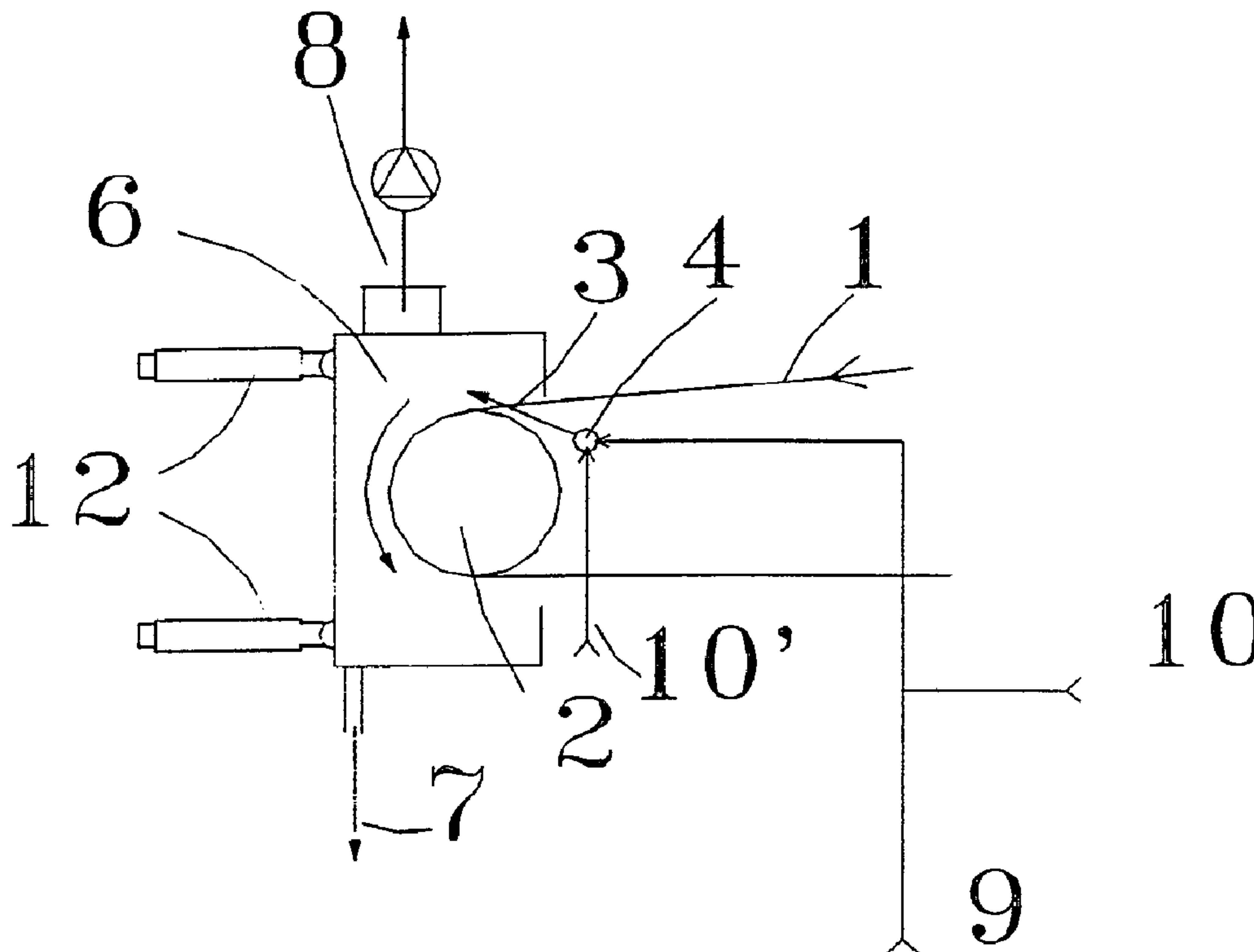




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 (72) Inventeurs/Inventors:  
 KOSKINEN, Pekka, FI;  
 HAVERINEN, Timo, FI  
 (73) Propriétaire/Owner:  
 EV GROUP OY, FI  
 (74) Agent: ROBIC

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 (54) Title: METHOD AND APPARATUS FOR CLEANING OF FABRICS, PARTICULARLY FABRICS OF A PAPER MACHINE



(57) Abrégé/Abstract:

Method of cleaning a fabric, particularly a paper machine fabric. The fabric (1) is led at least through one roll or cylinder (2) and the cleaning liquid is introduced into a gap (3) (closing nip) defined by the fabric (1) and the roll or the cylinder (2), into which gap the fabric (1) is coming.



