

- [54] **ELEVATABLE PAPER SUPPLY MECHANISM**
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- [51] Int. Cl. **B65h 19/12, B26d 7/00**
- [58] Field of Search **83/649, 650, 436, 203, 83/205**

- [56] **References Cited**
UNITED STATES PATENTS
- 3,292,471 12/1966 Sames et al. 83/649 X

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[57] **ABSTRACT**
A unitary sub-assembly for supplying cut paper sheets to a copying machine. It is a self-contained unit which includes two paper supply rolls, the necessary paper drive, and paper cutting knives. The entire sub-assembly may be elevated by the operator into a position for easy replacement of the paper supply rolls carried therein.

The foregoing abstract is not to be taken either as a complete exposition or as a limitation of the present invention. In order to understand the full nature and extent of the technical disclosure of this application, reference must be had to the following detailed description and the accompanying drawings as well as to the claims.

10 Claims, 6 Drawing Figures

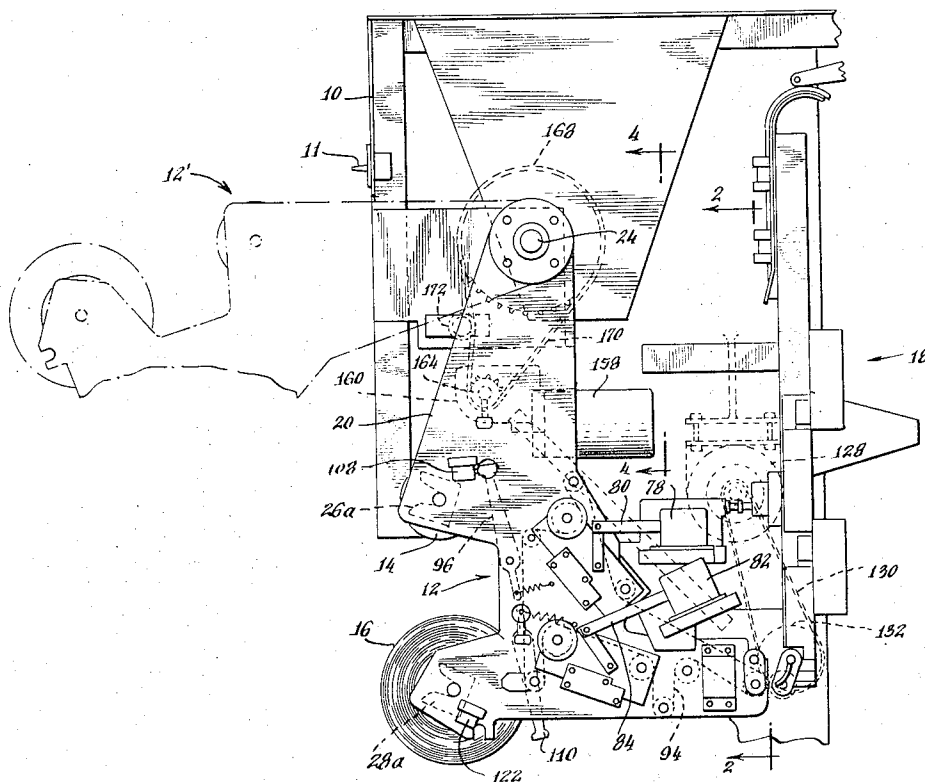


Fig. 1.

