

Sept. 21, 1943.

M. H. LOUGHRIDGE

2,329,919

CODE INDEXING SYSTEM AND APPARATUS

Filed July 5, 1941

2 Sheets-Sheet 1

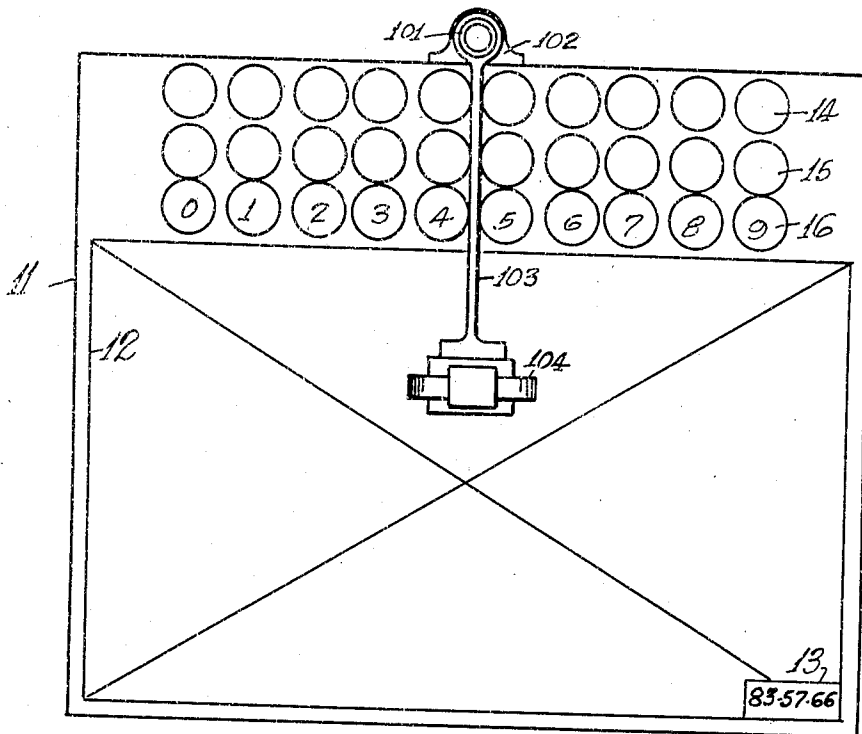


Fig. 1

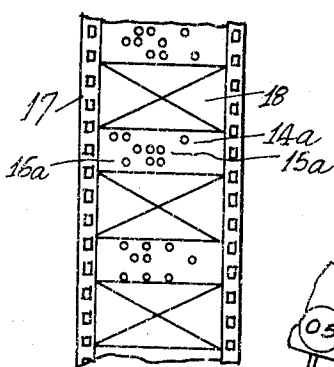


Fig. 2

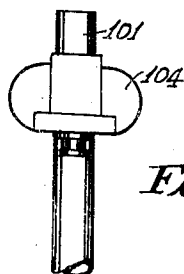


Fig. 1a

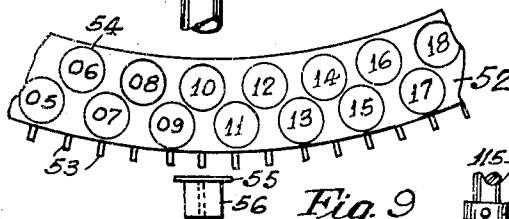


Fig. 9

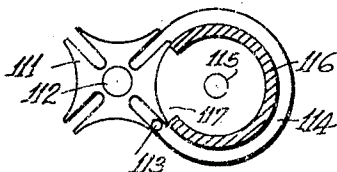


Fig. 8

