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[54] **DEVICE FOR AUTOMATICALLY FEEDING PHOTOSENSITIVE PAPER IN A COPYING MACHINE**

4 Claims, 1 Drawing Fig.

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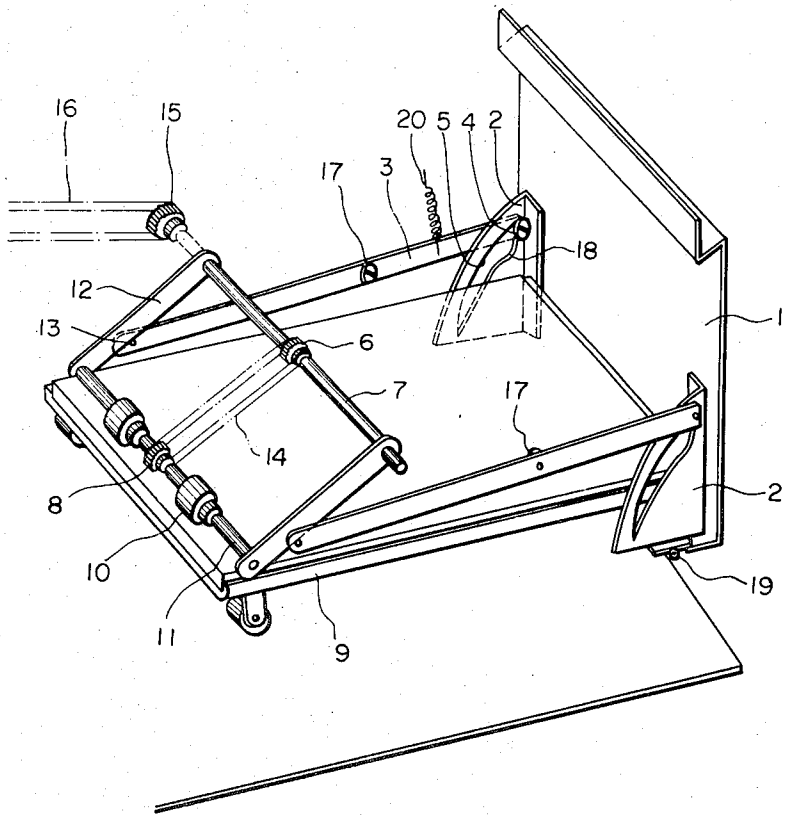
[56] References Cited

UNITED STATES PATENTS

2,357,816	9/1944	Flanigan	271/36
3,273,883	9/1966	Baronnie	271/9
3,507,488	4/1970	Yanagawa	271/36

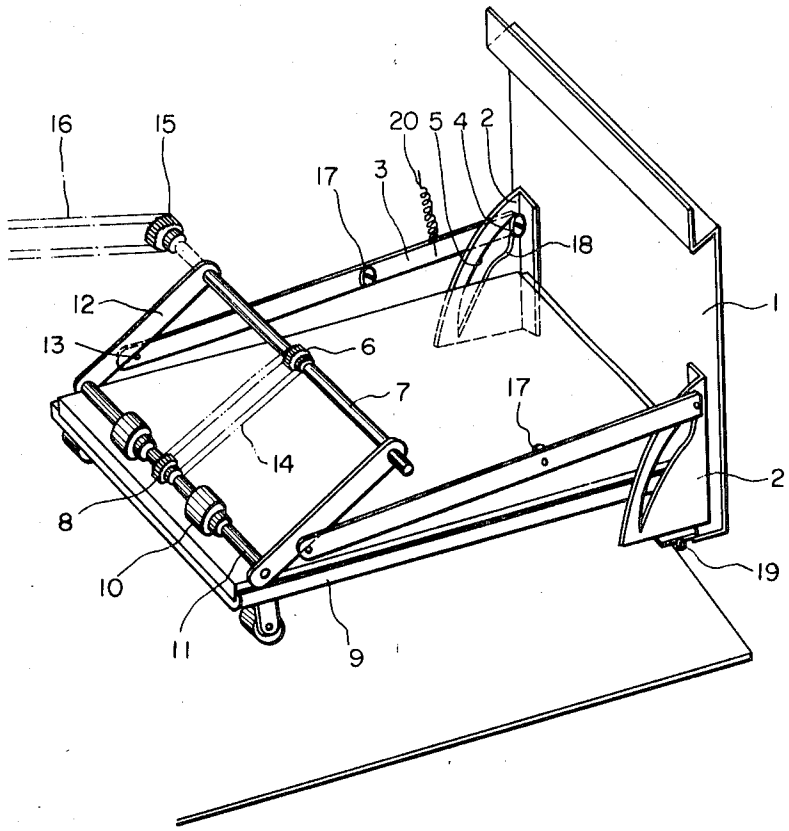
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ABSTRACT: A mechanism facilitating the loading of a copying machine with a stack of paper includes a lid hinged to the machine wall and swingable between a vertical position exposing the opening. A feed roller is fixed to a first shaft rotatably supported at a point remote from the opening between sidearms which are swingable about an upper drive shaft which is belt coupled to the first shaft so that the feed roller is movable with the sidearms between a raised retracted position and a normally lowered advanced position. Cam members are mounted on the lid and levers pivoted between their ends for swinging about a transverse horizontal axis have their inner ends engaging the underfaces of the sidearms and their outer ends provided with cam followers engaging the cams whereby the opening of the lid raises the feed roller to permit the insertion of a paper stack and the closing of the lid releases the sidearms to permit the lowering of the feed roller into engagement with the top sheet.



