CASING BEAD FOR USE IN A JOINT CONSTRUCTION

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ABSTRACT OF THE DISCLOSURE

A stucco-covered, curtain wall construction employs a joint including an elongate L-shaped casing bead and an elongate generally wing-shaped drainage cap member. The two joint components form a horizontally-disposed, structurally yielding joint between outer covering panel sections. The two joint components provide ventilation and water drainage between the windward and leeward sides of the wall.

BACKGROUND OF THE INVENTION

This invention relates to a water-shedding, expansible joint structure for use in a stucco-covered, curtain type, generally exterior wall. The term "curtain wall" is applied to a type of building construction in which an exterior non-load bearing wall is supported in front of the structural frame like a curtain. More particularly, this invention relates to a casing bead and a drainage cap or flashing in a ventilated curtain wall construction providing water drainage and a degree of equalization of air pressure between the wall cavity and the surrounding atmosphere.

Curtain type, as well as some other exterior panel walls having an exposure to rain driven by winds having a velocity as high as 90 miles per hour in certain areas of the United States, have been vulnerable to admittance of wind-carried water as well as to insufficient drainage of accumulated water from the cavity of the wall, or the interval between the exterior wall and the inner, supporting framing shell of the wall construction.

Oftentimes rain enters into the wall cavity wherever a joint line has not been sealed, or adequately sealed, against ingress of rain. Cracks, poorly designed joint lines or other type of leaky constructions which open to the atmosphere allow for admittance of water, and in many cases such constructions do not provide for drainage of water from the cavity of the wall.

The problem of infiltrated water has become crucial where the exposed wall area is large and vulnerable to rain driven by high velocity winds. The problem often is aggravated in cases where the water entering the wall cavity accumulates to a sufficient degree to cause leakage into the interior of the building with resulting damage. Such damage includes corrosion to metal parts, wetting and compacting of insulation materials and damage to building interiors and furnishings. Also, in some cases water entering the wall cavity does not drain to the exterior of the building, but soaks down through the wall portions causing structural deterioration and discoloration to visible exterior portions of the wall.

Previously, in stucco as well as other types of curtain walls, various attempts have been made to overcome this problem. Such attempts have included high quality workmanship on existing construction, the use of sealants and weepholes, and pressure equalization systems of various types.

In the normal use of the joint components provided by this invention, an elongate wing-shaped drainage cap is horizontally aligned on the exterior of a building frame or shell which may be formed of plaster-board sheathing. The cap has a central, flexible joint portion which serves as a drainage ledge and which is V-shaped in cross section. The central V is integrally formed with opposed coplanar wings, either or both of which may be fastened to the sheathing.

A casing bead of generally L-shaped configuration is set in place with the short leg of the L resting on the upper surface of the cap joint portion. The back of the bead has a plurality of flutes or grooves formed therein and extends above the upper wing of the drainage cap. The bead is secured in place, and stucco or other cementitious material may be formed into a panel over the sheathing on the short leg of the bead which serves as a panel edging and thickness gauge. Preformed panels may also be secured in place on the bead leg. Water formed in or entering into the wall cavity may readily drain to the exterior, through these grooves by gravity, as will hereinafter be explained in detail. Also, water driven into the joint between the cap and bead will be restrained or "baffled" in the restricted groove portions and will not readily pass into the wall cavity behind the panels.

It is an object of this invention, therefore, to provide a simple and inexpensive casing bead and drainage cap joint construction which is adapted to be disposed horizontally at the base of each course of either stucco-covered wall sections or infilled panel sections to prevent entrance into the joint of wind-driven water, while also providing drainage of condensation or other accumulated moisture from the wall cavity to the exterior of the building.

It is another object of this invention to provide a novel joint construction comprising a casing bead and drainage cap which functions to provide partial equalization of air pressure between the wall cavity and the exterior atmosphere. Such equalization eliminates one of the major causes of water infiltration into a wall, that is, a pressure differential between the cavity and the exterior.

