July 7, 1942. A. P. McCARRON 2,288,822

APPARATUS FOR VARYING THE POSITION OF A MICROPHONE

Filed Nov. 4, 1940 3 Sheets-Sheet 1

Fig. 1.

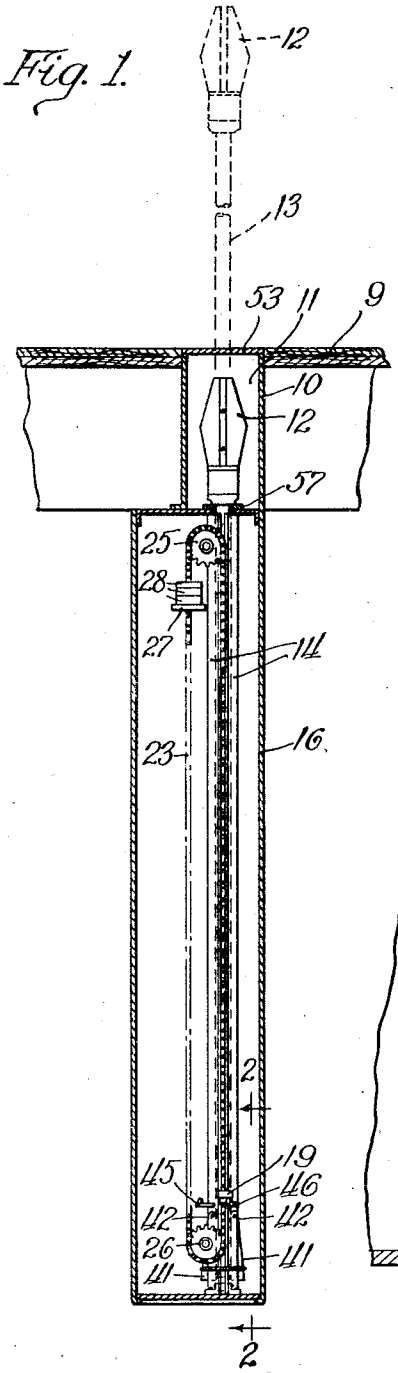
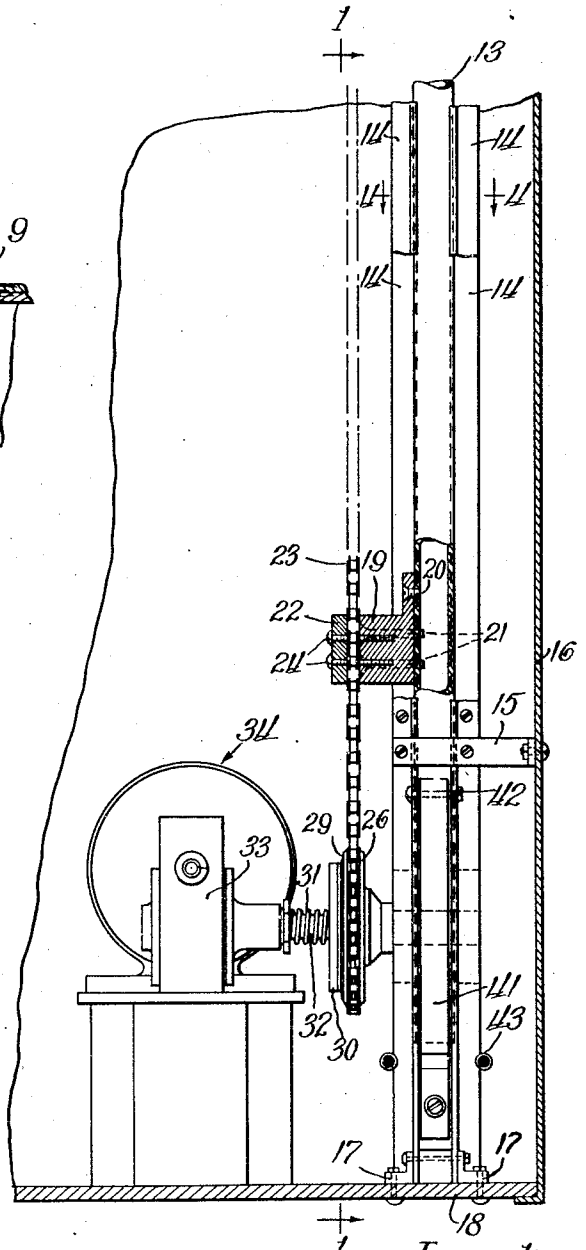


Fig. 2.



