

June 19, 1962

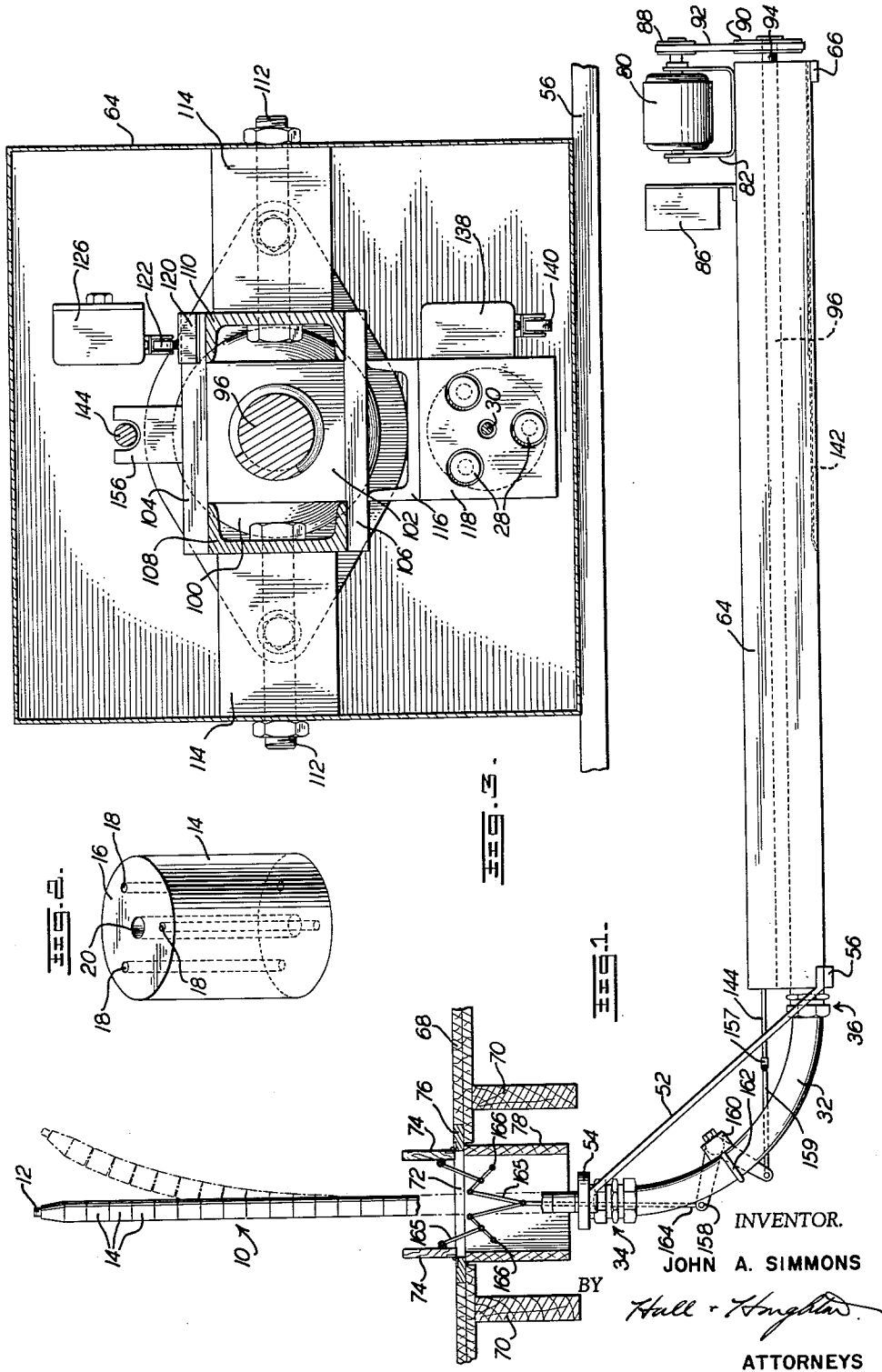
J. A. SIMMONS

3,040,137

ADJUSTABLE MICROPHONE STAND

Filed July 17, 1958

4 Sheets-Sheet 1



June 19, 1962

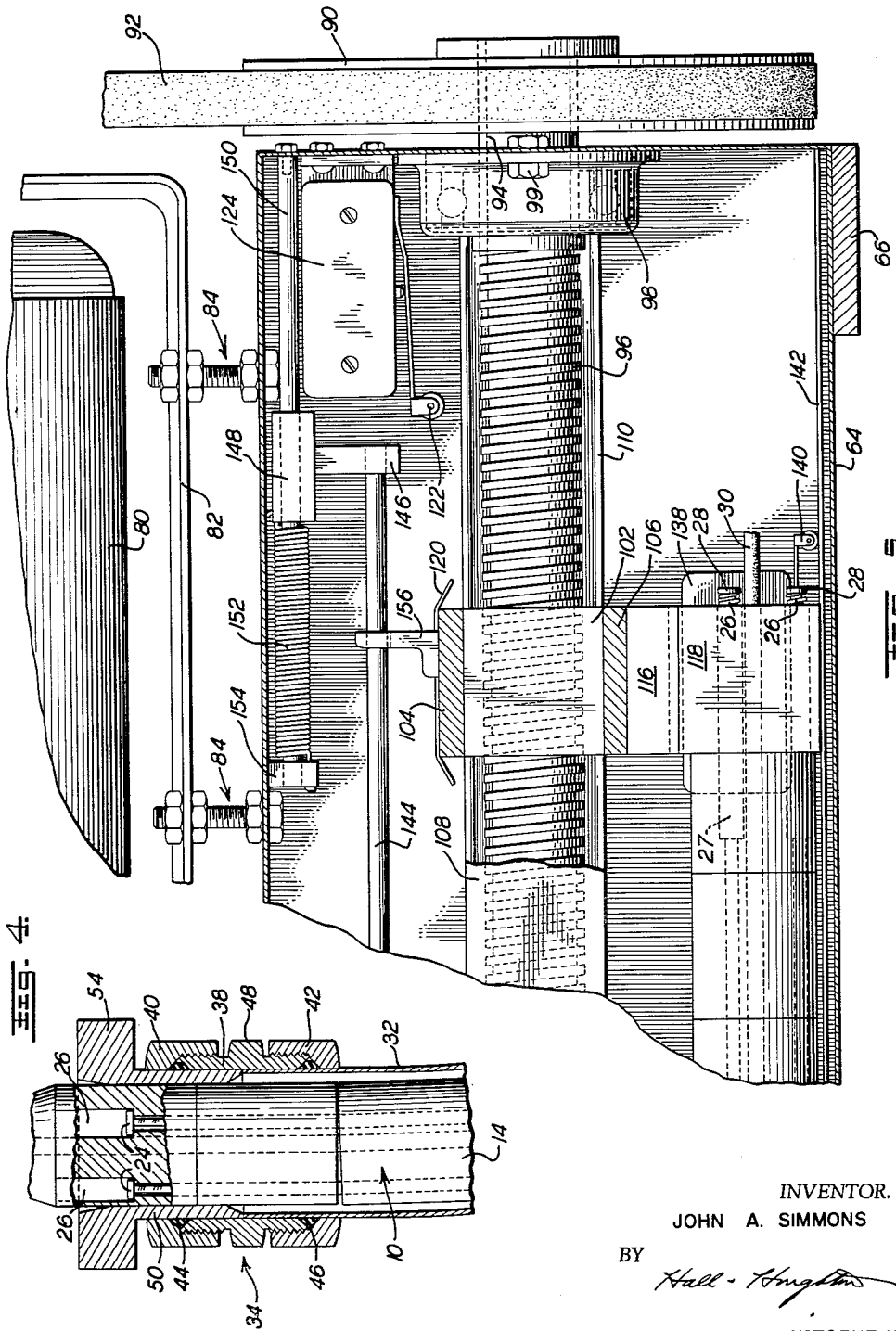
J. A. SIMMONS

3,040,137

ADJUSTABLE MICROPHONE STAND

Filed July 17, 1958

4 Sheets-Sheet 2



June 19, 1962

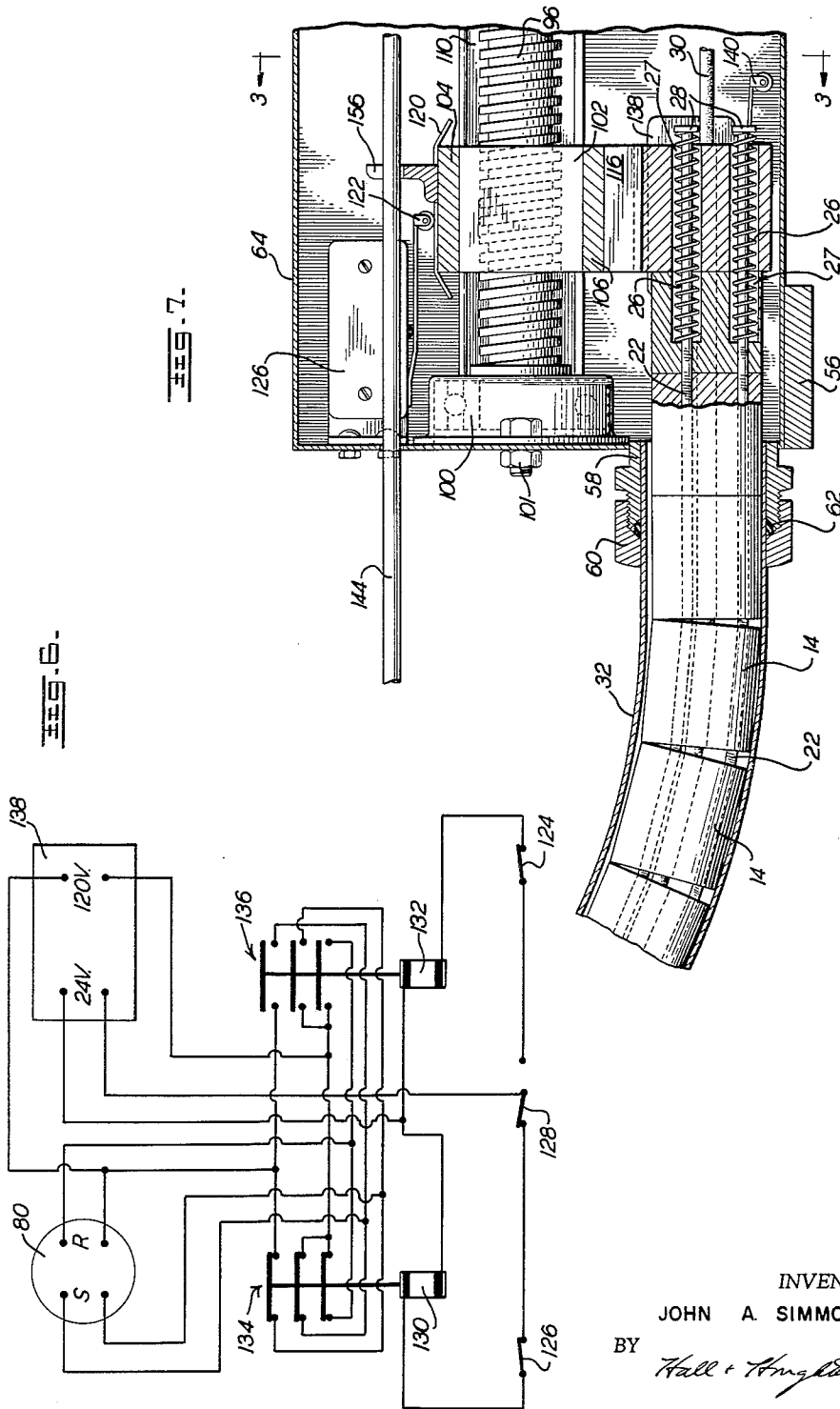
J. A. SIMMONS

3,040,137

ADJUSTABLE MICROPHONE STAND

Filed July 17, 1958

4 Sheets-Sheet 3



Filed July 17, 1958

ADJUSTABLE MICROPHONE STAND

4 Sheets-Sheet 4



Hall + Houghton.

ATTORNEYS

1

3,040,137

ADJUSTABLE MICROPHONE STAND

John A. Simmons, 1320 E. St. Louis, Las Vegas, Nev.

Filed July 17, 1958, Ser. No. 749,189

18 Claims. (Cl. 179-148)

This invention relates to an adjustable microphone stand and more particularly to a microphone stand having a flexible shaft which may be moved from a horizontal position below the floor of a stage to an upright position above the floor.

