United States Patent [19]

Perry

[11] **3,730,082**

[45] **May 1, 1973**

[54] IMPACT LINE PRINTER

[75] Inventor: **Richard Anthony Perry**, Attleboro, Mass.

[73] Assignee: **Odec Computer Systems, Inc.**, East Providence, R.I.

[22] Filed: **Aug. 24, 1971**

[21] Appl. No.: **174,315**

[52] **U.S. Cl.** ..... **101/93 C**

[51] **Int. Cl.** **B41j 1/30**

[58] **Field of Search** ..... 101/93 C, 93 R, 111

[56] **References Cited**

UNITED STATES PATENTS

3,041,964	7/1962	Simpson et al.	101/111
3,188,947	6/1965	Paige	101/93 C
3,241,480	3/1966	Cunningham	101/93 C
3,451,335	6/1969	Cunningham	101/93 C
3,499,382	3/1970	Potter et al.	101/93 C
3,576,164	4/1971	Drejza et al.	101/93 C

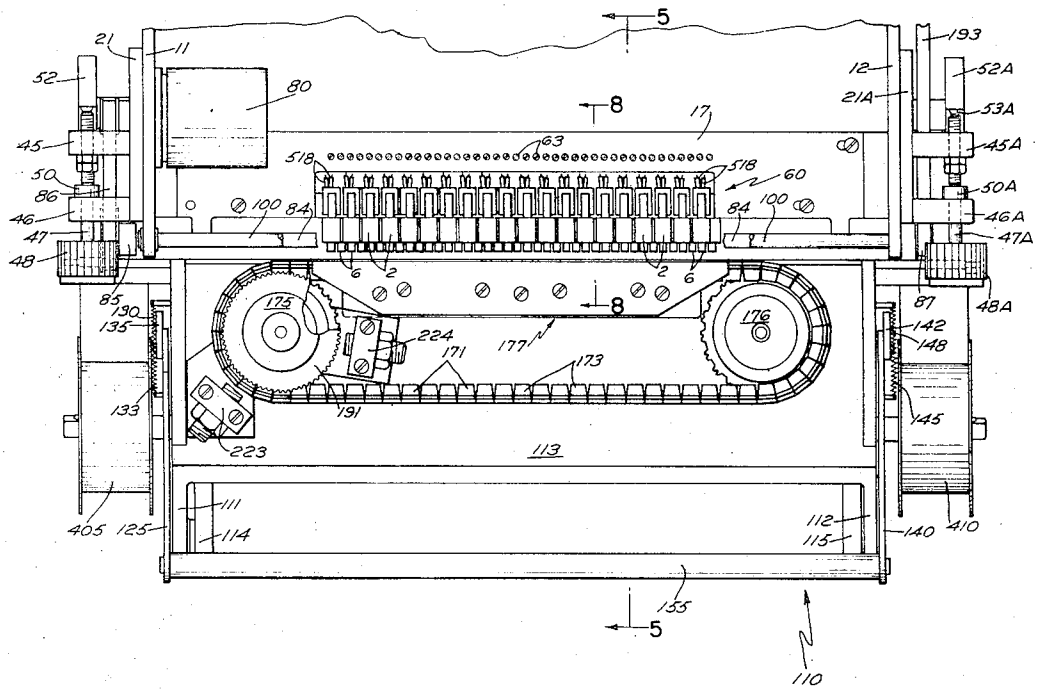
Primary Examiner—William B. Penn

Attorney—William Frederick Werner

[57] **ABSTRACT**

This disclosure relates to an impact hammer printer and the structure for adjusting the platen face of each individual hammer, individually and collectively in relation to a stationary anvil and type faces rotatively mounted in a closed loop past the platen faces of an upper and lower bank of hammers. The disclosure also includes a pivotal yoke arrangement forming part of the machine frame which carries the closed loop guide track, anvil and character carrying closed loop.

