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POSITIONING MECHANISM IN SELECTIVE
TYPE PRINTING MACHINES

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Filed Jan. 4, 1960, Ser. No. 214

8 Claims. (Cl. 101—93)

The present invention relates to a positioning mechanism, and pertains more particularly to a type member positioning mechanism for use in electronic data processing and other mechanisms.

In some types of electronic data processing mechanisms, each of a succession of steps in a data processing operation is accomplished by selectively either sending, or refraining from sending, an electrical pulse through each of a plurality of electrical circuits. By operatively associating a type carrying member with actuating means operating in timed relation with each of such circuits, said type carrying members can be selectively advanced to desired positions, from which, upon the completion of a desired cycle, a type element of each type carrying member can be moved toward a platen having a paper or other indicia receiving member thereon, thereby to print the result indicated by the positions of said type carrying members at a selected point of each cycle. This general type of mechanism, and the means for providing timed co-ordination of mechanical means with the pulse circuits, are well known in the art of electronic computers.

The present invention contemplates the provision of an improved positioning mechanism.

A further object of the invention is to provide an improved and simplified type rack positioning mechanism for use with electronic computers, data processing and other mechanisms.

The invention also provides a mechanism for selectively moving a type bar into and out of driven engagement with a drive member, the latter being actuated in successive, spaced increments, which increase in magnitude in binary progression.

A further object of the invention is to move a plurality of tiltably mounted, spring biased type racks into and out of meshed engagement with an intermittently actuated pinion in the intervals between successive actuations of the latter, pulse actuated means being provided to select the ones of said type racks to be moved by each successive actuation of the pinion.

These, and other objects and advantages of the invention, will be apparent from the following description and the accompanying drawings, wherein:

FIG. 1 is a fragmentary, perspective, somewhat diagrammatic view of a portion of a type rack positioning mechanism embodying the present invention, showing the type racks tilted out of meshed engagement with their pinions by their respective plungers.

FIG. 2 is a transverse, vertical, sectional view in reduced scale of the mechanism shown in FIG. 1, showing one of the type racks in meshed, driven engagement with its pinion, and including a face cam for actuating the drive rack.

FIG. 3 is a fragmentary view, similar to FIG. 2, but showing the type rack latched out of meshed engagement with its pinion.

Briefly, the illustrated form of the invention comprises a plurality of vertically movable type racks 10 mounted between a platen 11 and a printing hammer 12. When the latter is moved toward the platen, a type element 13 in each type rack 10 which is aligned with the printing hammer 12 will be carried thereby toward the left and

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into printing engagement with a paper tape 14 overlying the platen.

The type racks 10 are aligned in side by side relation between a pair of parallel guide bars 17 and 18, which are mounted just below the printing hammer 12 and platen 11, and with just sufficient clearance from the type racks to permit limited lateral tilting movement of the latter therebetween. The toothed lower portion 19 of each type rack 10 is urged by a curved leaf spring 20 toward meshed engagement with a pinion 21 mounted laterally adjacent thereto. The pinions 21 are all identical, and are driven intermittently, in unison, by a drive rack 22 and face cam 23.

A plurality of type rack disengaging plungers 24 are provided, one for each of the type racks 10, and said plungers are actuated simultaneously by a bail 25 in the dwell intervals between intermittent operations of the drive rack 22 to tiltably move the lower ends of the type racks 10 out of meshed engagement with their respective pinions 21 as shown in FIG. 1.

A spring biased, magnetic latch 27 is provided for each plunger 24, and, if energized, will free its associated plunger 24 to allow its associated type rack 10 to return into meshed engagement with the pinion under the biasing force of the leaf spring 20 associated therewith.

Any of the magnetic latches 27 which are not energized, will be moved to their spring biased, latching condition shown in FIGS. 1 and 3, and will thus retain their type racks 10 in their inoperative, or disengaged position as shown in FIG. 3 when the bail 25 returns to its right hand position of FIG. 3. The type racks 10 which return into meshed engagement with their respective pinions 21 will be driven upwardly upon the next successive downward actuation of the drive rack 22 by the face cam 23.

