Sept. 14, 1954 R. E. BALDWIN 2,688,916

STATISTICAL MACHINE

Filed Oct. 17, 1951

3 Sheets-Sheet 1

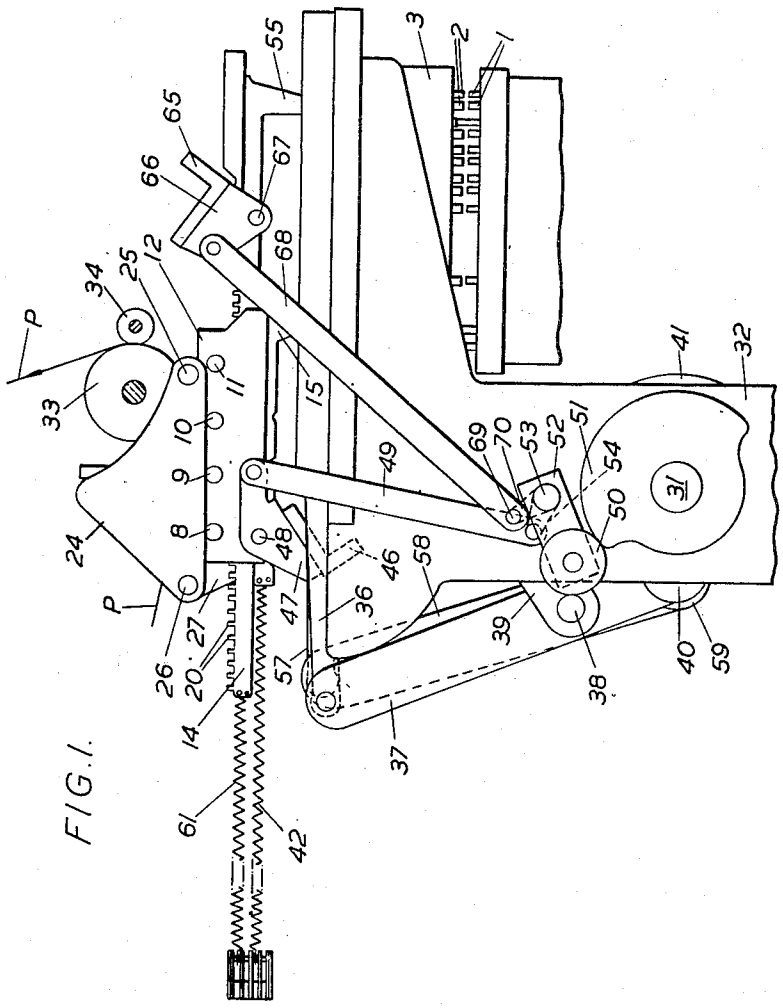

FIG. 1.

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3 Sheets-Sheet 2

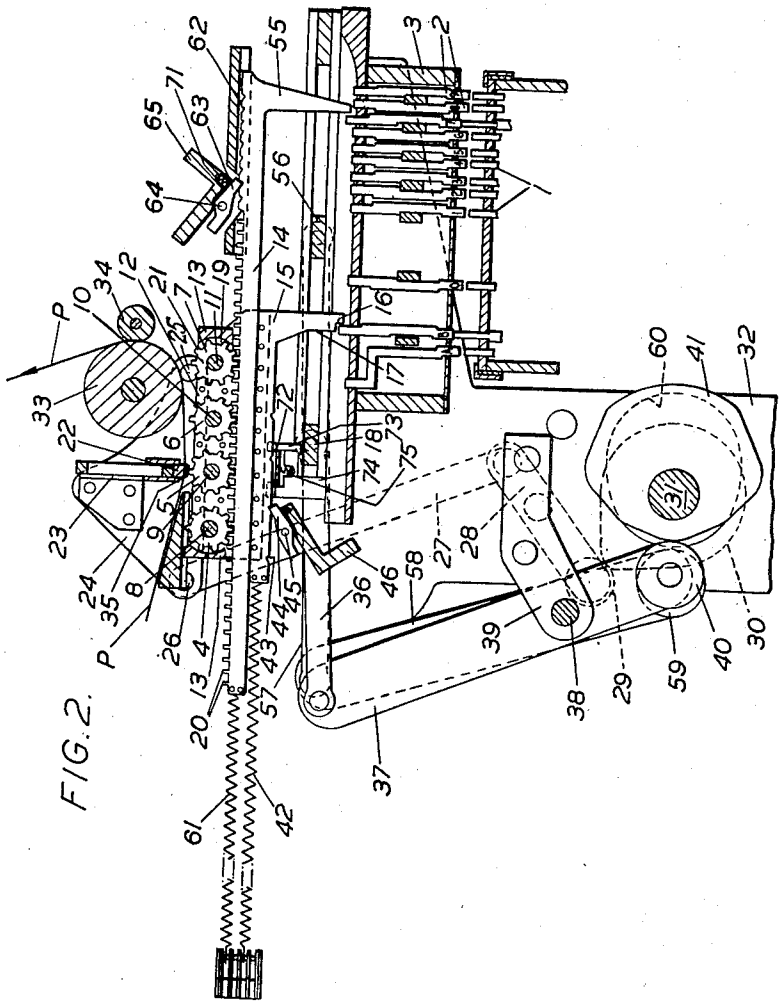

FIG. 2.

