June 23, 1959 E. F. KLEINSCHMIDT 2,891,648

ROTARY TYPEWHEEL PRINTER

Filed Oct. 31, 1956 5 Sheets-Sheet 1

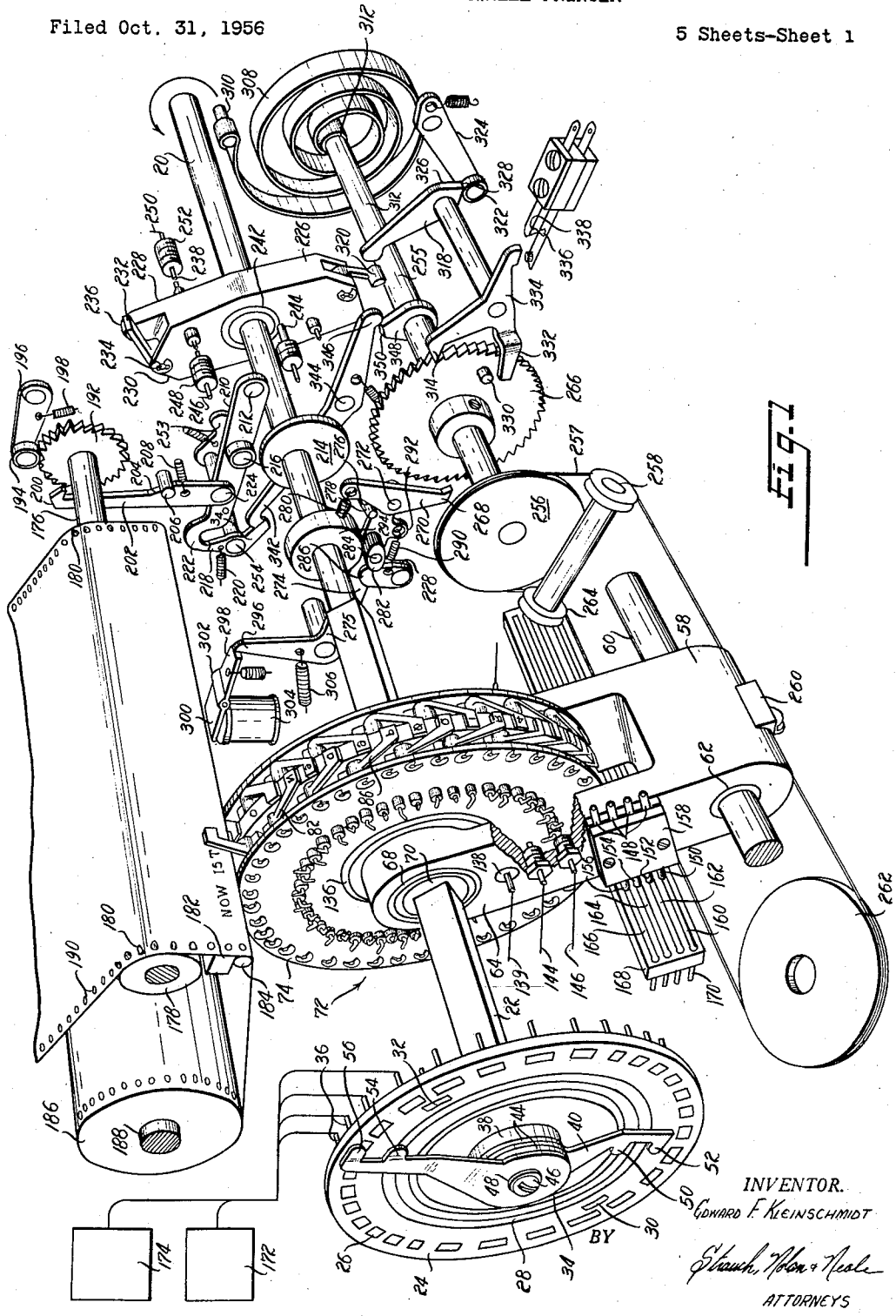


Fig. 1

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Filed Oct. 31, 1956 5 Sheets-Sheet 2