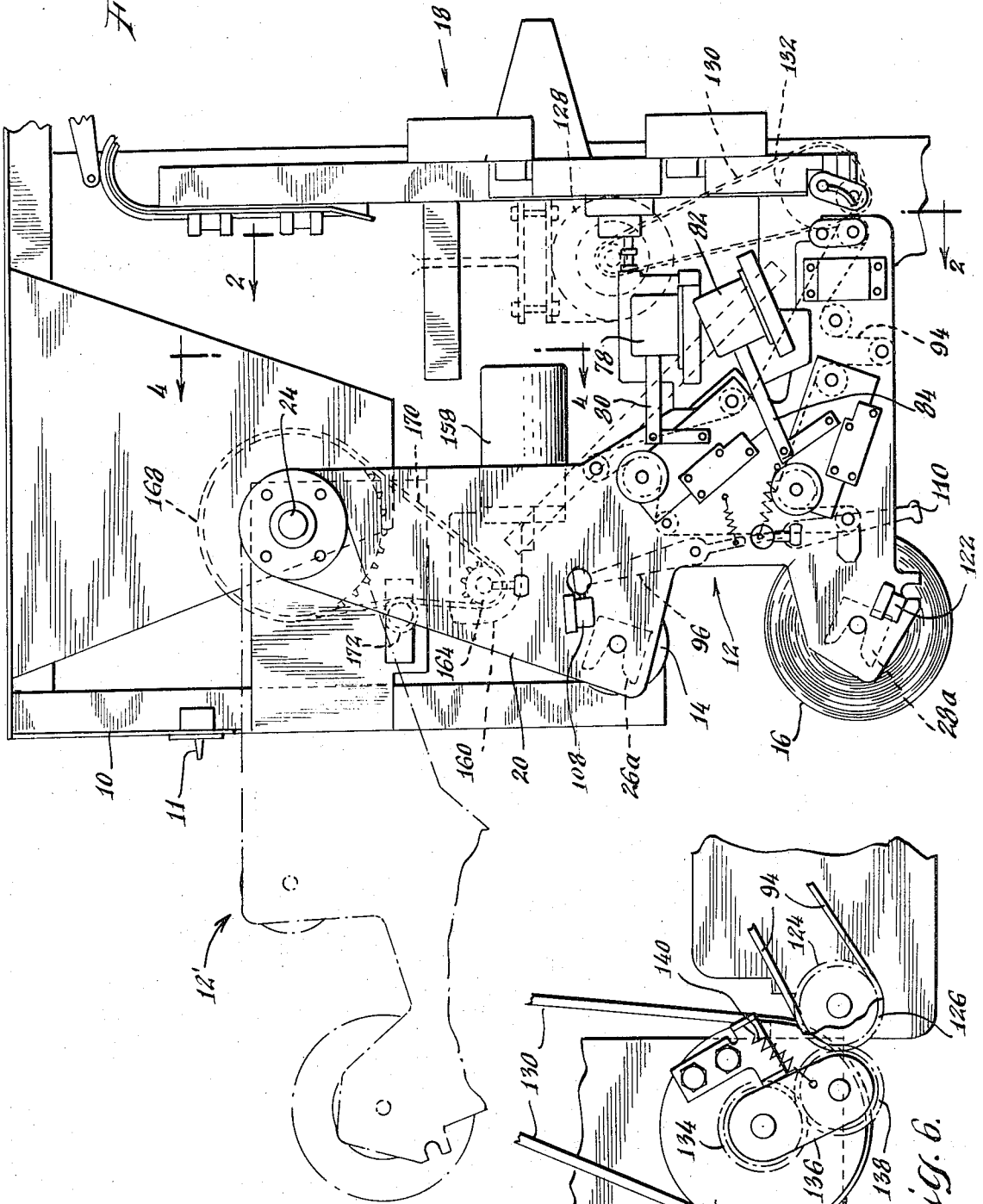


Fig. 6.

