

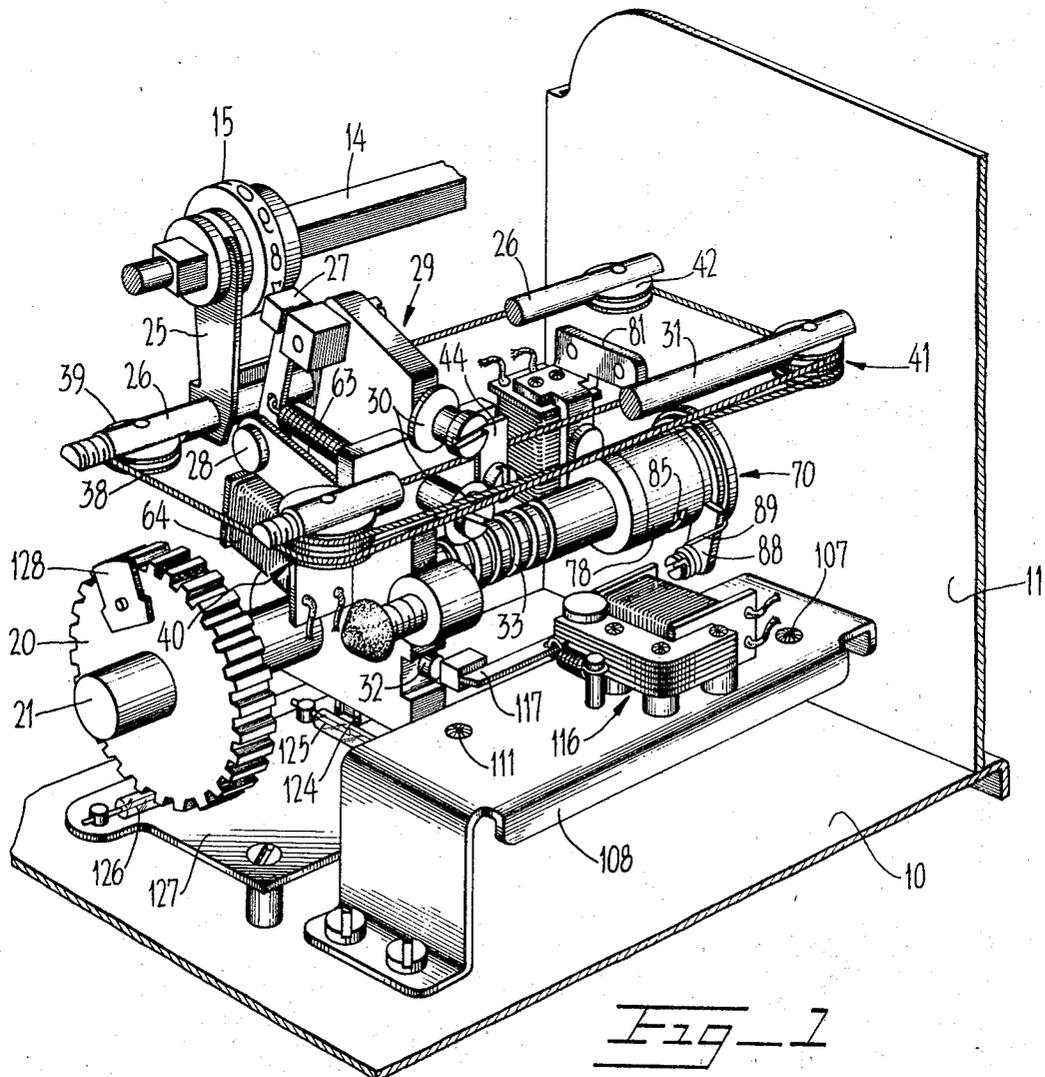
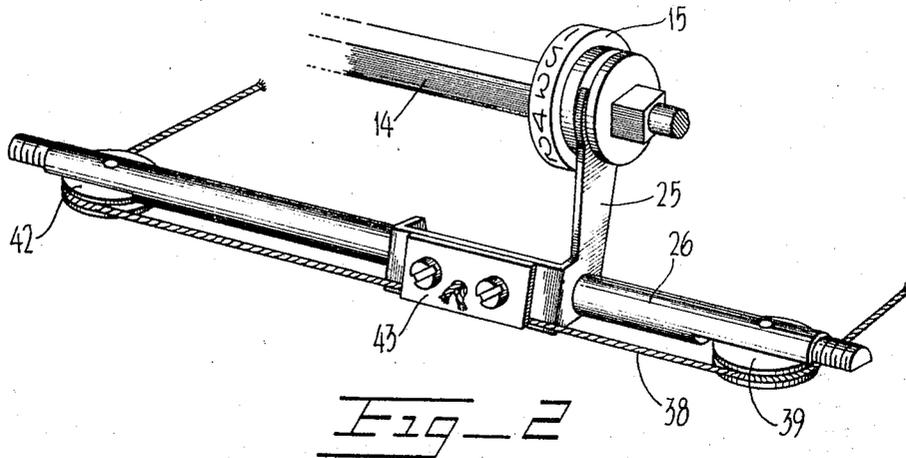
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INTERRUPTER FOR A TYPE WHEEL

