United States Patent [19]

Denley

[11] **3,793,951**

[45] **Feb. 26, 1974**

[54] **SIGNAL RESPONSIVE BELT PRINTER**

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[73] Assignee: **Teletype Corporation,** Skokie, Ill.

[22] Filed: **June 15, 1971**

[21] Appl. No.: **153,312**

[52] **U.S. Cl.** ..... **101/111,** 101/93 C, 197/49, 197/57, 197/82, 197/133 R, 197/151, 197/168

[51] **Int. Cl.** **B41j 1/60**

[58] **Field of Search** ..... 101/93 C, 111; 197/49, 57, 197/133 R, 151, 168, 82

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[57] **ABSTRACT**

A first solenoid angularly and incrementally moves a sprocket wheel spacingly to translocate a carriage for an endless belt of the printer to a printing station in a horizontal succession thereof. A second solenoid, in response to a carriage return signal, disables transmission of the force of the first solenoid to the carriage, and effects shunting of such force, through an interposer, to a mechanism for incrementally drawing a web from a supply coil a distance equal to line spacing.

A rockable bail is adapted releaseably to secure the coil in a seat on a pivoted gate which is arranged for opening and closing a coil chamber in the printer. A pair of spreadable spaced apart bail extensions project from opposed arms of the bail and are aligned when untensioned to provide an axis for rotation for holding the coil in its seat. When spread, the extensions permit coil replacement in said seat. A pair of cams which are integral with a bracket defining the seat are followed by the arms of the bail when rocked for controlling the condition of the extensions.

The belt of the printer is trained about an impactor and a sprocket wheel mounted on the carriage. A stepping motor is adapted, through the agency of a sprocket wheel, to align successive selected dies, carried longitudinally of the belt, for image transfer by the impactor at successive printing stations. A bracket supported by the carriage rocks in response to a third solenoid for driving the impactor into a printing mode in which the belt is tensioned. Restoration of the impactor to a non-print mode eases belt tension and thereby facilitates belt adjustment for die alignment for printing.

A replaceable cartridge has an endless ribbon disposed between the belt and the web for printing. An inking roller carried in the cartridge is coupled to carriage movement during carriage translocation between line start and carriage return positions and for driving the ribbon. A clutch uncouples the inking roller during carriage return to the line start position.

