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Denley

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[54] **INK RIBBON MECHANISM AND CARTRIDGE FOR IMPACT PRINTERS**

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

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Related U.S. Application Data

[62] Division of Ser. No. 153,312, June 15, 1971, Pat. No. 3,793,951.

[52] **U.S. Cl.** **197/168**

[51] **Int. Cl.²** **B41J 33/26**; B41J 33/04

[58] **Field of Search** ..... 197/151, 153 R, 153 A, 197/168, 171, 175

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[57] **ABSTRACT**

An endless ink ribbon is mounted in a cartridge for linear movement with respect to a print head also mounted within the cartridge and typically comprising a small belt printer used in a mobile teleprinter system. The cartridge is detachably mounted on a printer carriage, and an inking roller rotatably mounted in the cartridge is coupled to carriage movement when the carriage moves from a line-start position to a carriage-return position, for driving the ribbon. A clutch uncouples the inking roller during carriage-return to the line start position. The cartridge includes a cover disposed above the ribbon, a base disposed below the ribbon and having an aperture through which the roller is driven, and a plurality of ties for releaseably securing the cover to the base.

9 Claims, 6 Drawing Figures

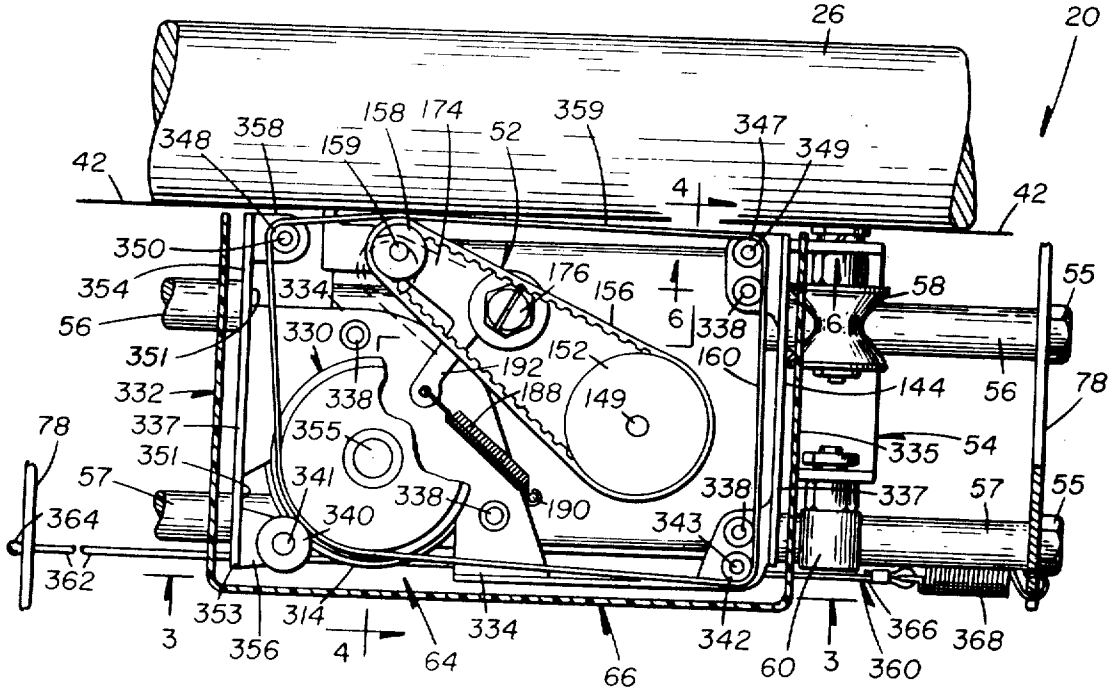
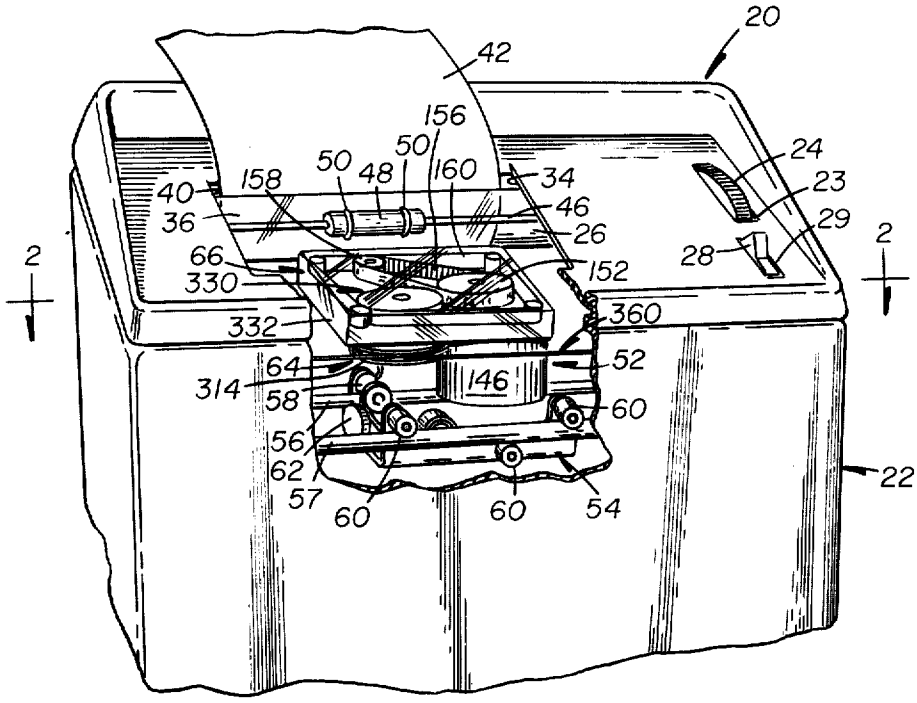


