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### (54) END CAP FOR SECURING A STRUCTURE UPON A PILE

(57) An end cap for securing a structure upon a pile is provided. The end cap (10) has a body (12) adapted in use to fit over an end of the pile (16). The body (12) has at least one pile fixing aperture (18). At least one attachment flange (14) extends from the body (12) and has a plurality of structure fixing apertures (24). The at least one pile fixing aperture (18) in use receives a fixture (30) to secure the end cap (10) to the pile (16). Each structure fixing aperture (24) in use receives a fixture (28) to secure the structure upon the end cap (10).

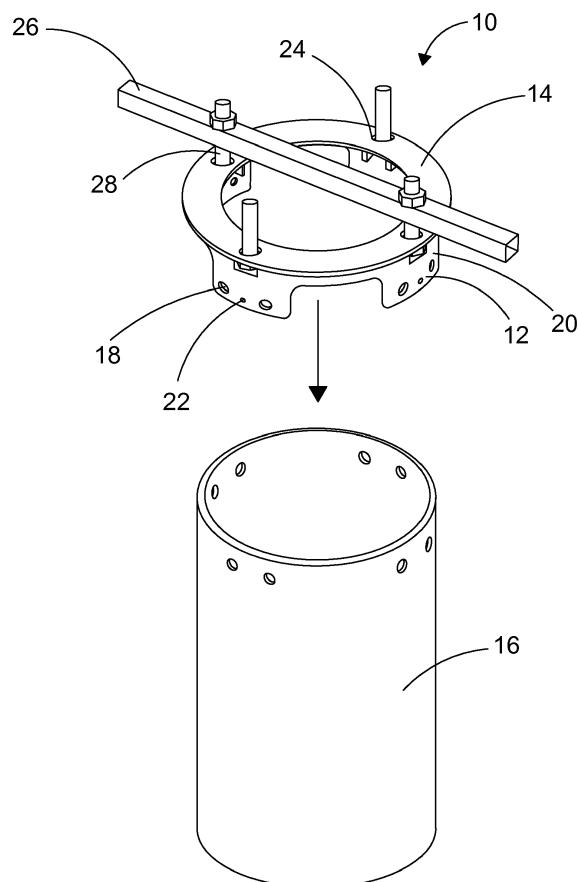


FIG. 2

**Description****Field of the Invention**

**[0001]** This invention relates to load-bearing piles, and in particular end caps for such piles which secure a structure upon the pile.

**Background of the Invention**

**[0002]** Steel piles are used in various construction applications to carry vertical loads. One example of such an application is in railway engineering. At present, railway engineers utilise mild steel tubular sections as piles to support track-side structures such as gantries supporting electrical cables or signalling apparatus. The piles supplied to the railway engineers are pre-cut to designated lengths, and are prepared with prefabricated connectors which connect a support member of the rail-side structure to the pile. If a pile cannot be driven into the ground to the required level then these prefabricated connectors cannot be used in their original form. This requires extensive remedial works to be carried out on site, which increases the time and cost of the engineering work. There have been attempts to overcome this problem using brackets, site cutting and drilling. However, each of these attempts to solve the problem is very expensive and time consuming.

**[0003]** It is an object of the present invention to obviate or mitigate this problem.

**Summary of the Invention**

**[0004]** According to a first aspect of the invention, there is provided an end cap for securing a structure upon a pile, the end cap comprising:

a body adapted in use to fit over an end of the pile and having at least one pile fixing aperture; and at least one attachment flange extending from the body having a plurality of structure fixing apertures, wherein the at least one pile fixing aperture in use receives a fixture to secure the end cap to the pile, and wherein each structure fixing aperture in use receives a fixture to secure the structure to the end cap.

**[0005]** The body may further comprise at least one positioning aperture, wherein the at least one positioning aperture in use receives at least one positioning fixture to position the end cap on the pile.

**[0006]** The end cap may further comprise at least one structure fixture extending through a corresponding at least one of the structure fixing apertures, and a transportation member attached to the at least one structure fixture for transportation of the end cap.

**[0007]** In a preferred embodiment, the body may comprise a plurality of body portions, wherein each body por-

tion comprises at least one pile fixing aperture. Each body portion may further comprise at least one positioning aperture, wherein the at least one positioning aperture in use receives at least one positioning fixture to position the end cap on the pile. The end cap may further comprise at least one structure fixture extending through a corresponding at least one of the structure fixing apertures, and a transportation member attached to the at least one structure fixture for transportation of the end cap.