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Filed Nov. 4, 1940 3 Sheets-Sheet 2

Fig. 3.

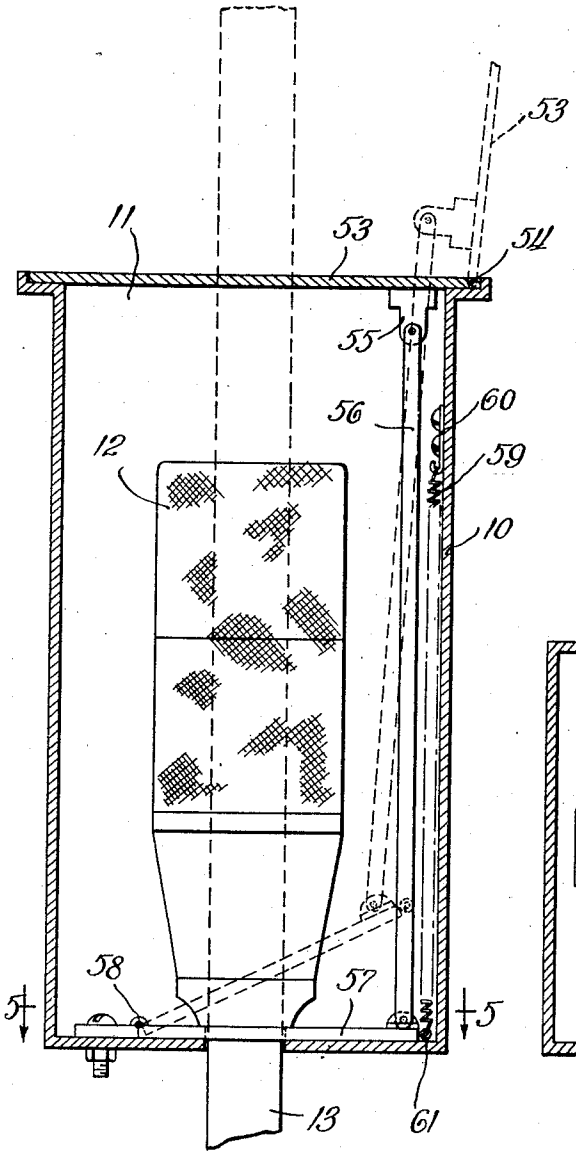


Fig. 4.

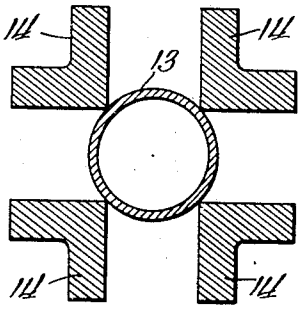
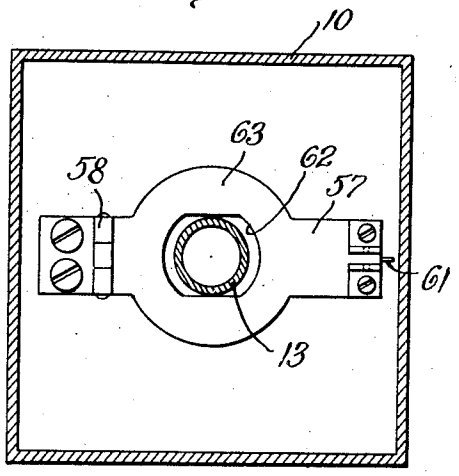


Fig. 5.



