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ABSTRACT OF THE DISCLOSURE

The feeder is applicable to a conventional electric typewriter and includes unitarily associated feed and receiving magazines with a common feed roll connected to function in synchronism with the typewriter platen. Incoming sheets bear at their leading edge margins upon a convex rough surface, the feeder being so adjustable as to angle that as each sheet leaves the feed roll another will move automatically into position. A solenoid energized manually to start the feed holds down the sheet advancing key of the typewriter to maintain the new sheet in continuous advance until its leading end trips a microswitch to open the holding circuit for the solenoid, leaving the sheet properly positioned for use.

CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of my application Ser. No. 323,625 filed Nov. 14, 1963, now abandoned, and identified by the same title.

BACKGROUND OF THE INVENTION

The feeder comprises unitarily associated feed and receiving magazines having a common feed roll operationally connected with a platen roll to function in precise synchronism therewith for delivering single or composite sheets into a typewriter or the like for and storing finished sheets discharged from the platen roll.

The magazines are unitary. They comprise laterally spaced side members extending upwardly and rearwardly from the feed roll and relatively laterally adjustable. Flanges on these members constitute the paper supporting means of the respective magazines.

Forming the bottom of the feed magazine and cooperating with the feed roll is the side thereof on which sheets pass by gravity from the feed magazine into the typewriter is a sheet supporting member which is desirable, but not necessarily, convex and which has a surface converging toward the feed roll at the diameter thereof which is normal to the magazine and to the plane on which the sheets are successively delivered. Preferably the surface is inclined toward said diameter at an angle such that the supported sheets tend to advance on the bottom of the magazine toward the roll, the most advanced sheet being held back by the trailing end of the sheet which is being acted on by the roll. Thus, each sheet will follow the preceding sheet automatically, no adjustment being required even if the sheets differ in length.

The supporting member preferably has a controlled roughness such as may be provided by surface grit to assist and make less critical the support for the sheets in the magazine pending delivery of successive sheets into the typewriter by the feed roll.

The relationship between the convex supporting surface and the feed roll and the magazine is such that the foremost sheet in the magazine is gravity delivered substantially precisely in a plane which is tangent to the feed roll as well as to the typewriter platen roll. Assuming that the supporting device has the preferred convex form, a given sheet receives progressively reduced support as the sheet approaches the plane of delivery to the feed roll. Finally, the abrasive member no longer provides substantial support and only the trailing end of the preceding sheet holds the foremost sheet on the convex supporting member.

A cover plate is pivoted on the frame and resiliently supports a roller coacting with the feed roll in passing paper to the paper-receiving magazine for proper positioning therein. The cover plate and all parts mounted thereon are enclosed in a hood and the entire cover assembly swings upwardly for substantially full access to the typed paper.

For electric typewriters, a switch and a relay are mounted on the frame under a rear cover and another switch is mounted in the front cover assembly for operation by the paper coming from the platen to break the relay circuit and arrest further advancement of the sheet. A solenoid is connected to the key controlling the traversing of the carriage and the rotating of the platen, this solenoid being controlled by contact of the two switches acting through the relay.

Regardless of the use of single sheets or multiple sheet packs and whether the sheets are fed individually or from a pack, it is necessary that the sheets substantially invariably and automatically assume the correct position for feeding into the typewriter and that succeeding sheets of a pack follow one another immediately and in the proper position.

The sets of rollers forming a part of the typewriter structure for holding the paper to the typewriter platen are usually not precision made or precision mounted and pressure of the several rollers of a set may be unbalanced so that paper may not be invariably initially placed with its leading edge parallel to the axis of the platen and the paper requires adjustment. Hence, a paper feeding device should be adjustable to compensate for unbalances in typewriter platen-roller action on the paper. Guide plates and cylinders or rolls must be provided to receive the paper from the plate and place it properly in a receiving tray. Hence, receiving guide rolls should be adjustable relative to the paper being fed as well as the means for moving the paper after it leaves the platen.

It is very important that the magazine and the feed roll and the abrasively surfaced sheet-support which forms the bottom of the magazine shall be adjustable to function with precision.

