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Declaration under Rule 4.17:

— of inventorship (Rule 4.17(iv))

[Continued on next page]

(54) Title: THE THREE-DIMENSIONAL JIGSAW

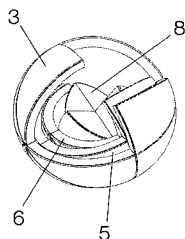


FIG. 8

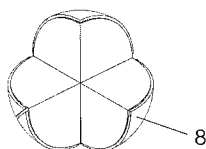


FIG. 9

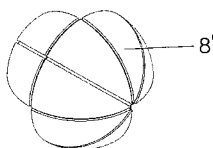


FIG. 10

(57) Abstract: The three-dimensional jigsaw is a toy made up of several spherical surfaces, preferably 4 spherical surfaces of different diameters, which are situated one inside the other and made up of individual elements, which are mutually joined in such a way that they form an individual spherical surface. The toy's final shape is achieved by joining the housing (3), element (2), and movable elements which are placed within the housing. Element (2) is a spherical segment made up of two neighboring spherical segments (4) of the top half of the sphere and two neighboring segments (4) of the bottom half of the sphere which are mutually shifted by 45°, i.e. the width of one segment of the sphere. Inside the housing (3) there are smaller diameter spheres (5), (6) and (7) with clearance between them, thereby enabling the rotation of each individual spheres within the other in all possible directions. Spheres (5) and (6), depending on the method of realizing the invention, consist of 4 elements or 2 elements, while the smallest diameter sphere essentially makes up an orb (7) considering the fact that it regularly consists of two full elements (8) and (8') (pictures 8, 9 and 10).



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- *with international search report*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

## THE THREE-DIMENSIONAL JIGSAW

Field of technique

The subject invention generally refers to a toy created from several mutually joined essentially similar individual elements in such a way that they form a spherical surface. Specially, the subject invention is envisioned as a three-dimensional jigsaw which consists of a series of spherical elements which function as components of a bigger whole, and assembly and disassembly of the toy is possible. According to the international classification of patents the subject invention can be classified as A63H33/00 to A63H33/10.

Technical problem solved by the invention

The three-dimensional jigsaw is a toy made up of several spherical surfaces, preferably 4 spherical surfaces, which are arranged one inside another, which consist of essentially geometrically same individual elements, different in their dimensions, which can easily be mutually joined in a way so as to form a spherical surface. This toy helps in developing fine motor skills in pre-school children, and considering the complexity during the assembly/disassembly of the toy, this toy can be produced in several varieties of models, depending on the child's age, that is, a simpler and a more complex variation of assembling the elements into the spherical element. To achieve the reduction in the weight of the toy, the recommended material for producing the toy is a foam-like material with a polyurethane base. Also, the three-dimensional jigsaw is firm, has a smooth surface and good sliding properties.

State of technique

As it is known, there are several types of toys on the market, aimed at developing the skill of assembling elements. In general, most of the toys possess a certain degree of complexity which cannot be changed according to the child's age. Jigsaw toys are made up of essentially similar individual elements which are joined between themselves by way of special joints or fasteners.

Document EP 63816 depicts a spatial jigsaw (puzzle) which consists of several three-dimensional elements that cannot be separated from one another, and that can move in relation to one another and are placed one inside the other. The outer and inner spherical elements have symbols which can be moved. The spatial jigsaw is used to develop patience and three-dimensional perspective.

Document WO9420186 displays a spherical shape (10) which is made up of several elements (12) of polygonal shape that are mutually overlapping with their side walls. Each of the polygonal members has an outer surface of a predetermined shape and peripheral side edges that stretch from the outer surface and which limit the outer surface. Means of joining the coinciding edges of the polygonal parts is also supplied, so that a spherical shape can be formed.

