

[54] **FACSIMILE DRUM FEED**

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[51] Int. Cl. **B41f 21/04**

[58] Field of Search **271/3, 82, 277; 346/125, 346/132, 138; 101/409; 29/118**

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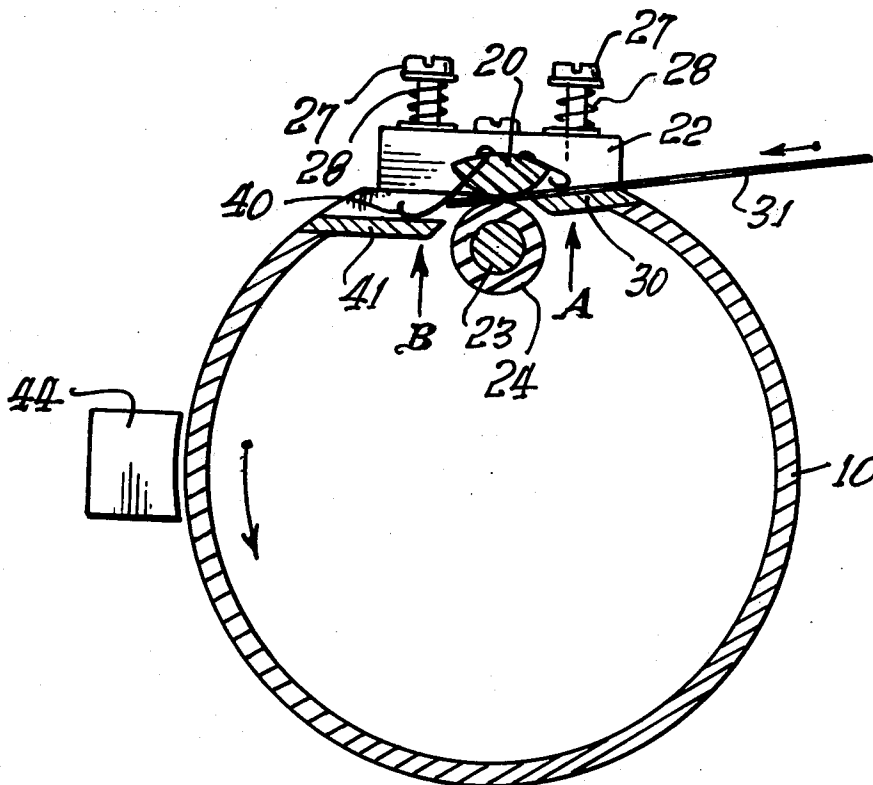
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[57] **ABSTRACT**

Apparatus for loading and unloading a flexible sheet on a drum of a facsimile transceiver is comprised of a feed roller disposed within the drum with its axis parallel to the drum axis, and its surface bearing against a guide bar mounted substantially flush with the surface of the drum in a longitudinal slot wider than the guide bar itself. A gear train carried by the drum at one end is driven to turn the roller while the drum is stationary to feed the leading edge of the paper from one side of the roller to the other. The leading edge of the paper on the other side of the roller is detected to stop the roller. The drum may then be turned, thus wrapping the sheet around the drum while the roller gear train is held stationary relative to the drum. Thereafter, when the drum has been stopped, the gear train may again be driven to turn the roller in the same direction to unload the paper from the drum.

