455/3

230

April 28, 1964

R. P. HERZFELD ETAL

3,131,351

OUTDOOR THEATER SOUND SYSTEM COMPRISING A PLURALITY OF TRANSMITTERS COUPLED TO A SINGLE DISTRIBUTION WIRE

Filed March 29, 1961

2 Sheets-Sheet 1

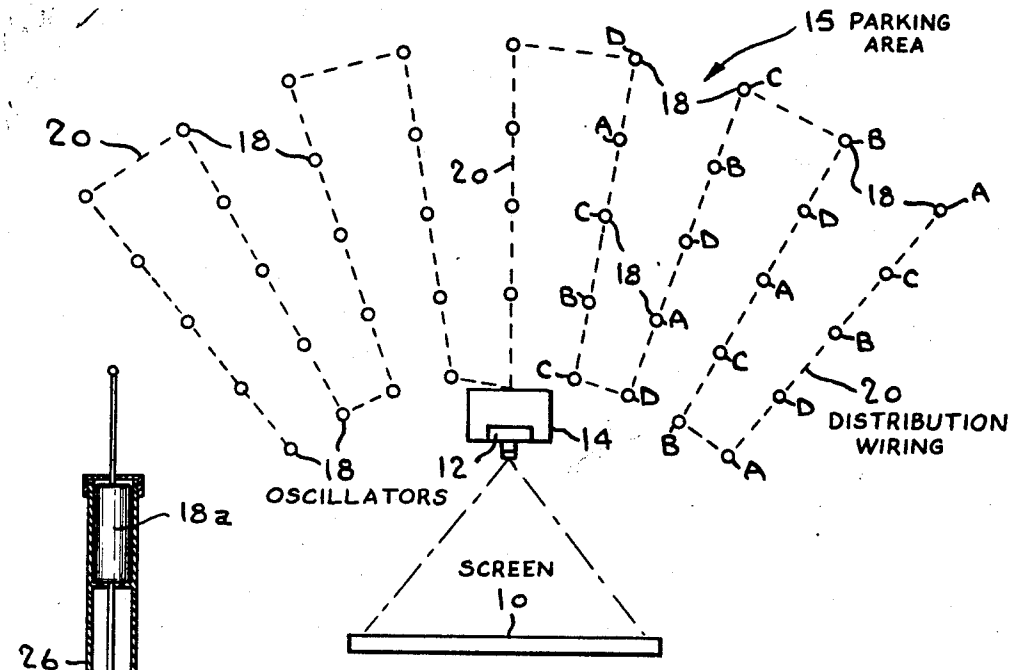


FIG. 1

FIG. 3a

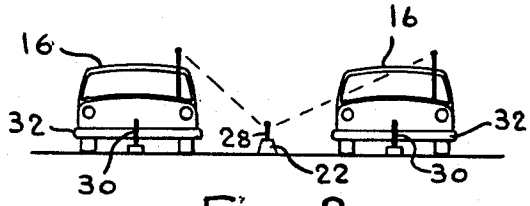


FIG. 2

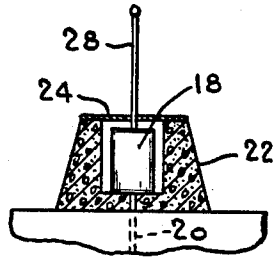


FIG. 3

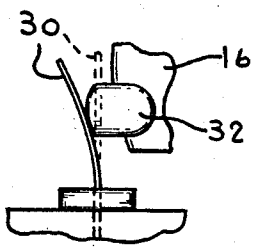


FIG. 4

INVENTOR.
RICHARD P. HERZFELD
GORDON L. DAVIDSON
BY John W. Michael
ATTORNEY

April 28, 1964 R. P. HERZFELD ETAL 3,131,351

OUTDOOR THEATER SOUND SYSTEM COMPRISING A PLURALITY OF TRANSMITTERS COUPLED TO A SINGLE DISTRIBUTION WIRE

Filed March 29, 1961 2 Sheets-Sheet 2

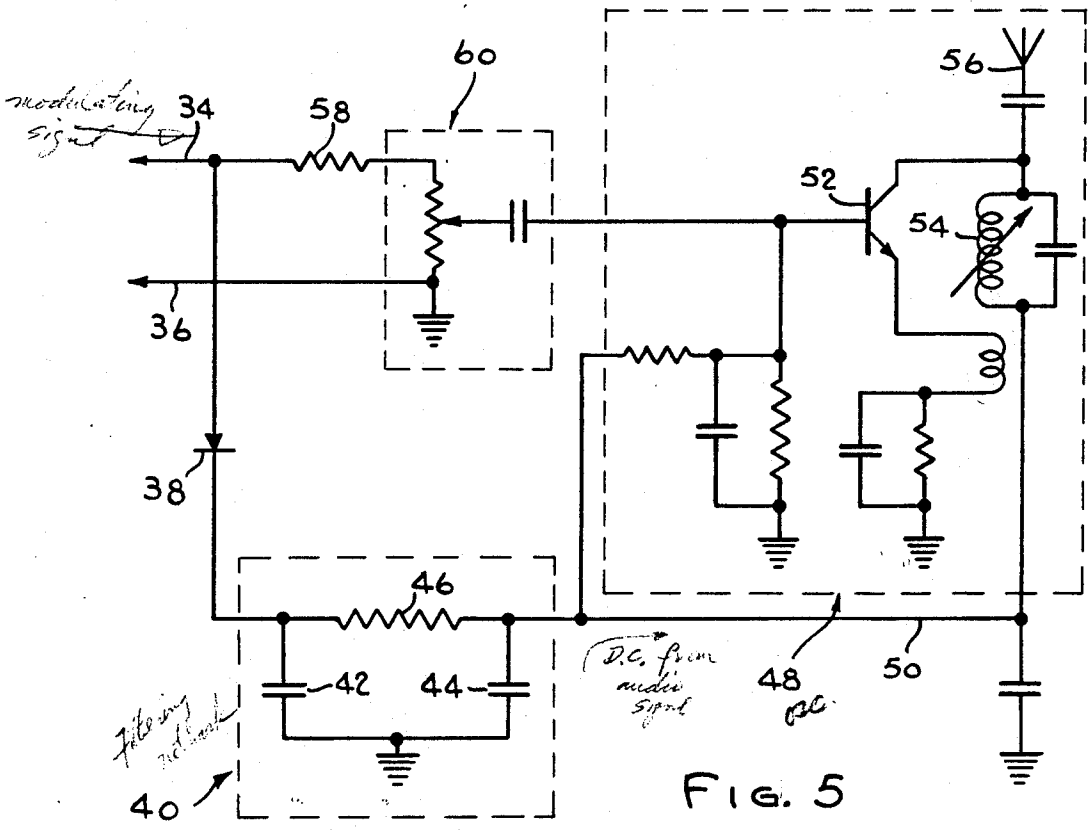


FIG. 5

