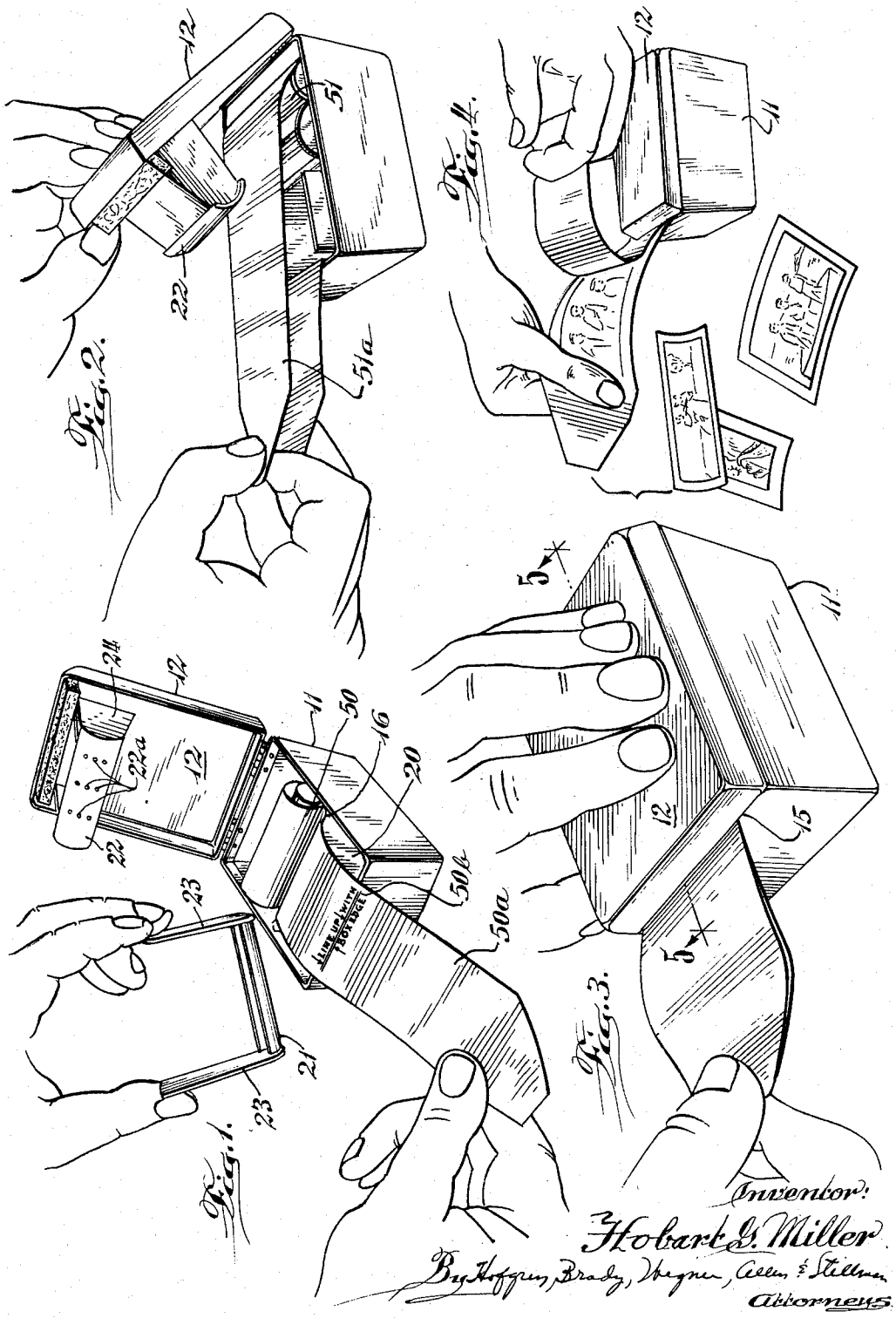
Oct. 20, 1964 H. G. MILLER 3,153,376

PHOTOGRAPHIC DEVELOPER

Filed Dec. 9, 1960 3 Sheets-Sheet 1



Inventor:
Hobart G. Miller
By Hoffman, Brady, Wegner, Allen & Stillman
Attorneys

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Fig. 5.