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<p>(21) International Application Number: PCT/FI96/00044</p> <p>(22) International Filing Date: 22 January 1996 (22.01.96)</p> <p>(30) Priority Data: 950281 23 January 1995 (23.01.95) FI</p> <p>(71) Applicant (for all designated States except US): EV GROUP OY [FI/FI]; Kirkkokatu 8 A, FIN-48100 Kotka (FI).</p> <p>(72) Inventors; and (75) Inventors/Applicants (for US only): KOSKINEN, Pekka [FI/FI]; Metsäkulmankatu 40, FIN-48910 Kotka (FI). HAVERINEN, Timo [FI/FI]; Maskulantie 1 C 16, FIN-21250 Masku (FI).</p> <p>(74) Agent: OY HEINÄNEN AB; Annankatu 31-33 C, FIN-00100 Helsinki (FI).</p>		<p>(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AZ, BY, KG, KZ, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b> With international search report.</p>
<p>(54) Title: METHOD OF APPARATUS FOR CLEANING OF FABRICS, PARTICULARLY FABRICS OF A PAPER MACHINE</p>		
<p>(57) Abstract</p>		
<p>Method of cleaning a fabric, particularly a paper machine fabric. The fabric (1) is led at least through one roll or cylinder (2) and the cleaning liquid is introduced into a gap (3) (closing nip) defined by the fabric (1) and the roll or the cylinder (2), into which gap the fabric (1) is coming.</p>		

METHOD AND APPARATUS FOR CLEANING OF FABRICS, PARTICULARLY  
FABRICS OF A PAPER MACHINE

The present invention is directed to a method of cleaning fabrics, particularly a paper machine fabrics.

The present invention is also directed to an apparatus for cleaning fabrics, particularly a paper machine fabrics.

10 Fouling of the fabrics has been experienced to be a problem in present fast running paper machines and particularly in such a machines which use fillers and/or recycled fibres. In addition, or alternatively to that, particularly the fast decreasing of permeability of the first drying fabrics or wires after the machine has been started is becoming more and more common, particularly in machines where so called suction rolls and web stabilizers are used for supporting the web in contact with the drying fabric. In such a case also dust and/or  
20 other particles in surrounding air and/or in the web is sucked through the fabric. Dust or other particles decrease rapidly the permeability of the fabric and thus eg. reduce the effect of the web stabilizing equipment, which may result in a need of decreasing the speed of the machine.

In presently used cleaning methods the cleaning of fabrics is typically accomplished by blowing pressurized air or cleaning liquid through the fabric with special  
30 nozzles, which are moved across the running direction of the fabric. In such a case, even if there were several nozzles adjacent to each other, a considerably long period of time is required for good cleaning result in order to have the whole fabric treated.

It is an intention of the present invention to provide a totally new method of cleaning of fabric, with which method shortcomings of prior art are minimized.

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It is also an intention of the present invention to provide a totally new apparatus for cleaning of fabric, with which method shortcomings of prior art are avoided.

The solution according to the present invention has several considerable advantages compared to prior art systems. The method according to the present invention is very quick. The whole fabric may be cleaned over its whole area even during a short break. For example, when a machine speed being 1300 m/min and the fabric having a length of 45 m, the cleaning of the fabric takes place about 29 times during a one minute cleaning period. Thus the method of the present invention does not require long shut-down periods of the paper machine. Also, the cleaning is accomplished during normal running conditions, that is running normal operation speed.

According to the present invention, there is provided a method of cleaning a drying wire in a drying section of a paper machine following a press section, comprising the steps of:

leading the drying wire (1) through at least one roll or cylinder (2) of the drying section of the paper machine;

introducing a cleaning liquid into a gap (3) defined by the drying wire (1) and the roll or the cylinder (2), in a direction of which gap (3) the drying wire (1) is moving;

pressing the cleaning liquid between the roll or cylinder (2) and the drying wire (1) so that the cleaning liquid is caused to be carried along through the drying wire (1); and

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spreading the cleaning liquid along a whole width of the drying wire (1).

According to another aspect of the present invention, there is provided an apparatus for cleaning a drying wire in a drying section of a paper machine following a press section, including at least one roll or a cylinder (2) and wherein the drying wire is led at least along said roll or cylinder, the apparatus comprising:

- 10 - a device for introducing and spreading cleaning liquid into a gap (3), over a whole width of the drying wire, the gap (3) being defined by the drying wire (1) and the roll or cylinder (2), into which gap the drying wire (1) is coming.

The invention will be explained in following by means of preferred examples referring to the following figures, in which

- 20 Figure 1 depicts an exemplary embodiment according to the present invention,

Figure 2 depicts another exemplary embodiment according to the present invention,

Figure 3 depicts still another exemplary embodiment according to the present invention,

- 30 Figure 4 depicts still another embodiment according to the present invention, and

Figure 5 depicts still another embodiment according to the present invention.

