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(54) **Self-gripping device**

(57) The subject of the invention is a self-gripping device having gripping elements moving in relation to each other or to an axis running through the device on one or multiple planes.

The self-gripping device, equipped with modules and connectors, features a contour of a spherical or cylindrical shape and consists of a connector (L) and at least two modules (m) having at least one embedded gripping element (a) having a stem (e) and a head (g). Such gripping elements (a) spread radially from the middle of the base (p) of the module (m) and are connected with the base (f) to the base of the module (p). Each module (m) can revolve around on its own axis or the common axis (d) and on its own or common planes (z) when connected to each other by means of the connector (L). The space (k) between the neighbouring heads (g) of the neighbouring modules (m) is therefore changeable.

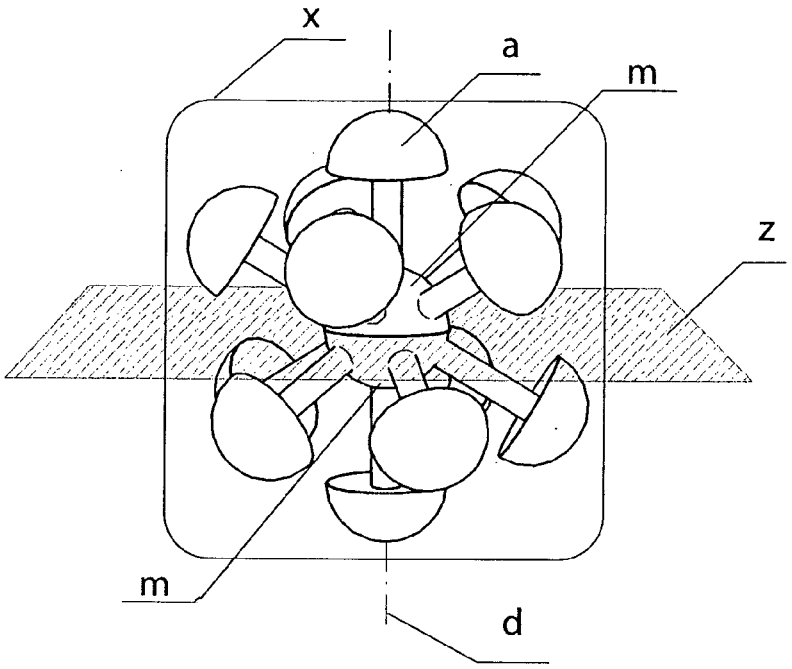

Fig. 1

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Description

[0001] The subject of the invention is a self-gripping device comprising self-gripping elements which move in relation to each other or to the axis running through the device on one or multiple planes.

[0002] Owing to their structure and shape, the devices manufactured so far impose the manner in which combination arising from connections between them are created according to strictly pre-imposed rules which do not allow any deviation from them as they are limited by the connection possibilities.

[0003] The currently used elements connecting the devices are permanently joined with the device and are its integral part. They take on the form of protruding elements, openings, hooks, loops and surfaces fitting into each other. They are positioned in relation to each other in a certain way which corresponds to the manner and principle of connecting where any deviation results in a lack of connection or a forced connection forming tensions. Such tensions may lead to the disconnection of the devices.

[0004] The Polish patent application No. P-386387 features a three-dimensional self-gripping device comprising at least three interconnected elements placed in a common base wherein the element has a head and a stem, where the stem's diameter is smaller than the head's diameter, and/or the stem's circumference is smaller than the head's circumference. The head of the self-gripping device is a three-dimensional solid figure, preferably being close to a semi-sphere or a complex three-dimensional solid in shape. The stem of the self-gripping device has the shape of a three-dimensional solid, preferably a cylinder whose circumference on the x-z plane, which is perpendicular to the straight line axis running through the head, the stem and the base of the device, is smaller than the head's circumference on the x-z plane, and/or its diameter on the x-z plane, which is perpendicular to the axis running through the head, the stem and the base of the device, is smaller than the head's diameter on the x-z plane. The base of the self-gripping device has a diameter and/or circumference which is smaller than, equal to or greater than the stem's diameter and/or circumference and takes the shape of a three dimensional form. The proportion of the stem's length to its diameter is equal or almost equal to, greater or smaller than zero. The axes of the device's stems connected to the base join or do not join at the same point on the base. The stem's axis running towards the base is a curved, straight or broken line. The head and/or the stem of the self-gripping device and/or the base are solids and/or openwork and/or blind openwork. The head, the stem and the base are made of materials of different physical properties and at least one of them is resilient and/or elastic. At least one connection between the head, the stem and the base of the self-gripping device is elastic and/or resilient. The three-dimensional gripping device connects with other three-dimensional self-gripping devices by means of the heads and the stems through clamping and/or hooking the heads with other heads and/or the heads with the stems and/or the stems with other stems.

[0005] The objective of the invention is to design an inexpensive and simply-constructed three-dimensional self-gripping device which, thanks to its construction, enables the easy gripping of objects and the creation of spatial forms of irregular shapes through the connection of numerous identical devices or their varieties. The self-gripping devices may be used as toy blocks or constructional elements intended for creating complex spatial forms which can be used as an element forming the structures of road surfaces, artificial ski slopes or the device and the connector can be used in reinforcing wires for creating reinforced concrete structures.

[0006] The self-gripping device is equipped with the modules and the connectors, and, according to the invention, is characteristic in that it has a spherical or cylindrical contour and it consists of the connector and at least two modules which have at least one embedded gripping element, and wherein the gripping elements are spread radially from the module's base centre and that their base is connected to the module's base, and wherein each module turns round on its own axis or on a common axis on its own plane or on common planes, and wherein the space between the neighbouring heads of the neighbouring modules is changeable. The gripping elements of the device have heads arranged in every possible position in relation to each other, preferably, according to the arrangement principle where the sum of the diameters of three neighbouring heads is larger than the sum of the distance between them, and where the stem's length is larger than the head's diameter and/or height, and where the minimum distance between the heads is not smaller than the stem's diameter. The gripping elements consist of a stem in the form of a three-dimensional solid, preferably being close to a cylinder in shape, and a head in the form of a three-dimensional solid, preferably being close to a sphere or semi-sphere in shape, and with the head's diameter being larger than the stem's diameter. The connection of the devices is effected after the heads of the gripping elements become hooked with each other and/or the heads become hooked with the stems in the event where the sum of the diameters of three neighbouring heads is smaller than the sum of the distances between them and the stem's length is larger than the head's diameter. The materials from which the gripping elements, the stems and the bases are made elastic and/or resilient and/or non-resilient properties. The connector, the module and the gripping elements are made of materials of identical or different physical properties, preferably, of resilient, elastic, low-friction coefficient materials and/or non-resilient materials. The heads of the gripping elements have smooth and/or ridged surfaces so that they can connect with other heads belonging to a device of the same type. The heads of the gripping elements have smooth surfaces and/or

surfaces with parallel cut-grooves lying in the cut- groove width distance from each other. The connector is a three-dimensional solid, preferably with a shape being close to a solid of revolution or a polygon, and which connects the modules in a way enabling them to revolve in relation to each other.

