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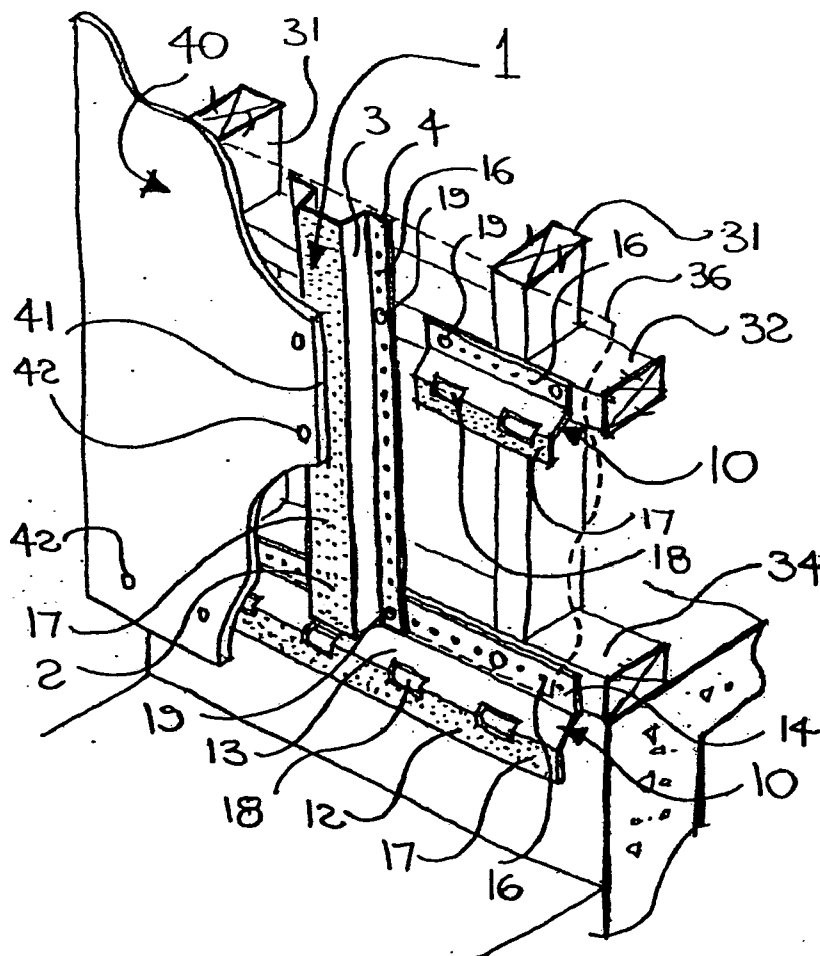
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(76) Inventor: **David Peter Dickinson, Auckland**
(NZ)**Publication Classification**Correspondence Address:
DAVID P DICKINSON
P.O. BOX 38,407 HOWICK
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(57) **ABSTRACT**

A cladding system, intended to exclude water from within a building having a cavity wall structure, includes passive means (a) for minimising any flow of water from the exterior that may reach the interior, and (b) open guides or enclosed channels for diverting such water so that it flows by gravity down the cavity to be drained outwardly. One implementation provides impervious battens modified to have water-diverting sides, and another provides solid slabs including channels connected by drainage cuts along their length to a surface to be drained.



