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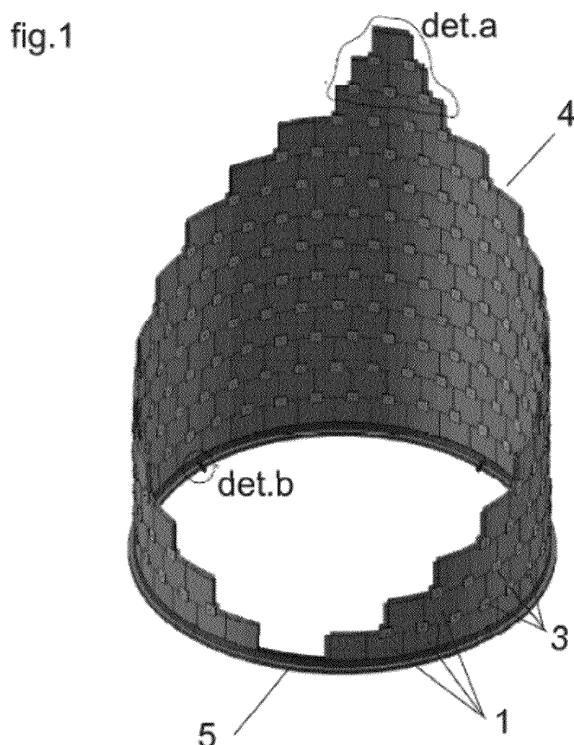
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(54) **BUILDING SYSTEM BASED ON PLATES OF RECYCLED MATERIAL**

(57) CONSTRUCTIVE SYSTEM BASED ON RECYCLED MATERIAL PLATES. In which a plurality of plates (1), made of injected recycled polymer material, joined together by coupling fittings (2) and secured by retaining

devices (3) form peripheral walls (4). Fitted on a base (5) which reproduces the floor plan of the structure being assembled.



## Description

### Technological field of the invention

[0001] The present invention generally pertains to the technological field of building construction systems and refers more specifically to a new design applied to a construction system employing recycled plastic material boards specially designed for silos Bulk carriers.

### Background of the invention

[0002] Although the system has been designed for preferential application in silos, it should be pointed out that it is used in numerous other types of buildings, such as sheds, houses and others, it being not the purpose of this descriptive report to limit the invention only to its preferential application. Thus, while the invention is described and illustrated with respect to a silo, it will be understood by one skilled in the art that the teachings disclosed herein may be applied to any type of building.

### Novelty and objectives of the invention

[0003] The invention disclosed in this specification relates to a plate-based construction system of recycled material, especially designed for silos, but which can be applied in the construction of a wide variety of other structures.

[0004] The structure consists essentially of plates of injected recycled polymer material, such as PET or other polymers. The plates have a shape that provides reciprocal fit and formation of a cohesive web of high structural strength. These plates are designed to allow fittings on all its edges (sides, top and bottom), to provide extremely easy, practical and fast assembly. In addition, the plates can be stacked and easily transported to the place where the structure will be built (silo or other type of building).

### Brief description of the drawings

[0005] In order that the present invention is fully understood and practiced by any person skilled in the art, it will be explained in a clear and sufficient manner to enable its reproduction, based on the attached drawings, which are only exemplary preferred embodiments of the invention without any intention of limiting the scope of protection only to the particular embodiments represented, in which:

**Figure 1** is a perspective view of a silo being constructed with the proposed constructional system, wherein a detail a and a detail b are highlighted.

**Figure 2** is the enlarged detail a, depicting a series of plates secured to each other (shown in dashed lines for better visualization of the fixation).

**Figure 3** is the detail b shown on an enlarged scale revealing a lower tie ring of the structure.

**Figure 4** is a cross-sectional detail of the peripheral wall and the lower tie ring of the structure.

**Figure 5** is a detail in top view of the peripheral wall and lower tie ring of the structure.

**Figure 6** is a perspective view of a plate.

**Figure 7** is a front view of the plate.

**Figure 8** is a top view of the plate.

**Figure 9** is a bottom view of the plate.

**Figure 10** is a side view of the plate.

**Figure 11** is a perspective view of the plate securing device.

**Figure 12** is a front view of the plate securing device.

**Figure 13** is a top view of the plate securing device.

[0006] It will be apparent to one skilled in the art that although the plates have been shown to have a curved profile, this shape is derived from the fact that they are intended to form a silo. The plates may be straight to form straight-walled structures and will still be within the scope of the invention.

