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(71) Applicant: **Inles d.d.**
1310 Ribnica (SI)

(72) Inventors:
- **Urh, Dusan**
  1317 Sodrazica (SI)
- **Ertl, Josef**
  8212 Pischelsdorf (AT)

(74) Representative: **Djukic, Dusan**
Mark-Inventa Co. Ltd.
Glinska ulica 14
1000 Ljubljana (SI)

(54) Window

(57) Present invention reveals a window (10, 20, 30, 40) consisting of a frame (12, 22, 32, 42), a window sash (11, 21, 31, 41), and hardware, hidden between said window frame and window sash, whereby the said window sash (11, 21, 31, 41) consists of an insert (11A, 21A, 31A, 41A) and glazing (11B, 21B, 31B, 41B), the latter consisting of at least one intermediate pane (112, 212, 312, 412), one innermost pane (114, 214, 314, 414) and one outermost pane (111, 211, 311, 411), the total thickness of the glazing (11B, 21B, 31B, 41B) being equal to the total thickness of the window sash (11, 21, 31, 41). The mentioned panes differ in height and width; the furthermost panes are preferably safety glasses and are enamelled along the rim and peripheral parts in any colour, whereas the space in between is filled with a rare gas. The window is distinguished for its low heat transfer and good acoustic insulation, while having relatively small thickness of the window wing.

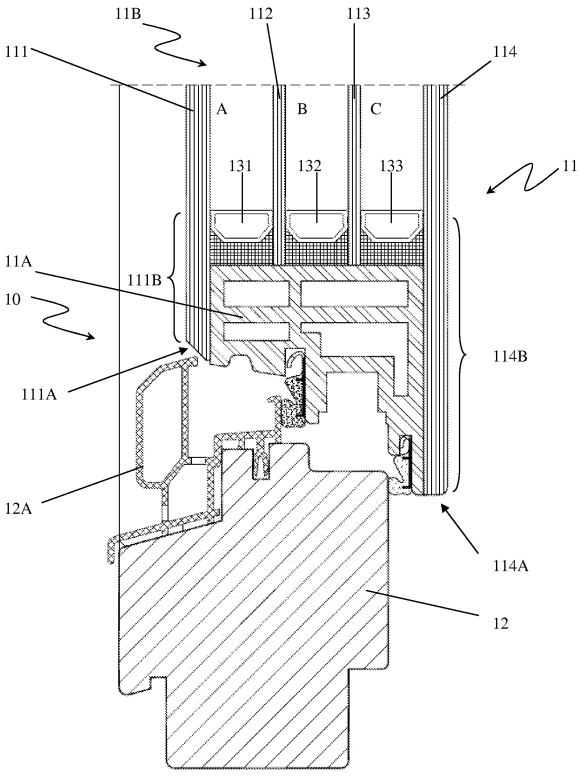


Figure 1A

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Description

Field of the invention

[0001] Subject invention belongs to the field of outdoor builders' joinery, more specifically to the field of windows and balcony doors.

State of the art

[0002] Windows and balcony doors (hereinafter referred to as windows) are known in the state of the art and consist of a frame and a wing which is glazed in the central part. The glazing of window wings may be single-pane, but it is usually double-pane or triple-pane.

[0003] A typical window according to prior art 50 is schematically shown in figure 5 and consists of window wing 51 and window frame 52, which has a rain protection cover aluminium profile 52A built in below. Window wing 51 consists of window sash 51A, which has glazing 51B in its central part. In the sash 51A of window wing 51, hardware is installed along the rim from the outside and on the inside of the rim which is intended for closing the window into window frame 52, which enables opening to the left or to the right side or tilt-and-turn opening or the combination of the mentioned. On the inside of window sash 51A there is also a latch installed for opening the window wing. The hinges around which the sash rotates when opening it may be entirely visible, partially visible, or entirely hidden between the window sash and the window frame. Along the rim of the window sash and window frame, there are also seals installed; usually two or three seals that fit the corresponding sealing brims when the window is closed.

[0004] The glazing in the central part of the window wing, according to the state of the art is made so that the total thickness of the glazing is significantly smaller than the thickness of the window sash, and with double-pane glazing amounts to 24 mm when window panes are 4 mm thick and 16 mm apart (i.e. 4 + 16 + 4 mm), as shown in diagram in figure 5, while the thickness of the window wing amounts to 68 mm. The remaining width is filled on the inside of the window by lath 54, with which glazing 51B is fixed onto the window sash 51A, and on the outside by fitted brim 55, which may be covered with an aluminium cover lath 55A.

[0005] The panes are separated by inter-pane spacer 53, whereas space Y, which is bordered by the panes and the spacer, is filled with a rare gas.

[0006] The window sash is usually made of the same material as the window frame, namely it may be made of wood, the combination of wood and aluminium, from aluminium profiles, or from plastics material profiles, usually from PVC.

Description of the technical problem

[0007] Along with having an acceptable price, a modern window must also meet quite a few technical requirements, such as good thermal and acoustic insulation, resistance to atmospheric influences, minimum need for maintenance, and safety against burglary, whereby the window must also have a modern aesthetic appearance and as many variants available as possible (various combinations of materials, colours, shapes, etc.).

[0008] The thermal and acoustic insulation of a window mostly depends on the thermal and acoustic insulation of the glazing as well as of the window sash and window frame. The total thermal and also acoustic transmittance of a window has been calculated for the entire window, i.e. for the glazing with the window sash and the window frame. But the maximum influence on the total insulation of the entire window bears the glazing of the window wing.

[0009] Greater thermal and acoustic insulation of the glazing is achieved by increasing the number of panes, whereas greater thermal and acoustic insulation of the window sash and window frame is achieved by increasing the thickness of the frames; and in case of hollow frames (aluminium and plastics material) by increasing the number of chambers following each other horizontally from the inside out.

[0010] The first weakness of the window wing according to the state of the art described above is the thickness of the window wing frame, which is significantly larger than the thickness of the glazing.