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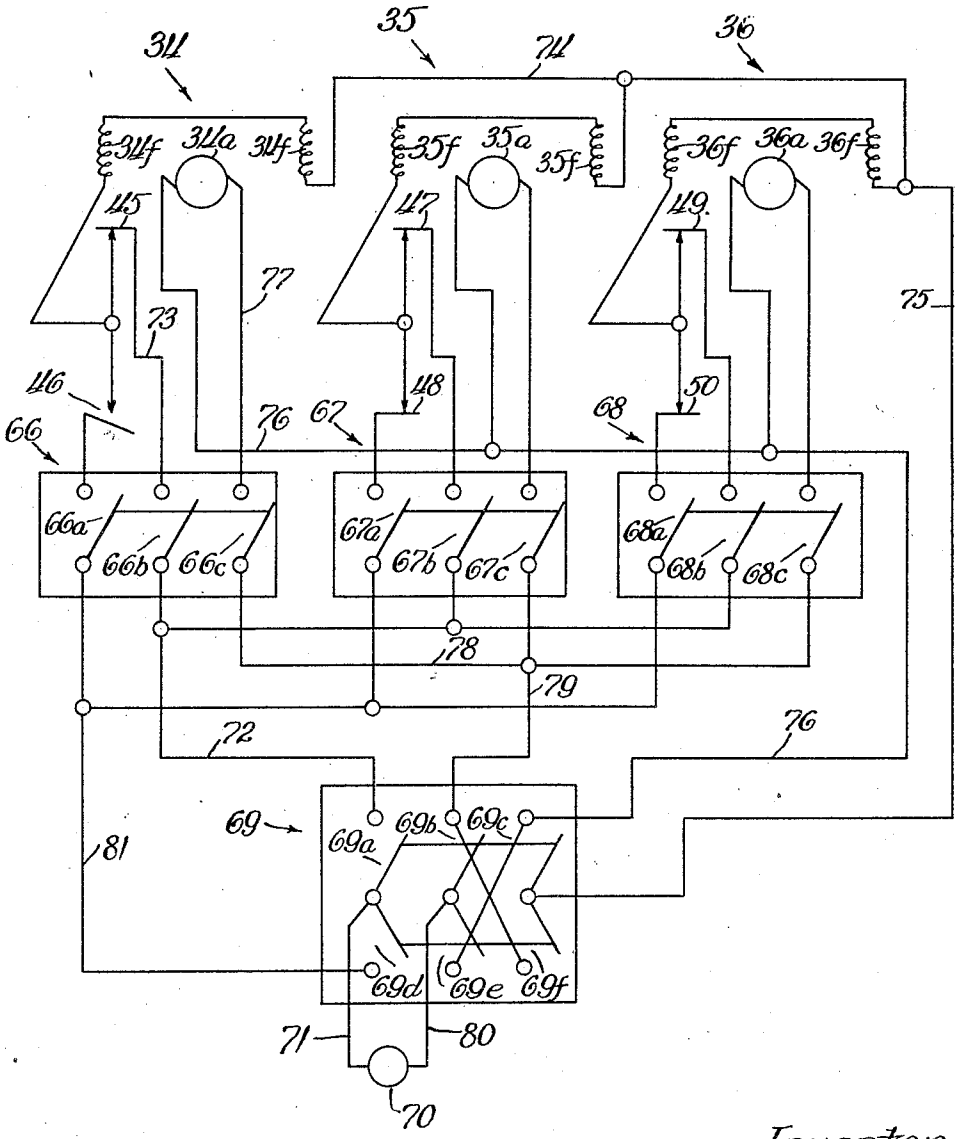
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APPARATUS FOR VARYING THE POSITION OF A MICROPHONE

Filed Nov. 4, 1940 3 Sheets-Sheet 3

Fig. 6.



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Patented July 7, 1942 2,288,822

UNITED STATES PATENT OFFICE

2,288,822

APPARATUS FOR VARYING THE POSITION OF MICROPHONES

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Application November 4, 1940, Serial No. 364,143

23 Claims. (Cl. 179—148)

My invention relates, generally, to remote control apparatus, and it has particular relation to apparatus for controlling the position of one or more microphones with respect to a floor or the like.

The purpose of this invention is to control the removal of a microphone or plurality of microphones independently or as a unit from a radio broadcast station or studio, television broadcast station or studio, theatre stage, dance hall, churches, hotels, convention halls, night clubs, moving picture stages studio or station, and in any such places where public address sound systems use a microphone or plurality of microphones by means of remote control so as to give the entertainers and broadcasters freedom of movement when said broadcast is not in use.

This is accomplished by an operator who does not have to appear and detract from the entertainer or broadcaster. The microphone, when taken away, enters a metal receptacle with a lid and is protected from mechanical injury. The above can be accomplished by diverse methods of mechanics using for power electricity, compressed air, hydraulic, or manual.

This invention does not have any connection with the output or control of the sound system whatsoever. It relates to a means of removing and replacing a microphone or a plurality of microphones from a metal receptacle or a plurality of metal receptacles that protects it or them from mechanical injury while not in use and can be done instantly without detracting attention from the broadcaster or entertainers.