[0007] The main features of the self-gripping device are its spherical or cylindrical shape as well as the changeable position of gripping elements of the neighbouring modules of the device in relation to each other.

[0008] Due to the changeable position of the gripping elements in relation to each other, the self-gripping device gains a greater ability of fitting into the gripping elements belonging to other devices of this type. Thanks to that, a situation in which some gripping elements repel each other instead of becoming fastened to them is definitely far less likely.

[0009] The subject of the invention was presented in the example showed in a pictorial drawing, where in Fig. 1 it is in an axonometric projection as the gripping device **x** in a spherical form and the plane **z** perpendicular to the axis of revolution **d** around which the modules **m** revolve, in Fig. 2 a section of the device **x** in a spherical form is presented wherein two modules **m** are interconnected without a separate connector **L**, wherein the modules **m** both serve as the connectors **L** and connect to each other inseparably in a way which allows the revolution of the modules in relation to each other and in relation to the common axis **d**; in Fig. 3 a section of the device **x** in a spherical form is presented with two interconnected modules **m** with the use of two modules **m** whose bases **p** also serve as the connectors **L**, wherein all the modules revolve around the common axis **d**, in Fig. 4 the device is presented in an axonometric projection wherein it is in the form of a cylinder consisting of a few modules revolving around the common axis **d** on the plane **z**; in Fig. 5, 6 and 7 - the elements **m** and **a** and **L** of which the gripping device in a cylindrical form is made are presented in an axonometric projection, in Fig. 5 - two modules **m** consisting of the gripping elements **a** and the base **p** are show in an axonometric projection, in Fig. 6 - the module **m** consisting of the gripping element **a** and the base **p** integrated with the connector **L** as well as the separate connector **L** are presented in an axonometric projection, in Fig. 7 and 12 the gripping element **a** is presented in an axonometric projection, in Fig. 8 a - section of the device is presented wherein it is in the form of a cylinder with the connector **L** and six modules **m** revolving around the common axis **d** on the plane **z**, in Fig. 9 and 13 - the device **x** in a spherical form is presented in an axonometric projection with the multiple planes **z** and multiple modules revolving around their own axes **d** connected with the connector **L**, in Fig. 10 and 11 and 12 the elements **m** and **a** and **L** are presented an axonometric projection of which the device **x** in a spherical form with numerous axes **d** is built, in Fig. 10 - the connector **L** is presented which connects the modules **m** of the device **x** in a spherical form and the multiple planes **d**, in Fig. 11 the module **m** is presented consisting of the base **p** and the gripping elements **a**, in Fig. 14 a section of the device **x** in a spherical form is presented with the numerous axes of revolution **d** with the modules **m** interconnected by means of the connector **L**, in Fig. 15 - a section of the device **x** is showed together with the options for connecting with other devices of this type from every side, in Fig. 16 - the interconnected devices **x** are presented, in Fig. 17 the same device **x** in an axonometric projection is presented as well as the changeable space **k** between the heads **g** changing their positions in relation to each other during the revolutions of the modules in relation to each other around the axis **d** on the plane **z**, in Fig. 18 the gripping element **a** and **a1** consisting of the head **g** and the stem **e** and the base **p** is presented, and in Fig. 19 - the gripping element **a** is presented wherein the head **g** has the diameter **sg** larger than the diameter **st** of the stem **e**.

[0010] As presented in figures (Fig. 1 to 19) the self-gripping device **x** is in the shape of a cylinder or a sphere and consists of the modules **m** having the gripping elements **a** as well as the axis of revolution **d** of the module **m** or of the modules' connector **L**, the plane **z** perpendicular to the axis of revolution **d** around which the module revolves, the module's base **p**, the head **g** of the gripping element **a**, the base **f** of the gripping element **a**, the stem **f** of the gripping element **a**, the changeable space **k** between the heads **g**, changing their position in relation to each other during the revolutions of the neighbouring modules **m** in relation to each other around the axis **d** on the plane **z**.

[0011] According to the invention, the gripping device **x** consists of at least two modules **m** interconnected directly or via the separate connector **L** and of the gripping elements **a** fastened with the base **f** to the base **p** of the module **m**. The module **m** has at least one gripping element **a** and the base **p**. The base **p** of the module **m** has the shape of a three-dimensional solid, preferably a solid of revolution. The module **m** has its own axis of revolution **d** around which it revolves. The modules **m** are interconnected by means of the connector **L**. The base **p** of the module **m** serves as the connector **L** in some cases. The modules **m** revolve in relation to each other and/or the connector **L**.

[0012] The connector **L** connects the modules **m** enabling them to revolve in relation to each other. The connector **L** is a three-dimensional solid with a shape preferably being close to a solid of revolution. The connector **L** and the module **m** and the gripping elements **a** are made of materials of different or identical physical properties, preferably of resilient, elastic and low friction coefficient materials.

[0013] The gripping elements **a** are spread radially from the base **p** of the module **m** and/or its axis **d** and are fastened to the module **m**. The gripping elements a consist of the stem **e** of an elongated shape, preferably being close to a cylinder, and of the head **g** with a shape of a complex solid figure, preferably of a spherical shape

or being mushroom-shaped.

[0014] The stem **e** is fastened by means of the base **f** to the module's base **p**. The stem **e** may be of any length, preferably being approximately three times larger than the height of the head **g**.

[0015] The head **g** has the abilities of connecting with other heads belonging to other devices through hooking or clamping (Fig. 18/a1). The diameter **sg** of the head **g** is larger than the diameter **st** of the stem **e**.

[0016] The space **k** between the neighbouring heads **g** of the neighbouring modules **m** is changeable because of the revolutions of these modules in relation to each other and their common or own axis **d**.

Claims

1. A self-gripping device, with the said device comprising modules and connectors **characteristic in that** the contour is of spherical or cylindrical shape and consists of the connector **(L)** and at least two modules **(m)** equipped with at least one embedded gripping element **(a),** and that the gripping elements **(a)** spread radially from the centre of the base **(p)** of the module **(m)** and are connected through the base **(f)** to the base of the module **(p),** and that each module **(m)** revolves around its own or the common axis **(d)** on its own plane or on common planes **(z),** and that the space **(k)** between the neighbouring heads **(g)** of the neighbouring modules **(m)** is changeable.