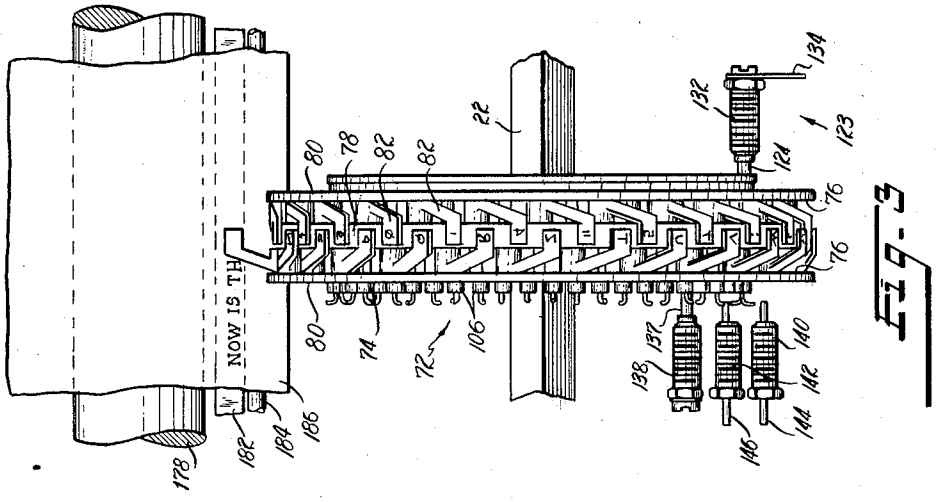


Fig. 3

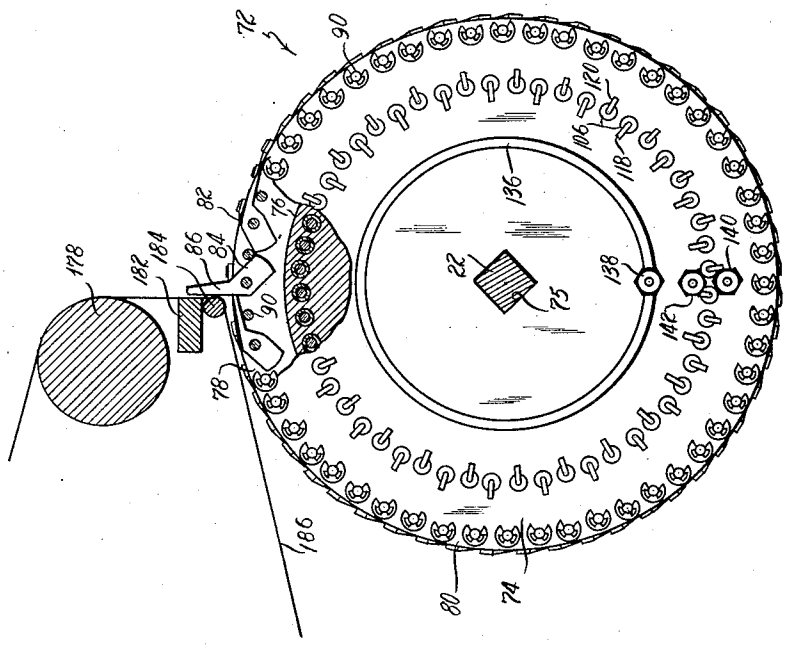


Fig. 2

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ROTARY TYPEWHEEL PRINTER

Filed Oct. 31, 1956 5 Sheets-Sheet 3

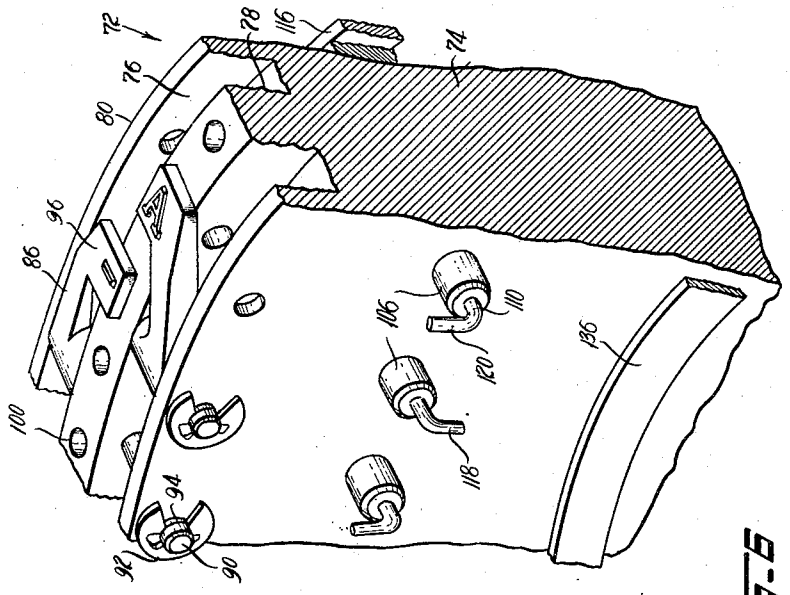


FIG. 5

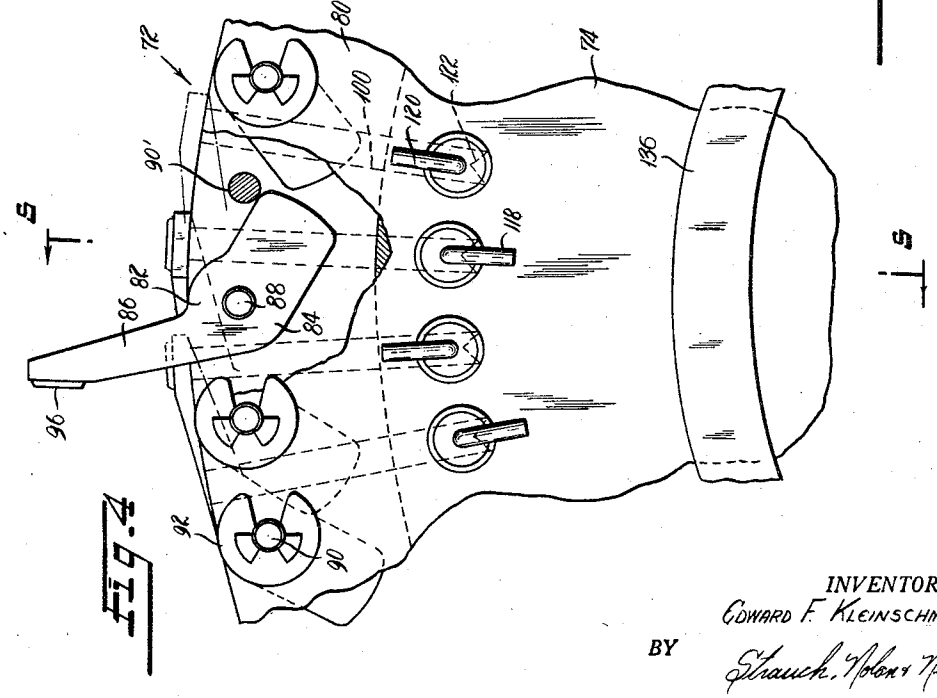


FIG. 4

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ROTARY TYPEWHEEL PRINTER

Filed Oct. 31, 1956 5 Sheets-Sheet 4

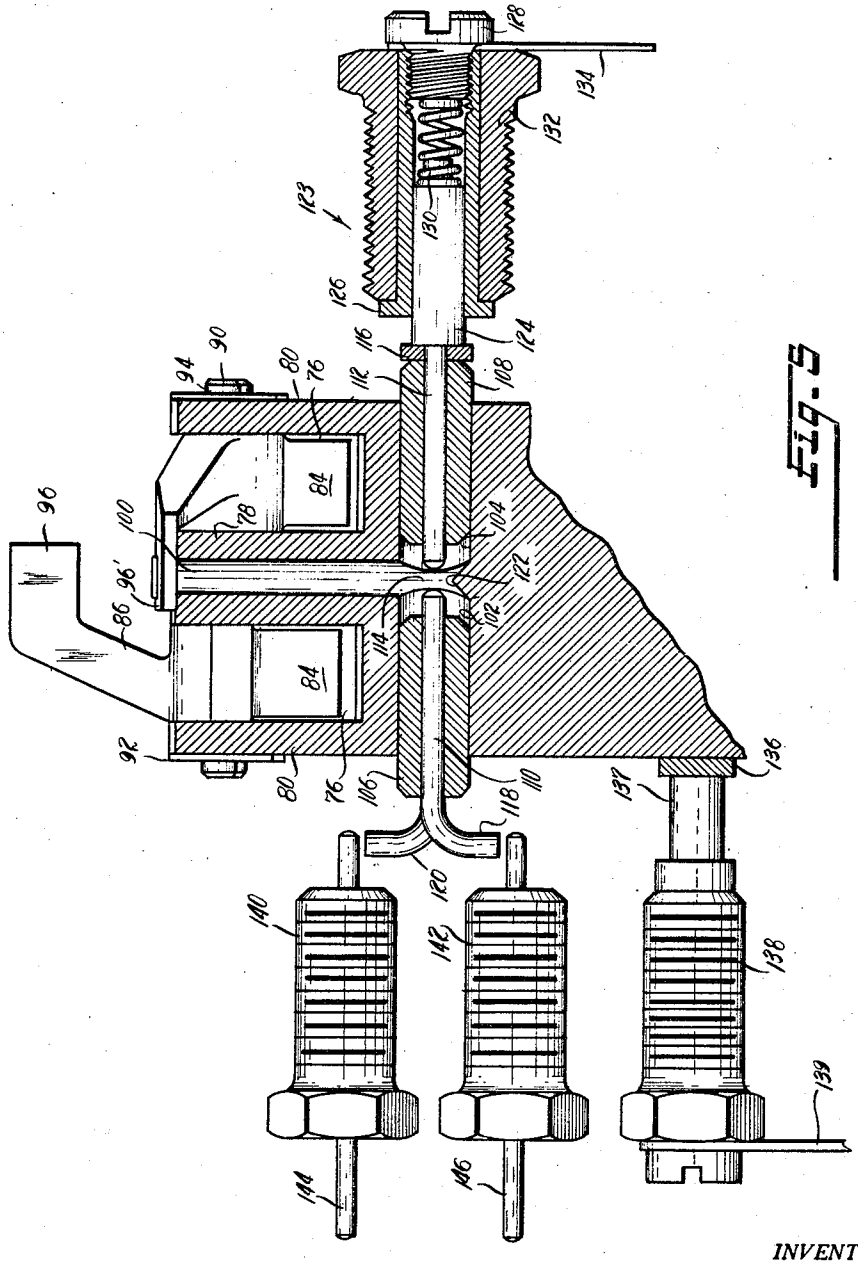


Fig. 5

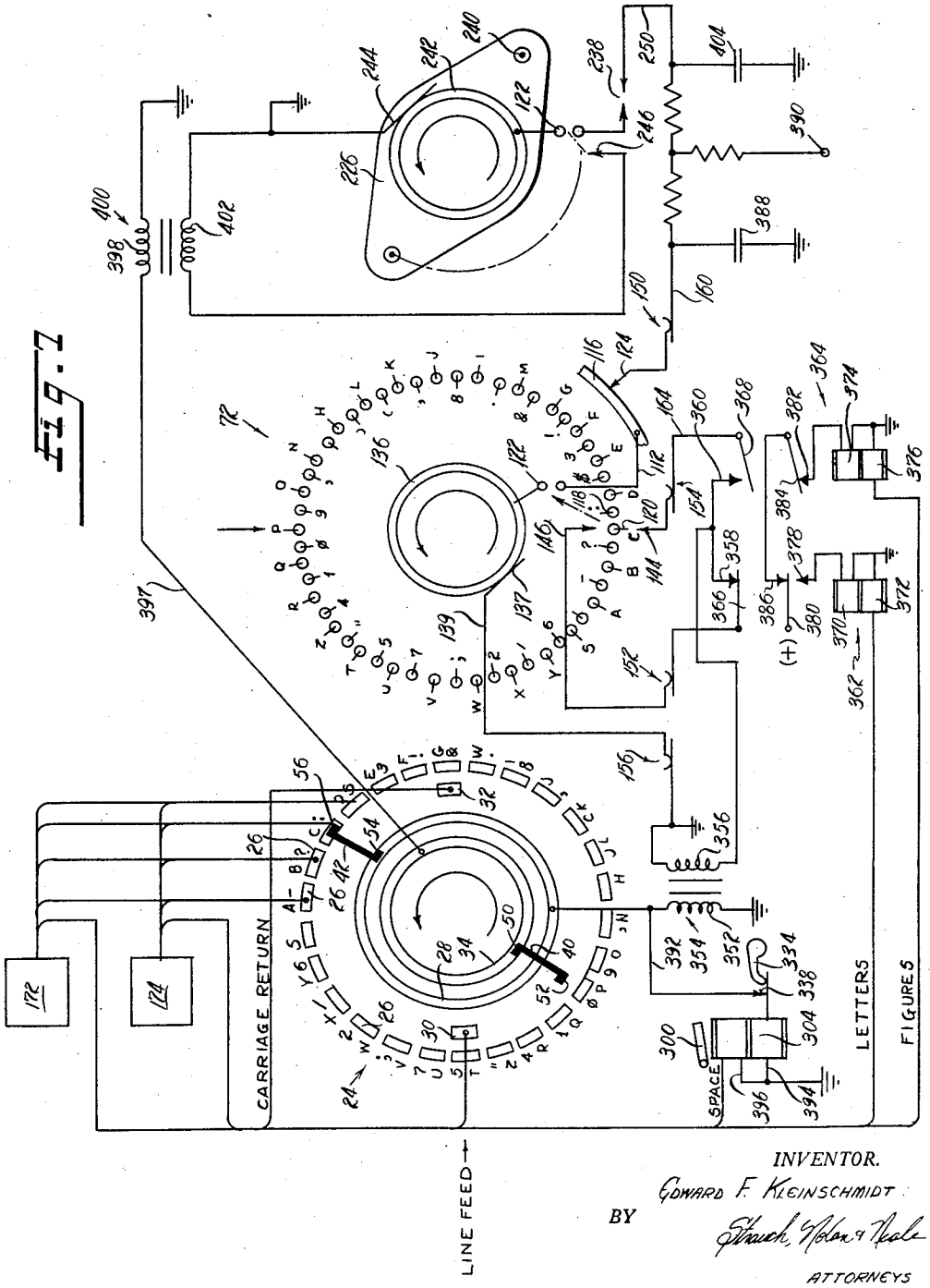
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ROTARY TYPEWHEEL PRINTER

