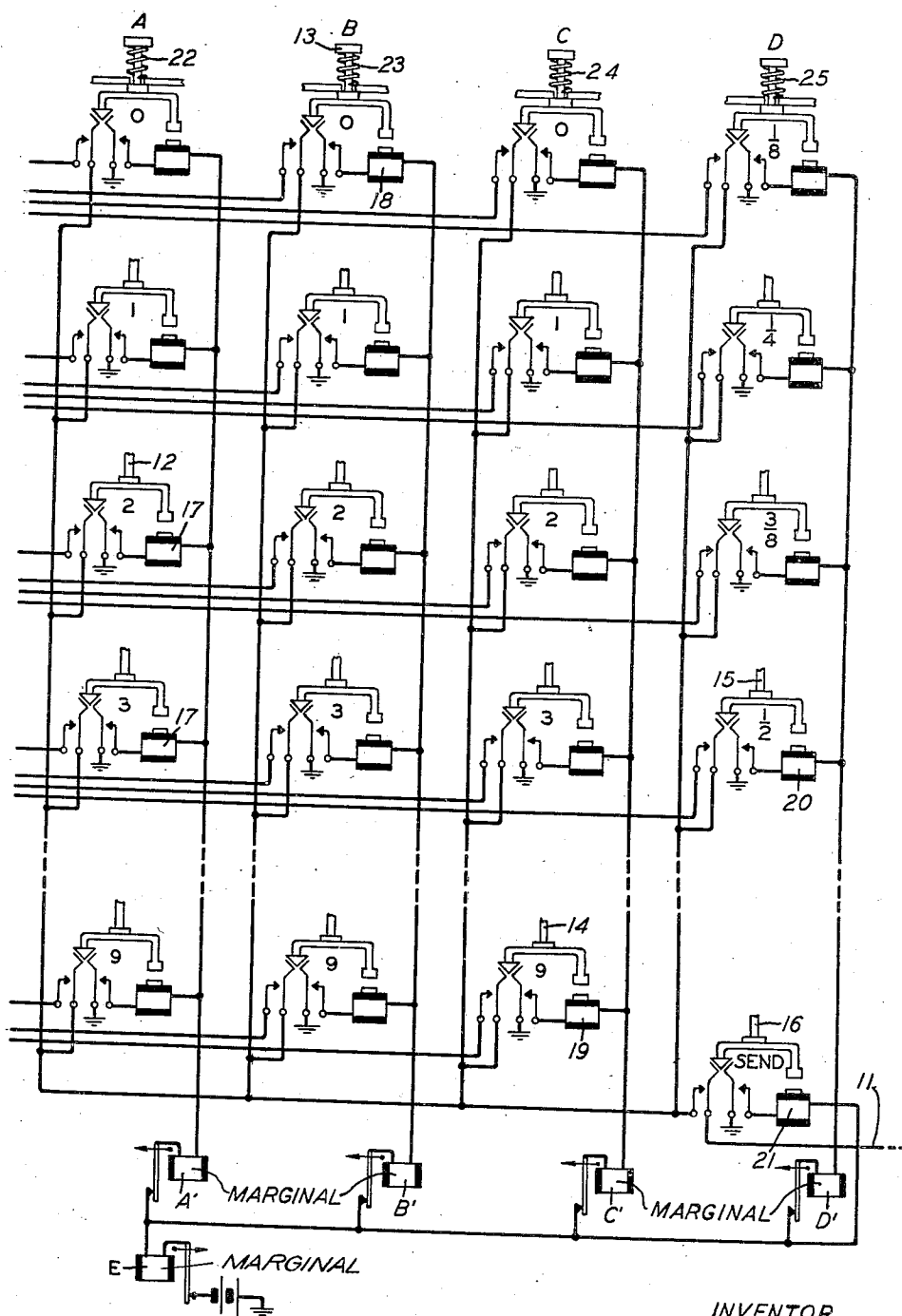


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L. A. GARDNER
ELECTRIC SWITCHING DEVICE

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ELECTRIC SWITCHING DEVICE

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4 Claims. (Cl. 177-380)

This invention relates to communication systems and more particularly to printing telegraph automatic exchange systems wherein intelligence of a changeable nature is stored by means of manually operating a series of locking keys for the purpose of automatically transmitting the latest intelligence to remote points whenever desired.