10 Claims, 20 Drawing Figures



10 Sheets-Sheet 1

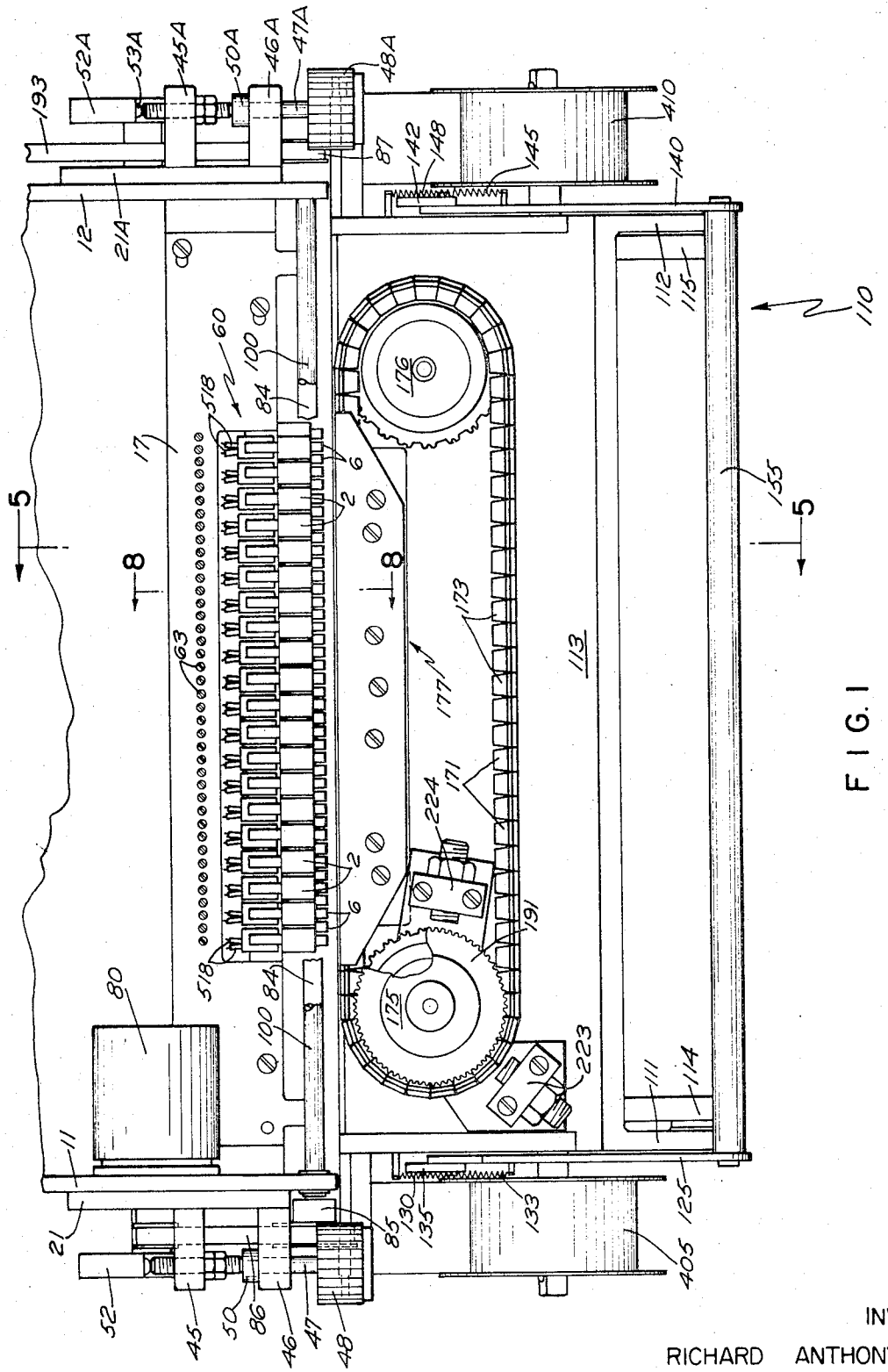


FIG. 1

INVENTOR
RICHARD ANTHONY PERRY
BY
William Frederick Varner
ATTORNEY

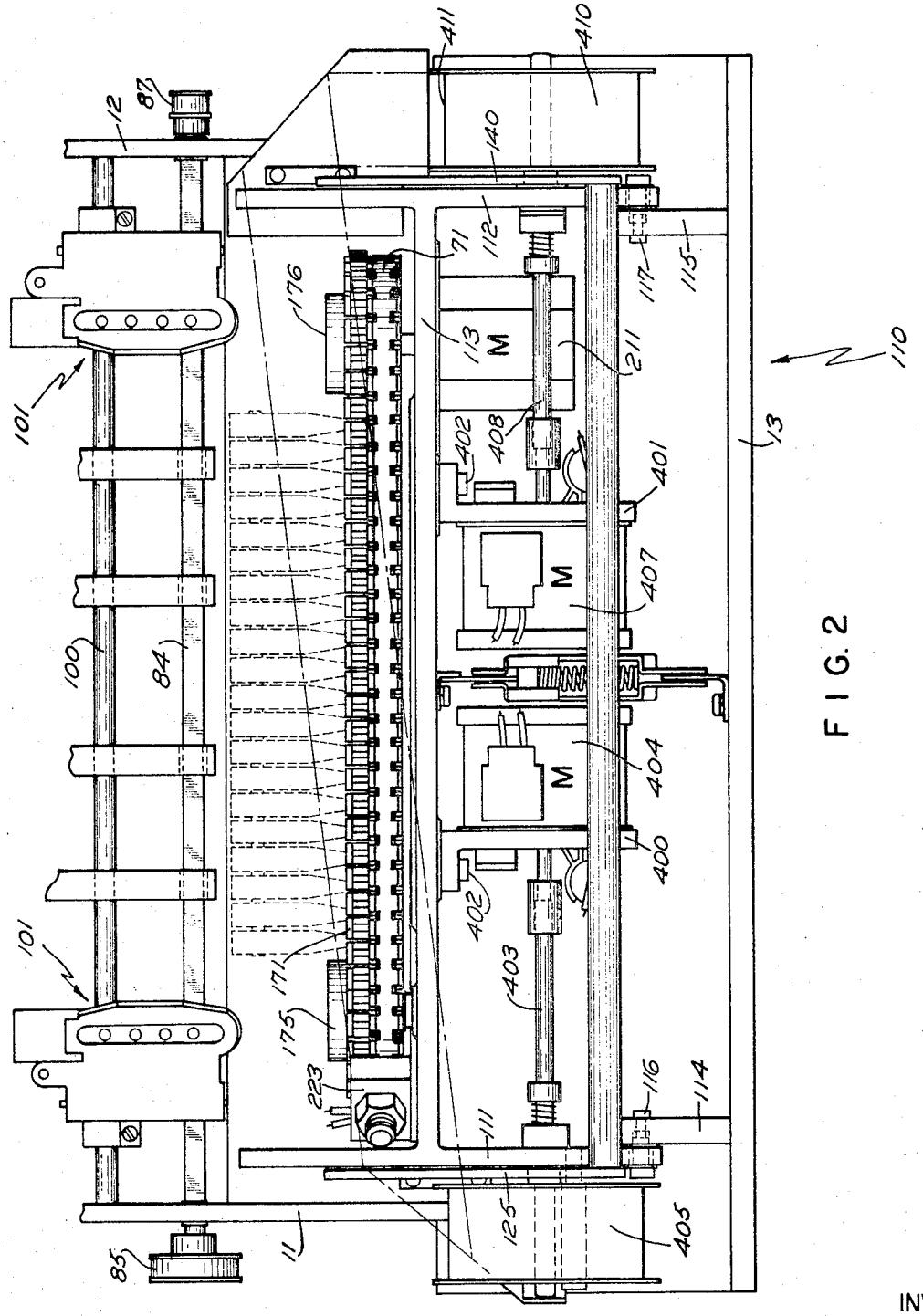


FIG. 2

INVENTOR
RICHARD ANTHONY PERRY

BY
William Frederick Werner
ATTORNEY

10 Sheets-Sheet 3

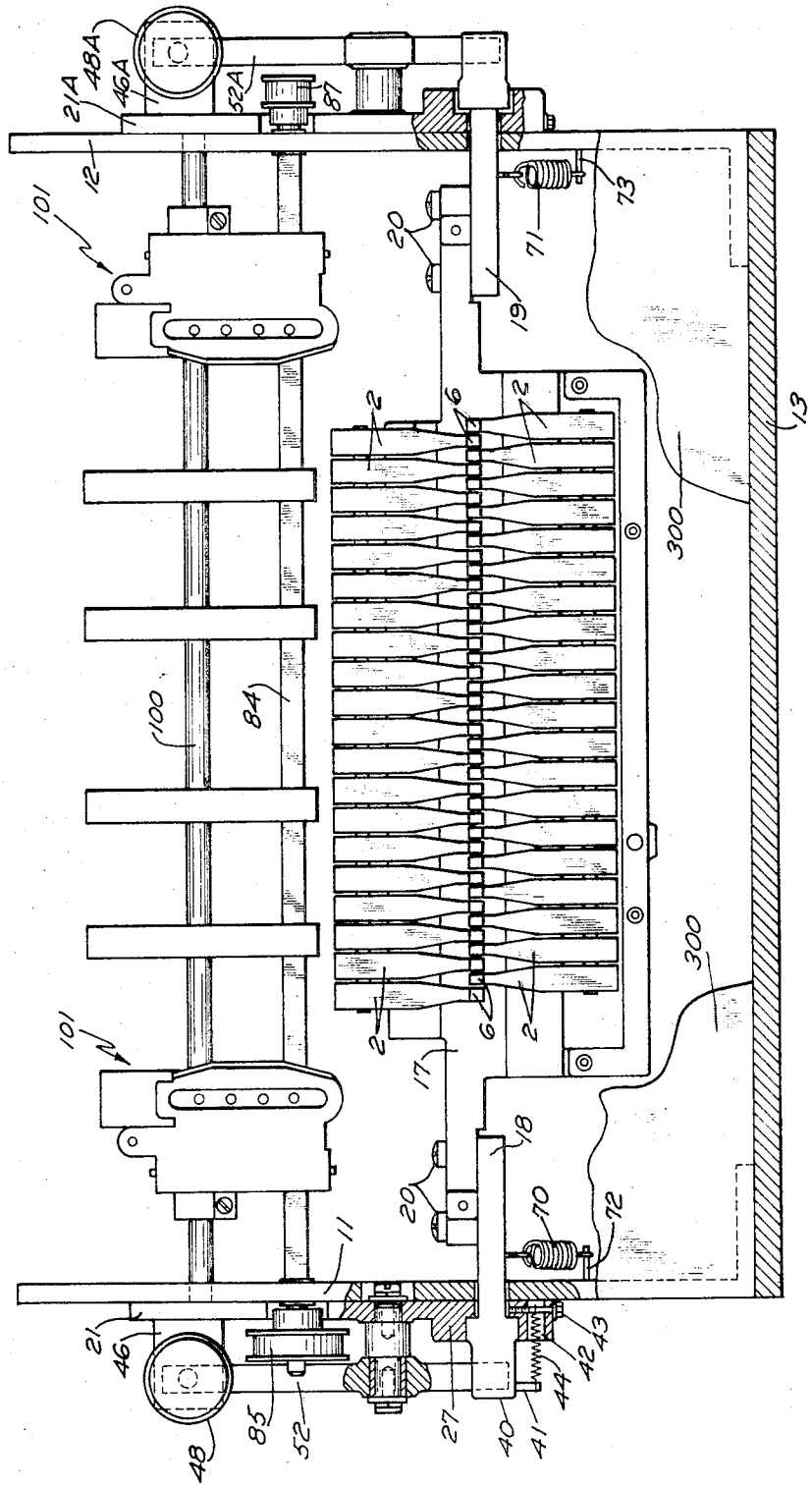


FIG. 3

INVENTOR
RICHARD ANTHONY PERRY

BY
William Frederick Varner
ATTORNEY

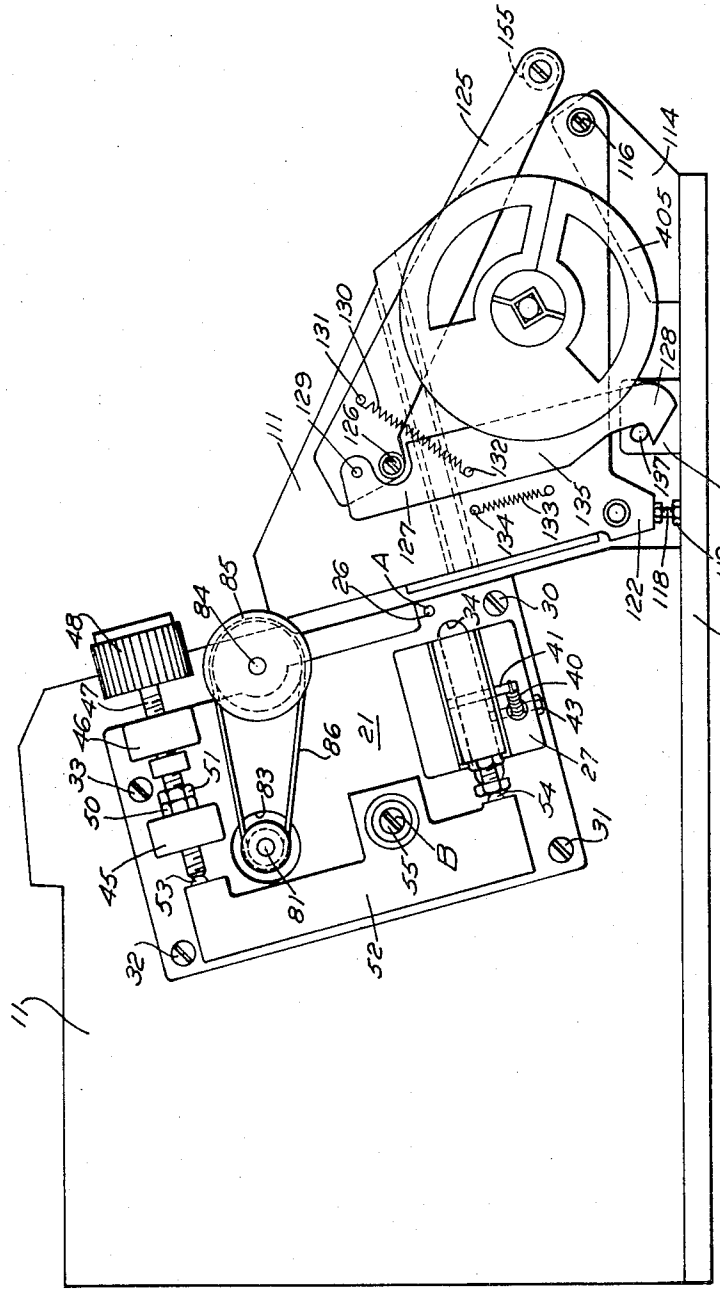


