

April 11, 1961

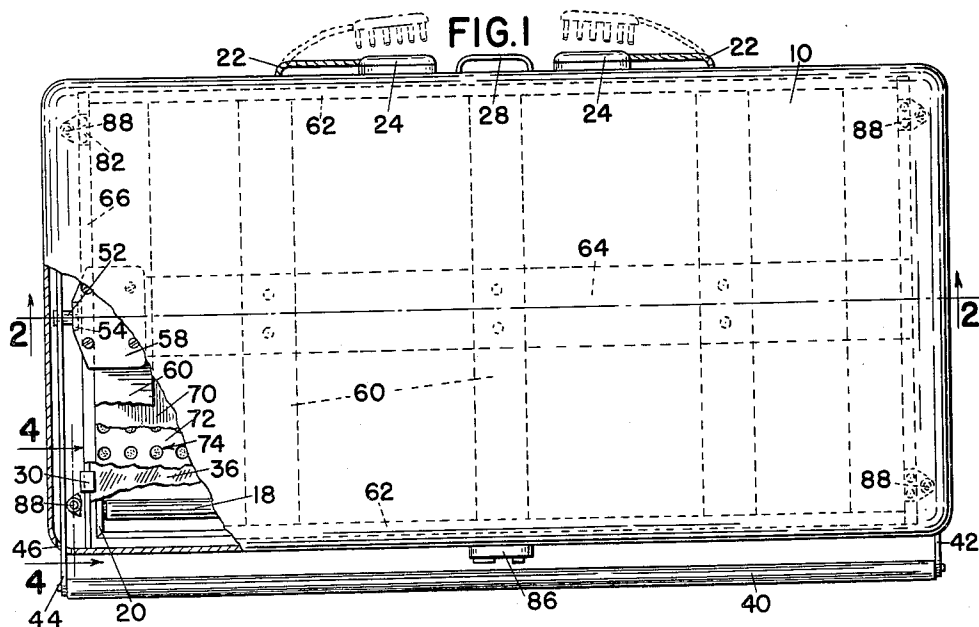
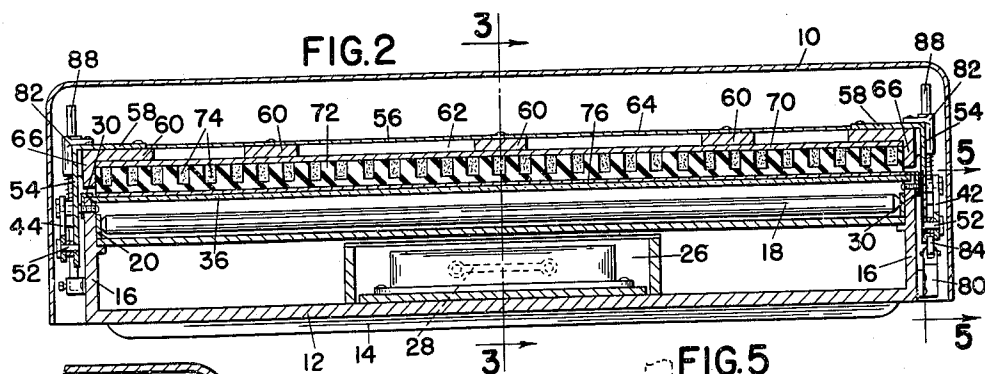
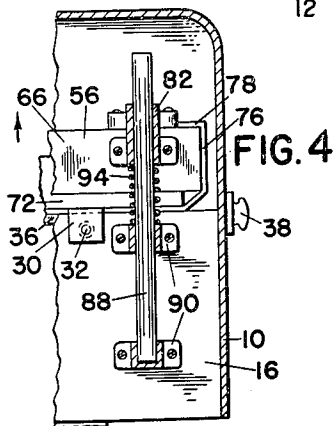
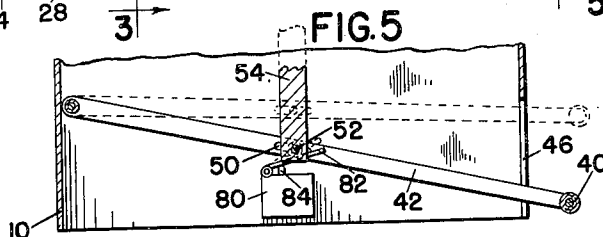
I. W. ELLSWORTH ET AL

