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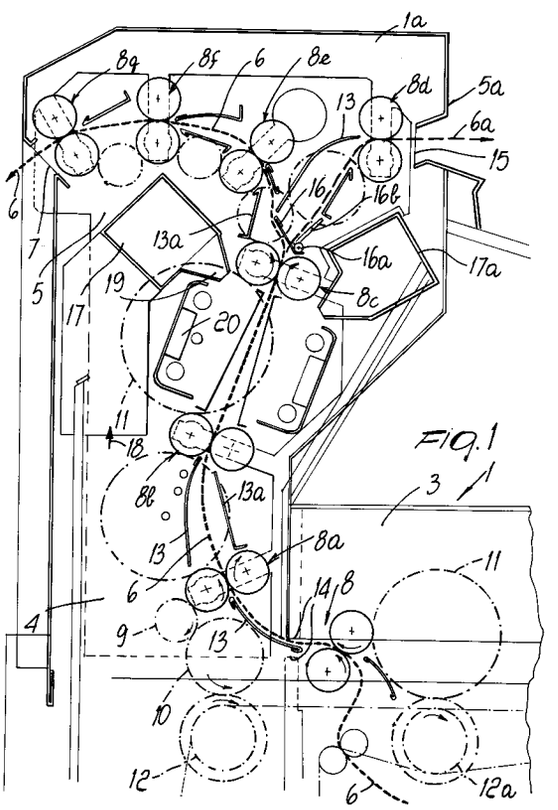
(54) Drying unit for automatic machines for developing photographic films and the like.

(57) The drying unit has a closed containment body (1) provided with motorized rollers (8) for receiving film (6) and/or sheet films (6a) which are caused to advance by rollers (8) of a washing tank (3). In an upward position, the containment body (1) has further pairs of motorized rollers (8a-8g) which define two separate paths for both the continuous film (6) and the sheet films (6a). One path (8e,8f,8g) is directed towards a conventional rear outlet (7), and the other path (8d,13-13a) is directed toward an outlet (15) which is arranged at the front of the machine. A path redirection device (16) is positioned in the branching region of the two paths (8e-8g,8d,13-13a) and has a lamina (16) which is oscillatable, from a position which is aligned with one of the paths (8e,8f,8g) to the position which is aligned with the other path (8d,13-13a). The redirection device (16) thus allows the simultaneous exit of continuous film (6) and sheet films (6a) through the rear opening (7) or also the simultaneous exit of the film (6) through the rear outlet (7) and of the sheet films (6a) through the front outlet (15).



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The present invention relates to a drying unit for automatic machines for developing photographic films, radiographic films and the like, which is provided with means for allowing, after developing rolls, reels of exposed sheet film, the exit of the formats of "negatives" simultaneously through separate outlets.

The known types of automatic machines for continuous developing of photographic films, radiographic films and the like, are capable of performing a series of operations for developing, fixing, washing and drying the exposed films on which the so-called "latent image" has been formed by exposure by means of photographic cameras. The known machines are substantially constituted by three separate tanks which are arranged in a line and respectively contain a developing solution, an aqueous solution of hyposulfite or the like, which fixes the emulsion deposited on the film, and a solution for washing the developed film, which in these conditions is termed "negative".

Downstream of these tanks there is a hot-air heating unit which dries the film before it exits from the machine, where it is rewound into a reel, ready for the step of printing on paper, plates or the like support to obtain the positive image.

The exposed film, i.e. the film which contains the latent image, is moved inside the tanks and the drying unit by means of pairs of motorized rollers with parallel axes which are mutually in contact along their generatrix, so as to make the film advance at preset speeds. The film is inserted in the first tank, the developing tank, through a horizontal slot and, by virtue of the traction exerted by the series of mutually touching rollers, the film advances and then exits through a slit-shaped opening located on the drying unit, i.e. to the rear of the entry opening in the developing machine.

In current machines, the traction rollers have such a length as to allow the simultaneous traction of two films side by side, or also of a continuous film and of exposed sheet films, which are fed in succession one after the other.

These developing machines must obviously operate in a darkroom, i.e. in rooms with a safelight or infrared light, to avoid damaging the film prior to developing, and in practice require long times, even approximately 1 hour, to allow the developing of rolls of films which normally have a length of 75/80 meters, as in the case of films used by industries, publishing or advertising companies and the like.

