

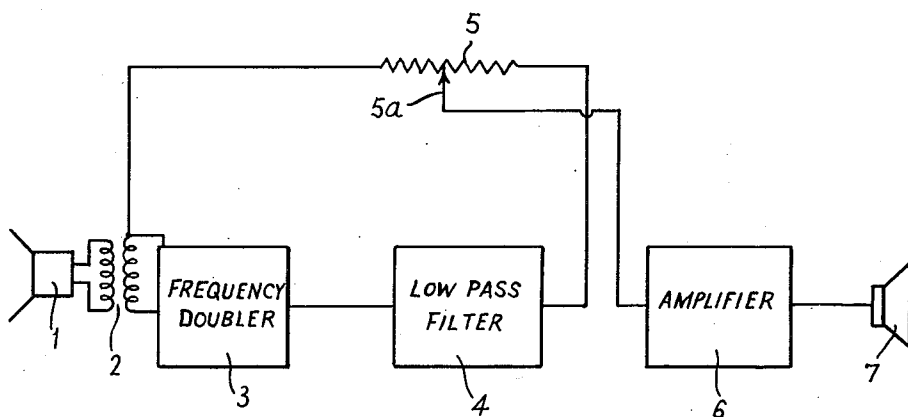
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APPARATUS FOR USE IN STETHOSCOPY

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1

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APPARATUS FOR USE IN STETHOSCOPY

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The present invention relates to apparatus particularly for use in stethoscopy. In this art the sounds to which it is desired to listen are picked up by a microphone which is substantially insensitive to airborne sounds but very sensitive to contact borne sounds, particularly in the low frequency audio range. The sounds picked up by the microphone are amplified and fed to one or more reproducers such as headphones, or a loudspeaker.

With such an apparatus, when listening to certain weak sounds, such as to the heart beats of an unborn baby, the output is a low frequency deep note which besides being tedious to the ear may give rise to undesirable feedback in the amplifier chain in view of the high amplification required particularly when a loudspeaker is employed.

According to the present invention, the output signals from the microphone are converted to a harmonic of their fundamental frequency. Preferably the harmonic signals are passed through a low pass filter to cut out the higher frequency components and the whole acts as a feedback trap. A frequency doubler circuit may be used to produce the harmonic. With this arrangement a sound is produced at the output which is more acceptable to a listener and undesired feedback is eliminated.

According to a feature of the invention means may be provided for selectively obtaining either an output consisting substantially entirely of the fundamental frequency from the microphone or an output consisting substantially entirely of the harmonic frequency. Such means may constitute a simple changeover switch associated with the fundamental and harmonic signals, or a variable control may be provided which besides enabling an output to be obtained which is either substantially totally the fundamental frequency or substantially totally the harmonic frequency, a mixture of these two frequencies can be obtained.

An embodiment of the invention will now be described with reference to the accompanying drawing which is a simplified block circuit diagram of a stethoscopy apparatus.

Referring to the drawing, 1 is a microphone, constructed for example as disclosed in British specification No. 798,825, whose output is fed through a transformer 2 to a frequency doubler circuit 3 which doubles the output frequency from the microphone. The frequency doubler circuit may employ crystal diodes and may be a full-wave or a bridge circuit. The output from the frequency doubler is fed to a low pass filter 4 which has a cut off frequency of the order of 200 cycles. Connected across the frequency doubler and low pass filter is a potentiometer 5 the slider 5a of which is connected to the input of an amplifier 6 feeding a loudspeaker 7. When the slider of the potentiometer is at the right-hand end of the track, as viewed in the drawing, the output fed to the amplifier 6 will be substantially entirely the harmonic frequency from the low-pass filter 4. When the slider 5a of the potentiometer is at the left-hand end of the track, as viewed in the drawing, the output fed to the amplifier 6 will be substantially the fundamental frequency from the

2

microphone 1. At intermediate positions of the potentiometer slider it will be apparent that the output will consist of a proportion of both the fundamental and harmonic outputs varying according to the position of the slider.

I claim:

1. An electronic stethoscope comprising a microphone for converting sounds into audio frequency oscillations, a frequency multiplier connected to the output of the microphone for producing harmonics of the original audio frequency oscillations, which harmonics are still in the audio frequency range, a low pass filter connected to the output of the frequency multiplier and passing all of the output frequencies of said frequency multiplier within the passband of said low pass filter, an amplifier, variable control means connected between the output from the microphone and the output from the low pass filter, said variable control means having an adjustable output connected to the input of said amplifier for applying to said amplifier an adjustable mixture of the output from the microphone and the output from the low pass filter and a transducer connected to the output of said amplifier for converting the output signals from said amplifier to audible sounds.

2. An electronic stethoscope comprising a microphone for converting sounds into audio frequency oscillations, a frequency doubler circuit connected to the output of the microphone for producing harmonics of the original audio frequency oscillations which harmonics are still in the audio frequency range, a low pass filter connected to the output of said frequency doubler circuit and passing all of the output frequencies of said frequency doubler circuit within the passband of said low pass filter, an amplifier, variable control means connected between the output from the microphone and the output from the low pass filter, said variable control means having an adjustable output connected to the input of said amplifier for applying to said amplifier an adjustable mixture of the output from the microphone and the output from the low pass filter, and a transducer connected to the output of said amplifier for converting the output signals from said amplifier to audible sounds.

3. Apparatus as claimed in claim 2, in which the variable control means comprises a resistive potentiometer device having an adjustable tap, means connecting one end of the potentiometer device to the output from the microphone, means connecting the other end of the potentiometer device to the output from the low pass filter and means connecting the adjustable tap to the input of said amplifier.

4. An electronic stethoscope comprising a microphone for converting sounds into audio frequency oscillations, a frequency multiplier connected to the output of the microphone for producing harmonics of the audio frequency oscillations, which harmonics are still in the audio frequency range, a low pass filter connected to the output of the frequency multiplier and passing all of the output frequencies of said frequency multiplier within the passband of said low pass filter, an amplifier, control means connected between the output from the microphone and the output from the low pass filter, said control means having an adjustable output connection connected to the input of said amplifier for applying to said amplifier either substantially only the output from said microphone or substantially only the output from said low pass filter, and a transducer connected to the output of said amplifier for converting the output signals from said amplifier to audible sounds.

5. Apparatus as claimed in claim 4, in which the fre-

quency multiplier comprises a frequency doubler circuit.

6. Apparatus as claimed in claim 4, in which the control means comprises a resistive potentiometer device having an adjustable tap, means connecting one end of the potentiometer device to the output from the microphone, means connecting the other end of the potentiometer to the output from the low pass filter and means connecting the adjustable tap to the input of said amplifier.

5

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