United States Patent [19]

Bowers, Jr. et al.

[11] **3,805,698**

[45] **Apr. 23, 1974**

[54] **PRINT CARRIER AND TRANSPORTABLE CARTRIDGE FOR THE SAME**

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[73] Assignee: **Memorex Corporation**, Santa Clara, Calif.

[22] Filed: **Oct. 2, 1972**

[21] Appl. No.: **294,222**

Related U.S. Application Data

[62] Division of Ser. No. 21,464, March 20, 1970.

[52] **U.S. Cl.** ..... **101/111**, 101/93 C, 197/175

[51] **Int. Cl.** **B41j 7/32**, B41j 1/20

[58] **Field of Search** ..... 101/93 C, 111, 382 MV; 197/175, 168, 151; 24/230–231, 240–242; 242/197–199

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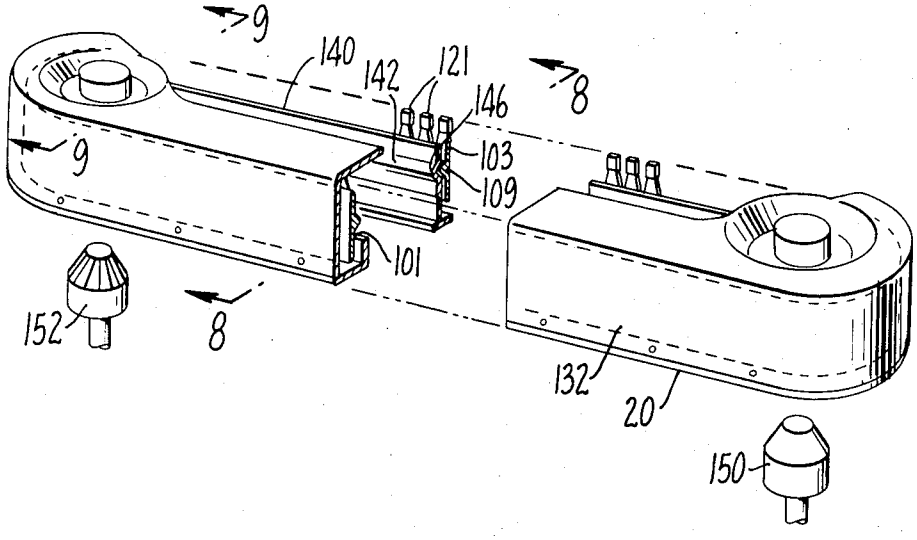
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Assistant Examiner—E. M. Coven
Attorney, Agent, or Firm—Limbach, Limbach & Sutton

[57] **ABSTRACT**

A print carrier for use in a chain printer apparatus which comprises an endless band with a plurality of printing fingers integrally formed with the band. Each of the printing fingers is provided with a print character. The band includes at least one integrally formed continuous strip portion, clocking means, and guide means. Desirably, the print carrier is utilized in a transportable cartridge assembly, which includes means for insuring proper print character alignment. The print characters can be made of plastic injection molded onto each of the print fingers.

