



(11) **EP 4 123 099 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
25.01.2023 Bulletin 2023/04

(21) Application number: **22183192.8**

(22) Date of filing: **05.07.2022**

(51) International Patent Classification (IPC):
E04C 2/04 ^(2006.01) **E04C 2/06** ^(2006.01)
E04C 2/288 ^(2006.01) **E04B 5/02** ^(2006.01)
E04C 2/00 ^(2006.01)

(52) Cooperative Patent Classification (CPC):
E04C 2/50; E04C 2/044; E04C 2/06; E04C 2/2885;
E04C 2002/002

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **06.07.2021 IT 202100017796**

(71) Applicant: **Eiseko Engineering di Cenzon**
Francesco e Pomini
Giorgio
37036 San Martino Buon Albergo (VR) (IT)

(72) Inventor: **Cenzon, Francesco**
37036 San Martino Buon Albergo (VR) (IT)

(74) Representative: **Fisauli, Beatrice A. M.**
Con Lor S.p.A
Via Bronzino, 8
20133 Milano (IT)

(54) **MULTI-PURPOSE PREFABRICATED SLAB**

(57) Prefabricated slab (10; 110) comprising a structure (12; 112) made of concrete and a reinforcement (14, 16, 18, 22, 24; 114, 116, 118, 122, 124), **characterized in** that it includes within it at least one lightening element

(20; 120) made of paper and/or cardboard suitable for creating a volume of lower density than the structure (12; 112) made of concrete, within the prefabricated slab.

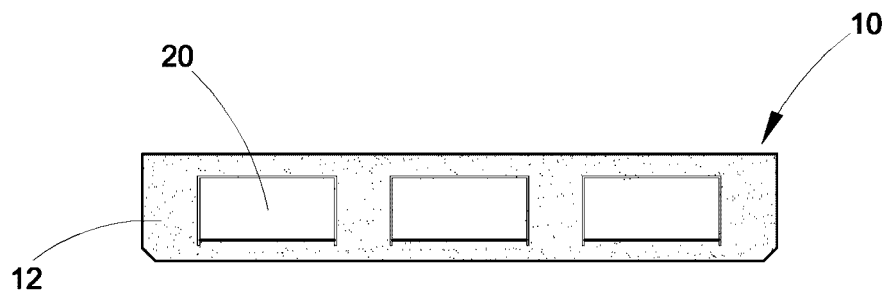


Fig. 2

Description

[0001] The present invention relates, in general, to a multi-purpose prefabricated slab, called "Eisekofly-Dalle-Beton-Papier". More specifically, it is a prefabricated reinforced concrete (R.C.) or prestressed reinforced concrete (P.C.) slab with special features that allow it to be used in an easy and advantageous manner compared to known precast slabs.

[0002] As is well known, prefabricated two-dimensional structures, known as precast slabs, are usually used to quickly construct slabs.

[0003] The best known prefabricated slab is the hollow core slab. It is a self-supporting structure, made of concrete with pre-stressed reinforcement made of strands, without shear reinforcement or distribution nets.

[0004] The honeycomb slab usually has a width of 120 cm or less and a height between 12 and 70 cm.

[0005] Holes are cut into the inside of the honeycomb slab to make the structure lighter.

[0006] The honeycomb slab is usually manufactured using an automatic extrusion machine that also creates the lightening holes, the number of which varies depending on the manufacturer and the application requirements.

[0007] The most significant problem with the honeycomb slab is precisely the need to use special machines to make it, which increases its cost and, above all, makes it inflexible in terms of size and shape.

[0008] Another well-known prefabricated slab type is the 'Predalle' slab, which has a width of 250 cm or less and a height of between 15 and 70 cm.

[0009] The 'Predalle' slab is self-supporting and is made of pre-stressed concrete and prestressed reinforcement.

[0010] The 'Predalle' slab has reinforcement made of strands and/or slow reinforcement, nets and stirrups. Lightening is achieved by means of polystyrene shapes.

[0011] The production of the "Predalle" slab takes place in successive steps on a flat bench, working in layers. As a result, it is not possible to cut holes as in the case of the honeycomb slab, but by means of polystyrene shapes that can have various conformations, although the typical one is rectangular in cross-section.

