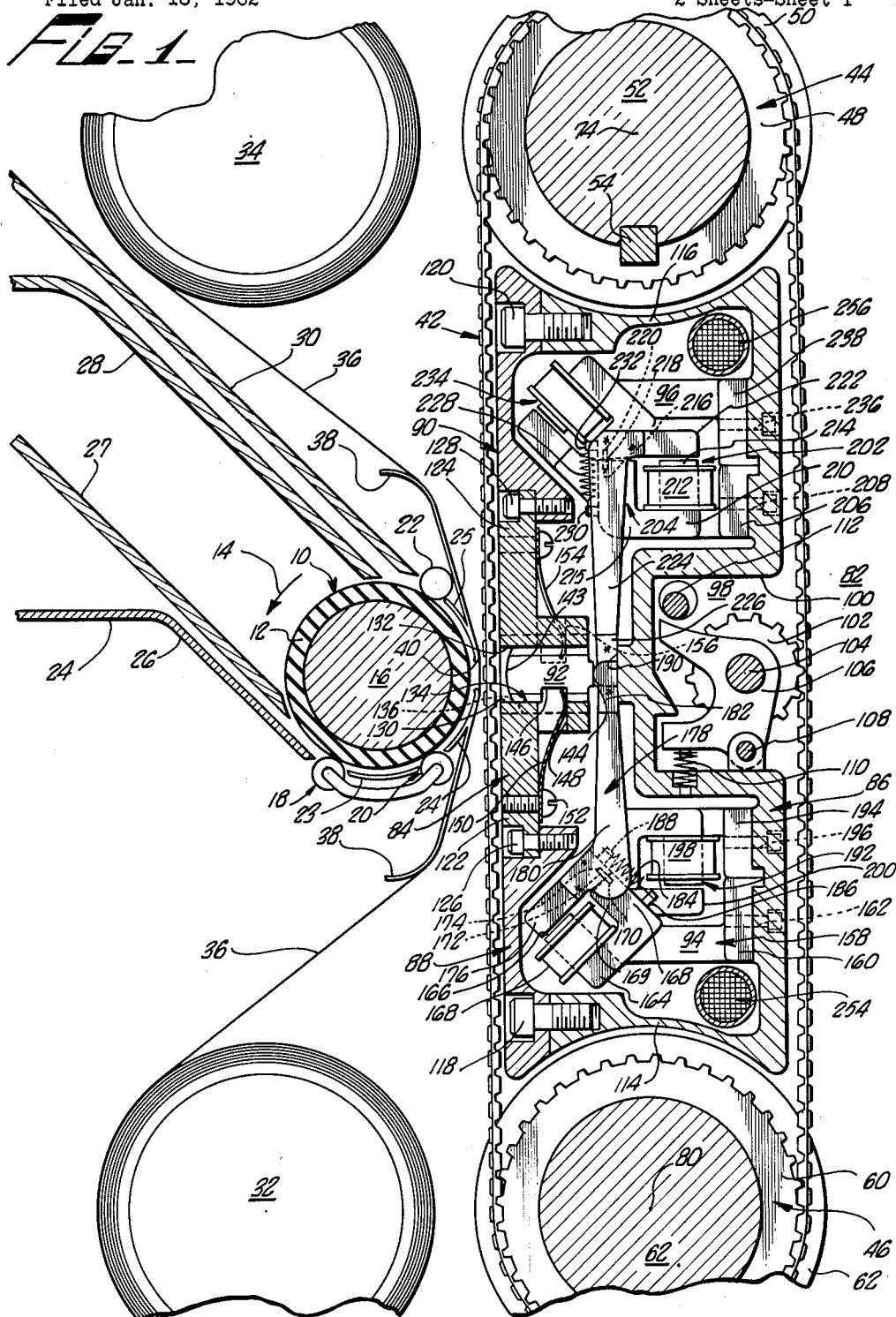


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HIGH SPEED BELT PRINTER WITH INTERNAL HAMMER

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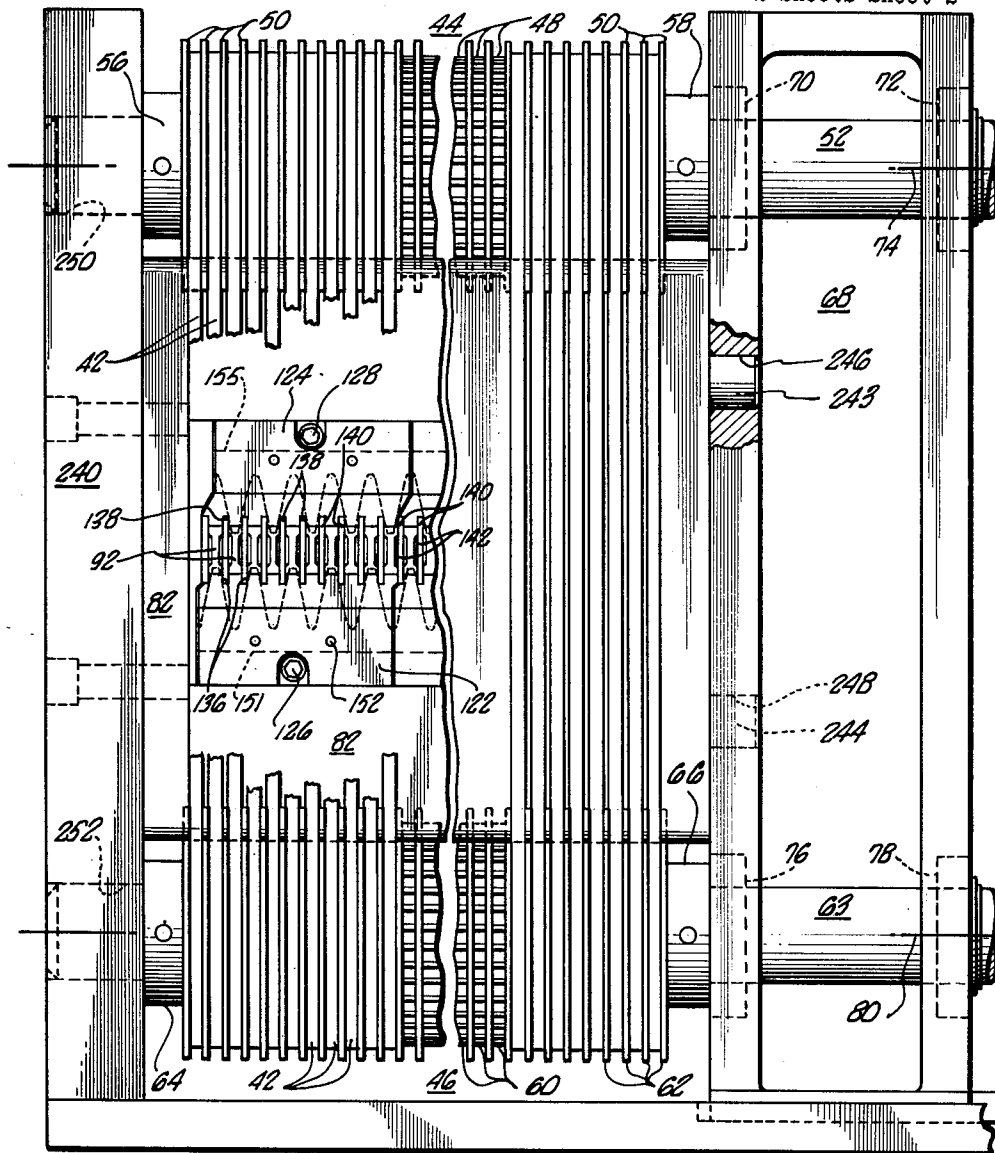


FIG. 3

FIG. 2

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3,164,084

HIGH SPEED BELT PRINTER WITH INTERNAL HAMMER

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This invention is directed to improvements in high speed printers and more particularly to a novel high speed platen printer.

In general, high speed printers include a moving type surface having type characters impressed thereon in a column array and a print hammer associated with each type column. Apparatus is also included for feeding a print medium, such as paper, between the type surface and the hammers. To print, the hammers are selectively propelled against the paper to force the paper into contact with the type surface.

Since the type surface and hammers lie on opposite sides of the paper, the feed apparatus is necessarily located outside the print area. Thus, to impart guiding movement to the paper, the feed apparatus must either drive the edges of the paper or grasp the top and bottom of the paper and pull the paper past the print hammers.

Due to the complexity and expense involved in constructing a feed apparatus of this type which is readily adjustable, in the past the paper feeding arrangements as well as the entire design of such high speed printers have been directed to the handling of paper of a single size. Accordingly, the use of high speed printers in printing on documents of varying sizes has been very limited.

