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(54) SYSTEM FOR INTERNAL INSULATION OF BUILDINGS, IN PARTICULAR OF SLANTED ROOFS AND MOUNTING METHOD FOR THE INTERNAL INSULATION

(57) A system for internal insulation of buildings, in particular slanted roofs and mounting method for the internal insulation.

In a system for internal insulation of buildings, in particular of slanted roofs with a wooden basic construction including rafters and/or beams and slats or profile strips arranged thereon at a distance attachment devices are used which are configured in two components, namely a base element and an attachment element adjustable relative thereto, wherein the relative positioning of attachment element and base element is fixate able.

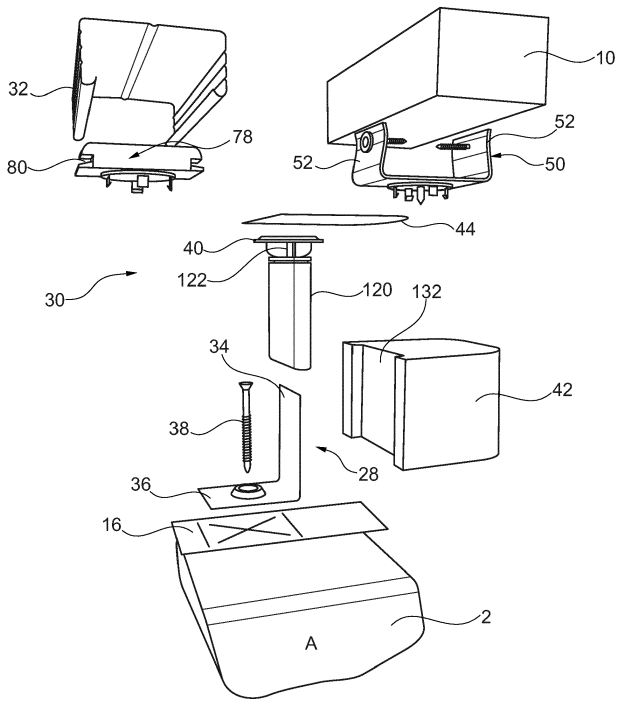

Fig. 5

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Description

[0001] The invention relates to a system for the internal insulation of buildings, in particular of slanted roofs according to the preamble of patent claim 1. The invention furthermore relates to a respective mounting method for applying an internal insulation, advantageously in the field of slanted roofs and a particularly suitable attachment device element.

[0002] In the field of building insulation so called on rafter insulation is known for slanted roofs wherein the insulation material is applied to rafters extending perpendicular to a ridge beam of a roof, wherein the rafters are arranged at a distance from one another and extend according to the slant of the roof. Thereafter a lower cover web forming a water repellent outer layer is placed on the insulation material, thereafter there is counter and support lattice work forming a support structure for the roof tiles. Optionally a vapor barrier foil or a similar suitable climate membrane can be provided in particular in a remodeling situation.

[0003] Additionally, also the portion between the rafters arranged at a distance from one another can be filled with insulation material. So called clamping felts are typically used for this purpose. Clamping felts are typically delivered on rolls and are provided with evenly spaced marking lines. For insulation purposes, sections are cut off by a knife or similar on site from the unwound clamping felt roll, wherein a length of the clamping felt rolls corresponds to a clear width between the rafters and a predetermined oversize. These clamping felt sections are accordingly inserted between the rafters under pressure which builds up a reset spring force within the clamping felt so that the clamping felt is firmly supported between the rafters. Due to a considerable thickness of the rafters a large amount of damping material can be arranged between the rafters due to a considerable thickness of the rafters when providing between rafters insulation which naturally increases the insulation effect.

[0004] The subsequently described invention does not relate to external insulation of buildings but to an internal insulation of buildings wherein the insulation material is arranged from an inside under the inward oriented faces of the rafters (so called under rafter insulation). Also for under rafter insulation a support lattice structure is used which is formed by slats or metal profiles attached at the rafters at a distance from one another like in on rafter insulation. This support lattice structure/metal substructure is arranged from an inside on the respectively deployed insulation materials and attached at the rafters with attachment device elements, as an alternative thereto, the support lattice structure is applied first and the insulation materials are introduced thereafter. The support lattice structure is used for receiving the inner covering for which typically sheet rock is used which is attached at the support lattice structure with screws. Insofar a force introduced through the support lattice structure has to be received overall by the attachment device elements.

[0005] When there are walls made from a beam construction, either in the field of slanted roofs or when there are walls that extend over the entire height of a story and which have a wooden structure, the internal insulation is analogously applied to the rafter wherein also here an intermediary rafter insulation is typically, this means insulation material is arranged between the offset support rafters. Since this configuration differentiates on the one hand side between rafters for roof construction and on the other hand side beams for walls the term rafter element is subsequently uniformly used for beams and rafters like the term slat element typically includes slats made from wood and also optionally used profile strips made from plastic or sheet metal, in particular so called C or CD profile strips. Also the term under rafter insulation is uniformly used for the internal insulation placed in front of the rafter elements in a slanted roof and also in a vertical wall.

[0006] A system of this type for internal insulation of slanted roofs formed by rafters is known from WO 2009 / 103 911 A2. Thus insulation plates made from mineral wool for heat and/or sound insulation are placed onto the rafters from an inside and supported by anchor elements which are configured like bolts. These bolt type anchor elements are attached at the rafters by an integrally formed base portion and respectively include a head piece which is configured for receiving U-profile bars, wherein the head piece can be furthermore clipped onto an anchor element and which is furthermore also provided with clip in grooves for clipping on the profile bar. After arranging the insulation elements at the rafters the U-profile strips are clipped onto the head pieces of the anchor elements transversal to the longitudinal direction of the rafters, so that a support lattice structure is formed which is eventually used for receiving the cover elements, in particular sheet rock plates. These sheet rock plates are typically attached by self cutting bolts at the support lattice structure from an inside of the room wherein the support lattice structure is made from suitable profile strips.

[0007] The insulation material plates are thus arranged between the rafter and the head element of the anchoring elements, optionally with a vapor barrier or a similar climate membrane arranged there between. The anchoring elements are arranged at an inside of the rafters through the integrally formed base pieces through a bolted connection. An adaptation through thermal insulation plates with different thickness is either provided through a respective offset of the bolted connection of the anchor elements at the rafter through the base element or the base element is formed from plural sections arranged behind each other which are connected with one another through weak sections, so that respective sections are separable from the base element as a function of the thickness of the thermal insulation plate. This system however causes a certain assembly complexity, in particular with respect to adaptation to heat insulation plates

with various thickness. Also during assembly the insulation elements arranged at the rafters are not secured against falling off which makes insulating large surface roofs more difficult.

[0008] A system for internally insulating buildings is known from WO 2006 / 061 538 A1 for insulating walls formed from bricks or wall elements, wherein mineral wool insulation elements are arranged at an inside of the wall made from wall elements which is oriented towards the interior space of the building, wherein an inner covering is applied to the mineral wool insulation elements. Also here sheet rock plates are used in particular for the inner covering.

[0009] In this system horizontally extending profile strips are attached at the built up wall into which support elements are clipped at a uniform distance from one another wherein the support elements protrude from the profile bars to an interior of the room. Horizontally extending profile strips are also arranged at the upper and at the lower end of the built up wall. Eventually the insulation material elements are placed onto bolt shaped support elements. Thereafter respective locking elements are placed onto the protruding bolts of the support elements, wherein the locking elements are provided with head elements with clip in grooves into which in particular vertically oriented C profile strips are clipped. The bolt of the support element and also a respective inner borehole of each locking element are provided with opposite engagement profiles in the form of rib bands with free spaces in between in which a longitudinally extending rib shaped bar is configured. Depending on the rotational orientation of the locking elements, they can be moved together with the vertical C profile strips clipped thereto on the bolts of the support element in a direction towards the applied damper element. In the desired position the locking elements are then locked by rotating a lever arranged at the locking element, so that the vertical profile bars are fixated in the desired insertion position at a distance to the horizontal profile strip on the support elements. Thereafter the sheet rock plates are placed onto the vertical profile bars and threaded together with screws with self cutting thread with these profile strips in order to form the inner covering.

[0010] Various quick attachment elements are furthermore known from (EP 2 476 921 A1, EP 2 476 922 A1) through which profiles strips are connectable with each other with an adjustable distance, in particular for connecting thermal insulation and/or sound insulation elements for building walls. These quick connecting elements are provided with an anchor bolt provided with a head piece for connecting to a C-profile and an insertion bolt insert able therein, wherein both elements are provided with corresponding rib bands over a partial circumference. In one orientation the insertion bolt can be moved relative to the anchor bolt and can interlock in a desired plug in position or insertion position by a rotation by 90° similar to WO 2006 061 538 A1.

[0011] In particular in the field of slanted roofs increasingly an under rafter insulation is used, thus always in combination with a between rafter insulation. This type of insulation is used for new construction and also for renovating buildings. Thus it is important that the support lattice structure is leveled as precisely as possible over the entire roof surface in order to receive the fairing elements so that the covering arranged on the support lattice structure is flat and level over the entire roof portion, in particular to provide an optically appealing surface configuration for the inner spaces provided under the roof portion. This leveling is very complex and time intensive, in particular due to the fact that the support lattice structure is attached at the rafters by a plurality of anchoring or attachment elements which overall have to be adjusted an set accordingly for leveling, e.g. by placing wood, veneer or plastic plates with different thickness behind the slats/profiles. Furthermore the inner insulation of slanted roofs is advantageously provided with insulation elements with different thickness which typically has the consequence that a plurality of different attachment elements has to be used for inner insulations of this type which are to be attached at the rafter in a suitable manner and respectively at a correct position for receiving the slats for the support lattice work and furthermore with a respective distance from the rafter in order to be able to receive the insulation elements arranged between support lattice work and rafters and vapor retarder foils or similar climate membranes. Thus the assembly of insulation elements for this type becomes very complex for an internal insulation of this type and based on errors during assembly difficulties occur thereafter when cover plates are applied in a separate process step because sufficient leveling of the support lattice work is missing. This requires additional complex measures, wherein damping can become time consuming and also expensive. Practical applications have shown that errors during such internal insulations are quite frequently caused by a deficient execution of the so that there is a need for a suitable mounting system for an internal insulation of this type, in particular in the slanted roof field.

[0012] Thus it is an object of the invention to provide a suitable system for an internal insulation of this type which can be used for mounting the insulation elements in a quick, simple and safe manner and in order to facilitate the execution of the insulation work and in order to prevent or avoid a deficient execution of the insulation caused by the mounting. It is another aspect of the invention to not only provide quick assembly but in particular also a precise assembly which in a simple manner facilitates an even leveling for subsequent layup of covering plates.

[0013] This object is achieved according to the invention by a system with the features of claim 1.

[0014] According to the invention the slat elements are arranged to form the lattice work for the fairing through attachment elements which are divided into a base element and an attachment element thus so that the attachment element that can be arranged on the base element

is adjustable into a desired elevation position relative to the base element and so that the attachment element is lockable in this position. Furthermore the attachment element includes a receiver element for the slat element of the support lattice arrangement thus a support for forming the under rafter insulation thus a support for the insulation elements is provided that are placed from below to the rafter elements for forming the under rafter insulation during the assembly by the base elements attached to the rafter elements, wherein in particular clamping felts are used for this purpose which when they are arranged between the connectors respectively provide support due to the built up reset forces. Thus support function for the insulation elements of the under rafter insulation is in particular important for the main application of insulating the slanted roof. Due to the attachment elements that are respectively placeable onto a base element a desired distance to the rafter can be adjusted which is advantageous because insulation elements with different thickness are used as required for the below rafter insulation. For clamping felts in a range of the below rafter insulation for example thickness dimensions in a range of 60 mm to 120 mm and above are typical. Simultaneously an individual leveling for the support lattice work is feasible so that a flat surface for the covering elements can be provided in a simple manner that are applied to the lattice structure. After the leveling has been performed only the slats have to be arranged in the receiver provided on the attachment element.

[0015] In particular receiver shoes with a U profile shaped receiver are suitable as receiver elements, wherein these receiver shoes are used in particular when slats made from wood are used. The receiver shoe is thus advantageously configured for the typical slat dimension of 60 x 40 mm, wherein for other slat dimensions thus 50 x 30 mm certainly also accordingly configured receiver shoes can be used. For improving support of the slats during assembly it is useful that knob or hook shaped protrusions are configured at least at one of the U-arms of the receiver shoe, so that a temporary support is provided as an assembly support already after the slat is inserted until the slat has been bolted to the receiver shoe. Depending on the application also profile strips made from sheet metal or plastic are used for forming a support slat, in particular C- profiles or CD profiles and similar. For this application the receiver element is provided as a head piece with laterally provided grooves for clip connecting profile strips of this type.

[0016] For mounting the attachment devices typically an assembly tool is used according to the invention wherein the assembly tool is configured band shaped and which includes positioning elements in a predetermined even distance, wherein a distance of the positioning elements from one another corresponds to the desired distance of the slat elements for forming the support lattice work. These assembly tools are attached along the rafter bottom side oriented into the interior of the space so that the positioning elements configured or provided thereon facilitate an exact and also quick arrangement of the attachment devices at the rafters during assembly which is very advantageous for an exact orientation of the support lattice work that is to be subsequently attached and which also facilitates a quick fixation of the attachment device at the rafters without complex measuring steps.

[0017] For an assembly aid according to the invention an adhesive tape with a release foil is useful thus with a glue surface on one side which is covered by the release foil wherein the release foil can have graphic markers as positioning elements, for example a cross shaped marking, a circular marking and similar depending how the base element is configured in the attachment portion at the rafter, so that a simple and form fitting placement of the attachment devices at the rafter is facilitated.

[0018] When required also pedestal elements can be used as positioning elements wherein the pedestal elements are also attached on a band with a distance from each other and wherein the pedestal elements are already provided with a receiving mechanism which corresponds to the base element so that also without screw, nails or similar mechanical attachment devices an anchoring of the base element at the rafter can be provided merely by inserting the base element into the respective pedestal element. Advantageously clip connections in particular also a bayonet connection are used as a quick coupling connector. A quick coupling connector of this type has the advantage that assembly times can be reduced significantly since screwing the attachment elements to the rafter can be omitted, typically a multiple screw connection is respectively provided per attachment device. The band connecting the pedestal elements can be attached in a suitable manner, thus through adhesion, with mechanical attachment devices or similar at the rafter.

[0019] The base element advantageously includes a pedestal which is provided in an advantageous variant at its lower end with at least one side ways protruding attachment flange, in particular one attachment flange protruding from one side of the pedestal or in particular two attachment flanges protruding at opposite sides from the pedestal through which the attachment at the rafter is provided by a bolted connection, a nailed connection or similar. In another advantageous variant which facilitates omitting the screw connection process the base element is configured as complementary connector element relative to the pedestal element in order to facilitate a quick coupling of the base element at the rafter element in that the base element is configured as a clip element, or in particular as a bayonet closure element or similar.

[0020] Thus, it is also advantageous according to the invention to combine plural different attachment options in the same base element wherein for example the lower portion of the base element can be configured as annular shoulder in case of a bayonet closure wherein the shoulder includes radial protrusions for forming the bayonet closure element, wherein the radial protrusions reach be-

hind respective grooves in the pedestal element, wherein however the annular shoulder is also additionally provided with openings for a pass through of screws or similar attachment devices, so that the attachment of the base element can be optionally performed with a bayonet closure or with a threaded connection or similar mechanical attachment devices.

[0021] It is advantageous to configure the base element as a simple sheet metal component or plastic component, in particular as an injection molded component which facilitates a cost effective production of these base elements. This is advantageous in particular because the attachment devices of this assembly system are mass produced components. In another advantageous variant extrusion cast profiles, in particular such profiles made from aluminum can be used for forming the base elements, wherein then only respective sections have to be cut off from one extrusion case profile. A configuration of this type is particularly suitable for an application where the attachment element is configured as overreaching element which is placed on the base element in an overreaching arrangement. Plastic components are useful for preventing heat bridges through the attachment devices, however influencing the insulation according to the invention with potential heat bridge effects is rather insignificant so rather also a respective metal is suitable in particular sheet metal or extrusion cast components.

[0022] The attachment element that can be arranged at the base element, however, can also be advantageously configured as an inserted element, wherein the base element is then accordingly configured for a respective receiver, in particular with a receiving pedestal for receiving the inserted element. Thus, the placement position of the inserted element in the base element is advantageously provided by form and/or friction locking, in particular by an interlocking fixation or a clamping process.

[0023] When using an attachment element configured as an insertion element the receiving pedestal can be configured in a simple manner in a single wall pedestal so that the pedestal is provided with horizontal slots that are offset on top of one another so that bars are configured above one another between the slots on the pedestal. These bars when configured as a sheet metal component can be sequentially shaped in opposite direction from the pedestal outward in particular cambered in order to form the receiving pedestal. This is advantageous because a receiving pedestal can thus be configured in a simple manner for example from a simple single wall sheet metal component thus an L shaped sheet metal component configured as a base element wherein the sheet metal component is then used for receiving the insertion element. In an advantageous variant thus the insertion element can be provided with a suitable engagement profile like e.g. interlocking elements wave profiles rib strips teethings, threaded profiles and similar and the receiving pedestal can be provided with a complementary engagement profile for mutual engagement. Thus an elevation adjustment and also a height adjustment and a fixation due to engagement are feasible. Teethings, waves and ribs are particularly suitable as engagement profiles which are advantageously arranged on top of one another like a band.

[0024] In a simple cost effective variant the insertion element can be directly formed merely by a leveling screw, at whose upper end only the receiver element for receiving a slat element is provided.

[0025] The leveling screw can be provided with a suitable thread profile or thread, wherein standard threads can certainly be used for cost reasons. The base element with which the leveling screw cooperates is thus provided with a complementary thread profile or thread as a receiving bushing. Calculations with maximum load through covering plates below the below spar insulation and in view of the weight of the insulation material have shown that the form locking due to interaction of the leveling screws with the respective receiving bushings of the base element suffices with multiple safety for the required load bearing. As required an additional friction locking clamping between leveling screw and base element can be provided through respective configuration of the receiving bushing, thus through subdividing into bars that are arranged on top of each other which are separated from one another through slots, wherein the friction locking clamping superimposes the form locking between the leveling screw and the base element and additionally contributes to a respective load bearing.

[0026] In an advantageous embodiment the pedestal at its upper end which is remote from the rafter is provided with a flange on a partial circumference of the pedestal which protrudes sideways, in particular with a flange that laterally protrudes beyond the pedestal which provides a contact surface for a placement of a vapor retarder foil or a similar climate membrane and also an advantageous support of the damping elements applied to the rafters for under rafter insulation during the mounting process, in particular during subsequent application of the elements for the support lattice work. This is particularly advantageous for the main application of a slanted roof. Thus it can be advantageous to provide a flange on a separate component in particular on a sleeve that can be placed onto the upper end of the base element that is remote from the rafter.

[0027] Advantageously the insertion element at its surface interacting with the receiving pedestal, in particular the bars of the receiving pedestal is provided with an engagement profile, in particular a groove profile and interacts with a complementary engagement profile in particular a groove profile in the receiving pedestal or at the bars. A wave profile is particularly suited as a groove profile. This engagement profile provides an advantageous support of the insertion element inserted into the receiving pedestal for assembly already before clamping the insertion element in the receiving pedestal so that the insertion elements placed so to speak overhead are already accordingly supported in the base elements or

in the receiving pedestal during the assembly process.

[0028] In another embodiment it is useful not to configure the attachment element as an insertion element but rather as an attachment element which reaches over the base element during attachment or wherein the base element penetrates the attachment element.

[0029] Thus, the attachment element in an advantageous variant can be configured as a section of an extruded profile in particular made from aluminum which is advantageously configured from two parallel longitudinal arms which can define the receiving cavity for penetrating the upper section of the base element between each other. In this portion a suitable engagement profile can be provided and a complementary engagement profile can be provided at the base element. For this purpose in particular a wave profile is suitable, in particular a fine wave profile or also a tooth or groove profile. Placing the attachment element is thus performed under respective pressure so that a relative adjustment between placement element and base element can be performed for suitable elevation adjustment. Due to the spring force of both longitudinal arms thus built up a respective stable anchoring of both structural elements is then achieved when both engagement profiles mesh so that the support lattice work is received with sufficient safety.

[0030] In an alternative embodiment the attachment element can be built up as an attachment sleeve. Thus it is advantageous that the sleeve is provided with a U shaped housing component which is closeable by a cover element. Suitable engagement profiles can be provided at both U-arms, in particular ribs or similar wherein the engagement profiles are interlock able with respective ribs of the base element. The interlocking is achieved in particular due to a tension build up when closing the cover element. Also this facilitates a subsequent readjustment of the attachment element in a simple manner even after applying the support lattice work. Since the cover element only has the be opened for the base elements and thereafter the insertion sleeve is adjustable relative to the base element and can be interlocked again by closing the cover element.

[0031] With the attachment device according to the invention a quick and simple mounting of an inner insulation can be provided in particular at slanted roofs. Thus, advantageously initially the positioning elements are arranged along each rafter thus through a an adhesive tape or a threaded connection so that thereafter the base element can be applied one after another at exactly predetermined positions. Since the positions are predetermined by the positioning elements provided on the bands no complicated measuring steps are required for determining the individual attachment points which facilitates a quick and simple placement and attachment of the base elements at the rafters. Thereafter the under after insulation is quickly arranged wherein the insulation elements can be fixated between the base elements in particular by a flange provided at the base element against drop down during assembly. Thereafter optionally also a vapor retarder foil or another suitable climate membrane can be applied in particular on the flanges of the base element, thereafter the attachment elements are applied to the base elements and eventually the lattice elements are arranged thus through a threaded connection with the accordingly configured receiving shoes. Attaching the climate membrane foil can be provided through glue pads provided on the flanges wherein the glue pads can be provided with a release liner for activating the glue connection. Particularly advantageous are glue pads based on a self-adhesive and simultaneously sealing compound which provide an air tight sealing of the penetrations of the foil in addition to the fixation of the foil. Suitable compounds are known to a person skilled in the art and provided by various vendors.

[0032] As an alternative to factory mounting the glue pads at the flange surfaces they can be applied to the flanges with a dispenser when mounted on site as required. This takes care of the fact that in a significant number of cases the climate membrane is directly attached to the rafters, so that the insulation according to the invention is arranged in front of the air tight layer on an interior side of the space and no foil layer is applied to the flanges wherein the factory attachment in many cases represents unnecessary complexity.

[0033] Alternatively the surfaces of the flanges can be provided with a hook and loop type surface structure for attaching the foil which cooperates with a respectively configured surface structure of the vapor retarder.

[0034] For the bands with the positioning elements it is advantageous to standardize them already for a particular length, thus with a predetermined distance of the positioning element relative to each other. The band length is influenced by process considerations and can be for example 10 meters. The distance of the positioning elements is determined by fire protection and static requirements and the size of the covering elements used, advantageously sheet rock plates typical distances are between approximately 40 cm and 62. 5 cm, the graphic marking elements are thus advantageously adjusted to the attachment element of the base element, so that the base element is only placed and positioned against the graphic pattern and can then immediately be screwed down or attached by a suitable quick connector.

[0035] According to another advantageous variant the pedestal of the attachment device is configured with a plug in shoe which is used for receiving the insertion element on which the profile bar or slat is received. Advantageously the plug in shoe is suspended at the pedestal and supported floating with respect to pressure or spring elastic. The plug in shoe can be configured in one component or can be advantageously configured in two components and can be produced and arranged integrally in one piece with the pedestal or also separately from the pedestal. The pedestal is thus in particular configured by two flange shaped elements which are arranged opposite to each other thus with a distance from one another so that an intermediary space is formed for receiving the

plug in shoe.

[0036] The plug in shoe is provided with an opening, in particular a bushing shaped opening for receiving the insertion element, in particular an insertion member arranged at this location which is configured with a threaded profile or an engagement profile, in particular a finely structured interlocking profile with interlocking distances of advantageously between 1 mm and 3mm, advantageously approximately 1.5 mm. The plug in shoe is thus configured so that inserting the plug in element thus advantageously a screw the opening is expanded thus advantageously against an suspension of the plug in shoe within the pedestal which eventually leads to a wedging and clamping in a desired mounting position.

[0037] Advantageously the plug in shoe is arranged within the pedestal or between the flange elements by bar shaped lobes which are arranged on both sides of the plug in shoe and which extend between the plug in shoe and the flange elements and which are furthermore advantageously arranged in series respectively on top of one another at a distance from one another. In a mounting position of the pedestal the lobes extend from the flange elements in a direction towards the plug in shoe upward at a slant angle, thus advantageously at an angle of approximately 30° to 60°, further advantageously 35° to 55°, particularly advantageously 45°.

[0038] The plug in shoe advantageously includes a bushing shaped component which defines the opening for receiving the plug in screw. Thus it is particularly advantageous for an integral configuration of the shoe in one piece that the plug in shoe is slotted up to the receiving opening so that it can expand when inserting the plug in element or the screw while building up reset forces. In an advantageous manner the plug in shoe is configured in two components including a head expansion that may be arranged at one end and thus it is advantageous that the insertion shoe is integrally configured with the remaining pedestal element for an integral configuration of the plug in shoe and also for a multicomponent configuration in particular a two component configuration of the plug in shoe, wherein the connection of the pug in shoe with the flange elements is provided through the lobes that are arranged on top of one another and provided on both sides. The opening in the bushing shaped portion of the plug in shoe is thus configured with an interlocking profile or a thread profile complementary to the plug in element so that interlocked plug in positions can be taken when inserting the plug in element or the insertion element.

[0039] This configuration yields a very quick and simple assembly of the insertion elements. The insertion element only has to be pushed or inserted into the opening of the plug in shoe, thus until the insertion movement stops wherein the insertion element remains fixated at this location. Now when the covering thus the profile bars or slats and sheet rock plates are applied then as a matter of configuration the clamping force between the pedestal and the insertion element increases so that a safe positioning in the desired mounting position is facilitated. Thus also a simple adjustment is possible when a manual pressure is applied to the expanded head element of the plug in shoe since this pivots the lobes upward in mounting position so that the clamping is reduced or removed so that an easy adjustment of the insertion elements is possible through translatoric insertion or movement of the insertion element within the pedestal. In an assumed desired interlocking position a fine adjustment is then possible in as far as rotating the screw facilitates an adjustment within the interlocking distance of the interlocking or thread profile. For easier turning for the purpose of adjustment the screw or the insertion element is advantageously provided with a square or hexagon or similar for applying a suitable tool for turning the screw.

[0040] According to another advantageously embodiment the insertion element thus in particular the screw is provided with an expanded top at its end that is oriented away from the free end, wherein the plug in element can be snap locked into the head of the insertion element which is thus provided with downward protruding clamping or clip members. Thus the clamping is provided so that after clamping the insertion element or the screw the plug in element is still rotatable within the head of the insertion element in order to perform readjustments.

[0041] In an advantageous embodiment of the invention the insertion element is universally configured for receiving a profile bar and also a slat. Thus, it is advantageous to provide two laterally opposed grooves at the top element for snap locking the profile bar and a stop bar that is laterally arranged and downward extending in mounting position for laterally attaching the slat which can then be screwed together with the top element by regular screws. This configuration has the advantage that various individual elements do not have to be stocked.

