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⑥ **PUZZLE.**

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| ⑤① References cited:
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Description

This invention relates to an improved puzzle and, particularly, to a puzzle which is basically two dimensional in form, as far as a user is concerned.

Over the last two or three years there has been a great resurgence in interest in puzzles and the phenomenal acceptance of the puzzle known as Rubik's cube is a good indication of this.

Whilst three dimensional puzzles certainly have a great attraction and interest, I believe that they suffer from certain disadvantages in that, unless a user has a highly developed spatial sense, it is often difficult to appreciate what the effect of certain changes in orientation of the faces will be.

For this reason, I believe that a puzzle which is basically two dimensional, that is one where the user can, at all times, see all the components of the puzzle, would be of great interest and it is, to produce a puzzle of this type the object of the present invention lies.

It has already been proposed in FR—A—2405077 and in US—A—3655194 to provide a puzzle having two overlapping rotatable circles of equal radius, each circle comprising a plurality of petals and each petal being formed of two arcs which are portions of a circle, the arrangement being such that adjacent circles have a common component which is spatially displaced in response to selective rotation of the circles. The present invention now provides a puzzle of the kind described in which the circles are defined by the plurality of petals and a plurality of triangles, the circumference of the circle forming the arcs of the petals is the same as the circles of the puzzle, the petals have a chord equal to the radius of the circles of the puzzle, the triangles have faces each being an arc complementary to the arc of the petals and adjacent circles have a plurality of common components.

In one specific form of the invention, the petals and triangles have complementary tongues and grooves and the circles comprising the puzzle are located in a base which has a peripheral tongue or groove complementary to that of the adjacent petals, whereby the components of the circles are constrained but without limitation to the rotational movement between circles having common components.

In a preferred form of the invention I may provide the components of a synthetic plastics material and a body member which may be separable so that, on assembly there is provided a hand held puzzle, the upper face of which demonstrates the features of the puzzle, and which can be readily manipulated by a user's hands.

In order that the invention may be more readily understood, I shall describe the invention in relation to the accompanying drawings; in which:—

Fig. 1 is a top plan view of an assembled puzzle consisting of two inter-locking circles;

Fig. 2 is a section along line 2—2 of Fig. 1

showing the overall construction of the base and the petals and triangles;

Fig. 3 is an underneath view of the puzzle with the base removed;

Fig. 4 is a plan view of the base of the puzzle with the upper portion removed;

Fig. 5 is an underneath perspective view of a petal;

Fig. 6 is a similar underneath perspective view of a triangle; and

Figs. 7, 8 and 9 are schematic views showing how the concept of the invention can extend to a number of inter-locking circles which, themselves, can be in an arrangement which is aesthetically pleasing and which is adapted for use in a number of different applications.

I shall refer firstly to the embodiment of Figs. 1 to 6 and, more specifically, to the general concept of the invention which is best illustrated in Fig. 1.

It can be seen that there are, effectively, two overlapping circles 10 and 20, each of which can be considered as having six peripheral petals, petals generally being indicated at 15, and six radial petals, the petals of each circle enclosing six triangles, indicated generally at 16.

It will be noted that five petals 15ⁱ to 15^v and two triangles 16ⁱ and 16ⁱⁱ are common to the two circles, the petals 15ⁱⁱ and 15^{iv} being peripheral petals of the left circle and the other three being radial petals and petals 15ⁱ and 15ⁱⁱⁱ being peripheral petals of the right circle and the other three being radial petals.

As can readily be visualised, provided each of the components are capable of movement, one relative to the other, it would be readily possible to rotate, as a whole, one or other of the circles which rotation will cause the displacement of the common components so that they will be partially or completely removed from the common position and if then the same circle or, more particularly, the other circle is then partially rotated, so there can readily be a random mixing of the various components.

Provided then the original selection of colours of the various components is such as to provide an organised pattern, the puzzle provides the possibility of disturbing this organisation, which is simply done by random movement of the two circles, and then permits an attempt to reconstruct the original organisation or, alternatively, the possibility of starting from an initial, organised, situation and to transpose various parts of the organisation.