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Fig. 7



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United States Patent Office

2,891,648

Patented June 23, 1959

2,891,648

ROTARY TYPEWHEEL PRINTER

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Application October 31, 1956, Serial No. 619,588

31 Claims. (Cl. 197—12)

This invention relates to electrically operated typewriters and more particularly to signal controlled typewriters for use in telegraph systems, wherein is employed a continuously rotating typewheel of unique design.

Typewheel printers offer a simple and convenient method for presenting type to a printing medium but they have the objectionable characteristic that the typewheel has to be arrested during the instant of printing. This causes great wear and tear on the machinery and puts a limitation upon the speed which may be obtained from such apparatus. Typewheel printers have been made wherein the typewheel does not stop for printing in which instance they depend upon the rapidity of the platen hitting the type character as it passes the printing position on the paper to give clear character delineation. It has been found that in this type of printer it is very difficult to print a straight line of type because the printing position is determined by the synchronization of two moving elements and if they are out of phase just a fraction of a second the character will be printed above or below the desired position. This form of printer is limited to relatively slow reception and is unsuitable in modern, high speed telegraph systems.

Other previously proposed typewheel printers have used continuously rotating typewheels with each character type on an individual pallet pivotally carried around the typewheel periphery. Pallets are moved to and from and retained in non-printing position by magnets, springs, latches and/or cams. One of these previously proposed machines utilizes a permanent magnet in the typewheel which normally attracts and holds each pallet against the typewheel in a non-printing position. A single electromagnet is positioned adjacent the typewheel periphery and can be selectively energized to pivot a type pallet away from attraction of the permanent magnet to an operative position. A cam or guide plate is contacted by the pallet just as the pallet hits the paper to push the pallet back against the permanent magnet for retention until that pallet is again selected by the electromagnet. In these forms of typewheel printers using magnets, springs, cams, latches, etc., for the pivoted pallets, the force that enables movement of the pallet from a non-printing position to a printing position is developed between two relatively rotating bodies, which enables synchronism errors of adjustment between the electromagnets and the typewheel using the rotational movement of the pallet, so that the type face of that pallet could drag or smear along the paper if the cam position were slightly out of adjustment in one direction and camming could occur before the type strikes the platen if the cam position were slightly out of adjustment in the other direction.

Several examples of prior art continuously rotating typewheel printers are disclosed in United States Patents Nos. 904,743 and 2,613,796.

In this present invention a unique continous rotary typewheel is used to enable extremely high speed operation yet the characters are printed in a perfectly straight line. A plurality of counterbalanced type character

pallets are carried on a rotating wheel, in such a fashion that, whether the pallets are in printing or non-printing position, the centrifugal force on the counterbalances will maintain the pallets in position. Any selected pallet is pivoted to a printing position by centrifugal force on the counterbalance when the balance of the selected pallet is shifted by a blast of air resulting from a spark in an associated chamber below the pallet. Pallets are moved back into non-printing position by rebound after striking the platen, which rebound movement pivots the counterbalance of the pallet to a position maintaining the pallet against the wheel by centrifugal force on the counterbalance. Each pallet has its associated blast chamber and electrodes for generating the spark. Selection of a desired type pallet is made through a commutator and electric circuitry as will be later described. Blast actuated, counterbalanced positioned hammers, similar in many respects to the aforementioned pallets, are provided for initiating special non-typing functions of the machine such as carriage return and line feed. The machine typing and type selecting structure is relatively simple to fabricate and is inexpensive. It omits magnets, electro-magnets, latches and camming plates and hence is extremely lightweight.

Accordingly it is a primary object of this invention to overcome the above enumerated objectionable features of prior art typewheel printers by the use of a novel typewheel which is of the continuous rotary type; which is capable of extremely high speed; and which prints the characters in a perfectly straight line.

Another object of the invention resides in the provision in a power operated typewriter of a novel continuously rotating wheel carrying operating printing devices on its circumference actuable toward operating position by a blast of air.

A still further object of the invention resides in the provision in a power operated typewriter of a novel continuously rotating wheel carrying operating devices controlled by a blast of air caused by an electrical discharge.

A further object of the invention resides in the provision in a power operated typewriter of a continuously rotating wheel having centrifugally controlled means for causing the operation of the machine functions.

Another object of the invention is the provision in a typewriting machine of a continuously rotating typewheel in which the type pallets are held by centrifugal force in a normal or unselected position and are selected for printing by upsetting or disturbing the centrifugal force by an electrical discharge.

A further object of the invention is the provision in a power operated typewriter of a continuously rotating typewheel which has rows of type pallets on the circumference of the typewheel which, upon selection by a blast of air, pivot to cause the printing of the selected character.

Further novel features and other objects of this invention will become apparent from the following detailed description, discussion and the appended claims taken in conjunction with the accompanying drawings showing preferred structures and embodiments, in which:

Figure 1 is a perspective view of the mechanical features of a printer constructed according to this invention with the various mounting frames and bearings left out for clarity;

Figure 2 is a left side elevation of the typewheel;

Figure 3 is a front view of the typewheel shown in Figure 2;

Figure 4 is a left side enlarged detail of the typing elements;

Figure 5 is an enlarged section taken on line 5—5 of Figure 4, illustrating the electrodes and spark chamber for each typing element;

Figure 6 is an enlarged perspective view of a section of the periphery of the wheel; and

Figure 7 is a schematic circuit diagram of the electronic components of the printer.

Having reference to Figure 1, the printing apparatus has a shaft 20 which is continuously rotated in a counterclockwise direction by a motor (not shown). An extension of shaft 20 has a square cross section 22 which extends across the printing area of the machine. At the left end of the shaft 20 is a commutator plate 24 which is rigidly mounted to the frame of the machine and does not rotate with the shaft 20. This plate 24 has twenty-six equally spaced outer electrical conducting segments generally indicated at 26, a conducting ring 28, segments 30 and 32 just inside the outer ring of segments 26, and an inner conducting ring 34. Terminals 36, projecting from the rear of the plate 24, are integral extensions of the segments and rings of the plate. To these terminals are connected wires associated with telegraphic equipment which will hereinafter be described. This commutator plate and segment may be in the form of a printed circuit, i. e., electrical segments and rings on a dielectric backing, with the conducting segments and rings plated with a hard metal to resist the wear of a continuously wiping brush.

At the left hand end of shaft 20 a collar 38 is fixed to rotate with the shaft 20 and this fixed collar 38 serves as a mounting for two brush arms 40 and 42. Brush arms 40 and 42 are insulated from one another and from the collar 38 by non-conducting washers 44 interposed between them and they are mounted and secured in position on the collar 38 by a screw 46 and insulating washer 48. Each of the brush arms 40 and 42 has two wipers at its outer end, the brush 40 having wiper 50 to wipe inner ring 34 and wiper 52 positioned to wipe the segments 30 and 32, and the brush 42 having wipers 54 and 56 to respectively wipe outer ring 28 and segments 26. The twenty-six segments 26 correspond to the letters of the alphabet and the segments 30 and 32 correspond to the machine functions, Line Feed and Carriage Return. Of Of course machine functions are not necessarily limited to these two named functions and segments for additional functions may be added as are necessary, but for simplicity of description only these two function segments and functions will be discussed.

