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(54) **Stiffening and/or bending modular structure comprising integrated elements**

(57) The present invention relates to stiffening and/bending modular structure for sets for realising complex figures, comprising, in combination, at least three polyhedral or spherical shaped elements (1; 11) spaced by

two elements (2; 12) having a substantially lengthened three-dimensional shape, said elements (1; 11; 2; 12) being assembled in such a way to realise a single integrated structure.

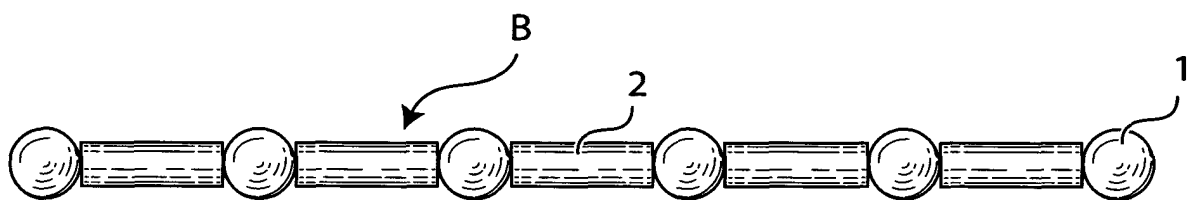


Fig. 2a



Fig. 2b

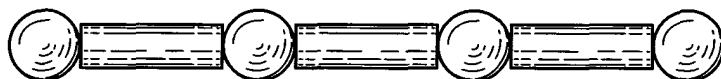


Fig. 2c



Fig. 2d

Description

[0001] The present invention relates to a stiffening and/bending modular structure for sets for realising complex figures.

[0002] More specifically, the invention relates to structures of the above kind allowing improving the construction possibility employing magnetic and ferromagnetic elements.

[0003] As it is well known, in the recent years different sets have been realised, based on the interaction between magnetic elements and ferromagnetic elements for realising complex figures.

[0004] Substantially, it is a combination of bars, having magnetic ends, or completely magnetic bars, combined with ferromagnetic elements, or spheres, in different ways for realising complex figures.

[0005] In the first macro category providing bars with magnetic ends must be considered as included toys known on the market with the name Roger's Connection, providing bars, all having the same sizes, comprised of two magnets separated by an air gap, or those marketed under the trade name Geomag®, the bars of which are comprised of a combination of magnet - Ferro magnet - magnet. In both cases complex figures are realised by employing ferromagnetic spheres.

[0006] In the second macro-category it must be considered as included the product known on the market as Supermag®, patented and realised by the same Applicant, providing bars with different sizes, and completely comprised of magnetic material. Supermag® has realised a remarkable improvement with respect to the known solutions, both as far as the possibility of realising always more complex figures, as well as for sturdiness of the obtained figures.

[0007] However, the needling exists to have structures allowing to obtain a further stiffening of the complex figures that are realised with each one of the previous products.

[0008] It is further felt the needling of having a structure allowing to realise figures having curved parts.

[0009] These and other results are obtained according to the present invention by a modular structure that can be applied to each one of the solutions known on the market.

[0010] It is therefore specific object of the present invention a stiffening and/bending modular structure for sets for realising complex figures, comprising, in combination, at least three polyhedral or spherical shaped elements spaced by two elements having a substantially lengthened three-dimensional shape, said elements being assembled in such a way to realise a single integrated structure.

[0011] Particularly, according to the invention, at least one of said polyhedral or spherical shape elements outer with respect to the structure can be comprised of a magnet.

[0012] In a first embodiment of the structure according

to the invention, it is provided at least a combination of a polyhedral or spherical shaped ferromagnetic element, a ferromagnetic element having a substantially lengthened three-dimensional shape, a polyhedral or spherical shaped ferromagnetic element, a ferromagnetic element having a substantially lengthened three-dimensional shape, a polyhedral or spherical shaped ferromagnetic element, said elements being integrally coupled each other.

