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(54) **Hinge and track assembly**

(57) The present invention relates to a hinge and track assembly (6) for a wing construction (1), such as a door or window construction. The hinge and track assembly (6) comprises a track (7) mounted to the wing frame (2), a connector (8) comprising a first section (8a) which is parallel with the axis of the track (7) and which is slideably arranged in the track, and a second section (8b) in the form of a pin which is perpendicular to the axis

of the track (7), and pin engaging means (9) on the wing (5) which pivotably engages with the second section (8b) of the connector (8) thereby allowing the wing (5) to pivot about the second section (8b) of the connector (8). The connector is further characterized in that the first section (8a) and the second section (8b) of the connector (8) are both sections of a single bent metal rod. In this way, a strong and effective hinge and track assembly is provided.

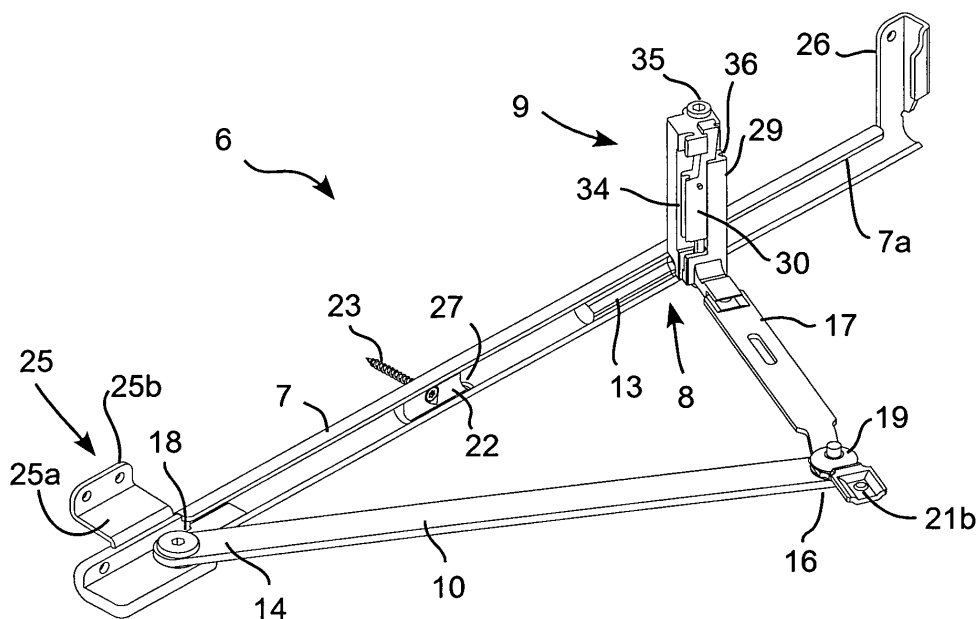


Fig. 2

Description

[0001] The current invention relates to a hinge and track assembly for a wing construction, such as a door or window construction, comprising a track mounted to the wing frame, a connector comprising a first section which is parallel with the axis of the track and which is slideably arranged in the track and a second section in the form of a pin which is perpendicular to the axis of the track, and pin engaging means on the wing which pivotably engages with the second section of the connector thereby allowing the wing to pivot about the second section of the connector.

[0002] The current invention also relates to a wing construction using such a hinge and track assembly as well as a connection element for establishing a connection to the wing sash.

[0003] Hinge and track assemblies of the kind described above are well known in the prior art. One common example of a wing construction which makes use of such a hinge and track assembly is an outwardly opening window construction. This type of window construction comprises a window frame which is rigidly attached to, for example, a wall of a house, and a window sash surrounding a glass pane. The hinge and track assembly as described above controls the motion of the window sash such that it is both pivoted and displaced when the window construction is opened. In this way, it is possible to access the outside surface of the glass pane. This means that it can be cleaned from the inside. Two examples of such window constructions are disclosed by US 5,491,930 and US 3,509,664.

[0004] In the context of the current application, the window frame of the above example is referred to as a wing frame and the window sash / glass pane assembly is referred to as a wing. The wing frame is the part of the wing construction which is rigidly attached to, for example the wall of a house. The wing is the part of the wing construction which is moveable. Another common example of a wing construction is a door.

[0005] One problem with the hinge and track assemblies known from the prior art is that the connector located between the track and the window sash is typically rather complicated since it needs to provide both a sliding function and a pivoting function. In addition, since all the load of the window is transferred to the track via this connector, the connector needs to be quite strong. This is especially true for modern windows which are typically much heavier than older windows. The connector is therefore typically a rather expensive and difficult to manufacture component.

[0006] Another problem with the hinge and track assemblies known from the prior art is that they are difficult to mount and adjust. Furthermore, the tracks known from the prior art were designed for lighter windows and are therefore not strong enough for modern windows which are typically heavier.

[0007] A first aspect of the current invention is there-

fore to provide a hinge and track assembly as mentioned in the introductory paragraph which has a simple, strong and inexpensive connector.

[0008] A second aspect of the current invention is to provide a hinge and track assembly as mentioned in the introductory paragraph where the connector can be manufactured such that the tolerances can be limited.