[0007] It will also be apparent to one skilled in the art that the dimensions, thicknesses and materials of the boards will depend on the needs of each design and that the curvature of each board will depend on the diameter of the silo to be constructed.

### Detailed description of the invention

[0008] The present invention relates to a plate-based constructional system of recycled material comprising a multiplicity of plates (1), made of injected recycled polymer material, joined together by coupling hubs (2) and secured by plate retaining device (3), forming peripheral walls (4) fitted onto a base (5) which reproduces the base floor of the structure being assembled.

[0009] The plates (1) are preferably comprised of recycled PET, but a number of other polymers may also be used, new, fully recycled materials or a mixture thereof may be employed. Each plate (1) is constituted by a main body (6) provided with recesses (2') and shoulders (2'') which form the reciprocal inserts with the subsequent plates (1). Each plate (1) is provided with holes (7) for receiving the retaining devices (3), which are formed by two panels (8 and 8') joined by steel screw (9), associated with washers and locking nut (10). Said devices (3) are mounted at each fixing point defined by the holes (7),

traversing the screw 9 and having a panel (8) on the inner surface of the wall (4) and a panel (8') on the outer surface of said wall (4), the final tightening being carried out through the nut (10). The base (5) is constituted by a rail, preferably of metal, which reproduces the inner and outer profile of the bottom of the plate (1) to provide perfect fit thereto.

**[0010]** In a preferred embodiment of the invention (shown by the figures), the proposed system is employed for the assembly of a silo (6), in which case the plates (1) have a curved profile, the curvature of which is a function of diameter of the silo. In this case, the rail forming the base (5) has a circular configuration. Preferably, the metal base (5) is subdivided into several sections to facilitate transportation, which are attached and secured together by screws at the site of the structure installation, and are secured to the ground by chemical or mechanical anchor bolts. The metal rail (5) may also be drilled at several points in its extension to receive screws, nut and washers, which will traverse the entire rail assembly (5) and the holes (7) of the plate (1) for final fixing of the plate to the base.

**[0011]** In another embodiment, the plates (1) are straight profile and the base (5) is constituted by rails which are joined in a different shape from the circular one.

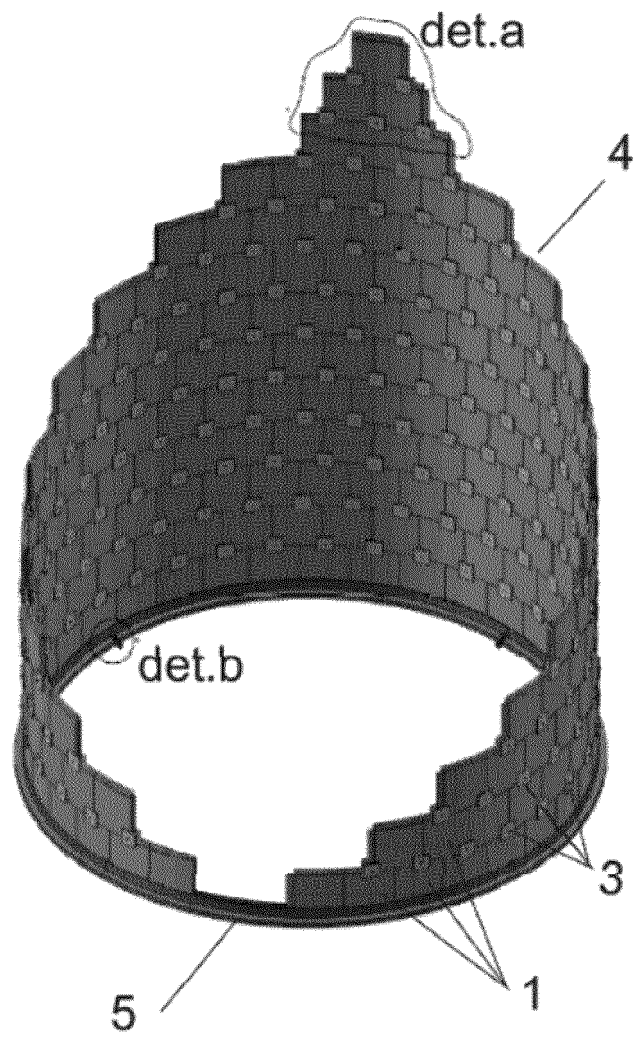
er profile of the lower part of the plate (1).

