(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
3 February 2011 (03.02.2011)

PCT

(10) International Publication Number
WO 2011/012096 A1

(51) International Patent Classification:
E04F 13/08 (2006.01) *F16B 13/04* (2006.01)

(21) International Application Number:
PCT/CZ2010/000088

(22) International Filing Date:
29 July 2010 (29.07.2010)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
PV 2009-510 31 July 2009 (31.07.2009) CZ

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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, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, 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.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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(54) Title: A DOWEL WITH ALTERNATIVE EMBEDDING OF THRUST PLATE IN THERMAL INSULATION LAYER AND A METHOD OF ITS MOUNTING

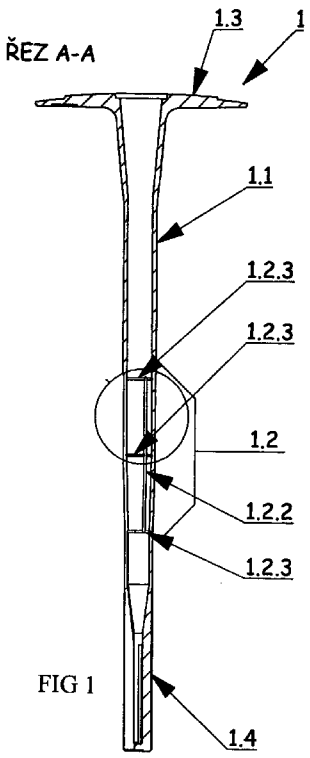

FIG 1

(57) Abstract: The dowel consists of a dowel shank with a thrust plate on one its end, with an expansion section on the opposite end, a compressible section on the shank, of an expanding element and of an element for creating a cut-through for embedding of the plate. On the cylindrical part of the shank (1.1) of the dowel (1) a compressible section (1.2) is situated, having a form of longitudinal segments (1.2.1) created by at least two longitudinal slots (1.2.2) in the wall of the shank (1.1), while closely to both ends of said longitudinal slots (1.2.2) and in the middle of longitudinal segments (1.2.1) the walls of the shank (1.1) are weakened, while the length of the compressible section (1.2) is at least two-and-half times larger than the outer diameter of the shank (1.1) and the element for performing the cut-through for embedding of the thrust plate (1.3) is created by an individual cutting-through element (3). The compressible section (1.2) can be situated on the shank (1.1) closely above the expansion section (1.4) or can be situated closely to the bottom side of the thrust plate (1.3). The dowel enables performing deep as well surface embedding with potential use of a mounting jig (8, 8').

WO 2011/012096 A1

Published:

— *with international search report (Art. 21(3))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

A dowel with alternative embedding of thrust plate in thermal insulation layer and a method of its mounting

Technical Field

The present invention concerns a dowel with an alternative embedding of the thrust plate into thermal insulation layer, applicable for fastening of thermal insulation panels for heat insulation of outer walls of buildings, and a method of its mounting.

Background Art

Coating of building elevation walls with heat insulation panels is one of preferred methods of thermal insulation of buildings. For their fastening plastic fasteners are used, that can be divided in dowels with an expansion section and with an expanding element, and dowels with an anchoring element of special form. A preferential attention has lately been paid to the possibility of a perfect and economically efficient finish of heat insulated building elevation in the final stage of work. It is therefore required (sometimes under an obligatory standard) to embed the dowel thrust plate and the head of the expanding element at least flush with the insulation panel surface, or preferentially to sink the dowel thrust plate deeper in the insulation with its subsequent covering with an insulating plug.

Embedding of a thrust plate with the head of the expanding element is solved in a known manner by shifting the thrust plate along the dowel shank resulting in compression of the insulating material, or by a deformation reducing the dowel shank length by means of a deformable element. Also known is the method of cutting-through of the insulation material for embedding of the thrust plate by means of special fixtures.

Known from the Patent Application EP 1457688A1 is a plastic dowel consisting of a hollow shank, a thrust plate, an expansion section and an expanding element. The dowel shaft comprises a deformable element enabling embedding of the thrust plate into the insulation material. The deformable element is formed by a thin-wall section on which at least one spiral projection (like a worm) is formed. The deformable element does not practically change its outer diameter during its deformation.

Known from the utility model DE29517042 U1 is a single-piece deformable element of a very thin wall thickness, integral with the reverse side of the thrust plate. The inner diameter of the deformable element exceeds the inner diameter of the dowel shank middle section. In the walls of the deformable element are formed grooves alternatively on the outer and on the inner surface. After application of a proper thrust on the thrust plate

against the expansion section the deformable element is deformed to form a sole wave of a bellows compensator.

The Patent Application WO2008/006465 A1 reveals the versions of dowel shank shortening either by shifting the thrust plate along the shank, or by using a deformable element. The deformable element is shaped in a whole as a single-piece foil-type joint having after its deformation the form of a single-piece bellows directly connected with the reverse side of the thrust plate.

The documents mentioned above all describe the dowels embedding the thrust plate merely in level flush with the insulation surface level.

Known from the Patent Specification DE 10159632B4 is a dowel enabling deep embedding of the thrust plate in the insulation material and its covering with an insulation plug, while the plate is shifted along the dowel shank. The plate has on its reverse side on its periphery a cutting-through element. For introduction of the expanding element into the expansion area of the dowel and at the same time for pressing the thrust plate into the insulating material a jig with a stop is used, providing for the desired depth of embedding. As an alternative a fixture for embedding of the plate in the insulation is shown, having on its circumference a cutting-through element as well as a stop for presetting of the embedding depth.

From the Patent Specification EP1318250 A1 is known a mounting jig and a method of mounting a dowel having a deformation section. In the first step a hole into the insulation and wall is drilled by means of a mounting jig and at the same time an annular deep cut with a required depth and diameter for housing of a thrust plate is performed. In the second step the dowel with the expanding element is inserted, then using the assembly jig, the expanding element is driven in and the thrust plate pressed home along with compression of the insulation material. The space over the plate is covered with an insulation plug.

Disclosure of invention

The latest state-of-the-art is improved by a dowel with alternative embedding of the thrust plate in the insulation material according to the present invention, consisting of a dowel shank with a thrust plate on its one end, with an expansion section on its other end and a compressible section on the shank, of an expanding element and of an element for performing a cut for embedding the plate.

The substance of the invention is in that on the cylindrical part of the dowel shank a compressible section is located in the form of longitudinal segments shaped by at least two longitudinal slots in the shank wall, while at both ends of said longitudinal slots and amidst of longitudinal segments the shank wall thickness is reduced. The compressible section is at least two-and-half times longer then the largest outer diameter of the shank. The element performing the cut-through for embedding of the plate represents an independent cutting part.

Weakening of shank walls at the slot ends and in the middle of longitudinal segments is achieved by means of cross grooves on the inner or outer shank wall.

The compressible section on the shank can be situated close to the expansion section or close to the reverse side of the thrust plate.

In a preferred implementation the compressible section situated below the thrust plate is expanded during screwing or hammering of the expanding element by means of an expanding collar situated in the upper part of the expanding element.

The plastic cutting-through element has a form of a cylindrical shell having a bottom with a centring part with outer diameter adapted for insertion into the drilled hole in the insulation and a notch for a free fitting of the thrust plate on the bottom, while above the bottom inside the shell is a stepped seat for a central fitting of the thrust plate, and on the reverse side of the bottom on the circumference are made sharp projections with cutting edges.

In a preferred implementation the cylindrical section of the shank is constituted by three sections with stepped inner diameters, while the first cylindrical section of the shank with the largest diameter flushes with the conical part below the thrust plate, its outer diameter ahead of the compressible section is reduced by a shoulder and the lesser diameter so obtained is after the compressible section still reduced by a conical passage to the diameter of the expansion section, thus simplifying the design of the injection tool of the transfer moulding machines.

