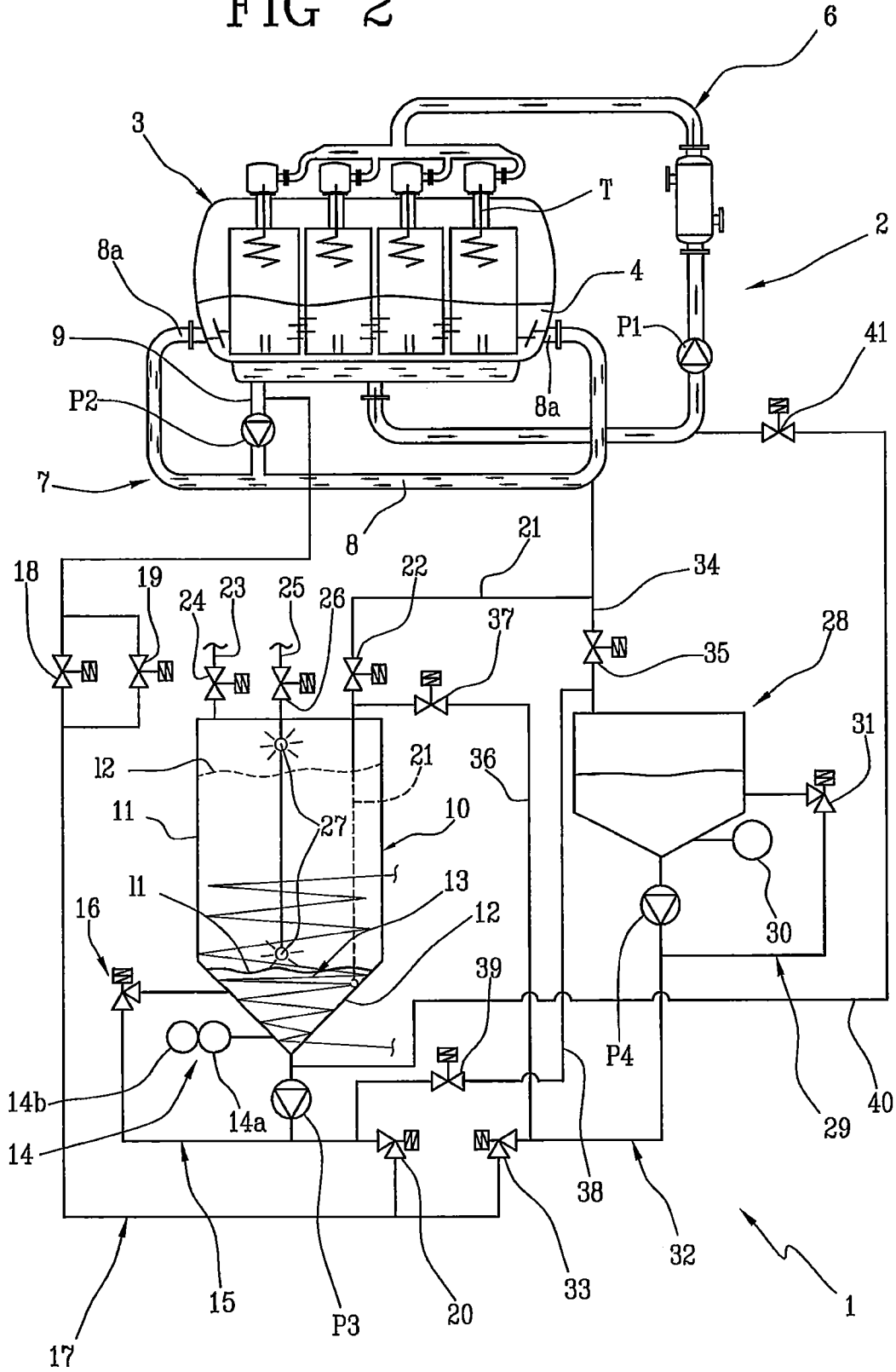


FIG 2



INTERNATIONAL SEARCH REPORT

International application No PCT/IB2011/050731
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A. CLASSIFICATION OF SUBJECT MATTER INV. D06B23/20 ADD.				
According to International Patent Classification (IPC) or to both national classification and IPC				
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) D06B				
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched				
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal				
C. DOCUMENTS CONSIDERED TO BE RELEVANT				
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
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A	column 7, line 64 - column 9, line 62; figure 2	2-10		

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<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"><input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C.</td> <td style="width: 50%; border: none;"><input checked="" type="checkbox"/> See patent family annex.</td> </tr> </table>			<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C.	<input checked="" type="checkbox"/> See patent family annex.
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C.	<input checked="" type="checkbox"/> See patent family annex.			
* Special categories of cited documents :				
"A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "&" document member of the same patent family			
Date of the actual completion of the international search	Date of mailing of the international search report			
13 April 2011	20/04/2011			
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Bichi, Marco			

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International application No

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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