United States Patent [19]

Munroe

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[54] **SIGNAL LIGHT**

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[21] Appl. No.: **157,843**

[52] **U.S. Cl.** ..... **340/378 R,** 340/123, 40/28 R, 40/33

[51] **Int. Cl.** **G08g 1/95,** G08b 5/00

[58] **Field of Search**. 340/83, 84, 103, 123, 46, 376, 340/378 R, 378 A, 379, 22; 40/33, 77, 28 R

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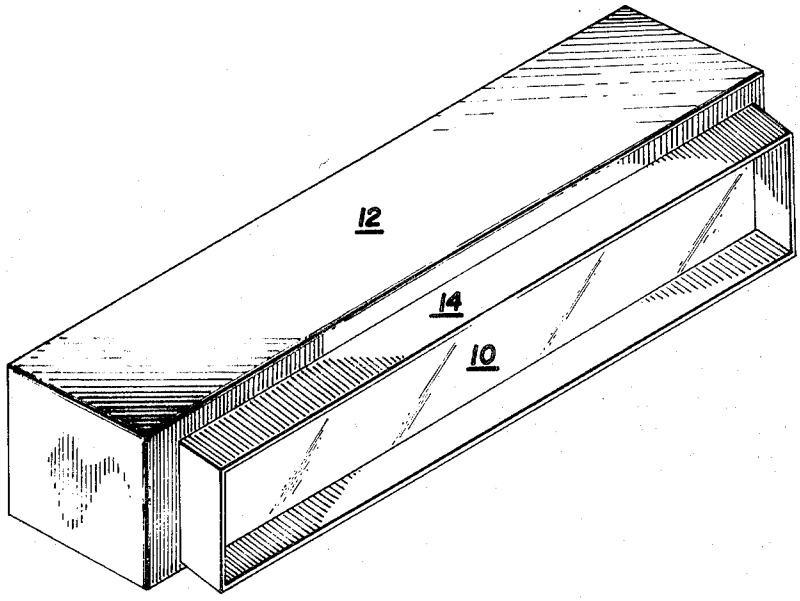
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Primary Examiner—John W. Caldwell
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Attorney, Agent, or Firm—Charles C. Krawczyk

[57] **ABSTRACT**

An enclosure for a signal light includes an elongated radiation transparent section. An elongated radiation source provides three colors of visible radiation, green, amber and red. The radiation source is electrically controlled for sequentially transmitting the green, amber and red colors through the elongated transparent section to provide signals for traffic control.

