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(54) **CLADDING FASTENER AND A METHOD FOR PROVIDING A CONCRETE ELEMENT WITH CLADDING FASTENER**

(57) The present invention relates to a novel cladding fastener, comprising an elongated spike (7), a sleeve (8) having a body (17) and a flange (13) extending to the side from the body (17), and wherein the first end (11) of the spike (7) comprises a form lock (14) for attaching to the concrete frame (3) of the concrete element (1). The

cladding fastener further comprises a spacer (9) and the second end of the spike (7) is provided with connection means (15) for attaching to the sleeve (8) and connection means (8) for attaching to the spacer (9). The spacer (9) is provided with connection means for attaching to the spike (23) and a fastener for grip (24).

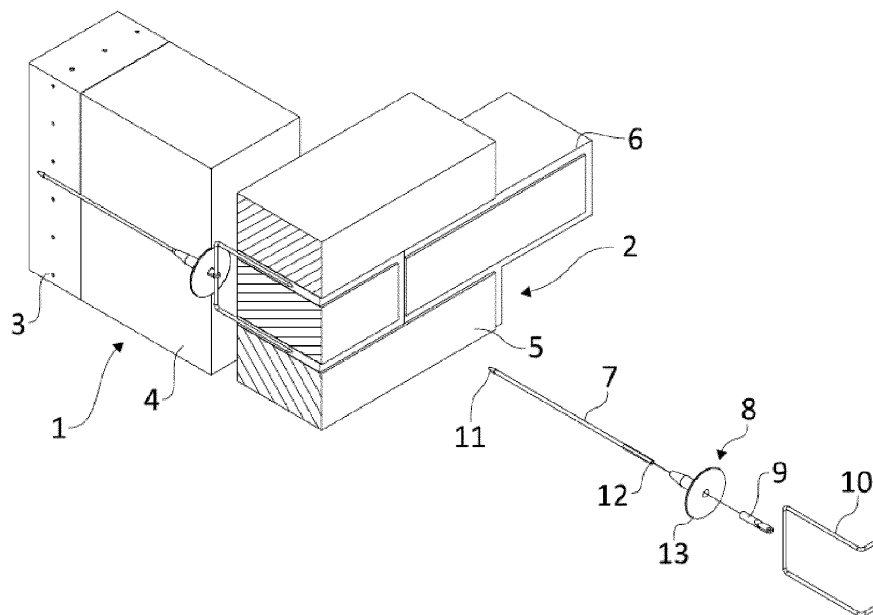


FIG. 1

Description

TECHNICAL FIELD

[0001] The present invention relates to building technology. The invention especially relates to production and finishing of concrete elements. In more detail, the invention relates to a fastener for fastening cladding of a concrete element and a method for installing the fasteners according to the preamble of claim 1.

BACKGROUND

[0002] In modern construction work concrete elements are the most common structural parts. Different types of elements are utilized for different uses and structures. One type comprises a cast frame made of reinforced concrete, insulation installed on the frame and an external cladding. The external cladding can be plastering applied on the insulation or an external lining fastened onto the concrete frame of the element, such as laid brick cladding. The cladding can suspend its own weight, such as brick cladding, or it can be supported by and fastened to the concrete frame and the insulation, such as plastering applied on the cladding. In any case the insulation and cladding must be bound to the concrete frame by means of suitable fasteners. The outer shell of a cavity wall, for example, is connected to the inner shell by means of brick ties. The purpose of brick ties is to transfer pulling and pushing forces between the shells and also to allow a slight mutual movement of the shells. Brick ties are dimensioned to suit each construction application. The type, model and length of brick ties are chosen and the required minimum amount (pcs/m²) is calculated for each structure type. Brick ties are usually used for fastening the heat insulation of the building as well.

[0003] One known brick tie comprises a steel spike fastened to the frame of the concrete element or the interior shell and installed into the concrete element by boring a hole for the steel spike into the concrete frame through the insulation of the element. The head of the steel spike is provided with a washer to contact the surface of the insulation, the washer being pressed and locked against the insulation by means of a spring steel locking washer. The outer end of the steel spike is provided with a loop for providing grip for the brick tie. The brick tie is threaded into the loop so that it extends to the mortar joints. The grips can vary according to the cladding solution. The method requires a lot of installation work as the brick ties are manually fastened to the frame of the element on the site. Further, the insulation is attached to the frame by means of brick ties only after the brick ties have been installed. Usually the insulation is fastened by means of plastic fasteners, whereby two sets of fasteners are required, the brick ties and the fasteners for the insulation.

[0004] The steel spike of the brick tie can also be installed into the element during pouring. In this case the loop end of the steel spike needed for connecting the grip

extends outside the surface of the insulation layer. Thus the solution can't be used with all manufacturing methods, such as horizontal pouring, as the protruding ends of the steel spikes would butt against the surface of the mould table.

SUMMARY

[0005] The invention relates to a cladding fastener having a spike attaching to the concrete of the concrete element that can be arranged to run in the insulation of the concrete element, a sleeve fastening to the spike and means for fastening to the grip of the cladding. The spike is fastened to the concrete during pouring.

[0006] The invention is characterized by what is disclosed in the characterizing parts of the independent claims.

[0007] According to one feature of the invention the cladding fastener comprises an elongated spike, a sleeve having a body and a flange extending to the side from the body and a spacer, wherein the first end of the spike is provided with a grip for fastening to the concrete frame and the second, opposite, end is provided with connection means for attaching to the sleeve and connection means for attaching to the spacer and wherein the spacer comprises connection means for attaching to the spike and a fastener for grip.

[0008] According to a second feature of the invention, in the method for providing a concrete element with a cladding fastener the spike is fastened to the body of the sleeve, the spike with its sleeve is pressed through the insulation and the insulation provided with the spike is positioned on the pouring table, subsequent to which a concrete layer is poured on the insulation, whereby the first end of the spike is attached to concrete during curing and the flange of the sleeve is positioned against the surface of the insulation opposite the concrete layer, thus locking the insulation onto the concrete by means of the sleeve and the spike.

[0009] According to a third feature of the invention the connection means of the spike for attaching to the spacer is a thread and the connection means of the spacer for attaching to the spike is a thread.

[0010] According to a fourth feature of the invention the connection means for attaching to the sleeve is a thread for attaching the spacer of the spike.

[0011] According to a fifth feature of the invention the spacer is a hole nut, the first end of which is provided with a female thread for attaching to the spike and the second, opposite, end is provided with a loop forming a hole.

[0012] According to a sixth feature of the invention the spacer is a hole nut, the first end of which is provided with a female thread for attaching to the spike and the second, opposite, end is provided with a flange extending to the side in relation to the axial direction of the female thread.

[0013] According to a seventh feature of the invention

the cladding fastener comprises a grip, such as at least one of the following: A U-shaped brick tie, steel spike and at least one piece of perforated band, steel spike and at least one L-shaped grip, having a loop at one leg, or binding mesh.

[0014] According to a seventh feature of the invention the spacer is a hole nut, the first end of which is provided with a female thread for attaching to the spike and the second, opposite, end is provided with a bar extending in the axial direction of the female thread.

[0015] According to an eighth feature of the invention the cladding fastener comprises an elongated spike, a sleeve having a body and a flange extending to the side from the body and a spacer, whereby the first end of the spike is provided with a form lock for fastening to the concrete frame and the second, opposite, end is provided with connection means for attaching to the sleeve and connection means for attaching to the spacer and wherein the spacer comprises spacer connection means for attaching to the spike and a fastener for the support mesh and the flange is provided with a support shoulder having a grip means for the support spike and a support spike.

