

May 5, 1959

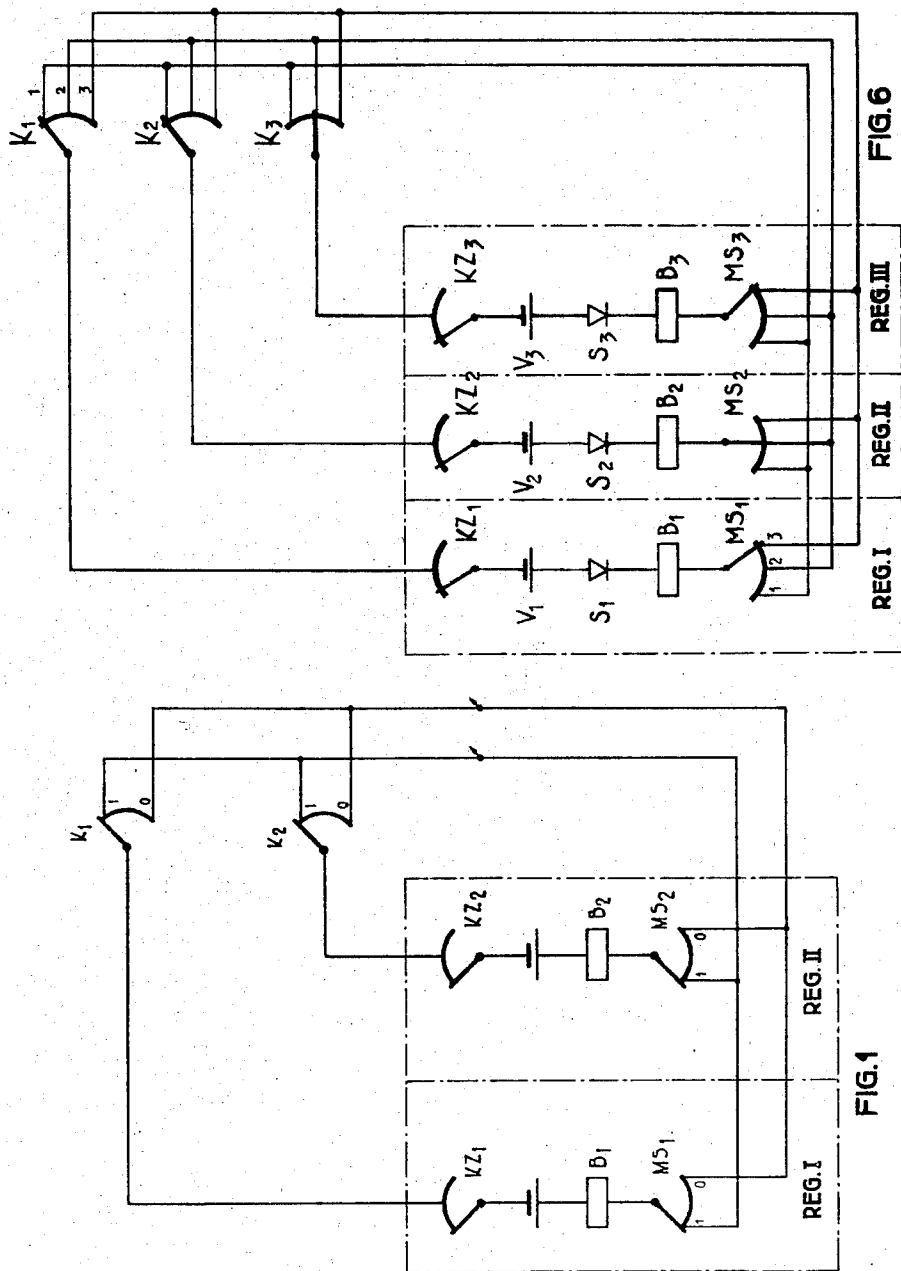
R. M. M. OBERMAN

2,885,480

RELAY REGISTER

Filed Sept. 10, 1953

5 Sheets-Sheet 1



INVENTOR.
Rochef M. M. Oberman
BY Michael S. Striker
ATTORNEY

May 5, 1959

R. M. M. OBERMAN

2,885,480

RELAY REGISTER

Filed Sept. 10, 1953

5 Sheets-Sheet 2

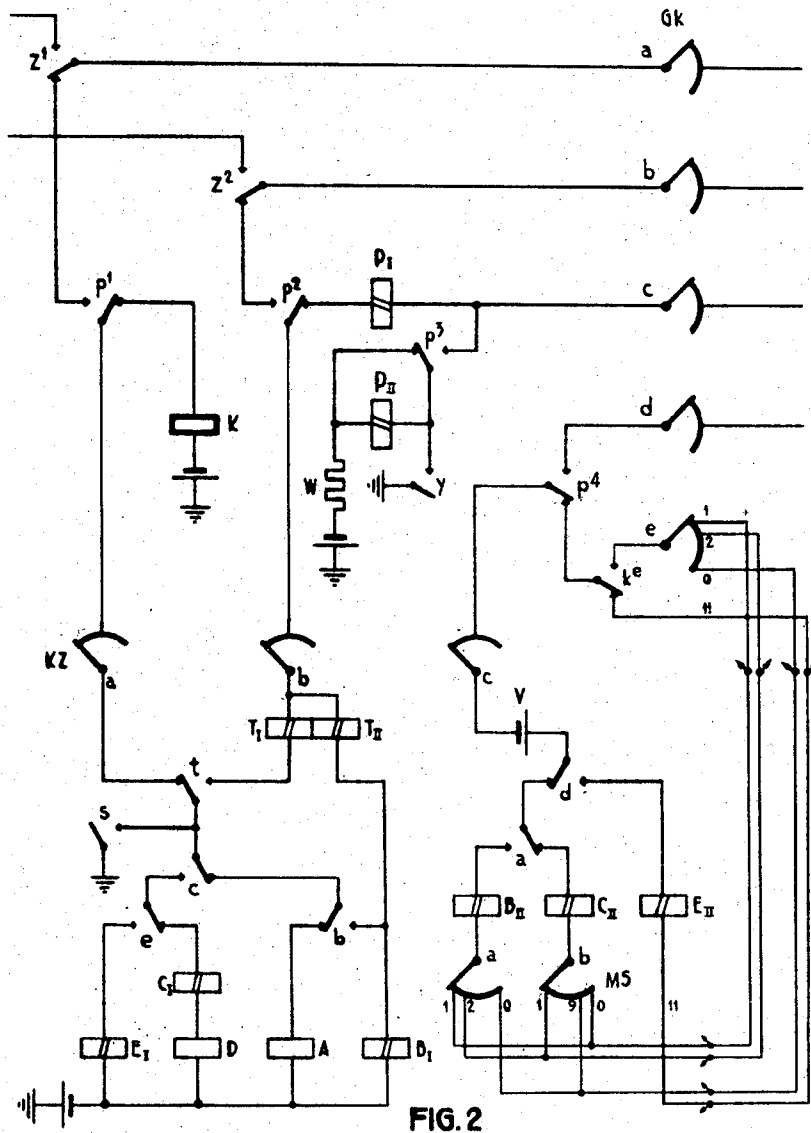


FIG. 2

INVENTOR.
Rolof M. M. Oberman
 BY *Michael A. Striker*
 ATTORNEY

May 5, 1959

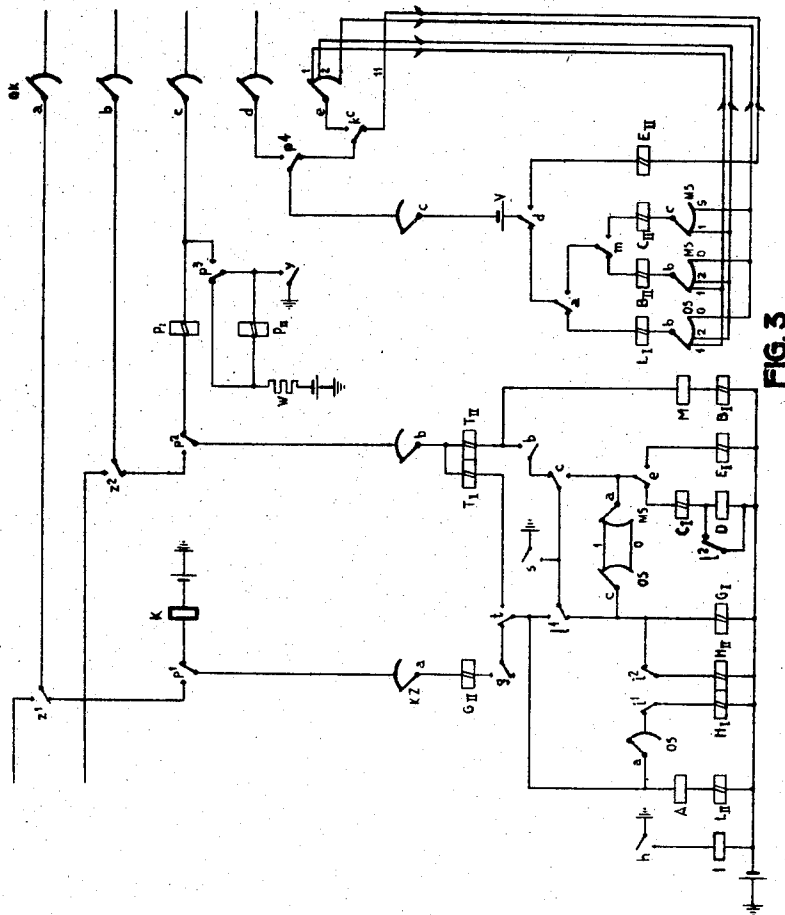
R. M. M. OBERMAN

2,885,480

RELAY REGISTER

Filed Sept. 10, 1953

5 Sheets-Sheet 3



INVENTOR.
Roelof M. M. Oberman
BY Michael A. Striker
ATTORNEY

May 5, 1959

R. M. M. OBERMAN

2,885,480

RELAY REGISTER

Filed Sept. 10, 1953

5 Sheets-Sheet 4

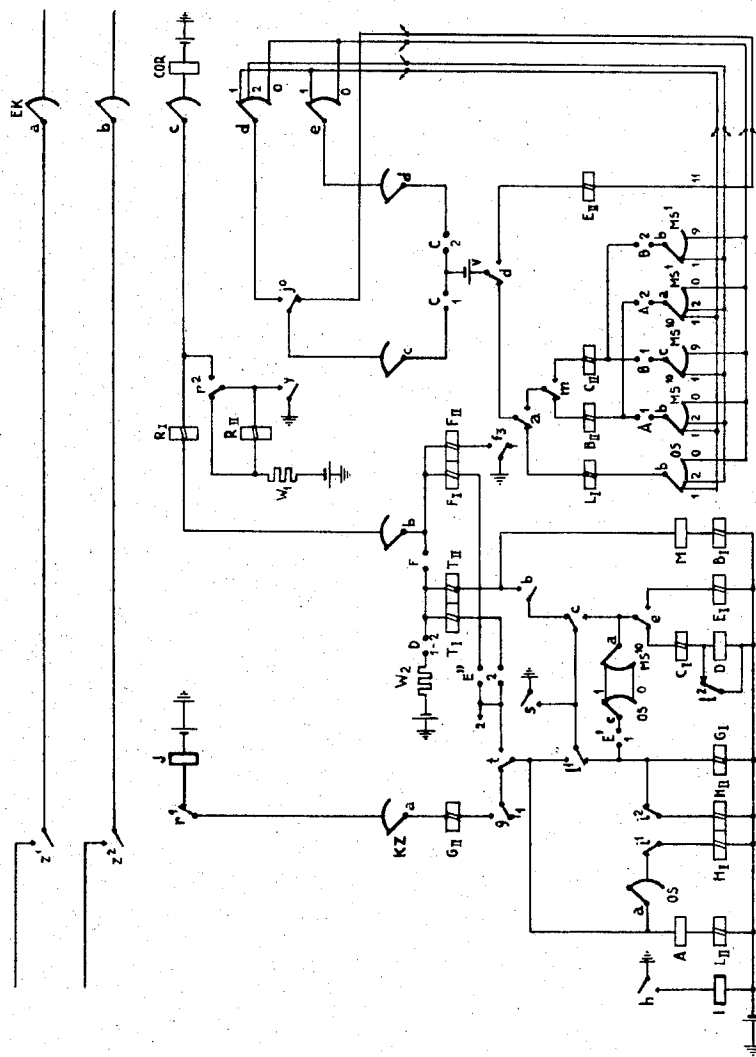


FIG. 4

INVENTOR.
Rolf M. M. Oberman
BY Michael S. Striker
ATTORNEY

May 5, 1959

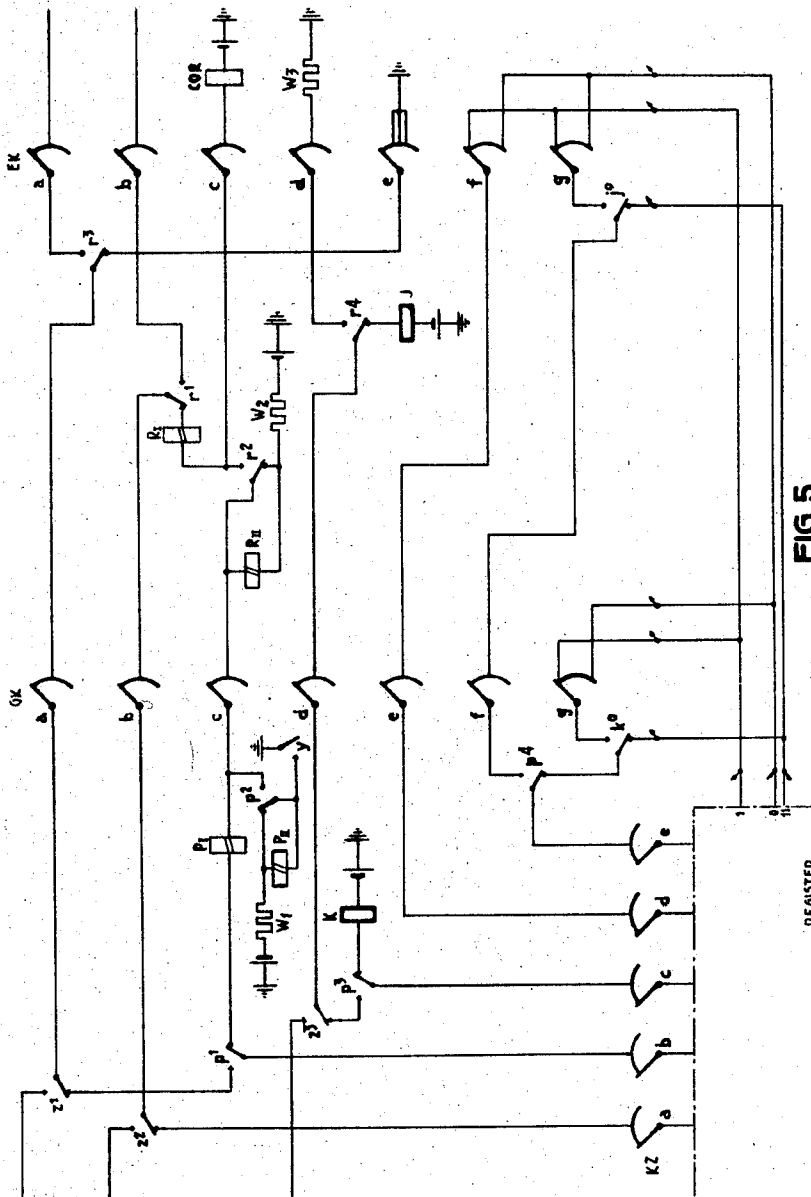
R. M. M. OBERMAN

2,885,480

RELAY REGISTER

Filed Sept. 10, 1953

5 Sheets-Sheet 5



INVENTOR.

Roelof M. M. Oberman

BY

Michael S. Striker

ATTORNEY

1

2,885,480

RELAY REGISTER

Roelof M. M. Oberman, Voorburg, Netherlands, assignor to De Staat der Nederlanden, Ten Dze Vertegenwoordigd Door de Directeur-Generaal des Posterijen, Telegrafie en Telefonie, The Hague, Netherlands

Application September 10, 1953, Serial No. 379,374
In Netherlands October 31, 1942

Section 1, Public Law 690, August 8, 1946
Patent expires October 31, 1962

26 Claims. (Cl. 179—18)

The present invention refers to automatic telegraph, telephone, telecontrol or telemetering systems in which registers are used to control successive selecting stages.

This application is a continuation-in-part application of my United States application Serial No. 768,029, entitled "Relay Register," filed on August 4, 1947, now abandoned.

The present invention relates, as does my co-pending United States patent application, Serial No. 772,870, filed September 8, 1947, also abandoned, to systems of the type in which a register and the various switching elements are not positioned by a series of impulses conveyed from the register to the switching elements, or conversely, but under control of a direct current. In this respect the present invention is different from that disclosed in my copending application, the latter application relating to a system in which a register is positioned by means of voice frequency alternating currents.

It is an object of this invention to provide in automatic telephone systems control elements for selectors which are simpler to design than those disclosed in my copending United States application Serial No. 772,870.

It is another object of the present invention to provide an arrangement in which the register and the various switching elements are positioned by direct current thus eliminating the filters and voice frequency generators necessary in a system such as disclosed in my copending application Serial No. 772,870.

It is another object of the present invention to simplify the design of known register systems and in particular to permit operation of the circuits of the selecting stages by a single relay.