18 Claims, 19 Drawing Figures

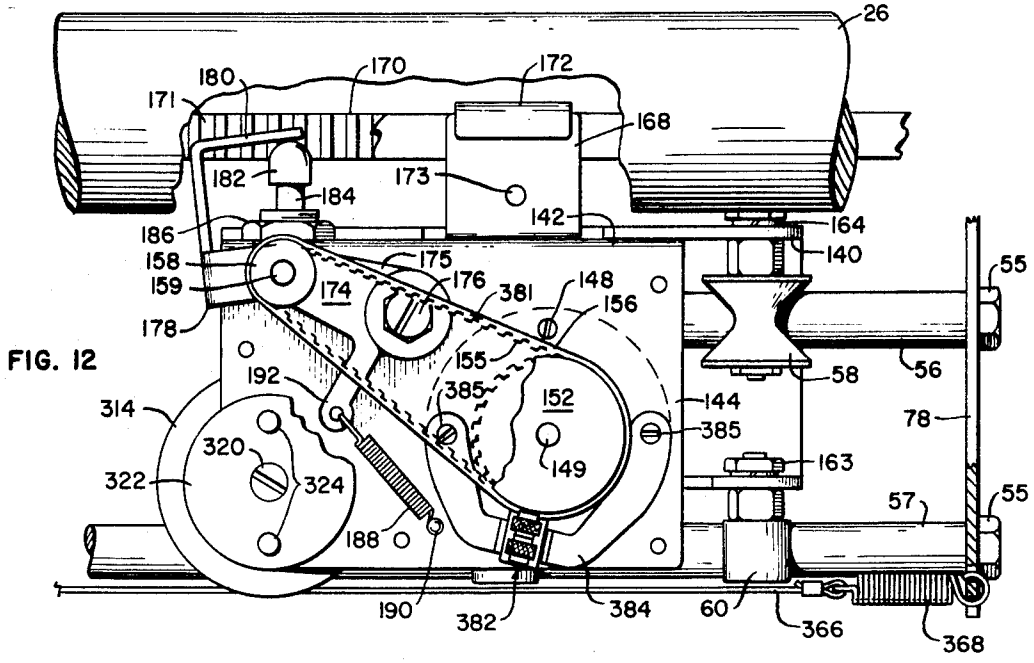


FIG. 12

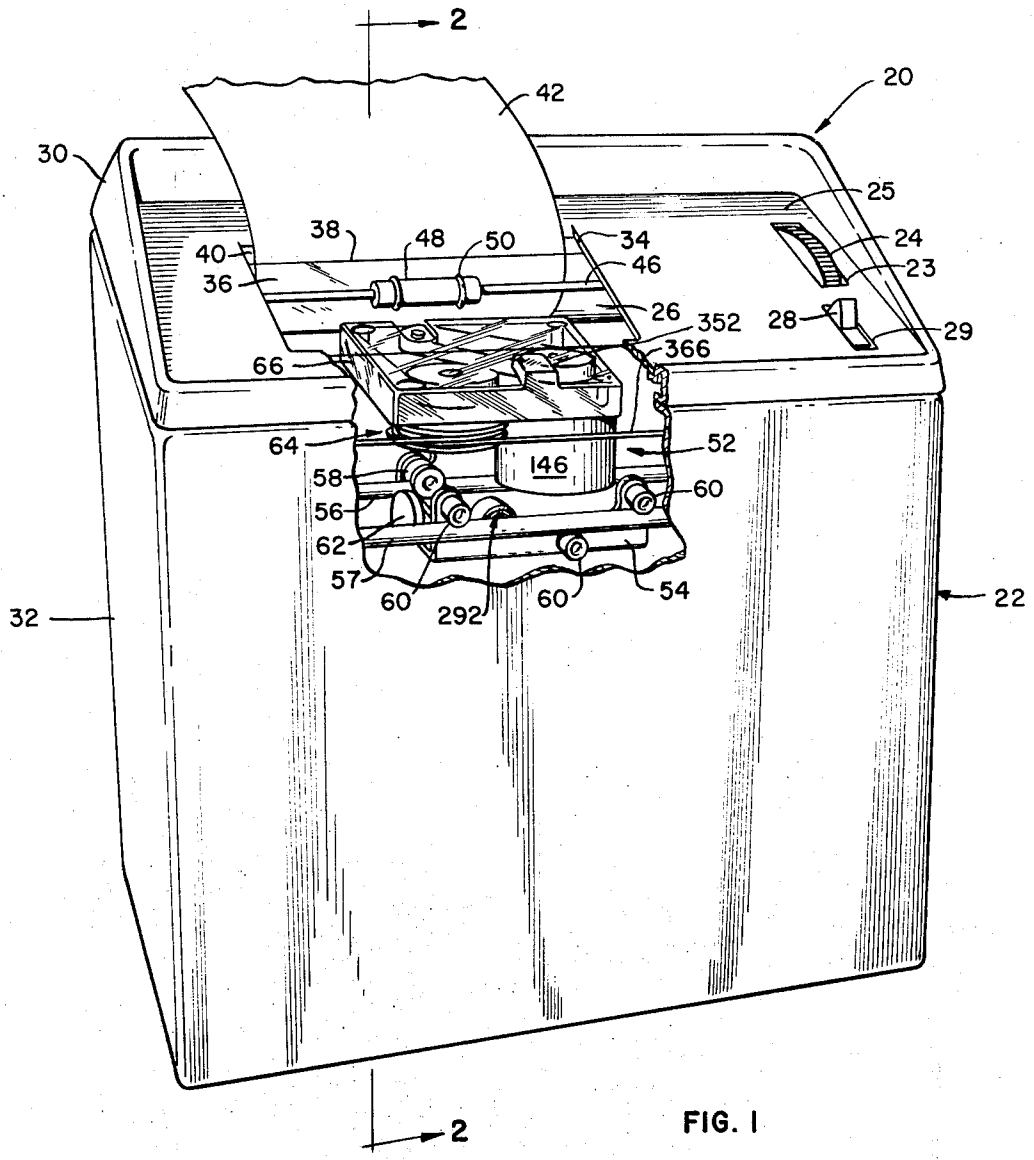


FIG. 1

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ATTORNEY

FIG. 2

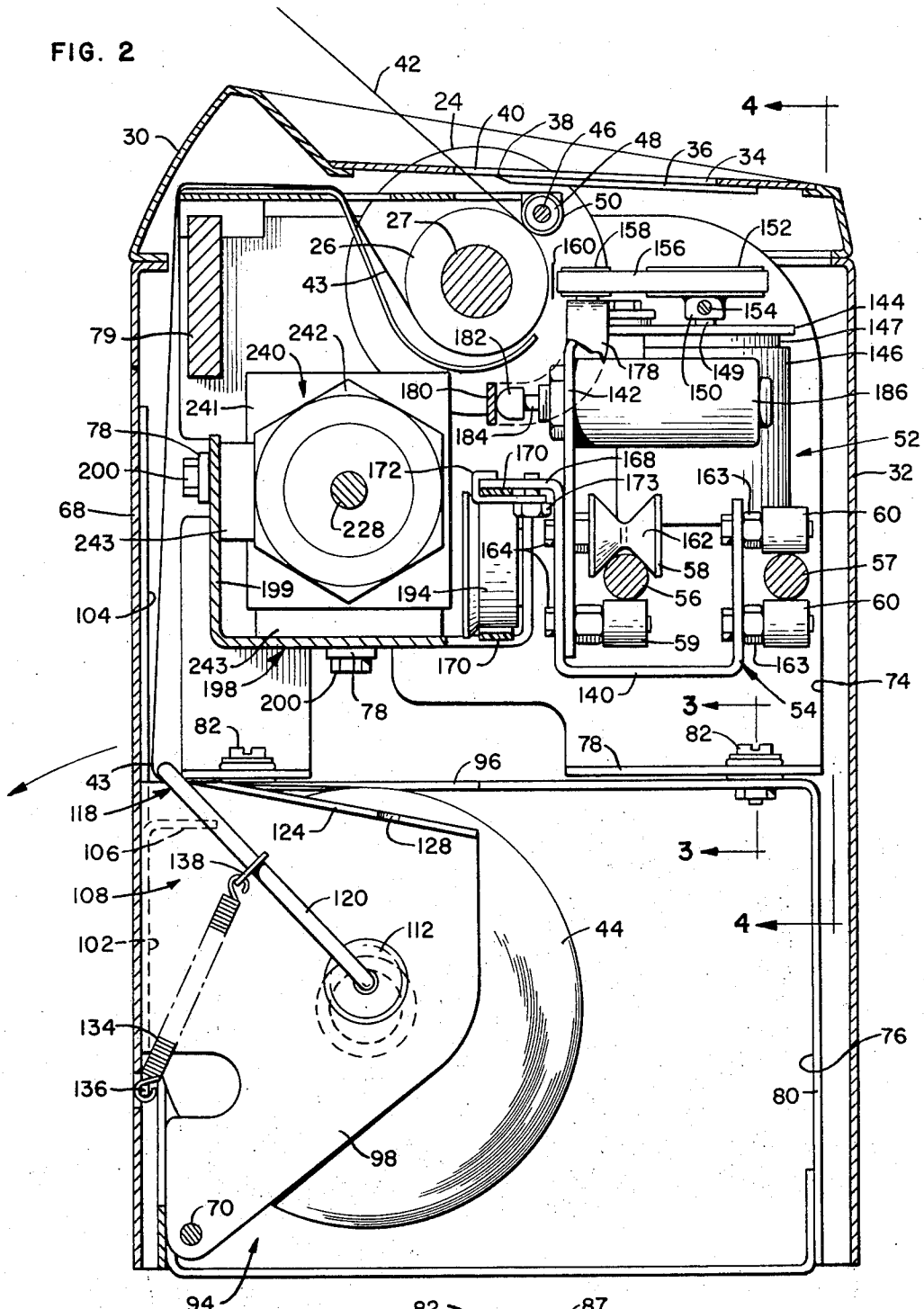

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FIG. 3

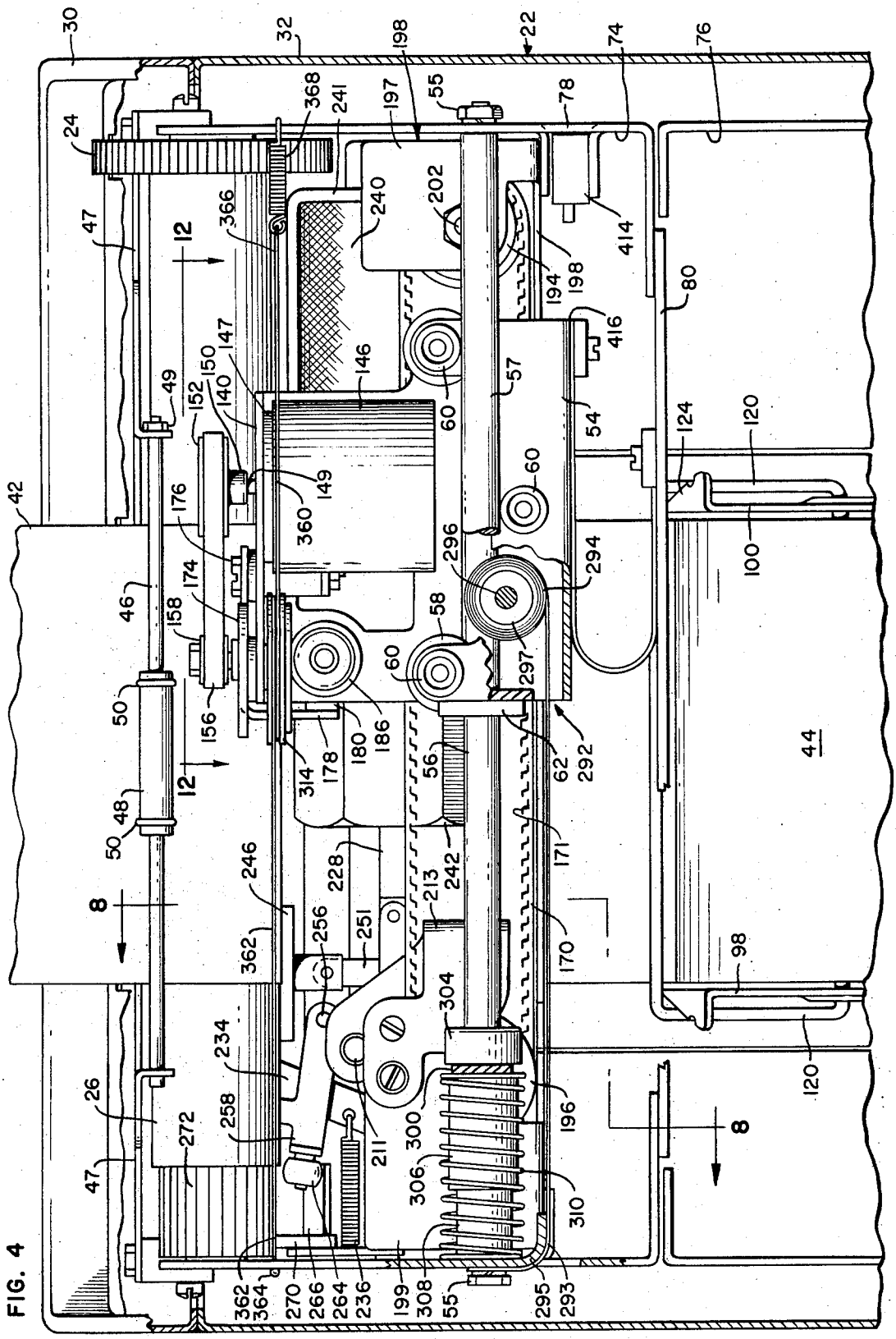

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FIG. 4

FIG. 5

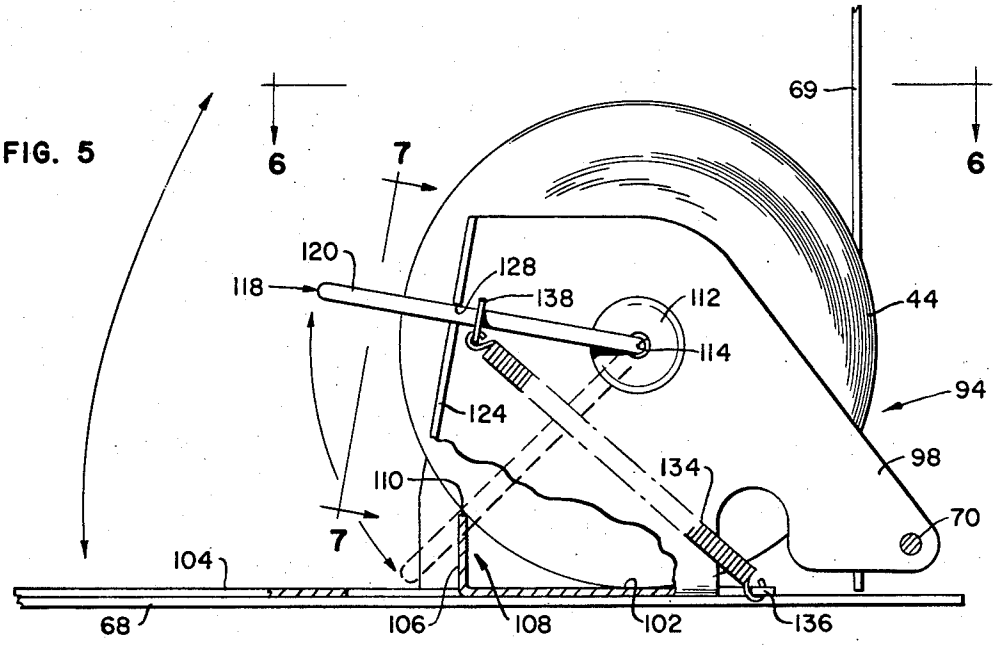
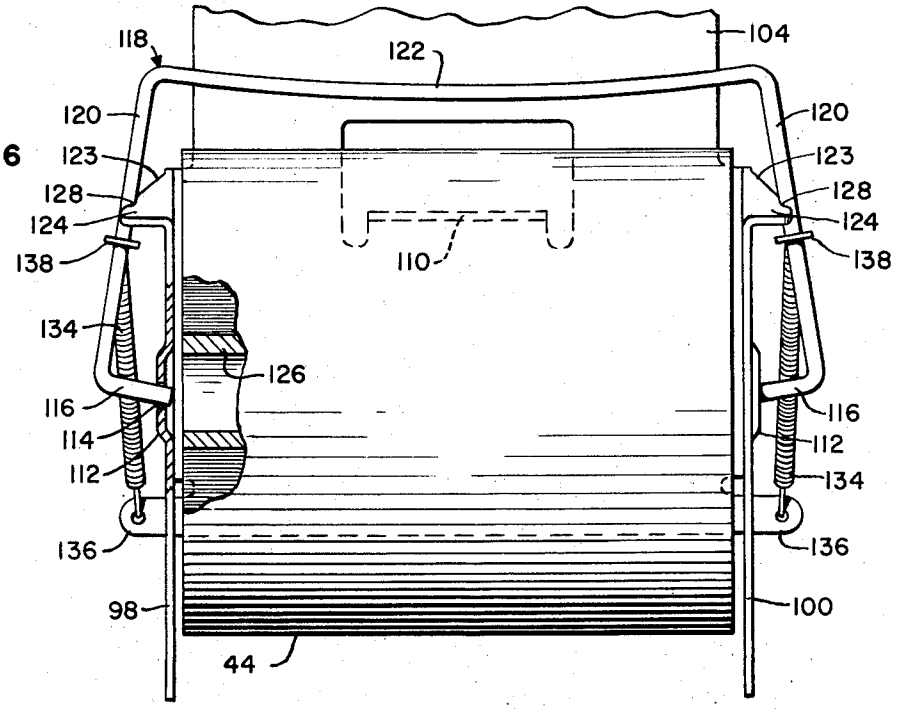