2,979,404

METHOD FOR SIMULTANEOUS PHOTOGRAPHIC PRINTING AND DEVELOPING

Original Filed Oct. 26, 1953

2 Sheets-Sheet 1



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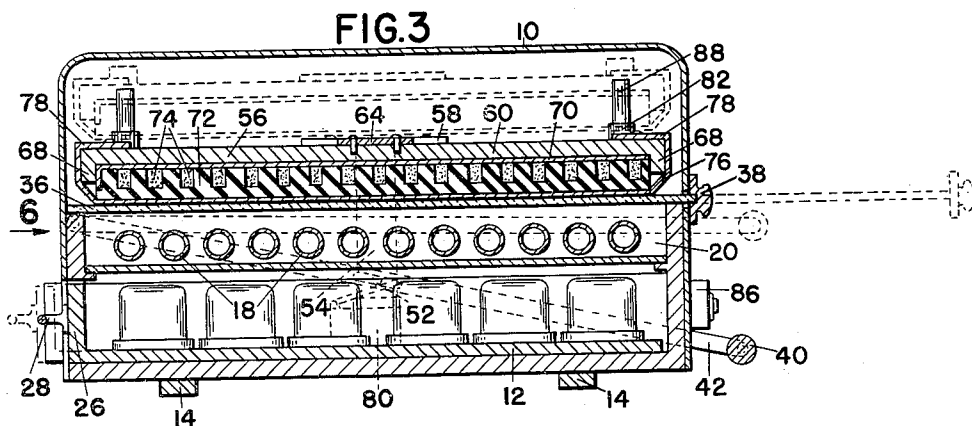
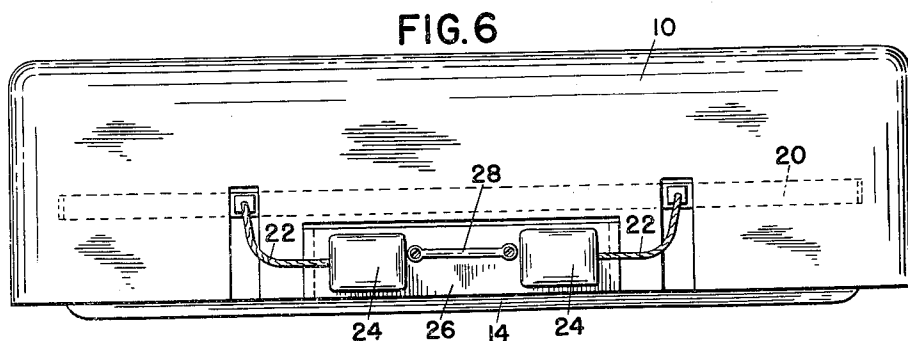
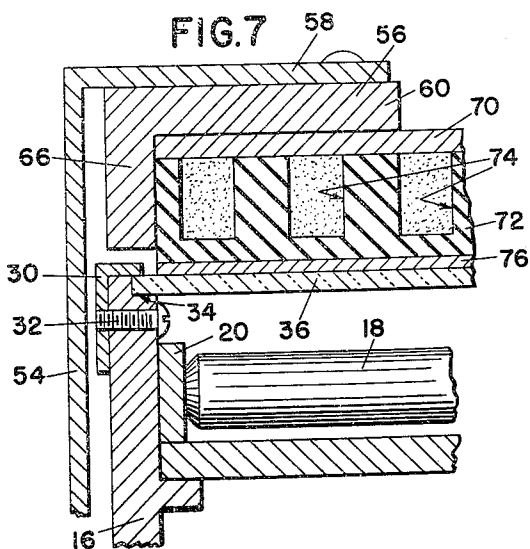
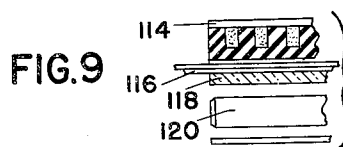
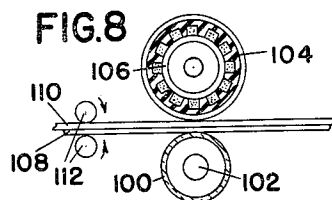
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2,979,404

**METHOD FOR SIMULTANEOUS PHOTOGRAPHIC
PRINTING AND DEVELOPING**

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Original application Oct. 26, 1953, Ser. No. 388,184, now Patent No. 2,817,279, dated Dec. 24, 1957. Divided and this application Nov. 7, 1957, Ser. No. 695,099

1 Claim. (Cl. 96—49)

This application is a division of our prior application Serial No. 388,184, filed by us on October 26, 1953.

This invention relates to a new and improved apparatus and method for printing and developing, particularly for reproducing a master or original which usually appears on substantially translucent paper or cloth or the like.

