

Oct. 2, 1934.

W. A. MUELLER

1,975,283

SOUND RECORDING

Filed Dec. 31, 1932

2 Sheets-Sheet 1

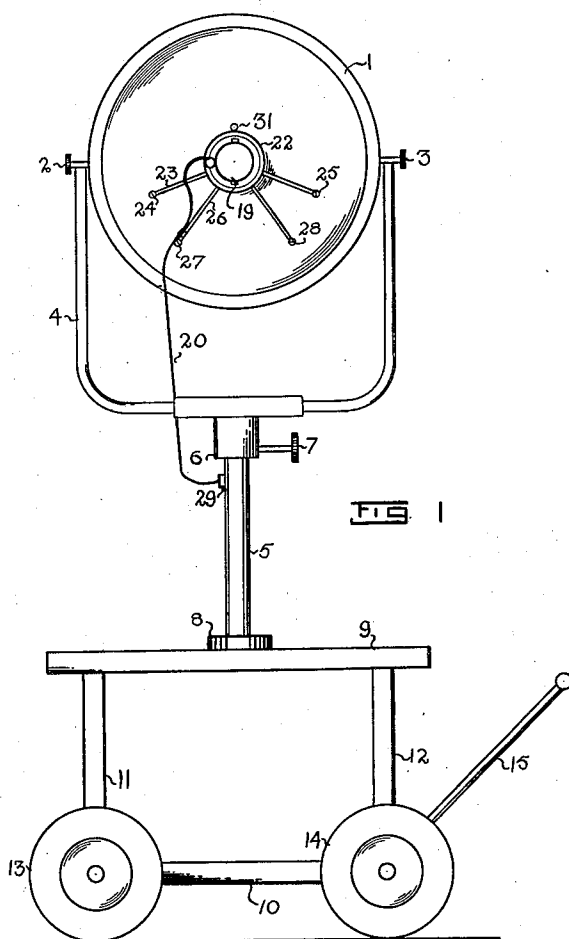


FIG 1

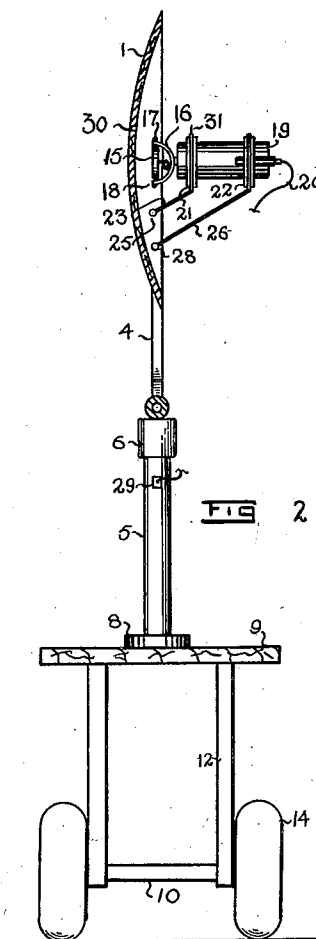


FIG 2

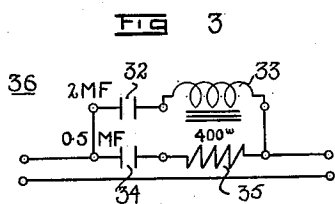


FIG 3

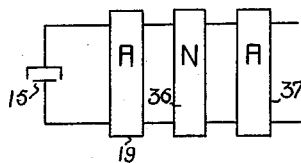


FIG 4

INVENTOR:
W.A. MUELLER.
BY *W. E. Beatty*
ATTORNEYS.

Oct. 2, 1934.

W. A. MUELLER

1,975,283

SOUND RECORDING

Filed Dec. 31, 1932

2 Sheets-Sheet 2

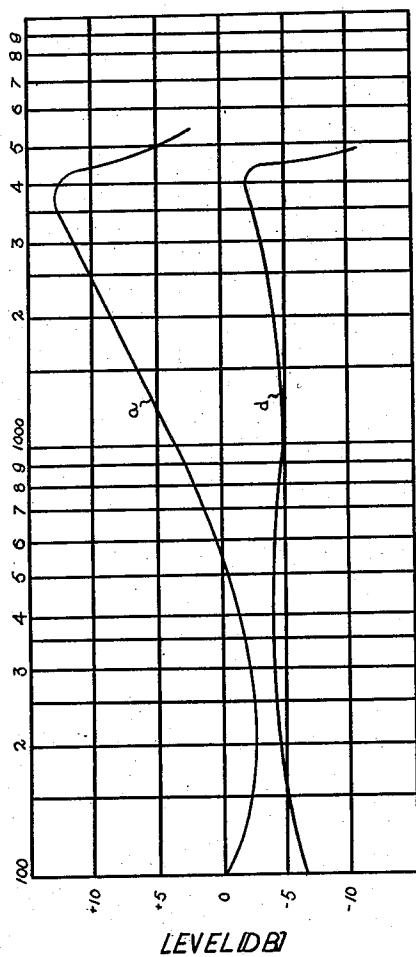


FIG 5

FREQUENCY C.P.S.