To the right of the commutator 24 is a U-shaped carriage 58 which slides on a track 60 through a lubricated bushing 62. Carriage 58 has two upwardly extending arms 64 and 66 which contain ball bearings 68 mounted in bores in their upper ends. Bushings 70 are press fitted into the holes of the bearings 68 and these bushings 70 have square holes through them to slide upon the square shaft 22. Thus the carriage 58 may be moved across the machine, guided by track 60 and square shaft 22, and the square shaft 22 may turn freely within the bearings 68. Mounted between the arms 64 and 66 of carriage 58, and fixed to rotate with and slide on the shaft 22, is a typewheel 72 which will now be described.

Having general reference to Figure 1 and detail reference to Figures 2 through 6, the typewheel body is a wheel 74, preferably made of steel or other suitable conductive material, having a square hole 75 (Figure 2) through its center enabling the wheel to slide freely upon and to rotate with the square shaft 22. The wheel 74 fits closely between the arms 64 and 66 of the carriage 58 so there is very little end play of the wheel with respect to the carriage. Around the circumference of wheel 74 are two annular grooves 76 (Figures 5 and 6) which form an annular, central, type pallet support 78 and two annular side flanges 80. Within grooves 76 are mounted fifty-two type pallets 82, twenty-six in each groove; those in the left hand groove carrying type slugs with the characters of the alphabet and those in the right hand groove having numerals and punctuation symbols. The pallets in one groove are circumferentially offset from the pallets

in the other groove so the letters and figures are alternatively disposed around the wheel. Each type pallet 82 has a counterbalance weight 84 (Figures 4 and 5) opposite the printing lever 86 and is pivoted at 88 on a shaft 90 which extends through the wheel and across both annular grooves 76. Snap washers 92, in annular slots 94 in the projected ends of shafts 90, retain the shafts 90 in the wheel 74. The pallets 82 are balanced in such a way that the rapidly rotating wheel develops a greater centrifugal force on the weight end 84 than on the lever end 86, thus tending to pivot the pallets 82 in a clockwise direction which holds the type slug end 96 against the central annular support 78. The balance of the pallets is also such that when a pallet 82 is lifted a short distance off the periphery of the support 78, the center of gravity of the pallet will be shifted relative to pivot 88 so the developed centrifugal force in the weight end 84 of the pallet 82 will then act to throw the weight 84 out counterclockwise to cause the type pallet to assume the operative position, one being shown in Figure 4. In the operative position, weight 84 will abut a portion of an adjacent shaft 90' which mounts the adjacent pallet in the annular groove on the other side of the wheel. The actuated pallet will remain in this outer operative position until after it strikes the printing platen when it will rebound back a position where its balance will cause it to be centrifugally held against the central support 78.

Having specific reference to Figure 5, one cylindrical chamber 100 is shown, and is essentially a blind bore disposed radially from the periphery of the central platform 78 toward the center of the wheel 74. This chamber 100 opens directly under a type slug 96' on the end of the pallet lever 86. There are fifty-two of these chambers (several being shown in Figures 4 and 6) around the wheel 74, each one associated with an individual type pallet. At the bottom of each chamber 100 are two aligned cross passages 102 and 104 leading to the outsides of the wheel 74. These passages 102 and 104 are plugged with insulators 106 and 108 which contain respective electrical leads 110 and 112. The inner ends of these leads constitute electrodes disposed to provide a gap 114 slightly smaller than the diameter of the chamber 100 and the outer ends of both leads project a short distance beyond the sides of the wheel 74. Ends of the right hand leads 112 are attached to a common bus bar 116 which is in the form of a metallic ring and which is carried by but insulated from the wheel 74. The ends of the left hand leads 110 are bent alternately radially inwardly and radially outwardly as at 118 and 120 respectively; the leads with ends 118 being associated with the "figures" pallets and the leads with ends 120 being associated with the "letters" pallets. The bottom of the chamber 100 is adjacent the gap 114 and has an upstanding integral projection 122 which has a conical shape as may be seen in Figure 5. The gap distances between the vertex of the cone 122 and each of the associated leads 110 and 112 are nearly the same, being of smaller dimension than gap 114. It is noted that the projection 122 is provided primarily to assure that the sparks will jump to ground at the base of chamber 100 rather than at other positions and need not be conical. An exemplary spark gap dimension used in tests was between 1/16 and 1/8 inch. As will be later described, a spark will successively jump each gap between leads 110 and 112 and the bottom projection 122. No spark passes across gap 114 between the electrode ends of leads 110 and 112.

Mounted in the right arm 66 of the carriage 58 is a brush assembly 123, shown in Figures 3 and 5, including a brush 124 composed of graphite or other suitable material contained in a brass cylindrical housing 126 which has an internally threaded portion at its right end for a screw cap 128. A spring 130 forms an electrical connection between the cap 128 and the brush 124 and also presses the brush 124 against ring 116 on the wheel

74. Brush housing 126 fits tightly into a threaded insulating sleeve 132 which is screwed into the arm 66 of carriage 58. An electrical connection 134 is made from the cap 128 to electrical equipment to be hereinafter described. A conducting ring 136 is conductively fastened to the left side of the steel wheel 74 and from this ring 136 a ground connection is made through a brush 137 of brush assembly 138 (Figures 1, 2 and 3) which is identical to the brush assembly described above. This ground brush assembly 138 is mounted in the left arm 64 of the carriage, and has a ground lead 139.

Mounted in threaded insulating sleeves 140 and 142, secured in the left arm 64, are two electrical leads 144 and 146, the lead 144 extending to a position closely adjacent the path of bent ends 120 of the "letters" leads 110 on the wheel 74 and the lead 146 extending to a position closely adjacent the path of bent ends 118 of the "figures" leads 110. In order to connect all of these four leads 134, 139, 144 and 146 to stationary electrical equipmenht they are wired to appropriate terminals 148 (Figure 1) at the respective ends of a group of four wipers 150, 152, 154 and 156 held in an insulating block 158 mounted on the carriage arm 64. The wipers 150, 152, 154 and 156 in turn commutate the circuits to bars 160, 162, 164 and 166 of a commutator plate 168 which is disposed substantially across the width of the machine. Conductors 170 connect the bars to associated electrical equipment to be later described.

The means to select a particular typeface for printing will now be disclosed. There is associated with this printing machine a typewriter keyboard 172 (illustrated schematically) with electrical contacts associated with each key and certain telegraphic equipment for translating the coded incoming electrical signals to their corresponding character representation. Such a translator, generally indicated at 174, is disclosed in United States Patent No. 2,759,046 which is assigned to the same common assignee as is the present application, wherein incoming sequential telegraph signals of the Baudot form are utilized to cause the permutative positioning of five mechanical elements which form the components of a switch to complete a circuit to one of thirty-two lines and place an electrical potential thereon. Each of these thirty-two lines is connected in parallel with thirty-two lines from the keyboard 172. Twenty-six of these lines are connected to the commutator segments 26, representing the characters of the alphabet when the machine is in "Letters" printing condition and representing the numerals 0–9 and the various punctuation symbols when the machine is in "Figures" printing condition. Two of the lines from the translator 174 and keyboard 172 above referred to are connected to the segments 30 and 32 and are associated with the functions Line Feed and Carriage Return. Two other lines from the translator and keyboard are connected into a bi-stable relay flip-flop circuit to control the "Letters" and "Figures" conditions of the printer; this circuit will be hereinafter completely described. One other line from the translator 174 and keyboard 172, representing "Space" signals, is utilized in a manner also to be disclosed later.

Referring to Figure 1, there is disposed above the printing wheel 72 a shaft 176 parallel to shaft 20. On this shaft is a drum 178 having sprocket teeth 180 at each end. Directly beneath the drum 178 is a platen bar 182 of suitable resilient material and beneath the platen bar is a roller 184. Behind the drum 178 is a roll of recording paper 186 which is carried on a spindle 188 running through its core. The edges of the paper have perforations 190 to be engaged by the sprocket teeth 180 to carry it along for line feeding purposes. The paper extends forward from the roll 186, under the roller 184, up in front of the platen 182 and over the feed drum 178. The platen is mounted directly over the square shaft 22 and the periphery of the type wheel 72 just clears the roller 184 as can be seen in Figure 1. The paper used in this specific embodiment has a pressure sensitive coating of white opaque material on top of a dark base. When a type slug strikes the paper this white coating is broken through to reveal the dark undercoating in the form of the type character. When using the pressure sensitive paper, a nylon platen 182 has a proper amount of resiliency for clear printing.

