April 1, 1952 R. G. WILLIAMS 2,591,650

CONTROL MEANS FOR COLOR LIGHTING APPARATUS

Filed Feb. 27, 1946 7 Sheets-Sheet 1

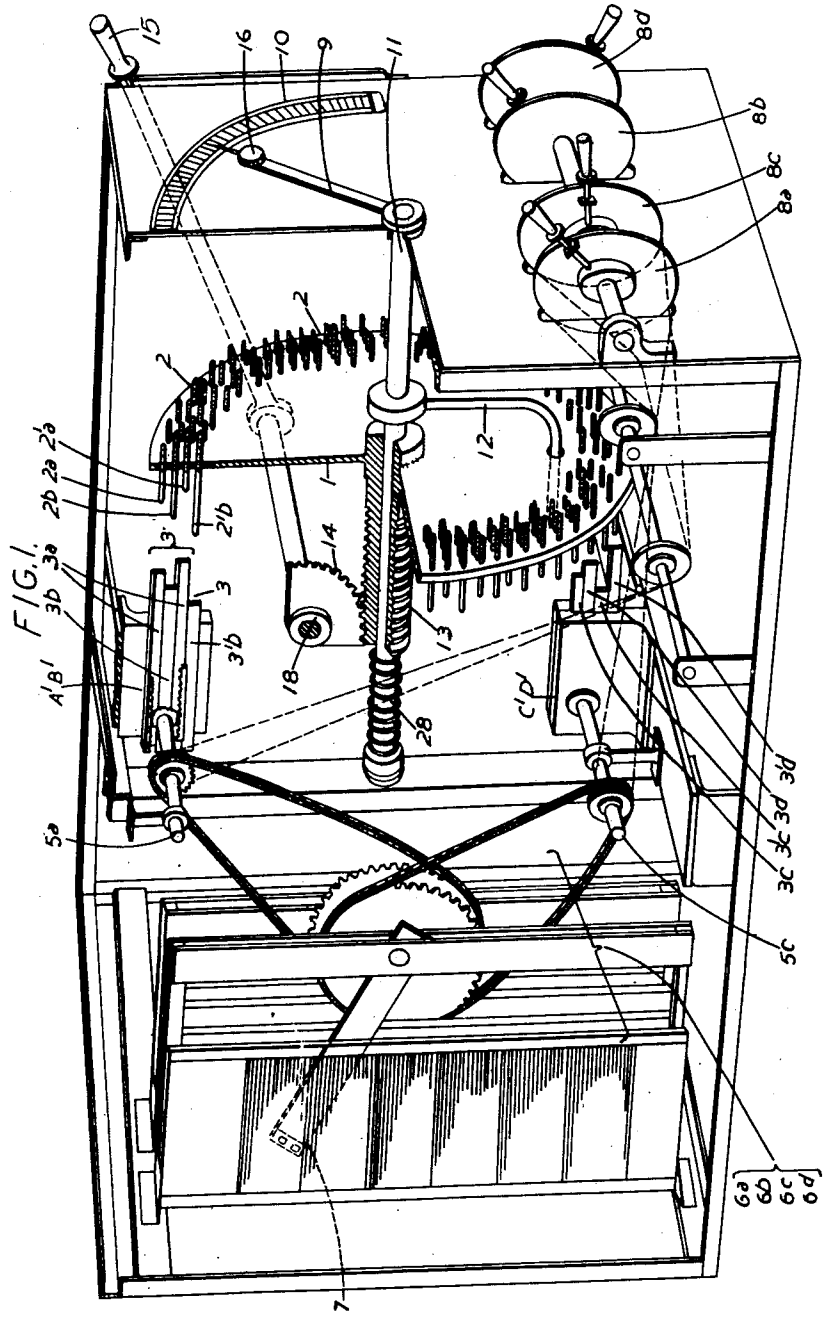

FIG. 1.

