(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 1 175 982 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
19.03.2008 Bulletin 2008/12

(21) Application number: **01119708.4**

(22) Date of filing: **17.10.1997**

(51) Int Cl.:
B28B 1/10 *(2006.01)* ***B28B 3/00*** *(2006.01)*
B28B 5/02 *(2006.01)* ***B28B 13/02*** *(2006.01)*
B30B 11/14 *(2006.01)*

(54) Method for pressing powder material

Verfahren zum Pressen von pulverförmigen Material

Procédé pour presser des matières pulvérulentes

(84) Designated Contracting States:
DE ES FR IT PT

(30) Priority: **22.11.1996 IT MO960151**
16.01.1997 IT MO970004
16.01.1997 IT MO970005

(43) Date of publication of application:
30.01.2002 Bulletin 2002/05

(62) Document number(s) of the earlier application(s) in accordance with Art. 76 EPC:
97945854.4 / 0 939 691

(73) Proprietor: **System S.p.A.**
41042 Fiorano Modenese (Modena) (IT)

(72) Inventors:
- **Camorani, Carlo Antonio**
  42014 Roteglia di Castellarano (IT)
- **Algeri, Maris**
  42014 Roteglia di Castellarano (IT)

(74) Representative: **Gotra, Stefano et al**
BUGNION S.p.A.
Via Vellani Marchi, 20
41100 Modena (IT)

(56) References cited:
WO-A-95/16644 **WO-A-96/15888**
FR-A- 1 182 282 **GB-A- 880 892**

EP 1 175 982 B1

Description

[0001] The present invention concerns a method for pressing powder material, in particular for the production of ceramic tiles.

[0002] PCT/EP95/04560 (=WO-A-96/15888) describes a system for pressing ceramic tiles, wherein a continuous strip of powders having a predetermined thickness and width is formed, predetermined areas of said strip being compacted to obtain tiles, or pre-compacted semi-manufactured products which are precursors of the tiles to be formed. In the latter case there is provided pressing semi-manufactured products in a die to obtain corresponding tiles ready to be subsequently dried and fired.

[0003] US-A-3,540,093 describes an apparatus for manufacturing ceramic tiles, having substantially uniform compactness, homogeneity, density and thickness, wherein from a bottom end of a hopper, in which powders of ceramic material are contained, a vertical strip of compacted powders is formed by action of opposed pressing rolls, from said strip some pre-compacted products being subsequently severed by cutting and distributed on a horizontal conveyor from which the severed products are transferred to a die to obtain tile bodies.

[0004] GB-A-880,892 describes an apparatus for forming clay material in which a mass of clay, humidified in such a way as to result at a plastic state, is laminated between a pair of rolls to obtain a layer of plastic material and subsequently the layer is formed by a forming die, without substantial alteration of the volume, in such a way as to obtain a plurality of tiles interconnected by webs which are subsequently cut by rotating disks.

[0005] Prior art comprises also some apparatuses for making tiles in which powders are distributed in two superimposed layers during distinct strokes of a distributing trolley or distinct phases of the same stroke of a distributing trolley, the trolley being generally provided with grids and each one leading the powders of a determined layer to the matrix of the press. An example of such a kind of apparatuses is described in IT-A-1,069,458. Moreover, in such apparatuses there is a productivity much lower than the productivity obtainable loading in just one layer, since providing distinct strokes for each trolley, or distinct phases of the stroke of loading, is time consuming, since the various layers are loaded into a matrix of a respective die in different steps and in a certain interval of time.

[0006] An object of the present invention is to improve the existent apparatuses for working ceramic tiles.

[0007] In accordance with the present invention, there is provided a method for pressing powder material to obtain tiles, as defined in claim 1.

[0008] The invention will be better understood and carried into effect referring to the attached drawings, wherein:

Figure 1 and 2 are schematic side views, partially sectioned and interrupted, of an apparatus for forming ceramic tiles showing in sequence pre-compacting of powder material and loading of the press;

Figure 3 is a schematic side view, partially sectioned, of a pressing apparatus for pressing powders on belt conveyor means, in a phase of pressing; in an embodiment with side containing means for lateral containing of the powders obtained with excess of powders;

Figure 4 is a top view of Figure 3;

Figure 5 is a section of continuous forming means with belt conveyor means provided with cavities or hollows arranged to receive powders to be pressed.

