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(54) Method of impregnating, with detergent liquid, fabrics for cleaning high precision rotary cylinders, particularly of printing machines, and the shaft for its implementation

(57) This method for impregnating cleaning fabrics with detergent liquid has the characteristic of radially and centrifugally spraying a reel of fabric (11) through profiled apertures (3) present in a rotatable feed shaft (1), said shaft being internally filled with detergent liquid under pressure in accordance with selectively variable parameters, said liquid being fed into said rotatable feed shaft (1) by suitable pipes provided with rotary seals.

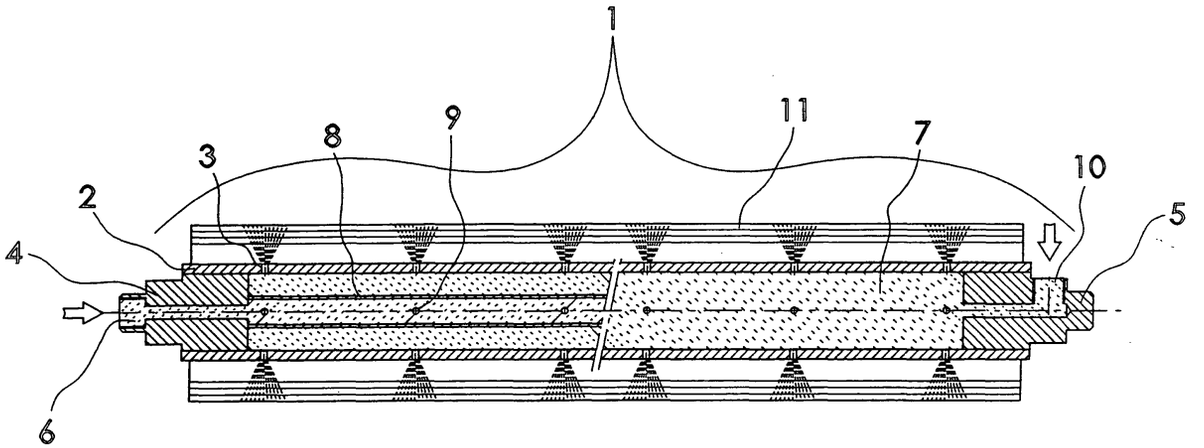

Fig. 1

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Description

[0001] This invention relates to a method for impregnating, with detergent liquid, fabrics for cleaning high precision rotary cylinders, particularly of printing machines.

[0002] This invention also relates to a shaft for implementing the method.

[0003] In conventional rotary cylinder cleaning devices which use woven or non-woven fabric, it is known to wet a portion thereof with detergent, after unwinding it from a feed shaft and before making it adhere to the surface of the rotary cylinder to be cleaned.

[0004] For this purpose a detergent distribution bar is used usually provided with nozzles facing the fabric and the cylinder to be cleaned.

[0005] With said operating method it is not always possible to achieve uniform detergent distribution, both because of the method of operation of the distribution bar or tube, and because of solid deposits and incrustations which form at the nozzles of the distribution bar.

[0006] In this respect, said incrustations can limit and even obstruct passage of the detergent, with serious operative consequences. In particular, if the fabric is not properly wetted, cleaning the rotary cylinder is pointless as it prevents printing restart or prejudices its quality.

[0007] Another drawback encountered in the known art is that the compressed air usually used to feed detergent to the conventional distribution bar causes undesirable vaporization and dispersion of the liquid detergent into the environment as it leaves the nozzles.

[0008] An object of the present invention is to define a method for impregnating, with detergent liquid, fabrics for cleaning high precision rotary cylinders, particularly of printing machines, which enables the detergent characteristics to be varied on the basis of the working conditions of the cylinders to be cleaned. Another object is to define a method, as aforestated, which enables the cleaning fabric to be wetted in a uniform manner.

[0009] Another object of the present invention is to define a method, as aforestated, which ensures uniformity of this detergent impregnation even after relatively prolonged periods of non-utilization.

[0010] Another object is to define a method, as aforestated, which enables the fabric to be wetted while wound into a reel.

[0011] Another object is to define a method, as aforestated, which enables the detergent consumption to be optimized.

[0012] Another object is to define a device for implementing the aforesaid method.

