United States Patent [19]

Betzoldt

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[45] **Aug. 13, 1974**

[54] **PUZZLE ASSEMBLY WITH INTERSECTING PIECES**

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[73] Assignee: **Lance A. Neibauer,** Wayne, Mich.

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[52] **U.S. Cl.** ..... **273/160,** 83/32, 144/326 R

[51] **Int. Cl.** **A63f 9/12**

[58] **Field of Search** 273/160; 46/15

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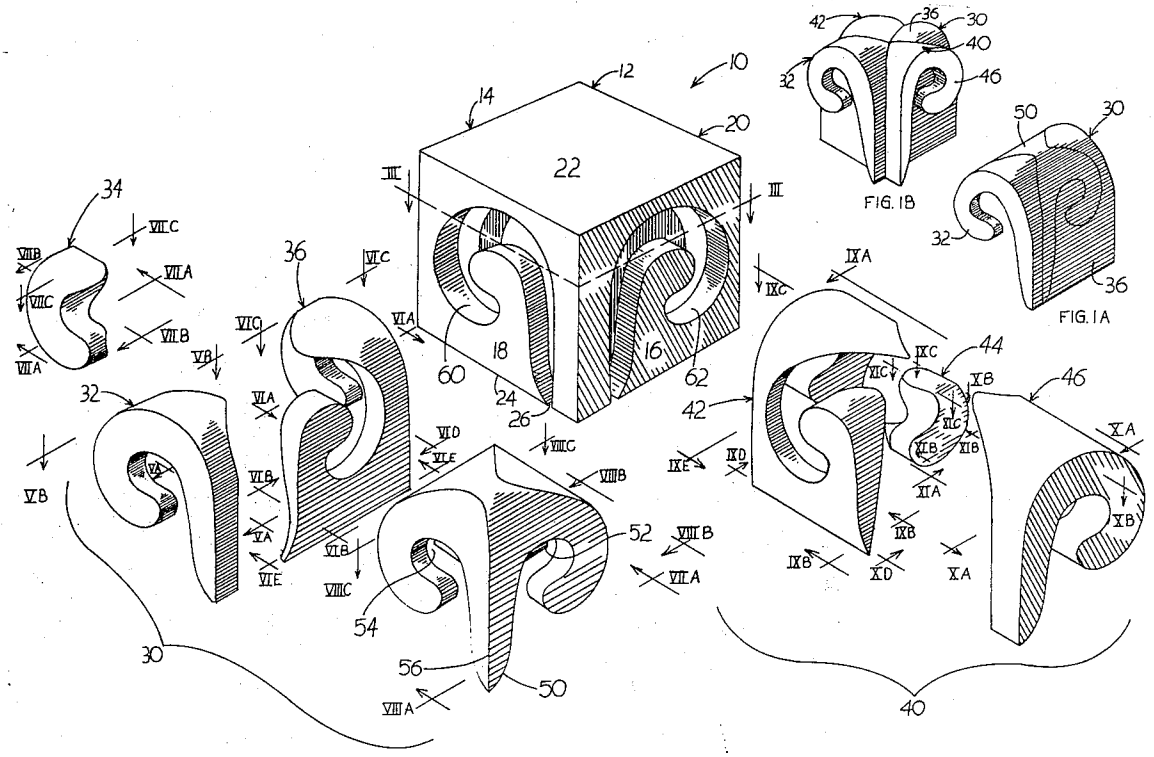
Primary Examiner—Anton O. Oechsle

Attorney, Agent, or Firm—Price, Heneveld, Huizenga & Cooper

[57] **ABSTRACT**

A puzzle formed from a block including several variously configured, interlocking unitary pieces which are slideable into and out of the block for assembly and disassembly. The pieces assemble into two intersecting cylinders within the block including a central piece which forms a part of both cylinders. The preferred method of forming the puzzle comprises cutting the cylinders by causing the instrument used for cutting to enter and exit the block along a single line for each cylinder.