[0042] Subsequently advantageous embodiments of the invention are described to schematic drawing figures, wherein:

FIG. 1 illustrates a portion of a slanted roof with rafters from an interior;
FIG. 2 illustrates a detail view of the slanted roof of FIG. 1 with an assembly tool with a graphic marker;
FIG. 3 illustrates another embodiment of an assembly tool with pedestals arranged on a band;
FIG. 4 illustrates a detail view of a portion of the slanted roof with the band that is provided with pedestals according to FIG. 3;
FIG. 5 illustrates a first variant A of an attachment device with an insertion sleeve in an exploded view;
FIG. 6 illustrates a view of the attachment device according to FIG. 5 with open insertion sleeve;
FIG. 7 illustrates a detail view according to FIG. 6;
FIG. 8 illustrates a view according to FIG. 7, however with a closed cover piece in a clamped position;
FIG. 9 illustrates a top view of the variant A with the receiver element to be applied;
FIG. 10 illustrates the embodiment according to variant A with an applied receiver element;

FIG. 11 illustrates a top view of the variant A with a clipped on profile bar;
FIG. 12 illustrates an embodiment of another attachment device according to variant B in an exploded view;
FIG. 13 illustrates a view of the variant B in a functional position;
FIG. 14 illustrates a view of the base element of the attachment device according to FIG. 12;
FIG. 15 illustrates a multi-functional receiver element for an attachment device;
FIG. 16 illustrates a front view of the attachment device according to FIG. 12 with a receiver element according to FIG. 15 in a functional position for receiving a profile bar;
FIG. 17 illustrates another embodiment of an attachment device in an exploded view;
FIG. 18 illustrates a detail view of the attachment device illustrated in FIG. 17;
FIG. 19 illustrates a view of the attachment device according to FIG. 18 with an applicable receiver element for a wooden bar;
FIG. 20 illustrates a lateral view of the variant C illustrated in FIGs. 17 - 19;
FIG. 21 illustrates a front view of the variant C with a sheet metal profile strip received therein;
FIG. 22 - 27 illustrates plural views of various sequential steps of a mounting method using the system;
FIG. 28 illustrates a representation of another embodiment of a attachment device in an exploded view;
FIG. 29 illustrates a perspective view of an attachment device before inserting the insertion element;
FIG. 30 illustrates a view according to FIG. 40 in which the insertion element is inserted;
FIG. 31 illustrates a representation of the pedestal with the received screw in a side view;
FIG. 32 illustrates three views of a pedestal of this embodiment in the operating position with a screw of the insertion element;
FIG. 33 illustrates a side view of the embodiment according to FIG. 39 illustrating the receiving top element;
FIG. 34 illustrates a side view of the attachment device showing a slat attachment at the top element;
FIG. 35 illustrates a representation of the attachment device according to FIG. 39 with a profile bar snap locked on;
FIG. 36 illustrates a respective view of the attachment device with the wooden slat applied;
FIG. 37 illustrates a perspective view of another embodiment of the attachment device in an exploded view in an application for receiving a sheet metal profile or a wooden slat;
FIG. 38 illustrates a perspective view with a sheet metal profile snap locked on;
FIG. 39 illustrates a detail, namely the top element according to FIG. 38 in an exploded view;
FIG. 40 illustrates a respective view with screws for attaching a wooden slat;
FIG. 41 illustrates a side view of the attachment device with the profile bar snap locked on; and
FIG. 42 illustrates a respective view with a wooden slat to be received.

[0043] Subsequently the invention is described with reference to a slanted roof configuration with rafters, wherein this embodiment is also implementable for beam structures of vertical walls.

[0044] It is well known that slanted roofs in a simple embodiment are made from an upper bridge beam at which rafters are attached on both sides in uniform intervals, thus on a left and on a right side of the bridge beam. At a lower end the rafters are attached at so called base beams. In case of an under beam insulation slats are arranged at an inside of the rafters, thus on an inward oriented side of the rafters transversal to the rafters wherein the slats are attached at the rafters which in turn are arranged along the rafters at a distance from one another and which form the horizontal support lattice work for receiving the inner fairing. The slats of the support lattice work do not only have to be able to carry the load but also have to be leveled precisely. Between this support lattice work the under spar insulation is advantageously attached with a thickness that corresponds to the slat depth wherein the so called inter slat insulation can be additionally arranged between the slats.

[0045] FIG. 1 schematically illustrates the configuration of one half of a slanted roof 1 with rafters 2 that are arranged at a distance to one another, a between rafters insulation 4 which is typically arranged flush with the rafters between the rafters 2, this means whose thickness corresponds to the height of the rafters and which completely fills the space between the rafters, a ridge beam 6 extending transversal to the rafters 2 and a bottom beam or threshold 8 and support lattice work arranged there between which is formed from slats 10 arranged at a distance from one another and extending transversal to the rafter.

[0046] In the embodiment illustrated in FIG. 1 eight slats 10 are provided in an exemplary manner between the ridge beam and the base beam 8 and wherein the slats 10 are attached at six rafters 2.

[0047] For a slanted roof half with a total of 6 rafters according to FIG. 1 this means that the slats have to be screwed down in a complex manner at 48 attachment points 12 and that they also have to be leveled. Thus FIG. 1 illustrates the slats 10 which extend horizontally and transversal to the rafters and which are not illustrated in a three dimensional manner but only has transversal bands for simplification purposes.

[0048] In case of the under rafter insulation described in an exemplary manner for description purposes the slats 6 have to be arranged at a distance to the rafters 2 so that respective insulation elements can be arranged

in the space between the rafters and the rear side of the slats 6. Thus according to the invention special attachment devices are attached which on the one hand side support the slat 6 respectively at a respective distance to the rafters 2 attach them at the rafters and furthermore are also configured so that they receive the slat 6 or can alternatively also receive C-profile bars and can be leveled in elevation which then forms the lattice work for the fairing that is eventually to be applied and which is mostly made from sheet rock plates. Attachment devices of this type are subsequently illustrated and described in different advantageous embodiments.

[0049] It is self-evident that this assembly work is complex, namely FIG. 1 only shows a roof half with 6 rafters in an exemplary manner. However typically many more rafters are provided per roof half of a roof thus also more attachment points for anchoring the support lattice work at the rafters.

[0050] In order to precisely attach these attachment devices at the provided attachment positions 12 which can be provided by a screw connection assembly aids are advantageously provided. For this purpose an adhesive tape is particularly suited wherein the adhesive tape can be wound from a roll and can be used for an adhesive attachment along each rafter 2 and wherein the adhesive tape is marked with markings 14 at a visible side that is oriented away from the adhesive joint with the rafters wherein the markings are arranged at even distances over the length of the adhesive tape 16 thus according to the nominal distance of the slats 10 of the support lattice work of the roof. A respective embodiment is illustrated based on FIG. 2 in which the respective adhesive tape 16 are already glued against the face of the rafters 2 oriented towards the interior of the room. The markings 14 which are provided on the visible side of the adhesive tape 16 and arranged at even distances from one another over the length of the adhesive tape are also clearly visible wherein the markers in this embodiment are formed in an exemplary manner by a cross marking. Other markings are also possible.

[0051] For an even orientation of all attachment points along the rafters of a roof half a thread 18 can be advantageously run horizontally on the rafters under tension so that all tapes for a roof half can be attached exactly in a line guided by the first markings and glued on the rafters on in another manner for example by staples. Alternatively this horizontal orientation axis is visualized by a construction laser. This yields an even pattern for all attachment points so that the attachment devices can be fixated exactly at the provided attachment points at the rafters.

[0052] A variant of a mounting aide of this type is illustrated in FIGs. 3 and 4 wherein the mounting aide is formed by a band 20 that is wound into a roller, in particular a band made from plastic material on which pedestal elements 22 are arranged, thus at uniform distances from one another wherein the distance corresponds to the provided distance between the slats 10 of the support lattice work. These pedestal elements 22 can be suitably attached on the band 20, thus through gluing, clip connection, inserted connection and similar. In the illustrated embodiment of FIG. 3 and 4 the pedestal elements 22 are centrally provided with an opening 24 through which the pedestal elements 22 can be attached at the rafters 2, in particular by screws, nails or similar. These pedestal elements are suitable for clip type, interlocking in particular bayonet shaped quick connectors for which the pedestal element has to be accordingly configured as bayonet closure receiver and the attachment device to be attached thereon has to be configured with a complementary bayonet configuration or similar.

[0053] In FIG. 4 in turn illustrates a thread 18 that is advantageously horizontally strong over the slats for precise alignment wherein the upper most pedestal elements 22 can be exactly applied to the thread so that a uniform orientation of all pedestal elements of the bands provided for the rafters can be provided in a simple manner.

[0054] As will be described infra in more detail the pedestal elements are provided with coupling members which facilitate a simple arrangement of the attachment devices at the pedestal elements, thus through a bayonet closure, clip interconnection or a similar quick connector. A connector of this type also facilitates dismounting attachment devices of this type.

[0055] These assembly aids facilitate a correctly positioned fixation of the attachment elements for the desired support lattice work and thus of the support slats or alternatively C or CD profile strips and similar made from sheet metal or plastic material. As stated supra the support lattice work has to be attachable at a distance from the rafters in order to be able to arrange the insulation that is provided between the rafters and the support lattice work. Furthermore the support lattice work also has to be precisely leveled in elevation which requires an exact orientation of the mounted slats at a level in order to provide an even surface for the fairing to be applied. Attachment devices suitable for this purpose are subsequently described in more detail.

[0056] The first embodiment of a respective attachment device is described with reference to FIGs. 5 - 11 wherein FIG. 5 illustrates an exploded view of all elements of the attachment device according to a first variant A.

[0057] As evident from FIG. 5 this attachment device is provided in particular for use together with a mounting 8 according to the previously described adhesive tape 16 thus in a cross configuration, wherein the adhesive tape 16 is illustrated in FIG. 5 for better representation only as a partial section like the rafter 2. The attachment device is made from a base element 28 to be attached at the rafter 2 and an attachment element 30 wherein FIG. 5 illustrates two embodiments of the attachment element 30, namely on a right side for receiving a slat 10 made from wood and on a left side for receiving a profile bar namely a C- profile bar made from sheet metal which

like the slat 10 is only illustrated in a portion. The profile strip is thus designated with the reference numeral 2 wherein for simplicity purposes this profile strip is also subsumed under the genus of a slat 10. Any strip with a different suitable cross sectional profile can be used as a profile bar.

[0058] The base element 28 which is illustrated in this embodiment as a sheet metal element however can also be made from plastic material as required and includes a pedestal 34 with an attachment flange 36 that is provided at a lower end and in particular integrally formed, wherein the attachment flange can be provided with openings so that the base element 28 can be attached at the rafter 2 with screws 38 in a suitable manner. Furthermore FIG. 5 illustrates an insulation element 42 that is illustrated in sections for below rafter insulation, wherein commercially available insulation elements are used for under rafter insulation which can be configured as required for thermal and/or sound insulation and which are mostly made from mineral wool like e.g. glass wool or rock wool. In particular a so called under rafter felt is suitable as an insulation element wherein insulation elements with different thickness, thus 60 mm, 80mm, 100 mm and similar are used as required, wherein a height of the pedestal can be accordingly adjusted to this thickness of the insulation element 42, this means respective pedestals with a respective elevation can be used. The bead shaped recess in FIG. 5 is only generated as an imprint due to the contact at the attachment element in an assembled position of the insulation element.

[0059] It is certainly also possible to make the pedestal elevation adjustable in order to be able to use the same pedestal for insulation elements with different thickness. This can be provided for example by a two piece configuration of the pedestal with respective interlocking connection with elevation offset interlocking devices or through disintegration of a respective insertion sleeve into tassels.

[0060] Furthermore FIG. 5 discloses a membrane, in particular a climate membrane 44 or a vapor retarder foil which is arranged flat on the insulation element 42 and advantageously glued together therewith. Respective climate membranes can be vapor retarders or respective under membranes for gluing purposes glue pads or glue tapes can be provided on the flange.

[0061] In case a respective C- shaped profile strip made from sheet metal or plastic material is used instead of a slat 10 made from wood according to the right illustration in FIG. 5 a head 78 configured as a clip on component is provided instead of a receiving shoe 50. This receiving shoe 50 is laterally provided with grooves 80 so that the profile strip 30 with its inward oriented C-arms 82 can be clipped into the grooves 80 and thus onto the head. Furthermore the insertion element 30 is configured identical to the variant illustrated on the right in FIG. 5.

[0062] The base element 28 is advantageously L-shaped and in particular configured as a single wall sheet metal component, wherein the L-arm is used as an attachment flange 36 for attaching at the rafter 2, thus with a screw connection according to FIG. 5 wherein the L-bar arranged perpendicular to the rafter 2 is configured as a single wall pedestal 34 for receiving a sleeve 120 that is moveable along a bar shaped pedestal 34 into a desired position at the pedestal 34 and interlockable as an attachment component. In the illustrated embodiment the base element 28 is configured as a sheet metal component and the sleeve 120 is advantageously configured from plastic material. The sleeve 120 includes a flange 40 at its upper end in FIG. 5 wherein the flange 40 is connected through a protrusion 122 with the furthermore housing shaped sleeve 120. The sleeve 120 can thus be overall integrally produced through injection molding from plastic material. The attachment device according to variant A can optionally be provided with a receiving element, e.g. a receiving shoe 50 for receiving a slat 10 made from wood or a head element 78 configured as a receiving element with laterally provided grooves 80 for a clip connection with a for example C-shaped profile strip 42. The receiving shoe 50 and also the head 78 for the interconnection with the profile strip are thus configured as inserted components and interlock able on the flange 40 from above after application, wherein the flange 40 includes respective interlocking openings. As apparent from the exploded view according to FIG. 5 a climate membrane 44 can be provided between the flange 40 and the inserted components.

[0063] Furthermore the two arms 52 of the receiving shoe can be provided with plural knobs or hooks at their inner surface and respectively include an attachment opening for a threaded connection with the wooden slat 10. Mostly screws are used for attaching the slats. The knobs or hooks are used for supporting and securing the slat already for the next screw connection by the two arms 52 of the receiving shoe 50 after inserting the slat into the receiving shoe 50. Thus it has to be considered that the illustration of FIGs. 5 - 11 is turned upside down for simplification purposes, actually however the rafter 2 is respectively on top and the receiving shoe with its two receiving arms 52 is oriented downwards.

[0064] As illustrated in FIG. 6 the sleeve 120 is made from an essentially U-shaped housing 124 whose two arms 126 laterally reach over the bar shaped pedestal 34 and which is furthermore closeable by an essentially L shaped cover relative to the sleeve 120 wherein the cover is pivot ably linked at the housing element 126 thus chambering the pedestal 34.

[0065] In order to provide a relative adjustment of the sleeve 120 with respect to the pedestal 34 tooth strips 120 in particular with a fine teething with teeth arranged on top of each other are advantageously formed in the illustrated embodiment at the inner surface of the two arms 126 of the housing element wherein the inner surface is respectively oriented towards the pedestal 34 in FIG. 6, wherein the pedestal has respective tooth strips at its two side edges as illustrated clearly in FIG. 7 which illustrates the sleeve 120 in open position. Also a rib pro-

file or a wave profile or a similar engagement profile is feasible. For positioning the sleeve 120 is opened and the housing element is placed onto the pedestal and inserted to the desired height relative to the pedestal 34. By closing the cover element 128 the L - arm 130 of the cover element reaches over the arm 126 of the housing element 124 from an outside in the illustrated embodiment and thus with a fit so that the two arms 126 are pressed together and the teething provided on the two pedestal edges is pressed into meshing engagement with the two opposite tooth strips 132 of the two arms 126 which provides exact leveling or adjustment of the sleeve 120 to the desired elevation relative to the pedestal 34. This means the interlocking is provided by closing the cover 128 wherein the sleeve 120 thus formed is depicted in FIG. 8.

[0066] FIG. 9 illustrates the arrangement of the attachment device with a sleeve 120 placed at a corresponding level for this purpose thus with a screw connection of the pedestal 34 through the attachment ear 36. Thereafter the clamping felt is arranged on the rafter to form the under rafter insulation.

[0067] The recess 132 (FIG. 5) of the insulation element illustrated in FIGs. 5 and 9 is used for illustration of the geometry formed by the presence of the base elements wherein the geometry is formed by the elastic mineral wool insulation material after their assembly wherein the mineral wool insulation elements adapt snug with their entire surface to the base element. Eventually as required a foil thus a climate membrane in particular a vapor retarder foil can be placed over the flange wherein as illustrated in FIG. 9 the head 78 or when receiving a slat 10 made from wood the receiving shoe 50 is interlocked with the flange 40. Thus at the bottom side of the head or head element 78 or of the receiving shoe 50 as illustrated in FIG. 30 a pointed pin or bolt 134 is advantageously integrally formed thus between two offset engagement elements 136 so that when the head 78 is inserted the climate membrane or the foil is penetrated. After applying the head 78 or the receiving shoe 50 a repeated leveling is certainly also possible in that only the cover element 128 is folded up and the sleeve 120 is then repositioned accordingly relative to the pedestal 34 and the cover element 128 is then closed again. In mounted position the clamping felt is supported by the clamped fit between the attachment devices wherein the laterally protruded flange 40 also prevents any downward drop out the clamping felt. FIG. 11 eventually illustrates the configuration after assembly has been performed with the clipped in profile 32.

[0068] Variant B which is illustrated in FIG. 12 into two alternative embodiments in a exploded view includes a base element in L shape similar to variant A which is produced in particular as a sheet metal component and attached at the rafter 2 by the attachment ear 36 for example through a screw connection. Also this attachment element can be optionally configured with a receiving shoe 50, thus illustrated as a sheet metal component for receiving a wooden slat 10 or for receiving a in particular C-shaped profile strip 32, wherein the head 78 is also configured as a sheet metal component herein and made from sheet metal or plastic material as required like the receiving shoe 50 as will be described infra.

[0069] The pedestal 34 is configured in the center portion as a receiving bushing 72 for receiving a screw 60 forming an insertion element 31 and for this purpose stamping steps form bars 76 that are arranged on top of each other wherein the bars are alternatively cambered or bent in forward and in backward direction so that a central receiving bushing is produced for receiving the screw 60. The receiving bushing can be provided with a thread that is complementary to the screw 60. For screws typical standard screws can be used but also self-tapping screws or similar. According to FIG. 14 the pedestal 34 which is fixated at the rafter 2 by screws 38 with the attachment lob 36 can be provided with an insertion sleeve 140 provided with a forward protruding flange 40, wherein the insertion element provided with the screw 60 is placed into the insertion sleeve 140 and elevation positioned by the screw 60 and fixated or attached relative to the pedestal 34. It is evident from FIG. 13 that the receiving shoe 50 is made from a sheet metal component 142 after bending the two arms to form a U profile to form the receiving shoe 50, wherein a plastic plate 144 for receiving the leveling screw 60 is received on the U-bar of the sheet metal component 142.

[0070] In another embodiment the insertion sleeve can be configured with interlocking devices and can be interlock able relative to the pedestal in various elevation positions.

[0071] FIG. 15 illustrates the alternative embodiment to the receiving shoe 50 configured as a head 78 for clipping on a particularly C-shaped profile bar 32 thus again through bending sheet metal sections from a flat sheet metal element 146 with four sheet metal lobes 148 grouped around a plastic material plate 144 wherein the sheet metal sections can be bent upward either for forming a receiving shoe 50 or for forming a head piece 78. The head element 78 thus produced according to the center illustration is used for receiving a profile bar, the receiving shoe 50 illustrated on the right side is used for receiving a wooden slat 10.

[0072] The advantage of this configuration that the same structural element can be used for both receiving variants for the sheet metal profile or for the wooden slat and can be transported to the construction site as a flat component wherein upward bending of the respectively opposite attachment lobes can be performed in a simple manner about the centrally arranged plastic plate 144. For illustration purposes FIG. 16 illustrates an attachment device according to variant B attached at a rafter 2 including a sheet metal profile 32 clipped in at the head 78. It is eventually apparent from FIG. 13 that the screw 60 used in variant B is configured flat in the upper portion and can be provided with a thread in the lower half so that clamping with the receiving bushing which is config-

ured in particular spring elastic through the bar formation is feasible by threading in the screw 60. Various embodiments are known for screws of this type and commercially available.

[0073] The subsequently described variant C according to FIG. 17 illustrates a base element 28 and an insertion element 40 which are both made from metal or plastic material in particular from extruded cast profiles by simply cutting off respective sections. In the illustrated embodiment the base element 28 and also the insertion element 30a have been cut off from an extruded cast aluminum profile as sections. As illustrated in FIG. 17 with the illustration of the attachment device in an exploded view also for this attachment device optionally a receiving shoe 50 for receiving a wooden slat 10 or a head 78 for receiving a profile bar can be used for receiving the inner fairing. The head 78 and also the receiving shoe 50 can thus the cut off from an extruded profile, in particular an aluminum extruded profile so that producing the attachment device according to variant C is cost effective and simple. The variant is characterized by robust instruction.

[0074] In particular the base element illustrated in FIG. 17 is attached on a rafter 2 by attachment flanges protruding on both sides from the pedestal 34 and using an assembly aide including a band 16 with markings 14. Wherein the attachment is provided by two screws 30. Like in the preceding embodiments optionally also a clip connection through respective pedestal elements at a lower end of the base element 28 using a respective band 20 according to FIG. 3 and 4 can be used, wherein an attachment through for example a bayonet closure or a similar quick connector is feasible. This applies optionally also for the preceding embodiments.

[0075] The single wall pedestal 34 with the advantageous attachment flanges 36 on both sides is advantageously tapered at its upper edge for easier attachment of the attachment element 30 in particular the pedestal has a conical cross section in order to facilitate attachment of the attachment element 30. Furthermore the pedestal 34 is provided with an engagement profile for the attachment element 30 wherein the engagement profile extends over most of the elevation of the pedestal 34, in particular from an upper edge of the pedestal 34 until proximal to the attachment flanges. The height of length of the wave profile can certainly be configured suitable for the degree of elevation adjustment of the attachment element relative to the pedestal. In the illustrated embodiment the engagement profile 51 is configured as a fine wave profile, wherein the waves extend transversally and in particular perpendicular to the two vertical side edges of the pedestal 34.

[0076] The attachment element 30 is made from two offset longitudinal arms 152 and 154 which include two inward oriented inner flanges 156 which are arranged opposite to one another at a lower end of the attachment 30 which is oriented toward the pedestal 34 wherein the inner flanges 156 define a plug in pass through 158 between each other wherein the plug in pass through is in particular configured channel shaped and facilitates inserting the attachment element 33 onto the pedestal 34. In the portion of the plug in pass through 158 the inner flanges 156 are advantageously provided with a complementary engagement profile 160 towards the pedestal 34, thus with a respective wave profile.

[0077] Herein the width of the insertion pass through 158 is slightly less than the thickness of the pedestal 34 so that the attachment element 30 has to be placed onto the pedestal 34 in order to facilitate a penetration of the pedestal 34 into the profile cavity 160 defined between the two longitudinal arms 152 and 154.

[0078] Since the two inner flanges 156 are advantageously provided at a lower end portion of the attachment end 30 of the longitudinal arms 152, 154 a spring effect is advantageously generated when attaching the attachment element 30 on the pedestal 34. This means the two longitudinal arms 152, 154 are slightly pressed in outward direction away from one another in a lower end portion of the attachment element so that a spring loaded reset force is built up which then provides a very firm attachment of the attachment element 30 on the pedestal 34 when the attachment element 30 is arranged on the pedestal 34 at the desired elevation wherein the firm attachment is reached due to the engagement of both wave profiles and a respectively high load bearing capability of the attachment device is assured in its interlocking positions. The two longitudinal arms 152, 154 are connected with one another slightly above a center of the arms by a continuous transversal bar 162 so that the two longitudinal arms are kept at a distance from one another. This transversal bar 162 in this embodiment separates the upper profile cavity 160 from an upper receiving cavity 164.

[0079] In an upper portion of the receiving cavity 164 the two longitudinal arms 152, 154 are advantageously provided at their opposite insides with another substantially corresponding engagement profile thus in turn in wave shape.

[0080] Instead of a wave profile certainly any suitable engagement profile, thus a tooth or groove profile can be used which facilitates a respective interlocking between the two plug in components thus under a spring load. As required, in particular for stiffening but also for securing against a fall out of the insulation elements of the below rafter insulation to be inserted support flanges 168 protruding on both sides from the arm are provided in the upper portion of the attachment element 30 and at the upper end wherein the support flanges 170 protrude on both sides. The support flanges 168 secure the insulation elements of the below rafter insulation against falling down during assembly and the support flanges 170 can be used as a support for a favor retarder to be introduced or for the same climate membrane. Thus for support respective adhesive pads (not illustrated) can be provided on the support flanges 170 or alternatively also hook and loop tapes wherein respective hook and loop structures

can be arranged at the climate membrane.

[0081] After applying the attachment element 30 on the pedestal 34 optionally a receiving shoe 50 (FIG. 19) can be applied to the support flanges 170 which is then attached in a suitable manner at the attachment element 30 thus respectively with a sheet metal screw 172 or similar which comes into engagement with the respective engagement profile 166 at the upper end of the two longitudinal arms 152, 154 so that the receiving shoe 50 can be respectively fixated on the attachment element 30. Advantageously two offset support ribs 174 are provided at the bottom side of the receiving shoe 50 wherein the support ribs 174 can provide a preload relative to the support flanges 170 for increasing the fixation when the screw 172 is turned in.

[0082] The engagement position of the sheet metal screw 172 into the engagement profile 176 comes from the sectional view in FIG. 20 which illustrates a receiving head 178 for receiving the profile strip 32 instead of the receiving shoe 50 illustrated in FIG. 19 wherein the profile strip is clipped on through its inward protruding arm into respective grooves 80 of the receiving head 178.

[0083] As an alternative to an optional clamping over the support ribs 174 described in conjunction with FIG. 19 the support ribs 174 as illustrated in FIG. 20 can be moved apart far enough so that they reach over the upper support flanges 170 on both sides when attaching the receiving head 178 or the receiving shoe 150 so that they chamber the upper portion of the receiving element 30 between each other.

[0084] FIG. 21 illustrates the attachment device according to variant C in mounted position wherein initially the base elements are attached on the rafters 2 with respective assembly aides that are described supra and the attachment elements 30 are applied. Thereafter the insulation elements of the under rafter insulation are applied, in particular using clamping felts, eventually a suitable climate membrane or vapor retarder foil is applied to the support flanges 170 and eventually the receiving shoe or the receiving head 78 are applied with a fixation by a suitable screw 172, thus a sheet metal screw which tightens against the interlocking of the engagement profile that is provided in an upper portion of the attachment element 30. The suitable adjustment in elevation is simply provided by respective sliding of the attachment element onto the pedestal, wherein the spring elastic aluminum profile interlocks on the pedestal 34 in the desired position so that a simple leveling can be provided without tools.

[0085] FIG. 21 eventually illustrates clipping on the support lattice work formed herein by sheet metal profile bars 32 which can eventually can be provided with the covering thus in the form of sheet rock plates by respective attachment devices like e.g. sheet metal screws.

[0086] Subsequently the complete assembly of a below rafter insulation using the attachment devices according to the invention is described. Thus starting from a roof half corresponding to FIG. 1 with 6 rafters and a between rafter insulation 4 introduced between the rafters 2 initially according to FIG. 22 a guide thread 18 is pulled taunt over the rafters wherein optionally already a vapor retarder foil or a respective climate membrane was already mounted on the between rafter insulation as required.

[0087] In a second step using the taunt guide thread 18 accordingly the adhesive tapes are glued perpendicular to the taunt guide threads 18 onto the rafters 2 after pulling a release foil from the adhesive tape, in case of an optionally mounted vapor retarder foil the tapes are glued onto the foil. Since the mounting process was illustrated for an attachment device according to variant B an adhesive tape with a cross marking 14 is used for this purpose accordingly.

[0088] Multiple assembly tests have shown that only a few minutes are required for pulling the guide thread 18 and for gluing the adhesive tapes onto the rafters or the vapor retarder foil.

[0089] Subsequently the assembly of the base elements illustrated in FIG. 14 is performed which are configured as sheet metal angles with an insertion sleeve 140 and thus using a screw connection at the rafters, wherein time requirements for a total of 48 attachment points are low. The attachment devices mounted on the roof in this step are evident from FIG. 24 where they are illustrated as rectangular insertion sleeves 140.

