United States Patent [19]

Fader

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[54] COPYING AND PHOTOGRAPHIC CONTACT PRINTING MACHINES

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[21] Appl. No.: **155,075**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 121,385, March 5, 1971, abandoned.

[52] **U.S. Cl.**.....**355/113,** 355/115
[51] **Int. Cl.**.....**G03b 27/04**
[58] **Field of Search**.....355/78, 79, 80, 97, 99, 100, 355/106, 110, 113, 114, 115, 117, 85, 89, 90

[56] **References Cited**

UNITED STATES PATENTS

3,288,047	11/1966	Limberger	355/100
3,202,070	8/1965	Pratt, Jr. et al.	355/100
3,397,630	8/1968	Pratt, Jr.	355/106
2,918,857	12/1959	Frantz	355/106 X
1,261,177	4/1918	Strong	355/114
3,211,072	10/1965	Jonker	355/89 X

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Assistant Examiner—Richard M. Sheer
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[57] **ABSTRACT**

A combination copying machine and photographic contact printer having two light stations; for copy making one is used for exposing the sensitive sheet material through the original and the other is used for developing the sensitive sheet material. For photographic contact print-making one or both of the stations are used as required by the photographic transparency from which the print is to be made, the type of reproduction and the reproduction material.

A photographic contact printer having a light station. The sensitive sheet material is exposed through the negative and the light is used for exposing-developing the sensitive sheet material.

6 Claims, 7 Drawing Figures

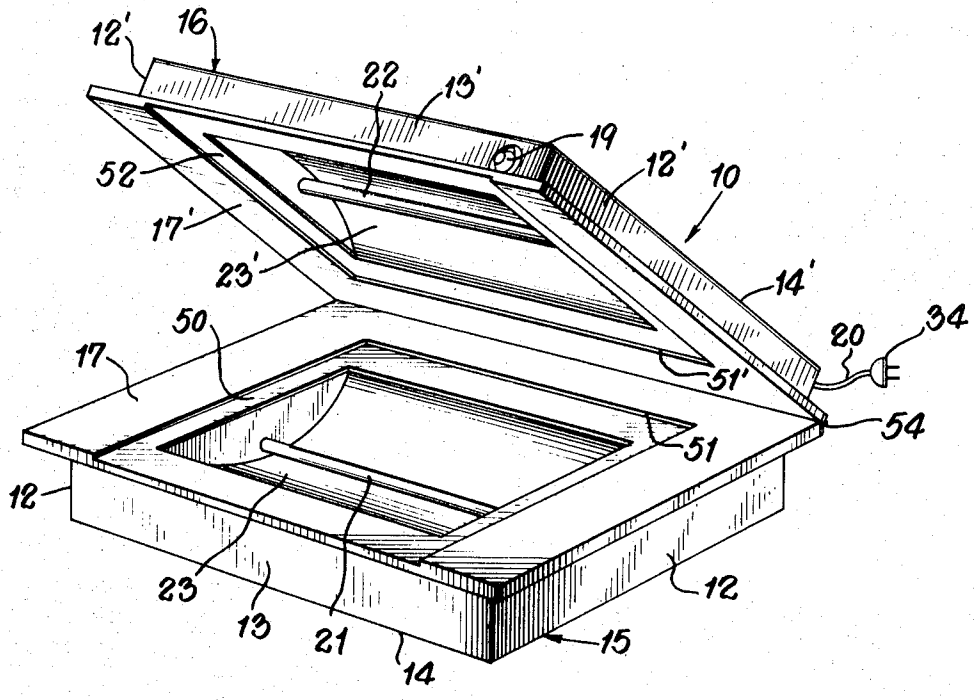


Fig. 1.

