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(72) Inventors; and
(71) Applicants : **RAJAT, Dhariwal** [IN/IN]; Madrat Games Pvt Limited, 1 b Lloyd Ville, 9/6 Lloyd Road, Cooke Town, Bengaluru, State Of Karnataka (IN). **BISHWAJEET HALDER** [IN/IN]; Interactive Games Designer, Madrat Games Pvt Limited, 1 b Lloyd Ville, 9/6 Lloyd Road, Bengaluru, State Of Karnataka (IN).

(74) Agent: **BRINDA, Mohan**; Mohan Associates, D-4, IIIRD Floor, Ceebros Building, New No. 32, (Old No.11), Cenotaph Road, Teynampet, Chennai - 600 018., State Of Tamil Nadu (IN).

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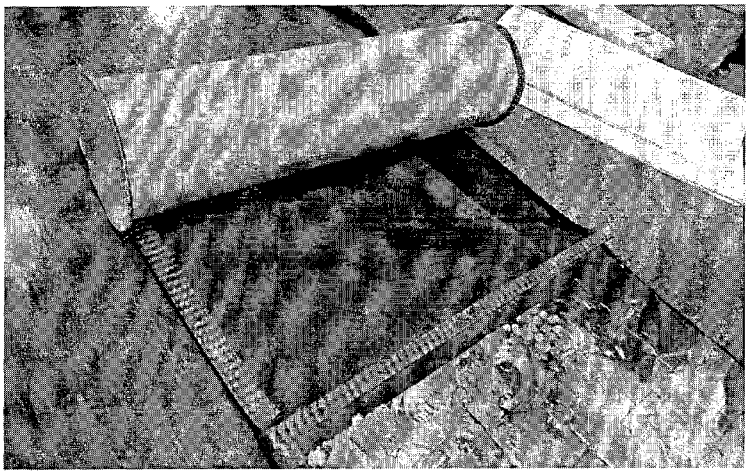

FIG 8D

(57) Abstract: This invention relates to a kit for a game board and puzzle comprising a plurality of puzzle bits, a flat frame means with a storage option and the puzzle bits being punched from the rear side, thereby displaying printed side puzzle bits with zero deflection to the user and the puzzle bits have specific protrusions for rolling an semi finished or unfinished or finished board / frame into a cylinder for storage.

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TITLE: A KIT FOR A GAME BOARD AND PUZZLE"

Applicant's Name: Rajat Dhariwal

Priority application no.:6228/CHE/2014 date 10/12/2014

FIELD OF INVENTION

The invention relates to jigsaw puzzle and more so particularly a jigsaw board game.

BACKGROUND OF THE INVENTION

A jigsaw puzzle is a tiling puzzle that requires the assembly of numerous small, often oddly shaped, interlocking and tessellating pieces. Each piece usually has a small part of a picture on it; when complete, jigsaw puzzle produces a complete picture.

DETAILED DESCRIPTION OF DRAWINGS

FIG 1 illustrates a sample piece of jigsaw puzzle
FIG 2 illustrates hidden objects in the puzzle with magnifying glass
FIG 3 illustrates puzzle glowing in the dark
FIG 4 illustrates the play trump cards after finishing puzzle
FIG 5 illustrates full frame with incomplete puzzle
FIG 6 illustrates the puzzle with normal pieces and puzzle with cut disappearing pieces
FIG 7 illustrates the frame with puzzle inside the box
FIG 8A-8L illustrates all components such as mats, bits, internal surfaces and others
FIG 9 illustrates the dimensions of the puzzle mat and cylinder
FIG 10 illustrates the side view of the cylinder with puzzle mat
FIG 11 illustrates the perspective view of cylinder with puzzle mat

DESCRIPTION OF INVENTION

According to the invention there is provided a puzzle apparatus, comprising of plurality of planar puzzle bits, wherein, the planar bits can be assembled together

into one or more planar jigsaw puzzle/s. Each of these planar bits generally have a first planar surface thereof as a part of an image which is shown as a whole in the assembled planar jigsaw puzzle/s. The bits are also generally to be arranged into an interlocking array in the completed planar puzzle. Hence the main object of the puzzle is to fit / interlock together a number of planar bits in a predetermined manner so as to form a coherent picture or image. Such assembly generally forms a layer or surface on the board of the system. Generally such bits are also not identical / but are compatible with one another for interlocking during the arrangement of puzzle bits on the puzzle board. Such bits shall also have suitable interlocking joints / edges for tightly receiving the adjacent bits with predetermined recesses and protrusions on the said bits. The edges shall need structural strength of repeat locking and unlocking and should be configured with a concept of minimal material wastage. Generally the images to be achieved are thematic and not abstract as it addresses either entertainment, education, skill testing etc. Hence accordingly such puzzles generally consist of a flat puzzle body with an image on its surface which is cut into plurality of differently shaped and selectively interlocking puzzle bits. The object of the puzzle is to assemble the cut puzzle bits onto a puzzle board which may also contain the same image [as of whole puzzle body] as a guide for arrangement.

The user as described above has plurality of random puzzle bits provided to them, each bit containing a portion of the whole image. The user has to determine where to place each bit on the board, by matching the bits with the image. The puzzle bits interlock consecutively if arranged sequentially in correct order and allows progress towards completion of the image coverage on the board with the available bits provided to the user.

The bits when precisely cut and when assembled form a complete clear picture. Generally a simple picture is stamped / punched with a steel rule die or using a continuous cutting saw, to create varying numbers of interlocking puzzle bits.

The puzzle apparatus as per invention comprises of plurality of planar pieces / bits, with each piece having a shape, configuration and may be color corresponding to a particular portion/s of a master board which contains with the master puzzle pattern

formed of grids. The puzzle application in general is to arrange the said puzzle / bits in conformity with the particular puzzle game so as to form a complete assembly. The said puzzle bits may accordingly have same color, configuration but different shape or vice versa in different embodiments.

The puzzle bits may be wholly of one color, with all faces in same color but is not limited. Hence the puzzle bits may be different colors from each other and each puzzle bit may be of single color or of multiple colors. None of these selections hinder the novelty element of the invention.

The games board may have its face marked with the master pattern, whereon the pieces/bits can be arranged on the board to conform with the master pattern. The interlocking puzzle bits shall when assembled on the pattern depicted on the boards, create an image identical to the pattern depicted on the board.

The invention also discloses the puzzle board and bits that can be stored / removed repeatedly from an internal cavity of a container, in dissembled state, partially assembled state and fully assembled state without permanently altering the container, bits or the board.

The invention in general may reveal broadly the puzzle apparatus. However the object of the invention is to provide a versatile and flexible puzzle apparatus which may be relevant in usage in different fields for different purposes such as simple board games for entertainment, educational game boards, such as for aptitude test or may be intelligence / knowledge test or may be a teasing mathematical recreation or skilled amusements. Hence the object is to create an apparatus which is educational and entertaining either simultaneously or independently.

Hence the invention is attempted to keep the apparatus as simple as it can be but offering the best solution at the end to the user.

The invention basically is simple at component levels, comprising of components such as boards and pieces / bits and may be with or without additional accessories.

The primary object of the invention is to provide the user to fit a plurality of pieces together into a continuous assembly in full accordance with the visible pattern on the board, Hence the first and sole objective is to produce an assembly of bits and a board with a storage option.

In a preferred embodiment of the invention, the board has a master pattern on one of its side / surface.

In another preferred embodiment, of the invention the board may have a pattern on one of its side/ surface and another pattern on the other side / surface.

