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OSCILLATING DEVICE ACTIVATED BY BIMETALLIC ELEMENT AND PROVIDED WITH AUTOMATIC AMBIENT TEMPERATURE COMPENSATING MEANS

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Fig. 3.

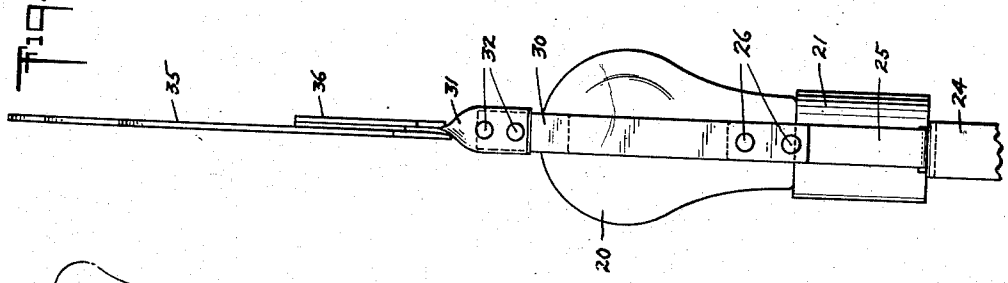


Fig. 2.

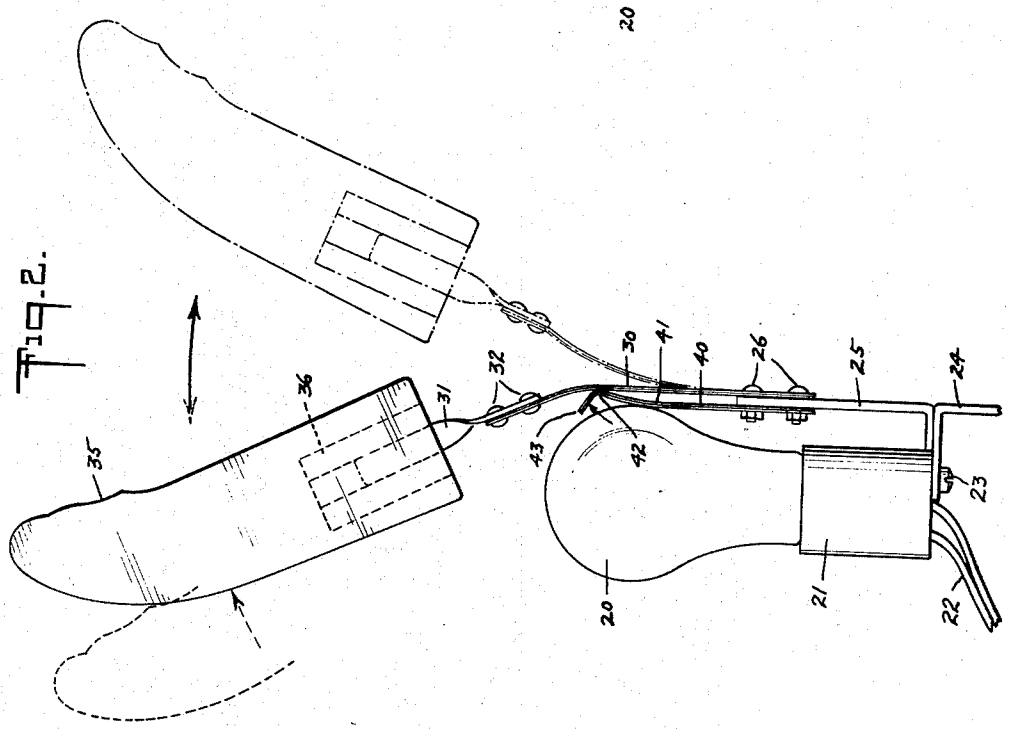
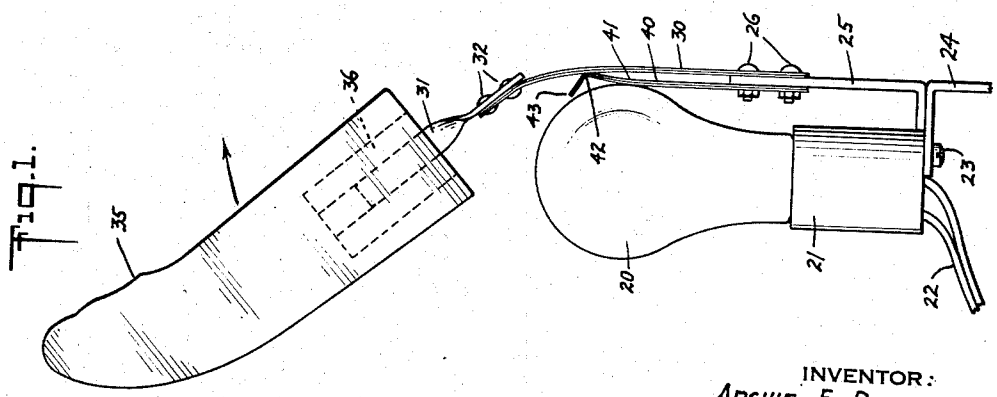