Upon the completion of each rotative cycle of the face cam 23, the printing hammer 12 is moved to the left in a conventional manner to drive the type elements 13 aligned therewith into printing engagement with the tape 14, after which the tape is advanced, and the type racks 10 are returned to their starting position shown in FIG. 2 in a well known manner.

Referring to the drawings in greater detail, the roller platen 11 is of a conventional type, as are also the means (not shown) for feeding the paper tape 14 or other suitable print-receiving element thereon. The printing hammer 12 is also of a conventional and well known type, as are the means for actuating said hammer upon the completion of each rotative cycle of the face cam 23. Some of these, and other conventional and well known elements of such mechanisms, are shown and described in greater detail in Patent No. 2,824,513, one of the copatentees of which is the inventor of the present invention.

The type racks 10 are, in general, of a conventional and well known type, each thereof having a plurality of type elements 13 mounted therein for laterally slidable, transverse movement toward and away from the platen. Each type element 13 has a usual type character 13a on its left end, and is provided with usual spring return means (not shown) to return it to its normal, illustrated position after each actuation thereof by the printing hammer 12.

The type rack guide bars 17 and 18 are of suitable rounded, smoothly polished material, such as, for example, steel, and guide type racks 10 for vertical movement therebetween, while at the same time leaving said type racks free for limited, lateral, tilting movement between their solid and broken line positions 10 and 10' of FIG. 2. The leaf springs 20 are mounted on a stationary bar 28, which extends transversely across the opposite side of the type racks 10 from the plungers 24. The bar 28,

in addition to providing mounting support for the leaf springs 20, also acts as a stop to limit the movement of the type racks by the action of their plungers 24.

The drive pinions 21 for all of the type racks 10, as well as that for the drive rack 22, are identical, and are secured, as by keys 29, to a common shaft 30. These pinions thus constitute, in effect, a single pinion common to all of the racks.

The drive rack 22 is supported for vertical slidable movement by a guide member 31, and the toothed portion 32 of the drive rack is in constant, meshed, driving engagement with its pinion 21. A cam follower roller 33 is journaled on one side of the lower end of the drive rack 22, and rides in a grooved cam track 34 in a side of the face cam 23. The latter is keyed to a shaft 35, journaled in bearing brackets 37, only one of which is shown, and is rotatively driven at a constant speed, by suitable and well known means (not shown) in synchronism with the plungers 24 and the usual actuating means for the printing hammer 12, so that the latter will be actuated once for each complete rotative cycle of the face cam 23.

The cam track 34 is of a width to receive the cam follower roller 33 for rolling movement therein, and has a plurality of inwardly offset track portions 38, each terminating in a concentric track portion or "dwell" 39. The first inwardly offset cam track portion 38a is offset radially inward a sufficient distance to move the cam follower roller 33 downwardly the distance required to rotate the pinions 21 an amount which will elevate all of the type racks 10 which are in meshed engagement with their pinions 21 the thickness (vertical distance as illustrated) of one type element 13.

The second inwardly offset cam track portion 38b advances the type racks 10 in engagement with their respective pinions 21 a distance of two type elements. The successive cam track portions 38c, 38d, 38e and 38f increase such advance rate in binary increments, i.e., distances of four, eight, sixteen, and thirty-two type elements, respectively. The number of such increments employed will, of course, depend upon the number of type elements required in each type rack. With six binary increments as illustrated, a total of sixty-four type elements 13 may be used in each type rack, i.e., one for each incremental step thus provided, plus one for the zero position.

For the purpose of the present disclosure, the rotative cycle of the face cam 23 is assumed to be completed when the cam roller 33 is in the concentric dwell portion 39f. The terminal position of each type rack 10 upon the completion of each such rotative cycle of the face cam 23 is determined by the successive two-stroke cycle actuations of its plunger 24, once during each time the cam follower roller 33 is in a dwell 39 of the cam track 34, and the selective, pulse-controlled operation of its respective magnetic latch 27 at the beginning of selected return strokes of the bail 25.

