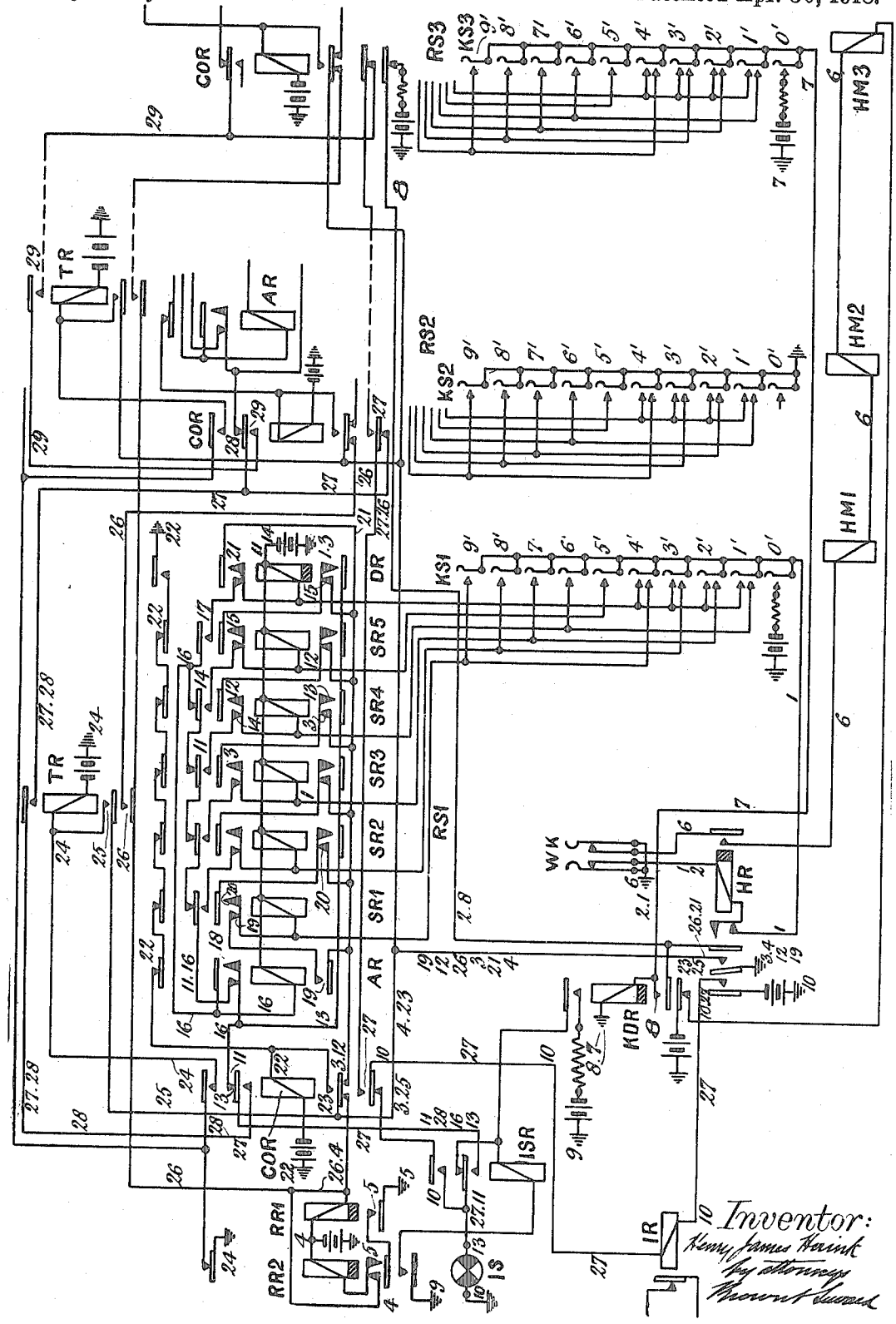
H. J. HERINK.

ELECTRIC IMPULSE SENDER.

APPLICATION FILED DEC. 23, 1916.

1,264,517.

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Inventor:
Henry James Herink
by attorneys
Brown & Brown

UNITED STATES PATENT OFFICE.

HENRY JAMES HERINK, OF LONDON, ENGLAND, ASSIGNOR TO THE RELAY AUTOMATIC TELEPHONE COMPANY, LIMITED, OF LONDON, ENGLAND.

ELECTRIC-IMPULSE SENDER.

