(19) Europäisches Patentamt
European Patent Office
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(11) **EP 1 844 879 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
17.10.2007 Bulletin 2007/42

(51) Int Cl.:
B22D 5/00 *(2006.01)* ***B22D 5/04*** *(2006.01)*
B22D 29/04 *(2006.01)* ***B22D 9/00*** *(2006.01)*

(21) Application number: **06380084.1**

(22) Date of filing: **12.04.2006**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

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(54) **A machine for demoulding ingots**

(57) A machine for multiple demoulding of ingots (2, 2') in which the machine has a chain for moulds (1) for housing the ingots (2, 2'), a guide (1') for leading the ingots (2, 2') from a feeding level F to a demoulding level D; a supporting mechanism (3) for collecting the ingots (2, 2') in the demoulding level D; a lowering device (6) for lowering a first ingot (2') from the demoulding level D to a transport level T and a second ingot (2) from the demoulding level D to a waiting level W; a spacing mechanism (4) for displacing a second ingot (2) from the waiting level W to the transport level T; transport means (5) for displacing the ingots (2, 2') from the transport level T to an exit level EX.

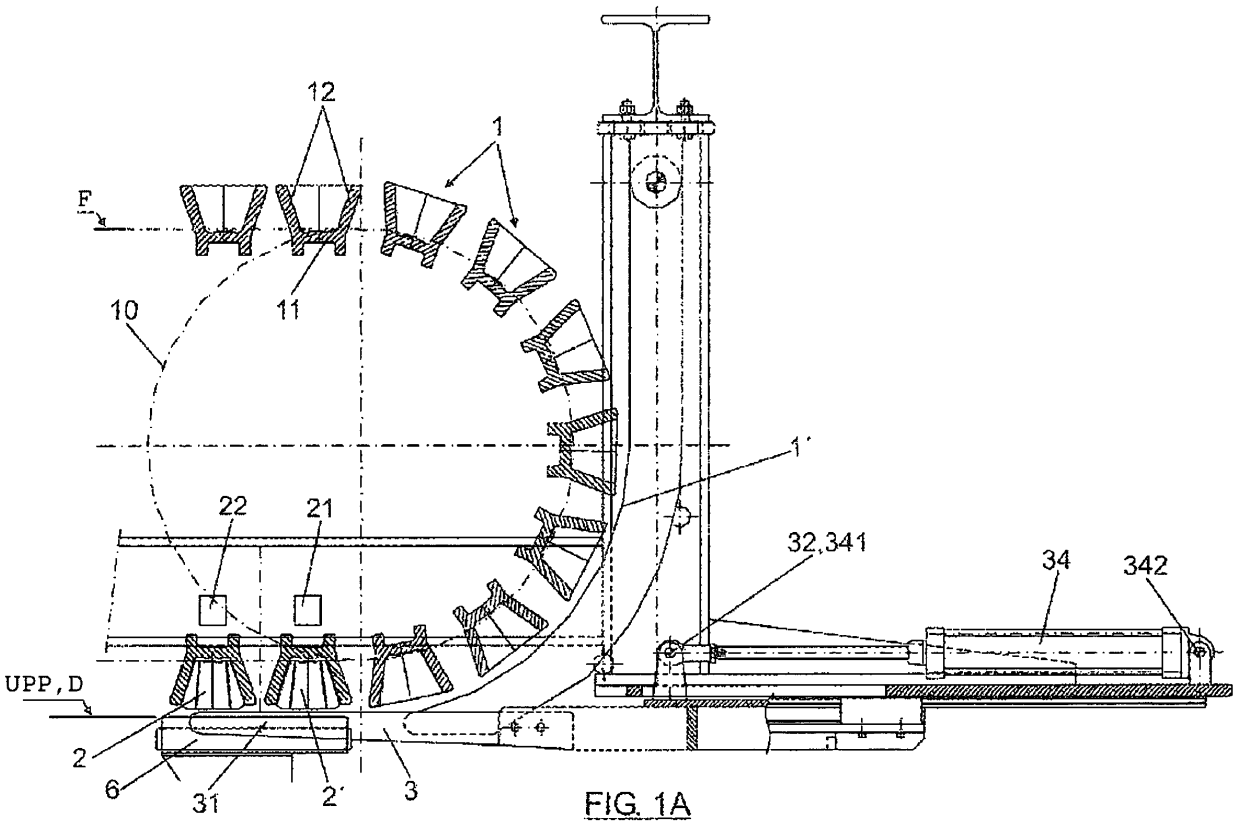

FIG. 1A

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Description

Field of the Invention

[0001] The invention relates to machines for demoulding ingots.

Background of the Invention

[0002] To date, demoulding ingots in a production line is carried out one by one, which increases the demoulding time thereof.

Description of the Invention

[0003] A first aspect of the invention relates to a machine for multiple demoulding of ingots having:

a conveyor chain for moulds, in which each mould has a base, two side walls and two end walls for housing an ingot;

[0004] Said machine comprises:

a guide for leading the ingots through the moulds and said guide, from the feeding level F to a demoulding level D for removing the ingots, the feeding level F being above the demoulding level D;
a supporting mechanism for collecting the ingots in the demoulding level D;
a lowering device:

to selectively lower the ingots to be demoulded:

lowering at least a first ingot from the demoulding level D to a transport level T;
lowering at least a second ingot from a demoulding level D to a waiting level W;

with:

the demoulding level D being above the waiting level W;
the waiting level W being above the transport level T;

a spacing mechanism for retaining at least a second ingot in the waiting level W and displacing the retained ingot from the waiting level W to the transport level T;
transport means for displacing the ingot from the transport level T to an exit level EX.