For example, as illustrated in Fig. 1, schematically I have shown the peripheral petals of the two circles as being of one colour, the radial petals, which are not common petals, as being of a second colour, although it may be preferred that the three such radial petals of one circle are all of a different colour to the equivalent petals of the other circle and the central common petal, petal 15^{iv}, may be of a different colour or a neutral colour. Similarly, whilst the various triangles 16 are shown as being uncoloured, it would be possible for the uncommon triangles, that is the

four triangles outwardly of the common petals, in each case, to be of the same or two different colours and of a colour or colours different to the common petals and it would be possible to effect transposition of these.

In this specification it is not proposed to provide specific instructions for any transposition of components or a general principle to return the components to the original organised position.

Referring now to Figs. 1 to 6 as they specifically illustrate one practical form of the invention, the invention can be considered to be illustrated as, effectively, full size in Fig. 1, although this is only exemplary, and is made from a face component 30, a base 31, nineteen petals 15 and ten triangles 16.

The various components may be moulded from a synthetic thermoplastics material and, preferably, a material which has good dimensional stability, as accuracy of formation is critical, and, also, which shows low friction properties where two components are in abutment or, alternatively, which is capable of being lubricated to give such properties.

I have found one suitable material for this to be high impact polystyrene and, if required, to aid the required frictional properties, the moulding powder may have incorporated a percentage of talc or of silicone.

The properties of various thermoplastics and methods of handling these are known in the art and will not be discussed further herein.

The face 30 is provided with a peripheral tongue 32 which extends fully around an aperture formed therein and which is spaced below the upper surface of the face by a distance equal to the thickness of the face member 33 of a petal 15.

Each petal has, below its face member 33, a groove 34 which is defined, on its lower edge, by a lower member 35, the arrangement being such that, when a petal is engaged with the peripheral tongue 32, the upper surface of the face 33 is at the same level as the upper surface of the face 30, the tongue 32 enters the groove 34 and transverse outward movement is restricted by the lower member 35.

Each triangle 16 is formed with a peripheral tongue 40 which is spaced below the triangle's face 41 by a distance equal to the thickness of the face member 33 of the petal so that, on inter-engagement of the triangle with the petal, so the upper surfaces of their face members lie in the same plane. Thus, when the total required number of petals and triangles are assembled into the aperture of a face member 30, the upper surface of the assembled body is effectively co-planar, as can be seen from the upper surface of Figure 2, and the outer appearance is then, of course, as illustrated in Fig. 1.

It will be seen that the lower member 35 of each petal is smaller than the face member 33 so that this does not, in any way, obstruct movement of the petal vis-a-vis the triangles and it will also be seen that each triangle has a lower portion 42 which is also smaller than the main body of the

triangle so as not, in any way, to obstruct movement of the triangle.

The downward extent of the portion 42 is such that its underside contacts ridges 51 in the base which extend upwardly therefrom and thus maintain the overall upper surface of the puzzle.

Also, in this way, because the area of contact is relatively restricted, there is a minimisation of friction between the components.

Each triangle has a downwardly extending stem 43 which extends below the surface of the portion 42 and which abuts the outer edge of ridges 50 and, thus, movement of the triangles is constrained by the location of these ridges and the relative orientation of the various components are also restrained.

Each petal is also provided with a pair of extensions 36, one of which abuts the outer surface of ridges 51 in the base to help to guide the petals in their movement and thus, again, to restrain these to move in the required manner.

Fig. 4 shows the orientation of the stems 43 and 36 in the base. Certain of the petals 15 and a triangle 16 are shown in this figure in chain dash lines to show the orientation of the components and the effective guiding by ridges 50 and 51.

Two arcuate grooves 52 are shown through the ridges 50, 51 and the external ridge in the base, which grooves permit the mounting of the peripheral petals in the common area. This can well be seen from examination of Fig. 4.

When the various components are assembled into the face member 30, the face member is located over the base 31 and the two members are held together either by gluing, ultrasonic welding or by any known method of connecting plastics components.

