

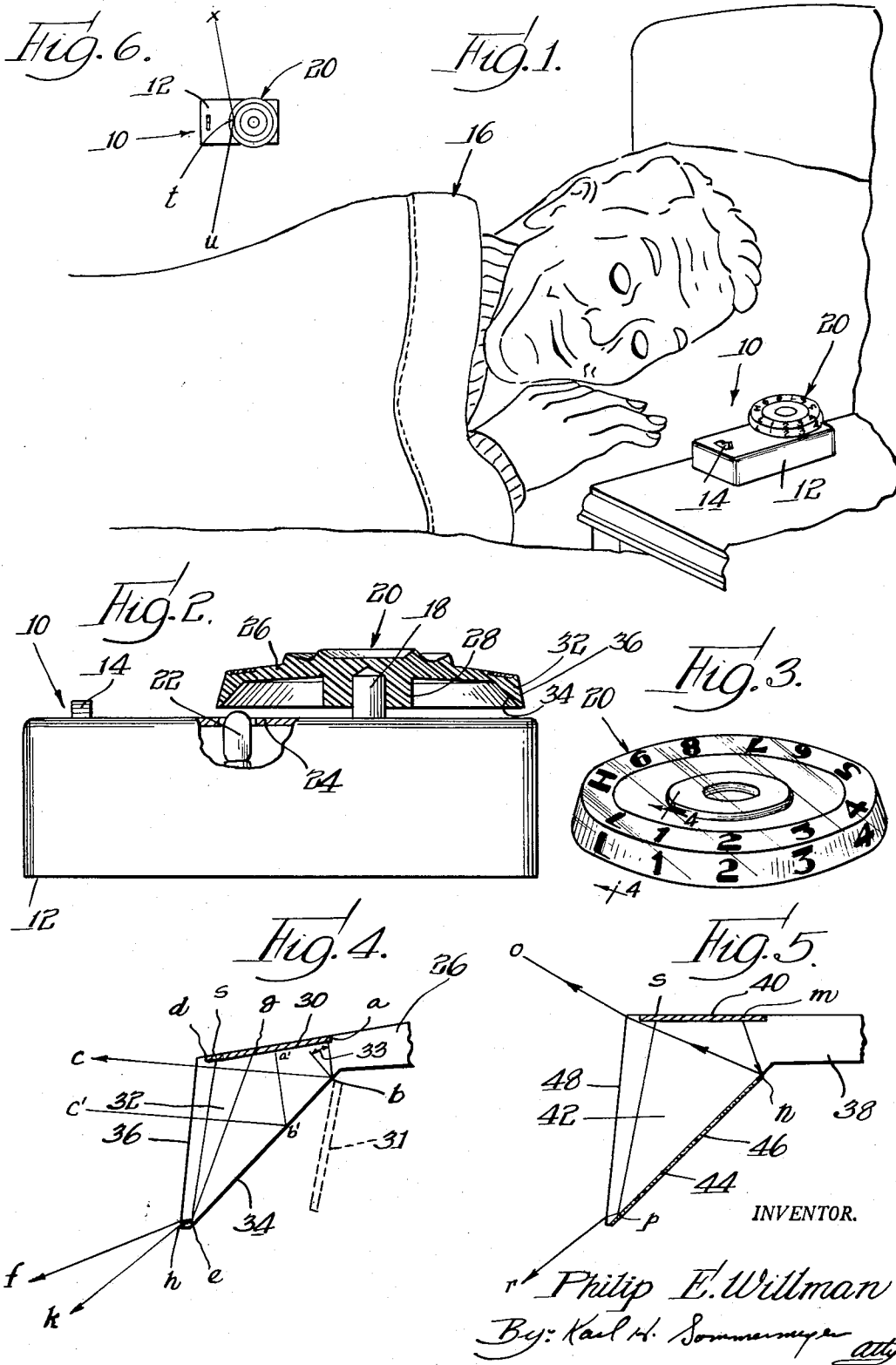
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P. E. WILLMAN

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CONTROL KNOB

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1

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Philip E. Willman, St. Charles, Ill., assignor to McGraw Electric Company, Elgin, Ill., a corporation of Delaware

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1 Claim. (Cl. 116—133)

The present invention relates to a novel control knob and more particularly to a novel control knob suitable for, but not limited to, use with a device for controlling the temperature of electric blankets, electric hot pads or the like.

