

June 2, 1970

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3,514,940

ILLUMINATING ASSEMBLY FOR A CLOCK

Filed April 11, 1969

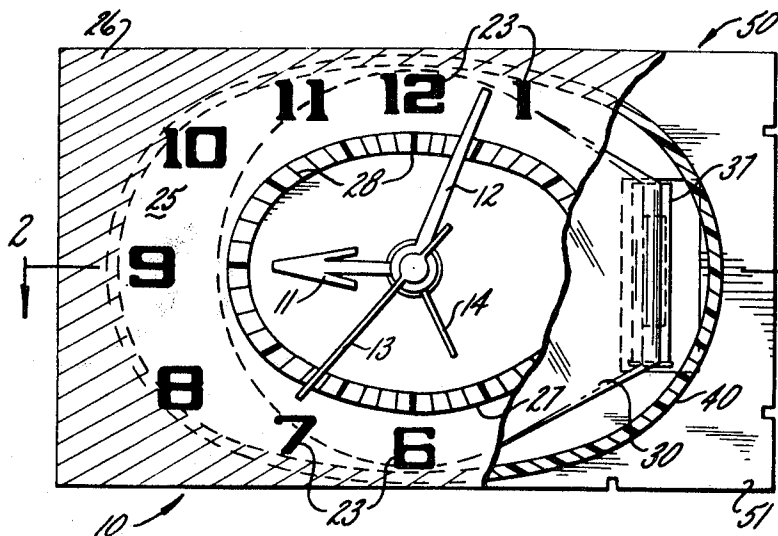


FIG. 1.

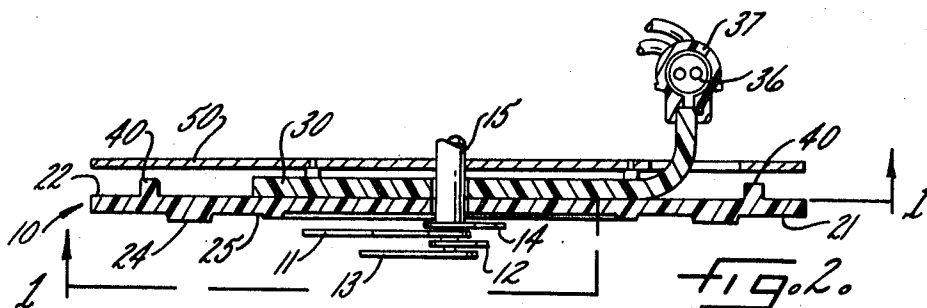


FIG. 2.

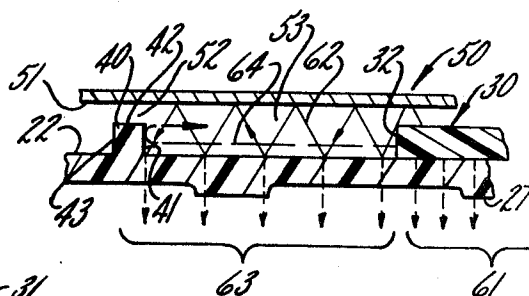
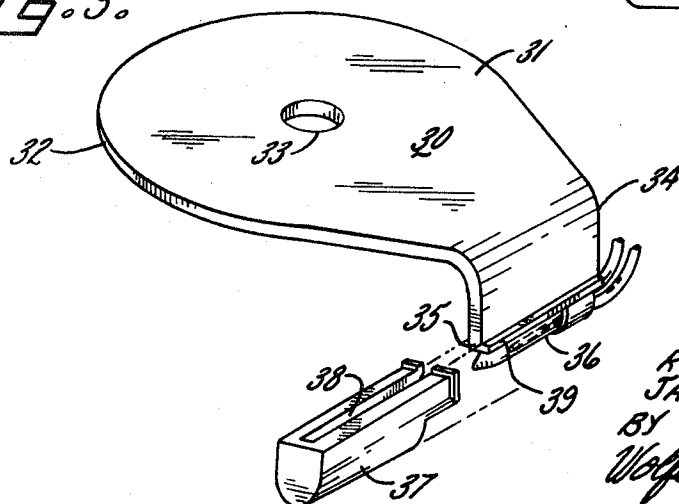


FIG. 4.

FIG. 3.



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1

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## ILLUMINATING ASSEMBLY FOR A CLOCK

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Filed Apr. 11, 1969, Ser. No. 815,472  
Int. Cl. G04b 19/30

U.S. Cl. 58—50

5 Claims

### ABSTRACT OF THE DISCLOSURE

An illuminating assembly for a clock having a lamp providing illumination which is invisible during the day and in which visible illumination for nighttime use is sharply restricted to a central field.

