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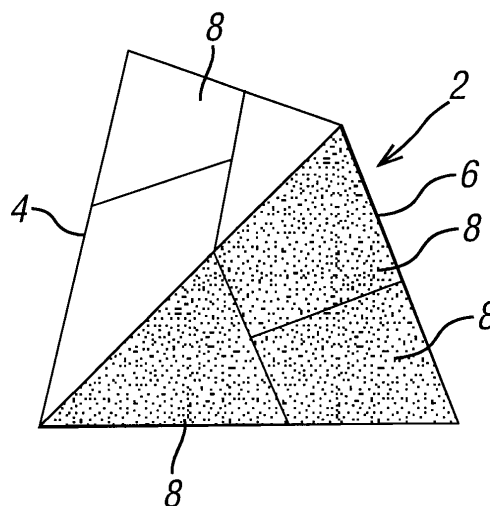
(54) **Modular tetrahedral rings**

(57) Rings of tetrahedral bodies are described in which each body has two opposed edges hinged to edges of respective tetrahedral bodies adjacent in the ring.

A body has two part-tetrahedral bodies separate or separable from other part-tetrahedral bodies with which respective tetrahedral bodies can be assembled. The two part-tetrahedral bodies are joined hingedly between edges corresponding to edges or part edges of the respective tetrahedral bodies.

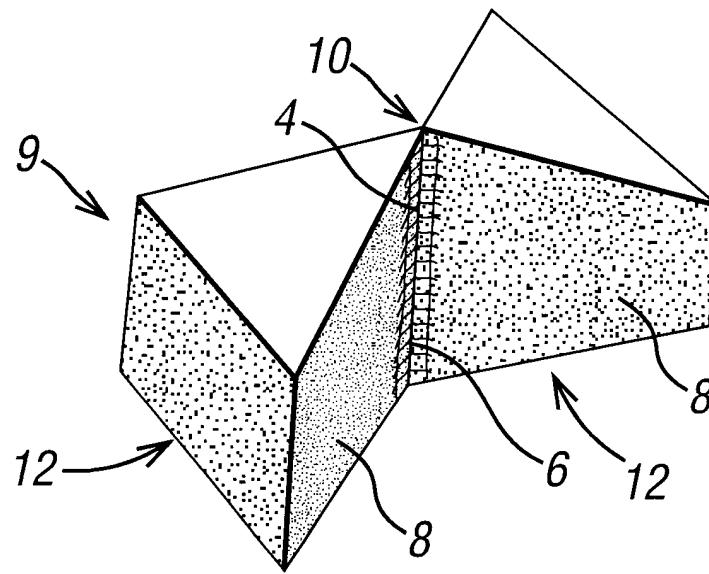
In constructing a ring from such bodies, joins need to be made only between parts which do not move relative to one another, the hinge being already provided. The body including the hinge may be conveniently moulded in one piece from a suitable plastics material.

FIG. 1a



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FIG. 1b



Description

[0001] This invention relates to rings of tetrahedral bodies, each body having two opposed edges hinged to edges of respective tetrahedral bodies adjacent in the ring.

[0002] It is an interesting property of such rings that they may be folded from a sheet material. One aspect of the invention, however, is concerned with the construction of such rings from three dimensional units which may, for example, be moulded in plastics material.

[0003] Against this background, one aspect of the invention provides a body comprising two part-tetrahedral bodies separate or separable from other part-tetrahedral bodies with which respective tetrahedral bodies can be assembled, said two part-tetrahedral bodies being joined hingedly between edges corresponding to edges or part edges of the respective tetrahedral bodies.

[0004] In constructing a ring from bodies embodying this aspect of the invention, joins need to be made only between parts which do not move relative to one another, the hinge being already provided. The body including the hinge may be conveniently moulded in one piece from a suitable plastics material.

[0005] Preferably the two part-tetrahedral bodies are identical. More preferably, a tetrahedral body may be assembled from a plurality of identical ones of said part-tetrahedral bodies. For example, if a tetrahedral body can be constructed from two of the part-tetrahedral bodies, the whole ring can be constructed from a set of identical bodies.