Fig. 1.



INVENTOR:
ARCHIE E. REITZ

BY Frederick Breitenfeld
ATTORNEY

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OSCILLATING DEVICE ACTIVATED BY BI-METALLIC ELEMENT AND PROVIDED WITH AUTOMATIC AMBIENT TEMPERATURE COMPENSATING MEANS

Archie E. Reitz, Los Angeles, Calif.

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5 Claims. (Cl. 60—23)

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My present invention relates generally to motors, and has particular reference to a motive unit which generates oscillatory movements as the result of distortion of a bi-metallic element whose opposite surfaces are subjected to different temperatures at successive intervals of time. Co-ordinately, my invention relates to oscillating devices in which the driving motor is of the character mentioned.

A general object of the invention is to improve the efficiency, reliability, and versatility of a type of motive unit that affords a simplified and unusually inexpensive source of relatively minute motive power suitable for such uses as the animation of light-weight advertising displays, amusement devices, and similar items. The type of motor to which the invention relates derives its energy from an activator having a temperature appreciably different from the ambient temperature, the temperature differential being utilized by means of the distortions of a bi-metallic element. This element is of the well-known type whose opposite surfaces have different temperature coefficients of expansion.

More particularly, motors of this type involve a resilient deflectable strip secured in association with the activator in such a way that one end of the strip is anchored at a point of pivotal support while the strip extends in an adjacent relation to the activator. The strip includes or is formed of a bi-metallic element adapted to distort upon subjection to the two different temperatures which are thus afforded. The distortion is effective to initiate a swinging movement of the strip away from the activator, and it is during this swing that the bi-metallic element is afforded an opportunity to resume its normal shape, so that upon the completion of the return swing the activator is again effective to distort the bi-metallic element and thereby repeat the operation.

In the preferred embodiment of the present invention, the source of temperature differential is an ordinary electric lamp of relatively low wattage. The heat generated by such a lamp is quite small but is nevertheless sufficient for the present purpose. Where the motor is to be used for the animation of advertising displays such as the cardboard devices commonly employed on store counters and in store windows, the use of an electric lamp as the source of temperature differential is of particular advantage because it can be utilized at the same time to illuminate the display.

It has been found that the heat radiated by such a lamp often warms up the surrounding

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region to an excessive degree and varies the ambient temperature gradient to such an extent that the desired cooling-off of the bi-metallic element during the outward swing does not occur as quickly and reliably as it should, the smooth and efficient operation of the motor being correspondingly impaired. It is a principal object of the present invention to overcome this difficulty and to provide a novel means for automatically compensating for variations in the ambient temperature.

In accordance with my invention, an independent bi-metallic member is interposed between the lamp and the resilient swinging strip, and is so positioned as to establish contact with the swinging strip and transmit heat to the latter (by conduction) on each return swing. The bi-metallic member also serves as a barrier to the transmission of radiant heat from the lamp to the space in which the movements of the swinging strip take place. In addition, the bi-metallic member is so constructed as to provide a substantially constant area of contact with the swinging strip under all operating conditions and to move the contact area away from the heat source in response to increased temperature thereof to limit the return swing of the strip by a corresponding amount.

The bimetallic member is itself of resilient character and thus serves to afford a resilient abutment for the strip on each return swing of the latter.

The preferred way of achieving the objects and advantages of the invention is illustrated in the accompanying drawing, in which:

Figure 1 is an elevational view of the working parts of an illustrative oscillating device constructed in accordance with the present invention;

Figure 2 is a view similar to Figure 1 showing the device under the operating conditions that exist after the lamp has become heated; and

Figure 3 is a view taken at right angles to Figure 1.

