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(54) **Heating resistor with ionising device, in particular for hairdryers and similar machines**

Heizwiderstand mit Ionisierungsvorrichtung, insbesondere für Haartrockner und ähnliche Maschinen

Résistances de chauffage avec dispositif d'ionisation, en particulier pour des sèche-cheveux et machines similaires

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Description

[0001] The present invention relates to a ionising device, to be used for enriching air flows with ions, and in particular hot air flows coming from hairdryers, hand-dryers or similar devices.

[0002] It is known that creation and admission of electrically charged particles into an air flow enables exploitation of different advantages in terms of air treatment and treatment of the objects that are impinged on by such an air flow.

[0003] In particular, application of a given amount of ions to a hot air flow coming from a hairdryer enables better results to be obtained on the hair in terms of drying and "tidiness", mainly due to the fact that the electrostatic charges carried by the hot air flow carry out neutralisation of the charges present on the hair thus reducing the mutual adhesion degree and therefore promoting hair stretching during drying (and ultimately preventing formation of tangles, frizzy hair and so on).

[0004] More generally, the beneficial effects of ions in the air consist in sanitation and neutralisation of the polluting agents and smells, as well as in bringing physical welfare to users of apparatuses such as hand-dryers, hairdryers or similar devices.

[0005] A hairdryer with an electric heating resistor and an ionising device according to the preamble of claim 1 is disclosed in EP 1 527 709 A. Generally, creation and subsequent admission of ions into the hot air flow are obtained through a suitable ionising device that is usually made up of a "tip" or "peak" placed to a given potential difference relative to a reference pole (generally a 3000 volt voltage is used) and positioned within the hairdryer's heating resistor: based on the well known electrical phenomenon of "dispersion of the tips", the electrical potential generates a series of charged particles in the vicinity of this tip, which particles are then carried by the hot air flow.

[0006] While the above described known art has been widely used in different application variants, it however has some drawbacks, above all in terms of density of the charge generated in the hot air flow.

[0007] In fact, the different "tip" geometries presently known often are not able to generate a sufficient amount of ions, due both to a too low voltage (that at all events cannot overcome a given threshold, beyond which production of ozone starts) and to the fluid-dynamic conditions in which the tip itself is.

[0008] In other words, while generation of charged particles around the "tips" of known type occurs, either these charges are generated in an insufficient number or they are forced to follow a trajectory inside the air flow that leads them to "become exhausted" by impact against obstacles inside the heating instrument; in this manner the generated ions do not succeed in coming out of the heating instrument and actually they do not succeed in exerting any effect on the object that is being submitted to drying.

[0009] It is an aim of the present invention to manufacture a ionising device and a support equipped with such a ionising device and a heating resistor equipped with such a ionising device capable of obviating the above mentioned drawbacks.

[0010] In particular, the present invention aims at conceiving a ionising device generating a high amount of electrically charged particles and able to disperse them in the most efficient manner from a fluid-dynamic point of view in the hot air flow.

[0011] In parallel, the present invention aims at manufacturing a ionising device that can be easily and cheaply mounted on a wide range of supports for heating resistors, and is therefore able to define a heating resistor (for hairdryers, hand-dryers or the like) which is very efficient both in air heating and in air ionisation.

[0012] Finally, the present invention relates to creation of a ionising device of proved reliability, simple mounting a low production costs.

[0013] The foregoing and further aims are achieved by an electric heating resister with an ionising device in accordance with the present invention having the features recited in the appended claims and hereinafter illustrated in an embodiment thereof given by way of non-limiting example with the aid of the accompanying drawings, in which:

- Figs. 1 to 7 show perspective views of different alternative embodiments of the ionising device in accordance with the invention; and
- Figs. 8 to 12 show different alternative embodiments of heating resistors provided with the ionising device in accordance with the invention.

[0014] With reference to the drawings, an ionising device is generally denoted at 1 and it substantially comprises at least one dispersion tip 1 which is adapted to generate and disperse a predetermined amount of electrically charged particles in a flow (which flow in turn will typically be a hot air flow emitted by a hairdryer and the like, or more generally an air flow that is submitted to heating through a heating resistor); then suitable electric supply means 3 is present which connects the dispersion tip 12 to an electric energy source.

[0015] A potential reference body 4 is interposed between the dispersion tip 2 and the electric supply means 3, so as to amplify the electrostatic effect of ionic generation (or more generally the electrostatic effects linked to the electrostatic-potential difference between the dispersion tip 2 and the electric energy source).

[0016] Unlike known ionising devices that practically do not oppose any "electric mass" to the tip, the present invention provides an additional circuit element interacting with the dispersion tip so as to increase efficiency and homogeneity in producing electric charges in the air flow.

[0017] Depending on the amount of electric charges that are wished to be generated, the presence of several

dispersion tips 2 can be provided, as shown in the drawings for example; in these cases, each dispersion tip will have its respective extension axis, and preferably these extension axes will be mutually parallel.

[0018] These dispersion tips 2 are connected to the potential reference body 4.

[0019] Conveniently, the dispersion tip 2 is made of an electrically conductive material and has a tapering course defining a main extension axis 2a; at the same time, the potential reference body 4 is rigidly connected to the dispersion tip 2 and is therefore made of an electrically conductive material that is coincident with the material of the dispersion tip 2.

[0020] In other words, the dispersion tip 2 and the potential reference body 4 constitute a single piece which is then connected to the electric supply means 3.

[0021] With reference to the drawings, it is possible to see that the potential reference body 4 can be made according to different geometries, depending on current requirements but it must be always sized and positioned such as to exert the above described amplification effect.

[0022] In one of the possible embodiments herein illustrated, the potential reference body is a laminar body extending in a lying plane 4a substantially parallel to the main extension axis 2a and preferably containing the main extension axis 2a.

[0023] In addition, in another embodiment herein shown the potential reference body 4 is a laminar body extending in a lying plane 4a substantially transverse (and preferably perpendicular) to the main extension axis 2a.

