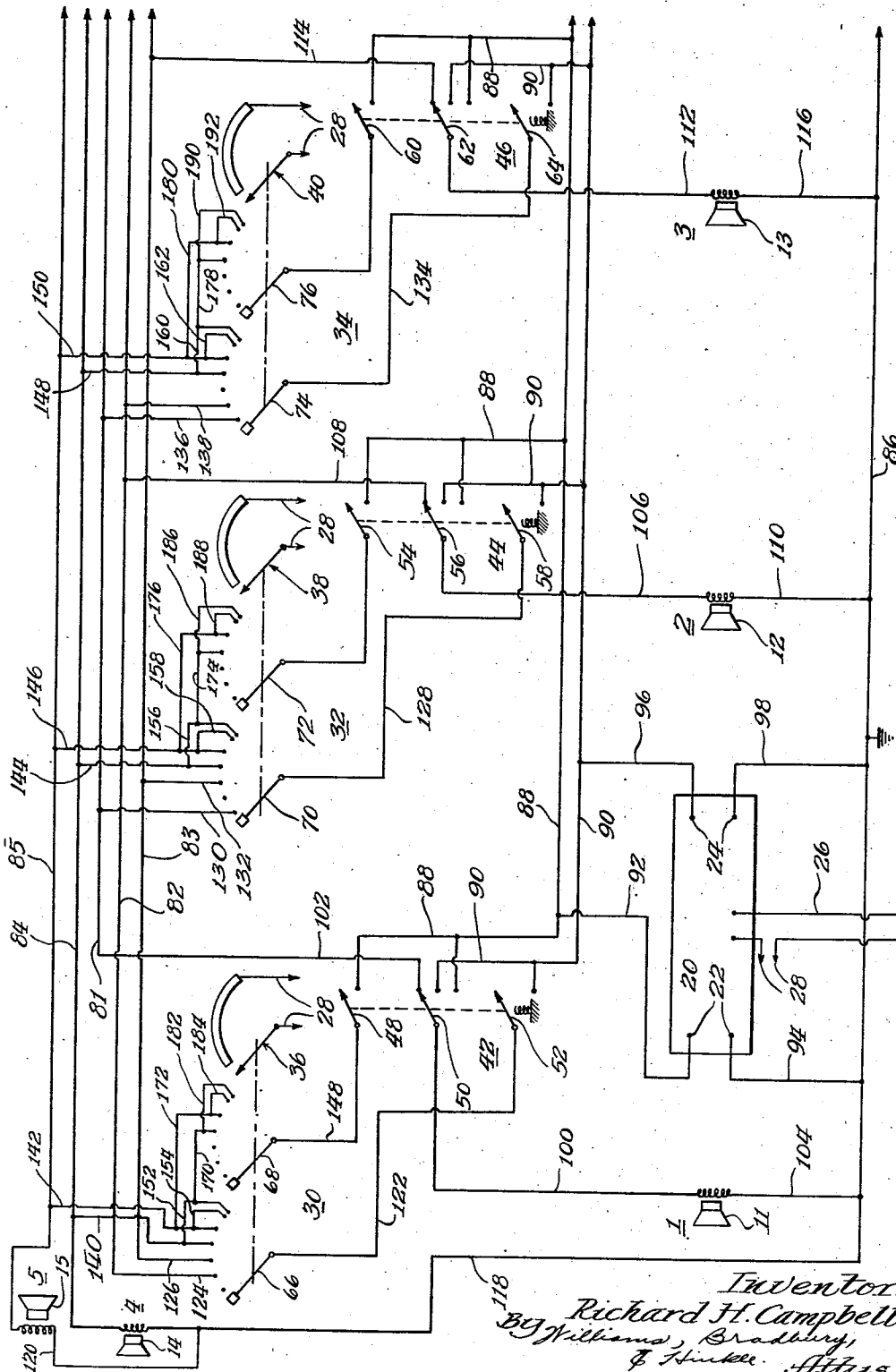


July 15, 1941.

