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COLOR WHEEL CENTERING DEVICE

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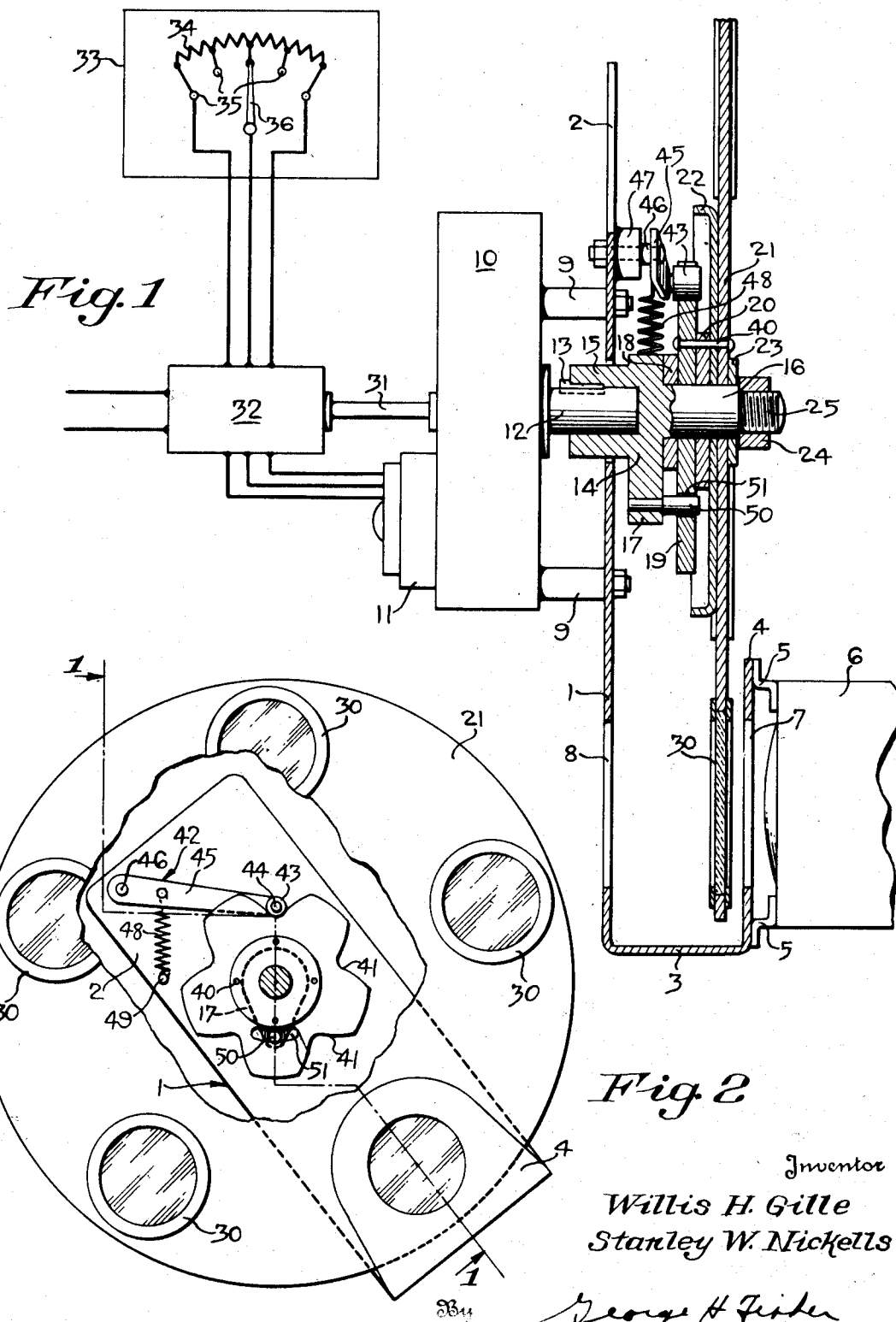


Fig. 2

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COLOR WHEEL CENTERING DEVICE

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This invention relates in general to light controlling apparatus, and more particularly to remote control devices for varying the color of light produced by theater lighting devices.

