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(71) Applicant : **ARPAL ALUMINUM LTD.**
8 Hapeled Street
Holon 58811 (IL)

(72) Inventor : **Emek, Mordechay**
Ha'Oranim Street
Kfar Shmaryahu (IL)

(74) Representative : **Weydert, Robert**
Dennemeyer & Associates Sàrl P.O. Box 1502
L-1015 Luxembourg (LU)

(54) Blast resistant windows.

(57) A blast resistant framework (1) for a casement window in which a window sash (9) is pivotally mounted on a fixed frame (3) comprising a rotary locking mechanism (29) provided with an engaging tongue and having a displacement stroke of at least 25 mm, carrier members (19, 18a, 18b) are mounted on the sash profiles having a displacement of a distance substantially equal to the displacement stroke ; corner transmission members (22, 23) are mounted about a pair of corners of said sash adjacent the shutting stile and coupled to a first carrier member (19), the displacement of which is accompanied by corresponding displacement of the other carrier members (18a, 18b) ; locking elements (20) are mounted on the carrier members (19, 18a, 18b) and receiving elements (21) mounted on the profiles of the fixed frame being respectively juxtaposed with respect to said locking elements (20), the locking elements (20) being lockingly engaged by the receiving elements (21) about lengths thereof substantially corresponding to said displacement stroke upon displacement of the locking elements (20) towards said receiving elements (21) as a result of rotation of said locking mechanism (29).

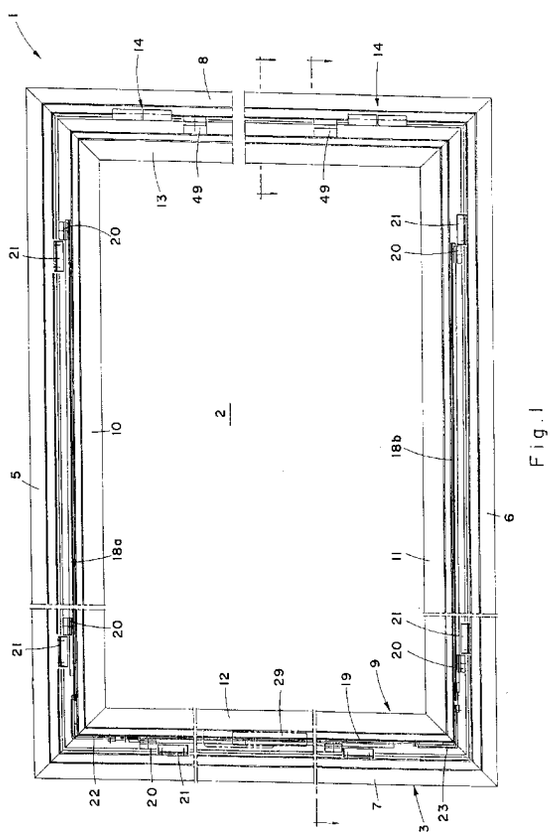

Fig.1

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FIELD OF THE INVENTION

The present invention is in the field of casement windows and more specifically it concerns a blast resistant framework for casement windows.

BACKGROUND OF THE INVENTION

The type of casement window with which the present invention is concerned (hereinafter "a casement window of the kind specified") comprises a rectangular framework consisting of a frame anchored within an opening in a wall and a sash swingably mounted thereon with locking means preventing unintended opening thereof.

Such casement windows are not normally designed to resist blasts caused, for example, by an explosion, although the frame may remain firmly anchored to the wall and the window pane itself may be blast resistant. In most cases the result of a blast will only be a slight deformation of the frame, but the sash itself may be completely detached therefrom.

This situation is particularly undesirable where the window must remain effectively sealed so as to prevent the entry of noxious gases.

It is the object of the present invention to provide a new and improved blast resistant framework for a casement window of the kind specified.