[0013] These and further objects will be seen to have been attained on reading the following detailed description of a method for impregnating cleaning fabrics with detergent liquid, characterised by radially and centrifugally spraying a reel of fabric (11) through profiled apertures (3) present in a rotatable feed shaft (1), said shaft being internally filled with detergent liquid under pressure in accordance with selectively variable parameters, said liquid being fed into said rotatable feed shaft (1) by suitable pipes provided with rotary seals.

[0014] The invention is illustrated by way of non-limiting example in the accompanying drawing, in which:

Figure 1 is a schematic horizontal cross-section through a rotary shaft which enables the detergent to be distributed on a reel of fabric by the method of the invention;
Figure 2 is a vertical cross-section through a cleaning device for rotary cylinders using a rotary shaft of the type shown in Figure 1;
Figure 3 is a diagram showing the unit for dispensing and feeding the detergent into the rotary shaft of Figure 1;
Figure 4 shows a variant of the unit for dispensing and feeding the detergent into the rotary shaft of Figure 1;
Figure 5 shows a device for winding the fabric onto a rotary shaft provided for impregnating it with detergent in accordance with the method of the invention.

[0015] With reference to the aforesaid figures, a rotary feed shaft 1 performs a double function, namely:

- conventionally feeding, to typical cylinder cleaning devices, the fabric which is wound in a reel on its outer surface;
- feeding the detergent from its central tubular cavity to an appropriately perforated periphery by centrifugal flow.

[0016] The rotary feed shaft 1 consists of a tube 2 of length such as to be able to wind a reel of fabric thereon and provided with a series of suitably profiled holes or apertures 3. These profiled apertures 3 are distributed on the surface of the tube 3 in substantially uniform manner.

[0017] To the ends of the rotary feed shaft 1 there are fixed two hubs 4 and 5 extending coaxially to the tube 2. Of these hubs, at least one is holed to connect a usual internal cavity 7 of the tube 2 to external feed means.

[0018] The hole provided is a completely axial hole 6 passing through the hub 4.

[0019] The detergent flows through said hole 6 and into the cavity 7 in such quantity and pressure that during operation it is able to emerge radially and centrifugally by passing through the profiled apertures 3, to uniformly impregnate the reel of fabric 11 wound on the outside of the tube 2.

[0020] For better distribution of the detergent within the cavity 7 of the tube 2 it is advantageous, but not indispensable, to use a further inner tube 8 of lesser diameter coaxial to the tube 2 and rigid with the hub 4, and provided with holes 9. The presence of this tube enables better mixing of the detergent liquid and better

distribution thereof in the fabric in both the axial and radial directions. In a variant of the feed shaft 1 there is also a radial hole 10 in the hub 5, disposed perpendicular to the axis of the rotary feed shaft 1 and connected via an axial hole (similar to the hole 6) to the cavity 7 of the tube 2.

[0021] By means of said radial hole 10, which is provided with a usual instant connector and check valve, the operator can manually feed the detergent into the feed shaft 1, using a usual portable feed and dispensing unit for the detergent, or using a temporary floating connection. In this manner the cavity 7 of the tube 2 acts as a detergent reservoir that can supplement or replace the already described automatic device, by using the central axial hole 6. The rotary feed shaft 1, on which the reel of fabric 11 has been wound, is rotatably and removably supported between the lateral shoulders of the cleaning device 12, which is installed in the printing machine parallel to and in front of the rotary cylinder to be cleaned, such as that described in Italian patent 1306450, of which a variant is shown in Figure 2 by way of example.

[0022] With reference to Figure 3, and to automatic operation, a detergent dispensing and feed unit cooperates with the feed shaft 1 to transfer thereto the detergent which, if necessary, is diluted with water.

[0023] The detergent and water are withdrawn from two collection tanks 19, 20, or directly from a drum of detergent and from the water main. Said tanks 19 and 20, if present, are provided with level controls to prevent operation of the feed system if detergent and/or water are absent.

[0024] The tanks 19 and 20 are connected to pumps 23 and 24 which, controlled by solenoid valves 25 and 26, feed the optimum wash solution into the interior of the rotary feed shaft 1 at suitable pressure (adjustable by usual means). As the various types (or degrees) of soiling could require the use either of the detergent alone, or of water alone, or of a mixture of both at a specific concentration, solenoid valves 27 and 28, operated at determined time intervals by the electronic control unit of the system, enable the relative quantities of detergent and water to be regulated. This enables the quantity and quality of the wash solution to be defined. Alternatively, a single pump 29 could be provided which, under the control of the solenoid valve 30, feeds both detergent and dilution water into the interior of the rotary feed shaft 1. If need be, these liquids can be withdrawn from a collection tank 31, where they arrive from respective collection tanks 34 and 35, pre-dispensed by valves 32 and 33, as shown in Figure 4. In this manner the feed shaft 1 totally and uniformly distribute the predetermined detergent quantity, previously conveyed to its interior, into the reel of fabric 11.