14 Claims, 10 Drawing Figures



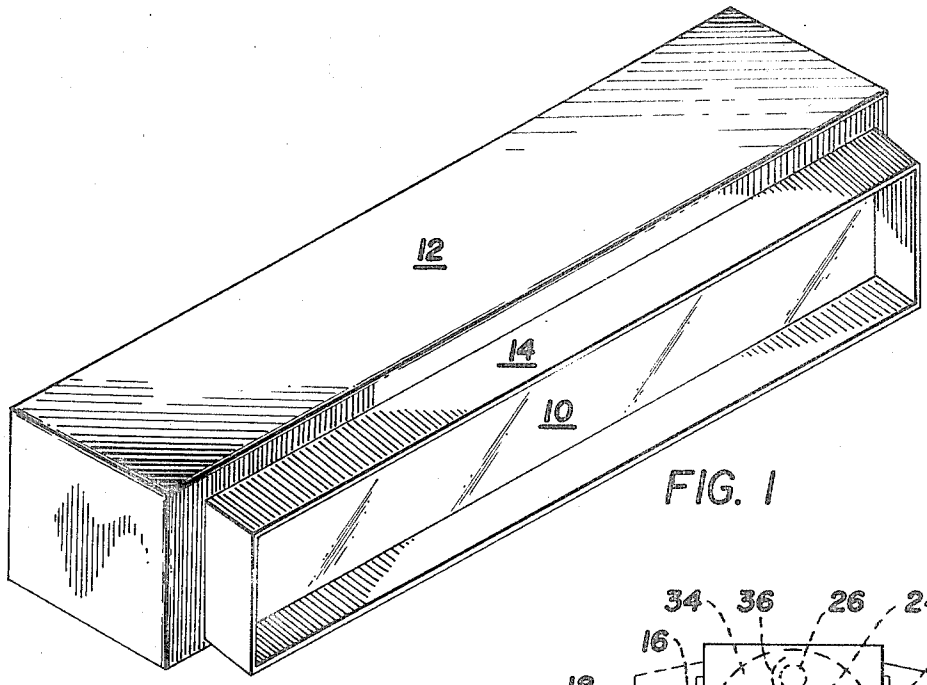


FIG. 1

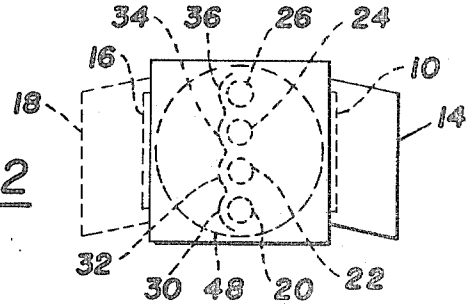


FIG. 2

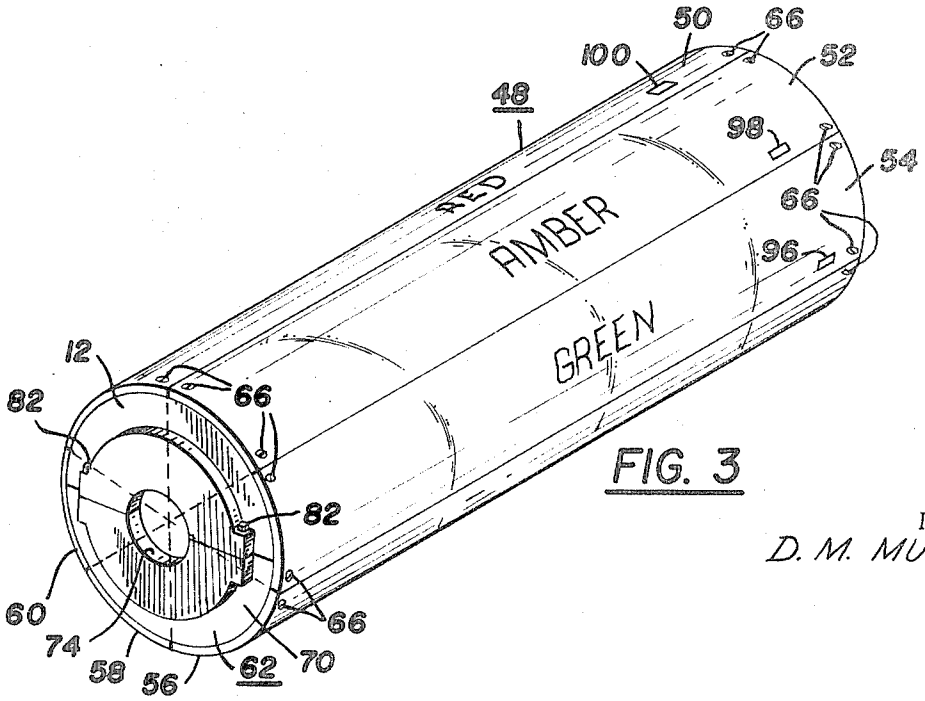


FIG. 3

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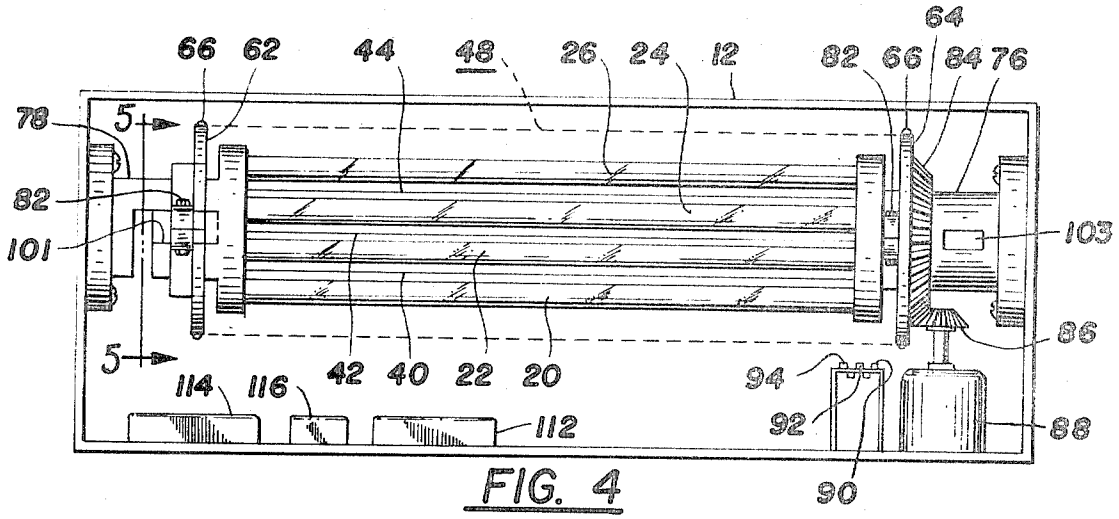