BRIEF DESCRIPTION OF THE INVENTION

In accordance with the present invention there is provided a rectangular, blast resistant framework for a casement window comprising:

a window sash pivotally mounted at a hanging stile thereof with respect to a hanging jamb of a fixed rectangular frame of the framework;

a rotary locking mechanism mounted on a shutting stile of the sash, having a rotary handle and an engaging tongue projecting out of said shutting stile and displaceable along said shutting stile upon rotation of the rotary handle by a displacement stroke of at least about 25 mm;

first, second and third elongated carrier members respectively and articulatedly mounted on said shutting stile and top and bottom rails of said sash so as to be displaceable therealong for a distance substantially equal to said displacement stroke, said first carrier member being engaged by said engaging tongue so as to be displaceable therewith;

upper and lower resiliently bendable transmission strips respectively and displaceably mounted about a pair of corners of said sash adjacent said shutting stile and respectively coupled at one pair of ends thereof to upper and lower extremities of said first carrier member and at an opposite pair of ends thereof to adjacent ends of said second and third carrier members so that displacement of said first carrier member is accompanied by corresponding displacements of said second and third carrier members;

sets of locking elements respectively mounted on each of said carrier members with constituent locking elements of each set spaced apart along the lengths of the respective carrier member;

like sets of receiving elements mounted respectively on the shutting jamb, a frame head and a frame sill of the fixed frame and being respectively juxtaposed with respect to said locking elements, said locking elements being lockingly engaged by said receiving elements about lengths thereof substantially corresponding to said displacement stroke upon displacement of the locking elements towards said receiving elements as a result of rotation of said handle in a first sense and being disengaged from said receiving elements upon displacement of said locking elements away from said receiving elements as a result of rotation of said handle in a second and opposite sense.

With such a blast resistant framework the number and extent of regions wherein the sash is locked to the framework are very substantially increased *vis-à-vis* known frameworks and in this way the dangers of the sash being detached from the frame are substantially reduced.

The blast resistant framework in accordance with the invention is readily suitable for instalment in an existing opening in a wall in place of a conventional casement framework.

When it is required to maintain the air-tight sealing of the blast resistant framework after a blast in which the frame and/or sash may have become slightly distorted, this can be readily effected by simple repositioning of the locking and receiving elements.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the present invention, one embodiment thereof will now be described by way of example and with reference to the accompanying drawings, in which:

Fig. 1 is a front elevation of a casement window according to the present invention;

Fig. 2 is a horizontal cross-sectional view of the window shown in Fig. 1, taken along the line II-II in Fig. 1;

Fig. 3 is a perspective exploded view of a locking mechanism of a framework of the window shown in Fig. 1; and

Fig. 4 is a cross-sectional view of a detail of the window shown in Fig. 1 taken along the line IV-IV, showing a reinforcing center lock in an open position.

SPECIFIC DESCRIPTION

Reference will now be made to Figs. 1 and 2 of

the drawings, which illustrate a rectangular framework 1 for a blast resistant window pane 2. The framework, which can be formed of a light metal such as aluminium, comprises an outer frame 3 which is anchored by means of bolts 4 within a corresponding rectangular aperture formed in a wall. The frame 3 consists of an upper frame head 5, a lower frame sill 6, a side shutting jamb 7 and a side hanging jamb 8.

The framework 1 furthermore comprises a window sash 9 which consists of profiled top rail 10, bottom rail 11, shutting stile 12 and hanging stile 13. The window sash 9 is pivotally mounted with respect to the outer frame 3 by means of hinges 14 secured respectively to the hanging jamb 8 and the hanging stile 13.

As seen in Fig. 2 of the drawings, the shutting and hanging stiles 12 and 13 are respectively formed with inwardly directed pairs of reinforcing flanges 15 and 16 designed to receive the end portions of the pane 2, the edges of which bear against spacer elements 17 secured to the stiles 12 and 13. The top and bottom rails 10 and 11 respectively (not seen in Fig. 2) are also provided with such reinforcing flanges.

The provision of the profiled sash rails and stiles with the inwardly extending flanges serves to reinforce the sash against mechanical shear and bending, as well as providing for an effective retention of the windowpane 2.

As seen in Fig. 1 of the drawings, the top and bottom rails 10 and 11 of the window sash 9 have slidably secured thereto respective upper and lower carrier members 18a and 18b whilst the shutting stile 12 has slidably secured thereto an upright carrier member 19. Mounted on the carrier members 18a and 18b and the upright carrier member 19 are spaced apart locking elements 20 designed to be releasably engageable in corresponding respectively juxtaposed receiving elements 21, secured to the adjacent upper frame head 5, lower frame sill 6 and side shutting jamb 7.

