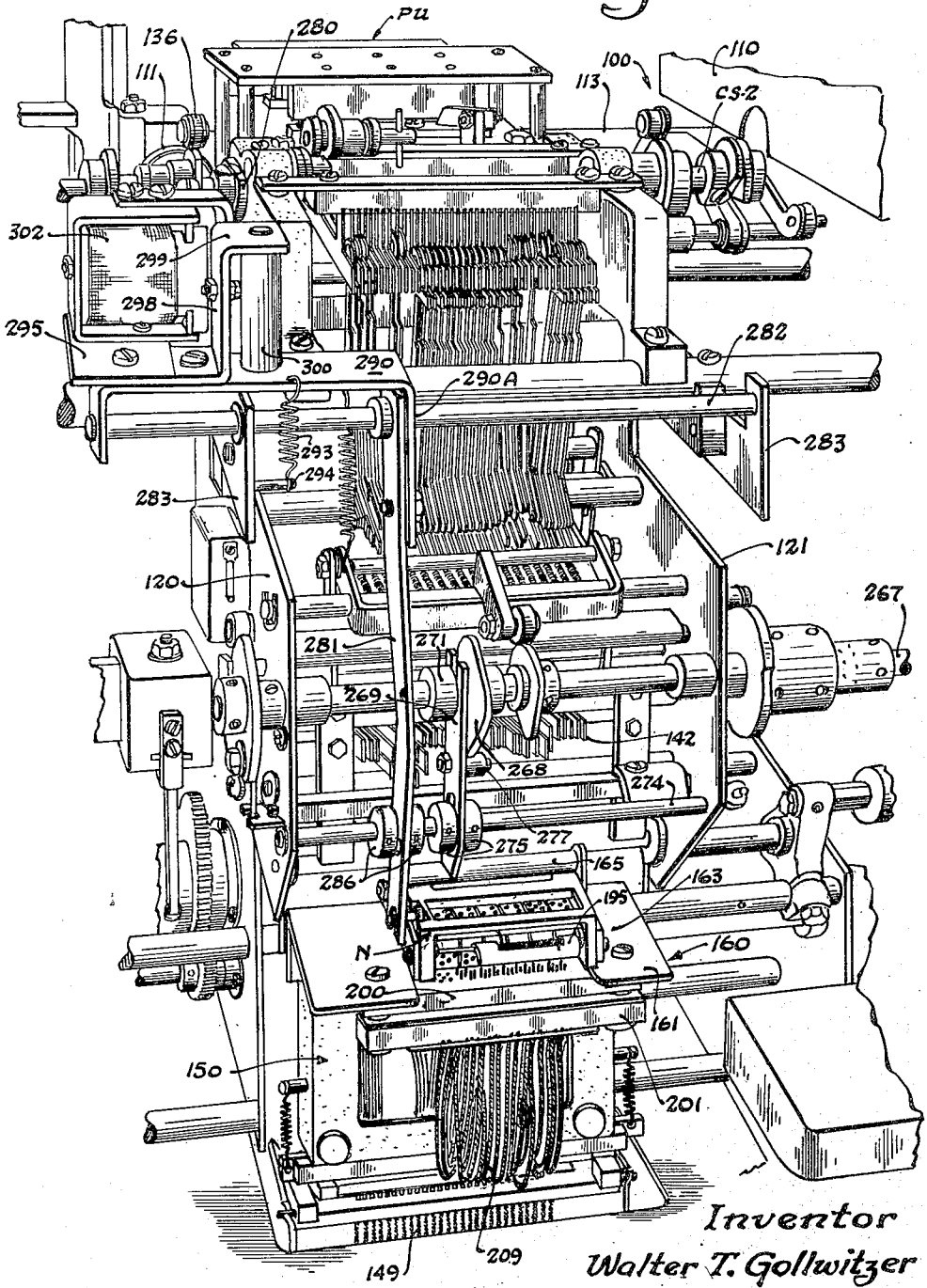
Oct. 9, 1956 W. T. GOLLWITZER 2,765,849

PRINTING MACHINES WITH SERIAL NUMBER PUNCHING

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Fig. 1

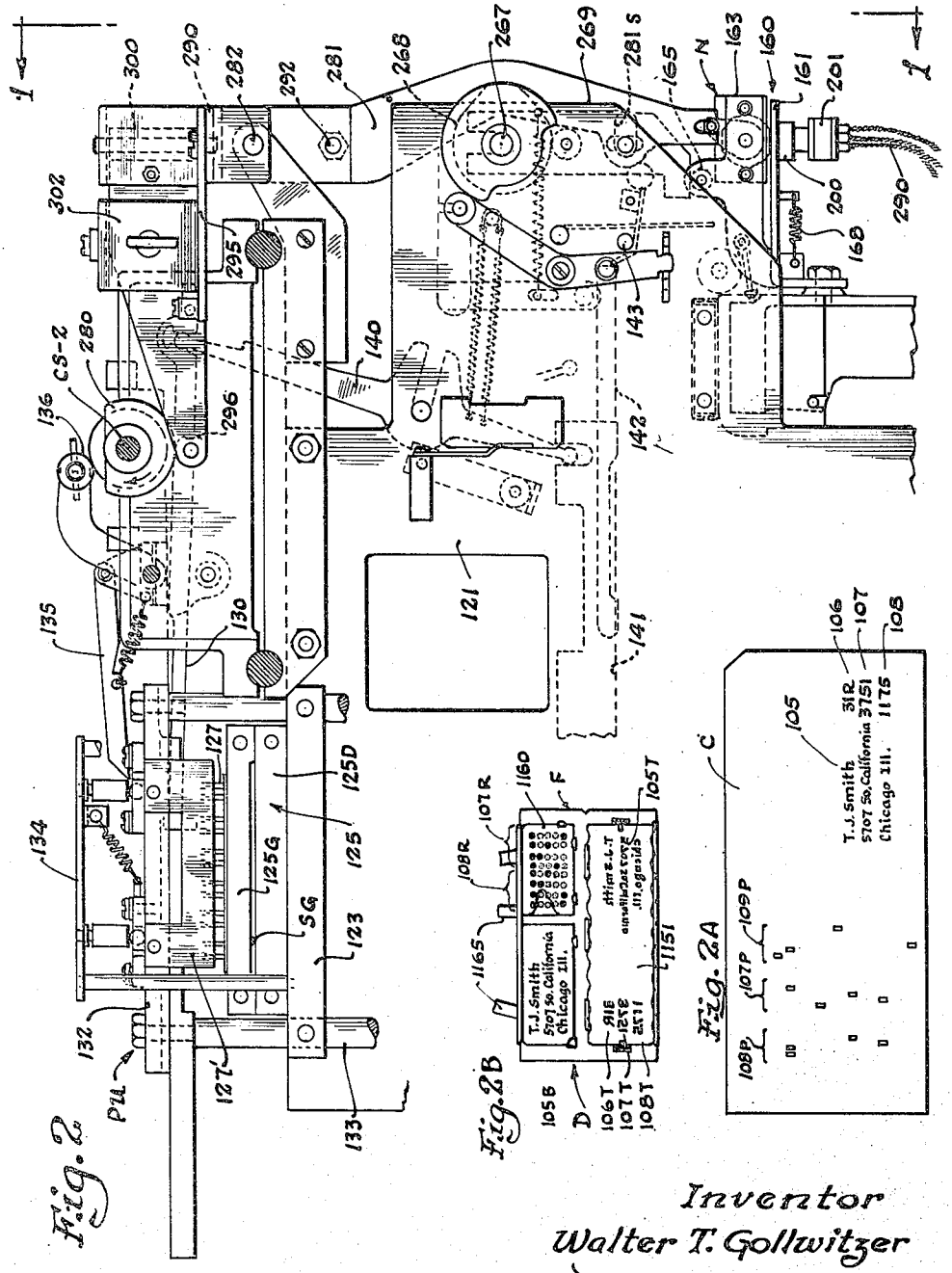


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PRINTING MACHINES WITH SERIAL NUMBER PUNCHING

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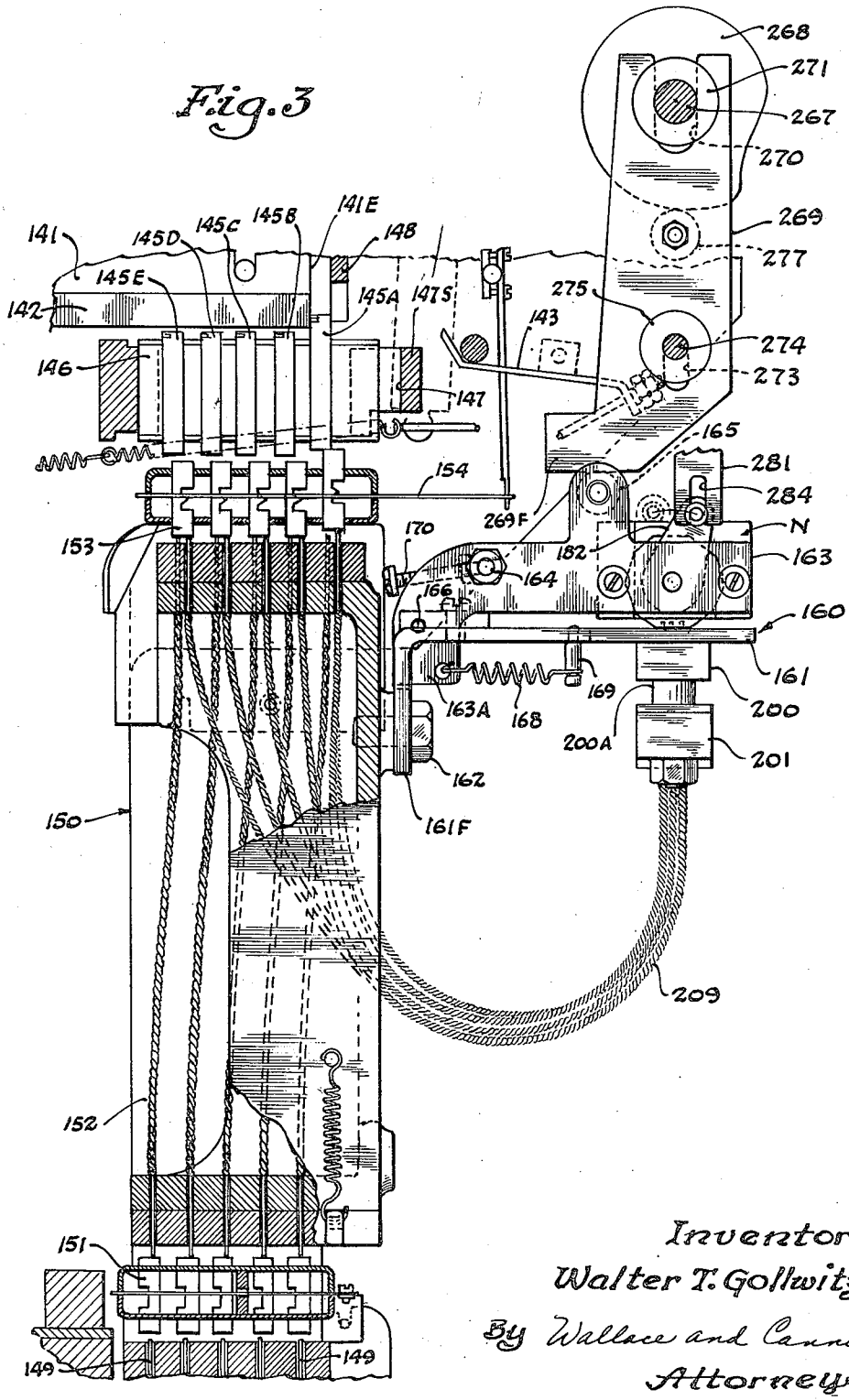
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Fig. 3