2. The self-gripping device of claim 1, characteristic in that the gripping elements **(a)** of the device **(x)** have the heads **(g)** which are arranged in every possible way in relation to each other, which is preferably on the arrangement principle according to which the sum of diameters of three neighbouring heads **(g)** is larger than the sum of the distances between them and the length of the stem **(e)** is larger than the diameter and/or the height of the head **(g)** and the minimum distance between the heads **(g)** is not smaller than the diameter of the stem **(e).**

3. The self-gripping device of claims 1 or 2, **characteristic in that** the gripping elements **(a)** comprise the stem **(e)** in the form of a three-dimensional solid figure, preferably being close to a cylinder in shape, and the head **(g)** in the form of a three-dimensional solid preferably being close to a sphere or a semisphere in shape, and that the diameter **(sg)** of the head **(g)** is larger than the diameter **(st)** of the stem **(e).**

4. The gripping device of claim 1 or 2 or 3, **characteristic in that** the connection between the devices is effected after the heads **(g)** of the gripping elements **(a)** are hooked to each other and/or the heads **(g)** are hooked to the stems **(e)** in the event when the sum of diameters of three neighbouring heads **(g)** is smaller than the sum of the distances between them and the length of the stem **(e)** is larger than the diameter of the head **(g).**

5. The self-gripping device of claim 1 or 2 or 3 or 4, **characteristic in that** the connector **(L)** and the module **(m)** and the gripping elements **(a)** are made of materials of different or identical physical properties, preferably of resilient, elastic and low friction co-efficient materials and/or non-resilient materials.

6. The self-gripping device of claim 1 or 2 or 3 or 4 or 5, **characteristic in that** the heads **(g)** of the griping elements **(a)** have smooth and/or ridged surfaces so that they can become connected with other heads **[a (1)]** of the device **(x)** of the same type.

7. The self-gripping device of claim 1 or 2 or 3 or 4 or 5 or 6, **characteristic in that** the heads **(g)** of the gripping elements **(a)** have smooth surfaces and/or surfaces with the parallel cut grooves **(t)** lying in the cut-groove **(t)** width distance from each other.

8. The self-gripping device of claim 1, **characteristic in that** the connector **(L)** is a three-dimensional solid figure, preferably with a shape being close to a solid of revolution or polygon, and that it connects the modules **(m)** in a way enabling them to revolve in relation to each other.