The upright carrier member 19 is coupled at its uppermost end to an adjacent end of the upper carrier member 18a by means of an upper, resiliently displaceable transmission member 22, whilst the lower end of the upright carrier member 19 is coupled to the adjacent end of the lower carrier member 18b by means of a lower, resiliently displaceable transmission member 23.

Reference will now be made to Figs. 2 and 3 of the drawings for a detailed description of the blast-resistant window locking mechanism and of the components thereof which have just been briefly described.

As seen in these figures, the upright carrier member 19 is formed at its longitudinal edges with respective elongated slots 24 adapted to receive corresponding flanges 25 formed integrally with the adjacent shutting stile 12. In this way, the upright carrier member 19 is slidably displaceable on and with respect to the shutting stile 12. Extending along the length of the upright carrier member 19 is an elongated dovetailed groove 26 in which are slidably fitted locking elements 20 formed with corresponding flanges which slidably fit within the dovetailed groove 26. The locking elements 20 are fixed in any desired position along the length of the upright carrier element by means of fixing screws 27.

As can be seen in Fig. 3 of the drawings, there is formed at an intermediate position of the upright carrier member 19 a slot 28.

A rotary locking mechanism 29 is mounted on the shutting stile 12 and is provided with a rotary handle 30 and an engaging tongue 31 projecting out of the shutting stile and into the slot 28. The rotary locking mechanism 29 is such that rotary movement of the handle 30 is converted into a linear translational movement of the engaging tongue 31 which is imparted to the upright carrier member 19. The displacement stroke of the engagement tongue 31, and therefore the linear displacement of the upright carrier member 19 upon rotation of the handle 30, is at least about 25 mm. As indicated above, the upright carrier member 19 is coupled to the carrier members 18a and 18b by means of upper and lower resiliently displaceable transmission members 22, 23. As shown in Fig. 3 of the drawings, the upper resiliently displaceable transmission member 22, which is constituted preferably by an elongated steel band, is secured, at a lowermost end thereof, to a rigid, substantially planar coupling element 32 having a coupling stud 33. The planar coupling element 32 is designed to fit into a corresponding recessed end portion 34 of the upright carrier member 19 with the stud 33 fitting within an aperture 35 formed in the end portion 34.

The elongated resiliently displaceable transmission member 22 extends through a right-angled rigid frame 36 which bounds the adjacent corners of the shutting stile 12 and the top rail 10 of the window sash 9 and is secured thereto by means of securing bolts 37. The end of the transmission member 22 remote from the coupling element 32 is formed with a downwardly depending coupling stud 38 which fits into an aperture 39 formed in an end portion 40 of the upper longitudinal carrier member 18a.

The lower end of the upright carrier member 19 is coupled to the lower resiliently displaceable transmission member 23 (via a corresponding stud and aperture 41 and 42). The member 23 extends through a right-angled rigid frame 43 secured to adjacent corners of the shutting stile 12 and bottom rail 11. The lower transmission member 23 is, in its turn, coupled to the lower carrier member 18b via a stud and hole arrangement 44 and 45.

The receiving elements 21 are slidably mounted in profiled portions of the side shutting jamb 7 and the upper frame head 5 and the lower frame sill 6.

As can be clearly seen in Fig. 1 of the drawings,

the locking elements 20 are fixed in position on their respective carrier members so as closely to adjoin the positioning of the receiving elements 21 on the adjacent frame. In this way, upon rotation of the rotary handle 30 in a clockwise sense, the upright carrier member 19 is displaced downwardly in the direction of the arrow 47 and the locking elements 20 attached to the upright carrier member are also displaced downwardly and into their adjoining receiving elements 21 so as to be effectively locked thereby. At the same time, the upper resiliently displaceable transmission member 22 is also displaced downwardly and causes a transverse movement in the direction of the arrow 48 of the upper carrier member 18a, with a consequent movement of the locking elements 20 associated with the upper carrier member 18a into their adjoining receiving elements 21, thereby effectively locking these elements 20 within the receiving elements 21. Similarly, the downward movement of the upright carrier member 19 results in a downward displacement of the lower resiliently displaceable transmission member 23 causing a transverse movement to the lower carrier member 18b in the direction of the arrow 47, with a consequent displacement of the associated locking elements 20 into their adjacent receiving elements.

In this way, the window sash is effectively and firmly locked to the window frame by means of a plurality of locking elements and it will be readily seen that the effectiveness of the locking is directly related to the number of locking elements and also to the length thereof, and these lengths are chosen so as to be directly related to the stroke of the carrier elements.

