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GB-A- 2 429 061

Description

The present invention relates to a fluid counter according to the preamble of Claim 1.

5

A fluid counter according to the preamble of Claim 1 is known from DE 197 29 473 A1. The terminal housing of this fluid counter has a pocket, into which a metering insert can be inserted. The pocket can be closed by means of a cover. The electronic parts
10 are also arranged on the cover of the metering insert.

Furthermore, a heat meter is known from the brochure of the measuring system "ultrakon®" ultrasonic heat meter EWZ 810 from IWK Regler und Kompensatoren GmbH, which comprises a volume
15 sensor comprising a terminal housing and an electronics housing and comprises a calculator unit with a display fastened on the volume sensor. The heat meter may be installed both in a horizontal pipeline and in a vertical pipeline. Via an optional fitting, the calculator unit can also be positioned, instead of
20 in a horizontal or vertical location, in an angled location. During the mounting of the volume transmitter, it is to be ensured that the electronics housing is always located laterally. Another arrangement results in incorrect measurements.

25

Similar arrangements are also known from the operating instructions for "static heat meter 2WR4" order number NZ 839e-000 of Siemens AG and the brochure ULTRAFLOW II E20 499 from Kamstrup A/S.

30

WO 00/23773 describes a method for determining fluid density. In this case, affixed on the outer side of the measuring tube are a plurality of ultrasonic transducers, the surface normal of which is arranged perpendicular with respect to the
35 longitudinal axis of the measuring tube. The ultrasonic signals of the respective ultrasonic transducer are reflected by a reference surface arranged inside the measuring tube directly back to the same ultrasonic transducer. The ultrasonic

transducers can be fastened in this case on the measuring tube in a 1-5 o'clock position or 7-11 o'clock position in relation to the position of a clock hand with respect to the cross section of the measuring tube. In further designs, in which the ultrasonic signal emitted by a first ultrasonic transducer is to be received by a second ultrasonic transducer, the ultrasonic transducers are positioned on the outer side of the measuring tube such that the surface normal thereof is inclined with respect to the longitudinal axis of the measuring tube.

US 2002/0124661 A1 discloses a device for measuring flows, in which the ultrasonic transducers can also be arranged laterally inclined with respect to the cross section of the measuring tube, but the surface normal thereof is also arranged extending obliquely with respect to the longitudinal axis of the measuring tube.

EP 1 096 236 A2 describes an ultrasonic flow rate meter for fluids, in which the surface normal of the respective ultrasonic transducer is arranged parallel to the longitudinal axis of the measuring tube and the ultrasonic signal leaving the respective ultrasonic transducer is reflected on a curve arranged in the measuring tube obliquely with respect to the opposite wall of the measuring tube and is also reflected further obliquely therefrom, until it reaches the second ultrasonic transducer.

GB 2 429 061 A discloses a housing for an ultrasonic flow rate meter. The ultrasonic flow rate meter has a U-shaped measuring tube housing. Furthermore, a multipart housing for electronic components is provided, the main part and lower part of which form a common cutout for accommodating the measuring tube housing and engage around the measuring tube housing in the manner of a clip. Accordingly, the housing for electronic components engages around the measuring tube housing and at the same time fixes the latter.

DE 103 27 076 B3 describes a fluid counter, which comprises a multipart measuring tube arrangement. A measuring tube, which

consists of brass, is located inside a measuring tube housing. The ultrasonic transducers are positioned on the upper side of the measuring tube housing in a corresponding cutout. The electronics circuit board and the display element are typically
5 located on the upper side of the transducer, each in a parallel arrangement with respect to the ultrasonic transducer surface. As the standardized installation plane, in a horizontal pipeline, for example for the medium water, a display having horizontally aligned display plane or a display plane rotated
10 by 90° (vertical) is provided, and in a vertical pipeline, a display having vertical display plane is provided. The horizontal installation plane with horizontal display plane is the installation position occurring most frequently in practice. Therefore, the ultrasonic transducer is seated at the highest
15 point through which fluid flows because of the most important, above-described arrangements. The disadvantage results therefrom that gas bubbles located in the fluid accumulate on the surface of the transducer and in this way cause disturbances in the measurement. Pivoting of the entire fluid counter to
20 avoid the occupation of the transducer surfaces with gas bubbles is not possible, since fluid counters have to be mounted in precisely established installation positions and moreover the readability of the display unit would no longer be ensured upon a pivot. The installation situations are therefore merely
25 subjected to very narrow limits.