An embodiment of the present invention involves a selector positioning arrangement usable in a telecommunication system comprising a register, marking means located in the register for marking one of a plurality of outlets connected to the marking means in accordance with digits dialled at a calling station, a selector having a plurality of contacts to which are connected the plurality of outlets and including selecting means for selecting one of the plurality of outlets, and control means located in the register and electrically interconnecting the selector and the marking means for controlling the selecting means so that the latter selects the one of the plurality of outlets marked by the marking means.

Another embodiment of a selector positioning arrangement usable in a telecommunication system comprises a selector having a plurality of contacts to which are connected a plurality of outlets and including selecting means for selecting one of the plurality of outlets; a voltage source electrically connected to the selecting means, a relay having a winding, a circuit including the voltage source and the winding of the relay and extending from the selecting means to one of the outlets to be selected by the selecting means so that the relay is energized by the current supplied by the voltage source in the circuit, and positioning means controlled by the relay for positioning the selecting means to the contact to which is connected the one of the plurality of outlets.

2

A particularly useful embodiment of the present invention involves a selector positioning arrangement usable in a telecommunication system or the like comprising a plurality of registers, marking means located in each of the plurality of registers for marking one of a plurality of outlets connected to each of the plurality of marking means in accordance with a digit dialled at a calling station, a plurality of selectors, each of the plurality of selectors belonging to a different group and having a plurality of contacts to which the plurality of outlets are connected, each of the plurality of selectors having selecting means for selecting one of the plurality of contacts, a switch located in each of the plurality of registers for connecting the register in which it is located to one of the plurality of selectors, and control means located in each of the plurality of registers and electrically interconnecting by means of the switch the selector connected to its register with the marking means located in that register, the control means controlling the positioning of the selecting means so that the selecting means mates with the contact to which is connected the one of the plurality of outlets marked by the marking means.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Fig. 1 shows the principle of the arrangement for a register and a group selector to be positioned by said register;

Fig. 2 shows a register and a group selector in a more elaborate schematic;

Fig. 3 gives the arrangement for a register with a group selector equipped with complete switching elements to prevent faulty positionings;

Fig. 4 represents the arrangement of a register with a final selector;

Fig. 5 shows the arrangement of a group selector and a final selector;

Fig. 6 shows a schematic with 3 registers and 3 group selectors.

In Fig. 1 two registers and two group selectors have been drawn as far as necessary to explain the invention. The marking switch MS1 of register 1 is e.g. positioned in a known way by one of the impulse series from the calling subscriber's dial.

After sufficient digits have been stored, the register starts positioning the selecting stages. The marking switch MS1 marks by its position one of, for instance, ten marking wires that are common to all the marking switches for the corresponding digits in all the registers of the relevant exchange and which are also common to all the contact groups of the control arches of the selecting stages relevant to the digits.

The control circuit of the register 1 comprises the wiper of the relevant marking switch MS1, a test relay B1, and a battery BA. The test relay B1 is energized when the control wiper of the relevant selector wipes the marked wire or the marked contact groups in the control arch. When relay B1 is operated the rotating selector may be stopped, in case the marked wire is hunted for, or the test for a free line may be initiated if a marked group is hunted for.

The voltage source that is applied in the described control circuit has to be separate for each register. This is one of the essential characteristics of this system.

These separate voltage sources may e.g. be obtained by small rectifiers.

3

The simple operation as described with reference to Fig. 1, however, has a serious objection. When applying it to systems having rotary switches, the control wipers of said rotary switches may consecutively wipe various groups of lines, in which case, serious faults may occur if the lines of one or more of the groups are fully occupied and in the meantime the selectors continue hunting for a free outlet in the group, relevant to the stored digit number.

If, for instance, the marking switch MS1 occupies the position 1 and the marking switch MS2 the position 0 and the selector K1 hunts for a free outlet only to find that all the outlets in the direction 1 are occupied, and if then the selector K2 is started by another register e.g. register 2, should the selector K1 now hunt for a free outlet among the group of outlets in the direction 0 while the selector K2 hunts in the group of outlets in the direction 1, both control relays B1 and B2 will be energized so that both selectors occupy a free line in an undesired group.

The relays B1 and B2 may thus wrongly operate in the circuit: marking switch MS1 position 1, control relay B1, battery BA in register 1, cord finder KZ1, selector K1 position 0, marking wire 0, marking switch MS2 position 0, control relay B2, battery in register 2, cord finder KZ2, K2 position 1, marking wire 1, marking switch MS1 position 1, so that the batteries are in series, which might cause serious damages.

A further object of the invention is the removal of the mentioned drawback of the arrangement in which the batteries in the respective registers may be connected in series. For this purpose the register must be provided with switching elements which disconnect the control circuit in the register before the control wiper of the selector can energize the control relay B when wiping in an undesired group, while in systems with continuous hunting, the control circuit has to be restored again at the commencement of the next rotation of the wiper through the contact bank. Insofar as required for the explanation of the invention Fig. 2 shows a register and a group selector of an automatic telegraph, or telephone, system with continuous hunting. This arrangement is provided with switching elements which eliminate the need for testing undesired groups not relevant to the stored digit number. The arrangement has been designed for the application in rotary systems which have, as known, a common driving motor for the various switches and the appropriate testing relays as usually applied in the Bell systems.

The invention can, however, also be applied to other kinds of systems, e.g. step by step and relay systems, which comprise step by step selectors and relays in the selecting stages, respectively, in which stages a free outlet may be found by means of the marking wire.

In Fig. 2 a marking switch MS is shown, which may be positioned in a known way by an impulse series from the calling subscriber's dial. The marking switches for storing the other impulse series relevant to the other digits of the called subscriber's number have not been shown for reasons of simplicity.

When the shown group selector GK has to be positioned, the contact *s* in the register of the starting relay S, which has not been shown, is closed. A relay A is energized in a circuit from ground over contact *s*, contact *c* of a relay C having two windings, contact *b* of the control relay B having two windings, a relay A battery to ground. When relay A is operated in this circuit and attracts its armature *e* which now prepares a control circuit over the second winding BI of the control relay B, the control circuit extends from the control wiper *e* of the group selector over the off normal contact *k*⁰, which only occupies the shown position when the group selector is in position 0, the back contact *p*₄, the bank and wiper *c* of the cord finder KZ, the battery V, the back contact *d*, front contact *a*, second winding of the control relay BII, the marked wire by

4

the marking switch MS over the arch *a*, to the marked contact of the arch *e* of the group selector GK.

When reaching the group which is marked by the position of the marking switch MS, the windings BI and BII of relay B are energized. This relay interrupts the circuit for relay A, by means of its contact *b* and closes a holding circuit over its first winding. The relay A deenergizes and releases its armature *a* thus disconnecting the first control circuit and closing an analogous circuit for the relay C.

The relay B applies by means of the contact *b* ground to the high-ohmic winding of the test relay T which has two windings. Relay T is energized if the group selector GK wipes via a free outlet which obtains, in known manner, the battery potential in the next selecting stage. The relay T is energized in a circuit extending from ground, over front contact *s* of the start relay S, back contact *c* of the second control relay C which has two windings, front contact *b* of the control relay B, high ohmic winding of test relay T, the *b*-wiper of the cord finder KZ, contact *p*₂ of the switching relay P of the shown selecting stage of the low-ohmic winding of said relay P, the *c*-wiper of the group selector GK, to the voltage source in the circuit of the next selecting stage.

The contact *b* of the control relay B also closes a holding circuit over its first winding BI.

Hunting for the first outlet of the marked group may create difficulties which may be avoided by letting the *e*-wiper begin wiping somewhat in advance with respect to the *c*-wiper of the same selector. The extent of the advance with respect to time is about equal to the operating time of the relay B. The advance of the operation of the *e*-wiper may also be obtained by widening the *e*-wiper.

The winding BI of relay B remains energized while hunting in the marked group. Only the first contact of each group has to be connected in this case to the relevant marking wire.

If all the outlets of the marked group are tested busy, a second control circuit in the register is established via relay C when searching for a free outlet in the next group. It may be observed that the winding BI of relay B is energized when hunting for a free outlet in the marked group, so that the relay A is released thereby breaking the original control circuit over the winding BII. The result is that the group selector GK cannot operate the relay B of another register at an undesired moment when hunting in a non marked group as was possible in Fig. 1.

The second control circuit provided with the control relay C has an analogous function to the one provided with relay B with the exception that the relay C is energized in the next group which is marked by the *b*-wiper of the marking switch MS.

The relay C attracts the armature or contact *c* which interrupts the testing circuit for the relay T by removing the ground therefrom.

The advanced positioning of the *e*-wiper with respect to the *c*-wiper of the group selector GK prevents the operation of the test relay T when the outlet, following the desired outlet, marked by the wiper *a*, is free.