In another preferred embodiment of the invention, the board may display more than one pattern on its surface, i.e. a specific pattern may be depicted within a portion of the surface of the board.

In another preferred embodiment of the invention, the full set of puzzle bits may be associated in the process of producing an assembly on the board.

In another preferred embodiment of the invention, only selected set of puzzle bits may be associated in the process of producing an assembly on the board.

In another embodiment of the invention, atleast one of the faces of puzzle bits may be marked with an identity mark to segregate the selective set of puzzle bits, when the apparatus is associated with using selected set of puzzle bits for the process of producing an assembly on the board.

As such the invention apparatus is intended to be used in a variety of ways and manner and also allows many new development teaching and testing methods and is not restricted to any field.

The invention allows variations by creating multiple patterns on the board and widening the scope even further by using marked puzzle bits. The working of the

puzzle bits may be such as size, shape, color or any marking etched / imprinted on the bit itself etc.

As such the invention not only entertains a child / user and systematically teaches a child / user to develop complex geometric patterns – by merely interchanging the laid out pattern/s on the board which merely not only involves physically placing of bits on the board but which mentally may need minimum optional or maximum analysis and reasoning and so also recognition skill of the user. Hence the apparatus can be a source of excitement and may provide abundance fun but will always involve certain amount of individual user's ingenuity, knowledge, skill etc.

The invention involves that the user using the apparatus opens the game kit by opening a cylinder / container which contains the puzzle bits, pulls out a frame means from the container, spreads the frame means which becomes the board for the game and dumps the puzzle bits out on the frame. The pattern/s on the board will be visible to the user and the user can then select the associated puzzle bits on the basis of the pattern selected for playing. Then the user commences to use the puzzle bits by placing the puzzle bits on the pattern.

The invention as described above discloses a generally a board which is a flat frame means. The flat frame means is divided into a central area / portion with two side areas on its two sides. Each of those areas have a ridge forming a sidewall along its periphery. Further the frame means is such that it can be rolled into a cylinder. Further the frame means can be rolled even with the disassembled puzzle bits are kept loosely on the two sides and the assembled bits kept on the central area. Further the frame means has the board area restricted to the central area and side areas are for the purpose of keeping the dissembled puzzle bits.

The frame means also has one open side which enables the folding and rolling of the frame into a cylinder, which the storage means.

The apparatus includes a roller onto which the frame means is rolled. Most preferably the roller is cylindrical in shape.

The roller generally has a cylindrical body with side walls at its end surface, thereby preventing the slip of the frame when rolled on the roller.

The apparatus shall also include a container to store the rolled frame means and so also the puzzle bits, some of which may be within the frame means and some may be dissembled bits.

The apparatus shall also include a mechanism for locking the frame onto itself after rolling, with or without the jigsaw pieces spread on the frame. Currently magnetic strips on front of the frame and metal strips at the back are used for locking. The positioning of these strips is critical as they have been put such that if rolling is incorrect i.e., too tight or too loose, locking will not occur (magnet and metal strips will not match when rolled incorrectly). This is critical to preserving the puzzle properly, such that the puzzle comes out in the same way on unrolling as it was when rolled.

The flat frame typically is a flat board which has a configured area such as square or rectangle but is not limited to these configurations.
The surface of the puzzle bits shall have specific printed indentifying indicia to match the jigsaw puzzle patterned on the board.

The other suffering in prior art is not image created by bits has irritating lines between bits when arranged.

As such die cutting or continuous cutting has been preferred over hand cutting to ensure that cutting motions that create the individual bits simultaneously form the surrounding bits, thus ensuring an exacting fit of the bits with respect to adjacent bits. Hence there is always an attempt to create individual bits with common separation lines to the surrounding bits to create the exacting shapes necessary to form interlocking bits with enough circumferential intimacy so a not to detract from the quality of the image when the puzzle is fully assembled. Hence the invention also

provides a method to facilitate a precision fabrication of a plurality of interlocking bits with those bits when assembled combining to form an image.

Hence the novelty of the invention is to have the puzzle bits being punched from the rear side, instead of conventional front side punch as known and practiced in prior art. The die enters from the rear side and thereby the invention is able disclose printed side puzzle bits with zero deflection, entirely unknown in prior art.

The invention also discloses to optimize the resource management for aesthetic purposes and discloses the condition for designing the puzzle bits. The puzzle bits are shaped such that the maximum angle [x] subtended between two adjoining interlocking puzzle bits is less than 140 degrees.

Also the puzzle bits have an average side length [a] wherein
a = 2* r* tan [90-[x/2]] and
r = n radius, n s the number of sides of polygon of the puzzle bit and x = 180* [[n-2]/n]. Also the puzzle bits have generally protrusions on rolling direction smaller than protrusions on other side. This will aid in rolling an assembled [partially or fully] board / frame into a cylinder for storage.

Presently, Eva Foam is used as substrate frame means but other materials have also been envisaged for following reasons

- Material used for substrate frame shrinks with time.
- Its surface is not that smooth.
- It tends to retain shape in which its rolled, its bounce back property is weak and demands some weight to revert back to original shape. Hence the material is not ideal for this usage.

Other materials which doesn't have such drawbacks can be used.

However irrespective of the material of the board, all of these allow the user when the user is through with using the apparatus that the user may then keep the

assembled puzzle in its assembled condition into the storage mode or more likely the user may roll the nearly complete or partially complete puzzle board onto the roller and thereafter store the same into the container, for later use / continuation of the unfinished game.

Throughout the description various embodiments and examples have been given which are merely exemplars and are not limitation on the apparatus or process disclosed or claimed.

Many of the examples / illustrations herein involve specific elements of disclosure, but it should be understood that those elements of disclosure can be utilized / envisaged in other ways to accomplish the same objectives of the invention. Any disclosure with one embodiment is not to be intended to be excluded from a similar role on other embodiments.

The invention allows very convenient and easy conversion of the abstract concepts into a tangible medium of education, entertainment and development of cognitive and motor skills of human, more specifically children.

Further additions of the invention, more specifically regarding the Game Mechanics, are giving below:

- Object Hunt: After completing Puzzle player search for a list of objects given via printed cards or such means. These objects are in accordance with the theme of the puzzle and may be hidden by means of camouflaging with the background of the puzzle.

- Magnifying Lenses: The objects are drawn in a very small size, almost indiscernible to the naked eye. Magnifying lenses are provided with the game kit to aid in finding these 'micro-objects'. (Fig 2)

- Glow in the dark: Puzzles will glow in the dark. (Fig 3)

- Data Duel: After completing the puzzle you can play data duel card with the cards having different categories on which players can challenge each other (Fig 4) . This takes care of one of the biggest limitations of jigsaw puzzles gameplay – that of replayability. This mechanism is similar to the popular Trump Card games, but could never be applied to jigsaw puzzles due to lack of previously described gameplay additions like objects, which is replayable.

Other major advantages of the invention are as below:

- Cuts disappear in the product as per invention
  - Normal puzzles have distorted image due to cuts. Puzzle+ looks flat like a game board (Fig 6)

- Puzzle Frame in the product as per invention
  - Novel & more convenient way to make Puzzles as the frame holds puzzle in place firmly and thereby pieces are less likely to get lost. Normal puzzle gets distorted on interacting with it.(Fig 5)
  - The arrangement allows the product to be moveable without distortion such it can be lifted or moved away to clean the surface in which it is placed.
  - The manner of keeping pieces back in box has been simplified and allows multiple distractions to do other moves.

