

[54] **PLATEN AND PAPER ROLL SUPPORT AND DRIVE MECHANISM**

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B41J 15/16; B41J 11/20

[58] Field of Search **242/75.4, 55.2; 197/133 A,**
197/133 R, 133 P, 133 F, 133 T, 138, 1 R,
138 R, 114 R, 114 A, 144

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[57] **ABSTRACT**

Paper feed mechanism for printer for electronic calculator comprises simplified paper roll support having readily removable shaft with longitudinally spaced peripheral grooves and sleeve slidable and rotatable on shaft to engage flexible inturred flange at one of its ends with a selected groove and outwardly extending flange at other end of sleeve thereby engageable with edge of paper roll to guide and impose drag against unwinding of different width rolls, and paper feed including spring-backed pressure roller, hollow cylindrical platen with end caps press-fitted therein having central hubs press-fitted on platen shaft, one with internal ratchet gear, and external platen gear rotatable on platen shaft as part of platen drive train including spring-loaded drive coupling cooperating with internal ratchet gear, intermediate gear and cyclically rotatable worm gear which, together with a detent, prevent backlash and effect minimum acceleration without overspin, all providing a rigidly located printing surface with manual twirling of platen available to feed paper by virtue of drive coupling acting as break-away clutch.

5 Claims, 4 Drawing Figures

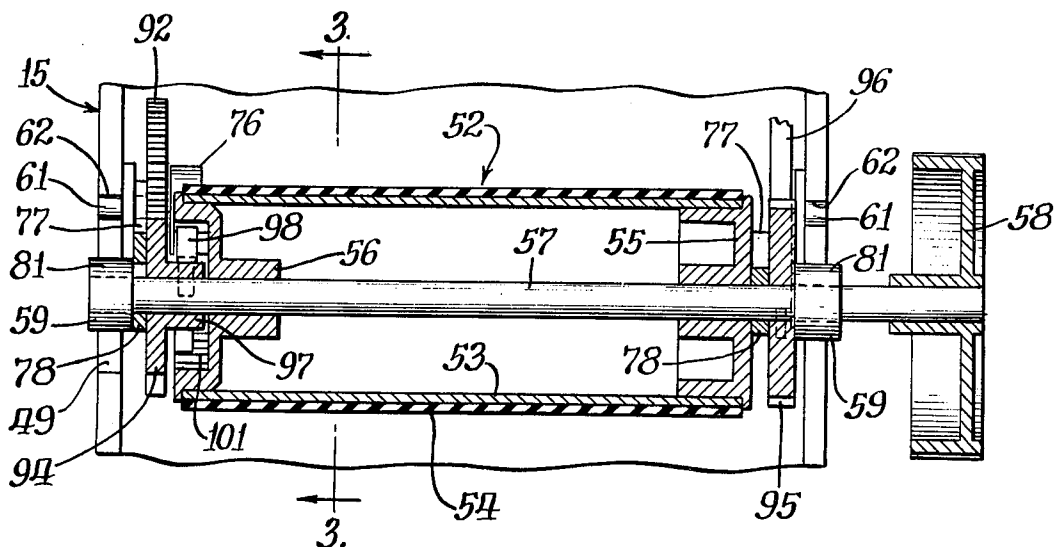


Fig. 1.

