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Publication number:

**0 075 027**  
**A1**

## EUROPEAN PATENT APPLICATION

published in accordance with Art. 158(3) EPC

Application number: **82901005.7**

Int. Cl.<sup>3</sup>: **G 03 D 3/00**, **G 03 D 5/00**,  
**G 03 D 13/00**

Date of filing: **02.04.82**

Data of the international application taken as a basis:

International application number:  
**PCT/JP 82/00099**

International publication number:  
**WO 82/03470 (14.10.82 82/25)**

Priority: **04.04.81 JP 49079/81**

Applicant: **KONISHIROKU PHOTO INDUSTRY CO. LTD.**,  
**No. 26-2, Nishishinjuku 1-chome Shinjuku-ku,**  
**Tokyo 160 (JP)**

Date of publication of application: **30.03.83**  
**Bulletin 83/13**

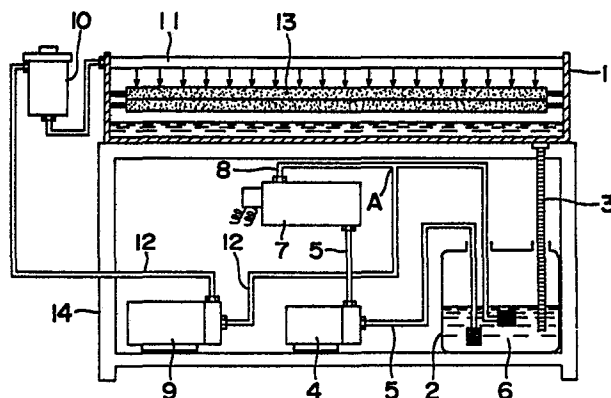
Inventor: **AOKI, Kazushige, 20-13,**  
**Ohwada-machi 6-chome, Hachioji-shi Tokyo 192 (JP)**

Designated Contracting States: **DE FR GB**

Representative: **Ben-Nathan, Laurence Albert et al, c/o**  
**MICHAEL BURNSIDE & PARTNERS 2 Serjeants' Inn**  
**Fleet Street, London EC4Y 1HL (GB)**

### FLUID CIRCUIT FOR TREATMENT DEVICE.

A fluid circuit in a treatment device in which a treatment liquid (6) in a storage tank (2) is supplied to a heat exchanger (7) to control its temperature, one part of the treatment liquid (6) is supplied to a treatment tank (1), and the liquid remaining in the tank (1) is returned to the storage tank (2) where part of the conduit feeding the liquid (6) from the tank (2) to the tank (1) is common to that used by the conduit returning the liquid (6) from the heat exchanger (7) to the tank (2).



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Description

FLUID CIRCUIT FOR TREATMENT DEVICE

Technical Field

The present invention relates to a fluid circuit for a photosensitive material treatment device or other treatment devices.

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Background Art

Generally, in conventional photosensitive material treatment device a treatment solution is always recirculated from the reservoir to the treatment tank to regulate the solution temperature even when no material is treated.

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But in recent years, in view of the oxidation of treatment solution and of power saving, an increasing number of fluid circuits are coming into use, in which the treatment liquid is recirculated through the liquid temperature regulation circuit when no photosensitive materials are being treated. One of such fluid circuits employs solenoid valves in the recirculation circuit which changes over so that when no material is treated

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the solution is recirculated in the temperature regulation circuit and when the material comes into the treatment tank the treatment liquid is made to flow to the treatment tank. In this type of fluid circuit, however, a pump of large delivery capacity must be operated at all times resulting in not a small power consumption. Further since the pump capacity is large, the solenoid valve is required to have a large orifice. Moreover the system requires one three-way solenoid valve or two two-way solenoid valves. In other fluid circuits, two pumps are used, one dedicated to delivering the treatment solution through the temperature regulation circuit and the other for delivering the solution through the treatment tank circuit. This kind of fluid circuit can achieve the object of power saving, but when applied to the treatment device equipped with a cartridge type reservoir intended to facilitate the supply and recovery of the treatment solution, the piping becomes complex and insertion opening on the reservoir becomes large in outer diameter. This makes it impossible to use polyethylene containers available on the market as a cartridge reservoir.

#### Disclosure of the Invention

Accomplished in the light of the above drawbacks, the present invention has a primary object to provide a fluid circuit for treatment devices which does not employ solenoid valves and has simple piping and small power

consumption.

