Feb. 19, 1957 J. J. MADDEN ET AL 2,781,846

PUNCH SELECTOR

Filed Jan. 7, 1954 5 Sheets-Sheet 1

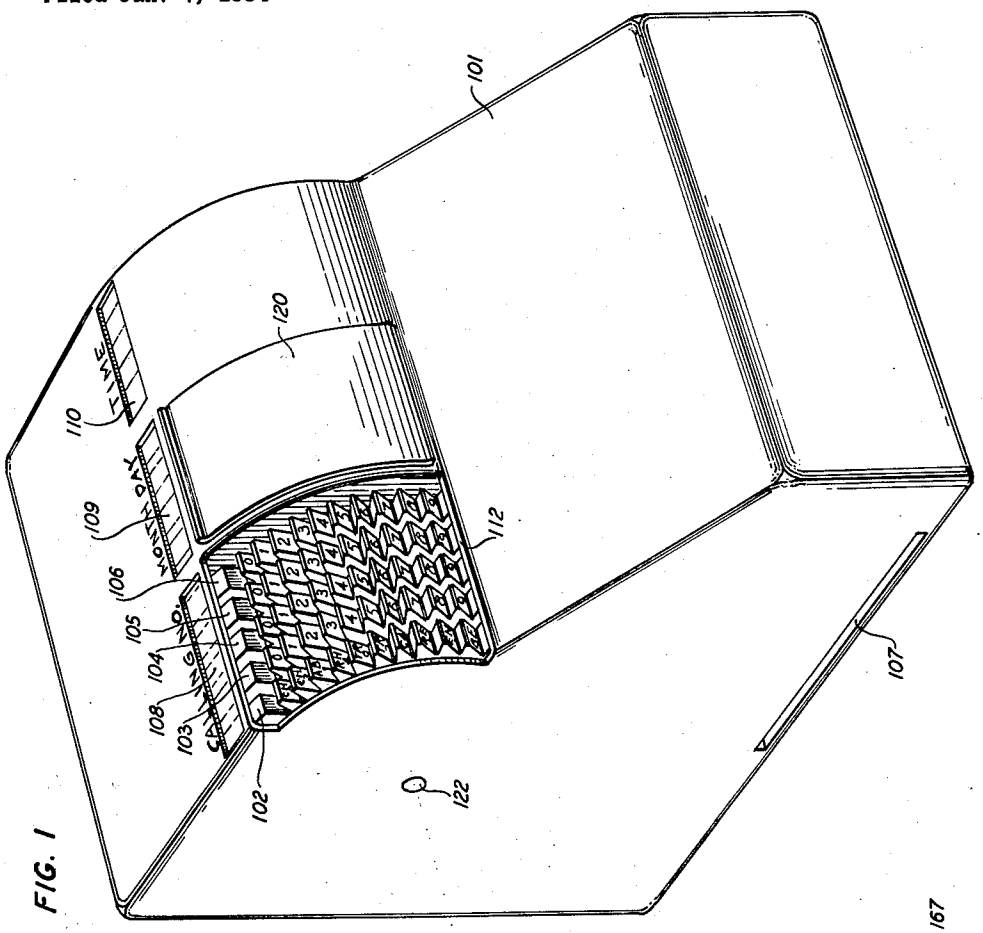

FIG. 1

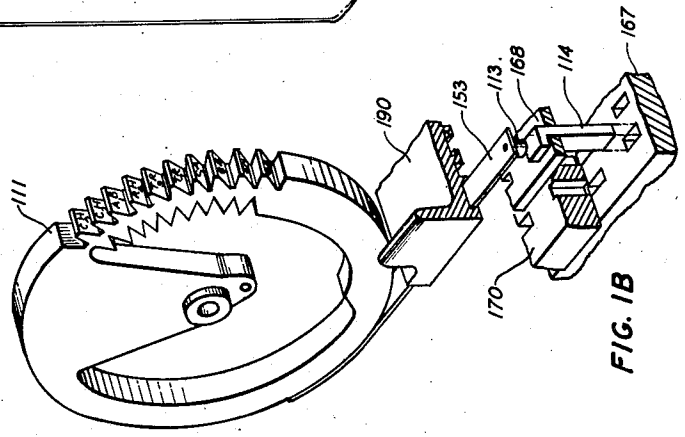

FIG. 1A

FIG. 1B

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Feb. 19, 1957 J. J. MADDEN ET AL 2,781,846

