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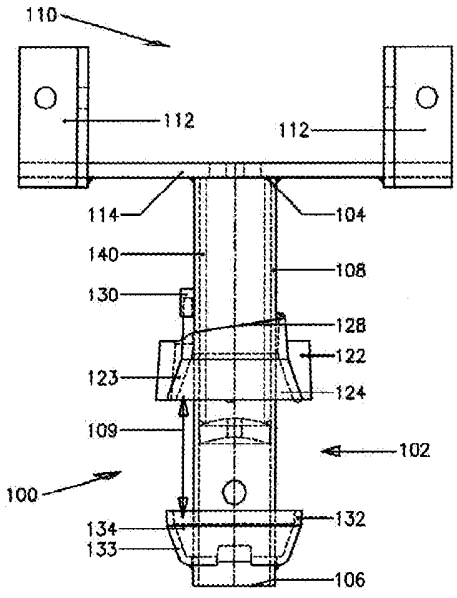
(54) **Forkhead for use in a modular scaffolding system.**

(57) A forkhead (100) for use in a modular scaffolding system, comprising:
- an axially extending shaft (102) having a first end (104) and a second end (106);
- a fork structure (110), connected to the first end of the shaft;
- coupling means (122, 130, 132), provided on the shaft and configured to connect an end of at least one ledger (180) to the shaft in an axial ledger connection range (109); and
- a mounting assembly (106, 150) configured to pivotally mount the forkhead to a standard (160).



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Title: Forkhead for use in a modular scaffolding system

Field of the Invention

The present invention relates to a modular scaffolding system, and more in particular, to a modular scaffolding system for supporting formwork.

Background

Modular scaffolding systems comprise a limited number of different building elements that can be connected together in large numbers to form a variety of scaffold frames. Due to their modular nature, the scaffold frames may be individually tailored to specific sites and applications. The propping of loads, e.g. formwork, during construction works is an example of such an application.

In general terms, a modular scaffold frame set up to prop a load typically comprises a plurality of standards (also called uprights), ledgers and cross-braces. The standards are connected to form vertically extending columns that are spaced apart at regular intervals. Horizontally oriented ledgers interconnect the columns at different height levels to form a more or less regular framework. Points where ledgers connect to standards are called nodes. The cross-braces may diagonally interconnect these nodes, either connecting nodes of the same level or connecting nodes of different levels, in order to increase the rigidity of the scaffold frame. Upper standards of the columns may further be provided with forkheads, which provide a support for girders or support beams that may in turn support the actual load.

The heights of the load-bearing forkheads of the scaffold frame need to be aligned with the height-profile of the structure to be supported. Since standards of a modular scaffolding system typically all have the same unit length (e.g. around 500 mm), it is likely that the desired heights of the forkheads are not an exact multiple of the unit length. This issue is normally dealt with by providing the forkheads not on top of fixed-length standards,

but on so-called screwjacks, i.e. standards whose effective length can be adjusted. The screwjacks are preferably configured such that their length can be adjusted continuously over a distance of about one standard unit length. Accordingly, the desired height of a forkhead mounted on such a screwjack is also continuously adjustable. A problem may arise when a load is applied to a forkhead mounted on an extended screwjack. Under certain conditions (e.g. side winds acting on a propped load) the forkheads may be subjected to non-vertical forces, which in turn may give rise to considerable bending stresses in the extended screwjacks that support them. The greater the degree of extension of a screwjack, the greater the experienced bending stress for the same non-vertical force. The bending stresses diminish the supporting capability of the screwjacks, and hence of the entire scaffold frame, and are therefore best avoided.

Two solutions to this problem have been put forward. The first solution entails the extension of the screwjacks to a lesser degree, and the additional use of base jacks (i.e. jacks that support the columns of a scaffold frame from below) to set the heights of the forkheads. The total required extension is thus divided between the base jacks and the screwjacks, such that neither of them needs to be fully extended. A drawback of this first solution, however, is that it is practically impossible to adjust the degree of extension of a base jack once a scaffold frame has been put up. Indeed, this is because the entire weight of the frame rests on the base jacks. A second, alternative solution is shoring up the individual screwjacks to a lower ledger level of the scaffold frame. Unfortunately, individually shoring up the screwjacks is a toilsome job, and what is more, it is prone to an asystematic approach that may lead to errors endangering the stability of the scaffold frame.

It is an therefore an object of the present invention to overcome or mitigate one or more of the above-mentioned problems associated with the use of extendable screwjacks.

Summary of the Invention

According to one aspect of the invention, a forkhead for use in a modular scaffolding system is provided. The forkhead comprises an axially extending shaft having a first end and a second end, and a fork structure that is connected to the first end of the shaft. The forkhead also comprises coupling means, provided on the shaft and configured to connect an end of at least one ledger to the shaft in an axial ledger connection range. The forkhead further comprises a mounting assembly configured to pivotally mount the forkhead to a standard.

The forkhead according to the invention is formed as a separate modular component that is detachably connectable to a standard, such as a screwjack, upon use. It connects to the standard in a pivotal manner, which advantageously diminishes torsion en bending stresses in the forkhead shaft and the standard, especially compared to a rigid connection between the two components. The forkhead features integrated coupling means that enable the use of its elongate, axially extending shaft in a manner analogous to the use of a common standard. In use, the shafts of different forkheads may thus be interconnected by a level of ledgers. This (top) level may then, as a whole, be shored to a lower level of ledgers of the scaffold frame, which lower level may be shored to a still lower level, and so on to ground level. Doing so ensures that non-vertical forces on the forkheads are taken up by the top level of ledgers and diverted downwards from there, effectively bypassing the standards that support the forkheads. This reduces exposure of the standards to the non-vertical forces, and thus to detrimental bending stresses that could result therefrom. Because the top level of ledgers that interconnects the forkheads is shored to a lower level of ledgers in its entirety, only a limited number of shores is required. A shore to forkhead ratio of 1:5 or less (e.g. 1:10 or 1:15) will typically suffice, which means that the work involved in raising a

secured scaffold frame for propping a load is greatly reduced, in particular in comparison to individually shoring the forkhead carrying standards.

Ledgers may be connected to the shaft in an 'axial ledger connection range'. This range is defined by the axial or longitudinal portion of the shaft over which a connected ledger is in contact with the shaft. According to an embodiment of the invention, the axial ledger connection range extends within a distance of 0 to 25 cm from the first end of the shaft.

To expose as little of the shafts of the forkheads and the standards that support them to non-vertical forces (and hence bending stresses), ledgers preferably connect to the forkhead shafts just below their load-bearing fork structures. To this end, the coupling means are preferably disposed within a distance of about 25 cm from the first end of the shaft of the forkhead, or at least configured to connect a ledger to the shaft within said range of 0 to 25 cm from the first end.

According to another embodiment of the present invention the mounting assembly comprises the second end of the shaft, said second end being open and configured to receive an end portion of a standard. The mounting assembly further comprises an internal stop surface, disposed in the shaft and configured for cooperation with a stop surface on the end portion of the standard.

To provide for a pivotal connection with a standard, the forkhead may be provided with a female mounting provision in the form of an open ended shaft that is capable of receiving a male mounting provision in the form of an end portion of a standard. The open end of the shaft effectively serves as a socket that has an internal stop surface against which, in use, a stop surface on the end portion of the standard may abut so as to transfer any vertical load from the forkhead onto the standard. The female-male connection thereby reliably secures the two components relative to each other.

According to a further embodiment of the present invention, an axial position of the internal stop surface is within the axial ledger connection range.

