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(54) **3-D PUZZLE WITH MOVING SECTORS**

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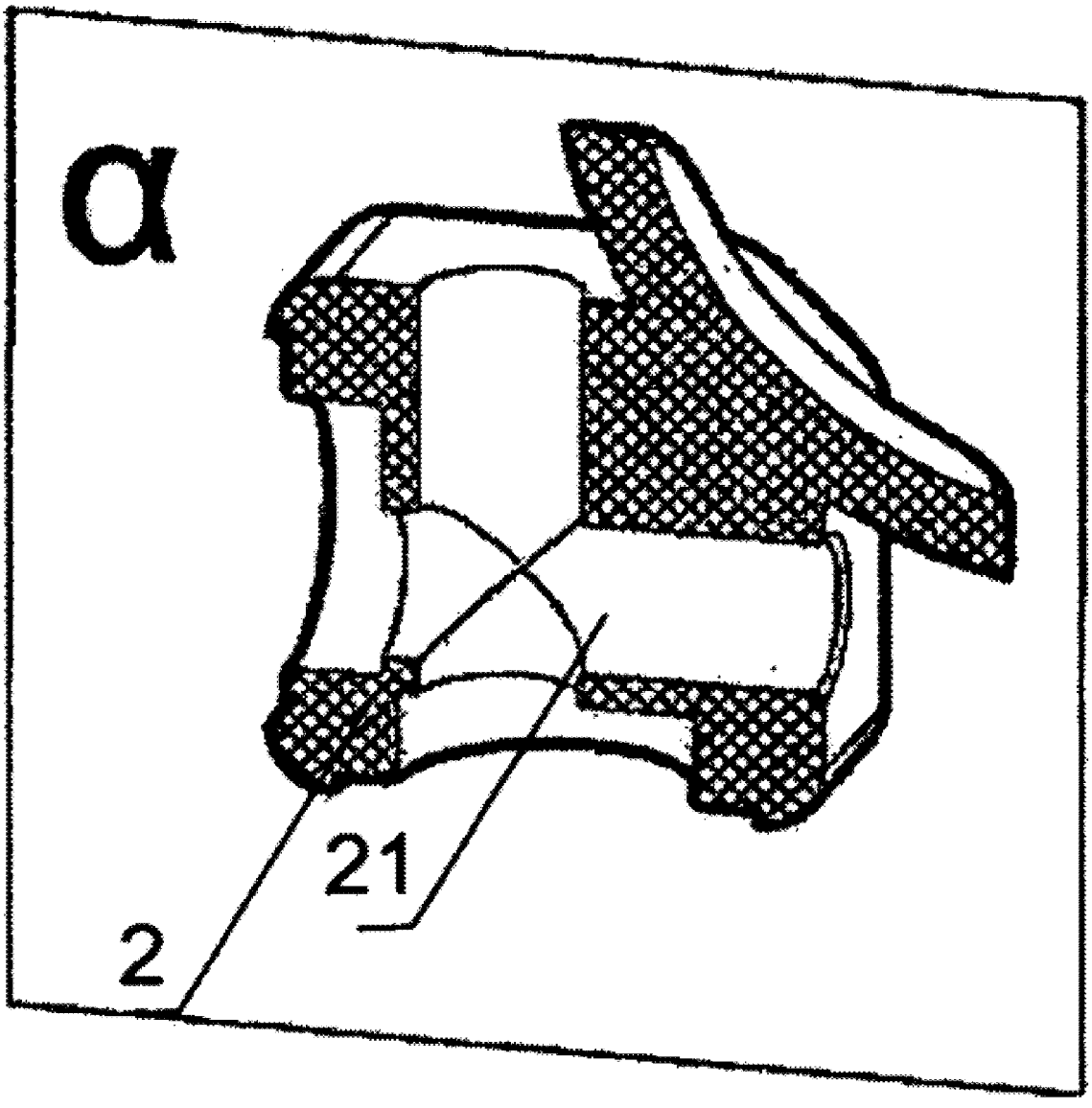
A63F 9/08	(2006.01)
A63F 9/34	(2006.01)

(52) **U.S. Cl.**

CPC ***A63F 9/0842*** (2013.01); *A63F 2009/0846* (2013.01); ***A63F 9/34*** (2013.01); ***A63F 9/0861*** (2013.01)

(57) **ABSTRACT**

A 3-D puzzle is implemented as cube consisting of twenty six movable sectors configured to move about a central cross-piece created by three axels that are perpendicular to each other. Each of the three axels has a far edge attached to a plate with stationary magnets positioned on it. All movable sectors have an outer surface and an inner surface configured to house a magnet. The movable sectors are classified as eight angular ones, twelve end ones and six central ones. The angular sectors have cavities configured to host three movable elements configured to be positioned perpendicular to each other.



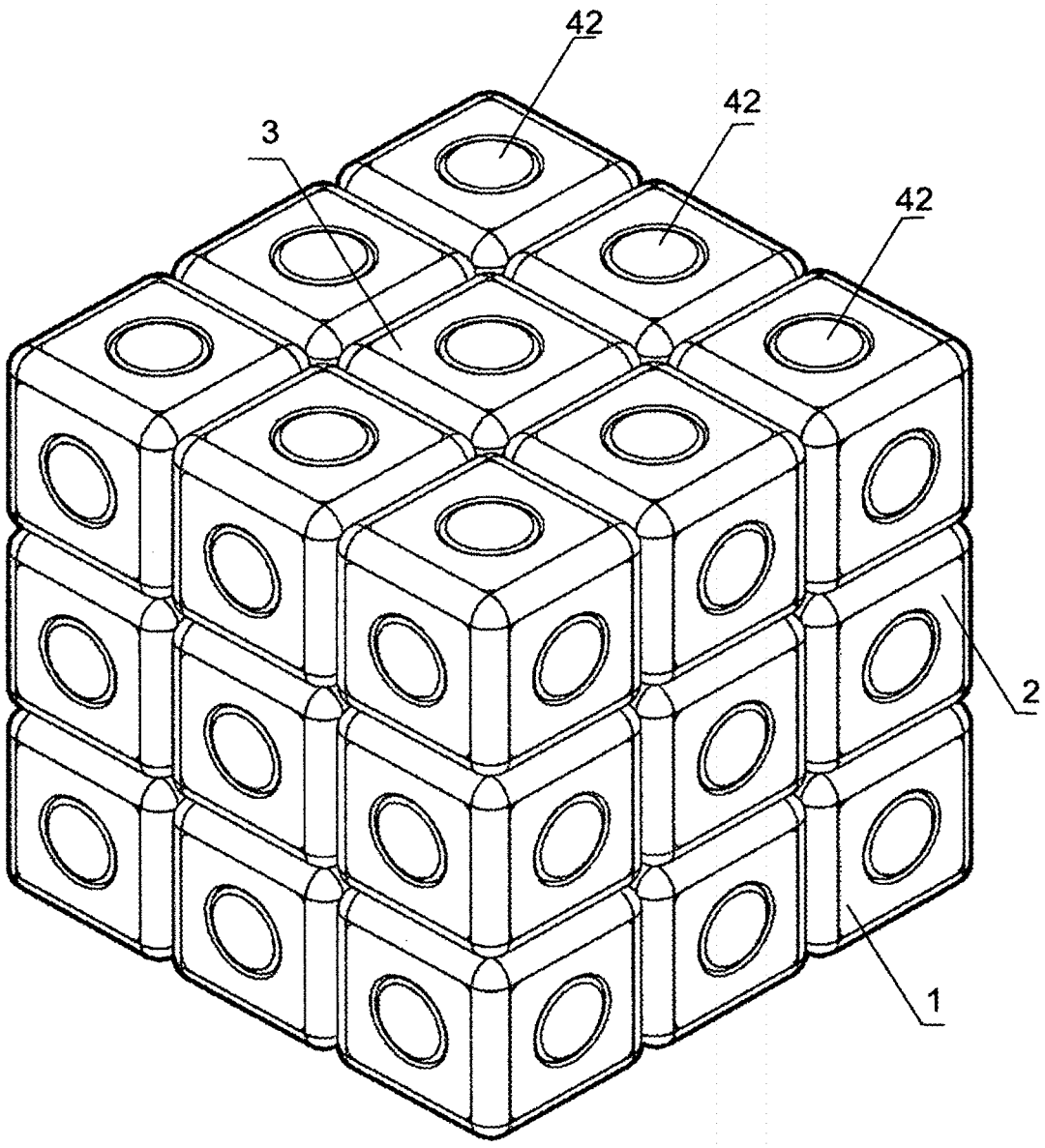


FIG. 1.

