

June 24, 1941.

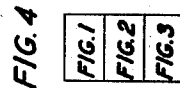
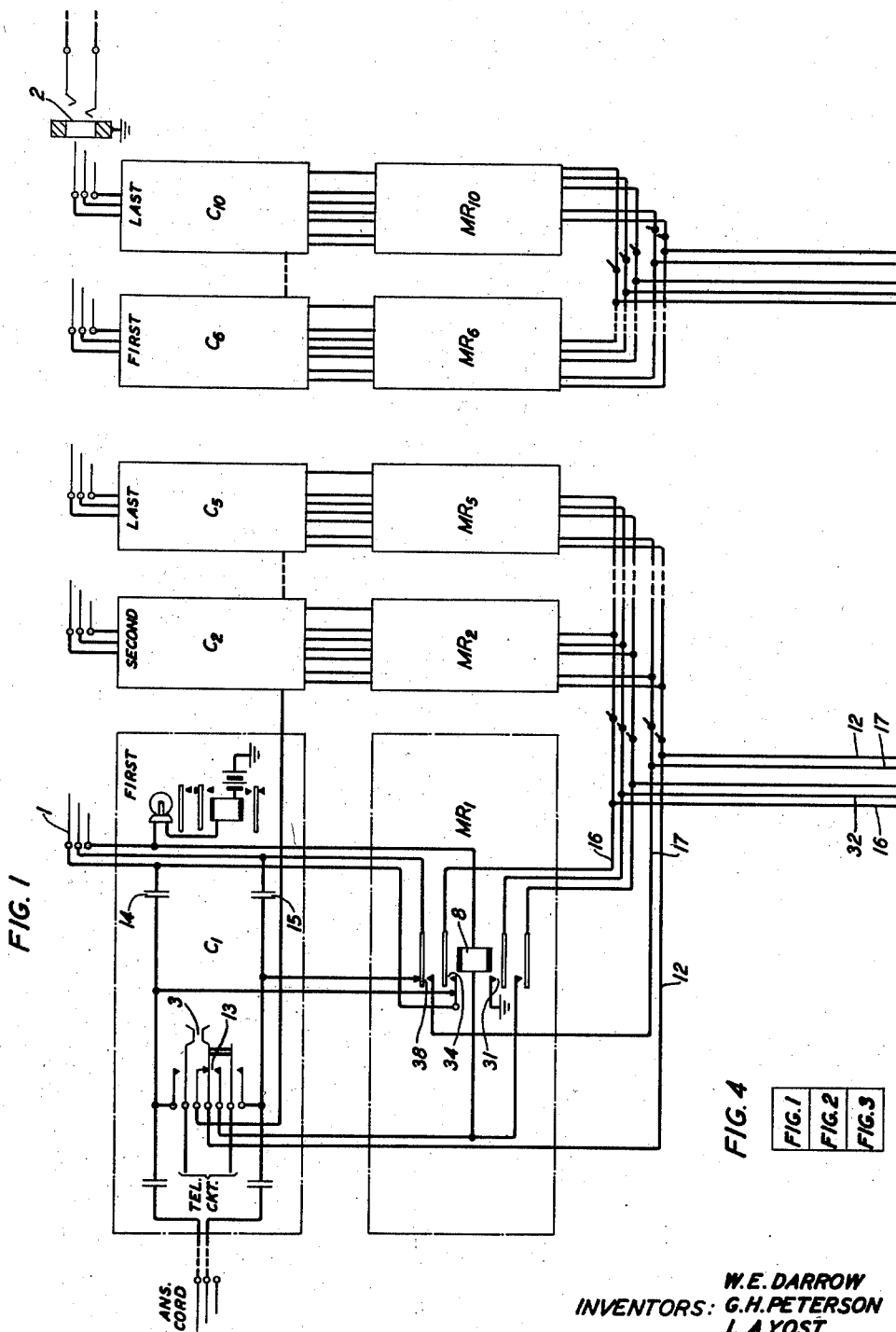
W. E. DARROW ET AL