[0009] In the context of the following description, with the reference V is indicated the longitudinal direction of advance of loose or compacted powders on belt conveyor means. With the term "powders", each movable material at the solid state, including granular materials, ceramic glazes and clay compounds is indicated.

[0010] As shown in Figures 1 and 2, powders 1 are contained in hopper distributing means 2 having an outlet section controlled by a dosing squeegee 2a, which is adjustable in height and faces a horizontal upper part of belt conveyor means 3, advancing the powders to be pressed at a press with mould means 4 for ceramic tiles, in such a way as to form a strip 6, or main layer, of powders. Between the hopper 2 and the mould means 4, distributing decorating means 7 may be interposed to pour on the strip 6 a decorating layer 8, the decorating means possibly comprising further hopper means 9 containing a decorating granular material 10, having an outlet section facing the strip 6 and controlled by a rotating dosing roll 11.

[0011] Figures 3 and 4 show that the powders 6, 8 are pressed with a punch 55 while they are contained by the exceed of the powders 71. Thus, only a central portion of the powders results pressed in a homogeneous manner to obtain the product 14, while the non-pressed powders 72 are circulated again. Each product 14 is subsequently transferred to a conveyor line 73 whereon a frame punch 74 is descended, said frame punch 74 cutting from the product the external portion of rejection 72a, so obtaining pressed and homogeneous products 14a.

[0012] Instead of the frame punch 74, mould means 4 may be used.

[0013] Figure **5** shows that, to obtain the compaction of the layer 6,8, it is possible to use compacting means 4 0 provided with orbital motion, or provided with a swinging, or vibrating motion, generally generating a circular action shown by arrows F4 and such as to compress the powders 6 and advance together with them along a portion of route of the belt conveyor means 3. Underneath the belt conveyor means 3 there is a movable controlling block 41, whereon the belt conveyor means 3 rests, the block being free to move along the direction Y1 toward the mould means 4 when the compacting means 40 compresses the powders 6 and to return to the initial position,

under the action of a return spring 42, when the compacting means 40 does not compress the powders 6. For this purpose, the movable block 41 is set up on rolls 43 interposed between the block 41 and a base body 44.

[0014] The compacting action of the compacting means 40 may also be obtained by a suitable vibrating-generator device: therefore the action of the compacting means 40 on the powders 6 may take place in a vertical plane orthogonal to the belt conveyor means 3.

[0015] Figure **5** also shows a compacting belt 59a interposed between the powders 6 to be pressed and the compacting means 40, advantageously provided with transversal severing means 52b extending toward the belt conveyor means 3 to sever, from the top, the layer of powders 6 during pressing.

[0016] The compacting means 40 may be elastically coupled with supporting means through elastic harmonizing means 40a and may be also coupled with vibration generating means 40b. With reference to Figure **5**, it is observed that the compacting means 4 0 may also be provided only with a reciprocating motion in a direction orthogonal to the belt conveyor means 3 and, in this case, the belt conveyor means 3 has to be driven with intermittent motion, i.e. step by step.

Claims

1. Method for pressing powder material (1, 10) to obtain tiles (14, 14a), comprising the steps of:

   - distributing powders (6, 8) on flexible conveyor means (3) and advancing said powders (6, 8) along an advancing direction (V) through a pressing station,
   - containing said powders (6, 8) on said conveyor means (3) by containing means in said pressing station,
   - pressing said powders (6, 8) in said pressing station during said advancing,

   characterized in that the powders (6, 8) are pressed with a punch (55) while they are contained by the exceed of the powders (71) to obtain the tile (14).

2. Method according to claim 1, wherein said method comprises the step of subsequently transferring each tile (14) to a conveyor line (73) whereon a frame punch (74) is descended, said frame punch (74) cutting from the tile (14) the external portion of rejection (72a), so obtaining pressed and homogeneous final tiles (14a).

3. Method according to claim 2 wherein said pressing commprises pressing by a compacting belt (59a) interposed between the powders (6) to be pressed and compacting means (40).