Further, the feed apparatus employed in such high speed printers does not lend itself to selective positioning or repositioning of documents. Thus, in the past, high speed printers have found only a limited use in printing processes for updating printed records such as those appearing on ledgers, checks, or tabular cards.

Also, since, in printing with the prior art type of printer, the hammers strike the paper to force the paper against the type surface, when it is desired to print a number of carbon copies the hammers are required to compress the many sheets of paper against the type surface. Due to air between the sheets of paper, a complete compressing of the paper against the type surface is not possible and as a result reliable printing through to the carbon copies is not possible.

In contrast to the conventional high speed printer, the present invention provides a relatively inexpensive, compact, yet rugged, high speed printer which is capable of rapid, clear and simultaneous printing on one or more print mediums of varying size and which is ideally suited to use in processes for updating printed records.

Briefly, the present invention, in a basic form, includes a drum platen and a plurality of rollers for tightly pressing one or more sheets of a print medium against the platen. Positioned adjacent to the platen are a plurality of flexible, continuous, inwardly toothed belts. Each belt has type characters disposed on its outer surface. Each type character is opposite a tooth. The toothed belts are arranged side by side and are simultaneously driven past the platen such that the type characters pass in succession immediately adjacent to the platen. Mounted within the belt loops is a plurality of print hammers. Each print hammer is aligned with a different belt and is positioned for movement substantially normal to the platen. Also mounted within the belt loops are means for selectively actuating the hammers to propel selective type characters against the print material.

Due to the positioning of the flexible belts, including

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the type characters, as well as the hammers and hammer actuating mechanisms on one side of the print material, a plurality of print mediums may be tightly compressed against a platen. Thus the type characters, in striking the print mediums, produce clear carbon copies of the type characters.

By turning the platen in a manner similar to that of the platen of a typewriter, documents of varying sizes may be brought into proximity with the type characters for selective printing thereon. Also, by selectively controlling the rotation of the platen, the high speed printer of the present invention may be utilized in the reprinting and updating of records on documents of varying sizes.

The above, as well as other features of the present invention, may be more clearly understood by reference to the following detailed description when considered with the drawings, in which:

FIGURE 1 is a schematic representation of a sectional side view of one form of the high speed platen printer of the present invention;

FIGURE 2 is an expanded schematic representation of a section of the flexible belt utilized in the printer of the present invention; and

FIGURE 3 is a schematic representation of a sectional front view of the printer.

Referring to the drawings, the high speed printer of the present invention includes a platen 10. By way of example only, the platen 10 is represented as a drum platen having a facing of rubber-like material indicated at 12. As indicated by the arrow 14, the platen 10 is rotatable about its longitudinal axis represented at 16 in a manner similar to the platen on a typewriter.

Associated with the platen 10 are pressure rollers 18, 20 and 22. The pressure rollers 18 and 20 are coupled together and press upward toward the center of the platen 10. The pressure roller 22 is spaced from the roller 20 around the circumference of the platen 10 and presses inward toward the center of the platen. Spaced slightly from and following the contour of the platen 10 are guide members 23, 24 and 25. The guide member 23 is located between the rollers 18 and 20, while the guides 24 and 25 are located adjacent the rollers 20 and 22, respectively. A print material, such as paper, being fed tangentially to the platen 10, is thus pressed into contact with the platen by the pressure rollers 18 and 20. As the platen 10 is rotated (by means not shown) the print material is guided by the guides 24 and 25 between the platen 10 and the pressure roller 22 to maintain pressure contact of the paper with the surface of the platen 10.

By way of example only, to feed paper tangentially to the platen 10, guide members represented at 26 and 27 are provided which extend adjacent the platen 10. By means not specifically shown, paper is guided along the guide member 26 and forced downward by the guide member 27 in a direction tangential to the platen 10 to a point between the pressure roller 18 and the platen 10.

To guide the paper from the platen 10, guide members, represented at 28 and 30, are provided. The guide members 28 and 30 extend tangentially to the platen 10 adjacent the pressure roller 22. Thus, as the paper passes between the roller 22 and the platen 10, it extends between the guide members 28 and 30 and is passed in an upward direction away from the platen 10.

The platen 10 may be moved by any one of a number of well known apparatus. For example, the platen 10 may be controlled by a motor drive which moves the platen in steps similar to that of a typewriter platen and may stop the platen at any point to provide alignment of the paper with the print mechanism of the present invention for adding information to documents of varying sizes. An example of a drive mechanism which may be

employed with the platen of the present invention is described in detail in the patent to E. J. Rabenda, No. 2,569,829, issued October 2, 1951.

