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## (54) MULTILAYERED STRUCTURE INCORPORATING A THERMOMETER

(71) We, S.p.A. CELLOGRAF SIMP, a company organised under the laws of the Italian republic, of Via A. Maffucci 18, Milan, Italy, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to a flexible multilayered sheet material article in which a temperature indicator is incorporated.

Liquid-crystal temperature indicators have been suggested, which are composed of a sheet supporting member for cholesteric crystals, these latter being usually micro-encapsulated, such crystals changing their colours at determined temperatures: they are distributed in different areas of certain configurations for representing the number which expresses in degrees the temperature at which the colour is changed, or another conventional symbol, which appears in several colours as the different temperatures are attained, so that there is displayed on the supporting member only the number which corresponds to the temperature to which the indicator is subjected.

It has likewise been suggested that such indicators be mounted on rigid supporting members so as to provide a room thermometer.

An aim of the invention is to use such type of indicator in combination with a material in the form of a comparatively pliable sheet so as to be able to equip therewith an article of common use having a sheet form.

According to the invention there is provided a multi-layered sheet material article comprising a transparent upper layer of pliable material and underlying sheet of pliable material having a recess formed therein, said recess housing a temperature indicating strip of pliable material of complementary form to that of said recess which contains liquid crystals which change their colour as the temperature varies.

A further embodiment of the invention comprises a multi-layered structure in which an intermediate layer is sandwiched between

a bottom supporting layer and a top transparent layer, an opening being formed through the intermediate layer, which is adapted to house the sheet supporting the temperature indicating strip, such a supporting sheet being separated from the bottom layer by the agency of a porous flexible layer.

The layer of porous material can be a sheet material of a natural or synthetic origin, such as a common paper. The other layers, conversely, are composed of sheets of plastics materials which are advantageously united together by any of the conventional welding procedures.

Particularly, with the latter embodiment, articles can be obtained which are free of defects such as the presence of air bubbles in correspondence with the area in which the thermometer proper is received.

It thus becomes possible to equip with a thermometric indicator any object of common use, the indicator remaining concurrently both protected and firmly positioned.

For example, a sheet calendar can carry in a lateral position, and with little or no added bulk, a thermometer in strip form of the kind referred to above.

In general, sheet articles lend themselves well to the application of the principle of this invention, which, due to their nature, remain normally on a table or pinned up and thus in direct contact with the ambient air, of which the temperature can thus be read out.

In the accompanying drawings there are indicated, by way of example, two embodiments of the invention.

FIGURE 1 is a perspective view of one embodiment of the present invention,

FIGURE 2 is a cross-sectional view of the embodiment of FIGURE 1 taken along the line II-II thereof; and

FIGURE 3 is a cross-sectional view of another embodiment of the present invention.

Referring to FIGURES 1 and 2, a bottom layer 10 carries a printed script 11 and showing any indication or image. In an area of the material 10 there is housed in a seat 100

thermometer strip 13 which forms the liquid crystal temperature indicator of the kind referred to above, in which the supporting member is pliable.

5 Such an assembly is then covered by a layer 12 of a transparent material, through which the indications of the thermometer strip 13 can conveniently read out.

10 The base layer 10 can be of any conventional type and can also be a multilayered structure made of a number of sheets of any nature.

A sheet article of common use and carrying other information or images is thus 15 equipped with a thermometer without any substantial price increase except the one inherent in the thermometer strip itself, since it is usual practice to cover the sheet articles to which a glossy and hard surface 20 must be imparted, with a transparent layer of plastics material.

With reference to Figure 3, which shows another embodiment of the present invention, an opening 113 is formed through 25 layer 110, such an opening containing a supporting member 114 which carries the cholesteric crystals which form the temperature indicators of the kind referred to above. The supporting member 114 is separated 30 from bottom layer 115 by means of a supporting member 116 made of a porous and flexible material. Such a material can be, advantageously, paper and numerous tests 35 have shown that such a multilayered structure is free from the formation of undesir-

able internal air bubbles in correspondence with the seat for the thermometer proper.

#### WHAT WE CLAIM IS:

1. A multilayered sheet material article comprising a transparent upper layer of pliable material and underlying sheet of pliable material having a recess formed therein, said recess housing a temperature indicating strip of pliable material of complementary form to that of said recess which contains 45 liquid crystals which change their colour as the temperature varies.

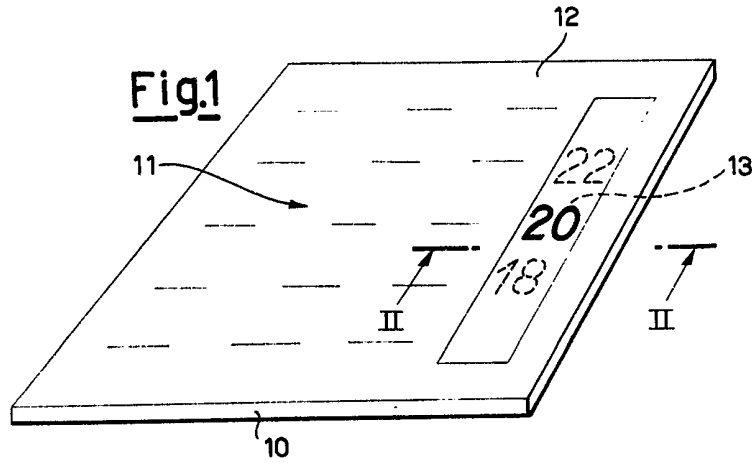
2. An article according to Claim 1, wherein a layer of porous flexible material is further housed in said recess below said 50 temperature indicating strip.

3. An article according to Claim 2, wherein said porous flexible material is paper.

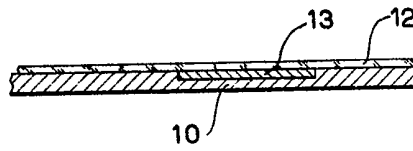
4. An article according to any preceding 55 claim, wherein said sheet means includes first and second lower layers, said recess being formed by an opening through the first lower layer, said second lower layer being arranged under said first lower layer. 60

5. A multilayered sheet material article, substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

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**Fig.2**



**Fig.3**

