Oct. 29, 1929. W. C. JONES 1,733,605

TACTUAL INTERPRETATION OF VIBRATIONS

Filed Jan. 17, 1923

FIG. 1.

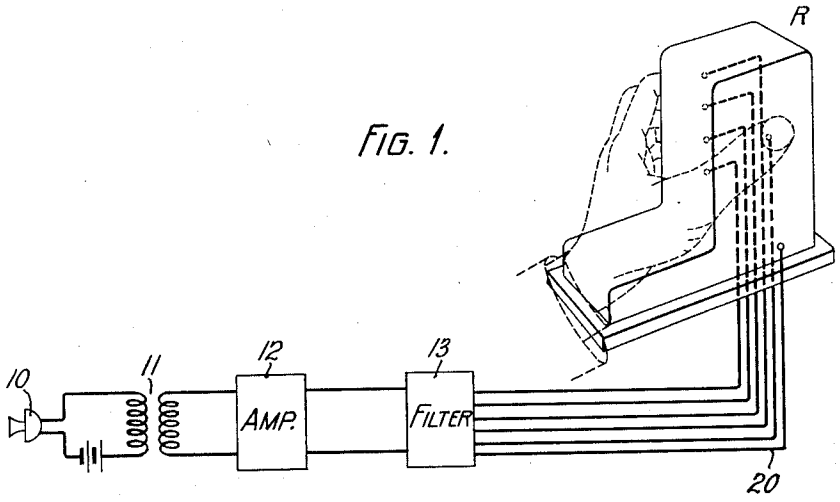
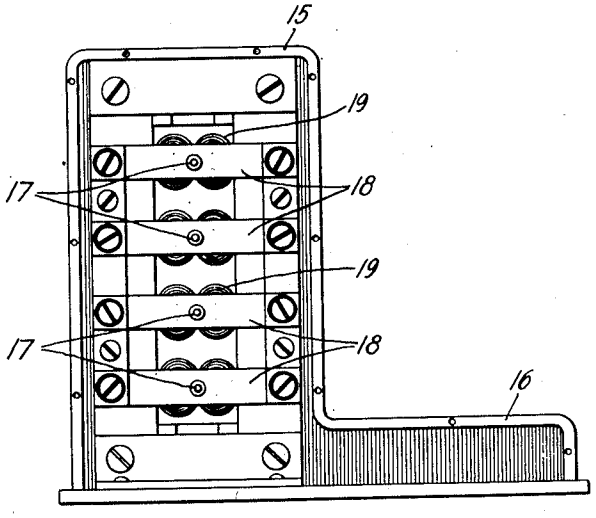


FIG. 2.



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Patented Oct. 29, 1929

1,733,605

UNITED STATES PATENT OFFICE

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TACTUAL INTERPRETATION OF VIBRATIONS

Application filed January 17, 1928. Serial No. 247,288.

This invention relates to the tactual interpretation of vibrations and its object is to enable a totally deaf person to interpret sounds or electrical vibrations through the sense of touch.

Heretofore various arrangements have been proposed to aid the deaf in interpreting sounds through the sense of touch, such an arrangement, for example, being disclosed in the application of Harvey Fletcher, Serial No. 110,099, filed May 19, 1926, in which arrangement the sound waves are converted into electrical waves and then amplified to operate electromagnetic means in accordance with the frequences of the sound waves, and thus to spacially stimulate the tactual nerves.

In accordance with the present invention which is an improvement on the device disclosed in the above application, there is provided a system in which the frequency spectrum of the waves corresponding to speech is broken up into separate bands which are impressed respectively upon the thumb and fingers of the observer. In its preferred embodiment, the receiving device comprises a structure containing five electromagnets each equipped with a vibratile member carrying at its center a projecting member or stimulator. Four of these stimulators extend from one side of the structure in such a way as to be easily engaged by the fingers of one hand and the fifth stimulator extends from the opposite side of the structure so as to engage the thumb. The structure is provided with a shelf portion upon which the wrist of the user may rest so that the thumb and fingers are held in contact with the stimulators with the minimum exertion, the fingers and thumb taking the positions which they would naturally assume when feeling of an object.