FIG. 4

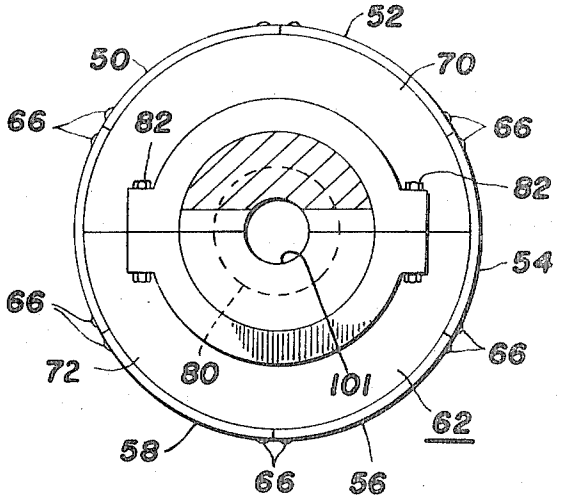


FIG. 5

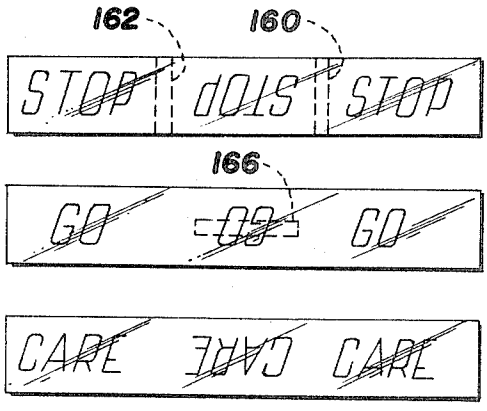


FIG. 6

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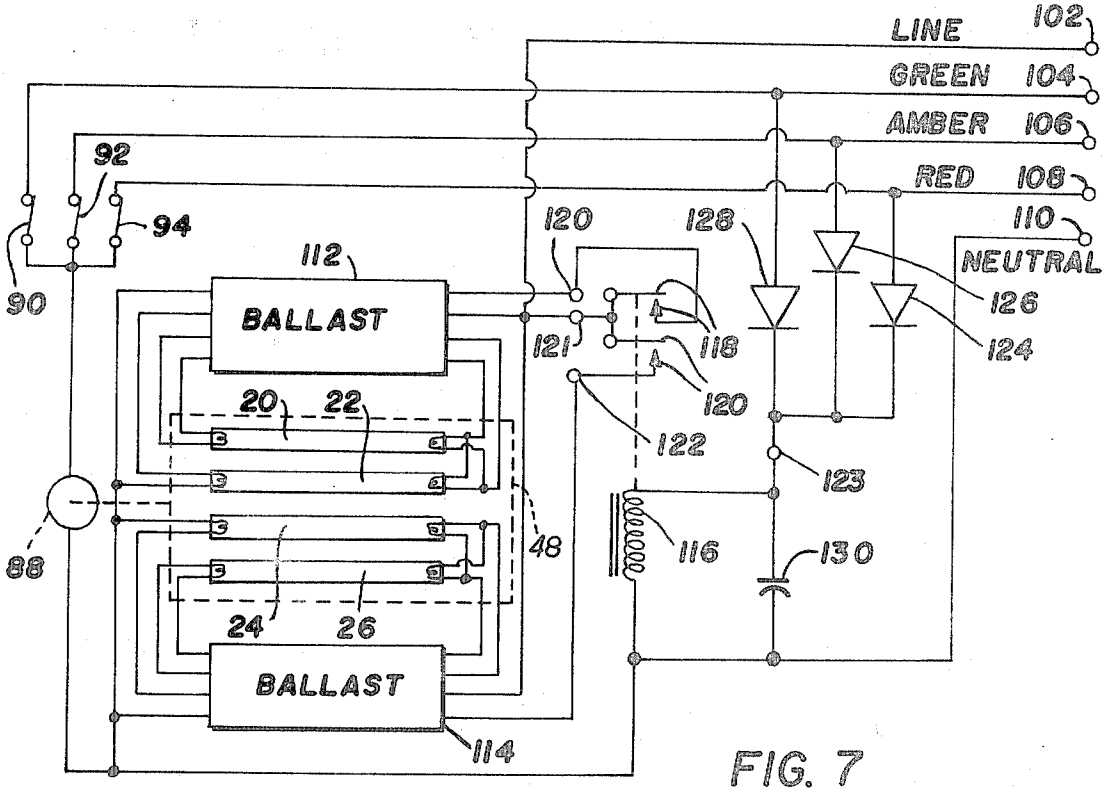