[0016] According to a ninth feature of the invention the cladding fastener comprises a positioning ring having connection means for attaching to the sleeve and a hole at the location of the connection means attaching to the spacer.

[0017] According to a tenth feature of the invention the grip means for the support spike is countersink hole provided with a bottom and having a hole for the support spike.

BRIEF DESCRIPTION OF DRAWINGS

[0018] In the following, some embodiments of the invention are disclosed in more detail by means of reference to the appended drawings, in which:

- FIGURE 1 is a perspective view in partial exploded view of a cladding fastener according to at least one embodiment,
- FIGURE 2 is a perspective view in partial exploded view of a cladding fastener according to at least one other embodiment,
- FIGURE 3 is a perspective view in partial exploded view of a cladding fastener according to at least third embodiment,
- FIGURE 4 is a perspective view in partial exploded view of a cladding fastener according to at least one embodiment,
- FIGURE 5a shows details of parts of Figure 1 to 4,
- FIGURE 5b is a cross-section of the parts of FIGURE 5a, and
- FIGURE 6 is a schematic cross-section view of a method of manufacturing according to at least one embodiment,
- FIGURE 7 is a side view of a cladding fastener according to at least one embodiment,

FIGURE 8 is a detail of the cladding fastener of figure 7,1

FIGURE 9 is a perspective view in partial exploded view of a cladding fastener according to at least one embodiment of the invention.

EMBODIMENTS

[0019] The present cladding fastener relates to manufacturing the cladding structures of concrete elements, especially to cladding structures made on site to elements prefabricated at the factory. Such structures include e.g. various brick claddings and plasterings. The part of the cladding fastener extending through the insulation of the concrete element is an elongated spike pushed through the insulation during the production of the element so that its tip extends slightly over the surface of the insulation. A sleeve with a flange arranged against the surface of the insulation is fastened to the side opposite the tip. The prefabricated insulation blocks are positioned on the pouring table and a layer of concrete is poured over the insulation. The tips of the spike are fastened to the curing concrete and at the opposite end of the spike the sleeve with its flange fastens the insulation in its place. The end opposite the end remaining in concrete is provided with connection means, preferably a thread. The sleeve is threaded onto this thread. The sleeve is provided with a central hole, the tip of the spike remains in the middle thereof. A spacer can be fastened to this threaded end for allowing fastening of different grips onto the element for attaching the cladding. For heavy claddings and especially for heavy plastering the cladding fastener comprises a shoulder further extending to the side from the flange and having at least one hole or other gripping means for the support spike. A support spike is arranged onto the gripping means and then pushed through the insulation, the tip remaining in the concrete. The cladding fastener can be modified in ways described hereinafter and thus it facilitates the cladding work done by bricklayer and production of the element at the factory.

[0020] FIGURE 1 illustrates schematically one type of brick tie. On the left side of the Figure the brick tie is installed in the concrete element 1 and the cladding 2. In this context, the cladding and concrete element must be understood as general terms, and the application range of the invention is not limited to the element solution and cladding types described here. The concrete element 1, however, mostly comprises a concrete frame 3 and an insulation layer 4 on the concrete frame 3. In the case of figure 1 the cladding consists of bricks 5 and a mortar joint 6. The brick tie shown as an exploded view on the right side of the figure comprises a spike 7, a sleeve 8, a spacer 9 and a brick tie 10. The spike 7 is an elongated steel spike. The steel spike extends at its first end 11 through the insulation layer 4 into the concrete frame as shown in the figure. The sleeve 8 is attached at the end of the spike 7 opposite the concrete frame, the sec-

ond end 12 and the spacer 9 is also attached to the second end 12 of the spike 7. As can be seen in FIGURE 1, the parts are positioned in the concrete frame such that the first end 11 of the spike is inside the concrete frame of the concrete element 1 and the second end 12 is near the surface of the insulation layer 4 opposite the concrete frame 3. The flange 13 of the sleeve 8 fastened to the second end 12 of the spike 7 is positioned against this surface. The flange 13 of the sleeve 8 thus locks the insulation layer 4 against the concrete frame 3. A spacer 9 is also attached to the second end 12 of the spike 7. The brick tie 10 is threaded into the fastening of the spacer 9. The brick tie 10 is a U-shaped tie with the tips of the arms of the U turned to the side. The brick tie 10 is dimensioned so that the brick 5 fits between its arms and the arm can be arranged into the mortar joint 6. The bent tips of the arms provide a good grip in the longitudinal direction of the brick tie.

[0021] The spike 7, sleeve 8 and spacer 9 of FIGURES 1 to 4 are described in more detail in FIGURES 5a and 5b. The spike 7 is an elongated spike, the first end of which is provided with a form lock 14 for attaching to the concrete. Here, the form lock is a wider part having a conical tip. Such a shape is easy to provide at e.g. the tip of a steel spike and the conical form facilitates pushing the spike 7 through the insulation layer 4. Alternative shapes include e.g. a transverse bulge structure, a wave-shaped form of the spike, a thread, spiral or toothing. Many suitable shapes are known in the field of concrete construction. The opposite end of the spike is provided with an M5 thread having a length of about 50 mm. In this example, the thread is the connection means for gripping 15 the sleeve 8 and at the same time a connection means for gripping 16 the spacer 9. Other locking methods can be used instead of the thread, such as cutting toothing, the locking used in zip ties or a spring steel tongue. The size of the thread can be varied. A thread is an advantageous locking method, because the plastic sleeve 8 can directly be threaded onto it without making a mating thread inside the sleeve. Similarly, as the spike 7 and the spacer 9 are usually made of steel, thread locking can be quickly and at low cost be formed into these parts, and additionally it is reliable and also allows removing parts, if necessary.

[0022] The sleeve 8 comprises a body 17 having a cone 18 at the first end thereof and a flange 13 at the second end. Here, the sleeve 8 is rotationally symmetrical about its central axis 19. In the figure the central axis 19 is the same for all parts 7, 8, 9, and thus they are coaxial after assembly. The function of the cone 18 is to facilitate the insertion of the sleeve 8 into the insulation layer 8, but other shapes can also be used. Here, the flange 13 is a round, planar flange resembling a washer. Alternatively a polygonal or a wing-like flange could be used. A countersink hole 20 into the body 17 is provided at the outer surface of the flange 13 of the sleeve 8, ending in a shoulder 21 and extending therefrom as a hole 22 into the end of the cone 18 of the sleeve 8. The coun-

tersink hole 20 and the hole 22 are formed through the sleeve 8. The diameter of the hole 22 is dimensioned for the M5 thread of the spike 7 so that when the sleeve 8 is threaded onto the spike, the thread cuts threads into the hole. Thus, a simple way of attaching has been provided. The countersink hole 20 is dimensioned so that the thread 12 at the second end of the spike 7 remains free inside the countersink hole 20 and the outer diameter of the spacer 9 fits inside the countersink hole 20.

[0023] Here, the spacer 9 is a hole nut, one end of which is provided with an M5 female thread and the other end with a loop having a hole. The M5 female thread forms the connection means of the spacer for attaching 23 the spike 7 and the loop with a hole forms a fastener for grip 24. The connection means for attaching 23 to the spike is preferably a thread corresponding with the spike, but as has been mentioned above, other fastening or locking methods can also be used. Especially the size and shape of the thread can be varied. The loop with a hole is an advantageous connecting means for grip 24. Alternative forms thereto could include a flange, truncated cone, hook/hooks, various quick locks and even a thread. However, a loop is easy to manufacture and providing grips thereto is easy and fast.