PUNCH SELECTOR

Filed Jan. 7, 1954 5 Sheets-Sheet 2

FIG. 2

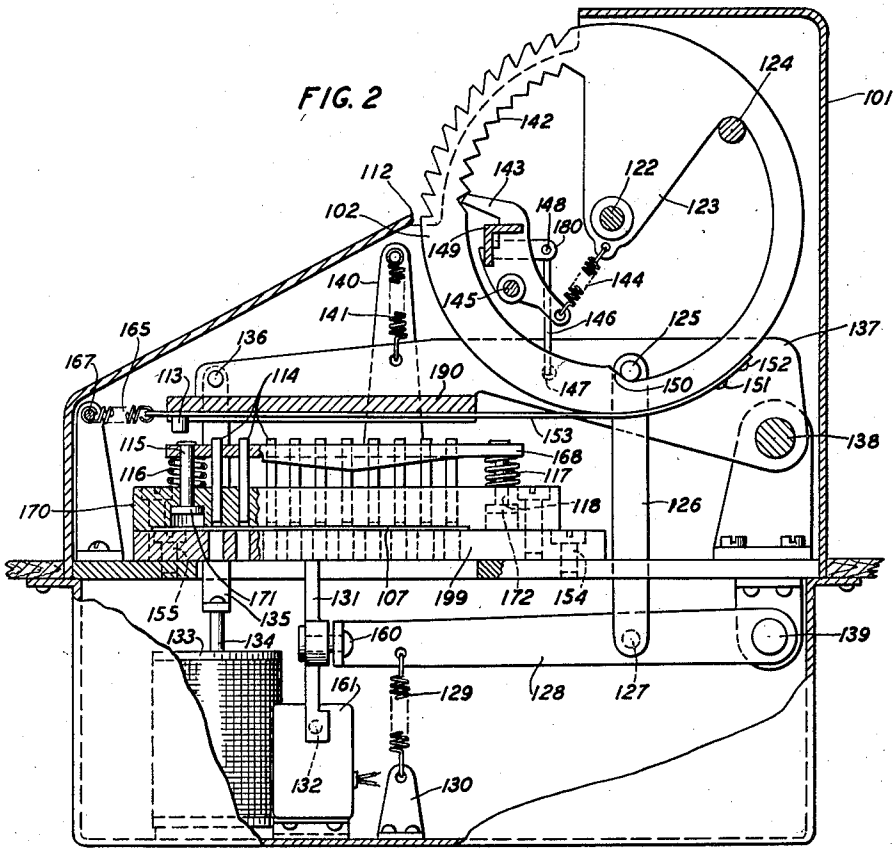


FIG. 7

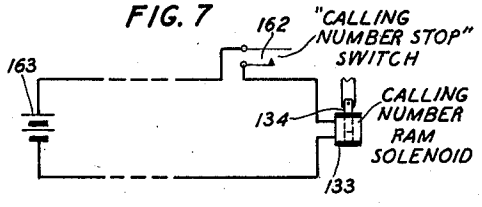


FIG. 8

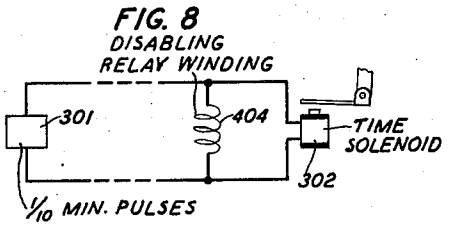
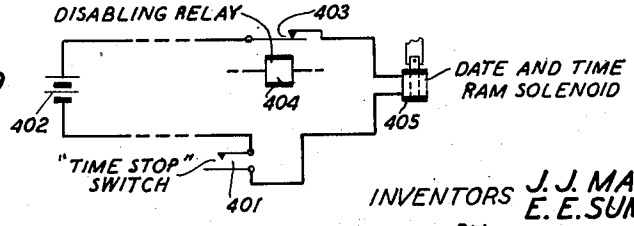


FIG. 9



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Feb. 19, 1957 J. J. MADDEN ET AL 2,781,846

PUNCH SELECTOR

Filed Jan. 7, 1954 5 Sheets-Sheet 3

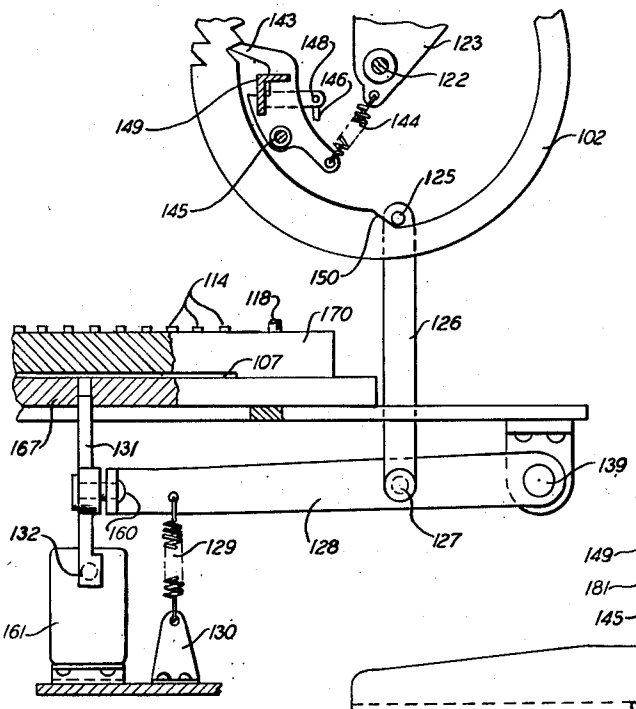

FIG. 3

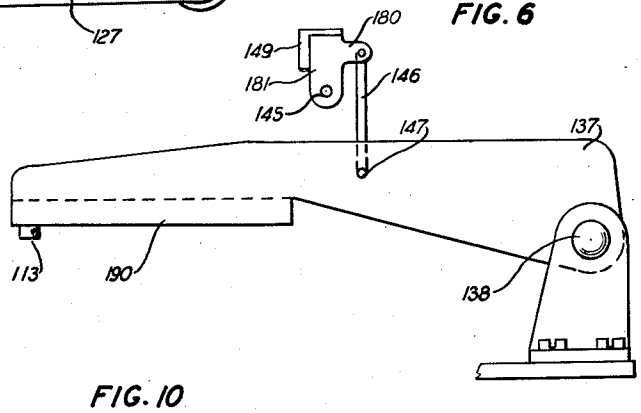

FIG. 6

FIG. 10

FROM		FOR ACCOUNTING USE	TIME ENTRIES				CALLING NUMBER				
3 (TC) NEW YORK, N.Y.			MONTH	DAY	HOUR	MINUTE					
PERSON		0 0 0 0 0	0 0	0 0	0 0	0 0	CH2	0	0	0	0
PLACE	TO STATE	1 1 1 1 1	1	1	1	1	CH3	1	1	1	1
COLLECT	TEL. NO.	2 2 2 2 2	2 2	2 2	2 2	2 2	AB1	2	2	2	2
	PERSON	3 3 3 3 3	3 3	3 3	3 3	3 3	RH1	3	3	3	3
ACCEPTED	ADDRESS NAME	4 4 4 4 4	4 4	4 4	4 4	4 4	TR9	4	4	4	4
TERM VIA	OPERATOR	5 5 5 5 5	5 5	5 5	5 5	5 5	TR7	5	5	5	5
FIRST ROUTE	MESSENGER	6 6 6 6 6	6 6	6 6	6 6	6 6	CA1	6	6	6	6
ALT. ROUTE	CLASS	7 7 7 7 7	7 7	7 7	7 7	7 7	RE7	7	7	7	7
		8 8 8 8 8	8 8	8 8	8 8	8 8	EN2	8	8	8	8
		9 9 9 9 9	9 9	9 9	9 9	9 9	BE2	9	9	9	9