FIG. 1



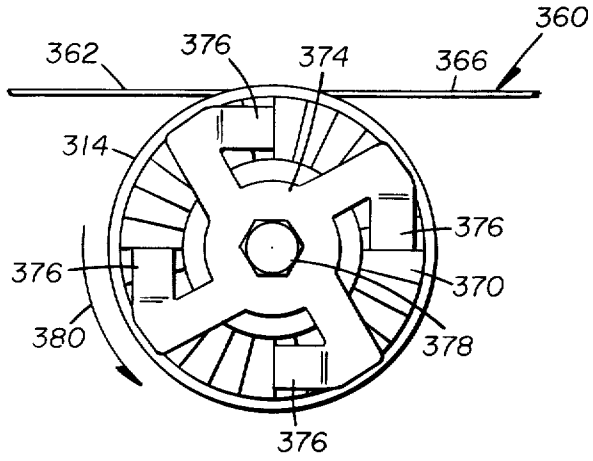


FIG. 5

FIG. 6

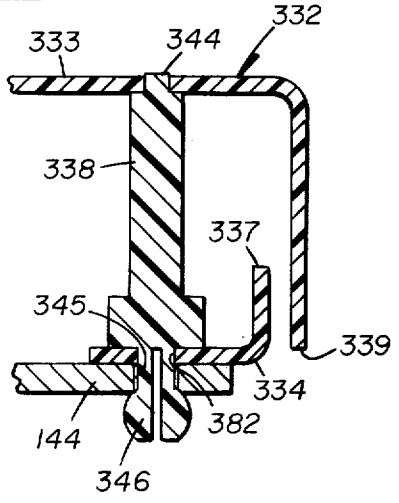


FIG. 2

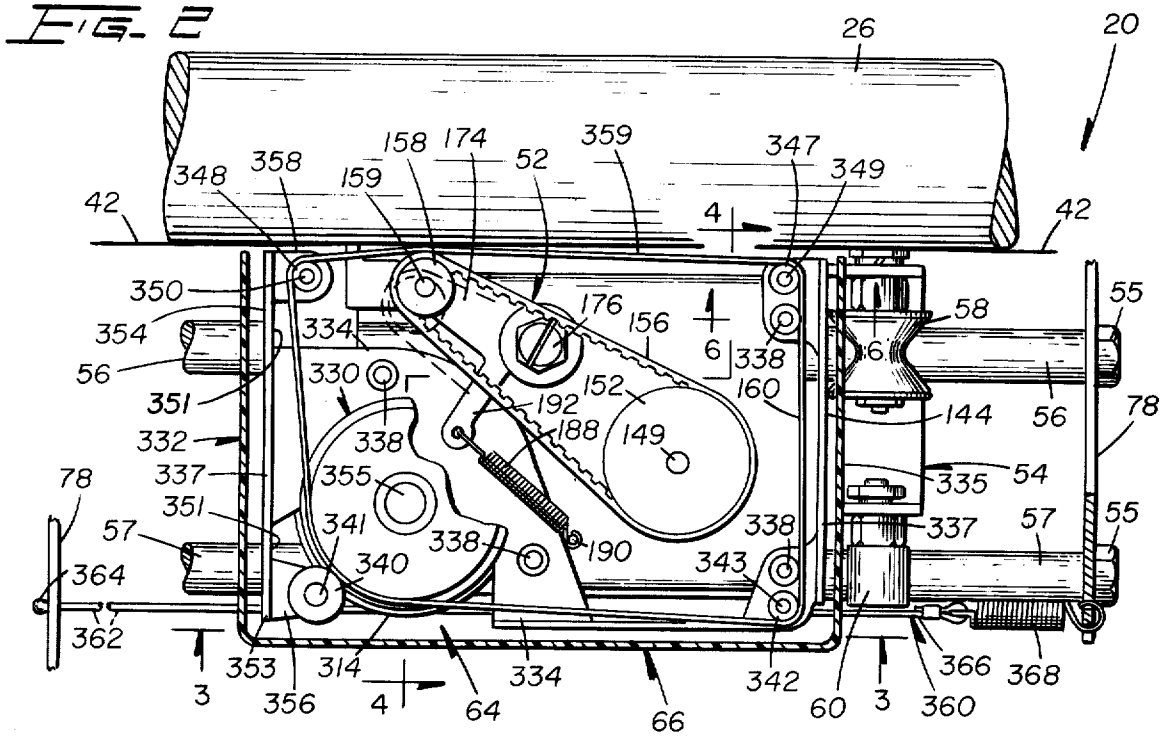


FIG. 3

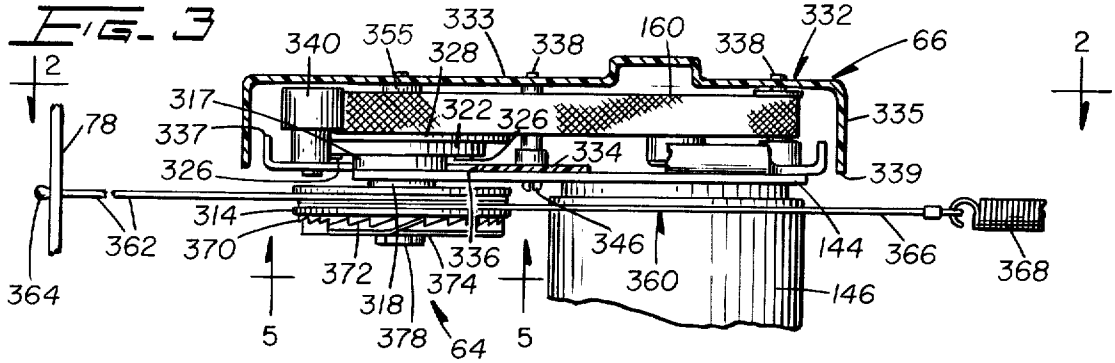
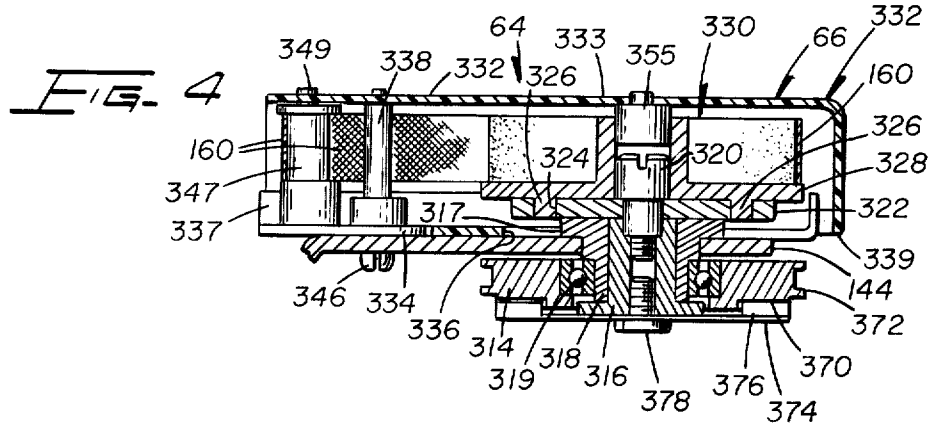


FIG. 4



INK RIBBON MECHANISM AND CARTRIDGE FOR IMPACT PRINTERS

CROSS REFERENCE TO RELATED APPLICATION

This application is a division of my copending application, Ser. No. 153,312, filed June 15, 1971 now U.S. Pat. No. 3,793,951 issued Feb. 26, 1974.