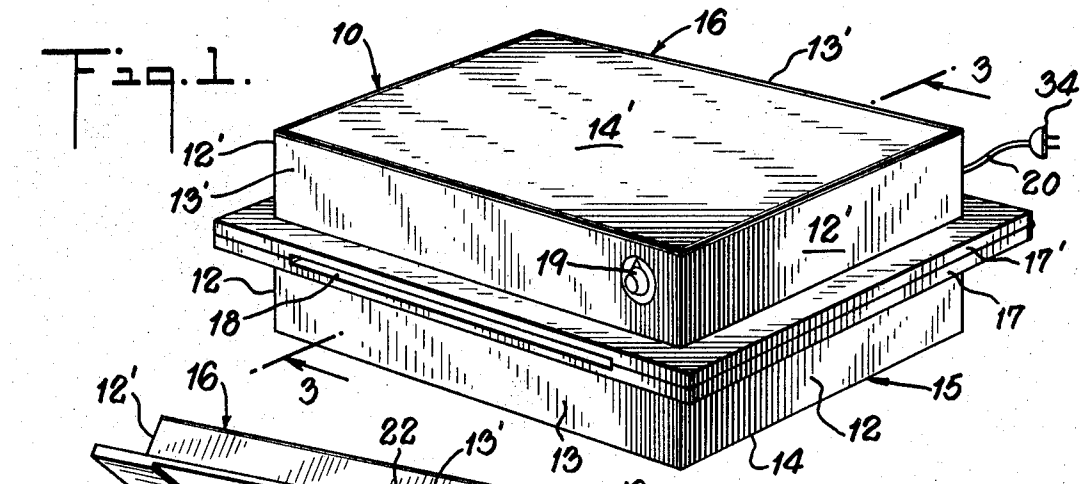


Fig. 2.

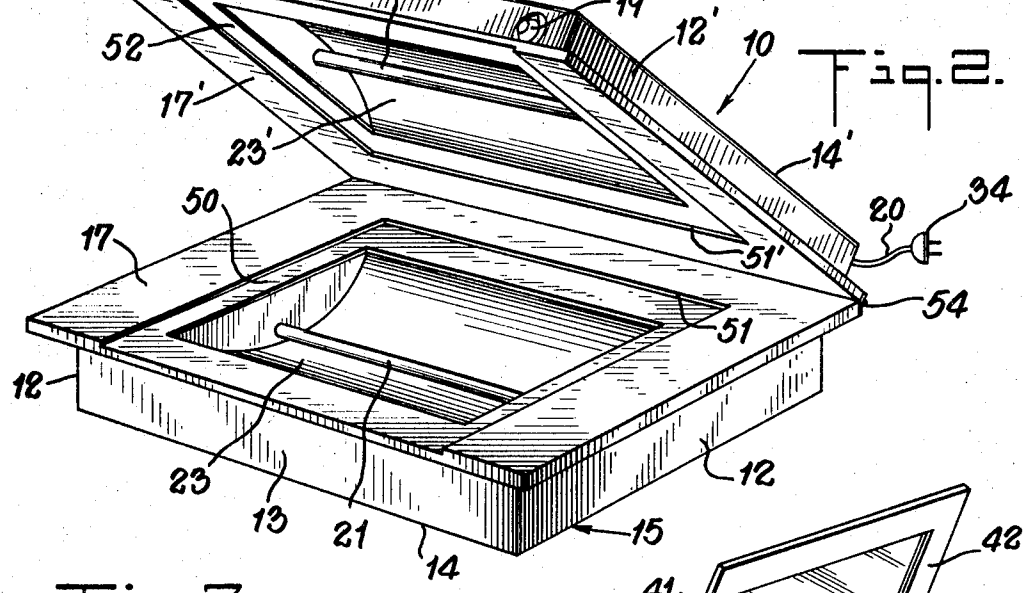


Fig. 3.

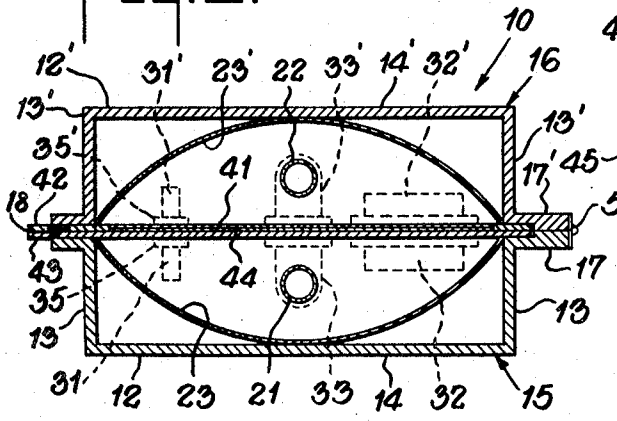
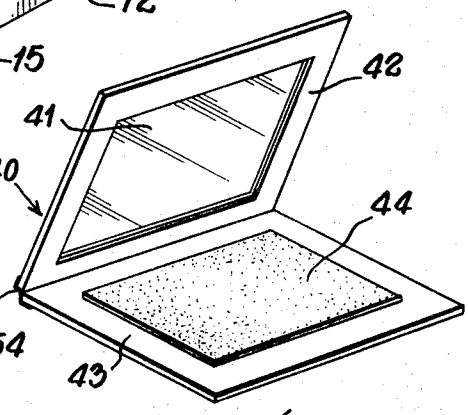


Fig. 4.



