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(54) Process for assembling a temperature sensor, and temperature sensor so formed

(57) A process for assembling a temperature sensor (1), comprises the steps of taking two blades (2) joined by a bridge (3) and partially embedding the blade in a connecting element (5) formed from plastics material.

The bridge (3) is sheared, and the two rheophore terminals of a temperature sensor (6) are welded to portions of the blades (2).

A plastics supporting body (8) is molded, incorporating the blades (2) and sensor (6).

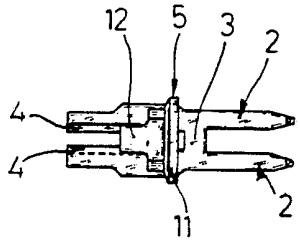

Fig.2

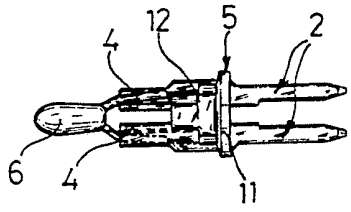

Fig.4

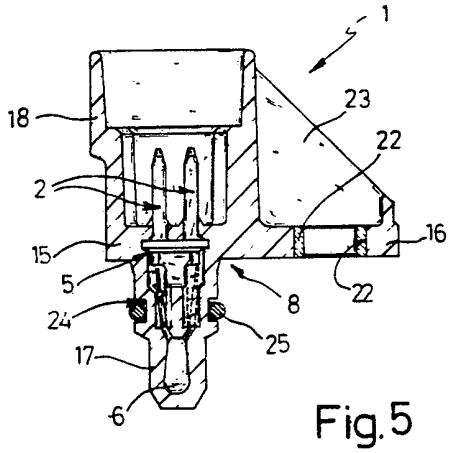

Fig.5

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The drawing(s) originally filed was (were) informal and the print here reproduced is taken from a later filed formal copy.