FIG. 4

INVENTOR
RICHARD ANTHONY PERRY
BY
William Frederick Kemes
ATTORNEY

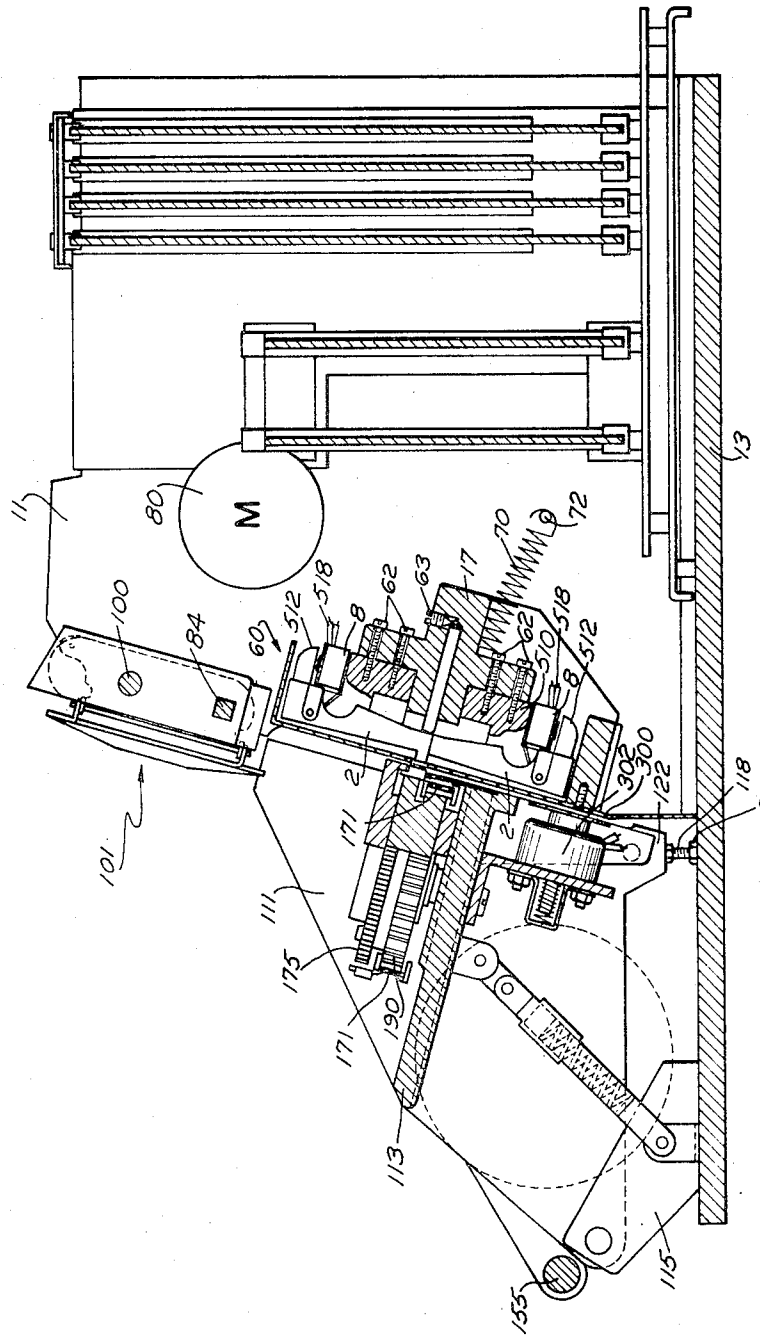


FIG. 5

INVENTOR
RICHARD ANTHONY PERRY
BY
William Frederick Varney
ATTORNEY

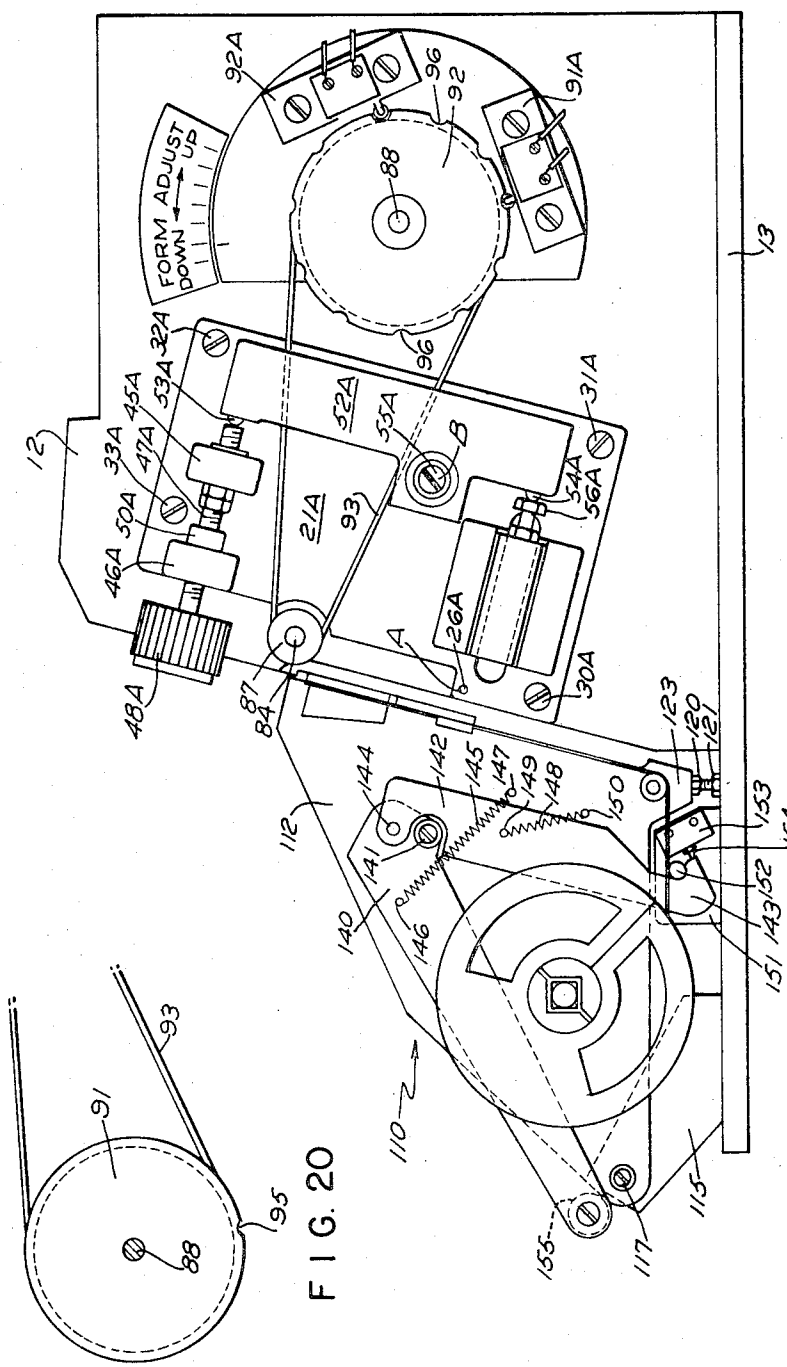


FIG. 6

FIG. 20

INVENTOR
RICHARD ANTHONY PERRY

BY
William Frederick Werner
ATTORNEY

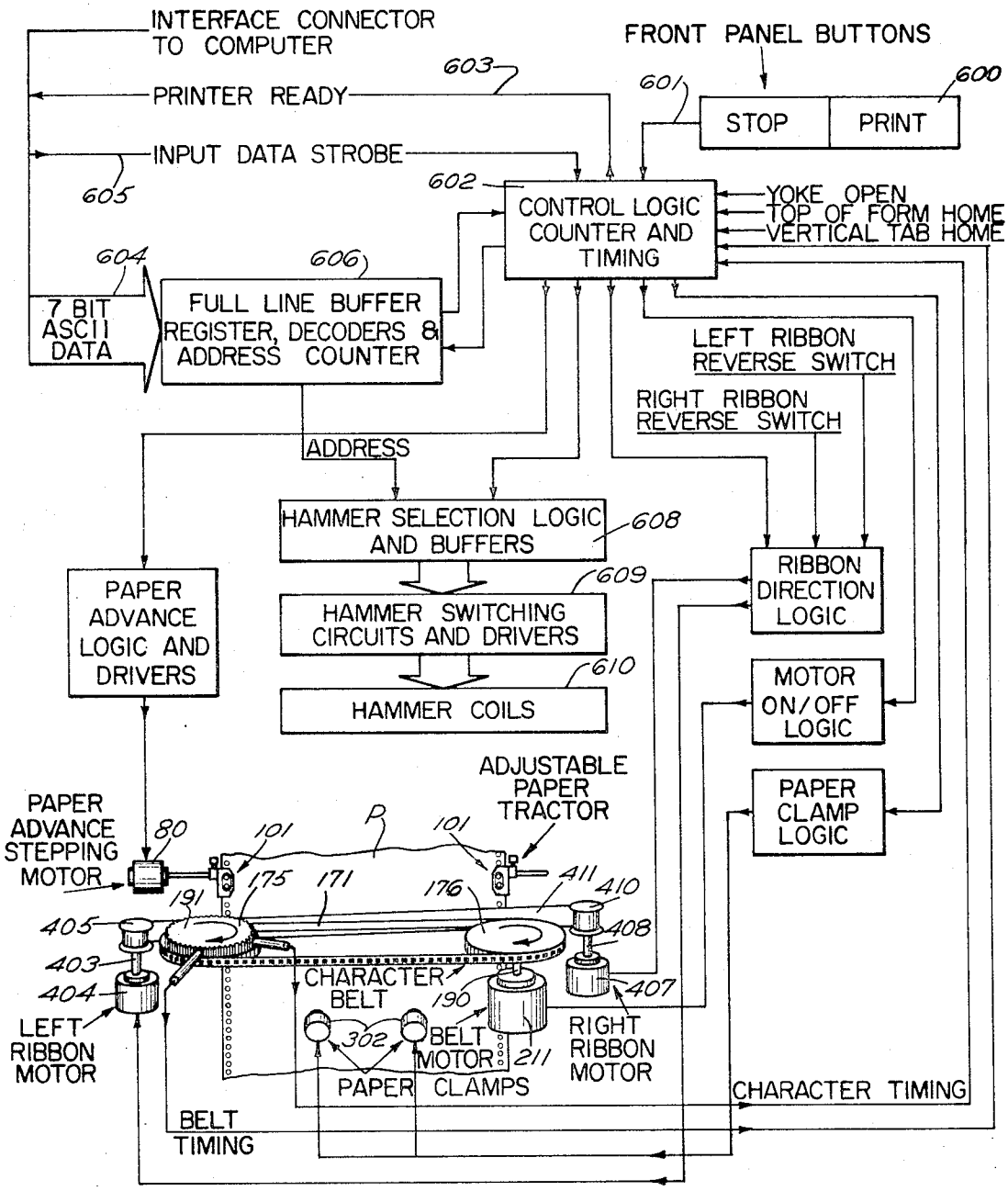


FIG. 7

INVENTOR
RICHARD ANTHONY PERRY
BY
William Frederick Varner
ATTORNEY