2,246,576

MACHINE RINGING SYSTEM

Filed Nov. 25, 1939

3 Sheets-Sheet 1



W.E. DARROW
INVENTORS: G.H. PETERSON
L.A. YOST
BY 
ATTORNEY

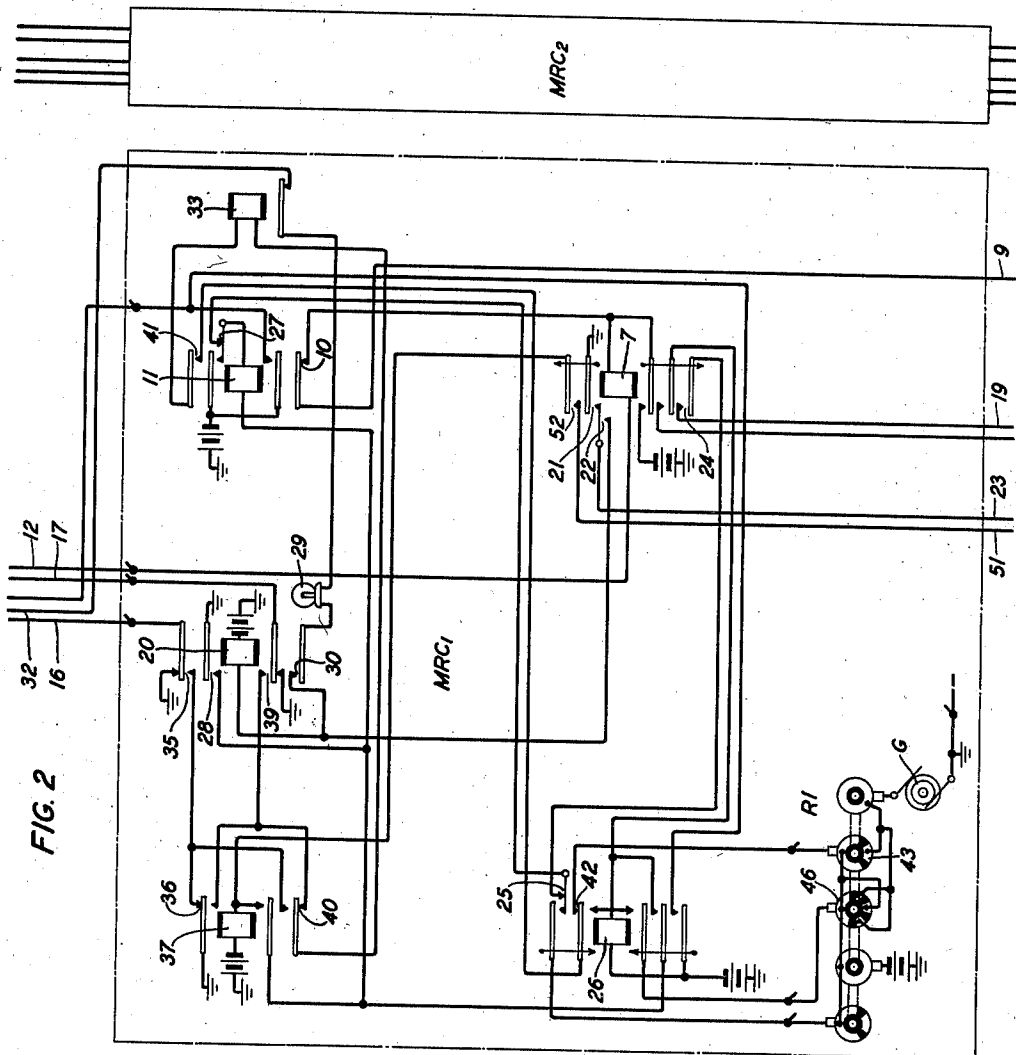
June 24, 1941.

W. E. DARROW ET AL
MACHINE RINGING SYSTEM

2,246,576

Filed Nov. 25, 1939

3 Sheets-Sheet 2



W. E. DARROW
INVENTORS: G. H. PETERSON
L. A. YOST
BY *H. H. Ferguson*
ATTORNEY

June 24, 1941.