[0024] The geometry of the potential reference body 4 can be of any type, provided it is a laminar body and has a sufficient surface for exerting the amplification effect of the electrostatic-charge generation underlying the present invention; conveniently, selection of the geometric figure to be given to the potential reference body also takes place based on the perturbing effect that is wished to be given to the hot air flow grazing said body under operating conditions.

[0025] With reference to the accompanying drawings, the potential reference body 4 is shaped like a polygon (that depending on current requirements can be a trapezium, a parallelogram or a rectangle and so on); in particular, at least one "base" of this polygon (the minor base of said trapezium, for example) is positioned adjacent to the dispersion tip 2, so as to support it; it is also to be noted that the dispersion tip 2 itself is connected to the potential reference body without a break.

[0026] In order to ensure the necessary structural and functional coherence, a support 5 is also present which comprises at least one thin sheet (that is generally made of a heat-resistant and/or electrically insulating material and, depending on current requirements, can also be coated with mica or another anti-static material); support 5 defines an orientation axis 5a and conveniently the dispersion tip 2 is mounted on this support 5 in a staggered configuration relative to the support 5 itself.

[0027] Positioning of the dispersion tip 2 is determined in such a manner that the fluid-dynamics of the air flow grazing the support can be exploited; in fact, staggering is such selected that the trajectories of the ions generated in the vicinity are capable of bringing the ions themselves to the outside of the heating device, and at the same time staggering is such selected that the dispersion tip 2 is not placed to an excessively perturbing position for the flow.

[0028] Should support 5 include two or more thin sheets intersecting at a central axis (which axis can be defined as a mid-line axis which is oriented along and is coincident with the orientation axis 5a), the dispersion tip 2 would be conveniently mounted in a staggered configuration relative to at least two contiguous faces of at least two thin sheets of support 5.

[0029] Consistently with the above described positioning criterion, the dispersion tip 2 (or dispersion tips, when more than one of them are present) has a minimum transverse staggering value relative to at least one thin sheet of support 5; this minimum staggering value is at least proportional to a speed profile of a flow on support 5 and/or to a distance from one end of support 5 placed downstream of the flow; according to particularly appreciable embodiments of the present invention, said minimum staggering value is most preferably included between 3 and 12 mm.

[0030] In order to find an optimal compromise between efficiency of dispersion of the electric charges and perturbation of the hot air flow, the dispersion tip 2 and/or the potential reference body 4 of the present device can have different configurations; for instance, the main extension axis 2a of the dispersion tip 2 can be parallel to the orientation axis 5a of support 5, while the lying plane 4a of the potential reference body 4 can be parallel or normal to the orientation axis 5a of support 5.

[0031] Still with reference to the accompanying drawings, in Fig. 12 it is possible to see an alternative embodiment of the present invention in which staggering of the different dispersion tips 2 (that at all events are connected without a break to a single potential reference body 4) is carried out by positioning the tips in a front area of support 5; in this way a geometric staggering is obtained both in a direction normal to the planes of the thin sheets constituting the support and along the orientation axis 5a.

[0032] Depending on current requirements, the alternative embodiment shown in Fig. 12 can be mounted within the relative heating apparatus in such a manner that the (individual) dispersion tip or the (multiple) dispersion tips are disposed "upstream" or "downstream" relative to the air flow.

[0033] It is also an aim of the present invention to provide an electric heating resistor, preferably to be used for heating hot air flows (and therefore suitable for installation in hairdryers, hand-dryers or similar machines); this heating resistor comprises:

- a support 5 made up of a predetermined number of

thin sheets (for instance, with reference to the attached drawings the support can comprise two thin sheets intersecting at 90°) which are preferably made of an electrically insulating material;

- at least one electric winding mounted on said thin sheets and designed to heat an air flow directed along an orientation axis 5a of the support; and
- at least one ionising device 1 mounted on the support and adapted to disperse a given amount of electrically charged particles in the air flow.

[0034] Still with reference to the accompanying drawings, it is possible to see that the ionising device can be only one, or a double ionising device can be present which is disposed either on opposite faces of the same thin sheet, or on opposite sides of the same face of a given thin sheet or also on adjacent faces of different thin sheets, depending on current requirements.

[0035] Mechanical connection between the ionising device is conveniently ensured through suitable connecting means 6 which depending on requirements can be of any type; for instance, with reference to the drawings this connecting means 6 consists of a rivet means passing through a suitable hole in a thin sheet constituting the support 5 and adapted to electrically connect the potential reference body 4 and/or the dispersion tip 2 to the electric supply means 3.

[0036] It is to be noted that the described rivet means enables very quick assembly of the whole heating resistor, and simultaneously perform two functions (structural coherence and electric continuity).

[0037] The invention enables achievement of important advantages.

[0038] First of all, the particular construction architecture of the ionising device, on the one hand, allows an efficient exploitation of the electric potential difference thereby generating much more electric charges (dispersed in the air) as compared with the structures of known type and, on the other hand, also allows these electric charges to be discharged in the hot air flow so that they can reach the hot air outlet in a great amount (i.e. without impacting against the filaments of the heating resistor or the walls of the support, or in any case against other inner surfaces of the heating instrument).

[0039] Secondly, the present invention can be easily configured both as to its position along the extension axis of the support/resistor, and as to the height for insertion into the flow, so that it is adaptable to a great variety of geometries and/or extensions of the heating resistors and/or the supports.

[0040] In addition, advantageously, the presence of ionising devices in a single heating-resistor support can be doubled or multiplied; in this manner there is an exponential increase in the ionic density of the hot air emitted by the heating instrument.

[0041] Finally, the present invention enables manufacture of the supports for heating resistors and manufacture of the heating resistors themselves to take place at low production costs, which will involve low sale prices.