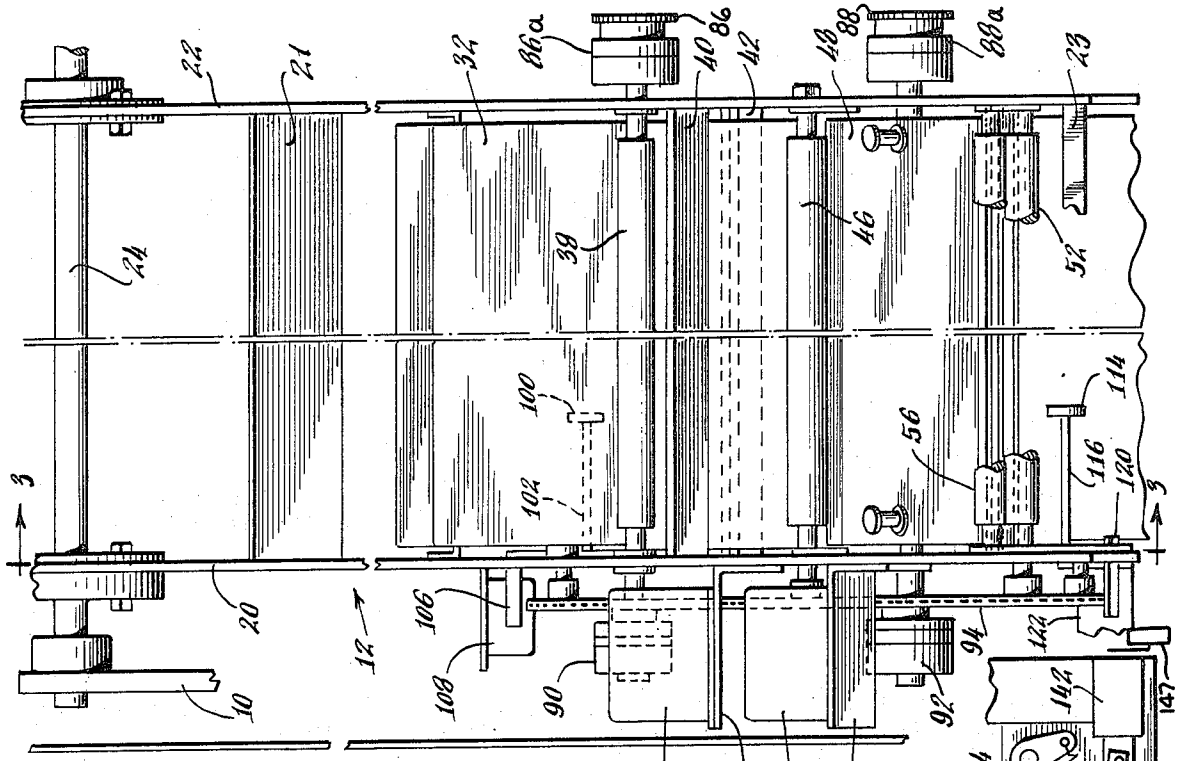


Fig. 2.