FIG. 6



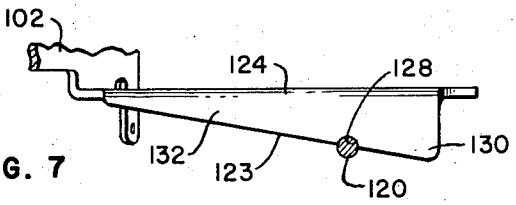


FIG. 7

FIG. 8

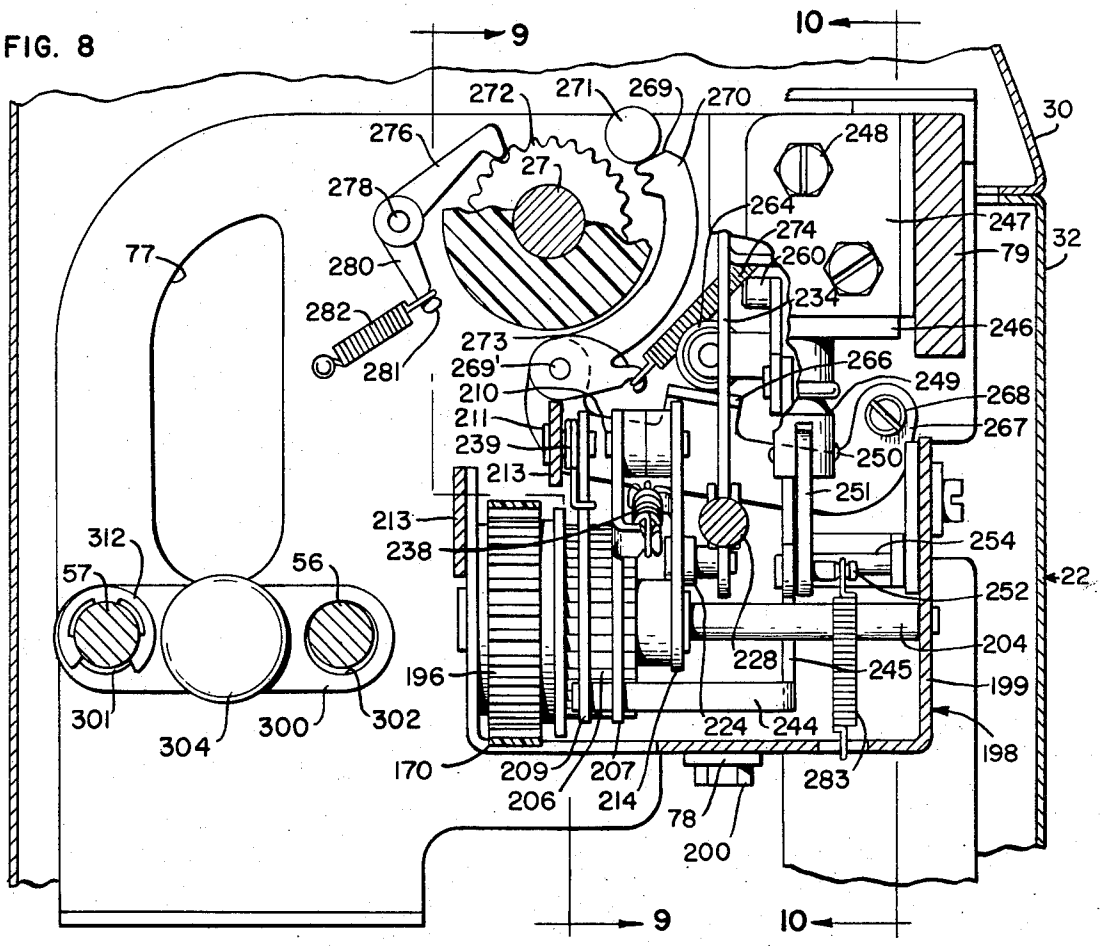

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FIG. 9

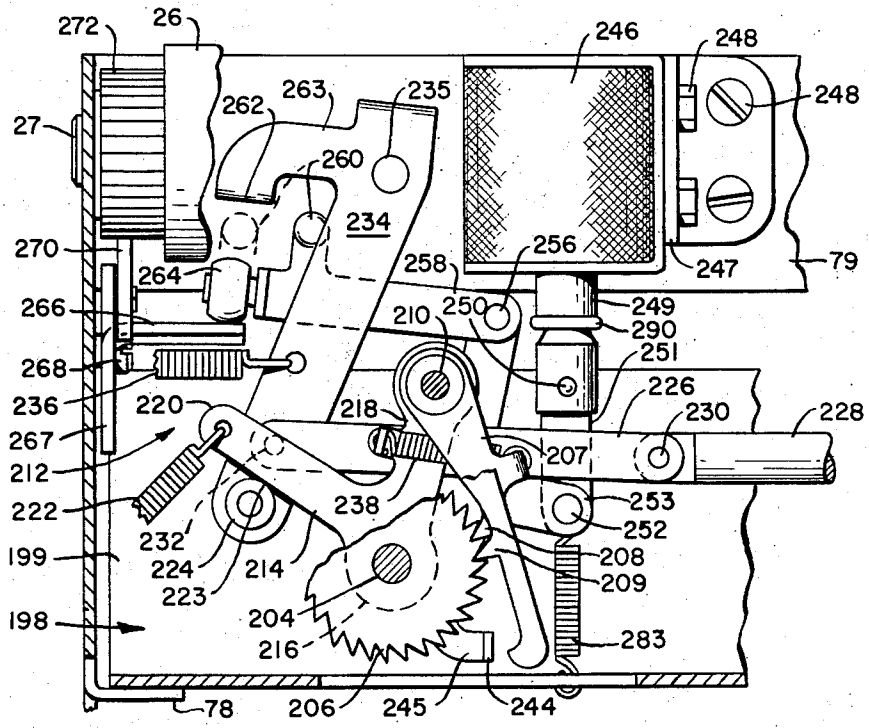
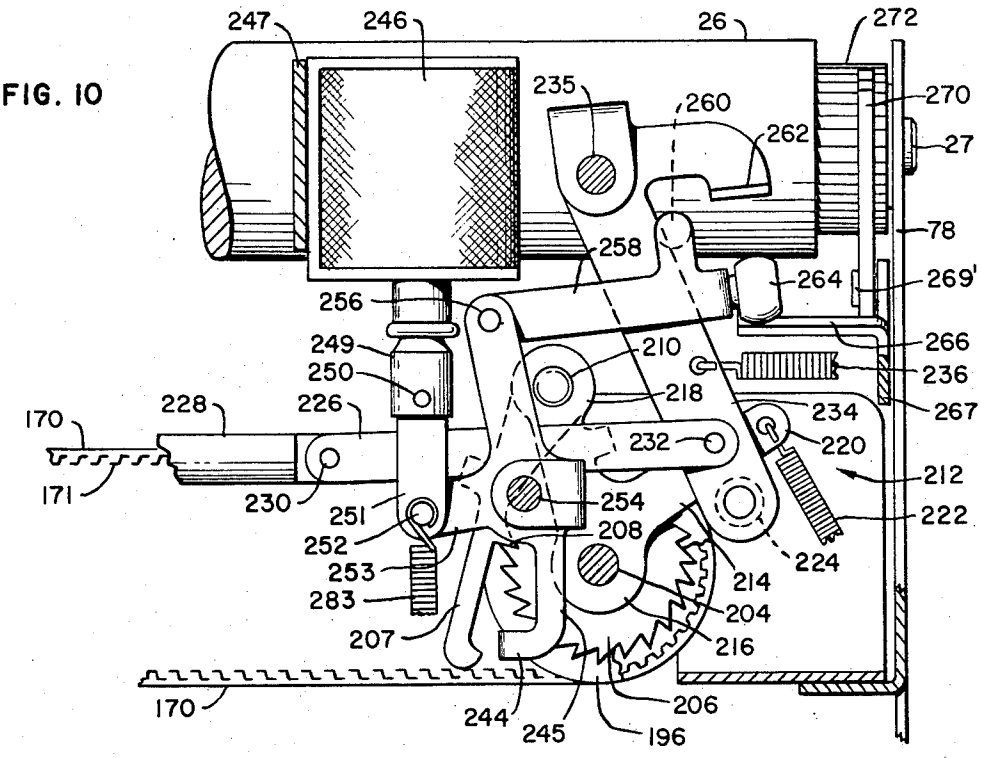