Due to the preferably slightly pivotal connection between the forkhead and a standard, the shaft of the forkhead and the standard need not be in complete alignment with each other. While the standard is typically oriented vertically, the shaft of the forkhead may extend in a slightly non-vertical direction. Ledgers typically connect to the shaft in a direction perpendicular thereto. This configuration implies that (even) substantially vertical load forces on the fork head include both force components acting in the direction of the shaft of the forkhead, and force components acting in a direction parallel to the ledgers. The latter force components may be partly absorbed by the ledgers, and also partly by the standard. The fact that the standard may experience the effects of force components parallel to the ledgers is because said force components – acting on the fork structure of the forkhead – generate a moment relative to points in the axial ledger connection range. In case the end portion of the standard does not coincide with the axial ledger connection range, an arm exists between the end portion of the standard and the axial ledger connection range through which the end portion of the standard may be forced to balance the moment generated by the aforementioned force components. Consequently, the end portion of the standard that supports the forkhead may be forced in a non-vertical direction, which again leads to a bending moment. This is clearly undesirable. To minimize such bending moments, the internal stop surface of the forkhead may preferably be disposed within the axial ledger connection range, and more preferably near the axial center thereof (e.g. no further than 10% of the axial length of the axial ledger connection range from an axial center of the axial ledger connection range). Such placement effectively eliminates the arm that might otherwise exist between the connection of the standard with the shaft on the one hand, and the connection of the shaft and the ledgers on the

other, forcing this latter connection (which is capable of supporting a force couple) to balance moments generated by the force components that do not extend parallel to the shaft.

With the internal stop surface of the shaft in the axial ledger connection range, load forces on the fork structure of the forkhead may be said to travel down the shaft, and split up at or around the axial position of the internal stop surface. Substantially vertical forces pass through the pivot formed by the two abutting stop surfaces of the forkhead and the standard, while substantially non-vertical forces are led into the at least one ledger that connects to the shaft at that position. As mentioned, said at least one ledger is to form part of a (top) level of ledgers that is shored to a lower level of ledgers, and so on, in order to safely guide any non-vertical forces experienced by the forkheads downwards through the scaffold frame. No moment due to substantially horizontal forces or force components is transferred onto the standard as the pivot formed by the two abutting stop surfaces lies within the axial ledger connection range. The result of this configuration is therefore that the standard merely experience a substantially vertical compressive load, and virtually no bending moment that may compromise its supporting capability.

According to a further elaboration of the invention, the internal stop surface of the forkhead is spheroidally curved.

A connection between the forkhead and a standard via their two aforementioned stop surfaces allows for some play. The shaft of the forkhead may, for example, be allowed to rotate a few degrees out of alignment with the standard. To enable smooth mutual reorientations of the forkhead and the standard under a varying load, and to minimize wear of the stop surfaces, the internal stop surface of the forkhead is preferably spheroidally curved. The stop surface on the end portion of an associated standard is, of course, preferably shaped complementarily to enjoy the full benefits of the configuration. Thus, in case the internal stop surface is curved concavely, the

stop surface of the associated standard is preferably shaped convexly, or vice versa.

These and other features and advantages of the invention will be more fully understood from the following detailed description of certain embodiments of the invention, taken together with the accompanying drawings, which are meant to illustrate and not to limit the invention.

Brief Description of the Drawings

Fig. 1 is a schematic perspective view of a known screwjack having an integrated fork structure;

Figs. 2-4 schematically illustrate an exemplary embodiment of a forkhead according to the present invention, whereby Fig. 2 is an orthogonal front view of the forkhead, Fig. 3 is an orthogonal side view of the forkhead, and Fig. 4 is a cross-sectional view of a shaft insert of the forkhead;

Fig. 5 is a schematic side view of a screwjack for use with the forkhead shown in Figs. 2-4;

Fig. 6 schematically illustrates a scaffold frame supporting a load;

Fig. 7 shows a detail of an upper portion of the scaffold frame shown in Fig. 6, illustrating the configuration of a top level of ledgers connected to the forkheads, whereby said top level is shored to a lower level of ledgers;

Fig. 8 schematically illustrates in a close-up taken from Fig. 7 a connection between a forkhead, a number of ledgers, and a screwjack; and

Figs. 9 and 10 schematically illustrate the working of the coupling means shown in, inter alia, Figs. 2 and 3.

Detailed Description

Fig. 1 is a schematic perspective view of an exemplary known screwjack 1. The screwjack 1 comprises a cylinder jacket-shaped inner tube 2 that is slidingly moveable into and out of a cylinder jacket-shaped outer tube

14. An upper end of the inner tube 2 is fixedly connected to a fork structure 6, for example through a weld. The fork structure 6 includes a substantially rectangular base plate 8, on the corners of which teeth 10 in the form of upstanding angle profiles are mounted. The angle profiles may comprise a number of holes 11. The inner tube 2 is further provided with an outer thread 4 over at least a significant portion of its length. An adjusting nut 12 that is screwable up and down the thread 4 is provided on the inner tube 2.

In use, a girder (not shown) may be supported on the base plate 8 of the fork structure 6, in between the teeth 10. The angular profile of the teeth 10 thereby helps to keep the girder in position. A wooden girder may, if desired, be bolted to the teeth 10 through the holes 11 to prevent it from slipping away. The weight of the girder and that of any load it carries are transferred from the fork structure 6 to the inner tube 2, and via the adjusting nut 12 provided thereon onto an edge or collar 16 of the outer tube 14. It will be clear that, in use, the adjusting nut 12 rests on the edge 16 of the outer tube 14. It is merely for reasons of clarity that the inner tube 2 and the adjusting nut 12 attached thereto are shown in a lifted position in Fig. 1, in particular to make the edge 16 of outer tube 14 visible. As the adjusting nut 12 rests on the edge 16, the height of the fork structure 6 relative to said edge 16 may be adjusted continuously by turning the adjusting nut. Such adjustment of the height of the fork structure 6 is, of course, preferably done before loading it. A lower end (not shown) of the outer tube 14 typically connects the screwjack 1 to the rest of a scaffold frame, which holds this lower end in place.

The screwjack 1 shown in Fig. 1 embodies several drawbacks. The fork structure 6, for example, is fixedly connected to the inner tube 2. Consequently, non-vertical or slightly off-center vertical loads, i.e. vertical loads on the base plate 8 of the fork structure 6 that are asymmetrically distributed relative to the (axis of the) inner tube 2 that supports it, may expose the join between the base plate 8 and the inner tube 2 to shear strains

and bending moments. In addition, an increasingly extended screwjack 1 gives rise to a larger distance (read: arm) between the load-bearing fork structure 6 and the (fixed) lower end of outer tube 14, and hence to larger bending moments in the inner tube 2 under the same non-vertical load. The bending moments induce tensile and compressive stresses in the inner tube 2, and may eventually cause its failure. These drawbacks associated with the known screwjack 1 can be overcome through the use of the forkhead 100 according to the present invention, to which attention is now invited.

Figs. 2-4 schematically illustrate an exemplary embodiment of a forkhead 100 according to the present invention. Fig. 2 depicts the forkhead 100 in a frontal view, Fig. 3 depicts the forkhead 100 in a side view, and Fig. 4 is a cross-sectional view of a shaft insert 140. The construction of the forkhead 100 will now be elucidated with reference to these figures.

The forkhead 100 comprises a shaft 102, having a first end 104 and a second end 106. Since the forkhead 100 may typically be used in a substantially upright orientation, as shown in Figs. 2 and 3, the first end 104 and second end 106 of the shaft 102 may occasionally be referred to as the upper and lower end of the shaft, respectively. Other relative designations, such as 'above', 'below', etc. may additionally be used to describe other elements as well, and it is understood that such designations derive from the normal orientation of use of the forkhead 100.

Connected to the first, upper end 104 of the shaft 102 is a fork structure 110, similar to the one shown in Fig. 1. It includes a base plate 114 that is joined to the upper end 104 of the shaft 102, e.g. through a weld. The base plate 114 is provided with a number of teeth 112 that are formed by upright angle profiles between which a formwork supporting girder (not shown) may be received. The base plate 114 then supports the girder from below, while the teeth 112 prevent the girder from moving laterally. It will be appreciated that many fork structure designs may be suited to practice the present invention. The number of teeth 112 of the fork structure 110, for

example, is primarily a matter of choice, although fork structures with two (i.e. a U-fork) or four regularly arranged teeth (as shown) are most common. The teeth 112 may further have a variety of shapes (e.g. cylindrical, or angular as shown), and the fork structure 110 as a whole may be made of one piece or be assembled from different elements that have been connected together. In principle, any fork structure capable of securely supporting a girder or other formwork (supporting) element is usable.