Floor stand microphones are widely used, particularly in stage productions in the entertainment field, but such microphones have several disadvantages. They are cumbersome and unwieldy and usually must be provided with weighted bases to increase their stability. Moreover, such microphones normally have long trailing microphone cables. These characteristics make it difficult to remove the microphones quickly when it is desired to clear the stage. Also, floor stand microphones are usually difficult to adjust, there being separate adjustments of the telescoping stand and the microphone head in most instances. Thus, the adjustment of the microphone to accommodate performers of different heights must frequently be done by stagehands, rather than by the performers themselves.

To alleviate some of the foregoing conditions microphone installations have been made in which the microphone is supported on a stand which is extensible and retractable between positions above and below the floor of a stage. In general, such installations employ either a rigid stand or a telescoping stand, both of which require considerable space below the stage to accommodate the stands in their retracted positions. Moreover, these stands are not flexible and are at least as difficult to adjust as the conventional floor stand models.

It is accordingly a primary object of the present invention to overcome the disadvantages set forth above by the provision of a unique and improved adjustable microphone stand.

Another object of the invention is to provide a microphone stand which is retractable below the floor of a stage but which requires very little space in its retracted position.

A further object of the invention is to provide a microphone stand having a unusual degree of flexibility but yet which is biased to a straight configuration, whereby the stand may be readily bent by the performer and moved about and yet will return to its normal straight configuration when released, so that it may be retracted quickly.

