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Merz

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[54] **APPARATUS FOR DEVELOPING PHOTOGRAPHIC MATERIALS**

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[52] **U.S. Cl.** **354/324**

[51] **Int. Cl.** **G03d 3/02**

[58] **Field of Search** ..... 95/89 R, 93, 96, 97; 354/297, 323, 324, 331

[56] **References Cited**

UNITED STATES PATENTS

3,280,716	10/1966	Gall	95/89 R
3,491,675	1/1970	Gold	95/89 R
3,517,600	6/1970	Woollacott	95/89 R
3,550,521	12/1970	Carrie	95/93
3,633,487	1/1972	Langkopf	95/89 R

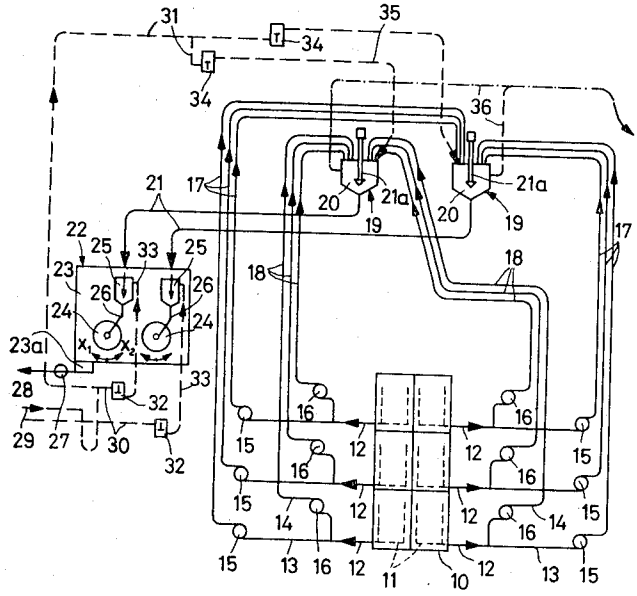
Primary Examiner—Fred L. Braun

Attorney, Agent, or Firm—Michael S. Striker

[57] **ABSTRACT**

A developing unit for photographic materials receives developer from a source via the intermediary of a supplying arrangement. The supplying arrangement dispenses metered quantities of developer and an adjusting arrangement is provided so that these metered quantities can be varied. A sensing arrangement senses the dispensing of the metered quantities and controls the operation of the supplying arrangement.

28 Claims, 11 Drawing Figures



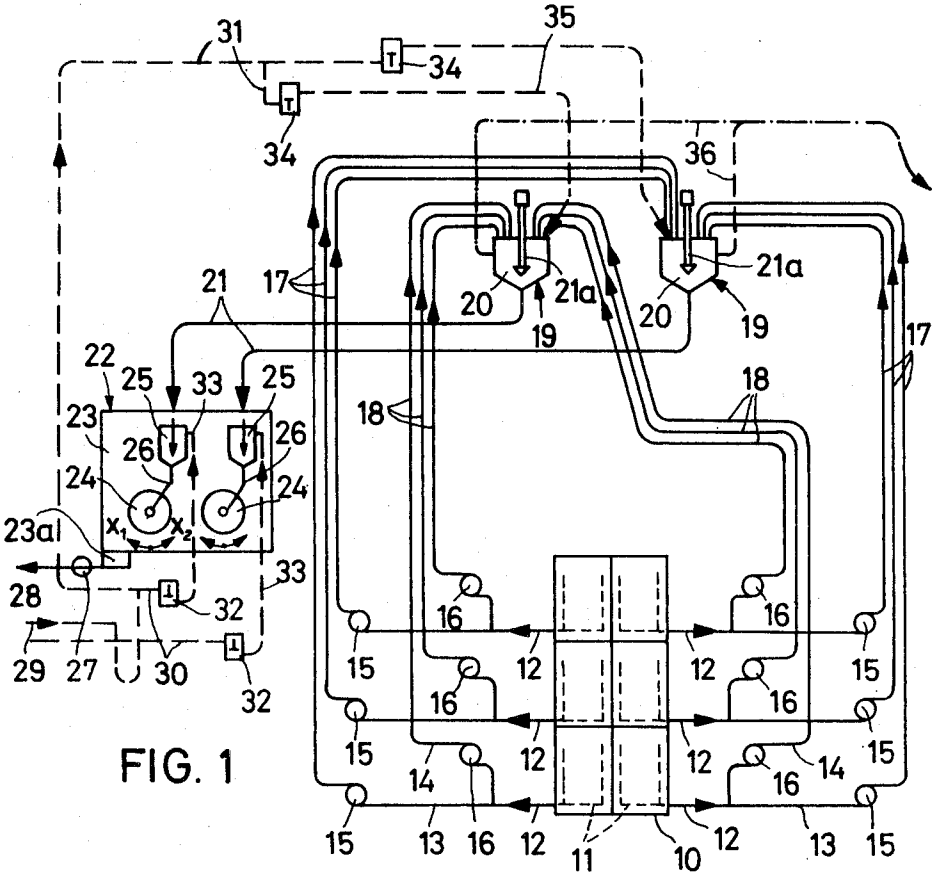

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FIG. 1

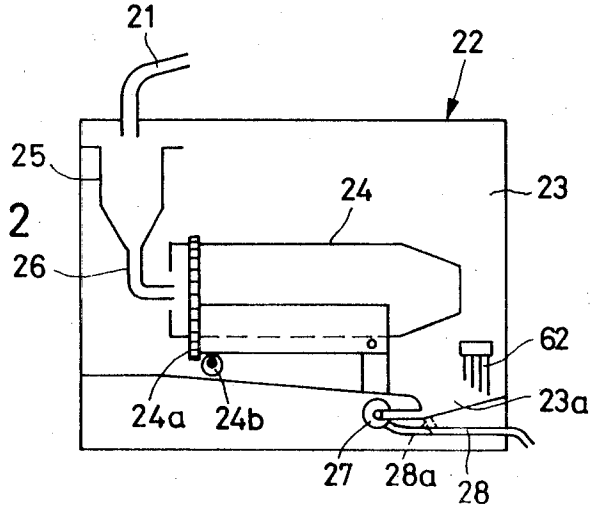
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FIG. 2