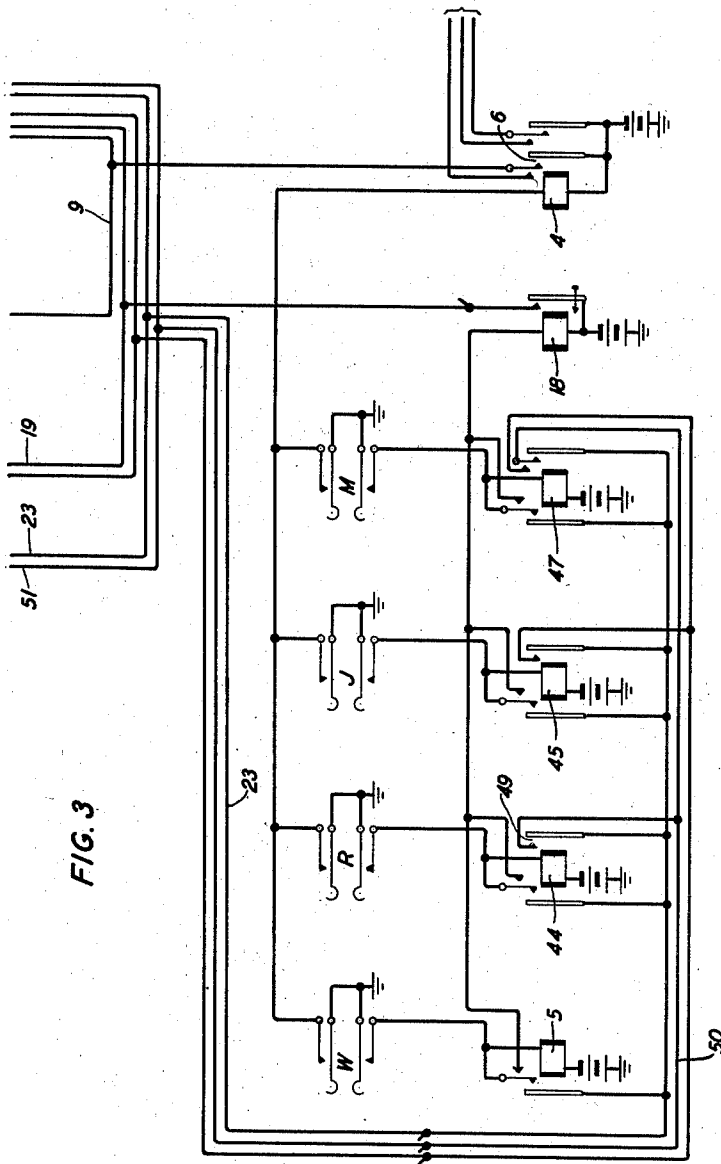
W. E. DARROW ET AL

2,246,576

MACHINE RINGING SYSTEM

Filed Nov. 25, 1939

3 Sheets-Sheet 3



W.E. DARROW
INVENTORS: G.H. PETERSON
L.A. YOST
BY
H. Kingman
ATTORNEY

UNITED STATES PATENT OFFICE

2,246,576

MACHINE RINGING SYSTEM

Wirt E. Darrow, Hollis, N. Y., and George H. Peterson, Glen Rock, and Lloyd A. Yost, Fanwood, N. J., assignors to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

Application November 25, 1939, Serial No. 306,062

2 Claims. (Cl. 179—51)

This invention relates to telephone systems and more particularly to telephone switchboards employing so-called machine ringing.

In Patent 1,606,161 issued November 9, 1926, to C. B. Fowler, a well-known machine ringing system is disclosed in which each cord circuit at an operator's position has associated therewith a plurality of relays which are controlled by means of a common or master ringing key arrangement to connect a common ringing source to the cord to which the operator's telephone is connected and which (cord) is connected to a called line. When a ringing key is operated, the master key circuit is connected through to the cord, which is in condition for ringing, and certain of the ringing control relays of the cord are operated, after which the ringing key circuit is disconnected and may be used to set ringing on another cord, and thereafter ringing current is intermittently and automatically applied to the cord and thence to the called line until the called subscriber answers, whereupon the cord relays are restored, and the ringing current disconnected.