3,526,309

Filed June 30, 1967

4 Sheets-Sheet 1





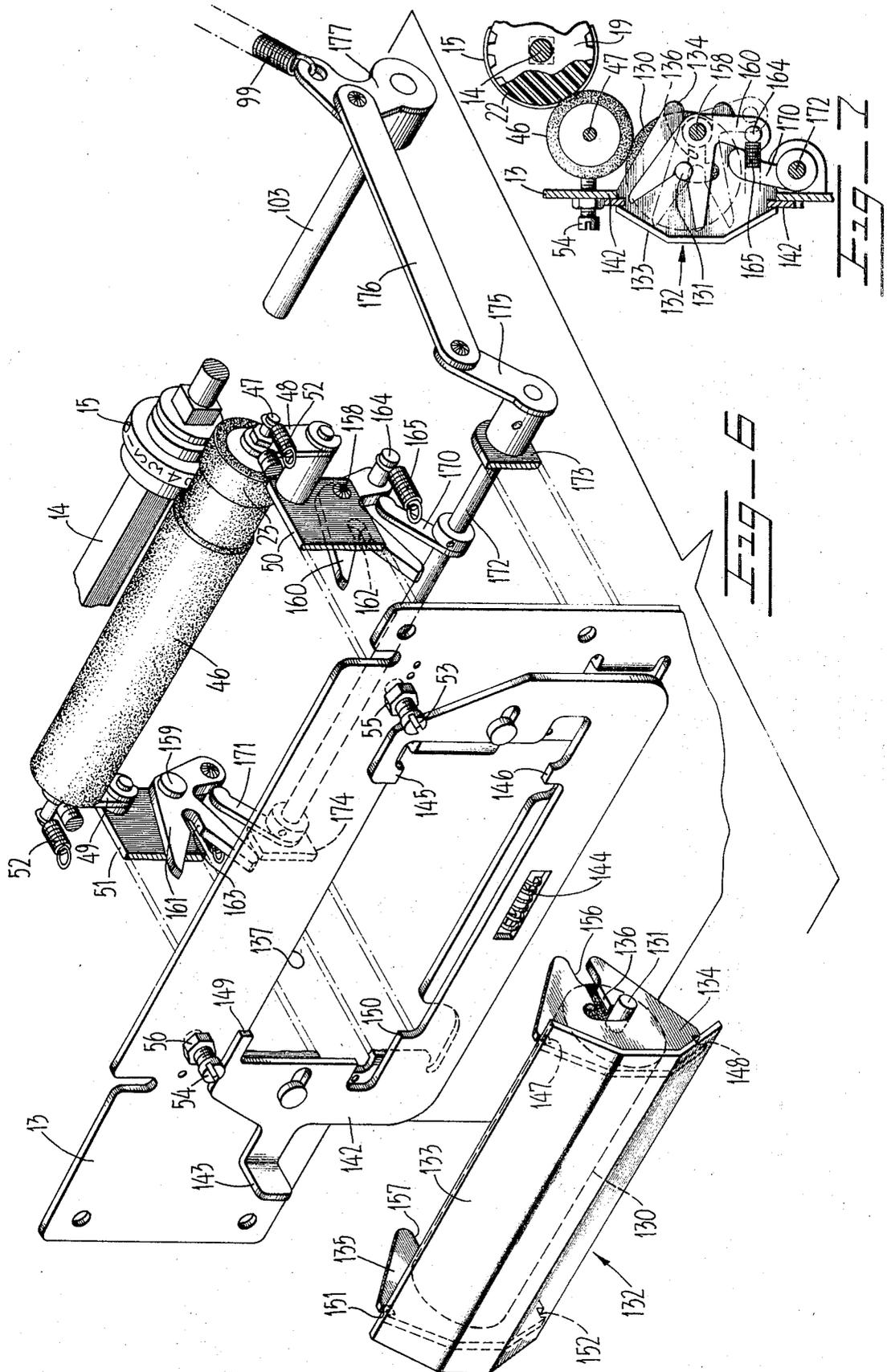
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**INK TRANSFER ROLLER WITH INK SUPPLY INTERRUPTER FOR A TYPE WHEEL**