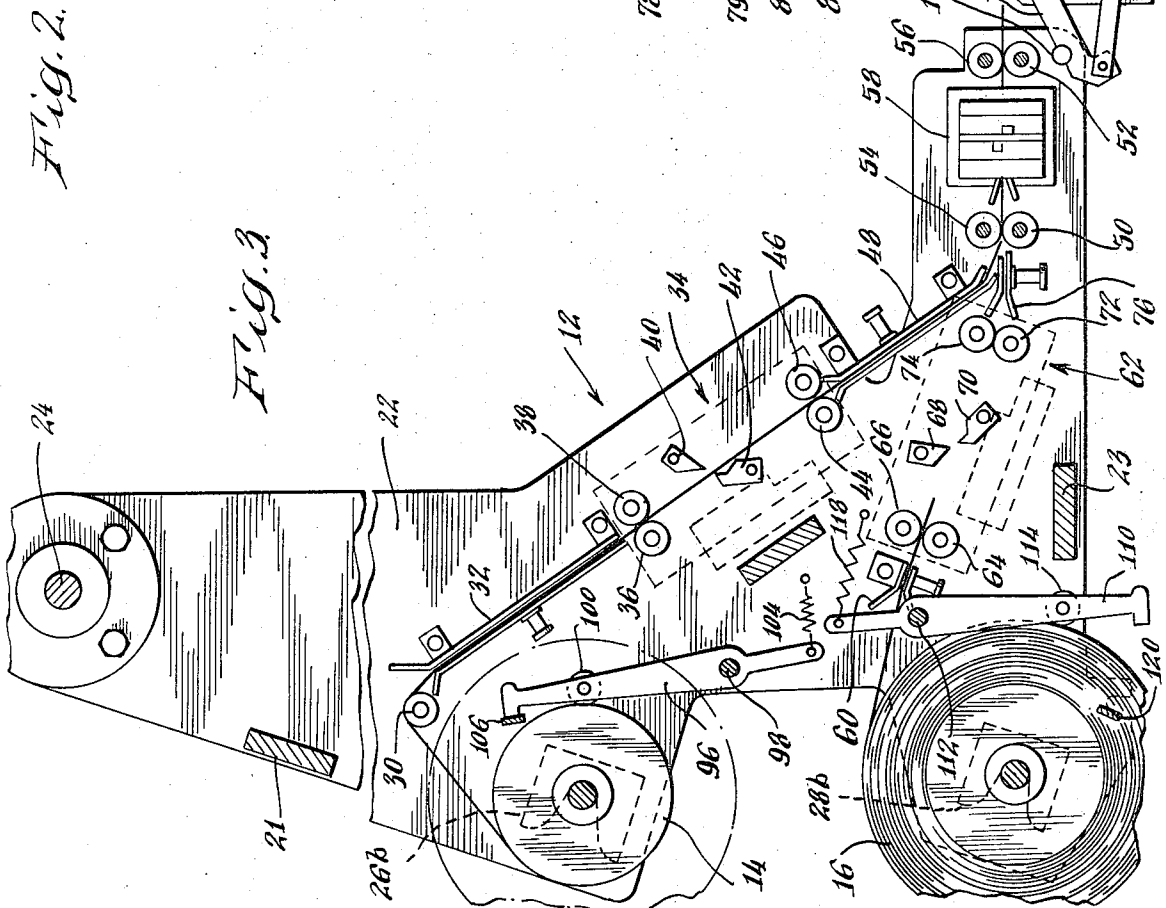


Fig. 3.

