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(72) Inventeurs/Inventors:

LAX, HERMANN, DE;
AU, ANDREAS, DE

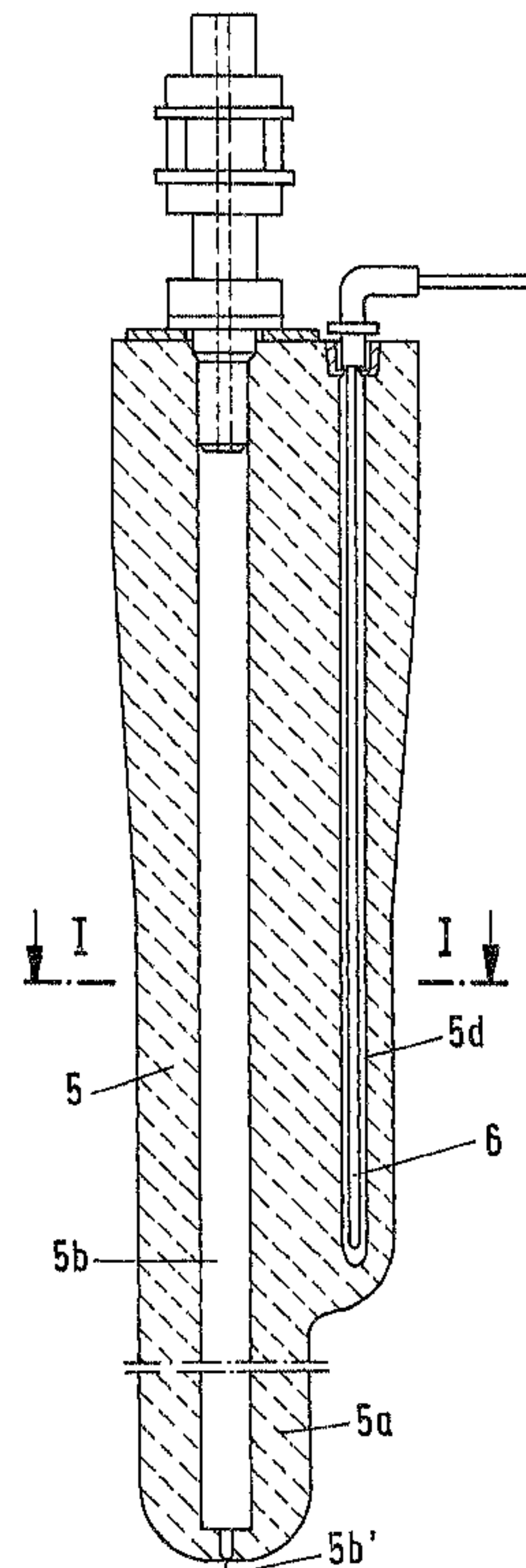
(73) Propriétaire/Owner:

THYSSEN STAHL AG, DE

(74) Agent: FETHERSTONHAUGH & CO.

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(54) Title: PLUG FOR METALLURGICAL VESSELS



(57) Abrégé/Abstract:

The invention relates to a plug made of refractory material for a metallurgical casting vessel, The plug 5, which can be formed with a central axial channel 5b, has an axial channel 5d which terminates eccentrically in front of the plug cap 5a and which is disposed in an axially extending rib 5c formed on the plug 5. A thermocouple 6 with its measuring cables is accommodated in said further axial channel 5d.



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ABSTRACT

The invention relates to a plug made of refractory material for a metallurgical casting vessel. The plug 5, which can be formed with a central axial channel 5b, has an axial channel 5d which terminates eccentrically in front of the plug cap 5a and which is disposed in an axially extending rib 5c formed on the plug 5. A thermocouple 6 with its measuring cables is accommodated in said further axial channel 5d.

Fig. 2 is intended for the Abstract.

Thyssen Stahl AG

Kaiser-Wilhelm-Str. 100

D-4100 Duisburg 11

PLUG FOR METALLURGICAL VESSELS

The invention relates to a plug made of refractory material in the form of a rod for a metallurgical casting vessel, the plug more particularly being formed with an axial channel for gas, additives and the like which extends to an outlet in the plug cap.