- The puzzle in the product as per invention can be preserved in one of the modes :
  - With the open frame the whole puzzle can be preserved whether the puzzle is complete or incomplete, or
  - Just roll the Inner cylinder over the puzzle mat which has extended plate base at bottom and top to keep the puzzle mat in line.(Fig 8), or
  - The whole puzzle with the frame can be preserved in a cylindrical box.(Fig 7)
- Side Frame Area in the product as per invention have a distinct role, which is
  - Side frame area is used to put puzzle pieces before making the puzzle (Fig 5)

NOW METHOD OF CALCULATION AND MAKING THE INVENTION IS DETAILED BELOW TO DISCLOSE HOW THE PRODUCT WAS ARRIVED AT

The invention relates to various aspects of jigsaw puzzle, such as a. Rolling b. Dye Design and c. Cut disappearing puzzle.

Rolling

For the jigsaw puzzle to get rolled with the cylinder, there are a number of variables to take into account. Essentially we are trying to approximate a circle (or rather a spiral due to the thickness of the "mat" in between the puzzle pieces and the cylinder) with a circumscribed polygon.

Fig 9 shows the important dimensions involved.

The main constraint in the design is the maximum angle (x) that can be subtended, between the two adjoining puzzle pieces, for them to fall in place when unrolled yet not break. The disadvantage of prior art been successfully overcome in this invention.

Given that,

a = 2 *r*tan(180/n); where n is the number of sides of the polygon, and

x = 180*[(n-2)/n]

The guiding formula 1 to determine the two key becomes: **a = 2*r*tan(90 –(x/2)) .**

Empirical testing shows that x should be lesser than 140 (degrees), for the current set of materials and the current application. Values of a and r have been chosen accordingly by the invention

The above formula 1 is however an ideal approximation, which assumes:

- Zero thickness of materials involved
- Polygon edges are completely straight – when actually they typically have jigsaw style protrusions for interlocking along the parallel plane. The material shall have some flexibility giving allowance to bend orthogonally as well.

Due to thickness & elasticity of the mat, puzzle pieces and rolling cylinder, to arrive at the ideal solution here are all the variables that need to be considered. We have arrived at our current invention keeping in mind Formula 1 as the guiding formula but the other variables have been tested empirically. A relationship between all of these variables has been disclosed herein.

1. Thickness of following materials :
a. Mat, Puzzle pieces: Mat and puzzle piece thickness increases the inradius (apothem) and circumradius respectively thus deviating from assumptions.
2. Outer Diameter of the Roller: Roller has some thickness which is neglected in approximations.
3. Tensile strength or Elasticity of following materials :
a. Puzzle pieces: Puzzle pieces are not rigid and as assumed thus they may bend and break after a certain force.
b. Mat: As puzzle pieces are harder then mat material, mat tends to compress.
c. Cylinder: Cylinder is assumed rigid but it also bends after a certain force.
4. Length of puzzle pieces and protrusions: It is assumed constant but may be smaller or bigger in successive progressions.

5. Smoothness of mat surface: Mat surface should be smooth so that edges of puzzle pieces do not tangle with mat surface.
6. Dye design: Delicate balance between locking and unlocking between puzzle pieces.
7. Weight of inner cylinder (empty and when full): weight of cylinder as it put force on pieces below it.

Dye Design : Smaller Protrusion in Rolling Direction

In the "Dye Design" or design of how pieces get cut, the Protrusions on puzzle pieces should be smaller in the Rolling Direction. In current puzzles horizontal and vertical protrusions are mostly similar. Protrusions are necessary for interlocking of

puzzle pieces. By using smaller protrusions in rolling direction the average length of each puzzle piece is reduced.

Cut Disappearing Puzzle

Cardboard Puzzles are manufactured either by color printed sheets pasted to card board or by printing directly on board and then die cut using specially designed die tool to get the distinctive shaped pieces. World over puzzles are manufactured with this technique. While using this technique we have noticed at the edges /cut line of every puzzle pieces, there is a depression or a downward curve. Due to this phenomenon, after the completion of a puzzle the surface becomes uneven and due to the deflection at the cutting area which breaks and misaligns the continuity of the design, do not remain faithful to the original design/picture of the puzzle.

The special featured puzzles completely do away with the above stated phenomenon. When the featured jigsaw as per invention is completed, it would come alive as a single sheet of board, almost with cut lines completely invisible.

This special feature is achieved by employing a special technique at the cutting/punching of the puzzles. With the help of continuous quality and process improvement program, with multiple revisit of the cutting process, we concluded that the deflection of the cut is greater at the beginning of the cut and almost zero at the end point of the cut. The invention employs a method in cutting that is just opposite to known prior art. To get this special feature, the invention ensures that, while cutting the jigsaw, the die enters from behind the cardboard and reaches the other side of the board that is pasted with the jigsaw design. As the printed design is at the end point of the cut there is zero deflection and hence almost continues in nature. With this the invention has changed the way a jigsaw puzzle looked and felt and hence Zero gap between each puzzle bits.

All variations and modifications that can be envisaged by person skilled in the art is well within the scope of invention.

CLAIMS:

1. A kit for a game board and puzzle comprising :-

a. a plurality of planar puzzle bits,

b. a flat frame means defining a first central interior area for assembling the puzzle bits, a second and a third interior area arranged on either side of the central first interior area for keeping the disassembled planar puzzle bits and each of the interior area having side walls along the periphery, and

c. the said frame means adapted further to be rolled into a cylinder, with the disassembled puzzle bits stored in only one of two side interior areas i.e. second or third interior area, and wherein generally the first, second and third interior area define a square or rectangular shaped interior area.

2. The kit for a game board and puzzle as claimed in claim 1 wherein the said frame means has atleast one open side adapted further to fold for rolling.

3. The kit for a game board and puzzle as claimed in claim 1 further includes a cylindrical roller onto which the frame means may be rolled wrappingly for storage.

4. The kit for a game board and puzzle as claimed in claim 2 wherein the roller has a cylindrical body with side walls at its two end surfaces.

5. The kit for a game board and puzzle as claimed in claim 1 further includes a container to hold within the rolled frame means rolled on the roller.

6. The kit for a game board and puzzle as claimed in claim 1 wherein the surfaces of the puzzle bits having a specific printed identifying indicia thereon on the basis of the intended jigsaw puzzle.

7. The kit for a game board and puzzle as claimed in claim 1 wherein the puzzle bits are punched bits from the rear side, with the die entering from rear side, thereby printed side of puzzle bits are characterized with zero deflection.

8. The kit for a game board and puzzle as claimed in claim 1 wherein the puzzle bits are shaped such that maximum angle (x) that can be subtended between two adjoining puzzle bits shall be preferably less than 140 degrees.

9. The kit for a game board and puzzle as claimed in claim 1 wherein the puzzle bits shall have an average side length (a), wherein a = 2*r*tan(90 –(x/2)) and r = in radius, n is the number of sides of polygon and x = 180*[(n-2)/n].

10. The kit for a game board and puzzle as claimed in claim 1 wherein the puzzle bits having protrusions on one side smaller than the other side, such that the puzzle bits have protrusions on rolling direction smaller than protrusions on other side, when the frame means with assembled bits are rolled over the roller.