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PUNCH SELECTOR

Filed Jan. 7, 1954 5 Sheets-Sheet 4

FIG. 4A

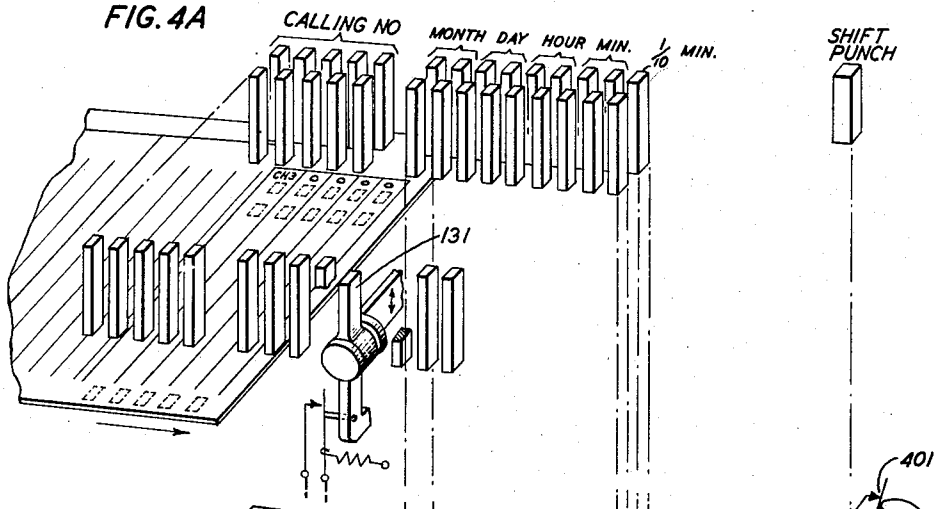


FIG. 4B

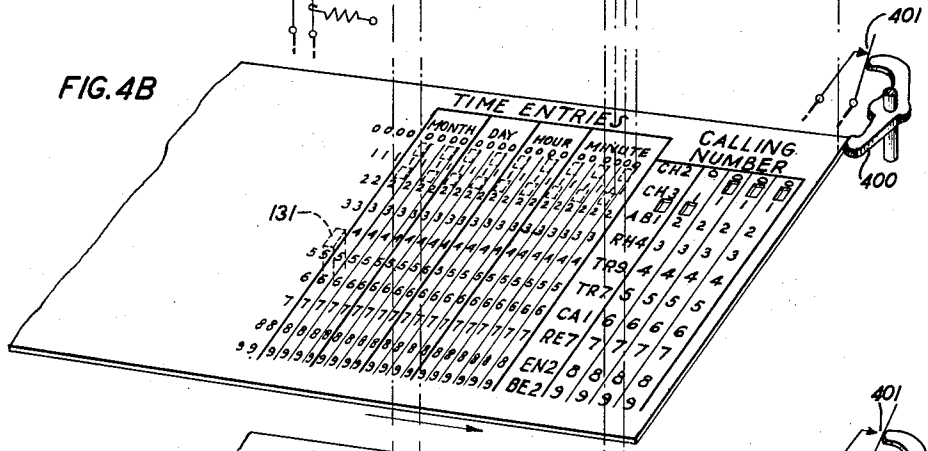
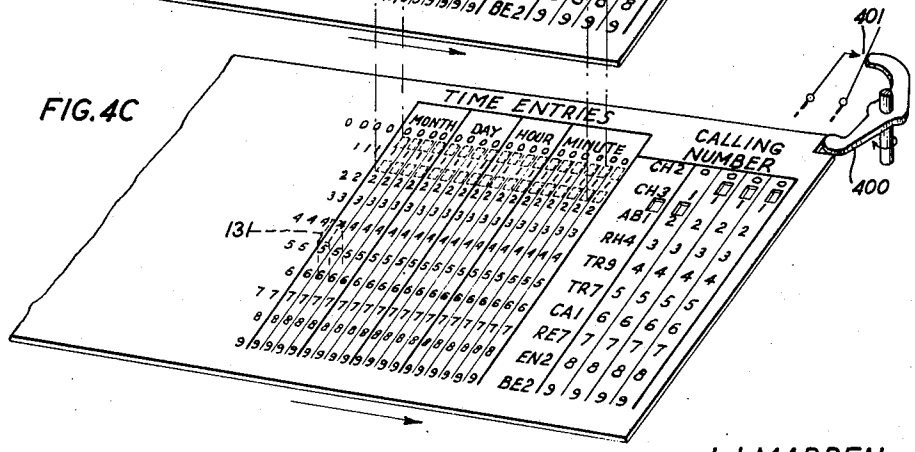


FIG. 4C



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Feb. 19, 1957 J. J. MADDEN ET AL 2,781,846

PUNCH SELECTOR

Filed Jan. 7, 1954 5 Sheets-Sheet 5

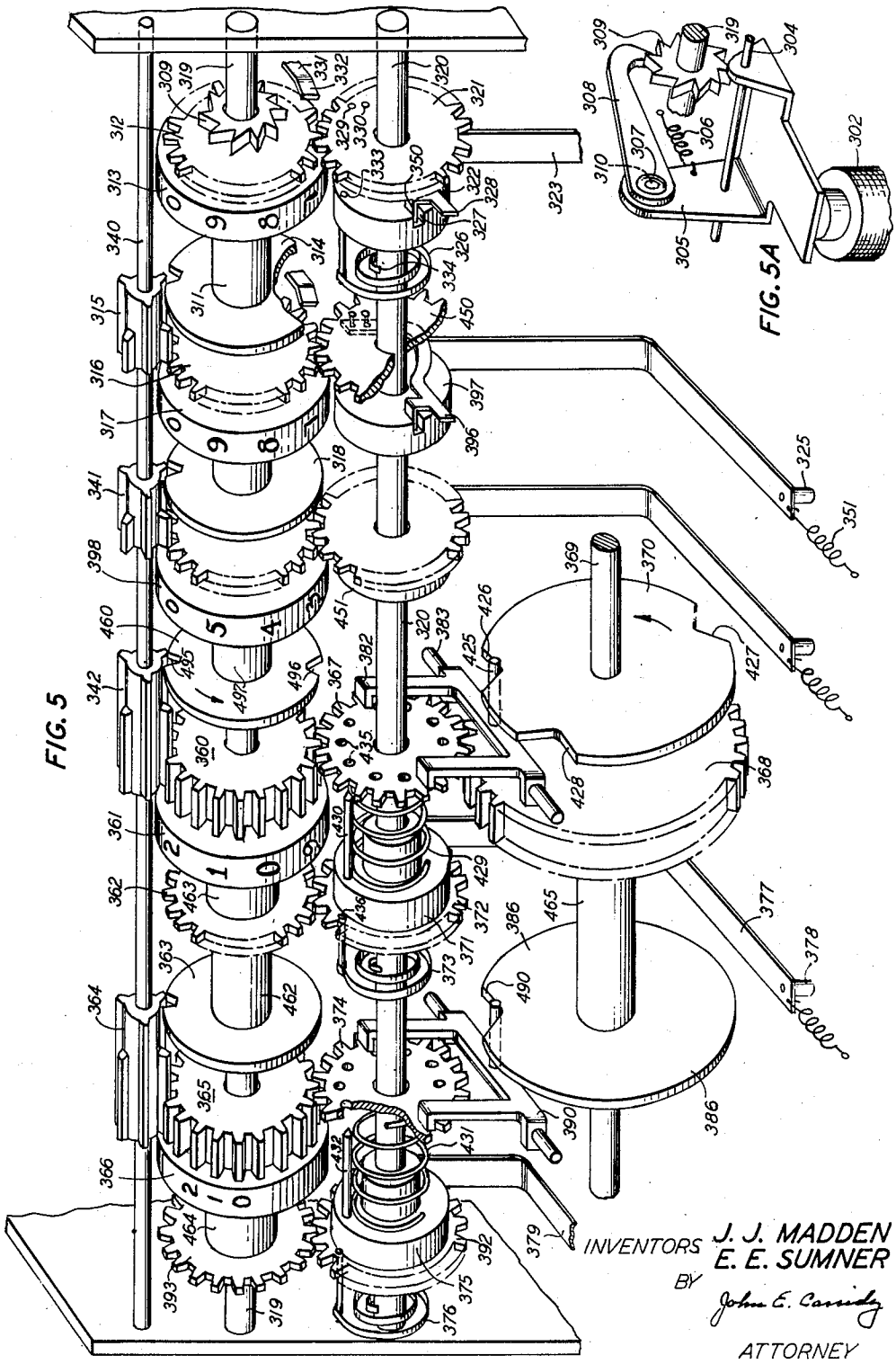

FIG. 5

FIG. 5A

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United States Patent Office 2,781,846 Patented Feb. 19, 1957

2,781,846

PUNCH SELECTOR

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Application January 7, 1954, Serial No. 402,799

4 Claims. (Cl. 164—112)

This invention relates to a selecting and recording device and more particularly to an arrangement wherein any of a plurality of symbols may be selected and recorded by perforating, printing or otherwise marking a record. An object of the invention is the improvement of selecting and recording devices. A more particular object of the invention is the simplification of a selecting and recording device with a view to reducing the expense thereof.