6 Claims, 9 Drawing Figures



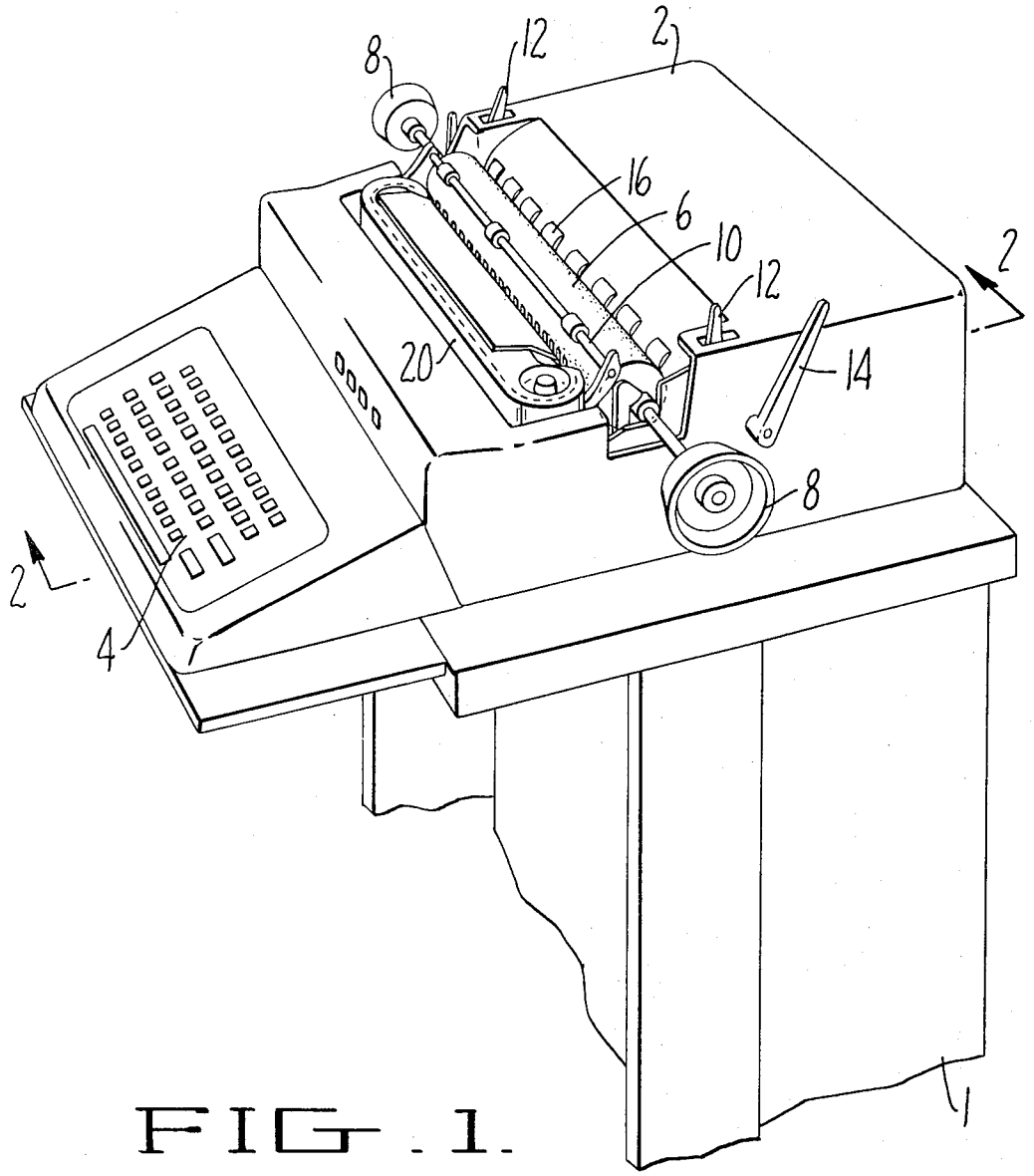


FIG. 1.