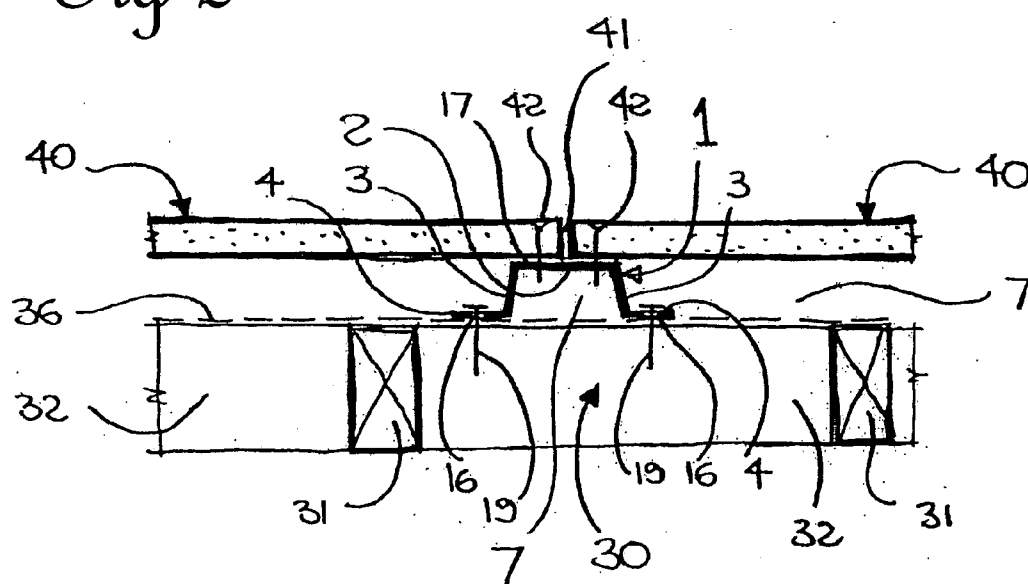


Fig 3

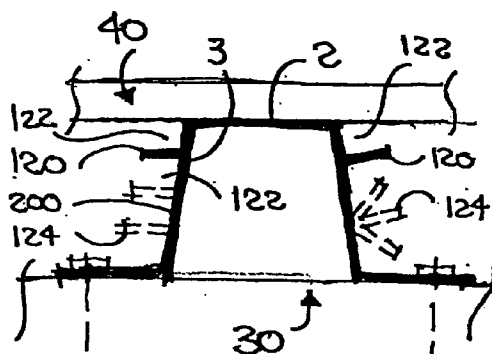


Fig 4

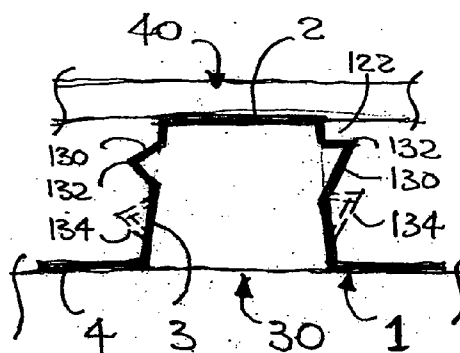


Fig 5

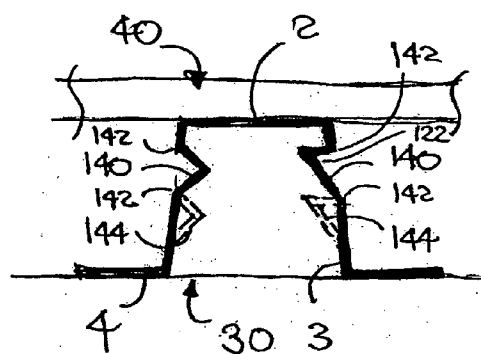


Fig 6

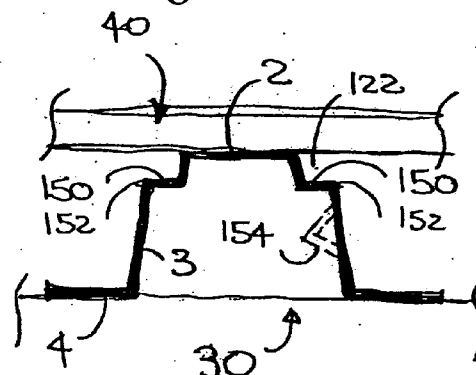


Fig 7

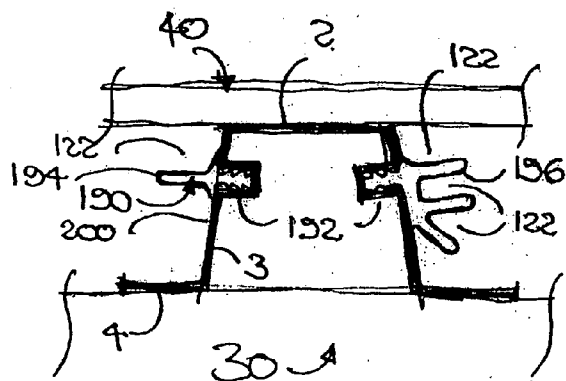


Fig 8a

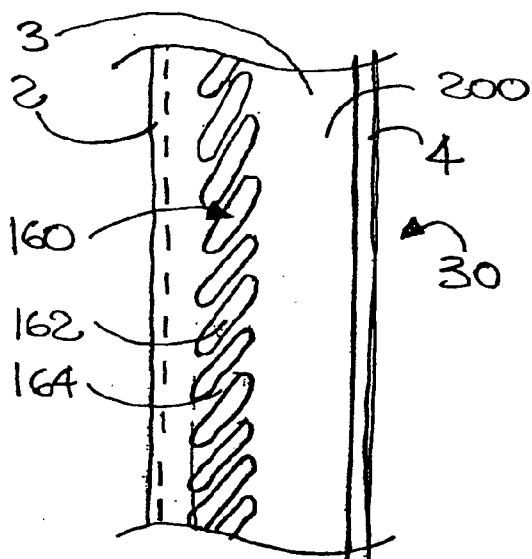


Fig 8b

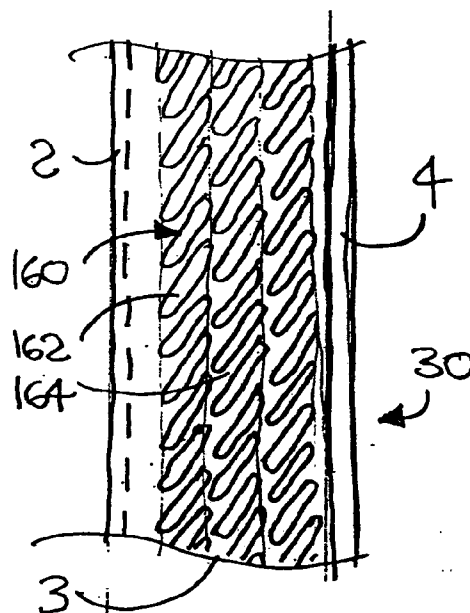


Fig 9a

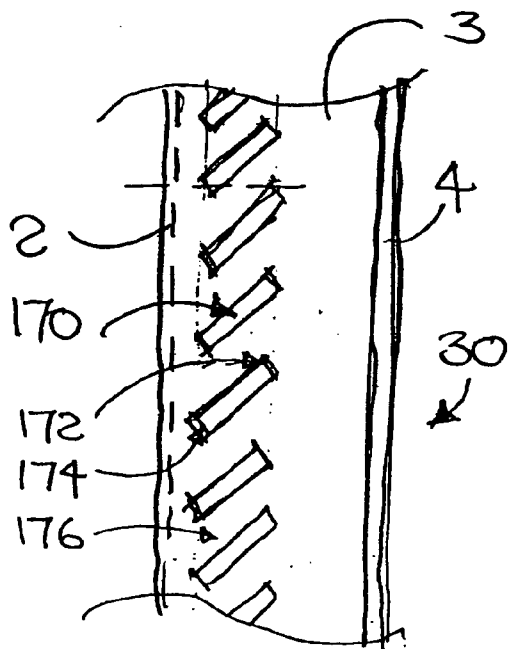


Fig 9b

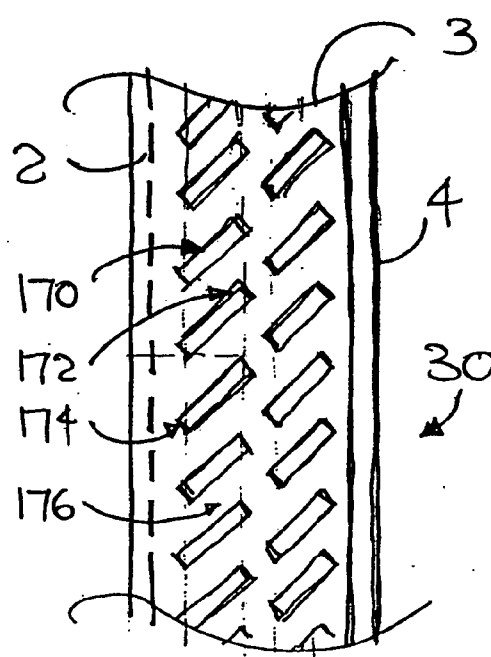


Fig 10

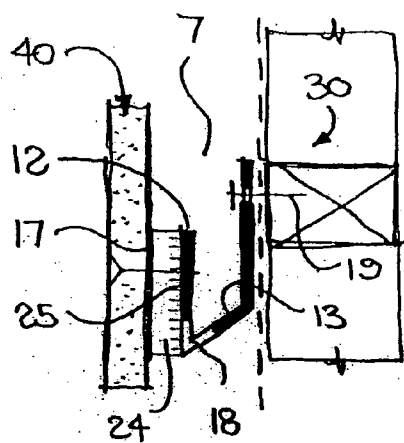


Fig 11

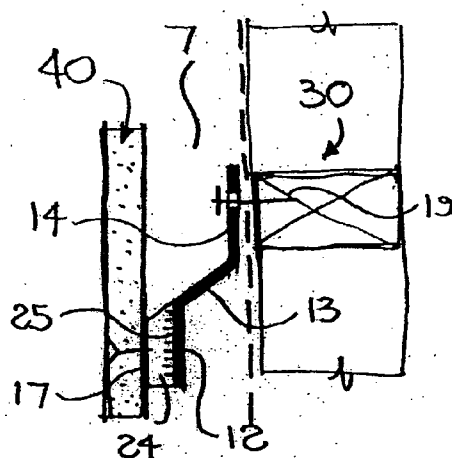


Fig 12

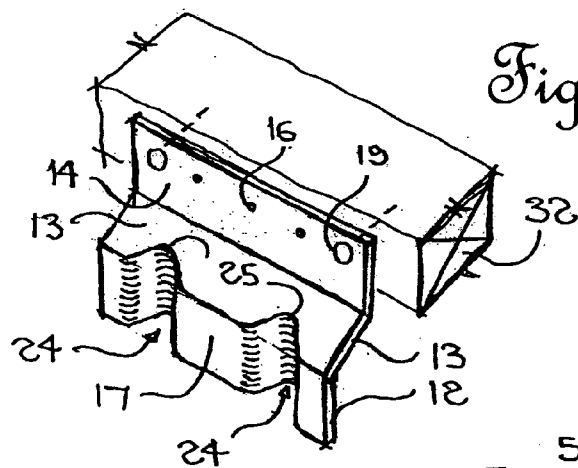
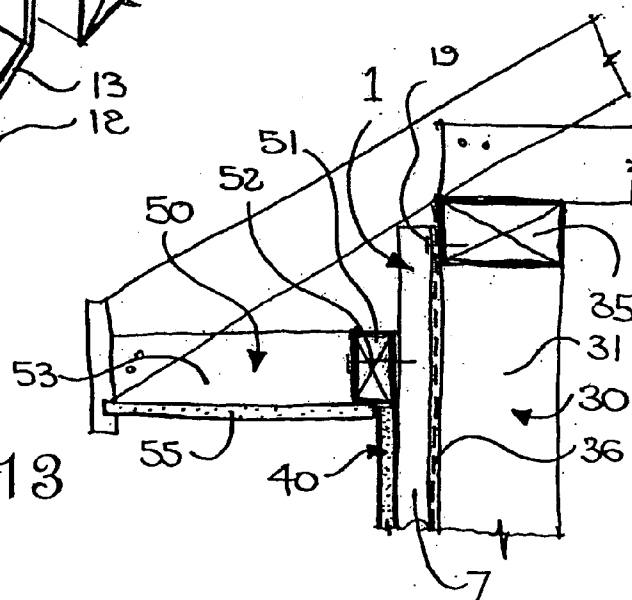