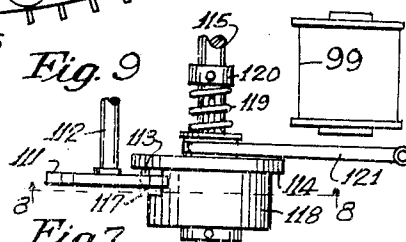


Fig. 7

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2 Sheets--Sheet 2

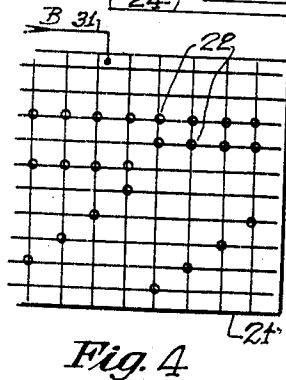
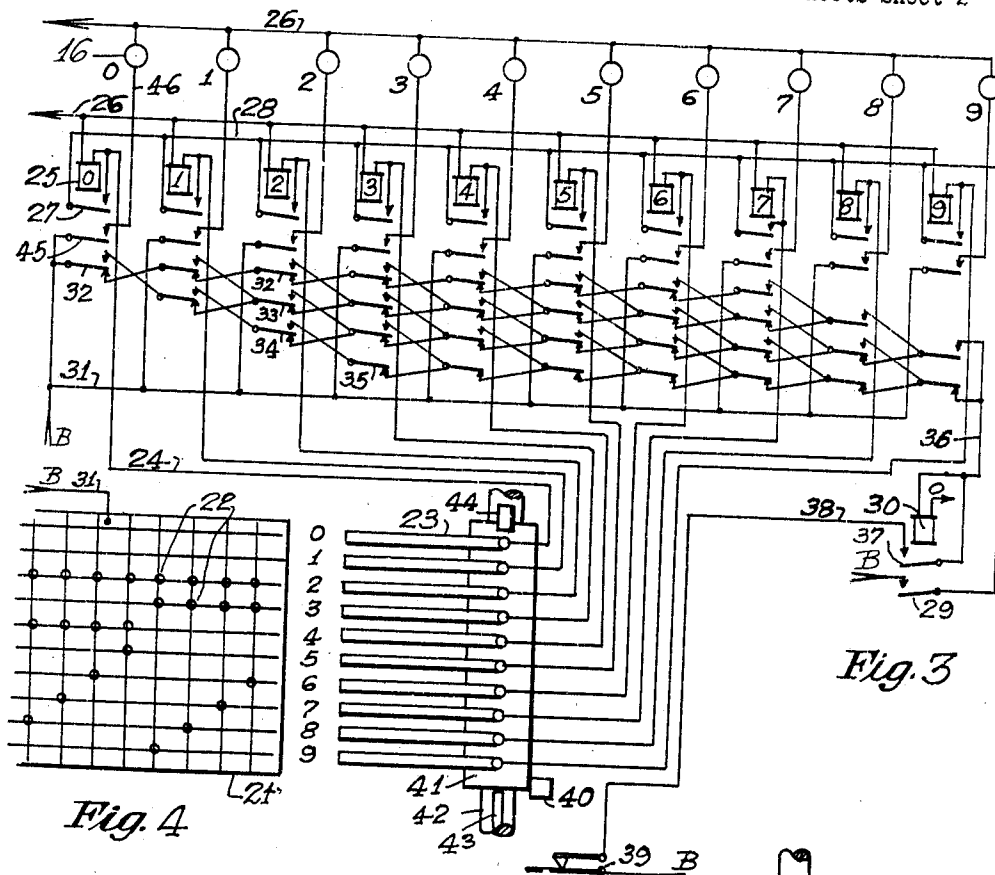


Fig. 4

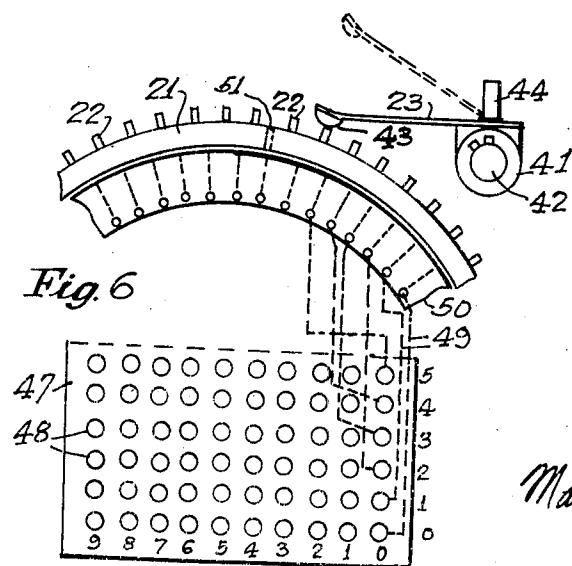


Fig. 6

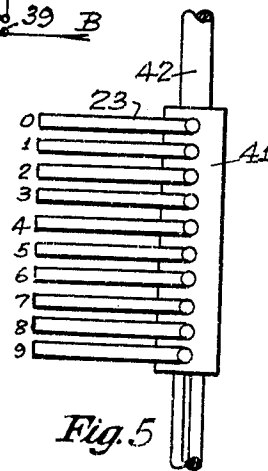


Fig. 5

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CODE INDEXING SYSTEM AND APPARATUS

