

[54] **DEVICE FOR SUPPLYING
CONTINUOUS SHEET OF PAPER
FROM A ROLLED PACKAGE USED IN
A COPYING APPARATUS**

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[58] Field of Search242/55, 56 R, 67.3 R, 71.9,
242/73, 75, 75.51, 116, 118.5; 200/61.15,
61.16

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[57]

ABSTRACT

An electrophotographic apparatus comprises supporting means for rotatably supporting a roll of paper, a mechanical system for advancing the paper through the apparatus, a roller rotatably mounted along the advancing path of the paper for eliminating the tendency of the paper to reroll; a cutting device for cutting the paper into separate sheets, and sensing means for sensing the consumption of the roll of paper. The supporting means comprises a rotatable shaft having a flange mounted on each end thereof for supporting therebetween the roll of paper. One end of the shaft is provided with a helical thread which cooperates with a pivotal lever on one flange to releasably and adjustably mount the flange on the shaft. A biasing spring urges the lever into engagement with the helical thread to releasably lock the flange on the shaft and the spring may be compressed by manually pivoting the lever against the spring force whereby the flange may be slid off of the shaft so that another roll of paper may be mounted thereon.

9 Claims, 8 Drawing Figures

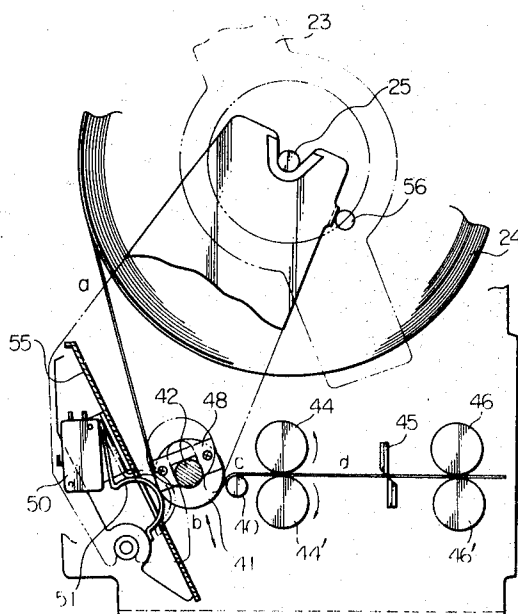


Fig. 3

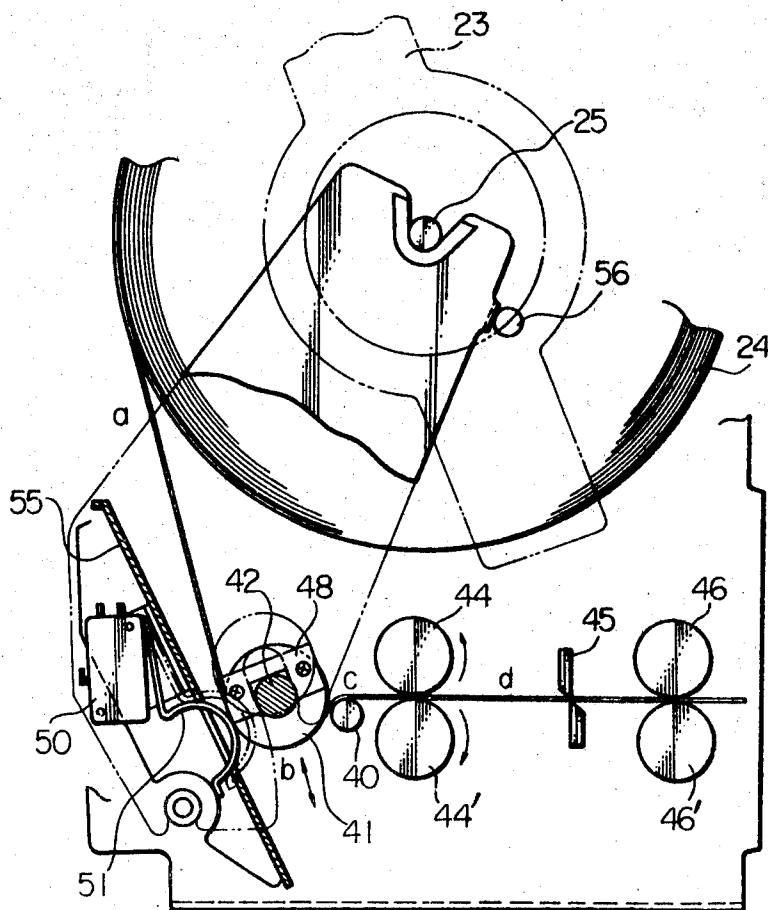


Fig. 4

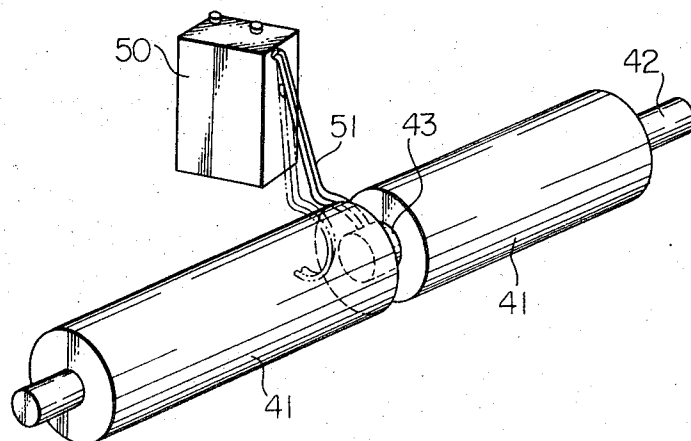