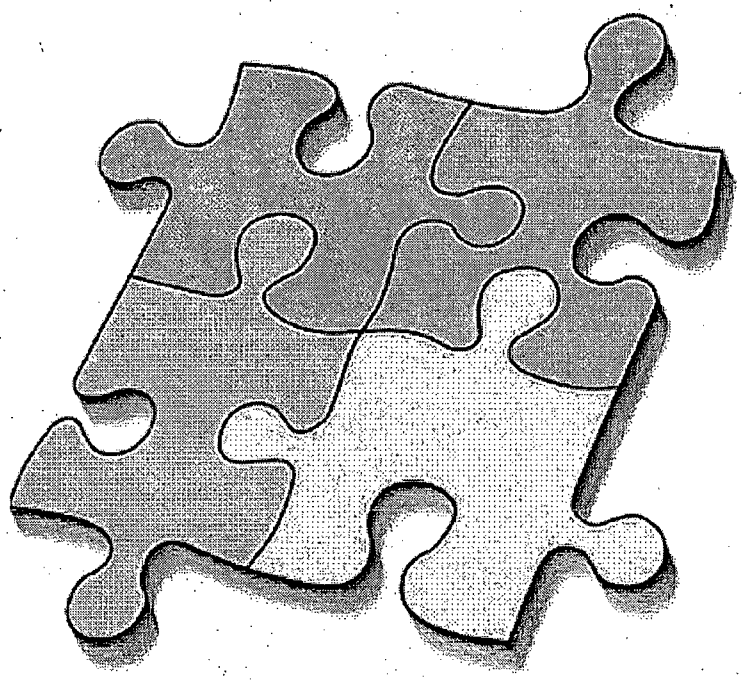


FIG 1

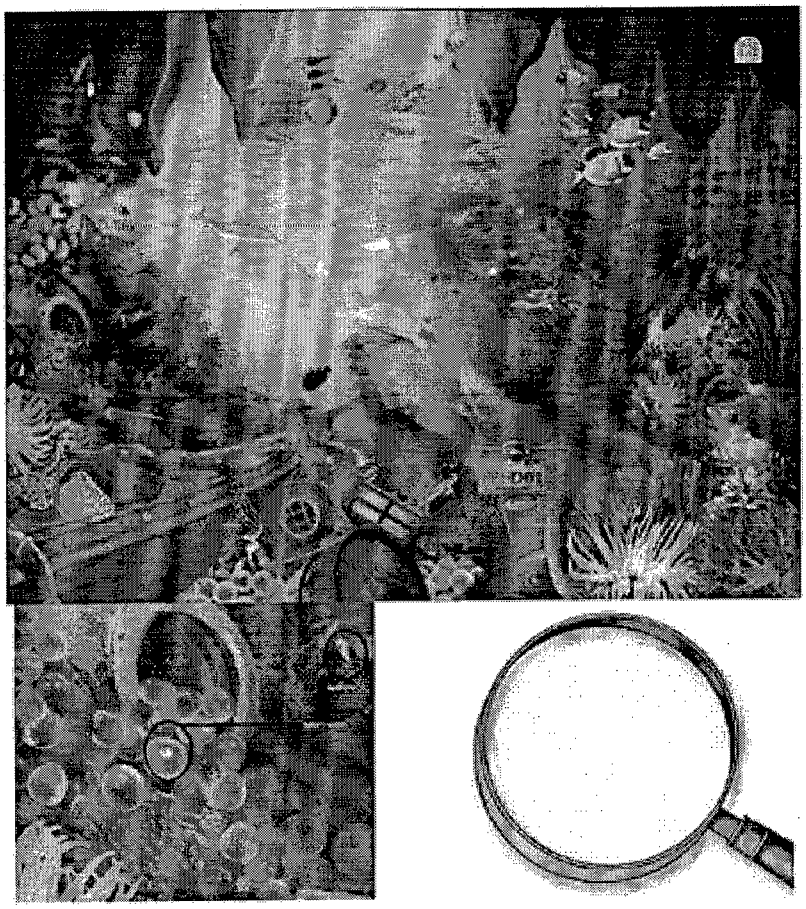


FIG 2

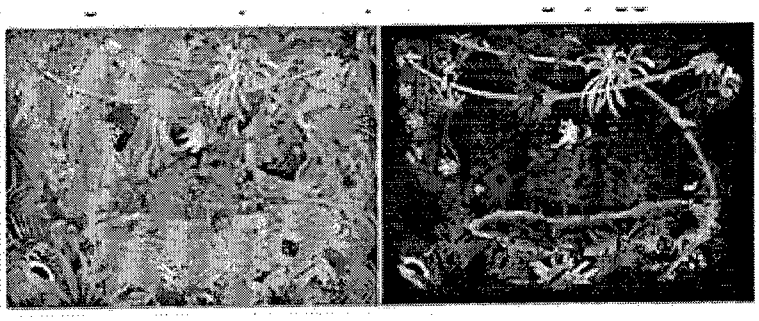


FIG 3

Total no. of sheets: 12
Sheet no.: 3

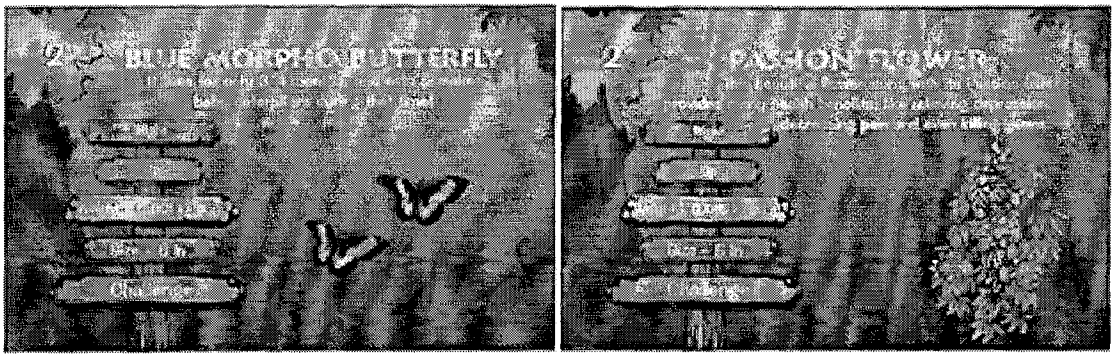


FIG 4

