United States Patent [19]

Ravera et al.

[11] **3,888,147**

[45] **June 10, 1975**

[54] **CUTTING DEVICE FOR CUTTING SHEETS FROM A ROLL IN A COPY MACHINE**

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[73] Assignee: **Ing. C. Olivetti & C., S.p.A.**, Torino, Italy

[22] Filed: **May 17, 1974**

[21] Appl. No.: **471,079**

Related U.S. Application Data

[62] Division of Ser. No. 251,994, May 10, 1972, Pat. No. 3,830,124.

[52] **U.S. Cl.** **83/64**; 83/205; 83/399; 83/583; 83/587; 83/589

[51] **Int. Cl.** **B26d 5/08**

[58] **Field of Search** 83/583, 586, 587, 589, 83/203, 204, 205, 399, 342, 64

[56] **References Cited**

UNITED STATES PATENTS

1,666,533	4/1928	Heck et al.	83/583
2,219,650	10/1940	Helsel	83/583 X
2,642,936	6/1953	Semler	83/587 X
3,552,251	1/1971	Neff et al.	83/342 X
3,645,157	2/1972	Giulio et al.	83/205
3,797,347	3/1974	Miciukiewicz et al.	83/205

FOREIGN PATENTS OR APPLICATIONS

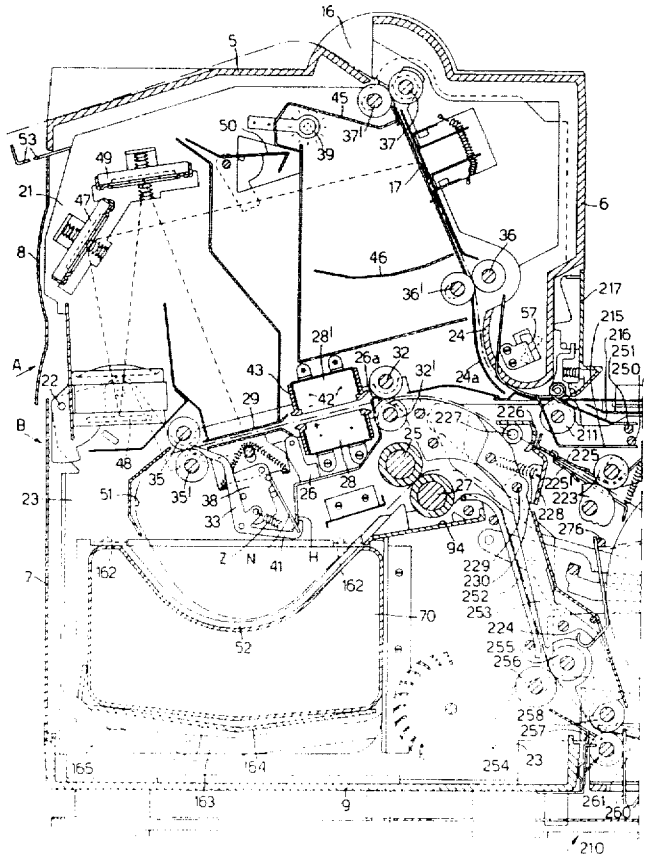
477,536	6/1929	Germany	83/583

Primary Examiner—Frank T. Yost
Attorney, Agent, or Firm—Ira J. Schaefer

[57] **ABSTRACT**

A roll cutting device in a fed electrostatic copying machine having a bed including a pair of rollers for receiving a roll of copy paper and means attached to the machine for maintaining the roll in a predetermined axial position in the bed, which includes a mechanical knife mechanism for cutting sheets from the roll, and means for insuring that the length of the copy paper cut by the knife mechanism falls between predetermined minimum and maximum lengths.