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Fig. 5.

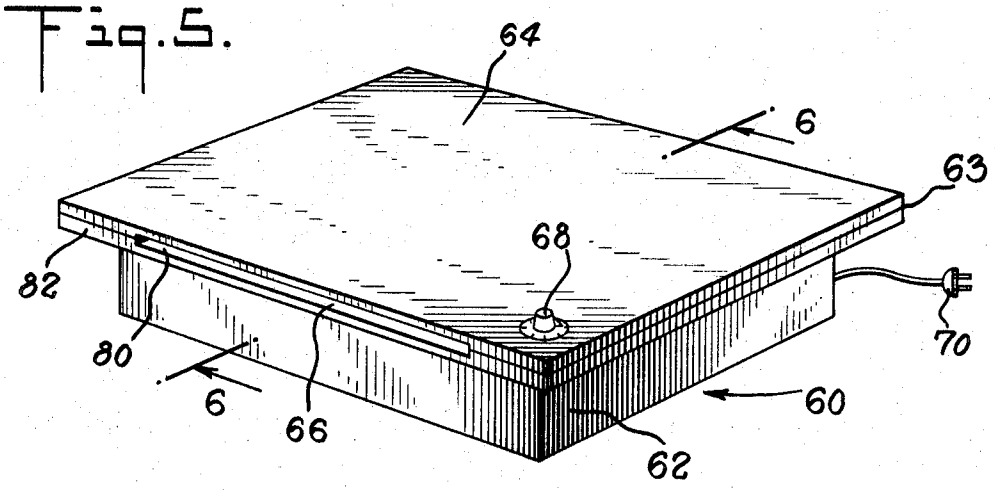
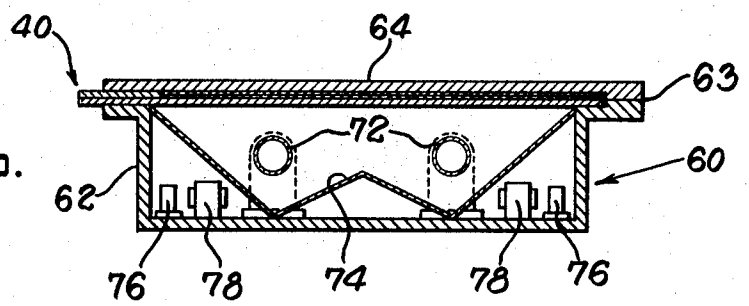


Fig. 6.



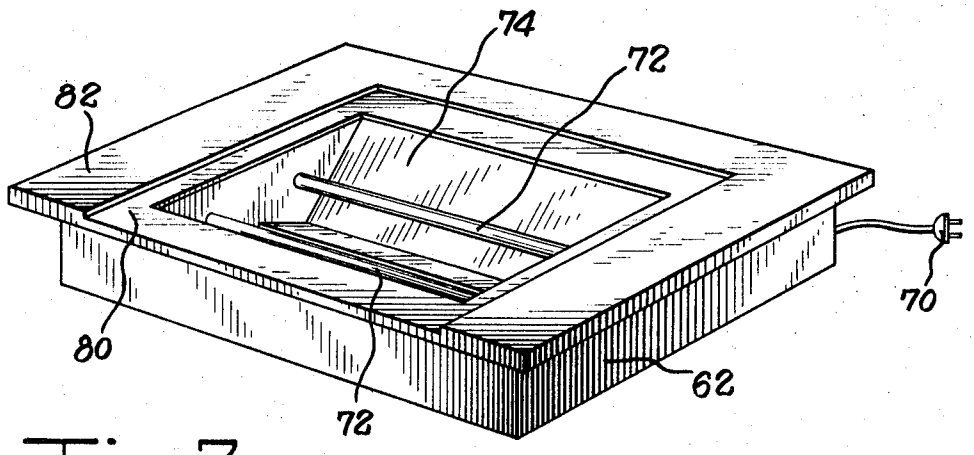


Fig. 7.

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COPYING AND PHOTOGRAPHIC CONTACT PRINTING MACHINES

This application is a continuation-in-part of my application filed Mar. 5, 1971,Ser. No. 121,385 since abandoned.

