May 16, 1961 D. H. CRONQUIST 2,984,177

SELECTIVE PRINTER

Filed Dec. 18, 1956 3 Sheets-Sheet 1

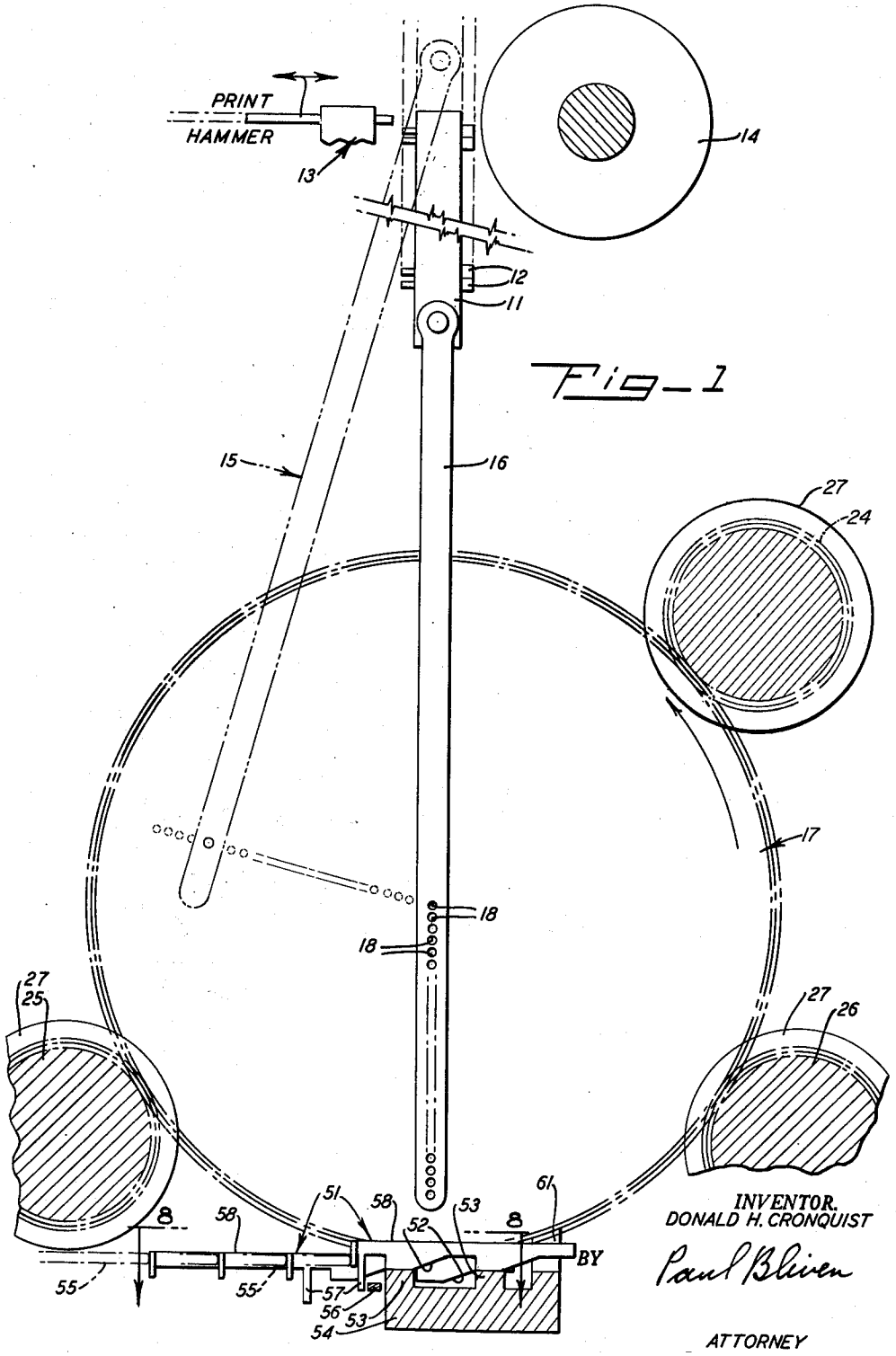


Fig-1

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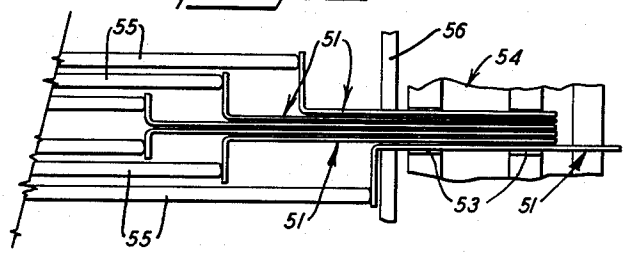
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SELECTIVE PRINTER

