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(71) Applicant: **DFV S.R.L.**
73030 Surano (LE) (IT)

(72) Inventor: **De Francesco, Francesco**
73030 Tiggiano (LE) (IT)

(74) Representative: **Bruni, Giovanni et al**
Laforgia, Bruni & Partners
Corso Duca degli Abruzzi, 78
10129 Torino (IT)

(54) **System for producing high insulating aluminium-wood mixed window and door frames**

(57) System for producing high insulating thermal cut aluminium-wood mixed window and door frames, characterized by the use of a complex profile in techno-polymer which couples, according to various ways, with the aluminium profile before the cutting of the components to be produced.

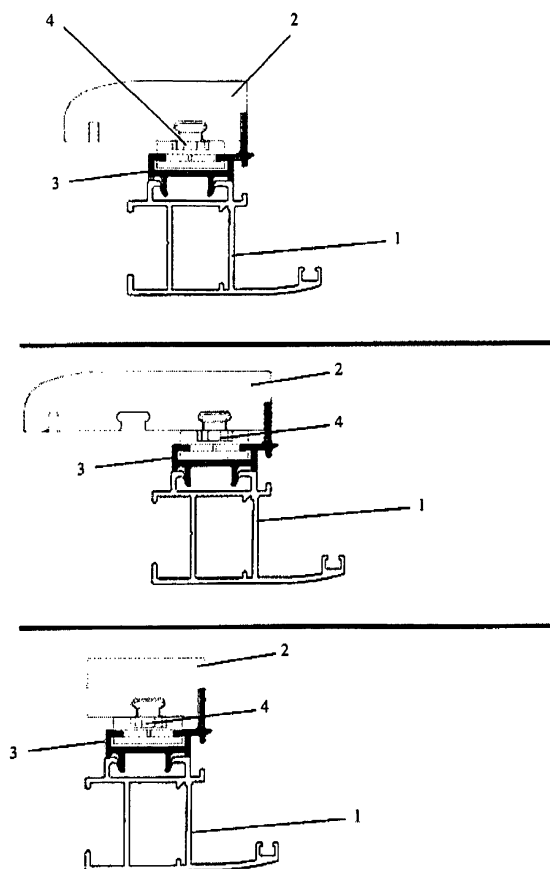


Fig. 4

Description

[0001] Object of the present invention is a system for producing high insulating aluminium-wood mixed winged window and door frames.

[0002] In the state of the art, there are known two principal classes of systems for aluminium-wood mixed window and door frames:

- a) aluminium-wood systems obtained with normal aluminum profiles coupled with wooden profiles where coupling can be provided in various ways (system with cold aluminium profiles);
- b) aluminium-wood systems obtained with thermal cut aluminium profiles coupled with wooden profiles.

[0003] The new Italian regulations about energy saving (legislative decree 192/05 and legislative decree 311/06) have fixed quite restrictive limitations concerning the thermal transmittance values for casings thus making the aluminium-wood systems obtained with cold aluminium profiles (without thermal cut) no more apt to be commercialized, thus restricting the field only on systems with thermal cut aluminium profiles, which represents a more expensive technology and therefore less competitive with respect to PVC or wooden casings. Generally, in terms of costs, the aluminium-wood casings with thermal cut systems available at the moment on the market cost approximately 40% more with respect to systems with cold profiles.

[0004] The systems with cold aluminium profiles do not provide the use of the so called "thermal cut", that is the "thermal" interruption between the aluminium profile and the wooden one, but they are coupled in various ways depending on the requirements.

[0005] The thermal cut aluminium-wood systems, instead, are made up of profiles usually separated by an insulating material which interrupts the thermal continuity between the inside and the outside, thus guaranteeing a high level of thermal insulation.

[0006] A typical way of introducing said plastic material (usually a techno-polymer, as polyamide) is for example its interposition between two different aluminium profiles with the wooden profile to be applied on the last aluminium profile. Therefore, the final configuration is schematically: aluminium - polyamide - aluminium - wood.

[0007] This solution has many disadvantages, among which the most important ones are: the problem of the expensive processing to obtain such a traditional thermal cut system considering the great use of aluminium material (double aluminium profile to be produced), as well as a not perfect efficiency from the thermal point of view since such systems suffer from the convection heat transmission since the thermal bridge protects only from direct induction.

[0008] Therefore, if on the one hand such systems guarantee a certain level of insulation from the thermal point of view, on the other hand they have the disadvantage of the too high costs for a wider diffusion as desired according to the same regulation.

[0009] Aim of the present invention is to allow the production of high thermal-insulating window and door frames (on average higher than the performances of thermal cut aluminium-wood window and door frames) at costs slightly deviating from the "cold" systems (approximately 10% more), since it is a system for producing aluminium-wood mixed window and door frames where the thermal interruption occurs by means of a sole complex profile in insulating material (techno-polymer) which couples with the aluminium profile before production cutting according to different coupling ways (snap-coupling, insertion-coupling, dovetail-coupling).