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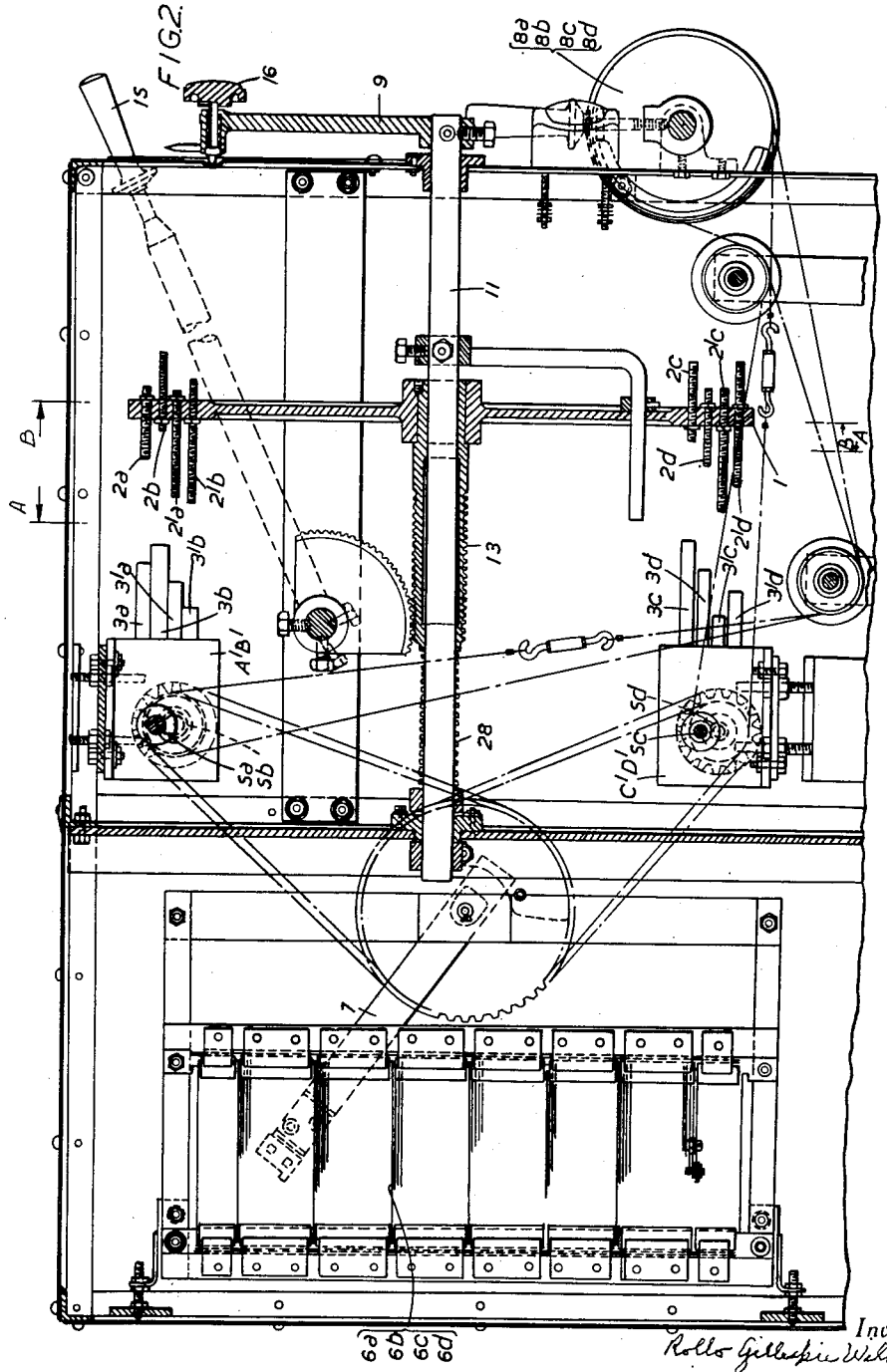
FIG. 2.



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CONTROL MEANS FOR COLOR LIGHTING APPARATUS

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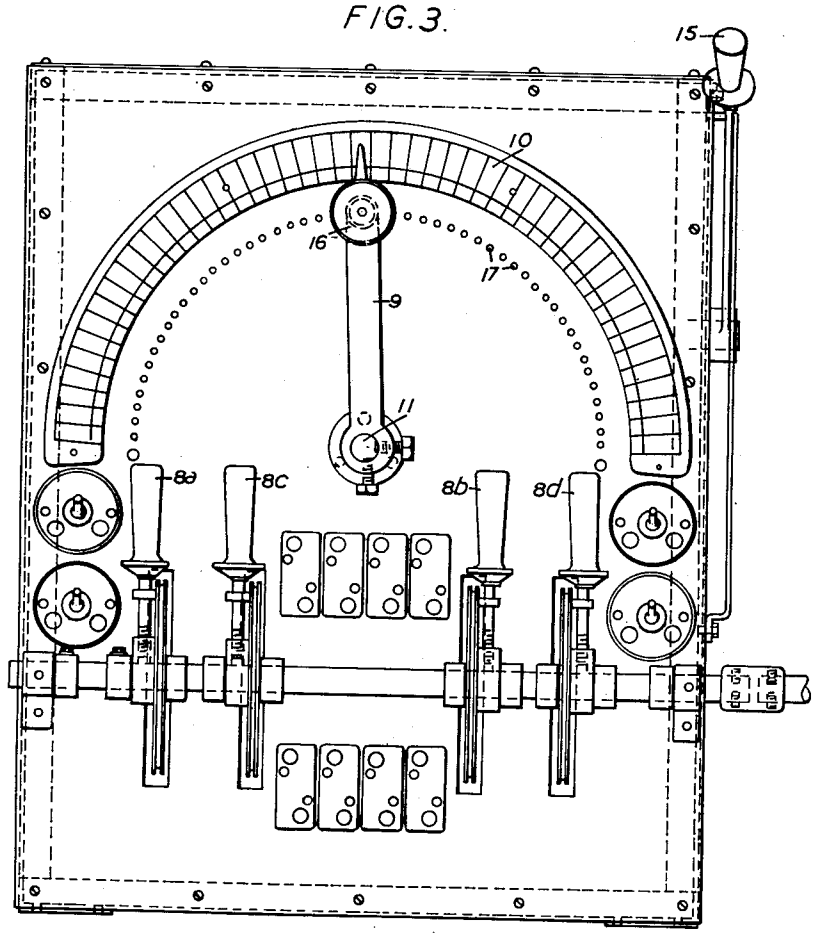
FIG. 3.



