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(54) THREE-DIMENSIONAL PUZZLE

(57) Three dimension puzzle (1) of the type of an educational toy, created for imagination development and space perception, made up by a number of n^3 (n x n x n) equal size cubic pieces, called cubes (2), n being a whole number larger than 1, provided with means for the interconnection of said cubes (2) and designed to create a main cubic piece with n cubes (2) per edge, with an illustration that corresponds to a different fraction o part of the illustrations selected for the 6n different two dimension puzzles that form the pictures of said three dimension puzzle (1).

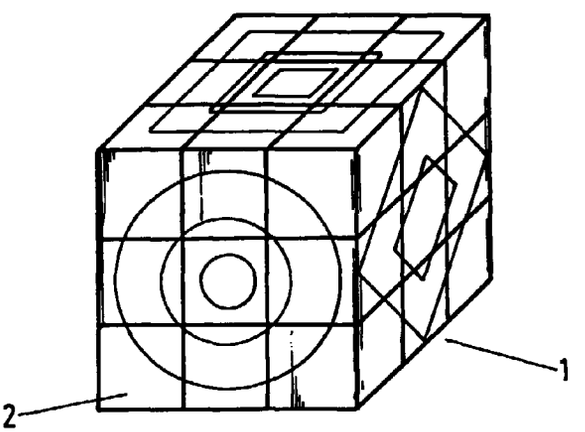

FIG.1

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Description

[0001] The object of present invention consists of, as indicated in the title, a three dimension puzzle, of the type of educational toys created for imagination development and space perception, and particularly the method to obtain combinations for adornment the three dimension puzzle faces, what means important advantages with respect to educational toys now present in the market.

[0002] At present, different types of educational toys are known such as puzzles, jigsaws and the like, made up by a given number of pieces which players must place and/or fit together adequately in order to get a determined image as, for example, a picture, a drawing, etc. Difficulty in this type of toys increases, generally, in relation to the number of pieces, also depending to a great extent on the abstract features of the picture to compose.

[0003] However, this type of educational toys is worked out on a surface, e.g. in two dimensions, and in most cases, there is an unique solution or picture to obtain (six in the case of cube puzzles), so that once they have been resolved, e.g. after obtaining a picture, the player has only the possibility of repeating the construction process if he wishes to go on playing.

[0004] The three dimension puzzle which is the object of present invention has been developed with the aim to create a new educational toy for imagination development and space perception.

[0005] A first inttention of present invention consists of the development of an educational toy for imagination development and space perception, for the player combines two and three dimensiones at a time, in the search of location and position of this three dimension puzzle pieces.

[0006] A second object of present invention consists of the method to obtain combinations for the illustration of said three dimension puzzle, such illustration understood as a manufacturing phase, the adornment of each of the pieces that are part of the three dimension puzzle being defined as part of the different pictures that are to be composed when playing the game.

[0007] Furthermore, the three dimension puzzle object of present invention consists of an educational jigsaw made up by a set of n^3 (n x n x n) pieces of cubic shape (named hereafter "cubes") of equal size, n being a whole number greater that 1, with elements for the interconnection of said cubes in order to obtain a main cubic piece with n cubes in each edge. The illustration of said cubes is formed by 6n different two dimension puzzles, which are apt for alternative visualization of n groups of six puzzles, one of each of the main piece faces which has cubic shape.

[0008] The illustration of each of the cubes consists, preferably, of a graphic print, engraved or sticked, but without excluding any other known printing technique, each cube printed face corresponding to a different part of the illustrations chosen for the 6n different two dimension puzzles which form the pictures of the three dimension puzzle object of present invention, of any type and figure, such as pictures, works of art, drawings, etc.

[0009] The connecting devices for the different cubes are adequate to define a main cubic piece of n cubes per edge, and consist, in a first construction idea, in an assembly of small round bars, made of paper, plastic, cardboard, wood, metal or similar materials, which are to be inserted in the corresponding holes drilled in center of all cube faces, these holes having an adequate size to hold said small round bars and of depth preferably less than half the cube edge. The hole size must be small enough as not to interfere with the picture of each of the two dimension puzzles visualized when composing the three dimension puzzle.

[0010] The mentioned cube connecting elements are adequate to define, by their interconnecting them, a main cubic piece with n cubes per edge, and consist, in a second construction idea, of a case made of transparent material like methacrylate, plastic or similar material, to contain tightly all the cubes and to allow to watch from outside the different pictures obtained when building the three dimension puzzle.

[0011] Nevertheless, said case may be shaped on different models as long as it meets the requirements set forth herebefore.

[0012] The connecting elements for the cubes are adequate to define, by means of their interconnection, a main cubic piece with n cubes per edge, and consist, in a third construction idea, of a frame made by three plans perpendicular to each other, made of transparent material and preferably provided with handling means like a handle, knob or similar.

[0013] Finally, as a fourth construction idea, such connecting elements for the different cubes consist of magnetic devices adequate to keep faces of three dimension puzzle cubes fastened together.

[0014] In this way, the three dimension puzzle object of present invention is made up by placing each one of the cubes as to build up a cubic piece with n cubes per edge, obtaining an different picture shown on each surface, with the possibility of making different combinations with cubes as to visualize 6n different pictures contained in the three dimension puzzle. The three dimension puzzle with this arrangement becomes an educational toy with complexity increasing substantially with the number of cubes and design complexity, being adequate to all ages and offering entertainement and pastime to players for being a game with more than one solution.

[0015] As it has been mentioned hereinbefore, a second object of present invention refers to the method to obtain combinations for the illustration of said three dimension puzzle, that illustration understood as a manufacturing process by which the illustration of every cube face is defined, once the 6n different pictures that are to be obtained during the

course of the play have been selected. The said illustration phase defines each of the different fractions or parts of the illustration selected for the 6n two dimension puzzles which correspond to all faces of cubes included in the three dimension puzzle, this being essential to reach a solution in the game. Through said illustration phase it is defined each of the different fractions or parts of the selected illustrations for the 6n two dimension puzzles associated with each face of cubes that form part of the three dimension puzzle, that being essential to reach a game solution. That method to obtain combinations for the illustration of three dimension puzzle will be used for the manufacturing or configuration of a prototype or model which, for example, will be later manufactured in series.

[0016] The method used to obtain combinations for said three dimension puzzle illustrations consists, mainly, of two different methods, depending upon the size of the three dimension puzzle, however the first method may be applied to any size of the three dimension puzzle.

[0017] Furthermore, the method used to obtain combinations for the illustration of said three dimension puzzle comprises the steps of:

a) building one of main cubes with n cubes per edge, this being one of the n solutions of the three dimension puzzle, named hereinafter "cube assembly";
b) splitting of cube assembly into smaller assemblies featured by the position that they occupy within cube assembly, like:

- corner cube subgroup, including those cubes at cube assembly corners
- edge cube subgroup, including those cubes placed at the cube assembly edges except corner cubes
- center cube subgroup, including those cubes placed in central zones on exposed faces of cube assembly; and
- interior cube subgroup, including those cubes placed in interior zones of cube assembly, therefore not being exposed cubes.

c) illustration of exposed faces of cubes which are part of corner, edge and central groups;
d) building a second cube assembly, from mentioned groups, by moving one or more cubes from one group to a different one;
e) splitting this second cube assembly into corner, edge, central and interior subgroups;
f) illustration of exposed faces of corner, edge, central and interior cubes, with the requirement that illustration, whether it is or not simultaneous, comprising two faces of one cube must figure a solid angle, and illustration, whether simultaneous or not, comprising three faces of one cube must figure a dryhedron;
g) sucessive construction of different cube assemblies, by following steps d) thru
f) in order to complete the n cube assemblies.

[0018] The method as described hereinbefore is conveniently used for n less than or equal to 6, being more complex in the case of larger three dimension puzzles.