[0013] Preferably, said ferromagnetic elements having a substantially lengthened three-dimensional shape are coated and/or said polyhedral or spherical shaped ferromagnetic elements are coated.

[0014] Furthermore, according to the invention, said coating is comprised of plastic material or by nickel-plating.

[0015] Always according to the invention, said polyhedral or spherical shaped ferromagnetic elements are comprised of spheres, and said ferromagnetic elements having a substantially lengthened three-dimensional shape are comprised of bars.

[0016] Still according to the invention, said polyhedral or spherical shaped ferromagnetic elements have different shape and size each other, or they have the same size and shape.

[0017] Furthermore, according to the invention, said ferromagnetic elements having a substantially lengthened three-dimensional have different shape and size each other, or they have the same size and shape.

[0018] Preferably, the coupling between the various elements is obtained by welding, or by die-casting.

[0019] Furthermore, coupling surfaces of contiguous elements can be shaped.

[0020] Said elements can be comprised of every material suitable to the coupling with a magnetic element.

[0021] According to a second embodiment of the structure according to the invention, it comprises a combination of a polyhedral or spherical shaped element, an element having a substantially lengthened three-dimensional shape, a polyhedral or spherical shaped element, an element having a substantially lengthened three-dimensional shape, a polyhedral or spherical shaped element, said elements being made integral each other by an outer envelope enclosing the same.

[0022] Particularly, according to the invention, said polyhedral or spherical shaped elements are comprised of ferromagnetic and/or magnetic material.

[0023] Always according to the invention, said elements having a substantially lengthened three-dimensional shape are comprised of ferromagnetic and/or magnetic material.

[0024] Still according to the invention, said envelope is comprised of plastic material.

[0025] Furthermore, according to the invention, said polyhedral or spherical shaped elements are comprised of spheres and said elements having a substantially lengthened three-dimensional shape are comprised of bars.

[0026] Further, according to the invention, said polyhedral or spherical shaped elements have different shape and size each other, or they have the same size and shape.

[0027] Always according to the invention, said elements having a substantially lengthened three-dimensional have different shape and size each other, or they have the same size and shape.

[0028] Finally, according to the invention, coupling surfaces of contiguous elements are shaped.

[0029] The present invention will be now described, for illustrative but not limitative purposes, according to its preferred embodiments, with particular reference to the figures of the enclosed drawings, wherein:

figures 1a - 1 d are schematic views of first embodiments of the system according to the invention not coated;

figures 2a - 2d are schematic views of first embodiments of the system according to the invention coated;

figures 3a and 3b show a particular of the system according to figures 1 and 2;

figures 4a - 4d are schematic views of second embodiments of the system according to the invention;

figures 5a - 5d are schematic views flexed structures according to figure 4;

figures 6a and 6b show a particular of the system according to figures 4 and 5.

[0030] Observing first figures 1 - 3, it is shown a first embodiment of the system according to the invention.

[0031] The solution shown provides a structure A comprised of a succession of metallic spheres 1, having different sizes, coupled with metallic bars 2, having different length and thickness.

[0032] Coupling between spheres 1 and bars 2 can be obtained by electro-welding, or they can be directly realised as a single die-cast ferromagnetic material piece.

[0033] As shown in the figures, composition of structure A can vary according to the specific needing, varying its sizes and providing a different number of coupled spheres 1 and bars 2.

[0034] Even if not represented, each structure A can also be comprised of a combination of bars 2, having different sizes and shape, with spheres, or other conjunction elements, also having different shape and dimensions.

[0035] Obviously, structure A according to the invention must start with a sphere 1 and terminate with another sphere 1, or with a magnet (not shown), in order to permit every kind of connection.

[0036] As it is clear from figure 2, structure A is nickel-plated and polished.

[0037] Specifically, each sphere 1 can be realised with the most different sizes, obviously employing ferromagnetic material (such as stainless steel) or other met-

al.