Another object of this invention is to provide a casing bead member having water draining grooves or flutes formed in the rear surface thereof and also incorporates therein a screeching lip flange for the gauging of stucco which may be applied thereto.

It is a further object of this invention to provide a casing bead member having a plurality of grooves or flutes of predetermined height so as to provide for the development of hydrostatic pressure by confined water columns. The columns oppose incoming water driven between the joint components by the wind striking the exterior of the casing wall construction; such grooves provide communication from the cavity of the wall to the exterior of the wall.

Another object of this invention is to provide the combination of an elongate casing bead member and an elongate drainage cap member to be installed in relatively movably engaged whereby adjacent sections of the curtain wall which are subjected to thermal or structural stresses may move relatively to each other in the vertical plane, such permissible movement obviating possible damage to the sections of the curtain wall.

It is another object of this invention to provide for novel joint-forming components in a casing wall construction which is adaptable to be erected in either the vertical plane as is normal, or planes inclined to the vertical if so desired.

The above, and other objects of this invention will become more apparent from the following detailed description when read in the light of the accompanying drawings and the appended claims.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary perspective view illustrating a casing bead and drainage cap member illustrated in
assembled relationship with a portion of a stucco panel disposed in normal position on the casing bead; FIG. 2 is a fragmentary exploded view illustrating rear surface portions of a casing bead and drainage cap provided by this invention; FIG. 3 is a fragmentary perspective view illustrating rear surface portions of a casing bead and drainage cap in assembled relationship with a fragment of a stucco panel formed thereon; FIG. 4 is a fragmentary sectional view of the joint components provided by this invention shown in normal assembled relationship in a multi-stored construction; FIG. 5 is a fragmentary perspective view of a modified casing bead provided by this invention; FIG. 6 is a perspective view of a clip member adapted to join drainage cap members together in horizontal alignment; FIG. 7 is a fragmentary sectional view illustrating the manner in which a drainage cap and modified casing bead member may be employed in conjunction with a building support; FIG. 8 is a fragmentary perspective view of a casing bead installed in the foundation region of a building.

DESCRIPTION OF THE INVENTION

Referring now more particularly to FIG. 1, an exterior view is therein depicted of a portion of a curtain wall which is illustrated in the illustrated type of curtain wall construction. The specific dimensions of the panels employed for forming the curtain wall are discretionary with the builder; a typical stucco panel will have dimensions of 4 to 6 feet in height and of 8, 10 or 12 feet in length. Each ledge 16 of each casing bead may have centrals disposed in regular spaced intervals to support the drainage cap. Lateral expansion of panels 14 may be accommodated in the manner described herein.

Inasmuch as a curtain wall by definition comprises a building construction in which exterior panels are non-load bearing but are supported by an inner supporting framework, it will be seen from FIG. 1 that the curtains or stucco sections 14 are disposed as a curtain over the sheathing 20. The specific details of construction of the casing bead 10 and the drainage cap 12 are more apparent from FIG. 2. In FIG. 2 it will be noted from FIG. 2 that the back 18 of each casing bead may have apertures 22 formed therein to facilitate passage of a securing means such as nails 26 illustrated in FIG. 1. The ledge 16 of each casing bead connects the back portion with a terminal flange 28 disposed substantially parallel to the back 18 and extending in the same direction therewith from the intersected ledge 16. Grooves or flutes 30, one of which is illustrated in FIG. 2, are arranged at regular intervals such as 3-inch intervals in the back 18 of the casing bead 10.

In the normal course of erection, the first joint element to be erected is the drainage cap 12. As will be seen from FIG. 2, the cap 12 comprises an upper wing member 32 which is connected to a lower wing member 34 by means of an inflected, V-shaped connecting joint 36. The lower wing 34, while in parallel relationship with the upper wing, need only have a height adequate to facilitate mounting, and may be one-half the height of the upper wing 32. The V-shaped connecting portion of the drainage cap terminates in a dip flange 38. Flange 38 is of U-shaped cross-section configuration and comprises a continuation of an upper slanted web and drainage surface 40 and a lower, substantially horizontally disposed web portion 42. Drainage surface 40 is preferably inclined at an angle of about 15 or 20 degrees to the horizontal. Fastener receiving apertures 44 may be disposed at regular intervals in each of the wing portions 32 and 34 of the drainage cap as is most clearly seen from FIG. 2.

