Nov. 12, 1963 H. C. STUERZL ETAL 3,110,882

LAMINATED PANEL DEVICE HAVING ELECTROLUMINESCENT INDICATING AREAS

Filed April 7, 1961 2 Sheets-Sheet 1

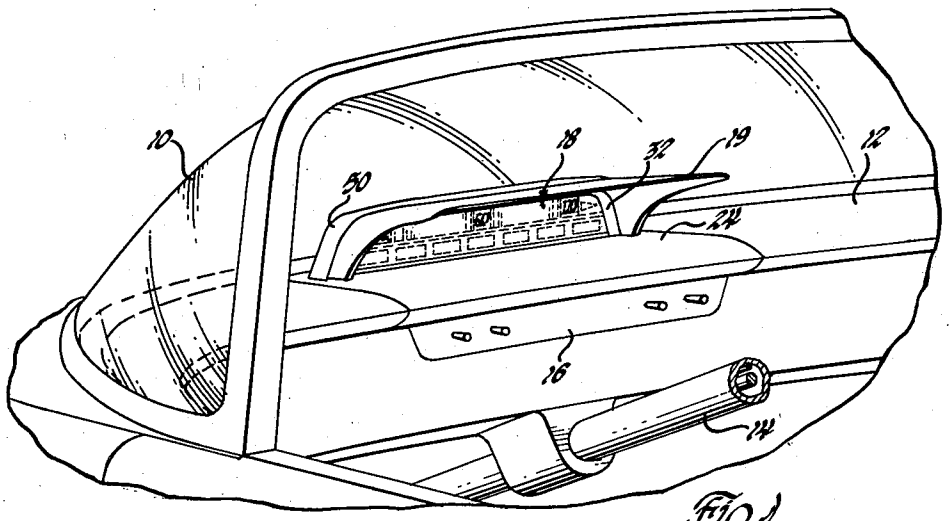


Fig. 1

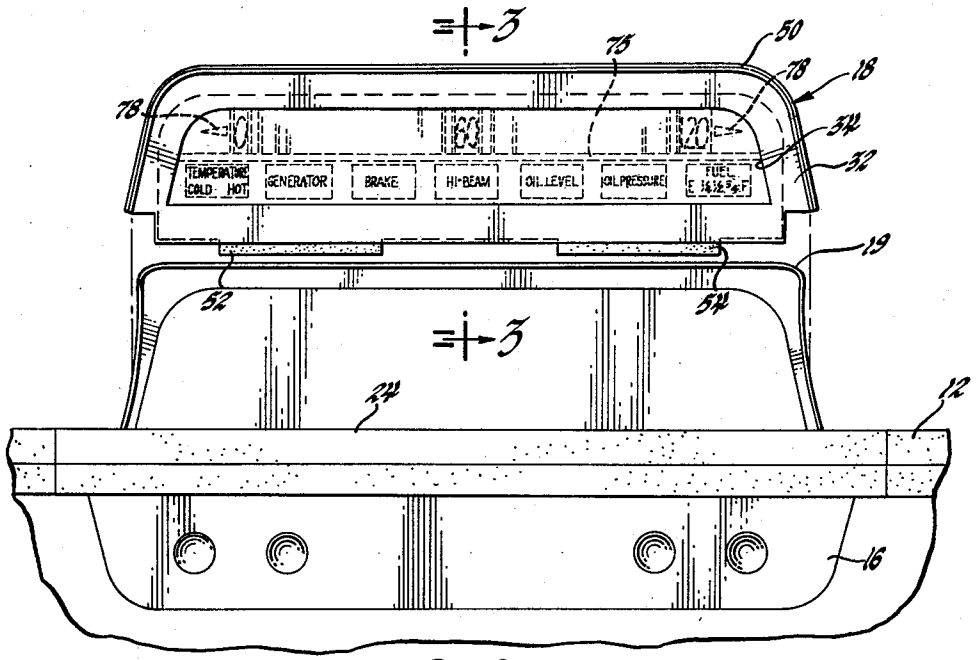


Fig. 2

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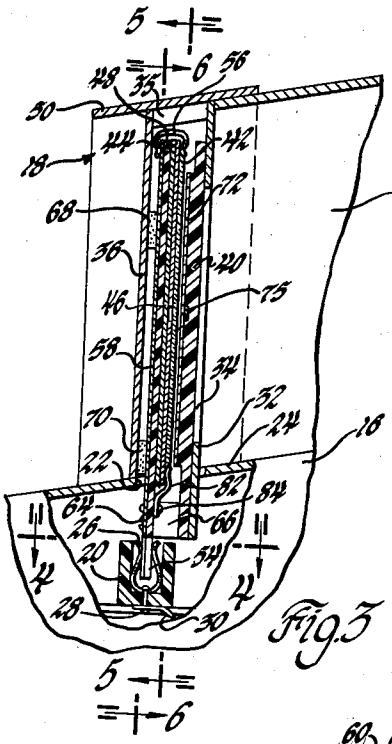


Fig. 3

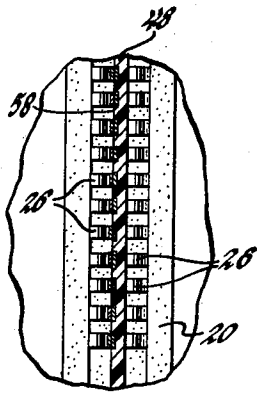


Fig. 4

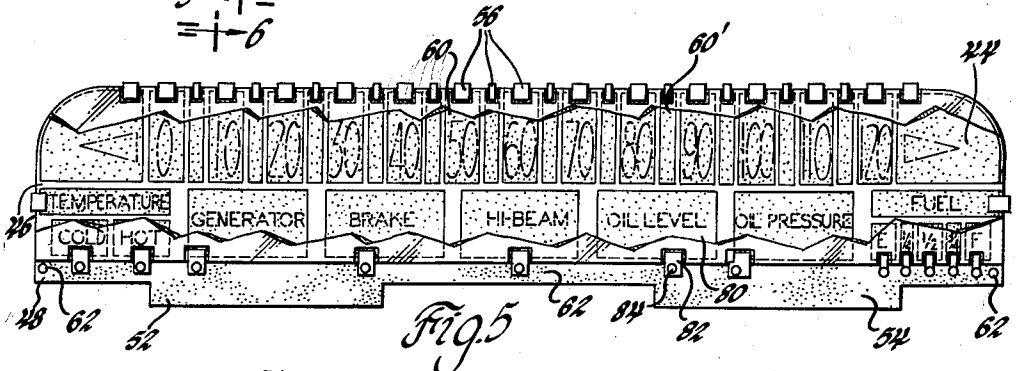


Fig. 5