Electric blankets and similar heating devices have heretofore been provided with control means having a knob with control indicia thereon for indicating the temperature to which the control is set. Such control means may be placed on a bedside table and the table may be so tall that the control knob lies above the eye level of a person lying on the bed. Since the control indicia on the knob are preferably located on an upfacing surface thereof, a person lying on the bed must lift his head or even lift himself substantially to a sitting position to read such indicia. It is therefore an object of the present invention to overcome this disadvantage of the heretofore known devices by providing a novel control knob constructed so that the indicia thereon may be read from positions located both above and below the level of the control knob or in other words the indicia may be read by either looking down on the knob or by looking at it radially.

Another object is to provide a control knob of the afore-described type wherein indicia carried on a surface approximately normal to the axis of the knob can be read from radial directions.

Another object is to provide a control knob of light-permeable material wherein indicia are readable through internal reflections.

Still another object of the present invention is to provide a novel control knob of the afore-described type which is pleasing in appearance.

Other objects and advantages of the present invention will become apparent from the following description and the accompanying drawings wherein:

Fig. 1 is a perspective view illustrating how a control device embodying the features of this invention may be placed on a bedside table and used in connection with an electric blanket;

Fig. 2 is a side elevational view partly in section of a control device embodying the novel features of this invention;

Fig. 3 is a perspective view showing the novel control knob of this invention;

Fig. 4 is an enlarged, fragmentary, cross-sectional view taken along line 4—4 in Fig. 3 and illustrates the manner in which the image of a numeral or the like on an upper surface of the control knob may be viewed from a lateral position;

Fig. 5 is similar to Fig. 4 that shows a slightly modified form of the present invention; and

Fig. 6 is a plan view indicating the wide angle through which a single indicium or numeral is readable from positions spaced radially or horizontally from the novel control knob of this invention.

Referring now more specifically to the drawings wherein like parts are designated by the same numerals through-

2

out the various figures, a control device 10 embodying the principles of this invention is shown best in Figs. 1 and 2. The control device includes a housing 12 which contains a switch of any known construction actuated by a toggle member 14 and connected with an electric blanket 16 or the like. The housing 12 also contains a thermostatic switch, also of known construction, for controlling the temperature of the electric blanket and the thermostatic switch is adjustable by means of a rotatable post 18. A control knob 20 embodying the features of this invention is fixed to the post 18 for rotating the post and since the control device is usually operated in a darkened room a light 22 is mounted within the housing for directing light through an opening 24 in the housing for illuminating the control knob from below.

As shown best in Fig. 1 devices such as control device 10 are frequently placed on a bedside table which may be so high that the upper surface of the control knob 20 is above the eye level of a person lying in the bed or at least sufficiently high so a person lying in the bed cannot conveniently view the upper surface of the control knob without lifting himself. Thus it is desirable to have control numerals or indicia on the control knob readable from a position located generally horizontally from the knob or in other words readable by a person lying in the bed.

Referring now particularly to Figs. 2, 3 and 4 the novel control knob 20 of this invention is preferably molded in a single piece from a transparent plastic material and is formed with a disc-shaped central body portion 26, a centrally located apertured boss 28 for receiving the post 18, and a flange 32 or rim of prismatic cross section. Around the periphery of the knob and on the portion of the upper surface thereof just above the flange 32 there is carried a plurality of indicia 30. In the embodiment illustrated these indicia include the letters H and L to indicate high and low temperature positions of the control knob and the numerals 1—9 to indicate various intermediate settings. The indicia 30 have an appearance contrasting with that of the surrounding surface, and may be formed in any known manner. Thus they may be molded as indentations, as raised portions, or with a contrasting surface texture. They may be applied as by printing or painting with a colored or opaque material, or by making the surface with a tool. In Figs. 2 and 4 these indicia 30 are shown as indentations filled with a colored, opaque material such as paint.