In the course of joint construction, a drainage cap 12 is horizontally aligned and secured in place to a supporting frame member such as the sheathing 20 shown in FIG. 1. The casing bead may be fastened on the upper web 40 of the drainage cap so that the right-angle juncture between the back 18 and the horizontal ledge 16 of the casing bead is nestably received in the juncture between the upper wing 32 and the upper web portion 40 of the drainage cap. The casing bead is disposed horizontally and is fixed by suitable fasteners such as nails or the like to the supporting framework. After the two joint components 10 and 12 are fixedly secured in place, a formable cementitious material such as stucco will be applied over the sheathing so that a sheet 14 will be formed, resting upon ledge 16 of the casing bead as illustrated in FIG. 1.

In order to secure firm engagement between each stucco panel 14 and the opposed sheathing 20, an expanded metal mesh may be secured in place against the sheathing and over back 18 of the casing bead by clip members 48 or large head nails or other equivalent securing means. The expanded metal layer 46 is adapted to function as means for keying the stucco in which the mesh is embedded to the supporting sheathing 20. To further assist in the keying action, the expanded metal sheet 46 may be pressed out of a single plane at regular intervals to further enhance desired engagement with the stucco material or other hardenable material. As will be noted from FIG. 1, the thickness of the finished stucco panel 14 substantially coincides with the width of the ledge 16 of the casing bead. As is seen from the illustrated joint of FIG. 4, the upper edge portion of each stucco panel may be formed between the rear surface 34 of a drainage cap member and the opposed depending flange 38.

The spacing between the supporting ledge 16 of each casing bead and the overlying lower web portion 42 of a drainage cap member determines the height of each stucco panel 14 which is formed in situ and employed in the illustrated type of curtain wall construction. The specific dimensions of the panels employed for forming the curtain wall are discretionary with the builder; a typical stucco panel will have dimensions of 4 to 6 feet in height and of 8, 10 or 12 feet in length. Each ledge 16 of each casing bead may have centrally disposed drainage apertures 50 formed therein at regular spaced intervals to support in the drainage of any water which may seep between the back 18 of the casing bead, the ledge 16 and the stucco panel 14 which is formed thereover (see FIGS. 1 and 3). The terminal flange or lip portion 28 of the casing bead may function as a screeding member, as may the depending flange 38 of an overlying drainage cap. Accordingly, after the formable stucco or other cementitious composition is applied over the back 18 of the casing bead and the overlying surface of the sheathing, a smoothing or leveling instrument may employ the depending and upstanding flange portions as screeds in forming the appropriate thickness of each panel 14.

FIG. 3 illustrates the intended function of the drainage cap member after the same has been erected in place in a curtain wall construction. The upper drainage web 40 of each drainage cap 12 is inclined to the horizontal at a slight angle. This slight angle also functions to space the adjacent horizontal courses of the stucco panels 14. The spacing between the panels is determined by the magnitude of the divergence between the web portions 40 and 42 of each central V-shaped portion 36 of each drainage cap member. Inasmuch as the web portions 40 and 42 of the V-shaped portion 36 may removably move relative to each other, upon the thermal expansion of the cementitious material defining each panel in a curtain wall, the same will be allowed to expand in the vertical direction because of the spring or resiliency in the connecting portion 36. Lateral expansion of panels 14 may be accom-
modulated by vertical framing members well known in the art, such as "I" beams engaging panels between opposed flanges. Such structures are not illustrated and constitute no portion of this invention.