Upon the operation of relay C in the second control circuit, contact *c* is switched over so that the holding circuit of relay B, namely first winding BI, is deenergized. Relay C establishes a holding circuit over its first winding CI, upon the operation of the second winding CII, in which circuit the relay D is also energized, the circuit extending from ground over contact *s* of the start relay S, front contact *c* of relay C which contact is effected at the energization of the winding CII, contact *e* of relay E, the first winding of relay C, relay D—battery and back to ground. Relay D attracts the armature of contact *d* which interrupts the control circuit for relay C and prepares a circuit for the relay E.

When hunting, or rotating, through the home position

5

(zero position), the group selector GK momentarily switches the contact *k0* into the shown position.

This results in the operation of relay E in a circuit extending from contact *k0*, over back contact *p4* of the switching relay P, C bank and wiper of the cordfinder KZ, battery V, front contact *d*, winding EII of relay E, conductor 11, and back to normal contact *k0*. The conductor 11 is common to the contacts *k0* of all the group selectors and to all the relays E in the registers. When operated the relay E interrupts the circuit including the winding C1 of relay C and the circuit for relay D by its contact *e* which establishes a holding circuit for its winding EI. The holding circuit extends from ground over contact *s*, front contact *c*, front contact *e*, winding E of relay E, battery, and back to ground. Relay E is released due to the interruption of the circuit of winding EI by contact *c* of relay C while the winding EII is interrupted by contact *k0* and by contact *d*.

After one rotation of the selector has been completed, the relay A is again energized, and the cycle is again repeated unless a free outlet in the group marked by the *a*-wiper of the marking switch MS is found.

When relay T is energized the operative circuit of the coupling magnet K of the group selector GK is interrupted. When relay T is energized the group selector GK is stopped on a free outlet in the marked group of bank *e*. The contact *t* closes on the operation of the relay T a circuit of a low-ohmic holding winding TI of this relay to prevent double connections.

The current flow in the circuit including the winding TI is increased to the extent that the switching through relay P of the group selector stage is energized and attracts its armatures and connects the register to the following selecting stage in which also a free outlet is to be hunted. The relay P remains operated over a second winding indicated by the reference PII. The contact *y* was closed when the relevant junction circuit is seized, a circuit for the energization of winding PII being formed from ground over the contact *y*, winding PII the resistance W—battery and back to ground. When the relay P is energized the contact *p3* of this relay is switched over before the switching over of contact *p2*. In this way the relay P remains energized, winding PII serving to hold relay P energized, winding PI being then deenergized. Contact *p3* applies a direct ground to the *c*-wiper of the group selector GK, so that the making of double connections becomes impossible. The arrangement of Fig. 2 is, however, not entirely complete. The shown group selector was not restored to its home position when the connection was released. The selectors in the described arrangement rotate as little as possible.

Unfortunately, a group selector which has not been restored to its home position in an arrangement such as shown in Fig. 2 may be positioned in the very manner described with reference to Fig. 1, and which was intended to be prevented by the two independent control circuits of Fig. 2.

Such faulty positioning may occur when the group selector is seized in a group which is marked by the second wiper *b* of the marking switch MS, while the preceding group is marked by the wiper *a* of the marking switch MS. This faulty operation cannot be prevented by the control circuits in the register described in relation to Fig. 2, since the control circuits are not both disconnected after hunting through the group marked by the *a*-wiper of the marking switch MS but instead the selector is started in a second group, marked by the *b*-wiper of the marking switch MS. Hence the busy test is performed in said second group which may result in the seizure of a wrong outlet.

If the arrangement of the group selector has not been provided with means to restore the group selector to its home position when the group selector is released, it is necessary to provide the register with a device, which first ascertains whether the seized group selector has still

6

to traverse the marked group of lines hunted for, or has already traversed it.

In the first case, where it is necessary to ascertain whether the marked group has been traversed, the group selector may be started normally and made to immediately hunt for a free line until it reaches the group marked by the *a*-wiper of the marking switch. In the second case, where it is desired to know whether the seized group has passed the marked group, the control circuits have to be disconnected and only at the beginning of a new rotation of the selector to be restored in their controlling function.

Fig. 3 represents an arrangement of a register and a group selector which has to be positioned by said register equipped with means to prevent faulty positioning of the group selector when starting with the wipers in an arbitrary position of said group selector. The shown arrangement has been designed to be used with Bell equipment. It will be apparent to those skilled in the art that many modifications of this arrangement can be made by using analogous equipment, as suggested by Fig. 3.

Except for the relay A, the relays shown in Fig. 3, which have the same denomination as those shown in Fig. 2, have the same functions in both arrangements.

The contact *s* is closed when the not shown starting relay S is energized so that the group selector GK may be positioned. Contact *s* establishes upon closure the circuits for the relays G and H which relays are energized. Relay G prepares a circuit for its second winding GII and the coupling magnet K of the group selector GK. Relay H closes a circuit for the stepping magnet I by means of its contact *h*, which stepping magnet causes the wipers of the so-called tracing switch OS to make one step, the stepping magnet, however, interrupting the circuit for both windings of relay H by its additional contacts *i1* and *i2*, resulting in the release of armature *h* and the deenergization of the stepping magnet I, after which succeeding steps may be made in the same manner. When there are ten outgoing groups, the tracing switch OS may be a ten-fold rotary switch with a home position. The relay L is energized when the *b*-wiper of the tracing switch OS wipes the marking wire of the group on which the *e*-wiper of the relevant group selector GK is positioned. The relay L interrupts by means of its contact *l* the original operation circuit for the relays G and H, and closes a holding circuit for its second winding LII and a holding circuit of the relay G, over the winding GII and the coupling magnet K of the group selector GK. The circuit extends from ground over contact *s*, front contact *l*, relay A relay L winding LII—battery and back to ground. The circuit for relay G extends over back contact *t* of the test relay T, front contact *g*, winding GII of relay G, *a*-wiper of the cord finder KZ, back contact *p1* of the switching through relay P in the group selector circuit, coupling magnet K of the group selector GK, battery and back to ground.

In the circuit for the winding LII of relay L the relay A also operates, resulting in the switching in of the control circuit over winding BII of relay B. The circuit extends from the wiper of bank *e* of the group selector GK, over off-normal contact *k0*, back contact *p4*, *c*-bank and wiper of the cordfinder KZ, battery V, front contact *a*, back contact *m*, winding BII of relay B, *b*-wiper of the marking switch MS, the marked wire to the marked contact group of the *e* bank of the group selector GK. The switched over contact *l* closes over the *a*-wiper of the tracing switch OS and contact *i1* an operation circuit for the left hand winding HI of the relay H. When the tracing switch OS is provided as a rotary switch it will rotate to its home position and stop there. If the relays C and D were not energized before the relay L was operated, the group selector GK will be positioned on a group preceding the marked group. The relays C and D are energized in the circuit from ground over contact *s*, back contact *p1*, *c*-wiper of the tracing switch OS, *a*-wiper of the marking

switch MS, back contact *e* of relay E, winding CI of relay C, relay D, battery to ground.

Relays C, D, and relay L may be energized at the same time, which may only occur when the relay C is energized before relay L is energized. Since it is apparent that relay L interrupts the energizing circuit for the relays C and D. The outlet marked by the wiper *a* of the marking switch is found by the *c*-wiper of the tracing switch OS, while the position of the group selector is determined afterwards by the *b*-wiper of the tracing switch OS resulting in the energization of winding LI of relay L.

It will be clear that if the group selector GK, when seized, is positioned on an outlet representing a group in advance of the group marked by the *b*-wiper of the marking switch MS, the relay C is energized in the circuit from ground over contact *s*, back contact *l*¹ over the series arrangement of the *c*-wiper of the tracing switch OS and the *a*-wiper of the marking switch MS, back contact *e*, winding CI of relay C, shunting back contact *l*², battery to ground. The tracing switch OS ascertains the positions of the group selector and the marking switch.

When energized the relay D switches in by means of the contact *d* the release relay E over winding EII and disconnects the control circuits. The relay E is energized when the group selector GK is hunting over the home or zero position of the selector.

If relay L is energized after relay C is energized, the group selector is started and rotates to its home position with interrupted control circuits, in which position the relay E is operated and restores the control circuits to normal again, so that the group selector may hunt in the normal way for a free outlet in the marked group.

No test may be performed if the group selector is already positioned on the marked group. This can be avoided by operating the relay C quicker than the relay L over its holding winding LII.

The operation of the arrangement shown in Fig. 3 is as follows. The marking switch MS with the associated wipers, of which the wipers *a*—*c* are shown in position in well known manner, the position of the wipers depending on the impulses from the subscribers dial or any other possible way of positioning the marking switch. After sufficient digits have been stored, the register is started for positioning the selector which has access to the wanted subscriber. The illustrated drawing shows the manner of positioning the group selectors. Only one group selector has been shown in conjunction with the necessary equipment in the register to explain the positioning of the group selector according to the invention.