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Fig. 4

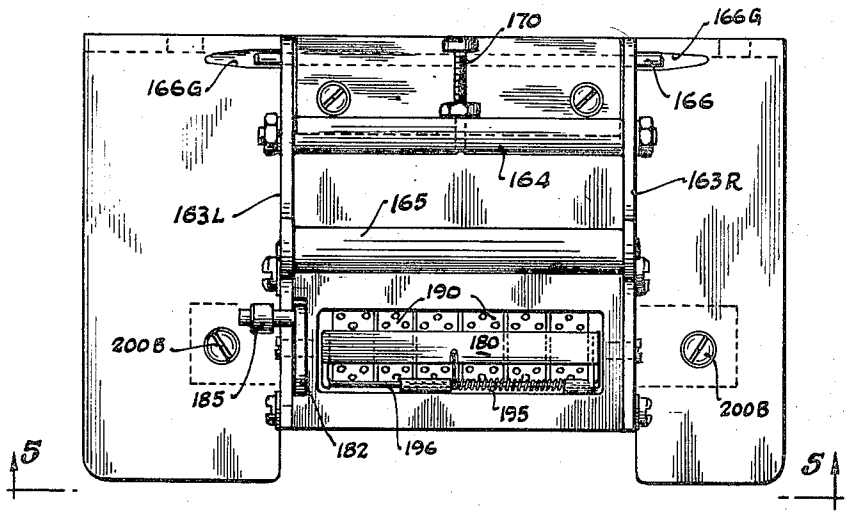


Fig. 5

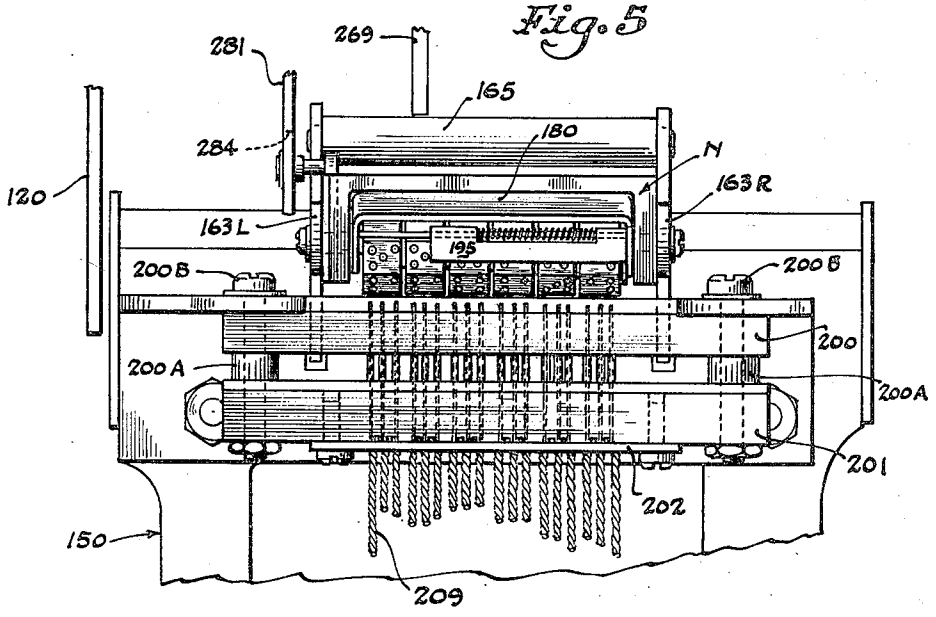
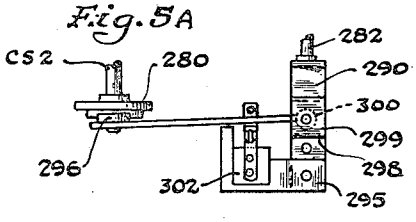


Fig. 5A



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Fig. 6

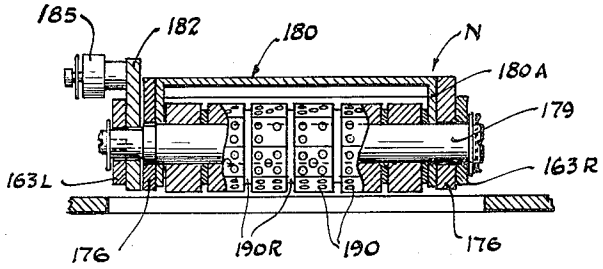


Fig. 7

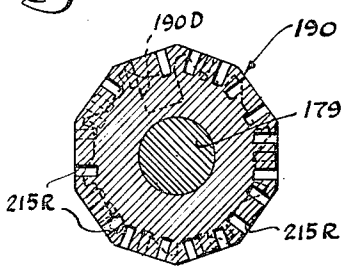
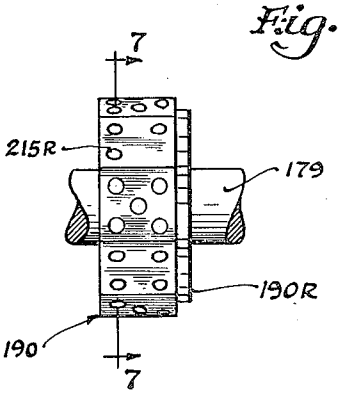


Fig. 8



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Fig. 9

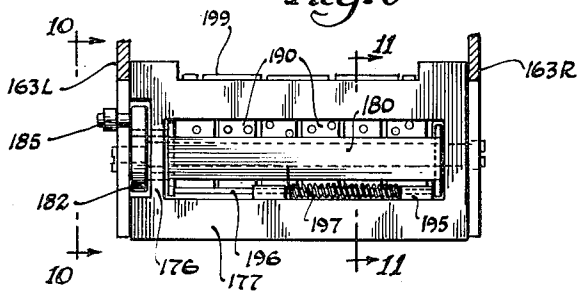


Fig. 10

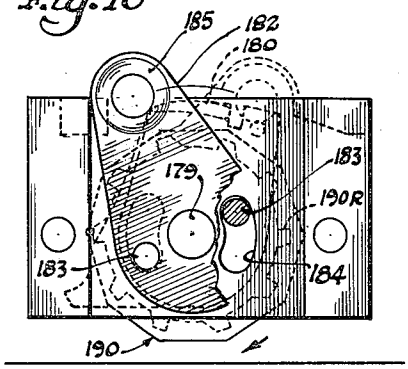
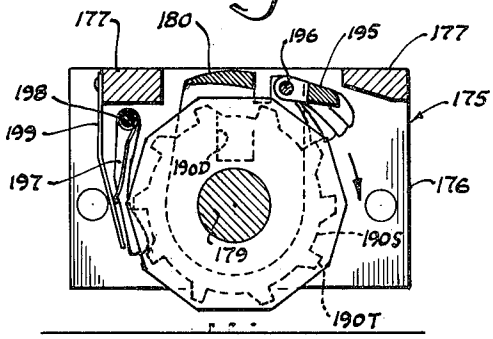


Fig. 11



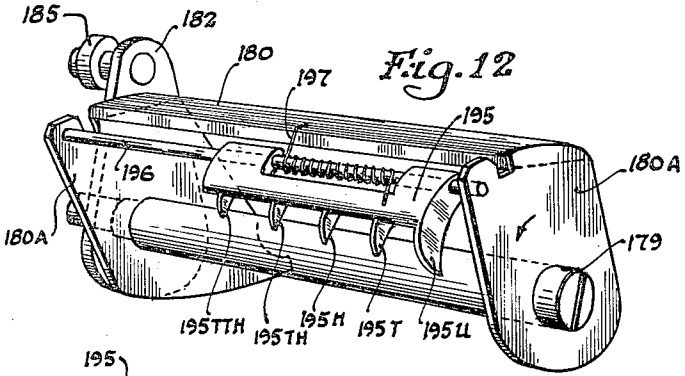
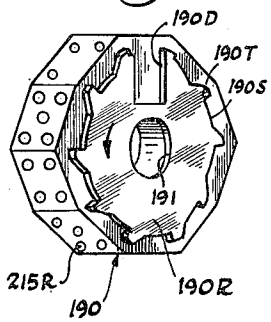


Fig. 12

Fig. 13



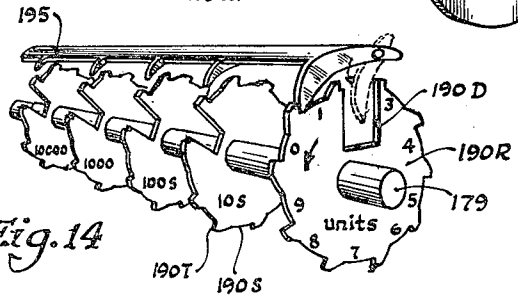


Fig. 14

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Fig. 15

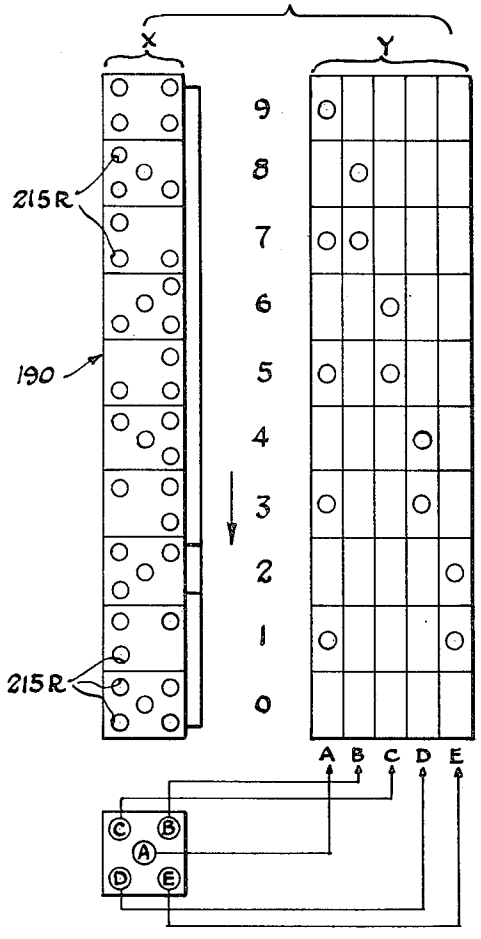
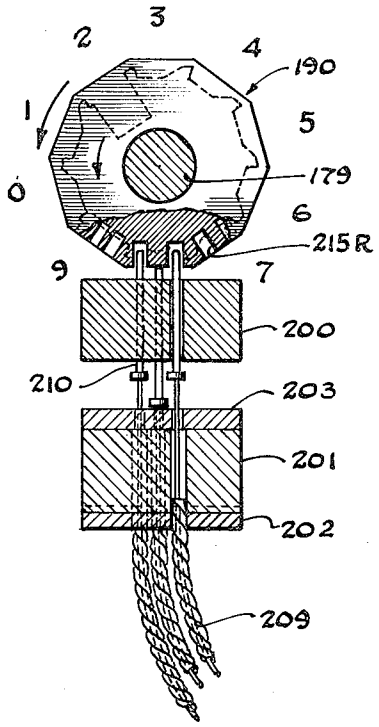


Fig. 16



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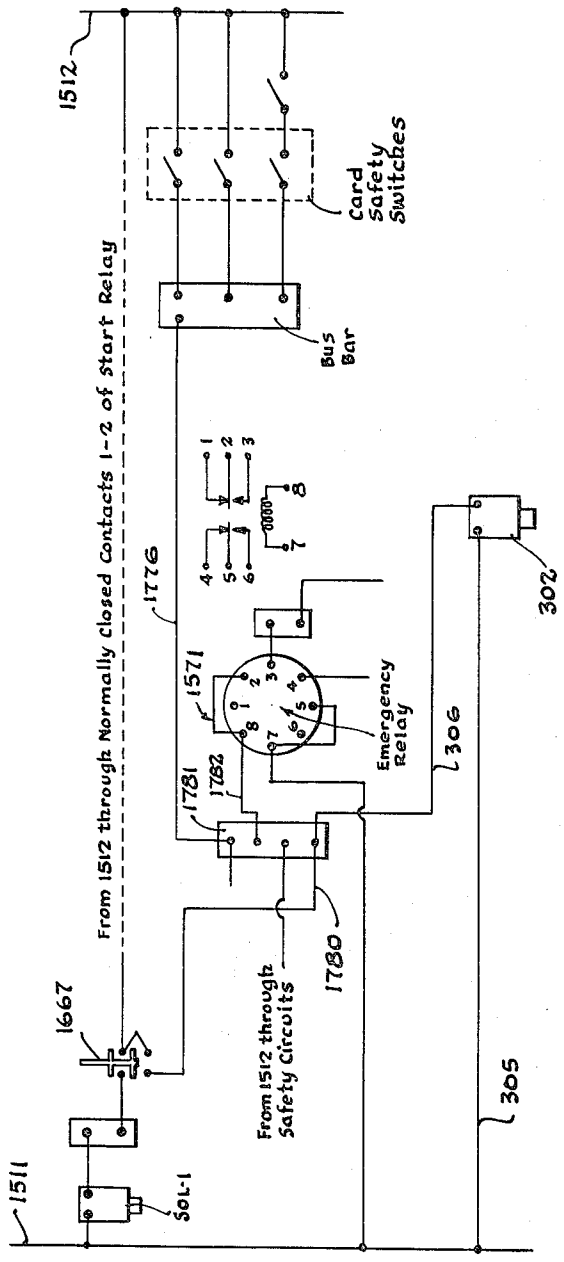