[0005] In the machine of the invention, the conveyor chain for moulds can be driven by a sprocket and the guide can:

have a shape conjugated with the portion of the conveyor chain for moulds meshed with the sprocket;
be opposite to the conveyor chain for moulds in a sector comprised between the feeding level F and the demoulding level D.

[0006] On one hand, the ingot supporting mechanism can be a retractable element having:

a first supporting end configured to collect the ingots;
a second connecting end articulated with first actuating means configured to move
the supporting mechanism alternatively between:

a demoulding position in which the first supporting end is located in the
demoulding level D in an extended state to receive the ingots from the
moulds; and
a transferring position in which the first supporting end is located in a retracted state to deposit the ingots on the lowering device.

[0007] The first actuating means can be a hydraulic or pneumatic cylinder which, in turn, can have:

a first fixing articulated on the second connecting end;
a second fixing articulated on a frame of the machine;

[0008] On the other hand, the lowering device can be an upward/downward moving element having:

a first supporting surface configured to support the ingots;
a first linking surface articulated to second actuating means configured to move the
lowering device alternatively between:

an upper position UPP in which the first supporting surface is located in the
demoulding level D so as to receive the ingots from the ingot supporting
mechanism; and
a lower position LOW under the transport level T, so as to define a run between the upper position UPP and the lower position LOW in which the
first supporting surface can be located in:

a waiting level W to deposit at least the second ingot on the spacing mechanism;
a transport level T to deposit at least the first ingot on the transport means.

[0009] The second actuating means can be a hydraulic or pneumatic cylinder, which in turn can have:

a first linkage articulated on the first linking surface;

a second linkage articulated on a frame of the machine.

[0010] Likewise, in the case of two by two demoulding and in one of the conceptions of the invention, the spacing mechanism can be a rocking element having:

a first supporting end configured to support at least a second ingot;
a second linking end articulated on a frame of the machine;
an intermediate portion between the first supporting end and the second end, articulated with a third actuating means configured to move the spacing mechanism alternatively between:

a collecting position in which the first supporting end is located in the waiting level W so as to receive at least the second ingot from the lowering device; and
an unloading position in which the first supporting end is located in the transport level T so as to deposit at least the second ingot on the transport means.

[0011] The third actuating means can be a hydraulic or pneumatic cylinder which in turn can have:

a third linkage articulated on the intermediate portion;
a fourth linkage articulated on a frame of the machine.

[0012] According to an alternative configuration, the spacing mechanism can be an upward/downward moving element having:

a second supporting surface configured to support at least the second ingot;
a second linking surface articulated with third actuating means configured to move the spacing mechanism alternatively between:

an upper collecting position UPP in which the second supporting surface is located in the waiting level W so as to receive at least the second ingot from the lowering device; and
a lower unloading position LOW under the transport level T so as to define a run between the upper position UPP and the lower position LOW in which the second supporting surface is located in the transport level T so as to deposit at least the second ingot on the transport means.

[0013] In this configuration, the third actuating means can be a hydraulic or pneumatic cylinder which in turn can have:

a fifth linkage articulated on the second linking surface;
a sixth linkage articulated on a frame of the machine.

[0014] The machine of the invention can further comprise removing means for dislodging an ingot from a mould. Said removing means can be selected from:

a striker which strikes the mould in a portion selected from the base, a side wall, an end wall and combinations thereof; in other words, there can be a single striker in the base, a single striker in a side wall, a single striker in an end wall, or there can be different combinations in which there is a striker in any of the locations;
a pusher which pushes the ingot through a portion selected from the base, a side wall, an end wall and combinations thereof; in other words, there can be a single pusher pushing the ingot through a portion in the base, a single pusher through a side wall, a single pusher through an end wall, or there can be different combinations in which there is a pusher pushing through any of the locations;
and combinations thereof; analogously to that indicated for the striker and the pusher, the removing means can include only strikers, only pushers, or any combination according to the arrangements defined while specifying how the striker and the pusher are.

[0015] In the machine of the invention, the transport means can be selected from an endless chain, an endless belt or combinations thereof.

[0016] In the same way, in the machine of the invention, the exit level EX can be in a position selected from above, below and at a same height as the transport level T.

Brief Description of the Drawings

[0017] A series of drawings are very briefly described which aid in better understanding the invention and are expressly related to an embodiment of said invention, specifically to the case of two by two demoulding of ingots, and presented as a non-limiting example thereof.

Figures 1A and 1 B show a sector and a plan view of the demoulding area of the machine in which the conveyor chain for moulds, the guide and the supporting mechanism can be observed.
Figures 2A and 2B show an elevational and side view in which the lowering device can be observed.
Figure 3 shows a side view in which a spacing mechanism can be observed.
Figure 4 shows a side view in which the exit level can be observed.

Description of a Preferred Embodiment of the Invention

[0018] A preferred embodiment of the invention is described below with the aid of the drawings. Figures 1A and 1B show that the machine for multiple demoulding of ingots (2, 2') has:

a conveyor chain for moulds (1), in which each mould (1) has a base (11), two side walls (12) and two end walls (13) for housing an ingot (2, 2').