It is an object of the present invention to provide an illuminating assembly for a clock in which the nighttime illumination is restricted to a softly lighted but well defined central field. It is a related object to provide an illuminating assembly in which the clock hands and indicia on the dial are clearly visible in conditions of darkness but in which the illumination is at a low, unostentatious level with even distribution of the light.

It is another object of the invention to provide an illuminating assembly which produces an attractive and interesting mode of illumination but which is inherently economical, requiring only a light conductor and modified dial. All that is required by way of dial modification is the inclusion of an integrally molded upstanding rib defining the central illuminated area and which serves to cut off radial transmission of light beyond the central area without any need to resort to masking or other surface treatment. As a result, the dial may be manufactured, and the clock easily assembled, at a cost which is substantially the same as a conventional dial without the illumination feature.

It is one of the more detailed objects of the present invention to provide a clock illuminating assembly employing a light conductor in the form of a disc of transparent plastic and which may be of standard configuration, substantially smaller than the area to be illuminated, while nonetheless producing even distribution of the light.

Other objects and advantages of the invention will become apparent upon reading the attached detailed description and upon reference to the drawing in which:

FIG. 1 is a face view of a clock dial employing an illuminating assembly constructed in accordance with the invention and partly broken away, as along the line 1—1 in FIG. 2;

FIG. 2 is a horizontal section looking along the line 2—2 in FIG. 1;

FIG. 3 is a perspective view of the light conducting member commonly referred to as a "diffuser";

FIG. 4 is an enlarged fragment of a portion of FIG. 4 showing the manner in which the illumination is limited to the central area or field.

While the invention has been described in connection with a preferred embodiment, it will be understood that we do not intend to be limited to the particular embodiment shown but intend on the contrary to cover the various alternatives and equivalents included within the spirit and scope of the invention.

Turning to FIGS. 1 and 2 of the drawing, the dial indicated at 10 is of rectangular configuration, serving as a background for conventionally provided clock hands 11—14 supported on the usual cluster 15 of concentric shafts. The dial has a face 21 and a back 22. Indicia in the form of numerals 23 are integrally molded on the

2

face, slightly upraised from the plane of the face and preferably opaques as indicated at 24. The numerals are arranged in oval configuration and form what may be referred to as a "field" 25. The field is distinguished from the peripheral portion 26 of the dial, which surrounds the field, and which, for convenience of identification, has been cross hatched in FIG. 1. Spaced inside of the numerals 23 is a forwardly projecting ridge 27, of conforming oval shape having divisions 28 in the form of stripes of opaque pigmentation for more accurate reading of the clock hands. The dial may be formed of any suitable plastic capable of being molded and which is translucent, preferably milk white, superficially and throughout the molded body, to provide good contrast for the opaque pigmented numerals 23.

In carrying out the present invention a light conductor, often referred to as a "diffuser," is provided in the form of a disc of transparent plastic having a relatively high index of refraction arranged flatly in back of the dial and having means for injection of light into one edge thereof for conduction of the light to the face and periphery of the conductor. As shown in the drawing, and especially in FIG. 3, the light conductor indicated at 30 has a face 31, a periphery 32 and a central opening 33 for clearing the shaft cluster 15. Bent at right angles to the face 31 and integral with the conductor, is a light transmitting tab, or conduit, 34 terminating in a flat edge 35 having a bulb 36 positioned closely along the edge. The bulb 36 is maintained in place, and shielded against unwanted escape of light, by a housing 37 which is of hollow molded construction. Formed along one side of the housing is a slot 38 which receives the tab 34 when the parts are assembled. The light housing, upon being slid into assembled position, is securely held by an integrally formed rib 39 which extends along the light-receiving edge. The light conductor is preferably made of transparent Lucite or other plastic having a high index of refraction so that the light from the bulb 36 is piped through the tab 34 into the body portion of the conductor where it fans out in all directions, with a portion of the light passing directly from the face into the translucent body of the clock dial. The conductor may be conveniently referred to as a "disc" although it need not be of circular shape.

In accordance with the present invention a continuous light fence is provided at the backside of the dial projecting rearwardly therefrom, encircling the field of the numerals, and presenting a light obstructing face which is of sufficient extent as to intercept the light which emanates from the periphery of the light conductor to confine the light to the enclosed field while maintaining the portion of the dial beyond the field in relative darkness. As shown in FIGS. 1, 3 and 4, the light fence, indicated at 40, has an inwardly facing surface 41, a back surface 42 and an outwardly facing surface 43. The surface 41, as shown, is arranged at generally right angles to the back surface 22 of the dial. It is found, in a practical case, that a light fence 40 having a dimension of about  $\frac{1}{16}$  inch integrally formed on the dial 10 having a thickness on the order of  $\frac{1}{16}$  inch is readily capable of obstructing the light emanating from the periphery 32 of a light conductor 30 having a thickness on the order of  $\frac{1}{16}$  inch or even slightly more than this. Preferably, for the purpose of further confining the light and producing contained multiple reflections, a dial backup plate 50 is used which conforms in outline to the dial itself and which has a reflecting front surface 51, and which is spaced to define a relatively narrow gap 52 adjacent the light fence 40. The fence, with its bridging effect, and the backup plate thus act together to define a chamber 53 in which multiple reflections may occur.