13 Claims, 7 Drawing Figures



SHEET 1 OF 2

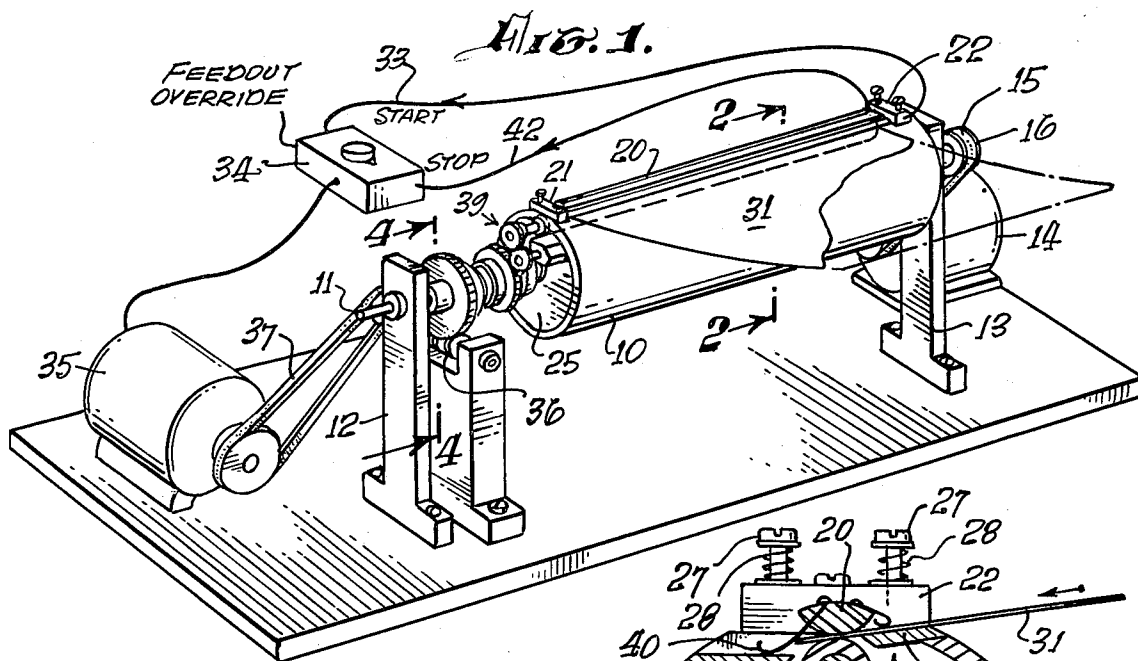
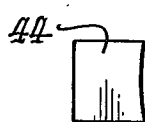