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FIG. 10



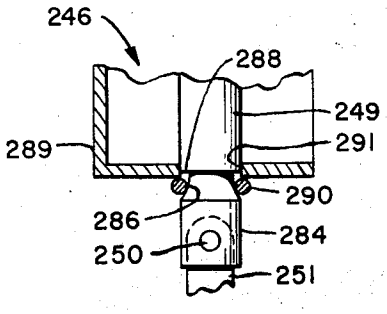


FIG. 11

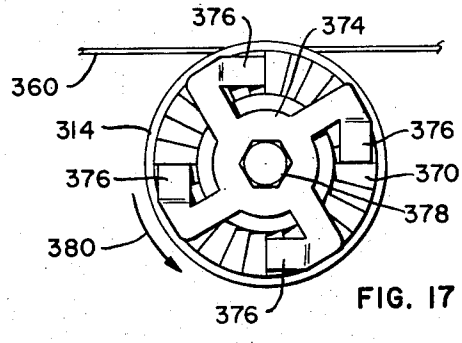


FIG. 17

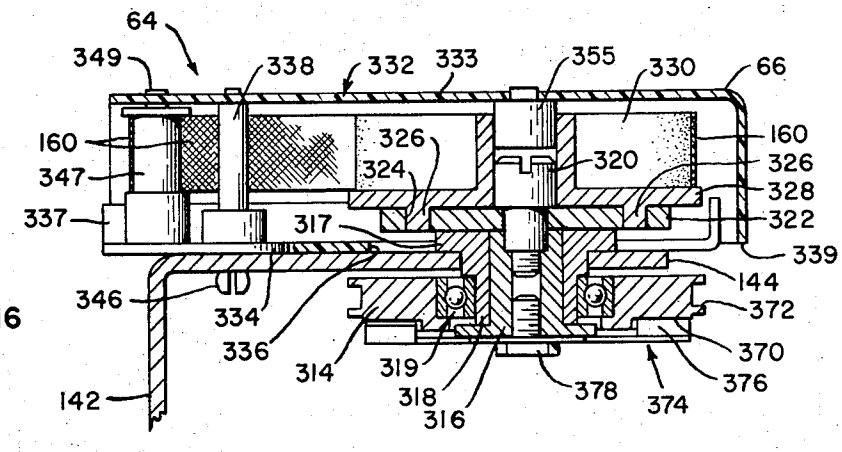


FIG. 16

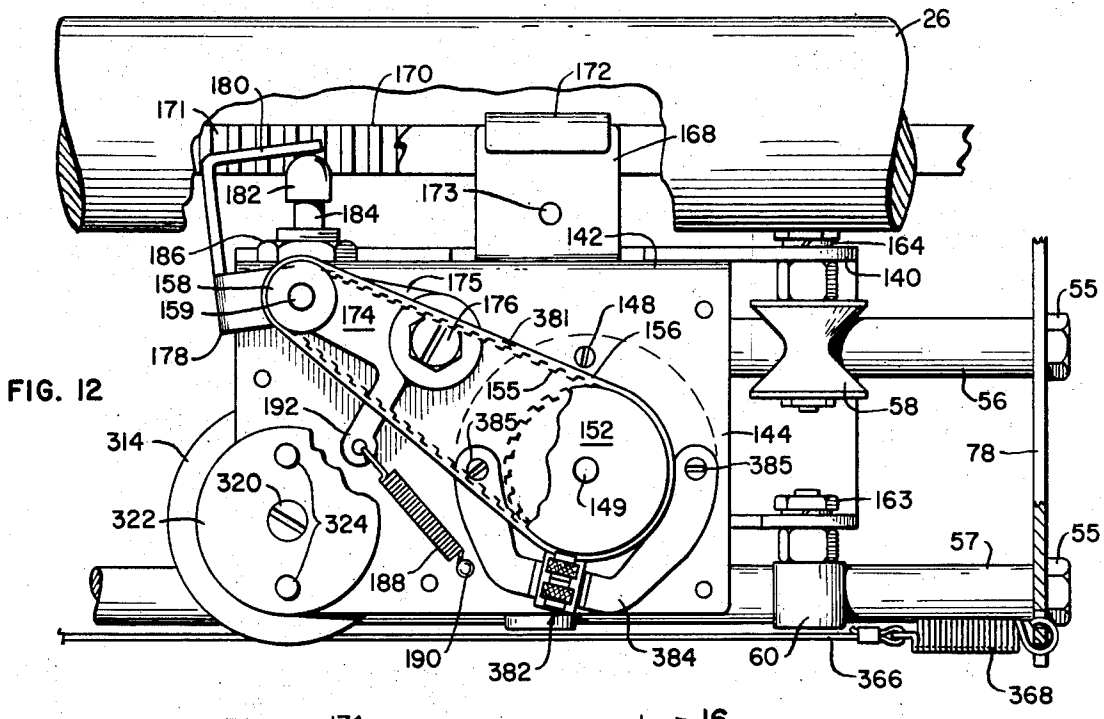


FIG. 12

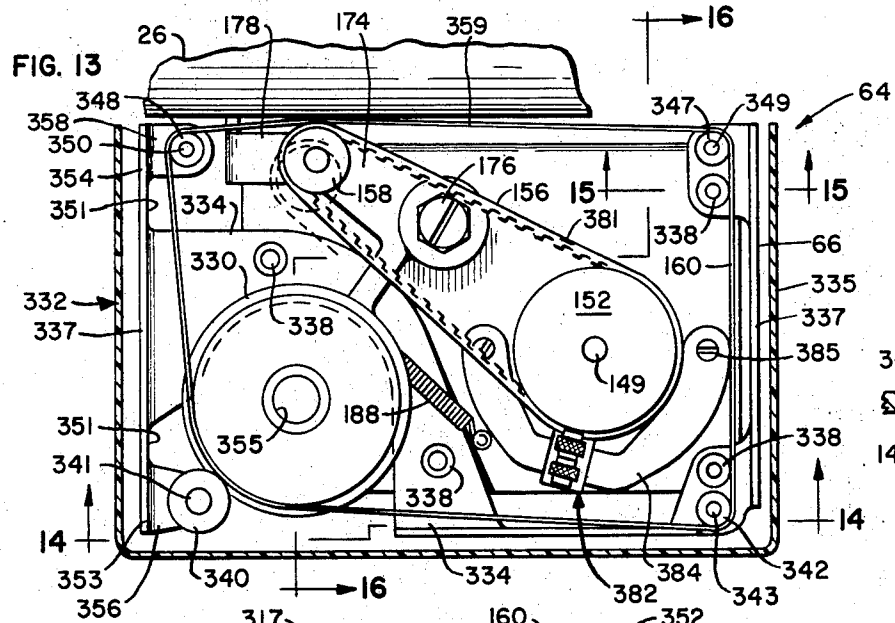


FIG. 13

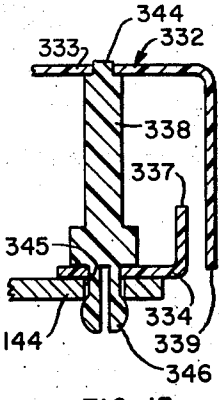


FIG. 15

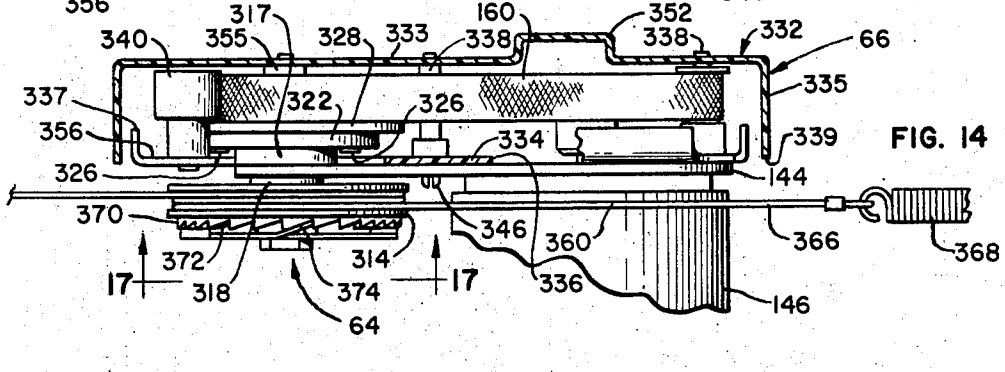


FIG. 14

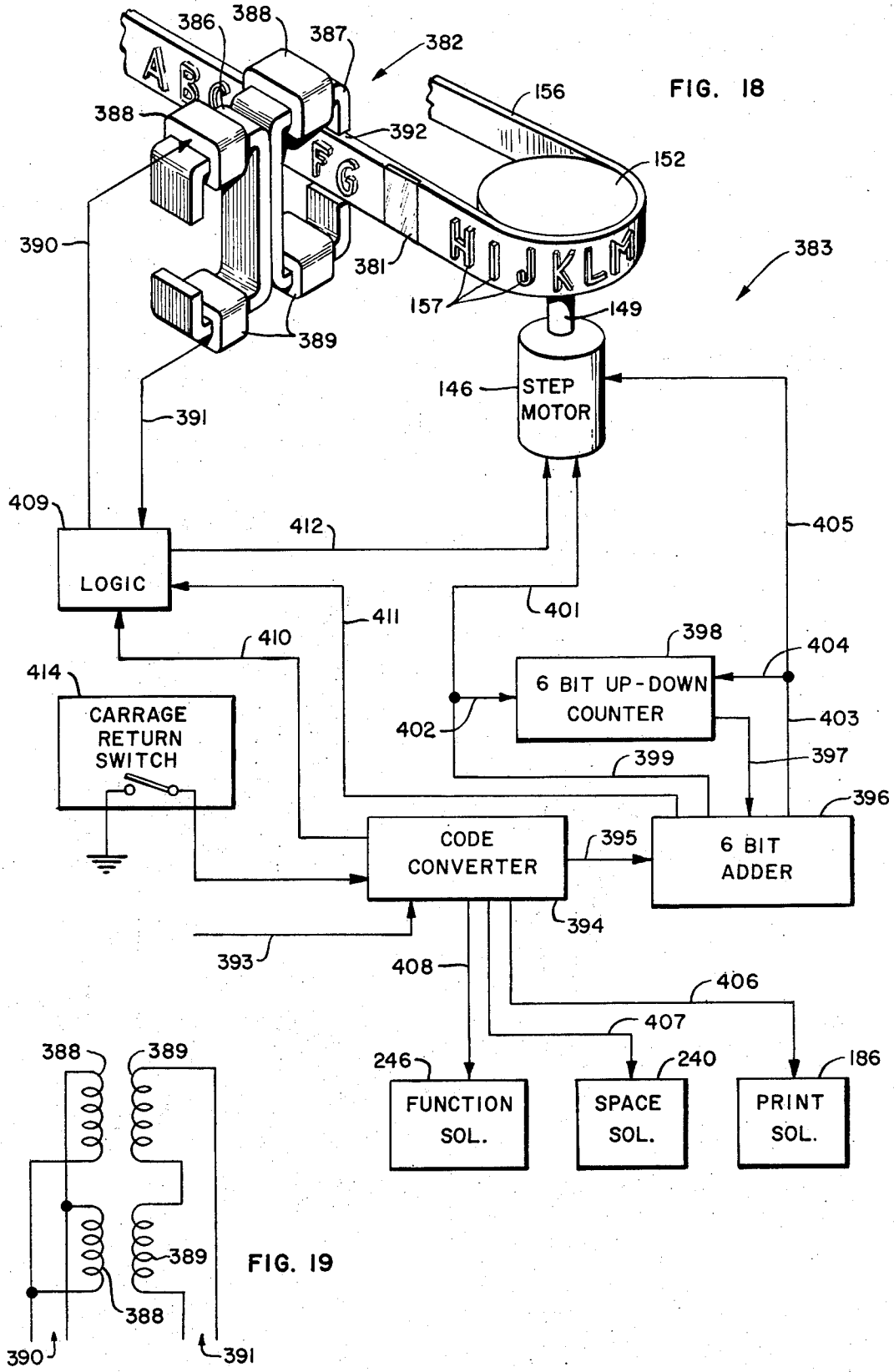

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STEP MOTOR
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LOGIC
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401
410
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404
414
6 BIT UP-DOWN COUNTER
CARRAGE RETURN SWITCH
402
403
399
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CODE CONVERTER
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6 BIT ADDER
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393
408
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407
246
240
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FUNCTION SOL.
SPACE SOL.
PRINT SOL.

FIG. 18

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FIG. 19

SIGNAL RESPONSIVE BELT PRINTER

FIELD OF THE INVENTION

The present invention relates to signal controlled printing. Particularly, it relates to teleprinters adapted for use in mobile installations.

Signal controlled printers are widely employed in various applications to transcribe messages that are received in the form of electrical signals. In addition to their widespread use in stationary installations, a considerable need also exists for such printers in mobile installations. For example, teleprinters in various vehicles would considerably improve the accuracy of communication with remote offices and also provide a permanent record of messages. Such installations have been proposed, for example, in police work, as well as in many other fields.

Although prior printers heretofore have been employed effectively in mobile units, their relatively large size has curtailed wide use in vehicles, such as automobiles. It is the primary object of the present invention to minify signal controlled printers. It is another object of the invention to enable easy use of printers of the indicated class in vehicles, such as automobiles.

Reducing printer size in accordance with the present invention results from minimizing the number of printer parts. The attendant benefit of reduced printer costs is calculated to encourage wider printer usage. Development of improved systems adapted for combination in a signal controlled printer have enabled attainment of the foregoing, and other objects of the invention which will be apparent from the ensuing detailed description. The features of said systems include (1) improved web handling means enabling web loading with one hand, (2) an improved ribbon and inking mechanism assembled in a disposable cartridge, (3) novel though simplified station spacing and line feed mechanisms, and (4) an improved impactor and die carrier assembly for printing in a small belt printer.

SUMMARY OF THE INVENTION

From one aspect, the invention is embodied in an impact printer which comprises an endless belt disposed in a circuit, the belt having a plurality of dies spaced apart longitudinally of the circuit. Impacting means are mounted for successively urging the belt into a printing mode at successive printing stations. Means are adapted for moving the belt circuitously for successively aligning selected dies with the impacting means for printing. Means are provided for translocating said belt and said impacting means simultaneously to successive printing stations. Means are also provided for replaceably supporting a web coil and for spending the web from the coil successive line spacing distances. The power stroke of a lineally reciprocative member is impinged on the translocating means and the spending means for selectively spacing the belt and feeding the web.

From yet another aspect, the invention is an impact printer wherein an impactor is movable into and out of a printing mode and is supported on a carriage arranged for reversible lineal translocation in a path to successive stations between line start and carriage return positions. An endless ribbon is driveable in a circuitous path for aligning successive ribbon segments with the impactor for printing. Means couple the ribbon driving means to the carriage movement.

From a still further aspect, the invention is embodied in an impact printer having printing means which comprises an endless belt trained about a drive roller and an impacting roller for moving the belt in a circuitous path to present successive selected dies on the external surface of the belt at successive aligned printing stations for printing. The impacting roller is rockable between a belt tensioned condition, when a selected die is in a printing mode, and a belt eased condition, upon removal of a selected die from a printing mode; and the belt is movable for presenting a selected die for printing while the belt is in its eased condition.

BRIEF DESCRIPTION OF THE DRAWING

In the ensuing detailed description, reference is had to the accompanying drawing in which:

FIG. **1** is a perspective view of a belt printer in accordance with the present invention, portions of the printer housing being broken away;

FIG. **2** is a vertical sectional view of the printer taken according to the line **2—2** in FIG. **1**;

FIG. **3** is a detailed view of fastening means taken according to the line **3—3** in FIG. **2**;

FIG. **4** is a partial vertical sectional view taken according to the broken line **4—4** in FIG. **2**;

FIG. **5** is a view of web managing means for the printer with a part broken away and in the same plane as, however, alternately conditioned from the condition of FIG. **2**, an alternate relative position of another part being shown in dashed lines;

FIG. **6** is a view of the web managing means taken according to the line **6—6** in FIG. **5**, parts being broken away;

FIG. **7** is a detailed view of a portion of the web managing means taken according to the line **7—7** in FIG. **5**;

FIG. **8** is a view of carriage spacing and line feeding means taken in a vertical plane according to the line **8—8** in FIG. **4**;

FIG. **9** is a view of the carriage spacing and line feeding means taken according to the line **9—9** in FIG. **8**, parts being broken away;

FIG. **10** is another view of the carriage spacing and line feeding means taken in a vertical plane according to the line **10—10** in FIG. **8**;

FIG. **11** is a detailed view of means for abating noise resulting from solenoid operation in the printer;

FIG. **12** is a top plan view of a carriage in said printer, a portion of a platen being broken away, taken along line **12—12** in FIG. **4**;

FIG. **13** is a view similar to FIG. **12**; however, showing a disposable ribbon cartridge mounted on the carriage, the top of the cartridge having been removed;

FIG. **14** is a view taken in a vertical plane according to the line **14—14** in FIG. **13**;

FIG. **15** is a detailed view of the ribbon cartridge according to the line **15—15** in FIG. **13**;

FIG. **16** is a detailed view taken according to the line **16—16** in FIG. **13**;

FIG. **17** is a plan view taken according to the line **17—17** in FIG. **14**;

FIG. **18** is an electrical scheme of a circuit for operating the printer; and

FIG. **19** is an electrical scheme of a sensor associated in the circuit.