[0010] These and other advantages will be better highlighted in the following detailed description of the invention which refers to the drawings 1/6 to 6/6, where it is shown a preferable embodiment of the present invention, which is absolutely not limiting.

[0011] In particular:

Fig. 1 shows various kinds of aluminium profile, usable in the production of window and door frames;

Fig. 2 shows various kinds of wooden profile, usable in the production of window and door frames;

Fig. 3 shows various kinds of profiles in insulating material, usable in the production of window and door frames;

Fig. 4 shows various examples of the assembly of the aluminium, insulating and wooden profiles;

Figs. 5 and 6 show sectional views of an embodiment of the final assembly of the window and door frame with all its principal portions.

[0012] Referring to figs. 1 and 3, 1 indicates various kinds of aluminium profiles usable in assembling window and door frames; similarly 2 indicates the respective wooden profiles, while 3 indicates the profiles in techno-polymer, which are complementarily shaped with respect to the relative aluminium profiles.

[0013] The new features are highlighted by the assembly of said components shown in fig. 4, where it is shown an absolutely non-limiting embodiment of the assembly of the three said components, which is the base for obtaining the final frame. According to the production system, the interruption of the thermal transmission is provided by using a sole

variably shaped profile 3 in insulating material, (usually a techno-polymer as polyamide), which is interposed between the aluminium profile 1 and the wooden profile 2. The coupling between polyamide 3 and wooden profile 2 is guaranteed by the provision of fixing dowels 4, which are housed in the suitable recess 3', of which the various polyamide strips are provided, as shown in fig. 3. On the opposite side of the recess 3', the polyamide strip 3 is provided with slightly arched projections 3'', which are introduced in the respective recesses 1' on the aluminium profile 1. According to a possible preferable embodiment of the invention, the coupling between the two parts can occur simply "by snap", that is by exerting a suitable pressure of the polyamide strip 3 on the aluminium profile 1, so that the projections 3'' are restrained in the recesses 1' of the aluminium profile 1. This operation is made possible thanks to the mechanic features of the two materials (aluminium and techno-polymer, as polyamide), which are both very resistant materials and apt to obtain high precision extruded profiles. Moreover since such operation does not require the use of particular devices and/or equipment, it is carried out manually and occurs even before the production cutting of the components, leading to clear advantages both from the point of view of assembly easiness and from the point of view of production time saving. In addition to the yet described advantages deriving from the usage of such coupling method of the polyamide profile 3 with the aluminium profile 1, there is also the extraction easiness of the single components in case of casing maintenance or repair. In fact, once the window frame is disassembled, the polyamide profile 3 can be easily extracted by sliding as in a guide from the respective aluminium profile 1. The resulting profile is therefore a thermally high-performance polyamide profile plus aluminium (1 and 3) and obtainable with very reduced costs thanks to the elimination of further processing steps as knurling and rolling, which instead are needed to obtain insulating profiles by means of the classic thermal cut technology.

[0014] Figs. 5 and 6 show instead various examples of the final assembly of the above-described principal components, according to the production system object of the present invention. It is clear that these are example embodiments since generally the casings are to be adapted to the different assembly conditions depending on the case. In fig. 5 above, for example, it is shown a section of a thermal cut casing, near the frame 5, in case the same is flush with the wall 6 (built in). In it, all the above-described components are shown: the aluminium profiles 1, the wooden profiles 2 and the polyamide profiles 3 "snapped" on the respective aluminium profiles and interposed between them and the wooden ones. In addition, it is also shown the double glass 7', as well in intermediate position between the aluminium and wooden profiles by means of almost clip shaped suitable insulating seals 8. The same insulating seals 8 are arranged in different points of the casing as for example between the various profiles (aluminium, polyamide or wood) belonging to the various elements of the window and door frame (frame, casing, wall), always in order to provide the interruption of the thermal continuity.

[0015] In fig. 6, at the bottom, it is instead shown a section of a possible preferable embodiment of the casing at the closing level of the two wings. Also in this case, the various principal components (aluminium profiles 1, wooden profiles 2, polyamide profiles 3) are combined between each other in order to interrupt the thermal continuity and are assembled according to the described production system, that is the various polyamide profiles 3 being coupled with the respective aluminium profiles 1. As in the preceding case, the double glasses 7 at the ends and the insulating seals 8 between the various components are shown. Another advantage of an aluminium-wood window and door frame according to what yet described is the particular shape of the various complex polyamide profiles 3, which, once adhered to the respective aluminium profiles 1, provide recesses inside which all the fittings and hardware needed are arranged to realize the casing (door and window). In this way, it is in fact avoided the heat transmission towards the casing inside occurs also through the yet thermally "insulated" fittings, thus leading to clear advantages in terms of global optimization of the system at thermal level.