[0019] The method used to obtain combinations for illustrations of said three dimension puzzle for n larger than or equal to 6, n being the number of cubes per edge of the three dimension main cube, comprises:

a) splitting the cube assembly of three dimension puzzle into groups featured by the position occupied by each of said cubes in all and each one of cube assemblies, like:

- corner cubes subgroup, formed by those cubes placed at corners of cube assemblies, in a number of 4n cubes;
- edge cube subgroup, formed by those cubes placed on edges of each cube assembly, except corner cubes, and in a number of 4n*(n-2) cubes; and
- center cube subgroup, formed by those cubes that are always placed on central zones of assembly cubes exposed faces, in a number of n*(n-2)*(n-2) cubes;

b) to obtain for each of the mentioned groups of the division (quotient and remainder R) of total number of cubes of a given group by the number of positions P of said group in a cube assembly;
c1) for a division on step b) with remainder other than zero, computing for each one of the groups of number G_{PT} in groups of R (remainder of division of step b)) cubes of three dimension puzzle group, obtained when dividing the total number of group cubes by remainder R of division made on step b);
c2) for an exact division on step b), i.e. R equal zero, determination for each of said groups of number G_{PT} of P positions groups (divisor in operation of step b)) cubes of said group of three dimension puzzle, obtained when dividing the total number of group cubes by divisor P on operation made on step b);
d1) for a non exact division on step b), i.e. R different from zero, working out, for each of groups, the number G_{CC} of groups of R (remainder in step b) operation) cubes of said group of cube assembly, obtained when dividing said

group positions in an given cube assembly by remainder R of division made on step b);

d2) for an exact division on step b), i.e. R equal zero, determination for each of groups from number G_{CC} of P positions group (divisor in operation made on step b)) cubes of said group per cube assembly, obtained when dividing the number of positions of said group in a given cube assembly by factor P of division made on step b), i.e G_{CC} equal to 1;

e) in the case that for one or several groups the result of divisions made on steps (c1 and c2) and (d1 and d2) be (one or both) a non whole number, for each one of the groups the following will be made:

e1) determine a natural number m in increasing order and approaching the decimal number(s) that multiplied by this number results in another natural number;

e2) the product of number G_{PT} of groups of R (remainder of division made on step b)) cubes from said group of three dimension puzzle, obtained through steps (c1 and c2), by said natural number m determined on step (e1), and obtaining a new number G_{PT}' of groups of R/m (remainder of division on step b) divided by said natural number m, determined through step (e1)) cubes from said group of three dimension puzzle;

e3) the product of number G_{CC} of groups of R (remainder of division made on step b)) cubes from said group of cube assembly, obtained through steps (d1 and d2), by said (natural number m) determined through step (e1), and obtaining a new number G_{CC}' of groups of R/m (remainder in division made on step b) divided by said natural number m determined on step (e1) cubes of said group from cube assembly;

e4) division of R (remainder of division made on step b)) cubes by said natural number m determined on step (e1), and obtaining R' (= R/m);

f) sucessive illustration of exposed faces of cubes forming said groups defined on step (a), as components of G_{PT} groups, of G_{CC} cubes, respectively G_{PT}' groups of G_{CC}' cubes, obtaining sucessively each one of the cube assemblies, splitting the number of cubes of each group into groups of G_{CC} cubes, respectively groups of G_{CC}' cubes, being required that cube illustration, whether simultaneous or not, comprising three faces of one cube form a tryhendron, and illustration, whether simultaneous or not, that comprises two faces of one cube form a solid angle..

[0020] A prototype or model that, for instance, later on will be used for series manufacturing, will be obtained by the method used to obtain combinations of illustrations of the herein described three dimension puzzle.

[0021] Also, as an option, instead of a series manufacturing of three dimension puzzles from said prototype, adhesive stickers can be made with patterns obtained from plane development of each one of cubes obtained through illustration step described hereinbefore, designed to be applied onto cubes forming the three dimension puzzle.

[0022] The bonding of each of said stickers on cubes forming said three dimension puzzle can be made either in the factory or by the user, and in this case he can himself build the puzzle pieces by applying the stickers. With that purpose, in accordance with a preferred design of the invention, the player is given application means, first including a device for centering sticker over cube face, preferably consisting of an L shaped pattern, with means for applying stickers and means for positioning corresponding cube, as well as a second bonding system designed for a simultaneous application of stickers on four cube faces, once a sticker has been positioned by the method previously described, Consisting mainly of a device to guide cube trough a square section hole of a size basically similar to that of cube with stickers applied on its faces, having front edges mainly rounded so as not to damage the sticker.

[0023] From what has already been mentioned, it is easily understood that advantages provided by the three dimension puzzle, as the object of present invention, likle being an educational toy designed for imagination development and space perception, with multiple solutions that will let player imagine different constructions for each of said solutions.

[0024] Optionally the three dimension puzzle, as the object of present invention, can be worked out on a computer monitor screen, so that instead of using it as a manual game it could be used as an educational toy by means of a computer program, commanded by means of a keyboard, mouse or similar.

[0025] Therefore, a three dimension program will be used, the program comprising imaging process for figuring cubes on computer screen as well as facing and plotting of said pictures, with possibility to create differente pictures with different sizes. Said program must include options for recreation, reduction and magnification of cube images, of its main faces, of main cube and of its respective faces; as well as options such as recordings of time spent for creating a cube and other required times; scores related to times spent and/or hits and misses; creation of a game guide; a background music during game progress; an alarm signal, advise or error signal in case of wrong piece positioning; and possibility for guide to offer other games within main game.

[0026] In order to better understand the object of present invention, a practical preferred performance of the three dimension puzzle, a method for its manufacturing and a methos to obtain combinations for illustration of said three dimension puzzle faces are described hereinafter, with reference to enclosed figures. Said figures show:

Figure 1 shows an example of a 27 cubes three dimension puzzle (3 x 3 x 3) as the object of present invention.

Figures 2a and 2b show a first arrangement of connection means for cubes which are part of three dimension puzzle represented in figure 1.

Figure 3 shows a second arrangement for means of connecting cubes which are part of the three dimension puzzle represented in figure 1.

Figure 4 shows a a third arrangement of connection means for cubes which are part of three dimension puzzle represented in figure 1.

Figure 5 shows an example of a sticker pattern obtained by developing, on a plane, each of the prototype cubes obtained through the illustration phase.

Figures 6a and 6b show, respectively, two examples for the arrangement of centering device of a cube face with respect to a sticker pattern as represented in figure 5.

Figure 7 shows an example of arrangement of bonding system designed to simultaneously apply sticker on four cube faces, once the sticker has been centered by any of the means represented in figures 6a and 6b.

[0027] The three dimension puzzle (1), as the object of present invention, as it is represented in figure 1, refers to an educational puzzle toy, which in present practical arrangement is made up of 27 cubes (2) of same size (3 x 3 x 3). These cubes (2) are provided with connection means designed in such a way that their assembly results in a main cubic piece with 3 cubes (2) per edge. Illustration of said cubes (2) can, for example, consists of a printed picture, and will comprise 18 different two dimension puzzles which, in this practical arrangement, corresponds to geometric figures, designed for alternative imaging of 3 groups of six puzzles, one for each face of main cube. Each of the printed faces of each one of said cubes (2) corresponds to a different fraction or part of selected illustrations of 18 different two dimension puzzles which form pictures in the three dimension puzzle (1).

[0028] Figures 2a and 2b, 3 and 4 represent, respectively, three optional arrangements of said connection means between the different cubes (2) designed to define, through their assembly,a main cubic piece with 3 cubes (2) per edge.

[0029] As a first arrangement, represented in figures 2a and 2b, those connection means consist of a set of small round bars (3) that can be inserted in corresponding holes (4) bored in center point of each cube face (2), of an adequate size to hold the round bars (3) without any clearance, and with a depth smaller than half the cube edge (2). As it can be noted in figure 2a, the size of said holes (4) is small enough as not to affect the view of each one of the two dimension puzzles developed when building the three dimension puzzle (1).

[0030] As a second arrangement, represented in figure 3, such connection means consist of a transparent case (5), with sliding cover (6), able to house without any clearance a complete cube (2), as well as to make it possible to watch from outside each of the illustrations shown when composing the three dimension puzzle (1), with case (5) side faces being formed by removables side bands (6').

[0031] This type of case can be made of many different designs, from a simple transparent box to more complex designs, like the one shown in figure 3, as long as requirements described hereinbefore are met.

[0032] Finally, and as it is shown in figure 4, in a third possible arrangement, said connection means between the different cubes (2) consist of a support (7) made of three planes (8a, 8b, 8c) perpendicular to each other, manufactured with a transparent material and mainly provided with handling means like a handle or knob (9).

[0033] Also, as a fourth possible arrangement, not shown in figures, said connection means of different cubes may consist of magnetic devices to keep fastened the faces of each one of the cubes that make the three dimension puzzle, and made, for instance, of small pieces or metal strips and ferrite cores inlaid in faces or inside of cubes.

