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FORM 1

SPRUSON & FERGUSON

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952

APPLICATION FOR A STANDARD PATENT

Electro-Nite International N.V., of Amerikalei 110, bus 5, 2000 Antwerpen, BELGIUM, hereby apply for the grant of a standard patent for an invention entitled:

A Metal Contact Member for a Measuring Lance for Taking Measurements in Metal Melts

which is described in the accompanying complete specification.

Details of basic application(s):-

Basic Applic. No:	Country:	Application Date:
P 38 04 880.9	DE	17 February 1988

The address for service is:-

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DATED this NINTH day of FEBRUARY 1989

Electro-Nite International N.V.

By: M.J. Anderson

Registered Patent Attorney

TO: THE COMMISSIONER OF PATENTS
OUR REF: 82570
S&F CODE: 60500

ACCEPTED AND AMENDMENTS ALLOWED 17-8-90

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SPRUSON & FERGUSON

COMMONWEALTH OF AUSTRALIA
THE PATENTS ACT 1952

DECLARATION IN SUPPORT OF A CONVENTION APPLICATION FOR A PATENT

AUSTRALIA CONVENTION STANDARD & PETTY PATENT DECLARATION

In support of the Convention Application made for a patent for an invention entitled:

Title of Invention

A Metal Contact Member for a Measuring Lance for Taking Measurements in Metal Melts

I/~~We~~ Hubertus Joannes Josephus Surinx

Full name(s) and address(es) of Declarant(s)

care of Electro-Nite International N.V.
Amerikalei 110, bus 5, 2000 Antwerpen
Belgium

do solemnly and sincerely declare as follows:-

Full name(s) of Applicant(s)

~~1. I am/We are the applicant(s) for the patent~~

(or, in the case of an application by a body corporate)

1. I am/~~We~~ are authorised by Electro-Nite International N.V.

the applicant(~~s~~) for the patent to make this declaration on its/~~their~~ behalf.

2. The basic application(~~s~~) as defined by Section 141 of the Act was/~~were~~ made

Basic Country(ies) in Federal Republic of Germany

Priority Date(s) on 17 February, 1988

Basic Applicant(s) by Electro-Nite International N.V.

~~3. I am/We are the actual inventor(s) of the invention referred to in the basic application(s)~~

Full name(s) and address(es) of inventor(s)

(or where a person other than the inventor is the applicant)

3. JOHAN MARIA JOSEPH KNEVELS

of Opitterpoort 20, 3690 Bree, Belgium

is/~~are~~ the actual inventor(~~s~~) of the invention and the facts upon which the applicant(~~s~~) is/~~are~~ entitled to make the application are as follows: ~~(respectively)~~

Set out how Applicant(s) derive title from actual inventor(s) e.g. The Applicant(s) is/are the assignee(s) of the invention from the inventor(s)

ELECTRO-NITE INTERNATIONAL N.V. is entitled by Contract of Employment between the inventor as employee and ELECTRO-NITE INTERNATIONAL N.V. as employer, as a person who would be entitled to have the patent assigned to it if a patent were granted upon an application made by the inventor.

4. The basic application(~~s~~) referred to in paragraph 2 of this Declaration was/~~were~~ the first application(~~s~~) made in a Convention country in respect of the invention(~~s~~) the subject of the application.

Declared at Houthalen this 1 st day of February 1989

ELECTRO-NITE INTERNATIONAL N.V.

.....

Signature of Declarant(s)
Corporate Vice-President R & D

SFP4 To: The Commissioner of Patents

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(12) PATENT ABRIDGMENT (11) Document No. AU-B-29803/89
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 603282

(54) Title
A METAL CONTACT MEMBER FOR A MEASURING LANCE FOR TAKING MEASUREMENTS IN METAL MELTS

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(56) Prior Art Documents
US 4438653
US 4377289
US 3233202