[0016] With respect to a traditional thermal cut window and door frame, characterized by the use of an insulating profile interposed between two aluminium profiles, the advantages deriving from the use of a production system as above described are many. First of all, the production system of aluminium-wood window and door frames object of the present invention leads to remarkable advantages from the point of view of the costs since it is needed a lower quantity of aluminium to realize the window and door frame, considering the aluminium price by weight. The two following tables confirm the preceding.

55 50 45 40 35 30 25 20 15 10 5

Table 1

HYPOTHESIS WITH RAL EFFECT PAINTED ALUMINIUM									
BRAND/ SERIES	FRAME WEIGHT	POL. FRAME	FRAME COST/ML	WING WEIGHT	POL. WING	WING COST/ML	COST PER KNOT	SAVING%	Trasmitt
ECOWIN W85	0.715	€ 1,00	€ 3.86	0,927	€ 1,60	€ 5,31	€ 9,17		1,96
HYDRO Wood85TT	1,316		€ 7,Z4	1,6		€ 8,80	€ 16,04	74,9%	2,54
ALCAN EUROW	1,306		€ 7,18	1,369		€ 7,53	€ 14,71	60,5%	N.D.
TOMA atlantis	1,7		€ 9.35	1,528		€ 8,40	€ 17,75	93.7%	2,21
ALCO KWOOD	1.575		€ 8,66	1,835		€ 10,09	€ 18,76	104,6%	2,46
ALCO WOOD TT	1,69		€ 9,30	1,715		€ 9,43	€ 18,73	104,3%	2,5
INDINVEST COUNTRY	1.48		€ 8,14	1,477		€ 8.12	€ 16,26	77.4%	2,5
ETA START WOOD TT	1.32		€ 7,26	1,77		€ 9,74	€ 17,00	85,4%	1,96
SPI	1,69		€ 9,30	1,715		€ 9,43	€ 18,73	104.3%	N.D.

55 50 45 40 35 30 25 20 15 10 5

Table 2

HYPOTHESIS WITH WOOD EFFECT PAINTED ALUMINIUM									
BRAND/ SERIES	FRAME WEIGHT	POL. FRAME	FRAME COST/ML	WING WEIGHT	POL. WING	WING COST/ML	COST PER KNOT	SAVING %	Trasm
ECOWIN W85	0,715	€ 1,00	€ 5,43	0,927	€ 1,60	€ 7,35	€ 12,78		1,96
HYDRO Wood85TT	1,316		€ 10,53	1,6		€ 12.80	€ 23,33	82.5%	2,54
ALCAN EUROW	1,306		€ 10,45	1,369		€ 10,95	€ 21,40	67,4%	N.D.
TOMA atlantis	1,7		€ 13,60	1,528		€ 12,22	€ 25,82	102,1%	2,21
ALCO KWOOD	1,575		€ 12,60	1,835		€ 14,68	€ 27,28	113,5%	2,46
ALCO WOOD TT	1,69		€ 13,52	1,715		€ 13,72	€ 27,24	113,1%	2,5
INDINVEST COUNTRY	1,48		€ 11,84	1,477		€ 11,82	€ 23,66	85,1%	2,5
ETA START WOOD TT	1,32		€ 10,56	1,77		€ 14.16	€ 24,72	93,4%	1,96
SPI	1,69		€ 13,52	1,715		€ 13,72	€ 27,24	113,1%	N.D.

[0017] In the above described tables there are calculated the costs per knot of a window and door frame made up according to the system object of the present invention, at the same price of the aluminium as raw material, compared to the respective competing products available on the market in terms of percentage saving. In both the tables such "typical" window and door frame is indicated with the name "ECOWIN W85".

[0018] As starting data, in table 1 (RAL effect painted aluminium hypothesis) it is considered a cost for cold aluminium equal to 4.00 €/kg, while in the case of thermal cut profile it is equal to 5.50 €/kg. Similarly in table 2 (wood effect painted aluminium hypothesis), the cost of the cold aluminum is equal to 6.20 €/kg while in the case of thermal cut profile it is equal to 8.00 €/kg. In the last column there are indicated the declared transmittance values expressed in W/mq*K.

[0019] The computing way used for the "typical" model ECOWIN is the following: the cost per knot resulting is the sum of the cost of the aluminium profile, obtained multiplying the weight for the price by kg of the cold profile, plus the cost per linear meter of the polyamide profile. For all the other systems the cost is calculated multiplying the cost per kg of the thermal cut aluminium profiles for the weight of the assembled thermal cut profiles. The comparison is carried out excluding the cost of the wooden profiles and of the fittings and hardware which can be considered equal for all the systems, possible differences being negligible. The high saving in percentage terms of the "typical" window and door frame "ECOWIN" is clear with respect to the principal competitors, while maintaining a high standard of thermal insulation at the same time.

