

[54] PUZZLE

[72] Inventor: Allen E. Dreyer, Richmond, Calif.

[73] Assignee: Universal Research Company, Berkeley, Calif.

[22] Filed: July 22, 1971

[21] Appl. No.: 165,278

[52] U.S. Cl.273/155, 46/17, 46/24, 273/157 R

[51] Int. Cl.A63f 9/08

[58] Field of Search273/155, 157 R; 35/18 A; 46/17, 24, 31

[56] References Cited

UNITED STATES PATENTS

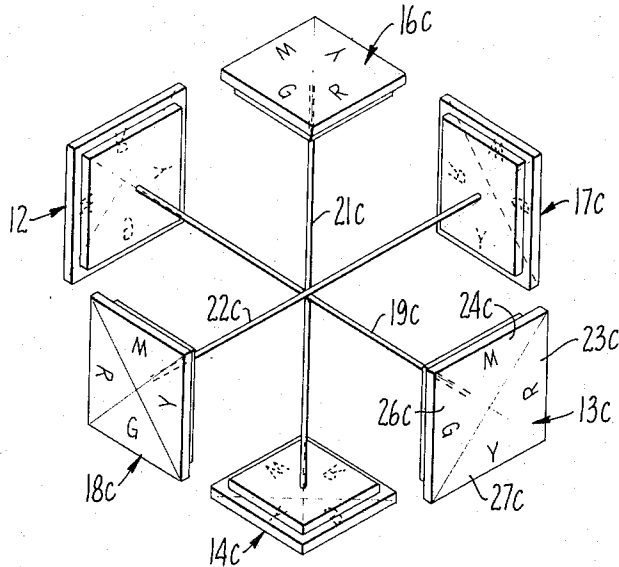
3,120,078	2/1964	Bessinger.....	46/17 X
3,222,072	12/1965	Dreyer.....	273/157 R
3,276,148	10/1966	Snelson.....	35/18 A
3,289,322	12/1966	Patrick.....	35/18 A
2,151,030	3/1939	Hinsen.....	273/58 K UX
3,646,592	2/1972	Bosley et al.....	273/157 R X

Primary Examiner—Anton O. Oechsle
Attorney—Schapp and Hatch

[57] ABSTRACT

A polyhedral puzzle is provided which is assembled from pairs of faces held to each other by an elastic member swivelably attached at the midpoint of the face, with said faces all having recessed edge configurations and being slightly but not perceptively different from each other, and formed to assemble into a regular polyhedron. A typical assembled puzzle is a cube formed with three pairs of opposed faces attached through elastic members with each face having a step-like recessed portion at the edge. Each of the opposed face members are alike and formed so that one pair of faces will nest completely into the other faces, another pair will completely overlap the other faces, and the third pair will partially nest and partially overlap. Another form of puzzle also contains design configurations on the faces which must be oriented as the puzzle is assembled in order to increase the difficulty of assembly thereof.

16 Claims, 9 Drawing Figures



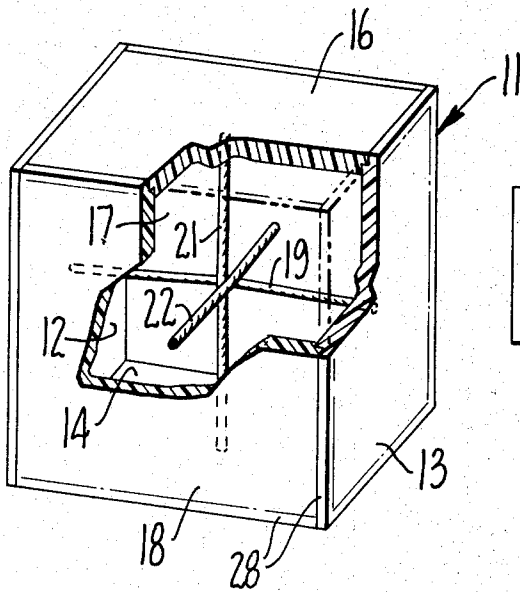


FIG. 1.