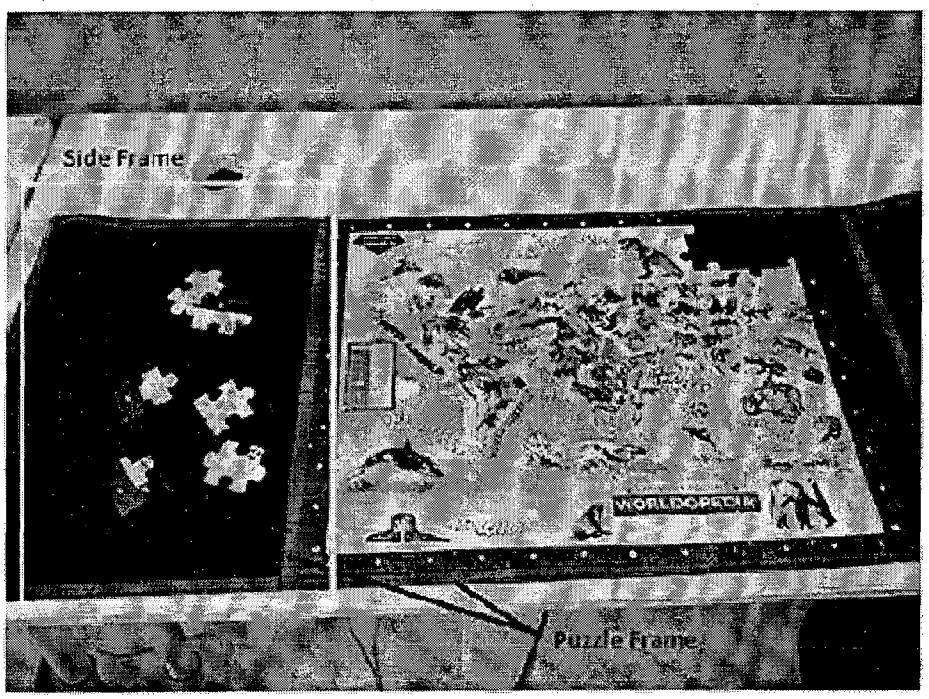


FIG 5

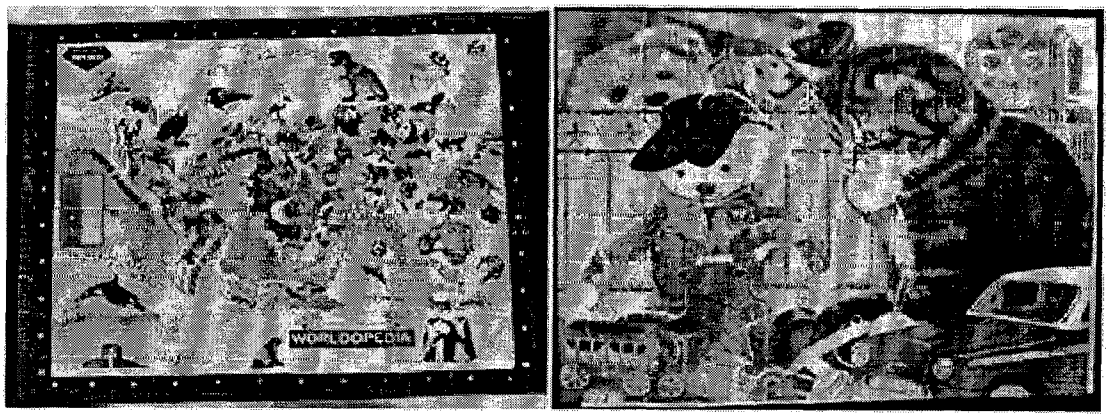


FIG 6

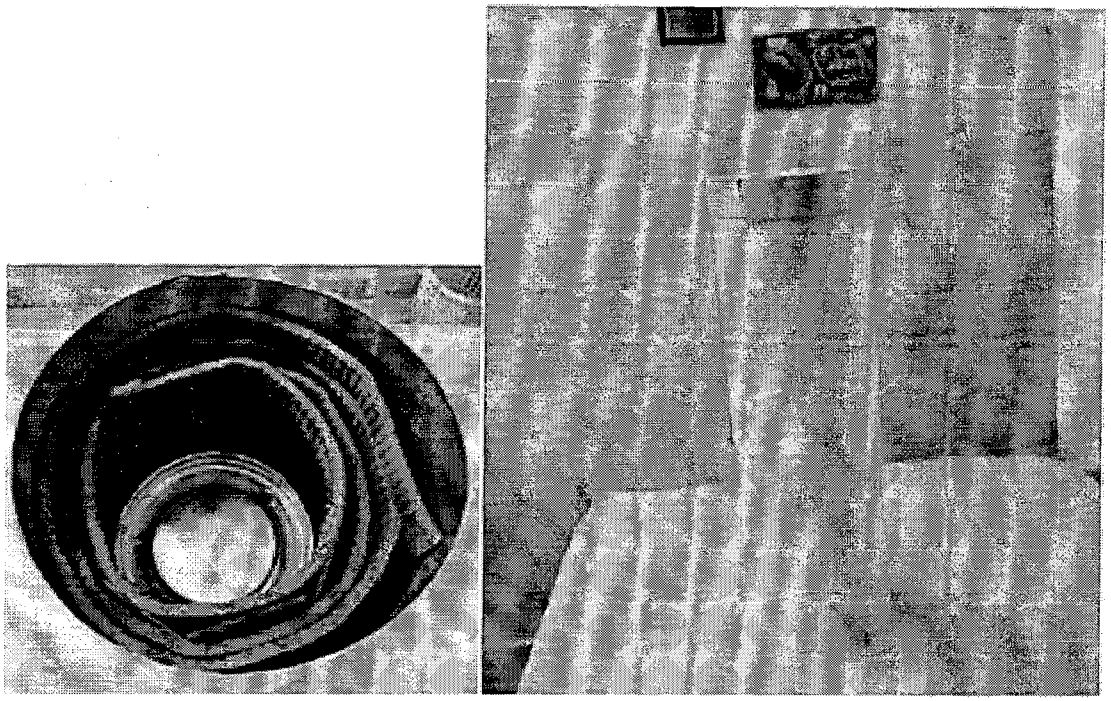


FIG 7

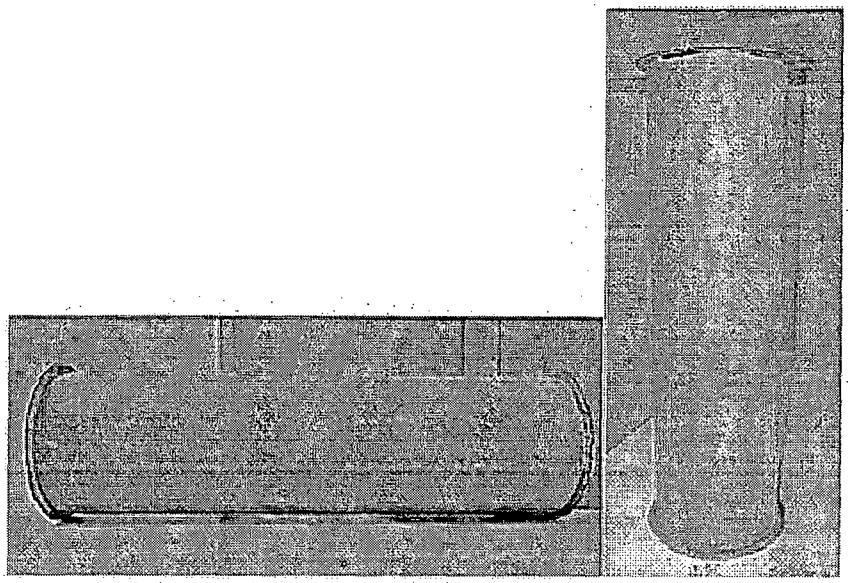


FIG 8A FIG 8B

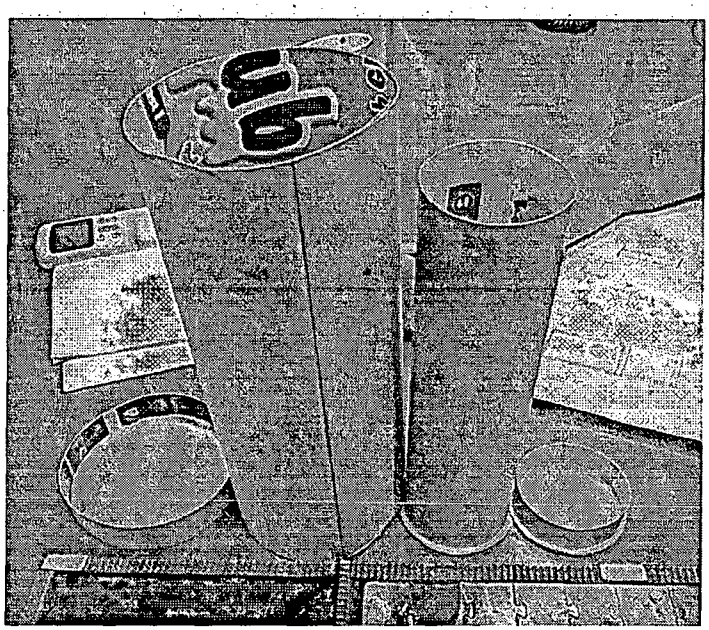