[0006] Even more preferably a tetrahedral body may be assembled from four of said part-tetrahedral bodies. As will be explained this enables rings of rings to be constructed using a set of identical bodies.

[0007] The body may be at least partly skeletal.

[0008] In one example, the body provides surfaces corresponding to those of the respective part-tetrahedra.

[0009] Each part-tetrahedral body may be provided with means for joining to another part or to other parts of the same respective tetrahedral body.

[0010] The means for joining may comprise permanent magnets.

[0011] In an alternative aspect, the invention also extends to a ring of rings of tetrahedral bodies, each body having two opposed edges hinged to edges of respective tetrahedral bodies adjacent in the ring of bodies, edges hinged to one another within the ring of bodies being also hinged to corresponding edges in rings of bodies adjacent in the ring of rings.

[0012] Edges hinged to one another within rings of bodies may also hinged to corresponding edges in other rings of bodies to form a plurality of rings of rings.

[0013] In this aspect, each ring of bodies preferably contains 6 tetrahedral bodies.

[0014] Also in this aspect, each ring of rings preferably contains 3 or 4 rings.

[0015] Embodiments of the invention will now be described with reference to the accompanying drawings, in which:

Figure 1a is a pictorial view of a tetrahedron;

Figure 1b is a pictorial view of a body embodying the invention;

Figure 2 is an exploded pictorial view showing how bodies are assembled to construct a tetrahedron;

Figure 3 is a view similar to that of Figure 2 showing the tetrahedron complete;

Figure 4 is an exploded pictorial view showing how further bodies are added to construct a hinge between adjacent tetrahedra;

Figure 5 is a pictorial view showing the addition of a further body completing the hinge between four adjacent tetrahedra;

Figure 6 is a pictorial view showing rings of tetrahedra hinged to other rings of tetrahedra generally laid out flat; and

Figure 7 is a pictorial view showing the rings of rings of Figure 6 formed into a geodesic dome as allowed by the hinges between tetrahedra.

[0016] A tetrahedron 2 is shown in Figure 1a. It is desired to construct a ring of tetrahedra in which two opposite edges, e.g. 2 and 4, are hinged to corresponding edges of other tetrahedra adjacent in the ring. To understand Figure 1b, consider the tetrahedron to be divided into four identical parts 8. The basic building block of this embodiment consists of a body 9 comprising two such parts 8 joined at their portion of the edges 4 and 6 by a hinge 10. In the present case the part tetrahedra 8 are moulded from suitable plastics material, with an integral thin web 12 joining them to provide the hinge 10.

[0017] In another arrangement, the body is skeletal, e.g. each of the edges illustrated in the drawings representing a frame member.

[0018] If two of the bodies are joined at their faces 12 as shown in Figure 2a, two half-tetrahedra are formed hinged at their faces 6 and 4 if two such assemblies, suitably oriented, are joined at their faces 14, a tetrahedron is formed in the centre, leaving two half-tetrahedra at the ends. Addition of further such assemblies to a minimum total of 6, enables the ends to be joined to form a ring of tetrahedra. This has the interesting property that it can be turned through its own centre, as is known.

[0019] If a single ring of tetrahedra is all that is desired, the basic building block could be the hinged half-tetrahedra illustrated in Figure 2a and formed in one piece instead of the two pieces illustrated.

[0020] The half- or quarter-tetrahedra may be joined by any suitable means. They may, for example, be permanently cemented together. If it is desired to be able to disassemble the construction, for example, as a toy or puzzle, the surfaces to be joined may be provided with complementary male and female members. In the present embodiment, however, the faces to be joined

have permanent magnets either in or behind them.

[0021] Although the shape of all the building blocks is the same, two complementary arrangements of magnets are illustrated in bodies 9a and 9b. In the drawing north and south poles are indicated by "N" and "S" respectively. Thus the faces 12 have an identical arrangement of single poles when oriented in the same direction. This provides a north pole facing a south pole when one of the bodies 9a or 9b is reversed to form the assembly of Figure 2a. Each face 14 is provided with a north pole and a south pole but their position is reversed between the two bodies 9a and 9b as illustrated in Figure 2a. This provides north poles facing south poles when a second assembly is oriented suitably to form a tetrahedron as illustrated.

