

"PROCESS FOR THE INSTALLATION OF CURTAIN WALLS AND
WALL ELEMENTS ESPECIALLY FOR THE EXECUTION OF THE PROCESS"

This invention relates to a process for the
5 installation of a curtain wall of a building which
comprises posts and tie bars, and to wall elements
especially for the execution of the process.

In principle two different processes are known
for the erection of a facade of curtain walls. In one mode
10 of construction the entire curtain wall consists of
individual wall elements which span the height of one or
more storeys of the building. These wall elements are
self-supporting and are fastened, for example, to the
floor/ceilings of the building. The installation of the
15 wall elements on the building takes place with the aid of a
cable winch or a crane which hoists the wall elements on
the outside of the building from ground level. This work
is time consuming and both the wall elements to be
installed and also the wall elements already installed may
20 be damaged during the assembling of the facade. The
hoisting of the wall elements, therefore, can be carried
out only very slowly, and because of their relatively large
area the elements are susceptible to wind forces.
Furthermore, this mode of construction involves additional
25 expenditure as it is necessary to establish joint closure,

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between the individual wall elements, at the building site. Because of this the use of ever wider post elevations has come about, for example a minimum width of 100 to 120 mm, which is often undesirable for aesthetic reasons.

5 However, the foregoing mode of construction using wall elements is that a not inconsiderable part of the working operations can be carried out in a base workshop, rather than on the building site, this including the installation of railing elements and glass panes.

10 In the other known mode of construction, the posts and tie bars to carry the glazing and the facade panels are delivered to the construction site as individual components and there assembled on the exterior of the building to form a facade skeleton. The fitting of the
15 skeleton with railing elements and glass panes then takes place from outside the building, and again strip and sealing profiles have to be applied, mostly with the aid of a scaffold or a gondola that is arranged to move in all directions on the outside of the building. Under like
20 conditions the aluminium weight of the facade erected in this manner from individual posts and tie bars is greater than that of a similar facade erected in the element construction mode.

 An advantage of the latter mode of installation,
25 using individual posts and tie bars, is that the real working time, and in particular the preparation time in the workshop, is less than is the case with the element

construction mode. Furthermore, it also provides the possibility of employing cross bars with narrower face views.

Underlying the invention is the problem of
5 devising a process with which the curtain wall of a building can be erected in the shortest possible time and in which the danger of damage to the curtain wall or its elements, or of injury to the workers engaged in the installation, is virtually excluded. That is, to combine
10 the advantages of the two known modes of construction with, so far as possible, a substantial avoidance of the relative disadvantages thereof which have been referred to.

The solution of this problem is characterized, according to the invention, in that a number of posts and
15 tie bars are pre-assembled on an auxiliary frame into a wall element, that the wall element is transported on the auxiliary frame to its place of installation, that the wall element is fastened to the building at the place of installation in such manner that the cohesion of the posts
20 and tie bars is assured, and that the frame is removed from the wall element and transported away from the wall element.

In the process of the invention there are combined the advantages of a post and tie bar construction
25 with the advantages of an element construction mode. The posts and tie bars can be delivered, already in their corresponding length dimensions, while work is still

proceeding on the basic building frame. The time-consuming and not unhazardous assembling of posts and tie bars on the outside of the building is eliminated, as the posts and tie bars are pre-assembled on the auxiliary frame which, in the first place, can be done more rapidly and, in the second place, can take place on a secure working surface without danger to the assembler.

For securing of the pre-assembled wall element unit so that it cannot fall apart during transport to its place of installation, it is preferred that only the posts are detachably secured to the auxiliary frame. For this there can be provided variously formed arresting means on the auxiliary frame, with the aid of which the posts can be screwed to or clamped on the frame.

In contrast to the pure post and tie bar mode of construction, when first the skeleton of posts and tie bars is hoisted on to the exterior of the building and then the glazing and the facade panels are fitted, it is now preferred that the glazing and the facade panels, or the like, should be pre-assembled on the auxiliary frame.

In order to shorten the assembling time and to keep low the risks, which would arise from the lengthy transport distances of pre-assembled curtain elements from the ground to their place of destination, the curtain wall parts such as posts, tie bars, glazing and panels may be stored on selected floors of the building, on which floors the pre-assembling on the auxiliary frame also takes place.

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The pre-assembling is preferably carried out on an assembling stand from which, as a further development of the invention, the pre-assembled wall elements can be transported by a cart to a zone immediately outside the building and close to their place of installation. From there the wall elements are preferably transported to the place of installation using a hoisting apparatus provided at the outside of the building. For such transport the wall element may be suspended with the auxiliary frame, with the latter directly suspended from the hoisting apparatus. Thus the posts and tie bars are only lightly loaded during transport, so that the fastening of the wall element to the auxiliary frame can be relatively simple. A transport eye may be provided on the auxiliary frame, by which the wall element is suspended (through the auxiliary frame) on the hoisting apparatus outside the building.