Each plunger 24 is of rectangular cross sectional shape, and is supported for slidably, longitudinal movement on a stationary support member 40. A forwardly projecting tooth 41 is provided on the forward or left hand end of each plunger, said tooth being of a size to fit snugly between adjacent teeth 19 of its associated type rack 10, and thereby to correct any slight vertical misalignment which may exist in the position of the type rack. An elongated, threaded pin 42 is screwed into a threaded axial hole provided therefor in the rear or right hand end of each plunger 24. Each of said pins has an enlarged head 43 on its outer end, and a coil compression spring 44 surrounds each pin 42.

The plunger actuating bail 25 may comprise, for example, a steel bar, having a plurality of holes 45 therein of a size, at their inner, or left hand ends, to receive the shanks of the pins 42 for guided, slidable movement therein. The right hand or rear portion of each pin receiving hole 45 is enlarged at 47 (FIGS. 2 and 3) to

freely receive therein the coil spring 44 which surrounds its associated pin. Each coil spring 44 in its normal, unstressed condition, is of a length just slightly greater than that of the portion of its encircled pin 42 which is exposed beyond the reduced portion of the hole 45 when both the bail 25 and plunger 24 are in their retracted, right hand positions of FIG. 2.

The bail 25 moves in intermittent, two-stroke cycles from its normal, or right hand position, as shown in FIGS. 2 and 3, to its extreme left hand position of FIG. 1, and then back again to the right to its position of FIGS. 2 and 3. Such a complete, two-stroke operation of the bail 25 occurs once during each dwell of the drive rack between successive downward advances thereof by the offset portions 38 of the cam track 34.

Upon each leftward stroke of the bail 25 to the position thereof illustrated in FIG. 1, all of the plungers 24 are moved thereby to their extreme left-hand position of FIG. 1, thereby tiltably moving their respective type racks 10, against the bias of their leaf springs 20, into contact with the stop bar 29 and disengaged from their pinions 21.

The magnetic latches 27 are mounted beneath the plungers 24 on a stationary support bar 48. The latch structure comprises an upwardly open channel member 49 with a plurality of notches 50 (FIG. 1) in the flange 51 thereof, one notch being provided directly beneath each plunger 24. A magnetically permeable latch tongue 52 is pivotally mounted in each of the notches 50, and a coil spring 53 is mounted in tension between the projecting right hand end portion of each latch tongue 52 and the channel member 49. The tension of the springs 53 biases the tongues 52 rotatively, in a clockwise direction, as illustrated in FIGS. 1-3, toward latching engagement with a notch 54 provided therefor in the under side of each plunger 24.

Within the channel member 49, and beneath the oppositely extending portion of each latch tongue 52, is secured an electro-magnet 55, which, upon being energized by an electric current pulse, supplied as a well known operating feature of the type of mechanism with which the present invention is to be used, magnetically attracts its associated latch tongue 52 and urges it downwardly toward its plunger releasing position of FIG. 2. Any of the plungers 24, the magnetic latches 27 of which are thus energized as the bail 25 begins its retractive stroke from its position of FIG. 1 to that of FIGS. 2 and 3, will be carried, by the return stroke of the bail 25, and the pressure of their associated coil springs 44, toward the right to the retracted position thereof shown in FIG. 2. This return movement of the unlatched plungers 24 releases the type racks 10 associated with each such plunger 24 for the return of such racks by their leaf springs 20 into meshed engagement with their associated pinions 21 as also shown in FIG. 2.

However, any of the magnetic latches 27 which are not so energized upon such return stroke of the bail 25 will allow the latch tongues 52 thereof to remain in their spring urged, latching position illustrated in FIGS. 1 and 3, thereby latching their respective plungers 24 in their left hand, advanced position of FIGS. 1 and 3. Such latched plungers 24 will hold their respective type racks 10 tilted to their disengaged position of FIG. 3, out of mesh with their respective pinions 21 during the next successive rotative movement of said pinions by the drive rack 22. Thus, only the type racks 10 which are in meshed engagement with their respective pinions 21 will be moved upwardly an amount determined by the radial inward offset of the cam portion 38 next actuating the drive rack 22.