[0020] Moreover, besides the advantage on the cost of the raw material, by using a lower quantity of aluminium, there are obtained also advantages from the point of view of energy efficacy, since a lower quantity of aluminium makes the system more high-performing (aluminum is an optimum heat conductor),

Claims

1. System for producing thermal cut aluminium-wood mixed window and door frames comprising a plurality of aluminium profiles (1) and wooden profiles (2), **characterized in that** the thermal interruption occurs by introducing a sole variably shaped complex profile in techno-polymer (3) between an aluminium profile (1) and a wooden profile (2).
2. System for producing thermal cut aluminium-wood mixed window and door frames according to claim 1, **characterized in that** said profile in techno-polymer (3) is coupled with the respective aluminium profile (1) according to various coupling ways such that the projections (3") of the list in techno-polymer are restrained in the recesses (1) of the aluminium profile (1).
3. System for producing thermal cut aluminium-wood mixed window and door frames according to claim 1 and 2, **characterized in that** the coupling operation of the profile in techno-polymer (3) on the aluminium profile (1) to provide a unique profile occurs before the cutting of the components of the window and door frame provided in the production step.
4. System for producing thermal cut aluminium-wood mixed window and door frames according to any one of claims 1 to 3, **characterized in that** the coupling operation of the profile in techno-polymer (3) on the aluminium profile (1), without needing particular devices and/or equipment, is carried out manually.
5. System for producing thermal cut aluminium-wood mixed window and door frames according to any one of claims 1 to 4, **characterized in that** the wooden profile (2) is coupled with the aluminium profile by means of fixing dowels (4), which are housed in the suitable recess (3') with which the profiles in techno-polymer (3) are provided.
6. System for producing thermal cut aluminium-wood mixed window and door frames according to any one of claims 1 to 5, **characterized in that** the fittings and the hardware, which are needed by the window and door frame, are arranged inside the recess (3') of the profiles in techno-polymer (3) in order not to allow the heat transmission to the inside of the window and door frame by means of the same.