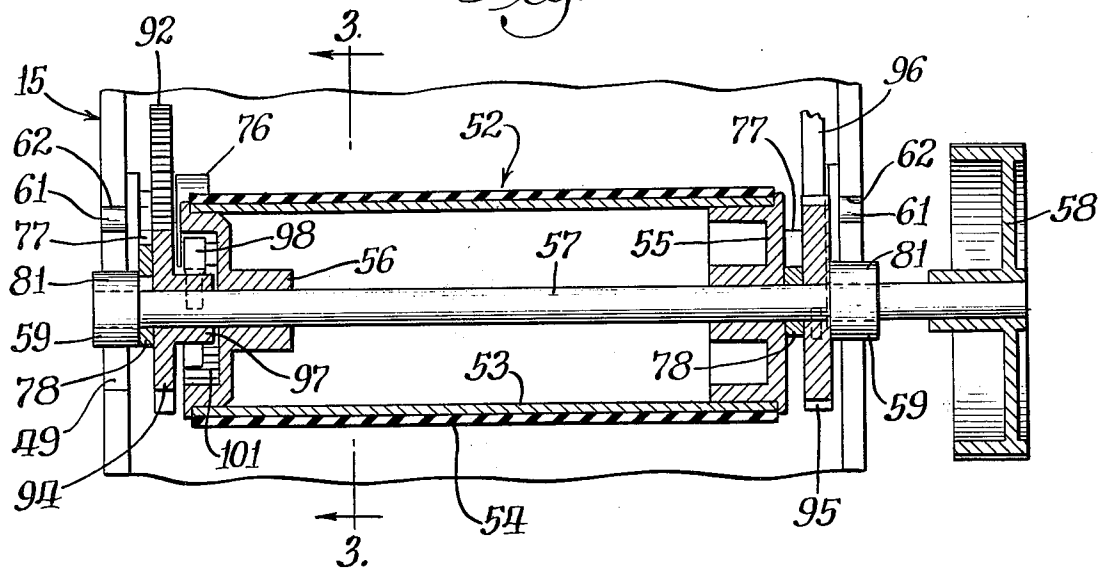


Fig. 2.

