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(56) Documents Cited
GB 2247951 A GB 2100860 A US 5482373 A
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(54) Abstract Title
Label with temperature sensor

(57) A label 1 has a temperature sensor 2 comprising a temperature sensitive material such as a liquid crystal reversible ink that changes colour above or below a predetermined temperature. The label 1 is intended for use as a price label for food, particularly for food that is kept on display in food counters in shops or self-service restaurants. The price of an item of food and any other relevant information is preferably displayed on the front of the label 1, while the temperature sensor 2 is preferably formed on the back of the label 1 to allow staff behind the food counter to monitor the temperature of the displayed food. The label may include a second temperature sensor that changes colour above or below a second predetermined temperature thereby indicating to staff whether the food is stored within a desired temperature range. The label can be placed in direct proximity to the food and therefore can indicate localized hot-spots that would not be detected by a conventional food cabinet thermometer.



FIG. 1(a)

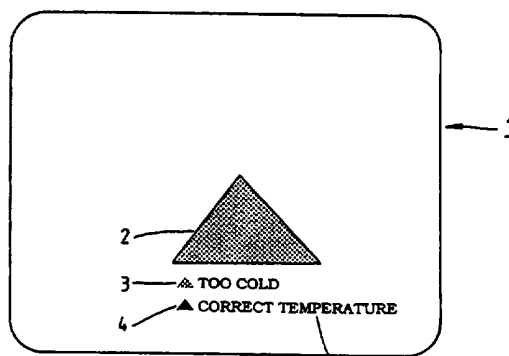


FIG. 1(b)

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FIG. 1(a)

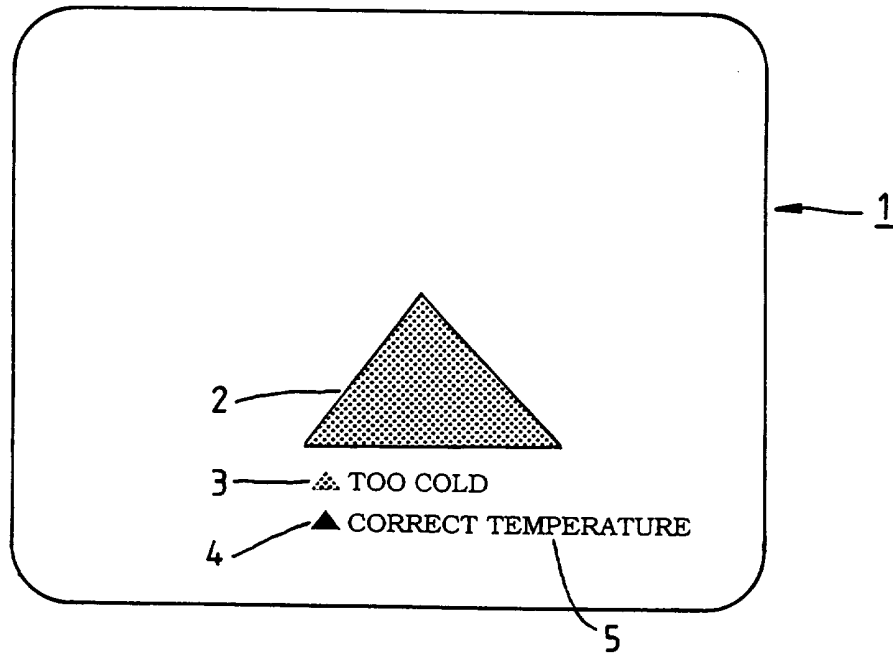


FIG. 1(b)

A label

The present invention relates to a label. More particularly it relates to a label, for example a price label for food, having a temperature sensor.

Many types of food on display in shops or stores need to be maintained at a temperature within a certain temperature range. For example, European Union laws currently require that the following foods are kept within set temperature limits:

frozen yoghurt, ice-cream	-20°C to -23°C
frozen foods	-18°C to -20°C
chilled foods	0°C to 5°C
hot foods (which are to be sold hot)	more than 63°C

These temperatures are chosen primarily to inhibit bacterial growth. If food is kept at too high a temperature, or at too low a temperature in the case of hot foods, the bacteria will rapidly multiply so that consumption of the food could cause food poisoning.

Food display cabinets or counters are usually provided with a thermometer. However, these generally monitor the temperature at only one point in a cabinet or counter, but a super-market food counter can be well over 10 m long. Clearly, the thermometer will not be able to detect temperature variations over the volume of the counter, so that local 'hot-spots' will not be discovered.

Hand held temperature probes are known. One such probe has a temperature sensor mounted on a thin rod. In use, the sensor is pushed into the food so that the temperature of the food can be measured and logged. In order to measure the temperature of all the food items in a counter it is necessary to probe each item of food separately. This is

laborious, and it is easy for the person using the probe to make mistakes when writing down the temperatures measured by the probe. Errors can also occur if the user records the temperature before the probe has reached thermal equilibrium with the food. Moreover, as the probe is pushed into the food it is necessary to clean the probe before each measurement, and this further increases the time taken to make the measurements. Furthermore, it is possible to damage the food when inserting the probe.

Infra-red temperature probes have been used in place of the above-mentioned probes. They do not require physical contact between the probe and the food, and they thus overcome the problems of contamination and damage. However, they are still very laborious to use when the temperature of each item of food must be individually determined.

The present invention provides a label with a temperature sensor. In a preferred embodiment the label is a price label.