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CONTROL MEANS FOR COLOR LIGHTING APPARATUS

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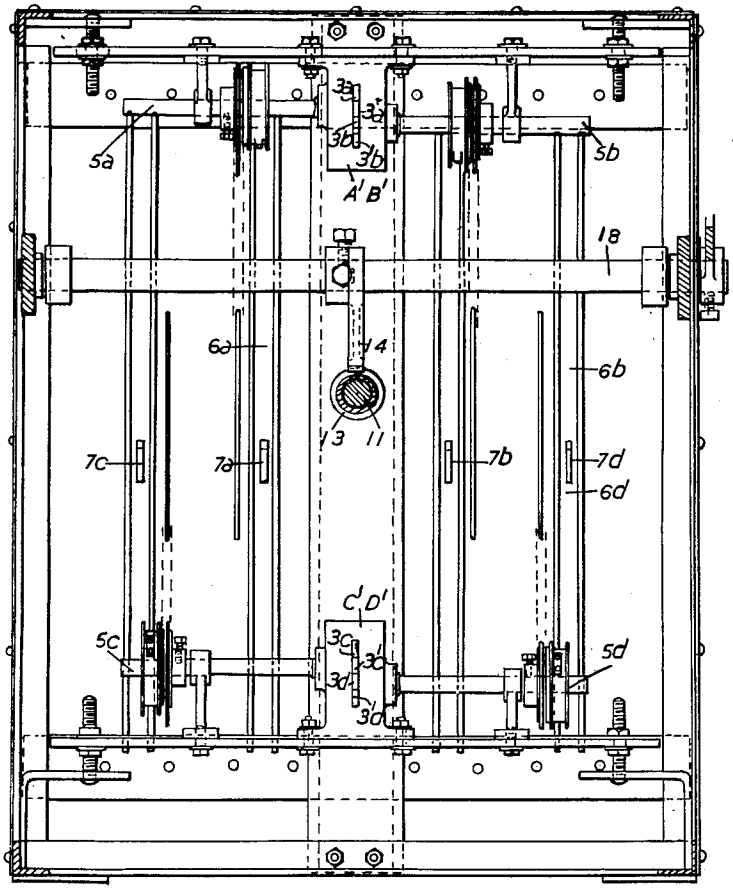
FIG.4



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CONTROL MEANS FOR COLOR LIGHTING APPARATUS

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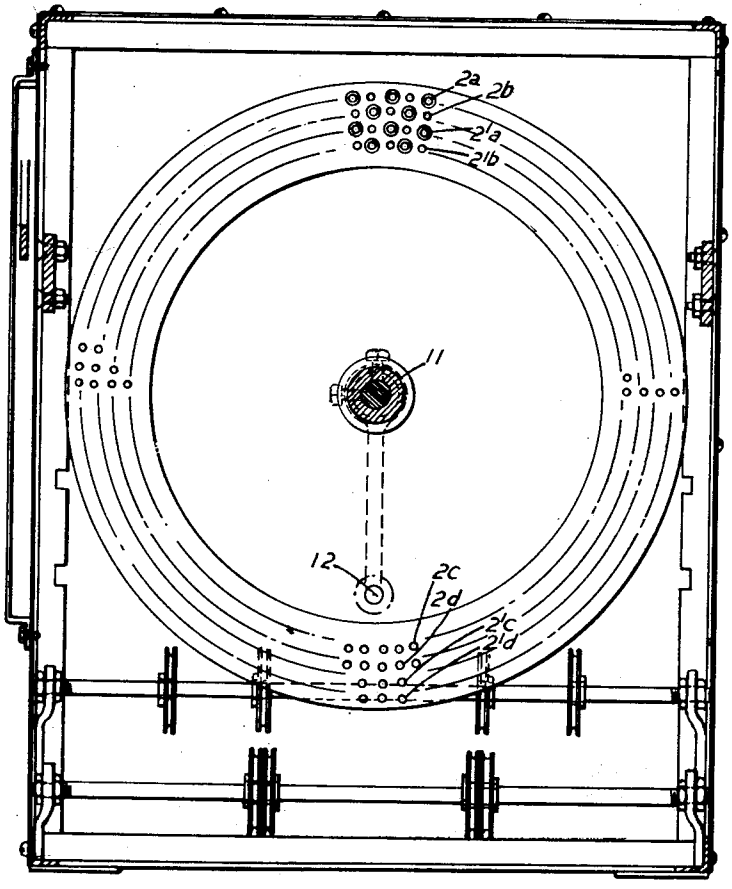
FIG.5.



