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(54) Benævnelse: **ELEKTRISK SENSOR**

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ELECTRICAL SENSOR

The invention relates to an electrical sensor, in particular a temperature sensor, with the features of the preamble of claim 1. The electrical sensor comprises a carrier element which is specially configured to accommodate at least one electrical or electronic component. This can be an active or passive component, in particular a measuring or sensor element. The electrical or electronic component can have connection wires or contact surfaces for connection to the connection wires of an electrical connecting line.

In the configuration as temperature sensor, the electrical sensor should be able to be integrated into a pipe or line system in such a way that it allows the temperature of a medium flowing through the pipe or line system to be measured.

Furthermore, a media-carrying line with an electrical sensor according to the invention is proposed. The line can be either a pipe or a bore through which a medium flows.

State of the art

Prior art

From the utility model DE 88 02 130 U1, a temperature sensor with a housing and a temperature-sensitive measuring element accommodated therein is known, which can be installed in a pipe system in such a way that one end of the housing, which contains the measuring element, is immersed in a liquid flowing through the pipe system. The temperature sensor is supported by a flange of the housing on the outside of a wall of the pipe system. Inside the housing, the measuring element is held in a recess in a plate, which also has support points for connection wires and conductors as well as an anchor for strain relief of the conductors. A thermally conductive contact between the measuring element and the inner wall of the housing is established by means of a thermally conductive paste.

Because the temperature sensor is immersed in the medium to be measured, a high level of measurement accuracy can be achieved. However, installing the temperature sensor requires opening the wall of the pipe system, which can lead to leaks.

Furthermore, from the published patent application DE 10 2014 118 206 A1, a temperature sensor with a support tube and a cap arranged at the end of the support tube, in which a measuring element is accommodated, is known. The cap is made of a particularly thermally conductive material. To measure the temperature of a surface, for example the surface of a pipe through which a medium flows, the cap is brought into contact with the surface. In this case, the wall of the pipe does not have to be broken through, such that the tightness of the pipe is guaranteed. However, the temperature of the medium can only be determined indirectly.

Other state-of-the-art sensors are known, for example, from WO 2011/042023 A1, JPS57168030 U, US 2017/284870 A1, and DE 102013200772 A1.

Based on the above-mentioned state of the art, the present invention is based on the object of providing an electrical sensor, in particular a temperature sensor, which is particularly easy to integrate into a media-carrying pipe or line system in order to measure a property of the medium, in particular the temperature of the medium. Furthermore, the sensor should have a high measurement accuracy and an improved response behaviour.

To solve the problem, the electrical sensor with the features of claim 1 is proposed. Advantageous further developments of the invention can be found in the respective dependent claims. Furthermore, a media-carrying line with an electrical sensor according to the invention is specified.

Disclosure of the invention

The proposed carrier element is at least partially tubular and delimits a cavity that is open on at least one side.

According to the invention, at least one receptacle for an electrical or electronic component is formed in a surface of the carrier element facing the cavity and/or in a surface facing away from the cavity.

As already mentioned at the beginning, the electrical or electronic component can be either an active or a passive component. To implement a sensor, a measuring or sensor element is preferably used as an electrical or electronic component. To implement a temperature sensor, for example, a temperature sensor, in particular in the form of a measuring resistor, can be used. Alternatively or additionally, a pressure measuring element can be integrated into the carrier element to implement a pressure sensor. However, the at least one electrical or electronic component does not necessarily have to be used to measure temperature and/or pressure. Completely different functionalities can also be implemented with the help of the at least one electrical or electronic component. For example, the flow velocity in a media-carrying line can be measured with the help of an electrical or electronic component. An example of an active component is a heat-emitting component that can be used as a heating element to heat the medium flowing through the line.

In order to protect the electrical or electronic component from external influences, the proposed carrier element is overmolded according to the invention after it has been fitted with the at least one component. The overmold can enclose the carrier element on all sides or can only be arranged in certain areas, for example only in the area of the at least one electrical or electronic component. Due to its load-bearing function, the carrier element can also be referred to as a "chassis".

The carrier element is preferably a prefabricated component on the basis of which, for example, an electrical sensor can be constructed. In contrast to a conventional circuit board or circuit board, the carrier element is not plate-shaped, but rather tubular in at least some sections. In at least one section, the carrier element therefore has an annular cross-section that encloses a cavity.

The proposed cross-sectional shape leads to an increased dimensional rigidity, in particular to an increased bending stiffness and torsional stiffness, of the carrier element. If the carrier element is overmolded after being fitted with the at least one electrical or electronic component, the component can be positioned and held precisely in an injection mold using the carrier element. This leads to a defined coverage of the component with the overmolding material. In this way, an electrical sensor can be produced that has a very high measurement accuracy.

In addition, the proposed cross-sectional shape of the carrier element according to the invention has further advantages.

For example, the proposed cross-sectional shape enables the formation of an electrical sensor that is at least partially tubular, such that it can be easily integrated into a media-carrying line. For example, an electrical sensor formed from a carrier element according to the invention can itself form a line section or be inserted into a line section in such a way that the medium flows through it. The cavity delimited by the carrier element or the electrical sensor can thus be used as a flow path for the medium.

In order to form a flow path for the medium, the cavity delimited by the carrier element and/or the electrical sensor is preferably configured to be open not only on one side, but on both sides. For example, the carrier element and/or the electrical sensor can be configured to be tubular over its or their entire length.

Alternatively or additionally, at least one opening can be provided in a tubular section of the carrier element and/or the electrical sensor, which connects the cavity with the outside space. For this purpose, the at least one opening is configured in a wall section of the carrier element that delimits the cavity. To form the at least one opening, a wall section of the carrier element that delimits the cavity can, for example, have a bore and/or a slot. If the at least one opening is not used as a flow path for a medium, it can serve to accommodate an electrical or electronic component or form a corresponding receptacle.

