Dec. 13, 1938. E. BREITLING ET AL 2,139,719

CASH REGISTER

Filed Sept. 4, 1936 3 Sheets-Sheet 1

FIG. 1

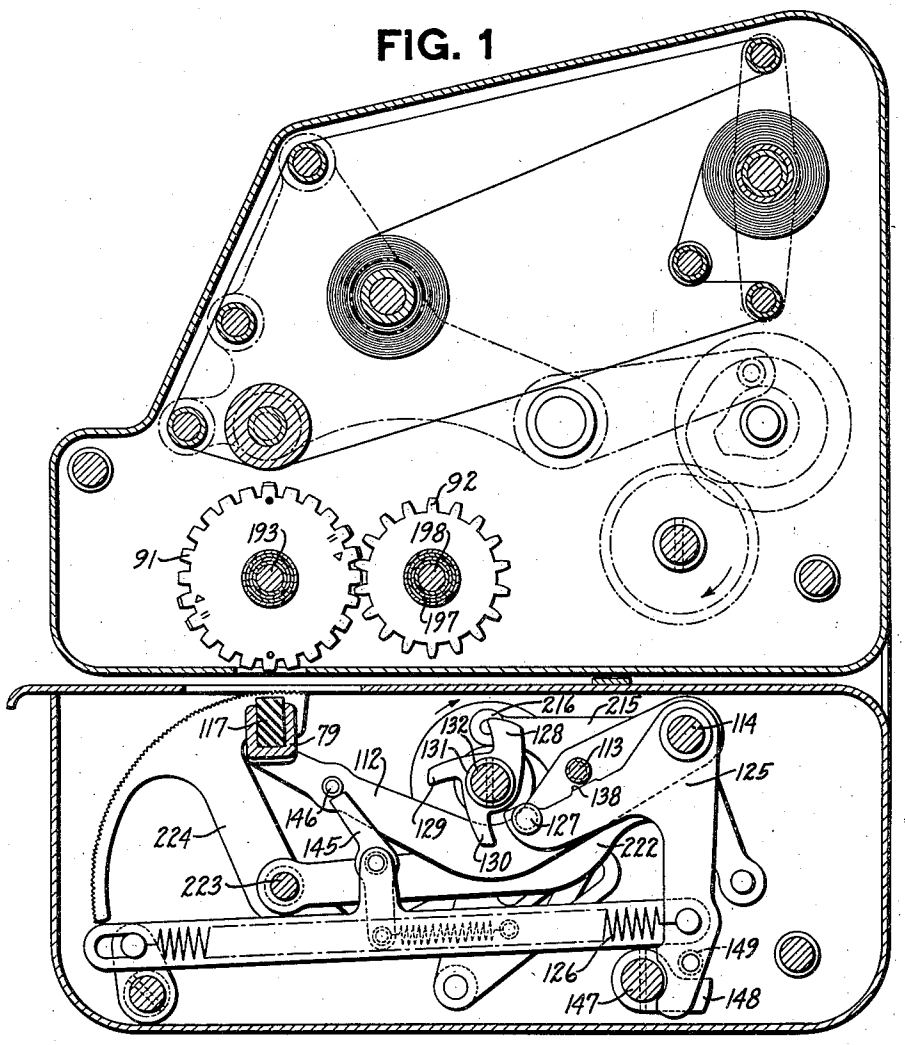
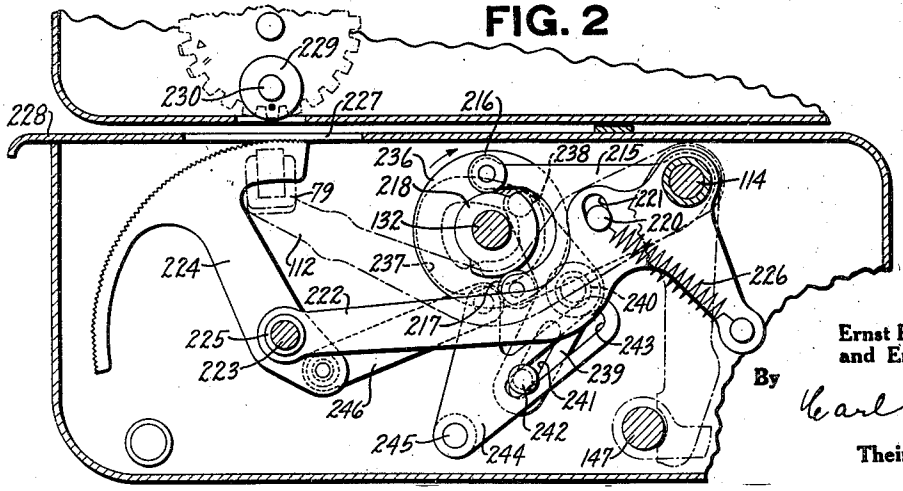