Fig. 17

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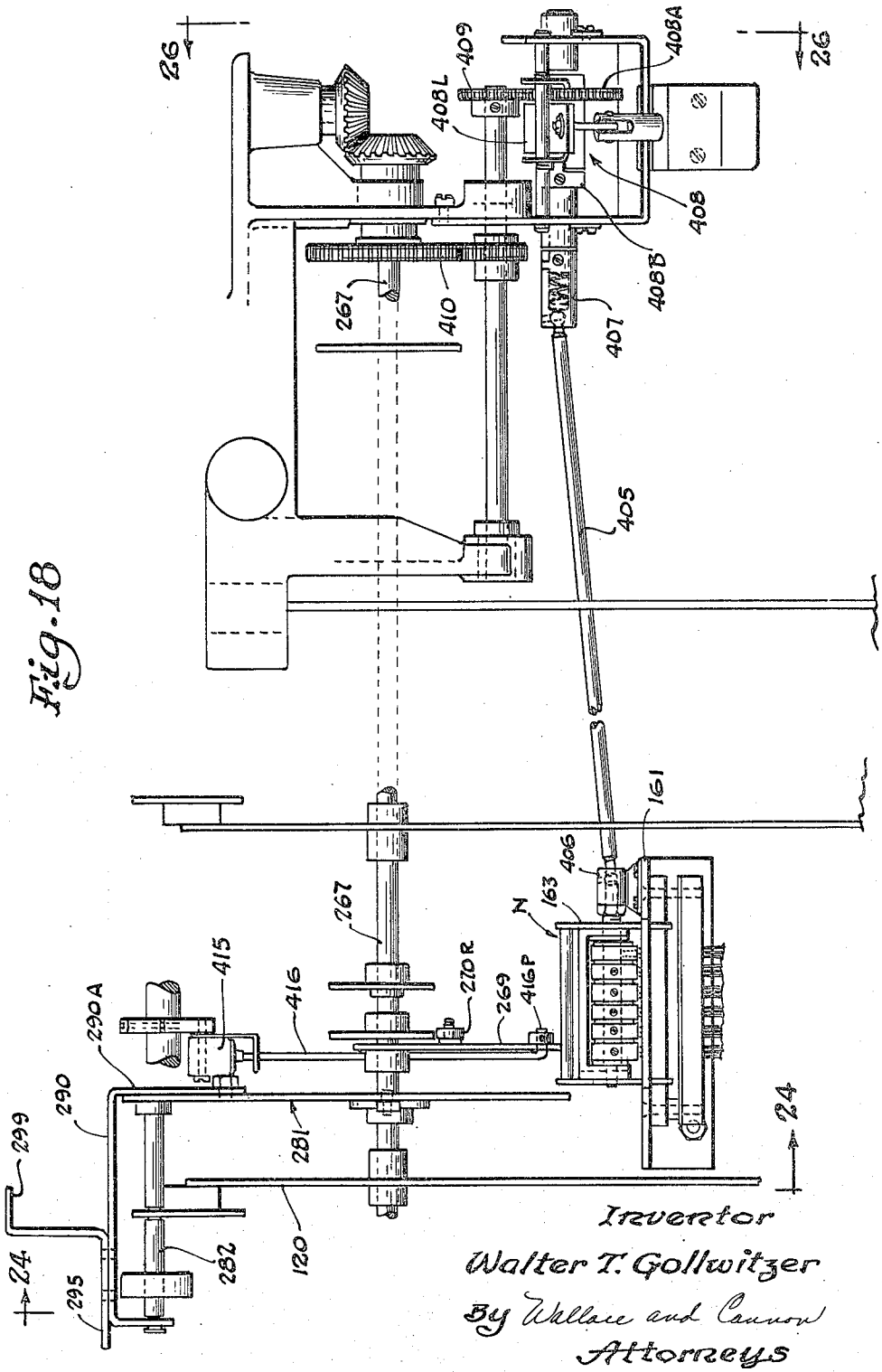


Fig. 18

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Fig. 19

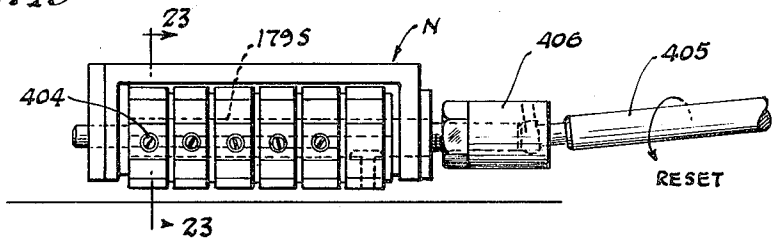


Fig. 20

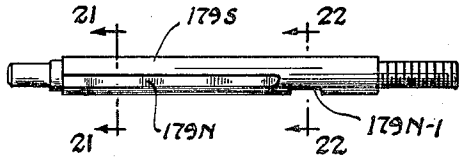


Fig. 21

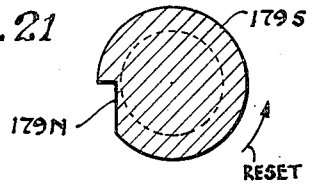


Fig. 22

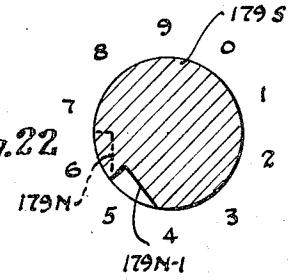


Fig. 23

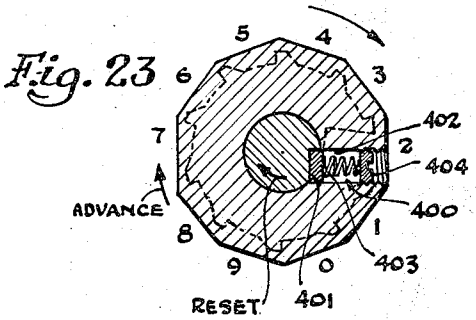
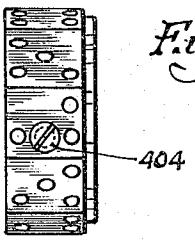


Fig. 24



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Fig. 26

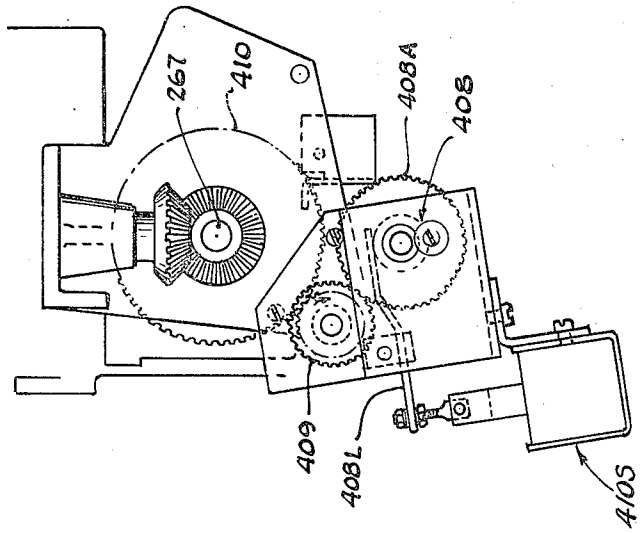
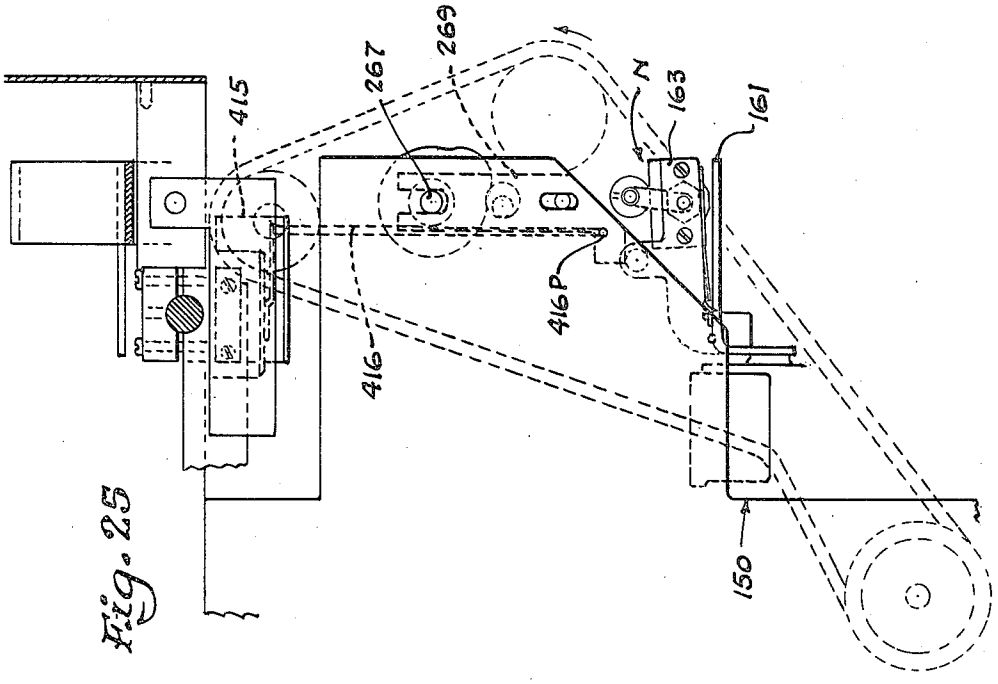


Fig. 25



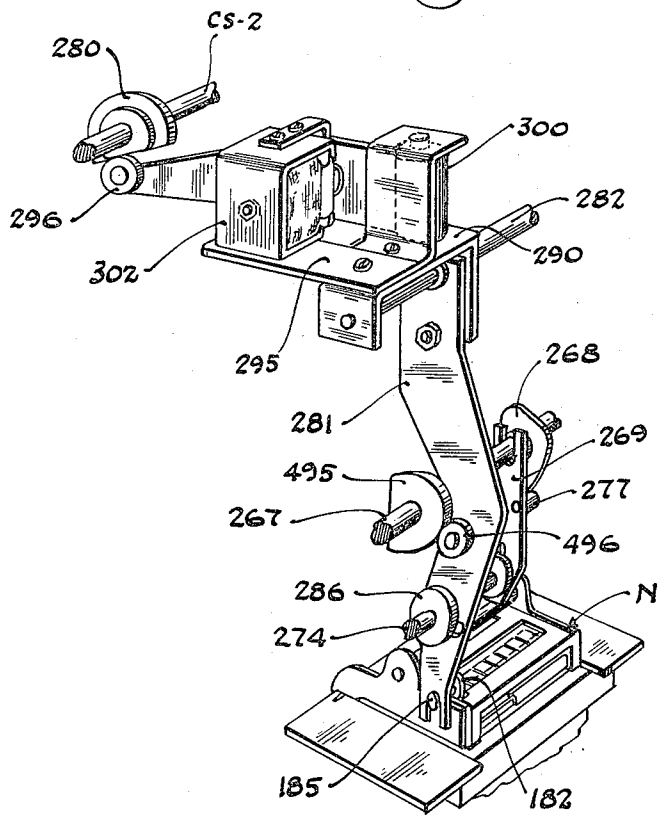
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Fig. 27



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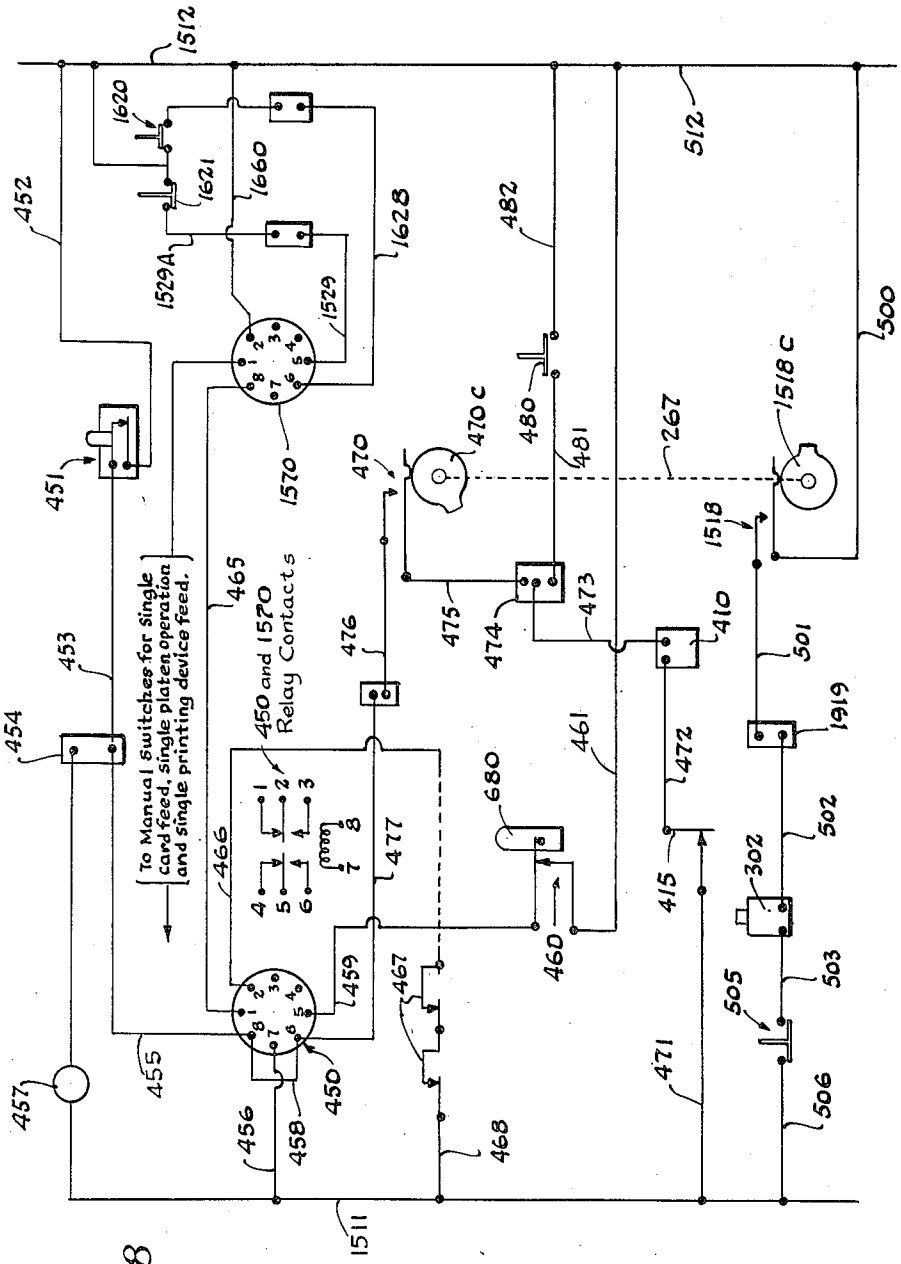