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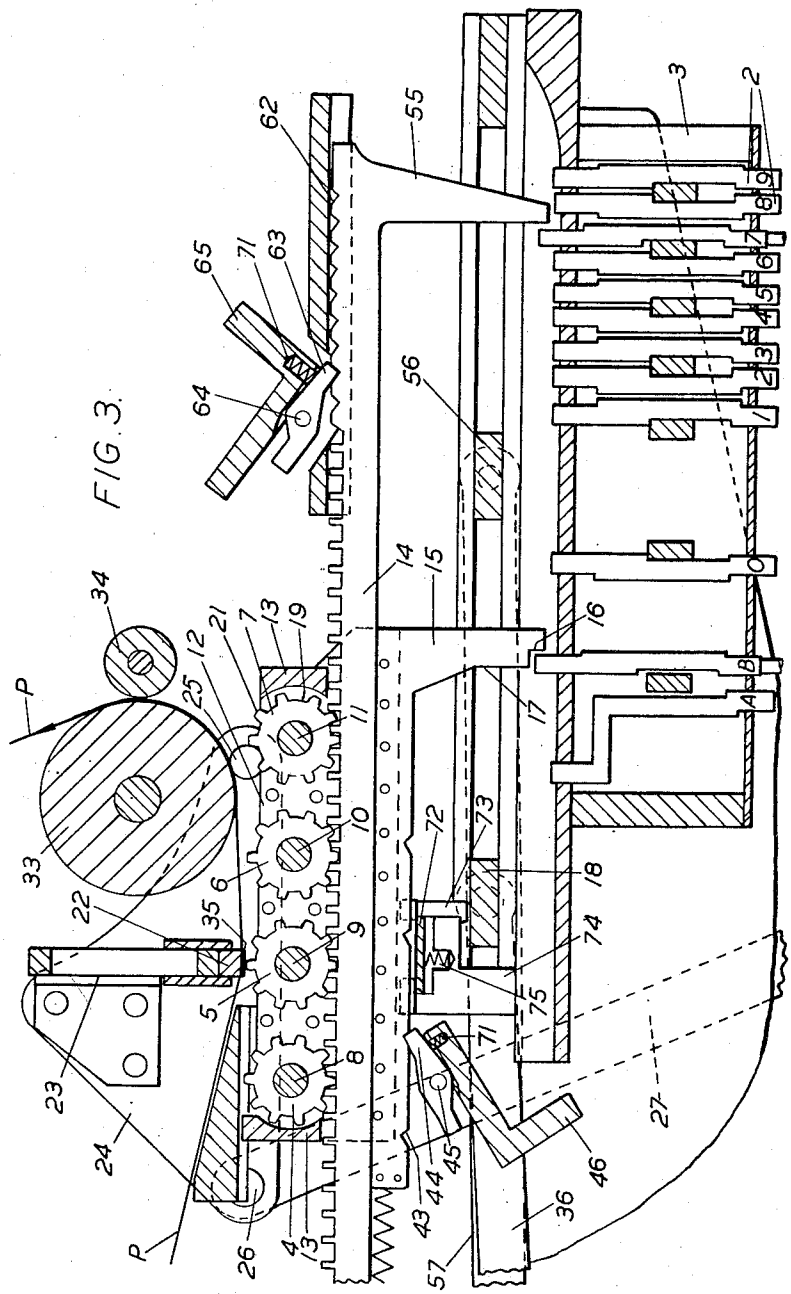
Sept. 14, 1954 R. E. BALDWIN 2,688,916

STATISTICAL MACHINE

Filed Oct. 17, 1951 3 Sheets-Sheet 3

FIG. 3.



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Patented Sept. 14, 1954

2,688,916

UNITED STATES PATENT OFFICE

2,688,916

STATISTICAL MACHINE

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Application October 17, 1951, Serial No. 251,665

Claims priority, application Great Britain November 29, 1950

15 Claims. (Cl. 101—93)

1

This invention relates to statistical machines and in particular to a method of and apparatus for printing a record of data sensed from a vertical column of a statistical record card.

Apparatus heretofore proposed for producing printed records of data sensed from statistical record cards has usually employed type-carrying bars, or sectors, or type wheels, each of which carries the full range of type characters from which selection is to be made and the rate at which such apparatus can operate is restricted to a speed of the order of 120 to 150 lines per minute. It is a main object of the present invention to provide an apparatus for producing printed records of data sensed from statistical record cards which apparatus will operate at a relatively high speed, that is a speed of the order of 400 lines per minnte.

According to the present invention there is provided a method of printing a record of data sensed from a vertical column of a statistical record card, comprising the steps of disposing type characters around the peripheries of a plurality of type-carrying elements mounted for angular movement in a carrier therefor, selecting a type character and aligning it with a platen for a printing operation by sliding or rocking the carrier relative to the platen and by angularly moving the type-carrying elements, and effecting relative movement between the carrier and the platen to effect the taking of an impression from the character aligned with the platen.

Further according to the present invention there is provided for producing a printed record of data sensed from a vertical column of a statistical record card, apparatus comprising a platen, a plurality of angularly movable type-carrying elements having type characters disposed around the peripheries thereof, a carrier supporting said plurality of type-carrying elements for angular movement and mounted for movement relative to said platen to position a selected one of the type-carrying elements in impression-taking position relative to the platen, character-selecting means to effect angular movement of the type-carrying elements simultaneously to select to character on each said element for alignment with the platen, locating means selectively to position the type-carrying elements in or substantially in impression-taking relation with the platen, and actuating means to effect relative movement between the platen and said carrier to cause an impression to be taken from the type characters aligned with the platen.

In order that the invention may be clearly

2

understood one embodiment thereof will now be described by way of example with reference to the accompanying diagrammatic drawings in which:

Figure 1 is a side elevation of a printing apparatus according to the invention,

Figure 2 is a view partly in section of the apparatus shown in Figure 1 and,

Figure 3 is a view, to an enlarged scale, of a part of the apparatus shown in Figure 2.