Known developing machines normally have a single outlet for continuous films and for cut sheets of film (commonly known as large format sheet film) of various sizes, arranged at the rear of the machine itself, so that in the case of the developing of exposed sheet films, which require a rapid checking of the developing quality prior to printing, the operator assigned to the feeding of the cut sheets and to the general control of the developing operations must move from his normal position in front of the machine to the rear position of said machine to remove the developed and dried sheet films; this entails wasted time and productivity as well as awkwardness. In order to obviate this disadvantage, provisions have already been made to make the finished sheet films exit toward the operator located in front of the machine, but the systems used entail onerous changes in the path of the sheet films which can be achieved, with an expenditure of time, only by highly specialized personnel; these changes must then be eliminated in order to return the machine to its original conditions.

In practice, it has furthermore been observed that the types of drying units for automatic developing machines are not always capable of uniformly heating the air in order to correctly dry the film or sheet film prior to its exit.

Therefore, the aim of the present invention is to provide a hot-air drying unit for machines for developing photographic films, radiographic films and the like simultaneously with sheet films of reduced sizes, structured so as to allow, by means of a device for redirecting the path of the continuous film strip and of the separate sheet films, the simultaneous exit of the rolls of film and of the sheet films through the conventional rear outlet of the machine, and optionally, simultaneous exit of the continuous film through the rear exit and of the sheet films through an opposite outlet, i.e. an outlet at the front of the machine and therefore in a position which is convenient for the operator.

An object of the invention is to provide a redirection device for said drying unit which has a very simple structure, is easy to operate and is safely reliable.

A further object of the invention is to provide a drying unit which is provided with such heating means as to produce a heating of the air which is uniformly distributed within said unit and is most of all directed on both of the opposite faces of the reels of film and/or sheet film arriving from the washing tank, which is arranged upstream of the drying unit.

This aim, these objects and others which will become apparent from the following description are achieved by a drying unit of the type constituted by a heated container, arranged downstream of the washing tank of a machine for the continuous developing of exposed sheet films and/or films, wherein the film and/or sheet films are caused to advance, in a guided manner, by pairs of motorized rollers which are mutually in contact, said unit

being constituted, according to the present invention, by a closed containment body which is provided, in a downward position, with at least one pair of parallel motorized rollers for receiving the film and/or sheet films which are caused to advance by the rollers in the washing tank and, in an upward position, with further pairs of motorized rollers which define, for both the film and the sheet films, two separate paths, one path being directed toward the slit-shaped opening which constitutes the conventional rear outlet of the machine, the other path being directed toward an outlet which is arranged at the front of said machine, a path redirection device being positioned in the branching region of said two paths, said redirection device being constituted by at least one lamina which is oscillatable, by means of a control which is external to the machine, from a position which is aligned with one of said paths to a position which is aligned with the other path, said redirection device thus allowing the simultaneous exit of the film and of the sheet films through said rear opening or also the simultaneous exit of the continuous film through the rear outlet and the exit of the sheet films through the front outlet.

More particularly, said device for redirecting the path of the continuous film and of the sheet films is substantially constituted by a lamina which is pivoted, so as to be oscillatable, to the opposite sides of the heating unit, parallel to the axis of the rollers, and is at least as long as approximately half of the length of the advancement rollers, so as to redirect the sheet films toward the front outlet without affecting the normal path of the film toward the rear outlet; the actuation of the angular movements of said oscillating lamina is furthermore performed by a magnetic, mechanical or similar device which can be actuated manually.

The drying unit is furthermore provided with a pair of impeller aspirators; an infrared-ray heating source or the like is associated with each of said aspirators, and the two impellers and the related heat sources are arranged opposite with respect to the film which advances toward the outlets.

Further characteristics and advantages of the present invention will become apparent from the following detailed description of a preferred but not exclusive embodiment thereof, given with reference to the accompanying drawings, provided only by way of non-limitative example, wherein:

figure 1 is a side view of a drying unit with two opposite outlets, according to the invention, shown without a side wall for a better understanding of its internal structure; and

figure 2 is also a side view of the internal structure of the fixing and washing tanks of a known developing machine, between which a device for redirecting the path of the developed and exclusively fixed sheet films, according to the invention, is arranged.

With reference to the above figures, the drying unit with two opposite outlets according to the invention can be used on known machines for the automatic developing of exposed sheet films and films which are in widespread use.

These machines, as is known and as at least partially illustrated in figure 2, are constituted by a parallelepipedal containment body 1 which is internally divided into three substantially identical tanks which are mutually interconnected in an upward position, as schematically illustrated in said figure 2. The first tank (not illustrated) contains a developing solution, the tank 2 contains a fixing solution, the tank 3 constitutes a washing environment, and a box-like body with two sections 4 and 5 comprises means for drying the film and/or developed sheet films.