In apparatus of this type, it has been customary to locate in the path of light issuing from a spotlight, a wheel having therein a plurality of different color screens, each of which may be selectively placed in registration with the beam of light by rotating the wheel to the proper angle. It has also been customary to control the angular position of such color wheels by remote control arrangements in order that the lighting effects of the entire theater may be controlled from a single point. Such remote control arrangements usually consist of an electric motor for rotating the wheel, and a selective type of controller associated with the motor, so that upon moving of the controller to obtain a desired color, the motor automatically rotates the color wheel to follow the movement of the controller thereby bringing the desired screen into registration with the spotlight. One form of remote control arrangement is illustrated in the application of Clarence W. Nessel Serial No. 67,819, filed March 9, 1936.

Heretofore, remote control devices for color wheels have not been entirely satisfactory, due to friction and inertia in the color wheel driving mechanism and other causes. These effects either caused the wheel to stop before the screen became centered with respect to the spotlight, or to cause the wheel to overrun thus carrying the center of the screen past the center of the spotlight. In either event, exact centering of the colored screen with respect to the spotlight could not be obtained, and it was necessary to make the colored screen substantially larger than the spotlight lens in order to compensate for the inaccuracies above noted.

It is an object of our invention, therefore, to provide a device for automatically bringing a color wheel to rest with its screen in exact registration with that of the spotlight.

It is a further object of our invention to provide a color wheel centering device which is simple in construction and which may be attached to known color wheel actuating devices for removing the defects above noted.

Another object of our invention is to provide a device for positively bringing a remotely controlled movable element to rest in a predetermined position, regardless of inaccuracies of the remote control apparatus.

Further objects and advantages will be appar-

ent from the following description taken in connection with the accompanying drawing, in which

Figure 1 is a side elevation, partly in section, of one form which our invention may take, and

Figure 2 is a front view of the device illustrated in Figure 1, parts being broken away and others being omitted for the sake of clearness.

Reference character 1 designates a U-shaped base frame having a long leg 2, a horizontal portion 3 and a shorter leg 4. Mounted upon leg 4 by means of brackets 5 is a spotlight 6. An opening 7 is formed in the shorter leg 4 and a corresponding opening 8 is formed in the longer leg 2, these openings allowing the passage of light from the spotlight to the desired object. Mounted upon section 2 of the frame by means of supporting sleeves 9 is a motor driving device 10. This device consists of an electric motor 11 which through a suitable gear train (not shown) rotates the shaft 12. Keyed to the shaft 12 as at 13 is an extension shaft structure 14. This structure comprises a hub 15 which surrounds shaft 12, an extension shaft 16, and a crank arm 17. Rotatably mounted upon the shaft 16 is a spacing washer 18, a cam 19, a second spacing washer 20, a color wheel 21 and a stiffening member 22 for said color wheel. These members are held on the shaft by means of a washer 23 and a cooperating nut 24 threaded on reduced portion 25 of extension shaft 16. Mounted around the edge of color wheel 21 are a series of differently colored screens 30. These screens are so spaced from the center of the wheel that they may be selectively brought into registration with the spotlight 6 by rotating the wheel to the corresponding angular position. The cam 19 is rotatably secured to the color wheel 21 by means of a rivet 40. This cam, while rotating freely on shaft 16, is however, rotated by shaft 12 through crank arm 17 and crank pin 50 which engages in a slot 51 of the cam. Thus the motor 11 in causing rotation of shaft 12, likewise causes rotation of the color wheel.