[0009] A third aspect of the current invention is to provide a hinge and track assembly as mentioned in the introductory paragraph which can be easily mounted and adjusted.

[0010] A fourth aspect of the current invention is to provide a hinge and track assembly as mentioned in the introductory paragraph which has a strong connection to the wing frame.

[0011] The above mentioned aspects are solved by a hinge and track assembly as mentioned in the introductory paragraph where the first section and the second section of the connector are both sections of a single bent metal rod. In this way a very strong and simple connector is provided. In addition the connector is simple to manufacture.

[0012] In a preferred embodiment, the hinge and track assembly can comprise a control arm, one end of which is pivotably connected to the wing frame via a first connection and the other end of which is pivotably connected to the wing via a second connection. In this way, the motion of the hinge and track assembly can be easily controlled.

[0013] The connector can also comprise a slider block moulded around at least a part of the first section of the connector. In one embodiment, the slider block is injection moulded around at least a part of the first section of the connector. In this way, the tolerances of the connector element can be limited to a single operation, namely the moulding operation.

[0014] In order to increase the stability of the assembly and to increase the ease of assembly, the sliding block of the connector can comprise at least one flat face and the track can comprise at least one flat face, thereby allowing said two faces to be essentially aligned when the connector is arranged in the track.

[0015] By providing an offset, in the direction which is perpendicular to the plane of the wing frame, between the first section and the second section of the connector, the point of rotation of the wing can be offset with respect to the sliding axis of the track.

[0016] In one embodiment, the pin engaging means can be detachably fastened to a groove on one edge profile of the wing and the pin engaging means can comprise a main body and a sliding element, said sliding element being displaceable with respect to the main body of the pin engaging means along an axis which lies on a plane which is parallel to the width of the groove and which is arranged at an angle to the centre axis of the groove. In this way, the pin engaging means can be simply and effectively attached to the wing. This further simplifies the assembly process.

[0017] By providing the sliding element with at least one face which is parallel to the centre axis of the groove, the sliding element can more effectively clamp onto the sides of the groove.

[0018] In order to allow the height of the window assembly to be adjusted, the pin engaging means can comprise adjustment means whereby the distance between the first section of the connector and the pin engaging means can be adjusted.

[0019] In order to allow the alignment of the window assembly to be adjusted, the control arm can comprise means for adjusting the distance between the first connection and the second connection of the control arm. The first connection and/or the second connection of the control arm could furthermore comprise friction means whereby the movement of the hinge and track assembly can be better controlled.

[0020] The hinge and track assembly according to the current invention can advantageously be used in a wing construction such as a door or window construction, comprising an essentially rectangular wing frame comprising four frame members forming the sides of the frame, a wing element, a first hinge and track assembly according to the invention connecting a first frame member with a first edge profile of the wing element, and a second hinge and track assembly according to the invention connecting a second frame member and a second edge profile of the wing element, said second frame member being parallel to said first frame member.

[0021] The first and second frame members of such a wing construction could have a cross section comprising a protrusion which protrudes essentially perpendicular to the plane of the wing frame and towards the wing element and the track of the hinge and track assemblies could be mounted to the protrusion on a face which is essentially parallel to the plane of the frame and which is closest to the wing.

[0022] In order to increase the strength of the connection between the hinge and track assemblies and the frame members, the tracks of the first and second hinge and track assemblies could further comprise at least one flange which extends in a direction away from the wing which permits the track to be attached to a part of the frame which does not form a part of the protrusion.

[0023] Furthermore, by advantageously locating one end of at least one of the tracks of the hinge and track assemblies at a location of the frame where two frame members meet and connecting said track to both frame members, the strength of the frame can be further increased.

[0024] The invention will now be described in more detail with reference to the drawings, where:

Figure 1 shows a schematic perspective view of a window construction where one embodiment of a hinge and track assembly according to the current invention is used,

Figure 2 shows a schematic perspective detail view of the above embodiment of the hinge and track assembly without the window construction,

Figure 3 shows a schematic perspective exploded view of the same,

Figure 4 shows a schematic perspective view of the pin engaging means and a fragment of the window sash of the window construction as shown in figures 1-3, and

Figure 5 shows a fragment of a cross section view as defined by the section line in figure 1.

[0025] The window construction 1 shown in figure 1 is of the kind which could, for example, be mounted in a wall of a house (not shown). The window construction 1 opens outwardly and is, in figure 1, shown as seen from the outside. The window construction is attached to the wall of the house via a window frame 2 which comprises four frame members 3a, 3b, 3c, 3d forming the sides of the window frame 2. In the current example, the frame members are made of wood.

[0026] The window construction 1 further comprises a window sash 5 which surrounds a glass pane 4. The window sash 5 in the current example is made from an extruded metal profile. The window sash 5 is connected to the window frame 2 via two hinge and track assemblies 6a, 6b. The two hinge and track assemblies 6a, 6b are mirror images of each other. The first hinge and track assembly 6a is mounted at the bottom of the frame 2 and the second hinge and track assembly 6b is mounted at the top of the frame 2.