There are presently known in the art many devices for selecting and recording symbols. There is need, however, for a relatively sturdy device to perform these functions, which device will give reliable service of long duration and nevertheless be so designed as to permit of its manufacture in quantity relatively inexpensively. In the manufacture of mechanical perforators by which a card or a continuous tape is perforated to afford a record of a transaction, the selecting mechanism, by means of which the perforators identifying the characters are set into position, prior to perforating or stamping the record, almost invariably is a system involving a plurality of linkages which requires considerable effort and expense to manufacture, assemble, adjust and maintain. In any selecting device, wherein a number of symbols, or code elements identifying symbols, are required to be perforated, printed or otherwise recorded simultaneously, the number of selecting elements required may become relatively numerous. In a selector-recording device having means for selecting and perforating a plurality of areas of a record simultaneously, since the selecting mechanism for selecting the individual elements or symbols is the most numerous of the elements in the device, simplified selecting mechanism, in which the elements comprising the individual selectors are minimized, will effect corresponding economies.

A feature of the present invention is a unique selecting mechanism for effecting the selection of the element which is to perform the perforation or print or stamp the desired symbol from an array of such elements.

In the present arrangement, instead of a system of linkages, such as are normally employed in a mechanical selecting and recording device, the selection is performed by actuating a rotatable selecting wheel from a normal position of rest to a predetermined stop or selecting position to determine the character to be perforated or recorded and, in response to the rotation, winding a flexible element, such as a short section of tape, a string, a strand, a band or a filament of metal, fiber, or plastic, for instance, onto the selecting wheel for a length proportional to the rotation of the rotatable element and thereby displacing an interposer element, secured to the free end of the tape, to a particular one of a number of selecting positions, to effect the selection of the perforating, printing or other recording element, from an array of such elements.

The selecting and recording device of the present invention may be employed to produce a perforated, printed or otherwise stamped record in a wide variety of

forms, for any of a large number of purposes. In one preferred embodiment, it may be employed, for instance, to record the calling number of a calling subscriber in a communication system together with other pertinent information, as a part of an accounting record of a transaction involving the usage of communication facilities.

The invention may be understood from the following description when read with reference to the associated drawings which taken together disclose a preferred embodiment of the invention. In the drawings:

Fig. 1 shows in perspective the selecting recording device of the present invention in assembled form;

Fig. 1A shows in perspective a single selecting code wheel, the flexible tape secured to the wheel and the interposer block secured to the free end of the tape, together with a single punch and the punch retractor;

Fig. 1B shows a die and guide plate assembly;

Fig. 2 shows an end view, partially in section, with a portion of the casing removed;

Fig. 3 is an end view, partially in section, showing the calling number card-stop mechanism;

Figs. 4A, 4B and 4C are perspective views of the card-stop calling number, answer time and disconnect time switches;

Fig. 5 is a perspective view showing the time selector mechanism;

Fig. 5A is a perspective view showing the solenoid for controlling the time selector mechanism;

Fig. 6 is an end view showing the calling number code wheel restoring mechanism;

Fig. 7 is a circuit diagram showing the calling number stop switch and the calling number ram solenoid circuit;

Fig. 8 is a circuit diagram showing tthe time solenoid circuit;

Fig. 9 is a circuit diagram showing the time stop switch, the time and the ram solenoid and the disabling relay circuit; and

Fig. 10 is a plan view of a card which is perforated by the present device.

Refer now to Figs. 1, 1A and 1B, a description of which will serve as an introduction to the detailed description that follows:

Fig. 1 shows a casing **101** which is employed to cover the selecting and recording mechanism of the present invention. Within the casing are mounted three different sets of selecting and perforating elements, one which may be employed to identify the calling subscriber's central office and directory number, for instance, has five selecting wheels **102**, **103**, **104**, **105** and **106**. The periphery of each selecting wheel is provided with a number of serrations, such as ten for instance, in a section which constitutes approximately a 90 degree segment of the wheel. The first wheel at the left, wheel **102**, is employed to identify the communication central switching office to which the subscriber is directly connected. Each one of the serrations on wheel **102** will be designated with a symbol identifying a different one of ten central communication switching offices, for instance. The next four selecting wheels, wheels **103**, **104**, **105** and **106**, reading from left to right, are employed to designate the calling subscriber's directory number which, it is assumed, is a four-digit number. Each one of these selecting wheels has ten serrations and the serrations on each individual wheel are numbered from 0 to 9. Thus the five selecting wheels permit the identification of any line numbered from 0 to 9999 in any of ten different offices.

The serrations in each selecting wheel are formed so as to permit the rotation of each wheel downwardly by means of an operator's finger, pencil or actuating device, from its normal position of rest to a stop position determined by the lower edge **112** of the casing

opening. Depending upon the location on the particular selecting wheel of the central office symbols and the calling number, thousands, hundreds, tens and units digit to be identified, the operator will actuate each of the five wheels from its normal position of rest through a defining limited arc to the stop position. In response to this, the individual flexible tape attached to each selecting wheel will be displaced by being drawn through a horizontal slot such as shown in guide block **190**, and wound onto the wheel for a distance equal to the length of the arc through which the periphery of the selecting wheel is rotated. Secured to the free end of the tape is an interposer block, such as **113**, which will be displaced from a normal position of rest through a corresponding distance and positioned over a particular one of a group of ten punches, only one, **114**, of which is shown in Fig. 1A. Each of the five selecting wheels employed to designate a calling subscriber's office and directory number will be operated in turn to position the five interposer blocks to completely identify the central office and the directory number of the calling subscriber. Each wheel is locked in its stop position in a manner to be described. At this juncture, each interposer block associated with each one of the five selecting wheels will be in individual vertical alignment with a particular one of ten punches associated individually with each wheel. Each group of ten punches is fixed in alignment in the path of its respective interposer as the flexible tape is wound on the code wheel.

Next the card, a plan view of which is shown in Fig. 10, is inserted in the card slot or rectangular aperture **107**. Reference to Fig. 10 indicates that the right-hand end of the card is to be perforated to identify the calling number. A stop is interposed in the path of the card, in a manner to be described, as it is inserted in aperture **107**, in such a position that the five columns of the card identifying the central office and directory number of the calling subscriber are in proper alignment with the corresponding punches. A calling number stop switch will thereupon be closed, energizing a calling number ram solenoid, which will actuate a ram, which in turn will actuate the individual interposers connected to each one of the five selecting wheels, to perforate a particular area in each of five columns of the card to identify the central office and the directory number of the calling subscriber. All of this will be described in detail hereinafter.

