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(54) **Printing apparatus**

(57) In a printing apparatus, comprising at least one paper cassette (1) for receiving a stack of sheets (2), especially a stack of paper, with the paper cassette (1) being provided for arrangement in a readiness position and a loading position, with the stack of sheets (2) being arranged in the readiness position for removal of sheets for a printing process and with the paper cassette (1) being arranged in the loading position for loading with sheets, especially paper, with the paper cassette (1) comprising a filling-level limiting apparatus (3) for predetermining the maximum filling level (4) of the receivable stack of sheets (2), and with the filling-level limiting apparatus (3) being provided in the loading position of the paper cassette (1) for making contact with an upper surface (21) of the stack of sheets (2), it is proposed for the purpose of preventing a faulty withdrawal of a sheet from the stack of sheets (1) that the filling-level limiting apparatus (3) is arranged in the readiness position of the paper cassette (1) at a distance from an upper surface (21) of the stack of sheets (2).

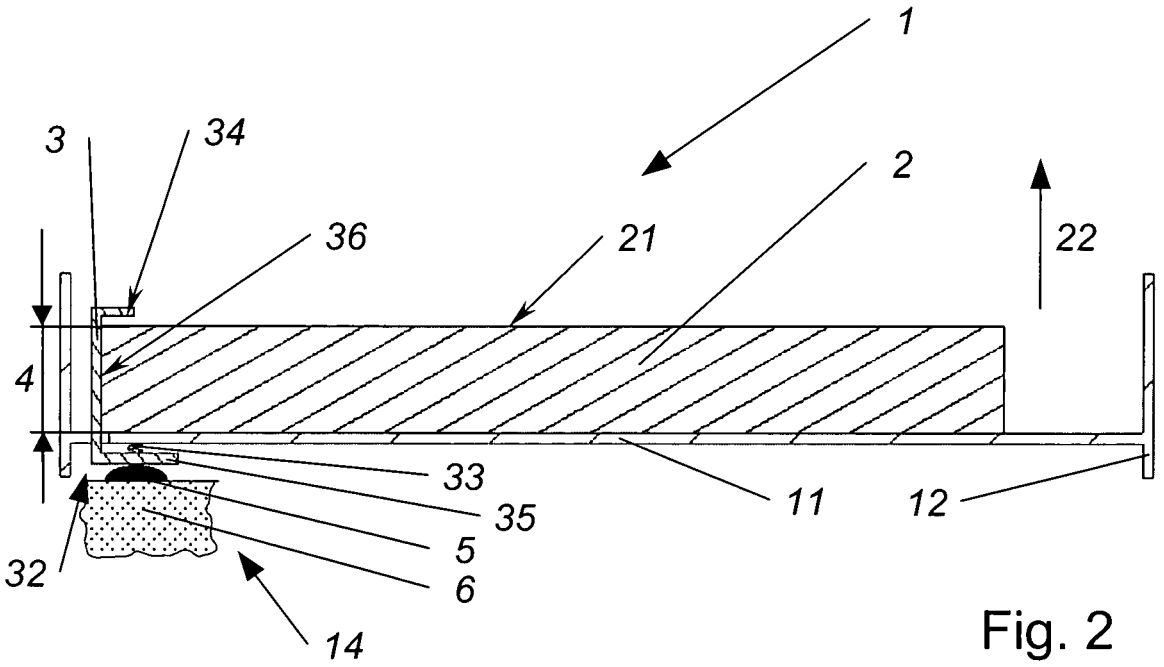

Fig. 2

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Description

[0001] The invention relates to a printing apparatus according to the preamble of claim 1. Printing apparatuses are known for example as printers, fax machines and/or copying machines. Known printing apparatuses often comprise the paper cassette for providing a stack of paper.

[0002] The disadvantageous aspect in conventional printing apparatuses with conventional paper cassettes is that when the paper cassette is filled completely, i.e. it is filled to 100% capacity or even more, which means it is provided with more sheets of paper than required, the removal of the sheets of paper from the stack of paper in the printing apparatus occurs repeatedly in a faulty way, which means oftentimes not with the required high reliability. The occurring faults are that two sheets are drawn in simultaneously, that no sheet is drawn in or that a sheet is damaged when drawn in, e.g. it is torn.