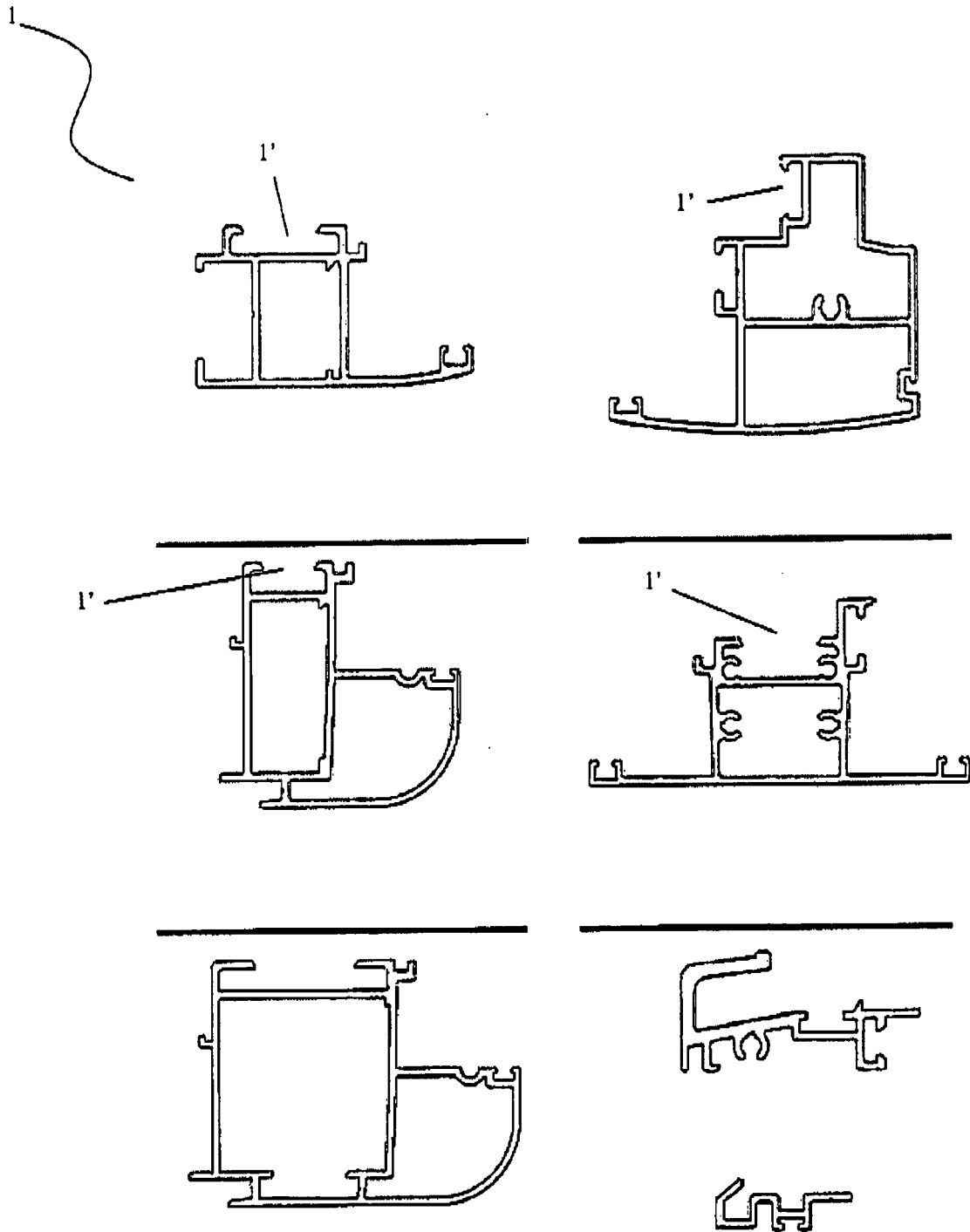


Fig.1

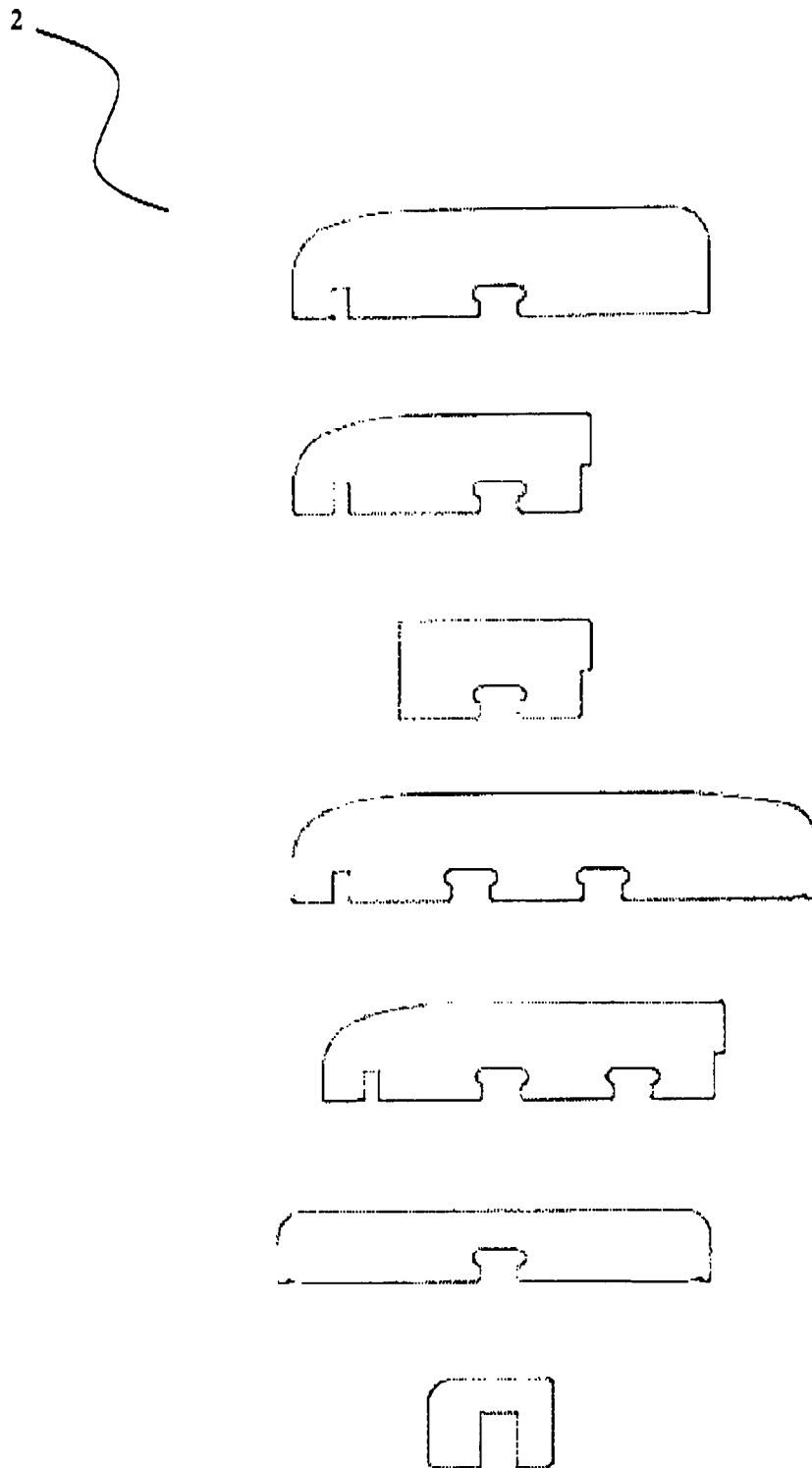


