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## (54) Fluorescent clock dial and process for producing the same.

(57) A mixing product of at least one plastic material and at least one fluorescent material, with a ratio of about 100 : 2 to 100 : 10 operated at a temperature of about 200°C to 250°C. Such a product, when processed appropriately by injection molding, sets to be a fluorescent dial. Combining of the fluorescent dial with dark-coloured pointers and numeral units forms a fluorescent clock dial.

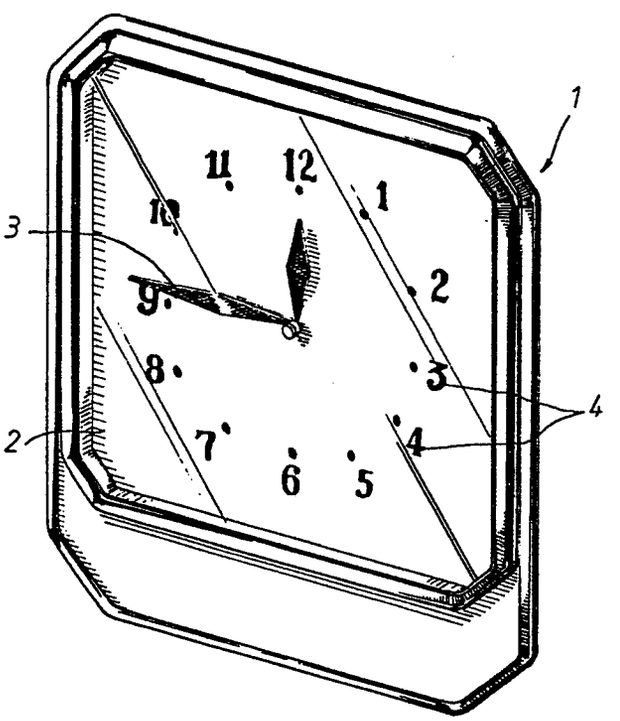


FIG. 1

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# Fluorescent clock dial and process for producing the same

This invention relates primarily to a product which, by an appropriate processing of injection molding, sets to a fluorescent clock dial having superior fluorescent characteristics.

Clock dials of varying sizes and shapes are well-known in the art. In particular, certain of such known clock dials are produced by screen printing.

Society is changing rapidly and now moves at a very fast pace. Efficiency is almost always considered to be one of the most important attribute.

As a result, the dependence or reliance on clocks and/or watches is greater than it ever was before. Looking at a clock or watch frequently in order to know the present time and being aware of the time has become a practice or a common habit. This is true even through one may not be a bit in a hurry.

One must use his or her eyes to look at the time. However, it is very difficult to notice the position of a clock and the time in the dark. This problem is frequently encountered.

Heretofore, general configuration of clock had only time-indicating means and seldom had an illuminating attachment. When the illuminating value is too faint to see, then it is impossible to look at the time even through a clock or a watch is available.

Usually, elderly people tend to be awaken early in the morning. Often, the first thing they would do is to make sure what time it is so that they can decide whether to go back to sleep or to get out of bed. However, it is very inconvenient for an elderly person to look at the time or even to notice the position of the clock while it's still dark. Therefore, he or she must get up from the bed and switch on the light in order to know the time. The worst of the matter is that it is difficult for one to sleep again if he has left his bed even if he is aware that it is still not time to get up. This may cause one to suffer from insomnia.

In response to the above-described problems, a watch having a hidden bulb therein and a button electrically connected to said bulb has been designed. The bulb illuminates once the button is pressed and the time display can be seen thereby.

In another prior configuration, the hour and minute hands as well as the numeral units of a watch or an alarm clock are covered with or printed with a flourescent layer. In the dark, each particular point is illuminated so as to indicate the present time.

If the user wants to stay aware of the time in a dark room, he may wear a watch with fluorescent hour and minute hands or a watch having a hidden bulb. However, it is inconvenient and uncomfortable to wear a watch while sleeping.

Conventional clock dials manufactured by screen printing of fluorescent numeral unit onto the dial, although convenient, are nevertheless too expensive to produce.

In fact, there exist many drawbacks in the production of clock dials by screen printing. They are summarized as follows:

1. high production costs;
2. low production speeds;
3. the screen is easily scratched or abraded or contaminated by dirt during the processing of the clock dial; and
4. the screen takes a long period of time to dry after being used for printing one time before it can be ready for a second printing.

Moreover, the result of the product is unsatisfactory since it gives obscure time-indicating feature which thereby renders it ineffective.

The drawbacks of having a hidden bulb inside a watch are:

1. high production costs; and
2. inconvenience due to the necessity of having to manually press the button.