FIG. 2



Inventors
Ernst Breitling
and Erich Wagner
By Karl Benot
Their Attorney

Dec. 13, 1938. E. BREITLING ET AL 2,139,719

CASH REGISTER

Filed Sept. 4, 1936 3 Sheets-Sheet 2

FIG. 3

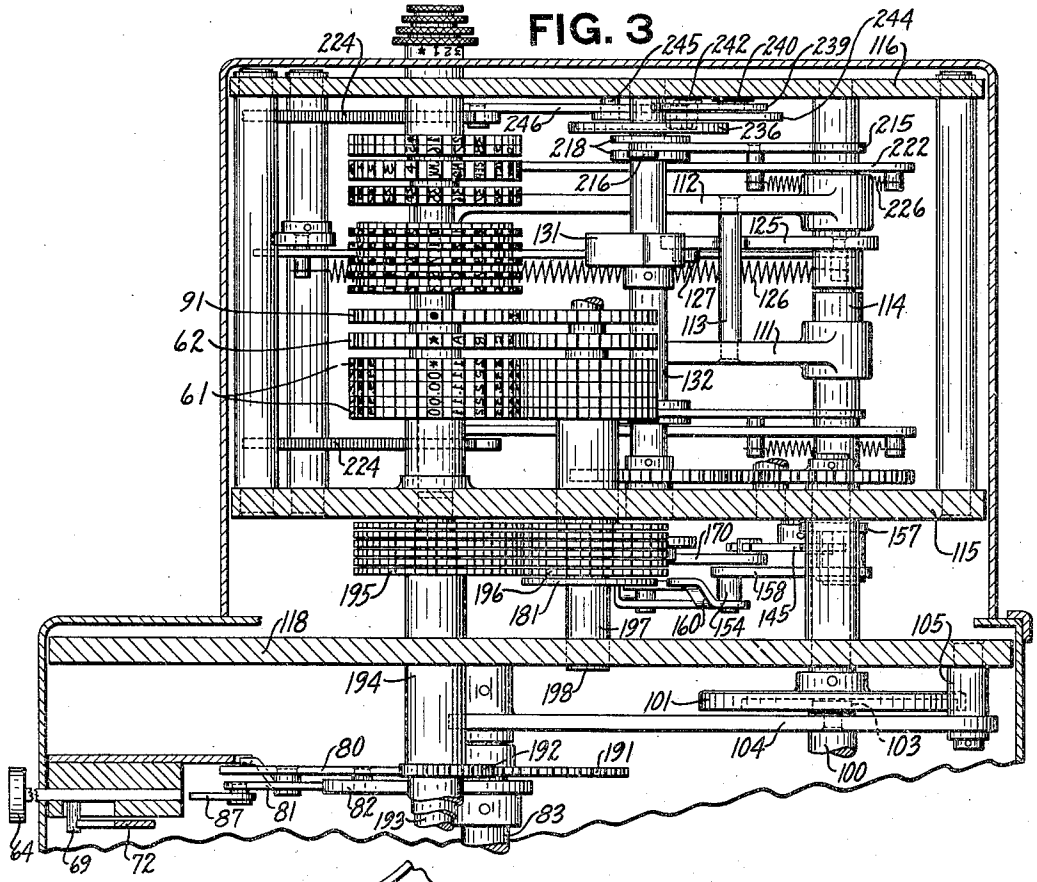
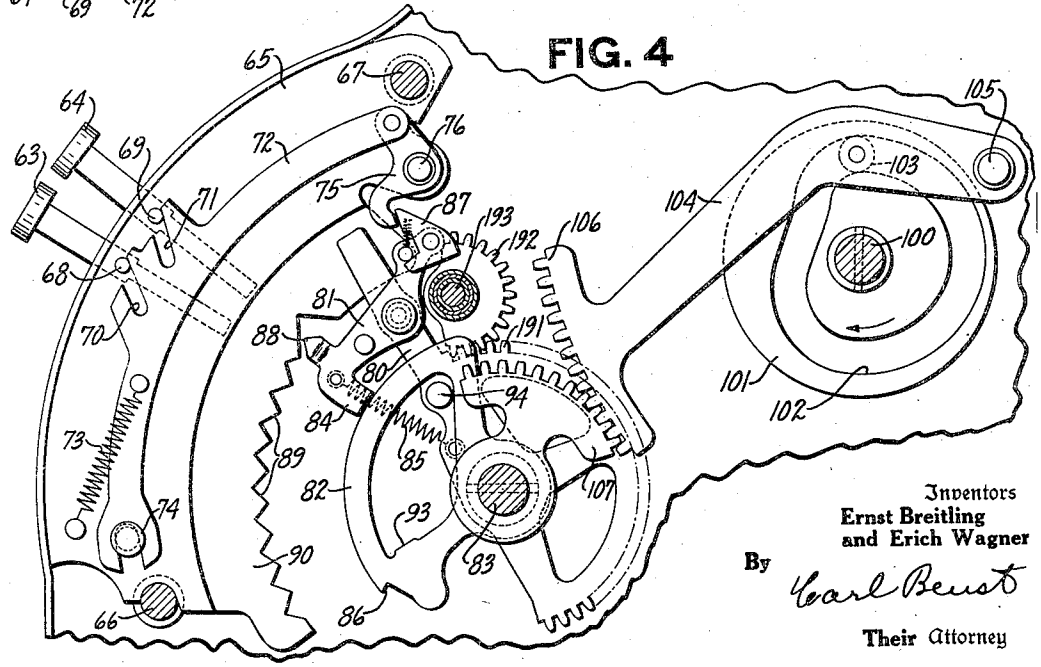