Claims

1. An electric heating resistor, comprising:

- a support (5) comprising at least one thin sheet made of a heat resistant and/or electrically insulating material and extending along a main orientation axis (5a);
- at least one electric winding mounted on said thin sheets and designed to heat an air flow directed along the orientation axis (5a) of the support (5);
- at least one ionising device (1) mounted on the support (5) and comprising
- at least one dispersion tip (2) having a main extension axis (2a) parallel to the main orientation axis (5a) of the support (5) and adapted to generate and disperse a predetermined amount of electrically charged particles into said flow, and
- electric supply means (3) connecting said dispersion tip (2) to a source of electric energy,

characterised in that it further comprises a potential reference body (4) which electrically connects said dispersion tip (2) to said electric supply means (3) to amplify an electrostatic effect of ionic generation
; the reference body (4) being a laminar body extending in a lying plane (4a) and being mounted transversally on said support (5) so that the at least one dispersion tip (2) being mounted on said support (5) in a staggered configuration relative to the support (5).

2. An electric heating resistor as claimed in claim 1, wherein the dispersion tip (2) is made of an electrically conductive material and has a tapering course defining said main extension axis (2a), the potential reference body (4) being rigidly connected to the dispersion tip (2) and being preferably made of an electrically conductive material coincident with the material of the dispersion tip (2).

3. A resistor as claimed in claim 1 or 2, wherein the potential reference body (4) is a laminar body extending in a lying plane (4a) substantially parallel to, and containing the main extension axis (2a).

4. A resistor as claimed in claim 1 or 2, wherein the potential reference body (4) is a laminar body extending in a lying plane (4a) substantially transverse to, and preferably perpendicular to the main extension axis (2a).

5. A resistor as claimed in anyone of the preceding claims, wherein the potential reference body (4) is shaped like a polygon, said polygon preferably being a trapezium or a rectangle, at least one base of said polygon being adjacent to and supporting the dispersion tip (2) preferably without a break.

6. A resistor as claimed in anyone of the preceding claims, wherein the staggered configuration of **the** at least one dispersion tip (2) relative to the support (5) is a geometric staggering defined in a direction normal to the plane of the thin sheet constituting the support (5) and/or along the orientation axis (5a) of the support (5).

7. A resistor as claimed in claim 6, wherein the support (5) comprises two or more thin sheets intersecting at a central mid-line axis oriented along and coincident with the orientation axis (5a), the dispersion tip (2) being mounted in a staggered configuration relative to at least two contiguous faces of at least two thin sheets of the support (5).

8. A resistor as claimed in claim 6 or 7, wherein said at least one dispersion tip (2) has a transverse staggering value, relative to at least one thin sheet of the support (5), preferably included between 3 and 12 mm; said staggering value being proportional to a speed profile of a flow on the support (5) and/or to a distance from one end of the support (5) placed downstream of said flow

9. A resistor as claimed in anyone of the preceding claims, comprising connecting means (6) interposed between at least said ionising device (1) and the support (5), said connecting means (6) being adapted to connect the ionising device (1) simultaneously to the electric supply means (3) and to the support (5).

10. A resistor as claimed in claim 9, wherein the connecting means (6) comprises a rivet means passing through the support (5) and adapted to electrically connect the potential reference body (4) and/or the dispersion tip (2) to the electric supply means (3).

Patentansprüche

1. Elektrischer Heizwiderstand, umfassend:

- einen Halter (5), der mindestens eine Lamelle aus wärmefestem und/oder elektroisolierendem Material umfasst, die sich längs einer Hauptausrichtungsachse (5a) erstreckt;
- mindestens eine elektrische Wicklung, die an den Lamellen angebracht und bereitgestellt ist, um einen längs der Ausrichtungsachse (5a) des Halters (5) gerichteten Luftstrom zu erhitzen;
- mindestens eine Ionisierungsvorrichtung (1), die am Halter (5) angebracht ist und umfasst:

  • mindestens eine Dispersionsspitze (2) mit einer Hauptabwicklungsachse (2a), die zur Hauptausrichtungsachse (5a) des Halters (5) parallel ist um eine vorgegebene Menge von elektrisch geladenen Teilchen im Luftstrom zu erzeugen und zerstreuen; und
  • Stromspeisemittel (3), die die Dispersionsspitze (2) mit einer elektrischen Energiequelle verbinden,

dadurch gekennzeichnet, dass er überdies einen Potentialbezugskörper (4) umfasst, der die Dispersionsspitze (2) mit den elektrischen Speisemitteln (3) elektrisch verbindet, um einen elektrostatischen Effekt einer ionischen Erzeugung zu verstärken; wobei der Bezugskörper (4) ein lamellenartiger Körper ist, der sich auf einer Ebene (4a) abwickelt und quer auf dem Halter (5) derart angebracht ist, dass die mindestens eine Dispersionsspitze (2) am Halter (5) in einer gegenüber dem Halter (5) versetzten Gestaltung angebracht ist.

2. Elektrischer Heizwiderstand gemäß Anspruch 1, bei dem die Dispersionsspitze (2) in einem elektrisch leitenden Material ausgeführt ist und einen sich verjüngenden Verlauf besitzt, der die Hauptabwicklungsachse (2a) festlegt, wobei der Potenzialbezugskörper (4) mit der Dispersionsspitze (2) starr verbunden und bevorzugter Weise in einem stromleitenden Material ausgeführt ist, das mit dem Material der Dispersionsspitze (2) zusammenfällt.

3. Widerstand nach Anspruch 1 oder 2, bei dem der Potenzialbezugskörper (4) ein lamellenartiger Körper ist, der sich auf einer Ebene (4a) entwickelt, die im Wesentlichen zur Hauptentwicklungsachse (2a) parallel ist und sie enthält.

4. Widerstand nach Anspruch 1 oder 2, bei dem der Potenzialbezugskörper (4) ein lamellenartiger Körper ist, der sich auf einer Ebene (4a) abwickelt, die im Wesentlichen zur Hauptentwicklungsachse (2a) quer liegt und bevorzugter Weise dazu senkrecht ist.