The drawbacks of having fluorescent hands and numeral units on a watch dial are even more serious:

1. tedious manual labor is required to spread the fluorescent substance onto the numeral units;
2. increased production costs due to the intensive manual labor.

The invention as claimed is intended to remedy these drawbacks. It enables the users to know the present time even in a dark environment.

Accordingly, there is provided an improved clock dial having better fluorescent characteristics.

It is also provided a cheaper and more effective process for producing a fluorescent clock dial.

One way of carrying out the invention is described in detail below with reference to drawings which illustrate only one specific embodiment, in which:

FIG. 1 is perspective view of a clock in accordance with the present invention; and

FIG. 2 is a flow diagram of a manufacturing process in accordance with the present invention.

As can be seen in FIG. 1, a clock dial 1 constructed in accordance with the present invention comprises a fluorescent dial 2, two dark coloured pointers 3 (i.e. hour and minute hands) and a plurality of dark coloured numeral units 4.

In describing the process, it will be convenient to refer to the accompanying flow diagram as shown in FIG. 2. The raw material infeed is plastic, preferably granular plastic, such as polyethylene

(PE), polypropylene (PP) and the like. The other raw material is fluorescent powder, such as LUMILUX GREEN 50,000.

An appropriate proportion of the granular plastic and powdered fluorescent material is mixed and stirred thoroughly before injection molding.

If the amount of fluorescent powder used is below the necessary amount with respect to the plastic, then the fluorescent characteristics will not be developed satisfactorily.

If the amount of fluorescent powder exceeds the required amount, then the product material may become brittle or fragile. In other words, an excess of fluorescent material results in a decrease of tensile yield and toughness. The material obtained therefrom is easily broken or torn when further processing.

It is found that 2 to 10g of flourescent material is preferably used for each 100g of plastic material. More preferably, 2 g of fluorescent material is used for 100g of plastic material.

The temperature when carrying out the mixing process is preferably at the temperature of about 200 to 250°C. In a preferred embodiment, the temperature should be set to 225°C if the product weighs 300 g. In another preferred embodiment, the temperature should be set to about 240°C if the amount of end product desired weights 500g.

Exceeding the recommended temperature may destroy the structure of the mixing product while too low a temperature results in a loosely packed combination of fluorescent material and plastic material and therefore, fluorescent powder may peel of eventually.

In short, the qualities of the product obtained will be affected by the temperature and the proportion of each raw material.

FIG. 2 discloses a flow diagram of a manufacturing process in accordance with the present invention having the following steps:

(1) feeding the plastic material and fluorescent material to a mixer, wherein 2 to 10g of fluorescent material is used for each 100g of plastic material;

(2) carrying out the mixing of plastic material and fluorescent material in the mixer operated at a temperature of about 200°C to 250°C;

(3) feeding the mixed material to an injection molding apparatus having suitable clock dial shaped dies; and

(4) combining the processed dial with dark-colored pointers and numeral units.

By the above-described procedures, the fluorescent clock dial can be manufactured readily in large amounts. The concept of this invention differs from conventional configuration in that the present invention has a fluorescent dial together with two dark-coloured pointers and a plurality of dark-coloured numeral units to shade the brightness while conventional designation has only several fluorescent points. The fluorescent performance and the time-indicating ability of the clock dial produced in this manner is superior to the conventional product. Moreover, the process for producing this product is of low cost and can be carried out readily.

The above description and preferred embodiment have been given for the purpose of illustration, and are not intended to be limitative. Many variations can be effected in various compositions, methods and processes, without exceeding the scope of the invention.

## Claims

1. A fluorescent clock dial comprising a fluorescent dial, two dark-coloured pointers and a plurality of dark-coloured numeral units; characterised in that said fluorescent dial is produced by injection molding of a mixing product of plastic material and fluorescent material.

2. A process for producing a fluorescent clock dial, characterised by the steps of:
(a) feeding at least a plastic material and a fluorescent material to a mixer;
(b) carrying out the mixing of plastic material and fluorescent material in the mixer;
(c) feeding the mixed material to an injection molding apparatus having suitable clock dial shaped dies; and
(d) combining the processed clock dial with dark-coloured pointers and numeral units.

3. A process according to Claim 2, wherein from 2 to 10g of fluorescent material is used for each 100g of plastic material.

