

[54] **COPYING APPARATUS**

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[56] **References Cited**

UNITED STATES PATENTS

3,597,074 8/1971 Murgas 355/25
3,594,079 7/1971 Murgas 355/8

3,510,218 5/1970 Limberger et al. 355/8 UX

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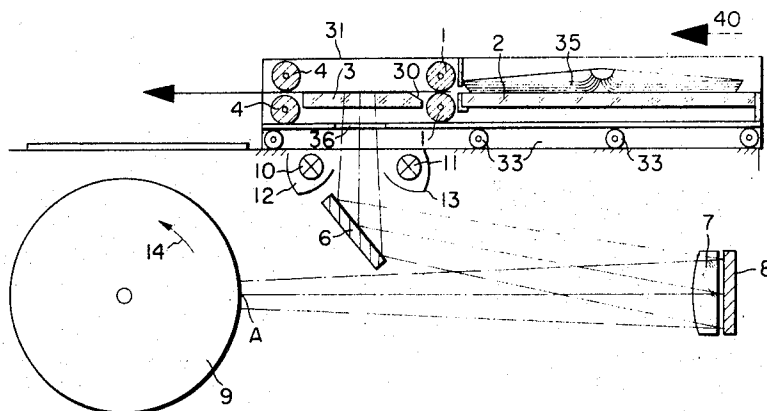
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[57] **ABSTRACT**

This specification discloses improvements in a copying apparatus of the type wherein sheet originals or thicker books may be selectively moved along a copying window and wherein a conventional transport mechanism for sheet originals is connected to a transparent book support positioned on an extension of the transport mechanism, said transport mechanism for sheet originals and said book supporting being selectively moved in common. The improvements consist in a fully automatic drive mechanism for moving the book support and the transport mechanism. The drive mechanism is arranged to impart preferably one reciprocal movement to the book support and the transport mechanism for sheet originals.