Fig. 5

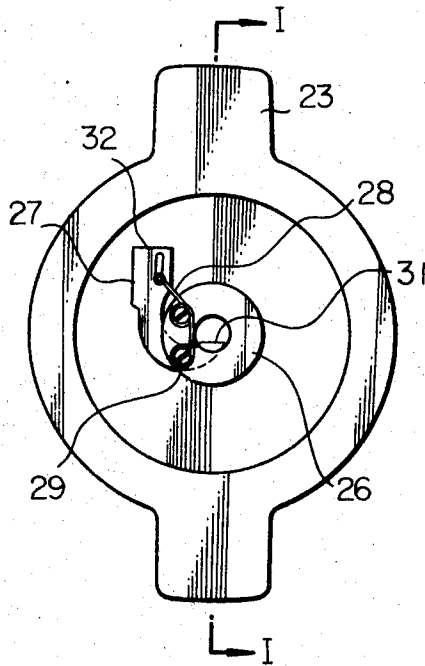


Fig. 6

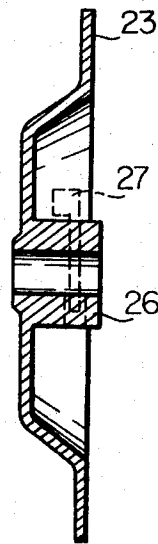


Fig. 7

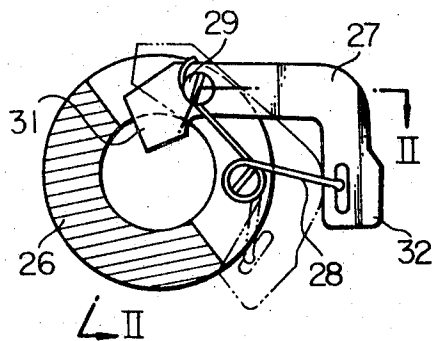
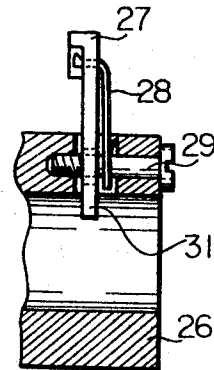


Fig. 8



DEVICE FOR SUPPLYING CONTINUOUS SHEET OF PAPER FROM A ROLLED PACKAGE USED IN A COPYING APPARATUS

This invention relates to a device for supplying continuous sheet of paper from a rolled package used in a copying apparatus, and is especially adaptable for use with electrostatic copying apparatus. In general, it is always necessary to supply the rolled sheet constantly and surely into the exposing and developing devices of the copying apparatus in order to perform the copying operation efficiently and surely. Accordingly, it is also always required not only to supply the rolled sheet under constantly flattened out conditions into the exposing and developing devices, but to sense quickly and certainly the consumption of the rolled sheet and to hold surely, readily and quickly the reserved rolled sheet to the holding means. However, in the conventional copying apparatus, the rolled sheet was used to supply without eliminating its re-rolling tendency, into the exposing and developing devices of the copying apparatus. Accordingly, unevenness of the exposure or of the development was apt to generate in the copied sheet. In addition to this drawback, smooth and stable supplying of the rolled sheet could not be achieved due to the clogging of the re-rolled sheet in the feeding device.