Referring to the drawings, the apparatus shown therein is arranged to be operated in accordance with data sensed from perforated statistical record cards. The record cards are fed in known manner to sensing mechanism which, being well-known, is not described herein but which, in one embodiment, comprises mechanism which includes sensing pins arranged to pass through perforations in a record card during a sensing operation and to operate transmission elements 1 which impart a setting to stops 2 contained in a stop basket 3. The arrangement of the stop basket and the manner of operation thereof is similar to that described in United States patent specification No. 1,245,502, the chief difference being that in the construction shown in the present drawings, the stops 2 are spaced somewhat differently from the manner in which they are spaced in the aforesaid prior specification. As can be seen in Figure 2, the stop basket includes twelve stops 2 corresponding respectively to the 0 to 9 positions in a vertical column of a record card and to the A and B positions. In the drawings being described there is shown, as will be well understood, only the mechanism required for one vertical column of a record card, but it will also be understood that in a statistical machine embodying the present invention there may be provided mechanism as described herein for each column of a record card, or such mechanism may be provided only for the columns comprising a predetermined field of a record card. As the mechanism for each column is identical it is necessary, for the understanding of the invention, only to describe the printing mechanism for one column and it is to be understood that in the drawings and the description thereof reference is, in general, made only to the printing mechanism for one column although some of the actuating mechanism is common to the printing mechanism for all columns.

Referring to Figures 2 and 3 there are shown therein four type-carrying elements 4, 5, 6 and 7 which are angularly movable on spindles 8, 9, 10

and 11 respectively supported in a carrier comprising plates 12 spaced apart by spacing elements 13. The plates are disposed on opposite sides of a character-selecting element consisting of a toothed element 14 so as to be movable relative thereto as will be described in greater detail below. The carrier for the type-carrying elements is provided with a depending element 15 comprising a first abutment having an abutment face 16 to be engaged by one or other of the A, B or 0 stops as will be described below and with a further abutment face 17 which is arranged to abut against a restoring bar 18 for the carrier when the bar is in its forward position as shown in Figure 2.

Each of the type-carrying elements 4, 5, 6, 7 is, as can be seen from the drawings, of relatively small diameter and has ten notches 19 formed in its periphery forming teeth to engage with corresponding teeth 20 on the toothed character-selecting element 14, and the peripheral faces 21 of the teeth formed between the notches 19 have type characters formed thereon. The four type-carrying elements between them accommodate a range of predetermined type characters, the accommodation being for forty characters, ten for each of the four type-carrying elements or wheels. If it is desired not to use the full character capacity of a wheel one or more of the peripheral faces may be a blank having no character formed thereon.

As will hereinafter appear, by moving the carrier for the type-carrying wheels from a certain position which is to the right as viewed in Figure 2 to an intermediate position which is to the left as viewed in Figure 2, as determined by the 0 stop or the A or B stop or by the restoring bar 18 at the end of its forward movement which is the position thereof as shown in Figure 2, one or other of the type-carrying elements is positioned beneath a platen 22 consisting of a resilient pad, for example a rubber pad, supported by plates 23 carried by brackets 24 pivoted at 25 to the frame of the carrier and connected at 26 to links 27 arranged for oscillation by arms 28 carrying cam rollers 29 which engage with cams 30 on a shaft 31 which is the driving shaft for the mechanism and which is mounted between a pair of machine frames 32. The cams 30 are arranged to move the platen so that it is oscillated towards and away from a type-carrying element in impression-taking position and so effect a printing operation on a web P of paper which is fed by any suitable mechanism, not shown, to and from printing position by feeding rollers 33, 34. It is to be understood that between the web P and the type-carrying elements there is provided, in any suitable known manner, a transfer medium such as an ink ribbon 35 which may be fed across the path of the type elements by employing any suitable known form of ribbon feeding mechanism, such mechanism, of course, being provided with reversing devices as is well understood in the art. Further, if desired, the printing operation may, as will be well understood, be effected on superposed webs interleaved, in known manner, with carbon webs or provided with other means whereby a plurality of copies may be made during a printing operation.

The carrier for the type-carrying elements is retained in its starting position, now shown, to the right of Figure 2 by the restoring bar 18 which is carried by a pair of links 36 supported by levers 37, pivoted at 38 to brackets 39 secured to the frames 32. The levers 37 carry cam rollers 40 which engage with cams 41 mounted on the driving shaft 31. When the restoring bar is moved to the left as viewed in Figure 2 the carrier for the type-carrying element is drawn to the left by a spring 42 so that it follows the restoring bar until it is arrested either by the 0 stop, or the A or the B stop, or until the restoring bar reaches the end of its stroke, to the left of Figure 2, in which position it dwells until it commences its return movement to restore the carrier to starting position. Due to the high speed at which the apparatus is arranged to operate, it is desirable so to construct the apparatus that the first abutment 15 impacts against the stops as lightly as possible. To this end the cams 41 are so shaped, as can be seen in Fig. 2, that the carrier approaches each stop in turn, until it is arrested by one of them, with a high velocity which is reduced to a low velocity as the abutment nears the stop. Thus, during the forward movement of the carrier, that is to the left as viewed in Fig. 2, the carrier approaches the first stop, shown in the drawings as the 0 stop, with a high velocity which is reduced to a low velocity as the abutment nears the stop then, if the carrier is not to be arrested by the stop, the speed of the carrier is again accelerated and is retarded as the abutment 15 nears the second stop, shown in the drawings as the B stop. Similarly, if the carrier is not arrested by the second stop its speed is again accelerated and is again retarded as the abutment 15 nears the third stop, shown in the drawings as the A stop.

