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ELECTROLUMINESCENT CEILING PANEL

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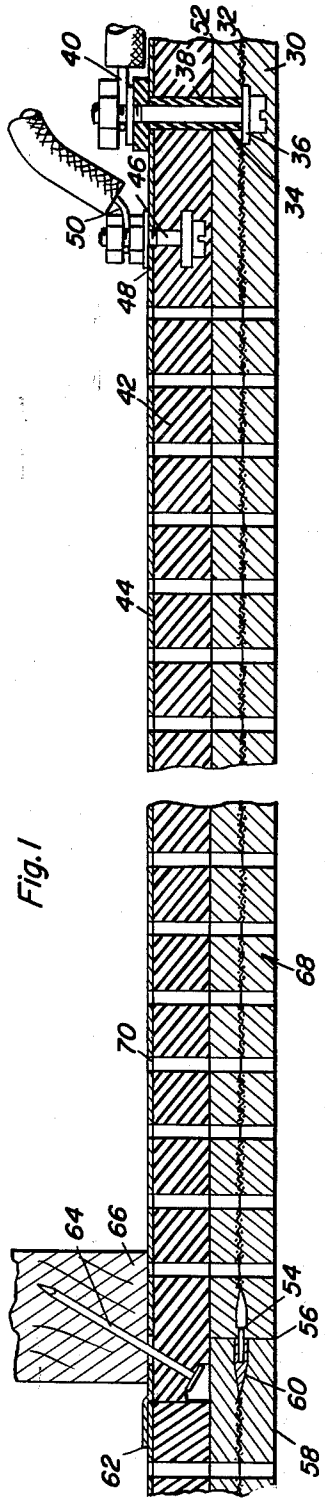


Fig. 1

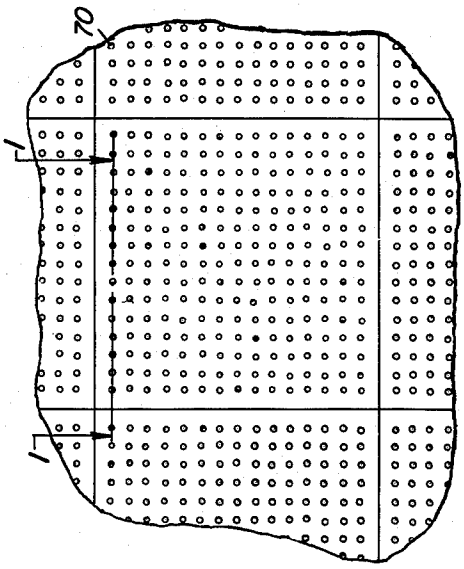


Fig. 2

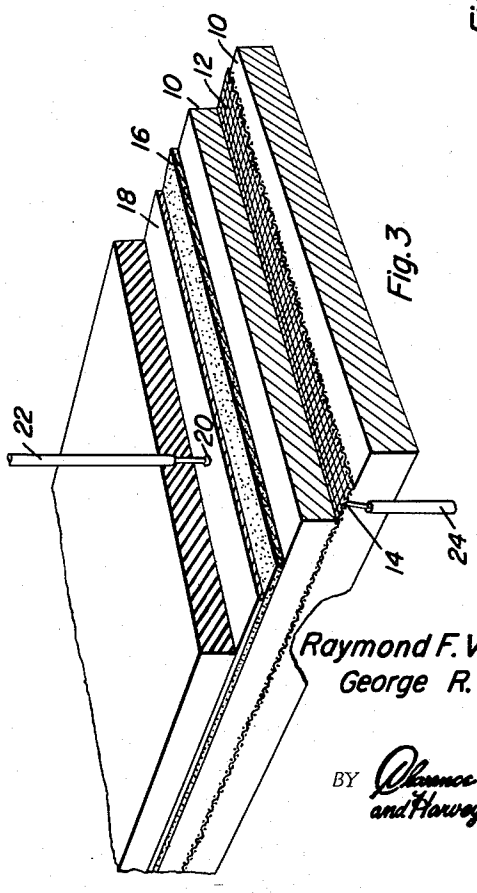


Fig. 3

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ELECTROLUMINESCENT CEILING PANEL

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This invention generally relates to ceiling panels and more particularly to a panel designed to be used on ceilings and utilizing the principle of electroluminescence.