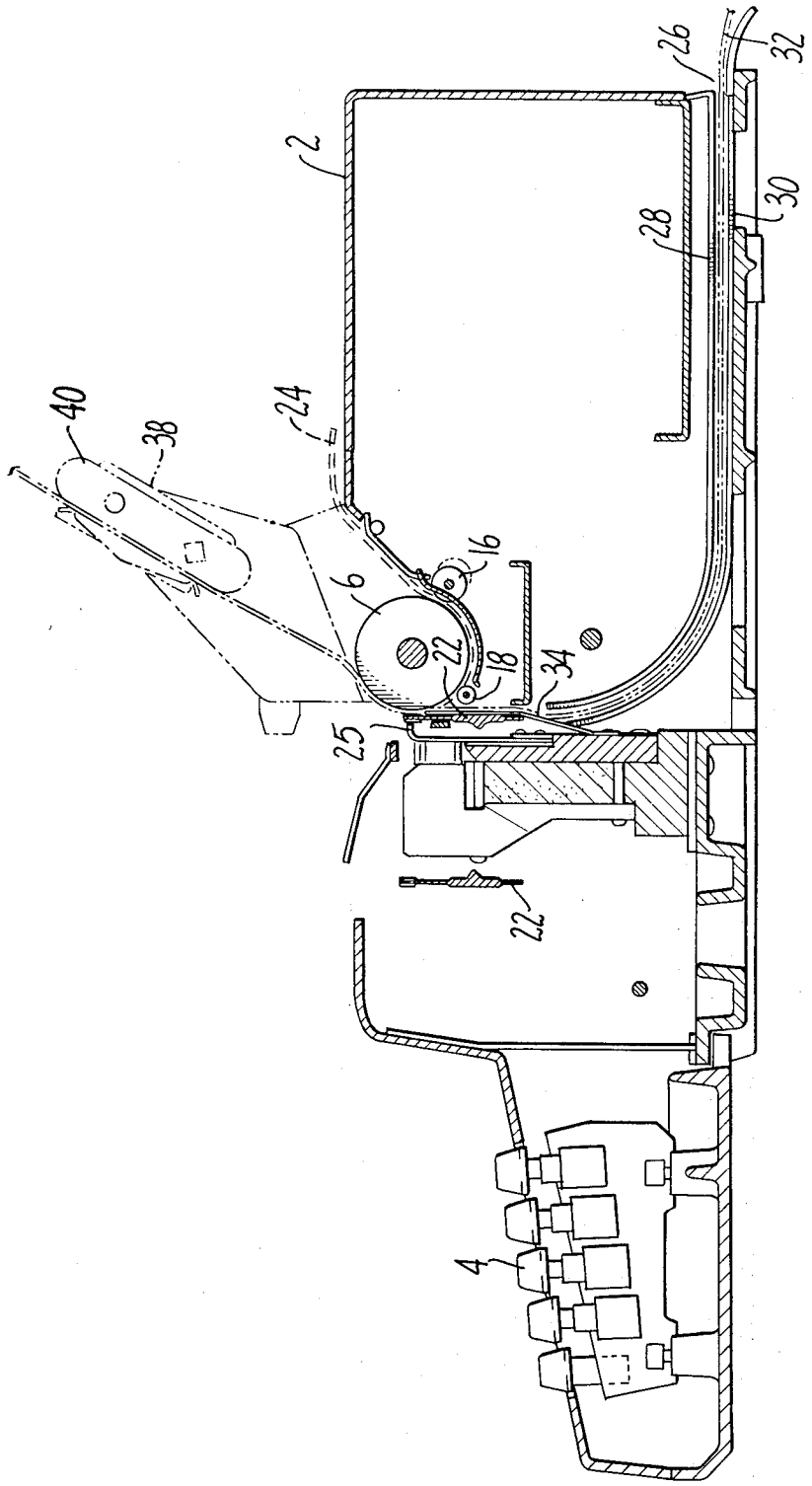


FIG. 2.

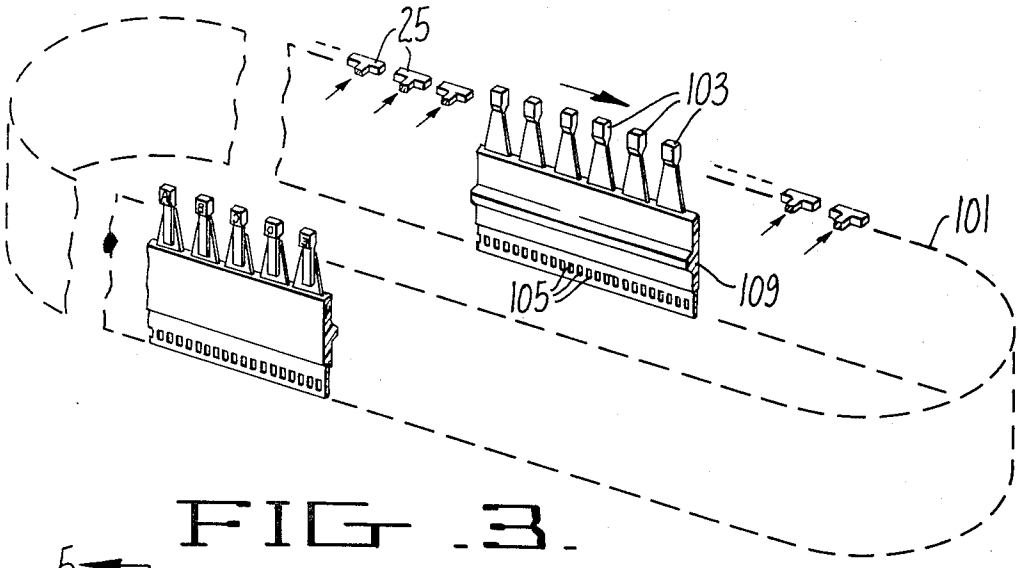


FIG. 3.