A flow rate meter having a straight measuring tube housing is known from DE 94 20 760 U1. A further housing, which contains electronic components and is connected to the measuring tube
30 housing directly in the region of the position of the ultrasonic transducer is additionally provided.

The object of the present invention is to provide a fluid counter of the type in question which can be easily produced and allows
35 variable positioning of the measuring tube housing in relation to the electronics housing.

The present object is achieved in the fluid counter of the type

in question by the features of the characterizing part of Claim 1. According to the invention, the securing device has a first securing part and a second securing part, which form a cutout for accommodating the measuring tube housing and engage around the measuring tube housing in the manner of a clip. As a result, a structurally particularly simple solution for fixing is provided. Because of the conceptual separation of the two housings and the angle-offset connectability thereof via the securing device, the two housings can be positioned at a desired angle with respect to one another in a simple manner. It is accordingly possible that the surface normal N of the ultrasonic transducer is arranged with respect to the uppermost position of the fluid-filled interior of the measuring tube housing in the installation position with the plane E in such a way that the ultrasonic signal in the horizontal installation position of the fluid counter does not impinge on the deflector device from above. According to the above-mentioned idea, the ultrasonic transducer or transducers is/are no longer located at the uppermost position of the space through which medium flows, but rather lower. In this way, the gas bubbles present in the fluid are collected at a point in the interior of the counter at which they have no effect influencing the accuracy of the measurement. At the same time, however, the good readability of the fluid counter remains due to the display unit, which is still located at the highest point. Moreover, according to the invention, the second securing part is connected to the housing as a standalone part. The second securing part can then be produced on its own. Finally, the electronics housing is embodied as a standalone housing.

30

The ultrasonic signal advantageously impinges laterally. The lateral angle offset of the surface normal N of the ultrasonic transducer with respect to the perpendicular to the plane E is in an angle range between 30° - 60° , preferably 40° - 50° , particularly preferably 42° - 48° . For example, the angle may be 45° .

35

Alternatively, in the installation position the ultrasonic

signal impinges on the deflector device 11 from the underside. Preferably, the angle offset of the surface normal N of the ultrasonic transducer is in this case in an angle range between 160°-200°, preferably 160°-190°. For example, the angle may be
5 180°.

The advantage of the lateral angle offset of 30°-60° or 160°-200° is also that if the display unit is rotated by 90° out of the installation plane to read the counter laterally, the
10 transducers are also not at the highest point and therefore the air bubbles can also then only collect laterally with respect to the transducer. This would not be ensured at an angle of 90°.

In particular, the above-mentioned angle specifications of the
15 surface normal N of the ultrasonic transducer relate to the perpendicular to the display plane A of the display element or at least a securing device for an external display element.

It is ensured by the above-mentioned features that the fluid
20 counter is well readable and the determinations of a standard installation are fulfilled, but at the same time disturbances as a result of air bubbles on the upper side of the measuring tube housing can be effectively precluded.

The securing device is advantageously embodied such that the
25 measuring tube housing can be clamped tight in the securing device. This type of mechanical fixing enables complex work (for example the introduction of threaded drilled holes) on the measuring tube housing, which consists of metal in particular,
30 to be omitted. Only minor mechanical machining of the measuring tube housing (for example the introduction of receptacle pockets for temperature sensors and/or drilled passage holes for ultrasonic signals) are still necessary. The multiplicity of parts can be reduced in this way and the costs of production can
35 be significantly reduced.

The above-described type of fastening has the additional advantage that at least one functional part can be held in

position by the securing device engaging around it. The functional part is, for example a transducer, which is located in a pocket or cutout, for example on the securing part, and/or a temperature sensor. Cutouts, which are simple to implement by machining, merely have to be provided for these functional parts. The fixing is performed by the engaging around of the securing device. This engaging around of the securing device prevents the elements to be held (transducers/T sensors) from being pressed out of the position thereof by the internal pressure of the medium.

An anti-rotation device can advantageously be provided between the measuring tube housing and the securing device, for example in the form of a projection on the securing device, which engages in a corresponding cutout on the measuring tube housing, or vice versa. Upon application of a torque to the measuring tube housing, for example when screwing it into a fluid line, a displacement of the angle of the measuring tube housing with respect to the securing device and thus an incorrect position and/or damage of the interior can be avoided in this way.