The continuous film 6 to be developed is initially introduced in the developing tank through a slit (not shown) provided in the front part of the container 1 and is then guided on a series of motorized rollers which have parallel axes and are mutually in contact; the function of said rollers is to advance the film (and/or the separate sheet films) through the tanks until they exit from a slit 7 (figure 1) defined to the rear of the machine in the side wall of the drying unit 5.

More precisely, the rotation axis of each pair of traction rollers 8 in the tanks 2, 3 and 4, protrudes horizontally from at least one of the opposite shoulders or side walls 1a which define the treatment tanks; conventional gears (not illustrated in the figures) are applied to the axes of the mutually touching rollers, mesh with one another and are actuated by gears 9 which in turn mesh with gears 10 and 11 etc. in order to allow the rollers of each pair to rotate in mutually opposite directions. In this manner the advancement of the film 6 is orientated in the same direction and at constant speed.

The transmission gears 9-10-11 are actuated by further gears 12-12a etc. (figure 1) which are driven by a conventional gearmotor or the like which is not shown.

The film 6 is then guided in its free path between a pair of rollers and the subsequent pair by guiding laminas 13-13a which are straight or curved according to the relative position of the various pairs of rollers; the length of the metallic laminas 13-13a etc. is preferably equal to that of the traction rollers.

According to the present invention, the drying unit 5 is constituted (figure 1) by a closed box-like body which extends vertically and is frontally anchored to the washing tank 3, to which it is connected exclusively through an opening 14.

A pair of parallel rollers 8a is arranged in the

lower part 4 of the drying unit 5, is driven by an actuation gear 9 and is identical to the pairs of rollers 8 of the preceding tanks. Above the pair of rollers 8a there is a second pair of rollers 8b, and the guiding laminas 13-13a are arranged between the pairs 8a and 8b; a further pair of rollers 8c is furthermore provided above the preceding pair 8b.

The film 6 which leaves the pair of rollers 8c can follow two separate paths, one of which is defined by two guiding laminas 13-13a and by a pair of rollers 8d which is arranged proximate to an outlet 15 defined in the front wall 5a of the drying unit, i.e. in a position at the front of the machine and thus directed toward the operator. The other path for said film 6 and/or for the separate sheet films is instead constituted by three successive pairs of rollers 8e-8f-8g (or also by only two pairs) which are arranged so as to advance the film toward the outlet 7 which is located at the rear of said machine.

In order to direct the continuous film (and/or the separate sheet films) fed by the pair of rollers 8c toward one or the other of the outlets 7 or 15 (figure 1), according to the present invention there is a path redirection device which is arranged directly downstream of said pair of rollers 8c.

Said device is substantially constituted by a metallic lamina 16 which is substantially as long as the rollers and oscillates about a pivoting axis 16a which is parallel to the axis of said rollers 8c.

By orientating the redirection lamina 16 toward the left (with reference to figure 1), the film which leaves the rollers 8c is forced to be guided between the rollers 8e, since said lamina 16 redirects it toward said rollers; if instead the lamina 16 is orientated in the position illustrated in broken lines in figure 1, wherein it is indicated by 16b, the film is redirected by the curved lamina 13 toward the pair of rollers 8d and thus toward the front outlet 15. The reference numeral 6a indicates the film (or sheet films) exiting from the opening 15 in figure 1.

Still according to the invention, the redirection lamina 16 can be provided in two co-planar parts which can rotate independently about the common axis 16; in this manner, by redirecting the first part of the lamina 16 toward the rear outlet 7 and the second part of the lamina 16 toward the front outlet 15, it is possible to make the film exit at the rear, as in known machines, and to make the sheet films exit through the front outlet.

Therefore, in practice said redirection device allows to make both a continuous film and the sheet films exit simultaneously from the rear opening 7 or -- if required --to redirect the sheet films toward the front opening 15 while leaving the continuous film free to exit at the rear of the machine.

If a drum for collecting the developed film is provided at the front of the machine, it is possible to make both the film and the sheet films exit through the front opening 15 simultaneously.

In order to control the redirections of the oscillating lamina 16, according to the invention there is a magnetic-attraction device or the like which can be actuated from outside the machine; said device is not illustrated in the figures, since it can be provided in many manners according to the operating requirements.