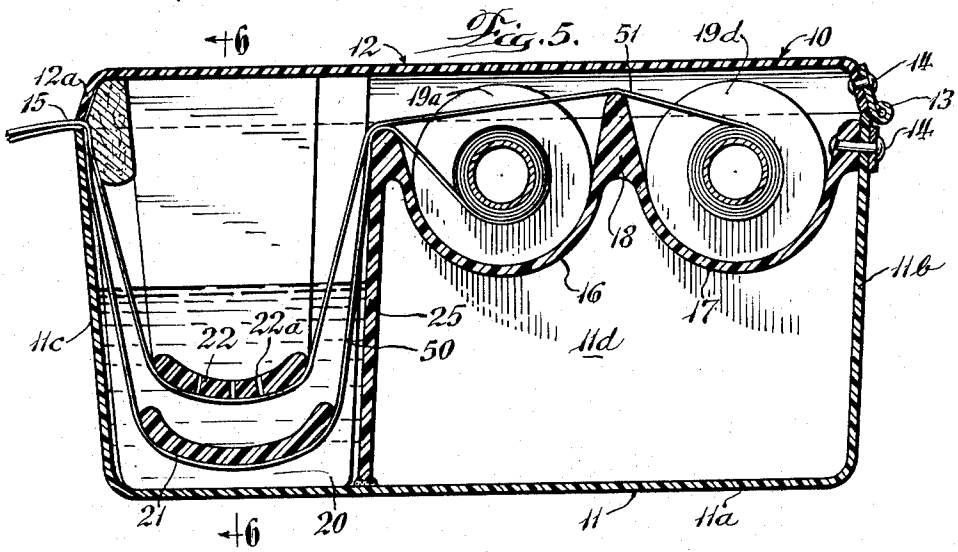


Fig. 6.

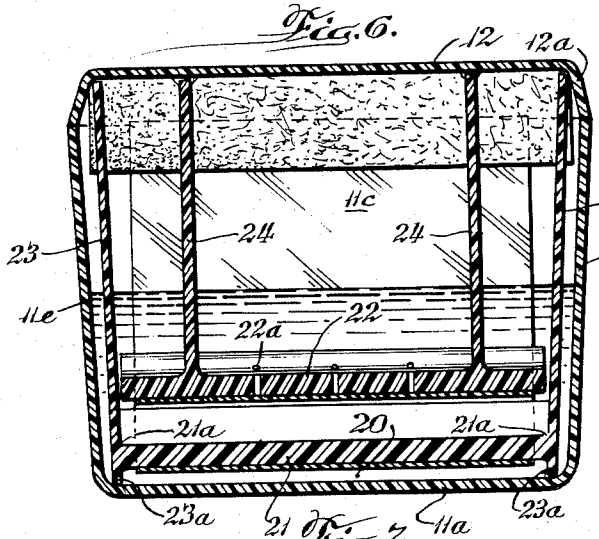


Fig. 8.

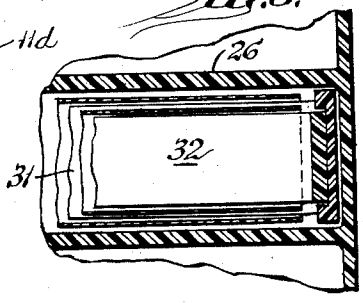
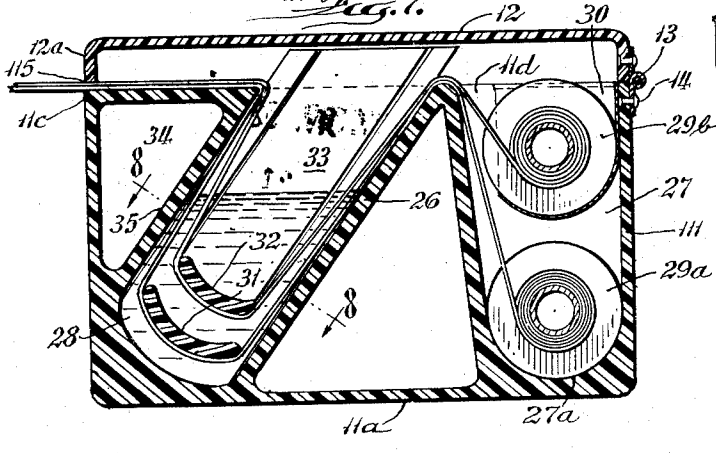


Fig. 7.