[0038] As already mentioned, coupling between sphere 1 and metallic bar 2 can be realised by electro-welding, or more simply by die-casting with the bar 2 directly within a suitable die.

[0039] Bar 2 can be realised with different sizes, being it possible varying length, thickness and mainly the shape of the bar.

[0040] In fact, bar 2 can take for example the shape of a cylinder, of a parallelepiped with a different base, etc.

[0041] If so wished, in the coupling point with sphere 1, head of the bar 2 can be bevelled according to a given angle to obtain a suitable coupling.

[0042] As already said, bar body is covered by a uniform plastic layer, having the thickness necessary only for the aesthetic coating of the system, obviously with different colour and kind, said coating not preventing the magnetic interaction with the magnet with which it must be coupled.

[0043] Instead, spheres 1 can be let bare and/or covered with a plastic surface layer

[0044] Structure A shown is particularly used for stiffening the complex figures realised employing bar magnetic elements, usually available on the market an employed for realising constructions, generic figures, and like. Particularly, it is used in combination with bars comprised of completely magnetic material, commercialised by the same Applicant under the Trade Mark Supermag®.

[0045] Coming now to observe figures 4 - 6 of the enclosed drawings, it is shown a structure B according to an embodiment of the invention, comprising a succession of metallic or magnetic spheres 11, and of metallic or magnetic bars 12, having different length and thickness.

[0046] Structure B is kept still by a plastic surface envelope 13, having suitable thickness to obtain the necessary ductility to obtain the torsion of the same system.

[0047] Obviously, composition of deformable structure B can have different sizes according to the number of spheres 11 and bars 12.

[0048] In this case too, structure B must necessarily start with a sphere 11 and terminate with another sphere 11, or with a magnet (not shown), in order to permit every kind of connection.

[0049] Torsion of structure is possible since between bar 12 and sphere 11 a direct coupling does not exist, integrity of the structure being guaranteed by the plastic envelope 13.

[0050] In this case too, sphere can be realised with the most different sizes, or have a different shape, and can be realised employing material (such as stainless steel) or other metal, or with a magnetic material.

[0051] As already said, integrity of structure B is obtained simply covering bars 12 and spheres 11 with a plastic surface layer directly within the die.

[0052] Bar 12 too can be realised with the most differ-

ent sizes, particularly its length, thickness and shape of the basis; in fact, it can take the shape of cylinder, of a parallelepiped with a different base, etc.

[0053] In this case too, sphere can be realised with the most different sizes, or have a different shape, and can be realised employing material (such as stainless steel) or other metal, or with a magnetic material.

[0054] In the articulation point with respect to the sphere 11, head of bar 12 can be bevelled according to a given angle.

[0055] Also structure B illustrated in the figures is particularly used for stiffening complex figures realised employing bar magnetic elements, usually available on the market and employed for realising constructions, generic figures, and like. Particularly, it is used in combination with bars comprised of completely magnetic material, commercialised by the same Applicant under the Trade Mark Supermag®.

[0056] The present invention has been described for illustrative but not limitative purposes, according to its preferred embodiments, but it is to be understood that modifications and/or changes can be introduced by those skilled in the art without departing from the relevant scope as defined in the enclosed claims.