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In the case of Figure 1 the fabric (1), such as a wire or felt of a paper machine has been arranged to run along the roll or cylinder (2). The gap (3) defined by the fabric (1) and the cylindric surface (of a cylinder of a roll) is called a nip. The nip is called as closing nip, if the fabric (1) is coming into the gap, and respectively as opening nip if the fabric (1) is leaving the gap. According to the invention liquid for cleaning the fabric is introduced into the closing nip (3), between the fabric (1) and roll (2). Thus the liquid is pressed between the roll (2) and the fabric (1) and further into the fabric (1) disengaging therefrom by an effect of eg. centrifugal force caused by the rotation of the roll (2). The liquid is thus carried along through the fabric. The fabric is cleaned of its whole width several times even during a period of one minute. In case the paper machine speed is 1300 m/min and the fabric having a length of 45 m, the cleaning of the fabric takes place about 29 times during a one minute cleaning action. Thus the cleaning of the fabric (1) according to the method of the present invention does not require long shut-down periods of the paper machine. The cleaning is preferably performed while the machine is running its normal operation speed.

The device (4) for introducing and spreading the cleaning liquid is preferably arranged into the drying section of the paper machine, for example in connection with a web stabilizers (5) nearest to the press section, preferably into a closing nip of a leading roll at press section side of the stabilizer (5). The device for introducing (4) and spreading the cleaning liquid comprises for example a duct means across the running direction of the fabric, the wall of which openings or nozzles are arranged for introducing cleaning liquid between the fabric and the roll. In the Figures a presently preferred direction of sprayed cleaning liquid is illustrated by an arrow. Openings or nozzles are arranged into the duct means

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preferably equally spaced to provide substantially even introduction of the liquid over the whole width of the fabric.

- 5 The device for introducing and spreading the cleaning liquid (4) may be rigidly attached to a paper web stabilizers used at least in a part of the drying section of a paper machine as shown in Figures 1 and 2.
- 10 Means for collecting (6) the the cleaning liquid may be arranged in connection with a roll or a cylinder, preferably to opposite side of the fabric than the device (4) for introducing and spreading the cleaning liquid. Preferably the means for collecting (6) the the cleaning  
15 liquid comprise a hood (6) provided with liquid (7) and gas (8) exhaust outlets. The hood (6) may be designed suitably for each individual application. It may be slightly different eg. in case the fabric is moving opposite direction of that shown in Figure 3.
- 20 Presently it is considered advantageous to use hot water having temperature between 40 - 100°C as the cleaning liquid. It is also possible to use some suitable detergent or solvent in connection with or in addition to  
25 using hot water. The detergent or solvent may be introduced by the device for introducing and spreading the cleaning liquid provided with a detergent or solvent introduction inlet (10, 10') arranged for example directly to device (4) or to ductwork delivering the  
30 cleaning liquid (9).

The hood (6) is movable/rotatably installed, and preferably provided with means for moving (12) and/or rotating the hood (12') in order to facilitate the  
35 changing of fabric. The hood may also comprise means for introducing cleaning agent (13) inside the hood, which cleaning agent may be for example hot water or some detergent or solvent.

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In Figure 4 there is shown an embodiment where an air blowing box (11a) is provided adjacent to opening nip of the roll or cylinder (2). There is also an air blowing box (11b) provided adjacent to the fabric on opposite side to the upper blowing box (11a). The air blowing box (11a, 11b) is provided in operational connection with the fabric (1) leaving the opening nip of the roll or cylinder (2). The air blowing box forms over pressure between the fabric and the box surface which causes an air flow through the fabric expelling possible remaining cleaning liquid from the fabric. The blowing box preferably comprises so called over pressure foil nozzles. Blowing box (11a, 11b) is advantageous for example for the following reasons. It forms a considerably large over pressure area even though requiring only minimized amount of air due to its two narrow nozzles on both sides of the box. The embodiment of Figure 4 is only exemplary and it is presently believed that it is an advantageous embodiment of the invention. However, it may be also possible to use only one of either the upper (11a) or lower (11b) blowing box if some specific situation so calls for.

In Figure 5 there is shown another embodiment almost similar to that of Figure 4 but having the air blowing boxes (11a, 11b) provided in a distance from the roll or cylinder (2), also the direction of movement of the fabric is opposite to that of Figure 4. The dashed line between the roll or cylinder (2) and the air blowing boxes (11a, 11b) illustrates that there may even be some means, such as rolls or cylinders, for changing the moving direction of the fabric (1) between the roll or cylinder (2) and the air blowing boxes (11a, 11b). This embodiment may come in question for example if the space is for some reason limited for construction shown in Figure 4. However, it may be also possible to use only one of either the upper (11a) or lower (11b) blowing box if some specific situation so calls for.

The air blowing box (11a, 11b) is provided with nozzle arrangement including a nozzle or nozzles selected from a group of at least so called over pressure foil nozzle and a slot nozzle. Thus the blowing box may comprise so  
5 called over pressure foil nozzles or a slot nozzle adjacent the roll or fabric surface blowing air against the direction of the movement of the roll or fabric surface. The air flow may also be directed perpedicularly to the fabric.

10

The blowing box (11a, 11b) is advantageous for example for the following reasons. It forms a considerably large over pressure area even though it requires only minimized amount of air due to its considerably narrow  
15 nozzles.

The air used in the air blowing box may be hot and considerably dry air, thus providing also evaporation of the water in the fabric. The air may for example from an  
20 air source providing air for web stabilizers or web turning air device(s).