Fig.2

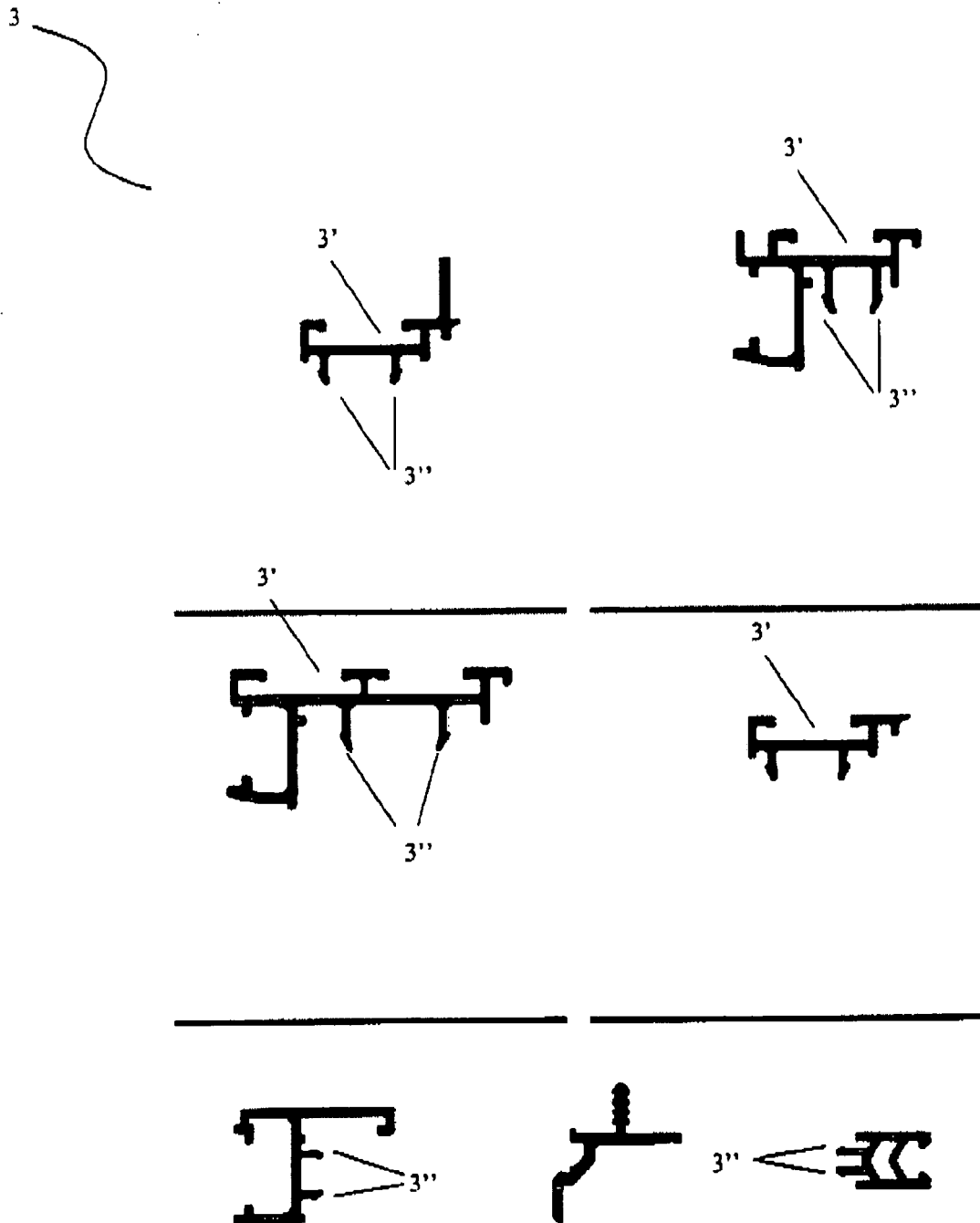


Fig.3