[0022] In Figure 6, there are illustrated 8 rings each of 6 tetrahedra 2. The rings 16 are hingedly connected in rings of four, so forming three rings of four, as illustrated. At some of the interconnections between rings, indicated by reference numeral 18, tetrahedra need to be hingedly connected to three other tetrahedra. This is not possible with the arrangement shown in Figure 2a.

[0023] In general, the tetrahedra may be constructed and hinged in any suitable way and may be partly or wholly skeletal. Most preferably, in order to provide hinge connections between four tetrahedra, part tetrahedra are arranged as illustrated in Figures 2b to 5. Referring to Figures 2b and 3, the tetrahedron is constructed, as previously from part-tetrahedra 8a to 8d. The free part-tetrahedra 8e and 8f are not connected together, however, nor are the part-tetrahedra 8g and 8h. A similar arrangement is used at both ends, so referring to the right hand side of Figure 4, a further body 9c of which a part-tetrahedron 8i is fixed to the part-tetrahedron 8e. The other part-tetrahedron 8j is free as illustrated.

[0024] As shown in Figure 5, another body 9d is then assembled on the structure with its part-tetrahedra 8k and 8l fixed to the part-tetrahedra 8j and 8f respectively. Two more part-tetrahedra are similarly assembled on each of the free half-tetrahedra in Figure 5. The arrangement gives a hinge connection between four tetrahedra.

[0025] At other points of interconnection, e.g. indicated by reference numerals 20 in Figure 6, the arrangement illustrated in Figure 2a is used since only two tetrahedra are required to be hingedly connected.

[0026] The arrangement shown in Figure 6 provides three interconnected rings each of four rings of six tetrahedra. The arrangement has the property of being flexible, that being allowed by the hinges. The hinges allow the arrangement to be flexed. Flexing the arrangement causes it to self assemble into a geodesic dome or complete sphere as illustrated in Figure 7. If such a dome or sphere is used in the construction industry, the tetrahedra will most likely be skeletal.

[0027] A dome would require constraining, e.g. by ties, in order to prevent it flattening out.

Claims

1. A body comprising two part-tetrahedral bodies separate or separable from other part-tetrahedral bodies with which respective tetrahedral bodies can be assembled, said two part-tetrahedral bodies being joined hingedly between edges corresponding to edges or part edges of the respective tetrahedral bodies.
2. A body as claimed in claim 1, wherein the two part-tetrahedral bodies are identical.
3. A body as claimed in claim 1, wherein a tetrahedral body may be assembled from a plurality of identical ones of said part-tetrahedral bodies.
4. A body as claimed in claim 3, wherein a tetrahedral body may be assembled from four of said part-tetrahedral bodies.
5. A body as claimed in any preceding claim, which is at least partly skeletal.
6. A body as claimed in any of claims 1 to 5, which provides surfaces corresponding to those of the respective part-tetrahedron.
7. A body as claimed in any preceding claim, in which each part-tetrahedron has means for joining to another part or to other parts of the same respective tetrahedra.
8. A body as claimed in claim 7, wherein the means for joining comprise permanent magnets.
9. A body as claimed in claim 7, wherein the means for joining include male and/or female members.
10. A ring of rings of tetrahedral bodies, each body having two opposed edges hinged to edges of respective tetrahedral bodies adjacent in the ring of bodies, edges hinged to one another within the ring of bodies being also hinged to corresponding edges in rings of bodies adjacent in the ring of rings.
11. A ring of rings of tetrahedral bodies as claimed in claim 10, wherein the bodies are at least partly skeletal.
12. A ring of rings of tetrahedral bodies, as claimed in claim 10, 11 or 12 wherein edges hinged to one another within rings of bodies are also hinged to corresponding edges in other rings of bodies to form a plurality of rings of rings.
13. A ring of rings as claimed in any of claims 10 to 12, wherein each ring of bodies contains 6 tetrahedral

bodies.

- 14.** A ring of rings as claimed in any of claims 10 to 12, wherein each ring of rings contains 3 or 4 rings.

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- 15.** A ring or rings as claimed in any of the claims 9 to 14 constrained in the form of a geodesic dome or sphere.

