United States Patent [19]

Schroter et al.

[11] **3,905,698**

[45] **Sept. 16, 1975**

[54] **PHOTOPRINTING APPARATUS IN WHICH DEVELOPER IS REPLENISHED IN PROPORTION TO THE TREATED SURFACE AREA**

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[73] Assignee: **Hoechst Aktiengesellschaft,** Frankfurt, Germany

[22] Filed: **Aug. 22, 1974**

[21] Appl. No.: **499,645**

[30] **Foreign Application Priority Data**

Aug. 25, 1973 Germany............................ 2343067

[52] **U.S. Cl.**.................................... **355/27;** 354/298

[51] **Int. Cl.**[2] **G03B 27/32;** G03B 27/52; G03D 13/00

[58] **Field of Search**......... 354/298, 299; 355/10, 27

[56] **References Cited**

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3,472,143	10/1969	Hixon et al.	354/298
3,763,758	10/1973	Manack et al.	354/298 UX
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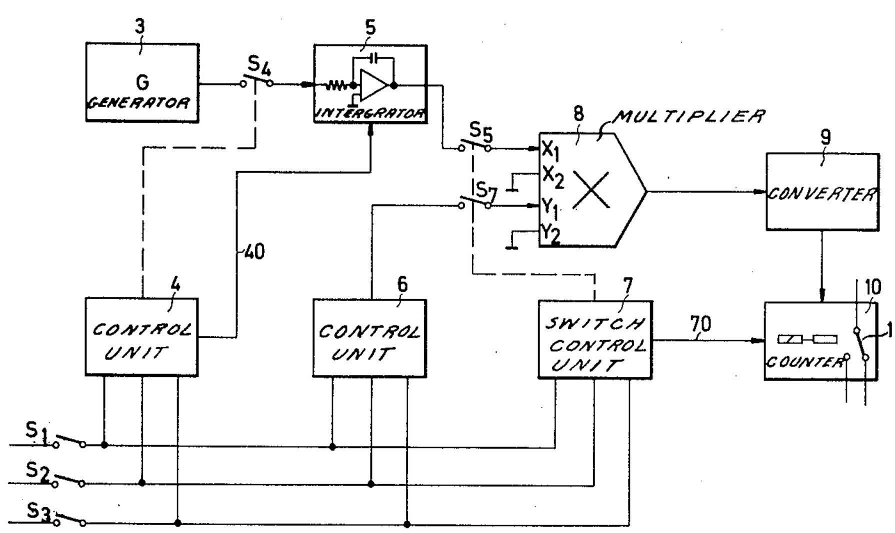
Primary Examiner—Richard A. Wintercorn
Attorney, Agent, or Firm—Cushman, Darby & Cushman

[57] **ABSTRACT**

Photoprinting apparatus of the type in which paper is selectively fed from one of at least two widths of paper and developed by material which is replenished in proportion to the treated surface area. The width of the paper is detected by discrete switches to produce an electrical signal which has a magnitude indicating the width and which is multiplied by a further signal indicating the length of paper. This multiplied signal in turn controls a pulse generator which applies its output to a counter which actuates a developer replenishing system upon reaching a predetermined count.

