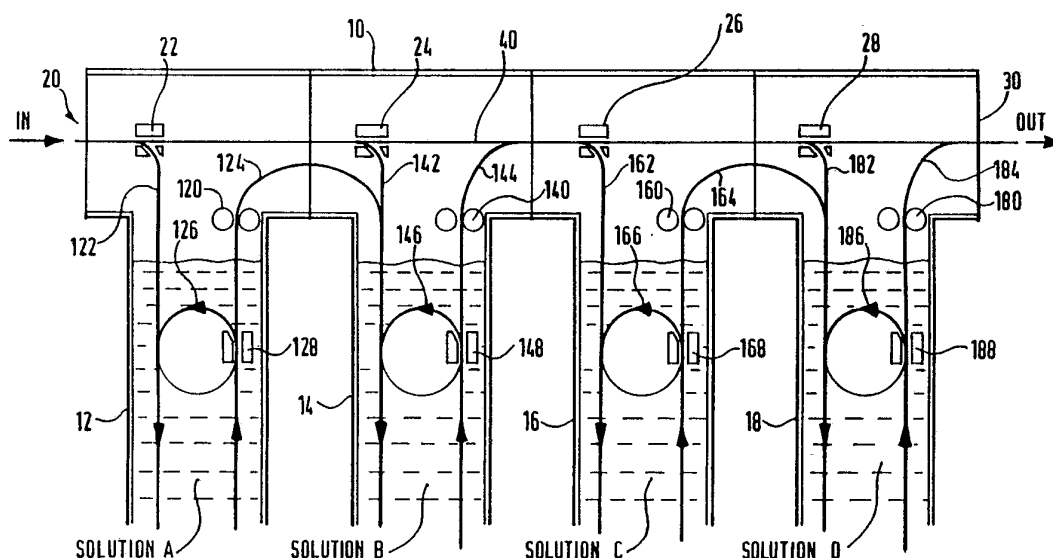




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(21) International Application Number: PCT/EP93/00102 (22) International Filing Date: 18 January 1993 (18.01.93) (30) Priority data: 9201277.2 21 January 1992 (21.01.92) GB (71) Applicant (for GB only): KODAK LIMITED [GB/GB]; Patent Department, Headstone Drive, Harrow, Middlesex HA1 4TY (GB). (71) Applicant (for all designated States except GB US): EASTMAN KODAK COMPANY [US/US]; Patent Department, 343 State Street, Rochester, NY 14650-2201 (US). (72) Inventors; and (75) Inventors/Applicants (for US only) : PUMMELL, Leslie, James, Horace [GB/GB]; 44 Highfield Way, Rickmansworth, Herts WD3 2PR (GB). WARD, Paul, Courtenay [GB/GB]; 18 Meadowbank, Oxhey Watford, Herts WD1 4NP (GB). KINGDON, Stephen, John [GB/GB]; 11 Oster Street, St Albans, Herts AL3 5JN (GB). OLDFIELD, James, Andrew [GB/GB]; 71 Weavers Way, Camden, London NW1 0XG (GB).		(74) Agent: PHILLIPS, M., D.; Kodak Limited, Patent Department, Headstone Drive, Harrow, Middlesex HA1 4TY (GB). (81) Designated States: CA, JP, KR, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>

(54) Title: PHOTOGRAPHIC PROCESSING APPARATUS**(57) Abstract**

In known photographic processing apparatus, strips of material are transported through a series of predetermined treatment stages to achieve the desired processing of the material. However, conventional apparatus tends to be "dedicated", that is, only capable of dealing with one particular processing technique, for example, black-and-white or colour processing only. Described herein is an arrangement in which the material being treated can be directed from one treatment tank (12, 14, 16, 18) to another at will thereby giving greater flexibility to processing different types of materials.

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PHOTOGRAPHIC PROCESSING APPARATUS

The present invention relates to photographic processing apparatus and is more particularly concerned with apparatus which is capable of carrying out more than one process by switching the material being processed between different treatment stages of the apparatus.

