(19) DANMARK

(10) DK/EP 2119920 T3

(12) Oversættelse af europæisk patentskrift

Patent- og Varemærkestyrelsen

(51) Int.Cl.: *F 16 B 13/08 (2006.01)* *F 16 B 13/00 (2006.01)*

(45) Oversættelsen bekendtgjort den: **2016-12-05**

(80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2016-08-17**

(86) Europæisk ansøgning nr.: **09160071.8**

(86) Europæisk indleveringsdag: **2009-05-12**

(87) Den europæiske ansøgnings publiceringsdag: **2009-11-18**

(30) Prioritet: **2008-05-14 IT TO20080359**

(84) Designerede stater: **AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK TR**

(73) Patenthaver: **ITW CONSTRUCTION PRODUCTS ITALY S.r.l. con Unico Socio, Viale della Regione Veneto, 5, 35127 Padova, Italien**

(72) Opfinder: **Kohan, Philippe, 10 Rue de la Victoire, 75009 Paris, Frankrig**
Lucon, Michele, Via Europa, 70, 35013 Cittadella, Italien

(74) Fuldmægtig i Danmark: **RWS Group, Europa House, Chiltern Park, Chiltern Hill, Chalfont St Peter, Bucks SL9 9FG, Storbritannien**

(54) Benævnelse: **Ekspansionsanker**

(56) Fremdragne publikationer:
EP-A1- 1 701 046
DE-A1- 3 921 733
DE-A1- 19 855 139
Anonymous: "Flexural strength testing of plastics", MatWeb, Material Propety Data , 6 August 2013 (2013-08-06), XP002710367, Retrieved from the Internet: URL:http://www.matweb.com/reference/flexur alstrength.aspx [retrieved on 2013-08-06]

DESCRIPTION

[0001] The present invention relates to an expansion anchor structured to fix a screw to a wall.

[0002] Specifically, the present invention relates to an expansion anchor, which is adapted to be engaged inside a hole obtainable in a wall and comprises a deformable tubular element in which a longitudinal through opening is obtained, capable of accommodating a fastening screw therein which is adapted in use to radially deform the anchor so as to increase the section thereof, so as to determine the locking of the anchor itself into the wall.

[0003] As known, the expansion anchors of the above-described type are integrally made of a homogenous plastic material, which is characterized by a particularly low rigidity so as to ensure sufficient deformability and flexibility to the tubular element.

[0004] Although on one hand, the anchor having a plastic material characterized by a low rigidity ensures a good radial expansion and an effective plastic deformation capable of conveniently allowing a good anchoring of the anchor itself into walls made of compact materials and/or walls having internal voids, on the other hand such a mechanical feature may prevent a correct, strong coupling of the screw onto the tubular element of the anchor.

[0005] Indeed, it often occurs that the progressive screwing of the screw into the longitudinal through opening of the anchor instead of causing a correct helical incision, i.e. a correct self-threading of the screw onto the internal wall of the anchor opening, determines a surface abrasion on the internal wall itself, particularly stressed on the head portion, thus causing an increase and damage of the internal section of the opening itself.

[0006] Therefore, in this case, in addition to becoming progressively uncoupled from the anchor, the screw is no longer capable of correctly and completely retracting the head portion of the tubular element towards its collar, thus causing an incomplete, ineffective anchoring of the anchor into the wall.

[0007] Furthermore, such an inefficiency is particularly highlighted when the anchor is fixed onto walls made of materials with low compactness and/or having an internal structure presenting voids. Indeed, in these circumstances, the retraction caused by the screw on the head of the anchor determines a deformation of the anchor inside the wall which originates an oversized expanded plastic knotting along the longitudinal axis. Such an oversized expanded plastic knotting serves the function of exerting a tightening torque on the screw so as to anchor it to the wall. However, the low rigidity of the plastic material of which the anchor is made often determines a tightening torque by the plastic knotting on the screw, which may be insufficient to ensure a correct anchoring of the anchor to the wall.