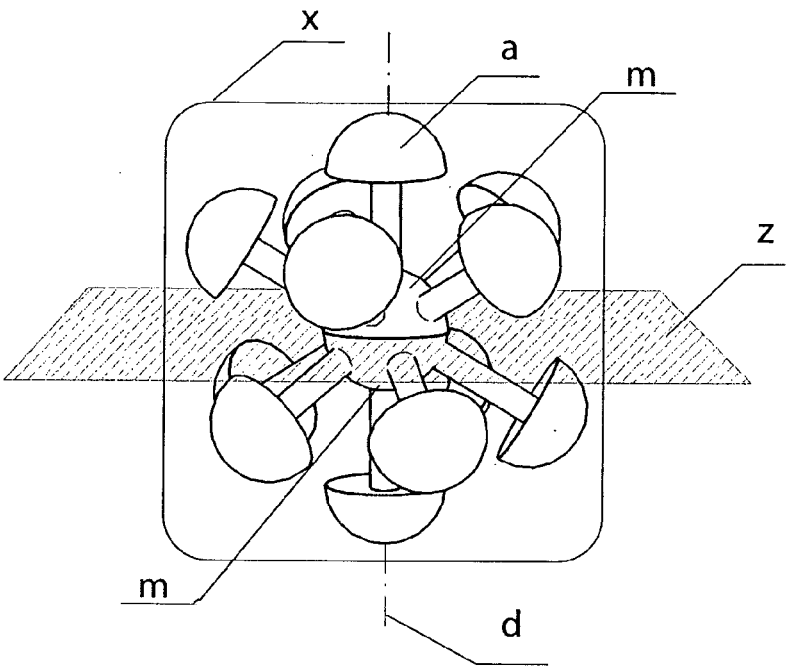


Fig. 1

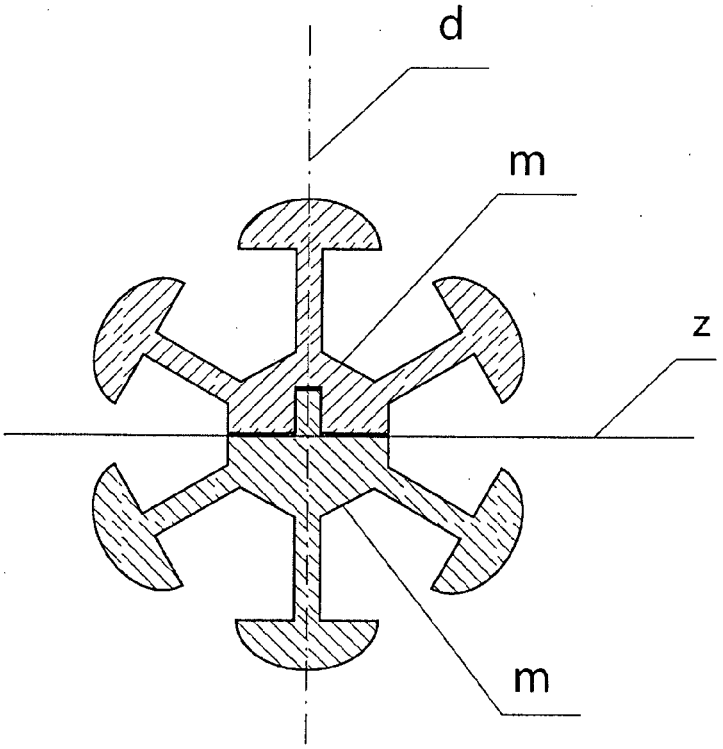


Fig. 2

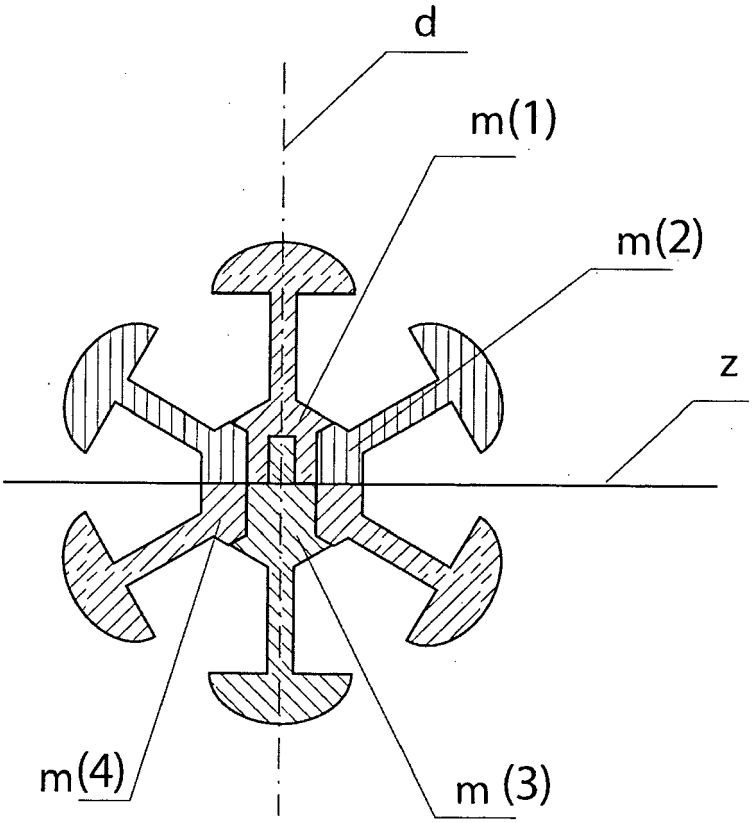


Fig. 3

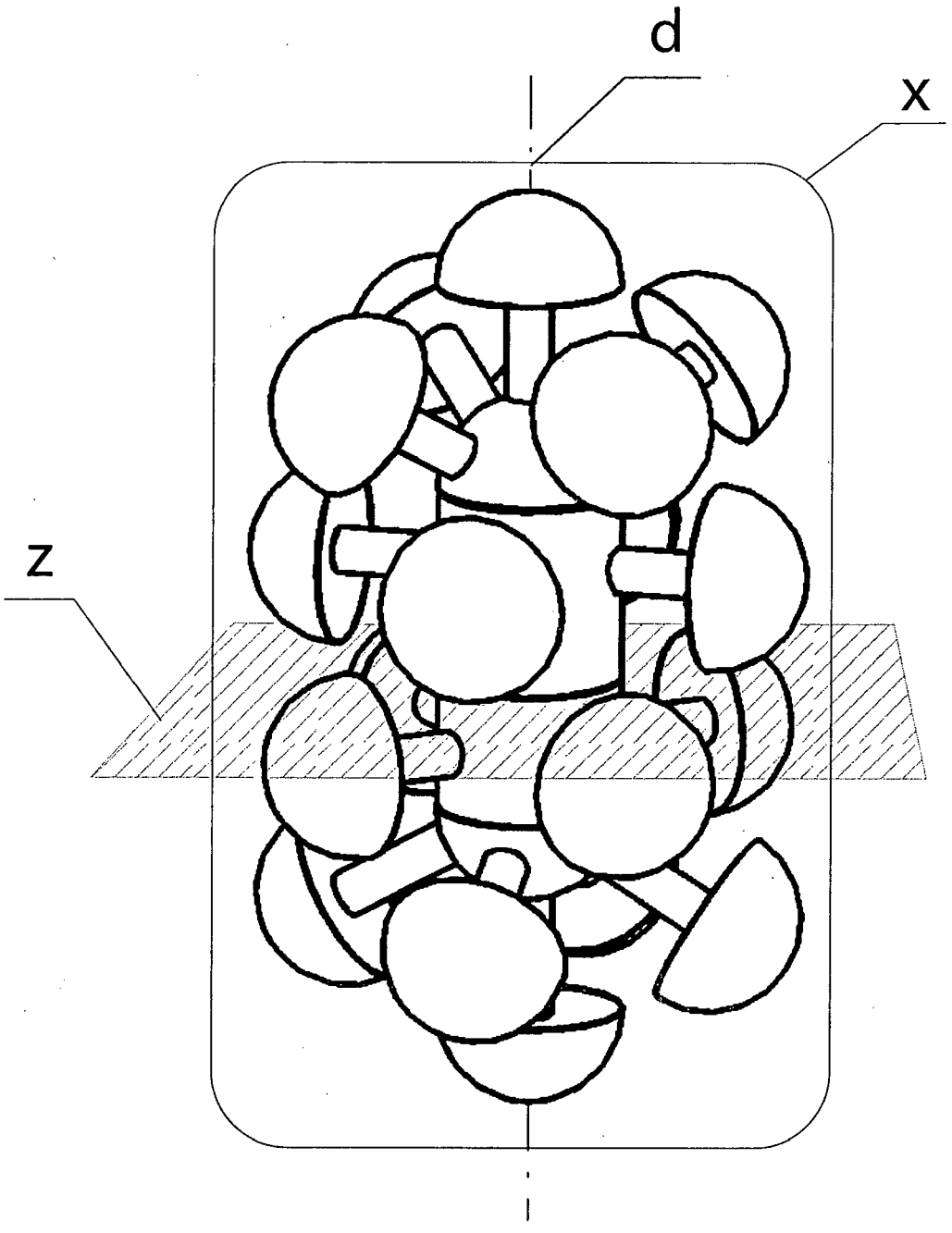


