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(54) **DEVICE FOR MEASURING COMPOUNDS IN BODY LIQUIDS**

VORRICHTUNG ZUR MESSUNG VON VERBINDUNGEN IN KÖRPERFLÜSSIGKEITEN

DISPOSITIF POUR MESURER DES COMPOSES DANS DES FLUIDES CORPORELS

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Description

Technical field

[0001] The present invention relates to a device for measuring the presence of substances in body liquids, particularly in blood serum, such as glucose.

Background of the invention

[0002] At many illness conditions it is of importance to be able to show the presence or absence of a certain substance/compound in a body liquid in order to be able to provide an accurate medication.

[0003] Such an illness is diabetes where modern insulin preparations require measurement of the blood sugar concentration, glucose concentration, in order to provide for an accurate dosage of insulin in connection with e.g., a meal, before going to bed, physical activity etc., the so called personal cheque of blood glucose.

[0004] As measurement takes place on the same place every time there is often used a relatively stationary device for the determination of e.g., glucose concentration, whereby one using a mini cyvette collects a blood drip, and introduces the cyvette in a device wherein the determination is made by analysing the product. At certain determinations a chemical reaction takes place in the cyvette whereupon the reaction product is determined.

[0005] However, there is often a demand for carrying out a determination under other different situations such as when out travelling, at the office, i.e., at different places during the day, whereby one needs a portable device for such determination.

[0006] EP 0 738 666 (=US 5,632,410) describes such a device comprising a rotating magazine containing a number of test electrodes/mini cyvettes, which rotate into position one after the other as need occurs. When measurement is to take place a test electrode is moved forward and out off the device, absorbency of a sample takes place, whereupon the test electrode is reintroduced into the device and measurement takes place, whereby the result is presented digitally on an electronic screen. After finished measurement the test electrode is thrown away out off the device. A magazine contains a number of test electrodes/mini cyvettes sufficient for the need during some days.

[0007] A similar device is also known from US 5,510,266 whereby there is a difference in the mechanical feeding of the magazine.

[0008] Both devices show a drawback in that the test electrode/mini cyvette is thrown away after reading, which means a great risk for spreading of infections to the surroundings of body liquid worn diseases such as HIV. The problem with the reminding product is that it can land up anywhere as one throws out the test electrode.

[0009] One object of the present invention is thus to obtain a device which minimises this risk and reduces the amount of rest waste and packing.

Summary of the present invention

[0010] It has now turned out possible to be able to solve this problem by means of the present invention which aims at returning the read test electrode/mini cyvette into the magazine and store it therein.

Detailed description of the present invention

[0011] The present invention relates to device for quantitative and/or qualitative determination of the presence/absence of a substance in a body liquid comprising a rotatably arranged magazine containing a number of test electrodes intended to be brought into contact with a body liquid to be determined, an arm arranged to influence a test electrode to a relative movement relative to said magazine and is characterized in that the arm comprises contact members arranged to releasably be fixed to said test electrode and arranged to return said test electrode to the magazine after a finished testing.

[0012] According to a further aspect of the invention it further comprises a magazine containing test electrodes placed in individual spaces for the determination of absence/presence of a substance in a body liquid and which is characterized in that the spaces receiving the test electrodes are inwardly tapering in such a way that an arm with its contact member introduced in such a space is brought to releasably grip and keep the test electrode so that this is released from said arm when being returned into said space.

[0013] According to a further aspect of the invention it comprises an arm with a contact sheet metal to be brought into contact with a test electrode whereby the arm is arranged to grip said test electrode, which preferably takes place as the arm is provided with flexible gripping claws placed on each sides of said contact sheet metals at its forward end and arranged to be able to be compressed around a contact end of a test electrode to grip the test electrode.

[0014] According to a preferred embodiment of the magazine it contains at least six spaces for test electrodes, preferably at least eight spaces for test electrodes.

[0015] By means of the present invention there is thus obtained that a test electrode/mini cyvette is returned and stored in the magazine and this may later be deposited in a safe way.

[0016] In the present invention there is used test electrodes or sensors of mini cyvette type having a generally flat rectangular form with a front, test end and a rear contact end. The sensor contains biosensing or reagent material reacting with blood sugar (glucose) or other body liquid. The test end is hereby intended to be placed in contact with the liquid to be tested, such as blood, and comprises a capillary extending from the test end into the sensor to the reagent material. The test end is placed

against a blood droplet having been pressed out of a persons finger after a prick, or another body liquid, whereby the blood droplet or the liquid is sucked into the sensor by means of capillary force so that the sensor serves as a container for the liquid to be tested. The liquid is then allowed to react chemically with the reagent material in the sensor whereby an electrical signal relative to the presence of the substance to be determined, e.g., blood sugar, is obtained and is transferred to the contact member being in contact with a calculating unit providing a digital signal being read on a screen. An alternative is to read the signal optically which, however, is more difficult to meet a pure quantitative value. Other compounds, which can be determined, are proteins in urine, signalling compounds in serum, specific antibodies in serum, specific DNA-hybridisation using fluorescence determination.

[0017] To connect the electrical signals being produced at the contact end to the monitoring part, the calculation unit, the sensor shall be introduced in a sensor holder before the test end is brought into contact with the liquid to be tested. The sensor holder contains a corresponding adapted contact member, which is connected to the contact end when the sensor is connected to the holder. Accordingly, the holder serves as a middle part between sensor and monitoring unit. The monitoring unit accumulates the values and/or analyses the result of the test performed and provides suitably a signal to a screen showing the result in digital form so that an accurate medication then can take place based upon the value obtained.

[0018] The present invention will now be described in closer detail with reference to the accompanying drawing which shows preferred embodiments, however, without being restricted to these. In the drawing

FIG. 1 shows a preferred embodiment of the present invention in a perspective view,
FIG. 2 shows the embodiment of FIG. 1 with an eliminated front end,
FIG. 3 shows the embodiment of FIG. 1 with eliminated front end and magazine,
FIG. 4 shows the front end of the embodiment of FIG. 1 in a perspective view from behind,
FIG. 5 shows a cross-section of the embodiment of FIG. 1,
FIG. 6 shows a lateral view of the embodiment of FIG. 1 rotated 90o around the longitudinal axis visavi FIG. 5,
FIG. 7 shows a cross-section of the embodiment of FIG. 1 rotated 90o around the longitudinal axis visavi FIG. 6,
FIG. 8 shows a lateral view of the embodiment of FIG. 1 rotated 90o around the longitudinal axis visavi FIG. 7,
FIG. 9 shows a cross-section along the line IX-IX in FIG. 8,
FIG. 10 shows a cross-section along the line X-X in FIG. 8
FIG. 11 shows an end view of the embodiment of FIG. 1,
FIG. 12 shows a detail of the embodiment of FIG. 1 comprising an arm with gripping claws,
FIG. 13 shows detail of FIG. 12,
FIG. 14 shows a detail of FIG. 13 with an isolated test electrode,
FIG. 15 shows a detail of the embodiment of FIG. 1 with a magazine without any house, and
FIG. 16 shows a detail of FIG. 15.