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CONTROL MEANS FOR COLOR LIGHTING APPARATUS

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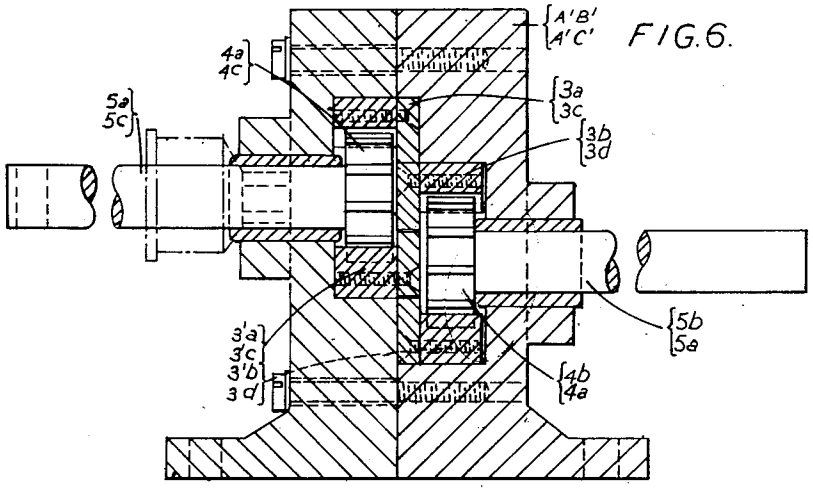

FIG. 6.

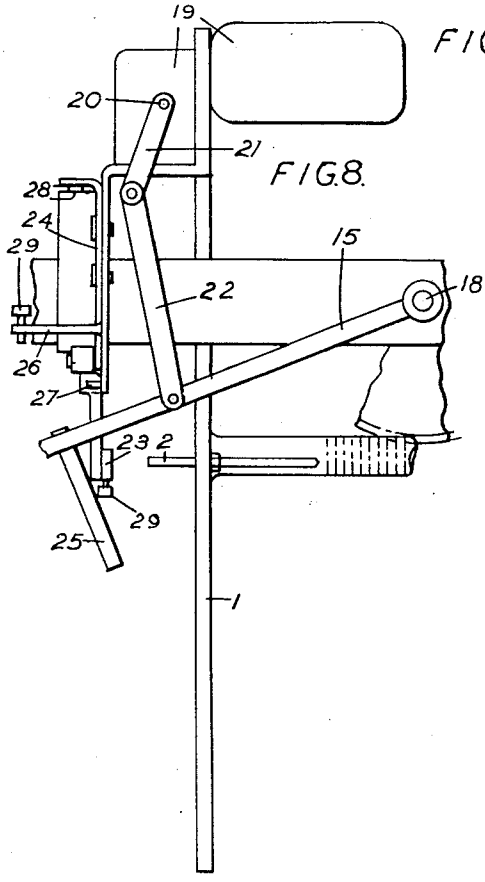

FIG. 8.

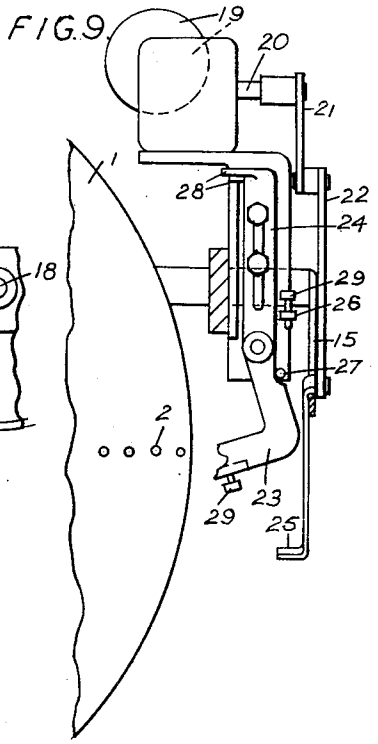

FIG. 9.