9 Claims, 12 Drawing Figures



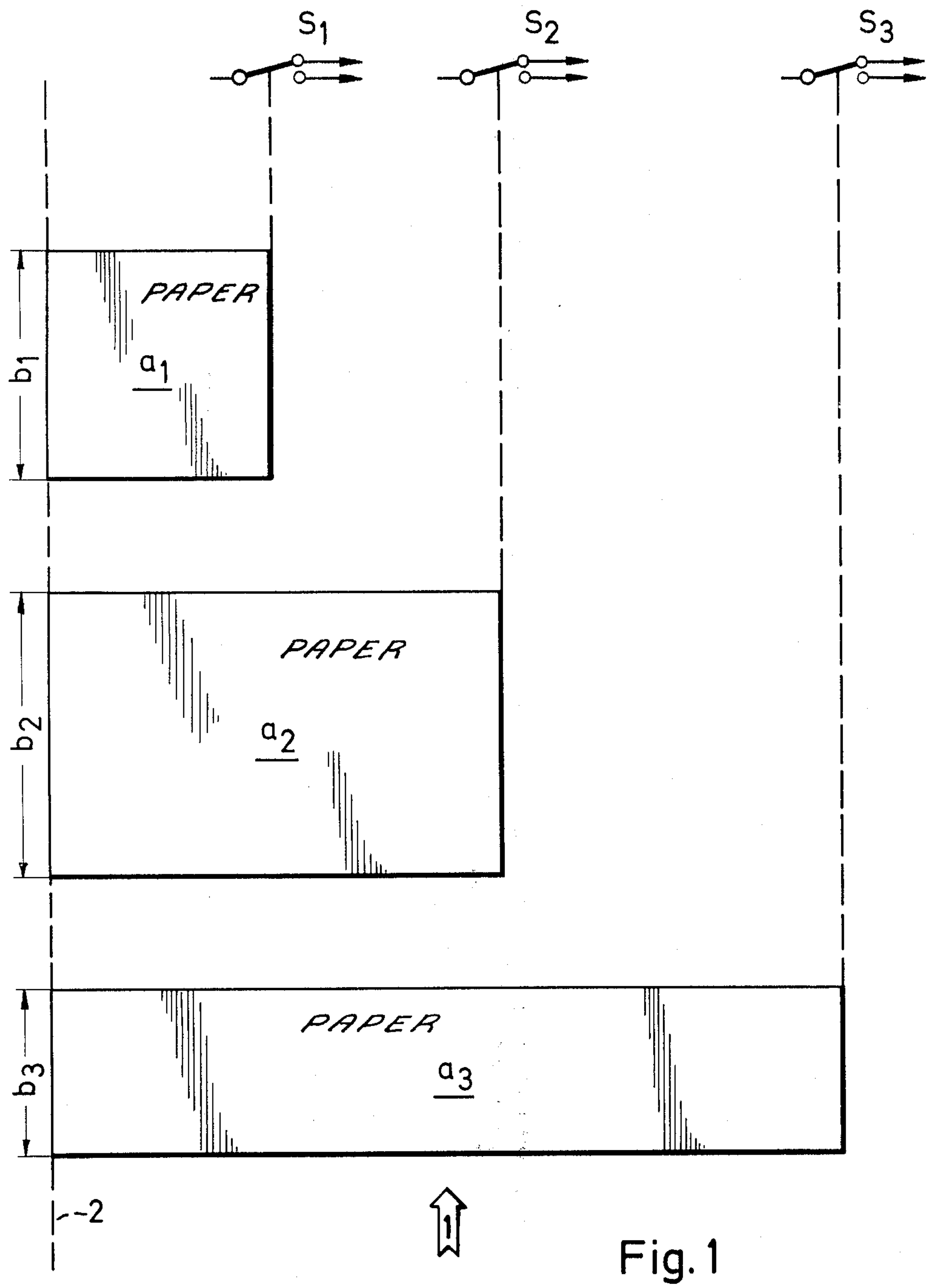


Fig. 1

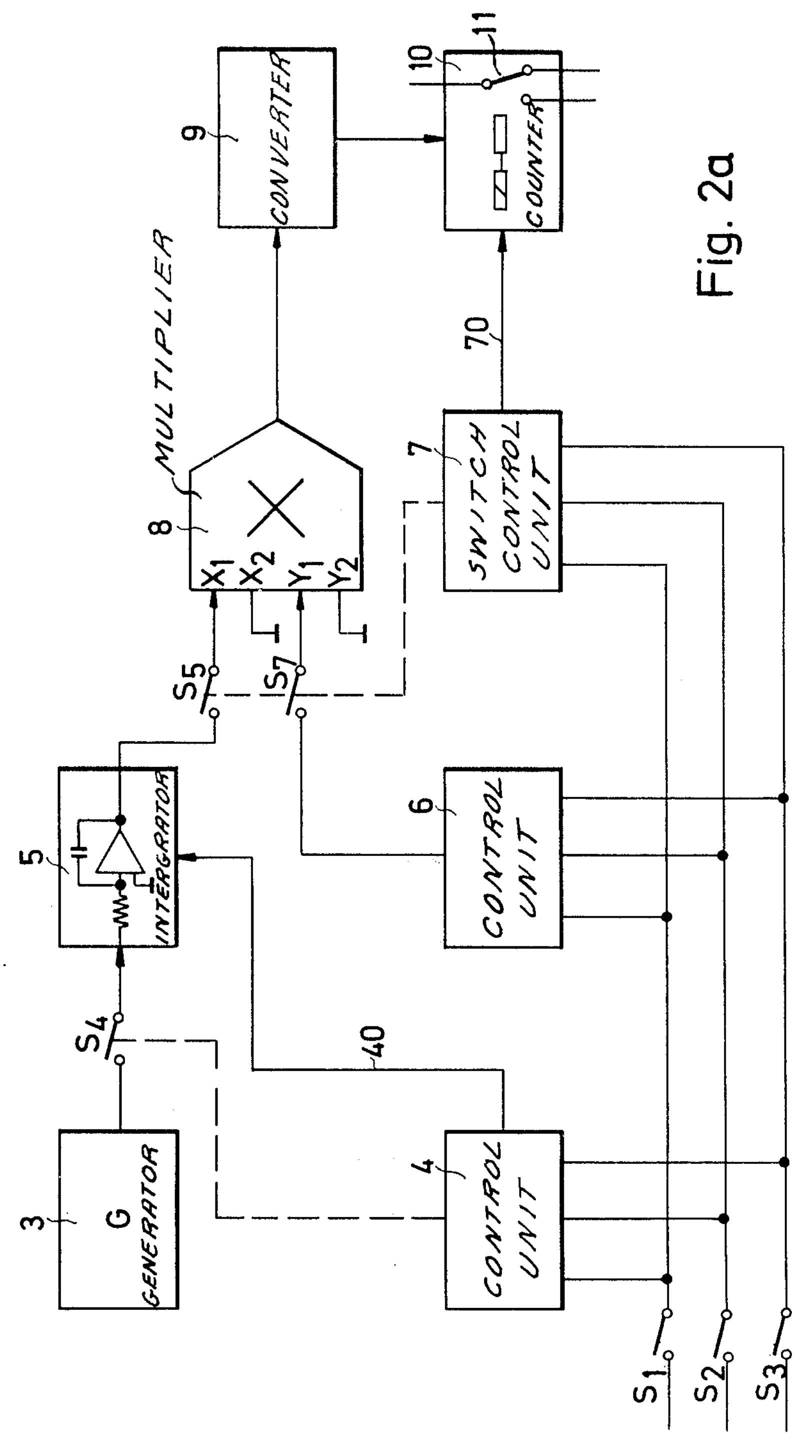

MULTIPLIER
8
X1
X2
Y1
Y2
9
CONVERTER
10
11
COUNTER
70
7
SWITCH CONTROL UNIT
S5
S7
5
INTERGRATOR
6
CONTROL UNIT
S4
40
3
G
GENERATOR
4
CONTROL UNIT
S1
S2
S3

