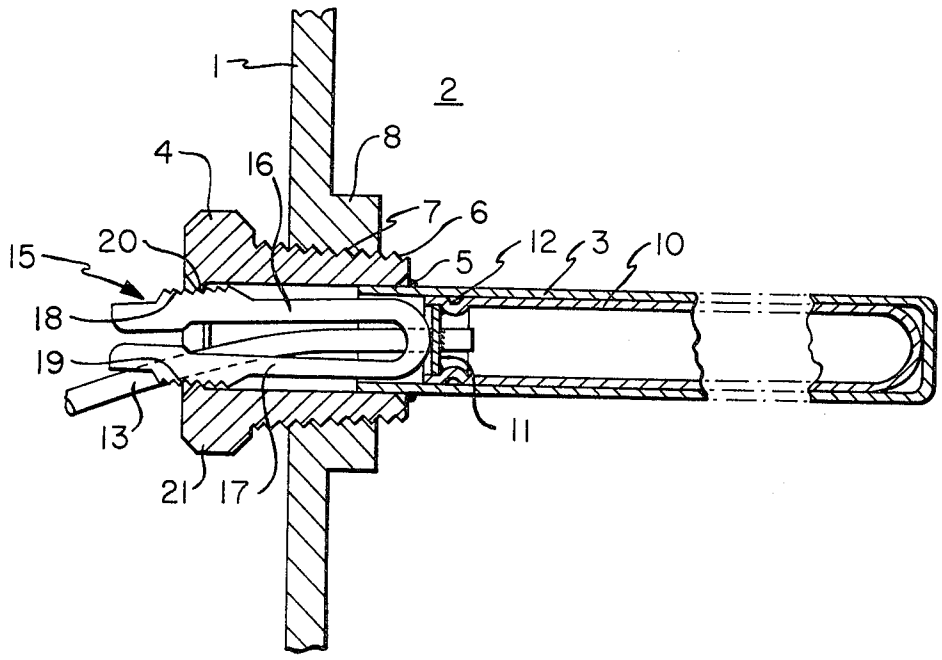
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BULB RETAINER

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BULB RETAINER

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ABSTRACT OF THE DISCLOSURE

A temperature sensing well and bulb assembly wherein a U-shaped resilient member holds the bulb in the well. The legs of this member are pressed together to insert it in the well and then released to engage the well and hold it in place.

The present invention relates to temperature sensing apparatus of the kind in which in operation a hollow bulb containing a liquid or awax for example, is placed in thermal contact with a fluid medium, the temperature of which is to be sensed, by mounting the bulb in a well which projects into a space containing the medium so that its outer surface is exposed to the medium while its interior is open at one end to some external space to enable the bulb to be inserted. Such apparatus will be referred to as temperature sensing apparatus of the kind specified.

In temperature sensing apparatus of the kind specified, the bulb is usually closed except for a narrow bore tube for communication with an apparatus capable of responding to the pressure in the bulb in such a way as to provide a measure of its temperature and thus in operation of the temperature of the medium. The bulb is usually constructed to fit closely into the inner end of the well so that its temperature is substantially that of the medium into which the well projects. Commonly the well is circular in cross-section, the bulb being of similar cross-section and of such diameter as to be a close slide fit into the well.

In order to enable the temperature of the medium, and in particular fluctuations in that temperature, to be sensed and followed accurately, it is desirable that the bulb be maintained in close contact with the inner end of the well so that there is little or no air space. The present invention is concerned with the provision of a simple and inexpensive means for ensuring this.

According to the present invention, in temperature sensing apparatus of the kind specified, the well is provided at or near its open end with an inwards projection through which the bulb can pass, the lengths of the well and the bulb being such that when the inner end of the bulb is in contact with the inner end of the well, its outer end is spaced inwardly from the outer end of the well, and the bulb is held in position by a substantially U-shaped clip, the two arms of which carry serrations on their outer edges and can be compressed together to enable the clip to pass into the well but on release spring apart so that the serrations can engage the projection, thus enabling the clip to be compressed and inserted into the well nose first to push the bulb against the inner end of the well and then released to hold the bulb in that position.

The inwards projection is preferably a simple inwardly projecting lip or flange extending round the inner circumference of the well. However, it will be appreciated that it will be sufficient for it to consist of diametrically opposed inwardly projecting parts although it will then be necessary to have the clip oriented within a particular sector in order that the serrations can engage the parts

provided. The term "projection" as used in this specification includes only projections involving at least such diametrically opposed parts.

