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R. N. FALGE ET AL

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INCANDESCENT LAMP

Filed Oct. 16, 1931

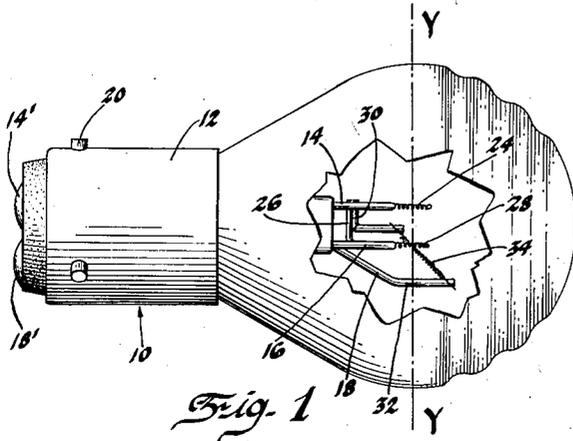


Fig. 1

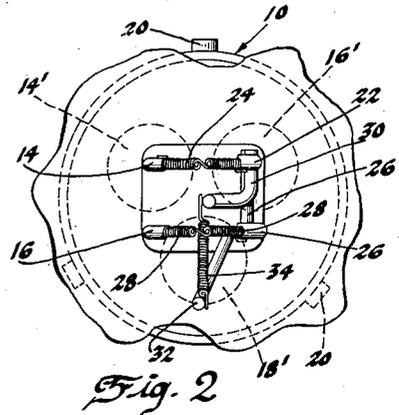


Fig. 2

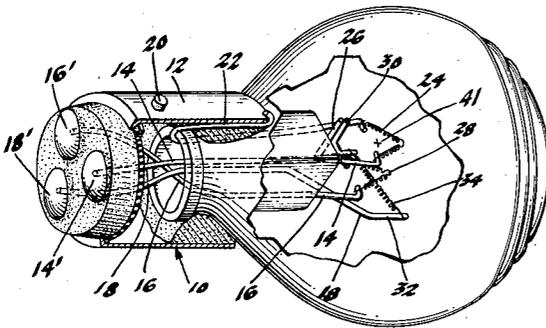


Fig. 3

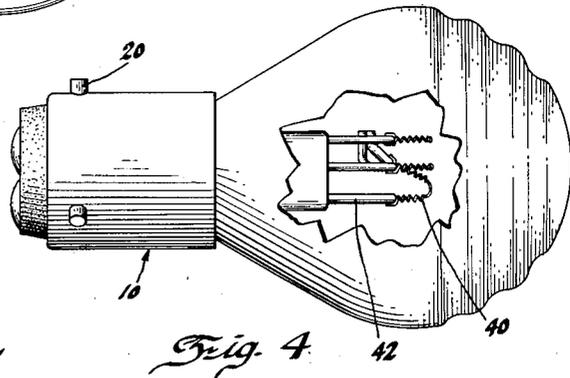


Fig. 4

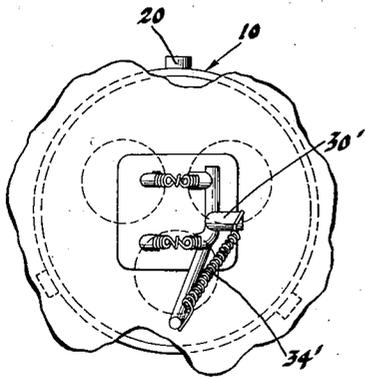


Fig. 5

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INCANDESCENT LAMP

Application filed October 16, 1931. Serial No. 569,246.

In our prior application Serial No. 539,518, filed May 23, 1931, we have described and claimed an improved automobile head-lighting system providing a wide choice of beams and combinations of beams from the two headlamps. An important feature of that system is a three filament bulb of special design and it is to that bulb that this application for patent is directed.