[0008] Finally, in the expansion anchors made of a homogenous plastic material of the above-described type, the user can only partially perceive the complete, effective anchoring of the anchor to the wall.

[0009] DE 39 217 33 discloses an expansible fixing plug comprising a first and a second sleeves assembled one inside the other, wherein the inner sleeve is made of a soft material and the outer sleeve is made of hard material.

[0010] DE 198 551 39 discloses a two-material sleeve-form expansible fixing plug comprising: a plurality of expansion tongues extending in a longitudinal direction so as to surround a circumferentially closed expansion hole formed to receive an expansion screw for expanding said fixing plug and a number of expansion fingers embedded in a respective expansion tongue on a side thereof opposite from expansion hole. The expansion fingers consist of one material, whereas expansion tongues and dilation zones consist of another material.

[0011] EP 1 701 046 discloses an expansion anchor having longitudinal gaps and corresponding longitudinal edges of the expansion limbs having zigzag shape.

[0012] Therefore, it is the object of the present invention to provide an expansion anchor which, in addition to having a higher tightening torque on the screw, is capable of ensuring, on one hand, a high radial deformability of the tubular element and an effective, strong self-threading of the screw inside the anchor itself at the same time.

[0013] According to the present invention, an anchor is implemented as claimed in claim 1 and preferably, but not necessarily, in any one of the dependent claims.

[0014] The present invention will now be described with reference to the accompanying drawings, which illustrate a non-limitative

embodiment thereof, in which:

- figure 1 shows a perspective view of an expansion anchor made according to the dictates of the present invention;
- figure 2 is a first side view of the expansion anchor shown in figure 1;
- figure 3 is a second side view of the expansion anchor shown in figure 1;
- figure 4 shows a top view of the anchor shown in figure 1 on enlarged scale; and
- figure 5 shows the expansion anchor according to a longitudinal section I-I in figure 2 on an enlarged scale.

[0015] With reference to the accompanying drawings, numeral 1 indicates as a whole an expansion anchor, which is adapted to be engaged inside a hole (not shown) obtained on a wall (not shown) with its longitudinal axis A being coaxial to the axis of the hole itself and structured to accommodate a screw adapted to expand and deform the anchor so as to anchor it to the wall.

[0016] Anchor 1 essentially comprises a tubular body 2 which extends along the longitudinal axis A and has a shaped collar 3 at one end, so as to be arranged in abutment against the wall; a shaped head 4 at an opposite end, so as to be able to be arranged in the innermost part of the wall hole; and a central section 5 arranged between collar 3 and head 4.

[0017] Collar 3 is coaxial to the axis A and comprises an annular flange, which is adapted in use to be arranged in abutment on the external surface of the wall so as to ensure the correct longitudinal positioning of anchor 1 inside the hole of the wall.

[0018] Instead, as regards the head 4, it comprises a deformable body 6 having a substantially cylindrical shape and made of a first plastic material having a predetermined mechanical rigidity; and at least one rigid insert 7, which is integrated in the deformable body 6 and is made of a second plastic material having a mechanical rigidity higher than the mechanical rigidity of the deformable body 6 itself.

[0019] More in detail, the first plastic material of which the deformable body 6 is made, has a mechanical rigidity characterized by a flexural modulus having a value higher than about 1500 Mega-Pascal and lower than 3000 Mega-Pascal; while the second plastic material of which the rigid insert 7 is made, has a mechanical rigidity characterized by a flexural modulus having a value higher than 3000 Mega-Pascal.

[0020] In the example shown in figures 1, 3, 4 and 5, the deformable body 6 of head 4 of anchor 1 comprises two longitudinal rigid inserts 7, which are firmly integrated in the deformable body 6 preferably, but not necessarily in diametrically opposite positions.

[0021] The deformable body 6 of the head 4 has a substantially cylindrical portion 6a firmly fixed to the central section 5 and a substantially truncate-conical end portion 6b, while each longitudinal rigid insert 7 is defined by a rigid, substantially parallelepiped-shaped portion extending parallel to the axis A, preferably over the whole length of the deformable body 6, so as to at least partially cross portions 6a and 6b.