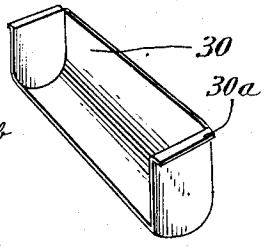


Fig. 9.

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Fig. 10.

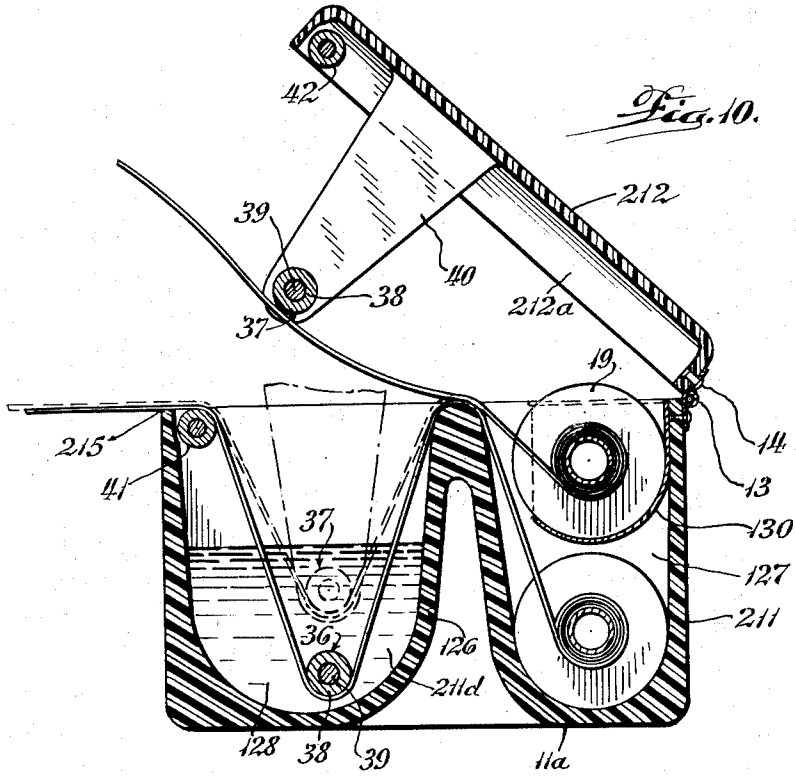


Fig. 11.

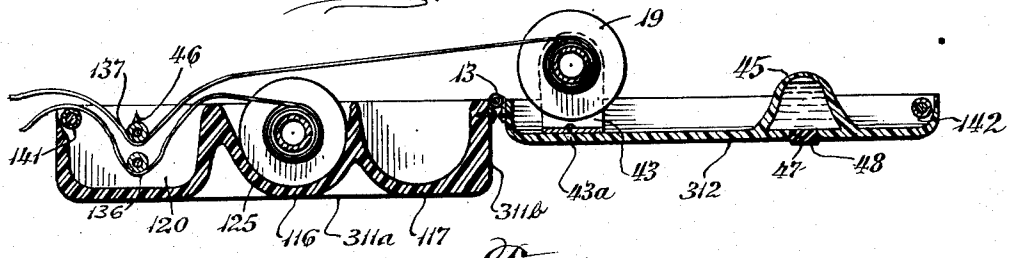
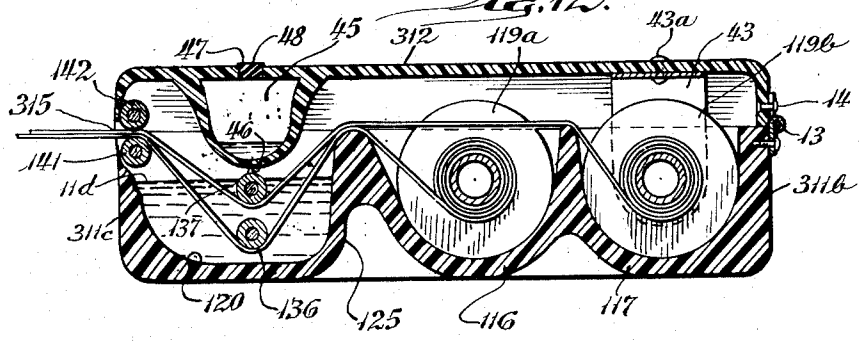


Fig. 12.