(57) Claim

1. A metal contact member which is disposed at the bottom end of a measuring lance and on to which a consumable probe can be fitted to make an electrical connection, said probe containing measuring means for taking measurements in metal melts, the contact member consisting of two tubes interconnected by a tapered portion of one tube being pushed into the widened opening of the other tube with the interposition of an insulating member in the form of a sleeve, the outer wall portions of the two tubes abutting a flange of the insulating member having the same outside diameter as the contact member, and a cup-shaped insulating member being inserted into the widered interior of the end of the contact member which is electrically connected to the probe, the cup-shaped insulating member interior containing contacts which are insulated from one another and which are connected, through the base of the insulating member, to leads taken out through the contact member, wherein the sleeve-shaped insulating member is sealed from the wall of the widened portion of one tube and from the wall of the tapered portion of the other tube of the contact member and the

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cup-shaped insulating member is sealed from the wall of the widened interior of the tube end connected to the probe by the insertion of annular seals, thus providing a moisture tight seal between said cup and sleeve insulating members and also between said first and second tubes.

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FORM 10

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952

COMPLETE SPECIFICATION

(ORIGINAL)

FOR OFFICE USE:

Class Int Class

Complete Specification Lodged:
Accepted:
Published:

Priority:

Related Art:

Name and Address of Applicant: Electro-Nite International N.V.
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Complete Specification for the invention entitled:

A Metal Contact Member for a Measuring Lance for Taking Measurements in Metal Melts

The following statement is a full description of this invention, including the best method of performing it known to me/us

A b s t r a c t

A metal contact member for a measuring lance for taking measurements in metal melts

A metal contact member for a measuring lance for taking measurements in metal melts, said contact member consisting of two tubes (10, 11) interconnected by a tapered portion (14) of one tube (11) being pushed into the widened opening (12) of the other tube (10) with the interposition of an insulating member (17) in the form of a sleeve, a cup-shaped insulating member (26) being inserted into the widened interior of the end of the contact member (1) and containing the contact by which the contact member is electrically connected to the measuring probe. The sleeve-shaped insulating member (17) is sealed off from the wall of the widened portion (12) of the tube (10) and the wall of the tapered portion (14) of the tube (11) of the contact member by the insertion of annular seals (21) while sealing of the cup-shaped insulating member (26) from the wall of the widened interior of the tube end connected to the probe is provided by another annular seal (30).

(Fig. 2)

D E S C R I P T I O N

A metal contact member for a measuring lance for taking measurements in metal melts

The invention relates to a metal contact member which is disposed at the bottom end of a measuring lance and on to which a consumable probe can be fitted to make an electrical connection, said probe containing measuring means for taking measurements in metal melts, the contact member consisting of two tubes interconnected by a tapered portion of one tube being pushed into the widened opening of the other tube with the interposition of an insulating member in the form of a sleeve, the outer wall portions of the two tubes abutting a flange of the insulating member having the same outside diameter as the contact member, and a cup-shaped insulating member being inserted into the widened interior of the end of the contact member which is electrically connected to the probe, the cup-shaped insulating member interior containing contacts which are insulated from one another and which are connected, through the base of the insulating member, to leads taken out through the contact member.

Measuring lances of this kind are used to determine oxygen activity and/or the temperature of steel melts. Incorrect measurements and divergent measurement results for which there was initially no explanation were found to occur in practice. Exhaustive experiments have shown that the falsification of the measurements is due to water inclusions present in the cardboard protective tubes surrounding the measuring probe and the contact member. On immersion of the probe into the melt the water is liberated and passes through capillary openings between the insulating members and the metal walls of the tubes of the contact member into its interior, which is filled with a filler. Since it is not possible to obtain perfect sealing between the filler and the metal tubes because of the different coefficients of thermal expansion of these parts, the

penetrating moisture can, under unfavourable conditions, advance as far as the electrical contacts and falsify the measurements.

The invention is based on this surprising finding which has been confirmed by the experimental results. The object of the invention is so to devise and seal the contact member disposed on the measuring lance as to obviate falsification of the measurements due to penetrating moisture.

Starting from a metal contact member of the type described in the preamble, according to the invention, the sleeve-shaped insulating member is sealed from the wall of the widened portion of one tube and from the wall of the tapered portion of the other tube of the contact member and the cup-shaped insulating member is sealed from the wall of the widened interior of the tube end connected to the probe by the insertion of annular seals.