[0025] The reason for this is to determine its complete impregnation, until saturated, by virtue of its absorption capacity and without the aid of further mechanical means for this purpose. In this respect, knowing the detergent retention capacity of the fabric and the quantity of this latter in use, it is simple to calculate the quantity of detergent to be fed into the rotary feed shaft 1. The physical-chemical characteristics of the detergent and its uniform initial distribution mean that the reel of fabric is immediately ready for use in nearly all the subsequent cleaning cycles, hence resulting in an increase in the effectiveness of the cleaning action and a reduction in the time of the operative cycle. The method of the invention enables the said uniform impregnation because, even with non-automatic operation, the presence of the profiled apertures 3 enables the liquid contained in the cavity 7 to always wet the lowerly situated region of the fabric reel. This occurs in any angular position acquired following the unwinding of that linear portion of fabric required by the specific cleaning operation. Consequently, if necessary, the method enables the detergent to be fed more than once at variable time intervals into the rotary feed shaft 1, determining the quantity on the basis of the diameter assumed by the reel of fabric 11 wound on it. In this case, a conventional electromechanical or electronic sensor measures the diameter of the reel and feeds a signal to the electronic control unit, which suitably varies the opening time of the dispensing valves 27 and 28.

[0026] In particular, the detergent is fed several times in respectively increasing, constant or decreasing quantities, from the beginning to the end of the reel of fabric 11, depending on whether the variation of the detergent distribution with time prevails or does not prevail over that of the residual quantity of fabric to be wetted. The sensor that measures the reel diameter is used to verify the availability of a new reel of fabric 11 and, vice versa, of a reel gradually being consumed or completely depleted. With reference to Figure 2, the rotary feed shaft 1 is at rest, or made to rotate intermittently (at suitable speed and time intervals), directly or indirectly, during the detergent feed. It can also be made to rotate to unwind a portion of the reel of pre-wetted fabric 11, which is brought into contact with a rotary cylinder 13 by means of a presser element 14, and rewound on a take-up shaft 15.

[0027] In a variant of the detergent feed method, one or more reels of fabric 11 are wetted before they are located in one or more cleaning devices 12.

[0028] As shown in Figure 5, the rotary feed shaft 1 is installed in a separate device 36 by which the fabric is wound into reels 11 on the rotary feed shaft 1 and is impregnated with detergent. The rotary feed shaft 1 is made to rotate continuously, or intermittently (at suitable speed and time intervals), for the following purpose: to wind thereon a portion of a large-diameter reel of fabric 38 supported by a shaft 37; or to wind thereon all the fabric of a reel 39 of the take-up shaft 15, in order to reuse it.

[0029] The aforedescribed dispensing and feed unit feeds the detergent into the interior of the rotary feed shaft 1, which distributes it into the reel of fabric 11 as soon as this latter has been completed following the un-

winding of the fabric from the reel 38.

[0030] Another possibility offered by the method is to feed the detergent while the reel 11 is being formed on the shaft 1, i.e. while it is rotating, the centrifugal force then facilitating distribution of the detergent.

[0031] When the reel of fabric 11 is ready for use, the rotary feed shaft 1 can be removed from the device 36 after cutting the fabric by a usual sliding blade cutter device 40.

[0032] Advantageously the method of the invention results in a drastic reduction in the consumption of evaporated detergent, and a large reduction in the emission of volatile organic compounds (V.O.C).

[0033] There is not limit to the type of detergent usable, for example of low, medium or high volatility, or of mineral or vegetable origin, depending on the structural and operational characteristics of the machine on which it is to be used.

[0034] A further advantage is that the quantity of detergent used can be accurately adapted to the quantity and/or quality of the fabric used.

[0035] A further advantage is that the cleaning operations effected are much quicker and effective, as the detergent quantity matches the specific conditions.

Claims

1. A method for impregnating cleaning fabrics with detergent liquid, **characterised by** radially and centrifugally spraying a reel of fabric (11) through profiled apertures (3) present in a rotatable feed shaft (1), said shaft being internally filled with detergent liquid under pressure in accordance with selectively variable parameters, said liquid being fed into said rotatable feed shaft (1) by suitable pipes provided with rotary seals.