It is clear to a man skilled in the art that the invention is not limited to the described embodiments.  
25 The features described above may be for example combined differently according to requirement of each application. Thus it is clear that the scope of the present invention may vary within the accompanied patent claims.

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CLAIMS

1. A method of cleaning a drying wire in a drying section of a paper machine following a press section, comprising the steps of:

leading the drying wire (1) through at least one roll or cylinder (2) of the drying section of the paper machine;

10 introducing a cleaning liquid into a gap (3) defined by the drying wire (1) and the roll or the cylinder (2), in a direction of which gap (3) the drying wire (1) is moving;

pressing the cleaning liquid between the roll or cylinder (2) and the drying wire (1) so that the cleaning liquid is caused to be carried along through the drying wire (1); and

spreading the cleaning liquid along a whole width of the drying wire (1).

2. The method according to claim 1, wherein the cleaning liquid is spread substantially evenly over the whole width  
20 of the drying wire (1) and is disengaged from the drying wire (1) by a rotation of a roll (2).

3. The method according to claim 1, wherein the cleaning liquid is spread with a device (4), which is arranged in connection with a web stabilizer.

4. The method according to claim 1, wherein a device (4) for introducing and spreading the cleaning liquid is arranged into the drying section of the paper machine in

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connection with a web stabilizer (5) nearest to the press section.

5. The method according to claim 4, wherein the cleaning liquid is collected with means (6) for collecting the cleaning liquid.

6. The method according to claim 1, wherein hot water having a temperature between about 40-100°C is used as the cleaning liquid.

7. The method according to claim 6, wherein a detergent or solvent is used in connection with or in addition to using hot water.

8. The method according to claim 7, wherein the detergent or solvent is introduced by a device (4) for introducing and spreading the cleaning liquid which is provided with a detergent or solvent introduction inlet (10, 10') arranged directly on the device (4).

9. The method according to claim 1, wherein at least one air blowing box (11a, 11b) is provided adjacent to the drying wire leaving the roll or cylinder 2, the method comprising the further steps of:

forming over pressure between the drying wire and a box surface by said air blowing box (11a, 11b);

causing an air flow through the drying wire; and

expelling any remaining cleaning liquid from the drying wire along with the air flow through the drying wire.

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10. The method according to claim 1, wherein an air blowing box (11a, 11b) forms over pressure by means of over pressure foil nozzles, a slot nozzle or a combination thereof, providing an air flow against a direction of movement of the roll or a drying wire surface.

11. The method according to claim 10, wherein the air flow is provided in a direction perpendicular to the drying wire.

12. An apparatus for cleaning a drying wire in a drying section of a paper machine following a press section, including at least one roll or a cylinder (2) and wherein the drying wire is led at least along said roll or cylinder, the apparatus comprising:

- a device for introducing and spreading cleaning liquid into a gap (3), over a whole width of the drying wire, the gap (3) being defined by the drying wire (1) and the roll or cylinder (2), into which gap the drying wire (1) is coming.

13. The apparatus according to claim 12, wherein the device (4) for introducing and spreading the cleaning liquid into the gap (3) is arranged in connection with a web stabiliser equipment.

14. The apparatus according to claim 12, wherein the apparatus further comprises means for collecting (6) the cleaning liquid arranged in connection with the roll or cylinder (2).

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15. The apparatus according to claim 14, wherein the means for collecting the cleaning liquid comprises a hood.
16. The apparatus according to claim 12, wherein the apparatus further comprises a detergent or solvent introduction inlet (10, 10') arranged directly to the device (4) or to a ductwork delivering the cleaning liquid (9).
17. The apparatus according to claim 12, wherein at least one air blowing box (11a, 11b) is provided in operational connection with the drying wire (1) leaving an opening nip of the roll or cylinder (2).
18. The apparatus according to claim 17, wherein the air blowing box (11a, 11b) is provided adjacent to the roll or cylinder (2).
19. The apparatus according to claim 17, wherein the air blowing box (11a, 11b) is provided with a nozzle arrangement including a nozzle or nozzles selected from the group consisting of an over pressure foil nozzle and a slot nozzle.
20. The apparatus according to claim 17, wherein the air blowing box (11a, 11b) is provided with a nozzle arrangement including a nozzle or nozzles being directed to blow air against a direction of movement of a roll or drying wire surface, or perpendicularly against the drying wire.

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21. The apparatus according to claim 14, wherein the means for collecting (6) the cleaning liquid is movably/rotatably installed.

22. The apparatus according to claim 15, wherein the means for collecting (6) the cleaning liquid is movably/rotatably installed and provided with means for moving (12) and rotating (12') the hood in order to facilitate changing of the drying wire.

23. The apparatus according to claim 15, wherein the means  
10 for collecting (6) the cleaning liquid is movably/rotatably installed and provided with means for moving (12) or rotating (12') the hood in order to facilitate changing of the drying wire.