[0003] The disadvantageous aspect is that the printing process is incomplete and/or erroneous or that the printing process is interrupted. It is further disadvantageous in this respect that in the erroneous drawing of the sheet of paper there will be a paper jam in the printing apparatus and printing can only be resumed after operator intervention, thus leading to a waste of time and/or additional costs. Two simultaneously withdrawn sheets of paper can further cause erroneous printing. The printed document may comprise disturbing empty sheets which may have to be sorted out.

[0004] It is therefore the object of the invention to provide a printing apparatus of the kind mentioned above with which the mentioned disadvantages can be avoided and with which a single sheet can be drawn in from a stack of paper into the printing apparatus without damage and with high reliability.

[0005] This is achieved in accordance with the invention by the features of claim 1.

[0006] This leads to the advantage that when the paper cassette is filled up to the maximum filling level, the drawing in of a sheet can be ensured without any tensioning of a sheet and without the simultaneous drawing in of several sheets at once. It is simultaneously ensured that overfilling of the paper cassette is prevented.

[0007] It is advantageous in this respect that all sheets of the stack of paper can be drawn in one by one with a constant high amount of reliability, with the likelihood of damaging the drawn sheet of paper being very low. It is further advantageous that the likelihood of interrupting the printing order due to erroneous drawing in of the paper is low. The invention further relates to a method according to the preamble of claim 10.

[0008] It is an object of the method to provide a method with which the advantages of the initially described printing apparatus can be provided in a simple and cost-effective way.

[0009] This is achieved in accordance with the invention by the features of claim 10.

[0010] The above advantages and advantageous effects are thus also achieved in an advantageous way.

[0011] The sub-claims which like claims 1 and 10 simultaneously form a part of the description relate to further advantageous embodiments of the invention.

[0012] The invention is described in closer detail by reference to the enclosed drawings which merely show preferred embodiments in an exemplary way, wherein:

Fig. 1 shows a schematic sectional view of a preferred embodiment of the paper cassette in its loading position, with the direction of view being in the direction of a movement of a sheet in the removal of a sheet in the printing apparatus, and

Fig. 2 shows the paper cassette according to Fig. 1 in the ready position and the release device and a part of the housing of the printing apparatus in the illustration according to Fig. 1.

[0013] Figs. 1 and 2 show a preferred first embodiment of a paper cassette 1 of a printing apparatus with at least one paper cassette 1 for receiving a stack of sheets 2, especially a stack of paper, with the paper cassette 1 being provided for arrangement in a readiness position and in a loading position, with stack of sheets 2 arranged for removal of sheets for a printing process in the readiness position of paper cassette 1 and the paper cassette 1 is arranged for loading with sheets, especially paper, in the loading position, with the paper cassette 1 comprising a filling-level limiting apparatus 3 for predetermining the maximum filling level 4 of the receivable stack of sheets 2, and with filling-level limiting apparatus 3 being provided in the loading position of the paper cassette 1 for contact with an upper surface 21 of the stack of sheets 2. To ensure that individual sheets, especially a single sheet of paper, can be drawn in with high reliability in an undamaged way from the stack of sheets 2 into the printing apparatus it is proposed that in the readiness position of the paper cassette 1 the filling-level limiting apparatus 3 is arranged at a distance from an upper surface 21 of the stack of sheets 2.

[0014] It is provided in this connection that either the filling-level limiting apparatus 3 and/or the stack of paper are displaced relative to one another during the displacement of the paper cassette from its loading position to its readiness position.

[0015] It is advantageous in this respect that the uppermost sheet of the stack of sheets 2 which thus forms the upper surface 21 of the stack of sheets 2 rests in a substantially loose manner on the one but top sheet of the stack of sheets 2 and substantially low holding forces act thereby. It is advantageous that the uppermost sheet can be withdrawn with a low amount of effort and with high reliability from the stack of paper and can be drawn for printing into the printing apparatus. It is also advantageous in this respect that the reliability is high that only one sheet is drawn in during the withdrawal of the upper-

most sheet into the printing apparatus. It is further advantageous that during the withdrawal of the uppermost sheet into the printing apparatus the sheet of paper is twisted merely to a very low extent, thus preventing with a high amount of reliability the tearing, deformation and/or twisting of the sheet to be drawn in.