A pair of ribbon spools 32 and 34 are located on either side of the platen 10. As illustrated, a ribbon 36 wound around the spool 32 passes over a ribbon shield 33 and over an opening 40 to the spool 34. By way of example, the guides 24 and 25 may form a part of the ribbon shield 33. The opening 40 is immediately adjacent the platen 10 and between the roller 20 and 22. Thus, to print on paper extending around the platen 10, a type character may be propelled against the ribbon 36 passing over the opening 40 to press the ribbon into contact with the paper.

To provide such print operation the present invention includes a plurality of flexible, continuous, inwardly toothed belts 42, which are driven past the platen 10 adjacent the opening 40. Each belt 42 includes a plurality of type characters disposed on its outer surface. Each type character is aligned opposite a tooth. The teeth as well as the type characters are spaced one from another such that in moving past the platen 10 the type characters are exposed one at a time to the platen through the opening 40.

To drive the belts 42, the belts are positioned over a pair of grooved pulley arrangements 44 and 46. The pulley arrangement 44 includes a plurality of individual grooved pulleys 48 separated by spacer members 50. The pulleys 48 are keyed to a drive shaft 52 as represented at 54 in FIGURE 1. The pulleys 48 are maintained on the drive shaft 52 by a pair of retaining members 56 and 58 which fit around the drive shaft 52 at either end of the pulleys 48 (see FIGURE 3). The grooves of the pulleys 48 mate with the teeth of the belts 42.

The pulley arrangement 46 also includes a plurality of individually toothed pulleys 60 separated by spacers 62. The pulleys 60 are mounted for free rotation about a driven shaft 63 and are maintained on the shaft 63 by a pair of retaining members 64 and 66 which extend around the driven shaft 63 at either end of the pulleys 60 (see FIGURE 3). The grooves of the pulleys 60 mate with the teeth of the belts 42.

As specifically represented in FIGURE 3, the drive shaft 52 is journaled to a frame arrangement 68 by a pair of bearing configurations 70 and 72. In this manner the drive shaft 52 is cantilevered from the frame 68 substantially normal thereto. Due to the bearing configurations 70 and 72, the drive shaft 52 is free to rotate (in response to a motor drive means not specifically shown) about its longitudinal axis 74 which extends substantially parallel to the axis 16 of the platen 10. As represented in FIGURE 1, the drive shaft 52 lies to one side of the platen 10.

The driven shaft 63 is also journaled to the frame arrangement 68 by a pair of bearing configurations 76 and 78. In this manner, the driven shaft 63 is also cantilevered from the frame 68 and extends substantially normal thereto. The driven shaft 63 is aligned in a common plane with the drive shaft 52 and due to the bearing configurations 76 and 78 is free to rotate about its longitudinal axis 80 which extends substantially parallel to the axis 16 of the platen 10. As represented, the drive and driven shafts 52 and 63 lie on opposite sides of the platen 10.

In this manner the belts 42 are aligned next to each other on the pulley arrangements 44 and 46 and are driven by a rotation of the drive shaft 52 past the platen 10 such that the type characters pass in succession immediately adjacent the opening 40.

Positioned internal to the belts 42 and between the pulley arrangements 44 and 46 is a support member 82. As illustrated in FIGURE 1, the support member 82 is divided into four sections 84, 86, 88 and 90. The support member 82 provides means for supporting a plurality of hammers 92, a first and second plurality of electromagnets 94 and 96 for actuating the hammers, and an appa-

ratus 98 for tensioning the belts 42 as they pass over the pulleys 44 and 46. The sections of the support member 82 may be denoted as the hammer support member 84, the actuator support member 86, and a pair of coupling members 88 and 90.

As represented in FIGURE 1, the actuator support member 86 extends between the pulley arrangements 44 and 46 along an inner surface of the belts 42 remote from the platen 10. The actuator support member 86 includes an inwardly recessed portion 100 facing the inner surface of the belts 42 remote from the platen. The recess 100 is centrally aligned between the pulleys 44 and 46.