An object of my invention is to control from a remote point the elevation of one or more microphones with respect to a floor.

Another object of my invention is to effect from a remote point the appearance and disappearance of one or more microphones at will.

A further object of my invention is to open a closure in a floor or the like to permit elevation of a microphone therethrough and to close the same after the microphone has been lowered through it.

It is another object of my invention to definitely limit the movement of the microphone in opposite directions independently of the will of the operator.

It is a further object of my invention to provide for individually and simultaneously controlling the movement of a plurality of microphones from a remote point.

Other objects of my invention will, in part, be obvious and in part appear hereinafter.

For a more complete understanding of the nature and scope of my invention reference can be had to the following detailed description taken in connection with the accompanying drawings in which:

Figure 1 is a view of a microphone arranged to be moved upwardly through an opening in a floor or the like together with a portion of the elevating apparatus, the view being taken generally along the line 1—1 of Figure 2;

Figure 2 is a detail view, certain parts being shown in section, that is taken generally along the line 2—2 of Figure 1; the scale being somewhat greater in order to more clearly illustrate the details of construction;

Figure 3 is a sectional view of the retainer cup through which the microphone is moved and showing the closure and the operating mechanism therefor;

Figure 4 is a detail sectional view taken along the line 4—4 of Figure 2;

Figure 5 is a detail sectional view taken along the line 5—5 of Figure 3; and

Figure 6 illustrates diagrammatically the circuit connections that can be employed for controlling the elevation of one or more microphones.

Referring now particularly to Figure 1 of the drawings, it will be observed that the reference character 9 designates a floor or the like which is provided with a retainer cup 10 forming a well 11 through which a microphone 12 of any suitable character well known to those skilled in the art is adapted to be elevated for use by a speaker, performer, etc., appearing on the floor 9. Preferably the microphone 12 is mounted on the upper end of a rod-like support member 13 through which the conductors (not shown) for the microphone are placed.

The rod-like support member 13 is guided for movement up and down in a vertical plane by means of suitable guide members in the form of angles 14 as is more clearly shown in Figures 2 and 4 of the drawings. It will be noted that the guide angles 14 are arranged so as to center the rod-like support member 13 therebetween and to guide it in its longitudinal movement while at the same time holding it fairly firmly in any position to which it may be operated. The guide angles are secured in place partly by means of support brackets 15, Figure 2, which are secured by any suitable means such as bolts to the side wall of a housing 16 which encloses the elevating apparatus. At their lower ends the guide angles

14 have clips 17 secured thereto which are in turn secured to the floor 18 of the housing 16.

A block 19 is secured to the rod-like support member 13 by means of screws 20 and 21 to provide for receiving a clamp block 22 for clamping an endless chain 23 thereto. The clamp block 22 is held in position by means of screws 24 which project into the block 19, as shown. The chain 23 extends over a suitable sprocket wheel 25 that is rotatably mounted at the upper end of the guide angles 14 and also over another sprocket wheel 26 that is rotatably mounted adjacent the lower end of the guide angles 14. A counter weight carrier 27 is fastened to the chain 23, as shown in Figure 1 of the drawings, for receiving counter-weights 28 which are used for counterbalancing the weight of the rod-like support member 13 and the microphone 12 carried thereby.

The front of the lower sprocket wheel 26 forms one part 29 of a friction disc clutch with which another part 30 in the form of a plate is arranged to cooperate and to have frictional engagement. The plate 30 is urged into engagement with the clutch face 29 by a coil spring 31 which surrounds a shaft 32 carrying the plate 30. The shaft 32 extends from a gear reduction mechanism 33 that is driven by a suitable motor 34. It will be understood that the plate 30 will be rotated at a reduced speed on energization of the motor 34 and that, because of its frictional engagement with the face 29 of the sprocket wheel 26, the latter will be rotated to move the rod-like support member 13 and microphone 12 carried thereby upwardly or downwardly depending upon the direction in which the motor 34 rotates. In the event that the rod-like support member 13 reaches its limit of travel in either direction and the motor 34 should remain energized, the plate 30 will slip with respect to the clutch surface 29, as will be readily understood.