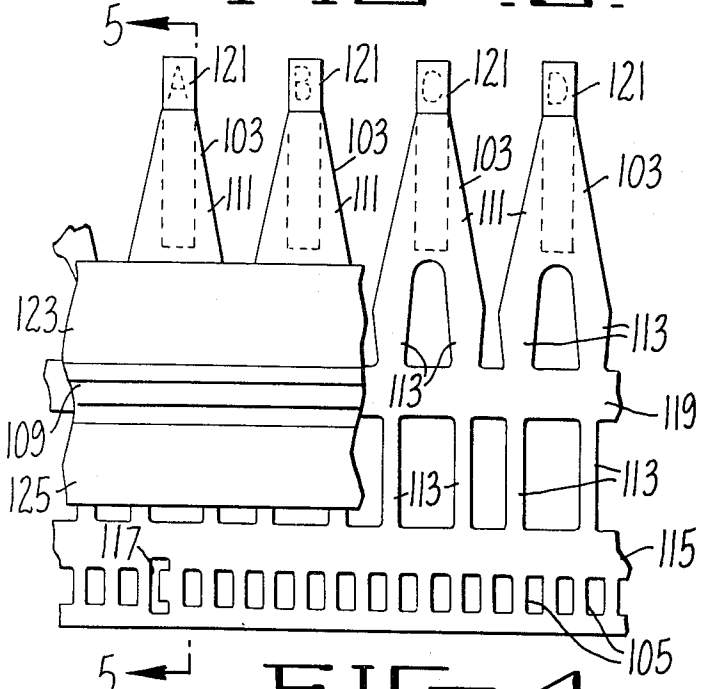


FIG. 4.

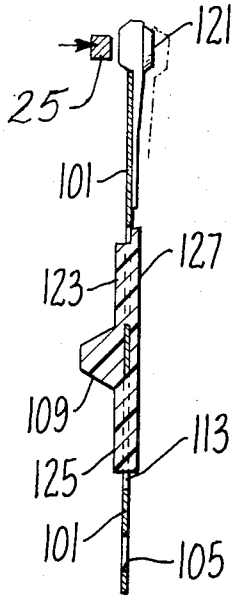


FIG. 5.

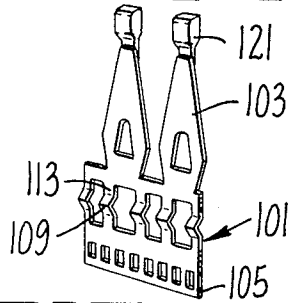


FIG. 6.

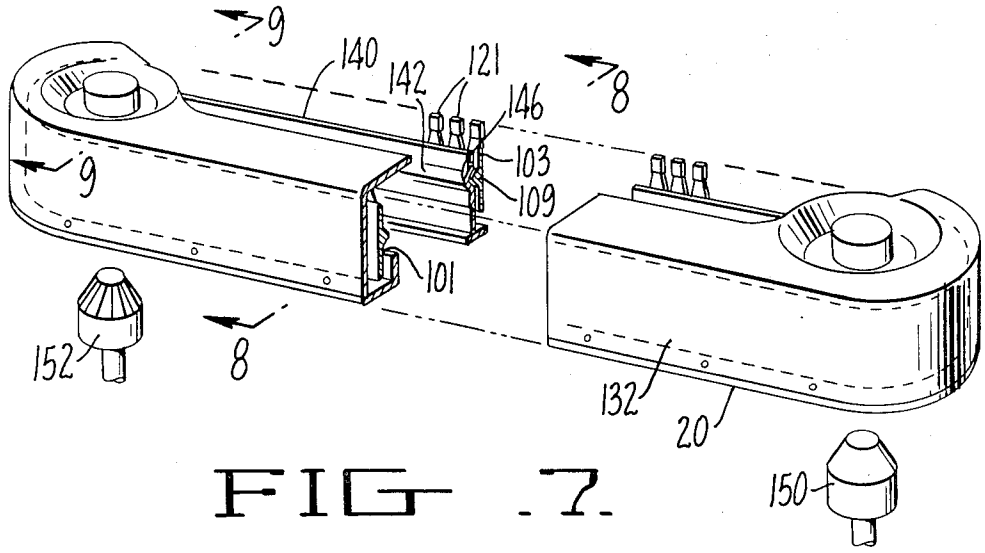


FIG. 7.