As can be seen from Figure 2 the lower edges of the plates 12 comprising the carrier are provided with four notches 43 to be engaged by a pawl 44, pivoted at 45 to an angle member 46 supported by bell cranks 47, Fig. 1, pivoted at 48 to the frames of the machine. Links 49 connected to the bell cranks 47 are oscillated by a cam roller 50 co-operating with a cam 51 on the shaft 31. The cam roller is supported by an arm 52 secured to a spindle 53 to which are also secured arms 54 connected to the lower end of the links 49. The arrangement is such that when the links 49 are moved upwards, as viewed in Figure 1, the pawl 44 is moved into engagement with one or other of the notches 43 according to the type-carrying element which is in printing position and moves the carrier therefor a short distance to the right, as viewed in Figure 2, so that the abutment 15 is moved slightly out of engagement with the stop by which it was arrested. To this end the stops are so arranged that they arrest the type-carrying elements in a position which is slightly beyond the printing position and the pawl 44 positively moves the carrier a short distance in the reverse direction and locates it accurately in impression-taking position with relation to the platen.

The toothed character-selecting element 14 with which the type-carrying elements are in mesh is provided with a depending portion 55 which comprises a second abutment to be arrested by one or other of the stops 2 representative of the one to nine positions in the vertical column of the card. The toothed character-selecting element 14 is moved to a starting position, not shown, to the right of Figure 2, by a restoring bar 56, the restoring bar being supported by a pair of links 57 connected to arms 58 pivoted at 38 to the bracket 39 and the arms 58 support a cam follower 59 which engages a cam 60 on the shaft 31. When the restoring bar 56 is moved to its furthest position to the left,

as indicated in Figure 2, the toothed character-selecting element 14 is caused to follow the restoring bar due to the action of a spring 61 until the abutment 55 is arrested by one or other of the one to nine stops or by the restoring bar 56 at the end of its travel. The upper face of the toothed character-selecting element 14 is provided with ten notches 62 with which there is associated a pawl 63 pivoted at 64 to an angle member 65 supported by bell cranks 66 pivoted at 67. The bell cranks are connected to links 68, Fig. 1, the other ends of which are connected at 69 to arms 70 secured to the spindle 53 for movement therewith. Thus, when the spindle 53 is rocked after the element 14 has been arrested by the appropriate stop 2, the pawl 63 is engaged in the appropriate notch 62 and causes the element 14 to be moved to the right, as viewed in Figure 2, for a short distance so that its abutment 55 is out of engagement with the stop by which it was arrested. Thus, when the type-carrying elements are moved angularly by the lengthwise movement of the toothed character-selecting element 14, they are each turned to a position slightly past that in which they are in register and they are positively returned to the position of register by the action of the pawl 63.

As can be seen from Figures 2 and 3, the pawls 44 and 63 are urged towards notches 43 and 62 respectively by springs 71 housed respectively in the angle members 46 and 65.

As will be understood from the drawings, the pawls 44 and 63 are held in raised position out of engagement with the notches 43 and 62 respectively until the carrier for the type-carrying elements and the toothed character-selecting elements have been arrested by their respective stops in the stop basket 3.

When the appropriate type character has been aligned with respect to the platen 22, the platen is moved downwards by the cam 30, as described above, so that an impression is made on the web P. Means is provided to accommodate slight differences in the heights of the characters and to this end there is provided beneath the carrier a resilient pad comprising a plate 72, Figs. 2 and 3, guided for movement in a vertical path by vertical guides 73, 74. At the upper ends of the guides are portions which overlie the path of the plate 72 and a spring 75 beneath the plate tends to urge it upwards into engagement with said overlying portions. The said overlying portions are slotted so that the plate 72 is engaged by the carrier during an impression-taking operation and the plate 72 moves against the action of the springs 75.

In operation, when a card is sensed the appropriate transmission elements 1 are actuated to set up the stops 2 associated therewith, whereupon the restoring bars 18 and 56 are caused to move to the left, as viewed in Figure 2, so that the carriers for the type-carrying elements and the associated toothed elements 14 move to the left, as viewed in Figure 2, from their starting positions until each is arrested by the appropriate stop. The pawls 44 and 63 then engage the carrier and the toothed character-selecting element respectively to move the carrier and the toothed character-selecting element slightly to the right and out of engagement with the stops by which they were arrested, thus aligning the selected type character with the platen 22 which is then operated to effect an impression-taking operation. The restoring bars are then again moved to the right, as viewed in Figure 2, and fully restore the carrier and the toothed character-selecting element 14 to their starting positions.

During the movement of the carrier and the toothed character-selecting element to the left as above described, there is relative movement between the carrier and the type element and the element 14 turns each of the type-carrying elements 4, 5, 6, 7 about its spindle so that a predetermined character on each of the type-carrying elements is moved into facing relation with the platen. Accordingly, any one of four characters may be disposed in printing relation with the platen, but the particular one from which printing is to be effected is determined by the position in which the carrier for the type-carrying element is arrested, as will be understood from the foregoing description.

Because of the high speed of operation of the apparatus, means are provided to eliminate rebounding and damage by impact. To this end, the abutment 55 of the toothed character-selecting element 14 is of a length such that it possesses a certain degree of resilience, thus reducing the impact stress between the abutment and a stop 2 or the restoring bar 56. Further, the springs 61 and 42 are heavy in weight and light in pull, so that when a toothed element 14 or its carrier is sharply arrested the spring associated therewith continues to travel, thus stretching the end of the spring which is connected to the member and so causing a sharp increase in the pull which holds the member against rebounding.