To achieve this object the fluid circuit of this invention comprises: a treatment liquid temperature regulating circuit for regulating the temperature of treatment liquid in the reservoir by supplying the liquid by a first pump to a heat exchanger; and a treatment tank circuit in which a second pump with a greater delivery capacity than the first pump supplies the treatment liquid to the treatment tank to treat the material in the tank and the used liquid collected at the bottom of the treatment tank is returned to the treatment liquid reservoir; whereby that part of the delivery pipe of the treatment tank circuit which is located near the reservoir and that part of the return pipe of the treatment liquid temperature regulating circuit which is located near the reservoir are formed by the same pipe.

#### Brief Description of the Drawings

Figure 1 is a cross section showing one embodiment of the fluid circuit for treatment devices according to this invention;

Figure 2 is a schematic diagram showing the flow of fluid through the treatment liquid temperature regulating circuit when no material is treated; and

Figure 3 is a schematic diagram showing the flow of fluid through the treatment tank circuit when a material is being treated.

Best Mode for Carrying Out the Invention

The present invention will now be explained in detail in the following.

Figure 1 is a cross section of a fluid circuit for treatment devices embodying this invention. Figure 2 is a schematic diagram showing the fluid circulation for regulating the temperature when no treatment is performed. Figure 3 is a schematic diagram showing the circulation of treatment solution when treatment is performed. In Figures 1 through 3, reference numeral 1 denotes a treatment tank below which is installed a cartridge type treatment solution reservoir 2 which is communicated with the lower part of the treatment tank 1 through a fluid pipe 3. Denoted 4 is a first pump which sends the treatment solution 6 through a delivery pipe 8 to a heat exchanger 7 from which the liquid is returned to the reservoir 2 through the return pipe 8. Designated 9 is a second pump which has a larger capacity (for instance more than two times greater) than the first pump 4. Reference numeral 10 represents a filter and 11 a spray nozzle. The spray nozzle 11, filter 10, second pump 9 and the reservoir 2 are interconnected by a delivery pipe 12. A part of the delivery pipe 12 located near the reservoir 2 (to the right of the branch point A of Figure 1) and a part of the return pipe 8 located near the reservoir 2 (to the right of the branch point A of Figure 1) are formed with a single and the same

pipe. Designated 13 are rollers for feeding material to be treated and 14 a frame for supporting the treatment tank 1. The circuit for regulating the temperature of the treatment solution 6 in the reservoir 2 consists of the first pump 4, the delivery pipe 5, the heat exchanger 7 and the return pipe 8. The treatment tank circuit for supplying the treatment liquid to the treatment tank and returning the used liquid to the reservoir 2 is made up of the second pump 9, filter 10, spray nozzle 11 and delivery pipe 12 and the used liquid recovery pipe 3.

The operation of the fluid circuit of this invention will be explained in the following. Firstly when no treatment is performed, the treatment solution 6 in the reservoir 2, as shown in Figure 2, is delivered by the first pump 4 to the heat exchanger 7 where it is heated (or temperature-regulated) to a certain temperature, after which the treatment solution is returned through the return pipe 8 to the reservoir 2. In this case the second pump 9 is not operating. Next, as the material to be treated is fed into the treatment tank 1, a sensor not shown detects the material and activates the second pump 9. The second pump 9 has a larger delivery capacity than that of the first pump 4, so that as shown in Figure 3 the treatment liquid 6 delivered from the heat exchanger 7 and the liquid 6 from the reservoir 2 are both drawn by the second pump 9 and after combining

together at the branch point A will be passed through the filter 10 into the spray nozzle 11 from which the liquid is sprayed against the material. The treatment solution 6 that was sprayed from the nozzle 11 collects at the bottom of the treatment tank 1 from which it is guided by the used liquid recovery pipe 3 into the reservoir 2.

The fluid circuit with the above construction has only three pipes inserted into the treatment solution reservoir 2 and these pipes can also be inserted into the openings of a polyethylene container available on the market which therefore can be used as a cartridge tank. When no treatment is being performed, only the first pump which has small delivery capacity is operating and therefore the electric power consumption is kept minimum. The fluid circuit of this invention has another advantage that since no solenoid valve is used the circuit is free from problems associated with the solenoid valve.

While in the above embodiment the first and second pumps 4, 9 are installed upstream of the heat exchanger 7 and the filter 10, they may of course be installed downstream. The filter 10 may be omitted.

#### Industrial Applicability

With this invention it is possible to realize a fluid circuit of treatment devices which does not employ solenoid valves and therefore is simple in piping and has a small power consumption.