[0011] Another weakness is found in the surface areas of both the horizontal part of fitted brim 55 and internal fitted lath 54, with which glazing is fixed in the window sash, since dust tends to accumulate mainly on the inside, whereas the outer side is exposed to atmospheric influences (sun, rain, hale, snow), therefore a protective cover lath 55A needs to be mounted on the outside of fitted brim 55.

Description of the invention

[0012] The invention in question solves the described technical problems by introducing a window that consists of the window frame and window wing, whereby the window wing consists of the sash and glazing, which is at least triple-pane and whereby panes are reciprocally separated by inter-pane spacers; the furthermost panes are fixed onto the window frame laterally from both sides, and the intermediate panes are inserted in the sash, thus making the thickness of the glazing equal to the thickness of the window sash.

[0013] According to the invention concerned, the window sash does not have fitted brim 55 or internal fitted lath 54; hence, no surface areas which would be exposed to atmospheric influences on the outside or on which dust would accumulate on the inside.

[0014] Since in the described embodiment the window sash is inserted between the furthermost panes, it is hereinafter referred to as insert.

Brief description of figures

[0015] The window according to the present invention is in continuation described in more detail with reference to attached enclosed figures. For easier understanding of the figures, it is important to understand that the window has typical shapes; i.e. it is rectangular with four typical cross-sections, namely through the top transom (S1), through the left mullion (S2), through the right mullion (S3), and through the bottom transom (S4).

[0016] The cross-sections through the top transom and both mullions (S1, S2 and S3) are usually reciprocally equal, whereas the cross-section through the bottom transom (S4) differs from the other three cross-sections in case of a wooden window frame (rain protection brim, space for indoor and outdoor shelf, etc.). If a window frame is made of plastics material or from aluminium profiles, all four typical cross-sections of the window (S1, S2, S3 and S4) are the same.

[0017] Enclosed figures show:

Figure 1A: First embodiment of the window according to the invention concerned, cross-section S4

Figure 1B: First embodiment of the window according to the invention concerned, cross-section S1, S2, S3

Figure 2A: Second embodiment of the window according to the invention concerned, cross-section S4

Figure 3: Third embodiment of the window according to the invention concerned, cross-section S1, S2, S3, S4

Figure 4: Fourth embodiment of the window according to the invention concerned, cross-section S1, S2, S3, S4

Figure 5: The window according to state of the art, cross-section S4

Detailed description of the invention

Description of the first embodiment

[0018] The first embodiment of the window according to the present invention is shown in figures 1A and 1B. Window 10 consists of window frame 12 and window wing 11, which consists of insert 11A and four-pane glazing 11B. The window has two levels of sealing.

[0019] Insert 11A is made of hollow profiles from plastics materials or aluminium. Furthermost panes 111, 114 are mounted laterally from both sides onto the window wing insert 11A, whereas inner panes 112 and 113 are placed in the insert. All four panes are reciprocally separated by spacers 131, 132 and 133. All three spaces A, B and C, which are limited by panes and spacers, are filled with a rare gas.

[0020] Pane 114, which is located on inside of window wing 11, is protective (toughened or multiple-walled glued) and enamelled along the outer rim 114A and on the peripheral part 114B and glued onto insert 11A. Insert 11A and the corresponding spacer are together with enamelled peripheral part 114B of pane 114 completely covered on the inside, so that they are not visible. The colour of enamelled surfaces 114A and 114B is optional.

[0021] Similarly, pane 111, which is located on the outside of window wing 11, is protective (toughened or multiple-walled glued) and enamelled along the outer rim 111A and on the peripheral part 111B and glued onto insert 11A. Insert 11A and the corresponding spacer are together with enamelled peripheral part 111B of pane 111 completely covered on the outside, so that they are not visible. The colour of enamelled surfaces 111A and 111B is optional.

[0022] In the shown embodiment, window frame 12 is made of wood and has aluminium rain protection profile 12A mounted on the bottom outer rim.

[0023] In the window embodiment shown in figures 1A and 1B, the thickness of panes 111 and 114 equals 6 mm, whereas the thickness of intermediate panes 112 and 113 ranges from 2 to 3 mm. Reciprocal distances between panes in the embodiment shown in figures 1A and 1B amount to 16 mm, which is the standard width of inter-pane spacers.

[0024] The distance between panes, or rather the widths of spaces A, B and C may be equal or different, which is determined by the chosen width of inter-pane spacers.

[0025] In the shown embodiment, the total thickness of the glazing is 3 mm, taking into account the thickness of intermediate panes (X_1 = (6 + 16 + 3 + 16 + 3 +16 + 6) mm = 66 mm) and therefore equal to the total thickness of window wing 11.

Description of second embodiment

[0026] The second embodiment of the window according to the present invention is shown in figure 2. Window 20 consists of the window frame 22 and window wing 21, which consists of insert 21A and four-pane glazing 21B. The window has three levels of sealing.

[0027] Insert 21A is made of hollow profiles from plastics materials or aluminium.

[0028] Outermost panes 211, 214 are mounted laterally from both sides onto the window wing insert 21A, whereas inner panes 212 and 213 are placed in the insert. All four panes are reciprocally separated by spacers 231, 232, 233A and 233B. All three spaces E, F and G, which are limited by panes and spacers, are filled with a rare gas.

[0029] Pane 214, which is located on inside of window wing 21, is protective (toughened or multiple-walled

glued) and enamelled along the outer rim 214A and on the peripheral part 214B and glued onto insert 21A. Insert 21A and the corresponding spacer are together with enamelled peripheral part 214B of pane 214 completely covered on the inside, so that they are not visible. The colour of enamelled surfaces 214A and 214B is optional.

[0030] Similarly, pane 211, which is located on the outside of window wing 21, is protective (toughened or multiple-walled glued) and enamelled along the outer rim 211A and on the peripheral part 211B and glued onto insert 21A. Insert 21A and the corresponding spacer are together with enamelled peripheral part 211B of pane 211 completely covered on the outside, so that they are not visible. The colour of enamelled surfaces 211A and 211B is optional.