Yet another object of the invention is to provide a microphone stand of the foregoing type which is especially adaptable to "microphone play" by performers.

A still further object of the invention is to provide unique mechanisms for moving and guiding a microphone stand or the like.

An additional object of the invention is to provide apparatus of the foregoing type which includes a door operable in accordance with the position of the microphone.

A still further object of the invention is to provide apparatus of the foregoing type having unique arrangements of mechanical and electrical components.

The foregoing and other objects, features, and advantages of the invention and the manner in which the same are accomplished will become more readily apparent upon consideration of the following detailed description of the invention when taken in conjunction with the accompanying drawings, which illustrate preferred and exemplary embodiments and wherein:

FIGURE 1 is a side elevation view, partly in section, of a first form of the invention, illustrating its general appearance;

2

FIGURE 2 is a perspective view of a detail of the invention;

FIGURE 3 is a transverse sectional view of a portion of the apparatus of FIGURE 1, the view being taken along line 3-3 of FIG. 7 in the direction of the arrows;

FIGURE 4 is a longitudinal sectional view of another detail of the invention;

FIGURE 5 is a longitudinal sectional view of a portion of the apparatus of FIGURE 1;

FIGURE 6 is a schematic diagram of a motor energization circuit employed in the invention;

FIGURE 7 is a longitudinal sectional view of another portion of the apparatus of FIGURE 1;

FIGURE 8 is a side elevation view of another embodiment of the invention; and

FIGURE 9 is an enlarged transverse sectional view of a portion of the apparatus of FIGURE 8, the view being taken along line 9-9 of FIG. 8 in the direction of the arrows.

Briefly stated, the apparatus of the invention comprises a flexible shaft that is resiliently self-biased to a straight configuration and that is guided between an upright position above the level of a stage floor to a substantially horizontal position below the level of the floor.

The flexible shaft is moved by a drive train including an electric motor which is energized from a circuit having limit switches which determine the maximum extent of movement of the shaft. The apparatus also may include a microphone muting switch controlled in accordance with the position of the microphone. A door is provided in the stage floor for passage of the microphone stand, and the operation of the door is controlled by a mechanism associated with the drive train for the shaft.

Referring to the drawings, and initially to FIGURE 1 thereof, the apparatus of the invention comprises a flexible shaft 10, one end of which is adapted to receive a microphone by virtue of a suitable coupling indicated at 12. In the preferred form of the invention the shaft is constituted by a series of cylindrical blocks 14, one of which is shown in detail in FIGURE 2. These blocks have mating flat end surfaces 16, which are normally juxtaposed, and may be formed of hard plastic, wood, or light metal. If a tapered shaft is desired, the block contours may be modified accordingly. Each block is provided with a plurality of longitudinal passages 18, three symmetrically arranged passages being shown. A larger central passage 20 is also provided. Passages 18 receive flexible cables 22 as shown in FIGURE 7, the passages of the successive blocks being aligned for this purpose. When the cables are placed in tension, they will retain the ends of the blocks in face-to-face relation, so that the shaft as a whole will assume a straight configuration shown by the solid lines in FIGURE 1. However, to permit the shaft to be readily deflected or bent as shown by the phantom lines in FIGURE 1, the cables are tensed resiliently. This may be accomplished by providing one end of each cable with an enlarged fitting 24 located within a recess 26 in the first block of the series, as shown in FIG. 4, the fitting being too large to pass through the narrow passage 18, and by providing the opposite end of each cable with a spring 26 as shown in FIGURE 7. These springs are located within enlarged recesses 27 in the last block or blocks of the series and are compressed in these recesses by fittings 28 attached to the respective ends of the cables. To permit adjustment of the tension of the cables, fittings 28 are preferably adjustable along the end portions of the cables, as by providing mating threads.

From the foregoing it will be apparent that when the flexible shaft is deflected from its straight configuration, the flat end surfaces of the blocks will separate as shown in FIG. 7, and certain of the cables will be placed in

greater tension, compressing their springs 28. When the flexible shaft is released, the springs will urge the cables back to their normal rest condition and will quickly return the shaft to its straight configuration. Moreover, since the springs can only be compressed to a limited extent, the deflection of the flexible shaft is limited, thus preventing permanent deformation of the shaft.

The central passages 20 in the blocks 14 receive a microphone cable 30 which is provided with a conventional microphone connector at one end and which is connected to the audio system at the other end. This cable preferably is wound on a spring biased drum (not shown).