12 Claims, 3 Drawing Figures



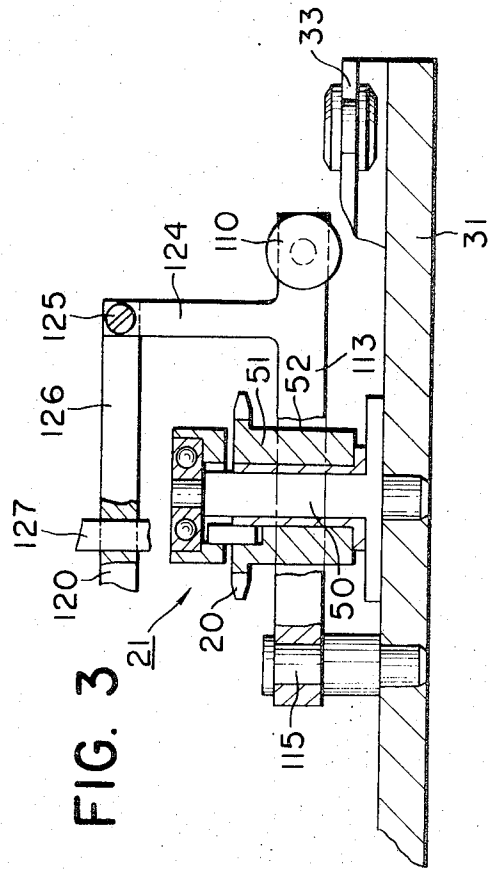
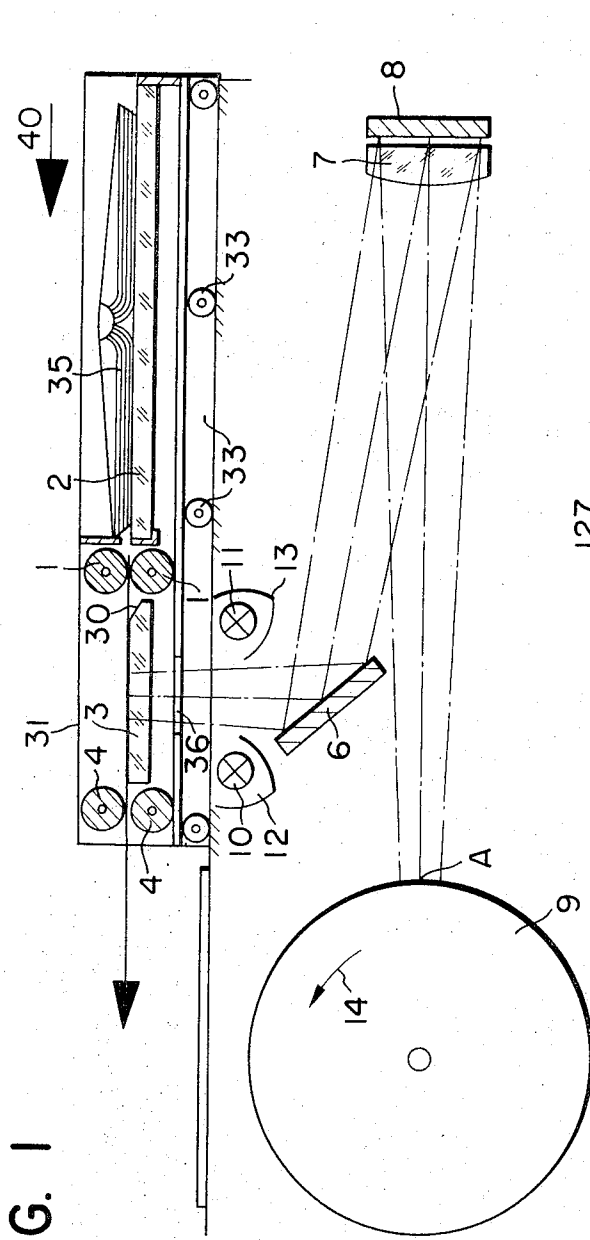
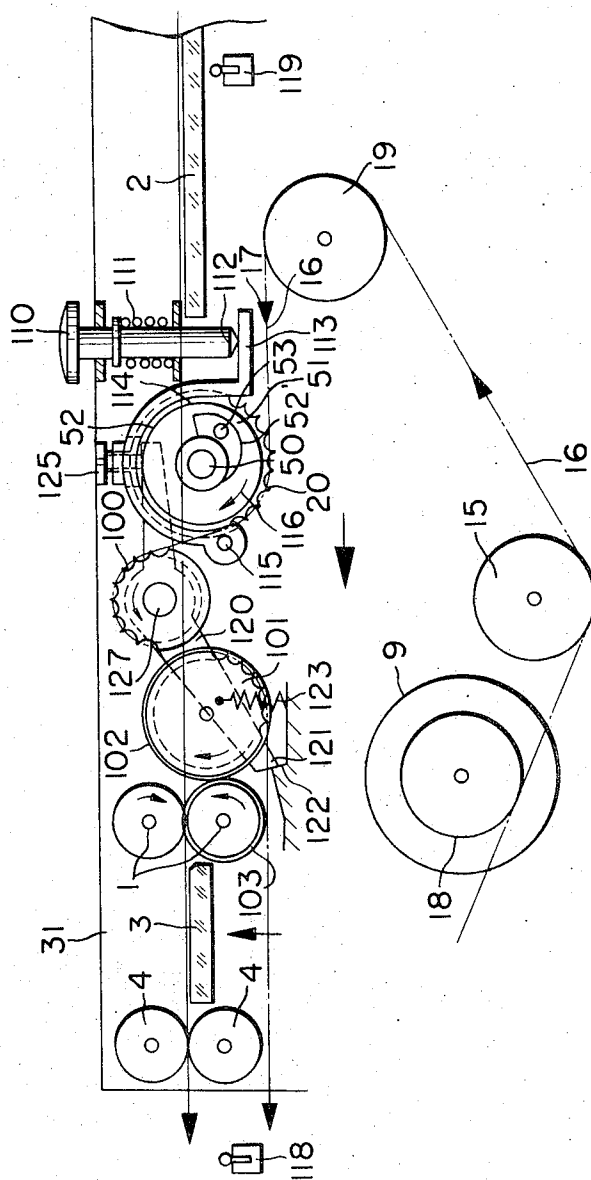


FIG. 2



COPYING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a copying apparatus, and more particularly the invention is an improvement on the invention disclosed in the copending application Ser. No. 225,483 filed Feb. 11, 1972.