The drying unit according to the invention furthermore has two prism-shaped box-like bodies 17-17a (figure 1) which are arranged on opposite sides of the film 6; a fan is mounted inside said bodies and aspirates air from the outside through an opening 18 and respectively 18a and blows it through the outlets 19-19a proximate to two heating devices 20-20a of the infrared-ray type or the like. In this manner, a uniform distribution of hot air is obtained on both faces of the film which passes between the two hot air generation systems.

Finally, the present invention furthermore provides a redirection device which is interposed between the fixing tank 2 and the washing tank 3 (figure 2) and is suitable for allowing the freshly developed and fixed sheet films to exit at the front of the machine, so as to allow the operator to promptly check the correct developing, without waiting for said sheet films to complete the entire path and without distracting the operator from his normal activity inside the darkroom.

Said redirection device is constituted by a curved lamina 21 (figure 2) which is approximately half as long as the rollers 8, can move vertically in both directions along lateral guides defined in the container above the tanks 2 and 3, and is arranged astride said tanks; said curved lamina 21 has a stem or grip elements 22 for connection to a mechanism for vertical translatory motion, not illustrated, which can be mechanical or of the magnetic-attraction type. The stem 22 is directed toward a front outlet 15a.

The curved lamina 21 acts as redirection and guiding device for the separate sheet films; in fact, when it is in raised position, as illustrated in solid lines in figure 2, it allows the sheet films and the film itself, which arrive from the upper rollers 8 of the fixing tank 2, to be guided between the first pair of rollers 8 of the washing tank; instead, when said lamina 21 is lowered until it skims the lower roller of the pair of rollers 8 of the tank 2, as illustrated in broken lines, the sheet films which exit from the rollers 8 of the fixing tank 2 are redirected onto the curved stem 22 and are guided to the front outlet 15a, thus allowing to rapidly check the developed sheet films.

In practice it has been observed that the particular structure of the drying unit as described above and the presence of the path redirection

devices allow to achieve the intended aim and objects, i.e. high usefulness and practicality in use.

Finally, it is evident that all the solutions which use the idea of solution which is the basis of the invention are also within the scope of the invention itself.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

Claims

1. Hot-air drying unit suitable for being arranged downstream of the washing tank of a machine for developing rolls of exposed sheet films and films, wherein said film and sheet films are caused to advance by means of pairs of parallel motorized rollers, characterized in that it is constituted by a closed containment body which is provided, in a downward position, with at least one pair of parallel motorized rollers for receiving the film and/or sheet films which are caused to advance by the rollers in the washing tank and, in an upward position, with further pairs of motorized rollers which define two separate paths for both the film and the sheet films, one path being directed toward the slit-shaped opening which constitutes the conventional rear outlet of the machine, the other path being directed toward an outlet which is arranged at the front of said machine, a path redirection device being positioned in the branching region of said two paths, said redirection device being constituted by at least one lamina which is oscillatable, by means of a control which is external to the machine, from a position which is aligned with one of said paths to a position which is aligned with the other path, said redirection device thus allowing the simultaneous exit of the film and of the sheet films through said rear opening or also the simultaneous exit of the continuous film through the rear outlet and the exit of the sheet films through the front outlet.

2. Drying unit according to claim 1, characterized in that said device for redirecting the path of the film and/or of the sheet films is constituted by at least one lamina which oscillates parallel to the axes of the advancement rollers and is at least half as long as the rollers, said redirecting lamina having such an inclination angle as to redirect and guide the sheet films toward said front outlet of the machine without affecting the path of the continuous film, which is directed toward the rear outlet.

3. Drying unit according to claims 1 and 2, characterized in that it has, for the actuation of said oscillating redirection lamina, a magnetic-attraction, mechanical or similar actuation device which can be actuated manually.

4. Drying unit according to claims 1 to 3, characterized in that it is provided with a pair of impeller aspirators, an infrared-ray or similar heating source being associated with each of said aspirators, said impellers and said heat sources being arranged opposite with respect to the film and/or sheet films which advance toward the outlets, so as to send hot air directly onto the opposite faces of the film and/or sheet films.

5. Drying unit according to one or more of the preceding claims, characterized in that said redirection device has two separate redirection laminas which are pivoted on the same axis parallel to the rollers and can be actuated both simultaneously and separately, so as to allow, if required, to redirect both the sheet films and the continuous film toward the front outlet.

