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(54) A distance element for use in a roof structure and a method of positioning and fixating a plurality of lathes in a roof structure

(57) A roof structure includes a set of sloping rafters, an underroof foil being positioned on top of the rafters and a plurality of lathes extending transversely relative to the rafters and serving the purpose of supporting roof tiles, roof plates or similar roof coverings. The lathes are fixated to the rafters in a space apart relationship and a specific distance above the underroof foil by means of a plurality of distance elements. Each distance element includes a body part having a lower side for contacting the underroof foil and defining a height corresponding to the distance, and each distance element has at least one wing element extending transversely relative to the body part and depending from the lower side for contacting and pressing the underroof foil downwards. The body part and the wing element of each distance element are made from corrosion resistant and weather proof material or materials. Preferably the distance element comprises two wing elements extending from opposite sides of the body part, and the body part and the wing element or wing elements are integrally produced in a casting or extrusion process. The distance element further preferably includes fixation flanges or fixation pins extending upwards from or relative to, respectively, the upper side of the body part for fixating or supporting, respectively, a lath relative to the body part.

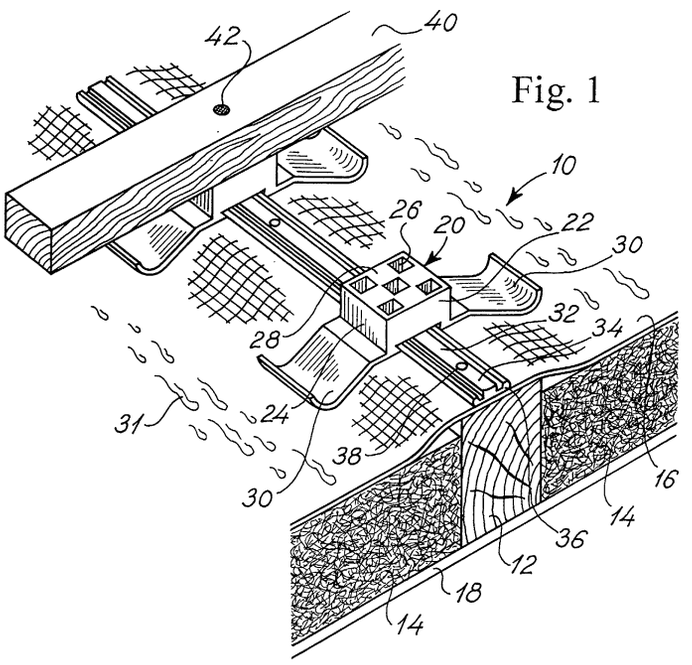

Fig. 1

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Description

[0001] The present invention relates in general to the technical field of underroof structures in which a plurality of lathes serving the purpose of supporting roof tiles of roof plates are mounted above a set of rafters defining the pitch of the roof and in which structure an underroof foil is positioned covering the pitch defining rafters or the sloping rafters and below the roof tile or roof plate supporting lathes. In general, the present invention relates to a novel technique of positioning and fixating the lathes relative to the supporting rafters. In the present context, the various terms used for defining the roof structure, in particular the terms lathes, rafters and underroof are to be construed as generic terms comprising a multiplicity of different expressions or terms used in the industry. In particular, the terms counter battens and tiling battens are to be construed as synonymous to the commonly used terms impregnated lathes and transversal lathes, respectively. Similarly, the term roofing underlay conventionally used in the industry is to be construed synonymous with the expression or term underroof foil used throughout the present specification. Furthermore, as far as the term rafters are concerned, the term is also to be construed comprising structural elements made from e.g. steel or plastics materials rather than the conventionally used wooden rafters.

[0002] In a conventional roof structure, the pitch defining rafters are used for supporting an underroof foil which is made from a plastics material and serving the purpose of preventing rain or snow from being introduced into the loft or into any insulating material positioned between the rafters. The underroof foil may be an impermeable foil or alternatively a water impermeable and vapour permeable foil as is well known in the art. The underroof foil is positioned covering the rafters and on top of the rafters and parallel therewith, impregnated lathes are normally used for defining a spacing between the transversal lathes and the underlying underroof foil and for fixation of the underroof foil. The use of the impregnated lathes extending parallel with the pitch defining rafters, have turned out to present certain drawbacks firstly relating to the materials used for the impregnation of the lathes and secondly in relation to the overall sandwiching structure.

[0003] As far as the impregnating wooden materials are concerned, the use of impregnated wooden lathes are from an environmental point of view unacceptable. It has further turned out that the use of impregnating materials in the impregnated lathes influences or deteriorates the underroof foil firstly due to the contact between the impregnated lathes and the underlying underroof foil but further through washing out of the impregnating constituents from the impregnated lathes as water originating from rain or from melting snow runs or flows down along the impregnated lathes. The impregnating constituents washed out from the impregnated lathes constitute themselves an environmental hazard but further deteriorates in many instances the plastics material of the underroof foil which are therefore converted into brittle and non-flexible foils which are easily torn apart by wind impact or by the pressure of snow lying on the underroof foil.

[0004] Numerous attempts have been made to improve the technique of producing roof structures and reference is made to the following publications: EP 0 894 914, DE 32 09 348, DE 3515 419, EP 0 046 944, and GB 2 306 981.

[0005] It is an object of the present invention to provide a novel fixation system including a distance element for use in a roof structure for the supporting of a plurality of lathes extending transversally relative to, in spaced apart relationship and raised above an underroof foil positioned on top of the pitch defining rafters of the roof structure which system including a plurality of distance elements eliminates the use of impregnated lathes and consequently solves the problems inherently associated with the use of impregnated lathes as far as environmental considerations and underroof foil preservation considerations are concerned.

[0006] It is a feature of the present invention to provide a system for the mounting of transversal lathes providing an improved ventilation below the roof tiles of roof plates by the elimination of the longitudinally extending impregnated lathes supported on top of the pitch defining rafters.

[0007] It is a particular advantage of the present invention that the novel technique of using a distance element as a substitution for the longitudinally extending impregnated lathes renders it possible to provide a bending down of the underlying roof for providing a central recess defined between any two adjacent rafters in which recess any snow or rain running down the underroof is prevented from permeating through any holes produced in the underroof foil at locations of fixating the underroof foil to the underlying pitch defining rafters.

[0008] The above object, the above feature and the above advantage together with numerous other objects, features and advantages which should be evident from the below detailed description of presently preferred embodiments of the present invention are according to a first aspect of the present invention obtained by means of a distance element for use in a roof structure including a set of sloping rafters, an underroof foil being positioned on top of the rafters and a plurality of lathes extending transversely relative to the rafters and serving the purpose of supporting roof tiles, roof plates or similar roof coverings, the lathes being fixated to the rafters in spaced apart relationship and a specific distance above the underroof foil by means of a plurality of distance elements, each distance element including a body part having a lower side for contacting the underroof foil and defining a height corresponding to said distance, each distance element having at least one wing element extending transversely relative to said body part and depending from said lower side for contacting and pressing

said underroof foil downwards, and the body part and the wing element of each distance element being made from corrosion resistant and weather proof material or materials.

[0009] The distance element according to the first aspect of the present invention is made from an environmentally acceptable corrosion resistant and weather proof material and provides through its body part the required vertical spacing between the transversal lathes and the pitch defining rafters of the roof structure. The provision of the wing element and according to the presently preferred embodiment of the distance element according to the first aspect of the present invention two wing elements extending from opposite sides of the body part, the underroof foil is forced downwards between the rafters providing a shallow recess or a broad groove in which any water or snow running down the sloping underroof foil is accumulated. Through the accumulation of water or snow running down the underroof in the recess provided by the foil deflecting wing element or wing elements of the distance element according to the first aspect of the present invention, the water or rain is prevented from contacting the body part of the distance element and any screws or nails or similar fasteners perforating the underroof foil in the location spots of fixation of the transversal lathes and distance elements relative to the supporting rafters.

[0010] Apart from the water accumulation feature obtained by the use of the wing element or elements of the distance element according to the first aspect of the present invention, a further advantage is believed to be obtained in terms of reduction of noise generated by the underroof foil through fluttering the underroof foil provided the underroof foil be exposed to wind impact. The fluttering of the underroof foil is prevented through stretching of the underroof foil.

[0011] It is further contemplated that the usage of the distance element as a substitute for the conventional impregnated lathes makes the work involved in the construction of the underroof more easy and less labour consuming since in the first place the size and the weight of the distance elements is radically reduced as compared to the weight and size of the conventionally used impregnated wooden lathes.

[0012] According to alternative embodiments of the distance element according to the first aspect of the present invention, the body part and the wing element or wing elements are made as separate components joined together in a welding, adhesion or mechanical fixation process e.g. by means of screws, rivets or like fixation elements such as through snap-fitting the body part and the wing element or wing elements together or alternatively the body part and the wing element or wing elements are integrally produced in an injection moulding, casting or extrusion process.