Fig. 5

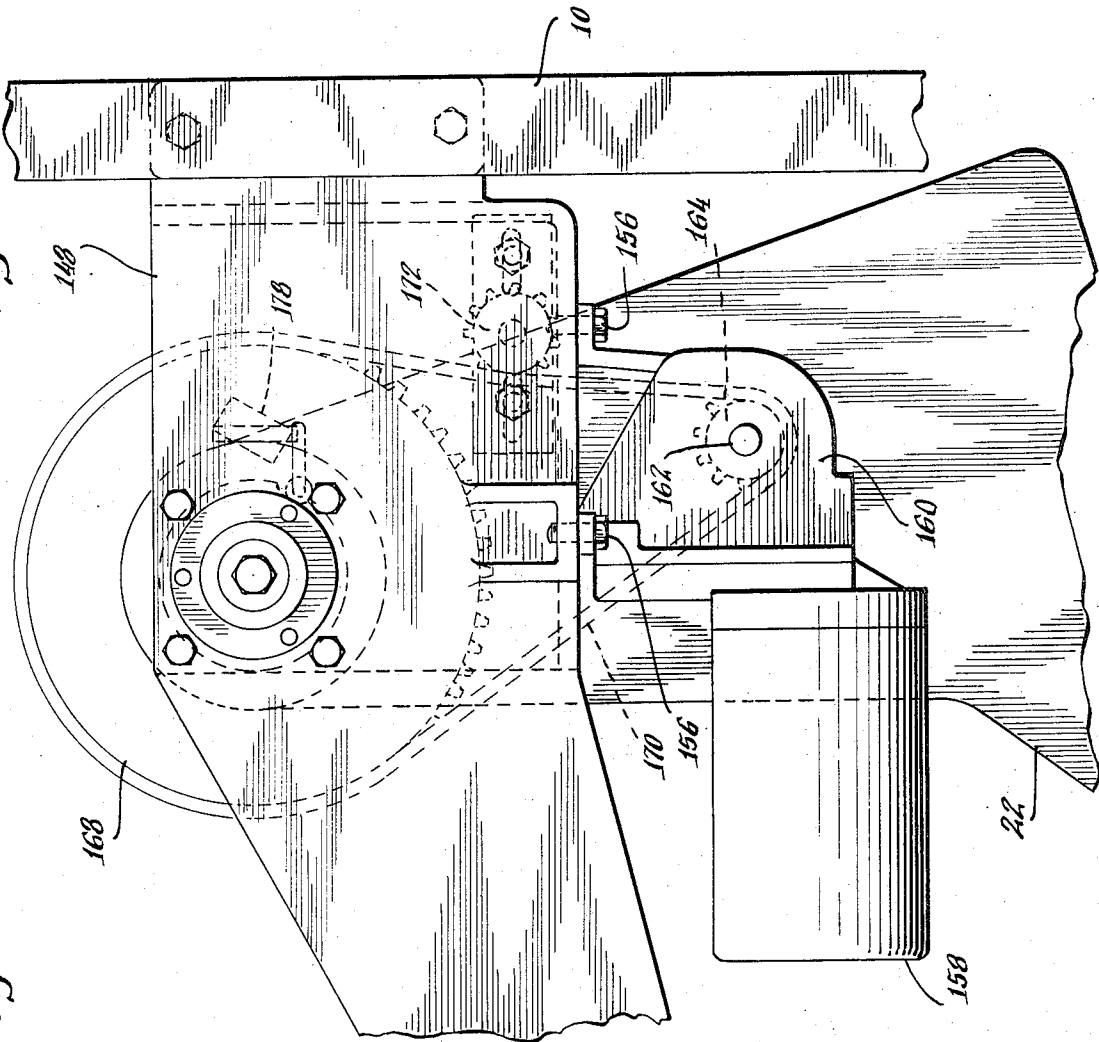
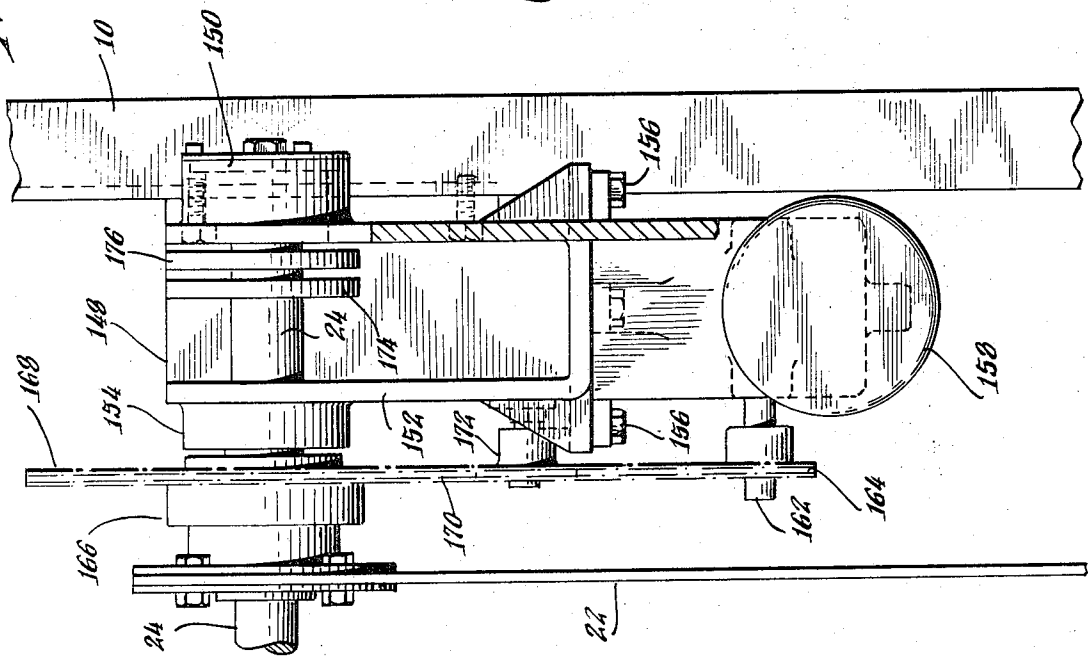


Fig. 4



ELEVATABLE PAPER SUPPLY MECHANISM

BACKGROUND OF THE INVENTION

This invention pertains to copying machines and, more particularly, to a paper supply mechanism for such a machine.

It has been proposed to provide a machine for automatically making offset masters from an original and thereafter automatically printing a desired number of copies from said master. The offset masters utilized in such a machine will be made from specially sensitized paper. This paper will be supplied in rolls and must be cut to proper size and fed into the photo-imaging portion of the machine. While in a feeding position, these rolls are enclosed within the machine in positions which render them rather difficult to replace. Accordingly, it is a primary object of this invention to provide a paper supply subassembly which is automatically elevatable out of the machine and into a position for convenient replacement of the paper supply rolls. Another object is to provide such an apparatus wherein the subassembly includes the essential driving means, knives, and elevating elements in a self-contained unit which can be easily assembled, replaced or repaired. Other objects, features, and advantages will become apparent from the following description and appended claims.