FIELD OF THE INVENTION

The present invention relates generally to inking ribbon systems for printing mechanisms, and particularly to ribbon systems for mobile belt printer installations such as are described in my parent application cited above.

BACKGROUND

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, such as automobiles and particularly 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, especially for use in 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 particularly pertinent to this application relate generally to an improved ribbon and inking mechanism, mounted in a disposable cartridge and assembled with a small print head.

SUMMARY OF THE INVENTION

With the foregoing and other objects in view, an inking system in accordance with this invention is used with an impact printer wherein an impactor is movable into and out of a printing position and is supported on a carriage arranged for reciprocation between line-start and carriage-return positions. An endless inking ribbon is driven in a circuitous path when the carriage moves in a forward or printing direction, for aligning successive ribbon segments with the impactor for printing, and includes a mechanism for inking and driving the ribbon in response to carriage movement. The ribbon is mounted in a cartridge, which includes a cover member disposed above the ribbon and secured by a plurality of ties to an apertured base, which is supported by the cover below the ribbon. A rotatable member disposed within the cartridge is adapted for inking and driving the ribbon, and it is connected to a power source selectively driven by the carriage, through the aperture in the case.

Other objects, advantages and features of the invention will be apparent from the following detailed description to a specific embodiment thereof, when taken in conjunction with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing, FIG. 1 is a perspective view of a belt printer, including an ink supply system in accordance with the present invention, portions of the printer housing being broken away to illustrate details of construction;

FIG. 2 is a top plan section showing a portion of the printer mechanism and a disposable ribbon cartridge for the printer. FIG. 2 is taken generally along the line 2—2 of FIG. 1, with portions omitted and with the top of the cartridge having been removed to illustrate details, as indicated by corresponding line 2—2 in FIG. 3;

FIG. 3 is a front vertical section through the cartridge, taken generally along the line 3—3 in FIG. 2;

FIG. 4 is a side vertical section along line 4—4 in FIG. 2, illustrating further details of the drive mechanism for an inking roller;

FIG. 5 is a bottom view taken according to the line 5—5 in FIG. 3, showing details of a clutch mechanism for selectively driving the inking roller; and

FIG. 6 is a detailed view of the portion of the ribbon cartridge according to the line 6—6 in FIG. 2.

DETAILED DESCRIPTION

Background and Printer Mechanism

Referring now in detail to the drawing and initially to FIGS. 1 and 2, portions of a mobile belt printer 20 are shown, as described in detail in my parent application, only the general features of which will be repeated herein for background in understanding the ink-supply mechanism of this invention and its association with the printing mechanism. The printer 20 includes an outer housing 22, having an aperture 23 through which a knurled knob 24 projects for manually controlling a platen 26 of the printer 20, and an on-off switch 28 which projects through another aperture 29 in the housing 22, for turning the printer 20 ON and OFF. The housing 22 further includes an elongated opening 34, in which a transparent tear shield 36 is mounted, which defines with the opening 34 a slot 40 for passing the upper end portion of a strip of paper or web 42, on which printing takes place, upward and out of housing 22.

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, which are arranged for holding the web 42 against the platen 26 in generally conventional fashion.

A printing mechanism, generally designated 52, is mounted on a carriage 54 arranged for reversible movement in a path extending laterally of printer 20, to the left and right in FIGS. 1 and 2, between a place of beginning or "line-start" station at the left of the housing 22 and a "line-end" or carriage-return station at the right of the housing 22. As described in the parent application, the carriage 54 and printing mechanism 52 are driven to the right across the web 42 to align the printing mechanism 52 with successive characters on the web 42, so that characters can be printed when print signals are received from the line. For this purpose, the carriage 54 is reciprocably mounted on horizontal guide rails 56 and 57, which are secured by fasteners such as 55 (FIG. 2) to spaced vertical frame members 78—78, mounted inside the housing 22 near the right and left end walls thereof. A plurality of rollers, such as 58 and 60, mount the carriage 54 recipro-

cably on the rails **56** and **57**, in generally conventional fashion. A bumper **62** (FIG. **1**) is mounted on the left side of carriage **54**, and is adapted with a dash pot (not shown) to dampen the force resulting from carriage return, as described in the parent application.