[0019] The device, which generally takes the shape of a larger pen, such as 10 x 70 to 30 x 140 mm, shows a substantially cylindrical house 31 having a removable front end 1. In this front end there is a through-going, rectangular hole 9 adapted to receive a test electrode 4. The hole 9 can hereby be arranged radially or perpendicular to the radius of the front part 1. Within the device a shaft 2 runs, preferably centrally, which is arranged to receive a magazine 3 comprising spaces for receiving several test electrodes/sensors/mini cyvettes 4. The magazine 3 is cylindrically shaped having a centrally arranged hole for receiving said shaft 2. The magazine 3 is held in place onto the shaft 2 by the front end 1 which in turn is held in place by a spring 5 and by the central shaft 2 running through the centre of the front end 1. The spring 5 is partly attached to a bottom plate 8, partly attached to the cylindrical house 31 via a loop 26 arranged herein, and a fastening point 27 arranged in the cylindrical house. On the cylindrical house 31 there is a centrally arranged slot 32 having a forwardly directed hook 12 and a protruding knob 16 arranged on a resilient tongue 28 being an integrated part of the house 31. Further, in the house 31, there is an eccentrically provided shaft or arm 13 containing contact sheet metal shield 14 to be brought into contact with a rear end of a test electrode 4. The arm 13 contains a line system, as well, for transmitting information from a test electrode to an electronic unit/processing unit 34 for calculating a reaction or a determination obtained in the test electrode 4, the result of which is shown on a screen 33 at the rear end of the house 31.

[0020] When a measurement is to be carried out the front end is rotated part of a revolution corresponding to the number of test electrodes, if eight test electrodes are present in the magazine, i.e., 1/8 of a revolution, whereby the magazine 3 is driven by means of hooks 6 arranged on the outside of the magazine 3. The hooks 6 are arranged to be received by corresponding hooks 7 arranged to a hook provided ring 17 at the inside of the front end 1, whereby the magazine is driven. A bottom plate 8 provided with hooks 18 is arranged behind the magazine 3, which bottom plate also is a support surface to the spring 5. The bottom plate 8 is secured against rotation with regard to the central shaft 2, whereby, at the rotation of the magazine 3, hooks 19 present in the rear edge of the magazine snap over the hooks 18 inter alia to indication a stepping. The bottom plate 8 is also

provided with a through-going hole 11 being congruent with the through-going hole 9 of the front end. After such a rotation the front end 1 is returned to its original position, whereby its inside hooks 7 snap over the hooks 6.

[0021] A non-used test electrode 4 has now been placed in the magazine in its cavity 15 and in front of said hole 9 of the front end 1. By pushing the front end 1 backwards this will become hooked onto a hook 12. Hereby the magazine 3 is brought against an arm 13 containing contact sheet metal 14 to be brought into contact with the rear contact end of the test electrode. The arm 13 simultaneously penetrates a protecting foil on the test electrode and its electrode cavity. The inlet of the cavity 15 is tapering/cone-shaped, whereby flexible gripping claws 10 arranged to the arm 13 are arranged to be compressed and grip and fix the test electrode 4 and whereby contact metal sheets 14 arranged in the test electrode receiving unit 20 of the front end of the arm 13, are brought into contact with the contact end present in the test electrode. In this position the test electrode is in a testing position per se, but does not extend out of the device. The front end 1 is subsequently moved rearward above the fastening hook 12, whereby the front point of the test electrode 4 is guided out of the hole 9. The test electrode can now receive a test droplet.

[0022] When the test has been finished, which takes less than a minute, one pushes on the knob 16 arranged to the hooking hook 12 of the front part 1, whereby the front end 1 is released and moves forward to its original position and whereby simultaneously the test electrode is moved into the magazine by means of the arm 13. The arm 13 with its contact sheet metals 14 is hereby released from the test electrode as the gripping claws 10 due to material flexibility are released from the test electrode.

[0023] The device may suitably in its rear end, in the case it is intended for testing of blood, receive a lancet device 21 comprising a spring loaded lancet 22, a tension spring 23 and a hooking member 24 with a release member 25. In order to penetrate the skin the lancet 22 is moved backwards and is tighten to the hooking member 24, whereby the rear end of the device is brought into contact with a finger pad, the release member 25 is actuated whereby the lancet is moved forward by means of the spring force and penetrates the pad to such a depth that blood penetrates. The device is then turned around so that the point of the test electrode can suck blood from the pad.

[0024] Further, the magazine may contain a drying agent in connection with the respective space for a test electrode, in those cases the test reagent is moisture sensitive and/or one utilises the meter in humid environments. The drying agent may then be present on a strip in the space or be in the form of a grain in side space communicating with the space.

References numbers

[0025]

1	Front end
2	Central axis
3	Magazine
4	Test electrode
5	Spring
6	Hook
7	Hook
8	Bottom plate
9	Hole
10	Gripping claw
11	Through-going hole
12	Hook
13	Arm
14	Contact sheet metal
15	Cavity
16	Knob
17	Hook provided ring
18	Hook
19	Hook
20	Test electrode receiving unit
21	Lancet device
22	Lancet
23	Tension spring
24	Hooking member
25	Release member
26	Loop
27	Fastening point
28	Flexible tongue
29	
30	
31	Cylindrical house
32	Slot
33	Screen
34	Electronic unit

Claims

1. Device for quantitative and/or qualitative determination of the presence/absence of a substance in a body liquid comprising a rotatably arranged magazine containing a number of test electrodes intended to be brought into contact with a body liquid to be determined, an arm arranged to influence a test electrode to a relative movement relative to said magazine,
characterized in
that the arm (13) comprises contact sheet metals (14) arranged to releasably be fixed to said test electrode (4) and is arranged to return said test electrode (4) to the magazine (3) after a finished testing.

2. Device according to claim 1,
characterized in
that the arm (13) with its contact sheet metals (14) is arranged to be brought into contact with a test electrode (4), whereby the arm (13) is arranged to grip said test electrode (4).

3. Device according to claim 2,
characterized in
that the arm (13) at its front end is provided with flexible gripping claws (10) placed on either side of said contact sheet metals (14) and arranged to be able to be compressed around a contact end of a test electrode (4) to grip the test electrode (4).

4. Device according to claims 1-3,
characterized in
that the arm (13) comprises a front end provided with a test electrode receiving unit (20) containing contact sheet metals (14) and flexible gripping claws (10) placed on each sides of said contact members at its forward end and arranged to be able to be compressed around a contact end of a test electrode to grip and retain a test electrode (4).

5. Device according to claims 1-4 **characterized in that** the magazine contains test electrodes placed in individual spaces for the determination of absence/presence of a substance in a body liquid, whereby the spaces (15) receiving the test electrodes (4) are inwardly tapering in such a way that the arm (13) with its contact sheet metals (14) introduced in such a space is brought to releasably grip and keep the test electrode (4) so that this is released from said arm (13) when being returned into said space.

6. Device according to claim 5,
characterized in
that the magazine (3) contains at least six spaces (15) for test electrodes (4).

7. Device according to claim 6,
characterized in
that the magazine (3) contains at least eight spaces (15) for test electrodes (4).

Patentansprüche

1. Vorrichtung zur quantitativen und/oder qualitativen Bestimmung des Vorhandenseins / der Abwesenheit einer Substanz in einer Körperflüssigkeit, umfassend ein drehbar angeordnetes Magazin, enthaltend eine Anzahl an Testelektroden, welche dafür vorgesehen sind, in Kontakt mit einer zu bestimmenden Körperflüssigkeit gebracht zu werden, einen Arm, der so angeordnet ist, dass er eine Testelektrode zu einer relativen Bewegung in Bezug auf das Magazin beeinflusst, **dadurch gekennzeichnet, dass** der Arm (13) Kontaktbleche (14) umfasst, die so angeordnet sind, dass sie lösbar an der Testelektrode (4) befestigt sind und so angeordnet ist, dass er nach einem beendeten Testen die Testelektrode (4) in das Magazin (3) zurückführt.

