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G. LESSMAN

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INTEGRAL BEAM LAMP AND PROJECTION SYSTEM

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Fig. 1.

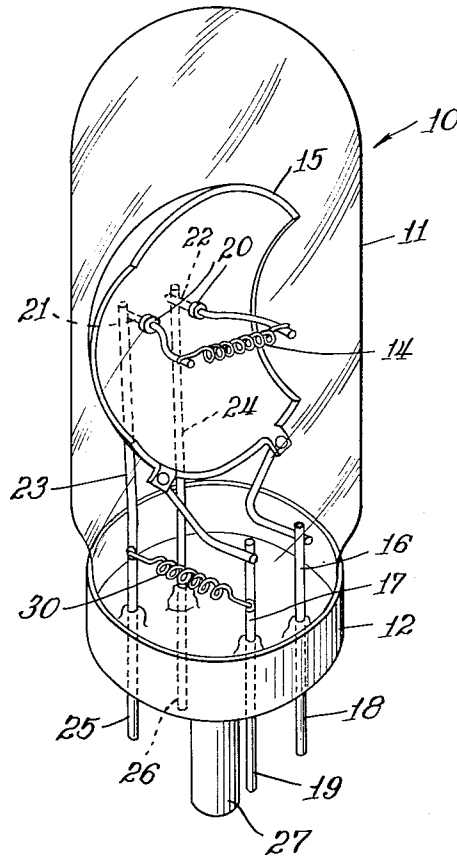
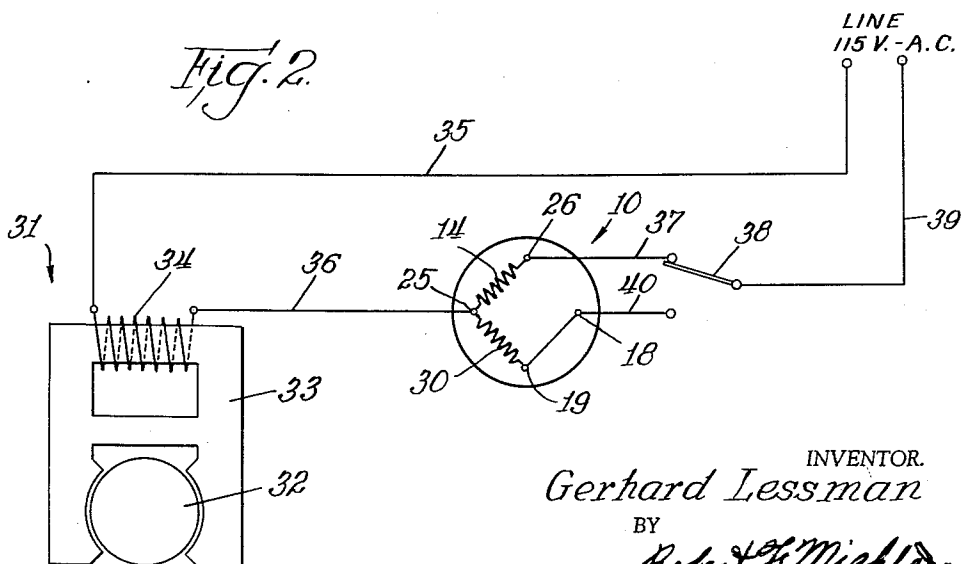


Fig. 2.



INVENTOR.

Gerhard Lessman

BY

Robert F. Miehley
Att'y.

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INTEGRAL BEAM LAMP AND PROJECTION SYSTEM

Gerhard Lessman, Rutland Township, Kane County, Ill.,
assignor to Bell & Howell Company, Chicago, Ill., a
corporation of Illinois

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7 Claims. (Cl. 88—24)

This invention relates to integral beam projection lamps for motion picture and similar projectors, and to a projection system employing same. By integral beam projection lamps is meant the class of lamps in which a reflector optical system, replacing the conventional glass condenser lenses, is an integral part of the lamp structure. Such a lamp may be in the form of a so-called sealed beam lamp, of which automobile headlamps are an example, or it may be similar to conventional tubular bulb projection lamps, but with a reflector mounted internally upon suitable supports, which is the form that has been selected for illustrative purposes.