Fig. 2a

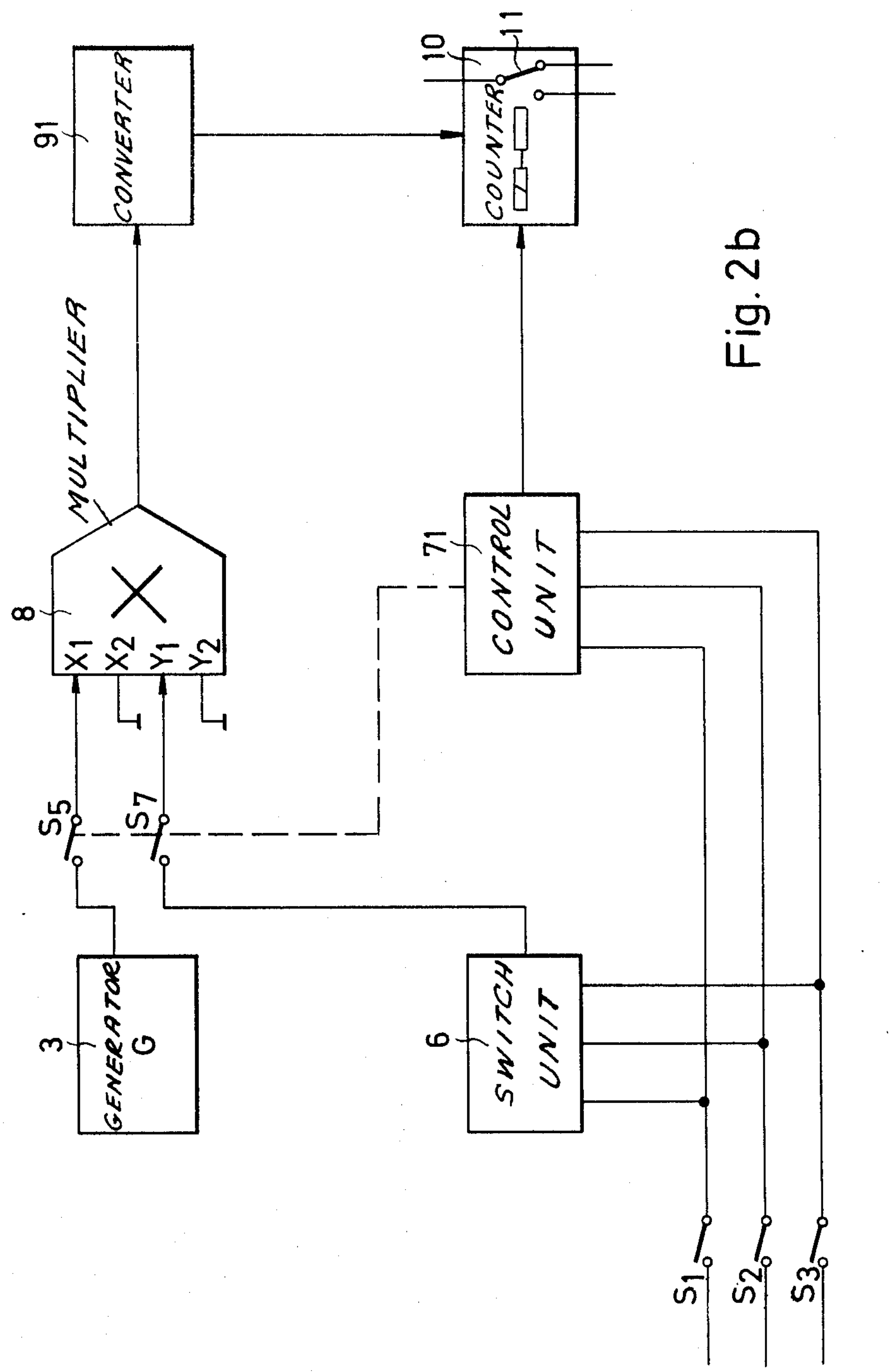

91
CONVERTER
10
11
COUNTER
MULTIPLIER
8
X1
X2
Y1
Y2
71
CONTROL UNIT
3
GENERATOR G
6
SWITCH UNIT
S5
S7
S1
S2
S3

Fig. 2b

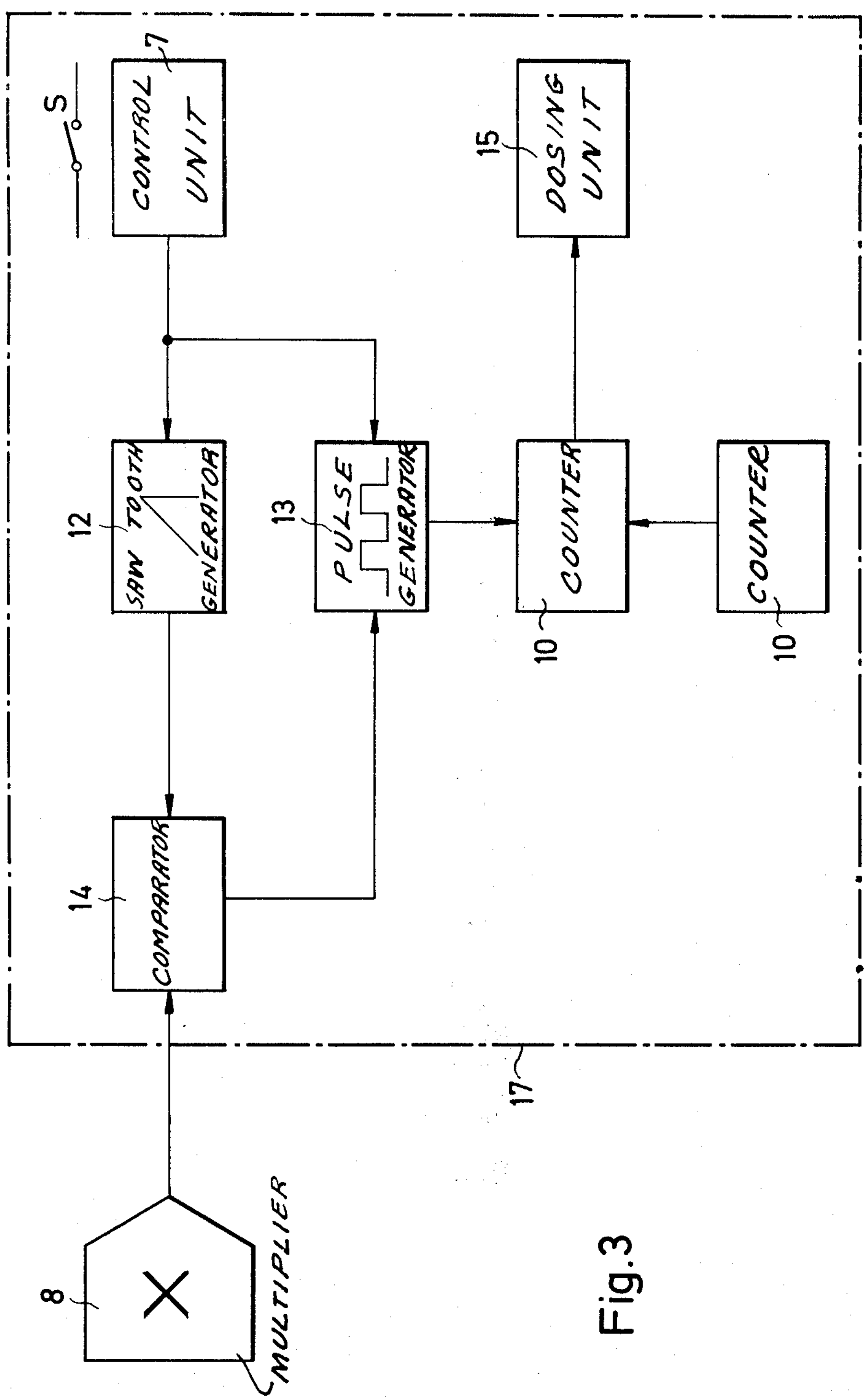

S