Patented May 1, 1973 3,730,082

10 Sheets-Sheet 8

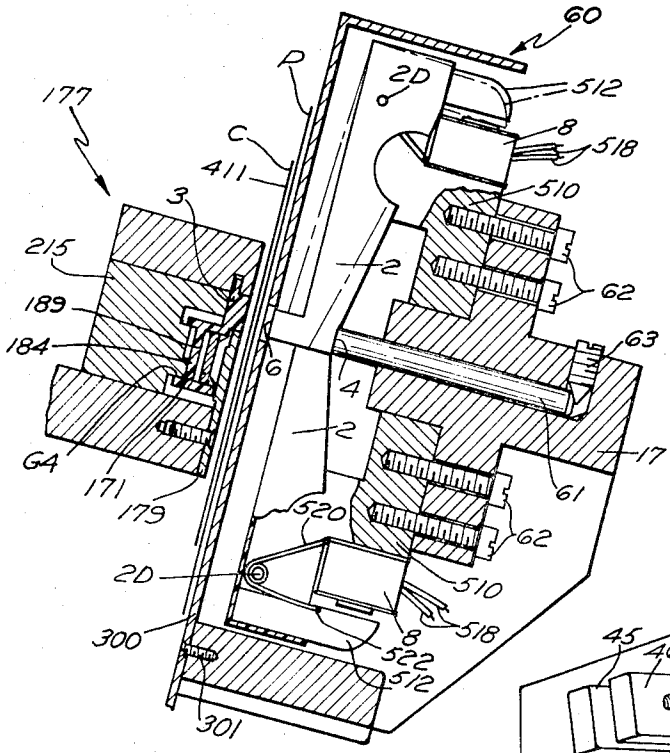


FIG. 8

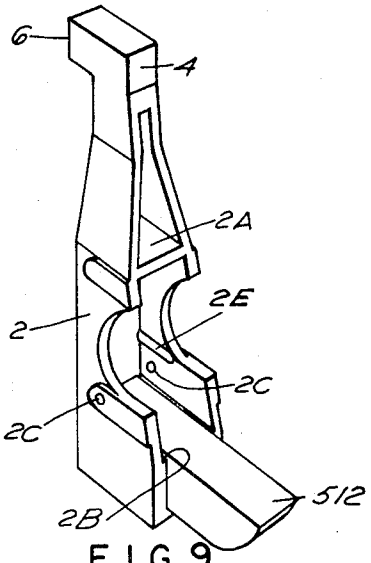


FIG. 9

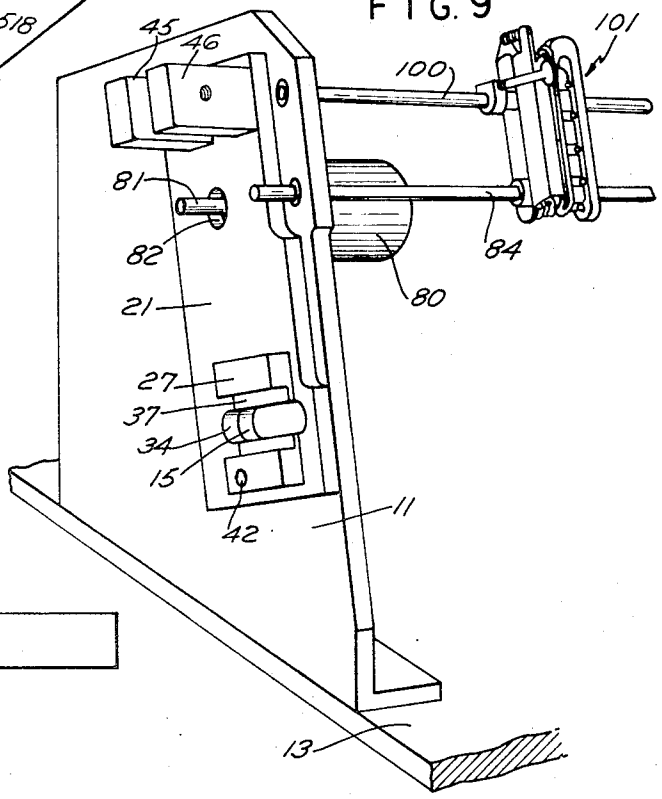


FIG. 10

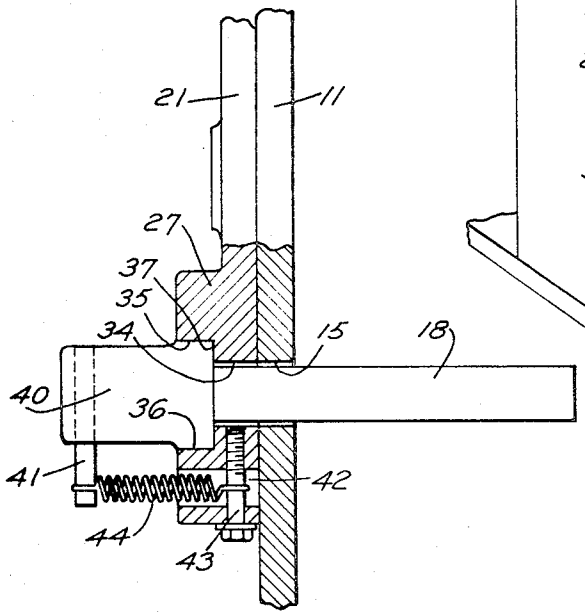


FIG. 11

INVENTOR
RICHARD ANTHONY PERRY
BY
William Frederick Varney
ATTORNEY

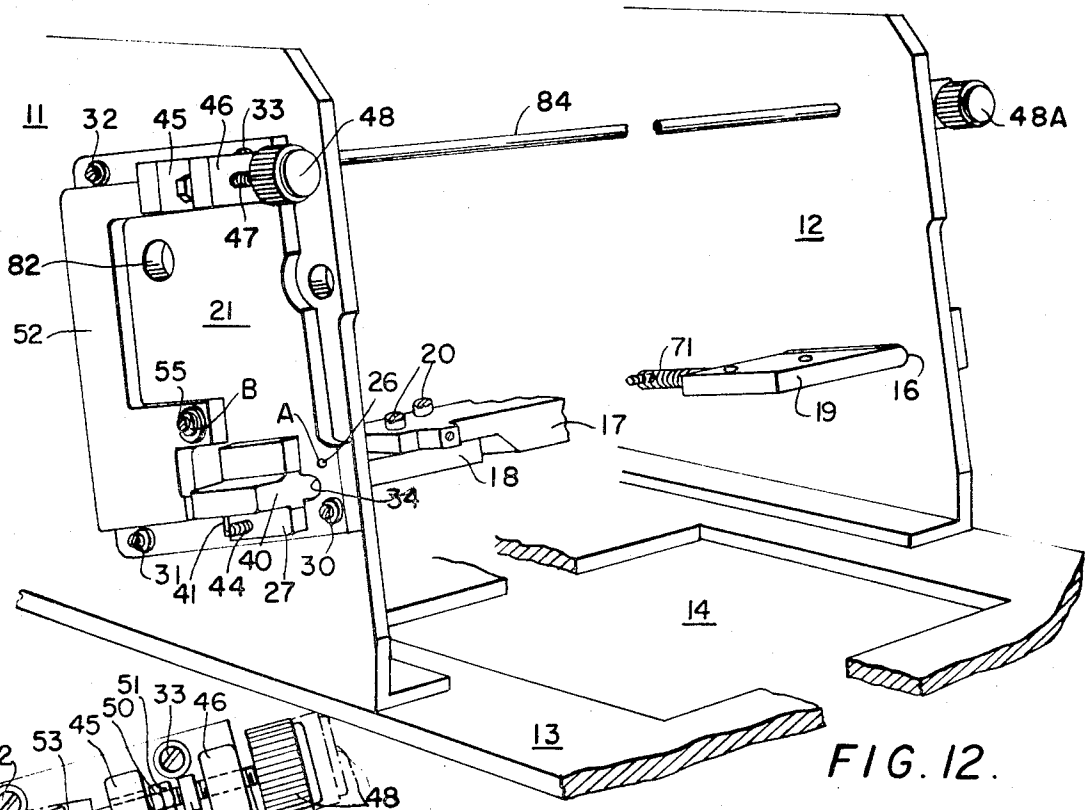


FIG. 12.

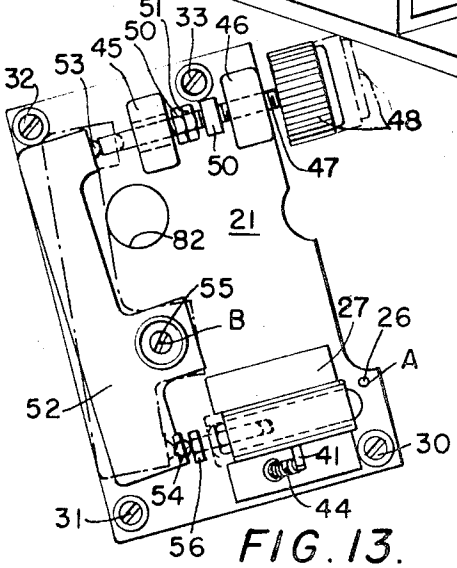


FIG. 13.

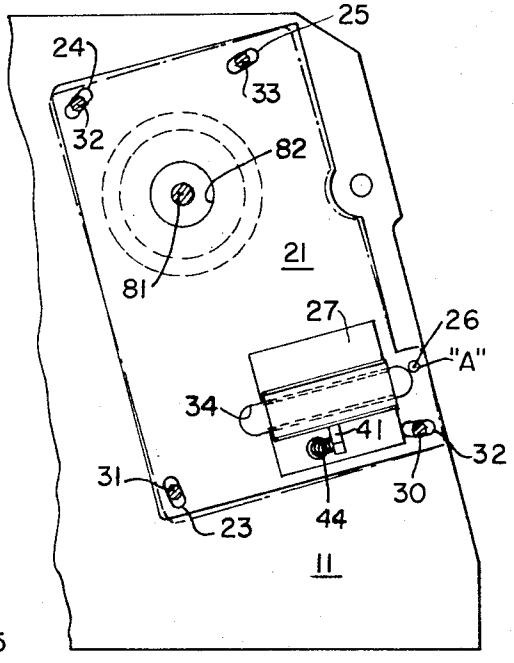


FIG. 14.