The shaft 102, which extends substantially perpendicularly from the base plate 114 of the fork structure 110, essentially comprises a hollow, cylinder jacket-shaped tube 108 in which a shaft insert 140 has been inserted during construction of the forkhead 100. The shaft insert 140 – for the sake of clarity shown separately in Fig. 4 – includes a hollow, cylinder jacket-shaped tube 142, a natural outer diameter of which is slightly larger than a natural inner diameter of tube 108, such that the insert may be securely fixed inside tube 108 by means of pressing. When the shaft insert 140 is properly introduced into tube 108, a first end 144 of the shaft insert tube 142 abuts the lower side of base plate 114 of the fork structure 110. A second end 146 of the shaft insert tube 142 is provided with a head 148, a lower surface of which provides a stop surface 150. The stop surface 150 is configured for cooperation with an end portion 166 of a screwjack 160 (to be discussed in relation to Fig. 5 below), with which it forms a hinge point (cf. Fig. 8). To this end, the stop surface 150 is spheroidally curved in such a way that the head 148 defines a concave socket in which a complementarily-shaped stop surface 170 of said end portion 166 of said standard 160 is pivotally receivable. The head 148 may further include a passage 152 to enable galvanization of the tube 142 of the shaft insert 40 once it has been inserted into the shaft's main tube 108.

Although the proposed construction of the shaft 102 is relatively light-weight due to the use of hollow tube segments 108, 140, yet sufficiently strong and economically manufacturable, it is contemplated that the shaft of the forkhead 100 may be constructed differently in other embodiments. The

shaft 102 may, for example, not have a circular cross-profile (even though this would probably inhibit the interchangeability of these components with components of other modular scaffolding systems), not include a separate shaft insert 140 (the internal support surface 150 may for example be formed by a portion of the base plate 14 of the fork structure 10), or possibly, not even have an internal support surface 150 (it is conceivable that the second end 106 of shaft 102 is to be received in a socket provided in a supporting standard, instead of the other way around as shown in Figs. 2-4). Such embodiments are all intended to fall within the scope of the present invention.

The shaft 102 is provided with coupling means 120 to enable one or more ledgers to be linked to the shaft. The coupling means 120 include a first, upper cup 122; a second, lower cup 132, and a cam 130. The second, lower cup 132 is rigidly connected to the shaft 102, and it defines an annular cup space 134 between an outer circumference of the shaft 102 and an inner circumference of an upwardly extending wall 133 of the cup. The first, upper cup 122 is not rigidly fixed to the shaft 102, but instead slidingly moveable along it, namely in between the base plate 114 of the fork structure 110 and the second, lower cup 132. Like the lower cup 132, the upper cup 122 defines an annular cup space 124, this time between an outer circumference of the shaft 102 and an inner circumference of a downwardly extending wall 123 of the cup. The first, upper cup 122 further includes a helically sloping brim 128 (of only one turn). The sloping brim 128 is configured for cooperation with the cam 130, which is provided on an outer circumference of the shaft 102.

It is noted that the above-described configuration of the coupling means 120, wherein the lower cup 132 and the cam 130 are fixed to the shaft 102, and the upper cup 122 is trapped on the shaft, in between the lower cup and the base plate 114, prevents any part of the coupling means 120 from getting lost or accidentally falling down when working at an altitude.

Figs. 9 and 10 illustrate how the coupling means 120 may be used to join ledgers 180 to the shaft 102. In Fig. 9, the upper cup 122 is suspended

on the cam 130. This allows one to place a number of ledgers 180, each having a flange 182 on both ends, in the lower cup 132. When all ledgers 180 are positioned (typically no more than four), the upper cup 122 may be lowered by sliding the cam 130 through the slot 126 so as to lock up the upper parts of the flanges 182 in the cup space 124. See Fig. 10. Subsequently turning the upper cup 122 clockwise brings the sloping brim 128 in wedging contact with the cam 130. Tightening the upper cup 122 by turning it further clockwise rigidly clamps the flanges 182 of the ledgers 180 between the cups 122, 132, and against the shaft 102 in the axial ledger connection range 109. Releasing the ledgers 180 is, of course, done by executing the steps in opposite order. The proposed coupling means 120 enable one to safely yet quickly interconnect the forkheads 100 by means of ledgers 180, which is an improvement over the situation wherein individual forkhead carrying standards must be shored using conventional, somewhat awkward (and often separately provided) couplers.

Fig. 5 schematically illustrates a screwjack 160 on which the forkhead 100 shown in Figs. 2-4 is mountable. The screwjack 160 comprises two cylinder jacket-shaped tubes 162, 172, one of which 162 is receivable in the other 172 in a telescoping manner. Inner tube 162 is, over an upper portion, provided with an external thread 164. The screwjack 160 further includes an adjusting nut 168, which can be screwed up and down the threaded portion of tube 162. In use, the adjusting nut rests on an edge or collar 174 of the outer tube 172 by which the part of the tube 162 that extends below the adjusting nut 168 is received. Turning the adjusting nut 168 one way will gradually raise the inner tube 162 from the outer tube 172, while turning it the other way will sink the inner tube 162 into the outer tube 172. Accordingly, the screwjack 160 serves as a mechanism that may be used to raise and lower a forkhead 100, mounted on an upper end portion 166 of the inner tube 162, to the desired height. – It is understood that the outer tube 172 is typically relatively short, i.e. shorter than the unit length of the

standards of a modular scaffolding system, and therefore not capable of accommodating the entire inner tube 162 . However, since the outer tube 172 is normally placed on top of other standard-length standards to form a (hollow) vertical column (193, see Fig.6), the inner tube 162 may in practice slide through the outer tube 172 and into these lower standards, so as to effect a lower forkhead height. – In order to enable a slightly hingeable connection with the forkhead 100, the upper end portion 166 of the inner tube 162 is provided with a spheroidally shaped stop surface 170 that is configured for cooperation with the stop surface 150 of the shaft insert 140. During construction, the stop surface 170 may for example be punched from a metal plate, and then be welded on top of the tube 162.

Fig. 6 schematically illustrates a scaffold frame 190 that is used for propping a load 200, e.g. a layer of formwork. For reasons of clarity, some conventional elements that might in practice be part of the scaffold frame 190, such as, for example, transoms, guardrail ledgers, toeboards etc., are omitted from the drawing. The depicted framework 190 comprises a plurality of standards 192, ledgers 180, couplers 120 and shores 194. The standards 192 are ordinary standards, different from the one shown in Fig. 5 in that they do not include a jack mechanism. In a vertical direction, the standards 192 are connected through conventional spigot-socket fittings (not visible, but each time located near the couplers 120) to form columns 193. These columns 193 are oriented vertically, in parallel and spaced apart at regular intervals. Near ground level, the standards 192 rest on base jacks 196 that allow for adjustment to terrain irregularities. The vertical standards 192 are laced together by horizontally oriented ledgers 180. The ledgers 180 are provided at discrete vertical levels that are spaced apart at regular intervals. In the framework of Fig. 6, the spacing between the levels is three standards 192. The ledgers 180 interconnect the standards 192, whereby the ledgers themselves are linked to the standards through couplers 120 that may be (but need not be) similar to the coupling means provided on the shaft 102 of the

forkhead 100 discussed above. Points where ledgers 180 connect to standards 192 are called nodes. Shores 194 may diagonally interconnect these nodes, either connecting nodes of the same level (not visible in Fig. 6) or connecting nodes of adjacent levels, in order to increase the rigidity of the scaffold frame 190.