In a preferred embodiment of the invention, the contact member is constructed as follows:

(a) The tapered portion of one tube of the contact member and the widened portion of the other tube are provided with stepped shoulders which form peripheral abutment surfaces;

(b) The sleeve-shaped insulating members contains stepped recesses disposed at appropriate places to form peripheral radial abutment surfaces situated opposite those of the tubes, sealing rings of elastic material being disposed between the opposite abutment surfaces and being clamped when the two tubes of the contact member are fitted inside one another;

(c) At its end facing the interior of the tube, the base of the cup-shaped insulating member contains a stepped peripheral recess situated opposite a corresponding stepped shoulder in

the inner wall of the tube, two opposite radial abutment surfaces being formed, between which a sealing ring of elastic material is clamped on insertion of the cup-shaped insulating member into the tube end.

Advantageously, the tube connected to the lance holder has the widening in the region of its bottom portion and the tube to which the measuring probe is connectable has the tapered portion at its top end.

In another advantageous embodiment of the invention, the base of the cup-shaped sleeve is provided with two cylindrical projections which extend into the cavity of the tube and which have longitudinal bores extending into the interior of the sleeve, the leads connected to the contact socket and contact pin are taken through bores in the projections and each entry aperture is covered by a shrink tube which bears sealingly against the lead and the cylindrical projection.

It has also been found advantageous if the top portion of the tube adjacent the lance is filled with a silicone material to replace the filler material conventionally used here.

The invention will be explained in detail with reference to the drawing which illustrates one exemplified embodiment and wherein:

Fig. 1 is a diagram showing an immersion measuring lance.

Fig. 2 is a longitudinal section through the contact member and

Fig. 3 is a longitudinal section through the bottom part of the contact member to an enlarged scale.

The immersion measuring lance shown in Fig. 1 consists of a lance holder (2), a steel tube (3), an abutment member (4), and a handle

(5). The cable (7), which is insulated from the continuous internal bore through which it passes, is connected, at the top end of the lance, via a quick plug-in connection (6), to the outer cable (8) leading to the measuring instruments, while the bottom end is connected to a contact member (1) which is fixed to the lance holder (2) and the special construction of which is the subject of the invention. An electrical contact, to which an interchangeable measuring probe, e.g. for measuring the oxygen activity and/or the temperature of a metal melt, can be detachably electrically connected, is mounted at the end of the contact member (1). Both the measuring probe and the contact sleeve are surrounded by one or more protective tubes (not shown) which usually consist of cardboard. The outer cardboard tube surrounding the contact member (1) can extend over the lance holder (2) as far as the abutment member (4).

As will be seen from Figs. 2 and 3, the contact member (1) consists of two cylindrical metal tubes (10, 11) disposed consecutively and interconnected by plugging into one another.

The top tube (10) on the lance side is electrically connected to the measuring lance while the bottom tube (11) is electrically connected to the measuring probe. In the region of its bottom end, the cavity of the tube (10) is widened out and the widened portion (12) is provided with a stepped shoulder (13) extending in the peripheral direction to form a peripheral radial abutment surface. The top end of the tube (11), which has the same outside diameter as the tube (10), is tapered; the tapered portion (14) is provided with a shoulder (15) which forms a stepped reduction of the diameter thereof to form a peripheral radial abutment surface. The portion (16) situated above the shoulder has a smaller outside diameter than the widened interior of the tube (10). The tubes (10, 11) are interconnected by fitting one inside the other with the interposition of an insulating member (17) in the form of a sleeve extending in the region of the overlapping ends of the tubes (10, 11). The insulating member has a

bottom flange (18) having the same outside diameter as the tubes of the contact member (1), the ends of the tubes abutting thereagainst. According to the invention, the insulating member (17) has stepped recesses (19, 20) which correspond to the stepped shoulders (13, 15) of the tubes (10, 11) and are so disposed that the abutment surfaces they form are situated opposite those of the contact member tubes. Sealing rings (21), e.g. O-rings of elastic material, are inserted between the opposite abutment surfaces and, when the tubes are fitted one inside the other, are compressed and clamped against the surrounding walls. The penetration of moisture through capillary openings between the metal parts of the contact member and the insulating member is thus avoided by simple means.