Fig 13



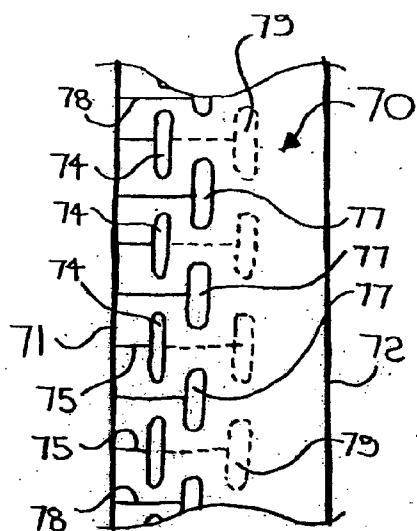


Fig 14

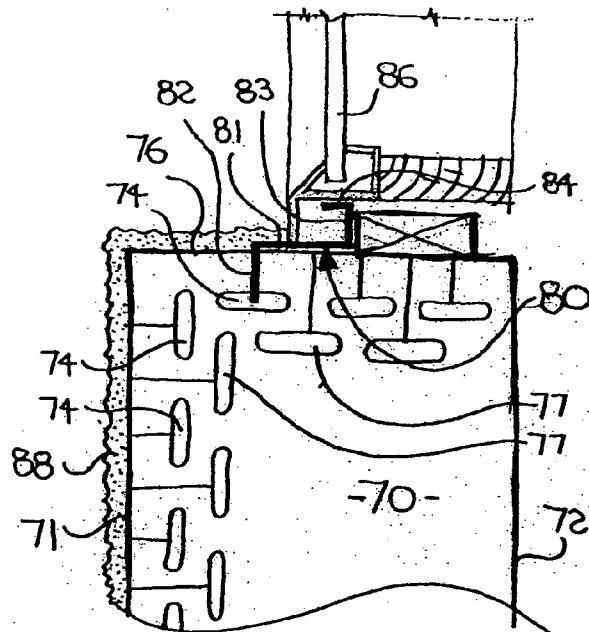


Fig 15

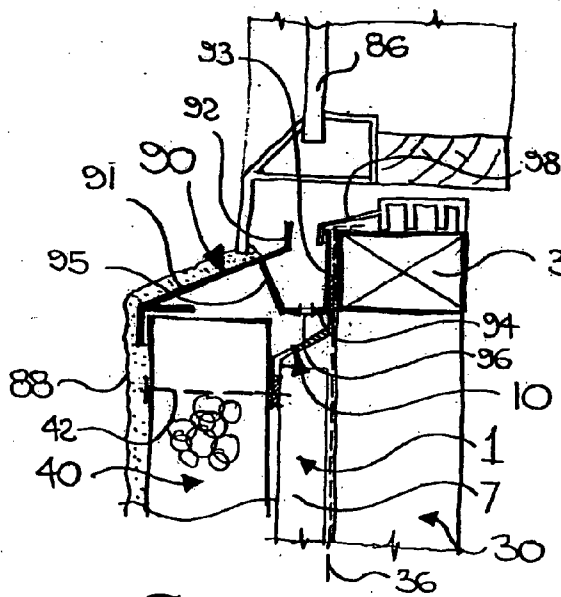


Fig 16

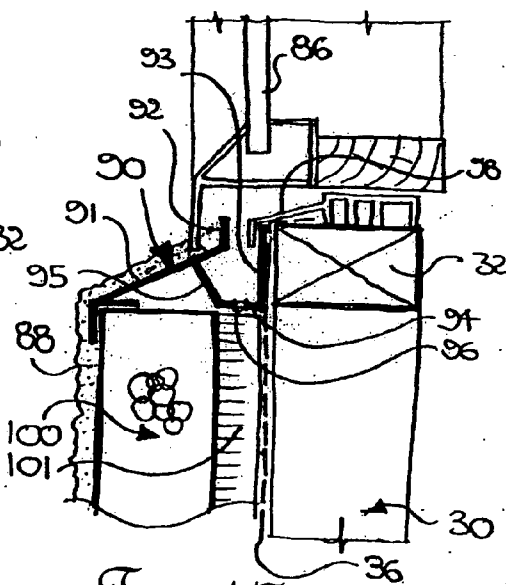


Fig 17

CLADDING SYSTEM FOR BUILDINGS

FIELD

[0001] This invention relates to a cladding system, related components, and a cladding method for use on buildings and in respect to exclusion of water from the building. More particularly the invention provides physical items capable of serving as moisture insulation means.

ABBREVIATIONS

[0002] Batten=a nailable or fastenable elongated strip of material, its thickness sets the cavity depth. May be vertical or horizontal.

[0003] DPC=Damp Proof Course

[0004] EIFS=Exterior Insulation and Finishing System

[0005] EPS=expanded polystyrene

[0006] Stud=a vertical timber member of a wooden frame, such as in a house wall.

[0007] Nog (also called dwang)=a horizontal timber member of a wooden frame, (fixed in between studs) such as in a house wall.

[0008] Plate=a horizontal timber member of a wooden frame, above or below the studs, such as in a house wall.

BACKGROUND

[0009] Buildings to be inhabited are meant to keep water (such as rain) out and in any case should remain substantially dry, in order to prevent rotting and to maintain a comfortable internal environment. Many cladding systems for buildings use external sheets of EPS, EIFS, fibrous cement board, plywood, metal, wood or any other material, and generally rely on an exterior coating such as a paint finish over the outer cladding sheets to prevent the penetration of moisture from the outside. This barrier can be easily breached, allowing moisture (that is, water) to enter or pass through the cladding material. Thereafter the water can accumulate behind the cladding layer, in part owing to the inability of the water to exit this layer. Water may penetrate by mass flow, by capillary action, or may be blown in by pressure from wind.

[0010] Water management difficulties can sometimes arise, from water evolved within a building such as by human activities and by gas heating. For instance water vapour migrating from the inside of a building may pass through a breather type building paper/vapour barrier, which permits the vapour to condense and become trapped between the outer cladding layer and an inner supporting structure. Any accumulation of moisture will tend to migrate to adjacent drier materials or colder surfaces due to water equalisation. In time the accumulated water passes through building paper/vapour barriers in part because such barriers generally are attached to the structure beyond by fixing systems that penetrate the barrier.

[0011] In particular where the supporting structure is timber or a stud and nog wall, such trapped dampness or water can lead to rotting of the supporting structure, which is dearly disadvantageous. Equally, for masonry structures, the collection and migration of water may cause undesirable internal dampness, and the physical and visual degradation of adjacent materials, which is equally disadvantageous.

[0012] In recent times, use of a cavity within an exterior wall, enclosing an inner structure, has become accepted building practice. Hence the water-resistant cladding becomes separate from the internal walls. One advantage of

having a cavity in a wall, between the external cladding member (which acts as a weather barrier and can become very wet) and a building's support structure, which is preferably kept relatively dry, is that a cavity helps prevent water from reaching the support structure inside. Industry authorities recommend that the cavity (separation) should be a minimum of 20 mm wide.

