United States Patent [19]

Knechtel et al.

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[45] **Feb. 19, 1974**

[54] **PHOTOCOPYING DEVICE**

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[73] Assignee: **Canon Kabushiki Kaisha,** Tokyo, Japan

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[21] Appl. No.: **301,929**

[30] **Foreign Application Priority Data**

July 16, 1969 Germany 1936169

Related U.S. Application Data

[63] Continuation of Ser. No. 54,324, July 13, 1970, abandoned.

[52] **U.S. Cl.** **355/29,** 355/11, 355/14, 355/27, 355/60

[51] **Int. Cl.** **G03b 29/00**

[58] **Field of Search** 355/11, 14, 29, 55–66

[56] **References Cited**

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Primary Examiner—Richard M. Sheer
Attorney, Agent, or Firm—Watson, Leavenworth, Kelton and Taggart

[57] **ABSTRACT**

In photocopying apparatus of the type in which originals of various sizes may be copied into sizes of preselected formats by the use of an objective lens and a mirror, both suitably movable for the purpose of image formation, paper is supplied from a supply roll, a measuring and controlling device cuts the supplied paper into a desired length, a table supports an original in a predetermined position, and switches provided along the path of the paper control the speed of the paper and a source of light at the same time. A row of push buttons is provided, each push button corresponding to predetermined sizes of original and of copy, being and effective to position the objective lens and, if required, the mirror, to operate one of the switches in accordance with a desired size of copy, and to control the length of the paper to be cut. The push buttons indicate the proper positioning of the original on the original supporting table, whereby originals of various sizes can be copied with desired magnifications and with high speed and great ease.