[0022] In the example shown in figure 1, each insert 7 comprises a rectangular tab which extends parallel to axis A, radially penetrates into the deformable body 6, and is embedded in the deformable body 6 itself so as to form a single body with the latter.

[0023] As regards the central section 5, it comprises a deformable, central cylindrical portion 8, which extends coaxial to axis A and is made of the first plastic material; and at least one pair of rigid, anti-rotation fins 9 which extend parallel to the axis A and are made of the second plastic material.

[0024] Specifically, the deformable, central cylindrical portion 8 has an external, substantially toothed surface and has at least one pair of through slots 10 and 11 which extend along a direction which is substantially parallel to the axis A according to a substantially zigzag profile, wherein a first slot 10 has a progressively increasing pitch from the collar 3 towards the head 4, while the second slot 11 has a pitch progressively decreasing from the collar 3 towards the head 4 itself.

[0025] Instead, as regards the rigid anti-rotation fins 9, they extend parallel to one another on a plane which is substantially orthogonal to the laying plane of the slots 10 and 11 over the whole length of the central cylindrical portion 8 and are shaped so as to have a substantially saw-tooth-shaped upper edge.

[0026] In the example shown in figures 1 and 3, each rigid fin 9 is shaped so as to have a main ridge 12, which is parallel to axis

A, which extends so as to protrude outwards from the face of the central cylindrical portion 8, and a series of transversal reinforcing segments 13, which are fixed to the face of the central cylindrical portion 8 and which extend orthogonal to the main ridge 12 being spaced from one another.

[0027] Anchor 1 further comprises two reinforcing rings 14 and 15 made of the second plastic material, in which a first reinforcing ring 14 coats one end of the central section 5 and is arranged in a position adjacent to the collar 3, while the second reinforcing ring 15 is also arranged coaxial to axis A and at least partially coats the head 4.

[0028] Specifically, the first reinforcing ring 14 comprises a cylindrical tubular portion having a preferably, but not necessarily smooth external surface, which extends between the ends of slots 10 and 11 and the collar 3, and four anti-rotation protrusions 16 arranged in pairs on two orthogonal planes, each having a substantially saw-tooth-shaped profile. In this case, two anti-rotation protrusions 16 are defined by a longitudinal extension of the anti-rotation fins 9 which is firmly fixed to the reinforcing ring 14.

[0029] Instead, as regards the second reinforcing ring 15, it comprises a cylindrical tubular portion, which is firmly fitted on the portion 6a of head 4 and has a preferably but not necessarily smooth external surface. More in detail, the second reinforcing ring 15 comprises at least one pair of anti-rotation protrusions 18 arranged parallel to the rigid fins 9, each of which is defined by a radial outward extension of a corresponding insert 7.

[0030] From the above description, it is worth specifying that the second reinforcing ring 15 which coats the head 4, is structured to conveniently control the deformation which is created on the anchor 1 under the bias of the screw being inserted and screwed, while the first reinforcing ring 14 serves the function of conveniently preventing the longitudinal opening caused by the extension of slots 10 or 11 towards the collar 3.

[0031] In other words, during the penetration of the screw into anchor 1, the first reinforcing ring 14 conveniently blocks the formation of longitudinal breaking lines between the slots 10 or 11 and the collar 3, as it is particularly rigid, while the second reinforcing ring 15 limits the radial deformation of the screw 4, and thus increases the screwing strength of the screw by originating a conveniently high tightening torque on the screw.

[0032] Furthermore, from the above description, it is worth specifying that the first 14 and second 15 reinforcing rings are connected to each other by means of the anti-rotation fins 9 and conveniently define a stiffening structure 20 of anchor 1 therewith.