[0090] Thereafter the under rafter insulation is introduced thus by clamping felts or similar with a width of for example 400 mm as illustrated in FIG. 25. In this assembly condition the clamping felts 190 used as insulations elements are secured by circumferentially protruding flanges 40 of the insertion sleeves 140 against falling down. Also this step is performed rather quickly. Thereafter also a vapor retarder foil or a suitable climate membrane can be applied to the under rafter insulation. For this purpose the flanges 40 of the insertion sleeves 140 are used for support. For this purpose the flanges 40 can be provided with respective glue pads from which only the release foil has to be pulled off so that the vapor retarder can be fixated easily on the flange 40 of the attachment devices.

[0091] Starting from the assembly condition in FIG. 25, thus applying the clamping felts between the base elements the attachment elements 30 are then applied according to FIG. 26 with the receiving shoes or optionally respective receiving heads 78 in analogy to FIG. 34 which can be performed with a cordless drill, wherein the surface can be leveled with a guide thread in order to provide a flat surface for the covering to be provided thereafter. Leveling is provided by the adjustment screws 60 visible from FIG. 13 which are received in the receiving shoe 50. Since a total of 48 attachment points is provided in the illustrated roof half and the assembly of the attachment element per attachment point is performed quickly little time is required for the assembly process according to FIG. 26 for 48 attachment points.

[0092] Thereafter the opposite attachment flanges that

are illustrated in FIG. 15 only have to be bent up by hand wherein depending on the lattice work thus whether wooden slats or profile strips are used the respective opposite attachment lobes are bent up as evident for example from the illustration according to FIG. 15 bottom. This process only takes a few minutes, wherein after for example C, D profiles can be clicked into these supports. This final assembly condition is illustrated in FIG. 27. Overall the time up to this final assembly illustrated in FIG. 54 for a roof half with a surface of 8.6 meters^2 is only 1.5 hours so that this system provides very quick assembly for precise alignment and precise and simple leveling of the profile strips or alternatively of wooden slats for the support lattice work. Thereafter respective covering elements like e.g. sheet rock plates can be applied which are connected with typical quick construction screws with the CD profiles or the wood lattice work.

[0093] Thus, this is an integrated mounting system which facilitates exact positioning of the attachment elements in a quick and simple manner, a secure mounting of the below rafter insulation between the attachment elements and which provides a flat mounting surface for the subsequent covering for a simple and quick leveling by attaching the lattice work on the receiving shoes or receiving heads.

[0094] Through the attachment elements with integrated support elements arranged with uniform row spacing and used as mounting aides for temporary fixation of the insulation elements or by the previously attached support lattice work. The insulation material can be advantageously mounted in roll off direction for a predetermined width without the insulation material falling out of the intermediary space during assembly. This installation is not possible with known types of below rafter insulation due to the lacking clamping effect transversal to the direction of production. It is appreciated that this generates substantial time savings when installing insulation material.

[0095] FIGs. 28 - 36 describe another advantageous embodiment of the invention. This partially represents a mix of the previously described embodiments so that identical reference numerals are used for identical components in order to improve clarity. This embodiment however is characterized in particular through a modified design principle in a portion of the pedestal for receiving the insertion element. Furthermore the top element of the insertion element is configured universal so that it is useable for receiving a profile as well as a wooden slat and similar so that separate alternative insertion elements do not have to be stocked.

FIG. 28 illustrates an exploded view of this embodiment of a retainer or a attachment device. The base element 28 includes a specially configured pedestal 34 which is subsequently described in more detail. This pedestal 34 includes an attachment device at its lower end for attachment at a rafter element 2. At a lower end of the pedestal 34 there is an accordingly configured annular shoulder 90 with radially protruding tongue shaped protrusions 92 which is configured for an engagement in a type of bayonet closure into the pedestal element 22 according to FIGs. 3 and 4. The pedestal element according to FIGS. 3 and 4 is provided with an annular shoulder 96 with recesses 94 that are complementary to the protrusions 92 and with accordingly undercut grooves 98 for forming the bayonet closure. Through a screw 24 the pedestal element 22 is attached in particular using a positioning band 21 at the pedestal element 22 so that a very quick and very precise positioning of the attachment devices is facilitated for assembly purposes. The pedestal 34 is rotated at an upper end according to FIG. 28, this means during installation the illustrated attachment device is rotated by 180° relative to the drawing and provided with a circular plate shaped flange 40 which is used for receiving a climate membrane or a respective vapor retarder foil, wherein in the illustrated embodiment a circular intermediary plate 180 can be provided between the membrane 44 and the flange 40. In FIG. 28 on top there is the insertion element 31 with a screw 60 and an especially configured head 78 which is configured for alternative reception of a sheet metal profile 32 or a wooden slat 10.

It is appreciated that instead of the illustrated bayonet shaped attachment of the pedestal 34 at the rafter element also any other suitable attachment device can be used, in particular the alternative attachment devices which have been described based on the preceding embodiments.

[0096] FIG. 29 illustrates the base element 28 in an attached position at the rafter element 2 with an attached damper plate 42 of which in turn only a portion is illustrated for reasons of clarity and a climate membrane 44 applied thereto which can be glued together with the base element 28, this means the flange 40, wherein in particular suitable gluing pads are provided on the flange 40 or the intermediary plate 180.

[0097] Thus in particular during assembly the base element 28 is attached at the rafter element 22 first in the previously described manner and thereafter the clamping felt is arranged, wherein the pedestal shape prevents the clamping felt from dropping out during assembly (FIG. 29 illustrates the position that is rotated by 180° for illustration purposes). In this position the insert element 31 is applied with the top element 78, wherein the screw 60 provided at the insert element 31 penetrates the climate membrane and is insertable into the pedestal 34 through an opening that is provided centrally in the intermediary plate or the flange 40 wherein this insertion is evident from FIG. 30.

[0098] FIG. 31 illustrates a modified configuration of the pedestal 34 which significantly defines the embodiment.

[0099] Accordingly the pedestal 34 includes two flange elements 182 and 184 that are arranged opposite to each other on the annular shoulder 90 provided in this embodiment wherein the flange elements are arranged with a distance from each other. In the illustrated embodiment

connectors are provided for stabilizing in a lower portion thus in a lower third wherein the connectors are provided herein in the form of an intermediary bar 186 with ribs. Besides the fact that this connector can be provided in any shape this connector is not necessarily provided. However the connector is useful for stabilization in particular for a light weight and material saving configuration of the pedestal. Furthermore the pedestal 34 includes a plug in shoe 188 which is provided at its top end with a plate for forming the flange 40. This plug in shoe is used for receiving the screw 60 of the insertion element as evident from FIG. 42 in which the insertion element is only illustrated with the screw. The plug in shoe 188 can be configured separately from the pedestal 34 thus as individual component but the plug in shoe is advantageously integrally provided in one piece with the pedestal 34 with the flange elements 182, 184 in the illustrated embodiment.

[0100] In interconnection between the plug in shoe 188 and the flange elements is advantageously connected with the flange elements by slanted bar shaped lobes 190. Thus the lobes 190 are configured in the upper portion of the pedestal 34, thus above the non mandatory connection bar 186 thus advantageously with an identical distance from each other thus on both sides of the plug in shoe188 which is thus arranged at a slant angle for the integral embodiment by the lateral lobes 190 which are arranged at a slant angle from top to bottom (in installed position from the bottom up viewed from the flange element). These lobes that are arranged on a left side and on a right side of the plug in shoe at the flange elements 182, 184 form spring elastic clamping tongues that will be described infra. Advantageously the lobes are slanted at an angle between 30° and 60°, advantageously in a range of 45°, so that the plug in shoe 188 is so to speak supported in a floating or spring elastic manner relative to the two flange elements 182, 184, thus using the lobes 190 that are provided on both sides.

[0101] The plug in shoe 188 can be provided in two components in an advantageous embodiment, thus it is made from two plug in shoe halves wherein each half is respectively received by a lobe row of lobes 190 arranged above one another at an opposite and corresponding flange element 182 or 184. Alternatively the plug in shoe 188 can also be formed integrally by itself thus not from two halves thus as a bushing below the head plate 188 forming the flange 40, wherein however advantageously at least one or plural slots are provided, thus in the illustrated embodiment one slot 192 which can advantageously extend over a length of the bushing and which is optionally also arranged in the flange 40 so that the plug in shoe 188 is configured in particular for receiving the insertion element, in particular the screw 60 with a spring elastic character.

[0102] The plug in shoe 188 which is provided with a central opening into which the slot 192 reaches in a radial direction is provided with an inner profile which is complementary to the profile of the screw 60 of the insertion element. The profile can be configured as a interlocking or screw profile or similar. Based on this embodiment the insertion element 31 with its screw 60 can be inserted in a simple manner into the pedestal, this means into the plug in shoe 188, thus far enough as required by the mounting position for receiving the slats or sheet metal profiles. Due to the insertion of the screw 60 into the plug in shoe188 the receiving bushing 198 of the plug in shoe 188 expands and thus also pivots the lobes 190 which are then pressed downward in the illustration according to FIG. 31. In a hanging position thus with the holder turned upside down the clamping force between the insertion element 31 or the screw 60 and the plug in shoe 188 or the pedestal 34 is increased, in particular under a load of the covering arranged at the attachment devices. In case a fine adjustment of the insertion element 30 inserted into the plug in tongues 188 or the pedestal 34 is required a fine adjustment can be provided by the screw 60.

[0103] In order to facilitate fine adjustment of the screw 60 a square or hexagonal profile is arranged above the thread of the screw 60, thus a hexagonal profile in the illustrated embodiment in particular integrally formed so that the screw is easily rotateable by a suitable tool, in particular a wrench.

[0104] For assembly purposes only the insertion element 30 is inserted with its screw 60 into the plug in shoe 188 far enough so that the insertion element 30 is in the desired position, wherein the bushing expands accordingly or in case of a two piece plug in shoe 188 the two plug in shoe element are pressed outward so that a respective clamping force is built up between the plug in shoe and the screw.

[0105] The interlocking of the interlocking or thread profile at the screw 60 or at the bushing shaped component 198 which come into engagement during insertion have an interlocking or a pitch in an advantageous range of 1 - 3 mm, in particular 1.2 - 18 mm, advantageously 1.5 mm. This means the distance profile to profile of the thread profile in the advantageous embodiment is 1.5mm. When the bolt 60, this means the insertion element 31 is inserted into the pedestal then an interlocking support is provided at the profiles at the screw and at the plug in shoe, wherein in case the interlocking dimension is 1.5mm which however can be advantageously selected at will but if this is not sufficient for the end position yet or not sufficiently precise then the desired end position can be reached precisely through fine adjustment of the screw.

[0106] Thus in a simple manner through manual pressure on the upper (in mounting position) plate 188 of the pedestal 34 the clamping can be removed and the insertion element can be adjusted as required in pull direction. It is a particular advantage of this embodiment that in principle the attachment device is adjustable without tools in that the insertion element 31 is only manually inserted into the respective end position and only when required a fine adjustment with a wrench or similar can

be performed. This type of attachment is similar in a way to an attachment with a ground anchor.

[0107] Based on FIG. 32 the insertion movement is illustrated in various positions wherein the pedestal is in a starting position on a left side, in a center the pedestal is illustrated with a screw arranged above and on a right side the pedestal is illustrated in a partially inserted position of the screw 60. The insertion element 31 that is subsequently described with reference to FIGs. 33 and 34 and the head piece 78 is certainly also useable for the previously described embodiments.

The insertion element includes a head piece 78 which is advantageously made from a plastic material like the pedestal 34 and the elements of the bayonet closure and made in particular through injection molding. The head piece 78 includes a base plate 200 from whose bottom side engagement members 202 protrude in downward direction according to the illustration in FIG. 33 wherein the engagement members form a free space between each other and the screw 60 can be snap locked with a head plate formed at its top side wherein the head plate however is freely rotating so that a fine adjustment during assembly is possible through the hexagonal or square element 196 with a suitable tool. Thus however also each suitable other attachment type between screw and head 78 is possible and included. Above the base plate 200 there is a block shaped head piece 206 which is advantageously configured with hollow spaces 208 in order to provide material savings. Grooves 80 are advantageously provided on both sides and opposite to the head piece 206 wherein the grooves facilitate snap locking a profile bar 32 through the advantageously inward curved ends of the profile bar 32. A lateral support can also be provided by the support and stop bar 210 which protrudes in upward direction on one side, herein the left side according to FIG. 33. Thus the head 78 is configured accordingly for simple snap locking of typical profile bars 32.

[0108] As evident from FIG. 34 the same head 78 can also be optionally used for attaching a wood slat 10. Thus the stop bar 210 of the head piece 206 is used as a stop bar and the slat contacts a top side of the head piece 206 and is attached at the head piece by screws.

It is evident from FIGs. 35 and 36 that the same attachment device is used with the head 78 for receiving a profile bar 32 by snap locking or a slat 10 through screw attachment. The screw 60 that can be snap locked into the head piece 78 has the advantage that it can be snap locked in on site or also in a manufacturing plant. It is advantageous to arrange the snap lockable screw in the head piece 78 in the manufacturing plant since this also facilitates using stronger hooks. Overall this embodiment has the advantage that an easy manual insertion of the insertion element 31 and thus a quick adjustment is possible and also a subsequent fine adjustment of the screw when required.

[0109] The embodiment according to FIGS. 37 - 42 relates in particular to the embodiment of the head piece 78 for alternate reception either of a sheet metal profile bar 32 or a wooden slat 10 and in particular supporting or fixating the head piece 78 with reference to the adjustment screw 60, wherein the description of FIGs. 37 seqq. only has an exemplary character and these measures can certainly also be used accordingly in other embodiments.

[0110] Accordingly components in FIG. 37 which are more or less identical or functionally equivalent to components in other embodiments are provided with the same reference numerals. It starts with the rafter element 2 on which for example a pedestal element 22 is attached which certainly can also alternatively configured according to the other embodiments which also applied for the pedestal 34 and the base member 28 and other components. It is evident in the embodimetn according to FIG. 37 that the head piece 78 is offset relative to the preceding embodiments relative to the insert 31, thus in the form of a screw 60 similar to the embodiment according to FIG. 12 as evident in particualr from FIGs. 39 and 40 by the same token the head piece 78 is configured as a universal receiving element, this means it can alternatively receive a sheet metal profile bar 32 according to the illustratons of FIGs. 28 and 41 or for the same component alterantively also a wooden slat 10 as evident from FIG. 37, right illustration top and FIG. 42.

[0111] Thus it is possible after applying either the sheet metal profile bar 32 or the wooden slat 10 to actuate the screw 60 without having any impediment from the snap locked sheet metal profile 32 or the wooden slat 10. This naturally facilitates assembly and also possible readjustments, in particular during assembly. Furthermore the embodiment according to FIG. 37 - 42 is very similar to the embodiemtn according to FIG. 29 and 30 which however is only exemplary since certainly the redesign according to the embodiment of FIG. 37 seqq. is also applicable analogously to the other embodiments. This applies also to the alternative receiving shoe for separate reception of a wooden slat as described in conjunction with the preceding figures. This is also the reason why the general configuration of the embodimetn according to FIG. 37 seqq. is not described in detail since this embodiment can also replaced by the preceding alternative embodiments. It is evident from FIG. 39 that the head piece 78 includes a stop element on a right side which stop element is configured as plural upward protruding stop bars 220 with an engagement groove 80 arranged behind them. On the opposite side horizontally protruding engagement members 222 are provided which protrude in outward direction beyond the block shaped configuration of the head piece 78 as evident from FIG. 41 and which facilitate snap locking the sheet metal profile bar 32. It is evident that the sheet metal profile bar 32 with ist two lateral C- arms reaches over the engagement members 222 and the stop members 220 and reaches behind them with their inward protruding extensions or arms 82 so that the bar 32 can be snap locked in a simple manner onto the head piece 78. The stop members 220 and/or the engagement members 222 respectively can

also be configured as a continuous bar when required.

[0112] The same head bar 78 can also be used for receiving a wooden slat 10 as evident from FIG. 37, top right illustration and FIG. 42. Thus it is advantageous to provide plural recesses or openings 224 (FIG. 39) on a top portion of the head piece 78, which facilitates a screw attachment of the wooden bar 10 with typical wood screws 51, wherein in this embodiment two attachment screws 51 can be provided in an exemplary manner. The recesses 224 can be evenly distributed in the illustrated embodiment, in particular in rows that are oriented perpendicular to each other and furthermore respectively parallel to each other so that a plurality of recesses 224 is provided and a quick and simple assembly of the wooden slats 10 can be performed with the screws 51. The stop members 220 are thus used as stop elements for a simple application of the wooden bar. From FIGs. 39 and 40 a support of the screw 60 is evident that is offset in outward direction relative to the head piece 78. This support is advantageously similar to the embodiment according to FIG. 12 due to an annular bead 228 that is arranged from the upper screw head 226 offset in downward direction and thus axially fixateable relative to the head piece 78 but rotateable. This in turn facilitates the assembly since the screw that is inserted overhead through snap locking cannot be lost anymore but can be rotated for adjusting the head piece 78 also for a received profile bar 32 or slat 10 relative to the pedestal 34. For this offset support an outward protruding lug 32 is advantageously provided at the head piece 78 in which lug the screw 60 is received. Also this only serves as an example, certainly also a bar shaped protrusion or similar can be used or configured. Last not least the head piece 78 as evident from FIGs. 39 and 40 can be provided on one side, thus advantageously the side opposite to the lug 128 or the screw 160 with a protrusion, thus in particular configured as a protruding bar 230 which facilitates manual handling of the head piece during assembly. Certainly this bar 230 is only provided when required, but advantageous in the context of the invention. This also applies for the configuration of a total of four stop members 220 for the support bar or for outward protruding horizontal bar shaped engagement members 222. Where required these engagement members can be configured as a bar or with more or fewer separate engagement members.

[0113] Advantageously the head piece 78 is also configured as a plastic component, in particular provided as an injection molded component.

The subsequent steps 21 and 22 relate to mounting the attachment device at the rafter or similar:

> Step 21: a method for mounting an interior insulatoin of building of using a system according to one of the preceding claims characterized in that bands that are provided with positioning elements are attached at the rafters in a longitudinal direction of the rafters, base elements 28 are placed onto the positioning elements and fixated with the rafters 2, subsequently attachment elements are placed onto the base elements and eventually slat elements are attached at the attachment elements in order to form the support slatting of the roof, wherein the insulation elements 42 for under rafter insulation are placed accordingly and that a guide thread is advantageosuly horizontally pulled against the rafters, at which guide thread the bands including the positioning elements are aligned for an even arrangement of the positioning elements along the rafters 2 and thereafter the bands are attached at the rafters 2, wherein in particular after attaching the base elements at the rafters 2 and after arranging the insulation elements between the base elements a vapor retarder foil for similar climater membrane is applied and fixated relative to the attachment elements.
>
> Step 22: an assembly method according to step 21, characterized in that after applying the slat elements onto the attachment devices a leveling is performed by relative adjustment of the attachment element relative to the base element and subsequent arresting of the attachment element.

Claims

1. A system for internally insulating buildings in particular slanted roofs, the system comprising: a particularly wooden base structure including rafters (2) or beams (subsequently designated rafter elements), slats (10) and/or profile strips (32)(subsequently designated slat elements) which are transversally arranged at the rafter elements (2) and at a distance from the rafter elements and at a distance from each other, insulation elements (42) arranged from an interior of a room at the rafter elements (2) and between the rafter elements and the slat elements (10, 32) for thermal and/or sound insulation, in particular made from mineral wool forming an inner insulation placed in front of the rafter elements, (subsequently designated under rafter insulation), and attachment devices for supporting the insulation elements (42) and for attaching the slat elements (10, 32) at the rafter elements (2) offset therefrom for forming a support lattice structure at which a covering towards an interior of the room that is in particular made from sheet rock plates is attachable,
   characterized in that
   the attachment devices are respectively formed from a base element (28) that is attachable at the rafter element (2) and an attachment element (30) that is adjustable relative to the base element and interlockable at the rafter element (2) in a predetermined adjustment position and **in that** a receiving element (50, 78) for receiving the slat element (10, 32) is arranged at the end of the attachment element (30) that is remote from the rafter.

2. The system according to claim 1,
characterized in that
a band shaped mounting aide is provided for attaching the base element (28) at the rafter element (2), wherein the mounting aid is provided along the rafter element (2) attachable thereto and with positioning elements (14, 22) for a predetermined positioned arrangement of the base elements at the rafter element (2), wherein the base elements are respectively provided at a distance from one another at the mounting aide, wherein the distance corresponds to a distance between the slat elements (10, 32) of the support lattice structure, wherein the positioning elements (14, 22) are advantageously respectively formed by a graphic marking (14) on a mounting aide that is formed as an adhesive tape (16) for a glue connection along the rafter and/or which are respectively formed by a pedestal element (22) which are arranged at a band that is attachable at a rafter element (2), advantageously by screws, nails and similar and which are respectively configured for a quick coupling connection with a base element (28), which are in particular configured as a bayonet closure or clip element.

3. The system according to one of the preceding claims,
characterized in that
the base element (28) includes a pedestal (34) which is provided at one end with at least one attachment flange (36) angled away from the pedestal (34), advantageously two opposite attachment flanges (36) for attachment at the rafter element (2) and/or with an interconnection element that is complementary with the pedestal element (22) for a quick connection of the base element (28) at the rafter element (2) through the pedestal element (22), wherein the composite element arranged at the pedestal element proximal to the rafter is configured in particular for forming a clip connection or a bayonet closure with the pedestal element (22), **in that** advantageously the pedestal (34) for forming the bayonet closure is provided at its lower end with an annular shoulder (90) and advantageously two opposite radial protrusions (92) for engagement in complementary recesses (94) for reaching behind an annular shoulder (96) of the pedestal element (22) after a respective rotation of the pedestal (34) relative to the pedestal element (22) and that in particular an end of the pedestal (34) proximal to the rafter is configured as quick connector, in particular as bayonet closure element and simultaneously provided with openings for optional attachment via screws and similar mechanical attachment devices at the rafter element (2).

4. The system according to one of the preceding claims,
characterized in that
the pedestal (34) includes a receiving sleeve (72) for an elevation adjustable reception of the attachment element (30) and that the attachment element (30) is configured as an insertion element (31) that is insertable into the receiving bushing (72), in particular pluggable which insertion element is clampable or fixable in a predetermined insertion position of the insertion component in the pedestal (72) through form and/or friction locking, whereas advantageously the pedestal (34) is configured with a single wall and subdivided into bars (76) arranged on top of one another by introducing slots that extend in particular perpendicular to the pedestal (34), wherein the bars are formed at both pedestal sides in outward direction, in particular cambered for forming a receiver in particular in a form of a receiving pedestal (72), in particular sequential and in opposite directions, and that the receiving bushing (72) is advantageously adapted with its inner cross section to the outer circumference of the insertion element, wherein in particular the receiving bushing (72) is configured due to slot formation or similar spring elastic for clamping on the insertion element (31).

5. The system according to claim 4,
characterized in that
the insertion element (31) or the attachment element (30) and the base element (38) are provided with complementary engagement profiles for fixating an adjustable relative position of both components relative to one another, wherein the engagement profile is an interlocking profile, a teething, a thread or a similar fixation mechanism.

6. The system according to claim 5,
characterized in that
the insertion element (31) is only formed by a leveling screw (60) on which a receiving element for the slat element (10, 32) is arranged, wherein the screw (60) is threadable into the receiving bushing (72) of the pedestal (34) which is in particular configured as a single wall sheet metal component for leveling the receiving element.

7. The system according to one of the claims 1 - 4,
characterized in that
the attachment element (30) is configured as a component that is insert able onto the pedestal (34) (Variant A, C), wherein the attachment element (30) at its end portion remote from the rafter includes a flange (40) protruding in outward direction at least at two opposite sides from the attachment element (30) for securing the insulation elements (42), wherein the flange includes a flat contact surface for arranging a vapor retarder foil or a similar climate membrane (44).

8. The system according to claim 7,

characterized in that
the attachment element (30b) is configured as an insertion sleeve (120) and includes a U-shaped housing element (124), whose two U-arms (128) reach around the pedestal (34) at its two side edges and the sleeve is configured as a clamping sleeve which fixates the attachment element (30b) in its clamp position relative to the base element in a predetermined position.

9. The system according to claim 8,
characterized in that
the side edges of the pedestal are configured with an engagement profile, in particular with a teething, in particular configured as a tooth bar and a complementary engagement profile, in particular a tooth bar (132) or similar is provided at the inside of the respective U-arm (126) of the sleeve (120) oriented towards the respective side edge of the pedestal (34), so that the sleeve (120) and thus the attachment element (31) is attachable at the pedestal (34) by preloading the two U-arms (126) of the sleeve (120).

10. The system according to claim 9,
characterized in that
at one of the two U-arms (126) of the housing element (124) a sleeve (120) or a cover element (128) is pivotably linked in particular through a film hinge, wherein the cover element is provided at one end with an arm (130) protruding in lateral direction towards the housing element, wherein the arm during closing the sleeve by the cover element (128) reaches over the free U-arm (126) of the housing component and clamps both U-arms (128) in an arresting position in which the teething is supported in an engaged fixation position and the insertion element (31) is blocked relative to the base element (28), wherein advantageously the sleeve (120) and the pedestal (134) have a rectangular cross section.

11. The system according to one of the claims 7 - 9,
characterized in that
the arm (130) of the cover element (128) includes plural inward oriented support tongues (131) which reach behind the backside of the housing element (124) in a closed position of the cover element (128) and **in that** advantageously inward protruding support ribs (133) are provided at an inside of the U-shaped housing element (124)of the sleeve (120) and of the cover element (128) wherein the support ribs advantageously extend over a height of the sleeve (120) and wherein the support ribs contact the pedestal (34) on both sides when the sleeve (120) is closed.

12. The system according to claim 7,
characterized in that
the attachment component (30) is configured as a section of an extruded profile, advantageously made from aluminum with two offset longitudinal arms (162, 164) which are connected with one another by at least one transversal bar (162), wherein inward protruding flanges (156) are provided at an end of the attachment element (30) at both longitudinal arms (162, 164) which end is remote from the rafters, wherein the flanges (156) define an insertion pass through (158) for penetration of the pedestal (34) between each other, wherein a width of the pedestal is less than a width of the penetrating pedestal (34) and wherein in particular the two inner flanges (156) are respectively provided with an engagement profile, advantageously in a form of a in particular fine wave profile and **in that** the pedestal (34) is provided with a complementary engagement profile (150) at least in the penetration portion opposite to the attachment element (30) so that the attachment element (30) is applicable under pressure on the pedestal (34) and fixable in the desired elevation position of the receiving element (50, 78) relative to the pedestal (34) under a spring preload through the longitudinal arms (152, 154) relative to the pedestal (34), wherein the arms are pressed apart and wherein advantageously the upper edge of the pedestal (34) is provided with an insertion tip with conical cross section and **in that** in particular at the end of the attachment element (30) remote from the rafters, the two longitudinal arms (152, 154) are provided with an engagement profile (126) for an interconnection element for fixating a receiving element (50, 78) that is applicable on the attachment element (30) like for example a sheet metal screw or similar.

13. The system according to one of the preceding claims,
characterized in that
the receiving element (50, 78) arranged at the end of the attachment element (30) remote from the rafters is configured as U-shaped receiving shoe (50) for receiving a slat element or configured as a head (78) with lateral grooves (80) for clipping in a profile bar (32), wherein in particular the receiving element (50, 78) is integrally configured at the attachment element (30) and in particular produced from plastic material through injection molding or insertable onto the end of theattachment element (30) that is remote from the rafter and interlockable, in particular through a clip connection.

14. The system according to one of the preceding claims,
characterized in that
the receiving element (50, 78) is formed from a sheet metal component (142) which includes four attachment flanges (48) that are arranged offset by 90° and which protrude laterally, wherein two respective opposite attachment flanges are arranged foldable in

upward direction for forming a U-shaped receiving shoe (50) and two other opposite attachment flanges (148) are foldable in upward direction for forming the head piece (78) with the lateral groove (80), so that the sheet metal component (152) is optionally configurable as a receiving shoe (50) for receiving a slat (10) made from wood or a head piece (78) for receiving a profile strip.

