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Dye and ink refining system

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GB 2 146 037 B

GB A 2015018
GB 0881855
EP A1 0059782
EP A1 0041240
K. Venkataraman, "The Chemistry of Synthetic Dyes", Academic Press, 1952, Volume 11, pages 1331-1332.
Kirk-Othmer Encyclopedia of Chemical Technology, Third Edition, (1981), Wiley-Interscience, 1981, Volume 13, page 702.

(58) Field of search
C4P

FIG.1

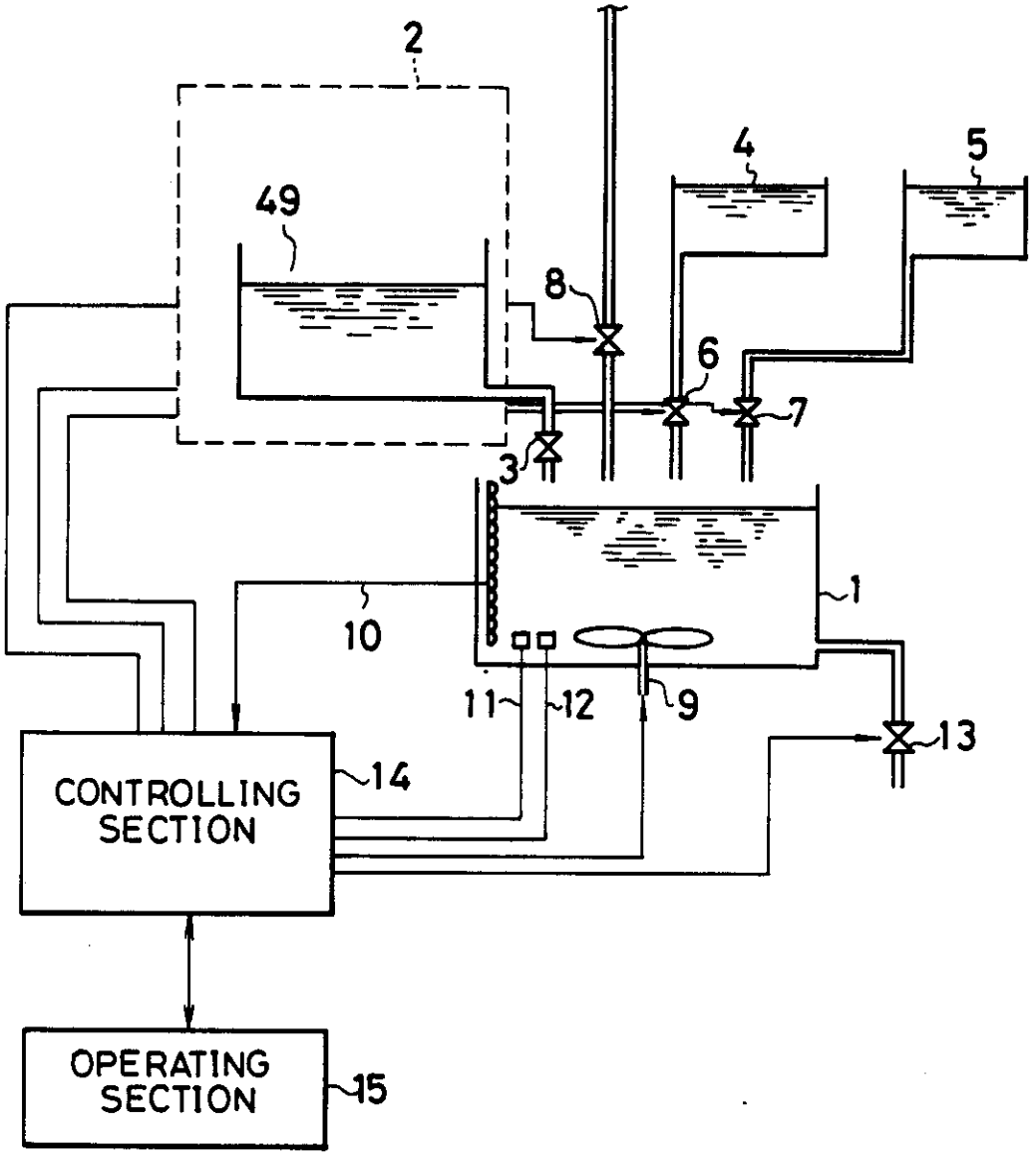
2
49
4
5
8
6
7
3
1
10
11
12
9
13
CONTROLLING SECTION
14
OPERATING SECTION
15