The principal object of this invention is to provide a novel ceiling panel having qualities favorably comparing with conventional ceiling panels and further utilizing therewith the principle of electroluminescence.

It is a further object of this invention to provide ceilings which emit light therefrom due to the actuation of phosphorescent material.

It is a further object of this invention to provide ceiling panels of such structure that they will absorb sound and pass air for heating or air conditioning.

In accordance with the above stated objects of this invention, below is disclosed an arrangement for ceiling panels comprising a phosphorescent layer of material having attached on both sides thereof an electrically conductive layer of material across which an electric source is connected. The resulting electric field created in the phosphorescent material will cause it to glow, thereby lighting the room. It is contemplated that an expandable polystyrene material shall be used for the panel. Such materials are commercially available and are noted for their excellent physical, thermal, and electrical properties.

In general, when certain materials, particularly, phosphors, are placed in a fluctuating electric field under proper conditions, they are excited to luminescence and will remain in this condition as long as the exciting field persists. This effect is known as electroluminescence and is not to be confused with fluorescence where a gas is electrically excited which in turn illuminates a phosphorescent material.

It is submitted, that the novelty of this invention lies in a new construction in ceiling panels. The resultant structure of this invention provides a ceiling possessing all the desirable qualities of conventional ceilings and featuring the phenomena of electroluminescence along therewith.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 shows a cross sectional view of one arrangement of the panel of this invention in operative condition and suspended from the beams of a house;

FIGURE 2 shows an elevational view of the ceiling; and

FIGURE 3 illustrates the general principles of this invention.

With continuing reference to the drawing where FIGURE 3 is used to illustrate the principles of this invention, numeral **10** represents a polystyrene material having a fine aluminum wire screen cast therein and connected to an electric source as shown at **14**. The aluminum screen is designated as **12**. On top of the polystyrene slab **10** is place a phosphorescent layer **16** which is covered by an aluminum foil **18** which is electrically connected to a source at **20**. If the electric source be direct current, the phosphorescent material **16** will emit a glow when the initial surge goes through phosphorescent layer **16**. However, upon saturation by the direct current, the glow will disappear. If a constant glow is desired from

the phosphorescent layer **16**, an alternating current source is preferred so that the phosphorescent layer will not become saturated. The action of these layers is directly analogous to a flat plate capacitor which becomes saturated by direct current. The complete circuit through the phosphorescent layer **16** may easily be traced from the aluminum foil **18** to the connection **20** wherefrom the circuit is carried to the electric source by lead **22**. The second terminal of the electric source is connected to lead **24** which electrically communicates at **14** with aluminum screen **12**. The polystyrene slab **10** has an aluminum powder admix therefore making it conductive and enabling the circuit to be completed to the phosphorescent layer **16**.

Referring now specifically to the embodiment in FIGURE 1, numeral **30** represents the polystyrene slab with the aluminum powder admix, this slab being of a conductive nature. A fine aluminum screen **32** has been cast in the slab **30** and is shown electrically connected to a aluminum bolt and washer **34** and **36**. Surrounding the aluminum bolt is insulating material **38**. It is contemplated that the bolt be fixed within the insulating washer **38** but connected to the aluminum screen **32**. Shown connected to the outer portion of bolt **34** is a terminal **40** which on its end, not shown, would be connected to preferably an alternating current electric source.