Although not illustrated, register springs may be provided to co-operate with the petals so that, on relative rotation of the two circular components on each required degree of rotation, that is after every 60° of rotation, the components will be positively located and the required orientation maintained.

Thus, if a user is to alternately rotate one circle to a stop and then the other similarly so the components will be in the correct orientation on each movement.

The embodiments of Figs. 7 to 9 show that the invention can be readily applied to a large variety of different combinations of circles and, reference to Figs. 7 and 8 specifically, will show the two ways in which three circles can be combined, Fig. 7 being where the centres of all three circles lie in a straight line and Fig. 8 shows an arrangement where such centres lie at the corners of an equilateral triangle.

Fig. 9 shows an arrangement of four circles where the centres are at the corners of a diamond having its shorter axis one radius of the circle and its longer axis the length of a chord having an arc comprised of the arcs of two petals.

It will be seen that by increasing the number of circles, so the orientation and complexity of the puzzle of the invention can be widely varied.

It will also be appreciated that, whilst the embodiment of Figs. 1 to 6 shows a particular constructional arrangement which is suitable for a hand held puzzle, there can be wide variation in the construction without departing from the concept of the invention.

For example, and exemplary only, there could be a surface which has a peripheral wall which defines the shape of the required puzzle and which is magnetic and each of the pieces of the puzzle could include a magnet of opposite polarity downwardly directed so that the whole assembly remains coherent but, yet, it being readily possible to effect rotation of the circles comprising the puzzle.

Claims

1. A puzzle having at least two overlapping rotatable circles (10, 20) of equal radius, each circle (10, 20) comprising a plurality of petals (15) and each petal being formed of two arcs which are portions of a circle, the arrangement being such that adjacent circles (10, 20) have at least one common component and selective rotation of either or any of the circles (10, 20) causes spatial displacement of the or each common component, characterised in that the circles are defined by the plurality of petals (15) and a plurality of triangles (16), the circumference of the circle forming the arcs of the petals is the same as the circles (10, 20) of the puzzle, the petals (15) have a chord equal to the radius of the circles (10, 20) of the puzzle, the triangles (16) have faces each being an arc complementary to the arc of the petals (15), and adjacent circles (10, 20) have a plurality of common components.

2. A puzzle as claimed in claim 1 wherein the petals (15) and triangles (16) have complementary tongues (40) and grooves (34) and the circles (10, 20) comprising the puzzle are located in a base which has a tongue or groove (32) on an inner periphery complementary to that of the adjacent petals, whereby the components of the circles are constrained but without limitation to the rotational movement between circles having common components.

3. A puzzle as claimed in claim 2, wherein the petals (15) and triangles (16) are of a synthetic plastics material and the base comprises two members (30, 31) which may be separable, the tongue or groove (32) being in the upper member (30) so that, on assembly, there is provided a hand held puzzle, the upper face of which demonstrates the features of the puzzle.

4. A puzzle as claimed in claim 3 wherein the lower base member (31) has at least one upwardly directed partial annular ridge (50) associated with each circle (10, 20) and each triangle (16) has a downwardly depending extension (43) adapted to be guided by one side of the ridge over a substantial part of its rotation.

5. A puzzle as claimed in claim 3 or 4 wherein the lower base member (31) has at least one upwardly directed partial annular ridge (51)

associated with each circle (10, 20) and each petal (15) has a downwardly depending extension (36) adapted to be guided by one side of the ridge over a substantial part of its rotation.

6. A puzzle as claimed in claim 3 wherein each petal (15) has two downwardly depending extensions (36), symmetrically located thereon, the spacing between the extensions being equivalent to the spacing between the associated upwardly directed annular ridges (51) of the adjacent circles (10, 20).

7. A puzzle as claimed in claim 1 wherein each petal (15) and triangle (16) is adapted to be located in a cut-out having the shape of overlapping circles (10, 20) and having means whereby they can be held therewithin.