Claim

A fluid circuit for treatment devices comprising:  
a treatment liquid temperature regulation circuit for  
regulating the temperature of treatment liquid in the  
5 reservoir by supplying the liquid by a first pump to a  
heat exchanger; and a treatment tank circuit in which a  
second pump with a greater delivery capacity than the  
first pump supplies the treatment liquid to the treatment  
tank to treat the material and the used liquid collected  
10 at the bottom of the treatment tank is returned to the  
treatment liquid reservoir; whereby that part of the  
delivery pipe of the treatment tank circuit which is  
located near the reservoir and that part of the return  
pipe of the treatment liquid temperature regulating  
15 circuit which is located near the reservoir are formed  
by the same pipe.

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FIG. 1

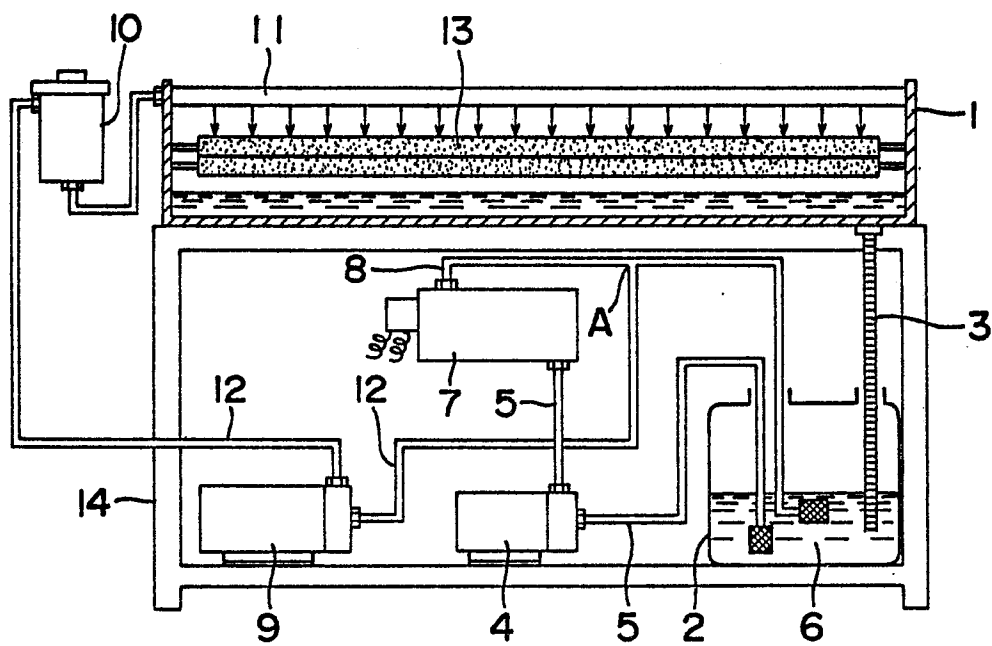


FIG. 2

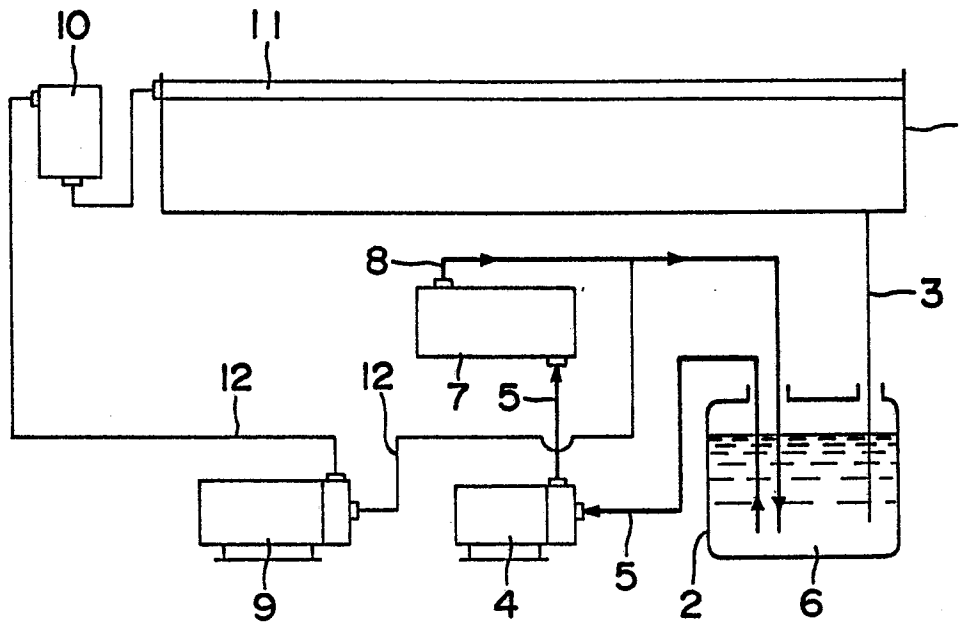
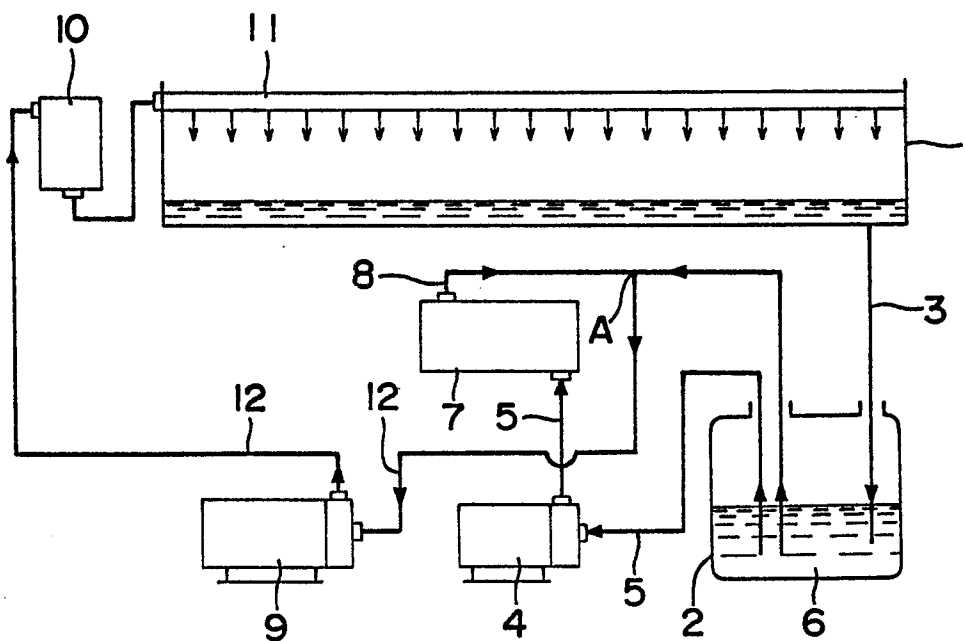


FIG. 3



# INTERNATIONAL SEARCH REPORT

International Application No.

0075027  
PCT/JP82/00099

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (If several classification symbols apply, indicate all) <sup>3</sup>		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int. Cl. <sup>3</sup> G03D 3/00, 5/00, 13/00		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>4</sup>		
Classification System	Classification Symbols	
