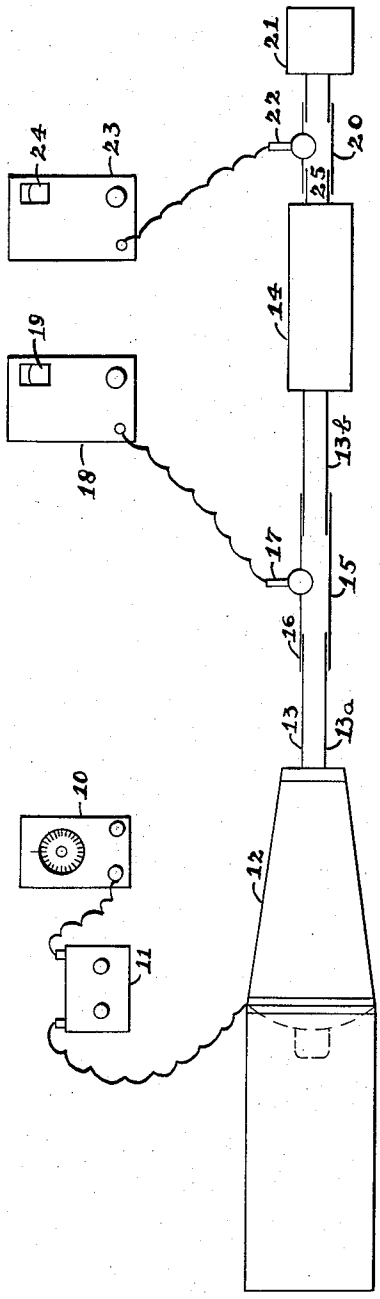
July 22, 1958 D. Y. MILNE 2,844,210

MEANS FOR DETERMINING THE EFFECTIVENESS OF SOUND REDUCING MEANS

Filed Feb. 17, 1955



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United States Patent Office 2,844,210 Patented July 22, 1958

2,844,210

MEANS FOR DETERMINING THE EFFECTIVENESS OF SOUND REDUCING MEANS

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Application February 17, 1955, Serial No. 488,880

4 Claims. (Cl. 181—.5)

This invention relates to a method and apparatus for defining the sound energy decibel output of a given engine, e. g., internal combusion, diesel, etc., and at any frequency (cycles per second).

The primary object of the invention is to provide a method and means for defining the sound energy decibel output at any frequency before and after the sound has passed through a sound reducing means, e. g., an automobile exhaust muffler. It is possible by reason of this invention to make a comparison of the sound *a* as it leaves any engine at any frequency as against the sound *b* as it leaves the muffler. To determine the extent of the sound removed by the muffler, one has only to ascertain the value of *a—b*. As a result of this invention, engineers will now be able to design mufflers and other sound-absorbing or reducing equipment properly and with a certainty not heretofore possible.

The accompanying drawing is a diagrammatic illustration of the invention, it being understood that, as far as the specific equipment employed is concerned, this is conventional and available commercially in numerous types on the open market, and may be obtained from many sources.

The numeral **10** indicates a suitable audio oscillator, the frequency of which can be varied, e. g., from about 20 cycles per second to 20,000 cycles per second, to create different sound outputs analogous to the frequency of the noises created respectively by various engines with which mufflers are to be associated. This is preferable to obtaining the sound effect by providing the specific engine in each case with microphone equipment.

Associated with the oscillator **10** is a standard type amplifier **11** and a loud speaker **12** mounted in a heavy wooden cabinet from which the noise is piped at **13** to a muffler **14**. Disposed in the pipe **14** on the inlet side of the muffler is an adjustably and detachably connected pipe section **15** which is slidably, telescopically mounted in and between the adjacent pipe sections **13***a* of the loudspeaker and **13***b* on the input side of the muffler, as shown at **16**.

Associated with the slidably mounted piping section **15** is an input microphone **17** to pick up the noise before it enters the muffler, this microphone being connected to a suitable sound level meter **18** which gives an input reading in decibels on the visible indicator **19**.