5 Claims, 12 Drawing Figures



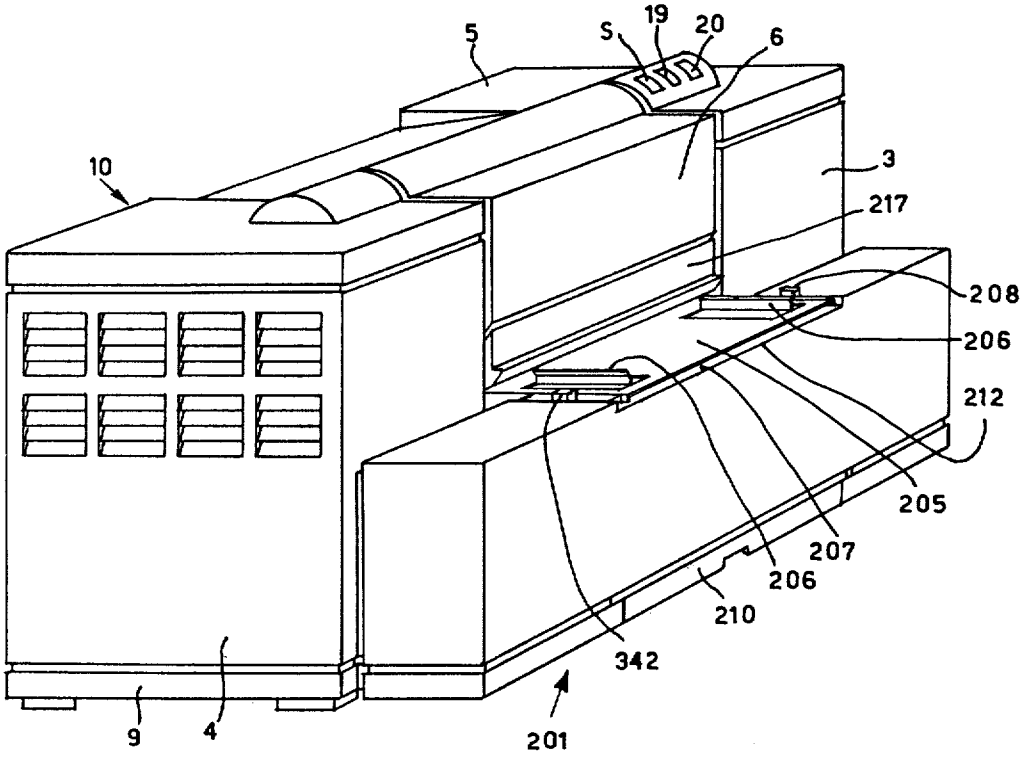


Fig. 1

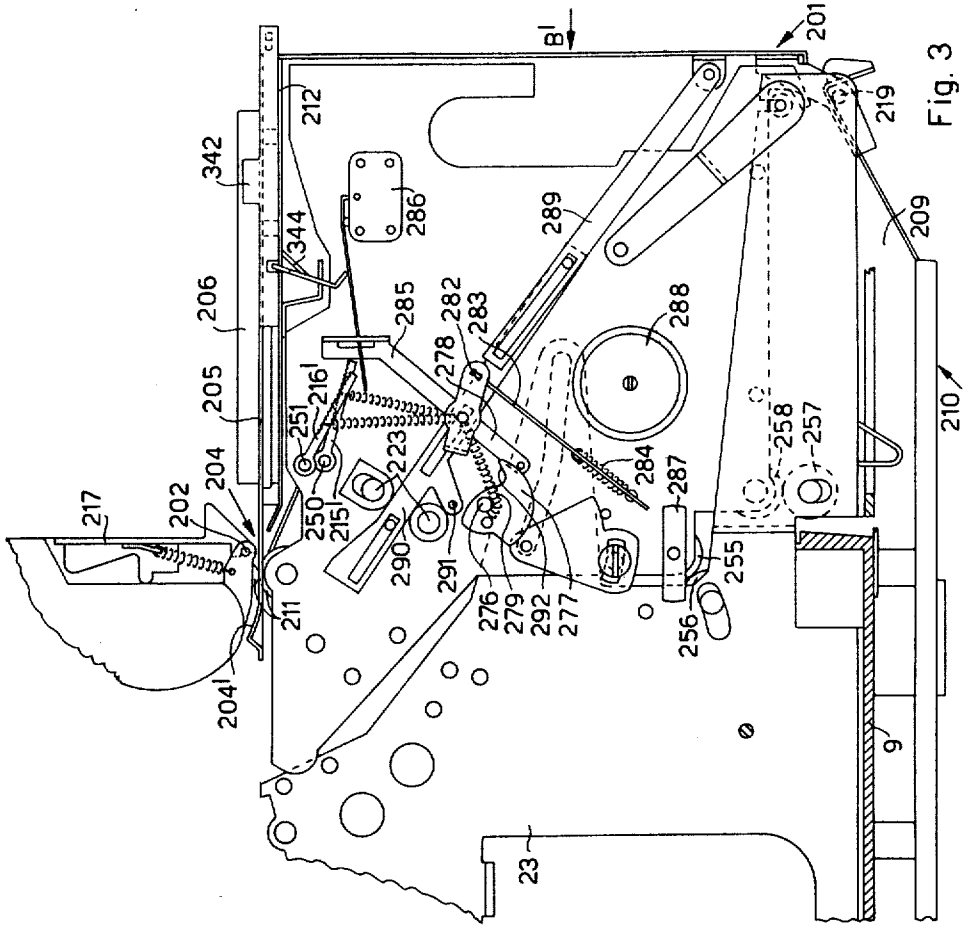


Fig. 3

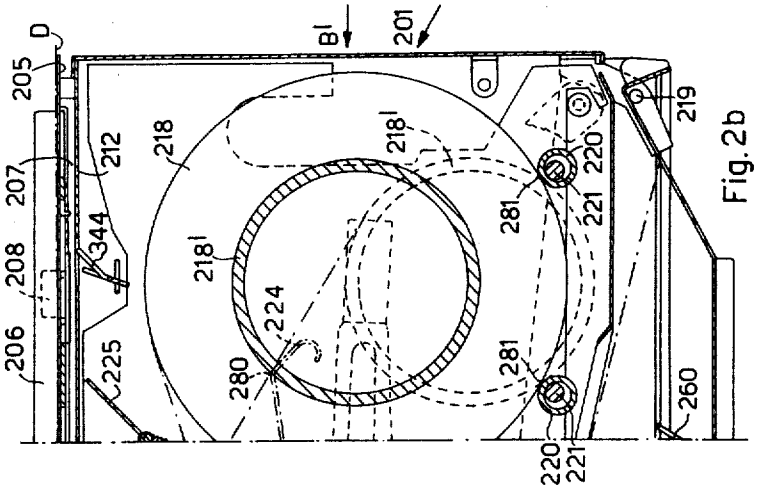


Fig. 2b

Fig. 2

Fig. 2a	Fig. 2b

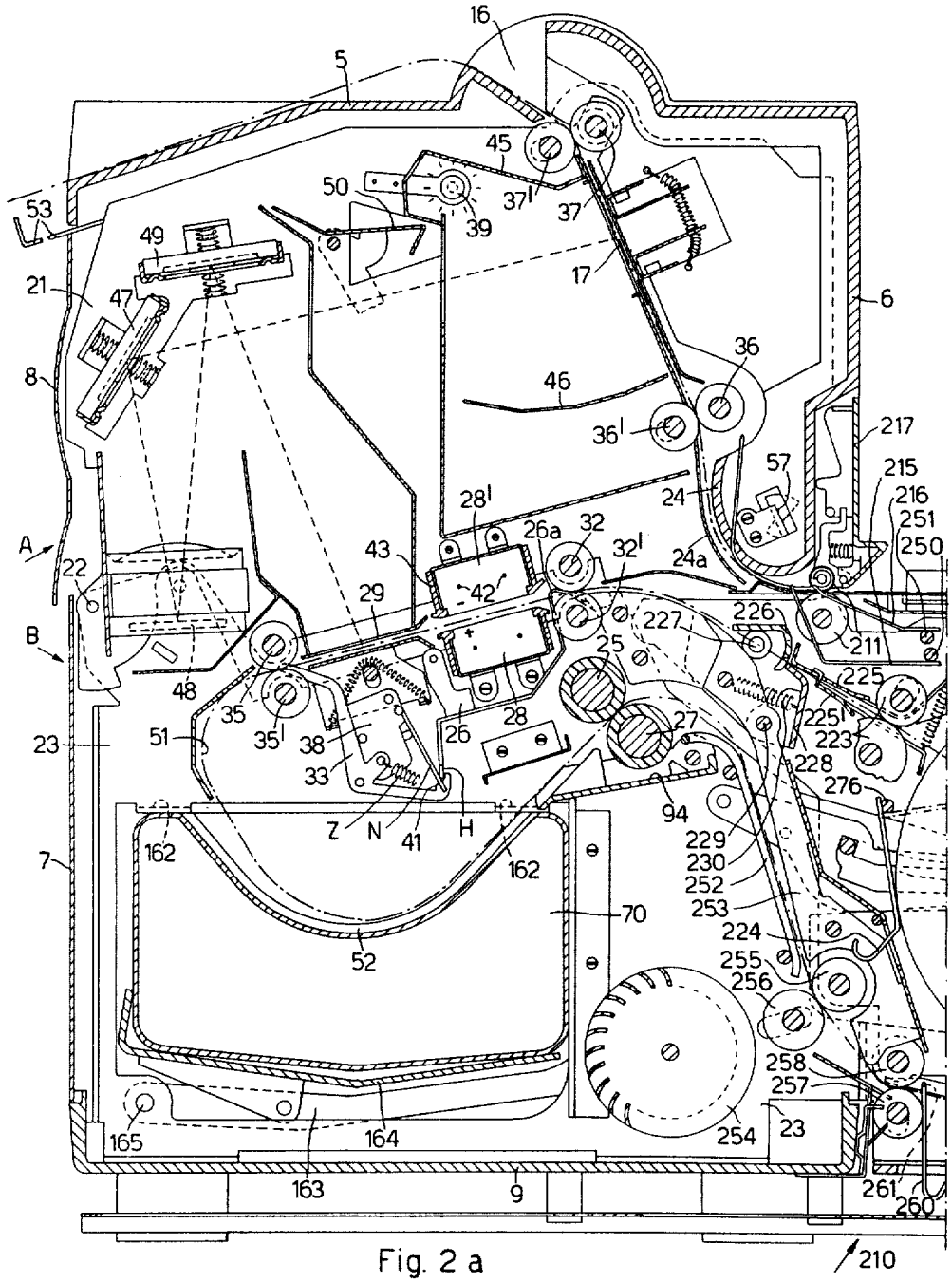

16
5
45
50
37'
37
39
53
49
17
21
47
6
36
8
46
36'
217
57
215
24
216
28'
26a
32
251
A
43
32'
24a
250
22
42
29
227
226
B
25
211
48
225
35
27
225'
51
35'
38
26
28
223
23
33
228
276
94
Z
N
41
H
229
7
162
162
230
252
70
253
52
224
255
256
258
165
164
257
254
23
163
9
261
260
210