6. Drying unit according to the preceding claims, characterized in that it has, in association with said front outlet for the developed sheet films, a further redirection device for said sheet films which is arranged between the fixing and washing tanks and is constituted by a curved lamina which is substantially horizontal, can move vertically and is suitable for allowing the exit of the freshly fixed sheet films through a front opening in order to facilitate the operator in checking the quality of the developing of the individual sheet films.

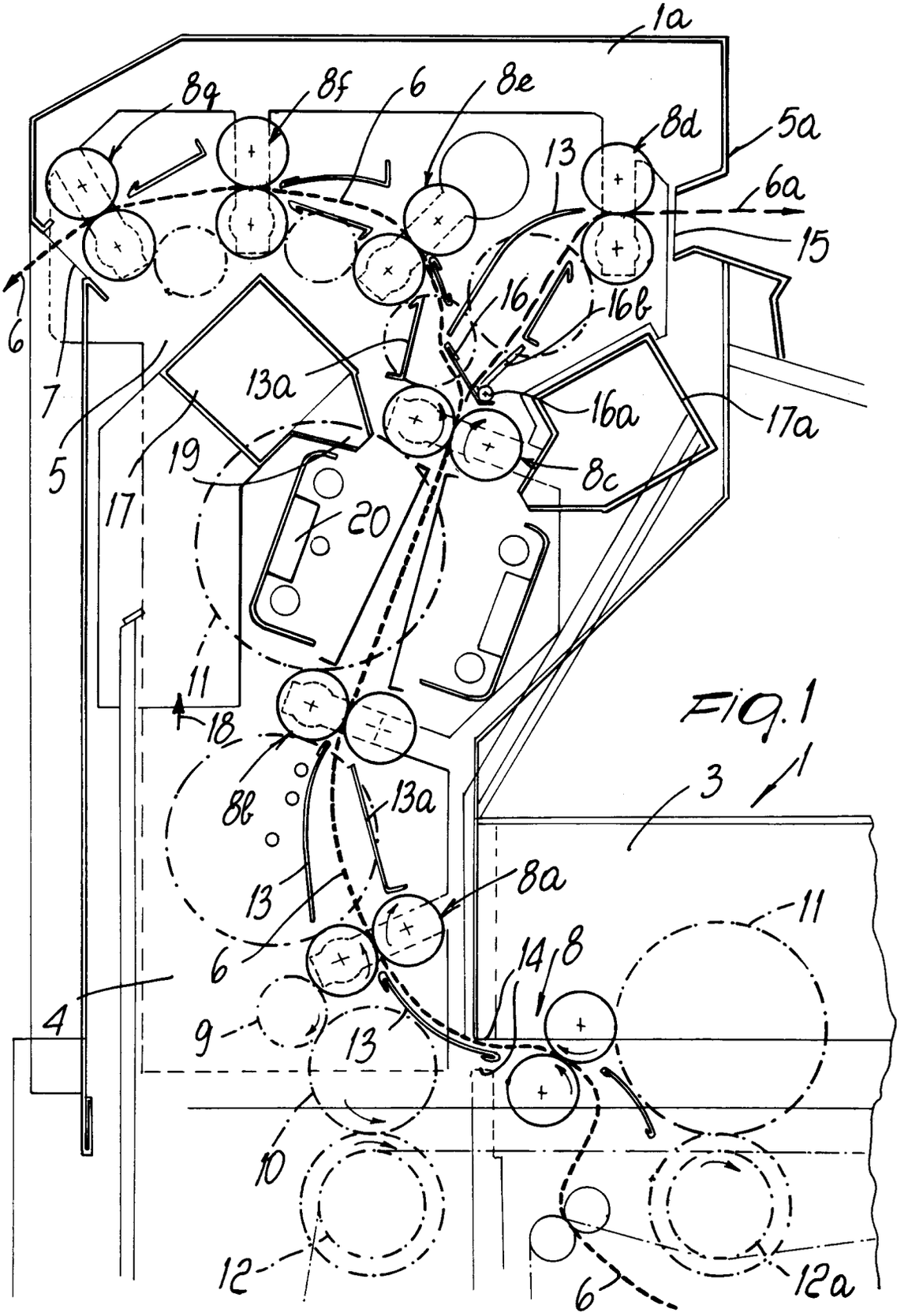
1a
8g
8f
6
8e
8d
5a
13
6a
15
16
16b
6
7
13a
16a
17a
5
19
8c
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FIG. 1
3
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8b
13a
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8a
11