Fig. 28

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United States Patent Office

2,765,849

Patented Oct. 9, 1956

2,765,849

PRINTING MACHINES WITH SERIAL NUMBER PUNCHING

Walter T. Gollwitzer, Euclid, Ohio, assignor to Addressograph-Multigraph Corporation, Wilmington, Del., a corporation of Delaware

Application March 10, 1953, Serial No. 341,450

10 Claims. (Cl. 164—111)

This invention relates to machines for producing business instruments such as checks, insurance premium notices, bills and the like.

In business establishments where bills, checks, and the like are prepared in large numbers, it has been customary in many instances to prepare such business instruments through the use of individual printing and control devices such as the printing and control devices illustrated in my Patent No. 2,132,412, patented October 11, 1938. Such printing and control devices embody a carrier or frame having one or more printing plates affixed thereon, and such printing plates are provided with embossed type which may be utilized for printing numerical amounts or which may be used for printing the name and address and other identifying data that may pertain to the person, company or the like to which the printing device may be assigned. In such printing and control devices, as shown in my aforesaid patent, an upper area of the frame of the printing device is utilized for carrying physically represented information such as numerical data, and such numerical data are represented as shown in such patent by perforations located in accordance with a predetermined positional code. Such printing and control devices also are arranged in most instances to carry identifying means such as tabs at one or more selected identifying positions along the upper edge thereof, and these tabs may be formed and arranged in accordance with any of the systems known in the art which include full or solid tabs, notched tabs, or perforated tabs.

The numerical data represented by the coded perforations in the printing and control devices may be sensed to govern or control mechanisms in the machine so that such mechanisms may cooperate with the printing and other operative mechanisms of such machine to produce a business instrument that includes not only one or more printed impressions from the embossed type of the particular printing and control device, but other physical representations such as printed information or data representing perforations or the like, such printed information or data representing perforations being made under control of the data representing perforations of the printing devices. Furthermore, such printing and control devices may be selectively utilized in such printing machines through the use of a governing means such as a selector mechanism that is responsive to the identifying means such as tabs that may be carried on the printing and control devices and which governing mechanism is effective to control the operation of the machine, in most instances, to control the print-skip operation of the machine. In other words, through the controlling action of the identifying means such as tabs, the machine may be rendered effective to produce business instruments only with respect to a portion of the printing and control devices that may be passed through the machine.

When business instruments of the aforesaid character are produced in large quantities, as for example in banks, governmental agencies, or utility billing departments and the like, it is of course desirable that the business instruments be capable of ready identification, sorting, and the like by the usual sorting and other equipment that is utilized where business intruments carry data represented by perforations or other physical means, and it is a primary object of the present invention to facilitate the production of business instruments having such identifying characteristics. More specifically, it is an object of the present invention to simplify the representation of serial numbers or consecutive numbers by means of coded perforations in business instruments of the aforesaid character, and the related object is to enable this to be accomplished in such a way that a punching mechanism that is adapted to be set up from and under control of printing devices that have coded information thereon may, at the same time, be readily controlled without materially changing or modifying the mechanism of the punch so as to enable the consecutive numbering operation of the punch to be accomplished.

Another and important object of the present invention is to enable a control mechanism for serial numbering of a group of business instruments to be readily and easily associated with a punch which is of such a character that it may be operated either with or without such serial or consecutive numbering control mechanism.

When business instruments are produced on automatic machines, such for example as the automatic machine that is shown in my copending patent application Serial No. 201,102, filed December 16, 1950 now U. S. Patent No. 2,710,406, it is often desirable to effect consecutive numbering or serial numbering of the business instruments that are classified in a particular group, and to start the numbering again with the number "1" whenever a new group of such instruments is to be produced. Another important object of the present invention is, therefore, to enable such an operation to be readily and easily performed, and more specifically it is an object to afford a consecutive numbering control mechanism for a punch apparatus that may be automatically controlled, as, for example, by group indicating tabs that may be provided selectively on the last printing and control device in any particular group, thus to enable the machine to operate in such a way that the serial numbering control mechanism is automatically reset upon the completion of a group of business instruments.

Another object is to afford such a serial numbering control mechanism adapted to be readily and easily associated with the timing and control apparatus of a printing machine of the kind shown in my aforesaid copending application, and a related object is to afford such a mechanism wherein the count-advancing means are adapted to be automatically disabled in those instances which arise in such machines where the operation of the machine is to be stopped under automatic control, thus to avoid production of a false count.

Other and further objects will become apparent from the following description and claims and are illustrated in the accompanying drawings, which by way of illustration, show preferred embodiments of the present invention and the principles thereof and what I now consider to be the best mode in which I have contemplated applying these principles. Other embodiments of the invention embodying the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

In the drawings:

Fig. 1 is a rear perspective view of the punch unit of machine for producing business instruments, said machine and particularly the punch unit thereof embodying the features of the present invention;

Fig. 2 is an elevational view of a fragmentary character taken from the left in Fig. 1;

Fig. 2A is a face view of a bill in the form of a tabulating card having a serial number and other data represented thereon by coded perforations;

Fig. 2B is a face view of a printing and control device used in connection with the mechanism of the present invention;

Fig. 3 is a vertical sectional view of a transfer frame embodying the serial numbering control of Figs. 1 and 2;

Fig. 4 is a plan view of a transfer frame equipped with the serial numbering control of the present invention;

Fig. 5 is a fragmentary rear elevational view as taken from the line **5—5** of Fig. 4;

Fig. 5A is a plan view of the numbering machine advancing means and the related safety solenoid;

Fig. 6 is a vertical sectional view of the serial numbering control shaft and related mechanism;

Fig. 7 is a sectional view taken along the line of **7—7** to Fig. 8;

Fig. 8 is a view showing a portion of Fig. 6;

Fig. 9 is a rear elevational view of the counting mechanism;

Fig. 10 is an end elevational view taken along the line **10—10** of Fig. 9;

Fig. 11 is a vertical sectional view taken along the line **11—11** of Fig. 9;

Fig. 12 is a perspective view illustrating the actuating means for the counting wheels;

Fig. 13 is a perspective view of one of the control members of the counting mechanism;

Fig. 14 is a perspective view of the various ratchets in association with the control mechanism;

Fig. 15 is a schematic view illustrating the relationship between the faces of the control wheels and the code that is utilized in the punch mechanism and in the printing and control devices;

Fig. 16 is a view illustrating the relationship between the control members and the Bowden cables;

Fig. 17 is a simplified wiring diagram showing the pertinent electrical connections in respect to Fig. 1 to 16;

Fig. 18 is a schematic view illustratnig an alternative embodiment of the invention wherein provision is made for automatically resetting the control mechanism;

Fig. 19 is a fragmentary illustration of the reset mechanism;

Fig. 20 is a view of the reset shaft that is embodied in the counter;

Figs. 21 and 22 are cross sectional views of the shaft taken substantially and respectively along the lines **21—21** and **22—22** of Fig. 20;

Fig. 23 is a schematic view showing the relationship between the shaft of Fig. 20 and the ratchet wheels of the control counter, Fig. 23 being taken along the line of **23—23** of Fig. 19;

Fig. 24 is a side elevational view of one of the counter wheels and further illustrating the relationship between the shaft and the deject mechanism;

Fig. 25 is an end view illustrating portions of the drive;

Fig. 26 is a view taken from the line **26—26** of Fig. 18 and showing additional features of the drive;

Fig. 27 is a schematic perspective view illustrating a portion of the numbering machine advancing mechanism and the control means therefor; and

Fig. 28 is a schematic wiring diagram showing the control circuits for the automatic tab-controlled reset mechanism.

For purposes of disclosure the invention is herein illustrated in Figs. 1 to 16 as embodied in a punch unit PU that is of the general character that is shown in my copending application Serial 201,102 filed December 16, 1950, this punching unit PU is included in a machine **100** for producing business instruments, and such machine being of the same general construction and embodying the same general mode of operation as the machine illustrated in my aforesaid copending application.

As disclosed in my aforesaid copending application, the machine **100** is adapted to produce business instruments from and under control of individual printing and control devices D, Fig. 2B, that embody printing means and data-representing control means, and each business instrument may have a printed identifying impression formed thereon from certain of the printing means of a printing and control device D, and may also have data-representing perforations formed therein by the punch unit PU under control of the control means of the same printing and control device. The punching unit PU may, of course, be operated to produce other data-representing perforations, that is, other than under the control of the printing and control devices.

Thus certain fixed data may be set up manually in the punching unit PU so as to produce the same data, such as the date, as perforations in each instrument, as described in my aforesaid copending application; and in contrast to this, the present invention is concerned with automatic control of the punching unit PU to produce data perforations representing changing data that varies from instrument to instrument. More specifically, the present invention is directed to the provision of a supplemental control for the punching unit PU whereby a series of business instruments produced by the machine **100** may be consecutively numbered by the formation of data-representing perforations therein, thereby to facilitate sorting, handling and like accounting operations that may need to be performed in respect to such business instruments.

The business instruments that are produced on the present machine are made from and under control of a series of printing and control devices D such as that shown in Fig. 2B of the drawings. This printing device D is of the general character shown in Fig. 2 of the first of my aforesaid copending applications, and each printing device D comprises a frame F having a printing plate **1151** removably mounted on the face of the frame F near the lower edge thereof, and a combined index and control card **1160** is mounted in the upper area of the frame. This nidex and control card **1160** is adapted to have numerical data represented therein by means of perforations arranged according to a five-position code that is indicated in Fig. 15 of the present drawings. The printing plate **1151** has embossed type characters thereon affording a name and address at **105T**, and numerical data **106T**, **107T** and **108T**. If desired, a portion of the text **105T** may be imprinted at **105B** on the index and control card **1160**.

The index and control card **1160** as herein shown also has the numerical information corresponding to the type characters **107T** and **108T** indicated therein by coded perforations at **107R** and **108R**, so that this data may be sensed in the machine to set up the punch unit PU in the manner described in my aforesaid copending application. The printing device D is also adapted to bear one or more identifying devices such as tabs **1165** at selected positions along its upper edge, and these tabs may be utilized in controlling the print-skip operation of the machine, as well as for other functions as will be described hereinafter.

As shown in Fig. 2A of the drawings, the machine **100** may produce a card-type bill C that may be desired, for example, in public utility work, and where this bill C is to be produced as a single business instrument, the machine may be set for what is termed "consecutive" operation, as described in my aforesaid copending application. It should be noted at this point, however, that the machine **100** may operate to produce such a bill as well as a related accounting card, and in such operation the machine is set for "duplicate" operation as described not only in my aforesaid copending application, but also in my copending application Serial No. 259,823, filed December 4, 1951 and now abandoned. The card-type

bill C that is shown in Fig. 2A of the drawings is of the usual Hollerith size and form, and in the present instance the card C has a printed identification in the form of a name and address **105** printed thereon, such printed name and address being formed from the printing means **105T** of a printing and control device D as described in the first of my aforesaid copending applications. It will also be noted that this bill has identification numbers **106**, **107**, and **108** printed thereon and these impressions are made respectively from the printing means **106T**, **107T** and **108T** of the printing and control device D. The bill C that is herein shown also has the number **107** represented therein by data-representing perforations **107P**, in accordance with the usual ten position code employed with such cards, while the number **108** is reproduced similarly in date-representing perforations **108P**. The bill C also has a serial number or identifying number **109P** formed therein by date-representing perforations that are made by the punching unit PU, and in a series of bills C produced by the machine, the serial number **109P** is advanced one for each bill C that is produced so that the series of bills are, in effect, consecutively numbered. It is with the control mechanism for setting up and governing the punching unit PU in producing these consecutive number perforations **109P** that the present invention is concerned.