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FIG.2

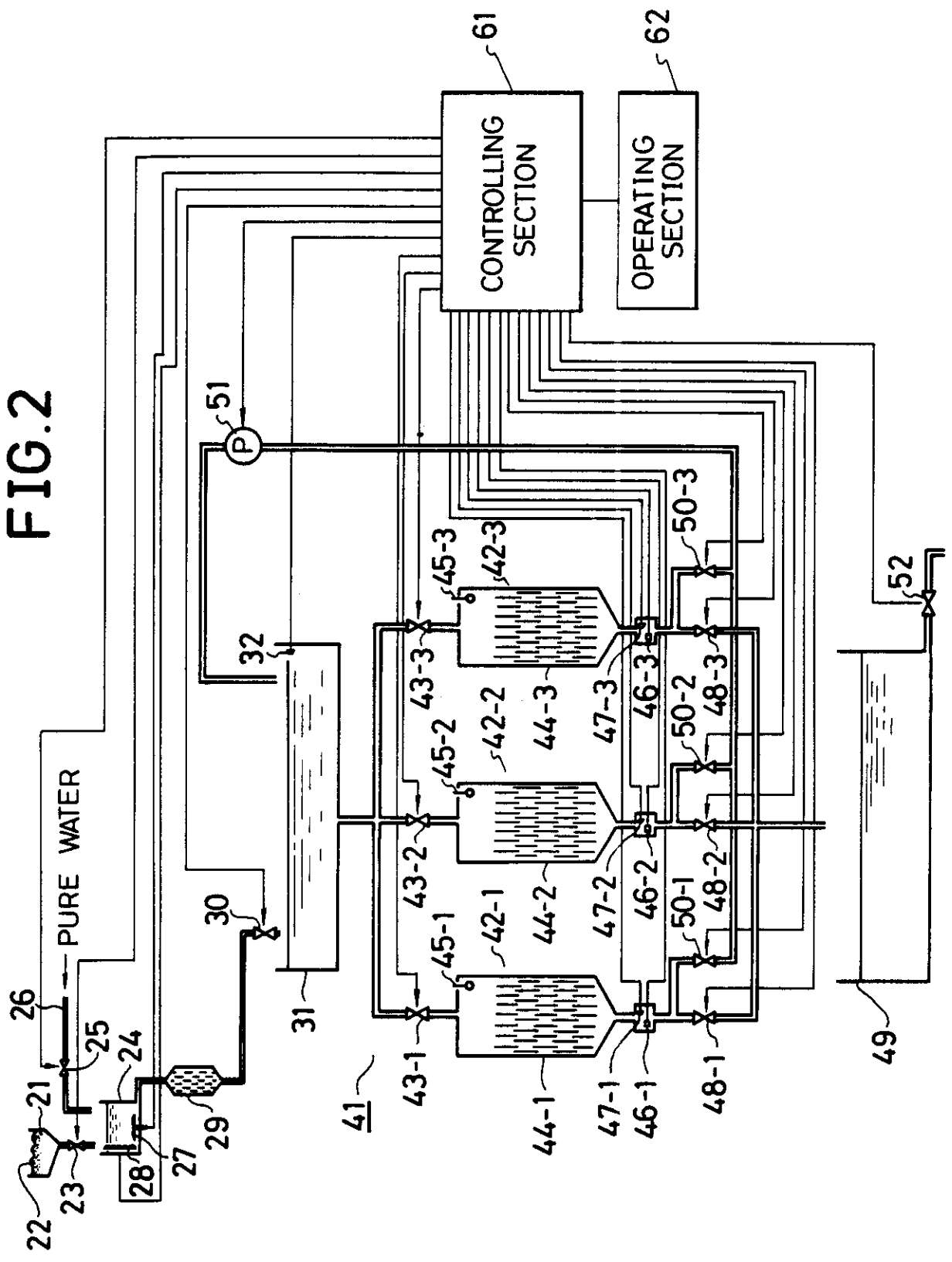

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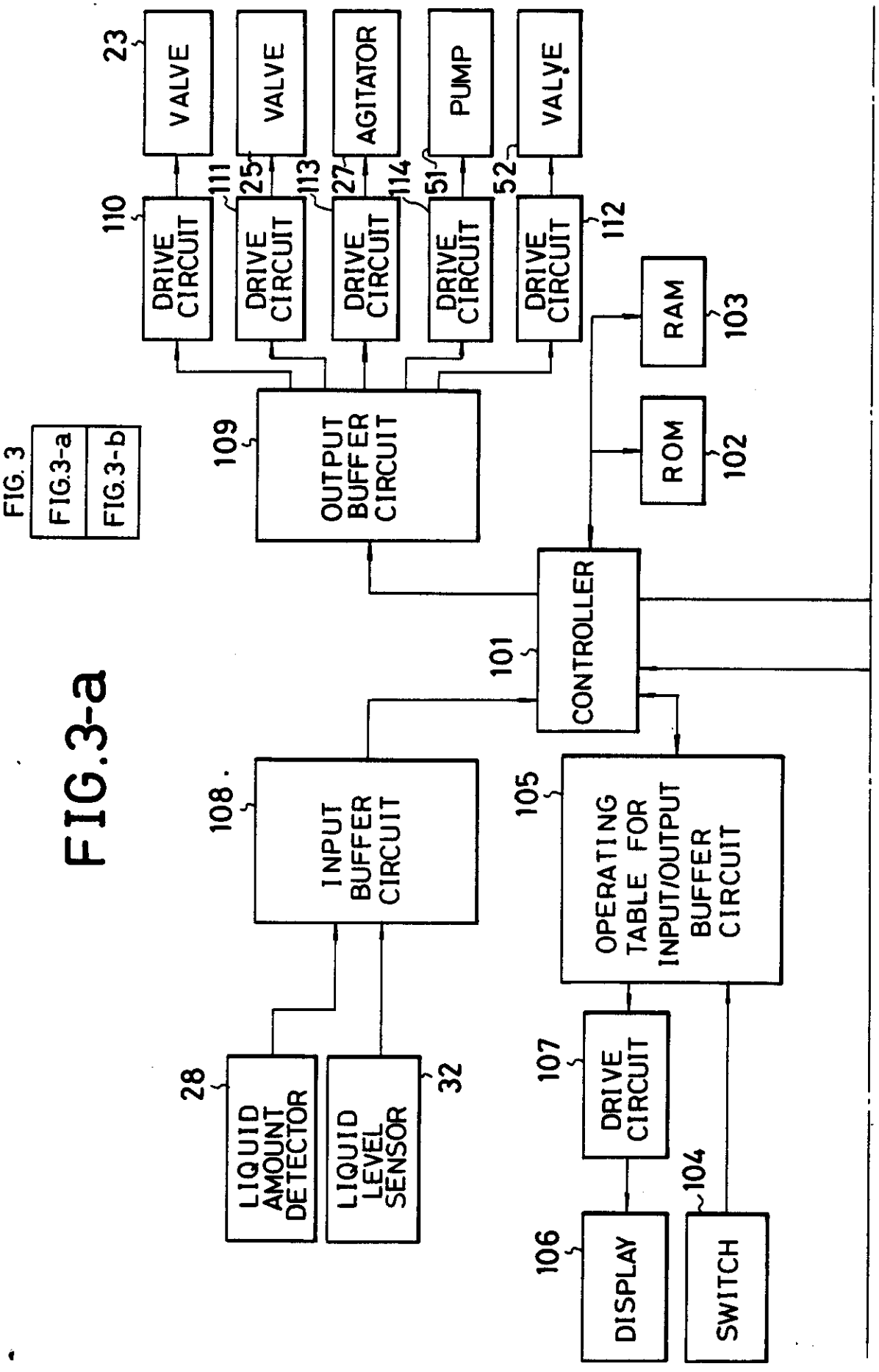
FIG. 3
FIG.3-a
FIG.3-b