United States Patent Office 3,153,376 Patented Oct. 20, 1964

3,153,376

PHOTOGRAPHIC DEVELOPER

Hobart G. Miller, Chicago, Ill. (% American Photocopy Equipment Company, 2100 W. Dempster, Evanston, Ill.)

Filed Dec. 9, 1960, Ser. No. 74,838
3 Claims. (Cl. 95—90.5)

This invention relates to a photographic film developing apparatus and more particularly to a developer which is adapted to develop and print photographic images from diffusion type film in one operation.

The ever increasing interest of the American people in the photographic arts as a hobby or for business purposes has placed great emphasis on production of ever simpler and cheaper photographic equipment. Emphasis has also been placed on the convenience of the photographer, as for example, in the use of the Polaroid Land camera which is capable of developing pictures in the camera as the film is exposed. However, such equipment is relatively expensive in the photographic equipment field.

The developer of this invention is simple and is designed for use with any kind of camera. It is relatively inexpensive since it may be constructed of a disposable plastic material, and it is capable of developing diffusion type film and producing pictures immediately after completion of exposure of a roll of film.

It is therefore an object of this invention to provide a developer such as that described above.

It is another object of this invention to provide a developer which is adapted to develop and print in one operation photographic images from diffusion type film.

It is another object of this invention to provide a developer adapted to develop and print photographic images in one operation from diffusion type film comprising, a substantially light proof container and a removable cover therefor, a film passing opening in the container, a developing fluid compartment in the container, means in the container for supporting at least a pair of film rolls capable of being developed through a diffusion type process, each of the rolls having an extended leader, and means in the container associated with the developing fluid compartment for urging film strips from the film rolls into the developing fluid whereby the film strips, due to an external extracting force on the leaders may be drawn through the fluid, have their surfaces contact and be drawn through the opening to provide developed images.

It is yet another object of this invention to provide a developer such as that described in the paragraph above wherein the developing fluid is contained in a reservoir which is designed to automatically fill the compartment on operation of the developer.

Other objects and advantages of this invention will become apparent from the following description taken together with the accompanying drawing.

Of the drawings:

FIGURES 1, 2, 3 and 4 are perspective views showing the operation of the developer of this invention.

FIGURE 5 is a vertical sectional view taken along the line 5—5 of FIGURE 3.

FIGURE 6 is a vertical sectional view taken along the line 6—6 of FIGURE 5.

FIGURE 7 is a vertical sectional view similar to FIGURE 5 of a second embodiment of the developer.

FIGURE 8 is a partial sectional view taken along the line 8—8 of FIGURE 7.

FIGURE 9 is a perspective view slightly reduced in size of a removable shelf provided in the embodiment of FIGURE 7.

FIGURE 10 is a vertical sectional view similar to FIGURE 5 showing a third embodiment of the developer.

FIGURE 11 is a vertical sectional view similar to FIGURE 5 of a fourth embodiment of the developer with the cover open; and

FIGURE 12 is a vertical sectional view of the embodiment of FIGURE 11 with the cover closed.

Referring now to the drawings, FIGURE 5 shows one embodiment of the developer **10** of this invention. The developer includes a container **11** which has a bottom wall **11***a*, side walls **11***b*, **11***c*, **11***d* and **11***e*, and a cover **12**. The cover **12** is attached to the container **11** by means of the hinge **13** which is connected to the cover and container by rivets **14** in a conventional manner. The container **11** and cover **12** provide a substantially light proof member which has a film passing opening **15** defined between a lip **12***a* of the cover and the side wall **11***c*.

Within the container **11** are two film supporting cradles **16** and **17** which are defined by a partition **25**. The cradles **16** and **17** are separated by an upstanding portion **18** so that a roll of film may rest in each cradle. The strips of film or rolls are disposed upon spools **19** which substantially fit the curve of the cradles **16** and **17**.