Each wall element to be applied to the exterior of the building by the process of the invention may comprise two or more posts and at least two, preferably three, tie bars joining the posts with one another. The number of posts is chosen dependent on the size of the glazing and panel areas and up to, say, five posts may be used with middle or intermediate posts presenting a closed profile and the two outer border posts presenting an open profile.

The connection of the tie bars to the posts can be achieved by slipping them on to pins provided on the



posts. These pins can be screwed to the posts or welded thereto, or they can be formed integrally with the posts. In order to accommodate longitudinal expansion of the tie bars, they preferably have a length somewhat shorter than the clear spacing between the posts.

In order to make it possible in each case to join two border posts each presenting an open profile to form a post of closed profile, the posts may be constructed with groove and tongue formations which engage one within the other.

Additionally, the border posts can be formed to present shanks the positioning of which is staggered, so that after their joining these shanks are seated on one another without play. The joining of the open profiles of the border posts can be achieved by means of screw bolts. For the reception of sealing strips and spacing strips the posts may be provided, for example, with dovetail-shaped grooves into which dovetail tongues provided on the sealing strips and spacing strips can be thrust. These sealing strips and spacing strips serve for the seating of the glazing or the facade panels to be installed between the posts and tie bars. The panels may be executed, for example, as a sandwich construction which may consist of a glass plate and a metal wall between which an insulating material is provided. It is also possible to construct the panels with a metal plate on both sides, for example of aluminium or stainless steel.

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For simple fastening of the facade panels and the glazing, the posts may present recesses on their outer side corners, to which the glazing and panels can be fastened seated in the recesses. The glazing and the panels may be clamped to the posts by means of yoke-like clamping strips. Cover strips may be provided for clamping to the yoke-like clamping strips to protect screw connections and the sealing strips from the rain and the effects of weathering generally.

10 The posts of individual wall elements can be joined one to the other by means of fitting pieces, or they may be aligned without providing direct connecting means. In order to accommodate lengthwise expansion of posts which are aligned, a suitable spacing is left therebetween, thereby producing a horizontal expansion joint between individual wall elements which are placed one above the other. Towards the outside thereof these horizontally extending expansion joints can be covered by the fitting of a metal plate which presents, for example, the continuation of a wall of a facade panel and establishes somewhat below the joint a bent-off zone capable, throughout a certain range, of compensating for length variations in the posts occurring, for example, through heat expansion.

25 Where rectangular corners or corners that enclose another angle are required in the formation of a facade, according to the particular requirements they may be composed from profiles that can be executed in one or



several parts.

Between the posts of a prefabricated wall element the tie bars may be differently designed according to their position. The tie bars serve to reinforce the facade and to receive glazing and facade panels. In the inner zone of the wall element the tie bars are preferably made in one piece and provided with grooves for the reception of sealing strips and spacing strips, and with screw threads for the reception of screw bolts. The fastening of the glazing and facade panels to the tie bars can be carried out in a similar manner to the fixing to the posts.

The tie bars extending along the upper and lower ends of each wall element are preferably executed in such manner that a tie bar with a closed profile results from the joining of two prefabricated wall elements. For example, the tie bars running along the top of the wall elements may be provided with a tongue while the tie bars running along the bottom of the wall elements present a corresponding groove to receive the tongue of a tie bar of a wall element that has already been mounted on the facade and provides a base or lower element for the wall element to be installed thereabove. In order to achieve a horizontal expansion joint the tongue may be provided with a suitable degree of play in the groove in which it is received. For sealing purposes the groove is preferably provided with a sealing lip. On the outside of a lower tie bar half of a wall element a stop strip is preferably

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arranged which, on emplacement of the wall element, overlies a seating strip present in the wall element installed underneath. A sealing lip may be provided between the seating strip and the stop strip. On the stop
5 strip there can be arranged an upward-opening gutter of U-shaped cross-section which, in the first place, serves for the fastening of the stop strip to the tie bar, and in the second place provides a water drainage gutter for water which might accumulate in the construction. Screw bolts
10 which hold the stop strip on the tie bar are preferably guided in the tie bar and through two openings in the stop strip. This provides that tilting moments arising in the wall element can be caught up and transferred, without it being possible for a deformation of the element parts to
15 set in.

While the tie bars in each case present only a length corresponding to the clear spacing of the posts, the tie bars composed of two tie bar parts of two different adjoining wall elements may be provided with a stop strip
20 which is formed in one piece extending over the entire width of the wall elements.

The wall elements do not in each case necessarily have to be provided with a top and bottom tie bar. Tie bars may also extend between the posts at intermediate
25 positions spaced from the ends of the posts.