[0013] The distance elements are generally mounted in accordance with well-known and conventionally used mounting techniques as the distance elements are simply positioned in their intentional positions and possibly fixated by means of nails or screws to the supporting rafter whereupon the transversal lathes are simply fixated by means of screws or nails which are screwed or nailed through the lath and through the distance element possibly in a predrilled bore or hole of the distance element. According to a particular embodiment of the distance element according to the present invention, fixation flanges or fixation pins extending upwards from or relative to, respectively, the upper side of the body part for fixating or supporting, respectively, a lath relative to said body part allowing a temporary fixation of the lath relative to the distance element or alternatively a permanent fixation provided the fixation flanges themselves establish a permanent fixation and arresting of the lath relative to the distance element. However, according to the preferred technique of fixating the lathes extending transversely relative to the supporting pitch defining rafters in the spaced apart relationship, the lathes are themselves fixated by means of screws or nails to the rafters rather than fixated to the distance element exclusively.

[0014] For providing a light weight and still mechanically stable structure of the distance element, the body part of the distance element may be constituted by a hollow body structure such as a honeycomb structure or any other relevant compartmentalized structure such as a structure including a circumferential outer wall and reinforcing partition walls defining separate sub-chambers within the body part, which may be opened or closed by opposite wall parts. The hollow structure may according to alternative versions of the light weight yet mechanically stable structure extend vertically relative to the supporting rafter, longitudinally relative to the supporting rafter or transversally relative to the supporting rafter.

[0015] The corrosion resistance and weather proof capability of the distance element may be provided by producing the body part and the wing element or wing elements from a plastics material such as PP, PE, PVC, ABS, ASA, POM, PPS or a corrosion resistant metal such as aluminium or electroplated steel.

[0016] According to a further advantageously and particularly preferred embodiment of the distance element according to the first aspect of the present invention, the distance element is fixated to or adapted to be fixated to a strip or rail of corrosion resistant and weather proof material, in which case the distance elements are aligned correctly relative to the supporting rafter through the use of the strip or rail. Provided the individual distance elements are fixated to the strip, the lath supporting system is simply mounted relative to the supporting rafters by positioning a specific length of the strip having the distance elements fixated thereto in the intentional positions of the distance elements which are kept in the equidistant spacing by the fixation strip itself.

[0017] In the present context, the terms strip or rail are to be construed as generic terms comprising any

elongated structural elements such as an extruded plastics band, an extruded plastics or aluminium profile or a metal rail or profile serving the purpose as defined above of allowing the individual distance elements to be fixated to the structural element, i.e. the strip or rail in question.

[0018] The use of the strip or rail according to the above described advantageous and particularly preferred embodiment provides the further advantage of safely fixating the underroof foil which is commonly supplied as a web having a specific width corresponding to the distance between any two, three or four rafters of the roof structure. In the positioning of the individual webs of the underroof foil, i.e. in the over- and underlying positioning of any two neighbouring webs, the safe fixation and rain and wind proof junction between the two overlying webs is established by means of the rail or strip being positioned on top of the overlying webs of the underroof foil.

[0019] In the preferred version of the above described preferred embodiment of the distance element, a separate strip of a flexible plastics material is used on the which the individual distance elements are snap-fitted as the plastics material strip is provided with distance markings presenting the distance between any two adjacent distance elements corresponding to a specific size or type of roofing tiles or roofing plates to be used in connection with the roof structure.

[0020] According to this particularly advantageously and presently preferred embodiment of the distance element according to the first aspect of the present invention, the distance elements is provided with a recess in the lower side of the body part and the rail is constituted by an extruded plastics band, preferably flexible and bendable plastics band which defines a planar lower surface for contacting the supporting rafter sandwiching the underroof foil therebetween and having a profiled upper surface defining catching flanges for catching into the co-operation recess in the lower side of the body part for arresting the distance element to the strip.

[0021] The above object, the above feature and the above advantage together with numerous other objects, features and advantages which should be evident from the below detailed description of presently preferred embodiments of the present invention are according to a second aspect of the present invention obtained by means of a roof structure including a set of sloping rafters, an underroof foil being positioned on top of the rafters and a plurality of lathes extending transversely relative to the rafters and serving the purpose of supporting roof tiles, roof plates or similar roof coverings, the lathes being fixated to the rafters in spaced apart relationship and a specific distance above the underroof foil by means of a plurality of distance elements, each distance element including a body part having a lower side for contacting the underroof foil and defining a height corresponding to said distance, each distance element having at least one wing element extending transversely relative to said body part and depending from said lower side for contacting and pressing said underroof foil downwards, and the body part and the wing element of each distance element being made from corrosion resistant and weather proof material or materials.

[0022] In the roof structure according to the second aspect of the present invention, the distance element according to the first aspect of the present invention is preferably implemented in accordance with any of the above described embodiments or variants.

[0023] The above object, the above feature and the above advantage together with numerous other objects, features and advantages which should be evident from the below detailed description of presently preferred embodiments of the present invention are according to a third aspect of the present invention obtained by means of a method of positioning and fixating a plurality of lathes extending transversely relative to a set of sloping rafters of a roof structure also including an underroof foil, comprising positioning an underroof foil on top of the sloping rafters, positioning a plurality of distance elements each including a body part having a lower side for contacting the underroof foil and defining a specific height, each distance element having at least one wing element extending transversely relative to the body part and depending from the lower side for contact and pressing down the underroof foil, and the body part and the wing element of each distance element being made from corrosion resistant and weatherproof material or materials, and positioning the lathes extending transversely relative to the rafters on top of the distance elements for positioning the lathes in spaced apart relationship and in a specific distance above the underroof foil, the distance corresponding to the height of the individual elements.

[0024] In the method according to the third aspect of the present invention the advantages described above in terms of easy mounting of the transversal lathes relative to the supporting rafters are obtained. In particular the usage of a strip or rail of a corrosion resistant or weather proof material such as a plastics band or an extruded aluminium strip as described above provide particular advantages in terms of an easy and reliable mounting and fixation of the transversal lathes relative to the supporting rafters in the roof structure.

[0025] In general it is contemplated that the following advantages be obtained in accordance with the teachings of the present invention.

[0026] A pre-fabricated and ready for use mounting system including a minimum number of light weight and environmentally acceptable low costs components is provided.

[0027] The use of impregnated lathes is eliminated providing substantial environmental advantages.

[0028] The use of plastics or other corrosion resistant and weather proof materials extend the useful life-time of the underroof structure. The ventilation of the roof above the underroof is improved by the omission of the

through-going impregnated lathes extending parallel with the supporting rafters thereby eliminating or reducing the risk of frost bursts of roofing tiles or roofing plates. Alternatively the structure allows the construction of more shallow structures, i.e. structures in which the spacing between the transversal lathes and the supporting pitch defining rafters is reduced. The improved venting capability as discussed above is believed further to be of importance or relevance at locations of establishing openings in the underroof foil for e.g. chimneys, sky lights, antennas, ventilation ducts etc. The use of the wing elements extending transversally from the body part of the distance element and depending downwardly from the body part prevents the underroof foil from fluttering thereby eliminating to a substantial extent any noise generated by the underroof foil and also to some extent eliminate the risk of the underroof foil being torn due to the fluttering.

[0029] The overall system is more light weight and compact as compared to the conventional system including impregnated lathes and allows a more rational and easy and reliable operation of mounting the transversal lathes relative to the supporting rafters. Through the use of the advantageous system including a supporting strip of an extruded plastics band to which the distance element be fixated, the extruded plastics band itself preferably included markings for the proper and correct positioning of the individual distance elements for providing a specific spacing between any two adjacent transversal lathes. The fixation of the extruded plastics band to which the distance elements be fixated further allows a proper fixation irrespective of the quality of the wooden rafters used since the presence of a split or knot in the supporting rafter is easily compensated for by the simple fixation of the extruded plastics band at a position adjacent the split or knot.

[0030] The overall mounting is believed to provide a more safe fixation of the underroof foil allowing the worker to step or unintentionally fall or stumble on the underroof foil thereby also providing an improved strength as compared to the conventional structure in terms of capability of supporting the roof, supporting any snow, rain or objects or portions positioned on the underroof foil. The reduced weight of the distance elements as compared to the impregnated lathes of course also reduces the overall weight of the roof structure.

[0031] It is further contemplated that the multi-point fixation of the distance elements and particular the extruded plastics band to which the distance element be fixated improves the tear out strength of the lath supporting fixation in particular in relation to any wind suction generated under the roof or any sub-pressure generated in the loft.