The mounting process in case of a surface embedding of the thrust plate in the insulation panel is in that the dowel shank is inserted in the pre-drilled hole in the insulation and in the basic wall so that the thrust plate rests on the insulation surface level and the expansion section is situated inside the wall. Then the expanding element is screwed in or hammered in so as to press the plate surface flush with the insulation level.

In the alternative case of deep fitting of the thrust plate in the insulation the dowel shank carrying the cutting-through element is inserted in the hole pre-drilled in the insulation panel and in the wall so that the bottom of the cutting-through element is situated on the insulation surface level. Then the expanding element is screwed-in so that the surface of the thrust plate is depressed by at least the plug thickness below the insulation surface level, whereupon the cavity over the thrust plate is filled by a plug made of the insulation material corresponding to the basic insulation make.

To achieve an accurate deep fitting of the thrust plate, it is suitable to use a mounting jig consisting of a stem for fastening in an electric screwdriver, fitted with a seat for a spacer or for a support ring and with a tang on its end.

In the alternative implementation of surface mount the mounting jig is used in a setup where it is the spacer which comes in contact with the seat area of the stem.

In the alternative implementation of deep embedded mount the mounting jig is used in a setup where it is the support plate which comes in contact with the seat area of the stem.

Brief description of drawings

The invention is in particular explained on the drawings in which Fig. 1 shows a longitudinal section of a dowel, Fig. 2 is an overall view of a dowel from Fig. 1, Fig. 3 presents a scaled-up longitudinal section of the compressible section of the dowel, Fig. 5 is a cross section of the compressible section, Fig. 6 is a cross section of the expansion section, Fig. 7 shows an expanding screw-type element, Fig. 8 an expanding hammering element, Fig. 9 is a view from upside of the cutting-through element, Fig. 10 is a partial section from Fig. 9, Fig. 11 is an axonometric view of the cutting-through element, Fig. 12 is a view on non-deformed dowel with screwed-in expanding element, Fig. 13 shows a deformation of 5 mm, Fig. 14 shows a maximum deformation by 15 mm, Fig. 15 is a view of surface mounting with a minimum embedding in the isolation, Fig. 16 is a view of a dowel with deep embedding of the thrust plate in a final stage after finished mounting, Fig. 17 is a view of a dowel with the compressible section below the thrust plate in non-deformed condition, Fig. 18 is a deformed compressible section of the dowel from Fig. 17, Fig. 19 presents a view of a dowel with an expanding element with an expansion collar, Fig. 20 a view of a dowel with deformation of the compressible section from Fig. 19, Fig. 21 brings a detailed view of an expanding element with an expansion collar, Fig. 22 is a mounting jig for surface mounting, Fig. 23 shows a mounting jig for deep embedding, Fig.

24 is a mounting jig in longitudinal section for deep embedding, Fig. 25 is a view from the side of the tang of Fig. 24 and Fig. 26 presents an axonometric view of the mounting jig from Fig. 23.

Examples of implementation of the invention

Example 1

Described in this example is a dowel with its compressible section above the expansion section and the way of installing deep embedding of the thrust plate in the insulation panel. The dowel consists of a thrust plate 1.3, a shank 1.1, on which a compressible section 1.2 is formed, consisting of three longitudinal segments 1.2.1 shaped by three longitudinal slots 1.2.2 in the wall of the shank 1.1. Close to both ends of slots 1.2.2 on the inner wall cross grooves 1.2.3 are formed. Equal grooves 1.2.3 are also made in the middle of all three longitudinal segments 1.2.1. The cross grooves 1.2.3 weaken the walls and substantially reduce the force necessary for the deformation of longitudinal segments 1.2.1 when reducing the length of the shank 1.1 for deep mounting of the thrust plate 1.3 in the isolation surface 4. The dowel 1 is clamped in the hole 7 of the wall 5 by friction resulting from expansion of the expansion section 1.4 owing to screwed-in expanding element 2. The expanding section 1.4 has a commonly known shape. The cylindrical part of the shank 1.1 has starting from its connection to the conical part from bottom of the thrust plate 1.3 the largest diameter, which is stepped down ahead of the compressible section 1.2 and continues with its reduced diameter till over the compressible section 1.2, after which follows a conical reduction down to the diameter of the expansion section 1.4.

The cutting-through element 3, fitted in the course of mounting on the thrust plate 1.3, has a form of a cylindrical shell 3.1 carrying a bottom 3.2 with a centring part 3.3 of an outer diameter for fitting into the drilled hole 7 in the insulating material 4, with a notch 3.4 to fit the lower part of the thrust plate 1.3 of dowel 1 and thence a free fitting of thrust plate 1.3 on the bottom 3.2. In the cutting-through element 3 on the lower side of bottom 3.2 on the periphery are formed sharp projections 3.5 carrying cutting edges.

All parts of dowel 1, expanding element 2 and cutting-through element 3 are made of plastic.

Mounting of dowel 1 for deep embedding of the thrust plate 1.3 proceeds so that the shank 1.1 with its cutting-through element 3 is inserted into the pre-drilled hole 7 in the insulation material 4 and in the wall 5 so deep that the bottom 3.2 of the cutting-through element 3

rests on the surface of insulation 4, thereafter the expanding element 2 is driven so far that the surface of the thrust plate 1.3 is depressed below the surface of isolation 4 at least by the thickness of the plug 6 and then the cut out cavity above the thrust plate 1.3 is filled by the plug 6 made of the same material as that of the isolation 4.

Example 2

This example describes a dowel with a compressible section situated close to the bottom side of the thrust plate and the mounting process for surface embedding of the thrust plate in the insulation panel. The dowel consists of a shank 1′.1 comprising a compressible section 1′.2 composed of six longitudinal segments created by six longitudinal slots in the wall of the shank 1′.1. Close to both slot ends are formed cross grooves on the inner wall.

In the case of surface embedding no cutting-through element 3 is used, and mounting is performed by pushing of the dowel shank 1.1 into the pre-drilled hole 7 in insulation 4 and wall 5 to bring the thrust plate 1.3 onto the surface of insulation 4 and the expanding section into the wall 5, whereupon the expanding element 2 is driven or hammered so deep that the surface of the thrust plate 1.3 is depressed flush with the surface of insulation 4.

Example 3

This example describes a dowel with a compressible section situated close to the bottom side of the thrust plate, and the mounting process of surface embedding of the thrust plate in the insulation panel. The compressible section 1′′.2 is composed of six longitudinal segments created by six longitudinal slots in the wall of the shank like in Example 2. For expansion of the compressible section segments is used an expanding collar 2′′.1 of the expanding element 2′′. Resulting deformation proceeds along the edge of the expanding collar 2′′.1, which after hammering of the expanding element 2′′ bends the longitudinal segment outwards and reduces so the dowel length.

Example 4

For an accurate deep embedding of the thrust plate in the insulation panel a mounting jig should preferably be used.

For surface embedding of the thrust plate 1.3 in the insulation is used a mounting jig 8 consisting of a stem 8.1 for clamping in an electric screwdriver, having a rest surface 8.5 and ending by a tang 8.4. On the stem 8.1 is fastened a spacer 8.2 with a support plate 8.3 so that the support plate 8.3 is directed towards the tang 8.4.

Mounting proceeds so that the shank 1.1 of the dowel is pushed into the pre-drilled hole 7 in insulation 4 and wall 5 so that the thrust plate 1.3 rests on the insulation surface 4 and the expansion section 1.4 is in the wall 5. Then the tang 8.4 of the mounting jig 8 is inserted into the corresponding seat in the head of the screw-driving expanding element 2 and the expanding element 2 is driven into the dowel so far as the support plate 8.3 rests on the insulation surface.

Example 5

For a deep embedding of the thrust plate 1.3 in the insulation panel a mounting jig 8' is used, where a spacer 8.2 with a support plate 8.3 is fastened with the spacer 8.2 directed towards the tang 8.4.