Fig. 2 a

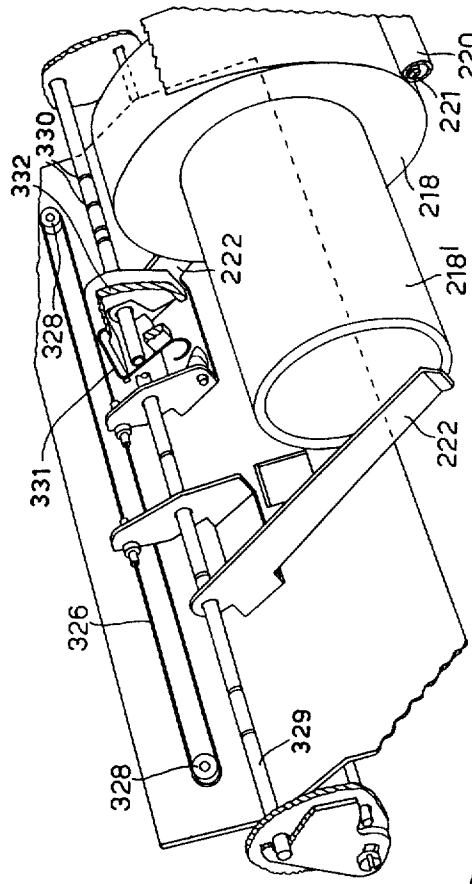

220
221
330
332
218
222
218'
328
331
222
326
329
328

Fig. 4

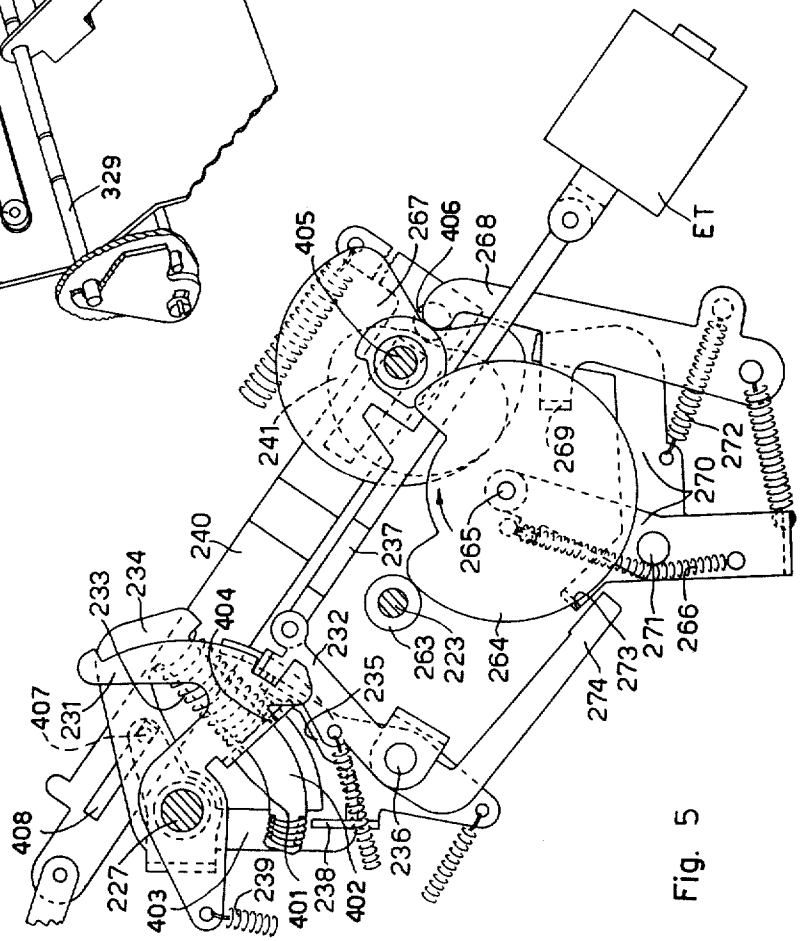

ET
405
267
406
268
241
269
270
272
240
237
265
233
234
404
232
263
223
264
271
266
407
231
235
273
274
408
227
403
239
401
238
402
236

Fig. 5

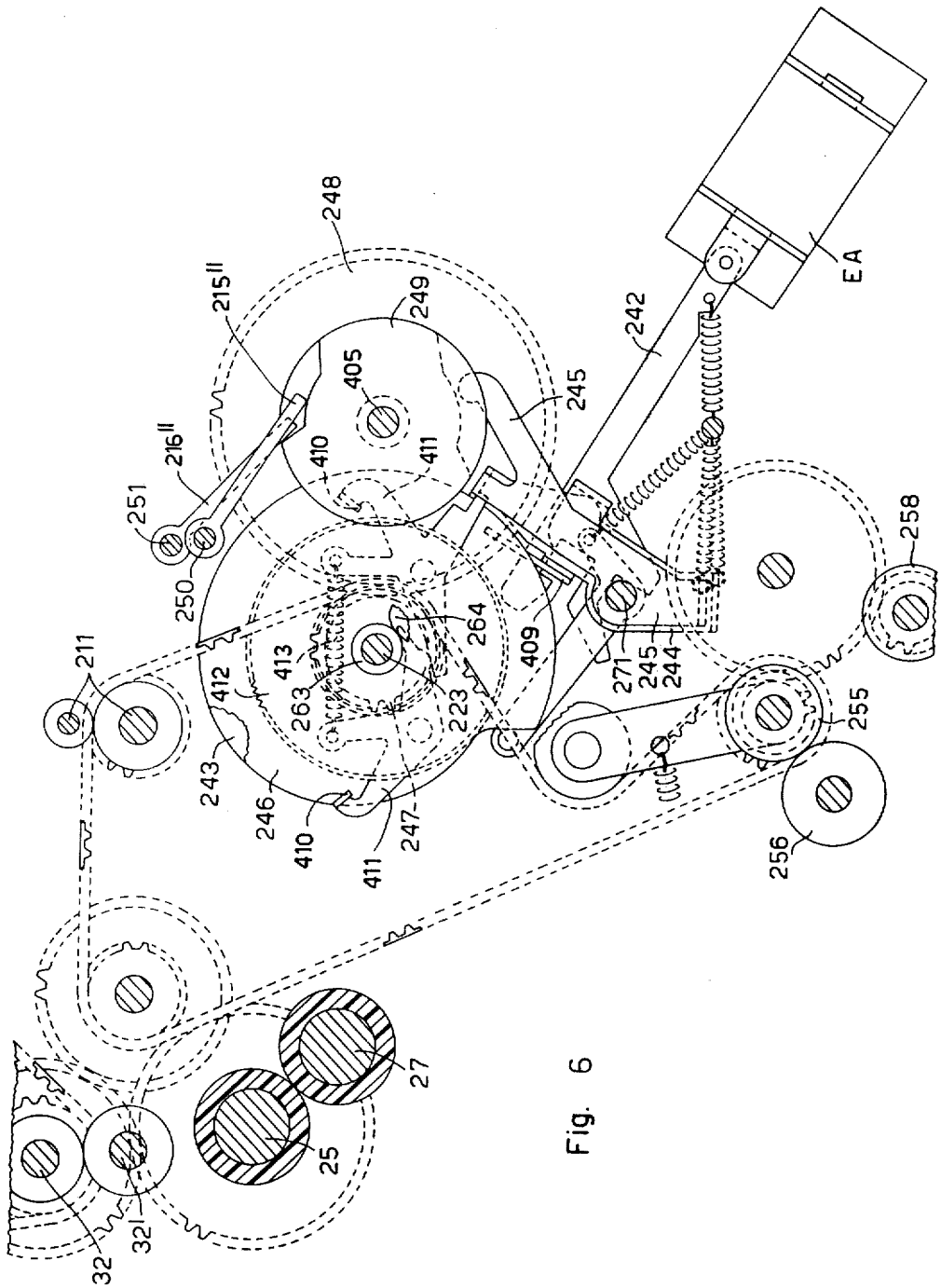

248
215II
249
405
245
242
EA
216II
410
411
251
250
258
264
409
211
412
413
263
223
271
245
244
255
243
246
247
410
411
256
27
25
32
32I