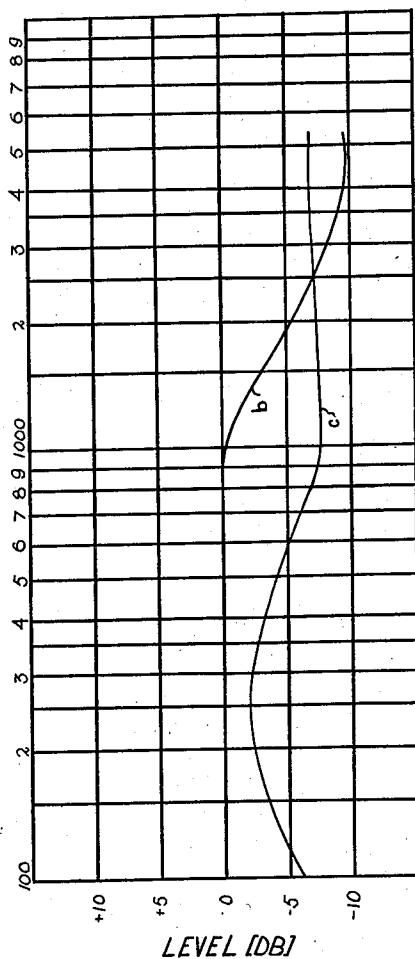


FIG 6

INVENTOR:
W.A. MUELLER.

BY *W. A. Beatty*
ATTORNEY.

UNITED STATES PATENT OFFICE

1,975,283

SOUND RECORDING

William A. Mueller, Hollywood, Calif., assignor
to United Research Corporation, Long Island
City, N. Y., a corporation of Delaware

Application December 31, 1932, Serial No. 649,677

4 Claims. (Cl. 179—1)

This invention relates to the art of recording sound and more particularly to a novel means for compensating for the distortion in the frequency range of sounds recorded while using a concentrator.

It has been a common practice to use a concentrator when recording sounds in conjunction with the taking of motion pictures in the open air, or where the rapidity of the action makes it impossible to follow the speakers with a microphone suspended from a boom. This concentrator usually takes the form of a parabolic reflector with a microphone placed at the focal point thereof. The instrument may be pointed in any desired direction and sound from that source alone will be reflected into the microphone while extraneous sonic vibrations will be excluded therefrom.

A great disadvantage is found in using this form of equipment in that the frequency range suffers an undesirable distortion. This distortion takes the form of an over emphasis of the higher frequencies.

The present invention overcomes this difficulty so that a more even tone quality is obtained throughout the entire frequency range.

The object of the invention is to improve the frequency characteristic of a microphone circuit employing a parabolic sound wave concentrator.

This is accomplished by positioning the microphone at one side of the true focal point of the concentrator, whereby the high end of the frequency range is drooped. The higher frequencies of the resultant characteristic are still over-emphasized and so electrical means are introduced into the output circuit of the microphone to further droop the high end of the frequency range and at the same time to slightly raise the low end, whereby a practically uniform characteristic is obtained throughout the entire frequency range.

For further details of the invention reference may be made to the drawings, wherein:

Figure 1 is a front elevation of a parabolic sound concentrator as used in this invention.

Figure 2 is a side elevation partly in cross section of Figure 1.

Figure 3 is a diagrammatic view of a preferred attenuation equalizer.

Figure 4 is a diagrammatic view of the circuit arrangement used in this invention.

Figure 5 is a set of curves showing the frequency characteristic without compensation and with compensation.

Figure 6 is a set of curves showing the characteristics of the two methods of compensation.

In order to record sounds easily in the open

air, it has been found desirable, by experiment, to construct a light weight, mobile sound concentrator. Referring to Figures 1 and 2, the concentrator bowl 1 is in the form of a parabola and is made of a suitable light material, such as wood. It is held in place by means of a pair of set screws 2 and 3 located at the opposite extremities of its diameter and supported by a U shaped framework 4.

The set screws 2 and 3 mate with brackets (not shown) on the parabola 1 so that the bowl may be tilted at any desired angle. The center of the bottom of framework 4 is rotatably attached to the top of column 5. A roller bearing (not shown) is provided in a housing 6 so that the concentrator bowl 1 may be rotated about the vertical axis of the column 5. The bowl 1 is locked in any position by means of a set screw 7 in the housing 6 and inter-acting with the roller bearing, as is well understood.

Column 5 rests in a collar 8 that is mounted on a base platform 9. Platform 9 is elevated from a truck 10 by means of suitable uprights such as 11 and 12. Truck 10 has dirigible wheels such as 13 and 14, and may be drawn or guided by means of handle 15.