[0012] The biggest problem with the "Predalle" slab is precisely the presence of the polystyrene shapes, which are polluting and not eco-friendly.

[0013] In particular, the 'Predalle' slab cannot be used in all those countries where the use of non-eco-compatible materials is prohibited.

[0014] For example, in France it is forbidden to use slab whose lightening is realised through the use of materials derived from petroleum.

[0015] The purpose of the present invention is to offer a prefabricated slab that is lightened without the aid of polluting lighteners.

[0016] Another purpose of the invention is to provide a prefabricated slab that is easily fabricated.

[0017] A further purpose of the invention is to provide a prefabricated slab whose mode of construction allows it to be manufactured flexibly, varying in size, shape and characteristics according to the requirements of use.

[0018] These and other purposes are achieved, according to the invention, by a prefabricated slab comprising a concrete structure and reinforcement.

[0019] In particular, the prefabricated slab according to the invention is characterised by comprising within it at least one lightening element made of a material typically chosen from paper or cardboard or both, said element being capable of creating a volume of lower density than the concrete portion within the prefabricated slab.

[0020] In this way, the lightening of the slab according to the invention is achieved without the aid of polystyrene moulds or other petroleum-derived and therefore environmentally unfriendly material.

[0021] Advantageously, the one or more lightening elements can be internally filled, so as to avoid any bending or folding.

[0022] Alternatively, the one or more lightening elements may be internally hollow, so as to further decrease the weight of the slab of the invention.

[0023] Advantageously, one or more lightening elements may have a parallelepiped shape and/or a cylindrical shape depending on the overall volume and dimensions of the prefabricated slab to be lightened.

[0024] This reinforcement usually comprises at least one strand or mesh or both.

[0025] Furthermore, in order to realise a reinforced structure, the prefabricated slab may comprise at least one strand and/or at least one mesh and/or one U-element.

[0026] In particular, the U-shaped element may protrude from the structure, so as to be a useful coupling element for an eventual casting above the prefabricated slab itself.

[0027] Advantageously, the prefabricated slab may comprise at least one fastening element useful for lifting the prefabricated slab when it is to be placed in the desired position.

[0028] Further features and details can be better understood from the following description, which is given as a non-limiting example, as well as from the accompanying drawing tables in which

figure 1 is a top view of a prefabricated slab according to the invention;

figure 2 is a side view of the prefabricated slab of figure 1;

figure 3 is a sectional side view of the prefabricated slab according to the sectional plane indicated by A-A in figure 1;

figure 4 is a cross-sectional side view of the prefabricated slab according to the cross-sectional plan indicated with B-B in figure 1

Figure 5 is a top view of a prefabricated slab according to a variant of the invention;

figure 6 is a side view of the prefabricated slab of figure 5;

figure 7 is a sectional side view of the prefabricated slab according to the sectional plane indicated with A-A in figure 5;

Figure 8 is a cross-sectional side view of the prefabricated slab according to the cross-sectional plan indicated with B-B in figure 5.

[0029] With reference to the appended figures, in particular figures 1 to 4, a prefabricated slab according to the invention is referred to as 10 in its entirety.

[0030] The precast slab 10 comprises a concrete structure 12 in the shape of a parallelepiped in which strands are embedded.

[0031] A lower mesh 16 and an upper mesh 18, both made of a metal alloy, are also embedded in the concrete structure 12 so as to make, together with the strands 14, a reinforcement embedded in the concrete structure 12.

[0032] Three parallelepiped lightening elements 20 are included in the concrete structure 12 to lighten the precast slab 10.

[0033] In particular, such parallelepiped elements 20 (of which only one is indicated with reference 20) are made entirely of cardboard; in other words, the volume defined by such parallelepiped elements is entirely occupied by cardboard.

[0034] Alternatively, such parallelepiped elements 20 may be internally hollow, i.e. made with only the perimeter faces of cardboard.

[0035] Furthermore, as illustrated in Figure 4, the prefabricated slab 10 according to the invention also comprises first U-shaped elements 22, which are entirely embedded in the concrete structure 12, and second U-shaped elements 24, which protrude superiorly from the same structure 12.