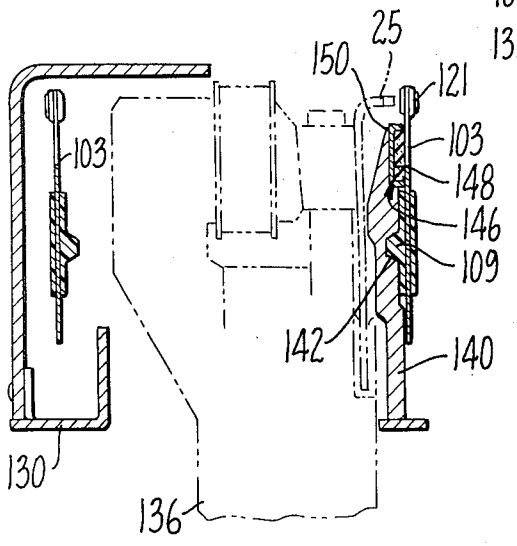


FIG. 8.

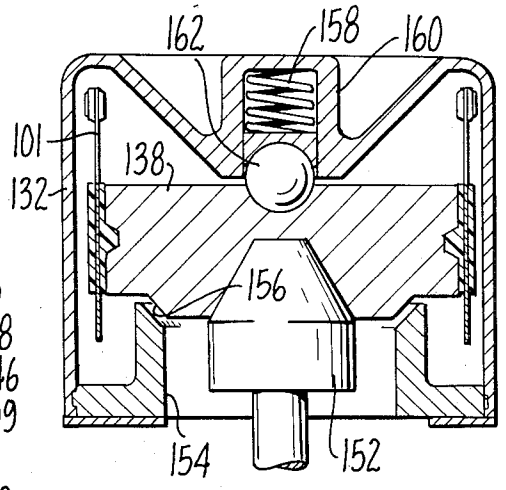


FIG. 9.

PRINT CARRIER AND TRANSPORTABLE CARTRIDGE FOR THE SAME

This application is a division of our copending application Ser. No. 21,464, filed Mar. 20, 1970.

BACKGROUND OF THE INVENTION

The present invention relates to a print carrier, and more particularly to a print carrier for use in a chain printing apparatus.

Chain printing apparatus has become important in applications requiring high speed printout. The general operational principle of chain printing is well-known. A chain or print carrier is rotated about two drums or spools. Carried on the chain are a plurality of printing fingers which are each provided with a different print character. Each of the printing fingers will pass past the printing area one time during each revolution of the chain.

In order to print a character, a hammer assembly is provided within the area about which the print carrier rotates. As the desired character passes the printout area a hammer is actuated. When actuated, the hammer strikes the desired print finger as it passes by which in turn strikes the printout paper.

The speed of printing is largely a function of the speed at which the print carrier can be rotated past the printing area as well as the speed at which the hammers can strike the print fingers.

Prior art print carrier chain belts include those constructed from woven metallic links an those from rubber belts. In the latter kind, the print characters are placed on pins which are inserted in the edge of the rubber belt. Such constructions are inefficient in operation, expensive to manufacture, and subject to breakage and misalignment at the speeds required in many of today's applications.

Prior art print carriers typically are difficult to load and unload when a different set of characters is required. Further, very few constraints have been placed on the print carrier to insure that the print fingers are properly aligned and positioned at the time when the hammer assembly is activated to print out the desired character.

SUMMARY OF THE INVENTION

According to the present invention a continuous print carrier is provided which includes a plurality of print fingers which are integrally formed with the remainder of the carrier band or belt. The band or belt additionally includes at least one continuous strip extending circumferentially around the band and also includes timing or clocking means which forms a part of the carrier for co-operative use with suitable sensing means in the chain print apparatus in order to properly actuate the hammer assembly to print the desired character. Desirably, the print fingers are of a bifurcated construction with the print characters secured to the projecting base portion of the bifurcation.

Additionally, guide means are provided on the print carrier which co-operate with the chain printing apparatus to insure that the print fingers are properly aligned in a direction parallel with the axis of rotation of the print carrier. Desirably, the guide means comprises a generally V-shaped projection extending circumferentially around the carrier and may be constructed from an extended plastic sheet bonded to the

print carrier or can be formed by crimping a portion of the print carrier itself.