Forward of the film supporting cradles is a developing fluid compartment **20**. The compartment **20** is defined by the forward portion of the bottom **11**, the wall **11***c*, portions of the walls **11***d* and **11***e* and the vertically extending portion of the partition **25**, to contain the necessary chemical solution for achieving development of the film. Within the compartment **20** when the cover **12** is in place is disposed a pair of film urging members or bars **21** and **22**. The lower film urging member is attached near either end **21***a* to a pair of flat elongated members **23** and is spaced from the bottom of the compartment **20** by means of extending sections **23***a*. This defines a film passing opening under the member **21**. The upper film urging member or bar is attached to the cover by means of the supporting members **24** so that on closure of the cover, the upper bar **22** is spaced from the lower bar **21**. The bar **22** has a plurality of passage **22***a* which allow developing fluid to pass therethrough.

The container is normally made of a lightweight plastic material and may be made disposable. However, of course, it is plain that the container can be constructed of materials other than plastic so long as they meet the necessary requirements for housing the chemicals required in developing.

Referring now to the embodiment shown in FIGURES 7, 8 and 9, it will be seen that a container **111** having an opening **115** is provided similar to that shown in FIGURE 5. However, the interior construction is slightly different. In this construction a triangular-shaped partition **26** divides the container into two compartments **27** and **28**. The compartment **28** serves the same function of the developing fluid compartment **20** of FIGURE 5, and the compartment **27** serves to provide a location for the film rolls which are disposed vertically in this construction. The lower film roll **29***a* rests on the curved bottom **27***a* of the compartment **27**. The upper film roll **29***b* rests in a removable cradle **30** which is shown separately in FIGURE 9. This cradle is supported on the side walls **11***d* and **11***e* of the container, by the lips **30***a* and is made removable so that the lower roll of film can be placed in the bottom of the compartment **27**.

Film urging members **31** and **32** are provided in the compartment **28** when the cover **12** is closed. These members are substantially the same as the members **21** and **22** of FIGURE 5. The member **31** is attached to elongated members (not shown) similar to the members **23** and the film urging member or bar **32** is attached to the cover by members **33**.

It will be noted that a flat portion **34** is defined by a

second triangular-shaped member **35**, and that the film passes over this flat member as it moves over the opening **115**. A function of this construction and of similar constructions in other embodiments will be explained in greater detail.

The embodiment shown in FIGURE 10 is also similar in container construction to that shown in both FIGURES 5 and 7, having an opening **215** and wall such as **211**. However, the interior construction is again slightly different but related to that shown in FIGURE 7. Thus, the interior of the container is divided into two compartments **127** and **128** by the inverted V-shaped partition **126**. The compartment **127** supports the film rolls, and a removable cradle **130** similar to that used in the embodiment of FIGURE 7 is provided. The film developing fluid is located in the compartment **128** in this embodiment, and a pair of rotatable members **36** and **37** are provided as film urging members. The lower member includes a cylinder **38** journaled for rotation on a rod **39**, the ends of which are supported in the side wall **211***d* and the opposite wall (not shown). The upper member **37** likewise includes a cylinder **38** which is journaled on a rod **39**. However, the rod is supported at its ends by the members **40** which are attached to the cover **212**. The position of the upper member **37** in the container when the cover is closed is shown in dotted lines.

A second pair of rotatable members **41** and **42** similar in construction to the members **37** and **38** is provided adjacent the opening **15**. The lower member **41** is supported by the same walls as the member **36**, whereas the upper member is supported by the skirt **212***a* and the opposite skirt (not shown) of the cover **212**.

Yet another embodiment is shown in FIGURES 11 and 12. This embodiment also includes a container **312** similar to that shown in FIGURE 5 having an opening **315**. However, the walls such as **311***b* and **311***c* of the container are somewhat shorter. The interior of the container is divided into a pair of film supporting portions **116** and **117** by means of a partition **125**. The forward roll of film **119***a* actually rests in the compartment **116**, whereas, the rear roll of film **119***b* which is positioned in the cradle **117** when the cover **312** is closed is actually supported by a pair of members **43**. The members **43** are riveted at **43***a* to the cover **312** and are made of a springy material such as springy plastic so that they may be spread apart slightly to receive a roll of film therebetween as is conventional in common cameras.