The register is started for positioning the selectors by the operation of relay S, which is not shown, by means of its shown contact *s*. The relay cannot be operated before relay Y, not shown, in the junction circuit has attracted its armature *y*. When contact *s* applies ground to contact *l*¹, relay H is operated in the circuit from ground over contact *l*¹ normal contact *l*², winding HII of relay H—battery to ground. Relay G is energized over winding GI connected across winding HII of relay H. Relay H closes a circuit by means of its armature for the stepping magnet I of the tracing switch OS.

The tracing switch OS has been provided to ascertain the position of the group selector with respect to the position of the marking switch MS. The tracing operation is performed as follows: the position of the group selector is traced over the *b*-wiper, while the position of the marking switch is determined by the *c*-wiper of OS. There are three possibilities: (a) the position of the group selector is first determined; (b) the position of the marking switch is first determined; (c) the position of the group selector is found at the same time as the position of the marking switch.

If the position of the group selector is found first, the following circuit will be completed: one of the contacts

in the *b*-bank of the tracing switch OS, the relevant marking wire, wiper *e* of the group selector GK, off-normal contact *k*⁰, back contact *p*⁴ of the switching relay P, *c*-bank and wiper of the cord finder, battery V, back contact *d* of relay D, back contact *a* of relay A, winding LII of relay L, relevant position of the wiper *b* of the tracing switch OS. Relay L is then energized and attracts its armature *l*¹ and *l*². By means of contacts *l*¹ *t* and *g* ground is applied to the winding GII and coupling magnet K of the group selector in the circuit: ground, over contact *s*, front contact *l*¹, back contact *t* of the test relay T, front contact *g*, winding GII of relay G, *a*-wiper and bank of the cord finder KZ, back contact *p*¹ of the switching through relay P, coupling magnet K, battery to ground. In parallel to this circuit, relay L operates its holding circuit winding LII in which circuit also relay A is operated. The latter circuit extends from ground over contact *s*, front contact *l*¹, relay A, winding LII of relay L—battery to ground. Relay A switches in the first control circuit including winding BII of relay B by means of its contact *a*, so that the group selector may immediately hunt for a free outlet, in the group of contacts in the *e*-bank of the group selector GK, which is marked by the *b*-wiper and the marking wire of the marking switch MS.

If the position of the marking switch is first determined the relay C is energized and closes a holding circuit for this relay in the circuit extending from ground, contact *s*, back contact *l*¹, *c*-wiper of the tracing switch OS, *a*-wiper of the marking switch MS, back contact *e*, winding CI of relay C, back contact *l*² of relay L—battery to ground. When contact C of relay C closes a circuit is established extending from ground over contact *s*, front contact *c*, back contact *e*, winding CI, back contact *l*²—battery to ground. Relay D is not energized until relay L is operated. The tracing switch OS traces now the position of the group selector over the *b*-wiper of the tracing switch OS as described above.

When the position of the group selector is found relay L breaks the shunt connection across relay D by means of its contact *l*², while the group selector wipers are started when contact *l*¹ closes as described above. Relay D by means of its contact *l* switches relay E in the control circuit so that the group selector is now rotated through its home position in which case relay E is energized in the following circuit: marking wire *ll*, contact *k*⁰, back contact *p*⁴, *c*-wiper of the cord finder KZ, battery V, winding EII of relay E to marking wire *ll*. Relay E restores relays C and D to normal by interrupting the holding circuit at contact *e*. Contact *e* closes a holding circuit for relay E by means of its winding EI, the circuit extending from ground over contact *s*, front contact *c*, front contact *e*, winding EI—battery to ground. This circuit is however interrupted by the deenergization of relay C which breaks the circuit at contact *c*. The group selector may now hunt for a free outlet in the marked group.

If the marking switch MS has marked a group on which the group selector is positioned, relay C is energized first in the circuit outlined above, and immediately after, the relay L, so that the group selector has to hunt through the home position for a free outlet.

The further operation of the arrangement shown in Fig. 3 deviates slightly from the one as shown in Fig. 2. When contact *l*¹ has been switched over, the group selector is started. The relay B operates since the contact *a* of relay A is switched over when relay L is energized when the group selector GK is hunting in the group marked by the *b*-wiper of the marking switch MS. As a result the relay M which is connected in series with the holding winding BI of the relay B operates. Relay M by means of its contact *m* interrupts the control circuit of relay B and closes the control circuit of the relay C in which the winding CII has been provided. The relay C operates as soon as the control wiper of the group selector GK reaches the first contact of the group following the

group marked by the *b*-wiper of the marking switch MS. The contact *c* removes the ground which has been applied by contact *b* to the operating winding of the busy test relay T.

The relay D which is now operated in series with winding CI of the relay C, in the circuit described above, switches in the unlocking relay E by means of contact *d* so that relay E is operated when the group selector reaches the home position.

The relay B closes a testing circuit for the busy test relay T by means of contact *b*, so that relay T may operate in the usual way when the *c*-wiper of the group selector GK hunts a free outlet in the marked group. The relay T interrupts the circuit for the coupling magnet K of the group selector GK by means of contact *t*, so that the selector is stopped on a free line. The contact *t* closes a circuit for the low-ohmic holding winding T₁ of the relay T, the current in the busy test relay increasing to the extent that the switching relay P of this group selector stage is energized. The circuit for the switching through relay is interrupted by contact *p2* of relay P so that the test relay T releases its armature. Contact *s* has to be opened momentarily to release relays A and L which are in series and the relays M and B which are also in series. The winding BII of relay B is also deenergized by the release of armature *a* of relay A so that the control circuits are restored to normal and register may be started in a known way for establishing the next stage of connection in the same manner.

In Fig. 4 a final selector EK has been shown for reasons of simplicity without the preceding group selector and is connected to the cord finder KZ of the register. The positioning of a final selector differs in some respects from the positioning of a group selector. The final selector is first positioned on the first contact of the wanted tens level and then on the contact of the wanted unit in this level. The busy test is performed when the final selector has been positioned on the called subscriber's line. In the same way as described with reference to the positioning of a group selector, the tracing switch OS discerns whether the *e* wiper of the final selector EK, which wipes the contacts of the *e*-bank, is positioned on a group of ten which lies before or beyond the marked group of ten. The final selector is started when relay L is energized for hunting a free group of tens. When the relays C and D are energized the final selector is started and permits the same to rotate through its home position.

The relay B is operated in both cases when the final selector reaches the first contact of the marked group of ten.

In Fig. 4 some contacts of the sequence switch of the register have been shown, which may effect the switching from the positioning of a group selector to the positioning on the tens and units by the final selector. The contacts which are closed at the positioning of the tens, are indicated by reference numeral 1, while the contacts which are closed when positioning the unit digit are marked 2.

The relay B is operated when the first contact of the marked ten is reached. The contact *b* applies ground to the winding TII of the relay T, which when controlling the positioning of the tens on the final selector, immediately operates and interrupts by means of its contact *t* the operating circuit for coupling magnet J of final selector EK.

Over the wire 2 the contact *t* applies ground to the sequence switch which steps to position 2, in which the positioning of the final selector is performed in accordance with the position of the marking switch MS1.

The contact *s* is interrupted momentarily so that all of the operated relays release. The tracing switch OS could remain in its home position since the final selector has been positioned to the desired group. The tracing switch OS is however started again to avoid complicated ar-

rangements. In this arrangement the circuit for energizing relays C and D is disconnected by the cam E' of the sequence switch contact.

Since the final selector EK has been positioned on the first contact of the desired tens, relay L is energized on the first step of the tracing switch OS, so that the final selector is started again, and stopped on the wire marked in the multiple of the units.

If when the final selector must be stopped on the first contact of the desired ten produces difficulties, a change-over contact (not shown) of relay A arranged in the energizing circuit of the coupling magnet J of the final selector EK, may give the necessary delay in the operation of this magnet.

The wipers *d* and *e* of the final selector EK serve as control wipers for the units digit and the tens digit respectively. These wipers have been provided in the Fig. 4 with a separate circuit to the register. It is also possible to provide only a single control wire for wipers *d* and *e*. In that case an auxiliary relay has to be equipped in the circuit of the final selector, which auxiliary relay operates after the positioning of the tens digit and then switches the control wire to the control wiper for the units. The two control arches *d* and *e* may also be combined in which case a register would be required which is somewhat more complicated. The first contacts of the tens of the control bank of the final selector would have to be connected to the control multiple of the tens, while the remaining nine other contacts of each group would have to be connected to the marking multiple of the unit. Before the positioning on the units is started, the final selector would have to be stopped on the ninth contact of the ten since this is the marked contact. The final selector is stopped with such a delay that it reaches the contact which is connected to the tens multiple so that the tracing switch OS can ascertain the position of the final selector with reference to the position of the marking switch MS10 at which time the positioning of the final selector may be performed in accordance with the marked wire. In this manner a single wiper is required for the final selector and all the preceding group selectors.

