Sept. 3, 1946. B. H. LOHMULLER ET AL 2,407,024

THEATER CURTAIN

Filed Aug. 17, 1944 3 Sheets-Sheet 1

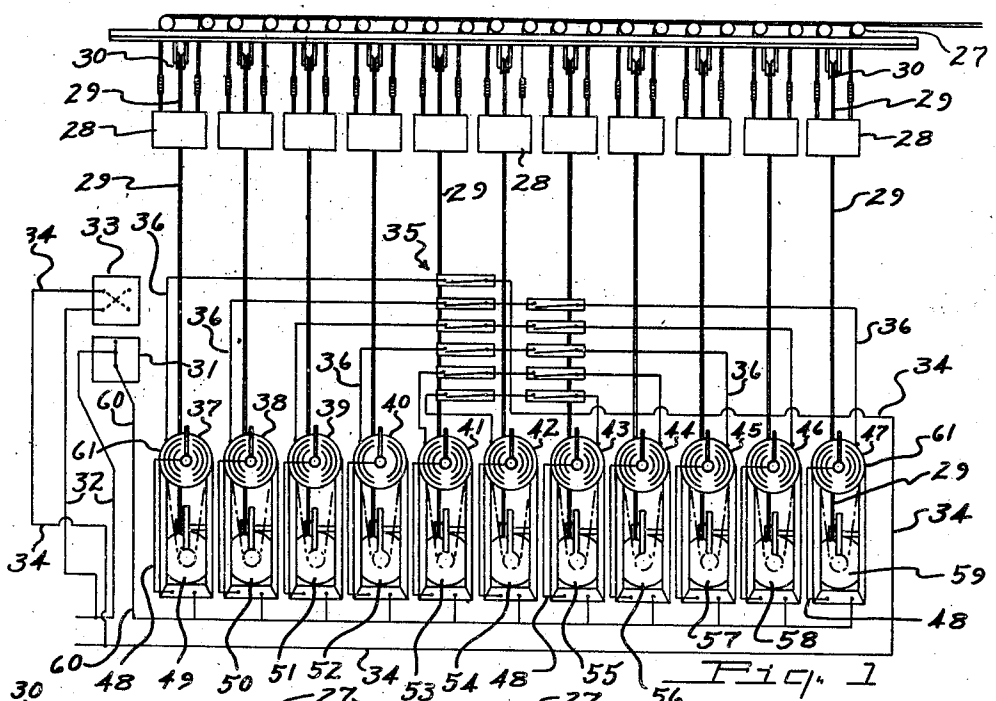


Fig. 1

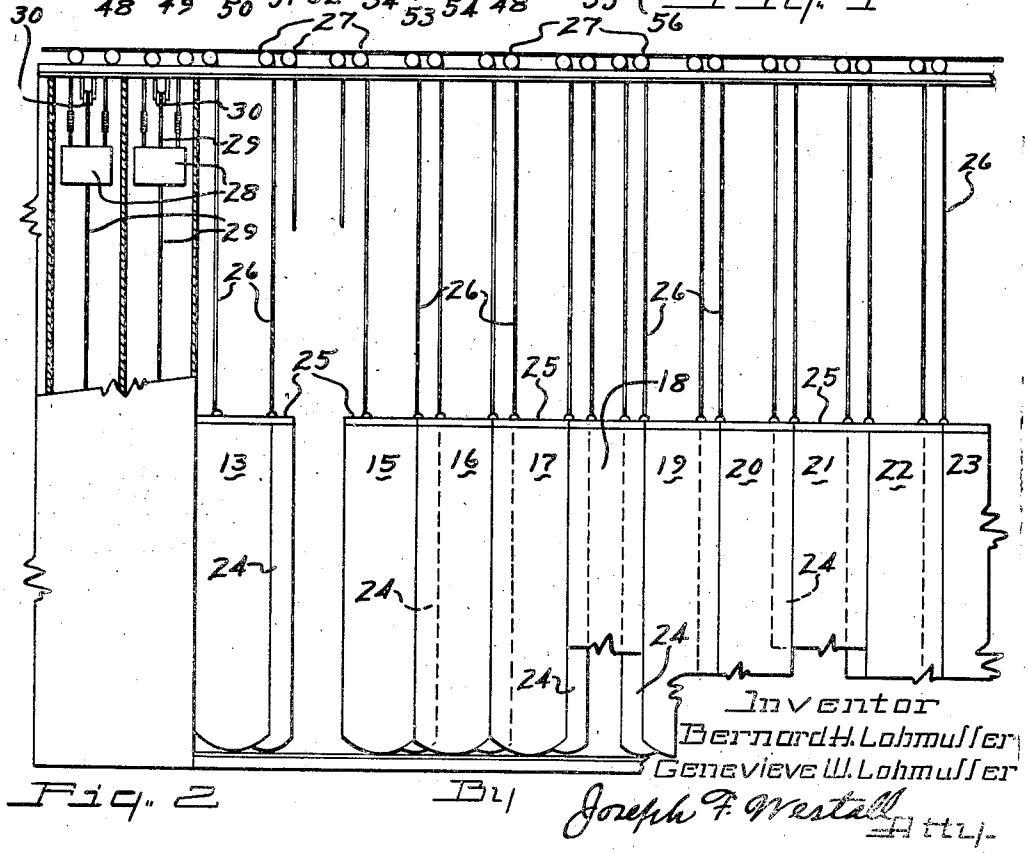


Fig. 2

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THEATER CURTAIN

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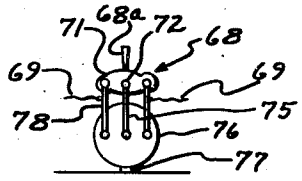