As will be seen from Fig. 2, two of the four measuring leads which pass out through the contact sleeve and the measuring lance and are connected to the measuring instruments, i.e. the leads (22, 23), are electrically connected to a contact consisting of a contact socket (24) and a contact pin (25). The contact is disposed in the interior of a cup-shaped sleeve (26) of insulating material which is pushed into and fastened in the bottom end of the contact member tube (11) facing the measuring probe. The contact pin (25) extends centrally through the base (27) of the insulating sleeve (26) while the contact socket (24) consists of a metal liner which covers the lateral inner wall of the sleeve (26).

In order to avoid moisture penetration at this point as well, the base (27) of the cup-shaped sleeve (26) is provided with a stepped inwardly extending peripheral recess (28) at the end facing the cavity of the tube (11), said recess (28) being situated opposite a stepped shoulder (29) in the inner wall of the tube (11). A sealing ring (30) of elastic material is inserted between the resulting radial abutment surfaces and is clamped when the cup-shaped sleeve is inserted (Fig. 3).

In a preferred embodiment of the invention, the base (27) of the cup-shaped sleeve (26) is provided with two cylindrical projections (31, 32) extending into the cavity of the tube (11) and formed with longitudinal bores which extend into the interior of the sleeve. The projection (31) is disposed centrally and serves to accommodate a lengthened part of the contact pin (25) while the second cylindrical projection (32) is disposed eccentrically and serves to feed the lead (22) to the contact socket (24). According to the invention, a shrink tube (33) covers part of the leads (22, 23) before they enter the cylindrical projections (31, 32), said tube fitting sealingly against the leads and also being drawn sealingly over the cylindrical projections.

The cavity (34) of the tubes (10, 11) is conventionally filled with a filler consisting of a two-component epoxy resin. Reference (35) denotes a mandrel, reference (36) a spacer plate formed with four apertures by means of which the leads can be kept spaced apart. It has also been found advantageous to fill a portion (37) of the cavity of the end of the tube (10) adjacent the lance extending substantially as far as the mandrel (35) with a silicone material which prevents the penetration of moisture to the top end of the contact member. The use of a silicone material instead of a conventional filler is possible in this region because the top end of the contact member heats up less than the middle and bottom portions thereof.

The claims defining the invention are as follows:

1. A metal contact member which is disposed at the bottom end of a measuring lance and on to which a consumable probe can be fitted to make an electrical connection, said probe containing measuring means for taking measurements in metal melts, the contact member consisting of two tubes interconnected by a tapered portion of one tube being pushed into the widened opening of the other tube with the interposition of an insulating member in the form of a sleeve, the outer wall portions of the two tubes abutting a flange of the insulating member having the same outside diameter as the contact member, and a cup-shaped insulating member being inserted into the widened interior of the end of the contact member which is electrically connected to the probe, the cup-shaped insulating member interior containing contacts which are insulated from one another and which are connected, through the base of the insulating member, to leads taken out through the contact member, wherein the sleeve-shaped insulating member is sealed from the wall of the widened portion of one tube and from the wall of the tapered portion of the other tube of the contact member and the cup-shaped insulating member is sealed from the wall of the widened interior of the tube end connected to the probe by the insertion of annular seals, thus providing a moisture tight seal between said cup and sleeve insulating members and also between said first and second tubes.

2. A metal contact member according to claim 1, wherein:

(a) the tapered portion of said one tube of the contact member and the widened portion of the other tube are provided with stepped shoulders which form peripheral abutment surfaces;

(b) the sleeve-shaped insulating member contains stepped recesses disposed at appropriate places to form peripheral radial abutment surfaces situated opposite those of the tubes, sealing rings of elastic material being disposed between the opposite abutment surfaces and being clamped when the two tubes of the contact member are fitted inside one another; and

(c) at its end facing the interior of said one tube, the base of the cup-shaped insulating member contains a stepped peripheral recess situated opposite a corresponding stepped shoulder in the inner wall of the one tube, two opposite radial abutment surfaces being formed, between which a

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sealing ring of elastic material is clamped on insertion of the cup-shaped insulating member into the tube end.

3. A metal contact member according to claim 1 or 2, wherein the tube is connected to a lance holder, and the said tube has the widening in the region of its bottom portion, and the tube to which the measuring probe is connectable has the tapered portion at its top end.