Fig. 6

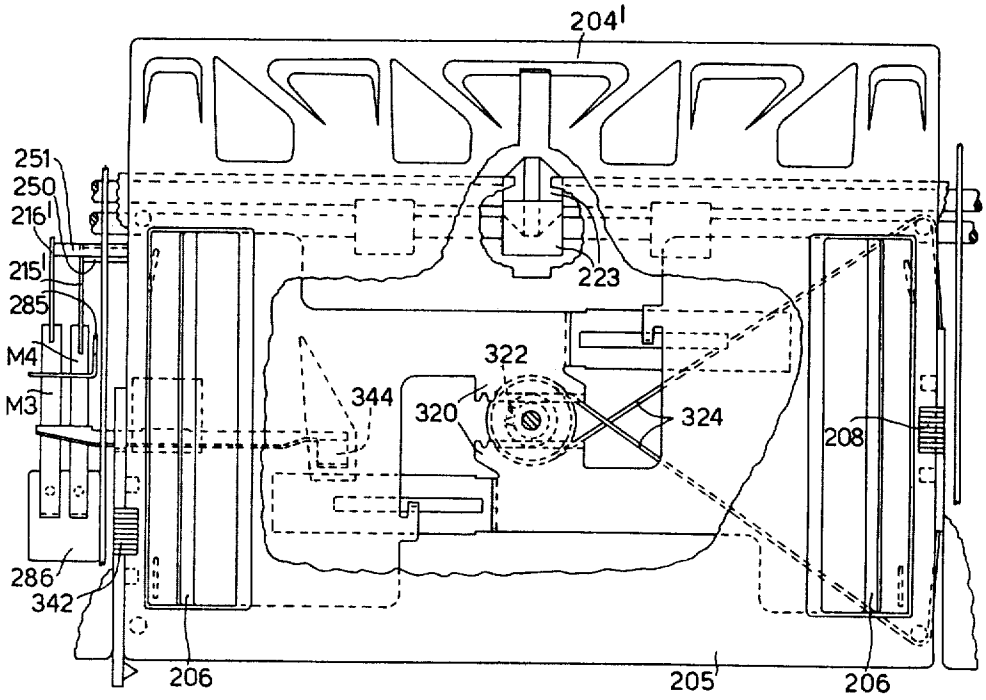

204'
251
250
216'
215'
285
M4
M3
286
342
206
344
322
320
324
223
208
205
206

Fig. 7

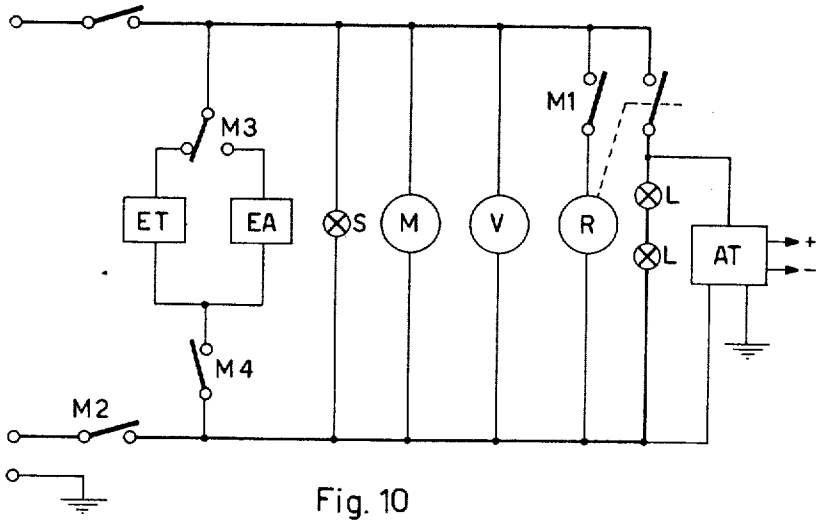

M3
ET
EA
M4
M2
S
M
V
M1
R
L
L
AT
+
-

Fig. 10

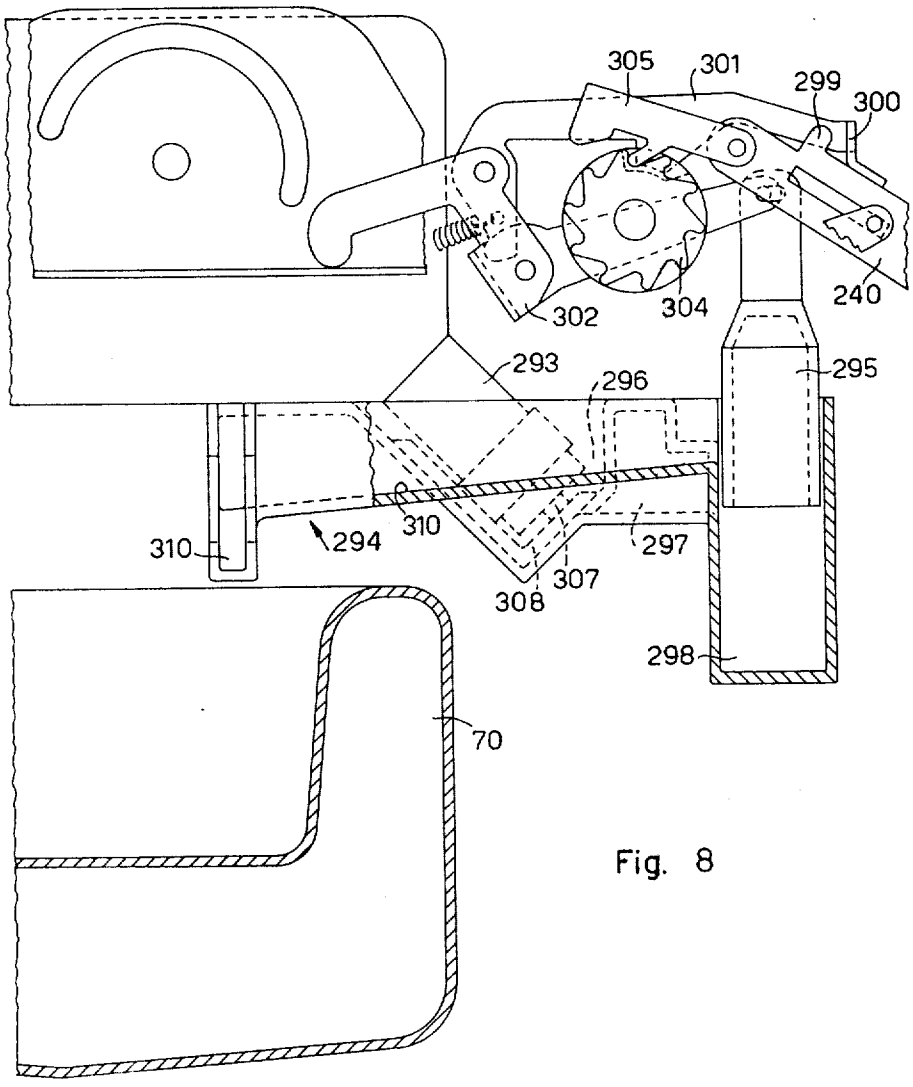

305
301
299
300
240
304
302
293
296
295
310
294
310
297
307
308
298
70

Fig. 8

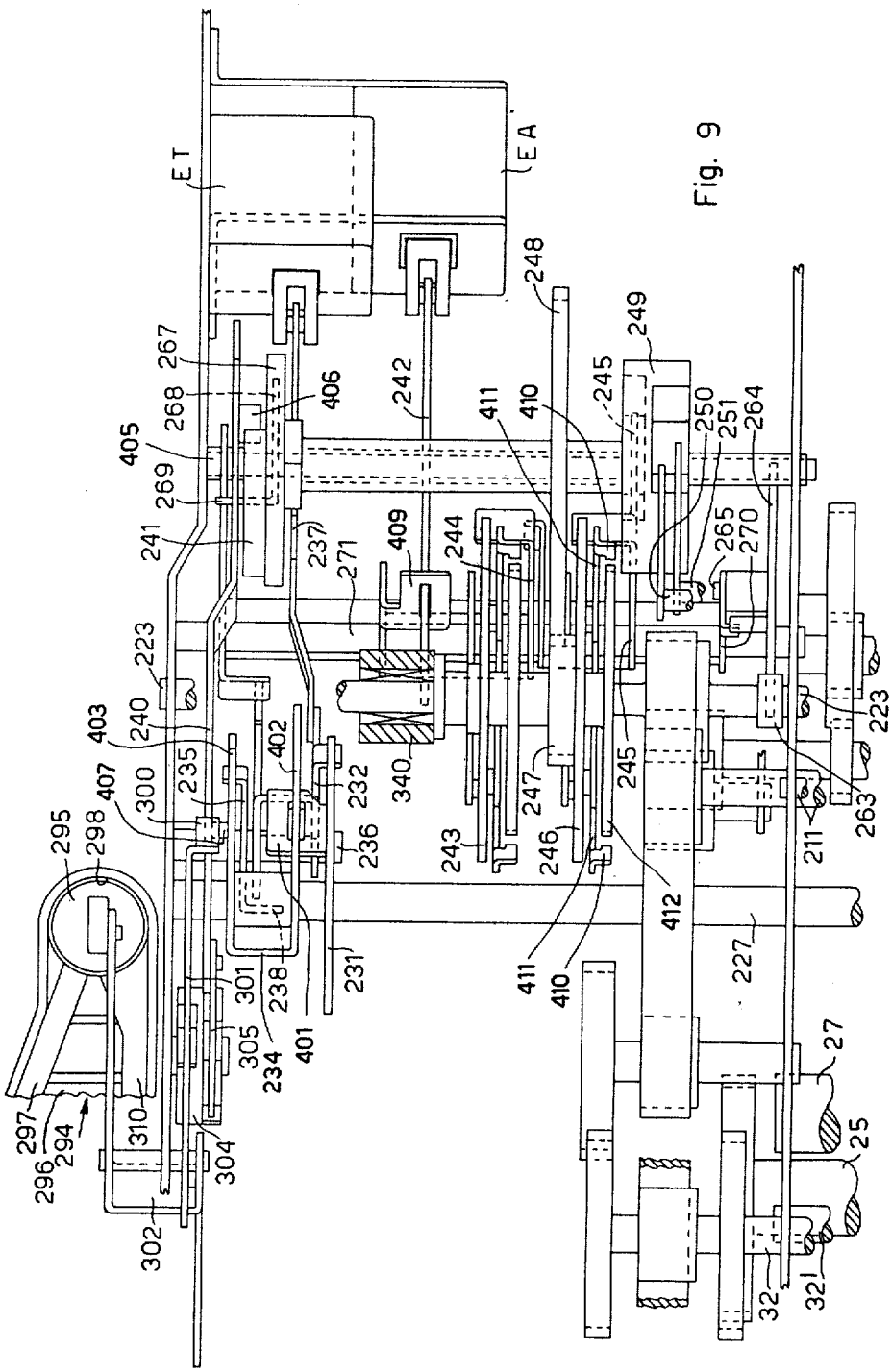

ET
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271
223
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403
402
235
300
407
232
340
247
243
246
236
295
298
297
296
294
310
304
302
301
238
231
401
305
234
412
227
27
25
32
321
211
263

Fig. 9

CUTTING DEVICE FOR CUTTING SHEETS FROM A ROLL IN A COPY MACHINE

This is a division of application Ser. No. 251,994, filed May 10, 1972 now U.S. Pat. No. 3,830,124.

BACKGROUND OF THE INVENTION

The present invention relates generally to improvements in copying machines for copying sheet originals having an image on one or both sides, and more particularly to improvements in a cutting device for roll fed electrostatic copying machines.

U.S. patent application Ser. No. 74,817 filed on Sept. 23, 1970, and assigned to the assignee of the present invention describes a sheed fed electrostatic copying machine, which includes a stationary lower portion which contains the developing station for the photosensitive paper carrying the electrostatic latent image and an upper portion which is hinged to the lower portion and which contains the optical projection area and the apparatus for handling the original. The structure of the machine described in this application is such that the internal parts thereof are easily accessible both for supplying the developer and for inspecting the copy or original sheet feeding, with complete electrical and mechanical safety. This prior art machine has the limitation, however, that the copy sheet must be hand fed with the original which somewhat limits its range of application.