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Fig-8



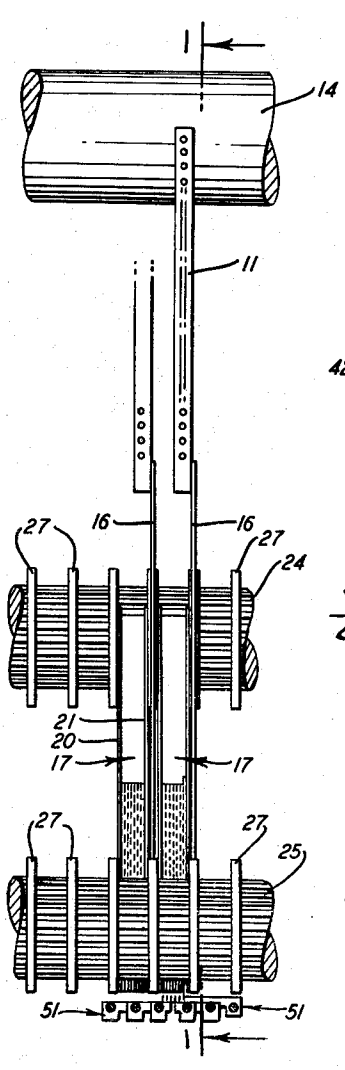


Fig-2

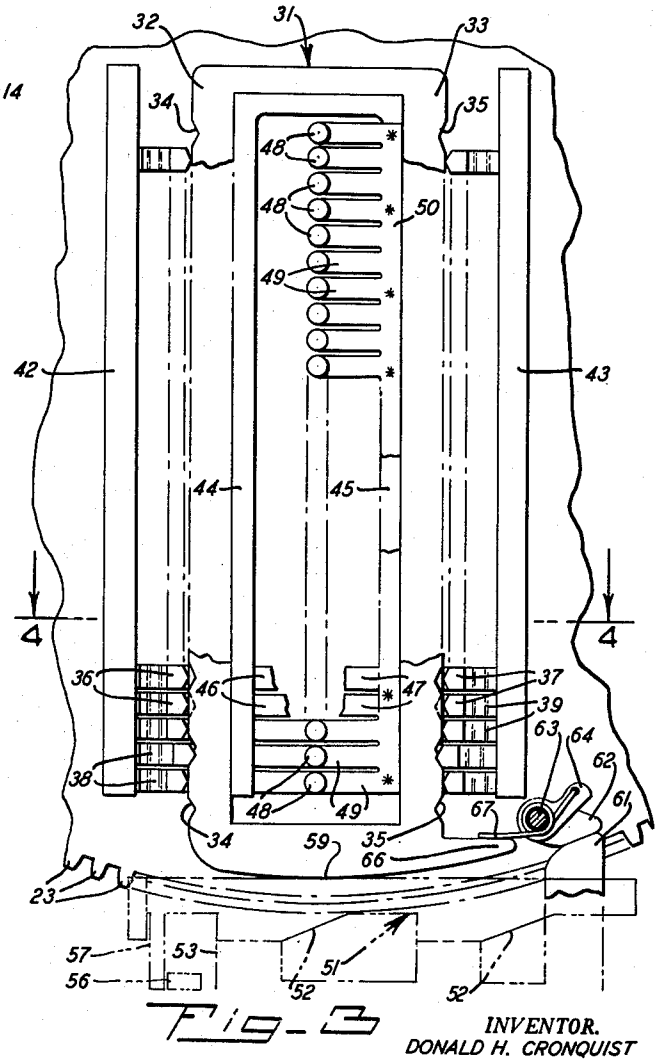


Fig-3

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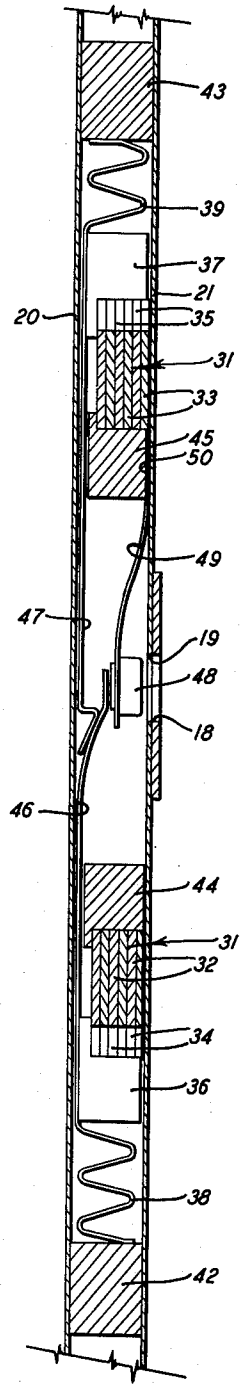


Fig_4

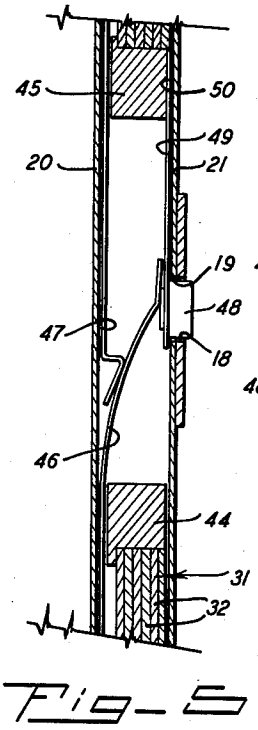


Fig_5

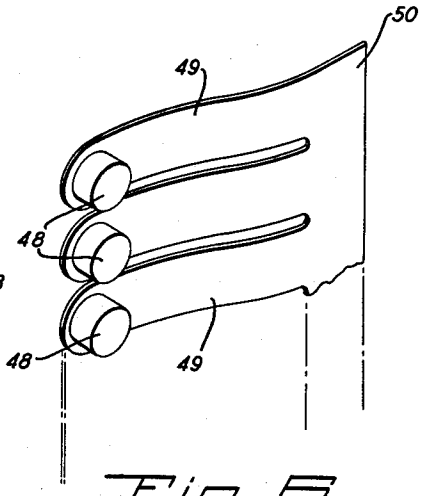


Fig_6

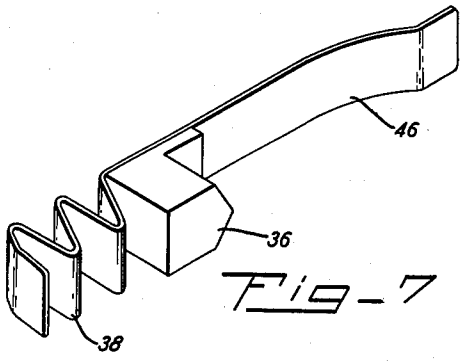


Fig_7

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United States Patent Office

2,984,177

Patented May 16, 1961

2,984,177

SELECTIVE PRINTER

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Filed Dec. 18, 1956, Ser. No. 629,092

13 Claims. (Cl. 101—93)

The present invention relates to a selective printer and, in particular, to a selective printer which has characteristics that make it inherently a high speed printer.

There have been many forms of selective printers but most of them are unsuited for high speed operation because of the large acceleration forces involved at high speeds. These large forces are present both in the selection process and in the type positioning process.

Thus, it is an object of the present invention to devise a selective printer which only requires low forces in the selection and in the type positioning.

Another object of the present invention is to move type selectively to and from printing positions in a manner such that these moves will be substantially harmonic.

A further object of the present invention is that of selectively positioning type by varying the radius of a crank or the radius of a crank and the length of a connecting rod cooperative with such crank.

