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15201222.5 18 December 2015 (18.12.2015) EP
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- (81) **Designated States** (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
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(54) **Title:** CURRENT TRANSFORMER FOR HIGH VOLTAGE GAS INSULATED SWITCHGEAR SUBSTATION

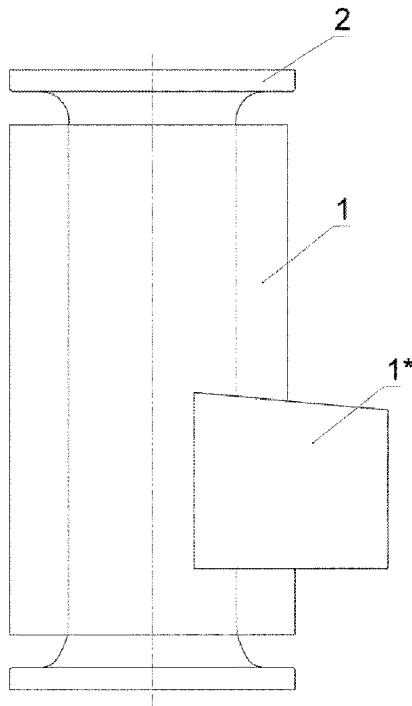


Fig. 1

(57) **Abstract:** The invention relates to a current transformer for high voltage gas insulated switchgear substation, wherein the current transformer is arranged in an enclosure of housing, according to the preamble of claim 1. In order to enhance the protection of current transformers in high voltage gas insulated switchgears, the invention is, that the current transformer is formed and/or embedded by vacuum casting resin outside of a metal tube, in such, that a primary conductor of the current transformer is located in the middle of a metal assembly and sealed by insulation gas, and that on the metal tube are fixed coils by polyurethane and centered, and that a further secondary box is casted sidely on the casted resin of the metal tube, in order to contain secondary side elements of the current transformer.

DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, **Published:**
LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, — *with international search report (Art. 21(3))*
SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA,
GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

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Current transformer for high voltage gas insulated switchgear substation

The invention relates to a current transformer for high voltage gas insulated switchgear substation, wherein the current transformer is arranged in a enclosure of housing, according to the preamble of claim 1.

Known current transformer for high voltage gas insulated switchgear substation are located outside or the SF6 (sulfurhexafluoride) gas insulation area of high voltage switchgear substations.

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Standard known current transformer enclosed by metal sheet as protection has lower IP protection and environment protection due to mechanical component sealed by silicone. More components are used and more space is necessary, which can be used for active parts. The transformer body has to be screwed to the GIS flanges to fix current transformers on GIS components that lead to shorter assembly time, lower cost and better manipulation.

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So the object of the invention is, to enhance the protection of current transformers in high voltage gas insulated switchgears.

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The invention is, that the current transformer is formed and/or embedded by vacuum casting resin outside of a metal tube, in such, that a primary conductor of the current transformer is located in the middle of a metal assembly and sealed by insulation gas, and that on the metal tube are fixed coils by polyurethane and centered, and that a further secondary box is casted sidely on

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- 2 -

the casted resin of the metal tube, in order to contain secondary side elements of the current transformer.

In a further advantageous embodiment, the metal tube is made of aluminum.

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In a further advantageous embodiment, the insulation gas is SF6.

In a further important embodiment, the complete arrangement is covered by epoxy or plastic resin, including the current transformer or transformers and the coils of the current transformer or transformers.

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Furthermore advantageous is, that the secondary box is integral part of the aforesaid resin.

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A last advantageous embodiment is, that in the secondary box are integrated secondary clamps and/or bushing supports and/or earthing clamp for the current transformer or transformers.

An embodiment of the invention is shown in the figures 1 and 2.

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A current transformer is formed by vacuum casting of epoxy resin 1 outside of an metal tube made of two aluminum tubes 2 which are connected by pressing and with the use of an insulation tube. The primary conductor of the current transformer is located in the middle of the aforesaid aluminum assembly and is sealed by SF6 gas. On the aluminum tubes 2 are fixed coils by polyurethane which are arranged there in a centered way. This allows to cast epoxy resin from all sides and create the secondary box 1*, which is then also made by epoxy. In the secondary box are arranged the secondary parts of the current transformer. The epoxy resin is creating the final design, increasing protection of SF6 leakage and generally is protecting coils and secondary side against to the environment.

