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(54) **THREE-DIMENSIONAL BURR FASTENER**

DREIDIMENSIONALER KLETTVERSCHLUSS

FERMETURE TRIDIMENSIONNELLE DE TYPE À ÉLÉMENTS D'ACCROCHAGE PAR CONTACT

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Description

[0001] The object of invention is a three-dimensional burr fastener that can be used especially to form three-dimensional fastening elements.

[0002] The hitherto known burr fasteners are in the form of flat strips which surfaces are covered with miniature hooks. Placing two strips one upon another enables interlocking of the hooks, thus forming a closure that is easy to do and undo. This solution is applied in production of clothes, sports equipment and in other everyday articles.

[0003] In prior art there are known technical solutions of different kinds, used for joining various objects by means of specially shaped fasteners.

[0004] US Patent No. US 3,921,259 discloses a self-gripping device with composite gripping elements. This invention relates to a self-gripping device made up of a plurality of composite gripping elements stiffly attached in an upright position to a base member. More particularly, this invention relates to such a self-gripping device wherein the composite gripping elements are made up of a metallic shaft and a distinct head element of a material different from the shaft.

[0005] European Patent Application No. EP 0619085 discloses a separable fastening component. The invention relates to a separable fastening component being widely used in the field of clothing. A separable fastening component has a base and a plurality of independent fastening element provided thereon. Each fastening element comprises a bundle of raised fibers with a grape cluster like aggregate of swollen heads consolidated together by fusion of the fiber ends and a trunk having a shape that tightens at the root and broadens towards the heads. This fastening component may be part of a male-female separable fastener.

[0006] US Patent No. 3,408,705 discloses fastener articles. This invention relates to fasteners, and more particularly to fasteners comprising mechanically interacting functional surfaces which can be engaged without regard to alignment.

[0007] US Patent Application No. US 2003/0131453 discloses fastener element patterning. This invention relates to patterning touch fastener elements, and more particularly to self-engageable patterns of mushroom-type fastener elements.

[0008] The purpose of the invention is to develop an inexpensive three-dimensional burr fastener of a simple design that owing to its design is able to form various detachable three-dimensional forms. According to the invention, a three-dimensional burr fastener consisted of not less than three elements joined together in a common base, each comprising a head which is in the shape of a solid or a complex solid and a stem which is in the shape of a solid, preferably of a cylinder shape, where the diameter of the stem is smaller than the diameter of the head, characterised in that the axes of the stems meet in one point in the volume of the base, and the burr fastener it is joined together with other three-dimensional burrs by means of the heads and stems, by the heads getting stuck between and/or catching the heads, and/or the heads getting stuck between and/or catching the stems, and/or the stems getting stuck between and/or catching the stems. The head, the stem, and the base are made of materials of different or identical physical properties and at least one of those is elastic and/or flexible. In the burr fastener according to the invention at least one joint between the head, the stem, the base of the element is flexible and/or elastic.

[0009] The object of invention has been shown in the example of embodiment in a drawing, where Fig. 1 shows an axonometric view of the three-dimensional burr fastener, Fig. 2 - shows an axonometric view of the three-dimensional burr fastener formed of several elements in a common base, Fig. 3 - shows an axonometric view of the way the burr fasteners are joined by the head getting caught between two stems, Fig. 4 - shows an axonometric view of the way the burr fasteners are joined by the stems getting caught between the stems, Fig. 5 - shows an axonometric view of the way the burr fasteners are joined by the head that is stuck between the heads, Fig. 6 - shows an axonometric view of the burr fastener element consisting of the head, the stem and the base of the perimeter and the area of section bigger than the perimeter of the head and bigger than the perimeter of the stem in the "x-z" plane perpendicular to the straight axis going through the head, the stem and the base, Fig. 7 - shows an axonometric view of the burr fastener element consisting of the head, the stem and the base of the perimeter and the area of section smaller than the perimeter of the head and bigger than the perimeter of the stem in the "x-z" plane perpendicular to the straight axis going through the head, the stem and the base, Fig. 8 - shows an axonometric view of the burr fastener element consisting of the head, the stem and the base of the perimeter and the area of section equal to the perimeter of the stem and smaller than the perimeter of the head in the "x-z" plane perpendicular to the straight axis going through the head, the stem and the base, Fig. 9 - shows an axonometric view of the burr fastener element consisting of the head and the stem, which base is the base of the burr fastener element, Fig. 10 - shows an axonometric view of an openwork head and an openwork stem, Fig. 11 - shows an axonometric view of an openwork head and a monolithic stem, Fig. 12 - shows an axonometric view of a three-dimensional burr fastener form made of three-dimensional burr fastener elements joined together in a common base, Fig. 13 - shows an axonometric view of two burr fasteners with mushroom heads joined together, Fig. 14 - shows an axonometric view of two burr fasteners with ball heads joined together, Fig. 15 - shows an axonometric view of two burr fasteners with disk heads joined together, Fig. 16 - shows an axonometric view of two burr fasteners with disk and mushroom heads joined together, Fig. 17 - shows an axonometric view of the burr fastener in the form of a chain with