A still further object of the invention is that of providing means for varying the length of a crank while such has rotary motion.

Yet another object is that of using coding bars to vary a crank length.

These objects are achieved by driving a type bar from a connecting rod which, in turn, is driven by a continuously rotating crank disc having a centerless mounting and drive, and by providing means for varying the crank radius of such disc in accordance with the desired type position.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of example, the principle of the invention and the best mode which has been contemplated of applying that principle.

A device embodying the above construction outline is hereinafter described in detail and illustrated in the accompanying drawings, in which:

Fig. 1 is a schematic elevational sectional view on the line 1—1 of Fig. 2, with parts broken away, but showing some of the principal parts involved in the present selective printer invention.

Fig. 2 is a side view of the device shown in Fig. 1 and showing two printing orders.

Fig. 3 is a detailed view of some of the mechanisms used in selecting and varying the crank length, and is taken from the same position as Fig. 1 but with the crankpin plate removed.

Fig. 4 is a section on the line 4—4 of Fig. 3.

Fig. 5 shows a portion of Fig. 4 but with parts thereof in a different operating position.

Fig. 6 is a detail view of the multiple crankpin combination used in the invention.

Fig. 7 is a detail view of one of the crankpin cam springs and attached coding bar detents.

Fig. 8 is a view on the line 8—8 of Fig. 1, being a plan view of the selecting or actuating blades.

With the advent of data processing machines having data fed thereto by tape, cards, or other non-manual

means, there has been need for selective printers capable of much higher speeds than formerly. While rack or type bar printers are old in the art, the mechanisms for selective control and actuation thereof to print position have, in the past, not been adapted to the speeds now needed.

Fig. 1 illustrates the principle upon which a machine involving the present invention operates, and shows the general arrangement of the primary parts of a machine embodying such invention. This view is taken on the line 1—1 of Fig. 2 so as to show from the axis end the mechanisms of a single print order. In this view there is shown a conventional print bar **11** having spaced therealong individual type dies **12** which in a printing operation are selectively moved a short distance transversely of the bar by a type hammer **13** to impinge against a platen **14** through an ink ribbon and a sheet (both not shown) upon which the selected characters are impressed. For each selected character to be printed, the bar is moved from a home position to the selected printing position, and then back to home. All the bars in a machine may print at once or each bar may print serially with respect to the others. Home position is considered to be the lowermost position which the bar takes, that shown in Fig. 1 in full lines. The dotted line position **15** illustrates another instantaneous position of the type bar and its connecting rod during a cycle of operation of the machine. The print bar **11** is guided by suitable means and is driven in its cycle by a connecting rod **16** connected to a composite crank disc **17**. The connecting rod **16** has near its crank end a series of crankpin holes **18** which, when the crank is in its lower dead center position (the position shown in full lines in Fig. 1), align with crankpin holes **19** in the adjacent face of the crank disc **17**. The effective crank length of the crank disc **17** and of the connecting rod **16**, and hence the position of the print bar at the time of the printing operation, are determined by which of the aligned holes has therein a crankpin, a crankpin being inserted in two of the aligned holes when the crank disc holes and the connecting rod holes are in lower dead center position, home position.

Each crank disc **17** is composed of two parallel, spaced apart, round plates or annuli **20**, **21** having gear teeth **23** formed on their peripheral edges. These teeth mesh with three small gears **24**, **25**, **26** spaced around the disc to hold it in position and to drive it. Each of these gears extends across all of the discs parallel to their common axis, and one or more of them drive the discs to give them continuous rotary motion, each in its plane and about a common axis through the centers of all the discs. Various means may be used to obtain proper spacing of the discs **17** and to hold them in their desired planes along the support gears **24**, **25**, **26**, such as combs or, as shown, spacing rings **27** may be secured to the support gears at suitable intervals. Spacing of the discs is necessary to allow for the movement of one of the connecting rods **16** between each two adjacent discs. However, this connecting rod clearance is only enough for free movement of the rods as the alignment of the rods is had by the disc spacing. As shown in Fig. 2, each connecting rod is driven from the disc to its left. This means that at the right end of the disc orders there is a dummy disc to space and hold in position the last connecting rod at that end.