The present invention relates to the copying of printed matter or the like and to making photographic contact prints from photographic transparencies (either black and white or color). More specifically the invention relates to copying and contact printing apparatus of maximum simplicity both in construction and in operation which makes it suitable for home, school and business use.

Most prior art copiers which are used for home, school and occasional business use are either of the wet type or of the two step type using an intermediate sheet or of the one step type producing nonpermanent copies.

It is an object of this invention to provide a new and improved copying device which requires no fluids or prior warm-up for operation, and which requires no further treatment of the finished copy or print outside the apparatus. The invention is intended for use with a single sheet of light sensitive material which enhances the simplicity of the apparatus. The invention provides an apparatus with two light stations (one for exposure and the other for developing) and is characterized by extreme simplicity and low cost. The invention provides an apparatus that is fully self-contained. It may be operated with complete safety requiring no previous training, making it ideal for use in homes, schools and business establishments.

In the apparatus of this invention a copy or print can be made by juxtaposition of the printed matter of photographic transparency to the sensitive material and their exposure to the light sources in the required sequence.

In the apparatus of this invention the two light stations need not be physically connected to one another since each station functions independently of the other. A source of electrical energy is all that is required to make each station function properly. For containment as a unit, both stations may be hinged together at the rear and opened for insertion of the materials for copying or printing or they may be permanently joined by adhesives or mechanical fasteners.

The invention also provides an apparatus with one light station which is utilized in the production of contact prints from either black and white or color transparencies. The light station in this embodiment of the invention serves ofr exposing-developing.

The foregoing and other objects, advantages, features and uses will be apparent during the course of the following description when taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a perspective view of a two light station machine of the invention;

FIG. 2 is a perspective view of the machine of FIG. 1 in the open position;

FIG. 3 is a sectional view taken along the lines 3—3 of FIG. 1 with the paper holder inserted;

FIG. 4 is a perspective view of the paper holder in which the material to be copied and the sensitive material are placed;

FIG. 5 is a view similar to that of FIG. 1 of a one light station machine of the invention;

FIG. 6 is a sectional view taken on the lines 6—6 of FIG. 5, viewed in the direction of the arrows with the paper holder inserted; and

FIG. 7 is a perspective view of the machine of FIG. 5 with the top removed.

In the drawings, wherein, for the purpose of illustration, there are shown preferred embodiments of the apparatus of the invention and wherein like numerals designate like parts throughout the same, the numeral **10** designates a two light station machine of the invention.

Apparatus **10** preferably includes two polyhedrons used as housings or light chamber enclosures, joined together to form a tracked opening **18** between them into which the paper holder is inserted. Chamber **15** is formed by side walls **12**, end walls **13** and top wall **14**.

Chamber **16** is formed by side walls **12'**, end walls **13'** and top wall **14'**. It is preferable to have chamber **15** with its opening facing upward and chamber **16** with its opening facing downward. The positions of both may be reversed, however, without affecting the operation or performance of the apparatus. The chambers, or enclosures, **15** and **16** are constructed with ledges **17** and **17'** providing for secure mating of the chambers or enclosures and a tracked opening **18** is formed within the recessed ledges **50** and **52** to provide for insertion and containment of the paper holder. A timer switch **19** is secured to the top chamber. This switch may be of any suitable type to control the on-off state of the light sources in each chamber. Joining both enclosures together insures the compactness of the apparatus, and the operator at no time comes in contact with the light sources within the chambers.

In FIG. 2 the enclosures are shown hinged open at the rear by means of hinge **54** to permit access to the interior of the machine **10**. Each light chamber encloses its own light source. An exposure bulb **21** is located within the exposure chamber **15** and a developing bulb **22** is located within the developing chamber **16**. In each chamber these bulbs, which are the light sources, are respectively backed by elongate, laterally arcuate reflectors **23** and **23'** which create an even light dispersion over the surface of the sensitive material.

The circuity of the apparatus **10** is similar for each chamber and follows standard fluorescent lighting practice. An electrical cord **20** with plug **34** is provided for attachment to a source of electrical energy. One wire of the electrical cord connects to the switch **19** and then to ballasts **32** and **32'** in the chambers. The ballasts are connected to their respective bulbs **21** and **22** through light sockets **33** and **33'** and then to starters **31** and **31'** mounted in sockets **35** and **35'**. The starters are connected to the other end of the bulbs through sockets and then to the other wire of cord **20**.