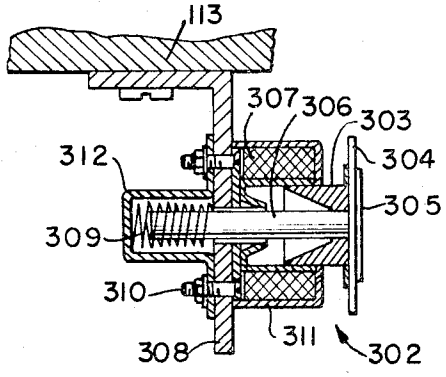


FIG. 15.

INVENTOR
RICHARD ANTHONY PERRY

BY William Frederick Werner
ATTORNEY

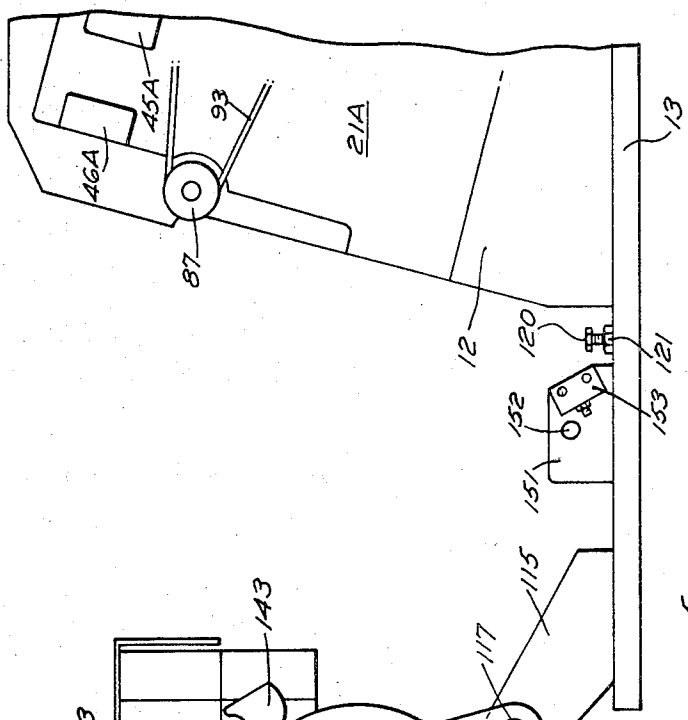


FIG. 17

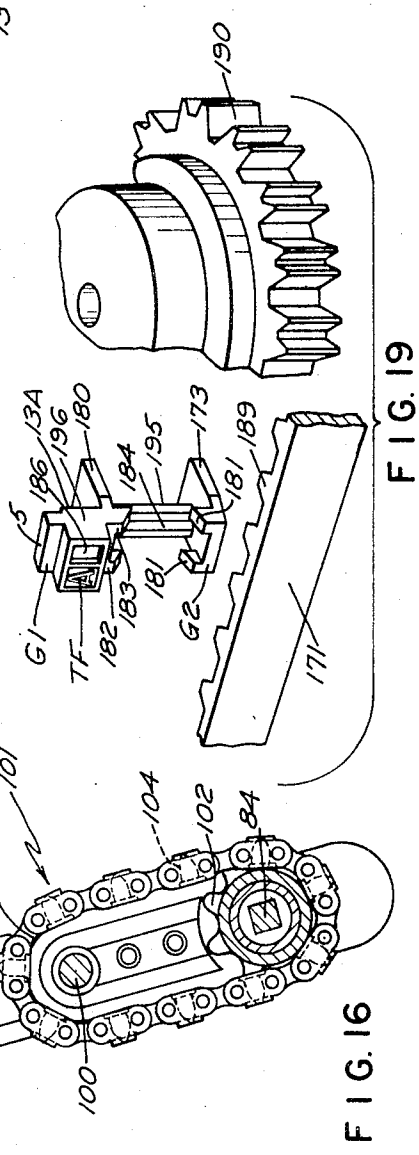


FIG. 19

FIG. 16

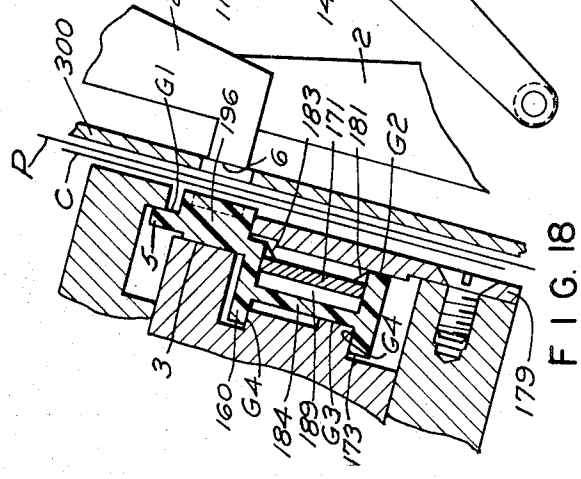


FIG. 18

INVENTOR
RICHARD ANTHONY PERRY
BY
William Frederick Varney
ATTORNEY

IMPACT LINE PRINTER

STATEMENT OF THE INVENTION

This invention relates to an impact hammer printer and more particularly to a machine which prints information stored in a memory. The invention provides for improved structural means for aligning the individual hammer face platens with the moving printing character to provide a clear imprint, although there are other features hereinafter described and claimed.

BACKGROUND OF THE INVENTION

A high speed chain or impact line printer utilizes information furnished by a primary source of information, such as a digital data source, for example, digital magnetic tape, digital computer, punched tape, punched cards, etc., an involves plural type elements or carriers cyclically movable in a continuous closed loop path. A plurality of print hammers arranged at uniformly spaced print positions along the path drive an interpositioned print medium or web against various type faces formed on the carriers. The striking of the print medium against the type faces by the print hammers occurs under the control of a memory or storage device which indicates which characters are to be printed at the various hammer print positions and a coacting type tracking means which identifies the various characters as they approach the various print positions along the path. When a complete set of characters has moved past every hammer position, a complete line of data will have been recorded on the print medium or web. The print medium is than advanced to a new line position; a new line of data is placed in storage and the process repeated without stopping the cyclical movement of the type elements or carriers attached to an endless belt forming the closed loop path or "type chain."

The type chain is in turn mounted to a drive mechanism whereby the carriers are continuously moved along a closed path at least part of which is straight.

While the type chain is well suited for high speed printer apparatus use, it exhibited several draw backs when it was desired to increase print output. The drawbacks stem from the inherent flexibility of the type chain to a variable degree contributes to errors in spacing and positioning of the type under higher repetitive impact from multiple print hammers. In other words, an increased hammer striking rate which accompanies increased printer operating speeds impose greater tension forces on the chain which affects laterial and longitudinal displacement of type carrier from their regular position, at a slower speed, along the chain. The result of such displacement is to lessen the precision in the coincidence of strike and location of the type carrier to thereby deleteriously affect print quality.

It is therefore a general object of this invention to provide an improved type mechanism for a high speed printer.

It is a more specific object of this invention to provide an improved type mechanism for a high speed printer which overcomes the above disadvantages of the type chain type mechanism, and which at the same time retains all the above-mentioned advantages thereof along with higher speed operating capabilities, long life, ease of maintenance, and precision in location of the platen faces of the impact hammers in relation to the type faces as the carriers move along the print line.

It is a specific object of the present invention to provide new and improved adjustment means for the impact hammers in relation to the type carriers as the closed loop rotates the carriers through a print line.

It is another object of the present invention to provide new and improved means to hold the paper at the exact moment the impact hammers strike the type faces on the carriers.

It is still another object of the present invention to provide the type chain, drive elements and guide elements as part of an assembly which is mounted as a self contained unit in a pivotally mounted yoke forming part of the machine frame.

It is further object of the present invention to provide an impact line printer with an improved integrated electronic circuit.

Other objects of the present invention will be pointed out in part and become apparent in part in the following specification and claims.

Referring to the drawings in which similar characters of reference indicate corresponding parts:

FIG. 1 is a plan view of the new and improved impact line printer with the cover removed.

FIG. 2 is a front elevational view, thereof.

FIG. 3 is a view similar to FIG. 2; however, the front hinged portion of the machine is removed to show the adjusting mechanism associated with the hammer bank.

FIG. 4 is a left side elevational view of FIG. 1.

FIG. 5 is a transverse vertical view taken on line 5—5 of FIG. 1.

FIG. 6 is a right side elevational view of FIG. 1.

FIG. 7 is a diagrammic view of the electrical circuitry.

FIG. 8 is a fragmentary sectional view taken on line 8—8 of FIG. 1.

FIG. 9 is a perspective view of an impact hammer, with the coil and core removed.

FIG. 10 is a fragmentary perspective view of the left side of the machine frame showing the left side pivot plate, a paper tractor and the motor for the paper tractor.

FIG. 11 is a fragmentary cross-sectional view of the left side, left side pivot plate and left side mounting plate.

FIG. 12 is a fragmentary perspective view showing the base, left side and right side of the machine frame with the left side pivot plate, hammer bar and left and right side mounting plates supported therein.

FIG. 13 is a side elevational view of the left side pivot plate showing the left side pivot arm in adjusted position.

FIG. 14 is a fragmentary side elevational view showing the left side pivot plate adjustably movable in relation to the left side.

FIG. 15 is a vertical sectional view through a paper clamp.

FIG. 16 is a side elevational view, partly in section, of a paper tractor.

FIG. 17 is a fragmentary side elevational view showing the yoke portion of the machine frame in open position.

FIG. 18 is a fragmentary cross sectional view showing a portion of a hammer provided with a platen, a paper web, a carbon ribbon, the belt having a carrier thereon, and the carrier guide track provided with an anvil.

FIG. 19 is a fragmentary perspective view showing the endless belt, a carrier mounted on the belt and a belt pulley.

FIG. 20 is a fragmentary view of the inside rim of a two rim wheel.

The machine frame consists of (see FIG. 12) a left side 11 and a right side 12, both fastened to a base plate 13 having a paper feed opening 14. Left side 11 and right side 12 are provided with, respectfully, elongated slots 15 and 16 (see FIGS. 11, 12).

A hammer bar 17 (see FIGS. 3, 5, 8 and 12) is provided with a left side mounting plate 18 and a right side mounting plate 19 which project, respectively, through elongated slots 15 and 16. Screw means 20, fasten hammer bar 17, respectively, to left side mounting plate 18 and right side mounting plate 19.