Mounting of the dowel 1 with deep embedding of the thrust plate 1.3 proceeds so that the shank 1.1 with the cutting-through element 3 is pushed into the pre-drilled hole 7 in insulation 4 and wall 5 so deep that the bottom 3.2 of the cutting-through element 3 rests on the surface of insulation 4. Then the tang 8.4 of the mounting jig 8 is inserted into the corresponding seat in the head of the screw driving expanding element 2 and the expanding element 2 is driven into the dowel so far as the support plate 8.3 rests on the insulation surface. The remaining cavity resulting from the deep cut above the thrust plate 1.3 is then filled with a plug 6 made of identical material of insulation 4.

Industrial applicability

The dowel according to the present invention is suitable for fastening heat insulating panels for thermal insulation of outer elevation walls of buildings. Its applicability concerns both surface embedding and deep embedding of the thrust plate in the insulating material.

List of Reference Numbers

1... dowel
1.1... dowel shank
1.2... compressible section
1.2.1 ... longitudinal segment
1.2.2 ... longitudinal slot
1.2.3 ... cross groove
1.3... thrust plate
1.4... expansion section
2... expanding element screwing type
2'... expanding element hammering type
2... expanding element hammering type with expansion collar
2''.1... expanding collar
3... cutting-through element
3.1... cylindrical shell
3.2... bottom
3.3... centring part
3.4... notch
3.5... sharp projections
4... insulation / insulating panel
5... wall
6... insulation plug
7... hole
8... mounting jig for surface embedding
8'... mounting jig for deep embedding
8.1... stem
8.2... spacer
8.3... support plate
8.4... tang
8.5... rest surface of the stem

CLAIMS:

1. A dowel with alternative embedding of the thrust plate in the insulating panel, consisting of a dowel shank with a thrust plate on its one end, with an expansion section on the opposite end, a compressible section on the shank, an expanding element and an element for creation of a cut-through for embedding of said thrust plate, **characterized in that** on the cylindrical part of the shank (1.1) of the dowel (1) a compressible section (1.2) is situated in the form of longitudinal segments (1.2.1) created by at least two longitudinal slots (1.2.2) in the wall of said shank (1.1), while close to both ends of said longitudinal slots (1.2.2) and about in the middle of said longitudinal segments (1.2.1) the walls of said shank (1.1) are weakened, while the length of the compressible section (1.2) is at least two-and-half times longer then the outer diameter of said shank (1.1) and the element for creating of the cut-through for deep embedding of said thrust plate (1.3) is created by an individual cutting-through element (3).

2. A dowel according to Claim 1, **characterized in that** a weakening of the walls of the shank (1.1) close to the ends of slots (1.2.2) and in the middle of longitudinal segments 1.2.1) is created by cross grooves (1.2.3) on the inner or on the outer wall of the shank (1.1).

3. A dowel according to Claim 1 and 2, **characterized in that** the compressible section (1.2) is situated on the shank (1.1) closely above the expansion section (1.4)

4. A dowel according to Claim 1 and 2, **characterized in that** the compressible section (1.2) is situated on the shank (1.1) closely to the bottom side of the thrust plate (1.3).

5. A dowel according to Claim 4, **characterized in that** the compressible section (1''.2) is expanded during hammering of the expanding element (2'') by means of an expanding collar (2''.1) situated in the upper part of the expanding element (2'').

6. A dowel according to Claim 1, **characterized in that** the plastic cutting-through element (3) has a form of a cylindrical shell (3.1) having a bottom (3.2) with a centring part (3.3) with its outer diameter fitting for insertion into a drilled-out hole (7) in insulation (4) and with a notch (3.4) for loose fitting of the thrust plate (1.3) on the bottom (3.2), while above said bottom (3.2) inside the shell (3.1) a step for central deposition of the thrust plate (1.3) is formed and sharp projections (3.5) with cutting edges are situated on the lower side of the bottom (3.2) on the periphery.

7. A dowel according to Claim 1, **characterized in that** the cylindrical part of the shank (1.1) is created by three sections with stepped outer diameters, while the first cylindrical section of said shank (1.1) with the largest diameter passes over flush onto the conical part below the thrust plate (1.3), and ahead of the compressible section (1.2) its diameter is stepped down and the resulting smaller diameter is after the compressible section (1.2) still reduced by a conical passage to the diameter of the expansion section (1.4).

8. Method of mounting of the dowel according to Claim 1, **characterized in that**

- in the alternative of surface embedding of the thrust plate (1.3) into isolation the shank (1.1) of the dowel (1) is inserted into a pre-drilled hole (7) in isolation (4) and wall (5) so deep that the thrust plate (1.3) rests on the surface of insulation (4) and the expanding section (1.4) is situated in the wall (5), then an expanding element (2, 2′, 2′′) is driven or hammered so that the surface of the thrust plate (1.3) is brought in flush with the surface level of the insulation (4).

- in the alternative of deep embedding of the thrust plate (1.3) in the isolation panel (4) the shank (1.1) of the dowel (1) carrying a cutting-through element (3) is pushed into a pre-drilled hole (7) in insulation (4) and wall (5) so that the bottom (3.2) of the cutting-through element (3) rests on the surface of the insulating panel (4), then an expanding element (2, 2′, 2′′) is driven or hammered in so that the surface of the thrust plate (1.3) is embedded at least by the thickness of the plug (6) below the surface level of the insulating panel (4), whereupon the cavity above the thrust plate (1.3) is filled by a plug (6) made of insulation material identical with that of the insulation panel.

9. Method of mounting of the dowel according to Claim 1, **characterized in that** prior to screwing in the expanding element (2, 2′′) a mounting jig (8, 8′) is used for an accurate deep embedding of the thrust plate into the insulating panel.

10. A mounting jig for implementation of the method of mounting according to Claim 9, **characterized in that** it consists of a stem (8.1) for clamping in an electric screwdriver, having a rest surface (8.5), with a spacer (8.2), a support plate (8.3) and ending by a tang (8.4), while the jig is used for the alternative of surface embedding in a setup in which the part resting on the rest surface (8.5) of the stem (8.1) is the spacer (8.2), whereas for the alternative of deep embedding said jig is used in a setup in which the part resting on the rest surface (8.5) of the stem (8.1) is the support plate (8.3).