15. The system according to one of the preceding claims,
characterized in that
the flange (40) of the attachment device is configured so that it is suitable as a contact for flat mounting of a foil and is used as an assembly aide which prevents a drop out of the insulation elements (42) arranged between the attachment devices during assembly, wherein advantageously the flange (40) laterally protrudes from the pedestal (34) or the insertion sleeve (140) at least over part of its circumference, advantageously over its entire circumference and forms a flat contact surface for a contact of a vapor retarder foil or a similar climate membrane and for supporting the insulation elements (42) arranged between the attachment devices.

16. The system according to one of the preceding claims,
characterized in that
the base element (28) configured at the pedestal (34) includes a plug in shoe (188) that is supported at the pedestal in a floating or spring elastic manner wherein the plug in shoe is provided with an advantageously elongated receiving opening for receiving the insertion element (31), in particular a plug in element provided at this location, wherein the plug in shoe is expandable by inserting the insertion element which generates a clamping reset force.

17. The system according to claim 16,
characterized in that
the plug in shoe (188) includes a bushing (198) including the insertion opening, wherein the bushing is at least provided with a longitudinal slot (192) extending to the receiving opening and that the plug in shoe is advantageously provided integrally in one piece or in plural pieces, in particular in two pieces.

18. The system according to claim 16 or 17,
characterized in that
the pedestal (34) advantageously includes two flange elements (182, 184) arranged opposite to each other, wherein the plug in shoe (188) is arranged between the flange elements and that the plug in shoe (188) is supported in a spring elastic manner on both sides by advantageously slanted lobes (190) at the flange elements (182, 184) so that inserting the insertion element into the receiving opening presses the lobes in outward direction by expanding the receiving shoe and that the plug in shoe (188) is advantageously configured integrally in one piece with the pedestal (34).

19. The system according to one of the preceding claims,
characterized in that
the insertion element (31) includes a plug in element with an interlocking or threaded profile, in particular a screw (60) through which the insertion element (31) is insertable into the plug in shoe (188) for forming the attachment device, wherein the plug in shoe in a portion of its receiving opening is provided with a complementary profile for engagement with the plug in element and that advantageously the screw or the plug in element is configured at its end oriented away from the free end with a tool engagement element, in particular with a hexagon (196) or with a square.

20. The system according to one of the preceding claims,
characterized in that
the insertion element (30) includes a universal head (78) which in order to receive a profile bar (32) with two opposite grooves (80) advantageously includes a lateral stop bar (210) and openings for attaching a slat (10) in particular through screw attachment.

21. The system according to one of the preceding claims,
characterized in that
the head piece (78) is formed with a stop bar that is advantageously divided into individual receiving members (220) and which stop bar or which receiving members protrude in upward direction, and/or that at least one laterally protruding engagement member (222) is provided at the head piece for reaching behind a sheet metal profile bar (32) that is snap lockable, and/or at least one laterally protruding handling bar (230) is provided, so that the head piece is universally provided for receiving slats or profile bars.

22. The system according to one of the preceding claims,
characterized in that
the insertion element (31), in particular the screw (60) is arranged at the receiving element or at the head piece (78) for the sheet metal profile bar (32) and/or the wooden slat (10) is laterally offset relative to the receiving element or the head piece (78), so that after mounting the sheet metal profile bar or the slat (32, 10) a direct access to the insertion element (31), in particular to the screw (60) is possible for adjustment.

23. A head piece for a system according to one of the

preceding claims,
characterized in that
the head piece (28) is configured as a universal head with features of one of the preceding claims, in particular the claims 20 - 22.

24. An attachment device for use in a system according to one of the claims 1 - 22,
characterized by
a base element and an attachment element respectively configured with features of at least one of the claims 1 - 22.

25. Method for mounting an interior insulatoin of building of using a system according to one of the preceding claims 1 to 22,
characterized in that
bands that are provided with positioning elements are attached at the rafters in a longitudinal direction of the rafters, base elements 28 are placed onto the positioning elements and fixated with the rafters 2, subsequently attachment elements are placed onto the base elements and eventually slat elements are attached at the attachment elements in order to form the support slatting of the roof, wherein the insulation elements 42 for under rafter insulation are placed accordingly and that a guide thread is advantageosuly horizontally pulled against the rafters, at which guide thread the bands including the positioning elements are aligned for an even arrangement of the positioning elements along the rafters 2 and thereafter the bands are attached at the rafters 2, wherein in particular after attaching the base elements at the rafters 2 and after arranging the insulation elements between the base elements a vapor retarder foil for similar climater membrane is applied and fixated relative to the attachment elements and that preferably, after applying the slat elements onto the attachment devices, a leveling is performed by relative adjustment of the attachment element relative to the base element and subsequent arresting of the attachment element.

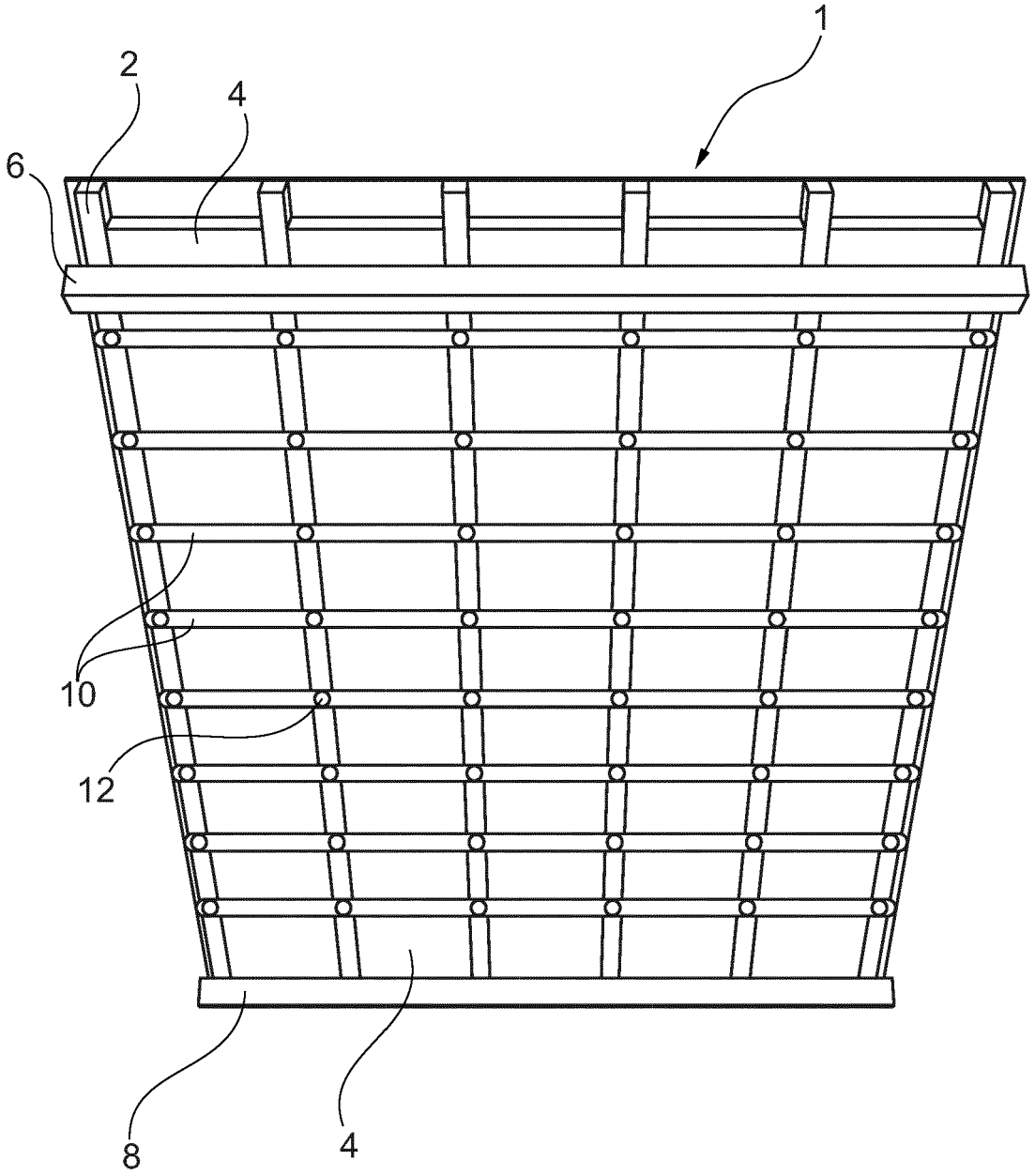


Fig. 1

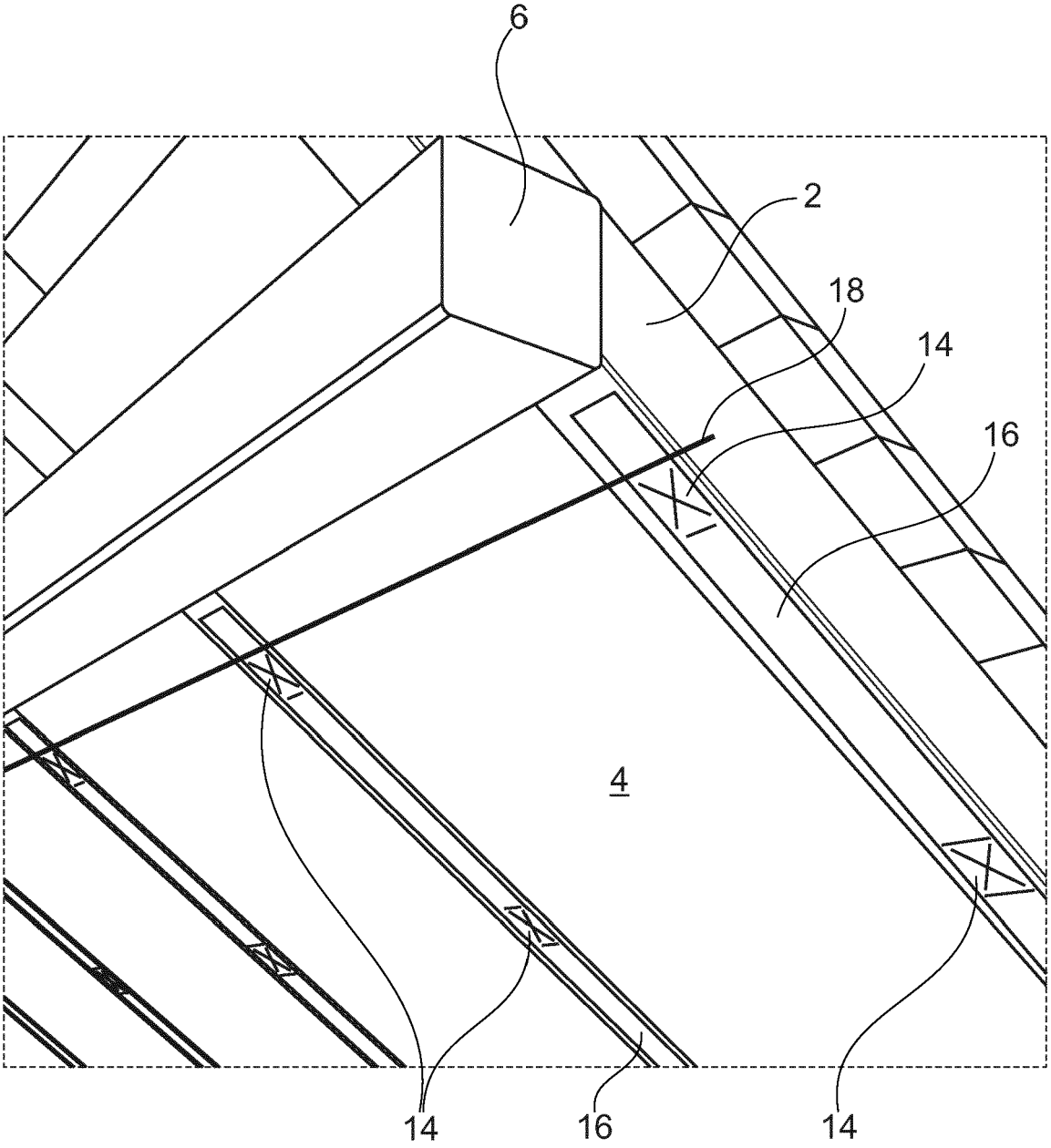


Fig. 2

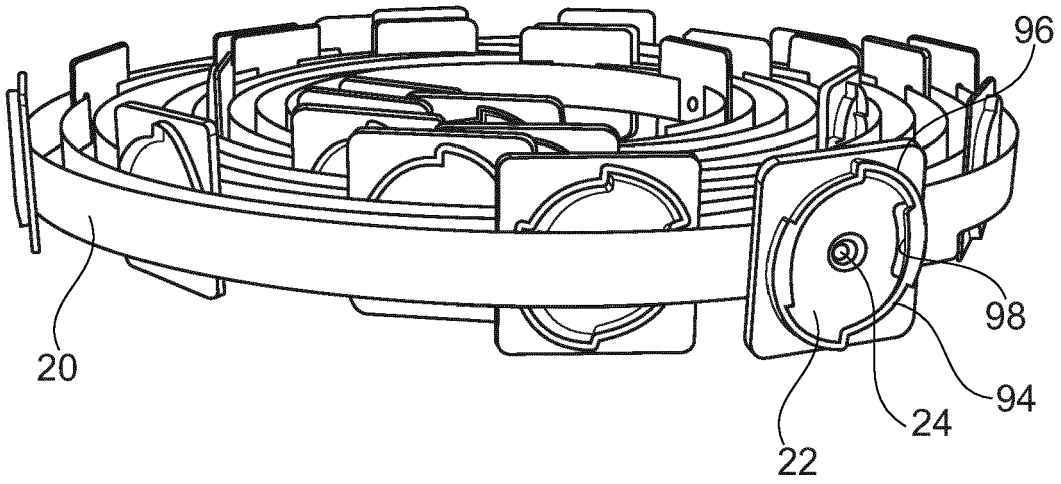


Fig. 3

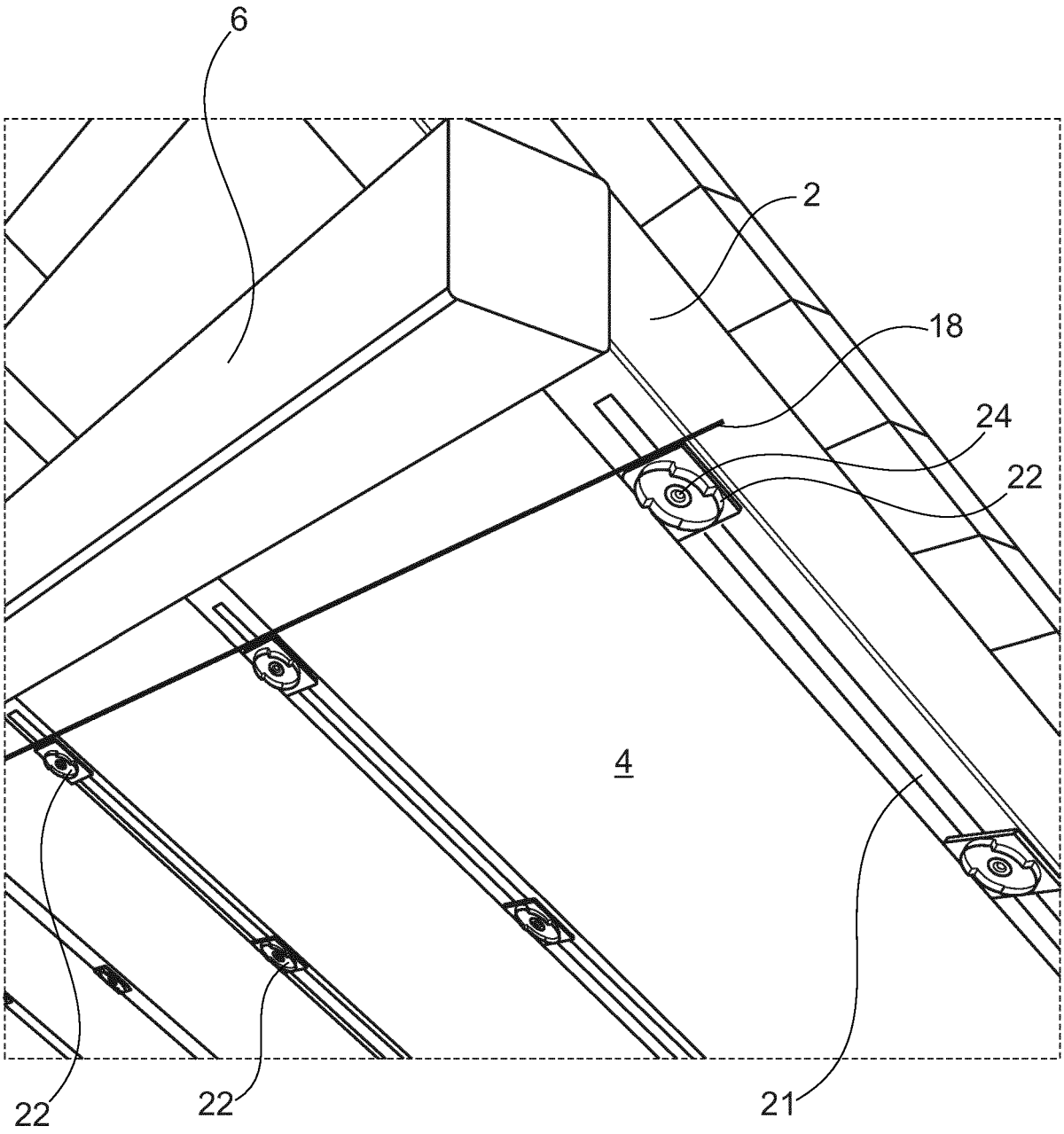


Fig. 4

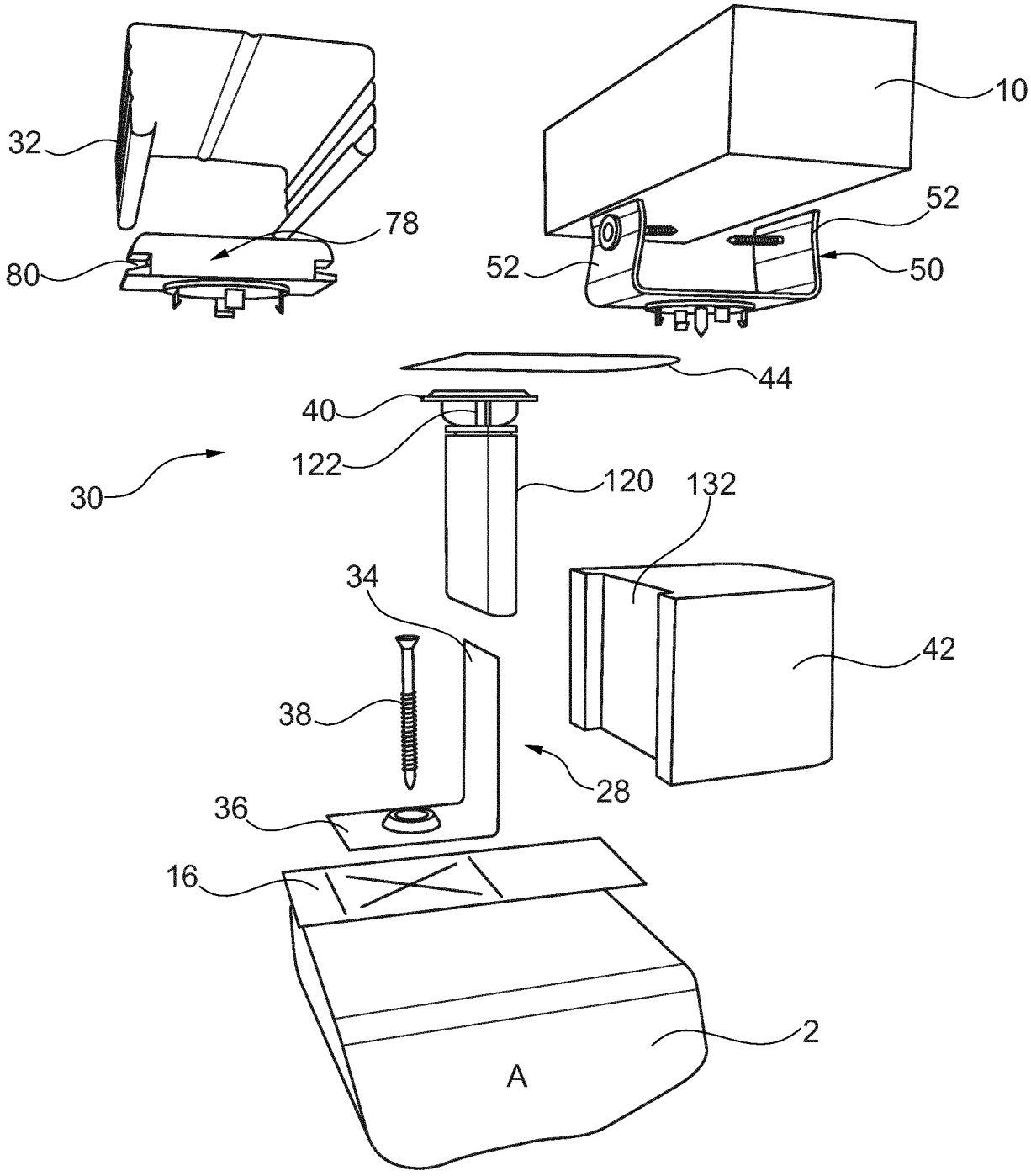
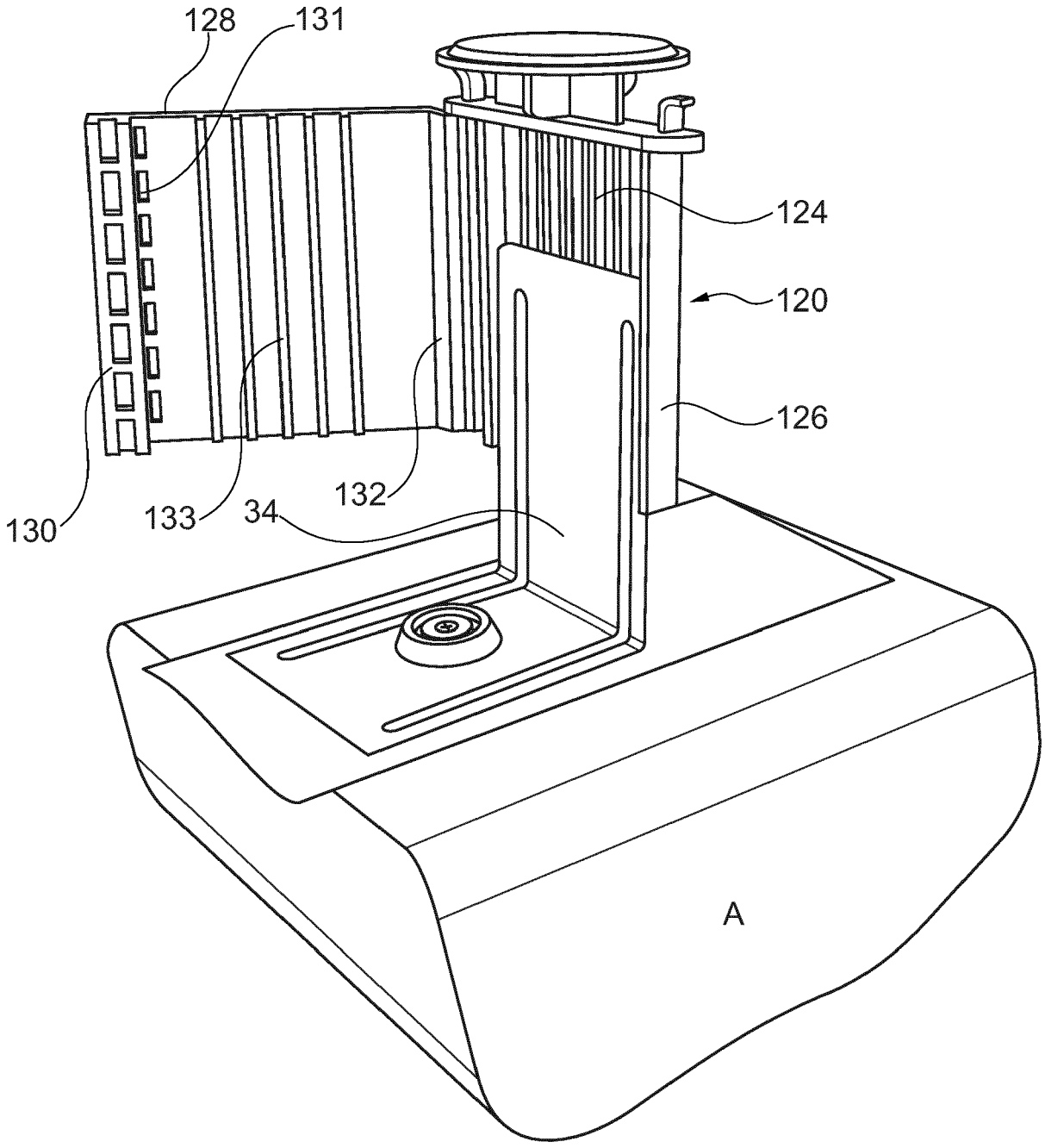


Fig. 5



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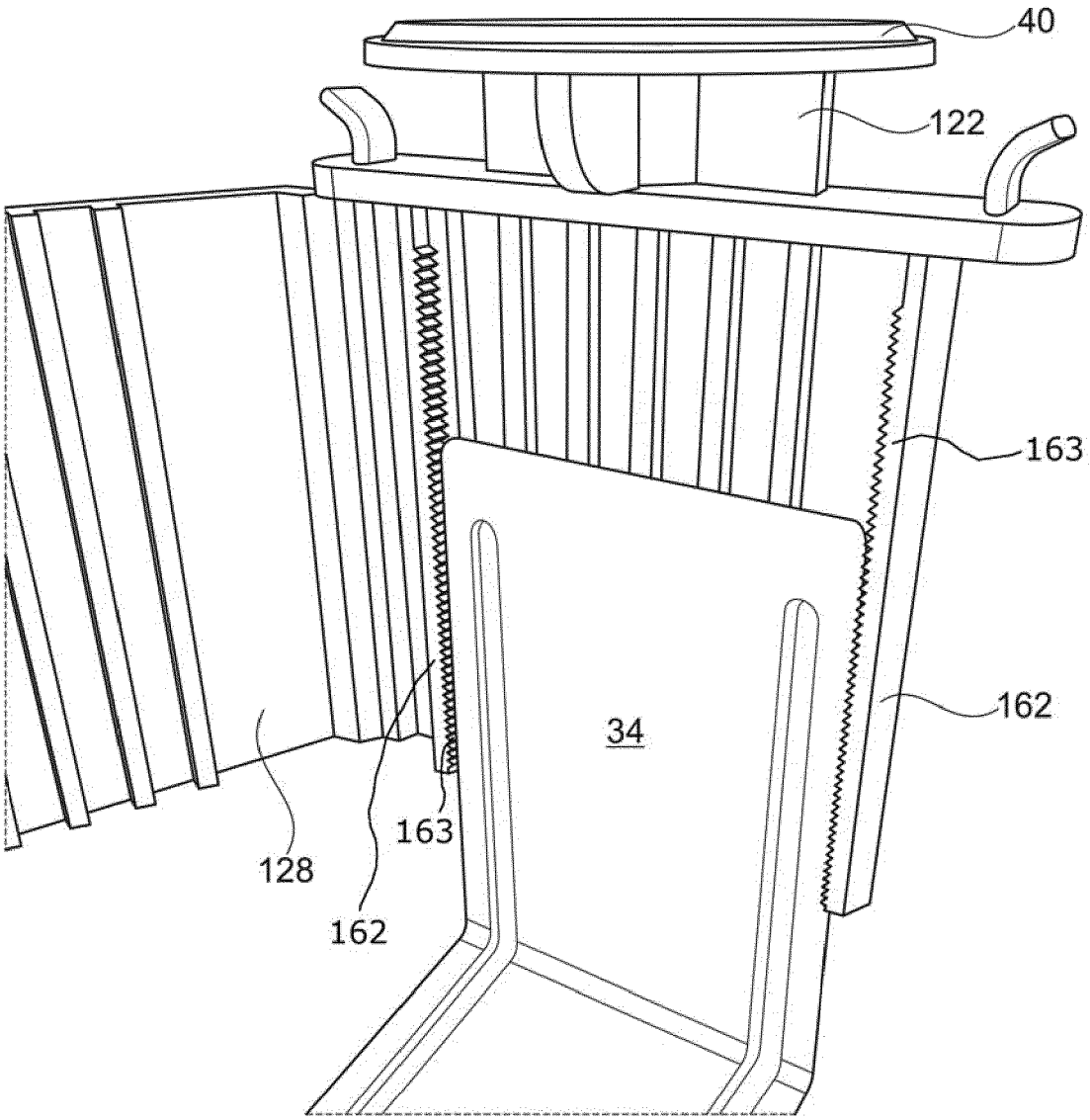