The operation of the illustrated form of the invention is as follows:

Assume, as mentioned previously herein, that each type rack 10 contains sixty-four type elements 13, and that the face cam 23 has six inwardly offset portions 38

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therein, which increase, in their effective advance of the type racks 10, in binary progression, in six increments of from one to thirty-two type elements 13. In order to print the topmost or zero position type element 13 in a selected type rack 10, the pulse program for that selected type rack would feed no pulses at all to its associated latch magnet 55. The latch tongue 52 of that magnet would, therefore, remain in spring biased, latching engagement with its plunger 24 throughout all six successive operative advances of the drive rack 22 during one complete rotative cycle of the face cam 23, thereby preventing the type rack 10 from ever tilting into meshed engagement with its pinion 21. The topmost type element 13, would, therefore, remain in lateral alignment with the printing hammer 12 throughout such entire rotative cycle of the face cam 23.

If it were desired to advance a selected type rack 10 to bring the second type element 13 into lateral alignment with the striking hammer 12 upon completion of a rotative cycle of the face cam 23, a pulse would be fed to the magnet 55 associated with that rack during only the retractive stroke of the bail 25 in advance of the operation of the drive rack 22 by the first offset portion 38a of the cam track 38. Such first operation of the drive rack 22 would raise the type rack 10 a distance of one type element 13. Thereafter, during the remainder of the rotative cycle of the cam 23, no more pulses would be fed to the latch magnet 55 of the selected type rack, and the second type element 63 would, therefore, remain in position to be engaged by the printing hammer 12 upon completion of such rotative cycle of the face cam.

If, for example, it were desired to bring the nineteenth type element 13 of a selected type rack 10 into lateral alignment with the printing hammer 12 upon completion of a rotative cycle of the face cam 23, the magnet 55 associated with the plunger 24 for such type rack would be pulsed during the return stroke of the bail 25 in advance of the actuation of the drive rack 22 by the second (2 type elements) and fifth (16 type elements) offset portions 38b and 38e of the cam track 38, thereby advancing such type rack a total distance of eighteen type elements 13. Thus, in accordance with the well known characteristics of a binary progression, by properly selectively pulsing the latch magnets 55, any of the sixty-four type elements 13 in any of the type racks 10 may be brought into register with the printing hammer 12 upon the completion of any rotative cycle of the face cam 23 for printing the type characters 13a of such selected elements on the tape 14.

Suitable means for returning the type racks 10 to their starting positions upon completion of each printing operation are well known to those familiar with the art, and it will, therefore, be unnecessary to enumerate the details thereof herein. However, Patent No. 2,824,513, mentioned previously herein, sets forth some conventional ways for performing this return operation.

Suitable means, such as, for example, conventional punch cards (not shown) may be used for selectively furnishing or withholding energizing pulses to the magnetic latches 27 during each dwell of the drive rack 22 at the moment when the bail 25 begins its return stroke from its advanced position of FIG. 1 toward its position of FIGS. 2 and 3, thereby to select the type racks 10 which are to be permitted, by their magnetically retracted latch tongues 52, to return, under the bias of their leaf springs 20, into driven, meshed engagement with their drive pinions 21, for advance thereby upon the next successive actuation of the drive rack 22 by an offset cam track portion 38.

Just prior to each printing stroke of the printing hammer 12, all of the plungers 24 preferably are moved, by a leftward stroke of the bail 25, to the position thereof shown in FIG. 1. This moves all of the type racks 10 to uniformly tilted position, and the teeth 41 on the ends

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of the plungers 24 insure accurate vertical alignment of all of the type racks 10 with a selected type element 13 of each in register with the printing hammer. Following each operative stroke of the printing hammer 12, the tape 14 is advanced, in a usual manner, ready for the next successive printing operation.