2 Claims, 2 Drawing Figures

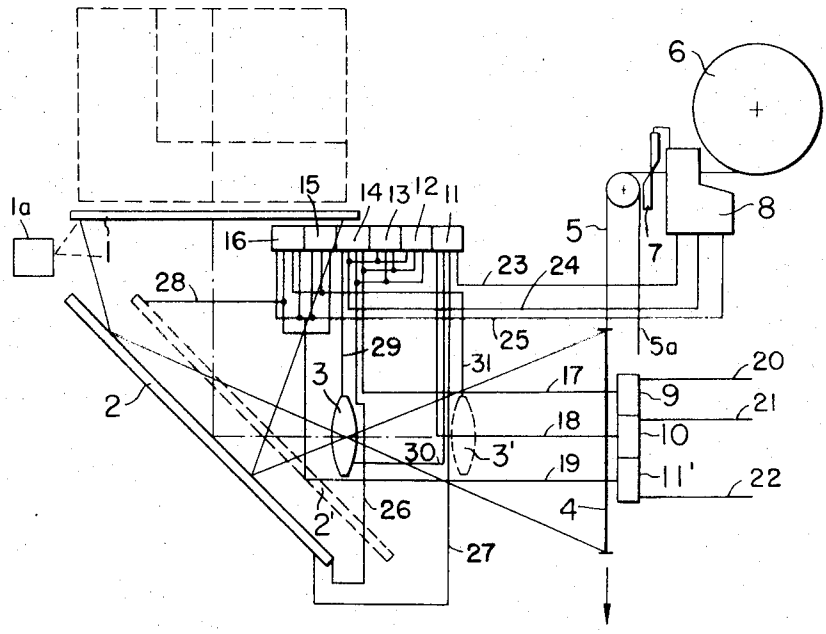


FIG. 1

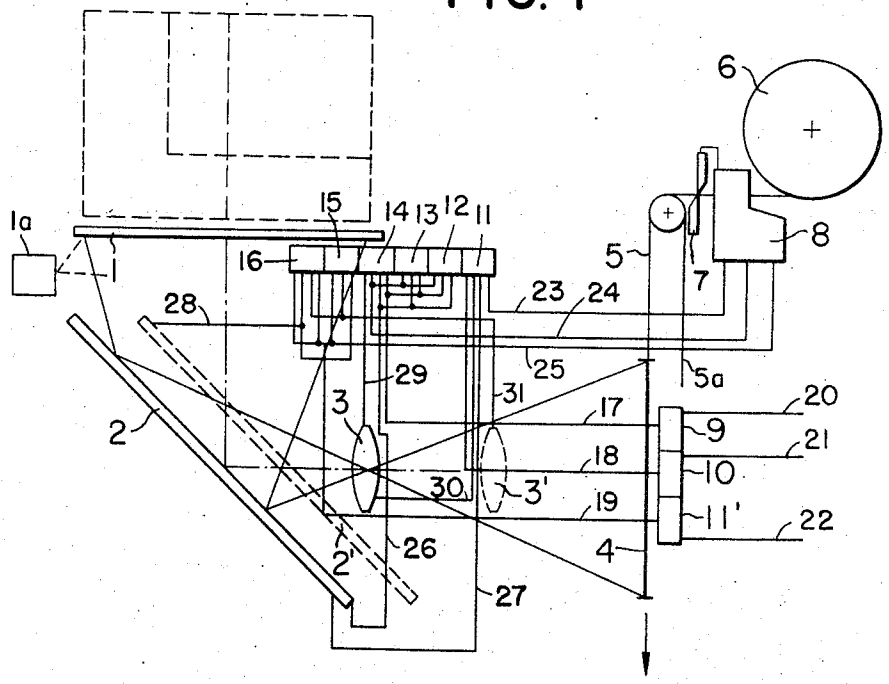
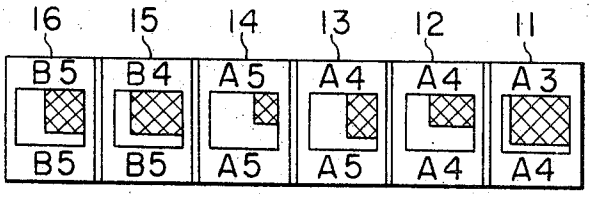

6
1a
15
14
13
12
11
16
5
8
7
23
24
28
25
5a
29
31
3
17
20
9
2
18
21
10
30
3'
19
11'
22
2'
26
4
27

FIG. 2


16
15
14
13
12
11
B5
B4
A5
A4
A4
A3
B5
B5
A5
A5
A4
A4

PHOTOCOPYING DEVICE

This is a continuation, of application Ser. No. 54,324 filed July 13, 1970, now abandoned.

FIELD OF THE INVENTION

This invention relates to a photocopying apparatus, and more particularly to photocopying apparatus of the type in which electrically charged paper, foil or like members are used for providing copies, wherein originals of various sizes may have their optical images formed into sizes of preselected formats on copying paper. Such apparatus comprises an objective lens suitably movable for the purpose of image formation, a selectively movable mirror, a roll of paper for supplying copying sheets, measuring and controlling means for cutting the supplied paper into desired sheet length, said paper having predetermined width, a table for supporting an original in predetermined position with respect to fixed table corner means, said copying paper being moved slowly or maintained stationary while it is exposed to light, and switches provided along the path of the paper for controlling the speed of said paper and a source of light at the same time.

DESCRIPTION OF THE PRIOR ART

The copying machine of the described type is very useful and has important advantages. It can copy originals of desired sizes and can copy them in desired formats of copy without waste of paper, because paper can always be fed from a roll of paper and cut into desired sizes. This apparatus can be operated at a very high speed and it may be called high-speed copying apparatus.

Such apparatus, however, has a disadvantage in that it is very difficult to operate, because originals of formats DIN A_3, DIN A_4, DIN A_5 and formats B_4 and B_5 must have their optical images formed into sizes DIN A_4, DIN A_5 or B_5 and due to the doctrine of combinations, this involves high possibilities of numerous errors in the adjustment of the apparatus, such as positional adjustment of the objective lens movable to change magnification, adjustment of the mirror compensating for the path of light to achieve sharp focusing, adjustment of the measuring means for supplying copying paper, and proper selection of the switches which are usually provided in pairs so that one of the switches acts to move the paper slowly and the other switch acts to restore the initial speed of the paper and, for example, turn on the flashlights for the exposure.

The possibilities of these errors in the adjustment of such apparatus are so great that the machine is operated solely by experts.

SUMMARY OF THE INVENTION

The object of the present invention is to provide photocopying apparatus of the foregoing type which can be readily operated by any ordinary person.

Such object of the present invention can be achieved by providing a row of push buttons, each of which represents a predetermined size of original and a predetermined size of copy and has several control functions, for example, the function of setting the objective lens and, if required, moving the mirror into the position represented by the push button, selecting one of the switches along the path of paper in accordance with the desired size of copy, and controlling the length into which copying paper is to be cut. The push buttons also indicate the positioning of the original on the original supporting table.