The well may be made up from a length of tubing closed at one end and secured, for example by soldering or welding, to a comparatively short sleeve, capable of supporting the tube relative to some larger structure. The sleeve may for example be provided with an external screw thread to enable it to be screwed into a correspondingly threaded aperture in the wall of a pipe or other conduit or the water space of a boiler for example. In such cases, the inwards projection may be provided on the interior surface of the sleeve, for example in the form of a lip or flange around its inner surface at the end remote from the sleeve. The open end of the tube may for example fit into one end of the sleeve.

The clip is preferably a flat U-shaped plate of a resilient metal such as phosphor bronze.

The serrations may for example be provided along the outer edges of the two arms possibly along comparatively short sections lying opposite one another. Preferably, where the serrations are regularly spaced, those on one arm are offset from those on the other arm by half the length of a single serration, so as to increase the number of different positions in which the clip can engage the projection.

One example of temperature sensing apparatus according to the present invention will now be described with reference to the accompanying drawing which shows a cross-section of the relevant parts of the apparatus.

Referring to the drawing, the apparatus shown is provided for use in sensing the temperature of water within a boiler, of which a section of one wall **1** is shown, the area **2** to the right of the wall **1** as it appears in the drawing, being a part of the interior of the boiler.

The well provided is formed by a tube **3** and a sleeve **4**. The tube **3** is closed at one end while its open end projects into the sleeve **4** and is secured to it for example by the solder material **5**. The sleeve **4** has an external screw thread **6** which is screwed into a corresponding thread **7** provided on the wall of an aperture passing through a boss **8** provided on the wall of the boiler.

A liquid or wax filled bulb **10** fits into the tube **3** and is inserted so that its inner end is in contact with the closed end of the tube **3**. The outer end of the bulb **10** is closed by a metal disc **11** which is soldered to an annular indentation **12** provided in the longitudinal wall of the bulb **10**. The disc **11** has a metallic capillary tube **13** sealed through it with one open end projecting a short distance into the bulb **10**. The other end is connected in known manner to a device (not shown) adapted to respond to expansion of whatever medium is used to fill the bulb.

The bulb **10** is held against the inner end of the well tube **3** by a flat U-shaped phosphor bronze clip **15** which is inserted nose first into the well after the bulb **10**. Its nose bears on the disc **11**. The clip **15** is sufficiently flexible that its arms **16** and **17** can be pressed towards one another while it is being inserted to enable the serrations **18** and **19** on the outer edges of the arms **16** and **17** to clear the inwardly projecting flange **20** provided close to the outer end of the inner surface of the sleeve **4**. After inserting the clip **15** as far as possible so that the bulb **10** is pushed fully home, the arms **16** and **17** are released to permit the serrations **18** and **19** to engage the flange **20**. This effectively holds both the bulb **10** and the clip **15** in position. To give as many effective holding positions as possible, the serrations **18** are offset with respect to the serrations **19** by half the length of one serration.

While the flange **20** is continuous, it, or any similar inwards projection provided could, if required, be limited to two diametrically opposed arcs.

To facilitate making a pressure-tight fit, the sleeve **4** and the aperture in the boiler wall, with their respective screw threads, are tapered, while the sleeve **4** is provided with an integral nut **21** to enable it to be screwed tightly into position.

It will be appreciated that temperature sensing apparatus according to the present invention may be employed both to measure water, or other liquid, temperatures in apparatus other than boilers and to measure the temperature of gases or vapors in other spaces. The actual form of the well and the bulb are immaterial.

The embodiments of the invention in which an exclusive property or right is claimed are defined as follows:

I claim:

1. Temperature sensing apparatus comprising a well having a closed end and an open end, a fluid filled bulb of less length than said well movable lengthwise within said well and positioned at the closed end thereof, and a retainer having an end engaging said bulb within said well, having a pair of lateral surfaces biased outwardly into engagement with opposite internal surfaces of said well, and having a pair of manually operable members extending beyond the open end of said well, said members being relatively movable to move said lateral surfaces radially with respect to said well.

2. Temperature sensing apparatus in accordance with claim **1** in which the retainer is a unitary U-shaped piece of resilient material, the bend of which engages the bulb.

3. Temperature sensing apparatus in accordance with claim **2** in which the lateral surfaces of said retainer are serrate and engage cooperating abutment means in said well.

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