2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** der Arm (13) mit seinen Kontaktblechen (14) so angeordnet ist, dass er in Kontakt mit einer Testelektrode (4) gebracht wird, wobei der Arm (13) so angeordnet ist, dass er die Testelektrode (4) greift.

3. Vorrichtung nach Anspruch 2, **dadurch gekennzeichnet, dass** der Arm (13) an seinem vorderen Ende mit flexiblen Greifklammern (10) ausgerüstet ist, die auf jeder Seite der Kontaktbleche (14) angeordnet sind und so ausgelegt sind, dass sie um ein Kontaktende einer Testelektrode (4) herum zusammengedrückt werden können, um die Testelektrode (4) zu greifen.

4. Vorrichtung nach den Ansprüchen 1 bis 3, **dadurch gekennzeichnet, dass** der Arm (13) ein vorderes Ende umfasst, das mit einer Testelektroden-Aufnahmeeinheit (20) ausgerüstet ist, welche Kontaktbleche (14) und an ihrem vorderen Ende auf jeder Seite der Kontaktelemente angeordnete, flexible Greifklammern (10) enthält, die so angeordnet sind, dass sie um ein Kontaktende einer Testelektrode herum zusammengedrückt werden können, um eine Testelektrode (4) zu greifen und zu halten.

5. Vorrichtung nach den Ansprüchen 1 bis 4, **dadurch gekennzeichnet, dass** das Magazin in einzelnen Räumen platzierte Testelektroden zum Bestimmen der Abwesenheit / des Vorhandenseins einer Substanz in einer Körperflüssigkeit enthält, wobei die die Testelektroden (4) aufnehmenden Räume (15) so nach innen abgeschrägt sind, dass der Arm (13) mit seinen Kontaktblechen (14), wenn er in einen solchen Raum eingeführt wird, dazu gebracht wird, die Testelektrode (4) lösbar zu greifen und zu halten, so dass diese von dem Arm (13) gelöst wird, wenn sie in diesen Raum zurückgeführt wird.

6. Vorrichtung nach Anspruch 5, **dadurch gekennzeichnet, dass** das Magazin (3) wenigstens sechs Räume (15) für Testelektroden (4) aufweist.

7. Vorrichtung nach Anspruch 6, **dadurch gekennzeichnet, dass** das Magazin (3) wenigstens acht Räume (15) für Testelektroden (4) aufweist.

Revendications

1. Dispositif de détermination quantitative et/ou qualitative de la présence/de l'absence d'une substance dans un fluide corporel, comprenant un magasin à montage rotatif qui renferme un certain nombre d'électrodes de test conçues pour être mises en contact avec un fluide corporel devant être déterminé, et un bras agencé pour influencer une électrode de

test dans le sens d'un mouvement relatif vis-à-vis dudit magasin, **caractérisé par le fait que** le bras (13) comporte des tôles métalliques de contact (14) conçues pour être fixées à ladite électrode de test (4), de manière libérable, et est agencé pour renvoyer ladite électrode de test (4) vers le magasin (3) après l'achèvement d'un test.

2. Dispositif selon la revendication 1, **caractérisé par le fait que** le bras (13) est conçu pour être mis en contact avec une électrode de test (4) par ses tôles métalliques de contact (14), ledit bras (13) étant agencé en vue de saisir ladite électrode de test (4).

3. Dispositif selon la revendication 2, **caractérisé par le fait que** le bras (13) est pourvu, à son extrémité frontale, de griffes flexibles de préhension (10) qui sont placées sur chacun des côtés desdites tôles métalliques de contact (14) et sont conçues avec aptitude à la compression, autour d'une extrémité de contact d'une électrode de test (4), de manière à saisir ladite électrode de test (4).

4. Dispositif selon les revendications 1-3, **caractérisé par le fait que** le bras (13) offre une extrémité frontale munie d'une unité (20) de réception d'électrodes de test, comprenant des tôles métalliques de contact (14) et des griffes flexibles de préhension (10) qui sont placées de chaque côté desdites pièces de contact, à leur extrémité antérieure, et sont conçues avec aptitude à la compression autour d'une extrémité de contact d'une électrode de test, en vue de saisir et de retenir une électrode de test (4).

5. Dispositif selon les revendications 1-4, **caractérisé par le fait que** le magasin renferme des électrodes de test logées dans des espaces individuels en vue de déterminer l'absence/la présence d'une substance dans un fluide corporel, sachant que lesdits espaces (15), recevant lesdites électrodes de test (4), se rétrécissent vers l'intérieur de telle manière que le bras (13), introduit dans un espace de ce type par ses tôles métalliques de contact (14), soit amené à saisir et retenir amoviblement l'électrode de test (4) de façon que cette dernière soit dissociée d'avec ledit bras (13) lorsqu'elle est renvoyée dans ledit espace.

6. Dispositif selon la revendication 5, **caractérisé par le fait que** le magasin (3) renferme au moins six espaces (15) dévolus à des électrodes de test (4).

7. Dispositif selon la revendication 6, **caractérisé par le fait que** le magasin (3) renferme au moins huit espaces (15) dévolus à des électrodes de test (4).