A left side pivot plate 21 is provided with four elongated slots 22, 23, 24 and 25 (see FIGS. 4, 12, 13, 14). The sides of the slots are struck on an arc from a center A located in a pivot pin 26 fastened in left side 11. Pivot plate 21 is pivotally mounted on pivot pin 26. Four machine screws 30, 31, 32, 33 are fastened in left side 11 and are located, respectively, in elongated slots 22, 23, 24, 25. The heads of said screws hold said pivot plate 21 in selected pivoted relative position against left side 11. The dot and dash position illustrated in (FIG. 14) shows one selected position of pivot plate 21 in relation to the solid line position.

Pivot plate 21 (see FIG. 11) is provided with an elongated slot 34 which is a companion slot to elongated slot 15 and with a boss 27 having a companion elongated slot to slot 34, consisting of top surface 35, bottom surface 36 and back surface 37.

Hammer bar mounting plate 18 is provided with a head 40 having surfaces which slidably engage top surface 35, bottom surface 36 and back surface 37. A pin 41 is fastened in head 40. An opening 42 is provided in boss 40. A screw 43 is fastened in boss 27 and passes through said opening. A coil spring 44 is fastened on opposite ends, respectively, to pin 41 and screw 43 to yieldingly hold head 40 against back surface 37 to prevent inadvertant sidewise movement of hammer bar 17 and misalignment of the hammer platens.

A right side pivot plate 21A constructed the same as left side pivot plate 21 is provided, to perform a simultaneous function with pivot plate 21, as will presently appear. (See FIG. 6).

Reference is now made to FIGS. 12 and 13 wherein, pivot plate 21 is provided with two pads 45 and 46. A fine density adjusting screw 47 provided with a head 48 is rotatively mounted in companion screw threads in pad 45 and passes through a clearance area in pad 46. An adjusting collar 50 is rotatively mounted upon screw 47. Two nuts 50, 51 are also rotatively mounted upon screw 47, for purposes which will presently appear.

A pivot arm 52 having a fulcrum point at B, a long arm head at 53 and a short arm foot at 54 is pivotally mounted to pivot plate 21 by means of a pivot post screw 55 with head 53 aligned for engagement with the end of screw 47 and foot 54 aligned for engagement with a screw 56 adjustably secured to left side mounting plate 18.

FIG. 8 depicts the hammers, generally indicated by reference numerical 60, fastened to the hammer bar 17 and the mechanism for adjusting the hammer face or platen 6 in relation to the type face on the carrier 5 and anvil 3.

The Impact Hammer For A Line Printer 60, is the subject of patent application Ser. No. 82,355 filed Oct. 20, 1970.

The Belt And Carrier For A High Speed Printer 5, is the subject of patent application Ser. No. 95,099 filed Dec. 4, 1970.

The hammer 60 (see FIGS. 8 and 9) comprises a body 2, a hammer head 4 and a hammer face or platen 6. The electromagnet arrangement comprises a coil 8, a core 10 partially housed within body 2 of the hammer and an armature 12 embedded in the base of the body 2. Machine screws 62 fasten the core 10 to hammer bar 17. The hammers 60 are arranged in an upper bank and a lower bank (see FIGS. 1,2,3, 5 and 8). The structural description and function of one hammer will surface for all the individual hammers 60 in the banks.

FIGS. 5 and 8 show a side view of the hammer 60 and the electromagnet combination in relation to anvil 3 and character or type carrier 5. FIG. 8 shows the hammer 60 in rest position in full lines and in actuated or hammer striking the carrier 5 supported by the anvil 3 position in dot and dash lines. In hammer 60 rest position the coil 8 is deenergized. In this position hammer platen 6 is removed from the type face of carrier 5 and the back surface of hammer head 4 comes to rest against a hammer adjusting pin 61 slidably mounted in hammer bar 17. One end of adjusting pin 61 within hammer bar 17 is provided with a 45° taper. A companion set screw 63 rotatively mounted in hammer bar 17 is also provided with a 45° taper and is so aligned in relation to adjusting pin 61 that rotational movement of set screw 63 towards adjusting pin 61 causes the set screw 63 to force adjusting pin 61 out of hammer bar 17 through engagement of the two 45° tapers. Conversely, adjusting pin 61 is held against set screw 63 by the back of head 4 engaging the end of adjusting pin 61.

When the coil 8 is energized, armature 512 is attracted to coil 8 and core 510 and hammer platen 6 moves from rest position to a position against the carbon ribbon C and paper P forcing the paper against the type face on carrier 5 supported by anvil 3, to thereby, print a character on the paper P.

The distance the hammer platen 6 travels from rest to printing position influences the clarity of the printed character on the paper. Adjusting pin 61 controls and/or varies by adjustment, that distance of travel and flight time.

In like manner the angle of hammer platen 6 in relation to the type face on carrier 5 determines the clarity of the printing. Hammer bar 17 controls the angle of the hammer platen 6, as will presently appear.

Body 2 of hammer 60 tapers from the base of the body to the hammer head 4. The taper in the body gives uniformity between degree of bend between hammers. A major portion of body 2 is hollow and open in back as is clearly shown in FIG. 9. To provide additional strength a shelf 2A is provided across the inside of body

2. Hammer head 4 projects approximately at a right angle from the narrow end of body 2 and terminates in a hammer platen 6.

The overall electromagnet structure comprises coil 8, core 510 and armature 512. Armature 512 is molded and embedded into the base of body 2 as shown in FIG. 9. Core 510 is essentially an H-shaped core and coil 8 is wrapped around one of the legs of the core 510. Leads 518 (see FIG. 1.) are provided to energize coil 8. A spring 520 (see FIG. 8) is slipped over the other leg of core 510. Spring 520 is so shaped that it wraps around the leg of core 510 and has arms 522 that project below core 510. Arms 522 of spring 520 wrap around and rest on the bearing surfaces 2B that are integrally formed inside hammer body 2. The coil, core and spring assembly is slipped into the opening in the back of hammer body 2 and is secured to the body 2 by means of pin 2D. Orifices 2C in body 2 and core 510 provide bearing support for pin 2D.

When the coil 8, core 12 and spring 20 assembly is secured in body 2 the arms 22 of spring 20 rest on the ledges 2B formed inside of hammer body 2. This is clearly shown in FIG. 9.

To obtain good printing results hammer platen 6 must strike flat against the type face on carrier 5. To ensure that hammer platen 6 strikes flat against carrier 5 hammer bar 17 is adjustable.

As previously described, hammer bar mounting plate 18 is supported in the boss 27 of pivot plate 21 (see FIGS. 11, 12, 13,14). Fine density adjusting screw 47 through head 48 is rotated so that pivot arm 52 is rotated about pivot post screw 55 as the end of screw 47 pushes head 53 which is yieldingly held against screw 56 through coil springs 70, 71 (see FIG. 3) which are fastened on opposite ends to hammer bar 17 and, respectively, to left side 11 and right side 12 at respectively, studs 72, 73 fastened in, respectively, left side 11 and right side 12.

In this manner, hammer bar 17 is slidably mounted to adjust the distance between the faces of the platen at rest and the anvil. As previously described pivot plate 21 adjusts the hammer bars and specifically the face of the platen in tilted position to align the platen face parallel to the face of the characters at the position of impact.

With reference to FIGS. 1, 3, 4 and 12, heads 48, 48A are rotated simultaneously, to align hammer bar 17 and platen 6, as just described. The corresponding parts, on right side 12 just described with reference to left side 11, carry an A for identification.

Reference is now made to FIGS. 1, 3, 4, 6, 10, 13, 14, wherein is shown the mechanism for advancing the paper (upward) in line increments. A stepping motor 80 is fastened to left side 11 with the motor shaft 81 projecting through a clearance orifice in left side 11 and through an elongated clearance orifice 82 in pivot plate 21. A small drive pulley 83 is fastened to motor shaft 81. A driving shaft 84 is rotatively supported in left side 11 and right side 12. A large drive pulley 85 is fastened to driving shaft 84 on one end. A belt 86 rotatively connects small drive pulley 83 with large drive pulley 85. A driven pulley 87 is fastened to driving shaft 84 on its opposite end. A stub shaft 88 is fastened to right side 12. A timing wheel having two rim peripheries 91, 92 is fastened to stub shaft 88. A belt 93 rotatively connects timing wheel rims 91, 92 with driven pulley 87. Rim 91 is provided with a single notch 95 and rim 92 is provided with a plurality of notches 96 evenly spaced around rim 92.

When fan fold paper is used, rim 91 through electric switch 91A informs the electric circuit that the top of the fan fold paper form is in proper printing position.

The notches 96 on rim 92 through electric switch 92A provide vertical tab indicators for the electric circuit.

If paper other than standard 11 inches fan fold forms are used, rims 91, 92 would be replaced with other cam format controls.

Reference is now made to FIGS. 2, 3, 10 and 16, wherein a support rod 100 is fixed on opposite ends in left side 11 and right side 12. Two paper tractors, generally indicated by reference numeral 101 are supported upon rod 100 and are rotatively driven by driving shaft 84. These paper tractors 101 are commercial products, well known to the art. They generally consist of two sprockets 102, 103, rotatively mounted, respectively, upon driving shaft 84 and rod 100. A toothed 104 chain is mounted in a closed loop around sprockets 102, 103. When fan fold paper is to be printed upon, it is provided with perforations on opposite sides of the sheet. The teeth 104 of paper tractors 101 engage the perforations as the paper is fed upward from the floor through paper feed opening 14 in base 13. The stepping motor 80 forming part of the electric circuit is energized in timed sequence to feed the paper upwardly through the indexed rotation of toothed chains 104.

A structural feature of the present invention is the pivotal yoke, generally indicated by reference numeral 110 consists of a left side plate 111, a right side plate 112 integrally connected by a platform 113. (see FIG. 2). A left bracket 114 and a right bracket 115 are fastened to base plate 13. Left pin 116 pivotally mounts left side plate 111 to left bracket 114. Right pin 117 pivotally mounts right side plate 112 to right bracket 115. An adjustable left side seating screw 118 is rotatively secured in base plate 13 and fastened in selected position through a left side lock nut 119. An adjustable right side seating screw 120 is rotatively secured in base plate 13 and fastened in selected position through a right side lock nut 121. Left foot 122 located on left side plate 111 rests upon seating screw 118 while simultaneously, right foot 123 located on right side plate 112 rests upon seating screw 120.