With this arrangement, the size of an original to be copied is first considered, and then the format of copying paper to be used for that original is selected. Then, the particular push button to be depressed is determined and the entire control function is effected by the depression of the selected push button.

At the same time, patterns provided on the respective push buttons or closely adjacent thereto enable the user to know how to position the original on the original supporting table of the machine, whereby the optical image of the original occupies the entire surface area of the copying paper.

For this purpose, the respective push buttons carry thereon symbols representing the sizes of original, symbols representing the sizes of copy, and patterns representing predetermined positions of the original on the original supporting table.

The invention will now be described by way of example with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic illustration of a photocopying machine according to the present invention.

FIG. 2 is an enlarged plan view showing the push button arrangement in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, an original to be copied is placed on an original supporting table 1 and illuminated by an illuminator device 1a. The optical image of the original is formed in an image plane 4 with the aid of a mirror 2 and an objective lens 3. A paper 5 fed by belt 5a from a roll of paper 6 moves in the image plane 4. A measuring device 8 measures the length of the paper fed and controls a knife 7. The knife cuts the paper into a suitable length. The copying paper thus cut reaches the image plane 4.

The objective lens 3 is movable to a position 3' so that originals of various sizes may have their optical images focused on various formats of copying paper, and as shown in FIG. 1, a mirror 2' can be rotated into position above the mirror 2 to provide a different length optical path and hence different size optical images.

A corona discharge (not shown) is provided in front of the image plane 4 so as to electrically charge the paper.

Behind the image plane 4 there are disposed three pairs of switches 9, 10, and 11', which vary the speed of movement of the paper 5 just before the image formation is effected, and at the same time turn on the aforesaid illuminator device, and further move the paper again at a predetermined speed after the paper has been exposed to light. The switches have first contacts to which lines 17, 18 and 19 are respectively connected and second contacts to which lines 20, 21 and 22 are connected.

The paper thus exposed to light is then developed by a developing device (not shown).

To control the function of the machine, there are provided a row of six push buttons 11, 12, 13, 14, 15 and 16. Each of these push buttons is provided with a black striped pattern, which represents how the original is to be disposed on the original supporting table 1.

If the original to be copied has the size of format DIN A_3, such original should be placed in the position as indicated on the push button **11.** In this case, the original is copied into the size of DIN A_4.

When the original has the size of DIN A_4 and it is desired to copy such original into the same size, the original should be placed in the position as indicated on the push button **12.** When the original has the size of DIN A_4 and it is desired to copy it into a reduced size of DIN A_5, the original should be placed in the position as indicated on the push button **13.**

The other push buttons represent the other format relations, i.e., DIN A_5 — DIN A_5, B_4 — B_5 and B_5 — B_5, respectively.

The user may depress, for example, the push button **11** after he has placed an original on the original supporting table 1 in the position as indicated by that push button. This causes the objective lens **3** to move to the position **3'** as shown in FIG. **1.** The button **11** also actuates the mirror **2'** into rotation. The button **11** also enables, i.e., supplies voltage to the first contact of, one of the three pairs of switches **9, 10** and **11'** (in this case, switch **11'**), and further controls the measuring device **8** so that the knife cuts the paper into the size of format DIN A_4. The other buttons, if depressed, may similarly actuate the above-mentioned parts.

Therefore, the user can select a suitable button for his original and the desired format of copy with the aid of the symbols provided on each button, place the original on the original supporting table in accordance with the indication on the selected button, and then depress that button. The apparatus will thereafter operate fully automatically.

FIG. **1** illustrates circuit means comprising various conductors or lines having particular interconnection in effecting the foregoing generally discussed machine functions. Thus, each of push buttons **11–16** has a plurality of output terminals selectively interconnected with output lines of other push buttons and with cutter **8,** switches **9, 10** and **11'** and, as shown schematically, with mirrors **2** and **2'** and lens **3.** Further understanding of the invention will be facilitated by a consideration of such selective line interconnection.