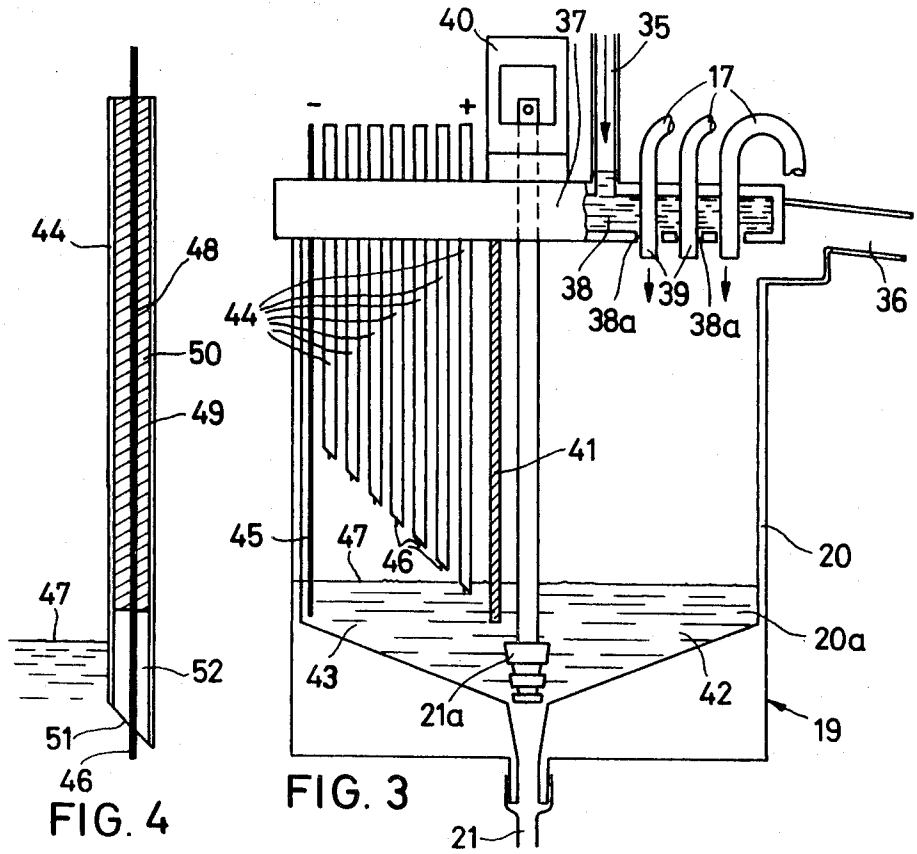

FIG. 4

FIG. 3

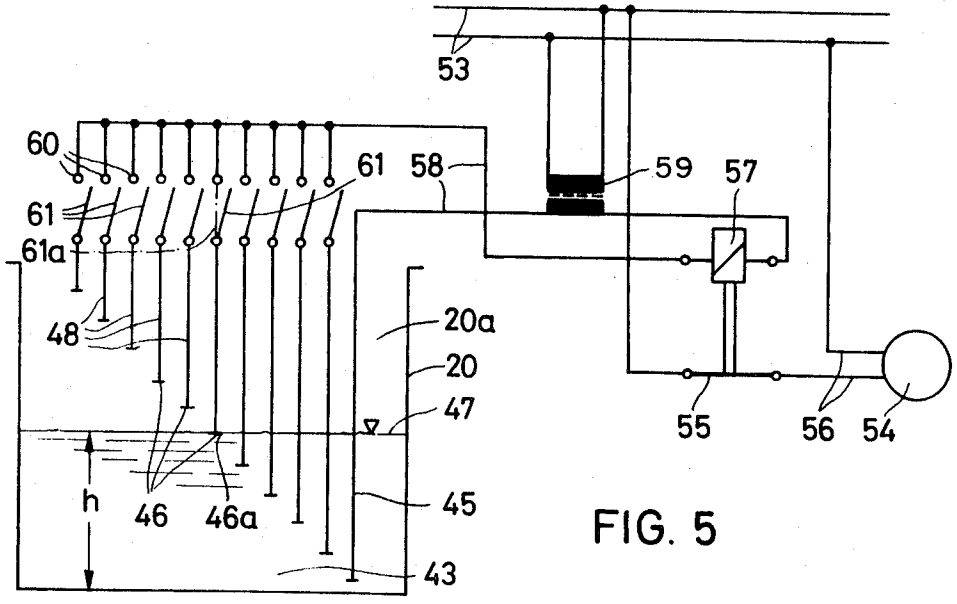

FIG. 5

FIG. 7b

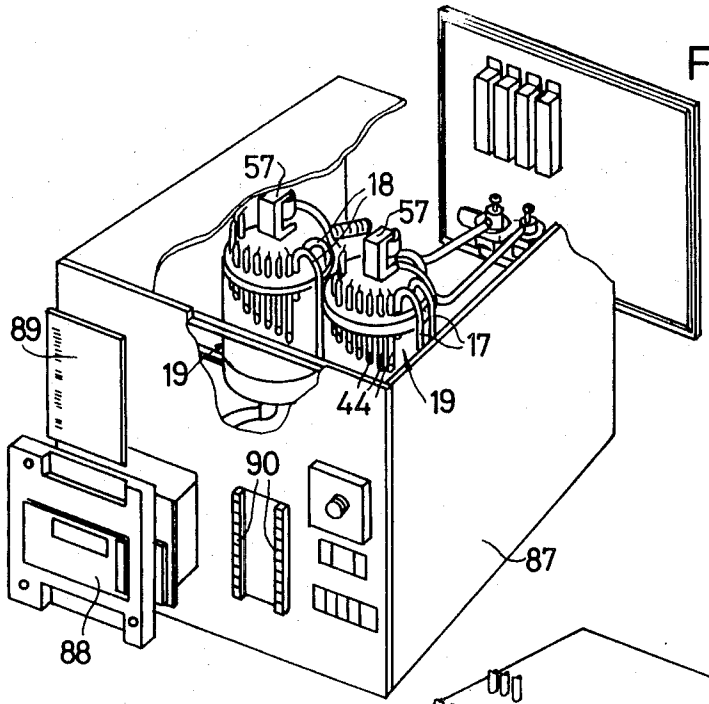

FIG. 7

FIG. 7a

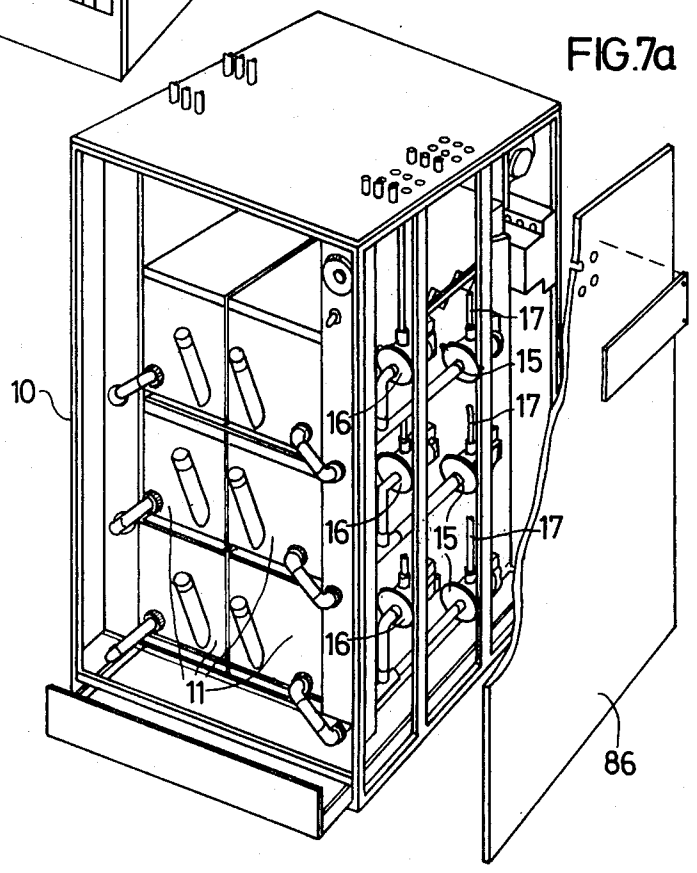

FIG. 6

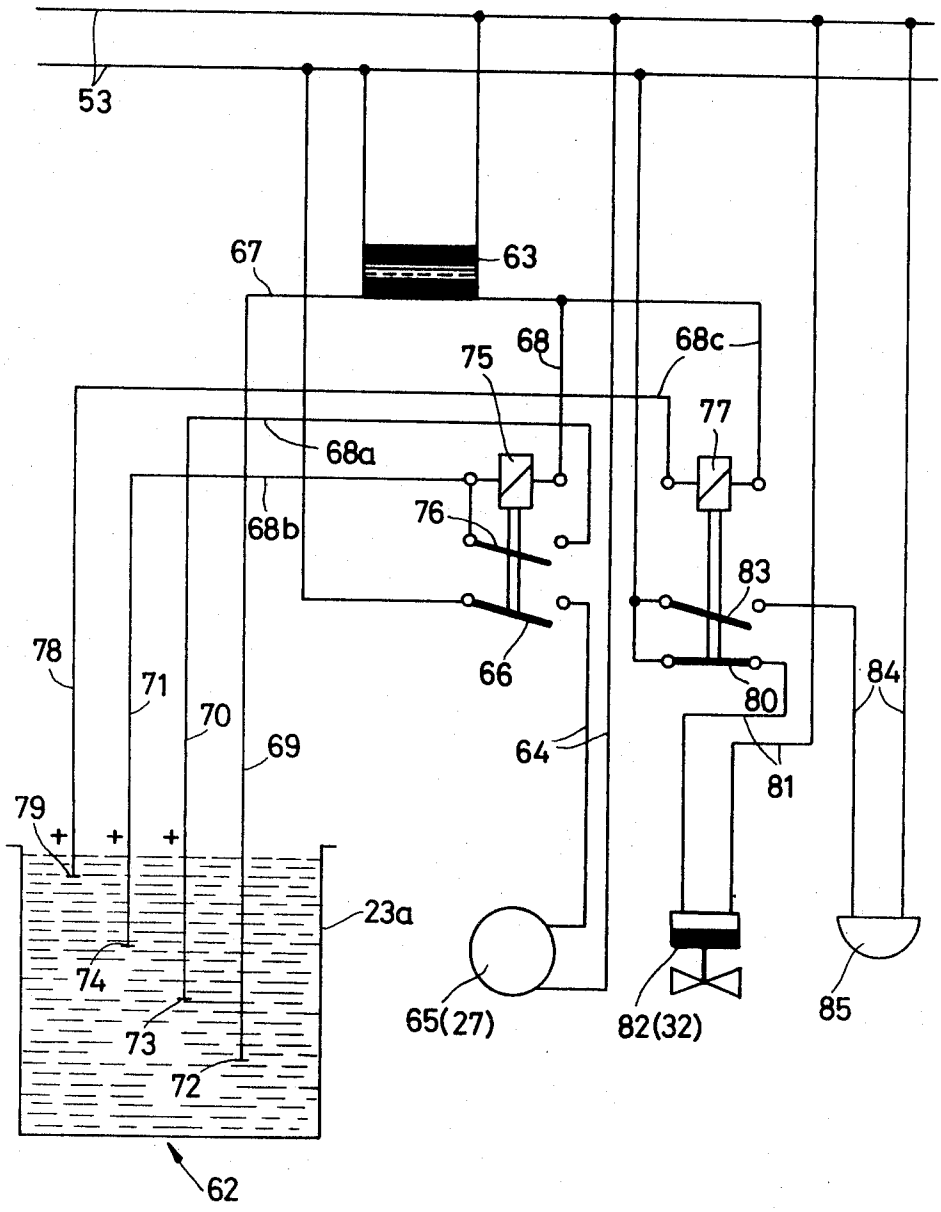
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FIG. 8

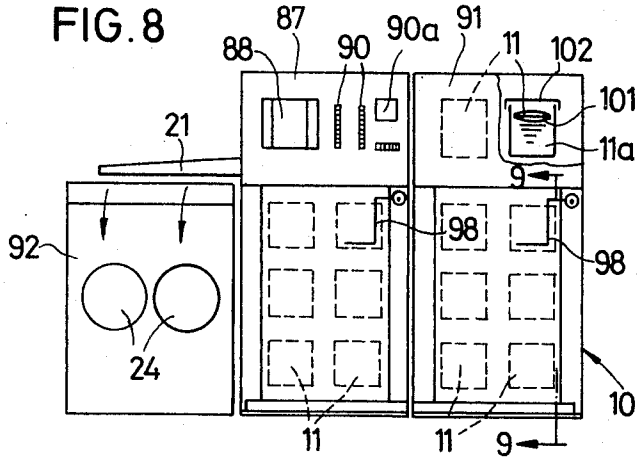
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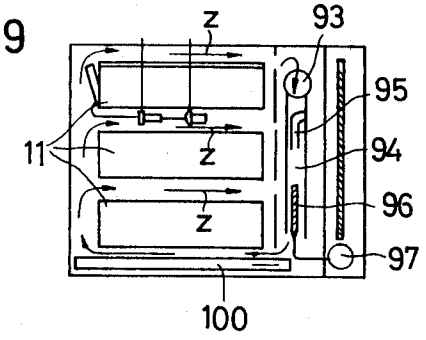
FIG. 9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APPARATUS FOR DEVELOPING PHOTOGRAPHIC MATERIALS

BACKGROUND OF THE INVENTION

The present invention relates to an apparatus for developing of photographic materials, and is particularly advantageous for use in developing of color film.