Our improved bulb is provided with three independently energizable filaments. Two of these are V-shaped filaments arranged in much the same way as the filaments in the conventional two-filament bulb in common use in headlamps. The third filament is so located as to give the desired optical effect in the headlamp and at the same time insure long life and easy manufacture. This filament is preferably of the straight coil type and so arranged that it overlaps the adjacent V-shaped filament at its open end preferably as near the center of such adjacent filament as is commercially practicable and then diverges therefrom. The overlapping of the filaments is an important feature of our invention as it makes possible a smooth composite beam without serious streaks or shadows when the straight coil filament is energized simultaneously with the filament it overlaps.

The lamp is provided with three insulated terminals, each in conducting relation with a lead connected to one side of one of the filaments, while the other sides of all three of the filaments are supported by a common lead wire secured to the metallic wall of the base. It has proven to be a particularly difficult problem to so arrange the various lead wires that the welding of the lead wires to each other and to the filaments may be conveniently and economically performed, and at the same time space the welded joints where the filaments are fastened to the lead wires at a sufficient distance from each other as regards the length of lead wire which separates them so that the heat from one will not cause the other to burn out at relatively low over-voltage when the two filaments are burned simultaneously.

This and other important features of the

invention can best be understood by reading the following specification in connection with the accompanying drawing in which:

Figure 1 is a side elevation of our improved bulb, and Figure 2 is an end view, the glass envelope in each case being broken away.

Figure 3 is a perspective view showing filaments and the connection of the leads to the insulated contacts and to the metallic wall of the base.

Figure 4 is a side elevation of a modified form of bulb.

Figure 5 is an end view of a further modification.

Our improved bulb comprises the base 10 including a cylindrical shell 12, through which extend lead wires 14, 16 and 18 having exposed contacts 14', 16' and 18'. The lead wires are insulated from the shell and from each other in the usual manner. The shell may be provided with three pins 20 arranged at unequal angles to each other as shown. These pins are adapted to cooperate with similarly spaced bayonet slots in the socket, making it impossible to insert the bulb in the socket with the wrong side up.

There is secured in conducting relation with the shell 12, as by solder, the lead 22 which provides a return path for the current supplied to all of the filaments. The portions of the leads 14 and 22 which are exposed within the bulb lie in the same plane and have their extreme ends inturned. To these ends are secured the ends of the filament 24.

To the lead 22 there is secured an auxiliary lead 26, extending downwardly into the same plane as the lead 16, and then forwardly, and having its extreme end bent toward the correspondingly bent end of the lead 16. To these ends are secured the ends of the filament 28.

There is also secured to the lead 22 a second auxiliary lead 30, extending downwardly to a point between the planes of the other lead wires, where it is bent toward the axis of the bulb and then forwardly. The lead 18 extends downwardly and forwardly to a point well below the lead wire 16 and is then extended forwardly as at 32. To the

ends of the leads 30 and 32 are secured the ends of the filament 34.

Leads 14 and 22 are sufficiently spaced from leads 16 and 26 so that in welding the filaments to them one of the welding jaws may be readily interposed between the pairs of leads while the other come down upon them from above or below the lead as viewed in Figure 1. The same operation is employed in the manufacture of the present day two filament bulb. The spacing between the pairs of leads is also sufficient to permit the introduction of welding jaws from the sides of the assembly as viewed in Figure 1 in welding the filament 34 to lead 30. The welding of filament 34 to lead 32 may be readily accomplished at the same time.

Referring to Figure 1, it will therefore be noted that in welding the V-shaped filaments 24 and 28 to their respective leads, the welding jaws move in planes parallel to the plane of the paper while in welding the filament 34 to its leads the jaws move in planes at right angles to the plane of the paper.