In the device shown, 20 represents an ordinary electric lamp, having a relatively low wattage such as 60 watts or so, mounted in an ordinary lamp socket 21. The socket is provided with wires 22 for connection to a source of electric current, and may be secured in any suitable fashion, as by bolt 23, to a supporting bracket 24 by means of which the lamp is mounted in appropriate association with a display or other oscillating device in connection with which it is to be used.

The bracket 24 is provided with a substantially

rigid upstanding member or bar 25 which extends alongside of and is spaced from the socket 21. Secured to the upper end of the bar 25, by bolts 26 or equivalent mounting expedient, is a resilient deflectable strip 30 which extends upwardly in adjacent relation to the lamp 20. This strip may be constructed in various ways. It includes as a part thereof a bi-metallic element so shaped and positioned that the heat of the lamp is effective to distort it and by such distortion to initiate a swinging movement of the strip away from the lamp. I have chosen to illustrate the strip 30 as being constituted almost entirely of a bi-metal, its lower end being directly secured to the bar 25. The strip 30 is so positioned that it normally lies in close proximity to the lamp 20, and the two metals of which the element is formed are arranged with respect to the lamp so that the heat from the lamp will distort the element to initiate a swinging movement away from the lamp.

For illustrative purposes I have shown an element 35, intended to represent part of an advertising display device, secured to the free end of the segment 31, the latter being secured to the upper end of the strip 30 by rivets 32. The element 35 may be composed of a blank of cardboard or the like and may have an appropriate cardboard loop or recess 36 formed on it by means of which it is frictionally supported upon the free end of the segment 31. The element 35 constitutes a "load" which is so designed and weighted in relation to the shape and disposition of the deflectable strip 30 on which it is mounted, that an oscillation of substantial magnitude may be achieved. In the illustrated construction, the parts are intended to swing back and forth within the approximate range indicated between the dashed line and the dot-and-dash position shown in Figure 2. More specifically, the center of gravity of the load is so located that when the bi-metallic element 30 is distorted under the influence of the lamp 20 the center of gravity moves past the dead center axis extending vertically through the point of pivotal support. Of course, the display element 35 may assume various desired configurations, the center of gravity being properly located and adjusted (if necessary) by means of weights (not shown) secured to the element.

In accordance with my invention, there is interposed between the lamp 20 and the swinging strip 30 an independent elongated bi-metallic shield or member 40 which is heat-conductive and which is heated by the lamp, yet opaque to the radiant energy emanating from the lamp. Where the lamp is of the ordinary shape shown, provided with a substantially globular glass filament enclosure, the shield or member 40 can be conveniently formed of a strip of bi-metallic material having its lower end secured to the inner face of the bar 25 by the bolts 26. The member 40 extends upwardly between the lamp 20 and strip 30 and has an intermediate portion 41 in abutment with the lamp. Adjacent to its upper end, the strip 40 is sharply bent to form a knee 42 projecting toward the element 30, the free upper end 43 of the member 40 being slightly spaced from the lamp.

When the lamp is turned on, it becomes heated in well-known fashion. This heat is transferred to the bi-metallic shield or member 40, and through it to the strip 30, causing a distortion of the bi-metallic element 30. The parts are so designed that the distortion of the element 30 is effective to move the center of gravity of the load 35 past the dead center axis, and as this happens the weight of the load amplifies the swinging movement that has been initiated. Depending upon the size, shape, resilience, and other characteristics of the deflectable strip or element 30 and of the load itself, the swinging movements will reach an extreme position shown in dot-and-dash outline at which the stress upon the element 30 is sufficient to impart a returning impulse. As the parts tend to resume their initial positions, the center of gravity returns across the dead center axis and becomes effective to complete the return swing. In the meantime, the bi-metallic element 30 has had an opportunity to return, at least partly, to its initial undistorted shape, and the process is repeated as the element 30 comes again into contact with the heated member 40.