**[0008]** The plurality of structure fixing apertures may be equidistantly spaced about the at least one attachment flange.

**[0009]** According to a second aspect of the present invention, there is provided a foundation for a structure, the foundation comprising a pile, and an end cap according to the first aspect of the invention.

**[0010]** According to a third aspect of the present invention, there is provided a method of securing a structure upon a pile using an end cap, the end cap comprising:

20 a body having at least one pile fixing aperture; and at least one attachment flange extending from the body having a plurality of structure fixing apertures,

25 wherein the method comprises the steps of:

placing the end cap over the end of the pile; securing the cap to the pile by way of at least one pile fixture extending through the at least one pile fixing aperture in the body; and securing the structure to the end cap by way of a plurality of structure fixtures extending through the plurality of structure fixing apertures.

**[0011]** The body may further comprise at least one positioning aperture and prior to securing the cap to the pile the end cap is positioned on the pile by threading at least one positioning fixture through the at least one positioning aperture to engage the pile.

**Brief Description of the Drawings**

**[0012]** Preferred embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 shows an end cap according to the present invention secured to a load-bearing pile;

Fig. 2 shows the end cap of Fig. 1 including a transportation member; and

Fig. 3 shows a side view of the end cap of Fig. 1 securing a structure upon the pile.

**Detailed Description of the Drawings**

**[0013]** With reference to Fig. 1 there is shown an end

cap 10 according to the present invention. The end cap 10 comprises a tubular body 12 and an annular attachment flange 14 which is attached to an upper end of the body 12. The body 12 is adapted to fit over an end of a tubular steel pile 16. The body 12 is sized so that there is a close fit between an internal surface of the body and an outer surface of the pile 16. The body 12 includes a plurality of fixing apertures 18 which in use will receive a pile fixture 30 which secures the cap 10 to the pile 16. The pile fixing apertures 18 may be arranged circumferentially about the body 12.

**[0014]** In the illustrated embodiment the body 12 includes a plurality of optional body portions or tabs 20. Each body portion 20 has a pair of pile fixing apertures 18.

**[0015]** The body 12 may have a plurality of positioning apertures 22, or each body portion 20 may have at least one positioning aperture. The positioning apertures 22 in use receive a positioning fixture such as a grub screw which secures the end cap 10 in position and in the correct orientation on the pile 16 while apertures are formed in the pile 16.

**[0016]** The attachment flange 14 includes a plurality of structure fixing apertures 24. In use, the structure fixing apertures 24 each receive a structure fixture 28 which secures a structure to the cap 10, as will be described in more detail below. In the illustrated embodiment, there is a single attachment flange 14 which is a continuous ring, and the plurality of structure fixing apertures 24 are equidistantly spaced around the attachment flange. An upper face of the attachment flange 14 is preferably substantially perpendicular to a longitudinal axis of the cap body 12.

**[0017]** The body portion 12 and at least one attachment flange 14 may be integrally formed, or formed as separate members which are attached together to form an end cap 10. The end cap 10 may be formed from steel. As depicted in Fig. 2, to assist with transportation of the end cap 10, the end cap 10 may optionally include a transportation member 26. The transportation member 26 is fixed to the end cap 10 by a pair of the structure fixtures 28. The structure fixtures 28 extend through the corresponding structure fixing apertures 24. The transportation member 26 allows the end cap to be carried by installers to the site of installation, and is removed before a support member 32 of the structure is secured to the attachment flange 14.

**[0018]** Known mechanical fixtures such as nuts and bolts are suitable for securing the pile 16 to the end cap 10 and the end cap to the support member 32. Alternatively, threaded screws may be used.

### Industrial Applicability

**[0019]** With reference to Figs. 2 and 3, a method of mounting a structure on a pile 16 using the end cap 10 will now be described. Firstly, the end cap 10 is carried to the location of the pile 16. This may be achieved without the need for lifting machinery by two installers using the

transportation member 26 to carry the end cap 10. Once at the location, the end cap 10 is placed over a protruding end of the pile 16, and the transportation member 26 is removed, if present. The rotational position of the end cap 10 on the pile 16 can be adjusted at this point so that the support member(s) 32 of the structure will be correctly oriented for securing to the end cap 10.

