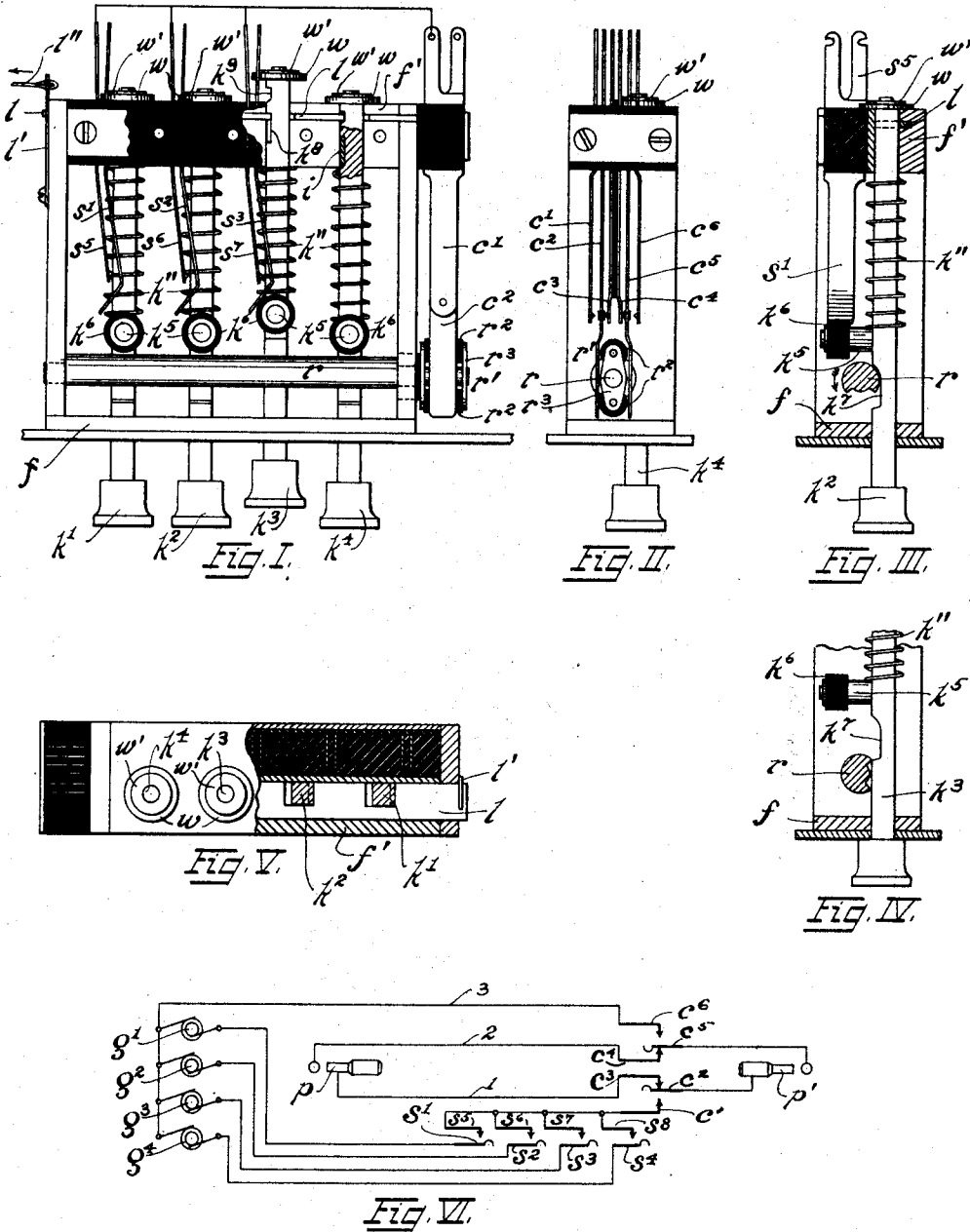


C. H. NORTH.
SELECTIVE RINGING KEY.
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SELECTIVE RINGING-KEY.

1,042,954.

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To all whom it may concern:

Be it known that I, CHARLES H. NORTH, a citizen of the United States of America, and a resident of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Selective Ringing-Keys, of which the following is a specification.