In known photographic processing apparatus, strips of film are transported through a series of predetermined treatment stages to achieve the desired processing of the film. However, conventional apparatus tends to be "dedicated", that is, only capable of dealing with one particular processing technique, for example, black-and-white or colour processing only.

US-A-3 331 276 discloses copying apparatus in which different processing paths are followed by the medium being processed. The described apparatus is used to form a positive copy of a document by following the steps of:-

- 1) forming a latent negative image of the document on one side of a double-sided photosensitive medium,
- 2) developing the negative image,
- 3) deactivating the photoconductor on the other side of the medium, and
- 4) exposing that side to radiation passing through the developed negative image so as to form a positive latent image of the original document.

The apparatus allows the medium to pass along one path twice, that is, during the development of the latent negative image on one side of the medium and then also during the subsequent development of the latent positive image on the other side of the medium. The medium is then switched to a second path where the

developed positive image is fixed and the negative image is bleached before the medium, with the copy of the document formed thereon, emerges from the apparatus.

5 In the apparatus described in US-A-3 331 276, the medium always passes through the first processing path (development) and then the second processing path (fix and bleach). The medium must pass through the first and second paths in that order for the apparatus
10 to work, that is, to produce a copy of the original document.

US-A-3 785 269 discloses automatic film processing apparatus which includes a movable guide element which allows the material being processed to be
15 directed along a transport path which provides the processing stages for that particular material. The material is given a coloured leader tape which is recognized by a colour-sensitive control system, the control system operating the movable guide in response
20 to the detected colour of the leader tape to direct the material to the appropriate processing stages.

However, in this arrangement, once the path has been selected, in accordance with the colour of the leader tape, it cannot be altered during the processing
25 sequence.

It is therefore an object of the present invention to provide photographic processing apparatus which is totally flexible and allows the material being processed to be switched from one path to another at
30 will.

According to one aspect of the present invention, there is provided photographic processing apparatus for processing more than one type of photographic material, the apparatus comprising:-

35 a housing having an inlet and an outlet;

a plurality of treatment stations arranged within the housing between the inlet and the outlet, each treatment station having a path along which the material passes during treatment;

5 a connecting path extending between the inlet and the outlet and connecting at least one of the treatment stations to at least one of the others;

directing means arranged in the connecting path for directing the material into the treatment
10 stations and also for directing material along the connecting path itself; and

control means for controlling the movement of material through the apparatus;

characterized in that the control means
15 includes actuation means for operating the directing means in accordance with the type of material being treated.

Apparatus constructed in accordance with the present invention has the ability to direct film either
20 into a treatment tank or to skip one or more tanks. This allows photographic processes to be mixed within the same apparatus. For example, the apparatus may comprise a first treatment tank containing black-and-white developer, a second treatment tank containing
25 colour negative developer, a third treatment tank containing bleach, and a fourth treatment tank containing fixer. In this arrangement, films are fed into the tank containing the appropriate developer, that is, black-and-white into the first tank and colour
30 into the second tank. However, due to the different processes involved, the colour film needs to pass through the third tank for bleaching prior to being fixed in the fourth, whereas the black-and-white film can pass directly from the first tank to the fourth
35 tank for fixing.

Naturally, other processing tanks, for example stop baths and wash tanks may also be present in apparatus constructed in accordance with the present invention.

5 For a better understanding of the present invention, reference will now be made, by way of example only, to the accompanying drawing, the single figure of which illustrates a schematic cross-section of a part of the apparatus according to the present
10 invention.

 Apparatus according to the present invention comprises a housing 10 in which four processing tanks 12, 14, 16, 18, each containing a different solution A, B, C and D, are arranged. The housing 10 has an inlet
15 20 and an outlet 30 which are arranged above the treatment tanks 12, 14, 16, 18. Naturally, there may be more than four treatment tanks, but only four are shown here for clarity.