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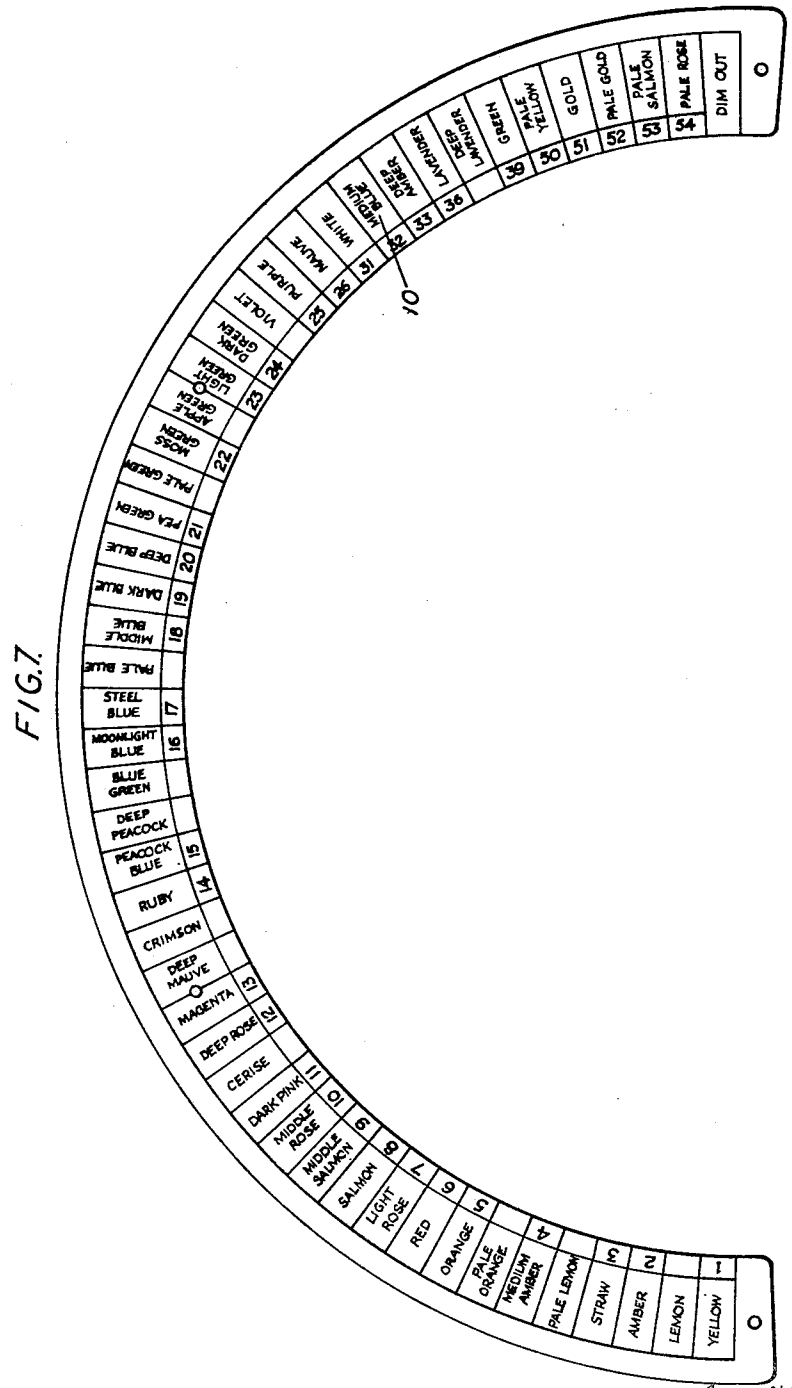

FIG. 7.

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Patented Apr. 1, 1952

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UNITED STATES PATENT OFFICE

2,591,650

CONTROL MEANS FOR COLOR LIGHTING APPARATUS

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Application February 27, 1946, Serial No. 650,414
In Great Britain March 3, 1945

7 Claims. (Cl. 315—318)

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This invention concerns apparatus of the type comprising a light source or plurality of light sources and means for projecting or producing coloured light (including white or non-coloured light) and the invention has for its principal object the provision of new or improved control means therefor. Any known or approved means including in particular the use of filters, may be employed for obtaining the coloured light.

Means may be provided for varying the intensity of light emitted from the light source or each light source and/or means may be provided for varying the colour medium or media through which the light passes. In varying the intensity of light emitted, that is to say the intensity of the utilisable emitted light, the intensity of the light source itself may be varied or the intensity of the source may remain constant and the intensity of the emitted light may be varied, such as by means of a mask, or the two different methods may be used in combination. It is preferred to employ electric lights and if the intensity of emitted light is varied by varying the intensity of the light source itself the means for varying such intensity may function to control the voltage applied to the light such as by the use of resistances, chokes, dimmers or the like.

A specific object of the invention is to provide control means for apparatus of the said type which are particularly suitable for stage lighting but it will be appreciated that the invention is not limited to this specific purpose and may be utilised for other purposes.

The invention provides in or for a colour lighting apparatus of the type specified a control system or apparatus comprising means movable to preselect the desired colour and/or intensity of light and further movable to produce such selected colour and/or intensity. The means movable to preselect the desired colour and/or intensity may comprise the same member that functions to produce such colour and/or intensity or there may be a member movable to preselect and another member to produce the colour and/or intensity; if the same member is used it may be movable in different senses.

As viewed from another aspect the invention provides a control system or apparatus comprising a selector and a transmitter which are relatively movable in one direction to preselect by their relative attitudes the desired colour and/or intensity and are relatively movable in another direction to cause the transmitter to transmit the selection and to effect the change (such as change of light intensity and/or colour medium

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or media) to that selected. As viewed from a still further aspect the invention provides a control system or apparatus comprising a selector movable in one direction to preselect the required colour and/or intensity by variation of intensity of emission from at least one light source and/or variation of colour media and in another direction to effect the change to the selected intensity and/or media.

Advantageously, these two movements just mentioned are movements of rotation and displacement (preferably axial displacement) and it is preferred that the rotational movement shall effect the selection and the displacement the intensity change.

From yet another aspect the invention consists in the provision of means for simultaneously controlling the intensity of each of a plurality of light sources each or selected of which is a coloured light or has associated with it a colour medium such as a filter which means comprises two members associated with each light which members are movable in a complementary sense.

From still another aspect the invention consists in means for controlling a plurality of lights comprising two members associated with each light and simultaneously movable in a complementary sense to vary the intensity and/or colour of said lights in combination with a preselector device for actuating said members.

In one mode of carrying the invention into effect manual means are provided for actuating a preselector device and manual means are provided for imparting relative movement between said device and members functioning to vary simultaneously the intensity and/or colour of a plurality of lights.

By the invention the rate of change of colour and/or intensity can be varied at will and a specific feature of the invention consists in the provision of means for manually adjusting each or selected of the plurality of lights and/or colours after or before any desired combination thereof has been selected.