My invention relates to improvements in selective ringing keys, especially adapted for controlling a plurality of sources of current in association with telephone switchboards. The said key is of the general type commonly employed in harmonic or other selective signaling, and is equipped with indicating means whereby the last prior call is automatically shown. In the use of keys of this type, a really serious defect has commonly been observed, in that cross-talk is frequently caused or augmented thereby, and the characteristic tone or interruption of the harmonic or signaling current frequently obtrudes itself upon the talking circuit. Continued experiment has shown that these undesirable results are largely caused by the condenser-effect necessarily present in the closely assembled switch springs, exposed to each other in multiple relation throughout a large number of circuits within the switchboard, as necessarily results with the ordinary selective key. The number of possible selective signals correspondingly increases the number of such condenser surfaces, and thereby augments the trouble in question, when employing the ordinary type of selective ringing key, and these are duplicated many times upon each section of the telephone switchboard to correspond with each of the connecting cord pairs. The foregoing difficulty is also accompanied by one of another sort observable in the operating room, namely, considerable noise in the mechanical operation of the keys, found to exist in the actuation of the plungers and their automatic detention and release, while if a master key is employed, the connecting mechanism is liable to lost motion, thereby causing a rattling or noise in the actuation of such master key, and finally its faulty operation. Observing these difficulties and other features capable of improvement in this class of apparatus, it has been my object to overcome such difficulties and improve otherwise upon the devices of the prior art, while maintaining the

cost of construction at a minimum and insuring durability and extreme simplicity in the apparatus evolved.

Referring briefly in a preliminary way to the device of my invention, I may say that it comprises a single controlled master key to which extend the only normal contacts of the cord circuit, and which are wholly disconnected from any contacts associated with the sources of ringing current. In connection with this master key is provided a rotary actuating mechanism, which insures a wide separation of the actuating springs, thereby minimizing any possible condenser effect, or permitting the use of a relatively large number of such springs in the key. The selective keys, which may be provided in any desired number, are individually formed of two co-acting contacts or springs, and a depressible plunger associated with the rotary actuating means for the master key; said plunger preferably being provided with a squared portion along its stem and a resilient stop. With the several selective keys is associated in turn, suitable detent mechanism which is designed to lock the key last depressed and release such key upon the actuation of a second selective key. All of these and other features will best be gathered by making reference to the accompanying drawings illustrating the preferred embodiment of my invention, wherein:—

Figure I is a view in side elevation and partially broken away, showing the preferred type of ringing key. Fig. II is an end view thereof illustrating the master key. Fig. III is a vertical sectional view wherein is best shown the universal rotary actuating means, which is further brought out in the sectional detail of Fig. IV, illustrating the same in ringing position. Fig. V, is a bottom view of the key partially broken away to illustrate the detent mechanism; and Fig. VI is a diagrammatic view of the key in association with the two connecting plugs of a cord circuit.

Throughout the several figures of said drawings I have employed the same characters of reference to indicate similar parts.

In the drawings I have chosen for illustration, a four-party selective ringing key, although a greater or less number of these keys may advantageously be used, since the essentials are a controlled or master key

governing the cord circuit contacts, and a plurality of selective keys governing the contacts connected with the corresponding generators of signaling currents. In practice there is associated with such selective key mechanism, the usual auxiliaries of a telephone switchboard comprising the cord circuit, a listening key, and the necessary generators or sources of current. I have shown in the diagram, Fig. VI, merely the essentials for employing my key in the cord circuit represented by the conductors 1 2, and the plugs p p' . The generators g' , g^2 , g^3 and g^4 are individually connected with the separate springs s' , s^2 , s^3 and s^4 of the selective key, while the opposing springs s^5 , s^6 , s^7 and s^8 are connected with one of the outer springs c of the controlled or master key, the corresponding outer spring c^6 being connected with the common return conductor 3 extending to one pole of each of the generators. The mechanical construction permitting this arrangement will now be explained in connection with the remaining figures of the drawings.