Fig. 4

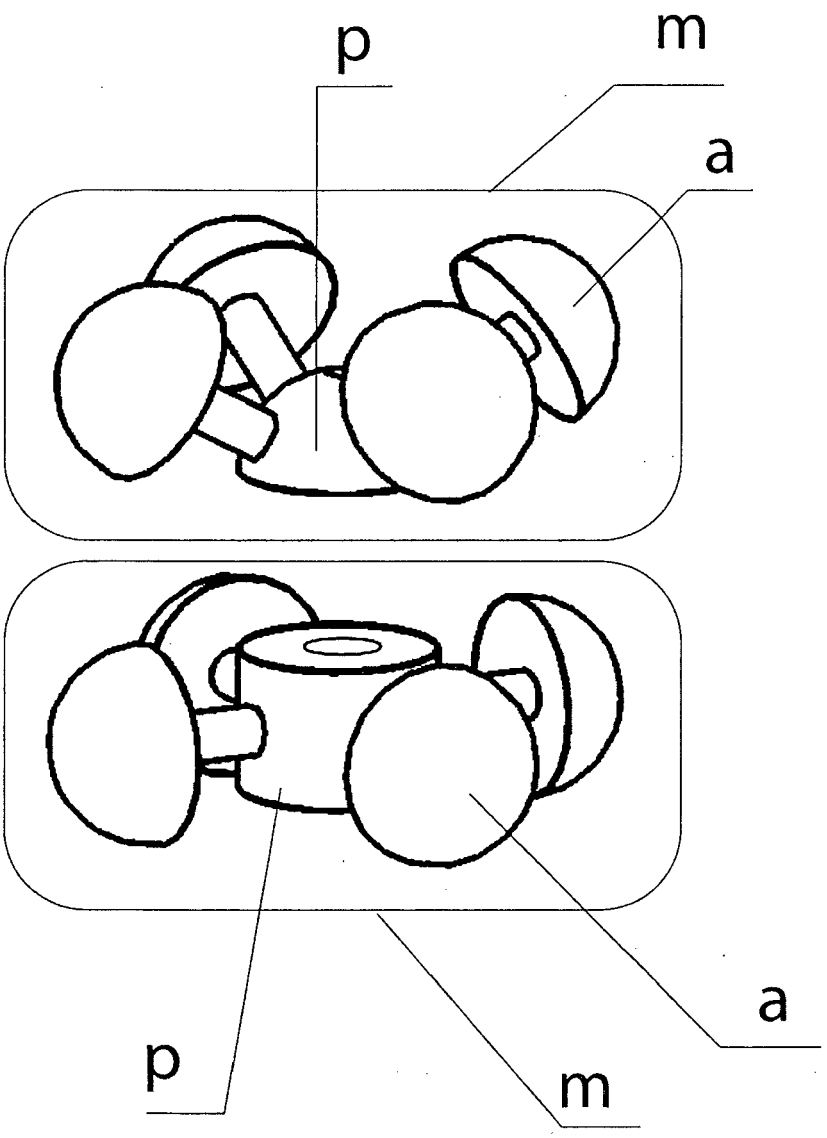
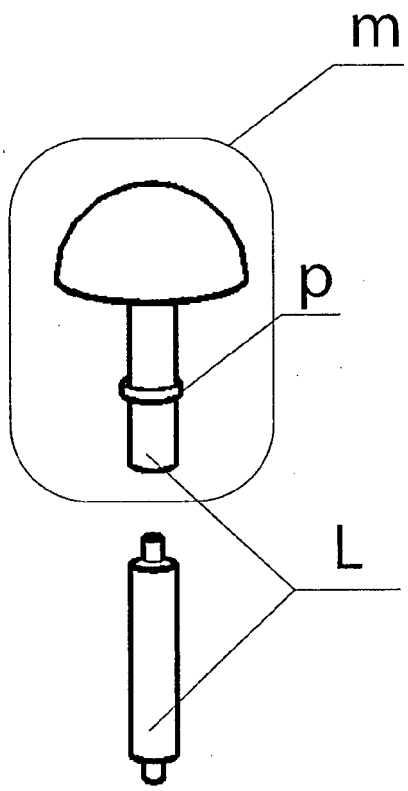


Fig. 5



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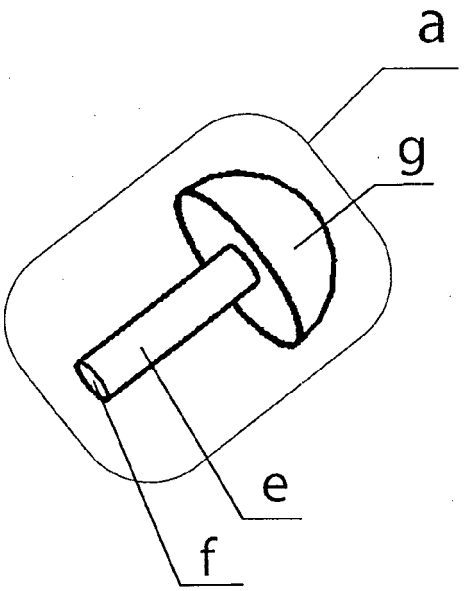