It is generally known that the luminous efficiency of incandescent lamps is greater at low design voltage operation. For this reason it is desirable to operate integral beam projection lamps at less than line voltage which is normally about 115 volts. The operation of integral beam projection lamps at less than standard voltage presents a power supply problem in motion picture and similar projectors if the cost of the transformer or choke necessary to reduce from line to lamp voltage is not permissible for the application. An obvious solution, often suggested, is to connect an auxiliary resistor in series with the lamp coil to reduce the voltage applied thereto. Unfortunately, this is an item of expense for a resistor capable of handling the large wattage involved. The necessary wiring and mountings add further to the cost. More important are the energy losses in the resistor. Using such a system the advantages of low wattage and high efficiency in the integral beam lamp are thrown away, to the end that almost as much power is used as in conventional biplane projection lamps. Inasmuch as most motion picture projectors and slide projectors use shaded pole motors for driving the projection mechanism and the cooling fan or blower, it has been found feasible to use the motor field winding as a choke in series with the coil of the low voltage lamp. Naturally, the design of the field winding is then adjusted to provide the required ampere turns at the correct lamp current. A great advantage of the motor field winding used as a choke is the fact that no cost is added, because the amount of copper required for the same number of ampere turns is approximately the same under most conditions. Thus the choke is much superior economically to a transformer secondary winding added to the motor field, which has also been proposed.

However, especially in motion picture projectors, it is often necessary or desirable to be able to operate the motor without at the same time burning the projection lamp in series therewith, for this would unnecessarily shorten the useful life of the relatively short lived projection lamp. A typical occasion for this requirement would be during the rewinding of motion picture film. It is of course possible to devise circuitry for switching a resistor equal to the lamp resistance in place of the lamp during the rewind cycle. This would require the use of a fairly high wattage resistor, mounted in the cooling air stream for adequate heat dissipation. The cost of the resistor, the wiring, and necessary fastenings is in many instances greater than is economically justifiable by the illumination gains attributable to the low voltage lamp design.

I have devised an arrangement wherein no additional

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external resistor is required, but a resistor in the form of a second tungsten coil is incorporated within the integral beam lamp structure. The advantages of such an arrangement are the convenience of wiring because the lamp is fitted with a four pin base suitable for making connections to the integral resistor, the absence of a cooling problem because the lamp is inherently capable of dissipating the heat due to the second resistor which is of the same wattage as the lamp coil, and the essentially lower cost of the internal lamp resistor compared to an external resistor of equal wattage dissipation. Further advantages will appear upon a reading of the following specification.

In order to describe the invention in detail, reference is made to the appended drawings, in which:

FIGURE 1 is a pictorial view of a currently available integral beam projection lamp; and

FIGURE 2 is a schematic wiring diagram of a typical lamp application as contemplated in this invention.

The drawings and the following description are of a single illustrative embodiment of my invention, which may be practiced with variations from the embodiment described without departing from the spirit of the invention.

Referring now to FIGURE 1 of the drawing, it will be observed that the reference character 10 designates, generally, an integral beam lamp which includes a sealed glass envelope or bulb 11 onto a four pin wafer stem type base 12, known to the trade as a "True Focus" base. The glass envelope or bulb 11 has mounted therein a horizontally coiled tungsten lamp filament or coil 14 which may be of about 150 watts rating and arranged to operate at a voltage less than standard line voltage or at a voltage which may be of the order 45 volts. The lamp filament or coil 14 is located at one of the foci of an elliptical reflector 15 which is focused upon a projector aperture (not shown) that is located at the other foci of the reflector 15. The reflector 15 is supported at the bottom by wire stems 16 and 17 which extend outwardly through the base 12 and provide at their lower ends front pins 18 and 19. It will be understood that the front pins 18 and 19 constitute two of the four pins of the base 12. The elliptical reflector 15 is centrally supported also by ceramic grommets 20 which are sleeved over filament coil lead wires 21 and 22 that extend through the reflector 15 and are attached to and held by wire stems 23 and 24, respectively. The wire stems 23 and 24 extend downwardly through the base 12 and terminate in rear pins 25 and 26 which constitute the other two pins of the four pin base. A central key pin 27 is employed for properly orienting the base 12 in the cooperating socket.

