United States Patent

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[54] PHOTOGRAPHIC PRINTING APPARATUS

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[52] **U.S. Cl.** **355/46**, 355/51, 355/54, 355/64

[51] **Int. Cl.** **G03b 27/44**

[58] **Field of Search** 355/46, 54, 43, 51, 64

[56] **References Cited**

UNITED STATES PATENTS

Re26,771	1/1970	Schwardt et al.	355/54
3,169,441	2/1965	Johnson	355/54 X
3,401,594	9/1968	Daugherty	355/46
3,424,527	1/1969	Bremson, Jr.	355/46 X

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[57] **ABSTRACT**

Photographic printing apparatus for printing a relatively large print and one or more relatively small prints of a single negative and of a predetermined size ratio in side-by-side relationship on a print paper. The apparatus includes a film carrier and a print paper support. A relatively short focal length lens device is provided for receiving light transmitted through the frame of a film carried on the film carrier and focusing it on print paper positioned on the print paper support to form a relatively large image for printing the relatively large print. Light re-directing means is provided for receiving light transmitted through the film frame and directing it around the relatively short focal length device and one or more relatively long focal length lens devices are provided for receiving such light and focusing it on the print paper to form one or more relatively small images adjacent the relatively large image to print the relatively small prints and to thereby enable the relatively large and relatively small prints to be printed side-by-side on the print paper to conserve print paper and minimize the amount of print paper trimming required.