As can be seen clearly, the load 200 supported by the scaffold frame 190 does not extend in a completely horizontal plane, but at an angle to the horizontal instead. To accommodate to the slope of the load 200, screwjacks 160 – where necessary supplemented by a conventional standard 192 (see the left columns) – bridge the distance between the highest truly horizontal level 198 of ledgers 180 and the forkheads 100 that support the load 200. This is best seen in Fig. 7, which illustrates a detail A from Fig. 6. In addition, a top level 199 of ledgers interconnects the forkheads 100, closely below the load-bearing fork structures 110 thereof. This top level 199 is shored to lower level 198, and so on, down to the ground level immediately above the base jacks 196. Non-vertical forces experienced by the forkheads 100 are thus prevented from being passed on to the screwjacks 160, in which they could give rise to bending stresses that might weaken the load bearing potential of the framework 190. Instead, any non-vertical forces on the forkheads 100 are safely guided into the top level 199 of ledgers 180, and from there on downwards to the ground via shores 194 and the other levels.

In Fig. 6, the number of depicted shores 194 connecting the top level of ledgers 199 to the level 198 below is four (4), whereas the total number of depicted forkheads 100 is eighteen (18). In practice, of course, the forkheads 100 at the top of the scaffold frame 190 may extend in a two-dimensional plane, comprising several rows of forkheads 100 'behind' the front row visible in Fig. 6. It is not necessary for each row of forkheads 100 to be shored individually. For most practical scaffold frames 190, the ratio between the number of forkheads 100 and the number of shores 194

connecting the top level of ledgers 199 and the level 198 below may be 1:5 or less, e.g. 1:10 or 1:15.

Fig. 8 is a detail B from Fig. 7, and illustrates a connection between a forkhead 100, an upper end portion 166 of an inner tube 162 of a screwjack 160, and two ledgers 180. The Figure clearly shows how the upper end portion 166 is received in the shaft 102 of the forkhead 100, and how the spheroidally shaped stop surface 170 of the standard 160 abuts the complementarily-shaped stop surface 150 of the forkhead 100. Visible is also how the cups 122, 132 clamp the ends of the ledgers 180 to the shaft 102 of the forkhead 100, such that the flanges 182 contact an axially extending ledger connection range 109 of the shaft 102. Said axial ledger connection range 109 includes the axial position of the stop surface 150 of the forkhead 100.

Although illustrative embodiments of the present invention have been described above, in part with reference to the accompanying drawings, it is to be understood that the invention is not limited to these embodiments. Variations to the disclosed embodiments can be understood and effected by those skilled in the art in practicing the claimed invention, from a study of the drawings, the disclosure, and the appended claims. Reference throughout this specification to "one embodiment" or "an embodiment" means that a particular feature, structure or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, the appearances of the phrases "in one embodiment" or "in an embodiment" in various places throughout this specification are not necessarily all referring to the same embodiment. Furthermore, it is noted that particular features, structures, or characteristics of one or more embodiments may be combined in any suitable manner to form new, not explicitly described embodiments.

List of elements

1	known screw jack
2	inner tube
4	external thread
6	fork structure
8	base plate of fork structure
10	tooth of fork structure
11	hole in tooth of fork structure
12	adjusting nut
14	outer tube
16	collar or edge of outer tube
100	forkhead
102	shaft
104	first end of shaft
106	second end of shaft
108	cylinder jacket shaped tube
109	axial ledger connection range
110	fork structure
112	tooth of fork structure
114	base of fork structure
120	coupling means / coupler
122	first, upper cup
123	cup wall
124	annular cup space
126	slot for cam
128	sloping brim
130	cam on shaft
132	second, lower cup
133	cup wall of second cup
134	annular cup space of second cup
140	shaft insert
142	tube of shaft insert
144	first end of tube of shaft insert
146	second end of tube of shaft insert
148	head of shaft insert
150	stop surface
152	central hole in head

160	screwjack
162	inner tube
164	external thread
166	upper end portion of inner tube
168	adjusting nut
170	stop surface
172	outer tube
174	edge or collar of outer tube
180	ledger
182	flange on ledger
190	scaffold frame
192	upright or standard
193	column of standards
194	shore
196	base jack
198	second highest level of ledgers
199	highest or top level of ledgers
200	load
A	detail
B	detail

Conclusies

1. Een gaffel (100) voor gebruik in een modulair steigersysteem, omvattende:

- een zich in axiale richting uitstrekkende schacht (102) met een eerste einde (104) en een tweede einde (106);
- een vorkstructuur (110), verbonden met het eerste einde van de schacht;
- koppelmiddelen (122, 130, 132), voorzien aan de schacht en ingericht om een einde van ten minste één ligger (180) in een axiaal liggerverbindingsgebied (109) met de schacht te verbinden; en
- een opzetsamenstel (106, 150) ingericht voor het scharnierbaar op een standaard (160) plaatsen van de gaffel.

2. De gaffel volgens conclusie 1, waarbij het axiale liggerverbindingsgebied (109) zich uitstrekt binnen een afstand van 0 tot 25 cm vanaf het eerste einde (104) van de schacht (102).

3. De gaffel volgens conclusie 1 of 2, waarbij het opzetsamenstel omvat:

- het tweede einde (106) van de schacht (102), waarbij genoemd tweede einde (106) open is en ingericht voor het ontvangen van een einddeel (166) van een standaard (160); en
- een intern aanslagoppervlak (150), voorzien in de schacht (102) en ingericht voor samenwerking met een aanslagoppervlak (170) aan het einddeel (166) van de standaard.

4. De gaffel volgens conclusie 3, waarbij een axiale positie van het interne aanslagoppervlak (150) binnen het axiale liggerverbindingsgebied (109) ligt.

5. De gaffel volgens conclusie 4, waarbij een axiale positie van het interne aanslagoppervlak (150) niet verder van een axiaal midden van het axiale liggerverbindingsgebied (109) is gelegen dan 10% van de axiale lengte van het axiale liggerverbindingsgebied.

6. De gaffel volgens een van de voorgaande conclusies, waarbij het interne aanslagoppervlak (150) sferoïdaal gekromd is.

7. De gaffel volgens een van de voorgaande conclusies, waarbij de koppelmiddelen een eerste (122) en een tweede (132) komvormig liggerklemelement omvattend, en waarbij elk van genoemde liggerklemelementen is voorzien rond de schacht (102) ter vorming van een ringvormige komruimte (124, 134) waarin een flens (182) die is voorzien aan genoemd einde van genoemde ligger (180) althans gedeeltelijk opneembaar is.

8. De gaffel volgens conclusie 7, waarbij het tweede liggerklemelement (132) stijf is verbonden met de schacht (102), zodanig dat zijn ringvormige komruimte (134) naar het eerste einde (104) van de schacht is gekeerd, en waarbij het eerste liggerklemelement (122) schuifbaar beweegbaar is langs een deel van de schacht (102) gelegen tussen het eerste einde (104) daarvan en het tweede liggerklemelement (132), waarbij de ringvormige komruimte (134) van het tweede liggerklemelement (132) zich tegenover de ringvormige komruimte (124) van het eerste liggerklemelement (122) bevindt.

9. De gaffel volgens conclusie 7 of 8, waarbij de koppelmiddelen voorts een nok (130) omvatten, voorzien aan de schacht (102) en ingericht voor samenwerking met het eerste liggerklemelement (122), zodanig dat wanneer een van een flens voorzien einde van een ligger (180) is ontvangen door de ringvormige komruimten (124, 134) van de eerste en tweede liggerklemelementen (122, 132), het eerste liggerklemelement ten opzichte van het

tweede liggerklemelement kan worden vastgeklemd door middel van de nok (130).

10. Een samenstel omvattende:

- een gaffel (100) volgens een van de voorgaande conclusies;
- een standaard (160), waarbij genoemde standaard een binnenbuis (162), een buitenbuis (172) en een stelmoer (168) omvat, waarbij de binnenbuis en de buitenbuis telescoperend ten opzichte van elkaar zijn gerangschikt, waarbij de binnenbuis over ten minste een deel van zijn lengte is voorzien van een externe schroefdraad (164), en waarbij de stelmoer is voorzien op het van schroefdraad voorziene deel van de binnenbuis, zodanig dat standaard een schroefspindel vormt, en

waarbij de binnenbuis (162) een einddeel (166) heeft dat opneembaar is door het tweede einde (106) van de schacht (102) van de gaffel, waarbij genoemd einddeel (166) een frontaal aanslagoppervlak (170) bezit dat is ingericht voor scharnierend contact met het interne aanslagoppervlak (150) van de gaffel.