[0033] In detail, the stiffening structure 20 of anchor 1 confers a relatively high rigidity to the anchor along the longitudinal axis A, which conveniently allows the user to push and/or drive the anchor 1 into the hole in the wall without causing any permanent deformation to the anchor 1 itself during the step of inserting, i.e. before screwing the screw therein.

[0034] A through opening 19 is also obtained in the body of anchor 1, which opening extends coaxial to the axis A in order to accommodate the shank of a fastening screw (not shown) and has a preferably but not necessarily cross-shaped transversal section with respect to axis A.

[0035] In use, when the fastening screw is screwed into the through opening 19 of the anchor 1, the end segment thereof internally cuts and progressively crosses the central section 5 to reach the inner part of head 4.

[0036] During this step, the central cylindrical portion 8 expands radially inside the hole under the bias of the screw and the rigid anti-rotation fins 9 are driven into the internal wall of the hole, thus preventing the rotation of anchor 1 about the longitudinal axis A.

[0037] Furthermore, during this step, because the screw is progressively screwed into the central cylindrical portion 8 made of the first plastic material, the user perceives a particularly low tightening torque.

[0038] Instead, when the thread of the screw cuts the deformable body 6 and the rigid inserts 7 of the head 4, the latter generates a tightening torque on the screw which is higher than the tightening torque exerted by the anchor during the previous step. The tightening torque increase on the screw is detected by the user which thus recognizes the condition of penetration of the screw thread into the head 4 of anchor 1.

[0039] By progressively cutting into the internal wall of the deformable body 6 and the rigid inserts 7 themselves, the thread of the screw starts retracting the head 4 towards the collar 3, thus completing the radial expansion of anchor 1.

[0040] Specifically, if the anchoring wall of anchor 1 has an internal structure having voids or gaps, the expansion/deformation of the anchor 1 inside the wall itself originates an expanded plastic knotting of the anchor 1 itself which is developed along the longitudinal axis A.

[0041] Specifically, the knotting of anchor 1 along the longitudinal axis A ends when the central body 5 is completely wound about the shank of the screw, and/or when anchor 1 completely rests on the inner faces of the wall gaps. During this step, the resting and compression exerted by the wall on the anchor 1 determines a contrast force thereon which conveniently opposes the retraction, caused by the screw, of head 4 from the hole present on the wall.

[0042] It is worth specifying that during this step, the presence of rigid inserts 7 on the head 4 determines the generation of a high tightening torque on the screw, which blocks the screwing of the same in the maximum tightening position, thus offering a highly efficient anchoring of the anchor which opposes the extraction from the hole.

[0043] It is worth specifying that the second reinforcing ring 15 determines a further increase of the tightening torque exerted by the anchor 1 on the screw.

[0044] Additionally, the presence of the first reinforcing ring 14 prevents the central body 5 under knotting and resting condition of the inner face of the wall from damaging the wall itself due to an excessively high compression, if the latter is made of light, not very compression-resistant materials, such as for example plasterboard walls.

[0045] The above-described anchor has many technical advantages.

[0046] Firstly, the rigid insert 7 on the deformable body 6 of the head 4 ensures a highly effective coupling of the screw on the anchor, while the deformability of the deformable body 6 of the head 4 itself conveniently allows to use different-type and diameter screws. Indeed, if on one hand the deformable body 6 promotes the engagement of screws with variously sized sections, by virtue of its low rigidity, on the other hand the rigid insert 7 ensures a more effective, strong coupling of the screw on the head 4 of the anchor, by virtue of its higher rigidity.

[0047] Specifically, the high rigidity of the plastic material of the inserts determines the formation of an internal thread when the screw self-threads on the anchor, which has a high resistance to stresses to which the head itself is subjected during the expansion and/or deformation/knotting steps of the anchor. Such a resistance indeed allows to tighten the screw, when completing the anchoring, with a higher tightening torque than that of the known anchors.

[0048] Additionally, the construction of anti-rotation fins 9 and anti-rotation protrusions 16 made of the second plastic material determines an increase of the contrast to anchor rotations, even when the holes are made in walls having void gaps and/or made of crumbly material, such as for example plasterboard walls.