The frame f mounts the several depressible plungers or keys k' , k^2 , k^3 and k^4 , one of which is shown in Fig. III in association with its set of springs s' s^5 . A coil spring k'' upon the stem of the plunger engages the laterally projecting arm k^5 equipped with a rotatable rubber sleeve or roller k^6 . This is adapted to engage the longer of the set of springs and cause it to make contact with the other. The upper portion of the stem or plunger is provided with a recess k^7 , wherein the rotatable member r lies and is adapted to be actuated as indicated in Fig. IV. The lower portion of the stem is square in cross-section, and fits snugly within the lower bar f' of the frame to prevent the rotation or twisting of the stem or plunger. One face of said stem is provided with additional recesses k^8 k^9 , as best shown in Fig. I, whereby the recessed locking bar l is adapted to be actuated against the tension of its spring l' . Upon the inner extremity of each of the plungers is provided a washer w of resilient material, preferably soft rubber, and a reinforcing washer w' . The former is adapted to engage the removable outer plate f'' of the frame and prevent any click or noise when the plunger is automatically released by the locking bar.

In Fig. I key k^3 is shown in its indicating position, being assumed to be the one last depressed, and in consequence the locking bar is in engagement with the outer wall of the recess k^8 thereof. In order to prevent all of the keys being held depressed, or for the purpose of making one of the keys a non-indicating key, the recess k^8 in the stem of key k^4 is provided with an insertible filler or member i which is flush with the face of the stem, and prevents the locking bar from

retaining said key in its depressed position. This member i may be removed or similar ones may be inserted in any of the plungers desired. As an additional precaution against maintaining all of the keys in their locked position, the spring l' is connected with a common trip or wire l'' adapted, when pulled, to actuate the leaf-spring l'' and secure the lateral movement of each of the locking bars in the keys at a given operator's position, whereby all of the selective keys thereat may be released. The controlled or master key is situated at the end of the frame; being best shown in Fig. II. In this instance it comprises six insulated springs c' , c^2 , c^3 , c^4 , c^5 and c^6 . The longest paired springs c^2 c^5 bear upon the rotatable actuating member r' carried at the end of rod r between the said springs which tend to maintain it in a vertical position. This actuating member comprises two insulating rollers r^2 retained between the yoke-pieces r^3 . Upon the rotation of the rod r through approximately 90° by the actuation of any of the selective keys, as indicated in Fig. IV, the actuating member r' thus is caused to assume a substantially horizontal position, thereby spreading the springs c^2 c^5 out of contact with springs c^3 c^4 and into engagement with springs c' c^6 . It will be noted that these latter springs c' c^6 are those alone through which the signaling currents are applied to the cord circuit, and in consequence I preferably space the said springs more distantly from the others, in order to reduce the condenser effect already spoken of. Instead, a greater number of springs may be employed in the master key, if required, since the rotatable actuating member movable through an arc approximately of 90° , is adapted to insure a considerable spread for the actuated springs c^2 c^5 .

The operation of the selective key and some of its advantages may now be explained.

Upon the complete depression of any key, as for example k^3 , which depression is governed approximately by the length of the key-stem, the locking bar l is first actuated to the left, Fig. I, against the tension of its spring l' by the inclined wall or face of the recess k^9 , thereby releasing any previously depressed key. The rotatable rubber sleeve k^6 engages the longer spring s^5 of the corresponding pair of springs, and actuates it into contact with its co-acting spring s^7 . Simultaneously the shouldered rod r is engaged by the abrupt wall of recess k^7 , and said rod and its connected actuating member r' are rotated approximately through an arc of 90° , so that said member assumes a horizontal instead of its normal vertical position. The circuit controlling springs of the cord circuit are thereby separated to cut off plug p , while

actuated springs c^2 c^5 are respectively engaged with the outer springs c' c^6 , whereby signaling current from the selective generator g^3 is transmitted through that portion of the cord circuit connected with the calling plug p' and over any electrical circuit with which said plug may be temporarily associated. It is seen that the harmonic current will be but momentarily associated with any of the springs connected with the cord circuit, and that but one of said springs in the controlled or master key is connected therewith, and in consequence the condenser effect is reduced practically to zero in my improved key as compared with the surface exposure of numerous paired springs found in other keys of the prior art. The actuation of the rotary controlling member is accomplished positively and silently, while the released selective keys, being brought to a stop by their respective rubber washers, produce approximately no click or sound. The locking and releasing mechanism, moreover, is very simple and the wear to which the several parts of my improved selective key are subjected, is very slight.