Opening of the window can be readily effected by rotation of the rotary handle in an anti-clockwise direction.

As can be seen in Fig. 1 of the drawings, the side hanging jamb 8 of the outer frame 3, together with the hanging stile 13 of the window sash 9 are provided with longitudinally spaced apart reinforcing means 49, designed to impart to the hinged sides of the rectangular framework adequate reinforcement against displacement in the event of blast and the like.

Reference will now be made to Figs. 2 and 4 of the drawings, which shows, on an enlarged scale, one of the reinforcing means 49 seen in Fig. 1 of the drawings. (Fig. 4 shows the means 49 with the window in an open position.)

As seen in Figs. 2 and 4 of the drawings, the hanging stile 13 is in principle identical in construction with the shutting stile 12 and is formed with inwardly directed flanges 13a which fit into corresponding recesses formed in an elongated locking member 50 having a projecting portion 51. The locking member 50 can be slidably positioned with respect to the hanging stile 13 and be fixed in the required position by a fixing screw 52.

Juxtaposed with respect to each elongated locking member 50 is an elongated receiving member 53 formed with a receiving recess 54 into which can matingly fit the projecting portion 51.

The elongated receiving member 53 is formed on either side thereof with elongated slots which receive inwardly directed flanges formed integrally with the hanging jamb 8. The receiving member 53 is slidably positioned with respect to the hanging jamb and is located in the required position opposite the locking member 50 by means of a positioning screw 55.

As can be clearly seen from the drawings, when the window is in a closed position the projecting portions 51 of the elongated locking members are firmly seated within the receiving recesses 54 of the elongated receiving members and in this way considerably reinforces the firm positioning of the window sash 9 within the outer frame 3.

It will be readily understood that the blast resistant protection afforded by the provision of the locking elements 20 and receiving elements 21, associated as they are with the hanging jamb 8 and hanging stile 13, the upper frame head 5 and the top rail 10, and the lower frame sill 6 and the bottom rail 11 on the one hand and, on the other hand, the elongated locking members 50 and elongated receiving members 53 associated as they are with the hanging jamb 8 and the hanging stile 13, is largely a function of the numbers of the elements and members, the longitudinal extent thereof and their cross-sectional dimensions.

It will be appreciated that the numbers of these elements can be readily increased as required and can be simply and effectively fitted in the required positions.

The longitudinal extents of the locking and receiving elements 20 and 21 is clearly closely related to the stroke of the engaging tongue 31 upon rotation of the rotary handle 30, which stroke is transmitted to the carrier members 18a, 18b and 19. Clearly, with the locking elements 20 closely juxtaposed (in the unlocked position of the window) with respect to the receiving elements 21 and with an equal spacing always being maintained between each juxtaposed pair of locking and receiving elements 20 and 21, the length of the stroke effectively determines the degree of insertion of each locking element into its corresponding receiving element. Where the spacing between the adjacent locking and receiving elements is minimal, then it can be ensured that the longitudinal extent of the locking elements correspond substantially to the stroke. Thus, by using a rotary locking mechanism 29 having a maximum stroke, it is possible to employ locking elements of correspondingly significant extent and this clearly contributes substantially to the effective locking of the sash within the frame.

A blast resistant framework as just described is effective against distortion and/or detachment with blasts corresponding to one atmosphere pressure

(14.2 PSI).

The rectangular framework 1 just described can be provided in a known manner with effective sealing means (not shown) to prevent ingress or egress of air, noxious gases and dust. The framework just described being provided with the reinforced locking mechanism, provides substantially increased protection against detachment of the sash from the frame in the event of blast. Furthermore, and should any local distortion be created either in the sash or in the frame, or in both, as a consequence of blast, which distortion could affect deleteriously the effective locking of the sash to the frame and, in consequence, the effective sealing nature of the framework, it is possible by simple means to reposition the locking and receiving elements and/or the locking and receiving members with respect to their respective stiles and jambs, so as to take into account any such local distortions and so as to restore the effective locking and sealing of the sash within the frame.

Furthermore, it will be appreciated that the blast resistant framework just described can be readily installed into any existing window opening.