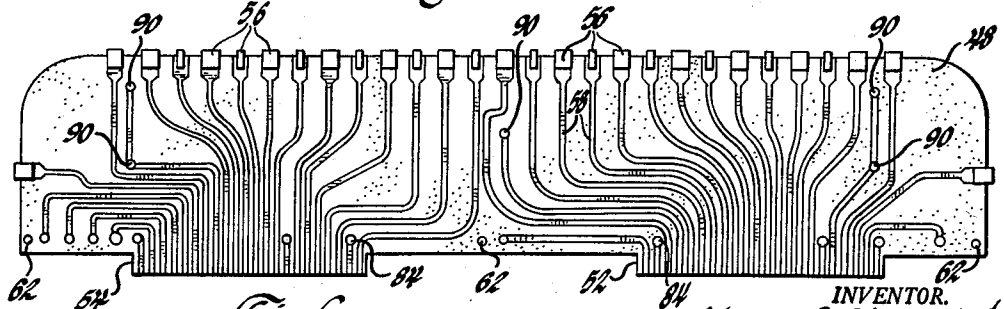


Fig. 6

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LAMINATED PANEL DEVICE HAVING ELECTRO-LUMINESCENT INDICATING AREAS

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5 Claims. (Cl. 340—52)

This invention relates to panel instrumentation and more particularly to laminated panel devices for giving one or more illuminated indications of speed, pressure, temperature or some other variable condition.