Window **108** is provided in casing **101** to afford means for checking that the calling number selecting wheels have all been rotated into the proper position to permit correct perforation of the card. Consonant with this, local areas, such as **111**, Fig. 1A, of the periphery of each selecting wheel are stamped, or otherwise designated, so that as each wheel is rotated to the stop position, a symbol identifying the symbol which will be punched, as a result of the selection effected by each selecting wheel, will be simultaneously rotated into position in registry with window **108**, so that the calling number, which has been set up by the selector, may be read on the selecting wheels through window **108** by the operator. Other windows **109** and **110** permit checking of the month, day and time selectors, to be discussed hereinafter.

In the present embodiment it is contemplated that the card per Fig. 10, as mentioned heretofore, will afford an individual record of a transaction, such as the usage of communication facilities by a subscriber in a communication system, a record of a toll call, for instance. The information afforded by the card is the identification of the central office to which the subscriber is connected, the directory number of the subscriber who has made the call, the date on which the call was made, the time of starting the call, the time of completing the call and the city, central office and directory number of the called party together with certain other pertinent items. The card is divided into three sections. The left-hand section is adapted for recording thereon certain of these items which will be written or typed thereon by the operator. The middle section is reserved for accounting purposes. The right-hand portion of the card is the only portion thereof with which we are presently concerned. In it are perforated areas defining the month, day, hour, minute and tenth of a minute when the call started, the month, day, hour, minute and tenth of a minute when the call terminated, the identity of the central station to which the calling subscriber station is directly connected and the directory number of the calling station.

The perforating of the card per Fig. 10, in the preferred embodiment, is performed in three steps. The identity of the central station and the directory number of the calling subscriber are first punched. The card, as mentioned, when first inserted engages a stop, which controls a microswitch, which in turn controls a solenoid, which actuates a ram, which engages the code wheel interposers and the code wheel interposers actuate the selected punches.

Reference to the section of the card per Fig. 10 under the heading Calling Number shows that in the left-hand column there are ten sets of three symbols each, each set of three symbols, such as CH2, CH3, AB1, etc., identifying a different central office. The corresponding interposer will be positioned so as to effect the selection of a punch which perforates a small rectangular area immediately below the symbols designating the central office involved. In Fig. 10, the small rectangle, immediately below the symbols CH3, represents a perforation and indicates that the subscriber making the toll call is directly connected to the Chelsea 3 office. The rectangle below the numeral 1 in the thousands column and the rectangles below the 0 in each of the hundreds, tens and units columns indicate that the subscriber's directory number is 1000. Therefore the whole designation is Chelsea 3-1000.

In the present embodiment the selector recorder, as mentioned, is arranged to perforate also areas indicating the month, day, hour, minute and tenth of a minute of answer time and the month, day, hour, minute and tenth of a minute of disconnect time. In order to do this, nine other sets of punches, and individual sets of selecting elements therefor, are provided. Each of the nine other sets is used twice, once to punch the answering time and once to punch the disconnect time. The card is provided with eighteen columns in which this information is perforated. Each of the nine columns allocated to starting time is alternated with a corresponding one of the nine columns allocated to terminating time with the starting column on the right of each pair and the terminating column on the left. Reference, for instance, to the columns allocated to recording the month on the card shows that there is a total of four columns assigned to this purpose. There are twelve months to be defined and two columns are assigned to the month of starting and two to the month of terminating a connection. Ordinarily, it is to be understood that, except at the end of a month, the month of starting and the month of terminating a toll connection will be the same. Of the four columns under the heading Month, the second and the fourth columns from the left are assigned to the starting month and the first and the third columns from the left are assigned to the terminating month. There is a perforation under the numeral 0 in each of the second and first columns under the heading Month and another perforation under the numeral 4 in each of the fourth and third columns indicating that the connection was started and terminated in the fourth month of the year. If the transaction occurred in the eleventh or twelfth month it would be indicated by a perforation under the numeral 1

in the first and second columns and another perforation under the 1 or the 2, respectively, in the third and fourth columns. And, in general, in defining the month, day, hour and minute, since each requires a numeral in the tens position of a two-digit number for complete definition, two sets of counting wheels and selecting elements are required in each instance.

The selector recorder mechanism for the month and day, as indicated in Fig. 1, is located in the middle portion of the selector recorder. The mechanism for the time, that is hours, minutes and tenths of minutes, as indicated in Fig. 1, is located in the right-hand portion of the selector recorder.

It is contemplated that the selector wheels controlling the punches, defining the month and day, will be set manually, once per month and once per day, respectively. An opening in casing **101** to afford access to these code wheels is provided with a readily demountable cover **120**, which may be adapted to be secured in position to cover the opening in any convenient manner, as by a formed spring catch, not shown.

The time selector mechanism will be controlled by a clock supplying impulses to a solenoid once every six seconds, or tenth of a minute, which in turn controls a cumulative time counter and indicator through proper gearing and a system of selectors and punches and a ram generally corresponding to those employed for the calling number identifier.

Refer to Figs. 4A, 4B and 4C. After punching the calling number information, the desired toll connection is established and, at the moment when the toll call is answered by the called party, the card per Fig. 10 is again inserted in aperture **107**. The stop which fixed the card in position for punching the calling number information will have been withdrawn, in a manner to be described, and a second stop, in the path of the card in the aperture **107**, will fix the card in position with the proper columns in alignment with the selected month, day, hour, minute and tenth of minute punches so that the answer time information may be perforated in the odd numbered columns, counting from right to left, of all of the time entries. Simultaneously, a small area of the card immediately adjacent the second stop will be notched to permit the subsequent insertion of the card for an additional distance equal to the width of a single column when the disconnect time is punched. When the toll circuit is disconnected the card will be inserted a third time a distance equal to the length of the second insertion plus a further short distance equal to the width of the notch, which corresponds to the width of the single column. This permits perforations of the disconnect time, month, day, hour, minute and tenth of minute in the even numbered columns of the time entries and effects perforation of directly comparable data in adjoining columns of all of the time entries to facilitate the computation of the elapsed time.

Refer now to Fig. 2. In Fig. 2 the central office wheel **102** is shown mounted on shaft **122**. Most of the internal area of the wheel has been cut away leaving a substantially circular rim portion and a wedge-shaped radial section **123** which is provided with an axial aperture to permit mounting on shaft **122**. In substantially radial alignment with the ten serrations on the periphery of the wheel are ten serrations **142** on the inner surface of the rim. Mounted on a shaft **145** is a detent **143** arranged to engage with the serrations **142**. A helical spring **144** connects a lower projection on the detent with an extension of the wedge-shaped portion **123** of the wheel. In the normal position the spring is distended tending to rotate detent **143** in a counterclockwise direction about shaft **145** and urging the upper left-hand extremity of detent **143** into engagement with the lowest of the serrations **142**. As wheel **102** is actuated in a counterclockwise direction by the operator, when a selection is to be made, detent **143** is actuated to follow the contour of the serrations under the influence of spring **144** and wheel **102** will be locked by the detent **143** in the position to which the wheel **102** is actuated.