4. A metal contact member according to any one of claims 1 to 3, wherein the base of the cup-shaped sleeve is provided with two cylindrical projections which extend into the cavity of the tube and which have longitudinal bores extending into the interior of the sleeve.

5. A metal contact member according to any one of claims 1 to 4, wherein the leads are connected to a contact socket and a contact pin said leads being taken through bores in the projections, and each entry aperture is covered by a shrink tube which bears sealingly against the lead and the cylindrical projection.

6. A metal contact member according to any one of claims 1 to 5, wherein the top portion of the tube adjacent the lance is filled with a silicone material to replace the filler conventionally used therein.

7. A metal contact member substantially as hereinbefore described with reference to the accompanying drawings.

DATED this TENTH day of AUGUST 1990
Electro-Nite International N.V.

Patent Attorneys for the Applicant
SPRUSON & FERGUSON

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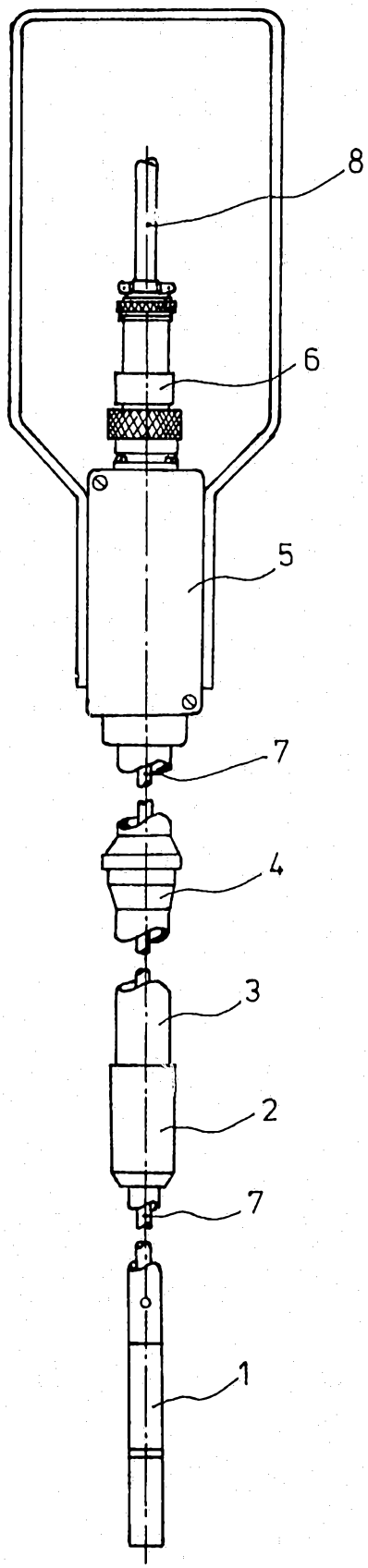


