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(54) Method and relative apparatus for the re-use of wash water in the photographic field.

(57) Method for the re-use of wash water in the photographic field, whereby the wash water coming directly from developing machines undergoes a filtration process and at least one step to render safe for photographic purposes the salts contained in the wash water, the above steps to filter and render safe entailing the recirculation of at least a percentage fraction of the wash water and the conversion both of the substances contained in the wash water such as carbonates, calcium, magnesium, iron, etc. and of the salts such as sulphites and thiosulphates resulting from the previous development and fixing step into compounds compatible with the photosensitive material.

Apparatus (10) suitable to carry out the above method, which comprises a recirculation circuit (23-28-25) and dosage means (30) governed by a means (32) that measures the surface of sensitive material, the dosage means (30) being associated with respective tanks (26-27) to hold first and second regenerating solutions (A and B).

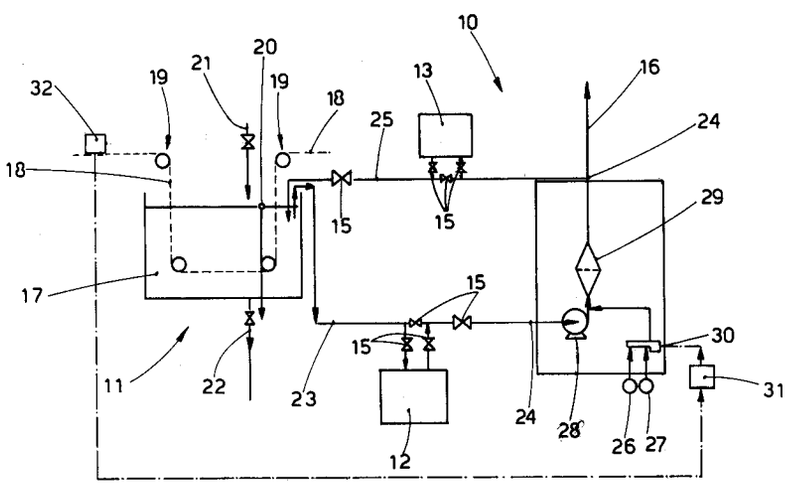

fig. 2

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This invention concerns a method for the re-use of wash water in the photographic field, as set forth in the main claim.

The invention concerns also an apparatus suitable to carry out such method.

The method and relative apparatus according to this invention are applied conveniently in particular, but not only, to the processes of the development of photosensitive material in black and white or colours and in particular in development dark rooms.

The method and relative apparatus according to the invention are applied usefully to photographic processes employing:

- sensitive materials for black and white photographs;
- sensitive materials for radiography in the medical and industrial field;
- sensitive materials of various types employed in the field of graphic arts;
- materials sensitive to colours of various types;
- photosensitive material in general, based on silver halides.

Developing machines in the photographic field are known which consist essentially of a set of tanks filled to a constant level, each of the tanks containing a specific solution (developing tanks, stop baths, fixing tanks, etc.) or running water (wash tanks).

An automatic conveyor system feeds the sensitive material at a constant speed through the set of various tanks.

During all these steps the sensitive material, whether it be a negative or a print, undergoes a set of chemical reactions which modify the composition of the chemical solutions though which it passes, and the wash water.

During a continuous development process it is therefore necessary to top up the reagents with a quantity equal to that used up in the reactions taking place during the process being performed.

The quantity of reagents which has reacted is in proportion to the surface of sensitive material processed. These reagents are re-introduced into the respective tanks by topping up those tnaks with a suitable quantity of solution proportional to the surface of sensitive material processed.

As an outcome, a quantity of used solution, whether chemical or resulting from the wash water, leaves the relative tank through an overflow.

The tanks are kept filled to a constant level by suitable systems with which the developing machine is equipped and which are not described here as they are already known and are not relevant for the purposes of this invention.

The wash water is normally discharged and not re-used but cannot be discharged in such a condition as it contains elements not compatible with the environmental regulations in force, which govern the discharges of water into various receiving bodies.

The wash water is therefore normally stored temporarily and undergoes, in batches or continuously, treatments of various kinds before being discharged. Reference should be made to US-A-3,997,347 for instance.

It is the current practice to employ oxidation systems, additions of hydrogen peroxide and/or sodium hypochlorite and to pass the water through ion-exchange resins as being systems to treat the wash water before releasing it into the various receiving bodies, so as to make it compatible with the regulations in force.

The systems cited above entail the drawbacks of complex operations and high running costs besides a great consumption of water employed in the developing machines, and this water has then to be treated before it can be discharged in compliance with the regulations in force.