An object of the invention is to maintain the operated keys in a locked position by electrical means.

Another object is to release the operated keys electrically whenever more than the desired number of keys are operated in any one column of keys or any one group of keys.

Heretofore, keys, such as those used in communication systems, have been provided with locking features which were obtained by means of sliding plates fixed to the key frame by means of retractile springs. While a key is being moved to its operated position, the plate is moved in such a manner that when the key reaches its final operated position, the plate springs back to its normal position, thereby locking the key in its operated position. The operation of a second key again moves the plate, permitting the first key to return to normal and the second key is then locked when the plate returns to normal. Such an arrangement is disclosed in Patent 1,943,969 granted to C. C. Lane on February 27, 1934.

According to the present invention the keys are of the push button type having inverted U-shaped plungers. One side of a plunger is adapted to engage a pair of contact springs which are arranged, when operated, to close an operating circuit for an electromagnet which, when energized, attracts the other side of the plunger to thereby hold the key in an operated position. This invention is particularly adapted to a stock quotation automatic telegraph exchange wherein the keys are employed for setting up in a storing device the latest quotation of any one stock, a separate set being provided for each stock listed on the exchange.

In the present invention provision is made for the automatic release of all operated keys when more than the desired number of keys are operated. For example, the maximum number of characters in a stock quotation are usually four comprising hundreds, tens, units and fractions and when more than four keys are operated the circuits for the energized holding magnets are automatically opened to release the operated keys.

Another feature is the immediate release by electrical means of an operated key should a

second key in one column, that is, in the hundreds, tens, units or fractions column be operated.

Other objects and features will be found in the following description and appended claims when taken in conjunction with the drawing.

The drawing illustrates a set of stock quotation keys which, when operated, are arranged to close contacts over which are transmitted code impulses corresponding to the digits 0 to 9 and fractions $\frac{1}{2}$ to $\frac{9}{16}$, the latter varying in increments of $\frac{1}{16}$.

The arrangement shown in the drawing provides means whereby outlying stock brokers' offices equipped with tape telegraph typewriter printers would be able, by sending the symbols of a certain stock to the stock exchange, to receive therefrom automatically the last sale price, which would be printed on the tape at the broker's printer immediately following the symbols of the stock for which the request was made. This last sale price would be stored in a mechanism by a stock exchange post operator and the system is so arranged that requests incoming from brokers' offices would automatically arrive at the point containing this last sale price. From this point the last recorded price quotation would be sent in response to every such request until changed by the post operator.

The post operator would be furnished with a set or bank of keys for each stock handled at any one post and by the manipulation of these keys, he would keep the storing or sending mechanism supplied with the last sale price of the stock to which the key set is assigned. A "bid and asked" quotation system would consist of a duplicate set of keys and senders, one set for "bid" price and one set for "asked" price.

The key set shown in the drawing is adapted to operate with a storing and sending mechanism of the rotary distributor type. The rotary distributor arrangement is described in detail in the applicant's copending application, Serial No. 564,940, filed September 24, 1931. The storing and sending arrangement is designed to transmit for each character seven impulses of the start-stop five unit code, consisting of the start and the stop impulses and the five signal impulses. These arrangements may also be designed to transmit by means of a six unit code by changing the transmitting elements of each accordingly.

The accompanying drawing shows the arrangement preferably adapted for the automatic stock quotation system disclosed in the applicant's copending application, supra, wherein the rotary distributor sender arrangement is employed.

