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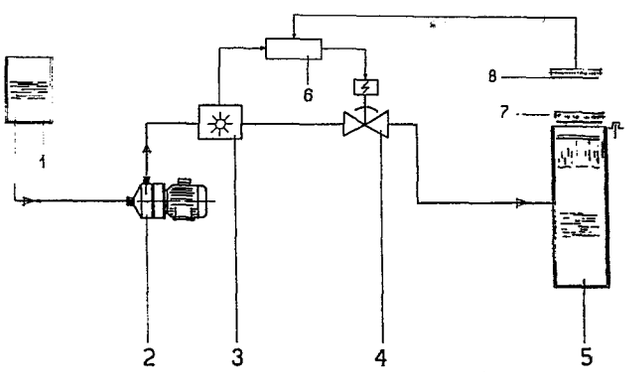
(54) **A device for automatically metering chemical products in a developing machine.**

(57) A device for attomatically metering chemical products in a developing machine comprises pump means (2) and valve means (4). An electronic program unit (6) including a memory is connected on the one hand to a photocell (8) sensing the quantity of paper (7) treated, and on the other hand, to a pulse counter (3) and to an electrovalve (4) so as to constantly monitor the consumption of substances from the treatment bath and to actuate said valve means for regenerating the chemical substances contained in the treatment vessel (5).



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A Device for Automatically Metering Chemical Products in a Developing Machine

Description

The present invention relates to a device for automatically metering the exact quantity of chemical products required for regenerating a treatment bath in a vessel of a developing machine for photographic films and papers.
At present, the regeneration of such baths is accomplished by calculating the surface area of the treated papers and by actuating, on the basis of the thus obtained information, a volumetric membrane pump for supplying one or several metered doses of chemical regenerating substances to the bath.

This known device suffers from various drawbacks mainly due to the long-term instability of the pump output (deterioration of the membrane, incrustation of the valves), to the insufficient metering accuracy and to adjustment difficulties (the pump output can only be varied by varying the stroke of the pump membrane).

It is an object of the present invention to provide a device of the type set forth, which operates completely automatically, quickly and accurately so as to control the regenerating system in a closed circuit.

The subject matter of the invention is thus a device connecting a container for chemical regeneration substances to a treatment vessel of a developing machine, said device comprising pump means and valve means and being characterized in that it comprises an electronic program unit including a memory and connected on the one hand to sensing means effective to sense the quantity of paper treated, and on the other, to a pulse counter and to an electrovalve, so as to constantly monitor the consumption of substances from

the treatment bath and to actuate said electrovalve for regenerating the chemical substances of said bath.

The characteristics of the invention and its advantages will become evident from the following description, given by way of a non-limiting example, with reference to the accompanying drawing, showing a diagrammatic representation of a device according to the invention.

In the drawing, a container 1 for chemical regeneration substances is connected to a magnetically driven centrifugal pump 2 for supplying said substances to a treatment vessel 5 of a developing machine via a pulse counter 3 and an electrovalve 4.

An electronic program unit 6 including a memory is connected on the one hand to photocell sensor means 8 employed for sensing the quantity of paper 7 treated within vessel 5, and on the other hand, to pulse counter 3 and electrovalve 4.

The program unit 6 compares the informations relating to the treated paper as supplied by the photocell sensor means 8 to dates contained in the included memory, and at the proper time initiates a regeneration cycle by opening electrovalve 4. Thanks to its magnetic drive system, centrifugal pump 2 is always rotating, but supplies the chemical substances from container 1 to vessel 5 only when electrovalve 4 is open. The regeneration cycle is terminated as soon as the metered quantity of the chemical substance as indicated by the pulse counter 3 corresponds to the quantity required according to the program, the respective dates being stored in the memory of program unit 6.

Shown in fig. 2 of the drawings is a preferred embodiment of program unit 6, comprising a binary pulse counter 9 the input of which is controlled by the photocell sensor means 8 by means of a pulse train. The output of counter 9, shown

as a single output in fig. 2, controls the first input section 11 of a binary comparator 10, the other input section of which is controlled by one stage of the memory 13. Memory 13, comprising for instance an integrated circuit type 2716 of Intel Corp., is adapted to generate at its output, shown as a single output in fig. 2, a binary reference number corresponding to the maximum quantity of paper that can be treated in tub 5 after each regeneration cycle. Comparator 10 may for instance comprise an integrated circuit of the type 74C85 made by National Semiconductor Corp. and is in a per se known manner adapted to generate a logic output level "1" only when the binary numbers applied to its inputs 11 and 12 coincide.

The output of comparator 10 controls a reset input of counter 9 and a control input 16 of a flipflop stage 14.

The output of flipflop stage 14 controls the electrovalve 4 and a reset and enable input of a binary pulse counter 15, and shows a logic level "1" when an identical level "1" is applied to its control input 16.

Counter 15 is substantially identical to counter 9 and is controlled by a pulse train generated by counter 3 (or flow meter) for generating at its output 17 a reset signal when the counted pulse number corresponds to the quantity of the chemical substance to be metered into tub 5. The output 17 of counter 15 controls a corresponding reset input of flipflop stage 14.

In operation, after each regeneration cycle counter 9 progressively counts the pulses received from photocell sensor means 8 until the counted number corresponds to the binary number at the output of memory 13, this number itself corresponding, as already explained, to the quantity of paper to be treated prior to initiating a new regeneration cycle. Comparator 10 then generates a logic output signal "1" for resetting counter 9 and commuting flipflop stage 14.