To insert an electrical sensor made from a carrier element according to the invention into a media-carrying line, no wall of the line needs to be opened, so there is no risk of leaks. Because the medium flows through or at least around the electrical sensor, a high level of measurement accuracy can be achieved. At the same time, the response time of the sensor is optimized.

The integration of an electrical sensor formed from a carrier element according to the invention into a media-carrying line can be carried out in such a way that the flow cross-section of the line is not reduced. For example, the electrical sensor can be integrated flush into a wall of the line. Alternatively, the electrical sensor can be integrated into a media-carrying line in such a way that the flow cross-section of the media-carrying line is deliberately reduced, for example in order to cause throttling and/or flow control.

Furthermore, an electrical sensor according to the invention can be integrated into a media-carrying line in such a way that the sensor is immersed in the medium. In this case, the medium flows around the sensor at least in some areas. To optimize the flow in the line, the sensor is preferably aligned parallel to the main flow direction within the line. In addition, the sensor can be integrated into a media-carrying line in such a way that the main flow of a medium is divided into at least two partial flows with the help of the sensor.

Alternatively or additionally, it is proposed that an electrical sensor according to the invention is integrated into a media-conducting line in such a way that the sensor interacts with a wall of the line to form at least one further cavity. The further cavity can also be used to guide the media or to form a cavity that is separated in a fluid-tight manner from the media-conducting area in order to accommodate, for example, another electrical or electronic component and/or an electrical line. In this case too, the electrical sensor is preferably aligned essentially parallel to the main flow direction within the media-conducting line.

The application examples described above show that an electrical sensor according to the invention does not necessarily have to have a circular outer contour and/or a circular cavity-delimiting inner contour in cross-section, but can also have an outer contour that deviates from the circular shape and/or a cavity-delimiting inner contour. Accordingly, the carrier element can also have an outer contour that deviates from the circular shape and/or a cavity-delimiting inner contour in cross-section. In the area of a tubular section, the carrier element can also have a cross-section that has a cavity-delimiting inner contour that deviates from the outer contour. This means that the outer and inner contours of the carrier element can be shaped differently in the area of the tubular section, such that the wall thickness of the tubular section varies over the circumference or in the circumferential direction. The same applies if the carrier element is tubular over its entire length.

According to a preferred embodiment of the invention, the carrier element has, at least in one section, an outer contour that deviates from the circular shape and/or an inner contour that delimits the cavity that deviates from the circular shape. The carrier element thus enables the formation of a large number of different electrical sensors that can be used in a variety of ways.

Furthermore, the carrier element is preferably configured to be tubular over its entire length. The cavity formed in the carrier element can thus be used to form a flow channel for a medium. If the carrier element is overmolded after being fitted with at least one electrical or electronic component, the overmold must be arranged in such a way that a continuous cavity remains. In order to form a branching further flow channel and/or to form a receptacle for an electrical or electronic component, at least one lateral opening can also be provided in the carrier element, which passes through a wall section of the carrier element that delimits the cavity and opens the cavity to the outside. The opening can be configured, for example, as a slot or window. The carrier element can have a constant or varying wall thickness over the circumference or in the circumferential direction. Furthermore, the wall thickness can vary in the longitudinal direction of the carrier element, such that, for example, the carrier element has a conically shaped outer or inner contour at least in sections.

The carrier element according to the invention has a high degree of dimensional rigidity due to its cross-sectional shape. As already mentioned, an annular cross-section does not necessarily have to be circular, but can also have an outer contour and/or inner contour that deviates from the circular shape. For example, the outer contour and/or the inner contour can have the shape of an ellipse or a polygon. Alternatively, the outer contour and/or the inner contour can form a free form. In addition, the cross-sectional shape of the carrier element can vary over its length or in the longitudinal direction.

The high dimensional rigidity of the carrier element counteracts any undesirable deformation of the carrier element during overmolding. With the help of the carrier element, the at least one electrical or electronic component can be positioned and held precisely in an injection mold, such that a defined coverage of the component with the overmolding material is guaranteed. The carrier element can therefore be used as a positioning aid during overmolding.

When the carrier element is fitted with the at least one electrical or electronic component, the component is preferably fixed in position at the same time. The at least one receptacle for the component is therefore preferably configured as a recess in the carrier element. The component can thus be inserted - completely or partially - into the recess such that it is secured against slipping. The dimensions of the recess are preferably adapted to the dimensions of the electrical or electronic component to be inserted therein such that the component is secured against slipping in at least two spatial directions. The positional fixation of the component via the carrier element counteracts in particular a change in the position of the component during a subsequent overmolding process.

It is further proposed that at least one guide channel for guiding one or more connection wires of the electrical or electronic component or an electrical connecting cable is connected to the at least one receptacle. Several connection wires can also form a connection wire that consists of several individual wires. If the connection wire or the connection wire has an insulating sheath, this is preferably removed before the connection wire or the connection wire is inserted into the guide channel.

The at least one guide channel preferably runs in the longitudinal direction and/or is configured as a longitudinal groove in the carrier element. This means that the at least one guide channel runs essentially parallel to a longitudinal axis of the carrier element. The guide channel can thus have a straight course such that the connection wires do not have to be bent. Several guide channels are preferably arranged at a distance, in particular at an angular distance, from one another such that they are separated from one another by a web of the carrier element. In this way, an electrical short circuit can be prevented.

The at least one receptacle for an electrical or electronic component and/or the at least one guide channel for guiding one or more connection wires can be formed both in the surface of the carrier element facing the cavity and in the surface of the carrier element facing away from the cavity. Inserting the component into the receptacle and/or inserting the connection wires into the at least one guide channel can be simplified by arranging the receptacle and/or the guide channel in the surface of the carrier element facing away from the cavity, i.e. on the outside. If the electrical or electronic component is, for example, a non-wired measuring resistor in SMD configuration, the required electrical contacting of the measuring resistor can be simplified if it is arranged on the outside. Arranging the electrical or electronic component on the inside has the advantage, in contrast, that the distance between the component and the medium can be reduced.