[0049] Furthermore, the implementation of the first reinforcing ring made of the second plastic material prevents the formation of longitudinal facture lines which determine the breakage and surface deformation of the anchor and therefore the surface damaging of the wall.

[0050] Finally, by virtue of the zigzag profile of the slots, it is impossible for the screw itself to cross the slots when the user inserts the screw into the anchor in a position being not coaxial with axis A.

[0051] It is finally apparent that changes and variations may be made to the anchor described and illustrated herein without therefore departing from the scope of the present invention as defined in the accompanying claims.

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- DE3921733 [0009]
- DE19855139 [0010]
- EP1701046A [0011]

Patentkrav

1. Ekspansionsanker (1), der omfatter et rørformet legeme (2), der strækker sig langs en længdeakse (A) og er konstrueret således, at det har et hoved (4) ved den ene ende, der er indrettet til at at komme i indgreb inden i et hul, der er tilvejebragt i en væg; hvilket hoved (4) omfatter et deformerbart legeme (6), der er fremstillet af et første plastmateriale, der har en på forhånd fastlagt mekanisk stivhed, og i det mindste én langsgående stiv indsats (7), der er integreret fast i det deformerbare legeme (6) og er fremstillet af et yderligere plastmateriale, der har en højere mekanisk stivhed end den mekaniske stivhed af plastmaterialet af det deformerbare legeme (6) selv,
hvilket rørformet legeme (2) omfatter en krave (3) og en deformerbar central cylindrisk del (8), der strækker sig koaksialt i forhold til aksen (A) mellem hovedet (4) og kraven (3) og er fremstillet af det første plastmateriale,
hvilket anker er kendetegnet ved, at det rørformede legeme (2) omfatter:
en første forstærkningsring (14), som er fremstillet af det yderligere plastmateriale, og som er placeret mellem den deformerbare centrale cylindriske del (8) og kraven (3) for at belægge den ene ende af den centrale cylindriske del (8);
en yderligere forstærkningsring (15), der er fremstillet af det yderligere plastmateriale og i det mindste delvist belægger det deformerbare legeme (6) på hovedet (4);
i det mindste et par af stive, antirotations-ribber (9), der strækker sig parallelt med længdeaksen (A) og er fremstillet af det yderligere plastmateriale; hvilke stive antirotations-ribber (9) er anbragt fast på den første (14) og den yderligere forstærkningsring (15).

2. Anker ifølge krav 1, ved hvilket hovedet (4) omfatter to langsgående stive indsatser (7), der er integreret fast i det deformerbare legeme (6) og i det mindste delvist trænger igennem det deformerbare legeme (6), således at de strækker sig inden i dette langs en i det væsentlige radial retning i

forhold til aksen (A).

3. Anker ifølge krav 2, ved hvilket den i det mindste ene stive indsats (7) omfatter en flig, der er indlejret i det deformerbare legeme (6), således at den udformer et enkelt legeme sammen med sidstnævnte.

4. Anker ifølge et hvilket som helst af de foregående krav, ved hvilket det deformerbare legeme (6) omfatter et første i det væsentlige cylindrisk legeme (6a) og en yderligere i det væsentlige afskåret konisk endedel (6b); hvor hver enkelt langsgående stive indsats (7) er defineret af en i det væsentlige rektangulær flig, der strækker sig parallelt med aksen (A), således at den i det minste delvist skærer den første (6a) og den yderligere (6b) del.

5. Anker ifølge krav 1, ved hvilket den deformerbare, centrale cylindriske del (8) er forsynet med i det mindste et par af langsgående gennemgående udsparinger (10, 11), der strækker sig langs en retning, der er i det væsentlige parallel med længdeaksen (A) i henhold til en i det væsentlige zigzag-formet profil.

6. Anker ifølge krav 5, ved hvilket en første udsparing (10) har en første hældning, der tiltager progressivt fra kraven (3) og hen mod hovedet (4), mens en anden udsparing (11) har en hældning, der aftager progressivt fra kraven (3) og hen mod selve hovedet (4).