5. Widerstand nach einem beliebigen der vorstehenden Ansprüche, bei dem der Potenzialbezugskörper (4) gemäß einem Vieleck ausgebildet ist, wobei das Vieleck bevorzugter Weise ein Trapez oder ein Rechteck ist, wobei mindestens eine Basis des Vieleckes nahe der Extrusionsspitze (2) liegt und diese trägt, bevorzugter Weise ohne Kontinuitätsunterbrechung.

6. Widerstand nach einem beliebigen der vorstehenden Ansprüche, bei dem die versetzte Gestaltung

der mindestens einen Dispersionsspitze (2) gegenüber dem Halter (5) aus einer geometrischen Versetzung besteht, die in zur Ebene der Lamelle senkrechter Richtung festgelegt ist, die den Halter (5) bildet und/oder längs der Ausrichtungsachse (5a) des Halters (5) angeordnet ist.

7. Widerstand nach Anspruch 6, bei dem der Halter (5) zwei oder mehrere Lamellen umfasst, die sich untereinander im Bereich einer mittigen Achse schneiden, die längs der Ausrichtachse (5a) ausgerichtet ist und mit derselben zusammenfällt, wobei die Dispersionsspitze (2) in gegenüber mindestens zwei anliegenden Flächen mindestens zweier Lamellen des Halters (5) versetzter Gestaltung angebracht ist.

8. Widerstand nach Anspruch 6 oder 7, bei dem die mindestens eine Dispersionsspitze (2) eine Querversetzungsbetrag gegenüber mindestens einer Halterlamelle (5) aufweist, der bevorzugter Weise zwischen 3 und 12 mm liegt; wobei der Versetzungsbetrag zu einem Flussgeschwindigkeitsprofil auf dem Halter (5) und/oder zu einem Abstand von einem Ende des Halters (5) proportional ist, das nach dem Luftstrom liegt.

9. Widerstand nach einem beliebigen der vorstehenden Ansprüche, umfassend Verbindungsmittel (6), die mindestens zwischen der Ionisierungsvorrichtung (1) und dem Halter (5) zwischengeschaltet sind, wobei die Verbindungsmittel (6) gleichzeitig die Ionisierungsvorrichtung (1) mit den Stromspeichermitteln (3) und mit dem Halter (5) verbinden.

10. Widerstand nach Anspruch 9, bei dem Verbindungsmittel (6) eine Vernietung umfassen, die durch den Halter (5) geht und den Potenzialbezugskörper (4) und/oder die Dispersionsspitze (2) mit den Stromspeicherungsmitteln (3) elektrisch verbinden.

Revendications

1. Résistance électrique de chauffage, comprenant:

- un support (5) comprenant au moins une feuille mince d'une matière thermorésistante et/ou électriquement isolante et s'étendant le long d'un axe d'orientation principal (5a);
- au moins un enroulement électrique monté sur lesdites feuilles minces et destiné à chauffer un écoulement d'air dirigé le long de l'axe d'orientation (5a) du support (5);
- au moins un dispositif d'ionisation (1) monté sur le support (5) et comprenant:

· au moins une pointe de dispersion (2) ayant un axe d'extension principal (2a) parallèle à l'axe d'orientation principal (5a) du support (5) et apte à engendrer et disperser une quantité prédéterminée de particules chargées électriquement dans ledit écoulement; et
· des moyens d'alimentation électrique (3) reliant ladite pointe de dispersion (2) à une source d'énergie électrique,

caractérisée en ce qu'elle comprend en outre un corps potentiel de référence (4) reliant électriquement ladite pointe de dispersion (2) auxdits moyens d'alimentation électrique (3) pour amplifier un effet électrostatique de génération ionique; le corps de référence (4) étant un corps laminaire s'étendant dans un plan de disposition (4a) et étant monté en sens transversal sur ledit support (5) de sorte que ladite au moins une pointe de dispersion (2) est montée sur ledit support (5) selon une configuration décalée par rapport au support (5).

2. Résistance de chauffage électrique selon la revendication 1, dans laquelle la pointe de dispersion (2) est réalisée en une matière électriquement conductrice et a un cours à section décroissante définissant ledit axe d'extension principal (2a), le corps potentiel de référence (4) étant relié rigidement à la pointe de dispersion (2) et étant de préférence réalisé en une matière électriquement conductrice coïncidant avec la matière de la pointe de dispersion (2).

3. Résistance selon la revendication 1 ou 2, dans laquelle le corps potentiel de référence (4) est un corps laminaire s'étendant dans un plan de disposition (4a) sensiblement parallèle à, et contenant l'axe d'extension principal (2a).

4. Résistance selon la revendication 1 ou 2, dans laquelle le corps potentiel de référence (4) est un corps laminaire s'étendant dans un plan de disposition (4a) sensiblement transversal à, et de préférence perpendiculaire à l'axe d'extension principal (2a).

5. Résistance selon l'une quelconque des revendications précédentes, dans laquelle le corps potentiel de référence (4) est en forme de polygone, ledit polygone étant de préférence un trapèze ou un rectangle, au moins une base dudit polygone étant attenante à, et supportant la pointe de dispersion (2) de préférence sans solution de continuité.

6. Résistance selon l'une quelconque des revendications précédentes, dans laquelle la configuration décalée de ladite au moins une pointe de dispersion (2) par rapport au support (5) comporte un décalage géométrique défini dans une direction normale au plan de la feuille mince constituant le support (5) et/ou le long de l'axe d'orientation (5a) du support (5).

7. Résistance selon la revendication 6, dans laquelle le support (5) comprend deux ou plus de deux feuilles minces se coupant à un axe central de ligne médiane orienté le long de, et coïncidant avec l'axe d'orientation (5a), la pointe de dispersion (2) étant montée selon une configuration décalée par rapport à au moins deux faces contiguës d'au moins deux feuilles minces du support (5).