2. Description of the Prior Art

The copying apparatus of the invention of U.S. Ser. No. 225,483 is of the type wherein two- or three-dimensional originals such as sheets or books may be selectively moved along a copying window and wherein a transport mechanism known per se for sheet originals, preferably a pair of guide rolls, is connected to a transparent book support, preferably a glass plate, positioned on an extension of the transport mechanism, said transport mechanism for sheet originals and said book support being selectively moved in common. Such copying apparatus has an advantage that sheet originals or desired pages of a thick book can be selectively copied. To copy a sheet original, the sheet original is introduced to guide rolls, with the aid of which the sheet original is moved through the copying apparatus in a known convenient manner. On the other hand, where a book is to be copied, the book is placed on the glass plate and moved over a copying window by the glass plate. This copying apparatus is very simple in operation and can achieve rapid copying.

To copy books, the book support is manually moved over the copying window. In order to synchronously move a book as original and a photosensitive sheet on which the original is to be copied, there is provided a drive motor which limits, through a free wheel, the velocity of the book support manually advanced.

SUMMARY OF THE INVENTION

It is an object of the present invention to improve the above described copying apparatus of the invention of said copending application and provide a copying apparatus in which the book support can be fully automatically moved over the copying window at a proper velocity.

Thus, according to the present invention, the above object may be achieved by providing a fully automatically operated drive mechanism for imparting preferably one reciprocal movement to the book support and to the sheet original transport mechanism to move them. As in the case of the apparatus according to the original invention, the drive mechanism can drive the sheet original transport mechanism independently of but simultaneously with the reciprocal movement of the movable apparatus portion including the book support and sheet original transport mechanism.

In a preferred embodiment of the present invention, there is provided a rotating endless chain which driven the sheet original transport mechanism and simultaneously therewith engages a drive gear of a free wheel. Unlike the construction of the apparatus according to the original invention, the non-driven shaft of the free wheel is journaled against rotation in the book support or in the sheet original transport mechanism, and brake or stop means selectively acts on the driven gear of the free wheel.

The free wheel is preferably of such a construction that the brake means brakes the drive gear of the free

wheel during forward movement of the book support and of the sheet original transport mechanism and that the free wheel itself assumes a braking position during backward movement of the movable apparatus portion.

With such a construction, one reciprocal movement is imparted to the endless chain.

In normal position, the drive gear of the free wheel is idly rotated and the chain drives the sheet original transport mechanism. When the drive gear of the free wheel is braked by the brake means, the drive gear is no longer rotated but it is moved with the chain by the movement thereof. Since the free wheel is journaled in the movable apparatus portion as described above, the movable apparatus portion is also moved together at the same time.

When the direction of movement of the chain is reversed, the brake means is released, preferably automatically, as will be described later. At this time, however, the free wheel brings itself into its braking position where the drive gear of the free wheel cannot begin its rotation. Thus, the free wheel is now moved by the chain therewith in the opposite direction and at the same time, the movable apparatus portion is also moved in company therewith. When the start position is reached, the direction of movement of the chain is again reversed. Now, however, the brake means is no longer acting on the drive gear of the free wheel, and therefore the drive gear is free to rotate. The movable portion remains at its start position and the sheet original transport mechanism is ready to transport a sheet original.

