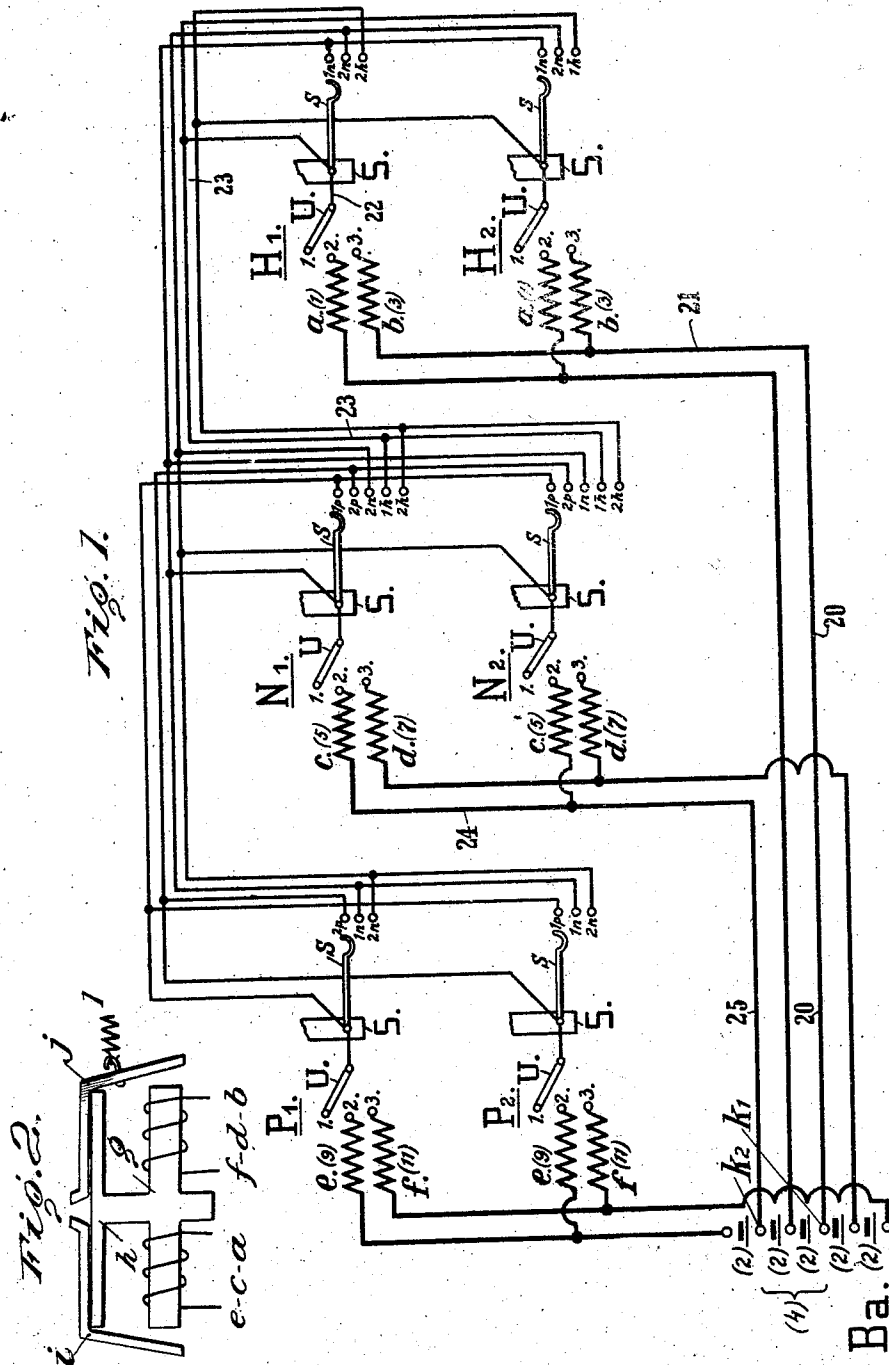


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 AUTOMATIC TELEPHONE EXCHANGE SYSTEM.
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AUTOMATIC TELEPHONE-EXCHANGE SYSTEM.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, FRIEDRICH WÖHLER, a citizen of the German Empire, and a resident of Hanover-Linden, in the Kingdom of Prussia, Germany, have invented certain new and useful Improvements in Automatic Telephone-Exchange Systems, of which the following is a specification.

This invention relates to telephone exchange systems in which existing talking connections are automatically disconnected in favor of more important connections.

