

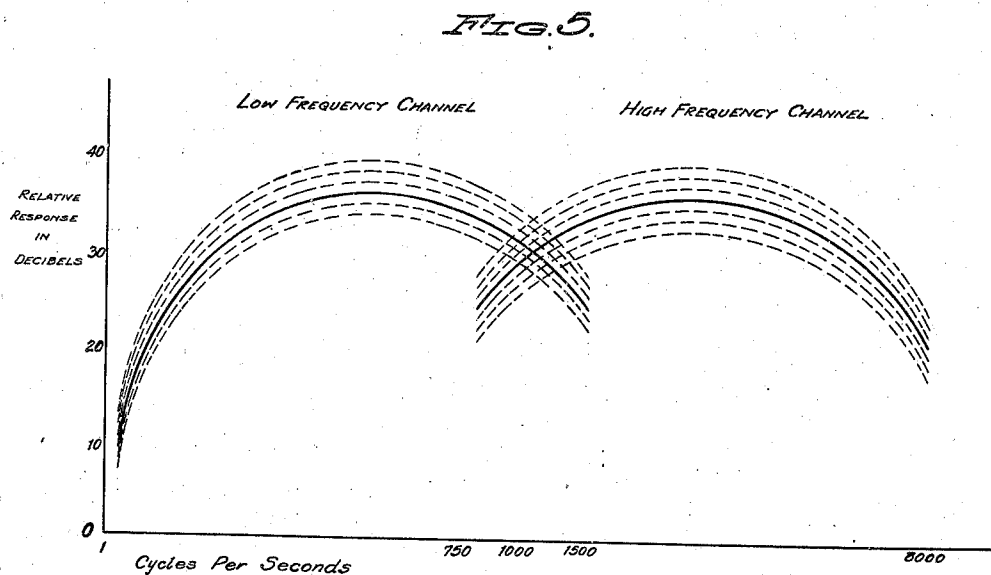
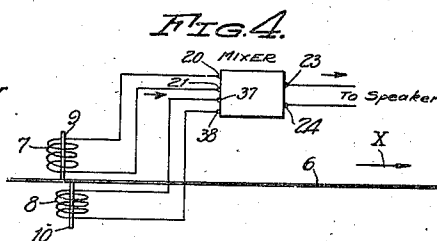
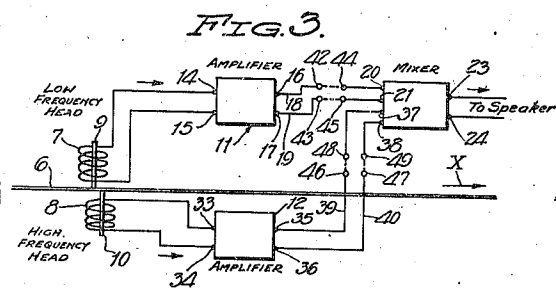
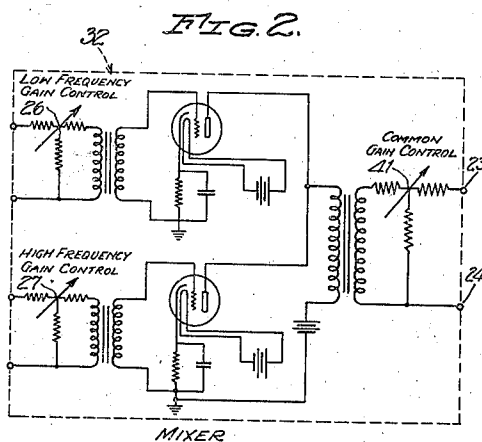
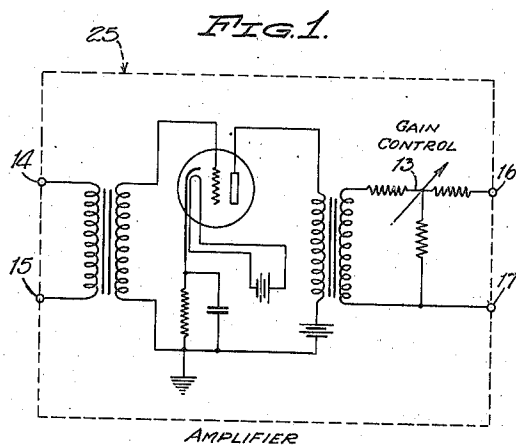
Aug. 5, 1941.

J. STAR

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TELEGRAPHONE AND LIKE APPARATUS

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JOSEPH STAR.
INVENTOR.