To avoid this waste of water and therefore of money and to obviate the high costs of treatment of the water to be discharged the state of the art includes apparatuses which can be connected to the developing machines so as to treat the wash water and make it re-usable for further washing operations, but these apparatuses employ techniques of ion exchange, activated carbon and ultra-filtration, with the unsatisfactory result that the developing machines become rather unpractical, complex and not very functional.

Some of the more commonly used ion-exchange apparatuses enable the standards to be met for the quality of water for photographic use (Standard DIN 19070, part 2), whereas others do not allow these standards to be met (DIN 19070, part 2) for the quality of water for photographic use and therefore do not ensure the standards required for photographic quality (Standard ANSI PH 4.8.1971).

Furthermore, these machines entail the shortcoming of employing expendable materials, such as ion-exchange resins, osmotic membranes, activated carbon, etc. which have to be replaced or regenerated after a given period of use since their purification power becomes saturated and they can no longer perform their function in a satisfactory manner.

Moreover, these expendable materials by their very nature possess a variable efficiency that decreases

with use, with a resulting progressive worsening of the quality of the wash water leaving these wash water recycling apparatuses.

These recycling apparatuses therefore involve the shortcoming of providing at their outlet a recycled wash water with qualitative characteristics that are not constant but deteriorate progressively.

It is precisely this variable quality of the treated water that makes these apparatuses unsuitable for use in certain dark rooms since the effects of washing with water of a variable quality lead to unacceptable sensitometric results being obtained on the photosensitive material.

Moreover, vacuum distillation systems too exist that enable wash water to be recycled for photographic use.

Such apparatuses, however, do not reduce the great quantity of water used by the developing machine, which therefore has to be connected hydraulically to the water supply network and to the sewerage system with pipes of a suitable diameter and at high installation costs which can be assessed as reaching as much as about thirty per cent of the cost of the developing machine.

These apparatuses to recycle the wash water have great dimensions and take up a great deal of space owing to the great quantity of water they have to treat.

The present applicant has designed, tested and embodied this invention so as to obviate the shortcomings of the state of the art and to achieve further advantages.

This invention is set forth and characterized in the main claim, while the dependent claims describe variants of the idea of the main solution.

The method and apparatus according to the invention are applied conveniently in particular, but not only, to the processes of development of photosensitive material in black and white or colours and in particular in development dark rooms.

This invention enables the water employed to wash the photosensitive material at the end, or in intermediate steps, of the cycle of development of the photosensitive material to be recycled.

The invention consists in using solutions to be added to the already used wash water coming from the wash tanks of the developing machines; to be more exact, these solutions contain:

- chemicals suitable to render safe for use the salts, such as thiosulphates and sulphites, contained in the wash water and coming from the preceding fixing step;
- products which activate the wash water and are able to eliminate substances contained in the wash water itself, such as carbonates, calcium, magnesium, iron, etc.

According to the invention the safe-rendering solution contains potassium iodide, tartaric acid, sodium bicarbonate, ethylene diamine sodium tetra-acetate or its derivatives and may also contain a bactericide, such as methanal for instance (commercially known as formaldehyde), whereas the regenerating solution contains potassium iodate and a "pH" stabiliser, such as, for instance, sulphuric acid, caustic soda, hydrochloric acid, acetic acid, caustic potash, calcium hydroxide or another compound having the same functions.

According to a variant the composition of such solutions, and in particular the potassium iodide and potassium iodate, can also be changed where the nascent iodine required for the reactions is produced with other reagents or indeed through electrolytic, osmotic, galvanic, etc. equipment.

According to the invention the wash water is caused to react with the safe-rendering solution and with the regenerating solution. This reaction may take place in the circulation line if the whole wash water is recirculated.

This reaction may also take place for a small part in the circulation line and for the remaining part in the wash tank in cases where only a percentage fraction of the wash water is recirculated. In this case the fraction of the wash water will be supersaturated with the safe-rendering and regenerating solutions.

According to a variant these reactions can take place at different times, for instance by injecting one solution into a possible storage tank and injecting the other solution instead into the circulation line.

The order in which the two solutions are injected is unimportant for the purposes of the invention although for reasons of conservation the safe-rendering solution containing potassium iodide is normally injected before the regenerating solution containing potassium iodate.

According to the invention the wash water is passed through a filter system, which may be merely mechanical and/or may comprise adsorbing cartridges.

The solutions can be injected equally well upstream or downstream of the filter system, but this injection is performed advantageously upstream of that system.