[0016] As a result, a paper jam during the withdrawal of the uppermost sheet can advantageously be prevented and similarly the positioning of the withdrawn sheet in the printing apparatus can be improved, so that the printed image can be positioned with more precision on the sheet of paper and/or further means for positioning the sheet in the printing apparatus can be omitted.

[0017] The printing apparatus can be arranged especially as a printer and/or copying machine. The sheet can be printed by the printing apparatus by means of laser printing, needle printing, ink-jet printing and/or thermoprinting.

[0018] The sheet is a thin-layered medium suitable for receiving a print image. The sheet suitable for printing in the printing apparatus is usually provided with a sheet thickness of between 0.01 mm and 1 mm. The sheet can be arranged especially as a sheet of paper which can also be designated as paper. Similarly, the sheet may be made of plastic and therefore be designated as a foil. The sheet can especially have a surface size of between A6 and A00 or can be cut with standardized dimensions or special dimensions. Sheets are usually arranged to be rectangular, with paper cassette 1 being arranged especially for rectangular sheets.

[0019] It can advantageously be provided that a filling-level boundary area 34 of the filling-level limiting apparatus 3 which can come into contact with the upper surface 21 and a paper stack support 11 are arranged in a third position 13 closer to one another than in a fourth position 14 of the same. The third position 13 - as shown in Fig. 1 - can be arranged to a frame 12 of the paper cassette 1 by means of a relative movement of the filling-level limiting apparatus 3 and/or to a frame 12 of the paper cassette 1 by a relative movement of the paper stack support 11. Filling-level limiting apparatus 3 and paper stack support 11 are arranged in their third position in the loading position of the paper cassette 1. Filling-level limiting apparatus 3 and paper stack support 11 are arranged in their fourth position 14 in the readiness position of the paper cassette 1.

[0020] The distanced arrangement of the filling-level limiting apparatus 3 to the upper surface 21 of the stack of sheets 2 can be achieved especially in such a way that the filling-level limiting apparatus 3 is moved for this purpose relative to the paper stack support 11 of the paper cassette 1. It can be provided advantageously that the filling-level limiting apparatus 3 is arranged in a first position 31 in the loading position of the paper cassette 1, and that the filling-level limiting apparatus 3 is arranged in a second position 32 in the readiness position of the paper cassette 1. This can occur especially by means of a method for operating the printing apparatus with at least the one paper cassette 1, in which method it is provided that the filling-level limiting apparatus 3 arranged in the first position 31 in the loading position of the paper cassette 1 is moved to a second position 32 during the displacement of the paper cassette 1 to the readiness position of the paper cassette 1, with the filling-level limiting apparatus 3 being arranged to be spaced from an upper surface 21 of the stack of sheets 2 in the readiness position of the paper cassette 1.

[0021] In the first position 31, which also can form the third position 13, the filling-level limiting apparatus 3, and especially the filling-level boundary area 34 of the filling-level limiting apparatus 3, is in contact with the upper surface 21 of the stack of sheets 2.

[0022] In the second position 32, which also can form the fourth position 14, the filling-level limiting apparatus 3, and especially the filling-level boundary area 34 of the filling-level limiting apparatus 3, is spaced from the upper surface 21 of the stack of sheets 2.

[0023] The motion between the first position 31 and the second position 32 can especially be arranged as a movement of translation, with the filling-level limiting apparatus 3 being moved in a substantially translational way. In particular, said translational movement can be aligned parallel to a normal line 22 to the upper surface 21 of the stack of sheets 2. It is advantageous in this respect that the filling-level limiting apparatus 3 can be lifted off the upper surface 21 of the stack of sheets 2 with minimal translational movement.