Instrument panels such as used on automobiles and also on stationary installations often comprise clusters of indicators and they are usually complex arrangements embodying mechanical devices of proportions which are bulky in relation to space available. If a revolution counter or speedometer is one of the instruments, it adds to the complications because such an instrument must be of such size as to give an easily read reading over a large scale. Illumination of digits by electroluminescence has been used effectively in a speedometer as taught in the United States Patent No. 2,858,632, granted November 4, 1958, in the names of M. J. Caserio and H. C. Stuerzl. The adaptation, however, necessitated the use of a mechanically actuated pointer to serve as a moving indicator. A speed warning device using a plurality of separately lighted indicia is disclosed in the United States Patent No. 2,504,582, granted April 18, 1950, in the name of D. I. Pugin. This latter adaptation, however, is bulky and not conducive to large and trouble-free production of esthetically appealing instrument panels.

An object of the present invention is to provide a compact panel device capable of indicating one or more variable conditions without embodying, at the panel, any movable indicating mechanical part such as a pointer. Another object is to provide an esthetic panel device embodying one or more indicators and which may be quickly inserted in a support mounting for electrical actuation by a signal or by signals originating elsewhere.

A feature of the present invention is a laminated panel device having multiple areas adapted to be illuminated in sequence as an indication of a variable condition. Another feature is an electroluminescent panel of compact dimensions and embodying a printed circuit pattern whereby discrete areas of the panel on its front side may be illuminated in accordance with a remote signal. Another feature is an electroluminescent panel bearing a printed circuit pattern and which may be mounted as a unit on a support from which one or more electrical signals may be obtained to operate the panel without the use of any moving mechanical parts located at or on the panel.

These and other important features of the invention will now be described in detail in the specification and then pointed out more particularly in the appended claims.

In the drawings:

FIGURE 1 is a perspective view of portions of an automobile windshield cowl and instrument panel in which arrangement a panel device embodying the features of the present invention is installed;

FIGURE 2 is an elevation view of the panel device as shown in FIGURE 1, the view being drawn to an enlarged scale and showing the panel device as positioned above the supporting structure prior to its lowering for insertion into its operative position;

FIGURE 3 is a sectional view drawn to a larger scale as seen looking in the direction of the arrows 3—3 in FIGURE 2 with the panel device lowered into its supported end and operative position;

FIGURE 4 is a sectional view looking in the direction of the arrows 4—4 in FIGURE 3;

FIGURE 5 is an elevation view of a portion of the panel as seen looking in the direction of the arrows 5—5 in FIGURE 3, the scale being somewhat reduced; and

FIGURE 6 is a view of the panel device looking in the direction of the arrows 6—6 in FIGURE 3 and showing the printed circuit pattern, the view being drawn to the same scale as used in FIGURE 5.

In FIGURE 1, a windshield 10 is depicted as protecting a passenger compartment and an instrument panel 12 of an automotive vehicle having a steering column 14. The panel 12 has built into it a support or housing 16 which serves as a source of signals to operate a panel device 18 which constitutes at least a part of one embodiment of the present invention. The support 16 is also provided with an overhanging hood 19, the presence of which is not necessary but which is preferred to enhance the appearance and effectiveness of the panel device 18 for daytime use as will be apparent.

In electroluminescent devices, a desired glow of a panel results from the application of a varying voltage across a sheet or coating of fluorescent phosphor. If an alternating, pulsating, or otherwise varying current is used to effect a variable electrical field within the phosphor, an area of the latter material will glow visibly and may be plainly seen through a protective plate or sheet of transparent, tinted or translucent glass or plastic. The illumination is uniform over the entire area and the amount of power consumed is small. In the present instance the creation of the effective electrical field is not in one area but in a multiple number of areas in a single laminated panel making it possible to indicate a condition such as the attainment of a given speed within a range of speeds and to do so without mechanical or moving indicator pointers and the like closely associated with the panel. With this in mind, it will be noted that the support 16 could have moving mechanical devices within it and this is immaterial insofar as the present invention is concerned but it should be provided with circuit connections to adapt it subsequently to transmit suitable signals to the panel device 18. For an automobile speedometer the several speeds to be indicated would each necessitate a separate contact to receive a signal that the speed of that contact has been attained by the vehicle. A device for establishing a separate circuit for each speed may be a centrifugal switch such as disclosed in the United States Patent No. 1,647,374, granted November 1, 1927, in the name of B. Robinson. Some other form of device may be used for this purpose and no further description is given herein regarding such device as it forms no part of the present invention. The arrangement, of course, should be such that successive circuits may be established or broken or made and broken dependent upon the effect desired.