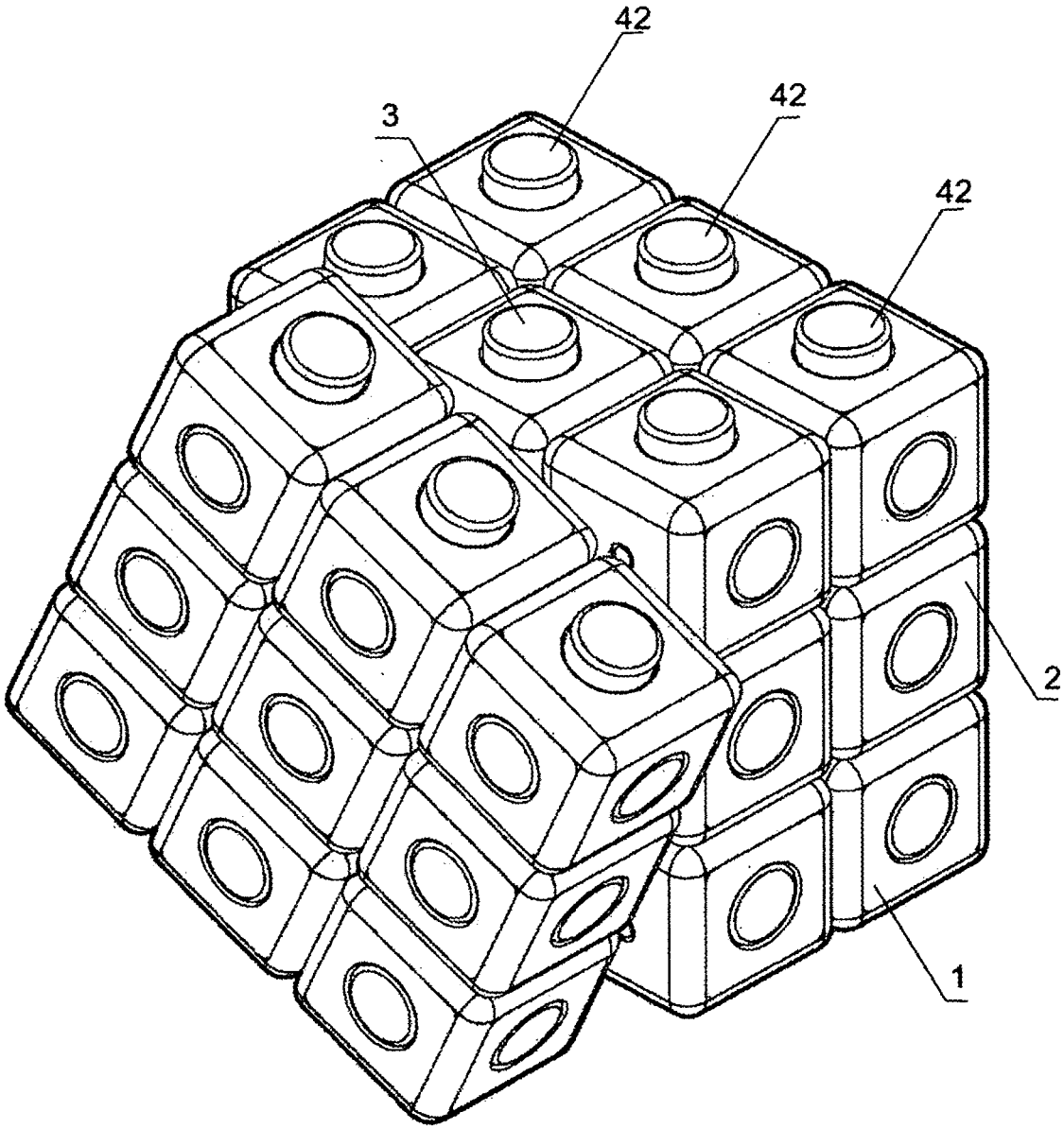
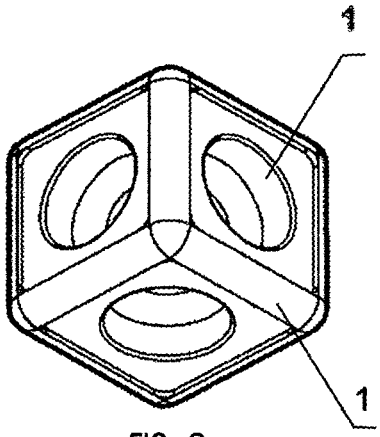


FIG. 2.



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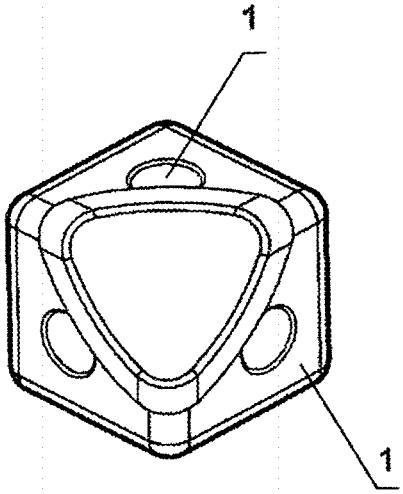

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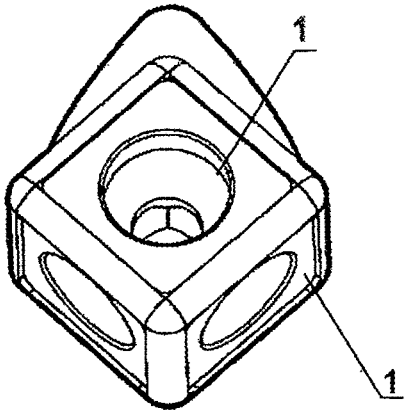

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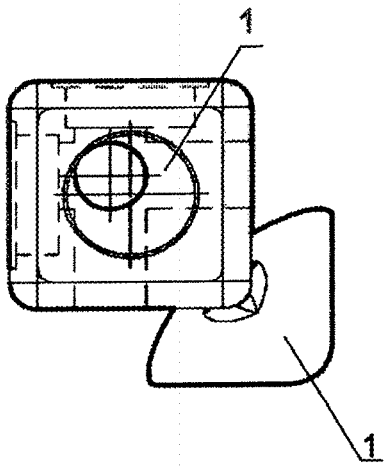

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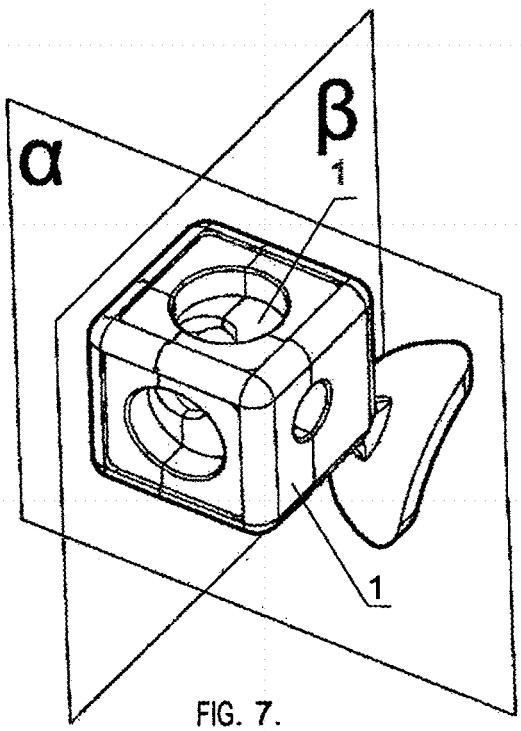

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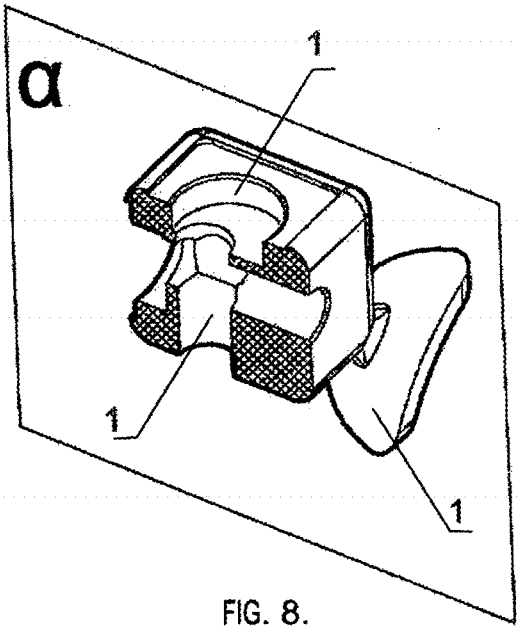

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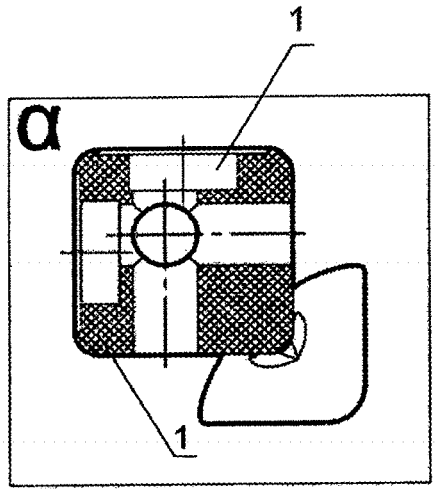

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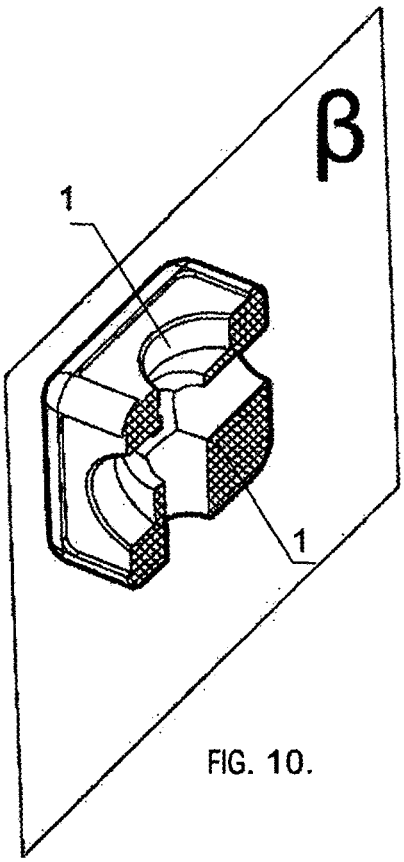

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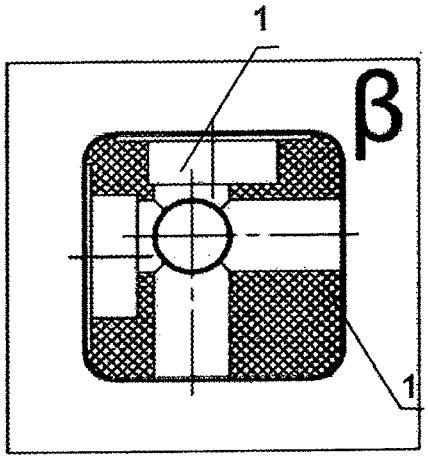

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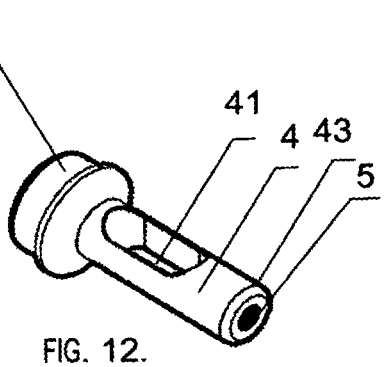

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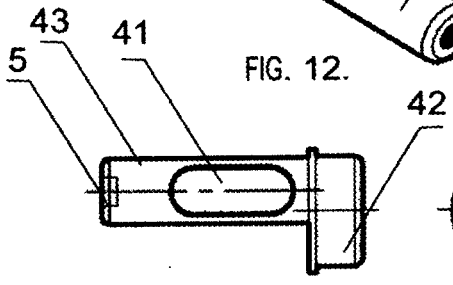

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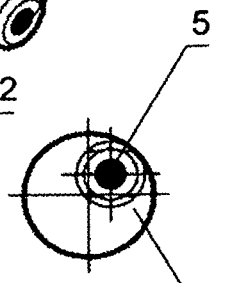