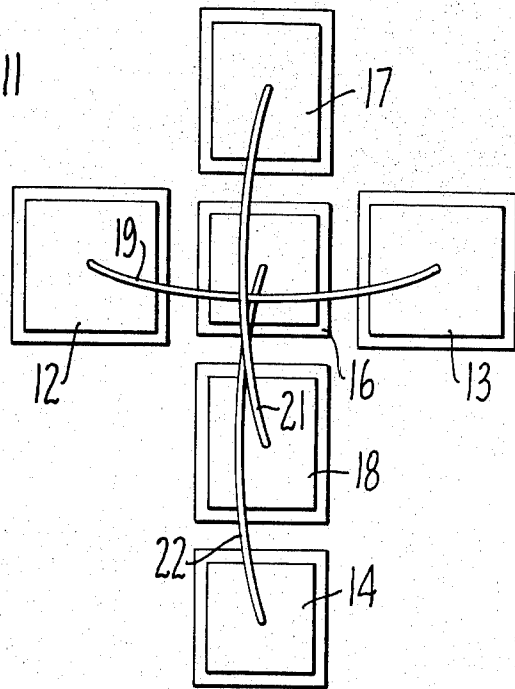


FIG. 3.

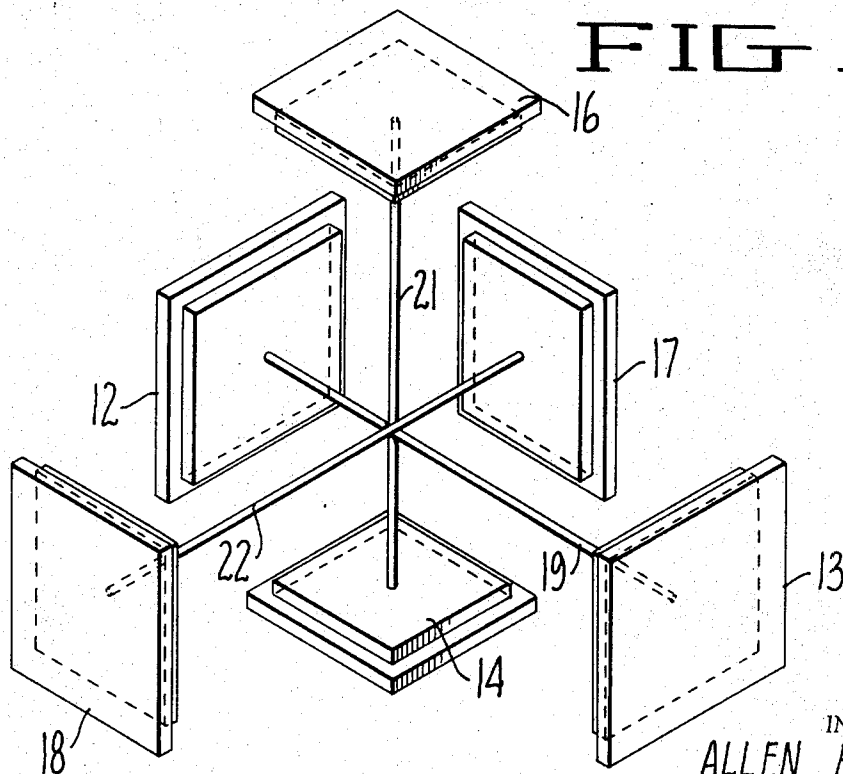


FIG. 2.

INVENTOR.
ALLEN F. DREYER
BY
Schapp & Hatch
ATTORNEYS

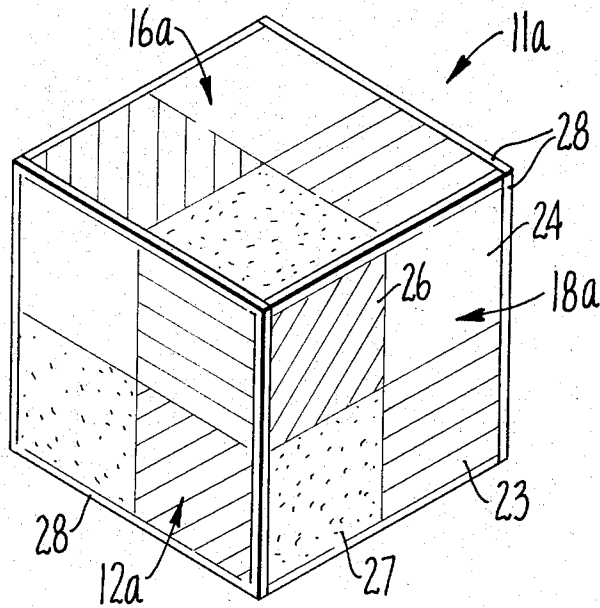


FIG. 4.