To maintain the belts 42 in driving relation around the pulley arrangements 44 and 46, the apparatus 98 is mounted in the recess 100 for tensioning the belts after they have been positioned over the pulleys. By way of example only, the tensioning apparatus 98 includes a toothed roller 102 which rotates around 104 on movable arm 106. The movable arm 106 is, in turn, hinged to the support member 86 as indicated at 108. The arm 106 is normally urged away from the armature support member 82 by a spring 110. The force of the spring 110 normally urges the toothed roller 102 into contact with the belts 42 as they pass over the pulley arrangements 44 and 46 to produce a tensioning of the belts 42. The arm 106 is positioned out of contact with an eccentric shaft 112. The eccentric shaft 112 extends through the frame member 68. When it is desired to release the tensioning force normally applied by the tensioning arrangement 98, the eccentric shaft 112 is turned. In response to a turning of the eccentric shaft 112, the arm 106 is caused to rotate at a counterclockwise direction around the pivot arrangement 108 to compress the spring 110 and force the toothed roller 102 out of contact with the flexible belts 42. In this position, the flexible belts 42 may be removed from the toothed pulley arrangements 44 and 46 for replacement, repair or cleaning.

The actuator support member 86 also includes a pair of inwardly flanged end portions 114 and 116 which extend toward the platen 10 to contact the coupling members 88 and 90, respectively. The coupling members 88 and 90 extend substantially normal to the end sections 114 and 116. As illustrated, the coupling member 88 is bolted at 118 to the end section 114 while the coupling member 90 is bolted at 120 to the end section 116.

The hammer supporting member 84 is positioned between the coupling members 88 and 90 parallel to a plane of the belts 42 as they pass the platen 10. As illustrated in FIGURE 1, the hammer supporting member 84 is divided into two L-shaped sections 122 and 124.

The L-shaped section 122 is bolted to the coupling member 88 as represented at 126, while the L-shaped member 124 is bolted to the coupling member 90, as represented at 128.

A base portion 130 of L-shaped member 122 and a base portion 132 of the member 124 are spaced from and extend substantially parallel to each other to define a slot 134. The slot 134 is aligned with the opening 40 in the ribbon guide 38.

As represented in FIGURE 3, the base 130 of the L-shaped member 122 includes a plurality of spaced grooves 136. In a similar manner, the base 132 of the L-shaped member 124 includes a plurality of grooves 138. Each groove 136 is in aligned association with a different groove 138. Pressure fitted into each pair of associated grooves 136 and 138 is a plate member 140. The plate member 140 together with the base portions 130 and 132 define a plurality of openings 142 in the hammer support member 84 facing the platen 10 in a common plane with the opening 40. Each belt is aligned with a different opening 142. The openings 142 are, in turn, dimensioned to the width and spacing of the belts 42 as they pass over the pulley arrangements 44 and 46.

As represented in FIGURE 3, mounted for sliding mo-

tion within each of the openings 142 is an elongated, lightweight print hammer 92. Due to the alignment of the openings 142 with the belts 42, a print hammer 92 is aligned substantially normal to each belt 42 as well as the platen 10 in a plane of the opening 40. The lightweight print hammers 92 each have a ramped forward face 143 facing a belt 42 and a rear face 144 extending beyond the slot 134 internal to the belt 42. As represented in FIGURE 1, the hammer 92 includes a slot 146 in one of its longitudinal surfaces. Extending into the slot 146 through an opening 148 in the base portion 130 of the L-shaped member 122 is a spring arm 150. The spring arm 150 forms one finger of a spring plate 151 (see FIGURE 3) which is coupled to the member 84 as indicated at 152. The spring arm 150 is shaped to exert a force on the hammer which normally urges the hammer out of contact with its associated belt 42.

In a similar manner, such as represented by a spring arm 154 (which forms one finger of a spring plate 155—see FIGURE 3) extending into a slot 156 of a hammer immediately adjacent the hammer 92 illustrated in FIGURE 1, each of the hammers 92 are slidably mounted normal to the platen 10 in an opening 40 and are normally urged out of contact with the belts 42.

Since the hammers 92 are normally urged away from the belts 42, to print with the print mechanism of the present invention it is necessary to propel the hammers 92 forward against the belts 42. To provide means for selectively actuating the hammers 92, the first and second plurality of electromagnets, represented generally at 94 and 96, are coupled to the actuator support member 86.

