

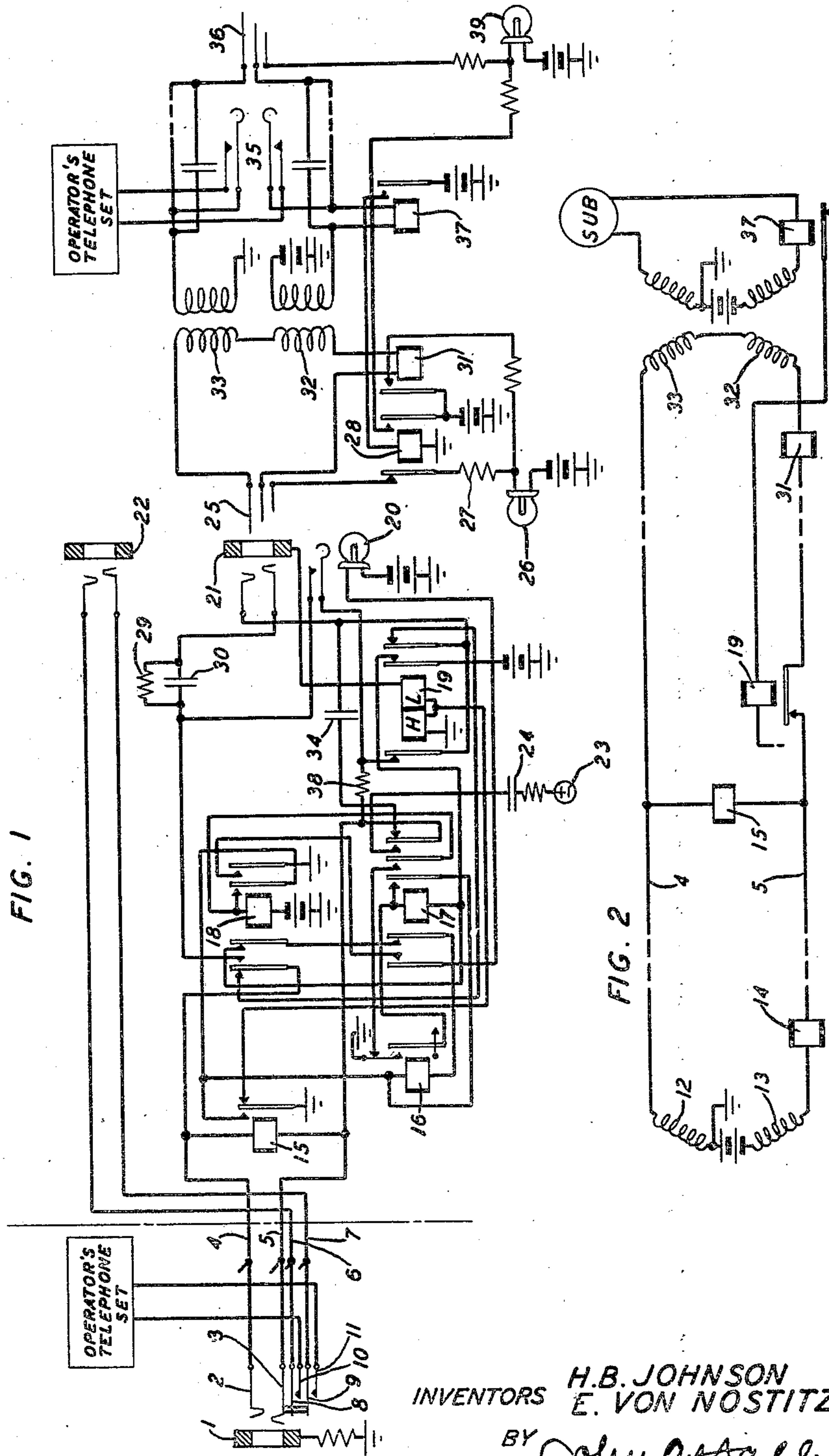
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TELEPHONE SYSTEM

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INVENTORS H.B. JOHNSON
E. VON NOSTITZ

BY *John A. Stall*
ATTORNEY

UNITED STATES PATENT OFFICE

HERBERT B. JOHNSON, OF FLUSHING, NEW YORK, AND ERICH VON NOSTITZ, OF WEST-FIELD, NEW JERSEY; SAID JOHNSON ASSIGNOR TO BELL TELEPHONE LABORATORIES, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK, AND SAID VON NOSTITZ ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK

TELEPHONE SYSTEM

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This invention relates to telephone systems and particularly to special service trunks.