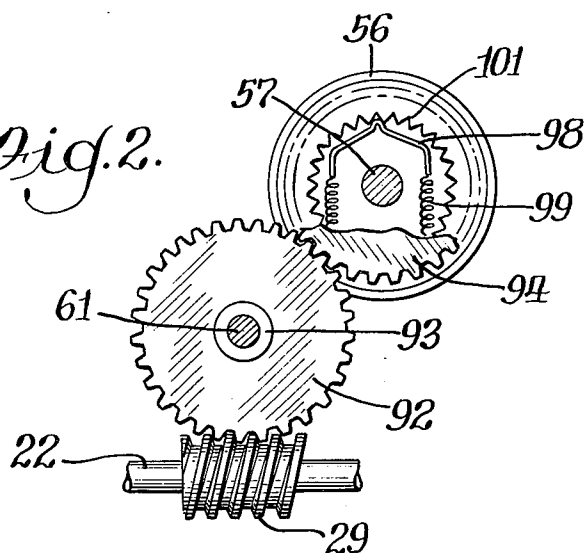
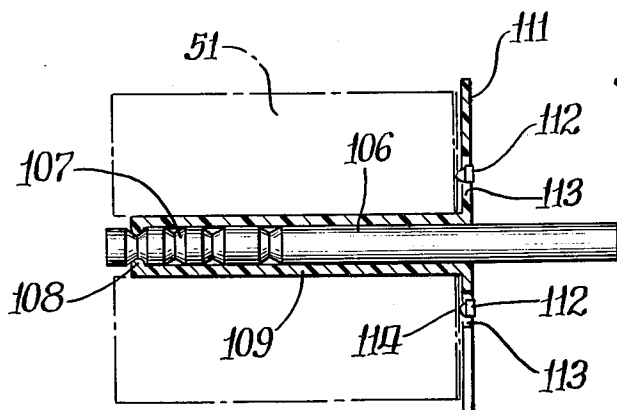
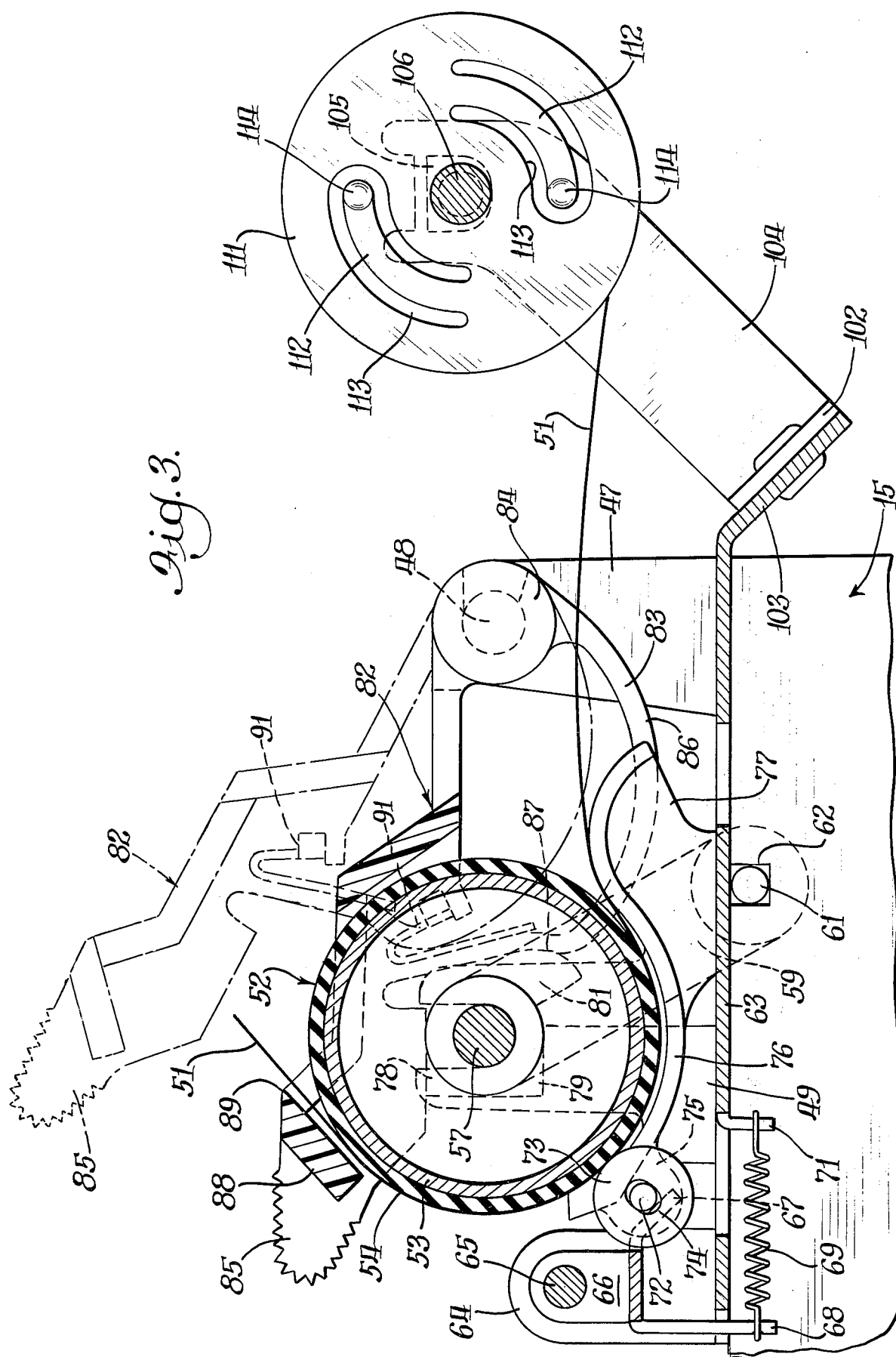


Fig. 4.





PLATEN AND PAPER ROLL SUPPORT AND DRIVE MECHANISM

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to business machines, and more particularly to paper support and feed mechanism for a printer employed in such machines.

2. Description of the Prior Art

The use of a cylindrical platen in printing calculating machines, and the like, is well known, but the positioning thereof relative to the printing members heretofore has not been required to be within very close limits. High speed electronic equipment on the other hand, such as wire dot printers, necessitates a rigid and accurately located platen and maintaining it in printing position within very close limits or tolerances. At the same time, it is essential that relative movement be effected selectively between the platen and a pressure roller, or the like, normally maintaining the paper in print-receiving position against the platen in order to facilitate initial insertion of the paper therebetween. This has been accomplished in the prior art in a variety of ways, such as by means of a manually swingable lever for moving the pressure roller against its spring and away from the platen. It also is necessary to effect cyclically operable paper advance to feed the paper incrementally at the proper time, and the prior art includes means for rotating a cylindrical platen to accomplish this while permitting selective manual rotation or twirling of the platen. Such prior art mechanisms, however, are not satisfactory in high speed electronic equipment because backlash and overspin inherent therein result in uneven and inaccurate printing.