R. H. CAMPBELL
COMMUNICATION SYSTEM
Filed March 25, 1940

2,249,456



Inventor
Richard H. Campbell
By Williams, Bradbury,
& Hinkle. Attys

UNITED STATES PATENT OFFICE

2,249,456

COMMUNICATION SYSTEM

Richard H. Campbell, Racine, Wis., assignor to
Webster Electric Company, Racine, Wis., a cor-
poration of Delaware

Application March 25, 1940, Serial No. 325,669

16 Claims. (Cl. 179—1)

The present invention relates to intercommuni-
cation systems, and particularly to intercom-
munication systems of the loudspeaking type.
It has for its primary object the provision of an
improved system for providing communication
between various parts of a residence or the like,
which parts include a plurality of locations with-
in the residence and one or more locations ex-
terior thereof, such as entrance ways.

The system of the present invention comprises
a single amplifier, a plurality of stations within
the residence and which are referred to hereinafter
as central stations, each provided with a
translating device consisting of a loudspeaker
adapted to be utilized both as a microphone and
a receiver, a communication direction control
switch and a selector switch, and a number of
stations located exteriorly of the residence and
hereinafter referred to as substations, provided
only with translating means of the previously-
mentioned type.

It is a further object of the invention to pro-
vide a system in which the previously-mentioned
elements of the system are arranged so that any
central station can be placed in communication
with any other central station, but in which
eavesdropping (listening to conversations at an-
other station when interstation communication
is not being carried on) between central stations
is prevented.

Other objects and advantages of the invention
will become apparent from the ensuing descrip-
tion, in the course of which reference is had to
the accompanying drawing, the single figure of
which represents schematically one embodiment
of the invention.

Referring now to the figure, it may be seen
that the illustrated system comprises five sta-
tions numbered 1 to 5, inclusive. Of these sta-
tions, 1, 2 and 3 are central stations and 4 and 5
are substations. The central stations may be
located on various floors of a house. For in-
stance, station 1 may be on the first floor, sta-
tion 2 in the basement, and station 3 on the
second floor, or in some other building associated
with the residence, such as a garage. Stations
4 and 5 may be located at the front and rear en-
trance ways to the house, respectively.

Translating devices consisting of loudspeaker
units adapted to be utilized both as microphones
and receivers are located at each station. Thus,
the loudspeakers at stations 1 to 5 have been
indicated by reference characters 11 to 15, in-
clusive. The loudspeakers are preferably of the
well-known permanent magnet type.

The system comprises but a single amplifier
20, which may be of any well-known construc-
tion and located at some convenient or out-of-
the-way place. It is provided with input con-
nections 22 and output connections 24. Power

is supplied to it from some suitable source
through conductors 26 and 28 under the control
of combined selector and power control switches
30, 32 and 34 at stations 1, 2 and 3, respectively.
These switches are illustrated in "off" positions,
wherein the communication circuits are broken
and the amplifier is disconnected from its power
supply. Whenever one of the switches is oper-
ated into any of a plurality of operative positions
to be described shortly, power is supplied to the
amplifier through power switches 36, 38 and 40
associated with switches 30, 32 and 34, respec-
tively. The power switches are all connected in
parallel so that closure of any one of them com-
pletes a power circuit to the amplifier through
conductor 28, conductor 26 being connected di-
rectly to the amplifier.

Each station is also provided with a three-
position communication direction control switch
having an "idle" position (the uppermost posi-
tion in which the switches are illustrated), a
"listen" position (the intermediate position), and
a "talk" position (the lowermost position). The
switches are so constructed and arranged as to
remain in their idle or listen positions when ac-
tuated thereto and are biased for movement
from the talk to the listen positions. The
switches at each station are so arranged with
respect to the loudspeakers at the respective sta-
tions that the latter are connected to individual
interstation circuits for reception of calls from
other central stations or, if desired, from the
substations.