In an advantageous embodiment of the fluid counter according to the invention, the first securing part is integrated in the measuring tube housing, that is to say is embodied as a one-piece component of the same. This is especially of advantage if the measuring tube housing as a whole consists of plastic.

The second securing part of the securing device is advantageously provided as a uniform part (adapter part) for accommodating first securing parts with different nominal through-flow cross sections of the measuring tubes. It is consequently possible to connect measuring tube housings with measuring tubes of a wide variety of nominal widths to the housing that contains the electronic parts just by exchanging the first securing part.

For this purpose, a plurality of optional mounting positions, for example a plurality of drilled mounting holes, are

preferably provided at different distances on the second securing part, so that, depending on which first securing part is to be mounted, one or the other mounting position can be selected.

5

In cases in which the electronics or an external display device is accommodated in a standalone housing, the second securing part may also be designed such that it fixes the external housing on a securing device on the second securing part in such a way
10 that, in the standard installation position, the external display element can be read while horizontal or tilted 90° and the transducers are positioned with the lateral angle offset in the measuring tube housing.

15 Because of the invention, the option exists of connecting the second securing part to the housing detachably, for example via snap connections or the like.

Because the respective mounting position is provided in a region
20 on the second securing part which protrudes laterally from the housing for the electronic parts, the mounting position(s) is/are accessible particularly easily for fastening the first securing part. In particular, a type of veranda-shaped projection of the second securing part can be provided on the
25 housing for the electronic parts.

At least one guide duct for a cable connection of the respective transducer and/or of a temperature sensor is advantageously provided in the housing. The guide duct ensures a predetermined
30 alignment and positioning of the relevant connecting cable and therefore easy mounting ability and reduction of mounting errors during the assembly.

The first securing part can advantageously be embodied as a
35 shell, which encloses the measuring tube housing on the underside, preferably over its length. Alternatively, however, a plurality of securing parts, for example two, can also engage around the measuring tube housing at a distance (for example on

the front side and rear side) for the fixing thereof on the second securing part in the manner of a clip.

5 If the ultrasonic transducer is also clamped during the clamping of the two housings to one another in the contact region, pressure forces occurring on the ultrasonic transducer can be absorbed in a simple manner by the housing.

10 The position moreover enables additional functional parts, for example a temperature sensor, to be fixed in a permanent position and securely on the measuring tube housing without complex machining measures, by fixing the functional part in position in the mounting location by way of the housing for the electronics components or by the enclosing part.

15 Advantageous embodiments of the present invention will be explained in greater detail hereafter on the basis of the figures of the drawing. Repeating features are only indicated once for the sake of comprehensibility. In the figures:

20 Figure 1 shows a very simplified, schematic longitudinal sectional illustration of the measuring tube housing of a first embodiment of the fluid counter;

25 Figure 2 shows a sectional illustration along line I-I of Figure 1;

30 Figure 3 shows a very simplified, schematic illustration in partial section of the first embodiment of the fluid counter according to the invention with mounted electronics housing and

Figure 4 shows an illustration in partial section of a second embodiment of the fluid counter according to the invention (without measuring tube housing).

35 Figure 1 shows a very simplified, schematic sectional illustration of a part of a first embodiment of a fluid counter 1. The fluid counter comprises a measuring tube housing 2, in

which an elongated measuring tube 3 is positioned to ensure a measurement distance. A deflector device 11, for example in the form of a mirror, is located inside the measuring tube, using which an ultrasonic signal emitted by an ultrasonic transducer 4 is reflected in the longitudinal direction with respect to the measuring tube 3 and vice versa.

A further housing (not shown for the sake of comprehensibility in Figure 1), which houses electronics elements, for example a display element, for example an LCD display or the like, is seated on the measuring tube housing 2. The plane of the display element is identified by A.

The location of the installation plane is identified with E in Figure 2. As shown in Figure 2, according to the invention, the respective ultrasonic transducer 4 is not arranged at the uppermost point in the interior of the measuring tube housing 2, but rather in contrast is located at a position which lies offset with respect to the uppermost point inclined at an angle α with respect to the perpendicular to the installation plane E. The inclination of the surface normal N of the ultrasonic transducer 4 to the perpendicular of the plane E is identified by the angle α . Gas bubbles in the fluid typically accumulate at the uppermost point in the interior of the measuring tube housing and therefore do not impair the ultrasonic propagation.