24. An apparatus according to claim 15, wherein the means for collecting (6) the cleaning liquid is provided with means for introducing a cleaning agent (13) inside the hood (6).

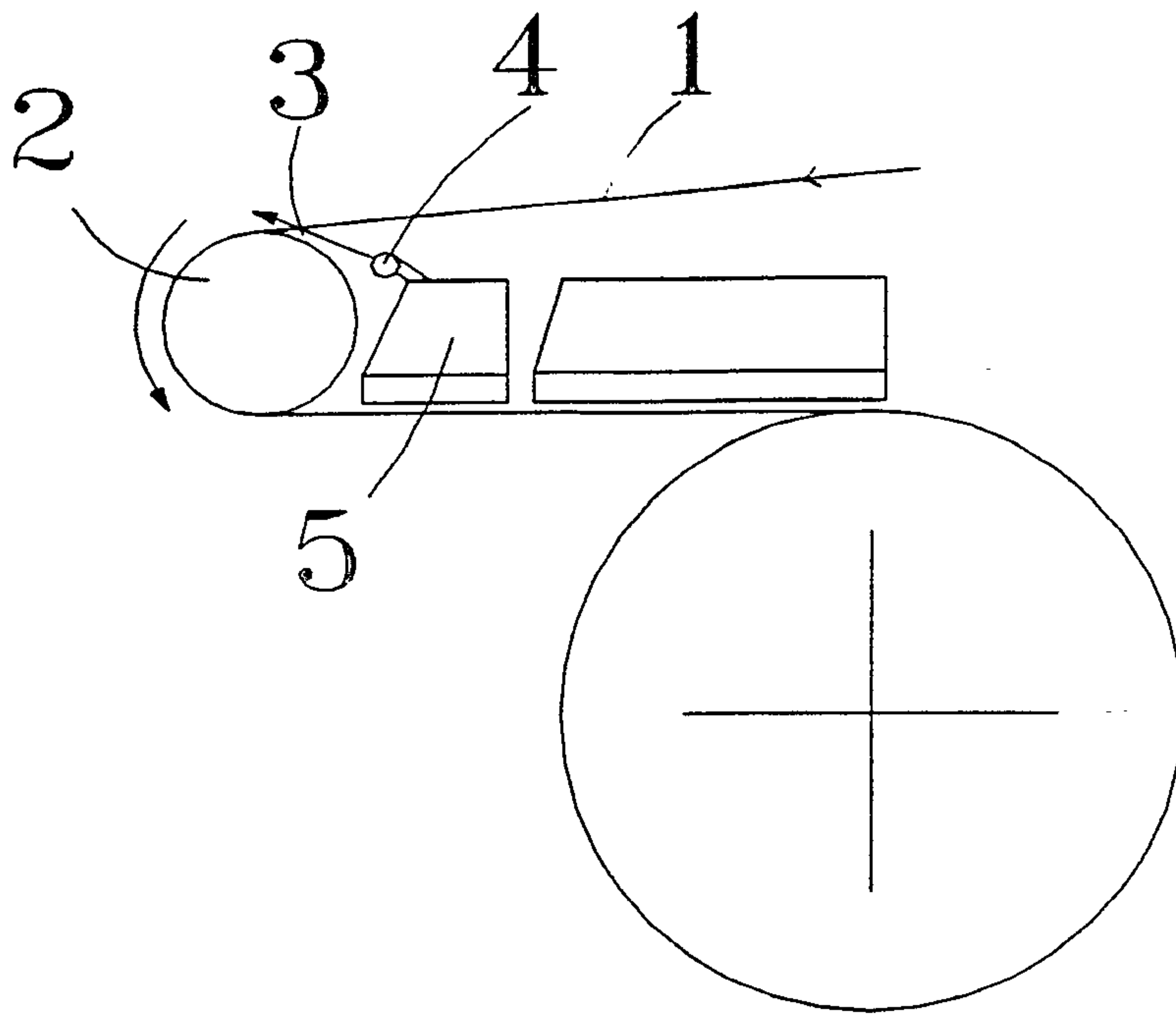