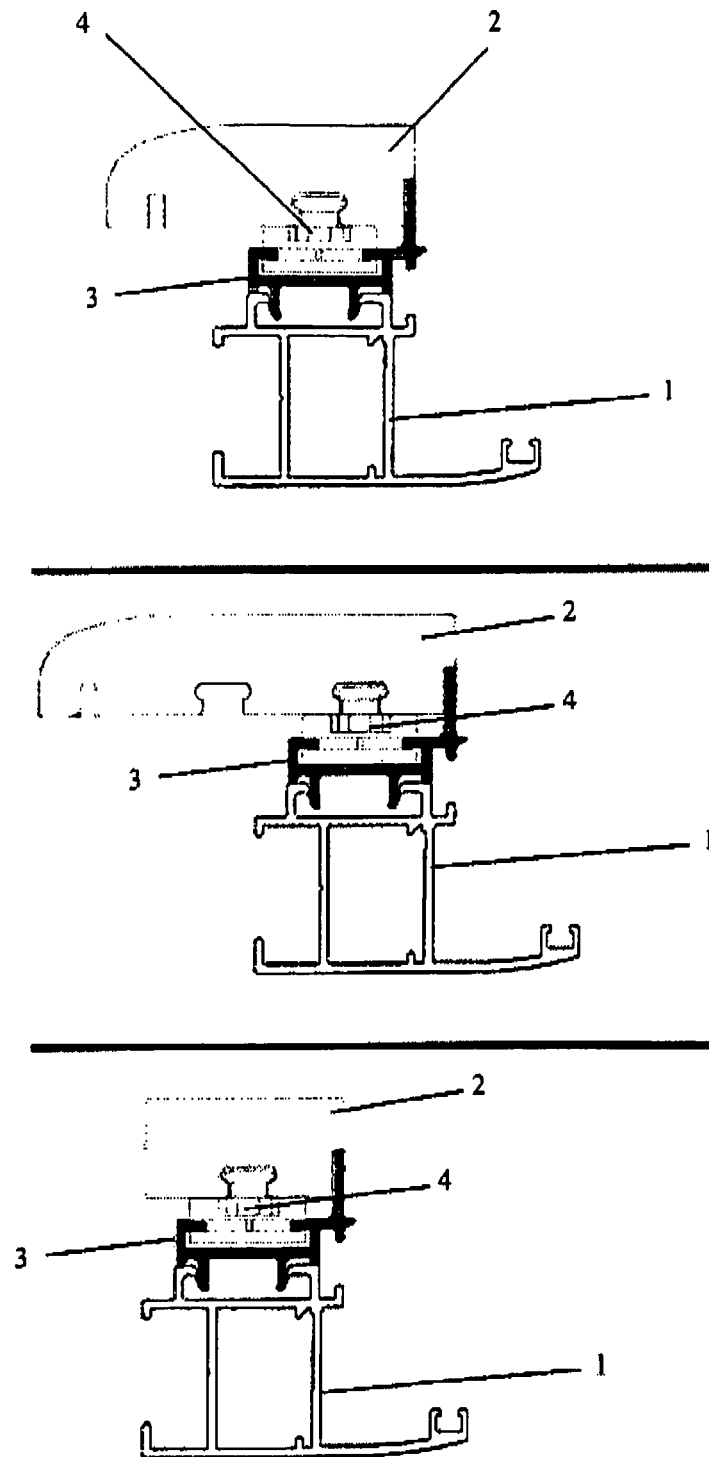


Fig. 4

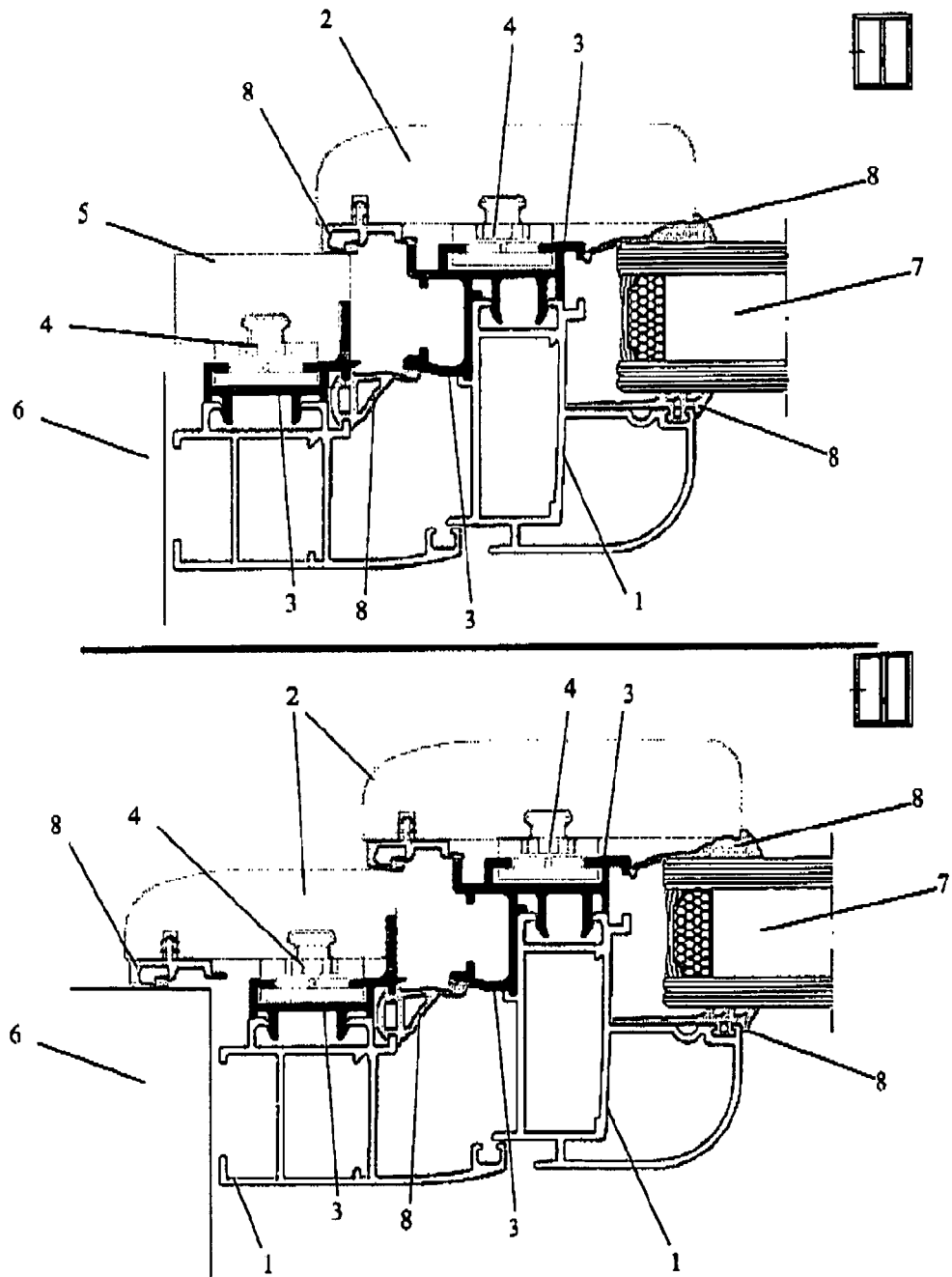