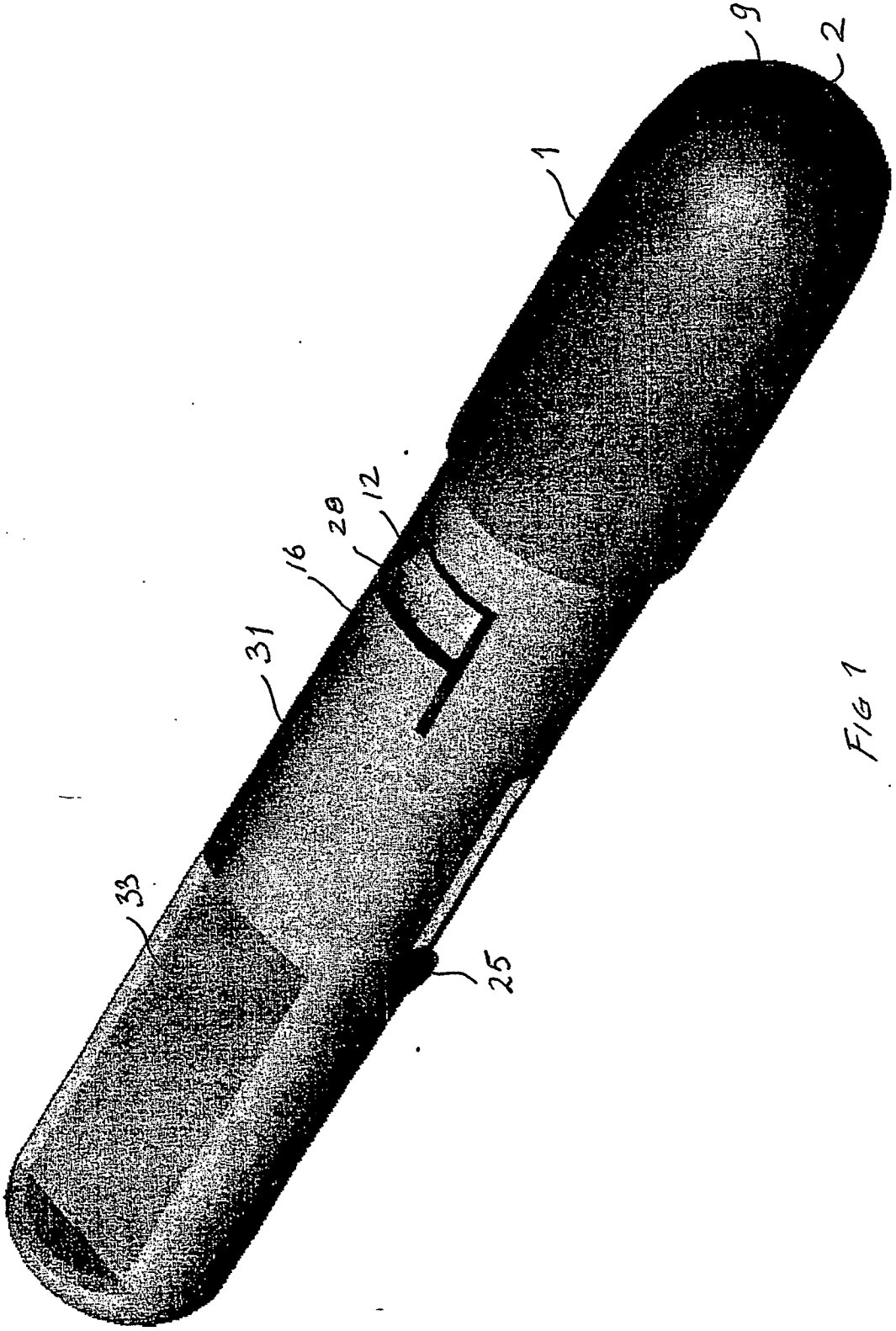

FIG 1

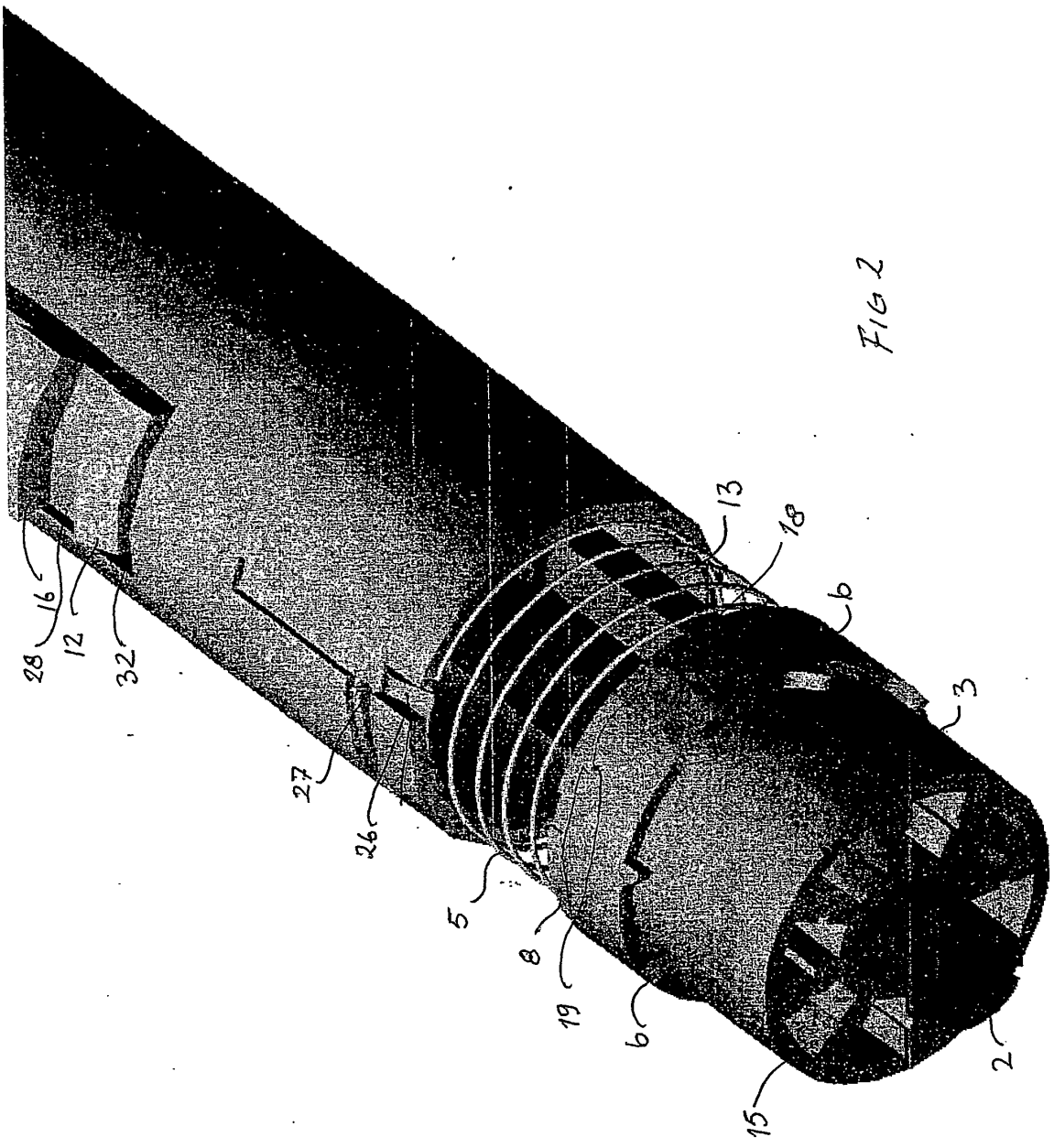

FIG 2

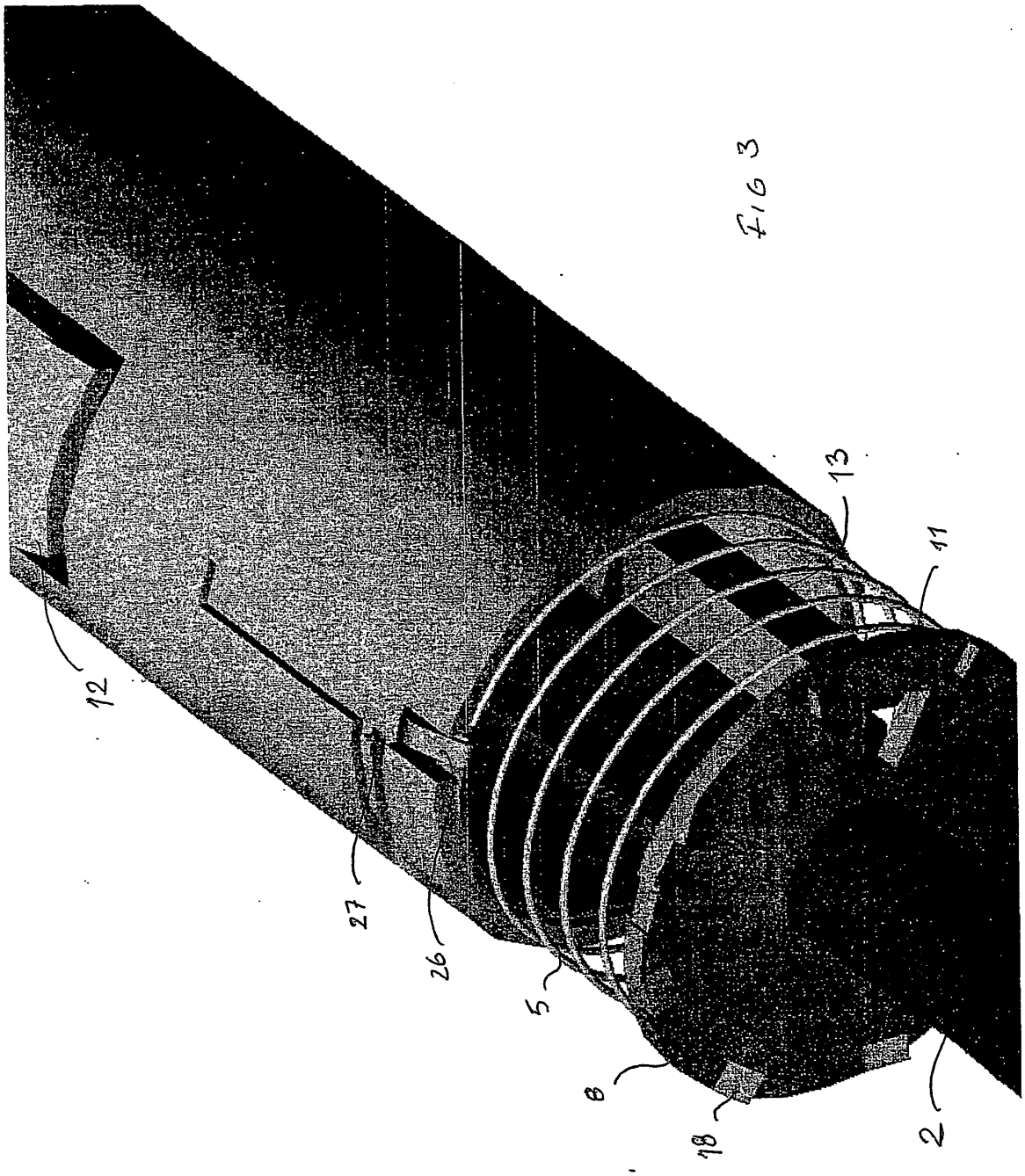

Fig 3