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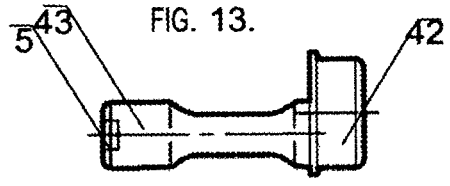

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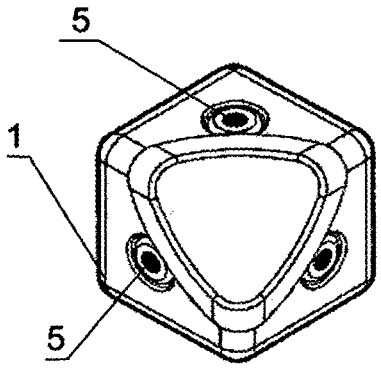

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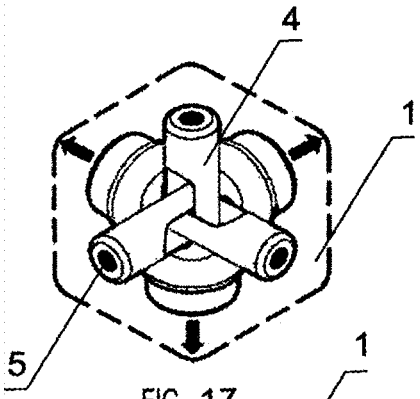

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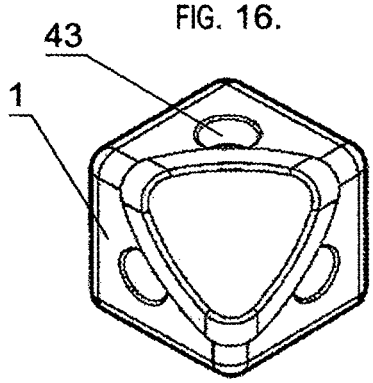

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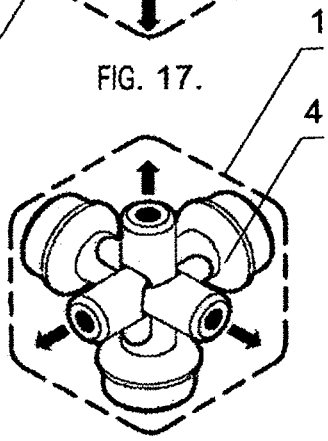

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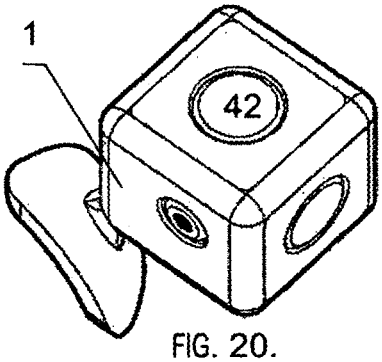

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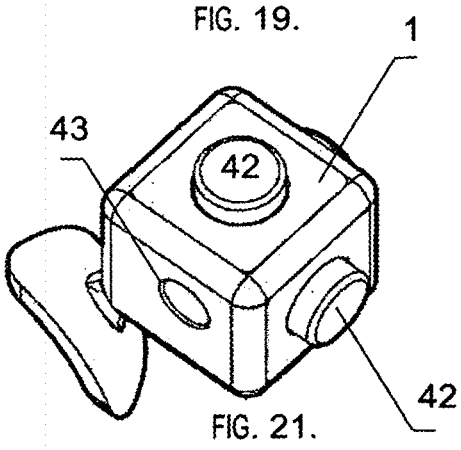

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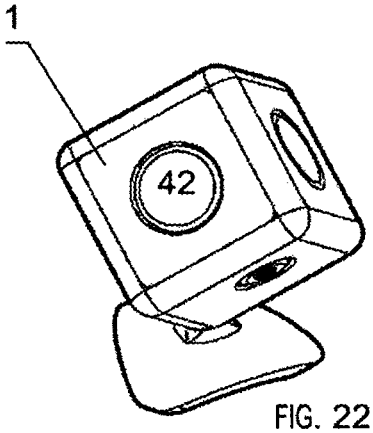

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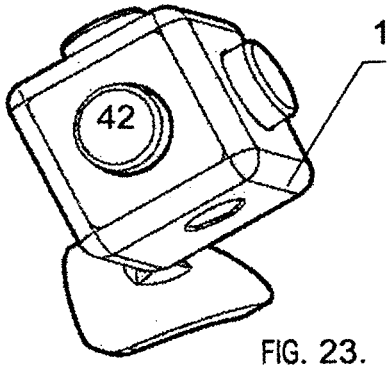

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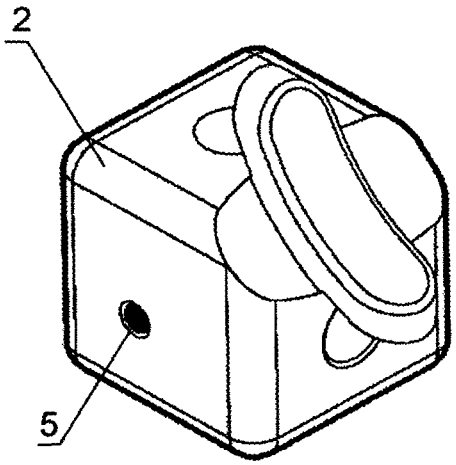

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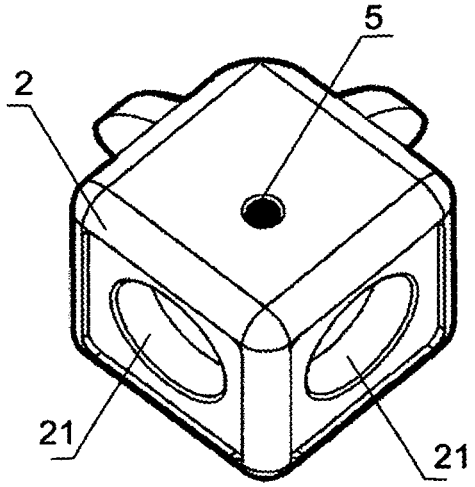

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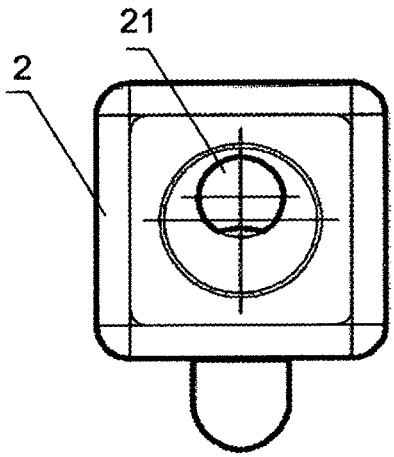

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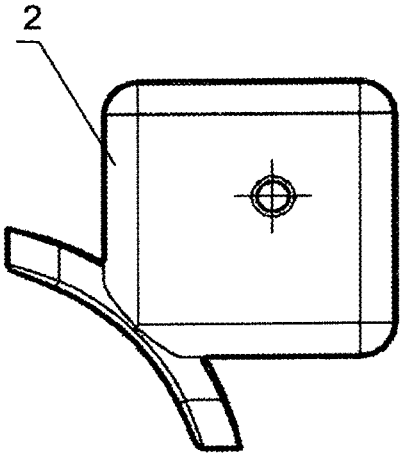

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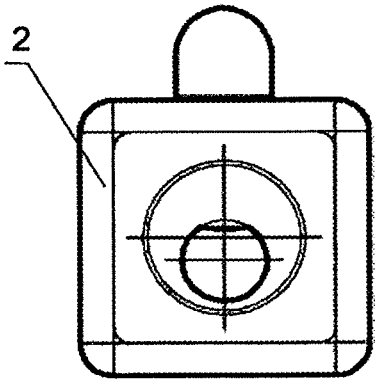

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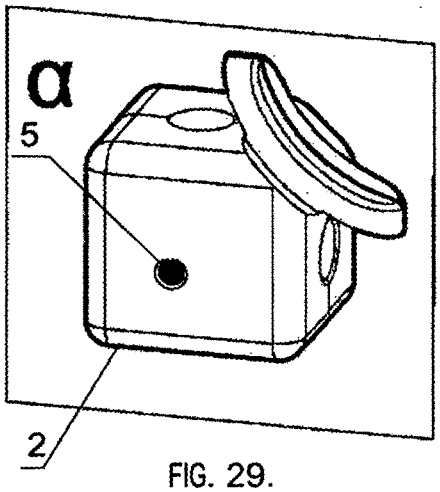

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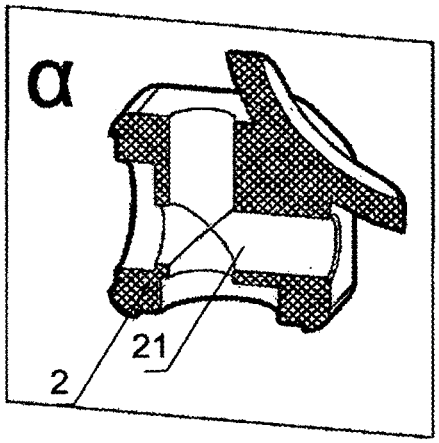

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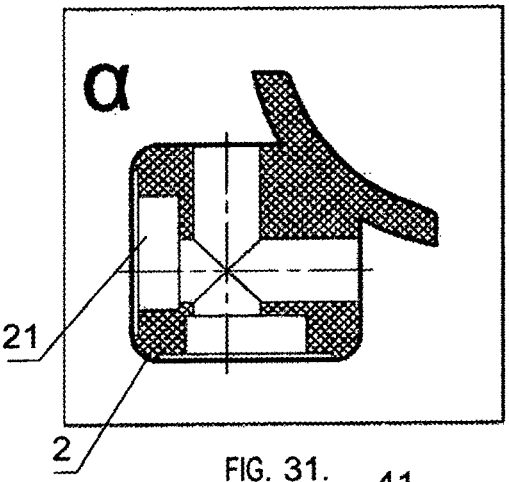

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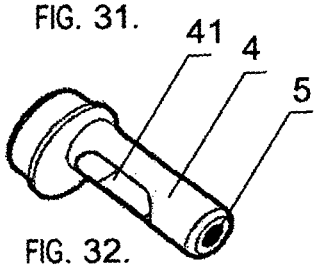