The first and second plurality of electromagnets are coupled in two separate rows along a rear face of the actuator support member 86 on opposite sides of the plurality of hammers 92. To provide for a highly compact actuator design, the armatures of the first plurality of electromagnets are interlaced with the armatures of the second plurality of electromagnets adjacent the rear face of the hammers 92. Accordingly, the armatures associated with the first plurality of electromagnets contact the rear face of alternate print hammers such as the first, third, fifth, etc. while the armatures associated with the second plurality of electromagnets 96 contact alternate print hammers such as the second, fourth and sixth, etc. The compact actuator design is further aided by alternating the location of the field structures of the first and second plurality of electromagnets relative to the actuator support member 86. Thus, as illustrated in FIGURE 1, an electromagnet 158 of the first plurality of electromagnets 94 includes a nonmagnetic base member 160 coupled to the actuator support member 86 by a screw 162. Coupled to the base 160 is a magnetic U-shaped field structure 164. A leg 165 of the field structure 164 supports a coil 168.

As illustrated, a leg 169 of the field structure 164 includes a slot 170 into which is tightly inserted a tongue member 172. The tongue member 172 is positioned into a slot 174 which extends into a solid magnetic portion 176 of an armature 178. The armature 178, in addition to the solid portion 176, which extends adjacent the coil 166, also includes an arm member 180 attached to the portion 176 as indicated and extending upward adjacent the hammers 92.

Attached to the upper end of the arm member 180 is a second solid member 182. The second solid member 182 is positioned to strike a rear face 144 of the hammers 92 when the electromagnet 158 is actuated.

A spring member 184 is coupled by pins 186 and 188 between the member 176 and the leg 169. The spring normally urges the armature 178 to pivot around a point defined by the tongue 172 and the slot 174, thereby maintaining the member 176 away from the coil 168 and the member 182 against a stop portion 190 of the actuator support member 86.

A second electromagnet 192, adjacent the electromag-

net 158, also includes a nonmagnetic base member 194 coupled to the actuator support member 86 by a screw 196. Coupled to the base member 194 is a magnetic U-shaped field structure which supports a coil 198 and an armature 200. The arrangement of the electromagnet 192 is more clearly illustrated with reference to an electromagnet 202 of the second plurality of electromagnets 96.

The electromagnet 202 and the electromagnet 192 are of similar construction except that the electromagnet 202 is inverted to extend an armature 204 downward to interlace with the armature 176 of the electromagnet 158 and the armature 200 of the electromagnet 88.

The electromagnet 202 includes a nonmagnetic base member 206 which is coupled to the actuator support member 86 by a screw 208. Coupled to the base 206 is a magnetic U-shaped field structure 210 for supporting a coil 212 on one of its upwardly extending legs 214.

As illustrated, a leg 215 of the field structure 210 includes a slot 216 into which is tightly positioned a tongue member 218. The tongue member 218 fits into a slot 220 in a solid magnetic member 222 of the armature 204. The armature 204, in addition to the member 222, which extends adjacent the coil 212, also includes an arm member 224 which is attached to the member 222 as indicated. The arm member 222 extends downward adjacent the hammers 92. A second solid member 226 is attached to the arm 224 and is positioned to strike a rear face 144 of a hammer 92 when the electromagnet 202 is actuated.

A spring member 228 is coupled by pins 230 and 232 between the leg 215 and the solid member 222. The spring 228 normally urges the armature 204 to pivot around a point defined by the tongue 218 and the slot 220 to maintain the member 222 away from the coil 212 and the member 226 against the stop portion 190 of the actuator support member 86.

An electromagnet 234, adjacent the electromagnet 202, is coupled to the actuator support member 86 by a screw 236 extending into its base member 238. The electromagnet 234 is constructed similar to the electromagnet 158 previously described. Thus, the coils of the electromagnets of the first and second plurality of electromagnets are alternately located adjacent to and remote from the actuator support member 86 internal to the belts 42. This provides a highly compact spacing of the armatures of electromagnets of the first and second plurality of electromagnets and thus, together with the aforementioned interlacing of armatures, allows a maximum number of electromagnets to be mounted in a minimum of space.

As illustrated in FIGURE 3, the support member 82 is coupled directly to a frame member 240 by a pair of screw members 241 and 242. The frame member 240 extends substantially normal to the platen 10. In this manner the support member 82, including the hammers 92, the plurality of electromagnets 94 and 96 as well as the belt tension apparatus 98, is cantilevered from the frame 240 to extend internal to the belts 42. To provide additional support for the support member 82, the support member 82 includes a pair of pin members 243 and 244 which extend from a side of the support member remote from the frame member 240. The pin members 243 and 244 extend into the frame member 68 and are supported by bores 246 and 248 which communicate therewith.