The logic signal "1" at the output of flipflop stage 14 initiates the opening of electrovalve 4 and simultaneously enables counter 15, which is always in its reset condition in the absence of said logic signal "1".

Counter 15 counts the pulses generated by counter 3, the operation of which is initiated by the opening of electrovlave 4. When the required amount of the chemical substance has been transferred from container 1 to tub 5, counter 15 generates at its output a reset signal for flipflop stage 14, whereby the latter causes electrovalve 4 to be closed so as to terminate the regeneration cycle.

The described device may obviously undergo various modifications within the scope of the invention There may for instance be employed a plurality of containers 1 containing various chemical substances to be supplied to different treatment vessels 5. In this case it is merely necessary to provide further connections of the kind described, and if need be to increase the capacity of the memory included in the program unit.

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A Device for Automatically Metering Chemical Products in a Developing Machine

Patent Claims

1. A device for automatically metering chemical products in a developing machine, particularly for supplying regenerating substances from a container thereof to a treatment vessel of the machine, said device including pump means and valve means and being characterized in that it comprises an electronic program unit (6) including a memory and connected on the one hand to photocell sensor means (8) effective to sense the quantity of paper treated, and on the other hand, to a pulse counter (3) and to an electrovalve (4), so as to constantly monitor the consumption of substances of the treatment bath and to actuate said electrovalve (4) for regenerating the chemical substances in said vessel (5).

2. A device according to claim 1, characterized in that said pump means (2) comprise a magnetically driven centrifugal pump.

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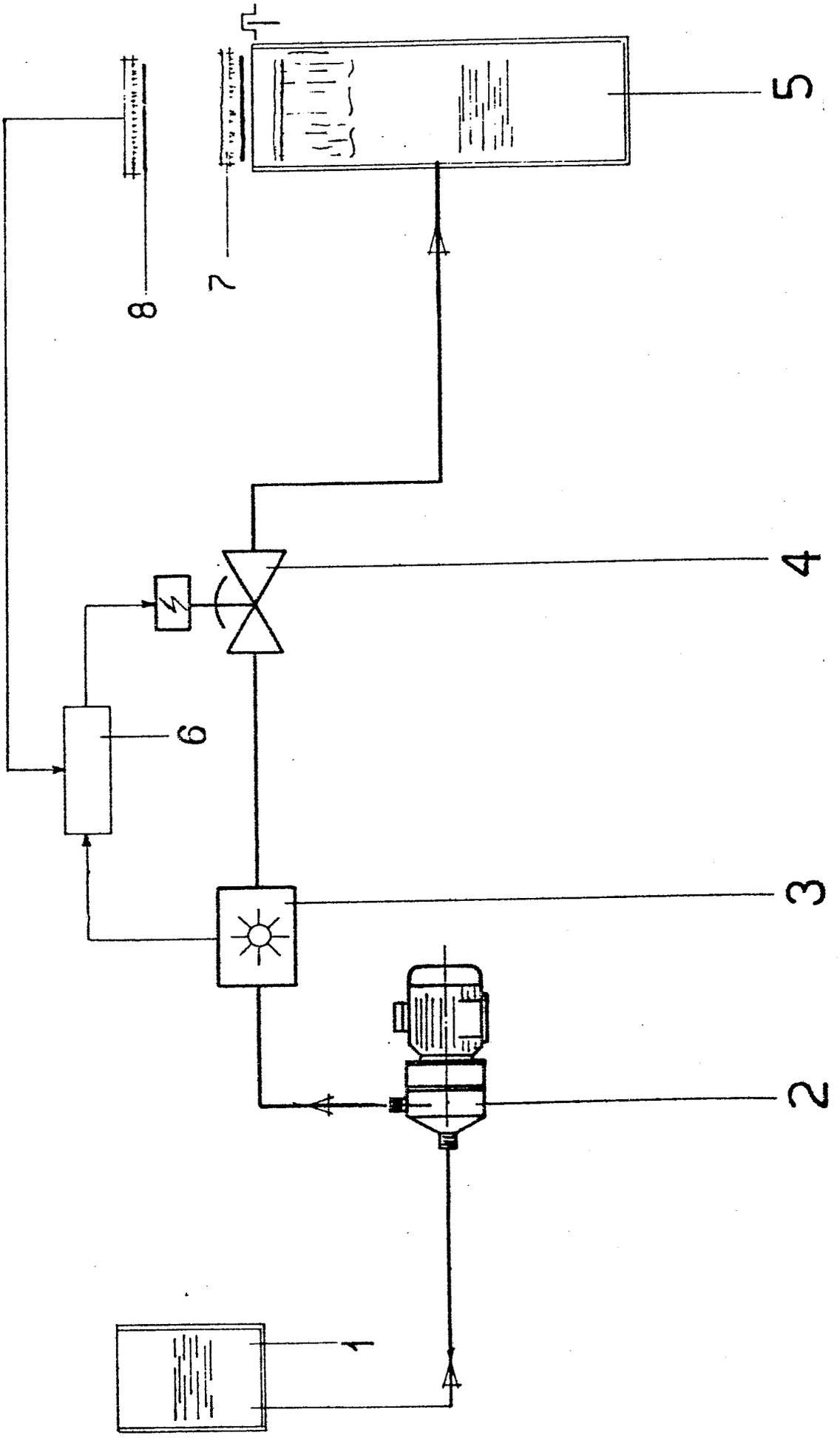

FIG. 1

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FIG. 2