FIG. 7

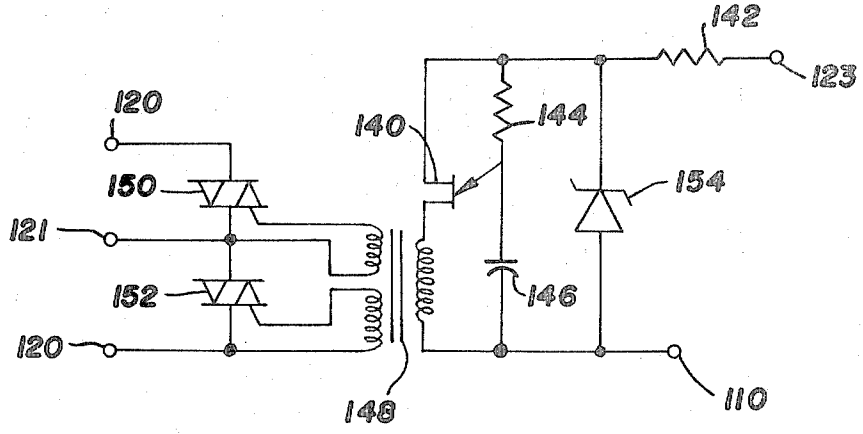


FIG. 8

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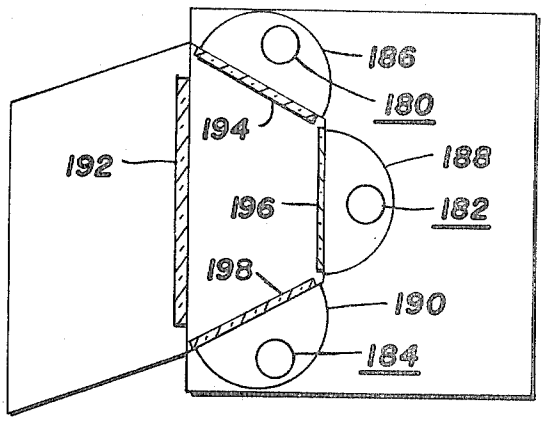


FIG. 9

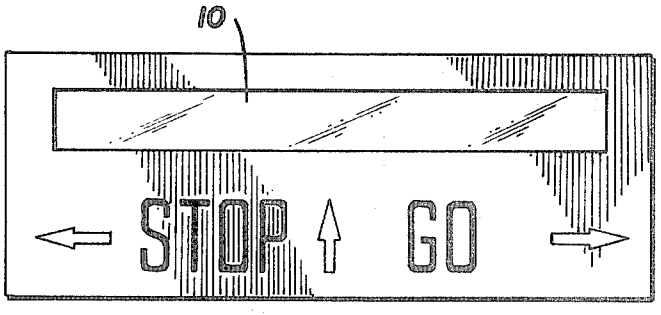


FIG. 10

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SIGNAL LIGHT

BACKGROUND OF THE INVENTION

This invention pertains to signal lights in general and more particularly to vehicular traffic lights.

The traffic lights presently in use include three separate colored signal areas comrising red, amber and green circular lenses arranged in a vertical row. Separate light sources are positioned behind each of the lenses that are individually energized to provide signals for traffic control. The size of such lenses is about eight inches in diameter. Since the size of the lenses is rather small, the range of visibility of the signal is limited. Furthermore, such small signal areas have a tendency to blend in with other colored background lights, and at times become difficult to observe. This is particularly dangerous in high speed traffic area wherein drivers need advanced warnings to provide sufficient time for safe response.

In addition to the foregoing, ambient light and/or reflection of the sun's rays from the lenses, diminish the effectiveness of such traffic lights by causing all three lenses to appear to be equally illuminated. Depending upon the lighting conditions, time of day, etc., situations often arise wherein it is extremely difficult to distinguish which of the three signal areas is actually illuminated from those not illuminated. This creates a dangerous situation since a vehicle operator is required to make a judgement as to the actual condition of the traffic light. Sun shades have been provided on such traffic lights to reduce the detremental effects of ambient light and reflection of the sun's rays, but were found to be only partially effective.

In a United States Design Patent No. 211,837 a traffic signal casing is illustrated having three horizontally disposed, elongated rectangular shaped red, amber and green signal areas mounted in a vertically disposed parallel array. The signal areas are intended to be separately illuminated with individual light sources in the same manner as the traffic lights presently in use. The range of visibility of such a traffic signal is greatly extended over the traffic signals presently in use, however its effectiveness is still diminished by ambient light and reflection of the sun's rays. Hence, such an arrangement requires extensive sun shields to improve the effectiveness of the traffic light. However the ambiguity problem still exists in the traffic light of the design patent wherein lighting conditions often exist wherein all three signal areas appear to be equally illuminated. In addition to the foregoing, the traffic signal of the design patent requires a very large casing to encompass the three large elongated signal areas. Such a large casing is highly resistant to winds and thereby exerts large and undesirable forces on its suspension systems. Furthermore, such traffic lights are substantially heavier than the traffic lights presently in use and therefore can not be readily substituted, particularly in cases wherein the present traffic light is mounted on a cable type suspension system.