The inner surface of the rim of wheel **102** has a short section **150** of its surface inclined upwardly from right to left to form a cam, and the incline is disposed so that it is just to the left of follower **125** of link **126** when wheel **102** is in the stop position. The lower end of link **126** is secured to lever **128** through pin **127**. As motion is first imparted to wheel **102**, by the operator, follower **125** rises along cam **150** and thereafter remains stationary in its elevated position. Arm **128** pivoted at **139** is rotated clockwise in a limited arc responsive to the elevation of follower **125** through link **126** and pin **127**. The left extremity of arm **128** is bent forwardly at right angles and is perforated to secure therein a short shaft **160**. The shaft projects through an aperture in the middle portion of calling number stop lever **131**. As arm **128** is raised, stop lever **131** is projected through an aperture in die **199** for a short distance into card slot **107** in the path of the card and in position to stop the card when the columns thereon allocated to the calling number are in registry with the proper punches. Stop **131** is rotatable through a limited arc about shaft **160**. The lower end of stop **131**, responsive to the rotation of stop **131**, upon engagement with the card, actuates element **132** of microswitch **161**.

Refer now to Fig. 7. Upon engagement of the lower section of stop **131**, with element **132** of microswitch **161**, contact **162** in Fig. 7 is closed energizing the calling number ram solenoid **133** from a source of potential **163** and drawing solenoid core **134**, Fig. 2, downwardly. The solenoid core **134** is secured to bar **135** and through pin **136** to ram **137** which is pivoted on shaft **138**. The ram **137** is attached to helical spring **141** secured to vertical riser **140**. As the solenoid **133** is energized, ram **137** is rotated in a counterclockwise direction about shaft **138** against the tension of spring **141**.

The metallic tape or string **153** may be secured to wheel **102** by means of screws **151** and **152**. When wheel **102** was actuated to effect a selection, interposer **113**, secured to the free end of metallic tape **153**, was displaced from its extreme left-hand position into a position in alignment with a particular one of the ten punches, such as **114**, dependent upon the distance through which wheel **102** was actuated. Ram **137** is provided with guide block **190**, having an individual slot or guide channel for each tape **153**, within which the movement of tape **153** is restricted. The left-hand end of tape **153** is normally urged toward the left under the influence of spring **165** which is secured to pin **167**.

As the ram descends, the interposer **113** engages the selected punch and forces it through an area of the card and into the opposed die in die block **199** which is provided with ten dies in registry with the ten selectable punches. Punch restorer **168** is mounted on two guides **115** and **118** which project into guideways in the punch guide block **170**. The guides have enlarged heads **171** and **172** which are displaceable in counterborings at the lower ends of the guideways and limit the upward motion of punch restorer **168**. Punch restorer **168** is normally urged upwardly by helical springs **116** and **117** through axial openings in which guides **115** and **118**, respectively, protrude. When the perforation has been completed and the solenoid is deenergized, ram **137** is restored to its normal position under the influence of spring **141** and the punch which has been actuated will also be restored to its normal position as punch restorer **168** is elevated under the influence of springs **116** and **117**.

It is to be understood that each of wheels **103**, **104**, **105** and **106** will also be mounted on shaft **122**. Each will be provided with an individual metallic tape such as **153** and an interposer such as **113**. The ram **137** will

be common to all five code wheels and will actuate the five interposers simultaneously. Each wheel will be equipped with an individual detent, such as 143, and an individual spring such as 144. The five detents will all be mounted on shaft 145. There will be an individual group of ten punches associated with each wheel. The punch restorer 168 is preferably common to all of the five groups of punches. The single solenoid 133 operates the common ram 137 and a single card-stop mechanism will be required for the calling party identifying mechanism. Wheel 102, which identifies the central station of the calling subscriber, will always be actuated when any calling subscriber is to be identified and, therefore, wheel 102 only need be provided with the camming surface 150 to control a card-stop mechanism associated with the calling number identifying mechanism.

The calling number mechanism is provided with means for restoring the selector wheels and the interposers to normal upon completion of the punching operation. This may be understood from reference to Fig. 2 and Fig. 6. Secured to ram 137 by pin 147 is a lever 146 which is in turn attached through pin 148 to a horizontal arm 180 and a vertical arm 181 integral therewith. The vertical arm has an aperture therein by means of which it may be rotated about shaft 145. A horizontal element 149, of right-angle section, is integral with elements 180 and 181. Element 149 is provided with a series of five notches in both its horizontal and vertical portions, into which the five detents, such as detent 143, project, as indicated in Fig. 2, to maintain the detents securely in position. When ram 137 is drawn downwardly by solenoid 133, the common detent release mechanism is rotated clockwise about shaft 145 moving each detent in a clockwise direction away from engagement with serrations 142 in the five selecting wheels which they have been locking in position. Wheels 102 to 106 will thereupon be rotated in a counterclockwise direction under the influence of their respective springs, such as spring 144, until the motion of each wheel is arrested by common stop 124. When the ram is raised, lever 146 will rotate the detent control mechanism in a counterclockwise direction about shaft 145 and the detents will be restored to their normal positions of rest.

The units and tens day punches and the units and tens month punches, as explained, are selected by removing cover 120 and actuating the day-selecting wheels manually once a day and the month-selecting wheels once a month. The serrations such as 142 and the cooperating detent for these selecting wheels are arranged in such manner that the selecting wheels may be actuated in either direction to any required position, the detent serving only to hold the wheels in the selected position against the force applied through the spring such as 165 to the free end of the tape such as 153. The cam surface 150, link 126, and the card-stop mechanism, together with the mechanism controlled through lever 146, which actuates the detents to permit the selecting wheels for the month and day selectors to restore to normal are not required.