FIG.3-a



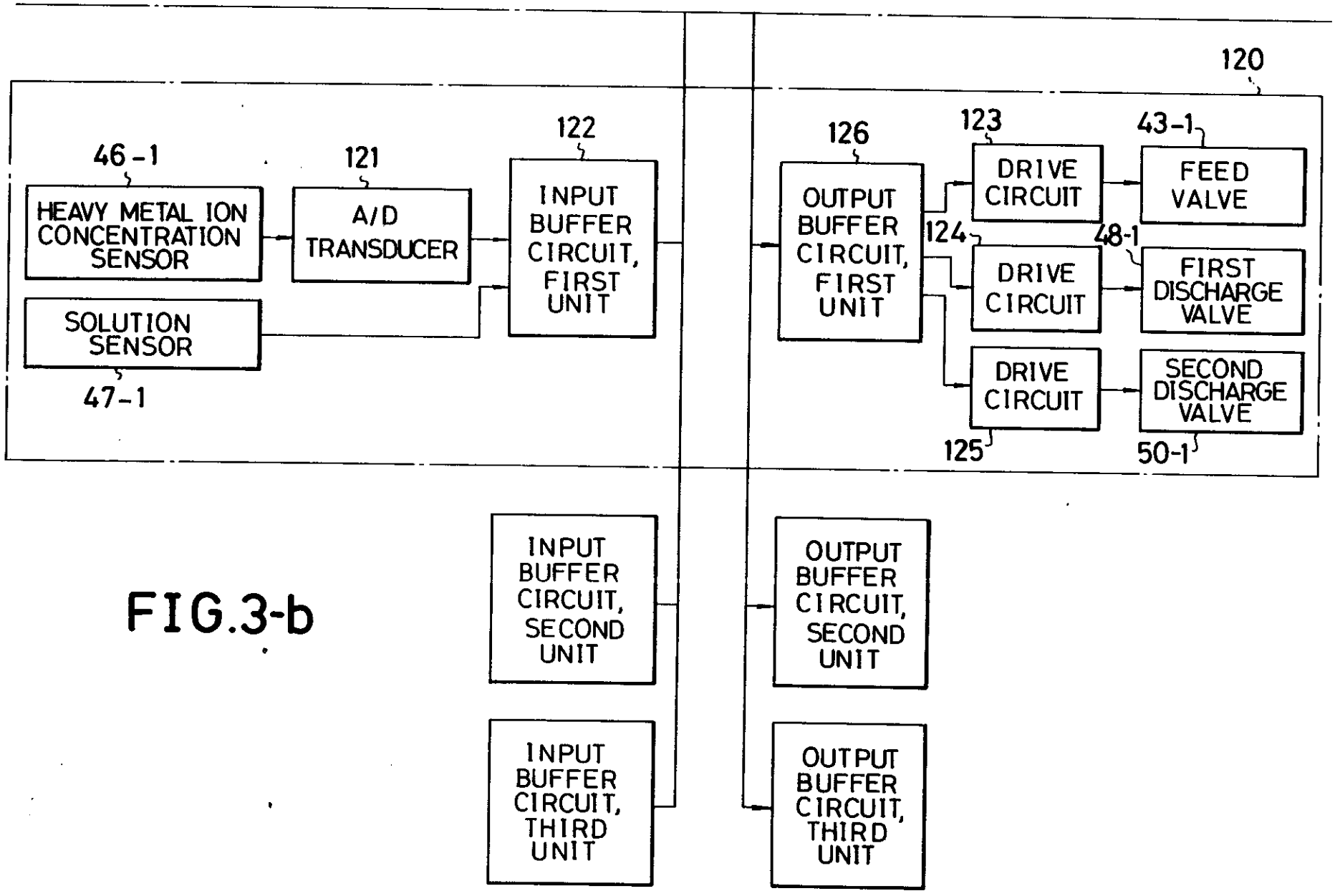


FIG.3-b

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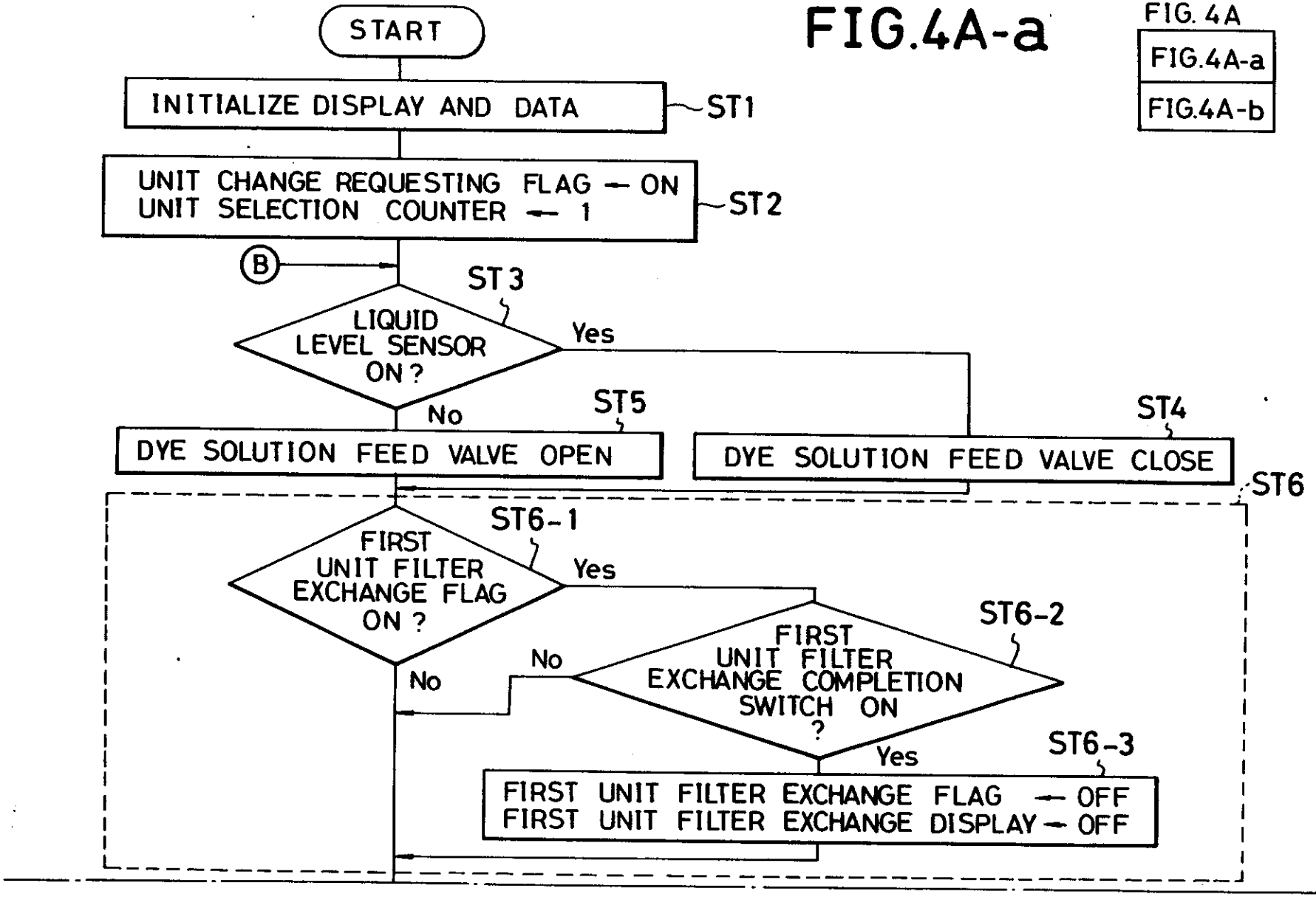

