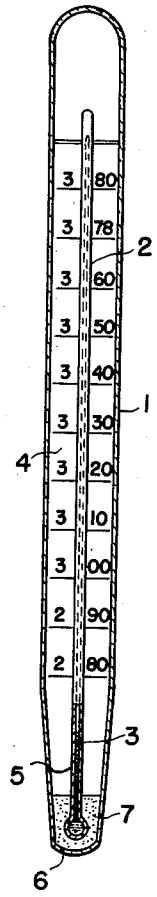
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THERMOMETER

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THERMOMETER

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1 Claim. (Cl. 73—353)

1

This invention relates to thermometers particularly adapted for the measurement of temperatures in candy and deep fats.

Such thermometers generally comprise an outer bulb surrounding an inner indicating tube carrying a column of thermally responsive liquid of e. g. mercury or alcohol, and between the lower end of the outer bulb and the reservoir end of the indicating tube there is positioned a mass of metal which serves as a ballast and as a heat conductive medium. The metallic mass hitherto employed in these thermometers has consisted of a fusible metal alloy, for example, an alloy containing 35% by weight of lead and 65% of tin, and the thermometer assemblies constructed therewith have suffered from the defects inherent to the usual glass to metal contact.

Thus the normal contraction of the metal in the bulb upon manufacture and repeated heating and cooling of the assembly in service gives rise to poor adherence between the glass and metal, a factor which leads to a "looseness" of the metal in the bulb and which may result in seriously lowered heat transmission.

Also in the process of manufacturing the assembly the cooling of the metal about the inner indicator tube exerts a squeezing pressure on the same leading to a relatively high reject condition.

Further the relatively high specific gravity of the fusible metal alloys unduly increases the weight of present assemblies since the volume of alloy required must be maintained sufficiently large to permit fusion thereof and to provide a continuous path between the bulb and indicator tube.

It is a primary object of this invention to provide an improved thermometer assembly which overcomes the above noted defects of present constructions.

This and ancillary objects are attained in the structure of invention by utilizing a mass of a fused inorganic salt or a mixture of salts as the ballast material to compactly fill the spacing defined between the outer bulb and the reservoir end of the indicator tube.

For thermometers having a maximum operating temperature of less than about 400° F. I prefer to use a fused mixture of potassium nitrate and sodium nitrate in the proportions of about 50% by weight of each. In these proportions the noted salts have a minimum melting point of about 424° F., and accordingly as the salt proportions vary from this ratio the mix melting point rises and other weight ratios may be suitably employed to readily provide thermometer

2

assemblies having a maximum temperature of operation of about 500° F. For example, other salt mixes, such as:

78% potassium nitrate 22% sodium nitrate (melting point 490° F.)	54% potassium nitrate 46% sodium nitrate (melting point 430° F.)
23% potassium nitrate 77% sodium nitrate (melting point 545° F.)	67% sodium nitrate 33% potassium nitrate (melting point 450° F.)

Potassium nitrate (melting point 650° F.)
Sodium nitrate (melting point 590° F.)

and other salts such as mixtures of sodium chloride and sodium sulphate in varying proportions, are within the inventive concept.

The single figure of the drawing illustrates a typical thermometer embodying the present invention.

In the drawing there is shown at 1 an elongated tubular outer bulb of glass in which there is enclosed an indicator tube 2 containing a column 3 of mercury or alcohol and a graduated scale 4 with which the indicator tube 2 cooperates. The reservoir end 5 of indicator tube 2 extends into the closed end portion 6 of outer bulb 1. Positioned in the spacing defined between reservoir 5 and portion 6 is the body 7 of ballast material which consists of 50% by weight of sodium nitrate and 50% potassium nitrate. This body 7 adheres closely to the bulb wall portion 6 and the inner tube end 5.

In the practice of the invention the salts, that is the potassium nitrate and sodium nitrate, are thoroughly mixed and then fused to homogeneity, whereafter the cooled mix is granulated and the required quantity of the particles inserted in the closed end portion of the outer bulb. The granulated material is then heated to the fusion point, about 424° F. for equal proportions by weight of the salts, and the indicator tube is thereafter inserted in the molten mass and the assembly allowed to cool. Due to the fact that the binary salt mix has only a very slight shrinkage the reservoir end is not subjected to any substantial stress, but firm adherence is secured between the fused salts and the glass walls of the bulb and indicator due to the inherent properties of these components, particularly the thermal coefficient of expansion which approaches that of glass. The thermometer assembly is thereafter completed in the manner known to the art.

Thermometers made in accordance with the above procedure may readily have an effective range between about 285° F. and 500° F.

A primary feature of the invention is the nontoxic character of the salts utilized permitting

ready handling of the molten material without the use of excessive protection equipment in manufacture. Also this feature is important for should accidental destruction of the thermometer occur in service a toxicity condition would not be created.

The resultant thermometer assembly has the distinct advantage of high heat transmission to the reservoir of the indicator tube with a lowered thermometer assembly weight and more uniform distribution of the ballast material. The cost of the process is reduced and the product having a white appearing bulb portion is more attractive to the eye than the dark gray metal of former structures. Among the most important advantages, however, are that the new assembly avoid the "looseness" of the metal in the bulb, characteristic of former structures, and has the further advantage of lowered manufacturing rejects due to the substantial elimination of the squeeze pressure on the indicator tube during manufacture.

It will be understood that this invention is susceptible to modification in order to adopt it to

different usages and conditions and, accordingly, it is desired to comprehend such modifications within this invention as may fall within the scope of the appended claim.

I claim:

A thermometer comprising an outer glass bulb having a closed lower end portion, an indicator tube enclosed by said bulb and having the reservoir end thereof extending into the said closed lower end portion of said bulb to define a spacing therebetween, and an integral body comprising a homogeneous mixture of fused inorganic salts compactly filling the said spacing between the said reservoir end and lower bulb portion and firmly adhered thereto.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,316,780	Freas	Sept. 23, 1919
2,051,540	Chaney	Aug. 18, 1936
2,271,193	Hohmann	Jan. 27, 1942