The apparatus according to the invention is connected hydraulically downstream of the developing machine and comprises within itself not only known pumping and filtration systems but also a dosing system which enables the desired quantities of the above solutions to be injected.

As the quantity of reagents to be injected is in proportion to the surface of the sensitive material

developed, automatic regulation of the dosing means is governed by a signal of the flow of water entering the developing machine if that flow is in proportion to the surface of the sensitive material processed.

According to a variant the regulation can be governed by a signal coming from known equipment which is included in the developing machine and which measures the surface of the sensitive material processed by the developing machine.

The wash water leaving the apparatus can be recycled to the same developing machine whence the water comes, or can be sent to other developing machines possible connected to the recycling apparatus.

The attached figures are given as a non-restrictive example of a preferred embodiment of the invention and show the following:-

Fig.1 is a three-dimensional view of the apparatus of the invention positioned downstream of a developing machine;

Fig.2 is a working diagram of the system shown in Fig.1.

According to the invention, to already used wash water leaving a developing machine 11 are added two solutions, a safe-rendering solution A and a regenerating solution B respectively, to enable that wash water to be re-used to treat further sensitive material.

In fact, the wash water after use contains substances such as sulphites and thiosulphates coming from the preceding step of fixing the sensitive material, and these substances have to be rendered safe and harmless so that the wash water can be re-used without endangering the successful development of sensitive material processed thereafter.

Moreover, also the substances contained in the wash water such as carbonates, calcium, magnesium, iron, etc. have to be removed from the water already used.

The safe-rendering solution A contains concentrated chemicals able to render safe for photographic purposes the salts and substances such as sulphites, thiosulphates, aluminium, etc. contained in the wash water coming from the preceding fixing step.

In this case the safe-rendering solution A contains the following reagents:

- potassium iodide KI
- tartaric acid $C_4H_6O_6$
- ethylene diamine sodium tetra-acetate $EDTANa_4$ (or derivatives thereof)
- sodim icarbonate Na (HCO_3)

and, as an additional element where the wash water has been recycled for a long time, a bactericide such as, for instance, methanal HCHO (normally called "formaldehyde") is added advantageously to this solution A.

The quantities of salts and substances such as sulphites, thiosulphates, aluminium, etc. contained in the wash water and coming from the preceding fixing step are in proportion to the surface of sensitive material processed.

Therefore the quantity of safe-rendering solution A employed to neutralize these solutions will be in proportion to the surface of sensitive material processed.

In particular, the invention includes addition of the safe-rendering solution A consisting of the following:

- potassium iodide 70-250 mgs/m^2 of sensitive material processed, preferably 180 mgs/m^2
- tartaric acid 35-150 mgs/m^2 of sensitive material processed, preferably 90 mgs/m^2
- $EDTANa_4$ or derivatives thereof 300-1000 mgs/m^2 of sensitive material processed,, preferably 800 mgs/m^2
- sodium bicarbonate 5-30 mgs/m^2 of sensitive material processed, preferably 20 mgs/m^2
- bactericide 5-30 mgs/m^2 of sensitive material processed, preferably 20 mgs/m^2.

This composition can be prepared at various levels of concentration since the solution is immitted into the wash water to be recycled in proportion to the surface of the sensitive material processed.

As a mere example a dosage into wash water ready for the reaction will be:

- potassium iodide	0.250 gr/lt
- tartaric acid	0.125 gr/lt
- $EDTANa_4$	1.000 gr/lt
- sodium bicarbonate	0.025 gr/lt
- bactericide	0.025 gr/lt

The regenerating solution B contains the following reagents:

- potassium iodate KIO_3
- pH stabilizer (for instance sulphuric acid H_2SO_4, caustic soda NaOH, hydrochloric acid HCl, acetic

acid CH_3COOH, caustic potash KOH, calcium hydroxide $Ca(OH)_2$ or another compound having the same function).

The quantities of substances contained in the wash water, such as carbonates, calcium, magnesium, iron, etc., which are eliminated by the regenerating solution B, are in proportion to the surface of the sensitive material processed.

Therefore, the quantity of the regenerating solution B too to be employed to neutralize the above substances will be in proportion to the surface of the sensitive material processed, and in particular the invention includes addition of regenerating solution B consisting of the following:

- potassium iodate 70-250 mgs/m^2 of sensitive material processed, preferably 180 mgs/m^2
- pH stabilizer 5-15 mgs/m^2 of sensitive material processed, preferably 12 mgs/m^2

This composition can be prepared at various levels of concentration since the solution is added to the wash water to be recycled in proportion to the surface of the sensitive material processed.