CONTROL UNIT
7
DOSING UNIT
15
SAW TOOTH GENERATOR
12
PULSE GENERATOR
13
COUNTER
10
COUNTER
10
COMPARATOR
14
17
MULTIPLIER
8

Fig.3

Fig. 4

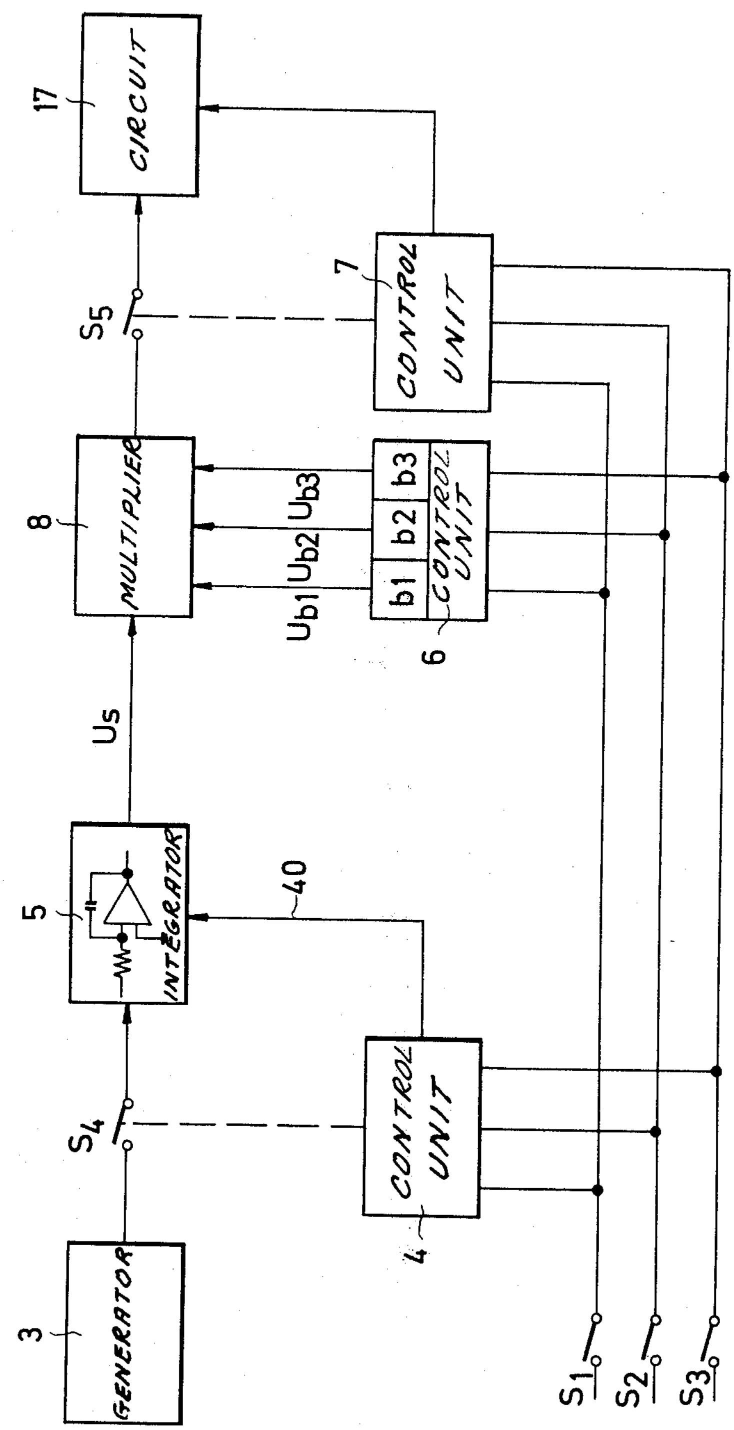
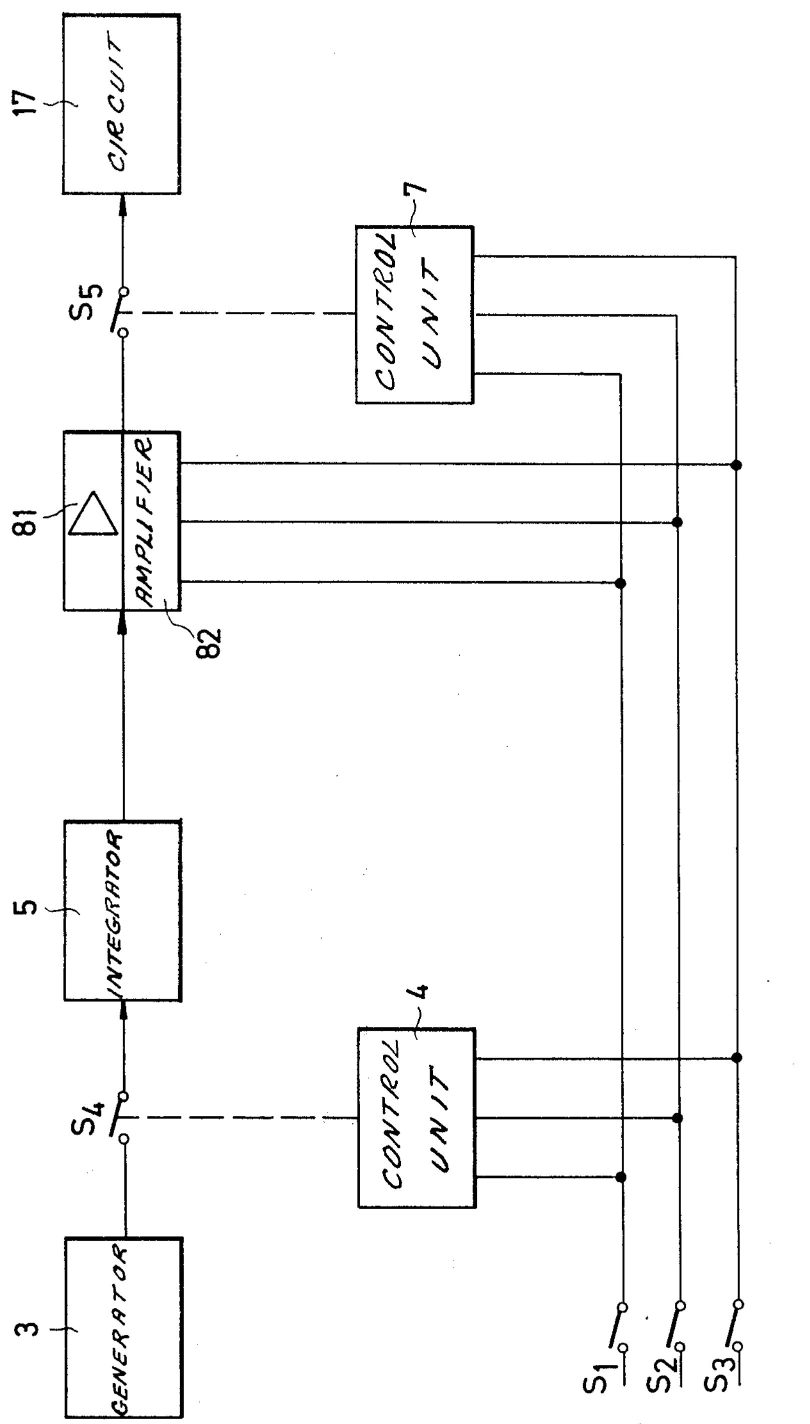