As shown in Figure 6 of the drawings, the motor 34 is preferably an electric motor. In addition to the motor 34, motors 35 and 36 can also be employed for elevating microphones at other positions such as at different locations on the floor 9 of the stage. Since these additional microphones and the elevating mechanism therefor would be a duplicate of the apparatus shown in Figures 1, 2, 3, 4, and 5 of the drawings, the details of construction have not been duplicated. The manner in which the motors 34, 35, and 36 are individually and commonly energized and reversed will be set forth in detail hereinafter.

It is desirable to retard the downward movement of the rod-like support member 13 as it approaches its lowermost position. For this purpose brake shoes 41 are hingedly mounted as indicated at 42 between adjacent pairs of the guide angles 14. The brake shoes 41 are biased toward each other by means of a coil tension spring 43 which surrounds them. It will be understood that the lower end of the rod-like support member 13 frictionally engages the adjacent surfaces of the brake shoes 41 and moves them apart. In so doing, the downward movement of the support member 13 is retarded and finally stopped.

With a view to effecting the deenergization of the electric motor 34 when it has operated the support member 13 and the microphone 12 carried thereby to either its uppermost or lowermost positions, limit switches 45 and 46 are provided. The limit switch 45 is arranged to be engaged by the lower side of the counterweight carrier 27 when the microphone 12 has been raised to the highest position. The limit switch 46 is shown as being engaged by a projection from the block 19 that is fastened to the chain 23 when the microphone 12 is in the completely retracted position. The limit switches 45 and 46 are located at the lower end of the housing 16 so as to permit them to be readily accessible for inspection and repair.

In Figure 6 of the drawings the connections for the limit switches 45 and 46 that are associated with the motor 34 are shown. It will be noted that additional limit switches 47 and 48 are provided for the motor 35 and that limit switches 49 and 50 are provided for the motor 36. These additional limit switches will be mounted and operated in a manner similar to that previously described for the limit switches 45 and 46.

When the microphone 12 is in the fully retracted position as shown in Figure 1 of the drawings, it is preferable that it be completely concealed. For this purpose a flap or closure member 53 is provided for closing the upper end of the well 11 in the retainer cup 10. The closure member 53 is arranged to be flush with the floor 9 and preferably fits snugly therewith so that its presence is scarcely noticeable. As shown in Figure 3 of the drawings, the closure member 53 is hingedly mounted at 54 and has depending from the underside thereof a bracket 55 to which one end of a link 56 is pinned. The other end of the link 56 is pinned to a lever 57 that is hinged at 58. A coil tension spring 59 interconnects a support clip 60 and an eye 61 projecting from the lever 57 and serves to bias the latter and the movable parts associated therewith to the positions shown by the broken lines.

As shown in Figure 5 of the drawings, the lever 57 is provided with a centrally located aperture 62 through which the support member 13 projects. Around the aperture 62 is an enlarged flat portion 63 against which the underside of the microphone 12 engages when it is moved downwardly.

As long as the microphone 12 remains in the retracted position, as shown in Figures 1 and 3 of the drawings by full lines, the lever 57 is held down against the biasing force of the spring 59 and the flap or closure member 53 completely covers the upper end of the retainer cup 10. When the support member 13 is moved upwardly, carrying with it the microphone 12, the latter moves out of engagement with the enlarged portion 63 of the lever 57 and the latter is then moved upwardly by the coil tension spring 59 to the position shown by the broken lines. The movement of the lever 57 is accompanied by corresponding movement of the flap or closure member 53 so that the latter is moved to the open position in advance of the movement of the microphone 12 above the level of the floor 9. When the microphone 12 is lowered, it will be understood that the flap or closure 53 is operated to the closed position by a reversal of the sequence of operations just described.

While the microphone 12 has been described hereinbefore as being arranged to be moved upwardly through the floor 9, it will be readily appreciated that it can be arranged for movement down through a ceiling if such an arrangement is desired. It can also be arranged to be moved horizontally. Further, one of several microphones can be arranged to be moved downwardly through a ceiling while others are arranged to be moved upwardly through a floor

and still others are arranged to be moved horizontally out of one or more walls or the like.

In Figure 6 of the drawings, as previously indicated, the circuit connections for controlling the operation of the motors **34**, **35**, and **36** are shown. It will be understood that only a single motor **34** can be employed or that as many additional motors **35**, **36**, etc., can be employed as desired. The number used will depend upon the number of microphones whose positions are to be controlled from a remote point in a control room as may be desired.