SUMMARY OF THE INVENTION

The improvement in a photocopy machine of the type requiring a supply roll of paper comprising a swinging frame and supply roll support means mounted on the frame. Also mounted on the frame are a mechanical knife and paper feed means for feeding paper from the supply roll through the knife and into the machine. Other means are provided for selectively swinging the frame outwardly from the machine and into a raised position to expedite the replacement of the supply roll.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a right-side elevation of the paper supply mechanism of the invention;

FIG. 2 is an enlarged cross-section taken substantially along the line 2—2 of FIG. 1;

FIG. 3 is a cross-section taken substantially along the line 3—3 of FIG. 2;

FIG. 4 is an enlarged partial view taken substantially along line 4—4 of FIG. 1 illustrating the elevating mechanism of the invention;

FIG. 5 is a right-side view of the apparatus shown in FIG. 4; and

FIG. 6 illustrates the gearing between the main machine and the elevatable paper supply sub-assembly.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With particular reference to FIG. 1 there is illustrated the supply end of a copy machine including a rigid framework 10 with a switch 11 mounted thereon and supporting a supply roll sub-assembly 12. The sub-assembly 12, as will be hereinafter explained, is pivotally mounted on the framework so that it may be rotated out of the machine and elevated into the position illustrated by the dashed-dotted lines 12'. Sub-assembly 12 is a self-contained unit which carries two paper supply rolls 14, 16. Paper is fed from only one

supply roll at a time. It is advanced through the sub-assembly by drive means contained therein and is cut into sheets of proper size. These sheets are then extruded onto the surface of a vertically disposed carrier 18 positioned within the framework of the machine. This carrier 18 forms no part of the present invention and, accordingly, will not be described in further detail.

The supply roll sub-assembly comprises a pair of spaced swing arms 20, 22 which are keyed to a common shaft 24 rotatably supported by the framework 10. The swing arms are joined by cross members 21, 23. Carried on the inner surfaces of the swing arms 20, 22 are a pair of cooperating paper roll holders 26 a, 26 b, for supporting the hubs of supply roll 14 and paper roll holders 28 a, 28 b, for supporting the hubs of paper supply roll 16.

With particular reference to FIG. 3, there will be seen to be rotatably supported between the swing arms 20, 22 an idler roll 30 over which the paper from supply roll 14 is fed into a guideway 32 formed by a pair of spaced plates. From guideway 32 the paper passes through a knife assembly 34. Knife assembly 34 comprises a drive roller 36 and pressure roller 38, a fixed knife 40, a moveable knife 42, and a drive roller 44 and pressure roller 46. From knife assembly 34 cut paper passes into a second guideway 48 and from thence, by means of drive rollers 50, 52 and pressure rollers 54, 56 through an electrostatic charging box 58 and out of the supply roll sub-assembly to the vertical carrier 18. In somewhat similar fashion, paper from roll 16 passes through guideway 60 into knife assembly 62. Knife assembly 62 comprises drive roller 64 and its associated pressure roller 66, fixed knife blade 68, moveable knife 70, and drive roller 72 and pressure roller 74. From knife assembly 62 the cut paper passes through guideways 76 and from thence through the same rollers 50, 54, charging box 58, and rollers 52, 56 as previously described. It will be understood in this connection that the paper supply rolls are used alternately, one being a feed roll and the other a spare. When the feed roll is exhausted, the spare roll is activated.

The moveable knife blade 42 is actuated by a solenoid 78 through a linkage 80 (FIG. 1). Moveable knife 70 is actuated by solenoid 82 and its linkage 84. Both solenoids are mounted by brackets 79, 83 to swing arm 20 as illustrated in FIG. 2. In order to obtain initial engagement of each paper web in the drive mechanism, the drive roller 36 is provided with a manual knob 86 mounted to the outside of swing arm 22. A similar manual knob 88 is provided at the end of the drive roller 64. The opposite end of drive roller 36 is provided with a clutch 90 and a similar clutch 92 is provided at the same end of drive roller 64. All of drive rollers 36, 44, 64, 72, 50 and 52 are driven by means of sprockets by a common drive chain 94. Drive chain 94 is driven by a motor external of the supply roll sub-assembly 12 as will be hereinafter explained.