The invention 40 of each drainage cap in conjunction with the underside of each ledge 16 of each casing bead defines an exit way 37 for the vertical grooves 30 formed in the rear surfaces 18 of the casing beads. Assuming that a high velocity wind carrying entrained water is blowing against the exterior cladding panels 14 of the curtain wall construction illustrated, water will be forced into the V-shaped opening and rise in the grooves 30 formed in the back of the casing bead member. The water columns in the grooves 30 will form hydrostatic heads opposing the force of the wind and water blowing into the openings between adjacent, parallel panel sections. The grooves 30 will serve as a means for equalizing the pressure between the atmosphere on the exterior of the stucco panels 14 and the interior cavity of the wall.

The grooves must have an effective cross-sectional area and water drainage. If the cross-sectional area of the groove is too small, inadequate drainage results. If the cross-sectional area is too large, any water in the groove does not maintain a sufficient continuity to provide a hydrostatic head functioning as a floating damper to the wind blowing into the openings between the panel sections.

Also, if the cross-sectional geometry of the grooves 30 possesses constricted portions, surface tension of the water, or even entrained dirt particles, is liable to restrict adequate and desirable flow within the groove. Grooves of generally semicircular configuration having a smooth wall trough in the configuration of a V or an easy swept curve, and having a dimension of at least about $\frac{3}{8}$-inch at the highest gapping have been found practical and desirable. Maximum gappings of about $\frac{1}{4}$-inch are contemplated by this invention. Spacing between the grooves may vary; a simple pattern of uniform spacing on 3-inch centers has been found to be effective and practical.

By way of a specific example, a casing bead of the type shown in the first four views of the drawing may have a lip flange 28 of $\frac{3}{8}$-inch in height, a ledge 16 one inch in width and a back portion 65 inches in height.

Table 1 below indicates preferred relative dimensions between the height of the back portion of a casing bead and the height of the upper wing portion of an underlying drainage cap.

<table>
<thead>
<tr>
<th>Casing bead height, inches:</th>
<th>Wing height, inches:</th>
</tr>
</thead>
<tbody>
<tr>
<td>4%</td>
<td>2%</td>
</tr>
<tr>
<td>5%</td>
<td>3%</td>
</tr>
<tr>
<td>6%</td>
<td>4%</td>
</tr>
<tr>
<td>7%</td>
<td>5%</td>
</tr>
</tbody>
</table>

Utilizing certain data taken from Climatological Data, United States Department of Commerce, Weather Bureau (1961), the following Table 2 indicates the wind velocities and geometry to permit by the casing beads and drainage caps of Table 1, the beads having flutes of substantially uniform cross section.

<table>
<thead>
<tr>
<th>Wind velocity (m.p.h.)</th>
<th>Static pressure (lbs/sq. ft.)</th>
<th>Semidecagon (radius, inch)</th>
<th>Back height, (inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>6</td>
<td>34</td>
<td>54</td>
</tr>
<tr>
<td>60</td>
<td>6</td>
<td>34</td>
<td>54</td>
</tr>
<tr>
<td>75</td>
<td>14</td>
<td>34</td>
<td>64</td>
</tr>
<tr>
<td>90</td>
<td>20.5</td>
<td>34</td>
<td>74</td>
</tr>
</tbody>
</table>

A modified drainage cap construction 10a is illustrated in Fig. 5. Cap 10a has a concavity formed in the rear surface 18a thereof, the rear surface being bent slightly along a middle axis 54. The slight concavity enables a spring action to be effected when the casing bead is secured in place against a supporting, planar sheathing surface. Thus the modified casing bead construction 10a is assured of secure, rattle-free engagement with the underlying sheathing surface or surfaces upon being nailed in place.

Modified casing bead 10a also illustrates grooves 30a which are slightly angled to the vertical so as to provide a more tortuous path for any water which is driven between the casing bead and underlying drainage cap. The groove portion 30a formed in the upper portion of casing bead back 18a in Fig. 5 forms angles when joining the lower groove portions 30a formed in the lower half portion of the back 18a of the casing bead 10a. The concavity illustrated in casing bead 10a may obviously be formed in casing bead 10 without altering the vertical disposition of the grooves 30. Also, the angled grooves 30a may be formed in a casing bead 10 having a planar rear surface portion 18 without a concavity. The depth of the concavity in the modified casing beads is fairly slight, being in the nature of approximately $\frac{1}{4}$-inch at its deepest point.