It is therefore an object of this invention to provide a new and improved signal light, the effectiveness of which is not diminished by ambient light and/or reflection.

It is also an object of this invention to provide a new and improved traffic light that is visible at substantially

greater distances than the traffic lights presently in use.

It is still a further object of the invention to provide a new and improved signal light having a large signal area and a casing therefor of minimum size, thereby reducing problems due to storms and wind.

It is also an object of the invention to provide a new and improved light weight traffic light having a large signal area that can be mounted on existing traffic light suspension systems.

The signal light of the present invention has a substantially greater range of visibility than the traffic light in present use, overcomes the problems due to reflection of the suns rays and ambient light, and is of a size and weight that it can be readily substituted for the traffic lights presently in use.

BRIEF DESCRIPTION OF THE INVENTION

The traffic control colors of the signal light of the invention are transmitted through a common section or signal area of the signal light. Radiation means provides at least two colors of signal radiation for transmission through the common signal area. Electrical responsive means sequentially controls the visible color of the radiation transmitted through the common portion. By using a common area as a changeable color signal source, the detrimental effects of ambient light are greatly reduced, and the ambiguities caused by the reflection of the sun's rays is essentially eliminated. The visible range of the signal light is increased by providing a large common signal area, such as for example, in the form of an elongated rectangle.

In a first embodiment of the invention, the radiation means comprises a common source of radiation and a plurality of movable filters. The electrical responsive means sequentially positions the filters between the source and the signal area to control the visible color of the radiation transmitted therethrough.

In a second embodiment of the invention, the radiation means comprises a plurality of separate light sources, filters, and optical means for directing filtered light from the sources to the common signal area. The electrical responsive means individually energizes the radiation sources to control the visible color of the radiation transmitted through the signal area.

BRIEF DESCRIPTION OF THE FIGURES

FIG. 1 is an isometric view of a casing for the signal light of the invention.

FIG. 2 is a side view of the signal light of FIG. 1, including a second signal area and a second sun shade, and including the radiation sources and color cylinder of a first embodiment of the invention in phantom.

FIG. 3 is an isometric view of the color cylinder of FIG. 2.

FIG. 4 is a front view of the signal light of FIG. 1 with the front panel removed and color cylinder shown in phantom.

FIG. 5 is a sectional view of FIG. 4 taken along lines 5 — 5.

FIG. 6 illustrates indicia for the color cylinder of FIG. 3.

FIG. 7 is a schematic diagram of a control circuit for energizing the light sources and driving the color cylinder of the first embodiment of the invention.

FIG. 8 is a schematic diagram of a triac circuit that can be substituted for the relay portion of circuit FIG. 7.

FIG. 9 is a side view of a second embodiment of the signal light of the invention.

FIG. 10 is a second embodiment of a casing for the signal light of the invention including indicia in the front panel.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The traffic light of the invention includes a common, changeable color, signal area for each direction of traffic control. In the embodiment of FIG. 1, the signal area comprises a clear window **10.** The window **10** has a generally elongated rectangular shape, and by way of example, can be six feet long and eight inches high. The window **10** is weatherproof mounted in an elongated rectangular shaped housing **12.** A sun shade or visor **14** surrounds the window **10.** Although the traffic light in FIG. 1 includes a single window, the traffic light could include a second window **16** and a second visor **18** (as illustrated in phantom in FIG. 2) on the side opposite window **10** so that the same traffic light can control opposite directions of traffic.

In a first embodiment of the invention, the traffic light includes four fluorescent lights **20 – 26** mounted in a vertical row (FIGS. 2 & 4). If a single window is to be used, reflectors **30 – 36** can be mounted behind the fluorescent lights to reflect the radiation in the direction of the window **10.** The reflectors **30 – 36** can also function as grounding strips to aid in starting the lamps. If the traffic light is to use two windows for opposite lanes of traffic, the reflectors **30 – 36** can be eliminated and the metal strips **40, 42** and **44,** extending along the length of the fluorescent tubes and adjacent thereto, can be used as the grounding strips, as illustrated in FIG. **4.**

A color cylinder **48** is mounted to surround and rotate around the fluorescent lamps **20 – 26.** The color cylinder is divided into 66° sectors **50 – 60.** The sectors **50** and **56, 52** and **58,** and **54** and **60** comprise filters designed to transmit red, amber and green radiation, respectively. The ends of the filter sectors **50 – 60** are mounted on to the circular mounting discs **62** and **64** by a simple disconnect arrangement, such as by dzus fasteners **66** or wind nuts, so that the filter sections can be readily removed for easy access to the fluorescent lamps.