The paper holder as shown in FIG. 4 consists of a hinged assembly **40** of two sections. One section consists of a rigid transparent material **41** set within a frame **42**. The other section is joined to the first section by hinge **45** and consists of a rigid opaque material **43** to which is bonded a resilient material **44** that nests within frame **42** and presses against the transparent surface **41** when the assembly is closed.

In a typical representative apparatus the chamber enclosures consisting of walls, ledges, top and bottom are made of 1/16 inch opaque panels of high impact styrene, although other opaque, rigid materials such as

Bristol board, masonite, sheet metal may also be used with equal results. In the representative apparatus the reflectors are of an elongate, laterally arcuate shape, although flat, rigid pieces of reflective material placed behind and sloping away from each light source created the same reflective effect. The reflective material used in the apparatus illustrated in FIGS. 1 – 3 consists of thin aluminum foil bonded to a heavy paper backing that can be curved into the desired shape and inserted within the light chambers. Fluorescent lamps of suitable light output and wavelength are used as the light sources.

In the preferred form of apparatus **10** illustrated, a transparent section **41** of the paper holder **40** is formed of 1/16 inch thick glass set within a ⅛ inch thick tempered masonite frame **42** and the opaque section **44** is formed of ⅛ inch thick Bristol board to which is bonded a 1/16 inch thick layer of half hard rubber **43**, both sections are joined together at one of the edges by a hinge **45** of plastic adhesive tape or similar material.

One method of using the apparatus **10** will now be briefly described. The apparatus **10** is first connected to a source of electricity, 110/120 volts AC. The hinged paper holder **40** is opened and the printed material to be copied is placed face down on the inner surface of the glass **41** within the frame **42**. On top of this is placed the sensitive material with the sensitive side against the back of the printed material to be copied. The paper holder is then closed with the resilient material **43** of the opaque section of the holder pressing the sensitive material against the material to be copied and in turn against the transparent surface **41**.

The paper holder **40** is fully inserted in the tracked opening **18** of the apparatus **10** with the transparent section **41** facing down against the opening of the exposure chamber **15**. Back ledges **51** and **51'** serve as a stop to prevent further insertion of frame **40** into the opening **18**. The exposure light **21** is turned on by means of the timer switch **19** for an appropriate length of time. At the end of this time the paper holder **40** is withdrawn from the apparatus and the material that is being copied is removed from the holder. The sensitive sheet is left in the paper holder **40** in its original alignment and the paper holder **40** is closed and reinserted in the opening **18** of the apparatus with the transparent surface **41** of the holder facing the opening of the developing chamber **16** on top. The developing light **22** is turned on by means of the switch **19** for an appropriate length of time. The paper holder **40** is withdrawn at the end of this time and the finished copy is removed. If further developing of the image is required, the sensitive sheet may be placed back in the paper holder **40** and inserted in track **18** for further contact with the developing light as desired or required.

Positive and negative contact prints can also be made from negative and positive transparencies using either the exposure light source or the developing light source or both in the correct sequence as required.

There is no limitation to the number of copies that can be made continuously on this apparatus, provided a fresh sheet of sensitive material is used for each copy. Suitable light-sensitive materials for use with this apparatus are readily available from existing commercial sources. This material reacts to one light spectrum for imposing an image upon the sensitive surface and to another light spectrum for developing or bringing up the image.

By way of illustration and not by way of limitation of the scope of the invention, following is an example of the parameters of a preferred form of two light station machine of the invention:

Sensitive sheet: DuPont DYLUX 503 Photosensitive Paper
Exposure light: 390 to 480 nanometers
Developing light: 300 to 380 nanometers

Either positive or negative images may be made from either a positive or a negative transparency in the two light station machine.

To produce positive copy from positive original or negative copy from negative original:

1. Place material to be copied face down on transparent face of holder.
2. Place sinsitive sheet on top of back of material to be copied.
3. Close the holder.
4. Insert holder in track with transparent face facing exposure light.
5. Expose the proper time.
6. Remove the holder from track.
7. Remove material to be copied from holder.
8. Insert holder in track with transparent face facing developing light.
9. Expose for proper time.
10. Remove holder from track.
11. Remove finished copy from holder.