The carrier element preferably has several receiving arrangements such that it can be fitted with several electrical or electronic components. For example, the carrier element can be fitted with several similar components such that a redundant system is created that has increased failure and thus functional reliability. Alternatively, the carrier element can be fitted with several different components, for example with measuring resistors covering several different measuring ranges. In this way, an electrical sensor can be created that can be used over a very wide measuring range.

The plurality of receiving arrangements are preferably arranged at a distance from one another, in particular at an angular distance, in the circumferential direction of the carrier element. This ensures that guide channels extending in the longitudinal direction and adjoining the receiving arrangements are also arranged at a distance from one another, in particular at an angular distance, such that the risk of an electrical short circuit is reduced.

In a further development of the invention, it is proposed that the carrier element is configured to be rotationally symmetrical, such that it is imaged onto itself when it is rotated around its longitudinal axis by a predetermined angle. For this purpose, the multiple receiving arrangements and/or guide channels are arranged at the same angular distance from one another. In this way, the space available on the carrier element is used optimally for fitting several electrical or electronic components.

Preferably, the carrier element is made at least in sections from synthetic material, preferably from an electrically insulating and/or thermally conductive synthetic material. When using an electrically insulating synthetic material, the carrier element can also be used as an insulating part, such that additional electrical insulation is not necessary. By using a thermally conductive synthetic material, the response time of an electrical or electronic component used for temperature measurement or heating can be improved. This applies in particular if the component is separated from the medium to be measured by at least one wall section of the carrier element.

Furthermore, the carrier element is preferably an injection-molded part, i.e. a molded part produced by injection molding. In this way, the carrier element can be produced in large quantities particularly easily and cost-effectively.

The electrical sensor, in particular a temperature sensor, which is also proposed to solve the problem mentioned at the beginning has a carrier element according to the invention and at least one electrical or electronic component. The component is accommodated in a receptacle of the carrier element. The component is preferably fixed in position by the carrier element in at least one spatial direction. The position fixation counteracts a relative movement of the component in relation to the carrier element. At the same time, a high level of mechanical stability is achieved through the dimensional rigidity of the carrier element, which is primarily due to the cross-sectional shape of the carrier element. The carrier element thus enables exact positioning of the electrical or electronic component in the mold during a subsequent overmolding process, such that a defined coverage of the component with the overmolding material is achieved. The electrical sensor created in this way therefore has a high level of measurement accuracy.

In the case of the electrical sensor according to the invention, the carrier element according to the invention preferably determines the basic shape of the sensor. The electrical sensor is therefore preferably configured to be tubular over its entire length or in sections. The proposed electrical sensor can thus be integrated into a media-carrying line in such a way that it itself and/or in conjunction with the line delimits at least one cavity that can be used as a flow path for the medium.

The proposed electrical sensor can have a circular or non-circular outer contour and/or inner contour in the area of the tubular section in the cross-section. The cross-sectional shape can also vary over the length of the electrical sensor. Furthermore, the electrical sensor is preferably tubular over its entire length. An electrical sensor that is tubular over its entire length has the advantage that it can be integrated into a media-carrying line in such a way that the medium flows through it. Due to its proximity to the medium, the sensor has a high measurement accuracy. In addition, no wall of the line has to be opened to install the sensor in the line, such that the tightness of the line is still guaranteed. The inner diameter of the tubular sensor can be adapted to the inner diameter of the line such that the free flow cross-section is not reduced. Alternatively, the sensor can be dimensioned and installed in such a way that a targeted reduction in the free flow cross-section is achieved. The inner diameter of the electrical sensor is preferably predetermined by the carrier element or by an overmolding formed on the carrier element.

With regard to the advantages of an electrical sensor according to the invention and specific application examples, reference is made to the advantages and application examples already described in connection with the carrier element according to the invention. This applies in particular with regard to the various options for integrating an electrical sensor according to the invention into a media-carrying line, which each result from the specific shape of the sensor.

The electrical sensor preferably has several electrical or electronic components. At least one of these components is preferably a measuring resistor. The at least one measuring resistor is advantageously a platinum measuring resistor, with the aid of which temperature measurements can be carried out. For example, a platinum chip temperature sensor with connection wires in accordance with DIN EN 60751 can be used. This has a flat configuration with connection wires emerging from the side. Alternatively, a platinum measuring resistor in SMD configuration (surface-mounted device) can be used, which has no connection wires. In addition, an NTC resistor (negative temperature coefficient) can be used as a measuring resistor, which is particularly small in volume and therefore enables the formation of a miniaturized temperature sensor.

If several identical measuring resistors are used that provide redundant information, the risk of failure can be minimized and the functional reliability of the sensor increased. If the carrier element is equipped with measuring resistors with different characteristics as required, for example with measuring resistors that have different response times and/or different electrical connection values, a sensor can be created that not only has a high level of measurement accuracy, but also covers a wide measurement range.

If the at least one electrical or electronic component has connection wires, these are preferably accommodated in at least one guide channel of the carrier element. Preferably, each connection wire is placed in its own guide channel in order to prevent an electrical short circuit.

According to the invention, the carrier element is overmolded with a synthetic material at least in some areas, preferably in the area of the at least one electrical or electronic component. The synthetic material overmold protects the component from external influences. In particular, the synthetic material overmold seals the sensor, which protects the electrical or electronic components from moisture and/or aggressive media. The robustness of the electrical sensor increases accordingly, making it versatile and/or integrable.

According to the invention, the synthetic material of the overmolding in the area of the at least one electrical or electronic component is preferably an electrically insulating and/or thermally conductive synthetic material. When an electrically insulating synthetic material is used, electrical insulation of the overmolded components and/or connection wires is achieved at the same time. By using a thermally conductive synthetic material, the response behaviour can be improved if the electrical sensor is a temperature sensor. The thermally conductive synthetic material also contributes to the electrical sensor, in particular the temperature sensor, having a high measurement accuracy.