Document US5100359 depicts a toy made from a certain number of different elements which are mutually joined so as to form a spherical shape. The first part of the elements has a pyramid-like shape with a hexagonal cross-section, and the other part of the elements, of which each has a pyramid-like shape with a pentagonal cross-section. The corresponding elements are joined in a special way so as to form a spherical shape, and have mutually overlapping protrusions and sockets.

Neither one of the above-stated documents depicts a three-dimensional jigsaw which has a variable degree of difficulty, i.e. variations in construction which require a more complex or a simpler level of expertise in assembling into a spherical shape, and can be adjusted in respect to the child's age. Furthermore, all the documents show essentially one spherical surface which is composed of several elements that are mutually overlapping because of their shapes, while the subject invention has more spherical surfaces arranged one inside the other, made up of elements which have to be assembled, while all the spherical surfaces freely rotate in all directions, which develops the child's knowledge of the geometrical shape of a sphere and its properties during the process of assembly or disassembly.

#### Exposition of the invention's essence

The purpose of the subject invention is to create a new type of toy consisting of individual elements which can be assembled, which apart from developing the skill of assembly and the three-dimensional perspective also offers the possibility of varying degrees of difficulty in manipulation, without changing the concept upon which the three-dimensional jigsaw is based.

The subject invention is comprised of several spherical shapes of varying dimensions which are situated one inside the other. Each of these spheres consists of several elements which can be mutually joined into a spherical surface, while the spheres can freely rotate in all directions.

Following one of the methods of realizing the invention, each of the spherical surfaces consists of 4 geometrically identical elements, while the spherical surface with the smallest diameter consists of two equal elements.

Following another method of realizing the invention, the spherical surfaces can consist of 2 geometrically different elements, where the spherical shape with the smallest diameter consists of two equal elements.

Following the method of realizing the subject invention, the side walls of certain elements have the same angle which is identical for all the elements. The spherical shapes can have different diameters; however the angles of the elements' sides remain the same in relation to the central point of the resulting sphere. The desirable dimension of the outer spherical surface is between 100 and 120 millimeters, while the targeted weight of the fully assembled toy is between 150 and 200 grams.

#### Short description of the pictures

Picture 1 shows the final shape of the fully assembled toy 1,

Picture 2 shows the three-dimensional view of the sphere disassembled into 4 component elements 4 following one of the methods of realizing the invention,

Picture 3 shows the three-dimensional view of the element of sphere 2 in various positions,

Picture 4 shows the three-dimensional view of the outer sphere made up of two elements,

Pictures 5, 6, 7 and 8 show the three-dimensional view of the toy in various phases of the spheres' assembly, and

Pictures 9 and 10 show the layout and the three-dimensional view of element 8 of sphere 7.

#### Detailed description of the invention

Referring to the pictures, the three-dimensional jigsaw is a toy created from several spherical surfaces, preferably 4 spherical surfaces of different diameters, which are located one inside the other and which are assembled from individual elements, which can easily be joined in such a way that they form an individual spherical surface. The three-dimensional jigsaw is made up of spherical surfaces of different diameters, preferably 4 spherical surfaces (1), (5), (6) and (7), which are located one inside the other and assembled from individual elements, in such a way that they form a single spherical surface, where the outer spherical surface (1) is made up of the housing (3) and the element (2) inside which is a smaller diameter sphere (5) inside which is an even smaller diameter sphere (6), where spheres (5) and (6) are made up of 4 elements (2), and the sphere with the smallest diameter basically makes up an orb (7) which is made up of two elements (8, 8').

Reference mark 1 denotes the final shape of the toy which is achieved by assembling the housing 3, element 2 and 10 movable elements which are located inside the housing, i.e. 6 movable elements within the housing, in case of the simpler model. The individual elements are expressed in the form of small elements made up of a plastic or similar material or polyurethane based foamy material. When housing 3 and element 2 are assembled they make up the outer sphere 1 that has the biggest diameter. The spheres are visually, by way of sockets or grooves 0,5 to 1 millimeter deep, divided in half, and each half of the sphere is divided into 8 identical spherical segments 4, so that the angle of one spherical segment is 45°. Following one method of realizing the invention, element 2 is a spherical segment made up of two neighboring spherical segments 4 of the top half of the sphere and two neighboring

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segment 4 of the bottom half of the sphere which are shifted between themselves by  $45^\circ$ , i.e. the width of one sphere segment (see picture 3).