[0027] The hinge and track assemblies 6a, 6b comprise a track 7, a connector 8, pin engaging means 9, and a control arm 10. In the current example the track 7 is a component rigidly fastened to a frame member 3a, 3c and the pin engaging means 9 is a component attached to the extruded metal profile of the window sash 5. However, within the scope of the invention, the track could also be formed as an integrated part of the frame member. In the same way, the pin engaging means could be formed as an integrated part of the sash. For example, the pin engaging means could be as simple as a hole drilled in the sash.

[0028] The connector 8 connects the pin engaging element 9 and the track 7. A first section 8a of the connector 8 is arranged parallel with the axis of the track and is slideably arranged in the track 7. A second section 8b of the connector 8 is arranged perpendicular to the axis of the track and is arranged inside a hole 11 in the pin engaging element 9. In this way, the sash 5 can be both displaced along the track 7 as well as pivoted around the second section 8b of the connector 8. In the current example, there is also an offset between the first section 8a of the connector 8 and the second section 8b of the connector in the direction which is perpendicular to the

plane of the frame 2. In this way, the pivot point for the sash is located at a distance from the frame, while still allowing the track to be mounted close to the frame.

[0029] The second section 8b of the connector 8 can also be formed with means to detachably lock the connector 8 and the pin engaging means 9 together. For example, the second section 8b could be formed with a groove 12 which engages with an o-ring (not shown) arranged in the hole 11 of the pin engaging means 9.

[0030] As can clearly be seen in figure 3, the connector 8 is made from a single piece of metal rod which is cut to the right length and then bent to the right shape. In this way, the connector 8 can be manufactured very simply, quickly and inexpensively. In addition, the connector 8 is very strong since it is made from a single piece of metal without any welding or assembly required.

[0031] In order for the connector 8 to better slide in the track 7, the first section 8a of the connector 8 is covered with a slider block 13 with good sliding properties. In the current example, the material of the slider block 13 is POM (Polyoxymethylene, Acetal), however it should be obvious to the person skilled in the art that many other materials could be used instead. In the current example, a lubricant is embedded in the material in order to improve its sliding properties.

[0032] In the current embodiment, the slider block 13 is injection moulded around the first section 8a of the connector 8. In this way, the tolerances on the slider block can be limited to the tolerances of a single mould. During the moulding of the slider block 13, the second section 8b of the connector 8 is held in a controlled orientation. The slider block 13 is then moulded around the first section 8a of the connector 8. In this way, the relationship between the slider block 13 and the second section 8b of the connector 8 is determined by the tolerances of the mould. In order to illustrate this feature consider the case where, during the bending of the connector, the angle between the first section 8a of the connector 8 and the second section of the connector was not correct. In the prior art, this angular error would cause jamming of the slider in the track. However, according to the current invention, the plastic will mould around the first section, and the form will not be dependent on the angle of the first section, but only on the angle of the second section. The effects of the angular error are therefore removed.

[0033] Figure 3 also shows that the plastic slider block 13 is not round, but comprises at least one flat face 13a. This flat face 13a engages with a corresponding flat flange 7a on the track. The flat face 13a on the slider block 13 prevents the connector 8 from rotating when it is placed in the track 7.

[0034] This is especially helpful during the assembly of the window construction 1. It should however be mentioned, that there is a couple of degrees of play between the flat face 13a on the connector 13 and the flat flange 7a on the track. This ensures that the connector 8 does not bind in the track 7 if there is a small misalignment.

[0035] The control arm 10 is used to control the motion

of the sash. A first end 14 of the control arm 10 is pivotably attached to the track 7 via a block 15 mounted at the end of the track 7. The second end 16 of the control arm 10 is pivotably attached to the sash 5 via a fastening element 17 fastened to the sash 5. Adjustment means 18a, 18b connect the first end 14 of the control arm to the block 15. The adjustment means comprise an eccentric nut 18a and a screw 18b. By rotating the eccentric nut 18a, the distance between the connection points of the control arm 10 can be adjusted. In this way, the alignment of the sash can easily be adjusted.

[0036] The second end 16 of the control arm 10 is attached to the fastening element 17 via friction control means 19a, 19b, 19c. The friction control means comprise a screw 19a, a nut 19b, and a spring washer 19c. By tightening or loosening the screw 19a, the friction is respectively increased or decreased. In this way, the motion of the sash can be effectively controlled. The fastening element 17 is attached to the sash 5 by sliding the fastening element 17 into a groove 20 in the edge profile of the sash and tightening screws 21 a, 21 b on the fastening element. This causes the fastening element 17 to clamp rigidly fast in the groove 20. One of the screws 21 a also clamps onto the pin engaging element 9. This ensures that the distance between the pin engaging element 9 and the fastening element 17 is correct.

[0037] A stop block 22 is arranged in the track 7 via a screw 23 in order to prevent with connector 8 from sliding too far in the track 7.