Depending on the position of the at least one electrical or electronic component, the surface facing the cavity and/or the surface facing away from the cavity and/or at least one end face of the carrier element can be overmolded with the synthetic material, at least in some areas. The synthetic material overmold preferably completely covers the at least one electrical or electronic component with the synthetic material, in order to prevent direct contact between the measuring resistor and the medium when the sensor is integrated into a media-carrying line.

According to the invention, the carrier element is overmolded at least in some areas with different synthetic materials, whereby preferably a first synthetic material is a thermally conductive synthetic material and a further synthetic material is a thermally non-conductive synthetic material. The use of the thermally conductive synthetic material can then be restricted to the area of an electrical or electronic component used for temperature measurement in order to achieve high measurement accuracy and short response times. In the remaining areas, a conventional non-thermally conductive synthetic material can be used for overmolded use. Since different synthetic materials can often be bonded better than similar synthetic materials, very tight transitions can be created. This ensures the required seal.

In a further development of the invention, it is proposed that the electrical sensor has at least one further electrical or electronic component. This means that the electrical sensor can take on additional tasks if required. In this way, the functionality of the electrical sensor can be increased. The further electrical or electronic component can be connected directly or indirectly, for example via a synthetic material overmold, to the carrier element of the electrical sensor.

Preferably, the further electrical or electronic component is a pressure measuring element for forming a pressure sensor. When the electrical sensor is integrated into a media-carrying line, the pressure in the media-carrying line can thus be measured. The electrical sensor can be, for example, a combined pressure and temperature sensor. Pressure measuring elements for forming a pressure sensor are available in a miniaturized embodiment, such that integration into an electrical sensor according to the invention is possible in a simple manner.

Preferably, the at least one further electrical or electronic component is integrated into the electrical sensor on the circumference or at the front. For example, a recess can be formed in the sensor on the circumference or at the front, in which the component is accommodated at least in part. If the electrical sensor is tubular, the further electrical or electronic component can be arranged at one end of the tubular electrical sensor, such that it completely or partially closes the cavity formed by the electrical sensor.

Since the electrical sensor according to the invention is preferably used to measure at least one property, in particular the temperature, of a flowable medium in a line, a media-carrying line with an electrical sensor according to the invention is also proposed. The line preferably has a section or a branch that is formed by an electrical sensor according to the invention and/or in which an electrical sensor according to the invention is accommodated. The electrical sensor is thus located in the flow path of the medium or itself forms part of the flow path for the medium. Due to the proximity of the electrical sensor to the medium, short response times and high measurement accuracy can be achieved. In addition, the wall of the media-carrying line does not have to be opened in order to integrate the electrical sensor. This means that the tightness of the line is not impaired. For this purpose, the electrical sensor is preferably integrated into the media-carrying line in such a way that a longitudinal axis of the electrical sensor is aligned parallel to the main flow direction of the medium.

The invention and its advantages are explained in more detail below using specific embodiments which can be seen in the accompanying drawings. The drawings show in:

Fig. 1, a schematic longitudinal section through an electrical sensor with a carrier element according to a first preferred embodiment of the invention,

Fig. 2, a schematic cross-section through the sensor of Fig. 1,

Fig. 3, a sectional view through an electrical sensor with a carrier element according to a second preferred embodiment of the invention,

Fig. 4, a perspective view of the sensor of Fig. 3,

Fig. 5, a perspective view of a carrier element equipped with electrical components for an electrical sensor according to a third preferred embodiment of the invention and

Fig. 6, a perspective view of a carrier element equipped with an electrical component for an electrical sensor according to a fourth preferred embodiment of the invention.

Detailed description of the drawings

The electrical sensor 2 according to the invention shown in Figures 1 and 2 is configured as a tube at least in sections, wherein the tube has a circular cross-section (see Figure 2). The cross-sectional shape of the electrical sensor 2 is predetermined by a carrier element 1, which is also configured as a tube. The carrier element 1 is equipped with two electrical components 7, which are located opposite one another on the outer circumference of the carrier element 1.

To fix the position of the electrical components 7, the carrier element 1 has receiving arrangements 6, the dimensions of which are adapted to the dimensions of the components 7. The receiving arrangements 6 are formed in a surface 5 of the carrier element 1, which defines the outer circumference of the tubular carrier element 1. In addition, guide channels 8 are formed in the same surface 5, which serve to accommodate connection wires 9. The guide channels 8 extend in the longitudinal direction of the carrier element 1, i.e. parallel to a longitudinal axis A of the carrier element 1, which at the same time forms a longitudinal axis of the electrical sensor 2. This ensures that the connection wires 9 do not cross.

The arrangement of the electrical components 7 in the surface 5 of the carrier element 1 defining the outer circumference has the advantage that the fitting of the carrier element 1 with the components 7 is simplified. This is because the surface 5 is more easily accessible than a surface 4 that encloses a cavity 3 of the tubular carrier element 1. Alternatively or additionally, the surface 4 of the carrier element 1 enclosing the cavity 3 can also be fitted with at least one component 7.

The ring-shaped cross-section of the carrier element 1 has the advantage that an electrical sensor 2 with a corresponding cross-section can be created in a simple manner. Such an electrical sensor 2 can be integrated into a media-carrying line in such a way that it forms part of the flow path of the medium. The medium flows directly in the longitudinal direction, i.e. parallel to the longitudinal axis A, past the sensor 2 or through the remaining cavity 3 of the sensor 2. In this way, short response times and high measurement accuracy can be achieved.

The electrical sensor 2 shown can in particular be a temperature sensor which has two platinum measuring resistors as electrical components 7. In the present case, these are arranged on the surface 5 of the carrier element 1 facing away from the cavity 3. Since the carrier element 1 is made of a thermally conductive synthetic material, the arrangement of the components 7 on the surface 5 facing away from the cavity 3 does not represent a significant disadvantage with regard to short response times and high measurement accuracy.