Ink supply and ribbon control means **64** in accordance with this invention, including a ribbon cartridge **66**, are mounted on the carriage **54** for movement with the printing mechanism **52**, as will be described in detail hereafter. The cartridge **66** is disposable, being releasably retained on carriage **54** by a mechanism which will be described in detail hereafter.

Referring to FIG. **3**, the carriage **54** includes a horizontal mounting plate **144**, on which the printing mechanism **52** and ink-ribbon cartridge **66** are mounted for movement with the carriage **54**. The printing mechanism **52** includes a stepping motor **146** (FIGS. **1** and **3**) suspended from the plate **144**, and having an output shaft **149** (FIG. **2**) extending above the plate **144**, for driving a sprocket wheel **152**. An endless flexible sprocket belt **156** is trained about the sprocket wheel **152**, and carries a plurality of uniformly spaced printing dies on its outer surface, as described in the parent application. The belt **156** is trained in a circuitous path in a horizontal plane, above the plate **144**, about the sprocket wheel **152** and a cylindrical impactor **158**. The impactor **158** functions as an idler sprocket for the belt **156**, and is arranged for rotation about a shaft **159**.

In the exemplary embodiment, each angular position of the belt **156** in its circuitous path corresponds to an angular condition of the motor **146**. Printing or image transfer is effected, a character at a time, while the carriage **54** is immobilized. Before each character is printed, the belt **156** is adjusted in its circuitous path to present a selected printing die at a printing station (opposite the inner or upper surface of impactor **158** in FIG. **2**) and at a predetermined angular position relative to and adjoining the impactor **158**. Then, the impactor **158** is driven toward the platen **26** (from the phantom-line position in FIG. **2** to the solid line position), for transferring the image of the die onto an aligned section of the web **42** through a segment of an inking ribbon **160** then disposed between the belt **156** and the web **42**, the ribbon **160** being mounted in the cartridge **66** adjacent to the belt **156** as will be described hereafter.

Means for driving the impactor **158** include an irregularly shaped lever **174**, which is rockably mounted on the plate **144** by a vertical pivot **176**. The impactor **158** is carried from an end portion of the lever **174**, so that the impactor **158** and the portion of the belt **156** entrained thereabout are rockable adjacent to the upper surface of the plate **144** and about the pivot **176** between the printing mode (solid line of FIG. **2**) and the non-print mode (phantom-line of FIG. **2**). The impactor **158** is operated by a "print" solenoid (not shown herein but described in detail in the parent application) against the action of a restoring spring **188**, which is connected between a fixed anchor **190** carried from the plate **144** and an extension **192** of the lever **174**.

Further details of the complete printer system, carriage drive system, line feed mechanism, paper supply mechanism, control circuits for operating, etc. are described in detail in the parent application.

Ink Supply and Ribbon Mechanism

This application concerns the ink supply and ribbon control means **64** for such a belt printer **20**, and the ribbon cartridge **66** used to mount the inked ribbon **160** and the belt printing mechanism, or print head, **52** in working relationship to each other and detachably on the carriage **54** to provide a small and compact print head and ribbon assembly for particular use in a mobile teleprinter as described in further detail in the parent application.

Referring now in detail to FIGS. **2–6**, the ink supply and ribbon control means **64** of the exemplary embodiment includes a sheave or pully wheel **314** (FIGS. **3**, **4** and **5**) which is mounted for rotation in a horizontal plane and is used both to ink the ribbon **160** and to drive the inked ribbon **160** with respect to the print head **52**, as the carriage **54** moves in the forward or printing direction, from left to right in FIGS. **2** and **3**. The agency for rotation comprises a ball-bearing ring **319** (FIG. **4**) 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 the mounting 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 the plate **144**; and an internally threaded tube **316** is mounted for rotation in the bore of bushing **318**. A horizontal face of flange **317** is tied to the tube **316** for rotation therewith by a screw **320**.

The flange **322** has a plurality of vertical holes **324** adapted for receiving a plurality of pins **326**, which depends from a lower horizontal flange **328** of a releasably 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 the plate **144** for supplying the endless ribbon **160** with ink by capillary transfer.