During casting it is important to monitor the casting temperature of the melt, more particularly of the melt leaving the casting vessel via its outlet. In a prior art casting vessel, therefore, a temperature measuring device in the form of a thermocouple disposed in a protective tube of refractory material is disposed between the outlet of the casting vessel and a casting jet protective tube supplying the melt. The protective tube is mounted on a cover of the casting vessel. The measuring device must be installed during the preparation of each casting. It is a complicated matter for the operatives to handle the protective tube on the cover of the casting vessel. Moreover, with thick slag covers on the molten steel, the protective tube, which has a thin wall due to the required low thermal insulation resistance, and the thermocouple disposed therein are easily damaged.

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It is also known to accommodate the thermocouple with the measuring cables in a central axial channel, closed at the bottom, in a rod-shaped plug. The disadvantage of that kind of arrangement is that it is impossible to supply
5 gas and/or additives to the melt via the plug, and due to the thick wall of the plug rod, the thermocouple indicates the temperature of the melt only with a certain delay and inaccurately.

It is an object of the invention to provide a
10 device for measuring the temperature in a metallurgical casting vessel which is robust and can be cheaply manufactured and which indicates as accurately as possible the temperature of the melt leaving the casting vessel via the outlet.

15 The invention provides a plug made of refractory material in the form of a rod for a metallurgical casting vessel, the plug having a first axially extending channel therein for gas, additives and the like, said plug terminating in a cap which includes an outlet opening from
20 said channel to the exterior of the plug, characterized in that the plug is formed with a second axially extending channel which terminates short of the plug cap and which accommodates a thermocouple with measuring cables.

In the plug according to the invention the extra
25 expense of accommodating the thermocouple and the measuring cables is only slight. The thermocouple with its measuring cables profits from the constructional robustness of the plug, which is required in any case. For this reason the wall thickness at the place where the thermocouple with the
30 measuring cables is accommodated can be very small,

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2a

something which meets the demand for as short a delay as possible in temperature measurement and for measuring accuracy. Also advantageously for measuring accuracy, the

temperature is measured immediately in front of the outlet from the casting vessel. This is more particularly advantageous if the casting vessel has a number of outlets, as is the case with a multi-strand casting installation. In that case the temperature can be measured individually for each outlet. Lastly, the invention obviates the retaining and installation means required for the thermocouple and its supply cables. Since the axial channel for the thermocouple is disposed eccentrically in the plug, enough space is also left to accommodate the further axial channel for gas, additives or the like which extends to an outlet in the plug cap, so that the plug can perform a double function.

According to one feature of the invention the plug has above the plug cap an axially extending formed-on rib which is formed with the channel for the thermocouple. The rib is advantageous, since in that case a thin wall, more particularly a wall of uniform thickness, can be obtained over substantially half the periphery. The wall thickness of the rib should be 15 mm at the most.

The invention will now be described in greater detail with reference to an embodiment thereof illustrated in the drawings, wherein:

Fig. 1 shows diagrammatically in vertical section and side elevation the casting vessel having a casting jet protective tube for the melt to be supplied and a plug,

Fig. 2 is an axial section to an enlarged scale of the plug shown in Fig. 1, and

Fig. 3 shows the plug illustrated in Fig. 2 in cross-section, taken along the line I-I in Fig. 2.

Molten metal is introduced into a casting vessel 1 via a casting jet protective tube 2 and in the flows out of the vessel 1 via an outlet 3. The casting vessel 1 is closed by a cover 4. A plug 5 in the form of a rod borne via a supporting arm 6 by a vertically reciprocable drive 7 is immersed into the melt via an opening in the cover 4. The outlet 3 can be closed by a plug cap 5a with which the lower end of the plug 5 is formed.