Most previous feeders have entirely separate magazines for supplying paper and receiving paper. It is advantageous in the instant device to have the magazines mounted unitarily and in the desired superimposed relationship where the structure is compact and can be applied and removed as a unit.

However, the most desirable feature of the instant device is the gravity feed wherein the movement of each successive sheet in the supply magazine to a position for engagement with the feed roll is controlled by the trailing end of that sheet which is passing through the feed roll to the typewriter platen. By reason of this organization, the sheets follow each other in closely spaced proximity, this result being achieved automatically without any necessity for making mechanical adjustments such as would be required to handle sheets of different length if the feed were mechanical.

DESCRIPTION OF THE INVENTION

In the drawing:

FIG. 1 is a perspective view of the present sheet feeder in operating position on and in connection with one of the well-known makes of electric typewriters now in use.

FIG. 2 is a sectional view on line 2—2 of FIG. 1, on an enlarged scale, of the feeder mechanism and of
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the carriage and platen structure through which the paper is passed.

FIG. 3 is an enlarged fragmentary diagrammatic view showing a roll and a relatively fixed cylinder for feed- ing sheets from the supply magazine to a typewriter platen. FIG. 4 is an elevation of an adjustable spring mounting for a roller coacting with a roll for feeding paper from the platen into a receiving tray, the viewpoint being indicated by line 4--4 of FIG. 2.

FIG. 5 is a somewhat diagrammatic front elevation of the sheet feeder diagrammatically showing connection of its paper-feeding roll to a typewriter platen.

FIG. 6 is a view taken on the broken line 6--6 of FIG. 5.

FIG. 7 is a fragmentary view showing in the plane of line 7--7 of FIG. 6 the manner for adjustably mounting the rotatable shaft for the paper-feeding roll.

FIG. 8 is a rear elevation of the sheet feeder with the rear cover removed.

FIG. 9 shows the manner in which an electric solenoid is related to the carriage return key of an electric typewriter.

FIG. 10 is an electrical diagram showing the connections between said solenoid and portions of an electric circuit for controlling the solenoid.

FIG. 11 is an enlarged fragmentary detail view of the attachment per se as mounted on a cover plate which is conventional in one brand of electric typewriter.

FIG. 12 is an enlarged diagrammatic view showing how the solenoid-actuated key functions to control the operation of the typewriter platen and the platen-driven feeder belt.

FIG. 13 is a fragmentary diagrammatic view similar to a portion of FIG. 2 showing the sheet issuing from the typewriter in a position in which it has operated a control switch used in the circuit of FIG. 10.

FIG. 14 is a diagrammatic view showing the issuing sheet further advanced from the position shown in FIG. 13, the switch operating lever having been released.

Referring more specifically to the drawings, reference numeral 11 generally designates a known make of electric typewriter having a carriage 12 (see FIG. 2) with a sheet metal pan 13 and a series of rollers 14 and 15 mounted to extend through the pan into contact with and along the length of a platen 16. Paper is further guided through the platen by a sheet metal guide 17 and is pressed on the platen by rollers 18. All of the above structure is well known and need not be further described. It may be explained that while the part 12 is designated in commercial practice as a carriage, it need not necessarily have movement in that style of typewriter in which the impression dies are mounted on a ball which moves across the paper.

The carriage 12 has a removable cover 12a and there is fixed to the rearward portion thereof a bracket 21 with upstanding ears 22 at the ends thereof and having slots 23 therein, to receive bolts for adjustably mounting of the present sheet feeder 24 at an angle to function as herein described and for shifting it upwardly and downwardly if necessary to coact with parts of the typewriter.

The sheet feeder illustrated in FIG. 11 comprises a frame consisting of end plates 25 (see also FIGS. 5, 7 and 9) joined by a flanged cross plate 26 on which are mounted other frame parts. Cross plate 26 adjustably supports feed magazine or tray side section 27 and bearing fastening means 28 (including bolts 29a and nuts 29b holding springs 29c) acting through slots 30 in plate 26. Preferably fiber elements 29a are inserted between the springs 29c and the plate 26 to assist in holding the parts in adjustment notwithstanding minor jars. The arrangement permits either side section to be adjusted laterally or pivoted as needed.