I P C	G03D 3/00 - 3/16, 5/00 - 5/06, 13/00	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched <sup>4</sup>		
	Jitsuyo Shinan Koho	1926 - 1982. May
	Kokai Jitsuyo Shinan Koho	1971 - 1982. May
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT</b> <sup>14</sup>		
Category <sup>5</sup>	Citation of Document, <sup>16</sup> with indication, where appropriate, of the relevant passages <sup>17</sup>	Relevant to Claim No. <sup>18</sup>
A	JP, B2, 52-32255 (Tokyo Inshokan Kabushiki Kaisha), 20. August. 1977 (20.08.77)	1
A	JP, B2, 54-28086 (Agfa Gevaert A.G.) 13. September. 1979 (13.09.79) & US, A, 3,978,506	1
A	JP, A, 50-86345 (Dainippon Screen Mfg. Co., Ltd.) 11. July. 1975 (11.07.75) & US, A, 3,990,088	1
A	JP, Y2, 54-10941 (Konan Camera Kenkyusho Kabushiki Kaisha) 18. May. 1979 (18.05.79)	1
<div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <p><sup>15</sup> Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 48%;"> <p>"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</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"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</p> <p>"Z" document member of the same patent family</p> </div> </div>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search <sup>2</sup>		Date of Mailing of this International Search Report <sup>2</sup>
June 18, 1982 (18.06.82)		June 28, 1982 (28.06.82)
International Searching Authority <sup>1</sup>		Signature of Authorized Officer <sup>20</sup>
Japanese Patent Office		