The cards C are fed in succession along a sheet guideway SG that is shown, in Fig. 2 of the drawings, as it is afforded in the punch unit by a slot, and in other portions of the machine the guideway SG is formed in different ways as described in the first of my aforesaid copending applications. These cards C come to rest successively at a punching station that is defined by the punching unit PU, and after the punching operation, each card C is advanced to a printing station that is defined in part by and beneath a printing head structure **110** that is shown in Fig. 1 of the present drawings at which printing station the printed impression is made that affords the printed data **105**, **106**, **107** and **108**. The cards C are advanced along such sheet guideway SG by means including driven feed rolls, only one of which is shown at **111** of Fig. 1 in the present drawings; and when a card C has moved into the throat of the punch unit PU, it is brought to rest by a stop finger structure that is described in detail in the first of my aforesaid applications and which is indicated generally herein by the reference character **113** Fig. 1 that is applied to the stop finger rocker. The stop finger rocker **113**, as well as many of the other elements of the present mechanism, is operated by cam means that are mounted upon a longitudinally extending cam shaft CS–2 that corresponds to the similarly identified cam shaft that is included in the first of my aforesaid copending applications, and the sheet feed means, such as the feed roller **111**, and the stop finger mechanism including the stop finger rocker **113**, are operated in proper timed relation by the cam shaft CS–2 so as to cause step-by-step advancing movement of the sheets or cards C along the sheet guideway SG.

The punching unit PU includes a pair of side plates **120** and **121** that are in vertical positions and in spaced relation, and extend in a front to rear direction with respect to the machine **100** so as to be transversely positioned with respect to the sheet guideway SG. The punching unit PU has a stationary horizontal mounting plate **123** extended between the side plates **120** and **121** and disposed beneath the sheet guideway SG, as shown in Fig. 2 of the drawings, and on this mounting plate **120** a sectional punch block **125** is mounted, such punch block being made up of a lower die block **125D** and an upper punch guiding block **125G** that are secured together and which have a horizontal slot formed therebetween, as shown in Fig. 2, so as to afford a portion of the sheet guideway SG into which a card or sheet C may move for the performance of a punching operation thereon. The upper punch block **125G** has a plurality of columns of punches **127** mounted therein, each column comprising a series of twelve punches **127**, and the punches **127** actually being mounted and guided in the upper guide block **125G** and being movable downwardly in a manner to be described hereinafter for cooperation with aligned die openings in the die block **125D** for effecting the desired punching operation. It will be understood that there is a relatively large number of columns of punches, and each column contains twelve such punches, and the punches **127** are arranged to be retracted in an upward direction by a stripper structure **127'**, as described in some detail in the first of my aforesaid copending applications. The punches **127** in each of the several columns are adapted to be selectively actuated, and this is accomplished through the provision of settable interposer means for each of the several columns, and such interposer means are arranged so that they may be manually set as described in the first of my aforesaid copending applications, or are arranged for automatic setting, as for example, under control of control means afforded on the individual control and printing devices. Thus, as will be described in further detail hereinafter, any particular punch **127** in any of the columns may be set for operation, and in such setting, an interposer such as interposer **130** is moved so that the head **130H** thereof is aligned with the desired punch **127**, and the heads of all of the interposers **130** are arranged to be disposed below an upper ram plate **132** that is adapted to be drawn downwardly through a punching stroke by means of four vertically reciprocable rods **133** that extend slidably downwardly through the mounting plate **123**, and it may be observed that the ram plate **132** may be a solid or one-piece member, as described in the first of my aforesaid copending applications, or it may be sectional in character so as to provide for selective suppression of punching in a particular field of the punch, as described in the second of my aforesaid copending applications. Thus, in the form illustrated in the present drawings, the punch unit PU is of the kind adapted for suppression of a selected field, and another stationary plate **134** is mounted above the upper position of the ram plate **132**, and a supplemental ram plate is mounted beneath the stationary plate **134** so that it may be latched to the ram plate **132** for downward movement therewith or may be released therefrom by means including a pawl **135** and cam follower **136** so as to suppress punching when this is desired. This structure however does not form part of the present invention and is described only to explain the presence of certain elements in the present drawings.

The automatically settable interposers **130** of the punching unit PU are arranged to be operated or set through transmitting levers **140** from and under control of settable slides **141** that form part of the punching unit PU as described in the first of my aforesaid copending applications. These slides **141** are normally returned to forward or lefthand positions as viewed in Fig. 2, by mechanism included in the punch unit PU, as described in the first of my aforesaid copending applications, and when a setting operation is to be performed, these slides **141** are released for rearward righthand movement as viewed in Fig. 2, these slides **140** being normally held in their restored or left-hand positions by means of pawls **142** that rest at their rear ends against a zero stop plate **143**. This zero stop plate **143** is arranged so that the pawls **142** may be shifted upwardly, thereby to enable the same to pass in a rearward or righthand direction, Fig. 2, and thus to permit the slides **141** to move under a spring action as described in the first of my aforesaid copending applications to the right, or rearwardly, to an extent determined by the setting of a series of five stop pins **145** that are shown in detail in Fig. 3 of the drawings.

The stop pins **145** are provided in duplicate for each of the several slides **141**, and are adapted for cooperation with rear end surfaces **141E** of the slides **141**, Fig. 3, and

as described in the first of my aforesaid copending applications, there are five such stop pins, identified as stop pins 145A to 145E for each order or column of the punching unit PU. The five stop pins 145 for each order are mounted in a slide bar 146 that is adapted for movement through a limited range in a rearward direction and into contact with a stop surface 147 on a stop bar 147S. The particular manner of operation of the aforesaid stop pins 145 is described in detail in my prior Patent No. 2,710,406 patented June 7, 1955. The five stop pins 145 in each order or column of the punching apparatus are arranged for selective operation or upward movement to set positions in accordance with a five element positional code in which either one or two of such stop pins are adapted to be actuated so as to thereby represent selectively the digits from 1 to 9, the code being indicated in the righ-hand column Y of Fig. 15 of the present drawings. Thus when the number 1 or any other odd digit is to be indicated and set in the punching apparatus PU, the stop pin 145A, Fig. 3, is actuated in an upward direction so that this pin 145A is adapted to engage with the lower side surface of a stop bar 148, and if the particular digit that is to be represented is the digit 9, this stop pin 145A is the only pin that is actuated, and this is indicated opposite the digit 9 in column Y of Fig. 15 of the drawings. If digit 1 is to be represented in the setting of punching unit PU, the stop pin 145A is set and this prevents movement of the slide 146 to the right in Fig. 3, and in addition, the stop pin 145E is set in an upward position and in this instance the edge 141E of the slide 141 will engage the left hand surface of the pin 145E, and the slide 141 will move through a setting movement of but one unit. This is in contrast to the movement when only the pin 145A is set, for in such an instance the slide 141 will move through a distance of nine units before the end surface 141E engages the pin 145A. Similarly, if the digit 3 is to be represented, the pins 145A and the pin 145D will be actuated, and in such an instance the slide 141 will move through a setting movement of 3 units. The same general operation is followed in connection with the setting of the other two odd digits 5 and 7, as explained in my aforesaid prior patent.

With respect to the even digits, the code arrangement as indicated in column Y of Fig. 15 is such that the pin 145A is not operated or set, and thus in such an instance the slide 141 will move to the right until it engages the abutment surface 147. Thus, the setting of pin 145E will, under such circumstances, allow the slide 141 to move through two units; the setting of the pin 145D will allow the slide 141 to move through four units; the setting of the pin 145C will allow the slide 141 to move through six units; while the setting of the pin 145B will allow the slide 141 to move through a setting movement of 8 units. These setting movements are, of course, reflected in the related interposers 130 so as to produce a corresponding selection or setting of the punch in the related columns thereof.

In the setting of the slide 141 and the related interposers 130, the normal operation is to effect such setting movement from and under control of data representing perforations in the printing and control devices D that are passed through the machine 100, and these data representing pereforations are formed in such printing and control devices, as described in the first of my two aforesaid pending applications, in accordance with the code such as that illustrated in column Y of Fig. 15 of the drawings. In the operation of the machine 100, the coded perforations in the printing and control devices D are sensed in the machine 100 and the presence of such perforations is transmitted to the appropriate column of the punching apparatus by means including Bowden wires 149 and a transfer frame 150 that is described in detail in my aforesaid copending application. The Bowden wires 149 are arranged to act upon transmitting plunger 151, Fig. 3, and these plungers are provided, five for each column of the punching unit PU that is to be controlled or set automatically, and each plunger 151 is arranged to act upon a transmitting wire 152, these transmitting wires 152 extending upwardly through the transfer frame 150 and being arranged to act upon corresponding upper plungers 153 that are disposed beneath the respective pins 145. Provision is made, as described in the first of my aforesaid copending applications, by means of a locking plate 154 and suitable operating mechanism, to lock the transmitting plungers 153 in their set positions after actuation by the transmitting wires 152, and the coded data-representing perforations of the printing and control devices D are thus effective to impart upward setting movement to related stop pins 145, thus to control the setting movement of the setup slides 141 of the punching unit PU.

All of the various orders of the punching unit PU are of course arranged and adapted, in most instances, for controlled setting movement by the stop pins 145, and the present invention is concerned with the provision of a supplemental control mechanism whereby these pins 145 may be automatically set by mechanism which will effect a consecutive serial numbering of the documents that are produced by the machine.

Under the present invention the serial numbering control is afforded by a supplemental control mechanism 160 that is associated with and mounted on the transfer frame 150. By thus associating the serial numbering control mechanism 160 with the transfer frame 150, it is possible to quickly and easily associate the serial numbering control mechanism with the machine when this is desired, and it is also possible to render the serial numbering control mechanism 160 effective to control any selected columns of the punch. Thus, as shown particularly in Figs. 3, 4 and 5, a mounting bracket 161 is mounted in a horizontal and rearwardly projecting position on the rear upper portion of the transfer frame 150, and this is accomplished by use of a downwardly extended flange 161F of the bracket, this flange 161F being secured by bolts 162 to the upper portion of the rear face of the body of the transfer frame 150. On the bracket 161 there is mounted a rocking frame 163 that is afforded by a pair of side plates 163R and 163L as noted in Figs. 4 and 5 of the drawings, and this rocking frame 163 is connected together in a rigid relationship by a plurality of spacer sleeves and bolts 164 and 165. The rocking frame 163 is pivoted at substantially the rear end edge of the bracket 161, or near left hand edge in Fig. 3 by means including a pivot pin 166. This pivot pin 166 passes through the two plates 163L and 163R and rests in grooves 166G shown in Fig. 4 of the drawings, the grooves 166G being formed in the upper surface of the bracket 166 so that the pivotal axis of the rocking frame 163 lies substantially in the plane of the upper surface of the bracket 161. Beneath the pivot 166, the plates 163R and 163L have downwardly projecting arms 163A. These arms 163A are connected by springs 168 to anchoring pins 169 so that the rocking frame 163 is normally urged in a counterclockwise direction, Fig. 3, thus to normally urge the frame to an elevated or retracted position. The upward or retracting movement of the rocked structure 163 is limited by an adjustable abutment screw 170 that is carried on the spacer sleeve 164 as shown in Figs. 3 and 4 of the drawings, the forward end of the abutment screw 170 being adapted to bear against the rear face of the transfer frame 150 as shown in Fig. 3 of the drawings.

The rocking frame 163 serves as a carrier for a serial numbering counter N which is adapted to be advanced one unit for each business instrument that is to be produced by the machine, and the counter N is adapted to be moved up and down with the rocking member 163 so that in such up and down movements, the serial numbering counter may serve, as will hereinafter be described, to

actuate the set-up pins 145 in the appropriate orders of the punching unit PU.

The counter N is in a broad sense similar to a common type of consecutive numbering device, particularly insofar as the actuating or advancing means thereof may be concerned, and insofar as the carry-over or tens-carry mechanism of the unit may be concerned, and it should be pointed out that this particular form of counting mechanism is not material to the present invention, any type of counting mechanism being capable of use. As will be evident in Figs. 5 to 11 of the drawings, consecutive numbering counter N comprises a main frame 175 that has end walls 176 and top bars 177, and this frame is mounted between the side frames 163L and 163R of rocking frame 163, as shown in Figs. 6 and 9 of the drawings. This mounting is, in the present instance, accomplished through the use of the main wheel-supporting shaft 179 of the counter N, this shaft being extended through the side plates 163R and 163L as well as through the two end walls 176 of the counter frame. The shaft 179 also serves as a carrying means for an advancing rocker 180 that is in the form of a bail and which has arms 180A that are pivoted on the axis of the shaft 179. This advancing rocker 180 is arranged to be operated through rocking movements by an operating arm 182 which is disposed on the outside of the left hand frame or end wall 176 as will be evident in Figs. 6 and 9 of the drawings, and which is connected to the adjacent arm 180A of the rocker by means of pins at 183 that extend through arcuate slots 184 formed in the left hand end wall 176 of the numbering machine frame 175.