From a further aspect the invention consists in apparatus for colour lighting comprising a plurality of lights in combination with means for simultaneously and automatically varying the colour and/or intensity of each of them according to a predetermined sequence.

Apparatus according to this invention has numerous applications. It may, as already stated, be used for stage lighting (including cinema lighting) and may be used for decorative and display purposes and shop window lighting. When used for stage lighting it is capable of re-

producing any standard shade at will, whilst furthermore, any of such shades will be readily varied at will to suit particular tastes: this is an important asset. When used for display purposes or shop window lighting any desired cycle of light changes can be produced and the apparatus will produce such cycle for any desired or predetermined period.

The foregoing and other features of the invention set out in the appended claims are incorporated in the control system or apparatus (in or for colour lighting apparatus of the specified type) which will now be described as an example.

With reference to the accompanying drawings in which

Figure 1 is a perspective view of one form of embodiment of the invention;

Figure 2 is a sectional elevation thereof;

Figure 3 is a front elevation;

Figure 4 is a section on the line A—A, Fig. 2, and

Figure 5 is a section on the line B—B, in Fig. 2;

Figure 6 is a section through one of the transmitters;

Figure 7 illustrates the operator's indicator panel;

Figures 8 and 9 illustrate actuating mechanism for the foregoing apparatus.

The example chosen is one in which the intensity of each of a plurality of light sources (with each or selected of which is associated a colour medium such as a filter) is varied to produce the desired effect.

The selector consists of a rotatable and axially-displaceable member such as a drum or disc 1 presenting at an end face as many series of selecting elements 2 as there are light sources to be controlled. These series are arranged in concentric circles and each series consists of a circle of elements 2 of contrasting heights each height being appropriate to a certain intensity of light emission from the source to which the series under consideration is allocated. The elements 2 are further arranged in colour combinations whereof each combination consists of an element of each series, so that the combination is appropriate to such intensities of emission from the light sources as will result, upon mingling, in a predetermined colour; by rotating the selector 1 any required colour combination may be brought to a selection station or stations at which the selecting elements 2 register with transmitting elements hereinafter referred to. The elements of each combination may be located in the same radial plane in which the axis of rotation lies, but may be staggered.

Each series may consist of pegs or pins of various lengths protruding from the aforesaid end face. As shown in the drawings, the pegs or pins 2 are adjustable for length of protrusion (being screwed through the disc 1 and provided with lock nuts) so that the colour combinations may be pre-set as required.

Associated with this selector there is a transmitter consisting of a stationary member presenting towards the selector a set of movable transmitting elements 3 equal in number to the number of series of selecting elements operable on the transmitter and equal to the number of light sources, each transmitting element being allocated to a light source to control, by its movement in the transmitter, the intensity of light emission from that source. These transmitting elements 3 are of course located at the same radius from the extended axis of the selector as are the series of selecting elements 2, and they may consist of slidable pins protruding from the transmitter towards the selector.

After rotation of the selector 1 to bring a required colour combination to the selecting station, the selector is moved axially so that the selecting elements 2 are brought into contact with and move, to the required extents, the transmitting elements 3 and these in turn (through suitable connections) vary the intensity of light emission of the light sources, with which they are associated, in accordance with the extent of their movement and the heights (i. e. the protrusion from disc 1) of the selector elements in the selected colour combination.

It is an advantage of the foregoing arrangement that after preselection the change can be effected at any desired speed, according to the speed of axial movement of the selector.

It is to be pointed out, however, that intensity variation up and down is required. For this purpose the selector incorporates, for each colour combination of selecting elements, a complementary combination (i. e. a long selecting pin in a colour combination having its complementary short pin in the complementary combination) and the transmitter incorporates a complementary set of transmitting elements; the complementary transmitting elements in the two sets are so coupled that when one is pushed in the other is moved out. For example, they may be connected by a lever or a cable, chain, or the like passing over a pulley or its equivalent, and movement of this connection in either direction varies a resistance or other voltage control associated with an electric lamp constituting the light source and thereby varies the intensity of light emission.

Specifically, the construction illustrated is arranged to control four light sources of primary colours. Therefore four series of selecting elements 2 are provided which may conveniently be distinguished by the letters A, B, C and D, the associated selector elements being numbered *2a*, *2b*, *2c*, *2d*. The arrangement may be such that any colour combination requires the presentation of the appropriate group or combination of their elements to a single transmitter, but the introduction of complementary selector elements (numbered *2'a*, *2'b*, *2'c* and *2'd*) renders it desirable to locate the elements of two series over one part of the circle, with the elements of the other two series over the other part of the circle, and to employ a transmitter which in effect consists of two spaced transmitters one of which is appropriated to two series and the other of which is appropriated to the other two series. Thus there is an upper transmitter A'B' controlling two light sources and operated on by selector elements *2a*, *2b*, *2'a*, *2'b*, of series A and B located over one half of the circumference of disc 1 and a lower transmitter C'D' controlling the other two light sources and operated on by selector elements *2c*, *2d*, *2'c*, *2'd*, located over the other half of the circumference of disc 1. Each colour combination comprises elements *2a*, *2b* and diametrically opposed elements *2c*, *2d*, and any given position of disc 1 results in the simultaneous presentation, to the two transmitters A'B' and C'D', of the requisite four elements and their complementary elements.