[0034] As it has been previously indicated, a second goal of present invention refers to the method to obtain the combinations for said three dimension puzzle (1) illustrations, such an illustration understood as a manufacturing phase where the illustration of all three dimension puzzle cubes is defined (1), once the pictures involved in the game performace are selected. Through that illustration phase, each fraction or different part of selected illustrations applied to each face of the three dimension puzzle (1) cubes (2) is defined, what turns out to be essential on reaching a solution. Such a method used to obtain combinations for the three dimension puzzle illustrations (1) is used for the manufacture or configuration of a prototype, which, later on, for instance, will be made on series.

[0035] Optionally, instead of series manufacturing of three dimension puzzles (1) from the prototype obtained, some sticker patterns can be made (10), as shown in figure 5, obtained from plane projection of each of cubes (2) taken from prototype on illustration phase. Said stickers (11) size must correspond with cube (2) size.

[0036] The application of each sticker (11) onto each one of cubes (2) that are part of said three dimension puzzle (1) can be done either in the factory or directly by the player, himself having the possibility to create his own three dimension puzzle (1) pieces. With the purpose of making it easy to bond the stickers correctly, the player can be provided with adequate bonding means.

[0037] Such as it is shown in figure 6a, such bonding means consist of an L shaped pattern (12), mounted on a base (13), fixed to it by a bolt and screw set (14) in through holes (15). Such L shaped pattern has, in its long side, a hole with size basically similar to that of cube face (2), prepared to receive a sticker (11) first side and, and in its short side

a cut in the connection plane with said base (13) of size basically equal to that a cube face (2), and prepared to receive a sticker second side (11). Furthermore, the L shaped pattern square inside angle turns to be a guiding device for the corresponding cube (2).

[0038] Figure 6b shows a simplified arrangement of bonding means represented in previous figure, consisting of a single piece (16), so as to define pattern (12) and base (13), represented in previous figure, as an unique piece. Said piece shape and size (16) correspond with elements represented in previously mentioned figure.

[0039] Once the sticker (11) has been applied onto one of the cube (2) faces, there is an optional second bonding means, as it is shown in figure 7, designed to apply the sticker (11) simultaneously onto four of the cube (2) faces. Those means consist of one piece (17) provided with a square section hole (18) of size basically similar to that of cube (2) with sticker bonded onto its faces. The front edges are round so as not to damage the sticker (11).

[0040] As it has been indicated hereinbefore, a second goal of present invention refers to the method used to obtain combinations for the illustration of said three dimension puzzle, such illustration understood as a manufacturing phase where illustration of each one of cubes that are part of the three dimension puzzle is defined, once the 6n different images that can be worked out with the game have been selected.

[0041] Now, as an example, we are going to describe the method used to obtain combinations for the illustration of a three dimension puzzle with 27 cubes, i.e. n = 3.

[0042] The mentioned method first comprises the building of one cube assembly with 3 cubes per edge, that means one of the three solutions of the three dimension puzzle. For other cases of three dimension puzzles of different size, the number of solutions will be equal to n.

[0043] After that, the cube assembly with 27 cubes is split into subgroups featured for the position that each one of them occupies within the cube assembly, as:

- corner cube subgroup, that includes the 8 cubes placed at cube assembly corners;
- edge cube subgroup, that includes the 12 cubes placed at cube assembly edges, except mentioned 8 corner cubes;
- center cube subgroup, that includes the 6 cubes placed at exposed face centers of cube assembly; and
- interior cube subgroup, that includes only one cube that ocupies the cube assembly center, and therefore is not an exposed cube.

[0044] Once the cube assembly is completed, we shall proceed to illustration of exposed faces of cubes that belong to corner, edge and center subgroups, with three exposed faces for the 8 corner cubes, two exposed faces for the 12 edge cubes and one exposed face for the 6 center cubes.

[0045] After that we shall proceed to building a second cube asembly, starting from said dividion into subgroups, by moving one or several cubes from one subgroup into a different subgroup, in accordance with following table (Table 1):

POSITIONS	CUBE ASSEMBLY 1	CUBE ASSEMBLY 2
Corner cubes subgroup C = 8 C.V. = 3	8-3 (1-3 6-3 1-3	1-3 } I_1-0 1-6 } V_1-3 6-4 } C_1-1
Edge cubes C = 12 C.V. = 2	12-2 (6-2 6-2	6-5 } V_1-3 6-4 } A_1-2
Center cubes subgroup C = 6 C.V. = 1	6-1	6-3 } A_1-2
Interior cubes subgroup C = 1 C.V. = 0	1-0	1-3 } V_1-3

Table 1

where:

"C" means the number of cubes of corresponding subgroup;
"C.V." means exposed faces of each one of corresponding subgroup cubes;
"-" means "of";
")" means "from"; and
"(" means "split"; and where:

expressions of the type "8-3" must be understood as "eight cubes of three covered faces",
expressions of type "6-4) A_1 -2" should be read as "six cubes, with four covered faces, coming from edge positions in cube assembly 1, with two covered faces"; and
expressions of type

"12-2 (6-2 ..
  6-2

should be read as "twelve cubes with two covered faces split into six cubes with two covered faces and six cubes with two covered faces".

[0046] In particular, the 8 cubes of corner cube subgroup of first cube assembly are split into three groups, as follows: one cube (with three covered faces), moves to a corner position in the second cube assembly, showing its three non illustrated faces; six cubes (with three covered faces) moves to six edge positions of second cube assembly, showing two of its three faces not yet illustrated; and one cube (with three covered faces) that moves to interior position of second cube assembly, not showing any of its faces not yet illustrated.

[0047] In the other hand, the 12 cubes of the edge subgroup in the first cube assembly are divided in two groups, one with six cubes (with two covered faces), that move to six edge positions of second cube assembly, and the other with six cubes (with two covered faces) moving to the six center positions of second cube assembly, showing one of their faces not yet illustrated.

[0048] The six cubes of center cubes subgroup (with one covered face) of first cube assembly move to corner positions in the second cube assembly, showing three of their faces not yet illustrated.

[0049] Finally, the cube of interior cube subgroup (with no covered face) moves to a corner position in second cube assembly.

[0050] The second cube assembly, built as indicated, shows on its six exterior faces the non illustrated respective faces of cubes that are part of the three dimension puzzle, then proceeding to illustrate the cubes exposed faces with six new images.

[0051] Once the second cube assembly is built and illustrated, we shall proceed to split said cube assembly into corner, edge, center and interior subgroups, in accordace with indications given hereinbefore.

[0052] Once this second cube assembly has been illustrated, we shall proceed to build the third cube assembly starting from said subgroups, by moving one or several cubes from each subgroup to a different subgroup, as per following table (Table 2):

POSITIONS	CUBE ASSEMBLY 2	CUBE ASSEMBLY 3
Corner cubes subgroup C = 8 C.V. = 3	1-3 } I_1-0 1-6 } V_1-3 6-4 } C_1-1	1-6 } V_2-3 1-6 } I_2-3 6-6 } C_2-3
Edge cubes subgroup C = 12 C.V. = 2	6-5 } V_1-3 6-4 } A_1-2	6-6 } V_2-4 6-6 } A_2-4
Center cubes subgroup C = 6 C.V. = 1	6-3 } A_1-2	6-6 } A_2-5
Interior cubes subgroup C = 1 C.V. = 0	1-3 } V_1-3	1-6 } V_2-6

Table 2

where same symbols used in table 1 apply.

[0053] As it is shown on table 2, the eight cubes of corner cubes subgroup in second cube assembly are split into three groups as follows:

- one cube (with three covered faces) that comes from interior cube subgroup of first cube assembly, and moves to a corner position of third cube assembly, showing its three not yet illustrated faces;
- one cube (with six covered faces) that comes from corner cubes subgroup of first cube assembly, and moves to interior position of third cube assembly; and
- six cubes (with four covered faces) that come from center cubes subgroup of first cube assembly, and move to ede positions in third cube assembly, showing their two faces not yet illustrated.

[0054] Also, the 12 cubes of corner cubes subgroup in the second cube assembly are divided in two groups:

- six cubes (with five covered faces), that come from corner cubes subgroup of first cube assembly and move to six

center positions of third cube assembly, showing their not yet illustrated face; and

- six cubes (with four covered faces), that come from edge cubes subgroup and move to six edge positions of third cube assembly, showing their two not yet illustrated faces.

[0055] The 6 cubes of center cube subgroup in second cube assembly, that come from edge cube subgroup of first cube assembly, having three covered faces, and move to six corner positions of third cube assembly, showing their three not yet illustrated faces.

[0056] Finally, the cube of interior cube subgroup, that comes from corner cubes subgroup of first cube assembly, having three covered faces, and move to one corner position of third cube assembly, showing its three not yet illustrated faces.