Other known copying machines attempt to overcome this limitation by storing the copy paper in roll form within the machine and providing means for cutting and feeding individual sheets from the roll. The apparatus provided in these machines is extremely complex, however, which makes the changing of rolls of paper by the operator very difficult especially when a roll of a different width than the previuos one is to be loaded.

SUMMARY OF THE INVENTION

In order to overcome these and other limitations with existing copying machines, Applicants provide according to their invention a roll fed copying machine in which the roll housing system is arranged in such a manner as to make the substitution of rolls by the operator extremely easy, and, moreover, on the system concerning the paper driving, guiding and cutting operation from said paper roll, as also on systems coordinating the original guiding operation, the automatic concentrated developer (toner) replenishing and the copy collection. The above mentioned main problem has been solved by the cutting device according to the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a left side front perspective view of a copying machine according to the invention.

FIG. 2 is a median sectional view made up of the FIGS. 2*a* and 2*b*, of the machine displayed in FIG. 1.

FIG. 2*a* is a partial left side median sectional view of the machine displayed in FIG. 2.

FIG. 2*b* is a partial view of the median sectional view of the machine displayed in FIG. 2.

FIG. 3 is a partial left side lateral view of the machine displayed in FIG. 2, the cover being removed in order to exhibit the paper roll out warning device.

FIG. 4 is a perspective view of the sensitized paper roll centering device.

FIG. 5 is a sectional side view of the driving system of the movable cutting blade and of the maximum copy sheet length.

FIG. 6 is a sectional side view of the paper feeding device.