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Application July 5, 1941, Serial No. 401,272

7 Claims. (Cl. 88—24)

This invention relates to indexing systems and has a particular application for indexing documents that are to be recorded by the microfilming process. An object of the invention is to record documents for filing purposes by a code so that the documents may be found by a mechanism that decodes this record; another object of the invention is to set up a code corresponding with the number or marks of a document, record this code with the document so that to find the document the record is decoded, and another object of the invention is to provide a plurality of rows of code marks for coding the designation of the documents with means for setting up and retaining the code on each row.

Another object of the invention is to provide a control mechanism, that may be operated by a keyboard or other means, and a code registering system operated by the control mechanism to set up a plurality of effective codes at a time, and a further object is to provide a control mechanism that may be changed from operating one code registering system to another.

Another object is to provide for the control and operation of a code system electrically.

These and other objects of the invention will be understood from the following specification and the accompanying drawings, in which:

Fig. 1 is a top plan view of a photographic table adapted to record the code marks in three rows and provided with a motion picture camera;

Fig. 1a is a detail showing in elevation the support of the camera in Fig. 1;

Fig. 2 is a portion of motion picture film with the code marks thereon;

Fig. 3 is a circuit diagram for controlling the code marks and retaining the code set up;

Fig. 4 is a graphic representation of the code to which the system shown is adapted;

Fig. 5 is a control mechanism for the code marks in a second row adapted for operation as in Fig. 3;

Fig. 6 shows a portion of a code wheel operated by a motorstat and controlled by a keyboard for setting up the code;

Fig. 7 is a portion of a Geneva movement, electrically declutched;

Fig. 8 is a front view of the Geneva movement, sectioned on line 8—8, Fig. 7; and

Fig. 9 is a portion of a code wheel for making scanners for decoding purposes.

This invention is shown in connection with the manufacturing drawings of a machine. These drawings are usually designated by several numerals in the title in which the highest

numerals usually indicate the class or type of machine and the following numbers each represent a unitary part of the machine. In addition to this standard parts frequently form part of several machines and the drawings for these parts have a distinctive classifying letter or numeral. In addition to a written index of the several drawings necessary for the construction of a machine, it is usual to inscribe or impress upon each part of the machine its designating number or mark and this is how the part is usually catalogued. The designation obtained from the part or from the index is all that is necessary in order to set up the system to reproduce the drawing of the particular part.

A photographic table is provided with a motion picture camera mounted in fixed relation with the table to photograph drawings placed on the table. When the drawing is placed on the table its designating numbers are translated into one or more codes and a portion of the table is reserved in which these codes in the form of lights are produced in rows having a definite location on the table in accordance with the code which they represent. The code marks have a fixed and definite relation on the photographic table, and correspondingly have a fixed and definite relation on each frame of the film, while the drawing itself is photographed on the body of the same frame.

The code used in the application is in accordance with application Serial No. 205,186, filed April 30, 1933, now Patent 2,266,779, Dec. 23, 1941, and is electrically operated. The first two figures of the code are coded in the first row of marks, the second two figures of the code are coded in the second row of marks and the third two figures of the code are coded in the third row of marks. In order to quickly and conveniently code the designation of the document, a code wheel is provided, corresponding with the code wheel in application Serial No. 248,894, filed December 31, 1938, now Patent 2,269,293, Jan. 6, 1942, and which has a capacity of at least 100 different codes. In order to quickly bring the code wheel into position for any selected code, a keyboard is used, having 100 keys which are arranged in squares so that the desired keys can be readily selected. These keys operate a motorstat which brings the code wheel into a position corresponding with the key that is operated.

The code wheel through a set of selecting fingers operates any three relays of a bank of ten to set up the code desired. The code is established only when three of the ten relays are en-

energized and the remaining relays are deenergized. In order that the same code wheel and keyboard may be used to set up, independently, the code for each of the three rows, an arrangement of control including a stick circuit is provided to retain the code set up in the first row; then the mechanism is changed to operate another bank of relays according to the next code to be set up and a stick circuit is again provided to retain the code, and, similarly the mechanism is again changed to operate a third bank of relays when the code wheel is moved to set up the code for the third row. When the code is thus established the document with its code is ready for photographing on a frame of the film, after which the mechanism is restored to the starting position and is ready for coding another document. The code wheel includes any movable member that can be positioned to selectively set up different codes.