8. Résistance selon la revendication 6 ou 7, dans laquelle ladite au moins une pointe de dispersion (2) a une valeur de décalage transversal, par rapport à au moins une feuille mince du support (5), de préférence comprise entre 3 et 12 mm; ladite valeur de décalage étant proportionnelle à un profil de vitesse d'un écoulement sur le support (5) et/ou à une distance d'une extrémité du support (5) placée à l'aval dudit écoulement.

9. Résistance selon l'une quelconque des revendications précédentes, comprenant des moyens de connexion (6) interposés entre au moins ledit dispositif d'ionisation (1) et le support (5), lesdits moyens de connexion (6) étant aptes à relier le dispositif d'ionisation (1) simultanément aux moyens d'alimentation électrique (3) et au support (5).

10. Résistance selon la revendication 9, dans laquelle les moyens de connexion (6) comprennent des moyens de rivetage passant à travers le support (5) et destinés à connecter électriquement le corps potentiel de référence (4) et/ou la pointe de dispersion (1) aux moyens d'alimentation électrique (3).

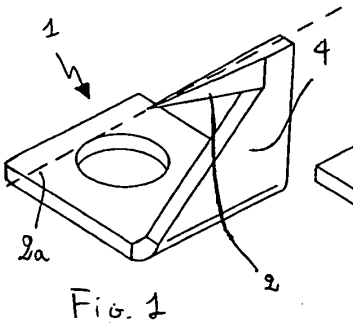


Fig. 1

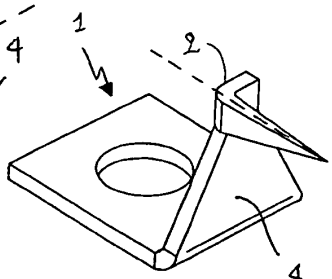


Fig. 2

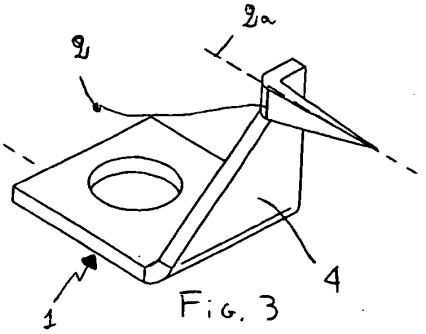


Fig. 3

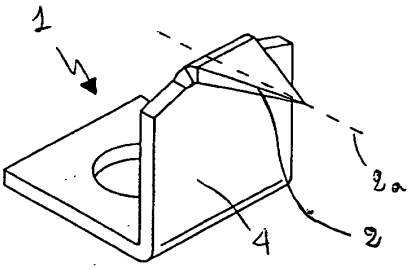


Fig. 4

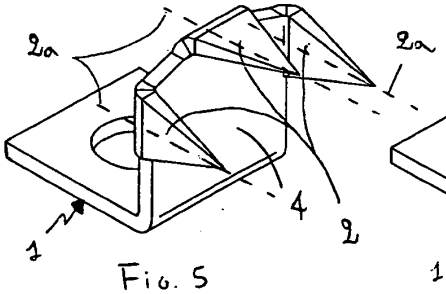


Fig. 5