For the run-off of the water collected in the U-shaped gutter of the stop strip, selected posts of the

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wall elements may include thereon run-off aprons which conduct this water to the outside of the facade. To this end the aprons may be provided as covers on the upper ends of the selected posts, and may be constructed so as to be

5 substantially Z-shaped in vertical direction and to present a water run-off gutter between raised border zones. The water drainage gutters shaped-on, for example, behind the stop strips may end over the depressed middle region of the

10 apron, so that the water flows from the strips on to the apron and can be led off from there. For the fitting of the aprons to the posts, the latter may have a recess at the top of the outside thereof with the depth of this recess corresponding to about the height of the border zones of the apron.

15 In order to avoid heat bridges and for the absorption of minor movements caused by temperature changes, the screw bolts which hold the stop strips on the tie bars may be sheathed with plastics tubing.

The invention will now be further described with

20 reference to the accompanying drawings which illustrate, by way of example, installation processes for curtain walls and various wall element constructions in accordance with the invention. In the drawings:

Figure 1 shows, in front view, a portion of a curtain

25 wall of a building;

Figure 2 shows a section through several storeys of the building while under construction;

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Figure 3 shows, in front view, a partially assembled curtain wall and a further wall element in process of being installed;

Figures 4 to 8 show schematic representations of
5 various process steps;

Figure 9 shows, in front view, an assembling stand with a pre-assembled wall element thereon;

Figure 10 shows a section through several storeys of a building similar to that illustrated in Figure 2 and
10 showing different apparatus for carrying out a process of the invention; and

Figure 11 shows, in front view, a wall element presented in an intermediate position while in course of installation;

15 Figure 12 shows a section through a middle post of a wall element;

Figure 13 shows a section through a border post of two joined wall elements;

Figure 14 shows a modified form of execution of a post
20 lining analogous to Figure 13;

Figures 15 to 17 show examples of execution of corner posts of a curtain wall;

Figure 18 shows a vertical section through two tie bars with different construction elements;

25 Figure 19 shows a vertical section through a wall element in the region of a tie bar with a horizontal expansion joint;

Figure 20 shows a vertical section through the tie bars of two wall elements placed one upon the other;

Figure 21 shows a modification of the tie bar shown in Figure 20;

5 Figure 22 shows, in perspective, a drainage arrangement in the region of a post; and

Figure 23 shows a section taken along the line XXIII-XXIII of Figure 22.

10 Figure 1 shows, in front view, a portion of a facade of a building, comprising a curtain wall composed of wall elements 10. Each of the wall elements 10 consists of a post and tie bar construction, and they comprise middle posts 12, outer left posts 14, outer right posts 16, middle tie bars 18, upper tie bars 20 and lower tie bars 22. In
15 the example illustrated each wall element has three middle posts 12 and one middle tie bar 18, providing overall dimensions of about 3.0 metres in width and 3.5 metres in height. The wall elements are assembled on an auxiliary frame inside the building, from the posts and tie bars, and
20 thereupon brought to the outside of the building and there fastened in position.

Figure 2 shows a partial cross-section through the building under construction and which is to be provided with a curtain wall, and also shown associated with a floor
25 24 of such building are the devices or apparatus necessary to bring the pre-assembled or prefabricated wall elements to their place of installation. An assembling stand 28 is

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movably arranged on rails 26 on the floor 24, and has a height which permits a convenient assembling procedure.

On its upper side the stand 28 presents longitudinally extending spars 30 transverse to which are support rollers 32. On these rollers 32 there rests an auxiliary frame 34 on which a wall element is to be pre-assembled, immediately prior to its installation. What may be considered as the upper end 36 of the the auxiliary frame 34 is shown to be bent at an angle and provided with a transport eye 38. When a wall element is assembled on the frame 34, the bent end portion 36 is adjacent and projects beyond that end portion of the wall element which is uppermost when installed. At the same time a substantial portion of the longitudinal extent of the wall element, approaching one-half thereof, projects beyond the opposite end portion of the frame.

The assembling stand 28 is positioned relatively close to the side of the building where the wall elements will be installed. Mounted on the floor 24 for movement between the stand 28 and the adjacent side of the building where the curtain wall is to be erected is a cart 40. As shown in Figure 2 there is mounted on the cart 40 a frame 34' corresponding to the frame 34, on the top of which is attached a wall element 10' which has previously been pre-assembled on the stand 28. The height of the cart 40 corresponds to the height of the assembling stand 28.

The upper side of the cart 40 is defined by

longitudinally extending transversely spaced spars which are transversely bridged by support rollers 44. The fact that a frame mounted on the stand 28 is supported on rollers 32 and the upper surface of the car presents
5 rollers 44 at the same height, enables a frame once it has a wall element assembled thereon to be easily and quickly slid from the stand on to the cart. An axle 46 of the cart 40 at the end thereof adjacent the stand 28, in the arrangement shown, is steerable making the cart readily
10 manoeuvrable to the exterior of the building. A safety railing 54 is mounted on the floor 24 adjacent its outermost edge, and a similar railing is provided in connection with and upstanding from each floor of the building adjacent its outermost edge. As will be seen, as
15 the cart 40 is moved from the stand 28 to the outer edge of the floor 24, its wheels 60 on an axle parallel to and spaced outwardly from the axle 46 are located by chocks adjacent the railing 54. At this time the top portion of the cart projects over and beyond the railing 54 which does
20 not have to be removed during the procedure for fastening a wall element.