The above prior art arrangement is very satisfactory but is relatively expensive due to the fact that each cord requires the addition of at least four extra relays in addition to the master ringing key equipment in order to provide the machine ringing service. In a switchboard position equipped with fifteen cords it will, therefore, be observed that about sixty extra relays are required for the cords alone.

An object of the present invention is to provide machine ringing facilities at switchboard positions with a substantial reduction in the cost, i. e., with relatively fewer relays per position.

A feature of the invention whereby the foregoing object is obtained resides in dividing the cords into groups, for example, into groups of five, adding one extra relay per cord and providing a common set of ringing control relays for each group, which relays are in turn controlled in the usual manner by means of a common or positional master ringing key equipment.

The invention will be understood from the following description and accompanying drawings.

The invention will be understood from the following description when read in connection with the accompanying drawings (Figs. 1, 2 and 3) arranged in accordance with Fig. 4, Fig. 1 of which represents a plurality of conventional common battery operator's cord circuits C1, C2, etc., arranged in groups of five, the first or No. 1 cord being shown in sufficient detail for an understanding of the circuit operation of the inven-

tion and cords Nos. 2, 5, 6 and 10 being represented by broken line rectangles. As shown in detail in connection with cord C1, each cord has associated therewith a relay and connections therefore indicated by the designation MR1, MR2, etc.

Fig. 2 shows a common ringing control circuit for each group of five cords designated as MRC1 and MRC2 and Fig. 3 shows a position master ringing equipment by means of which the operator is enabled to select the proper ringing current to be connected to the called subscriber's line.

A description of the operation of the circuit of this invention follows: Let us assume that the operator has connected the front or calling plug 1 of cord circuit C1 to the jack 2 of a four-party subscriber's line, has operated the talking key 3 and desires to ring the subscriber whose bell is connected between the tip conductor of the line and ground and whose code is one ring repeated at regular intervals until the subscriber answers by removing the receiver from the switchhook, which subscriber may be designated the "W" party.

In order to set the control circuit to effect this combination, the operator momentarily actuates the W ringing key (Fig. 3) thereby operating relays 4 and 5 whose circuits are obvious. Relay 4 in operating connects battery at its contact 6 to operate relays 7 and 8 whose circuits can be traced from battery, contact 6 of relay 4, conductor 9, contacts 10 of relay 11, winding of relay 7, conductor 12, contacts 13 of key 3, winding of relay 8 and sleeve of plug 1 and jack 2 to ground. Relay 8, in operating, removes the short circuit from condensers 14 and 15 in the cord and connects the tip and ring of the front or calling end of the cord over conductors 16 and 17 to the control circuit MRC1. Relay 5 operated simultaneously with relay 4 thereby operating relay 18 which relay connects battery to conductor 19. When relay 7 operated due to the operation of relay 4, it closed its contacts 21 and 22 thereby operating relay 20 and also connected ground to conductor 23 thereby providing a locking ground for relay 5 whereupon key W can be released and used to set ringing for another cord group. Relay 7 also locks itself, and relay 8, operated under control of the talk key and the plug and jack connection. Further, relay 7 by closing its lower contacts 24 extends battery from conductor 19 to operate relay 11, the circuit for which can be traced from battery, contacts of relay 18, conductor 19, contacts 24 of relay 7, contacts 25 of relay 26, con-

tacts 27 and winding of relay 11 and contacts 28 of relay 20 to ground. When relay 20 operated it closed its contacts 30 to provide a holding circuit for itself in series with pilot lamp 29 which can be traced from ground, contacts 31 of relay 8, conductor 32, contacts of tripping relay 33, lamp 29 and contacts 30 and winding of relay 20 to battery.