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Filed June 30, 1967, Ser. No. 650,501  
Int. Cl. B41j 27/10; B41f 31/30

U.S. Cl. 197-150

5 Claims

**ABSTRACT OF THE DISCLOSURE**

The mechanism of the invention serves as a means for intermittently supply ink to an ink transfer roller which is in constant rolling contact with the rotary printing device of a high-speed printer. Following one revolution or a plurality of revolutions of the printing device to complete a line of printed characters, a disposable self-contained ink supply roller is rocked into surface engagement with the transfer roller. Such engagement is maintained for approximately one revolution of the transfer roller.

**BACKGROUND OF INVENTION**

Field of the invention

This invention relates to an inking mechanism for printing machines and more particularly to the mechanism for transferring ink from one element to another.

Description of the prior art

In the field of electronic data processing a well-known means of providing information output is the so-called high-speed printer. These high-speed printers are of various types, one such type is a rotatable drum having a plurality of raised type characters in equally spaced rings disposed circumferentially on the peripheral surface of the drum. Arranged in a row axially parallel to the drum is a plurality of selectively actuatable print-hammers, one for each ring of characters. An inking ribbon and print receiving medium are disposed between the print drum and hammers and information is recorded on the print receiving medium, line-by-line, under control of the data processing system and during continuous rotation of the drum.

Another type of high-speed printing apparatus is a single continuously rotating type wheel on the peripheral surface of which the raised type characters are circumferentially arranged. The type wheel is moved along its axis of rotation transversely to the line-by-line movement of the print receiving medium, and moving along with the type wheel is a selectively actuatable print-hammer. For each revolution of the type wheel, the axial movement of the type wheel and the corresponding movement of the print-hammer is equivalent to a predetermined columnar spacing of the printing of the characters on the print receiving medium. In each columnar position of the type wheel, a signal is supplied by the data processing system which controls the actuation of the print-hammer and the printing of a desired character.

As in the rotary drum-type printer, the print receiving medium and inking ribbon are disposed between the print-hammer and the type wheel. However, it has been found that ink supplied to a transfer roller which is in constant rolling contact with the print drum or type wheel effects printed records much more efficiently and provides records that are highly satisfactory. In the inking systems of this type in use today, one or more ductor rollers carry the ink from an ink-fount to the transfer roller. In many of the prior art devices, such as those described in Pat. No.

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1,733,716, issued to Horace D. Black, and Pat. No. 2,467,199, issued to Harry W. Faerber, the transfer or ductor roll is rocked from a normal position engaging the ink-fount roller into engagement with the print drum, such rocking movement of the transfer roller occurring with each revolution of the print drum.

**SUMMARY OF THE INVENTION**

In a high-speed printing device utilizing a single continuously rotating type wheel, in constant contact with an ink-transfer roller, the raised type characters on the wheel remove ink with each revolution of the wheel as it moves axially from one columnar printing position to the next. If ink is supplied to the surface of the transfer roller with each revolution of the type wheel, as in prior art devices, an oversupply of ink is accumulated on the transfer roller when a plurality of characters are to be printed in each line. Under this condition, the printed characters are not clearly defined.

It is, therefore, an object of the present invention to provide a rotary printing device with an improved inking system for selectively controlling the application of ink to the ink-transfer roller after one or more revolutions of the device.