7. Anker ifølge krav 1, ved hvilket hver enkelt stive ribbe (9) er formet således, at den har en hovedkant (12), der forløber parallelt med længdeaksen (A), og en række af tværgående forstærkningssegmenter (13), der er fastgjort på den udvendige overflade af den cylindriske del (8) og strækker sig vinkelret på hovedkanten (12).

8. Anker ifølge et hvilket som helst af de foregående krav, ved hvilket den deformerbare, centrale cylindriske del (8) har

en i det mindste delvist takket udvendig overflade.

9. Anker ifølge et hvilket som helst af de foregående krav, ved hvilket det første plastmateriale har en mekanisk stivhed, der er kendetegnet ved et bøjningsmodul, der er større end omtrent 1500 megapascal og mindre end 3000 megapascal.

10. Anker ifølge et hvilket som helst af de foregående krav, ved hvilket det yderligere plastmateriale har en mekanisk stivhed, der er kendetegnet ved et bøjningsmodul, der er større end 3000 megapascal.

11. Anker ifølge krav 5, ved hvilket den første forstærkningsring (14) omfatter en cylindrisk rørformet del med en glat udvendig overflade, der strækker sig mellem enderne af udsparingerne (10) (11) og kraven (3), og fire antirotations-fremspring (16), der er placeret i par på to vinkelrette planer og har en i det væsentlige savtandformet profil.

12. Anker ifølge krav 4, ved hvilket den yderligere forstærkningsring (15) omfatter en cylindrisk rørformet del, der er anbragt fast på delen (6a) på hovedet (4), og i det mindste et par af antirotations-fremspring (18), der er placeret parallelt med de stive ribber (9), defineret af en radialt udvendig udstrækning af en tilsvarende indsats (7).