Within housing 3, there are smaller diameter spheres 5, 6 and 7. The clearance between the outer sphere (housing 3 and element 2) with the biggest diameter and sphere 5 is such that it enables an uninterrupted rotation of sphere 5 in all directions. Also, clearances between spheres 5 and 6, and sphere 6 and sphere 7 are such that the rotation of each individual sphere is enabled within another in all possible directions. Rotation is enabled thanks to the smooth surface of the elements which are made of the stipulated polyurethane based foamy material. When choosing the material needed for production, attention should be placed on the fact that the elements making up the jigsaw must possess: firmness, smooth surface and good sliding properties, as well as durability to wear and tear and atmospheric influences.

Spheres 5 and 6, depending on the method of realizing the invention, are made up of 4 elements or 2 elements. As it is seen from picture 2, by one method of realizing the invention spheres 5 and 6 are made up of 4 identical elements of which each element has a geometrical shape identical to the shape of element 2 which has already been defined for the outer sphere.

Following the other method of realizing the invention, spheres 5 and 6 are made up of two elements of which one has the shape of housing 3, and the other the shape of element 2 which are already geometrically defined for the outer sphere.

The smallest diameter sphere essentially makes up orb 7 considering that it regularly consists of two full elements 8 and 8'. Following one of the methods of realizing the invention, according to picture 8, one full element 8 is shown, which has three equal and symmetrically placed orb segments (horns), mutually interlocking with the other geometrically identical element 8' in such a way that they make up a sphere. Following the other method of realizing the invention, the sphere can be divided into two pieces which are not geometrically the same in such a way that the surfaces between the two orb parts geometrically overlap one on top of the other so as to form a full element, i.e. sphere 7.

The complexity of assembling the three-dimensional jigsaw is increased depending on the number of parts that have to be assembled, that is depending on the number of movable elements placed within the housing. Additionally, the geometrical shape of the elements which mutually compose into spheres can be different than the geometrical shape, provided that their shape is such that the extraction or the assembly of elements is enabled. Also, the individual movable elements placed within the housing, in such a way that they form spheres, can be of different geometrical shapes, which also contribute to the complexity of assembling the toy. The greater the number of individual elements, which require specific positioning in order to assemble the toy's final shape, the more complex the assembly is going to be.

By increasing the opening in the housing and omitting the sockets which create an optical illusion, it is possible to reduce the level of difficulty of solving the subject jigsaw. Opposite to that, by using more indented and less regular shaped sockets it is possible to significantly increase the difficulty of manipulating the toy. The displayed invention has three levels, but their number can be increased by decreasing the width of the walls of individual levels, and by changing the diameter of the housing. In determining the complexity of assembly or disassembly of the toy, color also has a certain role. Through the stated variations it is possible to create toys which are suited for different ages with respect to the difficulty of their assembly / disassembly.

Since the invention is displayed and described by calling upon certain desired methods of realizing it, it is implied that the expert persons from the technical field can make different changes in the form and details of the invention, without losing sight of the purpose and the entirety of the invention. Therefore, the object of protection of the invention shouldn't be limited by the methods of its realization, but should be defined by the patent claims which are stated next.