[0013] In order to cope with a problem of damp habitations, the construction industry has recently suggested it should be (a) mandatory to include a cavity that is a minimum of 20 mm wide behind any monolithic plaster cladding, and (b) desirable to supply a cavity behind other cladding materials. Such a cavity could be made by using vertical battens outside a vapour barrier and inside a cladding material, so as to allow moisture to run downwards and drain to the outside of a building. But, horizontal battens are generally also required to support cladding sheet edges and to prevent the middle of some types of cladding sheet from flexing or "scalloping" when being subjected to strong winds or other external forces. Unmodified horizontal battens tend to obstruct moisture from exiting the building quickly. If the battens are "water absorbent", they can hold and absorb the escaping moisture and transfer it to the vulnerable building structure through moisture equalisation, also, perhaps, rotting as a result of fungal or insect attack. This is dearly undesirable.

[0014] Treated timber battens may be used as spacers (i.e. to create a cavity) over the wall support structure; also with a DPC between the batten and the rear face of the cladding sheet to prevent moisture migrating into the timber batten. Another problem is that the fasteners used to fix the DPC to the batten, as well as fasteners used for the cladding sheets will puncture and therefore compromise the DPC's integrity, potentially allowing moisture to soak into the batten and into the structure beyond.

[0015] EPS battens are known, but have similar moisture absorption issues to the timber battens, as well as a whole range of other limitations. Most battens are not strong and may need to be installed vertically over the studs of the underlying support structure which can be impractical when the cladding sheet borders, as supplied, do not correspond to the location of the studs (where the battens are attached) resulting in waste, and increased costs in time and labour to mark and cut the sheets so that they match the lines of the studs. Also, in a typical 2.4 metre high timber stud frame, two horizontal rows of nogs would normally be provided, equally spaced between the top and bottom plates. Hence any proposed vertical battening system would need to span the 800 mm (approx) between nogs and top and bottom plates. Treated timber battens, being 20 mm to 30 mm deep (corresponding to the depth of the cavity required), are usually too flexible for cladding support if used to span gaps between the nogs. In addition, driving, screwing or hammering a fastener into a timber batten while constructing a wall is likely to split that batten.

[0016] A disadvantage of members that bridge the gap between the cladding and the interior wall is that the members may serve as bridges for water that contacts, drains down, and permeates the inner structure. For example, when the wind drives rainwater into window or door openings, it can be forced across and up the sill or threshold of the opening, toward the window/door joinery unit itself. It is common for cracks or gaps to exist where a window/door joinery unit abuts the sill of a cladding member below, because they have

different expansion characteristics. Such a crack permits the entry and accumulation of water behind the joinery unit.

PRIOR ART

[0017] Relevant prior art is described along with corresponding examples in the Preferred Embodiment.

OBJECT

[0018] It is an object of the present invention to provide water expulsion and water expulsion means for use as part of a cladding system for a building, or at least to provide the public with a useful choice.

STATEMENT OF INVENTION

[0019] In a first broad aspect the invention provides a cladding system for use underneath an external surface of an exterior wall of a building, wherein the cladding system provides a combination of physical, passive means within a cavity of the wall, the means capable of at least partially obstructing the movement of water across the cavity towards an internal, water-susceptible structure of the building, and means capable of at least partially causing the water to flow out of and be expelled from the cavity, thereby protecting the internal, water-susceptible structure from water.

[0020] In a first related aspect, the cladding system is comprised of a plurality of elongated, substantially impermeable members herein called battens, each batten having a first surface for receiving an exterior cladding panel and a second, opposed surface for mounting upon the underlying inner structure, the surfaces of the batten being separated on each side by a side surface bearing water path diverting means, so that when in use in a substantially vertical orientation, water drops, films or droplets attempting to pass towards the internal structure are intercepted and encouraged to flow downwards and out from a base of the wall.

[0021] Preferably the water diverting means as applied to a vertically oriented batten comprises at least one longitudinal fin and so that a pocket between the fin and the cladding panel comprises an open channel; thereby creating a preferential path for water flow.

[0022] Preferably the water diverting means comprises at least one longitudinal everted ridge, or optionally, the water diverting means comprises at least one longitudinal inverted valley.

[0023] In another version, a preferred water path-diverting means comprises at least one series of elongated, slanted surface modifications, each surface modification being slanted towards the cladding side at a lower end, so that, when in use, water is guided by the slanted orientation of the surface modification downwards and towards the cladding side of the batten.

[0024] Alternatively the or each surface modification comprises an elongated raised dome.

[0025] A further alternative surface modification comprises an elongated depression.

[0026] A yet further surface modification comprises an elongated aperture.

[0027] Preferably the water diverting means as applied to a horizontal batten comprises providing at least one longitudinally sloped side on the batten, so that, when in use, the slope is oriented downwardly and outwardly away from the internal structure so that water is diverted in a direction away from the internal structure and towards.

[0028] In a second related aspect, the cladding system provides a plurality of masses as an array of substantially rigid slabs; each slab having a first surface for receiving a cladding sheet and a second, opposed surface for mounting upon an underlying structure; each slab containing a plurality of continuous parallel internal channels, which channels, when oriented in an at least partially vertical direction, are capable of conveying the water towards a lower end of the channel.

[0029] In one option, each channel is parallel to and is at least intermittently connected through a slit to the first surface.

[0030] Preferably, when in use, each substantially rigid slab employs capillary action through the slit to draw water from the first surface towards the internal channel

[0031] Optionally each substantially rigid slab includes several rows of internal channels each channel being connected at least intermittently through a water-receiving slit to the first surface.

[0032] In a second broad aspect, the invention provides a method of installing a cladding system as previously described in this section, wherein the method includes the steps of affixing a plurality of substantially rigid slabs on to an underlying structure so that the internal channels in each slab are oriented vertically, and in line with channels on other slabs above or below them, then of affixing at least one cladding panel over the plurality of substantially rigid slabs, and of arranging draining means to carry water from the lowest point of the internal channels towards an exterior of the building.

[0033] In another related aspect, the method includes the further steps of providing articles within apertures included within a wall with drainage means, by use of substantially rigid slabs with draining slits adjacent the aperture as well as adjacent the cladding.

Preferred Embodiments

[0034] The description of the invention to be provided herein is given purely by way of example and is not to be taken in any way as limiting the scope or extent of the invention.

[0035] Throughout this specification, unless the text requires otherwise, the word “comprise” and variations such as “comprising” or “comprises” will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps. Orientation terms such as “vertical” or “horizontal” should be construed broadly.

BRIEF DESCRIPTION OF THE DRAWINGS

[0036] FIG. 1 is a diagrammatic isometric representation of the cladding system, with a generic top-hat (description of the appearance in section) batten.

[0037] FIG. 2 is a plan cross-section of a cladding system, showing a joint between generic cladding panels.

[0038] FIG. 3 is a diagrammatic cross-sectional view of a modified batten according to the invention.

[0039] FIG. 4 is a diagrammatic cross-sectional view of another modified batten according to the invention.

[0040] FIG. 5 is a diagrammatic cross-sectional view of a further modified batten according to the invention.

[0041] FIG. 6 is a diagrammatic cross-sectional view of yet another modified batten according to the invention.

[0042] FIG. 7 is a diagrammatic cross-sectional view of a modified batten according to the invention, having longitudinal inserts.

[0043] FIGS. 8a and 8b are diagrams of one side of a further modified batten according to the invention.

[0044] FIGS. 9a and 9b are diagrams of one side of a variant of FIGS. 8a and 8b.

[0045] FIG. 10 shows, in a cross-sectional view, one variation of a horizontal batten according to the invention.

[0046] FIG. 11 shows, in a cross-sectional view another variation of a horizontal batten according to the invention.

[0047] FIG. 12 shows, in a perspective view, a short horizontal batten according to the invention.

[0048] FIG. 13 shows, in a cross-sectional view one way to finish off the upper periphery of a wall using a cladding system according to the invention.

[0049] FIG. 14 shows, in a cross-sectional plan view, a water-diverting and cavity-creating cladding system according to the invention.