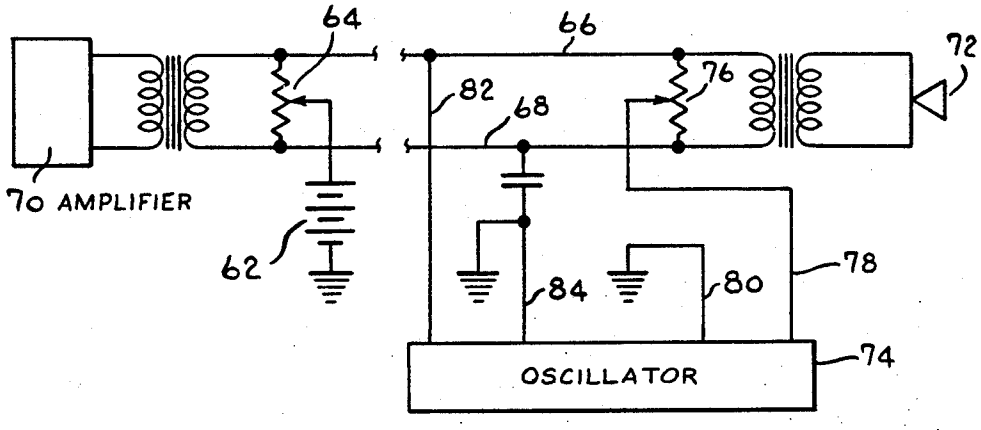


FIG. 6

INVENTORS
RICHARD P. HERZFELD
GORDON L. DAVIDSON
BY John W. Michael
ATTORNEY

United States Patent Office 3,131,351 Patented Apr. 28, 1964

3,131,351

OUTDOOR THEATER SOUND SYSTEM COMPRISING A PLURALITY OF TRANSMITTERS COUPLED TO A SINGLE DISTRIBUTION WIRE

Richard P. Herzfeld, 3541 N. Lake Drive, Milwaukee, Wis., and Gordon L. Davidson, Brookfield, Wis.; said Davidson assignor to said Herzfeld

Filed Mar. 29, 1961, Ser. No. 99,114
9 Claims. (Cl. 325—54)

This invention relates to apparatus for distributing sound to automobiles at outdoor theaters and more particularly to an improvement of the apparatus described and claimed in the copending application Serial No. 657,285, filed May 6, 1957 now Patent 2,979,607.