The tray sections 27 and 28 together with flanges 31 constitute a feed magazine for storing paper for delivery into the typewriter. For receiving paper which has been actuated upon by the typewriter, the tray sections also comprise a receiving magazine made by providing each section with a flange 32 on which paper is received from the typewriter. Tray section 28 can be moved laterally toward, and from, and can be angularly adjusted relative to, tray section 27 as part of the adjustment assuring correct feeding and correct storage of the paper. The bottom of the feed magazine is provided by supporting means for the lower edges of the sheets, later described.

It will be noted that the feed magazine and the receiving magazine are, in effect, superimposed forming parts of tray sections common to both. They lie at an angle extending upwardly and rearwardly from the platen.

A paper guide plate 35 extends in spaced relation to the cross plate 26 and has an aperture 350 therethrough for receiving a portion of a feed roll 36 mounted on a shaft 37 rotatably journaled in the end plates 25. Shaft 37 (see FIG. 7) is mounted in bearing 38 in adjustable mounting blocks 39 each having slots 40 therein to receive fastening means 41 of a size permitting shifting of the blocks in various directions in one plane for placing the shaft parallel to the platen axis. The plate 36 is connected with the shaft 37 of the latter by a toothed belt 44 so that rotation of the platen also rotates the roll 36 in precise synchronism with the platen to feed paper to the platen. The feed roll 36 is rubber or the like to engage the paper frictionally and is only soft enough to assure adequate roll surface contact on the paper for positive frictional feeding thereof.

It has been found that roll 36 should desirably have its peripheral surface exactly concentric with its shaft, and the roll is accordingly ground after mounting on its shaft. By reason of the concentricity thus obtained by the grinding and the adjustability of shaft 37, the roll 36 can compensate for non-uniformity in size and eccentricity in mounting of the typewriter platen roller 16, or its associated feed rolls 15, 14, 18.

Paper feed

Cross plate 26 has an aperture 260 therethrough opposite feed roll 36 to receive a paper feed control member 46 which constitutes the bottom of the feed magazine and has a surface of controlled roughness and is adjustably mounted by bracket 45 from plate 26. The preferably convex surface of this member is ground to allow the periphery of feed roll 36. Preferably this member has its closest approach to feed roll 36 in a diametrical plane normal to the path of paper feed and, at its terminus, is so nearly parallel to such path as to offer little support to the lower margin of a paper sheet transported by the feed roll. In practice, the member may be cylindrical although it does not rotate in use. Carborundum of 100 mesh or less has been found suitable.

Member 46 constitutes means (see FIG. 3) for temporarily supporting or holding sheets of paper with the leading edges in downwardly spaced relation. The relationship between the feed roll and the support member and the feeding magazine is critical. As clearly shown in FIG. 3, the trailing margin 141 of the sheet 140 which is engaged by the feed roll 36 is responsible for holding on the support member 46 the lower margin of the next ensuing sheet 42. However, the lower margin of sheet 42 has reached a position such that it is approaching tangency to the support member 46 and, despite the roughened surface of the latter, it readily slips by gravity from member 46 into the bite of feed roll 36 as soon as the trailing end 141 of sheet 140 passes through the bite.

The adjustment of member 46 with respect to feed roll 36 is very critical. Depending on the angle and the surface friction of member 46, it may be necessary to move it slightly. Slots 460 are provided for bolts 461 to permit of this adjustment (FIGS. 2 and 8).
The several sheets 138 of paper remaining in the feed magazine 139 will be so held by the most advanced sheet 42 that the lower ends of sheets 138 will be supported by the rough surface of member 46. Obviously, the holding means need not be a cylinder nor made of carbon rodium so long as it is capable of holding the lower ends of a number of sheets for release as a sheet comes to uppermost position. Member 46 is mounted in bracket 45 for rotational adjustment but does not rotate in its mounting. The free end of the bracket 45 is held to a given position of adjustment by a screw 47 attached to frame plate 26 and provided with a nut 48 acting against the compression of a spring 49. Turning the mowing wheels on the screw will bring the member 46 closer to the roll 36 and compresses the spring 49 to achieve a given spacing of the member 46 from the cylinder according to requirement of the paper being used.