FIG. 4



Inventors
Ernst Breitling
and Erich Wagner

By Earl Benoit

Their Attorney

Dec. 13, 1938. E. BREITLING ET AL 2,139,719

CASH REGISTER

Filed Sept. 4, 1936 3 Sheets-Sheet 3

FIG. 5

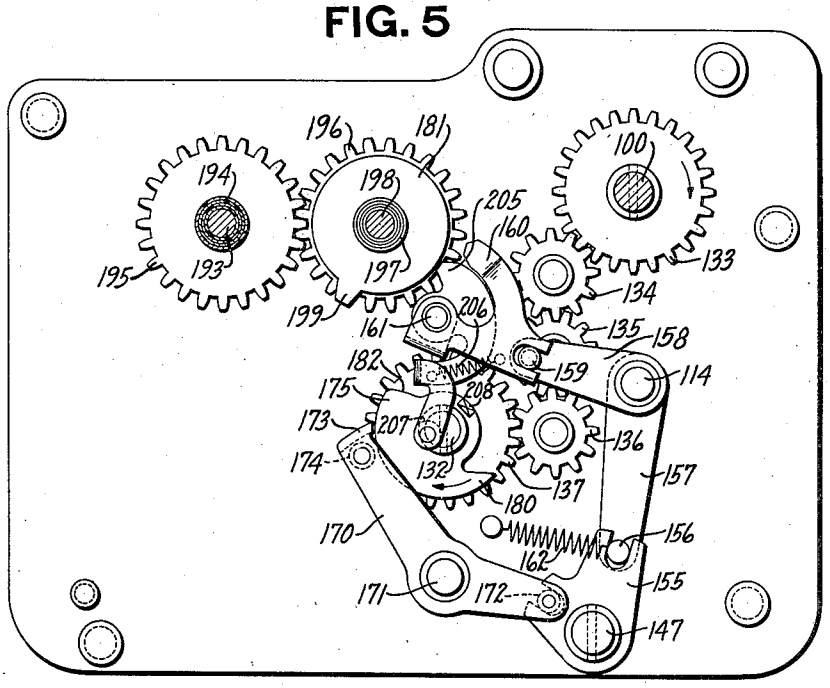
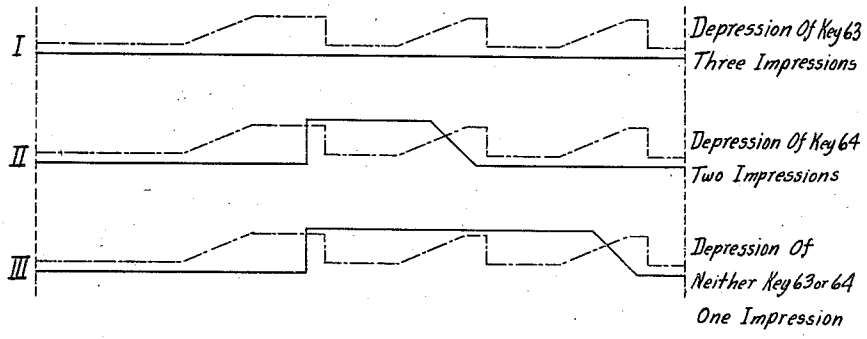


FIG. 6



Inventors
Ernst Breitling
and Erich Wagner

By Carl Benst

Their Attorney

Patented Dec. 13, 1938

2,139,719

UNITED STATES PATENT OFFICE

2,139,719

CASH REGISTER

Ernst Breitling and Erich Wagner, Berlin, Germany, assignors to The National Cash Register Company, Dayton, Ohio, a corporation of Maryland (1926)

Application September 4, 1936, Serial No. 99,328
In Germany September 13, 1935

7 Claims. (Cl. 101—93)

This invention relates to cash registers and accounting machines, and more particularly to printing mechanism which is adapted to selectively effect a variable number of impressions on record material by a single printing hammer, which is operated by a single cam member, during each operation of the machine.