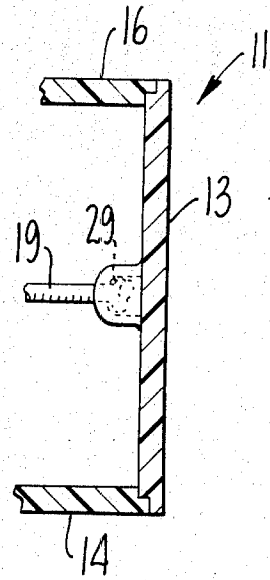


FIG. 6.

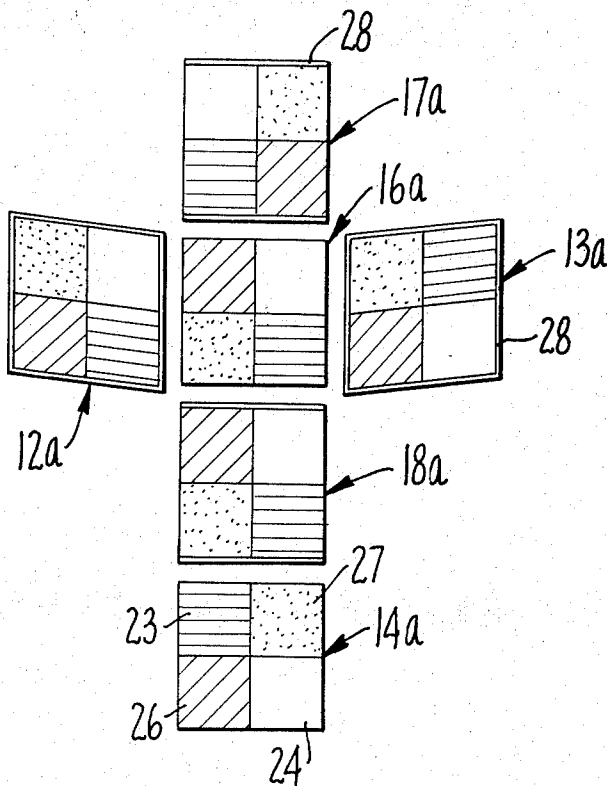


FIG. 5.

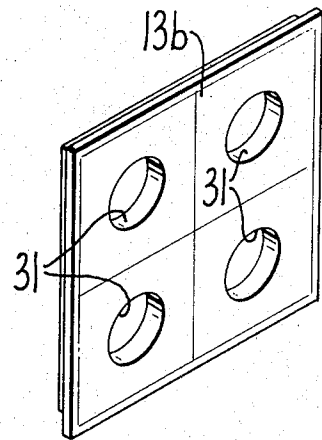


FIG. 7.

INVENTOR
ALLEN F. DREYER
BY
Schapp & Hatch
ATTORNEYS

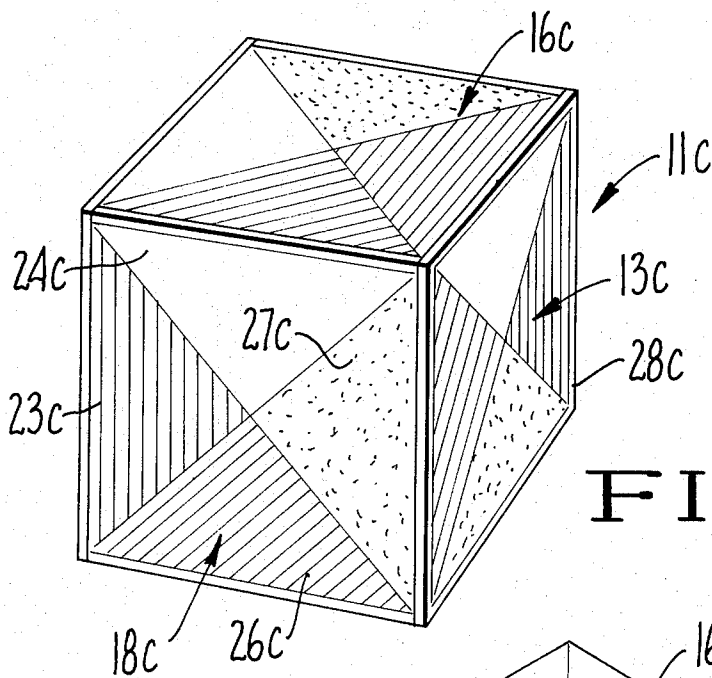


FIG. 8.