**[0020]** Once the cap 10 is in the required rotational position on the pile 16 the installer then threads a positioning fixture (not shown) through each positioning aperture and into the outer surface of the pile 16. This temporarily holds the end cap 10 in position on the pile 16 whilst the final connections are made between the pile, end cap and structure.

**[0021]** The installer then drills holes in the pile 16 through the pile fixing apertures 18 in the body portions 20. Once the apertures in the pile 16 have been drilled, the installer then threads a pile fixture 30 through each pile fixing aperture 18 and its corresponding hole in the pile. This secures the cap 10 to the pile 16.

**[0022]** The structure to be supported is then brought into position on the upper surface of the attachment flange 14, and orientated such that apertures in a bottom surface of the support member are aligned with the corresponding structure fixing apertures 24 in the attachment flange 14. The installer then threads a structure fixture 28 through each pair of aligned apertures and tightens a nut on the fixture to secure each support member 32 to the end cap 10 and the pile 16.

**[0023]** The end cap 10 described herein can be used to construct a foundation member 34 for a support member of a structure by placing it on an end of a pile 16.

**[0024]** The present invention provides a simple and cost effective solution for securing above-ground structures upon load-bearing piles when the pile cannot be driven into the ground to its full length. In such circumstances the top of the pile is removed but the workers on site do not need to weld or mechanically attach a new group of individual connectors onto the pile. Instead the cap of the present invention can be simply attached over the cut end of the pile and the structure then attached thereto. This significantly reduces the time and cost of erecting a structure which uses piles as part of the foundations of the structure.

**[0025]** Because the end cap may include a transportation member which is removed before the structure is fixed to the end cap, the end cap may be transported manually to the onsite location of the pile. This reduces the cost of the engineering work.

**[0026]** Because each body portion may include a positioning aperture, the end cap may be securely held to the end cap while the pile apertures are being drilled.

**[0027]** Modifications and improvements may be incorporated without departing from the scope of the invention, which is defined by the appended claims.

**[0028]** It should be understood that the body may not be a single cylindrical element which in use extends around the outer circumference of the pile. There may

be a number of body portions that in use are spaced apart circumferentially and connected to one another by the attachment flange.

**[0029]** It should be understood that the end cap may comprise more than one attachment flange. The attachment flanges may be spaced apart around the outer circumferential surface of the pile and extend from the body. Each attachment flange may have a structure fixing aperture which in use receives a fixture to secure the attachment flange to the support member of the structure.

**[0030]** It should be understood that the at least one attachment flange may be a single steel plate. The steel plate may include a centrally located structure aperture that can receive a structure fixture which can be used to secure the transportation member to the end cap.

**[0031]** The pile depicted in the drawings is tubular with a circular cross-section, and the end cap has been formed such that it can fit over it, but the end cap may be formed to fit over any cross-sectional shape of pile.

**[0032]** The end cap described herein has been described in the context of piles used in rail-side construction. However, it should be understood that the end cap described herein can be used in conjunction with piles across all areas of construction.

## Claims

1. An end cap for securing a structure upon a pile, the end cap comprising:

a body adapted in use to fit over an end of the pile and having at least one pile fixing aperture; and  
at least one attachment flange extending from the body having a plurality of structure fixing apertures,  
wherein the at least one pile fixing aperture in use receives a fixture to secure the end cap to the pile, and  
wherein each structure fixing aperture in use receives a fixture to secure the structure to the end cap.

2. The end cap of claim 1, wherein the body further comprises at least one positioning aperture, wherein the at least one positioning aperture in use receives at least one positioning fixture to position the end cap on the pile.

3. The end cap of claim 1 or 2, wherein the end cap further comprises at least one structure fixture extending through a corresponding at least one of the structure fixing apertures, and a transportation member attached to the at least one structure fixture for transportation of the end cap.

4. The end cap of claim 1, wherein the body comprises

a plurality of body portions, wherein each body portion comprises at least one pile fixing aperture.

5. The end cap of claim 4, wherein each body portion further comprises at least one positioning aperture, wherein the at least one positioning aperture in use receives at least one positioning fixture to position the end cap on the pile.

10 6. The end cap of claim 4 or 5, wherein the end cap further comprises at least one structure fixture extending through a corresponding at least one of the structure fixing apertures, and a transportation member attached to the at least one structure fixture for transportation of the end cap.