[0024] It can advantageously be provided that the filling-level limiting apparatus 3 comprises a lateral guide means 36 for lateral guidance of the stack of sheets 2. The lateral guide means 36 can be provided especially for lateral guidance of the stack of sheets 2 both in the first position 31, especially also in the third position 13, as well as in the second position 32, especially also in the fourth position 14, with the stack of sheets 2 being laterally guided by means of a lateral guide means 36 which is comprised by the filling-level limiting apparatus 3.

[0025] The lateral guide means 36 can preferably be arranged in a substantially planar way. In particular, the filling-level limiting apparatus 3 and/or the paper stack support 11 can be moved parallel to the substantially parallel lateral guide means 36 between the first position 31 and the second position 32, with the distance of the lateral guide means 36 to the stack of sheets 2 not changing. It is advantageous that despite the motion of the filling-level limiting apparatus 3 the lateral guidance of the sheet remains substantially the same both in the loading position as well as in the readiness position of the paper cassette 1.

[0026] In particular, the filling-level boundary area 34 of the filling-level limiting apparatus 3 can be lifted off the upper surface 21 of the stack of sheets 2 by means of the release device 5, with the release device 5 being provided for moving the filling-level limiting apparatus 3 from the first position 31 to the second position 32 during

the displacement of the paper cassette 2 from the loading position to the readiness position. The release device 5 is shown schematically in Fig. 2. During the displacement of the paper cassette 1 to the readiness position, which usually is into the interior of the housing of the printing apparatus, the guide surface 35 can advantageously be moved relative to the release device 5 and brought into contact with the release device 5. The guide surface 35, as shown in Figs. 1 and 2, can be displaced relative to the paper stack support 11, with the entire filling-level limiting apparatus 3 being moved in particular. It can advantageously be provided that the filling-level limiting apparatus 3 in the loading position will become arranged in the first position 31 automatically, which means without any manual action on the part of a user of the printing apparatus, for which purpose a pretensioning element 33 can advantageously be provided.

[0027] It can be provided especially in this context that the release device 5 is arranged on a housing 6 of the printing apparatus and, in the readiness position of paper cassette 1, is provided for making contact with the filling-level limiting apparatus 3, especially a guide surface 35 of the filling-level limiting apparatus 3. The filling-level limiting apparatus 3 can thus be moved easily from the first position 31 to the second position 32, with the filling-level limiting apparatus 3 being moved by means of a release device 5. For this purpose, the release device 5 can be arranged as a guide rib, hump and/or as a cam, so that the motion of the filling-level limiting apparatus 3 can be guided in a simple and reliable way, with this occurring without any manual intervention during the displacement of the paper cassette 2 from the loading position to the readiness position and vice-versa.

[0028] Since the release device 5, in the readiness position of paper cassette 1, is arranged as a counter-bearing to the filling-level limiting apparatus 3, especially to the guide surface 35 of the filling-level limiting apparatus 3, the release device 5 can also be designated as a counter-bearing.

[0029] It can be provided advantageously in this respect that the pretensioning element 33 is connected with the filling-level limiting apparatus 3 and the paper cassette 1. It can advantageously be provided that the pretensioning element 33 pretensions the filling-level boundary area 34 in the direction towards the paper stack support 11 and that the pretensioning element 33 tensions the release device 5 in the readiness position, i.e. it is moved in a direction against the direction of relaxation of the pretensioning element 33. When the release device 5 is arranged in a contact-free manner relative to the filling-level boundary area 34, the pretensioning element 33 relaxes, through which the filling-level limiting apparatus 3 is arranged substantially automatically in the first position 31 through the pretensioning element 33 and moves substantially automatically from the second position 32 to the first position 31.

[0030] This substantially automatic arrangement of the filling-level limiting apparatus 3 in its first position 31 can occur in an especially simple and reliable manner when the pretensioning element 33 is arranged between the paper stack support 11 and the guide surface 35.

[0031] The pretensioning element 33 can especially comprise a metal spring, and can preferably be arranged as a metal spring.