4. Method according to claim 2, further comprising transversal severing means (52b) extending toward the belt conveyor means (3) to sever, from the top, the layer of powders (6) during pressing.

Patentansprüche

1. Verfahren zum Pressen von pulverförmigem Material (1, 10), um Fliesen (14, 14a) zu erhalten, enthaltend die folgenden Phasen:

   - Verteilen der Pulver (6, 8) auf flexiblen Fördermitteln (3) und Vorlaufen der genannten Pulver (6, 8) entlang einer Vorlaufrichtung (V) durch eine Pressstation;
   - Halten der genannten Pulver (6, 8) auf den genannten Fördermitteln (3) durch Haltemittel in der genannten Pressstation;
   - Pressen der genannten Pulver (6, 8) in der genannten Pressstation während dem genannten Vorlauf;

   dadurch gekennzeichnet, dass die Pulver (6, 8) mit einem Stempel (55) gepresst werden, während sie durch den Überschuss der Pulver (71) eingegrenzt werden, um die Fliese (14) zu erhalten.

2. Verfahren nach Patentanspruch 1, bei welchem das genannte Verfahren die Phase des anschliessenden Transferierens einer jeden Fliese (14) an eine Förderbahn (73) enthält, auf welche sich ein Rahmenstempel (74) senkt, wobei der genannte Rahmenstempel (74) von der Fliese (14) den äusseren Überschussabschnitt (72a) abschneidet, so dass gepresste und homogene fertige Fliesen (14a) erhalten werden.

3. Verfahren nach Patentanspruch 2, bei welchem das genannte Pressen den Pressvorgang durch ein Kompaktierband (59a) enthält, das zwischen den zu pressenden Pulvern (6) und Kompaktiermitteln (40) eingesetzt ist.

4. Verfahren nach Patentanspruch 2, weiter enthaltend quer verlaufende Trennmittel (52b), die sich zu den Bandfördermitteln (3) hin erstrecken, um von oben die Schicht der Pulver (6) während des Pressens zu trennen.

Revendications

1. Procédé pour presser des matières pulvérulentes (1, 10) pour obtenir des carreaux (14, 14a), comprenant les phases de:

   - distribuer des poudres (6, 8) sur des moyens

de convoyage flexibles (3) et faire avancer lesdites poudres (6, 8) le long d'une direction d'avancée (V) au travers d'une station de pressage;
- contenir lesdites poudres (6, 8) sur lesdits moyens de convoyage (3) par l'intermédiaire de moyens de contenance dans ladite station de pressage;
- presser lesdites poudres (6, 8) dans ladite station de pressage pendant ladite avancée;

caractérisé en ce que les poudres (6, 8) sont pressées avec un poinçon (55) alors qu'elles sont contenues par l'excès de poudres (71) pour obtenir le carreau (14).

2. Procédé selon la revendication 1, dans lequel ledit procédé comprend la phase de transfert successif de chaque carreau (14) sur une ligne de convoyage (73) sur laquelle un poinçon en forme de cadre (74) descend, ledit poinçon en forme de cadre (74) découpant du carreau (14) la portion externe de rejet (72a), en obtenant ainsi des carreaux finaux (14a) pressés et homogènes.

3. Procédé selon la revendication 2, dans lequel ledit pressage comprend le pressage par un tapis roulant de compactage (59a) interposé entre les poudres (6) à presser et les moyens de compactage (40).

4. Procédé selon la revendication 2, comprenant en outre des moyens de rupture transversaux (52b) s'étendant vers les moyens de convoyage (3) pour entailler, depuis le haut, la couche de poudres (6) pendant le pressage.