[0031] In the shown embodiment, window frame 22 is made of wood and has aluminium profile 22A mounted on the outside along the entire rim.

[0032] In the window embodiment that is shown in figure 2 the thickness of panes 211 and 214 equals 6 mm, whereas the thickness of intermediate panes 212 and 213 ranges from 2 to 3 mm. Reciprocal distances between panes 211, 212 and panes 212, 213 in figure 2 embodiment are equal, namely 16 mm, and the distance between panes 213 and 214 amounts to 32 mm, which corresponds to the two standard widths of inter-pane spacers.

[0033] In the embodiment shown in figure 2, the total thickness of the glazing is 3 mm, taking into account the thickness of intermediate panes (X_1 = (6 + 16 + 3 + 16 + 3 +16 + 6) mm = 66 mm), and is therefore equal to the total thickness of window wing 21.

Description of third embodiment

[0034] The third embodiment of the window according to the invention concerned is shown in figure 3. Window 30 consists of the window frame 32 and window wing 31, which consists of insert 31A and four-pane glazing 31B. The window has three levels of sealing.

[0035] Insert 31A is made of hollow profiles from plastics materials.

[0036] Outermost panes 311, 314 are mounted laterally from both sides onto the window wing insert 31A, whereas inner panes 312 and 313 are placed in the insert. All four panes are reciprocally separated by spacers 331, 332, 333A and 333B. All three spaces L, M and N, which are limited by panes and spacers, are filled with a rare gas.

[0037] Pane 314, which is located on inside of window wing 31, is protective (toughened or multiple-walled glued) and enamelled along the outer rim 314A and on the peripheral part 314B and glued onto insert 31A. Insert 31A and the corresponding spacer are together with enamelled peripheral part 314B of pane 314 completely covered on the inside, so that they are not visible. The colour of enamelled surfaces 314A and 314B is optional.

[0038] Similarly, pane 311, which is located on the outside of window wing 31, is protective (toughened or multiple-walled glued) and enamelled along the outer rim 311A and on the peripheral part 311B and glued onto insert 31A. Insert 31A and the corresponding spacer are together with enamelled peripheral part 311B of pane 311 completely covered on the outside, so that they are not visible. The colour of enamelled surfaces 311A and 311B is optional.

[0039] In the shown embodiment, window frame 32 is made of profiles from plastics material.

[0040] The thicknesses of panes, reciprocal distances between panes, the thickness of the glazing, and the total thickness of the window wing shown in figure 3 are equal to those shown in figure 2.

Description of fourth embodiment

[0041] The fourth embodiment of the window according to the present invention is shown in figure 4. Window 40 consists of the window frame 42 and window wing 41, which consists of insert 41A and four-pane glazing 41B. The window has two levels of sealing.

[0042] Insert 41A is made of a combination of hollow profiles from plastics materials and aluminium.

[0043] Outermost panes 411, 414 are mounted laterally from both sides onto the window wing insert 41A, whereas inner panes 412 and 413 are placed in the insert. All four panes are reciprocally separated by spacers 431, 432, 433A and 433B. All three spaces P, R and S, which are limited by panes and spacers, are filled with a rare gas.

[0044] Pane 414, which is located on inside of window wing 41, is protective (toughened or multiple-walled glued) and enamelled along the outer rim 414A and on the peripheral part 414B and glued onto insert 41A. Insert 41A and the corresponding spacer are together with enamelled peripheral part 414B of pane 414 completely covered on the inside, so that they are not visible. The colour of enamelled surfaces 414A and 414B is optional.

[0045] Similarly, pane 411, which is located on the outside of window wing 41, is protective (toughened or multiple-walled glued) and enamelled along the outer rim 411A and on the peripheral part 411B and glued onto insert 41A. Insert 41A and the corresponding spacer are together with enamelled peripheral part 411B of pane 411 completely covered on the outside, so that they are not visible. The colour of enamelled surfaces 411A and 411B is optional.

[0046] In the shown embodiment, window frame 42 is made of a combination of hollow profiles from plastics material and aluminium.

[0047] The thicknesses of panes, reciprocal distances between panes, the thickness of the glazing, and the total thickness of the window wing shown in figure 4 are equal to those shown in figure 2.

Description of common characteristics

[0048] A common characteristic of the above described embodiments of the window according to present invention is equal thickness of window wing 11, 21, 31, 41 and glazing 11B, 21B, 31B, 41B, whereby the thickness of insert 11A, 21A, 31A, 41A is smaller than the total thickness of the window wing or glazing, respectively, and the fact that the mentioned insert is completely covered on the inside by innermost pane 114, 214, 314, 414 and on the outside by outermost pane 111, 211, 311, 411.

[0049] As evident from the description of the window wing according to the state of the art shown in figure 6 (the thickness of which amounts to 68 mm), from the descriptions of window wings shown in figure 1A or 1B (the thickness of which amounts to 66 mm) and those shown in figures 2, 3 and 4 (the thickness amounts to 82 mm), the solution according to the present invention provides a window where the total thickness of its window wing may be even smaller or not significantly larger than the thickness of the window wing according to state of the art, whereby considering the fact that it has four-pane glazing and thus lower heat transfer and at the same time higher acoustic insulation of the glass and hence the entire window.

[0050] The above described windows according to the invention concerned achieve the value of total thermal transmittance (U_w) between 1.4 and 0.6W/m^{2}K, depending on the selected window frame and the combination of gas, spacers, and emission applications in the glass wing.

[0051] The above described windows according to the invention concerned achieve the value of acoustic insulation (R_w) between 32 and 45dB.

[0052] With an appropriate combination of panes and the use of improved inter-pane spacers, the mentioned values U_W and R_w may be even more favourable and there is also the possibility of various degrees of shading.