8. A puzzle as claimed in claim 7 wherein each petal (15) and triangle (16) has a magnet associated therewith and having a base (30, 31) on or in which the petals and triangles are adapted to be received.

Patentansprüche

1. Puzzle mit wenigstens zwei überlappenden, drehbaren Kreisen (10, 20) mit gleichem Radius, wobei jeder Kreis (10, 20) eine Vielzahl von Blattelementen (15) aufweist, wobei jedes Blattelement aus zwei Kreisbögen gebildet ist und wobei die Anordnung so getroffen ist, daß benachbarte Kreise (10, 20) wenigstens einen gemeinsamen Bestandteil haben und eine ausgewählte Drehung eines oder jedes der Kreise (10, 20) eine räumliche Verschiebung des oder jedes gemeinsamen Bestandteils bewirkt, dadurch gekennzeichnet, daß die Kreise durch die Vielzahl der Blattelemente (15) und durch eine Vielzahl von Dreiecken (16) gebildet sind, wobei der Umfang des die Bögen der Blattelemente bildenden Kreises dem Umfang der Kreise (10, 20) des Puzzles entspricht, daß die Mittelsehne der Blattelemente (15) gleich dem Radius der Kreise (10, 20) des Puzzles ist, daß die Dreiecke (16) bogenförmige Seiten haben, die komplementär zu den Bögen der Blattelemente (15) sind, und daß benachbarte Kreise (10, 20) eine Vielzahl von gemeinsamen Bestandteilen haben.

2. Puzzle nach Anspruch 1, dadurch gekennzeichnet, daß die Blattelemente (15) und die Dreiecke (16) komplementär zueinander ausgebildete Laschen (40) und Nuten (34) haben und die das Puzzle umfassenden Kreise (10, 20) in einer Basis angeordnet sind, die eine Lasche oder Nut (32) an einer komplementär zu den angrenzenden Blattelementen ausgebildeten inneren Peripherie, wodurch die Bestandteile der Kreise zu der Drehbewegung zwischen den Kreisen mit gemeinsamen Komponenten, jedoch ohne Einarbeitung, genötigt sind.

3. Puzzle nach Anspruch 2, dadurch gekennzeichnet, daß die Blattelemente (15) und Dreiecke (16) aus synthetischem Kunststoff bestehen und die Basis zwei Teile (30, 31) umfaßt, die zerlegbar sein können, wobei die Lasche oder Nut (32) in dem oberen Teil (30) angeordnet ist, so daß sich

nach Zusammenbau ein handliches Puzzle ergibt, dessen Oberseite die Merkmale des Puzzles aufweist.

4. Puzzle nach Anspruch 3, dadurch gekennzeichnet, daß das untere Basisteil (31) wenigstens einen jedem Kreis (10, 20) zugeordneten, nach oben weisenden, teilkreisförmigen Wulst (50) aufweist und jedes Dreieck (16) eine nach unten weisende Erweiterung (43) hat, die durch eine Seite des Wulstes über einen wesentlichen Teil der Drehung geführt ist.

5. Puzzle nach Anspruch 3 oder 4, dadurch gekennzeichnet, daß das untere Basisteil (31) wenigstens einen mit jedem Kreis (10, 20) zugeordneten, nach oben gerichteten teilkreisförmigen Wulst (51) aufweist und jedes Blattelement (15) eine nach unten weisende Erweiterung (36) hat, die an einer Seite des Wulstes über einen wesentlichen Teil der Drehung geführt ist.

6. Puzzle nach Anspruch 3, dadurch gekennzeichnet, daß jedes Blattelement (15) zwei symmetrisch darauf angeordnet nach unten weisende Erweiterungen (36) aufweist, wobei der Abstand zwischen den Erweiterungen äquivalent ist zu dem Abstand zwischen den beiden zugehörigen nach oben gerichteten ringförmigen Wulsten (51) der benachbarten Kreise (10, 20).