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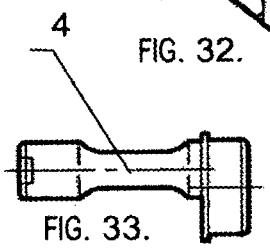

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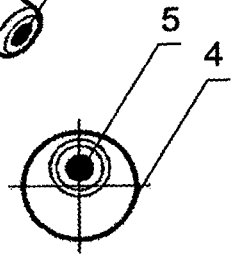

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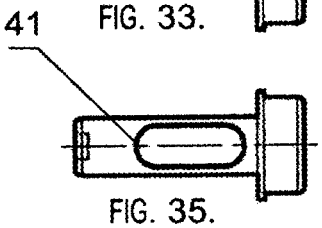

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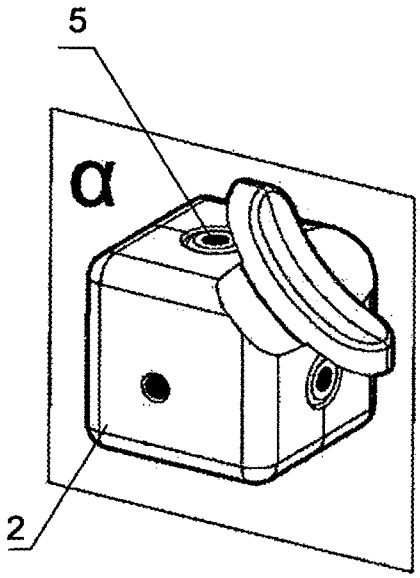

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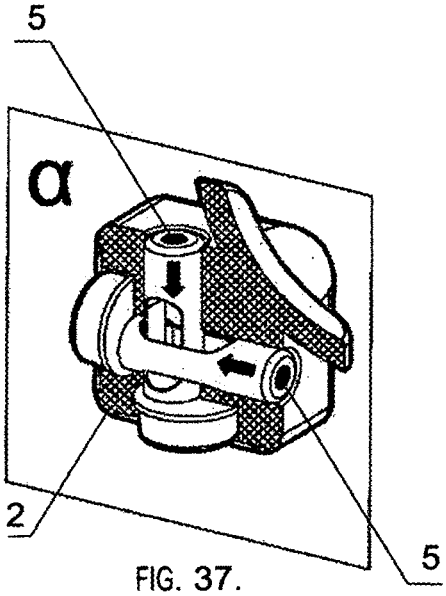

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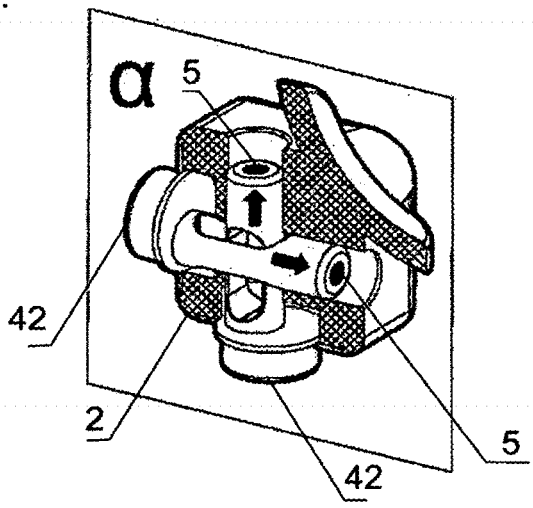

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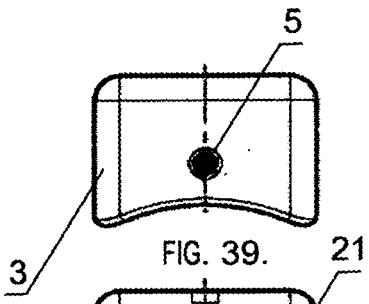

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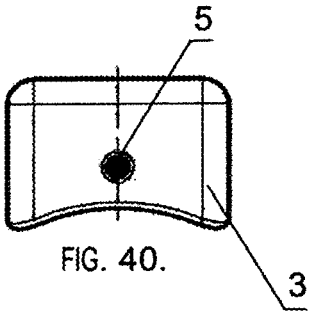

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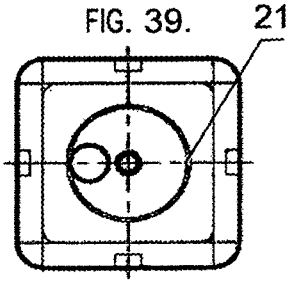
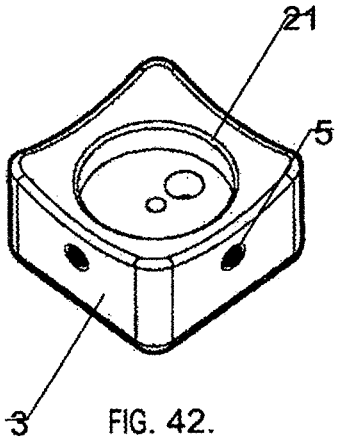


FIG. 41



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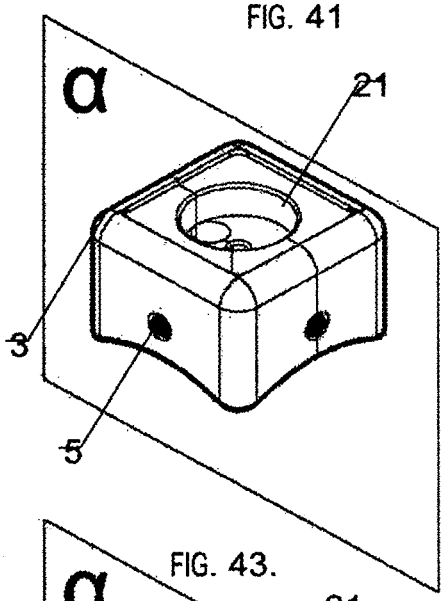

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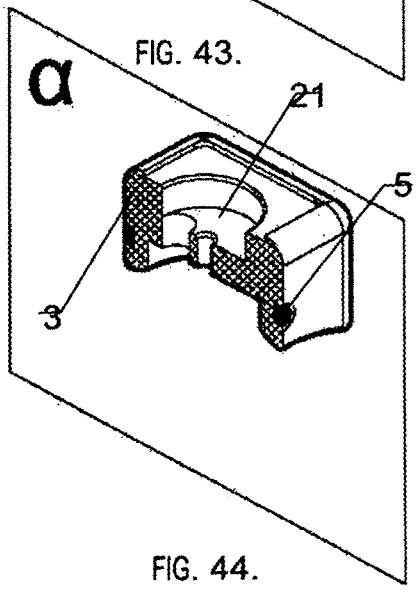

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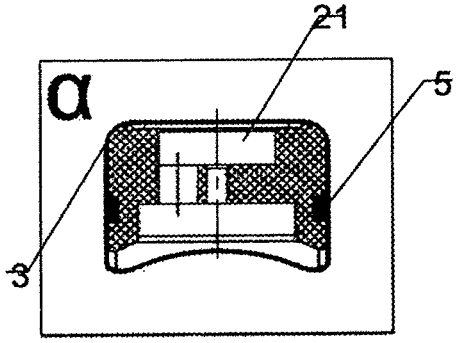

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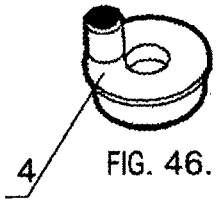

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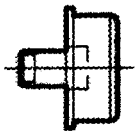

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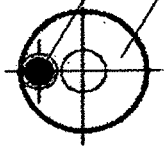

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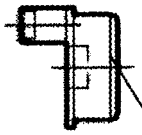

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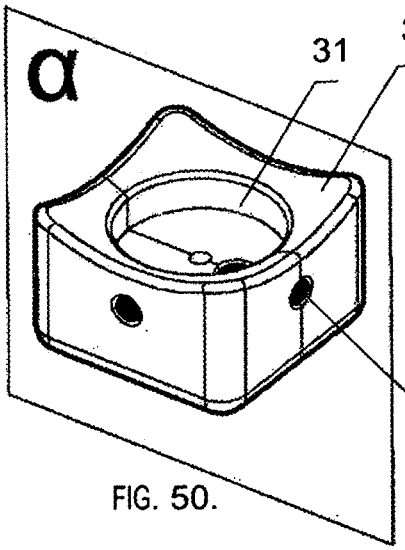

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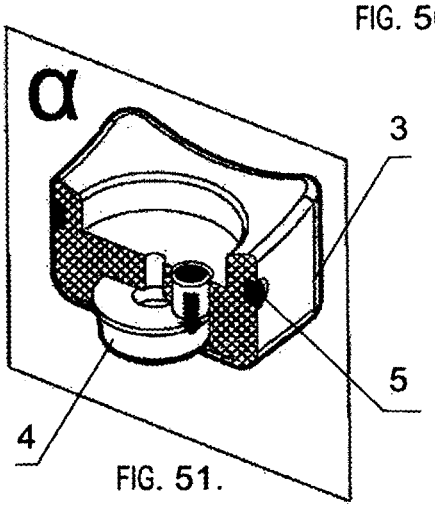

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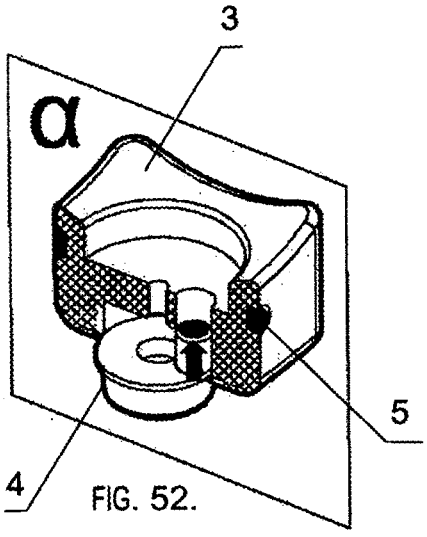