its outline shape similar to a cylinder, Fig. 18 - shows an axonometric view of one of the three-dimensional burr fastener forms made of a number of three-dimensional burr fastener elements with its outline shape similar to a half-globe, Fig. 19 - shows an axonometric view of the burr fastener element where the head and the base are ball-shaped and joined to the stem within boundaries clearly marked out, Fig. 20 - shows an axonometric view of the burr fastener element where the head and the base are drop-shaped and joined to the stem within boundaries marked out indistinctly, Fig. 21 - shows an axonometric view of the burr fastener element where the head is mushroom-shaped and joined to the ball-shaped base through the stem within boundaries clearly marked out, Fig. 22 - shows an axonometric view of the burr fastener element where the head is mushroom-shaped and joined to the drop-shaped base through the stem within boundaries marked out indistinctly, Fig. 23 - shows a cross-section of the sample burr fastener element where the head is bush-shaped and joined to the ball-shaped base through the stem, Fig. 24 - shows a cross-section of the sample burr fastener element where the head is bush-shaped and joined to the ball-shaped base through the stem, Fig. 25 - shows a cross-section of the sample burr fastener element with different heads, Fig. 26 - shows a cross-section of the sample burr fastener element with identical heads, Fig. 27 - shows a cross-section of a burr fastener part consisting of two heads and two stems joined together in a common base, and Fig. 28 - shows a top view of the burr fastener part shown in Fig. 27.

[0010] The three-dimensional burr fastener, as shown in the drawing, consists of the heads **1** positioned on the stems **2** that are seated in the base **3**. The head **1**, the stem **2** and the base **3** can take on different geometric forms and make the element **4** of the three-dimensional burr fastener that has been shown in Fig. 6, Fig. 7, Fig. 8, Fig. 9, Fig. 19, Fig. 20, Fig. 21, Fig. 22, Fig. 23 and Fig. 24. Burr fastener options consisting of a larger number of heads **1** and stems **2** joined together in a common base **3** have been shown in Fig. 2, Fig. 12, Fig. 17, Fig. 18, whereas the three-dimensional burr fasteners joined together have been presented in Fig. 3, Fig. 4, Fig. 5, Fig. 13, Fig. 14, Fig. 15, Fig. 16. Making the joint of at least two three-dimensional burr fasteners possible requires meeting of conditions defined by mathematical dependencies that have been shown in Fig. 27 and Fig. 28, which has demonstrated the axis **5** going through the shortest distance between the two nearest heads **1**. And thus, when identical three-dimensional burr fasteners are joined, as shown in Fig. 3, the condition must be met that $d<b$ and/or $c<b$ and/or $e-i \geq f$ and/or $f<b$, and/or when three-dimensional burr fasteners are joined, as shown in Fig. 4, the condition must be met that $c>f$ and/or $g+i \geq f$ and/or $a<b$, and/or when three-dimensional burr fasteners are joined, as shown in Fig. 5, the condition must be met that $b>a$ and/or $g+i \geq i+h$. Whereas identical three-dimensional burr fasteners cannot be joined in cases when $a>b$ and/or $e>b$ and/or $d>b$ and/or $g+i<h$ and/or $b<f$. Moreover, "a" dimension is a distance between the heads **1** in the axis **5**, "b" dimension is the width of the head in the axis **5**, "c" dimension is a distance between the stems **2** in the place where the heads **1** are joined to the stems in the axis **5**, "d" dimension is a distance between the stems **2** in the place where the stems **2** are joined to the base **3** in the axis **5**, "e" dimension is a distance between the base **3** and the widest "b" dimension of the head **1**, "f" dimension is the thickness of the stem **2** in the axis **5**, "g" dimension is the height of the stem **2** , "h" dimension is a distance from the widest "b" dimension of the head **1** to the top of the head **1**, and "i" dimension is a distance from the place where the stem **2** is joined to the head **1** to the widest "b" dimension of the head **1**.

[0011] The three-dimensional burr fastener can also be fitted with bush-shaped heads that have fastening capabilities themselves. Such a case has been shown in Fig. 26, where the bush-shaped heads **1** are in the form as shown in Fig. 24. Owing to such a shape of the heads **1** one can form large three-dimensional burr fasteners that can be joined to smaller ones. The three-dimensional burr fastener, as shown in Fig. 25, can also consist of different heads **1**, made of the elements **4** arranged as in Fig. 25, which enables obtaining even stronger joints between the three-dimensional burr fasteners.

[0012] The three-dimensional burr fastener can be used as a structural component of reinforcement of reinforced-concrete construction components that have been made so far as openwork three-dimensional structures made of long reinforcement bars of various cross-sections and diameters. Bars are joined together with stirrups to make a beam-shaped three-dimensional form. Stirrups are most often in the shape of a closed or not closed rectangular and they are joined to bars detachably using tie wire or permanently by welding. The disadvantage of the known concrete reinforcement is high labour demand connected with its construction resulting from the fact that when tie wire is used, many knots must be tied, and when the welding methods is applied, many spot welds must be made. Labour demand connected with construction of concrete reinforcement has also high impact on the unit cost of reinforcement that grows additionally due to the fact that highly competent technical staff must be employed.

[0013] The three-dimensional burr fastener can also be used as a block for construction of three-dimensional forms, such as coverings for playgrounds, ski landing areas, blocks for children and flowerpot structures or filling to protect transported products.