 Each treatment tank 12, 14, 16, 18 is in the
20 form of a rack having an inlet path 122, 142, 162, 182, an outlet path 124, 144, 164, 184, and a treatment path 126, 146, 166, 186 formed therein. When a film strip is to be treated in one of the tanks, it enters the appropriate tank 12, 14, 16, 18 along its respective
25 inlet path 122, 142, 162, 182 and is cycled around the treatment path 126, 146, 166, 186 for a given amount of time until it is fully treated in that tank 12, 14, 16, 18 and then exits from the tank along the outlet path 124, 144, 164, 184.

30 A connecting path 40 is provided between the inlet 20 and the outlet 30 of the housing 10 above the level of the treatment tanks 12, 14, 16, 18 and defines the reference path through the apparatus. A plurality of switches 22, 24, 26, 28 is arranged in the
35 connecting path 40 above the inlet path 122, 142, 162,

182 to each treatment tank 12, 14, 16, 18. These switches 22, 24, 26, 28 are controlled by control means (not shown) and are operated to direct the film into the appropriate treatment tank 12, 14, 16, 18.

5 Each treatment tank 12, 14, 16, 18 has a further switch 128, 148, 168, 188 also controlled by the control means. These switches 128, 148, 168, 188 switch the film out of the treatment path 126, 146, 166, 186 once the treatment has been completed. Each
10 switch 128, 148, 168, 188 may either switch the film into the next adjacent treatment tank or may switch the film up to the connecting path 40. In the embodiment described, switches 128 and 168 switch the film into the adjacent tank 14 and 18 respectively from tanks 12
15 and 16. This direct switching into an adjacent tank is needed where a stop bath is employed to curtail treatment, for example after a developer bath. Switches 148 and 188 switch the film up to the connecting path 40.

20 Squeegee rollers 120, 140, 160, 180 may also be provided to remove excess solution from the surface of the film as it leaves the treatment tank 12, 14, 16, 18.

 The first treatment tank 12 contains solution
25 A, which would be a developer solution. After the appropriate treatment time, the film is switched out of the treatment path 126 by switch 128 and emerges from the tank 12 at a lower level than the connecting path 40, and passes directly into the next tank 14, a stop
30 bath containing solution B. After a suitable time in the stop bath, the film is switched out of the tank 14 and re-joins the connecting path 40 at the higher level as shown. A similar arrangement is shown in respect of tanks 16 and 18.

In the described embodiment, treatment tanks 12, 16 may both be development tanks, one for black-and-white processing and one for colour negative processing. In this case, there would be not switching from treatment tank 14 (stop bath) into treatment tank 16 as different developers are used for the two processes. Instead the material being processed would enter either one of treatment tanks 12, 16 according to whether the material requires black-and-white or colour processing, and then pass on to at least one further treatment tank (not shown) via the connecting path 40. For example, for black-and-white processing, treatment tank 12 may be employed and then the material is switched into its associated stop bath, treatment tank 14, prior to re-joining the connecting path 40 for transport to the next appropriate treatment tank, namely, a fixing bath (not shown).

As the film enters the apparatus at the inlet 20, it is diverted by switch 22, either down into the first treatment tank 12 or ahead to the tank 16 or to a further treatment tank (not shown) as desired.

To prevent contamination of the cross-over between tanks, it is proposed that a separate path be designated for film to follow when exiting the developer tanks, for example into a stop bath prior to re-joining common transport paths. This eliminates contamination of film with traces of developer left on the common path.

It is to be noted that switches 128, 148, 168, 188 in treatment tanks 12, 14, 16, 18 are under software control as they need to be controlled so that the material being processed is processed for the correct time. However, switches 22, 24, 26, 28 in the connecting path 40, may be manually or software

controlled. This allows for flexibility in the processes which can be accommodated.

The apparatus of the present invention can be applied to any situation where various processes follow each other for one class of material but are all missed by all other materials.