In order to cause the wheel to be rotated to the correct angular position to bring the desired light into registration with the spotlight, we have illustrated a remote control device 31, 32, 33. While this remote control device may take any known form, we prefer to employ a control device as disclosed in Patent No. 2,028,110 to D. G. Taylor. In general this control arrangement comprises a balanced relay, the unbalancing of which causes the motor to run one way or the other. This relay is connected to a control potentiometer and to a balancing potentiometer

which is adjusted by the motor driving means. When the control potentiometer is moved from midposition it unbalances the relay and thus causes the motor to operate until the balancing potentiometer rebalances the relay and breaks the motor operating circuit. Thus for any adjustment of the control potentiometer, the motor driving means will assume a corresponding position. Located in the control box 32 (but not shown) is the balanced relay above mentioned and also the balancing potentiometer which may be operatively connected with the motor driving means 10 by shaft 31 which may be an extension of shaft 12. In the control box 33, which may be located wherever desired, is placed the control potentiometer 34. This potentiometer is tapped at five points, one for each screen in the color wheel. By adjusting contact arm 35 to the corresponding contact 35, the desired colored screen may be brought into registration with the spotlight. The remote control means above described forms no part of our invention and inasmuch as such control means is already known in the art we have not described it in detail. It is to be understood that any suitable remote control means may be employed.

As noted hereinbefore, the remote control devices of the type illustrated do not always cause the screen to be properly centered with respect to the spotlight due to friction, inertia and other factors. Our invention for overcoming this difficulty will now be described in detail. As mentioned hereinbefore, the color wheel is rotatably secured to the cam 19 by means of a rivet such as 40. By this arrangement the cam and color wheel rotate as a unit. Referring now to Figure 2, the cam 19 is provided with a series of depressions or recessed portions 41, there being one such portion for each screen in the color wheel, these recessed portions being angularly spaced in the cam correspondingly to the angular spacing of the screens 30 on the color wheel. A cam follower generally indicated at 42 comprises a roller 43 mounted upon a shaft 44 which is secured to an arm 45. Secured to the other end of arm 45 is a shaft 46 which is journaled to the member 2 as at 47. In order to urge the roller 43 into the recesses of the cam, a spring 48 is provided which is secured to the arm 45 at one end and at its other end is secured to the member 2. Whenever the cam is rotated so that the roller 43 enters a recess, this roller under the action of spring 48 will be urged towards the bottom of said recess. Inasmuch as the roller 43 is relatively stationary, the action of the spring 48 will cause the cam to be rotated to such a position that roller 43 reaches the bottom of said recess. By properly setting the cam 19 with respect to the color wheel 21, the screens 30 may be brought into registration with the light when the roller 43 is at the bottom of the corresponding recess on the cam. It will be seen, therefore, that the motor 10 has only to rotate the cam and color wheel to such a point that roller 43 enters a recess on the cam, and from that point the spring 48 will cause the cam to be rotated and stopped at the position wherein the screen is in exact registration with the spotlight.

In order to allow the centering device to operate more freely we have provided a lost motion driving means between the shaft 12 and the cam 19. This lost motion driving means comprises the crank 17, the crank pin 50, and the slot 51 into which the pin 50 extends. As shown in Figure 2, slot 51 is considerably longer than the diameter

of the pin, thus allowing cam 19 to rotate through a substantial angle freely of the pin 50. Due to this lost motion driving means the roller 43 urges the cam to its proper position without the necessity of rotating the motor with the cam, thus causing the color wheel to be quickly and positively centered once the motor has rotated the color wheel to the approximately correct position.

From the foregoing, it is apparent that when the controller arm 36 is moved to bring the desired color screen into registration with the spotlight, the remote controlling means has only to rotate the wheel to a point near the correct position, and from this point, the action of the cam follower in entering a recess of the cam will cause the wheel to be rotated to the exactly correct position, regardless of the actual stopping positions of the driving mechanism.