Heretofore in mechanisms of this type only the printing hammer was disabled at the time no impression was to be made, while the actuating means for said hammer was permitted to operate for each printing stroke of which the hammer was capable of being operated. This resulted in an unnecessary load being placed on the operating means for the machine and caused an unnecessary amount of wear on the idly operated parts.

It is therefore a primary object of this invention to provide novel means for preventing unnecessary operation of the printing hammer actuating means, thereby reducing the load thus ordinarily placed on the machine operating means and consequently reducing the amount of wear on certain parts of said actuating means.

Another object is to provide a printing hammer actuating cam and means whereby said cam is rendered ineffective when no impression is to be made by its associated printing hammer.

An additional object is to provide means for controlling the effectivity of a printing hammer actuating cam to thereby selectively effect a variable number of impressions from a set of type elements by a single printing hammer during each operation of the machine.

A further object is to provide a cam which coacts with a spring-tensioned member to cause the latter to impart a plurality of strokes to a a single printing hammer during an operation of the machine, and means for controlling said member so that said cam is rendered ineffective when no stroke of the hammer is to be made, thus controlling the number of impressions which the hammer will make from a set of type elements during such operation of the machine.

Another object is to provide means for disabling the printing hammer actuating means during certain operations of the machine to thereby cause a variable number of printing operations to be made.

It is a specific object of this invention to disable the printing hammer actuating means when no impression is to be made to prevent unnecessary operation thereof, thus reducing the load on the operating mechanism and unnecessary wear on certain parts of said actuating means.

With these and incidental objects in view, the invention includes certain novel features of construction and combinations of parts, the essential elements of which are set forth in appended claims and a preferred form or embodiment of which is hereinafter described with reference to the drawings which accompany and form a part of this specification.

Of said drawings:

Fig. 1 is a side view of the printing hammer and the actuating means therefor.

Fig. 2 is a side view of the slip feeding mechanism.

Fig. 3 is a top plan view of the printing and feeding mechanisms.

Fig. 4 is a side view of the impression control keys and the differential mechanism controlled thereby.

Fig. 5 is a side view of a portion of the mechanism for preventing operation of the printing hammer actuating means.

Fig. 6 is a time chart wherein the dotted lines represent the operation of the printing hammer actuating arm, while the solid line represents the blocking means for holding said arm against operation.

The invention is herein shown embodied in a machine which may be either electrically or hand operated, as preferred. Such machine is provided with the usual amount and transaction keys (not shown), the amount keys being used to enter values into the machine, while the transaction keys control the selection of the proper totalizers into which such values are added. In addition, these keys control the adjustment of type wheels **61** and **62** (Fig. 3) to print amounts and symbols corresponding to the amount keys and transaction keys, respectively, which are depressed. The machine is further provided with two special impression control keys **63** and **64** (Fig. 4) which are used to selectively control the printing mechanism to effect a variable number of impressions from the type wheels by a single printing hammer during each operation of the machine. The keys **63** and **64** also control a differential mechanism for adjusting a type wheel **91** to print various kinds of characters to designate the various impressions which the printing hammer is capable of making during an operation of the machine.

The printing mechanism, as shown in the accompanying drawings, is capable of selectively effecting, under control of the special keys **63** and **64**, from one to three impressions from the type wheels by a single printing hammer during each

operation of the machine. It is to be understood, however, that the invention is thus shown only by way of illustration, as it is capable of being constructed and arranged to cause the printing hammer to make a greater variety of numbers of impressions during an operation of the machine.

Since this invention relates only to the printing mechanism only that mechanism and its associated feeding mechanism are shown and described herein.

Special keys 63 and 64

The special keys **63** and **64** (Fig. 4) are slidably mounted in a key frame **65** carried by rods **66** and **67** supported at their ends in the side frames of the machine. The keys **63** and **64** carry laterally projecting studs **68** and **69**, respectively, which, when said keys are depressed, coact with inclined slots **70** and **71**, respectively, in a detent **72** and rock the latter upwardly against the action of a spring **73**. The detent **72** is supported at its lower end by a bifurcated portion thereof embracing a stud **74** carried by the frame **65**, while at its upper end it is pivotally connected to a zero stop pawl **75** pivoted on a stud **76** in the frame **65**. Thus whenever the detent **72** is rocked upward in the manner just described it will rock the zero stop pawl **75** clockwise to an ineffective position. Another detent (not shown), of an old and well known type, retains the keys **63** and **64** in their depressed positions until near the end of the operation of the machine, when said detent is caused to release the keys to the action of coiled springs (not shown) which return them to their normal undepressed positions. When this occurs the spring **73** then returns the detent **72** downwardly to its home position and, at the same time, moves the pawl **75** counter-clockwise to its normal effective position. The differential mechanism controlled by the keys **63** and **64** will now be described.