8 Claims, 37 Drawing Figures



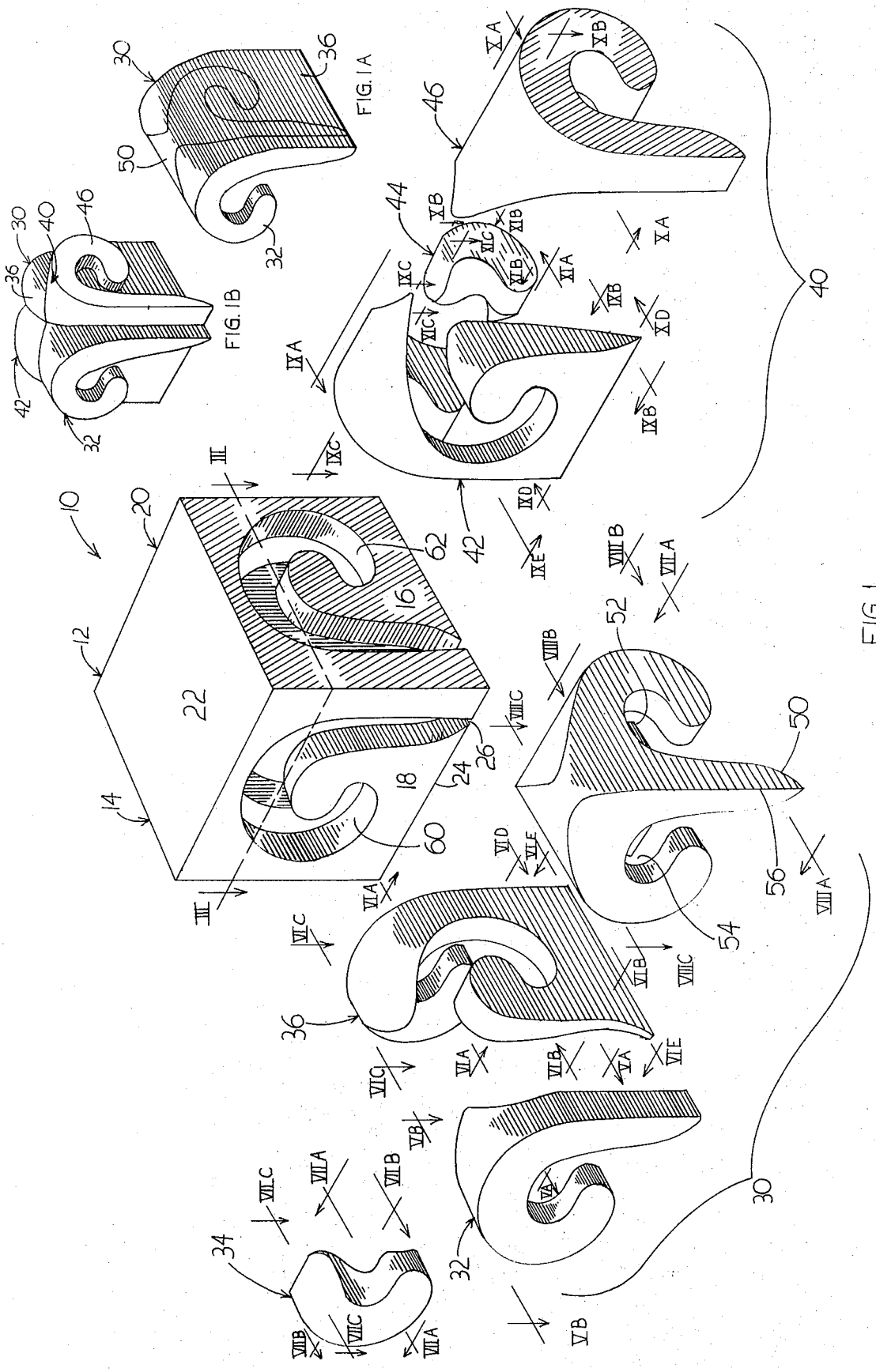


FIG. 1

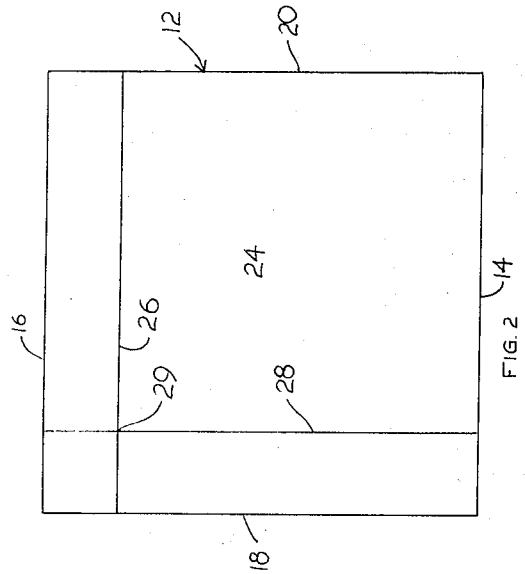


FIG. 2

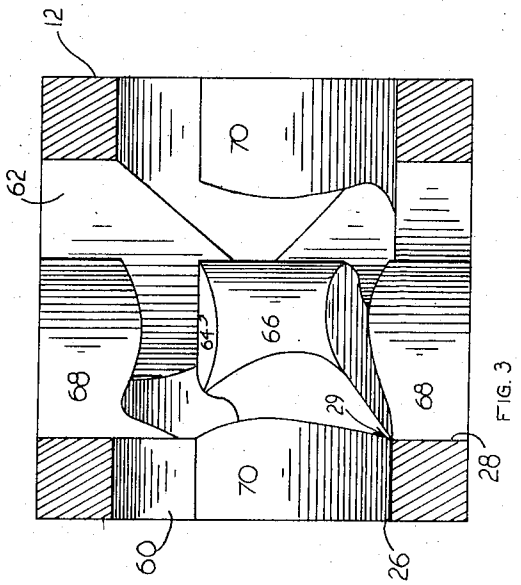


FIG. 3

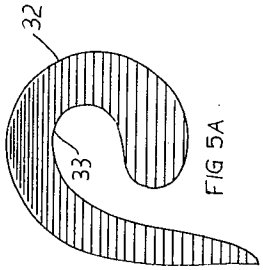


FIG 5A

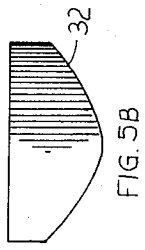


FIG. 5B

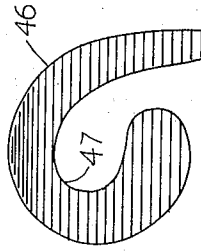


FIG. 10A

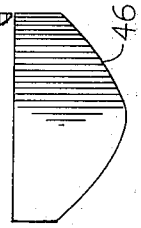


FIG. 10B

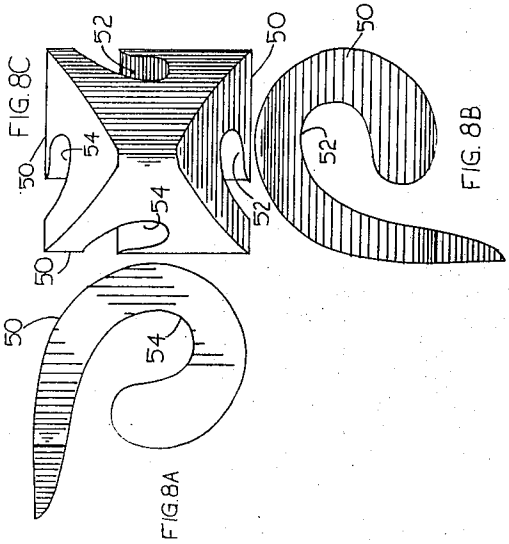


FIG. 8C

FIG. 8B

FIG. 8A

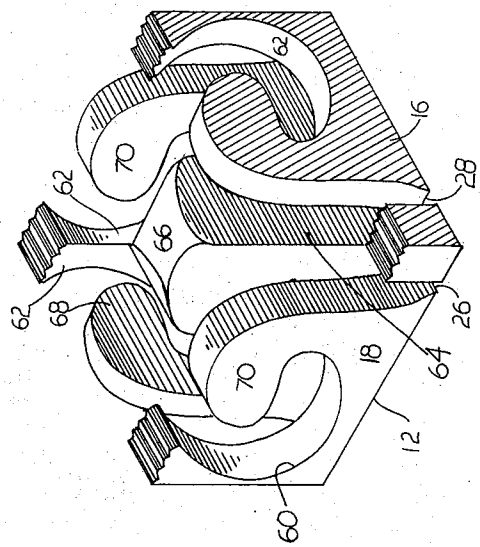


FIG. 4

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FIG. 7A
