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

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Description

The invention is especially suited to 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).

From US-A 4,314,753 an automatic control system of the above-mentioned type has already become known. This system allows to separately control developer exhaustion replenishment and fix exhaustion replenishment. The system comprises with respect to the developer exhaustion replenishment, an exhaustion replenishment reservoir connected to the input side of a pump. The output side thereof is connected to a developer tank via a flow meter. Both the pump and the flow meter are electrically connected to a microcomputer. This microcomputer comprises a memory for storing preset values and also for storing width and length information for each film strip. The film area is evaluated by means of a film width sensor and a feedback signal from the film transport. The output of the width sensor and the feedback signal are input to the microcomputer which evaluates the area of the photosensitive material being processed. The film width sensor may be comprised by a reflective infrared sensor array located above a feed table at the input slot of the film processing machine. In this control system the pump is activated continuously on and off by the pump relay which in turn is energized by a signal from the microcomputer. A minimum pump operation time is required since control of the pump for a period less than the minimum operation time is difficult and likely to cause inaccuracy.

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.

According to the invention this will be achieved in that said pump means comprises a magnetically driven centrifugal pump always rotating when the developing machine is operated, and electrovalve connected to said electronic program unit is provided in the supply line from said pump means to said treatment vessel, a quantity of regenerating substances to the treatment vessel being controlled by actuating said electrovalve.

The advantage of this device is that due to its

magnetic drive system the centrifugal pump is always rotating but supplies chemical substances from container to the vessel only when the electrovalve is open. This will enable a quick and accurate metering.

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 electrovalve 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.

Claim

A device for automatically metering chemical products in a developing machine, particularly for supplying regenerating substances from a container (1) thereof to a treatment vessel (5) of the machine, said device comprising:

pump means (2) for supplying regenerating substances to said treatment vessel (5);

flow meter means (3) for monitoring the quantity of regenerating substances supplied to said treatment vessel (5), and

an electronic program unit (6) including a memory (13) and connected to photocell sensor means (8) for determining the area of photographic paper (7) treated and to said flow meter means (3),

said electronic program unit (6) controlling the quantity of regenerating substances to said treatment vessel (5) as a function of the area of

photographic paper (7) treated, characterised in that

said pump means (2) comprises a magnetically driven centrifugal pump always rotating when the developing machine is operated, and

an electrovalve (4) connected to said electronic program unit (6) is provided in the supply line from said pump means (2) to said treatment vessel (5),

the quantity of regenerating substances to the treatment vessel (5) being controlled by actuating said electrovalve (4).

Patentanspruch

Vorrichtung zur automatischen Messung chemischer Produkte in einer Entwicklungsmaschine, insbesondere für die Lieferung regenerierender Substanzen aus einem Container (1) davon zu einem Behandlungsgefäß (5) der Maschine, wobei die Vorrichtung umfaßt:

eine Pumpeinrichtung (2) für die Versorgung des Behandlungsgefäßes (5) mit regenerierenden Substanzen;

einer Durchflußmeßeinrichtung (3) zur Überwachung der Menge der regenerierenden Substanzen, die dem Behandlungsgefäß (5) zugeführt werden, und

eine elektronische Programmeinheit (6), die einen Speicher (13) enthält und an eine Photozellensensoreinrichtung (8) zur Bestimmung der Fläche von Photopapier (7), das behandelt wird, und an die Durchflußmeßeinrichtung (3) angeschlossen ist,

wobei die elektronische Programmeinheit (6), die Menge der dem Behandlungsgefäß (5) zugeführten regenerierenden Substanzen als Funktion der Fläche des behandelten Photopapiers (7) steuert,

dadurch gekennzeichnet, daß die Pumpeinrichtung (2) eine während des Betriebs der Entwicklungsmaschine ständig rotierende magnetisch angetriebene Zentrifugalpumpe umfaßt, und ein Elektroventil (4), das an die elektronische Programmeinheit (6) angeschlossen ist, in der Versorgungsleitung von der Pumpeinrichtung (2) zu dem Behandlungsgefäß (5) vorgesehen ist, wobei die Menge der regenerierenden Substanzen für das Behandlungsgefäß (5) durch Betätigung des Elektroventils (4) gesteuert wird.