The principal object of the present invention resides in the provision of a method and apparatus for simultaneously printing or exposing, and developing the printed sensitized paper; the provision of an apparatus and method for exposing a sensitized paper to light with a master or original between the light source and the sensitized paper, and at the same time supplying developing means to the sensitized paper so that the printing and the developing is simultaneous, said apparatus being either for normal continuous production or made for a one-at-a-time fixed printing process, and the provision of an apparatus and method to provide a developing atmosphere in an air-tight space, in conjunction with a light source and including means for holding an original and a sensitized paper between the light source and in the developing atmosphere so that when the light source is turned on, the printing and the developing take place simultaneously.

Another object of the invention resides in the provision of a new and improved developer unit comprising a pad-like element which is relatively soft and porous and contains a developing chemical, i.e., a chemical which will decompose and diffuse through the porous pad or the like to come in contact with a sensitized paper which may be held down closely and flatly by the pad itself, so that the pad has a plurality of functions and provides means for ensuring a good pressure contact for exposure as well as providing a developing atmosphere; said pad having a reservoir containing developing compounds.

Still further objects of the invention include the provision of an apparatus comprising a housing containing therein a source of light and a developer unit, the latter being movable to and from the source of light, and there being provided between the unit and the source of light transparent means for holding flatly an original and coated or sensitized paper in flatwise overlying relation with respect thereto, in combination with means for moving the source of light and the developer unit relatively toward each other within the housing, said means including a switch for turning on the source of light when the developer unit is in pressure contact with the sensitized paper so as to provide a good even and sharp exposure and printing operation.

Other objects and advantages of the invention will appear hereinafter.

Reference is to be had to the accompanying drawings, in which:

Fig. 1 is a plan view of an apparatus according to the present invention, parts being broken away and part being in section;

Fig. 2 is a sectional view on line 2—2 of Fig. 1;

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Fig. 3 is a sectional view on line 3—3 of Fig. 2;

Fig. 4 is a sectional view on line 4—4 of Fig. 1;

Fig. 5 is a sectional view on line 5—5 of Fig. 2;

Fig. 6 is a rear view in elevation of the device, looking 5 in the direction of the arrow 6 in Fig. 3;

Fig. 7 is an enlarged sectional view of one end of the printing and developing unit; and

Figs. 8 and 9 are diagrammatic views, partly in section, showing modifications for continuous processing.

In carrying out the present invention, there is provided a housing generally indicated at 10, this housing providing a top, front and rear, and side walls. Connected between the front and rear walls there is provided a bottom member 12 which may be mounted upon members 14, the latter being supporting skids or felted means to prevent injury to a table top or the like supporting surface for the housing.

The bottom member 12 is itself provided with end walls 16 spaced inwardly from the end walls of the housing 10, and these end walls 16 may be utilized to provide a support for a series of light tubes 18 which are used as a source of light for the printing operation. These tubes may be held in energizing end clips 20 to which there are connected energizing wires 22 secured to removable plugs 24 for the transformers in the electrical system for the tubes 18. The plugs 24 are removable as indicated in Fig. 1 for replacement of worn parts and when these plugs have been removed, a drawer 26 may be slid out by means of a handle 28 for easy access to the transformers, etc. The tubes 18 are understood to be in fixed relation in the housing.

Just above the tubes upon side walls 16, there are mounted a series of side clips 30 as by means of fasteners 32 or any other desired means, and these clips, together with an indentation or groove forming an elongated shoulder at 34, provide edge guides for a sliding glass supporting member 36 (see particularly Figs. 3 and 7). The glass 36 is provided with a handle 38 and it may be slid in-and-out in the manner of a drawer, thus permitting the exposure of a print without allowing residue gas to escape. When positioned inwardly to its furthest extent as in full lines in Fig. 3, it completely overlies a series of tubes 18, light from which will clearly pass through the slidable glass.

The handle 28 and the plugs 24 are located at the rear of the device and at the front of the housing there is provided an elongated handle 40 which extends substantially the length of the housing 10 and at each end thereof is connected to the corresponding ends of pivoted levers 42, 44. These levers are elongated and extend through slots 46 in the front wall of the housing 10 to be pivoted adjacent the rear wall of housing 10. The levers and handle as described have a motion between the solid line down position and the dotted line up position of Fig. 5.

Intermediate the ends of the levers 42 and 44, they are provided with short slots such as indicated at 50 into which extend pins 52 so that the pins 52 are raised up and down with the levers. These pins are mounted on vertically movable upright members 54 which are connected to and support the developing unit indicated generally at 56 by means of angle brackets 58 which may form integral parts of the upright members 54.