Other objects and advantages will be apparent from the following description of a preferred embodiment of the invention as illustrated in the accompanying drawings in which:

FIG. 1 is a view in perspective of the printer with the right frame member removed;

FIG. 2 is a perspective view of the print wheel and transport means therefor;

FIG. 3 is a sectional elevational view of the printer;

FIG. 4 is a view in detail of the cyclic capstan spring clutch and the drive mechanism controlled thereby;

FIG. 5 is an elevational view of the clutch controlled drive mechanism;

FIG. 6 is an isometric projection of the inking mechanism;

FIG. 7 is a sectional end view of the inking mechanism showing the control for the movement of the ink supply roller;

FIG. 8 is a simplified block diagram showing the circuit components for controlling operation of the printing mechanism; and

FIG. 9 is a detailed showing of the drive pin for controlling movement of the print-hammer carriage, the view being taken on the plane indicated by line 9-9 in FIG. 8.

The invention is preferably shown as being embodied in a high-speed printing device of a well-known type which includes base 10 having a pair of spaced upright parallel side-frames 11 and 12 secured thereon (FIGS. 1 and 3). The spaced parallel relationship of side-frame members 11 and 12 is maintained by the transverse frame member 13 (FIGS. 3 and 6) which serves as a support for certain of the mechanisms. Journalled in the side-frame members 11 and 12 is a square shaft 14 which supports the type wheel 15 for axial sliding movement therealong. Rotation is imparted to square shaft 14 and, therefore, type wheel 15 by means of an electric motor 16 suitably supported on base 10. To this end, the toothed pulley 17 secured on the motor shaft drives the timing belt 18, which is drivingly engaged with the toothed pulley 19 secured on one end of the square shaft 14. The timing belt 18 is also drivingly engaged with the toothed pulley 20 secured on one end of the helical, or screw, shaft 21, which is suitably journaled in side-frame members 11 and 12 and is rotated at a speed one-half that of the square shaft 14.

In the embodiment shown, raised type characters "0" through "9" are arranged in a single helical turn on the

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periphery of the type wheel 15 as are ten arithmetical symbols such as "+" and "-." The hub of the type wheel 15 is rotatably engaged in the bifurcated upper end of the bracket 25 which is slidably supported on shaft 26 and serves to impart axial movement to the type wheel along square shaft 14. Movement of the type wheel 15 is coincident with that of the print-hammer 27 rockably mounted at 28 on the print-hammer carriage, generally indicated at 29, which is suitably supported on the helical shaft 21 for movement axially of the shaft. The print-hammer carriage 29 is further supported and guided in its movement transversely of the machine, by means of a pair of opposed truncated conical rollers 30 mounted on the carriage 29 in rolling contact with the shaft 31, secured at its respective ends in side-frame members 11 and 12. The shafts 14, 21, 26, and 31 are axially parallel, each to the others.

Movement is imparted to the carriage 29 to the right, from the home or "at rest" position shown in FIG. 1, by the selective engagement of the reduced diametrical end portion of the drive pin 32 (FIGS. 3 and 9) with the helical, or screw, thread 33 in the shaft 21, the pin 32 being retractably supported in a suitable cylindrical aperture in the carriage 29 and normally maintained in its engaged position by means of the spring and ball detent 34 (FIG. 9).

As the carriage 29 is moved, upon rotation of shaft 21, a like movement is imparted to the type wheel carrier 25 by means of the cable 38. To this end, pulleys 39 and 42 are mounted for rotation on suitable pins on the flattened portion of the respective ends of the shaft 26. Similar pairs of pulleys 40 and 41 are independently rotatably supported on suitable pins on the flattened portion of the respective ends of the shaft 31. Each end of the cable 38 is secured to the type wheel carrier 25 by means of the clamp 43, which serves to maintain the cable circuit taut. The circuit includes the passing of the cable 38 to the left from the carrier 25 (FIG. 2) passing over pulley 42, over the lower of the pair of pulleys 41 (FIG. 1), thence over the upper of the two pulleys 40, across to the upper of the pair of pulleys 41, passing over the lower of the pair of pulleys 40 to the pulley 39, returning to the right side of the type wheel carriage 25. At a point intermediate its length and between pulleys 40 and 41, the cable 38 is secured to the print-hammer carriage 29 by means of the clamp 44. Thus, it can be seen that upon the movement of the carriage 29 in either direction, a similar directional and synchronous movement is imparted to the type wheel 15.