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FIG. 7B
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FIG. 7C
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FIG. 11C
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FIG. 11A
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FIG. 11B
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FIG. 9A
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FIG. 9B
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FIG. 9D
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FIG. 9C
42
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FIG. 9E
FIG. 6C
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FIG. 6A
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FIG. 6D
36
FIG. 6E
36
37
FIG. 6B

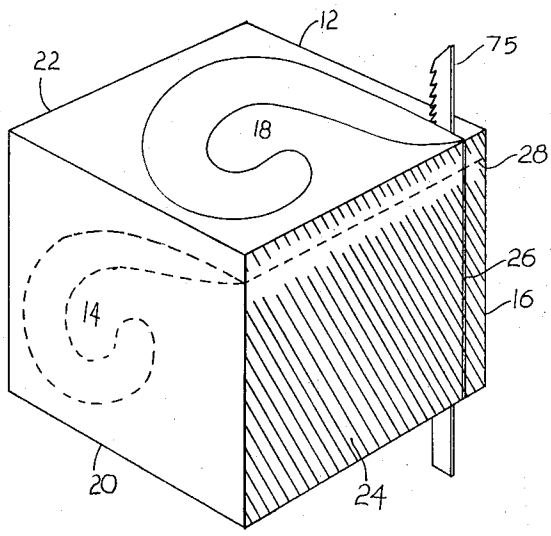


FIG. 12

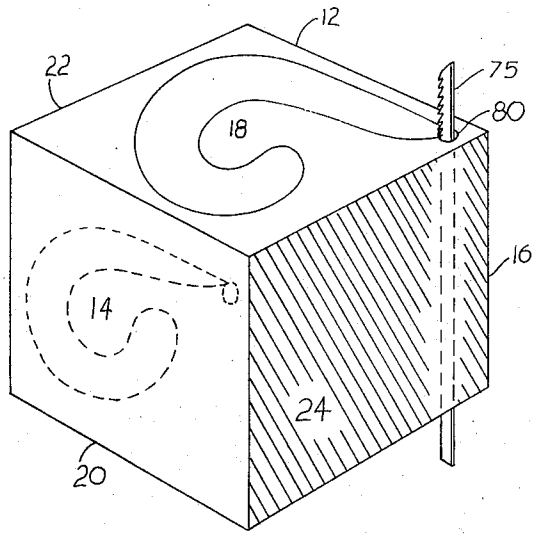


FIG. 13

PUZZLE ASSEMBLY WITH INTERSECTING PIECES

This invention relates to games and puzzles, and more particularly, to a puzzle requiring skill to assemble its several separate pieces into a complete block.