[0024] The purpose of the spacer 9 is to fasten the grip for binding and fastening the cladding. FIGURES 1 to 4 provide examples of these. Such examples include, among others, a U-shaped brick tie 10, steel spike and one or more perforated bands, steel spike and one or more L-shaped grips, one arm of which is provided with a loop, or binding mesh. These grips can be modified and combined as necessary. Instead of a loop the spacer can also be provided with a spike, hook, larger loop or other shape functioning as a direct grip to the cladding.

[0025] The invention is not limited to any certain material, but as at least parts of the cladding fastener are in ambient air, exposed to air and humidity, one advantageous material is austenitic steel. If there is no need for weatherization, other steel qualities can also be used. The most important feature limiting material selection is compatibility with concrete. Advantageously the sleeve 8 is made of a plastic suitable for construction use or of light metal alloy, for example.

[0026] Utilization methods according to some features of the invention are described in FIGURES 1 to 4.

[0027] The method of FIGURE 1 has already been partially described above. It is meant for laying a normal brick wall in connection with the concrete element, and the tie allows relative movement of the concrete element 1 and the cladding 2. For laying a normal brick wall, this cladding fastener comprises the following parts:

- The spike 7 is a steel spike, e.g. 4 mm thick, with a length of about 250 mm. The second end 12 of the spike 7 is provided with an M5 thread for a distance of 50 mm. The first end 11 comprises a bulge or the like part for gripping the concrete (form lock 14). The spike is positioned into the concrete pour during pro-

duction of the concrete element as described later.

- The sleeve 8, made of plastic and having a length of 50 mm with the diameter of the flange 13 being e.g. 60 mm. The plastic sleeve 8 is threaded onto the thread of the steel spike 7, whereby the thread of the spike 8 cuts threads into the plastic sleeve 8. The sleeve 8 and the spike 7 are connected to each other during production of the concrete element,
- the hole nut (spacer 9), that is threaded into the threads of the steel spike 7 inside the plastic sleeve 8. The hole nut is threaded onto the spike 7 prior to laying the bricks of the cladding 2.
- The brick tie 10 is pushed into the hole of the hole nut and turned into the mortar joint 6 between the bricks 5. When the brick cladding is laid, the arms of the brick tie 10 remain on both sides of one brick 5, in its mortar joints 6.

[0028] FIGURE 2 shows a brick tie for fastening a plaster net 25 on the insulation layer 4 of a concrete element 1. Here the spacer 9 is a plastic net sleeve 26 corresponding to the sleeve 7. The outer diameter of the net sleeve 26 is arranged to fit the countersink hole 20 of the sleeve 8, having an interior hole smaller than an M5 thread. When plastering over the insulation layer 4, a plaster net 25 is needed on the insulation layer 4 for attaching the plastering and keeping it uniform. The plaster net 25 is fastened to the thread of the spike 7 inside the sleeve 8 by means of threads. A hole is provided inside the net sleeve 26, smaller in diameter than an M5 thread. When the net sleeve 26 is threaded onto the spike 7, threads will be cut thereto. The plaster net 25 is positioned between the surface 4 of the insulation layer, flange 13 of the sleeve 8 and the flange of the net sleeve 25. In addition to fastening plaster net this fastening method can be used for fastening other planar intermediate parts of surface finishes. Examples of these include e.g. sheet metal, foils and other similar surface claddings.

[0029] FIGURE 3 shows a cladding fastener for laying tall bricks. It comprises a spike 7, sleeve 8 and a spacer 9 as described in FIGURE 5a. The grip consists of a connection spike 27 and two pieces of perforated band 28. One end of the connection spike 27 can be provided with a bulge 29 for preventing it from passing through the hole 9 in the spacer. The spike 7, sleeve 8 and spacer 9 are installed as described above, but the distance between them is arranged to suit the taller bricks. The distance can be e.g. 300 mm. Two spikes 7 with their plastic sleeves are installed through the insulation layer 4 at the element factory so that the distance between them in the vertical direction of the element 1 is about 300 mm. At the construction site, the bricklayer threads two pieces of perforated band 28 into a connection spike 27 with a length of about 350 mm and pushes the connection spike 28 through the holes of holed nuts used as spacers 9 so

that the pieces of perforated band 28 remain between the spacers. The pieces of perforated band 28 are positioned into the mortar joints when laying bricks.

[0030] FIGURE 4 shows a cladding fastener corresponding to that in FIGURE 3, with the pieces of perforated band 28 being replaced by L-shaped grips 30. They are provided with hanging holes 31 at the end of one arm. This solution can be used when the distance between the grips can be increased or a larger vertical adjustment range is needed for arranging at the places of mortar joints.

[0031] The cladding fastener described above is used especially in connection with concrete elements made by means of horizontal pouring. In this case the spike 7 is fastened to the concrete frame 3 during pouring and the sleeve 8 is fastened to the spike 7. The production is made so that the plastic sleeve 8 is installed at one end 12 of the spike by means of an automatic machine into the correct depth so that the end of the spike 7 is inside the sleeve 8, about 10 mm below the upper surface of the flange 13. Thus the thread of the spike 7 is visible for fastening to the spacer 9. Pre-cutting an M5 thread at the sleeve 8 is not necessary, as the thread is formed when threading the sleeve onto the steel spike 7. For threading the countersink hole 20 of the sleeve 8 can be provided with a hexagonal Allen socket shape or other suitable shape for a key. Correspondingly, if another fastening method is used instead of a thread, the tools are selected to match the fastener. The prepared spikes 7 with their sleeves 8 are pushed through the insulation and the insulations are laid on the pouring table. When the insulations are laid to form an insulation layer 4 the concrete is poured over the insulation layer 4. Curing of the concrete locks the spikes in place and the sleeves 8 and the spikes 4 penetrating through the insulation layer attach the insulation layer to the concrete frame 3. The spacers 9 and the grips are fastened and the cladding is constructed at the construction site as described above.

[0032] As an alternative to the above-mentioned method the spikes 7 with the sleeves 8 can first be placed on the pouring table either freely suspended by the flange 13 on the pouring table 32 and on a matrix prepared on the pouring table, subsequent to which the insulation layer is pressed onto the pouring table 32.

[0033] The Allen socket or other mating surface for the thread tool can also be in the bet sleeve.

[0034] FIGURE 7 shows one cladding fastener especially for fastening a plaster net. The features of this cladding fastener can be combined with the solutions described above, and correspondingly the features of the cladding fasteners described above can be applied in connection with the cladding fastener of figure 7.

[0035] On the left side of FIGURE 7 the brick tie is installed in the concrete element 1 and the cladding 2. In this context, the cladding and concrete element must be understood as general terms, and the application range of the invention is not limited to the element solution and cladding types described here. The concrete ele-

ment 1, however, mostly comprises a concrete frame 3 and an insulation layer 4 on the concrete frame 3. In the case of figure 1 the cladding 2 is plaster. The cladding fastener comprises a spike 7, sleeve 8, spacer 9 and a mesh support 36. The spike 7 is an elongated steel spike. The steel spike extends at its first end 11 through the insulation layer 4 into the concrete frame as shown in FIGURE 7. The sleeve 8 is attached at the end of the spike 7 opposite the concrete frame, the second end 12, and the spacer 9, 26 is also attached to the second end 12 of the spike 7. As can be seen in FIGURE 7, the parts are positioned in the concrete frame such that the first end 11 of the spike is inside the concrete frame of the concrete element 1 and the second end 12 is near the surface of the insulation layer 4 opposite the concrete frame 3. The flange 13 of the sleeve 8 fastened to the second end 12 of the spike 7 is positioned against this surface. The flange 13 of the sleeve 8 thus locks the insulation layer 4 against the concrete frame 3. A spacer 9 is also attached to the second end 12 of the spike 7.