The operation of the mechanism for selectively varying the effective crank radius of each of the crank discs, which rotates with and is individual to each disc, is based on the use of a set of six coding bars **31**. Each coding bar is in the form of an arch or hoop, having parallel longitudinal side rails **32**, **33**, with the longitudinal axis of the hoop on a diameter of the disc and the six bars in side by side engagement axially of the disc. Code notches **34**, **35** are formed along each outside longitudinal edge. These notches are sensed by detents **36**, **37**, one

series with a detent for each crankpin hole **19** along each outside longitudinal set of bar edges. Each detent extends transversely across the set of bars. Each detent is secured to, carried and guided by, and biased against the code bars by a detent and cam strip spring **38, 39.** These discs, detent series and related detent springs, and bar rails as viewed in Figs. 2 and 3 may be designated as left and right discs, detent series and springs, and rails, the left being even and the right odd numbered.

The use of six coding bars allows data in binary form to be fed into the printer to move one or more of the coding bars a short distance centrally of the disc, thereby translating the binary data to decimal, alphabet, or other form. The transfer from binary to decimal may be based on the form of code shown in the copending application Serial No. 610,537, filed September 18, 1956 (page 6).

At each side of the code bar and parallel to its rails **32, 33** is a detent spring base **42, 43** which also serves to space apart the disc cover plate **20** from the crankpin plate **21** and hold the plates together. Each detent spring bears against one of these spring bases to urge its detent against the coding bars to force the detent into a trough across the bars when such appears due to the relative setting of such code bars. The inside edges of the code bar rails **32, 33** are straight and parallel, and, when nested together, bear against and slide longitudinally on a pair of guide bars **44, 45,** one guide against each side of the hoop opening of the nested bars. These guide bars are notched to serve as combs for the detent strip-springs **38, 39,** as each spring has a finger **46, 47** that extends inwardly to the longitudinal center line of the code bar hoop. This is best seen in Fig. 4. These spring fingers **46, 47** are so formed that they act as cams so that when opposite detents move inward of the code bar hoops, the opposite finger ends will cam one on the other to move a crankpin **48** through aligned crankpin holes **18, 19** in the crankpin plate **21** and the connecting rod **16.** This actuated position of the spring fingers and their crankpin is shown in Fig. 5. There is a crankpin **48** for each of the crankpin holes **19** in the crankpin plate **21.** Each crankpin is carried on the end of a spring leaf **49** and all of the leaves have a common base **50** that is parallel to and secured between the right guide bar **45** and the disc plate **21.** An enlarged fragmentary view of the crankpins and their spring leaves and base is shown in Fig. 6. The code notches on the code bars are such that when all of the code bars are in home position, the crankpin at the top of the common base **50** (Fig. 3) will be actuated to enter its aligned crankpin holes. This top crankpin and its aligned holes are located at the center of the crank disc. This serves to secure the connecting rod **16** against movement when during the ensuing revolution of the crank disc no printing action is to be performed in that particular disc order.

Fig. 7 is a perspective view of one of the left hand detent strip springs **38** and its cam finger **46.**

Input of data to the coding bars **31** is accomplished by the movement of one or more of six setting blades **51** nested together adjacent the periphery of each of the crank discs **17.** There is one blade **51** for and in the plane of each code bar **31.** As seen in Figs. 1 and 3, the bottom edge of each blade has cam portions **52** which, when it is moved to the right, will force the blade upward by such cams engaging fixed follower portions **53** of a blade holder **54.** Fig. 8 shows a plan view of these blades and rods **55** which may be used for actuating the blades from a suitable source of binary data. A blade bail **56** extending across all of the disc orders is timed to return the actuated blades to their left position contacting a lug **57** secured to each of the blades, after each actuation of the blades.