It has been found convenient to provide a lever having a brake lining so that during the braking operation the lever is pivotally moved about its pivot point to engage the circumference of a cylindrical portion securely coupled to the drive gear of the free wheel. When the lever is moved to a braking position for braking the free wheel, the cylindrical portion of the free wheel coupled to the drive gear, when trying to rotate, tends to pull the brake lining engaged therewith in a direction for urging the same into secure contact with the circumference of the cylindrical portion. This ensures the positive braking of the drive gear and accordingly of the free wheel in that direction. When the direction of movement of the drive gear and accordingly of the cylindrical portion of the free wheel is changed, the brake lining is automatically disengaged from the cylindrical portion to release its brake. With such an arrangement, it is ensured that the drive gear of the free wheel is braked always by the said brake means in one of its directions of movement and by the free wheel itself in the other direction of movement.

Where the above described brake lever is used, the lever may conveniently be brought into its braking position by depressing a push button. The lever remains in its braking position until the direction of movement of the drive chain is reversed.

Further preferably, a brake pawl is provided and connected to the aforesaid brake lever to prevent the movable apparatus portion such as sheet original transport mechanism and book support from inadvertently advancing in their start position. The brake pawl is engaged with a projection, a recess or the like fixedly formed in the apparatus when the cylindrical portion of the free wheel is in non-braked position. With such an arrangement, the brake pawl is brought into locking engagement with the projection or the like when the mov-

able portion of the copying apparatus has returned to its start position, thereby positively avoiding any inadvertent advance movement thereof.

The brake pawl may preferably be pulled to its braking position by the action of a spring. The brake pawl and the aforesaid brake lever may advantageously be operatively connected to each other by means of an adjustable bridge member. Very conveniently, the brake lever may have a screw which may be carried on the brake pawl. The screw is usefull as adjust means.

The above described construction of the brake means is not restrictive. The braking of the drive gear of the free wheel may also be accomplished by such means as electromagnetic coupling or manually operated coupling.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described in greater detail with respect to an embodiment shown in the accompanying drawings, in which:

FIG. 1 is a schematic cross-sectional view taken longitudinally of the copying apparatus according to an embodiment of the present invention;

FIG. 2 is a partly cut-away side view of the apparatus of FIG. 1; and

FIG. 3 is a top plan view of a portion of the apparatus of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIG. 1, a sheet original to be copied is slidden on a glass plate 2 and introduced to a pair of transport rolls 1. The transport rolls 1 pass the introduced sheet original over a glass plate 3 and to a pair of transport rolls 4. The transport rolls 4 discharge the sheet original passed through the transport mechanism 1, 3, 4 onto a table 5. In the position as shown in FIG. 1, the glass plate 3 and accordingly the original passing thereover is projected upon a segment A of a copying from 9 by a mirror 6, an objective 7 and a mirror 8 disposed immediately behind the objective 7. Illumination of the glass plate 3 and accordingly of the original may be accomplished by two light sources 10 and 11 having reflectors 12 and 13, respectively.

The copying drum 9 is rotatable in the direction of arrow 14. The driving of this drum is accomplished by a motor 15 driving a chain 16 (FIG. 2). The chain 16 is guided around a gear 19 subjected to a slight brake force. The gear 19 is rotatable, but positionally fixed to the apparatus. The chain 16, after passing the gear 19, passes over a gear 20 in a free wheel 21 to be described, then over a gear 100 and next over another gear 101. Thereafter, the chain passes over unshown several gears to reach the drive motor 15. Another gear 102 is mounted on the shaft of the gear 101 to drive a gear 103 for the transport rolls. The transport rolls 1 and 4 are interconnected by unshown gears and chain, so that the transport rolls 1 and 4 are synchronously driven. The transmission ratio of the gear 102 to the gear 103 is suitably selected so as to equalize the velocity of rotation of the copying drum 9 and the velocity of movement of the original between the transport rolls 1 and 4. The transport mechanism 1, 3, 4 is disposed within a casing 31, which includes the glass plate 2. The casing 31 with the glass plate 2, transport mechanism 1, 3, 4 and table 5 is movable on roll tracks 33 in the direction

of arrow 40. During such movement, the gears 100 and 101 move along the chain.