A left side lever 125 is pivotally connected to left side plate 111 at 126. A locking link 127 provided with a hook 128 is pivotally connected to left side lever 125 at 129. An upper left spring 130 is fastened to left side lever 125 at 131 and to left side plate 111 at 132. A lower left coil spring 133 is fastened to locking link 127 at 134 and to left side plate 111 at 135. A pad 136 is fastened to base plate 13. An eccentric pin 137 is adjustable secured in pad 136. Hook 128 removably engages eccentric pin 137. Pin 137 is eccentric so that hook 128 will properly latch thereto when left side lock nut 119 is adjusted, for reasons which will presently appear.

A right side lever 140 (see FIGS. 6 and 17) is pivotally connected to right side plate 112 at 141. A right side locking link 142 provided with a right side hook 143 is pivotally connected to right side lever 140

at 144. An upper right coil spring 145 is fastened to right side lever 140 at 146 and to right side plate 112 at 147. The lower right coil spring 148 is fastened to right side locking link 142 at 149 and to right side plate 112 at 150. A right side pad 151 is fastened to base plate 13. An eccentric pin 152 is adjustably secured in pad 151. Hook 143 removably engages eccentric pin 152 in the same way and for the same reasons stated for hook 128. An electrical safety switch 153 having a switch button 154 is fastened to right side pad 151. The switch 153 is normally open to prevent the electrical circuit from operating. When hook 143 properly latches to eccentric pin 152, the right side hook will engage switch button 154 and close the switch to permit the electrical circuit to operate. A cross bar 155 is fastened on opposite ends to left side plate 111 and right side plate 112.

Reference is now made to FIGS. 1, 2, 5, 7, and 8, wherein is shown a belt 171 having a plurality of carriers 5 mounted on the belt. The detailed construction of the belt and carriers is the subject of U. S. Patent application Ser. No. 95,099 filed Dec. 4, 1970 by the inventor of the present invention.

The closed loop belt 171 is mounted upon a pair of pulleys 175 and 176 for rotation in platform 113. A front guide 179 and a guide track generally indicated by reference numeral 177 are utilized to provide belt 171 and carrier 5 guidance. A motor 211 is used to provide driving power to the belt system. A motor shaft 190 is directly connected to pulley 176. This arrangement of pulleys, guide track and belt with carriers is a conventional arrangement used in chain printers. FIG. 1 is a top plan view which shows a pair of electronic sensors 223 and 224 used to provide letter or character registration information.

FIG. 8 is a fragmentary enlarged cross sectional view of the hammer bar and hammers in relation to the anvil. FIG. 18 is a fragmentary enlarged cross sectional view of the carrier and guide track. The anvil 3 and guide surfaces (See FIGS. 8 and 18) provided by carrier guide track 177, and front guide 179. The guide track 177 is formed by a guide bar 215 and a front guide 179. The guide bar 215 and front guide 179 provide three guide surfaces G1, G2, G3 for carrier 5. These guide surfaces insure that the carrier 5 will ride against the anvil 3 and be supported thereby. Anvil 3 provides a fourth guide surface.

Front guide surfaces G1, G2 and rear guide surfaces 3, G3 insure that carrier 5 will maintain proper alignment along the carrier's vertical axis, so that, anvil engaging surface on carrier 5 will be parallel to anvil face 3 at the time the hammer platen 6 strikes a type face TF (see FIG. 19).

In this manner the anvil 3 forms a print line or a line upon which the printing takes place when a platen 6 strikes a type face TF.

The inside surfaces G4 prevent the carrier 5 from moving up and down in a vertical plane and therefore it must rotate in a horizontal plane.

The carriers 5 (see FIG. 19) are essentially clips having a letter or character head 196, an upper platform 180 integrally formed with and extending rearwardly from head 196, a lower platform 173 and a vertical post 195 integrally formed with lower platform 173 and upper platform 180 and head 196. Lower platform 173 carries a pair of upwardly extending prongs 181 and head 196 and platform 180 carries a pair of downwardly extending prongs 182 and 183 are preferably integrally formed as part of the carrier 5. Post 195 has a groove 184 formed therein along the entire length of the front of the post. A pair of generally rectangular shaped indentations 186 are formed in letter or character head 196. A letter or character TF is fastened in each of the indentations 186. An anvil engaging surface 13A is located as the rear surface of head 196 and is located opposite indentations 186.

The carriers 5 are slipped over belt 171 and are held on belt 171 by means of upper prongs 182, 183 and lower prongs 181. Carriers 5 are held in place along the belt 171 by means of groove 184 in post 195. Each carrier 5 is placed on belt 171 in such a position that its post 195 is centered on tooth 189 and the tooth slips into the groove 184 to prevent movement of the carriers 5 along the belt 171. Carriers 5 are placed on every other tooth 189. The teeth 189 not covered by carriers 5 engage the channels or grooves cut in pulley teeth 190.

Reference is now made to FIGS. 1 and 7 where a belt timing sensor 223 and a hammer impulse sensor 224 are shown. Carriers 5 are spaced uniformly, upon every other tooth 189 along belt 171; the first space on belt 171 being picked at random.

The first carrier 5 placed on belt 171 will be provided with one space 186 void of a magnetic sensitive letter or character TF. All other indentations 186, except those preselected, will be provided with magnetic sensitive letters and/or characters TF.

The nature of sensor 223 is such that it will be actuated by the magnetic sensitive characters. As soon as the first blank space 186 is sensed by sensor 223; this information is transferred, as the starting point of belt 171, to the electronic circuits used with high speed printers. In other words, the blank space or spaces 186 provide position information to indicate the location of a preselected carrier 5 on belt 171.

Pulley 175 is provided with a timing gear 191. Sensor 224 is actuated by metal or magnetic sensitive timing gear 191 which generates timing impulses picked up by sensor 224, to time the firing sequence of the hammers 60 which strike the characters TF.

A paper shield 300 is fastened to hammer bar 17 by means of screws 301 (see FIG. 8). A paper clamp 302 (see FIGS. 5 and 15) consists of an armature 303 provided with a disk 304 having a rubber cushion 305 and a stem 306, slidably mounted within a coil 307. A bracket 308 is fastened to platform 113 and is provided with a clearance orifice to accommodate stem 306. Screw means 310 fasten coil 307 to bracket 308. A cover 311 encases coil 307. A housing 312 is fastened to bracket 308 by means of screws 310. A coil spring 309 is located within housing 312 and abutts said housing on one end and engages a shoulder on stem 306 on the other end to yieldingly urge armature 303 outwardly from coil 307 so as to hold rubber cushion 305 against paper shield 300. Paper P interposed between shield 300 and cushion 305 is thereby held in position at the instant the hammers 60 strike the paper, because coil 307 forms part of the electrical circuit and is energized in timed sequence by that circuit.

Attention is directed to FIGS. 2, 5 and 7 wherein is shown the ribbon mechanism. Two brackets, a left bracket **400** and a right bracket **401** are fastened to platform **113**, as by means of screws **402**. A left ribbon motor **404** provided with a left ribbon shaft **403** is fastened to bracket **400** with shaft **403** rotatively supported in bracket **400** and left side plate **111**. A left ribbon spool **405** is fastened to left ribbon shaft **403**. Similarly a right ribbon motor **407** provided with a right ribbon shaft **408** is fastened to bracket **401** with shaft **408** rotatively supported in bracket **401** and right side plate **112**. A right ribbon spool **410** is fastened to right ribbon shaft **408**. A ribbon **411** is wound upon ribbon spools **405** and **410** and traverses before the print line of anvil **3**.

Reference is now made to the block-wiring diagram illustrated in FIG. **7** where digital data is received in ASCII code by means of control or space character impulses and data or printed character impulses.

Manual depression of print button **600** places the circuitry in position to receive control and data character impulses from a computer or other digital data source through impulses sent from print button **600** through connection **601** to control logic unit **602** and then through the printer ready connection **603** to the computer.

The information from the computer is presented at the "7 BIT DATA" arrow **604**. Upon command from the "INPUT DATA STROBE" **605**, the information from the "7 BIT DATA" arrow **604** is entered into the "FULL LINE BUFFER" **606**, wherein, one character at a time is received by the buffer **606** until the buffer **606** is notified by a control character that a full line has been given to the buffer **606**.

An electronic digital replica of the belt **171** and its array of type faces is produced in the "CONTROL LOGIC UNIT" **602**.

The word "LOGIC" as herein used, refers to binary or digital circuitry.

The "HAMMER SELECTION LOGIC" unit **608** in digital sequence selects a particular hammer by comparing the information stored in the "FULL LINE BUFFER" **606** with the information in the "CONTROL LOGIC" unit **602** and then through the "HAMMER SWITCHING CIRCUITS" **609** and "HAMMER COILS" **610**, fires one or more of the hammers in hammer bank **60** with the proper lead time. Simultaneously the printed character impulse is removed from the "FULL LINE BUFFER" **606** and is replaced with a space character impulse.

This procedure continues until all the stored printed character impulses in the "FULL LINE BUFFER" **606** have fired all the selected hammers out of the hammer bank **60** and replaced the printed character impulses with space character impulses.

Upon the firing of the last hammer in the above outlined sequence, the computer, though "7 BIT ASCII DATA" **604**, "FULL LINE BUFFER" **606**, and "CONTROL LOGIC" **602**, sends a control character impulse to the paper advance motor **80**, to thereby advance the paper.

When "fan fold" paper is used, the paper advances one line at a time by means of stepped motor **80**. If vertical tab or form feed is desired, command impulses from "7 BIT ASCII DATA" **604** are transferred to control rims **91**, **92** through electric switches **91A**, **92A**, respectively, as previously described.

While the paper is advancing the ribbon motors **404** and **407**, under control of "CONTROL LOGIC" unit **602** rotate to index the ribbon.