While the filaments 24 and 28 are of V-shape to afford a concentrated beam, the filament 34 is preferably in the form of a straight coil to spread the beam projected from it through quite a large vertical angle. This effect is enhanced by the position of the filament in the bulb. This large vertical spread is desirable for when the filament 34 is positioned below focus in the lamp the light is projected well above the horizontal and is distributed so as to give good general illumination, and when the filament 34 is above focus the same effect is obtained on the road nearer the car. The increased vertical spread also makes the beam blend better with the beams projected from the V-shaped filaments when the two are used simultaneously.

It is important that the light emitting or coiled portion of the filament 34 extend into the plane of the filament 28, or in other words, that the filaments 34 and 28 overlap. This overlap should preferably be such that the horizontal planes through the upper-most portions of the two filaments coincide. However, acceptable results will be obtained if manufacturing tolerances are limited to plus or minus $\frac{1}{16}$ ".

It is the overlapping of the filaments that insures that there will be no dark horizontal streak in the beam produced when the filaments are used together to build a composite beam pattern.

It is also desirable that the filament 34 intercept the plane of filament 28 as near the center point of the light emitting portion of filament 28 as is commercially feasible. I have indicated such center point at 41. This point is the geometrical center of the triangular area inclosed by the V-shaped filament. This is the point which is usually taken as coinciding with the focal point of

the parabolic reflector when a beam of maximum concentration is obtained.

It will be noted that the filament 34 is inclined at an angle of substantially 45° to the bulb axis. This is the preferred angle but is not critical for we have been able to get acceptable results with filaments arranged at angles varying from 30° to 90° or more. This angle is determined, to some extent, by the fact that it is desirable to have the center of filament 34 slightly ahead of the vertical axis Y—Y through the centers of filaments 28 and 24 so that when the filaments are out of adjustment in any direction the desired beam characteristics will be retained. This assists in maintaining acceptable beam patterns throughout the range of filament inaccuracy encountered in service.

It will be noted that the bulb has been designed especially for convenience in manufacture. Not only is the welding of the filaments to the leads easily accomplished in the manner previously described, but the design is also such that the welding of auxiliary leads 26 and 30 to the lead 22 may be accomplished at the same time by employing a single pair of welding jaws. The last operation may be further simplified by making leads 26 and 30 out of a single piece of wire, the adjacent ends of the leads being joined by an integral loop of metal.

We have taken special precautions to prevent failure of the filaments next to the welds where the filaments are joined to the common lead wire or the auxiliary lead wires, which, for this purpose, may be regarded as an integral part of the common lead wire. Where two filaments are welded close together to a common lead and simultaneously energized we have found that the combined heat from the two filaments is sufficient to cause the weaker of the two to fail near the weld, particularly when moderate over-voltage is applied. While this difficulty might be overcome by using a common lead of sufficient cross section to carry off the excess heat, this method would result in inefficiency due to excessive heat loss, and would probably make it necessary to use a larger stem thereby increasing the size and cost of the bulb and base. We have overcome the difficulty by separating the points of welding of the filaments to the common lead wire by a sufficient length of lead to prevent overheating. We have found, in practice, that a length of lead wire of approximately $\frac{1}{4}$ " is ample for this purpose.

If desired the preferred form of bulb may be altered by eliminating the upper V-shaped filament, although this will reduce the possible number of variations in illumination.

We have illustrated in Figure 4 a slight modification. In this form the straight coil filament 34 is replaced by a V-shaped fila-

ment 40 which likewise has one leg extending with in the V of the filament above it.

In Figure 5 we have shown a further modification in which the auxiliary lead 30' is of slightly different shape, extending downwardly to a point between the planes of the other lead wires then forwardly and outwardly. The straight coil filament 34' has its upper end secured to the outer end of the lead 30'. With this design the effect of the filament extending at an angle to one side as well as at an angle in a vertical plane is to distort the beam in the opposite direction. This is undesirable in that it disturbs the symmetry of the composite beams and interferes with the attainment of a vertical cutoff line at the left boundary of the beam when the bulb is used in the left headlamp to light only the center and right hand side of the road. This sidewise distortion is present also when the bulb is used in the right hand lamp for providing light above the headlamp level, but the effect is less objectionable in this case. If desired, the filament 40 of Figure 4 might be similarly mounted.