6 Claims, 5 Drawing Figures

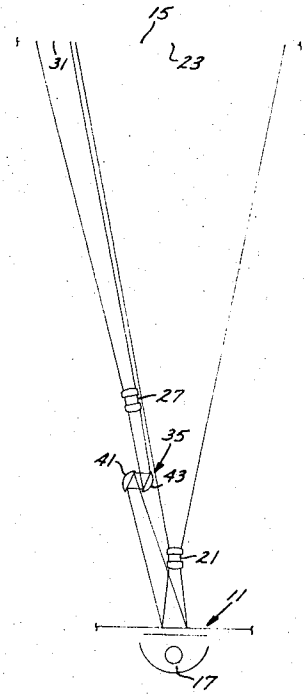


FIG. 1

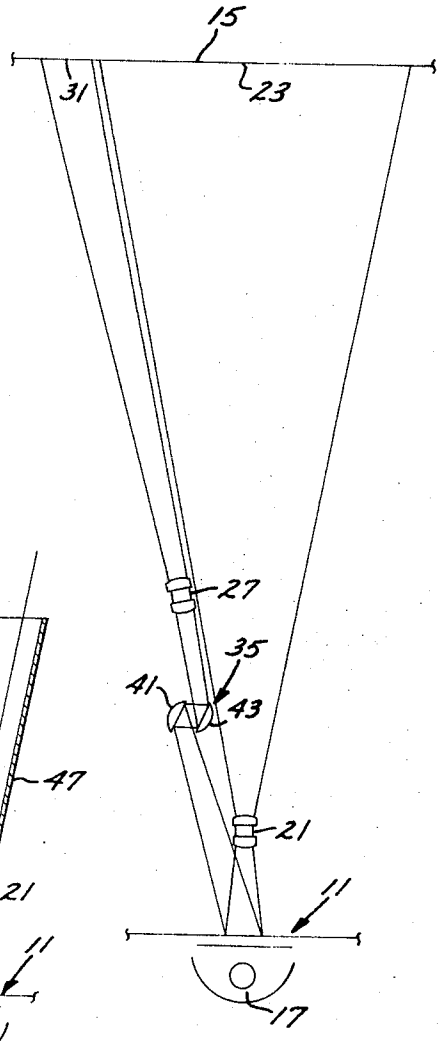


FIG. 2

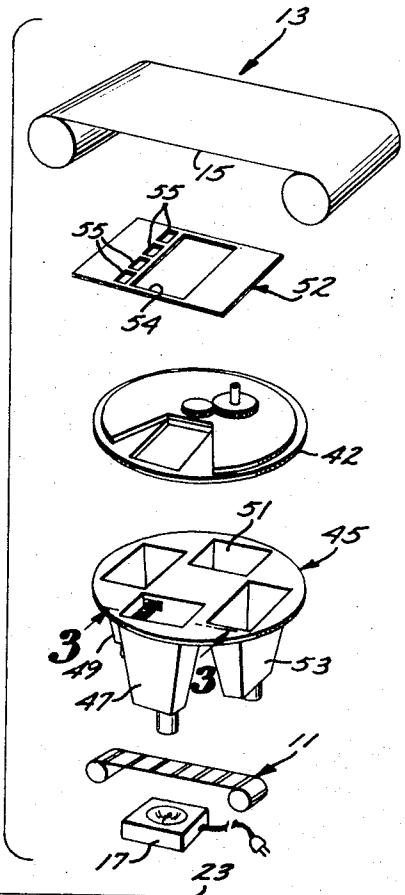
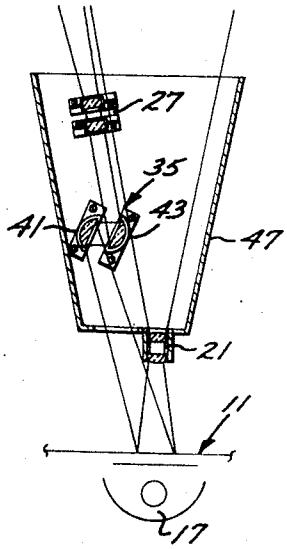


FIG. 3



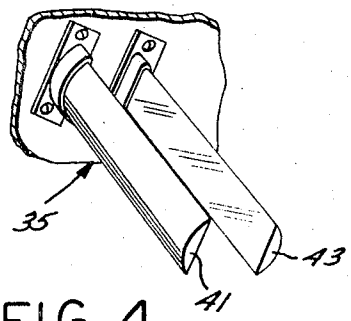
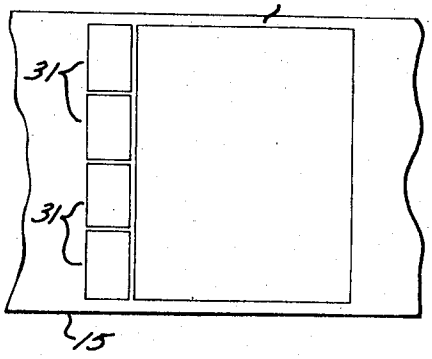


FIG. 4

FIG. 5



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PHOTOGRAPHIC PRINTING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to photographic printing devices for automatically printing a selected number of different sized prints of a single negative.

2. Description of the Prior Art

Photographic printing apparatuses have been proposed which include means for printing side-bY-side prints of different size from a single negative. Photographic apparatus of this type is disclosed in U.S. Pat. No. 3,400,896. However, prior art photographic printing apparatuses of this type suffer the shortcoming that certain combinations of prints of different sizes cannot be printed adjacent one another at the same time from the same negative because the lens elements for one size print would be disposed in the light path for the other size print. Applicant is unaware of any photographic printing apparatus which incorporates light re-directing means to enable printing of two different sized prints in side-by-side relationship even though light cannot be projected in a straight path from the light source to both prints.

SUMMARY OF THE INVENTION

The photographic printing apparatus of present invention is characterized by a film carrier, print paper support and light means for projecting light through a film frame positioned on the film carrier and onto print paper carried on the print paper carrier. A first lens device is provided for focusing a relatively large image on the print paper to print a relatively large print. Light re-directing means is provided for receiving light projected through the frame and directing it through one or more second lenses to focus one or more relatively small images on the print paper adjacent the relatively large image thereby enabling such prints to be printed side-by-side.

An object of the present invention is to provide a photographic printing apparatus which prints different sized prints in side-by-side relationship without requiring trimming of the borders of either print.