[0038] Figure 5 shows a cross section of the track 7 and the bottom frame member 3c as defined by the section line shown in figure 1. As can be seen from figure 5, the window frame members 3a, 3b, 3c, 3d are of the kind which have a cross section comprising a protrusion 24 protruding from the main part of the frame member. The track 7 is mounted on the face of the protrusion 24 which is parallel to the plane of the frame. In the prior art window constructions, the track is fastened directly to this protrusion 24. However, this leads to heavy loads on the protrusion which can lead to the protrusion breaking. This is especially true with heavy modern windows. Therefore, as shown in figures 1-5, a flange 25 on the track 7 engages with the main part of the frame members 3a, 3c instead of the protrusion 24 itself. This increases the strength of the connection between the track 7 and the frame member 3a, 3c.

[0039] As can be seen from figure 5, the flange 25 on the track comprises two main sections, a mainly horizontal section 25a and a mainly vertical section 25b. The mainly horizontal section 25a abuts the mainly horizontal face of the protrusion 24 of the frame member 3c and the mainly vertical section 25b abuts the mainly vertical face of the main part of the frame member 3c. Screws (not shown) or other fastening means attach the vertical section 25b of the flange 25 to the main part 3c of the frame.

[0040] The track 7 also comprises a second flange 26 which connects to the side frame member 3d. In this way,

the track helps to hold the frame together since the track is connected to both frame members meeting at a corner. With the prior art system, the track is only connected to the top and bottom frame members. Due to the weight of the window, there is a risk that the weight of the window causes the bottom frame member to separate from the side frame members. The second flange 26 of the track 7 of the current embodiment prevents this from happening. As can be seen in the figures, the second flange 26 is bent into a U shape. This increases the strength of the flange. It also allows the pin engaging means 9 to fit inside the U shape when the window is closed. This increases the theft security of the window construction.

[0041] The flanges 24, 26 also ensure that no screws are necessary in the sliding part of the track. This ensures that there are no screw heads which could contact the sliding block 13 and cause wear.

[0042] The track 7 is, in the current embodiment, formed from a metal plate which is first stamped and then bent into the correct shape. This results in a quick and effective manufacturing method. The track 7 furthermore comprises holes in the base of the track to allow rain water to escape from the track 7.

[0043] The pin engaging element 9 is connected to the sash 5 via a groove 28 in the sash 5. The pin engaging element 9 comprises a main body 29, a sliding element 30 and adjustment means comprising a screw 31. The sliding element 30 is arranged to slide along an inclined surface 32 on the main body 29 and along an axis which is at an angle to the centre axis of the groove 28. The axis is on a plane which is essentially parallel with the groove 28 on the sash 5. The axis is at an angle of around 5 degrees, but could also be smaller or larger. Smaller angles will require larger displacements but will give larger clamping forces. Larger angles will require smaller displacement but result in smaller clamping forces.

[0044] The screw 31 is arranged in a hole 33 in the main body 29 which is slightly larger than the diameter of the screw 31. This allows the screw 31 to freely move up and down in the hole. The screw is engaged via a thread in the sliding part 30 such that turning the screw causes the sliding part 30 to displace relative to the main body 29 of the pin engaging means. Since the sliding member 30 is arranged on an inclined surface 32 of the main body 29, displacement of the sliding body causes the sliding body to clamp onto the sides of the groove 28. In order to ensure a proper contact between the sliding element and the groove, the face 34 of the sliding element 30 and the face 36 of the main body which are in contact with the sides of the groove 28 are parallel to the axis of the groove 28.

[0045] In order to increase the effectiveness of the clamping action of the sliding element 30, the face 34 of the sliding element and the corresponding face 36 on the main body 29 which are in contact with the sides of the groove 28 are arranged at an angle to the main plane of the wing element 4. This angle can be seen in figure 4. Due to this angle, when the sliding element is clamped

onto the sides of the groove 28, the connection element 9 displaces in a direction which is parallel to the plane of the wing element 4 and perpendicular to the axis of the groove 28. This causes the connection element 9 to be clamped in the groove in two directions, one due to the combination of the inclined surface 32 of the main body 29 and the sliding element 30 and one due to the angled face 34 on the sliding element 30 and the angled face 36 on the main body 29. It could however, also be imagined that the faces 34,36 on the sliding body and the main body were not angled.

[0046] The pin engaging element 9 also comprises height adjustment means 35. The height adjustment means comprises a set screw 35 arranged in a thread in the hole 13 in which the second section 8b of the connector 8 is arranged. By adjusting the set screw 35, the distance between the pin engaging element and the first section of the connector can be adjusted. In this way, the height of the window can easily be fine tuned after the pin engaging element has been clamped to the sash.

[0047] It should be obvious to the person skilled in the art that the above described hinge and track assembly is just one embodiment out of many possible embodiments which are covered within the scope of the invention. The scope of the invention should therefore not be limited to the above embodiment.