The frame member 240 also includes a pair of bores 250 and 252. The bores 250 and 252 communicate with the ends of the drive shaft 52 and the driven shaft 63 remote from the frame 68. Thus, the drive shaft 52 cantilevers from the frame member 68 and is supported in the bore 250 by the frame member 240. In a similar manner the driven shaft 63 is cantilevered from the frame member 68 and is supported in the bore 252 of the frame member 240. In this manner the print mechanism of the present invention is separable into two sections—the shafts and belt assembly coupled to the frame member 68 and the hammer actuator assembly coupled to the frame

member 240. This construction provides for a simple sliding assembly of the printer as well as ease in replacing any part of the print mechanism for maintenance purposes.

To print with the present invention the electromagnets are selectively energized to strike the rear face of particular print hammers. To actuate the first and second plurality of electromagnets, a plurality of electrical conductors, indicated by the wire tubes 254 and 256, extend from outside the printer through the frame member 240. A pair of wires from the wire tube 254 is coupled to each coil of the first plurality of electromagnets 94 while a pair of wires from the wire tube 256 is coupled to each coil of the second plurality of electromagnets 96. Thus, by selectively energizing particular pairs of wires, particular electromagnets may be energized.

In response to a momentary current flow through a particular coil, the armature associated therewith is attracted toward the coil to cause the arm of the armature to strike the rear face of its associated print hammer. The hammer is propelled toward the belt associated therewith. The actuation of the electromagnet is so timed that the hammer strikes a tooth on the belt to force a type character against the ribbon 36. The ribbon 36, in turn, presses against print material to produce a printing thereon. After the type character presses against the ribbon 36, the hammer rapidly rebounds to its normal position by operation of the spring associated therewith.

Thus, by selectively energizing the electromagnets, particular print hammers 92 are propelled against the toothed belts 42 to produce clear and rapid printing of the type characters disposed on the flexible belts.

In practice, extremely clear printing of the type characters is produced with the print mechanism of the present invention. This is due in part to the flexibility of the belts 42 as well as the rapidity of the hammer operation. When a hammer strikes a tooth of one of the belts the belt stretches slightly as the type character is forced toward the platen. While the type character is pressing against the platen, the belt associated therewith continues to move. However, due to the flexibility of the belt, the belt stretches slightly to allow the type character to remain in pressure contact with the platen without smearing the printed character. When the hammer rebounds rapidly from the platen the belt springs back to its normal position ready for another print operation.

Such flexibility may be provided by belts of different composition. For example, the belts may be of metal, rubber, plastic or other materials of high strength and long flex life. Although any of the above materials may be utilized, it has been found that a belt composed of plastic provides superior print characteristics. Such a belt may be formed in a single mode operation and possesses the characteristic that it becomes stronger as it is flexed. Also, a plastic belt has a high strength in the areas of reduced cross-section as well as being a material which will not pound down with continuous hammering.

Thus, as described, the present invention, by including a plurality of inwardly toothed, continuous, flexible belts which are simultaneously driven past a platen, as well as a print actuating mechanism mounted internal to the flexible belts, provides a compact, rapid acting printer for printing on documents of varying sizes at extremely high speeds.

What is claimed is:

1. A high speed printer comprising:
 - a platen;
 - a plurality of continuous, flexible belts, each belt having type characters disposed on its outer surface;
 - means for moving each belt to pass type characters in succession adjacent to the platen;
 - a support member mounted internal to the belts;
 - a plurality of lightweight elongated hammers aligned in a common plane and mounted for sliding movement on the support member substantially normal

to the platen, each hammer having a forward face aligned with and immediately adjacent to a different belt;

a first plurality of electromagnets coupled to the support member on one side of the plane of the hammers, the electromagnet of the first plurality of electromagnets each having an armature, the armatures of the first plurality of electromagnets being hinged to strike a rear face of alternate ones of the hammers to propel the alternate hammers against alternate belts toward the platen;

a second plurality of electromagnets coupled to the support member on an opposite side of the plane of the hammers, the electromagnets of the second plurality of electromagnets each having an armature, the armature of the second plurality of electromagnets being interlaced with the armatures of the first plurality of electromagnets and hinged to strike a rear face of alternate hammers to propel the alternate hammers against alternate belts toward the platen.