7. The invention of claim 1 wherein the plates (1) have a curved profile.
8. The invention of claim 7 wherein the base (5) has a circular configuration.
9. The invention of claim 1 wherein the plates (1) have a straight profile.
10. The invention of claim 1 wherein base (5) has any configuration.
11. The invention of claim 1 wherein the base (5) is subdivided into several sections joined and secured together by screws and fixed to the ground by chemical or mechanical anchor bolts.

## Claims

1. A constructive system based on recycled material plates comprising a multiplicity of plates (1), consisting of injected polymeric material, joined together by coupling hubs (2) and fixed by retaining devices (3), forming peripheral walls (4) fitted onto a base (5) which reproduces the floor plan of the structure being assembled.
2. The invention of claim 1 wherein each plate (1) is comprised of new, recycled polymer material or a mixture of both.
3. The invention of claim 1 wherein each plate (1) is constituted by a main body (6) provided with recesses (2') and shoulders (2''), which form the plates which form the reciprocal inserts with the subsequent plates (1).
4. The invention of claim 1 wherein each plate (1) is provided with holes (7) for receiving the retaining devices (3).
5. The invention of claim 4 wherein the retaining device (3) is formed by two panels (8 and 8') joined by a steel screw (9), associated with washers and a nut (10).
6. The invention of claim 1 and 3 wherein the base (5) consists of a rail which reproduces the inner and out-