As a mere example, a dosage into wash water ready for the reaction will be:

- potassium iodate	0.25 gr/lt
- pH stabilizer	0.015 gr/lt

According to the invention the composition of the solutions by quantities may vary over a wide range.

In particular, one litre of safe-rendering solution A according to the invention will possess the following characteristics:

- ingredients:			
	normal	min.	max.
- potassium iodide	50 grs.	35 grs.	65 grs.
- tartaric acid	25 grs.	17.5 grs.	32.5 grs.
- $EDTANa_4$ or derivatives	200 grs.	140 grs.	260 grs.
- sodium bicarbonate	12 grs.	8.4 grs.	15.6 grs.
- bactericide	12 grs.	8.4 grs.	15.6 grs.
- water in a quantity required to make up 1 litre of solution			
- relative density from 1.05 to 1.5.			

In particular, one litre of regenerating solution B according to the invention will possess the following characteristics:

- ingredients:			
	normal	min.	max.
- potassium iodate	50 grs.	35 grs.	65 grs.
- pH stabilizer	3 grs.	2.5 grs.	4 grs.
- water in a quantity required to make up 1 litre of solution			
- relative density from 1.02 to 1.3.			

The addition of these products has a great effect of rendering safe and stabilizing the wash water for photographic purposes according to the following reactions:

- generation of nascent iodine (I_2) by reaction of the safe-rendering solution A with the regenerating solution B according to the following reaction:

a) $KI + KIO_3 \text{ ----> } I_2 + \text{by-products.}$

According to a variant the nascent iodine (I_2) can be produced also with other reagents and/or with electrolytic, osmotic, galvanic, etc. equipment. If the nascent iodine (I_2) is produced with these other methods, the solutions will vary as regards the potassium iodide (KI) and potassium iodate (KIO_3).

The nascent iodine (I_2) generated according to one or the other of the above methods makes possible

the following reactions:

b) $2\ (NH_4)_2S_2O_3 + I_2 \text{ ----> } 2\ NH_4I + (NH_4)_2S_4O_6$

c) $Na_2SO_3 + I_2 + H_20 \text{ ----> } Na_2SO_4 + 2\ HI$

Moreover, it is necessary to obtain the following reaction:

d) $S_2O_6^{=} + O_2 + 2\ e^{-} \text{ ----> } 2\ SO_4^{=}$

Furthermore, the tartaric acid $C_4H_6O_6$ reacts according to the following reactions:

e) $3\ C_4H_4O_6^{=} + 2\ Fe^{3+} \text{ ----> } (C_4H_4O_6)_3\ Fe_2$

f) $C_4H_4O_6^{=} + Fe^{2+} \text{ ----> } C_4H_4O_6Fe$

Meanwhile, the $EDTANa_4$, reacting with the salts of calcium, magnesium, iron, etc. forms complexes of salts.

The advantages achieved owing to these chemical reactions consist of the fact that it is possible to re-use in a qualitatively satisfactory manner the spent wash water in all dark rooms with a convenient filtration equipment irrespective of the types of solutions or sensitive materials employed or supplied by one manufacturer or another.

In fact the recycled water produced with this method enables the standards for the quality of water for photographic use (Standard DIN 19070 Part 2), to be met and therefore ensures the attainment of the standards required for photographic quality (Standard ANSI PH 4.8.1971).

Downstream or upstream of the processing step the wash water is passed through a filtration system, which may consist of simple mechanical filtering, or be by means of adsorbent cartridges.

In the figures the reference number 10 indicates generally an apparatus to recycle wash water in the photographic field, the apparatus 10 being installed downstream of a developing machine 11.

The developing machine 11 consists essentially of a set of tanks filled to a constant level, each tank containing a specific solution (developing tanks, stop baths, fixing tanks, etc.) while the last tank, a wash tank 17, holds water.

During all these steps an automatic conveyor system 19 feeds sensitive material 18 at a set speed through the various successive tanks.

The level of water in the wash tank 17 is kept constant in a known manner by immitting fresh water through a water topping-up intake 21 included in the wash tank 17 of the developing machine 11.

The developing machine 11 is also equipped in a known manner with a means 32 which measures the surface of the sensitive material processed in the developing machine 11 and visualizes and keeps a total of the value thereof.

In given cases a signal is emitted by the surface measuring means 32 and regulates the flow of wash water by means of a wash water regulator assembly.

The wash tank 17 is also equipped with an overflow 20 and is connected to a used wash water line 23 that connects the developing machine 11 to the wash water recycling apparatus 10.

In the example shown the wash tank 17 is equipped with an outlet 22 employed to empty the wash tank 17 whenever necessary.