The flexible shaft 10 passes through a guide 32, which is a curved tube in the form shown, typically a thin-walled 1 3/8" I.D. steel tube with a 16" radius of curvature. This guide is adapted to impart a substantially 90-degree change in direction to the shaft as it passes through the guide between upright and horizontal positions. As shown in FIGURE 1, the guide tube 32 is provided with couplings 34 and 36 at its respective ends. Coupling 34 is shown in greater detail in FIGURE 4 and comprises a sleeve 38 which receives one end of the guide tube 32 in a close fit. Sleeve 38 is externally threaded at its respective ends for cooperation with the internal threads of a pair of collars 40 and 42. The sleeve and the collars have opposed sloping surfaces which define spaces for reception of a pair of compression rings 44 and 46. The sleeve may also be provided with a hexagonal protrusion 48 for engagement with a wrench. Another sleeve 50 is inserted in sleeve 38 from the end opposite tube 32 and abuts the latter. Sleeve 50 has a smaller inner diameter than the tube 32 and serves to guide the flexible shaft 10 in a vertical direction when the shaft leaves the tube 32. The blocks 14 fit within the tube 32 with appreciable lateral play so that the blocks may move around the curve without any binding between the walls of the tube and the walls of the blocks.

It will be apparent from the foregoing that when the collars 42 are tightened onto the sleeve 38 the opposed sloping surfaces of the collars and sleeve 38 compress the rings 44 and 46 around the tube 32 and the sleeve 50 to hold all of the associated parts in place. The tube 32 may be steadied as shown in FIGURE 1 by suitable braces 52 attached to the enlarged shoulder 54 of sleeve 50 at one end and to a supporting member 56 at the other end.

Coupling 36, shown in detail in FIG. 7, is somewhat similar to coupling 34 and includes a sleeve 58, a collar 60, and an intervening compression ring 62. Sleeve 58 is held in an opening in a housing 64, as by welding it thereto or by threading it into the wall of the housing, and the corresponding end of tube 32 is secured in sleeve 58 by the compression ring 62.

As shown in FIGURE 1, the housing 64 is elongated and is supported by members such as 56 and 66, which may be metal strapping suspended from the underside of a floor indicated at 68. Usually, this floor will be part of a stage, and will be supported on conventional joists 70. To accommodate the microphone stand the floor will be provided with an opening 72, the opening being closed by one or more doors 74 pivotally supported on a frame 76, which may include a shroud 78. The mechanism for operating the doors will be described later.

In the form shown in FIGURE 1 the microphone stand is moved by a drive train including an electric motor 80 supported on housing 64 in a conventional motor mount 82 as by nuts and bolts 84 (FIG. 5). A relay box 86 may also be supported on the housing adjacent the motor. Motor 80 drives a pulley 88 attached to its drive shaft, and pulley 88 drives another pulley 90 through a belt 92. As shown in FIGURE 5, pulley 90 is affixed to a stub shaft 94 which is in turn fixed to or formed integrally with an elongated screw 96. Stub shaft 94 passes through the adjacent end of the housing 64 and is supported in a bearing 98 fixed to the housing end as by bolts and nuts 99. Screw 96 is substantially as long as the housing 64,

as shown in FIGURE 1, and passes from the bearing 98 to a complementary bearing 100 (FIG. 7) fixed to the other end of the housing as by bolts and nuts 101. Bearing 100 rotatably supports the corresponding end of the screw as by a stub shaft or other conventional arrangement.

Screw 96 carries a feed nut 102 best seen in FIGURES 3, 5, and 7. The feed nut is affixed to upper and lower guide plates 104 and 106 which slide on the mating surfaces of the flanges of a pair of opposed channels 108 and 110 best seen in FIGURE 3. As shown, the tips of the flanges of the channels engage the sides of the feed nut 102, which in the form shown is a rectangular block, and the channels are supported in their proper position by bolts and nuts 112 and by spacers 114. The end of the flexible shaft 10 is fixed to the feed nut as by a small channel member 116 which may be welded or otherwise secured to the guide plate 106 and to a block 118 which constitutes or is affixed to the last block in the flexible shaft series.

From the foregoing it will be apparent that when the motor 80 drives the pulley 90, the screw 96 will turn, and the feed nut 102 will move along the screw carrying with it the flexible shaft 10. In this manner the shaft will be moved through the elongated housing 64 and the curved guide tube 32. When the feed nut reaches its limiting position at one end of the housing, the microphone shaft will be fully extended, and when it reaches its limiting position at the opposite end of the housing, the shaft will be fully retracted. During this movement the microphone cable 30 will be reeled onto or off of its drum (not shown).