15 7. A foundation for a structure, the foundation comprising a pile, and an end cap according to any preceding claim.

20 8. A method of securing a structure upon a pile using an end cap, the end cap comprising:

25 a body having at least one pile fixing aperture; and  
at least one attachment flange extending from the body having a plurality of structure fixing apertures,

30 wherein the method comprises the steps of:

35 placing the end cap over the end of the pile;  
securing the cap to the pile by way of at least one pile fixture extending through the at least one pile fixing aperture in the body; and  
securing the structure to the end cap by way of a plurality of structure fixtures extending through the plurality of structure fixing apertures.

40 9. The method of claim 8, wherein the body further comprises at least one positioning aperture and prior to securing the cap to the pile the end cap is positioned on the pile by threading at least one positioning fixture through the at least one positioning aperture to engage the pile.

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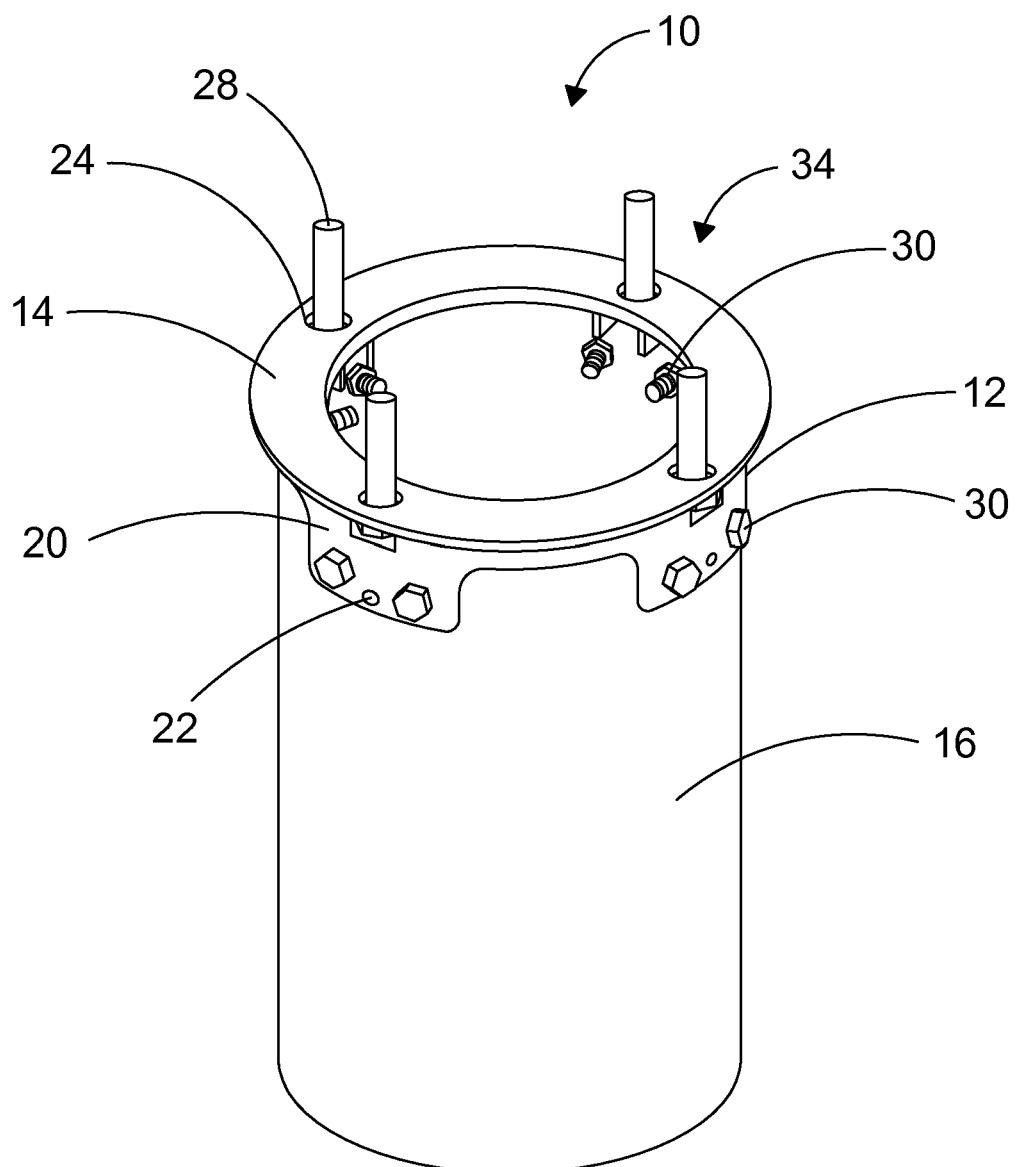