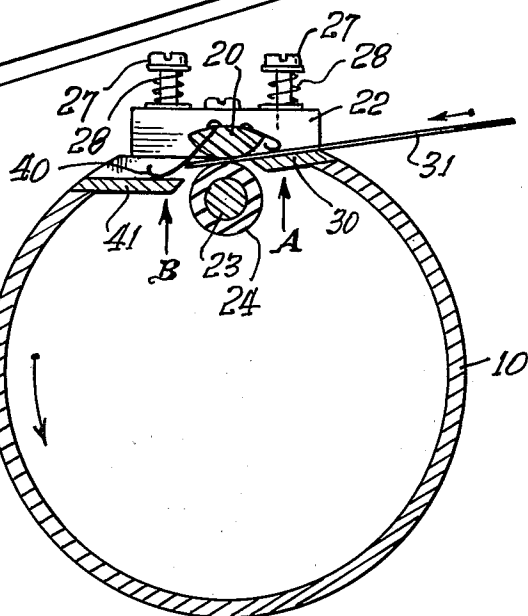
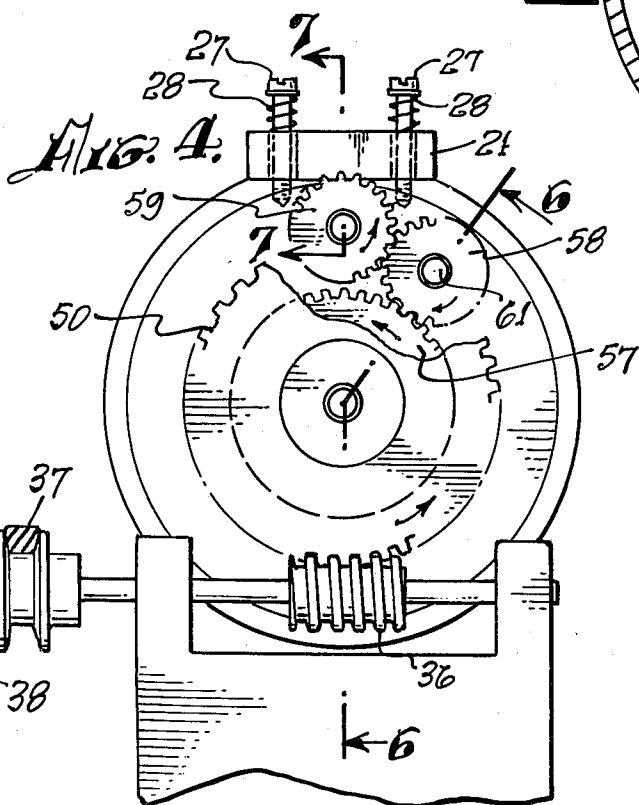
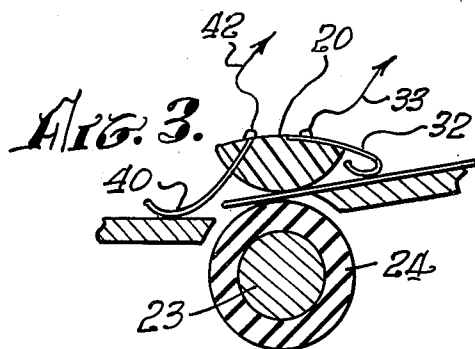