Modern telephone practice demands the utmost speed in completing connections and consequently in large systems where a great number of telephone numbers are constantly being changed the work of the intercepting operators is important and they should be given equipment to handle traffic with the least delay possible and the least annoyance to the calling subscriber. The present invention comprises an intercepting operator's trunk and cord circuit whereby calls to changed numbers may be completed by the intercepting operator without a demand by her that the calling subscriber make a new call and whereby supervision is given to the originating operator who handled the call in the first instance.

In accordance with one feature of this invention means are provided whereby an established telephone connection will comprise a source of talking current and a supervisory device at the outgoing end of a trunk, a holding device at the incoming end of the trunk responsive to the said talking current, a break point in the circuit beyond the holding device, a bridge for operating the said supervisory device beyond the said break point, and means under control of a called subscriber for operating the break point. Thus where such a connection involves at least the calling subscriber, the originating operator, the intercepting operator and the called subscriber the supervisory signals will be operated before the originating operator without calling in the intercepting operator until the connection is to be taken down.

Another operating feature in this special service is the necessity for the intercepting operator to communicate with the originating operator to the exclusion of the calling subscriber for in some instances it is more expedient for the originating operator to re-route the call than it is for the intercepting operator to forward such call. Accordingly, each intercepting operator's trunk has companion to it a talking circuit terminat-

ing in a companion outlet at the incoming end and arranged to be connected to the originating operator's head set through the operation of the trunk terminals at the outgoing end.

The drawings are two figures on a single sheet. Fig. 1 is a diagram of the circuit arrangement showing an intercepting operator's trunk leading from a completing operator's position to an intercepting operator's position together with the intercepting operator's cord circuit. Fig. 2 is a schematic showing the essentials of one feature of this invention.

The portion to the left of the broken line of Fig. 1 represents the circuits and equipment found at a completing operator's position. The intercepting trunk terminates in a jack 1 having tip and ring contacts 2 and 3 connected to trunk conductors 4 and 5, respectively. Companion to this trunk circuit is a talking circuit comprising conductors 6 and 7 which terminate in extra contacts 8 and 9, respectively. When a plug is inserted in jack 1 then the contacts 8 and 9 are moved into connection with contacts 10 and 11 respectively so that the talking circuit comprising conductors 6 and 7 is connected to the operator's telephone set.

This outgoing truck jack may be placed at a number of different kinds of completing operators' positions but in any case the circuit connected to it will place ground and battery on the tip and ring. This is shown schematically in Fig. 2 where ground and battery through the repeating coil windings 12 and 13 and the supervisory device 14 are shown connected to the conductors 4 and 5. The current supplied by this source of battery operates the relay 15 connected across the trunk and this relay in pulling up its armature completes a circuit from ground, armature and front contact of relay 15, winding of relay 16, inner left hand armature and back contact of relay 17, inner left hand armature and back contact of relay 18, back contact and inner right hand armature of relay 19 to battery. Relay 16 becomes energized in this circuit and establishes a new circuit from ground, front con-

tact and armature of relay 16, winding of relay 16, back contact and right hand armature of relay 19 to battery. Relay 17 becomes energized and locks in a circuit from
 5 ground, armature and front contact of relay 15, innermost right armature and front contact of relay 17 and thence to battery over the circuit traced. Upon the energization of relay 17 the circuit of relay 16
 10 is opened and this relay after an appropriate interval releases its armature to normal. Thereupon a circuit is established from ground, normal contacts of relay 16, front contact and middle right hand armature of relay 17, winding of relay 18 to
 15 battery. Relay 18 becomes energized and locks to the front contact of relay 15.