2. A method as claimed in the preceding claim, **characterised in that** the detergent and the water are withdrawn from two specific collection tanks (19, 20) provided with level controls (21, 22) to prevent operation of the feed system if detergent and/or water are absent, said tanks (19, 20) being connected to pumps (23, 24) which, controlled by solenoid valves (25, 26), feed the optimum wash solution, expressed by their association, into the interior of the rotary feed shaft (1) at suitable pressure.

3. A method as claimed in claim 2, **characterised in that** the detergent and water can be withdrawn respectively from a specific drum and from the water main.

4. A method as claimed in the preceding claims, **characterised by** comprising solenoid valves (27, 28) for varying the composition ratios of the mixture formed from detergent and water, said solenoid valves being operated at determined time intervals by a usual electronic control unit of the system.

5. A method as claimed in the preceding claims, **characterised by** using a single pump (29) which, under the control of a solenoid valve (30), feeds both detergent and dilution water into the rotary feed shaft (1).

6. A method as claimed in the preceding claims, **characterised by** withdrawing the liquids to be mixed from a suitable tank (31) at which they arrive from respective collection tanks (34, 35) pre-dispensed by means of valves (32, 33).

7. A method as claimed in the preceding claims, **characterised by** enabling the detergent to be fed more than once at variable time intervals into the rotary feed shaft (1), in order to define the quantity thereof on the basis of the diameter assumed by the reel of fabric 11 wound in it.

8. A method as claimed in the preceding claim, **characterised by** comprising an electromechanical or electronic sensor for measuring the diameter of the reel present on the rotary feed shaft (1), in order to feed a signal to a usual electronic control unit for suitably varying the opening time of the dispensing valves (27, 28).

9. A rotary feed shaft (1) implementing the method claimed in the preceding claims, usable in cleaning devices installed in the printing machine, or in a separate device for forming new or used reels of fabric, **characterised by** presenting, on that cylindrical surface on which the reel of fabric (11) is wound, a plurality of profiled apertures (3) or holes suitable for the radial centrifugal outflow of the detergent liquid or mixture of detergent liquids.

10. A shaft as claimed in the preceding claim, **characterised by** comprising at least one hub which is axially holed to connect its internal cavity (7) to an external environment from which to receive the detergent liquids.

11. A shaft as claimed in claim 10, **characterised by** presenting at least one tube or hole (6) of central axial arrangement.

12. A shaft as claimed in claim 10, **characterised by** presenting a radially extending pipe (10) cooperating with a possible axial portion, to enable said shaft (1) to be filled with detergent liquid by a manual procedure.

13. A shaft as claimed in claim 9, **characterised by** comprising an internal accessory tube (8) perforat-

ed (9) to offer an axial and centrifugal transit to the detergent liquids which favours their mixing.

14. A shaft as claimed in claim 9, **characterised by** being at rest or being made, directly or indirectly, to rotate continuously and/or intermittently at suitable speed and time intervals during the detergent feed into its interior.

15. A shaft as claimed in claim 9, **characterised by** being at rest or being made to rotate continuously and/or intermittently at suitable speed and time intervals, directly or indirectly, for the following purpose: to unwind the reel (11) of fabric which has been previously wound thereon or to wind thereon a portion of a large-diameter reel of fabric (38) or, alternatively, to wind thereon all the fabric of a reel (39), in order to reuse it.

