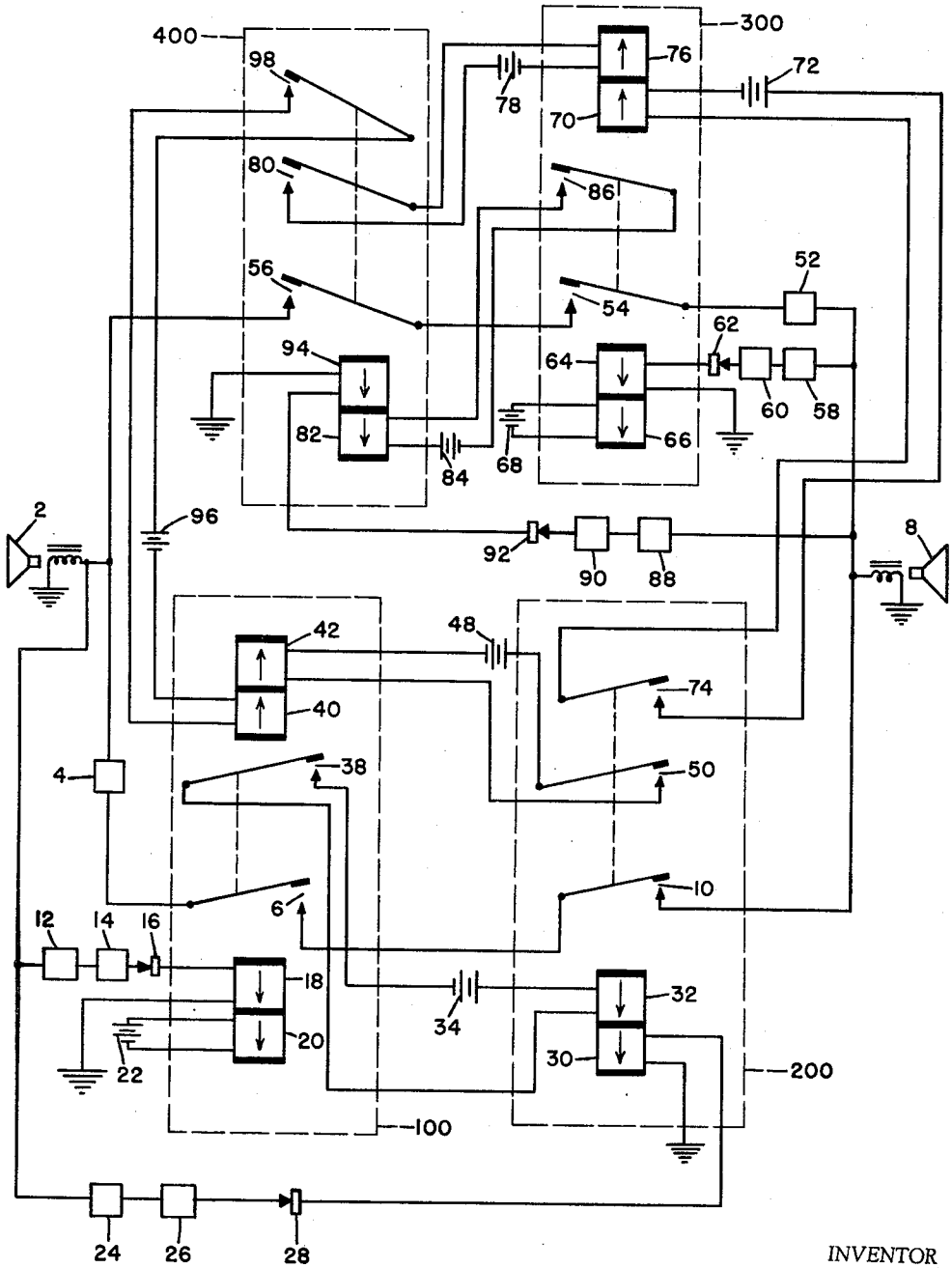
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VOICE ACTIVATED INTERCOMMUNICATION SYSTEM

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VOICE ACTIVATED INTERCOMMUNICATION SYSTEM

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The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates in general to intercommunication systems and more particularly to an intercommunication system that utilizes preselected frequencies that are generated orally by the user to determine the station that shall perform as a sending station and the station that shall perform as a receiving station.