[0032] The present invention is now to be further described with reference to the drawings, in which

Fig. 1 is a perspective schematic and sectional view of a roof structure including a rafter and a novel lath supporting system according to the present invention,

Fig. 2 is a perspective and schematic view similar to the view of Fig. 1 of the components of the lath supporting system according to the present invention,

Fig. 3 is a perspective and schematic view similar to the view of Fig. 2 of a second embodiment of the lath supporting system according to the present invention,

Fig. 4 is a perspective and schematic view similar to the views of Figs. 2 and 3 of a third embodiment of the lath supporting system according to the present invention,

Fig. 5 is a perspective and schematic view similar to the view of Fig. 1 of a modified version of the lath supporting system according to the present invention shown in Figs. 1 and 2,

Fig. 6 is a perspective and schematic view similar to the views of Figs. 1 and 5 of a fourth lath supporting system according to the present invention,

Fig. 7 is a perspective and schematic view similar to the views of Figs. 1, 5 and 6 of a fifth embodiment of the lath supporting system according to the present invention,

Fig. 8 is a perspective and schematic similar to the view of Fig. 4 of a sixth embodiment of the lath supporting system according to the present invention,

Fig. 9 is a perspective and schematic view similar to the views of Figs. 4 and 8 of a modified version of the sixth embodiment of the lath supporting system according to the present invention shown in Fig. 7,

Figs. 10a and 10b are perspective and schematic views similar to the views of Figs. 4, 8 and 9 of further modified versions of the sixth embodiment of the lath supporting system according to the present invention shown in Fig. 7,

Fig. 11 is a perspective and schematic view similar to the views of Figs. 2, 3 and 4 of a seventh embodiment of the one component of the novel lath supporting system according to the present invention,

Fig. 12 is a perspective and schematic view similar to the views of Figs. 2, 3, 4 and 11 of an eighth embodiment of the lath supporting system according to the present invention, and

Fig. 13 is a perspective and schematic view similar to the views of Figs. 2, 3, 4, 11 and 12 of a ninth embodiment of the lath supporting system according to the present invention.

[0033] In Fig. 1, a first embodiment of a novel lath supporting system according to the present invention is shown in its intentional use in connection with a roof structure. The overall roof structure is in its entirety designated reference numeral 10 and comprises a supporting wooden structure including a rafter 12, which extends transversally relative to the roof and sloping from

the ridge of the roof structure. In fig. 1, the illustration is intended to illustrate a position of the rafter 12 sloping from an elevated position at the upper left hand corner of Fig. 1 to a lower position at the lower right hand corner of Fig. 1. Between the rafter 12 and a plurality of adjacent rafters not shown in the drawings, insulating layers 14 are positioned, which insulating layers may be constituted by fibre glass, rockwool or any mineral fibre insulating layers or similar insulating layers such as foamed material layers, etc. or combinations of mineral fibre and foamed layer structures.

[0034] In Fig. 1, the roof structure 10 is illustrated in a top view as the roof structure is seen from the upper side of the structure. In this context, terms such as upper, lower, front, rear referring to a specific orientation are unless the context of the text clearly defines a different understanding of the term in question to be understood referring to the overall orientation of the roof and in consequence referring to the overall orientation referring to the gravitational force.

[0035] In Fig. 1, an underroof foil 16, such as the foil produced by the applicant company in accordance with the teachings of e.g. European patent application No. 01610029.9 to which reference is made, is positioned covering the individual rafters and the mineral fibre layers. At the opposite or lower side of the roof structure, a covering 18 is provided, which covering may be constituted by e.g. solid plywood plates, plaster boards, etc.

[0036] In a conventional roof structure, an impregnated lath 40 is positioned on top of each of the rafters 12, sandwiching the foil 16 between the impregnated lath and the rafter. As will be understood, the impregnated lath according to the prior art technique is extending parallel with the rafters and on top of these impregnated lathes, transversal lathes are positioned serving the purpose of allowing tiles, roof plates, etc. to be positioned on the roof structure.

[0037] For eliminating the drawbacks inherently due to the usage of the impregnated lathes, a lath supporting system according to the present invention is used in Fig. 1. The system basically comprises a set of rails or strips one of which is shown in Fig. 1 designated the reference numeral 32. The rail or strip is basically constituted by an extruded, profiled plastics band or alternatively an extruded or otherwise profiled metal rail. The terms rails or strip are as mentioned above to be considered and construed as generic terms comprising any fixed or bendable extruded or profiled structural element made from corrosion resistant materials such as a plastics material, aluminium or electroplated steel. In particular, the rail or strip 32 is constituted by an extruded aluminium profile or alternatively and preferably an extruded profiled plastics band made from solid or foamed plastics materials, e.g. ABS, PE, PP, PVC, ASA, POM, PPS or any other relevant plastics material. The use of the rail or strip 32 is of particular importance in relation to the fixation and sealing of overlaying webs of the underroof foil 16, which is conventionally supplied as a web material having a specific width corresponding to the spacing between any two, three or four pitch defining rafters of the roof structure. In the over- and underlying relationship between the two neighbouring webs of the underroof foil, the two webs need to be maintained tight together providing a safe fixation and also a water- and windproof sealing. By the use of the through-going rail positioned on top of the overlying webs of the underroof foil, the webs are safely pressed and fixated together. The rail or strip 32 is generally of a symmetrical configuration and comprises a central solid body 34 connected through wings of reduced thicknesses to two peripheral flanges 36 which define a slightly outwardly and upwardly sloping conical structure for co-operating with a matching recess of a distance element to be described in greater details below. The rail or strip 32 defines a substantially planar lower surface for facially contacting the upper surface of the underroof foil 16 positioned on top of the rafter 12. The rail or strip 32 is further provided with through-going bores 38 positioned equidistant along the length of the rail or strip for allowing the rail or strip 32 to be fixated to the rafter 12 by means of screws or nails.

[0038] On top of the rail or strip 32, distance elements 20 are positioned. The distance elements 20 are of an integrally cast structure, and are preferably made from a plastics material such as ABS, PE, PP, PVC, ABS, ASA, POM, PPS or any other temperature and weather resistant material, e.g. corrosion, resistant metal material such as aluminium or electroplated steel. The distance elements 20 each comprise a central body element 22. The element 22 is defined by an outer wall 24 defining a square configuration the interior of which is divided into a total of nine sub-chambers separated by inner partitioned walls and being closed by top or bottom closure wall parts at the upper side or alternatively at the lower side. As is evident from Fig. 1, four of the sub-chambers are closed at the top surface by top walls 28 whereas the remaining five sub-chambers are upwardly open as indicated by the reference numeral 26 referring to one of these five sub-chambers.

[0039] Alternatively, the upwardly open sub-chambers, one of which is designated the reference numeral 26, may be unclosed at the lower or bottom side.

[0040] At the bottom side of the body element 22, a recess 29 is provided for allowing the body element 22 and consequently the entire distance element 20 to be snap-fitted on to the rail or strip 32. The bottom recess is shown in greater detail in Fig. 2.

[0041] From opposite sides of the body element 22, wing elements 30 extend which wing elements are bent downwardly from the bottom side of the body element 22 serving the purpose of pressing down the underroof foil 16 for firstly stretching the underroof foil 16 for reducing any noise from wind impact on the foil and secondly for the purpose of collecting any water such as water droplets designated the reference numeral 31 at a central groove between any two adjacent rafters 12.

[0042] The distance elements 20 are positioned spaced apart or equidistantly at a specific mutual distance serving the purpose of allowing a transversal lath to be fixated relative to the rafter 12 by means of a nail or screw 42 which is forced into or screwed, respectively, into the rafter 12 extending through the central hole of the body element 22 of the distance element 20, and further through the rail or strip 32.

[0043] In fig. 2, the distance element 20 is shown in greater details separated from the supporting rail or strip 32 disclosing in greater details the bottom recess 29 of the body element 22.

[0044] In Fig. 3, a modified version and second embodiment of the distance element 20 shown in Fig. 3 is illustrated designated the reference numeral 20' in its entirety. In the present specification, components or elements identical to components or elements, respectively, described previously with reference to a preceding figure are designated the same reference numerals and components or elements differing from previously described components or elements, respectively, however serving the same overall purpose are designated the same integer as the previously described component or element, however, added a marking for identifying the structural difference form the previously described component or element. The modified distance element 20' shown in Fig. 3 differs from the above described first embodiment 20 of the distance element of the lath supporting system according to the present invention in that the vertical sub-chamber separating walls of the body element 22 shown in Fig. 1 and 2 are omitted and the body element 22' is provided with longitudinally extending holes 26'. Further as the central hole of the body element 22 shown in Fig. 1 and 2 is omitted, the modified version 20' shown in Fig. 3 is provided with upwardly protruding gripping or fixation flanges serving the purpose of gripping around and fixating a transversal lath such as the lath further shown in Fig. 1.