The amount of paper remaining on each of the supply rolls is sensed by means of a pair of pivot arms carried by swing arm 20. One such pivot arm 96 is mounted upon pivot 98 and carries a roller 100 at the end of elongated shaft 102 (FIG. 2). The roller 100 bears against the supply roll 14. The lower end of the pivot arm 96 is loaded by a spring 104 and, when the paper supply is substantially depleted, the upper end of the pivot arm engages the actuating blade 106 of a micro-

switch 108. A suitable opening in the swing arm 20 permits the blade 106 to pass therethrough. A similar arrangement is provided for sensing the paper supply on lower roll 16 where a pivot arm 110 on pivot 112 carries a roller 114 on shaft 116 and is loaded by spring 118 to engage the blade 120 of a microswitch 122.

As explained supra the chain 94 is driven by an external motor. This will now be explained with particular reference to FIGS. 1 and 6. From these figures it will be noted that the chain 94 is driven by a drive sprocket 124 having associated therewith a gear 126. Mounted on the machine frame is a drive motor 128 which drives a belt 130 and pulley 132 to which is attached a gear 134 of smaller diameter. Pivotaly mounted on the axis of gear 134 is a link 136 which carries at its free end a floating gear 138 meshing with gear 134. A spring 140 urges the link in a direction toward sub-assembly 12 and thereby urges gear 138 into mesh with the gear 126 carried by the sub-assembly.

The sub-assembly 12 is normally latched into its operating position by means of the latch mechanism illustrated in FIG. 3. This comprises a solenoid 142 which is connected to retract a spring-loaded latch bar 144 which normally latches the assembly by engagement with a latching stud 146 thereon.

A switch 147 is provided in the circuit for motor 158 so that said motor cannot operate until solenoid 142 upon actuation closes said switch 147.

The mechanism for elevating the supply roll sub-assembly 12 will now be explained with particular reference to FIGS. 4 and 5. As will be seen therein, a support casting 148 is mounted to the framework 10 and includes a bearing 150 supporting the end of the shaft 24.

Support casting 148 includes a U-shaped portion including a vertical wall 152 which carries on its outer surface a boss 154 for carrying a sleeve supporting the shaft 24. Mounted to the bottom of the casting 148 by means of bolts 156 is an electric motor 158 whose housing includes a gear box 160 from which extends a shaft 162 supporting a drive sprocket 164. Bolted to swing arm 22 is a hub 166 which encircles the shaft 24 and includes a sprocket 168. A drive chain 170 interconnects the drive sprocket 164 with the driven sprocket 168. An idler sprocket 172 is adjustably mounted on the wall 152 to take up slack in the chain. Mounted within the U-shaped portion of the support casting 148 and keyed to the shaft 24 are a pair of cams 174, 176. These cams are positioned to actuate microswitch 178 to control the rotation of motor 158. Instead of the chain drive 164, 170, 168 other drives may be used to rotate shaft 24 such as a lead screw and nut arrangement.

It is believed that the operation of the apparatus of this invention will now be apparent to those skilled in the art. The sub-assembly 12 is wholly self-contained and, when latched into position at the supply end of a machine as shown in FIGS. 1 and 3, it will feed paper from one of the two supply rolls 14, 16. As illustrated in FIG. 3, the feed roll is roll 14 while roll 16 is in standby condition as the spare. In this configuration, the paper feeds from roll 14 over idler roller 30, through the guide 32, and is passed by drive roller 36 through the knife assembly 34 where it is cut to length by the action of moveable knife blade 42 against the fixed knife 40. Electromagnetic brakes 86a and 88a are provided for braking the respectively associated feed rolls during the operation of the said knives. The paper

sheets thereby obtained are fed by means of drive roller 44 through the guideway 48 and are thereafter passed into the machine by drive rollers 50, 52, passing through charging box 58 as they exit from the sub-assembly 12. It will be understood that suitable controls are provided for running the motor 128 which actuates the guide rollers in the sub-assembly and for actuating the solenoids 78, 82 which control the cutting knives. However, the electrical controls do not form a part of this invention.