The feed nut 102 carries a ramp 120 which has inclined ends as shown, and the ramp is arranged to engage the operating arms 122 of a pair of switches shown as micro-switches 124 and 126 mounted at the opposite ends of the housing 64 (see FIGS. 5 and 7). These switches are of the normally closed type and are opened when their operating arms 122 engage the ramp 120. In FIGURE 5 switch 124 is shown in its normally closed condition, while in FIGURE 7, switch 126 is shown in its open condition. As will be seen hereinafter, switches 124 and 126 form a part of the energization circuit for motor 80 and serve to de-energize the motor automatically when the feed nut 102 reaches the respective ends of the screw 96.

A typical energization circuit for the motor is shown in FIGURE 6. Motor 80 may be a conventional split phase induction motor having a running winding connected to the terminals R and a starting winding connected to the terminals S. The motor is arranged to be energized from the 120-volt A.C. terminals shown upon the closing of a single pole double throw switch 128. When the switch is closed on one of its contacts, as shown, the motor will rotate in a first sense to move the microphone stand to its extended position, and when the switch 128 is closed on its alternate contact, the motor will rotate in the opposite sense to retract the microphone stand. The energization circuit includes a pair of relays 130 and 132, each of which has a triple pole single throw switch designated 134 and 136. Relays 130 and 132 are energized from the 24-volt terminals of the transformer 138, which steps down the voltage at the 120-volt terminals. The relay circuits include the switch 128 and the respective limit switches 124 and 126. It will be apparent from the circuit diagram that switch 128 is capable of energizing the relays 130 and 132 alternately and that switches 124 and 126 are capable of breaking the respective relay circuits. The circuit connections are such that the ends of the running winding of motor 80 are connected to the same terminals of the 120-volt source regardless of which relay 130 or 132 is energized, but that the ends of the starting winding are connected respectively to one or the other of the 120-volt terminals depending upon which relay is energized. As is well known, the direction of rotation of the motor 80 will depend upon the relative connections of the starting and running windings.

5

Switch 128 may be located in the sound control room, the spotlight booth, or at any other convenient location. In extending the microphone stand, switch 128 will be closed in its "up" position long enough to extend the stand to the desired degree in conformity with the height of the performer. Of course if switch 128 is held closed too long, the microphone stand will reach its maximum height and the corresponding limit switch will open to de-energize the motor. Retraction of the stand is accomplished in a similar manner by closing switch 128 to its "down" position.

The audio circuit from the microphone is preferably broken during the major portion of stand travel in order to eliminate the possibility of noise pick-up. This may be accomplished by attaching a muting switch, such as the microswitch 138 (FIGS. 3, 5, and 7) to the flexible shaft. The operating arm 140 of the switch may cooperate with a long ramp 142 extending within the housing 64 as shown in FIGURE 1. If the ramp is placed at the rear end of the housing as shown, the microswitch will be of the type which is normally closed and which is opened by engagement of its operating arm with the ramp. This switch will be wired into the audio circuit from the microphone in the usual manner.

The apparatus of the invention also preferably includes a door operating mechanism referred to briefly above. This mechanism may comprise an elongated control rod 144 which at the motor end of the housing is attached to a lug 146 (FIG. 5) affixed to a bearing sleeve 148 slidable on a short rod 150 supported in the housing parallel to rod 144. A tension spring 152 surrounds rod 150 and is connected at its ends to the sleeve 148 and the rod support 154. The feed nut 102 carries another lug 156 which embraces the rod 144 as shown in FIGURE 3. When the feed nut moves along the screw, lug 156 moves along rod 144, and near the end of the travel of the feed nut in retracting direction, lug 156 engages lug 146, moving rod 144 axially during the remaining movement of the feed nut before limit switch 124 opens the motor circuit. This tenses the spring 152, and it will be apparent that when the lug 156 moves in the opposite direction away from lug 146, spring 152 will draw the attached rod 144 back to its former position.

As shown in FIGURE 1, rod 144 extends from the end of the housing 64 and is pivotally connected at 157 to an extension 159 in turn pivotally connected to one arm of a bell crank 158. The fulcrum of the bell crank is supported on a block 160 which is affixed to the tube 32 by a U-bolt 162. The other arm of the bell crank is pivotally connected to a rod 164 which moves to open and close the doors 74 in response to turning of the bell crank in opposite directions by the rod 144. The linkage between rod 164 and the doors 74 may assume any conventional form, depending somewhat upon whether one or two doors are employed. The linkage shown is merely representative and includes duplicate sets of links 165 pivotally connecting the end of rod 164 to the doors 74. These links may have fixed pivots 166 on the shroud 78. Rod 144 may be adjustable axially with respect to extension 159 at junction 157, so as to ensure that the doors 74 will open and close properly with predetermined movement of the rod 144.