[0045] It is to be realised that the above described first embodiment and the modified embodiment of the distance element and also the rail or strip together constituting the novel lath supporting system according to the present invention are preferably adapted for use in connection with differently sized roof tiles, roof plates, or roof covering elements. Dependent on the size of the roof tiles or roof plates or the like to be used in connection with the roof structure, the transversal lathes such as the lath further shown in Fig. 1 are to be positioned in different mutual spacing dependent on the size of the actual roof tile or roof plates or the like. For allowing the worker mounting the lath supporting system on the supporting rafters, the rail or strip such as the rail or strip 32 shown in Figs. 1-3 may be provided with distance markings identifying the distance between any two distance elements 20 to be fixated to the rail or strip for use in connection with a specific kind of roof tile or roof plate. Alternatively, the rail or strips such as the rail or strip 32 shown in Figs. 1-3 may be provided with markings representing more than one roof tile or roof plate system or alternatively be provided with markings representing a measuring band i.e. markings representing a specific distance such as a distance of 1-5 cm or a specific number of inches.

[0046] In Fig. 4, a third embodiment of the lath supporting system according to the present invention is shown. As distinct from the above described first and second embodiments shown in Figs. 1, 2 and 3, respectively, which systems include a supporting rail or strip on to which a plurality of distance elements are fastened, the third embodiment designated the reference numeral 20" in its entirety shown in Fig. 4 comprises a central, extruded profile 22" of a general rectangular cross sectional configuration defining opposite top and bottom surfaces and opposite side surfaces. The top surface is designated the reference numeral 23" and the bottom surface is designated the reference numeral 25". The interior of the extruded block 22" is constituted by reinforcing partition walls one of which is designated the reference numeral 28" interconnecting two cylindrical walls 29" defining circular cylindrical recesses 27" for receiving a co-operating element of a separate wing element 30". As distinct from the above described first and second embodiments in which the wing elements 30 are integrally cast with the central body element of the distance element, the wing elements 30" of the third embodiment shown in Fig. 4 constitute separate elements each having a downwardly sloping or protruding flange 31" continuing into a bend part and connected to a block 33". From the opposite side of the block 33" i.e. the side opposite to the side from which the flange 31" protrudes, a circular bead 35" extends. The bead 35" is intended to be received within the circular cylindrical recess 27" of the extruded block 22".

[0047] The third embodiment 20" of the lath supporting system is mounted in a manner somewhat different from the manner in which the above described first and second embodiments shown in Figs. 1, 2, and 3, respectively, are mounted. Whereas in the first and second embodiments, the rail or strip 32 is first mounted on top of the underroof foil 16 as shown in Fig. 1 whereupon the distance elements 20 or 20' are positioned and fixated to the supporting rail or strip, the third embodiment of the lath supporting system shown in fig. 4 is mounted by initially positioning the extruded block 22" on top of the underroof foil 16 and fixated to the supporting rafter 12 by means of nails or screws which are mounted in through-going holes or bores predrilled or drilled at the site of mounting through the top and bottom walls 23" and 25" of the extruded block 22". Similar to the positioning of the individual distance elements 20 in a specific spaced apart relationship as illustrated in Fig. 1, a set of wing elements 30" are snap-fitted into the receiving and arresting circular cylindrical recesses 27" by means of the circular beads 35" of the wing elements. Whereas the distance elements 20 and 20' are to be positioned at a specific spaced apart relationship corre-

sponding to the intentional distance between any two adjacent roof tile or roof plate supporting lathes, the set of wing elements 30" shown in Fig. 4 need not be positioned in accordance with the distance between the roof tile or roof plate supporting lathes such as the lath further shown in Fig. 1.

[0048] In Fig. 5, a modified version of the first embodiment of the lath supporting system shown in Figs. 1 and 2, is illustrated. The modified embodiment shown in Fig. 5 basically differs from the above described first embodiment 20 in that the first embodiment 20 is constituted by an integrally cast structure whereas the modified version 20"' is composed of two separate components, namely a top component 22"' constituting the body element and a bottom component including the two wing elements 30"' and further a central plate part 31"' interconnecting the two wing elements 30"' and being provided with the central bottom recess 29. As is evident from Fig. 5, the bottom component is further provided with through-going holes or bores 33"' in registration with four of the upwardly open holes of the body element 22"' and serving the purpose of receiving a nail or screw for the fixation of the assembly including the body element 22"' and the wing element 30"'. Alternatively, the top component 22"' may be fixated to the central plate part 31"' by means of appropriate fixation elements such as co-operating male and female arresting elements constituting snap-fitting elements. Alternatively, the top component 22"' may in a non-permanent fixation be arrested relative to the central plate part 31"' by means of burr fixation elements of the type commonly known as velcro® fixtures.

[0049] In Fig. 6, a fourth lath supporting system according to the present invention is shown. The fourth embodiment shown in Fig. 6 differs from the above described systems in that the system does not include a rail or strip similar to the rail or strip 32 shown in Figs. 1-5 nor any body elements such as the body element 22"' shown in Fig. 5. The system generally includes a single bottom component 30^{IV} similar to the bottom component 30"' shown in Fig. 5, however differing from the wing component 30"' in that the bottom component is intended to be mounted in contact with the underlying underroof foil 16 having a top surface recess 29^{IV} in which a rod 32^{iv} such as a conventional lath or alternatively an extruded plastics or aluminium rod is received. Since the rod 32^{IV} is received within the recess 29^{IV} of the bottom component 30^{IV}, the rod is kept in a spaced apart relationship lifted above the underlying underroof foil and the rod 32^{IV} is therefore not contacted with the underlying underroof foil 16.

[0050] In Fig. 7, a fifth embodiment of the lath supporting system according to the present invention is shown including the strip or rail also constituting a component of the above described first, second, third and fourth embodiment of the lath supporting system according to the present invention. Like the above described modified version shown in Fig. 5 of the first embodiment of the lath supporting system, the distance element 20^{V} is composed of two parts, namely a body element or block 22^{V} in which the bottom surface recess 29^{V} is provided and a wing defining top component 30^{V} which includes the outwardly protruding wing elements and a central straddling wall component 31^{V} interconnecting the two wing flanges of the wing component 30^{V} and covering the underlying body element 22^{V}. On top of the straddling wall part 31^{V} of the wing component of 30^{V}, the transversal lath is fixated by means of the above described nail or screw 42 extending through the centre of the wall part 31^{V} of the wing component 30^{V} and the bottom body or block 22^{V}.

[0051] The fifth embodiment of the lath supporting system shown in Fig. 7 may further be modified by the omission of the rail or strip 32 and the body element or block 22^{V} as the straddling wing component 30^{V} may alternatively be used in connection with a central rod such as the above described rod 32^{IV} shown in Fig. 6 or alternatively in connection with a conventional impregnated lath.

[0052] In Fig. 8, a sixth embodiment of the lath supporting system according to the present invention is shown. The sixth embodiment designated the reference numeral 20^{VI} in its entirety basically constitutes a combination of the above described first and second embodiments in an integral structure which may advantageously be manufactured in an extrusion process. The sixth embodiment includes a central body 22^{VI} of a rectangular cross sectional configuration and including a plurality of longitudinally extending through-going apertures one of which is designated the reference numeral 26^{VI} separated by partition walls one of which is designated the reference numeral 28^{VI}. From the lower edges of the central body 22^{VI}, the wings 30 extend downwardly and sidewards from the central body.

[0053] On the top surface of the central body 22^{VI}, markings are provided one of which is designated the reference numeral 39 serving the purpose of allowing the worker mounting the lath supporting system on the supporting rafter to position the transversal lathes such as the lath further shown in Figs. 1 and 7 in correspondence with a specific marking further corresponding to the size of a specific type of roofing tile or roofing plate.

[0054] In Fig. 8, two sets of markings are provided on the top surface of the central body 22^{VI} for allowing the system to be used in connection with at least two different roofing tile or roofing plate dimensions or types. Alternatively, the markings may be used for allowing the worker to cut the extruded body constituting the sixth embodiment 20^{VI} into separate components or elements for providing individual distance elements similar to the distance elements 20 shown in Fig. 1.

[0055] In Fig. 9, a modified version of the sixth embodiment 20^{VI} shown in Fig. 8 is illustrated which modified version varies from the above described sixth embodiment in that a plurality of lath fixation clamps are fixated to the top surface of the central body 22^{VI} which

clamp elements include upwardly protruding flanges 27^{VI} interconnected by a central plate 28^{VI} which may be fixated to the top surface of the central body element 22^{VI} by means of screws or nails or alternatively as indicated in Fig. 9 by means of claw shaped flanges gripping round the top edge of the central body element 22^{VI} for co-operating with longitudinally extending ridges provided in the side walls of the central body 22^{VI}.

[0056] In Figs. 10a and 10b, further modified versions of the above described sixth embodiment of the lath supporting system according to the present invention shown in Fig. 8 are illustrated. Common to the further modified versions shown in Figs. 10a and 10b, is the feature of providing individual distance elements 20^{VII} produced from the extruded body 20^{VI} shown in Fig. 8 and fixated to a supporting flexible plastics band 32^{VII} serve the same purpose as the strip or band 32 described above with reference to Figs. 1 and 2. In Fig. 10a, the flexible band 32^{VII} is simply adhered to a lower surface of the body element 22^{VII} of the distance element whereas in Fig. 10b, a lower surface recess 29^{VII} is produced in the lower surface of the body element 22^{VII} of the distance element 20^{VII} which recess is designated the reference numeral 29^{VII} and serves the same purpose as the above described recess 29 illustrated in Figs. 1-3. By the provision of the recess 29^{VII}, the individual distance elements 20^{VII} may be fixated to the plastics band 32^{VII} on which distance markings 39^{VII} are provided for allowing the worker mounting the lath supporting system to adjust the individual distance elements 20^{VII} in conformity with a specific mutual spacing for accommodating a specific roofing tile or roofing plate size.