Linear 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. **2**, **3** and **5**), which has a medial portion frictionally coiled about pulley wheel **314**. A left-hand portion **362** (relative to FIGS. **2** and **3**) of the cable **360** is secured to the left-side frame member **78** by a fastener **364**; and a right-hand portion **366** is connected to one end portion of an expansion spring **368**, whose opposite end portion is connected to the right side frame member **78**. Thereby, upon movement of carriage **54** in opposite linear directions, the pulley wheel **314** will rotate in opposite directions about the fixed bushing **318**.

It is desired to transmit torque from the pulley wheel **314** to the inking roller **330** during only carriage spacing (left to right movement for printing), while isolating the torque of pulley wheel **314** from the ink roller **330** during carriage return to hold the ribbon **160** stationary at that time, so that fresh ribbon segments are advanced to the impactor **158** during the next carriage advance. For this purpose, a clutch (FIGS. **3** and **5**) is provided, characterized by a ratchet **370** fashioned on the lower face of a flange **372** on the pulley wheel **314**. Pawl means **374**, having a plurality of angularly spaced apart dogs or pawl segments **376**, is rigidly secured by a fastener, such as a screw **378**, to the tube **316** and accordingly to the flange **322**. In the exemplary embodiment, as the carriage **54** spaces (moves incrementally to the right with respect to FIG. **3**), the pulley wheel **314** and the ratchet **370** move in the direction of arrow

380 (FIG. 5). 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 the flange 322 will be positively tied to the pulley wheel 314 for moving the inking roller 330 to ink and advance the ribbon 160, as will be explained in detail hereafter.

However, when rotation of the ratchet 370 is in the angular direction opposite to that indicated by 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 be transmitted to the flange 322. As a result, during carriage return, the inking roller 330 will not rotate.

The inking ribbon 160 and roller 330 are included in the disposable cartridge 66, as generally described above, the cartridge 66 having a substantially rectangular plastic case 332 as illustrated in FIGS. 3, 4 and 5. A plastic base 334 of the case 332 is proportioned to fit within the depending sides 335 of transparent plastic cover 333 of said case 332. The inking roller 330 and the ribbon 160 are disposed above the base 334 and within the cover 333. The base 334 has an opening 336 (FIGS. 3 and 4) through which the 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. 5 and 6) have reduced upper end portions 344 which are rigidly secured to the top of the case 332; for example, by welding or the like. The base 334 is 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 382 in the base 334 and, when assembled, extend beyond the lower edge 339 of the cover 333. They are proportioned for force fit through apertures 345 (only one of which is shown in FIG. 6) in the mounting plate 144, for releasably securing the cartridge 66 thereto.

A pinch or pressure roller 340 (FIGS. 2 and 3) is mounted distal from platen 26, for rotation about a vertical axis member or pin 341 at one of the corners of the case 332 adjacent to the inking roller 330. A guide roller 342 is mounted at the other distal corner of the case 332 and is rotatable about a vertical axis pin 343. A pair of route rollers 347 and 348 are mounted at opposed platen-proximate corners of the case 332. These last rollers 347 and 348 are rotatable about vertical plastic axis pins 349 and 350, respectively.

The inking ribbon 160 is trained about the inking roller 330, the guide roller 342, and the route rollers 347 and 348 and is adapted for movement in a circuit defined thereby, as illustrated in FIG. 2. Ribbon driving force is imparted by the roller 330, as previously described, against which the ribbon is maintained in driving association by the pinch roller 340.

A plastic axis member 355 (FIGS. 2 and 4) for the inking roller 330 depends from the top of the cover 333, to which the axis member 355 is rigidly secured by welding or the like, the axis member 355 terminating short of the base 334 and the opening 336. Axis pins 343 and 349 are also secured to the top of the cover 333, and at their opposite ends are rigidly secured to the base 334 by means such as heat welding or the like. On the other hand, the axis pins 341 and 350 are not secured to the cover 333. This last arrangement permits the rollers 348 and 340 to be resiliently mounted, for maintaining suitable tension on the ribbon 160, and ribbon-driving pressure on the ink roller 330, respectively.

The resilient mounting is achieved by cutting base 334 away as at 351—351 (FIG. 2) from 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 the frame section 353; and similarly, the lower end portion of the axis pin 350 is rigidly secured in a base extension 358 from frame section 354.