[0050] FIG. 15 shows, in a cross-sectional plan view a water-diverting cladding system according to the invention in use around an aperture through a wall.

[0051] FIG. 16 shows, in a cross-sectional view, a sill framework below an aperture through a wall, according to the invention.

[0052] FIG. 17 shows, in a cross-sectional view, a variation sill framework below an aperture through a wall, using a cladding system according to the invention.

[0053] This invention applies to a variety of methods intended to resist the horizontal movement of water that has appeared within a wall, across the wall and into an internal structure, and to encourage the vertical movement of the water downwardly and directing it away from the structure, so that it can be passively expelled from the building before reaching the structure of the building and causing the well-known problems associated with damp or leaky buildings.

[0054] Each method of this cladding system may be used alone or in combination with the others.

[0055] This invention relates to providing cavities within exterior walls for buildings, of the type where an outer, weatherproof panel (at least as defined in terms of water ingress) is fixed over an inner structure that may be only partially moisture-proofed (such as by a layer of tarred paper or a reflective or permeable (breathable) foil sheet, and is itself susceptible to degradation in the presence of water and in the "leaky building problem". There is an empty cavity between the inner and outer walls. The usual construction sequence creates the inner structure or panel layer first. By "degradation" the inventor includes attack by microbes, especially fungi, and physical change and deterioration of materials, adhesives and components of composite materials over the intended lifetime of a building. Further, the existence of dampness within an inhabited space is undesirable, unhealthy and unpleasant.

[0056] A preferred method to fix the cladding panel over the internal structure is by means of nailable battens first fixed onto the inner structure, preferably over joints, and then the outer panel is fixed over the battens. Typically the battens run in vertical and also horizontal directions. This is a widely practiced procedure, but improvements have recently been made: see for example the prior art publication WO2007/087681, which provides improved battens with a "finish ready panel supporting surface". It is silent about water ingress or water management.

[0057] This invention serves to discourage water transfer from the cladding panels (including water arising by condensation) into an internal structure, and serves to encourage the

formation of a gravity-driven flow of water down through the cavity to be expelled out of the bottom of the cladding system. It does so by passive means, relying on shapes, gravity, and the properties of water.

[0058] Refer to FIG. 1 for a general view of the invention within a constructed cavity wall, with a generic batten 1 in place, oriented vertically. 40 shows a cladding panel or sheet. Items 31 are studs or vertical supports, usually made of wood but which may be steel or other materials. They are supported on a bottom plate 34, which rests on (for example) a concrete floor. Items 32 are horizontal nogs (dwangs). Nogs, studs, top and bottom plates make up a frame for a wall. Z-section horizontal battens 10 are also shown, fixed on to nogs by surfaces 14 and providing further support, in between the vertical battens, to the cladding panels so that they do not tend to bow in or out between battens. This diagram shows a water-impervious membrane or DPC 36 as a dashed line or outline. Fasteners 42 are used to fix the cladding panel to the vertical and/or horizontal battens, which in turn are fixed to the underlying support 30 (such as a wall frame) through the rear flanges using a pre-drilled contact surface by fasteners 19. The outer contact faces 2 and 12 of the battens etc are shown with (optional) surface roughening, typically dimpling 17, that is intended for use, during installation, to prevent the tip of a fastener being screwed in from wandering from side to side and thereby damaging the cladding panel. Of particular relevance to this invention are the sides 3 of the battens, which are shown free of detail in FIGS. 1 and 2, but which detail (for water management purposes) is shown in FIGS. 3-7. Any free water that is present within the cavity about the battens is expected to drain downwards, land upon the horizontal batten (s) 10, and be forced by the slope of surface 13 to run along the upper edge of the batten contact surface 12 until it runs through perforations such as 18. It should be noted that the substantially horizontally battens 10 are not limited to use in this orientation and can be used equally in a substantially vertical application. Alternatively, the battens 1, normally used in a substantially vertical orientation, may be used in a horizontal orientation although some of their water-diverting properties would be lost.

[0059] See also FIG. 2 which is a plan-view cross-sectional diagram showing the joint 41 and the finite thickness of the cavity 7 of the wall. The cladding panel 40, having finite width, terminates at joint 41. The horizontal placement of the vertical battens 1 is in part determined by the cladding width, so that joints 41 are supported by underlying battens and hence the joint after sealing will be supported and should not undergo deformation and subsequent parting. Of course, battens may be repeated in between panel joints as well as beneath the joints. It will be appreciated that any underlying batten 1 ought to be sufficiently stiff that it can bridge the vertical gap between a nog 32 and a plate 34, or between one nog and another. In practice, an internal room, placed to the bottom of FIG. 2 would be furnished with a plasterboard wall or the like, in order to make it fit for habitation, and a further space is thereby created within the framing between the plasterboard and the DPC 36. In general the reader may regard structure 30 as being any internal structure of a building.

[0060] Where a non-sheet cladding element 40 is used (e.g. weatherboards etc), the battens 1 can be installed at vertical spacings capable when in use of satisfying all relevant design loads and requirements for the specific application. If the support structure is masonry, concrete, brick masonry or any other substantially planar structure 30, the battens 1 can be

installed over that structure as “strapping” with appropriate fixing elements **19** at spacings that suit the requirements of the cladding material **40**.

[0061] Prior art: One alternative to a nailable batten is provided by the dual effect of sloped fingers on an impervious though perforated panel: U.S. Pat. No. 6,298,620. Another alternative is provided by the rolled corrugated material of CA2469365; also perforated in places. Both examples define a cavity wall space but neither is believed to be as useful in the structural sense as are battens.

[0062] For the wall system as described to this point, a problem relates to the physical connection made by the battens **1** and **10**, and the Z-flashing between the cladding panel and any inner structure **30**. Even impervious battens may carry water (perhaps arising from condensation from saturated air within the cavity space, against a cold cladding panel, or from a leak to the outside through or bypassing the cladding panel) over their sides across the cavity **7** and to make contact with the inner support structure **30**. Furthermore, wind may assist migration of this water across the cavity. As a result, even despite the presence of the barrier or DPC **36**, degradation may be initiated. Many means to prevent such transfer are known for ties between bricks, such as GB151755 Ashgrove, or U.S. Pat. No. 4,177,617, both of which provide a point or line that serves as a focus for the formation of a drip.

[0063] Therefore the cladding system of the invention, in a first version, makes improvements to the batten sides in order to obstruct and divert frank water as drips or funnels downwards and to escape from the wall cavity. Regarding prior art, the inventor is aware of U.S. Pat. No. 5,634,300 which is called a “post” for use in supporting the edges of cladding panels. This elongated member has a number of side ridges, but they are specifically formed for use as T-bolt attachment means for post-to-post attachments. The patent document does not mention water exclusion. A number of non-limiting examples of improved battens will now be described.

EXAMPLE 1

[0064] A fastenable batten in elongated shape is provided. The wide choice of preferred materials includes those that are preferably nailable, are rigid and robust, and are fit for purpose. Hence materials range from strips of wood, preferably treated so as to be fungi-resistant and impervious to moisture, through plastics, composite materials such as fibro-cement (water-impervious), and metals; for instance rolled, corrosion-resistant steel and extruded aluminum.

[0065] The batten **1** has a generally 4-sided shape wherein the side that shall be used to face the cladding wall panel is identified in the drawings as **2** and sometimes called “the front flange”; the side to face the inner wall panel is also identified as **4** and sometimes called “the rear flange”, and hence the sides that shall face into the wall cavity are also defined. (Of course the batten could be used the other way round—with flange **4** in contact with the cladding side). Those cavity-facing sides **3** are shaped in order that any water attempting to pass over the surface is (a) impeded, and (b) tends to arrive at drip-forming and flow-channeling means such that the water then flows out of the wall cavity under the influence of gravity and hence does not arrive at the inner wall panel. Each batten **1** according to the invention includes at least one of the following means to reduce or prevent the transfer of water from a cladding surface to any inner structure **30**.