Apparatus for developing of photographic materials, color films or otherwise, is already well known. Generally such apparatus uses a developing unit in which the photographic materials together with the developer liquid are accommodated. In this unit, the developer liquid is made to contact the photographic material by imparting movement to the unit and thereby to the developer liquid, or in other ways, and this results in the developing of the photographic materials.

One of the problems with the prior art, however, is the fact that such equipment is not always simple to operate and does not have a particularly high throughput which is of course desired.

More importantly, however, it is a disadvantage of the prior art apparatus that the amount of developer admitted into the developer unit can, for various reasons, not be precisely metered. This means that high-quality developing of the photographic materials, which depends to a large extent not only on good contact with the developer liquid but also on a rather precise amount of developer liquid, is impossible. It must be remembered here that usually several different liquid components are admitted into such a unit which together constitute the developer liquid, and it is the inability to properly control the ratio of the various components to one another which has been causing problems in the prior art.

SUMMARY OF THE INVENTION

Accordingly, it is a general object of the present invention to avoid the disadvantages of the prior art.

More particularly, it is an object of the present invention to provide an improved apparatus of the type in question which is not possessed of these disadvantages.

Still more particularly, it is an object of the present invention to provide such an improved apparatus in which the metering of developer liquid or liquid components admitted into the developer unit is precise and automatic.

Another object of the invention is to provide such an apparatus which is simple in its operation as well as being reliable.

Still a further object of the invention is to provide such an apparatus which has a high throughput capacity per unit of time and therefore operates very economically.

In keeping with these objects, and with others which will become apparent hereafter, one feature of the invention resides in an apparatus for developing photographic materials, particularly color films, which, briefly stated, comprises a film developing unit, a source of developer, and supplying means for supplying metered quantities of developer from the source to the unit. Selecting means is operatively associated with the supplying means for selecting the magnitude of the metered quantities, and sensing means is provided for sensing the developer content in the supplying means and for controlling the operation of the latter in dependence upon the sensed content and within the magnitude selected by the selecting means.

It is advantageous according to one concept of the invention if one or several heads or containers are provided as part of the supplying means, containing the developer liquid or constituent components of the developer liquid and provided with feelers which extend to different levels within their respective containers and which are part of an electrical circuit which is interrupted when the liquid level in the respective container reaches a certain point which can be preselected by the selection of the respective feeler, for instance interrupting the drive of a pump for pumping the contents into the developer unit. Of course, it is also possible to have the circuit completed under these circumstances.

The feelers themselves are advantageously in form of electrodes which are surrounded in insulated relationship by tubes having open ends which may be beveled to avoid the formation of droplets at these open ends. Also, it is advisable for the insulation which is located in the space between the interior of the tube at the respective electrode to be inwardly offset from the open end of the tube in order to permit the formation of an air bubble in this space, which facilitates proper operation of the circuit, as will be discussed later.

The container or containers communicate of course with the source of supply of the developer liquid, or of the liquid constituent components thereof, and in order to avoid the possibility that the turbulence of incoming liquid might trigger the operation of the circuit, or of the respective circuit do to the formation of waves which might momentarily simulate a liquid level different from the actual level, one or more baffles may be installed in the respective container between the feelers and the inlet openings for the incoming liquid.

It will be appreciated that the containers as well as the unit itself must be flushed at regular intervals in order to remove residual developer liquid or constituent components of such liquid. Insofar as the flushing of the containers is concerned, it is advantageous if the water used for this purpose is admitted into the container or containers in such a manner that it also flushes the inlet openings through which the developer liquid or component enters the respective container. If more than one inlet opening is provided in a container, then a collecting chamber may be provided interposed in the incoming conduits upstream of the inlet openings, and the flushing water may be admitted into this collecting chamber from which it is distributed to the respective inlet openings. The chamber and portions of the incoming conduits are advantageously provided in a cover of the respective container, which cover may be removably accommodated on the container.

The economics of operation of the novel apparatus, and the efficiency thereof, can be further improved if a common flushing system is provided which is common to both the container or containers and the unit. This has the advantage that all components in need of flushing can be flushed readily and efficiently, so that the individual developing processes are not followed by an undesired admixture of various chemical constituents of the developer, and that a change of the ratio of the constituent components of the developer in the unit by the dripping of residual liquid out of one of the containers can be reliably avoided. Also, any residue in the

various conduits connecting the components in question can be readily removed in this manner.

As is well known to those skilled in this art, in developer units of the type used in the apparatus according to the present invention there is always the possibility that the outlet provided in the unit may become clogged. This would lead to a backing-up of the developer liquid and/or any flushing water admitted into the unit and would cause significant problems. Such difficulties can be avoided if, according to a further concept of the invention, a signal-generating arrangement is provided which operates to generate a signal if the level of liquid in the developer unit is exceeded. In the event this excess level is sensed while the unit contains developer, the generated signal may be used to trigger an increased admission of water in order to prevent an excessive concentration of developer and possible disadvantageous consequences with respect to the film material. In the event the level of liquid is sensed while flushing water is admitted, the signal can be used to direct partial or complete termination of the admission of flushing water into the unit. In the former case, incidentally, the signal can also be used to interrupt partially or completely the admission of additional developer into the unit. A pump may be provided for pumping out the contents from the unit, and the signal may be used either to turn on the pump or to speed up the operation of the same. In addition, the same or another signal produced at the same time can be used to produce a warning, for instance to trigger an optical or acoustic warning.

On the other hand, it is desirable that a constant alternating switch switching on and off of the system (the pump, the admission of further liquid or the like) be avoided. For this reason the switching-off of the pump (once the latter has been switched on by the signal), or the admission of liquid flow into the unit will advantageously be permitted only after the level of liquid in the unit has dropped below a preset level which is lower than that at which the triggering was generated.