[0036] Such second U-shaped elements 24 serve to allow for a better coupling with the possible casting arranged above the precast slab 10.

[0037] At the four corners of the structure 12 are arranged fastening elements 26 useful for lifting the prefabricated slab 10 when it is to be arranged in the desired position.

[0038] According to a second variant of the invention illustrated in Figures 5 to 8, a prefabricated slab 110 comprises a parallelepiped-shaped concrete structure 112 in which strands are embedded.

[0039] A lower mesh 116 and an upper mesh 118, both of metal alloy, are also embedded in the concrete structure 112, so as to create, together with the strands, a reinforcement embedded in the concrete structure 112.

[0040] Included in the concrete structure 112 are six cylindrical lightening elements 120, suitable for lightening the precast slab 110.

[0041] In particular, such cylindrical elements 120 (of which only one is indicated by reference 120) are made entirely of cardboard; in other words, the volume defined by such parallelepiped elements is entirely occupied by

cardboard.

[0042] Alternatively, such cylindrical elements 120 may be internally hollow, i.e. made with only the perimeter faces of cardboard.

[0043] Furthermore, as illustrated in Figure 8, the prefabricated slab 110 according to the invention also comprises first U-shaped elements 122, entirely embedded in the concrete structure 112, and second U-shaped elements 124, which protrude superiorly from the same structure 112.

[0044] Such second U-shaped elements 124 serve to allow for a better coupling with the possible casting disposed above the precast slab 110.

[0045] Fixing elements 126 are arranged at the four corners of the structure 112, which are useful for lifting the prefabricated slab 110 when it is to be arranged in the desired position.

[0046] Further variants may also be provided which are to be considered within the scope of the invention.

[0047] For example, the shape of the lightening elements may be other than parallelepiped or cylindrical.

[0048] In any case, the presence of lightening elements such as parallelepiped elements 20 or cylindrical elements 120 makes it possible to avoid the use of shapes of polystyrene or other petroleum-derived material, while still achieving the desired lightening.

[0049] Furthermore, the use of such lightening elements allows the prefabricated slab according to the invention to be made without the use of specific machinery. Thus, it is possible to make the prefabricated slab according to the desired shape, size and characteristics, without constraints due to the use of machinery.

[0050] Additionally, the lightening element realised can comprise a containing structure made of paper and/or cardboard inside which is arranged a honeycomb or lattice structure, also typically made of paper and/or cardboard or another nonpolluting material, with the purpose of lightening the slab, but at the same time giving solidity to the lightening element itself.

[0051] Alternatively, the honeycomb or lattice structure can be filled with lightening material with a lower density than concrete.

45 Claims

1. Prefabricated slab (10; 110) comprising a structure (12; 112) made of concrete and a reinforcement (14, 16, 18, 22, 24; 114, 116, 118, 122, 124), **characterized in that** it includes within it at least one lightening element (20; 120) made of paper and/or cardboard suitable for creating a volume of lower density than the structure (12; 112) made of concrete, within the prefabricated slab.
2. Prefabricated slab (10; 110) according to the preceding claim, wherein the at least one lightening element (20; 120) is internally filled.

3. Prefabricated slab (10; 110) according to claim 1, wherein the at least one lightening element (20; 120) is internally hollow.

4. Prefabricated slab (10) according to any one of the preceding claims, wherein a paper and/or cardboard containing structure is comprised, inside which a honeycomb or mesh structure, also made of paper and/or cardboard or other material, is arranged.

5. Prefabricated slab (110) according to any one of claims 1 to 3, wherein a paper and/or cardboard containing structure, filled with a lightening material with a lower density than concrete, is comprised.

6. Prefabricated slab (110) according to one of the preceding claims, wherein the at least one lightening element (20) has a parallelepiped shape.

7. Prefabricated slab (110) according to any one of claims 1 to 5, wherein the at least one lightening element (20) has a cylindrical shape.

8. Prefabricated floor slab (10; 110) according to any one of the preceding claims, wherein the reinforcement comprises at least one strand (14; 114) or at least a wire mesh (16, 18; 116, 118) or both.

9. Prefabricated slab (10; 110) according to any one of the preceding claims, wherein at least one U-shaped member is included (22, 24; 122, 124).