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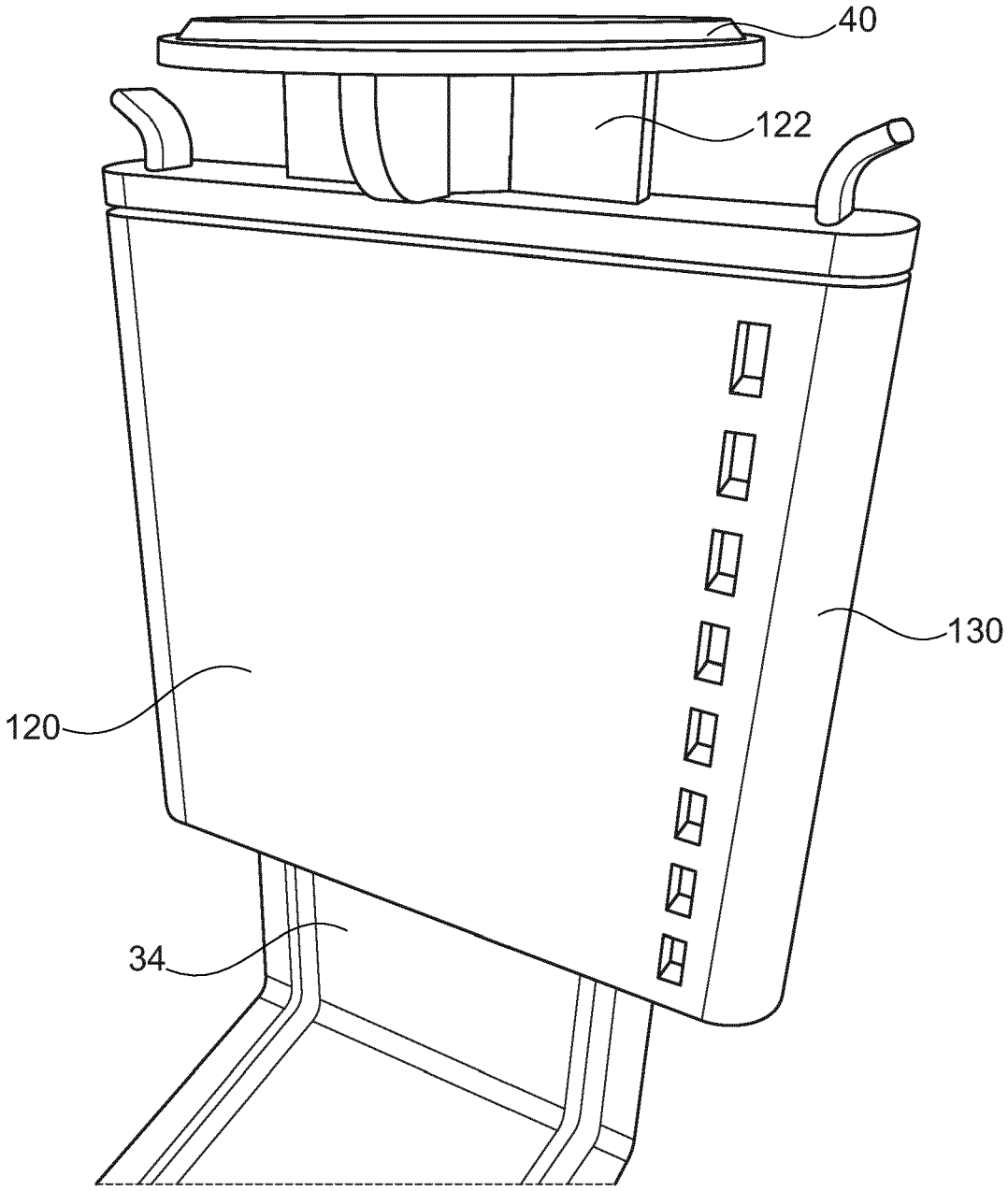

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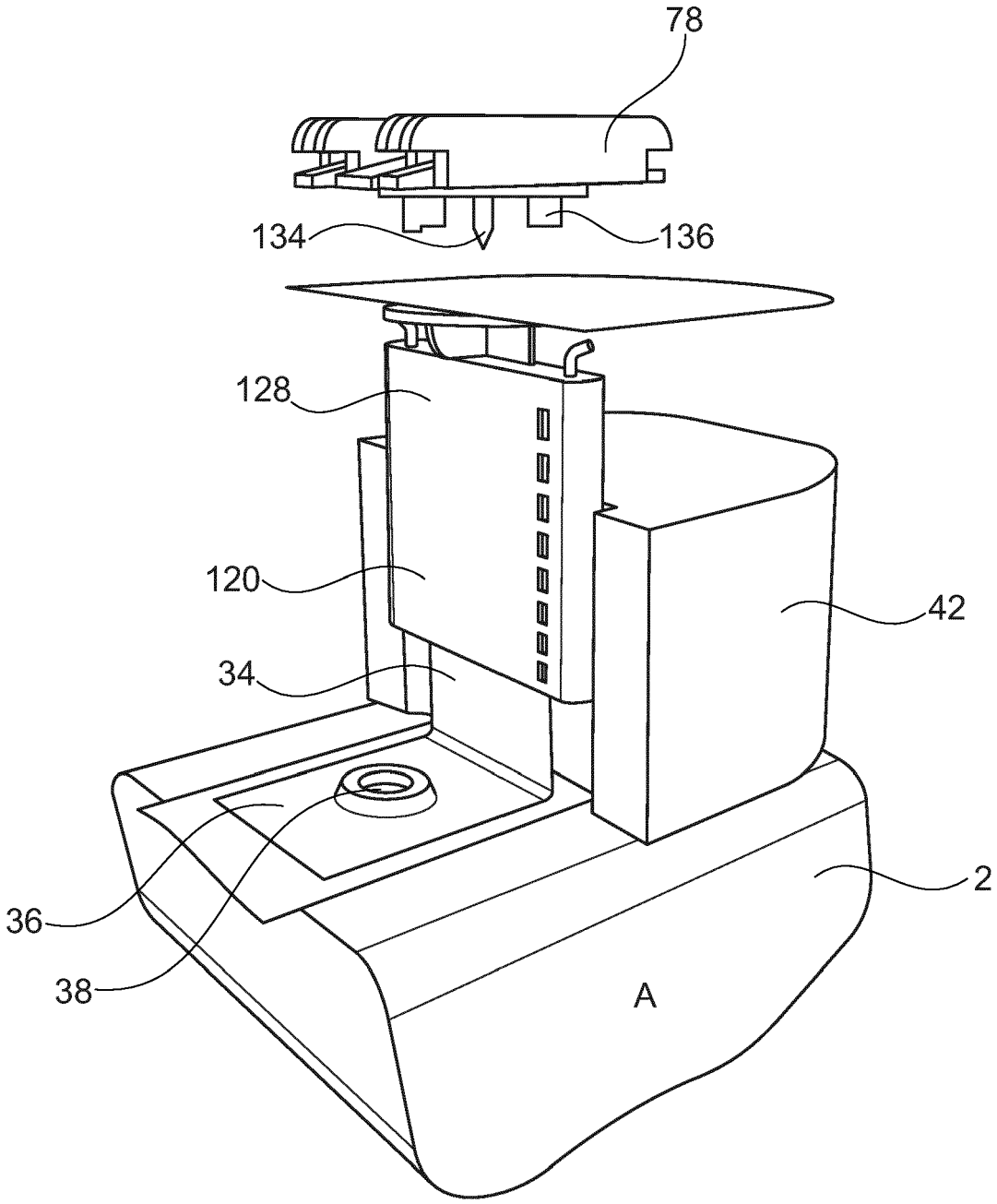

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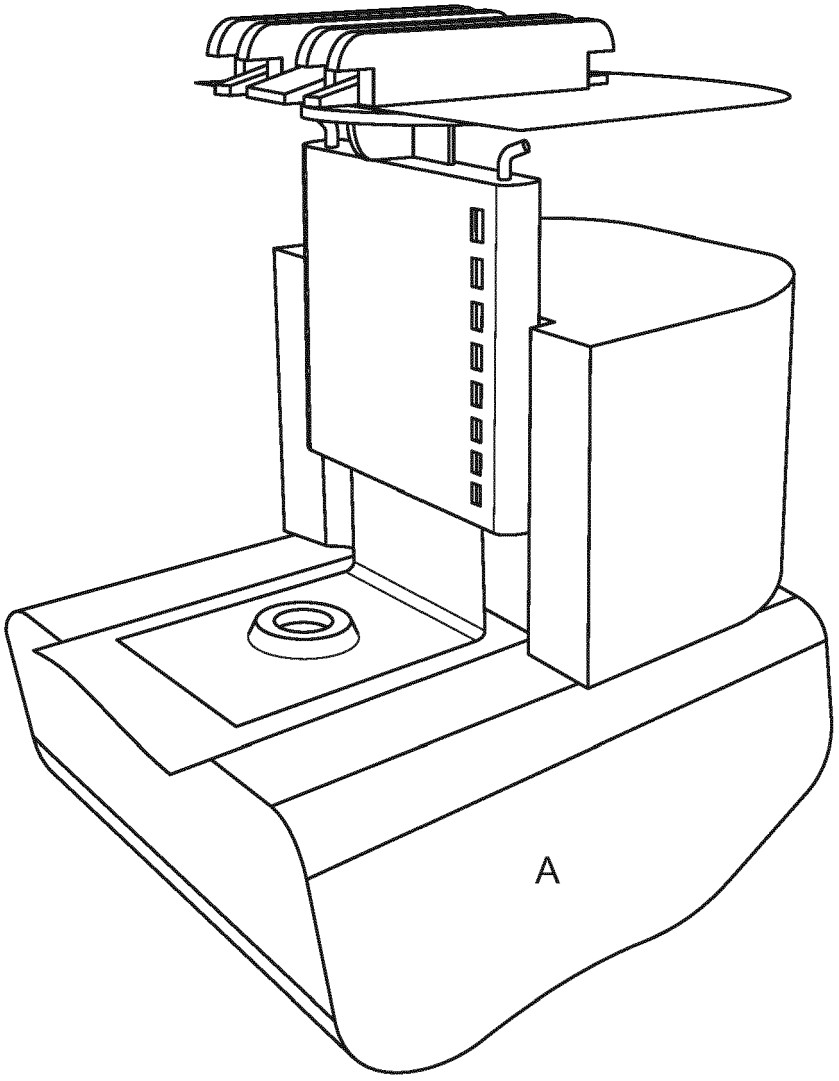

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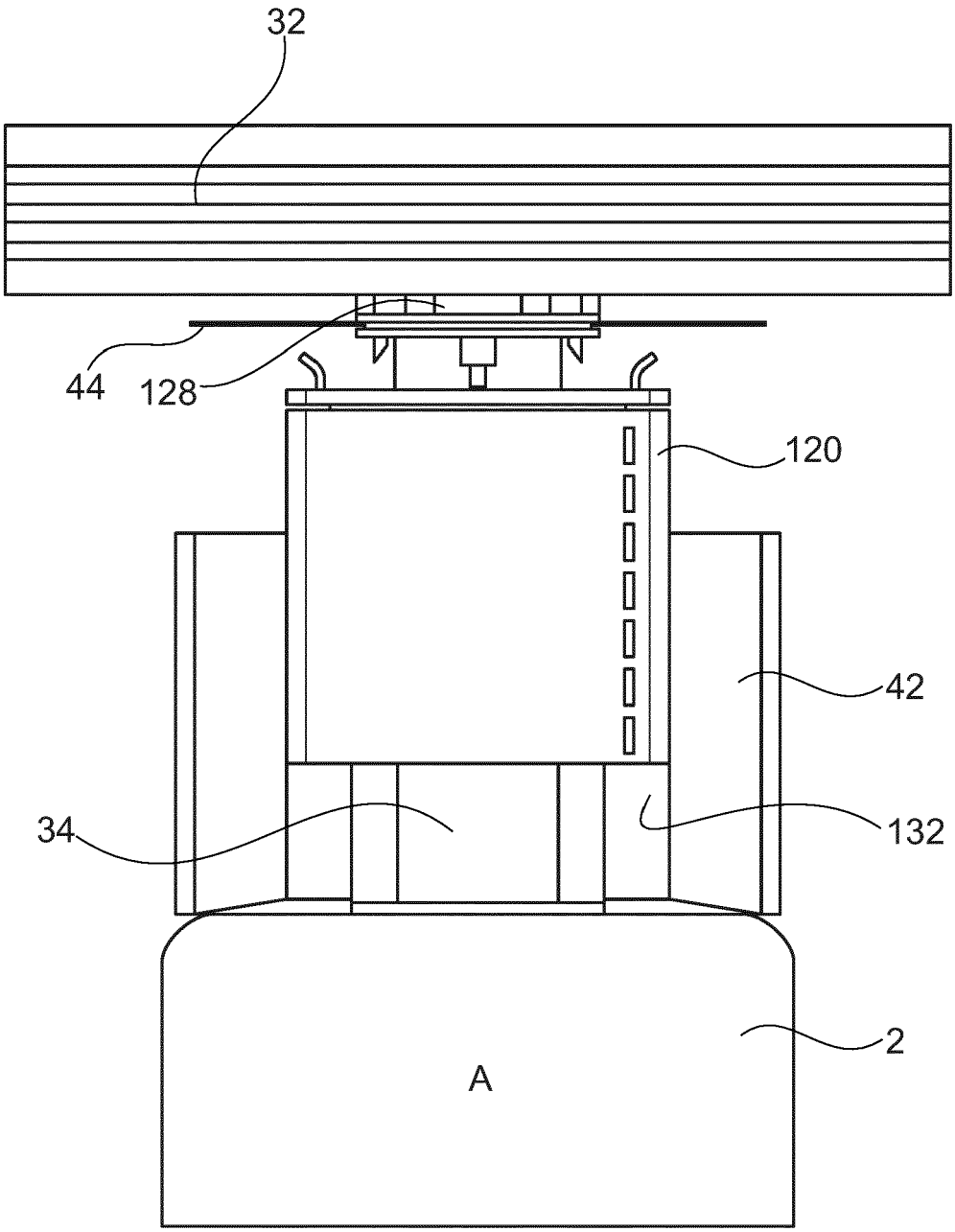

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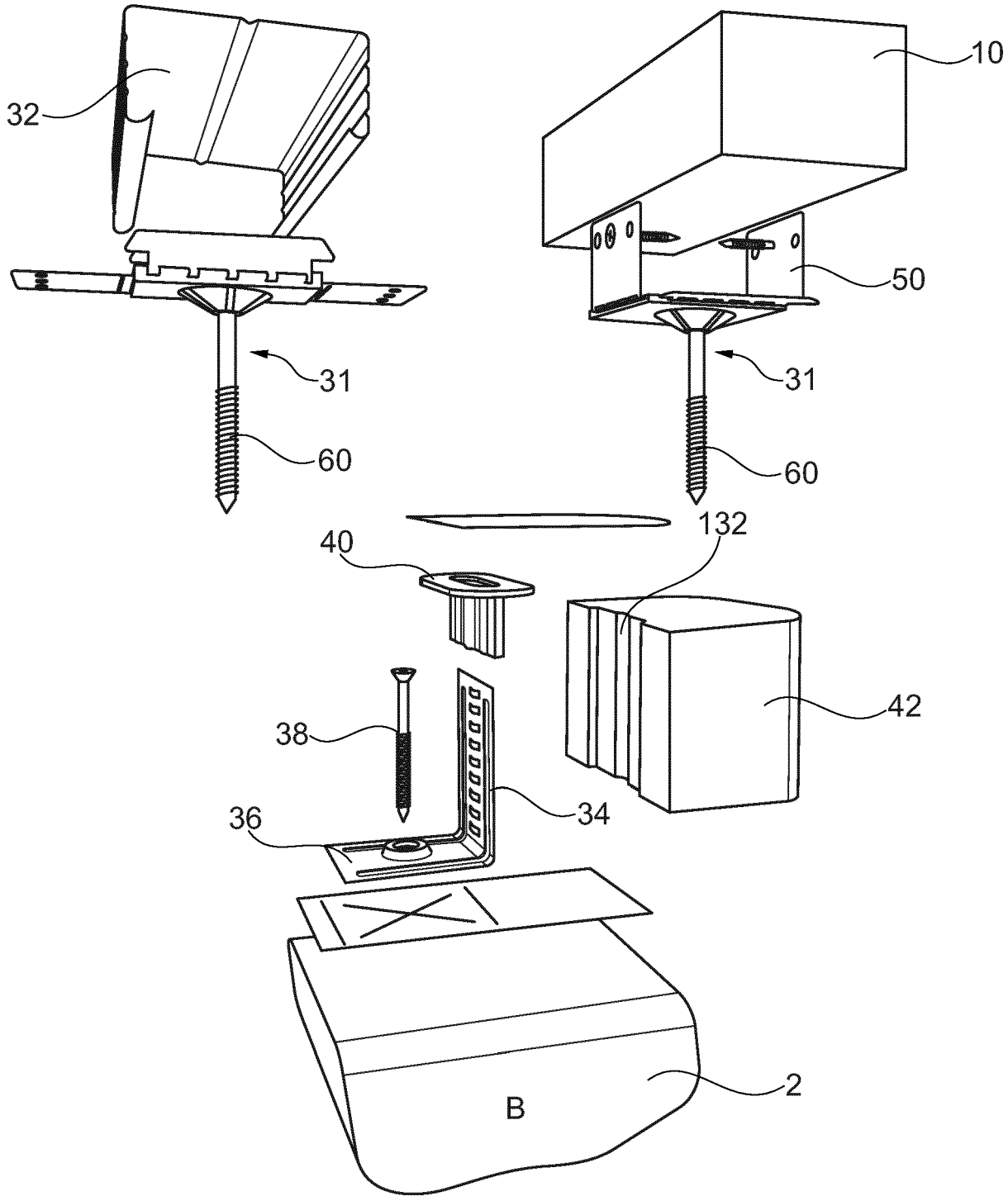

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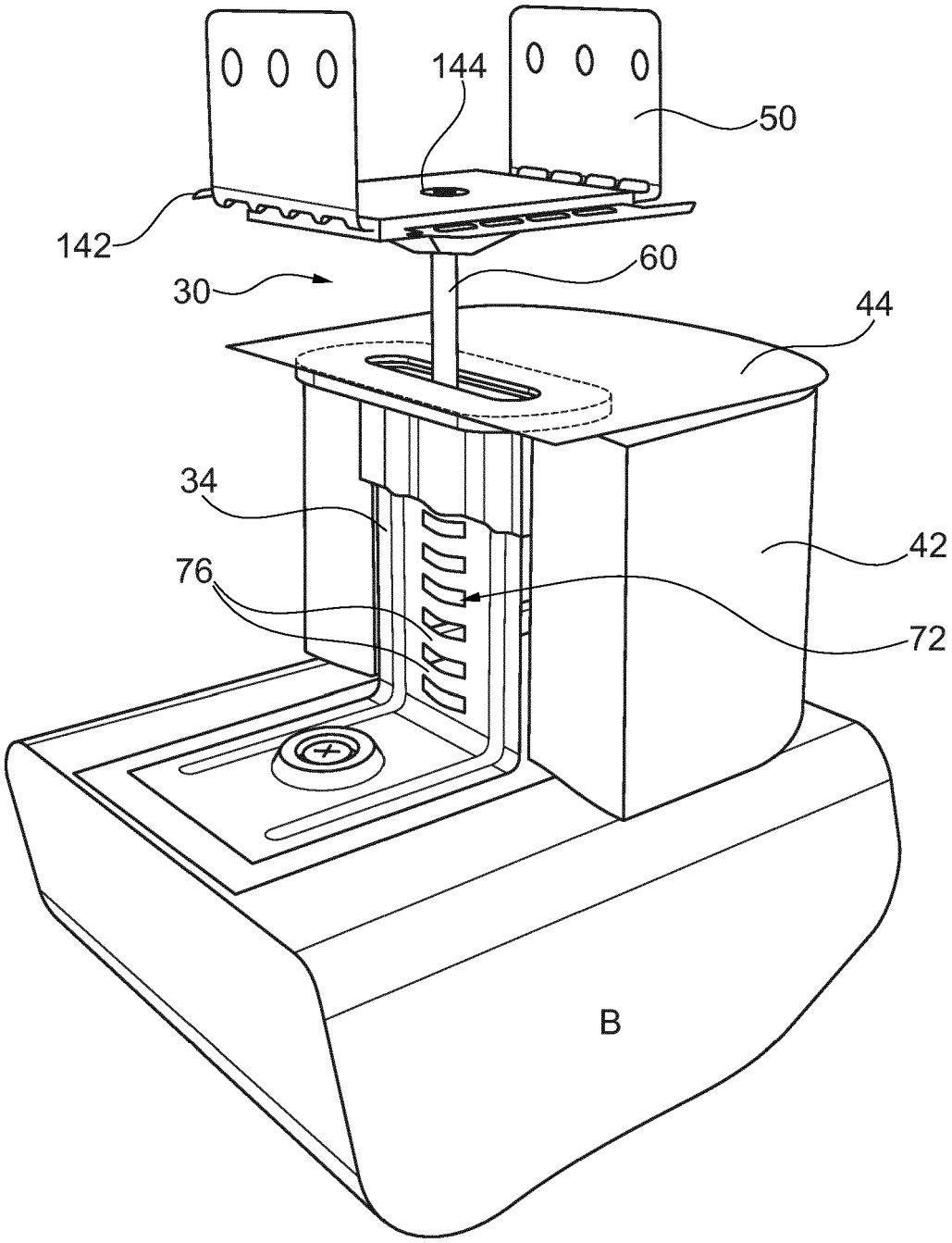

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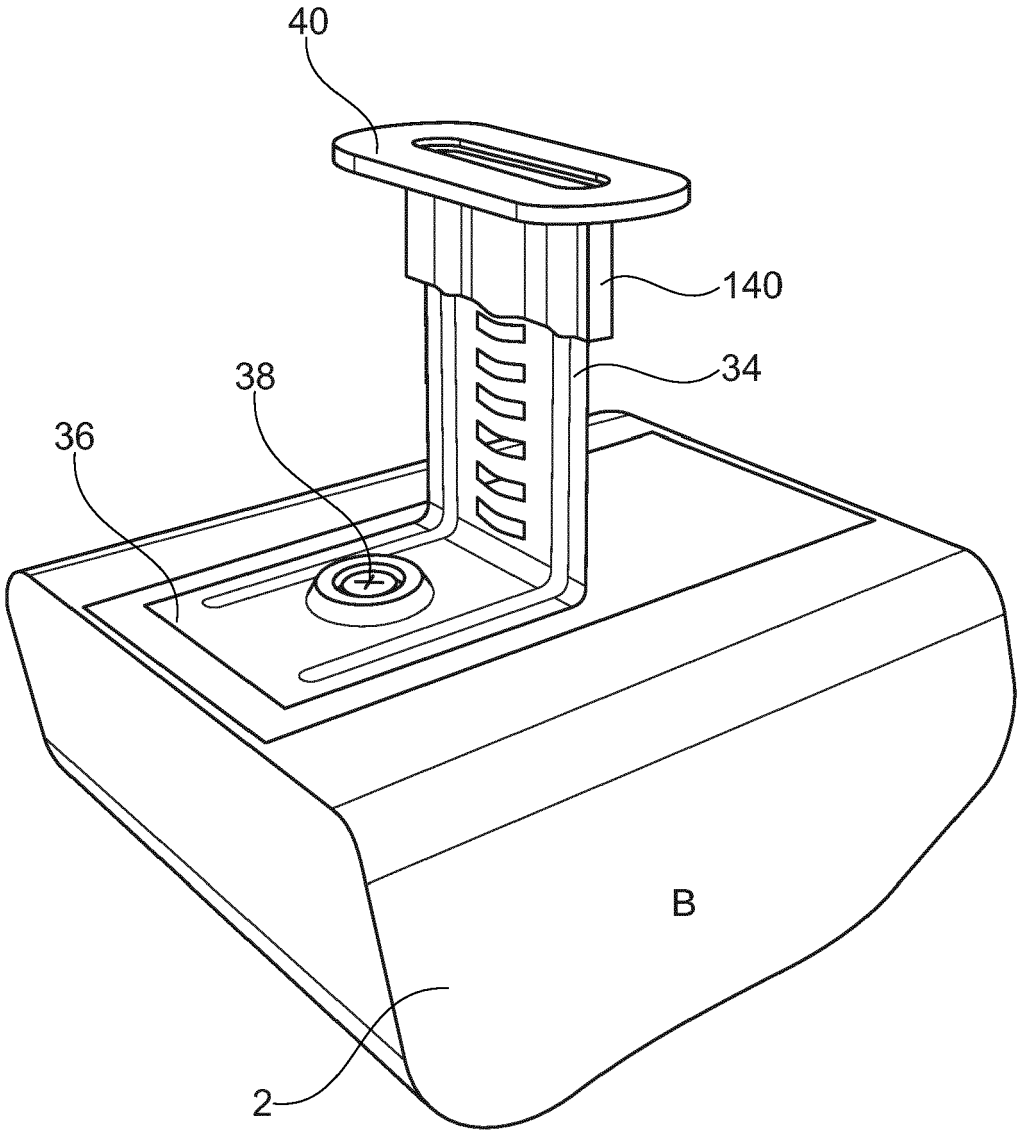