[0057] Again, the third cube assembly, built as indicated, shows on their six exterior faces the respective not yet illustrated faces of cubes which are part of the three dimension puzzle, to proceed with illustration of cubes exposed faces by appliying six different pictures.

[0058] As it has been indicated hereinbefore, the method so described is conveniently used in the case of puzzles with 6, or less, cubes per edge, getting a lot more complicated in case of larger three dimension puzzles.

[0059] For that reason, the present invention offers a second method to obtain combinations to illustrate the three dimension puzzle for n larger than or equal to 6, n being the number of edge cubes in the three dimension puzzle.

[0060] As an example, the method to obtain combinations to illustrate a three dimension puzzle, with 343 cubes, i.e. n = 7, is described as follows.

[0061] First of all, the whole of 343 cubes that form the three dimension puzzle is divided in subgroups featured for the position occupied by each one of said cubes in all and each one of the cube assemblies, like:

- the corner cube subgroup, that gathers those cubes that are always placed in corner positions in each cube assembly, made up of 4n cubes C_V), i.e. 28 cubes in this case;
- the edge cube subgroup, that gathers those cubes that are always places in edge positions in each cube assembly, except said corner cubes, and made up of 4n*(n-2) cubes (C_A), i.e. 140 cubes in this case; and
- the center cube subgroup, that gathers those cubes that are always placed in center positions on exposed faces of each cube assembly, and made up of n*(n-2)*(n-2) cubes (C_C), i.e. 175 cubes in this case.

[0062] Following that, for each of said subgroups we can obtain the work out (quotient (a_V, a_A a_C) and remainder (R_V, R_A, R_C)) of the total number of cubes of a given subgroup (C_V, C_A , C_C) by the number of positions of said subgroup within a cube assembly (P_V, P_A , P_C).

[0063] Thus, for the corner cubes subgroup, where $P_V = 8$ and $C_V = 28$

$$\frac{C_v}{P_v} = \frac{28}{8} = 3{,}5 \tag{1}$$

and therefore

$$a_V = 3 \tag{2}$$

$$R_V = 4 \tag{3}$$

[0064] In a similar way, for the edge cubes group, where $P_A = 60$ and $C_A = 140$

$$C_A / P_A = 140/60 = 2{,}333 \tag{4}$$

and therefore

$$a_A = 2 \tag{5}$$

and

$$R_A = 20 \tag{6}$$

[0065] Finally, for the center cubes subgroup, where $P_C = 150$ and $C_C = 175$,

$$C_C / P_C = 175/150 = 1,166 \quad (7)$$

and therefore

$$a_C = 1 \quad (8)$$

and

$$R_C = 25 \quad (9)$$

[0066] Once those relations have been obtained, we must determine, for each of said subgroups the number (G_{PTV} , G_{PTA} , G_{PTC}) of groups of R (R_V , R_A , R_C) (remainder of division of previous step) cubes of said subgroup of three dimension puzzle, obtained when dividing the total number of said subgroup cubes (C_V , C_A , C_C) by the remainder R (R_V, R_A , R_C) of the division done on previous step.

[0067] And in particular, for the corner cubes subgroup, since $C_V = 28$ and $R_V = 4$:

$$G_{PTV} = C_V / R_V = 28/4 = 7 \quad (10)$$

i.e., seven groups of four cubes per three dimension puzzle.

[0068] In a similar way, for the edge cubes subgroup, since $C_A = 140$ and $R_A = 20$,

$$G_{PTA} = C_A / R_A = 140/20 = 7 \quad (11)$$

i.e., seven groups of 20 cubes per three dimension puzzle.

[0069] Finally,, for the center cubes subgroup, since $C_C = 175$ and $R_C = 25$:

$$G_{PTC} = C_C / R_C = 175/25 = 7 \quad (12)$$

i.e. seven groups of 25 cubes per three dimension puzzle.

[0070] After that we have to determine, for each of said subgroups, the number (G_{CCV} , G_{CCA}, G_{CCC}) of groups of R (R_V, R_A, R_C) (remainder of previous step division, as per equations (3), (6) and (9)) cubes of said subgroup per cube assembly, obtained when dividing the number of positions of said subgroup in a given cube assembly (P_V , P_A , P_C) by the remainder R (R_V , R_A , R_C) of previous division.

[0071] Furthermore, for the corner cube subgroup, since $P_V = 8$ and $R_V = 4$;

$$G_{CCV} = P_V / R_V = 8/4 = 2 \quad (13)$$

i.e., two groups with four cubes per cube assembly.

[0072] Also, for the edge cube subgroup, since $P_A = 60$ and $R_A = 20$;

$$G_{CCA} = P_A / R_A = 60/20 = 3 \quad (14)$$

i.e. three groups of 20 cubes per cube assembly.

[0073] Finally, for the center cube subgroup, since $P_C = 150$ and $R_C = 25$;

$$G_{CCC} = P_C / R_C = 150/25 = 6 \quad (15)$$

i.e. six groups of 25 cubes per cube assembly.

[0074] Once we have obtained for each of the cubes subgroups the number of cubes per three dimension puzzle (G_{PTV} , G_{PTA} , G_{PTC}) by means of relations given in the equations (10), (11) and (12), as well as for the number of cube groups per cube assembly (G_{CCV}, G_{CCA} , G_{CCC}) by means of relations given in the equations (13), (14) and (15), we shall proceed to sucessive illustration of exposed faces of cubes that are part of said defined subgroups, by sucessively building each one of the cube assemblies.

[0075] Following table represents, schematically, the configuration of corresponding cube assemblies, for the corner cube subgroup:

CORNER CUBE SUBGROUP						
1° C.C.	2° C.C.	3° C.C.	4° C.C.	5° C.C.	6° C.C.	7° C.C.
4 - 3 4 - 3	4 - 3 4 - 3	4 - 3 4 - 3	4 - 3 4 - 6	4 - 6 4 - 6	4 - 6 4 - 6	4 - 6 4 - 6

Table 3a

where C.C. means "cube assembly".

[0076] As it is shown on Table 3a, first the set of cubes of corner subgroup ($C_V = 28$) is split into seven groups ($G_{PTV} = 7$) of four cubes ($R_V = 4$). For the sucessive construction of the different cube assemblies, two groups ($G_{CCV} = 2$) of four cubes ($R_V = 4$) are chosen and their faces being covered sucessively. Therefore:

- in the first cube assembly two of the seven four cube groups are chosen and three of its faces covered;
- in the second cube assembly two of the seven four cube groups are chosen and three of its faces covered;
- in the third cube assembly two of the seven four cube groups are chosen and three of its faces covered;
- in the fourth cube assembly the remaining four cube group is chosen and three of its faces together with one of the groups already illustrated in the first cube assembly and the three remaining faces not yet covered;
- in the fifth cube assembly we select the second group already illustrated in the first cube assembly, and cover the remaining three faces not yet illustrated and one of the groups already illustrated in the second cube assembly and covering the remaining three faces not yet illustrated;
- in the sixth cube assembly we select the second group already illustrated from the second cube assembly, and cover the remaining three faces not yet illustrated and one of the already illustrated groups from the third cube assembly, covering the remaining three faces not yet illustrated; and
- In the seventh cube we select the second of already illustrated groups from the third cube assembly, covering the three remaining not yet illustrated faces, and the four cube group with three illustrated faces in the fourth, covering the remaining three faces not yet illustrated.

[0077] As a consequence, those cubes within cube groups that should no be illustrated in the corresponding cube assembly, will be transferred to the cube assembly interior and are considered to be neutral cubes, independently from the exact position they occupy inside the corresponding cube assembly.

[0078] In a similar way we shall proceed with the edge subgroup cubes. Following table shows, schematically the configuration of corresponding cube assembly, for the edge cube subgroup;

Edge cubes subgroup						
1° C.C.	2° C.C.	3° C.C.	4° C.C.	5° C.C.	6° C.C.	7° C.C.
20 - 2 20 - 2 20 - 2	20 - 2 20 - 2 20 - 2	20 - 2 20 - 4 20 - 4	20 - 4 20 - 4 20 - 4	20 - 4 20 - 4 20 - 6	20 - 6 20 - 6 20 - 6	20 - 6 20 - 6 20 - 6

Table 3b

where C.C. means "cube assembly".