The circuit arrangements previously known for automatically operated central offices for groups of subscribers entitled to different classes or grades of service, as for instance, exchange lines, stations having the privilege of using exchange lines, and private or unprivileged stations that are not allowed to use any but exchange lines, either required special lines to be provided for the traffic between the various subscribers in such a manner that one and the same subscriber in conversing with various groups of subscribers was obliged to make use of various lines, or else more than the one customary test wire for indicating the busy condition or for immediately severing an existing connection was necessary.

The invention relates to a circuit arrangement in which the one customary test wire suffices for indicating the busy condition of the line in question as well as for the forcible disconnection of the existing connection and the simultaneous connection of a new one.

The fact that the various groups are entitled to various classes of service is due to the prescriptions of various postal administrations, that a privileged station may converse with the exchange line as well as with unprivileged stations whereas no connection is possible between exchange lines and unprivileged stations. A conversation on an exchange line would probably always be of greater importance than a conversation between two privileged stations, two unprivileged stations, or between a privileged station and an unprivileged one. A conversation between two privileged stations would also seem to be of more importance than one between a privileged station and an unprivileged station in case the connection was made by the latter.

In order to make possible the establish-

ment of a new connection by terminating the existing connection, according to the class of conversation, or by hindering the establishment of a connection of less importance, it is only necessary according to the invention to provide the release magnets of the selectors of the individual groups of subscribers with two windings, the first of which is connected to the test wire during the busy test of a line, usually in position 2 of the control switch, while the second is connected to the test wire after the completion of the connection, that is, in position 3 of the control switch. If the release magnets are provided with two windings, of which one is connected to the test brush of the corresponding selector during the testing operation, and the other during the conversation, the first one becoming effective at a lower current strength than the last one, and if this relative grading of the sensitiveness of the release magnets of the talking stations pertaining to the various classes of groups is so carried out that of the windings of the release magnets that are connected in series through the addition of another talking station during the testing of an existing connection, that of the station of lesser importance is always the more sensitive one, and finally if the test potential also is graded corresponding to the importance of the testing stations, so that the potential set up in the release magnet windings connected in series by a third station in testing an existing connection can only cause the winding of the station of lesser importance to respond, an existing connection between two stations can only be severed by a station belonging to a more important class than the station which effected the previously existent connection.

In the attached drawings: Figure 1 is a diagrammatic view of the system and Fig. 2 is a view of a special form of relay which is used in connection therewith.

P¹, P² indicate public connection selectors, N¹, N² the privileged selectors and H¹, H² unprivileged selectors.

S is the switch shaft with the switch contact *s* and the control switch U which may take the three positions 1, 2 and 3. The test wires, which so to say emanate at the corresponding selector, are of course connected in the same manner as the talking wires (not shown) to the fixed selector contacts of those

selectors with which talking traffic is allowed. The busy test of a line is effected in position 2 of the control switch U, the control switch remaining in position 3 during the duration of the talking connection. The release magnets of the various selectors are indicated by the two windings *a* and *b* of the unprivileged selectors, *c* and *d* of the privileged selectors, and *e* and *f* of the public connection selectors, which, for instance, are intended to respond in the same order to 1, 3, 5, 7, 9 and 11 amperes, being so connected to the poles of a divided battery that there is a potential between the two windings of one and the same release magnet causing the first winding only (position 2 of the switch) to respond when both windings are connected in series.

Let it be assumed that the unprivileged station H^1 has obtained connection to the unprivileged station H^2 . The brush *s* of H^1 is therefore located on the fixed selector contact H^2 and switch U is in position 3. The privileged station N^2 now attempts to obtain connection to H^1 , by connecting over the test wire, in position 2 of its test switch U, the winding *c* of its release magnet to the winding *b* of the release magnet H^1 , over the following path: terminal K^1 , lines 20, 21, winding *b* of magnet H^1 , lines 22, 23, brush *s* of N^2 , switch U, winding *c*, lines 24, 25 and back to terminal K^2 of battery Ba . The windings are connected to four electrical potential units of the current source Ba , their resistance being so measured that a current of, for instance, 4 amperes flows which solely causes the release magnet of H^1 , which already responds at 3 amperes, to take effect and interrupt the existing connection, whereas the new connection of N^2 with H^1 is closed owing to the winding *c* of N^2 not receiving sufficient current to enable it to respond. The same would have been the case if N^2 were to attempt to occupy the unprivileged station H^2 ,—the connection of H^1 with H^2 would have been released in the same manner.