With the foregoing description in mind, an explanation of the method whereby a type character may be displaced from the wheel and its representation recorded on the paper will now be given.

Briefly the selection of a type pallet is as follows: One of the outer segments 26 of the commutator is energized from the translator 174 or the keyboard 172 and, as the brush 42 rotates with the square shaft 22 and typewheel 72, its wiper 56 will eventually make contact with the energized segment. As the brush arm 42 is predeterminedly oriented with the typewheel 72 so that an electrode lead 110 of a type character of the wheel 72 will be opposite the lead 146 when the wiper 56 is on the corresponding segment 26, through circuitry to be described a high voltage-low current circuit will be completed between that segment and the ring 28 through the wipers 54 and 56 and this circuit will be commutated through the commutator bar 164 to the wiper 154 and thence to the lead 146 where a high voltage will appear. Turning now to Figure 5, as the wheel 74 is always connected to ground through lead 139, the high voltage appearing at the end of the lead 146 will seek to jump to ground at the point of least resistance which will take place through the gap between the lead 146, and the bent end 118 of electrode lead 110, and through the unionized gap from lead 110 to the wheel at the point of cone 122 at the bottom of the chamber 100. The current flow through this path will cause ionization of the air molecules at the bottom of the chamber 100, thus resulting in a low resistance path across the gap. A relatively low voltage, from a high current source, which is always present at the lead 112, will then become effective to increase current flow through the gap to the grounded cone 122 and a high intensity spark will result, the heat from which will expand the air within the chamber 100 and cause it to blow out the mouth of the chamber 100 with enough force to raise the type pallet 96 which covers the chamber mouth. The pallet lever 86 will fly out, swinging the counterbalance over center, whereupon the pallet will be moved to printing position by centrifugal force and the type slug 96 will strike the paper when the wheel has made approximately one half a revolution. At this point in the rotation cycle the pallet lever 86 pivots back, by rebound force from engagement with the platen bar 182, close to or onto the support 78 of the wheel where centrifugal force will retain it.

Having thus briefly described a means to select a type pallet for printing, the additional mechanical features of this printer will now be described, following which will be given a complete description of the electric circuits and their function.

Again referring to Figure 1, a ratchet wheel 192 is fixed to the right hand end of the feed drum shaft 176, and is positioned and held from unauthorized turning by a detent roller 194 pressed against ratchet 192 by a lever 196 and spring 198. Adjacent to the ratchet 192 is a paper feed pawl 200 on the end of a lever 202. Lever 202 is provided with a cam surface 204 which is held against a fixed post 206 by a spring 208. When the lever 202 is in the up position, as shown in the drawing, the pawl end 200 is held out of engagement with the ratchet teeth by coaction of cam surface 204 with the post 206 but when the lever is pulled downward the pawl end 200 is allowed to move in toward the ratchet to engage a

tooth and to turn the ratchet one tooth space. Turning of this ratchet wheel is under the control of space signals from the translator 174 in the following manner: A spring biased lever 210, which is pivoted to the machine frame at 212, is moved to a cocked condition by an eccentric cam 214 fixed on the shaft 20. As the cam 214 rotates, its eccentricity tends to lift the lever 210 through a roller 216 at a midpoint of the lever 210 up onto a latch 218 which is biased in a counterclockwise direction by a spring 220. The latch 218 is engaged by the end 222 of the lever 210 and clockwise turning of the latch 218 will cause the lever 210 to plunge downward, under spring bias, carrying the pawl lever 202, which is pivoted on the lever 210 at the point 224, with it.

The means to trigger the pawl lever latch 218 is a mechanism similar to the mechanism which prints the characters. On the shaft 20 is a two arm member 226 having on each arm a support 228 and a flange 230 corresponding to the support 78 and the flange 80 of the wheel 74. A hammer 232 is pivoted on a shaft 234 between the support and the plate and is counterbalanced in the same manner as the type pallets 82. Each hammer head, 236 and 320, covers the opening to an associated spark chamber (not illustrated) which is identical to the chambers 100 of the typewheel seen in Figure 5 and the leads 238 and 240 correspond to the leads 112 and 110 of the aforementioned wheel. On the side of the two armed member 226 is a conducting ring 242 for commutating the grounding connection through the brush 244. The lead 246 in its insulator 248 is associated with the ring 34 of the commutator 24 which in turn is intermittently connected by wiper arm 40 to segments 30 and 32 of the commutator. Segment 30 is associated with Line Feed Signals from the translator 174. The lead 250 in its insulator 252 is in a parallel circuit with the high voltage at the brush 124 of the typewheel 72. When a received Line Feed signal places a potential on the segment 30 that segment will ultimately be brushed by the wiper 52 of the arm 40 and a circuit will be completed through the wiper 52 to the ring 34 and finally to the lead 246. In the same manner as before described in conjunction with the typewheel, sequential sparks will jump the gaps within the chamber beneath the hammer 236 and that hammer will be caused to fly out by expelled air and be held by centrifugal force in a position to strike the end of a lever 253 which is fixed on the end of a shaft 254 connecting it to the latch 218. Striking of this lever 253 will cause the latch 218 to be turned clockwise, unblocking the lever end 222 of lever 210 and the lever 210 will drop down, actuating pawl 200, and the ratchet wheel 192 will be turned one tooth to advance the paper one line. The hammer 232 will be returned to its unselected position against the support 228 by its rebound off of the lever 253 and the next revolution of the shaft 20 will cause the lever 210 to be lifted by elliptical cam 214 and latched in cocked condition by latch 218, awaiting another Line Feed signal.

Below the main shaft 20 is an auxiliary stub shaft 255 upon which the space and carriage return mechanism is mounted. At the left end of this shaft 255 is fixed a cable drum 256 about which is wound one and one-half turns of an endless cable 257. The cable is guided under a sheave 258 to the bottom of the carriage 58 where it is fixed by a clamping device 260. The cable then takes one and one-half turns about another drum 262 and thence across the back of the carriage and around a sheave 264 to the drum 256. A cable tension spring may be placed in the rear stretch of cable. Turning of the drum 256 will cause the carriage 58 to be moved across the machine. Directly to the right of the drum a large ratchet wheel 266 having a number of teeth equal to the number of character spaces across the printed page is fixed on auxiliary shaft 255. The ratchet wheel 266 is stepped around counter-clockwise to move the carriage from left to right for character spacing.

A pawl 268, for stepping the ratchet, is formed on the end of a lever 270 which is pivoted at 272 on the end of an arm 274 of a lever 275. An upward extension of the lever 270 has a cam surface 276 at its rear edge held in sliding engagement with a fixed pin 278 by a coil spring 280. Downward movement of lever arm 274 will cause the pawl end 268 of lever 270 to be moved under spring bias toward the ratchet and further downward motion will step the ratchet one tooth. Upward movement of lever 270 causes engagement of cam surface 276 with pin 278 to move the pawl out of ratchet engagement. In order to impart this up and down motion to the pawl lever 270 an elliptical cam 282 is pivotally mounted on the center of the lever arm 274 on a post 284. This cam 282 has a serrated periphery and is maintained in a horizontal position by a notched detent 286 which is pivotally mounted on a depending extension 288 of the lever arm 274. The detent is held against the cam 282 by a spring 290 attached to a lug of the lever arm 274. Directly above the center of the cam 282 and fixed to rotate with the shaft 20 is a wheel 294 of rubber or other suitable material which offers a non-slipping peripheral surface. A magnet operated latch is employed to control the space function and to give it a timed relationship to the printing mechanism. An extension 296 of the lever 275 abuts the edge 298 of a magnet armature 300 which is pivoted at 302. Energization of the magnet 304 will cause the edge 298 to move up to release the arm 296, and the lever 275 will turn counter-clockwise, due to the force of a spring 306, to move arm 274 up and bring the elliptical cam 282 in contact with wheel 294. The serrations of the surface of cam 282 will be gripped by the rubber wheel 294 and rotation of the wheel 294 with the shaft 20 will cause the elliptical cam 282 to flop over for one-half a revolution. The latch component 298 in the meantime is spring restored so that when the lever 275 is forced down by the elliptical cam action, to cause the pawl 268 to step the ratchet one tooth, its return motion is arrested by the abutment of lever arm 296 with latch edge 298 and the cam 282 will no longer be in contact with the wheel 294 and it will be retained by the detent 286.

Operation of the magnet 304 takes place simultaneously with the type character spark selecting so that the above described spacing operation occurs during the one-half revolution between type selection and printing. In order that the type-wheel may be spaced independently of printing for in-between word spacing a second winding on the magnet 304 is connected directly to the space circuit from the translator 174. Any time that a pulse is put on this circuit the above described elliptical cam and pawl mechanism will cycle to space the carriage 58 to the right.