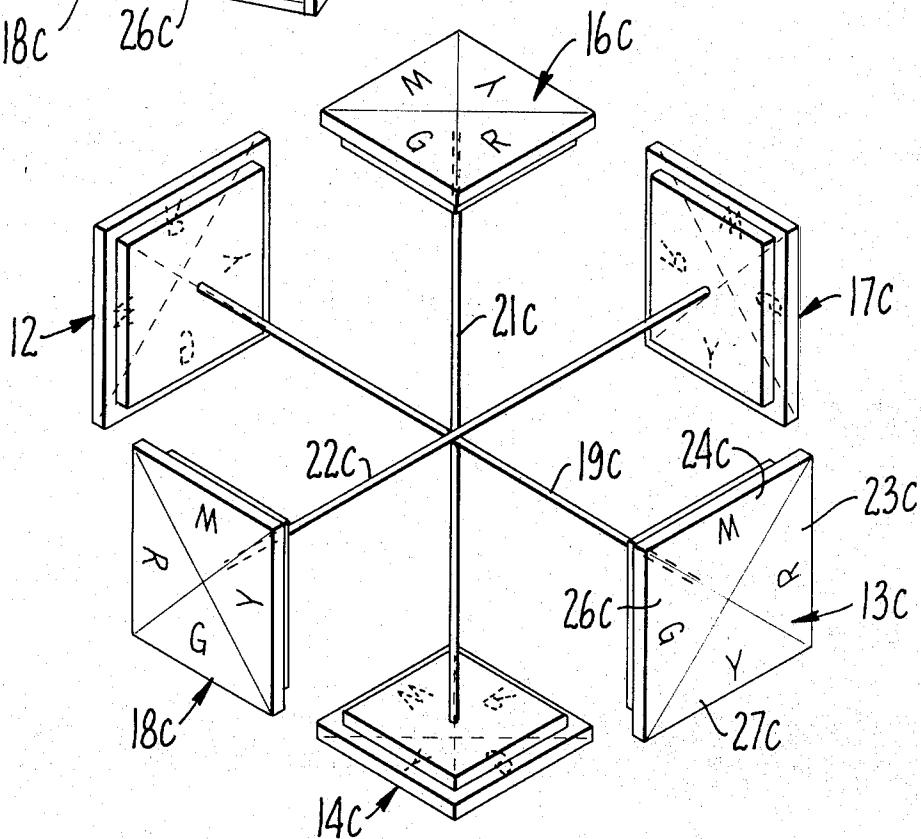


FIG. 9.

INVENTOR.
ALLEN F. DREYER
BY
Schapp & Hatch
ATTORNEYS

PUZZLE

BACKGROUND OF THE INVENTION

The present invention relates to a PUZZLE and more particularly to a puzzle in the form of a regular polyhedron which is broken up into individual parts and must be assembled in a certain manner to effect a solution of the puzzle.

Puzzles which are made up of individual parts and which are difficult to assemble are well known, and many different types of such puzzles have been developed. It is well known that these puzzles are capable of providing many hours of amusement, and various different types of puzzle configurations are continuously being designed in order to provide a new puzzle form.

Certain of these puzzles are in the form of wire elements that are put together or removed, block-like elements that should be placed in a given configuration, or parts of known units. The present invention relates to the latter type of puzzle, with the known unit being a regular polyhedron and preferably a cube.

SUMMARY OF THE INVENTION

Accordingly, it is a primary object of the present invention to provide a puzzle which is capable of solution by assembly of fixed components thereof, and capable of providing joy and amusement to the solver.

In order to provide symmetry and to pinpoint the desired assembly, the assembled puzzle is preferably in the form of a regular polyhedron having no more than twelve sides. In other words, in its broad aspect, the polyhedron may be a regular tetrahedron, a cube, or a dodecahedron. Preferably, the puzzle will be a cube and next in order of preference is the tetrahedron, because figures having large numbers of faces tend to become too difficult to assemble for practical purposes.