3
GENERATOR
S4
4
CONTROL UNIT
5
INTEGRATOR
40
Us
8
MULTIPLIER
Ub1
Ub2
Ub3
b1
b2
b3
CONTROL UNIT
6
S5
7
CONTROL UNIT
17
CIRCUIT
S1
S2
S3

Fig. 5


3
GENERATOR
S4
5
INTEGRATOR
81
AMPLIFIER
82
S5
17
CIRCUIT
CONTROL UNIT
4
CONTROL UNIT
7
S1
S2
S3

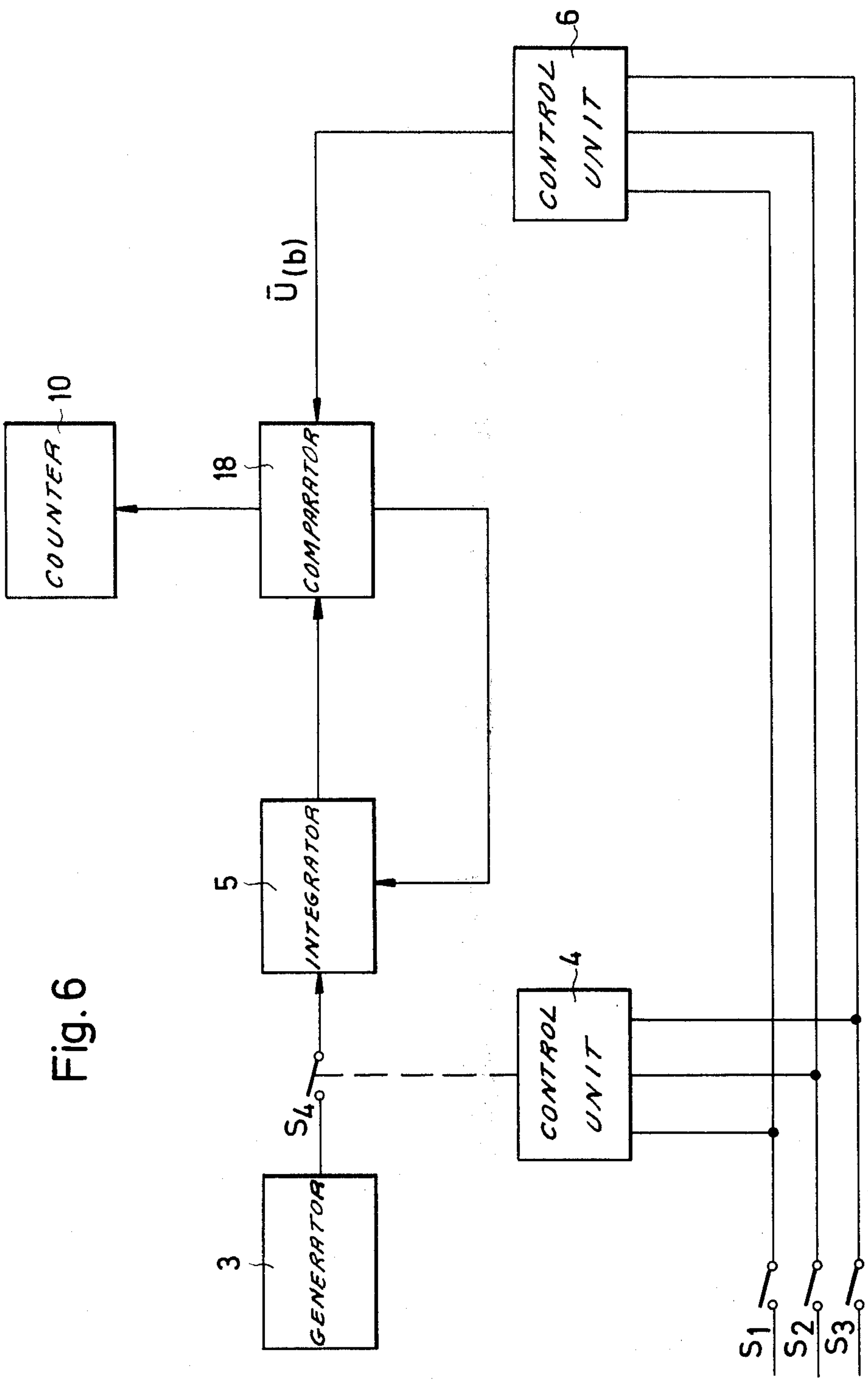

CONTROL UNIT
6
$\bar{U}_{(b)}$
COUNTER
10
COMPARATOR
18
INTEGRATOR
5
CONTROL UNIT
4
S_4
GENERATOR
3
S_1
S_2
S_3

Fig. 6

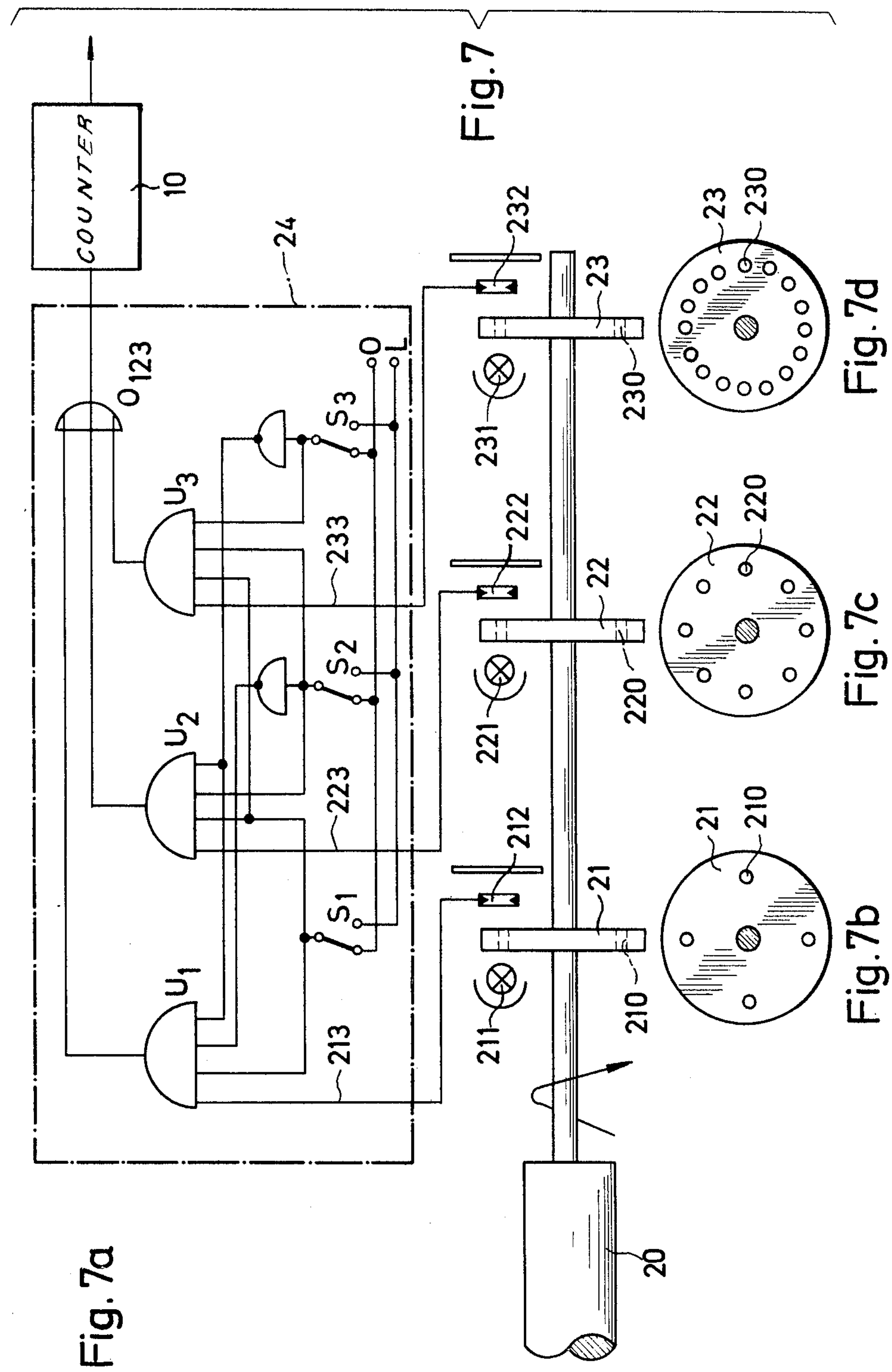


Fig.7
Fig.7a
Fig.7b
Fig.7c
Fig.7d
COUNTER
10
24
O_{123}
U_1
U_2
U_3
S_1
S_2
S_3
O
L
213
223
233
20
21
22
23
210
211
212
220
221
222
230
231
232

PHOTOPRINTING APPARATUS IN WHICH DEVELOPER IS REPLENISHED IN PROPORTION TO THE TREATED SURFACE AREA

BRIEF DESCRIPTION OF THE PRIOR ART AND SUMMARY OF THE INVENTION

The present invention relates to an improved photoprinting apparatus.

In some conventional photoprinting apparatuses, especially in the so-called DPD (diazo-powder-development) machines, the replenishing of consumed developer offers problems. The DPD process is a dry development process in which fine-grained materials containing certain amines are cascaded over the exposed diaxo paper for development thereof, these amines effecting coupling of the unsplit diazo compounds. In the course of the process, small quantities of the amines are constantly extracted from the developer material. This DPD process is described, for example, in German Offenlegungsschrift No. **2,126,160.** By this process, good copies are produced over a relatively long time, i.e. from many square meters of material to be developed, but thereafter, a relatively large quantity of amine must be restored. The present invention generally provides a photoprinting apparatus in which this replenishing may be easily and reliably performed, even in relatively difficult cases, such as the described DPD process.

Various attempts have been made in the reproduction field to solve the problems connected with the refilling or regeneration of developer materials. German Offenlegungsschrift No. **1,522,884** describes a regenerating system in which the regeneration coefficient is determined by measuring the blackness and the surface area of the original with the aid of a single photoelectric cell and using the measured value for controlling the supply of fresh developer solution to be added. This method can not be used in conventional photoprinting apparatuses because the quantity of developer consumed is substantially independent of the degree of blackness of the original. Instead, the developer consumption is substantially determined by the area of the photoprinting paper to be developed.

For regeneration of the developer in continuous photographic developing machines, it has already been proposed, in German Offenlegunsschrift No. **1,597,650,** to control the speed of the motor driving the dosing pump by switching different resistors into the motor circuit, using various switches which are actuated by the material passing through the machine and are dependent on the width of the material. Further, it has been suggested, in the same German Offenlegungsschrift, to record the length of the material passing through the machine and to store the values obtained, and to actuate a timer after a predetermined length of material has passed through the machine, so that regenerating material is introduced for an appropriate length of time. This latter method is only suitable for materials of the same width. If materials having different widths and different lengths are alternately used, there arises again the problem of a satisfactory dosage, and in this case it can not be solved by the possibilities pointed out in the above mentioned German Offenlegungsschrift. In particular, the diaphragm pump used for replenishing the developer is not operated, according to this system, when a specific surface area of material has been developed, but only when a length of material requiring refilling in the case of material of a certain width has been reached. The replenishing system of this German Offenlegungsschrift operates exactly only when developer is replaced for each individual sheet of copying material or for long webs of material of constant width. If, however, copying materials of different lengths and widths are processed one after the other and their surface areas are added up, and replenishing takes place only after a certain value has been reached, the replenishing system described in this German Offenlegungsschrift is unsuitable.

In German Auslegeschrift No. **1,098,362,** a process is described according to which the rate of travel of the material through a photoprinting apparatus using ammonia is determined by the evaporation speed. In this process, materials of different widths can not be taken into account, and there is no means for an exact, discontinuous dosage of developer at relatively long intervals.

Finally, German Auslegeschrift No. **1,814,980** describes a photoprinting apparatus which comprises a system for supplying liquid developer. This supplying system is operated by an R/C module, the resistance of this R/C module being diminished, in accordance with the width of the photoprinting paper, by short-circuiting parts of the total resistance. In this manner, the capacitor voltage necessary for operating the supply system is reached more rapidly in the case of paper of large width than it is for paper of narrower width. This relatively simple device can only be used for the continuous replenishing of developer during operation of the machine. If the developer dosage is to take place at very long intervals, which may even amount to several days, as in the case of the DPD process, this system can not be used.