[0032] In an advantageous further development (not shown), the filling-level limiting apparatus 3 can comprise a stop element which acts in the loading position and which is provided that the filling-level limiting apparatus 3 cannot displace from the first position 31 in the direction towards the second position 32 during the filling of the paper cassette 4. In the first embodiment of the paper cassette 1, the stop element can be arranged advantageously between the paper stack support 11 and the guide surface 35, thus ensuring a specific minimum distance between the paper stack support 11 and the guide surface 35.

[0033] It is provided in this connection that the stop element is ineffective in the readiness position. For example, the stop element can be moved out of the intermediate space between the paper stack support 11 and the guide surface 35, through which the filling-level limiting apparatus 3 can be displaced beyond the first position 31 in the direction towards the second position 32. The moving out of the stop element can advantageously occur by means of a counter-bearing, especially a counter-bearing comprised by the housing, which is arranged on the housing of the printing apparatus. The stop element can be displaced or twisted, and tilted for example, when moving the stop element out of the intermediate space between the paper stack support 11 and the guide surface 35.

[0034] In a second embodiment of the paper cassette 1 (not shown), it can be provided that the filling-level limiting apparatus 3 is arranged in a firmly positioned way relative to the frame 12 of the paper cassette 1, and that the paper stack support 11 is arranged to be movable relative to the frame 12 of the paper cassette 1, especially relatively displaceable to the frame 12. Such relative motion between the filling-level limiting apparatus 3 and the paper stack support 11 can occur especially in the same manner as described above, with the filling-level limiting apparatus 3 being arranged in a firmly positioned way relative to the frame 12 and the paper stack support 11 being moved.

[0035] The second embodiment of paper cassette 1 can be operated by means of a method in which it is provided that the paper stack support 11 which is arranged in the loading position of the paper cassette 1 in the fifth position is moved to a sixth position when displacing the paper cassette 1 from the loading position of the paper cassette 1 to the readiness position of the paper cassette 1, with the filling-level limiting apparatus 3 and the paper stack support 11 - relatively to each other - being arranged in the loading position in the third position 13 and the filling-level limiting apparatus 3 and the paper stack support 11 - relatively to each other - being ar-

ranged in the readiness position in the fourth position 14.

[0036] It can be provided especially in the second embodiment that the release device 5 is provided for cooperating with the paper stack support 11. The release device 5 can especially be arranged on the housing and disposed thereon in such a way that during the displacement of the paper cassette 1 to its readiness position the release device 5 moves the paper stack support 11 away from the filling-level boundary area 34. The pretensioning element 33 can especially be provided which can be arranged and/or disposed especially according to the above explanations made in connection with the pretensioning element 33.

[0037] Further embodiments in accordance with the invention merely have a part of the described features, with any combination of features being provided, especially also from different described embodiments.

Claims

1. A printing apparatus, comprising at least one paper cassette (1) for receiving a stack of sheets (2), especially a stack of paper, with the paper cassette (1) being provided for arrangement in a readiness position and a loading position, with the stack of sheets (2) being arranged in the readiness position for removal of sheets for a printing process and with the paper cassette (1) being arranged in the loading position for loading with sheets, especially paper, with the paper cassette (1) comprising a filling-level limiting apparatus (3) for predetermining the maximum filling level (4) of the receivable stack of sheets (2), and with the filling-level limiting apparatus (3) being provided in the loading position of the paper cassette (1) for making contact with an upper surface (21) of the stack of sheets (2), **characterized in that** the filling-level limiting apparatus (3) is arranged in the readiness position of the paper cassette (1) at a distance from the upper surface (21) of the stack of sheets (2).

2. A printing apparatus according to claim 1, **characterized in that** the filling-level limiting apparatus (3) is arranged in the loading position of the paper cassette (1) in a first position (31), the filling-level limiting apparatus (3) is arranged in the readiness position of the paper cassette (1) in a second position (32), and a filling-level boundary area (34) of the filling-level limiting apparatus (3) - which filling-level boundary area (34) can make contact with the upper surface (21) - is arranged in the first position (31) closer to a paper stack support (11) of the paper cassette (1) than in the second position (32).

3. A printing apparatus according to claim 2, **characterized in that** a release device (5) is provided for moving the filling-level limiting apparatus (3) from the first position (31) to the second position (32) during the displacement of the paper cassette (2) from the loading position to the readiness position.