Each of the motors **34**, **35**, and **36** comprises, respectively, armatures **34***a*, **35***a*, and **36***a* and field windings **34***f*, **35***f*, and **36***f*. Three pole single throw switches **66**, **67**, and **68** are provided, one for each of the motors **34**, **35**, and **36**, respectively. The poles of these switches are designated by the reference characters generally applied thereto with the letters *a*, *b*, and *c* added to identify the particular pole.

Common to the individual control switches **66**, **67**, and **68** there is a three-pole double throw reversing switch **69**, the upper poles of which are designated with the reference character generally applied to the switch and the letters *a*, *b*, and *c* added for the individual poles. The lower set of poles is similarly identified with the letters *d*, *e*, and *f*. The reversing switch **69** serves to connect the motors **34**, **35**, and **36** through the control switches **66**, **67**, and **68** to a suitable current source **70**.

It will be assumed in describing the operation of the invention that the microphone **12** occupies the position shown in Figure 1 of the drawings and that it is desired to elevate it to its maximum height. Under these conditions the limit switch **46** will be open as indicated in Figure 6. Limit switch **45**, however, is closed. Switch **66** is operated to the closed position and the reversing switch **69** is operated to its upper position completing the circuit through poles **69***a*, **69***b*, and **69***c*.

The circuit for energizing the motor **34** then can be traced from the source **70** through conductor **71**, pole **69***a*, conductor **72**, pole **66***b*, conductor **73**, limit switch **45**, field windings **34***f*, conductors **74** and **75**, pole **69***c*, conductor **76**, armature **34***a*, conductor **77**, pole **66***c*, conductors **78** and **79**, pole **69***b*, and conductor **80** back to the source **70**.

The motor **34** will then elevate the microphone **12** until the counterweight carrier **27** moves to its lower-most position where it engages the limit switch **45** and opens the previously traced circuit.

It will be understood that, as soon as the block **19** moves away from the limit switch **46**, it will be closed so that the motor **34** can be energized in a reverse direction to retract the microphone **12**.

The microphone **12** is lowered by reversing the position of the reversing switch **69** so that the lower poles are closed.

The circuit for energizing the motor **34** in a reverse direction can be traced from the current source **70** through conductor **71**, pole **69***d*, conductor **81**, pole **66***a*, limit switch **46**, field windings **34***f*, conductors **74** and **75**, pole **69***f*, conductors **79** and **78**, pole **66***b*, conductor **77**, armature **34***a*, conductor **76**, pole **69***e*, and conductor **80** back to the source **70**.

In the circuit just traced it will be observed that the current flows through the armature **34***a* in a direction which is the reverse of that in which it flows when the reversing switch **69** is in its upper position.

It will be understood that the operation of the motors **35** and **36** will be similar to the operation of the motor **34** and, accordingly, their operation will not be described in detail herein.

It will be apparent that if all of the control switches **66**, **67**, and **68** are operated to their closed positions, then when the reversing switch **69** is operated, the motors **34**, **35**, and **36** will be simultaneously energized and will operate in directions which correspond to the position of the reversing switch **69**. Thus it is possible to start all of the microphones moving in one direction and then to individually stop them at desired positions merely by opening the particular control switches **66**, **67**, and **68** as may be desired. Likewise, it is possible to simultaneously retract all of the microphones from whatever positions they may be in merely by closing the individual control switches **66**, **67**, and **68** and operating the reversing switch **69** to its lower position. The limit switches **46**, **48**, and **50** will then serve to individually deenergize the motors **34**, **35**, and **36**, respectively, as soon as the microphones individual thereto have been fully retracted.

Since certain changes can be made in the foregoing construction and different embodiments of the invention can be made without departing from the scope thereof, it is intended that all matters shown in the accompanying drawings and described hereinbefore shall be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

1. Apparatus for varying the position of a microphone comprising, in combination, means movable in a vertical plane for carrying the microphone, means for operating said means in opposite directions in said vertical plane, and means operable at a point remote from said operating means for controlling the operation of the same.

2. Apparatus for varying the position of a microphone comprising, in combination, means movable in a vertical plane for carrying the microphone, means for operating said means in opposite directions in said vertical plane, means operable at a point remote from said operating means for controlling the operation of the same, and means for limiting the movement of the first mentioned means in said opposite directions.