[0057] In the plastics bands 32^{VII} shown in Figs. 10a and 10b, through-going apertures 38^{VII} are optionally provided for allowing the plastics band 32^{VII} to be fixated to the supporting rafter such as the rafter 12 shown in Fig. 1.

[0058] In Figs. 11, 12 and 13, three further embodiments of the distance element of the lath supporting system according to the present invention are shown. In Fig. 11, the distance element in its entirety designated the reference numeral 20^{VIII} and constitutes a seventh embodiment of the distance element of the lath supporting system. Generally, the seventh embodiment 20^{VIII} shown in Fig. 11 and similarly the eighth and ninth embodiments 20^{IX} and 20^{X} shown in Figs. 12 and 13, respectively. are adapted to and configurated for use in connection with the profiled rail or strip 32 shown in Figs. 1, 2, 3, 4 and 5.

[0059] The seventh, eighth and ninth embodiments, however, exhibit additional features of the distance element of the lath supporting system according to the present invention. The central body of each of the three distance elements shown in Figs. 11-13 are constituted by a cellular structure including a multiplicity of open-ended chambers or cells, one of which is designated the reference numeral 26^{VIII} in Fig. 11 and similarly designated the reference numerals 26^{IX} and 26^{X} in Figs. 12 and 13, respectively. In the central part of the body of the distance elements 20^{VIII}, 20^{IX} and 20^{X}, a major aperture is provided defined by opposite parallel walls, one of which is designated the reference numeral 50 and reinforced through supporting partition walls 51 and 52.

[0060] The overall structure of the body part of the unitary distance elements 20^{VIII}, 20^{IX} and 20^{X} shown in Figs. 11, 12 and 13, respectively, serve the purpose of providing a light-weight, yet solid and stable lath supporting structure.

[0061] For temporarily supporting the lath in its intentional position supported by the distance elements 20^{VIII}, 20^{IX} and 20^{X} shown in Fig. 11, Fig. 12 and Fig. 13, respectively, a set of upwardly protruding fixation pins 48 are provided. The pins 48 serve the purpose of temporarily fixating the lath on the sloping supporting roof structure until the lath is permanently fixated by means of a nail or a screw such as the nail or screw 42 shown in Figs. 1 and 7 by allowing the transversal lath to rest on top of the surface of the central body of the distance element and to be supported by the upwardly protruding pins 48.

[0062] Through the provision of the major central aperture of the body of the distance elements 20^{VIII}, 20^{IX} ad 20^{X}, the risk of destroying or permanently deforming the distance element provided the nail or the screw such as the nail or the screw 42 shown in Figs. 1 and 7 is forced into the distance element is reduced.

[0063] The seventh. eighth and ninth embodiments 20^{VIII}, 20^{IX} and 20^{X} of the distance element of the lath supporting system according to the present invention further exhibit a particular feature relating to the provisions of or maintenance of a long time stable underroof foil depression. As most plastics material exhibit a long time deformation provided the material be exposed to a permanent mechanical impact, the three embodiments 20^{VIII}, 20^{IX} and 20^{X} shown in Figs. 11, 12 and 13, respectively, are provided with respective features for preserving the permanent depression of the underroof foil. In Fig. 11, the wings 30^{VII} are constituted by a horizontal web or wall 44 continuing in an obtuse angle into a further planar web or wall 45 continuing into an upwardly bend and curved end part 46. For preserving the obtuse angular position of the planar web or wall 45 relative to the horizontal web or wall 44, reinforcing flanges 43 are provided extending upwardly from the horizontal planar web or wall 44 and from the downwardly sloping planar web or wall 45.

[0064] In Fig. 12, the eighth embodiment 20^{IX} of the distance element of the lath supporting system according to the present invention is provided with a different means for preserving the intentional horizontal position of the wing element of the distance element and also the intentional obtuse angular position of the planar web or wall 45' relative to the horizontal planar web or wall 44' by means of an upwardly bend spring element 43' serving the purpose of springloading the planar webs

44' and 45' downwardly in their intentional position even after an extended period of time of use.

[0065] In Fig. 13, the permanent maintenance of the intentional configuration of the wing element of the distance element 20^{X} is provided by means of an interlayered spring steel element defining an obtuse angle, which element is composed of two spring steel parts 53 and 54 providing the intentional angular position of the planar web or wall 45" relative to the horizontal web or wall 44" and also of the upwardly bend and curved end part 46 in its depending position relative to the lower surface of the central body of the distance element in which bottom surface the recess 29 described above is provided. Whereas the above seventh and eighth embodiments 20^{VIII} and 20^{IX} shown in Figs 11 and 12, respectively, are integrally injection moulded from a plastics material, the ninth embodiment 20^{X} shown in Fig. 13 is injection moulded having the spring steel element composed of the two parts 53 and 54 integrally cast into the plastic structure of the distance element.

Example

[0066] In a prototype implementation of the lath supporting system according to the present invention as illustrated in Figs. 1-3, the central body 22 was made from a solid block of the material PP. The block measured width 50 mm, length 57 mm and height 25 mm. The wings 30 were separately produced and shaped into the wing configuration shown in Fig. 1. The wing 30 was made from POM and fixated to the solid body 22 by means of screws. The wings 30 each protruded 38 mm from the side walls of the block 22 and defined a downwardly deflection relative to the lower surface of the body 22 in the order of 10 mm. The recess 29 of the central body 22 constituted by the solid block made from PP having the width of 25 mm and a vertical height of 6 mm. The strip 32 was constituted by a strip of foamed PVC material and defined a width of 25 mm.

[0067] In a prototype set-up, the lath supporting system constituted by the prototype embodiment proved to be satisfactory as to mechanical stability and ability to provide the intentional deflection of the underroof foil for providing similar water or droplets guide as illustrated in Fig. 1.

Claims

1. A distance element for use in a roof structure including a set of sloping rafters, an underroof foil being positioned on top of the rafters and a plurality of lathes extending transversely relative to the rafters and serving the purpose of supporting roof tiles, roof plates or similar roof coverings, the lathes being fixated to the rafters in a spaced apart relationship and a specific distance above the underroof foil by means of a plurality of distance elements, each distance element including a body part having a lower side for contacting the underroof foil and defining a height corresponding to said distance, each distance element having at least one wing element extending transversely relative to said body part and depending from said lower side for contacting and pressing said underroof foil downwards, and the body part and the wing element of each distance element being made from corrosion resistant and weather proof material or materials.

2. The distance element according to claim 1, comprising two wing elements extending from opposite sides of the body part.

3. The distance element according to claims 1 or 2, the body part and the wing element or wing elements being made as separate components joined together in a welding, adhesion or mechanical fixation process e.g. by means of screws, rivets or like fixation elements.

4. The distance element according to claims 1 or 2, the body part and the wing element or wing elements being integrally produced in a casting or extrusion process.

5. The distance element according to any of the claims 1-4 further including fixation flanges or fixation pins extending upwards from or relative to, respectively, the upper side of the body part for fixating or supporting, respectively, a lath relative to said body part.

6. The distance element according to any of the claims 1-4, the body part being constituted by a hollow body structure of a honeycomb structure or a structure including reinforcing partition walls and a circumferential outer wall.

7. The distance element according to any of the claims 1-5, the body part and the wing element or wing elements being made from a plastics material such as PP, PE, PVC, ABS, ASA, POM, PPS or a corrosion resistant metal such as aluminium or electroplated steel.

8. The distance element according to any of the claims 1-6, the distance element being fixated to or adapted to be fixated to a strip or rail of a corrosion resistant and weather proof material.

9. The distance element according to claim 7, the distance element being provided with a recess in the lower side of the body part and the rail or strip being constituted by an extruded plastics band or aluminium strip defining a planar lower surface for contacting the supporting rafters sandwiching the under-

roof foil therebetween and having a profiled upper surface defining catching flanges for catching into the co-operating recess in the lower side of the body part for arresting the distance element to the strip or rail.

10. A roof structure including a set of sloping rafters, an underroof foil being positioned on top of the rafters and a plurality of lathes extending transversely relative to the rafters and serving the purpose of supporting roof tiles, roof plates or similar roof coverings, the lathes being fixated to the rafters in spaced apart relationship and a specific distance above the underroof foil by means of a plurality of distance elements, each distance element including a body part having a lower side for contacting the underroof foil and defining a height corresponding to said distance, each distance element having at least one wing element extending transversely relative to said body part and depending from said lower side for contacting and pressing said underroof foil downwards, and the body part and the wing element of each distance element being made from corrosion resistant and weather proof material or materials.