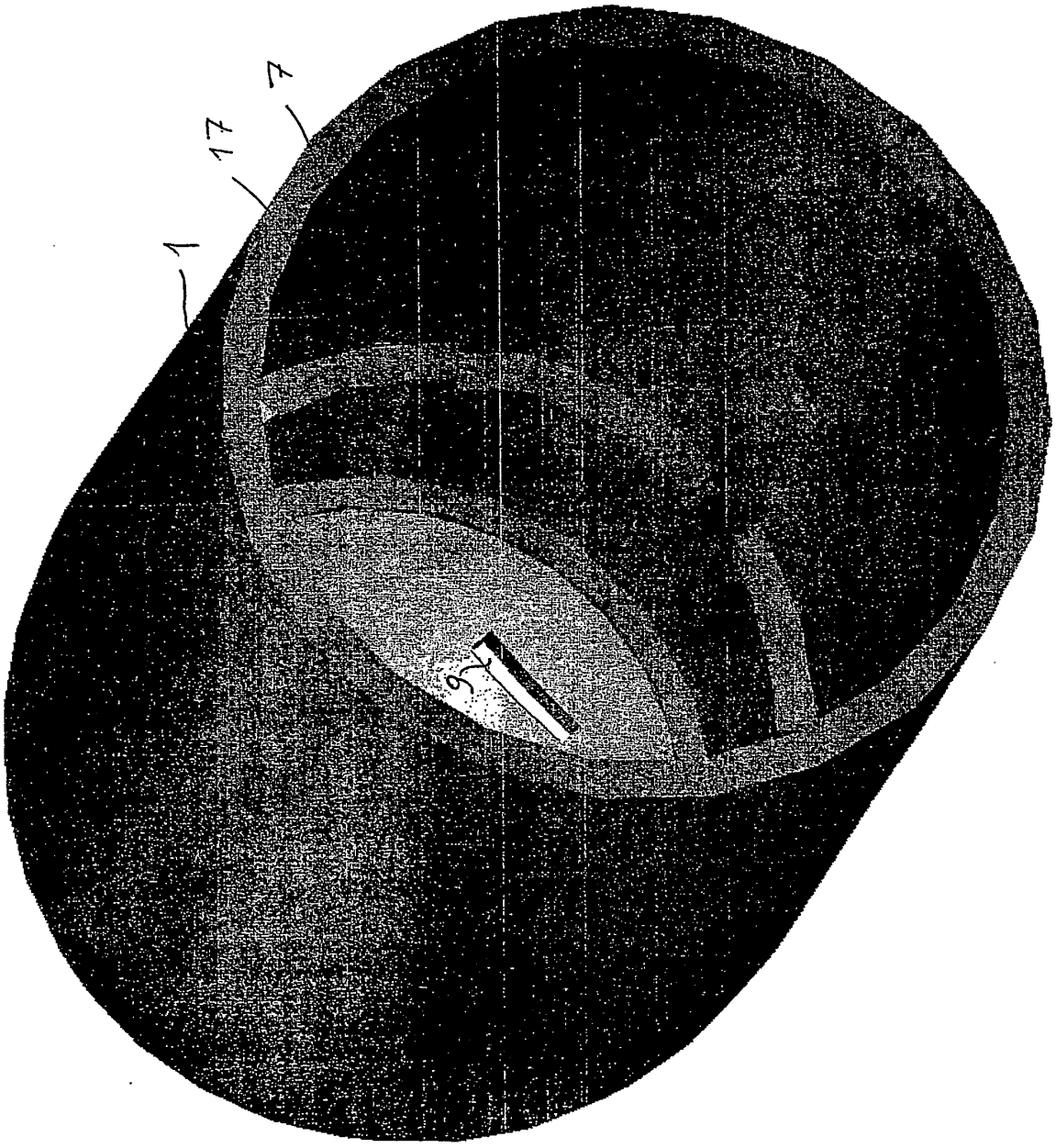

FIG 4

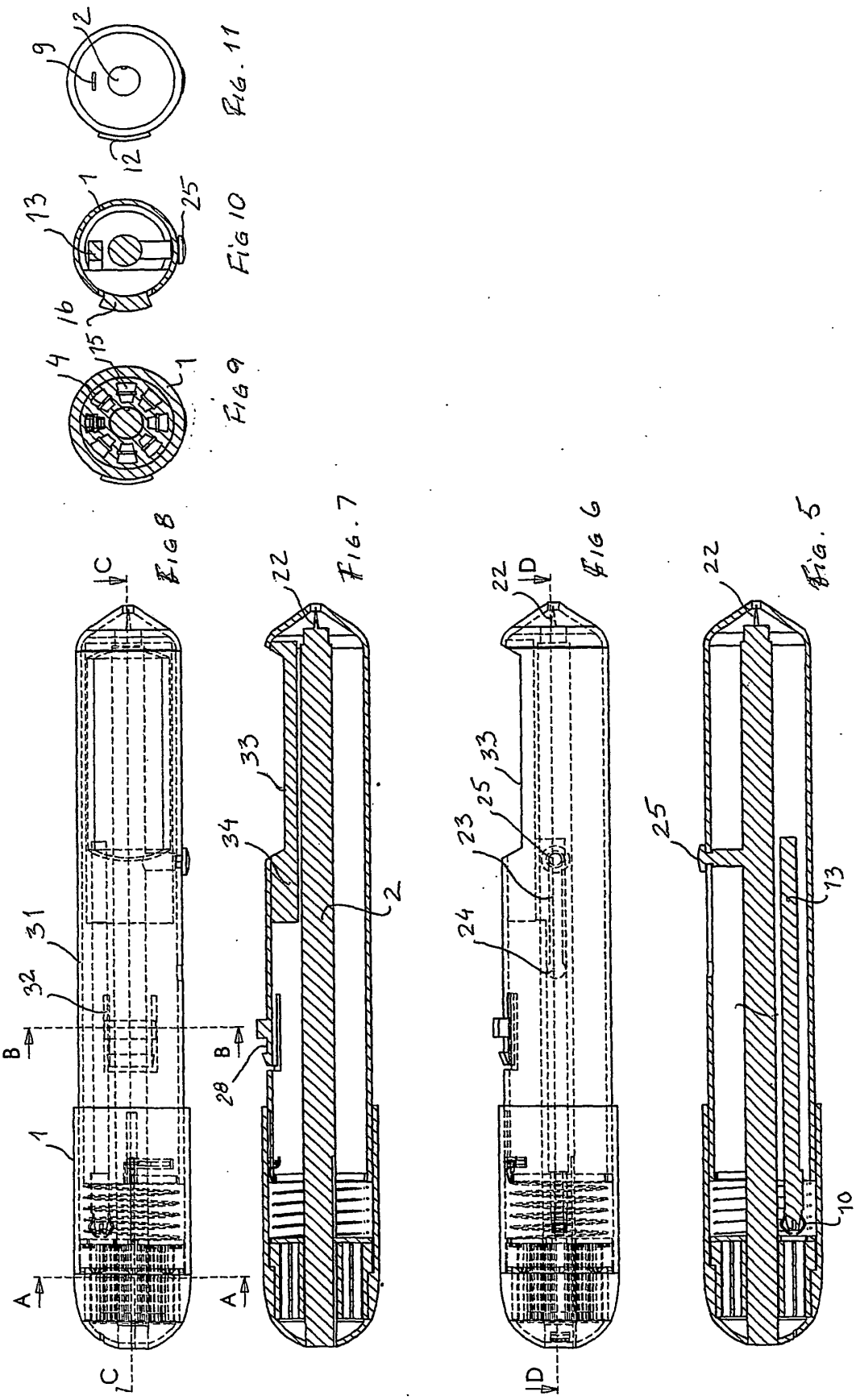
Fig 9
Fig 10
Fig. 11
Fig 8
Fig. 7
Fig 6
Fig. 5
A
B
C
D