One particular situation where the present invention would be of particular use is where it is desired to reduce the labour-intensive task of having to drain and replace processing chemicals according to the material to be processed. This can be achieved by having a single processor in which a plurality of treatment tanks are arranged, each tank containing a particular processing solution. Naturally, more than one tank may contain the same solution - this is arranged according to the most complex processing sequence.

For example, if it is desired to process black-and-white negative film, colour negative film, and colour reversal film in the same processor, the processor could be arranged to have treatment tanks in the following order:-

- 1) black-and-white developer;
- 2) stop bath;
- 25 3) colour negative developer;
- 4) stop bath;
- 5) bleach; and
- 6) fix.

In the case of colour reversal film, which is the most complex of the three processes under consideration, the film is processed in the following steps: 1), 2), (reversal exposure - possibly arranged in the connecting path between the treatment tanks), 3), 4), 5) and 6).

For colour negative film, the steps 3), 4), 5) and 6) would be required. Black-and-white film would then use steps 1), 2) and 6). Naturally, other processing steps may also be present, for example, appropriate washing and drying stages.

The arrangement described above is not limited to use with film processing by can be applied to the processing of photographic paper.

CLAIMS:

1. Photographic processing apparatus for processing more than one type of photographic material, the apparatus comprising:-

5 a housing (10) having an inlet (20) and an outlet (30);

a plurality of treatment stations (12, 14, 16, 18) arranged within the housing (10) between the inlet (20) and the outlet (30), each treatment station
10 (12, 14, 16, 18) having a path (126, 146, 166, 186) along which the material passes during treatment;

a connecting path (40) extending between the inlet (20) and the outlet (30) and connecting at least one of the treatment stations (12, 14, 16, 18) to at
15 least one of the others;

directing means (22, 24, 26, 28) arranged in the connecting path (40) for directing the material into the treatment stations (12, 14, 16, 18) and also for directing material along the connecting path (40)
20 itself; and

control means for controlling the movement of material through the apparatus;

characterized in that the control means includes actuation means for operating the directing
25 means (22, 24, 26, 28) in accordance with the type of material being treated.

2. Apparatus according to claim 1, wherein the treatment stations (12, 14, 16, 18) are serially arranged within the housing.

30 3. Apparatus according to claim 1 or 2, wherein each treatment station (12, 14, 16, 18) includes switch means for switching the material out of the station (12, 14, 16, 18) and either on to the connecting path (40) or directly to another station
35 (12, 14, 16, 18).

4. Apparatus according to any one of claims 1 to 3, wherein the actuation means includes software control for at least some of the directing means (22, 24, 26, 28).