The parts are porportioned such that the platen-proximate course 359 of the ribbon 160 (the upper course as viewed in FIG. 2) may be disposed between the printer belt 156 and the platen 26. Moreover, the entire belt 156, impactor 158 and sprocket wheel 152 are proportioned for disposition within the ribbon cartridge 66.

From the foregoing description, it will be apparent that this application relates to a compact and efficient construction for mounting the print mechanism 52, as well as the inking roller 330, ribbon 160, and ribbon drive system in the plastic case 332 to form the detachable cartridge 66, and for driving the ribbon 160 with respect to the printer belt 156 when the carriage 54 moves in the forward or printing direction, and to ink the ribbon 160 and advance it in timed relation to the belt 156 for printing.

While one particular embodiment of the invention has been described in detail hereinabove, it will be obvious that various modifications may be made from the specific details described, without departing from the spirit and scope of the invention.

What is claimed is:

1. In an impact printer wherein an inpactor is movable into and out of a printing mode and supported on a carriage arranged for reversible movement in a linear path to successive stations between line-start and carriage-return positions, the improvement comprising:
- an endless ribbon;
- means for driving the ribbon in a circuitous path for aligning successive ribbon segments with the impactor for printing;
- a pulley wheel mounted on the carriage and responsive to carriage movement for coupling the driving means to carriage movement;
- a pawl means connected to the driving means for enabling actuation of the driving means; and
- a ratchet connected to the pulley wheel for drivingly engaging the pawl means to actuate the driving means when the carriage moves in one direction, the pawl means being cammed over the ratchet as the carriage moves in the opposite direction thereby preventing actuation of the driving means.

2. A combination according to claim 1 wherein the driving means comprises a rotatable member coupled to the carriage and in engagement with the ribbon.

3. A combination according to claim 1 further characterized by:
- a framework for the printer; and
- a cord having opposed end portions connected to the framework and a medial portion coiled about the pulley wheel for enabling carriage movement to be translated into angular motion.

4. A combination according to claim 1, characterized by:

a cartridge, the cartridge including the ribbon, the driving means and a case disposed thereabout; and

means for releasably connecting the cartridge to the carriage.

5. A combination according to claim 4, wherein the case comprises:

a cover disposed above the ribbon and the driving means; and

a base having an opening exposing the driving means to the carriage.

6. A combination according to claim 1 wherein the pawl means comprises a plurality of angularly spaced segments and the ratchet is fashioned on a lower face of the pulley wheel, the ratchet and pawl means being arranged and proportioned so that as the carriage moves in one direction the pawl segments will be in driving engagement with the ratchet and so that when the carriage moves in the opposite direction the pawl segments will be cammed over the ratchet.

7. In combination with an impact printer of the type wherein an impactor is movable into and out of a printing mode and supported on a carriage arranged for reversible movement in a linear path to successive stations between line-start and carriage-return positions, an improved cartridge and ribbon mechanism, comprising:

an endless ribbon;

a case for the ribbon, including a cover disposed above the ribbon, a base and a plurality of ties secured to the cover for releasably supporting the base below the ribbon;

means for releasably mounting the case on the carriage;

means for driving the ribbon on a circuitous path for aligning successive ribbon segments with the impactor for printing;

means for coupling the driving means to carriage movement, the coupling means including a pulley wheel rotatably mounted on the carriage for translating carriage movement into rotational motion;

a first clutch element connected to the driving means for facilitating actuation of the driving means; and

a second clutch element connected to the pulley wheel for drivingly engaging the first clutch element to rotate the first clutch element and actuate the driving means to advance successive segments of the ribbon to the impactor when the carriage moves from the line-start to the carriage-return position, the first clutch element being cammed over the second clutch element to prevent actuation of the driving means and advance of the ribbon when the carriage moves in an opposite direction.

8. Apparatus as recited in claim 7, wherein the base includes an aperture and the driving means includes a rotatable member disposed within the cartridge for driving the ribbon, the rotatable member including a drive roller rotatably mounted on the cover in a position located over the aperture in the base and the ribbon being positioned in the case in driving engagement with the drive roller so that rotation of the drive roller causes movement of the ribbon along the circuitous path.

9. Apparatus as recited in claim 7, wherein:

the first clutch element is a pawl; and

the second clutch element is a ratchet.

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