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FIG. 1a

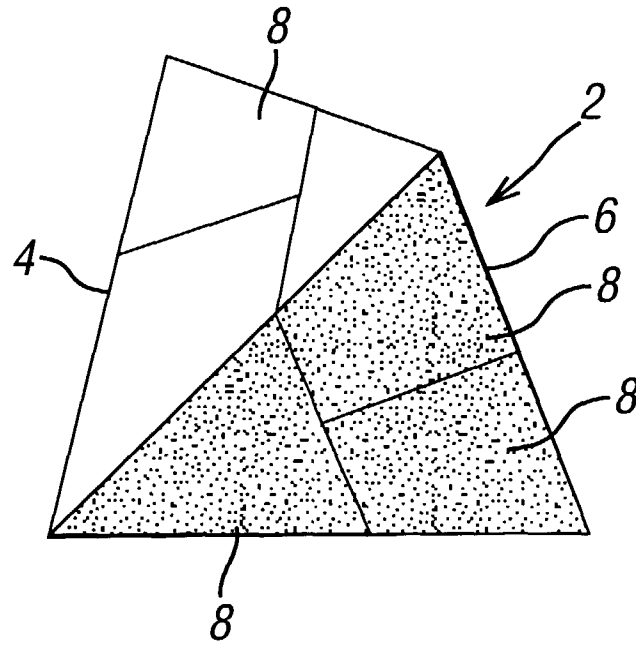
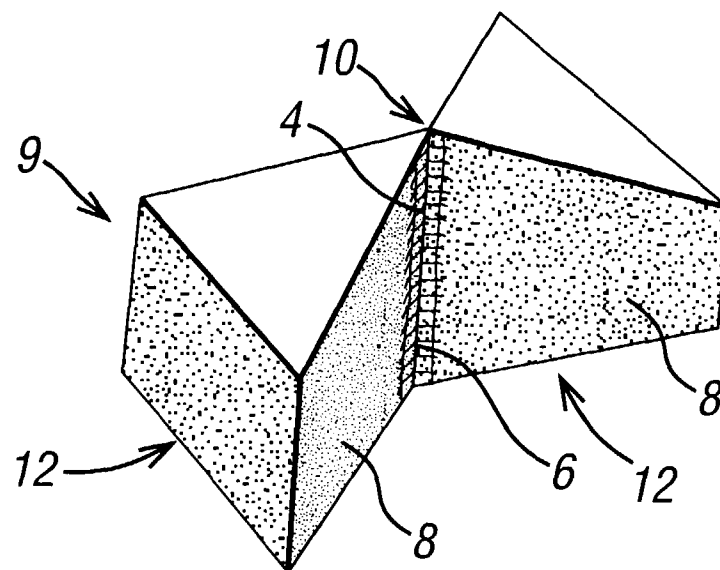