[0019] Figures 1A and 1 B show that the machine comprises:

a guide (1') for leading the ingots (2, 2') through the moulds (1) and said guide (1'),
from a feeding level F to a demoulding level D for removing the ingots (2, 2'), the feeding level F being above the demoulding level D;
a supporting mechanism (3) for collecting the ingots (2, 2') in the demoulding level D;

[0020] In figures 2A and 2B, a lowering device (6) can be observed:

to selectively lower the ingots to be demoulded:

lowering at least a first ingot (2') from the demoulding level D to a transport level T;
lowering at least a second ingot (2) from the demoulding level D to a waiting level W;

with:

the demoulding level D being above the waiting level W;
the waiting level W being above the transport level T.

[0021] Figure 3 shows a spacing mechanism (4) for retaining at least a second ingot (2) in the waiting level W and displacing the retained ingot (2) from the waiting level W to the transport level T; whereas Figure 4 shows the transport means (5) for displacing the ingots (2, 2') from the transport level T to an exit level EX.

[0022] Figure 1 A illustrates how the conveyor chain for moulds (1) is driven by a sprocket (10) and in which the guide (1'):

has a shape conjugated with the portion of the conveyor chain for moulds (1) meshed with the sprocket (10);
is opposite to the conveyor chain for moulds (1) in a sector comprised between the feeding level F and the demoulding level D.

[0023] In Figure 1A, it can also be seen that the supporting mechanism (3) is a retractable element having:

a first supporting end (31) configured to collect the ingots (2, 2');
a second connecting end (32) articulated with first actuating means (34) configured to move the supporting mechanism (3) alternatively between:

a demoulding position in which the first supporting end (31) is located in the demoulding level D in an extended state to receive the ingots (2, 2') from the moulds (1); and
a transferring position in which the first supporting end (31) is located in a retracted state to deposit the ingots (2, 2') on the lowering device (6).

[0024] Likewise, Figure 1A shows that the first actuating means (34) are a cylinder selected from a hydraulic and pneumatic cylinder having:

a first fixing (341) articulated on the second connecting end (32);
a second fixing (342) articulated on a frame of the machine;

[0025] On the other hand, Figures 2A and 2B shows that the lowering device (6) is an upward/downward moving element having:

a first supporting surface (61) configured to support the ingots (2, 2');
a first linking surface (62) articulated to second actuating means (64) configured to move the lowering device (6) alternatively between:

an upper position UPP in which the first supporting surface (61) is located in the demoulding level D so as to receive the ingots (2, 2') from the supporting mechanism (3); and
a lower position LOW under the transport level T, so as to define a run between the upper position UPP and the lower position LOW in which the first supporting surface (61) is located in:

a waiting level W to deposit at least the second ingot (2) on the spacing mechanism (4);
the transport level T to deposit at least the first ingot (2') on the transport means (5).

[0026] In Figures 2A and 2B, it can also be seen that the second actuating means (64) are a cylinder selected from a hydraulic and pneumatic cylinder having:

a first linkage (641) articulated on the first linking surface (62);
a second linkage (642) articulated on a frame of the machine.

[0027] Figure 3 shows that the spacing mechanism (4) is a rocking element having:

a first supporting end (41) configured to retain at least a second ingot (2);
a second linking end (42) articulated on a frame of the machine;
an intermediate portion (43) between the first supporting end (41) and the second end (42), articulated with a third actuating means (44) configured to move the spacing mechanism (4) alternatively between:

a collecting position in which the first supporting end (41) is located in the waiting level W so as to receive at least the second ingot (2) from the lowering device (6); and
an unloading position in which the first supporting end (41) is located in the transport level T so as to deposit at least the second ingot (2) on the transport means (5).

[0028] In Figure 3, it can also be seen that the third actuating means (44) are a cylinder selected from a hydraulic and pneumatic cylinder having:

a third linkage (441) articulated on the intermediate portion (43);
a fourth linkage (442) articulated on a frame of the machine.

[0029] According to an alternative embodiment, the spacing mechanism (4) can be an upward/downward moving element, having:

a second supporting surface configured to support at least the second ingot (2);
a second linking surface articulated with third actuating means configured to move the spacing mechanism (4) alternatively between:

an upper collecting position in which the second supporting surface is located in the waiting level W so as to receive at least the second ingot (2) from the lowering device (6); and
a lower unloading position under the transport level T so as to define a run between the upper position and the lower position in which the second supporting surface is located in the transport level T so as to deposit at least the second ingot (2) on the transport means (5).

[0030] In this alternative embodiment, the third actuating means can be a cylinder selected from a hydraulic and pneumatic cylinder having:

a fifth linkage articulated on the second linking surface;
a sixth linkage articulated on a frame of the machine.

[0031] Going back to Figure 1A, it is shown that the machine further comprises removing means for dislodging an ingot (2, 2') from a mould (1). Specifically, the removing means are selected from:

a striker (21) which strikes the mould (1) in a portion selected from the base (11), a side wall (12), an end wall (13) and combinations thereof;
a pusher (22) which pushes the ingot (2, 2') through a portion selected from the base (11), a side wall (12), an end wall (13) and combinations thereof; and combinations thereof.

[0032] In Figures 2A, 3 and 4, the transport means (5) can be seen, which can be selected from an endless chain, an endless belt and combinations thereof.

[0033] Likewise, Figure 4 shows the exit level EX; this exit level can be in a position selected from above, below and at a same height as the transport level T (the case depicted in Figure 4).

[0034] According to the machine of the invention, the demoulding phase takes place in the following way: the ingots (2, 2') arrive through the chain for moulds (1) and the ingots (2, 2') leave the mould in their reversed position by their own weight or aided by a stroke or push, landing, two by two in the support-arms (3).