Besides the above, an ordinary limit switch has been applied to a tensioned portion of the rolled sheet as a sensing means for sensing the absence of the rolled sheet by the relaxation of the tension of the rolled sheet which relaxation is obtained by the absence of the rolled sheet. However, in such an ordinary arrangement of the limit switch as applied to the conventional device as sensing means, the limit switch is apt to operate unreliably due to the rotational inertia force of the rolled sheet. Further, in general the conventional device for mounting the rolled sheet, was inconvenient for performing quickly and readily the mounting operation of the rolled sheet.

It is, therefore, a primary object of the present invention to provide an improved rolled sheet supplying device (which is) capable of eliminating the re-rolling tendency of the rolled sheet and of supplying rolled sheet under constantly stabilized conditions.

It is another object of this invention to provide an improved rolled sheet supplying device, in which, the consumed sheet is quickly and surely sensed during the copying process.

It is a further object of this invention to provide an improved rolled sheet supplying device which is capable of performing the holding or detaching operation of the rolled sheet to and from the holding means of the rolled sheet quickly, surely and readily.

The above-mentioned objects of this invention and the manner of attaining the improvement of the rolled sheet supplying device will become more apparent and the invention itself will be understood best by the reference to the following description of embodiments of the present invention taken in conjunction with the accompanying drawings wherein,

FIG. 1 is a partly omitted front view diagram for explaining principally the holding part of the rolled photosensitive sheet, a guiding roller and a pair of drawing out rollers in the rolled sheet supplying device used in the conventional copying apparatus,

FIG. 2 is a partly omitted front view diagram for illustrating principally the holding part of the rolled sheet, a guiding roller, an eliminating roller and a pair of drawing out rollers in the supplying device for the rolled sheet in accordance with the present invention,

FIG. 3 is an explaining diagram illustrating an arrangement of improved supplying device for the rolled sheet,

FIG. 4 is a schematic illustrating diagram showing the function of the limit switch,

FIG. 5 is a front view diagram of a detachable flange of the rolled sheet in accordance with the present invention,

FIG. 6 is a sectional diagram cut along the line I—I of FIG. 5,

FIG. 7 is an enlarged diagram for explaining (A) portion illustrated in FIG. 2, and

FIG. 8 is a sectional diagram cut along the line II—II of FIG. 7.

Some examples of the improvement achieved for performing the present invention will be hereinafter more in detail explained referring to the accompanying drawings.

Referring to FIG. 1, supporting or holding means 1 for the rolled sheet 4 in accordance with the prior art comprises a shaft 5, a fixed flange 2, and a detachable flange 3 for fixing the mounting of the rolled sheet 4. The detachable flange 3 has a boss portion 6 in which a bolt screw 7 is disposed for securing the detachable flange 3 to the shaft 5 for fixing the mounting of the rolled sheet 4 over the shaft 5. The rolled sheet 4 is drawn out to the exposing and developing devices (not shown in the drawing) of the copying apparatus by way of a guiding roller 11 and a pair of drawing out rollers 14, 14'.

In the embodiment seen in FIG. 2, an improved holding means 20 for holding the rolled sheet 24 has a shaft 25 having a saw-toothed type helical screw 30 having a helical rib and root portions. A lever 27 releasably engages with the root portion of the above-described saw-toothed type screw 30 and is rotatably disposed in boss portion 26 of a detachable flange 23. The lever or hook 27 is mounted for pivotal movement around a pin 29 and a tip portion 31 thereof is constantly biased against the root of the saw-toothed type screw by the biasing spring action of spring means 28. Sensing means comprising a limit switch 50 having a lever 51 is disposed close to a guiding roller 41 in such an arrangement that the position of the lever 51 of the limit switch 50 corresponds to the position of an annular groove 43 which is formed annularly around the guiding roller 41.

The rolled sheet 24 is advanced over a peripheral portion of the guiding roller 41 and an eliminating roller 40 which eliminates the re-rolling tendency of the rolled photosensitive sheet 24 by advancing means comprising a pair of drawing out rollers 44, 44' contacting each other with a certain contacting pressure. Accordingly, after the rolled sheet 24 is completely consumed, the lever 51 of the limit switch 50 fits into the groove 43. In this condition, an electric circuit (not shown in the drawing) for actuating a warning device operates so as to inform an operator of the copying apparatus of the complete consumption of the rolled sheet 24 by means of for example, a buzzer or a warning lamp.