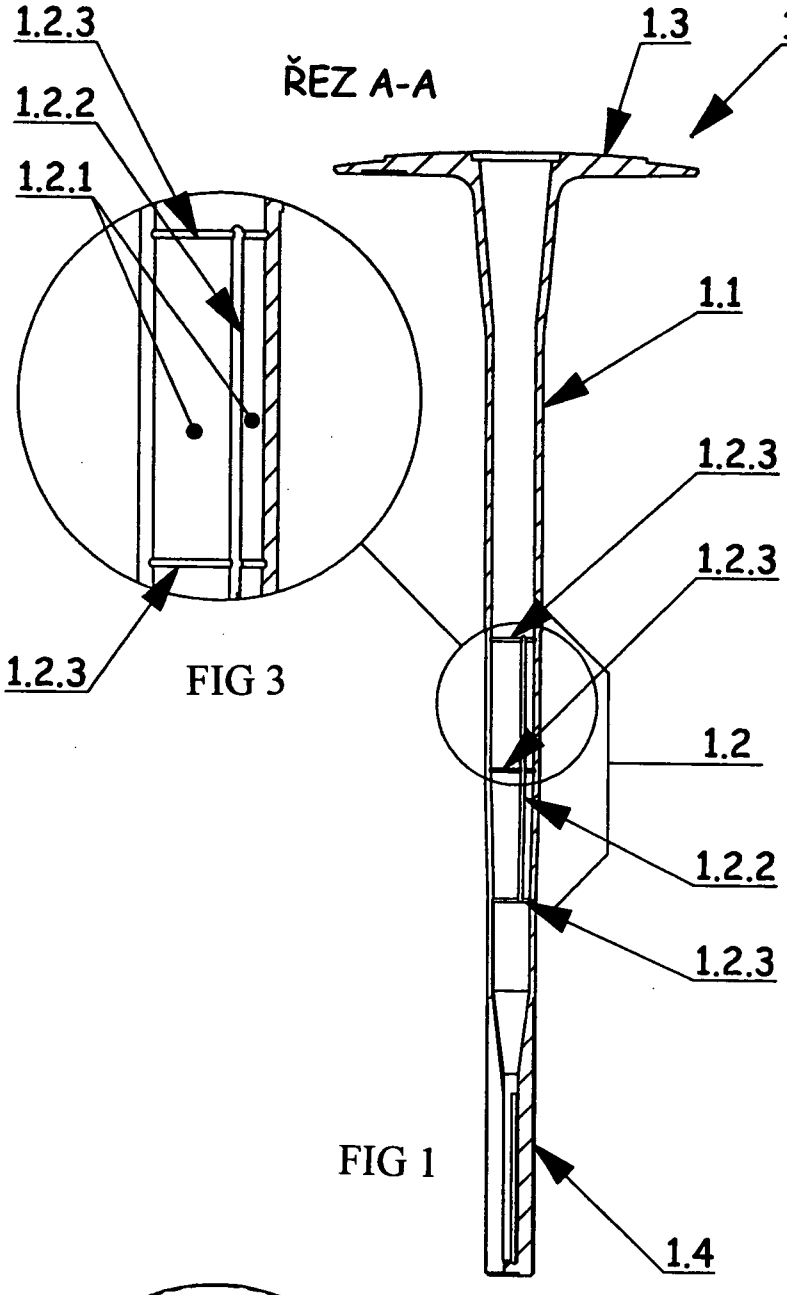

FIG 3

FIG 1

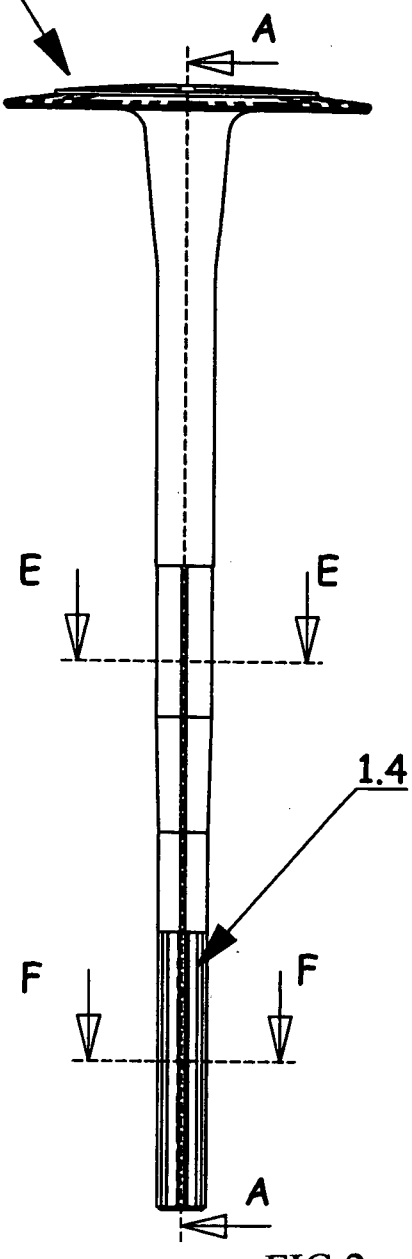

FIG 2

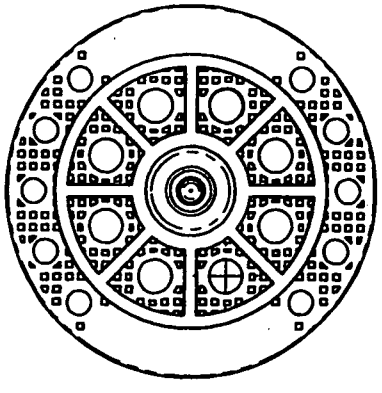

FIG 4

ŘEZ E-E

FIG 5

ŘEZ F-F

FIG 6

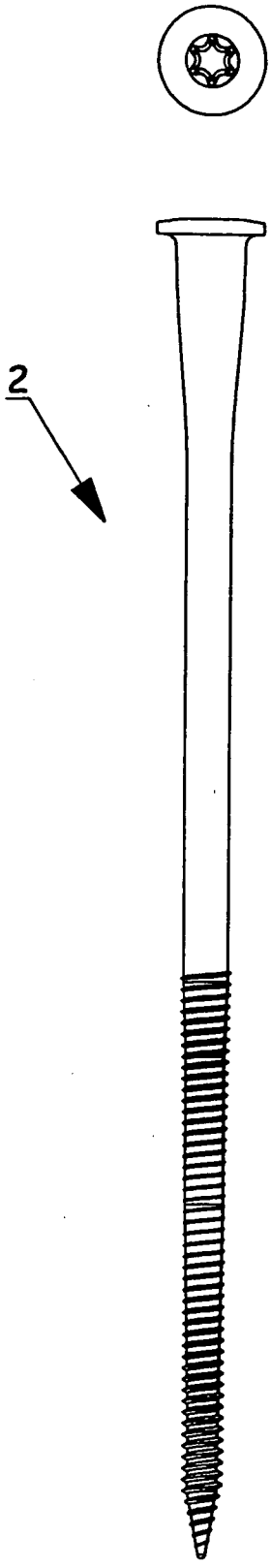

FIG 7

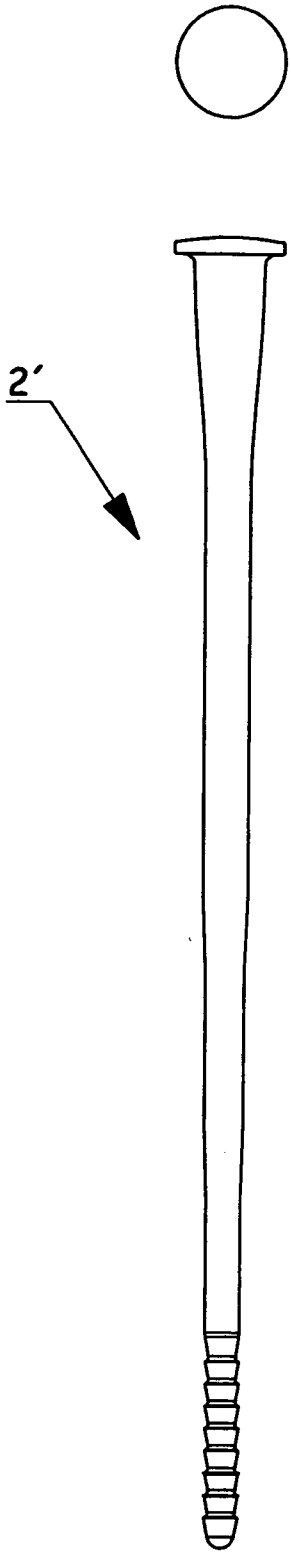

FIG 8

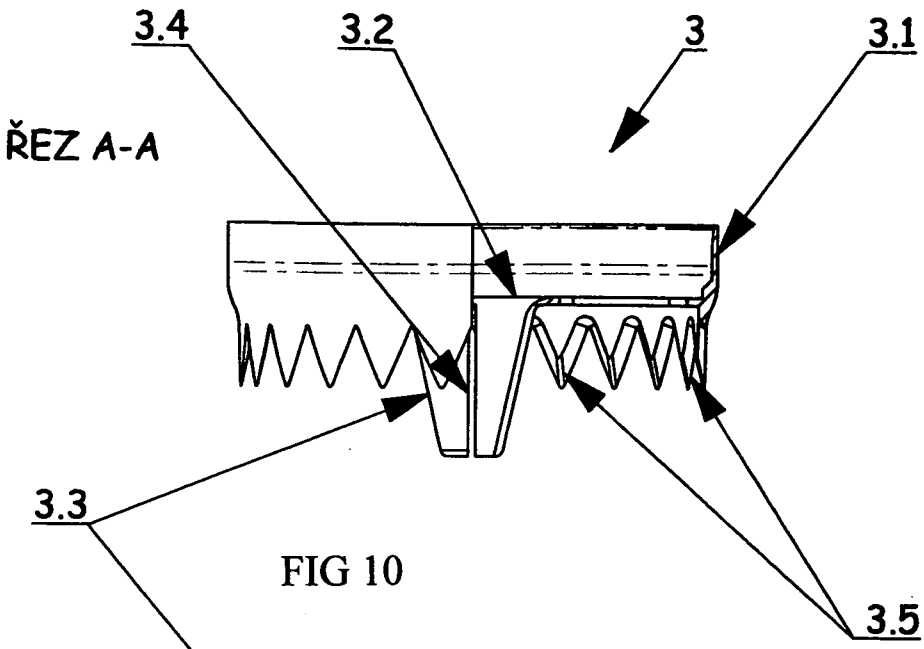

FIG 10

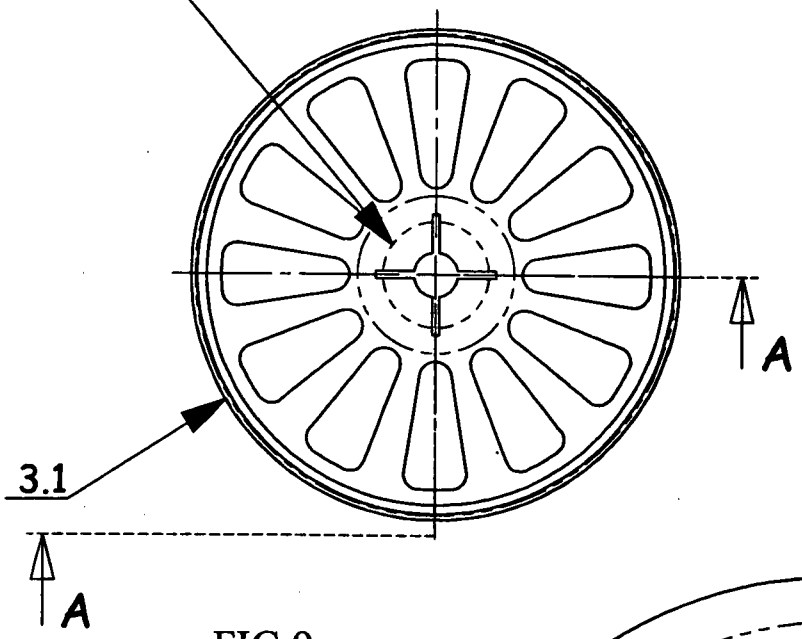

FIG 9

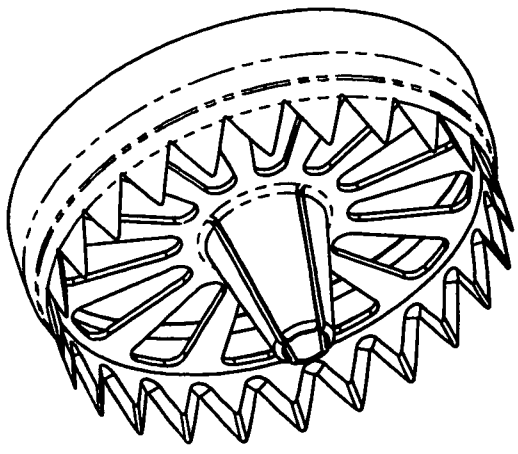

FIG 11

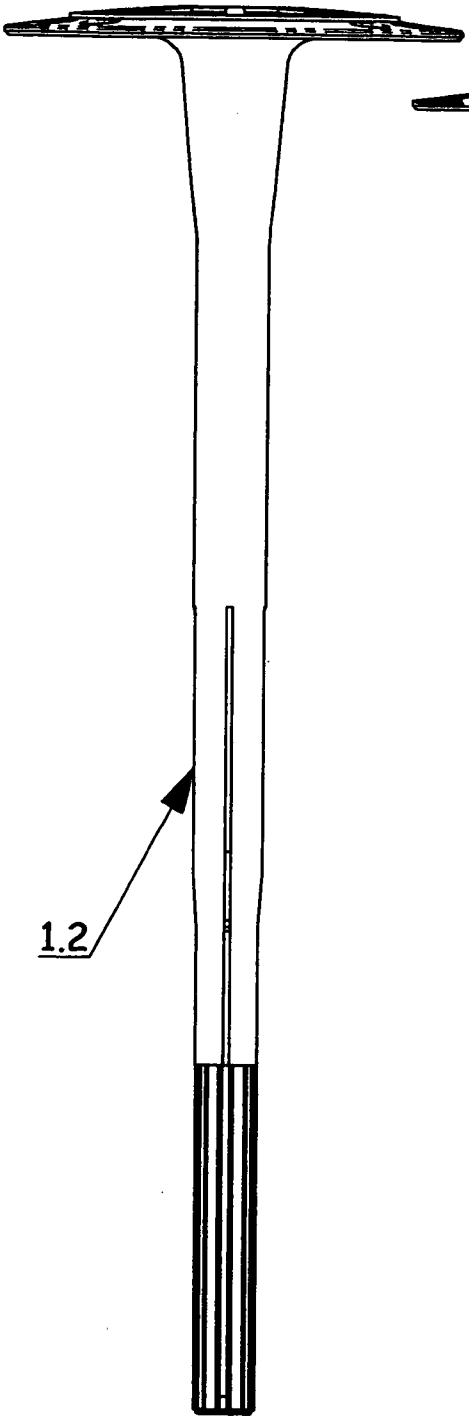

FIG 12

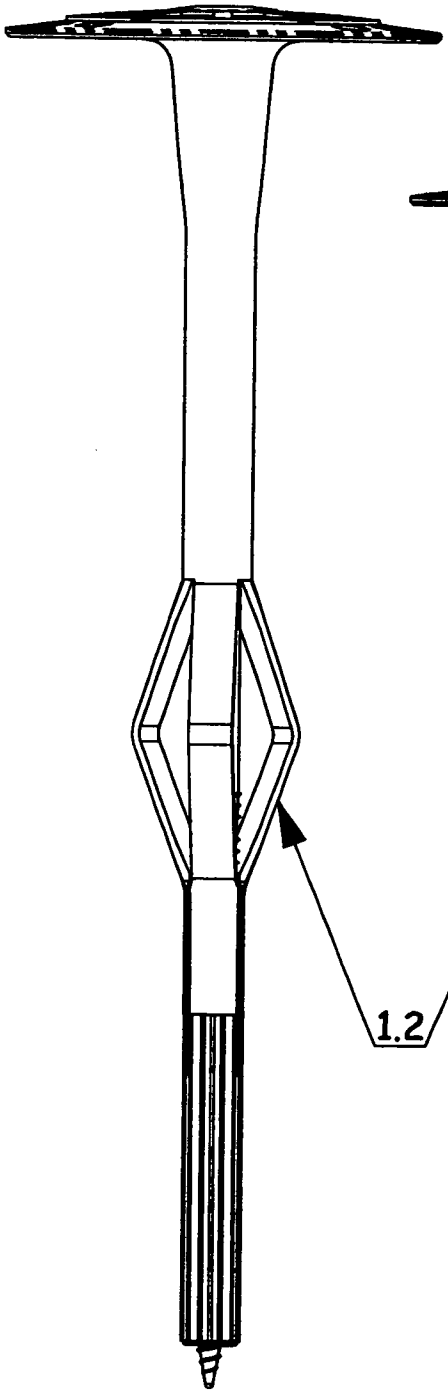