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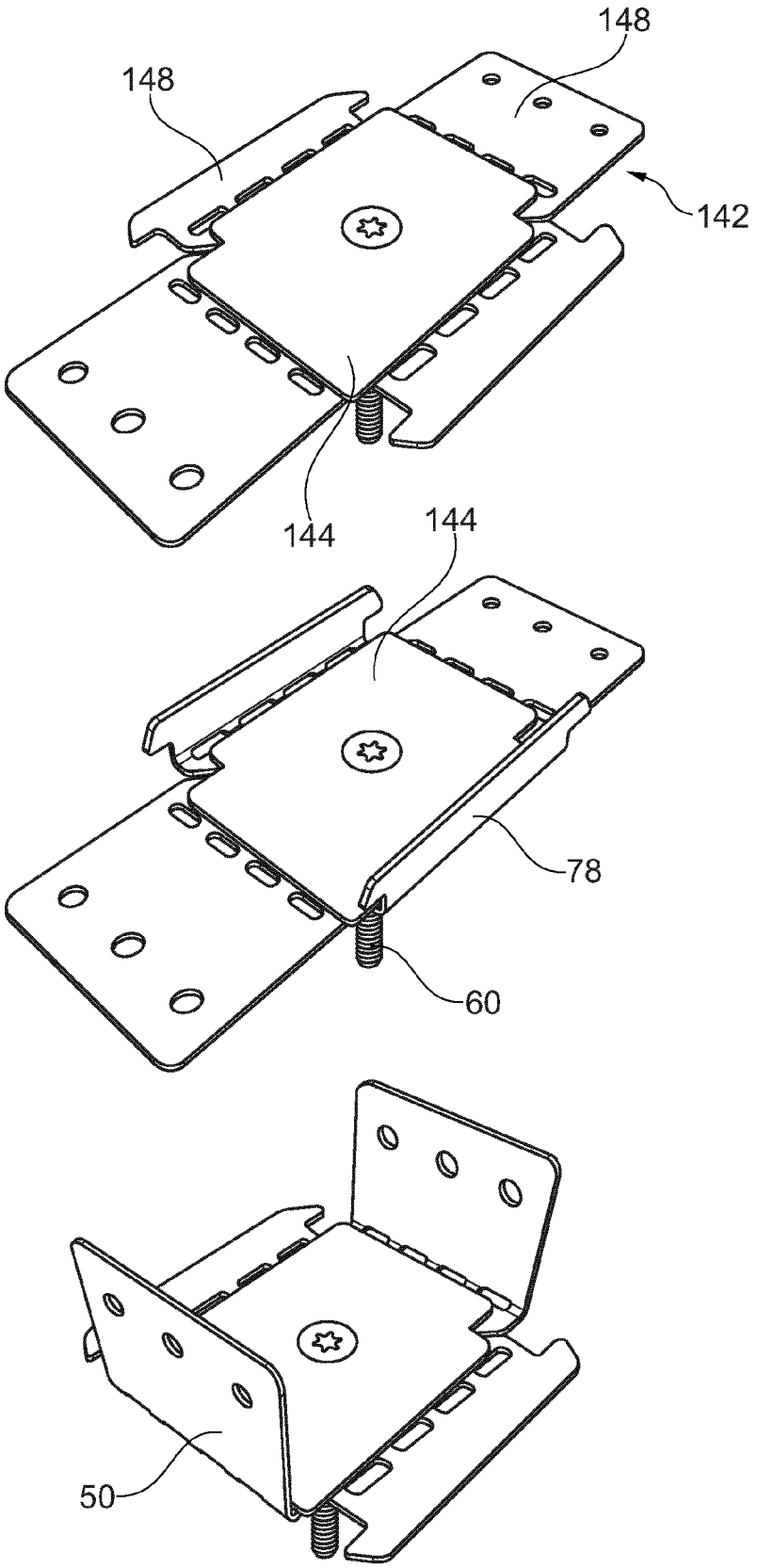

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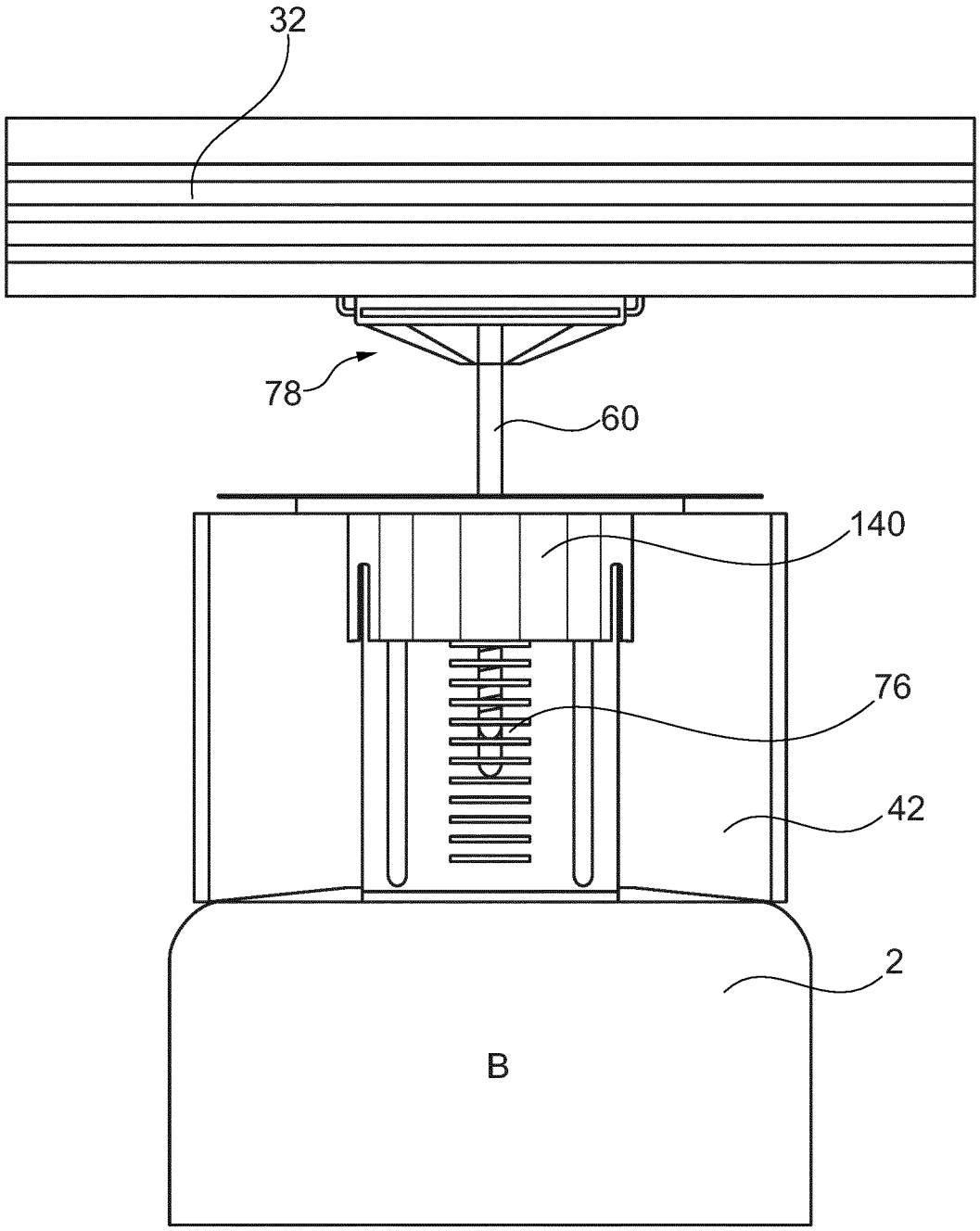

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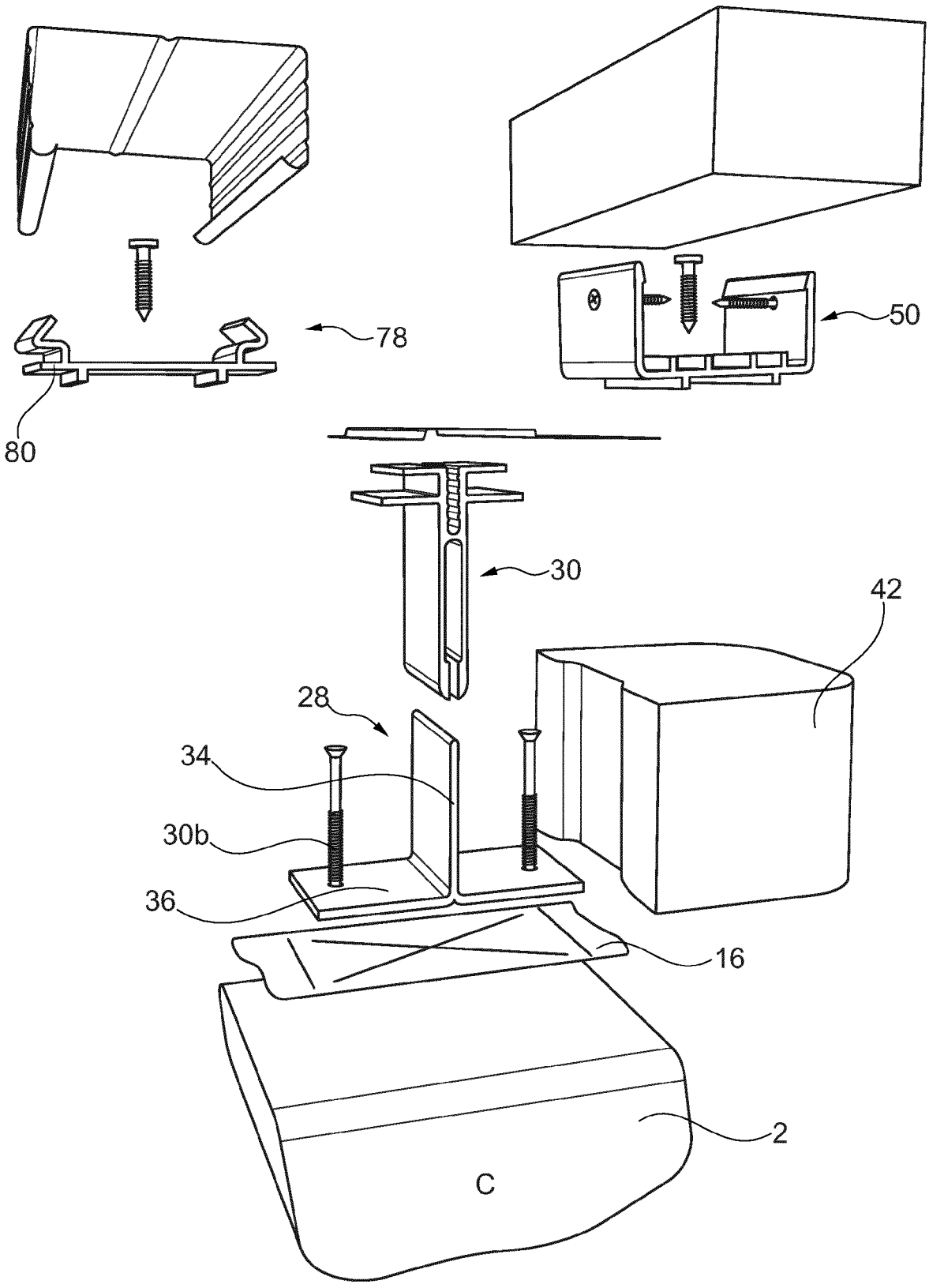

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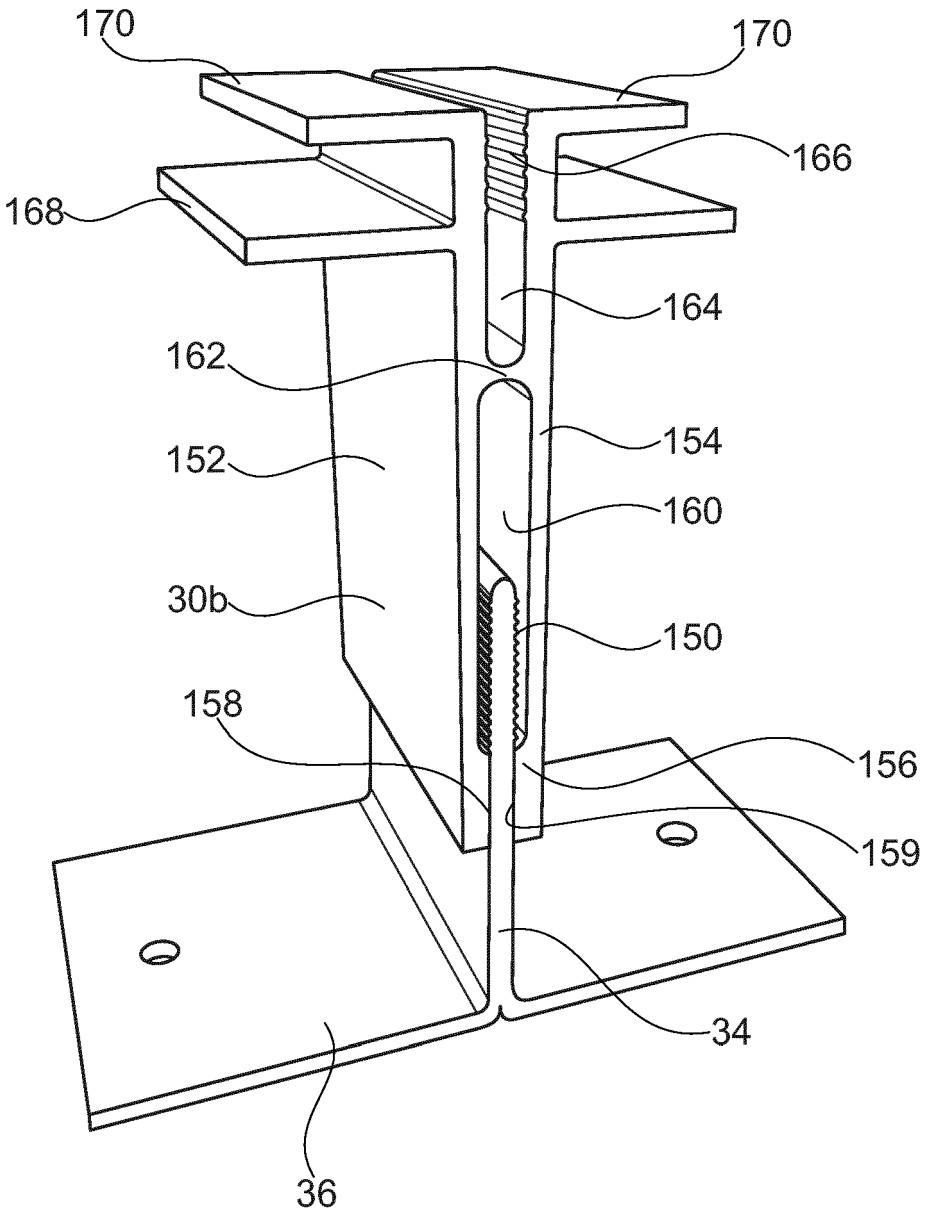

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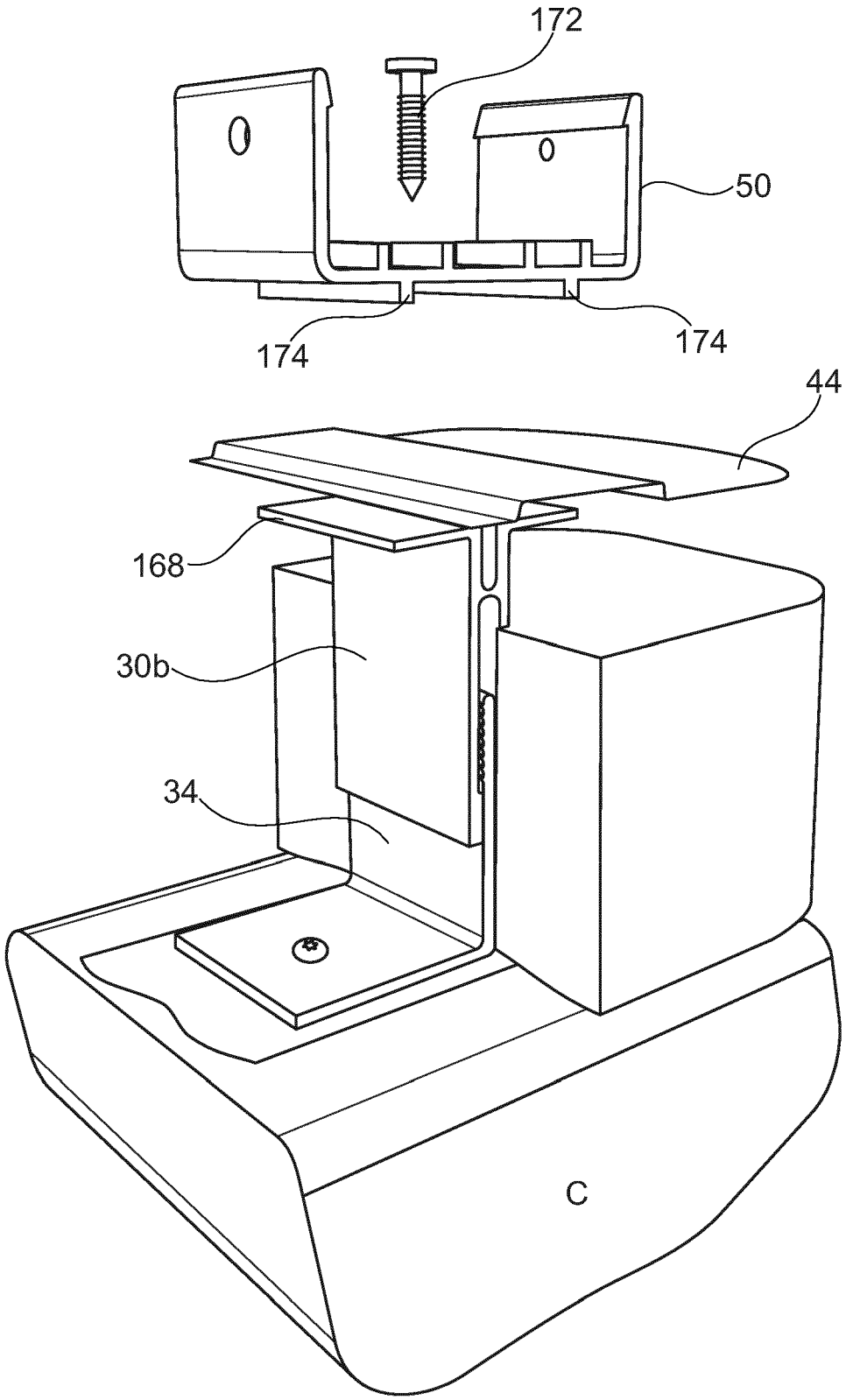

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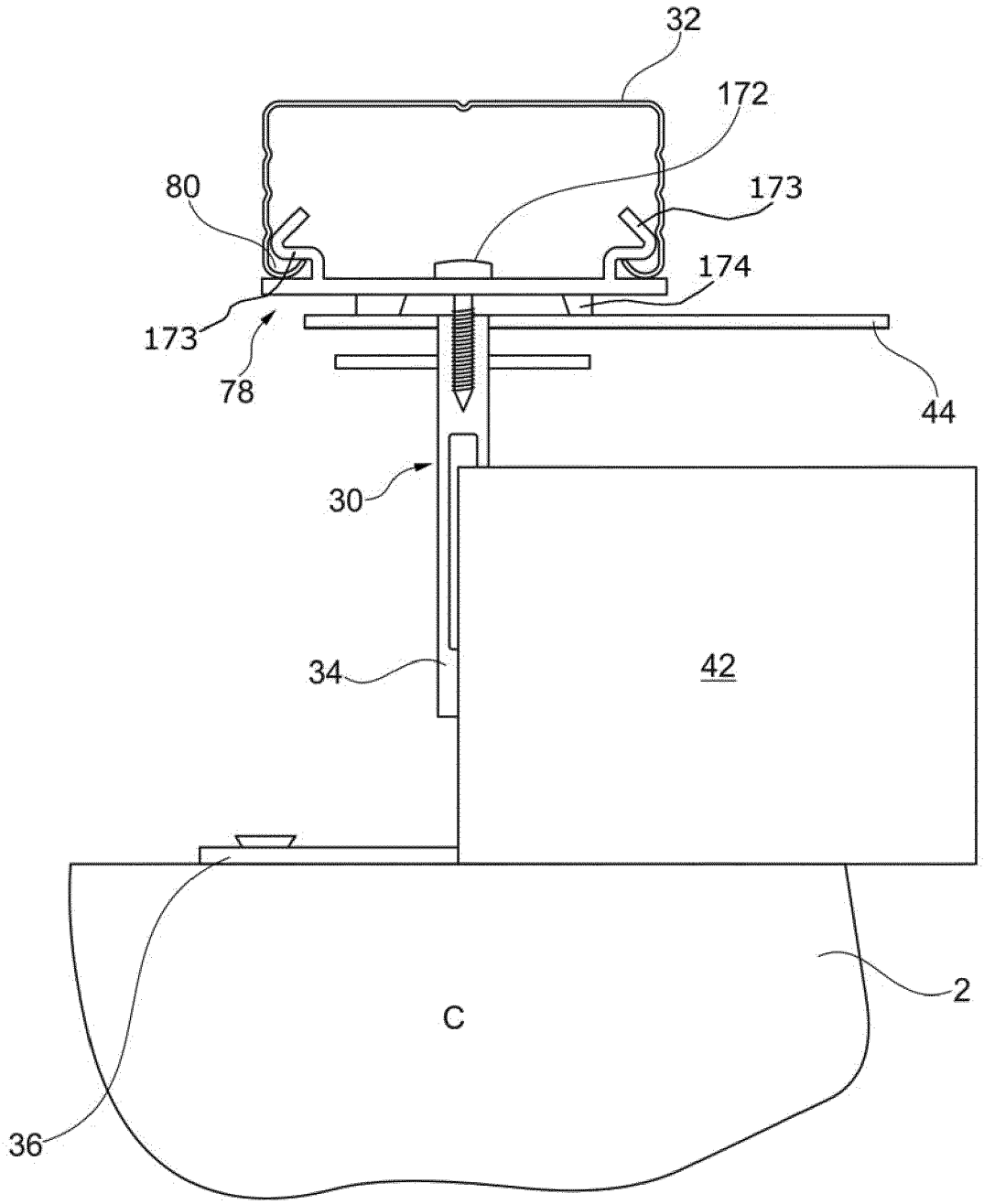

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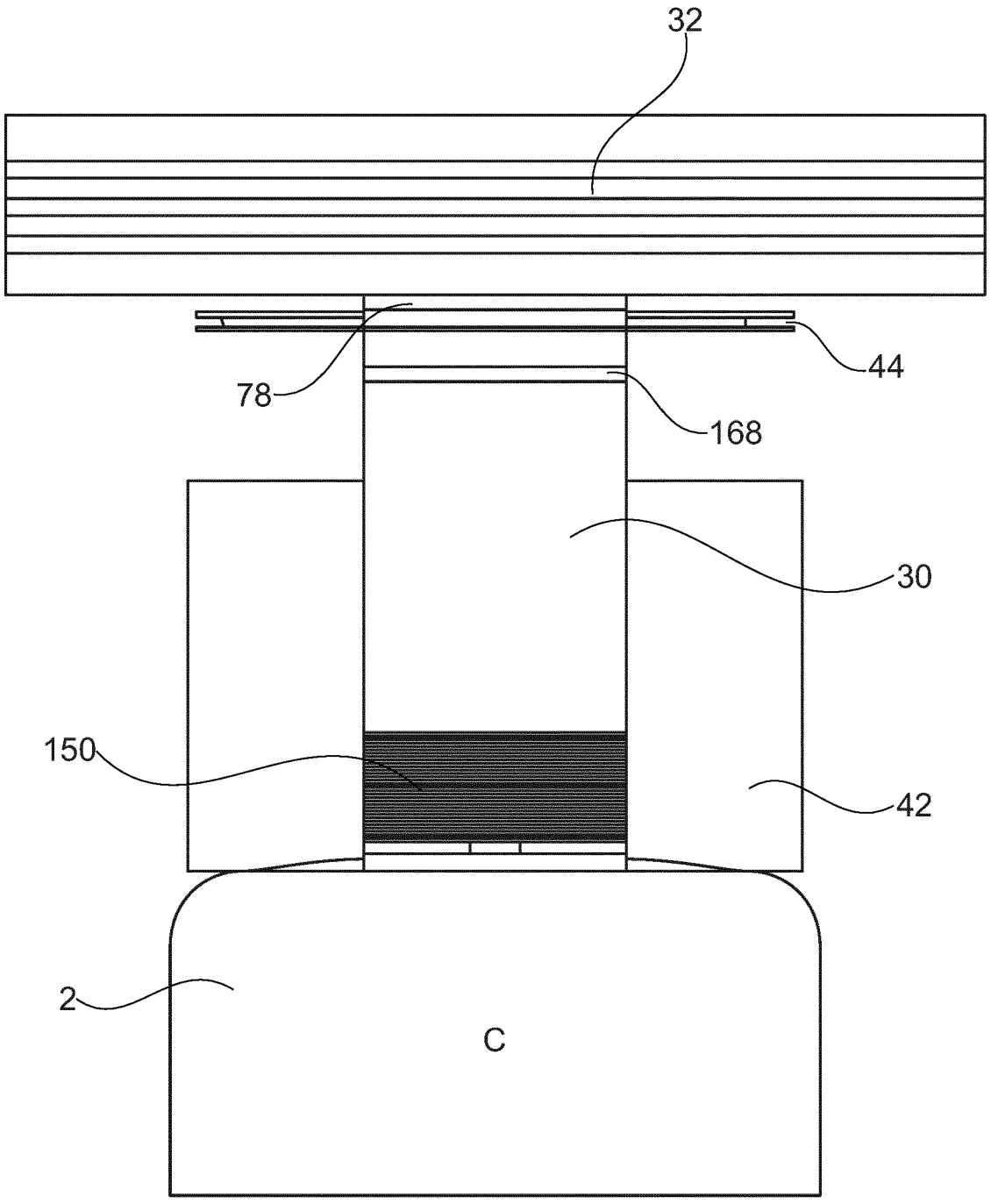

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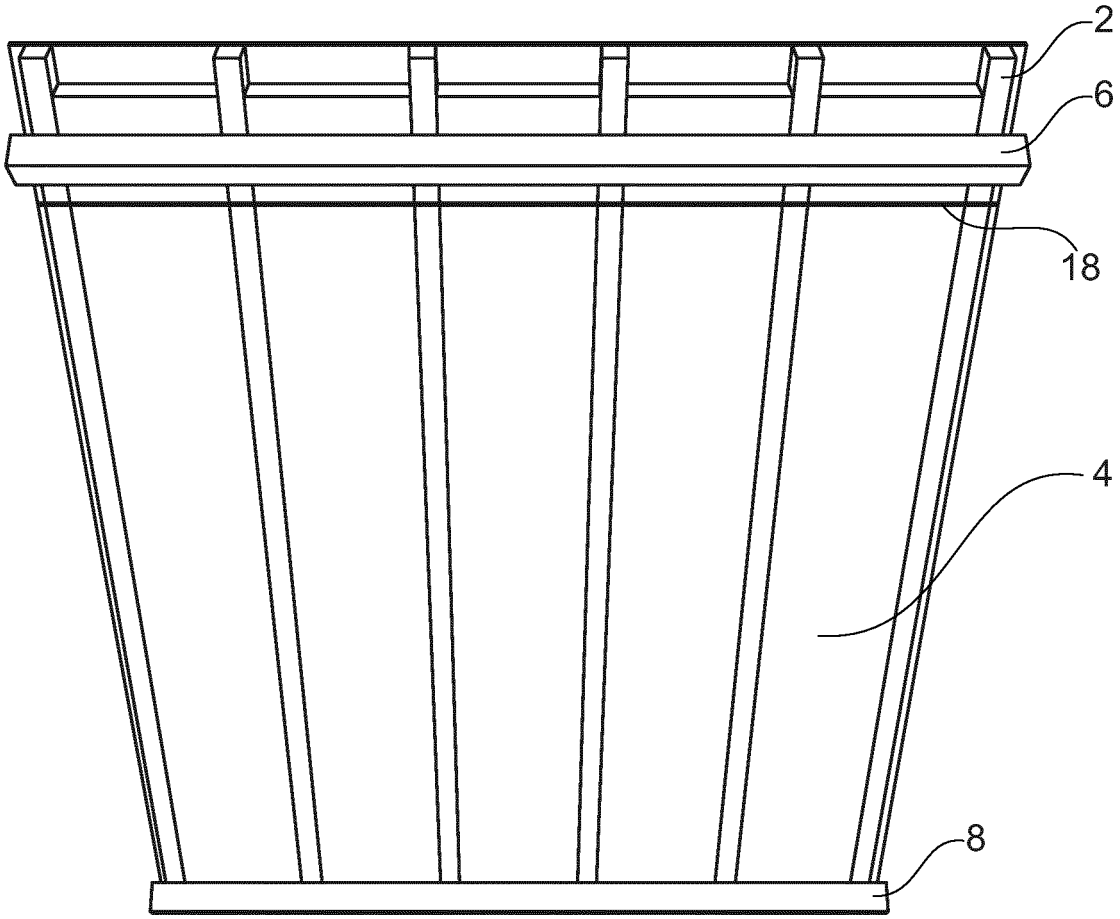