fig.1



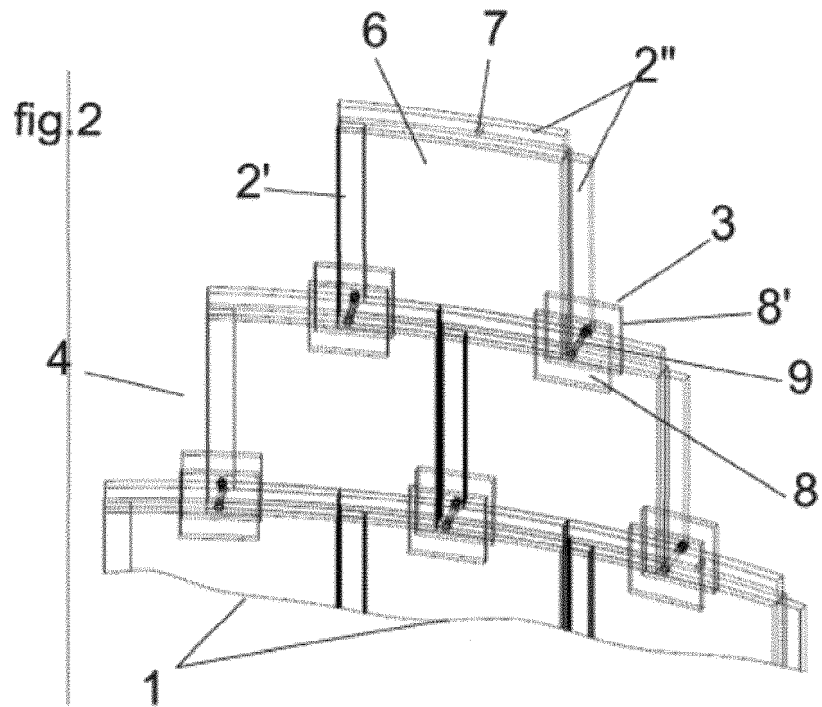


fig.3

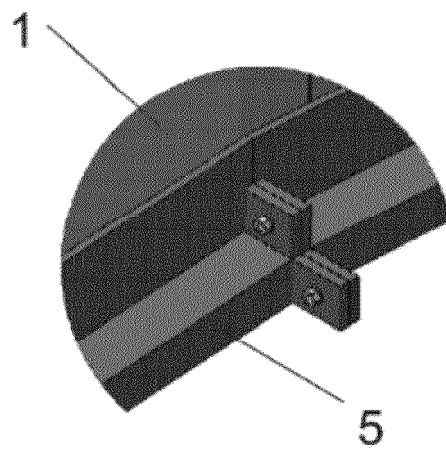


fig.4

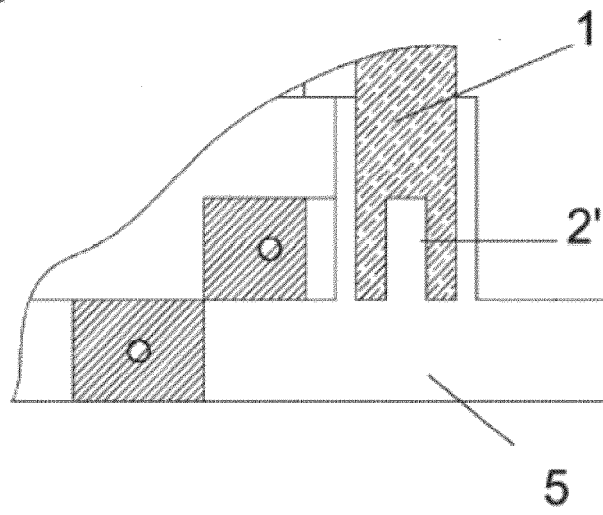


fig.5

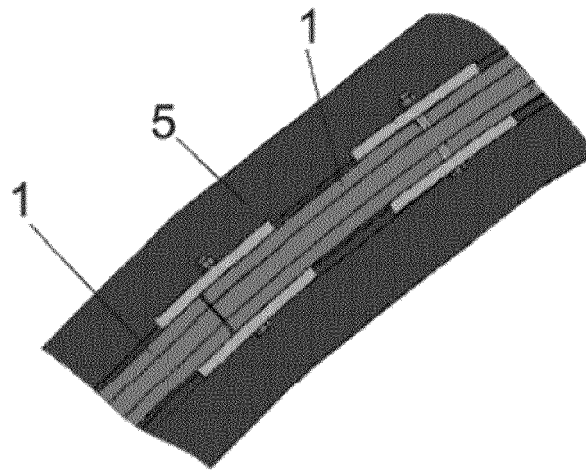


fig.6

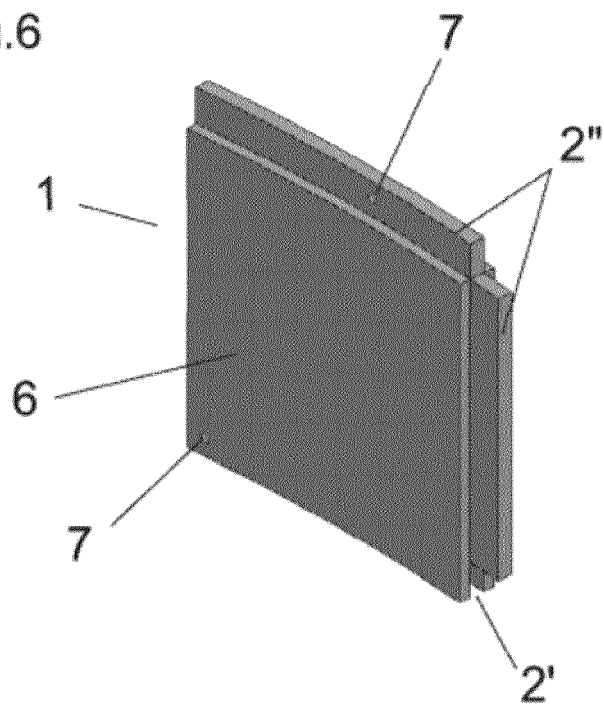
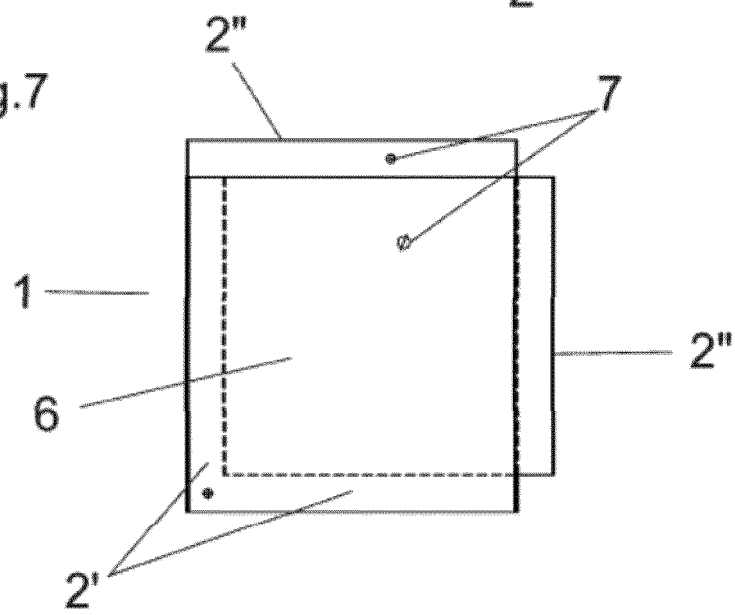