Claims

1. A hinge and track assembly (6) for a wing construction (1), such as a door or window construction, comprising:

- a track (7) mounted to the wing frame (2),
- a connector (8) comprising:

- i. a first section (8a) which is parallel with the axis of the track (7) and which is slidably arranged in the track, and
- ii. a second section (8b) in the form of a pin which is perpendicular to the axis of the track (7), and

- pin engaging means (9) on the wing (5) which pivotably engages with the second section (8b) of the connector (8) thereby allowing the wing (5) to pivot about the second section (8b) of the connector (8),

characterized in that the first section (8a) and the second section (8b) of the connector (8) are both sections of a single bent metal rod.

2. A hinge and track assembly (6) according to claim 1, **characterized in that** said hinge and track assembly further comprises a control arm (10), one end (14) of which is pivotably connected to the wing frame

(3a) via a first connection (18) and the other end (16) of which is pivotably connected to the wing (5) via a second connection (19).

3. A hinge and track assembly (6) according to claim 1 or 2,
characterized in that the connector (8) further comprises a slider block (13) moulded around at least a part of the first section (8a) of the connector (8).

4. A hinge and track assembly (6) according to claim 3, **characterized in that** the slider block (13) is injection moulded around at least a part of the first section (8a) of the connector (8).

5. A hinge and track assembly (6) according to claim 3 or 4
characterized in that the sliding block (13) of the connector (8) comprises at least one flat face (13a) and the track (7) comprises at least one flat face (7a), and that said two faces (13a, 7a) are essentially aligned when the connector (8) is arranged in the track (7).

6. A hinge and track assembly (6) according to any one of claims 1-5
characterized in that there is an offset, in the direction which is perpendicular to the plane of the wing frame (2), between the first section (8a) and the second section (8b) of the connector (8).

7. A hinge and track assembly (6) according to any one of claims 1-6
characterized in that the pin engaging means (9) is detachably fastened to a groove (28) on one edge profile of the wing (5) and that the pin engaging means (9) comprises a main body (29) and a sliding element (30), said sliding element (30) being displaceable with respect to the main body (29) of the pin engaging means (9) along an axis which lies on a plane which is parallel to the width of the groove (28) and which is arranged at an angle to the centre axis of the groove (28).

8. A hinge and track assembly (6) according to claim 7, **characterized in that** the sliding element (30) comprises at least one face (34) which is parallel to the centre axis of the groove (28).

9. A hinge and track assembly (6) according to any one of claims 1-8
characterized in that the pin engaging means (9) comprises adjustment means (31) whereby the distance between the first section (8a) of the connector (8) and the pin engaging means (9) can be adjusted.

10. A hinge and track assembly (6) according to claim 2, **characterized in**

that the control arm (10) comprises means for adjusting (18) the distance between the first connection (18) and the second connection (19).

11. A hinge and track assembly (6) according to claim 2 or 10
characterized in that first connection and/or the second connection (19) of the control arm (10) comprises friction means (19) whereby the movement of the hinge and track assembly (6) can be controlled.

12. A hinge and track assembly (6) for a wing construction (1), such as a door or window construction, comprising:

- a track (7) mounted to the wing frame (2),
- a connector (8) comprising:

- i. a first section (8a) which is parallel with the axis of the track (7) and which is slidably arranged in the track (7), and
- ii. a second section (8b) in the form of a pin which is perpendicular to the axis of the track (7), and

- pin engaging means (9) on the wing (5) which pivotably engages with the second section (8b) of the connector (8) thereby allowing the wing (5) to pivot about the second section (8b) of the connector (8),

characterized in that a slider block (13) is moulded around at least a part of the first section (8a) of the connector (8).