FIG. 7 is a plan view of the original inserting platform.

FIG. 8 is a side view of the automatic concentrated developer adding device.

FIG. 9 is a plan view of the device shown in FIGS. 5, 6 and 8.

FIG. 10 is a schematic diagram of the electrical circuit which controls the machine operation.

DETAILED DESCRIPTION

FIG. 1 shows a desk-top electrostatic copying machine having a body 10 which is arranged in such manner as to ensure perfect light-tightness in the machine so as to avoid leakage of the charge from the copy sheet.

The cover 10 is formed of upper and lower parts A and B (FIG. 2). The lower part B comprises end sections 3 and 4 (FIG. 1), and central section therebetween (FIG. 2), all mounted on a base 9. The upper section A can be swung upwardly as a whole on pivots 22 at the back of the machine and comprises a cover 5, upper central section 8 and also an upper front section 6 which is hinged on the part A by hinges 57 allowing the section 6 to be swung forwardly through about 60° to open up the path of the original. Hinging up the part A (through about 35°) opens up the path of the copy sheet. The walls of the side sections 3 and 4 are removable for maintenance and interchanging the developer tank. Located in the recess of the top section 6 is a front portion 217 rockable about the pins 202 (FIG. 3).

The lower portion of the machine furthermore includes a part B' (FIG. 2*b*), connected to part B (FIG. 2*a*). The part B houses the developing station and the associated apparatus, and part B' houses the sensitized paper and the associated paper feeding control members. The top portion A houses the optical, illuminating and exposing stations.

Located on the machine front is a slot 204 (FIG. 3) for inserting the original D (FIG. 2*b*) along a plane 205 defined by the cover of the lower portion 201 and provided with two side positioning elements 206. Located beneath the plane 205 and defined by the plane 212 is a slot 207 adapted for the manual insertion of the sensitized paper sheets, as an alternative to the use of the roll. The positioning members 206 are displaceable being controlled by a slide 208 located on the right side of the plane, so as to be always arranged in symmetric relation with respect to the machine central axis to ensure that the original is centered with respect to the optical system. The symmetric displacement of the two positioning members 206 is obtained by meshing a toothed rack portion 320 (FIG. 7) thereof with two diametrically opposed points of a single toothes wheel 322. The slide 208 rotates the toothes wheel by means of a cord 324.

The original D located by the operator on the plane 205 and fed between a pair of rollers 211 which rotate continuously while the machine is on. The rollers 211 feed the original D to the illuminating station 17 and ejection station 16 on the top portion A of the machine as displayed in FIG. 2*a*. Located directly below the slot

207 (FIG. 2*b*) of the lower section **201**, is an output housing member **209** (FIG. 3 wherein is inserted the drawer **210** which receives the copy sheets after processing, the drawer being extractable toward the machine front.

The copying machine is driven by an electric motor (not shown). Mounted on the element **5** (FIG. **1**) of the cover is an ON/OFF knob **19** which controls the motor. Located beside the knob **19** is a lamp S which indicates when the machine is operating. Located on the other side of the knob **19** is a rotatable exposure control knob **20** by means of which the operator selects the most suitable illuminating intensity for copying the original.

The frame of the machine includes a pair of similar spaced flanks **21, 21'** (FIG. 2*a*) which support the upper portion of the cover **10** and the other internal parts. Each flank **21, 21'** is connected to a corresponding lower flank portion **23, 23'** of the machine frame by hinging means **22.**

The plate **205** (FIG. 2*b*) of the insertion station, over which the original is fed face down into the machine, is secured to the frame and is coplanar to the plate **212** which acts as a support and guide for the copy sheet when it is manually inserted as an alternative to the roll feeding. The plane **205** includes an upwardly inclined portion **204'** (FIG. 3) located close to the input slot **204,** for guiding the original. The original, upon being fed between the rollers **211** (FIG. 2*a*) operates the levers **216, 215** located immediately downstream from the rollers **211,** which levers actuate the microswitches M3 and M4 (FIG. 7) controlling the sensitized paper feeding and cutting operation, as it will be explained hereinafter. When the portion **6** (FIG. 2*a*) of the cover is opened by rocking it about the hinge **57** in order to reach the original path, the front portion **217** rocks about the pin **202** wherefore the top roller of the pair **211** is moved apart from the lower one, thus clearing an original if it is jammed between the rollers.

The sensitized paper wound on the roll **218** (FIG. 2*b*) is revolvable about the pin **219** and is accommodated in a housing portion covered by the portion **201** of the cover. The roll **218** bears on the rollers **220** rotatable on the shafts **221** (FIGS. 2*b* and **4**). No sliding friction arises between the sensitized paper and the rollers **220** as their contact occurs on a rolling basis. This is very important in this case in order to prevent any damage of the electrophotographic coating of the copy paper with the consequent degradation of the finished copies.

The accommodation of the roll **218** on the support rollers **220** is particularly advantageous as it couples simple structure with extremely easy handling conditions for the operator. In prior art roll fed copying machines, the roll is usually positioned on a core shaft by side flanges which makes the changing of rolls a rather complex operation. Furthermore, when it is desired to mount in the machine a roll having a different width from the previous one, it is necessary to relocate both flanges and the associated side stop members on the shaft.

Conversely, according to the present invention, two arms **222** (FIG. **4**), affixed to the machine and not connected to the paper roll **218,** determine the lateral position of the roll. The arms **222** are mounted for axial movement on the shaft **329** and are connected to opposite sides of a cord loop **326.** The loop **326** rides tautly on a pair of idler pulleys **328.** The translation of one arm **222** on shaft **329** is coupled by cord **326** to the other arm **222** so that the arms **222** move together or apart in unison remaining centered about the machine axis. Thus different size rolls **218** may be loaded into the machine and easily centered merely by bringing the arms **222** into contact therewith.

During operation of the machine, the roll **218** exerts axial pressure on the arms **222** which tends to separate them. In order to prevent them from separating and causing misalignment of the paper fed from the roll **218,** a plurality of circumferential grooves **330** are provided in the shaft **329** and a leaf spring **331** is mounted on one of the arms **222.** One leg of the spring **331** normally bears resiliently against the shaft **329** and when the arms **222** are properly aligned to accept a roll of paper **218** of a particular standard width, the leg drops into one of the grooves **330,** thereby preventing further movement of the arms **222.** The other leg of the leaf spring **331** is encased in a plastic member **332** which is shown in a partial cut away manner. The manual depression of the member **332** causes the free leg of the leaf spring **331** to come out of the groove, thereby allowing the adjustment of the arms **222** to accept rolls **218** of a different width. In a preferred embodiment the support rollers **220** extend across the whole roll length so as to facilitate the even feeding of paper from the roll by the medium of their rolling friction over the paper and thus to insure the paper motion in perpendicular relation to the axis of the roll **218.**

Similarly, the first roller pair **223** driving the paper fed from the roll **218** is arranged so as to pull the paper only on a restricted central area thereof, in order to prevent a difference in tension between the right and the left hand margin of the roll from causing a lateral diversion of the sensitized paper. Conversely, the accommodation of the rollers may be restricted to the central areas of the roll, but being required in this event to insure the correct driving action on the right and left hand margin of the paper.

Other embodiments may use supporting systems made of rotary elements contacting the roll only on a restricted transverse area.