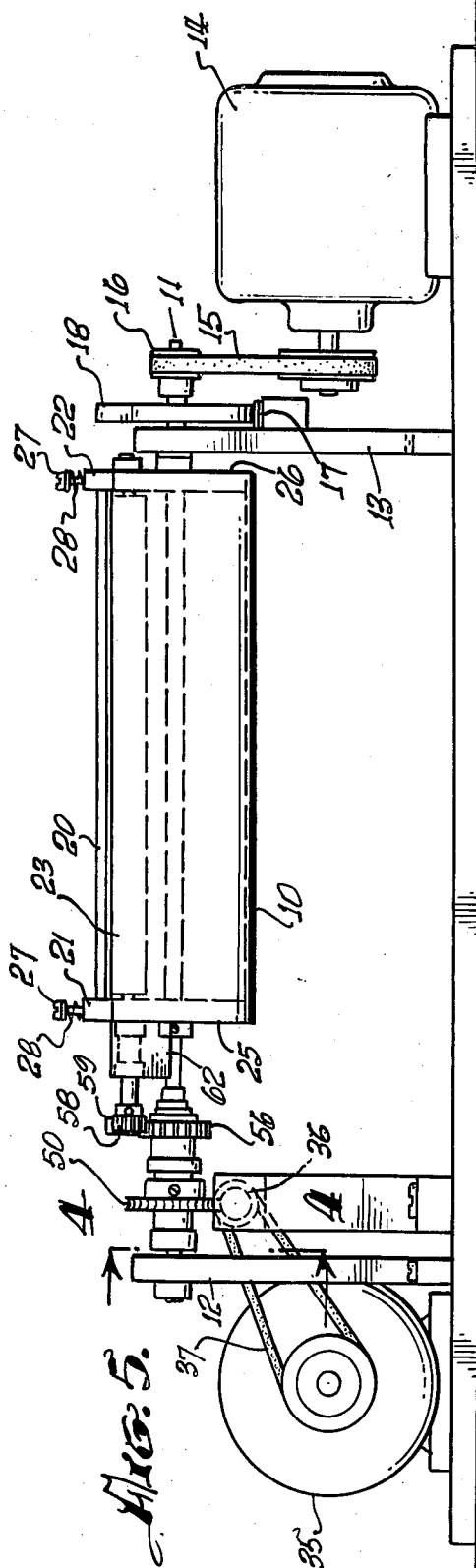
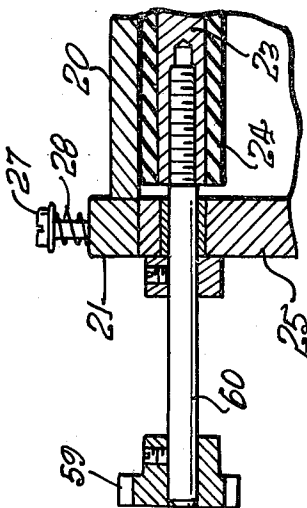
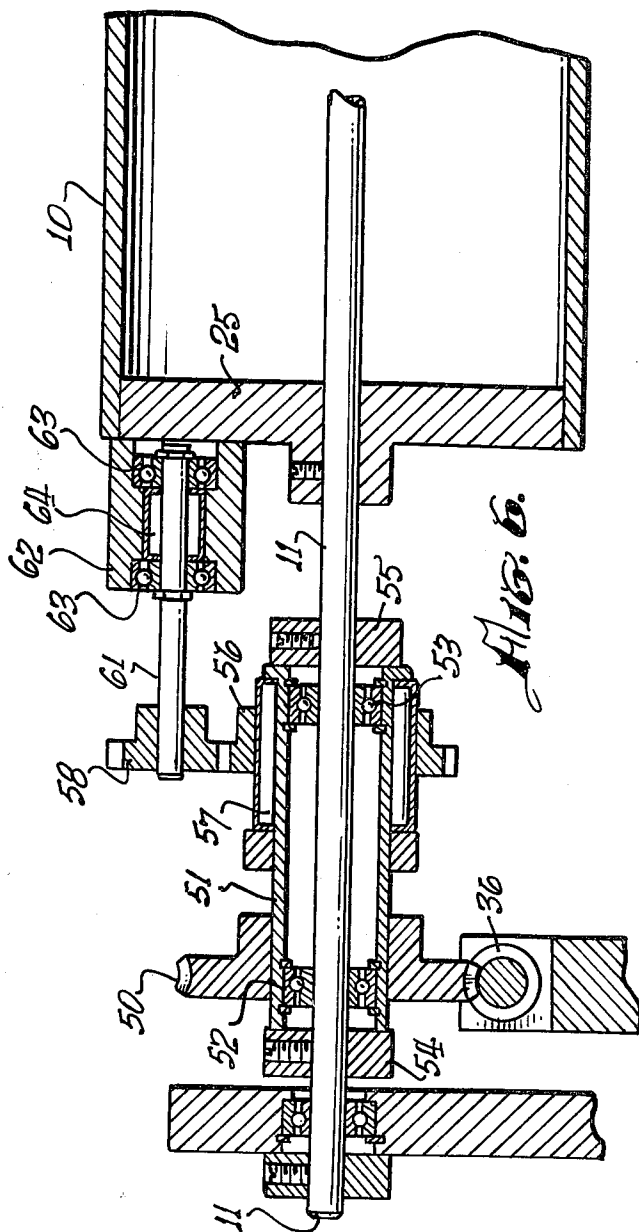