The puzzle parts include rigid face members formed of wood, or plastic or the like which are relatively thin. Preferably the thickness of each face member is of the order of, say, one-tenth of or less than one-tenth of the length of the shortest side. These face members are preferably provided in joined pairs connected through suitable connecting means attached at the midpoint of each side and formed of a flexible material. The material should also be rotatable or the attachment should be swivelable so that the sides may be rotated relative to one another.

It is an important feature of this invention, that the face members are not all exactly alike, although the face members will assemble to form completed faces which are of exactly the same size and shape. This is achieved because some of the faces contain portions of other face members along part or all of the edges where they nest within. In order to provide this nesting and yet enable the puzzle to be held in assembled position, recessed portions are provided in the internal side of the edges of the faces, with the recessed portions being preferably like the recess of a single stair. In this way, the length dimensions of the face members will vary by this overlapping factor or edge and with the thickness restricted to one-tenth of the length of the side. It will be seen that since the variation of length of the sides of the face members will be of the order of one-tenth or less than the shortest length and the stair section is a fraction of the thickness, the variation of length of the

sides is too small to be visually apparent. In this way, it is difficult to tell the larger faces from the smaller ones and this confusion is part of the difficulty involved in solving the puzzle. In addition, the manner in which the edges fit together may vary from a relatively simple form to a relatively complicated form.

For example, in the cubicle puzzle illustrated hereinafter, the opposed face members are alike with two faces composed of smaller squares, two opposed faces consisting of larger squares, and two opposed faces being rectangles having the smaller sides and larger sides. In this form, the connecting members are elastic and the members must be pulled apart against the elastic in order to render the puzzle more difficult. This design is also particularly adapted for use with face designs that must be oriented with respect to each other, because they allow for the most possible variations of rotation of the face members.

When the puzzle is a regular tetrahedron, it will be appreciated that the opposed faces will necessarily differ in order to provide the desired assembly. It will also be appreciated that symmetry and dissymmetry may be designed together with a degree of elasticity or the like in the connecting members. In certain cases, it may be desired not to have the connecting members elastic but to include relatively telescoping members formed of plastics or the like which are preferably permanently attached but allow for the face members to be moved relatively toward and away from each other as well as swivelled during assembly. It may also be desirable to provide a handle means such as recesses or bosses on the face members in order to provide a gripping means to make it easier for the user to spread the opposed face members apart. In such a case, however, the gripping means should be similar on all faces in order to avoid any hint of identity and retain the superficial similarity of all of the face members.

From the above descriptions, it is seen that another object of the invention is to provide a puzzle which is capable of being made in a number of variations of difficulty, but which are similar in operating principle.

A further object of the invention is to provide a puzzle which is relatively simple to construct and which is capable of being played without complicated or difficult directions.

Further objects and advantages of the invention will be apparent as the specification proceeds and the new and useful features of the puzzle will be more fully defined in the claims attached hereto.

BRIEF DESCRIPTION OF THE DRAWINGS

The preferred forms of the invention are illustrated in the accompanying drawings, forming a part of this description, in which:

FIG. 1 is a perspective view of a typical embodiment of the invention, but with the wall thickness of the faces enlarged in order to clarify face differences, and with parts broken away in order to illustrate the internal structure during assembly;

FIG. 2, an exploded perspective view of the puzzle shown in FIG. 1;

FIG. 3, a plan view illustrating the various face members of the puzzle of FIGS. 1 and 2;

FIG. 4, another form of the invention, but with the wall thicknesses in their normal desired proportions

and with indicia on the face members for rendering solution of the puzzle more difficult;

FIG. 5, a diagrammatic view of the face members shown in FIG. 4, indicating the puzzle members in solution position;

FIG. 6, a fragmentary cross-sectional view of the puzzle of FIG. 1 illustrating an alternate internal connecting member and attachment therefor;

FIG. 7, a perspective view of a modified form of face member that may be utilized to provide a modified form of puzzle;

FIG. 8, a puzzle form similar to that shown in FIG. 4, but with a different form of facial indicia; and

FIG. 9, an exploded perspective view of the puzzle shown in FIG. 8 illustrating in greater detail the orientation of the face members during solution thereof.