While the above described character spacing takes place a clock type spring 308 at the right hand end of the shaft 255 will be wound up through its attachment 310 to the machine frame and its connection 312 to the shaft 255. The torque stored by this spring 308 tends to rotate the shaft 255 clockwise but is prevented from doing so by a stop pawl 314. This pawl is one of the components of the carriage return mechanism which will now be described. A stub shaft 316, journalled in the machine frame, carries the pawl 314 at its left hand end. At the right hand end of shaft 316 is a lever 318 which projects into the path of a second hammer 320 on one of the arms of member 226. This hammer 320 operates in an identical manner to the hammer 232 of the line feed mechanism but it is located on the opposite side of the member 226 so that its circular path will be offset to one side of that of the hammer 232. When the lever 318 is struck by the hammer 320, it will be turned clockwise and through shaft 316 will cause the stop pawl 314 to be disengaged from the ratchet wheel 266 resulting in clockwise turning of the shaft 255 through stored force of the wound spring 308. Through drum 256 and cable 257

the carriage will be returned to the start of line position any time that this occurs. A detent roller 322 on the end of a spring biased lever 324 acting against an angular end 326 of the lever 318 will hold the stop pawl 314 away from the ratchet wheel 266 during the return of the carriage as the point 328 of detent lever end 326 will have been forced over to the other side of the roller 322. The stop pawl 314 will be restored to its engagement position with the ratchet 266 by a post 330 on the side of ratchet wheel 266 striking an arm 332 of the stop pawl 314 when the carriage has returned to its start of line position. The spring force of the detent 322 will hold the stop pawl 314 into engagement with the teeth of the ratchet 266. As the stop pawl 314 rides over a tooth during spacing its rise will be insufficient to cause the angular end 326 of pawl lever 318 to move to the other side of the roller 322.

The post 330 and the pawl arm 332 serve also to cause the carriage 58 to be automatically returned to the start of a line if a carriage return signal fails to be received. As the ratchet 266 makes one complete revolution during a complete traverse of the carriage the post 330 will push the pawl arm 332 upward to release the stop pawl 314 and allow carriage 58 to return.

Printing of characters will often occur during this automatic return and as the space mechanism is associated with printing, spacing must be prevented during this time. A finger 334 on the stop pawl lever 314 is adjacent to a normally closed pair of electrical contacts 336 and 338 in series with the control circuit of the space magnet 304 and when the stop pawl 314 is disengaged from the ratchet 266, the finger 334 depresses the contact 336 and breaks the circuit for the electromagnet 304 during the entire carriage return time. In order that the printer may automatically feed a line during the automatic returning of the carriage a finger 340 of the latch lever 218 is operated by a lever 342 which is pivoted in the middle at 344 and has a cam follower 346 to ride a cam 348 on the auxiliary shaft 255. When the shaft 255 has rotated to a position corresponding to the end of the line, a lobe 350 on the cam 348 will raise the follower 346 which in turn will depress the finger 340 and release the latch 218 to cause the line feed mechanism to cycle. Thus the paper will be feeding one line as the carriage is returning. A character that might be printed during this return will fall somewhere between the lines so that intelligence of a message will not be lost which might be the case if the character were not printed at all or if it was printed on top of other characters of the previous line or on top of characters of the following line.

Electrical circuit

At the left hand side of Figure 7 may be seen a plan of the commutator 24. There are twenty-six equally spaced segments 26 in an outer ring and each of these segments is individually connected electrically to a line from the translator 174 and keyboard 172 and has a positive potential when that line is selected by the translator or keyboard. Only three such lines are shown to avoid confusion. Each of the segments 26 is associated with a "Letters" and a "Figures" character of the typewheel and is selectable through telegraphic signals to the translator or through operation of a keyboard button. An outer ring 28 of the commutator 24 is disposed adjacent to all of the segments 26 and a circuit is completed between an energized segment 26 and the ring 28 by the wipers 54 and 56 when the brush 42 engages the energized segment. The outer ring 28 is connected to a primary coil 352 of a transformer 354 and thence to ground. The secondary coil 356 of the transformer 354 is connected to contacts 358 and 360 of relays 362 and 364 respectively. An armature 366 of relay 362 is connected to the machine commutator bar 162 which passes the circuit through wiper 152 and to lead 146 which is the "Figures" selecting lead on the typewheel carriage 58. An armature 368 of relay 364 is connected to the commutator bar 164 and through wiper 154 to "Letters" selecting lead 144.

One or the other of contact pairs 358 and 366 or 360 and 368 is always closed, this being accomplished by lock circuits of relays 362 and 364. Each of these relays has two windings, relay 362 having lock winding 370 and "Letters" winding 372 while relay 364 has lock winding 374 and "Figures" winding 376. Lock winding 370 terminates at contact 378 where it may be connected to a plus voltage through the armature 380. Lock winding 374 of relay 364 terminates at a contact 382 where it may be connected to a plus voltage through an armature 384 and normally closed contact 386 and armature 380 of relay 362. The "Letters" circuit from the translator 174 is connected through the winding 372 of relay 362 to ground and the "Figures" circuit is connected through the winding 376 of relay 364 to ground.

Operation of these relay circuits is as follows: Assume the printer is in "Figures" condition with the circuit from the commutator ring 28 through the transformer 354 to ground. A high voltage, exemplary values from 8,000 to 10,000 volts, and a low current are induced in the secondary winding which is connected through the contacts 358 and 366 to the lead 146. Relay 364 is locked in this condition by the circuit from the plus voltage at armature 380 through contact 386, through closed contacts 384 and 382 and through winding 374 to ground.

As the brush 42 wipes the segments 26 and the ring 28 and ultimately contacts the segment which is energized, as for example the segment (C:) shown in Figure 7 of the drawings with wiper 56 resting thereon, the circuit will be completed to the lead 146 and the high voltage at this lead will cause the low current to jump to point 122 through the gap between lead 146 and bent end 118 of lead 110 to the point 122 in the chamber 100 and thence to ground through brush 137 to wiper 156 to bar 166. Ionization of the air molecules within the chamber 100 at the gap between lead 110 and projection 122 will occur as previously explained and a high current spark will pass from the lead 112 to the projection 122 due to a charge stored in the capacitor 388 from a relatively low voltage electrical source 390, exemplary values being 800 to 1,000 volts. The type pallet for the character (:) will be displaced, by the air blast from chamber 100 due to the high intensity spark, from the surface of the wheel and the selected character is printed after a further one-half revolution of the typewheel.

If, instead of selecting and printing the "Figures" character (:) it is required that the "Letters" character (C) be printed, it is first necessary that a "Letters" signal be received by the coil 372 from the translator 174. When this occurs the armatures 380 and 366 will be pulled down with armature 380 engaging contact 378 to complete the circuit through the lock winding 370 of relay 362 and at the same time break the circuit through the lock winding 374 of relay 364. Relay 362 will thus be energized and locked and relay 364 will be released. Contacts 358 and 366 will be separated and contacts 360 and 368 will be closed. The circuit from the ring 28 is thus transferred to the "Letters" lead 144 through the commutator bar 164 and the wiper 154. This resulting circuit will be maintained until a "Figures" pulse is received by the "Figures" relay coil 376.

As previously stated, spacing of the carriage is instigated at the same time that any character selection occurs and this is accomplished through a parallel lead 392 from the ring 28. When a pulse appears on the ring 28 a circuit is completed through the coil 394 of the magnet 304 to pull the armature 300 and release the space mechanism which has been previously described. A second winding 396 of the magnet 304 is connected to the "Space" lead from the translator so that "Space" signals will also cause the carriage to be stepped across the page.

The circuits to the function mechanism are similar to those previously described but without the relay flip-flop.

There are two segments 30 and 32 on the commutator which are connected to the "Line Feed" and "Carriage Return" lines respectively from the translator. An inner ring 34 is connected through lead 397 to the primary coil 398 of a transformer 400 and thence to ground. The secondary coil 402 is connected to the lead 246 of the function selecting mechanism. The function member 226 is grounded through lead 244. The sparking lead 250 of the function selecting mechanism is in a parallel circuit with the relatively low voltage-high current source 399 and a capacitor 404.

The commutator segments 30 and 32 and the ring 34 are repeatedly brushed by the wipers 52 and 50 of the brush arm 40 and when one or the other of the segments is energized that particular function will be selected and performed as previously explained.