[0035] The machine of the invention also allows a spacing between ingots in the quick belt: the arms of the supporting mechanism (3) are removed so as to deposit the ingots (2, 2') on the lowering device (6). When the lowering device (6) moves downwards, it deposits a first ingot (2') on the quick belt or chain (5), while the second ingot (2) is deposited on a spacing mechanism (4). Once the first ingot (2') has advanced the desired distance on the quick chain (5), the spacing mechanism (4) moves downwards such that the second ingot (2) is deposited on the quick chain (5); in this way, both ingots (2, 2') are spaced by the desired distance and therefore, prepared for their subsequent handling.

Claims

1. A machine for multiple demoulding of ingots (2, 2') having:

a conveyor chain for moulds (1), in which each mould (1) has a base (11), two side walls (12) and two end walls (13) for housing an ingot (2, 2');

characterized in that it comprises:

a guide (1') for leading the ingots (2, 2') through the moulds (1) and said guide (1'), from a feeding level F to a demoulding level D for removing the ingots (2, 2'), the feeding level F being above the demoulding level D;

a supporting mechanism (3) for collecting the ingots (2, 2') in the demoulding level D;
a lowering device (6):

to selectively lower the ingots to be demoulded:

lowering at least a first ingot (2') from the demoulding level D to a transport level T;
lowering at least a second ingot (2) from the demoulding level D to a waiting level W;

with:

the demoulding level D being above the waiting level W;
the waiting level W being above the transport level T;

a spacing mechanism (4) for retaining at least a second ingot (2) in the waiting level W and displacing the retained ingot (2) from the waiting level W to the transport level T;
transport means (5) for displacing the ingots (2, 2') from the transport level T to an exit level EX.

2. The machine of claim 1 wherein the conveyor chain for moulds (1) is driven by a sprocket (10) and wherein the guide (1'):

has a shape conjugated with the portion of the conveyor chain for moulds (1) meshed with the sprocket (10);
is opposite to the conveyor chain for moulds (1) in a sector comprised between the feeding level F and the demoulding level D.

3. The machine of any of claims 1-2 wherein the supporting mechanism (3) is a retractable element (3) having:

a first supporting end (31) configured to collect the ingots (2, 2');
a second connecting end (32) articulated with first actuating means (34) configured to move the supporting mechanism (3) alternatively between:

a demoulding position in which the first supporting end (31) is located in the demoulding level D in an extended state to receive the ingots (2, 2') from the moulds (1); and
a transferring position in which the first supporting end (31) is located in a retracted state to deposit the ingots (2, 2') on the lowering device (6).

4. The machine of claim 3 wherein the first actuating means (34) are a cylinder selected from a hydraulic and a pneumatic cylinder having:

a first fixing (341) articulated on the second connecting end (32);
a second fixing (342) articulated on a frame of the machine;

5. The machine of any of claims 1-4 wherein the lowering device (6) is an upward/downward moving element having:

a first supporting surface (61) configured to support the ingots (2, 2');
a first linking surface (62) articulated to second actuating means (64) configured to move the lowering device (6) alternatively between:

an upper position UPP in which the first supporting surface (61) is located in the demoulding level D so as to receive the ingots (2, 2') from the supporting mechanism (3); and
a lower position LOW under the transport level T, so as to define a run between the upper position UPP and the lower position LOW in which the first supporting surface (61) is located in:

a waiting level W to deposit at least the second ingot (2) on the spacing mechanism (4);
the transport level T to deposit at least the first ingot (2') on the transport means (5).

6. The machine of claim 5 wherein the second actuating means (64) are a cylinder selected from a hydraulic and pneumatic cylinder having:

a first linkage (641) articulated on the first linking surface (62);
a second linkage (642) articulated on a frame of the machine.

7. The machine of any of claims 1-6 wherein the spacing mechanism (4) is a rocking element having:

a first supporting end (41) configured to retain at least a second ingot (2);
a second linking end (42) articulated on a frame of the machine;
an intermediate portion (43) between the first supporting end (41) and the second end (42), articulated with a third actuating means (44) configured to move the spacing mechanism (4) alternatively between:

a collecting position in which the first supporting end (41) is located in the waiting level W so as to receive at least the second ingot (2) from the lowering device (6); and
an unloading position in which the first supporting end (41) is located in the transport level T so as to deposit at least the second ingot (2) on the transport means (5).

8. The machine of claim 7 wherein the third actuating means (44) are a cylinder selected from a hydraulic and pneumatic cylinder having:

a third linkage (441) articulated on the intermediate portion (43);
a fourth linkage (442) articulated on a frame of the machine.

9. The machine of any of claims 1-8 further comprising removing means for dislodging an ingot (2, 2') from a mould (1).

10. The machine of claim 9 wherein the removing means are selected from:

a striker (21) which strikes the mould (1) in a portion selected from the base (11), a side wall (12), an end wall (13) and combinations thereof;
a pusher (22) which pushes the ingot (2, 2') through a portion selected from the base (11), a side wall (12), an end wall (13) and combinations thereof;
and combinations thereof.

11. The machine of any of claims 1-10 wherein the transport means (5) are selected from an endless chain, an endless belt and combinations thereof.

12. The machine of any of claims 1-11 wherein the exit level EX is in a position selected from above, below and at a same height as the transport level T.