## CLAIMS

1. The three-dimensional jigsaw, **indicated by the fact that**, it consists of spherical surfaces of different diameters, with preferably 4 spherical surfaces (1), (5), (6) and (7), which are placed one inside the other and which are made up of individual elements, in such a way so as to form an individual spherical surface, where the outer spherical surface (1) consists of the housing (3) and the element (2) inside which a smaller diameter sphere (5) is placed, inside which an even smaller diameter sphere (6) is placed, where spheres (5) and (6) consist of 4 elements (2), and the smallest diameter sphere essentially makes up an orb (7) which consists of two elements (8, 8').
2. The three-dimensional jigsaw according to claim 1, **indicated by the fact that**, the spherical surfaces (1), (5), (6) and (7) are divided in half by way of sockets, and each half of the sphere is divided into 8 identical spherical segments (4) so that the angle of an individual spherical segment is  $45^\circ$ , where the preferred depth and width of the groove is 0,5 to 1 millimeter.
3. The three-dimensional jigsaw according to claim 1, **indicated by the fact that**, the clearance between the outer sphere (1), which has the biggest diameter, and sphere (5), and between spheres (5) and (6), and spheres (6) and (7) is such that it enables the uninterrupted rotation of each individual sphere within the other in all possible directions.
4. The three-dimensional jigsaw according to claim 1, **indicated by the fact that**, the element (2) with the shape made up of two neighboring spherical segments (4) of the top half of the sphere and the two neighboring spherical segments (4) of the bottom half of the sphere, where the neighboring spherical segments of the top half of the sphere and the bottom half of the sphere are mutually shifted by  $45^\circ$ , i.e. the width of one segment of the sphere.
5. The three-dimensional jigsaw according to any of the preceding claims, **indicated by the fact that**, spheres (5) and (6) consist of 4 equal elements of which each element has a geometrical shape identical to the shape of element (2).
6. The three-dimensional jigsaw according to claim 1, **indicated by the fact that**, the orb (7) consists of two geometrically equal full elements (8, 8') where elements (8, 8')

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have three equal and symmetrically placed orb segments, which mutually interlock in such a way that they form an orb.

7. The three-dimensional jigsaw according to claims 1 and 5, **indicated by the fact that**, the orb (7) is divided into two parts which are not geometrically the same, whose surfaces between the two elements (8, 8') geometrically overlap each other so as to form an orb (7).
8. The three-dimensional jigsaw according to any of the preceding claims, **indicated by the fact that**, each of the spheres (5) and (6) consists of 2 geometrically different elements whose shapes correspond with the shape of the housing (3) and element (2), or 4 geometrically identical elements whose shape corresponds to the shape of the element (2), or 4 mutually geometrically different elements.
9. The three-dimensional jigsaw according to any of the preceding claims, **indicated by the fact that**, the geometrical shape of the elements mutually forming a sphere is different than the geometrical shape of the element (2).
10. The three-dimensional jigsaw according to any of the preceding claims, **indicated by the fact that**, all the elements (2) with a spherical surface have a smooth surface, and that they are made from a polyurethane based foamy material.

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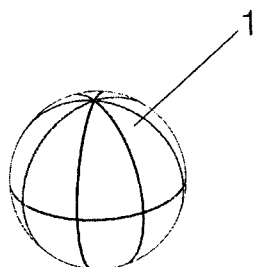