The sound passes through the muffler **14** on the outlet side of which is a pipe **20** terminating in a conventional anti-reflection unit **21** whereby the sound is removed and never returns to the system.

Disposed in the pipe **20** on the outlet side of the muffler is an output microphone **22** connected to a sound level meter **23** having means **24** for indicating in decibels the output amplitude of the sound after it has been subjected to the action of the muffler.

From the foregoing it will be observed that the sound created by the audio oscillator **10** or other source, such as the actual engine, is amplified to increase its loudness for

transmission by the loudspeaker in the pipe **13–15** where it is picked up by the input microphone **17** and the amplitude of the noise is recorded by the input sound level meter **18**. The sound travels through the muffler **14** which reduces the sound level in accordance with its capacity to absorb the noise at the frequency produced by the oscillator. The remaining sound passing through the pipe **20** on the output side of the muffler is picked up by the output microphone **22** and recorded on the output sound level meter **23**. The remaining sound passes through the anti-reflection unit **21** and out of the system.

The difference between the input and output readings **19** and **24**, respectively, gives a value in decibels of the muffling efficiency of the particular muffler **14** being tested at any frequency setting. A chart of these values over the frequency span desired, gives a curve representing the acoustical value of any muffler so tested and compared.

As explained above, the detachable, slidable pipe **15** carrying the input microphone **17**, is detachably connected to the muffler **14** through the sliding telescopic pipe connection therewith, as shown on the input side of the muffler at **16**. The muffler **14**, on its outlet side **25**, may have a similar telescopic, sliding, detachable connection with the pipe **20**, as on the input side, whereby the parts are all readily adjustable, detachable and replaceable and, particularly, various muffler constructions or other sound-reducing means may be placed under comparative test in this apparatus to determine the effectiveness of the sound-reducing means. The microphones, likewise, are readily detachable and replaceable, and the piping may be increased or reduced in length, as desired.

Thus, the muffler is detachably and slidably mounted in the system and the microphones may be detachably mounted in the pipes **15** and **20**, respectively. The detachable, adjustable and telescopic pipe arrangement on the input side of the muffler **14** may be duplicated and utilized on the output side of the muffler, if desired. Also, by reason of this construction, the extent or length of the pipes on either side of the muffler is made longitudinally adjustable.

Referring to the drawing, it will be observed that the pipes and the muffler and the loudspeaker and the anti-reflection unit are all arranged in a straight line, and that the sound level meters **18** and **23** are preferably disposed in close proximity to one another so that a comparative reading may be readily taken from one convenient point.

From the foregoing it will be appreciated that sounds and noises of varying frequencies may be utilized in testing mufflers, and other sound-reducing equipment. That is, the sound created by the oscillator **10** or an internal combustion engine or other source of noise will have a specific frequency, and this same frequency will be tested before the sound enters the muffler **14**, and after entering the muffler **14**. As explained, the frequencies may be changed at will, the invention not being limited to any specific frequency.

I claim:

1. An apparatus comprising an audio oscillator, an amplifier for said oscillator and a loudspeaker connected to said amplifier, a pipe of substantially uniform diameter throughout its length, a housing for said loudspeaker associated with one end of said pipe, a muffler having an input side connected to the other end of said pipe, a microphone arranged in said pipe, a sound level meter connected to said microphone, a second pipe of substantially the same diameter as the first-named pipe connected to the output side of the muffler, a microphone arranged in said second pipe, a sound level meter con-

nected to said last-mentioned microphone, and an anti-reflection sound unit disposed in the outlet of said second pipe by which the sound passes out of the system.

2. An apparatus according to claim 1 wherein said muffler is detachably connected to the first-named pipe.

3. An apparatus according to claim 2 wherein said muffler is adjustably connected to each of the pipes for longitudinal adjustment of the length of pipe on each side of the muffler.

4. Apparatus according to claim 1 wherein the sound level meters are in juxtaposed relation.

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