The communication direction control switches
at stations 1 to 3, inclusive, are indicated by
reference characters 42, 44 and 46, respectively.
Switch 42 comprises the three simultaneously op-
erable switch blades 48, 50 and 52; switch 44
comprises the three simultaneously operable
switch blades 54, 56 and 58; and switch 46 com-
prises the three simultaneously operable switch
blades 60, 62 and 64.

Before considering in detail the circuit con-
nections, it may be well to note that each of the
combined selector and power control switches
likewise consists of three simultaneously operable
switch blades. Switch 30 includes the previously-
mentioned switch blade 36 and blades 66 and
68; switch 32 includes the previously-mentioned
switch blade 38 and blades 70 and 72; and switch
34 includes the previously-mentioned switch
blade 40 and blades 74 and 76.

The system comprises a number of interstation
conductors exceeding by three the number of
stations. Each station is normally conditioned
for reception of calls—the central stations by
connection of the loudspeakers thereat to con-
ductors individual to the stations by the com-
munication direction control switches, and the
substations by direct connection. The conduc-

tors individual to stations 1 to 5, inclusive, are represented by reference characters 81 to 85, inclusive. The remaining three conductors are a ground conductor 86, which may very well be a shield for the remaining conductors, and amplifier input and output conductors 88 and 90. Input conductor 88 is connected by a branch conductor 92 to one of the input connection 22 of the amplifier, the other of which is connected to the ground conductor by a branch conductor 94. The output conductor 90 is connected to one of the amplifier output connections 24 by a branch conductor 96, the other of which is connected to ground by branch conductor 98.

The loudspeaker 11 at station 1 is connected to the station 1 conductor 81 by conductor 100, switch blade 50 and conductor 102, and to ground conductor 86 by a conductor 104. Similarly, loudspeaker 12 at station 2 is connected to the station 2 conductor 82 by conductor 106, switch blade 56 and conductor 108, and to ground conductor 86 by a conductor 110; and loudspeaker 13 at station 3 is connected to the station 3 conductor 83 by conductor 112, switch blade 62 and conductor 114, and to the ground conductor by a conductor 116.

Loudspeaker 14 at station 4 is connected directly to station 4 conductor 84 and to the ground conductor by a conductor 118; and loudspeaker 15 at station 5 is connected directly to station 5 conductor 85 and to the ground conductor by a conductor 120 and conductor 118.

The central stations can call each other by manipulation of the communication direction control switches and the combined selector and power control switches, the selector switches being first operated to select the desired station and render operative the amplifier, and the communication direction control switches being operated to the talk position. The selector switches at each station are so arranged that they can be connected to the interstation conductors individual to the other stations. Thus, the selector switch blade 66 at station 1 is operable to complete the circuits to the communication direction control switch blade 52 from conductors 82 and 83, through a conductor 122 interconnecting the switch blades and branch conductors 124 and 126 leading from conductors 82 and 83, respectively. Similarly, switch blade 70 at station 2 is operable to connect conductors 81 and 83 to communication direction control switch blade 58 through conductor 128 interconnecting the switch blades and branch conductors 130 and 132 leading from conductors 81 and 83, respectively; and selector switch blade 74 is operable to connect conductors 81 and 82 to the communication direction control switch blade 64 through a conductor 134 interconnecting the switch blades and branch conductors 136 and 138 leading from conductors 81 and 82, respectively.

Operation of any of the selector switches also completes the power supply circuit to the amplifier so that the amplifier is energized and a call may be made by operation of the communication direction control switch into its talk position. Thus, when the communication direction control switch 42 at station 1 is operated into its talk position, the loudspeaker 11 thereat is connected to the input of the amplifier through a circuit including switch blade 50, which connects the loudspeaker to the input conductor 88. At the same time, switch blade 52 connects the selected central station conductor directly to the output conductor 90, it being remembered that the loud-

speakers at the other stations are normally connected to the interstation conductors individual to those stations. The operators at stations 2 and 3 may similarly call the operators at the other stations by operation of the selector and power control switch and the communication direction control switch thereat.