The control of the flow of liquid into or out of the developer unit itself can also be sensed by an appropriate sensing arrangement, advantageously further feelers which extend to different levels into the liquid reservoir of the unit and which control an electrical circuit, particularly in such a manner that the operation of the liquid-draining pump (or its speeding up), or the shutting-off of liquid inflow into the developing unit will be triggered only after the level of liquid in the reservoir has dropped below the lowest feeler, it being assumed again that the feeler extends from above and has its lower end at different levels.

It is advantageous if the supplying means with the developer receptacle or receptacles and/or the developing unit itself—preferably together with the associated conduits and pumps—form a cabinet-like unitary system for reasons of compactness and neatness of appearance. In such a system the container or containers may for instance be located below the remainder of the supplying means.

As is also well known to those skilled in the art, the quality of the developing work on the film materials, and consequently the quality of the photographs obtained, depends to a substantial extent upon maintaining a certain temperature of the developer liquid. To assure the maintenance of such a temperature a thermostatic arrangement is provided according to the present invention which maintains the temperature of the developer in the single container, or of the various liquid constituents of the developer in several containers, at a preselected level. In addition, an air circulating system may be provided and heating and/or cooling devices and air impellers such as fans or the like which circulates air of desired temperature. The containers, or rather their chemical contents, may be protected against contact with oxygen in a very simple manner, namely by providing floats and/or covers on the containers.

It is also possible according to the invention to provide a programming device which provides for a programmed admission of developer components from the source of supply to the supplying means, for a metering of the components, for a forwarding of the components into the developer unit, and for the removal of the developer from the developer unit, including the admission and removal of flushing water to the supplying means and the developer unit itself. This further improves the economy and efficiency of operation as well as assuring a uniformly high quality of developed film material. A series of control elements, for instance switches or pushbuttons, may be provided by means of which to select desired programs and to initiate operation of the same, depending upon the requirements of the given circumstances.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is a schematic of an apparatus according to the present invention;

FIG. **2** is a diagrammatic longitudinal section through the developer unit of the apparatus;

FIG. **3** is a diagrammatic axial section through a supplying means of the apparatus according to the present invention;

FIG. **4** is a longitudinal section through a feeler used in the embodiment of FIG. **3**;

FIG. **5** is an electrical circuit showing the operation of the supplying means of FIG. **3**;

FIG. **6** is a view similar to FIG. **5** but illustrating the circuitry of the electrical control system for a liquid-removing pump used in the developer unit of FIG. **2**;

FIG. **7** is a perspective view of a cabinet, with FIG. **7***a* illustrating a cabinet for the chemical components of the developer liquid and FIG. **7***b* illustrating a cabinet console with the supplying means of FIG. **3**;

FIG. **8** is a diagrammatic view of a structural unit containing the constituent components of the apparatus according to the present invention; and

FIG. **9** is a section taken on line **9—9** of FIG. **8**.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Discussing the drawing now in detail, it will be seen that FIG. **1** illustrates schematically and in form of an overview an apparatus according to the present invention, showing the connection between the various components. It is preferred, but not necessary, that the ap-

paratus be in form of a unitary assembly such as is shown in FIG. 8.

Reference numeral 10 designates a cabinet containing the source of developer chemicals, namely a plurality of individual tanks 11. There is no need to go into details concerning the particular chemicals; these are well known. Reference numeral 19 designates in toto a supplying means, that is a metering arrangement having a plurality of metering heads or containers 20. In the present embodiment there are two of these containers 20 provided. Conduits 12 and respective branch conduits (two of them are shown) 13 and 14, as well as pumps 15 and 16 and conduits 17 and 18 are provided for supplying chemicals from the tanks 11 to the containers 20. A film developer unit 22 is provided having a developing chamber 23 in which there are located developing devices 24, preferably, but not necessarily, in form of horizontally positioned developing tubes. Supply conduits 21, which may be opened and closed by valves 21*a* that may be electromagnetically controlled, connect the containers 20—preferably at the lowest points thereof—with the unit 22 so that the chemicals—usually liquids—flow through the conduits 21 into inlet funnels 25 which are connected via conduits 26 with the devices 24.

The exposed film material or photographic material which is to be developed, is located in the tubes of the devices 24 and may for instance be distributed about the inner circumferential surfaces thereof. A drive 24*a* is provided and, as FIG. 2 shows, it causes the tubes 24 to alternately turn in one direction x_1, and then in the other direction x_2 through a certain portion of arc, so that the photographic material to be developed is made to constantly pass through the developer liquid accommodated in the tubes 24 and filling the same in part. An arrangement 24*b* may be provided which imparts a longitudinal rocking movement to the tubes 24.

Developer liquid becomes spent over a period of use, and the spent liquid is removed from the chamber 23 via a discharge pump 27 and an outlet conduit 28. The pump 27 can be supplemented with a direct discharge conduit 28*a* through which liquid can be discharged without the use of the pump, and in addition or in place of the conduit 28*a* there may be an overflow provided at an appropriate level in the lower portion of the chamber 23 or the reservoir 23*a* thereof in which the developer liquid is accommodated.

In equipment of the type in question it is necessary that the system be flushed periodically in order to remove residual developer chemicals. A flushing system for this purpose, using usually water in accordance with conventional practice, is illustrated in broken lines in FIG. 1 and provided with a supply conduit 29 which may be connected with a tap or another source of water. A conduit 30 branches off the conduit 29 through each of the container units or devices 24 with whose inlet funnels 25 they communicate via valves 32 and conduits 33. Additional branch conduits 31 branch off the conduit 29 and communicate with the respective containers 20 via valves 34 and conduits 35. Overflow conduits 36 are provided which prevent the liquids, that is chemicals or flushing water, from exceeding a certain level in the containers 20. Advantageously these overflow conduits are connected with the containers 20 at the highest point of the interior 20*a* thereof so that the entire height of the respective container 20 can be used for accommodating liquid to be metered.

Referring now to FIGS. 3–5, it will be seen that in these figures I have illustrated details of the supplying means 19. The illustrated container 20 has a hollow, preferably removable, cover 37, the hollow interior 38 of which can serve as a collector for the flushing water which is admitted via the conduit 35. The inlet conduits 17 for the developer chemical or chemicals extend in part through the space or chamber 38, such parts being identified with reference numeral 39 and having the outlet openings which communicate with the interior 20*a*. Conduits 17 are bent in a downward curve as close as possible above the upper side of the cover 37, extending downwardly to the pumps 15 and 16; the purpose of this is to assure that in the event the supply of liquid through these conduits is interrupted, only a relatively small amount of liquid remains in the conduits in those portions thereof from which it can flow into the container 20.