The object in coding the document as it is recorded photographically is to be able, by means of the code, to quickly find the photograph of any particular document. For this purpose a system of decoding is necessary in order to selectively locate the document. The common method of using motion picture film is in the form of a long ribbon which may have thousands of frames thereon and it is necessary to run this film through a projector in order to locate the document desired. The mechanism for this purpose is shown in U. S. Patent 2,209,342, July 30, 1940. While the ribbon type of film is at present the most popular, the coding system of this invention may be applied to film in any form in which the code marks can be properly registered with a scanner.

Decoding is provided by the use of a scanner having marks thereon corresponding with the code to be selected and as the film passes through the projector the marks on the film correspond in location with the marks on the scanner. When three of these marks in each row register or synchronize the code is thereby established and by means of an arrangement of photo-electric cells and decoding relays the projecting apparatus is controlled for any purpose desired. A system of this kind is shown in Patent 2,209,342, July 30, 1940.

It is contemplated that drawings will be photographically recorded of a complete machine at the same time and the film will be stored away for future use. Years afterwards it may be necessary to obtain prints of one or more frames of this film and the only information available is the marks, or numbers, that are on the parts themselves. In this case a code wheel is provided having at least 100 codes thereon corresponding with the code wheel which produced the indexing marks on the photographic table. This code wheel is used to apply the code marks to the scanner in accordance with the code desired, the scanner is then placed in the projector and the apparatus is operated until the film code synchronizes with the code of the scanner. The motion picture projector is operated by the usual Geneva motion which gives an intermittent movement to the film and when synchronism is reached this intermittent motion is declutched, which stops the film at the frame desired and locks it in this position. In some cases the film may be operated at higher speed through the projector until the position of synchronism is approached, when the speed is gradually reduced before stopping.

In the drawings, 11 is the photographic table upon which the drawing or document 12 to be photographed is placed and the drawing is provided with a designation at 13. A row of ten code marks is indicated at 14, a second row at 15 and a third row at 16. The circles indicate the position of each mark on the table and which are photographed by the camera 104, supported by the arm 103 on the stand 101, secured in fixed relation to the table at 102. The marks 14, 15 and 16 are, ordinarily, non-actinic, that is, they correspond with the surrounding background and make no impression on the film except the marks that are illuminated by the circuit arrangement hereinafter described. The film is indicated at 17, Fig. 2 in which the document is photographed at 18 and the code marks appear at 14a, 15a and 16a. A graphic representation of the code appears in the developed plan of the code wheel 21, Figs. 4 and 6, in which the pins 22, three of which stand out in each transverse row, determine the code and the code may be conveniently designated by the figures 0 to 9 to the right.

The shaft 42, Figs. 3, 5 and 6, has splined thereon the insulated sleeve 41, carrying the ten contact fingers 23, arranged to register one with each of the circumferential row of pins in the code wheel and to contact therewith by the contact 23. Connected with the first contact finger 23 by wire 24 is the relay 0 in the bank of relays 25 and the opposite side of this relay connects to the return circuit on wire 26 so that if the first finger contacts with a pin on the code wheel 21 a circuit is established from the conductor 31 to energize relay 0. The same circuit arrangement is used for each of the succeeding contact fingers opposite the numerals 1 to 9 and which correspondingly energize each of the code relays, numbered from 1 to 9, in the bank 25. A stick circuit is established for each of the relays energized in bank 25 through contact 27, wire 28 to contact 29 of relay 30 energized and to the energy wire B. This circuit operates in multiple for each of the relays energized.

The stick relay 30, which retains the code set up by three of the relays and the stick circuit described can only be energized when any three of the bank of relays 25 are energized and all the others are deenergized. This is obtained by a repeating circuit from the energy wire 31, through contact 32, of the first relay and extending through contacts 33, 34 and 35 of the succeeding relays to energize wire 36 which picks up relay 30, in the manner described in Patent 2,266,779, Dec. 23, 1941. When relay 30 is energized a stick circuit is established through contact 37 and wire 38 to contact 39 which is normally closed and to the energy wire B. When the sleeve 41 is restored to the starting position the insulated member 40 engages 39 to open the stick circuit and deenergize relay 30, restoring the system normal.