It will now be observed that relays 8, 11 and 20 are operated and held under control of the sleeve circuit and contacts of the tripping relay 33 independent of either the talk key 3 or ringing key W and therefore these keys can be released without interfering with the subsequent ringing operation. Release of the talk key 3 and key W permit relays 7, 5, 4 and 18 to release.

Lamp 29 serves as an indication to the operator that control circuit MRCI is set for ringing on the first group of cords (Nos. 1 to 5) and therefore as long as this lamp is lighted no other cord in this group can ring on a subscriber's line.

With relays 8, 20 and 11 operated, the tip of the front or calling end of the cord is connected to ground over contacts 34 of relay 8, conductor 16, contacts 35 of relay 20 and contacts 36 of relay 37 and the ring conductor of the cord is connected to the ringing interrupter R1 over contacts 38 of relay 8, conductor 17, contacts 39 of relay 20, contacts 40 of relay 37, winding of tripping relay 33, contacts 41 of relay 11 and contacts 42 of relay 26 to the one ring per cycle commutator 43 of the ringing interrupter R1 which alternately connects the circuit, just traced, to battery and the ringing generator G in a well-known manner.

When the called subscriber answers, tripping relay 33 operates, as is well understood, thereby extinguishing lamp 29 and releasing relay 20 which momentarily grounds the tip ring conductors of the line to absorb any charge thereon due to the ringing current. Relay 20 also releases relay 11 which in turn releases relay 8 thereby disconnecting the cord conductors from the position circuit.

As soon as lamp 29 is extinguished, the operator can set ringing on any other cord in the group if desired.

In case party R is to be rung and whose code is also one ring but whose bell is connected between the tip of the line and ground, the operator will proceed as before but will actuate ringing key R whereupon relay 44 instead of 5 operates. Relays 4, 7, 8, 18, 20 and 11 operate as before and also reversing relay 37 operates in a circuit which can be traced from ground, contacts 21 of relay 7, conductors 23, contacts 49

of relay 44, conductors 50 and 51, contacts 52 of relay 7 and winding of relay 37 to battery, which reverses the tip and ring conductors 16 and 17 with respect to the ringing interrupter commutator 43 whereupon ringing current and battery potential are alternately connected to the line as before but in a reverse direction.

If the J party is to be rung whose bell is connected between the "ring" conductor and ground and whose code is two rings, repeated at regular intervals, operation of the J key operates relay 45 and relays 4, 7, 8, 18, 20 and 11 as before. Also relay 26 instead of relay 37 operates which connects the ring conductor 17 to interrupter commutator 46 which connects and disconnects generator G twice per revolution of commutator 46. Operation of ringing key M operates relays 41, 4, 7, 8, 18, 20, 11 and both relays 26 and 37 and thereby connects the tip conductor 16 to commutator 46 thus causing two ringing current impulses per revolution of commutator 46 to be transmitted over the tip of the line.

What is claimed is:

1. In a telephone switchboard, a called line, a plurality of cord circuits divided into groups, an operator's telephone, means individual to each cord for connecting said telephone thereto, a source of ringing current and a plurality of selective keys common to said groups, ringing control means individual to each group of cords and controlled by said keys for extending said source to its respective groups of cords, and a relay individual to each cord jointly responsive to connection of said telephone thereto, connection of the cord to a line, and actuation of one of said keys for connecting said extended source through the cord to the line to the exclusion of all other cords of the group.

2. In a telephone switchboard, a called line, a plurality of cord circuits divided into groups, an operator's telephone, means individual to each cord for connecting said telephone thereto, a source of ringing current, and a plurality of keys common to all of said cord circuits, ringing control means individual to each group of cords and controlled by said keys for extending said source to the respective group of cords, and relay means individual to each cord, jointly responsive to actuation of the associated telephone connecting means, connection of the cord to a line, and operation of one of said keys, to connect the respective cord to the extended source of ringing current to the exclusion of all other cords of the group.

WIRT E. DARROW.
GEORGE H. PETERSON.
LLOYD A. YOST.