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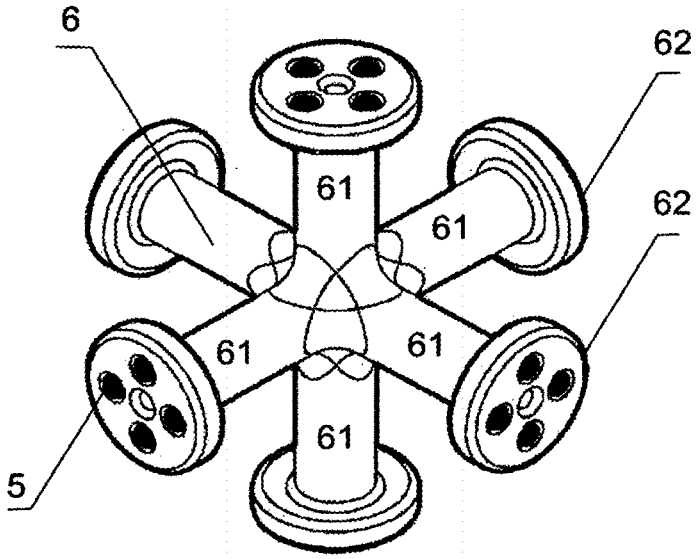

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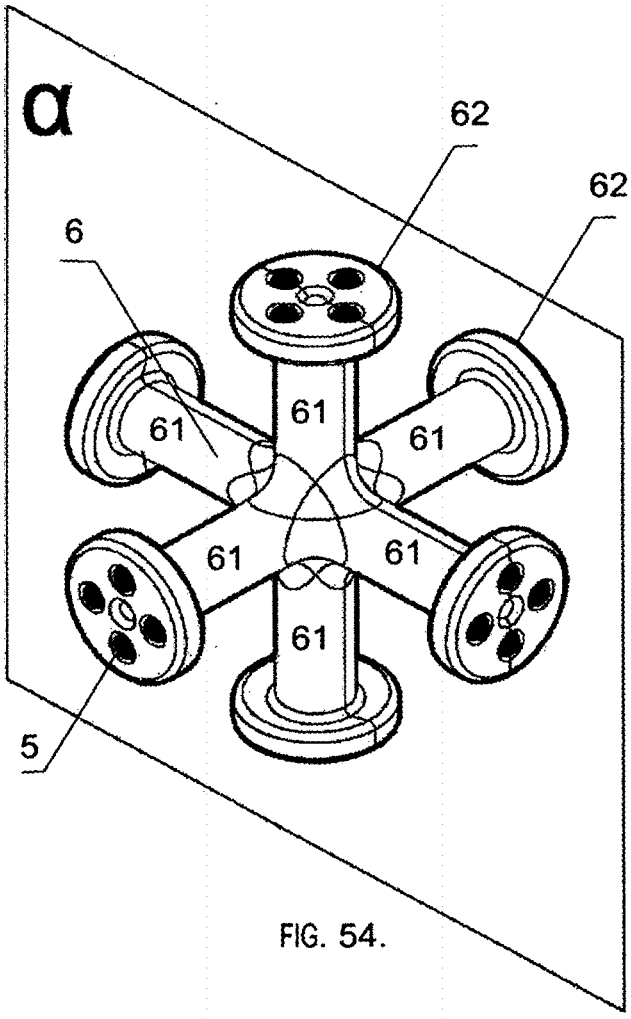

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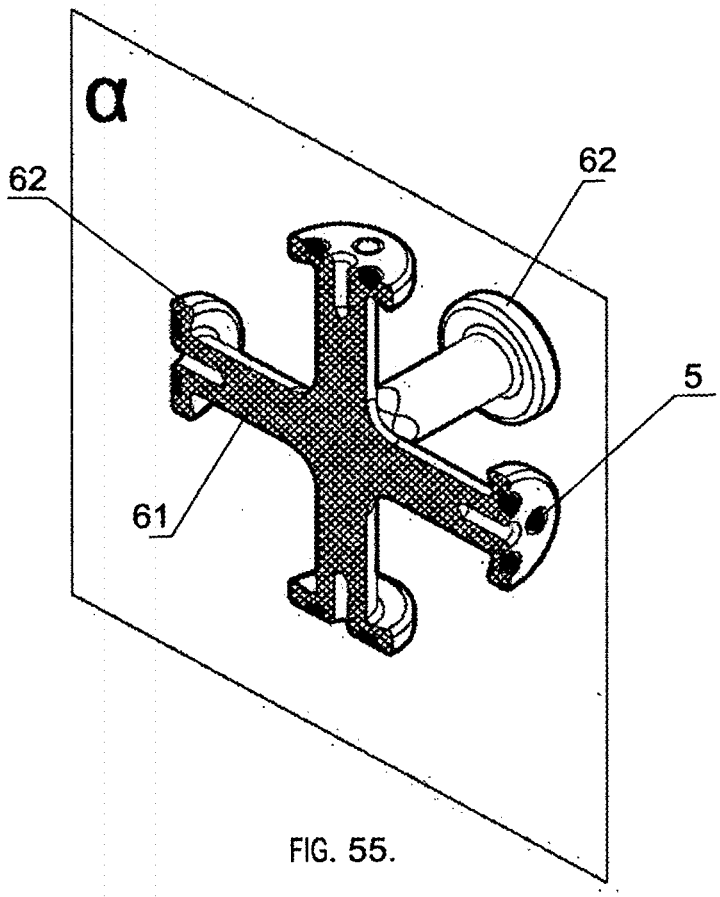

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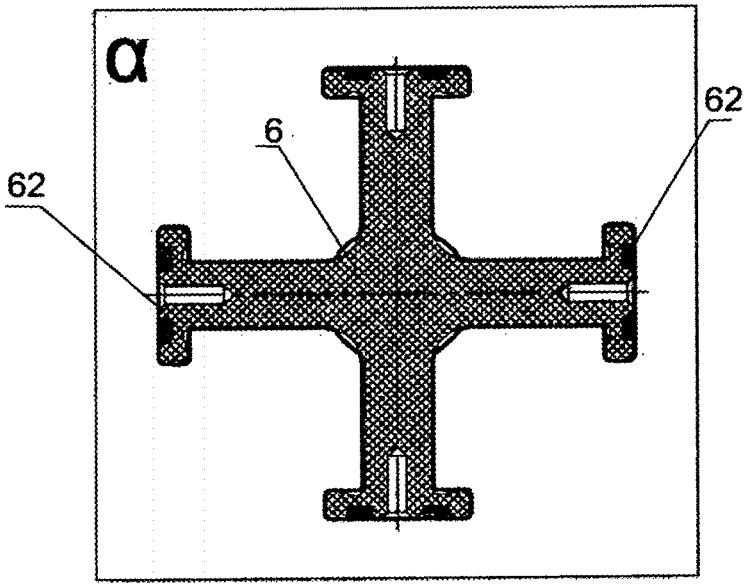

FIG. 56.

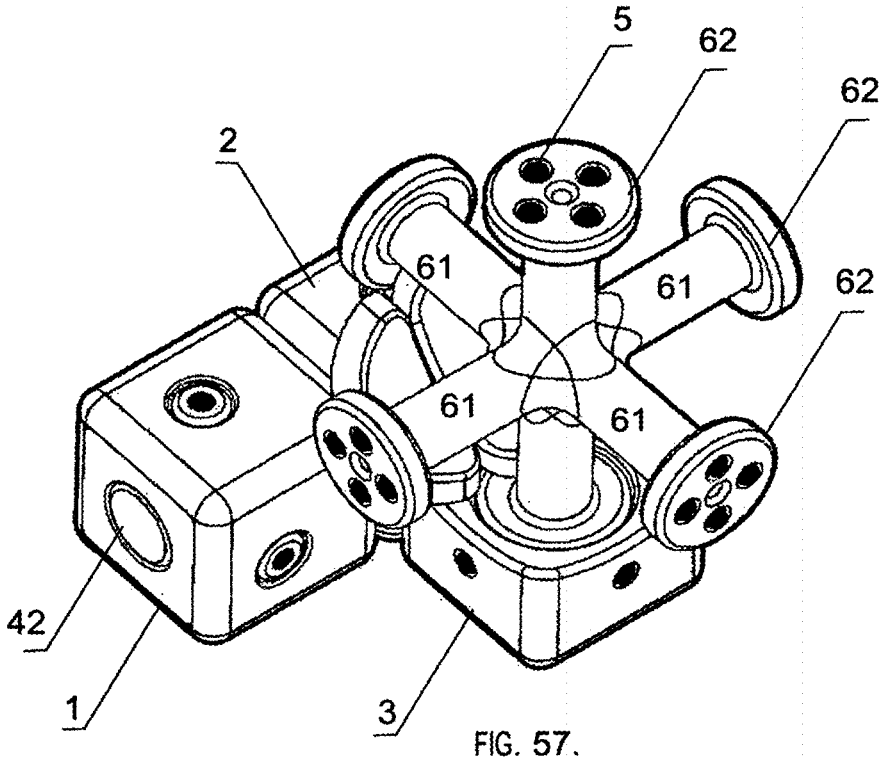

FIG. 57.

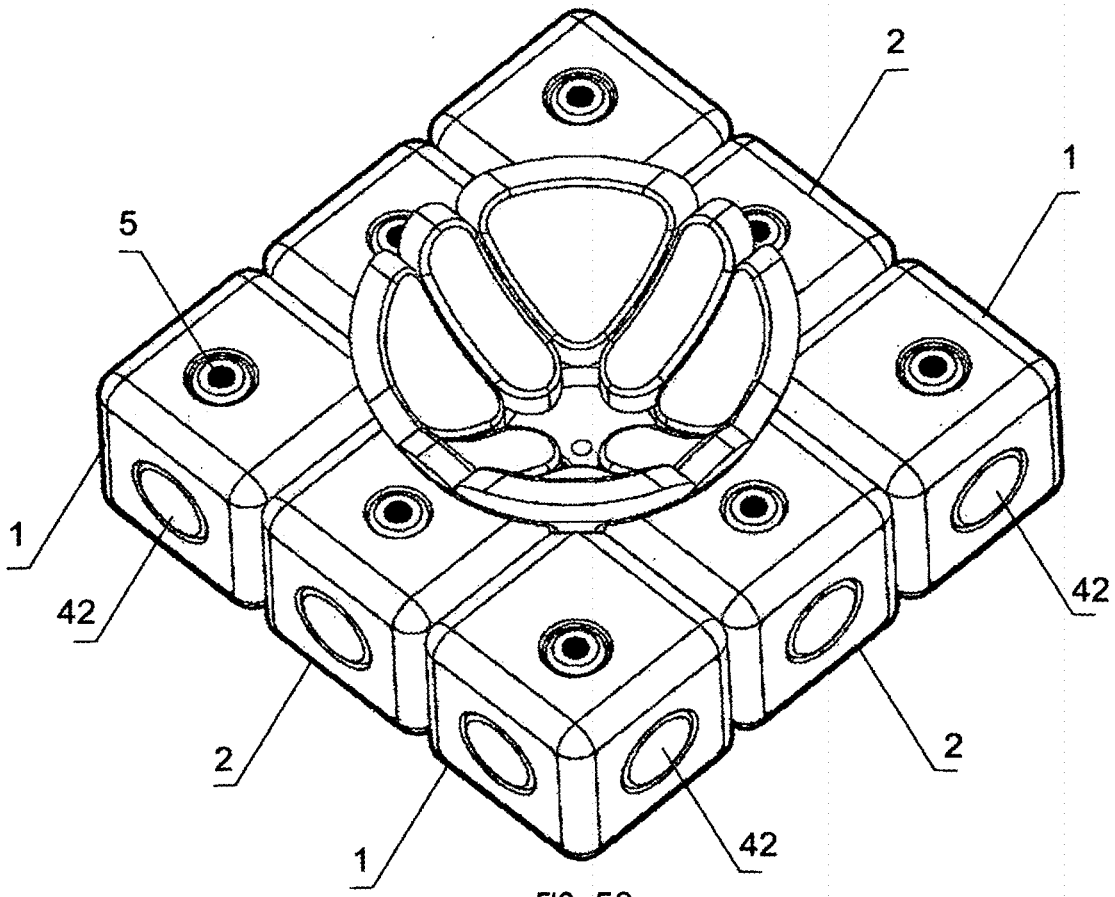

FIG. 58.