[0053] Another common characteristic of the above described embodiments of the window according to present invention is the possibility of combining the window sash with a window frame made of any material; namely, the window frame may be made of wood, a combination of wood and aluminium profiles, PVC profiles, or aluminium profiles, thus providing its compatibility and the possibility of combining it with all known window and facade systems.

[0054] All embodiments of the window according to the invention concerned show the use of hardware that is built into the insert and is located between the insert and the window frame when the window is closed and is therefore not visible. Such hardware is already known in state of the art and is for this reason not specifically described.

[0055] One other common feature of the above described embodiments of the window according to the invention concerned is the difference in the dimensions of panes. Namely, the thickness of intermediate panes 112, 113, 212, 213, 312, 313, and 412, 413 is smaller and ranges from 2 to 3 mm. The mentioned panes also have minimum height and width, and are made of plain glass that is used for glazing. Innermost pane 114, 214, 314, 414 is 6 mm thick in the shown embodiments and has maximum height and width, and is protective (toughened pr multiple-walled glued). Various thicknesses of inner and outer panes are possible within the limits of the thickness of the sash. Outermost pane 111, 211, 311, 411 is 6 mm thick in the shown embodiments and is smaller in height and width than the mentioned outermost pane and bigger than the mentioned intermediate panes and therefore equal to the innermost safety (toughened pr multiple-walled glued) pane.

[0056] The windows according to the invention concerned allow combinations of various colours and thus special aesthetic effects on account of their realisation, enamelled outer rims 111A, 114A, 211A, 214A, 311A, 314A, and 411A, 414A, and enamelled peripheral parts 111B, 114B, 211B, 214B, 311B, 314B and 411B, 414B.

[0057] Outermost panes 114, 214, 314, 414 and 111, 211, 311, 411 are along the peripheral part 114A, 214B, 314B, 414B enamelled on both surfaces, only on the outer surface, or only on the inner surface.

[0058] The expression "inner surface" implies the surface area with which pane connects with the insert, whereas the expression "outer surface" implies the opposite surface area.

[0059] In the preferential embodiment, the mentioned outermost panes are enamelled along the peripheral part only on the inner surface.

[0060] Innermost panes 114, 214, 314, 414 and outermost panes 111, 211, 311, 411 are glued onto insert 11A, 21A, 31A, 41A from their lateral side. Therefore, there is no surface area on the outside which would be particularly exposed to atmospheric influences, since there is no fitted brim 55 on the outside which would be exposed to atmospheric influences, and no surface area on the inside on which dust would accumulate. Since the window wing is completely smooth both on the inside and outside, the cleaning of panes is also simplified.

[0061] Outermost panes are glued onto the insert with the adhesive materials already known in the state of the art, namely multi-part polymer adhesives and similar.

[0062] In all four above described embodiments of the window according to the invention concerned four-pane glazing is used. This means that each glazing has three intermediate spaces (A, B, C; E, F, G; L, M, N; and P, R, S) that are filled with a rare gas, such as argon and krypton or a suitable mixture of gases.

[0063] By combining different component parts, numerous different embodiments of the above mentioned windows are possible. It is possible to use different types (shaded, reflex, smart, etc.), thicknesses and/or number of panes in the glazing as well as spacers of different dimensions and physical characteristics and so on.

[0064] The new window according to the present invention is described by virtue of four embodiments, which

however do not limit the invention in any sense, since anyone skilled in the art will immediately recognize other embodiments, which are however fully encompassed with present invention.

Claims

1. Window (10, 20, 30, 40) consisting of a frame (12, 22, 32, 42) and a window sash (11, 21, 31, 41) and hardware that is hidden between the mentioned window frame and window sash; its characteristic being that the mentioned window sash (11, 21, 31, 41) consists of insert (11A, 21A, 31A, 41A) and glazing (11B, 21B, 31B, 41B) and where the total thickness of the glazing (11B, 21B, 31B, 41B) equals the total thickness of the window sash (11, 21, 31, 41).

2. The window according to claim 1, **characterised in that**, the glazing (11B, 21B, 31B, 41B) of window sash (11, 21, 31, 41) consists of at least one intermediate pane (112, 212, 312, 412), one innermost pane (114, 214, 314, 414) and one outermost pane (111, 211, 311, 411) and where the distances between panes may be equal or different

3. The window according to claim 2, **characterised in that**, said panes of the glazing are of different sizes; namely, the height and width of innermost pane (114, 214, 314, 414) are the largest, the height and width of the intermediate pane (112, 212, 312, 412) are the smallest, while the height and width of the outermost pane (111, 211, 311, 411) are larger than the height and width of the mentioned intermediate pane and smaller than the height and width of the mentioned innermost pane.

4. The window according to any previous claim, **characterised in that**, the thickness of the mentioned intermediate panes (112, 212, 312, 412) ranges from 2 to 3 mm, and the thickness of the mentioned outermost panes (114, 214, 314, 414 and 111, 211, 311, 411) ranges from 4 to 8 mm, and that the said outermost panes are safety glasses.

5. The window according to any previous claim, **characterised in that**, the mentioned insert (11A, 21A, 31A, 41A) is on the inside completely covered with the innermost pane (114, 214, 314, 414) and on the outside with the outermost pane (111, 211, 311, 411).

6. The window according to any previous claim, **characterised in that**, the innermost pane (114, 214, 314, 414) and outermost pane (111, 211, 311, 411) are enamelled along the outer rim (111A, 211A, 311A, 411A and 114A, 214A, 314A, 414A) and along the peripheral part (111B, 211B, 311B, 411B and 114B, 214B, 314B, 414B).

7. The window according to claim 6, **characterised in that**, the mentioned outermost and innermost panes are enamelled along the peripheral parts on both surface areas, only on the outer surface, or only on the inner surface, preferably only on the inner surface.