The blades and the code bars have only two positions, a home position and a single actuated position. The action or cooperation between a blade and its related code bar is that of a wiper and its toe. The upper edge **58** of the blade may be considered as the wiper surface and the lower transverse edge **59** of the code bar hoop **31** as the toe surface. This toe edge **59** may be formed as an arc with a radius equal to its distance from the disc center. When a blade is raised and the discs rotated, the code bar toe edge **59** which is aligned with the raised blade will contact the wiper edge **58** of the blade to force the code bar to its actuated position. After the code bars have passed the blades, the blades are returned to their home position by the blade bail **56.**

The code bars for each disc are returned to home position by mechanisms which include a fixed reset blade **61** which may be part of the holder **54** for the movable blades. When the crank disc is at lower dead center, this reset blade **61** is contacted by a follower reset lever **62** which is secured to and pivots with a reset lever shaft **63** extending between the plates **20, 21** of the disc. The reset lever lies against the cover plate **20** and the six code bars **31** are spaced from this cover plate (Fig. 4) so that none of their toe edges **59** are contacted by the fixed reset blade **61.** Secured to the reset shaft **63** are six spring arms **64,** each in alignment with one of the six code bars. Wrapped around the shaft **63,** with one end secured to the spring arm and the other end bearing lightly on a nose **66** at the lower end of its aligned bar, is a reset spring **67,** one for each arm and bar. The action of this code bar reset mechanism is such that in the position of the parts as shown in Fig. 3 the reset springs **67** will, under the urging of the fixed reset blade **61** and its follower lever **62,** force down to home position all of the bars which are not being held in their actuated position by raised setting blades **51.** The reset lever **62** will leave the reset blade **61,** in the rotational direction indicated in Fig. 1, before the actuated code bars **31** leave their actuated blades **51.** When the reset lever **62** is not in contact with the reset blade **61,** the spring fingers **67** do not bear on the noses **66** of the code bars with sufficient force to return them to home position.

Operation of the selective printer is had when the discs **17** are coaxially supported and rotated on their common peripheral guide and drive gears **24, 25, 26.** When any or all of the discs rotate without data being fed to them, their connecting rods **16** are held against movement by the crankpin **48** located at the disc center being engaged with the connecting rod. The feeding of data to the setting blades **51** in an order raises one or more of the blades in that order so that as the toe **59** of each of the code bars **31** aligned with its respective wiper edge **58** of its blade **51** at the lower dead center position of the bars, those bars will be raised whose blades have been actuated. The coding notches on the code bars determine which crankpin will be moved to enter a crankpin hole **18** in the aligned connecting rod **16.** The connecting rod is wide enough to prevent the crankpins from leaving the crankpin cover plate **21** until the holes in the cover plate and the connecting rod are in alignment. The crankpin holes **18** may be elongated in the direction perpendicular to the length of the connecting rod to facilitate entry of the pin into the hole. This coupling of the disc **17** and the connecting rod **16** is done while the discs **17** are rotating. While the discs have been described as running at constant speed, the discs may be rotated by a variable speed drive which would give low speeds at bottom and top dead center of the crank motion, thus allowing more time for pin insertion and removal as well as for the printing operation. The variable speed drive would operate through the gears **24, 25, 26** and, since drives of this type are old in the art, is not shown. Rotation of the discs from the lower dead center position shown in Figs. 1 and 3 to the top dead center position will bring the connecting rods and the print bars **11** of those orders which have been actuated to their printing position where the print hammer **13** will actuate the type bars aligned with the

hammer against the platen 14 to effect the printing operation.

Further rotation of the discs to lower dead center will again bring the machine to the position shown in Figs. 1 and 3 where the code bars will again contact those blades having an actuated position as a result of new data having been fed thereto during the disc rotation from lower dead center position, those code bars in each disc not being raised by the actuating blades 51 are returned to their home position by the fixed clearing cam 61 acting on the cam follower lever 62 and the individual reset springs 67, one of which bears on the nose 66 of each of the code bars in a disc.

Resetting of the blades 51 is had through the cyclic action of the reset bail 56 moving the blades to the left, their home position, as the disc 17 leaves its lower dead center position.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to the preferred embodiment, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. A crank having formed therein a plurality of radially distributed crankpin openings, a crankpin arranged in alignment with each of said openings, and coding means carried by said crank and effective when selectively actuated to determine a particular one of said crankpins to be moved through its aligned opening, and means for moving the determined crankpin through its aligned opening.