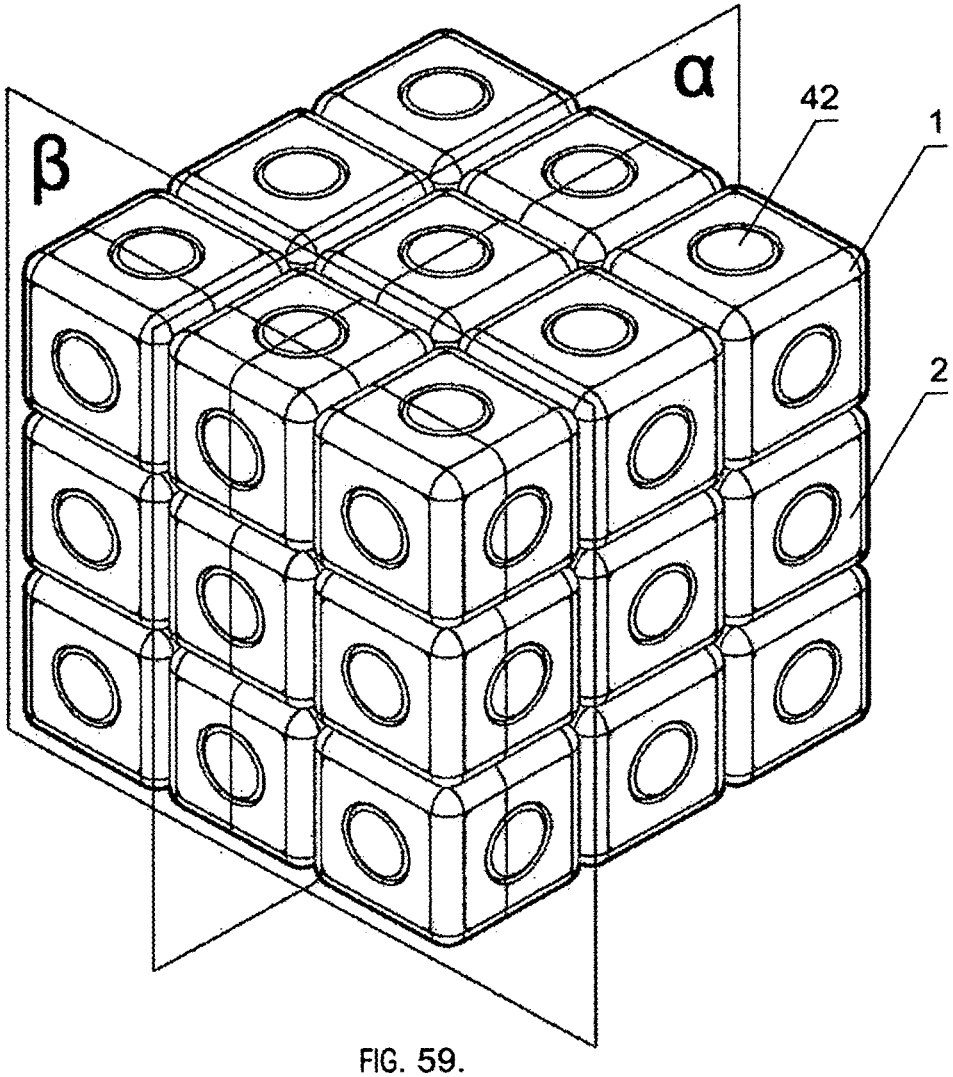

FIG. 59.

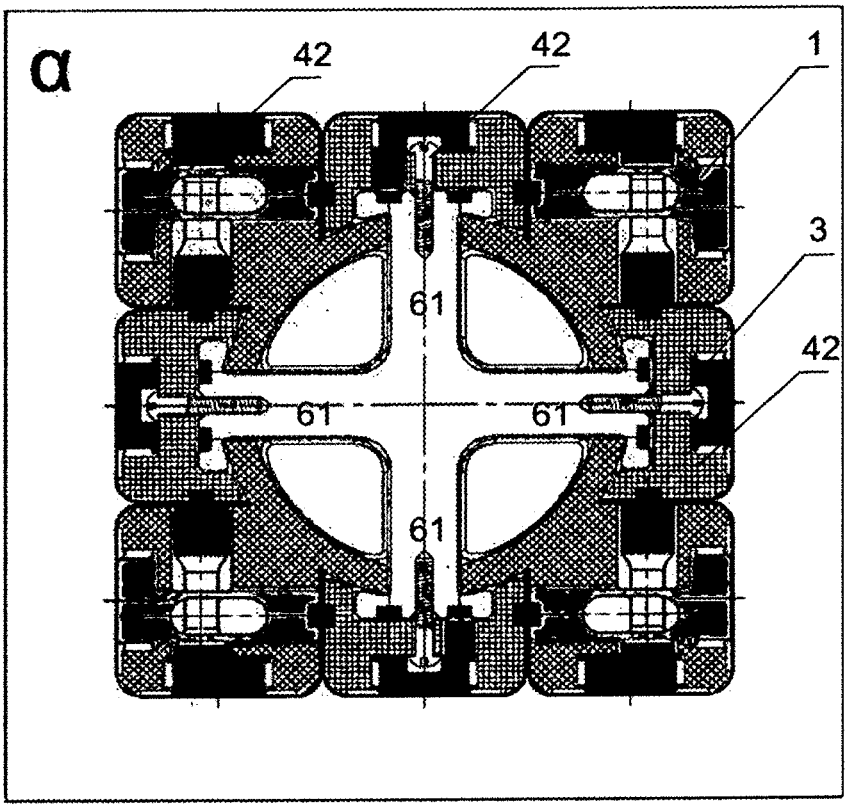

FIG. 60

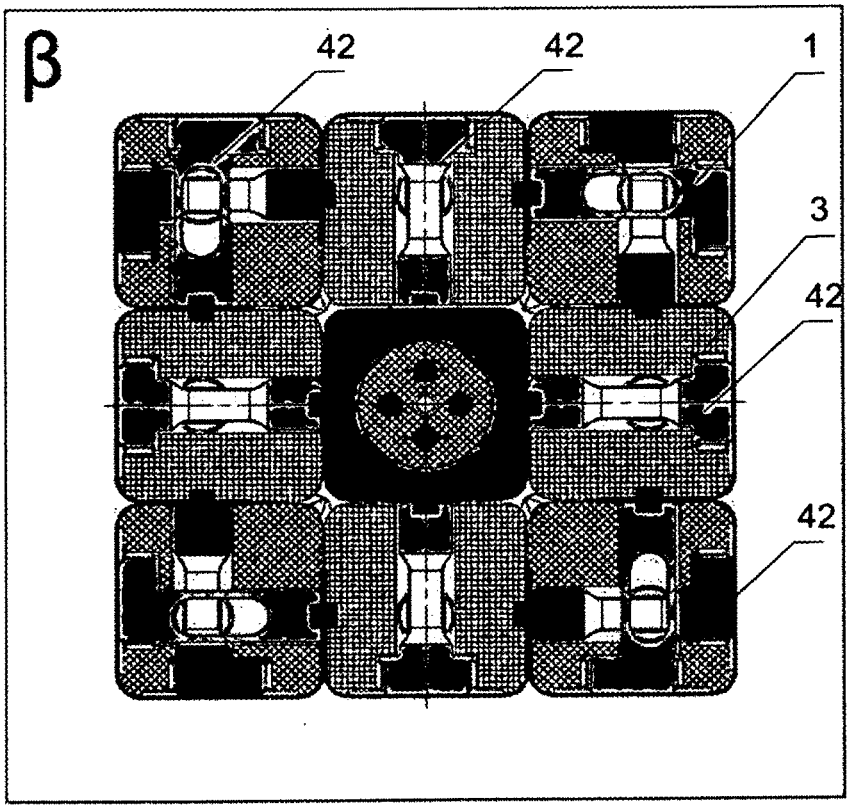

FIG. 61

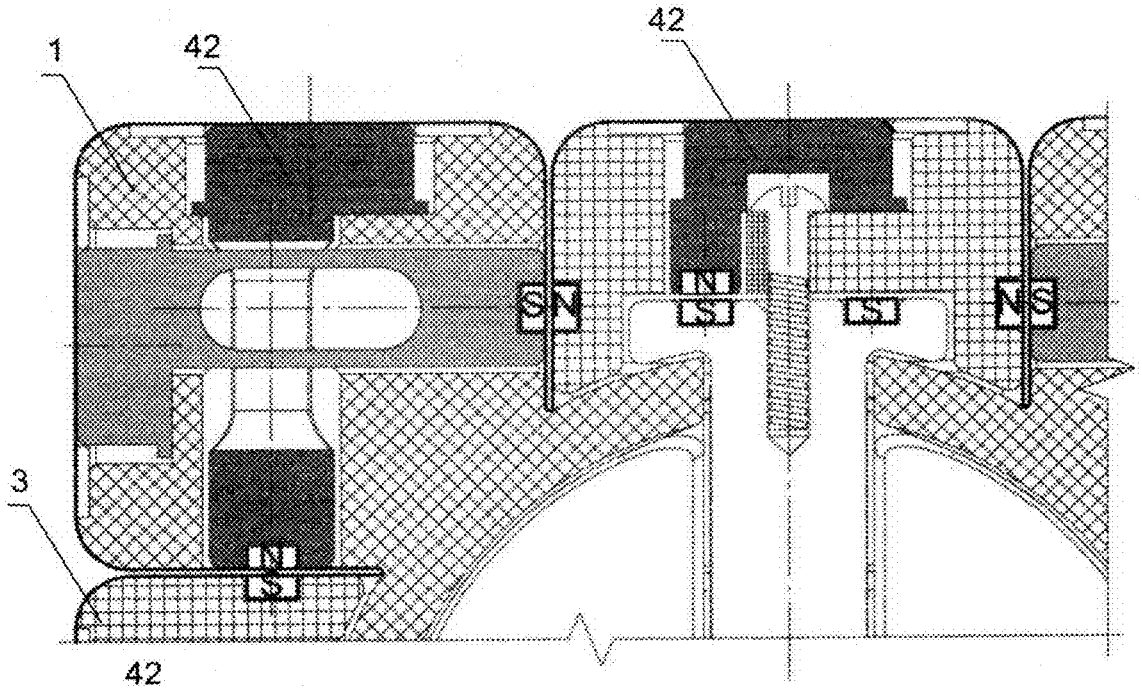

FIG. 62.