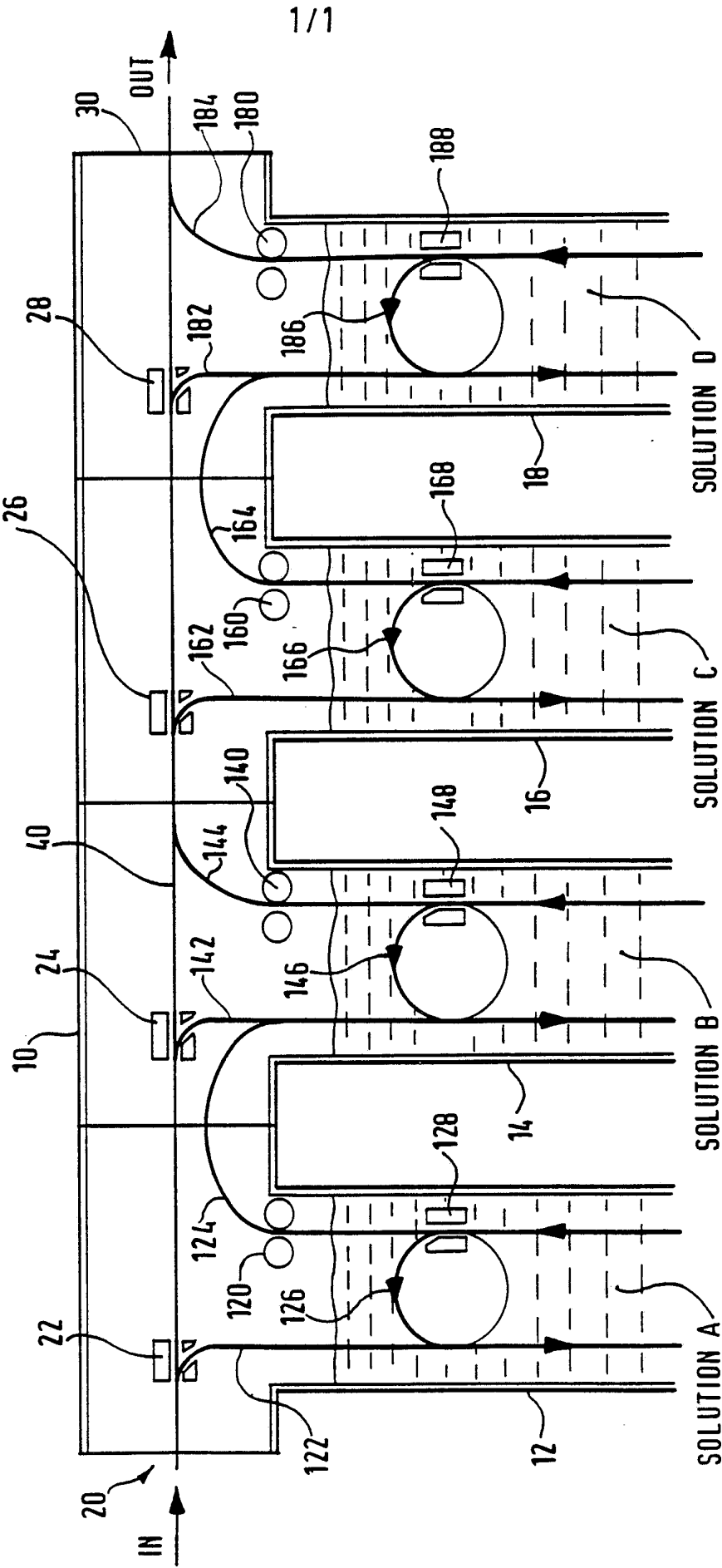


FIG.1.

INTERNATIONAL SEARCH REPORT

PCT/EP 93/00102

International Application No

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)⁶

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 G03D3/13

II. FIELDS SEARCHEDMinimum Documentation Searched⁷

Classification System	Classification Symbols
Int.Cl. 5	G03D

Documentation Searched other than Minimum Documentation
to the Extent that such Documents are Included in the Fields Searched⁸**III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹**

Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X	DE,A,3 942 394 (AGFA-GEVAERT AG) 27 June 1991 see the whole document	1,2
Y	---	4
Y	EP,A,0 257 790 (KONISHIROKU PHOTO INDUSTRY CO. LTD.) 2 March 1988 see abstract; figures	4
X	DE,A,4 019 740 (AUTOPAN HEIMERDINGER & STÄBLER GMBH & CO) 2 January 1992 see the whole document -----	1,2

¹⁰ Special categories of cited documents:

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IV. CERTIFICATION

Date of the Actual Completion of the International Search 28 APRIL 1993	Date of Mailing of this International Search Report 1 0. 05. 93
International Searching Authority EUROPEAN PATENT OFFICE	Signature of Authorized Officer HERYET C.D.

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.

EP 9300102
SA 69303

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
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28/04/93

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-A-3942394	27-06-91	WO-A- 9110169	11-07-91
EP-A-0257790	02-03-88	JP-A- 63153532 US-A- 4872033	25-06-88 03-10-89
DE-A-4019740	02-01-92	None	