Claims

1. A rectangular, blast resistant framework (1) for a casement window comprising:

a window sash (9) pivotally mounted at a hanging stile (13) thereof with respect to a hanging jamb (8) of a fixed rectangular frame (3) of the framework;

a rotary locking mechanism (29) mounted on a shutting stile (12) of the sash (9), having a rotary handle (30) and an engaging tongue (31) projecting out of said shutting stile and displaceable along said shutting stile upon rotation of the rotary handle (30);

characterized in that it comprises

first, second and third elongated carrier members (19, 18a, 18b) respectively and articulatedly mounted on said shutting stile and top and bottom rails (10, 11) of said sash (9) so as to be displaceable therealong for a distance substantially equal to said displacement stroke, said first carrier member (19) being engaged by said engaging tongue (31) so as to be displaceable therewith;

upper and lower resiliently bendable transmission strips (22, 23) respectively and displaceably mounted about a pair of corners of said sash (9) adjacent said shutting stile (12) and respectively coupled at one pair of ends thereof to upper and lower extremities of said first carrier member (19) and at an opposite pair of ends thereof to adjacent ends of said second and third carrier members (18a, 18b) so that displacement of said first carrier member (19) is accompanied by corresponding displacements of said second and third carrier members 18a, 18b;

sets of locking elements (20) respectively mounted on each of said carrier members (19, 18a, 18b) with constituent locking elements of each set spaced apart along the lengths of the respective carrier member;

like sets of receiving elements (21) mounted respectively on a shutting jamb (7), a frame head (5) and a frame sill (6) of the fixed frame (3) and being respectively juxtaposed with respect to said locking elements (20), said locking elements being lockingly engaged by said receiving elements (21) about lengths thereof substantially corresponding to said displacement stroke upon displacement of the locking elements (20) towards said receiving elements (21) as a result of rotation of said handle (30) in a first sense and being disengaged from said receiving elements (21) upon displacement of said locking elements (20) away from said receiving elements as a result of rotation of said handle (30) in a second and opposite sense;

the rotary handle (30) having a displacement stroke of at least about 25 mm.

2. A blast resistant framework according to Claim 1, characterized in that each carrier member (19, 18a, 18b) is formed at its longitudinal edges with elongated slots (24) in which are respectively and slidably received corresponding flanges (25) formed integrally with the shutting stile (12) and top and bottom rails (10, 11) of the sash (9).

3. A blast resistant framework according to Claim 1 or 2, characterized in that each locking element (20) is slidably adjustable along the length of its associated carrier member, securing means (27) being provided for fixing the locking element (20) in a desired portion on the carrier member (19, 18a, 18b).

4. A blast resistant framework according to any one of Claims 1, 2 or 3, characterized in that each receiving element (21) is slidably adjustable along the length of its associated shutting jamb (7), frame head (5) and frame sill (6), securing means being provided for fixing the receiving elements (21) in the desired positions *vis-à-vis* the locking elements (20).

5. A blast resistant framework according to any one of the preceding claims, characterized in that each locking element (20) is formed with an elongated projection and wherein each receiving element (21) is formed with an elongated recess into which a corresponding locking element projec-

tion is receivably retainable.

6. A blast resistant framework according to Claim 5, characterized in that said elongated projection and said elongated recess are formed with a dovetail engaging formation.

7. A blast resistant framework according to any one of the preceding claims, characterized in that said hanging jamb (8) and said hanging stile (13) are formed with longitudinally spaced apart inter-engaging reinforcing means (49).

8. A blast resistant framework according to Claim 7, characterized in that each reinforcing means (49) is constituted by a locking member (50) having a projecting portion (51) and being displaceably securable to said hanging stile (13) and a receiving member (53) displaceably securable to said hanging jamb (8) opposite an associated locking member (50) and adapted lockingly to receive said associated locking member.

9. A blast resistant framework according to any one of the preceding claims, characterized in that said frame (3) and sash (9) are formed with sealing means along their adjacent edges for prevention of ingress or egress of air, noxious gases or dust.

10. A blast resistant framework according to any one of the preceding claims, characterized in that the top rail (10), bottom rail (11), shutting stile (12) and hanging stile (13) are each provided with reinforcing flanges (15, 16) receiving the end portions of a pane (2).