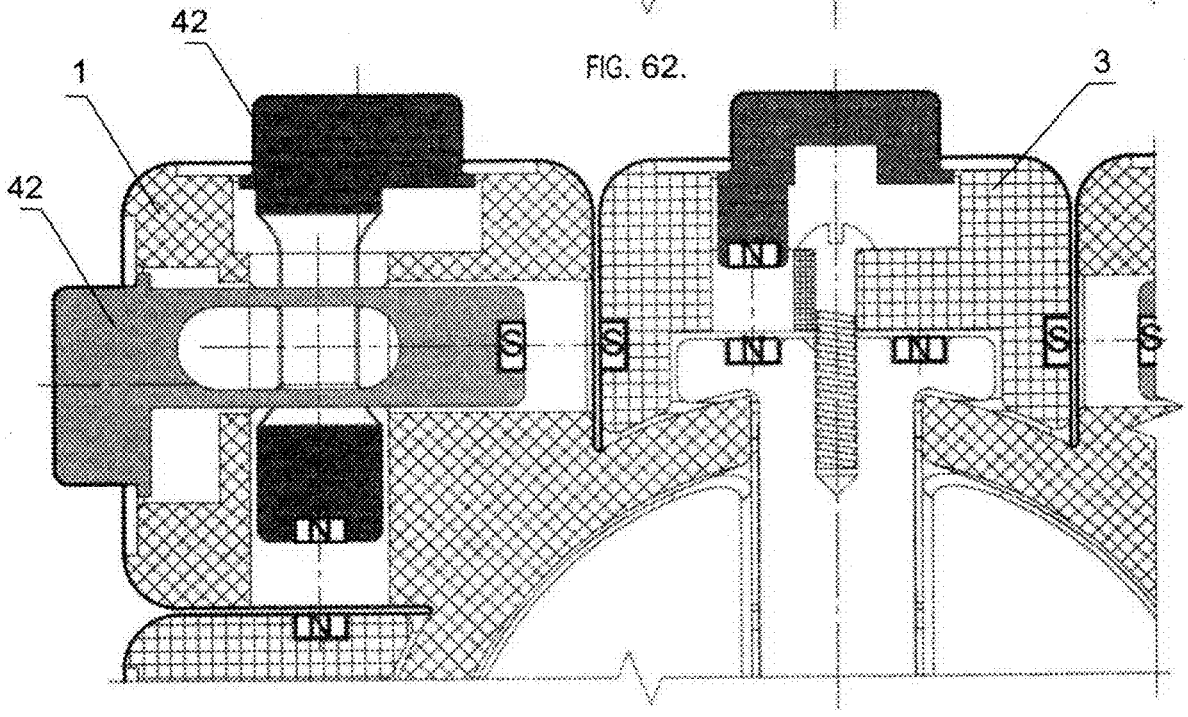

FIG. 63.

3-D PUZZLE WITH MOVING SECTORS

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application is a CIP of the U.S. patent application Ser. No. 16/974,148 filed on Oct. 21, 2020.

BACKGROUND

[0002] There are currently several magnetic puzzles available. A magnet puzzle with movable sectors is disclosed in RF Patent No. 2701264, published on Sep. 25, 2019. The disclosed puzzle uses magnetic fields to change the state of the puzzle. However, the proposed puzzle is rather simple and easy to solve.

[0003] Accordingly, a complex and hard to solve 3-D puzzle with magnets and movable sectors is desired.

SUMMARY OF THE INVENTION

[0004] Disclosed herein is the 3-D puzzle is implemented as cube consisting of twenty six movable sectors configured to move about a central cross-piece created by three axels that are perpendicular to each other. Each of the three axels has a far edge attached to a plate with stationary magnets positioned on it. All movable sectors have an outer surface and an inner surface configured to house a magnet. The movable sectors are classified as eight angular ones, twelve end ones and six central ones. The angular sectors have cavities configured to host three movable elements configured to be positioned perpendicular to each other. The relative positioning of the three movable elements can be changed. The end movable sectors have cavities that may host two movable elements configured to be positioned perpendicular to each other.

[0005] These and other features of the concepts provided herein will become more apparent to those of skill in the art in view of the accompanying drawings and following description, which describe particular embodiments of such concepts in greater detail.

BRIEF DESCRIPTION OF DRAWINGS

[0006] A more particular description of the present disclosure will be rendered by reference to specific embodiments thereof that are illustrated in the appended drawings. It is appreciated that these drawings depict only typical embodiments of the invention and are therefore not to be considered limiting of its scope. Example embodiments of the invention will be described and explained with additional specificity and detail through the use of the accompanying drawings in which:

[0007] FIG. **1** illustrates a view of the 3-D puzzle in an initial ordered state, according to the exemplary embodiment.

[0008] FIG. **2** illustrates a view of the 3-D puzzle in a state when a facet is turned, according to the exemplary embodiment.

[0009] FIGS. **3-6** illustrate views of an angular movable sector, according to the exemplary embodiment.

[0010] FIGS. **7-11** illustrate cross-section views of the angular movable sector, according to the exemplary embodiment.

[0011] FIGS. **12-15** illustrate views of a movable element of the angular movable sector, according to the exemplary embodiment.

[0012] FIGS. **16-23** illustrate various views of the movable elements of the angular movable sector, according to the exemplary embodiment.

[0013] FIGS. **24-28** illustrate views of the end movable sector, according to the exemplary embodiment.

[0014] FIGS. **29-31** illustrate cross-section views of the end movable sector, according to the exemplary embodiment.

[0015] FIGS. **32-35** illustrate various views of the end movable sector, according to the exemplary embodiment.

[0016] FIGS. **36-38** illustrate various views and positions of the elements of the end movable sectors, according to the exemplary embodiment.

[0017] FIGS. **39-42** illustrate views of a central movable sector, according to the exemplary embodiment.

[0018] FIGS. **43-45** illustrate cross-section views of the central movable sector, according to the exemplary embodiment.

[0019] FIGS. **46-49** illustrate views of the central movable sector, according to the exemplary embodiment.

[0020] FIGS. **50-52** illustrate various views of the elements of the central movable sector, according to the exemplary embodiment.

[0021] FIG. **53** illustrates a central cross-piece of the 3-D puzzle, according to the exemplary embodiment.

[0022] FIGS. **54-56** illustrate cross-section views of the central movable sector, according to the exemplary embodiment.

[0023] FIG. **57** illustrates an assembly of the central cross-piece with one angular movable sector, one end movable sector and one central movable sector, according to the exemplary embodiment.

[0024] FIG. **58** illustrates a top sector of the 3-D puzzle with movable elements, according to the exemplary embodiment.

[0025] FIG. **59** illustrates assembly of the entire 3-D puzzle, according to the exemplary embodiment.

[0026] FIGS. **60-61** illustrate cross-section views in planes α and β of the entire 3-D puzzle as shown in in FIG. **59**, according to the exemplary embodiment.

[0027] FIGS. **62-63** illustrate cross-section views that show how positioning of the movable elements changes when the same poles of the magnets are placed next to each other, according to the exemplary embodiment.

DETAILED DESCRIPTION

[0028] Before some particular embodiments are disclosed in greater detail, it should be understood that the particular embodiments disclosed herein do not limit the scope of the concepts provided herein. It should also be understood that a particular embodiment disclosed herein can have features that can be readily separated from the particular embodiment and optionally combined with or substituted for features of any of a number of other embodiments disclosed herein.

[0029] Regarding terms used herein, it should also be understood the terms are for the purpose of describing some particular embodiments, and the terms do not limit the scope of the concepts provided herein. Ordinal numbers (e.g., first, second, third, etc.) are generally used to distinguish or identify different features or steps in a group of features or steps, and do not supply a serial or numerical limitation. For example, "first," "second," and "third" features or steps need not necessarily appear in that order, and the particular embodiments including such features or steps need not

necessarily be limited to the three features or steps. Labels such as "left," "right," "top," "bottom," "front," "back," and the like are used for convenience and are not intended to imply, for example, any particular fixed location, orientation, or direction. Instead, such labels are used to reflect, for example, relative location, orientation, or directions. Singular forms of "a," "an," and "the" include plural references unless the context clearly dictates otherwise.

[0030] For clarity, it is to be understood that the word "distal" refers to a direction relatively closer to a patient on which a medical device is to be used as described herein, while the word "proximal" refers to a direction relatively further from the patient. Also, the words "including," "has," and "having," as used herein, including the claims, shall have the same meaning as the word "comprising."

[0031] Lastly, in the following description, the terms "or" and "and/or" as used herein are to be interpreted as inclusive or meaning any one or any combination. As an example, "A, B or C" or "A, B and/or C" mean "any of the following: A; B; C; A and B; A and C; B and C; A, B and C." An exception to this definition will occur only when a combination of elements, components, functions, steps or acts are in some way inherently mutually exclusive.

[0032] Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by those of ordinary skill in the art.

[0033] Embodiments disclosed herein are directed to a 3-D puzzle with movable sectors configured to be repositioned relative to each other. The sectors may have movable elements providing for various states of the 3-D puzzle.