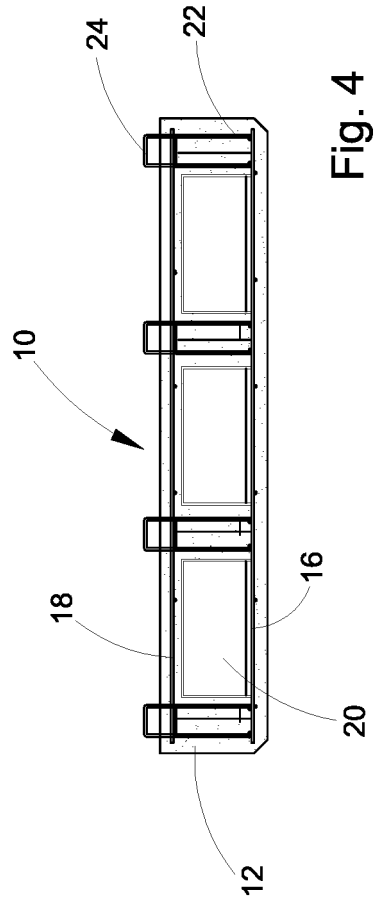
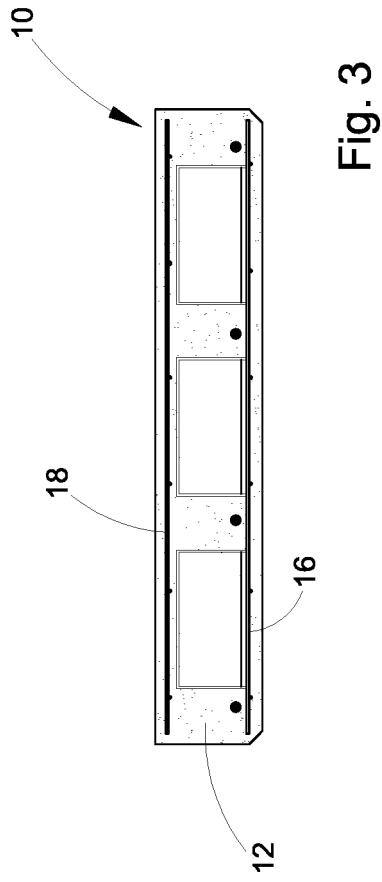
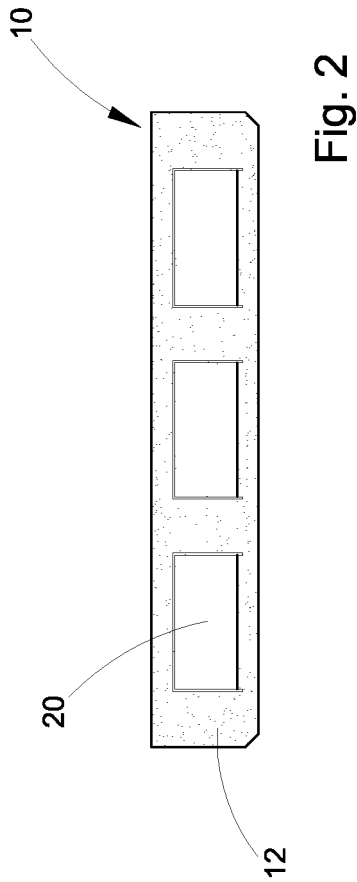
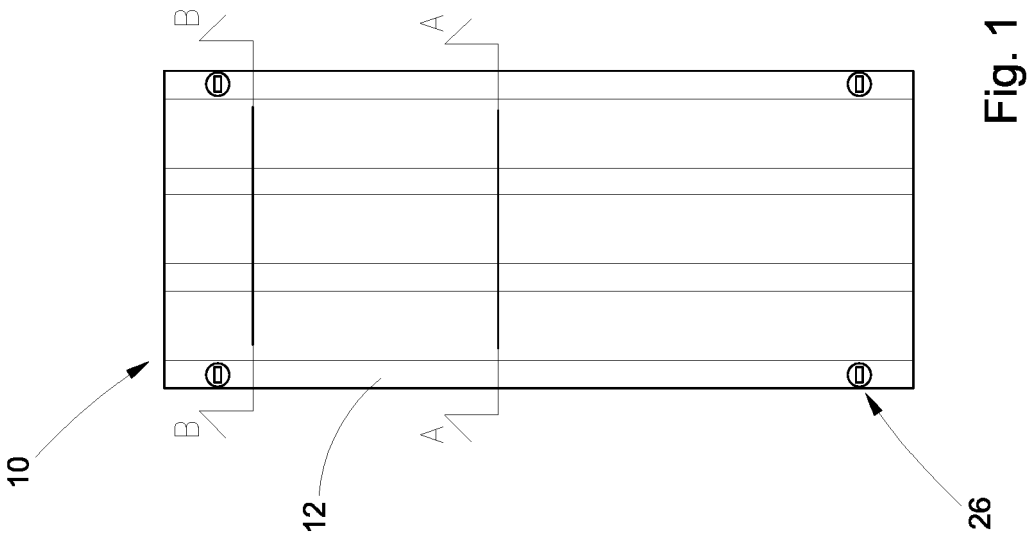
10. Prefabricated slab (10; 110) according to any one of the preceding claims, wherein the at least one U-shaped element (24; 124) protrudes from the structure (12; 112).