Fig. 1

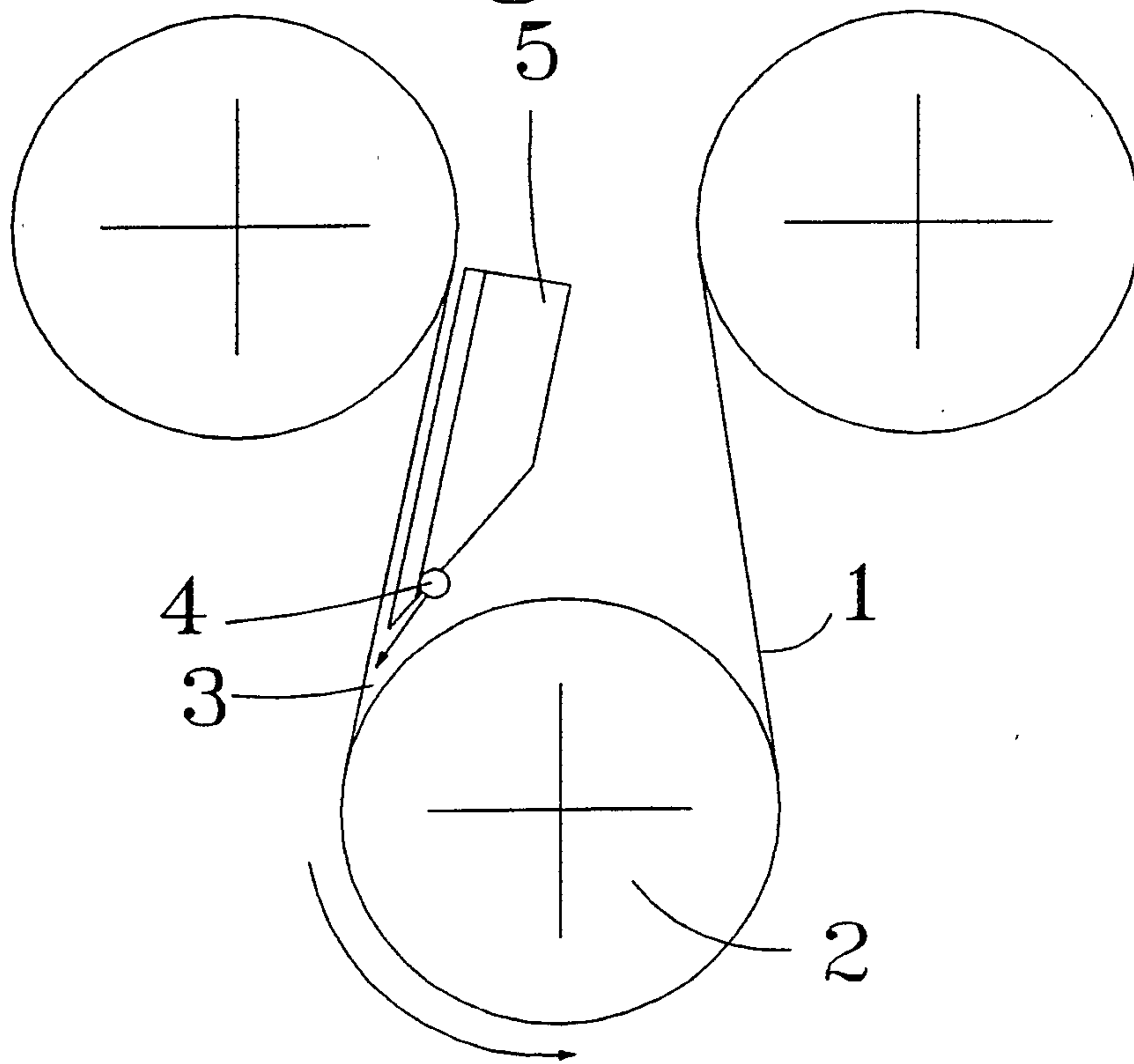


Fig. 2

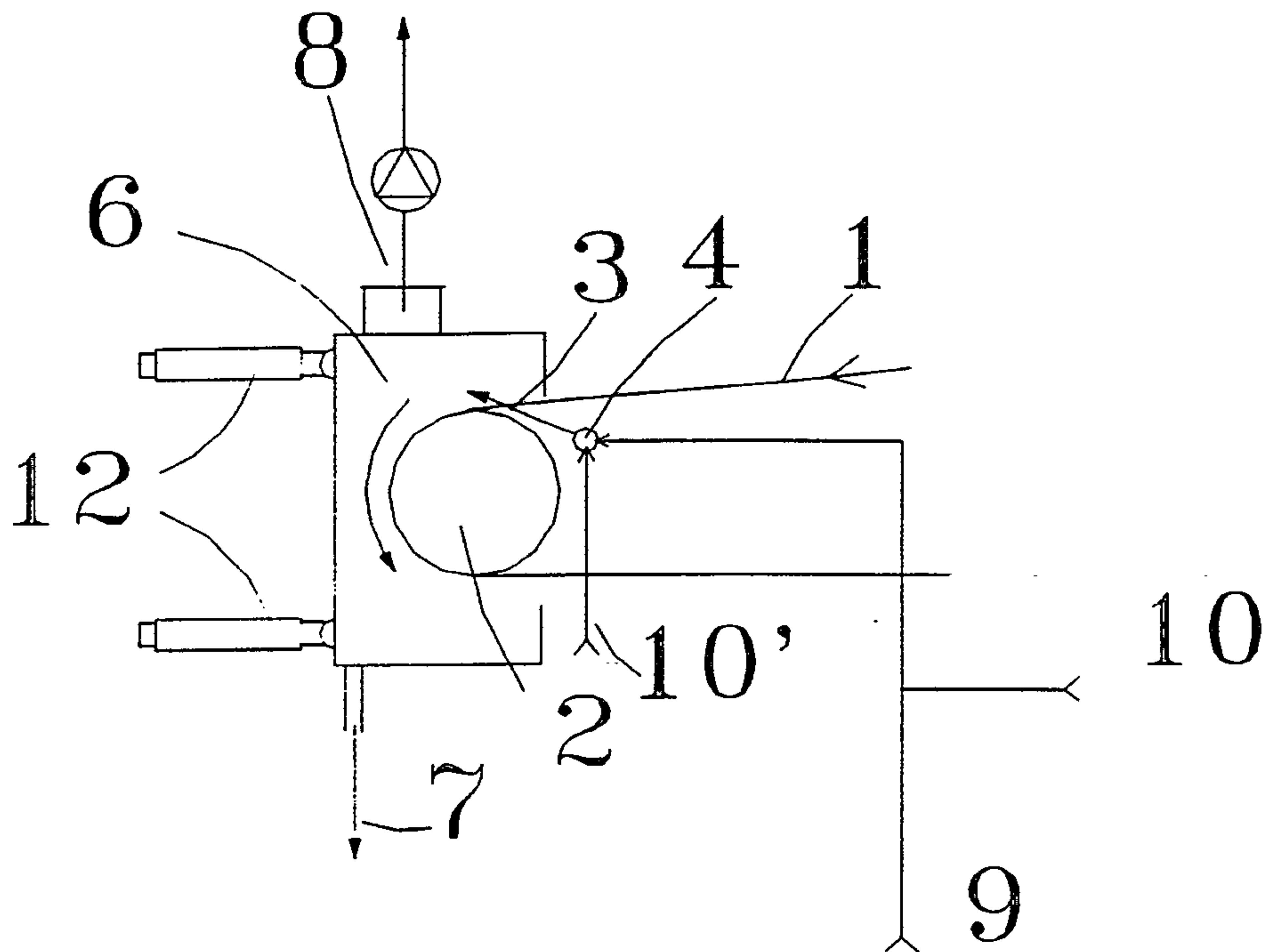