The usual sound system employed in outdoor theaters utilizes small speakers which are notable primarily for the poor quality of sound produced and their high maintenance and replacement cost.

In the copending application referred to above an improved sound system is disclosed wherein the audio portion of the moving picture is broadcasted as a radio signal in a frequency within the standard broadcast band for reception by the individual automobile radios of the theater patrons. Thus, the individual speakers and their attendant disadvantages are eliminated. A problem arises, however, in controlling the radiation of the radio signal so as not to extend it beyond the immediate vicinity of the outdoor theater. One solution of this problem is covered in the copending application Serial No. 793,368, filed February 16, 1959, now Pat. No. 3,023,308, wherein a radio signal is distributed to the stalls by means of a shielded non-radiating cable where a plurality of antennas connected to the shielded cable radiate the signal in the immediate vicinity of the antennas for reception by the radios in automobiles parked immediately adjacent the antennas. It is the object of this invention to provide a second alternative arrangement for controlling the radiation of the radio signal in an outdoor theater.

In the improved arrangement of this application the audio portion of the moving picture is transmitted as an audio signal to the individual parking stalls of the outdoor theater from the main projector. No special shielded non-radiating type cable is needed to transmit the audio signal and in existing outdoor theaters the wiring presently used to transmit the audio signal to the individual speakers at the stalls may be utilized in the apparatus of this invention.

At each stall or between adjacent stalls is mounted a small radio frequency oscillator (transmitter) and antenna which will broadcast a radio signal modulated by the audio signal from the projector. The radio signal will be radiated in a small area for reception only by cars parked in stalls immediately adjacent the oscillators. By use of a plurality of oscillators the area of radiation can be very accurately controlled so that the radio signal transmitted by such oscillators cannot be received outside the immediate vicinity of the outdoor theater.

Power for operating the multiple oscillators can be supplied to the stalls in any suitable manner. As an additional feature of this invention it has been found that by the use of proper audio amplification equipment an audio signal of sufficient magnitude can be produced which will serve to both modulate the oscillator output and to provide a source of power for the oscillators. This arrangement is particularly adaptable for use in an existing outdoor theater where audio amplification equipment of relatively high rating is usually available.

An alternative arrangement particularly suitable for new installations involves the use of a relatively small audio signal only large enough to modulate the oscillators and a "phantom" power circuit for operating the

oscillators which utilizes the same wires used to distribute the audio signal. This arrangement requires only a minimum investment in audio amplification equipment.

As a further optional refinement to the above arrangement, a means for grounding each automobile when parked in the respective stalls of the outdoor theater is provided to thus improve reception of the radio signal transmitted by the multiple oscillators.

Other objects and advantages will be pointed out in or be apparent from the specification and claims as will obvious modifications of the two embodiments shown in the drawings, in which:

FIG. 1 is a partially schematic layout of an outdoor theater with a sound distributing system embodying my invention;

FIG. 2 is a partially schematic view of a pair of adjacent parking stalls served by a single oscillator and antenna mounted between them;

FIGS. 3 and 3*a* show oscillator mounting arrangements for a new installation and an existing theater, respectively;

FIG. 4 is a fragmentary elevation view showing one arrangement for electrically grounding an automobile parked in the theater; and

FIGS. 5 and 6 are partially schematic wiring diagrams showing two alternative arrangements for providing power for operating the multiple oscillators.

Referring now to the drawings, FIG. 1 is a layout of a typical outdoor theater having a screen **10** on which the picture is projected from a movie projector **12** in a projection house **14** for viewing by the theater patrons in automobiles **16** parked in a parking area **15**. The audio signal from the sound projector **12** is fed to a plurality of radio frequency oscillators or transmitters **18** (FIGS. 3 and 3*a*) located between adjacent stalls as indicated in FIG. 2.