4. A printing apparatus according to claim 3, **characterized in that** the release device (5) is arranged on a housing (6) of the printing apparatus and is provided for making contact with the filling-level limiting apparatus (3), especially a guide surface (35) of the filling-level limiting apparatus (3), in the readiness position of the paper cassette (1).

5. A printing apparatus according to claim 3 or 4, **characterized in that** the release device (5) is arranged as a guide rib, as a hump and/or cam.

6. A printing apparatus according to one of the claims 1 to 5, **characterized in that** a pretensioning element (33) is connected with the filling-level limiting apparatus (3) and with the paper cassette (1).

7. A printing apparatus according to claim 6, **characterized in that** the pretensioning element (33) is arranged between the paper stack support (11) and the guide surface (35).

8. A printing apparatus according to one of the claims 6 or 7, **characterized in that** the pretensioning element (22) comprises a metal spring, and is especially arranged as a metal spring.

9. A printing apparatus according to one of the claims 1 to 8, **characterized in that** the filling-level limiting apparatus (3) comprises a lateral guide means (36) for lateral guidance of the stack of sheets (2).

10. A method for operating a printing apparatus, comprising at least one paper cassette (1) for receiving a stack of sheets (2), especially a stack of paper, with the paper cassette (1) being provided for arrangement in a readiness position and a loading position, with the stack of sheets (2) being arranged in the readiness position of the paper cassette (1) for removal of sheets for a printing process and with the paper cassette (1) being arranged in the loading position of the paper cassette (1) for loading with sheets, especially paper, with the paper cassette (1) comprising a filling-level limiting apparatus (3) for predetermining the maximum filling level (4) of the receivable stack of sheets (2), **characterized in that** the filling-level limiting apparatus (3) which is arranged in a first position (31) in the loading position of the paper cassette (1) is moved to a second position (32) during the displacement of the paper cassette (1) to the readiness position of the paper cassette (1), with the filling-level limiting apparatus (3) being arranged at a distance from an upper surface (21) of the stack of sheets (2) in the readiness posi-

tion of the paper cassette (1).

11. A method for operating a printing apparatus, comprising at least one paper cassette (1) for receiving a stack of sheets (2), especially a stack of paper, with the paper cassette (1) being provided for arrangement in a readiness position and a loading position, with the stack of sheets (2) being arranged in the readiness position of the paper cassette (1) for removal of sheets for a printing process and with the paper cassette (1) being arranged in the loading position of the paper cassette (1) for loading with sheets, especially paper, with the paper cassette (1) comprising a filling-level limiting apparatus (3) for predetermining the maximum filling level (4) of the receivable stack of sheets (2), **characterized in that** a paper stack support (11) which is arranged in a fifth position in a loading position of the paper cassette (1) is moved to a sixth position when displacing the paper cassette (1) from the loading position of the paper cassette (1) to the readiness position of the paper cassette (1), with the filling-level limiting apparatus (3) and the paper stack support (11) - relatively to each other - being arranged in the loading position in the third position (13) and in the readiness position in the fourth position (14).

12. A method according to claim 10 or 11, **characterized in that** the filling-level limiting apparatus (3) or the paper stack support (11) is moved by means of a release device (5).

13. A method according to one of the claims 10, 11 or 12, **characterized in that** the stack of sheets (2) is laterally guided by means of a lateral guide means (36) comprised by the filling-level limiting apparatus (3).