11. The roof structure according to claim 10, each distance element including any of the features of the distance element according to any of the claims 2-9.

12. A method of positioning and fixating a plurality of lathes extending transversely relative to a set of sloping rafters of a roof structure also including an underroof foil, comprising:

positioning an underroof foil on top of the sloping rafters, positioning a plurality of distance elements each including a body part having a lower side for contacting the underroof foil and defining a specific height, each distance element having at least one wing element extending transversely relative to the body part and depending from the lower side for contact and pressing down the underroof foil, and the body part and the wing element of each distance element being made from corrosion resistant and weatherproof material or materials, and positioning the lathes extending transversely relative to the rafters on top of the distance elements for positioning the lathes in spaced apart relationship and in a specific distance above the underroof foil, the distance corresponding to the height of the individual elements.

13. The method according to claim 12, the distance elements being fixated to the underlying rafters by means of a strip or rail of a corrosion resistant or weather proof material such as a plastics band, the distance elements being fixated to or being adapted to being fixated to the strip or rail.

14. The method according to claim 13, each of the distance elements having a recess in the lower side of the body part and the rail or strip being constituted by an extruded plastics band or aluminium strip defining a planar lower surface for contacting the supporting rafters sandwiching the underroof foil therebetween and having a profile upper surface defining catching flanges for catching into the co-operated recess in the lower side of the body part of each of the distance elements, the distance elements being fixated to the underlying rafters by snap-fitting the distance elements on to the rail or strip.

Fig. 1

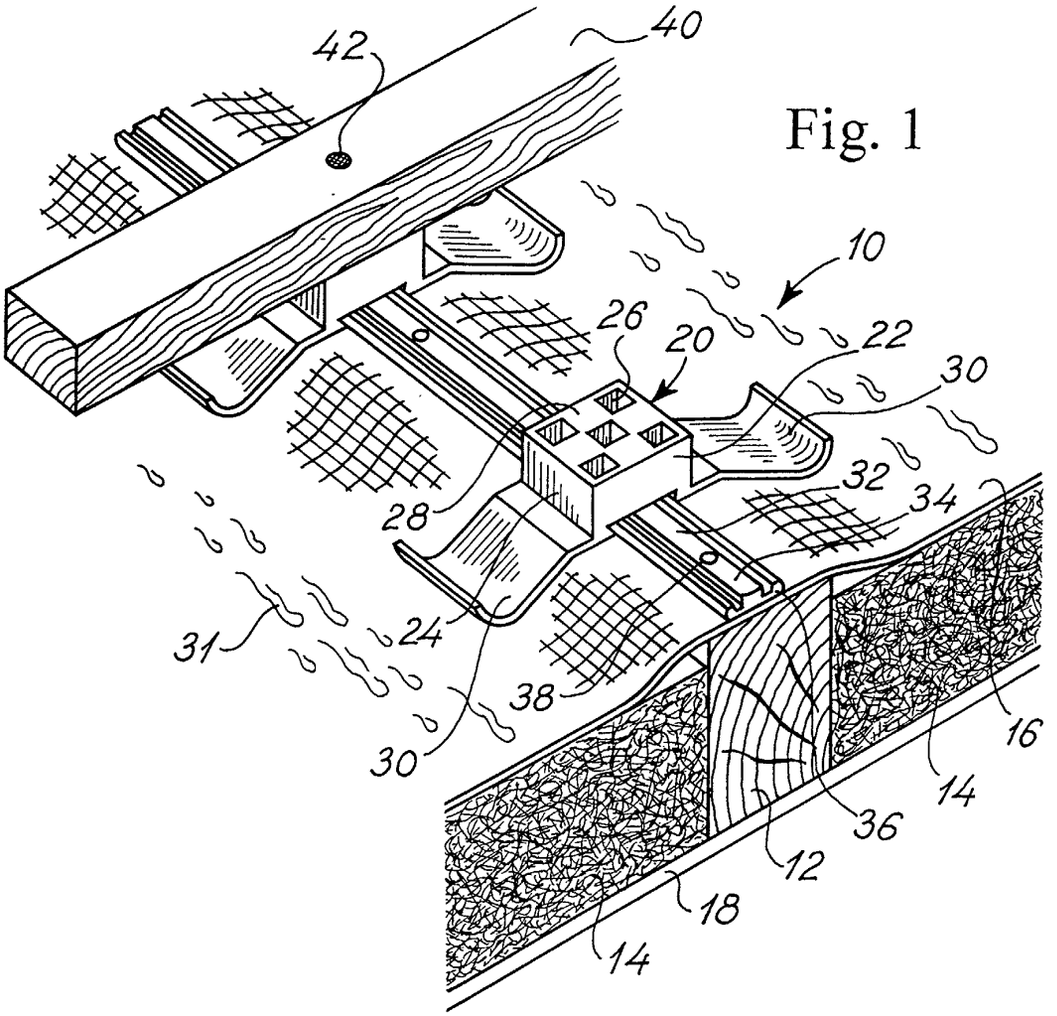
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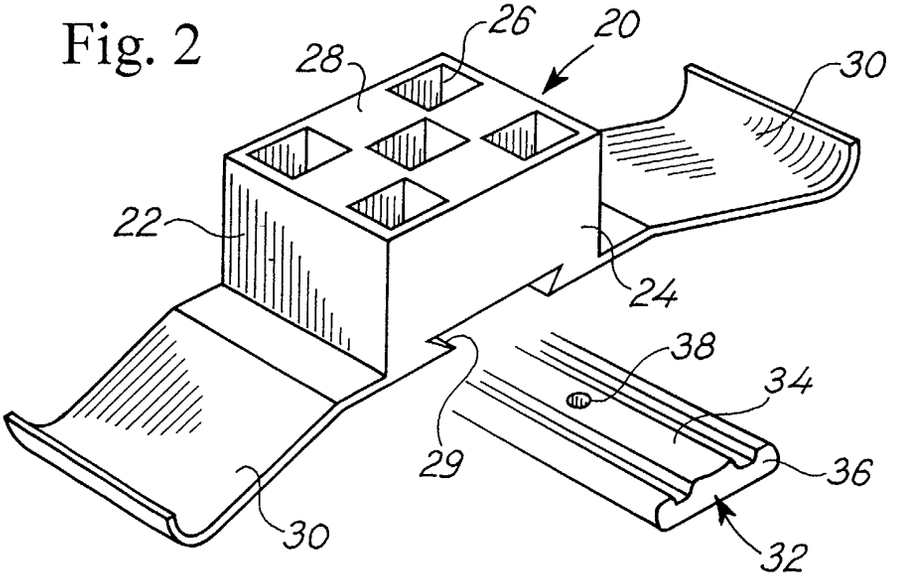
Fig. 2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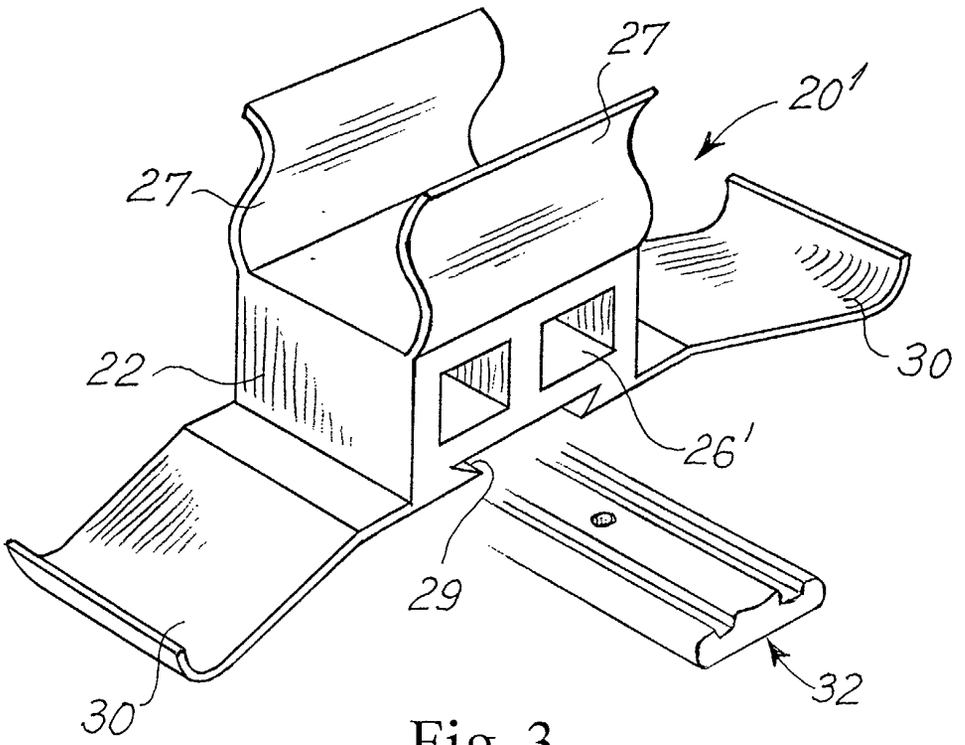