The present day intercommunication system comprises a plurality of stations that are strategically placed at various locations. To communicate with any one of a plurality of stations, the user must first press a button, or the like, to electrically connect his station to the desired station. To talk, the user must manipulate a talk-listen key. The talk-listen key must be in the talk position to transmit and in the listen position to receive. It thus becomes obvious that the work procedures of the two individuals involved must be suspended for the duration of the conversation; that a certain amount of skill is necessary on the part of the operator to co-ordinate the movement of the talk-listen key to the appropriate act of talking or listening; and that the operator must be within arms length of the intercommunication system to operate said system.

The present device was designed to operate as a completely automatic system that does not require that the operator manually manipulate buttons or switches to electrically connect his station to the desired station. This device also permits the users to switch their particular station from the listen position to the talk position automatically by the use of discrete frequencies that are contained within selected key words. Thus the users need not be within arms length of their station nor need they discontinue their prevailing work functions to operate this intercommunication device.

The present invention contains a plurality of transducers wherein each is capable of functioning as a microphone or as a speaker. Each transducer is electrically connected to the other transducer through an amplifier and a plurality of contacts. Said contacts are controlled by frequency sensitive filters that cooperate with the transducers.

Thus, to operate this device, the operator speaks a word that contains the proper frequency into his transducer. The frequency sensitive filter receives and operates on the discrete frequency. The discrete frequency is then rectified and utilized to operate a relay. This procedure is then repeated a second time with a different discrete frequency that activates a second relay that cooperates with said first relay. The contacts of said second relay cannot be activated until the contacts of said first mentioned relay are activated. The combined action of the first and second relays electrically connects a second transducer to receive the output signals of the first transducer. Thus the second transducer performs as a speaker. This condition continues to prevail until the person who is stationed at the second transducer recites the words that contain

the proper order of a different set of discrete frequencies. When this happens, the second transducer then becomes the microphone and the first transducer the speaker.

The discrete frequencies of each filter are distinct in that they are not present in the noise that is present in the surrounding area nor are they likely to occur during the transmitted conversations.

It is a general object of the present invention to provide an intercommunication device that is completely automatic in operation.

It is another object to provide a device that will not be sensitive to surrounding noise.

An additional object is to provide a device that will allow either party to interrupt the other at any desired instant.

It is another object to provide an intercommunication device that contains an unlimited number of stations where each station can be connected automatically to any other station by the generation of sequentially discrete frequencies.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein the figure shown is a schematic diagram of the invention.

Referring to the figure, a transducer 2 that functions as a microphone or as a speaker is electrically connected to the input of an amplifier 4. The output of said amplifier is connected to one of the contacts 6 of the differential relay 100. The other arm of contact 6 is connected to a transducer 8 through the make-break contacts 10 of the relay 200. Said transducer 8 can function as a microphone or as a speaker. A filter 12 that will pass a single preselected frequency only is electrically connected to receive the output of the transducer 2. The output signal of said filter 12 is fed into the amplifier 14 where it is amplified to the proper value. The amplified signal that appears at the output of the amplifier 14 is then rectified in the rectifier 16 and is then inserted into the coil 18 of the differential relay 100. The coil 20 of said differential relay 100 cooperates with said coil 18 and is connected across the battery 22. A second filter 24 that passes a second preselected frequency only is electrically connected to receive the output of the transducer 2. The output of said filter 24 is then amplified and rectified in the amplifier 26 and the rectifier 28, and is then inserted into the coil 30 of the relay 200. The coil 32 of said relay 200 cooperates with said coil 30 and is connected across the battery 34 through the contacts 38 of the differential relay 100. The differential relay 100 consists of the contacts 6 and 38 that operate together and cooperate with the plurality of coils 18, 20, 40 and 42. The coil 42 is connected across the battery 48 through the contacts 50 of relay 200. The relay 200 consists of the contacts 10, 50 and 74 that operate together and cooperate with the coils 30 and 32.

The output of the transducer 8 is electrically connected to the input of an amplifier 52. The output of the amplifier 52 is connected to the transducer 2 through the series connected contacts 54 and 56 of the differential relay 300 and relay 400 respectively. A third filter 58 that passes a third preselected frequency only is electrically connected to receive the output of the transducer 8. The output of the filter 58 is utilized to energize the relay coil 64 after being amplified and rectified in the amplifier 60 and the rectifier 62. The coil 66 of the differential relay 300 is connected across the battery 68 and is continuously energized. The coil 70 of the differential relay 300 is energized by the battery 72 through the contacts 74 of the relay 200. The coil 76 of differential relay 300 is energized by the battery 78 through the action of the contacts 80 of the relay 400. The coil 82

of the relay 400 is energized by the battery 84 through the contacts 86 of the differential relay 300. A fourth filter 88 that passes a fourth preselected frequency only is connected to receive the output of the transducer 8. The output of the filter 88 is amplified in the amplifier 90, rectified in the rectifier 92 and then utilized to energize the coil 94 of the relay 400. The coil 40 of the differential relay 100 is energized by the battery 96 through the contacts 98 of the relay 400.