For convenience in discussing the observed result of the structure which has been set forth above, the light

emanating from the light conductor 30 may be divided into three categories. The first is the diffuse light 61 which is directly transmitted into the dial from the interface between the dial and light conductor. It is this light which serves to illuminate the central portion of the dial within the confines of the light conductor. A second category of light is that which exists in the space 53 surrounding the light conductor and which undergoes multiple reflection as indicated at 62, impinging upon the back surface of the dial and being diffusely transmitted through the thickness of the dial to provide illumination in the region 63, i.e., the portion of the dial which lies between the periphery of the conductor and the light fence 40. The fence serves to prevent any multiple reflection of the light into the peripheral region 26 of the dial. While it is theoretically possible for some of the multiple-reflected light to escape through the gap 52 adjacent the fence, it is found, as a practical matter, that so little light escapes in this fashion as to be negligible in creating illumination at the dial periphery. With respect to a third category, the light, as indicated at 64, which is emanated radially from the edge 32 of the light conductor, is directly obstructed by the surface 41 and, upon reflection, simply adds to the light level within the space 53. Very little of the light 64 appears to enter the body of the translucent dial through the surface 41.

The net result is that there is a rather abrupt attenuation of the illumination at the region of the fence 40, producing a central field 25 which is evenly illuminated and which serves as a lighted background for the numerals while the peripheral portion of the dial 26, beyond the confines of the fence 40, is maintained almost perfectly dark.

The bulb 36 which is used is preferably of the neon type producing a light level within the field which is sufficiently low so that the artificial illumination is not apparent or visible during daylight hours, during which the entire dial surface, all the way out to the edges, appears uniformly milk white. However, as darkness approaches, an illuminated oval field is produced against which the opaque numerals, and the clock hands, are readily and accurately visible. As a result the clock changes its apparent shape, as well as appearance, depending upon the presence or absence of ambient light. Such change is brought about economically by reason of the formation of the fence integrally with the dial, which can be accomplished with little or no addition to the molding cost and without use of masks, but the novel effect adds substantially to the effectiveness, novelty and general sales appeal of the clock. Assembly of the clock is facilitated since there is no masking member which needs to be positioned or juggled.

It is one of the features of the present invention that a standard configuration of light conductor, or diffuser, 30 may be used, one which bears little relation to the size and shape of the illuminated field while nevertheless preserving the evenness of illumination. As shown in FIG. 1, the light conductor may be of modified circular shape and substantially smaller, in average radial dimension, than the oval field which is defined by the light-obstructing fence while still achieving even light distribution throughout the field.

We claim as our invention:

1. In an electric clock having a set of hands, the combination comprising a dial of translucent plastic material, opaque indicia thereon defining a central field for the clock hands, a light conductor in the form of a flat disc of transparent plastic having a relatively high index of refraction closely positioned in back of the dial and generally centered within the field, said light conductor having means for injection of light into an edge thereof for conduction of the light to the face and periphery of the conductor, and a continuous light fence on the back surface of the dial spaced inwardly from the edge of the dial for encircling the field and of such height as to lie obstructingly in the path of the light emanating radially from the periphery of the light conductor thereby to confine the light to the encircled field under nighttime conditions while maintaining the portion of the dial beyond the field in relative darkness.

2. The combination as claimed in claim 1 in which the light fence is in the form of a continuous upstanding rib integrally molded on the back of the dial.

3. The combination as claimed in claim 1 in which the light fence is in the form of a continuous upstanding rib on the back of the dial and in which the dimension of the fence is approximately equal to the thickness of the dial and thickness of the light conductor.

4. The combination as claimed in claim 1 in which the light conductor, in average radial dimension, is smaller than the illuminated field.

5. In an electric clock having a set of hands, the combination comprising a dial of translucent plastic material, opaque indicia thereon defining a central field for the clock hands, a light conductor in the form of a disc of transparent plastic having a relatively high index of refraction flatly arranged in the back of the dial and generally centered within the field, said light conductor having means for injection of light into one edge thereof for conduction of the light to the face and periphery of the conductor, a backup plate having a reflective front surface spaced in back of the conductor and extending to the peripheral portion of the dial, and a continuous light fence at the back of the dial substantially bridging the space between the dial and the backup plate for confining the light which is reflected between the dial and the backup plate and for obstructing radial passage of the light which is radiated directly from the periphery of the conductor to effect even illumination of the field within the fence while maintaining the peripheral portion of the dial beyond the field in relative darkness.

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U.S. Cl. X.R.

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