A further object of the present invention is to provide a photographic printing apparatus of the type described for simultaneously printing a combination of different sized prints that heretofore could not be printed simultaneously.

Another object of the present invention is to provide a photographic printing apparatus of the type described which is relatively compact.

These and other objects and the advantages of the present invention will become apparent from a consideration of the following detailed description when taken in conjunction with the accompanying drawing.

DESCRIPTION OF THE DRAWING

FIG. 1 is a schematic view of a photographic printing apparatus embodying the present invention;

FIG. 2 is an exploded perspective view of the photographic apparatus shown in FIG. 1;

FIG. 3 is a vertical sectional view, in enlarged scale, taken along the line 3—3 of FIG. 2;

FIG. 4 is a perspective detail view of a light bending device included in the photographic printing apparatus shown in FIG. 1; and

FIG. 5 is a top plan view, in enlarged scale, of a set of prints printed by the photographic apparatus shown in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The photographic apparatus of present invention includes, generally, a film carrier **11** for positioning a strip of film to be printed and a print paper support **13** for supporting photographically sensitized printing paper **15** on which the prints are to be printed. A light **17** is provided for projecting light through the selected film frames and onto the print paper **15**.

A first lens device **21** is provided for projecting image light along a long a selected axis to focus a relatively large image **23** on the print paper and a second lens device **27** is provided for focusing a plurality of relatively small images **31** on the print paper **15** adjacent the image **21** to print a plurality of relatively small prints immediately adjacent the relatively large print. The first lens **21** blocks the direct light path from the light **17** to the print area **31** so a light re-directing means, generally designated **35**, is provided for receiving light projected through the film frame and directing it through the second lens device **27** and onto the print paper **15** at **31**.

The photographic printing apparatus of present invention is particularly adapted for printing school children's pictures wherein a photographer visits the individual schools and photographs each student on a roll of film to provide a series of negatives of each student. The negatives are indexed and each student orders a combination of different sized photographs. It is desirable to provide a selection which makes both a relatively large 8 × 10 print **23** and a relatively small 1¾ × 2½ inch prints **31** available for selection by the student.

Commercially available print paper is available in a 10-inch wide strip and, consequently, it is desirable to print one of the large prints **23** arranged crosswise of the print paper **15** and four of the relatively small prints **31** disposed in stacked relationship crosswise of such print paper and adjacent the print **23**. However, the distance between the film mount **11** and print paper mount **13** is generally about 2½ feet and the focal lengths of the respective lens devices **21** and **27** dictate that the lens device **21** for the relatively large print **23** must be disposed in the direct light path from the light **17**, through the negative, to the area on which the relatively small prints **31** are to be printed. Consequently, light from the light device **17** to the second lens device **27** is blocked by such lens device **21** thereby preventing direct transmission of light to print the relatively small prints **31**.

This difficulty is overcome by providing the light bending or re-directing device **35** which includes a pair of mirrors **41** and **43** which are arranged with parallel confronting faces disposed at an angle of approximately thirty degrees to the vertical and separated so that light projected from the light device **17** and through the film **17** will be directed to the second lens device **27** and onto the print paper. The lens device **27** includes four separate sets of lens elements for focusing four identically sized images **31** on the print paper **15** to print four identically sized prints.

A rotary shutter **42** is provided for controlling the light from the lenses **21** and **27** to control the exposure time.

The film carrier **11** includes a feed spool and a take-up spool which cooperate to advance the film incrementally at distances equal to the width of a frame representing the width of a single negative.

Interposed between the film carrier **11** and the print paper **13** is a lens turret, generally designated **45**, which includes four downwardly projecting hollow lens housings **47**, **49**, **51** and **53** which have particular sets of lenses mounted therein for printing a particular combination of prints on the print paper **15** when the particular housing is registered in the optical axis between the film mount **11** and print paper **15**. The housing **47** has the lens sets **21** and **27** and light redirecting device **35** mounted therein.