The bracket 45 extends through a hole in a plate 50 which braces frame plate 26 against bending as force is applied on the bracket by its adjusting screw and the cylinder. A rear cover 51 encloses the bracket and much of its adjusting means and other parts to be described.

Paper discharge

A front cover hood 59 is pivotally mounted on the frame end plate 25 and carries a plate 60 with a transparent lip portion 61, the plate 60 coacting with guide plate 35 in forming a throat through which paper moves from the feed magazine 139. The throat plate 60 has an aperture 600 therethrough opposite the roll 36 for movement through such aperture of a roller 62 having its axle on resilient support 63 so that the roller presses the paper against roll 36 and turns the paper toward the receiving tray or magazine 32. Roller support 63 is a spring leaf (see FIG. 4) with a slot 64 for bolt 65 by which the roller is adjustably attached to plate 60. Thus, the location of roller 62 on feed roll 36 is varied to assure that paper B slides in proper alignment into receiving tray 32, where it is supported on bottom flange 320 and on the top surface of feed roll 36. Clockwise rotation of the roll as viewed in FIG. 2 keeps urging the sheets to the back of the receiving magazine.

A slot 74 is cut into the throat plate 60 at a location only slightly spaced longitudinally of the cover from the roller 62 so that paper of even small size will pass over the slot in movement from the magazine. A microswitch 68 is mounted on the throat plate 60 with a resilient finger 69 extending through the slot 74, the switch forming part of control circuitry to be described.

The switch 68 is marked N.C. in FIG. 10, meaning that it is normally closed. In the instant device, it is opened by each successive sheet of paper issuing from the platen toward the receiving tray or magazine. This breaks the relay circuit. FIGS. 13 and 14 show how the advancing margin 43 of the discharging sheet 144 has engaged lever 69 to open the switch 68. FIG. 14 shows how the lever 69 of normally closed switch 68 swings back to its closed position after the leading margin of the sheet 144 enters the throat 35c.

The front cover assembly 59–63 is pivoted at 165 so that it can be raised to give full access to approximately one-half the length of a letter size sheet as it comes from the platen. A spring detent 66 is mounted on the end plate 25 of the frame and the detent has a nose 67 to slip between the edge of the frame plate and the underside of the throat plate 60 to hold the cover assembly in its highest raised position. The cover is, of course, held up until the cover 59 is pulled down by the nose thereof from beneath the cover. Because of the above pivoting of the cover assembly, the paper is nearly as fully exposed as if the the feeder were not in use.

A push button electric switch 76 (see FIG. 8) is mounted on the frame end plate 25 at the left in FIG. 8 and a relay 77 is mounted on the frame end plate at the right in FIG. 8, the relay armature being under spring action to open the relay contacts when its windings are not energized. A microswitch 78 is mounted on frame cross plate 26 and has as its actuating finger 81 extending through an aperture in the plate to bear on the pack of paper in the feed magazine and to keep the switch closed so long as there is paper to be fed. The switch 78 is marked N.O. in FIG. 10, meaning that it is normally open. It is closed only when paper in the supply magazine bears on its arm. All the above parts adjacent to or carried on the rear of the frame plate 26 are covered by a rear cover 51 which is readily removable.

Referring now to FIG. 9, a solenoid 79 is connected to the carriage platen-rotating and "return" key 80 for continuing feeding of the paper into the carriage by holding the key down to turn the typewriter platen by increments of one line, as is usual in electric typewriters.

Referring now to FIG. 10, the microswitch 78 is closed as soon as paper is in position for typing thereon and presses against the switch finger 81. When the paper is to be advanced by one line more, closure of the push button switch 76 closes the circuit to the key 79 and to the solenoid 79. Platen 16 will continue its stepped rotative advance during the period of depression of the key 80 as is well known (provided there is paper in the feeder so that switch 78 is closed). All of the circuit parts are designed for this purpose so that the armature of relay 77 holds the holding circuit 77' to the solenoid 79 closed so long as the microswitch 68 is closed.