Included between and hingedly coupled to the spars 42 by transversely disposed arresting/pivot means 48 is a frame 53, which forms the portion of the top of the
25 cart 40 outermost from that end which positions adjacent the stand 28 to receive thereon a frame bearing a wall element 10 or 10'. When a frame 34 mounting an assembled

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wall element is slid from the stand 28 on to the top of the cart 40, it will then be moved on to the frame 53 and temporarily secured thereto by releasable clamping means located in the vicinity of the pivot means 48.

5 A piston-cylinder unit 50,52 is pivotally connected at one end to a portion of the chassis of the cart 40 at a location in underlying spaced relation to its top portion 42,44 to have the piston 52 which projects from its opposite end pivotally connected to the frame 53 at a
10 location spaced from the pivot means 48, in the direction of the end of the top portion of the cart which first receives thereon a frame bearing an assembled wall element. When the cart 40 is moved outwardly on the floor 24 to the position where its wheels are chocked as previously
15 described, the piston-cylinder unit 50 will be energized to pivot the frame 53 to a vertical position spaced immediately outward from the outer edge of the floor 24 and the safety railing 54 and clear thereof. At the same time, as will be obvious, the frame 34' and the wall element 10'
20 will be orientated to be generally perpendicular to the floor 24 and substantially parallel to the adjacent side of the building on which the wall element is to be installed.

 On the ceiling 56, i.e. on the floor of the storey above, there is arranged a monorail hoist trolley
25 58. This trolley is movable on a track perpendicularly to the plane of the drawing. When the facade element 10' on the cart 40 has been swung into the vertical position, as

described above, a suspension hook 62 of the monorail trolley 58 is engaged in the transport eye 38'. The clamping means at the pivot means 48 is now released and the element 10' with its auxiliary frame 34' is easily pushed outwards and transported laterally to the installation region. At that region the guidance of the wall element 10' can be taken over by the construction workers inside the railing.

In Figure 3 there is shown a partial front view of a building to which wall elements 10 have already been applied with a wall element 10' which is suspended from the trolley 58 and, for example, is transported to the left and downwards until it occupies its correct position in engagement with the adjacent or underlying wall element 10. In broken lines in this figure there are shown a spar 64 and struts 66 of the auxiliary frame 34'. On the spar 64 and its lower spar (not visible) there are fastened only the posts 12, 14 and 16 of the wall element. The tie bars are not fixed by screws to the auxiliary frame, since they are gripped by the posts and their position is stable.

Figure 4 shows a section through the building which is analogous to Figure 2 and illustrates the wall element 10' which, with the aid of the hoist trolley 58, is transported in both horizontal and vertical directions. The wall element 10' is still fastened to the auxiliary frame 34.

The intermediate position of wall element 10',

which corresponds to that of Figure 4, is shown to a larger scale in Figure 5. Figure 6 shows the wall element 10', the posts of which have been fastened to the floor/ceiling 68. The auxiliary frame 34' is still connected with the posts of the wall element 10'.

Figure 7 shows the wall element 10' fastened to the floor/ceiling 68, with the auxiliary frame 34' released from the element 10'. The auxiliary frame can now be hoisted by the trolley 58 up to the storey on which the swing cart 40 is present. There, the auxiliary frame 34' suspended from the trolley 58 can again be arrested on the rear end of the cart 40 and by contraction of the piston-cylinder unit 50 can be brought on to the upper side of the swing cart 40 in the horizontal position. After release of the clamping means of the arresting/pivot means 48, the auxiliary frame 34' can be slid on the cart 40 and rolled therefrom on to the assembling stand 28. The auxiliary frame 34 can now again be provided with posts, tie bars, glazing and facade panels for assembly of another prefabricated wall element.

Figure 9 shows, in front view, an assembling stand 28 on which rests an auxiliary frame 70. Middle posts 12, as well as an outer left post 14 and an outer right post 16, are joined with the auxiliary frame 70, for example by screws. The middle posts 12 present a closed profile in cross-section, while the outer posts 14 and 16 have in cross-section an open profile. The posts 14 and 16 are so shaped in cross-section that an outer post part 14

of one element when joined with an outer post part 16 of an adjoining element yields a composite post structure with a closed profile 72. Between each two adjacent middle posts there are provided tie bars 18, 20 and 22, the lower tie bars 22 being visible in Figure 9.

Figure 10 shows in vertical section a building with floor/ceilings 74, 76, 78 and 80. On the floor/ceiling 76 there are stored posts, tie bars, glazing, facade panels and sealing means of a curtain wall of a building facade, which components are pre-assembled on a frame into prefabricated wall elements. On the floor/ceiling 76 there can be seen a transport car 82, with the aid of which the pre-assembled wall elements are conveyed in front of the exterior of the building, where they can be suspended from a hoist trolley 84 by which they are transported to their installation positions.