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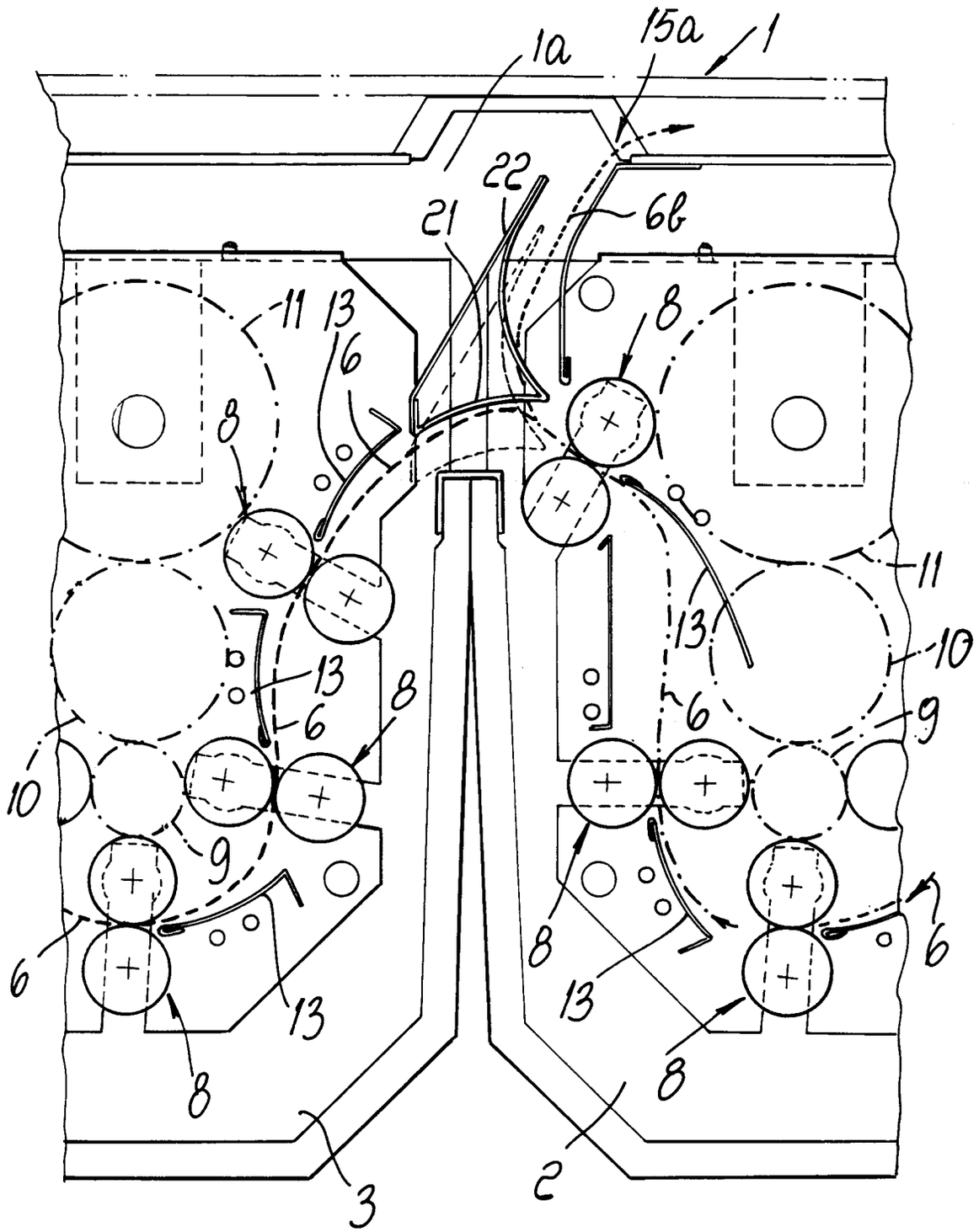

FIG.2

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 10 2149

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	FR-A-2 089 971 (L'ACCESSORIO RADIOGRAFICO) * claims 1,6; figures 1,6 *	1,4	G03D15/02 G03D15/00
A	GB-A-2 010 785 (AGFA-GEVAERT) * page 1, line 81 - line 124; figure 1 *	1-3,5-6	
A	DE-A-3 508 090 (KRAUSE) * column 3, line 21 - line 53; figures 1-2 *	1-2,5-6	
A	CH-A-635 449 (ZELACOLOR) * page 2, left column, line 62 - right column, line 45; figures 1-2 *	1,4-6	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

G03D
G03B
B65H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	20 MAY 1992	DEROUBAIX P.G

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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L : document cited for other reasons

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