Mounted immediately below the print paper stretched between the spools of the print support **13** is a light mask, generally designated **52**, which is formed with a relatively large rectangular aperture **54** for defining the print area of the print **23** and four relatively small apertures **55** arranged in stacked relationship for defining the print area of the prints **31**, the frame between such apertures blocking light to the print paper **15** to form well-defined picture borders.

In operation, the film strip to be printed is positioned in the film carrier **11** and the photographic printing apparatus actuated to energize the light **17** and the drive motors for the film carrier **11**, shutter **42**, lens turret **45**, and print paper support **13**. The apparatus will automatically advance the first frame

of film into the optical axis and will advance the particular cone **47**, **49**, **51** or **53** containing the lens set which will provide the desired combination of prints into the optical axis and the shutter **42** will be energized to print that set of prints.

When the lens mounting cone **47** is advanced into the optical axis and, if either the large print **23** or set of small prints **31**, or both, have been programmed, the shutter **42** will be opened to project light through the lens device **21** and onto the print paper area for the print **23**. Light will also be projected to the face of the mirror **41** and reflected therefrom to the face of the mirror **43** and then through the lenses **27** to the respective apertures **54** and **55** and onto the print paper area for the prints **31**. Consequently, the prints **23** and **31** will be printed in relatively close relationship and need only be cut apart with no requirements for additional trimming as would be the case if they were separated by a greater distance.

It will be clear that if only one or the other of the print sizes **23** or **31** is to be printed, then the aperture **54** or **55** for the other print size will be closed.

From the foregoing it will be apparent that the photographic printing apparatus of present invention provides a convenient means for printing different sized prints in side-by-side relationship to thereby eliminate the requirement for excessive trimming and providing print sizes in proportions which were heretofore unavailable.

Various modifications and changes may be made with regard to the foregoing detailed description without departing from the spirit of the invention.

I claim:

1. Photographic printing apparatus for printing relatively large and relatively small prints of predetermined size ration disposed adjacent one another on print paper, said apparatus comprising:

a film carrier;

a print paper support spaced from said film carrier for positioning said print paper;

light means for projecting light through film positioned on said film carrier and onto print paper on said print paper carrier;

a relatively short focal length lens device for receiving image light projected through a frame of said film to direct said image light along a selected optical path to focus a relatively large image on said print paper to print said relatively large print;

light re-directing means for receiving light projected from said light means and re-directing it to project at an angle to said selected optical path to be projected around said relatively short focal length lens device and be directed toward said print paper; and

a relatively long focal length lens device for receiving light from said light re-directing means to focus a relatively small image on said print paper adjacent said relatively large image to print said relatively small print adjacent said relatively large print whereby said relatively large and relatively small prints of predetermined size ratio may be printed simultaneously in relatively close spaced relationship.

2. Photographic printing apparatus as set forth in claim **1** wherein:

said light re-directing means includes a pair of reflectors arranged in spaced relationship with one of said reflectors having a reflective surface disposed in the path of light projected from said light means and through said film frame and the other reflector having a reflective surface disposed in the path of light reflected from said first reflector to direct said light through said relatively long focal length lens device and onto said print paper to form said relatively small image.

3. Photographic printing apparatus as set froth in claim **1** wherein:

said relatively long focal length lens device includes a plurality of lens sets for focusing a plurality of relatively small images on said print paper.

4. Photographic printing apparatus as set forth in claim **1** that includes:

an opaque light mask mounted adjacent said print paper carrier and formed with a frame defining apertures for passage of light to print said prints, the frame around said apertures blocking light to said print paper to form well-defined print borders.

5. Photographic printing apparatus as set forth in claim **2** wherein:

said relatively short focal length lens device includes a plurality of lens elements for focusing a plurality of relatively small images on said print paper.

6. Photographic printing apparatus as set forth in claim **2** that includes:

an opaque light mask mounted adjacent said print paper mount and formed with a frame defining apertures for passage of light to print said prints, the frame around said apertures blocking light to said print paper to form well defined print borders.

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