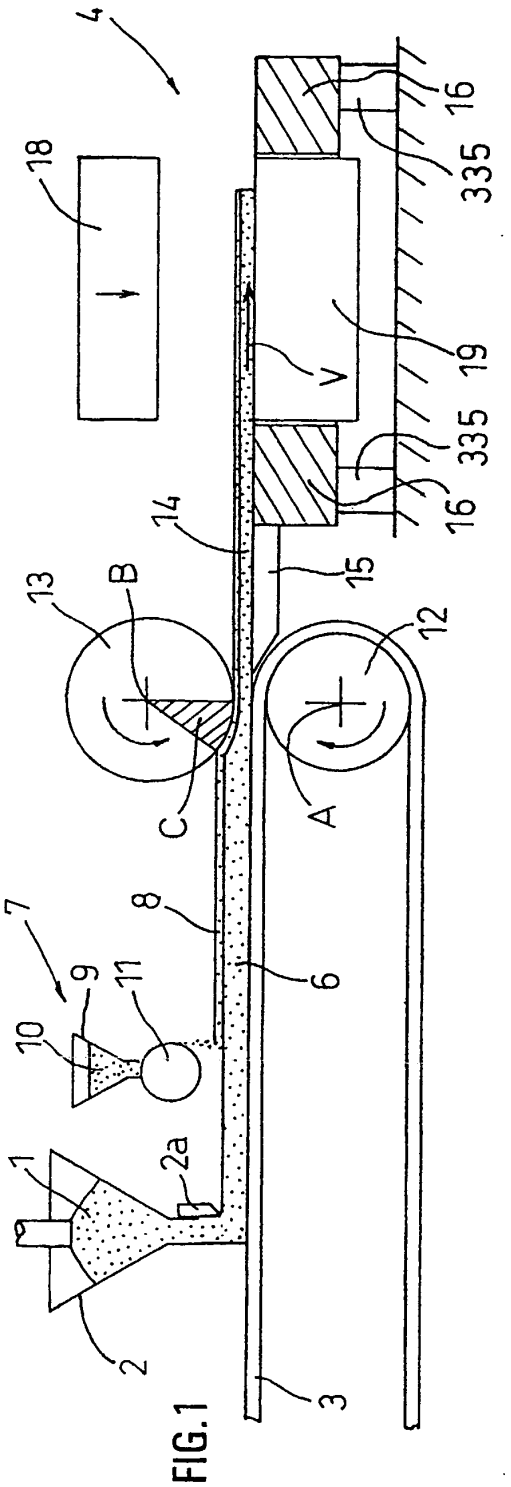
4
18
16
335
19
V
335
16
14
15
13
B
12
C
A
7
8
9
11
6
10
1
2a
2
3

FIG.1

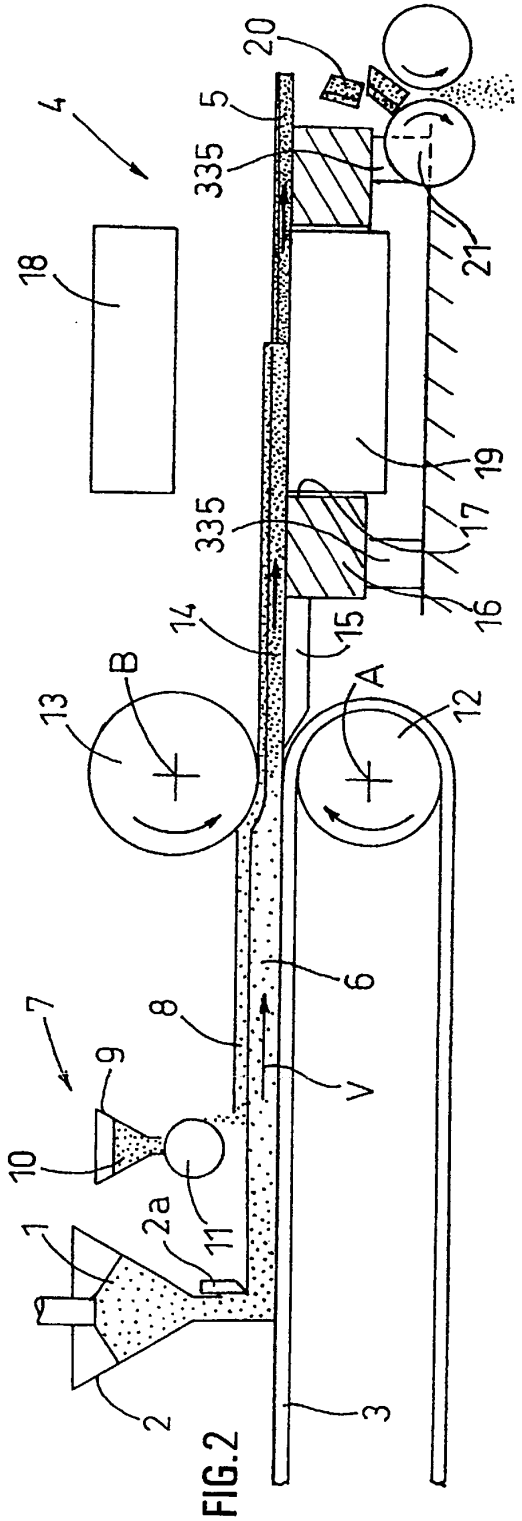
20
4
5
335
L
21
18
19
335
17
16
14
15
13
B
A
12
7
8
6
9
V
10
1
2a
11
2
3