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DEVICE FOR AUTOMATICALLY FEEDING PHOTOSENSITIVE PAPER IN A COPYING MACHINE

This invention relates to a device for automatically feeding photosensitive paper in a copying machine. More particularly, this invention relates to a photosensitive paper feeding device in a copying machine, in which a paper feeding frictional roller means located deep in the copying machine is operatively connected to a light blocking or sealing lid of the copying machine in such manner that the paper feeding frictional roller is raised and lowered as the lid is opened and closed, said paper feeding frictional roller means being supported by an actuating lever pivoted to a rotary shaft and being driven by the rotary shaft through a transmission chain engaging two sprocket wheels, one secured on the paper feeding frictional roller means and another one secured on the rotary shaft.

Generally speaking, if a copying machine includes a stocker for holding a stack of photosensitive paper or sheets, the photosensitive paper is fed to an exposing portion of the machine sheet by sheet by a frictional roller means from the top of the stack, in synchronism with the movement of an original to be copied in the copying machine. In a conventional copying machine using a cartridge-type or drawer-type stocker of photosensitive paper, it is necessary to mount both a paper feeding frictional roller and a driving means of the frictional roller on the stocker itself. It has also been proposed to use a different cartridge-type stocker having a means for connecting a driving mechanism within the copying machine to the stocker and a means for synchronizing the feeding operation of the photosensitive paper with the movement of the original in the machine. Thus, the conventional cartridge-type stockers inevitably become large in size. On the other hand, in the latter stocker having no built-in paper feeding frictional roller mounted on the stocker itself, for each loading of the photosensitive paper into the copying machine, it is necessary to raise a paper feeding frictional roller mounted on the main part of the copying machine which is located deep in the machine body, in order to allow the insertion of the photosensitive paper between the frictional roller and the baseplate of the stocker. Accordingly, such stocker having no built-in paper feeding frictional roller possesses the drawback that the loading of photosensitive paper cannot be effected accurately and quickly, due to the fact that the paper feeding frictional roller is located deep in the copying machine which makes difficult the quick and accurate manipulation of the frictional roller.

According to the present invention, there is provided an automatic paper feeding device in a copying machine using a paper stocker without any paper feeding roller mounted on the stocker itself, which feeding device obviates the aforesaid difficulties of conventional paper feeding devices. The lid of the stocker, which constitutes a part of the dark chamber of a copying machine, must be opened and closed for each operation of loading a stack of photosensitive paper in the copying machine. In the automatic paper feeding device according to the present invention, a bracket is secured to the back surface of a light-interrupting lid of the paper stocker of the copying machine, a guide opening or cam is formed on the bracket, an actuating lever means or arm is pivotally supported by a rotary shaft of the copying machine so as to rotatably hold a paper feeding frictional roller, and a link lever means is operatively connected to both said cam opening and said actuating lever in such manner that the paper feeding frictional roller is raised and lowered as the light-interrupting lid is opened and closed, whereby a stack of photosensitive paper can accurately and quickly be loaded in the automatic paper feeding device of the copying machine.