Fig. 3

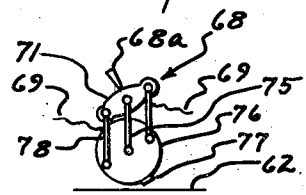


Fig. 4

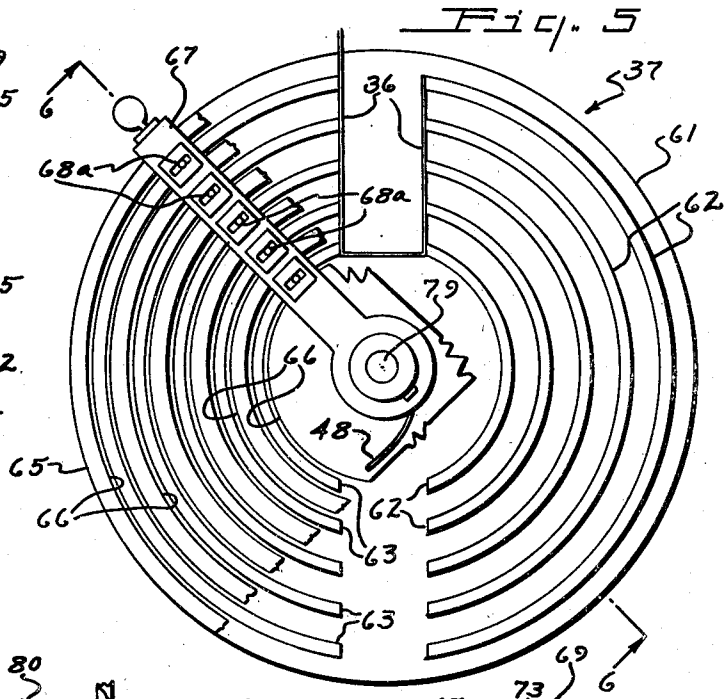


Fig. 5

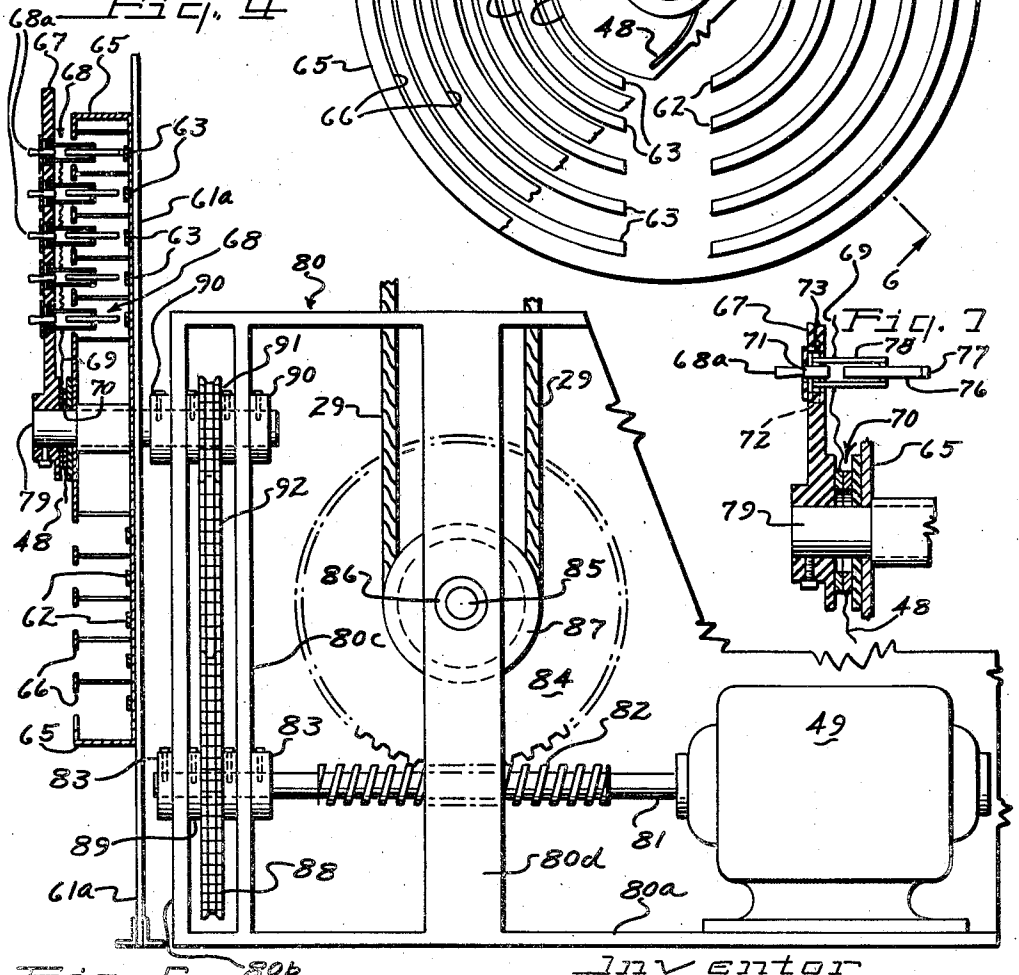


Fig. 6

Fig. 7

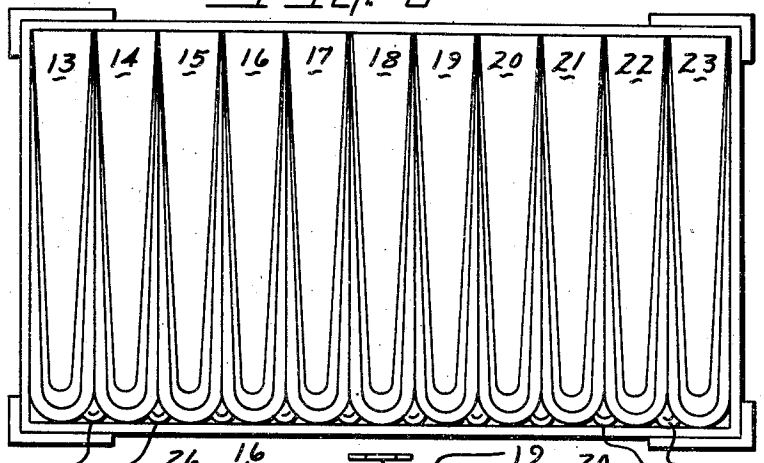
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THEATER CURTAIN