While we have shown the preferred embodiment of our invention it is to be appreciated that it may be practiced in various forms. For instance, if desired, the cam may be mounted so as to remain stationary, while the cam follower may be rotatively mounted with the wheel. Adjustable connecting means between the cam or follower and the wheel may also be provided. The lost motion connection, if desired, may be replaced by other forms of connections, as, for instance, an elastic coupling between the motor and wheel. Furthermore, the screen holder, and cam need not be rotatably mounted but may be made in other shapes and may move in other manners than rotation. The invention is also not limited to lighting devices but is applicable to other uses where remote control is desired. Therefore we desire to be limited only by the scope of the appended claims.

We claim as our invention:

1. In a lighting apparatus, a wheel carrying a plurality of colored screens and adapted to be rotated for selectively placing said screens in registration with a source of light, a motor for rotating said wheel, selective means for controlling said motor to cause it to position the desired screen in registration with said source of light, and means for positively positioning said screen with respect to said source comprising a cam fixed relatively to the color wheel, the assembly formed thereby being driven by said motor through a lost motion connection, said cam having a plurality of depressions therein at positions corresponding to the positions of the screens on the wheel, and a cam follower urged towards said cam for causing the cam upon stopping of said motor to assume a definite position, thereby properly positioning said screen with respect to said source of light.

2. In a lighting apparatus, a wheel carrying a plurality of colored screens and adapted to be rotated for selectively placing said screens in registration with a source of light, a motor for rotating said wheel, means connecting the motor and wheel and permitting relative movement therebetween, selective means for controlling said motor to cause it to position the desired screen in registration with said source of light, and means for positively positioning said screen with respect to said source comprising a cam fixed relatively to said color wheel, said cam having a plurality of depressions therein at positions corresponding to the positions of the screens in the wheel, and a cam follower urged towards said cam for causing the cam upon stopping of said motor to assume a definite position, thereby

properly positioning said screen with respect to said source of light.

3. In a lighting apparatus, a source of light, means for carrying a plurality of varied light controlling screens and movably mounted so as to selectively place said screens in registration with said light source a motor for moving said carrying means, selective means for controlling the motor to cause it to position the desired light controlling screen in registration with said source, and means for positively positioning said screen with respect to said source comprising a cam fixed relatively to said carrying means, the assembly formed thereby being driven by said motor through a lost motion connection, the cam having a plurality of depressions therein at positions corresponding to the positions of the screens on the screen carrying means, and a cam follower urged towards said cam for causing the cam upon stopping of said motor to assume a definite position, thereby properly positioning said screen with respect to said source of light.

4. In a lighting apparatus, a source of light, means for carrying a plurality of varied light controlling screens and movably mounted so as to selectively place said screens in registration with said source of light, a motor for moving said carrying means, means connecting the motor and carrying means and permitting of slight relative movement therebetween, selective means for controlling the motor to cause it to position the desired light controlling screen in registration with said source, means for positively positioning said screen with respect to said source comprising a cam fixed relatively to said carrying means, the cam having a plurality of depressions therein at positions corresponding to the positions of the screens on the screen carrying means, and a cam follower urged towards said cam for causing the cam, upon stopping of said motor, to assume a definite position, thereby properly positioning said screens with respect to said source of light.

5. In a lighting apparatus a source of light, means for carrying a plurality of varied light controlling areas and movably mounted so as to selectively place said areas in registration with said source of light, means for moving said carrying means, selective means for controlling said second means to cause it to position the desired light controlling area in registration with said source of light, means operatively associated with said carrying means for positively positioning said area with respect to said source, said last named means comprising a lost motion drive means interposed between said second means and carrying means, a cam having depressions therein at intervals corresponding to the locations of the light controlling areas on said carrying means, and a cam follower which is urged towards said cam.

6. In a lighting apparatus, a source of light, means for carrying a plurality of varied light controlling areas and movably mounted so as to selectively place said areas in registration with said source of light, means for moving said carrying means, means connecting the moving and carrying means and permitting of relative movement therebetween, selective means for controlling the moving means to cause it to position the desired light controlling area in registration with said source of light, and means operatively associated with said carrying means for positively positioning said area with respect to said source, said last named means comprising a cam having depressions therein at intervals corresponding

to the locations of the light controlling areas on said carrying means, and a cam follower which is urged towards said cam.