From the foregoing it is apparent that the microphone stand may be readily extended and contracted, that the amount of extension may be readily controlled to accommodate performers of different height, that the drive motor will be de-energized automatically when the microphone stand reaches the limits of its movement, and that the microphone stand may be easily bent or deflected in accordance with the wishes of the performer, quickly returning to its normal position when released. It will also be apparent that the apparatus of the invention can be accommodated in a relatively shallow space below the stage floor, and this is a significant characteristic of the invention, because many stage floors have little clearance beneath them.

6

FIGURES 8 and 9 illustrate an alternative form of the invention. In these figures the same flexible shaft 10, guide tube 32, and door assembly 74, 76, and 78 are shown. However, in this form the drive train is different, including a so-called gear motor 170 which moves with the flexible microphone shaft. The motor, which may be an induction motor, is geared down by a gear unit 172 to an output speed of about 57 r.p.m., for example. The motor drives a pinion 174 (FIG. 9) which mates with and rolls along an elongated rack 176. The rack is supported on a box frame member 178 which, along with a complementary box frame member 180 at the other side of the motor, is supported from the sub-flooring as by channels 182 or suitable metal strapping. As shown in FIGURE 9, the base 182 of the motor is bolted to an upper guide plate 184, which slides on the upper surfaces of box frame members 178 and 180 and which in turn is bolted to a block 186 having a similarly secured lower guide plate 188, which slides on the lower surfaces of members 178 and 180. The sides of block 186 may be slightly concave as shown to reduce the friction between the block and the mating side surfaces of the members 178 and 180. Block 186 is affixed to the end of the flexible shaft 10, the shaft having the same tension cables as before. When the motor is energized, as by the energization circuit previously described, the pinion 174 will turn, causing the motor to move along the frame members 178 and 180 and advancing the flexible shaft 10. The motor may be supplied from a cable which is rolled up on a drum or which is allowed to hang loosely, preferably from a junction box (not shown) located centrally of the length of members 178 and 180. To maintain a centralized electrical system, the limit switches 124 and 126 may be moved to the central location as shown. In this form of the invention the operating arms 122 of the limit switches may engage collars 188 and 190 affixed to a rod 192 corresponding to the rod 144 of the previous embodiment. Rod 192 is supported for axial movement in bearing blocks 194 at the respective ends of box frame member 180. The motor mount is provided with a lateral lug 196 which is arranged to engage complementary lugs 198 and 200 fixed to the rod 192 near its respective ends. Rod 192 is pivotally connected to a link 202 in turn pivotally connected to one arm of bell crank 158a, the other arm of which is pivotally connected to link 164 as before. As previously described, the bell crank is supported on tube 32 by virtue of a block 160 and a U-bolt 162. A tension spring 204 has its ends connected to the block 160 and the end of rod 192. The spring tends to draw rod 192 to the left in FIGURE 8, thereby moving the bell crank 158a to open the doors 74. When the motor lug 196 engages the rod lug 200 near the end of its retracting travel, the rod 192 will be moved in the opposite direction, closing the doors and tensing the spring. Just as the doors close, collar 188 engages the operating arm 122 of limit switch 124 and breaks the motor circuit. The motor circuit is broken at the limit of its movement in the opposite direction when motor lug 196 engages rod lug 198, causing a slight additional movement of the rod 192 sufficient to engage collar 190 with the operating arm 122 of switch 126, and thereby open the motor circuit.

The apparatus of FIGURES 8 and 9 has the same characteristics as the previously described apparatus and the same advantages. The hinge line of the doors in FIG. 8 has been shifted 90° from that of FIG. 1 to indicate a typical variant form. A muting switch may also be attached to the motor mount in FIGS. 8 and 9 and cooperate with a stationary ramp as before.

While there have been shown and described what are now believed to be preferred embodiments of the invention, it will be apparent to those skilled in the art that changes can be made in these embodiments without departing from the principles and spirit of the invention, the scope of which is defined in the appended claims.

Accordingly, the foregoing embodiments are to be con-

sidered illustrative, rather than restrictive of the invention, and those modifications which come within the meaning and range of equivalency of the claims are to be included therein.

The invention claimed is:

1. An adjustable microphone stand or the like comprising a flexible shaft adapted to support a microphone at one end, said shaft being laterally deformable but resiliently biased to a straight configuration a guide for said shaft adapted to be supported below a floor, said guide being shaped to guide said shaft from a substantially horizontal position below said floor to an upright position above said floor and comprising a curved tube, and motive means for advancing said shaft through said tube, said shaft being freely exposed in its upright position whereby it assumes its undeformed straight configuration.

2. An adjustable microphone stand or the like comprising a flexible shaft adapted to receive a microphone at one end, said shaft being laterally deformable but resiliently biased to a straight configuration guide means for guiding said shaft from a substantially horizontal position below the level of a floor to an upright position above the level of said floor, and motive means for advancing said shaft along said guide means, said shaft being freely exposed in its upright position whereby it assumes its undeformed straight configuration.