3. Apparatus for varying the position of a microphone comprising, in combination, movable means for carrying the microphone, means for operating said means in opposite directions, means operable at a point remote from said operating means for controlling the operation of the same, and means for braking the movement of said first mentioned means when the same approaches the limit of its travel in at least one direction.

4. Apparatus for varying the position of a microphone relative to a retainer cup or the like comprising, in combination, support means for carrying the microphone, means mounting said support means for movement out of and into the retainer cup, closure means for said retainer cup, and means for operating said closure means to the open position to permit moving the microphone out of said retainer cup and to the closed position after the microphone has been withdrawn into said retainer cup.

5. Apparatus for varying the position of a microphone relative to a retainer cup or the like comprising, in combination, support means for

carrying the microphone, means mounting said support means for movement out of and into the retainer cup, closure means for said retainer cup, and means controlled in accordance with the position of said microphone for operating said closure means to the open position to permit moving the microphone out of said retainer cup and to the closed position after the microphone has been withdrawn into said retainer cup.

6. Apparatus for varying the position of a microphone relative to a retainer cup or the like comprising, in combination, support means for carrying the microphone, means mounting said support means for movement out of and into the retainer cup, closure means for said retainer cup, and means biasing said closure means to one operative position, said closure means being arranged and adapted to be moved to another operative position in accordance with movement of the microphone from a predetermined position whereby said closure means is operated to the open position to permit moving the microphone out of said retainer cup and to the closed position after the microphone has been withdrawn into said retainer cup.

7. Apparatus for varying the position of a microphone relative to a retainer cup or the like comprising, in combination, support means for carrying the microphone, means mounting said support means for movement out of and into the retainer cup, closure means for said retainer cup, and spring means biasing said closure means to the open position, said closure means being arranged and adapted to be moved to the closed position in accordance with movement of the microphone into said retainer cup whereby said closure means is operated to the open position to permit moving the microphone out of said retainer cup and to the closed position after the microphone has been withdrawn into said retainer cup.

8. Apparatus for varying the position of a microphone relative to a retainer cup or the like comprising, in combination, rod-like support means for carrying the microphone at one end, means for guiding said support means for movement into and out of said retainer cup, means for moving said support means, means operable at a point remote from said moving means for controlling the operation of the same, closure means for said retainer cup, and means controlled in accordance with the position of said microphone for operating said closure means to the open position to permit movement of the microphone out of said retainer cup and to the closed position after the microphone has been withdrawn into said retainer cup.

9. Apparatus for varying the position of a microphone relative to a retainer cup or the like comprising, in combination, rod-like support means for carrying the microphone at one end, means for guiding said support means for movement into and out of said retainer cup, means for moving said support means, means operable at a point remote from said moving means for controlling the operation of the same, brake means adapted to cooperate with the other end of said rod-like support means for retarding the movement therof as it approaches one limit of its movement, closure means for said retainer cup, and means controlled in accordance with the position of said microphone for operating said closure means to the open position to permit movement of the microphone out of said retainer cup and to the closed position after the microphone has been withdrawn into said retainer cup.

10. Apparatus for varying the position of a microphone relative to a retainer cup or the like comprising, in combination, rod-like support means for carrying the microphone at one end, means for guiding said support means for movement into and out of said retainer cup, means for moving said support means, means operable at a point remote from said moving means for controlling the operation of the same, limit means disposed to be operated in accordance with the movement of said rod-like support member for automatically arresting the action of said moving means when the former has been operated by the latter to predetermined positions, closure means for said retainer cup, and means controlled in accordance with the position of said microphone for operating said closure means to the open position to permit movement of the microphone out of said retainer cup and to the closed position after the microphone has been withdrawn into said retainer cup.

11. Apparatus for varying the position of a microphone relative to a retainer cup or the like comprising, in combination, rod-like support means for carrying the microphone at one end, means for guiding said support means for movement into and out of said retainer cup, means for moving said support means, means operable at a point remote from said moving means for controlling the operation of the same, limit means mounted at the other end of said guide means and disposed to be operated in accordance with the movement of said rod-like support member for automatically arresting the action of said moving means when the former has been operated by the latter to predetermined positions, closure means for said retainer cup, and means controlled in accordance with the position of said microphone for operating said closure means to the open position to permit movement of the microphone into said retainer cup and to the closed position after the microphone has been withdrawn into said retainer cup.