FIG.4A-a

FIG. 4A

FIG.4A-a
FIG.4A-b

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FIG.4A-b

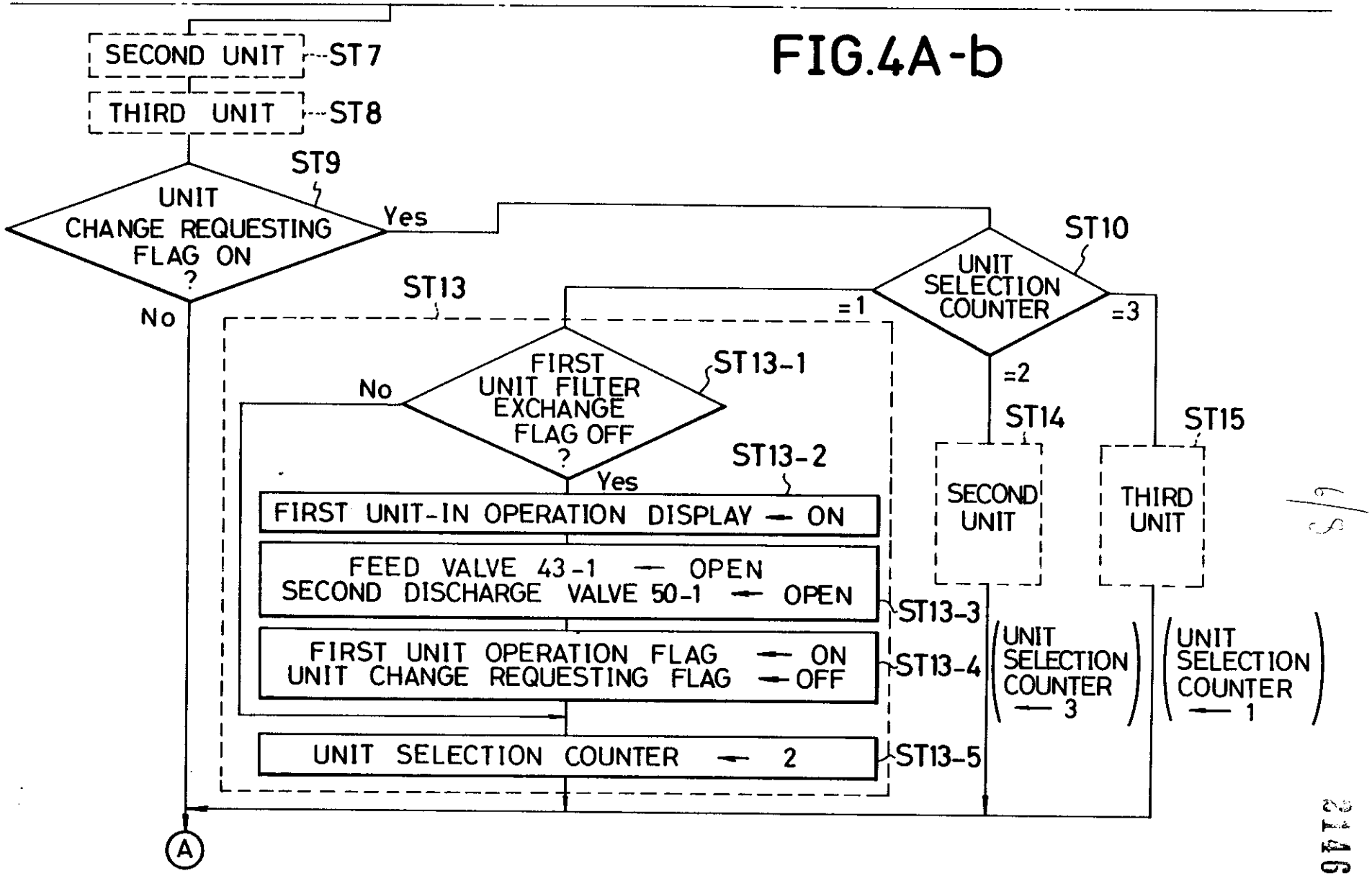

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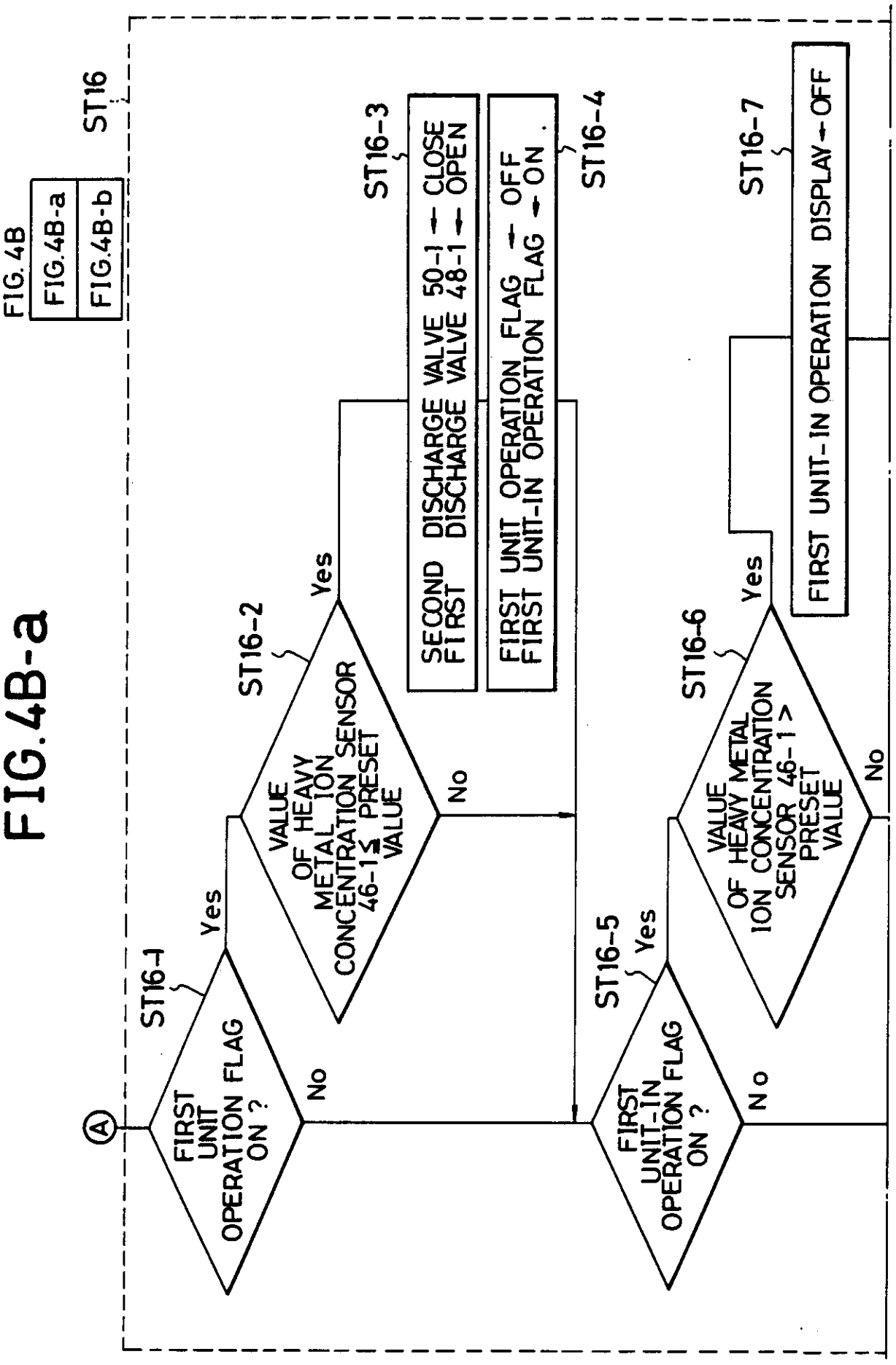
FIG.4B-a