Inking of the type-wheel 15 is effected by means of a transfer roller 46 having a cylindrical covering, preferably of rubber, the diameter of which is reduced at its right end (FIG. 6) to enable the type wheel 15 to rotate freely when in its home or "at rest" position, thereby preventing a build-up of ink on the type characters. The transfer roller 46 is supported for rotation on a shaft 47, which is secured adjacent each end in one end of each of respective arms 48 and 49, each arm 48 and 49 being pivotably mounted at its other end on respective ears 50 and 51, formed in parallel relationship and at a right angle to the transverse frame member 13. Normally, transfer roller 46 is urged counterclockwise, as viewed from the right in FIG. 6, by means of similar springs 52, but is adjustable by means of similar screws 53 and 54 and respective locknuts 55 and 56 to maintain an axial parallel relationship between roller 46 and shaft 14 and to control the adjustment of the roller relative to type wheel 15. Rotation of the transfer roller 46 is continuous and its peripheral velocity is substantially that of the type wheel 15, the roller being frictionally driven by the toothed pulley 19. For this purpose, the toothed pulley 19 has a flat peripheral surface portion 22, integrally formed and concentric therewith, in frictional contact with the surface of the end portion 23 of the transfer roller 46. In order to ensure a complete inking of the

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type characters, an interference of approximately .005 of an inch is normally maintained between the roller 46 and the type wheel 15. This interference also serves to provide sufficient frictional contact between the pulley surface 22 and surface portion 23 of roller 46.

The paper or printing medium P is fed upwardly line-by-line between type-wheel 15 and type-hammer 27 (FIG. 3) by means of paper feed rollers 60 and 61. Feed roller 60 is secured on shaft 65 journaled at its ends in respective side frames 11 and 12 while roller 61 is carried on shaft 66 supported at its ends in elongated slots (FIG. 5), in respective side-frame members 11 and 12 to enable the resilient adjustment of roller 61 with feed roller 60. A pair of similar springs 62 extend between shafts 65 and 66 adjacent the respective ends thereof to resiliently maintain sufficient pressure between rollers 60 and 61 for movement of the paper P.

Normally, spring 63 resiliently retains print-hammer 27 in spaced relationship to the type wheel 15 to enable the movement of the paper P therebetween. To effect printing, the electromagnet 64, associated with print-hammer 27, is energized, thereby causing the print-hammer to press the paper P against a selected type character on the type wheel 15 which is directly opposite. During each revolution of type wheel 15, the wheel moves axially one columnar space and while rotating continuously any selected character on the type wheel can be printed in each column on the paper P due to the helical arrangement of the type characters on the periphery of the wheel, as is well known. The columnar spacing corresponds to the pitch of the helix formed by the type characters on the type wheel.

Upon completion of a line of printed characters, whether it be one character or a plurality of characters, the carriage drive pin 32 is withdrawn from its engagement with the screw threads 33 of the continuously rotating shaft 21 to enable the return of the carriage 29 and type wheel 15 to the home position. At the same time, an annular increment of rotation is imparted to the paper feed roll 60 for the line spacing of the paper P. For this purpose, a capstan spring clutch is provided and is generally indicated at 70 (FIGS. 1, 3 and 4). At its left end, as viewed in FIG. 4, the screw shaft 21 is supported for rotation within the cup-shaped bushing 71 which, in turn, is journaled in the bearing bushing 72 secured in side-frame member 11. Intermediate its ends, the bushing 71 is provided with an integrally formed annular stepped flange 73 and disposed between the flange 73 and the bearing bushing 72 is a spacing ring, or washer, 74. The internal diameter of the cup-shaped bushing 71 is sufficiently greater than the diameter of the shaft 21 to provide a close running fit between the shaft and the bushing. The end surface of the open-end portion of the bushing 71 abuts the end surface of the hub of the stepped collar 75 secured on shaft 21 for rotation therewith. The outside diameter of the hub of the collar 75 and that of the abutting open-end portion of the bushing 71 is identical. Encircling the open-end portion of the bushing 71, as well as the hub of the collar 75, is a tightly coiled spring 77 having an inside diameter slightly less than the outside diameter of the two mating members. The diameter of the reduced portion or shoulder of each of the flanges 73 and 76 is identical and provides a bearing surface for the respective ends of a sleeve 78, the inside diameter of which is sufficiently greater than the outside diameter of the spring 77 to permit expansion of the spring within the sleeve. One end of the spring 77 is anchored in a suitable notch in the flange 73 of the bushing 71, while the other end projects radially outwardly and is engaged in a suitable aperture in the sleeve 78, so that if the sleeve 78 is held against rotation and shaft 21 is rotating in a clockwise direction, as viewed from the left in FIG. 4, the spring 77 is expanded to provide a free running fit between the spring and the shaft 21. However, when the sleeve 78 is re-

leased, spring 77 is permitted to assume its normal form, thereby providing a drive connection between shaft 21 and the bushing 71.