[0036] The spike 7, sleeve 8 and spacer 9 of FIGURES 7 and 8 are described in more detail in FIGURE 9. The spike 7 is an elongated spike the first end of which is provided with a form lock 14 for attaching to the concrete. Here, the form lock is a wider part having a conical tip. Such a shape is easy to provide at e.g. the tip of a steel spike and the conical form facilitates pushing the spike 7 through the insulation layer 4. Alternative shapes include e.g. a transverse bulge structure, a wave-shaped form of the spike, a thread, spiral or tothing. Many suitable shapes are known in the field of concrete construction. The opposite end of the spike is provided with an M5 thread having a length of about 50 mm. In this example the thread is the connection means 15 for gripping the sleeve 8 and simultaneously it is also the connection means 16 for gripping the spacer 9. Other locking methods can be used instead of the thread, such as cutting tothing, the locking used in zip ties or a spring steel tongue. The size of the thread can be varied. A thread is an advantageous locking method, because the plastic sleeve 8 can directly be threaded onto it without making a mating thread inside the sleeve. Similarly, as the spike 7 is usually made of steel, thread locking can be quickly and at low cost produced into these parts, and additionally it is reliable and also allows removing parts, if necessary.

[0037] The sleeve 8 comprises a body 17 having a cone 18 at the first end thereof and a flange 13 at the second end. Here, the sleeve 8 is rotationally symmetrical about its central axis 19. In the figure the central axis 19 is the same for all parts 7, 8, 9, and thus they are coaxial after assembly. The function of the cone 18 is to facilitate the insertion of the sleeve 8 into the insulation layer 8, but other shapes can also be used. Here, the flange 13 is a round, planar flange resembling a washer. Alternatively a polygonal or a wing-like flange could be used. A countersink hole 20 into the body 17 is provided at the outer surface of the flange 13 of the sleeve 8, end-

ing in a shoulder 21 and extending therefrom as a hole 22 into the end of the cone 18 of the sleeve 8. The countersink hole 20 and the hole 22 are formed through the sleeve 8. The diameter of the hole 22 is dimensioned for the M5 thread of the spike 7 so that when the sleeve 8 is threaded onto the spike, the thread cuts threads into the hole. Thus, a simple way of attaching has been provided. The countersink hole 20 is dimensioned so that the thread 12 at the second end of the spike 7 remains free inside the countersink hole 20 and the outer diameter of the spacer 9 fits inside the countersink hole 20.

[0038] Here, the spacer 9 is a net sleeve 26 having a net flange 37 at the first end thereof and a cylindrical sleeve 38 at the second end. The cylindrical sleeve 38 forms the connection means of the spacer for attaching 23 the spike 7 and the net flange 37 forms a fastener for grip, which in this example is mesh support 36. The cylindrical sleeve 38 comprises a hole for the spike 7. If the net sleeve 26 is made of plastic, it is attached to the end 12 of the spike 7 similarly to the sleeve 8. If the net sleeve 26 is made of, for example, steel or other metal for achieving sufficient strength, the connection means for connecting to the spike is advantageously a thread meshing with the spike, but as has been mentioned above, other attaching or locking methods can as well be used. Especially the size and shape of the thread can be varied. Advantageously the sleeve 8 and the net sleeve 26 are made of a plastic suitable for construction use or of light metal alloy, for example.

[0039] FIGURES 7 to 9 show a brick tie for fastening a plaster net 25 on the insulation layer 4 of a concrete element 1. Here the spacer 9 is a plastic net sleeve 26 corresponding to the sleeve 7. The outer diameter of the net sleeve 26 is arranged to fit the countersink hole 20 of the sleeve 8, having an interior hole smaller than an M5 thread. When plastering over the insulation layer 4, a plaster net 25 is needed on the insulation layer 4 for attaching the plastering and keeping it uniform. The plaster net 25 is fastened to the thread of the spike 7 inside the sleeve 8 by means of threads. A hole is provided inside the net sleeve 26, smaller in diameter than an M5 thread. When the net sleeve 26 is threaded onto the spike 7, threads will be cut thereto. The plaster net 25 is positioned between the surface 4 of the insulation layer, flange 13 of the sleeve 8 and the flange of the net sleeve 25. This attachment method can be used, in addition to attaching the plaster net, attaching other planar intermediate parts or surface finishes. These can include, for example, sheet metal, foils and other similar surface claddings.

[0040] For heavy claddings it is advantageous to separate the plaster net from the surface of the insulation 4. In this connection it is necessary to increase the load-bearing capacity of the cladding fastener. For increasing the load-bearing capacity the cladding fastener is provided with a widened flange 13 forming a support shoulder 5. This support shoulder 33 can be formed e.g. so that the hole 22 of the sleeve 8 is positioned non-axially into

a round flange, whereby the support shoulder is formed on the edge opposite to the hole 22. In principle the support shoulder 33 can have any shape, such as an oval, triangle or a square. Here the support shoulder 33 is provided with a hole 10 for the support spike 34. In this case the hole 10 for the support spike 34 is formed by a countersink hole, the bottom of which is skewed in relation to the axis of the spike 7 and the hole 35 of the support spike is perpendicular to the bottom of the bottom of the countersink hole. A support spike 34 is arranged into the hole 35 of the support spike, the support spike being at an angle to the axis of the spike 7 determined by the position of the bottom. As the support spike 34 is to receive a load caused by the weight of the plaster, it is advantageously positioned directly above the spike 7 and its tip 39 is directed upwards, whereby the support spike 34 is under tensile stress. The support spike 34 will naturally receive loads in other positions as well. The tip of the support spike 34 is provided with a roughening, thread or other locking form for gripping the concrete. On the end opposite the tip there is a bottom flange 40 being supported by the bottom of the support spike hole 35 that will position the support spike 34. Instead of a countersink hole the gripping means can be, for example, a fork, a penetrable surface or just a through-hole. A good positioning and support can, however, be achieved by means of a sufficiently long hole and countersink hole.

[0041] When making a thick plaster surface it is advantageous to be able to position the plaster net 25 at a distance from the surface of the insulation. For this purpose the cladding fastener is provided with a positioning ring 41. The positioning ring 41 consists of an open ring 42 and four spike feet 43 formed on one edge of the open ring. The flange 13 of the sleeve 8 is provided with holes 44 for the spike feet corresponding with the spike feet 43. The positioning ring 41 can be fastened on the flange 13 by pushing the spike feet 43 through the spike feet holes 44 of the flange 13 to contact the insulation. Thus the positioning ring 41 is positioned in its place and fastened to the insulation 4 by means of the spike feet 43. Other locking and positioning methods can be used instead of the spike feet 43, such as a countersink hole with an edge, a thread, quick lock or push-through spikes, for example. The shape of the positioning ring 41 can be different as well, but it must comprise a free opening or cutaway at the position of the hole 22 of the sleeve 8 for installing the net sleeve 26. The thickness of the positioning ring 41 defines the distance of the plaster net 25 from the insulation 4.