Fig. 3

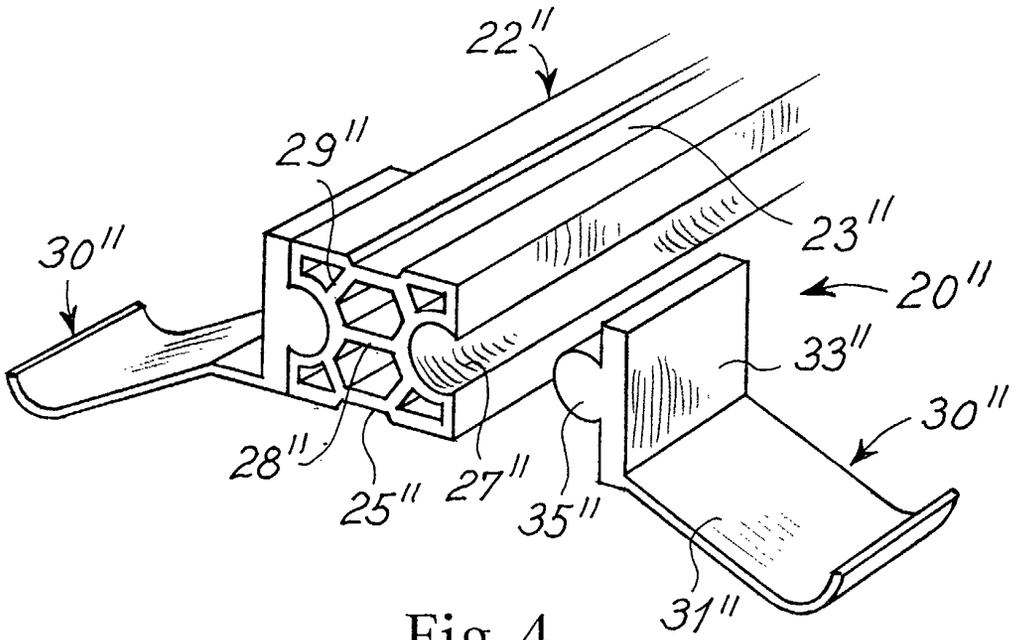
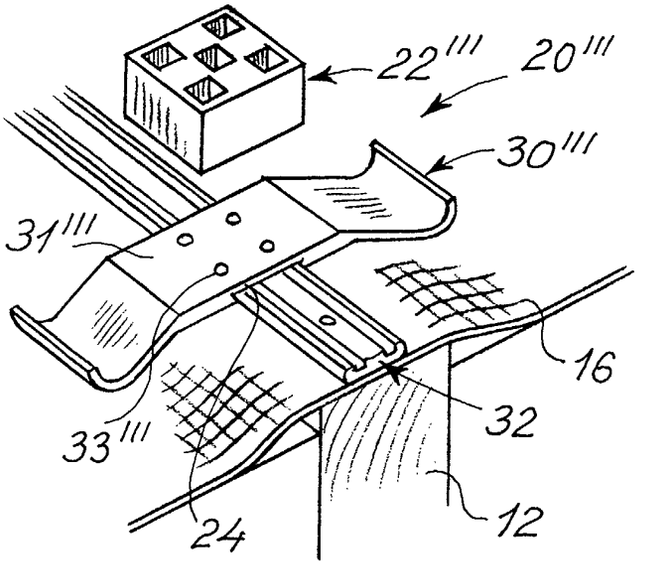


Fig. 4

Fig. 5



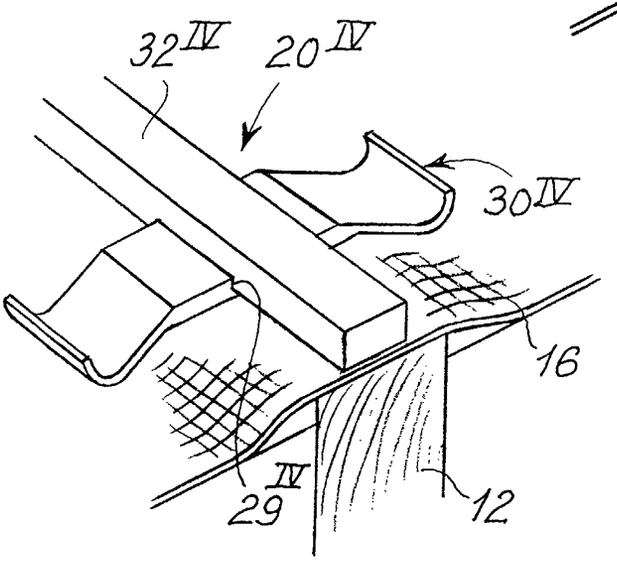
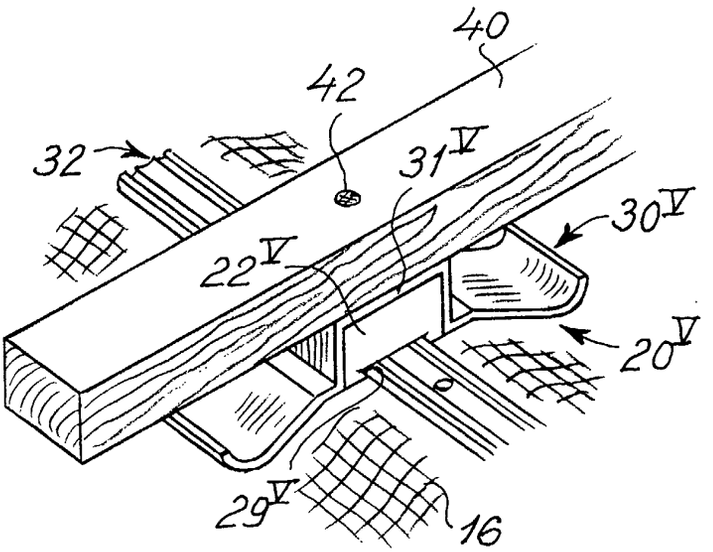