SUMMARY OF THE INVENTION

This invention eliminates such objectionable features of the prior art devices and provides paper support and feed mechanism that is especially adapted for use in high speed electronic printers. More specifically, it comprises a simplified cylindrical platen rotatably supported by pivotally mounted arms swingable by the camming action of a platen positioner for accurately locating the platen in printing position and rigidly maintaining it there, the platen positioner also including a paper tear-off blade. A simplified pressure roller structure is rendered effective by the platen positioner, being mounted for pivotal movement with the platen supporting arms and loosely supporting the pressure roller so that in addition to moving the platen to printing position, the platen positioner engages the shaft of the pressure roller with spring means which urge the pressure roller into resilient engagement with the platen. Cyclically operable drive means for incrementally rotating the platen include a worm gear, an intermediate gear meshing therewith and with a drive gear rotatable on the platen shaft, a spring-loaded drive coupling rotated by the drive gear, and an internal ratchet gear connected to the platen and cooperating with the drive coupling. A twirler is provided on the platen shaft for manually rotating the platen in either direction, the spring-loaded drive coupling then acting as a break-away clutch. The paper thus may be moved manually in either direction and is cyclically advanced automatically with a minimum of acceleration and without any overspin or backlash from a simplified multi-position paper roll support having a minimum number of parts

which is adjustable to provide drag on, and a side guide for, different width rolls. The paper roll support comprises a frame member secured to the machine base to anchor pivots for the platen supporting arms, and for mounting the spring means for the pressure roller, as well as trunnion arms for a paper roll mandrel which includes a horizontal spindle with longitudinally spaced peripheral grooves and a plastic sleeve slidable on the spindle with a flexible interturned flange at one end engageable in a selected groove and outwardly extending flange means engageable with an edge of the paper roll to impose drag against unwinding of different width rolls and to provide a side guide therefor.

In the drawings:

FIG. 1 is a detail top plan view of a platen included in the illustrated embodiment of the invention, with parts omitted and parts in section to show the drive mechanism;

FIG. 2 is a detail end elevation as seen from the left side of FIG. 1, with parts broken away and parts in section;

FIG. 3 is a vertical section taken substantially on the line 3—3 of FIG. 1 on an enlarged scale; and

FIG. 4 is a detail section taken longitudinally through the paper roll mandrel, as seen from the rear or from the right end of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring initially to FIG. 3, the paper support and feed mechanism illustrating a preferred embodiment of this invention is shown as being mounted on a plastic base 15 of a high speed serial printer, which base is substantially the same as that also designated by numeral 15 and fully illustrated and described in copending application for U.S. Pat. Ser. No. 366,473, filed June 4, 1973 now U.S. Pat. No. 3,861,510. Also disclosed in the latter are a power transfer shaft 22 and a paper drive worm gear 29 thereon (FIG. 2) and upstanding arms 47 (FIG. 3) at the outer rear corners of the base 15 having inwardly extending horizontal studs 48 at their upper ends, and upwardly extending positioning posts 49 spaced forwardly (left in FIG. 3) of the arms 47. These members 47, 48 and 49 comprise integral parts of the base 15 which is injection molded from a suitable reinforced plastic. It also is disclosed in that application that the paper drive worm gear 29 is cyclically operated for one revolution as each full or partial line of printing is completed. As will appear from the following description, each such rotation of worm gear 29 effects advancement of the paper receiving impressions by the printer one space or a distance equal to the height of the printed characters plus the desired spacing between the adjacent lines of printing.