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13
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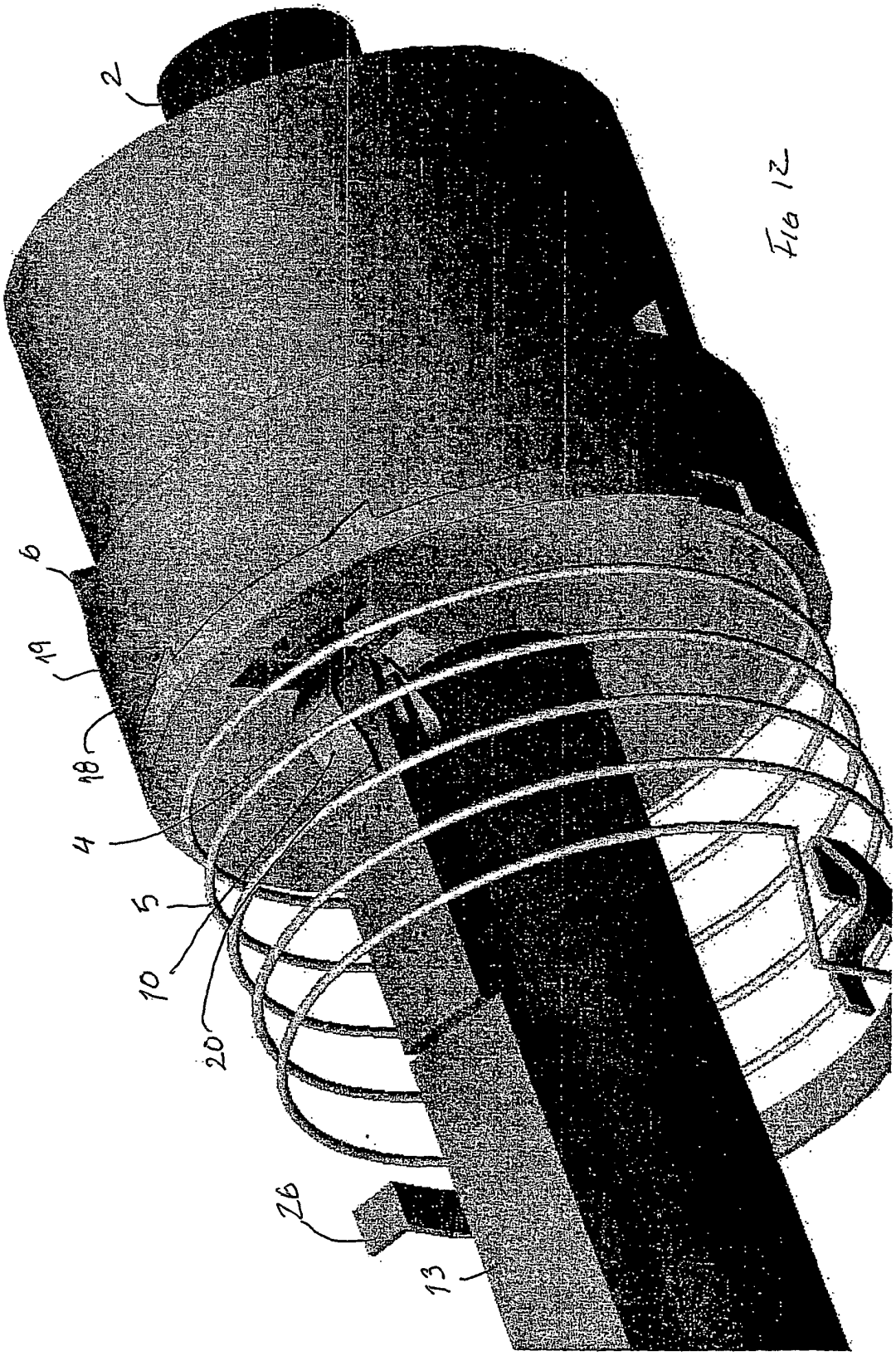