FIG. 1b



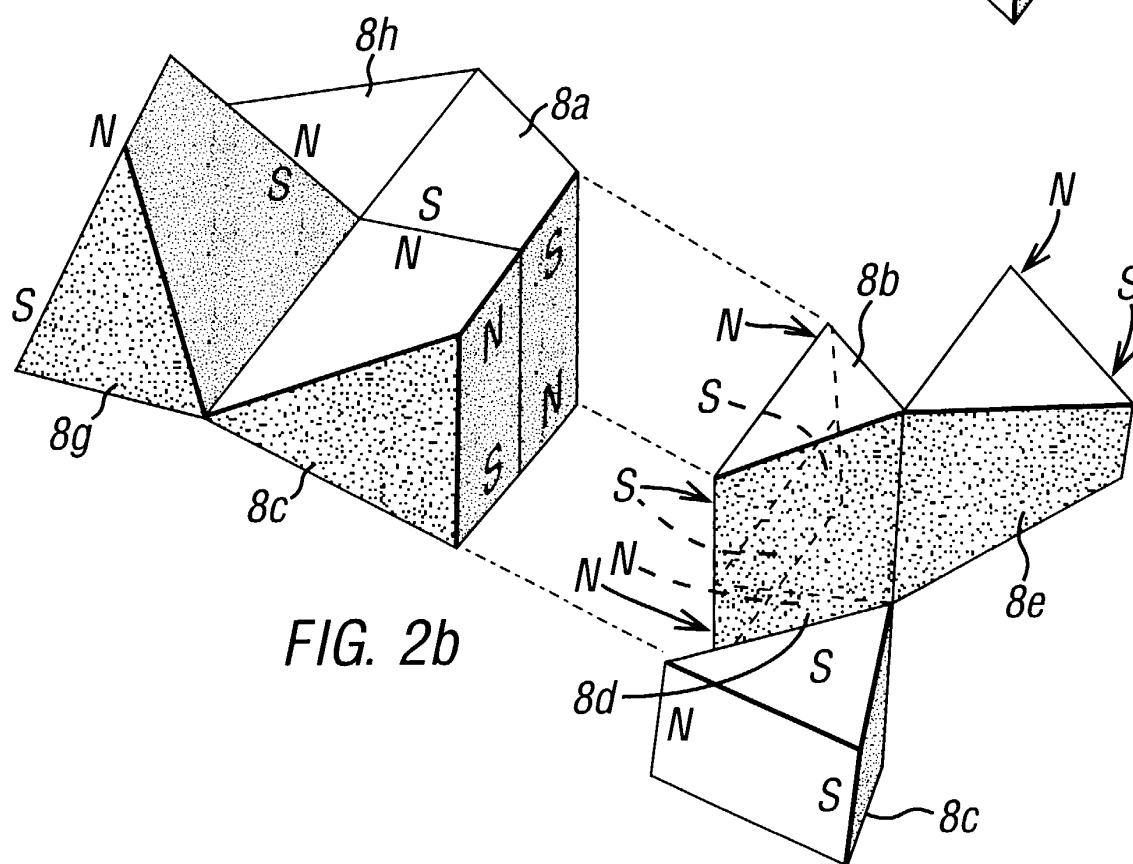
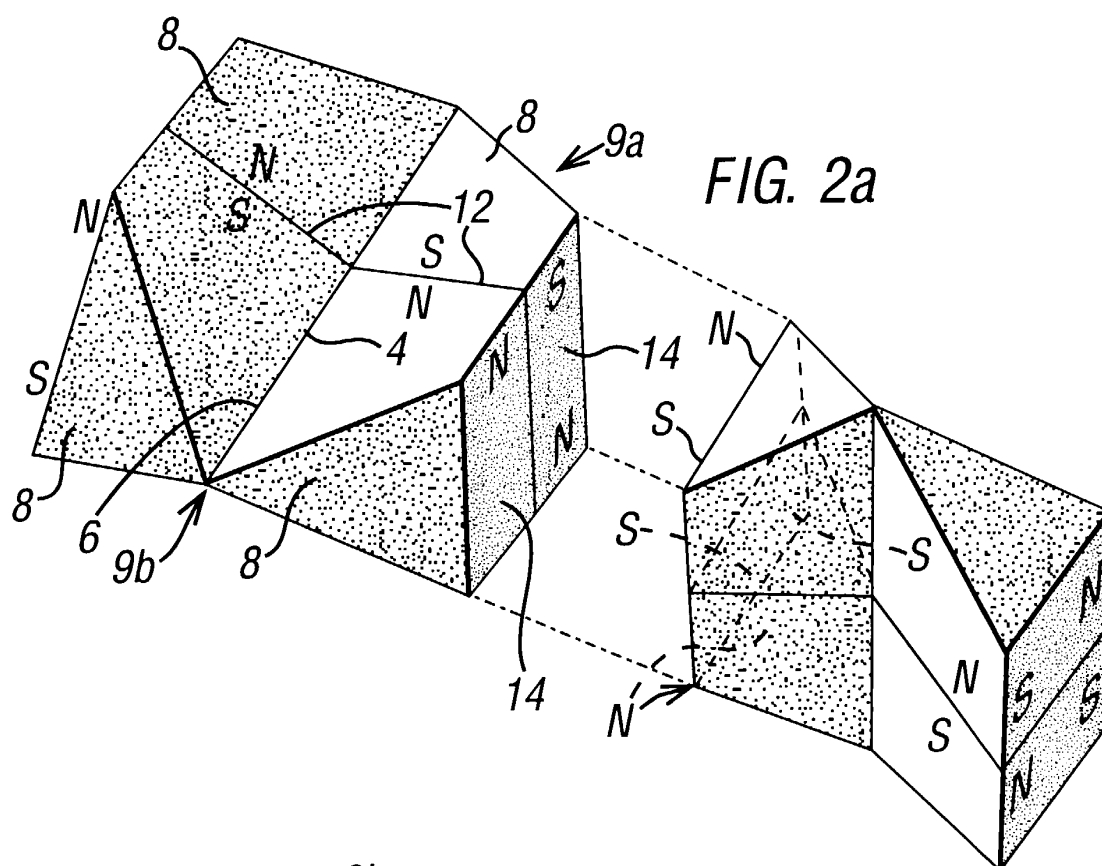