11. Samenstel volgens conclusie 10, waarbij één van het interne aanslagoppervlak (150) van de gaffel (100) en het aanslagoppervlak (170) van de standaard (160) een ten minste gedeeltelijk sferoïdaal gevormde draaikop vormt, en waarbij de ander van de twee aanslagoppervlakken een ten minste gedeeltelijk sferoïdaal gevormde kom vormt voor het scharnierbaar ontvangen van genoemde draaikop.

12. Een modulair steigerframe (190), omvattende:

- een veelheid aan standaards (192), liggers (180) en koppelmechanismen (120), waarbij de standaards een veelheid aan zich verticaal uitstrekkende kolommen (193) vormen die, door tussenkomst van de koppelmechanismen, onderling door de liggers zijn verbonden op verschillende hoogteniveau's; en

- een veelheid aan samenstellen volgens een van de conclusies 9 en 10, waarbij de standaards (160) van de samenstellen zijn geïntegreerd in de kolommen van het steigerframe aan bovenste einden daarvan, en waarbij de gaffels (100) operationeel op de standaards (160) van de samenstellen zijn geplaatst,

waarbij een veelheid aan liggers, vastgeklemd door de koppelmiddelen (120) van de gaffels (100), een bovenste liggerniveau (199) bepaalt, waarbij genoemd bovenste niveau op een aantal schoorposities naar een lager liggerniveau (198) is geschoord, en waarbij de verhouding van het aantal gaffels tot het aantal schoorposities 1:5 of kleiner is.