While the preferred forms of the invention are shown and described in detail, it should be understood that various changes or modifications may be made within the scope of the claims attached hereto without departing from the spirit of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring more particularly to the drawings, there is shown in FIG. 1 a typical puzzle 11 constructed according to the invention in which all of the puzzle faces present a similar appearance. As there shown, puzzle 11 is in the form of a cube formed from six face members 12, 13, 14, 16, 17 and 18 laid out as shown in the FIGS. 2 and 3. These face members are formed with step-like edges and have opposed members exactly alike. Thus opposed members 12 and 13 are the same size and shape and formed with their entire surface providing a surface of the cube and their nesting portion fitting into the staircase configurations of adjacent members. Similarly, face members 14 and 16 are the same size and shape but are formed to nest within face members 12 and 13 as well as members 17 and 18. Members 17 and 18, on the other hand, are slightly rectangular with the width dimension nesting within members 12 and 13, and the length dimensions overlapping members 14 and 16. In order to indicate these variations of dimensions, the drawings are exaggerated in FIGS. 1 through 3, but it will be appreciated that with thin members, they would look substantially alike, because the differences in size would not be apparent to the naked eye.

Each opposed pair of members is joined by an elastic which extends between the midpoint of the inner face of one member to the midpoint of the inner face of the other member, and is adapted to pass through the central area of the puzzle. Thus elastic members 19, 21 and 22 are provided as shown and they are constructed to allow a relative orientation of the puzzle faces and yet pull the puzzle pieces tightly together in assembly. In other words, the elastic should present enough force to hold the members in shape, and also enough force to tend to slightly collapse the puzzle. This tendency to collapse the puzzle renders it more difficult to assemble, because the user must be careful once he starts his assembly to complete it before the puzzle collapses and requires beginning anew. In the event the puzzle is assembled, but the nesting is not made properly, it will be necessary to correct the errors to achieve final as-

sembly of the puzzle. In this connection, it will be noted that the rectangular faces 17 and 18 will provide added difficulty, because they can be oriented 90° from the proper orientation and will not properly nest when so disoriented.

Although the stair form of nesting is shown and preferred, it will be appreciated that other systems of bevelling the edges may be utilized instead of the staircase configuration shown. However, the staircase configuration has the advantage of providing improper assemblies that will hold together and will require correction.

FIGS. 4 and 5 illustrate an alternate form of the invention, in which the face members are provided with indicia for showing an orientation of each face with respect to the other faces, yet which is provided with a generally similar appearance. For example, each face member of the puzzle of FIG. 4 is provided with four square color areas, with the same colors being used on each of the six puzzle faces, but in which the relative sequence of the colors vary. It will be noted that with four different colors provided in the four areas, each color is necessarily adjacent to a different color. The overall puzzle is designed so that it may be assembled with the colors of adjacent face members being different in all cases. With this arrangement, the puzzle is rendered more difficult by requiring specific orientation of the puzzle faces as well as assembly thereof.

Thus illustrated in FIGS. 4 and 5, a puzzle 11a is provided having faces 12a, 13a, 14a, 16a, 17a and 18a held together by suitable internally extending connecting members as in the embodiment of FIGS. 1 through 3. The drawing of FIGS. 4 and 5 shows that these members in thickness proportions similar to those suitable in accordance with the invention, but it will be appreciated that the opposite pairs of face members will be distinguishable from each other because of the border accentuated by the color areas. As shown in FIGS. 4 and 5, each puzzle face will contain a square red area 23, a square white area 24, a square green area 26, and a square yellow area 27 surrounded by a black border 28. With members that nest over the others such as face members 12a and 13a, the black border 28a is provided on the face thereof as shown in FIG. 5. However, face members 14a and 16a which nest entirely within the others have no border provided on the members themselves, but the assembled puzzle contains a boarder from the edge portion of members 12a, 13a, 17a and 18a. Similarly the members 14a and 16a provide a partial border on the face thereof with the remainder being provided by the edges of members 12a and 13a as will be apparent from the assembly indicated in FIGS. 4 and 5.