The print characters can be mounted on each of the plurality of print fingers in a number of ways. For example, the print characters can be made from metal and spot welded to each of the print fingers. In the preferred embodiment of the present invention, the print characters are made from plastic and are injection molded directly onto the print fingers.

In accordance with yet another feature of the present invention the print carrier band is provided with a transportable cartridge which is adopted for easy placement within a chain printing apparatus. The cartridge includes a recess for receiving the hammer assembly of the chain printing apparatus. The cartridge includes a sidewall portion which cooperates with the guide means on the print carrier band for accurately maintaining the print fingers in the desired position at the time of printing as the print fingers are conveyed past the hammer assembly.

The sidewall additionally includes a magnetic guidance means for preventing movement of the print fingers in a radial direction relative to the rotation of the print carrier as the print fingers pass the hammer assembly.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a typewriter embodying aspects of the present invention.

FIG. **2** is a cross-sectional view of FIG. **1** along section lines **2—2.**

FIG. **3** is a perspective view of a print carrier band in accordance with the present invention.

FIG. **4** is an enlarged view of a portion of the print carrier band shown in FIG. **3.**

FIG. **5** is a cross-sectional view of the print carrier of FIG. **4** shown along the direction indicated by the arrows.

FIG. **6** is a perspective view of another embodiment of the print carrier shown in FIG. **3.**

FIG. **7** is a perspective view of an improved print carrier cartridge suitable for use in a chain printing apparatus.

FIG. **8** is a cross-sectional view of the cartridge shown in FIG. **7** in a direction indicated by the arrows.

FIG. **9** is a cross-sectional view of the spool mounting assembly taken along the direction indicated by the arrows in FIG. **7.**

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A general understanding of the chain printing apparatus using the improved print carrier and cartridge of the present invention will be facilitated by reference now to FIG. **1** and **2.** FIG. **2** is a cross-section of FIG. **1** along section lines **2—2.** For greater clarity, the sprocket drive for computer type paper is not shown in FIG. **1.** The typewriter or other chain printing apparatus is shown on a standard **1** and includes many conventional features including a case **2,** a keyboard **4,** a cylindrical platen **6** having control knobs **8** at each end, retractable bar and paper guide rollers **10,** fixed paper guide rollers **11,** and levers **12** for adjusting to paper thickness and for selecting the number of spaces between lines. Lever **14** controls the release of rollers **16** and **18** and the release of platen **6** in order for paper to

be inserted in the machine. A chain printer mechanism or cartridge **20** is mounted adjacent to the face of platen **6** for typing characters on paper between the platen and the printer mechanism. A cross-section of the chain printing apparatus is shown in FIG. **2.** A hammer **25** strikes the type character on the chain **22** to drive the character against platen **6** to form an inpression.

Two possible paper feeds are shown in FIG. **2.** A conventional feed is accomplished by inserting a piece of paper **24** between the rear of platen **6** and retractable rollers **16** and **18.** As lever **14** is pulled partially forward, rollers **16** and **18** retract thus facilitating insertion. A second feed, for computer paper is made at opening **26** at the bottom rear of case **2.** Paper guides **28** and **30** guide the computer paper **32** along a curved path upward to the platen **6.** To permit easy insertion of the computer paper, lever **14** is pulled forward to its extreme position thus moving the entire platen assembly **36** (shown in FIG. **4**) to the rear slightly away from vertical spring guide **34.** A sprocket drive assembly **38** is employed when using computer paper in the typewriter unit. Details of these two paper feeds are the subject of an application of Ingemar H. Lundquist and John Pastrone filed concurrently herewith.

There is shown in FIG. **3** an improved print carrier chain or belt **101** which is illustrative of the present invention. The belt is rotated about two spools (not shown) located at opposite ends of the belt. The belt is continuous and includes a plurality of print fingers **103** which have included thereon the desired print characters. Located along the bottom of the belt **101** is a clocking means comprising a plurality of perferations or holes **105.**

In operation, the belt **101** rotates around spool or drums placed at opposite ends of the print carrier **101** in the direction indicated by the arrow. The exact position of each of the print fingers **103** are easily sensed by any suitable sensing means (not shown) such as a photo or magnetic detector. This information is used to monitor the position of the passing printing fingers and to activate the hammers **25** at the proper time. Thus as the desired print finger **103** passes the hammers **25,** the hammer assembly is actuated and a hammer **25** strikes the appropriate print finger **103** to print out the desired character.