Therefore, a specific object of the present invention is to provide an automatic paper feeding device capable of accurately and quickly loading a stack of copying paper therein.

Another object of the present invention is to provide an automatic paper feeding device of the aforesaid structure, in which the raising and lowering of the paper feeding frictional roller are effected by swinging about the axis of a rotary shaft, so that a transmission chain for driving the paper feeding frictional roller from the rotary shaft can be kept engaged with both the frictional roller and the rotary shaft during the raising and lowering of the paper feeding frictional roller.

Other objects and a fuller understanding of the present invention may be had by referring to the following description taken in conjunction with the single accompanying drawing, which is a schematic perspective view of an automatic paper feeding device of copying machine, according to the present invention.

Referring to the drawing, a copying machine has a light-interrupting or blocking lid **1** for a cartridge-type paper stocker **9**, which is pivotally mounted on the casing (not shown) of the copying machine by a suitable means, such as a hinge **19**, and a handle (not shown) is provided on the lid **1** for facilitating the opening and closing of the lid and for stopping a wheeled base plate of the paper stocker. A pair of brackets **2** are secured to opposing vertical edges of the lid **1** on the inner surface thereof substantially at right angle thereto, and a guide opening or cam opening **5** is formed in each bracket **2**. A pair of link levers **3** are pivotally supported by stationary pivot pins **17**. Pins **4** are secured to the tail ends of the link levers **3** and are operatively engaged with the cam openings **5**, respectively. A rotary or drive shaft **7** is axially supported by a framework (not shown) of the copying machine, and a sprocket wheel **15** is secured at one end of the rotary shaft **7** so as to receive driving power from a driving means (not shown) through a driving chain **16**. Another sprocket wheel **6** is also secured to the rotary shaft **7** at an intermediate point thereof, so as to drive a roller or driven shaft **11** through a transmission chain **15** engaging another sprocket wheel **8** secured to the corresponding point of the roller shaft **11**. The transmission chain **14** with cooperating sprocket wheels can be replaced with any other suitable transmission means, such as a gear train, an endless belt with cooperating pulleys, or the like.

The opposing ends of the roller shaft **11** are rotatably supported at one ends of a pair of actuating levers or arms **12** the other ends of which rotatably support the rotary shaft **7**. The actuating levers **12** are so disposed as to be engageable with head pins **13** secured to the corresponding link levers **3**. The head pins **13** are so positioned that they are spaced from the actuating levers **12** when the lid **1** is closed, but they come into operative engagement with the actuating levers **12** when the lid **1** is opened, as will be described hereinafter. A pair of paper feeding frictional rollers **10** are secured to roller shaft **11** at both sides of the sprocket wheel **8**. The frictional rollers **10** act to feed the top sheet of a stock of photosensitive paper on the cartridge-type stocker **9**, sheet by sheet.

With the paper feeding device of the aforesaid construction, when an original to be copied comes to a certain position relative to an exposing portion of the copying machine, the copying machine generates a signal for actuating the sprocket wheel **15** by driving chain **16**, so that the frictional rollers **10** are rotated through the transmission chain **14** engaging the sprocket wheels **6** and **8**. Therefore, the top sheet of the stack photosensitive paper is fed from the stocker **9** to the exposing portion. As the stack of the photosensitive paper on the stocker **9** is fed sheet by sheet to the exposing portion, the paper feeding rollers **10** are gradually lowered by the weight of the frictional rollers and related feeding mechanism, until the entire stack of the photosensitive paper is fed to the exposing portion.

When the frictional rollers **10** are lowered to a certain height relative to the link levers **3**, the actuating levers **12** come in contact with the head pins **13** of the link levers **3**. As the frictional rollers **10** move further downward, the actuating levers **12** swing counterclockwise about the rotary shaft **7**, so that the link levers **3** turn counterclockwise around the stationary pivot pins **17** by the engagement between the actuating levers **12** with the corresponding head pins **13**, as seen in the FIGURE. At the same time, each tail pin **4** moves upward

along the wide portion **18** of the corresponding cam opening **5**.