Fig. 7

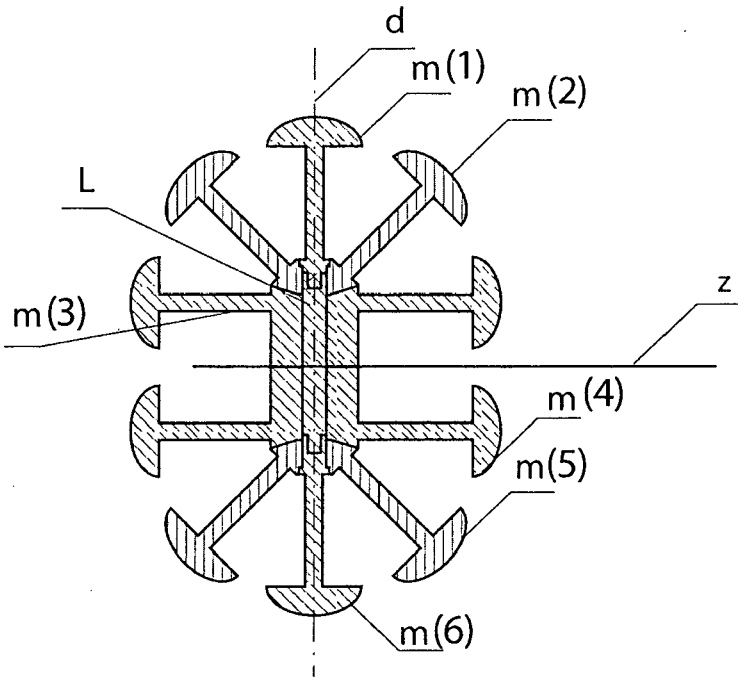

Fig. 8

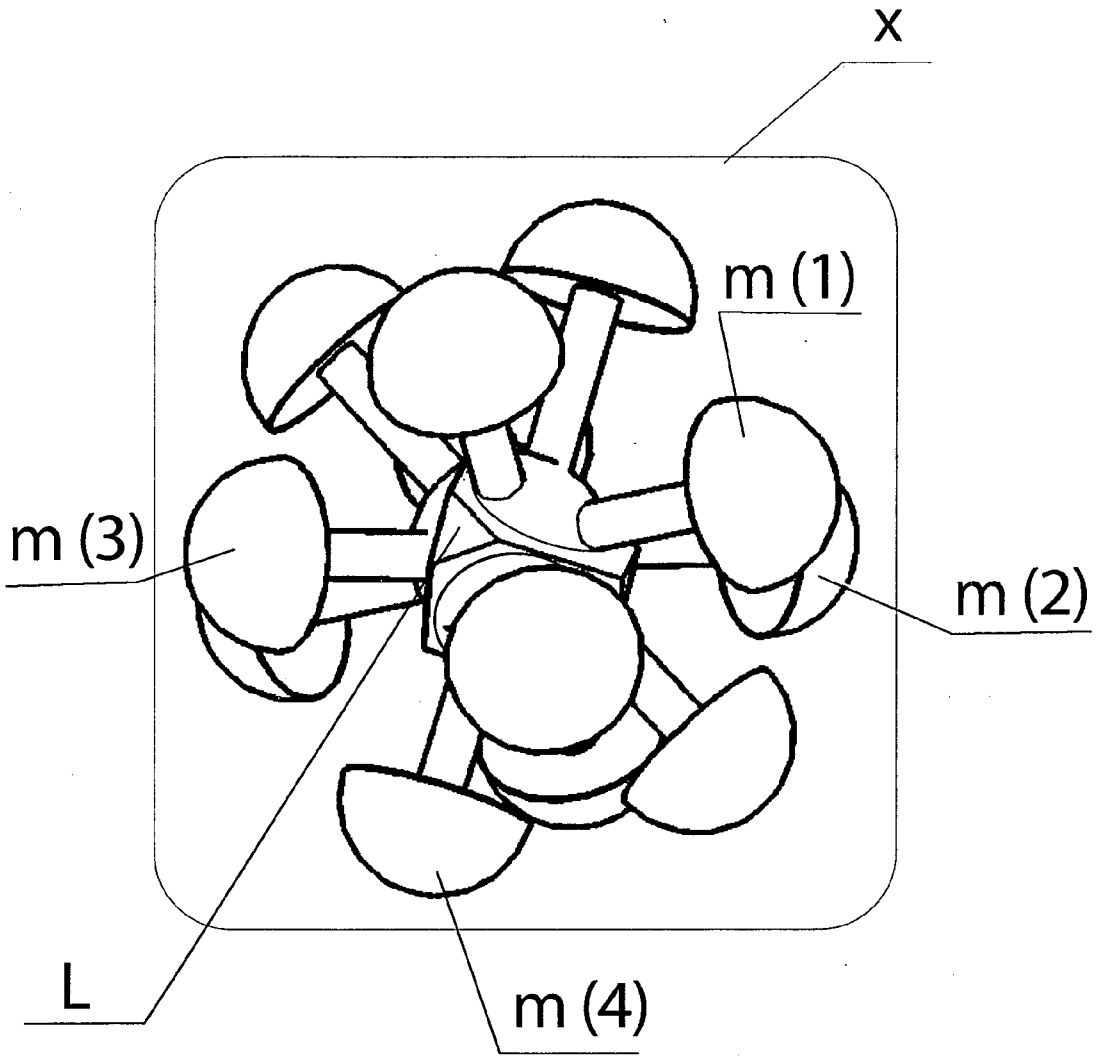

Fig. 9

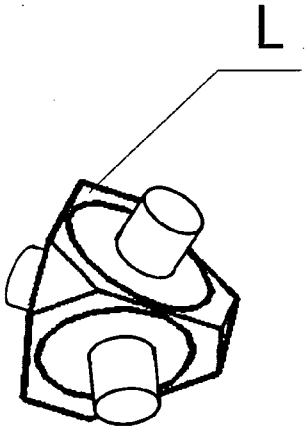

Fig. 10

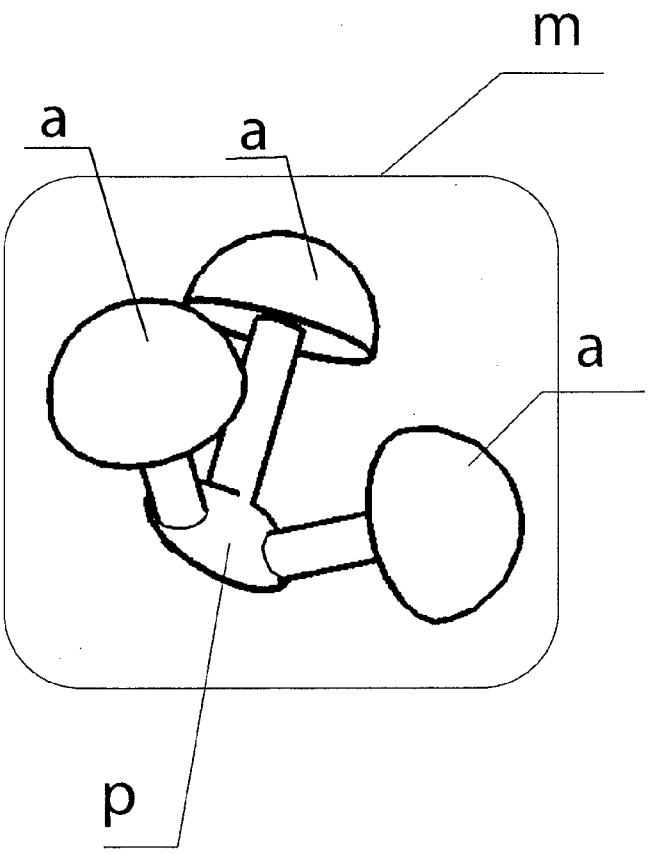

Fig. 11

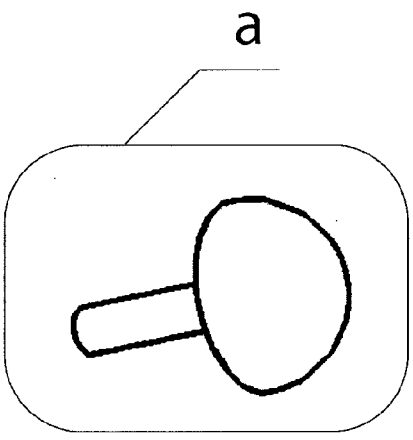

Fig. 12

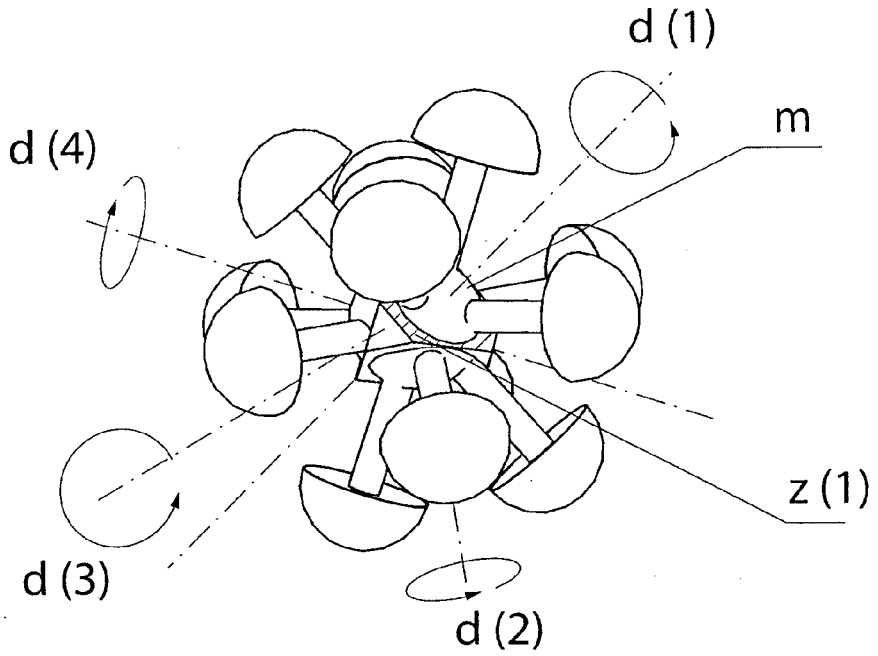

Fig. 13

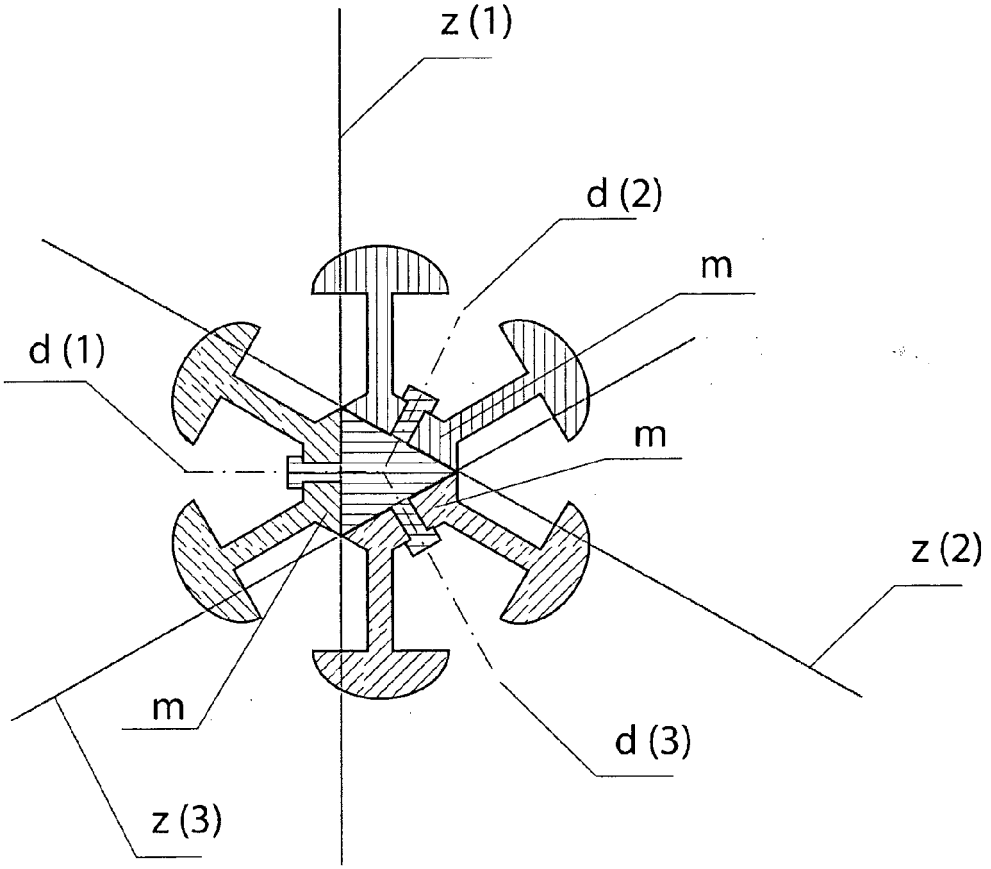

Fig. 14

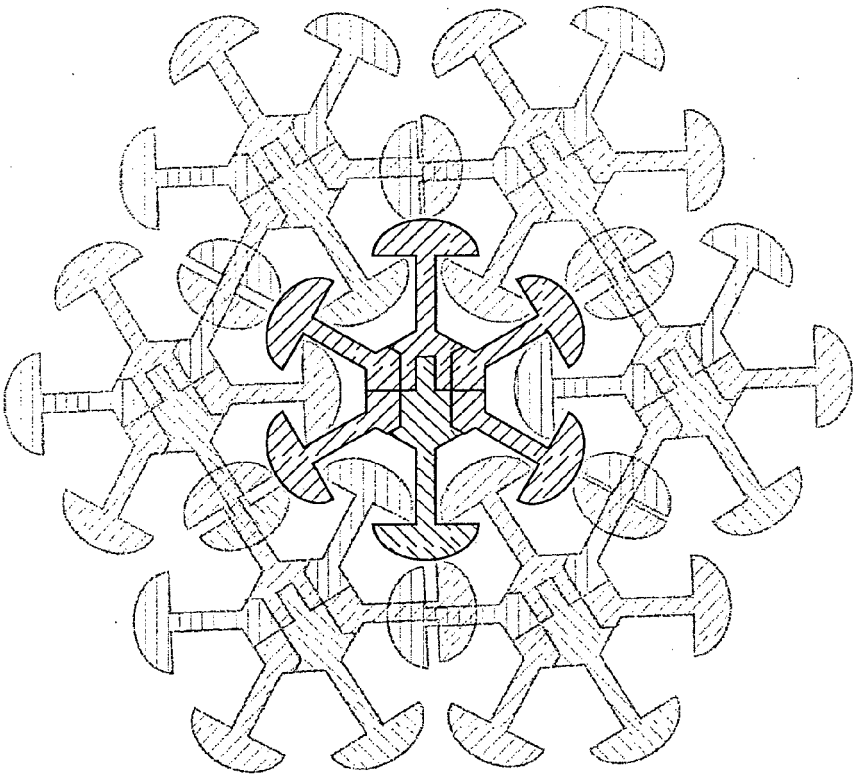

Fig. 15

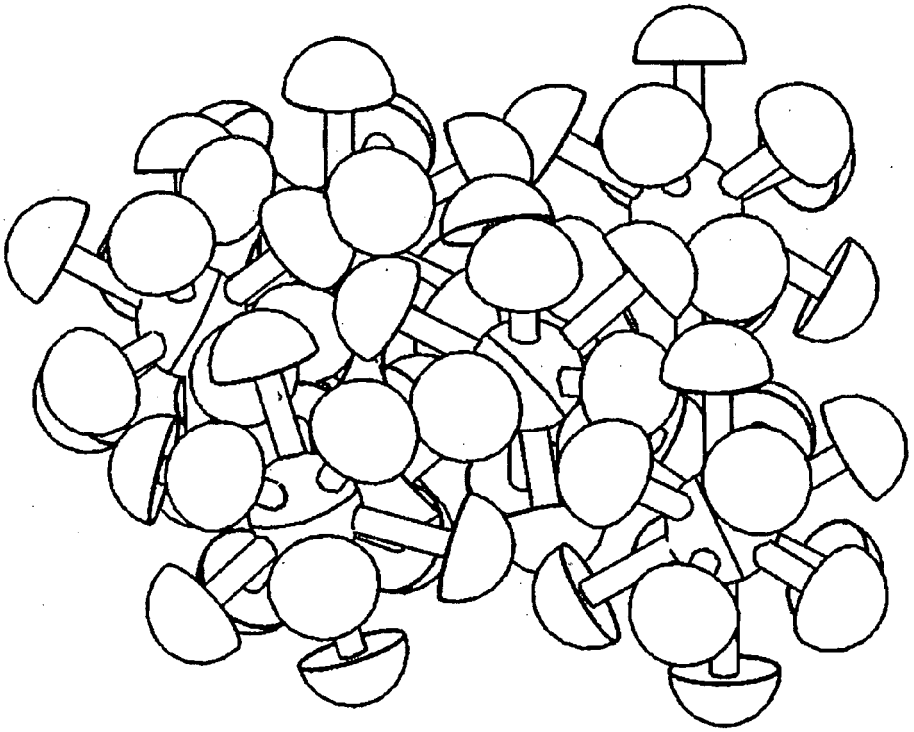

Fig. 16

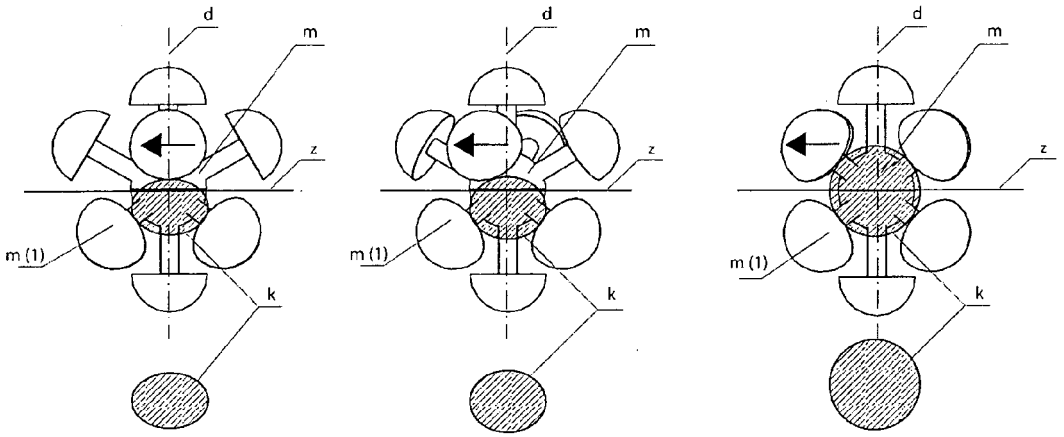

Fig. 17