Differential mechanism

The differential mechanism associated with the special keys **63** and **64** adjusts means for controlling the number of printing strokes imparted to the printing hammer **79** during each operation of the machine, as will be hereinafter described.

This differential mechanism includes a differentially movable actuator **80** (Fig. 4) which, through a latch **81** pivoted thereon, is driven first clockwise and then counter-clockwise during each operation of the machine by a driving segment **82** fast on a shaft **83** journaled at its ends in the side frames of the machine. A foot **84** on the latch **81** is constantly held in cooperative relation with the periphery of the segment **82** by a spring **85**. The driving segment **82** receives a constant excursion of movement, first in a clockwise direction and then in a counter-clockwise direction, during each operation of the machine by means hereinafter described.

As the segment **82** is thus rocked clockwise the foot **84** of the latch **81** will, near the end of such movement, be rocked into engagement with a shoulder **86** on said segment by the spring **85**. Then as the segment **82** is returned counter-clockwise to its home position it will, through the engagement of the shoulder **86** with the foot **84**, carry the latch **81** and the actuator **80** along with it until a resilient pawl **87** on said latch strikes either the zero stop pawl **75** or the stem of a depressed key **63** or **64**. When this occurs the pawl **87** is thereby rocked clockwise and causes the latch **81** to be rocked likewise. This disengages the foot **84** from the shoulder **86** and, at the same time, engages a locking projection **88** on said latch with one of a series of notches **89** in a locking plate **90** attached to the frame **65**. The actuator **80** is thus locked in its moved position, while the segment **82** continues its counter-clockwise movement until it reaches its home position. In this manner the actuator **80** is differentially positioned to adjust means hereinafter described for controlling the number of printing strokes imparted to the hammer **79** during each operation of the machine. The means for actuating the driving segment **82** will now be described.

Secured to a main drive shaft **100**, suitably journaled at its end in the machine side frames, is a cam **101** having a cam groove **102** coacting with a roller **103** on an arm **104** pivotally mounted on a rod **105** suitably supported in the machine. The shaft **100** and cam **101** receive one complete rotation in a clockwise direction upon each operation of the machine. When this occurs, the configuration of the groove **102** is such that the cam **101** will rock the arm **104** first counter-clockwise and then clockwise during each operation of the machine. The arm **104** has formed integral therewith a toothed rack **106** meshing with a segment **107** secured to the shaft **83**. It will thus be apparent that when the cam **101** rocks the arm **104** in the manner just described, the latter will, in turn, rock the gear **107**, shaft **83** and driving segment **82** first clockwise and then counter-clockwise.

The differentially movable actuator **80** is returned to its home position during the next succeeding operation of the machine by a surface **93** on the segment **82** coacting with a stud **94** on said actuator when the segment is rocked clockwise.

Printing mechanism

The printing mechanism includes a printing hammer **79** (Figs. 1 and 3) comprised of two arms **111** and **112** interconnected by a cross rod **113** and carrying a platen **117**. The arms **111** and **112** are freely mounted on a shaft **114** suitably mounted in frames **115** and **116**. The means for actuating the printing hammer will now be described.

Pivotally mounted on the shaft **114** (Fig. 1) is a printing hammer actuating arm **125** which is constantly under the tension of a spring **126**. The arm **125** carries a roller **127** which is adapted to coact with lobes **128**, **129** and **130** formed integral with a cam member **131** fast on a shaft **132**. The shaft **132** is journaled at its ends in the side frames **115** and **116** and is given one complete clockwise rotation, through the medium of a train of gears **133** to **137**, inclusive (Fig. 5), by the main drive shaft **100** during each operation of the machine. This likewise causes the cam member **131** to be rotated clockwise and the lobes **128**, **129** and **130** thereof, one after the other, coact with the roller **127** and rock the arm **125** counterclockwise, against the action of the spring **126**. After each lobe clears the roller **127**, the spring **126** acts to rock the arm **125** clockwise. Each of such clockwise movements of the arm **125**, through an edge **138** thereof coacting with a rod **113**, causes the hammer **79** to be rocked upwardly to take an impression from the type wheels. After each impression the hammer **79** returns to its normal position under the action of gravity, where it remains until again rocked upwardly as the result of one of the lobes coacting with the roller **127** on the actuating arm **125**.

After an impression has been made by the ham-

mer 79 from the type wheels, a pawl 145 coacts with a pin 146 on the hammer arm 112 to prevent, in an old and well known manner, any possible rebound of the hammer.