Fig 12

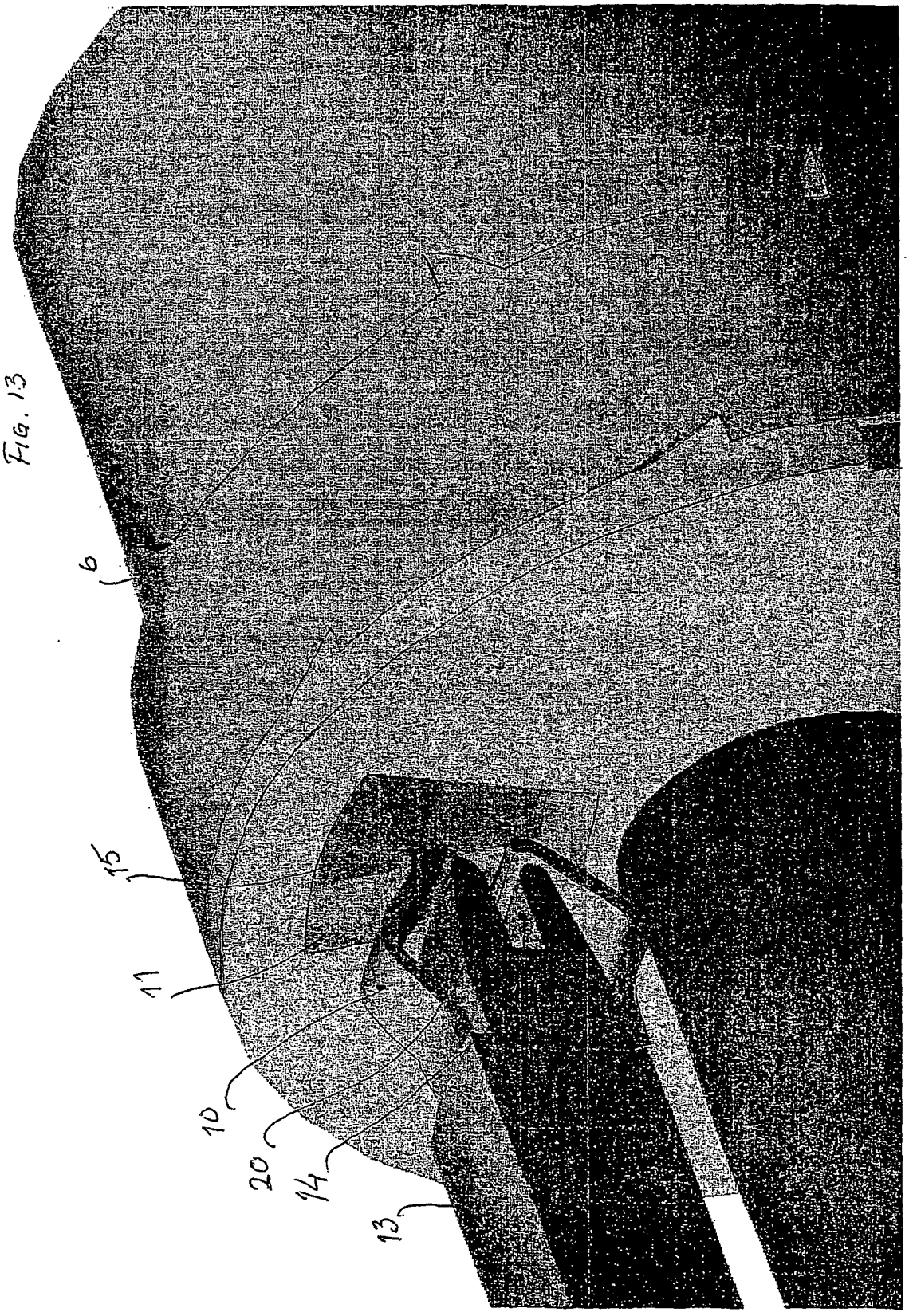
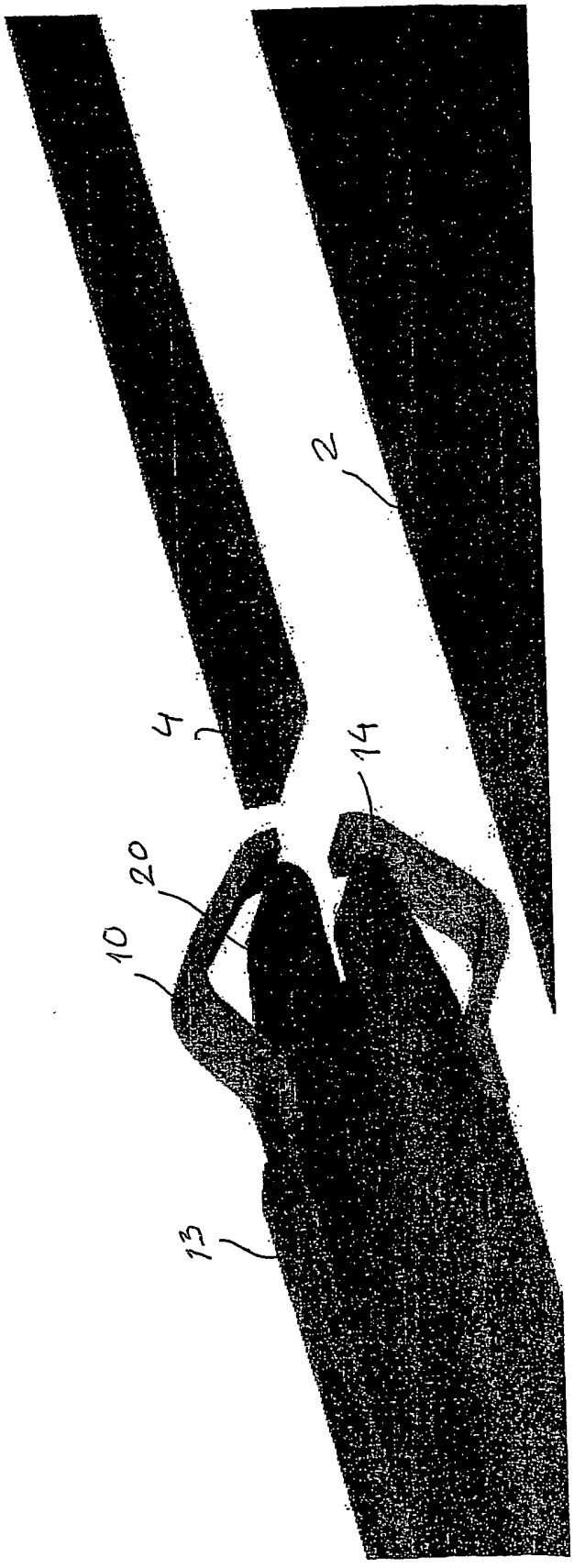