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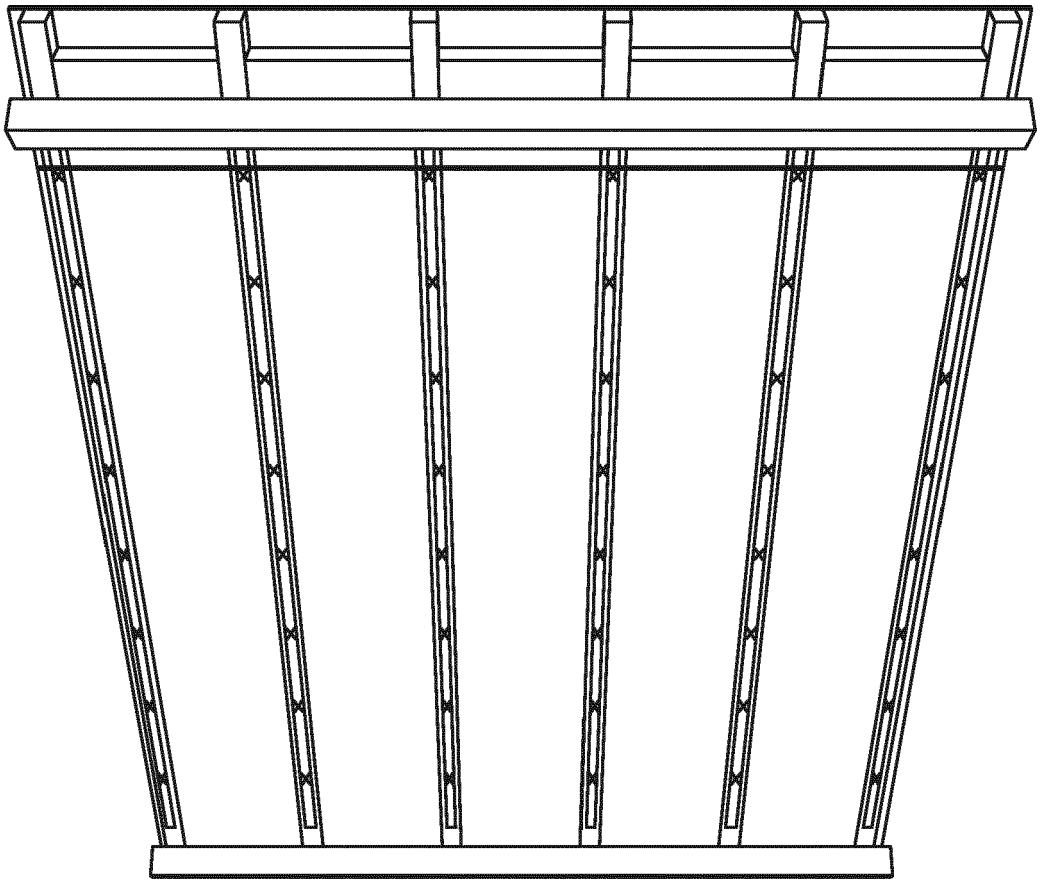

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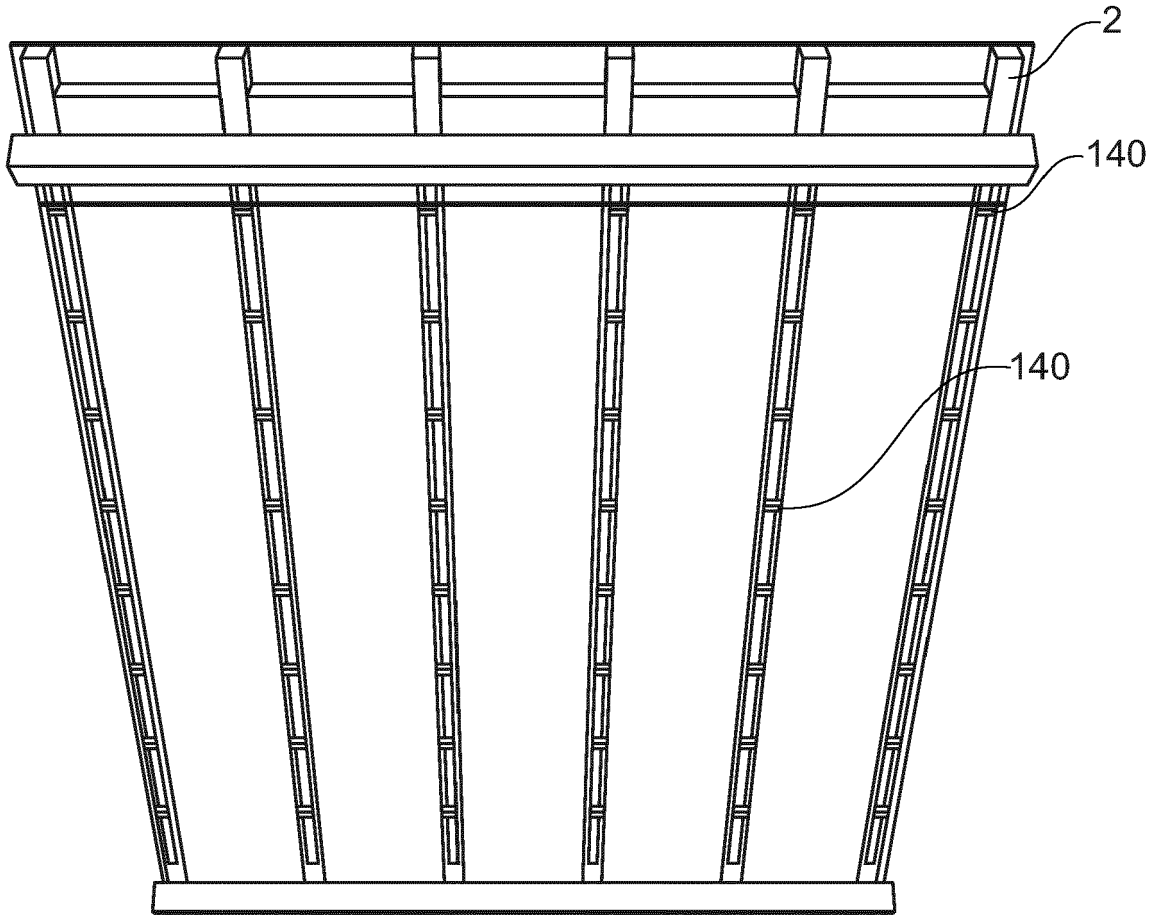

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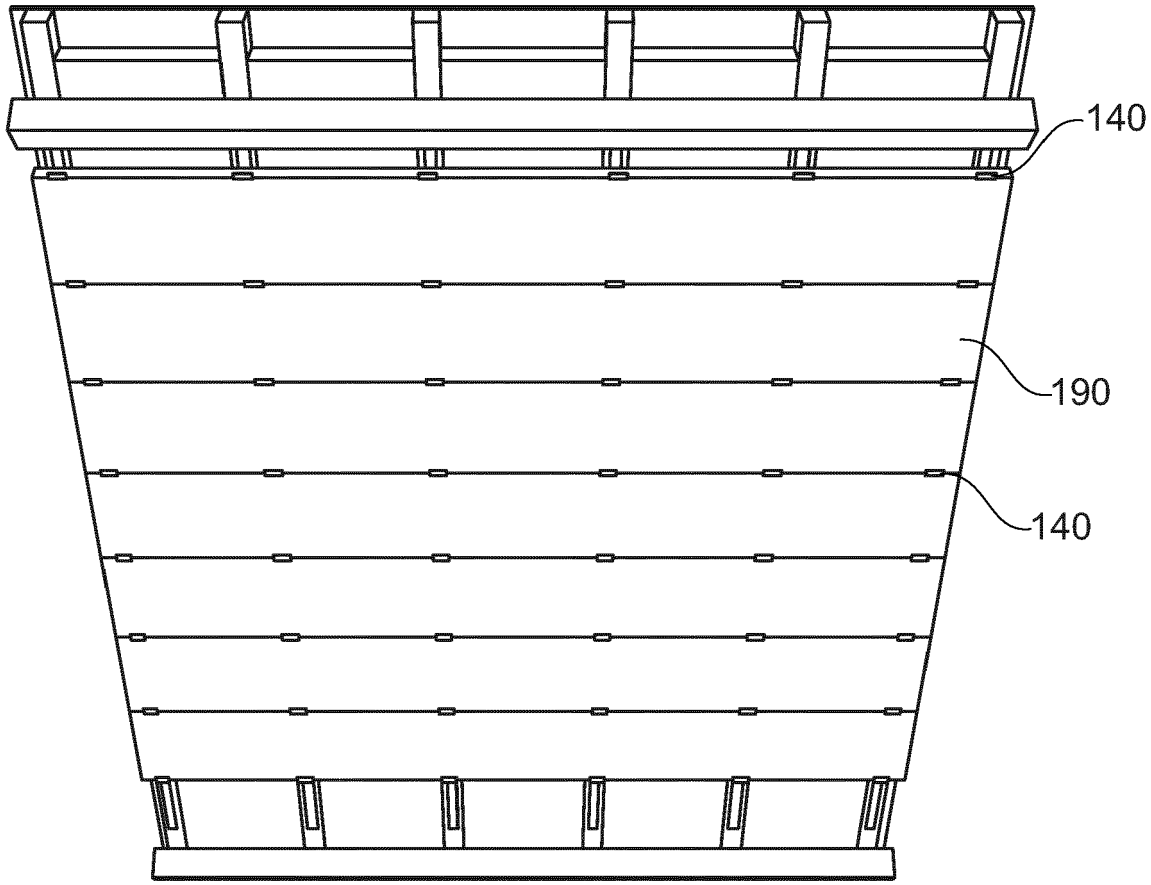

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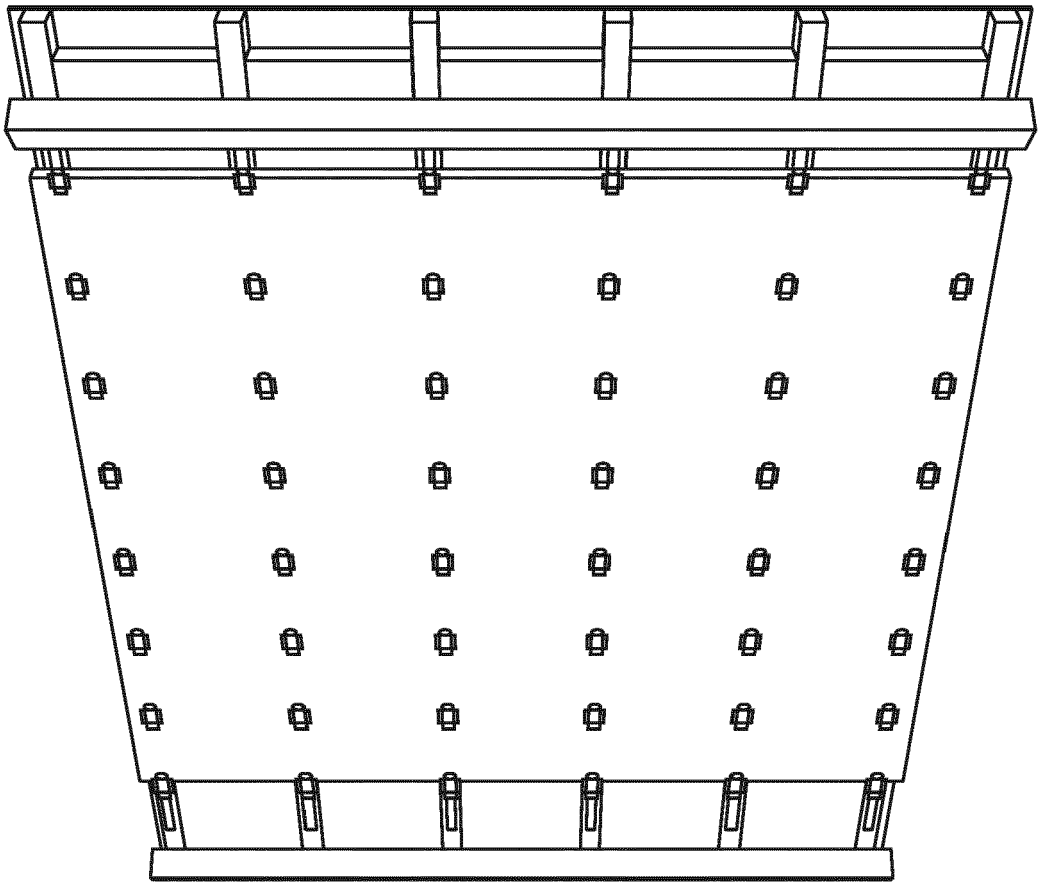

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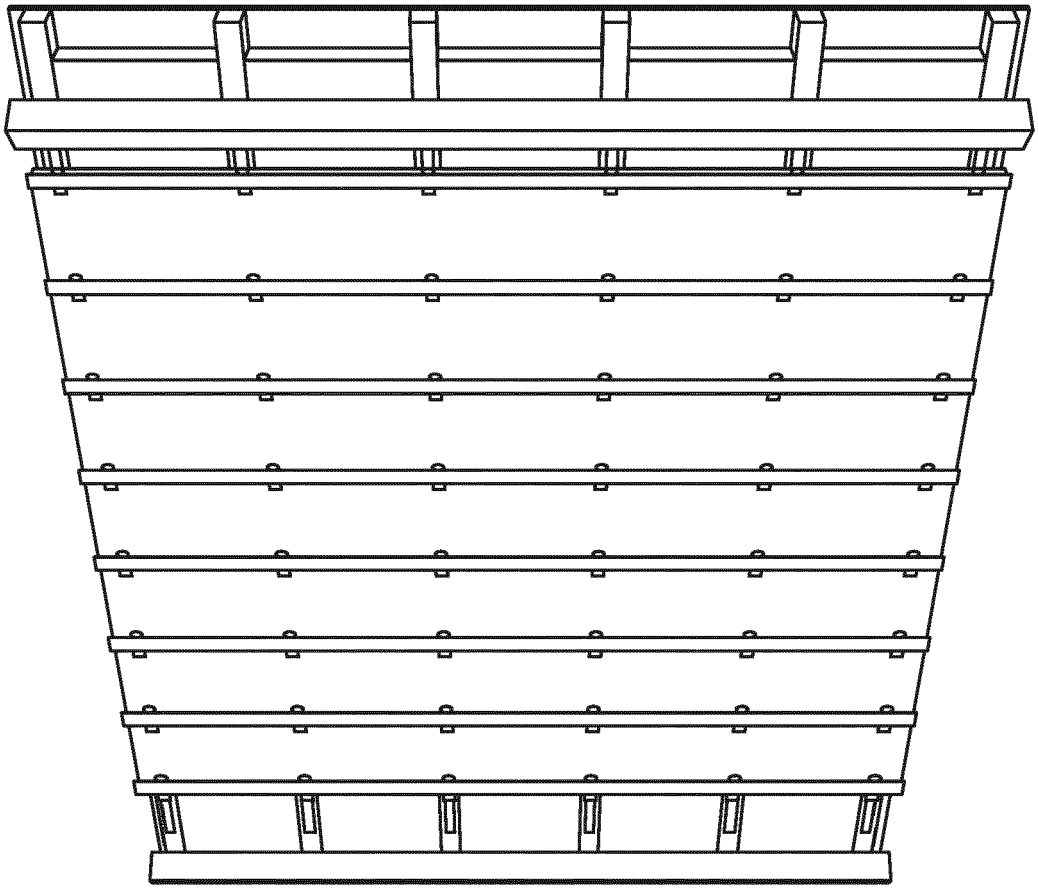

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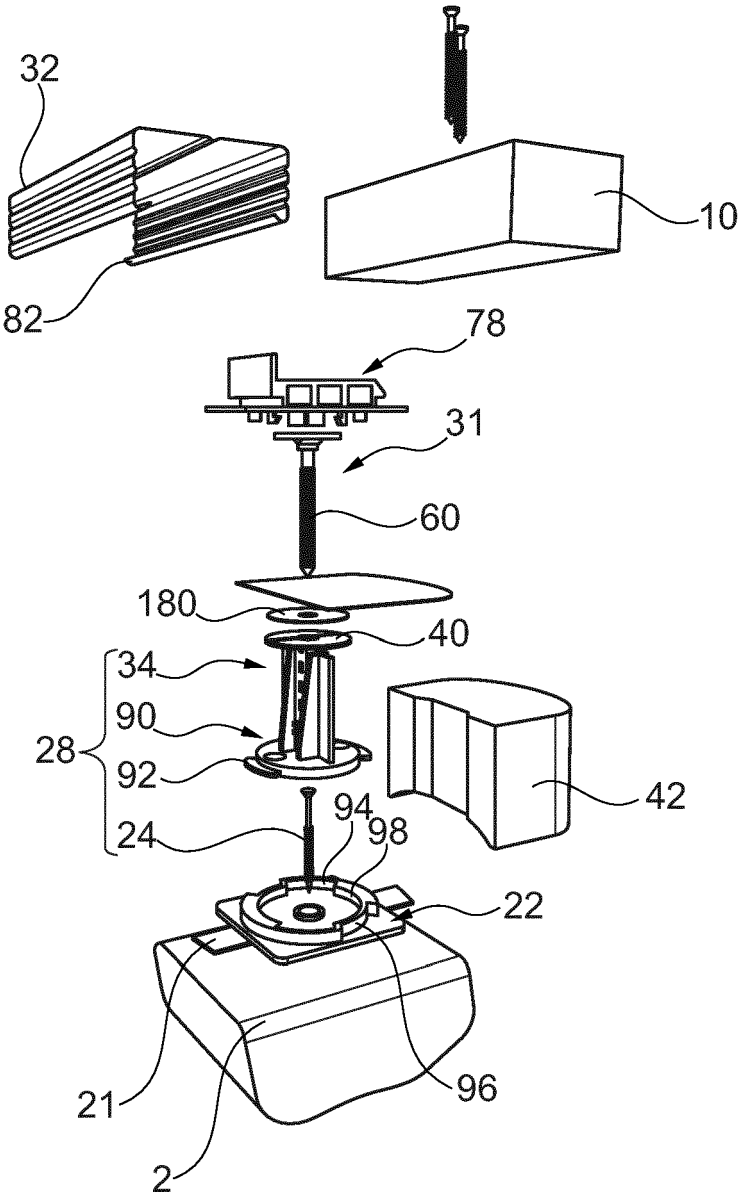

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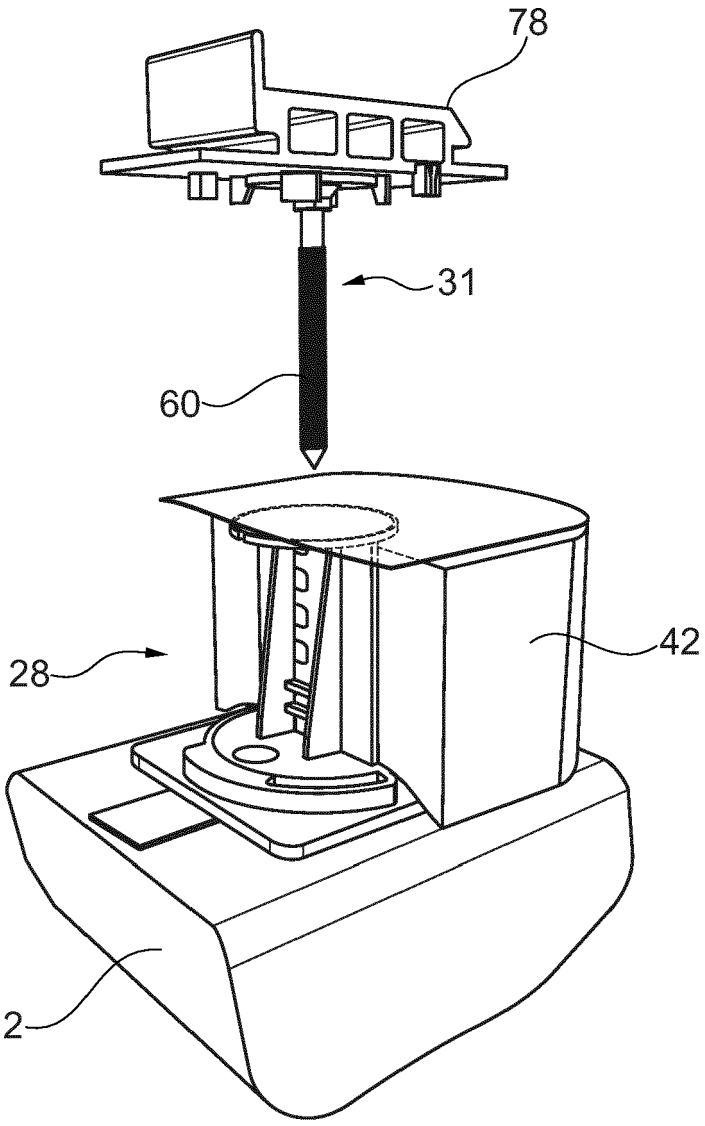

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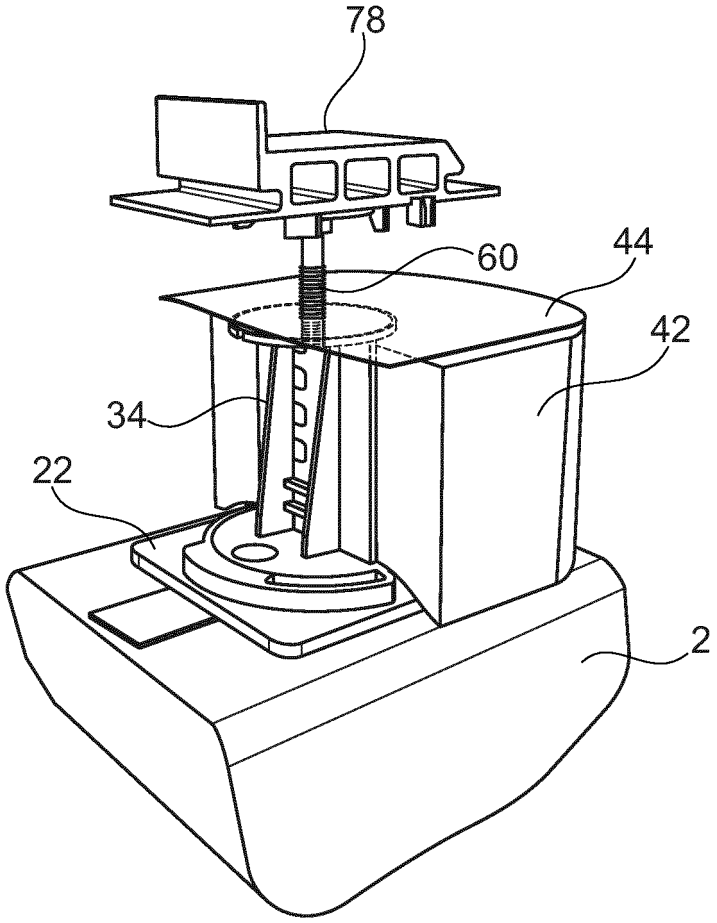

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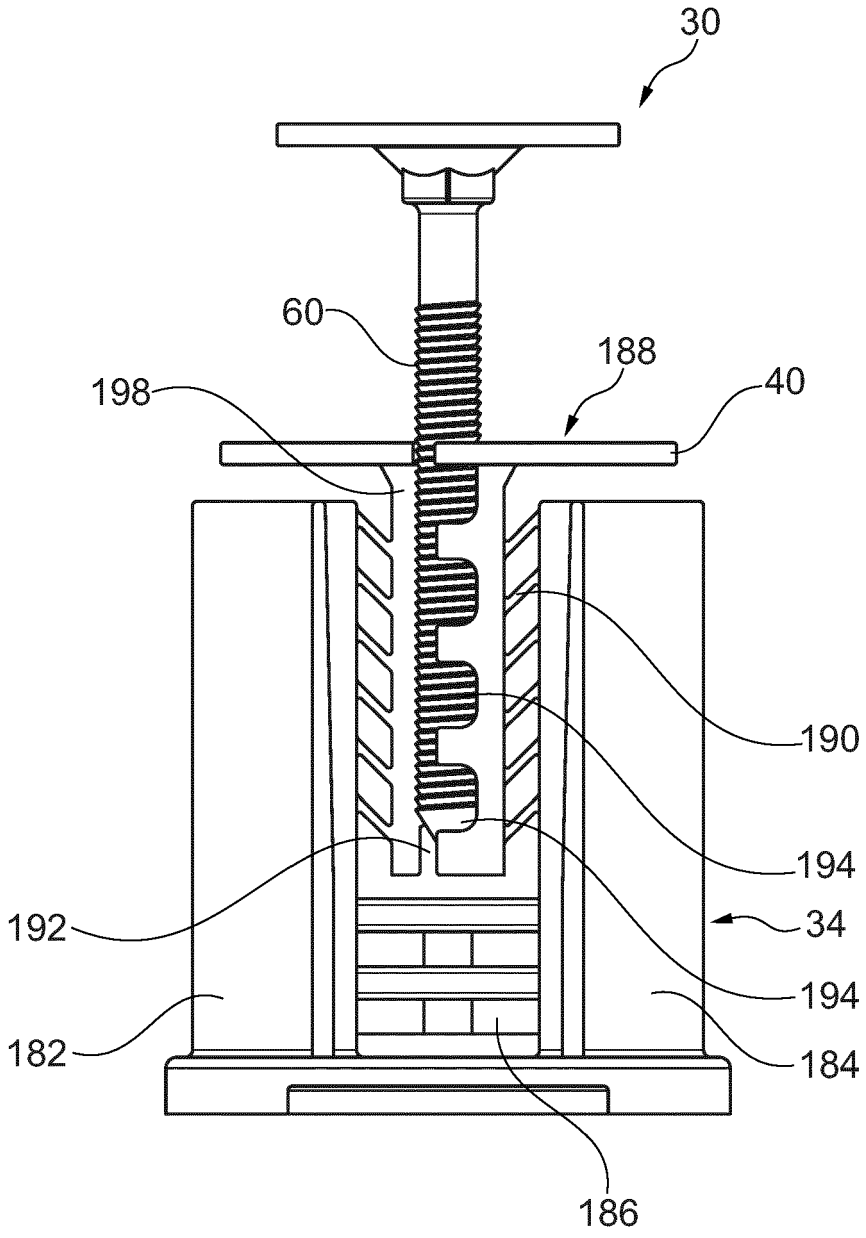