The wash tank 17 may comprise means to recirculate and/or stir the wash water and is also connected to a recycled wash water line 25 arriving from the wash water recycling apparatus 10.

In this case the used wash water line 23 and the recycled wash water line 25 are provided with shut-off means 15, which enable the wash water recycling apparatus 10 to be isolated from the developing machine 11.

In the example shown a storage tank 12 is also fitted to the used wash water line 23, while a restarting tank 13 is installed on the recycled wash water line 25.

In this case the storage tank 12 and restarting tank 13 respectively are equipped with shut-off means 15 to enable these tanks 12-13 to be isolated also during the working of the system consisting of the developing machine 11 and water recycling apparatus 10.

The apparatus 10 according to the invention comprises hydraulic attachment means 24, to which are connected respectively the used wash water line 23 and the recycled wash water line 25.

The apparatus 10 to recycle the wash water comprises pump means 28, which serve to restart the feed of the recycled wash water from the apparatus 10 to the developing machine 11 through the recycled wash water line 25, or to other developing machines through a connecting line 16.

The apparatus 10 to recycle the wash water is also equipped with filter means 29 through which the wash water is passed. These filter means 29 may be of a mechanical type and/or may also contain adsorbent cartridges.

The apparatus 10 comprises also at least two containers, namely a container 26 for solution A and a container 27 for solution B respectively, which feed dosing means 30 that inject into the used wash water the safe-rendering solution A and regenerating solution B respectively.

Moreover, the apparatus 10 to recycle wash water is equipped with a control panel 14 which comprises actuation, control, measurement and regulation means and relative warning lights and alarms.

The wash water leaving the wash tank 17 of the developing machine 11 is conveyed to the wash water recycling apparatus 10 through the used wash water line 23.

The pump means 28 located in the recycling apparatus 10 feed the recycled wash water through the recycled wash water line 25 towards the wash tank 17 of the developing machine 11, from which that wash water has arrived.

Alternatively, the pump means 28 can deliver the recycled wash water towards other developing machines along the connecting line 16. These pump means 28 may be of a self-priming type.

The dosing means 30 feed the pump means 28 with the required quantities of solution A and solution B, these quantities being drawn from the respective containers, namely container 26 for solution A and container 27 for solution B.

The dosing means 30 are actuated by a dosage regulator assembly 31, which receives signals from the means 32 fitted to the developing machine 11 to measure the surface of the sensitive material processed.

According to a variant this signal can arrive directly from a means that regulates the flow of wash water in the event that the developing machine 11 is equipped with such a means.

The wash water thus chemically treated passes through the appropriate filter means 29, which retain the substances contained in the wash water. These filter means 29 may be of a merely mechanical type or may contain adsorbent cartridges.

The filter means 29, which in this example are located downstream of the pump means 28 and of the point where the solutions are injected, may be located upstream of the pump means 28 and of the point where the solutions are injected.

According to a variant the safe-rendering solution A arriving from its container 26, or else the regenerating solution B arriving from its container 27, is injected in a congruous manner into the storage tank 12, whereas the other solution B or A is immitted in a congruous manner upstream or downstream of the pump means 28.

According to another variant the solution A (or B) is immitted in a congruous manner into the restarting tank 13, whereas the solution B (or A) is immitted in a congruous manner upstream or downstream of the restarting tank 13.

According to yet another variant the wash water is circulated in a quantity which is a percentage fraction of the quantity of water required to wash the surface developed.

According to a further variant again the wash water is circulated in a quantity which is a minimum percentage fraction of the order of some units.

If the wash water recycled is only a percentage fraction of the whole, then it is supersaturated with the solutions A and B, the reaction being completed in the wash tank 17.

In particular it is possible to achieve the following specific advantages arising from application of the method and relative apparatus according to the invention:

- lower cost for transfer of the wash water since by this method a very high percentage quantity of wash water, as much even as about ninety-nine per cent of the quantity of wash water used in developing machines, may be recycled, with a resulting financial benefit;
- lower installation costs for this apparatus since it requires hydraulic connections and relative valves of much smaller sizes than those employed hitherto;
- elimination of the hydraulic connection, hitherto required, of the developing machine to the water supply network and to the sewerage system with pipes of an adequate diameter and with high installation costs, which can be assessed as being up to about thirty per cent of the cost of the developing machine;
- the ability to draw smaller quantities of wash water for topping-up from suitable small-size tanks rather than from the main supply network;
- a considerable reduction in the volume of pollutants to be treated, with a resulting decrease in the cost of purification of the effluents to be discharged.
- constant maintaining, owing to the addition of the regenerating solution, of the quality of the wash water reused, and resulting elimination of photographic faults due to wash waters possessing a defective quality in the long term owing to repeated re-use;
- the ability, owing to the reactivating function of the solutions, to be applied to a very wide range of photographic processes, irrespective of the type of sensitive material employed and of the respective developing and fixing solutions.