Figure 3 shows the measuring tube housing 2 together with a securing device 6 and the housing 8 for accommodating the electronics components. A display element, for example in the form of an LCD display, which is indicated by the reference sign 7, is located on the upper side of the housing 8. The display element 7 lies in the plane A (display plane).

The measuring tube housing 2 is fixed via the securing device 6 on the housing 8. The securing device 6 comprises a first securing part 10, which forms a cutout 15 and which engages around the measuring tube housing 2. Furthermore, a second securing part 13, which has a plate-like shape in the embodiment

according to Figure 3, is provided. The measuring tube housing 2 is clamped between the first securing part 10 and the second securing part 13, for example by screwing the two securing parts 10, 13 together via screws (not shown), i.e. clamping them to one another.

Alternatively, the connection of the first and second securing parts 10, 13 can also take place via a one-sided suspension by means of hooking geometries, which are adapted to one another and attached on one side, of first and second securing parts 10, 13 and opposing screw connections.

The ultrasonic transducer 4 is in this case located for example in an opening 19 on the second securing part 13, which aligns with a drilled hole in the measuring tube housing 2. In the clamped state, the ultrasonic transducer 4 is held inside the cutout because of the structure. Mechanical impairments are advantageously absorbed by the second securing part 13.

Furthermore, a temperature sensor 18 is seated in a pocket 25 on the first securing part 10. This temperature sensor 18 is also held in the pocket 25 because of the structure. To enable the first securing part 10 to be pushed on when the temperature sensor 18 is previously mounted, the pocket 25 extends parallel to the plane of the drawing up to the open end of the first securing part. The pocket 25 is adapted to the size of the temperature sensor 18 inserted into the first securing part. The remaining cavity (not shown in Figure 3) is closed again later by a filler part (also not shown in Figure 3), for example made of plastic or rubber.

A projection 21, which engages in a corresponding cutout 20 on the first securing part 10, is formed in the measuring tube housing 2, for example on the side opposite to the ultrasonic transducer 4. In this way, an anti-rotation device is ensured, for example when the fluid counter is screwed together with the power supply connection.

The second securing part 13 is connected as a standalone part to the housing 8, for example via a snap connection, clamp connection, or the like.

- 5 The plane E in Figure 3 identifies the alignment of the plane in the installation position of the fluid counter 1, which is parallel with the display plane A.

Figure 4 illustrates a second embodiment of the fluid counter
10 according to the invention, with the electronics housing 8 for the electronics components omitted. The measuring tube housing 2 has a flange 22 having individual drilled flange holes 23 for the location-predetermined mounting on the line network in this case. The flange 22 is generally provided at both ends of the
15 measuring tube housing 2.

The embodiment according to Figure 4 also has an electronics housing 8 for the electronics components, which however is not shown in Figure 4 for the sake of comprehensibility. In contrast
20 to the embodiment according to Figure 3, the first securing part 10 of the securing device 6 is an integral component of the measuring tube housing 2. The measuring tube housing can be produced, for example from plastic, in one production step.

- 25 The cutout 20 illustrated in Figure 3 and the projection 21 engaging therein are not absolutely necessary in the embodiment according to Figure 4.