During printing, the paper, designated in FIG. 3 by reference numeral 51, is backed by a platen, indicated generally at 52 (FIGS. 1 and 3) which comprises a cylindrical steel sleeve 53 having a molded hard rubber covering 54, end caps 55 and 56 (FIG. 1) press-fitted into it and, in turn, press-fitted onto a shaft 57 on the righthand end of which is mounted a twirler 58. Arms 59 rotatably supporting the shaft 57 at their upper ends adjacent the end caps 55, 56 are pivotally mounted at their lower ends on pins 61 (FIG. 3) disposed in notches 62 formed in the base 15. It is preferred that the arms 59 be molded from a suitable plastic and that the pivot pins 61 be formed integrally therewith. These

pivot pins 61 are retained in their notches 62 by means of edge portions of a horizontal part of a frame member or plate 63 suitably mounted on the base 15.

An upwardly extending finger 64 (FIG. 3) formed integrally with the plate 63 at each forward corner supports an end of a transverse rod 65 on which the up-
standing ends of a spring-urged bracket 66 are rotat-
ably mounted. The bracket 66 has a pair of rearwardly
and downwardly extending camming fingers 67 and
forwardly disposed depending stop and spring-engaging
fingers 68 formed integrally with it. The lower ends of
the latter are connected to coil springs 69 anchored at
their rear ends by fingers 71 struck downwardly from
the plate 63. The springs 69 urge the bracket 66 in a
counterclockwise direction about the rod 65, as viewed
in FIG. 3, and such movement is limited by engagement
of the depending fingers 68 with the notched forward
edge of frame plate 63.

In the operating position of the parts shown in FIG.
3, springs 69 urge the camming fingers 67 upwardly
into engagement with a shaft 72 of a pressure roller 73.
The shaft 72 is journaled in slightly elongated slots 74
extending lengthwise substantially normal to the platen
52 in laterally spaced journal portions 75 formed inte-
grally with the forward part of a curved plastic paper
guide 76 which also functions as pressure roller sup-
porting means. Each end of the paper guide 76 com-
prises a downwardly extending vertical flange 77 pivota-
lly mounted on the associated pin 61 and an upwardly
extending bifurcated flange 78 embracing the platen
shaft 57. The guide 76 thus is mounted for swinging
movement with the arms 59 about pivot pins 61 and is
retained at all times in properly spaced relationship to
the platen 52.

It will be observed from FIG. 3 that when platen 52
is disposed in printing position, the upper platen shaft
journal portions of the platen supporting arms 59 are
engaged in shelves 79 at the upper ends of the base po-
sitioning posts 49. Means are provided for swinging the
platen into and rigidly retaining the same in that print-
ing position which comprises a cam lug 81 on and
formed integrally with each of the platen supporting
arms 59 and a platen positioner indicated generally by
reference numeral 82. The latter is integrally molded
from a suitable transparent plastic and comprises a
transverse body with a rib 83 at each side terminating
at its rear end in a bearing portion 84 pivotally
mounted on the associated stud 48 and a finger piece
85 at its forward end. Each rib has a lower curved cam
surface 86 blending with a reentrant detent surface 87
which cooperate with the cam lug 81 on the associated
platen supporting arm 59 to move the platen into print-
ing position as the finger pieces 85 are swung down-
wardly from a raised position, such as that shown in
dot-dash lines in FIG. 3, and to rigidly retain the platen
in the printing position illustrated therein in full lines.
The finger pieces 85 are joined by a transverse paper
tear-off blade 88 having a serrated cutting edge 89 con-
veniently disposed adjacent the platen 52 when the lat-
ter is in printing position. For purposes of strengthening
this platen positioner 82 and maintaining the desired
pressure against the cam lugs 81 to hold the platen
firmly in printing position, a metal insert 91 is snapped
into place at the juncture of each rib 83 and its associ-
ated finger piece 85.

Since the curved paper guide 76 is supported by
platen shaft 57 and pivot pins 61, it swings with the

platen in response to downward movement of platen
positioner 82 as just described. This results in engage-
ment of the loosely journaled shaft 72 of pressure rol-
ler 73 with the camming fingers 67 of the spring-urged
bracket 66 and swinging displacement of the latter
against the springs 69 to resiliently maintain the pres-
sure roller 73 in peripheral contact with the platen 52.