Annular openings 38*a*, surrounding the outlet openings of the portions 39, establish a communication between the space 38 and the interior 20*a* of the respective container 20. The purpose of this is to assure that the flushing water which is discharged into the space 38, whether under pressure or not, will enter directly into the outlet openings of the conduits 17 and thus flush these outlet openings before it enters the interior 20*a* of the container 20. A valve 21a is provided which controls the connection of the interior 20*a* with the unit 23 via the conduit 21. A solenoid or similar device is provided which controls the opening and closing of this valve, advantageously automatically in dependence upon a preselected program as will be discussed later.

The space 20*a* is subdivided by a baffle 41 into an inlet compartment 42 into which liquid is discharged by the conduits 17 from above, and into a sensing compartment 43 locating with the compartment 42 and into which the individual feelers 44 of the sensing system extend from above to different depths. Also there is provided a counter electrode 45 serving as a counter pole to the feelers 44. It is advantageous if the feelers 44 and the electrode 45 are mounted in the cover 37, advantageously in such a manner that they can be removed with the cover and then be removed from the same. The number of feelers 44 to be provided can be selected at will, so that the metering can be very precisely controlled, depending upon the number of feelers. The latter can also be made adjustable so that they can be inserted to greater or lesser depths in the container 20, permitting a precise height adjustment of their contacts 46 within the container 20.

It will be appreciated that the illustrated arrangement of the feelers 44 is exemplary only. They can also be arranged in other ways as long as it is assured that their contacts 46 are located at different levels within the compartment 43 so that the liquid level 47 rising in the compartment 43 will reach the individual contacts 46 of the various feelers 44 at different times. The electrode 45 extends over a height which corresponds at least to the difference between the highest and lowest contact 46.

One of the feelers 44 is illustrated on an enlarged scale in a longitudinal section in FIG. 4. It will be seen to have an interior electrode 48 which may, for instance, be of special steel, the lower free end of which

forms the contact **46.** The electrode **48** is located within a tube **49** surrounding it with spacing, and in the space between them is insulating material **50,** for instance a polyester resin or the like. The lower end of the tube **49** is open and surrounds the contact **46** to a greater or lesser degree. It is also beveled at **51,** the purpose being to prevent the formation of drops at the lower end in the event the liquid level **47** descends below the level at which the contact **46** is located. It is also advantageous if, as shown in FIG. **4,** the insulating material **50** is upwardly recessed from the contact **46** to assure that in the lower region of the tube **46** an air bubble **52** can be formed, preventing electrical shorting between the contact **46** to the liquid at the wall of the tube.

FIG. **5** shows a circuit diagram for the supplying means. The electrodes **48** with the contacts **46** of the feelers **44** (the latter are not shown) extend into the compartment **43,** together with the electrode **45,** all of them from above. Electrical energy is supplied at **53,** for instance representative of a source supplying alternating current at 220 volts, although this is of course only exemplary. The motor **54** is energized by the source of drive **1** of the pumps **15** or **16.** If desired, individual motors can be provided for each of the pumps, or motors **54** can be utilized which drive the pumps **15, 16** in groups or together in which latter case, however, special circuitry would have to be provided so that a pump selected for individual operation in accordance with a program could be driven alone or in conjunction with other individually selected pumps, whereas the remaining pumps would not be driven or would not supply liquid to the supplying means.

Switch **55** in the circuit **56** of the motor **54** can be operated to be switched on and off by a relay **57,** so as to energize and deenergize the motor **54.** The relay **57** is positioned in a low-voltage circuit **58** which includes the secondary side of a transformer **59** but is also connected with the source **53.** A conductor of the circuit **58** is connected with the counter electrode **45** which may, for instance, constitute the negative pole of the circuit **58,** and the conductor extends to individual contacts **60** which can be electrically connected with the electrodes **48** via individual switches **61.**

If one of the switches **61,** for instance the one that is designated with reference numeral **61***a*, is moved to closed position **61***a'* manually or automatically, and if the compartment **43** is empty, then the circuit **58** remains interrupted. This interruption continues even while liquid (for instance one of the chemicals from one of the tanks **11**) is admitted into the container **20,** as long as the level of liquid remains below that of the contact **46***a* that has been selected with the switch **61***a*. However, as soon as the level *h* is reached at which the liquid wets the contact **46***a*, the circuit between the counter electrode **45** and the contact **46** is closed, causing the relay **57** to open the switch **55** and to deenergize the motor **54.** This in turn results in deenergization of the pump **15** or **16** driven by the motor **54** and in a termination of the supply of liquid via the associated conduit **17** into the container **20.**

Referring now to FIG. **2,** it will be seen that here there is illustrated an arrangement **62** which has been diagrammatically shown in FIG. **2** also, and which is accommodated in the lower reservoir compartment **23***a* of the chamber **23** with which the outlet conduits **28** and **28***a* (the former with the pump **27**) are in communication. The arrangement **62** may be used to switch on the pump **27,** or to cause it to speed up operation, or again to close or partially close a valve in one of the conduits leading to the chamber **23,** for instance the valve **32** in the conduit **33** (see FIG. **1**) or a valve in the conduit **21** through which a mixture of flushing water and spent developer liquid is discharged during the flushing operation. This is to take place as soon as the level of liquid in the reservoir **23***c* reaches a certain predetermined level, the purpose to be sure that overflowing of the compartment **23** by liquid issuing from the conduit or conduits **33** and/or the conduit or conduits **21** is prevented.