From the foregoing description it will be understood that for each card column in the printing mechanism according to the present invention there is provided a carrier and type-carrying elements 4, 5, 6, 7 over the peripheries of which are interspersed the characters of a range from which selection is to be effected, and a toothed character-selecting element 14 associated therewith. The restoring bars 18, 56, the angle members 46, 65, the platen 22, and the buffer plate 72, however, are common to all the columns for which type-carrying elements are provided.

As will be well understood in the art, the stops 2 in the stop basket 3 may be set up from any suitable form of sensing mechanism, thus the sensing mechanism may comprise sensing pins arranged positively to engage and actuate the transmission elements 1, or electrical impulses may, as is well known in the art, be generated as a result of a sensing operation and these impulses may be employed to effect the setting of the stops 2.

I claim:

1. For producing a printed record of data sensed from a vertical column of a statistical record car, apparatus comprising a platen, a plurality of angularly movable type-carrying elements each having a part of a predetermined range of type characters disposed around the peripheries thereof, a carrier supporting said plurality of type-carrying elements for angular movement in the same plane and mounted for movement relative to said platen to position a selected one of the type-carrying elements in impression-taking position relative to the platen, character-selecting means to effect angular movement of the type-carrying elements simultaneously to select a character on each said element for alignment with the platen, locating means selectively to position the type-carrying elements in impression-taking relation with the

platen, and actuating means to effect relative movement between the platen and said carrier to cause an impression to be taken from the type character aligned with the platen.

2. For producing a printed record of data sensed from a vertical column of a staistical record card, apparatus comprising a platen, a plurality of angularly movable toothed type-carrying elements each having a part of a predetermined range of type characters formed on the peripheral faces of said teeth, a carrier supporting said plurality of type-carrying elements for angular movement in the same plane and mounted for movement relative to said platen to position a selected one of the type-carrying elements in impression-taking position relative to the platen, a toothed character-selecting element engaged by the teeth of each of the plurality of type-carrying elements and movable relative to said carrier to effect angular movement of the type-carrying elements simultaneously to select a character on each said type-carrying element for alignment with the platen, locating means selectively to position the type-carrying elements in impression-taking relation with the platen, and actuating means to effect relative movement between the platen and said carrier to cause an impression to be taken from the type character aligned with the platen.

3. For producing a printed record of data sensed from a vertical column of a statistical record card, apparatus comprising a stop basket, settable stops in said basket the stops being arranged in columns representative of data positions in vertical columns of a record card and the stops of each column being disposed in groups, a platen, a plurality of angularly movable toothed type-carrying elements each having a part of a predetermined range of type characters formed on the peripheral faces of said teeth, a carrier supporting said plurality of type-carrying elements for angular movement in the same plane and mounted for movement relative to said platen to position a selected one of the type-carrying elements in impression-taking position relative to the platen, a toothed character-selecting element engaged by the teeth of each of the plurality of type-carrying elements and movable relative to said carrier to effect angular movement of the type-carrying elements simultaneously to select a character on each said type-carrying element for alignment with the platen, a first abutment movable with said carrier for engagement with a stop of one said group of stops to determine which of the type-carrying elements is to be disposed in impression-taking position, a second abutment movable with said character-selecting element for engagement with a stop of another group of stops to determine type character selection and actuating means to effect relative movement between the platen and said carrier to cause an impression to be taken from the type character aligned with the platen.

4. For producing a printed record of data sensed from a vertical column of a statistical record card, apparatus comprising a stop basket, settable stops in said basket the stops being arranged in columns representative of data positions in vertical columns of a record card and the stops of each column being disposed in groups, a platen, a plurality of angularly movable toothed type-carrying elements each having a part of a predetermined range of type characters formed on the peripheral faces of said teeth, a carrier supporting said plurality of type-carrying elements for angular movement in the same plane and mounted for movement relative to said platen to position a selected one of the type-carrying elements in impression-taking position relative to the platen, a toothed character-selecting element engaged by the teeth of each of the plurality of type-carrying elements and movable relative to said carrier to effect angular movement of the type-carrying elements simultaneously to select a character on each said type-carrying element for alignment with the platen, a first abutment movable with said carrier for engagement with a stop of one said group of stops to determine which of the type-carrying elements is to be disposed in impression-taking position, a second abutment movable with said character-selecting element for engagement with a stop of another group of stops to determine type character selection, actuating means to effect relative movement between the platen and said carrier to cause an impression to be taken from the type character aligned with the platen, and restoring bars to engage said abutments and respectively restore said carrier and character-selecting element to a starting position from which they are movable to impression-taking position.

5. For producing a printed record of data sensed from a vertical column of a statistical record card, apparatus comprising a stop basket, settable stops in said basket the stops being arranged in columns representative of data positions in vertical columns of a record card and the stops of each column being disposed in groups, a platen, a plurality of angularly movable toothed type-carrying elements having type characters formed on the peripheral faces of said teeth, a carrier supporting said plurality of type-carrying elements for angular movement and mounted for movement relative to said platen to position a selected one of the type-carrying elements in impression-taking position relative to the platen, a toothed character-selecting element engaged by the teeth of each of the plurality of type-carrying elements and movable relative to said carrier to effect angular movement of the type-carrying elements and simultaneously to select a character on each said type-carrying element for alignment with the platen, a first abutment movable with said carrier for engagement with a stop of one said group of stops to determine which of the type-carrying elements is to be disposed in impression-taking position, a second abutment movable with said character-selecting element for engagement with a stop of another group of stops to determine type character selection, actuating means to effect relative movement between the platen and said carrier to cause an impression to be taken from the type character aligned with the platen, and restoring bars to engage said abutments and respectively restore said carrier and character selecting element to a starting position from which they are movable to impression-taking position, one said restoring bar in its forward position acting as a stop for said carrier to locate one of the type-carrying elements substantially in impression-taking position and the other bar in its forward position acting as a stop for the character-selecting element to determine one character-selecting position thereof.