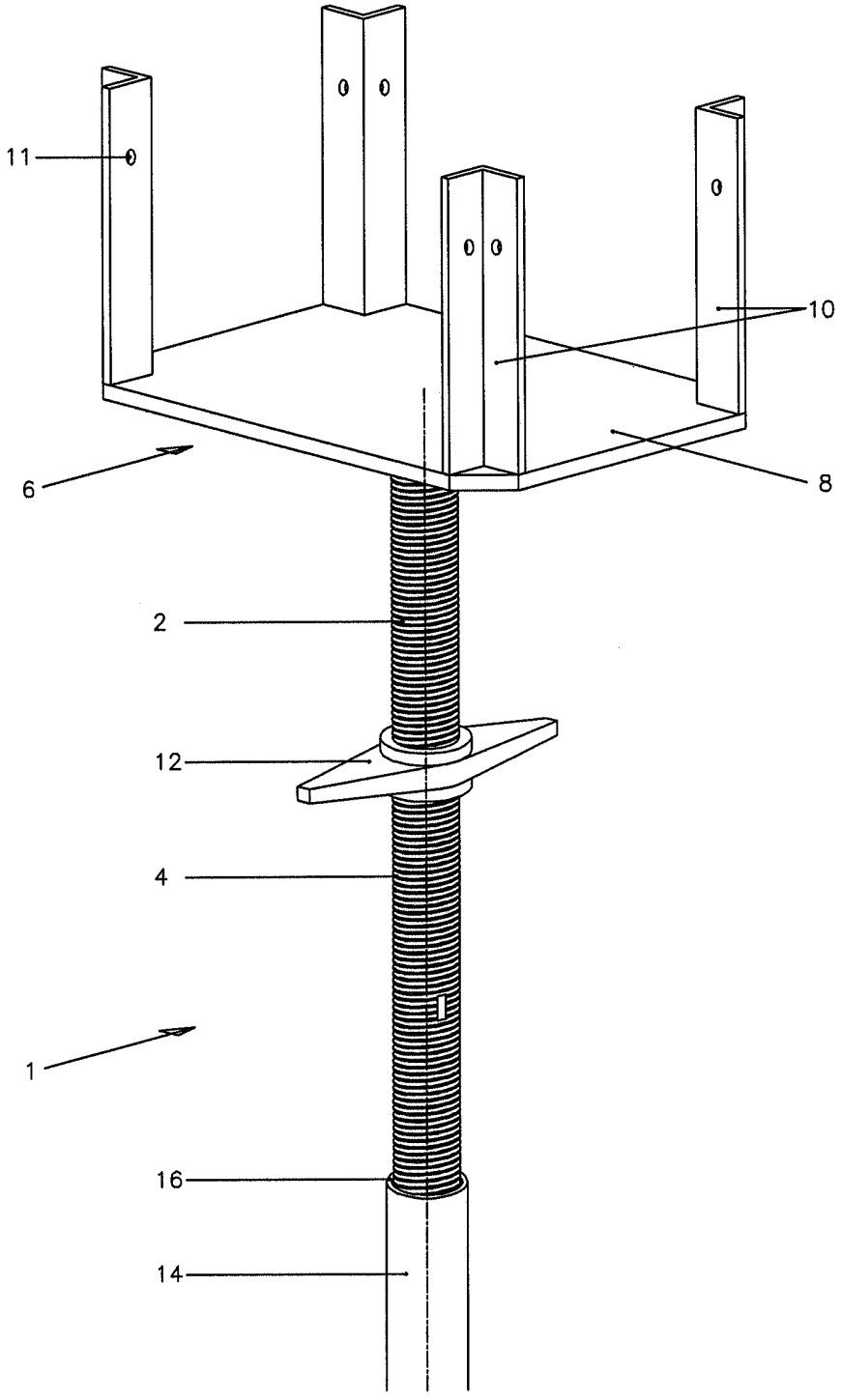


FIG. 1

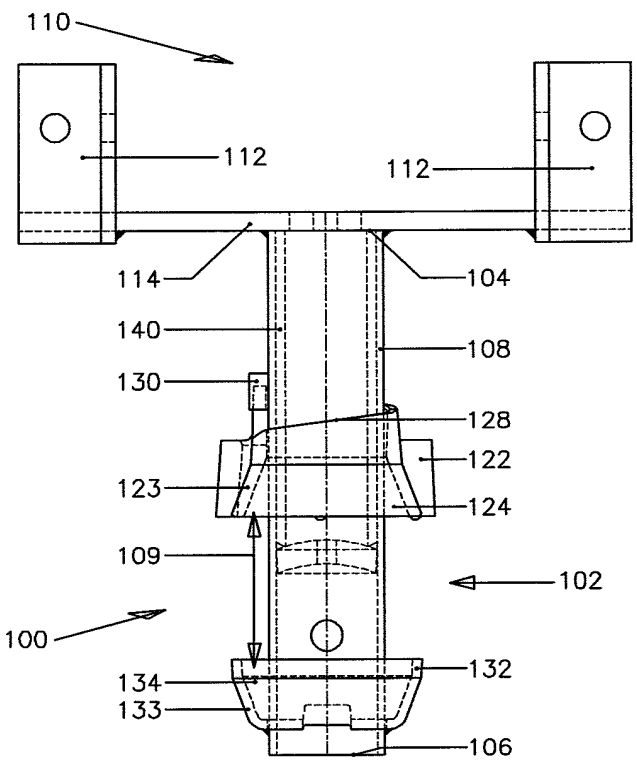


FIG. 2

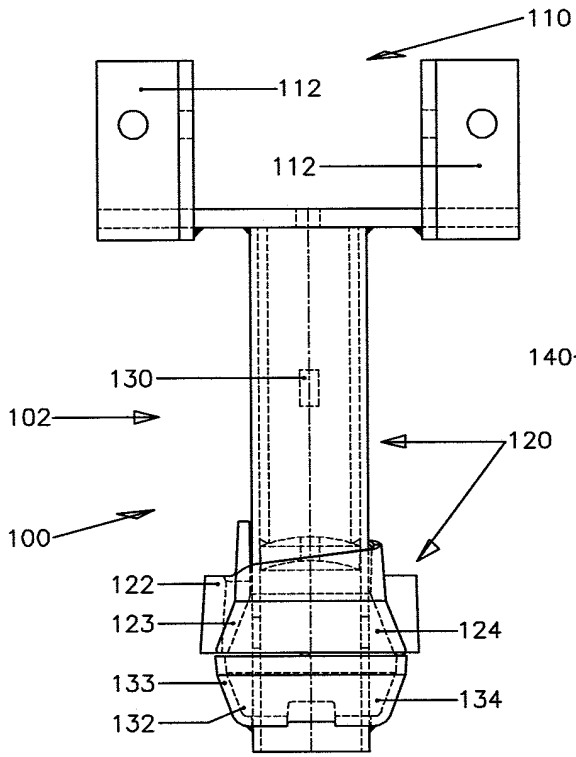


FIG. 3

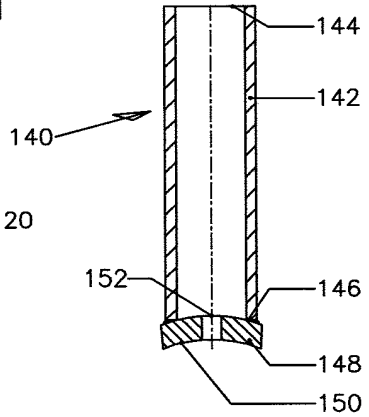


FIG. 4

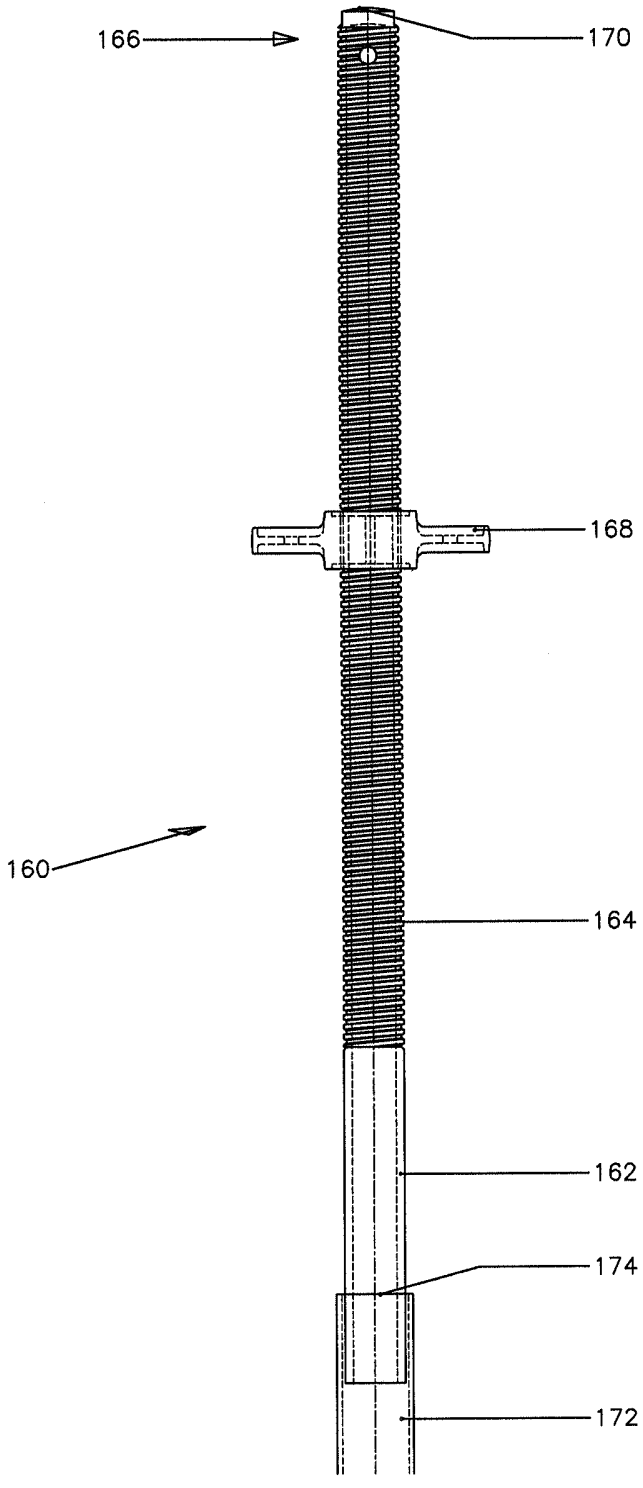
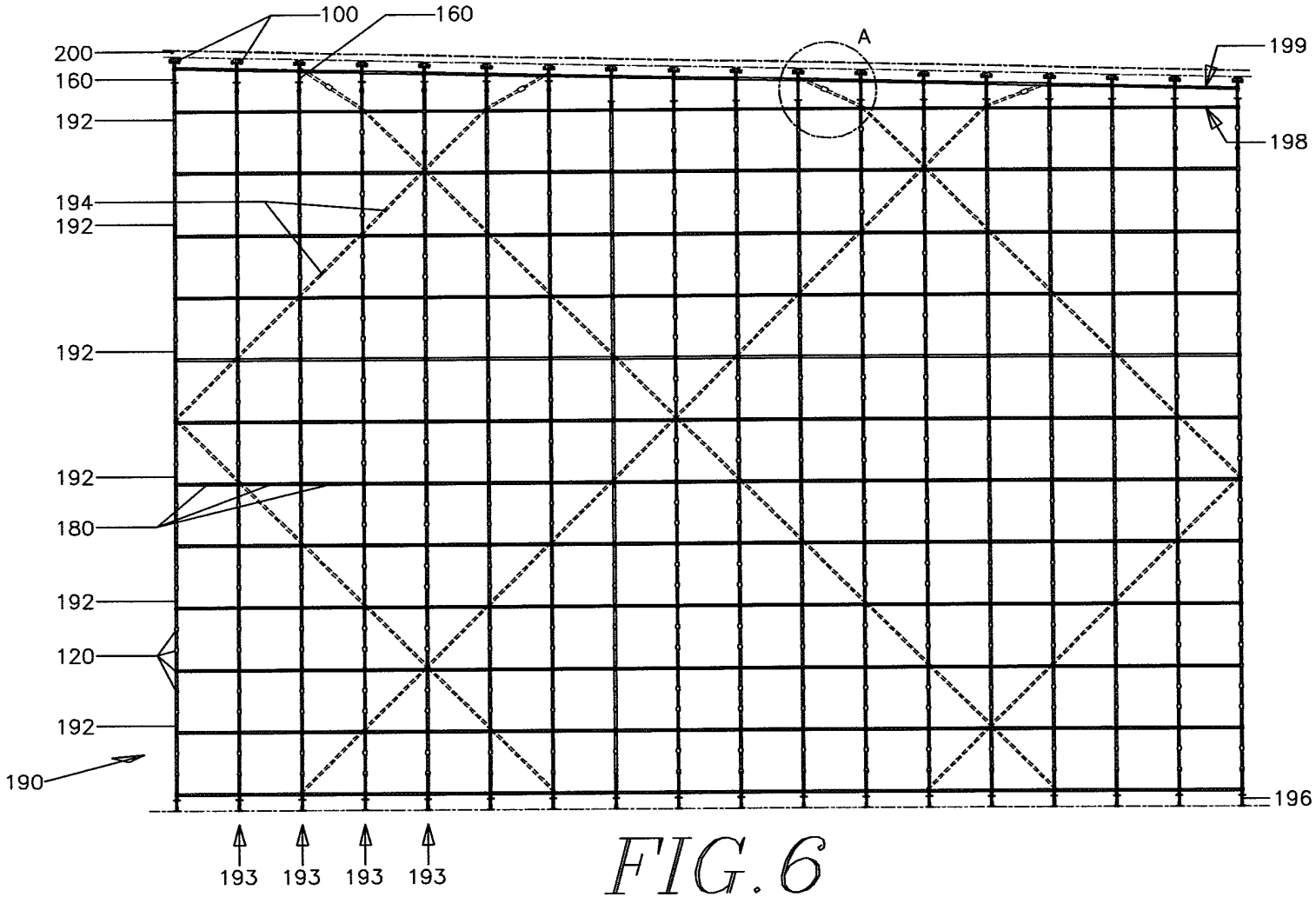