A generally V-shaped ridge **109** is provided circumferentially around the print carrier **101.** The ridge **109** is utilized in a manner which will be described in more detail subsequently to guide the print fingers **103** past the hammers **25.**

Details of the print carrier belt **101** are shown in FIGS. **4** and **5.** The print fingers **103** are bifurcated and include a base portion **111** and a pair of legs **113.** The ends of the legs **113** are integrally formed with a strip **115** which includes the plurality of timing holes **105.** Strip **115** additionally includes a C-shaped hole **117** which acts as the home or reference hole for purposes of monitoring the print fingers **103.**

A continuous strip **119** extends circumferentially around the entire print carrier **101.** As may be seen, the continuous strip **119** is integrally formed with the bifurcated print fingers **103** the legs of which it bisects.

The print carrier **101** can be formed from a single piece of thin material such as stainless steel. It has been found that 410 stainless steel which is magnetic and weldable, and which is approximately 0.005 inches thick works well. The configuration shown in FIG. **3** is desirably formed by use of well-known photo-chemical techniques. However the invention should not be limited thereto since the configuration of FIG. **4** could also be formed by mechanical stamping operations. An endless band is formed by lap-welding or otherwise securing the ends of the band together.

To the base portions **111** of the print fingers **103** are attached the desired print characters **121.** In the preferred embodiment of the present invention the print characters are made from plastic. The print fingers **103** are placed within a mold having the configuration of the desired character. Plastic such as a polycarbonate is injected within the mold to form the characters **121.** Alternately, the characters may be made from metal and spot welded to the print fingers **103.**

A guide means formed by the generally V-shaped ridge **109** is best seen by reference to FIG. **5.** In the embodiment illustrated in FIGS. **4** and **5,** the ridge **109** is made from a material such as polyurethane which is both transparent and flexible. The polyurethane rubber is extruded into a thin band which additionally includes generally flat portions **123** and **125.** To secure the extruded ridge **109** and flat portions **123** and **125** to the print carrier **101,** a second piece of similar plastic material **127** (FIG. **5**) is opposite thereto with the finger portions **113** of the print fingers **103** sandwiched therebetween. The two pieces of plastic are bonded together.

The ridge **109** can be used in conjunction with suitably disposed receiving means provided as a part of the chain print apparatus. Further details of this aspect of the present invention will be described subsequently.

FIG. **6** is illustrative of an alternate means by which the guide means or ridge **109** may be formed. Rather than using extruded plastic bands, the ridge **109** is formed by crimping the leg portions **113** of the print fingers **103.** The legs **113** are crimped into a V-shape suitable for use in guiding the print carrier belt **101.** Where practical, other means may be used for guiding the carrier and preventing its movement axially with respect to drive pulleys, but the V-shaped ridge **109** is preferred.

The transportable cartridge **20** shown in FIG. **1** is illustrated in greater detail in FIGS. **7** and **8.** The cartridge **20** includes a housing **132** which forms a recess **134** for receiving a hammer assembly **136** illustrated in phantom in FIG. **8.** The hammer assembly **136** includes the hammer **25** for striking the print fingers **103** as required. Details of a hammer assembly may be seen by reference to the patent application of Ronald T. Albo and John Pastrone filed concurrently herewith, and assigned to the assignee of the present invention.

The belt **101** rotates within the housing **132** about two spools or drums **138** shown in FIG. **9.** The spools **138** are mounted within the housing **132** in an improved manner and will be described subsequently in the description of FIG. **9.**

The housing **132** includes a sidewall **140** which includes a recessed portion **142** which cooperates with the V-shaped guide means or ridge **109** of the print carrier **101** as it passes the hammer assembly **136.** As a result of this guiding system, the print characters **121** are constrained from moving in a direction parallel with the axis of rotation of the respective spools, e.g., referring to FIG. **8,** in an upward or downward direction.

It is also important that the print characters **121** be maintained in a path which is a proper distance from the hammer **25.** If the print character **121** is too close to the hammer **25** the print finger **103** can scrape across the surface of the print-out paper which can result in damage thereto.