Claims

1. Stiffening and/bending modular structure for sets for realising complex figures, **characterised in that** it comprises, in combination, at least three polyhedral or spherical shaped elements spaced by two elements having a substantially lengthened three-dimensional shape, said elements being assembled in such a way to realise a single integrated structure.
2. Modular structure according to claim 1, **characterised in that** at least one of said polyhedral or spherical shape elements outer with respect to the structure can be comprised of a magnet.
3. Modular structure according to claim 1 or 2, **characterised in that** it is provided at least a combination of a polyhedral or spherical shaped ferromagnetic element, a ferromagnetic element having a substantially lengthened three-dimensional shape, a polyhedral or spherical shaped ferromagnetic element, a ferromagnetic element having a substantially lengthened three-dimensional shape, a polyhedral or spherical shaped ferromagnetic element, said elements being integrally coupled each other.
4. Modular structure according to claim 3, **characterised in that** said ferromagnetic elements having a substantially lengthened three-dimensional shape are coated.
5. Modular structure according to claim 3 or 4, **characterised in that** said polyhedral or spherical shaped ferromagnetic elements are coated.
6. Modular structure according to claim 4 or 5, **characterised in that** said coating is comprised of plastic material.
7. Modular structure according to claim 4 or 5, **characterised in that** said coating is realised by nickel-plating.
8. Modular structure according to one of the preceding claims 3 - 7, **characterised in that** said polyhedral or spherical shaped ferromagnetic elements are comprised of spheres.
9. Modular structure according to one of the preceding claims 3 - 8, **characterised in that** said ferromagnetic elements having a substantially lengthened three-dimensional shape are comprised of bars.
10. Modular structure according to one of the preceding claims 3 - 9, **characterised in that** said polyhedral or spherical shaped ferromagnetic elements have different shape and size each other.
11. Modular structure according to one of the preceding claims 3 - 9, **characterised in that** said polyhedral or spherical shaped ferromagnetic elements have the same size and shape.
12. Modular structure according to one of the preceding claims 3 - 11, **characterised in that** said ferromagnetic elements having a substantially lengthened three-dimensional have different shape and size each other.
13. Modular structure according to one of the preceding claims 3 - 11, **characterised in that** said ferromagnetic elements having a substantially lengthened three-dimensional have the same size and shape.
14. Modular structure according to one of the preceding claims 3 - 13, **characterised in that** the coupling between the various elements is obtained by welding.
15. Modular structure according to one of the preceding claims 3 - 13, **characterised in that** the coupling between the various elements is obtained by die-casting.
16. Modular structure according to one of the preceding claims 3 - 15, **characterised in that** coupling surfaces of contiguous elements are shaped.
17. Modular structure according to claim 1 or 2, **char-**

acterised in that it comprises a combination of a polyhedral or spherical shaped element, an element having a substantially lengthened three-dimensional shape, a polyhedral or spherical shaped element, an element having a substantially lengthened three-dimensional shape, a polyhedral or spherical shaped element, said elements being made integral each other by an outer envelope enclosing the same.

18. Modular structure according to claim 17, **characterised in that** said polyhedral or spherical shaped elements are comprised of ferromagnetic.

19. Modular structure according to claim 17, **characterised in that** said polyhedral or spherical shaped elements are comprised of magnetic material.

20. Modular structure according to one of the claims 17 - 19, **characterised in that** said elements having a substantially lengthened three-dimensional shape are comprised of ferromagnetic material.

21. Modular structure according to one of the claims 17 - 19, **characterised in that** said elements having a substantially lengthened three-dimensional shape are comprised of magnetic material.

22. Modular structure according to one of the claims 17 - 21, **characterised in that** said envelope is comprised of plastic material.

23. Modular structure according to one of the claims 17 - 22, **characterised in that** said polyhedral or spherical shaped elements are comprised of spheres.

24. Modular structure according to one of the claims 17 - 23, **characterised in that** said elements having a substantially lengthened three-dimensional shape are comprised of bars.

25. Modular structure according to one of the claims 17 - 24, **characterised in that** said polyhedral or spherical shaped elements have different shape and size each other.

26. Modular structure according to one of the claims 17 - 24, **characterised in that** said polyhedral or spherical shaped elements have the same size and shape.

27. Modular structure according to one of the claims 17 - 26, **characterised in that** said elements having a substantially lengthened three-dimensional have different shape and size each other.

28. Modular structure according to one of the claims 17

- 26, **characterised in that** said elements having a substantially lengthened three-dimensional have the same size and shape.

29. Modular structure according to one of the claims 17 - 28, **characterised in that** coupling surfaces of contiguous elements are shaped.