The intermediately stored individual parts are assembled on an auxiliary frame 86 into a wall element 88. There likewise, as in the process already described, only the vertical posts of the wall elements are attached by screws to the auxiliary frame. On the auxiliary frame 86 there is arranged, in the region of the centre of gravity of the wall element 88, a ball turntable 90 with an eccentric suspension capability.

The transport car 82 comprises a steerable chassis 92, wheels 94, a column 96 mounted on the chassis and a boom arm 98 which can swing on the column 96. The



vertical swinging movement of the boom arm 98 takes place above a supporting hydraulic piston-cylinder unit 100 by which it is controlled. On the free end of the boom arm 98 is a device to which the auxiliary frame 86 is fastened, through a plate 102 provided on the ball turntable, to the transport car 82. Swinging movement of the plate 102 is produced by a piston-cylinder unit 104 which articulates in the end portion of the boom arm 98.

For pre-assembling of a wall element 88 the auxiliary frame 86 is used, and on this frame the wall element is put together with its longitudinal posts attached by screws to transverse spars of the frame 86. The larger dimension of the wall element in this position runs parallel to the outside of the building. After the pre-assembly of the wall element it is turned by means of a turning device through 180°, so that the auxiliary frame is on top and the ball turntable 90 with the plate 102 can be joined to the boom arm 98 of the transport car 82.

So that the wall element can be guided between the floor/ceilings 74 and 76 over the safety railing 106 fixed at the outer edge of the floor/ceiling 76, the piston of the piston-cylinder unit 104 is drawn into its cylinder until the wall element 88 lies nearly horizontal. In this position the transport car 82 travels towards the outside of the building, whereby the wall element 88 is carried outwards over the railing so that it can be swung into the vertical by means of the hydraulic piston-cylinder unit.

104. The element is now rotated by hand on the ball
turntable 90 through 90°, so that the posts of the wall
element 88 assume a vertical position. In this position
the element 88 on the auxiliary frame 86 can be suspended
5 from the overhanging hoist trolley 84. The boom 98 and the
swinging piston-cylinder unit 104 are then released from
the plate 102 of the turntable 90 and the transport car is
reversed. The wall element 88 now hangs on the auxiliary
frame 86 suspended from the monorail trolley 84 and can be
10 guided by hand to its place of installation, for example on
the floor/ceiling 78 above an already fastened wall element
108.

After installation of the wall element 88 on its
fastenings, the auxiliary frame 86 is released from the
15 posts of the element 88 and brought back along the track of
the trolley 84 to the transport car 82. There, the
auxiliary frame 86 is again received by the transport car
82 in order to recommence the assembly cycle.

Figure 11 shows, in front view, a building with
20 wall elements 108 already installed and a wall element 88
which is still connected with the transport vehicle 82 by
way of the turntable 90 through its auxiliary frame 86.
The wall element 88 is in process of being rotated
precisely through 90°, in order to be positioned so that it
25 can be suspended from the trolley 84 and released from the
transport car 82, when it can be transported to its place
of installation.

Figure 12 shows a horizontal section through a middle post 12, which in cross-section presents a closed profile. On its outward-facing side the post is stepped to provide corner recesses, in which on one side plates of a Thermopane^{R.T.M.}/glazing 110 are seated and fastened the and, on the other side, a facade panel 112. The post 12 is made, for example, of aluminium and presents lateral pins 114 on to which are slipped the ends of tie bars 18. These pins 114 are preferably also made of aluminium and integrally joined with the post 12. On the outwardly-facing steps the post is provided with dovetail-shaped grooves 116, into which dovetail-shaped tongues formed on sealing strips 118 are thrust. The glazing 110 and the panel 112 are clamped to the post 12 by means of a yoke-like strip 120 which is provided with shanks on which sealing strips 122 are mounted. The securing of the strip 120 to the post 12 is achieved by means of screws 124. The strip 120 is covered and concealed by a cover strip 126 of triangular cross-section, the free shanks 128 of which snap into grooves formed in the strip 120. The panel 112 shown in Figure 12 is formed of a glass plate 130 disposed on the exterior of the building and of an aluminium wall 132 disposed on the interior of the building, between which an insulating material 134 is present.

Figure 13 shows a horizontal section through an assembled post, which consists of a left post part 14 and a right post part 16. On the post part 14 there is

shown a pin 138, on to which is slipped the end of a cross tie 18. The post part 14 is constructed on the inner side with a groove 140, which is engaged by a tongue 142 formed on the post part 16. On the outer side the post part 14 presents a shank 144, which grips over a shank 146 of the post part 16. A screw bolt 148 passes through the shanks 144, 146 and the groove 140 into the tongue 142, which ensures the cohesion of the post parts 14 and 16. On the outer side the post parts 14 and 16 are provided with recesses similarly to the posts 12, in which the glazing and the panels of the facade again seat. The glazing and panels are held on the post by means of strips 152 provided with sealing strips 150. A vertical cover strip 156 clamped between the horizontal cover strips 154 protects the post construction against rain and other weather conditions.