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- 3 -

Figure 2 shows the current transformer more detailed.

The primary conductor 3 is located inside the aforesaid aluminum tube 2. The aluminum tube 2 includes an aluminum flange 4. The intermediate space
5 between the primary conductor 3 and the aluminum tube 2, and aluminum flange 4 respectively, is filled with an insulating gas, for example SF6 (sulfurhexafluoride).

On the aluminum tube are positioned the secondary coils 6.

Like it can be seen, the secondary box 1* is integral part of the resin 1.
In this box are located secondary clamps and/or bushing supports and/or
10 earthing clamp for the current transformer or transformers.

This construction results in several advantages.

The resin body 1, made of epoxy or plastic resin, including all aforesaid components, results in an effective protection of all mechanical and electrical
15 parts, including the coils. Further more is result in a sure fixation and positioning of all components.

Furthermore, this construction can be produced in an automatic fabrication, with high performance in quality.

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List of reference signs

| | | |
|----|----|-------------------------------|
| | 1 | Epoxy resin |
| | 1* | Secondary box |
| 5 | 2 | Aluminum tube |
| | 3 | Primary conductor |
| | 4 | Aluminum flange |
| | 5 | SF6-Gas-Space |
| | 6 | Secondary coil |
| 10 | | <u>10</u> Current transformer |

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Claims

1. Current transformer for high voltage gas insulated switchgear substation, wherein the current transformer is arranged in a enclosure of housing,
5 **characterized in**
that the current transformer (10) is formed and/or embedded by vacuum casting resin (1) outside of a metal tube, in such, that a primary conductor (3) of the current transformer is located in the middle of a metal assembly and sealed by insulation gas (5), and that on the metal
10 tube are fixed coils by polyurethane and centered, and that a further secondary box is casted sidely on the casted resin of the metal tube, in order to contain secondary side elements of the current transformer.
2. Current transformer for high voltage gas insulated switchgear substation,
15 wherein the current transformer is arranged in a enclosure of housing,
characterized in
that the metal tube is made of aluminum.
3. Current transformer for high voltage gas insulated switchgear substation,
20 wherein the current transformer is arranged in a enclosure of housing,
characterized in
that the insulation gas is SF6.
4. Current transformer according to one of the aforesaid claims,
25 **characterized in**
that the complete arrangement (10) is covered by epoxy or plastic resin, including the current transformer or transformers and the coils of the current transformer or transformers.

5. Current transformer according to claim 4,
characterized in
that the secondary box (1*) is integral part of the aforesaid resin (1).

5 6. Current transformer according to claim 5,
characterized in
that in the secondary box (1*) are integrated secondary clamps and/or
bushing supports and/or earthing clamp for the current transformer or
transformers.

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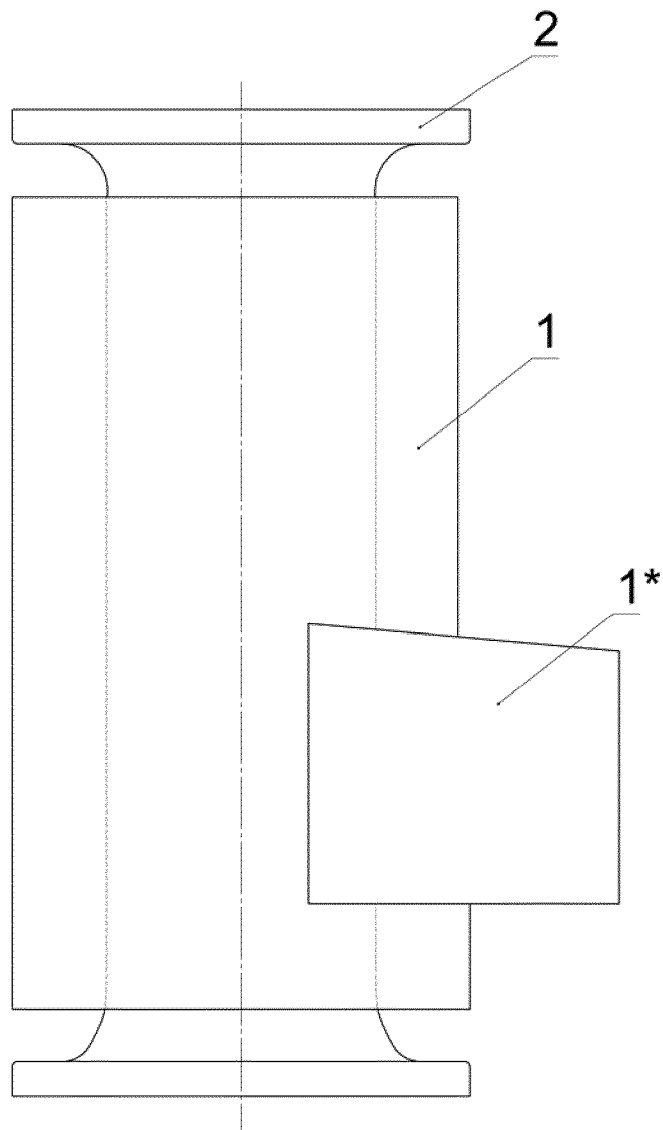