FIG 13

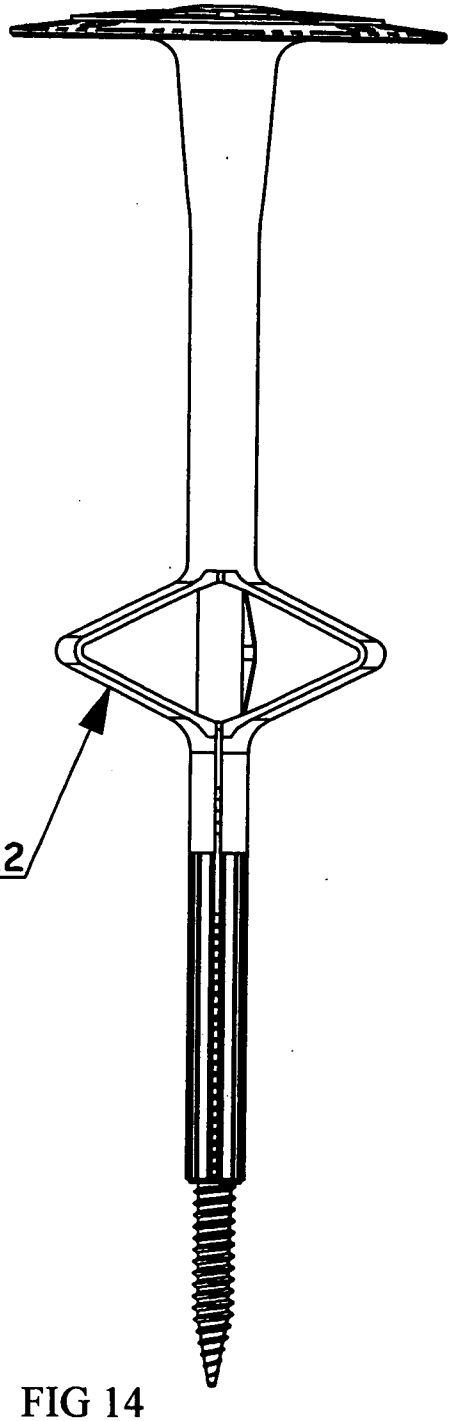

FIG 14

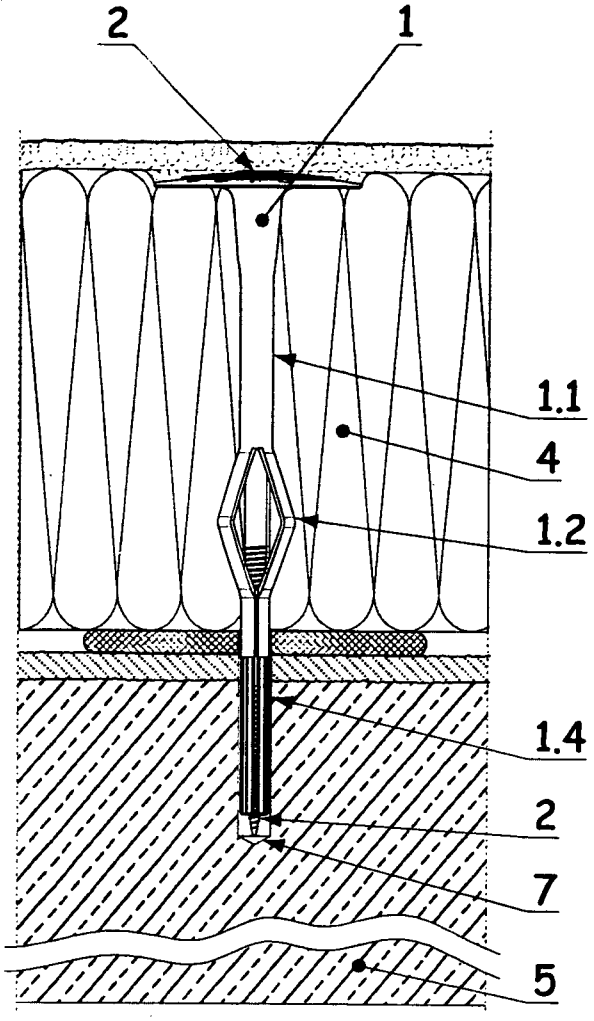

FIG 15

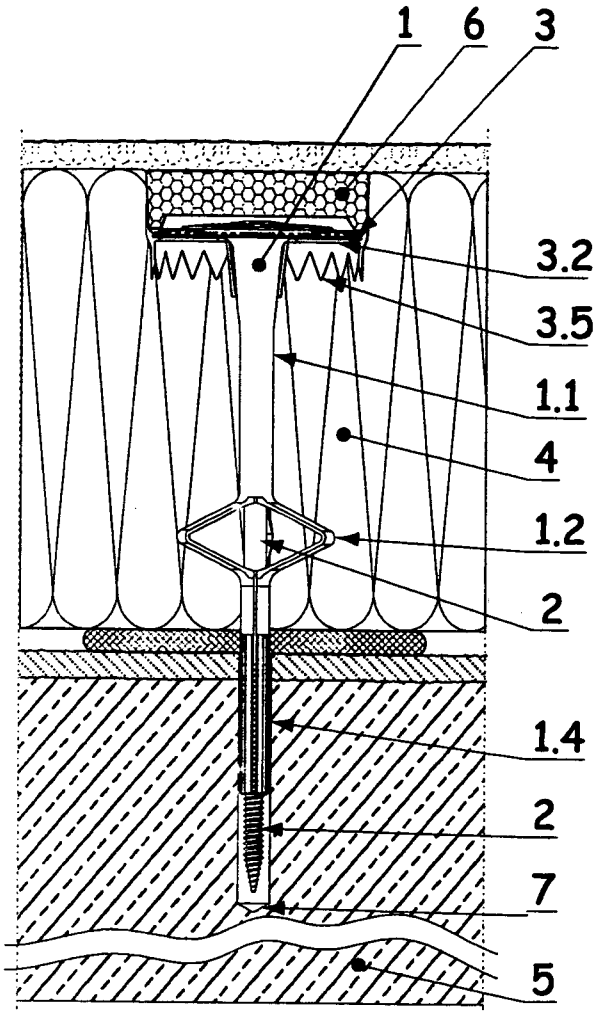

FIG 16

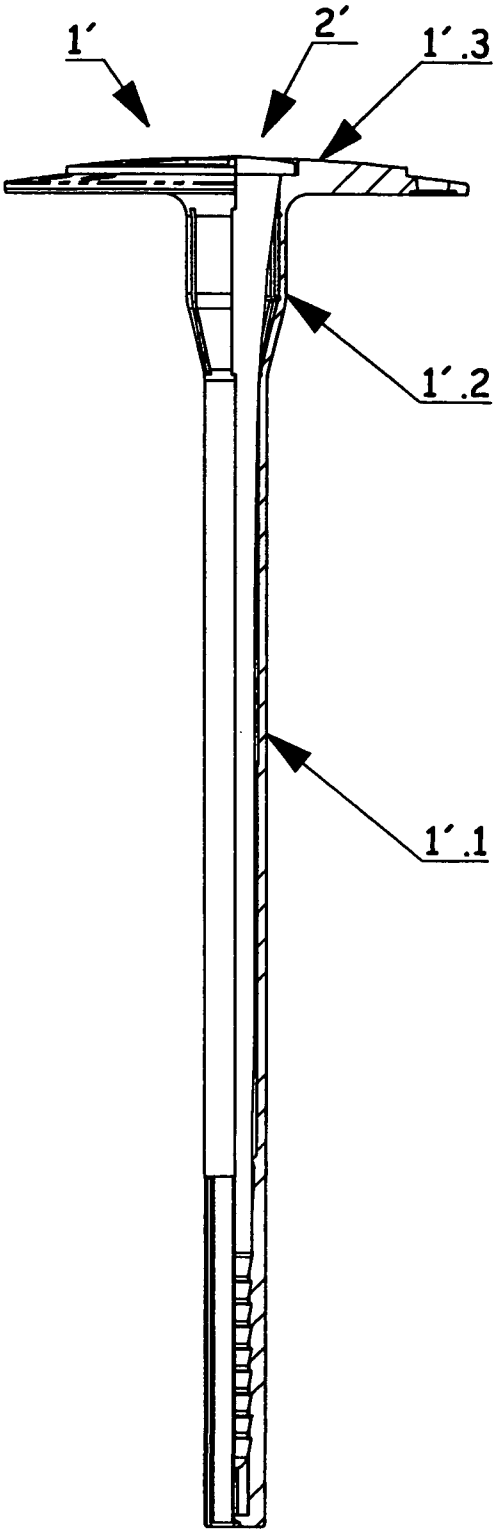

FIG 17

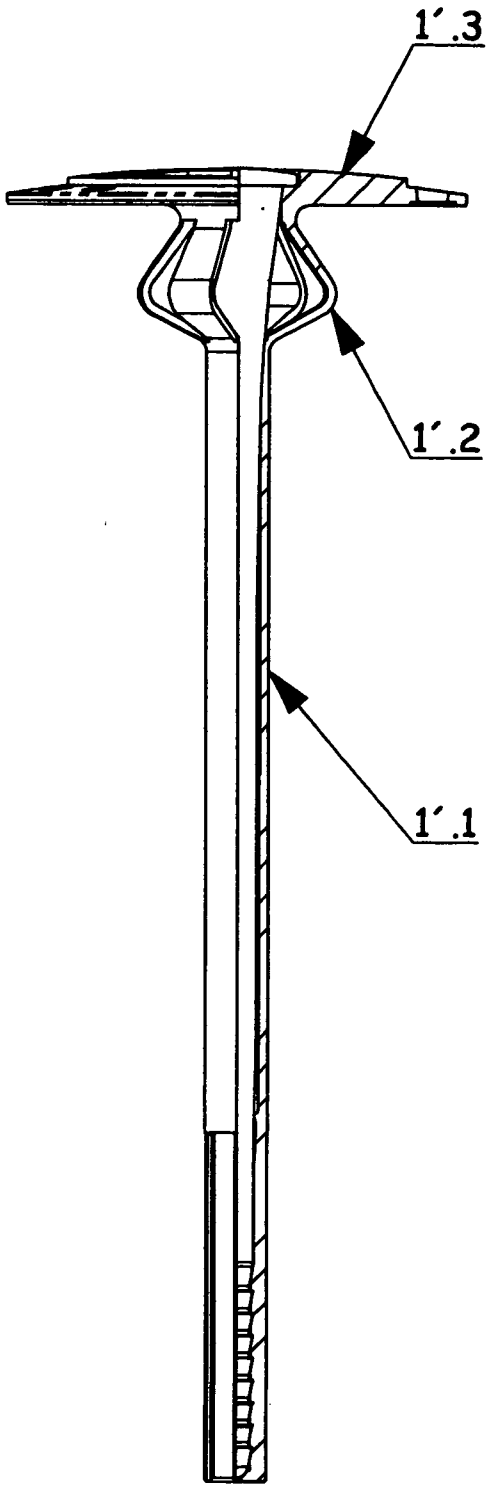

FIG 18

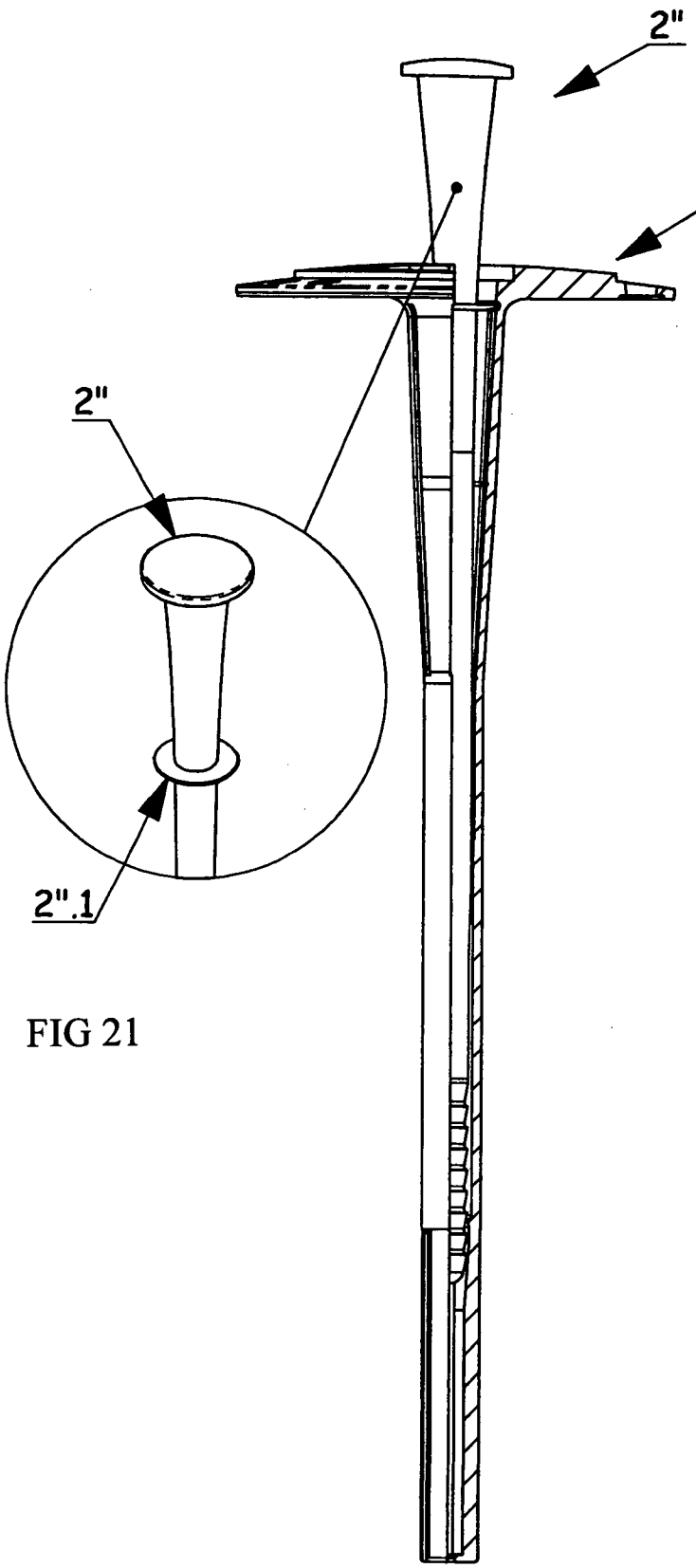

FIG 19

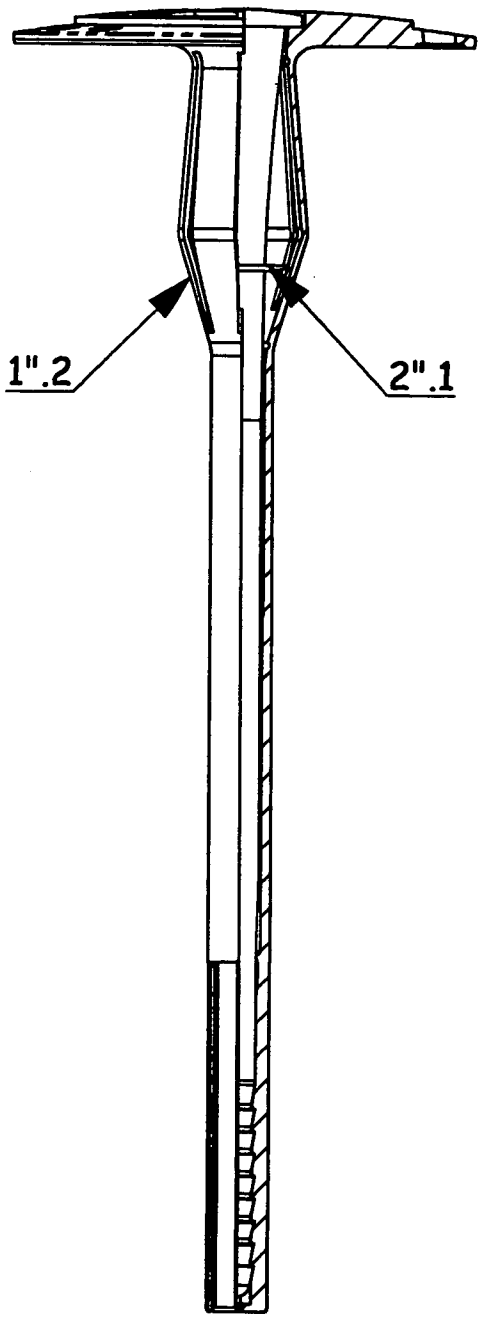

FIG 20

FIG 21

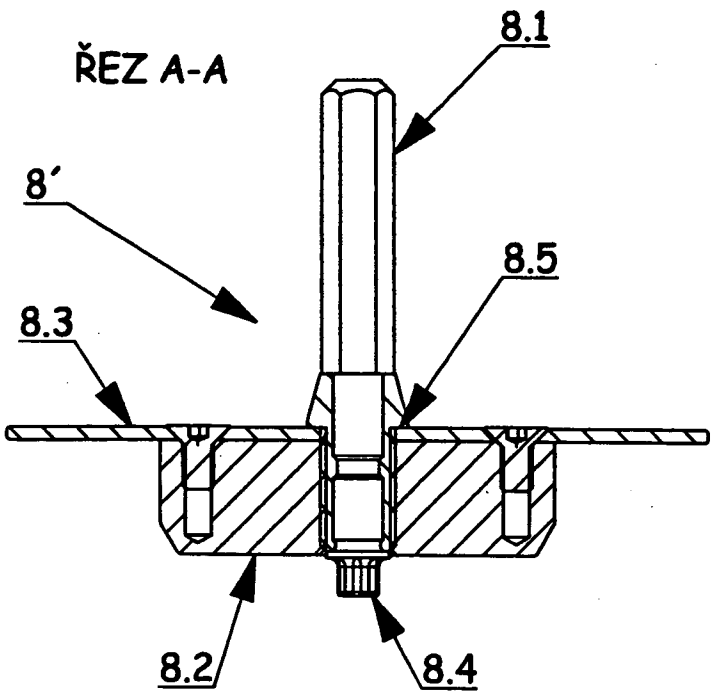

FIG 24

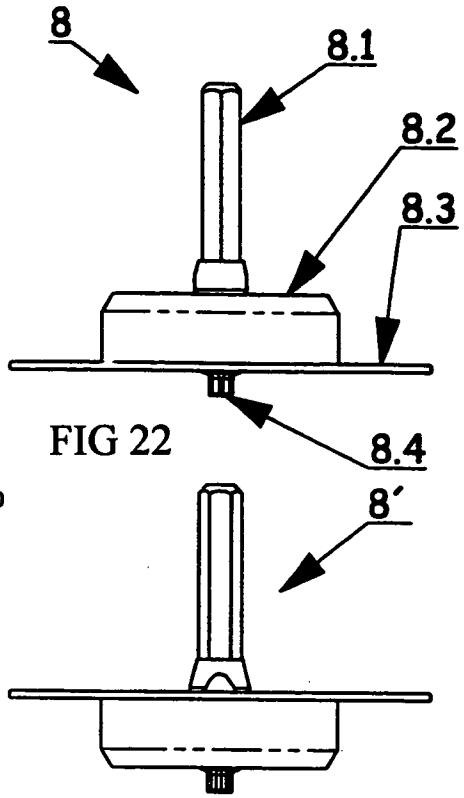

FIG 22

FIG 23

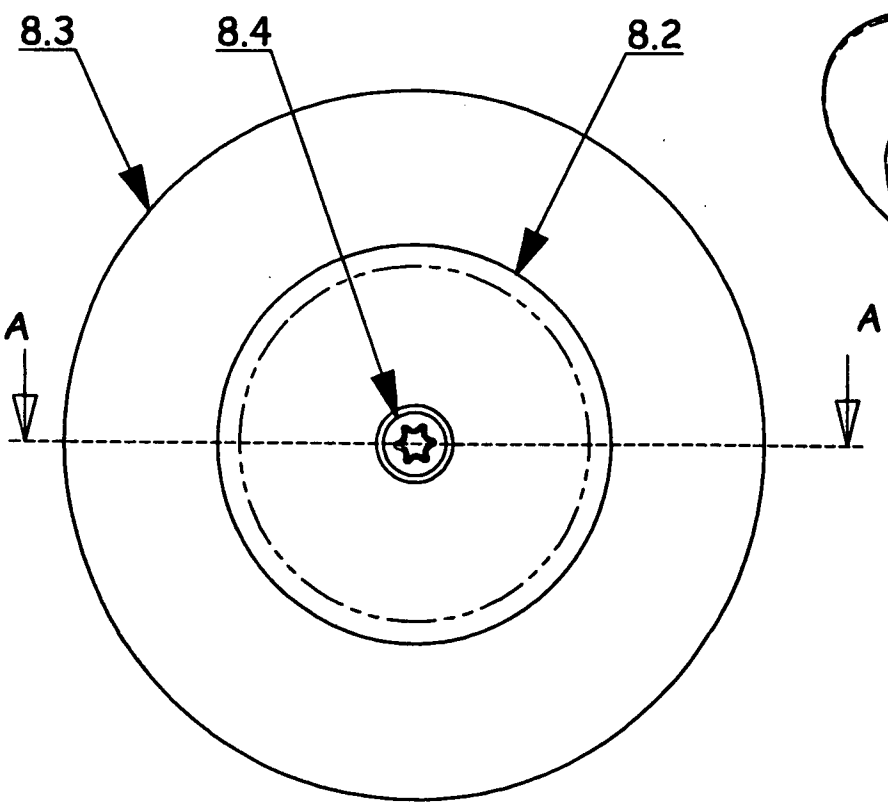