Fig. 2.



SHEET 2 OF 2



FACSIMILE DRUM FEED

BACKGROUND OF THE INVENTION

This invention relates to improved means for loading and unloading a sheet of flexible material on a drum, such as a drum of a facsimile transceiver, an electrostatic copier, and the like.

For many purposes, such as for transmitting or receiving facsimile signals read from or to be recorded on a sheet of flexible material (paper and the like), there is a need to load and secure the sheet on a drum which is then rotated one or more times to carry every segment of the sheet past one or more work stations. In the past, the leading edge of a sheet has been moved onto the surface of the drum at a particular location where the leading edge is clamped, such as by a bar normally recessed in a slot but raised out of the slot to permit the leading edge of the sheet to enter the space between the bar and the slot. When the bar is returned to the slot, the leading edge is clamped. The drum may thereafter be rotated, to wrap the sheet around the drum and transport it past one or more work stations. After all the work has been performed on the sheet, the drum is stopped and the bar is raised out of the slot, thus releasing the leading edge of the paper. The problem with such clamping systems is that separate provision must be made to remove the sheet from the drum.

OBJECTS AND SUMMARY OF THE INVENTION

An object of the present invention is to provide improved means for holding the leading edge of a sheet on a drum for the purpose of causing the sheet to wrap itself around the drum when the drum is rotated.

Another object is to provide a mechanism which will capture the leading edge of a sheet fed onto a drum, and which will hold it while the drum is rotated, thus wrapping the sheet on the drum, and thereafter, when the drum is again stopped, to feed the sheet off the drum.

These and other objects of the invention are achieved by providing a feed roller disposed within the drum with its axis parallel to the axis of the drum and its surface bearing against a guide bar mounted substantially flush in a slot on the drum parallel to the axis of the drum. The slot is significantly wider than the bar and is partially closed on each side of the bar and the roller by flat plates extending from the circumference of the drum to a position near the surface of the feed roller where it is pressing against the bar. One plate serves as a guide for the leading edge of a flexible sheet being fed onto the drum, while the plate on the other side of the bar serves as a guide for the leading edge of the sheet while it is being fed off of the drum. A switch detects the leading edge of the sheet being fed onto the surface of the drum to energize a motor which drives the feed roller through a gear train carried by the drum thus pinching the leading edge of the sheet against the guide roller to feed it through the other side where another switch detects the leading edge to stop the drive motor for the feed roller. The leading edge of the sheet is thus held firmly between the feed roller and the guide bar while the drum is rotated one or more times to wrap the sheet around the drum and carry it past one or more work stations. When the work on the sheet has been completed, the drum is stopped in a predetermined position. The paper may then be fed off the drum by energizing the drive motor for the feed roller to turn the

feed roller in the same direction as before, thus feeding the sheet out over the second guide plate. In that manner, the same mechanism which holds the leading edge of a sheet on the drum while the drum is rotated feeds the sheet off the drum after rotation of the drum has been stopped.

The novel features that are considered characteristic of this invention are set forth with particularity in the appended claims. The invention will best be understood from the following description when read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an isometric view of a drum with a sheet feed mechanism in accordance with the present invention.

FIG. 2 is a sectional view of the drum taken along a line 2—2 in FIG. 1.

FIG. 3 is an enlargement of a portion of FIG. 2.

FIG. 4 is a sectional view of the apparatus in FIG. 1 taken along a line 4—4.

FIG. 5 is a side elevation view of the apparatus of FIG. 1.

FIG. 6 is a sectional view taken along a line 6—6 in FIG. 4.

FIG. 7 is a sectional view taken along a line 7—7 in FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings generally, and first to FIG. 1, a hollow drum 10 is mounted on a shaft 11 journaled in bearings for rotation on stationary frame members 12 and 13. A motor 14 drives the shaft 11 through a belt 15 and pulley 16 to rotate the drum at a rate appropriate for the intended use of the drum, such as for facsimile transmitting or recording. While not being rotated, the drum is held stationary by a solenoid actuated brake shoe 17 (FIG. 5) against a brake drum 18 keyed on the shaft 11 as shown in FIG. 5. A guide bar 20 is mounted on the drum 10 at the ends thereof through spring loaded blocks 21 and 22. The bar is disposed in a longitudinal slot on the drum such that the outside surface of the guide bar is substantially even with the outside surface of the drum, as shown in FIG. 2.