6. For producing a printed record of data sensed from a vertical column of a statistical record card, apparatus comprising a stop basket, settable stops in said basket the stops being arranged in columns representative of data posi-

tions in vertical columns of a record card and the stops of each column being disposed in groups, a platen, a plurality of angularly movable toothed type-carrying elements having type characters formed on the peripheral faces of said teeth, a carrier supporting said plurality of type-carrying elements for angular movement and mounted for movement relative to said platen to position a selected one of the type-carrying elements in impression-taking position relative to the platen, a toothed character-selecting element engaged by the teeth of each of the plurality of type-carrying elements and movable relative to said carrier to effect angular movement of the type-carrying elements simultaneously to select a character on each said type-carrying element for alignment with the platen, a first abutment movable with said carrier for engagement with a stop of one said group of stops to determine which of the type-carrying elements is to be disposed in impression-taking position, a second abutment movable with said character-selecting element for engagement with a stop of another group of stops to determine type character selection, actuating means to effect relative movement between the platen and said carrier to cause an impression to be taken from the type character aligned with the platen, restoring bars to engage said abutments and respectively restore said carrier and character selecting element to a starting position from which they are movable to impression-taking position, cams to control the movements of the restoring bars, said cams being so shaped that each said abutment approaches each stop of its group in turn with high velocity which is retarded to a low velocity as the abutment nears the position at which it may be arrested by a stop, and springs connected respectively to said carrier and character-selecting element to cause them to follow the movements of the restoring bars away from said starting position, each said spring being relatively heavy in weight and light in pull so that when the carrier and character-selecting element are arrested by a stop the ends of the springs connected respectively to the carrier and the character-selecting element are extended thereby sharply increasing the pulling effect of the springs and causing said abutments to be retained against the arresting stops.

7. For producing a printed record of data sensed from a vertical column of a statistical record card, apparatus comprising a stop basket, settable stops in said basket the stops being arranged in columns representative of data positions in vertical columns of a record card and the stops of each column being disposed in groups, a platen, a plurality of angularly movable toothed type-carrying elements having type characters formed on the peripheral faces of said teeth, a carrier supporting said plurality of type-carrying elements for angular movement and mounted for movement relative to said platen to position a selected one of the type-carrying elements in impression-taking position relative to the platen, a toothed character-selecting element engaged by the teeth of each of the plurality of type-carrying elements and movable relative to said carrier to effect angular movement of the type-carrying elements simultaneously to select a character on each said type-carrying element for alignment with the platen, a first abutment movable with said carrier for engagement with a stop of one said group of stops to determine which of the type-carrying elements is to be disposed in impression-taking position, a second abutment movable with said character-selecting element for engagement with a stop of another group of stops to determine type character selection, actuating means to effect relative movement between the platen and said carrier to cause an impression to be taken from the type character aligned with the platen, restoring bars to engage said abutments and respectively restore said carrier and character selecting element to a starting position from which they are movable to impression-taking position, one said restoring bar in its forward position acting as a stop for said carrier to locate one of the type-carrying elements in or substantially in impression-taking position and the other bar in its forward position acting as a stop for the character-selecting element to determine one character-selecting position thereof, cams to control the movements of the restoring bars, said cams being so shaped that each said abutment approaches each stop of its group in turn with high velocity which is retarded to a low velocity as the abutment nears the position at which it may be arrested by a stop, and springs connected respectively to said carrier and character-selecting element to cause them to follow the movements of the restoring bars away from said starting position, each said spring being relatively heavy in weight and light in pull so that when the carrier and character-selecting element are arrested by a stop the ends of the springs connected respectively to the carrier and the character-selecting element are extended thereby sharply increasing the pulling effect of the springs and causing said abutments to be retained against the arresting stops.

8. For producing a printed record of data sensed from a vertical column of a statistical record card, apparatus comprising a stop basket, settable stops in said basket the stops being arranged in columns representative of data positions in vertical columns of a record card and the stops of each column being disposed in groups, a platen, a plurality of angularly movable toothed type-carrying elements having type characters formed on the peripheral faces of said teeth, a carrier supporting said plurality of type-carrying elements for angular movement and mounted for movement relative to said platen to position a selected one of the type-carrying elements in impression-taking position relative to the platen, a toothed character-selecting element engaged by the teeth of each of the plurality of type-carrying elements and movable relative to said carrier to effect angular movement of the type-carrying elements simultaneously to select a character on each said type-carrying element for alignment with the platen, a first abutment movable with said carrier for engagement with a stop of one said group of stops to determine which of the type-carrying elements is to be disposed in impression-taking position, a second abutment movable with said character-selecting element for engagement with a stop of another group of stops to determine type character selection, said stops being so located relative to the platen as to arrest the carrier and character selecting element in positions slightly in advance of the impression taking position, aligning means positively to move the carrier and character-selecting element rearward slightly to disengage the abutments from their arresting stops and position the selected character for impression-taking,

actuating means to effect relative movement between the platen and said carrier to cause an impression to be taken from the type character aligned with the platen, and restoring bars to engage said abutments and respectively restore said carrier and character-selecting element to a starting position from which they are movable to impression-taking position.