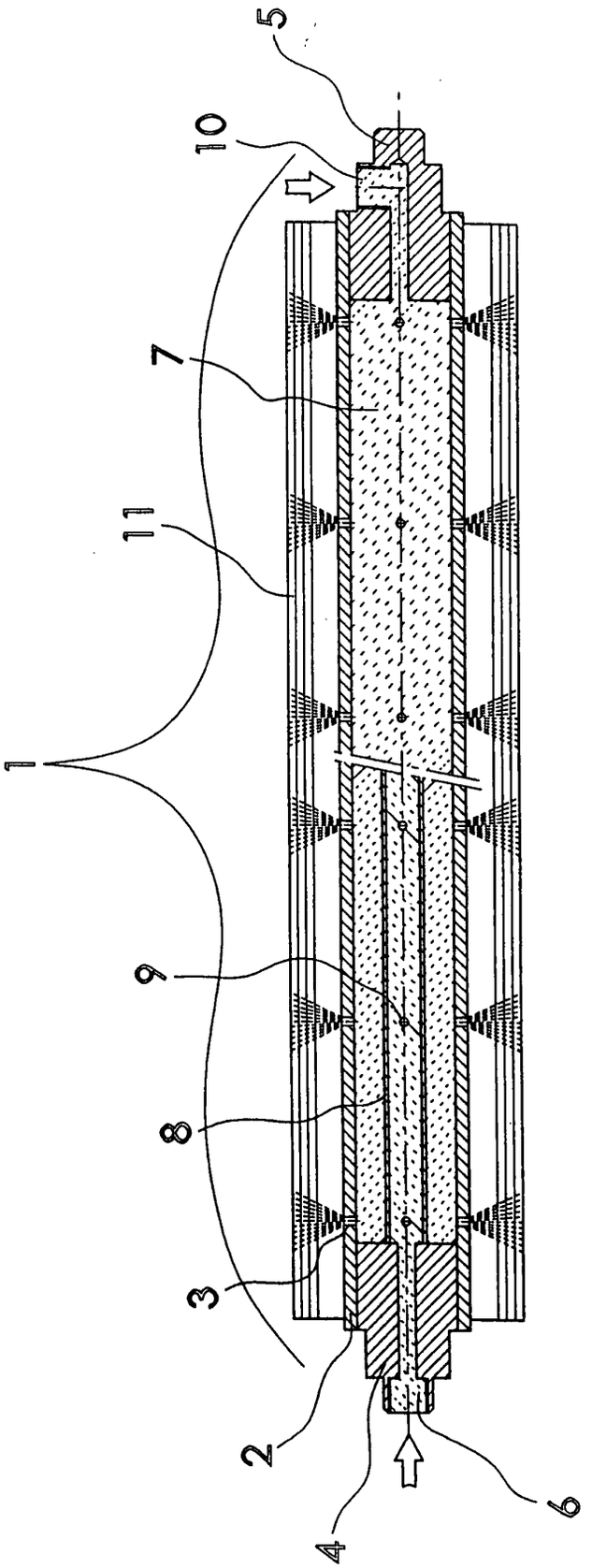

Fig. 1

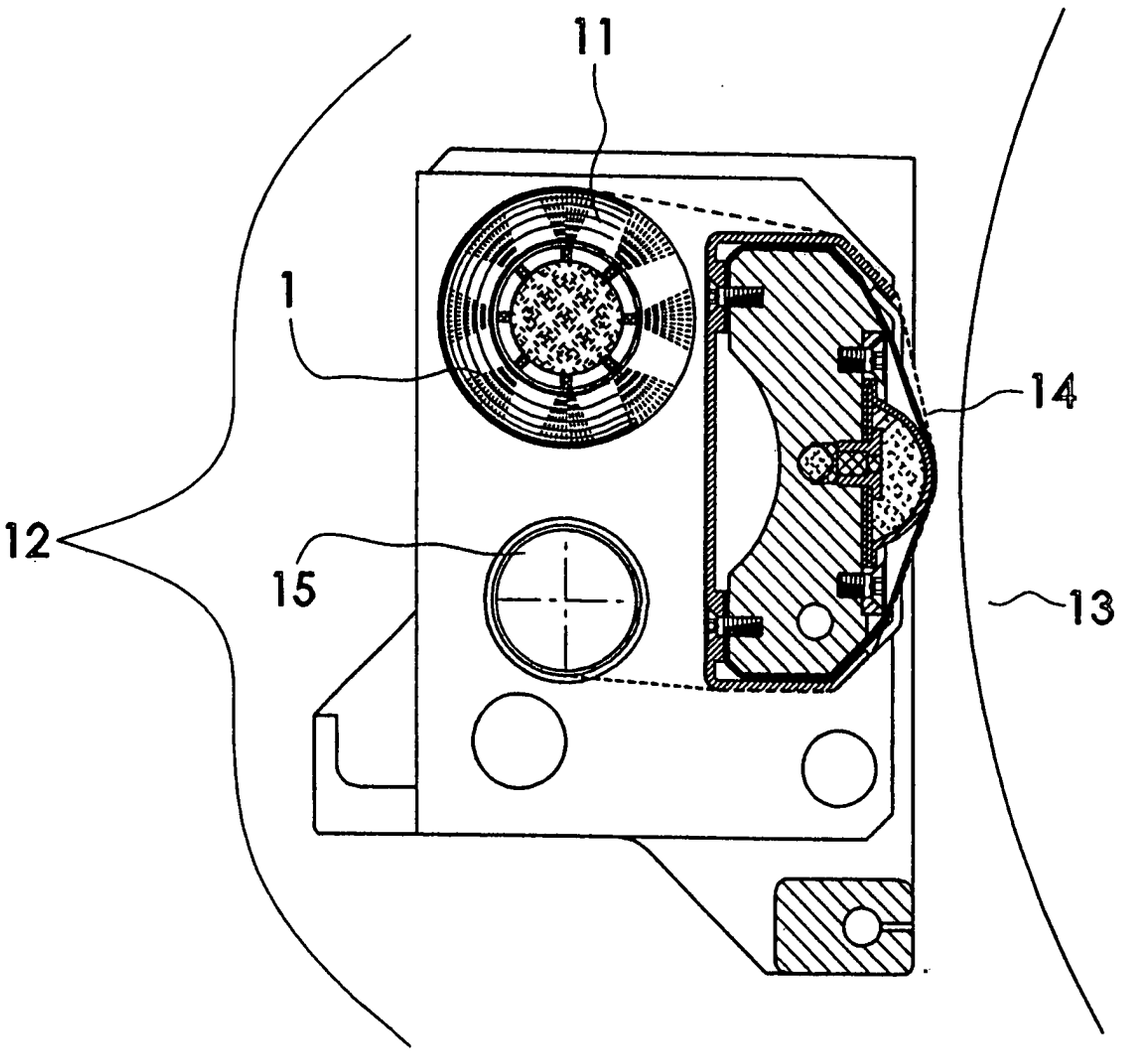