The two transmitters are substantially identical. The elements 3 of the upper transmitter A'B' comprise element *3a* and its complementary

element 3'*a* of one light source, and element 3*b* and complementary element 3'*b* of a second light source. Likewise the elements 3 of the lower transmitter C'D' comprise element 3*c* and complementary element 3'*c* of a third light source, and element 3*d* and complementary element 3'*d* of the fourth light source.

A representative transmitter is shown in Fig. 6, wherein the transmitting elements and the complementary elements are racks. Elements 3*a* and 3'*a* mesh with opposite sides of a pinion 4*a* on shaft 5*a*, protruding from one side of the transmitter A'B', and elements 3*b*, 3'*b* with a like pinion 4*b* on shaft 5*b* protruding from the other side thereof. For the other transmitter C'D', elements 3*c*, 3'*c* mesh with corresponding pinion 4*c* on shaft 5*c* and elements 3*d*, 3'*d* with pinion 4*d* on shaft 5*d*. The rotation thus imparted to these four shafts by the advance of disc 1 serves to transmit the selection afforded by the prior rotation of said disc so as to produce the required light change, in the illustrated construction it serves to vary four dimmers or resistances 6*a*—6*d* associated one with each of four light sources of differing primary colours so that any desired colour mixture may be obtained (each resistance being adjustable by means of a contact arm such as 7 to vary the intensity of illumination from the associated source between nothing and a maximum value).

It will be appreciated that after a change has been effected the selector 1 may be withdrawn from the transmitter ready for a further preselection. Advantageously, an individual intensity control is associated with each light source which may be operated (e. g. manually) when the selector has been withdrawn, to vary the intensity of emission of a source from the value set by the transmitter and thereby to vary the colour from that preselected by the original colour combination of the selector. Such manually-operable, individual intensity controls are indicated at 8*a*, 8*b*, 8*c* and 8*d*. In general, the operation of such an individual control will result in a re-setting of the two complementary transmitting elements by rotating the associated shaft 5*a*—5*d* through suitable connections.

It is desirable to provide, in association with the selector 1, a pointer 9 movable over a scale 10 of colours or of numbers indicative of colours so as to afford a visual guide for the preselection.

In the hand operated construction shown in Figures 1 to 6 the selector 1 is slidably mounted on a shaft 11 to which the pointer 9 is attached and is rotatable by said pointer and shaft through the medium of key arm 12. The selector further carries a sleeve 13 cut with parallel teeth that mesh in any position of rotation of the disc 1 with a quadrant 14 on shaft 18 movable by a hand lever 15 against the action of spring 28. Thus rotation of the pointer 9 serves to set the selector and movement of the hand lever 15 serves to advance the selector towards the transmitters to carry the required selection into effect. It will be seen that the speed at which the change-over from the old selection to the new selection is effected, is governed solely by the speed at which the hand lever 15 is moved, so that a gradual fade-in and fade-out may be produced, and this is an important advantage.

The pointer 9 is conveniently provided with a spring-pressed releasable plunger 16 arranged to be received in any selected one of a series of holes 17 associated with the scale 10.

It may be said that apparatus in accordance with this invention may be actuated automatically if desired. For example the selector may be inched round by electrical means. This may be done by so arranging matters that after a colour change has been made and when the selector is moved axially away from the transmitter, an electrical contact is made which causes the selector to rotate to another colour, whereupon it is moved axially by electrical means to operate the transmitter and effect another colour change. In other words both rotary movement and axial movement of the selector in either direction may be effected by electrical means.

One method by which apparatus according to this invention may be actuated automatically is illustrated in Figs. 8 and 9. There is an electric motor 19 adapted to rotate a spindle 20 which imparts rotary motion to an arm 21 mounted radially thereon. The free end of this arm 21 is pivotally connected to one end of a link 22 the other end of which is connected, also pivotally, to an arm extending radially from the aforementioned shaft 18. This arm may be the hand lever 15 beforementioned, if desired. From this arrangement it will be seen that when the motor 19 is in operation, reciprocating motion is imparted automatically to the selector 1.

In order to rack the selector 1 round automatically, there is provided a clawker 23 freely pivoted to a vertical slide 24. The slide is raised when the arm 15 is raised to withdraw the selector 1 by the engagement of a projection 25 (on the aforesaid arm 15) with a projection 26 on the slide 24. In the lowered position of the slide 24 the selector 1 is forward in engagement with the transmitter, and the clawker 23 is in an inoperative position as shown. As the slide 24 is raised when the selector is withdrawn the clawker is guided into an operative position by a fixed peg 27, which, when the clawker is in the inoperative position as shown, is received in a recess formed in the rear face of the clawker. In this position the clawker is in engagement with the tail of one of the aforementioned pins 2 and further upward movement of the slide causes the clawker to rack the selector 1 round.

Suitable stops 28 may be provided to determine the downward or disengaged position of the clawker while adjusting means 29 may be fitted to ensure that the clawker engages the selector pin 2 at the correct time and position. The slide and clawker may be lowered by their own weight or a return spring may be fitted.