Claims

1. A three-dimensional burr fastener consisted of not less than three elements (**4**) joined together in a common base (**3**), each comprising a head (**1**) which is in the shape of a solid or a complex solid and a stem

(2) which is in the shape of a solid, preferably of a cylinder shape, where the diameter of the stem (2) is smaller than the diameter of the head (1), **characterised in that** the axes of the stems (2) meet in one point in the volume of the base (3), and the burr fastener it is joined together with other three-dimensional burrs by means of the heads (1) and stems (2), by the heads (1) getting stuck between and/or catching the heads (1), and/or the heads (1) getting stuck between and/or catching the stems (2), and/or the stems (2) getting stuck between and/or catching the stems (2).

2. The burr fastener according to claim 1, **characterised in that** the head (1), the stem (2), and the base (3) are made of materials of different or identical physical properties and at least one of those is elastic and/or flexible.

3. The burr fastener according to claim 1, **characterised in that** at least one joint between the head (1), the stem (2), the base (3) of the element (4) is flexible and/or elastic.

Patentansprüche

1. Ein dreidimensionaler Klettverschluss, der mindestens aus drei auf einer gemeinsamen Basis (3) miteinander verbundenen Elementen (4) zusammengesetzt ist, von denen jedes aus einem Kopf (1) in Form eines Körpers oder eines Volumenkörpers und einem Stiel (2) in Form eines Körpers, vorzugsweise eines Zylinders besteht, wobei der Durchmesser des Stiels (2) kleiner als der Durchmesser des Kopfes (1) ist, **dadurch gekennzeichnet, dass** sich die Achsen der Stiele (2) in einem Punkt im Volumen der Basis (3) treffen und der Klettverschluss sich mit anderen dreidimensionalen Klettverschlüssen mit dem Kopf (1) oder dem Stiel (2) verbindet, indem die Köpfe (1) miteinander verklemmt und/oder an den Köpfen (1) aufgehängt werden und/oder die Köpfe (1) mit den Stielen (2) verklemmt und/oder aneinander aufgehängt werden und/oder die Stiele (2) miteinander verklemmt und/oder an den Stielen (2) aufgehängt werden.

2. Ein Klettverschluss gemäß Anspruch 1, **dadurch gekennzeichnet, dass** der Kopf (1), der Stiel (2) und die Basis (3) aus Materialien mit unterschiedlichen oder gleichen physikalischen Eigenschaften gefertigt sind und mindestens eins von diesen Elementen elastisch und/oder flexibel ist.

3. Ein Klettverschluss gemäß Anspruch 1, **dadurch gekennzeichnet, dass** mindestens eine Verbindung zwischen dem Kopf (1), dem Stiel (2) und der Basis (3) im Element (4) elastisch und/oder flexibel ist.

Revendications

1. Fermeture tridimensionnelle de type à éléments d'accrochage par contact constituée d'au moins trois éléments (4) assemblés sur un socle commun (3), chacun des éléments comprenant une tête (1) en forme de solide ou de solide composé et une tige (2) en forme de solide, avantagesement en forme de cylindre, le diamètre de la tige (2) étant plus petit que le diamètre de la tête (1), **caractérisée en ce que** les axes de tiges (2) se croisent dans un point dans le volume du socle (3) et la fermeture à éléments d'accrochage est liée aux autres fermetures à l'aide des têtes (1) et tiges (2) par blocage et/ou accrochage des têtes (1) par rapport des têtes (1) et/ou blocage et/ou accrochage des tête (1) par rapport des tiges (2), et/ou blocage et/ou accrochage des tiges (2) par rapport des tiges (2).

2. Fermeture à éléments d'accrochage selon la revendication 1, **caractérisée en ce que** la tête (1), la tige (2) et le socle (3) sont en matières dont les caractéristiques physiques sont différentes ou les mêmes et au moins un d'eux est souple et/ou flexible.

3. Fermeture à éléments d'accrochage selon la revendication 1, **caractérisée en ce qu'**au moins une liaison entre la tête (1), la tige (2) et le socle (3) dans l'élément (4) est souple et/ou flexible.