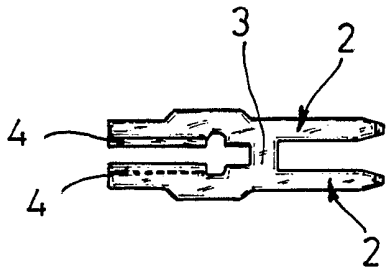


Fig.1

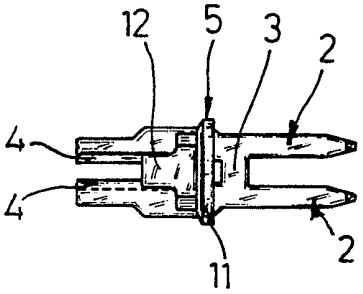


Fig.2

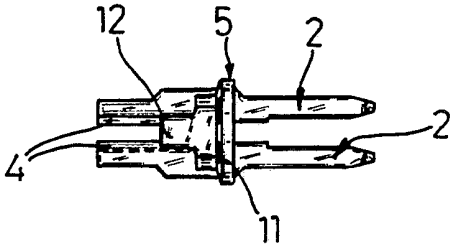


Fig.3

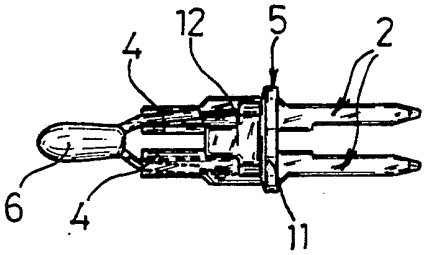


Fig.4

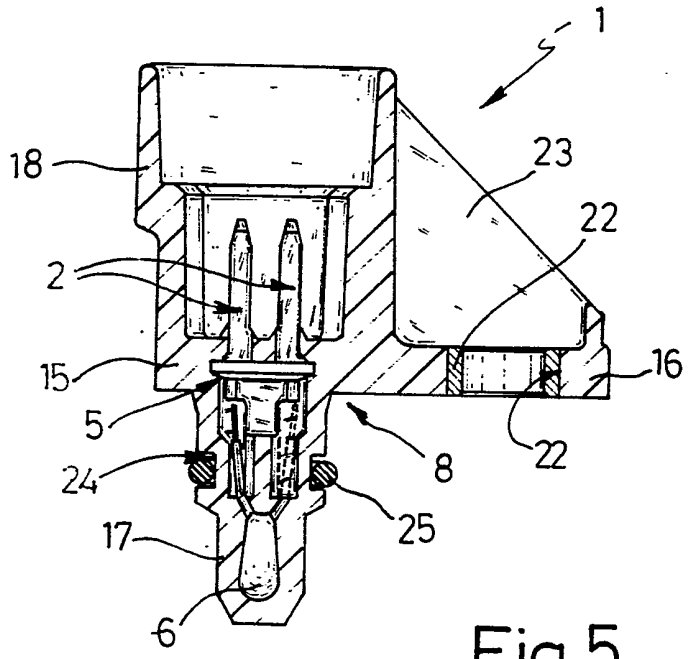


Fig.5

Fig.6

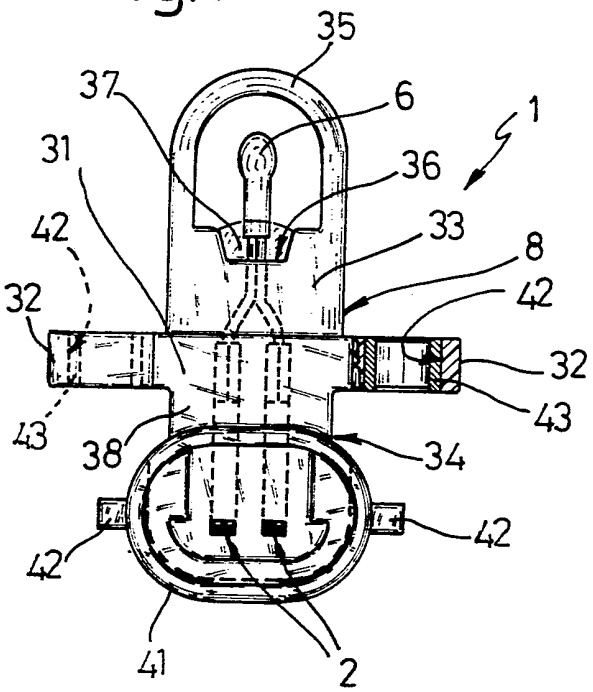
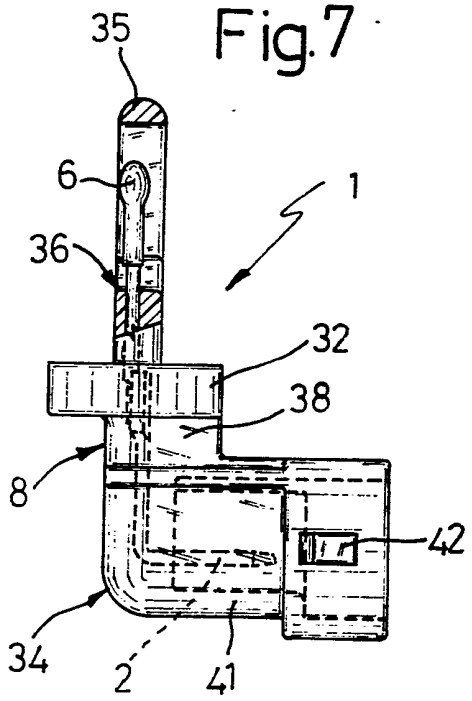


Fig.7



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PROCESS FOR ASSEMBLING A TEMPERATURE SENSOR, AND TEMPERATURE SENSOR SO FORMED

The present invention relates to a process for assembling a temperature sensor, and to a temperature sensor produced using the said process.

The aim of the present invention is to provide a low-cost robotized process for assembling a temperature sensor; and a temperature sensor of straightforward, low-cost design.

With these aims in view, according to the present invention, there is provided a process for assembling a temperature sensor, characterised by the fact that it comprises:

- a first stage wherein plastic material is molded on to two blades joined by a bridge, so as to form a connecting element mechanically connecting two portions of the said blades;
- a second stage wherein the said bridge is sheared, for electrically insulating the said blades; and the two rheophore terminals of a temperature sensor are welded to portions of the said blades;

- a third stage wherein a plastic body is molded for supporting the said blades and the said sensor.

According to the present invention, there is also provided a temperature sensor produced using the said process and characterised by the fact that it comprises a plastic body having a center portion from which extends at least a connecting flange; a first lateral portion housing portions of the said two blades and constituting a protecting element for a temperature sensor having its rheophore terminals connected to the said blades; and a second lateral portion having at least a cup-shaped portion inside which the ends of the said blades extend for enabling connection to a connector.

The main stages in the process according to the present invention will be described by way of example with reference to the accompanying drawings, in which :

- Fig.s 1 to 5 show the main stages in the temperature sensor assembly process according to the present invention;

Fig.s 6 and 7 show front and side views respectively of a further embodiment of the Fig.5 temperature sensor assembled using the same process.