7. Puzzle nach Anspruch 1, dadurch gekennzeichnet, daß jedes Blattelement (15) und jedes Dreieck (16) in einem Ausschnitt in der Gestalt sich überlappender Kreise (10, 20) angeordnet sind und Mittel aufweisen, durch die sie dazwischen gehalten werden.

8. Puzzle nach Anspruch 7, dadurch gekennzeichnet, daß jedes Blattelement (15) und jedes Dreieck (16) einen zugeordneten Magneten und eine Basis (30, 31) aufweisen, auf oder in der die Blattelemente und die Dreiecke aufgenommen sind.

Revendications

1. Un puzzle avec au moins deux cercles rotatifs (10, 20) de même rayon se recouvrant partiellement. Chaque cercle (10, 20) comporte plusieurs pétales (15), chaque pétale est formée de deux arcs formant des parties du cercle. Les cercles (10, 20) sont arrangés de manière à ce qu'ils sient au moins un composant commun et à ce qu'une rotation sélective de n'importe quel cercle (10, 20) entraîne un déplacement dans l'espace du (des) composant(s) commun(s). Ce puzzle est caractérisé en ce que les cercles sont définis par la pluralité des pétales (15) et par une pluralité de triangles (16). Il est également caractérisé en ce que la périphérie du cercle formant les arcs des pétales est égale à la périphérie des cercles (10, 20) du puzzle. Il est également caractérisé en ce que les pétales (15) ont une corde égale au rayon

des cercles (10, 20) du puzzle, que les faces des triangles (16) forment des arcs complémentaires aux arcs des pétales (15), et que les cercles (10, 20) ont une pluralité de composants communs.

2. Un puzzle suivant la revendication 1, caractérisé en ce que les pétales (15) et les triangles (16) comportent des languettes (40) et des rainures (34) complémentaires. Ce puzzle est également caractérisé en ce que les cercles (10, 20) sont montés dans un logement qui comporte une languette ou une rainure (32) sur une périphérie intérieure et complémentaire à celle des pétales adjacentes. Cela produit une contrainte entre les composants des cercles, mais ceci sans limitation du mouvement rotatif des cercles de composants communs.

3. Un puzzle suivant la revendication 2, caractérisé en ce que les pétales (15) et les triangles (16) sont en matière plastique synthétique et que le logement comporte deux éléments (30, 31) séparables. L'élément supérieur (30) comporte une languette ou une rainure (32) afin que, lors de l'assemblage, on obtienne un puzzle qui peut être tenu dans la main et dont la face supérieure démontre les caractéristiques du puzzle.