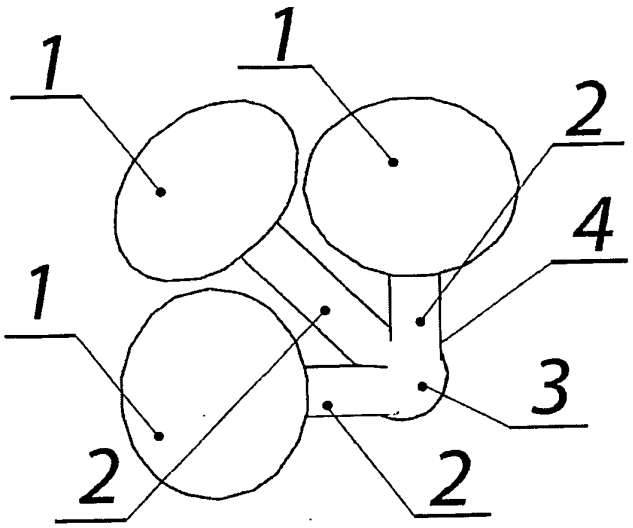


Fig. 1

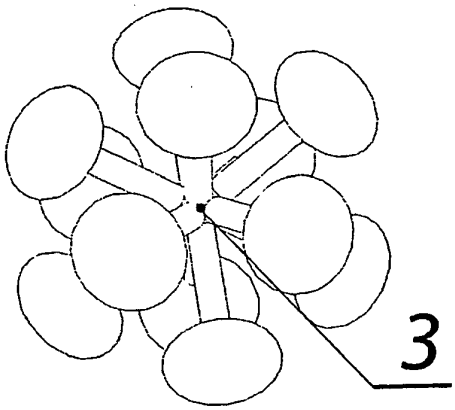


Fig. 2

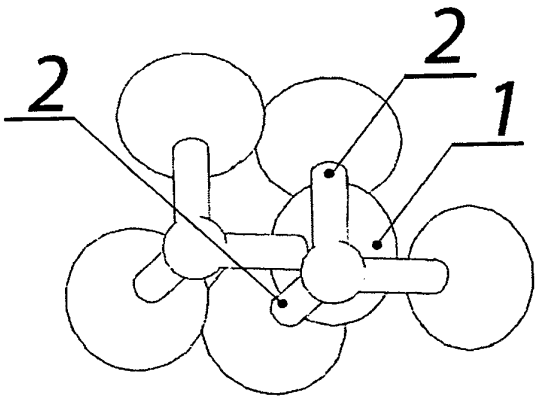


Fig. 3

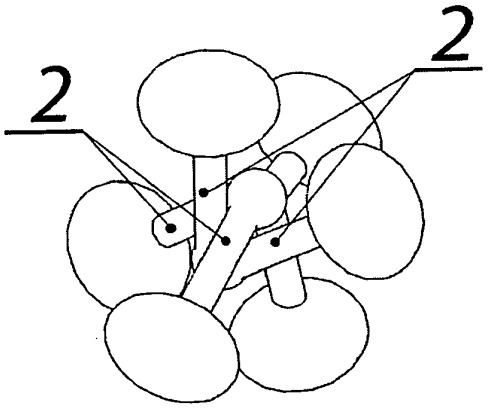


Fig. 4

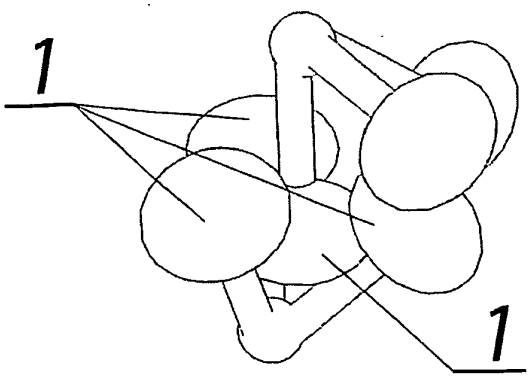


Fig. 5