United Kingdom law requires that every item of food displayed for sale carries, or is accompanied by, certain statutory information such as the price of the food. This is generally provided by a price label which identifies the product and gives the price. Each type of food on display will have its own price label, and this will generally be provided in the direct proximity of the food so that it will be at substantially the same temperature as the food. Providing each price label with a temperature sensor enables the temperature throughout the display counter or cabinet to be monitored easily.

In a preferred embodiment the front side of the label carries information and the temperature sensor has a display on the back side of the label.

This embodiment is suited for, inter alia, display cabinets or counters for chilled food, for example such as a meat counter. The public will see the information about the food, and the serving staff behind the counter will be able to monitor the temperature of the food.

In a preferred embodiment the temperature sensor comprises an indicator material that changes colour at a pre-determined temperature, such as a reversible ink. This would provide a simple indication as to whether the food was above or below the pre-determined temperature.

In another preferred embodiment, the label comprises first and second temperature sensors, the first temperature sensor indicating whether the temperature is above or below a first set temperature and the second temperature sensor indicating whether the temperature is above or below a second set temperature. This would be suitable for use with food that has to be kept within a specified temperature range (rather than simply above or below a specified temperature).

A preferred embodiment will now be described by way of an illustrative example with reference to the accompanying figures in which:

Figure 1(a) is a view of the front side of a label according to the invention; and

Figure 1(b) is a view of the back side of the label of Figures 1(a).

Figure 1(a) shows the front of a label 1 according to the present invention. It is printed with information about the product, and also shows the price of the product.

As shown in Figure 1(b), the back of the label is provided with an temperature sensitive material 2. This changes colour at a pre-determined temperature T_c . The back of the label 1 is also printed with two coloured areas 3, 4. One of these is the colour that the temperature sensitive material adopts below T_c , whereas the other is the colour that the temperature sensitive material takes above T_c .

In this embodiment the label 1 is for a hot food cabinet/counter. The temperature sensitive material has a T_c of around 63°C, and is red below T_c and black above T_c . The coloured area 3 is printed in red, and the coloured area 4 is printed in black. The

label is supported by a stand (not shown), and is placed in the counter or cabinet adjacent to the food so that the temperature of the temperature sensitive material will be substantially equal to the temperature of the food. A member of the serving staff simply has to check that the temperature sensitive material 2 is black - if it changes to red the temperature of the display cabinet or counter is too low.

The back of the label is printed with simple instructions 5 as to the meaning of the colour of the temperature sensitive material 2.

The label 1 is manufactured by a simple extension of conventional manufacturing methods. Firstly, the information, such as the product name and the price, for the front sheet of the label is printed onto a sheet of paper, card or plastics film. The coloured areas 3, 4 and the instructions 5 are then printed onto the rear surface of the paper, card or plastics film.

Usually several tickets are printed simultaneously on one sheet.

The temperature sensitive material 2 is then put on the rear surface of the sheet. It can be in the form of a piece of a temperature sensitive material which is adhered to the sheet, or a temperature sensitive dye or paint can be applied to the sheet. The sheet of the printed tickets is then laminated with clear plastic film (not shown) on both sides, in the same way as in the manufacture of conventional labels. Finally the sheet is cut into individual tickets.

A Liquid Crystal reversible ink is an example of a temperature sensitive material suitable for use in a label according to the present invention. For example, Thermax^(RTM) RTTS63 reversible ink has a transition temperature T_c of 63°C , and so is suitable for use on a label for hot foods. Other Liquid Crystal reversible inks in the Thermax^(RTM) range have different values for T_c , and are suitable for labels for chilled or frozen foods.

Such a temperature sensitive material can be programmed, during manufacture, to change colour at a particular temperature, as is well known, so that a label which indicates whether the temperature is above or below any desired temperature can be produced. This means that labels can be produced to meet any changes in the specified temperature ranges. It is also straightforward to manufacture labels for use in other countries where different temperature limits are in force.

The present invention is not limited to a food label. A label according to the present invention can be used with any goods which must be kept, or which are preferably kept, within a certain temperature range, for example such as drinks. A label according to the invention can also be used in self-service restaurants and cafes, as well as in shops or stores.

Where the temperature sensitive material is a material that changes colour at a specific temperature, the colours are not limited to red and black. Temperature sensitive materials, such as liquid crystal reversible inks, are available in a wide range of colours.

CLAIMS:

1. A label comprising a temperature sensor.
2. A label as claimed in claim 1 wherein the label is a price label.
3. A label as claimed in claim 1 or 2 wherein the front side of the label carries information and the temperature sensor has a display on the back side of the label.
4. A label as claimed in claim 1, 2 or 3 wherein the temperature sensor comprises an indicator material that changes colour at a pre-determined temperature.
5. A label as claimed in claim 4 wherein the indicator material is a reversible ink.
6. A label as claimed in any preceding claim wherein the label comprises first and second temperature sensors, the first temperature sensor indicating whether the temperature is above or below a first set temperature and the second temperature sensor indicating whether the temperature is above or below a second set temperature.
7. A label substantially as described herein.



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Claims searched: 1-7

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Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): G1D (DH31A, DH31X, DH35A, DH35B, DH51, DH52)

Int Cl (Ed.6): G01K 1/14, 11/12, 11/14, 11/16

Other: Online: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2247951 A (COWELL) - see page 2, lines 21-35	1,4,5
X	GB 2100860 A (SPIRIG) - see page 1, lines 50-65	1, 3, 4
X	US 5482373 (HUTCHINSON) - see column 3. lines 46-54	1,4,5
X	US 4933525 (PHILLIPS) - see column 6, lines 19-26	1,4,5,6
X	US 4509533 (CHERVITZ) - see column 3, lines 19-26	1,4,5,6

X Document indicating lack of novelty or inventive step
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