[0079] As it is shown on Table 3b, the whole of edge cube assembly (C_A = 140) is split into seven groups (G_{PTA} = 7) of twenty cubes (R_A = 20). For the sucessive construction of the different cube assemblies three groups (G_{CCA} = 3) of twenty cubes (R_A = 20) are chosen, and their faces sucessively covered. Therefore:

- in the first cube assembly three of the seven groups of twenty cubes are chosen and two of their faces covered;
- in the second cube assembly three of the seven groups of twenty cubes are chosen and two of their faces covered;
- in the third cube assembly the remaining group from the seven groups of twenty cubes is chosen and two of its faces covered, and two of the groups already illustrated in the first cube assembly, covering two of the remaining faces not yet illustrated;
- in the fourth cube assembly the remaing group from the three already illustrated groups of the first cube assembly, covering two of the remaining faces not yet illustrated, and two of the three groups already illustrated in the second cube assembly, covering two of the remaining faces not yet illustrated;
- in the filth cube assembly the remaining group from the three groups already illustrated in the second cube assembly is chosen, covering two of the remaining faces not yet illustrated, the group with two illustrated faces from the third cube assembly, covering two of the remaining faces not yet illustrated, and one of the two groups with four illustrated faces from the third cube assembly, covering its remaining two faces not yet illustrated;
- in the sixth cube assembly the other group from the two groups with four illustrated faces is taken from the third cube assembly, covering its remainig two faces not yet illustrated, and two of the three groups with four illustrated faces from the fourth cube assembly, covering its two remaining faces not yet illustrated; and
- in the seventh cube, the other one from the three groups with four illustrated faces is taken from the third cube assembly, covering its two remaining faces not yet illustrated, and the two groups with four faces not yet illustrated from the fifth cube assembly, covering its two remaining faces not yet illustrated.

[0080] As in the previous case, the cubes included in cube groups that will not be illustrated in the corresponding cube assembly, will be transferred to the cube assembly interior, and be considered neutral cubes, independently from the exact position that they occupy within the corresponding cube assembly.

[0081] Finally, we shall proceed with the cubes of the center cube subgroup. Following table shows, schematically, the configuration of corresponding cube assemblies, for the center cube subgroup;

Center cubes subgroup						
1° C.C.	2° C.C.	3° C.C.	4° C.C.	5° C.C.	6° C.C.	7° C.C.
25 - 1	25 - 1	25 - 2	25 - 3	25 - 4	25 - 5	25 - 6
25 - 1	25 - 2	25 - 2	25 - 3	25 - 4	25 - 5	25 - 6
25 - 1	25 - 2	25 - 3	25 - 3	25 - 4	25 - 5	25 - 6
25 - 1	25 - 2	25 - 3	25 - 4	25 - 4	25 - 5	25 - 6
25 - 1	25 - 2	25 - 3	25 - 4	25 - 5	25 - 5	25 - 6
25 - 1	25 - 2	25 - 3	25 - 4	25 - 5	25 - 6	25 - 6

Tabla 3c

where C.C. means "cube assembly".

[0082] As it is shown on Table 3c, the whole center cube subgroup (C_C = 175) is divided in seven groups (G_{PTC} = 7) of 25 cubes (R_C = 25). For the sucessive construction of the different cube assemblies six groups (G_{CCC} = 6) of 25 cubes (R_C = 25) must be chosen and their faces being covered sucessively. Thus:

- from first cube assembly six of the seven 25 cube groups are taken and one of its faces covered;

- from second cube assembly we take the rest of the seven 25 cube groups, covering one of its faces,. and five of the six groups illustrated on one of their faces in the first cube assembly, covering another of its faces;
- from third cube assembly we take the rest group of the six groups with one face illustrated after the first cube assembly, covering another one of its faces, the group with one illustrated face after the second cube assembly, covering another one of its faces, and four of the five groups with two illustrated faces alter the second cube assembly, covering another one of its faces.
- from fourth cube assembly we take the rest group of five groups with two illustrated faces after the second cube assembly, covering another one of its faces, the two groups with two illustrated faces after the third cube assembly, covering another one of its faces, and three of the four groups with three illustrated faces after the third cube assembly, and covering another one of its faces;
- from fifth cube assembly we take the rest of groups with three illustrated faces after the third cube assembly, the three groups with three illustrated faces after the fourth cube assembly, and covering another one of its faces, and two of the three groups with four illustrated faces after the fourth cube assembly, and covering another one of its faces;
- from the sixth cube assembly we take the rest of groups with four illustrated faces after the fourth cube assembly, the four groups with four illustrated faces after the fifth cube assembly, covering another one of its faces, and one of the two groups with five illustrated faces afyter the fifth cube assembly, and covering its last face; and
- from seventh cube assmbly we take the rest of the groups with five illustrated faces alter the fifth cube assembly, and the five groups with five illustrated faces after the sixth cube assembly, and covering its last face.

[0083] It must be taken in consideration that, as in previous cases, those cubes included in cube groups not illustrated within the corresponding cube assembly, will be moved to the cube aseembly interior, and will be considered as neutral cubes, independently from the exact position where they are placed inside the corresponding cube assembly.

[0084] Optionally, the three dimension puzzle object of present invention can be built by using an adequate software so that the game, as an educational toy, instead of being used manually, could be worked out with a computer, a keyboard, mouse, or similar system and a monitor screen.

[0085] Therefore a three dimension (3 D) program with image processing will be used, with following options:

- show on the computer screen the cubes on 3 D, as well as facing and figuring them, allowing for the composition of several pictures of different sizes with different complexity levels;
- animation of cubes and of main cube or even of partial pictures of them, with possibility of moving from one position to another;
- reduction and magnification of pictures of cubes and main cube, and of their respective faces and pictures;
- remove the pieces from main cube and dismantle same;
- timing control of times spent on building the main cube and other interesting times;
- scoring depending on the time spent and/or hits and misses;
- game guide, so that the watching of pictures, pieces, etc. induces in the player a psycological condition of unrest and disorder in order to stimulate him;
- a background music during the game progress;
- an alarm signal or attention call every time the player places a piece in a wrong position;
- choice of other games within the main game or alternatives to the player to choose a preferred solution.

[0086] Once the nature of presente invention, as well as one method to put it into practice, have been described sufficiently, we must only add that in the its whole and the parts of it, it is possible to introduce changes in shape, materials and arrangements, as long as those alterations do not substantially affect to the invention features, which are claimed as follows.

Claims

1. Three dimension puzzle (1) of the type of educational toys created for imagination development and space perception, made up by an assembly of n^3 (n x n x n) equal pieces of cubic shape, called "cubes" (2), n being a whole number larger than 1, and provided with means for interconnection of said cubes (2) designed to define, by means of their interconnection, one cubic piece or main cube with n cubes (2) per edge, whose illustration corresponds with a fraction or separate part of the illustrations selected for the different 6n two dimension puzzles which form the pictures of said three dimension puzzle, featured in that the method used to obtain combinations for said three dimension puzzle illustration comprises the steps of:

    a) building one of the main cubes with n cubes per edge, that represents one of the n solutions of the three

dimension puzzle, which will be, hereinafter, called "cube assemblies";

b) splitting of the number of cubes contained in said cube assembly into subgroups, featured in that the position that each one of them occupies in the cube assembly, like:

- the corner cube subgroup, that includes those cubes placed in the cube assembly corner positions;
- the edge cube subgroup, that includes those cubes placed in the cube asembly edge positions except said corner cubes;
- the center cube subgroup, that includes those cubes placed in the cube assembly exposed face center positions; and
- the interior cube subgroup, that includes those cubes placed in the cube assembly interior positions, and therefore they are hidden.

c) illustration of exposed faces of cubes that belong to corner, edge and center subgroups of cube assembly.

d) building of a second cube assembly, starting from said division in subgroups, by moving one or several cubes from one subgroup to a different subgroup.

e) splitting the number of cubes contained in said cube assembly into said corner, edge, center and interior subgroups.

f) illustration of exposed faces of cubes that belong to corner, edge and center subgroups of cube assembly, being required that the illustration, whether simultaneous or not, comprising two faces of same cube, covers a solid angle, and the illustration, whether simultaneous or not, comprising three faces of same cube, covers a tryhedron;

g) sucessive building of the different cube assemblies, repeating steps (d) through (f) to complete the n cube assemblies.