The invention provides a simple, positively operating, and relatively inexpensive printing mechanism for use in electronic calculating, data processing and other mechanisms wherein the ultimate in speed of operation is not required.

While I have illustrated and described a preferred embodiment of the present invention, it will be understood, however, that various changes and modifications may be made in the details thereof without departing from the scope of the invention as set forth in the appended claims.

Having thus described the invention, what I claim as new and desire to protect by Letters Patent is defined in the following claims.

1. A printer comprising an elongated type carrier movable lengthwise and transversely during a positioning operation thereof, an intermittently moving drive means laterally adjacent to, and acting longitudinally of, the type carrier in a plurality of successive, spaced increments of known magnitude for each positioning operation of the type carrier, means urging the type carrier transversely into operative engagement with the drive means, and controlled means acting oppositely to said urging means in intervals between selected increments of movement of the drive means for moving the positional member out of operative engagement with the drive means.

2. A printer comprising an elongated type carrier movable lengthwise thereof, guide means laterally restraining an intermediate portion of the type carrier, said type carrier being free for limited, lateral tilting movement about an axis at the guide means, an intermittently moving drive means laterally adjacent to, and acting longitudinally of the positional member and spaced longitudinally of the type carrier from the guide means and means acting between selected movements of the drive means for selectively tilting the type carrier about such axis into and out of operative engagement with the drive means.

3. An arrangement according to claim 2 wherein the guide means comprises a pair of members mounted one on each of two opposite sides of the type carrier.

4. Printing mechanism comprising a positional rack, drive means operating intermittently in successive increments of known magnitude, means biasing said rack into driven engagement with the drive means, disengaging means operating on said rack in each interval between successive operations of the drive means for positively moving the rack out of engagement with the drive means, and latch means operatively associated with said rack of selectively latching the latter out of engagement with the drive means during a succeeding incremental operation of the drive means.

5. Printing mechanism comprising a positional rack, drive means operating intermittently in successive increments of known magnitude, means biasing said rack into driven engagement with the drive means, disengaging means operating on said rack in each interval between successive operations of the drive means for positively moving the rack out of engagement with the drive means, and latch means mounted selectively to engage the disengaging means in its operated position for selectively latching the rack out of engagement with the drive means during a succeeding incremental operation of the drive means.

6. Type positioning mechanism comprising a plurality of positional type racks movable lengthwise thereof, a drive gear associated with each type rack, each type rack and its associated drive gear being relatively movable transversely of the length of the rack into and out of meshed engagement with each other, drive means actuating the drive gear in successive increments with a dwell

between successive incremental actuations thereof, disengaging means driven in timed relation with said drive means and actuated during each dwell of said drive means for relatively moving each rack and its drive gear out of meshed engagement with each other, means individually urging each type rack and its drive gear toward meshed engagement with each other, and selectively operable latch means individually associated with each rack and its drive gear for latching selected racks and their drive gears out of meshed engagement with each other during a successive incremental actuation of the drive gears by the drive means.

7. Type positioning mechanism comprising a plurality of positional type racks movable lengthwise thereof, a drive gear associated with each type rack, each type rack being also movable transversely thereof into and out of meshed engagement with its associated drive gear, drive means simultaneously actuating all of the drive gears in successive increments with a dwell between successive incremental actuations thereof, a disengaging member mounted adjacent each type rack and movable transversely of the type racks from a position clear of its adjacent type rack to a position wherein its adjacent type rack is moved thereby out of meshed engagement with its associated drive gear, disengaging member actuating means driven in timed relation with said drive means and operated during each dwell of said drive means for moving all

of said disengaging members to disengage their respective type racks from their associated drive gears, means individually urging each type rack toward meshed engagement with its associated drive gear, and latch means individually associated with each disengaging member and selectively movable between unlatched and latched relation therewith, thereby to latch selected disengaging members in their type rack disengaging position during a successive incremental actuation of the drive gears by the drive means.

8. An arrangement according to claim 7 wherein each disengaging member is provided with a centering toothed element positioned for toothed, centering engagement with its associated type rack upon each actuation of the disengaging members.

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