FIG. 5


100
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A
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180
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120
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190
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193

FIG. 6

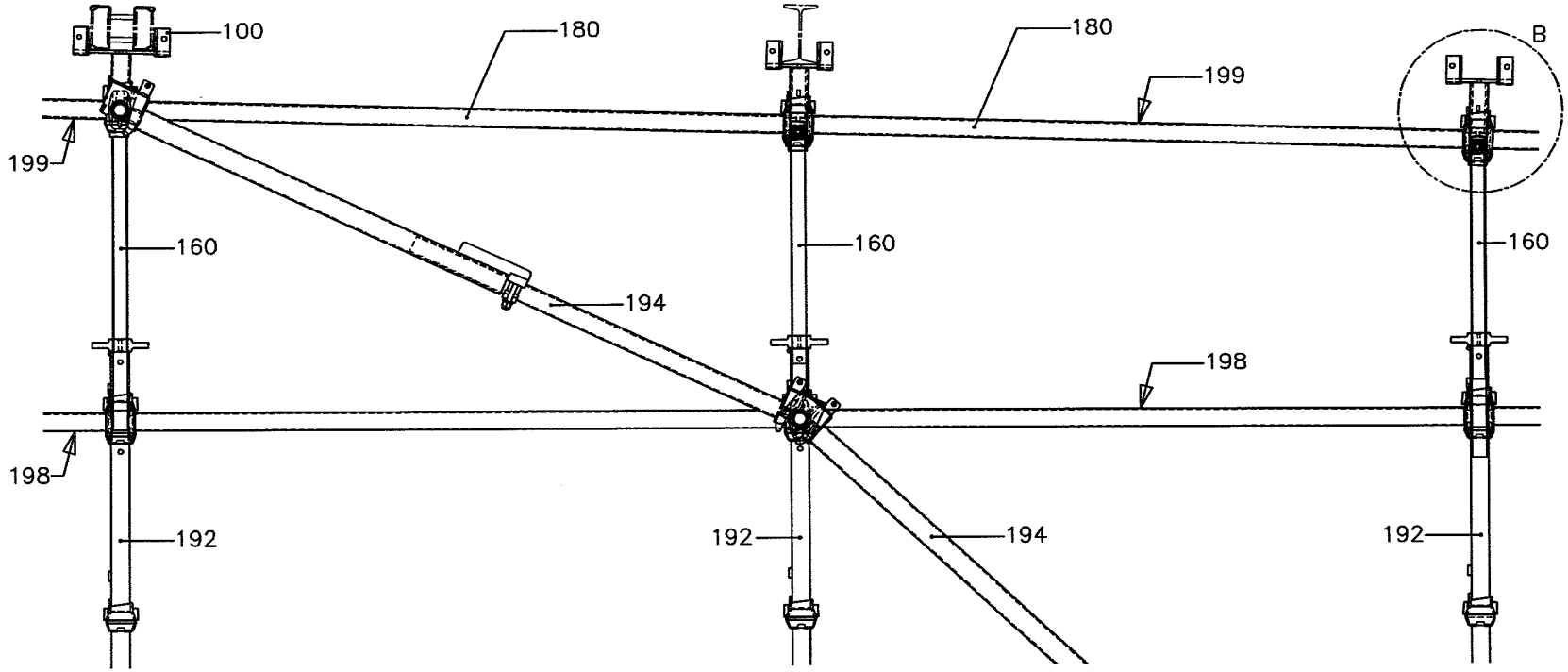


FIG. 7

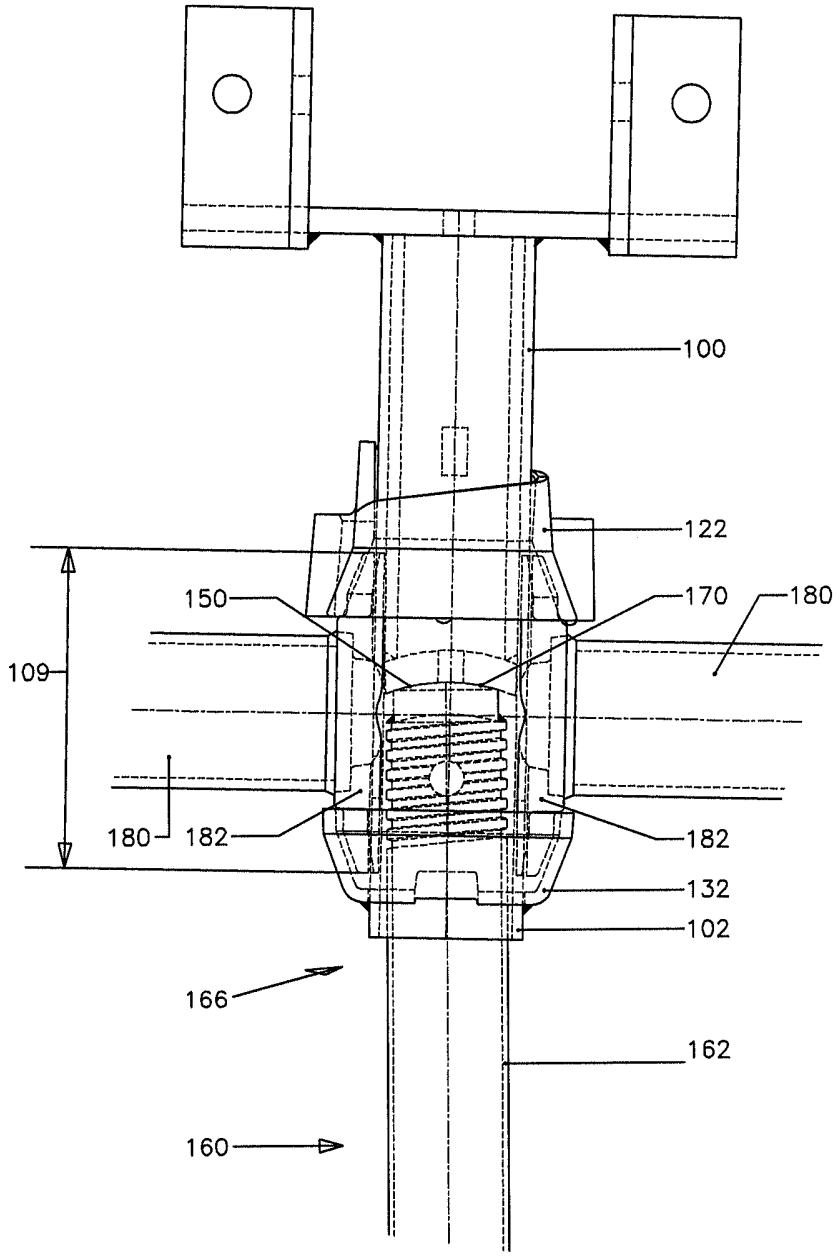
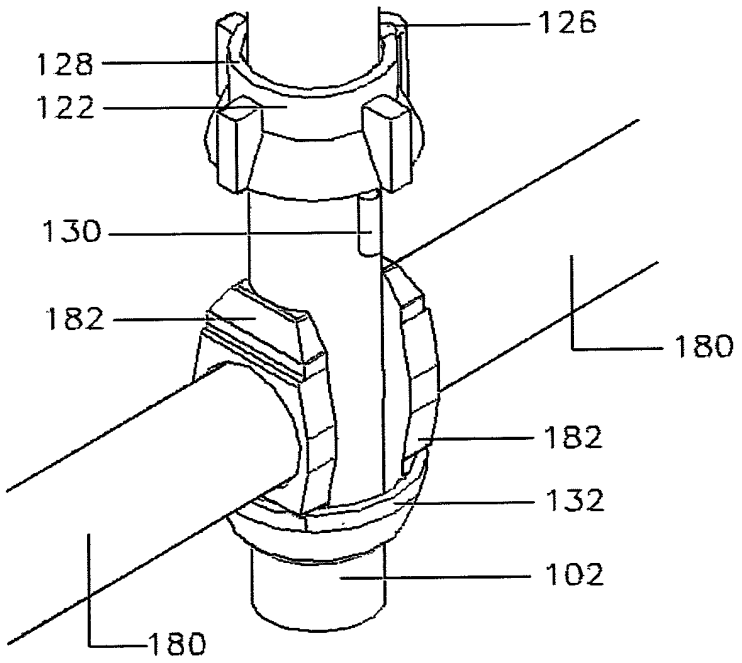