FIG. 3

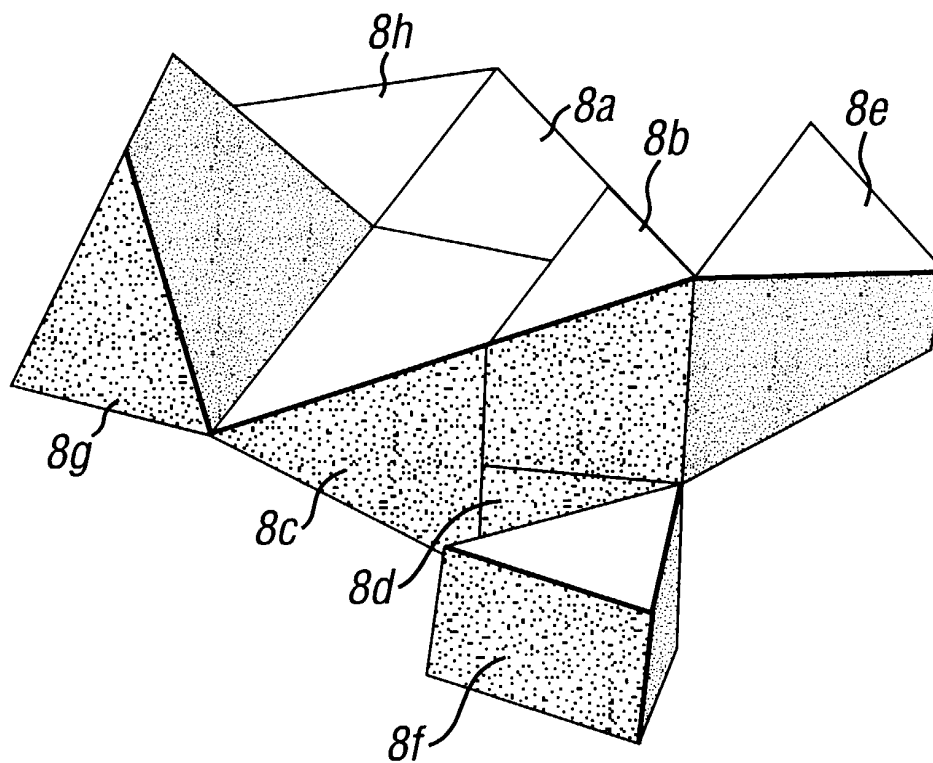


FIG. 4

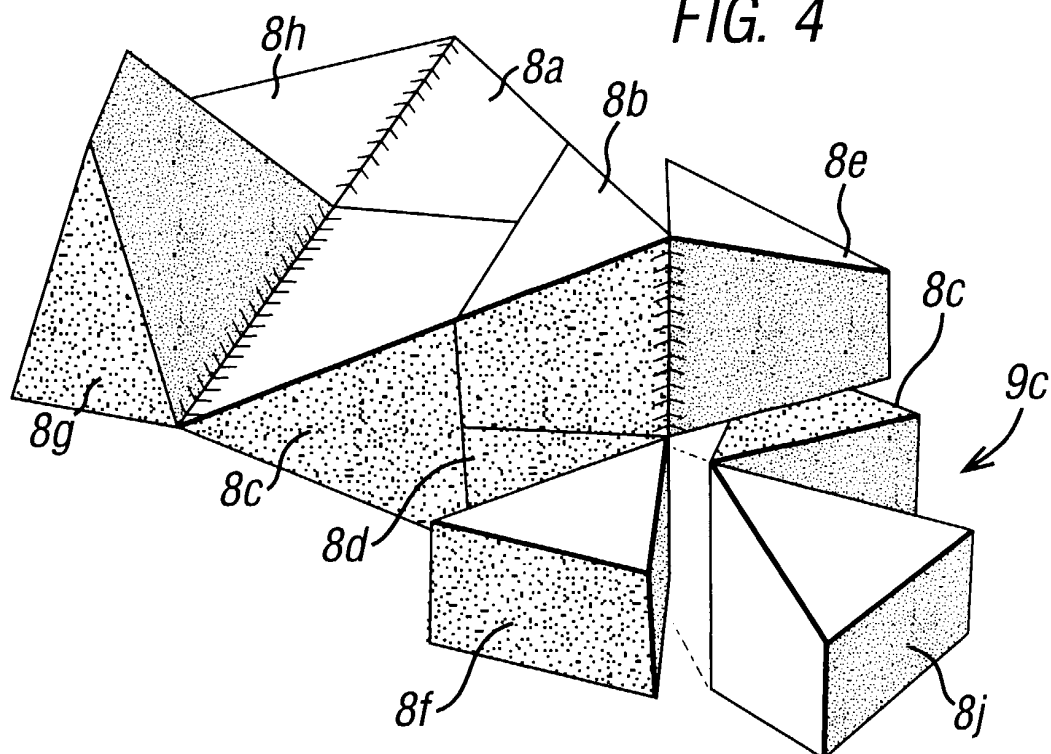