Simultaneously, with the start of the paper advance, "CONTROL LOGIC" unit **602** signals the computer to supply more data through "7 BIT ASCII DATA" arrow **604** and "FULL LINE BUFFER" **606**.

The cycle is now repeated. The "FULL LINE BUFFER" **606** accepts one character impulse at a time until the buffer **606** receives a full line.

Simultaneously, with the start of the firing of the first hammer to start the printing of a line, the "CONTROL LOGIC" unit **602** sends a digital impulse to the paper clamps **302** to actuate the paper clamps into paper holding position. Upon completion of a printed line "CONTROL LOGIC" unit **602** sends impulses to release the paper clamps **302**, to allow the paper to be advanced to the next print line.

With the manual depression of print button **600**, the initial response of the computer is to send a control character impulse to the "FULL LINE BUFFER" **606**, which decodes the impulse and sends the information to the "CONTROL LOGIC" unit **602**, thereby to cause the belt motor **211** to rotate pulleys **175**, **176** and belt **171**.

Having shown and described a preferred embodiment of the present invention, by way of example, it should be realized that structural changes could be made and other examples given without departing from either the spirit or scope of this invention.

What I claim is:

1. In an impact line printer a hammer bar adjustably supported in a machine frame for arcuate movement around a fixed pivot, a bank of impact hammers secured to said hammer bar, individual adjusting means in said hammer bar for controlling the throw of the individual impact hammer, a yoke pivotally mounted in said machine frame, a pair of pulleys rotatively supported in said yoke, a closed loop belt, supporting an array of carriers provided with type faces, operatively connected to said pair of pulleys for movement of said type faces past said bank of impact hammers on a print line for printing on a web, and circuit means for rotating said pulleys and providing signals indicating the position of said type faces and the firing of the impact hammers in selected sequence.

2. The impact hammer printer of claim **1** in which the yoke comprises a carrier guide track having an anvil fastened to said yoke, with said array of carriers rotatively traversing through said guide track past said bank of impact hammers on a print line provided by said anvil for printing on a web, and circuit means including a motor for driving said pair of pulleys, a belt timing sensor and a hammer impulse sensor for providing signals indicating the position of said type faces and the firing of the impact hammers in selected sequency, said yoke pivotally moving said carrier guide track and anvil toward and away from said bank of hammers.

3. An impact hammer printer comprising a machine frame having a base plate provided with a paper feed opening, a left side and a right side, elongated slots in, respectively, said left side and right side, a left side pivot plate provided with two left side pads and an

elongated slot aligned with said elongated slot in said left side, a pivot pin fastened in said left side pivotally mounting said left side pivot plate to said left side, means fastening said left side pivot plate in selected arcuate position in relation to said left side, a left side pivot arm pivotally mounted in said left side pivot plate, a left side fine density adjusting screw rotatively mounted in said two left side pads abutting one end of said left side pivot arm, a right side pivot plate provided with two right side pads and an elongated slot aligned with said elongated slot in said right side, a pivot pin fastened in said right side pivotally mounting said right side pivot plate to said right side, means fastening said right side pivot plate in selected arcuate position in relation to said right side, a right side pivot arm pivotally mounted in said right side pivot plate, a right side fine density adjusting screw rotatively mounted in said two risht side pads abutting one end of said right side pivot arm, a hammer bar having a left side mounting plate projecting through the elongated slots in said left side and said left side pivot plate, and right side mounting plate projecting through the elongated slots in said right side and right side mounting plate, left side spring means fastened at one end in said left side mounting plate and the other end fastened to said left side, right side spring means fastened at one end in said right side mounting plate and on the other end fastened to said right side, said left side mounting plate abutting the other end of said left side pivot arm, and said right side mounting plate abutting the other end of said right side pivot arm, whereby rotation of said left side and right side fine density adjusting screws slidably moves said hammer bar against the tension of said left side and right side spring means to move said hammer bar back and forth in said elongated slots.

4. The impact hammer printer of claim **3** in which the hammer bar is provided with an upper bank and a lower bank of impact hammers, individual adjusting means in said hammer bar for controlling the throw of the individual impact hammer, a carrier guide track, having an anvil, fastened in said machine frame, a pair of pulleys rotatively mounted in said machine frame, a closed loop belt, supporting an array of carriers provided with type faces, operatively connected to said pair of pulleys so as to traverse through said guide track past said bank of impact hammers on, a print line provided by said anvil for printing on a web, and circuit means including a motor for driving said pair of pulleys, a belt timing sensor and a hammer impulse sensor for providing signals indicating the position of said type faces and the firing of the impact hammers in selected sequence, the arcuate movement and the fine density adjusting screw movements adjusting the position of the platen on the impact hammers in relation to the array of characters at the moment of impact.

5. In an impact line printer, a hammer bar adjustably supported in a machine frame, a bank of impact hammers secured to said hammer bar, individual adjusting means in said hammer bar for controlling the throw of the individual impact hammer, a paper shield fastened to said hammer bar, a yoke, provided with a platform, pivotally mounted in said machine frame, a pair of pulleys rotatively supported on said platform, a magnetic sensitive timing gear fastened to one of said pair of pulleys, a carrier guide track having an anvil fastened to said platform, a closed loop belt, supporting an array of carriers provided with magnetic sensitive type faces, operatively connected to said pair of pulleys for movement of said type faces past said bank of impact hammers on a print line for printing on a web, said carrier guide track guiding said closed loop belt through the path of travel of a print line, a pair of paper clamps fastened to said platform, latch means releasably securing said yoke to said machine frame, said yoke pivotally moving said carrier guide track, anvil and pair of paper clamps toward and away from said bank of hammers and said paper shield, and circuit means, including a motor for driving said pair of pulleys, and magnetic sensitive timing gear, belt timing sensor and a hammer impulse sensor for providing signals indicating the position of said type faces and the firing of the impact hammers in selected sequence and for actuating said pair of paper clamps toward and away from said paper shield.

6. The impact hammer printer of claim **5** in which the machine frame consists of a left side and a right side fastened to a base plate having a paper feed opening, a motor, having a motor shaft, forming part of said circuit means fastened to said left side, with said motor shaft projecting through an orifice provided in said left side, a small drive pulley fastened to said motor shaft, a driving shaft rotatively supported, respectively, in said left side and said right side, a large drive pulley fastened to one end of said driving shaft, a belt rotatively connecting said small drive pulley with said large drive pulley, a support rod fastened on opposite ends in said left side and said right side, two paper tractors, each tractor having two sprockets rotatively mounted, respectively, upon said driving shaft and rod, a closed loop toothed chain, one for each of said two paper tractors, mounted around said two sprockets, whereby said motor in the timed sequence of said circuit means rotates said driving shaft and two sprockets to advance a paper web.

7. The impact hammer printer of claim **6**, in which, a driven pulley is fastened to the other end of said driving shaft, a stub shaft fastened to said right side, a timing wheel, having two rim peripheries, fastened to said stub shaft, a belt rotatively connecting said timing wheel with said driven pulley, one of said two rim peripheries having one notch, the other of two rim peripheries having a plurality of notches evenly spaced around said rim, an electric switch having a switch button, forming part of said circuit means and fastened to said right side, said switch button riding said rim having one notch and being actuated by said notch, a second electric switch, having a switch button, forming part of said circuit means and fastened to said right side, said last mentioned switch button riding said rim having a plurality of notches and being actuated by said notches, to thereby control the feeding of the paper web through said circuit means.

8. The impact hammer printer of claim **6** in which a left bracket is fastened to said platform, a left ribbon motor having a left ribbon shaft, fastened to said left bracket with said left ribbon shaft rotatively supported in said left bracket and said left side plate, a left ribbon spool fastened to said left ribbon shaft, a right ribbon motor having right ribbon shaft, fastened to said right bracket with said right ribbon shaft rotatively supported in said right bracket and said right side plate, and a right ribbon spool fastened to said right ribbon

shaft and a ribbon fastened on one end to said left ribbon spool and on the other end to said right ribbon spool, said ribbon rotatively passing on a print line for printing on a web, said left ribbon motor and said right ribbon motor forming part of said circuit means to be actuated in timed sequence by said circuit means.

9. In an impact line printer, a machine frame having a base plate, a hammer bar supported in said machine frame, a bank of impact hammers secured to said hammer bar, a yoke consisting of a left side plate and a right side plate integrally connected by a platform, a left bracket and a right bracket fastened to said base plate, a left pin pivotally mounting said left side plate to said left bracket, a right pin pivotally mounting said right side plate to said right bracket, an adjustable left side seating screw rotatively secured in said base plate, an adjustable right side seating screw rotatively secured in said base plate, a left foot on said left side plate removably engaging said left side seating screw, a right foot on said right side plate removably engaging said right side seating screw, a left side lever pivotally connected to said left side plate, a locking link provided with a hook pivotally connected to said left side lever, an upper left spring fastened on one end to said left side lever and on the other end to said left side plate, a lower left coil spring fastened on one end to said locking link and on the other end to said left side plate, a pad fastened to said base plate, an eccentric pin adjustably secured in said pad, said hook removably engaging said eccentric pin, a right side lever pivotally connected to said right side plate, a right side locking link, provided with a right side hook, pivotally connected to said right side lever, an upper right coil spring fastened on one end to said right side lever and on the other end to said right side plate, a lower right coil spring fastened on one end to right side locking link and on the other end to said right side plate, a right side pad fastened to said base plate, an eccentric pin adjustably secured in said right side pad, said right side hook removably engaging said last mentioned eccentric pin, an electrical safety switch having a switch button fastened to said right side pad, said switch normally open is closed said right side hook engages said switch button to close said electrical safety switch, a cross bar fastened on opposite ends, respectively, to said left side plate and said right side plate, a pair of pulleys rotatively supported in said platform, a closed loop belt, supporting an array of carriers provided with type faces, operatively connected to said pair of pulleys for movement of said type faces past said bank of impact hammers on a print line for printing on a web, said yoke pivotally moving said type faces toward and away from said bank of hammers.

10. The impact hammer printer of claim 6 in which a pair of electrically actuating paper clamps are fastened to said platform, a paper shield fastened to said hammer bar, and electrical circuit means actuating said pair of paper clamps toward and away from said paper shield.

* * * * *