A conventional arrangement for enabling the key 80 to rotate the platen 16 and the feed roll 36 is shown diagrammatically in FIG. 12. The typewriter is presumed to be operated by a motor (M) 85 which is connected by belt 86 with a driving friction roll 87. Depression of the key 80 either manually or by means of solenoid 79 transmits motion through link 88 to a lever 89. The pinion 90 supports lever 89 from a lever 91 which is pivoted at 92 and carries an elliptical cam 93 in a position which is normally spaced slightly from the motor operated drive roll 87, the latter being in continuous operation.

A finger 94 on lever 89 is normally held by the bias of spring 95 against one of two stops 96 on the elliptical cam 93. Compression of the plunger not only withdraws the finger 94 momentarily from the stop 96 on the cam but it also pivots lever 91 and thereby urges the entire cam bodily on lever 91 into contact with the motor driven roll 87. The latter rotates the cam 180°, the eccentricity of the cam about its mounting pin 97 oscillates lever 91 away from stop 96 bias against the bias of spring 99, thereby transmitting motion through link 101 to a pawl engaging lever 102. This lever is caused to oscillate clockwise as viewed in FIG. 12 to cause the pawl 103 to engage a ratchet tooth 104 on the platen 16 to advance the platen rotatively through a predetermined angle or increment usually representing the space between consecutive lines of typewriting.

Continued depression of the key 80 will continue to hold the finger 94 retracted and the cam 93 in engagement with the motor driven roll 87 to continue the stepped advance of platen 16. Whereas the advance of platen 16, its motion is communicated through the toothed belt 44 with the driving roll of my paper feeding attachment.

Operation

In use, a supply of paper A (which may be a single sheet or carbon copy sets) is placed in the feed magazine or tray parts 31 forming the paper positioning and supply means. The lower edge of the sheets A bear on the holding member 46 in slightly spaced relation. The most advanced sheet 42 has its leading end resting on a portion of member 46 which is convergent to feed roll 36 at such an angle that the sheet 42 would be discharged by contact with feed roll 36 but for the tendency of sheet 140 to exclude sheet 42 from contact with roll 36 and
from passage through the throat 360 between roll 36 and member 46. Sheet 42 will immediately follow sheet 140 as it leaves the nip of the feed roll 36 and the cylinder 46. It is very important that the successive sheets leaving the magazine are fed through throat 360 between the supporting member 46 and the feed roll 36 in substantially precise tangency to the feed roll.

It is also important that each sheet is followed by the next without delay. It will be seen that when the trailing end 141 of the sheet of paper 140 passes throat 360, the lower end of the next sheet 42 is left virtually unsupported by reason of the convexity of member 46, whereby said ensuing sheet 42 slides forwardly and downwardly relative to member 46 and is engaged by the feed roll 36.

Since the sheet 42 immediately follows the trailing end 141 of the sheet 140, and since it is desirable that the ensuing sheet 42 continue its advance far enough so that the typing thereon will be initiated at a proper spacing below its leading margin, I have provided the above described arrangement whereby manual closing of the switch 76 energizes the solenoid switch 77 and its holding through conductor 77. This locks the solenoid switch closed until the advancing end 43 of the sheet 144 engages the switch bar 69 of switch 68 to open this normally closed switch, thereby interrupting the holding circuit, permitting the solenoid switch 77 to open, thus terminating the sheet-advancing feed. As shown in FIG. 14, the leading end 43 of sheet 144 immediately clears the switch operating lever 69 to permit switch 68 to reclose as soon as it has performed this function.

By reference to FIG. 2, it will be seen that a sheet of paper on the platen is held thereto by the rollers 14, 15 and 18 so that the roll 36 and cylinder 46 are only required for a short time and are not necessary to movement of the sheet around the platen.