LIST OF REFERENCE NUMERALS

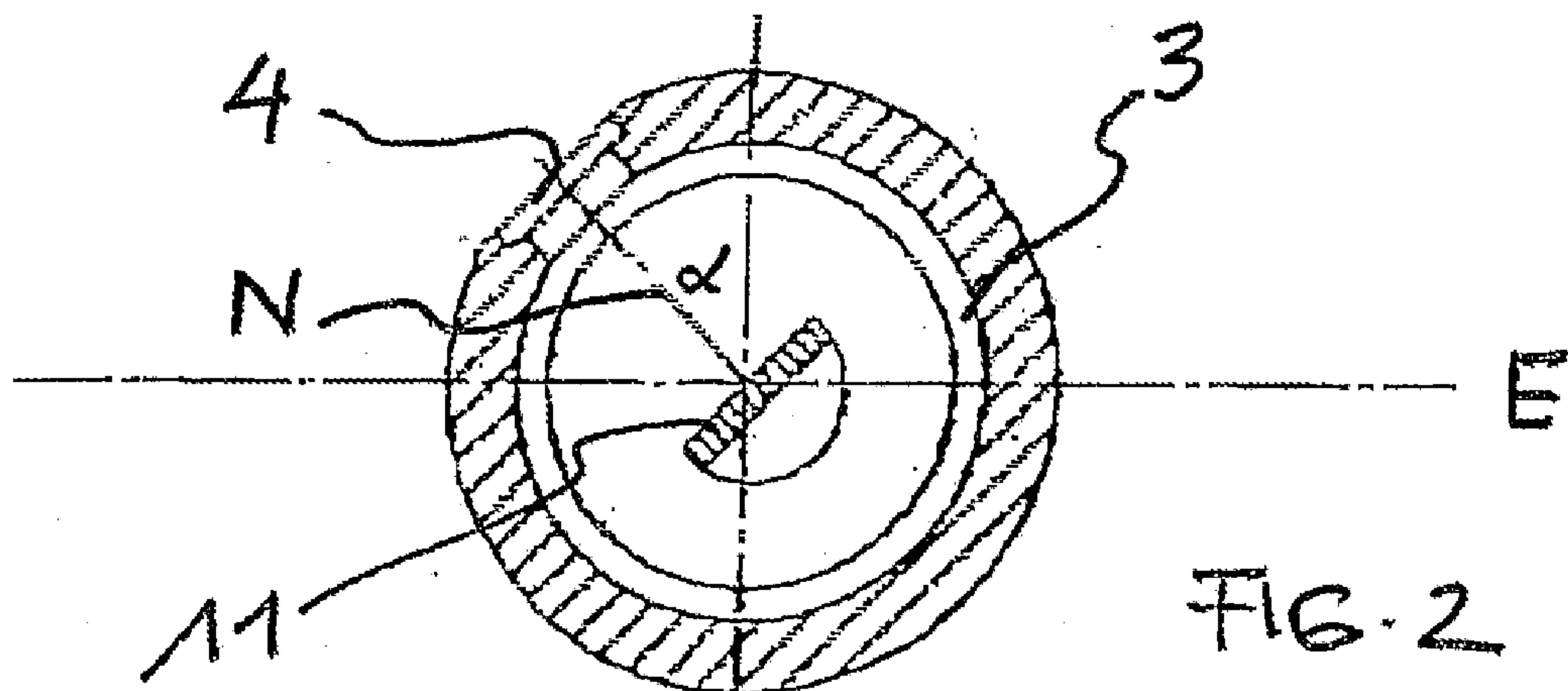
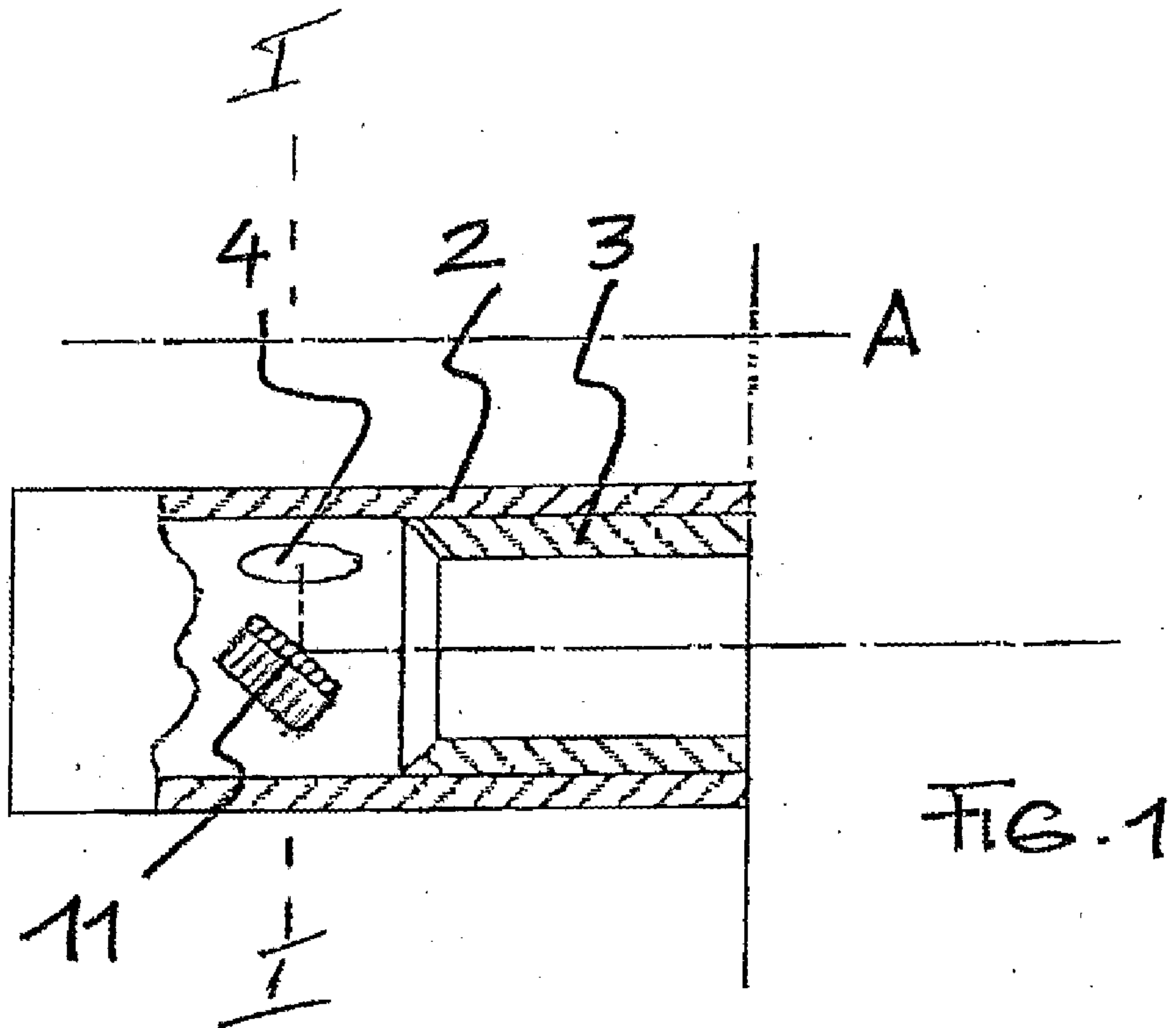
	1	fluid counter
	2	measuring tube housing
5	3	measuring tube
	4	ultrasonic transducer
	6	securing device
	7	display element
	8	electronics housing
10	10	first securing part
	11	deflector device
	13	second securing part
	15	cutout
	18	temperature sensor
15	19	opening
	20	cutout
	21	projection
	22	flange
	23	drilled flange holes
20	25	pocket