The busy test is made after the final selector is in the marked position over a circuit in the register extending from ground over contact *s*, front contact 1¹, front contact *t*, cam E' position 2 of the sequence switch, a high-ohmic winding FI of the test relay F, the *b*-wiper of the cord finder KZ, a low-ohmic winding RI of the relay R, over the *c*-wiper of the final selector EK, the relay COR, battery, and ground. When the called subscriber is free, the battery is connected in the circuit and the relay F is operated in series with the relay COR of the relevant subscriber. Relay F closes by means of contact *f* a low-ohmic holding winding FII parallel to the operation winding FI. The switching relay R of the final selector circuit operates when the low-ohmic winding of F is energized.

The relay R has a holding circuit constituted of high-ohmic winding RII connected in series with contact *y* of the seizing relay of the junction circuit.

The switching through of the junction circuit when the called subscriber is free, or the release of the connection to the called subscriber when busy, may be effected in any manner known in automatic telephone of telegraphy systems which requires no further discussion.

The operation of the arrangement according to Fig. 4 is almost identical to the operation discussed with reference to Fig. 3. Contact *s* is closed for starting the positioning of the final selector EK on the tens level. Upon the closure of contact *s* the relays G and H are operated as in the circuit described with reference to Fig. 3. The tracing switch OS starts wiping the position of the final selector with regards to the position of the marking switch MS10. In the way described above, the group selector

may start hunting immediately for the marked outlet or after rotating through its home position.

Relay A is operated in series with winding LII or relay L and switches in by means of contact *a*, the control circuit provided with relay B. Relay B is operated when the marked contact is found in the circuit *b*-wiper of the marking switch MS10, marked wire and contact in the *d*-bank of the final selector EK off normal contact *j*₀, *c*-wiper of the cord finder KZ, cam C, position 0 of the sequence switch, battery V, front contact *a*, back contact *m*, winding BII of relay B, cam A position 1 of the sequence switch, and back to *b*-wiper of the marking switch MS10.

Relay B closes a holding circuit by means of contact *b*, over its winding BII in series with relay M which circuit has been described with reference to Fig. 3. Relay M switches, as has been mentioned with respect to the preceding figure, relay C in the control circuit which has however, with respect to the positioning of the final selector no effect since the test relay T is energized in the circuit from ground over contact *s*, back contact *c*, front contact *b*, winding TII of relay T, cam D of the sequence switch in position 1, resistance W1—battery to ground, so that the coupling magnet J is released.

Contact *s* is opened momentarily to start the positioning of the final selector EK in the unit digit. Again the same circuits are closed and the positioning is performed over the *e*-wiper of the final selector EK and the *d*-wiper of the cord finder KZ, cam C of the sequence switch position 2, the control circuit over winding BII of relay B and the *a*-wiper of the marking switch MS1.

A complete arrangement of a group selector GK in combination with a final selector EK is shown in Fig. 5. The arrangement of Fig. 5 cooperates with a register, not shown and includes apparatus according to the described system of the invention. The operation of the successive selecting stages are controlled by register equipment which has been described with reference to the preceding drawings. There are, however, some particulars that should be mentioned with regard to the switching of a series of selecting stages in the system according to the invention. The relays P and R, which switch through the circuits of the group selector GK and final selector EK respectively, have to be energized over different wires since if the same wire were used, upon the operation of the switching relay P of the group selector GK, relay R of the final selector EK would likewise operate since said relays are arranged in series. This results in seizing the selector in the position in which the selector was previously released. This position will very seldom be the outlet to the wanted subscriber.

For this reason it has been found advantageous to include the operating winding P1 of relay P of the group selector GK, in one of the circuits of the auxiliary wires of the final selector which plays no part in the group selector circuit. This arrangement is indicated in Fig. 5.

The group selector is positioned by the register in the same manner as that described in relation to Fig. 3. The coupling magnet K remains energized over the *c*-wire until a free outlet has been found. The wanted group is marked over to the *g*-bank. When the group selector is stopped on a free outlet, the relay P switches the register to the final selector stage by means of its contacts *p*₁, *p*₃ and *p*₄. Relay P remains energized by means of holding winding PII in the circuit from ground over contact *y*, winding PII of relay P, resistance W1—battery to ground.

The final selector is positioned by the register in a manner described with reference to Fig. 4. The marked tens level is tested over the wiper *d* of the cord finder KZ, the wiper *e* of the group selector GK, and the wiper *f* of the final selector EK. The final selector EK is operated by means of the coupling magnet J which is operated in the circuit ground in the register over wiper *d* of the cord finder KZ, front contact *p*₃, back contact *z*₃, wiper *d* of

the group selector GK, back contact *r*₄, coupling magnet J—battery to ground. The coupling magnet J is released when the desired level is reached after which the final selector is started again for selecting the wanted unit digit which is marked over the bank *g* of the final selector. The test circuit runs from wiper *g* of the final selector EK, off normal contact *j*₀, wiper *f* of the group selector, front contact *p*₄, wiper *e* of the cord finder to register and from register over the marked wire to marked contact on the *g* bank of the final selector EK. The final selector is stopped on the marked contact again and the busy test for the called subscriber is performed over the *c*-wiper of the final selector EK. If the subscriber is free a connection may be made to the battery by means of the relay COR which is energized when the line is free. Relay R switches the final selector through to the called subscriber. Relay R is energized in the circuit: from ground in register over wiper *a* of cord finder KZ, back contact *z* to wiper *b* of the group selector GK, back contact *r*₁, winding R¹ of relay R, wiper *c* of the final selector EK, cut-off relay COR—battery to ground.

Relay R holds remains energized in the circuit from ground over contact *y*, front contact *p*₂, wiper *c* of the group selector GK, winding R² of relay R, resistance W²—battery to ground. The junction circuit may now connect the calling subscriber to the called subscriber.

In the described arrangements the voltage source for the control circuits have been shown in the registers. The system according to the invention can also be equipped with separate voltage sources arranged in the marking wires. In the preceding figures it was, however, simpler to draw this voltage source in the registers.

To prevent malfunctions as mentioned with respect to Fig. 1, the voltage source must be provided in a special manner, which may be seen in Fig. 6. In Fig. 6, 3 group selectors K have been shown, which are only indicated with their relevant control wipers. For the sake of clarity these group selectors have been provided with three outgoing connections. If Fig. 6 was not equipped with the rectifiers S₁₋₃ faulty operation might occur especially if group selector K3 which must be positioned in group 3 has been positioned in group 2, while group selector K2 which must be positioned in group 2 has been positioned in group 1, and group selector K1 has been positioned in group 1, although this selector should be positioned in group 3. Such faulty positioning would occur since marking switch MS3 in position 3, over relay B3, battery V3, cord finder KZ3, group selector K3 on group 2, marking wire 2, marking switch MS2 in position, relay B2, battery V2, cord finder KZ2, group selector K2 on group 1, marking wire 1, group selector K1 in group 1, cord finder KZ1, battery V1, relay B1, marking switch MS1 in position 3 gives a complete but faulty circuit.

This circuit contains 3 batteries, two of which are in series, the third being connected in opposite polarity to the other two so that all three batteries will try to operate the control relays B. The current direction through the relay B1 with appropriate current source V1 is opposite to the direction of current flow during a normal test, as may easily be seen from the description of the circuit.

In this way in a system with 10 outgoing directions there may be 9 batteries in series with 1 opposite battery.

For this reason the voltage of the separate current sources such as V1, V2, and V3 for testing should not be chosen too high. At the same time means must be provided in the control circuits to restrict current flow in one direction only. This may be realized by providing each separate current source with e.g. a dry rectifier, which has a sufficiently high resistance for blocking the current in the wrong direction.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of communication differing from the types described above.

While the invention has been illustrated and described as embodied in telephone systems, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. In a telecommunication system, comprising, a register; marking means located in said register for marking one of a plurality of outlets connected to said marking means in accordance with digits dialled at a calling station; a selector having a plurality of contacts to which are connected said plurality of outlets and including selecting means for selecting one of said plurality of outlets; operating means for operating said selecting means; and control means located in said register, said control means including a relay and a voltage source for energizing said relay and electrically interconnecting said selector and said marking means for rendering inoperative said operating means when said selecting means is connected to the contact to which is connected said one of said plurality of outlets marked by said marking means and forming thereby a circuit extending from said selecting means to said one of said plurality of outlets.

2. In a telecommunication system, comprising, a register; marking means located in said register for marking one of a plurality of outlets connected to said marking means in accordance with digits dialled at a calling station; a selector having a plurality of contacts to which are connected said plurality of outlets and including selecting means for selecting one of said plurality of outlets; operating means for operating said selecting means; and control means located in said register, said control means including a relay and a voltage source and electrically interconnecting said selector and said marking means for rendering inoperative said operating means when said selecting means is connected to the contact to which is connected said one of said plurality of outlets marked by said marking means and forming thereby an energizing circuit for said relay extending from said selecting means to said one of said plurality of outlets.