FIG 8C

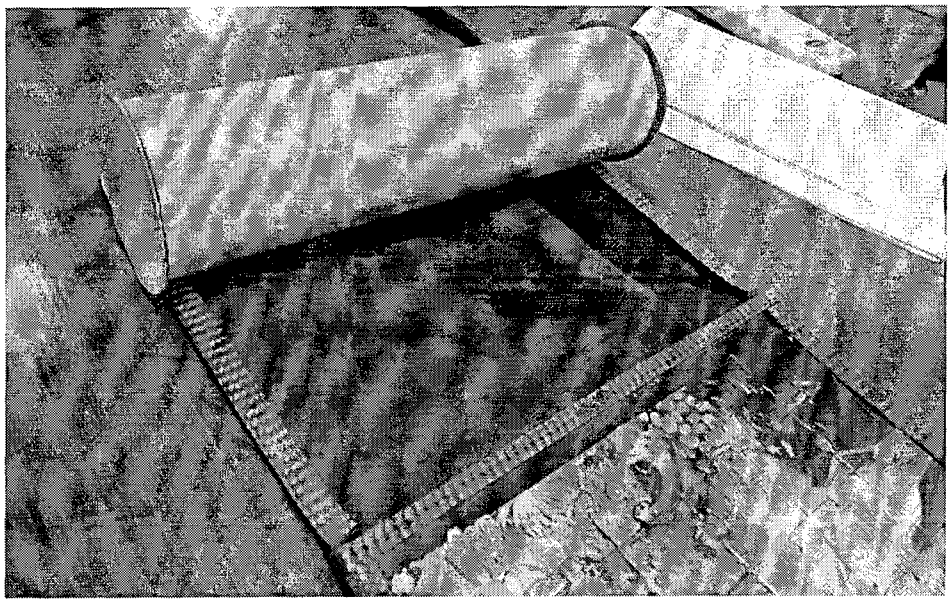


FIG 8D

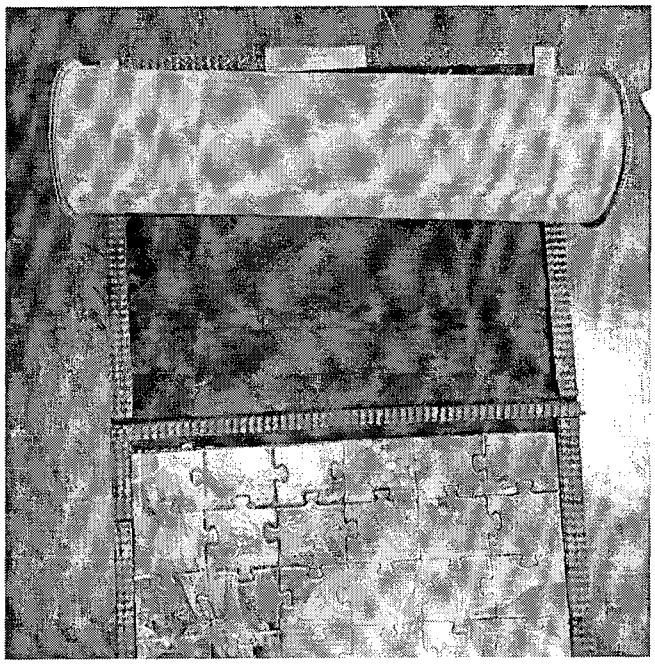


FIG 8E

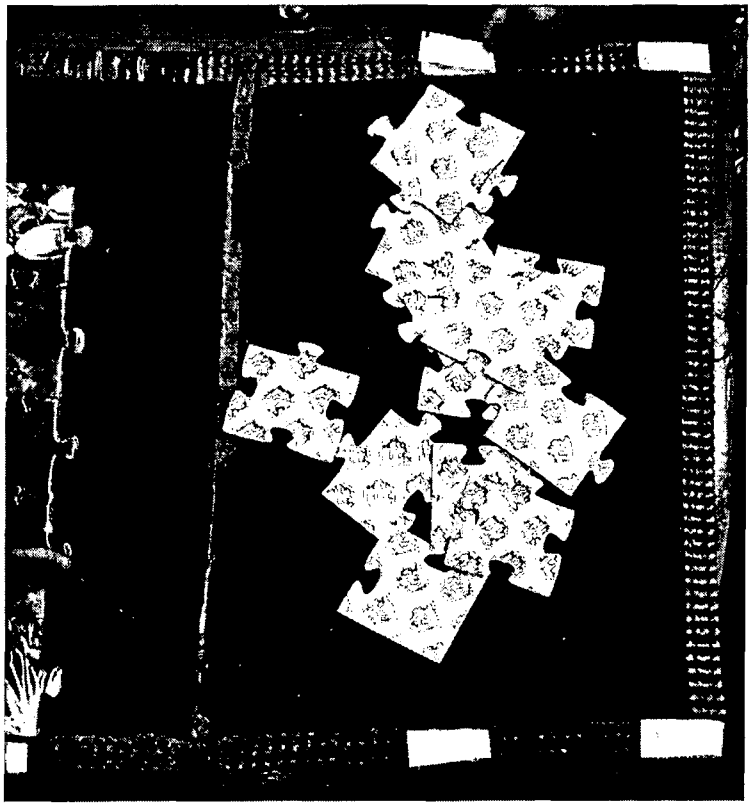


FIG 8F

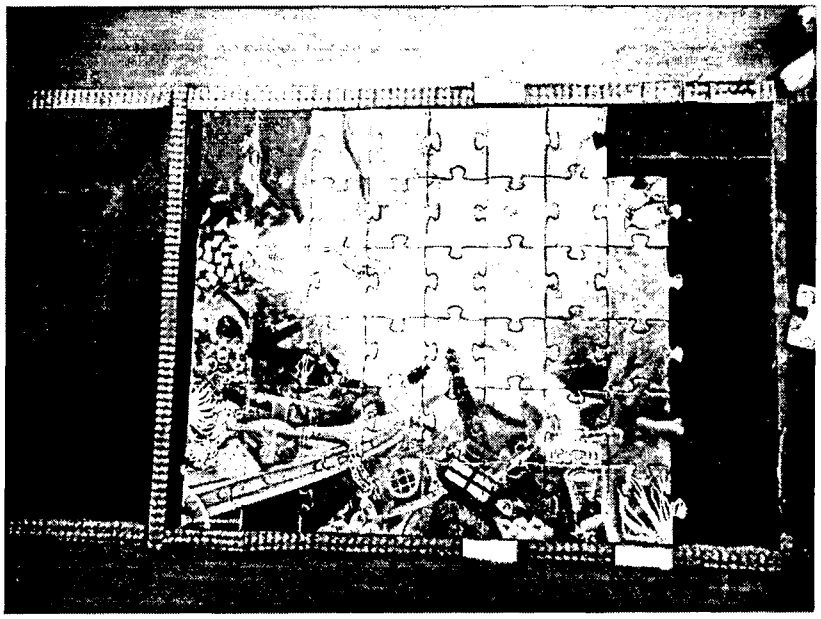


FIG 8G

FIG 8H

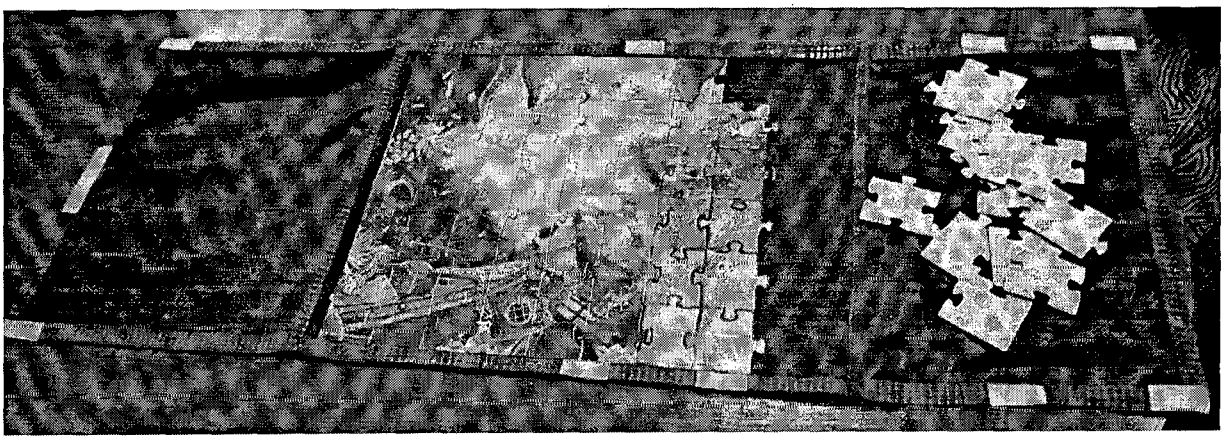