When the lid **1** is opened to reload a fresh stack of the photosensitive papers, the lid turns clockwise about the hinge **19** together with the brackets **2** integrally secured thereto. The profile of the cam opening **5** of each bracket **2** is such that the cooperating tail pin **4** is lowered as the lid **1** turns clockwise, so as to turn the cooperating link lever **3** clockwise. Thus, the head pins **13** of the link levers **3** act to swing the actuating levers **12** clockwise for raising the frictional rollers **10**. As a result, a suitable spacing is formed between the frictional rollers **10** and the base plate of the stocker **9**, and the spacing is maintained as long as the lid **1** is kept open for loading a fresh stack of photosensitive papers in the copying machine. In other words, the wheeled baseplate of the stocker **9** can be withdrawn from the copying machine, and after being loaded with the fresh stack of copying photosensitive papers, the stocker **9** can be inserted again into the copying machine.

As the lid **1** is closed, the brackets **2** move to the position, as shown in the FIGURE, so as to allow the counterclockwise swing of the link lever **3** by allowing the upward movement of the tail pins **4** of the levers **3**. Accordingly, the head pins **13** are lowered and separated from the cooperating actuating levers **12**, so that the actuating levers **12** swing counterclockwise about the rotary shaft **7** due to the weight of the lever **12**, the roller shaft **11** with the rollers **10** and the sprocket wheel **8**, and the transmission chain **14**. Consequently, the frictional rollers **10** move downward until coming into operative contact with the newly loaded stack of photosensitive copying papers, due to the weight of the aforesaid paper feeding elements. Thereafter, the actuating levers **12** gradually swing counterclockwise as the copying paper is fed to the exposing portion of the copying machine, as described in the foregoing.

In the illustrated embodiment of the paper feeding device of the present invention, various modification are possible. For instance, the position of the head pins **13** can be so chosen as to be separated from the actuating lever **12** at a certain angular position and continue its downward movement away from the levers **12** by its own weight, or a suitable spring **20** can be connected to the link levers **3** or other members for the purpose of maintaining a substantially constant pressure acting on the photosensitive paper to be fed while keeping the head pins **13** away from the cooperating actuating levers **12**. As pointed out in the foregoing, the stack of photosensitive paper is fed sheet by sheet to the exposing portion of the copying machine by the rotation of the frictional rollers **10**, in synchronism with the movement of the original to be copied in the copying machine.

Although the present invention has been described with a certain degree of particularity, it is understood that the present disclosure has been made only by way of example and that numerous changes in the details of construction and the combination of arrangement of parts may be resorted to without departing from the spirit and scope of the invention as hereinafter claimed.

What I claim is:

1. In a copying machine having an end opening providing access to the interior of said machine to permit the loading thereof with a stack of paper sheets:

a. a lid hinged to said machine and swingable between a closed position registering with said end opening and an open position exposing said opening;

b. a paper sheet stack support member positioned in said machine and longitudinally movable through said opening;

c. a transverse drive shaft positioned above said support member;

d. an arm swingably supported about the axis of said drive shaft;

e. a transverse driven shaft rotatably supported by said arm and normally downwardly urged therewith;

f. a friction feed roll affixed to said driven shaft for rotation therewith;

g. transmission means drive coupling said shafts;

h. a cam mounted on the inner face of said lid and movable therewith; and

i. a lever pivoted between its ends about a transverse axis and having an inner end movable into engagement with said arm and an outer end provided with a follower defining element engaging said cam whereby the opening of said lid effects the raising of said lever and driven shaft to a retracted position permitting the insertion of a paper sheet stack and said support member beneath said feed roll and the closing of said lid effects the release of said lever and driven shaft to drop said feed roll into engagement with the top of said stack.

2. A device as set forth in claim **1**, characterized in that said transmission means is a chain which operatively meshes with a sprocket wheel secured to said drive shaft and another sprocket secured to said driven shaft.

3. A device as set forth in claim **1**, characterized in that said lever has a head pin engageable with said arm.

4. A device as set forth in claim **3**, characterized in that said device further comprises a spring means acting on said arm so as to bias said head pin away from said arm for effecting a constant pressure between said frictional roller means and said stack of paper by the weight of that portion of said device which acts on said stack of paper when said lid is closed.