The developing member or unit comprises as disclosed a built-up framework including transverse members 60 which may be connected together by front and rear members 62 and by a central strap or the like 64 which runs the length of the frame. The frame made up of members 60 and 62 is provided with down-turned side portions 66 and down-turned front and rear portions 68, so that an inverted flanged receptacle is seen to be provided.

In this receptacle there is located a continuous solid

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sheet or backing member indicated at 70 and this forms a bottom for the inverted container above described.

Located upon this bottom, i.e., underneath the same, there is a relatively thick layer of soft porous material indicated at 72, and this is provided with a series of pockets 74 in which is located the developing chemicals or compounds, one of which may be ammonia bicarbonate. The element 72 may conveniently be made of aerated foam latex.

In some cases, it is preferred to adhesively secure the pad 72 to the backing member 70, but in other cases it is preferred to leave the two elements completely separate. In the latter case, there will be provided a canvas 76 which extends under the pad and extends beyond the front and rear edges thereof as at 78 to extend up around the edges of the framework 60 at which point the canvas may be secured by any desired means. This construction forms a complete unit which is completely removable from the apparatus for replenishment or replacement, whether the pad 72 is adhesively secured to the backing 70 or not.

At one end of the housing there is provided a switch 80 operated by a lever 82 and as lever 42 descends, switch 80 is actuated to turn on the light tubes 18; and when the levers 42, 44 are moved to the upper position, the lever 82 rises under influence of the switch actuator 84 which is spring-loaded as is well known to those skilled in the art. At the front of the device, there is a manual main switch 86 which controls switch 80, the latter being incapable of activation unless the main switch 86 is turned on.

In order to provide that the developer unit shall rise and descend freely and accurately, there are provided four posts which are all alike and which are indicated by reference numeral 88. These posts are each mounted by brackets 90 on the side walls of the housing or those at 16 of the bottom 12. The developer unit 56 is provided at strategic locations with sleeves 82 receiving the rods 88 and cushion springs 94 may be provided to cushion the descent of the unit.

In the operation of the device, the glass 36 is withdrawn to its fullest extent. An original to be copied is laid down thereon and a sensitized paper is laid on top of the original with the coated or sensitized surface thereof downwardly in contact with the original. The slide is then returned to fully housed condition as shown in solid lines in Fig. 3. The main switch 86 is turned on, and the handle 48 is depressed to the solid line position of Fig. 5 against the action of the springs 94.

When the handle 40 is at its lowermost position, the switch 80 is activated and the light tubes 18 are turned on, whereupon of course the sensitized paper starts to decompose as to the sensitized coating thereof, but the portions which are not effected by the light are not so decomposed.

Simultaneously the developing atmosphere engendered from the developing chemicals contained in the pad at 74 and which gradually evaporate to produce a developing atmosphere through the porous pad, initiate the developing action simultaneously with the printing action and thus the original is duplicated by being printed from one side and developed from the other completely simultaneously. As soon as the developing has proceeded far enough, the handle is raised, the slide withdrawn, and the original and the sensitized paper removed, whereupon of course the lights 18 go out due to the action of switch 80.

The canvas cover 76 provides a clean surface against which the print is made in good contact, and this canvas is removable and can be washed and replaced. The soft pad which provides the developing atmosphere also provides a soft but firm means by which substantially 100 percent contact is maintained of the sensitized paper to the original as are both of them to the glass slide for extreme sharpness of printing. Any well known or con-

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ventional latching means may be utilized to hold the handle 40 in downward position as long as desired.

With normal printing, the exposure time and developing time are so synchronized that the developing action stabilizes the sensitized surface of the paper and it is fixed at the moment that the correct exposure has been reached thus stopping over exposure. Thus, the exposure has been controlled and limited by the developer. With different qualities and types of tracing papers and cloths of different light transmission qualities, different exposure times may be used; but it is immaterial whether the light is left on for a long or a short time as long as sufficient printing and developing takes place. No timing device is required to stop the printing or developing action since after the initial simultaneous exposure and developing, the sensitized paper being completely developed, any additional time the paper is left in the apparatus will not result in any further development. The apparatus can be left in operation any length of time, with no change in the quality of the printed material.