[0034] According to the exemplary embodiments, the 3-D puzzle is implemented as a cube consisting of twenty six movable sectors configured to move about a central cross-piece created by three axels that are perpendicular to each other. Each of the three axels has a far edge attached to a plate with stationary magnets positioned on it. All movable sectors have an outer surface and an inner surface configured to house a magnet. The movable sectors are classified as eight angular ones, twelve end ones and six central ones. The angular sectors have cavities configured to host three movable elements configured to be positioned perpendicular to each other. The relative positioning of the three movable elements can be changed. The end movable sectors have cavities that may host two movable elements configured to be positioned perpendicular to each other. The relative positioning of the three movable elements can be changed. The central movable sectors have cavities configured to accommodate one movable element. According to the exemplary embodiment, the magnets interact with each other by pairs in any static position of the 3-D puzzle. As a result, the movable elements are either being pulled to the center or being pushed away from the center.

[0035] Accordingly, the elements of the 3-D puzzle may move by principle of the Rubik's cube. However, the exemplary 3-D puzzle does not use colors for the movable sectors. Instead, the sides of the cube use round button-like elements positioned on every movable sector. The button-like elements can be either in "extended" or in "pushed down" binary state.

[0036] Since the 3-D puzzle has magnets positioned inside, at each turn of a segment of the puzzle, a new interaction of magnet pairs occurs. Magnetic pull/push causes repositioning of the movable sectors that change the appearance of the 3-D puzzle.

[0037] In one embodiment, the plates with static magnets may be shaped as disks. Thus, regardless of a static position of the 3-D puzzle, the magnets always interact with each other by pairs causing the movable sectors to be either pulled to the center or be pushed away from the center thereby creating different variations of the 3-D puzzle.

[0038] In one embodiment, the plates housing the static magnets include four magnets each. Thus, regardless of a static position of the 3-D puzzle, the magnets always interact with each other by pairs.

[0039] The FIGs. described below use the following numbering of the exemplary features and elements:

[0040] **1**—an angular movable sector;

[0041] **2**—an end movable sector;

[0042] **3**—a central movable sector;

[0043] **11**, **21**, **31**—respective cavities of the movable sectors;

[0044] **4**—movable elements of the sectors;

[0045] **41**—openings of the movable elements;

[0046] **42**—an outer portion of the movable elements;

[0047] **43**—an inner portion of the movable elements;

[0048] **5**—magnets;

[0049] **6**—a cross-piece,

[0050] **61**—an axel of the central cross-piece,

[0051] **62**—end plates.

[0052] Please not that arrows indicate direction of movement of the elements.

[0053] N—is a North pole of the magnets, and

[0054] S—is a South pole of the magnets.

[0055] According to the exemplary embodiments, FIGS. **1-63** depict the 3D puzzle and its parts including movable sectors **1-3** configured to change relative positioning to each other. The movable sectors **1-3** host movable elements **4** configure to create different states of the 3D puzzle.

[0056] According to one embodiment, some of the movable elements **4** are connected by static magnets **5**. The movable sectors **1-3** have cavities **11**, **21**, **31** configured to accommodate the movable elements **4**. Each of the movable elements **4** is configured to move into the cavities **11** or **21** or **31** under the force created by other permanent magnets of the 3-D puzzle during repositioning of the movable sectors **1-3** relative to each other.

[0057] As discussed above, the 3-D puzzle may be implemented as a cube consisting of 26 movable sectors that form the cube as a 3×3×3 formation. The movable sectors may move about the central cross-piece **6** created by three axels **61** that are perpendicular to each other. Each axel has the plate **62** that holds the static magnets **5**.

[0058] All movable elements **4** have an outer portion **42** and an inner portion **43** that holds the round magnets **5**. As discussed above, the movable sectors are classifies as eight angular ones **1**, twelve end ones **2** and six central ones **3**. The angular movable sectors **1** have cavities **11** that accommodate three movable elements **4** that have inner openings **41** that allow perpendicular positioning of the elements **4** relative to each other while providing for freedom of movements. The end movable sectors **2** have cavities **21** configured to host two movable elements **4** that have inner openings **41** that allow perpendicular positioning of the elements **4** relative to each other while providing for freedom of movements. The central movable sectors **3** have cavity **31** that each hold one movable element.

[0059] According to the exemplary embodiment, the magnets **5** interact with each other in pairs regardless of the

current static position of the 3-D puzzle. Consequently, the movable elements **4** are either being pulled to the center or being pushed away from the center of the cube that represents the 3-D puzzle.

[0060] Please note that the novel design of the puzzle provides for axes along which the movable elements move that do not coincide with the axels **61** of the central cross-piece—i.e., the symmetry axes of the 3-D puzzle. According to the exemplary embodiment, all axes along which the movable elements move are off-set. Thus, the movable elements **4** are not symmetrical and do not have any of the symmetry axes as can be seen from the FIGs. such as, for example, FIGS. **8**, **9**, **10** and **11** as wells as from depictions of the movable elements shown in FIGS. **13**, **14** and **15**.

[0061] Further novelty may be seen from connection of the movable elements **4** of the angular movable sectors **1** shown in FIGS. **17** and **19**. The movable elements are configured to be easily taken apart for creating the connections.

[0062] According to the exemplary embodiment, all movable sectors (**1**, **2** and **3**) may have elements extending above the surface for providing the integrity of the 3-D puzzle during the rotation of the side facets.

[0063] FIG. **58** illustrates a top sector of the 3-D puzzle with movable elements, according to the exemplary embodiment.

[0064] FIG. **59** illustrates assembly of the entire 3-D puzzle, according to the exemplary embodiment.

[0065] FIGS. **60-61** illustrate cross-section views in planes α and β of the entire 3-D puzzle as shown in in FIG. **59**, according to the exemplary embodiment.

[0066] Referring to FIGS. **62** and **63**, the poles of the magnets are shown as S and N. These FIGs. illustrate how positioning of the movable elements changes when the same poles of the magnets are placed next to each other. The pushing away force created by the same magnet poles cause extension of the outer portion **42** of the movable elements **4** as shown in FIG. **63**.

[0067] When opposite magnetic poles end up next to each other, the pulling force causes the movements of the outer portion **42** of the movable elements **4** toward the center of the 3-D puzzle as can be seen in FIG. **62**.

[0068] According to the exemplary embodiments, the 3-D puzzle with movable sectors operates as follows. In an arbitrary position, the facets of the movable sectors have different positions of the movable elements: one portion may be extended and one may be pushed-in. The goal of the player is to transfer the 3-D puzzle into an ordered state from a random state. This is not a trivial task by any means. The ordered state is the state when all movable elements are in a "pushed-in" position as shown in FIG. **1**. As soon as any facet of the cube is turned, the 3-D puzzle transforms into a random state as shown in FIG. **2**. The random state is characterized by some movable element being in "pushed-in" position while others are in the extended position.

[0069] The 3-D cube-shape puzzle according to the exemplary embodiments, advantageously, allows for movement move the movable sectors easily while maintaining the integrity of the cube-shape puzzle. Once the movable sectors are moved, the magnets begin interacting with each other and change the state of the movable elements.

[0070] Embodiments of the invention may be embodied in other specific forms without departing from the spirit of the present disclosure. The described embodiments are to be considered in all respects only as illustrative, not restrictive. The scope of the embodiments is, therefore, indicated by the appended claims rather than by the foregoing description. All changes that come within the meaning and range of equivalency of the claims are to be embraced within their scope.

What is claimed is:

1. A 3-D magnetic puzzle, comprising:

a plurality of movable sectors configured to host movable elements configured to change a state of the 3-D magnetic puzzle, wherein:

the movable sectors are configured to change their positioning relative to each other; and

the movable sectors comprising cavities configured to accommodate the movable elements comprising magnets, wherein each of the movable elements is configured to move inside the cavity responsive to a magnetic force generated by the magnets when the movable sectors change their positioning relative to each other.

2. The 3-D magnetic puzzle of claim **1**, further comprising a cube formed by the plurality of the movable sectors configured to move about a central cross-piece formed by axels that are perpendicular to each other.

3. The 3-D magnetic puzzle of claim **2**, wherein the axels comprising end plates configured to accommodate at least one static magnet.

4. The 3-D magnetic puzzle of claim **2**, wherein the cube comprising twenty six movable sectors that form the cube as a 3×3×3 formation.

5. The 3-D magnetic puzzle of claim **2**, wherein the end plates comprising disks configured to hold at least four static magnets.

6. The 3-D magnetic puzzle of claim **1**, wherein the movable elements comprising an outer potion and an inner portion configured to hold at least one magnet.

7. The 3-D magnetic puzzle of claim **1**, further comprising eight angular movable sectors, twelve end movable sectors and six central movable sectors.

8. The 3-D magnetic puzzle of claim **6**, wherein the angular movable sectors comprising cavities configured to accommodate at least three movable elements comprising openings for mutually perpendicular positioning.

9. The 3-D magnetic puzzle of claim **6**, wherein the end movable sectors comprising cavities configured to accommodate at least two movable elements comprising openings for mutually perpendicular positioning.

10. The 3-D magnetic puzzle of claim **6**, wherein the central movable sectors comprising cavities configured to accommodate at least one magnet.

11. The 3-D magnetic puzzle of claim **1**, wherein the magnets interact with each other by pairs causing the movable elements to be either pulled to or pushed away from a centre of the 3-D magnetic puzzle.

12. The 3-D magnetic puzzle of claim **1**, further comprising at least two removable shipping locks configured to keep the collapsible shroud from folding.

13. A method of a 3-D magnetic puzzle, comprising:

obtaining a cube-shaped 3-D magnetic puzzle, comprising:

a plurality of movable sectors configured to host movable elements configured to change a state of the 3-D magnetic puzzle, wherein:

the movable sectors are configured to change their positioning relative to each other; and

the movable sectors comprising cavities configured to accommodate the movable elements comprising magnets, wherein each of the movable elements is configured to move inside the cavity responsive to a magnetic force generated by the magnets when the movable sectors change their positioning relative to each other; and

turning a facet of the cube-shape 3-D magnetic puzzle to cause the movable elements to change their state from a pushed-in position to an extended position and vise versa.

13. The method of claim **9**, further comprising turning other facets of the cube-shaped 3-D magnetic puzzle to bring the magnetic puzzle to an ordered state, wherein all of the movable elements are in pushed-in position.

* * * * *