BACKGROUND OF THE INVENTION

Games of skill in the form of puzzles have long been known. Typically, such puzzles are constructed from separate elements which may be variously glued, bonded, or otherwise secured together to form intricate pieces of varying configurations. The intricate pieces are assemblable in a defined pattern to form a recognizable whole. Such prior puzzles are not only expensive to manufacture but are often susceptible to breakage or fracture due to the great number of elements which must be secured together to form the individual pieces. Additionally, prior puzzles of this type have been difficult and tedious to manufacture because of their design which has been necessarily intricate to provide a challenge for the person attempting the assembly of the puzzle.

SUMMARY OF THE INVENTION

Accordingly, it is the purpose of the present invention to provide an intricate and challenging game or puzzle which requires skill on the part of a person attempting the assembly thereof. The puzzle includes several variously configured yet intricate, interlocking pieces, each of which is a unitary whole. Further, the puzzle may be quickly, easily and inexpensively manufactured by making only two saw or other cuts into a block of material thereby obviating the tedious assembly previously required to fashion puzzles requiring skill for assembly. The result, therefore, is an inexpensive yet intricate and challenging game of skill which will provide hours of amusement.

The puzzle comprises an element or block having two sets of opposing external surfaces. Using a saw or other cutting tool, a cylinder, preferably having the shape of a closed involute, is cut into each set of surfaces such that the cylinder extends between the two surfaces. The external surfaces and cylinders are so located that the cylinders intersect one another thereby causing one of the puzzle pieces to be common to both cylinders.

In cutting each of the cylinders, the cut is started along a surface of the element or block separate from any of the external surfaces included within said two sets. A curve in the shape of a closed involute is followed by the cutting instrument, with the curve ending or closing at the point at which it began. Accordingly, the saw or cutting instrument is caused to exit from the block or element along the same line at which it entered the block. Therefore, in the preferred embodiment, the completed puzzle, including the assembly block or element and each of the separate pieces, will include only two locations on its external surface wherein the cutting instrument enters the block. These locations may be thereafter filled or adhered together to unify the assembly block after manufacture.

The resulting puzzle manufactured in accordance with this method includes two interlocking cylinders each having several variously configured pieces. Each of the pieces is slideably received in the assembly block. The resulting odd shapes of the various pieces provide a significant challenge for anyone attempting to reassemble the puzzle.

These and other objects, advantages, purposes and features of the invention will become more apparent from a study of the following description taken in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded perspective view of the puzzle of the present invention showing the assembly block and the individual puzzle pieces received therein;

FIG. 1A is a perspective view of several of the separate pieces assembled into one of the cylinders of the preferred embodiment;

FIG. 1B is a perspective view of all of the separate pieces assembled into the two, interlocking cylinders as they would appear when assembled completely within the assembly block;

FIG. 2 is a bottom view of the assembly block shown in FIG. 1 illustrating the two locations where cuts are made during manufacture of the puzzle in accordance with the present method;

FIG. 3 is a cross sectional, plan view of the assembly block excluding the separate puzzle pieces taken along Plane III—III of FIG. 1;

FIG. 4 is a fragmentary, perspective view of the sectioned assembly block shown in FIG. 3;

FIG. 5A is an end elevation of one of the separate puzzle pieces taken along Plane VA of FIG. 1;

FIG. 5B is a plan view of the piece shown in FIG. 5A taken along Plane VB of FIG. 1;

FIG. 6A is a side elevation of another puzzle piece taken along Plane VIA—VIA of FIG. 1;

FIG. 6B is an end elevation of the piece shown in 6A taken along Plane VIB—VIB of FIG. 1;

FIG. 6C is a plan view of the puzzle piece shown in FIG. 6A and 6B taken along Plane VIC—VIC of FIG. 1;

FIG. 6D is an end elevation of the puzzle piece shown in FIGS. 6A–6C, taken opposite to that shown in FIG. 6B and along Plane VID—VID of FIG. 1;

FIG. 6E is a side elevation of the puzzle piece shown in FIGS. 6A–6D taken along Plane VIE–VIE of FIG. 1;