While the shield or member 40 serves as a barrier to the transmission of radiant heat from the lamp to the space in which the movements of the bi-metallic element 30 take place, and thus normally prevents this ambient region from becoming overheated, this mere shielding action is not always as effective as may be desired under certain operating conditions. For example, when the motor is operating within a small, confined space which is not well ventilated, the temperature gradient away from the lamp may not decrease sufficiently to provide proper cooling for the bi-metallic element 30. Under such circumstances it may be advantageous to shift the range of oscillation of the swinging strip 30 between extreme positions further removed from the lamp than the extreme positions of normal operation. In this way the bi-metallic element is moved outward to a point of lesser temperature and its return swing limited to a point not quite so close to the lamp.

To accomplish these ends, the bi-metallic member 40 is effective. Under conditions of greater than normal operating temperature, the member 40 distorts away from the lamp 20 so that the knee 42 moves in the direction of the arrow, as shown in Figure 2. As the bi-metallic element 30 establishes contact with the knee 42 on its return swing, the swing is correspondingly limited to a position slightly further from the lamp 20 as the temperature of the latter increases.

The bi-metallic member 40 is itself preferably fabricated of resilient deflectable material which, however, is substantially stiffer than that of the bi-metallic element 30. This affords a desirable resilient abutment for the swinging strip on each return swing.

An additional feature helping to make the motor self-compensating and continuously operative under all possible operating conditions resides in the sharply bent knee 42 of the bi-metallic member 40. The knee 42 projects toward the bi-metallic element 30 and provides a finite, substantially linear contact with the element 30 upon each return swing. As the knee 42 is sharply bent, the contact area is substantially the same regardless of the position of distortion of the member 40. That is, the area of contact between the knee 42 and the element 30 does not vary appreciably under different conditions of operation, so that the heat conducted between the member 40 and the element 30 on each return swing is substantially totally dependent on the temperature differential therebetween which has been substantially compensated for as described hereinabove.

From the foregoing, it is seen that the present invention provides, in simple and inexpensive fashion, an automatic ambient temperature compensator, adapted to perform efficiently and reliably under widely different operating conditions.

In general, it will be understood that those skilled in the art will be enabled to modify the details herein described and depicted without necessarily departing from the spirit and scope of the invention. It is intended, therefore, that these details be considered as illustrative and not in a limiting sense.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. An oscillating device of the kind described, comprising an electric lamp, a resilient deflectable strip secured at one end to a point of pivotal support and extending in adjacent relation to said lamp, including as a part thereof a bi-metallic element so shaped and positioned that the heat of the lamp is effective to distort it and by such distortion to initiate a swinging movement of the strip away from the lamp, and a bi-metallic member positioned between said lamp and said strip to provide a barrier to the transmission of radiant heat from the lamp to the space within which the movement of said strip takes place, said strip establishing contact with and being heated by said bi-metallic member on each return swing, said bi-metallic member being itself distorted away from said lamp in response to increased temperature of the latter to limit the return swing of said strip by a corresponding amount.

2. An oscillating device as defined in claim 1, said bi-metallic member being formed with an angular knee portion projecting toward said strip for contact therewith on the return swing of said strip, said knee portion providing a relatively small and constant area of contact with said strip regardless of the distortion of said bi-metallic member.

3. An oscillating device of the kind described, comprising an electric lamp including a substantially globular filament enclosure, a resilient deflectable strip secured at its lower end to a point of pivotal support and extending upward therefrom in adjacent relation to said lamp, said strip including as a part thereof a bi-metallic element so shaped and positioned that the heat of the lamp is effective to distort it and by such distortion to initiate a swinging movement of the strip away from the lamp, a load carried by the free end of the strip and having its center of gravity so located that as the strip moves under the influence of said distortion the center of gravity is carried past the dead center axis which extends vertically through said point of support, thereby amplifying the swinging movement away from the lamp, and an elongated bi-metallic member secured at its lower end and extending upward between said lamp and said strip, said member having its intermediate portion abutting said globular filament enclosure and its upper end portion formed with an angular knee for contact with said strip on the return swing of the latter, said bi-metallic member being distorted to move the angular knee away from the lamp in response to increased temperature of the latter, to limit the return swing of the strip by a corresponding amount.

4. An oscillating device as defined in claim 3, wherein said knee comprises a sharply bent portion of said bi-metallic member adapted to make line contact with said strip regardless of the distortion of said member.

5. An oscillating device as defined in claim 3, wherein said bi-metallic member is itself fabricated of resilient deflectable material to afford a resilient abutment for said strip on each return swing.

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