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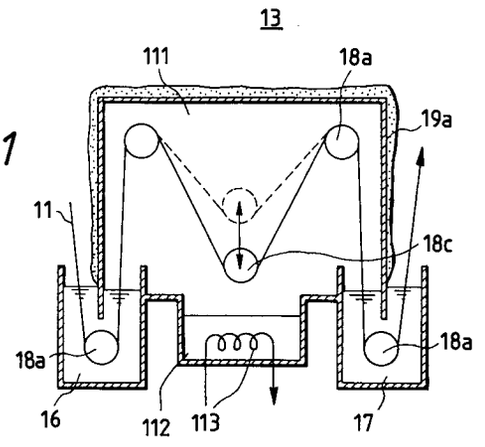
(54) Steam treatment method for a planographic printing plate support and apparatus therefor.

(57) To provide a steam treatment method for treating an etched surface of a planographic printing plate support and an apparatus therefor with steam, in which the printing plate support enters a treatment room through an inlet vessel sealed with water. The printing plate support is fed in the treatment room under conditions of a temperature within a range of 80 °C to 105 °C and an air pressure in the treatment room in a range of −50 to 300 mmAq relative to the normal pressure. Further, the apparatus is provided with movable guide rollers feeding the printing plate support in the treatment room to variably change a staying time of the printing plate support in the treatment room in accordance with a predetermined treatment speed.

FIG. 1



EP 0 541 068 A1

Background of the Invention

The present invention relates to a steam treatment method for a planographic printing plate support and an apparatus therefor, and particularly relates to a method and an apparatus for treating a planographic printing plate support by use of steam after the planographic printing plate support is produced to form an anodized layer on a surface of an aluminum plate, or for treating an aluminum plate by use of steam after the aluminum plate is dyed with a dyestuff.

In the case of using an aluminum plate (including an aluminum alloy) as a planographic printing plate support (hereinafter merely referred to as "support"), conventionally, an anodized layer is formed on the aluminum plate, and in order to optimize the adhesion between the support and photosensitive layer, there has been a support treating apparatus in which the support is treated by steam or hot water after the anodized layer is etched thereby provide a photosensitive printing plate having a superior stability in course of time, a superior characteristic of development, and no dirt retention in its non-picture portion (See USP 4,116,695 corresponding to Japanese Patent Post-Examination Publication No. Sho-56-12518).

In such apparatus for treating a support continuously by steam, steam supply nozzles 2 are provided in the upper and lower regions of a support 1 as shown in Fig. 3 so as to spray steam directly to the support 1.

Further, the inlet and outlet of the room for treating the support with steam is provided with a steam leakage prevention system (sealing system) which is not in contact with the surface of the support. As a steam treatment apparatus without contact to the surface of a support, there have been used an apparatus in which the back surface of a support is supported by a roller to make the gap between the roller and the surface of the support as narrow as possible, and an exhaust hole is provided in a wall opposite to the surface of the support (reference is made to Japanese Patent Unexamined Publication No. Sho-58-131470), an apparatus in which a seal portion of a labyrinth structure without contact with a support is provided on closely to both surfaces of a support 1 at the inlet and outlet portion to reduce the escape stream as smaller as possible.

However, each of these apparatuses have the following problems.

(1) It is necessary to form high-accurate leakage preventing means in inlet and outlet portions.

(2) There is a limitation in the clearance of a gap in order to prevent flapping of a support from hurting the support and producing a fault, so that there is a case where an effect of leakage prevention cannot be obtained.

(3) It is necessary to add an equipment for increasing the clearance to an unstable portion upon the thickness of the support or the flapping action of the support, such as a joint portion between new and old supports, so that the apparatus becomes complicated and large in structure.

(4) The quantity of steam to be used becomes larger than necessity.

The inventor of the present application, in order to solve the foregoing conventional problems, has proposed a surface treating apparatus for a printing plate support having inlet and outlet portions which can do with only necessity as the quantity of used steam by inexpensive equipment, without a relationship to the thickness of the support or flapping thereof, and without hurting the support. That is such a surface treating apparatus, as shown in Fig. 3, for treating a printing plate support continuously by use of steam, characterized in that a small vessel filled with liquid is provided as at least one of inlet and outlet for the printing plate support to come in from and go out to the outside so that the printing plate support is fed through the small vessel while the printing plate support is being supported by rollers (European Unexamined Patent Publication No. 0452954 A2).