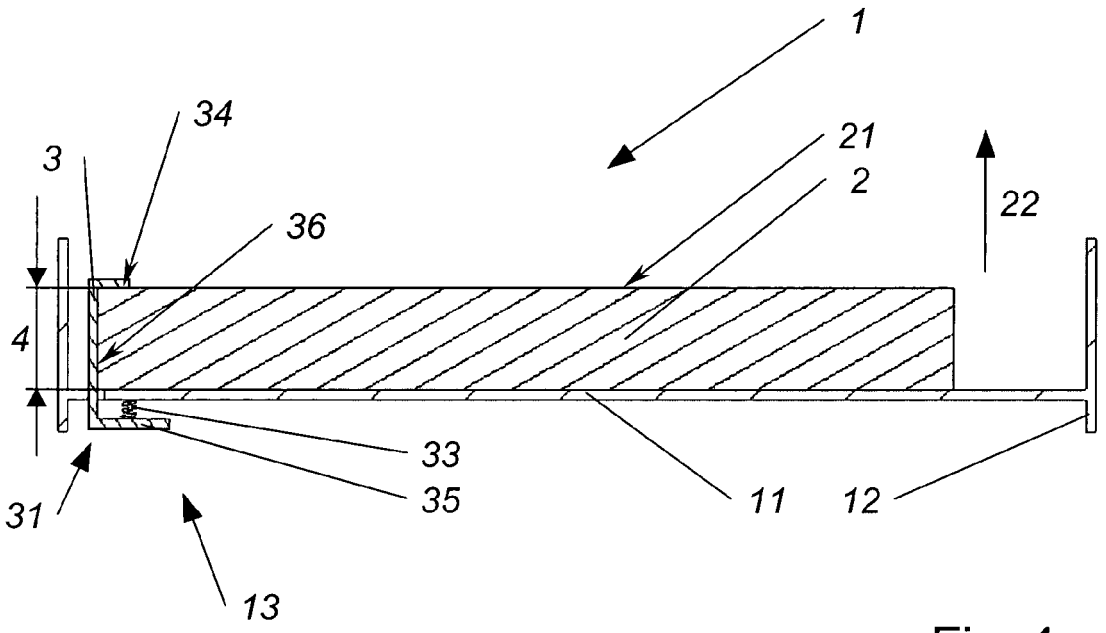
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Fig. 1

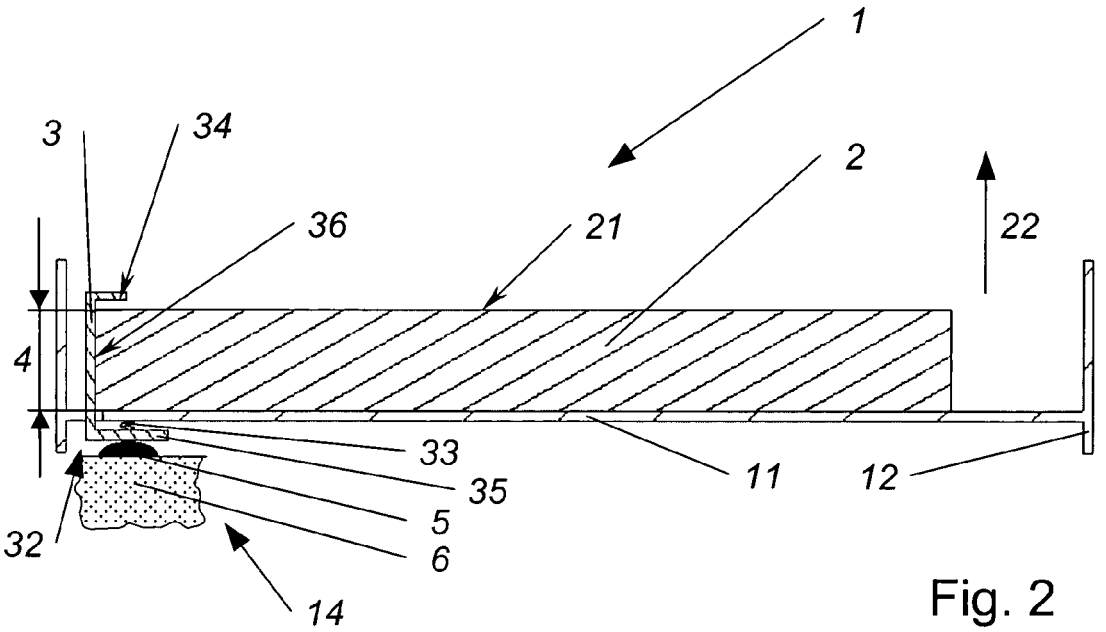
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Fig. 2

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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	20 March 2009	Lemmen, René

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