DETAILED DESCRIPTION OF THE ILLUSTRATED PRINTER

Referring now to the drawing, particularly to FIG. 1, shown is a signal controlled belt printer 20. It is less than the width of an adult human body and is proportioned to be hung over the front bench from the bench back in an automobile of standard size. The printer has a housing 22 comprised of an upper section 30 and a lower section 32. A rotationally mounted knurled knob 24 projects through an aperture 23 in an upper sloping flat surface 25 of upper housing section 30 for manually controlling a platen 26 (FIG. 2). A shaft 27 (FIGS. 9 and 10) which supports the platen 26 is journalled in an upper frame member 78 of the printer framework. An on-off switch, of which only a manual member 28 (FIG. 1) is shown, projects through another aperture 29 in surface 25.

Surface 25 has an opening 34 in which a transparent shield 36, which partially occludes said opening 34, is mounted. A tear edge 38 of the shield 36 is spaced from the upper side of said opening 34 to provide a slot or passage 40 for moving the downstream end portion of a web 42 or carrier for records out of housing 22. Within the housing 22, the web 42 is supplied from a roll or coil 44 (FIGS. 2, 4, 5, and 6) and extends along a path 43.

A pressure roller 48, concentric with its support shaft 46, carries a pair of laterally spaced apart friction bearings, herein shown as O-rings 50 (FIGS. 1, 2, and 4). They are arranged for holding the web 42 against platen 26 in a customary fashion. Accordingly, the support shaft 46 extends laterally; and it is hung with a horizontal aspect from a pair of frame extensions 47, a nut 49 securing the support shaft 46 to said frame extensions 47.

A printing mechanism, generally designated 52 (FIGS. 1 and 2), is comprised of a carriage 54 arranged for reversible movement in a path extending laterally of printer 20 between a place of beginning or line start station at the left (FIG. 1) of housing 22 to a line end or carriage return station at the right of the housing 22. A rear rail 56 and a forward or front rail 57 facilitate carriage movement. They are spaced apart in a horizontal plane and extend laterally of housing 22, with opposed rail end portions being secured by fasteners 55 (FIG. 4) to upper frame member 78. A plurality of rollers 58, 59, and 60 guidingly couple the carriage 54 to said rails 56 and 57.

Roller 58 is a guide roller and has a circumferential groove 162 (FIG. 2) in which the upper portion of rear rail 56 is slidingly engaged. Roller 59 is cylindrical, engaging the under surface of rail 56, and with roller 58 prevents vertical displacement of carriage 54. Rollers 60 are also cylindrical, being similar to roller 59, and slideably engage front rail 57 from above and below. Fastening means 163 connects the rollers 60 to a forward portion of carriage 54; whereas, like fasteners 164 connect rollers 58 and 59 to the rear portion of said carriage 54.

A bumper 62 mounted on the left side (relative FIG. 1) of carriage 54 is adapted to damp the force resulting from carriage return in a manner which will be described hereinafter. Ink supply and ribbon control means 64 for printer 20 include a ribbon cartridge 66. The latter is disposable, being releasably retained on carriage 54 by means which will be ensuingly described.

In addition to upper frame member 78, the framework of printer 20 comprises a lower frame member 80 (FIG. 2). The frame members 78 and 80 are rigidly secured together within housing 22 and by fastening means generally designated 82. A pair of opposed framework openings 77 (only one of which is seen in FIG. 8) are proportioned and disposed for enabling manipulation of frame member 78 and the structures connected to or hung therefrom. A cross tie 79 (FIGS. 2 and 8), which extends across the rear of apparatus, rigidifies the upper frame member 78.

For damping frame vibrations, fastening means 82 comprises a plurality of metal screw assemblies (exemplified in FIG. 3). A metal screw 84 associated in each of said assemblies projects through aligned apertures in both frame members 78 and 80. The screw 84 is threaded through member 80 to draw said frame members 78 and 80 together. A washer 85 is held in engagement with each screw head 87 by a first resilient ring 86, the ring 86 being disposed about the shank of the screw 84 and arranged for compression against the washer 85 and frame member 78. A second resilient ring 88 is disposed about the shank of each screw 84 between frame members 78 and 80 and engaged with facing surfaces thereof. Cushioning of the frame members 78 and 80 is enhanced by a chamfered surface 90 which is formed in frame member 78 about the shank of the screw 84. Tightening of a lock nut 92 on the free end of the screw 84 insures rigid association of the frame members 78 and 80 with ring 88 compressed therebetween and against the chamfered surface 90. Thereby, concentric location of the shank of the screw 84 is insured within frame member 78.

The framework divides the interior of the housing 22 into an upper chamber 74 and a lower chamber 76 (FIG. 2). Coil 44 is mounted in the latter chamber 76 for replacement when spent. Means for managing said coil 44 comprises a manually controllable door 68 (FIGS. 2 and 5). It is rockable about a pivot 70 in an opening 69 in housing 22 between a closed, first or vertical aspect (FIG. 2) in which the opening 69 is closed and an open, second or horizontal aspect (FIG. 5) in which the opening 69 is open.

A U-shaped bracket 94 has a pair of laterally spaced apart side plates 98 and 100, and a connecting section 102 (FIGS. 2, 4, and 5) with a tongue or extension 104. The connecting section 102 and said tongue 104 are secured to the inside flat of door 68 for securing the bracket 94 thereto with side plates 98 and 100 extending perpendicularly. Accordingly, a web coil 44 mounted on said bracket 94 will follow the door 68, an opening 96 in frame member 80 enabling such coil 44 to be rocked between a loading position in which the door 68 is open and a printing position in which the door 68 is closed.

A tongue 106 is struck inwardly from bracket 94 at the juncture of connecting section 102 and tongue 104. The tongue 106 and side walls 98 and 100 define a coil seat 108. The tongue 106 is disposed and proportioned such that its inner edge 110 will cause a full coil 44 to be seated with its coil supporting cylinder 126 (FIG. 6) aligned in an axial position for enabling coil rotation for web 42 removal in a manner which will ensuingly be described.

Side plates **98** and **100** have a pair of opposed, outwardly struck, horizontally aligned hubs **112** with center openings **114.** The opposed ends of spaced apart axis lugs or extensions **116** of a squared C-shaped manually swingable spring bail **118** are engaged in the holes **114.** The bail **118** has a pair of opposed flexible arms **120** from the ends of which the axis lugs **116** angularly project each generally toward the other. The arms **120** are integral with and connected to opposite ends of a bail connecting section **122** and are proportioned to space section **122** away from seat **108** and clear of side plates **98** and **100.** In consequence of the foregoing arrangement, the bail **118** is rockable over seat **108,** between a coil loading position (solid line of FIG. **5**) and a printing or web retained position (dashed line of FIG. **5**).

Opposed arms **120** are disposed in following engagement with corresponding camming edges **123** of a pair of tapered flanges or cams **124** along which the arms **120** slide as bail **118** is swung. Each of the cams **124** projects outwardly from one of side plates **98** and **100** and has a wide part **130** (FIGS. **6** and **7**) and a narrow part **132.**

The proportioning of parts is such that when arms **120** are disposed in engagement with the narrow parts **132,** the arms **120** will be relaxed or untensioned; and axis lugs **116** will be coaxially and horizontally aligned, and though spaced apart, they will be unspread. Thusly conditioned, the axis lugs **116** are adapted for engagement in opposed end openings of the supporting cylinder **126** for coil **44.** Thereby, the axis lugs **116** comprise means for enabling coil rotation, for uncoiling or spending the coil **44** as web **42** is fed a line at a time and for preventing coil removal from seat **108.** On the other hand, when arms **120** are disposed in engagement with wide parts **130,** the arms **120** are tensioned and spread; and the axis lugs **116** will correspondingly spread, disaligned, and out of cylinder **126** (FIG. **6**), though retained in hubs **112.** Thereby, a coil **44** can be replaced in seat **108,** provided door **68** is open.

Moreover, the arrangement of parts is such that, when the lugs **116** are in spaced condition, bail section **122** will have been moved from over seat **108** enabling coil replacement. However, when the lugs **116** are in untensioned or printing position, said bail section **122** is disposed over the seat **108,** further preventing coil removal.

A pair of opposed detenting notches **128** (FIGS. **6** and **7**) in the wide part **130** of cams **124,** are adapted to releaseably hold bail **118** in loading position whereby coil replacement is facilitated. Once a new coil **44** has been inserted in seat **108,** it is readily locked into the chamber **76** and the bail **118** restored to coil retaining position by manually releasing arms **120** from the detenting notches **128.**

A pair of expansion springs **134** then, under tension, restore bail **118** to coil retaining condition. Each of said springs **134** is disposed adjacent one of the sides **98** and **100** and has an inner end anchored on a lug **136** which is secured to door **68,** and an outer end connected to a lug **138** which is secured to each arm **120.** Additionally, the springs **134** damp web moving force during line feed. To that end web **42** is routed in course **43** between bail **118** and bracket **94,** the web **42** supporting the bail (FIG. **2**).

Carriage **54** comprises a U-shaped strap **140** (FIGS. **2** and **4**) and a horizontally disposed motor hanger, hanger or mounting plate **144.** Extension **142** of said mounting plate **144** is secured to the strap **140** by means of the fasteners **164** which also secure rollers **58** and **59** to carriage **54.**

The mounting flange **147** of a stepping motor **146** is secured to plate **144** by fasteners **148** (FIG. **12**) and thereby suspends the motor **146** from the plate **144.** The hub **150** of a sprocket wheel **152** is secured by a fastener **154** (FIG. **2**) to the output shaft **149** of said motor **146** above plate **144.** An endless flexible sprocket belt **156,** comprising printing means, carries a plurality of printing dies **157** (FIG. **18**) on its outer surface, the dies **157** being spaced apart uniformly longitudinally of said belt **156.** The belt **156** is trained in a circuitous path in a horizontal plane above plate **144,** and about sprocket wheel **152** and a cylindrical impactor **158.** The cylindrical impactor **158** functions as an idler sprocket for the belt **156** and is arranged for rotation about a pivot **159** (FIG. **12**). Molded teeth **155** (FIG. **12**) on the inner surface of belt **156** operably mesh in driven relationship with the sprocket wheel **152** and are guided by parallel flanges of the impactor **158.**

In the exemplary embodiment, each angular position of belt **156** in its circuitous path corresponds to an angular condition of motor **146.** Printing or image transfer is effected, a character at a time while carriage **54** is immobilized. Before each character is printed, the belt **156** is adjusted in its circuitous path, if required, for presenting a corresponding selected printing die **157** at a printing station and at a predetermined angular position relative to and adjoining impactor **158.** Then the impactor **158** is driven toward platen **26** for transferring the image of such die **157** onto an aligned section of web **42** through a segment of an inking ribbon **160** then disposed between the belt **156** and the web **42.**

Means for driving impactor **158** include an irregularly shaped lever **174** (FIGS. **12** and **13**) which is rockably connected to hanger plate **144.** Vertical axis means or a pivot **176** for effecting the connection extends through one end portion of a flat arm **175** of the lever **174** which is disposed above plate **44.** Pivot **159** is carried from the other end portion of said arm **175.** Thereby, impactor **158** and the portion of the belt **156** thereabout entrained are rockable adjacent the upper surface of plate **144** and about pivot **176** between a printing mode (solid line of FIG. **13**) and a non-print mode (phantom line of FIG. **13**).