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Fig. 8



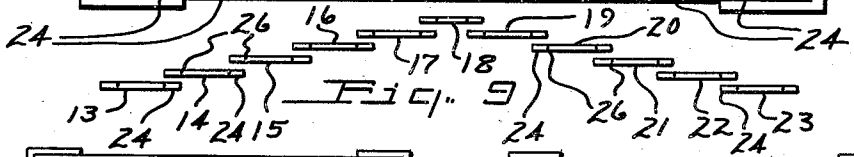


Fig. 9

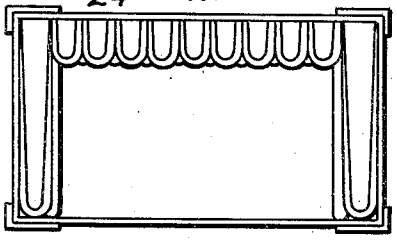


Fig. 10

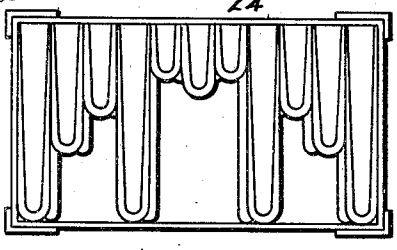


Fig. 11

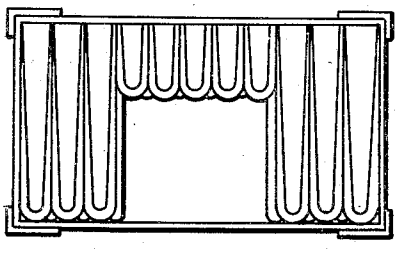


Fig. 12

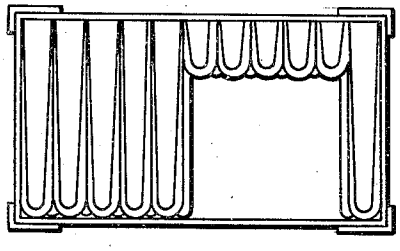


Fig. 13

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2,407,024

THEATER CURTAIN

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Application August 17, 1944, Serial No. 549,886

23 Claims. (Cl. 160—126)

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Our invention relates to a composite theatre curtain formed of a plurality of separate panels, each of which is adapted to be, separately, raised or lowered any of a series of predetermined distances, said panels also being adapted to be so manipulated in any desired plurality of adjoining or separated groups, thus to selectively form in any relative position in the composite curtain one or more openings, and to provide such opening or openings with any desired contour of a large selection of configurations permitted by such manipulation. Our invention also relates to means for relatively raising and lowering component panels of such curtain as above indicated which, after a simple manual setting of certain operating means for a selective relative location and contour of opening or openings in said curtain, will automatically quickly and positively cause each of a group of selected panels to synchronously move to the desired relative positions.

It is a principal object of our invention to provide a composite curtain comprising a desired plurality of separate panels, each of which may be separately manipulated to aid in forming any of a large number of selective configurations of openings in the composite curtain and of different relative locations.

It is also an important object to provide panels, as component parts of a curtain, each of which may be decorated or draped as desired.

Still another object is to provide simple control pre-setting means for actuating mechanism to raise and lower the curtain panels to provide any one or more of such selective aperture configurations.

Provision of automatic mechanism which, when set in operation through pre-set controlling means, will cause the curtain panels of any selected group to be synchronously moved to form desired configurations, is also an important object of our invention.

In the drawings:

Fig. 1 is an elevation showing (upper part of the figure) counterweights, pulleys, and cables for individually raising and lowering the curtain panels; also illustrating (lower part of the figure) the electric operating panel-board and, diagrammatically, its electric operating means;

Fig. 2 is an elevation of a plurality of adjoining curtain panels and cables, and cable attachments to tops of each panel, respectively, and, as to two of them, the arrangement of counterweights;

Fig. 3 is an elevation of one of the switch mechanisms of the indicator-control, there being

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five such switches for each curtain panel, said switch being shown with circuit closed;

Fig. 4 is an elevation of the switch mechanism of Fig. 3, with circuit open;

Fig. 5 is a front elevation of the circuit breaker and its casing cover (one for each curtain panel) and its rotating arm carrying five of the switch mechanisms illustrated in Figs. 3 and 4, left-hand side of Fig. 5 showing part of the casing cover which is broken away in the right-hand side to show the face of the circuit breaker;

Fig. 6 illustrates diagrammatically a motor and the mechanism which it actuates for raising and lowering one of the curtain panels, and also mechanism for rotating the switch carrying arm shown as part of the elevation of Fig. 5, the section indicated by line 6—6 of Fig. 5 being at the left-hand side of Fig. 6;

Fig. 7 is an enlargement of a portion of Fig. 6;

Fig. 8 is a front elevation of the curtain as a whole, showing the arrangement of its adjoining component panels;

Fig. 9 is a diagram showing in plan the staggered and overlapping arrangement of the respective battens of each of the curtain panels and the relative locations of attachment of the cables for raising and lowering;

Figs. 10, 11, 12 and 13 are front elevations, illustrating a few of the numerous selective curtain aperture configurations possible with our invention.

Referring to the drawings in which like numerals indicate similar parts throughout the several views, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22 and 23 (Fig. 2) indicate curtain panels, each a separate curtain adapted to be raised and lowered without disturbing the position of any of the others.

Each of said curtain panels 13 through 23 are formed of any suitable material such as canvas or the like, and faces of each may be painted or covered or draped in such manner as artistic or designing skill may dictate.