[0066] FIG. **3** is a plan-view cross-sectional diagram of a first example batten **1**. The basic top-hat section as in FIGS. **3-7** is “decorated” or “embellished” by full-length side fins **120** which are set back from the rear face of the cladding material **40**, hence creating a space or pocket or gutter **122** between the cladding material **40**, the web face **200**, and the fin **120**. Pocket **122** shelters any water reaching this inner surface **30** from the influences of possible air movement within the cavity **7**, which may be causing or encouraging any water on the rear face of the cladding panel **40** to travel horizontally across the web face **200**. This allows gravity to have a greater influence on any water droplets, allowing them to be expelled downwards. The fins provide (a) barriers that obstruct water migration more or less horizontally across the side **3**, (b) a lengthened surface for any capillary tracking, and in particularly (c) provide corners that help concentrate the water into funnels. The vertical edges reduce the contact area of droplets and being vertical, promote water movement downwards. Further fins **124** (shown as dashed lines **124**) may also be induced as further barriers to travelling water, thus creating additional pockets **122** (or gutters) and thus increasing the ability of these modified battens to prevent horizontal water migration across the batten side **200**. This is advantageous if a water droplet should get past a first fin **120**. Horizontal batten **10** is described in relation to FIGS. **10-12**. If the fins are interrupted along the length of the batten, the water has to leap the gap or, could migrate into the structure **30**. Although absolute sizes are not limiting as to the scope of the invention, for guidance and for use in a typical single-storey dwelling the front flange is preferably about 20 mm to 100 mm wide, the sides are about 20 mm to 100 mm wide, and each rear flange is about 20 mm to about 80 mm wide. Of course the sides determine the wall cavity depth.

[0067] FIG. **4** is a plan-view cross-sectional diagram of a variant batten. In effect, these battens **1** have one or more grooves **130** formed along their sides **3**, along their entire length. These grooves are in the form of a “V”, projecting outwardly in order to create longitudinal edges that not only obstruct water migrating horizontally, but promote water movement downwards, due to reduced surface contact at the convex edge **132** of each groove. Additional grooves (shown as dashed lines **134**) may also be included as further barriers to travelling water, thus creating additional pockets or gutters and thus increasing the ability of these modified battens to prevent horizontal water migration across the batten side **3**. This is advantageous if a water droplet should get past the first groove **132**.

[0068] FIG. **5** is a plan-view cross-sectional diagram of another variant batten **1**. A similar idea to that of FIG. **4** is shown, but this version, being decorated inwardly is more easily stacked for economical transport. Battens of FIG. **5** have one or more grooves **140** formed inwardly along their entire length. The grooves have longitudinal edges that not only obstruct water migrating horizontally, but promote water movement downwards, because of reduced surface contact at the convex edges **142** of each groove. Also, the inwardly projecting grooves **140** serve as gutters **122** as described above, to assist with the diversion of unwanted water. Further grooves (shown as dashed lines **144**) may also be included to create further barriers to the migration of water. They create additional pockets **122** (or gutters) thus increasing the ability of these modified battens to prevent horizontal water migration across the batten side surface **200**.

[0069] FIG. 6 shows another way to form grooves or gutters or spaces 122 yet retain “stackability” by causing the battens 1 to have grooves 150 formed in their sides along their entire length, from the top end to the bottom end. These vertical surfaces create one or more longitudinal edges, not in contact with the cladding panel 40, that obstruct water migrating horizontally (as described for FIG. 4), and promote water movement downwards, due to reduced surface contact at the convex edges 152 (at the junction of two meeting surfaces).

[0070] FIG. 7 is a plan-view cross-sectional diagram of a batten 1 having ribs 194, 196 made of a separate, somewhat resilient, elongate strip material which are called “gaskets” herein, that is pressed into a groove along one or both sides of the batten and held in place, such as by adhesive or by interlocking of a series of ridges which have the same effect as the integral ridges or troughs previously described in this section. Hence the basic batten, having a pair of grooves 192 along its sides, may be installed either with or without the additional gaskets with pockets or gutters 122 between the cladding material 40 and the fin 194 or 196. These resilient ribs may also be useful as flashing surrounding a window, door, vent or other aperture passing through a wall.

[0071] FIGS. 8a, 8b and 9a, 9b together illustrate another way of decorating the sides 3 of a batten 1, facing external cladding panels at the left, to divert water away from an internal wall or space 30. The sloping oval protrusions 160 or rectangular apertures 170 (or other, functionally similar shapes) may be provided as a single row in FIGS. 8a, 9a or as multiple rows in FIGS. 8b, 9b. The shapes 160/170 are pressed, roll-formed, punched or otherwise formed into the batten sides 3 so that ridges 162 and valleys 164 remain in each side surface of each batten, with their profiles sloping downward and toward the front flange 2 of the batten 1, that, when in use, supports the cladding panel. Their elongated shapes are an obstruction to water moving horizontally towards the rear surface 4, and their relatively steep angle tends to successively deflect the water from protrusion to protrusion or from cut edge to cut edge as it falls rapidly down the face of the batten side 3. Hence these decorations promote the downward movement of water toward the front flange 2 and away from the support structure 30. Meanwhile, it is advantageous to retain the water droplets against the batten side surface by surface tension, to control their descent until the droplets exit the cladding at the bottom of batten 1.

[0072] The battens shown in FIG. 9a or 9b have one or several rows of apertures 170 cut, punched or otherwise formed through their sides 3, to comprise slanting slots (in the non-limiting example, shown as rectangles) that, especially when in a vertical series, offer the greatest ability to intercept unwanted moisture. When droplets of water endeavour to traverse the batten sides 3, they will hit an aperture 170 and run around the edge to the lowest point 174, which acts as a drop-forming focus. Thereafter, the droplet should then cross the surface 176 to the aperture below, and so on. Should any air currents within the wall cavity 7 tend to divert the droplets horizontally when crossing the surface 176, they are intercepted by the lower aperture, because the high point 172 of the lower aperture is higher than the low point 174 of the aperture above.

[0073] Any feasible combination of the decorations to the sides of a batten as described herein may be used. The size or extent of the decorations is not important, so long as the are large enough to influence water movement yet not so large that they may contact the rear of the cladding panel (or per-

haps spider webs or the like, that appear in time). Also, the decorations should not detract from the overall strength of the batten, serving as a cladding support means.

[0074] The battens may be formed by any economical method from any suitable material. In general the material should be relatively impervious to water, even though nylon (which takes up some water) would be acceptable. Sharpish outer edges help to control the water drops and make films into drops. An impregnated or wood, or a composite material based on wood should also be satisfactory, even though none of the drawings of sections through battens show an appropriate profile for a solid member made for example of wood. Paraffin wax is an example impregnating material. Example methods for manufacture include casting, milling, extrusion (as for plastics or some metals such as aluminum) or rolling a strip made of metal sheet, perhaps in more than one pass. Preferably a galvanizing, paint or other surface anti-corrosion protection is applied after rolling. In the case of hollow battens, fastening is preferably made through pre-formed holes into the support structure 30, and then the second panel is fastened to the batten most likely blindly or through drilled holes, so that the batten should be able to receive penetrating fasteners such as self-tapping screws or the like. Preferably each batten is sufficiently long that a single one will cover a wall, such as 3 to 4 metres long, but should allow for end-to-end contact and alignment so that the ridges carrying drips downward are aligned.