1,264,517. Specification of Letters Patent. Patented Apr. 30, 1918.

Application filed December 23, 1916. Serial No. 138,627.

To all whom it may concern:

Be it known that I, HENRY JAMES HERINK, a subject of the King of Great Britain, residing at Marconi House, Strand, London, England, have invented new and useful Improvements in Electric-Impulse Senders, of which the following is a specification.

The object of this invention is to provide improved apparatus for sending out by the depression of keys or the like operation, impulses depending in number on the key or switch operated. Such apparatus may be used, for instance, in semi-automatic telephone systems to interrupt one or more circuits so as to operate automatic switches in known manner.

According to this invention the keys control impulse counting devices or selectors which consist of relays and in which the number of selective positions is less than the maximum number of impulses for which they are adapted.

The invention is illustrated in the accompanying drawing, which shows a key-board and the associated circuits and relays.

KS1, KS2 and KS3 are the key-sets, and RS1, RS2 and RS3 the corresponding relay selectors, there being one key-set and one selector for each digit of the number to be called. Only three key-sets are shown but any number wanted can be used and connected up in a similar way. Only the first selector is shown complete. Each selector consists of a starting relay AR, five counting or switching relays SR, a differentiating relay DR, an interrupter cut-off relay COR and a transfer relay TR serving to transfer the circuits from the selector in question to the next one. There is no transfer relay associated with the last selector. Common to all the selectors are two retarding relays RR1 and RR2 which provide a certain time interval before a succeeding selector is operated. IS is a common impulse sender in the form of a rotating interrupter, and IR is an impulse relay by which the impulses are transmitted to the automatic switches. Keys that have been depressed are locked in position by holding magnets HM1, HM2, HM3, which hold down the keys until a units key is depressed, when they will all come up together. No impulses are sent until a units key is depressed. By operating a wipe-out key WK, the operator is able to correct an error in the selection of the keys as long as the units key has not been depressed.

If the operator wants to call the subscriber No. 730, she depresses the corresponding keys 7′, 3′ and 0′. The hundreds key closes a circuit 1 through a holding relay HR and the switching relay SR3 of the first selector. HR is retained over 2 and SR3 over 3. RR1 and RR2 are operated over 4, the latter being retained over 5. The holding magnets HM1, HM2 and HM3 are energized in a circuit 6. The tens key 3′ causes the energization of relays DR and SR2 of the second selector, which relays are retained over circuits similar to 3. The units key 0′ does not operate any selector relay but closes the circuit 7 of a key-disconnecting relay KDR, which locks itself over 8 and opens circuit 6 of the holding magnets whereby the keys are released and restored to normal.

Upon the operation of relay KDR, a circuit 9 is completed through a starting relay ISR. If at this moment the interrupter IS happens to be in position to give out an impulse, said relay is short-circuited over the interrupter. It always operates therefore only in a non-closing position of the interrupter, thus preventing the impulse relay IR from receiving only the tail end of an impulse which might or might not energize it. After relay ISR has energized, current impulses are sent from the interrupter partly through impulse circuit 10 to relay IR, partly to the first selector RS1. The number of impulses received by IR corresponding to the first digit is determined by the selector which, after having received a certain number of impulses, causes the cut-off relay COR to be energized and to open the impulse circuit 10.

The selector operates generally as described in United States Patent No. 1226184.

For digit 1, key 1 completes circuits to energize SR4 and DR over HR. Circuit 22 is therefore opened by SR4 and closed by DR. SR5 is energized from the interrupter circuit (and opens circuit 22) and deenergizes SR4 which closes circuit 22. DR being energized there is no retaining circuit for SR5 so that it deënergizes and completes circuit 22 to energize COR which opens the retaining circuit of DR.

Keys 2 to 4 inclusive energize DR and

the relay SR preceding the relay which is to receive the first impulse.

Keys 5 to 9 only complete a circuit for the relay preceding the first impulse relay, SR being operated by one of the impulses as detailed for key 7.

Key O simply energizes HR, all the selector relays receiving impulses.