4. A process according to Claim 2, wherein the mixing step is carried out at a temperature of about 200°C to 250°C.

5. A process according to Claim 2, wherein the plastic material used is polyethylene or polypropylene.

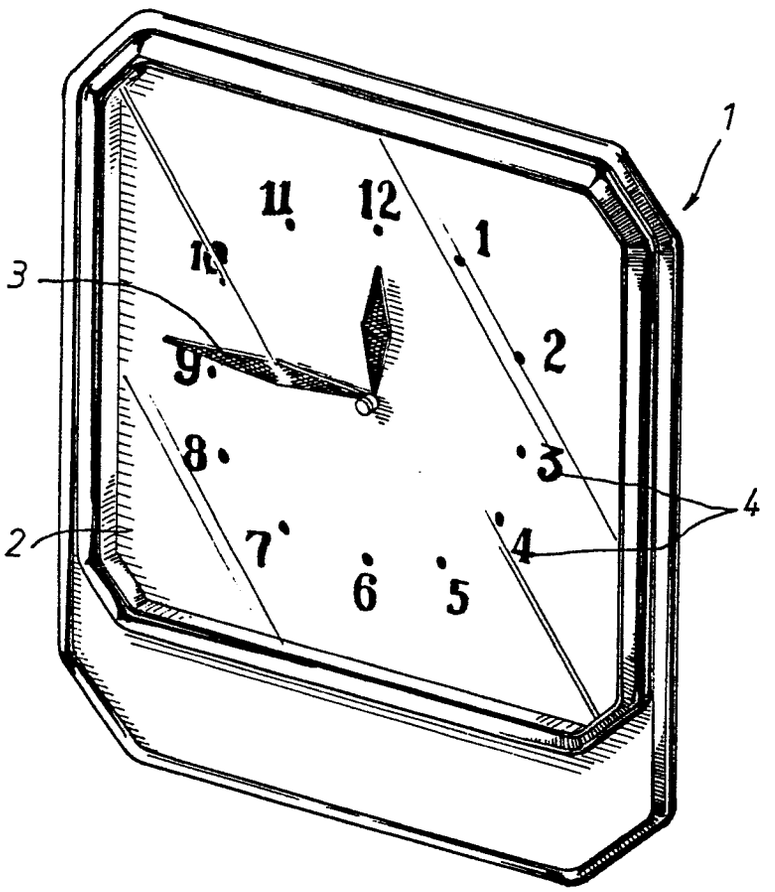


FIG_1

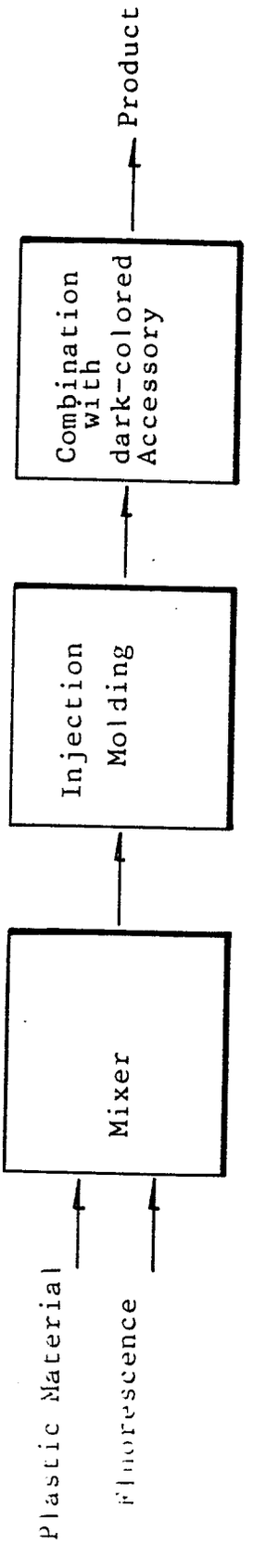
Plastic Material
Fluorescence
Mixer
Injection Molding
Combination with dark-colored Accessory
Product

FIG. 2

European Patent Office

# EUROPEAN SEARCH REPORT

Application number

EP 87 10 3721

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int. Cl.4) |
|---|---|---|---|
| X | FR-A-1 081 957 (DUBOIS)<br>* Whole document * | 1,2 | G 04 B 19/32 |
| A | | 3,4 | |
| Y | FR-A-1 131 289 (MANUFACTURE D'HORLOGERIE DE BETHUNE)<br>* Page 1, column 2, lines 26-28 * | 1,2,5 | |
| Y | PATENT ABSTRACTS OF JAPAN, vol. 6, no. 100 (P-121)[978], 9th June 1982; & JP-A-57 34 478 (RICOH TOKEI K.K.) 24-02-1982<br>* Abstract * | 1,2,5 | |
| A | US-A-2 395 185 (ISENBERG)<br>* Whole document * | 1-4 | TECHNICAL FIELDS SEARCHED (Int. Cl.4) |
| A | CH-A- 265 250 (TESECO AG)<br>* Page 1, lines 23-33,48-50 * | 1,2,4 | G 04 B<br>G 04 D<br>G 01 D |

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| THE HAGUE | 04-11-1987 | PINEAU A.C. |

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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