8. The window according to any previous claim, **characterised in that**, the window frame (12, 22 32, 42) is made of wood, a combination of wood and aluminium profile, profiles from plastics material, aluminium profiles, or a combination of the mentioned, whereas the insert (11A, 21A, 31A, 41A) is made of hollow profiles from plastics material and/or aluminium hollow profiles.

9. The window according to any previous claim, **characterised in that**, the spaces between panes (A, B, C; E, F, G; L, M, N; and P, R, S) are filled with a rare gas, possibly argon, krypton, xenon, or a mixture of these.

10. The window according to any previous claim, **characterised in that**, the thickness of the window wing with four-pane glazing is 82 mm or less.

11. The window according to any previous claim, **characterised in that**, the thickness of the window wing with four-pane glazing is 66 mm or more.

12. The window according to any previous claim, **characterised in that**, the thermal transmittance of the entire window U_w ranges between 1.4 and 0.6 W/m^2K, and the acoustic insulation R_w ranges between 32 and 45dB.

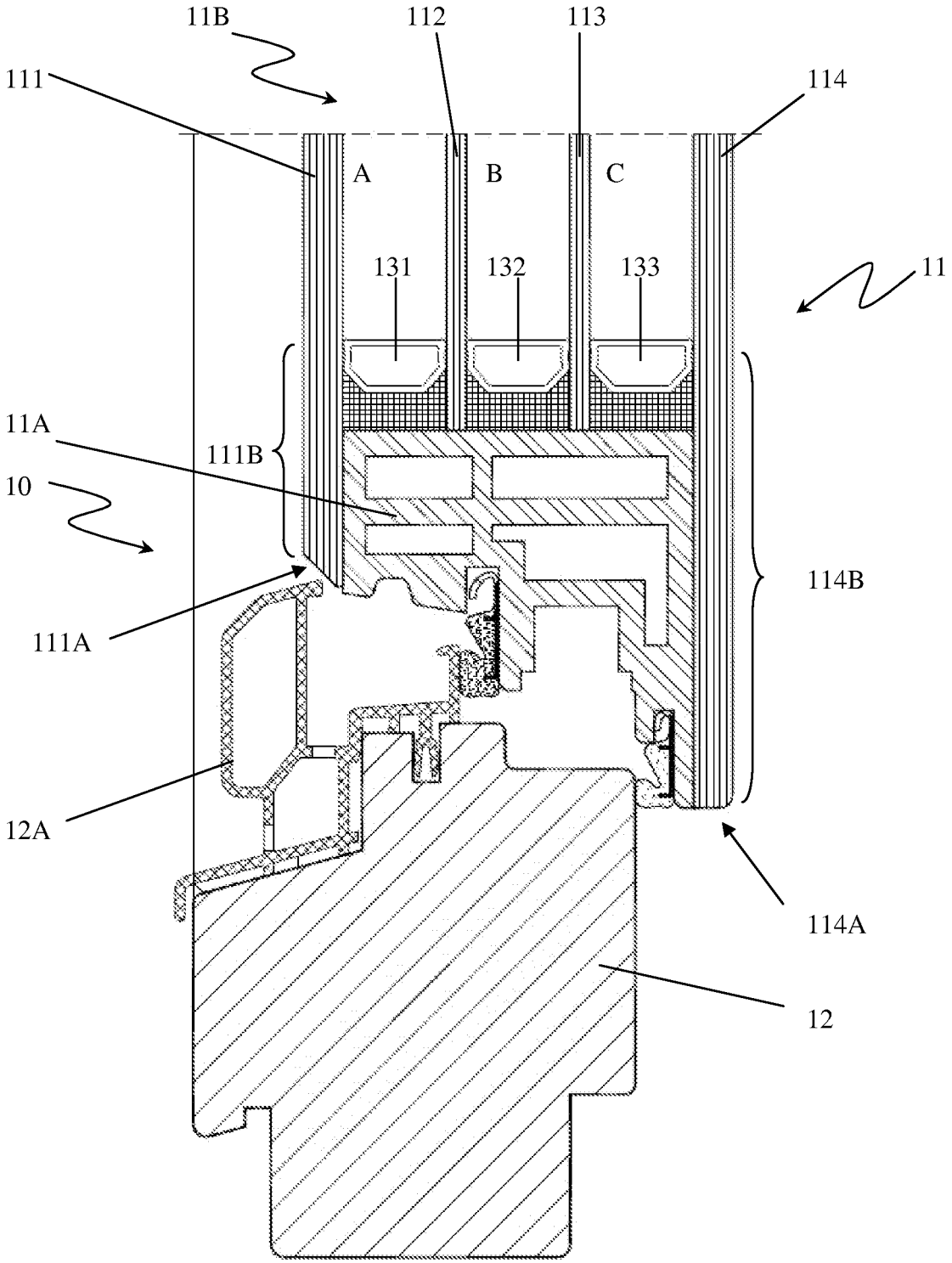

11B
112
113
111
114
A
B
C
131
132
133
11
11A
111B
10
114B
111A
12A
114A
12

Figure 1A

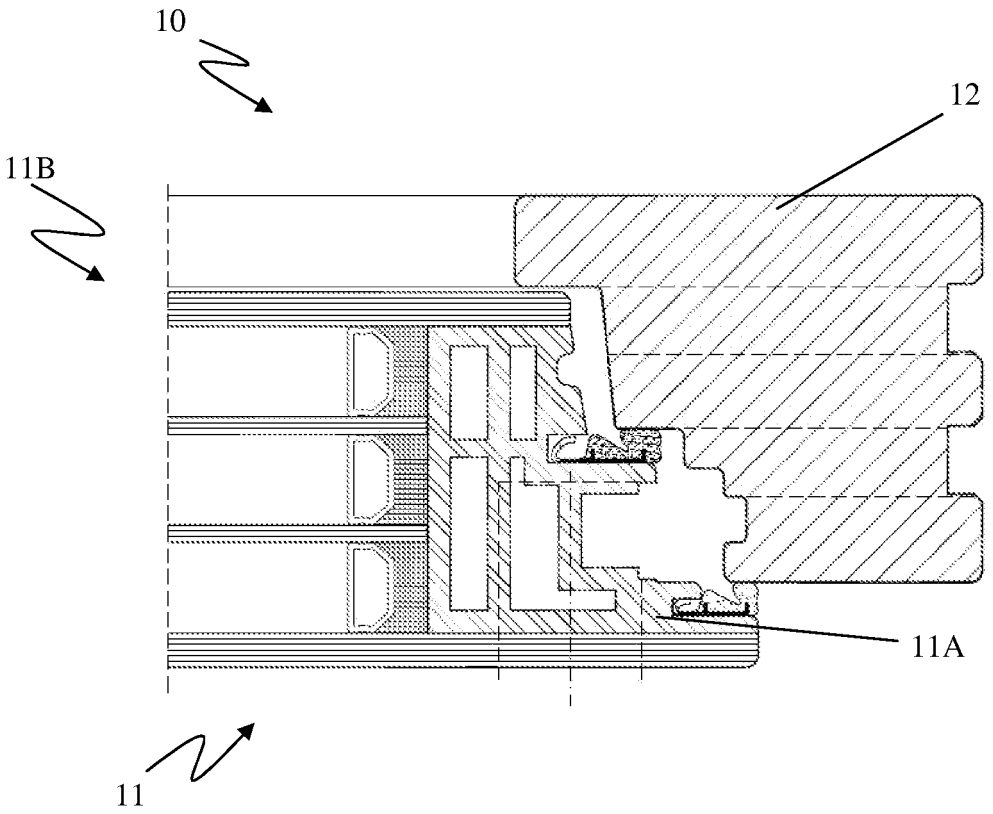


Figure 1B

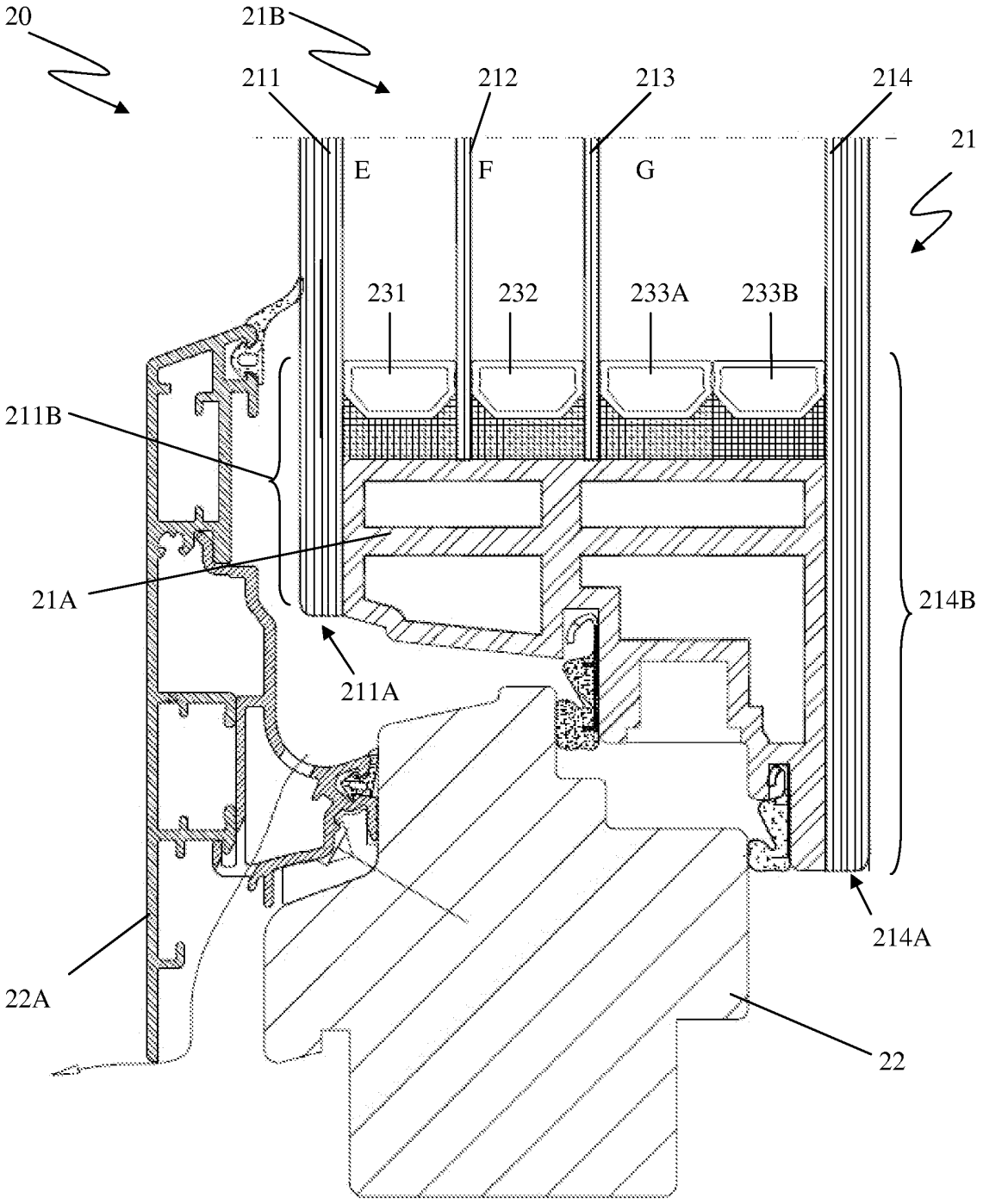

20
21B
211
212
213
214
21
E
F
G
231
232
233A
233B
211B
21A
211A
214B
214A
22A
22

Figure 2

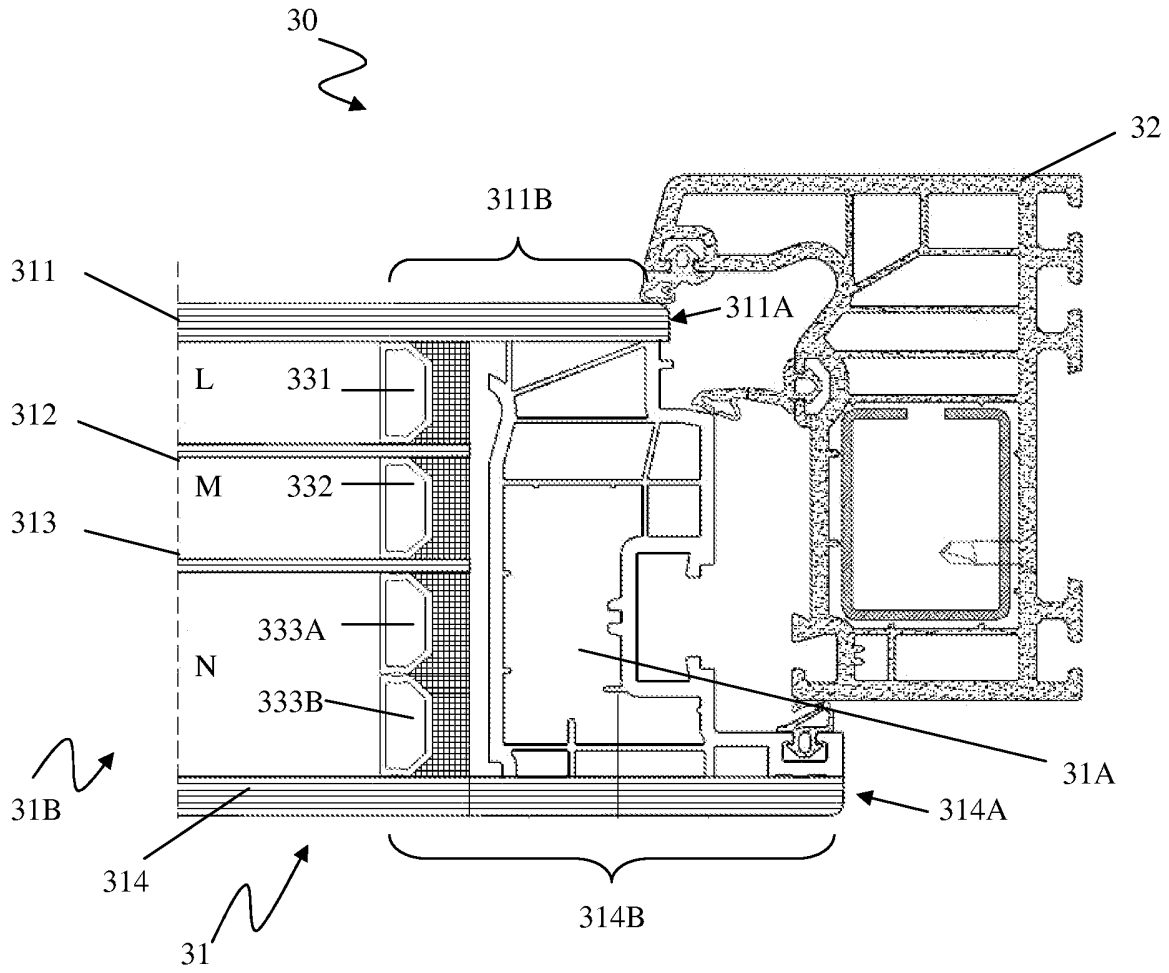

30
32
311B
311
311A
L
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312
M
332
313
333A
N
333B
31A
31B
314A
314
314B
31