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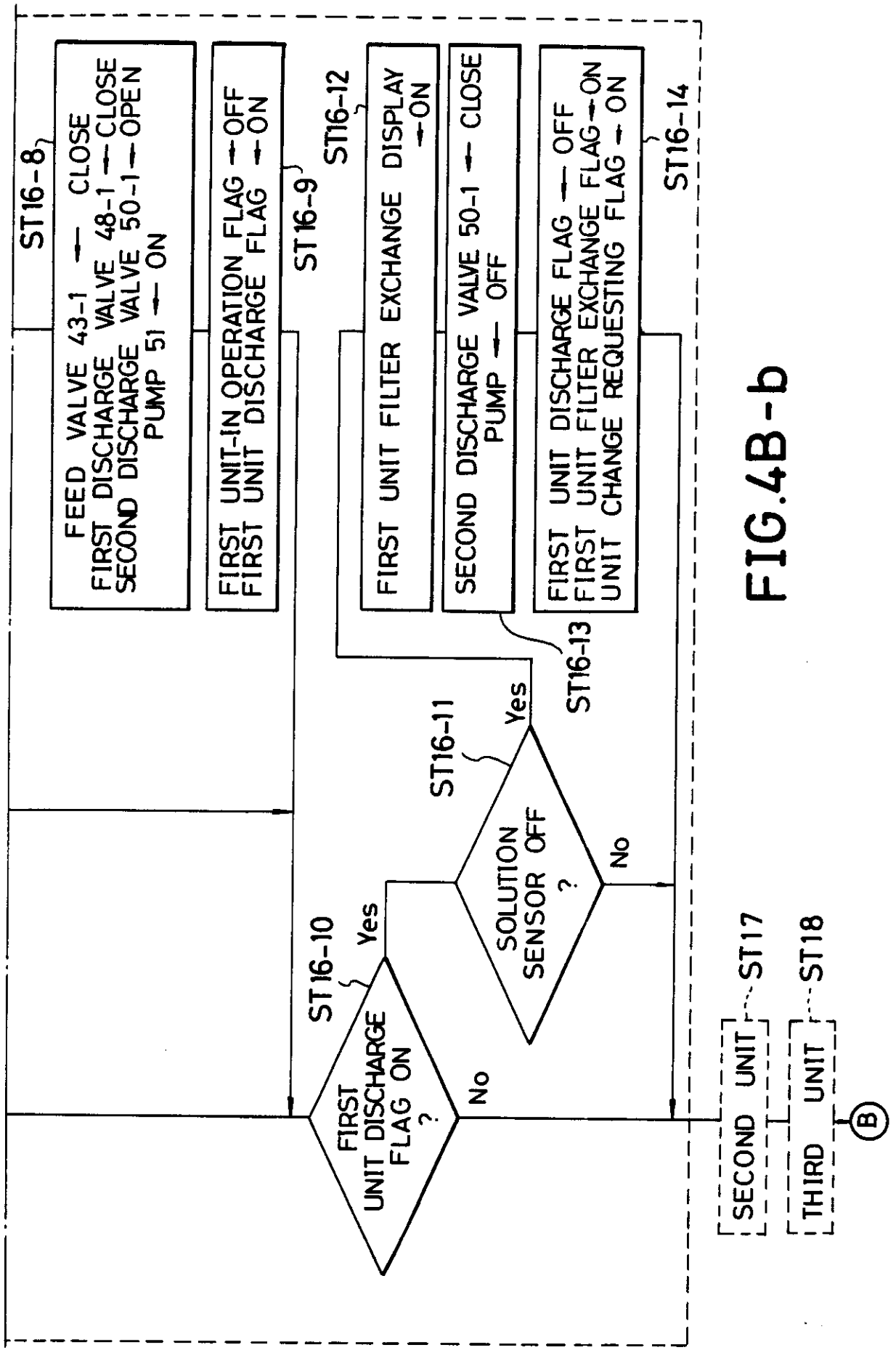

FIG.4B-b

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Dye and Ink Refining System

This invention relates to a dyestuff refining system, and, more particularly, it is concerned with a dyestuff refining system capable of continuously supplying refined dyestuff which is suitable for preparing recording liquid (generally called "ink") adapted to use in ink jet recording, writing implements, and other uses.

Ink to be used for an ink jet recording system which implements recording of information by ejecting ink within a recording head through an ejection orifice by means of vibrations transmitted from a piezo-electric vibrator or other expedients, employs various dyestuffs and pigments which are dissolved or dispersed in a liquid medium such as water or other (e.g. organic) solvent. Similar ink is used in writing implements such as felt pens, fountain pens, etc.

Such ink may comprise the following three chief components: water soluble dyestuff, water as the solvent for the dyestuff, and glycols as a desication-preventive agent.

The water-soluble dyestuff can contain a large amount of inorganic salts such as sodium chloride and sodium sulfate either as by-products of the dye-synthesis, or as added salting-out agents, diluents, or level-dyeing agents.

We have discovered that when recording ink is prepared with use of dyestuff containing such inorganic salts, problems can arise: the inorganic salts can lower the solution stability of the dyestuff in the ink to bring about agglomeration and sedimentation of the dyestuff. Further, in the ink jet recording heads and writing implements, if and when the ink is evaporated in the vicinity of the ejection orifice causing the liquid composition to change, deposition of the inorganic salts can be induced. These phenomena cause clogging to take place at the discharge orifice which is highly undesirable.