It will be understood that release of the platen by lift-
ing the finger pieces 85 of the platen positioner 82 will
enable clockwise swinging (viewing FIG. 3) of the
platen with the paper guide 76, as by spring means not
shown, and that this will be assisted by the springs 69,
at least until the fingers 68 of the bracket 66 are
stopped by contact with the frame plate 63. This will
admit of simple initial threading of the end of the paper
51 from the roll between the guide 76 and the platen
52. It also will be appreciated that a similar effect may
be obtained by a manually operable extension (not
shown) that can be placed on the bracket 66 which
may be provided for swinging that bracket clockwise,
as seen in FIG. 3, against the action of springs 69, even
when the platen is latched in printing position, to disen-
gage the fingers 67 from the shaft 72 of pressure roller
73 and permit the latter to drop by gravity away from
the platen.

Drive means for cyclically rotating the platen 52 in-
crementally includes the paper drive worm gear 29 pre-
viously described, an intermediate gear 92 (FIGS. 1
and 2) meshing with the worm gear and having a hub
93 rotatably mounted on the lefthand pin 61, and a
drive gear 94 rotatably mounted on platen shaft 57 and
continuously meshing with the intermediate gear 92. It
will be appreciated that since the platen shaft 57 is
swung by the arms 59 (FIG. 3) about the pins 61, the
drive gear 94 (FIG. 2) will roll slightly on the interme-
diate gear 92 during shifting of the platen away from
and back into printing position, but the gears 29, 92
and 94 will always remain in meshing relationship to
insure minimum acceleration of drive gear 94 and no
overspin or backlash in this platen drive means. When
the manually operable twirler 58 is rotated or any other
time that the platen shaft is rotated by the drive means
29, 92, 94, a ratchet wheel 95 secured to the platen
shaft 57 adjacent the righthand end of the platen (FIG.
1) cooperates below the shaft with the forward end of
a detent pawl 96 spring urged into engagement there-
with to assure feeding of the paper 51 thereby a distan-
ce of only one space or some integral multiple
thereof. The drive gear 94 has a hub 97 (FIG. 1) with
suitable parallel slots on opposite sides of its bore for
slidably receiving the legs of a spring-loaded drive cou-
pling 98 and housing springs 99 (FIG. 2) cooperating
with those legs to urge the coupling radially outwardly
into driving engagement with an integral ratchet gear
101 formed in the lefthand end cap 56 of the platen 52.
The gears 29, 92 and 94 are so dimensioned that one
complete rotation of the worm gear by shaft 22 will ef-
fect an incremental rotation of the platen to advance
the paper 51 one space, the paper being held against
the platen by the pressure roller 73.

It will be appreciated that in addition to thus auto-
matically feeding the paper, the platen may be selec-
tively rotated manually by the twirler 58 to move the
paper in either direction, the spring-loaded drive cou-
pling 98 then automatically acting as a break-away
clutch.

As shown in FIG. 3, the paper 51 is in the form of an initially rolled strip, and novel means forming part of the instant invention are provided for supporting and guiding the paper roll and imposing drag against its unwinding. This paper roll support means includes a substantially U-shaped bracket 102 secured in any suitable manner to a rear flange 103 on the frame plate 63 and having parallel rearwardly and upwardly extending trunnion arms 104. The inner surface of the upper end portion of each arm 104 is indented to form a recess 105 for removably receiving and frictionally retaining one end of a horizontal spindle 106. As best seen in FIG. 4, the spindle 106 is provided with a plurality of longitudinally spaced peripheral grooves 107 selectively engageable by flexible inturned flange means 108 on the inner end of a sleeve 109 rotatably mounted on the spindle. The sleeve 109 preferably is molded from a suitable plastic and is provided at its outer end with an outwardly extending flange 111 having arcuate fingers 112 in slots 113, each with a free end formed with an inwardly extending protuberance 114 for frictionally engaging an edge of a roll of paper carried by sleeve 109 and spindle 106. As will be appreciated, after the spindle 106 and sleeve 109 are inserted into the bore of a paper roll, the spindle may be moved downwardly into the recesses 105 (FIG. 3) in the trunnion arms 104 and sliding of the sleeve 109 inwardly to the right, to the left in the rear view of FIG. 4, to engage the inturned flange 108 in the proper or appropriate groove 107 will move the outer or righthand end of the paper roll (left end in FIG. 4) into frictional engagement with the right trunnion arm 104 which, with the flange 111 and its spring fingers 112 and their protuberances 114, will constitute guides to guide the roll and impose frictional drag against unwinding thereof by the platen 52. The specific positioning and spacing of the grooves 107 adapts the paper roll support means to similarly accommodate rolls of different widths, and the arrangement of the flange 111 and its spring fingers 112 insures the desired guiding and drag-imposing results without requiring the parts to be manufactured to close tolerances. A principal effect of this novel paper roll support means is the resulting guiding of the paper roll during paper feed. It also effects braking of the roll to keep it from spinning, particularly in jump feed operations. And its total or end result is to prevent uneven spacing and assure accurate paper positioning, even at the extremely high speeds of electronic printers.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction, and arrangement of the parts without departing from the spirit of the invention or sacrificing all of its material advantages, the form hereinbefore described and shown in the drawings being merely a preferred embodiment thereof.