Referring particularly to Fig. 2: Each of the curtain panels 13 through 23 (14 being omitted from this figure) is rounded at its lower end (curtain 23, as illustrated in this figure, being partly broken away); and each of said panels except center curtain panel 18 (also shown partly broken away) is provided with a lateral lapped extension 24, also rounded at its lower end to substantially fill space between bottom and upwardly curved edges of adjoining panels, such lapped extensions 24 being secured to the edges

of their respective panels by any means well known in the art.

Still referring to Fig. 2: Lateral lapped extensions 24 on curtain panels 13 through 17 (14 being omitted in this figure to more clearly illustrate this detail) carry such lapped extensions 24 on their right-hand edges, while curtain panels 19 through 23 carry such lapped extensions 24 on their left-hand edges, curtain panels 17 and 19 thus having such lapped extensions 24 spaced apart but adjoining each other, and center curtain panel 18 being adapted to cover such lapped extensions 24 of its adjoining curtain panels 17 and 19, as well as the space between them.

Each of said curtain panels is attached by any means well known in the art to a batten 25 (Fig. 2). The respective curtain panels are not in lateral alignment with each other, but are staggered so that adjoining edges overlap as most clearly shown in Fig. 9. To each of said battens 25 are secured two cables 26—26 (as most clearly shown in Fig. 9), each of which passes upwardly from its respective batten 25 over a respective pulley 27 mounted a sufficient distance above the proscenium arch for permitting raising of each of the curtain panels, if desired, out of view of the audience or with only desired lower portions in view (the latter alternative being most clearly illustrated in Figs. 10 through 13 of the drawings). After passing over respective pulleys 27—27, cables 26—26 are attached to their respective counterweights 28, the function of which, as well as their means of attachment to the cables, being old in the art therefore not needing further description.

Each counterweight 28 has attached to its upper surface a cable 29 which, after passing upward over a pulley 30, extends downward around a pulley actuated by a motor, later to be described, and thence upward to the bottom of counterweight 28 to which it is attached.

In Fig. 1 is illustrated, largely diagrammatically, the relative positioning (which, preferably, will be at either side of the stage) of the counterweights 28 and their appurtenances, including cables 29, for raising and lowering the respective curtain panels, also at the left and lower part of the figure, showing the operating panel board with its switches, circuit breakers, and electric wiring. Each curtain panel is provided with a motor and controlling means identical with all the others.

Generally describing the electric apparatus and wiring connections as illustrated in the lower part of Fig. 1: Main single pole switch 31 adapted to connect a source of electric power with the motor-controls and motors of each panel of the composite curtain, is connected by wire 32 to motor reversing switch 33, which is, by wire 34, connected to terminals of each of a series, 35, of 11 single pole switches, each of which is connected by a wire 36 to each, respectively, of an appropriate terminal of circuit breakers 37, 38, 39, 40, 41, 42, 43, 44, 45, 46 and 47 (details of which circuit breakers will later be explained in our consideration of Figures 3 through 7 of the drawings). The other terminals of each of circuit breakers 37 through 47 are connected by respective wires 48 (as indicated with respect to circuit breaker 37, Fig. 1) to respective motors 49, 50, 51, 52, 53, 54, 55, 56, 57, 58 and 59. Wire 60 and its extensions (not numbered) to each motor connects the main switch 31 with each of said motors 49 to 59 inclusive.

Referring particularly to Fig. 5, and its sectional view in Fig. 6, in which is illustrated the construction and mode of operation of circuit breaker 37 and its appurtenances (all other circuit breakers 38 through 47, as illustrated in Fig. 1, being identical). Circuit breaker 37 comprises a disk 61 of insulating material, which is rigidly attached as part of the operating panel board 61*a*.

Concentrically disposed and preferably equispaced in two series, each series being on an opposite side of the surface of disk 61, with their upper surfaces in the same plane, are copper conductor strips 62 and 63, each in the form of a segmental annulus, respective ends of each of which respective series being in the same annular circles with corresponding conductor strips of the opposite side of disk 61, the interrupted annulus between ends of corresponding strips 62 and 63 being the surface of the insulating material of disk 61.

In Fig. 1, as above described, wires 36 (in the interests of simplicity of the diagram) from the appropriate switches of series 35 are illustrated as connected to the several disks 61. Amplifying details of Fig. 5 show these wires 36 connected to each of a series of copper strips 62 and 63 of each of circuit breakers 37 through 45; so as, when circuit is completed, to energize each of said strips 62 and 63.