In this apparatus, since a support is fed through the small vessel provided in the inlet and outlet while the support is being supported by rollers, the inlet and outlet portions of this apparatus are sealed by the liquid in the small vessel and there is no fear of hurting the support since the support is fed through the liquid, and there is also no problem upon clearance.

In the conventional art, however, there has been the following problems, as a result that steam supply nozzles 2 are arranged upon the upper and lower regions of a support 1 so as to spray steam directly to the support.

(A) It is difficult to perform the steam treatment uniformly on a support in a conventional system because of a partial difference in distribution of steam. Further, there is a case where unevenness of treatment is produced.

(B) The steam supply quantity becomes excessive more than necessity.

(C) It is difficult to control the speed of reaction. (It is impossible to control the temperature, pressure, etc. at a treatment portion.)

(D) Since a length inside the treatment room is fixed, it is necessary to change a travelling speed when it is required to change the steam treatment quality in accordance with the variation in kind of products or the like, and an expensive equipment is required to change the temperature/pressure in the treatment room.

Summary of the Invention

Therefore the present invention has been made to eliminate the above described problems, more specifically an object of the present invention is to provide a steam treating process for a printing plate support and an apparatus therefor, in which unevenness of treatment can be prevented, the steam supply quantity can be reduced further, it is easy to control the speed of reaction, and it is possible to change the time required for treatment by changing the treatment conditions.

The above object of the present invention can be achieved by:

A method for treating an etched surface of a planographic printing plate support with steam, comprising steps of: heating water in a water tank provided in a treatment room to control a temperature in the treatment room within a range of 80 °C to 105 °C and an air pressure in the treatment room within a range of −50 to 300 mmAq relatively to an atmospheric pressure; and feeding the planographic printing plate support through the treatment room by guide rollers.

In the method, during the feeding step, the printing plate support is fed into the treatment room through water filled in an inlet vessel, wherein the temperature of water in the inlet vessel is controlled to exceed 40 °C.

Furthermore, a steam treating apparatus for treating an etched surface of a planographic printing plate support with steam, the apparatus comprising: a casing for forming a treatment room, in which an opening is provided at a bottom portion of the casing; a water tank filled with water which is provided at the bottom portion of the casing to cover the opening of the casing; a heating means for warming and evaporating water in the water tank portion to control a temperature in the treatment room within a range of 80 °C to 105 °C and an air pressure in the treatment room within a range of −50 to 300 mmAq relatively to an atmospheric pressure; and guide rollers provided above the water tank in the treatment room for supporting and feeding the planographic printing plate support.

In the above apparatus, at least one of the guide rollers is movably provided in the treatment room to set a length of the planographic printing plate support in the treatment room variably in accordance with a predetermined speed of the steam treatment.

In the above apparatus, an upwards/downwards moving frame is provided at an upper portion of the casing for supporting the movable guide rollers provided in an upper portion of the treatment room, and a middle wall of the casing between the moving frame and a lower portion of the casing consisting of a bellows−like flexible material so as to tightly seal the treatment room.

In the present invention, as to at least one of guide rollers provided movably in the treatment room, if the shaft of the guide roller is mealy movable, it is necessary to provide a complicated seal mechanism between a shaft of the guide roller and the wall of the treatment room. Therefore, preferably a guide roller provided in an upper portion of the treatment room is supported by an upwards/downwards moving frame, and the wall between the moving frame and the guide rollers provided in a lower portion of the treatment room is connected and sealed by a bellows−like flexible material. Consequently it is possible to change the length of the support accommodated in the treatment room in accordance with a predetermined level of the treatment.

In the present invention, as to set the temperature of water in the inlet small vessel exceeding 40 °C, for example, the following systems may be provided:

(I) A heater being provided in the small vessel formed in the lower portion of the treatment room to thereby control temperature automatically;

(II) The temperature of water is detected and a cooling medium (cool water, etc.) or heating medium (steam/heater, etc.) is led in accordance with the detected temperature value;

(III) A predetermined quantity of hot water is prepared in another tank so as to be supplied to the small vessel.

In accordance with the above systems, the temperature of the support entering the treatment room can be kept at a high degree, whereby it is possible to avoid unevenness of reaction speed in the treatment room.

Brief Description of the Drawings

Fig. 1 is a schematic side view of an embodiment of the steam treatment method and apparatus according to the present invention.

Fig. 2 is a schematic side view of another embodiment of the steam treatment method and apparatus according to the present invention.

Fig. 3 is a schematic side view of a conventional steam treatment process and apparatus.

Detail Description of the Preferred Embodiments

An embodiment of the present invention will be described in accordance with the drawings.