BY

Herbert Smith
ATTORNEY.

UNITED STATES PATENT OFFICE

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TELEGRAPHONE AND LIKE APPARATUS

Joseph Star, New York, N. Y., assignor to Radio Development and Research Corporation, New York, N. Y., a corporation

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2 Claims. (Cl. 179—100.2)

This invention pertains to telegraphone reproducing systems and more particularly to a two-way telegraphone reproducing system.

Heretofore, telegraphone reproducing systems which utilized a magnetizable recording tape frequently employed two similar pick-up heads connected in series or in parallel. Both heads were of substantially identical construction so that the frequency response of one head was substantially identical with that of the other head. If the output of the pick-up device were connected to an amplifier having a gain control, permitting variation in signal strength, the only result would be to change the total output volume without any appreciable variation of the relative intensities of the high and low portions in the frequency spectrum.

The present invention contemplates utilizing a multi-channel reproducing system to effect reproduction of separate bands of high frequency and low frequency magnetic impulses as recorded on a magnetizable tape. This is accomplished by employing two or more reproducing coils or pick-up heads, each responsive to a separate band of frequencies, and each head having a predetermined responsive characteristic. The outputs of the separate head are connected to separate amplifiers, with the output of the amplifiers connected to a mixer. The arrangement also contemplates the output of the separate pick-up heads going to a mixer. It is understood that the output of the mixer in each case will ultimately lead to a reproducing device, such as a loud speaker.

It is therefore an object of this invention to provide a telegraphone reproducing system employing a plurality of pick-up heads, one pick-up head having a predetermined response characteristic different from another pick-up head, in order to obtain substantially uniform response to a wide range of frequencies.

A further object of the invention is to provide a telegraphone reproducing system having a wide range of substantially uniform frequency by means of a plurality of pick-up heads, each pick-up head being connected either directly, or indirectly to a mixer which permits adjustment of the relative amount of output derived from each of the several pick-up heads.

A further object is the provision of a reproducing system of the class described having a more convenient method of equalization, obviating the necessity for using coils and condensers, or extensive equalizers as is conventional in the single channel systems.

A further object is to provide a telegraphone reproducing system employing two pick-up heads, one head being responsive to the upper portion of the total frequency range, and the other head being responsive to the lower portion of the total frequency range the output of each head going to a separate amplifier, the output of each amplifier being connected to a common mixer, and each of the amplifiers having an independent gain control to permit adjustment of the signal intensity from its respective pick-up head.

Further and other objects will become apparent to those skilled in the art from a pursuit of the following specification:

Fig. 1 is a schematic wiring diagram of a conventional amplifier with a gain control.

Fig. 2 is a schematic wiring diagram of a conventional multi-channel mixer with gain controls.

Fig. 3 shows a plurality of pick-up heads connected through individual amplifiers to a mixer.

Fig. 4 shows two pick-up heads connected directly to a mixer.

Fig. 5 shows a graphical representation of the intended frequency response characteristic of the reproducing system.

Referring to the drawing, and particularly Fig. 3 the magnetizable tape 6, may be any suitable magnetic material. Pick-up heads 7, and 8, have pole pieces 9, and 10, respectively, which pole pieces engage the tape 6, for the purpose of reproducing the signals magnetically impressed thereon. The pole pieces of the pick-up heads are staggered in the present showing, but they may be directly opposite each other depending upon magnetization used for recording. In the manner shown the pole pieces will each supply a convenient magnetic path for the changing flux resulting from the passage of the magnetized tape, and cause this flux to pass through the center of its associated coil. This changing flux generates a voltage in the coil. The pick-up heads 7 and 8 have different frequency response characteristics brought about by suitable design. The factors affecting these characteristics are coil inductance and resistance, core material and dimensions, etc. By suitable design the head is made responsive to the desired channel, or band of frequencies. The low frequency head, for example, is shown as having been designed for response to a range of frequencies from say 20 to perhaps 1500 cycles per second, while the design of the high frequency head has a range of response from, say 750 to perhaps 8000 cycles.

Fig. 5 shows a set of rectangular coordinates the

vertical axis representing output in decibels, and the horizontal axis representing a substantially logarithmic scale of frequencies. Frequency response characteristics are shown plotted with respect to these axes. The range of relative output energy has been arbitrarily selected from zero to 40 decibels, and the range of frequencies has been indicated as extending from 1 to 8000 cycles per second. These are ranges commonly encountered in commercial equipment.