Still referring to Fig. 5: Casing cover 65 (Fig. 5), broken away, as illustrated, to show on one side disk 61 and its conductor strips 62 and 63, is provided with a series of annular slots 66—66 registering above conductor strips 62 and 63 for the passage therethrough of switch mechanism later to be described. Arm 67, carrying switches for contact with copper strips 62 or 63, is pivoted at the center of disk 61 and is adapted to be rotated a full circle over the surface of said disk. Said rotating arm 67 carries a series of switches 68, each being adapted to establish electrical contact with a different pair of oppositely disposed conductor strips 62 and 63. To complete circuit to the respective motors 49 through 59, each of switches 68 are connected in series by wire 69 which is attached to conductor annulus 70 (Figs. 6 and 7), which conductor annulus 70 is connected by wire 48 to the appropriate motor.

Figs. 3 and 4 are, respectively, elevations of the mechanism of each of said switches 68, Fig. 3 showing the switch 68 establishing contact with one of the copper strips 62, and Fig. 4 showing the switch open.

Rockers 71 of insulating material of switches 68 are pivoted to oscillate on rocker pins 72, ends of which pin 72 are respectively supported in opposite walls of slots 73 in the respective arms 67, through each of which extends operating lever handles 68*a* of switches 68. Pivoted to the center of rocker 71 are links 75, the lower ends of which are pivotally attached to the centers, respectively, of conductor disks 76, each of which carries contact element 77 for establishing circuit through copper strips 62 and 63 of circuit breakers 37 through 47, respectively. Links 78—78 are respectively pivoted to outer ends of rockers 71, and at their opposite ends to outer edges of disks 76, wires 69, connected respectively to links 78 of adjacent switches, the innermost switch on each of rotating arms 67, being attached respectively to conductor annulus 70 (Fig. 7).

Arms 67 are secured, releasably if desired, at their lower ends to shafts 79, such connection in Figs. 6 and 7 being clearly shown by set screw

(not numbered). Each of motors 49 through 59 are, as shown in Fig. 6, carried on a suitable base 80*a* of supporting frame 80, motor shaft 81 carrying worm 82, the outer ends of shafts 81 being carried in suitable bearings 83 supported by frame members 80*b* and 80*c*.

Worms 82 mesh with respective worm-gears 84 carried by shaft 85 in suitable bearings 86 carried by frame member 80*d*. Groove pulley 87 is suitably attached to worm gear 84 so as to rotate with said gear, and the respective curtain cables 29 pass around the grooves of respective pulleys 87 so that rotation of a worm gear 84 and its attached pulley 87 will raise or lower, according to the direction of rotation, the associated curtain panel of the particular unit being operated.

Keyed adjacent to the end of motor-shaft 81 is sprocket wheel 88, which is secured in suitable bearings 89—89, supported by frame members 80*b* and 80*c*.

After passing through an opening in respective covers 65 of each of circuit breakers 37 through 47, respective shafts 79 extend through operating board standard 61*a*, and are each supported in bearings 90—90 carried respectively by frame supporting members 80*b* and 80*c*, between which supports are keyed sprocket wheels 91, sprocket chains 92 (one for each unit) passing around and meshing with sprocket wheels 88 and 91 of each of the respective units.

Preliminarily to describing operation: It is apparent that each of the conductor strips 62 or 63 of the circuit breaker illustrated in Fig. 5 (of which there are five conductor strips in each series on each side of disk 61) are of different arcuate lengths. The curtain is moved only while a selected one of switches 68 of any given panel operating means is in contact with one of the conductor strips 62 or 63, as such selected switch 68 when closed completes a circuit to operate the motor for raising (or lowering) the curtain, and the motor operates only while the circuit is thus closed; so that when the rotating arm 67 (Fig. 5), after beginning its rotative movement, reaches the end of the strip, the circuit is opened and the motor stops. Lengths of respective conductor strips 62 and 63 of the circuit breaker 61 (Fig. 5) of any given unit (all units being identical) are proportional in length to the upward or downward desired movement of the curtain. Thus, as an illustrative example, the conductor strips 62 or 63 (Fig. 5) nearest the center of disk 61, being the shortest of the strips (speed of the motor and relative size of the gearing mechanism being properly correlated) is designed to raise or lower the curtain ten feet, the raising and lowering only continuing while switch 68 establishes circuit through said shortest conductor strip through the motor. The next adjoining strip is of a length to raise the curtain 12 feet; the next strip, 14 feet; the next strip, 16 feet; and the longest strip, 18 feet.