On top of the aluminum polystyrene layer **30** is a second polystyrene layer **42** having a phosphorescent admix and insulative properties. An aluminum foil **44** is attached to the phosphorescent layer **42**, a second aluminum bolt **46** is cast in the polystyrene phosphorescent layer **42** with a portion of the aluminum bolt **46** electrically in contact with the aluminum foil **44** at **48**. An electrical lead **50** is electrically connected to the aluminum bolt **46** and continues on to the opposite terminal of the alternating current source. A complete circuit through the phosphorescent layer from the alternating current source will now be apparent. From the alternating current source, the circuit proceeds through lead **40**, aluminum bolt **34** to aluminum screen **32**. Since the polystyrene aluminum layer **30** is conductive the circuit will be completed to the boundary **52** between the polystyrene aluminum layer **30** and the polystyrene phosphorescent layer **42**. From the other side of the alternating current source the circuit will proceed through lead **50** to aluminum foil **44**. A resultant electric field will be set up across the phosphorescent layer from the aluminum foil **44** to the boundary **52** thereby exciting the phosphorescent material to luminescence.

Each panel is provided with an electrically conductive pin **54** at its outer edge **56** for connection to an adjacent panel **58**. All the panels will be equipped with electrically conductive sockets **60** which are readily adaptable to electrically cooperate with a pin **54** which is in turn electrically conected to the aluminum screen **32**. Likewise, the aluminum foil is intended to complete a circuit as by the overlapping of the aluminum foil **44** at **62**.

A nail **64** is shown affixed in the insulating polystyrene layer **42** holding the panel to a house beam **66**. Using the supporting means, it is of utmost importance to make sure that the metallic nail **64** does not short-circuit the path between the polystyrene aluminum layer **30** which is conducting and the conducting aluminum foil **44**. These particular supporting means are obviously not the only ones available for this panel and numerous other means would no doublt be apparent to one skilled in the art.

A recessed line is shown at **68** on the bottom surface of the aluminum conducting layer **30**. The purpose of this line is to visually define individual tile members in the panel. It is thought that this dummy joint appearance will make the ceiling panel more attractive and therefore

add utility to this invention in that appearance is of prime importance in a device of this type.

Continuous holes **70** are shown through the aluminum foil **44**, in sulating polystyrene layer **42** and conducting polystyrene layer **38**. These holes **70** may either be punched, drilled, or cast originally. They serve the function of more efficiently absorbing sound and furthermore, may be utilized to pass air for heating or air conditioning.

In accordance with this device, most any alternating current voltage may be impressed between insulated leads **40** and **50**. That is to say, that the voltage may be widely varied from 110 volts to 2400 volts, the light intensity being dependent on the particular voltage value. The intensity of the phosphorescent layer is further dependent upon the frequency of the exciting source which is not to be necessarily limited to the ordinary 60 cycles per second.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A ceiling panel comprising a layer of electrical insulating electroluminescent material, an aluminum foil attached to one side of said electroluminescent material, an electrically conductive light transmissive layer attached to the other side of said electroluminescent material, electric source means connected between said aluminum foil and said electrically conductive layer and a plurality of continuous apertures through said layers.

2. A ceiling panel comprising a layer of electrical insulating electroluminescent material, an aluminum foil attached to one side of said electroluminescent material, an aluminum screen attached to the other side of said electroluminescent material, terminals secured to said aluminum foil and said aluminum screen, electric source means connected between said terminals for creating a field across said electroluminescent material, and a plurality of arranged continuous apertures through said foil, layer and screen.

3. The combination of claim 2 including pin means electrically connected to the aluminum screen, and socket means electrically connected to the aluminum screen, said pin and socket means adapted to electrically cooperate so that a series of panels may be utilized.

4. The combination of claim 3 wherein said panels include dummy joints in the form of intersecting recessed lines along the panel for lending a particular appearance to the panel.

References Cited in the file of this patent

UNITED STATES PATENTS

2,716,298	Spielmann	Aug. 30, 1955
2,792,447	Kazan	May 14, 1957
2,809,316	Jeges	Oct. 8, 1957
2,818,531	Peek	Dec. 31, 1957