Although it will be apparent from the design of the face configurations which members nest within and which ones do not, orientation of the members becomes exceedingly difficult and disassembly and reassembly of the puzzle is frequently required many times before a correct solution is achieved by the solver. It will be appreciated that the relative orientation of the four perfectly square face members may vary 90° and produce a large number of combinations. Thus a user may obtain some hint by allowing the opposite elastic members to find their natural orientation by holding one up in the manner of members 14 and 16

of FIG. 2. This will assist the solver in orienting the puzzle assuming, of course, that the puzzle is made with the elastics stretched opposite the members in their proper orientation. Otherwise, such a system may render the puzzle more difficult depending upon the observance of the orientation by the user. In any event, this tendency for a fixed arrangement between opposite members may be eliminated by providing a swivel such as that illustrated in FIG. 6. It will be appreciated, that although the swivel FIG. 6 is shown for a modification of the puzzle of FIG. 1, that it may be utilized in the modification of FIGS. 4 and 5, or that of 8 and 9, or any other suitable modification to which it may be applicable.

Referring more particularly to FIG. 6, it is seen that face member 13 is provided with a swivel 29 on the center of the internal side thereof, with swivel member 29 formed to anchor elastic member 19 therein. Other swivels are provided on each face so that the entire puzzle is equipped with swivel connections and a tendency toward a preset fixed orientation of opposite members is positively avoided.

In some situations, orientation of the puzzle becomes more difficult than that desired for certain levels of difficulty. This is particularly true where colored areas are provided and it is desired to make changes of face orientation without collapse of the entire puzzle. In such a situation, handle means may be provided, but it will be understood that handle means should be symmetrical so as to preserve the desired overall similarity of opposed members.

A typical example of handle means is shown in FIG. 7, where a face member 13b is provided with four bore holes 31 symmetrically provided therethrough. Although four square areas are indicated bodily, it will be appreciated that they may remain alike as in the embodiment of FIG. 1, or colored differently as in the embodiment of FIGS. 4 and 5. In either case, the holes 31 provide a convenient grip for pulling the member against the elastic and orienting it, and this function is achieved without a hint of difference between the various face members. It will be appreciated that other handle means may be provided such as a single centrally located hole, or a centrally located boss suitable for gripping, or for handles replacing the bore holes 31 as shown in FIG. 7.

In FIGS. 8 and 9 a further embodiment of the invention is illustrated in which a puzzle 11c is shown. The puzzle 11c is similar to the puzzle 11 and 11a with correspondingly similar parts labeled with the same numbers. Thus the puzzle contains elastic members 19c, 21c and 22c connecting opposite pairs of face members to each other. As illustrated in the drawing, face member 12c is connected to face member 13c by elastic 19c, face member 14c is connected to face member 16c by elastic member 21, and face member 17c is connected to face member 18c by elastic member 22. The red, yellow, white and green color areas are provided as well as the border 28 similar to the embodiment of FIGS. 4 and 5, but in the embodiment of FIGS. 8 and 9 the color areas are triangular rather than square and only two colors abut each other from adjacent faces.

This design provides a more attractive and easier operating device than the embodiment of FIGS. 4 and

5, and provides a simpler appearance. However, the number of solutions is the same as that of the embodiment of FIGS. 4 and 5 and the levels of difficulty therefore similar. Although the embodiment of FIGS. 8 and 9 show the elastic connection of the embodiment of FIGS. 1 through 3, and the handleless face portion, it will be appreciated that this embodiment could be equipped with swivels such as those shown in FIG. 6 or handle means such as those illustrated in FIG. 7, or both, if desired.

It will also be appreciated that although the cube form of the invention has been described in detail, that the principles thereof may be provided with a regular tetrahedron or a regular dodecahedron structure. In case of a regular tetrahedron structure, the equilateral triangles of each of the four faces can be divided into three congruent triangles with each side of the larger triangle as a base and the center of the triangle as a vertex for each of the three internal triangles. Three colors and color orientation can then be provided to render such puzzle more difficult than the simple version. Similarly, the pentagons of the dodecahedron could be carved up into five colored triangles utilizing each side as a base and the center as the vertex to divide the triangles. However, such a puzzle would probably be too difficult for all but the most devoted puzzle solvers.

From the above description, it will be appreciated that the present puzzle form provides a structure which is capable of providing puzzles from the simple to the difficult with a minimum number of parts.