The circular mounting discs **62** and **64** comprises two similar semicircular portions **70** and **72** (FIG. 5) each including a smooth semicircular bearing surface **74** in the central portion thereof. Two bearing mounts **76** and **78** are fastened to opposite ends of the casing **12.** Each bearing mount **76** and **78** includes a circular ring type cut-away portion **80** that includes a suitable bearing so that the mounting discs **62** and **64** can be mounted into the cut-away portion for easy rotation on the bearing mounts. The semicircular portions **70** & **72** of the mounting discs **62** and **64** are positioned in place in the cut-away **80** and are fastened together by the bolts **82.** A bevel gear **84** is suitably fastened to the circular mounting disc **64** and is coupled by a bevel gear **86** to an electric motor **88.** When energized, the motor rotates the color cylinder **48** about the fluorescent tubes **20 – 26** to position the various filter sections **50 – 60** between the lamps and the window **10** to control the color of the radiation transmitted through the window.

Three reed switches **90, 92** and **94** are mounted adjacent one end of the color cylinder **48** and are spaced longitudinally along the color cylinder. Three pairs of magnets **96, 98** and **100** (only one of each pair are shown in FIG. 3) are positioned along the color cylinder with a spacing therebetween corresponding to the spacing between the reed switches **90, 92** and **94** respectively. A pair of magnets are provided for each color of filter (one for each filter) and each pair follows the same circular path as the color cylinder **48** is rotated. The magnets **96** corresponding to the green filter, the magnets **98** corresponding to the amber filter and the magnets **100** corresponding to the red filter, actuate the reed switches **90, 92** and **94** respectively. The combination of the magnets and reed switches provides a switching arrangement for controlling the positioning of the color cylinder. It is to be understood of course that other switching arrangements, such as for example cam operated switches, could also be used.

The fluorescent lamps **20 – 26** are mounted at opposite ends to the bearing mounts **76** and **78** by bayonet type sockets. The wires to the sockets extend through holes **101** and **103** in the bearing mount.

The electrical circuit for energizing the fluorescent lamps **20 – 26** and controlling the rotational position of the color cylinder **48** is illustrated in FIG. **7.** The terminals **102 – 110** are adapted to be connected to a conventional traffic control switching system used to control the traffic signals in present use. The fluorescent lamps **20 – 26** are rapid start, high output type lamps. The lamps **20** and **22** are energized by the ballast **112** while the lamps **24** and **26** are energized by the ballast **114.** The ballasts **112** and **114** are conventionally connected between the power terminals **102** and **110** and the lamps **20 – 26,** to energize the lamps when the relay **116** is energized to close the contacts **118** and **120.**

The ballasts **112** and **114** are flashing type ballasts that continuously apply heating power to the lamp cathodes. The ballasts **112** and **114** also apply a high voltage to the lamps to start an energizing arc discharge in each lamp when the relay **116** is energized to apply a short-circuit across the terminals **120** and **121,** and **121** and **122.** Whenever the relay **116** is energized, all four lamps **20 – 26** will be energized. The light source for the traffic signal is comprised of two pairs of lamps (**20** and **22,** and **24** and **26**) connected in duplicate circuits so that if one lamp or a ballast fails, the other two lamps will continue to function.

The motor **88** is connected at one end to the terminal **110** and at the other end through the reed switches **90, 92** and **94** to the terminal **104, 106** and **108** respectively. The reed switches **90, 92** and **94** are normally closed until a corresponding magnet **96, 98** and **100** moves to a position adjacent to a reed switch to open the reed switch.

In operation, when an alternating current potential applied to anyone of the terminals **104 – 108,** the connected diode (**124, 126** and **128**) rectifies the alternating current to energize the relay **116.** A capacitor **130** is connected across the coil of relay **116** to keep the relay coil energized during negative cycles of the rectified alternating current pulses. When the relay **116** is energized, the lamps **20 – 26** rapidly turn on. Hence, the lamps **20 – 26** are energized any time an alternating potential is applied to any of the terminals **104 – 108.**

The motor 88 is energized by applying power to any of the terminal 104, 106 and 108 provided the connected reed switch 90 – 94 is closed. For example, if the color cylinder is positioned in the red output position (the red filter 50 or 56 is positioned between the lamps and the window 10), or in a position where all three reed switches are closed (as in any intermediate position of the color cylinder between color output positions), and power is applied to the terminal 104, the motor 88 will be energized through the reed switch 90 to rotate the color cylinder 48 until a magnet 96 is moved into position to open the reed switch 90. The position of the magnets 96 with respect to the reed switches 90 is such that the motor is de-energized when a green filter 54 or 60 is the output position. In the same manner when power is applied to the terminal 106, the color cylinder will automatically rotate an amber filter 52 or 58 to the output position, and when power is applied to the terminal 108, a red filter 50 or 56 is automatically rotated to the output position. Hence it can be seen, by selectively applying power to the terminals 104 – 108, the visible color of the radiation transmission through the window will be controlled.