A fuel gage panel may be energized by successive circuits established by a float operated switch operated at several predetermined liquid fuel levels and contacts for these circuits would be located in the support 16 together with the contacts for the speedometer.

Other gages, such as those indicating variations in oil level, oil pressure, high beam lights, brake application, generator charging, hot or cold temperature, may serve to impart signals in the form of electric current available at proper contacts within the support 16.

FIGURES 3 and 4 illustrate one manner of maintaining contacts within the support 16 for imparting signals to the panel device 18. A plastic elongated member 20 having an inverted U-shaped cross section is mounted within the support 16 and along and beneath a slot 22 formed in the top wall 24 of the support. Contacts 26 in the form of spring clips are each held by means of a conductive rivet 28 to a terminal 30 leading to the source of a particular signal. Some of the spring clips are grounded as will further appear.

The panel device includes a bezel or metal rim plate 32 defining an elongated opening 34 (FIGURE 2) through which all the panel indicator readings may be observed. The rim plate 32 is spaced by several blocks such as the block 35 (FIGURE 3) from a rear metal plate 36. Screws (not shown) are utilized to retain this relation. Between the plates 32 and 36 enclosed a plastic window 40, a transparent plastic or glass protector sheet 42, a coating of electroluminescent material 44 covering discrete areas of a metal backing plate 46, and a dielectric or main supporting plate 48.

Integral with the rear metal plate 36 is a cover rim 50 enclosing the space between the plates 32 and 36 and having its width extending forwardly and rearwardly beyond those plates. The rim 50 is adapted to overlap the rear margin of the hood 19 which is joined at its sides to the wall 24. The slot 22 extends along substantially the full width of the hood 19 to receive depending parts of the panel device 18.

The main supporting plate 48 is preferably of plastic and is quite rigid so that two depending tongues 52 and 54 thereof may be pushed down into the spring clips 26 when the panel device 18 is located as a unit on the support 16. A printed circuit pattern as shown in FIGURE 6 is carried by the rear side of the plate 48. It comprises leads which extend upwardly from the bottom edges of the tongues 52 and 54. Most of the leads terminate along the top edge of the plate 48 for effecting operation of the speedometer aspect. Conductive spring clips 56 are provided each of which connects a lead of the printed circuit pattern such as a lead 58 to an area such as the area 60 (10 miles per hour increment indication) or 60' (between 10 mile increments) on the front side of the metal plate 46. This area 60 and 60' is one of multiple discrete areas on the plate 46 which are covered by the electroluminescent material 44 as seen in FIGURE 5. Three holes 62 are provided in the lower margin of the plate 48 so that three screws and three spacing blocks such as the screw 64 and the block 66 (FIGURE 3) may be used to hold the plate 48 securely to the rim plate 32. Plastic sponge material is employed as at 68 and 70 to hold the clips 56 and the printed pattern clear of the rear plate 36.

The transparent protector sheet 42 covering the areas of material 44 is of such thickness that it clears a closely adjacent but spaced light filter coating 72 on the rear side of the window 40. This filter 72, if made of a colored plastic (preferably blue, green or yellow) is extremely attractive and provides suitable contrast under daylight conditions when exterior parts such as the rim 50 and the plate 32 are chromium finished with the hood 19 and the support 16 painted blue. Other color combinations are, of course, suitable. A horizontal groove is formed in the window 40 to retain a silver colored strip of plastic 75 separating the speedometer viewing face of the panel from the lower condition indicators. The speedometer face has an arrowhead 78 exposed to view at each end. This arrowhead is of blue light filtering material surrounded by an opaque or black paint with the material and paint being applied to the rear side of the plate 40. These arrowheads may be lighted to indicate a right or left turn for the vehicle as will be understood. The indicia in the over-all panel are formed by a filling of opaque white paint in grooves formed on the back side of the window 40.