The rim or flange 32 acts as a reflecting prism for making the under surfaces of the indicia 30 visible from the sides. Light from the indicia 30 passes down within the solid transparent material of flange 32, is reflected at surface 34 and passes out to the left thru face 36 where it may be observed. Because of this optical function of the flange 32, the knob is preferably made of a transparent material having a high index of refraction. Specifically, the knob 20 of Figs. 2, 3 and 4 is made of methyl methacrylate which is sold under the trademarks Lucite and Plexiglas. With methyl methacrylate, which has an index of refraction of 1.49, total reflection occurs when a light ray within the body of methyl methacrylate intersects a surface thereof at an angle of incidence greater than approximately 40°. Thus any ray in the prism, such as ray *ab* in Fig. 4, that strikes the surface 34 at an angle of incidence of 40° or more will be totally reflected even though surface 34 is uncoated. The angle of incidence is the angle between the ray and the normal to the surface, so that angle 33 is the angle of incidence of ray *ab*.

As may be seen in Figs. 2 and 4 surfaces 34 and 36 are surfaces of revolution about the axis of the knob. They are parts of cones. The slant of reflecting surface 34 makes an angle of 45° with the axis of the knob and the slant of peripheral surface 36 makes an angle of 6°

3

with the axis. Rays ab and $a'b'$ as shown in Fig. 4 make an angle of substantially 40° with surface 34 and are reflected as rays bc and $b'c'$ for permitting observation from the direction of the rays c and c' . The image of index or numeral 30 in Fig. 4 will lie approximately at the position 31, its precise position depending in part on the slight magnifying effect of the curved refracting surface 36, the reducing effect of the curved mirror surface 34, and the apparent foreshortening of the space because the speed of light in the methyl methacrylate is lower than in air.

An attempt to view the image 31 from an angle materially above the direction bc will require an angle of incidence at surface 34 less than the critical angle of approximately 40° , and so will not utilize total reflection. A small part of the light will, of course, be reflected from surface 34 to the observer but the resulting image will be faint and may even be unobservable because of the presence of other light. However the loss of an observable image at 31 from viewing positions above the line bc is acceptable because from such positions the index 30 itself may be viewed from above.

The attempt to view the image 31 from an angle below the direction bc will utilize an angle of incidence at surface 34 greater than the critical angle of approximately 40° and so will succeed in obtaining total reflection and the resultant bright image. However, whether or not a complete image will be observed will depend on the angle of observation and the extent of surface 34. For example, in Fig. 4, a light ray de traveling from point d at the opposite or lower end of the index or number 30 will be reflected from the surface 34 at point e along line ef with refraction at surface 36. The direction of the ray f is then the lowest angle from which the image of the whole of index 30 can be seen. But a numeral or other index may be identifiable even when only part of it can be seen, and accordingly it may be readable from lower angles. For example, a ray passing from point g to point e will be reflected to point h on the surface 36 and then from this direction k the portion dg of the index 30 can not be seen, but the portion to the right of g will be visible. Thus as the angle of observation is lowered from the line ef to the line hk the outer portion of the index 30 between the points dg will pass out of view but a sufficient portion may still be visible to permit reading thereof. Accordingly in the construction of Fig. 4, the image 31 of the index 30 can be seen and read from any angle of observation between approximately the directions hk and bc . Above the angle bc the index 30 can be viewed directly from above.

As shown in Fig. 2 the lamp 22 for illuminating the indicia or numerals is preferably located below the control knob and adjacent the prismatic flange. The light from the lamp will pass freely into the flange through the surface 34 because total reflection does not occur when the light ray passes from the less dense medium (air in this instance) to the medium of greater optical density. Some of this light will go directly from the surface 34 to the numeral 30 to illuminate it. Other light will be reflected to the numeral from the peripheral surface 36. The location of the lamp is not critical. However, the lamp is preferably located so that it will illuminate only the single numeral or index immediately over it and such numeral is located at a position to indicate the temperature to which the control knob has been adjusted. As shown in Fig. 6 the illuminated numeral or index is visible, and may be easily read, not only from positions located directly radial therefrom but also from any position within a horizontal angle of about 160° indicated by the lines tu and tx . While the control knob of this invention will normally be used in a darkened room so that it must be illuminated by the lamp 22, it may also be used in a lighted room or it may be illuminated by a light located otherwise than beneath the knob and the reflected images of the numerals or indicia will still be visible in the manner described above.