[0042] The cladding fastener described above is used especially in connection with concrete elements made by means of horizontal pouring. In this case the spikes 7 are fastened to the concrete frame 3 during pouring and the sleeve 8 is fastened to the spike 7. The production is made so that the plastic sleeve 8 is installed at one end 12 of the spike by means of an automatic machine into the correct depth so that the end of the spike 7 is inside the sleeve 8, about 10 mm below the upper surface

of the flange 13. Thus the thread of the spike 7 is visible for fastening to the spacer 9. Pre-cutting an M5 thread at the sleeve 8 is not necessary, as the thread is formed when threading the sleeve onto the steel spike 7. For threading the countersink hole 20 of the sleeve 8 can be provided with a hexagonal Allen socket shape or other suitable shape for a key. Correspondingly, if another fastening method is used instead of a thread, the tools are selected to match the fastener. The prepared spike 7 with its sleeve 8 is pushed through the insulation and the support spike 34 is pushed in its place, after which the insulations are laid on the pouring table. When the insulations are laid to form an insulation layer 4 the concrete is poured over the insulation layer 4. The curing concrete locks the spikes in place and the sleeves 8 and the support spikes 34 and the spikes 8 penetrating through the insulation layer 4 attach the insulation layer to the concrete frame 3. The spacers 9 and the positioning ring 41 are fastened and the cladding is manufactured at the construction site by pushing the positioning rings 41 into the flanges. The plaster net will be arranged between the positioning ring 41 and the flange 27 of the net sleeve 26 as shown in figure 2.

[0043] The above-mentioned dimensions and materials are only examples of one application range of the invention. It is obvious that the dimensioning and selection of materials are made according to the application, taking into consideration thickness of insulation, the loads exerted on the structure and the environmental load of the materials, among others.

INDUSTRIAL APPLICABILITY

[0044] The invention can be used in construction industry.

LIST OF REFERENCE NUMBERS

[0045]

- | | |
|----|--|
| 1 | Concrete element |
| 2 | Cladding |
| 3 | Concrete frame |
| 4 | Insulation layer |
| 5 | Brick |
| 6 | Mortar joint |
| 7 | Spike |
| 8 | Sleeve |
| 9 | Spacer |
| 10 | Brick tie |
| 11 | First end |
| 12 | Second end |
| 13 | Flange |
| 14 | Form lock |
| 15 | Connection means for attaching to the sleeve |
| 16 | Connection means for attaching to the spacer |
| 17 | Body |
| 18 | Cone |

19	Centre axis	
20	Countersink hole	
21	Shoulder	
22	Hole	
23	Connection means of the spacer for attaching to the spike	5
24	Fastener for the grip	
25	Plaster net	
26	Net sleeve	
27	Connection spike	10
28	Piece of perforated band	
29	Bulge	
30	L-shaped grip	
31	Suspension hole	
32	Pouring table	15
33	Support shoulder	
34	Support spike	
35	Hole for support spike	
36	Net support	
37	Net flange	20
38	Cylindrical sleeve	
39	Tip	
40	Bottom flange	
41	Positioning ring	
42	Open ring	25
43	Spike foot	
44	Hole for spike foot	

Claims

1. A cladding fastener, comprising:

- an elongated spike (7),
- a sleeve (8) having a body (17) and a flange (13) extending to the side from the body (17), and
- wherein the first end (11) of the spike (7) comprises a form lock (14) for attaching to the concrete frame (3) of the concrete element (1)

characterized in that

- the cladding fastener comprises a spacer (9), and
- the second end of the spike (7) is provided with connection means (15) for attaching to the sleeve (8) and connection means (16) for attaching to the spacer (9), and
- the spacer (9) is provided with connection means (23) of the spacer for attaching to the spike (7) and a fastener for grip (24).

2. A cladding fastener according to claim 1, **characterized in that** the connection means (16) of the spike (7) for attaching to the spacer (9) is a thread and the connection means (23) of the spacer for attaching to the spike is a thread.

3. A cladding fastener according to claim 2, **characterized in that** the connection means (15) of the spike (7) for attaching to the sleeve (8) is a thread for attaching of the spacer (9) of the spike (7).

4. A cladding fastener according to any of the previous claim, **characterized in that** the spacer (9) is a hole nut, the first end of which is provided with a female thread for attaching to the spike (7) and the second, opposite, end is provided with a loop forming a hole.

5. A cladding fastener according to any of claims 1 to 3, **characterized in that** the spacer (9) is a hole nut, the first end of which is provided with a female thread for attaching to the spike (7) and the second, opposite, end is provided with a flange extending to the side in relation to the axial direction of the female thread.

6. A cladding fastener according to any of the previous claims, **characterized in that** the cladding fastener comprises a grip, the grip being e.g. at least one of the following:

- a U-shaped brick tie (10),
- a connection spike (27) and at least one piece of perforated band (28),
- a connection spike (27) and at least one L-shaped grip (30), one arm of which is provided with a loop (31), or
- a tie net (25).

7. A cladding fastener according to claim 1, **characterized in that** the spacer (9) is a hole nut, the first end of which is provided with a female thread for attaching to the spike (7) and the second, opposite, end is provided with a bar extending co-axially to the axial direction of the female thread.

8. A cladding fastener according to any of the previous claims, wherein the first end (11) of the spike (7) comprises a form lock (14) for attaching to the concrete frame (3) of the concrete element (1), **characterized in that**

- the cladding fastener comprises a spacer (9) and a support spike (6), and
- the second end of the spike (7) is provided with connection means (15) for attaching to the sleeve (8) and connection means (28) for attaching to the spacer (9),
- the spacer (9) is provided with connection means of the spacer for attaching to the spike (23) and a fastener for grip (24, 27), and
- the flange (13) forms a support shoulder extending to the side and having a grip means (10) for the support spike (6).

9. A cladding fastener according to claim 8, **characterized in that** the cladding fastener comprises a positioning ring (31) having connection means (33) for attaching to the sleeve (8) and a hole at the position of the connection means (22) attaching to the spacer (9, 26). 5
10. A cladding fastener according to claim 1 or 2, **characterized in that** the grip means for the support spike (6) is a countersunk hole having a bottom and provided with a hole (10) for the support spike (6). 10
11. A method of providing a concrete element with a cladding fastener, wherein 15
- a spike (7) is fastened to the body (17) of a sleeve (8) comprising a body (17) and a flange (13),
 - the spike (7) complete with the sleeve (8) is pushed through an insulation layer (4) so that the first end of the spike extends out from the insulation layer (4), and 20
 - a concrete layer is poured over the insulation layer (4), whereby the first end (11) of the spike (7) is fastened by the curing concrete and the flange (13) of the sleeve (8) is positioned against the surface of the insulation layer (4) opposite the concrete layer, locking the insulation layer (4) to the concrete by means of the sleeve (8) and the spike (7). 25 30
12. A method according to claim 11, **characterized in that** the sleeve (8) is attached to the spike (7) by means of a thread connection. 35
13. A method according to claim 12, **characterized in that** the sleeve (8) is attached to the spike (7) by means of an automatic thread tool. 40
14. A method according to any of claims 11 to 13, **characterized in that** the spike (7) is first pushed through the insulation layer (4) after which the insulation layer (4) is positioned onto the pouring table (32) with the spike (7). 45
15. A method according to any of claims 11 to 13, **characterized in that** the spike (7) is positioned onto the pouring table and the insulation layer (4) is pressed to contact the spike (7) on the pouring table (32). 50
16. A method according to any of claims 11 to 15, **characterized in that** a support spike (34) is pressed into the flange (13) and the insulation layer (4). 55