The machine is so arranged that when no key 63 or 64 is depressed the printing hammer 79 will make only one impression. This is accomplished by means which, when the hammer actuating arm 125 is rocked counter-clockwise by the first lobe 128 of the cam member 131, will hold said arm in such rocked position, against the action of the spring 126, until after the lobes 129 and 130 have moved idly past the roller 127, when said means will release the arm 125, whereupon the spring 126 will rock said arm clockwise to impart one printing stroke to the hammer 79. The means for thus holding the arm 125 in its rocked position will now be described.

Secured on a shaft 147 (Fig. 1) is a blocking arm 148 which is adapted to be moved counter-clockwise into the path of a roller 149 on the hammer actuating arm 135, after said arm has been rocked counter-clockwise by the lobe 128, and thus block any clockwise movement of the arm by the spring 126 until the proper time for actuating the hammer 79 to make an impression. The means for controlling the operation of the blocking arm 148 is as follows.

Pinned to the shaft 147 (Fig. 5) is an angular lever 155 which is bifurcated at one end to embrace a stud 156 carried by an arm 157 loosely mounted on the shaft 114. The arm 157 is connected by a sleeve to an arm 158 having a pin 159 engaged by a bifurcated portion of a feeling element 160 pivoted on a stationary stud 161. A spring 162 constantly tends to rock the arm 157 clockwise but is normally prevented from doing so by lever 170 pivotally mounted on a stud 171. The lever 170 carries at one end a stud 172 engaged by another bifurcated portion of the lever 155, while at its other end it has formed a flange 173 and carries a roller 174, said flange coacting with the periphery of a cam 175 secured to the shaft 132.

The cam 175 receives one complete clockwise rotation with the shaft 132 during each operation of the machine. When a shoulder 180 formed on the cam 175 passes by the flange 173, the lever 170 is thus freed to be rocked clockwise, through the lever 155, by the spring 162. When this occurs, the spring 162 rocks the arm 157 clockwise and the lever 155 counter-clockwise. Such counter-clockwise movement of the lever 155 rocks the shaft 147 and blocking arm 148 likewise, thus placing the latter in the path of the roller 149 on the hammer actuating arm 125, thereby blocking it against further operation. When the arm 157 is rocked clockwise as just described, the arm 158 will thereby be rocked likewise and in so doing will rock the feeling element 160 counter-clockwise so that the upper end thereof is in contact with the periphery of a control disk 181.

Near the end of the clockwise rotation of the cam 175 a cam surface 182 thereon coacts first with the roller 174 and then with the flange 173 and cams the lever 170 counter-clockwise to its home position. The roller 174 is provided to reduce friction between the arm 170 and cam 175. Such movement of the lever 170 results in the restoration of the lever 155, arms 157 and 158 and feeling element 160 to their home positions. At this same time the blocking arm 148 is moved clockwise to its home position, thus removing it from the path of the roller 149 to thereby permit the spring 126 to rock the arm 125 clockwise to impart a printing stroke to the hammer 79.

If the special key 63 is depressed, then the differential mechanism controlled thereby will adjust the control disk 181 to cause the printing hammer 79 to make three impressions during an operation of the machine. The manner in which the differential mechanism adjusts the control disk 181 to cause three impressions to be taken from the type wheels will now be described.

The differentially movable actuator 80 (Fig. 4) has formed integral therewith a toothed segment 191 which meshes with a gear 192 loose on a shaft 193 suitably mounted in the frames 115, 116 and 118. Thus when the actuator 80 is differentially positioned under control of the key 63, the segment 191 will rock the gear 192 clockwise a corresponding extent. The gear 192, being connected by a sleeve 194 to a gear 195 (Figs. 3 and 5), will in turn cause the latter to be rotated clockwise a like extent. The gear 195 meshes with a gear 196 which, together with the control disk 181, is secured to a sleeve 197 loose on a shaft 198 mounted in the frames 115, 116 and 118. Such clockwise movement of the gear 195 will accordingly rotate the gear 196 and control disk 181 counter-clockwise to a position where a projection 199 on said disk is directly opposite the upper end of the feeling member 160. From this it will be seen that when the cam 175 releases the lever 170, as hereinbefore explained, to permit the spring 162 to rock the arm 157 clockwise, thereby moving the blocking arm 148 into its effective blocking position, the projection 199 will pervent counter-clockwise movement of the feeling member 160 and, consequently, prevent the spring 162 from rocking the arm 157 clockwise. Thus the spring 162 is prevented from rotating the shaft 147 counter-clockwise and the arm 148 will remain in its normally ineffective position. From this it will be seen that the spring 126 will be free to rock the hammer actuating arm 125 clockwise each time the latter is rocked counter-clockwise by the lobes 128, 129 and 130 on the cam member 131, thus causing the hammer 79 to make three impressions from the type wheels.