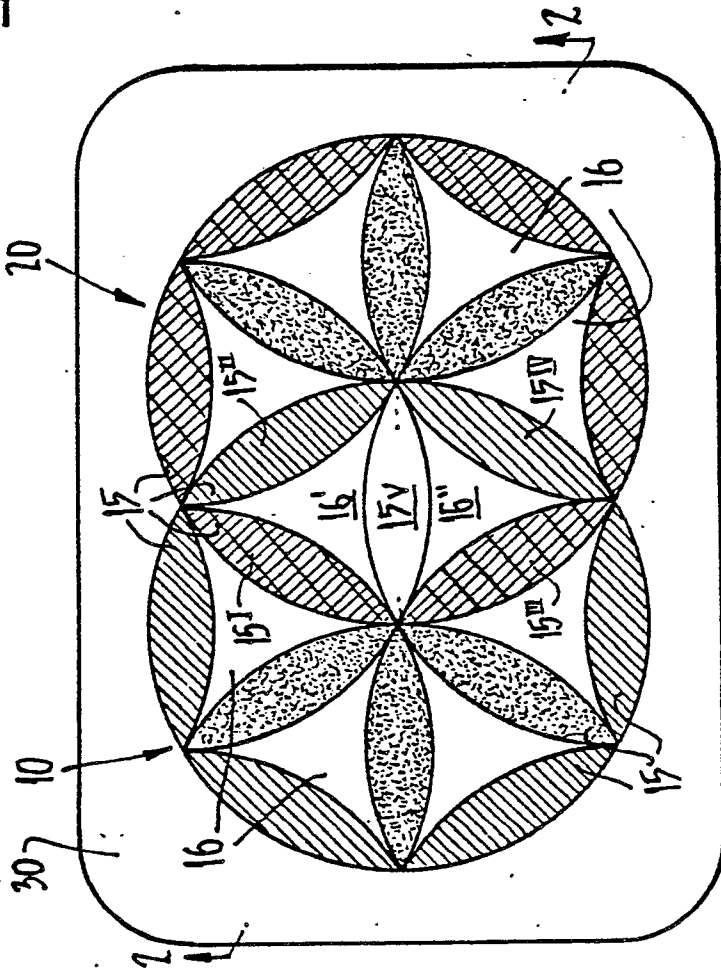
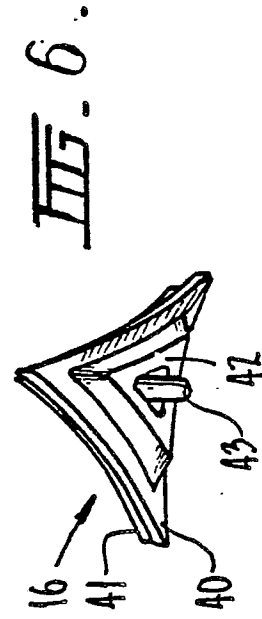
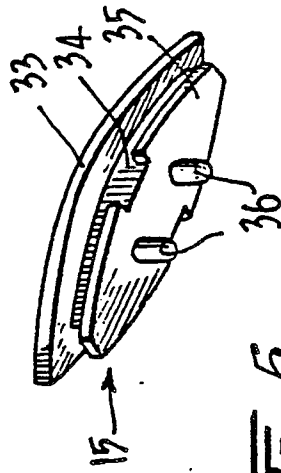
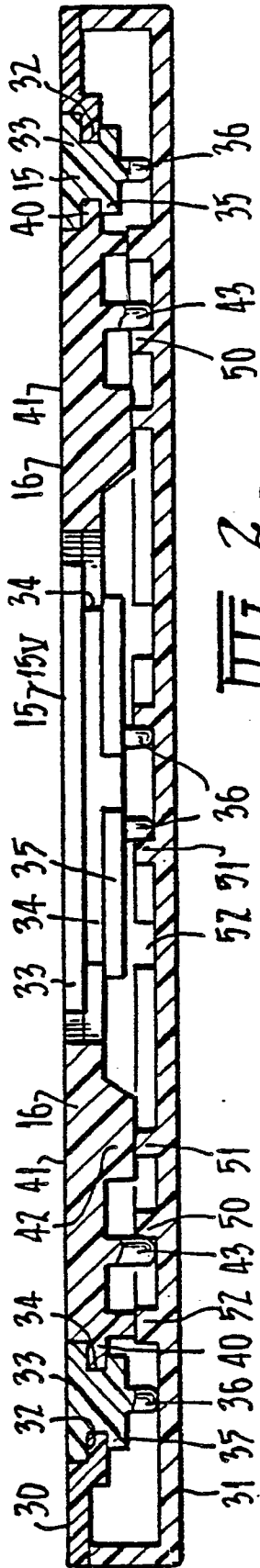
4. Un puzzle suivant la revendication 3, caractérisé en ce que l'élément inférieur (31) du logement comporte au moins une crête (50) en forme d'anneau partiel associée à chaque cercle (10, 20). Chaque triangle (16) comporte une goupille (43) guidée par le côté de la crête lors de la majeure partie de la rotation.

5. Un puzzle suivant les revendications 3 ou 4, caractérisé en ce que l'élément inférieur (31) du logement comporte au moins une crête (51) en forme d'anneau partiel associé à chaque cercle (10, 20). Il est également caractérisé en ce que chaque pétale (15) comporte une goupille (36) guidée par le côté de la crête lors de la majeure partie de la rotation.