In FIG. **6,** reference numeral **53** is again representative of the source of electrical supply, reference numeral **63** designates a transformer the primary side of which is connected with the source **53.** A circuit **64** connected with the source **53** also includes the motor **65** of the pump **27,** which can be energized or deenergized by a switch **66** closing the motor circuit. Conductors **67** and **68** are connected with the secondary side of the transformer **63** and the conductor **67** extends to an electrode **69** acting as a feeler and which may for instance be a negative electrode, whereas at the conductor **68** with its branch conductor **68***a* and **68***b* is electrically connected with two additional feeler electrodes **70** and **71** which may be positive if the electrode **69** is negative. The electrodes have contacts **72, 73** and **74,** respectively, which extend from above to different levels into the reservoir **23***a*. A relay **75** provides for a connection of the circuit with the electrodes **70** and **71,** and via a switch **76** arranged after the relay **75** with the electrode **70.** If the switch **76** is closed, the electrode **70** is connected with the conductor **68.**

A further conductor **68***c* extends to a third positive feeler electrode **78** having a contact **79.** A relay **77** is interposed in the conductor **68***c*. FIG. **6** indicates that the contacts **72, 73 74** and **79** are located at different levels in the reservoir. A switch **80** interposed in a circuit **81** is activated by relay **77,** and the circuit may be utilized to for instance energize or deenergize a magnet **82** of a magnet valve **32** in the conduit **33,** as well as to activate or deactivate a switch **83** in a circuit **84** which triggers a warning signal **85.**

As long as, with this arrangement, the level of liquid in the reservoir **23***a* is below the contact **73,** the circuit which in FIG. **6** is connected via the transformer **63** to the source **53** is without current, because the current path between the negative contact **72** and the positive contact **73, 74** and **79** is interrupted. Only the valve **32** is connected via switch **80** and circuit **81** to the supply **53** and is in open condition, so that flushing water can freely enter—for instance via the conduit **33**—into the chamber **23.**

When the level of liquid reaches the contact **73,** the circuit continues to remain interrupted because the switch **76** is open. However, when the level of liquid has risen to reach the contact **74,** then the circuit between the contacts **72** and **74** will be completed and relay **75** will become energized to close the switch **66** and the switch **76.** Closing the switch **66** causes the motor **65** of the pump **27** to become energized, so that the pump pumps liquid out of the reservoir **23***a* with the result that the level therein will drop. On the other hand, the switch **76** was closed at the same time switch **66** was closed, and this closed the circuit for the electrode **70** having the contact **73,** so that even after the

level of liquid drops below the level of the contact **74**, a circuit remains completed between the contacts **72** and **73**. As a result of this the pump **27** will continue to operate even after the level of liquid drops below the contact **74**, and in fact until the level of liquid drops below the contact **73**. Only then will the pump be deenergized, and this delay has been incorporated in the construction to prevent constant alternating switching on and off of the pump **27** as soon as the level of liquid exceeds or drops below the contact **74**.

Of course, malfunctions in the operation of the pump **27** can occur, or the inflow of liquid can be so substantial that the pump **27** might not be able to cope with it. In any case, the level of liquid in the reservoir **23** would continue to rise despite the operation of the pump **27** (or with the pump **27** being inoperative) above the contact **74**. If this takes place, and the level finally rises to the contact **79**, the circuit via the latter is completed, causing the relay **77** to open the switch **80** and to close the switch **83**. Opening of the switch **80** results in closing of the valve **32** in the inflow conduit **33** for flushing water. Closing of the switch **83** activates a warning signal **85**, for instance an optical or an acoustical signal which indicates that the outflow of liquid from the reservoir **23***a* does not take place properly and that there is a danger that overflowing might occur. This will then result in alerting the operator to the fact that necessary corrective measures must be taken at once.

Coming now to FIG. **7**, it will be seen that in the portion **7***a* thereof there is shown the console **10** with the tanks **11**, the pumps **15** and **16** and the conduit **17**. The front wall of the console and one of the side walls **86** have been shown partially removed for the sake of clarity. An upper portion **87** (shown in FIG. **7***b*) can be placed atop the console **10** and contains the supplying means **19** with the containers **20**. All control elements necessary for controlling the operation of the apparatus are mounted at the front wall of the console, including a program control device **88** which can accept a control card **89** on which the computer program for the program-controlled operation of the apparatus may be encoded, for instance in form of punches, magnetically or otherwise. A series **90** of switches, for instance push-button switches, permits a selection of the metered quantities of chemicals, by selecting the respective feeler **44** in response to depressing of the appropriate switch.

FIGS. **8** and **9**, finally, show an assembly according to the present invention, that is a construction in which all of the constituent components of the apparatus are combined in a unitary assembly. Reference numerals **10**, **11**, **88** and **90** designate the components previously discussed. The upper portion **87** of the assembly accommodates the components **88** and **90**. A unit **91** is placed onto the right-hand compartment on the right-hand console **10** and may also serve to accommodate tanks **11**. Two pivotable overflow tubes **21** are provided which can discharge into the (not illustrated in FIG. **8**) inlet funnels which supply the metered chemicals into the units **24** located in a console **92** surrounding the developing chamber **23**.

It is advantageous to provide an air circulation system circulating the air as indicated by the arrows, and for instance a ventilator, fan or the like can be used for this purpose. It is well known that the temperature of the developer chemicals should be controlled as closely as possible to obtain the best developing results. The ventilator **93** serves the purpose of circulating the air through the console or consoles **10** to maintain the temperature therein as constant as possible. Channels are provided between the tanks and the walls of the console or consoles **10** and a channel **94** connects these with the ventilator **93** so that the latter can pass air around the tanks **11**. A heating device **95** and a cooling device **96**, both well known in the art, can be provided. A compressor **97** serves to remove heat from the cooling device **96**. A thermostat **98** is provided sensing the temperature in the console or consoles **10** and controlling the operation of the devices **93**, **95** and **96** in order to maintain the desired temperature constant. In the lower portion of the console or consoles **10** there will be provided a drip pan **100** which can receive condensation. A timer **90***a* can be connected into the circuit in order to vary the programmed control times. An individual tank **11** is shown in diagrammatic section in the upper portion **91** shown in FIG. **1**, and the liquid chemicals in the tank **11** are designated with reference numeral **11***a*. A float **101** is provided which prevents the entry of air to the chemicals, because this could result in deterioration of the chemicals. A dust cover **102** is provided which prevents the entry of dust or other contaminants into the interior of the tank **11**.

It will be understood that each of the elements described above, or two or more together may also find a useful application in other types of constructions differing from the type described above.

While the invention as been illustrated and described as embodied in an apparatus for developing of photographic materials, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

I claim:

1. In an apparatus for developing photographic materials, particularly color films, a combination comprising a film developing unit; a source of developer; supplying means for supplying metered quantities of developer from said source to said unit; selecting means operatively associated with said supplying means for selecting the magnitude of said metered quantities; sensing means for sensing the developer content in said supplying means and for controlling operation of said supplying means in dependence upon the sensed content and within the magnitude selected by said selecting means; and signal-generating means for generating a control signal for controlling the inflow of medium into said unit in response to the contents of said unit exceeding a predetermined level, and for also generating a warning signal at least substantially simultaneously with said control signal.