Fig. 6

Fig. 7



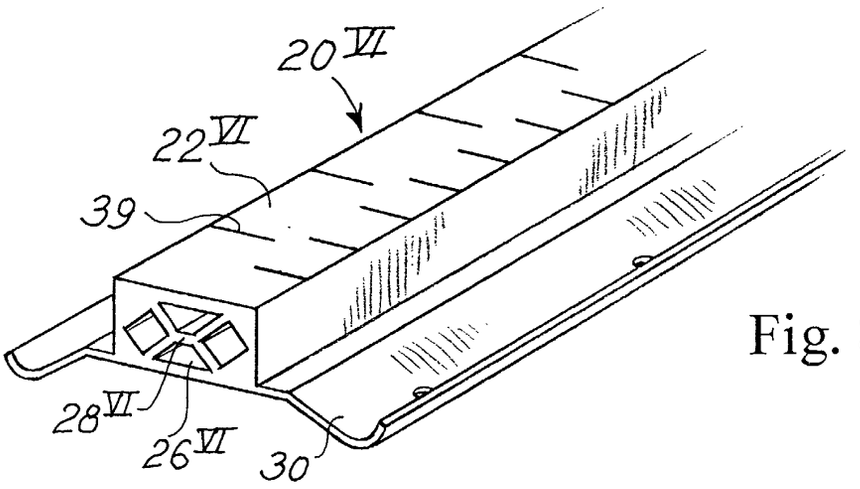


Fig. 8

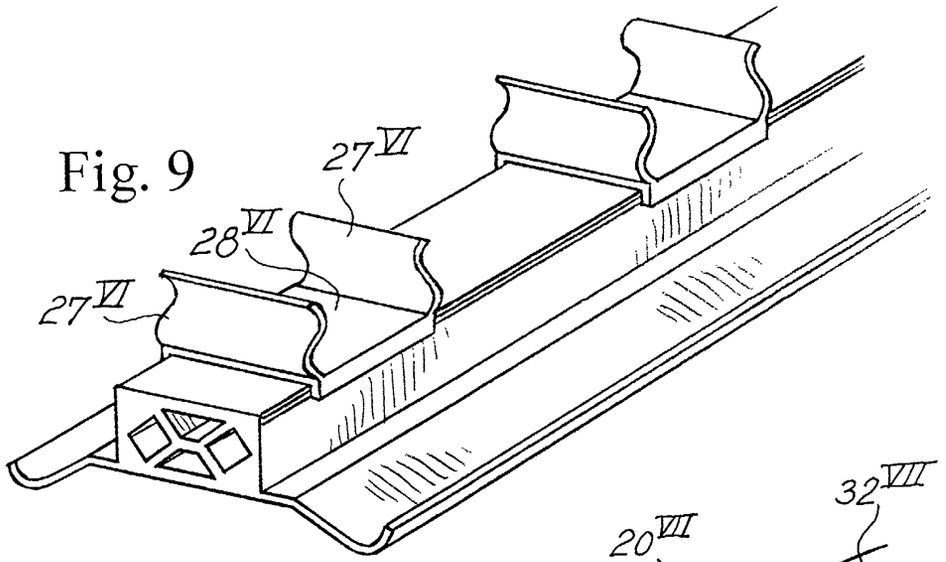


Fig. 9

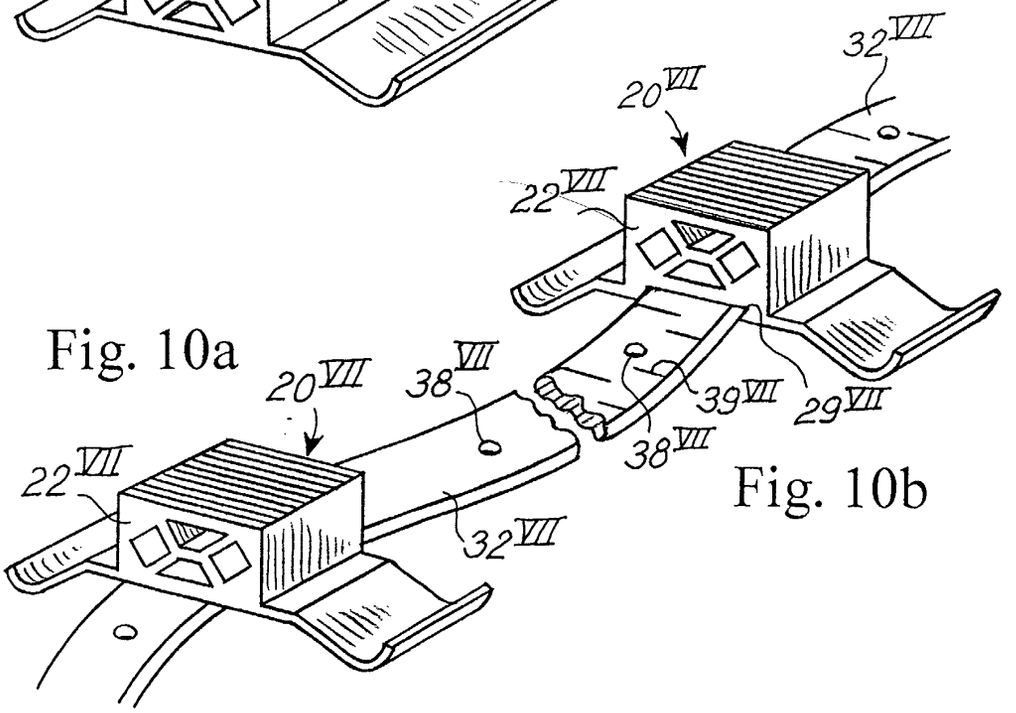


Fig. 10a

Fig. 10b

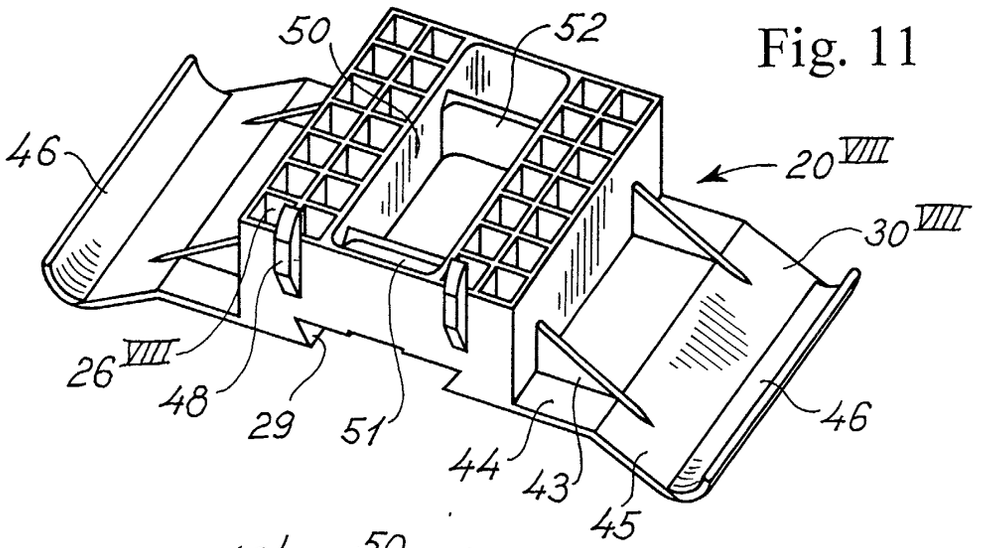


Fig. 11

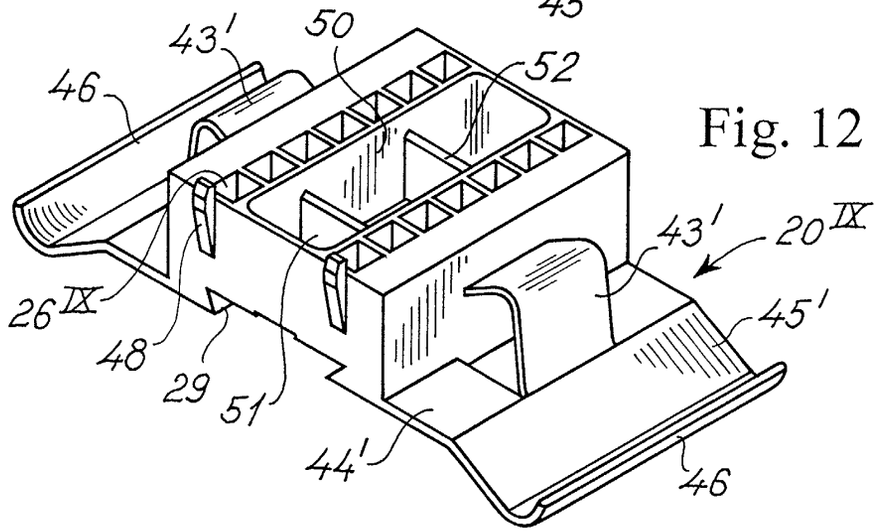


Fig. 12

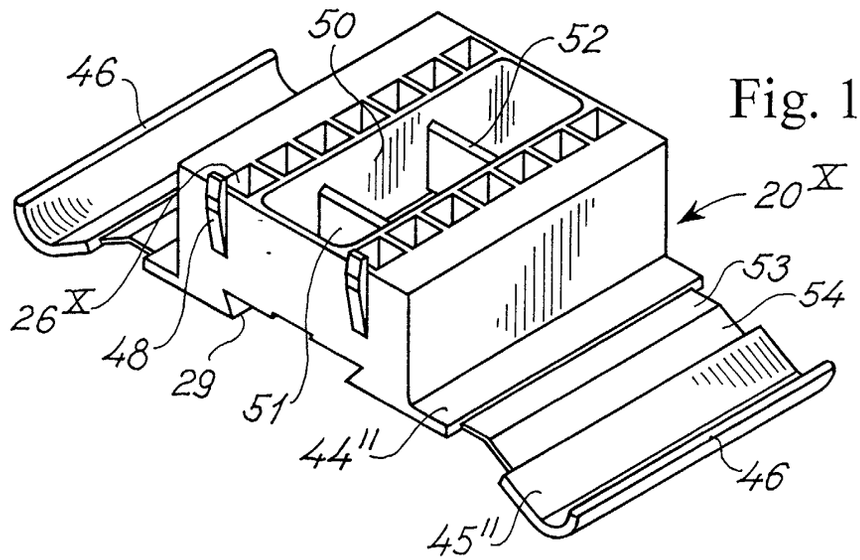


Fig. 13

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 01 61 0123

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 4 848 049 A (HANSON GLENN R) 18 July 1989 (1989-07-18) * abstract; figures *	1,2,4,5,7	E04D12/00
A	DE 86 10 892 U (MÜLLER WINFRIED MATTHIAS) 25 September 1986 (1986-09-25) * claims 5,7; figures *	1,10,12	
A	GB 2 169 324 A (ANCHOR BUILDING PRODUCTS LTD) 9 July 1986 (1986-07-09) * page 3, column 2, line 71 - line 83; figures 6,8,7 *	1,10,12	
A	US 6 108 992 A (SHAW JOHN G) 29 August 2000 (2000-08-29) * page 1, line 21 - line 22; figures 2,7 *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7) E04D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	18 April 2002	Demeester, J

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18-04-2002

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4848049 A	18-07-1989	NONE	
DE 8610892 U	25-09-1986	DE 8610892 U1	25-09-1986
		DE 3712933 A1	04-02-1988
GB 2169324 A	09-07-1986	IE 57189 B1	20-05-1992
US 6108992 A	29-08-2000	NONE	

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