I claim:

1. A polyhedral puzzle formed from a plurality of pairs of opposed face members, each of the face members being of similar size and shape to the corresponding paired member, and each face member having recessed edges to provide outer faces larger than the inner faces thereof, and a plurality of elastic members corresponding to the number of pairs of opposed faces with each elastic member being disposed between each pair of said face members and centrally connected to the inner faces thereof, said elastic members being of a length sufficient to be taut and under tension between the face members when the face members are assembled in the form of a polyhedron said elastic members being sufficiently elastic to enable any one of said face members to be pulled outwardly from the assembly and rotated relative to the same.

2. A polyhedral puzzle as defined in claim 1, in which the recessed configuration at the edges of each face member is in the form of a staircase configuration having two steps thereof, with the puzzle formed for the intermediate step to be pulled against and accurately fit the edges of adjacent faces by the elastic member for holding the polyhedral shape of the solved puzzle.

3. A polyhedral puzzle as defined in claim 2, in which the staircase configuration is similar on all sides of the face member so as to present a symmetrical pattern.

4. A polyhedral puzzle as defined in claim 1, in which the elastic members are connected to the face members through swivels permitting relative rotation of the face members with respect to each other.

5. A polyhedral puzzle as defined in claim 1, in which each of the faces of the polyhedral puzzle contains color designs which are to be matched with the color designs on adjacent faces when the desired polyhedral

solution is obtained, whereby the number of solutions is restricted by requiring rotational and opposed orientation of the puzzle faces.

6. A polyhedral puzzle as defined in claim 1, in which the faces are formed with manual gripping means for allowing the player to grasp the opposed faces, pull them apart against the elastic tension, and rotate same.

7. A cubical box puzzle comprising three pairs of opposed face members, with the opposed face members of each pair being of the same size and shape as its mate, each of said face members having its edges formed in a staircase configuration to present outer faces larger than the inner faces thereof, and three elastic members disposed with a single member between each pair of said face members and centrally connected to the inner faces thereof, said elastic members being of sufficient length to be taut and under tension between the face members when the face members are assembled in the form of a cube said elastic members being sufficiently elastic to enable any one of said face members to be pulled outwardly from the assembly and rotated relative to the same.

8. A cubical puzzle as defined in claim 7, in which the elastic members are connected to the face members through swivels permitting relative rotation of the face members with respect to each other.

9. A cubical puzzle as defined in claim 7, in which each of the faces of the polyhedral puzzle contains color designs which are to be matched with the color designs on adjacent faces when the desired polyhedral solution is obtained, whereby the number of solutions is restricted by requiring rotational and opposed orientation of the puzzle faces.

10. A cubical puzzle as defined in claim 7, in which the faces are formed with manual gripping means for allowing the player to grasp the opposed faces, pull them apart against the elastic tension, and rotate same.

11. A cubical puzzle comprising three pairs of opposed face members, and three connecting means forming three units with each unit consisting of one of

the pairs of face members and one of the connecting means extending between said pair of members, each face member having an outer face and a smaller inner face formed from a stepped-edge configuration extending around the perimeter of said member, each of the opposed face members being alike, and the units of face members being formed so that one unit will nest completely into the other units while another unit completely overlaps the other units and the third unit partly nests and partly overlaps the other units, said face members each having a thickness of less than about one-tenth of the length of the shortest face side so that all face members will superficially appear alike, and said connecting means being formed to allow any of the face members to be pulled outwardly and rotated with respect to one another and yet normally retain the assembled cubical position of the puzzle.

12. A cubical puzzle as defined in claim 11, in which the connecting means are connected to the face members through swivels permitting relative rotation of the face members with respect to each other.

13. A cubical puzzle as defined in claim 11, in which each of the outer faces of the polyhedral puzzle contains four color designs which are to be matched with the color designs on adjacent faces when the desired polyhedral solution is obtained, whereby the number of solutions is restricted by requiring rotational and opposed orientation of the puzzle faces.

14. A cubical puzzle as defined in claim 13, in which the color design forms four squares on each of the faces of the assembled cube and a border at each edge thereof.

15. A cubical puzzle as defined in claim 13, in which the color design forms four triangles and a border on each face of the assembled cube.

16. A cubical puzzle as defined in claim 11, in which the faces are formed with gripping means for allowing the player to grasp the opposed faces, pull them apart, and rotate same.

* * * * *

45

50

55

60

65