Input line **23** to cutter **8** is connected solely to push button **11,** such that the cutter cuts paper to length according with that required by push button **11** (FIG. **2**). Input line **24** to cutter **8** is connected to push buttons **12, 13** and **14,** such that the cutter cuts paper to the common length required by push buttons **12, 13** and **14.** Input line **25** to the cutter is connected to push buttons **15** and **16,** such that the cutter cuts paper to the common length required by push buttons **15** and **16.**

In similar grouping, lines **17, 18** and **19** connect switch **9** to push buttons **12, 13** and **14,** switch **10** solely to push button **11,** and switch **11'** to push buttons **15** and **16.**

Mirror **2** is indicated, by lines **26** and **27,** as employable on the operation of push buttons **11, 12, 13** and **14.** Mirror **2'** is indicated, by line **28,** as employable on the operation of push buttons **15** and **16.**

Lens **3** is in its solid line position, as indicated by lines **29** and **30,** on the operation of push buttons **11, 12, 13** and **14** and in another broken line position, shown as lens **3',** as indicated by line **31,** on the operation of push buttons **15** and **16.**

By way of further explanation of the operation of the machine of the invention, let it be assumed that, following an A–4 to A–4 photocopying operation (push button **12**), it is desired to perform B4–B5 photocopying operation. The original is placed on table **1** as shown on push button **15** in FIG. **2.** Upon operation of push button **15,** lines **25, 31, 19** and **28** are concurrently energized. On energization of line **25,** cutter **8** thereby receives direction to cut paper **5** to one preselected length different from other preselected lengths dictated on energization of lines **23** and **24.** On energization of line **31,** lens **3,** then in its solid line position, is moved rightwardly to its broken line position. On energization of line **19,** the first contact of switch **11'** is supplied with voltage, and on energization of line **28,** mirror **2'** is rotated into operative position to receive an original light image in place of mirror **2.** Belt **5a** transports the copy sheet cut by cutter **8** in image plane **5** and as the sheet advances into predetermined position, switch **9** is operated. Thereupon, line **20** is energized, in turn energizing an illuminator (not shown) connected thereto and generating said original light image. As above-discussed, line **20** may also control apparatus (not shown) connected thereto and providing for variation in the speed of movement of belt **5a,** and hence the copy sheet.

As will be evident to those skilled in the art, the conductive connecting means of FIG. **1** may conveniently be used with various apparatus, heretofore known, for effecting copy sheet cutting, lens and mirror displacement, original illumination and transport belt speed control.

What is claimed is:

1. In apparatus for the photocopying of originals of various formats on copying sheets of different sizes, including a table for supporting said originals, an illuminator for providing an image of said original, an exposure station defining a transport path through which said copying sheets are transported to receive said image, an optical system for selectively providing ones of a plurality of optical paths between said table and said station for said images, each such provided optical path being of a singular predetermined length, said system including mirror and lens means, and means for cutting copying paper to provide said different sized copying sheets, the improvement comprising:

a. a plurality of switches spaced from one another along said transport path and operated upon predetermined positioning of said copying sheets relative thereto, each said switch having an input line and an output line;

b. a plurality of push buttons having output terminals energized on push button operation, each said push button providing a visual indication of a relationship between original format size and the size in which said original format is to be photocopied;

c. first circuit means connecting preselected of said push button output terminals to preselected of said switch input lines for energizing a preselected one of said switch input lines upon operation of each of said push buttons and thereby providing energization of a preselected one of said switch output lines upon operation of said switches;

d. second circuit means including first conductors connected to preselected of said push button output terminals, said first conductors being selectively energized on operation of different ones of said push buttons, thereby providing electrical indi-

cation of a preselected one of said copying sheet sizes; and

e. third circuit means including second conductors connected to preselected of said push button output terminals, said second conductors being selectively energized on operation of different ones of said push buttons, thereby providing electrical indication of a preselected one of said optical paths.

2. The invention claimed in claim **1** wherein said push buttons further provide visual indications of the positioning of all said originals on said table.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,792,926 Dated February 19, 1974

Inventor(s) Wilhelm Josef Knechtel and Detlef Schaffer

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Title page, item [30], "1936169" should read --1936169.4--.

Title page, item [56], "2/1968 Mihojerich et al." should read --12/1968 Mihojevich et al.--.

Title page, item [57], line 13, delete "being".

Column 1, line 10, before "wherein" insert --and--.

Column 3, line 24, after "8" insert --, i.e., by supplying voltage to one of input lines 23, 24 and 25 thereto,--.

Column 3, line 39, "lines" should read --terminals--.

Column 4, line 44, "different sized" should read --different-sized--.

Signed and sealed this 20th day of August 1974.

(SEAL)
Attest:

McCOY M. GIBSON, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

FORM PO-1050 (10-69)

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* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334.

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