Figure 14 shows a modified form of execution of a cover strip 158, which is constructed integrally with a clamping strip 162 provided with sealing strips 160.

Figures 15, 16 and 17 show various embodiments of facade posts. Figure 15 shows an outer corner post 164, which comprises three corner shanks 166, 168 and 170, which are in each case screwed together in pairs. A glazing 172 and a facade panel 174 are fastened to the corner post 164 by means of yoke-like strips 176 and 178, to which there are clamped cover strips 180.

Figure 16 shows an inner corner post 182 which

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is constructed of two post parts 184 and 186 which each present a closed profile in cross-section. The angular recess formed between the post parts 184 and 186 is filled by a part 188 to provide an overall closed profile. On the post part 186 there can be seen a pin 190 on to which the end of a tie bar 192 is slipped, an expansion joint gap being left between the end of the tie bar and the wall of the post part 186. On the post part 186 there is seated a glazing 194 and, on the post part 184, a panel 196 which are both pressed by a common strip 198 on to the post parts 184 and 186, respectively. Sealing strips 200 are provided between the glazing 194 and the post part 186, between the strip 198 and the glazing 194, between the panel 196 and the post part 184, and between the strip 198 and the panel 196. A cover strip 202 is clamped on to the strip 198.

Figure 17 shows a post 204 which is provided on a corner of the building at which the facade parts thereof meet at an obtuse angle. The post 204 consists of two parts 206 and 208 which are joined to one another by means of screw bolts 210. On the post parts 206 and 208 there are moulded pins 212 and 214, on to which are respectively slipped the ends of tie bars 216 and 218. On the outward-facing side of the post 204 insulating plates 224 and 226 are fastened by means of strips 220 and 222. The strips 220 and 222 are provided with cover strips 228. Within the post 204 there are mounted appropriately profiled rails 230 and 232, interconnecting the shanks of

the post parts 206 and 208 to which they are fixed by screws 210. Between the insulating plates 224,226 and the post parts 206,208, and the strips 220,222 respectively, sealing strips 234 are provided.

5 Figure 18 shows a vertical section of a wall element including two differently constructed tie bars 236 and 238. The tie bar 236 presents an axially symmetrical profile and is provided on its front or outermost side with corner recesses, in which seat a glazing 240 and a facade
10 panel 242. Securing of the glazing and of the facade panel is achieved by a strip 244 which is attached by a screw 246 to the tie bar 236. Sealing strips 248 on the sides of the post and sealing strips 250 on the strip 244 seal the
15 building to the outside. The sealing strips 248 are provided with dovetail-shaped tongues which engage into dovetail-shaped grooves on the post. The sealing strips
20 250 and the strip 244 have interlocking grooved formations. A cover strip 252 is elastically snapped into position in grooves on the strip 244.

20 The tie bar 238 presents in cross-section a square form and is constructed with a flange 254 on its outward-facing side. This flange serves as as top for the facade panel 242. Under the tie bar 238 there is arranged
25 a differently formed facade element 256, which comprises an outer metal plate 258 and an inner metal plate 260. The outer metal plate 258 is spaced from the tie bar 238 by a plastics spacer 262. The facade panel 242 and the facade

element 256 are held on the tie bar 238 by a strip 264. This strip is formed on the side facing the post with a shank 266 of L-shaped cross-section the portion of which parallel to the strip 264 serves as a counter-support for
5 screws 268 that engage in a female screw thread formed in the tie bar 238. So that the heads of the screws 268 are accessible, passage holes 268' are formed in the strip 264. A cover strip 270 of approximately triangular cross-section is resiliently engaged in side grooves in the strip 264.
10 On the inside the wall 260 of the facade element 256 is bent over at a right angle and provided with a sealing strip 272, which bears against the inside surface of the tie bar 238.

Figure 19 shows a vertical section through a tie
15 bar 274 in the zone of which a horizontal expansion joint 276 is formed on a related post. On the inward-facing side the tie bar 274 is formed with a gutter 278, which is U-shaped in cross-section and in which is received the wall of a facade panel 282. The end of that wall is provided
20 with a sealing strip 284 and a screw 286 with the aid of which the frictional engagement of the end 280 within the gutter 278 can be adjusted.