Fig. 3

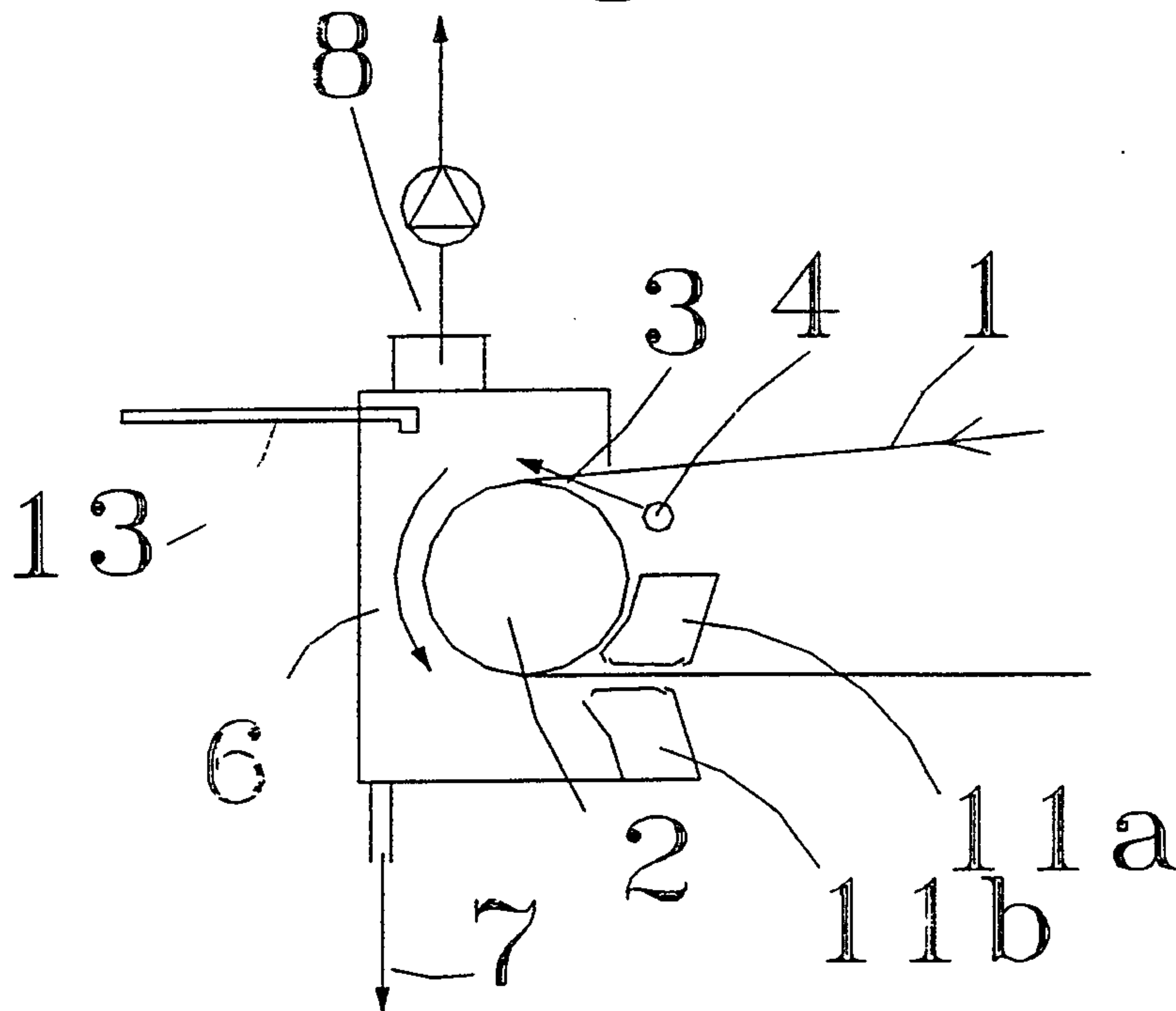


Fig. 4

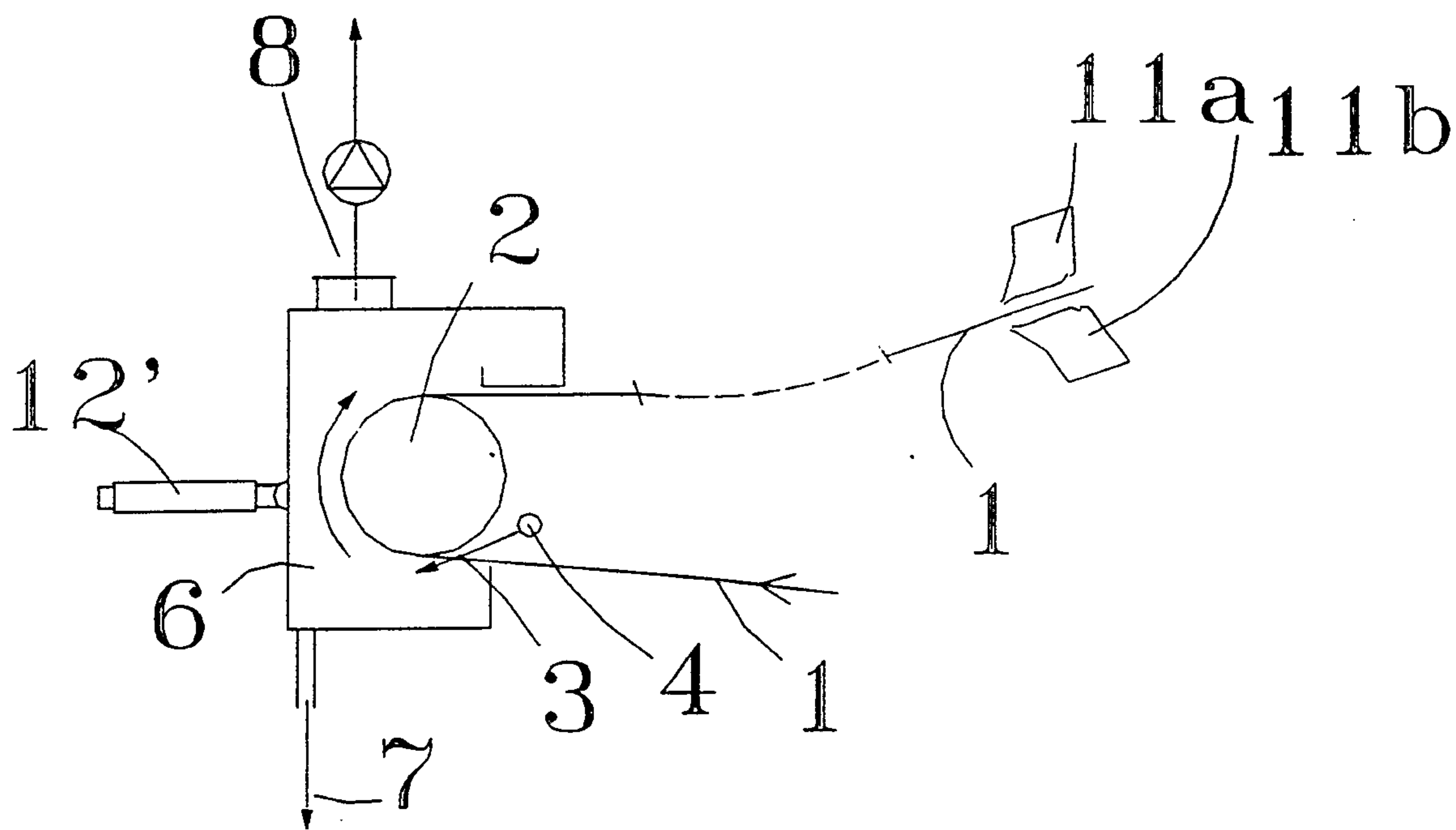


Fig. 5