To protect the electrical components 7 from external influences, in particular from aggressive media, the carrier element 1 in the present case has an overmolding with a synthetic material 10 at least in the area of the components 7. This is again a thermally conductive synthetic material 10 in order to ensure short response times and high measurement accuracy. The overmolding with the synthetic material 10 extends over a length Lx parallel to the longitudinal axis A, both on the surface 5 and on the surface 4 of the carrier element 1. The carrier element 1 also has an end face 11, which is also overmolding with the synthetic material 10. The end of the carrier element 1 having the components 7 is thus completely surrounded by the synthetic material 10. The section with the length Lx is followed by a section with a length Ly, which is overmolding with another synthetic material 12. This is a thermally non-conductive synthetic material. This synthetic material 12 is also arranged on the carrier element 1 on both the outside and inside circumference, directly adjacent to the overmolding with the synthetic material 10.

The carrier element 1 is thus completely enclosed by synthetic material, which leads to optimal sealing. The overmolding with the additional synthetic material 12 ensures that the connection wires 9 of the electrical components 7 are also protected.

The thickness of the overmolding with the synthetic materials 10, 12 is chosen to be the same all the way around, such that an inner diameter D_I remains that corresponds to the inner diameter of the carrier element 1 minus twice the thickness of the inner overmolding. This cross section is available as a flow cross section for the medium after the electrical sensor 2 has been installed in a media-carrying line (not shown). The outer diameter D_A in this case corresponds to the outer diameter of the carrier element 1 plus twice the thickness of the outer overmolding. The electrical sensor 2 can be configured in such a way that, for example, the inner diameter D_I or the outer diameter D_A corresponds to the inner diameter of the media-carrying line, such that the free flow cross section of the line is not restricted or deliberately reduced.

Fig. 3 shows a modification of the previously described embodiment. Here, electrical components / in the form of measuring resistors for temperature measurement and a further electrical component 13 are integrated into the electrical sensor 2. The further electrical component 13, which in this case is a pressure measuring element for forming a pressure sensor, is arranged on the front side and is connected to the carrier element 1 via an overmolding with a synthetic material 12.

The electrical sensor 2 shown in Fig. 3 can be integrated into a media-carrying line in such a way that the longitudinal axis A of the sensor 2 is aligned parallel to the main flow direction of the medium within the line and a part of the medium flows into the cavity 3 of the sensor 2. In order to ensure the flow through the line, the outer diameter D_A of the electrical sensor 2 is preferably selected to be smaller than the inner diameter of the line, such that the medium flows both into the sensor 2 and outside past the sensor 2. With the help of the further electrical component 13, the pressure in the media-carrying line can also be measured.

The electrical sensor 2 of Fig. 3 also has wired measuring resistors as components 7. This means that the measuring resistors are provided with connection wires 9 (see Fig. 4), which are inserted into guide channels 8 when the measuring resistors are inserted into receiving arrangements 6 (see Fig. 4). The step of electrically contacting the measuring resistors is thus omitted. The further electrical component 13 arranged on the front side has connecting lines 14, which are led out of the component 13 on the front side (see Fig. 4).

Fig. 5 shows a carrier element 1 according to the invention for forming an electrical sensor 2, which has two wired measuring resistors as electrical components 7. In contrast to the embodiments of Figures 1 to 4, the tubular carrier element 1 here does not have a circular cross-section, but a square cross-section. The carrier element 1 has both a square outer contour and a square inner contour in cross-section. The outer and inner corners are each slightly rounded. The measuring resistors are accommodated, for example, in two walls of the carrier element 1 arranged at an angle and delimiting the cavity 3, in each case in a surface 5 of the carrier element 1 facing away from the cavity 3.

A further preferred embodiment of a carrier element 1 according to the invention for an electrical sensor 2 is shown in Fig. 6. The carrier element 1 is also tubular, wherein the cross section or cross-sectional shape of the carrier element 1 is based on a free form. The cavity 3 is delimited by walls with varying degrees of concave or convex curvature. In a wall, specifically in a surface 5 facing away from the cavity 3, an electrical component 7 in the form of a measuring resistor is accommodated in a receptacle arrangement 6.

List of reference numerals

1	carrier element
2	sensor
3	cavity
4	surface
5	surface
6	receiving arrangement
7	component
8	guide channel
9	connection wire
10	synthetic material
11	end face
12	synthetic material
13	component
14	connecting line

Patentkrav

1. Elektrisk sensor (2), især temperatursensor, med et bæreelement (1) og mindst en elektrisk eller elektronisk komponent (7), som er optaget i et modtagearrangement (6) af bæreelementet (1) og fortrinsvis er fastgjort på plads af bæreelementet (1) i mindst én rumlig retning, hvor bæreelementet (1) er udført rørformet i det mindste i sektioner og afgrænser et hulrum (3), der er åbent i det mindste på den ene side, og hvor modtagearrangementet (6) for den elektriske eller elektroniske komponent (7) er udformet i en overflade (4), der vender mod hulrummet (3), eller i en overflade (5) af bæreelementet (1), der vender væk fra hulrummet (3),
kendetegnet ved, at bæreelementet (1) i det mindste i nogle områder er omstøbt med forskellige plastmaterialer (10, 12), fortrinsvis hvor et første plastmateriale (10) er et termisk ledende plastmateriale, og et yderligere plastmateriale (12) er et termisk ikke-ledende plastmateriale, og hvor bæreelementet (1) i området for den mindst ene elektriske eller elektroniske komponent (7) er omstøbt med et plastmateriale (10), som er et elektrisk isolerende og/eller termisk ledende plastmateriale.

2. Elektrisk sensor (2) ifølge krav 1,
kendetegnet ved, at bæreelementet (1) i det mindste i et afsnit omfatter en ydre kontur, der afviger fra den cirkulære form, og/eller en indre kontur, der afgrænser hulrummet og afviger fra den cirkulære form.