When key 7 is depressed the first impulse to the selector is sent over 11 through relay SR4 which energizes and locks itself over 12. SR4 breaks the retaining circuit 3 of SR3, but as long as the first impulse lasts the latter is retained over 13. Upon the cessation of the first impulse SR3 deënergizes. The second impulse operates SR5 over 14, which locks itself over 15 and opens 12 so that, upon the cessation of the second impulse, the relay SR4 deënergizes, preparing the circuit of relay AR. The third impulse energizes AR over 16 (through series contacts and back to winding) and DR over 17 (through series contacts). AR is held over 18 and energizes, over 19, SR1 which is retained over 20, DR is retained over 21 and opens 15. As a consequence, upon the cessation of the third impulse, relays SR5 and AR deënergize. The fourth impulse energizes SR2 in a similar way, SR1 being deënergized at the end of said impulse. Similarly SR3, SR4 and SR5 are operated by the fifth, sixth and seventh impulses respectively. At the end of the seventh impulse SR5 deënergizes, as now relay DR is energized (and therefore no retaining circuit for SR5), and a circuit 22 is closed in which COR energizes opening the impulse circuit 10 and the retaining circuit of DR and locking itself over 23. At the same time RR1 is deënergized and opens the retaining circuit of RR2, RR1 and RR2 are slow to deënergize, thereby providing a sufficient time interval between the last hundreds impulse and the first tens impulse. RR2 deënergizing closes circuit 24 through transfer relay TR which locks itself over 25. TR energizes and closes circuit 26 through relay RR1. RR1 and RR2 energize as before and close circuit 9.

Relay ISR energizing completes an impulse circuit 27 for IR and an impulse circuit 28 for the second selector. As SR2 of said selector is already energized owing to the depression of key 3′, the first impulse energizes SR3, the second SR4 and the third SR5. Relay DR being energized, SR5 deënergizes at the end of the third impulse thereby closing a circuit 22 through COR of the second selector. RR1 and RR2 are thereby again deënergized and the impulse circuits are extended over 29 to the third selector in the manner described with reference to the second selector.

No relay was previously energized in the third selector because the units digit is 0, and this one therefore receives 10 impulses. At the end of the tenth impulse, relay COR of this selector energizes and opens the impulse circuits. It also opens circuits 2 and 8 thereby causing the deënergization of relays HR and KDR. Relay HR breaks all retaining circuits so that the whole apparatus is restored to normal and is ready to be used for another call.

In the arrangement shown, the key-board itself may evidently be connected to more than one set of relays in which case the operator need not wait until all the impulses have been sent out from the first set of relays but, as soon as all the keys are released, may start another call through a second set of relays, and so on. Thus the number of sets of relays that may be connected to one key-board may be equal to the number of times an operator can manipulate the keys during the interval that is needed for a set of relays to transmit the greatest number of impulses required for a call.

What I claim is:—

1. In an impulse sending device, the combination of a plurality of keys, an impulse counting device consisting of relays, the number of counting relays being less than the maximum number of impulses to be received by said device, means whereby for any number of impulses other than one certain number a counting relay associated with a depressed key is energized and means whereby the counting relays commencing at the relay next to such associated relay are then successively energized.

2. In an impulse sending device, the combination of a plurality of keys, an impulse counting device consisting of relays, the number of selective positions of such counting device being less than the maximum number of impulses to be received by said device, means whereby for any number of impulses other than one certain number a counting relay associated with a depressed key is energized and means whereby the counting relays commencing at the relay next to such associated relay are then successively energized.

3. In an impulse sending device, the combination of a plurality of keys, an impulse counting device consisting of relays, the number of counting relays being less than the maximum number of impulses to be received by said device, means whereby for any number of impulses other than one certain number a counting relay associated with a depressed key is energized, means whereby the counting relays commencing at the relay next to such associated relay are then successively energized and means whereby the counting device is automatically re-set after it has been set up to a fixed position.

4. In an impulse sending device, the combination of a plurality of keys, an impulse counting device consisting of relays, the number of counting relays being less than the maximum number of impulses to be received by said device, means whereby for any number of impulses other than one certain number a counting relay associated with a depressed key is energized, means whereby the counting relays commencing at the relay next to such associated relay are then successively energized, and a differentiating relay adapted to determine whether the counting device shall be re-set or not.

5. In an impulse sending device, the combination of a plurality of keys, a plurality of impulse counting devices consisting of relays, one counting device being provided for each digit of the number set by the keys, and a timing relay adapted to insure the lapse of a suitable time interval between the last impulse to one counting device and the first impulse to the next.

6. In an impulse sending device, the combination of a plurality of keys, an impulse counting device consisting of relays, an impulse circuit whereby impulses may be sent to the relays, an interrupter in such circuit and a relay adapted if its circuit is closed in a closing position of the interrupter to be short-circuited over the interrupter.

HENRY JAMES HERINK.