The accompanying drawings show the various stages in the assembly of a temperature sensor 1, two embodiments of which are shown in Fig.s 5 and 6, mainly designed for detecting the temperature of a liquid or gas. The process according to the present invention commences with a pair of parallel, coplanar blades 2 joined by an intermediate bridge 3 (Fig.1). A first end of each blade 2 presents a small inner edge portion 4 turned perpendicularly upwards. The blades and the bridge are of electrically conductive material and may be formed integrally.

The process according to the present invention comprises:

- a first stage wherein a plastic connecting element 5 is molded for mechanically connecting two portions of blades 2 adjacent to bridge 3 and between bridge 3 and the said portions 4 (Fig.2);
- a second stage wherein the said bridge 3 is sheared, for electrically insulating the said blades 2 (Fig.3);
- a third stage wherein the two rheophore terminals of a temperature sensor 6 are welded to respective portions of blades 2 left exposed by the said connecting element 5 (Fig.4);
- a fourth stage wherein blades 2, connecting element 5 and sensor 6 are incorporated inside a molded plastic body 8 supporting blades 2 and sensor 6 (Fig.s 5 and 6).

Alternatively, bridge 3 may be sheared after welding the terminals of sensor 6. Molded connecting element 5 presents a first portion 11 incorporating, while at the same time separating, the center portions of blades 2; and a second portion 12 extending along the gap between blades 2 and cooperating with a small portion of upturned inside edge portions 4, which provide for separating the rheophores of sensor 6, as shown in Fig.4.

Fig.5 shows a temperature sensor 1 produced using the aforementioned process, and employed for detecting the temperature of a liquid. In this case, plastic body 8 comprises a center portion 15 from which extends a coplanar connecting flange 16; a closed lateral portion 17 housing connecting element 5 and sensor 6; and a cup-shaped lateral portion 18 engaged by a connector (not shown) connected, in use, to the portions of blades 2 extending inside

portion 18. Flange 16 presents a through hole 21 housing a metal bush 22 which, in use, is fitted through with a screw for securing sensor 1 to the wall of the body containing the temperature-controlled liquid. Between flange 16 and portion 18, there is also formed a strengthening rib 23. Along the outer surface of portion 17, there is formed an annular groove 24 housing an annular seal 25. Both portions 17 and 18 of body 8 present the same longitudinal axis.

Fig.s 6 and 7 show a sensor 1 employed for detecting the temperature of a gas. In this case, plastic body 8 comprises a center portion 31 from which two coplanar connecting flanges 32 extend in opposite directions; and two lateral portions 33 and 34. Portion 33 is substantially flat, and houses the rheophores of sensor 6, which is located inside the space defined by a protective bridge 35 formed in one piece with the free end of portion 33.

The rheophore end of sensor 6 is located in a recess 36 formed on the free end of portion 33, and inside which a layer of protective resin 37 is deposited subsequent to the body 8 molding stage. Portion 34 presents a first portion 38 having the same longitudinal axis as portion 33; and a second portion 41 bent perpendicularly in relation to portion 38. The said portion 38 is solid, whereas portion 41 is cup-shaped and presents, on its outer surface, two teeth 42 for a connector (not shown), the terminals of which extend, in use, inside the said portion 41 in such a manner as to contact the blade 2 portion also extending inside the said portion 41. Blades 2 are also bent perpendicularly as on portion 34, which bending ope-

ration is, of course, performed prior to molding body 8. Each of flanges 32 presents a hole 42 housing a metal bush 43 which, in use, is fitted through with a screw for securing sensor 1 to the wall of the body containing the temperature-controlled gas.

The advantages of the present invention will be clear from the foregoing description. Firstly, the above process is performable automatically, by virtue of all the assembly stages involving a single one-piece, easy-to-handle element, thus enabling fast, low-cost production of sensor 1. Furthermore, commencing from the same component, sensors 1 of various designs may be formed for adapting to different temperature-controlled fluids and mounting bodies.

To those skilled in the art it will be clear that changes may be made to both the process and sensor 1 as described and illustrated herein. For example, instead of being bent perpendicularly upwards, portion 4 of each blade 2 may present a tubular structure having a longitudinal slot forming a C-section seat in which to house the terminals of sensor 6. This would provide for improved mechanical connection between sensor 6 and blades 2, thus enabling sensor 6 to be positioned easily in relation to body 8 during molding of the same.