It will be observed that the front pins 18 and 19 are normally electrically connected together through the metallic elliptical reflector 15. However, they are insulated from the rear pins 25 and 26 across which the lamp filament or coil 14 is connected. In accordance with this invention advantage is taken of the fact that the front pins 18 and 19 are insulated from the rear pins 25 and 26 to connect a tungsten coil or internal resistor 30 between the wire stem 23 and the wire stem 17 or between the pins 25 and 19. Preferably the tungsten coil or internal resistor 30 has a voltage and wattage rating substantially equal to or near that of the lamp filament or coil 14. Since the wire stems 16 and 17 are interconnected, the tungsten coil or internal resistor 30 can be connected to either of them.

As will appear hereinafter the only function of the tungsten coil or internal resistor 30 is to provide a resistance in a circuit equivalent to that of the lamp filament or coil 14. The tungsten coil or internal resistor 30 then can be positioned at the lower part of the glass envelope or bulb 11. Preferably it is positioned, as

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shown, below the lower edge of the reflector 15 where danger of its being short circuited is avoided and yet it is out of sight of the optical system. However, it is located at a safe distance above the wafer stem base 12.

While the lamp filament or coil 14 must be designed in accordance with good lamp design practice for this type of projection lamp in terms of source size, type of winding, and rated life, it is unnecessary to impose equally stringent requirements upon the tungsten coil or internal resistor 30 since, as pointed out, it functions only as a resistor and not as a light source. Any convenient coil configuration can be used for the tungsten coil or internal resistor 30 which approximates the electrical characteristics of the lamp filament or coil 14. In general the tungsten coil or internal resistor 30 can be designed for a lower operating temperature than that of the lamp filament or coil 14 so as to assure a long, safe operating life. When a lower operating temperature is used for the tungsten coil or internal resistor 30, there is a smaller amount of blackening of the glass envelope or bulb since less tungsten is evaporated from the tungsten coil or internal resistor 30 at such lower temperature.

FIGURE 2 shows one application for the integral beam lamp 10 provided with the tungsten coil or internal resistor 30. The circuit here shown can be employed in a projector for operating the projector in the usual manner and for operating the rewind mechanism at which time it is not desired that the lamp filament or coil 14 be energized in order to prolong its life.

In FIGURE 2 it will be observed that the integral beam lamp 10 is shown diagrammatically with the lamp filament or coil 14 being connected between the rear pins 25 and 26, the tungsten coil or internal resistor 30 being connected between the rear pin 25 and the front pin 19, and the front pins 18 and 19 interconnected. The common connection between the front pins 18 and 19 is provided, as described above, by the metallic reflector 15.

The motor for operating the projector and rewind mechanism is illustrated, generally, at 31. It includes a rotor 32 which can be connected selectively to drive either the projector or the rewind mechanism, the arrangement being such that for either operation the rotor 32 rotates in the same direction. Cooperating with the rotor 32 is a magnetic core 33 that is provided with a field winding 34. In accordance with this invention the field winding 34 is connected in series circuit relation with either the lamp filament or coil 14 or the tungsten coil or internal resistor 30.

The system shown in FIGURE 2 can be energized from a suitable source of alternating current such as 115 volt source as indicated as constituting the line. A conductor 35 directly connects one terminal of the field winding 34 to the line. Another conductor 36 connects the other terminal of the field winding 34 to the rear pin 25 which is a common connection to the lamp filament or coil 14 and to the tungsten coil or internal resistor 30.

For operation as a projector the lamp filament or coil 14 is energized in series with the field winding 34. The circuit is completed through conductor 37, switch blade 38 and conductor 39 to the other side of the line.

When it is desired to operate the motor 31 for rewinding purposes and it is not desired to energize the lamp filament or coil 14, the switch blade 38 can be shifted to the alternate position where the circuit to the tungsten coil or internal resistor 30 is completed through a conductor 40.