In describing the operation, let us first assume that the curtain panels are in lowermost position with lower edges on the stage. It is desired to raise all but the two end curtain panels to a position illustrated in Fig. 10, which let us say is eighteen feet. The main switch is open. The first step of the operator will be to manually rotate the switch arms 67 of curtains to be moved to a position over the ends of conductor strips 62 or 63. The operator next closes each of the respective switches 68 which contact with the outermost or larger of the respective conductor

strips 62 or 63. Then, the reversing switch being in proper position, the main switch is closed and the circuit flows through the motor, which coincidentally raises the curtains and rotates the switch arm 67 (Fig. 5). When the switch arm reaches the end of said series of strips, circuit will be broken through the motor and the motor will stop. Obviously to lower the curtain the direction of rotation of the motor is changed by the reversing switch, so that a reverse movement of the arm will lower the curtains. From the foregoing description it will be seen that any one or more of the curtain panels may be set for raising or lowering by manipulation of the appropriate switches 68 of the units to be raised or lowered.

Our invention is not to be limited to the apparent proportional spacing apart of the respective ends of series 62 and 63 of conductor strips on disk 61, as illustrated in Fig. 5. Such strips, on the contrary, may be nearer together than appearing in the drawings, so as to permit the slight manual operative movement of arm 67, as above described, between ends of respective series of conductor strips 62 in 63; also arm 67 may be rigidly connected to shaft 79, as (without specific description) illustrated in Fig. 5, or which will be releasably secured to said shaft by set screw, as shown in Figs. 6 and 7; or said arm may be so connected by releasable or adjustable means which, being well known in the art, need not be further described. Also, while we have illustrated and described two series 62 and 63 of conductor strips, it will be obvious to any of skill in the art that one series only of conductor strips could be used with like effect. It is also apparent that other forms of switches 68 and other means of breaking circuit through the motor after a cycle of operation could be substituted with like effect. Also, the staggered alignment of respective curtain panels as illustrated in Fig. 9 could be varied—all without departing from the spirit of our invention, the scope of which is as defined in the appended claims.

What we claim and desire to secure by Letters Patent is:

1. In a device of the character described, a curtain comprising a plurality of separate panels, and means to raise and lower, separately, each panel.

2. In a composite theatre curtain, a plurality of curtain panels, means to raise and lower each panel independently of the others, and means to limit the raising and lowering, respectively, of each of said panels.

3. A composite theatre curtain comprising a plurality of separate curtain panels, each adapted to be automatically raised and lowered to any of a series of predetermined positions.

4. In a device of the character described, a curtain panel, means to wholly or partially raise and lower said curtain panel, and means to automatically limit the extent of raising or lowering said panel to any of a series of predetermined positions.

5. In a device of the character described, a plurality of separate curtain panels, means to separately raise and lower said curtain panels, means to limit raising and lowering of each of said panels to any of a series of different positions, and means to control said raising and lowering means.

6. In a device of the character described, a plurality of curtain panels adapted to be separately raised and lowered, each of said panels

being disposed in a different vertical plane from all but one of the others, and each having lateral edges overlapping corresponding adjacent edges of an adjoining curtain panel.

7. In a device of the character described, a plurality of separate curtain panels adapted to be separately raised and lowered, each of said panels being disposed in a different vertical plane from all but one of the others, and each having lateral edges overlapping corresponding adjacent edges of an adjoining curtain panel, and means to limit raising and lowering of each of said panels to a series of predetermined positions.

8. In a device of the character described, a plurality of separate curtain panels, each adapted to be separately raised and lowered, each of said panels being disposed in a different vertical plane from all but one of the others, and each having lateral edges overlapping corresponding adjacent edges of an adjoining curtain panel, means to limit raising and lowering of each of said panels to a series of predetermined positions, and means to control raising and lowering of said panels.

9. In a device of the character described, a plurality of separate curtain panels adapted to be separately raised and lowered, each of said panels being disposed in a different vertical plane from all but one of the others, and each having lateral edges overlapping corresponding adjacent edges of an adjoining curtain panel, means to limit raising and lowering of each of said panels to a series of predetermined positions, means to control raising and lowering of said panels, and means to actuate said last-mentioned means.