FIG. 1

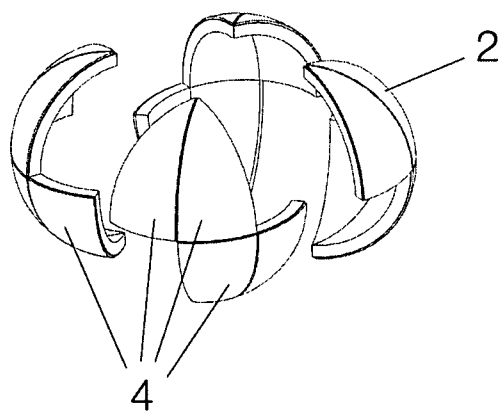


FIG. 2

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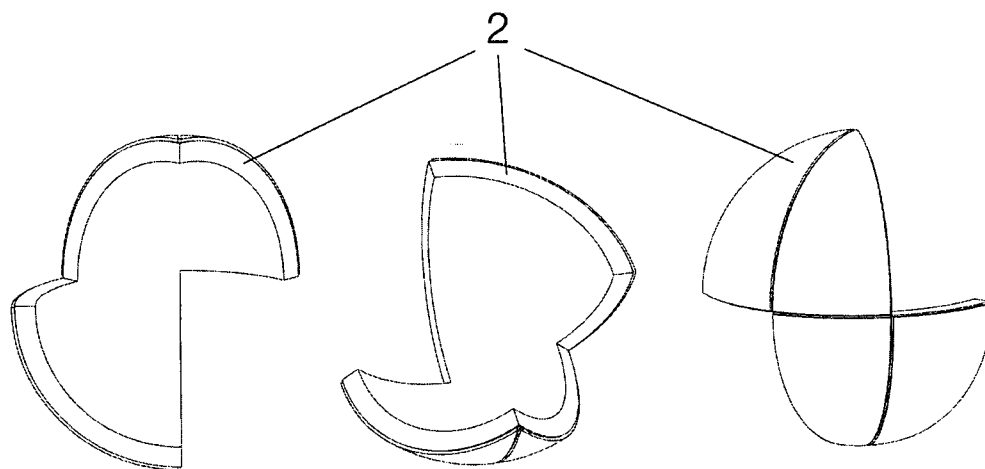


FIG. 3

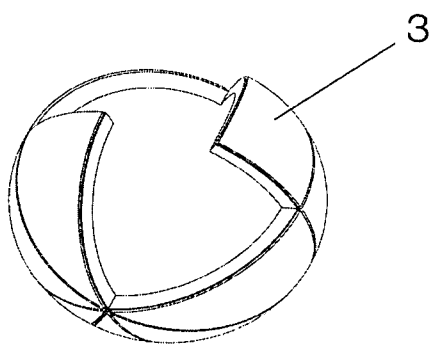


FIG. 4

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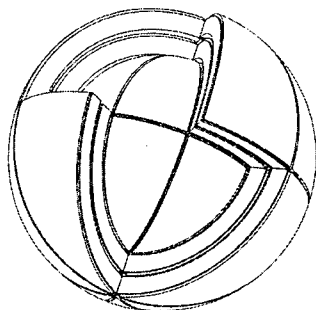