As more clearly viewed in FIG. 3, the rolled sheet 24 passes along a passage shown by *a-b-c-d* and then the rolled sheet is cut by a cutter 45 into individual copying sheets so as to expose the image of the originals (not shown in the drawing). The lever 51 of the limit switch 50 contacts the grooved portion of the guiding roller 41 with the sheet between them. Therefore, as already explained above, the lever 51 of the limit switch 50 falls within the groove 43 as shown in the dotted line when the final end of the rolled sheet passes away from the guiding roller 41 and the limit switch provides a corresponding output signal.

That is, as more clearly understood from the schematic illustration shown in FIG. 4, the lever 51 of the limit switch 50 falls within the groove 43 of the guiding roller 41 so as to actuate a buzzer or a warning lamp (not shown in the drawing). Thusly, according to the present invention the consumption of the rolled sheet is surely and quickly detected. An eliminating roller 40 is disposed between the guiding roller 41 and a pair of the drawing out rollers 44, 44' for eliminating the re-rolling tendency of the rolled sheet. The re-rolling tendency of the rolled sheet is completely eliminated by passing over the guiding roller 41, the eliminating roller and the drawing out rollers.

An adjusting member 48 for adjusting an axial center position of the guiding roller 41 are provided on a shaft 42 of the guiding roller 41 so as to modify the arranging position of the guiding roller 41 corresponding to a degree of the re-rolling tendency and to qualities or thickness of the rolled sheet 24. In other words, the passage of the rolled sheet is selectively adjustable by the adjusting member 48 according to the degree of the re-rolling tendency and to the qualities or thickness of the rolled sheet. That is, the area of the contacting surface of the rolled sheet to the guiding roller 41, the eliminating roller 40 and the drawing out rollers 44, 44' is suitably modified so as to acquire the best eliminating conditions for the re-rolling tendency of the rolled sheet 24.

The holding or detaching operations of the rolled sheet to and from the holding means for the rolled sheet will be described hereinafter in more detail referring to FIGS. 2 and 5 to 8.

In case of securing the rolled sheet 24 over the shaft 25 of the holding means 20, the rolled sheet is, first mounted over the shaft 25 shown in FIG. 2 and then the detachable flange 23 is slidably fitted on the end of the shaft 25 by pushing down an arm portion 32 of the lever 27 for example by fingers. In this condition, the detachable flange 23 comes in contact with the end surface of the rolled sheets 24. Accordingly, the detachable flange 23 revolves slightly 2 or 3 times by releasing the arm 32 of the lever 27 so that the tip portion 31 of the lever 27 releasably engages with the root portion of the saw-toothed type screw 30. In this condition, the rolled sheet 24 is securely mounted between the fixed flange 22 and the detachable flange 23.

In the case of detaching the rolled sheet from the holding means 20, the detachable flange 23 is pulled out of the shaft 25 by again pushing down or depressing the arm 32 of the lever 27 so as to release the engagement between the tip portion 31 of the lever 27 and the root of the saw-toothed type screw 30. These operations, as clearly understood from the above description, can be performed quickly and readily.

As more clearly viewed in FIGS. 2 and 7, in case the hook 27 is disposed as shown by real lines as in FIG. 7, the tip portion 31 thereof is engaged with the root of the saw-toothed type screw 30. When the lever 27 is disposed as shown by dotted lines as in FIG. 7, the engagement of the lever 27 and the saw-toothed type screw 30 is released, therefore, the detachable flange 23 is freely axially movable on the saw-toothed type screw 30 formed at one end portion of the shaft 25.

In view of the foregoing, it will be apparent to those skilled in the art that I have accomplished at least the principle object of my invention and it will also be apparent to those skilled in the art that the embodiment herein described may be variously changed and modified without departing from the spirit of the invention, and that the invention is capable of uses and has advantages not herein specifically described; hence it will be appreciated that the herein disclosed embodiment are illustrative only, and that my invention is not limited thereto.