The two solid curves represent the frequency response characteristics of the low and high frequency channels, adjusted by the volume controls to give substantially uniform response over the entire range. The dotted curves indicate the effect of changing the volume controls. If, for example, the individual volume control 27 associated with the high frequency channel were adjusted to increase the channel output, the right hand characteristic curve would be shifted to one of the upper dotted positions, the amount of each shift being determined by the magnitude of the change in volume adjustment. Adjustment of the common volume control 39 will shift both characteristics simultaneously without altering their relative positions with respect to each other. The shape overall response characteristic will therefore depend upon the adjustments of the individual channel controls, 26 and 27 with respect to each other. Predominance may be given, if desired, to either channel by independently increasing its respective volume, or gain although ordinarily the most faithful reproduction will be obtained when the characteristics occupy the relative positions indicated by the solid curves in Fig. 5.

The output of the head 7 is connected to the input terminals 14 and 15 of the amplifier 11. The output terminals 16 and 17 are connected by wires 18 and 19 respectively to the input terminals 20 and 21 of the mixer 22. The output of the mixer has terminals 23 and 24 which connect to a loud speaker or other load. Since the amplifiers 11 and 12 are substantially the same as a conventional amplifier 25, then the gain control 13 could vary the signal intensity of the output of the individual heads before the signals were communicated to the input of the mixer. The pick-up head 8 is connected to the input terminals 33 and 34 of the amplifier 12. The output terminals 35 and 36 of the amplifier 12, are connected by conductors 39 and 40, respectively to the terminals 36 and 38 respective of the mixer.

It is to be understood that the expression "mixer" includes any suitable device for combining two or more signals, for the purpose of bringing the signals to a common output.

The gain controls 26 and 27 of the mixer 32, Fig. 2, would be particularly adapted for use when the pick-up heads 7 and 8 were connected directly to the input terminals 20, 21, 37, 38 of the mixer shown in Fig. 4.

The present system may also be used where it is desirable to use a separate speaker or load connected to each pick-up head, and have the speakers conveniently placed to mix the audible sounds. For example, the connection shown dotted, may be broken between the terminals 42 and 44, 43 and 45, 46 and 48, and 47 and 49. One speaker may then be connected across ter-

minals 42 and 43, while a second speaker may be connected across terminals 46 and 47. The result of the two speakers having their audible signals mixed would permit the use of the high and low frequency heads used in conjunction a single magnetizable recording tape. The mixer is used where single sound reproducer, or speaker is used.

From the foregoing it will be seen that by using two pick-up heads having different frequency response characteristics, the reproducing system will effectually accentuate either the high or low frequency channel, as desired, will combine them so that the acoustic output of the speaker or speakers will produce the desired tonal effect.

It is further pointed out, by comparing Figs. 3 and 4, that the essence of the invention resides in utilizing a plurality of pick-up heads each having a separate predetermined response characteristic. The primary advantage of the invention results from overcoming the great practical difficulty of designing and constructing a single pick-up head to respond uniformly to wide range of frequencies. Those design factors which improve response to high frequencies are detrimental to sensitivity in the low frequency range, and vice versa. By splitting the desired range of frequencies into two or more bands, and providing a specially designed pick-up head for each band, the problem of design and commercial manufacture is greatly simplified.

While specific details of the invention have been herein shown and described, the invention is not confined thereto, as changes and alterations may be and may become apparent to those skilled in the art without departing from the spirit thereof as defined by the appended claims.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent of the United States, is:

1. A telegraphone reproducing system of the class described having two pick-up heads one being disposed on either side of a movable magnetizable material, a magnetic core securely affixed within each of the pick-up heads, said core adapted to protrude from the coil of each of said heads to engage the magnetizable material, one of said pick-up heads having a predetermined response characteristic adapted to be responsive to a given band of frequencies, the other of said pick-up heads having a response characteristic adapted to be responsive to a band of frequencies different from said first pick-up head, the output of each of said pick-up heads going into the input of the mixing device, and a sound reproducing device connected to the output of the mixing device.

2. A telegraphone reproducing system employing two pick-up heads each of said pick-up heads comprising a coil and a core securely affixed therein, one of said pick-up heads being responsive to the upper portion of the total frequency range and the other head being responsive to the lower portion of the total frequency range of the magnetic frequencies impressed upon the movable magnetizable material, the output of said input heads connected to the input of the mixing device, and a reproducing device connected to the output of the mixing device.

JOSEPH STAR.