11. Prefabricated slab (10; 110) according to one of the preceding claims, wherein the at least one fastener (26; 126) useful for lifting the prefabricated floor (10; 110) when it is to be arranged in the desired position is included.

45

50

55



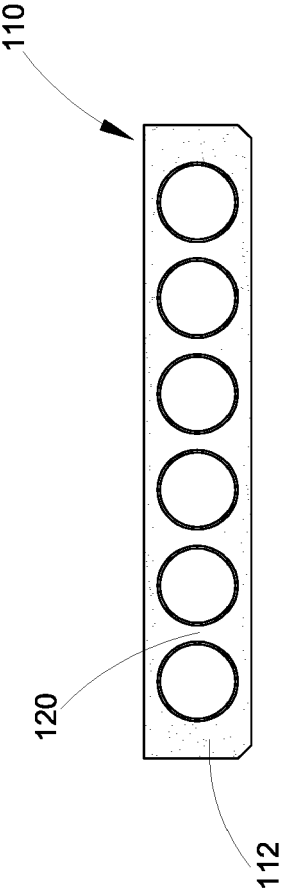


Fig. 6

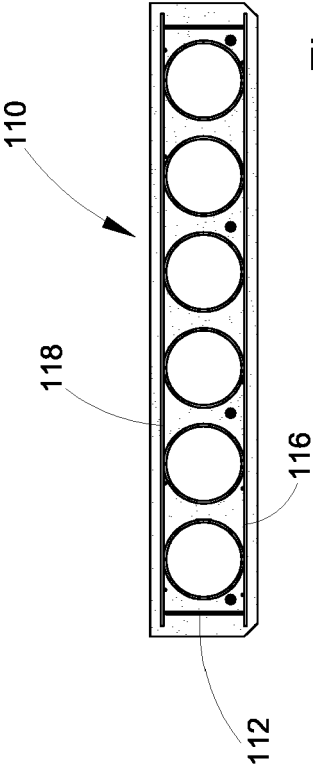


Fig. 7

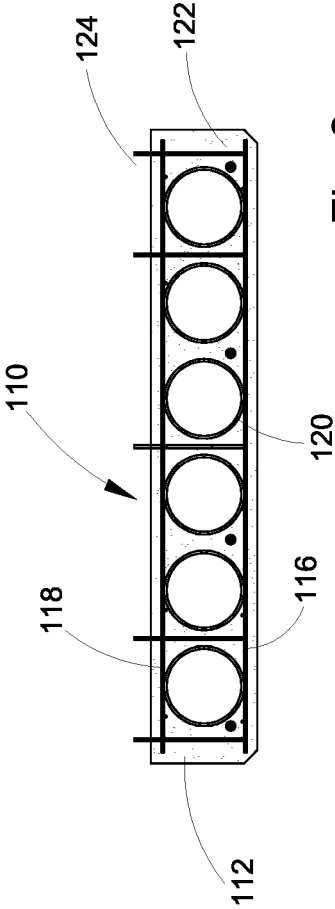


Fig. 8

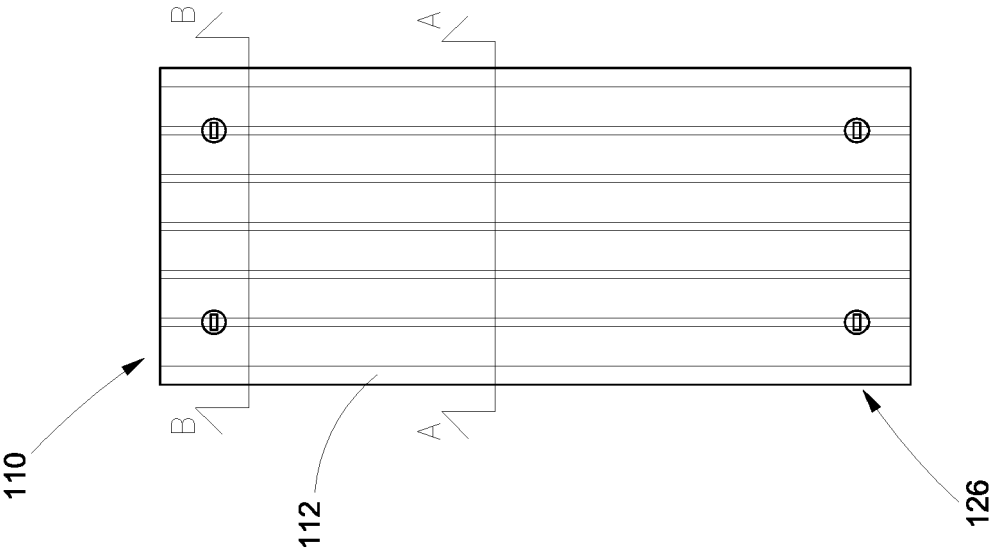


Fig. 5



EUROPEAN SEARCH REPORT

Application Number

EP 22 18 3192

5

10

15

20

25

30

35

40

45

50

55

1

EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 0 857 836 A2 (IMAZ ODRIEZOLA MIGUEL MARIA [ES]) 12 August 1998 (1998-08-12) * column 4, line 44 - column 5, line 20 * * figures * -----	1-11	INV. E04C2/04 E04C2/06 E04C2/288 E04B5/02 E04C2/00
X	US 6 272 805 B1 (RITTER KLAUS [AT] ET AL) 14 August 2001 (2001-08-14) * the whole document * * see especially column 3, lines 11-12 * -----	1-11	
X	CN 1 337 510 A (QIU ZEYOU [CN]) 27 February 2002 (2002-02-27) * the whole document * * See the 2nd paragraph of the translation, relating to the prior art. * -----	1-11	