The microphone assembly consists of a condenser microphone 15 fastened to a semi-circular ring 16 by means of a pair of set screws 17 and 18 at the opposite ends of the diameter thereof. The ring 16 is fastened to the inner end of a small circular amplifier 19 and suitable electrical connections 20 are provided therefor, as is well understood.

A pair of supporting rings 21 and 22, in spaced relation, surround the amplifier 19. Depending from the ring 21 is a V shaped supporting bracket 23, which is fastened to the face of the bowl 1 by means of a pair of screws 24 and 25. A second V shaped bracket 26 depends from the ring 22 and is fastened to the face of the bowl 1 by means of the screws 27 and 28. The electric cable 20 passes to a plug 29 conveniently mounted on the column 5 and any suitable source of potential may be applied thereto in order to energize microphone 15. The plug 29 may also serve as a convenient point from which to lead off sound currents from the microphone 15 to the recording circuit.

The bowl 1 is accurately pointed in the desired direction by means of a rifle sight comprising a small aperture 30 in the face thereof which acts as a back-sight. A small apertured ring 31 mounted on the supporting ring 21 is in direct alignment with the aperture 30 and acts as a front-

sight. Thus, the operator looks through the aperture 30 and by means of the ring 21, aims his sound concentrator at the object from which the desired sound is to emanate.

5 Referring now to Figure 5, the curve A shows the frequency characteristic of the concentrator bowl 1 with the condenser microphone 15 set at the true focal point thereof. From this curve it will be seen that the high end of the frequency
10 range is vastly accentuated with the recording microphone in this position.

In order to overcome this difficulty, the recording microphone 15 is moved 3 inches inside of the true focal point towards the concentrator bowl 1 and the frequency characteristic thereof will be affected as shown by curve B, Figure 6. The focal distance in this case is 13 inches, and the distance of the microphone 15 from the concentrator bowl 1 is therefore 10 inches. In this position, the
15 high end of the frequency range has been dropped, all frequencies below 1000 cycles being unchanged.

An equalizing circuit as shown in Figure 3 is introduced in the output circuit of the amplifier 19 in order to still further attenuate the higher frequencies and flatten out the characteristic. The characteristic of this attenuation equalizer as used in the output circuit of the microphone amplifier 19, is shown by curve C in Figure 6. It will be seen that this expedient accentuates the
20 low end of the frequency range. The resultant curve of the frequency characteristic of the concentrator bowl 1, with the microphone 15, 3 inches inside of the true focal point and the concentrator equalizer in the output circuit of the amplifier
25 19, is shown by the curve D in Figure 5. This curve shows a practically constant characteristic up to 4,500 cycles.

Referring to Figure 3, the attenuation equalizer 36 consists of a branch in one side of the output line from amplifier 19. One arm of the branch consists of a condenser 32 of 2 MF capacity in series with a suitable inductive resistance 33. The other branch, in parallel with the first branch, consists of a condenser 34 of a 0.5 MF capacity
30 in series with a resistance 35 of 400 ohms.

As shown in Figure 4, the equalizing network 36 is introduced in the circuit between the amplifier 19 and the head amplifier 37. The recording microphone 15 is shown connected to the
35 amplifier 19.

Thus it will be seen that a sound concentrator is provided, the frequency characteristic of which is improved by altering the position of the record-

ing microphone in relation to the focus of the concentrator, and by electrical compensation means whereby a substantially uniform characteristic throughout the entire frequency range is obtained.

Having thus described the invention what is claimed as new and desired to secure by Letters Patent is:

1. The method of improving the frequency characteristic of sound wave receiving apparatus employing a substantially parabolic sound wave concentrator adjacent a microphone which comprises positioning said microphone at one side of the true focal point of said concentrator and in electrically equalizing the sound wave currents thereby produced by said microphone so located.

2. The method of improving the frequency characteristic of a microphone circuit employing a substantially parabolic sound wave concentrator for said microphone which comprises positioning said microphone between said concentrator and the true focal point thereof, whereby the frequency characteristic droops at the higher end of the acoustic range and in electrically compensating the resultant characteristic, whereby a more nearly uniform frequency characteristic is obtained than would be the case if said microphone were located at the true focal point of said concentrator.

3. The combination of a microphone, a substantially parabolic bowl sound wave concentrator therefor, means for positioning said microphone between said bowl and the true focal point thereof, and means for substantially equalizing the attenuation of the current from said microphone so located within said bowl, said last mentioned means comprising a network having a pre-assigned attenuation characteristic determined by the position of said microphone with reference to the focal point of said bowl.

4. The combination of a microphone, a substantially parabolic bowl sound wave concentrator therefor, means for positioning said microphone at one side of the true focal point of said bowl, and means for substantially equalizing the attenuation of the current from said microphone so located with respect to said bowl, said last mentioned means comprising a network having a pre-assigned attenuation characteristic determined by the position of said microphone with reference to the focal point of said bowl.

WILLIAM A. MUELLER.