FIG 8I

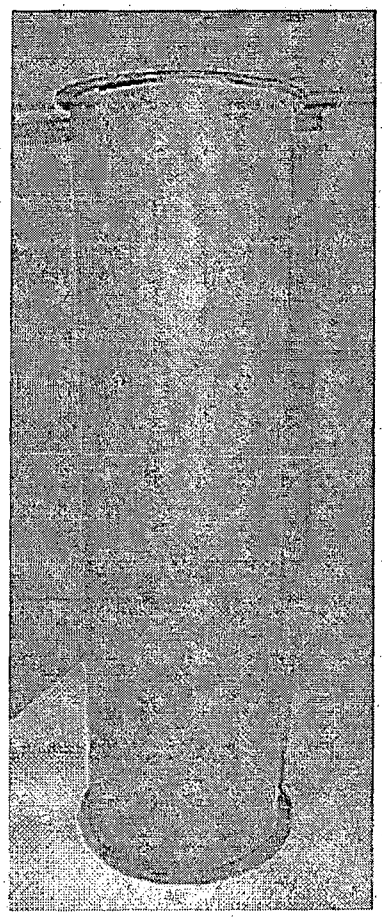


FIG 8J

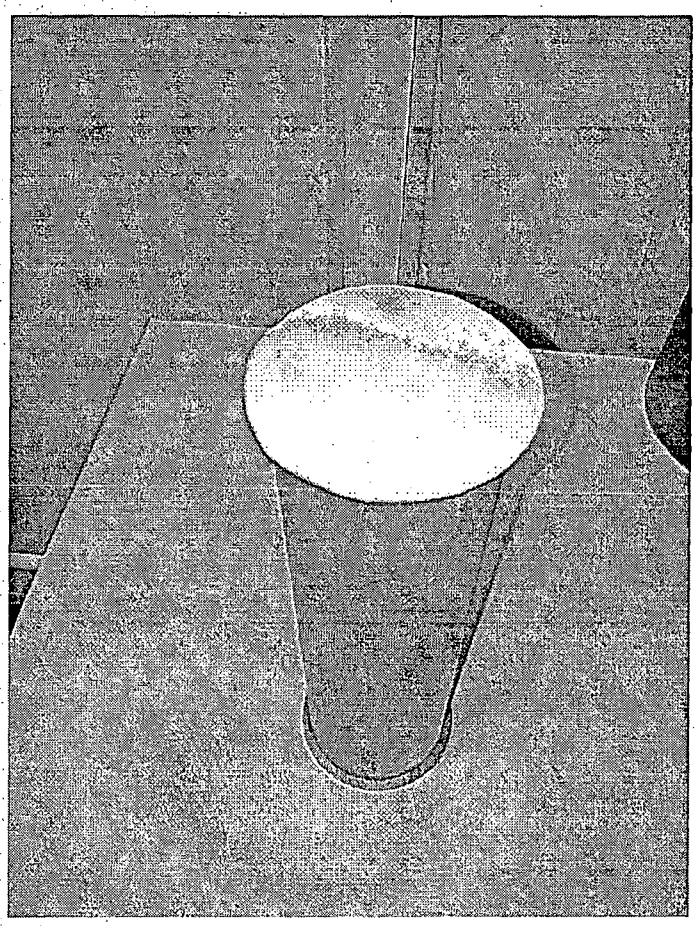


FIG 8K

Total no. of sheets: 12
Sheet no.: 10

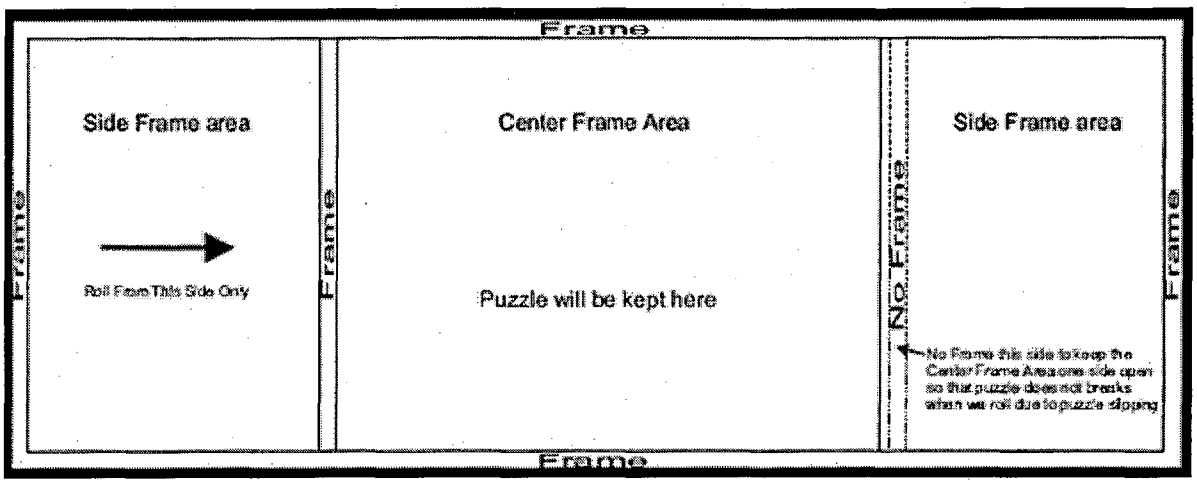
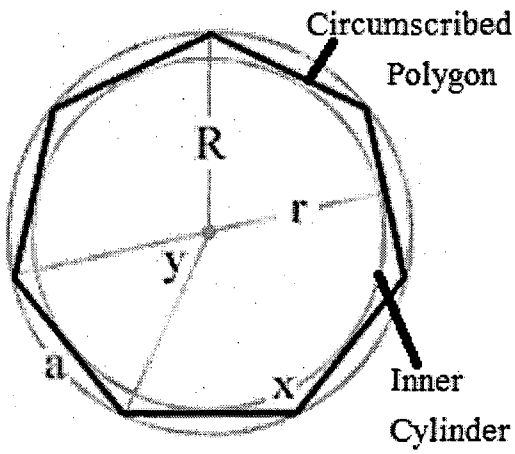