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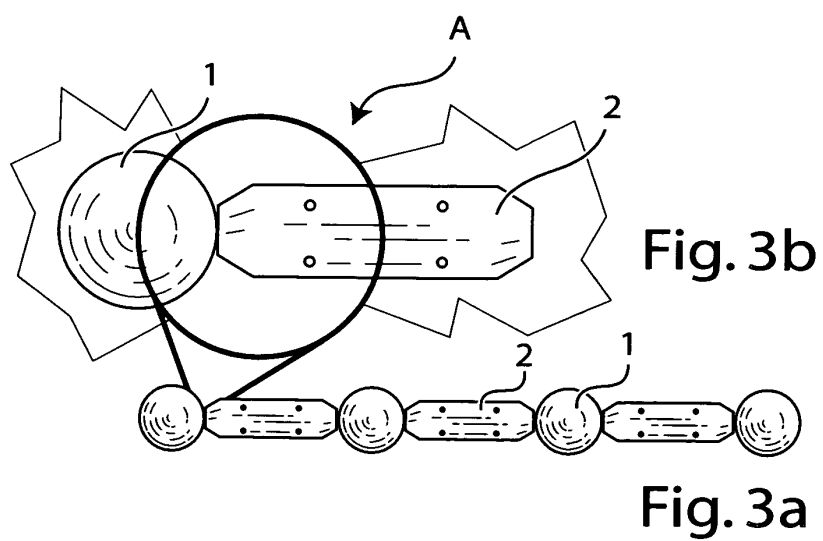
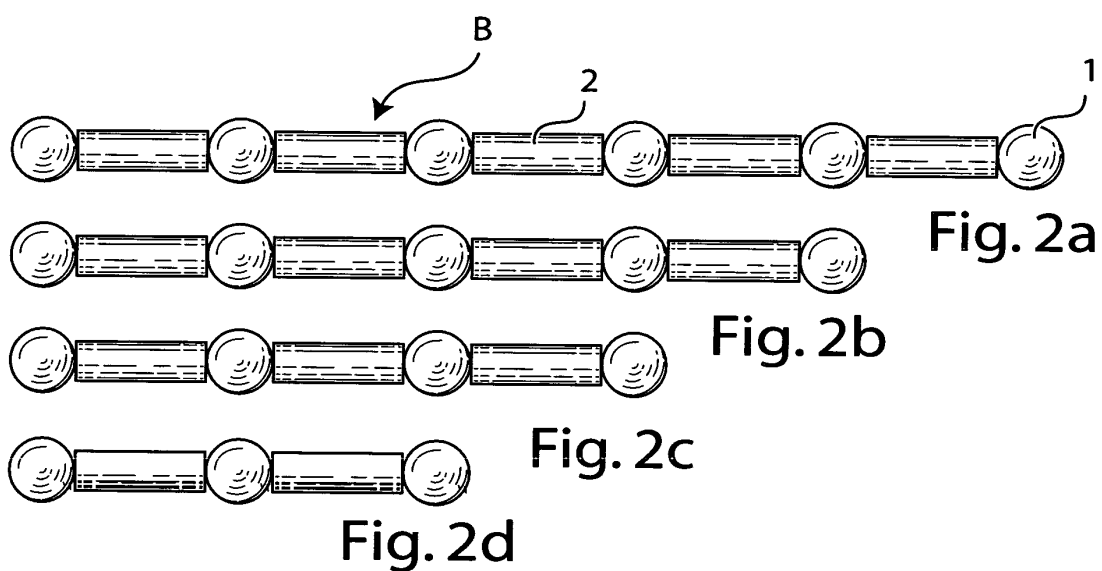
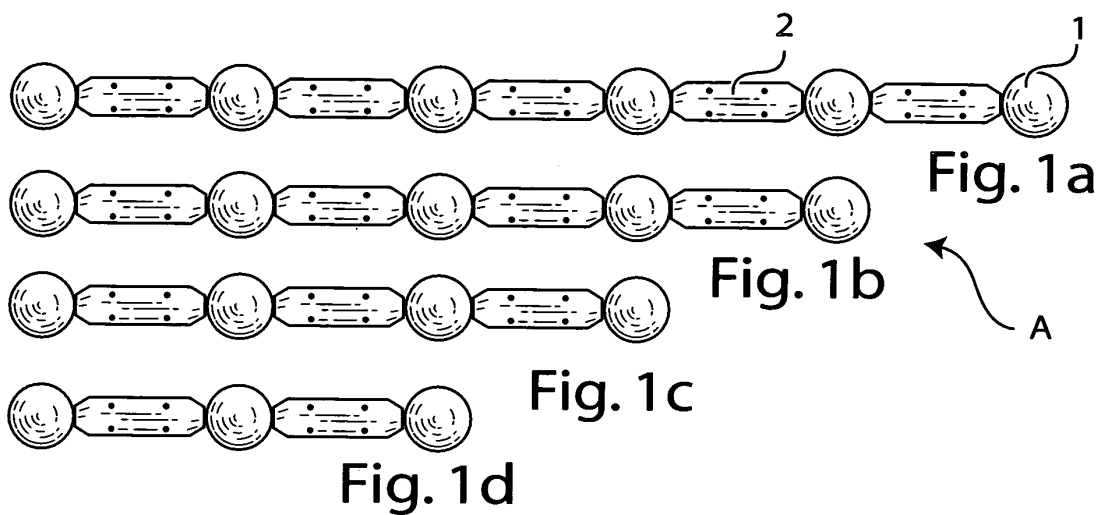
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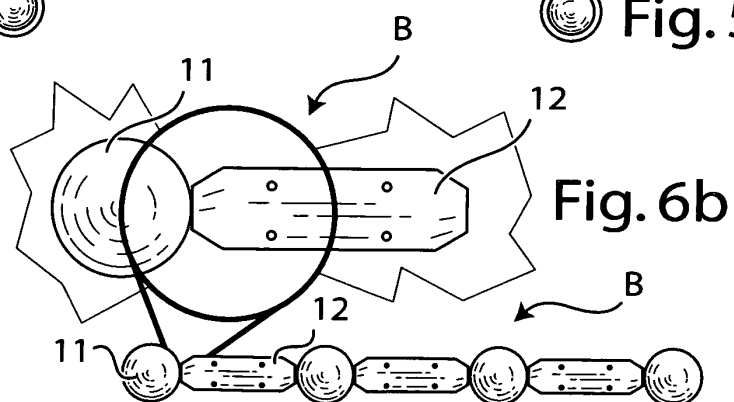
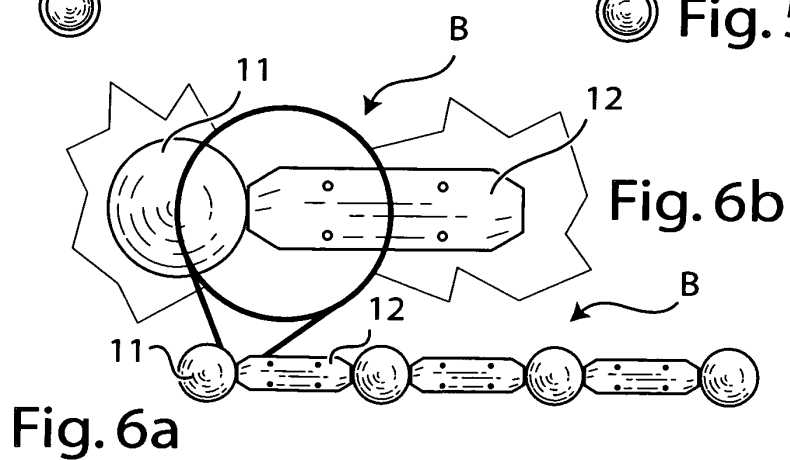
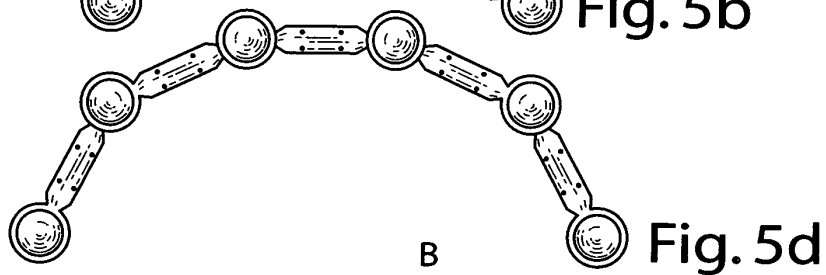