FIG. 7A is a side elevation of another puzzle piece taken along Plane VIIA—VIIA of FIG. 1;

FIG. 7B is an end elevation of the puzzle piece shown in FIG. 7A taken along Plane VIIB—VIIB of FIG. 1;

FIG. 7C is a plan view of the puzzle piece shown in FIGS. 7A and 7B taken along Plane VIIC—VIIC of FIG. 1;

FIG. 8A is a side elevation of the puzzle piece common to both cylinders when the puzzle is assembled taken along Plane VIIIA—VIIIA of FIG. 1;

FIG. 8B is an end elevation of the common puzzle piece shown in FIG. 8A taken along Plane VIIIB—VIIIB of FIG. 1;

FIG. 8C is a plan view of the common puzzle piece shown in FIGS. 8A and 8B taken along Plane VIIIC—VIIIC of FIG. 1;

FIG. 9A is an end elevation of yet another puzzle piece taken along Plane IXA—IXA of FIG. 1;

FIG. 9B is a side elevation of the puzzle piece shown in FIG. 9A taken along Plane IXB—IXB of FIG. 1;

FIG. 9C is a plan view of the puzzle piece shown in FIGS. 9A and 9B taken along Plane IXC—IXC of FIG. 1;

FIG 9D is an end elevation of the piece of FIGS. 9A–9C taken along Plane IXD–IXD of FIG. 1;

FIG. 9E is a side elevation of the piece of FIGS. 9A–9D taken along Plane IXE—IXE of FIG. 1;

FIG. 10A is a side elevation of yet another piece taken along Plane XA—XA of FIG. 1;

FIG. 10B is a plan view of the puzzle piece shown in FIG. 10A taken along Plane XB—XB of FIG. 1;

FIG. 11A is an end elevation of yet another puzzle piece taken along Plane XIA—XIA of FIG. 1;

FIG. 11B is an end elevation of the puzzle piece shown in FIG. 11A taken along Plane XIB—XIB of FIG. 1;

FIG. 11C is a plan view of the puzzle piece shown in FIGS. 11A and 11B taken along Plane XIC—XIC of FIG. 1;

FIG. 12 is a perspective view of a block wherein a saw blade is used to cut a cylinder therein in accordance with the preferred method; and

FIG. 13 is a perspective view of a block wherein a saw blade is used to cut a cylinder therein in accordance with an alternative method.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings in greater detail, FIG. 1 shows the puzzle **10** of the present invention comprising an element of block **12** including external surfaces **14** through **24.** In the preferred embodiment, block **12** comprises a solid cube of wood or other material which is easily cut with a saw or other instrument, the six external surfaces of the cube all being equivalent in size and disposed in planes at right angles to one another. As shown in FIG. **1,** block **12** is the assembly block into which the variously configured separate pieces of the puzzle are slidably received during assembly. Originally, as will be more fully explained below, the separate pieces are preferably cut from the solid block resulting in the hollowed-out assembly element or block **12.**

Extending between each of two external surfaces **14, 16** and **18, 20,** which surfaces **14, 16** and **18, 20** generally oppose one another on the block, are two right cylinders **30** and **40.** Each cylinder, because of the intersecting cuts made during the manufacture of the puzzle from the solid block **12,** includes several variously configured separate pieces **32, 34, 36** and **42, 44, 46** as shown in FIG. **1.** One central piece **50** lies at the center of the two intersecting cylinders **30** and **40** when assembled and is thus common to both cylinders. FIGS. **1A** and **1B** illustrate cylinder **30** when assembled alone and the two cylinders **30** and **40** when assembled as they would appear within the assembly block **12.**