FIG. 5

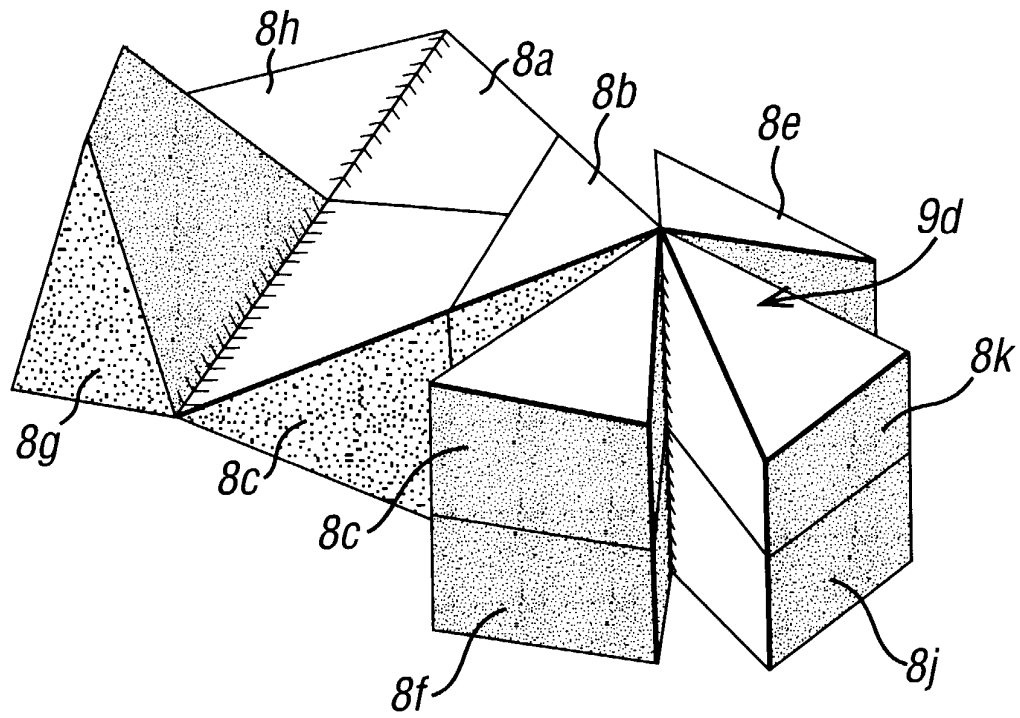


FIG. 7