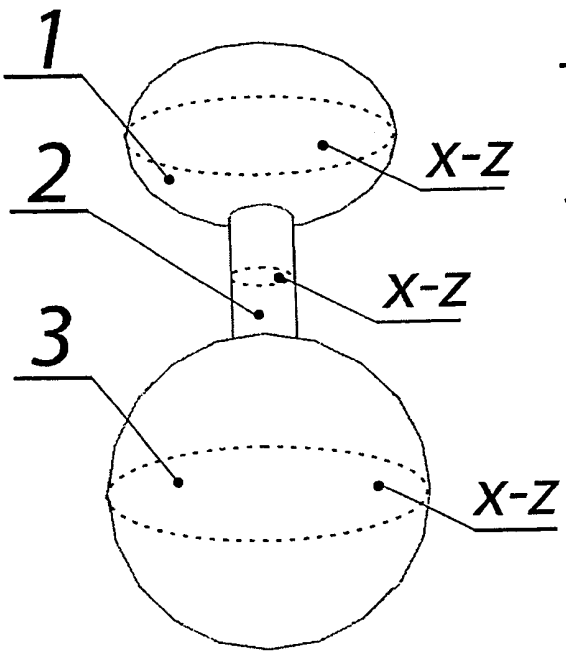


Fig. 6

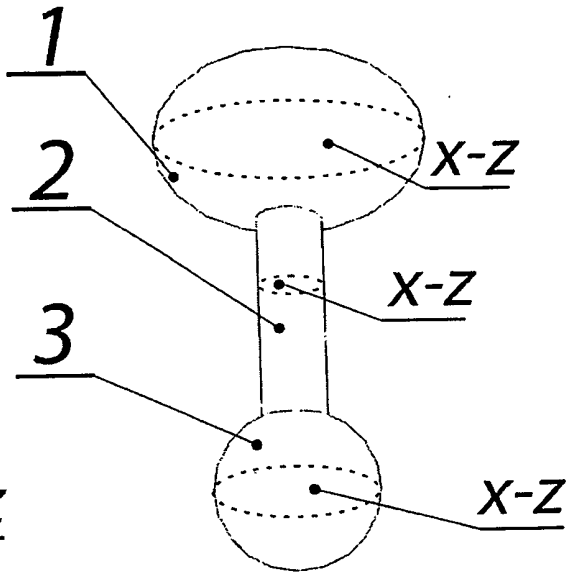


Fig. 7

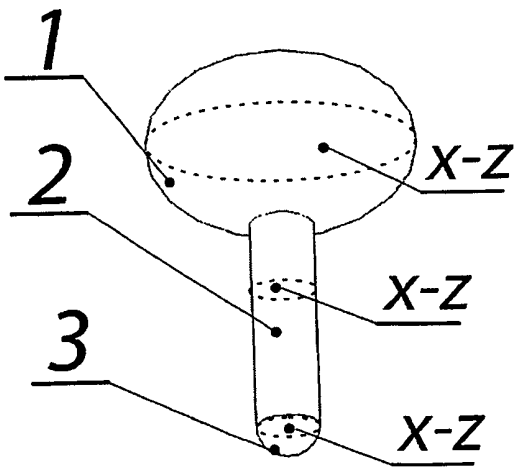
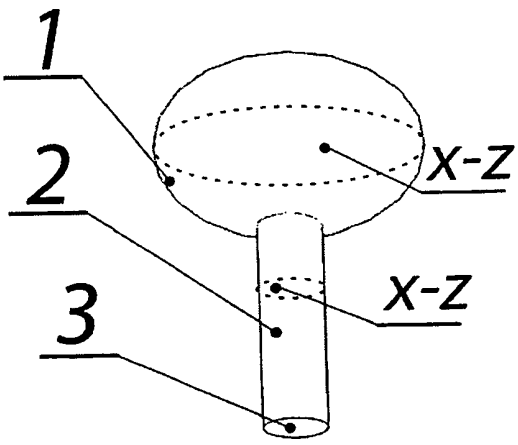


Fig. 8



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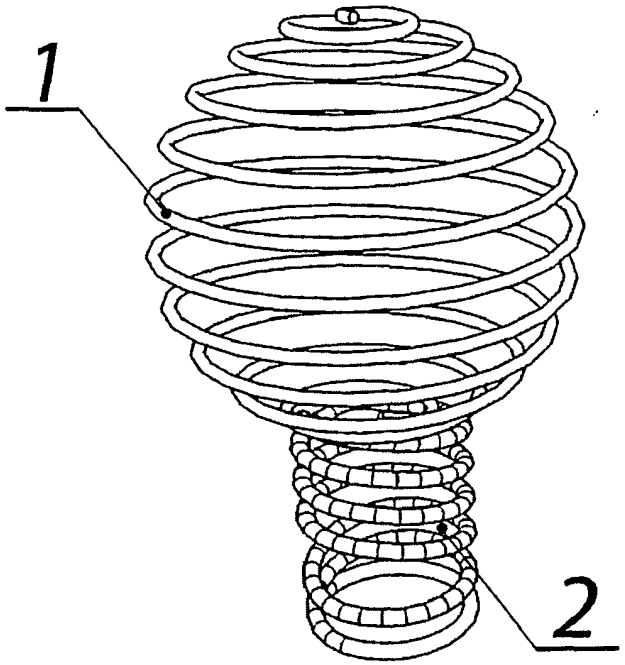