The speedometer aspect is presented by alternate wide areas 60 of electroluminescent material, one area for each ten mile increment of speed and narrow areas 60' are provided as stated above. The circuits may be closed so that, for example, if the car is proceeding at 65 miles per hour, a narrow area 60' between the indicia 60 and 70 will be brightly illuminated and the indicia 60 and 70 will be faintly illuminated. If the car is traveling at 70 miles per hour, the indicia 70 may be brightly lighted and flanked by two less illuminated areas dependent upon the current supplied through the printed circuit pattern. The variation in illumination may be provided by suitable resistors.

The lower instrument aspects may be represented by the oil level gage. The existence of a low level may be indicated by the glow of a discrete area 80 of electroluminescent material formed on the metal plate 46. Current may be supplied to this material by a spring member 82 held by a conductive rivet 84 to a lead of the printed circuit pattern.

For each discrete area of electroluminescent material 44 a signal is received by way of a terminal 30, a clip 26, a lead of the printed circuit pattern, a clip 56 or a rivet 84 and a spring member 82. The changing current of the signal causes the effected discrete area to glow and the current passing through that area is grounded to complete the circuit because the metal plate 46 is grounded. Such ground is by rivets such as the rivets 90, the heads of which touch the rear side of the metal plate 46. These rivets 90 pass through the plate 48 and are connected to ground leads of the printed circuit pattern.

It will be appreciated that the panel device may be made as a unit and simply inserted through the slot 22 for proper engagement of the printed circuit leads to register and make electrical contact with the clips 26, the latter also acting as means for retaining the laminated structure in its proper position. This is a great advantage in quantity production procedure as heretofore numerous connectons were made in the congested and almost inaccessible space concealed by the customary instrument panel and particularly as such panels are placed in automobiles.

We claim:

1. A laminated instrument panel device for indicating at least one variable condition, a support having a slot and including a source of variable field power supply, a hood mounted outside said support, said panel device including a rear dielectric support plate carrying a printed circuit pattern, retaining means inside said support, a metal plate grounded to said support and insulated from said pattern by said support plate, multiple discrete areas of electroluminescent material on said metal plate and exposed to view from between said hood and support, a tongued portion of said dielectric support plate extending through said slot and engaging said retaining means, and conductive means connecting said power supply to said pattern and to said discrete areas whereby each of the latter may be caused individually to glow by the application of said variable field through said pattern.

2. A laminated instrument panel device as set forth in claim 1, the support plate, metal plate and multiple discrete areas of said device being formed as a laminated unit prior to assembly with said support and hood by insertion through said slot.

3. A laminated instrument panel device for indicating a variable condition such as speed, a support for said device and including a power source for producing a variable field, a slot in said support, said device including a rear dielectric plate carrying a printed circuit pattern and extending through said slot, a metal plate grounded to said support and insulated from said pattern by said dielectric plate, multiple areas of electroluminescent material on one side of said metal plate and exposed to view outside said support, a transparent sheet arranged as a protective shield on said material, and conductive means connecting said power source to said pattern and said areas whereby said areas may selectively be illuminated by the application of said variable field to cause said electroluminescent material to glow.

4. A laminated instrument panel device as set forth in claim 3, including a hood partially surrounding said panel device and from under which said areas may be viewed, and colored filter material in registry with said areas.

5. A laminated instrument device, a support for said

device having a slot, retaining means inside said support in alignment with said slot and including a power source and ground connections, a rear dielectric plate extending through said slot and carrying a printed circuit pattern connected to said power source, a metal plate separated from said pattern by said rear dielectric plate and connected to said ground connections, transparent material, multiple areas of electroluminescent material on one side of said metal plate between the latter and said transparent material and exposed to view through the latter

and outside said support, and the device and support being such that said device is insertable and detachable for installation and removal by way of said slot.

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