Fig. 5

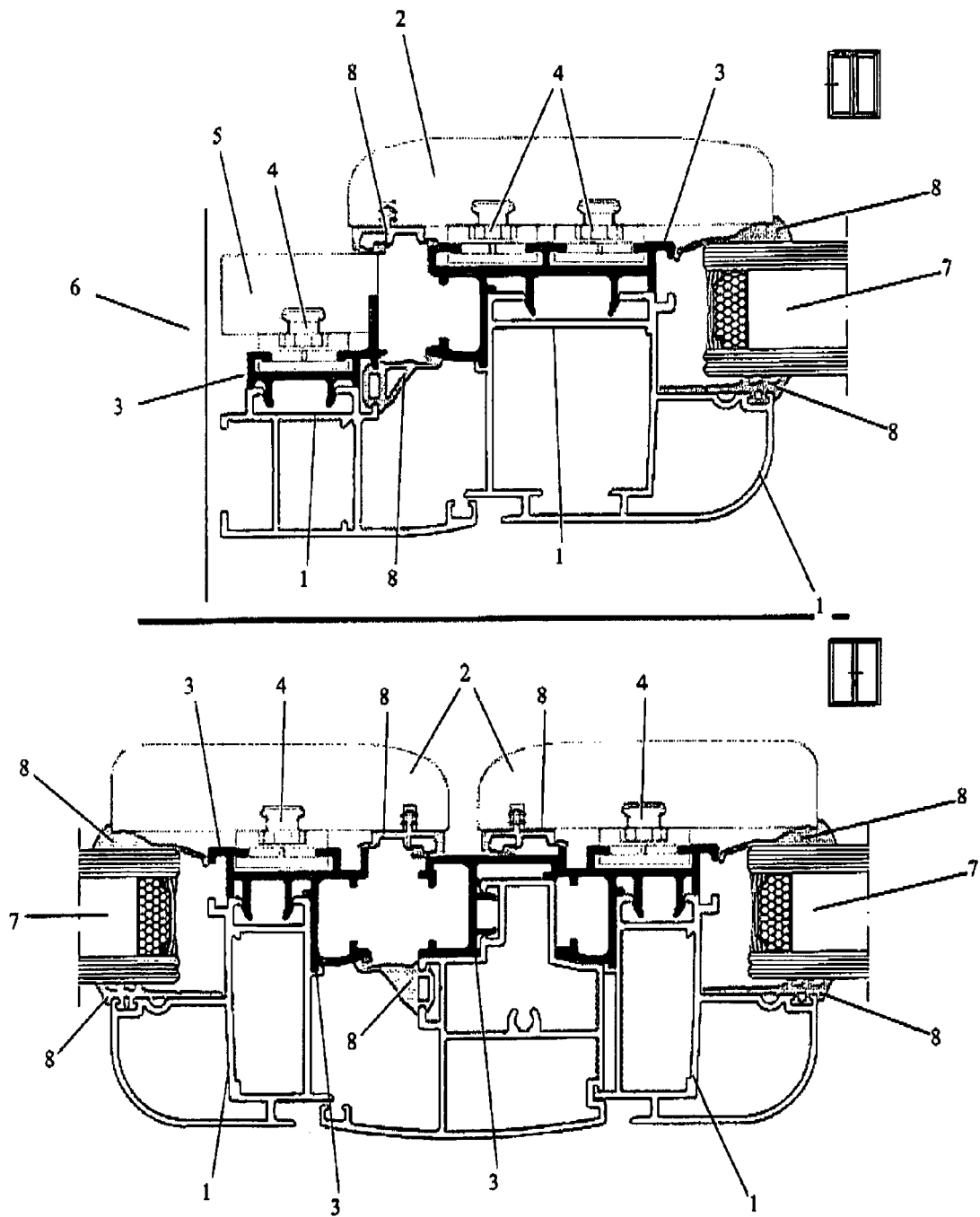


Fig. 6