FIG 25

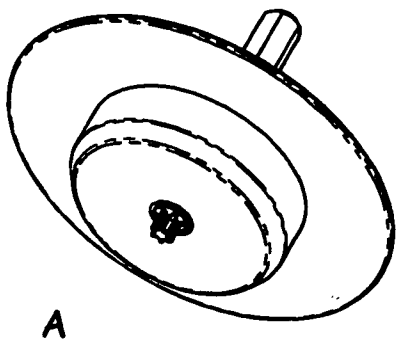

FIG 26

INTERNATIONAL SEARCH REPORT

International application No
PCT/CZ2010/000088

A. CLASSIFICATION OF SUBJECT MATTER
INV. E04F13/08 F16B13/04
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)
E04F F16B

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 practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 1 248 000 A1 (EJOT KUNSTSTOFFTECH GMBH [DE]) 9 October 2002 (2002-10-09) column 5, paragraph 23 - column 6, paragraph 25 column 7, paragraph 31; figures 1,5,11	1-10
Y	EP 0 288 023 A2 (TRURNIT FRIEDRICH GMBH CO KG [DE]) 26 October 1988 (1988-10-26) column 3, line 18 - line 49; figures 3,4	1-3,8
X	EP 1 818 477 A2 (RANIT BEFESTIGUNGSSYSTEME GMBH [DE]) 15 August 2007 (2007-08-15) column 6, paragraph 22; figure 7	10

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28 December 2010	07/01/2011

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Heinzler, Markus

INTERNATIONAL SEARCH REPORT

International application No
PCT/CZ2010/000088

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 1 318 250 A2 (EJOT KUNSTSTOFFTECH GMBH [DE] EJOT GMBH & CO KG [DE]) 11 June 2003 (2003-06-11) cited in the application column 8, paragraph 28 - column 10, paragraph 34; figures 4-9	1-10
A	DE 295 17 042 U1 (BREMKES PETER [DE]) 14 December 1995 (1995-12-14) cited in the application page 9, paragraph 2 - paragraph 4; figure 4	4

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/CZ2010/000088

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