As illustrated, each of the cylinders **30** and **40** has a right cross-sectional shape of a closed involute. This shape is best illustrated in FIG. 1 and the figures illustrating the end views of separate pieces **32, 36, 42, 46** and **50.** Because of the interlocking nature of the cylinders and pieces, the various pieces have varying configurations which provide portions outlining the closed involute shape for each cylinder as illustrated in FIGS. **5–11.** The common puzzle piece **50,** because it must interlock with both cylinders **30** and **40,** has the same involute shape when viewed from either its side or end as seen in FIGS. **8A** and **8B.**

To assemble the puzzle, one first inserts smaller piece **44** into corresponding shape aperture **52** in central piece **50** (FIGS. **1** and **8C**). Thereafter, end pieces **32** and **36** are interlocked with the central piece **50** to form cylinder **30.** Subsequently, cylinder **30** may be slideably received in aperture **60** extending between surfaces **18** and **20** in assembly block **12.** (See FIGS. **1, 3** and **4.**) Following the insertion of cylinder **30,** smaller piece **34** is inserted in correspondingly shaped aperture **54** on piece **50** (FIGS. **1** and **8C**) after which end pieces **42** and **46** may be slideably received in aperture **62** of assembly block **12** (FIGS. **1, 3** and **4**). Cylindrical aperture **62** extends between surfaces **14** and **16** through the entire block **12.** Both cylindrical apertures **60** and **62** have the shape of a closed involute corresponding to the cross-sectional shape of the cylinders **30** and **40.** As will be seen from FIGS. **3** and **4,** the space in which the two cylindrical apertures **60** and **62** intersect within block **12** forms an intricately configured open space within the block. An upstanding projection or pedestal **64** is located within the center of the intersecting space. Projection **64** includes an enlarged head **66** whose cross-sectional shape aligning with cylindrical apertures **60** and **62** corresponds to the shapes of apertures **52** and **54** respectively thereby allowing the central piece **50** to be passed thereover during assembly. Further, areas **43** and **47** of pieces **42** and **46** correspond to the shape of projections **68** (See FIGS. **9B, 9E** and **10A**), while areas **33** and **37** of pieces **32** and **36** correspond in shape to projections **70** (See FIGS. **5A, 6B** and **6D**).

Accordingly, it will be understood that the several, individual, unitary pieces **32–36, 42–46,** and **50** may be serially assembled and disassembled within the assembly element or block **12** to provide a challenging puzzle. Since each piece interlocks with and conforms to the shape of at least one adjacent piece, the pieces must be assembled in order beginning with the assembly of either cylinder **30** or **40** first, followed by the insertion of the end pieces from the remaining cylinder.

The present puzzle may include cylinders having cross-sectional shapes or forms other than that of a closed involute as in the preferred embodiment. Of course, the other shapes may result in varying numbers and configurations of the separate puzzle pieces different than that in the preferred embodiment. Further, the present puzzle need not be formed from a solid block of wood or other similar material but may be formed from molded plastic and be either hollow or solid. In either case, if the cross-sectional shape of a closed involute is used as illustrated, the assembly element **12** and individual pieces will have the external outlines and shapes substantially as shown and described above.

DESCRIPTION OF THE METHOD

Referring now to FIGS. **1, 2, 12** and **13,** the preferred embodiment of the present inventive puzzle may be formed by providing a solid block of wood or other similar material which is easily sawed or cut. The first of the two cylinders **30** and **40** is formed from block **12** by cutting along a rectilinear line extending generally parallel to an edge of the cube **12** between two of the opposing external surfaces lying in planes generally perpendicular to the surface including the rectilinear cutting line. For example, as shown in FIGS. **2** and **12,** cylinder **30** may be cut first by using a jigsaw **75** or other saw or cutting instrument, to cut into the block along a rectilinear line **26** generally parallel to surface **16** of

the cube. The saw or cutting instrument is used to cut along a curve in the shape of a closed involute as shown on surface **18** in FIGS. **1** and **12.** The curve may be previously drawn on surface **18** to serve as a guide. The end of the curve will be seen to end at the point at which the curve was begun, i.e., along rectilinear line **26.** Thus, line **26** is the only cut which must be made on the exterior surface of the cube to form the closed involute cylinder.