[0075] FIGS. 10 and 11 are vertical (elevation) cross-sectional diagrams through a mid-part of a wall beside a nog, showing the cavity space 7, cladding panel 40 and inner wall framing. A horizontal “Z” section of horizontal batten 10, fastened by for example nail 19 to the inner wall 30 is shown in FIG. 11, whereas the lower limb of the “Z” is bent the other way up (as a “J” section flashing or a “return”) in FIG. 10, as an alternative. FIG. 10, a variation of the batten 10, shows vertical passages 24 in the outer face of flange 2 and a cutout 18 for water egress in the horizontal batten 10. In FIG. 11, air and water share the same space 24, and cutouts or apertures 18 are not needed. FIG. 12 is a perspective view of a portion of horizontal batten from FIG. 11. The length of this material is either short, as shown, or may even be so long that it forms a barrier right along a base of a wall, thereby preventing (if the holes 24 are small enough or covered by a screen) access to vermin. In a multi-storey building, each storey may have a separate upper and lower periphery, or the entire height of the wall may be treated as a single wall. Note that FIG. 1 also shows a base of a wall, with horizontal battens 10 in the form of a “Z” flashing having apertures 18 along the junctions of surfaces 12 and 13 at the rear face of cladding panel 40.

[0076] FIG. 13 shows an upper periphery of a wall including the system of the invention, with batten 1 being fastened by fastener 19 to a top plate 35 of a wall. 53 and cladding panel or strip 55 together delineate an eave. Note that the cavity space 7 opens into the eave space.

EXAMPLE 2

[0077] The system of the invention also provides a thick water-diverting layer for use in, or comprising a cavity wall. Preferred slab materials include expanded polystyrene, other structural plastics preferably foamed plastics, concrete such as a lightweight concrete as long as the material is capable of being formed with channels and slits within the slab. The material may be at least in part water-permeable.

[0078] Preferably the slab is from about 20-30 mm to about 400 mm thick and includes a series of channels that are formed a minimum of 10 mm into the slab from the front face of the slab. See, in particular FIG. 14 which is a plan cross-section (i.e. a horizontally cut section) when the EPS mass is orientated when in use with the channels vertically oriented. Here 70 is the EPS slab, typically, which may be the full thickness of the (virtual) cavity wall. Such slabs can be cut from a large cast block of expanded polystyrene typically using hot-wire cutting means. Sometimes each slab is cast by letting the polystyrene beads (including a gas or a gas-forming substance) expand when heated within a confined space of the same size as the desired slab. Extrusion is another preferred method of manufacture. This drawing shows a first array of channels 74 that extend the full length of the slab and each channel has a corresponding slit 75 cut between an outer surface 71 and the channel interior. The slit is a result of the hot-wire cutting method, and may also act as a capillary channel to carry water into the channel. It is possible that a slit is not necessary, if the material of the slab is water-permeable. More than one array of channels may be used at different depths, such as second layer 77 with corresponding slits 78, and optional third layer 79. Layer 79 intercepts and direct path of moisture through the slab. Since this EPS slab is capable of serving a structural purpose as well, it is preferable not to create too large a continuous void within the slab. The network of channels permits air to infiltrate the core of the block and so assists drying of the block through convection. Having a plurality of channels through the material of the block aids in drying of the block.

[0079] The mass of expanded polystyrene (EPS) is preferably selected from the available range of densities after expansion so as to be substantially impervious to the transfer of moisture. The "HD" grade (moderately dense though not as dense as geotechnical grades) is preferred, although any grade will do. The more water-permeable grades may be enhanced with a non-permeable coating on the face 72 which lies against the inner structure 30 of the building, opposite to the outer face 71 bearing the slits and opposite to the cladding.

[0080] The principle of this aspect of this cladding system for buildings invention is to implant a parallel series of relatively wide internal channels within the mass of EPS. Each channel of the example slab has a relatively narrow slit to the exterior along one side. Capillary action through the corresponding narrow slit will tend to draw any free water into the internal channel. Hence the slab acquires a preferred use orientation, in which the channels run vertically.

[0081] Prior art: It has been noted that U.S. Pat. No. 6,247,874 teaches a draining strap for use in drying soil in a garden or field, using a similar principle. This draining strap is somewhat flexible and can be laid down into the soil. U.S. Pat. No. 5,615,525 teaches a similar construction for "below-grade" lining of basements, wherein panels of the material are placed in the soil around a basement and serve to remove water from the soil into a drain so that the basement does not get so damp. U.S. Pat. No. 5,056,281 teaches a similar type of channeled EPS, for the same application as U.S. Pat. No. 5,615,525.

[0082] None of these specifications suggest use of an EPS draining panel installed within a building wall including a cavity space, with objective of channeling water that may appear within the cavity or the slab, where the EPS incidentally also has the advantage of serving as thermal and/or acoustic insulation, may support an external finishing plaster coating, giving a monolithic appearance, and provides struc-

tural rigidity and supports the cladding wall. Indeed, EPS slabs when installed may provide sufficient bracing for the wall to surpass earthquake-resistance requirements. One way to make this drainable EPS is to use a "mole plough" design of hot-wire cutter—or a series of such cutters—to melt the continuous channels and slits into a slab of EPS.

[0083] The channeled EPS slabs can be used to create a virtual cavity without battens in a wall, to define and fix the dimensions of the cavity, or may be spaced apart from the cladding panels by a small amount. In a preferred method of use, the slabs could be glued or otherwise fastened onto the interior support wall at the time of installation, or glued to the frame of studs and nogs, or on to the water-resisting membrane. Fasteners may be used. Further water resistance is obtained by using one layer of channeled EPS slab on top of another layer of channeled EPS slab, with the joints staggered so that there is no direct path for water between the cladding panels and the interior walls of the building.

[0084] FIG. 15, also a plan cross-section, introduces further aspects. A surface coating 88 (such as a plaster) may be applied directly to the slit-bearing EPS slab 70 surface 71. The jamb of the joinery unit 86 is supported by a structure that may also support the panel 70. A flashing 80 is installed behind the joinery 86 to prevent any water infiltrating the joint between the joinery 86 and the finishing coating 88. Any such water will be evacuated vertically downward and out over a flashing below, to the outside of the cladding face. This flashing 80 comprises a flat portion 81 that sits vertically against the edge surface 76 of the EPS slab or cladding block 70, between the block and the joinery unit 86. The flashing 80 has a return portion 83 at one end, from which another return portion 84 is projected, creating a vertical channel behind the joinery 86. The flat portion 81 has another return 82 projected from its other end, which is inserted or lapped into a continuous, vertical cut (75 or 78)—likely to be a slit or a slit enlarged by a saw cut—in the block 70 in order to improve weather tightness. Any water infiltrating the block 70 along the surface adjacent the joinery unit will reach one of the drainage apertures (74 or 77) before it can migrate into the building. The finishing coating 88 is applied over the block 70 and the flashing 80, up to the joinery 86. The slab of EPS 70 for this invention may have the slit-and-channel formations extended around two sides (71 and 76) (This example can also be applied around doors and other apertures, such as around air conditioning units).

[0085] FIGS. 16 and 17 are vertical sections through the lowest side of a window fitting. Channels are not shown in the slab of EPS 40 since the cut passed between channels. FIG. 16 shows a sill detail of a window or door opening, comprising a sill flashing 90 below a window or door joinery section 86, on top of an EPS slab serving as a cladding element 40. A cavity 7, created with battens 10, abuts part of an internal wall frame 30.