2. The combination of claim 1 in which said coding means includes a plurality of code bars arranged in contact with each other and axially of said crank.

3. The combination of claim 2 which includes a separate detent related to each of said crankpins, and means for biasing each of said detents against said bars so as to sense the coding of said bar and toward a position determinative of movement of its related crankpin.

4. The combination of claim 2 which includes a nest of blades, each of said blades having an edge thereof in the plane of one of said bars, said nest being located peripherally of said crank, and means for selectively moving said blades to thereby selectively move said bars.

5. A mechanism having: a crank having therein a plurality of crank-crankpin openings, a connecting rod having therein a plurality of rod-crankpin openings having a distribution such that all of said rod openings may at one time be aligned with all of said crank openings so that there are a plurality of aligned pairs of openings, one in the crank and one in the rod in each pair, crankpin means insertable in and between an aligned pair of said openings to link said crank and rod together, and means carried by said mechanism and effective when selectively actuated to insert a crankpin means in a selected aligned pair of said openings to link said crank and rod together for cooperative movement.

6. The combination of claim 5 in which said crank is in the form of a disc, a plurality of said discs arranged in side-by-side and coaxial relationship, and means located peripherally of said discs supporting them in such relationship and rotating them.

7. In a printer, the combination of: a type carrier, a number of type characters positioned along and carried by said carrier, and mechanism for positioning said carrier in various selectable printing positions related in number and position to the number and position of characters carried by said carrier, comprising: a connecting rod, means linking said rod to said carrier, a crank for driving said rod and adapted to be linked thereto, said crank and said rod each having therein a plurality of openings related in number and position to the number and position of said characters, the openings of said crank and said rod having a distribution such that all of said rod openings may at one time be aligned along said crank with all of its openings so that there are such a number of aligned pairs of openings having such positional relationship, one opening in the crank and one in the rod in each pair, crankpin means insertable in and between an aligned pair of said openings to link said crank and rod together, character selecting means carried by said mechanism and effective when selectively actuated to insert a crankpin means in a selected aligned pair of said openings to link said crank and rod together for cooperative movement upon rotation of said crank, and means for rotating said crank whereby such selective actuation results in a change in the effective lengths of said crank and rod, and the locating of said carrier in a printing position corresponding to a selected actuation of said character selecting means.

8. The combination of a plurality of said type carriers and mechanisms, as set forth in claim 7, arranged in side-by-side relationship, and in which combination each of said cranks is in the form of a disc and said discs are coaxial, and means located peripherally of said discs supporting them in such relationship and rotating them.

9. The combination of claim 7 in which said crankpin means includes a separate crankpin related to each of said pairs of openings and responsive to said character selecting means for insertion in its related pair of openings.

10. The combination of a plurality of said type carriers and mechanisms, as set forth in claim 9, arranged in side-by-side relationship, and in which combination each of said cranks is in the form of a disc and said discs are coaxial, and means located peripherally of said discs supporting them in such relationship and rotating them.

11. A printer having a rotatable crank, a connecting rod, said crank and rod constituting cooperating parts, type positionable by said crank and rod, a plurality of crankpins associated with and carried by said parts, each crankpin adapted to connect said crank to said rod so as to give said crank and rod different lengths as compared with a connection by any of the other said crankpins, means effective when selectively actuated to connect said crank and said rod with a selected one of said pins whereby rotation of said crank will selectively position said type, and means for rotating said crank.

12. A printer having a plurality of type carriers, each said carrier being positionable to a plurality of printing positions, a separate crank disc for each of said carriers, a separate connecting rod connected to each of said discs and linked to a said carrier, rotation of each of said discs thru its connected rod adapted to drive its related carrier to and from a printing position, said discs being in side-by-side and coaxial position, and means located peripherally of said discs for supporting and rotating them.

13. A printer having a plurality of coaxially arranged crank discs, each of said discs carrying a plurality of radially distributed crankpins, guiding and moving means for moving each of said pins transversely of said discs, coding means carried by each of said discs and effective when selectively actuated to determine a particular one of said crankpins to be given such movement and to actuate said moving means to move such particular crankpin, and means external to said discs for selectively actuating said coding means.

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