The color cylinder is illustrated as having six sections, two green, two red, and two amber, so that the color cylinder can operate in a single output traffic signal of FIG. 1, and also in a dual output traffic signal of the type illustrated in FIG. 2. The same color filter is located on opposite sides of the cylinder so that the same signal color can be provided for opposite directions of travel by a single traffic light. It is to be understood of course, that if the color cylinder is to function as a traffic signal for a single direction of travel, then the color cylinder only needs three filter sections, one for each signal color, red, green and amber. In addition to the foregoing, the relay 116 is needed only if it is desirable to provide a flashing signal. Flashing is accomplished by periodically removing and applying power to the selected terminal 104 – 108. If there is no need for flashing signals, the relay 116 and the diodes 124, 126 and 128 can be eliminated and the contacts 120, 121 and 122 can be connected together for continuous illumination.

Although a color cylinder is illustrated as a movable filter means to control the visible color transmitted through the common signal area or window 10, other types of movable filters could also be used. For example, the color filter can comprise a continuous flexible band including three equal lengths of red, amber and green filter material. The band can be mounted to extend longitudinally about the lamps 20 – 26 so that a portion of the filter is always positioned between the lamps and the window 10. The band can be held in place at opposite ends of the lamps by rollers. One roller can comprise a drive roller and the other an idle roller. The magnetic reed switch control circuit of FIG. 7 can be used to control the selective positioning of the colored band.

Alternatively, separate rectangular shaped filters can be movably mounted on a separate sliding track for selective movement into position between the lamps 20 – 26 and the window 10. The filters can be so positioned in place by a rack and pinion motor driven gear arrangement, or by an electromagnetically operated lever mechanism.

The solid state circuit of FIG. 8 can be substituted for the relay 116 of FIG. 7 by connecting the terminals of the solid state circuit to the terminals having the same reference numerals in FIG. 7.

A unijunction transistor 140, a resistor 142 and a capacitor 146 are connected as a relaxation oscillator to apply pulses through a transformer 148 to render the triacs 150 and 152 conductive. A zener diode 154, a resistor 142 and a capacitor 130 provide a stable supply voltage for the relaxation oscillator circuit. When an alternating potential is applied to any of the terminals 104, 106 and 108, rectified AC pulses are applied to the zener diode 154 and the relaxation oscillator is tuned on, which turn provides signal pulses to the gates of the triacs 150 and 152 to render the triacs conductive to turn on the fluorescent lamps 20 – 26.

Since a common signal area is used for traffic signal control, some sort of provisions may be provided for color-blind drivers. Various indicia can be provided on the filter means to provide an indication of the condition of the signal light. For example, in the case of the color cylinder 48, the words STOP, GO and CARE can be included respectively on the red, green and amber filters 50 – 60. The words can be formed of clear portions in the filters so the words clearly stand out. In the case wherein the color cylinder is to be used with the traffic light of FIG. 2 to control two directions of traffic, the indicia can be included in the various filter sections as illustrated in FIG. 6 so that an indicia is provided for both directions of traffic control.

It should be understood, of course, that other forms of indicia can be included on the color cylinder to additionally indicate the condition of the traffic signal. For example, as illustrated in with with dashed lines in FIG. 6, the red filter section can include two separated vertical clear bars 160 and 162, the green filter can include a single elongated horizontal clear bar 166, while the amber filter section would not include any clear portions. In addition to the foregoing a separate indicia can be included on the front panel to provide an indicia corresponding to the condition of the traffic light, as illustrated in FIG. 10 wherein the words STOP and GO are formed with red and green filter material respectively. In such a case, separate light sources will be provided for each indicia that are conventionally energized in accordance with the condition of the signal area or window 10. Furthermore, the front casing can also include directional arrow type signals, when required.

In a second embodiment of the invention illustrated in FIG. 9, three separate fluorescent light sources 180, 182 and 184 provide the amber, red and green light respectively. Each light source comprise a plurality of fluorescent lamps, each connected to be energized by a separate electrical circuit in a manner similar to that illustrated in FIG. 7, however requiring a single diode and a separate relay for each light source. The reflectors 186, 188 and 190 are mounted behind the lamps to direct radiation from the lamps to a common elongated window 192 of the type illustrated in FIGS. 1 and 10. An amber filter 194 is placed in front of the source 180, a red filter is placed 196 in front of the source 182 and a green filter 198 is placed in front of the lamp 184. Accordingly, when the sources 180, 182 and 184 are selectively energized, an amber, a red, and a green color, respectively, is transmitted through the window 192. The color control system of FIG. 9 can be em-

ployed with a traffic light of the type illustrated in FIG. **10** to provide the added signal for colorblind drivers.