Patentkrav

1. Fluidmåler med
et målerørshus (2),
5 et i målerørshuset (2) anbragt målerør (3),
en målestrækning, der befinder sig i målerøret (3),
et ultralydstransducerarrangement af i det mindste en
ultralydstransducer (4)
til generering af et ultralydssignal
10 og/eller til konvertering af et ultralydssignal, der gennemløber
målestrækningen, til et elektrisk signal og en
omstyringsindretning til omstyring af ultralydssignalet i
målerørets (3) længderetning, hvor
der er indrettet et elektronikhus (8) til optagelsen af
15 elektronikdele, kendetegnet ved, at
elektronikhuset (8) er udformet som selvstændigt hus,
målerørshuset (2) er anbragt i en holdeindretning (6),
holdeindretningen (6) kan monteres på elektronikhuset (8),
holdeindretningen (6) har en første holdedel (10) og en anden
20 holdedel (13), hvilke holdedele danner en udtagning (15) til
optagelse af målerørshuset (2) og griber omkring målerørshuset
(2) på samme måde som en bøjle,
ultralydstransduceren (4)
befinder sig i en udsparring (19) på den
25 anden holdedel (13), hvilken udsparring flugter med en boring i
målerørshuset (2), og
den anden holdedel (13) som selvstændig del er forbundet med
elektronikhuset (8).
- 30 2. Fluidmåler ifølge krav 1,
kendetegnet ved, at
målerørshuset (2) kan fastklemmes i holdeindretningen (6).
3. Fluidmåler ifølge krav 1,
35 kendetegnet ved, at
i det mindste en funktionsdel, især en transducer (4) og/eller
en temperaturføler (18), holdes i position af holdeindretningen
(6).