6. Un puzzle suivant la revendication 3, caractérisé en ce que chaque pétale (15) comporte au moins deux goupilles de guidage (36) symétriques par rapport au centre de la pièce et séparées par un espacement équivalent à celui entre les crêtes (51) en forme d'anneaux partiels associés aux cercles adjacents (10, 20).

7. Un puzzle suivant la revendication 1, caractérisé en ce que chaque pétale (15) et chaque triangle (16) est conçu pour être placé dans un logement découpé ayant la forme des cercles recouvrants (10, 20) et comportant un dispositif de maintien.

8. Un puzzle suivant la revendication 7, caractérisé en ce que chaque pétale (15) et chaque triangle (16) comporte un aimant et que le puzzle comprend un logement (30, 31) sur ou dans lequel sont placés les pétales et les triangles.



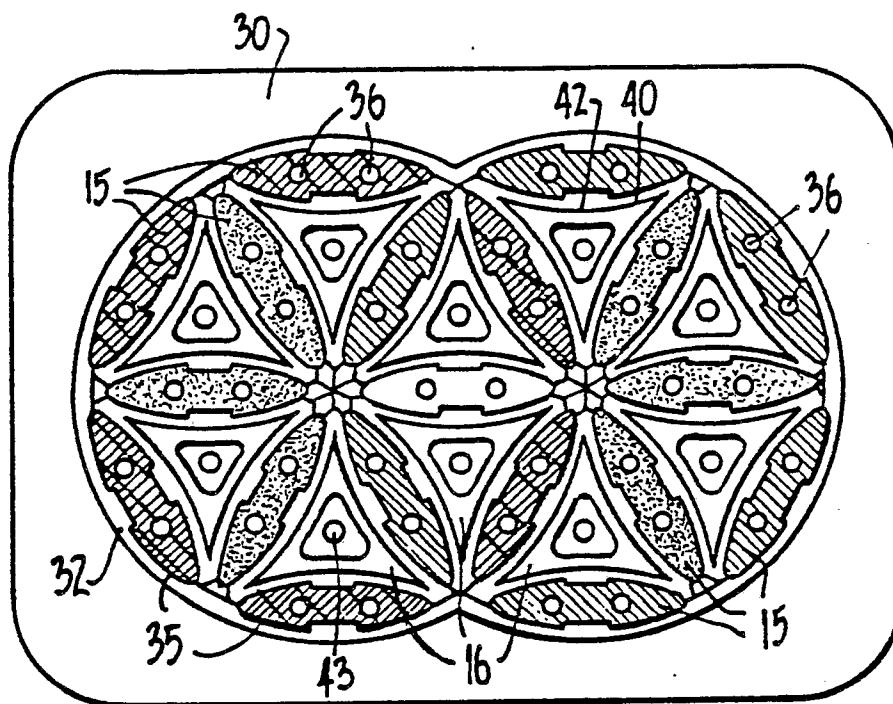


FIG. 3.