FIG.2

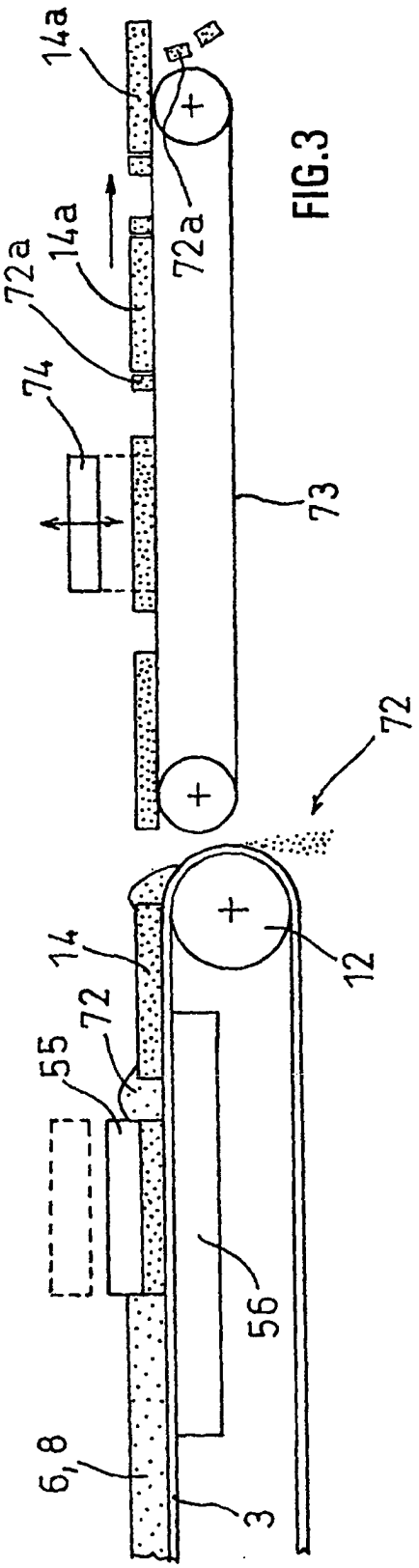
14a
72a
14a
72a
74
73
72
14
12
55
72
56
6,8
3