Each of the relays in bank 25 from energy wire 31 through front contact 45 and wire 46 energizes the bank of lights indicated from 0 to 9 in the row 16. These lights are displayed on the photographic table and constitute the code marks. It will be noted that since only three of the relays in the bank 25 can be energized at a time, as there are only three pins in the transverse rows of the code wheel, there must be three lights displayed for each code position of the code wheel. The circuit controlling relay 30 operates to detect any irregularities in this system of control.

The system in Fig. 3 shows the method of setting up a plurality of code marks and retaining them in one row. When the same code wheel is used to set up code marks in the next row a second sleeve is provided on the shaft 42, Fig. 5, corresponding with that shown in Fig. 3 and controlling a corresponding circuit. Other sleeves are provided corresponding to Fig. 5 and controlling circuits corresponding to Fig. 3 for each additional code to be set up. When changing from one sleeve to another the fingers 23 may be raised as indicated in dotted outline in Fig. 6, when they are transferred from one position to another. A handle 44 is provided for this purpose.

The code wheel Fig. 6 may be positioned electrically by the system shown in application Serial No. 282,833 July 4, 1939, or it may be positioned pneumatically by the mechanism shown in application Serial No. 315,300 January 24, 1940. A reference point may be provided at 51 in the code wheel 21 and which is influenced by energy released through the stator 50 and the conduits 49 from the keyboard 47, provided with a bank of 100 keys 48, arranged in vertical and horizontal rows of ten. Each key represents the accumulation of these numbers. The code wheel 21 may be operated mechanically or by other means in response to the key board.

The code wheel 52, Fig. 9, is provided with pins 53 which correspond with the pins 22 in Figs. 4 and 6 and this wheel is provided at 54 with figures in the circles which indicate the numerals that correspond with the code set up by the pins 53. A scanner 55, located on the block 56, which is perforated to correspond with all the pins in the transverse row of the code wheel, is perforated by the pins 53 when the block 56 is raised to engage the pins; this applies the code to the scanner for the number which is opposite the pins. The scanner is changed in position and the code wheel rotated to set up a second code thereon and this is continued for the number of codes desired. The code wheel 52 may be operated with a mechanism the same as 21; however, as the scanners are only infrequently required this wheel may be operated manually.

The mechanism provides for declutching the Geneva drive of the projector. This is controlled by the magnet 99, Fig. 7, which, through the armature lever 121 slides the drum 118 on the shaft 115 against spring 119 engaged by collar 120. The drum 118 has a flange 114 carrying the driving pin 113 which engages the slots of the star wheel 111, mounted on shaft 112, which drives the sprocket of the film. A gap is provided at 117 in drum 118 to release the star wheel for one step as shaft 115 rotates, at other times the star wheel is locked by engaging drum 118. When magnet 99 is energized driving stud 113 is moved out of engagement with the star wheel and the solid drum is provided opposite this wheel to prevent its rotation and to lock the film in the position in which it has been stopped. When magnet 99 is deenergized, spring 119 restores the mechanism to the running condition. Magnet 99 is controlled by the de-coding system not shown.

In operation the drawing 12 is placed in the table 11 and the first code to be set up is for the number 66. The first sleeve 41 is brought into register with the code wheel and the key of the keyboard 47, corresponding with 6 in the vertical and horizontal row is operated; this brings the code wheel into the proper position, the contact fingers 23 are then lowered to engage the pins 22 and the code 66 is set up in row 14 and

retained there. The second sleeve, Fig. 5, is brought into register with the code wheel while the first sleeve is removed and the key of the keyboard 47 corresponding to 57, is operated; this sets up a code corresponding to 57 on the row 15; likewise a third sleeve is brought into register with the code wheel and the key of the keyboard corresponding to 83 is operated to set up the corresponding code in row 16. This provides the lights or marks necessary for recording with the photographic document on the frames of the film. The code is changed for each document as the numbers change. Generally numbers will follow in succession and change only in the units so that the units code, or the code for the first 100, will change for each document while the other codes will be carried over for a number of documents.

The scanner is made by a complementary code wheel to the wheel which established the code and the figures on the face of this code wheel afford a ready means of translating the designation of any part or document in code to the scanner. The scanner is suitably mounted in the projector to register with the code marks of the film.