3. The invention of claim 2, said shaft comprising a series of blocks having mating end surfaces and resilient means for biasing said end surfaces to juxtaposed relation.

4. The invention of claim 3, said blocks being cylindrical and having flat mating end surfaces, said resilient means comprising tensioning means passing through said blocks in sequence.

5. The invention of claim 4, said tensioning means passing through passages in said blocks and being connected to the respective ends of said shaft.

6. The invention of claim 2, said floor having an opening receiving a door, said shaft passing through said opening when said door is open, and means for opening said door automatically when said shaft is advanced toward its upright position.

7. The invention of claim 2, said motive means comprising a motor driven screw and a feed nut thereon attached to said shaft.

8. An adjustable microphone stand or the like comprising a flexible shaft, said shaft being laterally deformable but resiliently biased to a straight configuration a curved guide for guiding said shaft from an upright position to a substantially horizontal position, motive means for advancing said shaft through said guide, said motive means comprising an electric motor, means for energizing said motor, and means for de-energizing said motor automatically when said shaft reaches predetermined limits of travel, said shaft being freely exposed in its upright position whereby it assumes its undeformed straight configuration.

9. The invention of claim 8, said motive means comprising a screw driven by said motor and a feed nut thereon attached to said shaft, said de-energizing means comprising a limit switch operated in accordance with movement of said shaft.

10. The invention of claim 8, said motive means comprising a rack, a pinion movable therealong, and an electric motor driving said pinion and movable therewith along said rack, said shaft being connected to said motor.

11. An adjustable microphone stand or the like comprising a flexible shaft, said shaft being laterally deformable but resiliently self-biased to a straight configuration, a curved guide adapted to guide said shaft from an upright position to a substantially horizontal position, an elongated substantially horizontal screw adjacent one

end of said guide, a feed nut on said screw fixed to one end of said shaft, the other end of said shaft being adapted to receive a microphone, means including an electric motor for rotating said screw, a door by which said shaft passes to its upright position when said door is open, and means connected to said feed nut for operating said door, said shaft being freely exposed in its upright position whereby it assumes its undeformed straight configuration.

12. The invention of claim 11, said door operating means comprising a linkage movable in one direction by said feed nut and movable in the opposite direction by a spring.

13. The invention of claim 11, said microphone stand having a muting switch associated therewith, said switch being operable in accordance with the position of said feed nut.

14. Apparatus of the type described comprising a flexible shaft laterally deformable but resiliently self-biased to a straight configuration, a curved guide for said shaft adapted to impart a substantially 90-degree change in direction to said shaft, motive means for moving said shaft along said guide between an operating position and a retracted position, a door by which said shaft passes to its operating position when said door is open, and means responsive to the position of said shaft for opening and closing said door, said shaft being freely exposed in its operating position whereby it assumes its undeformed straight configuration.

15. The invention of claim 14, said motive means comprising an electric motor, said door operating means comprising a rod movable axially by said motive means, said motor having an energization circuit including limit switches operated by said rod.

16. The invention of claim 15, said motor being movable with said shaft along said rod, said rod being movable by means fixed to said motor, and said limit switches being operable by means fixed to said rod.

17. A flexible microphone stand adapted to receive a microphone at one end thereof, said stand comprising a series of blocks of right cylindrical configuration having flat juxtaposed end surfaces, successive blocks defining a substantially continuous smooth external stand surface, said blocks having an axial passage therethrough adapted to receive a cable for said microphone, said blocks having a plurality of off-axis passages therethrough, elongated flexible tensioning means passing through said off-axis passages, and means including said tensioning means for urging said end surfaces together resiliently.

18. An adjustable microphone stand or the like comprising a flexible shaft, said shaft being laterally deformable but resiliently biased to a straight configuration a guide for guiding said shaft between upright and substantially horizontal positions, a substantially horizontal rack extending from one end of said guide, a pinion on said rack, and an electric motor connected to said pinion, said shaft being connected to said motor for movement therewith and with said pinion along said rack, said shaft being freely exposed in its upright position whereby it assumes its undeformed straight configuration.

References Cited in the file of this patent

UNITED STATES PATENTS

616,672	Kelling	Dec. 27, 1898
870,429	Grimler	Nov. 5, 1907
1,250,064	Whims	Dec. 11, 1917
1,905,539	White	Apr. 25, 1933
2,048,865	Hufschmid	July 28, 1936
2,288,822	McCarron	July 7, 1942
2,540,738	Kapiowitz	Feb. 6, 1951
2,580,889	Carlson	Jan. 1, 1952