This invention relates generally to solution handling apparatus, and more specifically to a solution handling apparatus having an interlock switch mechanism incorporated therein so that the apparatus will operate only when the working components thereof are in their proper operating positions.

Solution handling apparatus such as photographic processing and image-transfer copying devices are well known in the art. In such copying devices a sensitized photographic sheet or matrix is exposed in an exposing mechanism, the exposed sheet is then processed in a suitable liquid, and the processed sheet is pressed into intimate contact with a non-sensitized copy sheet to cause transfer of an image from the photographic sheet to the copy sheet upon separation of the sheets. A copying device of this type is specifically disclosed in U.S. Patent No. 2,666,384.

The more recent models of such devices each have incorporated therein an exposing mechanism, a power-driven copy sheet feeding mechanism, a processing tray, a removable solution container, a movable probe for hydraulically connecting and disconnecting the container to and from the tray, and a pump for recirculating the processing solution between the container and tray. One of the disadvantages of prior devices incorporating a solution container of the removable type and/or a movable probe is that it is possible to operate the device with the solution container and/or probe absent from their proper operating positions. Inadvertent operation of the device with the container and/or probe removed may result in the spillage of several matrices and copy sheets before the operator realizes that there is no solution in the processing tray. This disadvantage is obviated by a preferred form of applicant's invention, wherein an interlock switch mechanism disconnects the power supply to the device if the solution container and/or probe are not in their proper operating positions.

Accordingly, one of the objects of the present invention is to provide a solution handling apparatus having an interlock switch mechanism for assuring that the power supply is connected to the apparatus only when working components thereof are in their proper operating positions.

Another object of the invention is to provide an interlock switch mechanism for a photographic copying apparatus or the like that is of simple design and construction, that is highly reliable and efficient in operation, and economical to manufacture.

Objects and advantages other than those set forth above will be apparent from the following description when read in connection with the accompanying drawings, in which:

FIG. 1 is a segmental side elevation view, partly in section, of a solution handling apparatus according to a preferred embodiment of the apparatus in which an interlock switch mechanism constructed in accordance with the present invention is embodied and shown in an operative position; FIG. 2 is an enlarged perspective view of a part of the structure of FIG. 1 with portions thereof sectioned; FIG. 3 is a view similar to FIG. 1 showing the interlock switch mechanism in one of its inoperative positions; FIG. 4 is a segmental view in section taken along line 4-4 of FIG. 3; and FIG. 5 is a schematic wiring diagram partially in block diagram form for a photographic copying apparatus embodying the invention.

As shown in the drawings, a fixed bracket 6, seen dotted in FIGS. 1 and 3, of a photographic copying apparatus or the like, not shown, supports an annular member 8 rigidly secured thereto by any suitable means. A cylindrical probe 10 (see FIG. 2) formed of a solution corrosion resistant material is insertable in annular member 8, and has a knob 12 secured to one end thereof, and a tube 14 inserted in a bore 16 at its opposite end. The probe 10 has a peripheral groove 18, and a radially extending opening 20 connecting the base of groove 18 to one end of bore 16. The probe 10 further has annular recesses above and below groove 18 for receiving O rings 22 to prevent axial leakage of solution out of groove 18. The probe 10 also has a radially extending pin 24 slidable in a slot 26 formed on the inner periphery of annular member 8. One of the surfaces 28 forming slot 26 has an arcuate portion 30 having axially spaced recesses 32, 34. In the normal position of probe 10 when inserted into the member 8, the pin 24 bottoms in recess 32. Upon rotation of probe 10 in a clockwise direction as seen in FIG. 2, the pin 24 slides along arcuate portion 30 and bottoms in recess 34. This action causes axial movement of probe 10 moving groove 18 thereof into axial alignment with a radially extending solution output opening 36 in member 8.