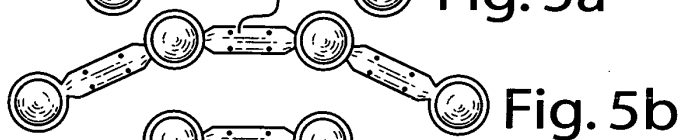
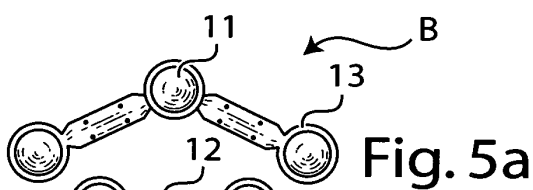
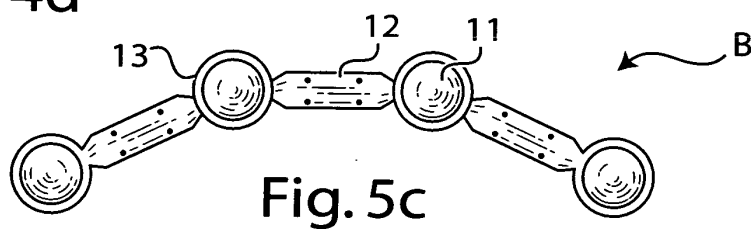
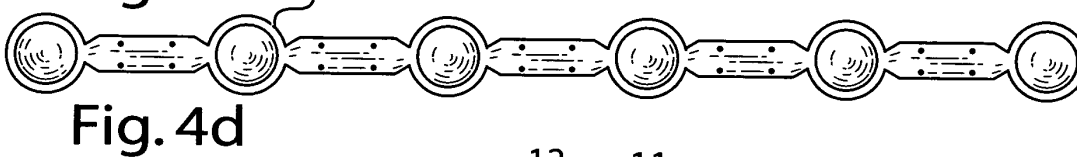
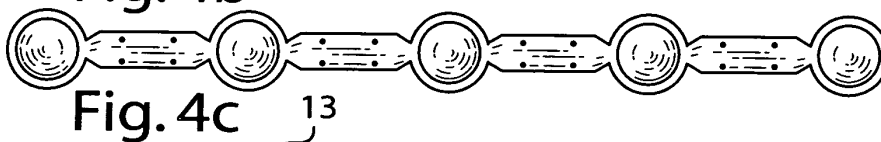
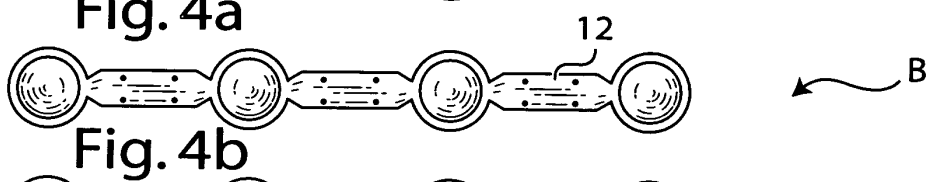
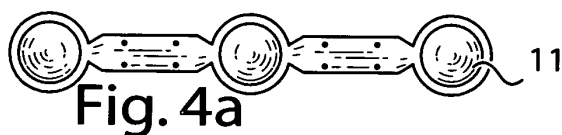
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European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 04 42 5758

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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 18 February 2005	Examiner Rosborough, J
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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