Fig. 1 is a summarized view of an embodiment of the present invention.

In Fig. 1, a treatment room 111 is formed an bottom open shape by a wall 19a. At a leading edge portion of the bottom of the treatment room 111, an inlet small vessel 16 is provided as an inlet portion of a printing plate support 11 to be filled with water sealing the inlet portion, in which a guide roller 18a for the support 11 is provided. At a trailing edge portion of the bottom of the treatment room 111, an outlet small vessel 17 is provided as an outlet portion of the support 11 to be filled with water sealing the outlet portion, in which another guide roller 18a is provided. A water－tank 112 is provided between the inlet small vessel 16 and the outlet small vessel 17 for sealing the bottom of the treatment room 111. Therefore, the wall 19a, the inlet small vessel 16, the outlet small vessel 17 and the water tank 112 form a steam treatment apparatus 13. In the treatment room 111, guide rollers 18a are fixed on the wall 19a and guide roller 18c is disposed to movably hold a shaft thereof on the wall. A heater 113 is provided in the water tank 112.

Next, an operation of the present invention will be described in accordance with Fig. 2.

Fig. 2 shows a summarized view of a preferable embodiment of the present invention.

In Fig. 2, after the surface of a printing plate support 1 is treated, the printing plate support 1 enters a treatment room 11 through a guide roller 8 in a small vessel 6 sealed with water in a steam treating apparatus 3. Guide rollers are provided in the treatment room 11 so that the printing plate support 1 can stay for a time necessary to treat the printing plate support 1 by steam, and a plurality of movable guide rollers 8b are provided at an upper portion in the treatment room 11 in which shafts of the rollers 8b are held to a moving frame 10. Walls between the moving frame 10 and the guide rollers 8c are connected to each other through a bellows portion 9b consisting of a bellows－like flexible material to thereby tightly seal this portion.

A water tank 12 is provided at a lower portion of the treatment room 11, and filled with water, and a heating means 13 for warming and evaporating the water is provided therein. The heating means may be a steam heater or an electric heater.

When the water heater 13 causes steam to be evaporated from the surface of the water and causes the printing plate support 1 to be fed in the treatment room 11, the operating conditions in the treatment room 11 is that the temperature is kept a range of 80 °C to 105 °C, and the air pressure in the room 11 is kept in a range of －50 to 300 mmAq relative to the atmospheric pressure. The water temperature in the small vessel 6 as the inlet is kept to be not lower than 40 °C in accordance with the kind of the support to be treated, and the moving frame 10 is transferred upwards/downwards in accordance with the treatment speed so that the length of the support 1 in the treatment room 11 is adjusted. The printing plate support 1 treated under the optimum condition in the treatment room goes out of the apparatus 3 by a guide roller 8a in the water in an outlet small vessel 7.

As another automatic control member, a heater 13 is provided with a thermal controller 14 controlling the temperature in the treatment room 11 within the range of 80 to 105 °C. A steam exhaust quantity controller 16 is provided in order to control a damper so that the pressure in the treatment room is maintained to be －50 to 300 mmAq relative to the atmospheric pressure.

Further, heat insulator 17 is provided on the outer surface of the wall 9a, 9b and 9c of the treatment room 11 to keep the temperature so as not to produce dewdrops on the inner surface of the wall.

(Example－1)

After an anodized layer was formed on an aluminum support (the thickness 0.3 mm, and the width 1000 mm), the steam treatment was performed thereon by the apparatus in Fig. 1.

Conditions in the treatment room:

temperature: 99.8 to 100.0 °C (measured at four points in the water tank)

pressure: 30 mmAq (relative to the

atmospheric pressure)

The quantity of used steam was about 30 kg/hr, unevenness was not occurred in the produced aluminum plate, and there is almost nothing scattering of treatment in the width direction or longitudinal direction of the aluminum plate.

Since the values of the temperature and pressure in the treatment room could be adjusted freely, it was possible to adjust the steam treating reaction speed.

(Comparative Example – 1)

Steam treatment was performed on the support similar to that in Example – 1 by the apparatus in Fig. 3.

Conditions in the treatment room:

temperature: 97.8 to 102.3 ° C (there was scattering among measured points)

pressure: 30 mmAq (relative to the normal pressure)

The quantity of used steam was about 180 kg/hr, and unevenness was produced, showing the obtained aluminum plate has a difference between the portions in which steam treatment reaction was advanced and the portions in which steam treatment reaction was not advanced.