Fig. 10

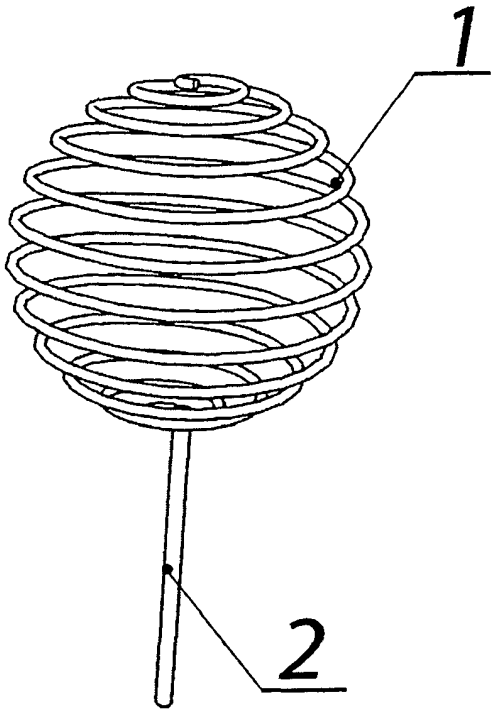

Fig. 11

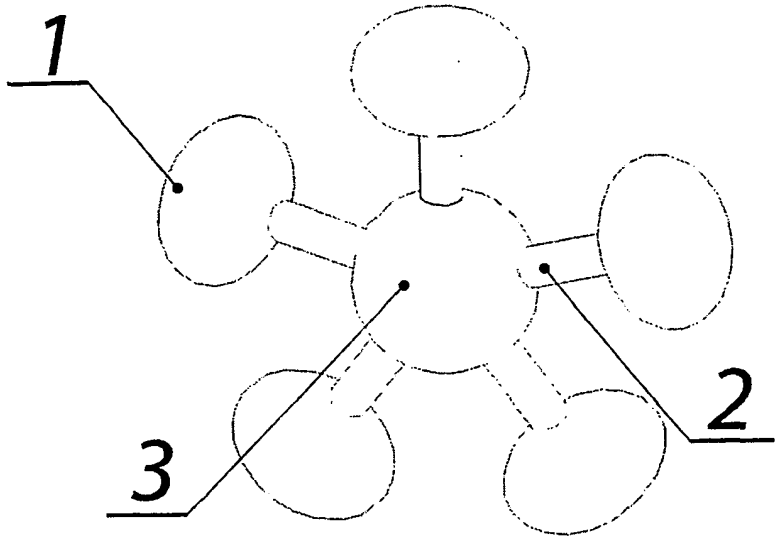

Fig. 12

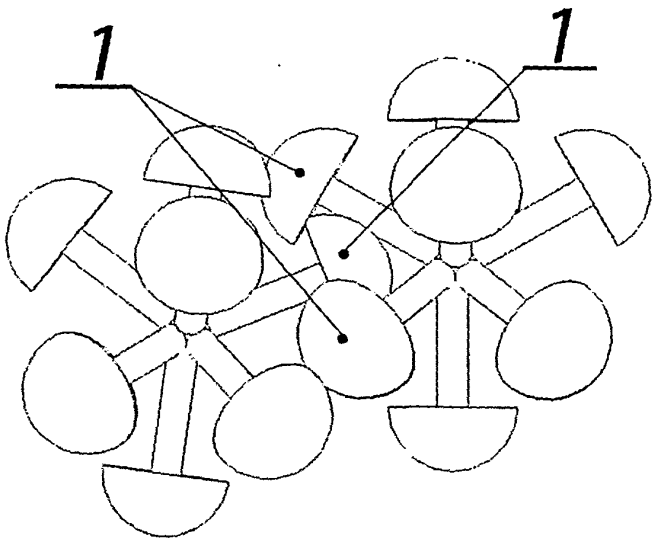

Fig. 13

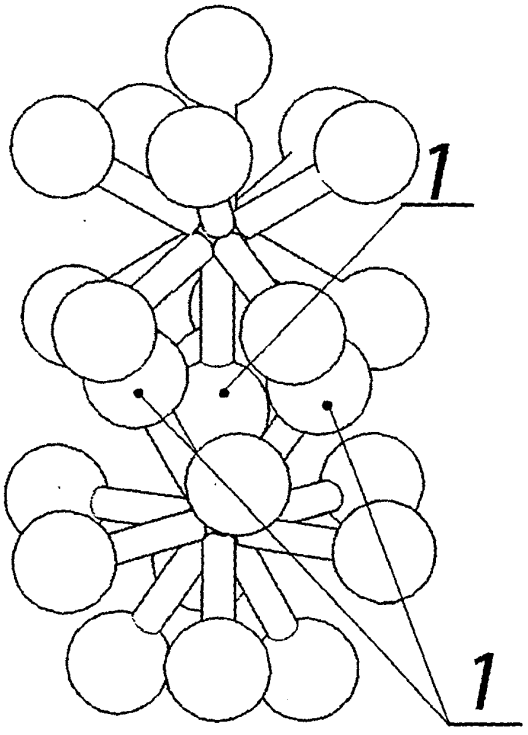

Fig. 14

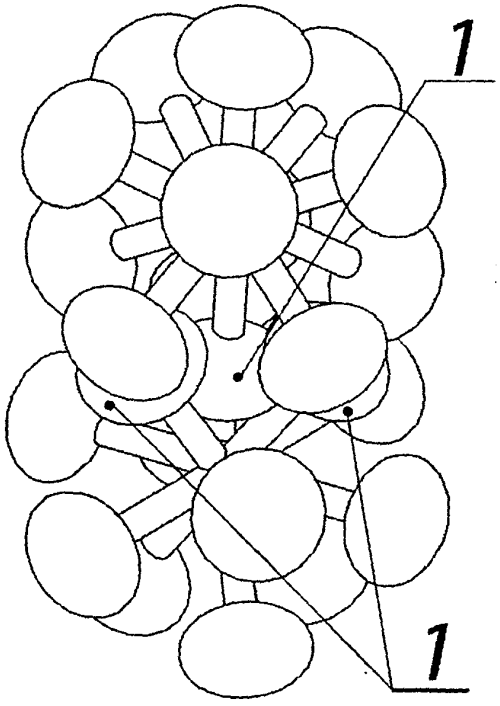

Fig. 15