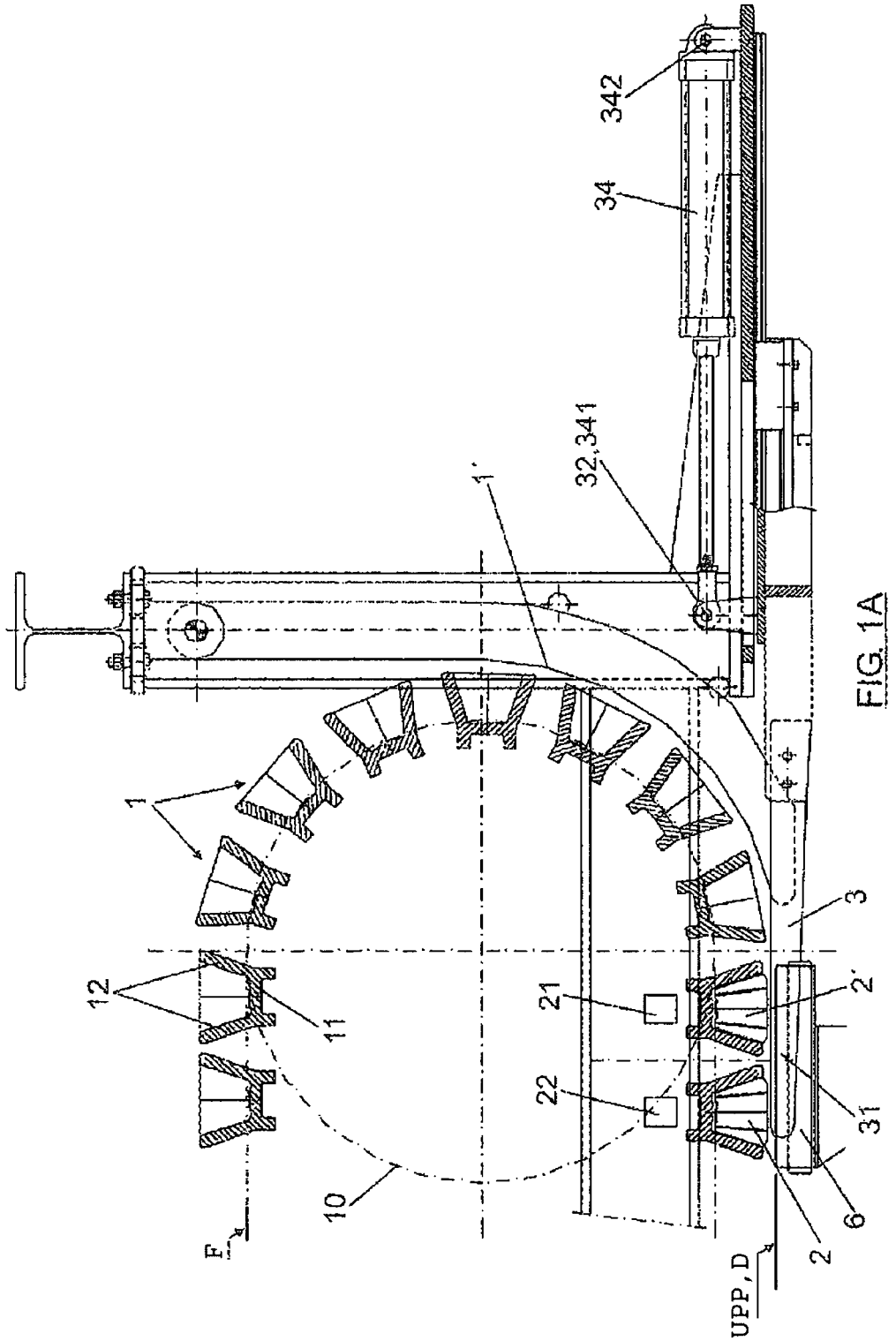

FIG. 1A

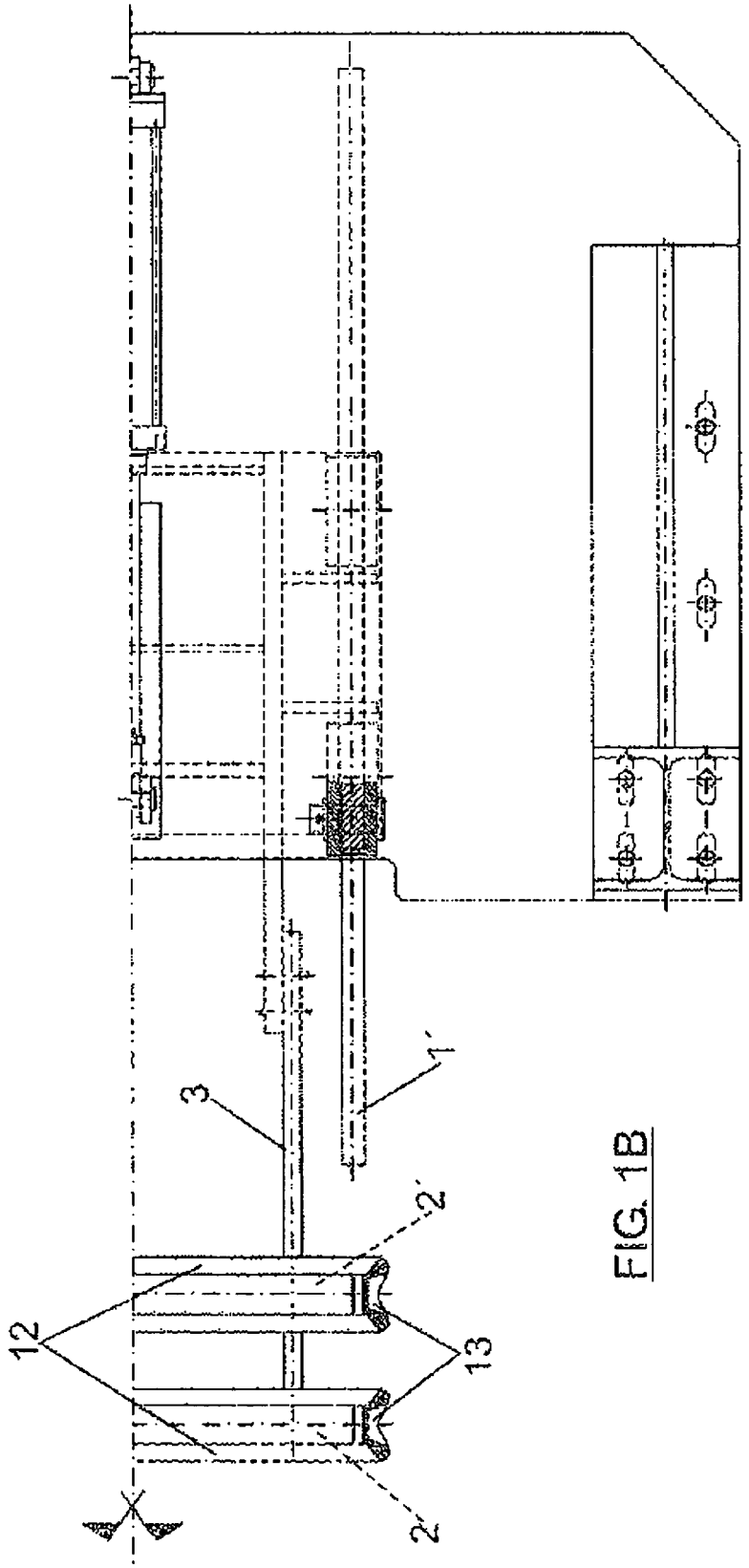

FIG. 1B

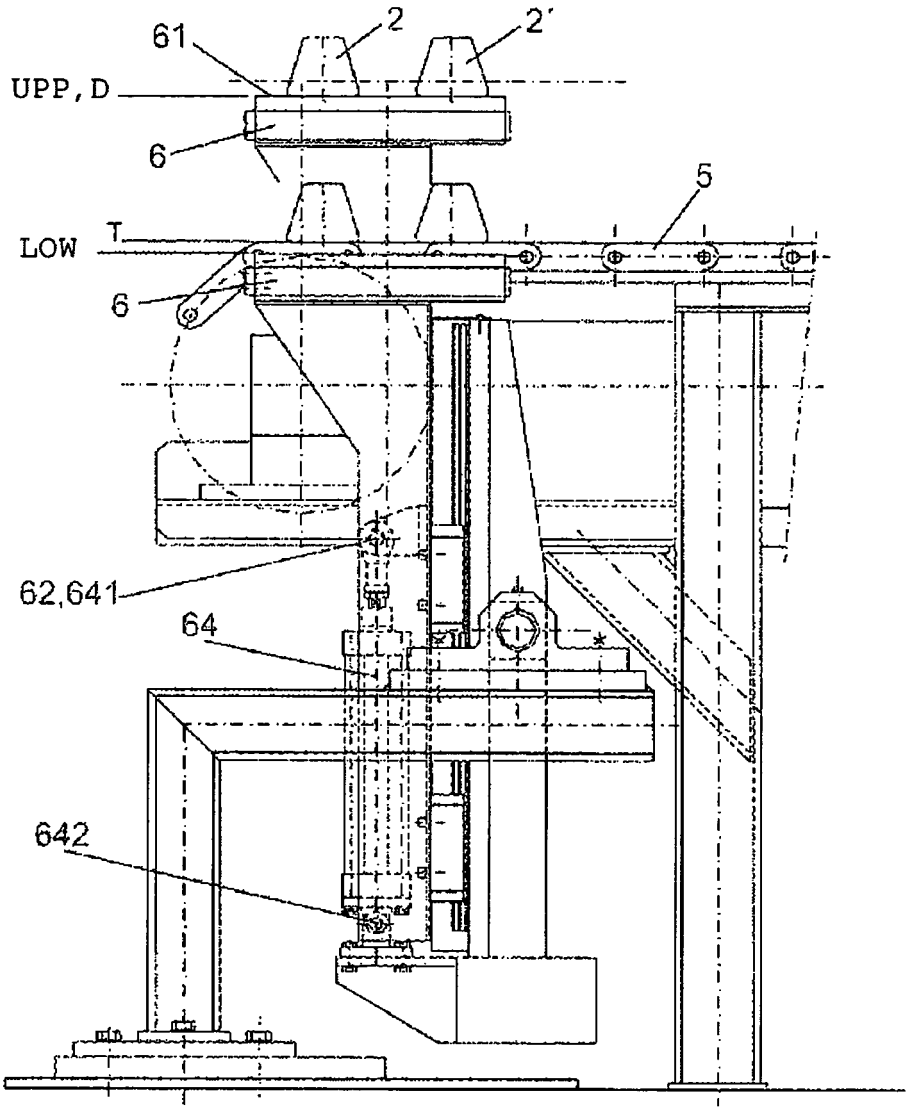

FIG. 2A

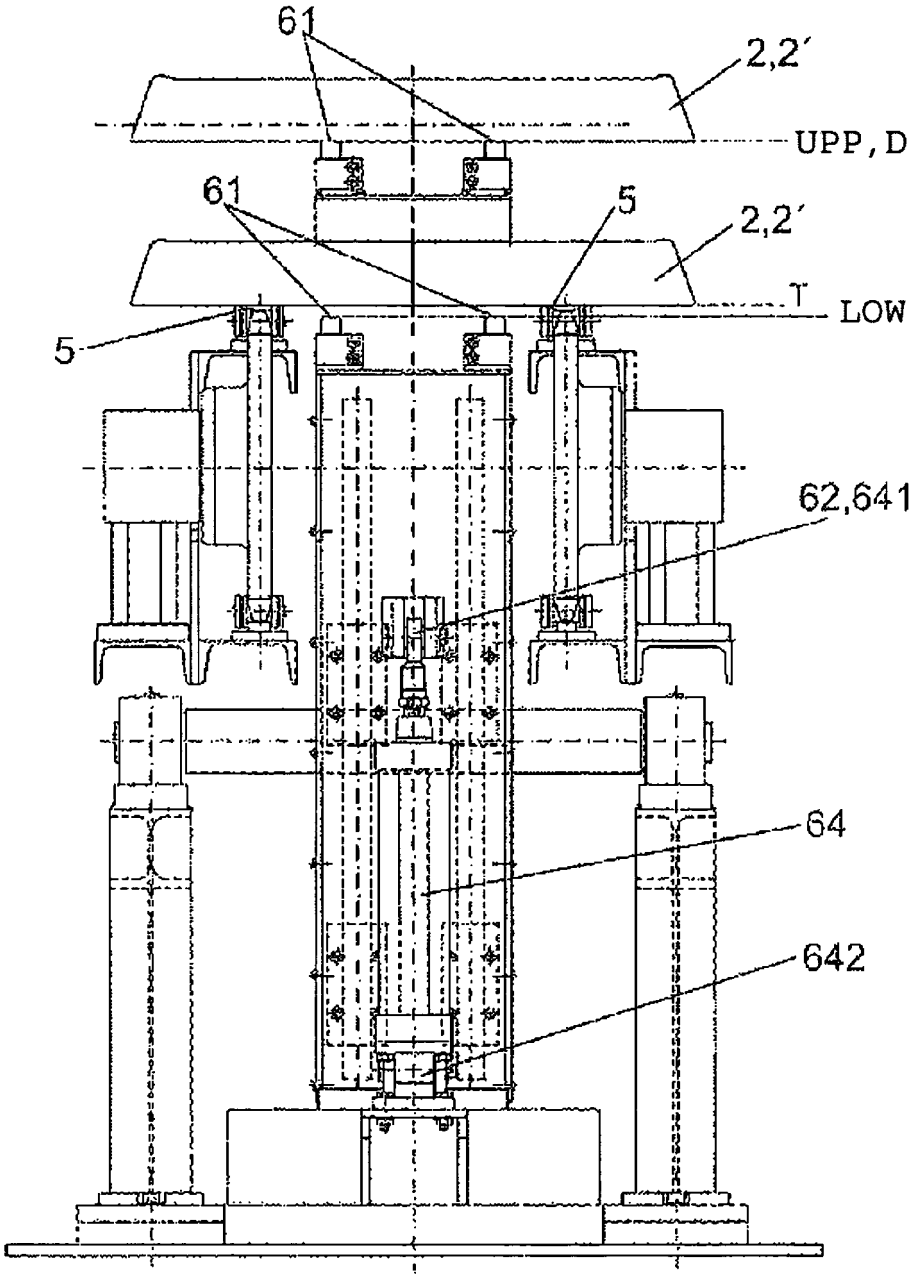

FIG. 2B