The partition **125** also defines a compartment **120** for film developing fluid. Within this compartment is located a pair of rollers **136** and **137** similar to the rollers **36** and **37** in the embodiment of FIGURE 10, and supported by the container walls in the same fashion. A second pair of rollers **141** and **142** located adjacent the opening **115** perform the same function as the comparable rolls **41** and **42** in FIGURE 10.

A film developing fluid storage reservoir or compartment **45** is provided on the underside of the cover **12**. A filling opening **47** which may be plugged **48** is provided in the cover **312** over the container **45**. This compartment is constructed of a material which is soft enough to be penetrated. On each of the side walls **11***d* and **11***e* is provided a sharp piercing member **46**. This member **46** is located above the upper roller **137**. The construction is designed so that when the cover **12** is placed in the closed position, the sharp member **46** will pierce the container **45** thus allowing the developing fluid to run into the compartment **120** for operation of the developer.

As previously mentioned, the film which is adapted to be developed by the developer of this invention is that of the diffusion type. A diffusion type film is customarily defined as one that can produce a photographic image through the use of a silver halide layer which produces a reversed image on an inert material, for example, a material which is not sensitive to light, provided the silver halide layer, after being exposed to light for the production of a master image and then being impregnated with a developer to develop the image, is pressed or squeezed, in the presence of a fogging agent and a silver halide solvent onto an inert printing material while the layer is still imbibed with the developing fluid. If this is done that part of the silver halide in the layer which has not reduced during the exposure to light and which in the ordinary photographic process would be fixed out in the fixing bath will adhere to the reception material and will enter this material by diffusion and will produce thereon a reversed image. In order to render this image freely visible, the light sensitive layer containing the master image is removed from the reception material. Fogging agents are substances capable of promoting the reduction of silver halides without requiring the action of light. Examples of these substances are colloidal silver, colloidal forms of sulphur, silver sulphide, hypophosphites, stannous chloride and organic sulphur compounds such as thiosinamine. As silver halide solvents, the following may be used: sodium sulphate, sodium thiosulphate and the like.

Generally, the film which is exposed in the camera may be either a photosensitive film in a photosensitive paper both of which contain the silver halide layer. The reception material is produced so that the fogging agent is cast on the surface thereof by means of a gelatin solution or the like. Passage of the exposed film and the reception material through a developer thereafter bringing the two strips into contact will cause a reaction to take place and the image will appear on the reception material. Thus it is that the two rolls of film material are used in the developer of this invention, one roll being the exposed roll having the silver halide material and the other roll being the reception material containing the fogging agent. Other films of this general type with numerous variations and make-up are well known in the photographic trade. All of these films, of course, are usable in the developer of this invention. It being only necessary that the diffusion type transfer take place.

In FIGURES 1 through 4, the operation of the developer can be seen. The developer shown in these views, is the embodiment of FIGURE 5. In FIGURE 1, one roll of film **50** is in place in its cradle **16**. This is the reception material. It will also be noticed that the roll of film **50** has an elongated leader **50***a* which bears an indication at **50***b* as to the proper location of the film. It can also be seen that the lower member **21** is being held in the operator's hands prior to its insertion.

FIGURE 2 shows a second roll of film **51** in place, this being the exposed roll containing the silver halide layer. This roll also has an extended leader **51***a*. As can be seen, the cover **12** is about to be closed placing the upper member **22** in place so that the strips of the film **19***a* and **19***d*, respectively, pass under the members **21** and **22** as shown in FIGURE 5. Of course, the developing fluid is already in place in the compartment **20**.

In FIGURE 3, it can be seen that the operator is withdrawing the strips of film from the container through the opening **15**. In FIGURE 4, the operator is peeling apart the strips of film and it can be seen that the pictures or images have been transferred to the reception material and are completely developed.

As the film strips **50** and **51** emerge from the developing fluid, they are forced into contact by their passage through the opening **15**. Furthermore, since the film strips are traveling in a direction at an angle to the opening **15**, they must turn about the upper edge of the wall **11***c* on passage through the opening. This creates a squeegee effect on the film and removes excess developing fluid. Referring to the embodiments of FIGURES 7, 10 and 12, this same operation results due to the flat surface **34** in the embodiment of FIGURE 7 which provides the squeegee effect and the contact necessary for development because of its angled position with respect to the direction of travel of the film. So also do the rollers **41** and **42** in FIGURE 10, and **141** and **142** in FIG-

URES 11 and 12. Thus in each instance the film strips are forced together and are squeezed to remove excess developing fluid.