The audio signal from amplification equipment of sound projector **12** is carried to the radio frequency oscillators **18** by means of wire conductors **20** which extend from the projection house throughout the parking area **15** of the theater. The layout of wires **20** can take any suitable form and may be located either above or below ground. In an existing outdoor theater utilizing individual speakers at the stalls the existing wiring for transmitting the audio signal from the projector to such speakers may be utilized in this system to transmit the audio signal from the projector to the oscillators **18** mounted at the stalls. It will be noted in this regard that no special shielded non-radiating type cable need be employed to distribute the audio signal to the oscillators **18** located at the stalls as in the case of the arrangement shown in the copending application Serial No. 793,368 now Patent 3,023,308.

In a new installation, oscillators **18** can be mounted in any suitable arrangement such as that shown in FIG. 3 wherein oscillator **18** is mounted in a cavity formed in a concrete abutment **22** and having a protective cover **24**. To facilitate easy replacement of the oscillators for service and repair the oscillators can be made with a plug-in type connector for connection with the distribution wiring **20**.

In existing theaters utilizing individual speakers for sound distribution the speakers are usually mounted on a post located between a pair of adjacent stalls, each post having two speakers mounted on it. In such existing arrangements the oscillator **18***a* can be made an elongated shape so that it can be mounted inside the mounting posts **26** as shown in FIG. 3*a* for plug-in connection to the distribution wiring **20**.

The radio frequency oscillators **18** are provided with antennas **28** for transmitting the radio signal to the cars parked immediately adjacent the transmitters. Antennas

28 may be made from any suitable material such as chrome plated steel or copper, for example.

The transmitters 18 for broadcasting a radio signal modulated by the audio signal (distributed by wiring 20) for reception by the car radios in cars 16 may be of any suitable construction. To minimize cost, size and upkeep a transistorized oscillator is preferred. Experience has shown that an oscillator using a maximum of two transistors is suitable and in most installations a single transistor unit may be used. To prevent any possibility of the occurrence of an interfering "beat signal" between adjacent oscillators transmittting on the same frequency, the various units are set to transmit at different frequencies. As shown in the right hand portion of FIG. 1, for example, the transmitters can be set at four different frequencies designated by the letters A, B, C and D. The particular patterns used will vary with each particular installation but in all cases the pattern will be designed to provide the maximum distance between units transmitting on the same frequency.

With a multi-frequency arrangement as described above, a self-excited type of radio frequency oscillator using a variable inductance coil (for frequency adjustment) provides the desired operation at a relatively low unit cost. It should be understood, however, that crystal-type oscillators could also be used. Similarly, a variable condenser could be used in place of a variable inductance coil in the self-excited type unit.

The problem of energizing oscillators 18 can be handled in several ways depending on the circumstances. For example, in an existing theater the audio amplification equipment for supplying an audio signal to the individual speakers at the stalls is usually capable of producing an audio signal of sufficient magnitude to be used as a source of power for the oscillators in addition to serving to modulate the oscillator signal. A partially schematic wiring diagram of such a circuit is shown in FIG. 5. The audio signal is fed in to the circuit by leads 34, 36. Lead 34 is connected to a germanium rectifier 38 which in turn is connected to a filter network 40 (enclosed in dotted lines) comprising a pair of filter condensers 42, 44 and a filter resistor 46. Direct current from filter network 40 is carried to a self-excited oscillator 48 (enclosed in dotted lines) by a lead 50. This direct current power serves to energize oscillator 48 which requires only about 3 to 6 volts for its operation.

As shown in the drawing, the oscillator 48 includes a single transistor 52 and a variable induction coil 54 for varying the frequency of the radio signal transmitted from the antenna 56. The audio signal for modulating the radio signal is carried to oscillator 48 from leads 34, 36 through an isolating resistor 58 and a volume control network 60 (enclosed in dotted lines).

To insure uninterrupted operation of oscillator 48 during periods of silence during the movie (no audio signal produced), an auxiliary signal can be impressed on leads 34, 36 at the projector house to provide a constant source of power for the oscillator. This auxiliary signal would have a frequency somewhere above the audible frequency of about 20 kilocycles so that it could not be heard on the radios of the theater patrons.