X	BE 626 689 A (CANTILLANA) 16 April 1963 (1963-04-16) * page 2, line 1 - page 5, paragraph 5 * * figures * -----	1-11	
			TECHNICAL FIELDS SEARCHED (IPC)
			E04C
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 15 December 2022	Examiner Durrenberger, Xavier
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 22 18 3192

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

15-12-2022

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0857836 A2	12-08-1998	EP 0857836 A2	12-08-1998
		ES 2138521 A1	01-01-2000
		ES 2166260 A1	01-04-2002
		ES 2166268 A1	01-04-2002
US 6272805 B1	14-08-2001	AT 166940 T	15-06-1998
		AT 406064 B	25-02-2000
		AU 4689593 A	20-12-1994
		CN 1093767 A	19-10-1994
		DZ 1737 A1	17-02-2002
		EP 0701647 A1	20-03-1996
		GR 960300025 T1	31-05-1996
		JO 1788 B1	25-12-1994
		JP H09504844 A	13-05-1997
		KR 960702880 A	23-05-1996
		MY 111596 A	27-09-2000
		PL 56798 Y1	29-01-1999
		PL 314849 A1	30-09-1996
		US 6272805 B1	14-08-2001
		US 2001010140 A1	02-08-2001
		US 2003029107 A1	13-02-2003
		WO 9428264 A1	08-12-1994
		ZA 938397 B	09-06-1994
CN 1337510 A	27-02-2002	NONE	
BE 626689 A	16-04-1963	NONE	