FIG. 1

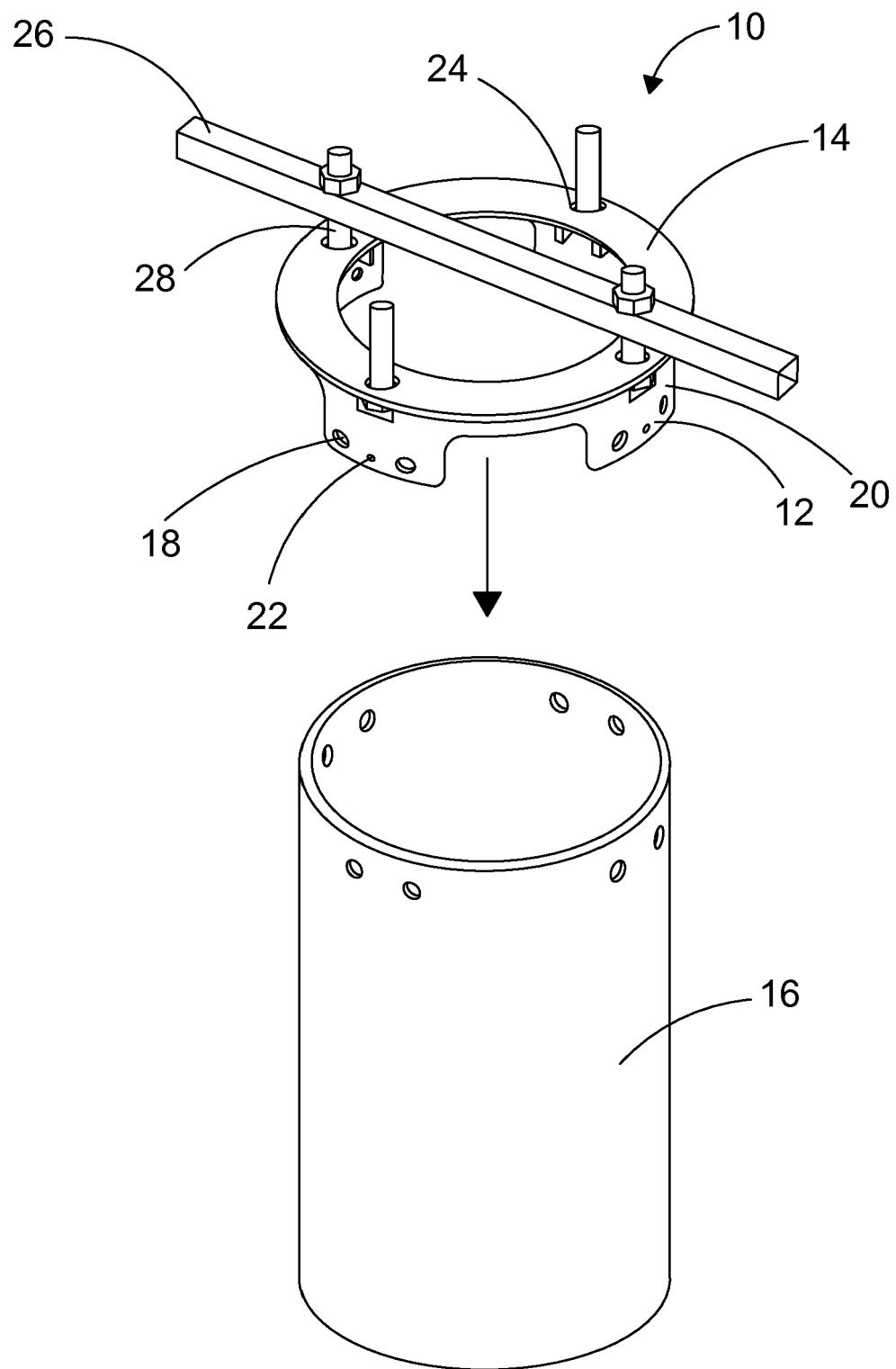


FIG. 2

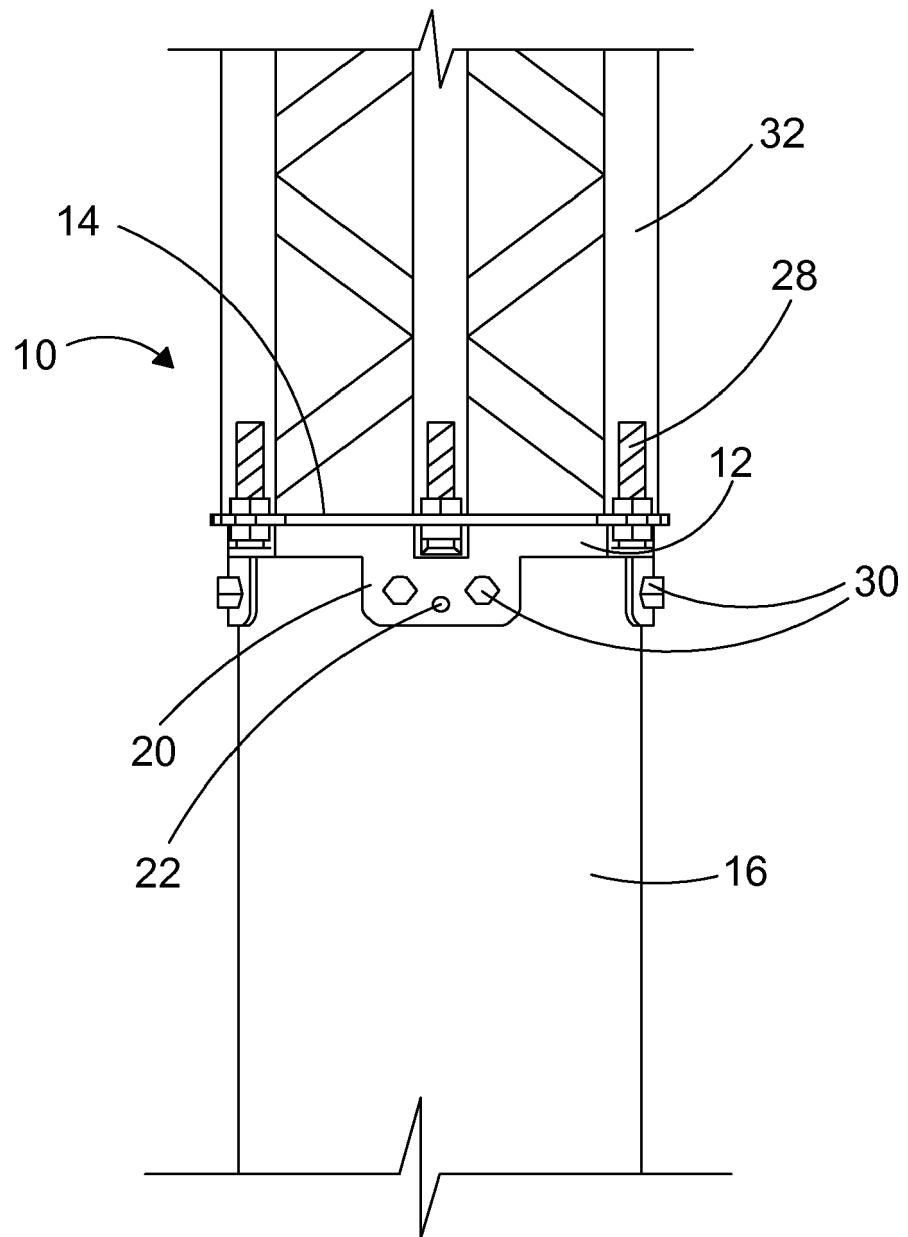


FIG. 3



## EUROPEAN SEARCH REPORT

Application Number  
EP 17 16 5073

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50	1 The present search report has been drawn up for all claims		
55	Place of search Munich	Date of completion of the search 28 June 2017	Examiner Geiger, Harald
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			
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EPO FORM 1503 03-82 (P04C01)			

**ANNEX TO THE EUROPEAN SEARCH REPORT  
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EP 17 16 5073

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 The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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