The advancing rocker 180 is utilized as an actuating means for the several elements of the counting or serial numbering mechanism, and as herein shown, this mechanism is of a multiple-order type in which a plurality of counting or numbering wheels 190 of special form are provided, and each of these numbering wheels 190 has a ratchet wheel 190R affixed thereto. The several number wheels 190 and the associated ratchet wheels 190R are of the same form and construction, and only one of these elements will therefore be described. Thus, as shown in Figs. 13 and 16, each number wheel 190 is in the form of a relatively wide member that has a central opening 191 therein through which the shaft 179 extends to rotatably support the numbering wheel. Since the present apparatus is intended and adapted for operation in accordance with the decimal system of counting, the numbering wheels 190 are in the form of regular decagons in that they have ten equal sides, and thus by advancing the numbering wheel through an angle of 36° about its central axis, the faces of the wheel may be brought successively into an operative position, which in the present instance is a downwardly facing position. The numbering wheels 190 have their ratchet wheels 190R fixed on the right hand side thereof and in a concentric relationship therewith as will be evident in Figs. 6 and 13, and such ratchet wheels 190R have ten teeth 190T formed thereon at equally spaced intervals.

Between most of these teeth, a relatively shallow notch is provided, as indicated at 190S in Fig. 13 of the drawings, but at one point that is between two adjacent teeth in a particular location as will hereinafter be described, a relatively deep notch 190D is provided. These teeth 190T and the notches 190S and 190D are adapted for cooperation with a pawl structure 195 that is mounted on a shaft 196 carried on the actuating rocker 180 as will be evident in Fig. 12 of the drawings. This pawl structure 195 is urged in a ratchet-engaging direction by means of a torsion spring 197, shown in Fig. 12, and in such engaging movement, this pawl structure 195 is adapted to have a plurality of teeth that are carried thereon engaged with one or more of the ratchet wheels 190R in a more or less conventional manner so as to not only advance the counter unit by unit, but also to effect a tens-carry operation in a manner that is well known in the art. Thus the pawl 195, as shown in Fig. 12, has five teeth formed thereon of different sizes and lengths and these are allocated to the several orders of the counter. These five teeth are identified in Fig. 12 as teeth 195U which pertains to the units order of the counter 195T that is allocated to the tens order of the counter, 195H that is allocated to the hundreds order of the counter, 195TH that is allocated to the thousands order of the counter, and 195TTH that is allocated to the ten thousands order of the counter. The tooth 195U is relatively long as will be evident in Figs. 11, 12 and 14, and the teeth in the higher orders become progressively shorter as will be evident in Fig. 12.

The arrangement is such that in rocking movements of the advancing rocker 180 from the full line position shown in Fig. 10 to the dotted line position shown in Fig. 10, the units order pawl 195U is effective to engage the teeth 190T of the units order, but all of the other teeth of the pawl structure 195 are held high enough to prevent engagement thereof with the ratchet wheels to which they are allocated. This relationship being shown in a schematic way in Figs. 11 and 14 of the drawings. When, however, the units order numbering wheel is at its 9 position, that is when the face allocated to the number 9 is in its lowermost position, the deep notch 190D is disposed in such a position as to be engaged by the tooth 195U, and the form of this tooth is such that this allows an increased rocking movement of the pawl 195 in an engaging direction. When this occurs the tooth 195T engages one of the shallow notches 190S of the related ratchet 190R and of course the tooth 195U engages the ratchet wheels of the units order numbering wheel. Hence in the next advancing or rocking movement of the advancing rocker 180, the units order numbering wheel 190 will be advanced to its zero position, while the tens order numbering wheel 190 will be advanced from its zero position to its "one" position.

In the next operation of the advancing rocker 180, the large tooth 195U again limits the movement of the pawl 195 in an engaging direction, and actuating movement is imparted only to the units order of the counter. This same relationship prevails throughout successive movements until the tens order numbering wheel 190 has been advanced to its "9" position, and the tooth 195T then drops to the deep notch 190D of the tens order ratchet wheel 190R, and in the next operation of the advancing rocker 180, the numbering wheel 190 of the hundreds order is advanced by the tooth 195H from the zero position to the "1" position. Since this general mode of operation is well known in the art, no further description thereof is deemed advisable. The several numbering wheels 190 are held in their indexed positions to which they are moved by the rocker 180 by means of a plurality of retaining pawls 197 that are arranged to engage between the teeth 195T on the side of the wheels opposite from the side that is engaged by the pawl 195. These retaining pawls 197 are mounted on a shaft 198 and are yieldingly urged toward their effective or retaining positions by means of springs 199.

The ten faces of each numbering wheel 190 are allocated, as hereinabove described, to the several significant digits and zero, and these faces are utilized as actuating abutment surfaces, which are effective, in downward rocking movements of the rocker 163, to impart setting movement to the pins 145, as will be described, clearance recesses are afforded in such abutment surface so that selective or coded abutment surfaces may be provided in five different index positions on each face, as will be evident in Fig. 15 of the drawings. These coded arrangements on the faces of the wheels 190, as afforded by the clearance recesses and abutment surfaces, are utilized in a downward actuating movement of the rocker 163 to selectively actuate sets of five Bowden cables 209 that are extended between the bracket 161 and the upper portion of the transfer frame 150 to selectively actuate the transfer pins 153 and the set up pins 145 in a manner that is

identical with the actuation thereof from the Bowden cables **149**. Thus the mounting bracket **161** has a mounting block **200** fixed to the lower face thereof and this block **200** has a second block **201** mounted therebeneath in a downwardly spaced relation by means of spacers **200A** and bolts **200B**. The mounting block **201** has a lower plate **202** fixed to its lower face and the sheaths of a plurality of Bowden cables **209** are anchored in the plate **202**. The wires of the Bowden cables **209** extend upwardly through the block **201** and through relatively small guide openings in an upper plate **203**, and these wires are arranged so that their upper ends may be engaged with the downwardly facing heads of a plurality of pins **210** in the nature of transmitting pins which extend upwardly through guide openings in the guide or mounting block **200**. The other ends of the Bowden cables **209** are extended downwardly, and then upwardly and forwardly into the transfer frame **150** and are associated with the upper portion of the transfer frame **150** beneath the transfer pins **153** in the same manner as the transfer wires **152**.

The pins **210** are arranged in groups of five in the pattern illustrated in the lower portion of column X of Fig. 15, a set of five such pins **210** being afforded directly beneath each of the numbering wheels **190**, and the arrangement is such that when the normal restoring movements are applied to the settable pins **145** of the punching unit PU, such restoring movements will be transmitted through the pins **153** to the Bowden cables **209** so as to move the pins **210** to the upper positions that are shown in respect to two of the pins illustrated in Fig. 16 of the drawings. Thus, when all of the Bowden wires **209** are restored and all the pins **210** are in their elevated or restored positions, a downward movement of the rocking structure **163** serves to move all of the numbering wheels **190** downwardly to the lowered position shown in Fig. 16, and in such movement, those pins **210** that are opposite the unbroken or abutment surface of the downwardly facing surface of the numbering wheel are pushed downwardly as illustrated in respect to the center one of the three pins shown in Fig. 16, and in contrast to this, those pins **210** that are opposite recesses **215R** are allowed to remain in their unactuated or restored relationship. This action is utilized in effecting the desired setting of the pins **145** by so forming the recesses **215R** that the remaining portion or unbroken surfaces of each side of the numbering wheel **190** constitute a coded representation of the number or digit to which the numbering wheel is allocated. Thus, as will be evident in Fig. 15 and particularly in column X thereof, each surface of the numbering wheel **190** has five index points that are designated points A, B, C, D, and E, and by means of arrows in Fig. 15 these index positions are related to the corresponding positions of the code of column Y of Fig. 15. These arrows and the lettered designations also serve to coordinate this schematic illustration with the several set up pins **145** which are identified by the reference character **145** with a lettered suffix in each instance that corresponds with the several index positions that are illustrated in column X of Fig. 15.

To carry the description further, it will be noted that in a representation of zero, the related surface of the numbering wheel **190** has recesses **215R** formed in all five of the index positions A to E. Because of this, the downward movement of this face of the numbering wheel **190** will not cause actuation of any of the related Bowden cables **209**. In a representation of the digit 1 on the related face of the numbering wheel **190**, it will be noted that recesses **215R** are formed in positions B, C and D so that the Bowden cables **209** that are associated with these index positions will not be actuated, while those Bowden cables that are associated with positions A and E will be actuated. It will be noted that this conforms with the code shown in column Y of Fig. 15. Similarly, in reference to the digit 2, the related face of the numbering wheel **190** has recesses **215** formed in index positions A, B, C and D, and hence when set to the digit 2, an operation of the numbering wheel **190** through a downward or actuating stroke will not cause operation of those Bowden cables that are related to these positions. However, as to the Bowden cable that is opposite index point E, the abutment surface at point E of the face of the numbering wheel engages the related pin **210** and the Bowden cable **209** that is related to this index position will be actuated, thereby to conform with the representation of the digit 2 as shown in column Y. Correspondingly, coded patterns in the other faces of the number wheels **190** serve to cause coded actuation of the Bowden cables **209** in accordance with the code of Fig. 15.

When the counter N has been set to any particular number, the supporting rocker **163** may be moved or actuated downwardly through a setting movement in which the pins **145** of selected orders of the punching unit PU are set to correspond with the setting of the counter N, and this is done by means operating in timed relationship with respect to the operation of the punch unit. As herein shown, such actuation is obtained from a cam shaft **267** which corresponds to the similarly numbered cam shaft in the first of my aforesaid copending applications. This cam shaft **267** operates, as described in such copending application, to control and actuate certain of the elements of the punching unit including the locking plate **154** and the means that restore the pins **145**. Thus, as shown in Figs. 1, 2 and 3, the cam shaft **267** has a single lobe cam **268** mounted thereon, and adjacent to such cam **268** a vertical slide plate **269** is mounted. This slide plate **269** has a vertical slot **270** formed adjacent the upper end thereof so as to slidably embrace the cam shaft **267**, and a positioning collar **271** fixed on the cam shaft **267** serves to hold the upper end of the slide plate **269** against the adjacent face of the cam **268**. Downwardly from the cam shaft **267** and spaced somewhat upwardly from the rocker **163**, the slide plate **269** has a second slot **273** formed therein which embraces a guide rod **274**, such guide rod extending between the side plates **120** and **121** of the punching unit, and there being two positioning collars **275** fixed on the rod **274** on opposite sides of the slide plate **269** to guide the side plate for vertical reciprocating movement. At its lower end the slide plate **269** has a laterally projecting foot **269F** that projects in a forward or left-hand direction as shown in Fig. 3, and this foot **269F** is arranged to overlie the cross rod **165** of the rocker. The slide plate **269** is thus urged in an upward direction along with the rocker **163**, and this normally tends to hold a cam roller **277** that is mounted on the slide plate **269** in engagement with the lower edge of the cam **268**.

As hereinabove pointed out, the cam **268** is a single lobe cam and it is located in a rotative sense on the cam shaft **267** in such a position that the downward movement of the rocker **163** will occur at substantially the same time as the operation of Bowden cables **149** as described in the first of my aforesaid copending applications. In other words, the downward actuation of the rocker **163** occurs at the time when the locking plate **154** is released, and the locking plate **154** is returned to its locking position prior to the time when the rocker **163** returns to its upper or retracted position. Thus, in each cycle of operation of the cam shaft **267**, the counter N is moved downwardly so as to set the pins **145** in accordance with the setting of the numbering machine or counter N. This, in effect, conditions the punching unit for the punching of a particular serial number in the next operation of the punching unit. As described in the first of my aforesaid copending applications, the machines of such application may be operated in what is termed print-skip and impressions may be made with respect to only certain of the printing and control devices D that are passed through the machine. The pins **145** will be set up in respect to each printing device that is passed through the machine, and in the event that no bill or check is to be prepared from a particular printing device, the printing means and the

punching means of the machine do not operate and the pins 145 that have been set up are restored so that they may be set up in accordance with numerical data derived from the succeeding printing and control device. When the pins 145 are thus restored, it will be evident that the pins that have been set up from and under control of the numbering machine N will also be restored, and at the time when the next printing device is sensed, the serial number that is set on the numbering machine N will be effective to again start the pins 145.