Pivot **176** is disposed somewhat medially of output shaft **149** and pivot **159;** and the parts are arranged such that said pivots **176** and **159** and the axis of shaft **149** are closest to alignment when the impactor **158** is in a printing mode. By reason thereof, belt **156** is highly tensioned during printing. However, as said belt **156** is rocked to a non-print mode, pivot **159** is moved away from such alignment and closer to shaft **149.** Thereby, belt tension is relaxed, whereby belt movement for alignment of an ensuing die **157** is facilitated.

Means for rocking the impactor **158** between print and non-print modes comprises a boss or follower **180** (FIG. **12**) in the form of a small plate fashioned below plate **144** and integrally with an end portion **178** of lever **174.** A striker **182** carried from the end of a reciprocative arm **184** of a printing solenoid **186** (FIGS. **2** and **4**) is arranged for pushing follower **180** during each power stroke of said solenoid **186.** Thereby, the impac-

tor 158 is rocked into a printing mode against the effect of a restoring spring 188 whose opposite ends are connected to an anchor 190 carried from plate 144 and an extension 192 from lever 174.

Means for spacing or stepping the carriage 54 to translocate printing means 52 to successive equally spaced apart and horizontally aligned printing stations include an offset flange 168 (FIG. 2) of strap 140. It is secured to an endless sprocket belt 170 by means comprised of a clamping plate 172 and a screw assembly 173. Moreover, said last belt 170 extends laterally of the framework in a horizontal plane. Laterally spaced apart idler and drive sprocket wheels 194 and 196 (FIGS. 2, 4, and 8) about which belt 170 is trained are disposed in a circuitous path in a vertical plane. The sprocket teeth of sprocket wheels 194 and 196 have a meshed relationship with molded teeth 171 (FIGS. 4 and 12) fashioned on the inner surface of belt 170.

An elongated laterally extending U-Shaped frame member 198, which is secured by a plurality of fasteners 200 (FIG. 8) to an extension of upper frame member 78, has a pair of laterally spaced apart bracket elements 197 and 199. As viewed from the front in FIG. 4, the bracket 197 is near the right end of the terminal and the bracket 199 near the left end, with the frame 198 extending across the entire length of the apparatus as shown in FIG. 4 and, in section, in FIG. 2. A shaft 202 for idler sprocket wheel 194 is journalled in bracket element 197. A shaft 204 of drive sprocket wheel 196 is secured in bracket element 199.

A ratchet wheel 206 (FIGS. 8, 9, and 10) included in the carriage spacing or stepping means comprises a transmission component in the means for driving belt 170. The ratchet wheel 206 is journalled on shaft 204 for transmitting carriage driving torque. To incrementally rotate the ratchet wheel 206, an arm 207 (FIG. 9) having a feed pawl 208 is mounted rockably about an axis defined by a pivot pin 210.

Means for operating feed pawl 208 comprises a linkage generally designated 212. The linkage 212 includes a V-shaped link 214 having a hub 216 journalled about shaft 204. An arm 218 of the link 214 which projects from hub 216 supports pin 210 through the agency of which link 214 is connected to arm 207. A moment arm 220 of link 214 is connected to the frame member 78 by tension spring 222. The arm 220 has a follower surface 223 along which a cam roller 224 is slideable. The roller 224 is carried from a lower end of a lever 234, and opposite to a pivot pin 235 about which lever 234 is rockable. The position of engagement of the cam roller 224 and said lever 234 determine the place of torque transfer from said lever 234 to arm 220 and accordingly said link 214.

A solenoid 240 (FIGS. 2 and 4) rocks lever 234 through the agency of a link or arm 226. The arm 226 has one end portion pivoted as at 232 to the lever 234 medially of roller 224 and pivot pin 235 and another end portion pivotally connected as at 230 to the lineally reciprocative member plunger or rod 228 of solenoid 240. An expansion spring 236 is arranged with one end portion attached to frame member 78 and an opposite end portion connected to a medial portion of said lever 234 for biasing the lever 234 clockwise with respect to FIG. 9. An expansion spring 238 having an end portion secured to link 214 and an opposite end portion connected to a medial portion of feed pawl 208 biases the pawl 208 into operative engagement with ratchet wheel 206.

Solenoid 240 is mounted in a frame 241 and has a lineal power stroke (to the right with respect to FIG. 9) and a return stroke. A guide member 242 (FIGS. 2 and 4) for solenoid plunger 228 is supported on a plurality of spacers 243 and therewith secured to the U-shaped frame member 198 by the fasteners 200 (FIGS. 2 and 8). In consequence of the foregoing construction, upon actuation of solenoid 240, lever 234 rocks counterclockwise (relative to FIG. 9) against the restoring action of restoring spring 236 and causes cam roller 224 to move responsively along surface 223 toward shaft 204 thereby shortening the moment of arm 220. In turn, link 214, against the restoring action of spring 222, moves clockwise, its torque being transmitted to arm 207 which is drawn downwardly by expansion spring 238 for driving the feed pawl 208 downwardly for advancing ratchet wheel 206 one notch. Though the force of the solenoid 240 increases, thereby to increase the force on member 228 as the power stroke progresses, the shortening of the moment of arm 220 insures uniform transmittal to or application on pawl 208 of the varying force imposed on the plunger 228.

The parts are proportioned such that upon such advancement of the ratchet wheel 206, pulley wheel 196, which is secured to said ratchet wheel 206, moves a distance required to advance carriage 54 one step or printing space or column. Upon the deenergization of solenoid 240, lever 234 is restored to an untensioned condition by spring 236; and link 214 is restored by spring 222. As the last mentioned link 214 moves counterclockwise to its restored position, its torque is effective for moving arm 207 upwardly, thereby to disengage pawl 208 from between the teeth of ratchet wheel 206 and responsively to tension spring 238, when the ratchet wheel 206 is restrained in a manner which will appear from the following description.

A check pawl 209 is rockable about a fixed axis pin 211. Said pin 211 is mounted in a bracket 213 (FIG. 8) which is fixed relative to frame member 78. The check pawl 209 is proportioned for engaging between the teeth of ratchet wheel 206 and for restraining or preventing ratchet wheel return (counterclockwise with respect to FIG. 9) while permitting clockwise motion of the ratchet wheel 206 in consequence of the feeding movement of pawl 208. Therefore, the check pawl 209 is adapted for preventing movement of carriage 54 toward line start position (to the left with respect to FIG. 4) though permitting carriage movement for spacing. A torsion spring 239 (FIG. 8) urges the check pawl 209 into holding engagement with the rachet wheel 206. It becomes tensioned as the check pawl 209 moves outwardly and slides over the ratchet teeth during feeding movement. However, it draws the check pawl 209 into ratchet holding engagement as the feed pawl 208 rocks in its reverse mode.

To enable carriage return to its line start station, a rockably mounted pawl kickout member or stripper 244 is aligned with the lower end portions of arm 207 and the check pawl 209. The stripper 244 comprises a lower end extension of a lever 245, and is responsive to a function solenoid 246 (FIGS. 8, 9, and 10) whose power stroke is up (with respect to FIG. 10). The arrangement is such that as lever 245 is rocked counterclockwise (from its position of FIG. 9), the stripper 244 will engage arm 207 and check pawl 209 and move

them a distance sufficient to prevent their engagement with ratchet wheel **206**, thereby permitting carriage return to its line start position.

Function solenoid **246** is mounted in a bracket **247** (FIG. **8**). The bracket **247** is secured to tie **79** and upper frame member **78** by a plurality of fasteners **248**. The plunger **249** of said solenoid **246** is connected by a pivot **250** to one end portion of a straight arm **251**, the arm **251** being connected at its other end portion by a pivot **252** to a medial extension **253** of lever **245** whose main portion is spaced from arm **251**. A pivot **254** for lever **245** is disposed such that upon energization of solenoid **246**, said lever **245** will be rocked clockwise (relative to FIG. **10**) to its kick-out or stripping position.

The upper end portion of the lever **245** is connected by a pivot **256** to an interposer **258** fashioned as an arm. Accordingly, the interposer **258** will be driven to the right (relative to FIG. **10**) during the power stroke of solenoid **246**. A rod **260** carried from interposer arm **258** is proportioned and arranged such that upon energization of said solenoid **246**, the interposer rod **260** will move into alignment with a striker **262** (dotted line position of FIG. **9**). The striker **262** rocks responsively to solenoid **240** as it is carried from an extension **263** of lever **234**. The rod **260** and the striker **262** are proportioned such that as lever **234** rocks counterclockwise (relative FIG. **9**) when the interposer rod **260** is in said dotted line position, the rod **260** will be driven downwardly, thereby to rock arm **258** counterclockwise. In the absence of the movement of the interposer **258**, however, when solenoid **240** is actuated, the striker **252** is ineffective for any purpose. Accordingly, energy of solenoid **240** is shunted to arm **258** only when the function solenoid **246** has been energized.

A barrel roller or bearing **264** carried on an outer end portion of arm **258** rides on a medial extension **266** of a line feed lever **267**. A body portion of the line feed lever **267** is disposed transversely of the medial extension **266** and has one end portion connected about a fixed pivot **268** (FIG. **8**) and an opposite end portion pivotally connected, as indicated by the numeral **269'**, to the lower end portion of a line feed pawl **270**. The roller **264** is proportioned and arranged for sliding alternately to the left and to the right (with respect to FIG. **9**) on extension **266** during each cycle of solenoid **246**. It is also adapted to drive downwardly against extension **266** upon actuation of rod **260** by striker **262** for rocking lever **267** counterclockwise (relative to FIG. **8**).

Pawl **270** has an operative relationship with a ratchet **272** such that when function solenoid **246** is actuated, said pawl **270** will be drawn downwardly and into driving engagement with the teeth of said ratchet **272**. The ratchet **272** is incrementally rotatable being secured on shaft **27**, the parts being proportioned such that for each stroke of the pawl **270**, the ratchet **272** will move an angular distance equal to the displacement of web **42** one line in a downstream direction.