2. A combination as defined in claim **1**, said supplying means comprising at least one container and communicating with said unit for permitting the flow of de-

veloper to the latter; and wherein said sensing means comprises electric circuit means including two feelers extending into said container and each having a free end located at a different predetermined level therein, said electric circuit means being operative for interrupting the flow of developer to said unit in response to the level of developer in said container reaching one of said free ends.

3. A combination as defined in claim **2**, said circuit means including a source of electrical energy, each of said feelers being connected with one pole of said source of electrical energy; and wherein said circuit means further includes an electrode in said container connected with the other pole of said source of electrical energy and having a free end portion located at least at the lowest of said predetermined levels.

4. A combination as defined in claim **2**, said container having inlet means communicating with same; and further comprising a baffle interposed between said inlet means and said feelers for shielding the latter against the turbulence of incoming developer.

5. A combination as defined in claim **2**, said container having an upper end; and wherein said feelers extend downwardly in said container from said upper end.

6. A combination as defined in claim **2**, said container having a lowest portion provided with an outlet; further comprising a normally closed valve in said outlet; and operating means for opening said valve.

7. A combination as defined in claim **6**, wherein said operating means comprises an electromagnet controlled by said sensing means.

8. A combination as defined in claim **6**, and further comprising a flushing system common to said supplying means and said unit for flushing developer from the same.

9. A combination as defined in claim **4**, said unit being located at a level lower than said supplying means and having at least one inlet funnel; and wherein said supplying means comprises at least one outlet conduit for said developer to and from a position in which it in fluid communication with said inlet funnel.

10. A combination as defined in claim **1**, further comprising programming means for programmed control of the supply of developer to said supplying means from said source, supply of said metered quantities to said unit, and admission and removal of flushing water to said supplying means and said unit.

11. A combination as defined in claim **10**, said programming means including switching means operative for selecting different programs.

12. A combination as defined in claim **10**, further comprising a console accommodating said source, supplying means and unit; and wherein said programming means is carried by said console.

13. In an apparatus for developing photographic materials, particularly color films, a combination comprising a film developing unit; a source of developer; supplying means for supplying metered quantities of developer from said source to said unit; selecting means operatively associated with said supplying means for selecting the magnitude of said metered quantities; sensing means for sensing the developer content in said supplying means and for controlling operation of said supplying means in dependence upon the sensed content and within the magnitude selected by said selecting means; and signal-generating means for generating a control signal for controlling the inflow of medium into said unit in response to the contents of said unit exceeding a predetermined level, said unit having a reservoir for said developer, and said signal-generating means being at least in part located in said reservoir.

14. A combination as defined in claim **13**; and further comprising a pump controlled by said control signal for removing contents from said unit in response to generation of said control signal.

15. A combination as defined in claim **13**, and further comprising a pump controlled by said control signal for removing contents from said unit in response to generation of said control signal and at least until the level of contents has dropped below said predetermined level.

16. A combination as defined in claim **15**, said signal-generating means comprising an electric circuit and a plurality of electrode members connected in said circuit and having free ends located at different levels in said reservoir.

17. A combination as defined in claim **13**, said unit having a reservoir for said developer; further comprising a pump for removing the contents of said reservoir from the same at least in part and at least when such contents exceed a predetermined level.

18. A combination as defined in claim **13**, wherein said source, supplying means and/or unit together form a cabinet-shaped structural assembly.

19. A combination as defined in claim **18**, wherein said source is located in a top portion and said supplying means is located in a bottom portion of said assembly.

20. A combination as defined in claim **18**, further comprising thermostatically controlled means operative for maintaining the temperature of at least said source at a preset level.

21. A combination as defined in claim **20**, said thermostatically controlled means comprising heat-exchange means.

22. A combination as defined in claim **21**, said thermostatically means further comprising circulating means for circulating air in contact with at least said source.

23. In an apparatus for developing photographic materials, particularly color films, a combination comprising a film developing unit; a source of developer; supplying means for supplying metered quantities of developer from said source to said unit, said supplying means comprising at least one container and communicating with said unit for permitting flow of developer to the latter; selecting means operatively associated with said supplying means for selecting the magnitude of said metered quantities; and sensing means for sensing the developer content in said supplying means and for controlling operation of said supplying means in dependence upon the sensed content and within the magnitude selected by said selecting means, said sensing means comprising electric circuit means including two feelers extending into said container and each having a free end located at a different predetermined level therein, said feelers each including a conductive electrode member and a tubular member surrounding said electrode member electrically insulated therefrom and having a bevelled tip, and said circuit means being operative for interrupting the flow of developer to said unit in response to the level of developer in said container reaching one of said free ends.

24. A combination as defined in claim 23, wherein said feelers are carried by a cover of said container.

25. A combination as defined in claim 23, said container having an upper end portion; and further comprising an overflow opening provided in said upper end portion for overflowing of water used to flush developer from said container.

26. A combination as defined in claim 23, said tubular members being open at said tip; and wherein each of said feelers includes electrically insulating means interposed between the respectively associated tubular and electrode members and terminating inwardly of the respective open bevelled tip.

27. In an apparatus for developing photographic materials, particularly color films, a combination comprising a film developing unit; a source of developer, including a reservoir; supplying means for supplying metered quantities of developer from said source to said unit; selecting means operatively associated with said supplying means for selecting the magnitude of said metered quantities; sensing means for sensing the developer content in said supplying means and for controlling operation of said supplying means in dependence upon the sensed content and within the magnitude selected by said selecting means; a pump; and signal-generating means for generating a control signal for controlling the inflow of medium into said unit in response to the contents of said unit exceeding a predetermined level, said signal-generating means controlling said pump so that the latter removes contents from said unit in response to generation of said control signal and at least until the level of contents has dropped below said predetermined level, said signal-generating means comprising an electric circuit and a plurality of electrode members connected in said circuit and having free ends located at different levels in said reservoir for said developer, including a first electrode member having its free end located at the highest level to which liquid is to rise in said reservoir and operative for terminating inflow of liquid into said reservoir in response to the contents therein reaching its free end, a second electrode member having its free end located at a lower level, and a third electrode member having its free end located at an intermediate level and connected with said second electrode member in such a manner as to initiate operation of at least said pump when the level of contents reaches said free end of said third electrode member and continue the initiated operation at least until such level drops below said free end of said third electrode member.

28. A combination as defined in claim 27, said supplying means further comprising a container, at least one conduit communicating with an upper end of said container, and having an outlet portion provided with a discharge opening directed into said container, a conduit portion extending downwardly of said upper end outside said container, and a bend portion connecting said outlet portion and said conduit portion; said pump being interposed in said conduit portion.

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