4. Fluidmåler ifølge i det mindste et af kravene 1-3,
kendetegnet ved, at
der er indrettet en drejesikring mellem målerørshuset (2) og
5 holdeindretningen
(6).
5. Fluidmåler ifølge i det mindste et af kravene 1-4,
kendetegnet ved, at
10 den første holdedel (10) er integreret i målerørshuset (2).
6. Fluidmåler ifølge i det mindste et af kravene 1-5,
kendetegnet ved, at
den anden holdedel (13) er indrettet som fælles del til optagelse
15 af første holdedele (10) med forskellige nominelle
gennemstrømningstværsnit.
7. Fluidmåler ifølge krav 6,
kendetegnet ved, at
20 der på den anden holdedel (13) er indrettet flere valgbare
montagepositioner til fastgørelse af den første holdedel (10).
8. Fluidmåler ifølge i det mindste et af kravene 1-7,
kendetegnet ved, at
25 den anden holdedel (13) er løsbart forbundet med elektronikhuset
(8), fortrinsvis via en snapforbindelse eller klemmeforbindelse.
9. Fluidmåler ifølge et af kravene 7 eller 8.
kendetegnet ved, at
30 montagepositionen foreligger på et fremspring på den anden
holdedel (13), hvilket fremspring rager sideværts ud over
elektronikhuset (8).
10. Fluidmåler ifølge i det mindste et af kravene 1-9,
35 kendetegnet ved, at
der i elektronikhuset (8) er indrettet i det mindste en
føringskanal for kabelforbindelser.

11. Fluidmåler ifølge i det mindste et af de foregående krav 1-10,
kendetegnet ved, at
den første holdedel (10) er udformet som skål.