It should be pointed out that where the machine operates in skip cycle, the setting of the numbering machine remains the same. In other words, the numbering machine N is advanced one unit only in those cycles where a bill or check is to be produced, and the means for attaining such advancing of the numbering machine are operated by the cam shaft CS–2 as shown in Figs. 1 and 2 of the drawings. Thus the cam shaft CS–2 has a cam 280 thereon that is arranged, as will hereinafter be described, to impart rocking movement to an operating lever 281 that is pivoted on a horizontal pivot shaft 282. This shaft 282 is supported in a pair of bracket arms 283 that are extended rearwardly from the portions of the frame of the punching unit adjacent to the respective side plates 120 and 121. The arm 281 extends downwardly from the mounted shaft 282 and has a downwardly opening slot 284 formed in its lower end. This downwardly open slot is arranged to embrace a roller 285 that is supported on the advancing arm 182 of the numbering machine N. Somewhat above its lower end, the arm 281 is guided between a pair of collars 286 fixed on the shaft 274, and between these two collars, the arm 281 has a slot 281S formed there which is substantially horizontal in position and through which the shaft 274 extends. By reason of the provision of the slot 284, it will be evident that the rocker 163 may be moved up and down as required to effect the desired actuation of the Bowden cables 290, and by rocking movement of the lever or arm 281, the advancing arm 182 of the numbering machine may be rocked back and forth as required. This arm 182 may be moved through a retracting movement in a counter-clockwise direction from the position shown in Fig. 3 to a retracted position, or may be returned in an advancing or clockwise direction to impart the desired advancing movement to the numbering machine N.

The operative connection between the arm 281 and the cam 280 is afforded by means whereby the cam 280 may automatically be rendered ineffective to impart advancing movement to the numbering machine N. In accomplishing this purpose, a mounting bail 290 is mounted on the shaft 282 with the cross bar of the bail 290 disposed above this shaft and with one arm 290*a* extending downwardly along the arm 281 and connected to the arm 281 by a screw 292. A spring 293 connected at its upper end to the rear edge of the cross bar of the bail 290 extends downwardly and is connected to an anchoring pin 294 so as to tend to rock the arm 281 in a clockwise direction as viewed in Fig. 2.

The cross bar of the bail 290 serves as a mounting for a downwardly projecting arm 295 which has a laterally projecting cam roller 296 at its forward end, and as will be more fully described hereinafter, this cam roller is normally disposed beneath the lower edge of the cam 280. The mounting of the arm 295 on the bail 290 is however accomplished in such a way that the arm 295 may be swung laterally so as to thereby withdraw the roller 296, from its effective position beneath the cam. Thus, as shown in Fig. 1, the arm 295 has an upwardly extending portion 298 and a laterally extending portion 299 on the upper end of the portion 298 so that the arm 295 may be pivoted on a vertical axis 300 carried on the body of the bail 290. Spring means are provided which normally urge the arm 295 in such a direction as to locate the roller 296 below the cam 280 and electrically operated means are afforded which, when operated, serve to swing the arm 295 about its pivotal axis 300 and to thereby withdraw the roller 296 from its operative relationship beneath the cam 280. Such electrically operated means are herein afforded by a solenoid 302 mounted on the arm 295 and having the armature thereof arranged to be projected toward a stationary surface of the frame of the punching unit. The solenoid 302 has its armature normally projected by the usual spring means so as to normally tend to maintain the arm 295 and the roller 296 in their effective or operative relation to the cam 280. However, when the solenoid 302 is operated, it is effective to swing the arm 295 and the cam roller 296 toward an ineffective relationship. When this occurs, the spring 293 will serve in some instances to return the arm 281 in a clockwise direction, and the fact that the roller 296 is no longer engaged with the cam 280 serves to prevent operation of the arm 281 through an advancing or counterclockwise movement. Hence, the numbering machine N remains in the setting that was established in the previous cycle of the machine.

This controlling operation of the solenoid 302 is arranged to take place in the embodiment of Figs. 1 to 16 by electrical control connections incorporated in the machine of the first of my aforesaid copending applications in the manner shown in Fig. 17 of the present drawings. Thus Fig. 17 constitutes a simplified portion of Figs. 31 and 31A of such copending application, using the same reference characters in most instances and including the emergency relay 1571 described in such application. This relay 1571 is effective when energized, through any one of various safety circuits, to stop operation of the machine, or in other instances when the card feed switch 1667 is operated, the emergency relay 1571 is energized so as to disable certain machine functions as described in such copending application. As shown in Fig. 17, a wire 305 extends from the line wire 1511 to one terminal of the solenoid 302 while a wire 306 extends from the other terminal of the solenoid 302 to the bus bar 1781. Thus any circuit which will energize the emergency relay 1571 is effective to operate the solenoid 302, thus to prevent the entry of a false count into the numbering machine N.

In many uses of machines of the kind shown in my aforesaid copending applications, it is desirable to produce checks, bills or the like in groups or ledger groups which are punched with a common ledger number set up by means of the manual set-up means described in the first of such applications, and in such instances it is desirable to reset the consecutive numbering mechanism at the start of each group or ledger. In Figs. 18 to 28 of the drawings an embodiment of the invention is illustrated whereby such reset operation may be attained automatically under control of tabs or like indicating means carried by the last printing device in each ledger group.

Thus, as shown in Figs. 19 to 22, the counter N is, in this instance, provided with a special central mounting shaft 179S that may be rotated in an advancing direction when the counter N is to be reset, and which, in such advancing or resetting movement, is operable upon the individual number wheels 190 to rotate the same to the desired reset relation as will be described. The shaft 179S has an elongated, longitudinally extended notch 179N formed therein so as to be disposed within the tens order number wheel 190 and all of the number wheels of higher orders, and a small notch 179N–1 arranged to be disposed within the units order number wheel 190. The notch 179N–1 is disposed so that it is offset one angular space, or 36 degrees, in a leading direction with respect to the notch 179N, as shown in Figs. 20 to 22, so that when reset operation takes place, the units order wheel 190 will be set to its "1" position, while all the other wheels 190 will be set to their zero positions. The number wheels 190 in this instance each have a spring pawl 400 mounted therein for engagement with the notches of the shaft 179S. The pawl 400 comprises a piston-like

head 401 mounted in a generally radial bore 402 in the number wheel 190 and having a spring 403 disposed in the bore 402 and compressed by a threaded plug 404 so as to urge the head 401 radially inwardly toward the notches. These notches are so formed that when the number wheels 190 advance in the normal operation of the counter N, the pawls 400 cam out of the notches and there is no motion transmitting or blocking action, but when the shaft 179S is rotated in an advancing direction through a single cycle reset movement, each number wheel 190 will be picked up by the engagement of its pawl 400 with the related notch of the shaft 179S, and such wheels will thus be reset to the desired positions.

Such single cycle reset movement is imparted to the shaft 179S by means including a reset shaft 405 connected at its opposite ends by universal joints 406 and 407 to the shaft 179S and to the driven member 408B of a one-revolution clutch 408. The clutch 408 has a driving member 408A, and this driving member 408A is in the form of a gear that is constantly rotated by means including gears 409 and 410 from the printing device feed shaft 267. The clutch 408 is of the uniform-engaging type shown, for example, in my prior Patent No. 2,265,134, patented December 9, 1941, and it embodies a normally effective stop lever 408L which may be released by means of a solenoid 410S so as to permit engagement of the clutch 408 for operation through its one revolution cycle. Since the clutch 408 engages at only one rotative relation, as described in my aforesaid patent, the shaft 179S moves through its cycle of rotation and stops in the same rotative position after each cycle, thus to set the units order wheel 190 in its "1" position and the other wheels in their zero positions.

In the embodiment of the invention shown in Figs. 18 to 28, a safety switch 415 is mounted in a stationary position on the bracket 290A so as to be almost directly above the upper end of the vertically reciprocable plate 269. This switch 415 is arranged to be normally closed, and it has an operating rod 416 extended downwardly therefrom and connected at 416P to the lower portion of the plate 269. This rod 416 is effective to open the switch 415 as soon as the plate 269 moves downwardly from its upper or rest position, and this switch 415 is utilized to disable the automatic reset mechanism of the consecutive numbering machine N at all times except when the numbering machine is in its upper or retracted position.

The manner in which the automatic reset mechanism is controlled is illustrated in Fig. 28 of the drawings, which constitutes a partial reproduction of the wiring diagram included as Figs. 31 and 31A of the first of my aforesaid copending applications, and the same reference characters are utilized in such copending application. Thus, it will be noted that the start relay 1570 is included in Fig. 28, and an additional relay 450 is shown which constitutes the numbering machine reset control relay. This relay 450 is of the same type and construction as the start relay 1570, and the relationship of the six contacts of the relay 450 has been schematically illustrated in Fig. 28 adjacent to this relay. Considered in a broad sense, it is to be pointed out that the reset relay 450 is energized each time the numbering machine N is to be automatically reset, and the operation of the relay 450 initiates such resetting operation and other functions as will be described. The reset relay 450 is arranged to be automatically energized under control of a normally open tab-operated switch 451, which is associated with the tab sensing and selector mechanism that includes the sensing head SH of the first of my aforesaid copending applications, although it might be associated with many other types of sensing and selector mechanism. Thus, as shown in Fig. 28, a wire 452 is extended from the wire 1512 to one contact of the switch 451, while a wire 453 extends from the other contact of the switch to a terminal block 454. A wire 455 extends from the terminal block 454 to the No. 8 terminal of the relay 450, and circuit is extended from the No. 7 terminal of the relay 450 by a wire 456 to the other line wire 1511. Thus, when the switch 451 is closed, the relay 450 will be energized, and this fact is visually indicated by a signal light 457 that is connected between the wire 1511 and the terminal block 454. A strap 458 connects the No. 8 terminal of the relay 450 with the No. 6 terminal thereof, and this affords part of a holding circuit which extends through normally open contacts 5 and 6 of this relay and through a wire 459 to a safety switch 460 that is normally closed. A wire 461 extends from the other contact of this switch to the line wire 1512. Thus, a holding circuit is provided for the relay 450, and this holding circuit remains effective until the switch 460 is open. This switch 460, for reasons that will be set forth presently, is arranged to be opened by manual withdrawal of the lock plate 680 of the manual setting means of the punching unit PU, such lock plate and its function being described in detail in the first of my aforesaid copending applications.

The operation of the machine is arranged to be stopped by the operation of the reset relay 450, and for this purpose, the normally closed contacts Nos. 1 and 2 of this relay are connected in the operating and holding circuit of the start relay 1570. Thus, it will be noted that the initial energizing circuit for the start relay 1570 extends from the start switch 1620 through the wire 1628 to the terminals 6 and 7 of the relay 1570, while the holding circuit for this relay extends from the stop switch 1621 through the wires 1529A and 1529 to the No. 5 terminal of this relay, thus to be closed when the Nos. 5 and 6 contacts of this relay are closed due to operation of the relay. The other side of the starting and holding circuit for the start relay 1570 is, in the present instance, modified by extending a wire 465 from the No. 8 terminal of the relay 1570 to the No. 1 terminal of the reset relay 450. A wire 466 is extended from the No. 2 terminal of the reset relay 450 to the safety switch circuit which is schematically indicated in Fig. 28 as including a number of safety switches 467 in series, and with the end of this series of switches connected at 468 to the line wire 1511. The wire 466 thus connects to the safety switch circuit in the same manner as the wire 1630A of the first of my aforesaid copending applications. The contacts 1 and 2 of the reset relay 450 are closed when the relay 450 is released, so that under such conditions the normal starting and running operations of the machine may be controlled in the usual manner, but when the reset relay 450 is energized, the contacts 1 and 2 thereof are open so that the start relay is de-energized and the machine is stopped.

By reason of the holding circuit that is afforded for the reset relay 450, the machine remains disabled until the control switch 460 is opened. This continued disabling of the machine is utilized in the present instance to remind the operator that the manually set ledger number that has been set up on the punching unit PU must be changed before the machine is again started, and this reminding function is attained by associating the switch 460 with the lock plate 680 of the manually setting portion of the punching unit PU.

When the reset relay 450 is operated as aforesaid, the reset solenoid 410S is energized in proper timed relation to the operation of the other elements of the machine. This is accomplished through a timing switch 470 that is normally open and is arranged to be closed by a reset timing cam 470C that is mounted on the printing device feed shaft 467. Circuit for the reset solenoid 410S is afforded by a wire 471 extended from the line wire 1511 to one contact of the safety switch 415, a wire 472 being extended from the other contact of this switch to one terminal of the solenoid 410. A wire 473 extends from the other terminal of the solenoid 410S to a terminal block 474, while a wire 475 extends from this terminal block to one contact of the switch 470. Wires 476 and 477 in series are extended from the other contact of the

switch 470 to the No. 6 terminal of the reset relay 450. Thus, when the contacts 4 and 5 of this relay are closed due to operation of the relay, circuit is extended through the wire 459, the switch 460 and the wire 461 to the other line wire 1512. Hence, upon operation of the relay 450, the operating circuit for the reset solenoid is conditioned, and at the proper time in the machine cycle the cam operated switch 470 is closed and the reset mechanism is operated through its one revolution cycle.