Claims

1. Method for the re-use of wash water in the photographic field, whereby the wash water coming directly from developing machines undergoes a filtration process and at least one step to render safe for photographic purposes the salts contained in the wash water, the method being characterized in that the above steps to filter and render safe entail the recirculation of at least a percentage fraction of the wash water and the conversion both of the substances contained in the wash water such as carbonates, calcium, magnesium, iron, etc. and of the salts such as sulphites and thiosulphates resulting from the previous development and fixing step into compounds compatible with the photosensitive material.

2. Method as claimed in Claim 1, whereby a step of filtration and regeneration is also carried out with recirculation of at least a percentage fraction of the wash water and with the conversion both of the substances contained in the wash water such as carbonates, calcium, magnesium, iron, etc. and of the salts such as sulphites and thiosulphates resulting from the previous development and fixing step into compounds compatible with the photosensitive material.

3. Method as claimed in Claim 1 or 2, whereby the safe-rendering step is achieved by adding to the wash water a safe-rendering solution which is correlated functionally with the surface of sensitive material processed.

4. Method as claimed in any claim hereinbefore, whereby the regeneration step is achieved by adding to the wash water a regenerating solution, which is correlated functionally with the surface of sensitive material processed.

5. Method as claimed in any claim hereinbefore, whereby the safe-rendering step is achieved by adding to the wash water first and second regenerating solutions, which are functional according to the surface of sensitive material processed.

6. Method as claimed in any claim hereinbefore, whereby the reaction between the first and second regenerating solutions and the substances contained in the recycled water takes place at least partly in the recycling step.

7. Method as claimed in any claim hereinbefore, whereby the first solution (solution A) contains at least:
   - tartaric acid (from 35 to 150 mgs/m^2)
   - $EDTANa_4$ (from 300 to 1000 mgs/m^2).

8. Method as claimed in any claim hereinbefore, whereby the first solution (solution A) contains also:
   - a bactericide (from 5 to 30 mgs/m2).

9. Method as claimed in any claim hereinbefore, whereby the first solution (solution A) contains:
   - sodium bicarbonate (from 5 to 30 mgs/m2).

10. Method as claimed in any claim hereinbefore, whereby the second solution (solution B) contains at least:
   - a pH stabilizer (from 5 to 15 mgs/m2).

11. Method as claimed in any claim hereinbefore, whereby the first solution (solution A) contains at least:
   - potassium iodide (from 70 to 250 mgs/m2).

12. Method as claimed in any claim hereinbefore, whereby the second solution (solution B) contains at least:
   - potassium iodate (from 70 to 250 mgs/m2).

13. Method as claimed in any claim hereinbefore, whereby nascent iodine is immitted.

14. Apparatus (10) suitable to carry out the method of any of the claims hereinbefore, which is characterized in that it comprises a recirculation circuit (23-28-25) and dosage means (30) governed by a means (32) that measures the surface of sensitive material, the dosage means (30) being associated with respective tanks (26-27) to hold first and second regenerating solutions (A and B).

15. Apparatus (10) as claimed in Claim 14, in which the dosage means (30) feeds a used wash water line (23) with at least one solution (A or B).

16. Apparatus (10) as claimed in Claim 14 or 15, in which the dosage means (30) feeds a recycled wash water line (25) with at least one solution (A or B).

17. Apparatus (10) as claimed in Claim 14, 15 or 16, in which filter means (29) are included in association with pump means (28).

18. Apparatus (10) as claimed in any of Claims 14 to 17 inclusive, in which a storage tank (12) is included on the used wash water line (23).

19. Apparatus (10) as claimed in any of Claims 14 to 18 inclusive, in which a restarting tank (13) is included on the recycled wash water line (25).