Revendication

Dispositif pour le dosage automatique de produits chimiques dans une machine de développement, en particulier pour transférer des substances de régénération d'un réservoir (1) de la machine vers une cuve de traitement (5) de la machine, ledit dispositif comprenant:

une pompe 2 pour fournir des substances de régénération à ladite cuve de traitement (5);

un débitmètre (3) pour contrôler la quantité de substances de régénération fournie à ladite cuve de traitement (5); et

une unité de programmation électronique (6)

comportant une mémoire (13) et connectée à un moyen capteur à cellules photoélectriques (8) Pour déterminer la superficie du papier photographique (7) traitée et audit débitmètre (3);

ladite unité de programmation électronique (6) commandant la quantité de substances de régénération transférée vers ladite cuve de traitement (5) en fonction de la superficie du papier photographique (7) traitée, caractérisé en ce que:

ladite pompe (2) comprend une pompe centrifuge entraînée magnétiquement tournant en per-

manence lorsque la machine de développement est en fonctionnement; et

en ce qu'une électrovanne (4) connectée à ladite unité de programmation électronique (6) est prévue dans la canalisation d'alimentation allant de ladite pompe (2) à ladite cuve de traitement (5);

la quantité de substance de régénération transférée vers la cuve (5) étant commandée par actionnement de ladite électrovanne (4).

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FIG. 1

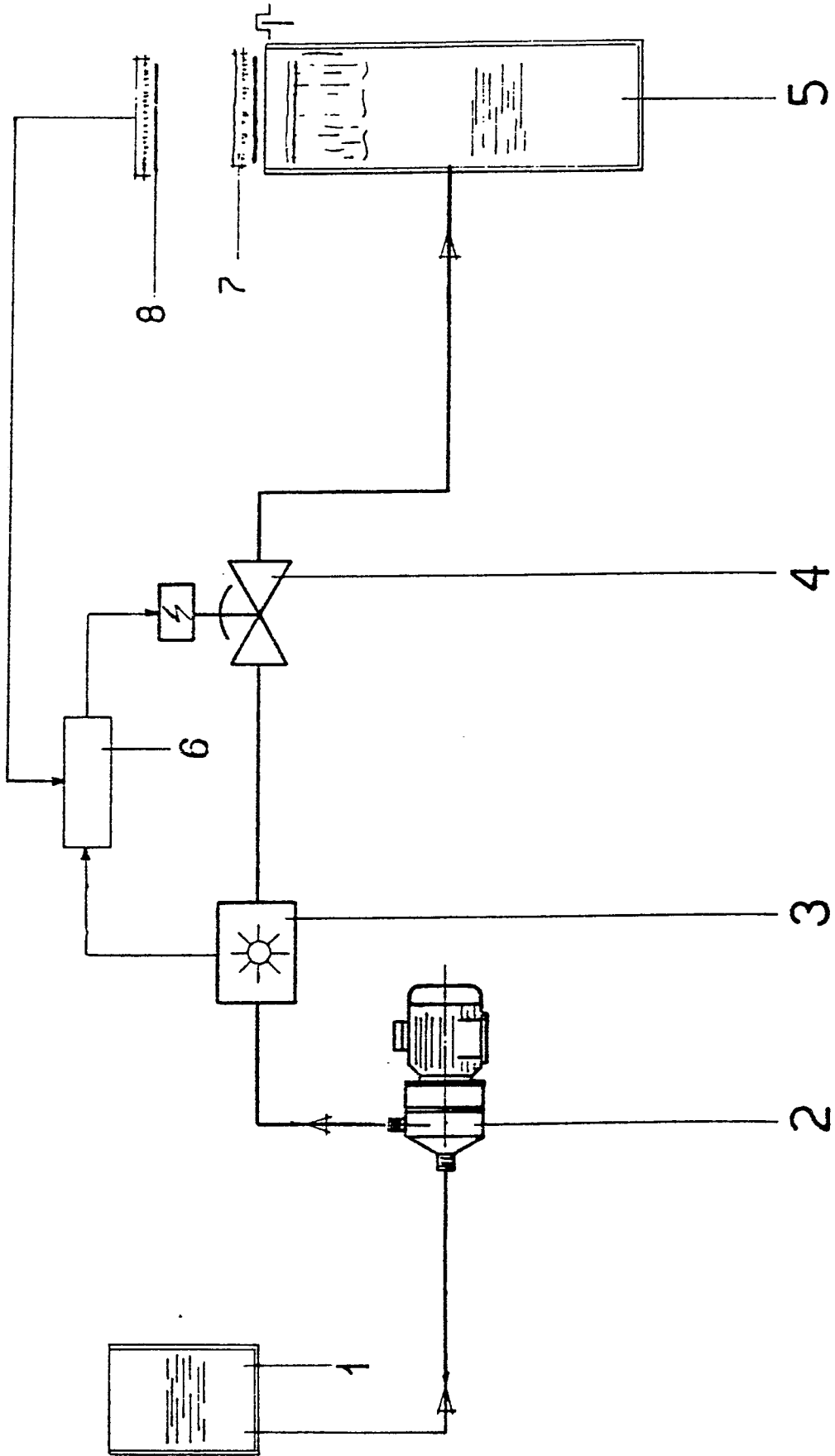


FIG. 2