fig.7



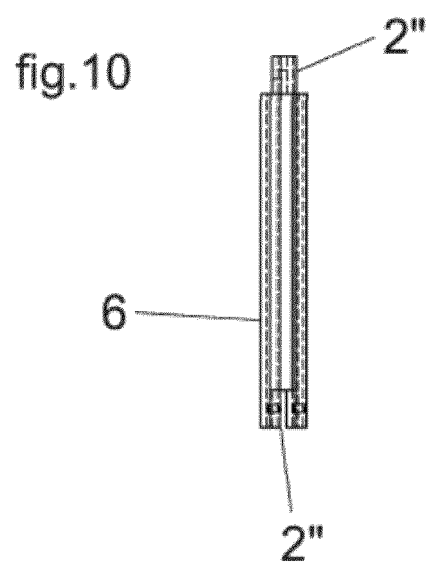
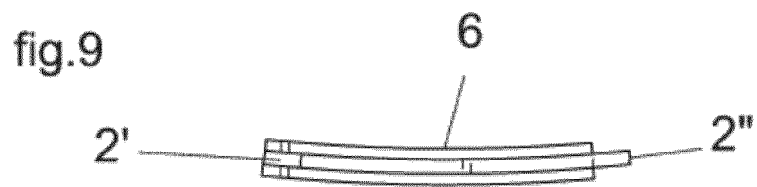
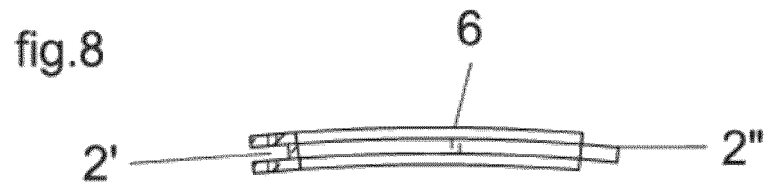