9. For producing a printed record of data sensed from a vertical column of a statistical record card, apparatus comprising a stop basket, settable stops in said basket the stops being arranged in columns representative of data positions in vertical columns of a record card and the stops of each column being disposed in groups, a platen, a plurality of angularly movable toothed type-carrying elements having type characters formed on the peripheral faces of said teeth, a carrier supporting said plurality of type-carrying elements for angular movement and mounted for movement relative to said platen to position a selected one of the type-carrying elements in impression-taking position relative to the platen, a toothed character-selecting element engaged by the teeth of each of the plurality of type-carrying elements and movable relative to said carrier to effect angular movement of the type-carrying elements simultaneously to select a character on each said type-carrying element for alignment with the platen, a first abutment movable with said carrier for engagement with a stop of one said group of stops to determine which of the type-carrying elements is to be disposed in impression-taking position, a second abutment movable with said character-selecting element for engagement with a stop of another group of stops to determine type character selection, said stops being so located relative to the platen as to arrest the carrier and character-selecting element in positions slightly in advance of the impression-taking position, aligning means positively to move the carrier and character-selecting element rearward slightly to disengage the abutments from their arresting stops and position the selected character for impression-taking, actuating means to effect relative movement between the platen and said carrier to cause an impression to be taken from the type character aligned with the platen, and restoring bars to engage said abutments and respectively restore said carrier and character-selecting element to a starting position from which they are movable to impression-taking position, one said restoring bar in its forward position acting as a stop for said carrier to locate one of the type-carrying elements in or substantially in impression-taking position and the other bar in its forward position acting as a stop for the character-selecting element to determine one character-selecting position thereof.

10. For producing a printed record of data sensed from a vertical column of a statistical record card, apparatus comprising a stop basket, settable stops in said basket the stops being arranged in columns representative of data positions in vertical columns of a record card and the stops of each column being disposed in groups, a platen, a plurality of angularly movable toothed type-carrying elements having type characters formed on the peripheral faces of said teeth, a carrier supporting said plurality of type-carrying elements for angular movement and mounted for movement relative to said platen to position a selected one of the type-carrying elements in impression-taking position relative to the platen, a toothed character-selecting element engaged by the teeth of each of the plurality of type-carrying elements and movable relative to said carrier to effect angular movement of the type-carrying elements simultaneously to select a character on each said type-carrying element for alignment with the platen, a first abutment movable with said carrier for engagement with a stop of one said group of stops to determine which of the type-carrying elements is to be disposed in impression-taking position, a second abutment movable with said character-selecting element for engagement with a stop of another group of stops to determine type character selection, said stops being so located relative to the platen as to arrest the carrier and character-selecting element in positions slightly in advance of the impression-taking position, notches formed respectively in said carrier and character-selecting element, pawls movable in timed relation with the carrier and character-selecting element to engage in said notches and positively move the carrier and character-selecting element rearward slightly to disengage the abutments from their arresting stops and position the selected character for impression-taking, actuating means to effect relative movement between the platen and said carrier to cause an impression to be taken from the type character aligned with the platen and restoring bars to engage said abutments and respectively restore said carrier and character-selecting element to a starting position from which they are movable to impression-taking position, one said restoring bar in its forward position acting as a stop for said carrier to locate one of the type-carrying elements in or substantially in impression-taking position and the other bar in its forward position acting as a stop for the character-selecting element to determine one character-selecting position thereof.

11. For producing a printed record of data sensed from a vertical column of a statistical record card, apparatus comprising a stop basket, settable stops in said basket the stops being arranged in columns representative of data positions in vertical columns of a record card and the stops of each column being disposed in groups, a platen, a plurality of angularly movable toothed type-carrying elements having type characters formed on the peripheral faces of said teeth, a carrier supporting said plurality of type-carrying elements for angular movement and mounted for movement relative to said platen to position a selected one of the type-carrying elements in impression-taking position relative to the platen, a toothed character-selecting element engaged by the teeth of each of the plurality of type-carrying elements and movable relative to said carrier to effect angular movement of the type-carrying elements simultaneously to select a character on each said type-carrying element for alignment with the platen, a first abutment movable with said carrier for engagement with a stop of one said group of stops to determine which of the type-carrying elements is to be disposed in impression-taking position, a second abutment movable with said character-selecting element for engagement with a stop of another group of stops to determine type-character selection, actuating means to effect relative movement between the platen and said carrier to cause an impression to be taken from the type character aligned with the platen, and a resilient pad disposed beneath said carrier to accommodate slight

differences in the heights of characters on the type-carrying elements.

12. For producing a printed record of data sensed from a vertical column of a statistical record card, apparatus comprising a stop basket, settable stops in said basket the stops being arranged in columns representative of data positions in vertical columns of a record card and the stops of each column being disposed in groups, a platen, a plurality of angularly movable toothed type-carrying elements having type characters formed on the peripheral faces of said teeth, a carrier supporting said plurality of type-carrying elements for angular movement and mounted for movement relative to said platen to position a selected one of the type-carrying elements in impression-taking position relative to the platen, a toothed character-selecting element engaged by the teeth of each of the plurality of type-carrying elements and movable relative to said carrier to effect angular movement of the type-carrying elements simultaneously to select a character on each said type-carrying element for alignment with the platen, a first abutment movable with said carrier for engagement with a stop of one said group of stops to determine which of the type-carrying elements is to be disposed in impression-taking position, a second abutment movable with said character-selecting element for engagement with a stop of another group of stops to determine type character selection, actuating means to effect relative movement between the platen and said carrier to cause an impression to be taken from the type character aligned with the platen, a plate disposed beneath said carrier for movement towards and away therefrom, plate positioning abutments to determine the normal relation between said plate and carrier, and springs urging said plate towards said positioning abutments to accommodate slight differences in the heights of characters on the type-carrying elements.