DRAWINGS

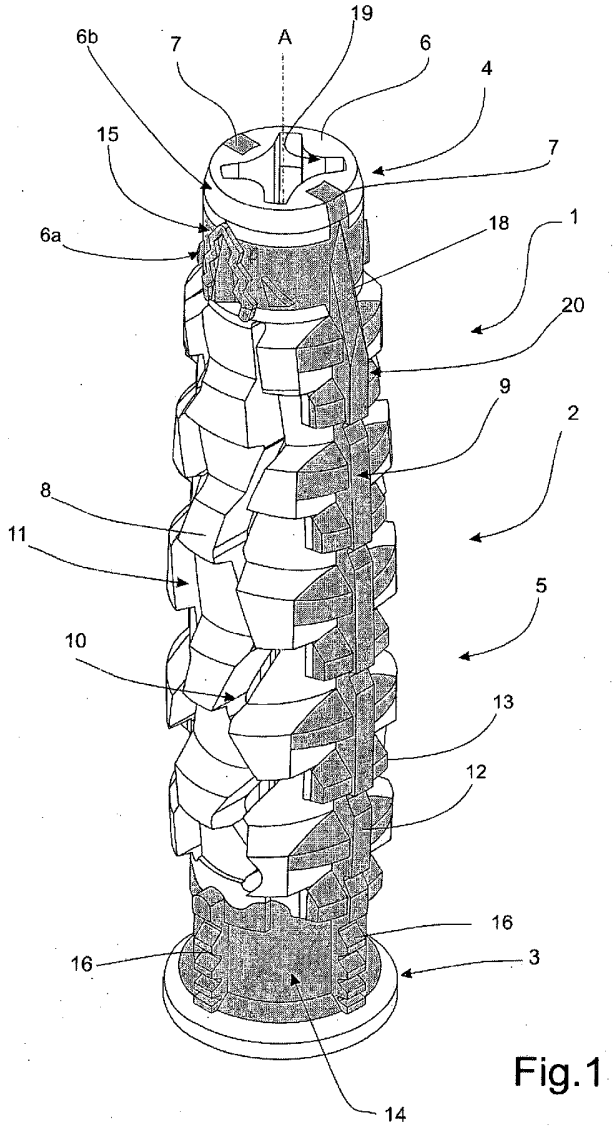

Fig.1

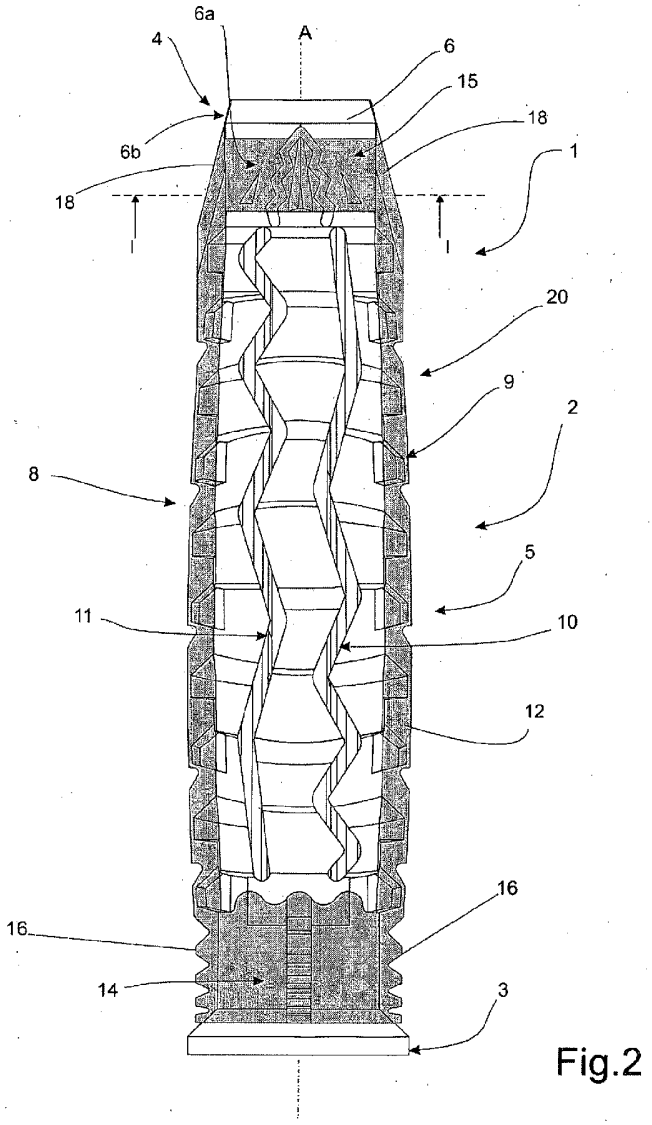

Fig.2