The illustrated preferred embodiment allows a wide tolerance concerning the consequence of roll deformities on the uniformity of feeding of the paper, owing to the compensation and the self adaptation of the system to irregularities in the roll. An advantage deriving from the present system is the absence of any dimensional limitation for the roll core. When the portion **201** of the cover is opened a lever system (not shown) causes the feeding rollers **223** (FIG. 2*b*) to be separated from each other and a sensing member **224** to be separated from the roll **218,** the sensing member **224** indicating the exhaustion of the roll, thus making easier for the operator the insertion of the leading edge of the new roll between the rollers **223.**

The feeding of the sensitized paper is executed by the rollers **223.** In a preferred embodiment they are represented by two rollers driving the paper only on its central portion. In this way the system results in being less responsive to parallelism errors between the different axes, which may affect the paper motion by causing lateral displacements. Furthermore, if the operator inserts the leading edge of the paper between the rollers **223** in a skewed fashion, the rollers **223** tend to automatically reset it into the correct position. The leading edge of the paper is fed by rollers **223** through the guides **225, 225'** which transfer it toward the cutting device.

The guide 225' may be lowered for facilitating the extraction of the paper sheets stopped on the area located immediately before the cutting device. The latter is made of a cutting blade 226 rotatable about the shaft 227. The cutting surface is cylindrically shaped with axis thereof corresponding to the shaft 227. The cutting edge has a helical shape so that it cooperates with blade 228 to cut the paper in a scissors-like fashion. The counter-blade 228 which is capable of executing small rocking motions about the shaft 229 is held in contact with the blade 226 by the spring 230. The shafts 227 and 229 are slightly skewed with respect to one another so as to further ensure the counter-blade 228 is in contact with only a single point of the cutting edge of the blade 226 at any given time during its rotation.

The system for operating the movable blade 226 is displayed in detail in FIG. 5 in conjunction with FIG. 9. The lever 231 is mounted on shaft 227 for movement with blade 226 (FIG. 2*a*). Lever 231 normally bears against the pawl 232 being urged thereagainst by the compression spring 233 which bears against lug 401 on lever 231. The other end of the spring 233 bears against the arm 402 of the bridge lever 234 which extends through aperture 404 in lug 401. Bridge lever 234 is in turn held in place by the lever 235 which bears against the other arm 403 of the bridge lever 234.

When the electromagnet ET is activated by the signal to cut the paper (generated by the actuation of microswitches M3 and M4 (FIG. 7) as will be explained below), the pawl 232 is rocked about its shaft 236 by the pull rod 237 which is connected to the electromagnet ET, and in this way the lever 231 (and the cutting blade 226 connected thereto) is released and rotates clockwise by the action of the spring 233. Near the end of its travel the lug 401 on lever 231 strikes the lug 238 of the lever 235 which is thus rotated counterclockwise and allows the lever 234 to rock about its shaft under the bias of the spring 233. The counterclockwise rotation of the lever 234 relaxes the spring 233 and allows the lever 231 to be reset by spring 239 thereby resetting the blade 226. The blade resetting operation is necessary because of the requirement of having an opening between the blades 226 and 228 immediately after a copy sheet is cut in order to allow the subsequent portion of the roll 218 to be fed between the blades 226 and 228.

The pull rod 240 controlled by the cam 241 mounted on shaft 405 through cam follower 406 mounted on rod 240 then resets the lever 234 through pin 407 on leg 403, which pin 407 rides in slot 408 of rod 240, thereby reloading the spring 233.

As the original is inserted into the machine it controls downstream from the rollers 211, first the microswitch M3 (FIG. 7) by means of the lever 216 (FIG. 2*a*) and then the microswitch M4 (FIG. 7) by means of the lever 215 (FIG. 2*a*) which energizes the electromagnet EA (FIG. 6 in conjunction with FIG. 9) so that the pull rod 242 coacts with arm 409 of V-shaped pawl 244 and releases the pawl 244 which had been locking the one-revolution clutch 243 (the clutch executes only one revolution after which it is locked again by the pawl 244) and rotates the copy paper feeding rollers 223 connected to said clutch. The coupling operation between the clutch 243 and the roller 223 is made by means of a one-way clutch (not shown) so that the roller 223 keeps rotating and driving the paper even when the clutch 243 has concluded its revolution.

When the electromagnet EA is energized, the pull rod 242 through pawl 244 also rotates the V-shaped pawl 245 clockwise thereby engaging the clutch 246 by allowing the lugs 410 on the coacting elements 411 pivotally mounted on clutch 246 to engage the teeth on the driving member 412 under the bias of spring 413. The clutch 246 rotates the cam 249 by means of the gears 247 (connected to the clutch 246) and 248. This cam 249 is provided with two tracks. The first has the object to hold back the pawl 245 for two full revolutions of clutch 246 so that the clutch 246 is disengaged only after it has completed three full revolutions. Since the gears 247 and 248 ratio is 1:3, this corresponds to a full revolution of the cam 249. Two levers 215, 216 reside on the other track of cam 249, being connected to the shafts carrying the levers 216, 215 respectively. Their control function will be described below. The motion transmission to the parts described in FIG. 6 is obtained by a transmission system known per se, connecting the parts by toothes wheels and belts.

As the trailing edge of the original leaves the pair of rollers 211 (FIG. 2*a*) it first releases the lever 216 thereby resetting the microswitch M3. As can be seen in FIG. 10, in this way the electromagnet EA (FIG. 6) is released and the electromagnet ET (FIG. 5) is energized controlling the movement of the cutting blade of the sensitized paper. The electromagnet ET is deenergized when the lever 215 and the microswitch M4 are reset. The operation and the reset travel of the cutting blade have been already described above.

The function of the cam 249 with regard to the cutting operation is to prevent by its edge contacting the levers 215 and 216, a too-short original from prematurely resetting the microswitches M3 and M4 which would result in the cutting of a piece of copy paper by the blade 226, which is shorter than the maximum separation between the feed rollers (in particular the rollers 35, 35' and 25, 27 preceding and following the developer container 70 respectively). Otherwise the copy could get stuck in the container 70. Therefore, the periphery of the cam 249 is shaped in such a manner as to allow the microswitches M3 and M4 to be reset according to the aforesaid sequence and the copy to be cut according to a length which is slightly longer than the aforesaid separation. All these features are significant in the event the originals to be reproduced are shorter than the above mentioned critical separation existing between the feed rollers.

Another safety feature in the cutting system is represented by a device (FIG. 5) ensuring in all events that the sensitized paper is cut into a given length, for example of 500 mms, in the event that no cutting has occurred previously. Normally, this device becomes operative:

a. when lacking the signal concerning the cutting occurring after the end of the original, owing to a microswitch malfunction or to another accidental event,

b. when the original is longer than a predetermined maximum length.

The reasons that this device was installed is both (a) to prevent the roll being unwound owing to the first accidental failure; and (b) to prevent the copy from being damaged as it would reach a dangerous tension if exceeding a certain length after the slack portion in the developer 70 is taken up, because it is pulled by the squeegee rollers 25, 27 at a speed which is higher than

that of the feed rollers 35, 35' located in a preceding position.

This device provides a rubber roller 263 mounted on the lower shaft of the roller pair 223 (FIG. 2a), the roller 263 contacting the disk 264 freely mounted on the pin 265 at every feeding cycle. The disk 264 is reset at every cycle to a fixed position by means of the resetting spring 266. The cam 267 executes a full revolution at every paper feed cycle, being integral to the gear 248 (FIG. 6). The cam 267 displaces the lever 268 at its initial revolution portion, the projection 269 whereof rocks the lever 270 about its fulcrum 271, against the bias of the recall spring 272. This displacement moves the disk 264 apart from the roller and resets it to the starting position under the influence of spring 266.