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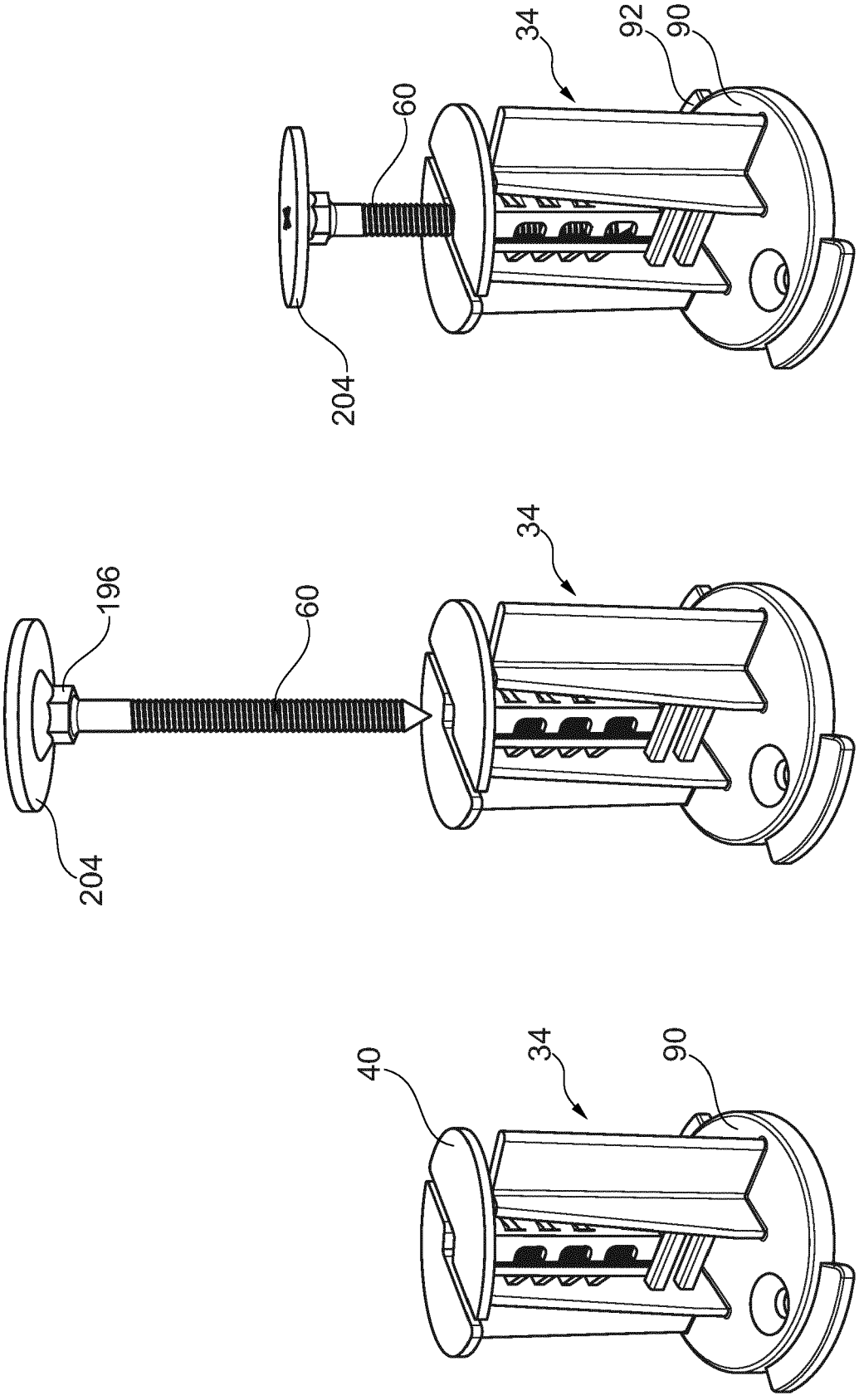

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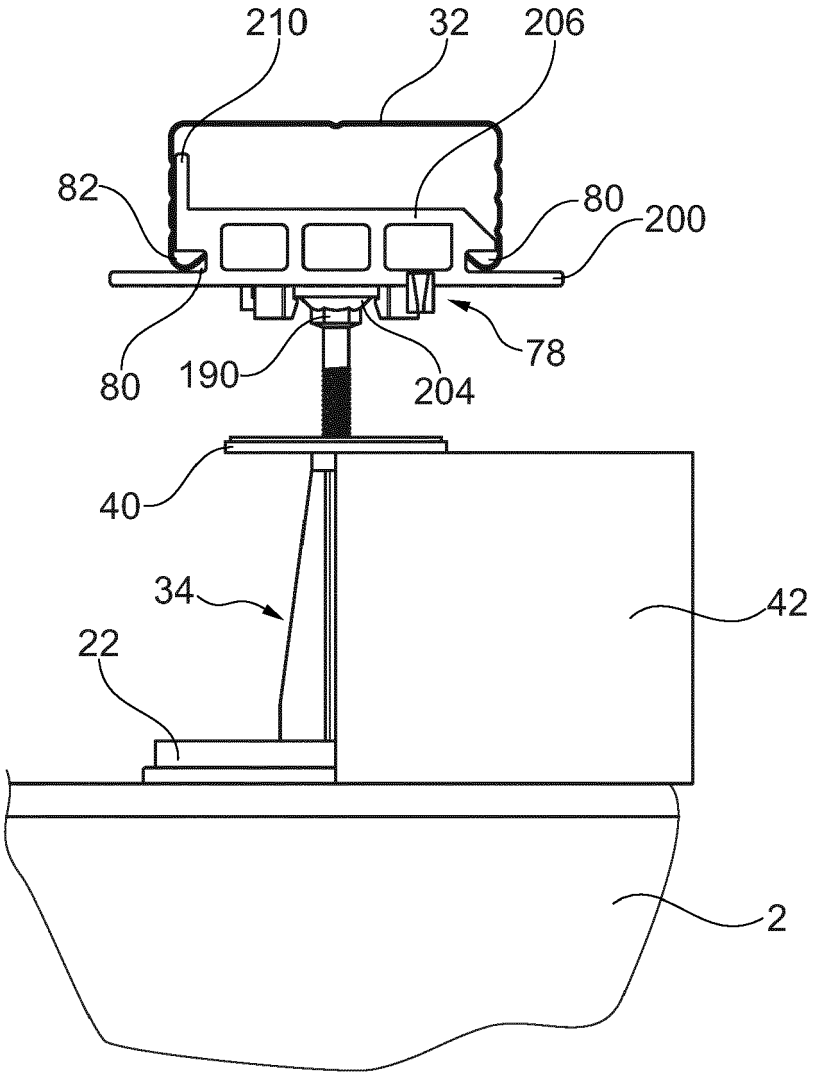

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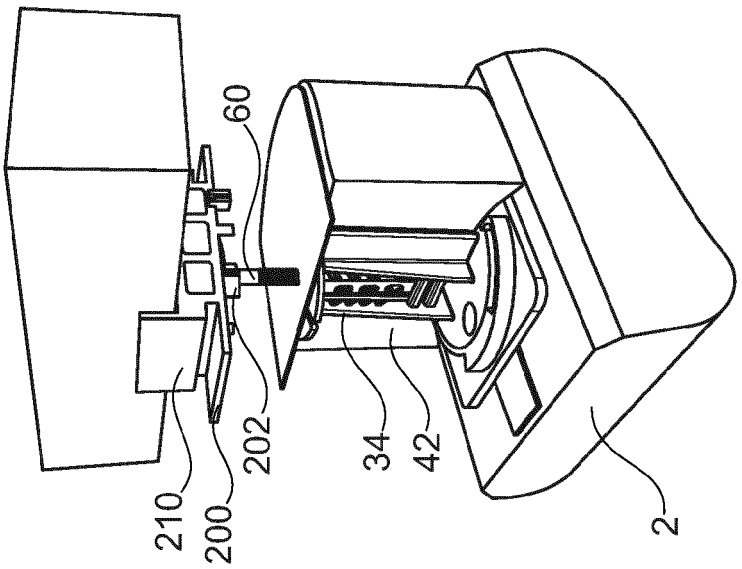

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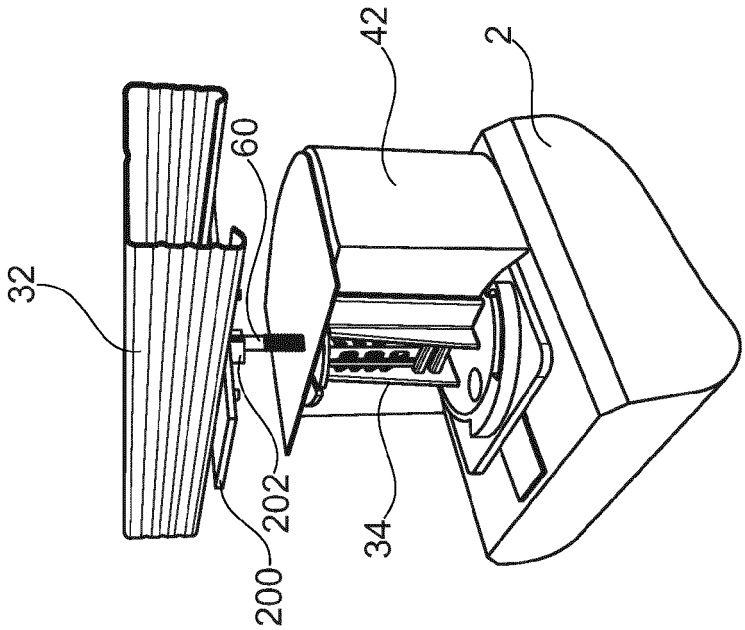

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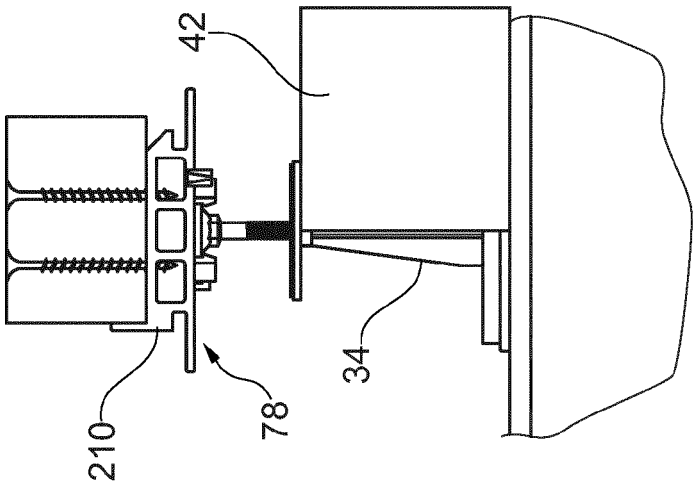

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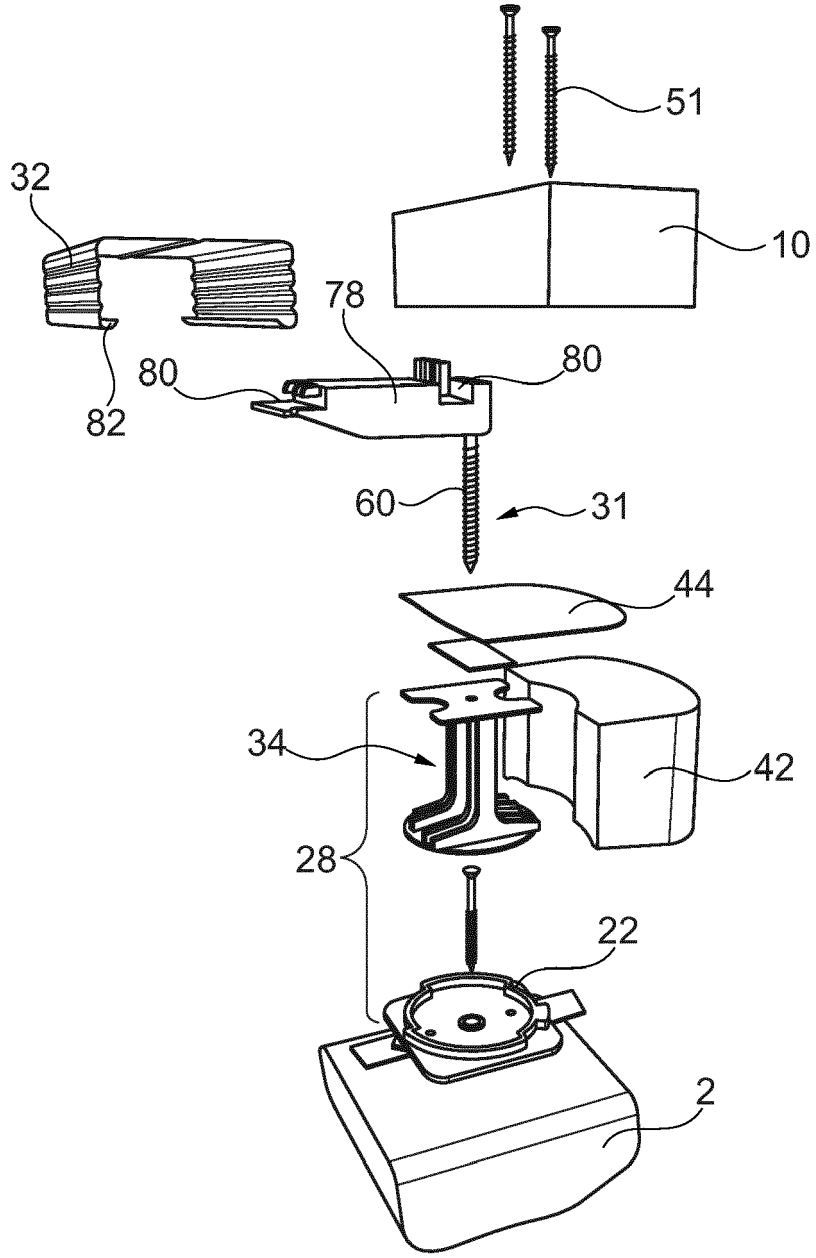

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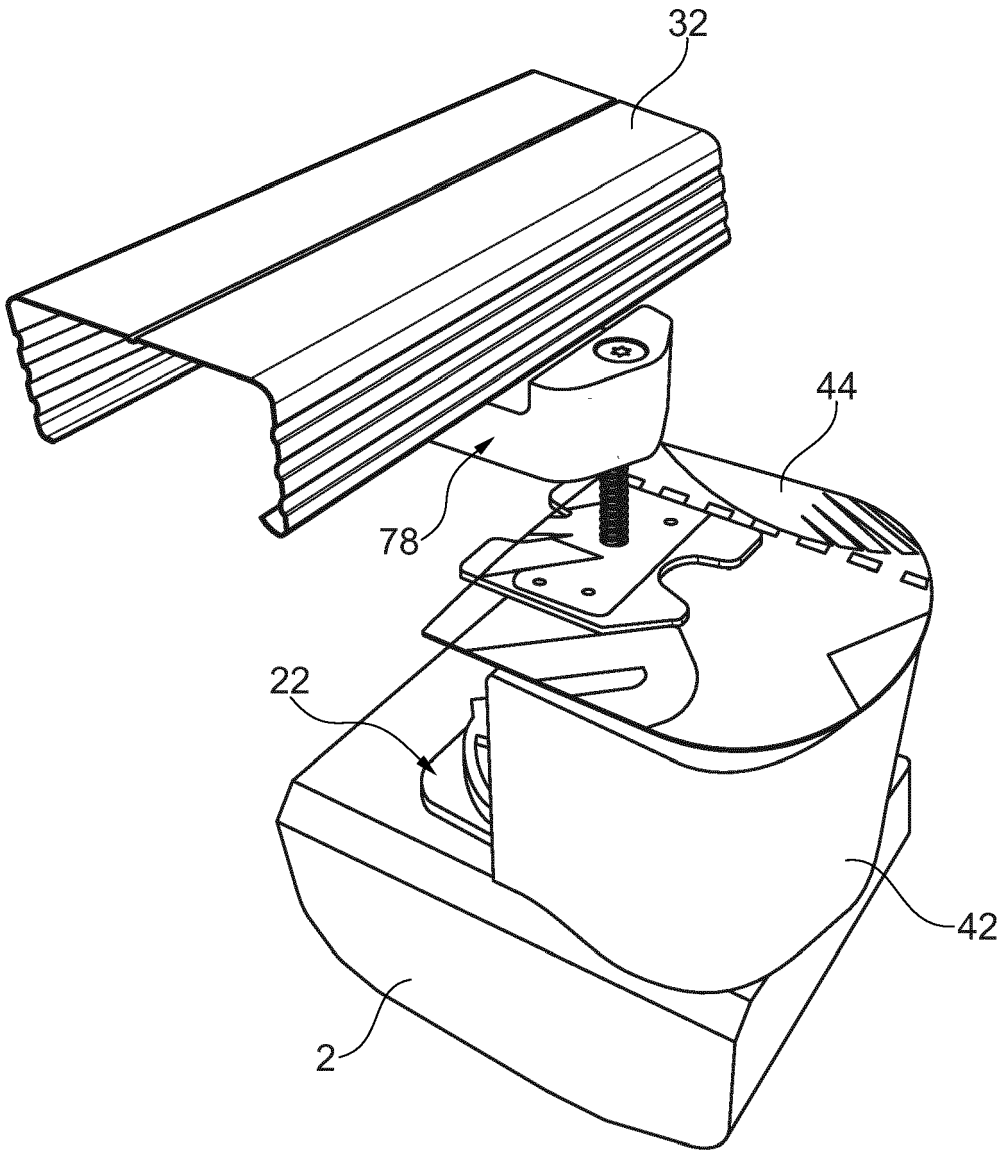

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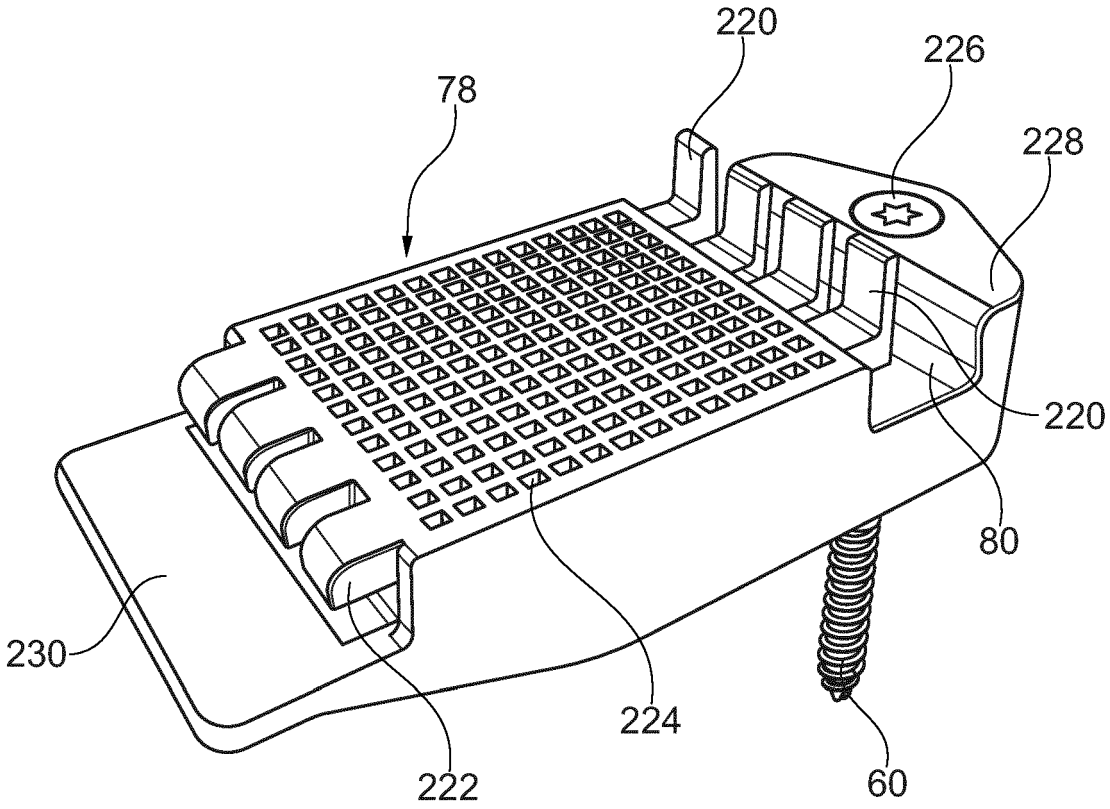

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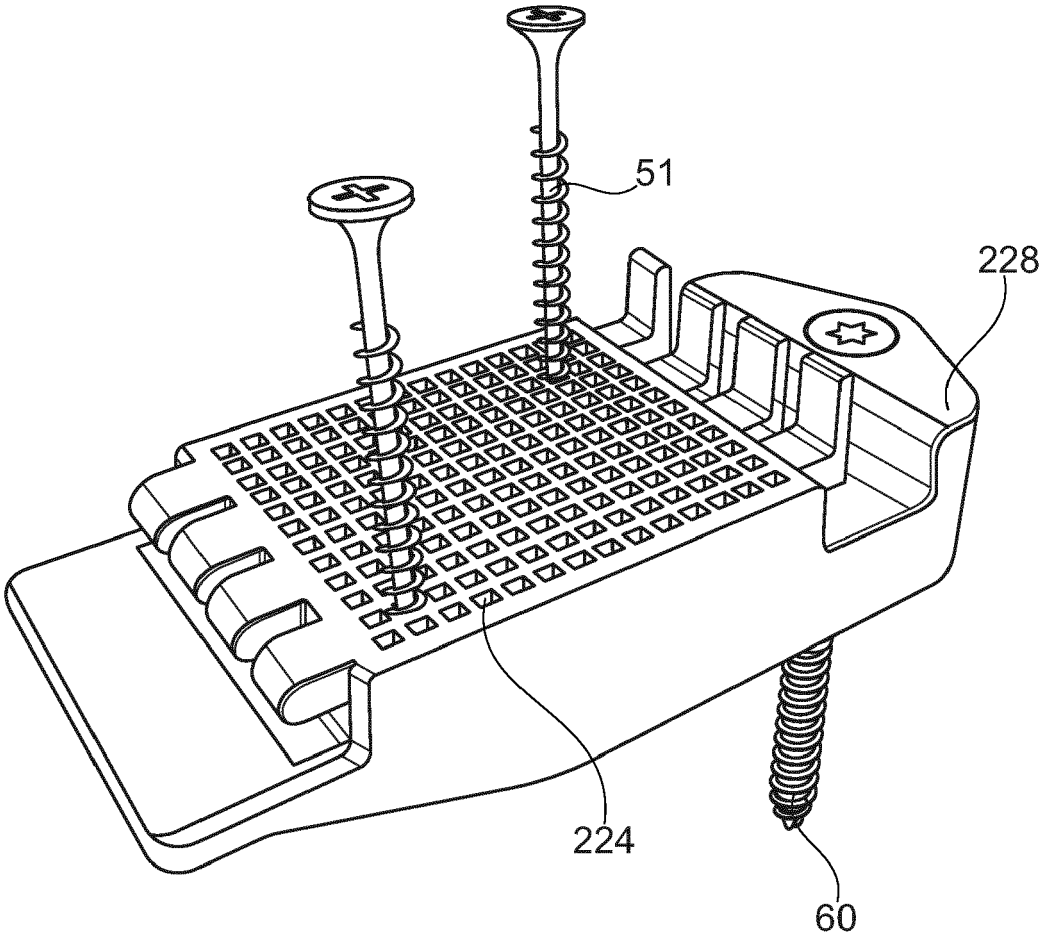

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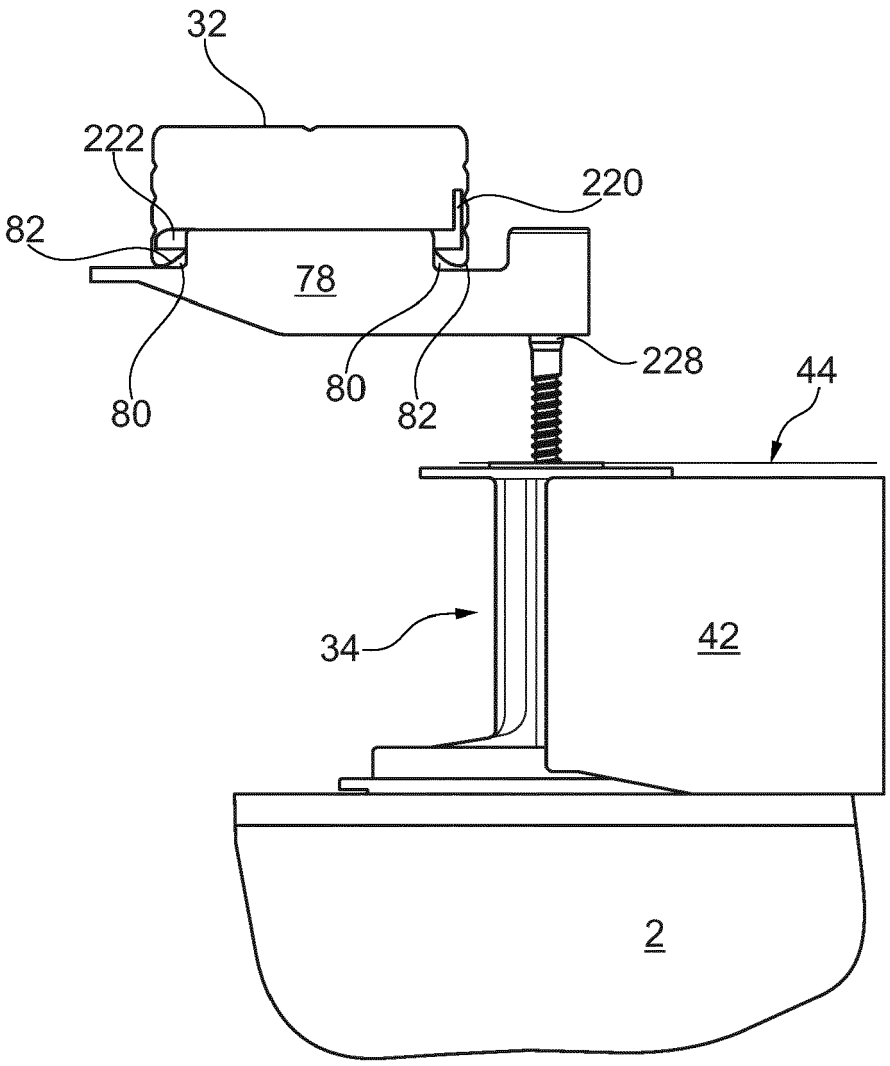

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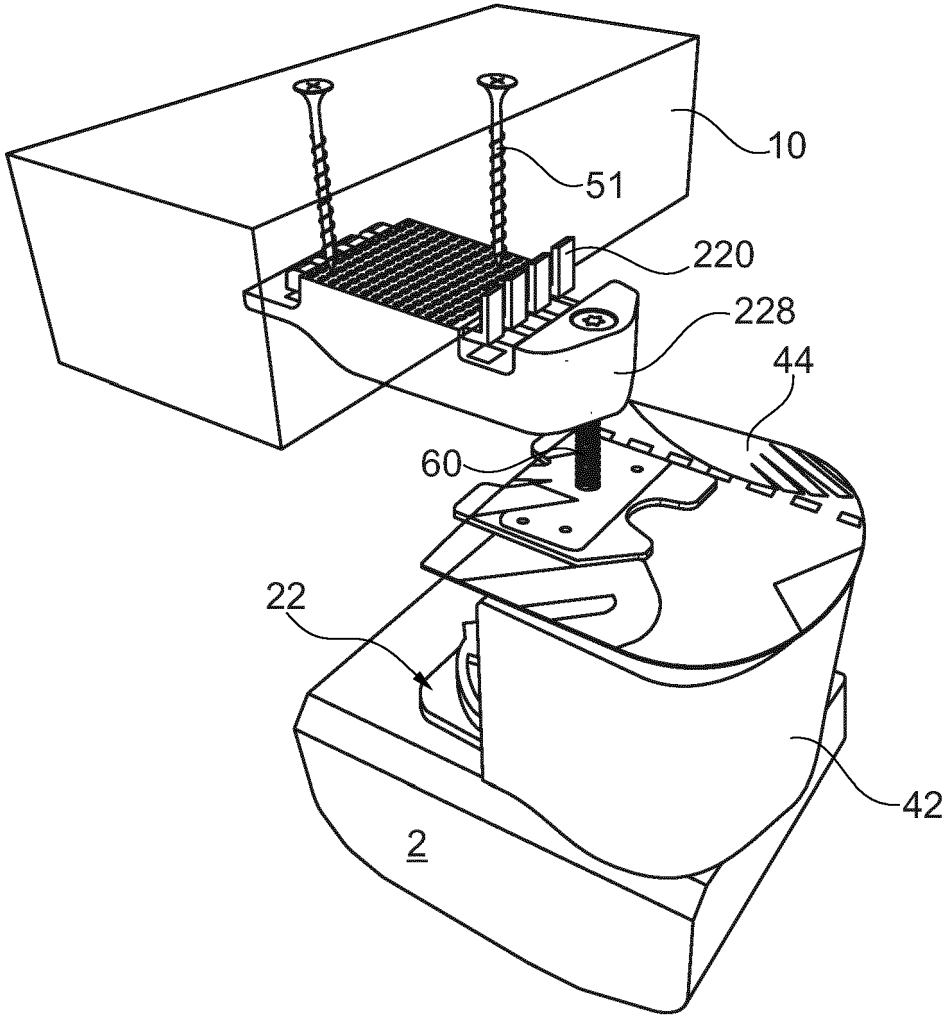

Fig. 42

REFERENCES CITED IN THE DESCRIPTION

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