Fig. 2

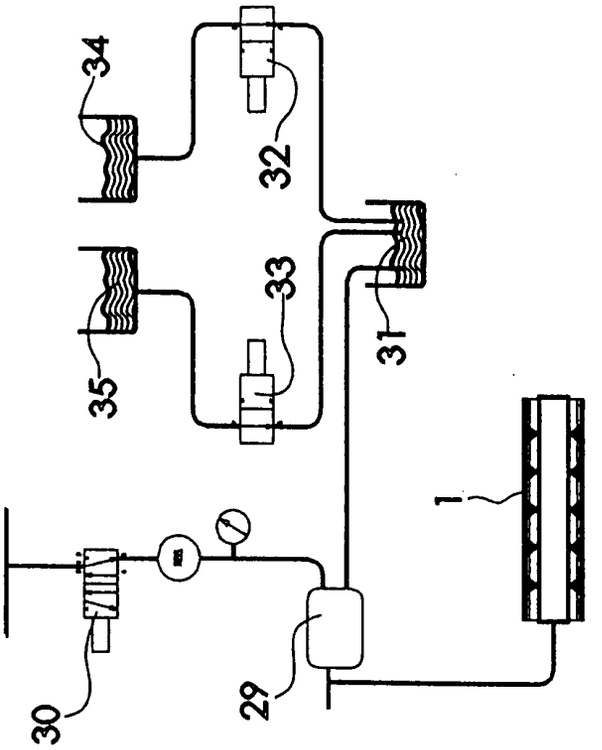

Fig. 4