FIG. 1

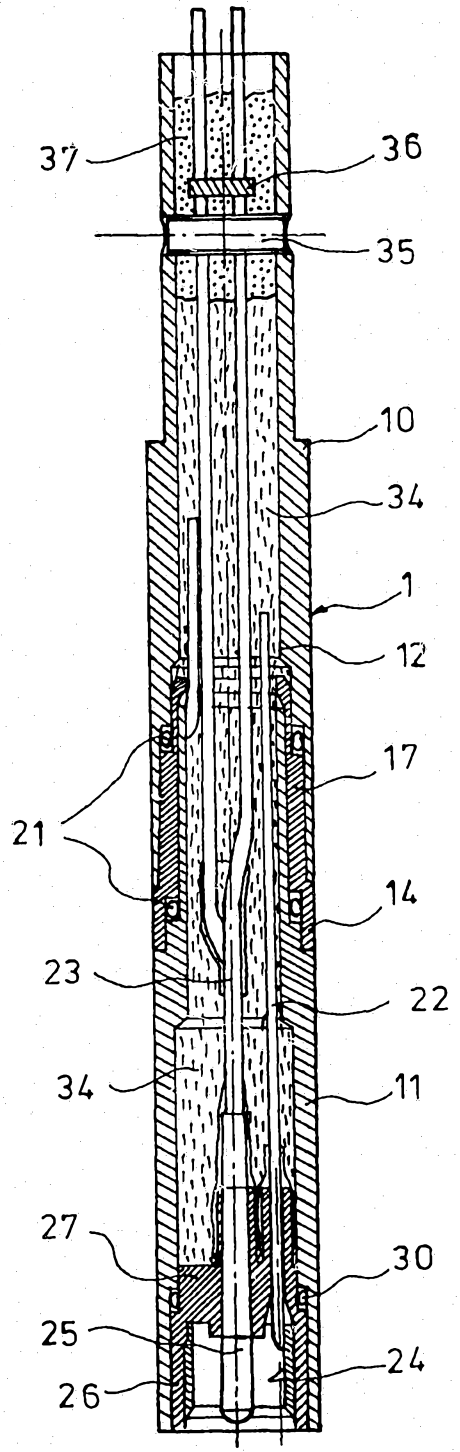
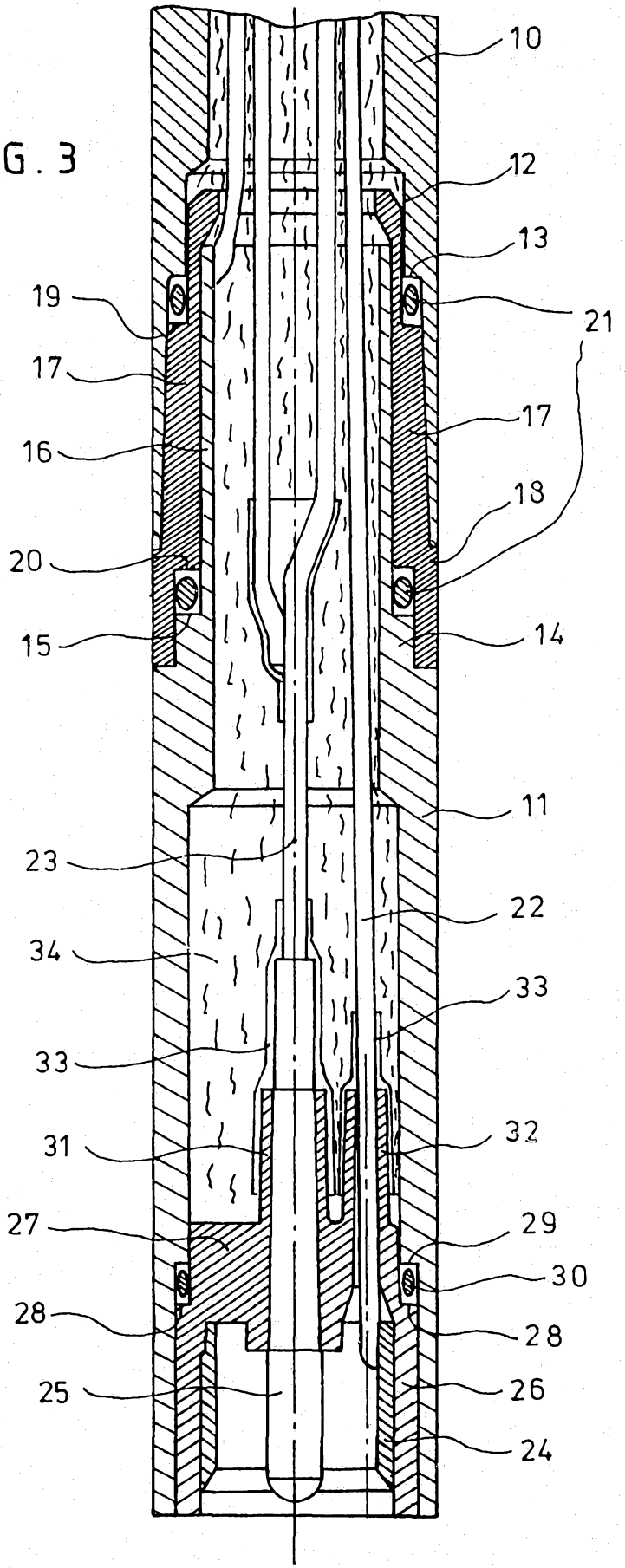


FIG. 2

FIG. 3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