3. In a telecommunication system, comprising, a register; marking means located in said register for marking one of a plurality of outlets connected to said marking means in accordance with digits dialled at a calling station; a selector having a plurality of contacts to which are connected said plurality of outlets and including selecting means for selecting one of said plurality of outlets; operating means for operating said selecting means; and control means located in said register, said control means including a voltage source and a relay for rendering inoperative said operating means when said selecting means is connected to the contact to which is connected said one of said plurality of outlets marked by said marking means; and means included in a circuit extending from said selecting means to said one of said plurality of outlets for opening and closing said circuit, said relay being energized in said circuit by the current supplied by said voltage source when said means is in the closed position thereof.

4. In combination, a selector having a plurality of contacts to which are connected a plurality of outlets and including selecting means for selecting one of said plurality of outlets; a relay; a circuit including said relay and extending from said selecting means to at least one

of said plurality of contacts of said selector; a voltage source included in said circuit; marking means for marking one of said plurality of outlets in accordance with digits dialled at a calling station, said marking means forming part of said circuit; and positioning means controlled by said relay for positioning said selecting means to the contact to which said one of said plurality of outlets marked by said marking means is connected.

5. In combination, a selector having a plurality of contacts to which are connected a plurality of outlets and including selecting means for selecting one of said plurality of outlets; a relay; a circuit including said relay and extending from said selecting means to at least one of said plurality of contacts of said selector; a voltage source included in said circuit; marking means having contacts to which are connected said plurality of outlets and marking one of said plurality of outlets in accordance with digits dialled at a calling station, said marking means forming part of said circuit; and positioning means controlled by said relay for positioning said selecting means to the contact to which said one of said plurality of outlets marked by said marking means is connected.

6. In combination, a selector having a plurality of contacts to which are connected a plurality of outlets and including selecting means for selecting one of said plurality of outlets; a relay; a circuit including said relay and extending from said selecting means to at least one of said plurality of contacts of said selector; a voltage source included in said circuit; marking means having contacts to which are connected said plurality of outlets and marking one of said plurality of outlets in accordance with digits dialled at a calling station, said marking means forming part of said circuit; positioning means controlled by said relay for positioning said selecting means to the contact to which said one of said plurality of outlets marked by said marking means is connected; and means for rendering inoperative said positioning means when said selecting means reaches the contact to which the desired one of said plurality of outlets is connected.

7. In a telecommunication system a selector positioning arrangement, comprising, marking means for marking one of a plurality of outlets connected to said marking means in accordance with a digit dialled at a calling station; a plurality of selectors, each of said selectors having a plurality of contacts to which said plurality of outlets are connected and including selecting means cooperating with said plurality of contacts; a switch for connecting one of said selecting means of said plurality of selectors to a register; a control circuit including said switch and extending from said selecting means connected to the register to one of said plurality of outlets connected to said plurality of contacts of said selectors; a voltage source and a relay arranged in said control circuit; and positioning means controlled by said relay for positioning said selecting means of said selectors to the contact connected to said outlet marked by said marking means.

8. In a telecommunication system a selector positioning arrangement comprising marking means for marking one of a plurality of outlets connected to said marking means in accordance with a digit dialled at a calling station; a plurality of selectors, each of said selectors having a plurality of contacts to which said plurality of outlets are connected and including selecting means cooperating with said plurality of contacts; a switch for connecting one of said selecting means of said plurality of selectors to a register; a control circuit including said switch and extending from said selecting means connected to the register to one of said plurality of outlets connected to said plurality of contacts of said selectors; a voltage source and a relay arranged in said control circuit; and positioning means controlled by said relay for positioning said selecting means of said selectors to the contact connected to said outlet marked by said marking means,

15

said positioning means being operative when said relay is unenergized and inoperative when said relay is energized in said control circuit.

9. In a telecommunication system, a selector positioning arrangement, comprising, marking means for marking one of a plurality of outlets connected to said marking means in accordance with a digit dialled at a calling station; a plurality of selectors, each of said selectors having a plurality of contacts to which said plurality of outlets are connected and including selecting means cooperating with said plurality of contacts; marking wires multiplying said plurality of outlets of said selectors; a switch having a contact bank and a plurality of contacts on said contact bank, one of said plurality of contacts being electrically connected with said selecting means for connecting the same to a register; and control means electrically interconnecting by means of said switch said selecting means connected to the register with said marking means, said control means controlling said selecting means connected to the register so that said selecting means selects the contact to which is connected said one of said plurality of outlets marked by said marking means.

10. In a telecommunication system a selector positioning arrangement comprising marking means for marking one of a plurality of outlets connected to said marking means in accordance with a digit dialled at a calling station; a plurality of selectors, each of said selectors having a plurality of contacts to which said plurality of outlets are connected and including selecting means cooperating with said plurality of contacts; a switch having contact bank and a plurality of contacts on said contact bank, one of said plurality of contacts being electrically connected with said selecting means for connecting the same to a register; and control means electrically interconnecting by means of said switch said selecting means connected to the register with said marking means, said control means controlling said selecting means connected to the register so that said selecting means selects the contact to which is connected said one of said plurality of outlets marked by said marking means.

11. In a telecommunication system, a selector positioning arrangement, comprising, a plurality of registers; marking means located in each of said plurality of registers for marking one of a plurality of outlets connected to said marking means in accordance with a digit dialled at a calling station; a plurality of selectors, each of said plurality of selectors having a plurality of contacts to which said plurality of outlets are connected and including selecting means cooperating with said plurality of contacts; a switch located in each of said plurality of registers and having a contact bank having a plurality of contacts, one of said plurality of contacts being electrically connected with one of said selecting means, said switching means connecting said selecting means to its register for positioning said selecting means; and control means located in each of said plurality of registers and electrically interconnecting by means of said switch said selecting means with said marking means, said control means effecting the mating of said selecting means with the contact to which is connected said one of said plurality of outlets marked by said marking means.

12. In a telecommunication system, a selector positioning arrangement, comprising, a plurality of registers; marking means located in each of said plurality of registers for marking one of a plurality of outlets connected to said marking means in accordance with a digit dialled at a calling station; a plurality of selectors, each of said plurality of selectors having a plurality of contacts to which said plurality of outlets are connected and including selecting means cooperating with said plurality of contacts; a switch located in each of said plurality of registers and having a contact bank having a plurality of contacts, one of said plurality of contacts being electrically connected with one of said selecting means, said switching means connecting said selecting means to its regis-

16

ter for positioning said selecting means; and control means located in each of said plurality of registers, said control means including a voltage source and a relay and electrically interconnecting by means of said switch said selecting means with said marking means, said control means insuring the connection of said selecting means with the contact to which is connected said one of said plurality of outlets marked by said marking means.

13. In a telecommunication system, a selector positioning arrangement, comprising, a plurality of registers; marking means located in each of said plurality of registers for marking one of a plurality of outlets connected to each of said plurality of marking means in accordance with a digit dialled at a calling station; a plurality of selectors, each of said plurality of selectors belonging to a different group and having a plurality of contacts to which said plurality of outlets are connected, each of said plurality of selectors having selecting means for selecting one of said plurality of contacts; a switch located in each of said plurality of registers for connecting the register in which it is located to one of said plurality of selectors; and control means located in each of said plurality of registers and electrically interconnecting by means of said switch the selector connected to its register with said marking means located in that register, said control means controlling the positioning of said selecting means so that said selecting means mates with the contact to which is connected said one of said plurality of outlets marked by said marking means.

14. In a telecommunication system, a selector positioning arrangement, comprising, a plurality of registers; marking means located in each of said plurality of registers for marking one of a plurality of outlets connected to each of said plurality of marking means in accordance with a digit dialled at a calling station; a plurality of selectors, each of said plurality of selectors belonging to a different group and having a plurality of contacts to which said plurality of outlets are connected, each of said plurality of selectors having selecting means for selecting one of said plurality of contacts; a switch located in each of said plurality of registers for connecting the register in which it is located to one of said plurality of selectors; control means located in each of said plurality of registers and electrically interconnecting by means of said switch the selector connected to its register with said marking means located in that register, said control means controlling the positioning of said selecting means so that said selecting means mates with the contact to which is connected said one of said plurality of outlets marked by said marking means; and means for preventing cross connections between said selectors belonging to different groups with said marking means located in each of said plurality of registers.