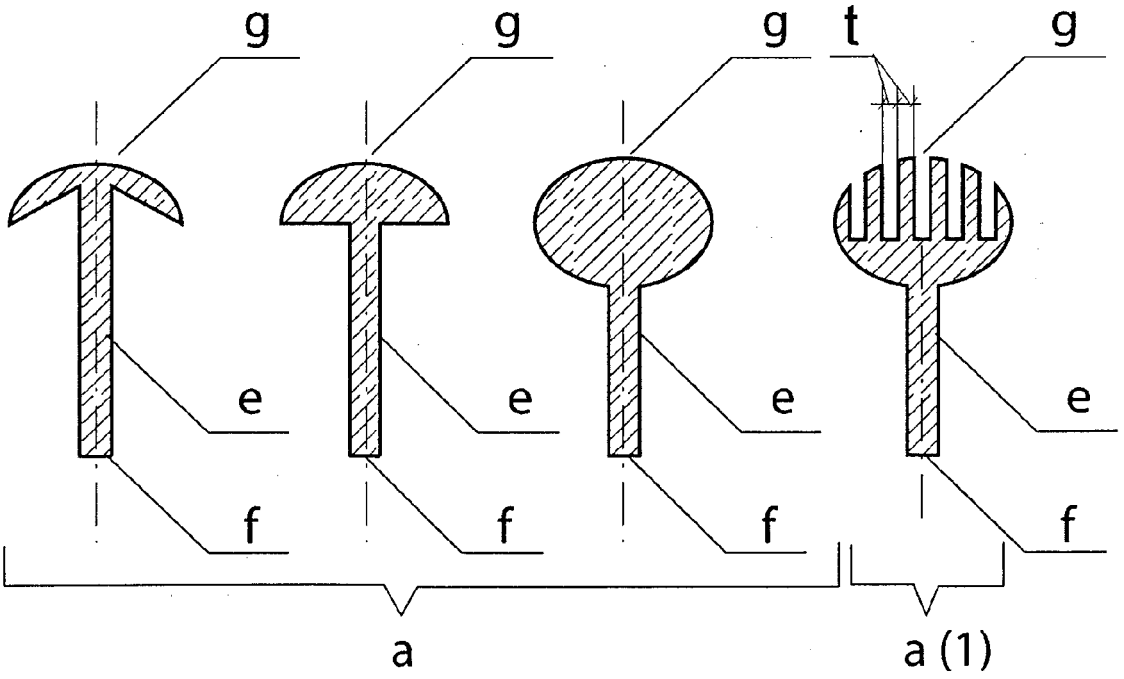

Fig. 18

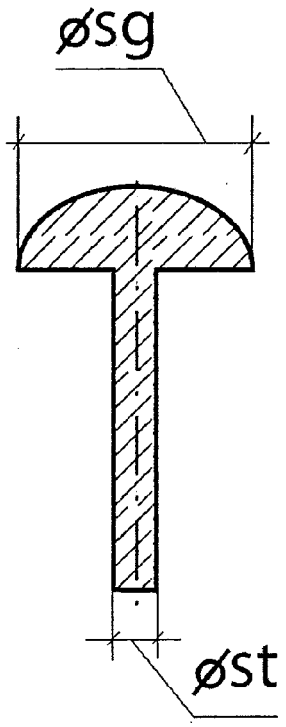

Fig. 19

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EUROPEAN SEARCH REPORT

Application Number
EP 12 46 0027

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 2010/050831 A1 (3D STUDIUM FORM PRZEMYSLOWYCH [PL]; WARDAS JAROSLAW [PL]) 6 May 2010 (2010-05-06) * the whole document *	1-8	INV. A63H33/06 A44B18/00
A	US 2007/111634 A1 (ROSENZWEIG GARY L [US]) 17 May 2007 (2007-05-17) * the whole document *	1-8	
A	US 3 597 874 A (OGSBURY CHARLES S ET AL) 10 August 1971 (1971-08-10) * the whole document *	1-8	

TECHNICAL FIELDS SEARCHED (IPC)

A63H
A44B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	7 September 2012	Turmo, Robert

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 12 46 0027

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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07-09-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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Patent documents cited in the description

- PL P386387 **[0004]**