Also carried by the drum is a feed roller 23 having a rubber coating or sleeve 24. The feed roller is positioned with its axis parallel to the axis of the drum and with its rubber coating or sleeve 24 pressed against the guide bar 20 as shown in FIGS. 2 and 4. The ends of the feed roller 23 are carried by shafts journaled in end plates 25 and 26 of the drum as may be more clearly seen in FIG. 7 for the end of the feed roller 23 shown on the left in FIGS. 1 and 5. The blocks 21 and 22 which carry the guide bar 20 are secured to the end plates 25 and 26 of the drum by screws 27 passing through oversized holes in the blocks to the end plates so that the blocks may ride up and down on the screws 27. Springs 28 bias the blocks down to provide the desired pressure between the guide bar 20 and the feed roller.

The longitudinal slot on the drum through which the guide bar 20 and the feed roller meet is wider than the guide bar and the feed roller as shown in FIG. 2. A plate 30 is connected to the drum along the slot edge on the side from which a sheet 31 of flexible material,

such as paper, is to be fed onto the drum. The plate 30 carries the leading edge of the sheet to a position between the guide bar and the feed roller. When the leading edge of the sheet 31 reaches position A shown in FIG. 2, a microswitch 32 senses the leading edge to produce a "start" signal on a line 33 shown in FIG. 1 to cause a control 34 to energize a motor 35. See FIG. 3.

The motor 35 drives a worm gear 36 shown in FIG. 4 through a belt 37 and pulley 38. The worm gear in turn drives a gear train indicated generally at 39 in FIG. 1 to rotate the feed roller counterclockwise as shown in FIG. 2. When the leading edge of the sheet 31 being fed onto the drum manually, or by suitable automatic feed means, reaches the feed roller, it is pinched against the guide bar 20 and fed through to the other side between a microswitch 40 and a guide plate 41 connected to the drum on the other side of the slot. The guide plate deflects the paper in a direction generally out and away from the drum surface. Again see FIG. 3.

When the leading edge of the sheet 31 progresses to a point B on the guide 41, the microswitch 40 produces a signal on a line 42 (shown in FIG. 1) to the control 34 to stop the motor 35. The sheet thus fed onto the drum is now held firmly between the guide bar and feed roller. When the motor 35 is stopped, the drum is still being held stationary in the position shown by the brake 17.

Once the motor 35 has been stopped, the motor 14 may be energized (by a control not shown) to cause the drum 10 to rotate, thus wrapping the sheet around the drum and carrying the sheet past one or more work stations, such as a scan or record station 44 shown in FIG. 2. After the drum has completed one or more revolutions past the work station, the drum is stopped by the control for the motor 14 being deenergized and the brake 17 being energized. Once stopped, the paper is fed out from the drum by again energizing the motor 35, such as by applying an override signal to the control 34, to cause it to turn in the same direction as before. That again drives the feed roller counterclockwise as viewed in FIG. 2 to feed the sheet 31 to the left.

The plate 41 guides the leading edge of the sheet out at a significant angle with respect to a tangent to the drum at the feed-out point so that a tray (not shown) positioned nearby may receive the sheet. This assumes the drum 10 is stopped in the position shown to unload the sheet. In practice, the drum may be stopped in any position, such as in a position 180° from that shown, to unload a sheet. The choice of where to stop the drum to unload a sheet will depend upon the environment or application of the present invention.

The gear train 39 driven by a worm gear drive and carried by the drum 10 will now be described with reference to FIGS. 4, 5 and 6. The worm gear drive is comprised of a worm gear 36 which drives a gear wheel 50 that is rigidly connected to a sleeve 51 journaled by bearings 52 and 53 on the drum shaft 11. Collars 54 and 55 hold the sleeve 51 in position on the shaft. The worm gear 36 is so driven by the motor 35 through the pulley 38 as to rotate the gear wheel 50 counterclockwise as viewed in FIG. 4. The sleeve connected to the gear wheel 50 drives a main gear 56 in the same direction through an over-running clutch 57 shown in FIG. 6. A reversing gear 58 then drives a gear 59, also counterclockwise as viewed in FIG. 4. The gear 59 is keyed to a shaft 60 (FIG. 7) connected to the feed roller 23.