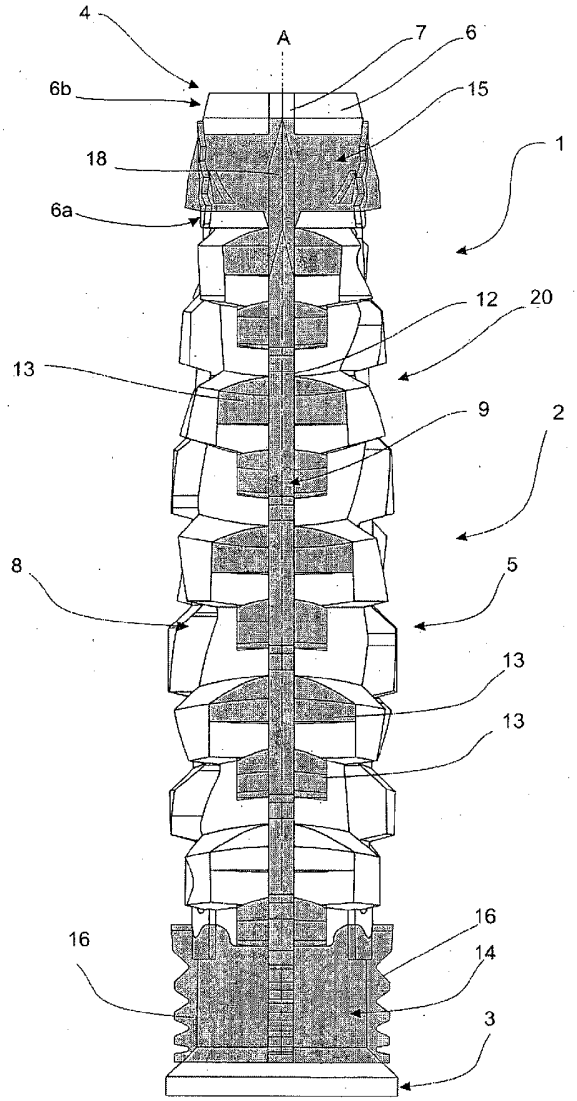

Fig.3

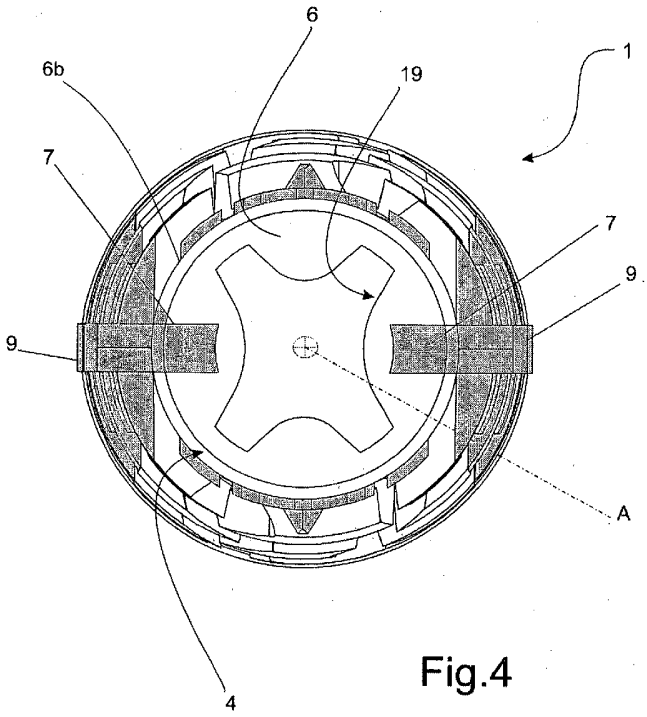

Fig.4

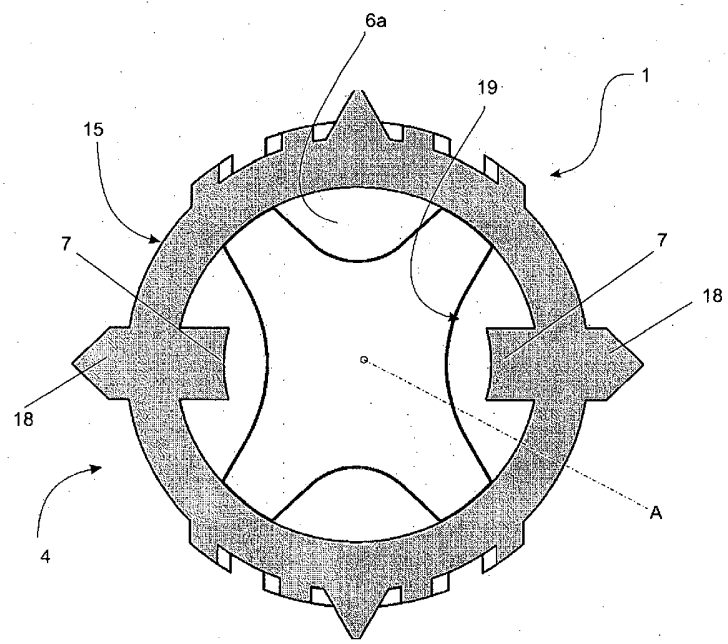

Fig. 5