The called station can respond when the communication direction control switch at the calling station is returned to its listening position, and this is possible without operation of the selector switch thereat. Thus, assuming that station 1 has called station 2 and the communication direction control switch 42 at station 1 has been returned to its listen position, at which time selector switch blade 50 connects the loudspeaker 11 directly to the output conductor 90, the operator at station 2 can talk to station 1 by simply depressing the communication direction control switch 44 thereat to its talk position, wherein the loudspeaker 12 is connected directly to the input conductor 88. It may be seen, therefore, that communication may be carried on in alternate directions by alternately manipulating the communication direction control switches at the two stations from their listen to their talk positions.

The combined selector and power control switches at the central stations are operable into positions to connect either or both of substations 4 and 5 to the central station. Selective individual connection of the stations is provided by extending branch conductors from conductors 84 and 85 to be engaged by the selector switches in different positions thereof, and joint connection is provided by extending additional branch conductors to be engaged by the selector switches in one position thereof. Thus, conductors 84 and 85 are connected by branch conductors 140 and 142, 144 and 146, and 148 and 150, which are adapted to be engaged by switch blades 66, 70 and 74, respectively, in different positions thereof. Additional branch conductors 152 and 154, 156 and 158, and 160 and 162 are provided for simultaneous engagement by these switch blades when operated into a further position.

To enable substations 4 and 5 to communicate with the central station, additional branch conductors are extended from conductors 84 and 85 to be engaged by switch blades 68, 72 and 76 at stations 1, 2 and 3, respectively. Conductors 84 and 85 are connected by branch conductors 170, and 172, 174 and 176, and 178 and 180, so that the latter may be engaged by the abovementioned switch blades in different positions thereof. Additional branch conductors 182 and 184, 186 and 188, and 190 and 192 are provided, so that these may be engaged simultaneously when the switch blades are operated into a further position.

In order to condition any of the central stations for the reception of calls from the substations, it is necessary that the selector switches be operated to select the desired substation or substations and the talk-listen switch be operated into its listen position. For instance, supposing that the operator at station 1 desires to receive calls from substation 4. Then the selector switch 30 at station 1 is operated into a position wherein switch blade 68 connects conductor 84 to the input of the amplifier 20 through switch blade 48, it being remembered that the communication control switch is in its intermediate or listen position. The connection of the loudspeaker 14 to the input extends through the following circuit: Conductors 84, 140, 152, 170 switch blade 68, conductor 148, switch blade 48, and the con-

ductors 88 and 92, the circuit being completed through ground. The loudspeaker 11 at station 1 is connected to the output of the amplifier 20 through a circuit including conductor 100, switch blade 50 and conductors 90 and 98, the circuit being completed through ground. When the operator at station 1 responds to a call from station 4, the talk-listen switch 42 is depressed to its lowermost position, at which time the loudspeaker 11 is connected to the input and the loudspeaker 14 to the output of the amplifier. The former is connected to the input through conductor 100, switch blade 50 and conductors 88 and 92, the circuit being completed through ground. Loudspeaker 14 is connected to the output of the amplifier through conductors 84, 140, switch blade 66, conductor 122, switch blade 52, and conductors 90 and 98, the circuit being completed through ground. Thus, alternate communication in opposite directions may be effected by operation of the talk-listen switch 42 from its intermediate to lowermost positions.

Communication may be similarly carried on between central station 1 and substation 5 alone by operating the selector switch into a position wherein switch blade 66 is in engagement with conductor 142 and switch blade 68 is in engagement with conductor 172. Central station 1 may communicate with both stations 4 and 5 by operating the selector switch into a position wherein switch blade 66 simultaneously engages conductors 152 and 154, and switch blade 68 simultaneously engages conductors 182 and 184.

The remaining central stations may communicate with one or both the substations 4 and 5 in a similar manner through circuits that have been described in detail above.