FIG.3

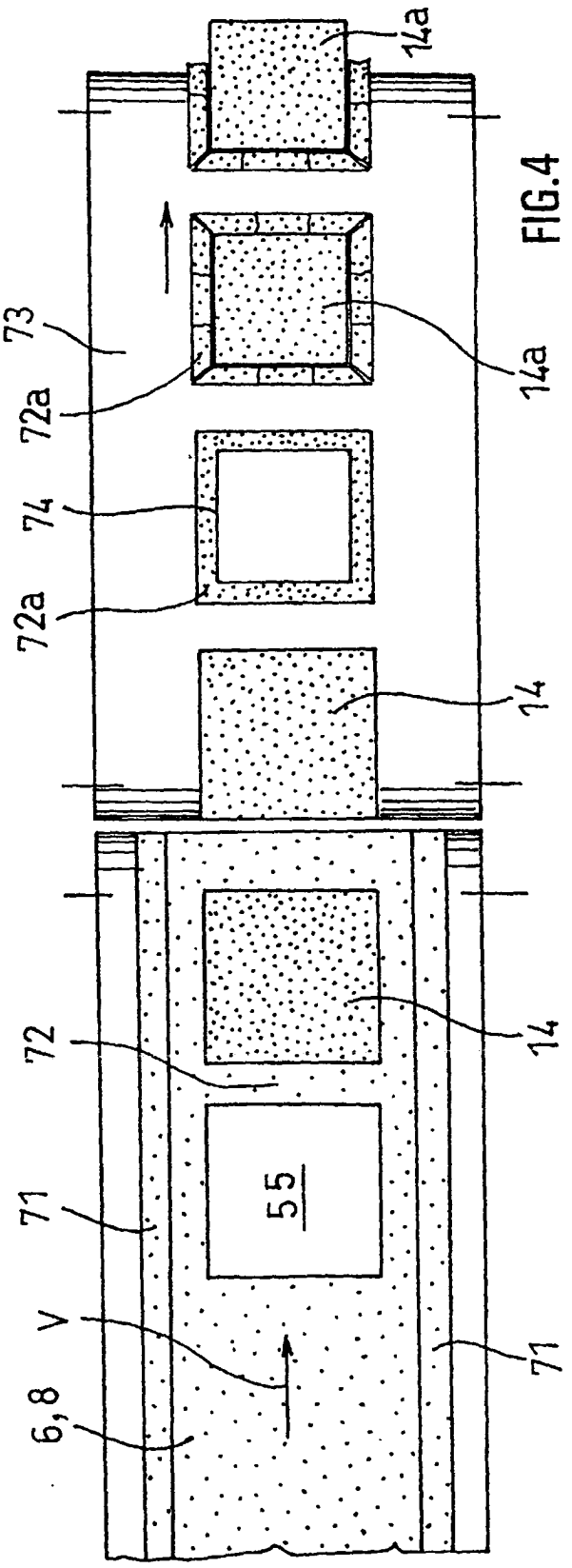
14a
73
72a
14a
74
72a
14
72
14
71
55
V
6,8
71

FIG.4

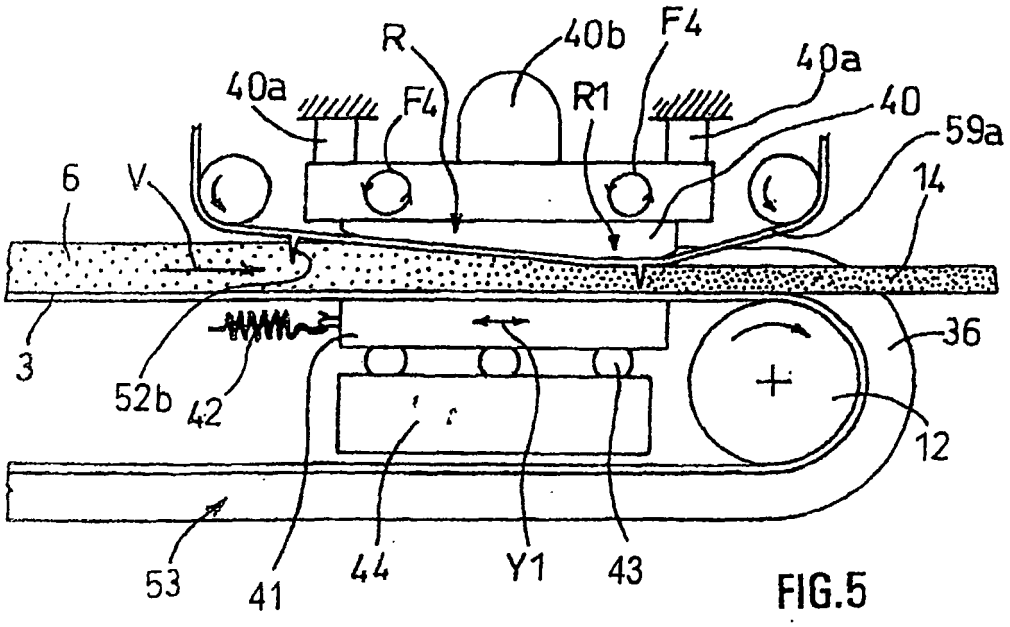

FIG.5

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 9504560 W **[0002]**
- WO 9615888 A **[0002]**
- US 3540093 A **[0003]**
- GB 880892 A **[0004]**
- IT 1069458 A **[0005]**