Having now described the preferred embodiment of my invention, I claim as new, and desire to secure by Letters Patent, the following:—

1. In a selective-ringing key, the combination with a plurality of ringing-current controlling-keys, of an extended lug associated with each, a rotatable member common to each key and engaging said lugs, a rotary actuated part carried by the rotatable member, and a controlled or master key associated with said actuating member and adapted to be operated upon each actuation of any selective key, substantially as set forth.

2. In a selective-ringing key, the combination with a plurality of longitudinally movable plungers each equipped with an extended lug, of sets of switch springs respectively associated with and adapted to be actuated thereby, a rotatable toothed member independently actuated by the lug upon any of said plungers, a rotary actuating member associated therewith, and a master key equipped with switch springs adapted to be actuated in common with each of the selective plungers, substantially as set forth.

3. In a selective-ringing key, the combination with a plurality of longitudinally movable plungers, of sets of switch springs respectively associated with and adapted to be actuated thereby, a rotatable member independently actuated by each of said plungers, a rotary actuating member associated therewith, a master key equipped with switch springs adapted to be actuated in common with each of the selective plungers, restoring springs individual to said plungers, resilient stops positioned respectively upon said plungers opposite the springs and locking

and releasing means for retaining in partially depressed position any one of said plungers, substantially as set forth.

4. In a selective-ringing key, the combination with a plurality of paired switch contacts and means for individually actuating them into electrical engagement; one contact of each pair being respectively connected with a source of signaling current, a contact in an associated master key connected with each of the other contacts of said pairs, a second contact in the master key connected with the sources of signaling current, paired contacts in said master key, adapted to be actuated into engagement with the aforesaid contacts, and means for effecting such actuation upon the closure of circuit between any of the signaling current contacts, substantially as set forth.

5. In a selective-ringing key, the combination with a plurality of paired switch contacts and means for individually actuating them into electrical engagement; one contact of each pair being respectively connected with a source of signaling current, a contact in an associated master key connected with each of the other contacts of said pairs, a second contact in the master key connected with the sources of signaling current, paired contacts in said master key, adapted to be actuated into engagement with the aforesaid contacts, paired coacting contacts in the master key normally in electrical engagement therewith and adapted to control the continuity of a cord circuit, and means for effecting the actuation of the first pair of contacts out of engagement with the latter, and into engagement with the contacts governing the signaling currents, substantially as set forth.

6. In a selective-ringing key, the combination with a plurality of paired selective-ringing contacts respectively connected with corresponding sources of selective-signaling currents, one contact of each pair being connected with a normally open contact in an associated master key, said contact in the master key, and a corresponding contact therein connected with each of the sources of signaling current, normally closed paired contacts in the master key adapted to control the continuity of the cord circuit, means for effecting the individual actuation of the paired selective-signaling contacts, and additional associated means for momentarily disengaging the last named contacts in the master key, and for connecting one of said pairs to the aforesaid signaling-current controlling contacts in the master key upon the actuation of any of the selective signaling contacts, substantially as set forth.

7. In a selective signaling key, the combination with a plurality of actuating plungers, and a plurality of paired contacts associated each to each, one contact of each

of said pairs being connected with a contact in an associated master key, said master key, comprising a pair of normally disengaged contacts, one of which is permanently
5 connected with said pairs as above, and the other is adapted to be connected with sources of signaling current, two normally engaged pairs of contacts in the master key, and means actuated by any of the plungers for
10 disengaging said engaged pairs of contacts in the master key, and for momentarily connecting one pair with the signaling current contacts in said master key, substantially as set forth.
15 8. In a selective-ringing key, the combination with a plurality of longitudinally

movable plungers and their associated switch contacts; each of said plungers being provided with a detent, a locking member adapted to engage any of said detents, 20 and an adjustable part adapted to be associated with any detent and prevent its engagement by the locking member, substantially as set forth.

Signed at Cleveland, this 29th day of 25 April, A. D. 1907, in the presence of two subscribing witnesses.

CHARLES H. NORTH. [L. s.]

Witnesses:

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."