Extending through the plug 5, which is moulded from pressed refractory material, is an axial central channel 5d via which gas, additives or the like can be directly conveyed to the outlet 3 and added to the melt. The plug 5 has the basic shape of a circle in cross-section. Formed on the plug 5 above the plug cap 5a is a rib 5c in which a further axial channel 5d extends. A thermocouple 6 with its measuring cables is accommodated in the axial channel 5d. The wall of the channel 5d is comparatively thin, being 15 mm at the most. Since the thermocouple 6 is disposed directly above the plug cap 5a and the thickness of the wall is small on all sides in the zone of the thermocouple 6, and the thermocouple 6 is disposed with as small a clearance as possible in the channel 5d, the temperature of the melt leaving the casting vessel 1 via the outlet 3 is reliably determined very rapidly and with high accuracy.

The plug with integrated temperature measurement is inexpensive to produce. No extra expense is involved in the forming-on of

the bulge 5c during the conventional pressing of the refractory material to produce the plug 5. The channel 5d is either drilled or produced during pressing.

Wording on Fig. 3: Schnitt = section.

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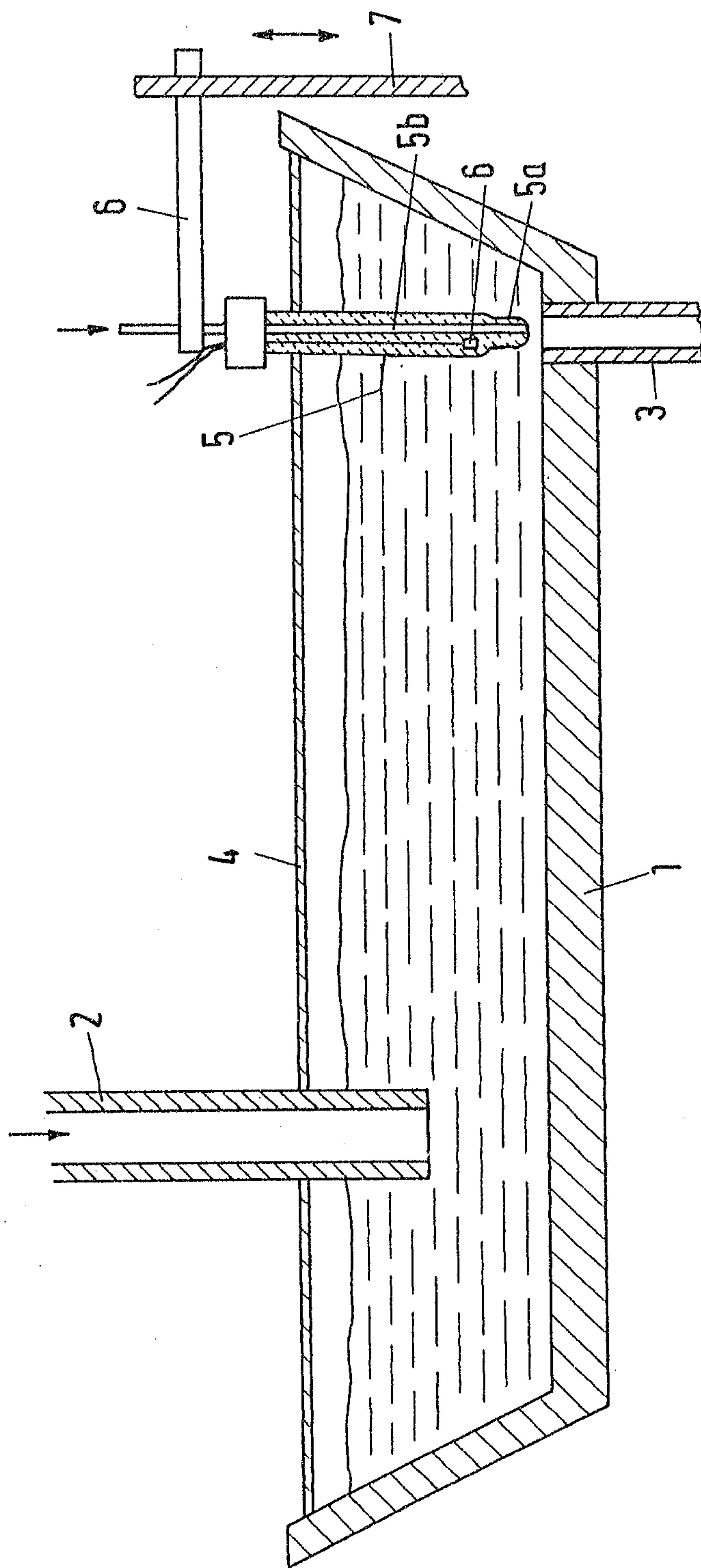
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CLAIMS:

1. A plug (5) made of refractory material in the form of a rod for a metallurgical casting vessel (1), the plug having a first axially extending channel (5b) therein for
5 gas, additives, said plug terminating in a cap which includes an outlet (5b') opening from said channel (5b) to the exterior of the plug, characterized in that the plug (5) is formed with a second axially extending channel (5d) which terminates short of the plug cap (5a) and which accommodates
10 a thermocouple (6) with measuring cables.
2. A plug according to claim 1, characterized in that it includes above the plug cap (5a) an axially extending formed-on rib (5c) in which is formed said second channel (5d) for the thermocouple (6).
- 15 3. A plug according to claim 2, characterized in that the wall thickness of the rib (5c) around said second channel (5d) is 15 mm at the most.

FETHERSTONHAUGH & CO.
OTTAWA, CANADA
PATENT AGENTS

Fig.1



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Fig.2

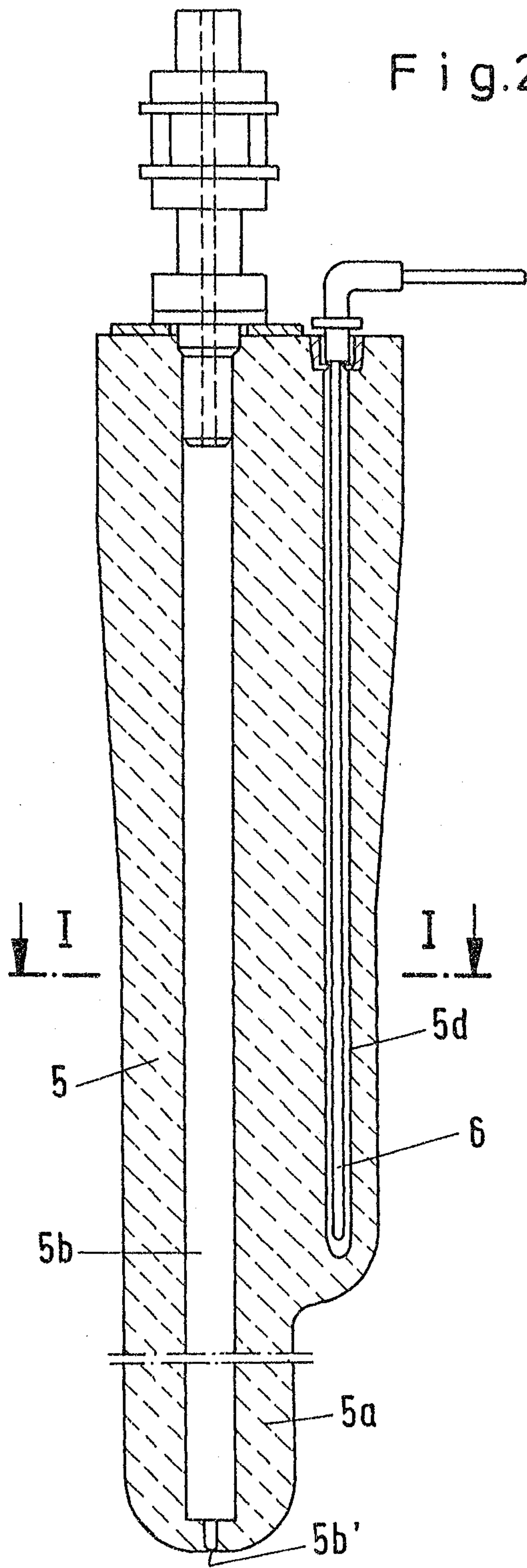
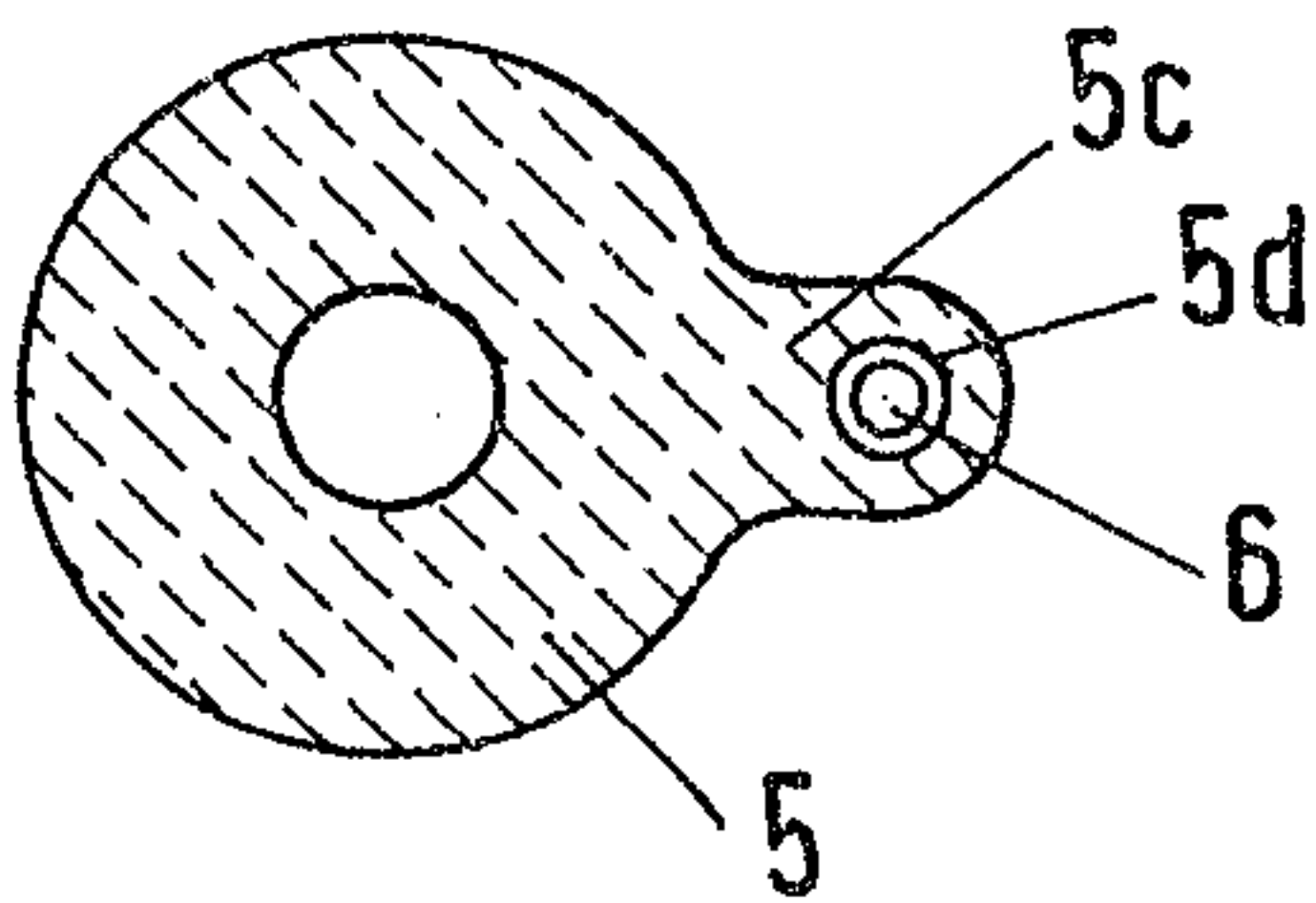


Fig.3
(I-I)



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