To produce negative copy from positive original or positive copy from negative original:

1. Place material to be copied face down on transparent face of holder.
2. Place sensitive sheet on top of back of material to be copied.
3. Close the holder.
4. Insert holder in track with transparent face facing developing light.
5. Expose for proper time.
6. Remove holder from track.
7. Remove material to be copied from holder.
8. Insert holder in track with transparent face facing exposure light.
9. Expose for proper time.
10. Remove holder from track.
11. Remove finished copy from holder.

It is also within the contemplation of the invention to dis-pense with hinge **54** and join the two housings together permanently by means of adhesive or suitable mechanical fasteners.

Machine **60** (FIGS. 5 – 7) is a single light station machine of the invention. It is utilized to produce contact prints from black and white or color transparencies. The machine is seen to comprise a polyhedral housing **62** and a cover **64**. Housing **62** and cover **64** are joined along line **63** by adhesive or mechanical means such as bolts and nuts. Housing **62** has a stepped ledge with upper portion **82** and recessed portion **80** and cover **64** is similarly shaped so that a tracked opening **66** for receiving paper holder **40** is formed.

In its preferred form, a pair of bulbs **72** are mounted in chamber **62** of machine **60** and are suitably con-

nected to the source of a-c voltage through timer switch **68** and plug **70**. Starters **76** and ballasts **78** are provided in accordance with fluorescent lighting practice. A reflector **74**, suitably shaped so as to concentrate the light from bulbs **72** toward the opening in housing **62**, is mounted in housing **62**. Reflector **72** is shown as formed from a plurality of plane surfaces but it may be arcuate, parabolic or of other shapes so long as light of the desired intensity and distribution impinges on the material in holder **40**. Holder **40** is inserted in tracked opening **66** with the transparent face toward bulbs **72** in the same manner as we have described heretofore in connection with the apparatus **10**.

By way of illustration and not by way of limitation of the scope of the invention, following is an example of the parameters of a preferred form of one light station machine of the invention:

Sensitive sheet: DuPont DYLUX 503 Photosensitive Paper

Light: 300 to 380 nanometers

Contact prints from black and white or color transparencies are made in the following manner when utilizing the photosensitive paper mentioned above.

1. Insert plug **70** into source of 110/120 volts AC.
2. Place the transparency face down on the transparent face of the holder.
3. Place sensitive sheet on top of the back of the transparency.
4. Close the holder.
5. Insert the holder in track with the transparent face toward the light source.
6. Expose for the proper time. By way of examples, black and white negatives should be exposed between about 15 to 30 seconds. Color transparencies, depending upon negative density and contrast, should be exposed between about **1** and **3** minutes.
7. Remove the holder from the track.
8. Remove the material from the holder.

While particular embodiments of the invention have been shown and described, it is apparent to those skilled in the art that modifications are possible without departing from the spirit of the invention or the scope of the subjoined claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A machine for producing a copy of an original on a sensitive sheet which is developed by light comprising:

a pair of superposed housings, each having an open face, placed so that the open faces are opposed to each other;

said housings having superposed stepped ledges forming a tracked opening between said open faces;

a first light source mounted in one of said pair of housings having a wave length such that when a sensitive sheet is exposed thereto through an original for sufficient time, an undeveloped image of such original is imposed thereon;

a second light source mounted in the other of said pair of housings having a wave length such that when a sensitive sheet is exposed thereto for sufficient time, an image of such original is developed thereon;

holding means insertable in and removable from said tracked opening comprising an opaque support and a transparent sheet for holding therebetween an original and a sensitive sheet in superposition such that when the transparent sheet is facing the first light source, an undeveloped image of said original is imposed on such sensitive sheet and when such sensitive sheet is exposed to the second light source for a sufficient time, the undeveloped image of such original on such sensitive sheet is developed;

said opaque support of said holding means precluding light from either of said sources from simultaneously impinging upon such sheets contained in said holding means.

2. The invention of claim **1** wherein:

said housings are hinged along one edge of each of them so as to be movable between a first position wherein the open faces are close to one another and a second position wherein the open faces are spaced from one another to permit access to the interior of the machine.

3. The invention of claim **5** including:

reflecting means mounted behind each of the light sources to obtain an even distribution of light across the open face.

4. The invention of claim **1** including:

reflecting means mounted behind each of the light sources to obtain an even distribution of light across the open face.

5. The invention of claim **1** wherein:

said two housings are affixed to each other.

6. The invention of claim **5** including:

reflecting means mounted behind each of the light sources to obtain an even distribution of light across the open face.

* * * * *