While the drum 10 is being rotated counterclockwise as viewed in FIG. 4 by the motor 14, the over-running clutch 57 permits the gear 56 to rotate freely with the drum. The intermediate gear 58 is carried by the drum on a shaft 61 so that it remains stationary relative to the gear 56 while the drum is rotating. To assure that there is not relative motion between the gears 56 and 58, the shaft 61 is journaled in a block 62 connected to the end plate 25 of the drum by bearings 63 and an over-running clutch 64 which locks the shaft 61 to the block 62 if the gear 58 attempts to turn counterclockwise relative to the drum. Thus, while the drum 10 is rotating, the gear wheel 50 is stationary and the gear train 39 is free to move with the drum around the shaft 11 due to the over-running clutch 57 functioning as a free bearing while the drum 10 is rotating counterclockwise. While the drum 10 is held stationary by the brake 17, and the motor 35 is energized to drive the feed roller, the over-running clutch 57 locks and the over-running clutch 64 is free. This assures that the feed roller will only feed in one direction, and that only while being driven counterclockwise relative to the drum while the drum is stationary.

It would be possible to rotate the drum counterclockwise and to drive the feed roller at a sufficiently high rate to permit the feed roller to feed paper through from one side of the roller to the other while the drum is rotating, but that would serve no purpose since the object of the feed roller is to capture and hold the leading edge of a sheet being fed onto the drum at a fixed location, and to later feed out the sheet at a fixed location. Consequently, it is to be understood that the two motors 14 and 35 are never to be energized at the same time. That being the case, a single drive motor may be used to separately and alternately drive the feed roller and the drum through suitable mutually exclusive clutches.

Although a particular embodiment of the invention has been described and illustrated herein, it is recognized that modifications and variations may readily occur to those skilled in the art. For example, the drum need not be cylindrical. In some applications a cross section of the drum in a plane normal to its turning axis may be elliptical. As another example of a variation, the roller drive means may be simply a motor carried by the drum and energized by brushes on slip rings on the drum. Another modification or variation could obviously be the means for sensing the leading edge of the sheet to start and stop the drive motor for the roller. While a microswitch is shown which, when activated by the sheet, breaks a circuit ground connection through the drum, an other equivalent switch arrangement could be used, such as an optical switch arrangement. Consequently, it is intended that the claims be interpreted to cover such modifications and variations.

What is claimed is:

1. Apparatus for holding an edge of a flexible sheet on the surface of a drum mounted on a shaft for rotation of said drum on an axis parallel to a curved surface thereof, said apparatus comprising:

a slot on the surface of said drum parallel to said axis, an elongated bar and feed roller combination, said bar being disposed parallel to the axis of said roller and in contact therewith, said combination being mounted flush on said drum in said slot with both the axis of said roller and the center line of said bar being disposed in a plane passing through said

drum at approximately a right angle with a plane tangent to said drum surface, and means for turning said feed roller while said drum is stationary and said sheet is being fed into said slot from one side of said combination with said edge of said sheet moving into contact with both said bar and said roller.

2. Apparatus as defined in claim 1 including a plate fixed to said drum and extending from said one side of said slot toward said roller and bar to guide said edge of said sheet to where said roller and bar meet, and a plate fixed to said drum and extending from said other side of said slot toward said roller and bar to guide said edge of said sheet out away from said drum.

3. Apparatus as defined in claim 2 wherein said means for turning said roller is comprised of a gear train carried by said drum at one end thereof, a worm gear drive to said gear train fixed on a sleeve journaled on said shaft by bearings and means coupling said sleeve to said gear train for locking said sleeve to a first gear of said gear train upon turning said sleeve in one direction by driving said worm gear drive in one direction, and unlocking said sleeve from said first gear of said train when said drum is rotated.