German Utility Pat. No. **1,865,362** describes a photoprinting machine which is provided with a regenerator dosage system and in which photoprinting papers of different widths are withdrawn from magazines. According to this utility patent, a plurality of microswitches are arranged transversely to the direction of feed, each of these microswitches being connected with a pulse generator transmitting electrical pulses to a counter, which pulses correspond to the length and width of the carrier material. A regenerator dosage system may be provided which is actuated by a defined number of counting pulses indicating the width and length of the photoprinting material. In this apparatus, counting pulses corresponding to the length and the width of the material are thus passed to the counter. With this construction, a regeneration of developer material in accordance with the surface are treated is only possible in the case of definite, preselected sizes of copying materials to be reproduced.

Finally, German Offenlegungsschrift No. **1,772,564** describes a dosing system for use in a developing apparatus operating simultaneously with several webs of paper of different widths. By means of scanners, the papers control the application of a voltage to the appropriate number of poles of a multi-pole revolving switch. This switch is driven at a constant speed and operates dosing motors each time it taps a live contact during its revolution. In this manner, the dosage is proportionate to the width and, at the same time, the machine is capable of processing several webs of paper. Since it may occur, especially in the case of short sections of web, that no developer is added in one of the processing paths, because the revolving switch has not yet reached the corresponding position of its circumference, it is further provided in this German Offenlegungsschrift that the different contacts of the switch relating to the different webs are arranged in staggered positions.

This last-described device is only suitable for the introduction of developer during development. It can not be used in such cases in which the replenishing of developer substance takes place at very long intervals, possibly after several days. Further, this device may not be used in an apparatus in which the speed of travel of the copying material may be varied.

None of these known systems is suitable for modern photoprinting machines in which, on the one hand, certain operating data, such as length, width and speed of travel of the copying material, may be varied, and, on the other hand, exact quantities of developer material, especially of amines in the case of the DPD process, must be added at very long intervals, or after a large number of paper sheets of varying sizes have been processed.

It is the object of the present invention to provide an apparatus which allows an exact replenishing of developer material at relatively long intervals, even when several rolls of copying material of different widths are used in operation and the copying material is severed in lengths corresponding to the individual original and is processed at varying speeds, using, for example, the transparency of the original controlling the speed of travel. The construction of the apparatus is preferably such that no manual adjustment is necessary when one of the parameters described (length, width, or speed of travel) is varied. Further, the apparatus is preferably simple in construction, cheap in its manufacture, and not susceptible to trouble during operation. According to the present invention, a pulse train proportionate to the treated surface area is produced by a pulse generator which produces a number of pulses in proportion to the length of the copying material passing through the apparatus and in which the proportionality factor is adjusted according to the width of the copying material being processed, by means of scanners arranged in the path of travel of the copying material.

Other objects and purposes of the inventon will be clear from the following detailed description of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagrammatic representation showing the arrangement of scanners related to copying materials of different widths.

FIG. 2*a* is a block diagram showing the electric control of the replenishing system according to the invention.

FIG. 2*b* is a modified block diagram.

FIG. 3 is a block diagram showing the conversion of an area-related voltage into an area-related number of pulses.

FIG. 4 is a further modification of the electric circuit of a replenishing system according to the invention.

FIG. 5 is a block diagram showing a further modification of the electric wiring for the replenishing system according to the invention.

FIG. 6 is a block diagram showing an electric wiring for the control of the replenishing system.

FIG. 7 is a diagrammatic representation showing an embodiment in which the pulse train is mechanically generated.

DETAILED DESCRIPTION OF THE DRAWINGS

For the DPD process, in which amine compounds, adsorbed to granulate carrier materials, are cascaded as the developer material over the exposed photoprinting paper, a definite quantity of developer (amine) is added, for example after **300** square meters of paper have been developed, in order to re-establish conditions for optimum development. Modern photoprinting apparatuses contain several rolls of photoprinting paper of different widths in order to be capable of processing originals of all sizes. In FIG. **1**, the insertion of different lengths b_1, b_2, and b_3 of photoprinting paper of different widths is diagrammatically shown. The direction of feed is indicated by the arrow **1** and the guide bar by the line **2.** Switches **S1, S2,** and **S3** are arranged in the path of travel of the photoprinting materials. These conventional switches are so constructed and arranged that the narrowest paper **a1** actuates only switch **S1.** Paper **a2,** which is next in width, actuates switch **S1** and switch **S2,** the wiring of switch **S2** being such that it simultaneously switches off switch **S1.** For this purpose, switch **S2** is equipped with an on-contact and an off-contact, the off-contact being connected in series with switch **S1.** Similarly, switch **S3** is provided with an on-contact and an off-contact, and the off-contact of switch **S3** is likewise connected in series with the on-contact of switch **S2.** In this manner, it is guaranteed that only switch **S1** is effective when paper of the width **a1** is processed, whereas in the case of paper **a2** only switch **S2** and in the case of paper **a3** only switch **S3** is operated. This inter-connection may also be produced by means of electronic logic, e.g. an OR-gate. Any number of switches suitable for a given photocopying machine can be employed.

The first example for the controlled replenishing of, e.g., amines will now be explained with reference to block diagram FIG. 2*a*. A direct current signal is generated in generator **3,** the magnitude of the current being proportional to the speed of the copying material. The direct current signal may be produced, for example, by means of a tacho-alternator or by any other known means. As soon as the leading edge of copying material of the selected size reaches one of the switches **S1, S2,** or **S3,** a switch **S4** is actuated by way of a control unit **4.** This control unit may consist of an OR-gate with three inputs each connected to one of the switches **S1, S2** or **S3,** the output of which triggers a transistor having a relay coil in its collector-emitter-path, which relay coil, in turn, actuates switch **S4.** The OR-gate has only **0** at its output when all its inputs are at **0.** Alternatively, it is possible to use a direct electric control, without mechanical switches. As soon as at least one of the switches S1, S2, and S3 is closed, the control unit **4** sends a brief electrical pulse through line **40,** which serves to reset integrator **5** to zero, which may be effected, for example, by briefly short-circuiting the capacitor (see below) by way of a transistor.

The voltage of generator **3** is integrated in the integrator **5.** The integrator may be, as shown, an operational amplifier having a capacitor circuit in feedback, such as the integrator marketed by Burr-Brown (Burr-Brown Research Corporation, Tucson, Arizona, USA) under the designation **3268.** Upon detection of the trailing edge of the paper, switch S4 reopens and switches S5 and S7 are closed by switch control unit 7. Unit 7 can similarly consist of conventional logic gates, together with a multivibrator so that switches S5 and S7 are closed for a fixed time. The integrated voltage of generator 3 is applied to input x_1 of multiplier 8 via closed switch S5 and a voltage signal is applied to the second input y_1 of multiplier 8 by unit 6, the magnitude of the latter voltage being proportional to the width of the paper. The switches S1, S2 and S3 may each control a different relay in control unit 7 which connect predetermined voltage sources to the switch S7, or alternately the switches may control a transistor, the emitter circuit of which may comprise resistors of different sizes, which, in turn, apply the correct voltage to switch S7. Thus, a voltage is produced at the output of multiplier 8 whose magnitude corresponds to the product of the numeral values of the input voltages (for practical reasons multiplied by a factor of 0.1, e.g.). This output voltage of the multiplier 8 is accordingly in proportion to the surface area of the paper passing through the apparatus. This voltage is passed to an analogue-to-digital convertor 9, such as the unit marketed by Burr-Brown under the designation of ADC-30-12N-USB. At the output of this analogue-to-digital convertor, pulses are produced whose frequency is proportional to the magnitude of the input voltage. These pulses are coupled to a preset subtraction counter 10, such as the counting unit marketed by Messrs. Landis-Gyr (Zug, Switzerland) under the designation RP 214 E. After reaching a certain preset number, the counter 10 triggers a dosing process by means of its switch 11, e.g. the introduction of a certain quantity of amine into the developer trough. If desired, a frequency divider may be arranged between the analogue-to-digital convertor and the counter. To ensure minimum error, subtract counter 10 is perferably connected to switch control 7 by line 70 so as to be operable only while switches S5 and S7 are closed.