[0086] FIG. 17 shows an alternative way to use the invention, whereby the cladding element 40 and the cavity creating battens 1 and 10, being substituted for A solid EPS cladding block 100 has a rearward cavity provided by a plurality of substantially vertical channels 101 being cut or otherwise formed in the rear face of the block 100. During a storm, the wind may drive rainwater into window and door openings, causing moisture to migrate upwards across the sill, toward the window or door joinery unit 86. If a crack develops between a window or door joinery unit 86 and the finishing plaster 88, water may be driven into the structure of the

building due to the pressure of the wind forcing moisture into the crack. Protection includes the following aspects:

[0087] The sill flashing **90** has a sloping sill platform **91** over which a finishing plaster **88** can be applied. Any water entering a crack between the plaster **88** and the joinery **86** will be resisted in the first instance by the vertical up-stand **92** of the flashing, which sits behind the joinery section **86**. However, should a storm be particularly strong, forcing water in and over the top of the vertical up-stand **92**, the moisture will then drain by gravity down into the collection channel beyond. This channel has a floor **94** and two side walls **93** and **95**. The side wall **93** abuts the support structure and laps up behind a sill tray flashing **98** above, thus protecting the structure **30** from water damage. The side wall **95** connects the sill platform **91** to the channel section that is fixed to the structure. This side wall **95** also leads the infiltrating water to the floor **94** of the channel without contacting adjacent materials. The water can then exit the channel through apertures **96** formed in the channel floor **94**, and subsequently exits the cladding system by flowing downwards through the cavity **7** behind the cladding sheets **40**, which are supported off the structure **30** by the vertical battens **1**. Also, in FIG. **16** a horizontal batten **10** is fitted and fixed up behind the sill flashing **90** to support the top edge of the cladding sheet with fixings **42** and to divert the moisture exiting the apertures **96** toward the rear face of the cladding sheet **40**, away from the support structure **30**, which may rot. Equally, FIG. **17** utilizes the same sill flashing **90** (and principles thereof), permitting any infiltrating moisture to exit a building, or more specifically a cladding system **100**, without allowing the water to reach the support structure **30** and cause undesirable damage.

ADVANTAGES OF THE INVENTION

[0088] The invention provides an acceptable and cost effective method of creating a cavity system about a new or an existing structure yet of overcoming the tendency of water to travel into the structure.

[0089] Unlike other battens, those of this invention may be located in order to suit the dimensions of prefabricated cladding panels. They also determine the thickness of the cavity of the cavity wall.

[0090] Battens according to the cladding system of the invention are capable of minimising the inwards migration of water, yet of maximizing the diversion of water downwards into draining means discharging it safely from the cladding system with virtually no risk to adjacent moisture and rot sensitive materials (of the support structure)

[0091] Draining slabs according to the cladding system of this invention are (a) capable of minimising the inwards migration of water, and of maximizing the diversion of water downwards and beyond the cladding envelope, and (b) are capable of serving as structural elements, by (a) supporting cladding means, and (b) providing bracing, if adequately fixed to the underlying interior structure.

[0092] Said draining slabs can be added to existing buildings, if the outer cladding is taken off, so as to reduce moisture admitted into the building, or to render existing buildings compatible with new regulations concerning moisture resistance.

[0093] Finally, it will be understood that the scope of this invention as described and/or illustrated herein is not limited to the specified embodiments. Those of skill will appreciate that various modifications, additions, known equivalents, and

substitutions are possible without departing from the scope and spirit of the invention as set forth in the following claims.

1. A cladding system for an exterior wall of a building, characterised in that the cladding system provides a combination of physical, passive means within a cavity underneath the cladding of the wall, the means capable of at least partially obstructing the movement of water across the cavity towards an internal, water-susceptible structure of the building, and means capable of at least partially causing the water to flow out of and be expelled from the cavity, thereby protecting the internal, water-susceptible structure from water.

2. A cladding system as claimed in claim **1**, characterised in that the cladding system is comprised of a plurality of elongated, substantially impermeable members herein called battens, each batten having a first surface for receiving an exterior cladding panel and a second, opposed surface for mounting upon the underlying inner structure, the surfaces of the battens being separated by at least one side surface bearing water path diverting means, so that when in use in a substantially vertical orientation, Water drops, films or droplets attempting to pass towards the internal structure are intercepted and encouraged to flow downwards and out from a base of the wall.

3. A batten for a cladding system as claimed in claim **2**, characterised in that the water diverting means comprises at least one longitudinal fin, so that when in use the fin acts as a barrier to moisture migrating across the side surface, creating a pocket between the fin and the cladding panel comprises an open channel; thereby creating a path for water flow.

4. A batten for a cladding system as claimed in claim **2**, characterised in that the water diverting means comprises at least one longitudinal everted edge.

5. A batten for a cladding system as claimed in claim **2**, characterised in that the water diverting means comprises at least one longitudinal inverted valley.

6. A batten for a cladding system as claimed in claim **2**, characterised in that the water path-diverting means comprises at least one series of elongated, slanted surface modifications, each surface modification being slanted towards the cladding side at a lower end, so that, when in use, water is guided by the slanted orientation of the surface modification downwards and towards the cladding side of the batten.

7. A batten for a cladding system as claimed in claim **6**, characterised in that the or each surface modification comprises an elongated raised dome.

8. A batten for a cladding system as claimed in claim **6**, characterised in that the or each surface modification comprises an elongated depression.

9. A batten for a cladding system as claimed in claim **6**, characterised in that the or each surface modification comprises an elongated aperture.

10. A horizontal batten for a cladding system as claimed in claim **2**, characterised in that the horizontal batten includes at least one longitudinally sloped side so that, when in use, the slope is oriented downwardly and outwardly away from the internal structure so that water is diverted in a direction away from the internal structure and towards a drain.

11. A horizontal batten for a cladding system as claimed in claim **10**, characterised in that the horizontal batten includes intermittently spaced passageways at the intersection of the downwardly sloping side and the first surface, to allow moisture to egress past the horizontal batten when in use.

12. A cladding system as claimed in claim **1**, characterised in that the cladding system comprises at least one mass of a

water-permeable material, inside which a plurality of parallel, continuous, elongated drainage channels are made.

13. A cladding system as claimed in claim **12**, characterised in that the cladding system comprises at least one mass of a material inside which a plurality of parallel, continuous, drainage channels are made; each drainage channel being substantially vertical when in use.

14. A cladding system as claimed in claim **12**, characterised in that the cladding system comprises at least one mass of a material inside which a plurality of parallel, continuous, drainage channels are made; each channel being accompanied by a corresponding narrow elongated slit.

15. A cladding system as claimed in claim **12**, characterised in that the cladding system uses a plurality of masses as an array of substantially rigid slabs; each slab having a first surface for receiving a cladding sheet, panel, or finishing surface and a second, opposed surface for mounting upon an underlying structure; each slab containing at least two continuous parallel internal channels.

16. A cladding system as claimed in claim **12**, characterised in that the cladding system uses a plurality of masses as an array of substantially rigid slabs; each slab having a first surface for receiving a cladding sheet, panel, or finishing surface and a second, opposed surface for mounting upon an underlying structure; each slab containing at least two con-

tinuous parallel internal channels, each nearby and connected at least intermittently through a slit to the first surface.

17. A cladding system as claimed in claim **12**, characterised in that the plurality of parallel, continuous, drainage channels, when viewed in plan, are configured so that they form at least one series of at least two channels, substantially parallel to the first surface of the cladding sheet.

18. A cladding system as claimed in claim **17**, characterised in that the plurality of parallel, continuous drainage channels, when viewed in plan, are configured so that they form at least two series of at least two channels, whereby the channels of one series are offset with, or to, the channels of an adjacent series; so that any imaginary line projected perpendicularly from any point on the first surface, will cross or be intercepted by at least one drainage channel.

19. A cladding system as claimed in claim **14**, characterised in that each substantially rigid slab employs capillary action through the slit to draw water from the first surface towards the internal channel, which, when oriented in an at least partially vertical direction, is capable of conveying the water towards a lower end of the channel.

20. A cladding system as claimed in claim **14**, characterised in that each substantially rigid slab is provided with an array of slits and corresponding channels emerging on to more than one surface.

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