On the other hand, if the special key 64 is depressed the differential mechanism will adjust the control disk 181 to cause the printing hammer 79 to make only two impressions. The manner in which this is accomplished is as follows.

Also pivotally mounted on the stud 161 (Fig. 5) is an auxiliary feeling member 205, the upper end of which is normally held in cooperative relation with the periphery of the control disk 181 by a spring 206 connecting said member to the feeling member 160. A lower bent over portion of the member 205 carries a roller 207 which is normally out of the path of a lug 208 on the cam 175. Depression of the key 64 causes the differential mechanism to rotate the control disk 181 counter-clockwise to cause the projection 199 to coact with the member 205 and rock it slightly clockwise, said projection remaining in a position directly opposite the upper end of the member 205 and thus serving to hold the latter in its moved position. Such clockwise movement of the member 205 moves the roller 207 into the path of the lug 208 on the cam 175. When the lobe 128 on the cam member 131 (Fig. 1) rocks the arm 125 counter-clockwise and the shoulder 180 on the cam 175 releases the lever 170 to permit the spring 162 to move the blocking arm 148

into its effective position, as previously explained, thus holding the arm 125 in the position in which it has been rocked by the lobe 128, no impression will be made by the hammer 79. However, after the lobe 129 has passed idly by the roller 127, the lug 208 will coact with the roller 207 and cam the latter further clockwise until said roller coacts with the flange 173 on the lever 170 and rocks the latter counter-clockwise. Such counter-clockwise movement of the lever 170 causes the arm 148 to be returned to its normal ineffective position, thus releasing the arm 125, under the action of the spring 126, to actuate the hammer 79 to take an impression from the type wheels. As the lug 208 clears the roller 207 the spring 162 again rocks the lever 170 clockwise and the shaft 147 counter-clockwise, thus tending to rock the arm 148 again into its effective blocking position with relation to the roller 149. However, the arm 125 being at this time in its home position, the upper side of the arm 148 merely contacts the under side of the roller 149 and has no effect on the arm 125. Before the third lobe 130 on the cam member 131 becomes effective, the cam surface 182 on the cam 175 coacts with the flange 173 to return the lever 170 and, consequently, the blocking arm 148 to their home positions, so that the lobe 130 can coact with the roller 127 and rock the arm 125 counter-clockwise in the manner previously explained, after which the spring 126 will rock the arm 125 clockwise to cause another impression to be taken from the type wheels by the hammer 79.

Record material feeding mechanism

Feeding mechanism, constructed along lines old and well known in the art, is provided for feeding an inserted slip during the intervals between the different strokes of the printing hammer 79 during each operation of the machine. This mechanism will now be described.

Pivotally mounted on the shaft 114 is an arm 215 (Figs. 2 and 3) carrying two rollers 216 and 217 cooperating with a pair of cams 218 fast on the shaft 132. The arm 215 is provided with a laterally projecting pin 220 which extends through a slot 221 formed in an arm 222 also pivotally mounted on the shaft 114. The arm 222 is connected by a sleeve to a companionate arm (not shown), both carrying a rod 223 having loosely mounted thereon two rotatable feeding segments 224. The two segments 224 are connected together by a sleeve 225 so that they will operate as a single unit. A spring 226 also serves to connect the arm 215 with one of the support arms 222.

When the shaft 132 is rotated clockwise, as heretofore mentioned, the cams 218 thereon rock the arm 215 slightly clockwise. When this occurs, the arm 215, through the medium of the spring 226, moves the supporting arms 222 clockwise, thereby raising the feeding segments 224 until they extend through an opening 227 in a record material carrying table 228. The segments 226 will then cooperate with a pair of anti-friction rollers 229, loose on a stationary stud 230, to feed an inserted slip or other form of record material at the proper time.

Before being raised to their effective feeding positions, the feed segments 224 are rocked clockwise preparatory to performing their feeding function. The means for thus rocking the segments will now be described.

A cam 236, fast on the shaft 132, is provided with a cam groove 237 which coacts with a roller 238 on an angular lever 239 pivoted on a pin 240 mounted in the frame 116. The lower portion of the lever 239 is provided with an elongated slot 241 and is connected to another lever 244 also having formed therein an elongated slot 243. A bolt 242 extends through both of the slots 241 and 243 to connect the two levers 239 and 244 together, said bolt being clamped by nuts (not shown) in one of said slots. One arm of the lever 244 is connected by a link 246 to one of the feed segments 224.