13. For producing a printed record of data sensed from a vertical column of a statistical record card, apparatus comprising a stop basket, settable stops in said basket the stops being arranged in columns representative of data positions in vertical columns of a record card and the stops of each column being disposed in groups, a platen, a plurality of angularly movable toothed type-carrying elements having type characters formed on the peripheral faces of said teeth, a carrier supporting said plurality of type-carrying elements for angular movement and mounted for movement relative to said platen to position a selected one of the type-carrying elements in impression-taking position relative to the platen, a toothed character-selecting element engaged by the teeth of each of the plurality of type-carrying elements and movable relative to said carrier to effect angular movement of the type-carrying elements simultaneously to select a character on each said type-carrying element for alignment with the platen, a first abutment movable with said carrier for engagement with a stop of one said group of stops to determine which of the type-carrying elements is to be disposed in impression-taking position, a second abutment movable with said character-selecting element for engagement with a stop of another group of stops to determine type character selection, said stops being so located relative to the platen as to arrest the carrier and character selecting element in positions slightly in advance of the impression-taking position, aligning means positively to move the carrier and character-selecting element rearward slightly to disengage the abutments from their arresting stops and position the selected character for impression-taking, a resilient pad disposed beneath said carrier to accommodate slight differences in the heights of characters on the type-carrying elements, actuating means to effect relative movement between the platen and said carrier to cause an impression to be taken from the type character aligned with the platen, and restoring bars to engage said abutments and respectively restore said carrier and character-selecting element to a starting position from which they are movable to impression-taking position.

14. For producing a printed record of data sensed from a vertical column of a statistical record card, apparatus comprising a stop basket, settable stops in said basket the stops being arranged in columns representative of data positions in vertical columns of a record card and the stops of each column being disposed in groups, a platen, a plurality of angularly movable toothed type-carrying elements, having type characters formed on the peripheral faces of said teeth, a carrier supporting said plurality of type-carrying elements for angular movement and mounted for movement relative to said platen to position a selected one of the type-carrying elements in impression-taking position relative to the platen, a toothed character-selecting element engaged by the teeth of each of the plurality of type-carrying elements and movable relative to said carrier to effect angular movement of the type-carrying elements simultaneously to select a character on each said type-carrying element for alignment with the platen, a first abutment movable with said carrier for engagement with a stop of one said group of stops to determine which of the type-carrying elements is to be disposed in impression-taking position, a second abutment movable with said character-selecting element for engagement with a stop of another group of stops to determine type character selection, said stops being so located relative to the platen as to arrest the carrier and character-selecting element in positions slightly in advance of the impression-taking position, aligning means positively to move the carrier and character-selecting element rearward slightly to disengage the abutments from their arresting stops and position the selected character for impression-taking, a plate disposed beneath said carrier for movement towards and away therefrom, plate positioning abutments to determine the normal relation between said plate and carrier, springs urging said plate towards said positioning abutments to accommodate slight differences in the heights of characters on the type-carrying elements, actuating means to effect relative movement between the platen and said carrier to cause an impression to be taken from the type character aligned with the platen and restoring bars to engage said abutments and respectively restore said carrier and character selecting element to a starting position from which they are movable to impression-taking position.

15. For producing a printed record of data sensed from a vertical column of a statistical record card, apparatus comprising a stop basket, settable stops in said basket the stops being arranged in columns representative of data positions in vertical columns of a record card and the stops of each column being disposed in groups, a platen, a plurality of angularly mov-

able toothed type-carrying elements having type characters formed on the peripheral faces of said teeth, a carrier supporting said plurality of type-carrying elements for angular movement and mounted for movement relative to said platen to position a selected one of the type-carrying elements in impression-taking position relative to the platen, a toothed character-selecting element engaged by the teeth of each of the plurality of type-carrying elements and movable relative to said carrier to effect angular movement of the type-carrying elements simultaneously to select a character on each said type-carrying element for alignment with the platen, a first abutment movable with said carrier for engagement with a stop of one said group of stops to determine which of the type-carrying elements is to be disposed in impression-taking position, a recond abutment movable with said character-selecting element for engagement with a stop of another group of stops to determine type character-selection, said stops being so located relative to the platen as to arrest the carrier and character-selecting element in positions slightly in advance of the impression-taking position, notches formed respectively in said carrier and character-selecting element, pawls movable in timed relation with the carrier and character-selecting element to engage in said notches and positively move the carrier and character-selecting element rearward slightly to disengage the abutments from their arresting stops and position the selected character for impression-taking, a plate disposed beneath said

carrier for movement towards and away therefrom, plate positioning abutments to determine the normal relation between said plate and carrier, springs urging said plate towards said positioning abutments to accommodate slight differences in the height of characters on the type-carrying elements, actuating means to effect relative movement between the platen and said carrier to cause an impression to be taken from the type character aligned with the platen, and restoring bars to engage said abutments and respectively restore said carrier and character-selecting element to a starting position from which they are movable to impression-taking position, one said restoring bar in its forward position acting as a stop for said carrier to locate one of the type-carrying elements in or substantially in impression-taking position and the other bar in its forward position acting as a stop for the character-selecting element to determine one character-selecting position thereof.

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