2. A high speed printer comprising:

- a platen;
- a first frame member;
- a drive shaft journaled to the first frame member to extend substantially parallel to the platen;
- a driven shaft journaled to the first frame member to extend substantially parallel to the platen member in a common plane with the drive shaft;
- a plurality of continuous flexible belts, each belt having type characters disposed on its outer surface, each belt also being directed in driving engagement over the drive shaft and driven shaft, respectively;
- a second frame member;
- a support member coupled to the second frame member internal to the belts;
- a plurality of print hammers coupled to the support member for movement substantially normal to the platen, each hammer being aligned with and adjacent to a different belt;
- and means coupled to the support member for selectively propelling each print hammer against a belt to force a type character against the platen.

3. The apparatus defined in claim 2 wherein the print hammers are lightweight elongated hammers slidably mounted on the support member for movement normal to the platen and wherein the means for selectively propelling each hammer to strike a belt includes a plurality of electromagnets coupled to the support member, each electromagnet having an armature hinged to strike a different elongated hammer when the electromagnet is energized, the apparatus also including means for normally urging each hammer away from the platen and out of contact with the belts.

4. The apparatus defined in claim 2 including means coupled to the support member and impinging the belts for tensioning the flexible belts to maintain the belts over the drive and driven shafts.

5. The apparatus defined in claim 4 including means for disengaging the means for tensioning to allow the belts to be removed from the drive and driven shafts.

6. A high speed printer, comprising:

- a platen;
- means for clamping a print medium to the platen;
- a plurality of continuous belts each forming a closed loop and each carrying an array of type characters on a surface facing the platen;
- means for movably supporting the belts in closely spaced relationship such that type characters on adjacent belts are spaced apart only slightly more than the width of the belts,
- means for moving the belts to transport the type characters in succession adjacent the platen such that each one of the plurality of type characters carried by each of the belts is successively positioned directly

opposite a different predetermined area of the print medium clamped to the platen;
 and a plurality of print units positioned within the loop of the belts, each print unit being associated with a different belt and including means for striking a surface of its associated belt remote from the platen to press a selected one of the type characters on the belt into engagement with the print medium when the selected character is opposite the associated predetermined area on the print medium.

7. In a high speed printer for printing a plurality of characters on a print medium passing closely over a platen, the combination of:

a plurality of continuous belts each forming a closed loop and each carrying an array of type characters on a surface facing the platen;

means for movably supporting the belts in closely spaced relationship such that type characters on adjacent belts are spaced apart only slightly more than the width of the belts;

means for moving the belts to transport the type characters in succession adjacent different areas of the print medium clamped to the platen;

a plurality of print elements positioned within the loop of the belts, each print element being associated with a different belt and being mounted to strike a face of the associated belt remote from the platen to press a type character against the print medium;

and means positioned within the loop of the belts for propelling selected print elements against their associated belts to produce a selected printing of a plurality of type characters on the print medium.

8. The apparatus defined in claim 7 including means for normally urging each print element away from the platen.

9. In a high speed printer for printing a plurality of characters in a plurality of aligned character spaces on a print medium passing over a platen, the combination of:

a drive shaft;

a driven shaft;

a plurality of continuous belts, each belt forming a closed loop and each having a plurality of type characters disposed on its outer surface;

means for aligning the belts side by side to pass over the drive shaft and the driven shaft such that each belt is aligned with a different character space on the print medium and that rotation of the drive shaft causes each one of the plurality of type characters to be successively positioned directly opposite the character spaces with which the belts are aligned;

a plurality of print units positioned between the drive and driven shafts and mounted within the loop of the continuous belts, each print unit being associated with a different belt and each including means for striking a surface of an associated belt remote from the platen to press any selected one of the type characters against the print medium in the associated character space when the selected type character is opposite the associated character space.

10. The apparatus defined in claim 9 wherein each print unit includes a lightweight print element aligned with a belt to strike an inner surface of the belt remote from the platen and an electromagnet having an armature hinged to strike a side of the print element remote from the platen to propel the print element against the associated belt when the electromagnet is excited.

References Cited in the file of this patent

UNITED STATES PATENTS

2,053,063	Bryce	Sept. 1, 1936
2,093,545	Bryce et al.	Sept. 21, 1937
2,101,444	Miles	Dec. 7, 1937
2,737,883	Crawford	Mar. 13, 1956
2,831,424	MacDonald	Apr. 22, 1958
2,918,865	Wooding	Dec. 29, 1959
2,950,048	Luhn	Aug. 23, 1960
2,990,767	Demer et al.	July 4, 1961
3,012,499	Amada	Dec. 12, 1961
3,041,964	Simpson	July 3, 1962