Only so much of the apparatus is shown as will give a clear understanding of the invention. A set of keys is provided at a trading post on the floor of the exchange for each stock handled at that post. There are in each set 38 keys arranged in four rows, A, B, C, and D, namely, hundreds, tens, units and fractions, respectively, and in each of rows A, B, and C there are ten keys corresponding to the digits 0 to 9 and in row D there are 7 keys corresponding to the fractions $\frac{1}{8}$ to $\frac{7}{8}$ varying in increments of $\frac{1}{8}$, and one key called a "send" key, for connecting all the keys in operated condition to the conductor 11 which is included in the operating circuit for a series of sender relays which reproduce the information for a series of transmitting points at which it is available to a plurality of calling, or brokers', lines. The circuit including conductor 11 and its function are described in the applicant's copending application, supra.

The post operator would note the last sale price and set up the combination on the quotation keys, after which he would press the "send" key, thus making the price available for any subsequent request incoming from a broker's office. Each one of the quotation keys and the "send" key would have associated with it a set of contacts and a holding coil which would be sufficiently energized at the time the key is depressed to hold the key in its operated position. The key would remain operated until the holding circuit through the key contacts and the holding magnet is opened as will be hereinafter described.

These columns or rows of keys have connected in series in the holding circuits thereof a marginal slow release relay adjusted to operate on a current drain of more than one key holding coil. Therefore, in case two quotation keys in any one column are depressed it would be impossible to keep the second one operated and the first one would return to normal. These marginal relays A' to D' inclusive are respectively connected to the quotation keys in the four rows A to D inclusive. A marginal relay E, also of the slow release type is one which will operate on a current drain of slightly more than five keys including the "send" key, and would return all keys to normal in case the operator should make an error by trying to set up a combination of more than five keys for a quotation of any one stock. The slow release feature of these marginal relays will allow the magnetic circuit of the holding coils to be completely deenergized before the relays return to normal wherein the holding or locking circuits are again prepared for a new key setting.

Let it be assumed that the last sale price or quotation on any certain stock is 209½. The post operator will depress keys 12, 13, 14 and 15 and "send" key 16. The operation of key 12 immediately closes at the right hand contacts of the key an operating circuit for holding magnet 17 which may be traced from ground at key 12, through the windings of holding magnet 17, relay A' and relay E, in series, armature and contact of relay E to grounded battery. Relays A' and E being of the marginal type do not operate but magnet 17 does, that is, energizes sufficiently to hold key 12 in an operated or depressed position. The operation of keys 13, 14 and 15 will likewise energize holding magnets 18, 19 and 20 respectively, through their associated marginal relays B', C' and D'. The "send" key 16, when operated, is similarly locked, but through a circuit extending from ground through the closed contact of key 16, through the windings of holding magnet 21 and

marginal relay E, in series, armature and contact of relay E to grounded battery.

The outer left hand contact sets of the operated keys 12, 13, 14 and 15 are each arranged to continually receive a combination of start-stop five unit code impulses corresponding to the digits or fractions represented by these keys and when the "send" key 16 is depressed to its operated position the combinations of impulses received over each of the operated keys, 12, 13, 14 and 15 are transmitted, in turn, through the left hand contact set of key 16 to the conductor 11, the sequence of the combination, that is, in the hundreds, tens, units and fractions places, being effected by the arrangement of the hundreds, tens, units and fractions groups of segments on the distributor sender device (not shown) but described in detail in the applicant's copending application, supra.

Should the operator by mistake operate two keys in column or row A, the current drain through the windings of the associated holding magnets will be sufficient to operate relay A' and to thereby open the energizing circuit for the magnets. Should the relay A' in response to the operation of two keys in row A, fail to operate, there will be, when "send" key 16 is eventually operated, six magnets, two in row A and one each in rows B, C, and D and the one associated with the "send" key, energized, and the current drain through the six magnets will be sufficient to operate relay E which opens the energizing circuits through all the energized magnets, and the operated keys will be returned to normal because of the tension in the coil springs such as those designated 22, 23 etc. on the key shafts.

Should it be desired to change the key setting because of a change in the sale price of the stock any unoperated key may be operated to effect the operation of relay E, whereby all operated keys are released.