To remedy this problem, an improved magnetic guidance means **146** is provided. Magnetic guidance means **146** includes a strip of magnetic material **148** such as rubber impregnated with magnetized particles which is secured to the sidewall **140** in the vicinity of the hammers **25.** The magnetic material is embedded within the sidewall **140** by a (-shaped metal holder **150.** In order to prevent damage to the passing print fingers **103,** the exposed surface of the magnetic material **148** and the ends of the (-shaped channel **150** are coated with a suitable bearing surface such as Teflon. Thus, as the print fingers **103** pass by the magnetic means **146,** the print fingers are drawn to the magnetic material **148** and yet remain undamaged due to the Teflon surface provided thereon. The magnetic guide **146** is particularly effective in holding the print character fingers in line as they come around the pulleys at high speed where contrifugal force tends to pull them out of line. This magnetic guide means **146** is very useful in permitting high speed operation of the chain whether the chain is mounted in the carriage or directly in the case **2** with the magnetic guide **146** also mounted in the case.

When the cartridge **130** is placed within the chain printing apparatus, the print drive shaft **150** acts against the biasing action of the spring **158** to lift off the spool **138** from the seat portion **154.** In this position, the spool **138** is free to rotate about the bearing **162.**

Such a cartridge arrangement gives the chain printing apparatus great flexibility in that different sets of character print can be exchanged easily and conveniently in a very quick and simple operation. Further, as a result of the magnetic guidance means and the guide arrangement used, great accuracy in print out is insured.

We claim:

1. A transportable cartridge assembly adaptable for use with a chain printer apparatus including a hammer assembly having a print line with a plurality of selectively operable hammers and at least one drive shaft operably connectable to said cartridge assembly for rotating a print carrier belt past the print line, said cartridge assembly comprising:

a. an elongated housing assembly;

b. first and second spools including means for rotatably mounting the same at opposite ends of said housing and wherein at least one of said spools additionally includes means for engaging the drive shaft of the chain printer apparatus; and

c. an endless print carrier belt having an edge from which a plurality of printing fingers project, each printing finger having a distal end with a print character secured thereto, each finger being at least in part comprised of a ferromagnetic material; said carrier belt being mounted about said first and second spools for rotation in an oblong manner around said spools;

wherein said housing assembly encases a substantial portion of the print carrier belt and includes an inner guiding sidewall arranged longitudinally between the spools on the print line, said sidewall having an outwardly facing guide surface against which the endless belt and printing fingers are conveyed and having an edge across which hammers from the hammer assembly selectively strike the distal ends of said printing fingers, which ends project beyond the edge of the sidewall; said sidewall including a magnetic guidance means mounted in the outwardly facing guide surface adjacent the edge for restraining movement of the printing fingers in a general direction radially to that of the rotating print carrier belt.

2. The transportable cartridge assembly as in claim **1** wherein said elongated housing assembly includes an elongated substantially central recess therein for receiving the hammer assembly of the chain printer apparatus.

3. A cartridge assembly as in claim **1** wherein said magnetic guidance means includes a magnetic element covered by a suitable bearing surface for slidably engaging the printing fingers as each is conveyed therepast.

4. A cartridge assembly as in claim **1** wherein said spools include a circumferential surface having a recessed portion extending circumferentially around said spools and said outwardly facing guide surface of said sidewall includes a recessed portion extending along at least a part of its length, said recessed portions receiving suitable projecting guide means provided circumferentially around said print carrier belt for restricting movement of said belt to a circumferential direction.

5. A cartridge assembly as in claim **1** wherein said spools are substantially cylindrical with a top surface and a bottom surface and wherein at least one of said mounting means comprises a seating surface formed in said housing which engages the bottom surface of at least one of said spools, a bearing means axially engaging the top surface of the spool, and biasing means for maintaining the bottom surface of the spool in frictional contact with the seating surface and for permitting said spool to be raised from said seating surface when said spool is engaged by the drive shaft of the chain printer apparatus.

6. A cartridge assembly as in claim **5** wherein said housing includes a spring retaining portion and wherein said biasing means comprises a spring which is loaded within said spring retaining portion and a ball bearing which is seated in said top surface of the spool in engagement with the spool.

* * * * *