Where the original is a page of a thick book, the book 35 is placed on the glass plate 2 and then it is transported over a slit-like copying window 36 while being supported on the glass plate, so that a desired page of the book to be copied is projected upon the copying drum 9 in the same manner as described above.

As is apparent from FIGS. 2 and 3, the free wheel 21 has a shaft 50 mounted to the casing 31 against rotation. A hollow shaft 51 is fitted around the shaft 50. The hollow shaft 51 is coupled to the gear 20 and terminates at a cylindrical portion 52. As seen in FIG. 2, the hollow shaft 51 has a gradually enlarged cut-away 52' in which a ball 53 is received.

The copying apparatus is provided with a push button 110 subjected to the force of a spring 111. When the push button 110 is depressed downward, the lower end thereof urges down a lever 113 which is mounted for pivotal movement about a pivot 115 and has a brake lining 114. Upon depression of the lever 113, the brake lining 114 contacts the cylindrical portion 52 of the aforesaid hollow shaft 51. At this time, the brake lining 114 is positioned below a line connecting the center of the pivot 115 and the center axis of the free wheel. As it moves in the direction of arrow 17, the chain rotates the gear 20 and accordingly the cylindrical portion 52 in the direction of arrow 116. As the result of such movement, the brake lining 114 is urged into close contact with the cylindrical portion to thereby prevent the rotation of the cylindrical portion. Accordingly, the gear 20 is also braked. Thus, the free wheel including the gear 20 is pulled by the chain 16 to move with the chain in the direction of arrow 117. During that while, the casing 31 including a movable apparatus portion is pulled to move on the roll tracks by the shaft 50 secured to the casing 31. When the glass plate 2 has passed over the copying window 36, the casing 31 formed as a slide strikes against a limit switch 118. This actuates the switch 118 to reverse the direction of revolution of the drive motor, thus moving back the chain 16 in the opposite direction. During this backing movement, the gear 20 of the free wheel is rotated with the cylindrical portion 52 in the direction opposite to the arrow 116. Since the brake lining 114 tends to follow such reversed rotational movement of the free wheel, the lever 113 is raised then. However, the gear 20 is now blocked and braked separately due to the structure of the free wheel itself. Namely, when the reversed rotational movement occurs, the ball 53 in the cut-away 52' formed in the free wheel shifts toward the narrower area of the cut-away 52' so that the shaft 50 and gear 20 are coupled together against movement relative to each other. Since the shaft 50 is mounted against rotation as described previously, the gear 20 is prevented from rotating and is moved with the chain 16 in the rightward direction as viewed in the drawing. This movement, at the same time, accompanies the backward movement of the casing 31. When the casing 31 slides on the tracks to return to its start position, it strikes against another limit switch 119. Upon actuation of the limit switch, the direction of movement of the chain is again reversed through the change-over of the motor 15. Since the braking of the gear 20 moving in this direction is accomplished by depression of the push button 110, the gear 20 is free to rotate in this position where the push button is not depressed as yet.

Accordingly, the chain at this stage does not move the casing 31. The chain simply moves round while driving the gear 102 and accordingly the transport rolls 1 and 4. The apparatus is now in a position for copying sheet originals.

In order to prevent the casing 31 formed as a slide from inadvertently moving to its start position, there is provided a brake pawl 120. In its normal position, the brake pawl 120 has its end 121 in abutting engagement with a projection 122 fixed to the apparatus. A tension spring 123 pulls the brake pawl into abutting engagement with the projection 122. The brake pawl 120 is operatively connected to the aforesaid lever 113 by means of a bridge portion 124. The bridge portion 124 has a screw 125, by which the lever 113 is secured to one end 126 of the brake pawl 120. The brake pawl 120 is pivotally movable about a shaft 127. When the lever 113 is urged downward, the end 126 of the brake pawl 120 is urged downward therewith. The end 121 is raised away from the projection 122, so that the casing 31 is unlocked for movement. As soon as the casing 31 is returned to its start position, the tension spring 123 again engages the end 121 of the brake pawl with the projection 122. During the return movement of the casing, the lever 113 has already been raised as described above, whereby the end 126 of the brake pawl 120 is released, and thus the engagement between the brake pawl end 121 and the projection 122 becomes possible due to the tension spring 123. The screw 125 is useful for adjustment.