Relay 18 now closes a circuit from ground at its outer right hand armature and front
 20 contact, the front contact and outer left hand armature of relay 17 calling signal 20 to battery. Signal 20 operates and indicates to the operator that a call is awaiting attention on the trunk terminating in jacks 21
 25 and 22. At the same time a circuit is established from source of ringing current 23, condenser 24, front contact and outermost right hand armature of relay 17 to ring conductor 5 and this source of ringing tone
 30 transmits to the calling subscriber the characteristic ringing signal so that the calling subscriber will be appraised of the fact that the call has been forwarded.

The intercepting operator now inserts
 35 plug 25 into jack 21 to answer the call. This will primarily result in a circuit from battery, supervisory lamp 26, resistance 27, left hand armature and back contact of relay 28, sleeve of plug 25, sleeve of jack 21, right
 40 hand low resistance and left hand high resistance windings of relay 19 in series to ground. Relay 19 becomes energized in this circuit and opens the energizing circuit of relay 17. Relay 17 deenergizes and re-
 45 turns its armatures to normal. The original energizing circuit of relay 18 is now opened but this relay remains locked to the front contact of relay 15.

A talking circuit may now be traced from
 50 tip of jack 1, jack spring 2, conductor 4, outermost left hand armature and front contact of relay 18, resistance 29 and condenser 30 in parallel therewith, the ring contact of jack 21, ring of plug 25, supervisory relay 31, repeating coil windings 32
 55 and 33, tip of plug 25, tip of jack 21, condenser 34, back contact and outermost right hand armature of relay 17, ring conductor 5, jack spring 3. Thus, although ground
 60 and battery are connected to conductors 4 and 5 and still maintain relay 15 energized, no direct current path will be found through the repeating coil windings 32 and 33 on account of the condenser 34. There-
 65 fore, any supervisory device, such as 14,

which may be connected in circuit with conductor 5, will fail to operate at this time.

When the operator through the use of listening key 35 communicates with the calling subscriber and finds out that through the
 70 facilities at her command she may complete the intercepted call, she inserts the plug 36 into an appropriate jack. When the called subscriber answers the supervisory relay 37
 75 will operate. This will connect battery to the winding of relay 28 which in turn will bring up its armatures. The left hand armature will open the circuit of relay 19 and this relay now becoming deenergized con-
 80 nects a resistance 38 about condenser 34 so that current from the source of talking current connected to jack 1 will now flow through the windings 32 and 33 and cause the supervisory device thereat to operate.

When the called subscriber answers and
 85 causes the operation of relay 37 relay 28 in bringing up its right hand armature shunts the calling supervisory lamp 39 and causes it to grow dark in the usual manner. At the same time supervisory lamp 26 is caused
 90 to be dark since its energizing circuit is open.

At the end of the conversation when the called subscriber connected through plug 36
 95 hangs up and causes the deenergization of relay 37 then relay 19 will again be operated to open the shunt about condenser 34 and thus cause the distant supervisory device to operate. The supervisory device 39 will
 100 also operate to indicate that the called subscriber has hung up. Although the sleeve circuit has now been closed by the deenergization of relay 28 to cause the energization of relay 19 supervisory lamp 26 will
 105 not operate as yet since high resistance winding of relay 19 allows insufficient current to flow through such signal lamp 26. The action of relay 19 in placing the condenser 34 in series with the bridge consisting of
 110 repeating coil windings 32 and 33 while deenergizing the distant supervisory device 14 also deenergizes the supervisory relay 31. When the originating operator takes the plug out of jack 1 then the holding relay
 115 15 will become deenergized and moving its armature to its back contact will short circuit the high resistance winding of relay 19 so that supervisory lamp 26 now receives enough current to glow. This is a signal to
 120 the intercepting operator that the cord circuit may now be taken down.