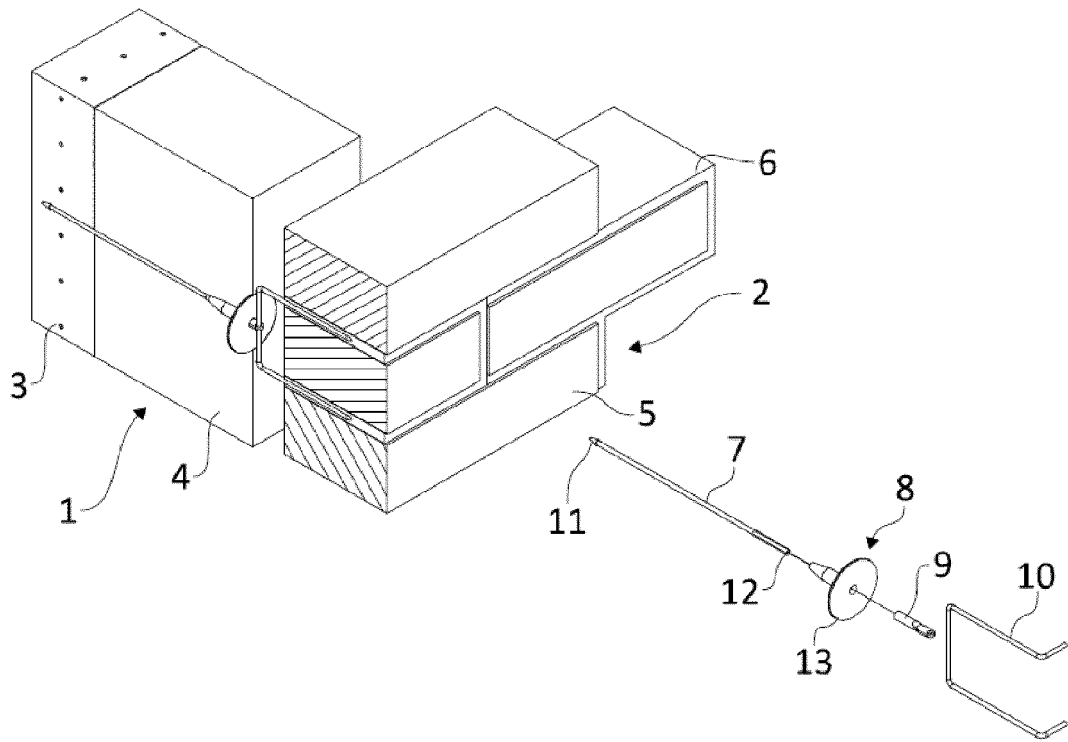


FIG. 1

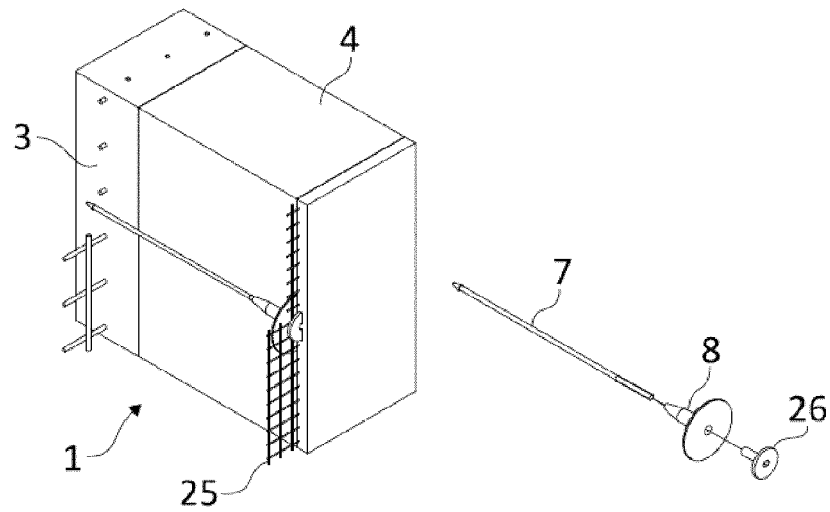


FIG. 2

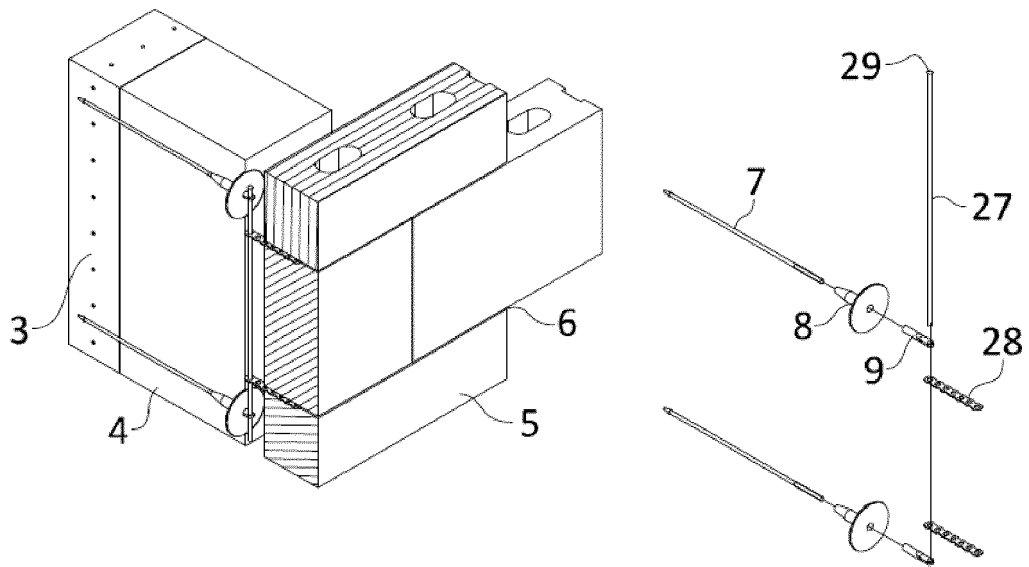


FIG. 3

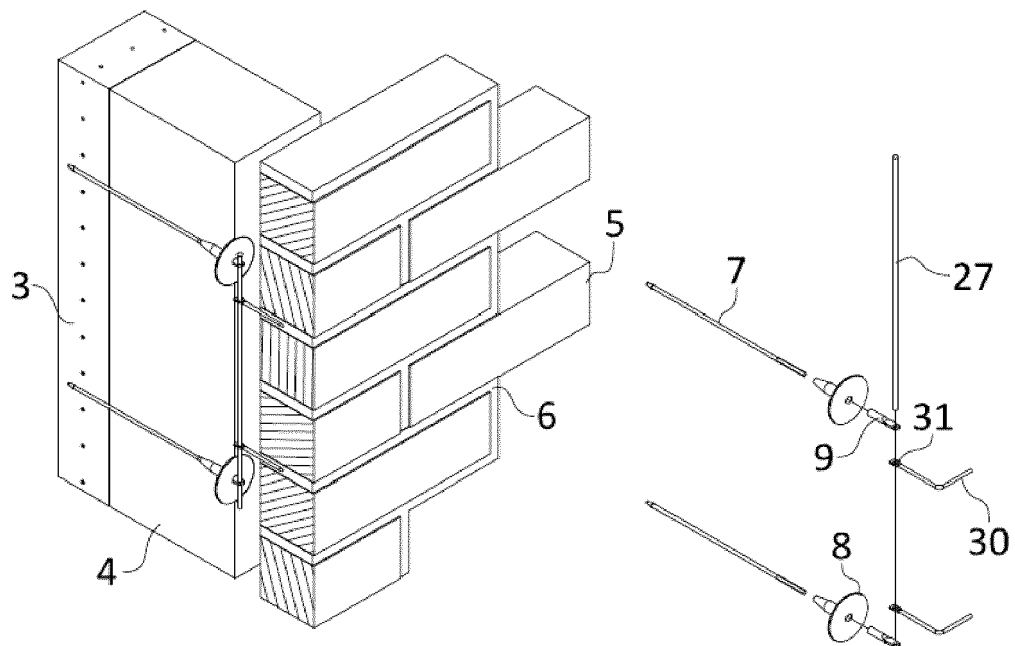


FIG. 4

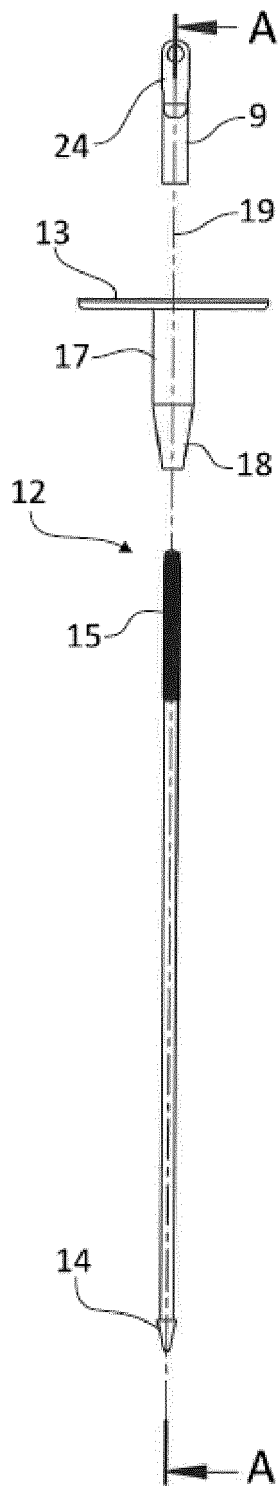


FIG. 5A

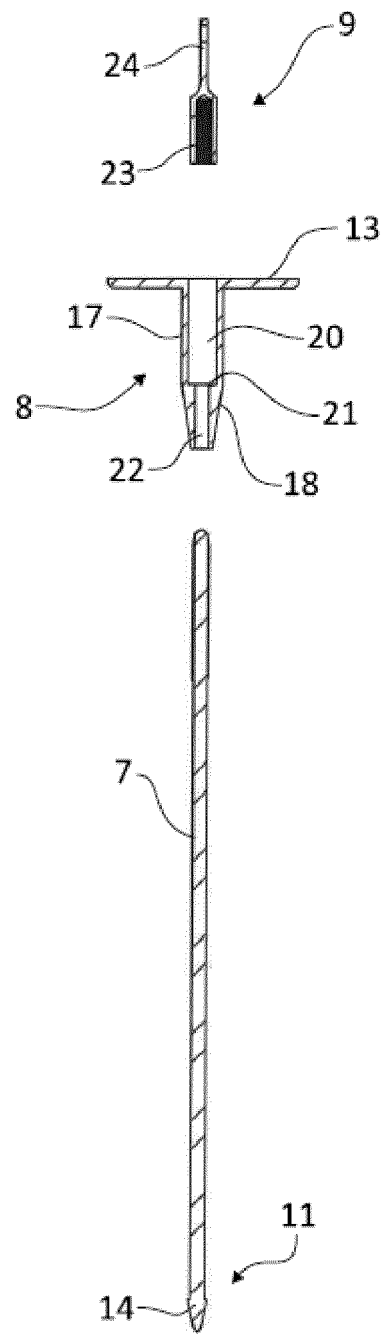


FIG. 5B

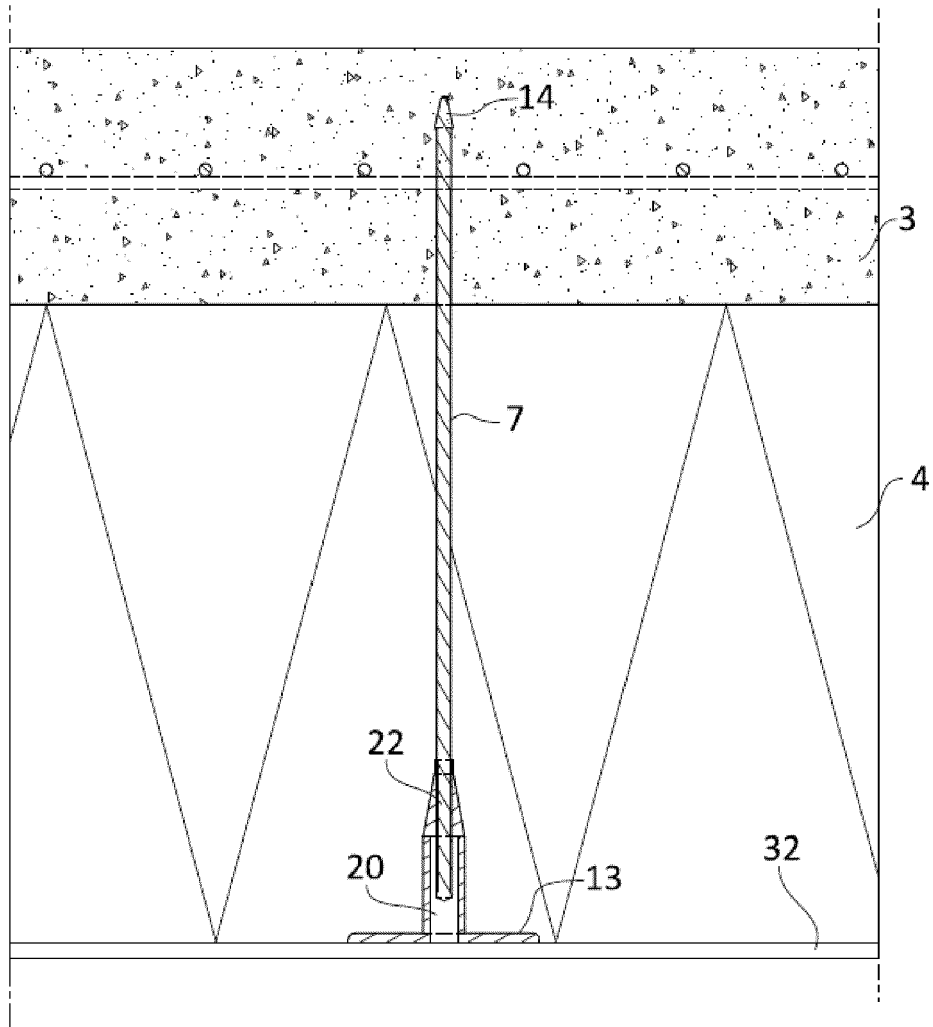


FIG. 6