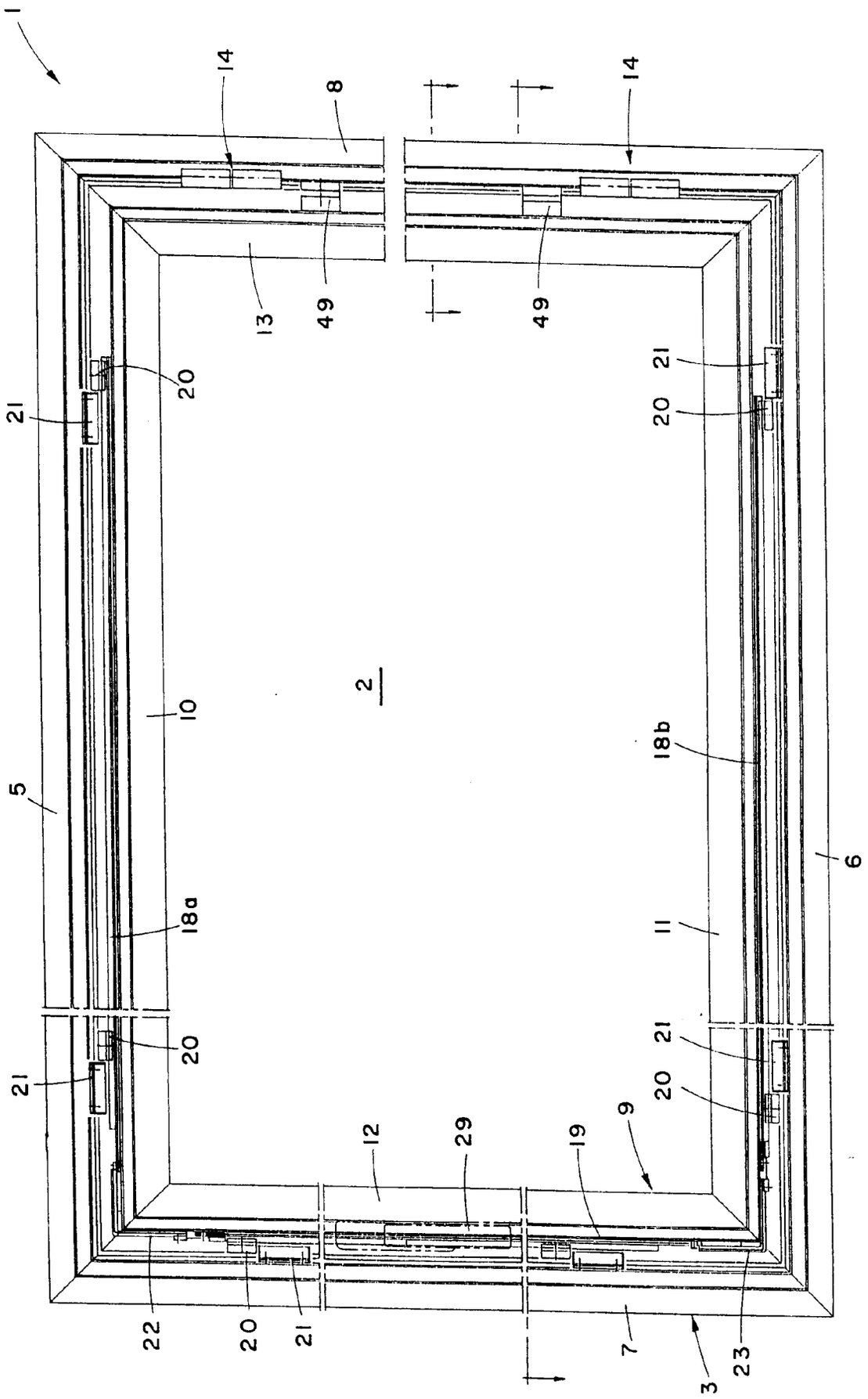
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Fig. 1