If the privileged station N^1 has called up the public connection line P^2 , neither another privileged station nor an unprivileged station can release the connection, owing to the fact that the winding *d* of the privileged station N^1 only responds at 7 amperes whereas a further privileged station N^2 , on testing, would connect the winding *c* which already responds at 5 amperes. 6 potential units are connected at the battery, which, on *c* and *d* being connected in series, produce a current of 5 amperes.

If an unprivileged station should wish to obtain connection to a privileged station, the winding *d* would be connected in series with the winding *a*, whereby the potential would be 4 amperes and sufficient to hinder the connection.

Three parts are essential for a proper mode of operation, namely, the first winding of the one release magnet, the second winding of the other release magnet, and a certain part of the battery,—these three parts being connected in series on each occasion. If the two windings coming in question are of different, properly graduated, resistance, only the relay of higher resistance will respond on each occasion, the relay of lesser resistance remaining in normal condition.

The problem may be solved in another manner than by the aforementioned one, namely, by making all the necessary relays, or release magnets, of all the groups, of the same construction and of equal resistance and solely making the armatures of the individual electromagnets subject to different counteracting forces (for instance by differently tensioned springs for retaining the armatures in normal position) in such a manner that of two relays that are connected in series only the one that responds more easily attracts its armature, that is, that one of which the spring was so adjusted as to cause the armature to respond at the potential in question, whereas the armature of the relay remaining in normal condition was adjusted in such a manner as to enable it to respond at a higher potential only. According to this arrangement each of the two windings of one and the same release magnet would have to be provided with an individual armature, of which each one alone would be capable of effecting the restoring of the selector. Such a device is illustrated in Fig. 2 in which the core *g* is magnetically united with the heel piece *h* which supports the two armatures *i* and *j*, the movement of armature *j* being retarded by spring *l*. The windings *e*, *c* and *a* of Fig. 1 would surround the left-hand portion of the core *g* while the windings *f*, *d* and *b* would surround the right-hand portion of the core *g*. The armatures *i* and *j* may be arranged to operate relay contacts or to directly bring about the release of the associated switch. This is necessary because if the party at station N^1 is talking and the party at N^2 tries to connect with N^1 , if one armature were used the windings *c* of N^2 and *d* of N^1 would be energized and since their resistance is the same they would pull up their armatures and both would release, whereas if a heavier armature were provided for *d* than for *c*, the release magnet of N^2 only would pull up its armature and cause the release of the associated selector.

I claim:—

1. In a telephone exchange system, the combination with a plurality of groups of lines each terminating in an automatic switch, a test circuit for each of said switches including a single test brush, means

for placing on said test circuit an electrical condition characteristic of the group of lines to one of which the switch is connected, and an electro-responsive device of a busy line included in said test circuit adapted to selectively respond to said characteristic electrical condition.

2. In a telephone exchange system, the combination with a plurality of groups of lines each terminating in an automatic switch, a test circuit for each of said switches including a single test brush, means for impressing a potential characteristic of the group of lines to one of which the switch is connected, and an electro-responsive device of a busy line included in said test circuit adjusted to respond to one such potential and not to another.

3. In a telephone exchange system, the combination with a plurality of groups of lines each terminating in an automatic switch, a test circuit for each of said switches including a single test brush, means for impressing a potential characteristic of the group of lines to one of which the switch is connected, and a release magnet for each of said switches, said test circuit including also said release magnets, whereby, upon the release magnet of a testing switch being included in circuit with the release magnet of a busy switch one or the other of said release magnets will be energized according to the potential impressed upon the test brush of the testing switch.

4. In a telephone exchange system, the combination with a plurality of groups of

lines each terminating in an automatic switch, a test circuit for each of said switches including a single test brush means for impressing a potential characteristic of the group of lines to one of which the switch is connected and a release magnet for each of said switches, the resistance of the magnets being graded in groups corresponding to the line grouping, said test circuit including also said release magnets, whereby upon the release magnet of a testing switch being included in circuit with the release magnet of a busy switch, one or the other of said release magnets will be energized according to the relative resistances of the magnets and the potential impressed upon the test brush of the testing switch.

5. In a telephone exchange system, the combination with a plurality of lines, automatic switches for interconnecting the same having a test contact for each line and a test brush adapted to contact therewith, release magnets for said switches having two coils, one connected to said test brush when the switch is testing and the other after the connection has been established the first winding being effective to energize the magnet at a lower current strength than the other.

In witness whereof, I hereunto subscribe my name this twenty ninth day of November A. D. 1912.

FRIEDRICH WÖHLER.

Witnesses:

GUSTAV BUSSE,
MORISE RÖPLUN.