In order that the reset mechanism may readily be operated without operation of the reset relay 450, a normally open manually operated reset switch 480 is provided and is connected by wires 481 and 482 between the terminal block 474 and the line wire 1512.

The advancing action of the numbering machine N is effected in a somewhat different manner in the embodiment of the invention shown in Figs. 18 to 28, and this requires a slightly different relationship of the parts and the provision of different electrical circuits, as will be described. Thus, in Figs. 18 and 27 of the drawings, it will be noted that an additional cam 495 is provided on the printing device feed shaft 267, and this cam 495 is arranged to act on a roller 496 that is fixed on the operating lever 281. The cam 495 is of the same form as the cam 280 hereinbefore described, but it is rotatively positioned on the shaft 267 in such a way that it tends to hold the numbering machine advancing lever 182 in its advanced position at the time when the cut away portion of the cam 280 would normally allow the lever 281 and the lever 182 to operate through what may be termed a retracting movement. With this arrangement of the cams 280 and 495, the numbering machine N is advanced only in those cycles wherein the solenoid 302 is energized so as to withdraw the roller 296 out of its operative engagement with respect to the cam 280. This materially simplifies the proper inter-relationship of the numbering machine advancing mechanism with the other operations of the machine. Thus, as shown in Fig. 28 of the drawings, the control solenoid 302 is, in this instance, arranged to be energized whenever the printing device feed mechanism of the machine is operated through a feeding cycle. Thus, the selector timing switch 1518 which is normally open and arranged to be closed by a cam 1518C on the printing device feed shaft 267, has one contact thereof connected by a wire 500 to the line wire 1512, and a wire 501 extends from the other contact of this switch to a terminal block 1919 that is shown in the first of my aforesaid copending applications. A wire 502 extends from this terminal block to one terminal of the control solenoid 302, while a wire 503 extends from the other terminal of this solenoid to one stationary contact of a normally closed control switch 505, the other stationary contact of which is connected by wire 506 to the other line wire 1511. Thus, the solenoid 302 will be energized in each cycle of machine operation in which a printing device is given an advancing movement, and when this occurs, the desired advancing movement will be imparted to the counter end. The switch 505 serves as a non-accumulating control switch so that the operator may, under some circumstances, prevent advance of the counter N by opening of this switch. Such a situation occurs when the machine is first loaded with printing devices, since under such circumstances one or more idle cycles of the machine are required in order to advance the first printing device to the sensing position.

Conclusion

From the foregoing description it will be apparent that the present invention enables distinctive identifying data such as a serial number to be readily and easily applied to business instruments such as checks, bills and the like. It will also be evident that under the present invention, such consecutive numbering of business instruments may be accomplished in a simple and effective manner in a punching apparatus that requires setting in accordance with a multiple element numerical code. Furthermore, such serial numbering in a machine of this type may, under the present invention, be accomplished without materially changing or modifying the mechanism of the punch. It will be evident, of course, that with such an arrangement the punching mechanism may be utilized either with or without the serial numbering mechanism, thus to greatly extend the usefulness of such punching apparatus.

It will also be evident that the present invention enables serially numbered documents to be produced in groups with a new series of serial numbers for each such group, and under the present invention the serial numbering mechanism is automatically reset upon completion of each group of business instruments. It will further be evident that the present invention insures that the operation of the serial numbering mechanism will avoid introduction of a false count in each instance, thus to simplify the production of such serially numbered documents.

Thus, while I have illustrated and described the preferred embodiments of my invention, it is to be understood that these are capable of variation and modification, and I therefore do not wish to be limited to the precise details set forth, but desire to avail myself of such changes and alterations as fall within the purview of the following claims.

I claim:

1. A data transfer frame adapted to be interposed between a sensing means and the set-up means of an apparatus such as a multiple order punch or the like, said transfer frame including a bottom plate and a top plate rigidly connected together in substantially spaced and parallel relation, and said plates having a plurality of corresponding openings formed in said bottom and top plates in parallel columns and adapted to receive transmitting wires with the upper and lower ends of such wires extended through corresponding openings in different columns of the top and bottom plates respectively, a bracket extended from one side of said frame and having a supporting shelf, and a movable carrier mounted for movement toward and away from said shelf, a multiple order counter mounted on said carrier with its axis parallel to said shelf, said counter having a plurality of rotatable counting elements allocated respectively to the units order and the respective higher orders of the counting mechanism and each mounted for rotative indexing movement to positions allocated successively to zero and the digits from 1 to 9, mechanism for making single digit entries into the units order counting element and for effecting tens carries from each of the lower order counting elements to the counting element of the next highest order in each instance, an operating member operatively associated with said mechanism and movable through an entry stroke for effecting such entries, said counting elements each having ten equally spaced faces allocated respectively to zero and the digits from 1 to 9 and having physical abutment surfaces thereon affording coded physical representations of the numerical value of the digit or zero to which the respective faces are allocated, elongated flexible transmitting elements mounted at one end on said shelf in a shiftable relation and arranged for cooperation with said physical representations of said counting elements, and the other ends of said transmitting elements being adapted to be extended through said openings in said top plate in any selected columns thereof; and said carrier serving to move said counter bodily toward said transmitting elements to impart selective movement thereto in accordance with the physical representations on the adjacent faces of said counting elements.

2. A data transfer frame adapted to be interposed between a sensing means and the set-up means of an apparatus such as a punch or the like, said transfer frame including a bottom plate and a top plate rigidly con-

nected together in substantially spaced and parallel relation, and said plates having a plurality of corresponding openings formed in said bottom and top plates in parallel columns and adapted to receive transmitting wires with the upper and lower ends of such wires extended through corresponding openings in different columns of the top and bottom plates respectively, a bracket extended from one side of said frame and having a supporting shelf, and a movable carrier mounted for movement toward and away from said shelf, a multiple order counter mounted on said carrier with its axis parallel to said shelf, said counter having a counter wheel for each order of the counter and each wheel affording groups of physical abutments representative of the significant digits and zero in order and in accordance with a predetermined numerical code, elongated flexible transmitting elements mounted at one end on said shelf in a shiftable relation and arranged for cooperation with said physical abutments of said counter wheels, and the other ends of said transmitting elements being adapted to be extended through said openings in said top plate in any selected columns thereof; and said carrier serving to move said counter bodily toward said transmitting elements to impart selective movement thereto in accordance with the physical representations on the adjacent faces of said counting elements.

3. In a machine of the character described, a sheet guideway along which sheets falling in to different groups of related sheets may be fed in succession to a punching position, means to sense the occurrence of separation of such groups, a punching unit disposed at said position and embodying multiple order punching mechanism settable in each order to produce numerical data representations in accordance with a predetermined positional code, a serial number control counter operatively associated with selected orders of said punching unit for setting such orders of said punching unit for producing numerical data representations of serial numbers in such sheets, means operable in each cycle of operation of said machine to advance said serial number counter, power means for resetting said serial number control counter and including a uniform engaging one revolution driving clutch, and control means operable upon sensing of a group separation as aforesaid to initiate operation of said power reset means and to stop operation of said machine.

4. In a machine of the character described, a sheet guideway along which sheets may be fed in succession to a punching position, a punching unit disposed at said position and embodying multiple order punching mechanism, said punching machine being automatically settable in certain of the orders thereof, manually operable means for setting other orders of said punching mechanism, and said mechanism being operable to produce numerical data representations in accordance with a predetermined positional code, a serial number control counter operatively associated with selected orders of said punching unit for setting such orders of said punching unit for producing numerical data representations of serial numbers in such sheets, means operable in each cycle of operation of said machine to advance said serial number counter, power means for resetting said serial number control counter and including a uniform engaging one revolution driving clutch, control means operable to initiate operation of said power reset means and to stop operation of said machine, and means operable upon said control means to prevent restarting of said machine until said manual setting means of said punching apparatus have been reset.

5. In a machine for producing business instruments, a sheet guideway along which sheets may be fed in succession to a punching position, a punching unit disposed at said position and embodying multiple order punching mechanism, said punching machine being automatically settable in certain of the orders thereof, manually operable means for setting other orders of said punching mechanism, and said mechanism being operable to produce numerical data representations in accordance with a predetermined positional code, a serial number control counter operatively associated with selected orders of said punching unit for setting such orders of said punching unit for producing numerical data representations of serial numbers in such sheets, advancing means operable to advance said serial number counter each time a business instrument is produced, means operable to disable said advancing means when a condition is detected in the machine indicating that a business instrument will not be produced in a particular machine cycle, power means for resetting said serial number control counter, control means operable to initiate operation of said power reset means and to stop operation of said machine, and means operable upon said control means to prevent restarting of said machine until said manual setting means of said punching apparatus have been reset.

6. In a machine for producing business instruments, a sheet guideway along which sheets falling in to different groups of related sheets may be fed in succession to a punching position, means to sense the occurrence of separation of such groups a punching unit disposed at said position and embodying multiple order punching mechanism, said punching machine being automatically settable in certain of the orders thereof, manually operable means for setting other orders of said punching mechanism, and said mechanism being operable to produce numerical data representations in accordance with a predetermined positional code, a serial number control counter operatively associated with selected orders of said punching unit for setting such orders of said punching unit for producing numerical data representations of serial numbers in such sheets, advancing means operable to advance said serial number counter each time a business instrument is produced, means operable to disable said advancing means when a condition is detected in the machine indicating that a business instrument will not be produced in a particular machine cycle, power means for resetting said serial number control counter, and control means operable upon the sensing of a group separation as aforesaid to initiate operation of said power reset means and to stop operation of said machine.

7. In a machine for producing business instruments, a sheet guideway along which sheets falling in to different groups of related sheets may be fed in succession to a punching position, means to sense the occurrence of separation of such groups a punching unit disposed at said position and embodying multiple order punching mechanism settable in each order to produce numerical data representations in accordance with a predetermined positional code, a serial number control counter, means for operatively associating said counter with any selected orders of said punching unit for setting such orders of said punching unit for producing numerical data representations of serial numbers in such sheets, means operable in each cycle of operation of said machine in which a business instrument is to be produced to advance said serial number counter, power means operable in any setting of said serial number control counter for resetting said serial number control counter, and control means operable independently of the numerical setting of said control counter to initiate operation of said power reset means when a group separation is sensed as aforesaid.

8. In a machine for producing business instruments from and under control of individual printing and coded numerical devices, each adapted to bear identifying and data representing means and which may fall in to different groups of related ones of such devices identified by said identifying means, said machine including sensing means for sensing such identifying and data representing means, a sheet guideway along which sheets may be fed in succession to a punching position, a punching unit disposed at said position and embodying multiple order

punching mechanism settable in each order under control of said sensing means to produce numerical data representations in accordance with a predetermined positional code, a serial number control counter, means for operatively associating said counter with any selected orders of said punching unit for setting such orders of said punching unit for producing numerical data representations of serial numbers in such sheets, means operable in each cycle of operation of said machine in which a business instrument is to be produced to advance said serial number counter, power means for resetting said serial number control counter, and control means operable under control of identifying data sensed by said sensing means to initiate operation of said power reset means.

9. In a multiple order numerical recording apparatus having an independently settable member in each order settable to a different position for each digit to determine the digit to be recorded in each such order, set-up control mechanism in the respective orders each adapted to assume different multiple set positions to control in turn the setting of the related settable member to its corresponding numerical recording position, code translating mechanism for each of said orders operable in accordance with a predetermined multiple element code to set said set-up control mechanism to one of its set positions representative of the digit to be recorded, a serial numbering control means embodying a multiple order counting mechanism having a counter for each order of the counting mechanism, said counters each having means formed thereon at equally spaced intervals thereabout to represent the respective significant digits and zero in order and in accordance with said predetermined multiple element code, and transmitting means arranged for actuation by such means on said counters in accordance with the setting of said counters and adapted for connection with said code translating mechanism in any order thereof to govern setting of the related settable members.

10. In a multiple order numerical recording apparatus having an independently settable member in each order settable to a different position for each digit to determine the digit to be recorded in each such order, set-up control mechanism in the respective orders each adapted to assume as many different multiple set positions as there are positions for the related settable member to control in turn the setting of the related settable manner to its corresponding numerical recording position, code translating mechanism for each of said orders having one kind of setting for odd digits and another kind of setting for even digits in accordance with a predetermined multiple element code to set said set-up control mechanism to one of its set positions representative of the digit to be recorded, a serial numbering control means embodying a multiple order counting mechanism having a counter for each order of the counter, said counters each having means formed thereon at equally spaced intervals thereabout to represent the respective significant digits and zero in order and in accordance with said predetermined multiple element code, and code transmitting means arranged for actuation by such means on said counters and adapted for connection with said code translating mechanism in any order thereof and in accordance with said predetermined multiple element code to govern setting of the related settable members.

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