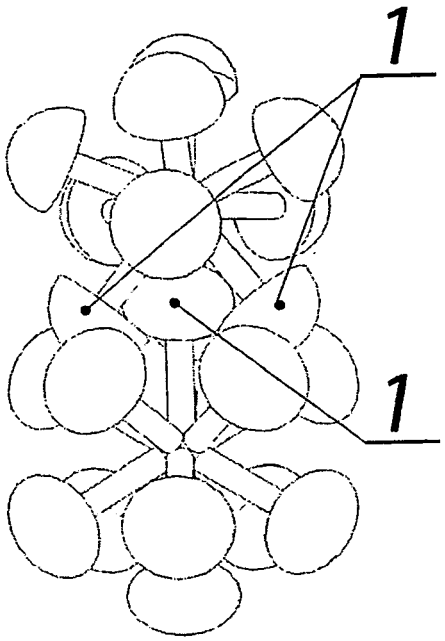

Fig. 16

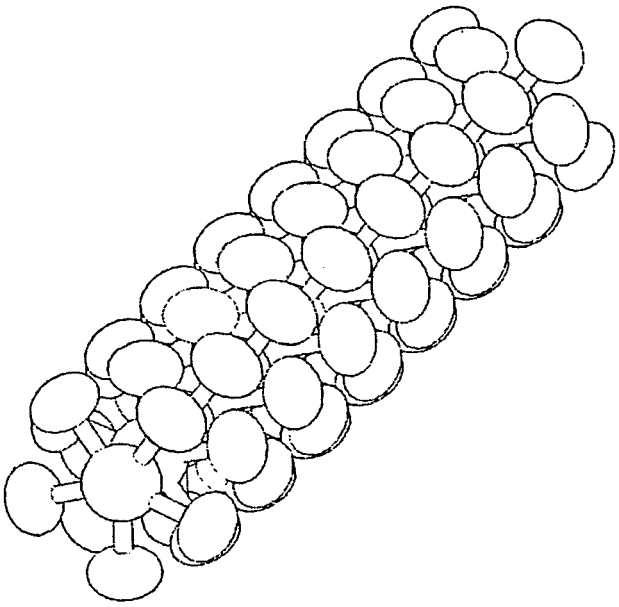

Fig. 17

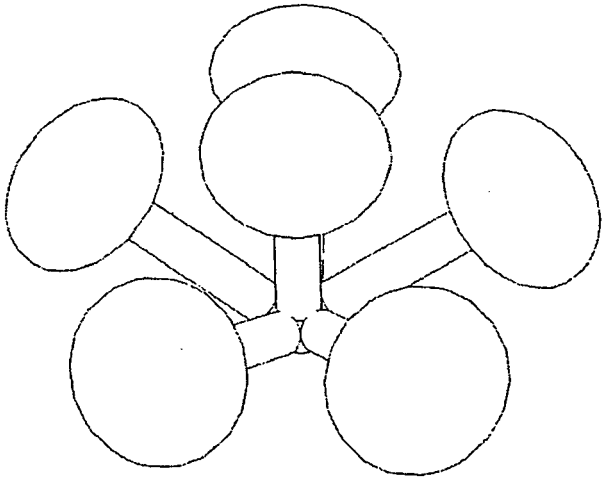

Fig. 18

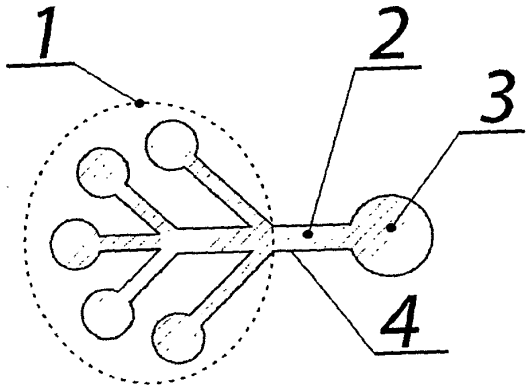

Fig. 23

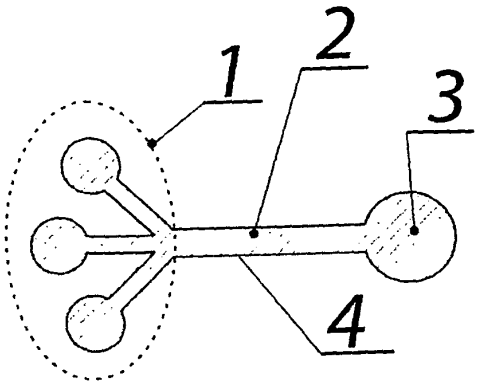

Fig. 24

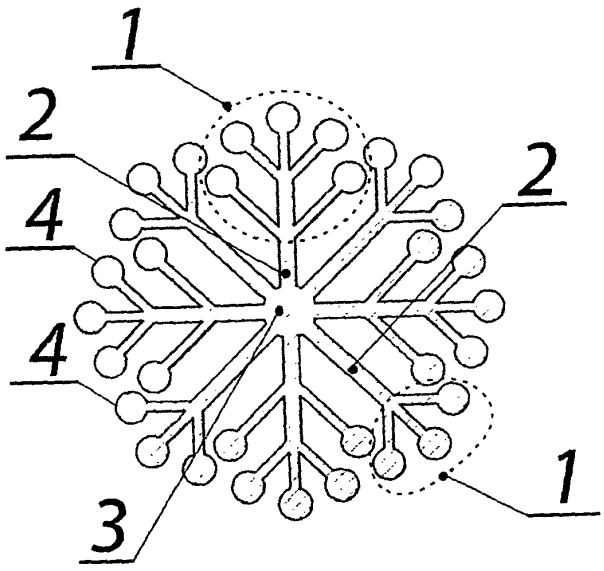