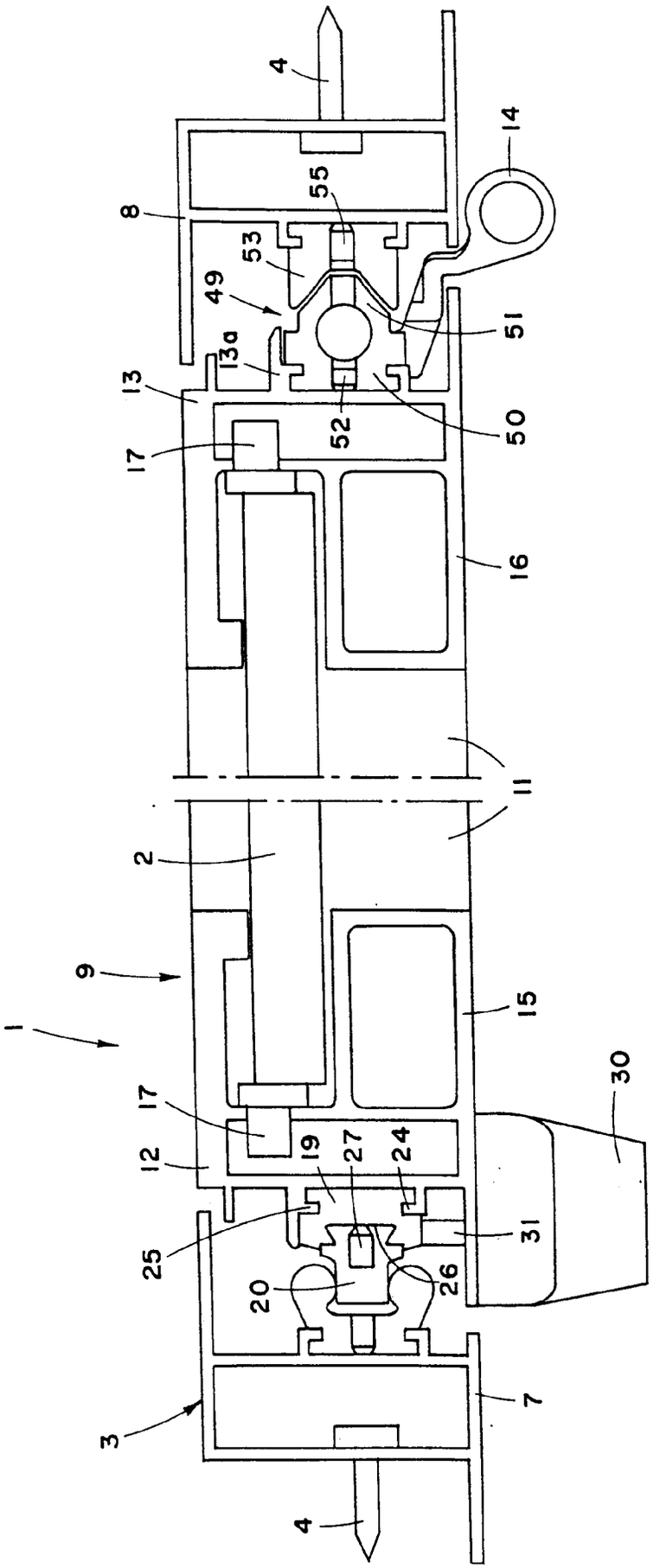
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Fig.2