fig.11

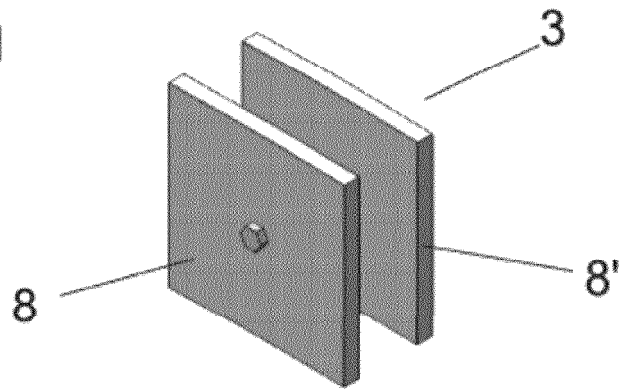


fig.12

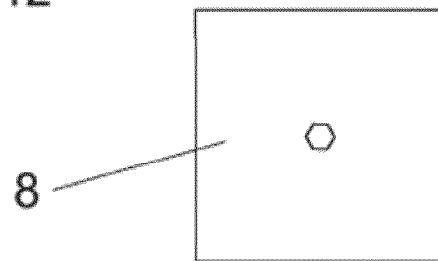
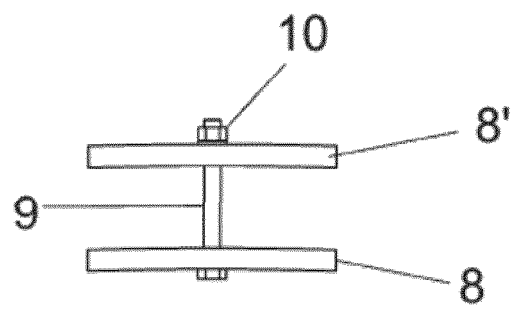


fig.13



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/BR2015/050059

## A. CLASSIFICATION OF SUBJECT MATTER

**E04C 2/16 (2006.01), E04C 2/18 (2006.01), E04C 2/40 (2006.01), E04B 2/46 (2006.01)**

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)

**E04C**

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

**SINPI (Banco de Patentes do INPI-BR)**

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

**EPODOC, ESPACENET**

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                      | Relevant to claim No. |
|-----------|-------------------------------------------------------------------------------------------------------------------------|-----------------------|
| Y         | DE 3214724 A1 (RENFTLE HANS DIPL ING)<br>03 November 1983 (1983-11-03)<br>Abstract, Figures 2, 3, 7 and 9               | 1 – 11                |
| Y         | US 3410044 A (CONTEMPORARY WALLS LTD)<br>12 November 1968 (1968-11-12)<br>Claims 1-4, 6-7, Figures 1-5                  | 1 – 11                |
| Y         | GB 175696 A ( THOMAS BEEVERS BELVOIR)<br>21 February 1922 (1922-02-21)<br>report, column 1, lines 10-30, Claims 1, 3, 4 | 1 – 11                |
| X         | US 4769961 A1 (JOSEPH GILLET ROCHEFORT)<br>13 September 1988 (1988-09-13)<br>Abstract, Figures 1-3                      | 7                     |

☒ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

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“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

“&amp;” document member of the same patent family

Date of the actual completion of the international search

**14 September 2015**

Date of mailing of the international search report

**25/09/2015**

Name and mailing address of the ISA/

Authorized officer

Facsimile No.

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## INTERNATIONAL SEARCH REPORT

International application No.

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| C (Continuation). | DOCUMENTS CONSIDERED TO BE RELEVANT                                                                       |                       |
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| Category*         | Citation of document, with indication, where appropriate, of the relevant passages                        | Relevant to claim No. |
| Y                 | FR 2456176 A1 (GTM GATIMENT TRAVAUX PUBLICS )<br>05 December 1980 (1980-12-05)<br>Claims 1-6, Figures 3-4 | 1 – 11                |

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INTERNATIONAL SEARCH REPORT  
Information on patent family members

International application No.

PCT/BR2015/050059

|    |               |            |                                                 |                                        |
|----|---------------|------------|-------------------------------------------------|----------------------------------------|
| 5  | DE 3214724 A1 | 1983-11-03 | None                                            |                                        |
|    | -----         | -----      | -----                                           | -----                                  |
|    | US 3410044 A  | 1968-11-12 | None                                            |                                        |
|    | -----         | -----      | -----                                           | -----                                  |
| 10 | GB 175696 A   | 1922-02-21 | FR 541387 A<br>US 1457437 A                     | 1922-07-26<br>1923-06-05               |
|    | -----         | -----      | -----                                           | -----                                  |
|    | US 4769961 A1 | 1988-09-13 | None                                            |                                        |
|    | -----         | -----      | -----                                           | -----                                  |
| 15 | FR 2456176 A1 | 1980-12-05 | FR 2456176 B1<br>FR 2499609 A2<br>FR 2519048 A2 | 1982-10-29<br>1982-08-13<br>1983-07-01 |
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