From the foregoing description it will be apparent that the field winding 34 of the motor 31 has connected in series therewith the necessary amount of resistance when the system is operated either for projection purposes or for rewinding purposes. It is merely necessary to shift the switch blade 38 from one position to the other to effect one or the other type of operation. The intermediate position of the switch blade 38 can be used as an "off" position, if desired,

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While for the sake of explicitness I have described a specific embodiment of my invention, I do not wish to be limited thereby but only by the scope of the following claims.

What is claimed as new is:

1. In a motion picture projection system capable of selective projection and film rewinding operations, in combination, a source of line voltage, a projection lamp having a sealed bulb containing a lamp filament and an internal resistor coil of approximately the same electrical characteristics, a projector motor having a field winding, and circuit means including switch means for selectively connecting said field winding for energization across said source through said lamp filament when said projector is being used for projecting and through said resistor coil when said motor is being used for rewinding.

2. In a motion picture projection system capable of selective projection and film rewinding operations, in combination, a source of line voltage, a projection lamp having a sealed bulb containing a lamp filament and an internal resistor coil of approximately the same electrical characteristics commonly connected together, a projector motor having a field winding, and circuit means including switch means for selectively connecting said lamp filament to said field winding in series circuit relation for energization across said source when said projector motor is being used for projecting, and said resistor coil when said projector motor is being used for rewinding.

3. In a motion picture projection system capable of selective projection and film rewinding operations, in combination, a source of line voltage, a projection lamp having a sealed bulb containing a lamp filament and an internal resistor coil of approximately the same electrical characteristics, a projector motor having a field winding, and circuit means including switch means for selectively connecting said field winding to the common connection between said lamp filament and said resistor coil and for energization across said source through the connected one of said filament and coil whereby the lamp filament will be energized when the projector motor is being used for projecting and the resistor coil will be energized when said motor is being used for rewinding.

4. In a motion picture projection system capable of selective projection and film rewinding operations, in combination, a source of line voltage, a projection lamp having a bulb sealed to a base through which at least three wire stems project externally in insulated spaced relation, a lamp filament and a resistor coil in said bulb commonly connected to one of said wire stems and individually connected to the other two stems, a projector motor having a field winding, and circuit means including switch means for selectively connecting through said wire stem said lamp filament and said resistor coil to said field winding in series circuit relation for energization across said source whereby said lamp filament will be energized when the projector motor is being used for projecting and the resistor coil will be energized when said motor is being used for rewinding.

5. In a motion picture projection system capable of selective projection and film rewinding operations, in combination, a source of line voltage, a projection lamp having a bulb sealed to a base through which at least three wire stems project externally in insulated spaced relation, a lamp filament and a resistor coil in said bulb commonly connected to one of said wire stems and individually connected to the other two stems, a reflector mounted on one of said stems for optical cooperation with said lamp filament and having its reflecting surface out of the line of sight of said resistor coil, a projector motor having a field winding, and circuit means including switch means for selectively connecting through said wire stem said filament and said coil to said field winding in series circuit relation for energization across said source whereby said lamp filament will be energized when the projector motor is being used for projecting and the

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resistor coil will be energized when said motor is being used for rewinding.

6. In an integral beam projection lamp of the class described, in combination, a bulb sealed to a multiple pin base, a reflector within said bulb, a lamp filament within said bulb within the field of view of said reflector, a resistor coil of approximately the same resistance as that of said lamp filament within said bulb and out of the field of view of said reflector and out of the optical system of the lamp and circuit means for separately energizing said filament and coil through said multiple pin base.

7. In an integral beam projection lamp of the class described, in combination, a bulb sealed to a multiple pin base, a stemmed lamp filament within said bulb supported by and energized through a pair of the pins of said base, a stemmed reflector for said lamp filament supported by

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at least another pin of said base, and a resistor coil within said bulb out of the optical field of said reflector and out of the optical system of the lamp and connected and supported at one end by one of the stems of said lamp filament and at the other end by the stem of said reflector.

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