After a revolution of the cam 267 the disk 264 starts rotating beginning from its rest position, being frictionally driven by the roller 263. After approximately a full revolution of disk 264 which corresponds to the maximum copy length, an indentation of the disk edge makes the riding lever 270 to rock and the arm 273 displaces the projection 274 of the stop lever of the movable cutting blade 226, thus initiating the copy cutting operation. Conversely, if the copy is shorter than the maximum length, the disk 264 stops on the position corresponding to the copy length. The rotation of the cam 267 during the subsequent feed cycle then resets the disk 264.

The end of roll signalling device (FIG. 3) indicates by an acoustic signal that the roll has come to an end and concurrently it cuts off the electric circuit so that the insertion of an original into the machine does not affect the feed and the paper cutting device. This device is made of a sensing member 224 (FIG. 2b) secured to the freely mounted shaft 276. Secured to one end portion of the shaft 276 is a cam 277 whereon bears a pin of one arm of the bridge lever 278. When the paper roll 218 is full, the sensing member 224 is biased against it by the spring 279. Conversely, when the roll is nearly exhausted the sensing member 224 rocks in a counter clockwise direction and contacts the point 280 located on the paper roll rearside. As long as the last paper portion is pushed by the weight of the roll core 218' against the point 281 of the support roller 220, the sensing member 224 controlling the cam 277 holds the lever 278 in the starting position. When the end of the paper on the core 218' is fed past the point 280, the sensing member 224 rocks further in the counter clockwise direction under the bias of the spring 279 and the cam 277 rotates with it. The pin on the lever 278 is held against the lower portion of the cam 277 by the action of spring 284. Fulcrumed on the point 282 on the other leg of the bridge lever 278 is the striker 283 which is downwardly biased by the spring 284. The counterclockwise rotation of the cam 277 causes the projection 285 of the lever 278 to rock clockwise so as to lock the microswitches 286 (M3 and M4) thus preventing them from being controlled by the original. At the same time the striker 283 is lowered and moved into the path of the continuously rotating hammer 287. The striker 283 is thus hit impulsively and will strike the bell 288 by inertia causing the emission of an acoustical signal.

During the opening of the movable portion 201 of the cover, portion 201 controls the cam 292 by means of the pull rod 289 connected to the slide 290 provided with the stationary pin 291, thus causing the backward displacement of the sensing member 224 and its disengagement during the roll loading and replacing operation.

The cut sensitized paper follows its path through the charging, exposing and developing stations as is described in detail in the above mentioned patent application U.S. Ser. No. 74,817 and displayed in FIG. 2. After the copy sheet passes between the squeegee rollers 25, 27, it is transferred between the guides 252, 253 in front of the tangential blower 254 (FIG. 2a). The latter, along with the rollers 255 and 256, has the function to dry the copy before it emerges from the machine. The copy is subsequently transferred between the rollers 257 and 258 to be dropped into the drawer 210. The blower 254 blows an air flow toward the copy output area, in particular beneath the copy, so as to complete its drying and prevent a direct contact between the copy in motion and a copy already dropped into the drawer 210. The pendulum 260 swinging about the shaft 261 performs the function to hold the training area of the already dropped copy lowered against the drawer 210 and to ensure the correct passage of the leading area of the subsequent sheet.

The drawer 210 may be extracted toward the machine front, sliding beneath the bottom of the machine, so as to be capable of receiving copies having different formats.

A sliding member 342 is located on the left side of the original insertion plate 205 of the machine. When the slide 342 is in the forward position, it locks the levers 215' and 216' of the microswitches M4 and M3 and prevents these levers from being controlled by the levers 215 and 216, thereby preventing the feeding of roll 218. In the other position, the slide 342 displaces element 344 which prevents the copy sheet from being manually inserted into the slot 207.

According to a preferred embodiment of the invention, provided on the developing station (FIG. 8) is an automatic concentrated developer adding device, which keeps constant the concentration of the liquid developer in the container by means of the automatic addition of a fixed quantity of concentrate after a predetermined number of copies are made.

The device comprises a concentrate cartridge 293, a cartridge support 294, a piston 295, and a linkage 240 which lowers the piston, for example every ten copies. When the cartridge 293 is inserted into its seat in a recess in the support 294, the seal 307 is opened, causin by pushing on the offset 308, thus causing the emission of the concentrate. The concentrate then flows first into the chamber 296 and then into the chamber 298 through the duct 297. When the rise of the level covers the seal opening, the concentrate emission stops at a level which is automatically reestablished every time the liquid is drained from the chamber 296.

The slide 240 executes a reciprocal movement for every copy. Starting from the reset position the slide 240 is first displaced rightwards bringing its projection 299 to push against the lug 300 of the lever 301, the displacement of the latter and of the bail 302 is thus capable of displacing the piston 295. As the lever 301 resides on the cam 304 the latching of the lug 300 with the projection 299 is possible only for one position of the cam 304, which accomplishes a full revolution, in the specific event every 10 copies, being rotated by the pawl 305 by one-tenth of revolution at every leftward travel of the slide 240. After each 10 copies the piston 295 executes a travel of controlled length into the

chamber **298**, thereby causing a predetermined quantity of liquid to overflow into the duct **310** which transfers it into the main container **70** of the developer.

The electrical schematic diagram displayed in FIG. **10** shows the continuously operated unit including the motor M, the blower V and the ON/OFF lamp S, and the cyclically operated units which are set into operation only when the copy sheet feeding operation is started.

What we claim is:

1. A cutting device for cutting sheets of paper from a roll in a copying machine comprising:

a rotatable cutting member having a cylindrical blade and a substantially helical cutting edge;

a movably mounted straight counter blade;

means for resiliently biasing said counter blade into contact with said cylindrical blade of said cutting member;

a first member mounted for rotation with said rotatable cutting member;

spring means for urging said first member in a first rotational direction;

latching means for preventing said first member from rotating under the influence of said spring means;

selectively actuatable release means for disengaging said latching means from said first member for allowing said first member to rotate under the influence of said spring means for rotating said rotatable member through a cutting stroke;

means for resiliently biasing said first member to rotate in a second rotational direction opposite to said first direction, the rotational moment of said biasing means being less than the moment of said spring means; and

means actuated by said first member near the end of its stroke for releasing the tension on said spring means to allow said first member to be reset in said second direction by said biasing means in order to open a space between said rotatable cutting member and said counter blade immediately after completion of the cutting stroke of said rotatable cutting member.

2. The cutting device of claim **1**, wherein said rotatable cutting member is mounted for the axial rotation of said cylindrical blade, said counter blade and the axis of rotation of said cylindrical blade being skewed with respect to one another.

3. The cutting device of claim **1** further comprising:

means for sensing the length of copy paper fed from said roll and for actuating said selectively actuable release means when said length is equal to the length of the original to be copied.

4. The cutting device of claim **3** further comprising:

means for blocking the actuation of said selectively actuable release means until a predetermined length of copy paper has been fed from said roll, independently of the length of the original to be copied.

5. The cutting device of claim **4** wherein said means for sensing and actuating, actuates said release means after a predetermined maximum amount of said copy paper has been fed, independently of the length of said original.

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