On the outward-facing side the tie bar 274 is constructed with grooves 288, in which are received the
25 ends of plastics spacer bodies 290. At their other ends the spacer bodies 290 are received in grooves of a strip 292, which is F-shaped in cross-section and which presses a

glazing 294 through a sealing strip 296 against a sealing strip 298 provided in the tie bar 274. The facade panel 282 is provided on its under-side with a bottom plate 300, which is connected to the inside of the panel and the tie bar 274, the spacer 290 and the strip 292. The front or outer wall of the facade panel is formed with a generally triangular cross-section in the region of the tie bar, with an end shank 304 which points upwards and which is clamped between the strip 292 and a downward-pointing end shank 306 of the bottom plate 300. Between the strip 292 and the end shank 304 a sealing band 308 is provided, this band having an approximately circular cross-section.

Figure 20 shows a vertical section through a facade in the region of a tie bar which is composed of an upper tie bar part 310 and a lower tie bar part 312. The upper tie bar part 310 corresponds to the bottom tie bar of a facade element pre-assembled from posts and tie bars, and the lower tie bar part 312 corresponds to the top tie bar of a pre-assembled facade element. On the inward-facing side the tie bar part 310 is constructed with a groove 314 of U-shaped cross-section, and on the outward-facing side it is constructed with a downward-opening gutter 316 of U-shaped cross-section. The horizontally extending shank portion of the gutter 316 serves as a stop for a glazing 318. The glazing 318 is held, gripped between sealing strips 320 and 322, by a stop strip 324 fixed by screws on the tie bar 310. An upward-opening gutter 326 is formed on

the inside of the stop strip 324. A screw 328 passes from the outside through the stop strip 324, through the downward-facing side shank portion of the gutter 316, and through the upward-facing side shank portion of the gutter 326 into the tie bar 310. This form of fastening ensures that the screw is supported along its length and in the event of a slight tilting of the wall element thereabove cannot be bent.

The long downward-facing shank portion of the stop strip 324 is constructed so as to extend below the under-edge of the tie bar 312. The tie bar 312 presents on its upper side a shank 330 which carries in a groove at its end a sealing strip 332, and it is constructed of such length that it extends into the downward-opening groove 314 of the tie bar 310. On the outside the tie bar 312 is provided with grooves in which run the adjacent ends of two plastics spacer bodies 334. The other ends of the spacer bodies 334 are received in grooves of an abutting strip 336. A glazing 338 is provided between the outside of the tie bar 312 and the abutting strip 336, in this arrangement the glazing being disposed between a sealing strip 340 on the adjacent side of the tie bar and a sealing strip 342 on the adjacent side of the strip 336. On the outer side of the abutting strip 336 a sealing strip 344 is arranged in a groove, with a sealing lip which seals against the inside of the stop strip 324.

The upwardly-open gutter 326 of U-shaped

cross-section which is formed on the inside of the stop strip 324 serves the purpose of leading off water from the inside to the outside of the facade structure. This water may be the result of condensation or be water which has penetrated from the outside. Aprons provided on the border posts of the pre-assembled wall elements serve for drainage of the water from the gutter.

Figure 21 shows a basically similar but somewhat different form of execution of an upper tie bar part 346, the vertical dimension of which is greater than that of the tie bar 310 just described. Correspondingly, the stop strip 348 is of greater heightwise extent. The greater vertical extent of the tie bar part 346 yields the advantage that a screw 350 in the zone of the shanks 352 and 354 of the gutters which are moulded, respectively, on the tie bar 346 and the stop strip 348 can be provided with a plastics sleeve 356. The downward-facing shank of the stop strip 348 is tapered at its lower end and presents a short upwardly-bent shank portion which forms, with the front wall thereof, a gutter 360. A lower tie bar part 362 with the abutting strip 364 mounted on it is constructed similarly to the corresponding part 312 of Figure 20.

Figure 22 shows a perspective view of the upper end of a post 366 which is formed with a front recess 368. A water run-off apron 370 provided on the end of the post is formed of two raised border zones 372 and a middle zone 374, and is constructed to be substantially Z-shaped in

longitudinal section. The depth of the border zones 374 is about the same as the depth of the recess 368. Stop strips 376 and 378 run in front of this water run-off apron, and they are formed with run-off gutters 380 and 382 on their rear inner sides, that is the sides directed towards the building. The water run-off gutters end approximately at the edges of the middle zone 374 of the water run-off apron 370. Thus water collecting in and running along the gutters can drip or run off the gutters into the middle of the water run-off apron, from which the water will run outwardly on to the upper outer side of the post 366. The juncture of the two stop strips 376 and 378 can be formed in such a way as to provide a vertical expansion joint at this point.

Figure 23 shows a section through a post 366 in the region of said upper end thereof. The water run-off apron 370 forms, including its middle shank portion, a covering for the post and its outer or front vertical shank portion serves for the drainage of the water as described. Above the post 366 there is shown another post 384, which is suspended on a floor deck 386. The posts 366 and 386 are not firmly joined one with the other, so that there is obtained therebetween a horizontal expansion joint.