We claim:

1. Paper support and feed mechanism for a business machine, comprising a rotatable platen having a supporting shaft, platen positioning means for rigidly and accurately locating said shaft to accurately present said platen in printing position and releasable manually to enable swinging of said platen away from printing position, drive means for cyclically rotating said platen incrementally without overspin or backlash while said platen is either in or away from printing position, and

paper roll support means for rotatably mounting a roll of paper axially to supply paper to said platen and for guiding said roll and imposing an axially directed drag against said paper roll to prevent free unwinding of the paper from said roll, wherein said platen positioning means comprises arms pivotally mounted at their lower ends and respectively rotatably supporting end portions of said platen shaft at their upper ends, and a unitary platen positioner having pivotally mounted legs for cammingly engaging said arms to move said platen into said printing position, a base having means for pivotally supporting said legs and upstanding posts limiting movement of said arms by said legs of said platen positioner, a frame member secured to said base, and rearwardly and upwardly extending trunnion arms supported at their lower ends by said frame member and comprising part of said paper roll support means, wherein said paper roll support means comprises a horizontal spindle and said trunnion arms are formed at their upper ends to frictionally engage and removably retain the end of said spindle, and wherein said paper roll support means comprises a sleeve slidable and rotatable on said spindle with outwardly extending flange means engaging an edge of said paper roll.

2. A paper support and feed mechanism according to claim 1, wherein said outwardly extending flange means comprises a flange having arcuately disposed spring fingers formed integrally and connected at one end therewith, each said finger having its other end free for movement axially of said spindle and an axially extending protuberance thereon engaging said edge of said paper roll.

3. A paper support and feed mechanism according to claim 1, wherein said spindle is provided with longitudinally spaced peripheral grooves, and said sleeve comprises flexible inturned flange means formed integrally therewith and engageable in a selected said groove to accommodate rolls of different widths.

4. Paper support and feed mechanism for a business machine, comprising a rotatable platen having a supporting shaft, platen positioning means for rigidly and accurately locating said shaft to accurately present said platen in printing position and releasable manually to enable swinging of said platen away from printing position, drive means for cyclically rotating said platen incrementally without overspin or backlash while said platen is either in or away from printing position, and paper roll support means for rotatably mounting a roll of paper axially to supply paper to said platen and for guiding said roll and imposing an axially directed drag against said paper roll to prevent free unwinding of the paper from said roll, a pressure roller having a shaft, pressure roller supporting means for loosely supporting said roller for rotation and radial movement relative to said platen, and spring means cooperating with said pressure roller shaft in response to operation of said platen positioning means to resiliently maintain said pressure roller in peripheral contact with said platen.

5. Paper support and feed mechanism according to claim 4, wherein said pressure roller supporting means comprises a rigid curved paper guide, and means engageable with said platen supporting shaft and said platen positioning means for maintaining said paper guide in closely spaced relation to said platen in all positions thereof.

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