The differential relay 300 contains the contacts 54 and 86 that are actuated by the coils 64, 66, 70 and 76. The relay 400 contains the contacts 56, 80 and 98 that are affected by the coils 82 and 94.

The filters, amplifiers and rectifiers are of conventional design and construction and are well known to those experienced in the art. Therefore the design and construction of said filters, amplifiers and rectifiers are not shown nor described in detail.

The differential relays 100 and 300 are similar and are of the double pole single throw type. Each differential relay contains two sets of contacts and four electrically distinct activating coils wherein two coils are located above the contacts and two coils are located below the contacts.

The relays 200 and 400 are similar and are of the three pole single throw type. Each relay 200 and 400 contains three sets of contacts and two electrically isolated activating coils wherein said coils of each relay are located on the same side of the contacts. The operation of the differential relay 300 and relay 400 is similar to the operations of the differenital relay 100 and relay 200 respectively; however, said first mentioned set of relays allows information to flow from transducer 8 to transducer 2 and said second set of relays allows information to flow from transducer 2 to transducer 8.

In the operation of this device, the user speaks a word or words containing the preselected combination of sequentially arranged frequencies into his transducer 2 or 8. The differential relay 100 is of the double pole single throw type containing four activating coils 18, 20, 40 and 42. Two of the coils 18 and 20 cooperate to retain the relay contacts 6 and 38 in a closed position. The remaining coils 40 and 42 cooperate to retain the contacts 6 and 38 in an open position. The coil 20 is continuously energized and generates a value of magnetic flux that is sufficient to hold the contacts 6 and 38 closed but is not of sufficient value to initially close said contacts. Thus the differential relay 100 cannot close until the coil 18 is energized and produces the additional magnetic flux that is required. The first sound that is spoken into the transducer 2 that contains the proper frequency will be passed by the filter 12. This signal is then amplified in the amplifier 14, rectified in the rectifier 16 and then fed into the relay coil 18. The signal that is inserted into said coil 18, in combinaiton with coil 20, is of sufficient value to close the contacts 6 and 38. The coil 20 retains said contacts 6 and 38 in the closed position after the signal in coil 18 ceases. The closed contacts 38 complete the circuit to energize the coil 32 of the relay 200. The coil 32 of the relay 200 operates in the same manner and preforms the same functions as the coil 20 of the differential relay 100. The interconnection of the differential relay 100 with the coil 32 of the differential relay 200 determines the order of the code frequencies. The flux that is required to close the contacts 10, 50 and 74 of the relay 200 is produced by speaking the second predetermined code frequency into the transducer 2. This signal is passed by the second filter 24, and then amplified and rectified in the amplifier 26 and the rectifier 28. The rectified signal is fed into the coil 30 of the relay 200 and assists coil 32 in closing the contacts 10, 50 and 74. This action of the relay 200 completes the audio circuit from the transducer 2 to the transducer 8 through the audio amplifier 4. The contact 50 completes the circuit, and energizes the coil 42, of the differential relay 100. Said coil 42 tends to open the contacts 6 and 38. Magnetically, the coil 42 cooperates with the coil 40 in the same manner as the coil 20 cooperates with the coil 18. The necessary additional magnetic flux that is necessary to open the contacts 6 and 38 of the differential relay 100 must come from the coil 40 that is activated through the normally open contacts 98 of the relay 400. Thus, in completing the circuit the transducer 2 performs as a microphone and the transducer 8 performs as a speaker. The transducer 8 has the potential strength to open the existing circuit of the transducer 2 so that transducer 8 will perform as a microphone and transducer 2 will operate as a speaker.

To reverse the direction of flow of information, the transducer 8 must perform as a microphone and the tranducer 2 must operate as a speaker. The user at the transducer 8 speaks a sound that contains the first required frequency. This frequency closes the contacts 54 and 86 of the differential relay 300 in the same manner as the coil 18 assisted in the closing of the contacts of the differential relay 100. The action of the differential relay 300 completes the circuit of the coil 82 of the relay 400. At the instant the second preselected frequency is received by the transducer 8 and is fed to the coil 94 of the relay 400 through the filter 88, amplifier 90, and rectifier 92, the contacts 56, 80 and 98 will close. The circuit is now complete for the transference of information from transducer 8 to transducer 2 so that transducer 8 operates as a microphone and the transducer 2 performs as a speaker.