CLAIMS:

1. A process for the installation of a curtain wall of a building, comprising posts and tie bars, wherein a number of posts and tie bars are pre-assembled on an auxiliary frame into a wall element, the wall element is transported on the auxiliary frame to its place of installation, the wall element is fastened to the building at the installation place in such a way that the cohesion of the posts and tie bars is assured, and the auxiliary frame is detached from the wall element and transported away from the wall element.
2. A process according to claim 1, wherein only the posts of the wall element are detachably secured to the auxiliary frame.
3. A process according to claim 1 or 2, wherein in addition to the posts and the tie bars also facade panels, glazing and the like are pre-assembled on the auxiliary frame.
4. A process according to any one of claims 1 to 3, wherein the individual component parts of the curtain wall (posts, tie bars, glazing and panels) are stored on certain floors of the building and the pre-assembling on the auxiliary frames is carried out on these floors.



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5. A process according to any one of claims 1 to 4, wherein the pre-assembled wall elements are finally transported to the place of installation by a hoisting apparatus provided in the region of the outside of the building.
6. A process according to claim 5, wherein for transport the wall element is suspended on the hoisting apparatus together with the auxiliary frame.
7. A process according to claim 5 or claim 6, wherein the wall elements are transported by a cart from the assembling stand to the place of suspension on the hoisting apparatus.
8. A process according to claim 7, wherein the wall element is suspended on the hoisting apparatus outside the building.
9. A process according to any one of claims 1 to 8, wherein the wall elements are pre-assembled on an assembling stand.
10. A wall element when used in a process according to claim 1, wherein at least two posts forming outer border posts are provided which are interconnected by at least two tie bars.



11. A wall element according to claim 10, wherein outer border posts and upper and lower tie bars present an open profile, and middle or intermediate posts and middle or intermediate tie bars present a closed profile.

5 12. A wall element according to claim 10 or 11, wherein the tie bars are slipped on to pins provided on the posts.

13. A wall element according to claim 12, wherein the tie bars are shorter by a small amount than the clear
10 spacing between the posts.

14. A wall element according to any one of claims 10 to 13, wherein the outer border posts are formed with groove and tongue formations.

15. A wall element according to any one of claims 10
15 to 14, wherein the outer border posts are formed with staggered shanks.

16. A wall element according to any one of claims 10 to 15, wherein the outer border posts of two adjacent elements are joined by screw bolts.

20 17. A wall element according to any one of claims 10 to 16, wherein the posts are constructed with dovetail-



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shaped grooves for the reception of sealing strips or spacer strips.

18. A wall element according to any one of claims 10 to 17, wherein the posts present corner recesses on their outer sides for the reception of glazing and/or facade panels.

19. A wall element according to claim 18, wherein the glazing and the facade panels are fastened to the posts by yoke-like strips provided with sealing strips.

20. A wall element according to claim 19, wherein cover strips are clampable to the yoke-like strips.

21. A wall element according to any one of claims 10 to 20 in an arrangement with a similar wall element, wherein the posts of the two elements which are arranged one above the other are put together over fitting pieces.

22. A wall element according to any one of claims 10 to 21 in an arrangement of similar wall elements, wherein between such elements arranged one above the other horizontal expansion joints are provided.

23. A wall element according to one or more of claims 10 to 22, wherein the tie bars provided at the top of the wall element present on the inside a longitudinal tongue

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rovided with a sealing lip and present on the outside a support strip provided with a sealing lip, and the tie bars at the bottom of the wall element are constructed on the inside with a longitudinal groove and on the outside with a stop strip.

24. A wall element according to claim 23, wherein the bottom tie bars on a wall element present on the outside a downward-opening U-shaped shank, the stop strips present an upward-opening U-shaped shank and are fastened to the tie bars over screw bolts which are guided through the adjacently extending sides of the U-shaped shanks.

25. A wall element according to claim 24, wherein the stop strip secures a glazing or a facade panel.

26. A wall element according to claim 24 or 25, wherein the stop strip is constructed in one piece between border posts of the wall element.

27. A wall element according to claim 26, wherein the upward-opening U-shaped shank of the stop strip is constructed as a water drainage gutter, and aprons are provided on the border posts for the drainage of water from the stop strip.

28. A wall element according to claim 24, wherein the screw bolts are guided through said shanks in a plastics

sleeve.



29. A wall element according to claim 27, wherein the apron is provided as a cover on the upper end of a post, is constructed in Z-form in vertical direction and presents a water drainage gutter between raised border zones.

30. A wall element according to claim 27 or 29, wherein the water drainage gutters of the stop strip end over a depressed middle zone of the apron...

31. A wall element according to claim 29 or 30, wherein the post presents at the top a recess on the outer side of the post, the depth of which recess about corresponds to the height of the border zones of the apron.

32. A process for the installation of a curtain wall of a building, substantially as herein particularly described with reference to Figures 1 to 9, or Figures 10 and 11, of the accompanying drawings.

33. A wall element when used in a process according to claim 1, constructed and arranged substantially as herein particularly described with reference to any one or more of the accompanying drawings.