2. Three dimension puzzle, in accordance with first claim, featured in that the method used to obtain combinations for the illustration of said three dimension puzzle, for n larger than or equal to 6, n being the number of cubes per edge of three dimension puzzle, comprising following steps:

a) splitting the number of cubes included in the three dimension puzzle into subgroups, featured for the position that each cube occupies in all and each of the subgroups, like:

- the corner cube subgroup, that gathers those cubes that are always placed in corner positions in each one of cube assemblies, made up by 4 n cubes;
- the edge cube subgroup, that gathers those cubes that are always placed in edge positions in each one of cube assemblies, except for said corner cubes, made up by 4n*(n-2) cubes; and
- the center cube subgroup, that gathers those cubes that are always placed in center positions on exposed faces of each one of cube assemblies, made up by n* (n-2)*(n-2) cubes;

b) obtaining for each one of said subgroups of the division (quotient and remainder R) of total number of cubes in a given subgroup by the number of positions of said subgroup in a cube assembly;

c1) for a non exact division made on step (b), i.e. R not equal to zero, working out for each one of the said subgroups of number G_{PT} of R groups (remainder of division made on step (b)) cubes of said subgroup per three dimension puzzle, obtained when dividing the total number of cubes in said subgroup by the remainder R of division made on step (b);

c2) for an exact division on step (b), i.e. R equals to zero, working out for each one of said subgroups of number G_{PT} of groups of P positions (factor in the division on step (b)) cubes of said subgroup per three dimension puzzle, obtained when dividing the total number of cubes in said subgroup by factor P of division made on step (b);

d1) for a non exact division on step (b), i.e. R not equal to zero, working out for each one of said subgroups of number G_{CC} of groups of R (remainder of division on step (b)) cubes in said subgroup per cube assembly, obtained when dividing the number of positions of said subgroup in a given cube assembly, by the remainder R of the division of step (b);

d2) for an exact division on step (b), i.e. R equals to zero, working out for each one of said subgroups of number G_{CC} groups of P positions (factor in the division on step (b)) cubes of said subgroup per cube assembly, obtained when dividing the number of positions of said subgroup in a given cube assembly by factor P of division made on step (b), i.e. G_{CC} is equal to 1;

e) in the case that for one or several of the subgroups the result of divisions made on steps (c1 and c2) and (d1 and d2) be (one or both) a non whole number, for each one of said subgroups we have:

e1) to determine a natural number m in increasing order and closer to the decimal number(s) that when multiplied by same produce another natural number;

e2) the product of number G_{PT} of groups of R (remainder of division made on step (b)) cubes of said subgroup per three dimension puzzle obtained through steps (c1 and c2), by said (natural number m) determined through step (e1), then obtaining a new number G_{PT}' of groups of R/m (remainder of division on step (b) divided by said natural number m, determined on step (e1)) cubes of said subgroup per three dimension puzzle;

e3) the product of number G_{CC} of groups of R (remainder of division on step (b)) cubes of said subgroup per cube assembly, obtained through steps (d1 and d2), by said natural number m determined on step (e1), working out a new number G_{CC}' of groups of R/m (remainder of division on step (b) divided by said natural number m determined on step (e1)) cubes of said subgroup per cube assembly;

e4) the division of R (remainder on step (b)) cubes by said (natural number m) determined on step (e1), obtaining R' (= R/m);

f) sucessive illustration of exposed faces of cubes contained in each one of said subgroups defined on step (a), gathered in groups of G_{PT} groups of G_{CC} cubes, respectively G_{PT}' groups of G_{CC}' cubes, building sucessively each one of the cube assemblies, splitting the number of cubes of said subgroups into groups G_{CC} cubes, respectively groups of G_{CC}' cubes, being required that cube illustration, whether simultaneous or not, that comprises three faces of same cube covers a trihedron, and the illustration, simultaneous or not, of cubes that comprises two faces of same cube covers a solid angle.

3. Three dimension puzzle in accordance with claims 1 and 2, featured in that those means for the collection of the different cubes (2) consist of a set of small round bars (3), made of paper, plastic, wood, metal or similar material and holes (4) bored in all faces center point of each cube (2), of adequate size to hold, without my clearance, the said small round bars (3) and with a depth preferably less that half the cube edge (2).

4. Three dimension puzzle in accordance with claims 1 and 2, featured in that those means for the interconnection of different cubes (2) consist of a case (5) made of a transparent material like metacrylate, plastic or similar, of an adequate size to house, without any clearance, all the cubes (2) and to allow to view from outside all the illustrations obtained on completing the three dimension puzzle (1).

5. Three dimension puzzle in accordance with claims 1 and 2, featured in that those means for the interconnection of the different cubes (2) consist of a base (7), made preferably by three planes perpendicular to each other (8a, 8b, 8c), made of a transparent material, provided of handling means like a handle, knob (9) or similar.

6. Three dimension puzzle in accordance with claims 1 and 2, featured in that those means for the interconnection of the different cubes (2) consist of magnetic devices designed to keep fastened the faces of all cubes in the three dimension puzzle, and mainly made of a set of pieces or small metal strips and ferrite cores inlaid on cube faces (2) or inside them.

7. Three dimension puzzle in accordance with claims 1 and 2, featured in that it is built by following a computer program and shown on its screen so that the game is worked out by using associated equipment like a keyboard, mouse and similar.

8. Three dimension puzzle in accordance with claims 1 and 2, featured in that some sticker patterns can be made from a plane development of each one of prototype cubes obtained through the illustration step, designed to be bonded on each one of the cubes included in the three dimension puzzle.

9. Three dimension puzzle in accordance with claim 8, featured in that the bonding of each of the stickers on the cubes is made by bonding means that consist of a first centering device of cube face with respect to sticker, mainly consisting of a L shape pattern with sticker and cube guiding means, as well as a second bonding system designed to bond, simultaneously, the sticker on four cube faces after having centered the sticker over one face by means of previous method, and mainly consisting of means to guide the cube through a square section hole with size basically equal to that of cube covered with sticker, and having rounded edges to avoid damages to sticker.