It will be understood that the directional terms "above" and "below," etc., are used in this specification in a relative sense only. In actual practice, the bulb is used with one side up in one headlamp and the other side up in the other headlamp, as described in our prior application. Such variations in use of the bulb will, of course, not take it outside of the scope of the appended claims.

We claim:

1. An incandescent electric lamp comprising a bulb provided with at least three independent leads and with a common return lead extending to a point opposite one of said independent leads, a filament bridging said opposed leads, a plurality of branch leads having their end portions secured in parallel relation to said return lead to permit of their being simultaneously welded thereto, one of said branch leads extending to a point opposite another of said independent leads and in a plane parallel to said first-named pair of opposed leads, a filament bridging said opposed leads, the other of said branches extending to a point substantially midway between said planes, said third independent lead terminating at a point beyond said parallel planes and forward of said filaments and a filament connecting said last-named branch with said third independent lead.

2. An incandescent electric lamp comprising a bulb provided with at least three independent leads and with a common return lead extending to a point opposite one of said independent leads, a V-shaped filament bridging said opposed leads, a plurality of branch leads secured to said return lead and having their end portions secured in parallel relation to said return lead to permit of simultaneous welding, one of said branch

leads extending to a point opposite another of said independent leads and in a plane parallel to said first-named pair of opposed leads, a V-shaped filament bridging said opposed leads, the other of said branches extending to a point substantially midway between said planes, a third independent lead terminating at a point beyond said parallel planes and forwardly of the remaining leads, and a rectilinear filament connecting said last named branch and lead and intersecting one of said planes.

3. An incandescent electric lamp comprising a bulb provided with at least three independent leads and with a common return lead extending to a point opposite one of said independent leads, a V-shaped filament bridging said opposed leads, a plurality of branch leads secured to said return lead and having their end portions secured in parallel relation to said return lead to permit of simultaneous welding, one of said branch leads extending to a point opposite another of said independent leads and in a plane parallel to said first named pair of opposed leads, a V-shaped filament bridging said opposed leads, the other of said branches extending to a point substantially midway between said planes, a third independent lead terminating at a point beyond said parallel planes and forwardly of the remaining leads, and a rectilinear filament connecting said last named branch and independent lead and having a portion of its light emitting section in the same plane as the lowermost of the V-shaped filaments and within the angle defined thereby, the innermost ends of said filaments being approximately equidistant from the base.

4. An incandescent electric lamp comprising a bulb provided with at least three independent leads and with a common return lead extending to a point opposite one of said independent leads, a filament bridging said opposed leads, said return lead being provided with a plurality of branches, one of said branches extending to a point opposite another of said independent leads and in a plane parallel to said first-named pair of opposed leads, a V-shaped filament bridging said opposed leads, the other of said branches extending to a point substantially midway between said planes, a third independent lead terminating at a point beyond said parallel planes and forwardly of the remaining leads, and a rectilinear filament connecting said last named branch and independent lead and having a portion of its light emitting section in the same plane as the V-shaped filament and within the angle defined thereby, the innermost ends of said last named filaments being approximately equidistant from the base.

5. An incandescent lamp comprising a bulb containing an axially extending V-shaped filament, a filament having a rectilinear portion passing through the V-

shaped filament adjacent its center, one end
of said rectilinear portion terminating but a
short distance from said V-shaped filament
while the other end is more distant therefrom
5 so that when the filaments are viewed from
the side the effect of a T-shaped filament is
obtained having its maximum intensity adja-
cent the point of intersection of the filaments,
and leads for supplying current to said fila-
10 ments, and means for energizing said fila-
ments.

In testimony whereof we affix our signa-
tures.

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