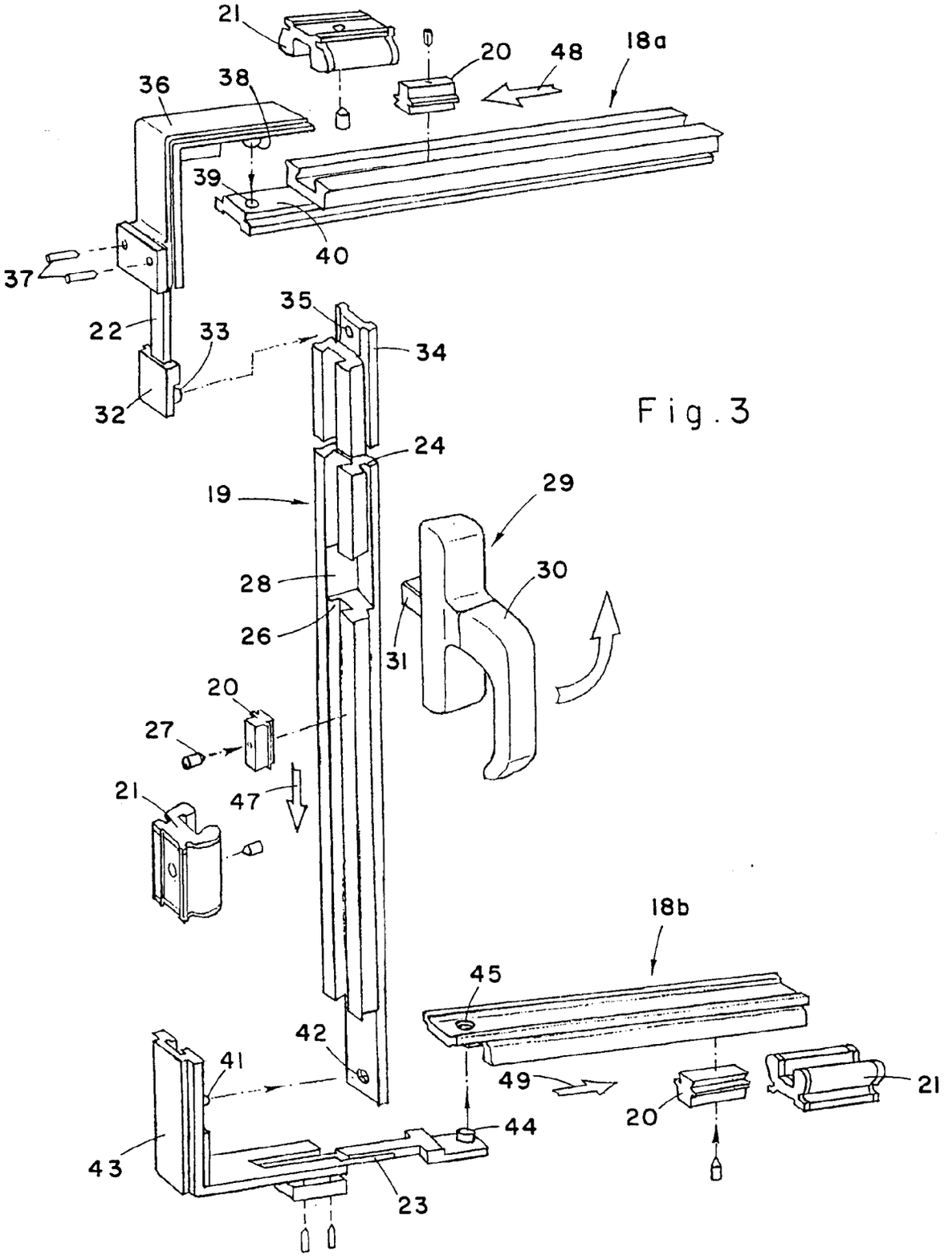
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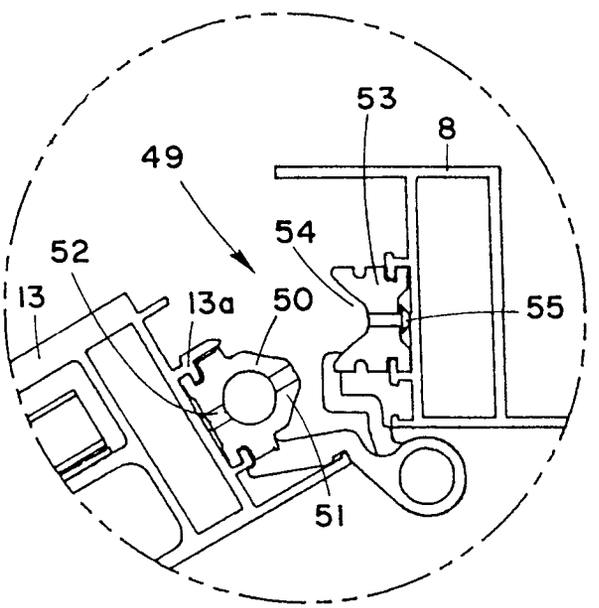
Fig.3

Fig. 4



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EUROPEAN SEARCH REPORT

Application Number
EP 93 63 0067

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
A	FR-A-2 358 535 (SYCO PRODUKTENENTWICKLUNGSGESELLSCHAFT) * the whole document *	1-4,9,10	E05C9/06
A	FR-A-2 237 041 (VEREINIGTE BAUBESCHLAGFABRIKEN GRETSCH) * figures 1,7 *	1-3,7,8	
A	FR-A-2 529 247 (WILH. FRANK) * figure 1 *	1	
A	FR-A-2 073 131 (REUSCHENBACH) * the whole document *	1,9,10	

TECHNICAL FIELDS SEARCHED (Int.Cl.5)

E05C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	13 December 1993	Teerling, J

CATEGORY OF CITED DOCUMENTS

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