Normally, the sleeve 78 is latched in the position shown in FIGS. 3 and 4 to disable the driving function of the coil spring 77. At the completion of each cycle of clockwise rotation of the clutch 70, i.e., after one revolution of the sleeve 78 (FIG. 3), the upturned end portion of latch lever 79 engages in an aperture 85 (FIGS. 1 and 3) in the sleeve 78. Latch lever 79 is rockably mounted intermediate its ends on pin 80 carried by bracket 81, which is suitably secured by means of rivets 82 on side-frame member 11. Bracket 81 also serves as a support for an electromagnet 83 which serves, upon energization thereof, to rock latch lever 79 counter-clockwise to its sleeve releasing position against the urgency of a relatively light spring 84. Following one revolution of the clutch 70 and the reengagement of the latch lever 79 in the opening 85 in the sleeve 78, there is a slight angular override of the bushing 71 which enables the end of the ant backlash pawl 88 to be rocked by means of torsion spring 89 into position for engagement by the shoulder in the flange 73, the pawl 88 being pivotally mounted on the side-frame 11. Secured on the closed end surface of the bushing 71 is a fourteen tooth pinion 90 concentric with shaft 21, and enmeshed with the teeth of the seventy tooth internal gear 91 (FIGS. 4 and 5) of cam disk 92 rotatably mounted on pin 93 secured on side-frame member 11. A pinion 94 is secured on the inner wall of the cam disk 92, concentric therewith and enmeshed with the gear 95, secured on the outer extended end of the shaft 65 which carries paper feed roller 60, the roller 60 receiving a 36° angular rotation for each full revolution of the clutch 70.

Upon energization of electromagnet 83 to effect engagement of the clutch 70, a 72° angular rotation is imparted to the cam disk 92. During this partial revolution of the cam disk 92, a cam follower 96 is rocked counter-clockwise about its pivot 97 on side-frame member 11. The cam follower 96 is provided with a toothed sector 98, which is meshed with pinion 102 secured on the flattened end portion of the shaft 103 journaled in side-frame members 11 and 12 (FIGS. 3, 5, 8 and 9). In addition to being journaled at its ends in the side-frame members 11 and 12, shaft 103 also passes through a suitable aperture in the print-hammer carriage 29 and is normally resiliently urged by a spring 99 (FIG. 6) to the counter-clockwise rocked position shown to maintain the follower 96 in engagement with the peripheral surface of cam disk 92. As the shaft 103 is rocked clockwise (FIGS. 5 and 9) by cam follower 96, the surface 104 (FIG. 9) of the flattened portion of the shaft engages the shoulder 105 formed in the carriage drive pin 32, moving the pin to the left out of engagement with the screw threads 33 of shaft 21. Upon retraction of the carriage drive pin 32 from its engagement with the screw shaft 21, the print hammer carriage 29 is released to the influence of the relatively strong spring 106 secured at its one end on pin 107 carried by bracket 108 (FIG. 3) and at its other end on a pin 109 secured on the print-hammer carriage 29, the spring passing over a pulley 110 rotatably supported on the pin 111 (FIG. 1) carried by the bracket 108.

One suitable and well-known control system for the high-speed printer is shown in FIG. 8 and includes a conventional timing mechanism 118 in conjunction with the control or buffering unit block 114 for controlling synchronization of the printing of the type characters with the rotation of the type-wheel 15. As a factor is transferred from a keyboard or other data processing system into the buffering unit 114, the carriage start circuit 115 becomes effective to energize electromagnet 116 supported on bracket 108 of the machine. Upon energization of electromagnet 116 the lever 117 is rocked to effect re-

engagement of the carriage drive pin 32 with the screw threads 33 of the continuously rotating shaft 21.