By the foregoing there has been described a unique continuously rotating typewheel with pivoted type character pallets which are retained in non-printing and printing position by centrifugal force acting through pallet counterbalances. Pallet selection for printing is accomplished through an electric commutator circuit and the force to shift the pallets so centrifugal force will move them into printing position is realized by a high intensity spark in a chamber below the selected pallet. This unique typewheel and pallet arrangement with associated control circuitry omits many cumbersome parts and adjustments and enables high speed accurate selection and typing. Actuation of machine functions is also accomplished through hammers, similar in appearance to the type pallets, shifted by an air blast from a high intensity spark, so centrifugal force will move them to an operative position.

Having fully described one specific embodiment of this invention what is claimed as new is:

1. In a printing apparatus: a plurality of air blast generator means; a rotating carrier mounting said air blast generator means for rotation therewith; and a plurality of printing means on said carrier controlled by associated ones of said air blast generator means.

2. In a printing apparatus: a rotating carrier; a plurality of printing means pivotally mounted adjacent the periphery of said carrier for movement between printing and non-printing positions; a plurality of independent means, integral with each of said plurality of printing means, subject to centrifugal force developed by rotation with said carrier to maintain associated printing means in either printing or non-printing position depending on the pivotal position of said printing means; and means to selectively move each printing means into printing position.

3. A printing apparatus comprising: a type carrier; means for rotating said type carrier; a plurality of type printing means pivotally mounted in spaced relation around said carrier for movement to printing or non-printing position; means, integral with said type printing means, responsive to centrifugal force for selectively maintaining said type printing means in each of printing or non-printing position; a plurality of electrical spark means for selectively forcing associated type printing means to a position where the means responsive to centrifugal force is effective to move the selected type printing means to a printing position; means for receiving a signal condition, selecting a spark means corresponding to the received signal condition and actuating said spark means to move the associated type printing means to printing position; and means selectively operated during a cycle of type printing operation to cause a machine character space operation.

4. A printing apparatus comprising: a type carrier; means for selectively moving a record medium relative to said type carrier; means for continuously rotating said type carrier; a plurality of type printing means pivotally mounted at spaced positions around said type carrier; a plurality of spark chambers disposed in said type carrier

associated with individual type printing means and each having a discharge opening coacting with a portion of an associated type printing means offset from the pivotal mounting of the associated type printing means so a discharge from the associated chamber will shift said type printing means about its pivotal mounting toward a printing position; and means for selectively generating a high intensity spark in a selected spark chamber corresponding to a specific signal condition.

5. A printing apparatus comprising: a carrier; a plurality of type members pivotally mounted in spaced relation on said carrier and movable between printing and non-printing positions; means for causing relative spacing movement between said carrier and a record medium, and for causing reverse relative movement between said carrier and the record medium to a start of line position; means for line spacing the record medium; spark blast means for selectively causing movement of said type members from a non-printing position to a printing position; and means for moving said carrier to cause such selected type to make a character representation on the record medium.

6. A printing apparatus comprising: a platen bar; continuously rotatable power means including a shaft disposed parallel to said platen bar; a type wheel mounted on said shaft for conjoint rotation with said shaft and translation across the front of said platen bar, so that a page record medium may be passed over said platen bar between said platen bar and said type wheel; a plurality of type members shiftably disposed on said type wheel for movement between printing and non-printing positions; a plurality of spark chambers disposed in said type wheel, each chamber having a blast discharge opening positioned adjacent a respective type member to enable a blast of air from said chamber for causing movement of a respective type member from a non-printing position to a printing position where type wheel rotation causes the type member to press the record medium against said platen bar and record a corresponding selected character representation on the record medium; spark electrodes in each spark chamber; means for creating a high intensity spark between a set of spark electrodes in any one of said spark chambers to create a blast of air out of the said one spark chamber discharge opening; and electric signal receiving means including a commutator rotating with said shaft for selecting a spark chamber and initiating actuation of said high intensity spark means between a set of electrodes in the selected spark chamber below a type member having a character representation thereon in accord with a specific signal corresponding to said character.

7. In a printing apparatus as defined in claim 6, a counterbalance means on each of said type members mounted to move and maintain said type member in either the printing or non-printing positions by centrifugal forces developed by type wheel rotation, whenever the type member is shifted to a position adjacent either position.

8. A printing apparatus comprising: means for transferring character representations from a type element carrier to a record medium; means for effecting operating functions of relative sequential and operative movement between said type carrier and said record medium; and electric spark generated air blast means for selecting desired type elements with representations for transfer to said record medium and for initiating actuation of selected operating functions.

9. A printing apparatus comprising: a plurality of spark generated air blast means for actuation of selected printing and function operations; signal receiving means for passing a high voltage from a low current source through a selective circuit to cause a high voltage ionizing spark in a selected air blast means; and a low voltage-high current source circuit triggered by said high voltage ionizing spark to cause a high intensity spark through said selected air blast means.

10. For use in a printing apparatus, a type wheel including: a plurality of weighted type members pivotally mounted in a circumferentially spaced relation on said type wheel for movement to printing and non-printing positions; each type member being so balanced that centrifugal forces developed in said type member by type wheel rotation will maintain said type member in either printing or non-printing position after the type member is positioned.

11. For use in a continuously rotating type wheel printing apparatus, a type wheel comprising: a rotatable body; a plurality of type pallet members pivoted on axes parallel to the body axis, circumferentially spaced around said body and movable to printing or non-printing positions, each type pallet having a type character platform end and a weighted end on opposite sides of the pallet axis, said platform and weighted ends being so disposed and balanced relative to each other to enable the centrifugal force developed in the pallet member by body rotation to maintain said pallet member with the platform against said body when said pallet is moved to non-printing position and to maintain said pallet member with the platform substantially radially disposed from said body axis when said pallet is moved to printing position.

12. For use in a printing apparatus; a type wheel comprising: a rotatable body; a plurality of weighted type members pivotally mounted in a circumferentially spaced relation on said body for movement to printing and non-printing positions; each type member being so balanced that centrifugal force developed in said type member by body rotation will maintain said type member in either printing or non-printing position after the type member is positioned adjacent a respective one of said positions; and a plurality of blast chambers in said type wheel, with individual discharge openings covered by associated ones of said type members when in a non-printing position, and a means in each blast chamber adapted to be selectively energized from an external power source for developing an air blast from said chamber.

13. For use in a printing apparatus, a type element carrier including: a plurality of pivotally mounted type elements, each being inherently movable to and releasably retained in either a printing or non-printing position when shifted on its pivotal axis to predetermined positions; and means adapted to be selectively energized to create an air blast for selectively initiating movement of any desired type element to a printing position, whereby the selected type element will move to printing position.

14. A member for use in a rotating type wheel printing apparatus comprising: a rotatable body; and an element pivoted on said body, movable to a position adjacent said body and to a second position extending from said body, having its mass disposed relative to a line from the center of said rotating body through the element pivot axis so the element will stay in either one of its two positions due to centrifugal forces developed in said element by rotation of said body.

15. A member as defined in claim 14, wherein a blast chamber is disposed in said body with a discharge opening covered by a portion of said element when said element is in its position adjacent to said body.

16. A member for use in a rotating type wheel printer comprising: a rotatable body of electrically conductive material; a plurality of type pallet members arranged in circumferentially spaced relation on said body on pivot axes parallel to the axis of the body and movable between a non-printing position where a portion of said pallet rests against the periphery of said body and a position where said pallet extends away from said body; a plurality of substantially radially disposed blind bores in said body, one under each of said portions of respective pallets that rest against the periphery of the body; independent electrodes projecting into each of said bores from the exterior of said body; and means insulating said electrodes from said body where they project through said body.

17. A member as defined in claim 16, wherein said electrodes on one side of said body have ends bent in substantially radially disposed directions relative to the body axis; said ends being directed alternately inward and outward relative to the body axis.

18. For use in combination with a printing apparatus, a rotatable body comprising: at least one member adapted to be moved by centrifugal force developed by said rotatable body to an operative or inoperative position; a chamber in said body having an open end positioned relative to said member so an air blast from said chamber will shift said member from an inoperative position toward an operative position to enable centrifugal force to move said member to the operative position; two electrodes projected from the exterior of said body into said chamber with the inner ends of said electrodes spaced from the wall surface of said chamber; and di-electric means isolating said electrodes from said body.

19. A rotatable body as defined in claim 18 in combination with control means to select and initiate movement of said member to an operative position comprising: a high voltage-low current source circuit having one side adapted to be placed in close proximity to one of said electrodes and the other side of the circuit connected to said body; a low voltage-high current source circuit connected to cause a completed circuit from the other one of said electrodes through said body upon ionization of the air in said chamber by a high voltage spark from said one electrode to said body to cause the air in said chamber to expand and move out of said open end; and means to energize said high voltage-low current source.