(Example – 2)

In Fig. 2, the upper three of five guide rollers in the treatment room are transferred. In the upper three guide rollers, bearing portions on their both sides are supported on their opposite sides to the same moving frame 10, and a normal seal mechanism is employed in penetration portions between its shaft and the wall of the treatment room. The wall (9a and 9c) of the treatment room is divided into upper and lower parts which are connected through a heat – proof bellows portion 9b constituted by a bellows – like material. The moving frame 10 is connected to an upwards/downwards operating mechanism (not – shown). For example, when the length of treatment is to be shortened, the upwards/downwards operating mechanism is actuated to move the moving frame 10 downward. Together with the downwards movement of the moving frame, the upper wall of the treatment room and the upper three guide rollers move downwards, and the bellows portion is shortened to complete the shortening of the length of treatment. Consequently, it was become possible to cope with the treatment speed.

After an anodized layer was formed on a roughened aluminum support, the steam treatment was performed thereon by the apparatus of Fig. 2.

The thickness and width of the aluminum support, and the water temperature in the inlet small vessel portion 6 is determined as variables, the temperature in the treatment room and the performance of steam treatment (performance of residual color) were measured. The result is as shown in Table 1.

Table 1

Support Size		Water Temperature in inlet Small Vessel (°C)	Temperature in treatment Room (°C)	Performance of Residual Color
Thickness (mm)	Width (mm)			
0.2	800	30	100	excellent
		50	100	excellent
		70	100	excellent
0.2	1500	30	97	good
		50	100	excellent
		70	100	excellent
0.4	800	30	97	good
		50	100	excellent
		70	100	excellent
0.4	1500	30	94	poor
		50	99	excellent
		70	100	excellent

From the result shown in Table 1, it is apparent that the residual color performance is deteriorated at a relatively low temperature when the thickness and/or width of the support is increased so that the mass is increased, and it does not go well if the water temperature in the inlet small vessel is 30 °C when the temperature in the treatment room is low. Therefore, preferably, the water temperature in the inlet small vessel is selected to be not lower than 40 °C.

There was no unevenness in supports which were good or excellent in residual color performance. At that time, the quantity of used steam was not higher than about 80 kg/hr.

(Comparative Example – 2)

After an anodized layer was formed on a roughened aluminum support, steam treatment was performed thereon by the apparatus of Fig. 3.

Scattering was produced among places in the treatment room where the temperature was in a range 95 to 103 °C. The quantity of used steam was about 400 kg/hr. Unevenness was produced in the obtained support.

According to the steam treatment method for a printing plate support and an apparatus therefor in accordance with the present invention, the following result is obtained:

It is possible to perform a uniform steam treatment all over the width and length of the support, and there is no unevenness of treatment or the like;

The temperature distribution in a treatment room is small;

It is possible to set the temperature and pressure in the treatment room to desired values so that the speed of reaction can be controlled;

The energy supply quantity is reduced to its necessary minimum;

Since it is possible to perform treatment with pure steam evaporated from water, there is no possibility that reaction is impeded by the presence of an impurity may be mixed which may occur when the steam fed through piping is sprayed directly;

Since condensed water in the treatment room is re – used as water in a water tank portion, utilization efficiency of utilities is very high;

Since it is possible to change the length of the support in the treatment room, the length of treatment can be changed without changing the line speed so that the desired steam treatment performance can be obtained; and

Since it is possible to adjust the temperature of the support by control the water temperature in the inlet small vessel within the treatment room to be not lower than 40 °C, the temperature in the treatment room

can be stabilized independently of the width and thickness of the support so that even treatment can be carried out and the possibility of generation of treatment scattering can be eliminated.

Claims

1. A method for treating an etched surface of a planographic printing plate support with steam, comprising steps of:

   heating water in a water tank provided in a treatment room to control a temperature in said treatment room within a range of 80 °C to 105 °C and an air pressure in said treatment room within a range of −50 to 300 mmAq relatively to an atmospheric pressure; and

   feeding said planographic printing plate support through said treatment room by guide rollers.

2. A method according to Claim 1, during said feeding step, further comprising a step of feeding said printing plate support into said treatment room through water filled in an inlet vessel which is filled with water, and a step of feeding said printing plate support out of said treatment room through water filled in an outlet vessel which is filled with water.

3. A method according to Claim 2, wherein the temperature of water in said inlet vessel is controlled to exceed 40 °C during said feeding step for feeding said printing plate support into said treatment room.