The scanner intercepts the light beam projected from the marks on the film except from those marks which register with the marks of the scanner. When the code in each row is established through the scanner the three relays in each bank, corresponding to the rows, are energized which operate to energize magnet 99 and declutch the Geneva drive. This is the main purpose of the system. Any condition which does not synchronize will not stop the mechanism.

The system comprises a control mechanism which sets up the code and a registering mechanism which registers the code in response to the control mechanism. The control mechanism comprises the code wheel and key board which adjusts the wheel for the code corresponding to the key that is operated. The code is expressed in a plurality of marks for each key which can set up a code having a capacity of 100 or more designations.

The code is registered by an electric system controlled by the control mechanism and having a capacity to translate the code of each key into the code marks for registering purposes by which the code is applied to any useful purpose. Each row of code marks has an electric system for its operation which selectively brings the code marks into register in response to the control mechanism. It is contemplated that several codes may be required at the same time. Each code requires its own electric system for its registration so that it is necessary to set up each code and to retain this code while the other codes are set up until the entire designation has been coded.

In this system one control mechanism operates each of the registering systems progressively. It is applied to operate the first code, then it is changed from this code to operate the next code, then it may be again changed as necessary to operate other codes. This change is effected in a simple manner by changing the electrical connections to each of the electric registering system. Without this change a separate key board and code wheel would be required for each code.

The electric system of registering the code enables the codes established to be retained by a stick relay until the final cycle of operation when

this relay is deenergized and the system thereby restored for further operation.

The electric control between the control system and the registering systems avoids mechanical complications and enables the use of remote control between the key board and the other apparatus.

Having thus described my invention, I claim:

1. In a code indexing system, a row of code marks, a relay controlling each mark, a circuit controlling each relay, a code wheel having a plurality of radial pins projecting in transverse rows on its periphery arranged according to each code, a row of fingers making contact with said pins, said fingers controlling selected circuits of said relays to energize the relays and thereby set up the code desired, a stick relay energized by the relays setting up the code only when these relays are in the energized position and holding the selected relays energized to maintain the code independent of the position of the code wheel, and means for registering the code.

2. In a code indexing system, a row of code marks, a relay controlling each mark, a circuit controlling each relay, a code wheel having a plurality of radial pins projecting in transverse rows on its periphery arranged according to each code, a first row of fingers making contact with said pins, said fingers selectively controlling the circuits of a plurality of said relays to establish a code, means for retaining said code independently of said fingers, a second row of fingers making contact with another row of said pins, said second fingers selectively controlling the circuit of another group of said relays to establish a second code, means for retaining said code independently of said second fingers and means for recording said codes.

3. In a code indexing system, a row of code marks, a relay controlling each mark, a circuit controlling each relay, a code wheel having a plurality of radial pins projecting in transverse rows on its periphery arranged according to each code, a row of fingers making contact with said pins, said fingers controlling selected circuits of said relays to energize the relays and thereby set up the code desired, a holding relay for holding said selected relays energized, means for recording said codes and means for restoring said system to the normal condition by deenergizing said holding relay.

4. In a code system a first row of code marks, a second row of code marks, a relay controlling each mark, a circuit for each relay, a code wheel controlling said circuits according to the code to be set up, means including said wheel for establishing a code in the first row of marks, means for retaining said code independently of said wheel and means including said wheel for establishing a code in the second row of marks, means for simultaneously recording said codes and a key-board for operating said code wheel to set up the codes desired.

5. Means for setting up a first and a second code comprising a control mechanism operated by a key board to set up the codes desired, a code register for registering a plurality of code marks for each operated position of the code mechanism, means operatively connecting said mechanism with said code register to register the first code, means for retaining this code and means for changing the operative connection after the first code is established to operate the second code by the control mechanism so that both codes may be utilized at the same time.

6. Means for setting up a first and a second code, comprising a control mechanism, a first code register and a second code register, means for operating said control mechanism to set up the codes desired in said code registers, means operatively connecting said mechanism with the first register to register the code, means for retaining this code, and means for changing the operative connection to register the second code so that both codes may be utilized at the same time.

7. Means for setting up a first and a second code, comprising a control mechanism, an electric system for registering the first code, a second electric system for registering the second code, a first set of circuits connecting said electric system with said control mechanism for setting up the first code, a second set of circuits connecting the second register system with said control mechanism, for setting up the second code, means for transferring said control mechanism from operating one set of said circuits to operate the other set of said circuits and electrically operated means for retaining the code set up by one set of circuits when the transfer is made to the other set of circuits.

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