We have found that by controlling the inorganic salt concentration within a predetermined maximum when producing the ink (in general, limited

to 0.5 wt.% or less with respect to the total ink composition) these problems can be avoided. We have found such control to be indispensable when the dyestuff available on the general market, which contains therein inorganic salts as impurities, is used for preparation of ink for the ink jet recording as well as for use in writing implements.

An object of the present invention is to provide a system for purifying a dye used for producing ink which is capable of producing ink of high quality suitable for ink jet recording or writing implements, reliably and simply and capable of continuous production under automatic control.

According to the invention there is provided a dye purification system comprising means for producing a solution of the dye and separation means including an ion-exchange resin for capturing heavy metal ions in said dye solution, said separation means including valve means for separating dyestuff solution in which the concentration of heavy metal ions is at or below a predetermined value from dyestuff solution in which the heavy metal ion concentration is above the predetermined value.

The invention includes an ink production system comprising a dye purification system as described above, and an ink preparing section which

prepares ink with the purified dye solution discharged from said system.

The invention also includes a method of manufacturing ink in which, prior to the addition of further ingredients, a dye solution is purified by the reduction of heavy metal ions by ion exchange on an ion exchange resin to maintain the heavy metal ion concentration below a predetermined value.

In the drawings:-

Fig. 1 is a schematic flow chart showing an example of the device according to the present invention;

Fig. 2 is a schematic flow chart of the means for purifying dye in the device shown in Fig. 1;

Fig. 3 composed of Figs. 3-a and 3-b is a block diagram showing the controlling section in the device shown in Fig. 1; and

Fig. 4A composed of Figs. 4A-a and 4A-b and Fig. 4B composed of Figs. 4B-a and 4B-b are flow charts showing the purifying operation in the treating units in the device shown in Fig. 1.

Fig. 1 shows an example of the device of the present invention. In this Figure, numeral 1 is an ink formulating tank, and from a dye purifying means 2, an aqueous dye solution purified as

hereinafter described is supplied through a valve 3. On the other hand, from a reservoir section 4 and a reservoir section 5 are supplied through valves 6 and 7 respectively, a water-soluble organic solvent and an additive into the formulating tank 1. Further, pure water is supplied similarly through a valve 8. These materials supplied are stirred by means of a stirrer 9 to formulate an ink.

The amount of the ink prepared in the formulating tank 1 is detected by a liquid amount detector 10. The dye concentration and the heavy metal ion concentration in the ink prepared in the formulating tank 1 are also detected by a dye

concentration detector 11 and a heavy metal ion concentration detector 12, respectively. Based on the outputs from both of these detectors, the final property management of the ink (lot management) is performed. The ink prepared with desired values of respective components is discharged through a discharging valve 13, if necessary.

Numeral 14 is a controlling section which performs driving control of the respective sections, and 15 is an operating section which is provided with various kinds of display sections and driving switches, etc. (14, 15 are indicated 61, 62 in Fig. 2).

Fig. 2 shows the constitution of the dye purifying means in the device shown in Fig. 1.

In this Figure, numeral 21 is a dye feeding section containing dye powder 22 and the dye powder 22 is fed through a dye valve 23 into a formulating tank 24. Also, into the formulating tank 24, pure water is fed through a pure water feed pipe 26 having a pure water valve 25 interposed therein.

In the formulating tank 24, the dye powder 22 and pure water are mixed and dissolved by means of a formulating tank agitator 27 to prepare an aqueous dye solution. The amount of the aqueous dye solution residing in the formulating tank 24 is detected by a formulating tank liquid amount detector 28. In the aqueous dye solution obtained in the formulating tank, there remain particles of the dye powder not dissolved, and these are removed by filtration with a filter 29. For the filter 29, a conventional filter paper or Fluoropore (trade name), etc. may be available. The dye solution removed of particles by passing through the filter 29 is fed to a feed tank 31 through a dye solution feed valve 30.

The feed tank 31 is provided with a feed tank liquid level sensor 32 and the liquid level in the feed tank is controlled by opening-closing control of the dye solution feed valve 30 based on the output from the sensor.

Next, 41 is a purifying section for removing heavy metal ions from an aqueous dye solution, comprising a plurality of treating units, three units of the first to the third treating units 42-1, 42-2 and 42-3 in this example. In each treating unit 42 (42-1 - 42-3), the aqueous dye solution in the feed tank 31 is fed through the feed valve 43 (43-1 - 43-3) to the ion-exchange resin column 44 (44-1 - 44-3). The ion-exchange column 44 separates heavy metal ions from the aqueous dye solution through the so called ion-exchange separation. More specifically, through ion exchange in the column, heavy metal ions higher in absorption contained in the aqueous dye solution are captured by the ion-exchange resin and remain within the column. Here, within the column, a valve 45 (45-1 - 45-3) for control of the liquid level is provided to control the amount of the aqueous dye solution fed into the column. The column 44 is also mounted detachably from the treating unit, and whether the column is mounted or not is detected by the filter exchange completion switch which is not shown.

Next, heavy metal ion concentration sensor 46 (46-1 - 46-3) are provided in the effluent solution passage at the lower end portion of the columns 44 to detect the heavy metal ion concentration in the effluent solution from the column 44.

As the method for detecting heavy metal ion concentration, there may be employed the measurement method with the use of metal ion electrodes or the measurement method by atomic absorption spectroscopy. Solution sensors 47 (47-1 - 47-3) are similarly provided in the effluent solution passage to detect presence of the effluent solution in the effluent solution passage.

The effluent solution from the column 44 is discharged through a first discharge valve 48 (48-1 - 48-3) to a reservoir 49. Also, through a second discharge valve 50 (50-1 - 50-3), by the action of a circulating pump 51, the solution is recycled to the feed tank 31. Opening-closing control of both valves 48 and 50 is performed based on the detection result of the heavy metal ion concentration sensor 46 as described below.

The aqueous dye solution removed of heavy metal ions obtained in the reservoir 49 is taken out through the feed valve 52, (3 in Fig. 1) and provided for use in preparation of ink.

Fig. 3 shows each parts concerning the dye purifying means in the control system in the device as shown in Fig. 1. In this Figure, 101 is a controller and has the function of driving control of the respective sections. 102 is a read-only memory (ROM) and memories the control program with

the operational procedure as shown in Fig. 4. 103 is a random access memory (RAM) and performs temporary memories of various kinds of data. 104 shows various kinds of switches arranged at the operational section 15, and sends various kinds of instruction signals through the input-output buffer circuits 105 to the controller. 106 is a display arranged at the operational section 15 and, as hereinafter described, has the first to the third unit filter exchange displays representing that column exchange in the respective treating units is necessary and the first to the third in operation displays representing that the respective units are in operation of purifying the aqueous dye solution. 107 is a drive circuit for performing display control of the display 106 based on the drive signal from the controller 101.