20. A combination rotatable body and control means as defined in claim 19, provided with at least two of said members and independent chambers with electrodes associated with each member; a first set of two of said electrodes, one for each of said two chambers, being on one side of said body and having exterior ends disposed to rotate in two distinct paths; said one side of said high voltage-low current source circuit including a switching system with bi-stable means controlling two selective circuit paths; a second set of two electrodes, one for each of said two selective circuit paths, positioned closely adjacent the respective paths of said ends of said first set of two electrodes; said means to energize said high voltage-low current source circuit being synchronized with said rotatable body to be energized only when said ends of said first set of two electrodes are in close proximity to said second two electrodes; and a signal responsive means to control operation of said bi-stable means.

21. A printing apparatus including a rotary carrier having a plurality of printing means spaced around its periphery, each being movable between printing and non-printing positions; printing characters on said printing means, some having letters and other having figures; a plurality of air blast generator means in said type wheel, one for each of said plurality of printing means, for selectively causing movement of said printing means to printing position; means for energizing a selected one of said air blast generator means including signal receiving means adapted to receive signals from a plurality of sources less in number than said plurality of printing means and control means enabling said means for energizing a selected one of said air blast generator means to energize either one of two predetermined air blast means corresponding to a letter and a figure represented by the same received signal.

22. A page printing apparatus comprising: power operated printing mechanism; mechanism for performing line feed operations including a rotating shaft with a cam member fixed thereto, a resiliently biased reciprocable linkage assembly operative to feed a record medium one line during each reciprocation; a latch assembly for maintaining said linkage assembly in an inoperative position; power operated means rotated in synchronism with said cam member including an air blast generating means

selectively operable to momentarily actuate said latch assembly to release said linkage assembly, whereupon said linkage assembly moves under biased force into the path of said cam which restores said linkage assembly to a latched position.

23. A page printing apparatus as defined in claim 22, wherein means are provided for character spacing of said printing mechanism and for returning said printing mechanism to a start of line position and includes a mechanism to trip said latch assembly upon return of the mechanism to a start of line position.

24. A printing apparatus comprising: power operated printing mechanism; mechanism including a ratchet wheel for character spacing of said printing mechanism relative to a record medium and for relatively positioning said printing mechanism and the record medium to a start of line position, including a power operated rotating wheel; a step spacing pivoted linkage assembly including a pawl for engaging said ratchet wheel and moving said character spacing mechanism one space for each operation of said linkage assembly; resilient means biasing said linkage assembly toward the periphery of said wheel; latch means maintaining said linkage assembly in an inoperative position against resilient bias; control means responsive to received printing signals and line space signals for releasing said latch means; an elliptical cam pivotally mounted on said linkage assembly so its periphery will be moved to engage the periphery of said wheel upon movement of said linkage assembly, to thereby reciprocate said linkage assembly and to cause pawl actuation of said ratchet; and detent means on the linkage assembly to prevent said cam from freely rotating on its pivot.

25. A printing apparatus as defined in claim 24, wherein a storage spring is provided in said mechanism for character spacing to store power developed by pawl and ratchet spacing movement for return to start of line position; a ratchet stop pawl is disposed to engage said ratchet wheel and prevent return to a start of line position; and a signal controlled spark generated air blast means is provided to effect movement of said ratchet stop pawl to an inoperative position and permit a return to start of line position under power of said storage spring.

26. A printing apparatus as defined in claim 25, wherein a spark generated air blast actuated line feed mechanism is provided; and a further means is provided and adapted to be automatically actuated upon a return to start of line position to operate said line feed mechanism.

27. A printing apparatus as defined in claim 25, wherein a detent coacts with said ratchet stop pawl to maintain it in either of its operative and inoperative positions and means are included in said character spacing mechanism for engagement with said stop pawl upon return to a start of line position, to restore said stop pawl into its operative position.

28. A printing apparatus as defined in claim 27, wherein means are provided to be actuated by said stop pawl when in an inoperative position to block occurrence of character spacing operations responsive to received printing signals.

29. A printing apparatus as defined in claim 28, wherein said control means for said latch means includes a solenoid and solenoid control circuit adapted to be energized each time a printing signal is received, and said means actuated by said stop pawl to block occurrence of character spacing operations responsive to received signals is a normally closed switch in said solenoid control circuit normally biased to closed position and which is engaged by said stop pawl and opened whenever said stop pawl is in an inoperative position.

30. In combination, a rotary wheel, type bars pivoted to the wheel and normally disposed in an inner position lying against a peripheral portion of said wheel and movable outwardly substantially radial to the wheel, and having end type which are faced forward when the bars are radially disposed to operative positions; centrifugally responsive means maintaining said bars in inactive position against the wheel periphery and means including said centrifugally responsive means for moving said bars to operative position; and a platen for supporting a recording medium adapted to be struck by the type when a specific type bar is disposed substantially radially to said wheel and having a resilient nature to provide a rebound force to a type bar sufficient to move the type bar to a position from whence said means maintaining said bars in inactive position will be operative.

31. A printing apparatus comprising: a platen bar; power means including a continuously rotatable shaft parallel to said platen bar; a type carrier non-rotatably fixed to and axially shiftable on said shaft including a plurality of type members pivotally mounted on said type carrier, each type member having two centrifugally stable positions, one against said type carrier and one projecting substantially radially from said type carrier, and a spark gap chamber in said type carrier for each type member with a blast discharge opening covered by its respective type member when that type member is positioned against the type carrier, and electrodes projected from the exterior of said carrier into each spark gap chamber insulated from said type carrier providing at least two spark gaps in each spark gap chamber; a carriage mounting said type carrier and shiftably mounted for movement parallel to said shaft; first electrode means disposed on said carriage closely adjacent the path of rotation of the exterior ends of a portion of said electrodes, including at least one electrode in each spark gap chamber; a first electric contact means disposed on said carrier to provide a circuit to another portion of said electrodes, including at least one electrode in each spark gap chamber; a second electric contact means disposed on said carriage to provide a circuit common to all spark gap chambers; a carrier member rotated by said power means including hammer members pivotally mounted at positions spaced from the carrier member axis and having centrifugally stable positions one against said carrier member and one projected away from said carrier member, and a spark gap chamber in said carrier member for each hammer member with a blast discharge opening covered by its respective hammer member when that hammer member is positioned against the carrier member, and electrodes projected from the exterior of said carrier member into each spark gap chamber insulated from said carrier member providing at least two spark gaps in each spark gap chamber; a second electrode means fixed closely adjacent to the path of movement of a portion of the carrier member electrodes including at least one electrode in each carrier member spark gap chamber; a third electrode means fixed closely adjacent the path of movement of another portion of the carrier member electrodes, including at least one electrode in each carrier member spark gap chamber and a third electric contact means disposed to provide a circuit common to all spark gap chambers; electric signal receiving means including a commutator with contact portions, and a rotating brush assembly for receiving electric signals indicative of letters, figures and machine functions and making bridged circuits in timed synchronization with said type carrier and carrier member; at least two electric circuitry means connected to independent ones of said contact portions of said commutator including means to generate a high voltage-low current source, energized whenever said commutator provides a bridged circuit with a received signal; one of said electric circuitry means controlling letters and figures selection and printing operations and the other of said electric circuitry means controlling machine function selection and operations; said means to generate a high voltage-low current source in said one electric

circuitry means having circuitry means connected between said first electrode means and said second electric contact means; said means to generate a high voltage-low current source in said other electric circuitry means having circuitry means connected between said second electrode means and said third electric contact means; a circuit including a source of relatively low voltage-high current connected to provide a circuit between said first electric contact means and said second electric contact means and to provide a circuit between said third electrode means and said third electric contact means, said relatively low voltage being insufficient to pass current across an un-ionized spark gap in any chamber; means for character spacing said carriage laterally, parallel to said platen bar in one direction and means, normally restrained, for moving said carriage in the other direction; solenoid control means including a control circuit in parallel with said one electric circuitry means for selectively connecting said power source to said means for character spacing said carriage each time a printing signal is received through said commutator; means for line feeding a record medium between said platen bar and type carrier adapted to be selectively operated by said

power means; latch means normally maintaining said line feeding means inoperative and automatically reset in latched position after each line feed function; means operative by engagement with an operatively positioned hammer member on said carrier member for releasing said latch means for said line feeding means, enabling power operation for a line feed function; and means normally restraining said carriage return means, rendered inoperative by engagement with a second operatively positioned hammer member on said carrier member to enable carriage return movement, reset to restraining position upon completion of carriage return, and automatically disabling the character spacing control circuit during carriage return.

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