Figure 3

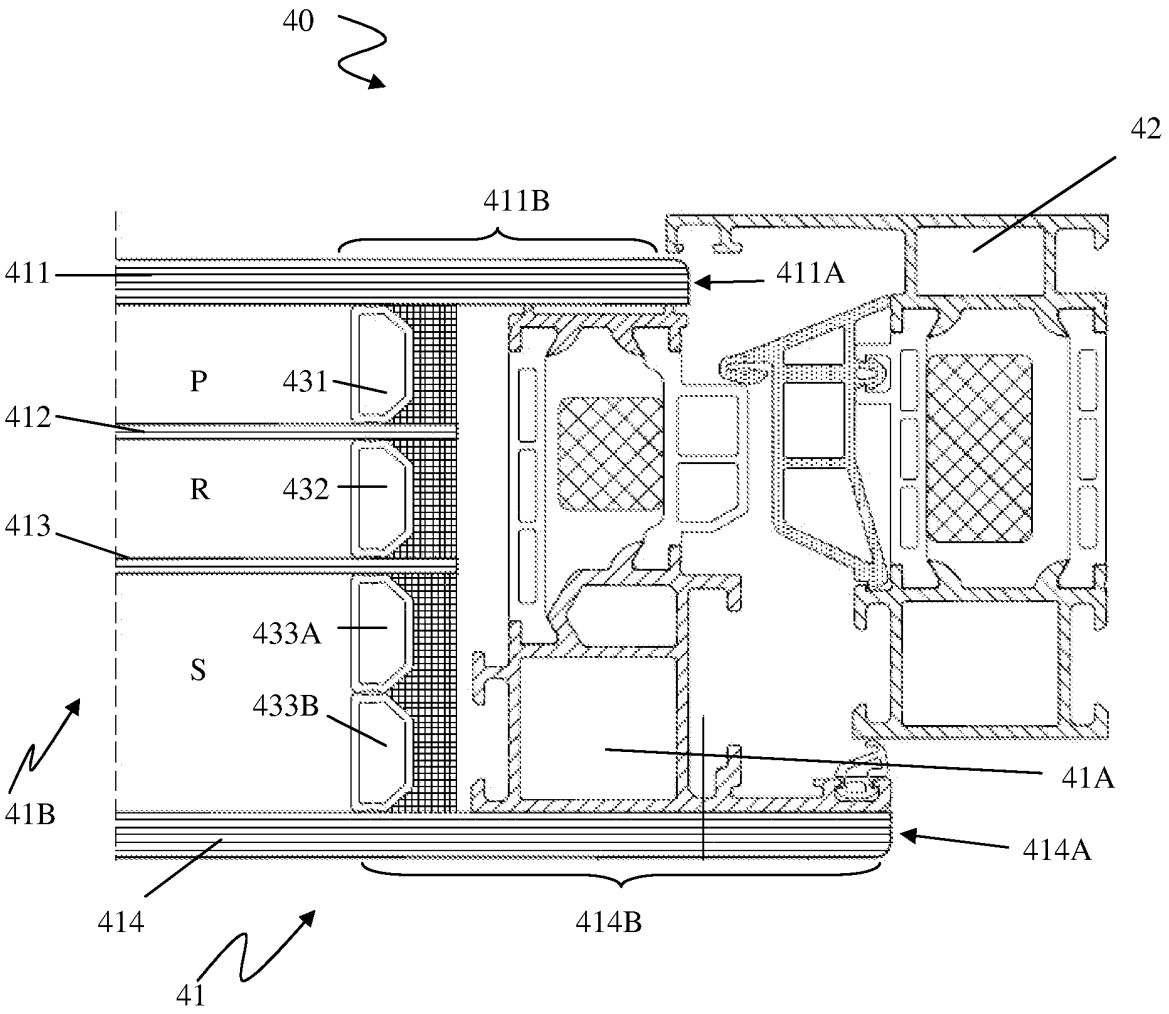

40
42
411B
411
411A
P
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412
R
432
413
433A
S
433B
41A
41B
414A
414
414B
41

Figure 4

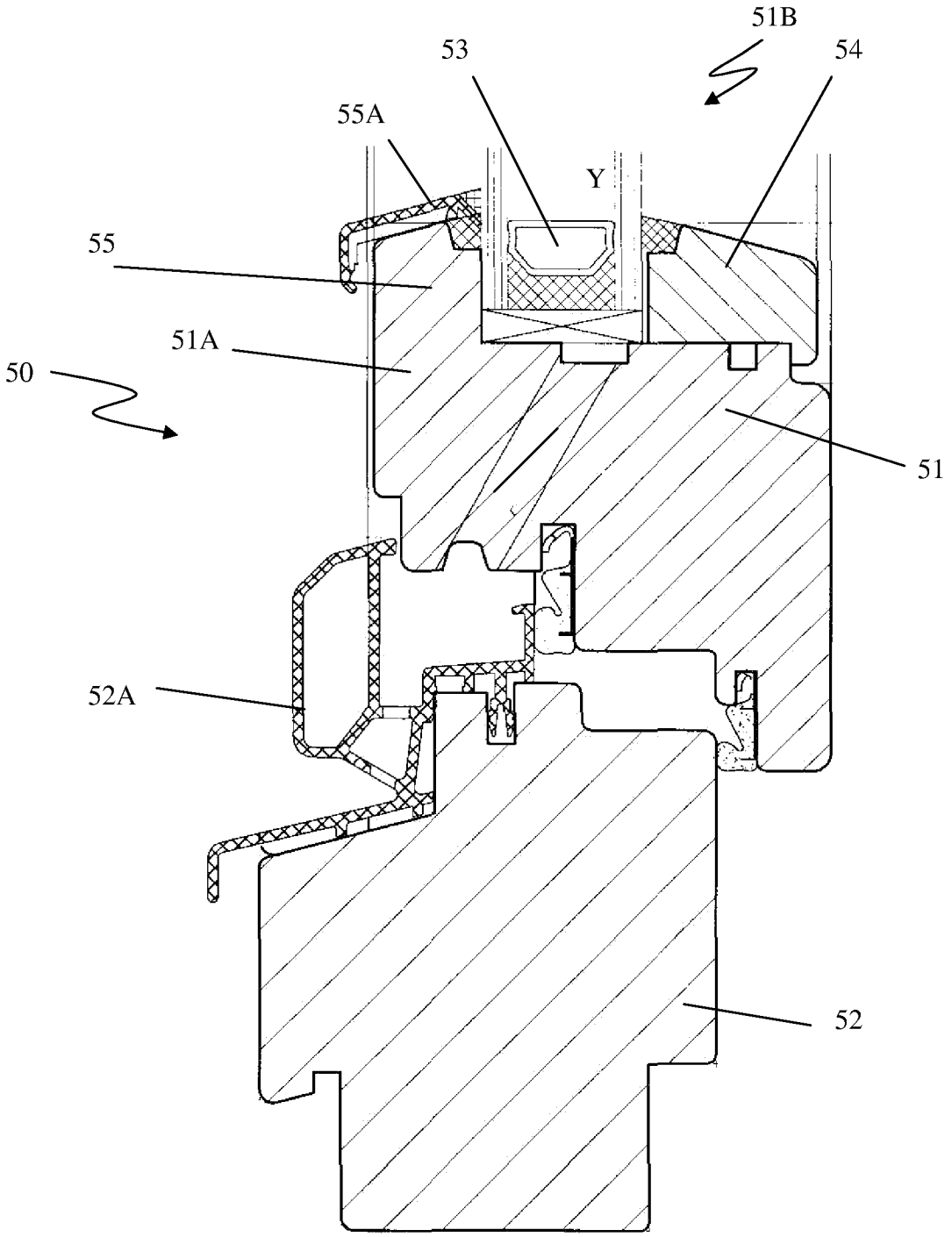


Figure 5

Europäisches Patentamt
European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 10 18 6396

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 1 528 213 A1 (PIAVEVETRO S R L [IT]) 4 May 2005 (2005-05-04) * the whole document *	1-12	INV. E06B3/02 E06B3/66
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Place of search	Date of completion of the search	Examiner
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