An alternative arrangement for energizing the various oscillators is shown in FIG. 6. This arrangement would be used, for example, in an existing installation where the audio amplification equipment was of relatively low capacity or in a new installation where it was desired to use an audio amplifier of minimum rating. The FIG. 6 arrangement utilizes a so-called "phantom power circuit" wherein a D.C. power component from a power source such as battery 62 is impressed on the audio system by means of a phantom resistor 64 connected across the wires 66, 68 which carry the audio signal from an amplifier 70 at the projection house to a speaker 72 at a stall in the viewing area. The power component for operating the oscillator 74 is taken off at the stall by means of a second phantom resistor 76 connected to the oscillator by a lead 78. The power circuit is grounded as at 80. The audio signal for modulating the radio signal produced by oscillator 74 is fed into the oscillator by leads 82, 84 as shown. While both resistors 64 and 76 are shown as being adjustable to facilitate balancing the circuit it should be realized that fixed resistors could be employed. It is also noted that while a conventional loud speaker 72 is shown, such speaker could be completely eliminated. By providing both a loud speaker 72 and an oscillator 74 at each stall, a theater patron would have a choice of receiving the audio portion of the movie by either the loud speaker or by the car radio.

By the use of oscillators having predetermined design characteristics as outlined above, the area of radiation from the antennas can be confined very accurately to about ten or twelve feet from each antenna. The reception by radios in cars 16 parked within such areas will be clear and loud and when the car moves out of the area the signal will disappear. This arrangement, therefore, eliminates any problem of the radio signal being picked up by automobile radios outside the theater area or by radios in neighboring homes, for example.

To improve reception of the radio signal and therefore make it possible to use oscillators of minimum size and power, a means such as that shown in FIG. 4 may be provided to electrically ground the automobile when parked in a theater stall. It will be apparent that a number of arrangements can be utilized to ground the automobile and, by way of example, one such arrangement is shown in FIG. 4. Such arrangement utilizes a flexible metal rod 30 mounted at the end of each stall area in a position whereby the bumper 32 of the automobile 16 will make contact with the rod. Rod 30 is electrically grounded in any suitable manner and therefore will ground the automobile when parked in a stall as shown.

Although several embodiments of the present invention have been illustrated and described, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

We claim:

1. In a sound system for an outdoor theater having a parking and viewing area, audio means including a motion picture projector for producing an audio signal, conductor means for transmitting said audio signal connected to said audio means and extending to the parking and viewing area of the outdoor theater, and a plurality of radio frequency oscillators mounted in the viewing area and connected to said conductor means, said radio frequency oscillators adapted to produce a radio signal modulated by said audio signal and to radiate said radio signal only in the immediate vicinity of said oscillators for reception by radios in automobiles parked in the immediate vicinity of said oscillators.

2. An outdoor theater sound system according to claim 1 in which there is a single oscillator for each two adjacent parking stalls in the outdoor theater, said oscillators located between each pair of adjacent stalls.

3. An outdoor theater sound system according to claim 1 in which there is a means for grounding the radios of the automobiles parked in the outdoor theater when receiving the radio signal from said oscillators.

4. An outdoor theater sound system according to claim 1 in which said conductor means includes the existing wiring in the outdoor theater sound system formerly used to transmit an audio signal from the audio means to loud speakers mounted at the parking stalls.

5. An outdoor theater sound system according to claim 1 in which adjacent oscillators in the parking and viewing area are set to transmit on different radio frequencies.

6. In a sound system for an outdoor theater having a parking and viewing area, audio means including a motion picture projector for producing an audio signal,

conductor means for transmitting said audio signal connected to said audio means and extending to the parking and viewing area of the outdoor theater, a plurality of radio frequency oscillators mounted in said parking and viewing area and connected to said conductor means, said oscillators adapted to produce a radio signal modulated by the audio signal carried by said conductor means and to radiate said radio signal only in the immediate vicinity of said oscillators for reception by radios in automobiles parked in the immediate vicinity of said oscillators, and power means for energizing said oscillators.

7. In a sound system for an outdoor theater according to claim 6 in which said power means includes a source of low voltage direct current impressed on said conductor means at the projector house and taken off said conductor means at each oscillator.

8. In a sound system for an outdoor theater according to claim 7 in which said power means further includes

a resistor connected to said conductor means at the source of low voltage direct current and a resistor connected to said conductor means at each oscillator.

9. In a sound system for an outdoor theater according to claim 6 in which said electrical power means includes a rectifying and filtering means for each oscillator adapted to convert part of the audio signal delivered to each oscillator into a low voltage direct current component for energizing said oscillator.

References Cited in the file of this patent

UNITED STATES PATENTS

1,818,669	Beckmann	Aug. 11, 1931
2,111,398	Kippenberg	Mar. 15, 1938
2,522,930	Chakiris	Sept. 19, 1950
2,981,833	Bryan	Apr. 25, 1961
3,023,308	Herzfeld	Feb. 27, 1962