Fig. 25

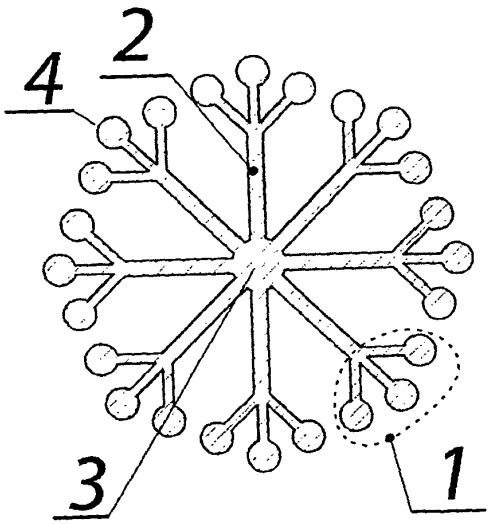

Fig. 26

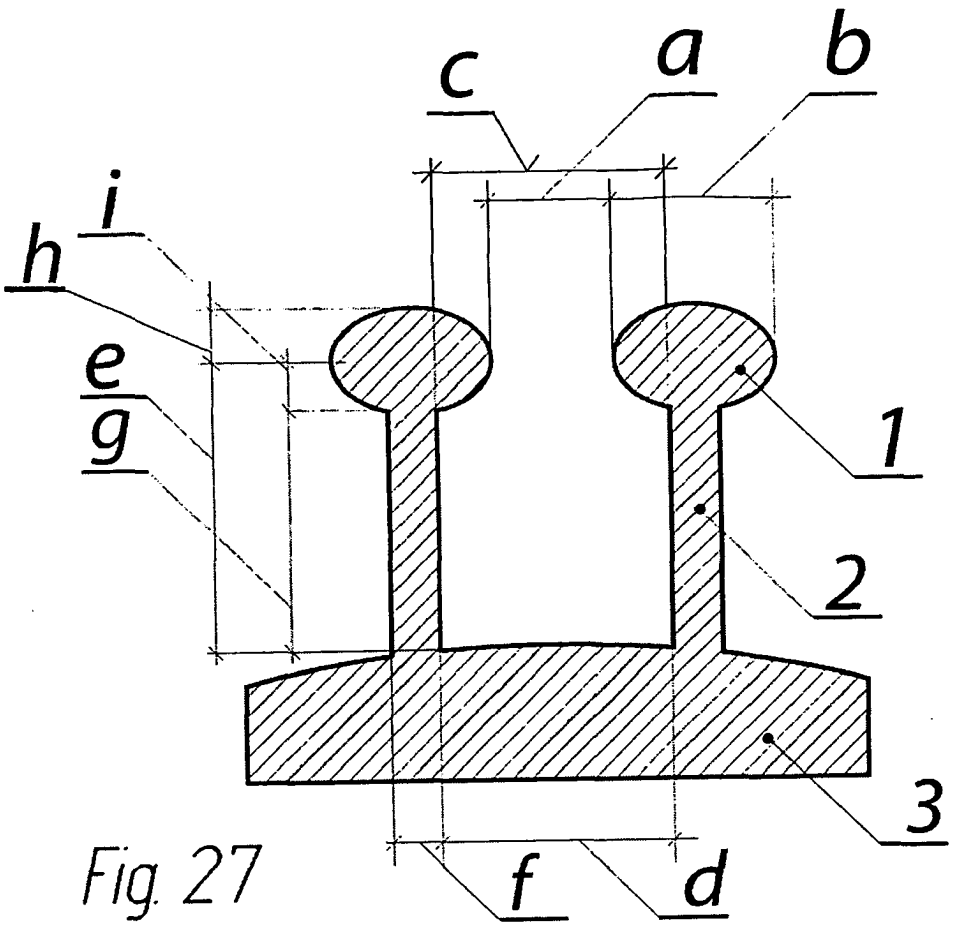

Fig. 27

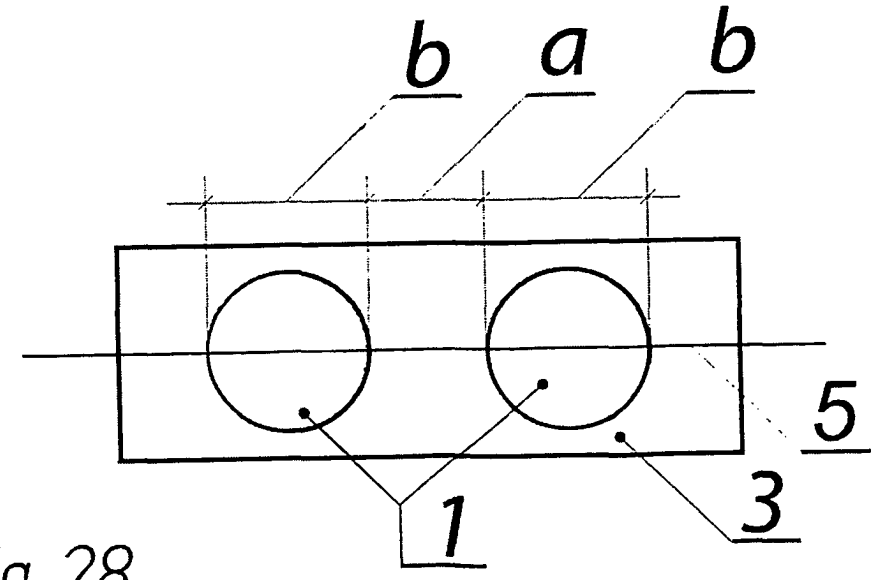

Fig. 28

REFERENCES CITED IN THE DESCRIPTION

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