15. In a telecommunication system, a selector positioning arrangement, comprising, a plurality of registers; marking means located in each of said plurality of registers for marking one of a plurality of outlets connected to each of said plurality of marking means in accordance with a digit dialled at a calling station; a plurality of selectors, each of said plurality of selectors belonging to a different group and having a plurality of contacts to which said plurality of outlets are connected, each of said plurality of selectors having selecting means for selecting one of said plurality of contacts; a switch located in each of said plurality of registers for connecting the register in which it is located to one of said plurality of selectors; control means located in each of said plurality of registers and electrically interconnecting by means of said switch the selector connected to its register with said marking means located in that register, said control means controlling the positioning of said selecting means so that said selecting means mates with the contact to which is connected said one of said plurality of outlets marked by said marking means; and means

16. In a telecommunication system, a selector positioning arrangement, comprising, a plurality of registers; marking means located in each of said plurality of registers for marking one of a plurality of outlets connected to each of said plurality of marking means in accordance with a digit dialled at a calling station; a plurality of selectors, each of said plurality of selectors belonging to a different group and having a plurality of contacts to which said plurality of outlets are connected, each of said plurality of selectors having selecting means for selecting one of said plurality of contacts; a switch located in each of said plurality of registers for connecting the register in which it is located to one of said plurality of selectors; control means located in each of said plurality of registers and electrically interconnecting by means of said switch the selector connected to its register with said marking means located in that register, said control means controlling the positioning of said selecting means so that said selecting means mates with the contact to which is connected said one of said plurality of outlets marked by said marking means; means located in each register for positioning said selecting means; and means for preventing cross connections of said selectors belonging to different groups with said marking means located in each of said plurality of registers.

18. In a telecommunication system, a selector positioning arrangement, comprising, a plurality of registers; marking means located in each of said plurality of registers for marking one of a plurality of outlets connected to each of said plurality of marking means in accordance with a digit dialled at a calling station; a plurality of selectors, each of said plurality of selectors belonging to a different group and having a plurality of contacts to which said plurality of outlets are connected, each of said plurality of selectors having selecting means for selecting one of said plurality of contacts; a switch located in each of said plurality of registers for connecting the register in which it is located to one of said plurality of selectors; control means located in each of said plurality of registers and electrically interconnecting by means of said switch the selector connected to its register with said marking means located in that register, said control means controlling the positioning of said selecting means so that said selecting means mates with the contact to which is connected said one of said plurality of outlets marked by said marking means, said control means including a voltage source and a relay energized by said

19. In a telecommunication system a selector positioning arrangement comprising a plurality of registers; marking means located in each of said plurality of registers for marking one of a plurality of outlets connected to each of said plurality of marking means in accordance with a digit dialled at a calling station; a plurality of selectors, each of said plurality of selectors belonging to a different group and having a plurality of contacts to which said plurality of outlets are connected, each of said plurality of selectors having selecting means for selecting one of said plurality of contacts; a switch located in each of said plurality of registers for connecting the register in which it is located to one of said plurality of selectors; control means located in each of said plurality of registers and electrically interconnecting by means of said switch the selector connected to its register with said marking means located in that register, said control means controlling the positioning of said selecting means so that said selecting means mates with the contact to which is connected said one of said plurality of outlets marked by said marking means, said control means including a voltage source and a relay energized by said voltage source in circuit extending from said selecting means to said one of said outlets marked by said marking means; and means for preventing cross connections of said selectors belonging to different groups with said marking means located in each of said plurality of registers, said means for preventing cross connections including rectifier means forming part of said control means,

21. In a telecommunication system, a selector positioning arrangement, comprising, a plurality of registers; marking means located in each of said plurality of registers for marking one of a plurality of outlets connected to each of said plurality of marking means in accordance with a digit dialled at a calling station; a plurality of selectors, each of said plurality of selectors respectively having a plurality of contacts to which said plurality of outlets are connected, each of said plurality of selectors having selecting means for selecting one of said respective plurality of contacts; a switch located in each of said plurality of registers for connecting the register in which it is located to one of said plurality of selectors; control means located in each of said plurality of registers and electrically interconnecting by means of said

switch the selector connected to its register with said marking means located in that register; said control means controlling the positioning of said selecting means so that said selecting means mates with the contact to which is connected said one of said plurality of outlets marked by said marking means; said control means including a voltage source and testing means energized by said voltage source in a circuit extending from said selecting means to said one of said outlets marked by said marking means; and means for preventing cross connections of said selectors belonging to different groups with said marking means located in each of said plurality of registers.

22. In a telecommunication system, a selector positioning arrangement, comprising, a plurality of registers; marking means located in each of said plurality of registers for marking one of a plurality of outlets connected to each of said plurality of marking means in accordance with a digit dialled at a calling station; a plurality of selectors, each of said plurality of selectors respectively having a plurality of contacts to which said plurality of outlets are connected, each of said plurality of selectors having selecting means for selecting one of said respective plurality of contacts; a switch located in each of said plurality of registers for connecting the register in which it is located to one of said plurality of selectors; control means located in each of said plurality of registers and electrically interconnecting by means of said switch the selector connected to its register with said marking means located in that register; said control means controlling the positioning of said selecting means so that said selecting means mates with the contact to which is connected said one of said plurality of outlets marked by said marking means; said control means including a voltage source and testing means energized by said voltage source in circuit extending from said selecting means to said one of said outlets marked by said marking means; and means for preventing cross connections of said selectors belonging to different groups with said marking means located in each of said plurality of registers, said means for preventing cross connections including rectifier means forming part of said control means.

23. In a telecommunication system, a selector positioning arrangement, comprising, a plurality of registers; marking means located in each of said plurality of registers for marking one of a plurality of outlets connected to each of said plurality of marking means in accordance with digits dialled at a calling station; a plurality of selectors each respectively having a plurality of contacts to which said plurality of outlets are connected, each of said plurality of selectors having selecting means for selecting one of said plurality of contacts; a switch located in each of said plurality of registers for connecting the register in which it is located to one of said plurality of selectors; means for positioning said selecting means; and control means located in each of said plurality of registers for controlling the operation of said positioning means and electrically interconnecting by means of said switch the selector connected to its register with said marking means located in that register, whereby said selecting means is stopped on the contact to which is connected said one of said plurality of outlets marked by said marking means.

24. In a telecommunication system, a selector positioning arrangement, comprising, a plurality of registers; marking means located in each of said plurality of registers for marking one of a plurality of outlets connected to each of said plurality of marking means in accordance with digits dialled at a calling station; a plurality of selectors each respectively having a plurality of contacts to which said plurality of outlets are connected, each of said plurality of selectors having selecting means for selecting one of said plurality of contacts; a switch located in each of said plurality of registers for connecting the register in which it is located to one of said

plurality of selectors; means for positioning said selecting means; control means located in each of said plurality of registers for controlling the operation of said positioning means and electrically interconnecting by means of said switch the selector connected to its register with said marking means located in that register, whereby said selecting means is stopped on the contact to which is connected said one of said plurality of outlets marked by said marking means; and means cooperating with said control means for rendering inoperative said positioning means when said selecting means contacts the contact to which is connected said one of said plurality of outlets marked by said marking means.

25. In a telecommunication system, a selector positioning arrangement, comprising, a plurality of registers; marking means located in each of said plurality of registers for marking one of a plurality of outlets connected to each of said plurality of marking means in accordance with digits dialled at a calling station; a plurality of selectors each respectively having a plurality of contacts to which said plurality of outlets are connected, each of said plurality of selectors having selecting means for selecting one of said respective plurality of contacts; a switch located in each of said plurality of registers for connecting the register in which it is located to one of said plurality of selectors; means for positioning said selecting means; control means located in each of said plurality of registers for controlling the operation of said positioning means and electrically interconnecting by means of said switch the selector connected to its register with said marking means located in that register, whereby said selecting means is stopped on the contact to which is connected said one of said plurality of outlets marked by said marking means; means cooperating with said control means for rendering inoperative said positioning means when said selecting means contacts the contact to which is connected said one of said plurality of outlets marked by said marking means; and means forming part of said control means for preventing cross connections of said selectors in said different groups with said marking means located in each of said plurality of registers.

26. In a telecommunication system, a selector positioning arrangement, comprising, a register; marking means located in said register for marking a plurality of outlets in accordance with digits dialled at a calling station, said marking means comprising a control wiper adapted to wipe over its contact bank having a plurality of contacts to which are connected said plurality of outlets; a first and a second selector each comprising at least one contact bank having a plurality of contacts to which are connected said plurality of outlets, said selectors having a control wiper wiping said contacts of said contact bank; means for connecting said first selector to said register; moving means for moving the wiper of said first selector over its contacts and control means located in said register and interconnecting said control wiper of said first selector and said control wiper of said marking means for rendering inoperative said moving means when the control wiper of said first selector is positioned to engage the contact to which the outlet marked by said marking means is connected; and means for switching through the connections from said first selector to said second selector.

References Cited in the file of this patent

UNITED STATES PATENTS

Re. 22,794	Deakin	Oct. 1, 1946
2,242,397	Kater	May 20, 1941
2,354,667	Deakin et al.	Aug. 1, 1944
2,444,065	Pouliart	June 29, 1948
2,529,166	Lesigne	Nov. 7, 1950
2,579,333	Pappazoglu	Dec. 18, 1951
2,581,457	Theillaumas	Jan. 8, 1952
2,629,019	Lesigne	Feb. 17, 1953