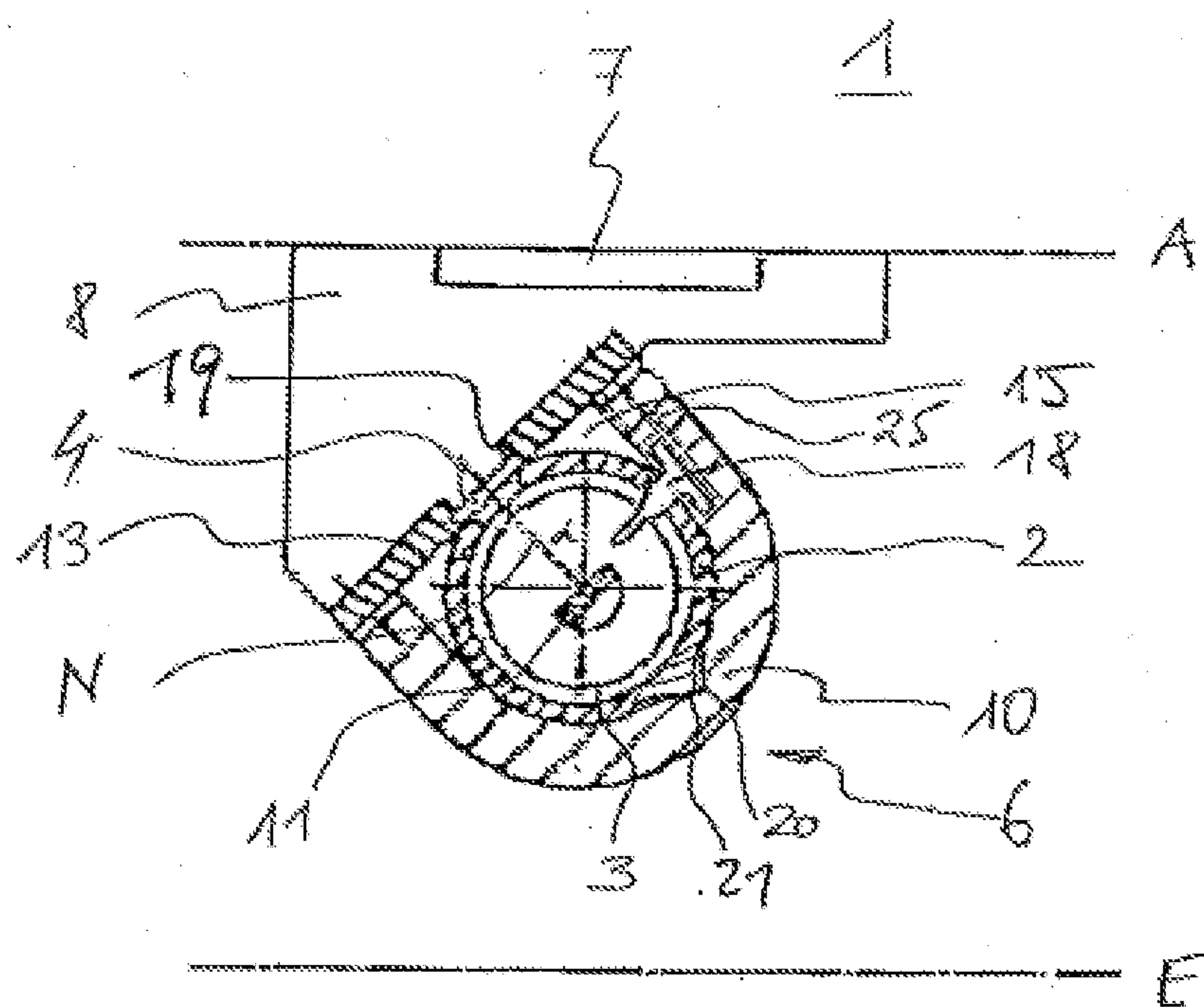


Fig. 3

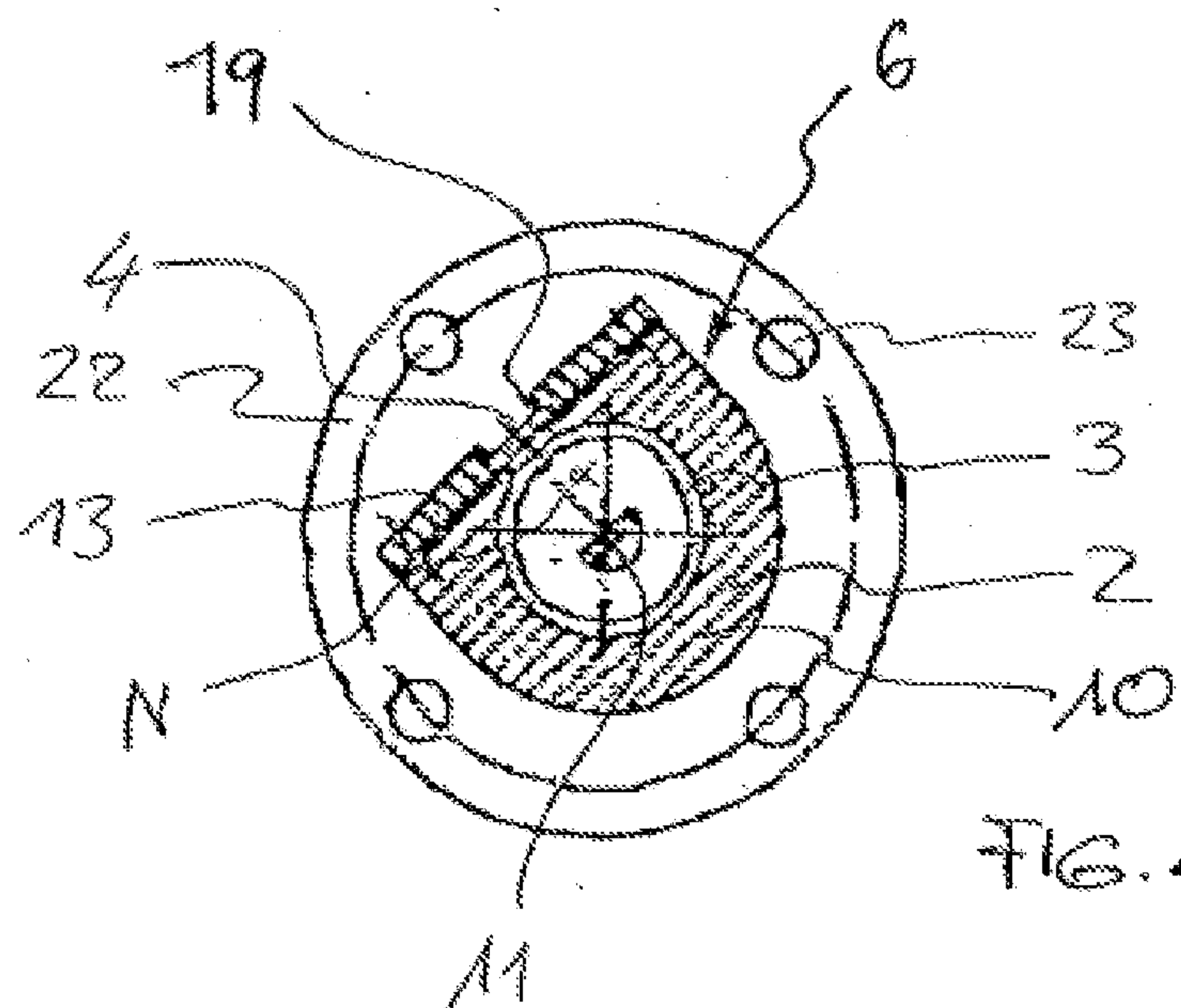


FIG. 4