Since it is only for a specified, constant time that a voltage is applied by the control unit 7 to the multiplier, through its inputs x_1 and y_1, that time being determined by means of a monostable multi-vibrator, the number of pulses emitted by the analogue-to-digital converter is proportional to the surface area of the paper which passed through the apparatus.

Instead of an off the shelf analogue-to-digital convertor, a convertor circuit 17 as diagrammatically shown in FIG. 3 may be used for converting the output voltage of the multiplier 8 into counting pulses. The control unit 7 actuated by the trailing edge of the paper starts a sawtooth generator 12 and a pulse generator 13. The output voltage of the sawtooth generator 12 is passed to one of the inputs of a comparator 14, and the output voltage of the multiplier 8 is passed to the other input of comparator 14. As soon as the sawtooth voltage, starting from zero, has reached the same value as the output voltage of the multiplier 8, comparator 14 emits a pulse which stops the pulse generator 13, which may be a multivibrator. In this manner, the pulse generator 13 supplies a number of counting pulses which is proportional to the output voltage of the multiplier 8. These counting pulses are passed to a preset counter 10 which actuates the dosing unit 15 for a predetermined period of time after the preset number as set by preset control 10' has been reached, for example by opening a valve in the amine supply line. Thereafter, the counter 10 begins counting again and repeats the above.

Instead of a preset counter, a step-by-step motor may be used, the angular position of which is proportionate to the number of pulses received. If necessary, the step-by-step motor may be preceded by a frequency divider which causes a step to be switched by every two-hundredth pulse only, for example. At a specific angular position, the step-by-step motor may release a pulse, either directly or in combination with a gear, which, in turn, effects the addition of a defined quantity of amine.

The embodiment shown in FIG. 2*b* differs from the one just described mainly by the absence of an integrator 5 and the control unit 4 with its associated switch S4, and by a different control unit 71. When one of the switches S1, S2, or S3 is closed, the switches S5 and S7 are caused to be closed by way of the control unit 71, which may be a relay controll by suitable logic gates. Thus, the voltage of the generator 3, the magnitude of which is in proportion to the speed of travel, is applied to input x_1 of the multiplier 8, and a constant voltage is applied to input y_1 which, by way of unit 6 and depending on which switch is actuated, is proportional to the width of the copying material being processed. Thus, the output voltage of the multiplier 8 is proportional to the area speed (cm^2/sec) of the copying paper. The analogue-to-digital convertor 91 converts this voltage into a pulse train whose frequency is proportional to the input voltage. The number of pulses counted by the counter 10 is thus proportional to the surface area of the copying material being processed. By the line 70 between the control unit 71 and the counter 10, the counter 10 is switched on only during the time in which the copying paper actuates at least one of the switches S1, S2 and S3. Instead of switches S5 and S7, it is also possible for the control unit 71 to operate only one switch arranged in the connecting line between the multiplier 8 and the analogue-to-digital converter 91 (see FIG. 4).

FIG. 4 shows afurther embodiment of the replenishing control according to the invention. In this embodiment, the leading edge of the photoprinting paper actuates switch S4 and thus causes the voltage of the voltage generator 3 — which corresponds to the speed of travel — to be applied to integrator 5. However, the output of integrator 5 is directly connected with the multiplying input of the multiplier 8. Depending on which of the switches S1, S2 and S3 is actuated, one of the voltages U_{b1}, U_{b2}, or U_{b3}, which correspond to the width of the selected copying material, is applied to the other input of the multiplier 8 by way of the control unit 6. Thus, at the output of the multiplier, a voltage U_3 results whose magnitude is proportional to the surface area of the copying paper which passes through the apparatus. By way of the control unit 7 actuated by the trailing edge of the material, this output voltage U_3 is applied for a constant period of time to the circuit 17, as shown in FIG. 3 and described above.

FIG. 5 is a diagrammatic representation of a control circuit in which the multiplier is replaced by an amplifier 81 which amplifies the voltage deriving from the integrator 5 by a factor which, in turn, is determined by the switches S1, S2, and S3 and thus is proportionate to the width of the copying material. The degree of amplification is selected by a component 82 arranged in the amplifier 81, with the aid of switches S1, S2 and S3.

Thus, the voltage at the output of the amplifier **81** is proportional to the treated surface area, and this voltage is converted into counting pulses, upon actuation by the trailing edge of the material and by way of the control unit **7**, by the analogue-to-digital converter described in detail with reference to FIG. **3**. The resulting counting pulses, whose number is proportional to the voltage, are added up. Since the frequency of these pulses is constant, as soon as a predetermined number has been reached, the dosing device is actuated.

A further embodiment is shown in FIG. **6**. By way of the control unit **4**, the leading edge of the photoprinting paper applies to the integrator **5** the voltage produced by pulse generator **3**, which is proportional to the speed (cm/sec) of the photoprinting paper passing through the apparatus. At a substantially constant speed, an approxmiately linear increase of the voltage at the output of the integrator will result. By way of the control unit **6**, and depending on which of the switches **S1, S2** or **S3** is actuated, a voltage corresponding to the width of the material is produced. The output voltage of the generator **5** and the reference voltage U(*b*), which is inversely proportionate to the width, are applied to the two inputs of conventional comparator circuit **18**. As soon as the two voltages applied to the comparator **18** are identical, the comparator **18** produces a pulse by way of its start-stop-switch which resets integrator 5 to zero, i.e. the pulse restarts the sawtooth voltage. At the same time, the comparator **18** passes a counting pulse to the counter **10**. As compared with the voltage increase at the integrator, the voltages U(*b*) are selected such that the comparator **18** releases a pulse immediately after a fraction of the smallest surface area to be treated has passed the apparatus. If the smallest surface area to be treated is of size **DIN A 4**, for example, the pulse is to be related to a surface representing a fraction of the **DIN A 4** formate. If the speed of travel of the photoprinting paper passing through the apparatus is varied, the number of pulses for a certain surface area of paper remains nevertheless constant, because the voltage reaching the integrator is correspondingly higher, so that the comparator **18** releases pulses more frequently within a given unit of time than in the case of a lower speed of travel.

Instead of selecting the reference voltage U(b), it is also possible to vary the increase of the voltage generated by the sawtooth generator **5** by way of the switches **S1, S2** and **S3**. Whereas in the first described case the highest voltage U(b) is applied to the comparator for paper of the narrowest width and the lowest voltage U(b) for paper of the largest width, i.e. the voltages U(b) are inversely proportional to the widths b, the integrator — which in the present case is used as a sawtooth generator — is this time adjusted such that, with one and the same voltage U(b), the sawtooth generated is the steeper the larger the width of the paper, at a constant voltage of the tacho alternator **3**. The part areas may be counted at the beginning or at the end of the sawtooth.