Pawl **270** has a follower surface **269** (FIG. **8**) for movement along an arcuate surface of a fixed roller cam **271**. The center of the cam **271** is spaced from an anchoring extension **273** on the pawl **270** to which one end of a pawl expansion spring **274** is anchored. A toggle type arrangement of the parts generates maximum spring tension when the cam center and extension **273** are most widely spaced; pawl **270** then being in "centered" position. In a first of its over center positions, the pawl **270** is biased into operative engagement with ratchet **272**. In its second over center position (FIG. **8**), pawl **272** is biased out of ratchet engagement. The power and return strokes of solenoid **246** are adequate to overcome maximum tension of spring **274**. In consequence, upon energization of said solenoid **246**, the pawl **272** will move to its first over center or line feed position; and upon deenergization of said solenoid **246**, the pawl **272** will be rocked out of ratchet engagement and move into its second over center position.

A check pawl **276** (FIG. **8**) is rockable about a fixed pivot **278** and has a lower extension **280** fashioned with a hook **281**. An expansion spring **282** anchors in said hook **281** and biases the check pawl **276** toward ratchet **272**. The pawl **276** is proportioned for engaging between the teeth of said ratchet **272** and for preventing counterclockwise ratchet movement (relative to FIG. **8**). It is also proportioned for slipping over the ratchet **272** to permit ratchet movement for line feeding of web **42**. The foregoing arrangement permits manual adjustment of platen **26** by rotation of knob **24** clockwise with respect to FIG. **8**.

Though the power stroke of solenoid **246** is effected against the action of a restoring spring **283** (FIGS. **8** and **10**), further damping to minimize noise may be required. To that end, plunger **249** has a head **284** with a conically tapered neck **286**. Dampening means comprising an O-ring **290** (FIG. **11**) is disposed about the neck **286** in engagement with a shoulder **288** which defines an opening **291** in the solenoid assembly in which plunger **249** is reciprocative. The parts are proportioned such that the compression force of the O-ring **290** matches the force of the power stroke of the solenoid **246** at about the time head **284** would tend to engage the frame **289** of solenoid **246**.

Carriage return means comprises a coil or clock spring **292** (FIG. **4**) having an end portion **293** which extends through a curved guide **295** and is rigidly secured relative to the left side of upper frame member **78**. The guide **295** extends between the left end portions of rails **56** and **57** and is rigidly secured by any suitable means to the left side of the upper frame member **78**. The spring **292** has another end portion **297** journalled on post **296** about which the spring **292** is coilable. The post **296** in turn is secured to carriage **54** transversely of said rails **56** and **57**. Thereby, as the carriage **54** moves toward its line start station, the spring **292** will coil. As it moves in an opposite direction, the spring **292** will uncoil and become tensioned for carriage return.

A bridge **300** which extends transversely of rails **56** and **57** has a pair of rail passing apertures **301** and **302** (FIG. **8**). An abutment pad **304** is secured to the right hand surface of the bridge **300** medially of the apertures **301** and **302** in alignment with bumper **62** (FIG. **1**). A pneumatic cylinder **306** having an axis extending longitudinally of said rails **56** and **57** has a right end portion which is secured to the left surface of said bridge **300**. The cylinder **306** has a left end portion through which its plunger **308** projects longitudinally of said rails **56** and **57**, the outer end portion of said plunger **308** being rigidly secured by suitable means to the left side of upper frame member **78**.

Bridge **300** and cylinder **306** are movable longitudinally of the rails **56** and **57** to the left (with respect to FIG. **4**) against the action of a compression spring **310**.

The spring 310 is disposed about the cylinder 306 and plunger 308 with its left end bearing against upper frame member 78 and its right end bearing against bridge 300. The arrangement damps the force of carriage 54 upon return (when ratchet wheel 206 is released). A retainer 312 (FIG. 8) arranged on rail 57 limits rebound movement of cylinder 306 (to the right relative FIG. 4) as a result of decompression of spring 310 following carriage return.

Ink supply and ribbon control means 64 of the exemplary embodiment is associated with a sheave or pulley wheel 314 (FIGS. 14 and 16) which is mounted for rotation in a horizontal plane. The agency for rotation comprises a ball-bearing ring 319 having an outer race rigidly connected to the pulley wheel 314 and an inner race secured to an immobilized cylindrical bushing 318. The bushing 318 projects vertically through plate 144 and defines an axis of rotation for the pulley 314.

A radial flange 317 of the bushing 318 is rigidly secured to the upper surface of plate 144; and an internally threaded tube 316 is mounted for rotation in the bore of bushing 318. A horizontal mounting plate or flange 322 is rotatable against the upper surface of flange 317 and is tied to the tube 316 for rotation therewith by a screw 320.

Plate 322 has a plurality of vertical holes 324 adapted for receiving the plurality of pins 326 which depend from a lower horizontal flange 328 of a releaseably mounted assembly of an inking roller 330. In consequence, the inking roller 330, which, in the exemplary embodiment, is impregnated with printing ink, is rotatable above the surface of plate 144 for supplying endless ribbon 160, with ink by capillary transfer during printing.

Lineal movement of the carriage 54 during carriage spacing is translated into rotation of the inking roller 330 through the agency of a cable 360 (FIGS. 4 and 14) which has a medial portion frictionally coiled about pulley wheel 314. A left hand portion 362 (relative to FIG. 4) of the cable 360 is secured to the upper frame member 78 by a fastener 364; and a right hand portion 366 thereof is connected to one end portion of an expansion spring 368 whose opposite end portion is connected to the right side of the upper frame member 78. Thereby, upon movement of carriage 54 in opposite linear directions, pulley wheel 314 will rotate in opposite angular directions about bushing 318.

Means for transmitting pulley wheel (314) torque to the inking roller 330 during carriage spacing and correlatively for isolating the torque of pulley wheel 314 from ink roller 330 during carriage return comprises a clutch (FIGS. 14 and 17) characterized by a ratchet 370 fashioned on the lower face of flange 372 of pulley wheel 314. Pawl means 374 having a plurality of angularly spaced apart dogs 376 is rigidly secured by a fastener, herein shown as a screw 378 to tube 316 and accordingly to plate 322. In the exemplary embodiment, as carriage 54 spaces (moves incrementally to the right with respect to FIGS. 4 and 14), the pulley wheel 314 and the ratchet 370 move in the direction of arrow 380 (FIG. 17). The parts are fashioned, arranged and proportioned such that as the ratchet 370 moves in such last direction (380), dogs 376 will be in driving engagement with the ratchet 370 and accordingly plate 322 will be positively tied to pulley wheel 314 for moving inking roller 330. However, when rotation of the ratchet 370 is in an angular direction opposite arrow 380, the ratchet 370 will slip, which is to say that the dogs 376 will be cammed over the ratchet 370 by its teeth and accordingly the pulley 314 will slip and its torque will not impinge on plate 322. As a result, during carriage (54) return, the inking roller 330 will not rotate.

Inking ribbon 160 and inking roller 330 are included in disposable cartridge 66 having a substantially rectangular plastic case 332. A plastic base 334 of the case 332 is proportioned to fit within the depending sides 335 of a transparent plastic cover 333 of said case 332. The cover 333 has a dome 352 (FIGS. 1 and 14) to accommodate sensing means 382 to be hereinafter described. The inking roller 330 and the ribbon 160 are disposed above the base 334 and within said cover 333. The base 334 has an opening 336 through which flange 322 projects to enable mounting of the inking roller 330; and it also has a plurality of perimetric upturned base flanges 337 which rigidify the base 334.

A plurality of vertical plastic ties 338 (FIGS. 15 and 16) have reduced upper end portions 344 which are rigidly secured to the top of case 332, for example, by welding or the like. Base 334 is releaseably secured to the cover 333 by ends 346 of ties 338. These ends 346 are spring-like or resilient, being split; and they are force fit through openings in base 334, and when assembled, extend beyond the lower edge 339 of cover 333. They are proportioned for force fit through aperture 345 (only one of which is shown in FIG. 15) in the mounting plate 144 for releaseably securing cartridge 66 thereto.

A pinch or pressure roller 340 (FIGS. 13 and 14) is mounted distal from platen 26 for rotation about a vertical axis member or pin 341 at one of the corners of case 332 adjacent inking roller 330. A guide roller 342 mounted at the other distal corner of the case 332 is rotatable about a vertical axis pin 343. A pair of route rollers 347 and 348 are mounted at opposed platen proximate corners of case 332. These last rollers 347 and 348 are rotatable about vertical plastic axis pins 349 and 350, respectively.

Ribbon 160 is trained about inking roller 330, guide roller 342, and the route rollers 347 and 348 is adapted for movement in a circuit defined thereby. Ribbon driving force is imparted by roller 330 against which the ribbon 160 is maintained in driving association by pinch roller 340.

A plastic axis member 355 (FIGS. 13 and 16) for the inking roller 330 depends from the top of cover 333 to which the axis member 355 is rigidly secured by welding or the like, said axis member 355 terminating short of base 334 and over the opening 336. Axis pins 343, and 349 are also secured to the top of cover 333 and at the opposite ends are rigidly secured to base 334 by means such as heat welding or the like. On the other hand, axis pins 341 and 350 are not secured to the cover 333. This last arrangement permits rollers 348 and 340 to be resiliently mounted for maintaining suitable tension on ribbon 160, and ribbon driving pressure on ink roller 330, respectively.

The resilient mounting is achieved by cutting base 334 away as at 351-351 (FIG. 13) to adjoining upturned flanges 337 such that a pair of resilient or flexible frame sections 353 and 354 are provided. The lower end portion of axis pin 341 is rigidly secured in an extension 356 from frame section 353; and similiarly

the lower end portion of axis pin **350** is rigidly secured in a base extension **358** from frame section **354.**

The parts are proportioned such that proximate course **359** (FIG. **13**) of ribbon **160** may be disposed between belt **156** and the platen **26.** Moreover, the entire belt **156,** impactor **158** and sprocket wheel **152** are proportioned for disposition within the ribbon circuit.

For management of belt **156** for printing, a detectable member, which may be magnetically permeable, such as a soft iron slug **381** (FIGS. **12, 13,** and **18**), is set into belt **156** and preferably occupies a space having the same dimensions as a space taken by a die **157.** Sensing means **382** for said slug **381** are supported above mounting plate **144** from inner ends of a pair of arms **384** having outer ends which are secured by fasteners such as screws **385** to said mounting plate **144.** Each of a pair of substantially identical C-shaped transformer cores **386** and **387** (FIG. **18**), and comprising said sensing means **382,** has an identical primary welding **388** and identical secondary winding **389.** The primary windings **388** are connected in parallel (FIG. **19**) and to input lead means **390** of circuit **383.** The secondary coils **389** are series opposing, being connected to output lead means **391** in circuit **383.** The cores **386** and **387** are supported such that the opposed ends of core **387** are disposed in vertical alignment above and below belt **156,** the opening between said core ends defining a sensing station **392.**

As a result of the foregoing arrangement, an input from lead means **390** through coils **388** will produce like, though opposed, signals in the secondary coils **389** which will cancel and produce zero output in lead means **391,** except when the belt **156** is positioned in its path such that slug **381** is disposed at station **392.** This last belt position is referred to as the home position of belt **156.**

OPERATION OF THE EXEMPLARY EMBODIMENT

Included in circuit **383** is a code converter **394.** This is fed by serial line signals over a conductor **393** to a storage of serial line signals to a parallel output. The converter **394** generates parallel signals representative of a succession of characters to be reproduced from the line signals. The code converter **394** may be of known construction and is adapted for generating for each character in succession a plural (herein six) level encoded output. Such output is imposed through parallel lead means **395** on a plural (six) level adder **396.** Each condition of an up-down counter **398** represents a corresponding circuit condition of belt **156;** and said up-down counter **298** is adapted to generate a plural (six) level encoded output characteristic of a die **157** then in printing position or at a printing station preparatory to image transfer. Such last encoded output is imposed upon the adder **396** through parallel lead means **397** and is algebraically added (or compared) in the adder **396** with the encoded output representative of the character to be reproduced and received by the adder **396** from the code converter **394.**

Only while the outputs from code converter **394** and counter **398** simultaneously are different, adder **396** will produce simultaneously a pair of operating signals through a pair of common leads **399** and **403.** The operating signal through lead **399** provides (*a*) an input through lead **401** for conditioning the drive of motor **146** for driving and (*b*) an input through lead **402** conditioning counter **398** for counting. The operating signal through lead **403** is imposed on counter **398** through a lead **404** and upon a drive of motor **146** through a lead **405.** The last signal is a directional and governs the direction of rotation of stepping motor drive and accordingly the direction of counting. In consequence of the directional signal, the speed with which a die **157** is aligned for printing is enhanced over a condition in which belt **156** is driveable only in one angular direction from any instantaneous position to an ensuing position.