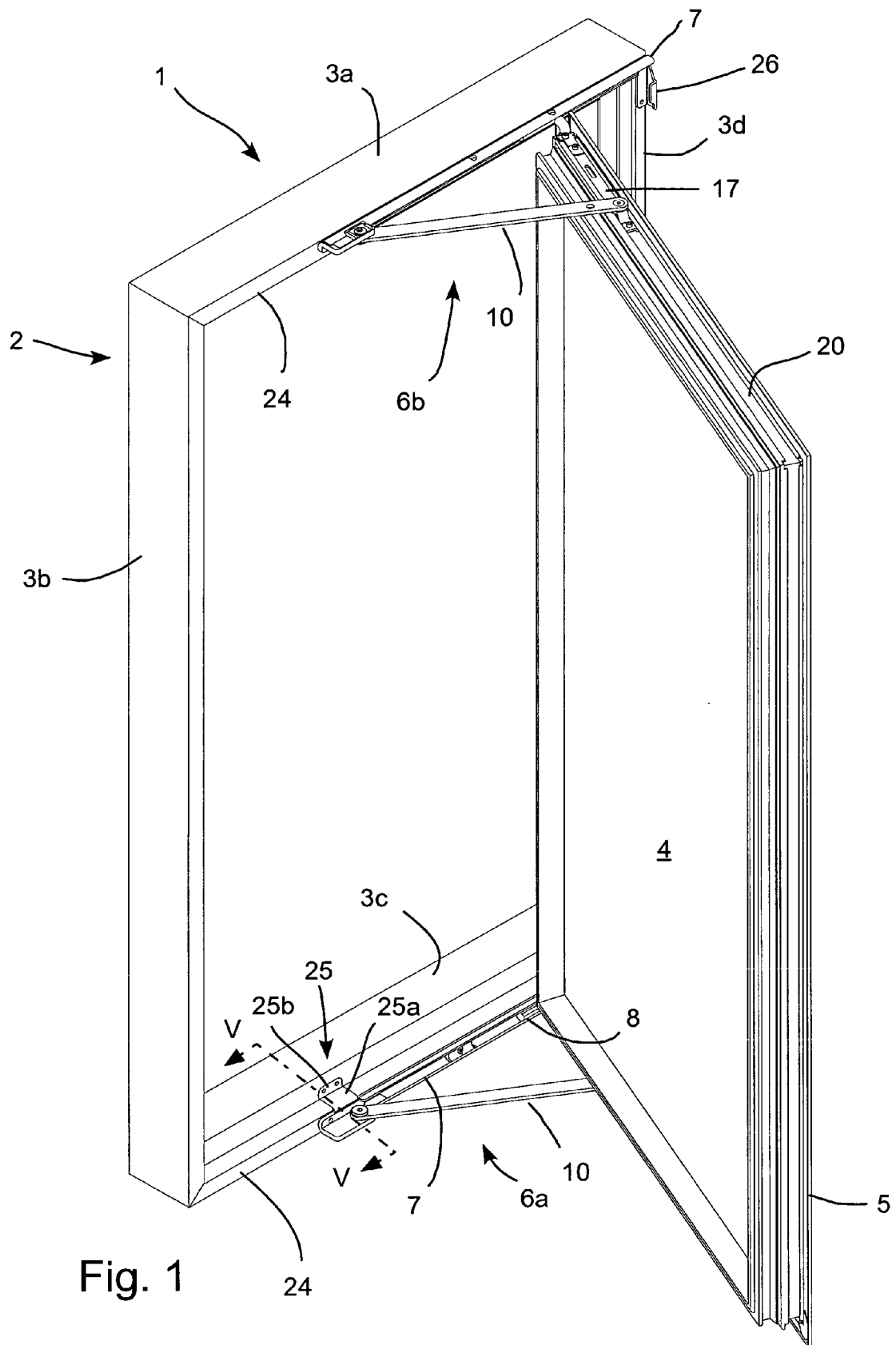
13. A hinge and track assembly (6) according to claim 12, **characterized in that** said hinge and track assembly further comprises a control arm (10), one end (14) of which is pivotably connected to the wing frame (2) via a first connection (18) and the other end (16) of which is pivotably connected to the wing (5) via a second connection (19).

14. A hinge and track assembly (6) according to claim 11 or 12,
characterized in that the slider block (13) is injection moulded around at least a part of the first section (8a) of the connector (8).

15. A hinge and track assembly (6) according to claim 12, 13, or 14
characterized in that the first section (8a) and the second section (8b) of the connector (8) are both sections of a single bent metal rod.

16. A wing construction (1), such as a door or window construction, comprising:

- an essentially rectangular wing frame (2) comprising four frame members (3a,3b,3c,3d) forming the sides of the frame,
 - a wing element (4,5),
 - a first hinge and track assembly (6a) according to any one of claims 1-15 connecting a first frame member (3c) with a first edge profile (5) of the wing element, and
 - a second hinge and track assembly (6b) according to any one of claims 1-15 connecting a second frame member (3a) and a second edge profile (5) of the wing element, said second frame (3a) member being parallel to said first frame member (3c).
17. A wing construction (1) according to claim 16, **characterized in that** said first (3c) and second frame members (3a) have a cross section comprising a protrusion (24) which protrudes essentially perpendicular to the plane of the wing frame (2) and towards the wing element (4,5) and where the track (7) is mounted to the protrusion (24) on a face which is essentially parallel to the plane of the frame (2) and which is closest to the wing (5).
18. A wing construction (1) according to claim 17, **characterized in that** the tracks (7) of the first and second hinge and track assemblies (6a,6b) further comprise at least one flange (25) which extends in a direction away from the wing (5) and permits the track (7) to be attached to a part of the frame (2) which does not form a part of the protrusion (24).
19. A wing construction (1) according to claim 16, 17 or 18, **characterized in that** one end (26) of at least one of the tracks (7) of the first and second hinge and track assemblies (6a, 6b) is located at a location of the frame (2) where two frame members (3c, 3d) meet and that said track (7) is connected to both frame members (3c, 3d).
20. A connection element (9) detachably fastened to a groove (28) on one edge profile (5) of a wing, said connection element (9) comprising a main body (29) and a sliding element (30), said sliding element (30) being displaceable along an axis which lies on a plane which is parallel to the width of the groove (28) and which is arranged at an angle to the centre axis of the groove (28) **characterized in that** said connection element (9) further comprises adjustment means (31) to adjust the displacement of the sliding element (30) with respect to the main body (29) of the connection element (9).
21. A connection element (9) according to claim 20, **characterized in that** the adjustment means (31) is a screw (31) arranged between the main body (29)
- of the connection element (9) and the sliding element (30).