CLAIMS

1) - A process for assembling a temperature sensor , characterised by the fact that it comprises:

- a first stage wherein plastic material is molded on to two blades joined by a bridge , so as to form a connecting element mechanically connecting two portions of the said blades ;
- a second stage wherein the said bridge is sheared, for electrically insulating the said blades ; and the two rheophore terminals of a temperature sensor are welded to portions of the said blades ;
- a third stage wherein a plastic body is molded for supporting the said blades and the said sensor .

2) - A process as claimed in Claim 1, characterised by the fact that, in the said third stage, the said body is formed with a first portion designed to protect the said sensor ; and a cup-shaped second portion inside which the ends of the said blades extend for enabling connection to a connector.

3) - A process as claimed in Claim 2, characterised by the fact that, in the said third stage, the said first portion of the said body incorporates part of the said blades and the said sensor .

4) - A process as claimed in Claim 3, characterised by the fact that it comprises a further stage, following the said third stage, in which an annular seal is inserted inside an annular groove formed on the outer surface of the said first portion .

5) - A process as claimed in Claim 2, characterized by the

fact that, in the said third stage, the said first portion of the said body incorporates part of the said blades and the rheophores of the said sensor ; and defines, by means of a bridge formed in one piece with the said first portion , a space inside which the said sensor is housed.

6) - A process as claimed in Claim 5, characterised by the fact that it comprises a fourth stage wherein a layer of protective resin is deposited inside a recess formed on the said first portion and housing the portion of the said sensor from which the said rheophores extend.

7) - A process as claimed in any one of the foregoing Claims from 2 to 6, characterised by the fact that, between the said second and third stages, it also comprises an intermediate stage wherein the said blades are bent perpendicularly; the said second portion of the said body being molded in the said third stage so that it, too, is L-shaped.

8) - A temperature sensor produced using the process as claimed in any one of the foregoing Claims from 1 to 7, and characterised by the fact that it comprises a plastic body having a center portion from which extends at least a connecting flange ; a first lateral portion housing portions of the said two blades and constituting a protecting element for a temperature sensor having its rheophore terminals connected to the said blades ; and a second lateral portion having at least a cup-shaped portion inside which the ends of the said blades extend

for enabling connection to a connector.

9) - A temperature sensor as claimed in Claim 8, characterised by the fact that the said first lateral portion incorporates the said sensor .

10) - A temperature sensor as claimed in Claim 9, characterised by the fact that the outer surface of the said first lateral portion presents an annular groove for housing an annular seal .

11) - A temperature sensor as claimed in Claim 8, characterised by the fact that the said first lateral portion is substantially flat, and incorporates part of the said rheophores on the said sensor ; the free end of the said first lateral portion presenting a protective bridge defining a space housing the said sensor.

12) - A temperature sensor as claimed in Claim 11, characterised by the fact that the free end of the said first lateral portion presents a recess housing the portion of the said sensor from which the said rheophores extend; a layer of protective resin being deposited inside the said recess .

13) - A temperature sensor as claimed in any one of the foregoing Claims from 8 to 12, characterised by the fact that the said first and second lateral portions present the same longitudinal axis.

14) - A temperature sensor as claimed in any one of the foregoing Claims from 8 to 12, characterised by the fact that the said second lateral portion presents a first portion having the same longitudinal axis as the said first lateral portion ; and a second cup-shaped por-

tion having its longitudinal axis substantially perpendicular to that of the said first portion ; the portion of the said blades extending inside the said second portion of the said second lateral portion also being bent perpendicularly in relation to the remaining portions of the said blades incorporated inside the said first portion and the said first lateral portion .

15) - A temperature sensor assembly process as claimed in any one of the foregoing Claims from 1 to 7, and as described and illustrated herein with reference to the accompanying drawings.

16) - A temperature sensor as claimed in any one of the foregoing Claims from 8 to 14, and as described and illustrated herein with reference to the accompanying drawings.

17) - A process according to any of claims 1 to 7 in which the said bridge is sheared after the terminals have been welded to the blades.

18) A process for assembling a temperature sensor including the steps of moulding plastics material on to two blades joined by a bridge of conducting material, so as to form a connecting element of electrically insulating material mechanically connecting two portions of the blade, electrically connecting two terminals of a temperature sensor to the two blades respectively, and moulding a plastics body for supporting the blades and the sensor, the bridge being severed after the connecting member has been formed.

19) A temperature sensor formed by the process of any of claims 1 to 7 or claims 17 or 18.

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