Eavesdropping, that is, listening to conversation being carried on at station 1 when the communication control switch 42 thereat is in the idle position, is prevented, because in the idle position of the switch the loudspeaker 11 at station 1 is not connected to the input of the amplifier. It may be noted, however, that when communication is being carried on between any two of the stations, another station may listen in on the conversation. Eavesdropping is also prevented when the communication control switch at any central station is in its intermediate or listen position, because the loudspeaker at the station at this time is connected to the output of the amplifier.

It is to be noted that while only a comparatively few stations have been illustrated in the embodiment of the invention described above, it should be understood that the number of stations may be varied to suit the demand of particular installations. Likewise, while only a single embodiment of the invention has been described, it is not contemplated that the principles of the invention should be limited thereto. Other modifications thereof will suggest themselves to those skilled in the art, and it is contemplated that the present invention is limited only by the claims appended hereto.

What I claim and desire to secure by United States Letters Patent is:

1. In an intercommunication system, the combination including, an amplifier having input and output connections, a plurality of stations each including a translating device utilizable as a microphone and a receiver, a multi-position communication control switch and circuits controlled thereby, and interstation circuits individual to each station, said circuits and switches being so

constructed and arranged that the devices at each station are connected to the interstation circuit individual to the station directly through the switch in one position of the switch thereat and to the input and output of the amplifier in other positions of the switch.

2. In an intercommunication system, the combination including, an amplifier having input and output connections, a plurality of stations each including a translating device utilizable as a microphone and a receiver, a multi-position communication control switch, a station selector switch and circuits controlled by said switches, and interstation circuits individual to each station, said circuits and communication control switches being so constructed and arranged that the devices at each station are connected to the interstation circuit individual to the station in one position of the switch thereat and to the input and output of the amplifier in other positions thereof, and said selector switches, communication control switches and circuits being so constructed and arranged that the selector switch at each station is selectively operable to connect interstation circuits individual to other stations to the communication control switch at the station and the latter is adapted in one position thereof to connect the selected circuit to the output of the amplifier.

3. In an intercommunication system, the combination including, an amplifier having input and output connections, a plurality of stations each including a translating device utilizable as a microphone and a receiver, a three-position communication control switch, a station selector switch and circuits controlled by said switches, and interstation circuits individual to each station, said circuits and communication control switches being so constructed and arranged that the devices at each station are connected to the interstation circuit individual to the station in a first position of the switch thereat and to the output and input of the amplifier in second and third positions thereof, and said selector switches, communication control switches and circuits being so constructed and arranged that the selector switch at each station is selectively operable to connect interstation circuits individual to other stations to the communication control switch at the station and the latter is adapted in its third position to connect the selected circuit to the output of the amplifier.

4. In an intercommunication system, the combination including, an amplifier having input and output connections, a plurality of stations each including a translating device utilizable as a microphone and a receiver, interstation circuits each terminating in a pair of branch conductors at one station and connected to the translating devices at the other stations, a multi-position communication control switch at the one station, a selector switch at said one station operable selectively to connect said pairs of branch circuits to said communication control switch, and circuits controlled by said switches so constructed and arranged that in one position of said communication control switch the translating device at said one station is connected to the output of the amplifier and the translating device at a selected other station is connected to the input of the amplifier through one of a pair of branch conductors and in another position of the switch the translating device at said one station is connected to the input of the amplifier and the translating device at the selected other station

is connected to the output of the amplifier through another of a pair of branch conductors.

5. In an intercommunication system, the combination including an amplifier having input and output connections, a plurality of stations each including a translating device utilizable as a microphone and a receiver, interstation circuits between one of said stations and the remaining stations, each of said circuits terminating in a pair of branch conductors at said one station and connected to the translating devices at the other stations, a communication control switch at said one station, selector switch means at said one station operable to connect one or more of said pairs of branch conductors to said communication control switch, and circuits controlled by said communication control switch, said switches and circuits being so constructed and arranged that in one position of said communication control switch the translating device at said one station is connected to the output of the amplifier and the translating devices at the selected other stations are connected to the input of the amplifier through one of said branch conductors, and in another position of the switch the translating device at said one station is connected to the input of the amplifier and the translating devices at the selected other stations are connected to the output of the amplifier through the other of said branch conductors.