Fig. 1

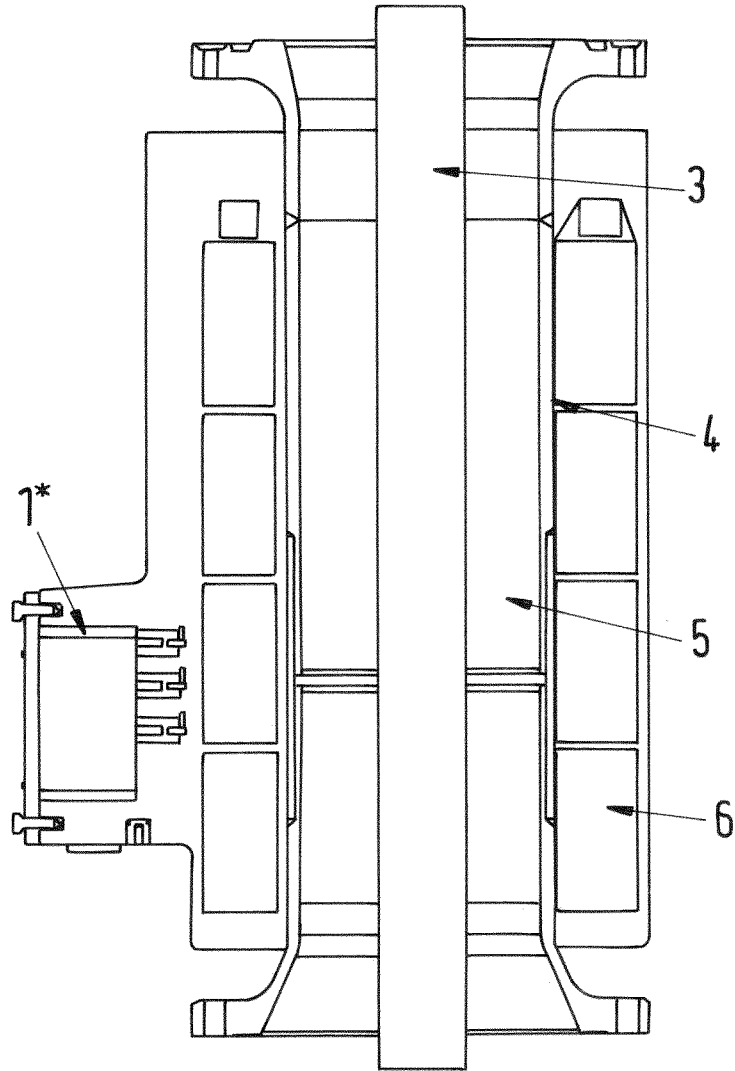


Fig.2

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/081255

A. CLASSIFICATION OF SUBJECT MATTER
INV. H01F38/30
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H01F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

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| Y | column 1, lines 1 - 6 column 2, lines 11 - 17 figure 1 ----- | 1 |
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Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

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| Date of the actual completion of the international search 10 March 2017 | Date of mailing of the international search report 23/03/2017 |
| Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016 | Authorized officer Van den Berg, G |

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/081255

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