The detection outputs from the liquid amount detector 28 of the formulating tank and the liquid level sensor 32 of the supplying tank are supplied to the controller 101 through the input buffer circuit 108. The drive circuits 110 to 114 are used for on-off control of respective loads (valves, 23, 25, 52, agitator 27, pump 51) based on the drive control signals supplied through the output buffer circuit 109 from the controller 101.

Next, 120 is the control system for the treating unit 42-1. Since the constitutions for the respective treating units are same, other units 42-2 and 42-3 are omitted in the drawing. The detection signal from the heavy metal ion concentration sensor 46-1 is converted to digital signal through the A/D converter 121 and then supplied through the input buffer circuit 122 to the controller 101. On the other hand, from the liquid sensor 47-1 is outputted a digital detecting signal and supplied through the input buffer circuit 122 to the controller 101. 123, 124 and 125 are drive circuits for opening or closing the respective valves 43-1, 48-1 and 50-1, respectively, and they are placed under on-off control by the drive signals supplied through the output buffer circuit 126 from the controller 101.

In the dye purifying means in this Example as constituted above, based on the detection signals from the heavy metal ion concentration sensor 46, treatment for removal of heavy metal ions is conducted while successively changing the respective treating units 44-1 - 44-3. This is because, there is limit in capacity of the ion-exchange resin within the ion-exchange column 44 of capturing heavy metal ions and, after absorption of a certain amount of heavy metal ions, no more ion-exchange separation is effected. As the result, the dye solution

containing heavy metal ions is discharged as such and the heavy metal ion concentration in the effluent solution from the column 44 will be increased. By detection of the elevation of such concentration, use of the ion-exchange column is made no longer possible, and purification of the dye solution is conducted thereafter by either one of the two columns. The ion-exchange resin column which has been made no longer useful is exchanged with a new column or the ion-exchange resin is subjected to regeneration treatment so as to be capable of purification in the same treating unit again.

Fig. 4 shows the operations in each of such treating units, wherein the respective flags perform the following judgements:

Unit filter exchange flag: flag which indicates exchange of filter, namely exchange of the ion-exchange resin column, and, when this flag is on, the corresponding unit filter exchange display gives a display that filter exchange is necessary;

Unit change demanding flag: flag demanding change of the treating unit, and, when this flag is on, the treating unit designated by the unit selection counter is selected, and the dye purifying operation is transferred to the treating unit selected;

Unit operating flag: flag which indicates that the corresponding treating unit is selected;

Unit-in operation flag: flag which indicates that the corresponding treating unit is in operation;

Unit discharging flag: flag which becomes on when the heavy metal ion concentration in the effluent solution from the column in the corresponding treating unit exceeds a setting value, and indicates start of recycle operation of the effluent solution to the feed tank 31 by the pump 5I.

Next, the respective steps in Fig. 4 are to be explained.

In Fig. 4 (A), in the step STl, the respective displays and data are initialized. In the step ST2, the treating unit change demanding flag is turned on, and the content of the unit selecting counter is set on "1". In the step ST3, from the detection output from the feed tank liquid level sensor 32, it is judged whether a predetermined amount of dye solution is stored in the feed tank 31 or not. When the desired amount of dye solution is stored, after closing the dye solution feed valve 30 in the step ST4, the operation proceeds to the step ST6. Whereas, when the desired amount is not attained, the feed valve 30 is opened in the step ST5 to feed the dye solution.

The step ST6 is the treating step when there is filter exchange demand in the first treating unit

42-1, and consists of the steps ST6-1 through ST6-3. First, in the step ST6-1, when it is judged that the first unit filter exchange flag is on, the operation proceeds to the step ST6-2, and judgement is made about whether the first unit filter exchange completion switch is on or not. When it is on, the operation proceeds to the step S6-3, where the first unit filter exchange flag is turned off, simultaneously with extinction of the display on the first unit filter exchange display that exchange is necessary. Then, the operation proceeds to the step ST7. In the step ST6-1, if the filter exchange flag is off and the filter exchange completion switch is off in the step ST6-2, the operation should proceed to the step ST7 along the flow of "NO".

The step ST7 and the step ST8 are treating steps, respectively, when there are filter exchange demands for the second treating unit 42-2 and the third treating unit 42-3, and they have the same content as the step ST6 and therefore their explanation are omitted.

In the step ST9, it is judged whether the unit change demanding flag is on or not, and the operation proceeds to the step ST10 if the judgement is affirmative, while to the step ST16 in Fig. 4 (B), if it is negative. In the step ST10, judgement is made about the content of the unit selection counter,

and the operation proceeds to the step ST13, if the content is "1", to the step ST14 when it is "2", and to the step ST15 when it is "3", respectively.

The steps ST13 - ST15 are treating steps when the respective treating units 42-1 - 42-3 are selected. Since the content of each of the steps ST13 - ST15 is the same, only the content of the step ST13 when the first treating unit 42-1 is selected is to be explained. First, in the step ST13-1, it is judged whether the first unit filter exchange flag is off or not. If the judgement is negative, the operation proceeds to the step ST13-5, while to the step ST13-2, when it is affirmative. In the step ST13-2, the first unit-in operation display is turned on to indicate that the first treating unit 42-1 is in operation. In the step ST13-3, the feed valve 43-1 and the second discharge valve 50-1 are opened. Subsequently, in the step ST13-4, the first unit operation flag is turned on, simultaneously with turning off the unit change demanding flag. Next, in the step ST13-5, the content of unit selection counter is changed to "2" and then the operation proceeds to the step ST16. Here, the unit selection counter is a ring counter in which the content is changed in the order of "2", "3", "1", "2"...., and its content changes to "3" by performing the step ST14, and its content

changes to "1" by performing the step ST15.

Next, the steps ST16, ST17 and ST18 in Fig. 4 (B) are steps for controlling discharge of the effluent solution from the ion-exchange columns in the respective treating units. Since the content of each step is the same, only the content of the step ST16 for exhibiting control in the first treating unit 42-1 is to be explained.

First, in the step ST16-1, it is judged whether the first unit operation flag is on or not. In the case of negative judgement, the operation jumps to step ST16-5, while it proceeds to the step ST16-2 in the case of affirmative judgement. In the step ST16-2, it is judged whether the heavy metal ion concentration in the effluent solution from the column detected by the heavy metal ion sensor 46-1 is at a setting value or lower. If negatively judged, the operation proceeds to the step ST16-5, while to the step ST16-3 if affirmatively judged. In the step ST16-3, the second discharge valve 50-1 is closed and the first discharge valve 48-1 opened. As the result, in the ion-exchange resin column 44-1, the aqueous dye solution from which the heavy metal ions are removed to a value not higher than the setting value is discharged into the reservoir tank 49 through the first discharge valve 48-1. Next, in the step ST16-4, the first unit operation flag is

turned off and the first unit-in operation flag turned on before proceeding to the step ST16-5.