A solution container or reservoir 38 of any normal type is provided having an outlet opening 40 in the upper end thereof. The container 38 may be readily removable from the apparatus after probe 10 has been removed from annular member 8. In its operative position, container 38 rests on a support 42 and has one end thereof in engagement with a stop flange 44.

An interlock switch mechanism is interposed between probe 10 and container 38. The switch mechanism comprises a substantially S-shaped bracket 46 pivotally mounted at one end on a pin 48 carried by a fixed portion 50 of the apparatus. Such fixed portion 50 may be the housing of a photographic copying apparatus or the like, not shown. The bracket 46 has a rib 52 along one edge thereof as best seen in FIG. 4 having a downwardly extending lip 54 at one end. A helical spring 56 encircles lip 54 and a fixed projection 58, seen dotted, extending from bracket 6. The spring 56 urges bracket 46 in a counterclockwise direction, causing rib 52 thereof to engage the underside of an annular shoulder 60 fixed to the periphery of probe 10, as best seen in FIGS. 1 and 3. A switch 62 of any normal type is rigidly secured to the free end of bracket 46. The switch 62 has a pivotally mounted arm 64 with a roller 66 seating in recess 32, and a slidable pin 68 movable by arm 64 for actuating a normally open switch contact 70, see FIG. 5, in a known manner.

In the operation of the preferred form of the invention, if probe 10 is either removed from annular member 8 or positioned therein with its pin 24 nesting in recess 32 as seen in FIG. 2, the S-shaped bracket will be in its inoperative position substantially as seen in FIG. 3 with switch contact 70 of switch 62 in an open position.
Now, if container 38 is positioned in its operative position, and probe 10 inserted in annular member 8 and manually rotated causing pin 24 to slide along arcuate surface 30 and bottom in recess 34, the shoulder 60, upon axial movement of the probe 10, will force bracket 46 in a clockwise direction against the bias of its spring 56 into its operative position shown in FIG. 1. This movement of bracket 46 urges roller 66 into engagement with the end of container 38 causing roller 66 and arm 64 to move in a counterclockwise direction, moving switch contact 70 into its closed position. As seen in FIG. 5, this action would connect the power supply to the apparatus so that it may operate in a known way, assuming the On-Off switch had been previously closed by the operator. However, if the operator has inadvertently failed to place a solution container 38 in the apparatus, the exposing mechanism, pump and sheet feeding mechanism will not operate, even though probe 10 is moved into its operating position, because no means will be provided to close switch contact 70. Also, if the operator replaces storage container 38 but fails to move probe 10 into its operative position, see FIG. 3, the apparatus will not operate because switch contact 70 will remain open. Accordingly, it is clear that the apparatus will operate only if both probe 10 and container 38 are in their operative positions.

The invention has been described in detail with particular reference to a preferred embodiment thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention as described hereinabove and as defined in the appended claims.

We claim:

1. In an apparatus having a tray, a solution reservoir removable from said apparatus, and electric motor drive means for operating a portion of said apparatus, the combination comprising:

   (1) first means movable between a first position for hydraulically connecting the contents of said reservoir to said tray and a second position for hydraulically disconnecting the two; and

   (2) interlock means for disabling said electric motor drive means except when said first means is in said first position and said reservoir is properly positioned in the apparatus, said interlock means including

   (a) a member movable from a normally inoperative position to an operative position in response to movement of said first means to its first position, and

   (b) electrical switch means controlling said electric motor drive means and movable to an operative position in response to movement of said member to its operative position and in which operative position said switch means is actuated by the proper positioning of said reservoir in the apparatus, to render said electric motor drive means operative.

2. The invention according to claim 1 wherein said first means has a shoulder, and said interlock means comprises a spring and a bracket biased by said spring into engagement with said shoulder.

3. The invention according to claim 1 wherein said first means comprises an axially movable cylindrical probe having solution passage means, and an annular shoulder, and said interlock means comprises a spring and a pivotal bracket biased by said spring into engagement with said shoulder, said bracket further carrying said switch.

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