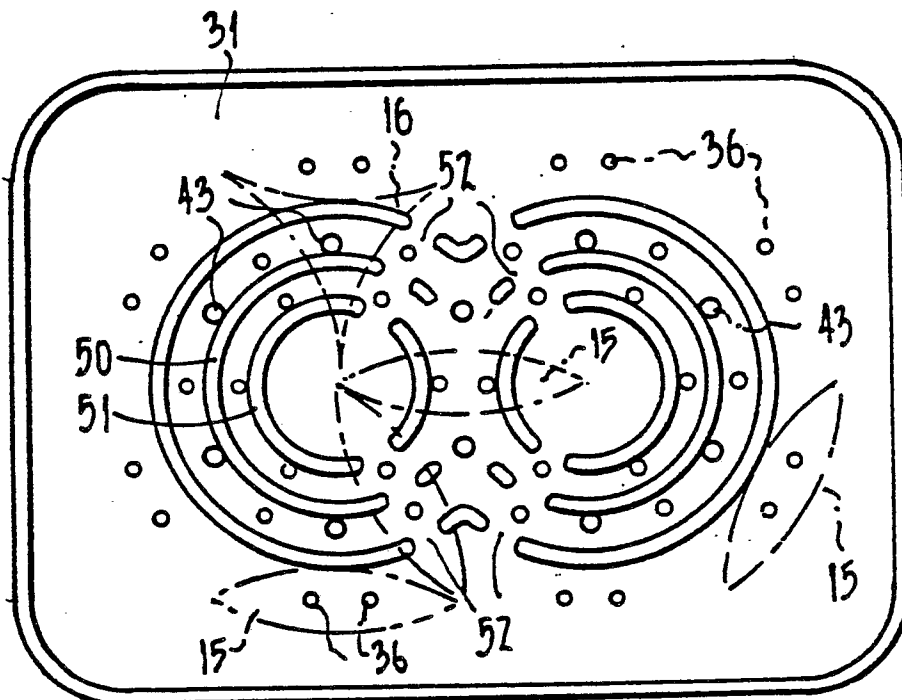
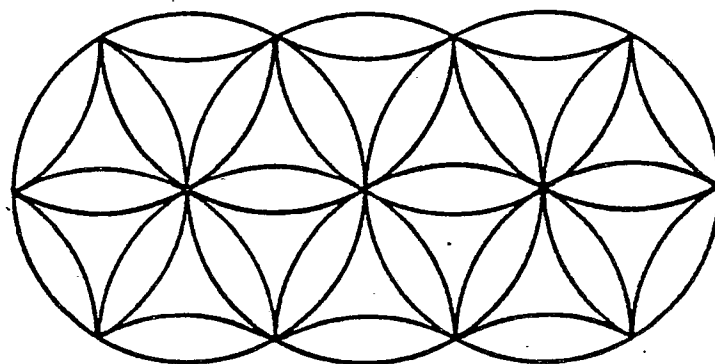
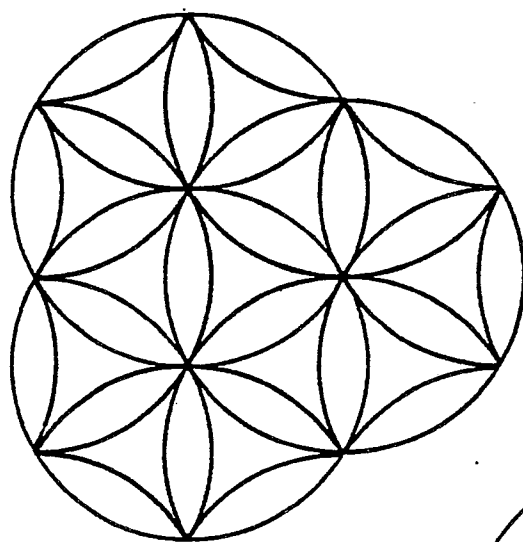


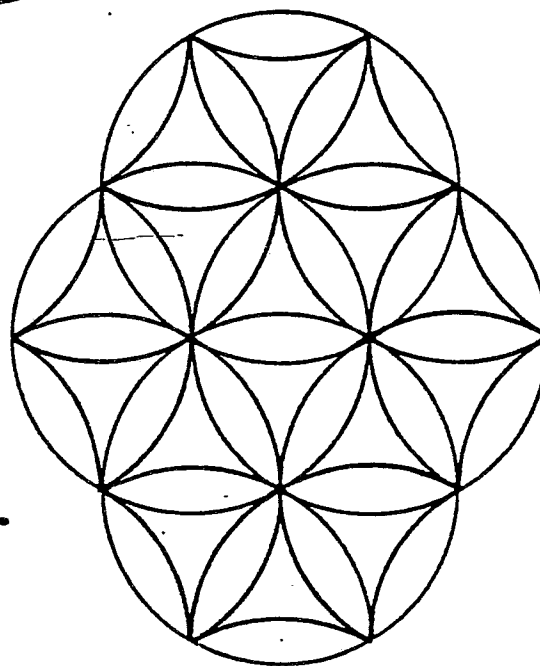
FIG. 4.



III. 7.



III. 8.



III. 9.