Refer now to Figs. 5 and 5A which show, in perspective, the tenth of minute, unit minute, tens of minutes, unit hours and tens of hours selectors and to Fig. 8 which shows the time solenoid circuit. A clock 301, Fig. 8, controls the transmission of a voltage pulse every tenth of a minute to the time solenoid 302 and the winding of the disabling relay to be described hereinafter. The time solenoid rotates bell crank 305 counterclockwise in a limited arc about fixed shaft 304 against the tension of helical spring 306. The limited rotation is imparted through shaft 307, secured to the vertical arm of bell crank 305 and translated into reciprocating motion of pawl 308, which is apertured at 310 to accommodate shaft 307. The pawl 308 at its right-hand end engages notched wheel 309 which turns freely on shaft 319 and is actuated intermittently one-tenth revolution every six seconds, or one revolution every minute. Notched wheel 309 and shaft 319 are shown also in Fig. 5. Wheel 309 is integrally secured to hollow shaft 311 which is freely rotatable on shaft 319. On shaft 311 are also integrally mounted spur gear 312, tenths of minute index wheel 313, and a single toothed counting gear 314 of the cumulative counting mechanism. The single toothed gear 314 will make one revolution per minute and once per minute, at the end thereof, gear 314 engages a spur on the right-hand end of transfer gear 315. Gear 315 is one of a plurality of similar gears mounted on fixed shaft 340 and arranged to turn freely thereon. Th mechanism is well known in the art as a "Veeder Root" transfer. Each of the transfer elements such as 315, 341, 342 and 364 may be considered to comprise two spur gears integrally joined laterally and having a common axis of rotation. The right-hand section of the transfer gear, such as 315, may have three teeth spaced at 120 degrees, for instance, and the left-hand section may have six teeth spaced at 60 degrees. The three teeth are in longitudinal alignment with alternate ones of the six teeth. The portion of the gear having six teeth co-acts with a spur gear such as 316 loosely mounted on shaft 319 and integrally joined to the unit minutes index wheel 317 and its associated single tooth gear 318. Gear 316 may have twenty teeth, for instance. Each rotation of the single tooth gear 314 thus advances gear 318 and its associated minute index or counter wheel 317 one-tenth of a revolution in one minute and a complete revolution in ten minutes. The motion of gear 318 is not continuous but intermittent in ten steps at the end of each minute of a ten minute interval.

The "Veeder Root" transfer also serves as a means of locking the counter train against accidental or spurious rotation. During the interval, while none of the three teeth of the three tooth gear is in engagement with the depression in the single tooth gear, the adjacent inner surfaces of two adjoining teeth of the three tooth gear engage the circular periphery of the single tooth wheel, which locks the transfer gear and the higher order wheel against rotation.

Single tooth gear 318 co-acts with another "Veeder Root" transfer 341 generally resembling that described in the foregoing but differing in that the gearing is arranged to advance the counter one step for each ten minute interval and one complete revolution in an hour. And, in general, motion is imparted by a single tooth gear once per revolution to the gear of the next higher order of the counter through the associated transfer gears.

In the normal position of rest each of the cumulative time counter index wheels will be in the zero position and each associated interposer will be in alignment with the corresponding zero punch which is in the first punch position in each instance.

The hours and tens of hours counting mechanism and selecting mechanism are mounted to the left of the tens of minutes counter in Fig. 5. Their operation will be described hereinafter. First the selecting mechanism associated with the other counters will be described.

The selecting mechanism in Fig. 5, associated with the tenth of minute, minute, and ten minute counters, as distinguished from the corresponding counter, or index wheel mechanism, per se, will now be described.

Each of these selecting units comprises a spur gear, such as 321, and a selecting wheel, such as 322, mounted on fixed shaft 320, and each freely rotatable thereon. Spur gear 321 meshes with spur gear 312. Selector wheel 322 is coupled to gear 321 through detent 328 rigidly secured to the left-hand surface of gear 321 by means of pins, such as 329 and 330. A tongue 350, on detent 328, directed toward the left, projects into an aperture 327 on selector wheel 322 to impart rotation thereto, as gear 321 rotates. A flexible element, such as a metallic tape, or string 323, is secured to wheel 322 and passes

through a tape guide, not shown in Fig. 5 but similar to that in Fig. 2, intermediate the ends of the tape, to fix the tape in position so that, as it is wound on wheel **322**, its interposer, such as **325**, traverses an array of punches, not shown, having their tops in horizontal alignment as shown for the calling subscriber number punches in Fig. 2.

Detent **328** co-acts with a fixed cam **331**. The cam is positioned so that its sloping cam surface **332** engages the left-hand surface of the left-hand end of detent **328** once per revolution, to disengage selector wheel **322** from its driver, by forcing tongue **350** toward the right and out of aperture **327**, whereupon spring **326**, one end of which is fixed at **334** to fixed shaft **320** and the other end of which projects through an aperture **333** in wheel **322**, which spring has been tensioned by the rotation of wheel **322**, restores the wheel to its normal position of rest. Simultaneously, a spring, such as **351**, which has been tensioned by the winding of tape **323** onto the wheel **322** restores the tape **323** with its interposer, such as **325**, to its normal position of rest. The camming action is arranged so that the cam releases the wheel **322** slightly anti-clockwise of the rest position. After the spring **326** restores selector wheel **322** to the normal position of rest, tongue **350** reengages in aperture **327** and a new cycle of operation of this portion of the mechanism begins.

The selector wheel **397** and its associated apparatus, individual to the unit minutes counter, is similar to that for the tenths of minutes selector described in the foregoing. Spur gear **316** drives spur gear **450**. Detent **396** carried by gear **450** drives the unit minute selector wheel **397**.

The tens of minutes counter wheel **398** is arranged to indicate each of the six tens of minutes in a full hour in one half of a revolution, so that a full revolution indicates each of the tens of hours in two hours. To do this the numerals 0, 1, 2, 3, 4 and 5 are spaced consecutively at 30 degree intervals and are then repeated. The diameter of the corresponding selector wheel **451** is chosen so that it winds its connected tape so as to effect a selection of the punches in positions 0, 1, 2, 3, 4 and 5 during the first half revolution. The selector wheel is then restored to its position of rest and repeats the selection of the same punches in positions 0, 1, 2, 3, 4 and 5 during the second half revolution. In order to do this the tens of minutes selector wheel has two apertures and the gear driving the tens of minutes selector wheel has two detents and two cams, not shown, cooperating therewith.

The tens of minutes counter wheel **398** and gear **460** are integral with hollow shaft **497** which shaft is rotatable freely on fixed shaft **319**. Gear **460** has two teeth **495** and **496** spaced diametrically and advances gear **360**, through transfer gear **342**, one step each hour and two steps for each rotation of gear **460**.