4

In Fig. 5 there is illustrated a slightly modified form of the present invention wherein the control knob includes a central, disc-shaped, body portion 38 and a prismatic rim or flange 42 and a recessed indicium 40. This knob is generally similar to the corresponding elements of the afore-described embodiment of Figs. 2, 3 and 4, but differ principally in that the reflecting surface 44 of the prismatic flange is partially silvered or covered with a partially transparent metallic coating 46 so that light rays will be partially reflected and partially transmitted through the coating. With this arrangement substantial reflection at the surface 44 will occur at all angles of incidence, and consequently the reflection of the indicia 40 can be observed from higher angles than is possible when depending only on the phenomena of total reflection. Accordingly, the peripheral surface 48 extends higher relative to the mirror surface than does the corresponding surface 34 of Fig. 4 to permit such viewing. For example in Fig. 5, ray mm reflected as indicated along no , permitting observation from the direction o . As the viewing angle is raised, less and less of the tops of the numerals (right hand portion of index 40 as seen in Fig. 5) can be seen and it is this effect that sets the upper limit of acceptable viewing angles of the reflected image. For the construction of Fig. 5 the upper and lower limits of acceptable viewing of the index 40 through the peripheral face are approximately the lines o and r . Above the line o , and even somewhat below it, the index 40 can be viewed from above.

It is understood that the specific structures illustrated and described above are given by way of example and that if desired, both the position and magnitude of the acceptable viewing angles may be changed. Thus the viewing angles may be lifted or lowered as desired by rotating the surfaces 34 and 36, for example, together without changing the angle therebetween. The magnitude of the acceptable viewing angle may be changed by varying the magnitude of the angle between the surfaces 34 and 36 because any such change from the position illustrated will have a greater effect on the angle refraction of the ray bc than on the ray ek .

The construction of the present invention provides a control knob of simple construction, yet of considerable beauty, a knob that displays its indicia for easy reading from both radial and axial directions. Furthermore, it accomplishes these ends with its indicia only on surface s where they can be molded without difficulty. A knob such as shown here, if molded, would be drawn from its mold in an axial direction, and that circumstance severely restricts the forms that can be given to indexes molded on the peripheral face. On the end face the characters can be molded in deep and sharp detail for good contrast and consequently easy reading. For example, paint and wax are held best by a deep and sharp indentation.

While the preferred embodiments of the present invention have been illustrated and described herein it is obvious that many structural details may be changed without departing from the spirit and scope of the appended claim.

The invention is claimed as follows:

A control assembly including a base housing, a control disc pivotally mounted on said housing and having a generally horizontal body portion provided with an annular display of discrete indicia visible at the top thereof, said control disc also including an annular prismatic portion of transparent material depending from the body portion in the form of a rim, the outer surface of said prismatic portion depending angularly from adjacent the outer edges of the indicia on said body portion and the inner surface of said prismatic portion being inclined inwardly of the axis of the disc and upwardly toward the body portion to substantially underlie the indicia thereon and provide a reflecting surface, and a source of illumination carried by said housing and disposed within

5

the rim on the body portion and generally vertically below the indicia on the body portion with the inner inclined reflecting surface of the prismatic portion substantially traversing and disposed between the source of illumination and the indicia on the body portion, said source of illumination operating to direct the light beam upwardly through the inner inclined surface of the prismatic portion to illuminate by outline the indicia from which the light beam is reflected to the inner inclined

5

6

reflecting surface of the prismatic portion from which the image of the indicia will appear for view substantially radially through the outer surface of the prismatic portion.

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