4. A steam treatment apparatus for treating an etched surface of a planographic printing plate support with steam, said apparatus comprising:

   a casing for forming a treatment room, in which an opening is provided at a bottom portion of said casing;

   a water tank filled with water which is provided at the bottom portion of said casing to cover said opening of said casing;

   a heating means for warming and evaporating water in said water−tank portion to control a temperature in said treatment room within a range of 80 °C to 105 °C and an air pressure in said treatment room within a range of −50 to 300 mmAq relatively to an atmospheric pressure; and

   guide rollers provided above said water−tank in said treatment room for supporting and feeding said planographic printing plate support.

5. An apparatus according to claim 4, further comprising an inlet vessel filled with water which is provided at a leading edge of said casing as an inlet to enter the planographic printing plate support into said treatment room through water in said inlet vessel, water in said inlet vessel being adjusted a temperature to exceed 40 °C.

6. An apparatus according to claim 5, wherein said inlet vessel is provided with a heater for adjusting the temperature of water in said inlet vessel.

7. An apparatus according to claim 5, further comprising a means for supplying water to said inlet vessel, water being adjusted the temperature to exceed 40 °C in said supplying means.

8. An apparatus according to claim 5, further comprising an outlet vessel filled with water which is provided at a trailing edge of said casing as an outlet to take out the planographic printing plate support from said treatment room through water in said outlet vessel.

9. An apparatus according to claim 4, wherein at least one of said guide rollers is movably provided in said treatment room to set a length of said planographic printing plate support in said treatment room variably in accordance with a predetermined speed of the steam treatment.

10. An apparatus according to Claim 9, further comprising an upwards/downwards moving frame provided at an upper portion of said casing for supporting said movable guide rollers provided in an upper portion of said treatment room, and a middle wall of said casing between said moving frame and a lower portion of said casing consisting of a bellows−like flexible material so as to tightly seal said treatment room.

11. An apparatus according to claim 4, further comprising a steam amount controlling means for control an amount of the steam in said treatment room to adjust the temperature in said treatment room within the range of 80 ˚C to 105 ˚C.

FIG. 1

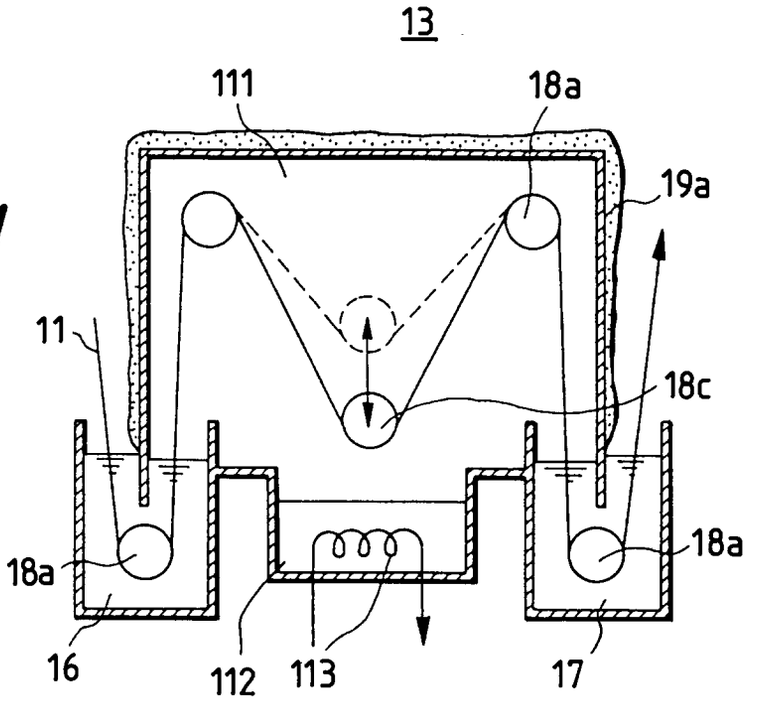
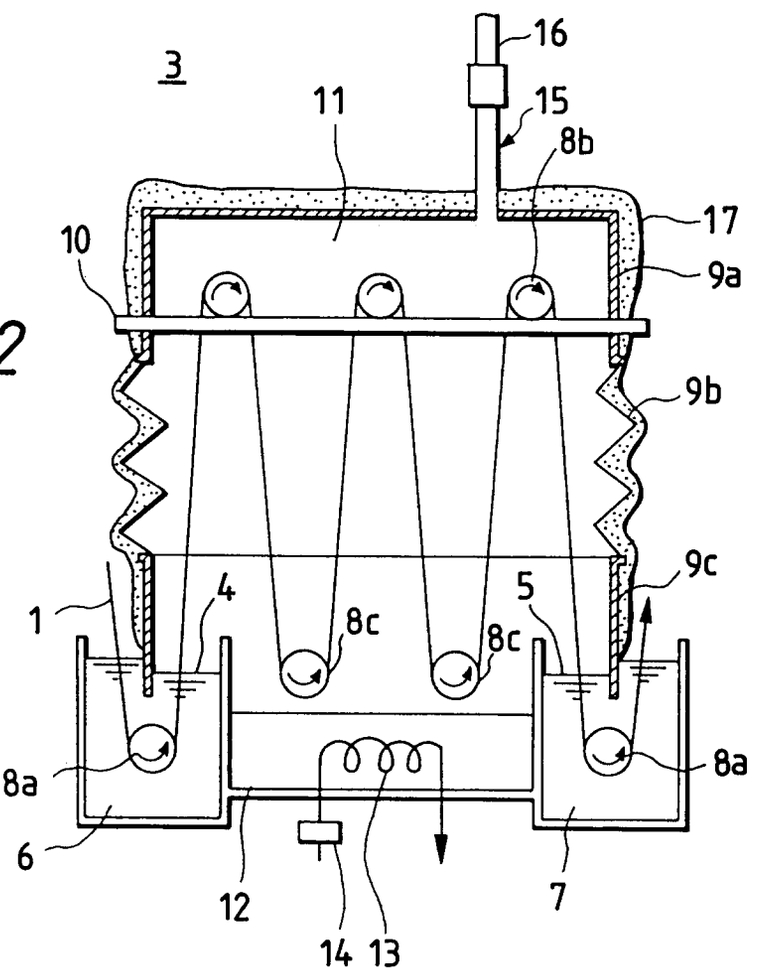