FIG. 5

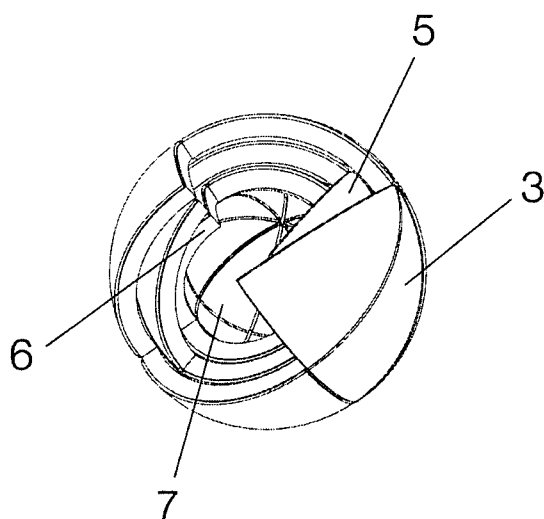


FIG. 6

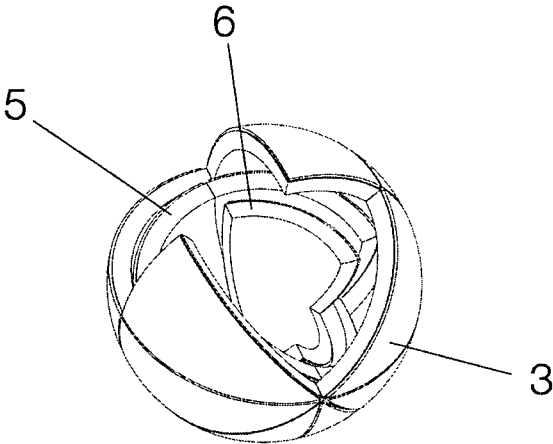


FIG. 7

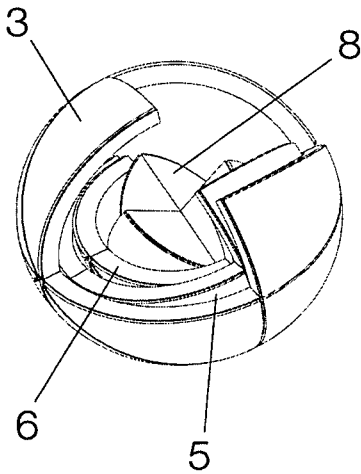


FIG. 8

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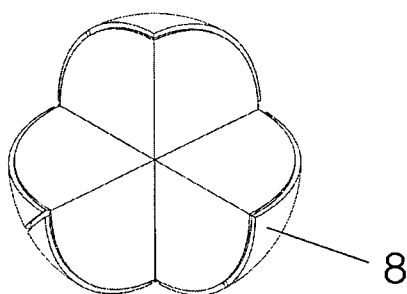


FIG. 9

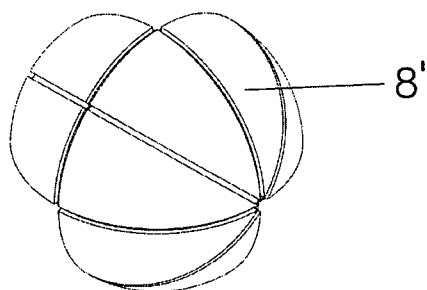


FIG. 10

## INTERNATIONAL SEARCH REPORT

International application No

PCT/HR2008/000026

## A. CLASSIFICATION OF SUBJECT MATTER

INV. A63F9/08

ADD. A63F9/12

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)

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 practical, 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             | BE 904 894 A1 (MUNNIX INES MARIA)<br>1 October 1986 (1986-10-01)<br>page 1, line 4 - line 6<br>page 2, line 17 - line 21<br>claim 4<br>figures | 1                     |
| A             | EP 0 385 518 A (REZE VITAL DE [BE])<br>5 September 1990 (1990-09-05)<br>figures                                                                | 1                     |
| A             | EP 0 295 787 A (HEDRON LEISURE LIMITED<br>[GB]) 21 December 1988 (1988-12-21)<br>figure 11                                                     | 1                     |
| A             | US 6 805 350 B1 (WU YU FENG [TW])<br>19 October 2004 (2004-10-19)<br>the whole document                                                        | 1                     |
| -----<br>-/-- |                                                                                                                                                |                       |



Further documents are listed in the continuation of Box C.



See patent family annex.

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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

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\*8\* document member of the same patent family

Date of the actual completion of the international search:

17 November 2008

Date of mailing of the international search report

28/11/2008

Name and mailing address of the ISA/

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Turmo, Robert

# INTERNATIONAL SEARCH REPORT

International application No  
PCT/HR2008/000026

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 2 424 538 A (BEDER SAMUEL L)<br>29 July 1947 (1947-07-29)<br>the whole document<br>----- | 1                     |
| A         | US 784 888 A (F.F.REISNER)<br>14 March 1905 (1905-03-14)<br>the whole document<br>-----     | 1                     |

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/HR2008/000026

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date         |
|-------------------------------------------|---------------------|----------------------------|-----------------------------|
| BE 904894                                 | A1                  | 01-10-1986                 | NONE                        |
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| EP 0295787                                | A                   | 21-12-1988                 | NONE                        |
| US 6805350                                | B1                  | 19-10-2004                 | US 2004222588 A1 11-11-2004 |
| US 2424538                                | A                   | 29-07-1947                 | NONE                        |
| US 784888                                 | A                   |                            | NONE                        |