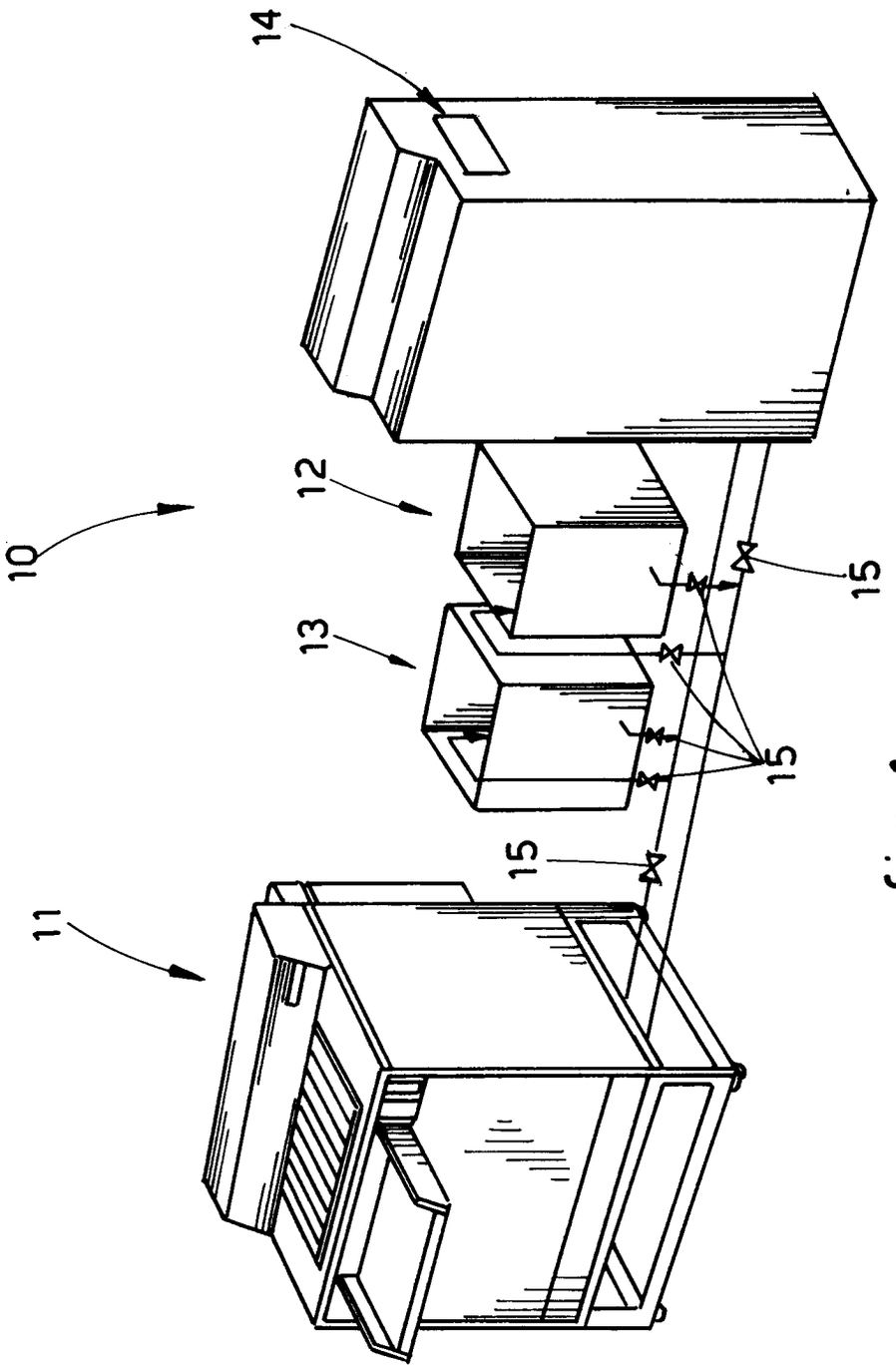

fig.1

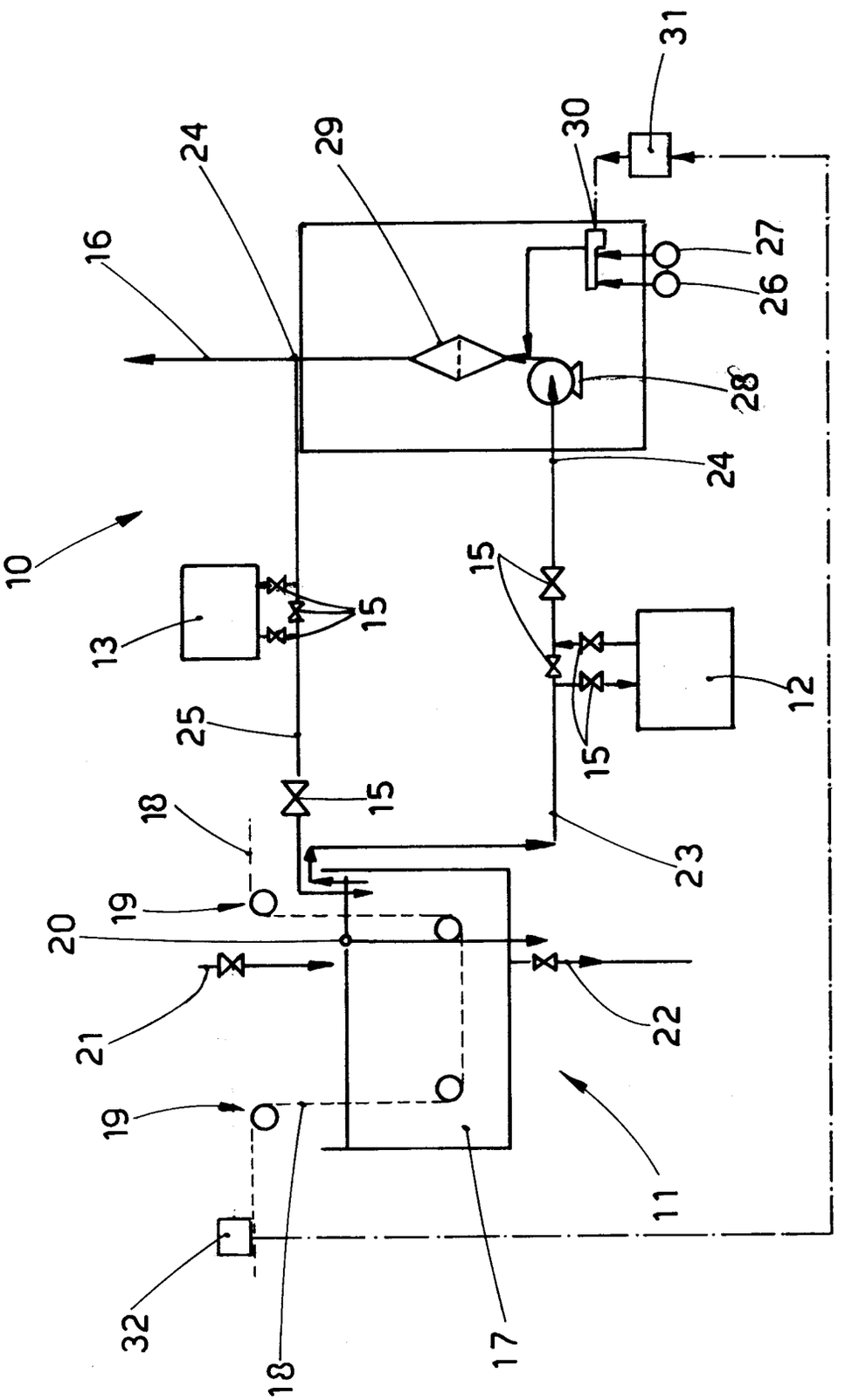

fig. 2

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 10 0984

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)
D,Y	US-A-3 997 347 (H.N.PARSONAGE) * column 3, line 15 - line 22 * * column 4, line 53 - line 63 * ---	1	G03C5/395 G03D3/06
Y	PATENT ABSTRACTS OF JAPAN vol. 14, no. 574 (P-1145)20 December 1990 & JP-A-2 247 642 (FUJI PHOTO FILM CO. LTD.) 3 October 1990 * abstract * ---	1	
A	WORLD PATENTS INDEX LATEST Section PQ, Week 9016, Derwent Publications Ltd., London, GB; Class P83, AN 90-118793 & JP-A-2 067 547 (FUJI PHOTO FILM CO. LTD.) 7 March 1990 * abstract * ---	7	
A	US-A-3 594 157 (T.N.HENDRICKSON) * abstract * * column 2, line 55 - column 3, line 9 * ---	1	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	SMPTE JOURNAL vol. 85, no. 3, March 1976, US pages 154 - 159; M.W.BEACH: 'MICROBIAL GROWTHS IN MOTION-PICTURE PROCESSING' * page 158, column 3, paragraph 7 * * abstract * ---	8	G03C G03D
X Y	DE-A-2 850 173 (EUROGRAPH GESELLSCHAFT FÜR PHOTOMECHANIK MBH) * figures 3,4 * ---	14 17	
Y	FR-A-2 248 538 (A.TIRABOSCHI) * claims 1,2 * ---	17	
A	US-A-4 480 901 (V.OSEGOWITSCH) * abstract * ---	14	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	15 MAY 1992	BOLGER W.

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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	WO-A-8 604 522 (KODAK LIMITED) * figure 1 * ---	14	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)

The present search report has been drawn up for all claims

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