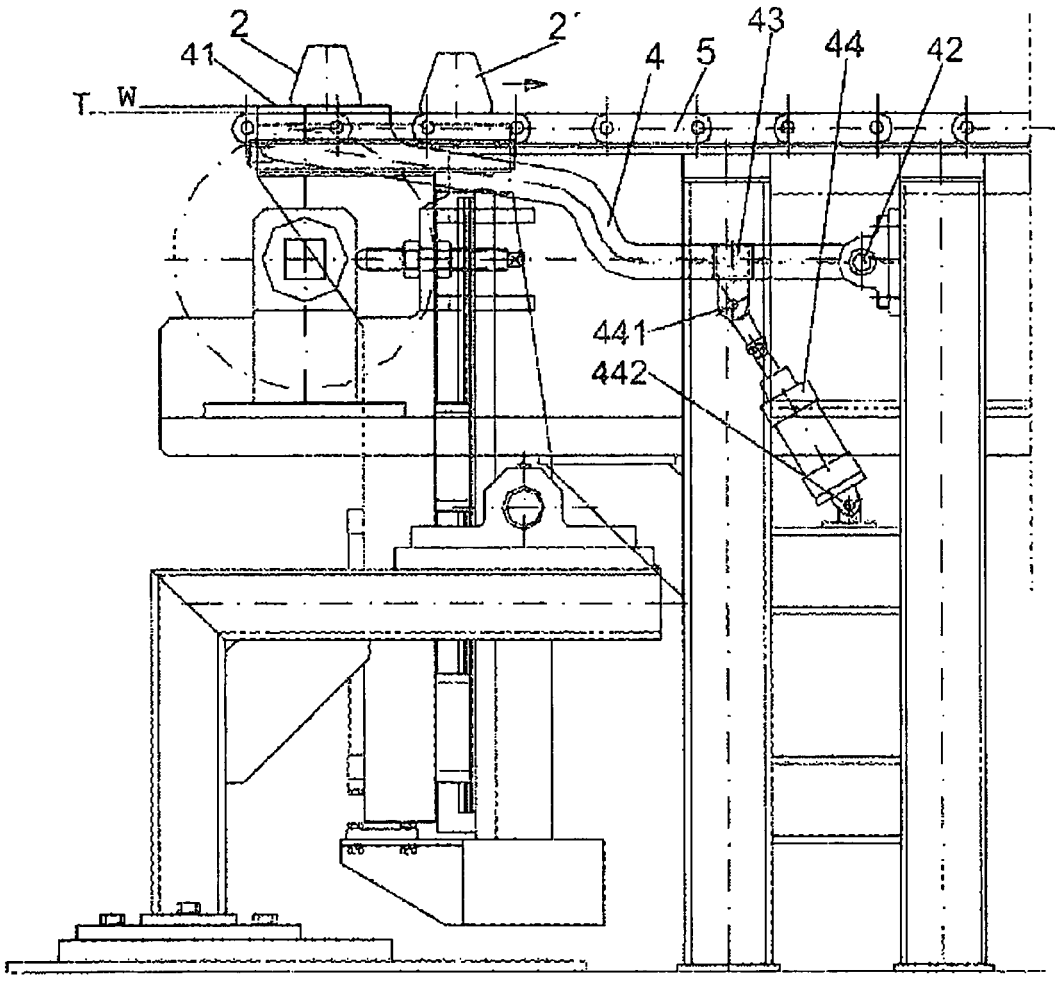

FIG. 3

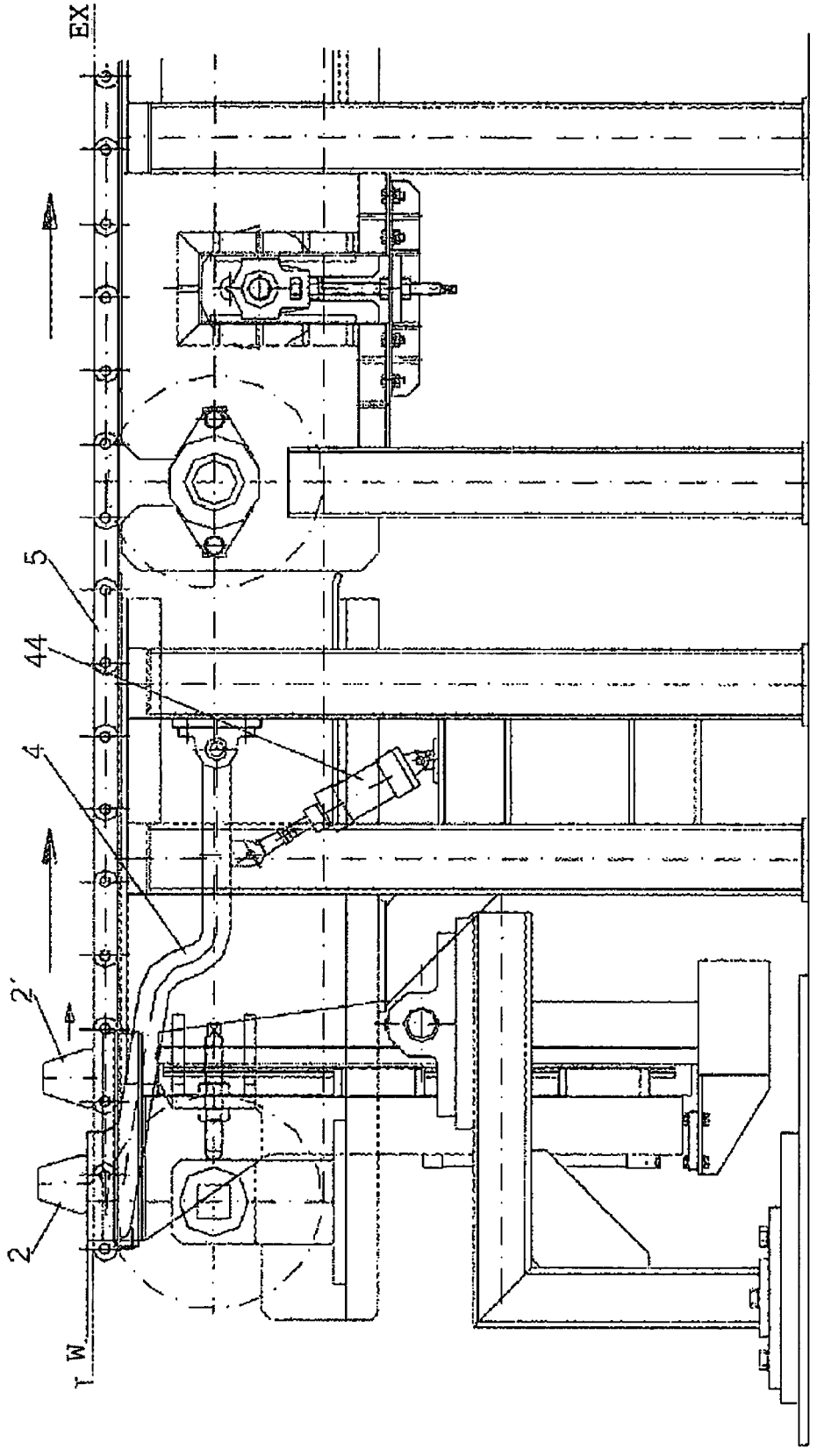

FIG. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 06 38 0084

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)

B22D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	8 September 2006	Baumgartner, Robin

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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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

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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
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