12. Apparatus for varying the position of a microphone comprising, in combination, rod-like support means for carrying the microphone at one end, means for guiding said support means for up and down movement in a vertical plane, motor means, means operatively interconnecting said support means and said motor means, and manually operable means at a point remote from said motor means for controlling the operation of the same to extend and retract the microphone at will.

13. Apparatus for varying the position of a microphone comprising, in combination, rod-like support means for carrying the microphone at one end, means for guiding said support means for movement, electric motor means, means operatively interconnecting said support means and said motor means, manually operable means at a point remote from said motor means for controlling the operation of the same to extend and retract the microphone at will, and limit switches located at the other end of said support means in the retracted position and operable in accordance with the position thereof for deenergizing said electric motor means when the microphone has been moved to predetermined positions.

14. Apparatus for varying the positions of a plurality of microphones comprising, in combination, movable means for carrying each microphone, means for operating said means to differ-

ent positions, and means operable at a point remote from said operating means for simultaneously controlling the operation of the same.

15. Apparatus for varying the positions of a plurality of microphones comprising, in combination, movable means for carrying each microphone, means for operating said means to different positions, and means individual to each operating means and located at a point remote therefrom for selectively controlling the operation thereof.

16. Apparatus for varying the positions of a plurality of microphones comprising, in combination, movable means for carrying each microphone, means for operating said means to different positions, means individual to each operating means and located at a point remote therefrom for selectively controlling the operation thereof, and means at said remote point for simultaneously controlling the operation of said operating means.

17. Apparatus for varying the positions of a plurality of microphones comprising, in combination, a rod-like support member for carrying each microphone at one end, means for guiding each support member for movement from one position to another, an electric motor for each support member, means operatively interconnecting each support member and the electric motor individual thereto, and manually operable means at a point remote from said electric motors for simultaneously controlling the operation of the same.

18. Apparatus for varying the positions of a plurality of microphones comprising, in combination, a rod-like support member for carrying each microphone at one end, means for guiding each support member for movement from one position to another, an electric motor for each support member, means operatively interconnecting each support member and the electric motor individual thereto, a pair of limit switches for each electric motor and operable in accordance with the position of the support member individual thereto for deenergizing the electric motors when the corresponding support members have been operated thereby to predetermined positions, and manually operable means at a point remote from said electric motors for simultaneously controlling the operation of the same.

19. Apparatus for varying the positions of a plurality of microphones comprising, in combination, a rod-like support member for carrying each microphone at one end, means for guiding each support member for movement from one position to another, an electric motor for each support member, means operatively interconnecting each support member and the electric motor individual thereto, a pair of limit switches for each electric motor and operable in accordance with the position of the support member individual thereto for deenergizing the electric motors when the corresponding support members have been operated thereby to predetermined positions, and control switch means individual to each electric motor and located at a point remote therefrom for selectively controlling the operation thereof.

20. Apparatus for varying the positions of a plurality of microphones comprising, in combination, a rod-like support member for carrying each microphone at one end, means for guiding each support member for movement from one position to another, a reversible electric motor for each support member, means operatively interconnecting each support member and the electric motor individual thereto, a pair of limit switches for each electric motor and operable in accordance with the position of the support member individual thereto for deenergizing the electric motors when the corresponding support members have been operated thereby to predetermined positions, reversing switch means common to said electric motors and located at a point remote therefrom for simultaneously controlling the operation thereof in opposite directions, and control switch means at said remote point for each electric motor for individually controlling the energization thereof.

21. Apparatus for varying the position of a microphone comprising, in combination, rod-like support means for carrying the microphone, means guiding said support means for reciprocatory movement, motor means including a rotatable member, means operatively interconnecting said support means and said rotatable member, and manually operable means for controlling the energization of said motor means in opposite directions for moving said support means and the microphone carried thereby in one direction or the other at will.

22. A microphone stand comprising a hollow base and an upright tubular member supported thereby, a microphone supporting member telescopically supported in said upright member, a reversible motor in said base, and means operatively connecting said motor with said microphone supporting member for raising and lowering said supporting member incident to reverse operation of said motor.

23. A microphone stand comprising a hollow base and an upright tubular member supported thereby, a microphone supporting member telescopically supported in said upright member, a reversible motor in said base, means operatively connecting said motor with said microphone supporting member for raising and lowering said supporting member incident to reverse operation of said motor, and a control circuit for said motor including a reversing switch remote from the stand.

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