4. Apparatus as defined in claim 3 including means coupled to a gear in said gear train for locking said gear train when said drum is rotated in said one direction and unlocking said gear train while said sleeve is turned in said one direction.

5. Apparatus for loading and unloading a flexible sheet on the surface of a drum adapted to be rotated in one direction, said apparatus comprising:

a guide bar mounted flush on said drum in a longitudinal slot parallel to the axis of rotation,

a feed roller disposed within said drum bearing against said bar with its axis parallel to said guide bar,

means for turning said roller in said one direction while said drum is stationary and a sheet is being fed into said slot from one side with its leading edge moving into contact with both said bar and said roller to cause the leading edge of said sheet to be pulled in between said bar and roller,

means for stopping said roller when said leading edge emerges from between said bar and roller on the other side, and

means for overriding said stopping means while said drum is stationary to rotate said roller in said one direction to unload said sheet from said drum.

6. Apparatus as defined in claim 5 including a plate fixed to said drum and extending from said one side of said slot toward said roller and bar to guide said edge of said sheet to where said roller and bar meet, and a plate fixed to said drum and extending from said other side of said slot toward said roller and bar to guide said edge of said sheet out away from said drum.

7. Apparatus as defined in claim 5 wherein said means for turning said roller in said one direction is comprised of a gear train carried by said drum at one end thereof, a worm gear drive to said gear train fixed on a sleeve journaled on said shaft by bearings and means coupling said sleeve to said gear train for locking said sleeve to a first gear of said gear train upon turning

said sleeve in one direction by driving said worm gear drive in one direction, and unlocking said sleeve from said first gear of said train when said drum is rotated.

8. Apparatus as defined in claim 7 including means coupled to a gear in said gear train for locking said gear train when said drum is rotated in said one direction and unlocking said gear train while said sleeve is turned in said one direction.

9. Apparatus for loading and holding a flexible sheet on the surface of a drum while said drum is stationary, said drum being fixed on a shaft with the axis of said shaft parallel to said drum surface, said shaft being supported for rotation in one direction in a frame, said apparatus comprising

a guide bar mounted in a longitudinal slot in the surface of said drum parallel to said shaft axis, said bar being flush with said drum surface and said slot being substantially wider than said bar,

a feed roller disposed within said drum with its axis parallel to said drum surface, said roller bearing against said bar,

means carried by the drum for turning said roller in said one direction while said drum is stationary and a sheet is fed into said slot from one side with its leading edge moving into position between said bar and roller until it is in contact with both said bar and roller to cause the leading edge of said sheet to be fed to the other side of said slot on the other side of said bar and roller, and

means for stopping said roller turning means when said leading edge emerges from between said bar and roller on said other side, whereby said sheet is held by its leading edge to cause it to wrap itself around said drum when said drum is thereafter rotated.

10. Apparatus as defined in claim 9 including means for overriding said stopping means while said drum is again stationary to again rotate said roller in said one direction to unload said sheet from said drum.

11. Apparatus as defined in claim 10 including a plate fixed to said drum and extending from said one side of said slot toward said roller and guide bar to guide the leading edge of said sheet to where said roller and guide bar meet, and a plate fixed to said drum and extending from said other side of said slot toward said roller and guide bar to guide the leading edge of said sheet out away from said drum.

12. Apparatus as defined in claim 9 wherein said means for turning said roller in said one direction is comprised of a gear train carried by said drum at one end thereof, a worm gear drive to said gear train fixed on a sleeve journaled on said shaft by bearings and means coupling said sleeve to said gear train for locking said sleeve to a first gear of said gear train upon turning said sleeve in one direction by driving said worm gear drive in one direction, and unlocking said sleeve from said first gear of said train when said drum is rotated.

13. Apparatus as defined in claim 12 including means coupled to a gear in said gear train for locking said gear train when said drum is rotated in said one direction and unlocking said gear train while said sleeve is turned in said one direction.

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