Following the engagement of the carriage drive pin 32 with the helical threads 33 of the shaft 21, the timing mechanism of print-hammer control unit 118 effects the energization of the electromagnet 64 to operate the print-hammer 27 for the printing of a desired character with each revolution of the type wheel 15. As the printing of each digit type character is effected from right to left on the record receiving medium P, a zero suppression circuit of a conventional type and generally indicated by block 119 comes into play to sense all higher orders of the factor to be printed. If the highest significant digit has been printed, the zero suppression circuit 119 effects energization of the electromagnet 83 through the clutch control circuit, generally represented by block 120, thereby causing engagement of the clutch 70. Upon engagement of the clutch 70 for one revolution of the pinion gear 90 and a 72° angular rotation of the cam disk 92, the cam follower 96 becomes effective to rock shaft 103 clockwise (FIGS. 5 and 9) against the urgency of a spring 99 (FIG. 6), thereby withdrawing carriage drive pin 32 and releasing the carriage 29 to the influence of the spring 106. At the same time, the paper feed roller 60 receives a 36° angular rotation to move the paper P one line space.

Upon return of the carriage 29 and type wheel 15 to the home position, shown in FIGS. 1 and 3, the permanent magnet 124, secured on the carriage, closes reed switch 125, which is in series with the reed switch 126. The switches 125 and 126 are suitably supported on the bracket 127 secured on base 10 and are included in the carriage start circuit 115 (FIG. 8). As the carriage 29 reaches its home position and effects the closing of reed switch 125, the closing of the second reed switch 126 is effected by the permanent magnet 128 (FIG. 1) on toothed pulley 20 and in timed relationship to the angular rotation of shaft 21. Thus, upon command from the buffering unit 114, the carriage drive pin 32 is reengaged in the lead portion of the screw 33, as seen in FIG. 8.

Simultaneously, with the return of the carriage 29 to its home position and the line spacing of the paper P, a self-contained ink supply roller 130, preferably molded of an ink impregnated elastomeric material, commonly known as "Porelon," is rocked into engagement with the transfer roller 46. As the type wheel 15 returns home with the movement of the carriage 29 it is rotating continuously together with the rotation of the transfer roller 46. Thus, it can be seen that during the engagement of the ink impregnated roller 130 with the transfer roller 46, a like rotation is imparted to the roller 130 and the ink is transferred from the roller 130 to the transfer roller 46. Referring now to FIGS. 6 and 7, the self-contained ink supply roller 130 is secured on a shaft 131 replaceably and rotatably supported in a removable holder, generally indicated at 132. An angularly formed cover plate 133 of the holder 132 has, secured adjacent each end thereof and at right angles thereto, respective parallel end plates 134 and 135. Each of the end plates 134 and 135 is provided with identical horizontally disposed T-shaped slots 136, the crossed portion of which is arcuately formed. Normally, the extended ends of the shaft 131 are rotatably supported in the lower end of the arcuately formed portion of the T-shaped slots 136 as seen in FIG. 6.

When replacing the ink supply roller 130, the roller holder 132 is inserted into an opening 137 in the transverse frame member 13. As the holder 132 is moved into place in the machine, a latching slide 142 is moved to the left in FIG. 6 and held there by means of a laterally extended ear 143 against the urgency of a compression spring 144. When in place, the latch slide 142 is released so that the respective lobes 145 and 146 of the slide engage corresponding notches 147 and 148 in end plate 134. Similarly, an extension 149 of a shoulder 150 of the slide engage respective notches 151 and 152 of the end plate

135. Thus, the holder 132 is latched in its operative position, as seen in FIG. 7.

As the holder 132 and the ink supply roller 130 are moved into the latched position, the enlarged open end portion 156 and 157 of the T-shaped slots 136 in respective end plates 134 and 135, engage the round head of respective pins 158 and 159 which pivotally support respective levers 160 and 161 on the laterally extended ears 50 and 51. The forked opening of each of the slots 162 and 163 in one arm of the respective levers 160 and 161, serve to facilitate the movement of the extended ends of shaft 131 into position in the slots 162 and 163. It will be noted that the engagement of the enlarged openings 156 and 157 of the T-shaped slots 136 with the heads of the respective pins 158 and 159, together with slots 162 and 163, ensure axial parallel relationship between ink supply roller 130 and transfer roller 46. The other, or angularly depending arm, of each of levers 160 and 161 carries similar pins 164, each pin supporting one end of similar relatively light springs 165, the other ends of which springs are secured to transverse plate member 13.