FIG 8L



r = inradius (apothem)
R = circumradius
a = side length
n = number of sides
x = interior angle
y = exterior angle
A = area
P = perimeter

FIG 9

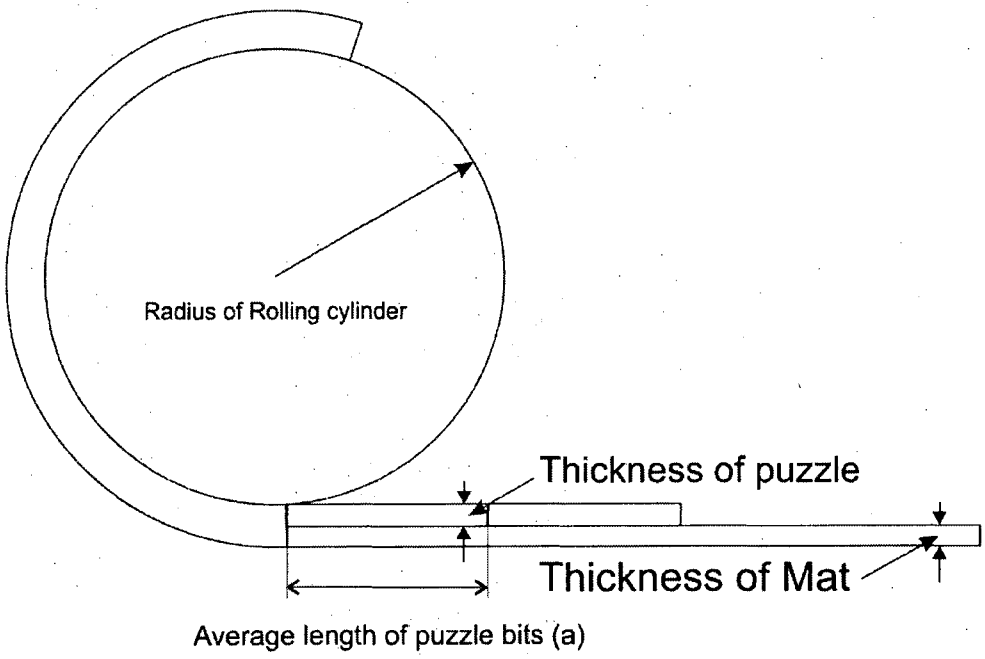
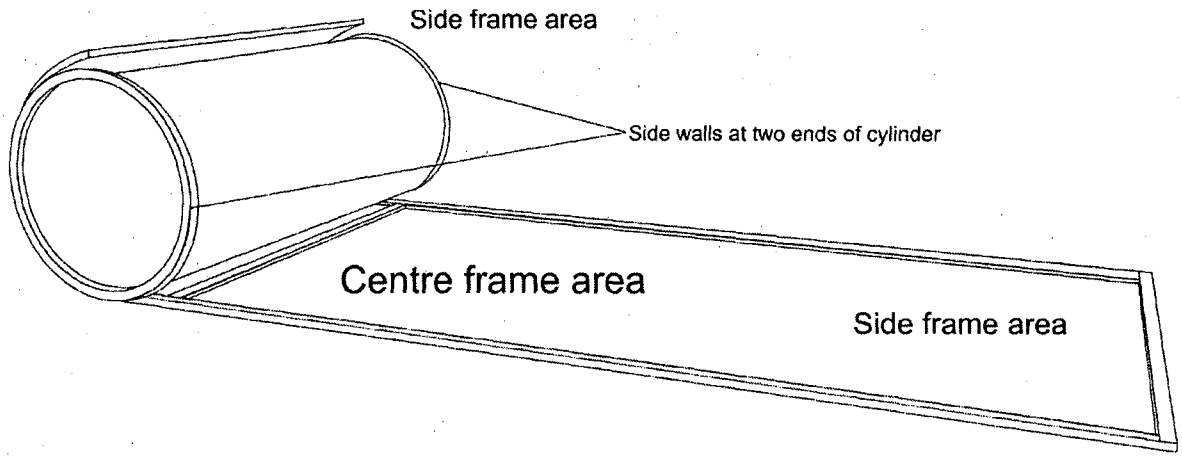

Radius of Rolling cylinder
Thickness of puzzle
Thickness of Mat
Average length of puzzle bits (a)

FIG 10


Side frame area
Side walls at two ends of cylinder
Centre frame area
Side frame area

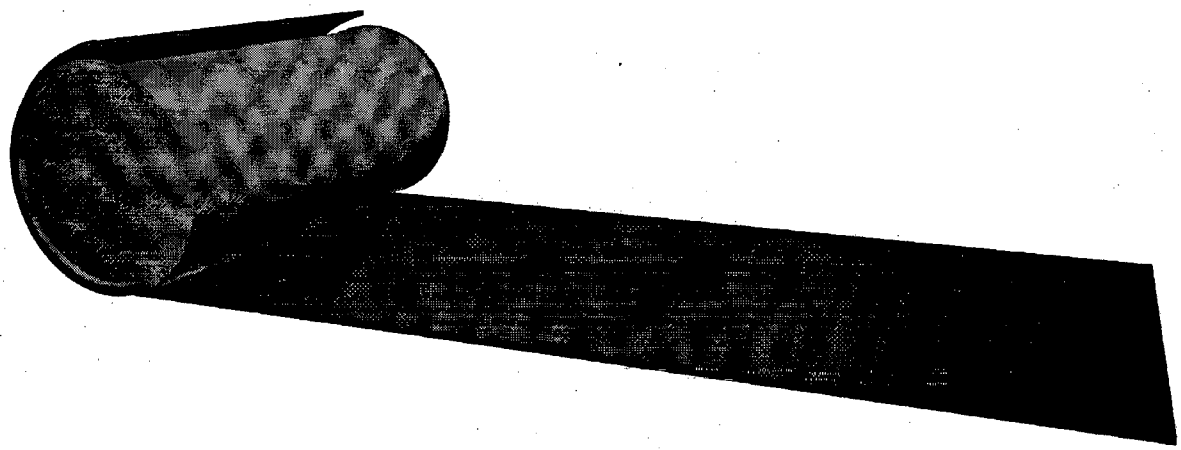


FIG 11

INTERNATIONAL SEARCH REPORT

International application No
PCT/IN2015/000195

A. CLASSIFICATION OF SUBJECT MATTER
INV. A63F9/10
ADD.

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)
A63F

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)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 375 707 A (RICHER JACQUES [CA]) 27 December 1994 (1994-12-27) claims 1-21; figures 1-4	1-10
X	WO 99/56845 A1 (WELLS PAUL [GB]) 11 November 1999 (1999-11-11) claims 1-10; figures 1-3c	1-10
X	AT 500 016 A1 (MINASS ERIK MAG [AT]) 15 October 2005 (2005-10-15) claims 1-10; figures 1-3	1,2,6, 8-10
X	US 2008/157468 A1 (DEDRICK PAUL [US]) 3 July 2008 (2008-07-03) claims 1-16; figures 1-11	1,2,8-10

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

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

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"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
21 October 2015	29/10/2015

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Shmonin, Vladimir

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INTERNATIONAL SEARCH REPORT

International application No
PCT/IN2015/000195

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 219 168 A (MORRIS JAMES E [US]) 15 June 1993 (1993-06-15) claims 1-7; figures 1-9 -----	1
A	CN 202 070 130 U (PEILI ZHANG) 14 December 2011 (2011-12-14) claims 1-4; figures 1,2 -----	7-10

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IN2015/000195

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		WO 9316775 A1	02-09-1993
CN 202070130 U	14-12-2011	NONE	