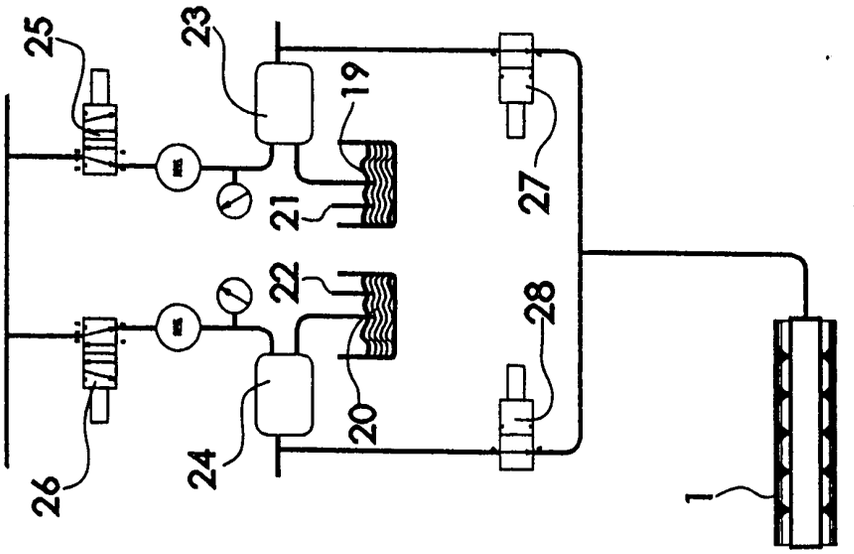

Fig. 3

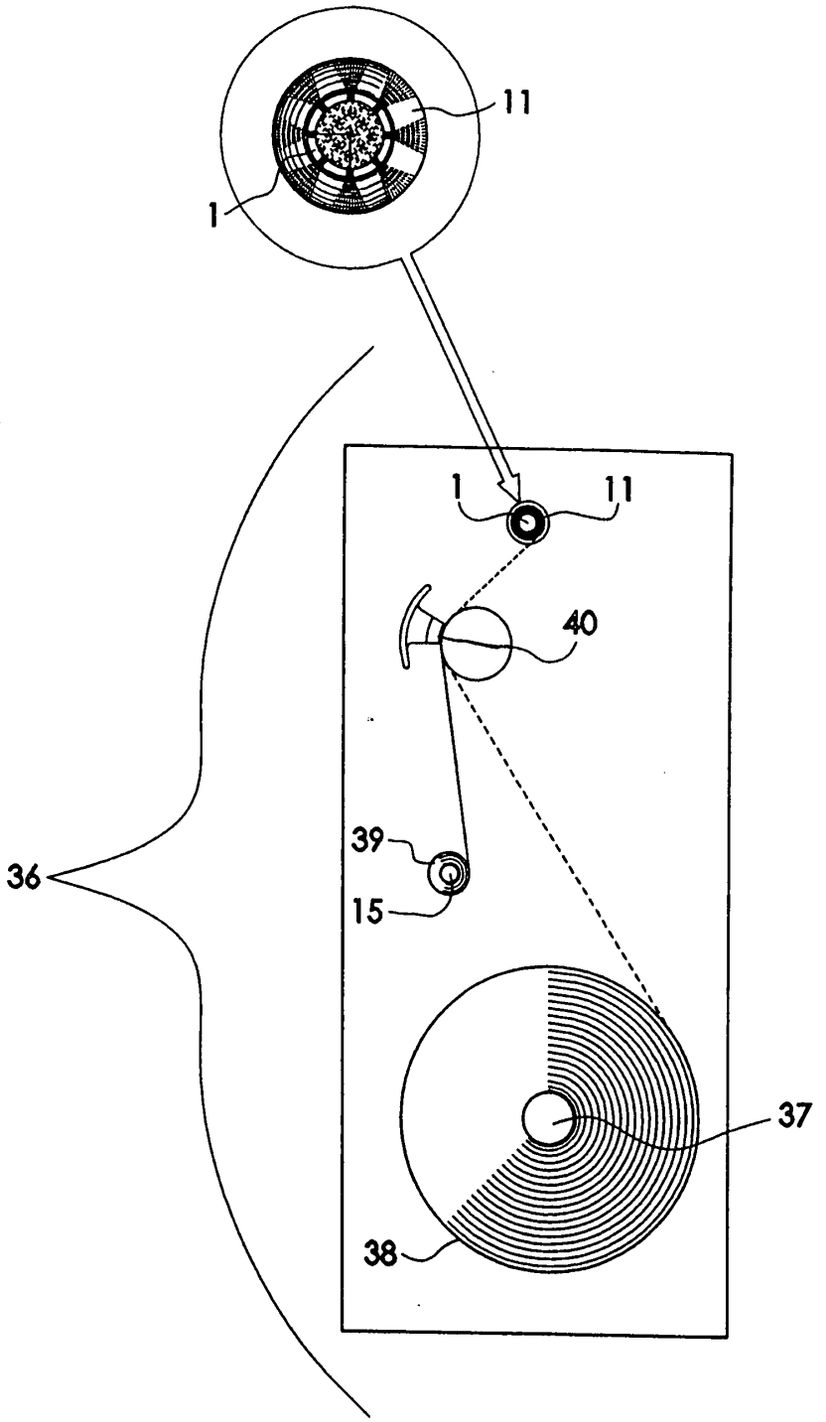

Fig. 5