Operation of the other embodiments shown is substantially the same as that given for the embodiment of FIGURE 5. In FIGURE 7, the film rolls 29 and 29*b* are vertically located. However, insertion of the other parts and the function of the developer is substantially the same. The same may be said of the embodiments of FIGURES 10 and 11.

Color film may also be easily developed by the developing apparatus of this invention. In order to accommodate such film it is only necessary to provide additional developing fluid compartments such as **20** shown in FIGURE 5. In each of the additional compartments, film urging members or bars such as **21** and **22** in FIGURE 5 are also provided. Such additional compartments are necessary since additional developing baths are necessary for color film.

Having thus described my invention as related to the embodiments shown in the accompanying drawings, it is my invention that the invention be not limited by any of the details of description unless otherwise specified, but rather be construed broadly within its spirit and scope as set out in the accompanying claims.

I claim:

1. An inexpensive manually operated, completely self-contained developer adapted to develop film and print photographic images therefrom using diffusion type film all in one operation, comprising: a substantially light-proof container including a bottom wall, side walls and a removable cover, said cover and one of said side walls defining a film passing opening; a developing fluid compartment in said container; a pair of film rolls supporting cradles disposed in said container on a side of said fluid container remote from said opening; said film being capable of being developed through a diffusion type process and each of said rolls having an extended leader; a pair of substantially vertically disposed, horizontally extending bars positioned in said compartment; each adapted to urge a strip of film from one of said rolls into a developing fluid when said removable cover is placed thereover so that no light may exist inside said container during operation of said developer; a film strip contacting surface in said container on the opposite side of said compartment from said cradles, said contacting surface comprising a plurality of rotatable rollers positioned at an angle at the passage of said film strips so that said film strips are brought into contact after their emergence from the fluid and said film strips due to an external extracting force on said leaders may be drawn from said fluid and said opening to provide developed images.

2. An inexpensive manually operated, completely self-contained developer adapted to develop film and print photographic images therefrom using diffusion type film all in one operation, comprising: a substantially light-proof container including a bottom wall, side walls and a removable cover, said cover and one of said side walls defining a film passing opening; a developing fluid compartment in said container; a pair of film rolls supporting cradles disposed in said container on a side of said fluid container remote from said opening, said film being capable of being developed through a diffusion-type process and each of said rolls having an extended leader; a pair of substantially vertically disposed, substantially horizontally extending rollers positioned in said compartment; each adapted to urge a strip of film from one of said rollers into a developing fluid when said removable cover is placed thereover so that no light may exist inside said container during operation of said developer; a film strip contacting surface in said container on the opposite side of said compartment from said cradles, said contacting surface comprising a plurality of rotatable rollers positioned at an angle to the passage of said film strips so that said film strips are brought into contact after their emergence from the fluid and said film strips due to an external extracting force on said leaders may be drawn from said fluid and said opening to provide developed images.

3. An inexpensive manually operated, completely self-contained developer adapted to develop film and print photographic images therefrom using diffusion type film all in one operation, comprising: a substantially light-proof container including a bottom wall, side walls and a removable cover, said cover and one of said side walls defining a film passing opening; a developing fluid compartment in said container; a pair of film rolls supporting cradles disposed in said container on a side of said fluid container remote from said opening, said film being capable of being developed through a diffusion type process and each of said rolls having an extended leader; a pair of substantially vertically disposed, substantially horizontally extending rollers positioned in said compartment; each adapted to urge a strip of film from one of said rollers into a developing fluid when said removable cover is placed thereover so that no light may exist inside said container during operation of said developer; a film strip contacting surface in said container on the opposite side of said compartment from said cradles, said contacting surface comprising a plurality of arcuate surfaces positioned at an angle to the passage of said film strips so that said film strips are brought into contact after their emergence from the fluid and said film strips due to an external extracting force on said leaders may be drawn from said fluid and said opening to provide developed images.

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