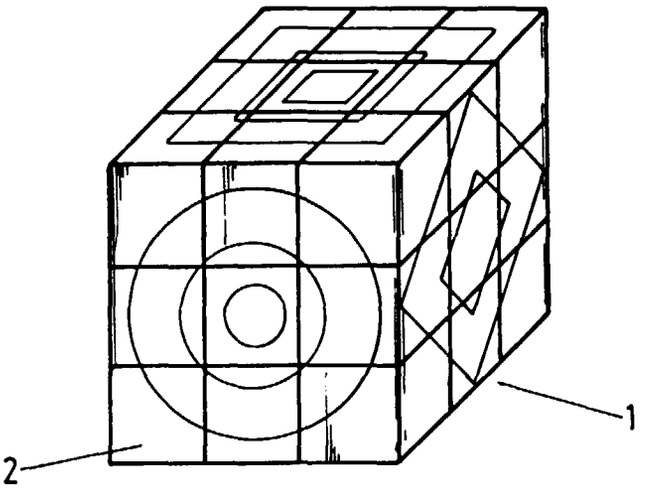

FIG.1

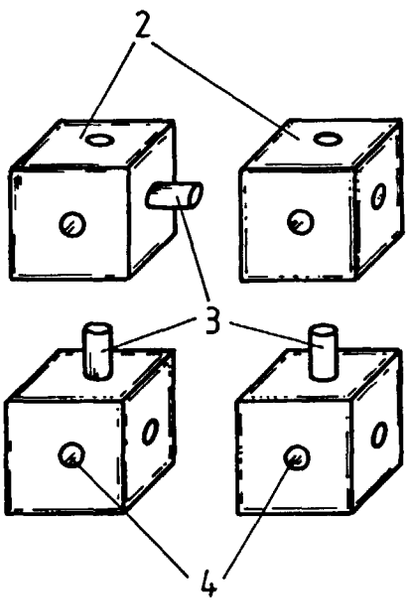

FIG. 2a

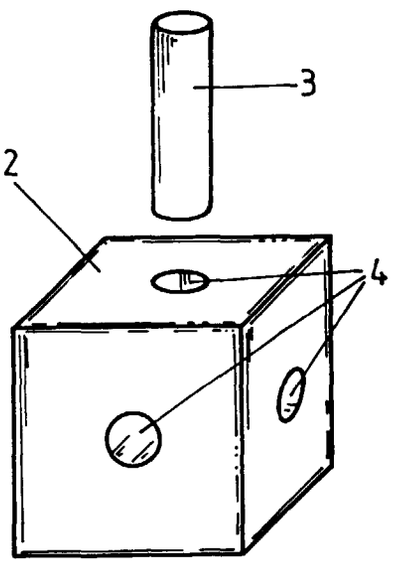

FIG. 2b

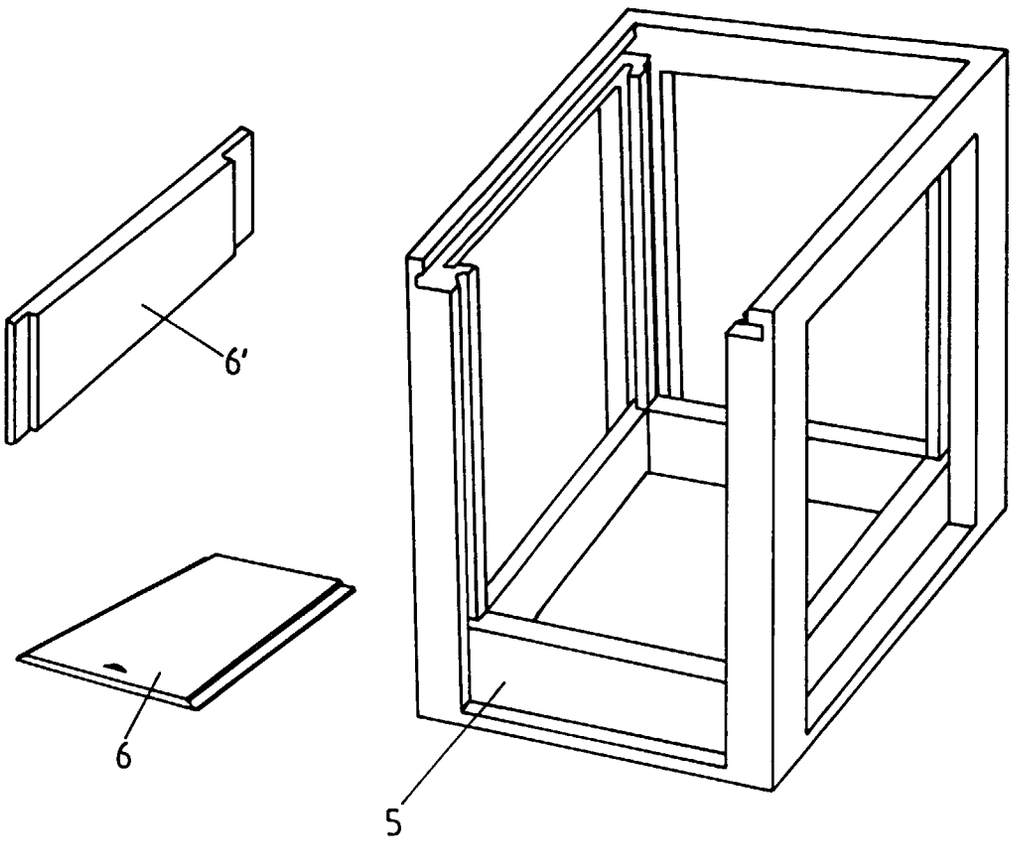

FIG. 3

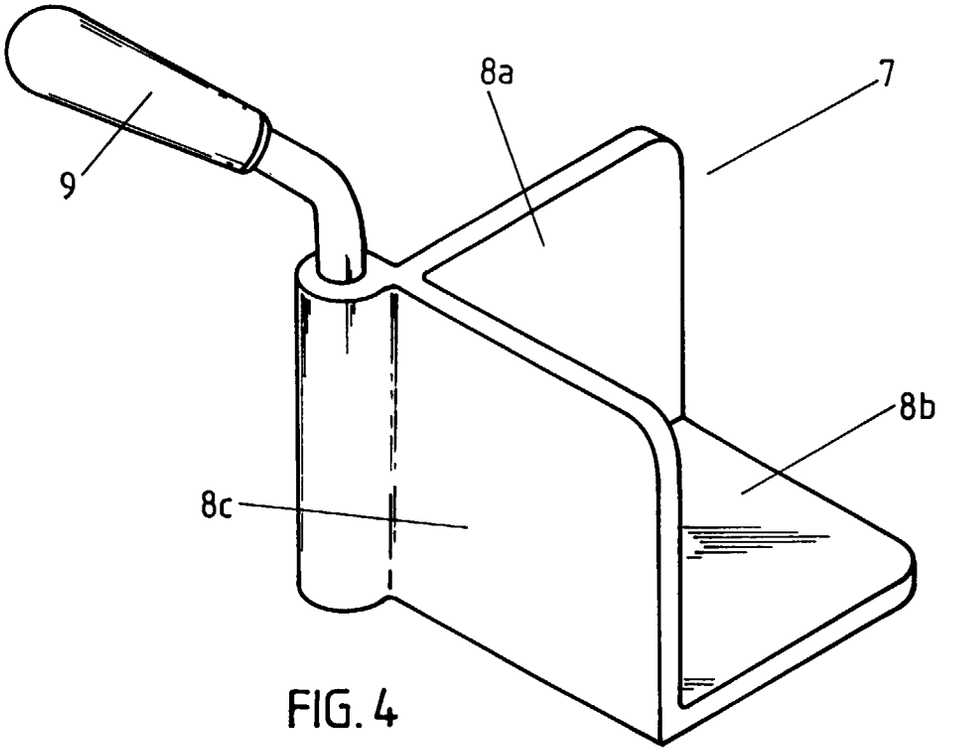

FIG. 4

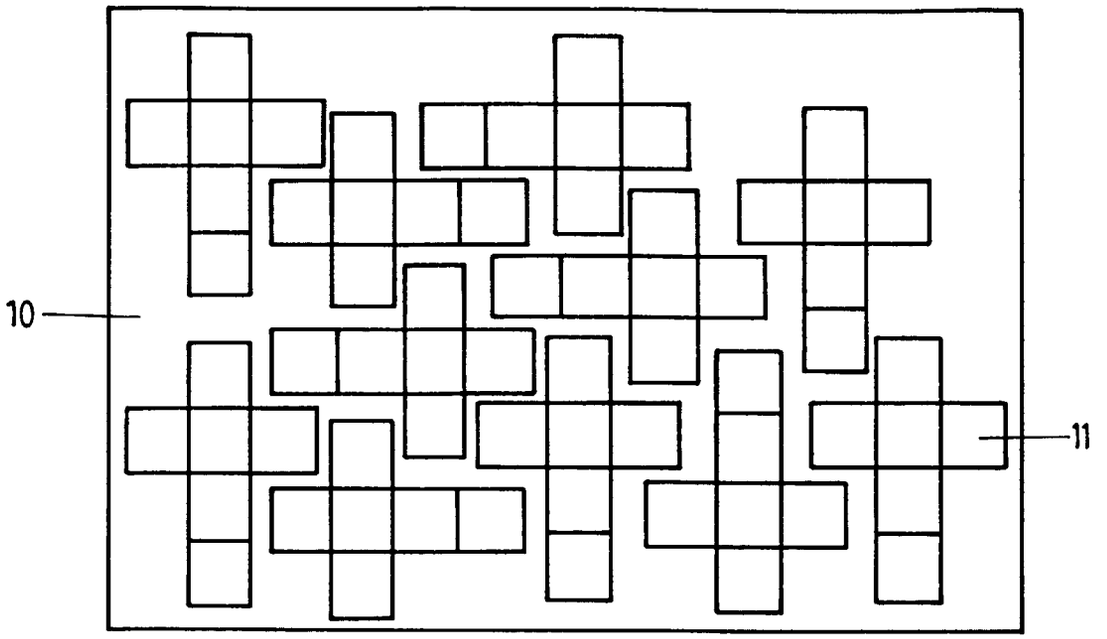

FIG. 5

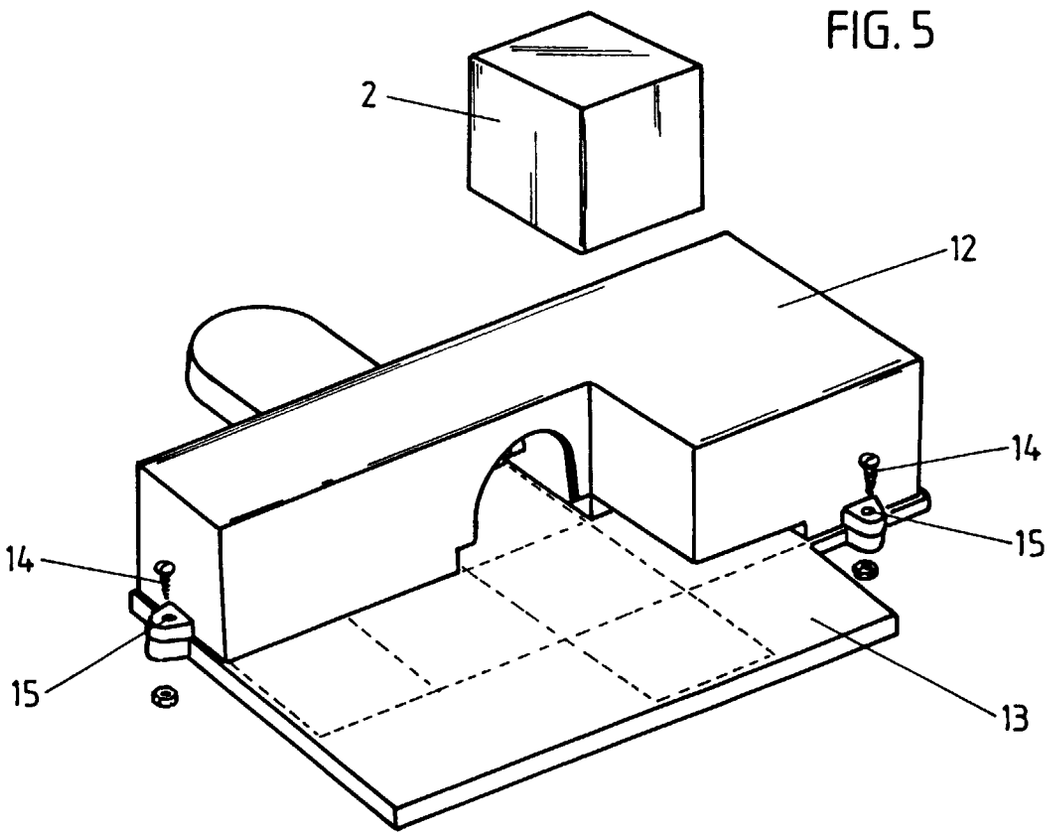

FIG. 6a

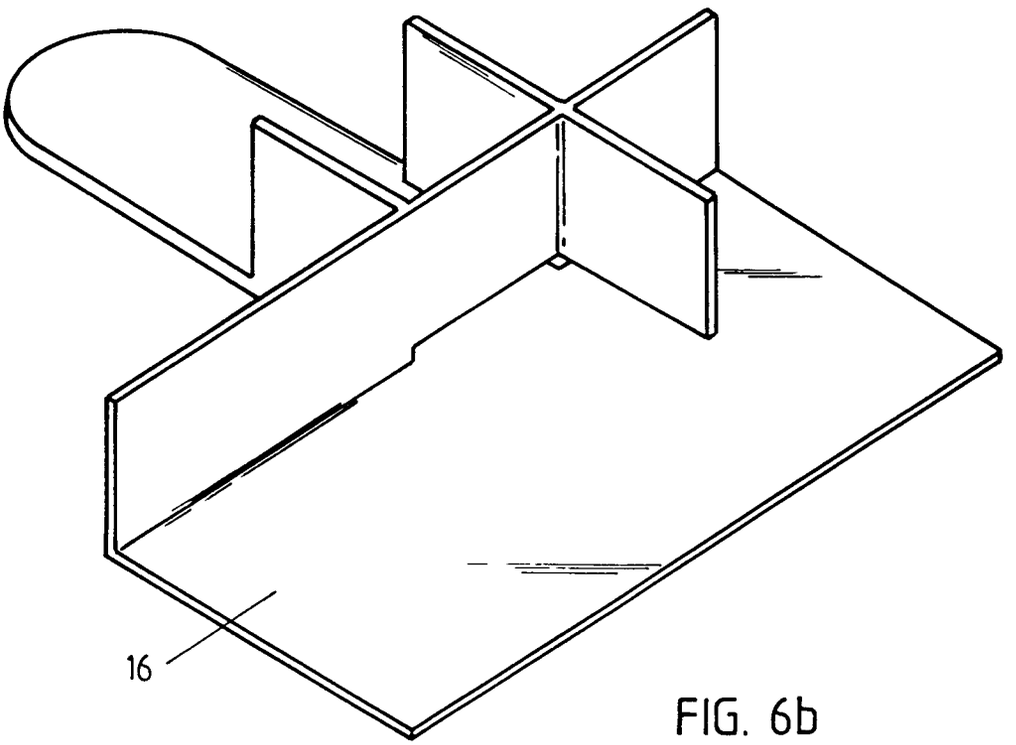

FIG. 6b

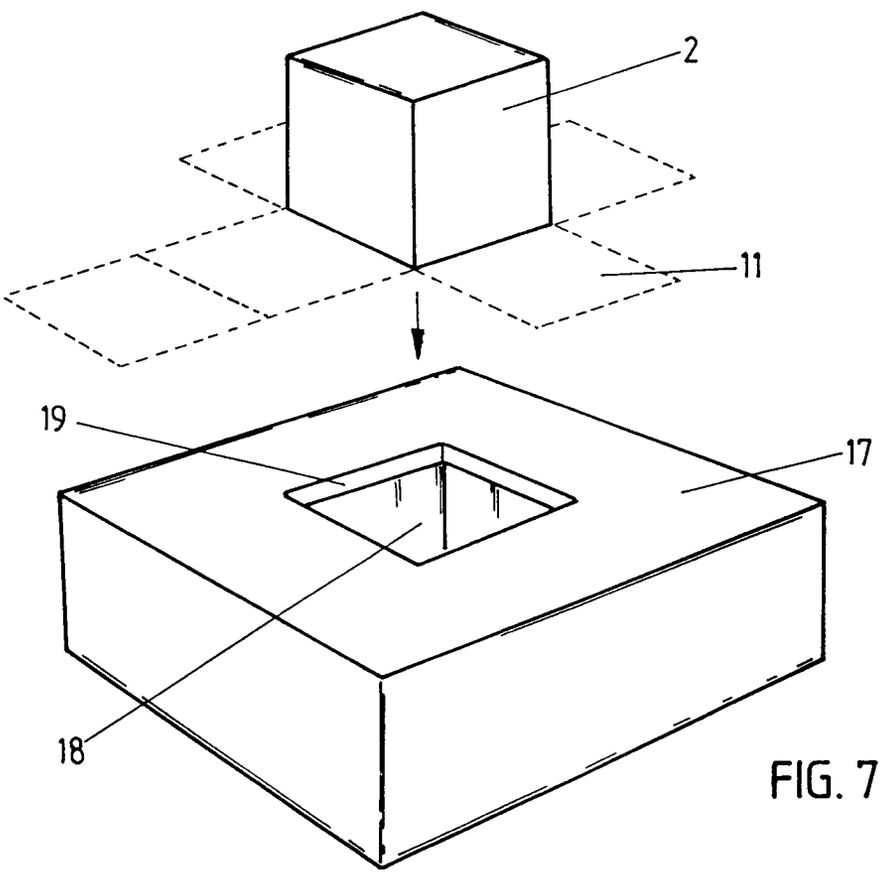

FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES 97/00226

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 : A 63 F 9/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 : A 63 F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, CIBEPAT, ECLA, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US-4210333-A (SHANIN) 1 August 1980 (01.08.80) Column 2, line 21 - column 5, line 23, column 6, lines 23-33, figures	1 4
X A	GB-675678-A (FRANCIS WILFRED PYLE) 16 August 1952 (16.08.52) The whole document	1 8
X A	US-4210332-A (SHANIN) 1 August 1980 (01.08.80) Column 3, line 16 - column 6, line 52, figures	1 4,8
A	US-4494756-A (WINER) 22 January 1985 (22.01.85) Column 6, line 54 - column 7, line 9; column 9, lines 31-64; figures	1,4
A	US-3672681-A (WOLF) 27 June 1972 (27.06.72) Column 2, line 26-54, figures 1-3	3
A	US-3888443-A (FLANIGEN) 10 June 1975 (10.06.75) Column 1, line 59 - column 2, line 46; figures	4,5
A	EP-51576-A (VARGA) 12 May 1982 (12.05.82) Abstract; figures	6

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 January 1998 (29.01.98)	3 February 1998 (03.02.98)
Name and mailing address of the ISA/ S.P.T.O. Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES 97/00226

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP-701850-A (TRIGAM S.A.) 20 March 1996 (20.03.96)	
A	GB-2290979-A (PHILIP & TACEY LIMITED) 17 January 1996 (17.01.96)	

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/ES 97/00226

Patent document cited in search report	Publication date	Patent familiy member(s)	Publication date
US4210333	01.07.80	NONE	
GB675678	16.07.52	NONE	
US4210332	01.07.80	NONE	
US4494756	22.01.85	NONE	
US3672681	27.06.72	NONE	
US3888443	10.06.75	US3771795	13.11.73
EP51576	12.05.82	BE890742 BE888110 BE886029	01.02.82 16.07.81 02.03.81
EP701850	20.03.96	NONE	
GB2290979	17.01.96	NONE	

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