In accordance with another feature of the invention vibrating elements of this receiving device are arranged to have natural frequencies outside the frequency range to which the tactile nerves respond readily. It has been determined that the intensity of the stimulation required to reach the threshold of feeling increases very rapidly above a frequency of approximately 1000 cycles and it is very difficult to tactually detect a continuous frequency in excess of 1500 cycles. In the preferred embodiment the resonant frequencies of all elements of the structure are in excess of 1800 cycles, thereby eliminating confusion due to resonant frequencies. By making the resonant frequencies high, it is also possible to make the stiffness of the vibrating elements great enough to prevent excessive changes in air-gap length due to variations in the force exerted by the pressure of the fingers and thumb upon the stimulators.

This invention may be more clearly understood by reference to the accompanying drawing, in which Fig. 1 is a schematic view of a system embodying the features of this invention for the tactual interpretation of electrical vibrations such as those produced by speech, and Fig. 2 shows in detail the receiving element disclosed in Fig. 1.

Referring to the drawing, a microphone or transmitter 10 is connected through a suitable transformer 11 to the input terminals of an amplifier 12, the output of which is connected to the input terminals of a filter 13. This filter is arranged to break up the speech spectrum into five separate bands which are adapted to operate stimulators conveniently located on the receiving element R to stimulate the tactile nerves of the thumb and fingers of the user. Preferably, the speech spectrum, covering the range in which the textile nerves are sensitive, is broken up into bands which bear an octave relation to each other. Satisfactory results have been obtained when the range of the respective bands covers frequencies of zero to 125, 125 to 250, 250 to 500, 500 to 1000, and frequencies above 1000. In Fig. 1 the conductors are shown schematically as connected directly to the stimulators, but it will be understood that these stimulators are preferably operated by electromagnets which are connected between the respective terminals of the filter and the common conductor 20.

The receiving element, as will be more clearly understood by reference to Fig. 2, comprises a casing 15 provided with a shelf portion 16 adapted to support the wrist of the user in such a way that the thumb and

fingers may engage their respective stimulators with a minimum of exertion. Extending through perforations in one side of the receiver are four pins or stimulators 17 which are adapted to be engaged by the fingers of the user, while a similar stimulator extends from the opposite side of the receiver and is so positioned as to be easily engaged by the thumb of the user. These stimulators are mounted on reed members 18, each of which is mounted in operative relation to an electromagnet 19. The vibrating reeds are designed to have natural frequencies outside the frequency range to which the tactile nerves respond readily. Since is has been determined that it is very difficult to tactually detect a continuous frequency in excess of 1500 cycles, the natural frequency of the reed members and of other elements of the receiver is preferably in excess of 1800 cycles.

While this system is described as being especially adapted for the interpretation of speech, it obviously can also be used for the interpretation of other electrical vibrations of suitable frequencies. For example such a system may be used for the tactual interpretation of vibrations produced by telegraph or signaling currents or for interpreting vibrations produced electrically from phonograph records.

What is claimed is:

1. A tactual receiver comprising a mounting, a vibratile member having a portion extending from one side of the mounting to engage the thumb of the observer, and a plurality of vibratile members extending from the opposite side of the mounting and adapted to engage the fingers of the user, said vibratile members being respectively responsive to different frequencies.

2. A tactual receiver comprising a vibratile member for stimulating the tactile nerves of the user, said member having a natural frequency outside the frequency range which may be readily detected tactually.

3. A tactual receiver comprising a vibratile member for stimulating the tactile nerves of the user, said member having a natural frequency greater than 1800 cycles per second.

4. A tactual receiver comprising a shelf portion arranged to permit the hand of the user to rest thereon and a mounting associated therewith and having a vibratile member extending from one side thereof and a plurality of vibratile members extending from the opposite side thereof in such a position as to respectively engage the thumb and fingers of the user when the hand is resting on said shelf, said vibratile members being respectively responsive to different frequencies.

5. A system for the tactual interpretation of vibrations comprising a multiple band filter and a plurality of vibratile members responsive to the respective bands, each of said vibratile members having a portion extending therefrom adapted to stimulate the tactile nerves of the user.

6. A system for the tactual interpretation of speech comprising means for breaking up the speech frequency spectrum into a plurality of distinct bands bearing an octave relation to each other, and a plurality of vibratile members responsive to the respective bands and having portions extending therefrom adapted to stimulate the tactile nerves of the thumb and fingers of the user.

In witness whereof, I hereunto subscribe my name this 13th day of January, 1928.

WARREN C. JONES.