13
111
18a
19a
11
18c
18a
18a
16
112
113
17

FIG. 2


3
16
11
15
8b
17
10
9a
9b
9c
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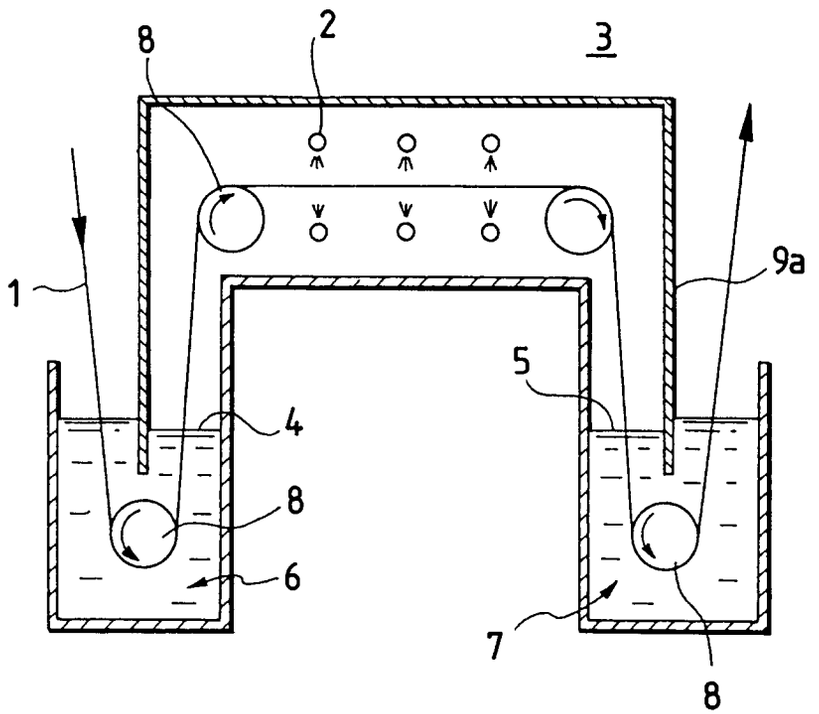
4
5
8c
8c
8a
8a
6
12
7
14
13

FIG. 3
PRIOR ART



European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 11 8901

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.5)
D,A	EP-A-0 452 954 (FUJI PHOTO FILM LTD)		B41N3/03
D,A	US-A-4 116 695 (T. MORI)		
A	US-A-4 416 123 (Y. SANDO)		
A	US-A-4 472 950 (Y. SANDO)		
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B41N

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	15 JANUARY 1993	HAENISCH U.P.

CATEGORY OF CITED DOCUMENTS

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