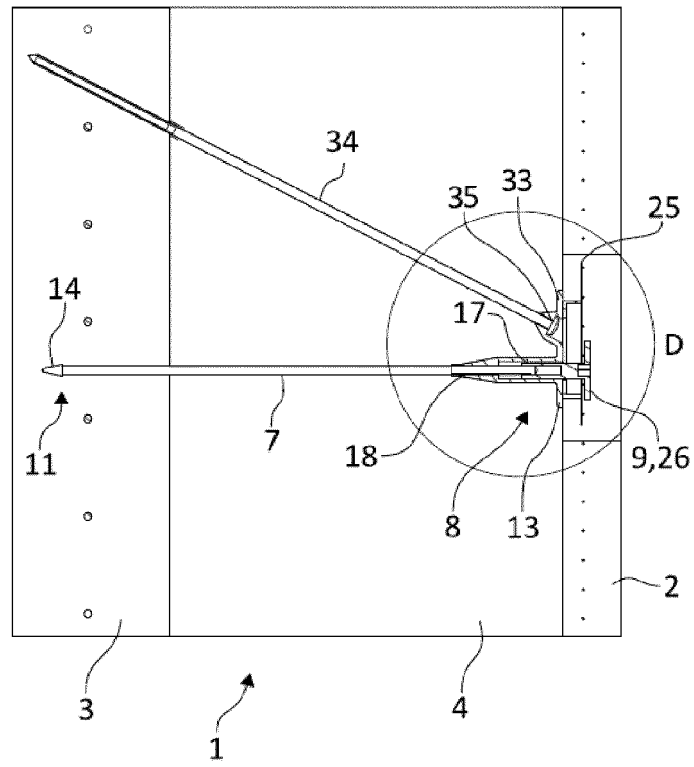


FIG. 7

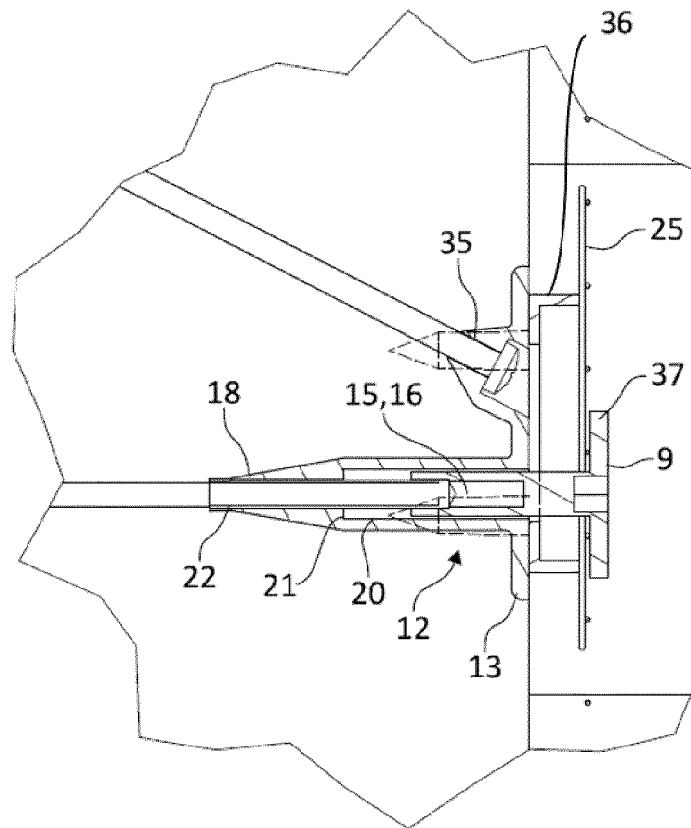


FIG. 8

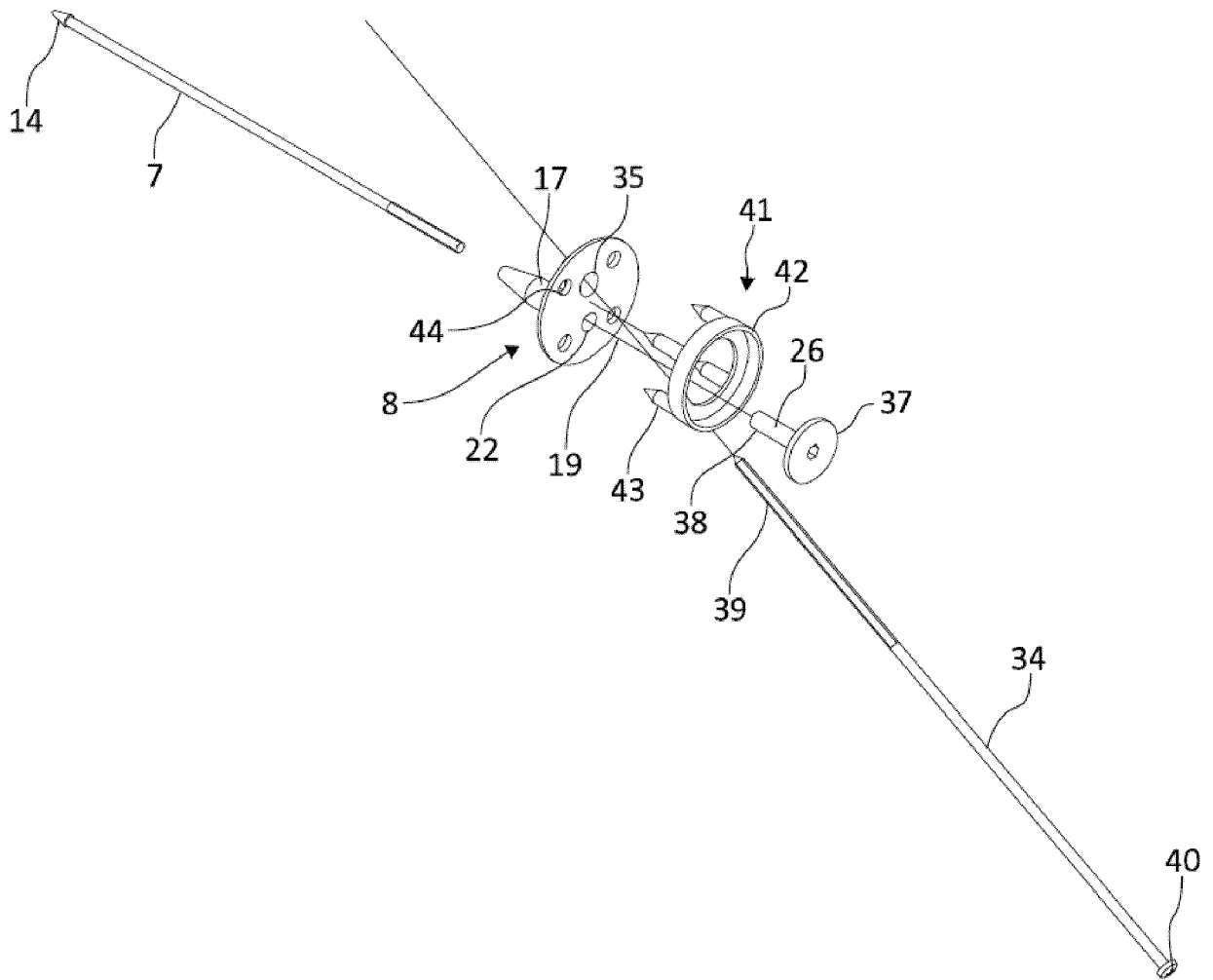


FIG. 9



EUROPEAN SEARCH REPORT

Application Number

EP 21 20 8118

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X	US 2009/133357 A1 (RICHARDS JOSEPH P [US]) 28 May 2009 (2009-05-28) * paragraphs [0058] - [0077] * * figures *	1-16	INV. E04B1/41 E04B1/76 E04C2/288
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			E04B E04C
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 4 April 2022	Examiner Durrenberger, Xavier
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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04-04-2022

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