6. In an intercommunication system, the combination including an amplifier having input and output connections, a plurality of stations each including a translating device utilizable as a microphone and a receiver, a multi-position communication control switch and circuits controlled thereby, a station selector switch and circuits controlled thereby, interstation circuits individual to said stations, another station having a similar translating device, an interstation circuit to which said device is connected, said selector switches and circuits being so constructed and arranged that said interstation circuits may be selectively connected to said communication control switches and said communication control switches and circuits being so constructed and arranged that when one of said plurality of stations is selected at a station, the communication control switch thereat is operable to connect the translating device thereat to the output or input of the amplifier and the selected interstation circuit to the output of the amplifier when the translating device is connected to the input of the amplifier, and when said other station is selected the communication control switch is operable between two positions alternately to connect said translating devices to the output and input of the amplifier.

7. In an intercommunication system, the combination including, an amplifier having input and output connections, a plurality of stations each including a translating device utilizable as a microphone and a receiver, a multi-position communication control switch and circuits controlled thereby and a station selector switch and circuits controlled thereby, interstation circuits individual to said stations, a plurality of other stations having similar translating devices, interstation circuits to which said devices are connected at said other stations, said selector switches and circuits being so constructed and arranged that said interstation circuits may be selectively connected to the communication control switches and said communication control switches and

circuits being so constructed and arranged that when one of said first plurality of stations is selected at a station the communication control switch at the station is operable to connect the translating device thereat to the output or input of the amplifier and the selected interstation circuit to the output of the amplifier when the translating device is connected to the input of the amplifier, and when one of said other plurality of stations is selected the communication control switch is operable between two positions alternately to connect said translating devices to the output and input of the amplifier.

8. In an intercommunication system, the combination including, an amplifier having input and output connections, a plurality of stations each including a translating device utilizable as a microphone and a receiver, a three-position communication control switch, and a circuit connection from said switch directly to said translating device, interstation circuits individual to said stations, said switch being adapted to connect said translating device directly to the interstation circuit associated with the station in a first position and to connect the translating device directly to the output and input of the amplifier in second and third positions of the switch.

9. In an intercommunication system, the combination including, an amplifier having input and output connections, a plurality of stations each including a translating device utilizable as a microphone and a receiver, a two-pole three-position communication control switch and a station selector switch, and interstation conductors individual to each station, said input and output connections leading to each of said stations, a circuit connection from the selector switch to one pole of the communication control switch, a circuit connection from the translating device to the other pole of the communication control switch, said second-mentioned pole being adapted to connect said translating device directly to the interstation conductor individual to the station in a first position thereof, to the output circuit in a second position thereof, and to the input connection in a third position thereof, and said first-mentioned pole being adapted to connect the selector switch to the output connection in the third position of said communication control switch.

10. In an intercommunication system, the combination including, an amplifier having input and output connections, a pair of stations each including a translating device utilizable as a microphone and a receiver, an interstation circuit terminating in a pair of branch conductors at one station and connected to the translating device at the other station, a two-pole selector switch at said one station adapted to complete circuits to said branch conductors in a predetermined position thereof, a multi-position three-pole communication control switch at the one station, two of said poles being connected directly to the poles of said selector switch, the third pole of said communication control switch being connected directly to the translating device at said one station, the poles of said communication control switch being adapted in one position to connect the translating device at one station to the output of the amplifier and one of said branch conductors to the input of the amplifier, and in another position to connect said translating device to the input of the amplifier and the other branch conductor to the output of the amplifier.

11. In an intercommunication system, the combination including, an amplifier having input and output connections, a plurality of stations each including a translating device utilizable as a microphone and a receiver, interstation circuits between one of said stations and the other stations, each of said circuits terminating in a pair of branch conductors at said one station and being connected directly to the translating devices at the other stations, a two-pole selector switch at said one station adapted simultaneously to complete circuits to said branch conductors, a multi-position three-pole communication control switch at said one station, two of said poles being connected directly to the poles of the selector switch and the third pole being connected directly to the translating device at said one station, said communication control switch being adapted in one position thereof to connect one of said branch conductors directly to the input of the amplifier and the translating device at said one station to the output of the amplifier, and in another position to connect the other of said branch conductors directly to the output of the amplifier and the translating device to the input of the amplifier.