As shown in Fig. 8, this invention may be carried out by providing rotary apparatus including a glass or other transparent tube 100 having embedded therein a source of light 102 and capable of rotation in conjunction with a rotary developer unit cylinder comprising a porous developing combined holder 104 which is similar to that at 72 except that it is based upon a rigid cylindrical backer 106. This developing unit rotates in conjunction with a light source from the glass tube 100 with the original at 108 and the sensitized paper at 110, in conjunction therewith. The method is generally the same as before, with the light source printing and the developing unit developing simultaneously, but in this case the process is continuous and may be applied to long runs and long drawings such as could not be conveniently handled by the apparatus illustrated in Figs. 1 to 7. Any desired feed rollers 112 may be utilized to feed the material and appropriate housings and paper-receiving means may be provided as is well known in the art. Also, see Fig. 9, a flat developer unit 114 may have continuously passed beneath it a sensitized paper and original 116, with the glass 118 and light tubes 120 similar to the disclosure of Figs. 1 to 7 but the difference here is that the process is continuous as in Fig. 8.

It can be seen that the presence of ammonium bicarbonate deposited in the cored holes of the foam rubber is a source for the ammonia fumes or vapors required for developing ammonia developed papers. The NH_4HCO_3 is started to decompose by its own presence in the foam rubber and decomposes slowly to give off ammonia, carbon dioxide, and moisture. The small amount of water given off is retained in the foam rubber due to the cellular characteristic of foam rubber. This moisture in turn helps to continue the decomposition of the compound at a continuous slow rate. When the cored holes are once filled with compound, and decomposition has started, the developer is always in readiness for immediate developing with no elapse of time required to put it in readiness. It is found that once this foam rubber is filled, it would be a ready developer for a considerable length of time, without being refilled. Once developing action is diminished noticeably, it can be refilled by removing the foam rubber and refilling the holes.

It has been found that under normal operating temperatures, no heat is required to be applied to the foam rubber or compound, to promote decomposition. Heat, however, can be applied to meet abnormal conditions.

The fluorescent tubes are black light rated at 40 watts and give off relatively a minimum amount of heat. Other types of tubes could be used if desired. This heat is conducted through the glass to the foam rubber and thereby to the compound, resulting in partially evaporating any excess moisture accumulated in the foam rubber during the time the machine has not been in use. This does not necessarily mean that if the machine were to remain

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un-used and continuously closed, that excessive moisture would be imparted to the foam rubber, since with the machine continuously closed, any moisture which might otherwise be absorbed in foam rubber from the ambient air will not be imparted to the foam rubber. The characteristics of the foam rubber is such that it could completely absorb all the moisture given off through the decomposition of the compound without imparting this moisture to the print or tracing. Therefore, the present process is a dry action.

It is found that as an optional process to this machine that exposing of sensitized surfaces and developing may be done as separate processes if the case warrants such departure. This may be required in cases such as making of cloth reproductions or as materials which are not porous enough to allow developing from the rear. In such cases, the non-porous sensitized material may be exposed in the same manner previously described except that after a predetermined exposure time, this non-porous material is merely turned over, putting the sensitized portion in contact with the developer when it is lowered. The removal of the tracing or original, is not necessarily required, since there is no moisture present on the tracing to damage same.

It has been found that various qualities of tracing materials of different light transmission qualities varying from 43% to 90% light transmission have been reproduced on sensitized paper at the same time by this simultaneous exposure and developing process, with all reproductions having equal quality with regard to the printed matter with only a slight difference in the background coloring. The pressure contact between the tracing and sensitized paper imposed by the partially compressed foam rubber at the lower position, gives a sharp-lined print with a good dense image.

The use of instant start type of fluorescent lamps and transformers and the continuous readiness of the developer, make this unit ready for printing and developing immediately with no warm-up time required.

Heretofore, printing and developing machines have been costly, as two independent units were necessary,

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namely a developing unit and a printer, and time control devices were necessary. Small portable machines have proved impractical from a cost and efficiency standpoint. Therefore, this invention has considerable merit toward making it possible for consumers, who, heretofore, were not able to purchase such a machine because of prohibitive costs, to enjoy its fruits.

Having thus described our invention and the advantages thereof, we do not wish to be limited to the details herein disclosed, otherwise than as set forth in the claim, but what we claim is:

The method of printing and developing a substantially translucent original image in a substantially enclosed chamber which contains a source of light in one area of the chamber and a source of ammonia vapor at another area of the chamber, said method comprising the steps of placing an original image on a sensitized paper whose sensitized coating decomposes under the influence of light, in said chamber between the light and the source of ammonia vapor, said paper being dry process paper and requiring printing by light and development by ammonia vapor, passing light through the original image to the paper at one side of the paper and simultaneously causing the application of substantially dry ammonia vapor through the other side of the paper, the ammonia vapor developing the image in the paper simultaneously with the printing by the exposure to light, without regard to the length of time of the exposure to the light or to the ammonia vapor.

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