In the step ST16-5, it is judged whether the first unit-in operation flag is on or not. In the case of off-state, the operation proceeds to the step ST16-10, while to the step ST16-6 in the case of on-state. In the step ST16-6, it is judged whether the concentration detected by the heavy metal ion concentration sensor 46-1 is a value in excess of the setting value or not. When it does not exceed the setting value, the operation proceeds to the step ST16-10, while to the step ST16-7, when it is excessive. In the step ST16-7, the first unit-in operation display is turned off and then the operation proceeds to the step ST16-8, where the feed valve 43-1 and the first discharge valve 48-1 are closed. Further, simultaneously with opening of the second discharge valve 50-1, the circulating pump 51 is driven to commence recycle operation which recycles the effluent solution from the column 44-1 through the second discharge valve 50-1 to the feed tank 31. Then, in the step ST9, after the first unit-in operation flag is turned off and the first unit discharge flag is turned on, the operation proceeds to the step ST16-10.

Next, in the step ST16-10, it is judged whether the first unit discharge flag is on or not,

and the operation proceeds to the step ST17 if it is off, or to the step ST16-11 when it is on. In the step ST16-11, it is judged whether the solution sensor 47-1 arranged in the passage of effluent solution from the column 44-1 is off or not, namely whether there remains the effluent solution in the passage of effluent solution. In the case when it is not in off-state, that is, when the solution is detected, the operation proceeds to the step ST17, or to the step ST16-12, when it is under off-state. The off-state means that all the aqueous dye solution having higher value of heavy metal ion concentration than the setting value discharged from the column 44-1 has been completely recycled to the feed tank 31. In the step ST16-12, the first unit filter exchange display is turned on to indicate that exchange of the column of the first treating unit is necessary. Next, in the step ST16-13, while closing the second discharge valve 50-1, driving of the pump 51 is stopped to stop the recycle operation. Next, in the step ST16-14, the first unit discharge flag is turned off, and while turning on the first unit filter exchange flag, the unit change demanding flag is also turned on. Thereafter, the operation proceeds to the step ST17.

Subsequently, after following the steps ST17 and ST18, the operation returns again to the step

ST3 shown in Fig. 4 (A).

By practicing the respective steps as described above, purification of the aqueous dye solution is effected in the respective treating units 42-1 - 42-3, whereby purified aqueous dye solution reduced in heavy metal ion concentration to lower than the setting value can be obtained in the reservoir 49.

As described above, according to the first aspect of the present invention, by capturing heavy metal ions in a dye solution by practice of ion-exchange separation, heavy metal ions contained in the dye solution can be excluded and an ink can be prepared with the use of the dye solution from which the heavy metal ions have been removed, and therefore it is possible to produce an ink of good quality suitable for use in ink jet recording or writing implements. Further, according to the present invention, such an ink can be produced continuously and automatically.

According to the second aspect of the present invention, heavy metal ions in a dye solution are captured by practice of ion-exchange separation, only the dye solution from which the heavy metal ions are removed is extracted by fractionation by practice of such ion-exchange separation, and by doing so, an ink can be prepared with the use of such a

purified dye solution. Therefore, it is possible to produce an ink of good quality suitable for use in ink jet recording or writing implements. Further, according to the present invention, such an ink can be produced continuously and automatically.

According to the third aspect of the present invention, in preparation of ink, the heavy metal ions in a dye solution are removed by providing a plurality of treating sections for capturing heavy metal ions by practice of ion-exchange separation and the dye solution from which heavy metal ions are removed with these treating sections is used for preparation ink, whereby large scale production of ink of good quality suitable for ink jet recording or writing implements is rendered possible continuously and automatically.

Further, according to the fourth aspect of the present invention, in preparation of ink, the heavy metal ions in a dye solution are removed by providing a plurality of treating sections for capturing heavy metal ions by practice of ion-exchange separation and operating these treating sections at the same time or selectively to produce a dye solution removed of the heavy metal ions, and the dye solution thus produced can be used for preparation ink, whereby a desired amount of ink suitable for ink jet recording or writing implements can be

produced automatically and at good efficiency.

Further, by providing a plural number of treating means for capturing metal ions in a dye solution by practice of ion-exchange separation and displaying which one of these means is in state of operation, production of a purified dye solution suitable for preparation of an ink for ink jet recording, etc. can be performed simply and reliably.

Also, by providing a treating means for capturing metal ions in a dye solution by practice of ion-exchange separation and controlling the operation of the treating means based on the metal ion concentration in the dye solution after practice of such ion-exchange separation, removal of metal ions from the dye solution can be done very reliably.

Further, by providing a treating means for capturing metal ions in a dye solution by practice of ion-exchange separation, judging whether renewal of the treating means is necessary or not based on the metal ion concentration in the dye solution after practice of such ion-exchange separation, and displaying so when it is necessary, removal of metal ions from the dye solution can be done very reliably.

CLAIMS:

1. A dye purification system comprising means for producing a solution of the dye and separation means including an ion-exchange resin for capturing heavy metal ions in said dye solution, said separation means including valve means for separating dyestuff solution in which the concentration of heavy metal ions is at or below a predetermined value from dyestuff solution in which the heavy metal ion concentration is above the predetermined value.

2. A system according to claim 1 including means for recycling dyestuff solution where the heavy metal ion concentration is above said predetermined value.

3. A system according to any preceding claim including a plurality of ion-exchange separation units.

4. A system according to claim 3 including an operation control means for selectively operating any one of said units.

5. A system according to claim 3 or claim 4 including a display means which displays which one of said units is operating.

6. A dye purification system substantially as described herein with reference to Figs. 2 to 4 of the accompanying drawings.

7. An ink production system comprising a dye purification system according to any preceding claim, and an ink preparing section which prepares ink with the purified dye solution discharged from said system.

8. An ink production system substantially as described herein with reference to the accompanying drawings.

9. A method of manufacturing ink in which, prior to the addition of further ingredients, a dye solution is purified by the reduction of heavy metal ions by ion exchange on an ion exchange resin to maintain the heavy metal ion concentration below a predetermined value.

10. A method according to claim ~~15~~ 9 in which a plurality of ion exchange units are utilised in succession to allow continuous production and replenishment of spent units, under computer control.

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Title DYE AND INK REFINING SYSTEM

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