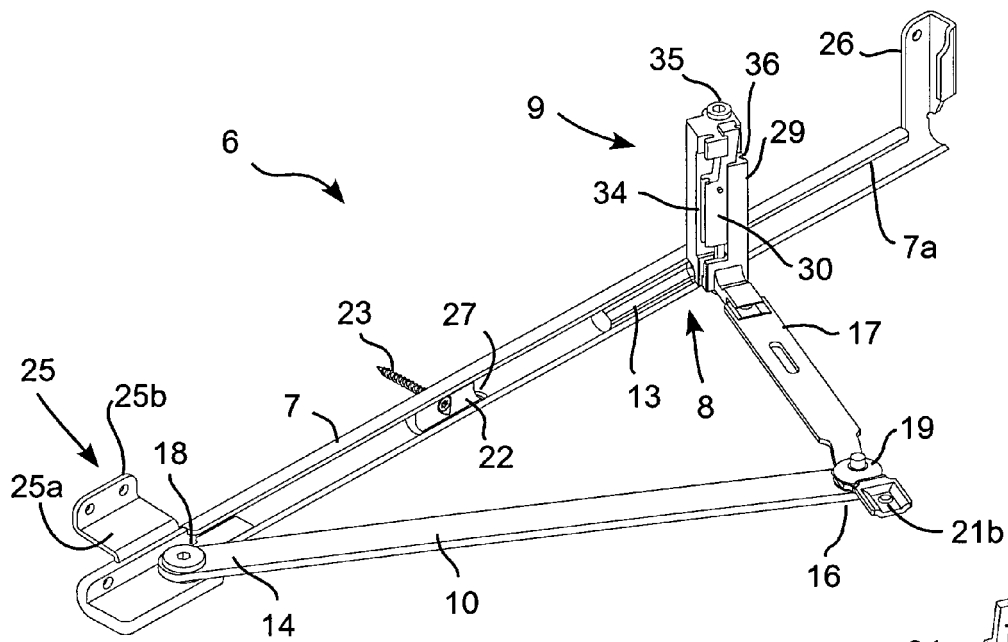


Fig. 2

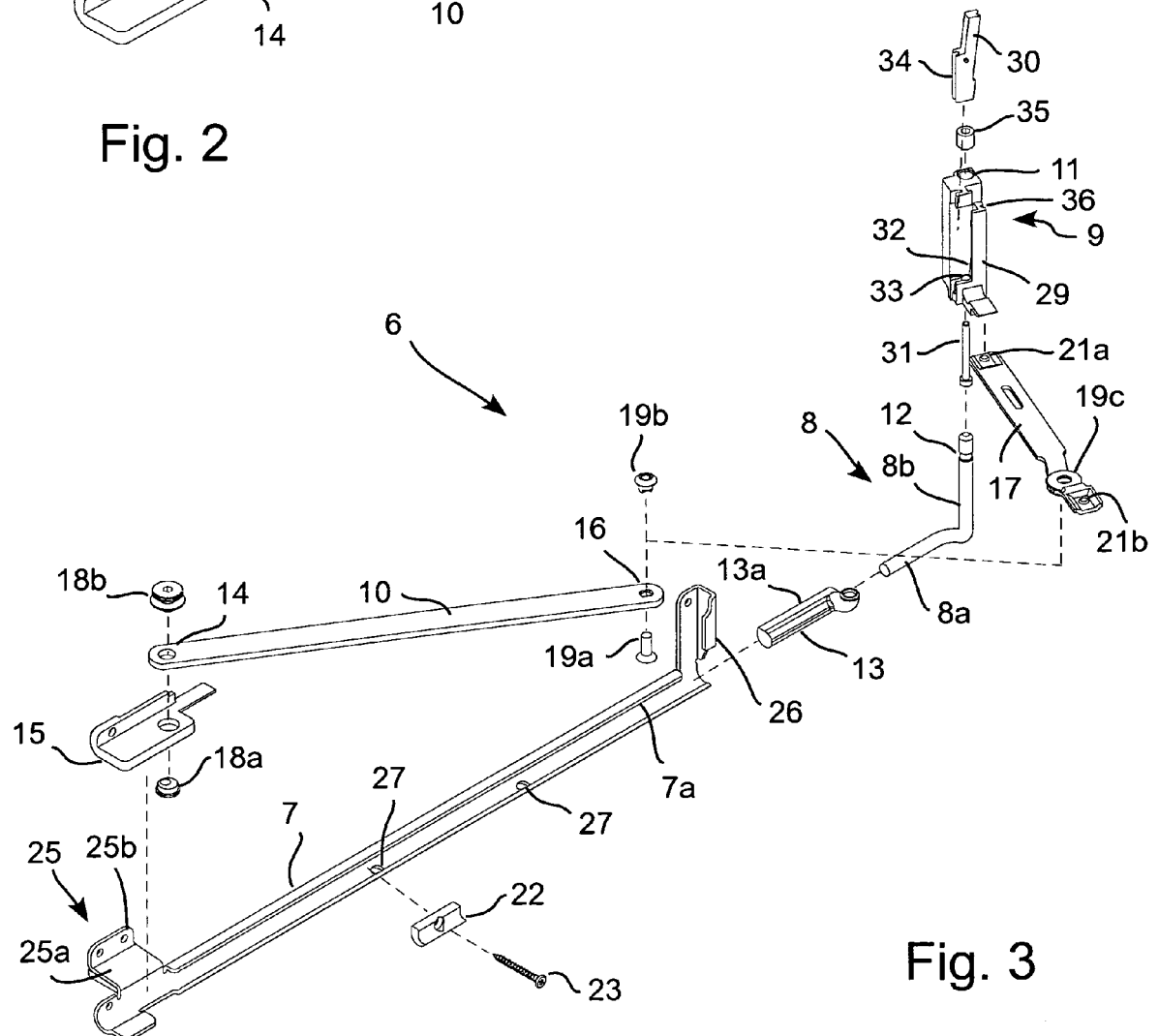


Fig. 3

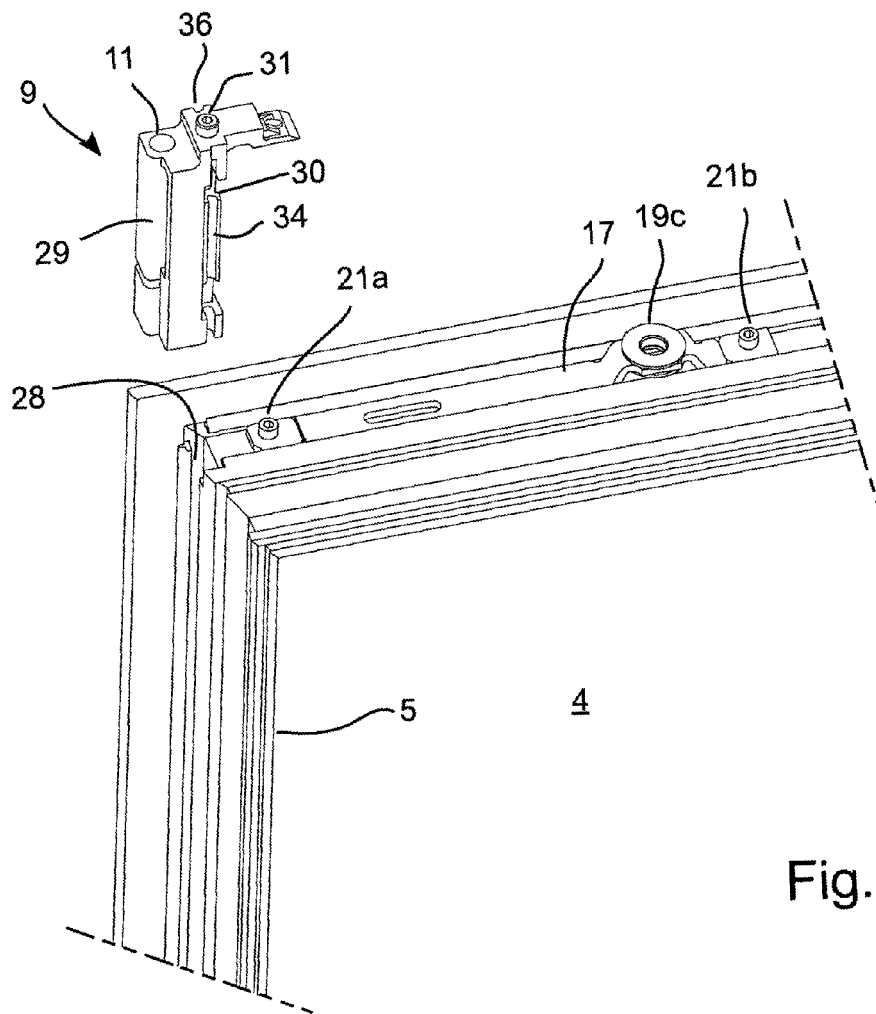


Fig. 4

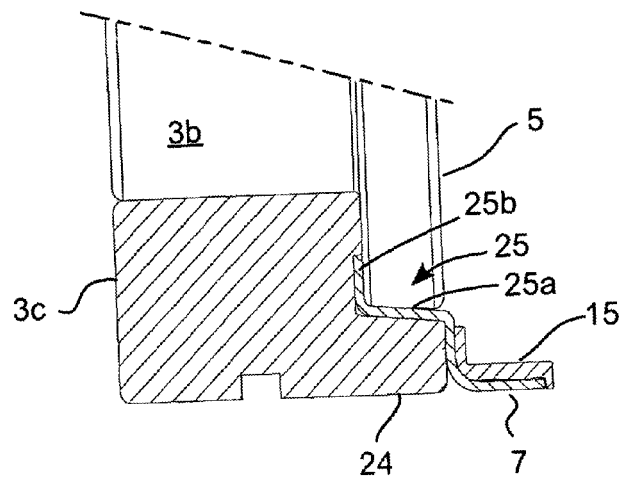


Fig. 5

REFERENCES CITED IN THE DESCRIPTION

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