If the embodiment of the invention of FIG. **9** is to be used with a casing of FIG. **2** to control opposite directions of travel, the arrangement of FIG. **9** can be duplicated to transmit radiation in opposite direction. Alternatively, the reflectors **186, 188** and **190** can be modified to direct radiation in opposite directions and a single source for each color can be used.

In addition to the foregoing, the amber source **180** can be eliminated and the green and red sources energized simultaneously to produce the amber color.

I claim:

1. A traffic signal comprising:
an enlcosure including an elongated radiation transparent section, wherein the elongated dimension of said section is at least two times longer than the shortest dimension of said section;
elongated radiation means mounted within said enclosure for providing at least two visible colors of radiation for transmission through said transparent section, and
means responsive to an electrical signal for sequentially controlling the visible color of radiation to be transmitted through said transparent section.

2. A traffic signal as defined in claim **1** wherein:
said elongated radiation means includes an elongated radiation source and a plurality of filters mounted for movement between said source and said transparent section, and
said means responsive to an electrical signal sequentially moves said filters between said source and said transparent section.

3. A traffic signal as defined in claim **2** wherein:
said plurality of filters are rotatably mounted in the form of a cylinder and surround said source, and
said means responsive to an electrical signal sequentially rotates said filters into position between said source and said transparent section in a step-by-step manner.

4. A traffic signal as defined in claim **1** wherein:
said elongated radiation means includes a plurality of separate radiation sources, a separate filter for each separate source and means for directing radiation from said separate sources through their respective filter to said transmitting section, and
said means responsive to an electrical signal includes a circuit for individially energizing said separate sources.

5. A traffic signal comprising:
an elongated enclosure including an elongated radiation transparent section;
radiation means mounted within said enclosure for providing an elongated source of visible radiation;
a filter means for transmitting different ranges of visible radiation wavelengths corresponding to at least two different colors;
means for movably mounting said filter means for movements between said radiation means and said transparent section, and
electrical means coupled to said filters means for moving said filter means between said radiation means and said transparent section so that at least two colors of visible radiation can be sequentially transmitted through said transparent section.

6. A traffic signal as defined in claim **5** wherein:
said filter means includes indicia that is visible in said transparent section when positioned between said radiation means and said transparent section.

7. A traffic signal as defined in claim **6** wherein:
said indicia transmitts a range of visible radiation wavelengths different from the portion of said filter means surrounding said indicia.

8. A traffic signal as defined in claim **7** wherein:
said indicia forms clear portions of said filter means.

9. A traffic signal as defined in claim **5** wherein:
said source of radiation comprises fluorescent lights, and
said filter means includes at least two filters for transmitting radiation corresponding to red and green visible colors.

10. A traffic signal as defined in claim **5** wherein:
said filter means has a form in the shape of a cylinder and surrounds said source;
said filter means includes at least two separate filter portions, longitudinally disposed along different portions of said cylinder in parallel with the axis of the cylinder for providing at least two different colors, and
said filter means is mounted to rotate about said axis around said radiation source.

11. A traffic signal as defined in claim **5** wherein:
said enclosure is formed with two elongated radiation transparent sections with a separate one of said two transparent sections being located on opposite sides of said enclosure for controlling two opposite directions of traffic, and
said filter means is movably mounted for movement between said sections and said radiation source to control the visible color of the radiation transmitted through said transparent sections.

12. A traffic signal as defined in claim **11** wherein:
said filter means has the form of a cylinder and surrounds at least a portion of said radiation source, and includes at least two separate filter portions disposed longitudinally along the circumference cylinder for providing at least two different colors, and
said filter means is mounted to rotate along the axis of the cylinder about said radiation source.

13. A traffic signal comprising:
an enclosure including a radiation transparent section;
at least two radiation sources mounted within said enclosure for directing radiation through said transparent section;
at least two filters for transmitting at least two different colors;
means for mounting one of said filters to control the color of the radiation transmitted from one of said sources through said transparent section;
means for mounting the other one of said filters to control the color of radiation transmitted from said other source through said transparent section, and
electrical means for controlling the energization of said radiation sources so that at least two different colors are sequentially transmitted through said transparent section.

14. A traffic signal comprising:
an enclosure including a seperate radiation transparent section on opposite sides thereof for controlling two opposite directions of traffic;
radiation means mounted within said enclosure for providing at least two visible colors of radiation for transmission through said transparent sections, and
means responsive to an electrical signal for sequentially controlling the visible color of radiation to be transmitted through said transparent sections.

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