The adjustments possible in the present feeder are particularly important in securing the action which makes the present sheet feeder successful. Adjustment of one side of the feeding-receiving tray relative to the other side positions the sheets for proper engagement between the feed roll 36 and holding member 46, and the proper discharge of the sheet from the feed roll to the platen 16. Adjustment of the feed roll shaft 37 to parallelism with the platen 16 further assures that the leading edge of each sheet will be presented properly to the platen. Adjustment of the mounting bracket to a different angle and/or different level compensates for any unbalanced pull on sheets in the typewriter. Fine adjustment of the member 46 not only controls spacing for paper thickness, but also controls the spacing between the trailing edge of one sheet and the leading edge of another sheet. Adjustment of the receiving guide roller 62 relative to the feed roller 36 assures that paper will be properly placed in the receiving magazine. Hinging of the front cover assembly gives full access to the typewriter. Any purpose desired and the front cover may be held up when manual use of the typewriter is required. Other advantages of the present feeder will be apparent upon consideration of the disclosure.

I claim:

1. A device for feeding sheets of paper to a typewriter platen and an associated pressure roll and comprising:
   (a) a feed roll,
   (b) means mounting said feed roll for rotation,
   (c) means for rotating said feed roll,
   (d) a sheet supply magazine having first sheet guiding means extending downwardly toward said feed roll for gravity delivery of successive sheets to said feed roll,
   (e) the magazine having at its bottom a sheet supporting member with a fixed convex rough surface.

II. The path of said sheets and converging downwardly toward said feed roll in a position in which it is engaged concurrently by the ends of a plurality of sheets and nearly tangentially by the end margin of the first sheet, the sheets advancing successively toward the feed roll having progressively decreasing support from said surface as they approach tangency to said surface,

III. Having its said rough surface so steeply pitched at said throat as to be incapable of supporting the most advanced sheet in said first guiding means except as said advanced sheet is held to said member by a preceding sheet already traversing said throat,

(f) discharge of said preceding sheet from said throat permitting gravity delivery of said advanced sheet into said throat for engagement with said feed roll to be propelled thereby toward said platen,

(g) whereby said sheets automatically follow each other without substantial spacing and without requiring mechanical adjustment to compensate for changes in length of sheets.

2. A device according to claim 1 in which the throat has its minimum cross section substantially at a plane diametrical with respect to the feed roll and normal to the said first sheet guiding means and to the path of paper through the throat.

3. A device according to claim 1 in further combination with
   (h) a mounting bracket, and
   (i) means for the pivotal adjustment of the magazine on the bracket.

4. A device according to claim 1 in which the means for rotating said feed roll includes means comprising a toothed belt for driving said feed roll directly from the typewriter platen and in synchronization therewith.

5. A device according to claim 1 in which the sheet supply magazine has a sheet receiving magazine unitarily connected therewith, second sheet guiding means for guiding toward said receiving magazine sheets issued from said platen, said second sheet guiding means being positioned to define a sheet path tangential to the feed roll at the slide thereof opposite the sheet supporting member at the bottom of the feed magazine, the sheet receiving magazine including sheet supporting means offset rearwardly from said path and rearwardly inclined in an upward direction and having a support for the bottom of the sheets in which support extends rearwardly from the top of the feed roll whereby sheets acted on by the feed roll are delivered rearwardly against said last mentioned sheet support.

6. A device according to claim 5 in which laterally spaced magazine members have flanges constituting portions of the aforesaid supply magazine and receiving magazine, and means mounting said laterally spaced members including means whereby one of said laterally spaced magazine members is laterallv and pivotally adjustable with respect to the other.

7. A device according to claim 5 in which the second sheet guiding means for guiding the sheets delivered from the platen includes an angularly adjustable roll which holds such sheets to the feed roll and directs them into the receiving magazine.

8. A device according to claim 5 in further combination with electrical means for controlling the operation of said feed roll and including a circuit having a switch which is normally open and which when closed conditions said electrical means for feed roll operation and having an actuator which is in the path of paper in the feed magazine and is displaced thereby in a direction to close the switch only when paper is present in the feed magazine.

9. A device according to claim 5 in further combination with means for electrically controlling the operation of
the feed roll and comprising a holding circuit including a normally closed switch, said switch having an operating lever in the path of a sheet traversing said second sheet guiding means from the feed roll to the receiving magazine for opening said switch and thereby opening said holding circuit.

10. A device according to claim 9 in which said lever is biased to reclose said last mentioned switch as the leading end of the sheet which actuated the switch disengages the lever as soon as the sheet has advanced sufficiently to locate said sheet on the platen in a position to receive typing.

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