FIG. 13

Fig. 14



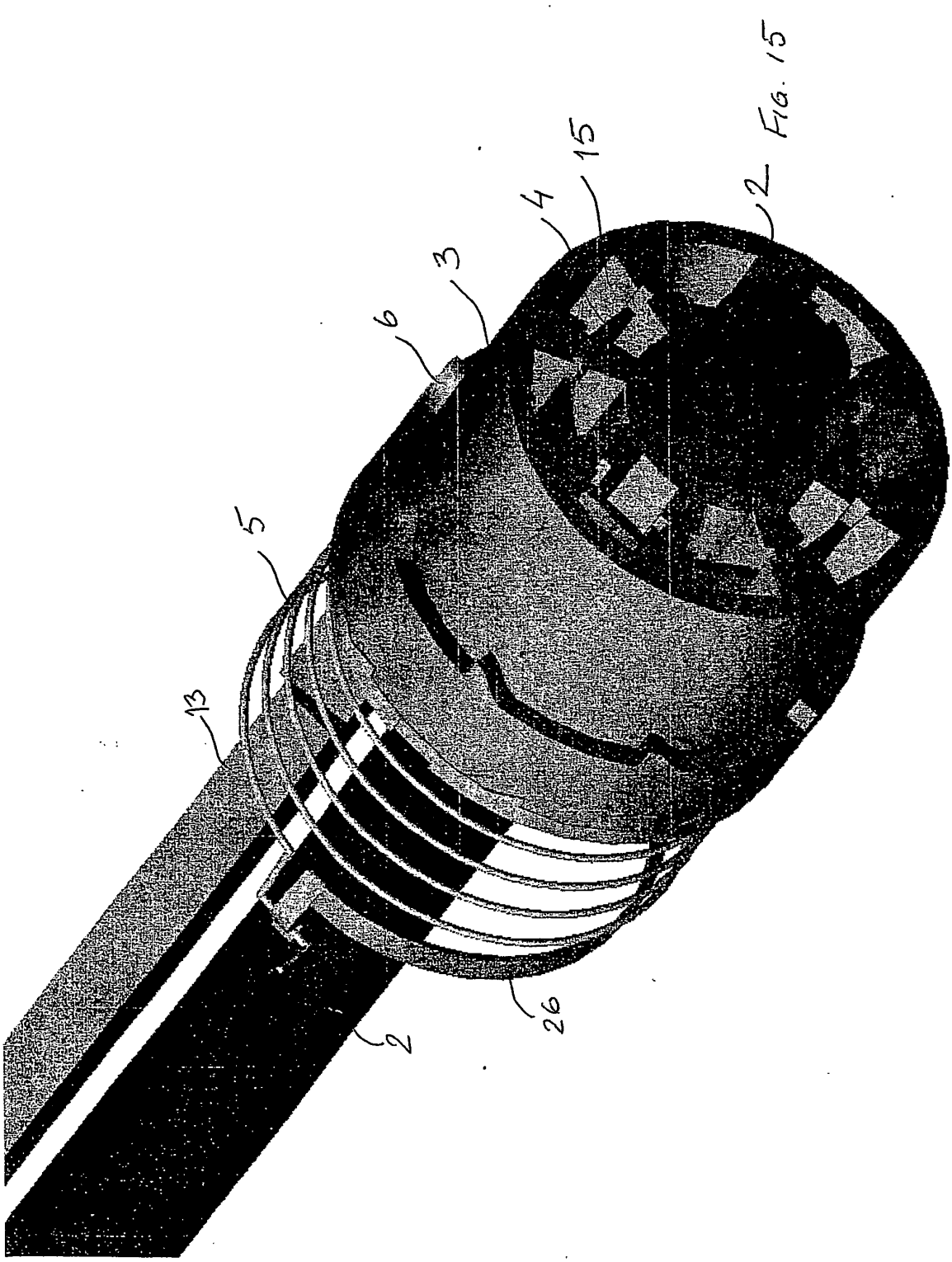
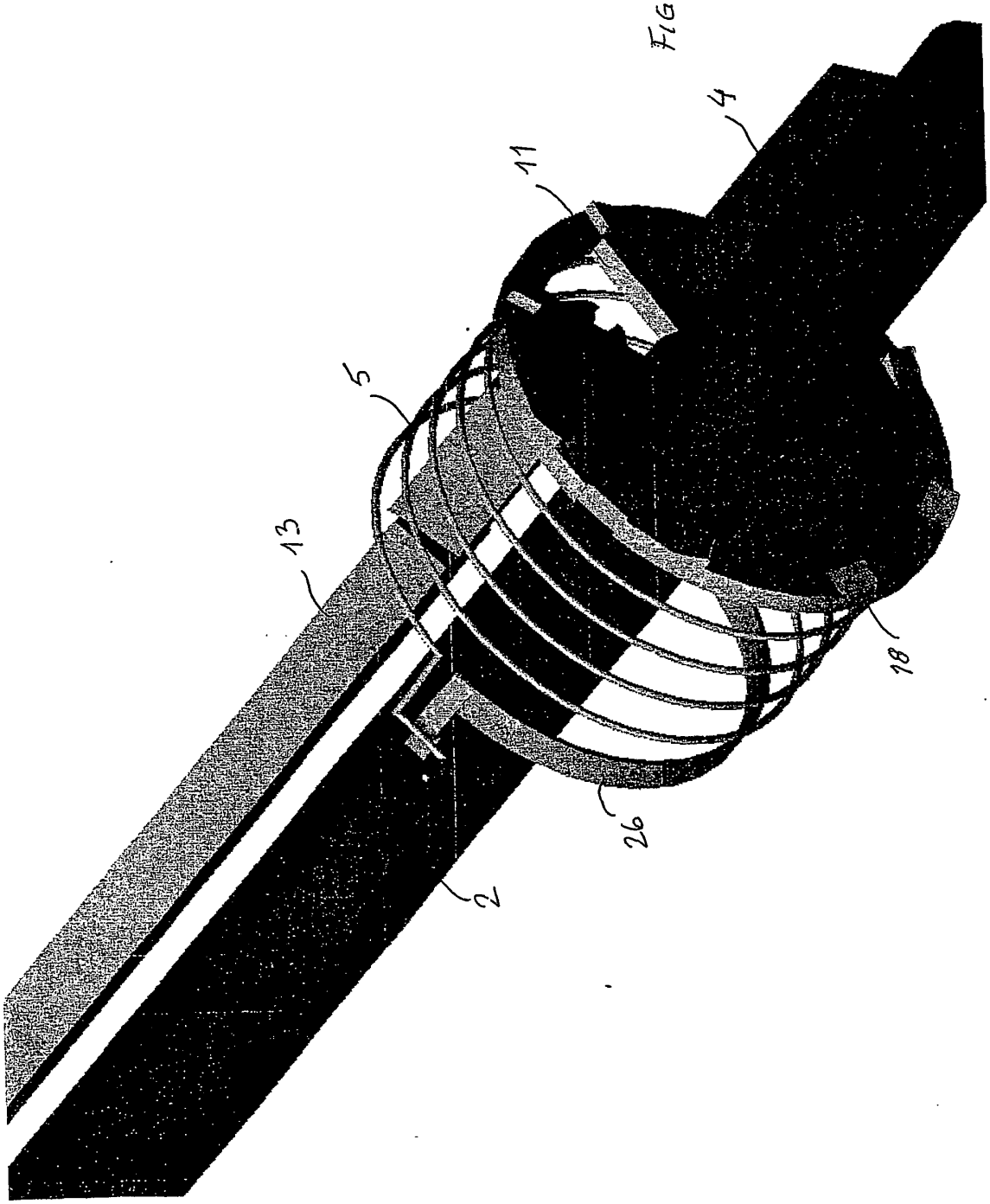


Fig. 15

FIG. 16



REFERENCES CITED IN THE DESCRIPTION

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专利名称(译)	用于测量体液中化合物的装置		
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申请号	EP2002786320	申请日	2002-11-12
[标]申请(专利权)人(译)	ANDERSSON GERHARD BRINK EVA		
申请(专利权)人(译)	ANDERSSON，GERHARD BRINK，EVA		
当前申请(专利权)人(译)	ANDERSSON，GERHARD BRINK，EVA		
[标]发明人	ANDERSSON GERHARD BRINK EVA		
发明人	ANDERSSON, GERHARD BRINK, EVA		
IPC分类号	B01L99/00 G01N27/28 A61B5/00 A61B5/1473 A61B5/15 A61B5/151 G01N27/327 G01N27/403 G01N27/416 G01N33/487		
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外部链接	Espacenet		

摘要(译)

本发明涉及用于定量和/或定性确定体液中物质存在/不存在的装置，该装置包括可旋转地布置的盒子，该盒子包含多个用于与待测体液接触的测试电极，设置成影响测试电极相对于所述盒相对运动的臂，其中所述臂包括接触片金属，所述接触片金属布置成可释放地固定到所述测试电极并且布置成在完成测试之后将所述测试电极返回到所述盒。作为包含在所述装置中的臂。