If in answer to the calling subscriber's request the intercepting operator finds that the connection may be more easily handled by the originating operator she inserts plug
 125 25 into jack 22 and thereby puts herself into immediate communication with the originating operator.

The schematic circuit representation in Fig. 2 shows how an established connection ...

will involve a source of talking current and a supervisory device connected to a trunk having a relay responsive to this source of talking current, a break point in the trunk beyond the holding relay, a bridge across the trunk beyond the said break point, a source of talking current inductively coupled with the trunk and a supervisory device for controlling the said break point. In the schematic drawing relay 37 is shown with a back contact since it actually controls a relay 28 having a back contact. Through an arrangement of this sort the supervisory signals initiated by the called subscriber are relayed past the intercepting operator to the originating operator without effecting the intercepting trunk which is held by relay 15.

What is claimed is:

1. An established telephone connection, comprising a source of talking current and a supervisory device, a trunk circuit including a holding relay responsively to said source of talking current, a break point in said trunk beyond said holding relay, a bridge circuit across said trunk beyond said break point, another source of talking current and a supervisory device inductively coupled with said bridge circuit, and means controlled by said second supervisory device for controlling said break point for in turn controlling said first supervisory device.

2. An established telephone connection, comprising a source of talking current and a supervisory device, a trunk circuit including a holding relay responsive to said source of talking current, a break point in said trunk beyond said holding relay, a bridge circuit across said trunk beyond said break point, another source of talking current and a supervisory device inductively coupled with said trunk circuit, and means including said second supervisory device and a separate conductor for controlling said break point.

3. In a telephone system, an operator's position including an operator's telephone set, a trunk outgoing from said position, a circuit companion to said trunk, and means responsive to a connection to said trunk at said operator's position to connect said companion circuit to said operator's telephone set.

4. In a telephone system, an operator's position including an operator's telephone set, a trunk outgoing from said position, connection terminals for said trunk at said position, a circuit companion to said trunk, and means responsive to the actuation of said connection terminals for connecting said companion circuit to said operator's telephone set.

5. In a telephone system, an operator's position including an operator's telephone

set, a trunk jack accessible at said position, a trunk outgoing from said position terminating in said jack, a talking circuit, contacts on said jack for connecting said talking circuit to said telephone set, and a pair of companion jacks at the distant end of said trunk in which said trunk and said talking circuit terminate.

6. In a telephone system, a first operator's position, a second operator's position, a trunk between said positions, connection terminals for said trunk at said positions, a talking circuit companion to said trunk terminating in separate connection terminals at said second operator's position, and means responsive to the operation of said trunk connection terminals at said first operator's position for extending said talking circuit.

7. In a telephone system, a first operator's position, an operator's set thereat, a second operator's position, a trunk between said positions, connection terminals for said trunk at said positions, a talking circuit companion to said trunk terminating in like connection terminals at said second operator's position, and means responsive to the operation of said trunk connection terminals at said first operator's position for connecting said talking circuit to said operator's set.

8. In a telephone system, a first operator's position, a second operator's position, trunks between said positions, connection terminals for said trunks at said positions, a talking circuit individual to each said trunk between said positions, connection terminals for said talking circuits at said second position contiguous to the connection terminals of said associated trunks, and means responsive to the operation of said trunk connection terminals at said first position for extending said talking circuits.

9. In a telephone system, a first operator's position, an operator's telephone set thereat, a second operator's position, trunks between said positions, said trunks terminating in jacks at said positions, a talking circuit individual to each said trunk between said positions, said talking circuits terminating in jacks at said second operator's position and in jack contacts of the respective corresponding trunk jacks in said first operator's position, and other jack contacts cooperating with said talking circuit jack contacts to extend said talking circuits to said operator's telephone set.

In witness whereof, we hereunto subscribe our names this 13th day of August, 1930.

HERBERT B. JOHNSON. 125
ERICH VON NOSTITZ.