The casing bead and drainage cap constructions provided by this invention are adaptable to a variety of uses. Thus, the casing bead 10 may be employed by itself as the floor line in a concrete course or slab construction as illustrated in Fig. 8. The casing bead having the cladding panel 14 provides communication between the exterior atmosphere and the cavity of the wall by means of grooves 30, the casing bead 10 being secured directly to the slab 56 by appropriate securing means.

The casing bead and drainage cap may also be employed for purposes of ventilating a soffit construction as illustrated in Fig. 7. A modified casing bead 13 is therein illustrated supported from a roofing deck 58, and in conjunction with the underlying drainage cap, forms a baffle member providing a ventilating opening into the underlying soffit space formed in part by the framing member 60 and soffit board 61.

FIG. 4 is illustrative of the casing bead and drainage cap provided by this invention employed in a multi-storied construction in which spandrel 62, defining the juncture between adjacent floor members, supports a steel shelf angle 66 by means of suitable fasteners, not illustrated. Sheathing 68 is secured to vertical supports 70 which engage runner members 72 at opposed portions; the runners in turn engage the shelf angle. In addition to the illustrated casing bead 10 and drainage cap 12, FIG. 4 also illustrates the utilization of a flashing strip 74 which may be employed for assisting the drainage of water from the cavity of the spandrel 62, the top portion of the building by directing the flow of condensate or other water onto the upper web portion 40 of the illustrated drainage cap 12. The flashing 74 may be a strip of water-resistant tar paper, or even deformable metal which is rust resistant.

FIG. 6 illustrates a splicing clip 76 which may be employed to assure horizontal continuity and closure of drainage caps 12. Clips 76 have a U-shaped clip portion 78 adapted to nestably receive adjacent portions of drip flanges 38 arranged in a horizontal course. In normal use clips 76 are interposed between the casing beads and drainage caps.

It is seen, therefore, that a novel joint construction has been provided which is particularly adapted for use in curtain wall constructions. The novel casing bead and drainage cap effect a number of useful functions and may be employed in a number of useful applications, as is obvious from the above description of the constructions illustrated in the drawings.

The novel curtain wall joints enable water which is forced into the cavity of the wall behind the exterior facing to readily drain therefrom by gravity, and also enables any condensate formed in the wall cavity to drain to the exterior of the wall without causing any damage. The novel venting grooves formed in the rear surface of the casing bead also function as a communi-
cating path enabling pressure to equalize between the exterior and interior cavity of the curtain wall.

Although the foregoing description has been specific with respect to stucco or other cementitious composition which is formed into panels in situ and placed on the described casing bead members, it should be appreciated that the above described joint components may also be employed in conjunction with preformed panel members such as cast cement slabs which may be fitted into place on the ledge of the casing bead and fixed in place by means of grouting which assures the establishment of a continuous seal between the supporting casing bead and the inlaid members forming the panel supported by the casing bead. The provided joint components may, of course, be employed in a variety of structures not defining what is technically a "curtain wall" construction. The materials of composition for the components should be of adequate strength and water resistant to serve the described purposes.

It is apparent from the foregoing description that a number of modifications may be made in the construction above described. This invention is to be limited only by the scope of the appended claims.

I claim:

1. An elongate casing bead having a first back portion, a ledge integrally formed at substantially right angles with said first back portion; a second casing back portion angularly disposed to said first casing back portion along a line of juncture in a direction away from said ledge; said back having continuous grooves extending along the heights of said first and second casing back portions said bead being bendable along said line of juncture whereby said first and second casing back portions may assume a coplanar relationship when the grooved surfaces thereof are urged against a planar surface.

2. The casing bead of claim 1 in which said grooves are of uniform cross section and the groove portions in said first and second back portions are angularly disposed to each other when said back portions assume a coplanar relationship.