3. Elektrisk sensor (2) ifølge krav 1 eller 2,
kendetegnet ved, at det mindst ene modtagearrangement (6) er udformet som en udsparing i bæreelementet (1), hvor dimensionerne af udsparingen fortrinsvis er tilpasset dimensionerne af den elektriske eller elektroniske komponent (7), der skal indsættes deri.

4. Elektrisk sensor (2) ifølge et af de foregående krav,
kendetegnet ved, at mindst én styrekanal (8) til føring af en eller flere forbindelsesledninger (9) af den elektriske eller elektroniske komponent (7) eller en elektrisk forbindelsesledning er forbundet med det mindst ene modtagearrangement (6), hvor styrekanalen (8) forløber fortrinsvis i længderetningen og/eller er udformet som en langsgående not i bæreelementet (1).

5. Elektrisk sensor (2) ifølge et af de foregående krav,
kendetegnet ved, at bæreelementet (1) omfatter en flerhed af modtagearrangementer (6), som fortrinsvis er anbragt i en afstand fra hinanden, især i en vinkelafstand, i bæreelementets (1) omkredsretning.

6. Elektrisk sensor (2) ifølge et af de foregående krav,
kendetegnet ved, at bæreelementet (1) er fremstillet i det mindste i sektioner af plastmateriale, fortrinsvis af et elektrisk isolerende og/eller termisk ledende plastmateriale, og/eller er en sprøjtestøbt del.

7. Elektrisk sensor (2) ifølge et af de foregående krav,
kendetegnet ved, at den elektriske eller elektroniske komponent (7) er en målemodstand, f.eks. en platin-målemodstand, især en platin-målemodstand i SMD-udførelse, eller en NTC-modstand.

8. Elektrisk sensor (2) ifølge et af de foregående krav,
kendetegnet ved, at den elektriske eller elektroniske komponent (7) omfatter forbindelsesledninger (9), som er optaget i mindst én styrekanal (8) af bæreelementet (1).

9. Elektrisk sensor (2) ifølge krav 1
kendetegnet ved, at overfladen (4), der vender mod hulrummet (3), og/eller overfladen (5), der vender væk fra hulrummet (3), og/eller mindst en endeflade (11) af bæreelementet (1) er omstøbt med plastmateriale (10) i det mindste i

visse områder (10).

10. Elektrisk sensor (2) ifølge et af de foregående krav, **kendetegnet ved, at** den elektriske sensor (2) omfatter mindst en yderligere elektrisk eller elektronisk komponent (13), som fortrinsvis er et trykmåleelement til dannelse af en tryksensor.

11. Elektrisk sensor (2) ifølge krav 10, **kendetegnet ved, at** den mindst ene yderligere elektriske eller elektroniske komponent (13) er integreret periferisk eller ved endefladen i den elektriske sensor (2).

12. Medieledende ledning med et afsnit eller en afgrening, som er udformet af en elektrisk sensor (2) ifølge et af kravene 1 til 11, og/eller hvori en elektrisk sensor (2) ifølge et af kravene 1 til 11 er modtaget .