When the roll 14 is depleted and pivot arm 96 contacts the microswitch blade 106, the control circuit stops roll 14 and actuates the clutch 92 of drive roller 64 to begin feed from roll 16. The paper from roll 16 passes in a similar fashion through knife assembly 62 and into the machine.

The top of the machine illustrated in FIG. 1 would normally be about chest height. Accordingly, it will be apparent that replacement of roll 14 or 16 would be somewhat difficult due to their position. However, this task is greatly simplified by the apparatus of the present invention. The operator simply moves the switch n into an upper position. This actuates the latching solenoid 142 (FIG. 3) to release the latch 144 and also energizes motor 158. As motor 158 begins to turn, it advances the drive chain 170 to rotate sprocket 168 in a clockwise direction as viewed in FIG. 1. The sprocket, which is affixed to the swing arm 22, thereby raises the entire sub-assembly 12 into the position 12' shown in FIG. 1 at which point it is stopped by means of one of the cams 174, 176 through microswitch 178. After replacement of roll 14 with a fresh paper roll, this switch 11 is depressed and the motor 158 is caused to operate in the reverse direction to lower the sub-assembly 12 into its original position. As this position is approached, the gear 126 (FIG. 6) re-engages the gear 138 forcing the latter gear and the link 136 inwardly against the force of spring 140. When sub-assembly 12 reaches its final operating position the latching stud 146 is re-engaged by the latch bar 144 to retain it in such position.

It is believed that the many advantages of this invention will now be apparent to those skilled in the art. It will also be apparent that a number of variations and modifications may be made in this invention without departing from its spirit and scope. Accordingly, the foregoing description is to be construed as illustrative only, rather than limiting. This invention is limited only by the scope of the following claims.

We claim:

1. In a photocopy machine of the type requiring a supply roll of paper, the improvement which comprises: a swinging frame; supply roll support means mounted on said frame; mechanical knife means mounted on said frame for cutting said paper; paper feed means mounted on said frame for feeding paper from said supply roll, through said knife means, and into said machine; and means for selectively swinging said frame outwardly from said machine and into a raised position to expedite the replacement of said supply roll.

2. The improvement of claim 1 wherein said supply roll support means comprises: means for supporting a first paper supply roll; and means for supporting a second paper supply roll.

3. The improvement of claim 1 wherein said swinging means comprises: a drive wheel secured to said swinging frame for rotation therewith about a common axis

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of rotation; and means for selectively rotating said drive wheel in either of two directions of rotation.

4. The improvement of claim 3 wherein said rotating means comprises: a reversible motor mounted externally of said frame; and flexible drive means interconnecting said motor and said drive wheel.

5. The improvement of claim 1 wherein said paper feed means comprises: a plurality of drive rollers; a single flexible drive means on said frame common to all of said drive rollers; a drive motor on said machine external of said frame; and means for interconnecting said drive motor and flexible drive means when said frame is in its lowered position and breaking such connection when said frame is in its raised position.

6. The improvement of claim 5 wherein said interconnecting means comprises: a first gear external of said frame and driven by said drive motor; a second gear; link means pivoted about the axis of said first gear and retaining said second gear in engagement therewith; means for resiliently urging said link means and second gear in the direction of said swinging frame; a third gear carried by said swinging frame for engagement with said second gear when said swinging frame is in its lowered position; and means for driving said

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flexible drive means from said third gear.

7. The improvement of claim 1 wherein said machine includes means for latching said swinging frame in its lowered position and selectively releasing said latching means.

8. The improvement of claim 2 wherein said paper feed means comprises: a first series of drive rollers for advancing paper from said first supply roll along a first path into said machine; and a second series of drive rollers for advancing paper from said second supply roll along a second path into said machine.

9. The improvement of claim 8 wherein said knife means comprises: a first knife in said first path; and a second knife in said second path.

10. The improvement of claim 9 wherein said paper feed means further comprises: a single flexible drive means on said frame common to all of said drive rollers; a drive motor on said machine external of said frame; and means for interconnecting said drive motor and flexible drive means when said frame is in its lowered position and breaking such connection when said frame is in its raised position.

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