When the encoded outputs of converter **394** and counter **398** match the operating signals through common leads **399** and **403** will cease with consequent termination of motor drive and counting. The parts are arranged such that a die **157** corresponding to a character to be reproduced then will be disposed at the printing station.

Simultaneously with a character available signal at the code converter **394** a corresponding signal is produced over a lead **406** to printing solenoid **186,** said last signal being suitably synchronously delayed by known means (not shown) until a desired die **157** is aligned at the printing station. Thereupon, striker **182** (FIG. **12**) will drive against follower **180** causing printing movement of impactor **158** from the dotted to the solid line position (FIG. **13**) driving the selected die **157** against ribbon **160** for impactingly producing a corresponding image on a portion of web **42** then aligned with such die **157.**

Also simultaneously with a character available signal, code converter **394** generates another output, synchronously delayed by means (not shown), which energizes spacing solenoid **240** through a lead **407.** Ensuingly, (provided there has been no carriage return signal) pawl **208** will be rocked while in engagement with ratchet **206** to rotate shaft **204** for driving sprocket wheel **196** (FIG. **4**); and accordingly, pulley belt **170** will be driven incrementally and carriage **54** will move one space to the right (with respect to FIG. **4**) against the action of restoring spring **294.** Simultaneously ribbon **160** will be incrementally driven.

Code converter **394** is adapted to produce a distinctive character return encoded output over parallel lead means **395** in response to a carriage return signal. Such distinctive character return encoded output is effective for driving belt **156** to its home position (in which slug **381** is disposed at station **392**). The arrangement of parts is such that when slug **381** is in such home position, counter **398** registers zero.

In response to a carriage return signal, code converter **394** generates yet another output, following a synchronous delay, by known means (not shown), the last output being imposed over a lead **408** for energizing function solenoid **246.** Moreover, in a proper time sequence, in response to such carriage return signal, spacing solenoid **240** also is energized through lead **407.** Resultantly, armature **251** (FIG. **10**) is drawn inwardly and stripper **245** is rocked a distance sufficient to cause pawls **208** and **209** to disengage ratchet wheel **206** and prevent the related power stroke of spacing solenoid **240** from advancing carriage **54.** Instead the power of such last stroke will be shunted, through interposer **258** to lever **267** for driving pawl **270** downwardly a distance sufficient to feed web **42** downstream one line.

Should counter **398** have an output which corresponds to the home position of belt **156** following receipt of a carriage return signal, when in fact slug **381** is not disposed at home station **392,** (in consequence of some malfunction) the error is attended by homing means including a conventional logic circuit **409.** The logic circuit **409** receives a carriage return signal from code converter **394** by way of a lead **410.** It is adapted to receive a signal from adder **396** over a wire **411,** when adder **396** is in a driving mode. Upon absence of a signal in wire **411,** when a carriage return signal has been received over lead **410,** the logic circuit **409** will consider the nature of the output of sensor **382** over lead means **391.** If such last output discloses that slug **381** is not at station **392** (as would be the fact in the presumtive situation), the logic circuit **409** will generate an output over lead **412** for driving motor **146.** This driving condition will continue until the sensor output indicates that slug **381** is disposed at station **392,** at which time motor driving output over lead **412** will terminate.

The logic circuit **409** is employed upon the initial setting of circuit **383.** That is to say, by means (not shown) when the switch controlled by manual member **28** is moved to an "on" condition, a carriage return signal is generated. A chain of effects from such signal, and which have heretofore been described in connection with carriage return or line feed function, ensues, whereby the belt **156** is moved to home condition and counter **398** is set at zero.

In the event line feed is required and no carriage return signal is present in the intelligence being reproduced, carriage **54** is prevented from being overdriven by a switch **414** (FIGS. **4** and **18**) which is mounted on the right side of upper frame member **78** in line with the leading end **416** of carriage **54.** When this switch **414** is carriage actuated, it produces a carriage return signal in consequence of which the heretofore described carriage return chain of events occurs.

As many modifications in the described construction could be conceived, and as many widely different embodiments could be made without departing from the spirit and scope of the claims, it is intended that all matter contained in the accompanying specification shall be considered as illustrative only and not in a limiting sense.

I claim:

1. An impact printer comprising:

an endless belt disposed in a circuit and having a plurality of printing dies spaced apart longitudinally of the circuit;

impacting means mounted for successively urging said belt into a printing mode at successive printing stations;

means for moving said belt circuitously for successively aligning selected dies with said impacting means for printing;

means for translocating said belt and impacting means simultaneously to successive printing stations;

means for replaceably supporting a web coil;

means for spending the web from said coil successive line spacing distances;

a reciprocative member having a lineal power stroke; and

means for selectively impinging force of said power stroke on said translocating means and said spending means for selectively spacing said belt and feeding said web a line at a time.

2. A printer according to claim **1** further characterized by printing ink supply means including an endless ribbon having a segment disposed adjacent said web and a die aligned for printing, and means for driving the ribbon in a circuitous path responsively to translocation of said belt and said impacting means.

3. A printer according to claim **2** wherein said translocating means comprises a carriage supportingly associated with said belt and said impacting means, said carriage having a place of beginning at the start of printing of a line of intelligence and a terminal station at end of printing of a line of intelligence, and characterized by means for returning said carriage from said terminal station to said place of beginning.

4. A printer according to claim **3** further characterized by means for disabling said driving means as said carriage returns.

5. A printer according to claim **4** characterized by a cartridge releaseably mounted on said carriage and including said ribbon and said driving means.

6. A printer according to claim **1** wherein said translocating means comprises a carriage supportively associated with said belt and said impacting means, a rotatably mounted ratchet coupleable to said power stroke for moving said carriage, and a pawl connected to said reciprocative member for rotating said ratchet, and wherein said selective impinging means includes a rockable member aligned with said pawl for disabling said translocating means.

7. A printer according to claim **6** wherein said selective impinging means also includes an interposer connected to said rockable member, said interposer having first and second positions in which said power stroke is coupled to and uncoupled from said moving means.

8. A printer according to claim **7** characterized by a solenoid operatively connected to each said reciprocative member and said rockable member.

9. A combination according to claim **1** wherein said reciprocative member has a return stroke following each lineal power stroke and characterized by:

means for increasing the force imposed on said reciprocative member as it moves through said lineal power stroke; and

means for transmitting the force of said reciprocative member to said translocating means uniformly during said lineal power stroke.

10. A combination according to claim **9** wherein said increasing means is a solenoid.

11. A combination according to claim **9** wherein said transmitting means comprises:

an arm having a moment coupled to said translocating means and rockable between a carriage spacing phase and a return phase; and

means for shortening the said moment as the force imposed on said reciprocative member increases.

12. A combination according to claim **11** wherein said shortening means comprises:

a lever connected to said reciprocative member and rockable responsively thereto; and

a cam arranged for movement longitudinally of said moment arm in response to rocking of said lever.

13. A combination according to claim **12** wherein said arm is mounted for rocking in a carriage spacing phase and in a return phase corresponding to the condition of said reciprocative member; and said cam is car-

ried from said lever in sliding engagement with said arm for impinging thereon the force of said reciprocative member at the position of engagement thereof.

14. A printer comprising:

a framework having opposed lateral sides;

a carriage mounted for movement from side to side of said framework between a place of beginning and a carriage return station;

a spring connected to said carriage for tensioning upon carriage movement from said place of beginning toward said carriage return station for restoring said carriage to said place of beginning;

an endless printing belt mounted on said carriage in a circuitous path for translocation to successive printing stations and having a plurality of dies carried longitudinal of said path, said printing belt arranged for movement independently of said carriage;

means for supporting a web for image transfer adjacent said belt;

a stepping motor mounted on said carriage for driving said printing belt and aligning a selected die with the web;

an endless ribbon having a segment arranged for disposition between a selected die and the web;

a driveable sprocket wheel mounted on said framework, and a driven belt associated with said sprocket wheel for moving said carriage a space at a time from said place of beginning to said carriage return station;

means for driving the ribbon circuitously responsively to movement of said carriage a space at a time;

a first ratchet wheel associated with said sprocket wheel for moving said carriage;

a second ratchet wheel connected to said supporting means for feeding a web a line at a time;

first solenoid operated means in impacting association with said printing belt for driving each selected die into engagement with said ribbon for image transfer to said web;

second solenoid operated means drivingly associated with said first ratchet wheel for spacing said carriage following image transfer; and

third solenoid operated means for shunting the power of said second solenoid operated means away from said first ratchet wheel to said second ratchet wheel following movement of said carriage to said carriage return station.

15. A printer according to claim **14** wherein said second solenoid operated means comprises a feed pawl rockably mounted for movement through a spacing condition in which said first ratchet wheel is driven a selected angular distance for spacing said carriage and a reverse condition in which said feed pawl slips relative to said first ratchet wheel, and characterized by a check pawl having a ratchet wheel holding condition for preventing carriage return while said feed pawl is in said reverse condition and a slipping condition relative to said first ratchet wheel while said feed pawl is in said spacing condition.

16. A printer according to claim **15** wherein said second solenoid operated means also includes:

a solenoid actuated first lever;

a shaft mounted for rotation, said first ratchet wheel and said sprocket wheel mounted about said shaft; and

a link mounted about said shaft and rockably associated with said lever, said feed pawl connected to said link and rockable thereby between said spacing and reverse conditions.

17. A printer according to claim **16** wherein said third solenoid operated means comprises a solenoid actuated second lever having a stripper aligned with said feed pawl and said check pawl, and an interposer; and wherein said second lever has a first condition in which said feed pawl and check pawl are conditioned for spacing said carriage and a second condition in which said stripper prevents engagement of said first ratchet wheel and said pawls and said first lever has a striker aligned with said interposer when said second lever is in its second condition for moving said second ratchet wheel to line feed a web.

18. A printer according to claim **14** characterized by:

means for generating electrical effect according to an image to be transferred to a web;

counting means for generating output corresponding to a die aligned for image transfer; and

means for comparing said electrical effect and said output to produce a signal for driving said stepping motor until said output matches said electrical effect.

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