What is claimed is:

1. A device for supporting a rolled web comprising: a shaft having opposite ends; a first flange connected to one end of said shaft; a second flange removably connected to the other end of said shaft and cooperative with said first flange to support therebetween a rolled web; and means mounting said second flange on said shaft for releasable engagement therewith in a plurality of axially spaced-apart locations along said other end and for complete removal from said shaft, said means comprising means defining a plurality of axially spaced-apart grooves in said other end of said shaft, means defining a bore extending through said second flange slidably receiving therethrough said other end of said shaft, a lever pivotally mounted on said second flange manually pivotal into one position wherein same releasably engages with one of said grooves thereby releasably locking said second flange in one of said locations along said shaft and manually pivotal into another position wherein said lever is out of engagement with said shaft thereby enabling said second flange to be axially slid relative to and removed from said shaft, and biasing means continuously biasing said lever to said one position; whereby a rolled web may be supported by removing said second flange, then inserting the rolled web over said shaft, and replacing said second flange and engaging same with said shaft to support the rolled web between said flanges.

2. A device according to claim 1; wherein said means defining a plurality of axially spaced-apart grooves comprises a helical rib projecting outwardly from said other end of said shaft defining a groove between each two adjacent turns of said helical rib.

3. A device according to claim 1; wherein said lever has a first arm dimensioned to fit within said grooves when said lever is in said one position and a second arm, and means mounting said lever at a position between said first and second arms for pivotal movement into and out of said one position in response to manual depression of said second arm.

4. In an electrophotographic apparatus: supporting means for rotatably supporting a roll of paper rolled in one direction into a package, said supporting means including a pair of spaced-apart opposed and rotatable flanges for receiving therebetween the roll, means mounting one of said flanges for movement toward and

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away from the other flange to enable the roll to be positioned between said flanges, and means including a lever pivotally mounted on said one flange for releasably locking said flanges in spaced-apart relationship; advancing means for unrolling the paper from said supporting means and advancing same along a path of travel; means disposed along said path of travel for eliminating the tendency of the paper to reroll in said one direction; a cutting device disposed along said path of travel downstream from said last-mentioned means operative to cut the paper into separate sheets; and sensing means for sensing the absence of the paper upstream from said cutting device and providing a corresponding output signal.

5. An electrophotographic apparatus according to claim 4; wherein said sensing means comprises a rotatable roller positioned along said path of travel and receiving around a peripheral portion thereof the paper and having means therein defining an annular groove, a pivotally mounted lever positioned in opposed relationship from said annular groove for pivotal movement towards and away from said groove, means continuously urging said lever towards said groove whereby said lever is prevented from entering said groove by the paper whenever the paper is wrapped around a peripheral portion of said roller and said lever is pivoted into said groove whenever the paper is absent from around a peripheral portion of said roller, and means responsive to pivotal movement of said lever into said groove for providing said output signal.

6. An electrophotographic apparatus according to claim 4; wherein said supporting means comprises a rotatably mounted shaft having connected thereto in spaced-apart relationship therealong said pair of flanges, and wherein said means mounting said one flange for movement toward and away from said other

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flange comprises means defining an opening through said one flange slidably receiving therethrough an end portion of said shaft, and wherein said means for releasably locking said flanges includes screw threads on said end portion of said shaft releasably engageable with said lever and cooperative therewith to releasably lock said one flange on said shaft.

7. An electrophotographic apparatus according to claim 6; wherein said means for releasably locking said flanges includes a biasing spring normally biasing said lever into releasable engagement with a root portion of said screw threads with a force effective to releasably lock said one flange on said shaft but which may be overcome by manually depressing said lever against the biasing force thereby disengaging said lever and enabling said one flange to be removed from said shaft.

8. An electrophotographic apparatus according to claim 6; wherein said means for eliminating the tendency of the paper to reroll in said one direction includes a pair of arcuate guiding surfaces receiving around a peripheral portion thereof the paper and cooperative together to guide same along an arcuate path effective to eliminate the natural tendency of the paper to reroll in said one direction, and means mounting said pair of arcuate guiding surfaces for relative movement toward and away from each other to selectively vary the extent of contact of the paper with said arcuate guiding surfaces whereby the rerolling tendency of the paper may be effectively eliminated regardless of the thickness of the paper or the size of the roll.

9. An electrophotographic apparatus according to claim 8; wherein said pair of arcuate guiding surfaces each comprise a rotatable roller disposed along said path of travel.

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