Where a plurality of sets of colour lighting apparatus of the type specified are employed (e. g. at various locations about a stage), each with a control system or apparatus according to this invention, means may be provided for operating all the control systems in unison or individually. One set of control apparatus in accordance with this invention may be used to operate collectively two or more sets of colour lighting equipment and means may be provided whereby each equipment gives the same light or one or more gives one coloured light or lights and one or more gives another coloured light or lights. There may, for example, be a bank of control apparatus each comprising a selector movable in a rotary and axial sense to actuate transmitters in manner described and the transmitter of each apparatus control a plurality of light sources: the colour changes produced by each apparatus may be the same or different as desired.

It may be said that in carrying the invention into effect each light source preferably, but not

necessarily, comprises a plurality of lights; if for example there are four light sources including one for white light and three different coloured lights there may be (in one embodiment which is now referred to by way of example only) two or more separate lamps and reflectors for the white light and two or more separate lamps, reflectors and coloured screens for each colour: the screens for each colour may be identical with one another in colour or otherwise as desired and the number of lamps and reflectors for each colour (including white light) may be the same or different as desired. In controlling the light sources in accordance with the invention it will be appreciated that when any light source is varied all the lamps comprising that source are varied simultaneously and to the same extent.

In conclusion it may be said that the disc with selector elements thereon or the framework with associated elements may be so mounted in the apparatus that it can readily be replaced by another disc or framework having differently arranged elements whereby different colours and/or sequences can readily be obtained.

In the specification the expression "colour light" and similar expressions, where the context so permits, mean and include white or non-coloured light and intensity of light. Furthermore in the appended claims where the terms "dimming means" and "dimmer" are employed, it is to be understood that these terms may include such conventional means as rheostats, etc., for varying the intensity of a light source by varying the amount of current supplied to such light source, or, as previously indicated, may include masks for varying the intensity of a source of light by varying the intensity of the light emitted therefrom.

I claim:

1. Apparatus for varying the intensity of a plurality of sources of light of different colors comprising adjustable dimming means for each source of light, force transmitting means for adjusting the dimming means, said transmitting means being operable to effect a plurality of different adjustments of the dimming means, means selectively movable relative to the transmitting means to a plurality of preselecting positions, means for moving said selectively movable means selectively to a preselecting position, and means operable independently of said last-mentioned means for moving said selectively movable means to operate directly the transmitting means to effect a preselected change in the intensity of the combined sources of light.

2. Apparatus for varying the intensity of a plurality of sources of light of different colors comprising adjustable dimming means for each source of light, force transmitting means for adjusting the dimming means, said transmitting means being operable to effect a plurality of different adjustments of the dimming means, means selectively movable relative to said transmitting means in one direction to a plurality of preselecting positions, said selectively movable means being relatively movable in a second direction to actuate the transmitting means to effect a change in the combined intensity of the sources of light, means for moving said selectively movable means selectively to a preselecting position, and means operable independently of said last-mentioned means for moving said selectively movable means in said second direction to operate the transmitting means to effect the preselected change in the intensity of the combined sources of light.

3. Apparatus for varying the intensity of a plurality of sources of light of different colors comprising an adjustable dimmer for each source of light, force transmitting means for adjusting each dimmer, said transmitting means being operable to effect a plurality of different adjustments of the dimmers, preselecting means relatively rotatable with respect to said transmitting means to a plurality of preselecting positions, said preselecting means being further movable in a direction relatively toward and away from said transmitting means in each of said preselecting positions, means for selectively rotating said preselecting means relative to said transmitting means to a preselecting position, and means independent of said last-mentioned means for relatively moving said preselecting means toward said transmitting means to engage and operate the transmitting means to effect a change in the intensity of the combined sources of light corresponding to the preselecting position of the preselecting means.

4. Apparatus for varying the intensity of a plurality of sources of light of different colors comprising an adjustable dimmer for each source of light, a force transmitting means for adjusting each dimmer, each transmitting means including an element movable to effect a plurality of different adjustments of its corresponding dimmer, a disk mounted for rotation relative to said movable elements, said disk being further movable toward and away from said elements, a plurality of operating pins mounted in said disk and adapted to selectively engage the movable elements of said transmitting means when said disk is moved toward said transmitting means, means for rotating said disk to a plurality of preselecting positions, and means for moving said disk toward said preselecting means in each preselecting position so that the pins mounted therein engage said movable elements of said transmitting means to effect an adjustment of the dimmer means and a change in the combined intensity of the sources of light.

5. Apparatus in accordance with claim 4 which includes a scale indicating the various combinations of colors obtainable, and in which the means for rotating the disk includes a pointer arm adjacent said scale.

6. Apparatus in accordance with claim 4 which includes a shaft upon which said disk is mounted for movement axially of the shaft, and in which said transmitting means are spaced about said shaft at a distance therefrom substantially equal to the distance from the shaft of the pins mounted in said disk.

7. Apparatus in accordance with claim 6 in which the disk is fixed on said shaft against substantial relative rotary movement and in which the shaft is rotatable about its axis to rotate said disk.

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