Fig. 1

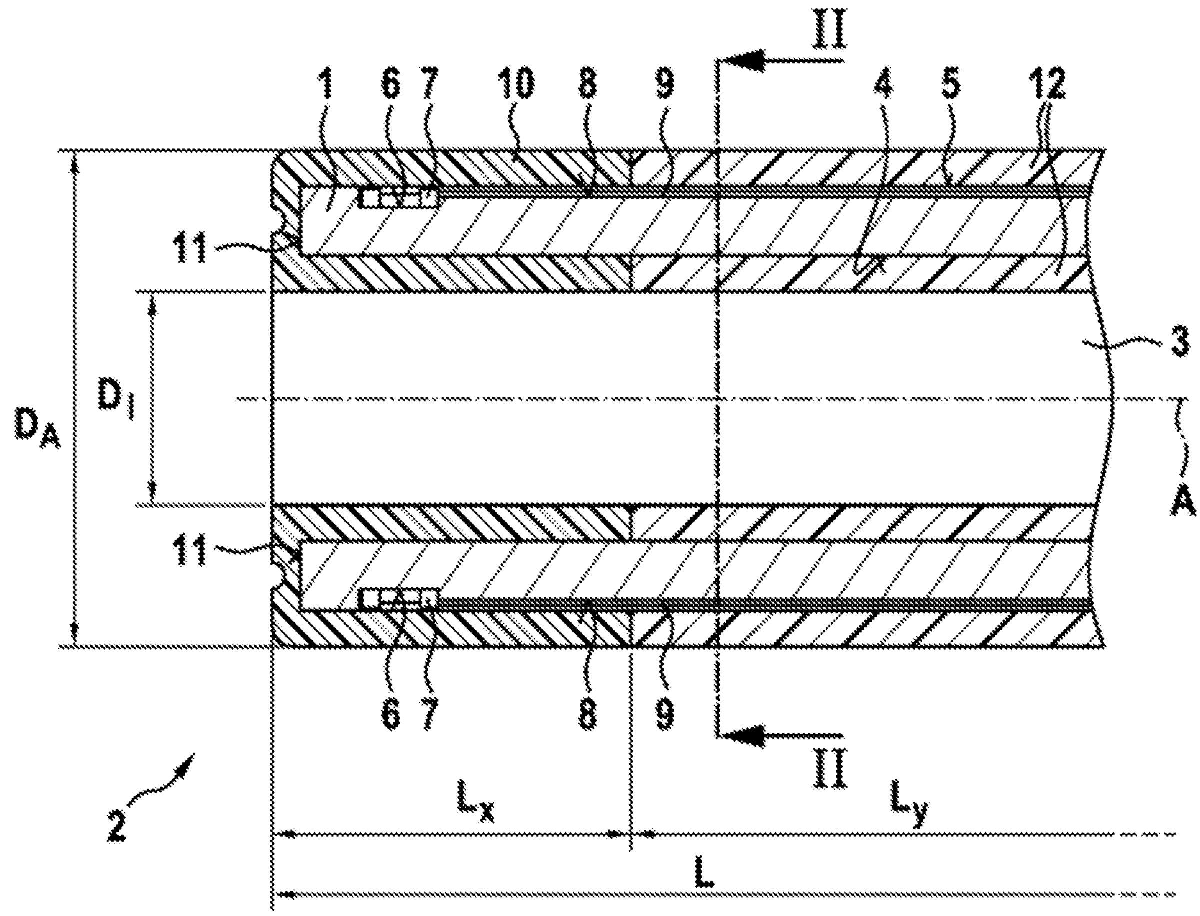

Fig. 2

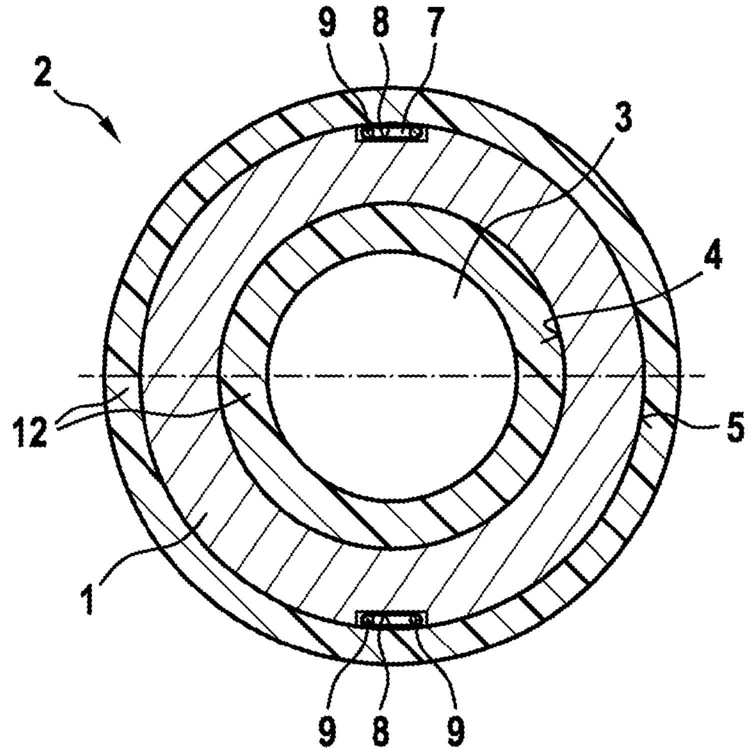

Fig. 3