12. In an intercommunication system, the combination including, an amplifier having input and output connections, a plurality of stations each including a translating device utilizable as a microphone and a receiver, interstation circuits between one of said stations and the other stations, each of said circuits terminating in a pair of branch conductors at said one station and being connected directly to the translating devices at the other stations, a two-pole selector switch at said one station adapted simultaneously to complete circuits to said branch conductors, a multi-position three-pole communication control switch at said one station, two of said poles being connected directly to the poles of the selector switch and the third pole being connected directly to the translating device at said one station, said communication control switch being adapted in one position thereof to connect one of said branch conductors directly to the input of the amplifier and the translating device at said one station to the output of the amplifier, and in another position to connect the other of said branch conductors directly to the output of the amplifier and the translating device to the input of the amplifier, said branch conductors having other branch conductors extending therefrom and so arranged as to be engaged simultaneously by said poles of the selector switch in another position thereof, whereby communication may be established between said one station and selected ones or all of the other stations.

13. In an intercommunication system, the combination including, an amplifier having input and output connections, a plurality of stations each having a translating device utilizable as a microphone and a receiver, a three-pole three-position communication control switch and a two-pole multi-position selector switch, interstation circuits individual to said stations adapted selectively to be connected to a first pole of the communication control switch by one pole of the selector switch, another station having a similar translating device, an interstation circuit to which said device is connected and having a pair of branch conductors engageable by the poles of said selector switch in one position thereof, conductors leading from the two poles of the selector

switch to the first and a second pole of the communication control switch, a conductor leading from each of the translating devices at said plurality of stations to the third poles of the communication control switches thereat, the third pole of the communication control switch at each station being adapted to connect the translating device thereat to the interstation circuit individual to the station in a first position of the switch, and to the output and input of the amplifier in the second and third positions thereof, the second pole being adapted to connect the other of the two poles of the selector switch to the input in the second position thereof, and the third pole being adapted to connect the one pole of the selector switch to the output in the third position thereof.

14. A unit for use in an intercommunication system comprising a single amplifier and other similar units, including in combination amplifier input and output connections, a translating device utilizable as a microphone and a receiver, a communication circuit individual to the unit, a three-position communication control switch connected directly to the translating device and adapted in a first position to connect the translating device directly to the interstation circuit, and in other positions selectively to connect said translating device to the input and output connections.

15. A unit for use in an intercommunication system, including amplifier input and output connections, a translating device utilizable both as a microphone and a receiver, an interstation circuit individual to the station and interstation circuits individual to other units in the system, a three-position two-pole communication control switch, one pole of which is directly connected to the translating device, a station selector switch adapted selectively to engage the second-mentioned interstation conductors and connected to the other pole of said communication control switch, said communication control switch being adapted in a first position to connect the translating device to said first-mentioned interstation circuit through said one pole, in a second position to connect said device to the output connection through said one pole, and in a third position to connect said device to the input connection through said one pole, and the other pole being adapted in the third position to connect said selector switch to the output connection.

16. A unit for use in an intercommunication system, including in combination, amplifier input and output connections, a translating device utilizable as a microphone and a receiver, a plural-position three-pole communication control switch, a two-pole selector switch, an interstation conductor terminating in a pair of branch conductors engageable by the blades of the selector switch in one position of said switch, conductors interconnecting the two poles of the selector switch to first and second poles of the communication control switch, a conductor connecting the device to the third pole of the communication control switch, said first and third poles being adapted to complete circuits to the input and output connections respectively in one position of the communication control switch and said second and third poles being adapted to complete circuits to the output and input connections in another position of the communication control switch.

RICHARD H. CAMPBELL.