The instant that the contacts 98 of the relay 400 close, the circuit of the coil 40 of the differential relay 100 is complete and said contacts 6 and 38 open. The action of the contacts 38 opens the circuit of the coil 32 thus opening the contacts 10, 50 and 74 of the relay 200. The person at the transducer 8 can now speak continuously until he is interrupted when the person at transducer 2 uses his discrete code frequencies.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A voice operated intercommunication system comprising first and second transducers, first and second filters, and first and second differential relays each having contacts and an operating coil, said first transducer being coupled through said first filter to the operating coil of said first differential relay to close the contacts thereof, said second transducer being coupled through said second filter to the operating coil of said second differential relay to close the contacts thereof, a first circuit connecting said transducers comprising said contacts of said first differential relay, a second circuit connecting said transducers comprising said contacts of said second differential relay, and means controlled by said transducers and said differential relays and operable upon completion of one of said circuits between said transducers through the contacts of one of said differential relays to open the contacts of the other of said differential relays.

2. A voice operated intercommunications system comprising a first transducer, a first multiplicity of filters, each passing a different voice frequency, electrically coupled to said first transducer, a second transducer, a first multiplicity of relays, each having an operating coil and contacts, each of said relay operating coils being electrically coupled to one of said filters and operating in accordance with filter output signals, and said relay contacts serially connecting said first and second transducers, a second multiplicity of relays, each having an operating coil and contacts, a second multiplicity of filters, each passing a different voice frequency, electrically coupled to said second transducer and said sec-

ond multiplicity of relays, each of said relay operating coils being electrically coupled to a filter and operating in accordance with filter output signals, and said relay contacts serially connecting said first and second transducers, said multiplicities of relays being interconnected so that operation of one of said multiplicities of relays to establish a connection between said transducers will automatically interrupt the connection between said transducers established by the other of said multiplicity of relays.

3. The structure of claim 2 wherein said contacts of each of said first multiplicity of relays are arranged to operate in a given sequence and said contacts of each of said second multiplicity of relays are arranged to operate in a given sequence, thereby requiring a particular sequence of relay contact operation.

4. A voice operated intercommunication system comprising a first transducer, a first filter electrically coupled to said first transducer, a first amplifier coupled to said first filter, a rectifier electrically coupled to said amplifier, a first relay comprising a first, second, third and fourth coil, and a first and second pair of ganged contacts, said first coil being electrically coupled to said rectifier and said second coil being permanently energized, said relay contacts both closing when said first coil is energized, a second filter electrically coupled to said first transducer, a second amplifier electrically coupled to said second filter, a second rectifier electrically coupled to said second amplifier, a second relay comprising a first and second coil and a first, second, and third pair of ganged contacts, said first coil being energized when said second contacts of said first relay close, said second coil being coupled to said second rectifier, said contacts of said second relay all closing when said second coil is energized, a third amplifier coupling said first contacts of said first relay to said first transducer, a second transducer electrically coupled to said first contacts of said second relay, said contacts also being coupled to said first contacts of said first relay, said third coil of said first relay being connected to said second contacts of said second relay and energized when said second contacts of said second relay close, a third filter electrically coupled to said second transducer, a fourth amplifier

electrically coupled to said third filter, a third rectifier electrically coupled to said third filter, a third relay comprising a first, second, third and fourth coil and a first and second pair of ganged contacts, said first coil being electrically coupled to said third rectifier and said second coil being permanently energized, said third relay contacts both closing when said first coil is energized, a fourth filter electrically coupled to said second transducer, a fifth amplifier electrically coupled to said fourth filter, a fourth rectifier electrically coupled to said fifth amplifier, a fourth relay comprising a first and second coil and a first, second and third pair of ganged contacts, said first coil being connected to said second contacts of said third relay and energized when said second contacts close and said second coil being coupled to said fourth rectifier, said contacts of said fourth relay all closing when said second coil is energized by the output of said fourth rectifier, said first contacts of said fourth relay being coupled to said first transducer, a sixth amplifier coupling said first contacts of said third relay to said second transducer, said first contacts of said third relay also being coupled to said first contacts of said fourth relay, said fourth coil of said first relay being connected to said third contacts of said fourth relay and energized when said third contacts of said fourth relay close, said fourth coil of said third relay being connected to said second contacts of said fourth relay and energized when said second contacts of said fourth relay close, said third coil of said third relay being connected to said third contacts of said second relay and energized when said third contacts of said second relay close.

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