As shown in FIG. **13,** to avoid making such an external cut, one could also bore through the solid block through surfaces **18** and **20** to provide a hole **80** large enough to admit the saw blade **75** or blade of another cutting instrument. The saw blade could then be inserted through hole **80** as shown and used to cut any desired curve through the block without actually breaking the external surface of the block except along the opposing surfaces **18, 20.**

In a manner similar to that described above, the second or remaining cylinder may then be cut along a rectilinear line **28** extending generally parallel to surface **18** of the cube **12.** The steps followed are exactly similar to that for the first cylinder, namely, cutting along any desired closed curve, preferably a closed involute, and causing the blade to exit along the line **28** where it originally entered. The two cut lines **26** and **28** therefore intersect at point **29** which corresponds to the edge **56** of central piece **50** as shown in FIG. **1.** If the cylinders **30** and **40** are cut beginning with lines **26** and **28** as described above, the cuts **26** and **28** may be filled with a filling or adhesive material to secure the portions of the cube on either side of those cuts or lines together to strengthen and rigidify the resulting assembly block.

Accordingly, once the two cylinders have been formed or cut in the above manner, the puzzle is completed and the variously configured pieces may be disassembled from and assembled into the assembly element or block **12** thereby providing a challenging and intersecting puzzle for the operator.

It will now be understood that the present invention provides both a challenging puzzle having numerous interlocking, intricate pieces which may be assembled and disassembled as a test of skill. The puzzle may be manufactured quickly, easily and inexpensively from a single block of wood by making merely two cuts about predetermined curves on the block. The assembly block and several pieces are all unitary structures and require no further manufacturing processes to place them in operable form allowing assembly and disassembly of the puzzle.

While one form of the invention has been shown and described, other forms will now be apparent to those skilled in the art. Therefore, it will be understood that the embodiment shown in the drawings and described above is merely for illustrative purposes, and is not intended to limit the scope of the invention which is defined by the claims which follow.

The embodiments of the invention in which an exclusive property or privilege is claimed are as follows:

1. A puzzle comprising an element having at least two sets of external surfaces; each of said sets including two generally opposing surfaces on generally opposing sides of said element; said element having a plurality of separate pieces slideably received therein; said pieces being variously configured and comprising portions of at least two intersecting cylinders in said element; each of said cylinders extending between a different set of said two sets of two generally opposing surfaces of said element and slidably received in a correspondingly shaped aperture formed within and extending between said opposing surfaces of one of said respective sets; said cylinders having cross sectional areas of the same size and shape when taken along planes perpendicular to the side surfaces of said cylinders and intersecting such that at least one of said pieces forms a portion of both of said cylinders; said one piece being received completely internally of said element and defining two areas having the same size and shape when said one piece is viewed along the longitudinal axes of said two cylinders.

2. The puzzle of claim **1** wherein said element is a cube; the planes including said sets of opposing surfaces being perpendicular to one another.

3. The puzzle of claim **1** wherein said cylinders are right cylinders.

4. The puzzle of claim **3** wherein said right cylinders each have a cross-sectional shape comprising an involute; said cylinders including seven of said separate pieces.

5. The puzzle of claim **1** wherein said respective cylinders each have a cross-sectional shape of an involute when taken parallel to at least one of said respective opposing surfaces.

6. The puzzle of claim **1** wherein the portion of said element remaining after said pieces are removed comprises a unitary, remaining section; said pieces all interlockingly engaging said remaining section when slideably received therein.

7. The puzzle of claim **1** wherein said element is a solid block; said separate pieces each being solid and cut from said block.

8. The puzzle of claim **1** wherein said respective cylinders each have side surfaces and a cross-sectional shape of an involute when taken along a plane which is perpendicular to the side surfaces of the respective cylinder.

* * * * *