FIG. 7 illustrates a further embodiment of the invention in which the pulse train is mechanically generated. Element **20** is rotated by the photoprinting machine as a direct function of the speed at which paper is being fed through the machine. Element **20** may be coupled to the drive motor or otherwise driven. Three apertured discs **21, 22,** and **23** are mounted on shaft **20** for rotation therewith respectively past sources of light **211, 221,** and **231,** so that holes **210, 220,** and **230** in discs **21, 22,** and **23** periodically transmit light from the light source to associated photoconducting elements **212, 222,** and **232.** Thus, photoconducting elements **212, 222,** and **232** produce pulse trains having a frequency which is directly related to the number of apertures in the associated plate. From FIG. **7***b*, 7*c* and **7***d* it can be seen that the frequency of the pulses produced by photoconductor element **222** will be roughly twice the frequency of the pulses produced by photoconductor element **212.** Similarly, the pulse train produced by element **232** will have a frequency which is twice the frequency of the pulses produced by element **222.**

These three pulse trains are each applied to respective gates U_1, U_2 and U_3. Switches S_1, S_2 and S_3 are also connected to these gates so that one and only one of the pulse trains is applied to subtraction counter **10** by the control circuit **24.** Thus, a pulse train which varies as a function of the width of the paper and its speed is produced and applied to the subtraction counter which then accumulates a count during a time period which is a function of the length of the paper.

During operation, pulse trains are applied to the three inputs of control unit **24** and the frequency of these pulse trains is proportional to the speed of travel of the photoprinting paper. The switches S_1, S_2 and S_3 take care that in each case only one of the three pulse trains reaches counter **10** which, as described above, actuates the dosing of a certain quantity of amine when a predetermined value is reached. For this purpose, the three switches S_1, S_2 and S_3 are connected with three AND-gates U_1, U_2, and U_3 having four inputs each, in a manner such that the first AND-gate U_1 allows passage of the pulses of the phototransistor **212** only when S_1 is on L and S_2 and S_3 lie on **0**; that the second AND-gate U_2 allows passage of the pulses of phototransistor **222** only when the switches S_1 and S_2 are on L and switch S_3 lies on **0**; and that the third AND-gate U_3 allows passage of the pulses of phototransistor **232** only when all the switches S_1, S_2, and S_3 lie on **0.** This logical circuit may be produced by two negation members, as shown in FIG. **7.** Be means of a triple OR-gate **0123,** the three outputs of the AND-gates are combined and the output of the OR-gate is connected to the counter **10.** This wiring scheme, which is described by way of example, is meant for the case described in FIG. **1,** wherein photoprinting paper is fed from three different rolls along a common guide bar **2** and wherein paper of the width a_1 closes only switch S_1, paper of the width a_2 closes switches S_1 and S_2, and paper of the width a_3 closes all the switches S_1, S_2, and S_3, i.e. sets them from 0 to L. For other paper feeding systems, other wiring schemes according to the present invention may be used.

What is claimed is:

1. Photoprinting apparatus comprising

an exposure station,

means for selectively feeding one of at least two photoprinting papers of different widths to said exposure station,

a developing station for developing the exposed photoprinting paper,

means for scanning the photoprinting paper to produce a first electrical signal upon detection of the leading edge and a second electrical signal upon detection of the trailing edge of the photoprinting paper, switching means for detecting the width of the respective photoprinting paper selected and producing an electrical signal indicating that width, and

means for replenishing developer material in proportion to the surface area of the paper treated, including an electric pulse generator connected to said scanning means for receiving said first and second signals and producing a number of electric pulses that number being a function of the length of the photoprinting paper, a control circuit connected to said switching elements and to said pulse generator for adjusting the proportionality between the length of the severed photoprinting paper and the number of pulses to a value which is proportional to the width, as a function of the signals produced by said switching elements and counter means for counting the pulses produced by said pulse generator and, as soon as a predetermined value is reached, actuating said developer replenishing system to add a defined quantity of developer and reset said counter means.

2. Photoprinting apparatus according to claim 1, wherein said pulse generator includes means for generating a voltage proportional to the speed of the photoprinting paper and wherein said control circuit includes a voltage source whose voltage is proportional to the width of the respective photoprinting material and which is switched on by the respective switching elements; means for applying the output of said generating means and said voltage source to the inputs of an electronic multiplier which produces an output voltage whose amplitude is proportional to the product of the numerical values of the input voltages; means for connecting the output of said multiplier to the input of an analogue-to-digital converter which generates, as its output, a number of pulses which is proportional to the input voltage, and means for connecting the output of said analogue-to-digital converter to the input of said counter.

3. Photoprinting apparatus according to claim 2, wherein said switching means includes, connected between said generating means and one of the inputs of said multiplier: a first control switch switched on by the leading edge and off by the trailing edge of said paper and wherein said control circuit includes an integrator and a second control switch means switched on for a constant period of time by the trailing edge of said paper, means connected between said voltage source and the other input of said multiplier, switched on by the trailing edge of the copying material for the same period of time for producing voltage proportional to the width of the material and applying that voltage to second input of said multiplier; an analogue-to-digital converter connected to said multiplier for producing a pulse train whose frequency is proportional to its input voltage; and means connecting output of said analogue-to-digital converter to said counter means.

4. Photoprinting apparatus according to claim 2, wherein the signal at the output of said generating means is connected to one of the inputs of said multiplier by way of a first control switch which is switched on by the leading edge of the copying material and switched off by its trailing edge; that voltage of the control circuit is connected by way of a control switch wired in the same way as control switch with the other input of the multiplier, the output voltage of said multiplier being proportional to the product of the numerical values of the input voltages; and the output of the multiplier is connected with the input of said pulse generator.

5. Photoprinting apparatus according to claim 2, wherein said control circuit includes a single control switch arranged between the output of said pulse generator and the input of said counter, said control switch being switched on by the leading edge of the copying material and switched off by its trailing edge.

6. Photoprinting apparatus according to claim 1, wherein the pulse generator comprises a generator which generates a voltage which is proportional to the speed of the photoprinting paper; a first control switch actuated by the leading edge of the copying material for applying the speed-related signal of the generator to an electrical integrator unit which thus yields at its output a voltage which is proportional to the time integral of the time slope of the voltage at the input; a voltage generator whose voltage is inversely proportional to the width of the copying material being processed and which is switched on by a switching element relating to the respective width; means for connecting the output voltage of the integrator and the adjusted voltage at the output of the control circuit to the inputs of a comparator which releases a pulse at its output when the two voltages are identical; and means for connecting the output of the comparator with the input of said counter, and, at the same time, with the reset input of the integrator unit in a manner such that the pulse released by the comparator resets the integrator.

7. Photoprinting apparatus according to claim 1, wherein said pulse generator includes a speed-related generator connected, by way of a switch which is actuated, by the leading edge of the copying material with the input of an integrator; the output signal of the integrator being connected to one of the inputs of a multiplier whose other inputs are connected, by way of a control unit with a width-related voltage; the signal at the output of the multiplier being operated by a further control circuit responsive to one of the inputs of a comparator whose second input is connected with the output of a sawtooth; said further control circuit being actuated by the trailing edge of the paper to start a pulse generator which passes pulses of a constant frequency to said counter means; and that, when the input voltages are identical, the comparator releases a pulse which stops the pulse generator.

8. Photoprinting apparatus according to claim 1, wherein a speed-related generator is connected, by way of a switch actuated through control circuit by the leading edge of the material, with an integrator the output of which is connected with the input of an amplifier; the amplifying ratio of the amplifier is adjusted in proportion to the width of the material by a control circuit actuated by the leading edge of the paper; the output voltage of the amplifier which is proportional to the surface area of the material is converted by means of an analogue-to-digital converter into a number of pulses which is proportional to the input voltage, and that these pulses are connected to the counter means.

9. Photoprinting apparatus according to claim 1, wherein the drive of the feeding system for the copying material is provided with elements which revolve with it and which produce, with each revolution, a number of electrical pulses in the connections associated with them the ratios between the numbers of pulses being the same as the ratios between the different widths of copying material; switches actuated by the leading edge of the copying material connect the one of the connections which relates to the copying material of the selected width, to the input of a pulse counter; and the counter actuates the replenishing system as soon as a predetermined number has been reached.

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