Means may be provided with each key set for indicating to the operator at a post the moment when the transmission of a quotation is completed so that he may then make the change in the key set. As stated above and described in the copending application, supra, the distributor sender is continually sending quotations over the left-hand closed contact sets of the operated keys, and between successive quotations the distributor transmits "space" or "wait" impulses. The post operator may select the half second interval of the "wait" impulse as being desirable to effect the change in the key setting, thereby avoiding a change during the transmission of a quotation. The indication means may be a signal lamp (not shown) but provided at each key set and arranged to be operated by the "wait" impulse whereby the operator will know when the quotation is completed.

The hundreds keys form a set of elements corresponding to the hundreds denomination, the tens a set of elements to the tens denomination, etc. and each key is connected to its distributor segment which forms a sender of a code combination corresponding to its denomination and particular character of that denomination.

What is claimed is:

1. In a switching system, a plurality of manually operated keys disposed in rows, means individual to each key for magnetically locking said key in an operated position, means individual to each of said rows for rendering ineffective the

locking means in said each of said rows when more than one key in said each of said rows are in operated positions, and means common to all said rows for rendering ineffective the magnetic locking means of all said rows when the total number of operated keys exceeds the number of rows of keys.

2. In combination, a plurality of sets of elements, said sets being arranged in groups, each of said sets of elements comprising a manually operable key, a pair of normally opened contact sets responsive to the operation of said key, a circuit including one of said contact sets and a magnet, when energized, for holding each key when operated, in an operated position, said circuit including a path common to all the circuits of its group, a path common to all said circuits of all said groups, and a source of current connected to the second mentioned path, and a connection including the other of said contact sets, said connection including a third path common to all said other connections of its group and an outgoing path common to all said other connections of all said groups, means in said outgoing path for completing said third path when one or more keys are held in their operated positions by their energized magnets, means connected in each of the first mentioned paths for releasing the keys held in operated positions when more than one key in the group are operated, and other means connected in the second mentioned path for releasing the keys held in operated positions when the number of keys operated exceeds the number of groups of element sets.

3. In a switching system, a plurality of manually operated keys arranged in groups, a holding magnet for each of said keys, a normally opened operating circuit for each of said magnets, said circuits including a normally closed path common to the operating circuits of the magnets of each group, and a second normally closed path common to all the first mentioned normally closed paths, a source of current connected to said second path, means in engageable relation with each of said keys for completing the operating circuit for the associated magnet in response to the operation of said key, a circuit-breaking de-

vice in each of said first mentioned paths, means for operating said device when more than one key in a group are in operated positions, a second circuit-breaking device in the second mentioned path, and means for operating said second circuit-breaking device when the total number of operated keys exceeds the number of groups of keys.

4. In combination a plurality of manually operated double plunger keys arranged in groups, a plurality of electromagnets respectively associated with said keys for locking their respectively associated keys in operated positions, a pair of normally opened contact spring sets on one of the plungers of each of said keys, a source of potential, an operating circuit connected to said source, in which the electromagnets of each group of keys are respectively connected in parallel paths, each path including one of said sets of contact springs, an additional electromagnet and an armature thereof in each of said operating circuits for releasing all operated keys in a group when more than one key in the group are in operated positions, an incoming path connected through the other of said sets of contact springs on each of said keys, an additional manually operated double plunger key, an electromagnet and an operating circuit therefor for locking said additional key in its operated position, said operating circuit for the last mentioned electromagnet being connected to the first mentioned operating circuit to form a common path, a single outgoing path for said incoming path, a pair of normally opened contact spring sets on said additional key, one of the last mentioned sets responsive to the operation of said additional key for connecting one or more of the incoming paths respectively closed by one or more of the operated keys in different groups to said single outgoing path, and the other of the last mentioned sets being responsive to the operation of said additional key for completing the operating circuit of the last mentioned electromagnet, and an additional electromagnet and an armature therefor in said common path for releasing all operated keys when the total number of operated keys exceeds the number of groups of keys.

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