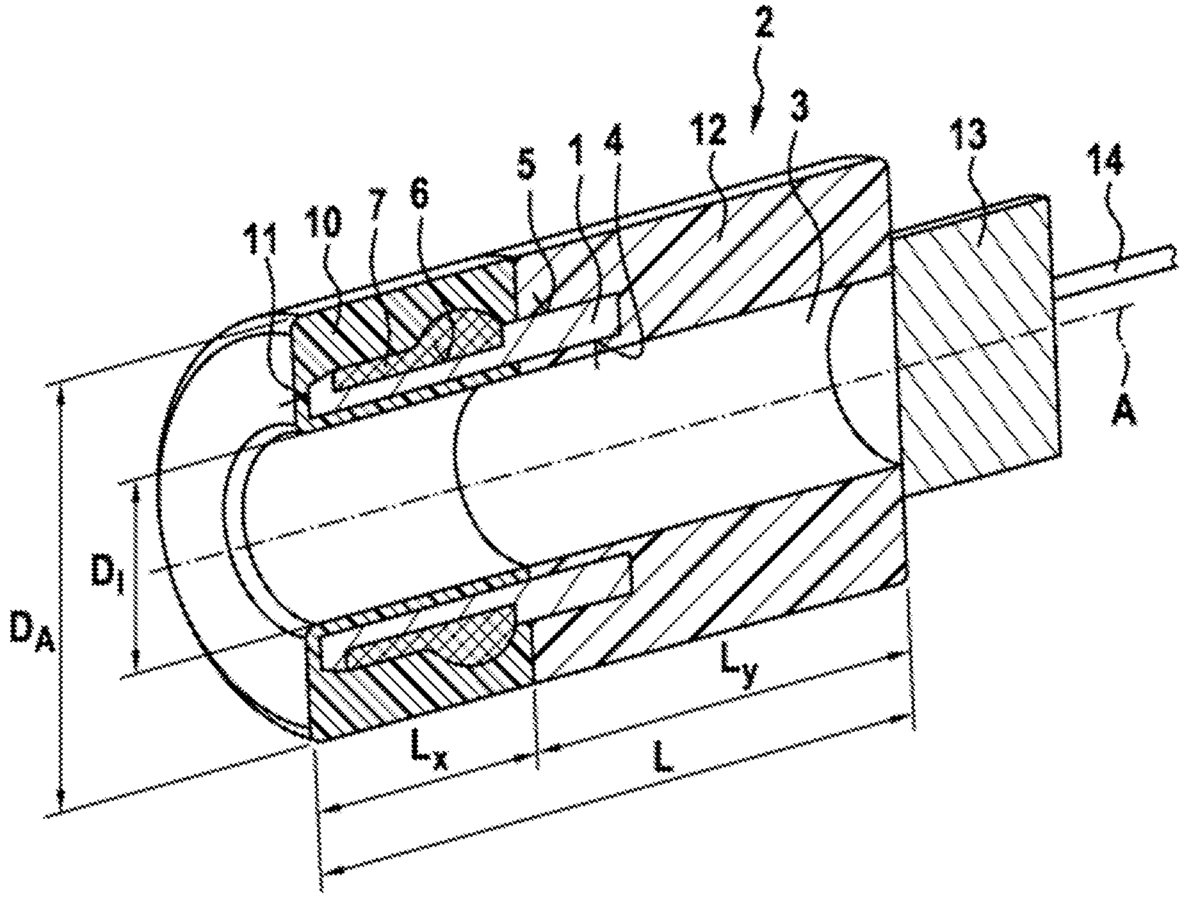

Fig. 4

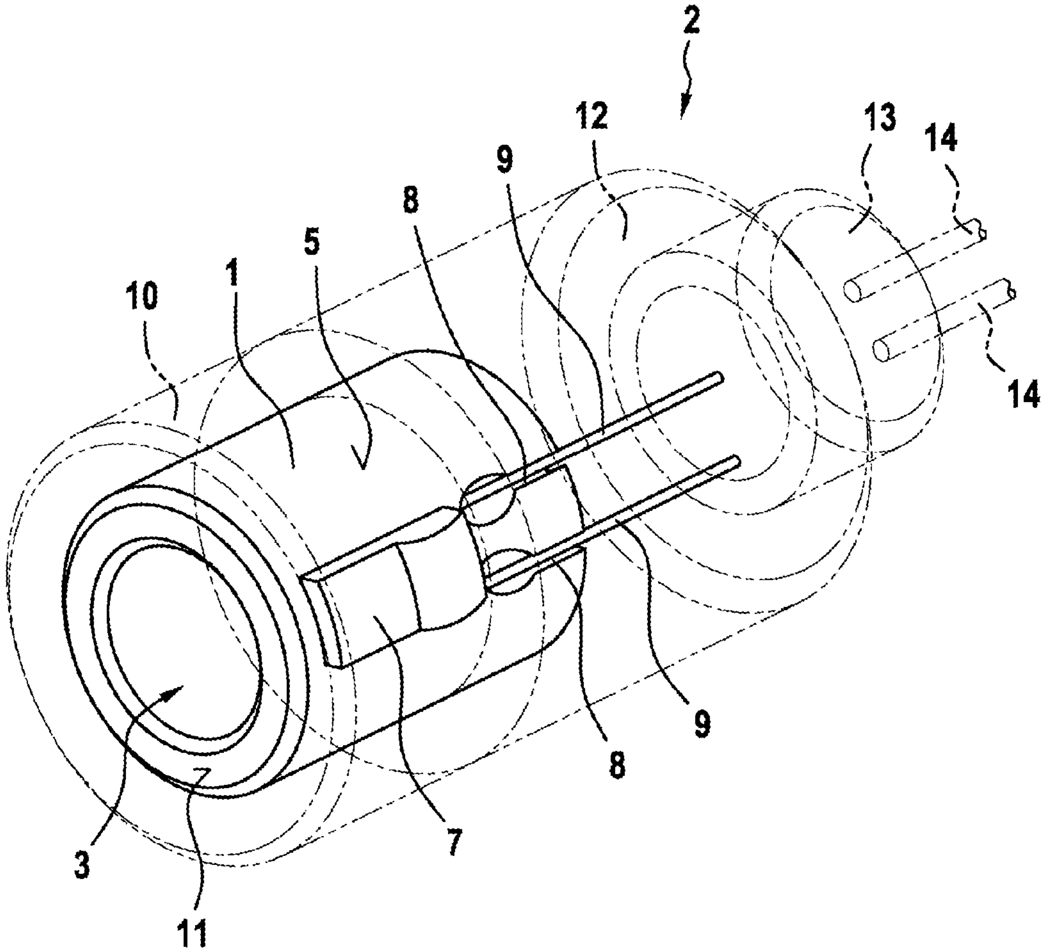

Fig. 5

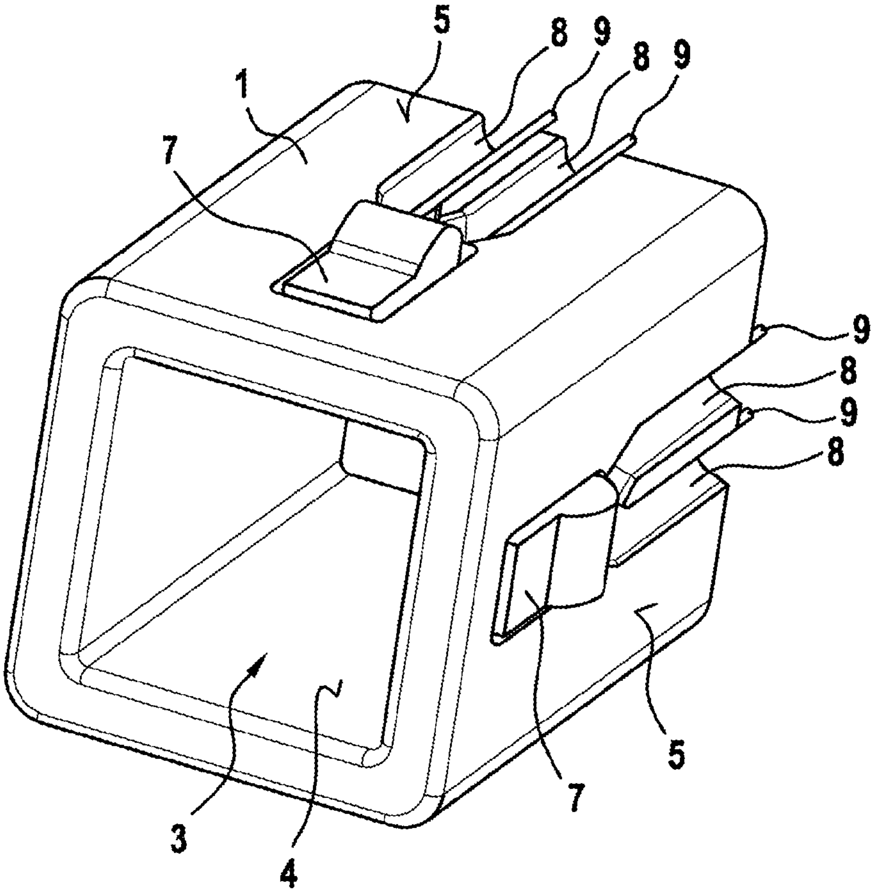

Fig. 6