We claim:

1. In a copying apparatus having a window through which an original is exposed for copying, wherein a sheet-like original or a thick original such as a book is selectively moved past said copying window, and wherein there is provided a transport mechanism having rollers for transporting the sheet-like original, a reciprocally movable thick original carrying plate fixedly connected to said transport mechanism so that said mechanism is laterally immovable with respect to said carrying plate, and means for releasably retaining said reciprocally movable carrying plate in a fixed position during copying of a sheet-like original, the improvement comprising: drive means for operating said transport mechanism to rotate said rollers, actuator means for releasing said retaining means, and means coupled to said actuator means for automatically reciprocating said carrying plate through a full cycle of movement upon movement of said actuator means.

2. In a copying apparatus having a window through which an original is exposed for copying, wherein a sheet-like original or a thick original such as a book is selectively moved past said copying window, and wherein there is provided a transport mechanism having rollers for transporting the sheet-like original, a reciprocally movable thick original carrying plate fixedly connected to said transport mechanism so that said mechanism is laterally immovable with respect to said carrying plate, and means for releasably retaining said reciprocally movable carrying plate in a fixed position during copying of a sheet-like original, the improvement comprising: drive mechanism means for operating said transport mechanism to rotate said rollers, actuator means for releasing said retaining means, and

means interconnecting said actuator means and said drive mechanism means for automatically reciprocating said carrying plate through a full cycle of movement upon movement of said actuator means.

3. A copying apparatus according to claim 2, wherein said drive mechanism means includes a movable endless chain for driving said rollers of said sheet original transport mechanism, and wherein said interconnecting means includes a shaft fixed to said carrying plate, a wheel rotatably mounted on said shaft and having a sprocket fixed thereto and disposed in engagement with said chain, said interconnecting means further including brake means adapted to selectively engage said wheel in response to movement of said actuator means.

4. A copying apparatus according to claim 3, wherein said brake means is adapted to brake said wheel during advancing reciprocal movement of said carrying plate, wherein means are provided to prevent rotation of said wheel during the backward reciprocal movement of said carrying plate, and wherein means are provided for imparting a reciprocal movement to said chain.

5. A copying apparatus according to claim 4, further comprising limit switch means provided at the terminal points of the advancing and backward movement of said carrying plate, and a motor coupled to drive said chain, wherein said limit switch means are adapted to reverse the direction of revolution of said motor for driving said chain.

6. A copying apparatus according to claim 4, wherein said brake means comprises a pivotally mounted brake lever having a brake lining, said lever being movable about its pivot to engage said brake lining thereof with the circumference of a cylindrical portion of said wheel.

7. A copying apparatus according to claim 6, further comprising a resiliently mounted push-button, wherein said brake lever is adapted to be urged down into a braking position upon depression of said resiliently mounted push-button.

8. A copying apparatus according to claim 6, further comprising a brake pawl connected to said brake lever, and said apparatus is provided with abutment means, wherein said brake pawl is adapted to be brought into abutting engagement with said abutment means when said brake lever is in a non-braked position, and to be disengaged from said abutment means when said brake lever is in said braking position.

9. A copying apparatus according to claim 8, further comprising a spring, wherein said brake pawl is biased into its braking position by the action of said spring.

10. A copying apparatus according to claim 8, further comprising adjustable bridge means, wherein said brake lever and said brake pawl are operatively connected together by means of said adjustable bridge means.

11. A copying apparatus according to claim 10, wherein said adjustable bridge means includes a screw engaged with said brake lever and carried on said brake pawl.

12. A copying apparatus according to claim 3, wherein said brake means comprises an electromagnetic coupling device connected for energization by said actuator means.

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