The unit hour selecting mechanism is arranged to effect selections of punches from 0 to 9 and then to be restored to normal. It will repeat this cycle and then will be operated through a shorter interval of four hours to correspond to the twenty-four hours in a day, at the end of which time it is required to be again restored to normal. Spur gear **360** freely rotatable on shaft **319** meshes with and drives spur gear **367** freely rotatable on shaft **320**. Selector wheel **371** for the unit hour selector has secured thereto a pin **430** having a conical end arranged to engage in apertures **435** in gear **367**. There may, for instance, be ten apertures equally spaced angularly. The one hour selector wheel **371** is integral with spur gear **372** which meshes with and drives spur gear **362**. Gear **362** is connected to hour index wheel **361** through hollow shaft **463** which is freely rotatable on hollow shaft **462**. Shaft **462** is secured at its right-hand end to gear **360** and at its left-hand end to single tooth gear **363**. Gear **363** drives gear **365** through transfer gear **364**. Gear **365** is freely rotatable on shaft **319** and meshes with and drives spur gear **374**. Spur gear **374** drives selector wheel **375** through pin **432** which engages with an aligned aperture in wheel **374**. Selector wheel **375** is freely rotatable on shaft **320** and coaxial with gear **392** and integral therewith. Gear **392** meshes with and drives gear **393** which is secured through hollow shaft **464** to the tens of hour index wheel **366**. Gear **367** meshes with and drives gear **368** which is secured through hollow shaft **465** to cam **370** on its right-hand end and to cam **386** on its left-hand end. Gear **368**, hollow shaft **465**, cams **370** and **386** are rotatable freely as a unit on fixed shaft **369**. The gearing ratios are such that gear **367** advances one-tenth of a revolution in intermittent steps each hour and a full revolution in ten hours. Gear **368** and cams **370** and **386** integral therewith make one revolution each twenty four hours. Cam **370** has three depressions in its peripheral surface. Cam follower **425** bears on the surface of cam **370**. At the end of a ten hour interval follower **425** is urged downwardly to enter the depressed surface **427**. Follower **425** is the horizontal element of a bell crank **382** which is rotatable about shaft **383**. The vertical portion of bell crank **382** is bifurcated and the upper ends of the bifurcations project toward the left bearing at two points, as indicated, against the right-hand surface of gear **367** which is normally urged toward the right by spring **429**. When follower **425** is lowered into the depressed portion **427** of the surface of cam **370**, the bell crank rotates about its axis **383** and permits gear **367** to slide toward the right while remaining meshed in gears **360** and **368**. To permit this, gear **367** is substantially thinner than gears **360** and **368**. The displacement of gear **367** is sufficient to permit pin **430** to disengage from the aperture with which it is momentarily in engagement in gear **367**. Selector wheel **371** and gear **372** are thereupon restored to normal under the influence of spring **373**. Gear **362** and the hour index wheel **361** are also responsively restored to normal.

Follower **425** will again be depressed into the depressed surface **428** in cam **370** at the end of a second ten hour interval to permit the restoration of the hour selecting mechanism and its associated index wheel **361**. After a third interval of four hours, the mechanism will be restored again to normal when follower **425** engages depressed surface **426**.

Cam **386** controls the tens of hours selecting mechanism to permit its restoration once every twenty four hours. It is provided with one depressed area **490** on its peripheral surface to permit this. Bell crank **390**, gear **374**, spring **431** and pin **432** operate in substantially the same manner as described for the unit hour selecting mechanism with the exception, of course, that the tens of hour mechanism operates only once in twenty four hours to restore.

In the preferred embodiment a separate ram and solenoid are employed for punching the date and time perforations. The ram mechanism has not been illustrated as it is the same as shown in Fig. 2 except that the detents, the detent release mechanism, the card stop and card-stop switch mechanism, shown in Fig. 2, are not employed.

The circuit for the date and time solenoid which operates the date and time ram to actuate the nine sets of date and time punches is shown in Fig. 9. The time stop switch control **400** is shown in Fig. 4B. It is first actuated to close contact **401**, Fig. 4B and Fig. 9, when the card, Fig. 10, is inserted in aperture **107**, Fig. 1, the second time. As shown in Fig. 9, the circuit of the date and time solenoid extends from the positive terminal of battery **402**, through contact **403** of the disabling relay **404**, winding of the date and time ram solenoid **405** and contact **401** of the time stop switch, when closed by the insertion of the card, to the negative pole of battery **402**. When the date and time ram solenoid is energized, the date and time ram is actuated to project a selected one in each of the nine sets of date and time punches to punch a record of the time of answering the call by the called

station. Simultaneously, as mentioned in the foregoing, the card per Fig. 10 is notched to permit its insertion to a greater disance, when the circuit interconnecting the calling and called subscriber is disconnected or when communication is finished. At this time the card is inserted a third time to operate the same card time stop control **400** and contact **401** as on the second insertion. The circuit per Fig. 9 will therefore again function to operate the time and date ram a second time to punch the disconnect time information.

Attention is called to the disabling relay, the winding **404** of which is shown in Fig. 8 and the winding and contact **403** controlled thereby in Fig. 9. Whenever a voltage pulse is sent out under control of clock **301** to energize the time solenoid **302**, it is desirable to prevent the operation of the date and time solenoid **405**. For this reason, each time a pulse is sent out under control of the clock **301**, winding **404** of the disabling relay is energized to open contact **403** and prevent operation of the date and time ram solenoid until transmission of the time pulse is ended. The relay may be made slow to release to insure that the mechanism controlled by the solenoid **302** has come to rest before date and time ram solenoid **405** is energized.

What is claimed is:

1. A selecting mechanism comprising a rotatable surface having one end of a tape or string secured thereto, means for winding said tape onto said surface, an array of selectable punch elements, means responsive to said winding for directing an unwound section of said tape along said array, means for predetermining the amount of said rotation so as to select any predetermined one of said selectable elements an individual interposer selecting element secured to said unwound portion, means responsive to the winding of a predetermined length of said tape or string onto said rotatable surface for positioning said interposer in registry with a predetermined individual one of said punch elements, a ram for actuating said interposer and said predetermined punch element, electrical means for actuating said ram, a switch and a control element for said switch for energizing said electrical means and means responsive to the actuation of said rotatable surface for actuating said control element into a ready position, so as to permit its subsequent operation.

2. A selector recorder having an array of punches, a string, an interposer secured to a free end on said string, means for directing said interposer along said array to effect a selection of a predetermined punch, said means comprising a guide for said string, a rotatable element for winding said string and means for predetermining the amount of said rotation, a switch control, a switch responsive to said control, a solenoid responsive to said switch, a ram responsive to said solenoid to actuate the individual selected punch through said interposer and means for operating said switch control from a non-actuable to an actuable position, responsive to the rotation of said rotatable element.

3. In combination in a time controlled selector and recorder, a source of pulses at regular timed intervals, an intermittent cumulative counter responsive to said pulses to indicate cumulative elapsed time, a selector mechanism co-acting with said counter, said selector mechanism comprising a rotatable device, a tape or string secured to said rotatable device, means in said selector and recorder, responsive to said pulses, for operating said tape or string intermittently in discrete displacements, an array of selectable elements individually selectable in response to said intermittent displacement, said cumulative counter comprising a first gear train, a second gear train, a first spring for interconnecting said gear trains, said rotatable device integral with said second gear train, a cam controlling the interconnection of said gear trains through said spring, means responsive to said cam for decoupling said gear trains and a second spring for restoring said second gear train to normal in response to said decoupling.

4. In combination in a time controlled selector and recorder, a source of pulses spaced at regular intervals, a cumulative counter responsive to said pulses, a selecting wheel co-acting with said counter, means for actuating said selecting wheel intermittently in response to said pulses, a tape or string displaceable in response to the intermittent displacement of said selecting wheel, a selecting element secured to said tape or string, a plurality of selectable elements disposed in the path of motion of said selecting element, means for restoring said wheel to a normal position of rest after the lapse of a predetermined interval, said restoring means comprising a spring tensionable in response to the actuation of said selecting wheel and camming means for releasing said selecting wheel after the duration of a predetermined time interval.

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