10. A composite theatre curtain comprising a plurality of curtain panels, means to raise and lower, separately, each curtain panel, and means to set said raising and lowering of each curtain panel to a predetermined position relative to the others.

11. A composite curtain comprising a plurality of curtain panels adjoining each other laterally, means to control raising or lowering of a selected plurality of said curtain panels to provide a desired contour opening in said composite curtain, and means to actuate said last-mentioned means.

12. In a device of the character described, a curtain panel having its lower edge arcuately formed, said panel having an extended lateral edge, the lower edge of which lateral edge is arcuately formed, said panel being adapted to be raised and lowered.

13. In a device of the character described, means adapted to raise and lower a curtain panel provided with a counterweight for said curtain, said means comprising a disk carrying a plurality of spaced-apart arcuately formed conductor strips, and switch means adapted to establish an electrical circuit through a selected one of said conductor strips.

14. In a device of the character described, means adapted to raise and lower a curtain panel, said means comprising a disk carrying a plurality of spaced-apart arcuately formed conductor strips, switch means adapted to establish electrical circuit through a selected one of said conductor strips, and means to move said switch means while in contact with said conductor strip the length of said conductor strip.

15. In a device of the character described, a curtain panel, means to control raising and lowering of said curtain panel to any of a plurality of predetermined positions, said means comprising a disk of electric insulating material carrying on its face a series of electrical conductor strips, each member of said series being of segmental circular contour and spaced laterally from an adjoining member of said series, the members of said series of conductor strips being electrically connected in parallel, an arm spaced above and adapted to be rotated over said conductor strips, said arm carrying a series of electric switches each adapted to make and break electrical contact with one of said conductor strips, and means to rotate said arm over said conductor strips.

16. In a device of the character described, a curtain panel, means to control raising and lowering of said curtain panel to any of a plurality of predetermined positions, said means comprising a disk of electric insulating material carrying on its face a series of electrical conductor strips, each member of said series being of segmental circular contour and spaced laterally from an adjoining member of said series, the members of said series of conductor strips being electrically connected in parallel, an arm spaced above and adapted to be rotated over said conductor strips, said arm carrying a series of electric switches, each adapted to make and break electrical contact with one of said conductor strips, and means to rotate said arm over said conductor strips.

17. In a device of the character described, a curtain panel, means to raise and lower said curtain panel, and means to control such raising and lowering to any of a series of predetermined positions, said last-named means comprising a disk of insulating material carrying conductor strips and also comprising an arm adapted to be moved in an arc over said conductor strips, said arm carrying a series of switches, each of such switches being adapted to make or break electrical circuit through one of said conductor strips, said curtain raising means and said arm of said control means being actuated by the same motor.

18. In a device of the character described, a curtain panel, a counterweight for said curtain panel, a cable connected at one of its ends to a batten forming part of said curtain panel, said cable passing over a pulley supported above said curtain panel, said cable being attached at its opposite end to said counterweight, means to raise and lower said curtain panel comprising a cable attached to said counterweight, said cable passing over a pulley supported above said counterweight and around a grooved pulley keyed to a shaft, a frame carrying bearings for said shaft, to which shaft is also keyed a worm gear, a worm meshing with said worm gear and carried by an electric motor shaft, the shaft of said motor carrying also a sprocket wheel journalled in said last-mentioned frame to rotate with said motor shaft, a sprocket chain carried by said sprocket wheel and in engagement with a second sprocket wheel, said last-mentioned wheel being keyed to a shaft carried by said frame, to which shaft is also keyed a switch arm.

19. In a device of the character described, means for raising, lowering and holding in selected position a plurality of curtain panels comprising a rotatable arm carrying a plurality of switches, each of said switches comprising a conductor disk carrying a contact element to establish electrical circuit and also comprising a rocker pivoted by links to said conductor disk and carried by said switch arm, the switch being operable by a handle mounted on the rocker.

20. A composite theatre curtain, comprising a plurality of separate curtain panels.

21. A composite theatre curtain, comprising a plurality of separate curtain panels having adjacent edges overlapping.

22. In a composite theatre curtain, a plurality of separate curtain panels, and means for raising and lowering, stopping and holding in any position, intermediate, fully raised and lowered positions, each of said curtain panels.

23. In a device of the character described, a

plurality of curtain panels and means to separately raise, lower and hold said panels, respectively, in partially raised positions, said panels, except one, being disposed in pairs in different vertical planes, and each panel having a lateral edge adapted to overlap an adjacent edge of an adjoining curtain panel.

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