Prior to raising the feeding segments 224 to their effective feeding position, the lever 239 is rocked clockwise by the cam groove 237 in the cam 236. Said lever 239, by means of the bolt 242, rocks the lever 244 and, at the same time, the feed segments 224 clockwise, thus moving the segments to their initial feeding position, after which said segments are raised to their effective positions, as before explained.

Before the counter-clockwise feeding movement of the segments 224 is begun, the printing hammer 79 is permitted to make a first impression. The roller 238 then coacts with an eccentric portion of the cam groove 237 and, through the medium of the parts 239, 242, 244 and 246, rocks the feeding segments 224 counter-clockwise sufficiently to feed the record material one step of movement. The printing hammer 79 is then again permitted to make a second impression before the record material is given a further feeding movement by the segments 224. After such second impression, the roller 238 coacts with another eccentric portion of the cam groove 237 to cause the feed segments 224 to rock counter-clockwise to their home positions, as viewed in Fig. 2, and while doing so feed the record material another step of movement. The printing hammer 79 is then permitted to make a third impression before the cams 218 cause the segments 224 to be lowered to their normal positions, out of cooperative relation with the anti-friction rollers 229, thus releasing the inserted record material to be withdrawn from the machine.

Since the construction and operation of the invention has been fully explained in connection with different operations in which the printing hammer 79 effects each of the different number of impressions of which it is capable during an operation of the machine, it is thought that a further description of the operation of the machine would only amount to repetition.

While the form of mechanism herein shown and described is admirably adapted to fulfill the objects primarily stated, it is to be understood that it is not intended to confine the invention to the one form or embodiment herein disclosed, for it is susceptible of embodiment in various forms all coming within the scope of the claims which follow.

What is claimed is:

1. In a machine of the class described, the combination of type wheels; a single printing hammer for making impressions therefrom; a retractable actuating member for said hammer; an element for normally retracting and releasing said member a plurality of times during an operation of the machine; and means for selectively holding said retractable actuating member in retracted position, out of cooperative relation with said element to thereby cause said hammer to make a variable number of imressions.

2. In a machine of the class described, the combination of type wheels; a single printing

hammer for making impressions therefrom; a spring-tensioned retractable actuating member for said hammer; an element for normally retracting and releasing said member a plurality of times during an operation of said machine; manipulative devices; and means under control of said devices for selectively holding said actuating member retracted in spring-tensioned position and out of cooperative relation with said element to thereby cause said hammer to make a variable number of impressions.

3. In a machine of the class described, the combination of type wheels; a single printing hammer for making impressions therefrom; a retractable actuating member for said hammer; a spring to actuate said member from its retracted position; an element for normally retracting said member a plurality of times during an operation of said machine; manipulative devices; a control disk adjustable under control of said devices; and means under control of said disk for selectively holding said actuating member in its retracted position out of cooperative relation with said element to thereby cause said hammer to make a variable number of impressions.

4. In a machine of the class dsecribed, the combination of type wheels; a single printing hammer for making impressions therefrom; an actuating member for said hammer; an element for normally operating said member a plurality of times during an operation of said machine; manipulative devices; a differential mechanism adapted to be set under control of said devices; a control disk differentially adjusted by said mechanism; means normally ineffective but adapted to be rendered effective to selectively hold said actuating member out of cooperative relation with said element to thereby cause said hammer to make a variable number of impressions; and a pair of feeling members which coact with said disk to determine the effectivity of said means.

5. In a machine of the class described, the combination of type elements; a single printing hammer for making impressions therefrom; a resilient actuating arm for said hammer; a roller on said arm; a cam for normally coacting with said roller a plurality of times to operate said arm a like number of times during an operation of said machine; a second roller on said arm; and means for selectively coacting with said second mentioned roller to hold said arm in a position where said first mentioned roller is out of cooperative relation with said cam to thereby cause the hammer to make a variable number of impressions.

6. In a machine of the class described, the combination of type wheels; a single printing hammer for making impressions therefrom; a resiliently operable retractable actuating member for said hammer; an element for normally moving said member into retracted position a plurality of times during an operation of said machine; a cam; and means controlled by said cam for selectively holding said actuating member in retracted position out of cooperative relation with said element to thereby cause said hammer to make a variable number of impressions.

7. In a machine of the class described, the combination of type wheels; a single printing hammer for making impressions therefrom; an actuating member for said hammer; an element for normally operating said member a plurality of times during an operation of said machine; manipulative devices; an actuator adapted to be differentially positioned under control of said devices; a control disk rotatably adjusted by said actuator; a cam; means controlled by said cam for holding said actuating member out of cooperative relation with said element to prevent operation of said hammer; and a pair of feeling members each of which is adapted individually to coact with said disk to alter the control normally exercised by said cam over said means to selectively control the operation of said hammer to make a variable number of impressions.

ERNST BREITLING.
ERICH WAGNER.