7. In a colored light projecting system, in combination, apparatus comprising a member movable into a plurality of predetermined positions for selectively determining the color of light to be projected by the apparatus, means for moving said member to said predetermined positions, selective means for controlling the moving means to cause it to position said movable member at a desired predetermined position, a lost motion drive means interposed between said moving means and movable member, and means for positively placing and holding said member in a desired predetermined position comprising a cam fixed relatively to said movable member and having therein a series of depressions at locations corresponding to the predetermined positions of said movable member, and a follower urged against said cam whereby said movable member is accurately centered in said predetermined positions.

8. In a colored light projecting system, in combination, apparatus comprising a member movable into a plurality of predetermined positions for selectively determining the color of light to be projected by the apparatus, means for moving said member to said predetermined positions, selective means for controlling the moving means to cause it to position said movable member at a desired predetermined position, a lost motion drive means operatively associated with said movable member interposed between said moving means and movable member, and means for positively placing and holding said member in a desired predetermined position comprising a cam having therein a series of depressions at locations corresponding to the predetermined positions of said movable member, and a follower urged against said cam whereby said movable member is accurately centered in said predetermined positions.

9. In a colored light projecting system, in combination, apparatus comprising a member movable into a plurality of predetermined positions for selectively determining the color of light to be projected by the apparatus, means for moving said member from one position to another, a remote controller for said means arranged to cause actuation of said means to move the member toward a selected one of said predetermined positions, said means being of a type operable to move said member in a continuous movement to the vicinity of any one of said predetermined positions under control of said remote controller, means providing for a limited amount of relative movement between said first means and said member and adjusting means for eliminating the effect of inaccuracies in the positioning of said member in response to said remote controller, said adjusting means including a device for positively moving said member to the correct predetermined position after it has been moved into the vicinity thereof by said first means whereby said member is accurately centered in said predetermined positions.

10. In a colored light projecting system, in combination, apparatus comprising a member movable into a plurality of predetermined positions for selectively determining the color of light to be projected by the apparatus, means for moving said member from one position to another, a remote controller for said means arranged to cause actuation of said means to move

the member toward a selected one of said predetermined positions, said means being of a type operable to move said member in a continuous movement to the vicinity of any one of said predetermined positions under control of said remote controller, means providing for a limited amount of relative movement between said first means and said member, and adjusting means for eliminating the effect of inaccuracies in the positioning of said member in response to said remote controller, said adjusting means comprising a cam and a cam follower therefor, said cam and cam follower being operably associated with said member so as to set said member in a predetermined position irrespective of said first means when said member has been moved to a position adjacent said predetermined position whereby said member is accurately centered in said predetermined positions.

11. In a colored light projecting system, in combination, apparatus comprising a member movable into a plurality of predetermined positions for selectively determining the color of light to be projected by the apparatus, means for moving said member to a selected one of said predetermined positions, and means operatively associated with said carrying means for positively positioning said member in said predetermined positions, said last named means comprising a lost motion drive means interposed between said moving means and member, a cam means having depressions therein at intervals corresponding to the predetermined positions of said member, a cam follower for said cam means, and means urging said follower against the cam.

12. In a colored light projecting system, in combination, apparatus comprising a member movable into a plurality of predetermined positions for selectively determining the color of light to be projected by the apparatus, means for moving said member to a selected one of said predetermined positions, and means operatively associated with said carrying means for positively positioning said member in said predetermined positions, said last named means comprising a lost motion drive means interposed between said moving means and member, a cam fixed relatively to said member, said cam having depressions therein at intervals corresponding to the predetermined positions of said member, a cam follower for said cam, and means urging said follower against said cam whereby upon stopping of said moving means said cam assumes a definite position thereby setting said member in a predetermined position.

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