The springs 165 serve to bias each lever 160 and 161 and ink supply roller 130 in a clockwise direction as viewed in FIG. 7, wherein the roller shaft 131 is positioned in the top end of the arcuate portion of the T-shaped slots 136 while effecting rolling contact of the roller 130 with transfer roller 46. Normally, springs 165 are maintained under tension or stretched by the round end portion of each of arms 170 and 171 engaging the leading edge surface of the depending arms of respective levers 160 and 161. Each of the arms 170 and 171 is secured on a shaft 172 supported for rocking movement in spaced parallel ears 173 and 174 formed at right angles to transverse plate 13. At one end, shaft 172 carries an arm 175, secured thereon, and having a pivotal connection at its free end with one end of a link 176, the other end of which is pivotally connected to an arm 177 secured on shaft 103.

Spring 99 secured at its one end in arm 177 and at its other end in the framework of the machine, is sufficiently heavy to overcome the influence of springs 165, thereby normally maintaining the levers 160 and 161 in the counter-clockwise rocked position in FIG. 6, and the dash line indicated position in FIG. 7. It will be remembered that the spring 99 also serves to maintain cam follower 96 (FIG. 5) in engagement with the peripheral surface of cam disk 92.

Thus, it can be seen that upon engagement of the spring clutch 70 for one revolution of bin 90 (FIGS. 4 and 5) and a 72° angular rotation of cam disk 92, the cam follower 96 imparts a clockwise angular rotation to shaft 103 (counter-clockwise in FIG. 6). With such rocking of shaft 103, levers 160 and 161 are released to the influence of springs 165 to effect rolling contact of ink supply 130 with transfer roller 46. Also, as described hereinbefore, the rocking of shaft 103 releases print hammer carriage 29 from shaft 21 to enable the carriage 29 and type wheel 15 to return to their home position moving axially along the respective continuously rotating shafts 21 and 14.

It will be noted that the energization of the electromagnet 83 (FIGS. 3 and 8) to effect engagement of spring clutch 70 may be controlled selectively by manual operation of the paper advance switch 178 through the clutch control circuit 120 (FIG. 8).

What is claimed is:

1. An inking device for printing machines comprising: a rotary print wheel for printing characters in a line and in selected ones of a plurality of columnar positions on a print receiving medium, an ink transfer roller in constant rolling contact with said print wheel during a printing operation, a driving means for rotating said print wheel and said transfer roller at a synchronous peripheral velocity, an ink supply means movable from a normally inactive to an active position to apply ink to the surface of

said transfer roller subsequent to the printing of each line of characters by said print wheel, power-operated means for controlling the movement of said ink supply means relative to said transfer roller, a normally disengaged cyclically operable clutch driven by said driving means and operable upon engagement thereof to effect operation of said power-operated means to control movement of said ink supply means, means for engaging said clutch, an electromagnetic means for operating said engaging means, and means for selectively controlling energization of said electromagnetic means.

2. In a device of the character described in claim 1 wherein said ink supply means includes:

- a shaft,
- a replaceable self-contained ink supply roller carried by said shaft,
- means removably supporting said ink supply roller for movement therein,
- a pair of levers for controlling the movement of said ink supply roller in said supporting means and rockable by said power-operated means from a normally inactive to an active position to effect peripheral contact of said supply roller with said transfer roller, each of said levers having an open-end slot engageable by the respective ends of said shaft, and
- means for latching said ink supply roller in said supporting means and said shaft in engagement with said slots.

3. In a device of the character described in claim 2 wherein said power-operated means comprises:

- a cam means driven by said driving means upon selective operation of said controlling means and the engagement of said cyclically operable clutch,
- means controlled by said cam means for effecting rocking of said levers and the movement of said ink supply roller relative to said transfer roller, said cam controlled means normally operable to retain said ink supply roller in the inactive position, and
- resilient connecting means operated by said cam controlled means to rock said levers thereby moving said ink supply roller to the active position.

4. In a device of the character described in claim 3 wherein said cam controlled means comprises:

- a rock shaft,
- a pair of arms mounted on said rock shaft for movement therewith, one of said arms for each of said levers normally engaged therewith to retain said ink supply roller in the inactive position,
- said resilient means connecting each of said arms with the corresponding lever, and
- a cam follower operable by said cam means to impart motion to said rock shaft thereby rocking said arms and enabling operation of said resilient means to move said ink supply roller to active position.

5. In a device of the character described in claim 4 wherein said resilient means is a tension spring.

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U.S. Cl. X.R.

101—98, 352; 197—49