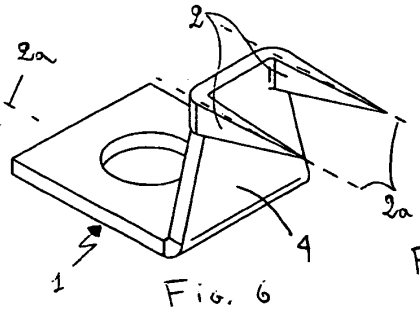


Fig. 6

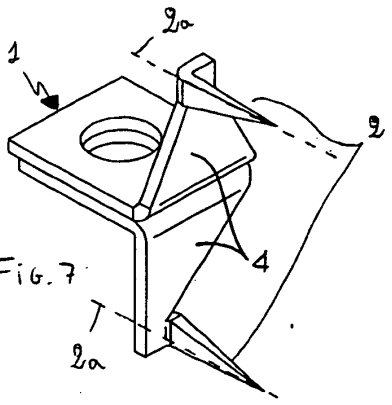


Fig. 7

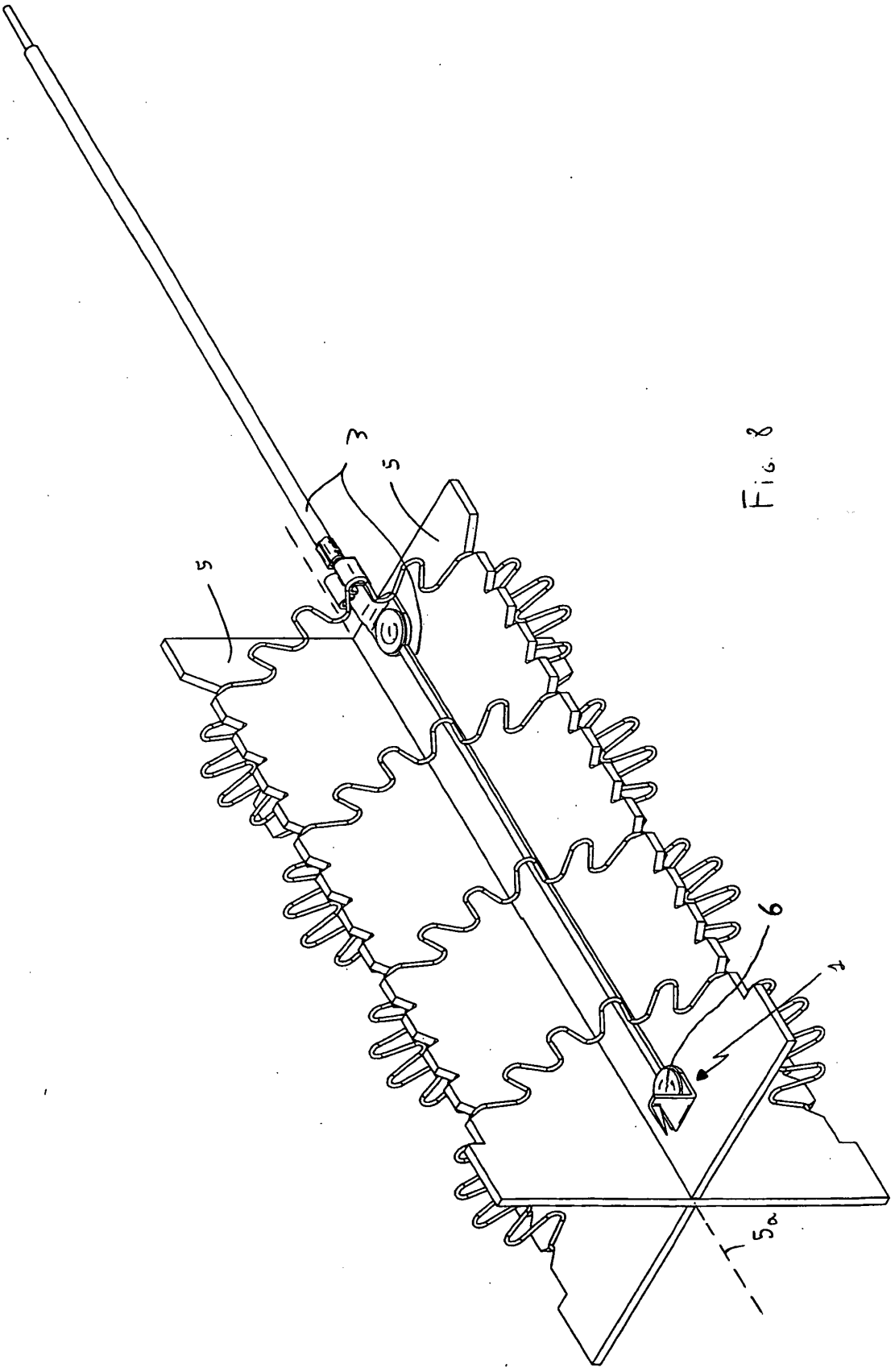


Fig. 8

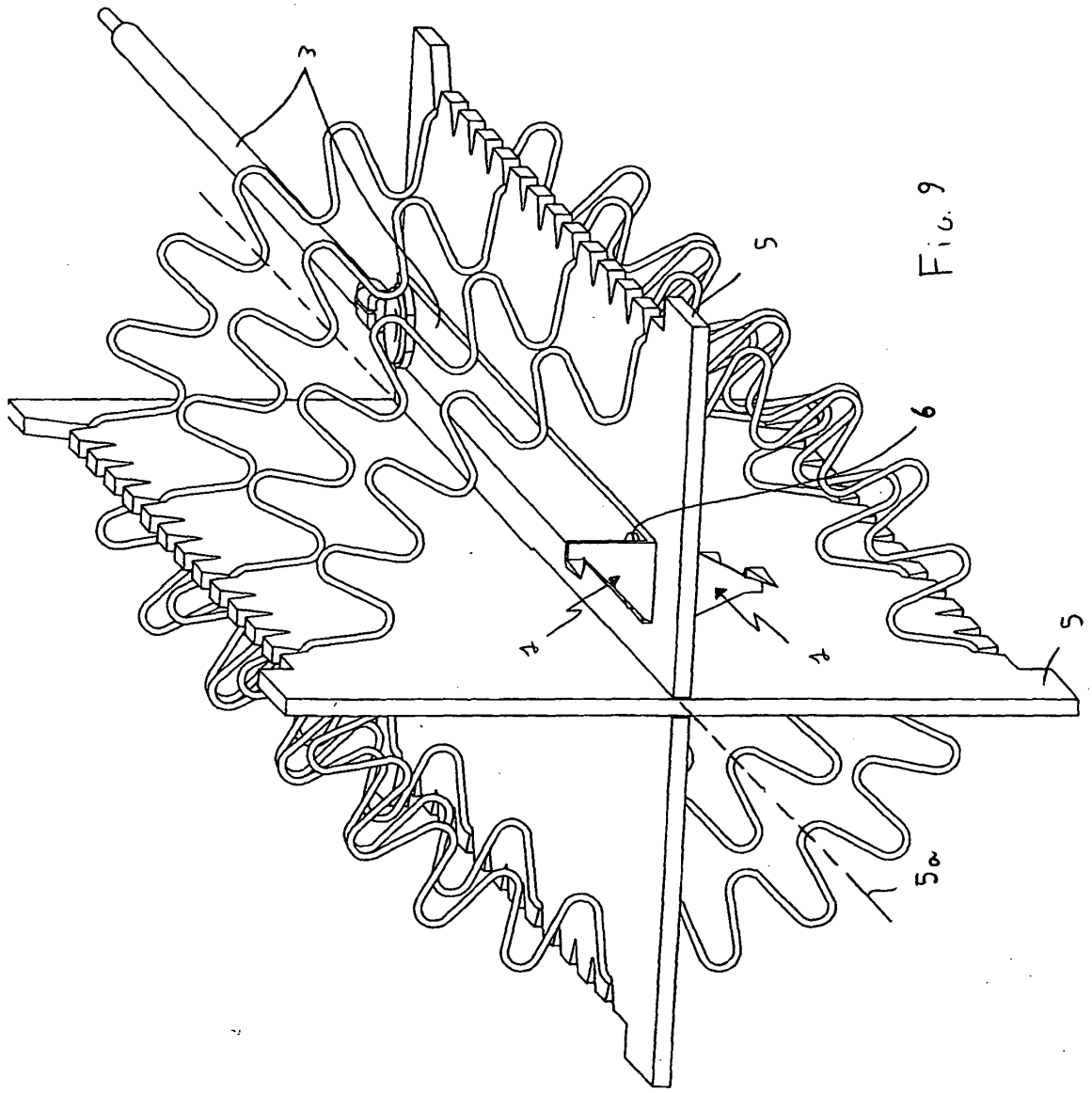


Fig. 9

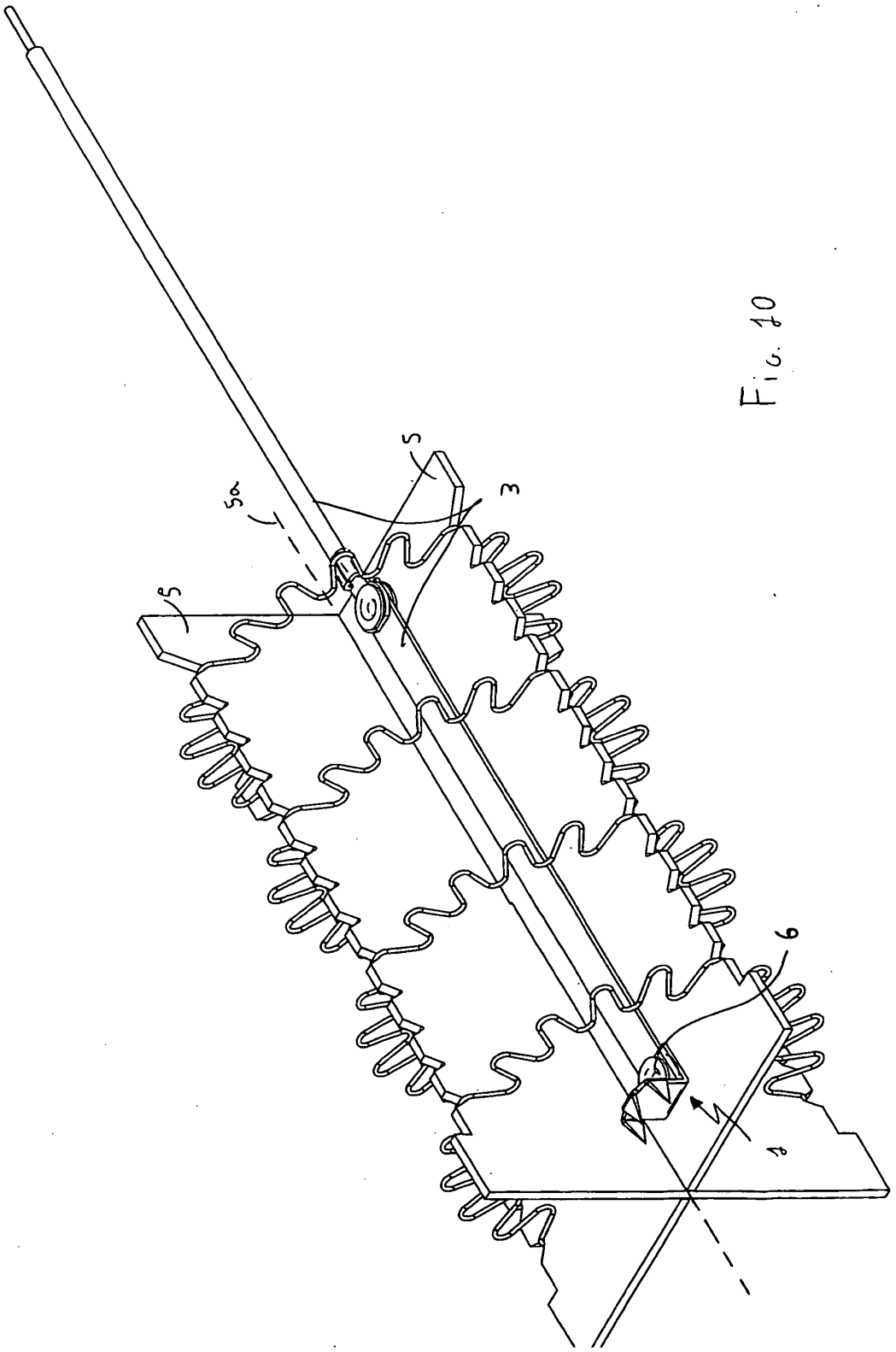


Fig. 10

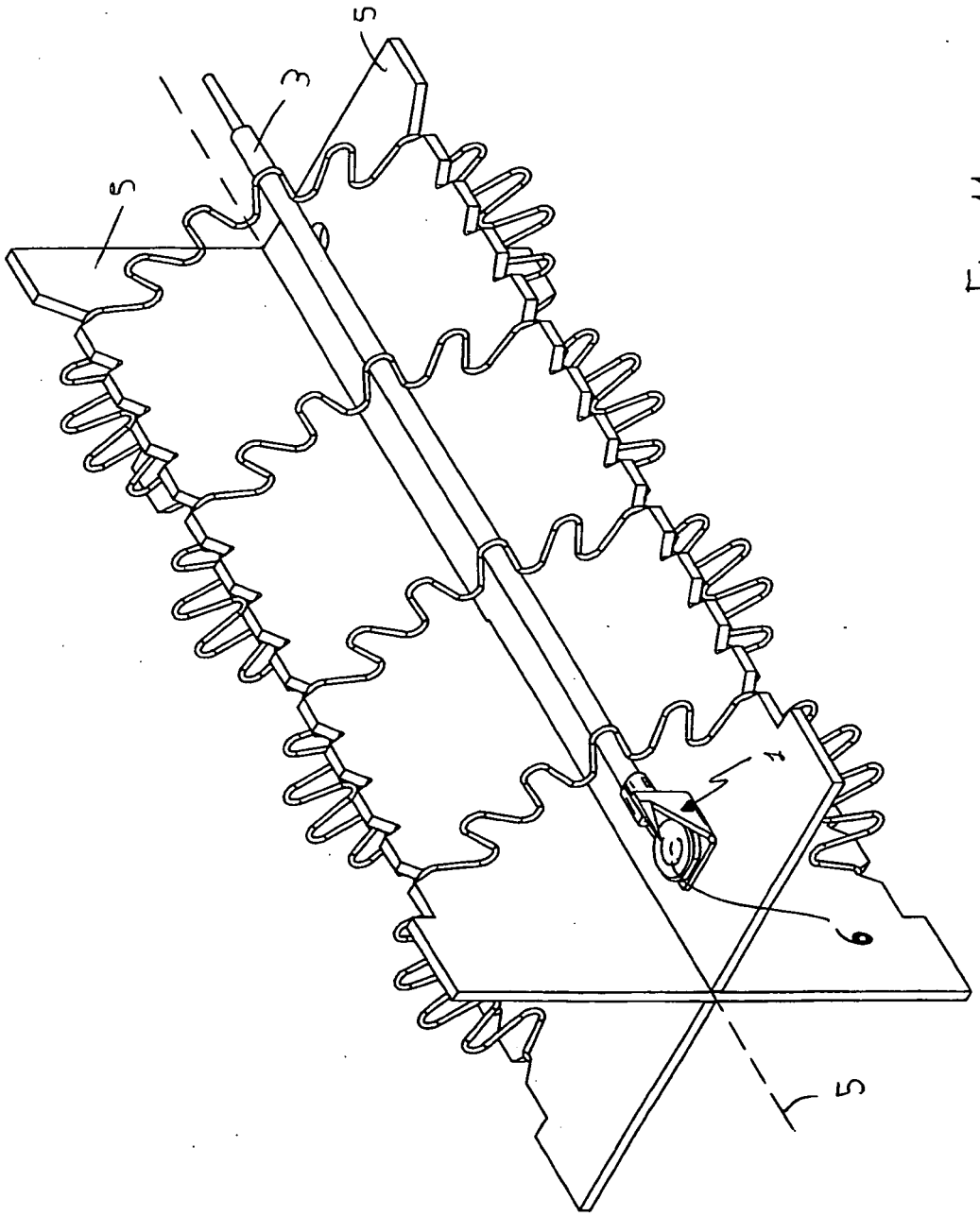


Fig. 11

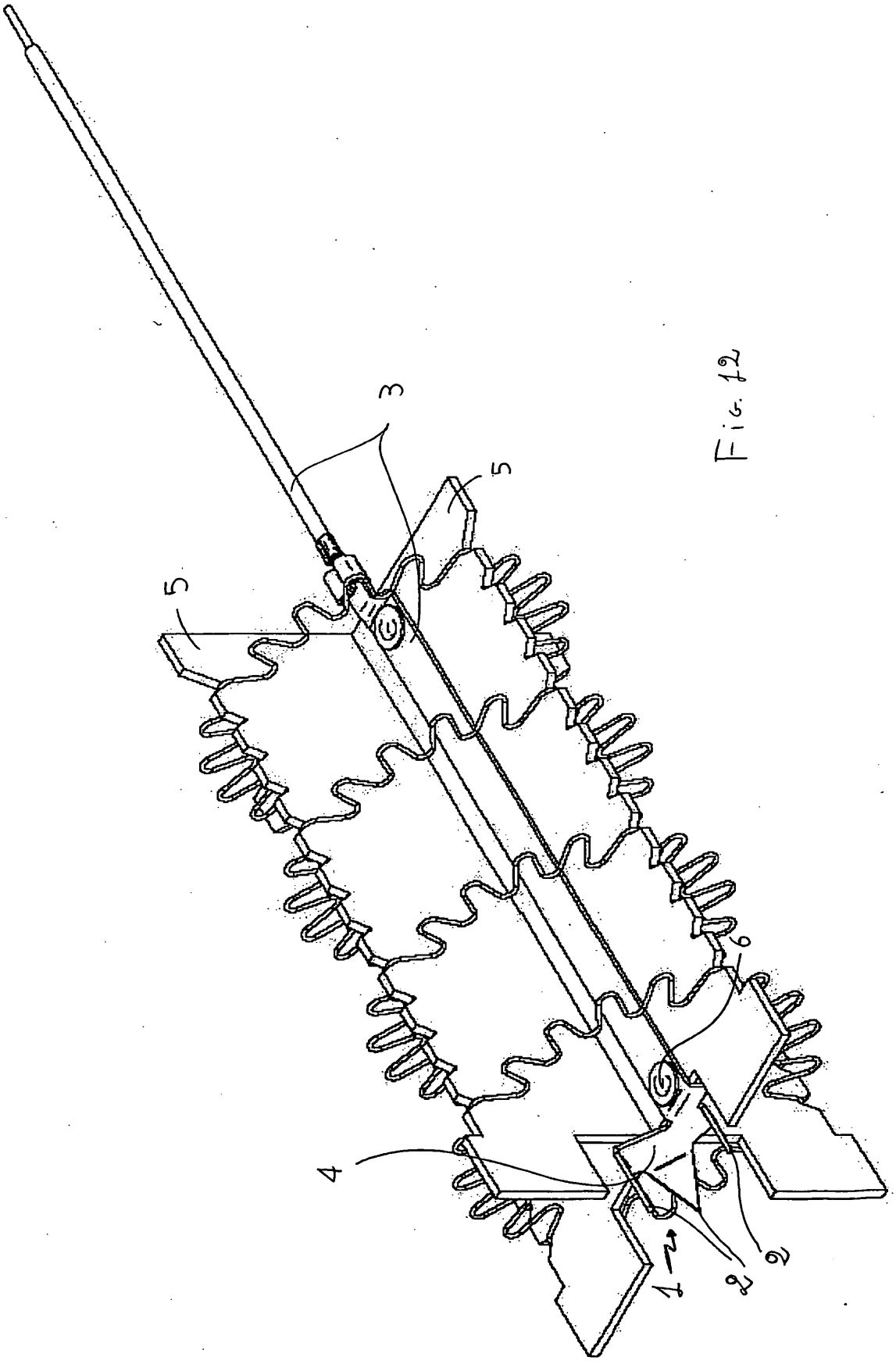


Fig. 12

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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