FIG. 8


126
128
122
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182
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182
132
102
180

FIG. 9

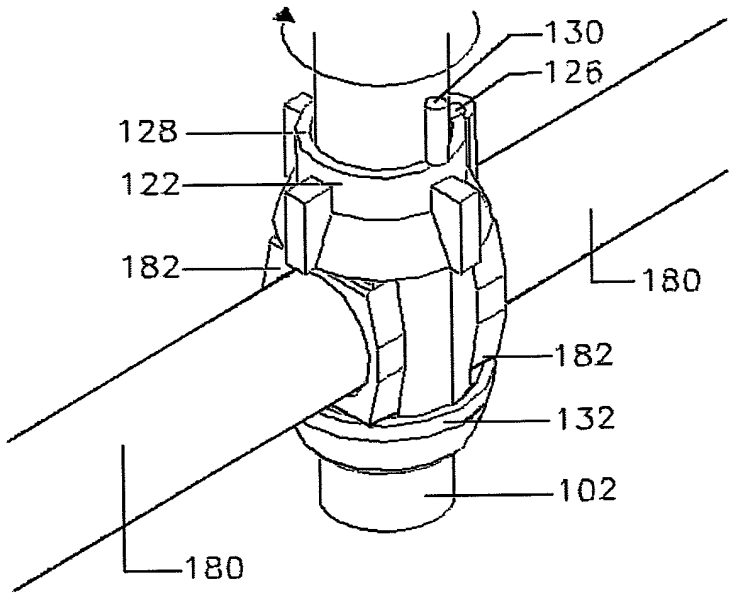
130
126
128
122
182
180
182
132
102
180

FIG. 10

SAMENWERKINGSVERDRAG (PCT)

RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE	KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE
	P88613NL00
Nederlands aanvraag nr. **2003142**	Indieningsdatum **06-07-2009**
	Ingeroepen voorrangsdatum
Aanvrager (Naam) **Scafom International B.V.**	
Datum van het verzoek voor een onderzoek van internationaal type **26-11-2009**	Door de Instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr. **SN 53279**

I. CLASSIFICATIE VAN HET ONDERWERP (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)

Volgens de internationale classificatie (IPC)

E04G11/48 **E04G7/30**

II. ONDERZOCHTE GEBIEDEN VAN DE TECHNIEK

Onderzochte minimumdocumentatie

Classificatiesysteem	Classificatiesymbolen
IPC	**E04G**

Onderzochte andere documentatie dan de minimum documentatie, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

III.	☐	**GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES**	(opmerkingen op aanvullingsblad)
IV.	☐	**GEBREK AAN EENHEID VAN UITVINDING**	(opmerkingen op aanvullingsblad)

ONDERZOEKSRAPPORT BETREFFENDE HET RESULTAAT VAN HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE

Nummer van het verzoek om een onderzoek naar de stand van de techniek
NL 2003142

A. CLASSIFICATIE VAN HET ONDERWERP
INV. E04G11/48 E04G7/30

Volgens de Internationale Classificatie van octrooien (IPC) of zowel volgens de nationale classificatie als volgens de IPC.

B. ONDERZOCHTE GEBIEDEN VAN DE TECHNIEK

Onderzochte miminum documentatie (classificatie gevolgd door classificatiesymbolen)
E04G

Onderzochte andere documentatie dan de mimimum documentatie, voor dergelijke documenten, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

Tijdens het onderzoek geraadpleegde elektronische gegevensbestanden (naam van de gegevensbestanden en, waar uitvoerbaar, gebruikte trefwoorden)
EPO-Internal, WPI Data

C. VAN BELANG GEACHTE DOCUMENTEN

Categorie °	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
X	EP 0 473 394 A1 (LEADA ACROW LTD [GB]) 4 maart 1992 (1992-03-04) * kolom 6, regel 30 - regel 51; figuren *	1-3,6-12

☐ Verdere documenten worden vermeld in het vervolg van vak C.

☒ Leden van dezelfde octrooifamilie zijn vermeld in een bijlage

° Speciale categorieën van aangehaalde documenten

"A" niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft

"D" in de octrooiaanvrage vermeld

"E" eerdere octrooi(aanvrage), gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven

"L" om andere redenen vermelde literatuur

"O" niet-schriftelijke stand van de techniek

"P" tussen de voorrangsdatum en de indieningsdatum gepubliceerde literatuur

"T" na de indieningsdatum of de voorrangsdatum gepubliceerde literatuur die niet bezwarend is voor de octrooiaanvrage, maar wordt vermeld ter verheldering van de theorie of het principe dat ten grondslag ligt aan de uitvinding

"X" de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur

"Y" de conclusie wordt als niet inventief beschouwd ten opzichte van de combinatie van deze literatuur met andere geciteerde literatuur van dezelfde categorie, waarbij de combinatie voor de vakman voor de hand liggend wordt geacht

"&" lid van dezelfde octrooifamilie of overeenkomstige octrooipublicatie

Datum waarop het onderzoek naar de stand van de techniek van internationaal type werd voltooid	Verzenddatum van het rapport van het onderzoek naar de stand van de techniek van internationaal type
16 februari 2010	
Naam en adres van de instantie European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	De bevoegde ambtenaar Andlauer, Dominique

Formulier PCT/ISA/201 (tweede blad) (Januari 2004)

ONDERZOEKSRAPPORT BETREFFENDE HET RESULTAAT VAN HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE

Informatie over leden van dezelfde octrooifamilie

Nummer van het verzoek om een onderzoek naar de stand van de techniek
NL 2003142

In het rapport genoemd octrooigeschrift	Datum van publicatie	Overeenkomend(e) geschrift(en)	Datum van publicatie
EP 0473394 A1	04-03-1992	DE 69107935 D1	13-04-1995
		DE 69107935 T2	20-07-1995
		ES 2070438 T3	01-06-1995
		IE 913047 A1	11-03-1992

OCTROOICENTRUM NEDERLAND

WRITTEN OPINION

File No.	Filing date *(day/month/year)*	Priority date *(day/month/year)*	Application No.
SN53279	06.07.2009		NL2003142

International Patent Classification (IPC)
INV. E04G11/48 E04G7/30

Applicant
Scafom International B.V. te Budel

This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the application
- ☐ Box No. VIII Certain observations on the application

Examiner
Andlauer, Dominique

Application number

WRITTEN OPINION

NL2003142

Box No. I Basis of this opinion

1. This opinion has been established on the basis of the latest set of claims filed before the start of the search.

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the application and necessary to the claimed invention, this opinion has been established on the basis of:

   a. type of material:

   ☐ a sequence listing

   ☐ table(s) related to the sequence listing

   b. format of material:

   ☐ on paper

   ☐ in electronic form

   c. time of filing/furnishing:

   ☐ contained in the application as filed.

   ☐ filed together with the application in electronic form.

   ☐ furnished subsequently for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty	Yes:	Claims	2, 4-5, 7-12
	No:	Claims	1, 3, 6
Inventive step	Yes:	Claims	4-5
	No:	Claims	1-3, 6-12
Industrial applicability	Yes:	Claims	1-12
	No:	Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 Reference is made to the following document:

D1 EP 0 473 394 A1 (LEADA ACROW LTD [GB]) 4 maart 1992 (1992-03-04)

2 The present application does not meet the criteria of patentability, because the subject-matter of at least claim 1 is not new.

D1 already discloses the technical features of claim 1:

A forkhead comprising cf. fig. 1-2):

- an axially extending shaft (12, 14) having a first end and a second end;
- a fork structure (4), connected to the first end of the shaft (12, 14);
- coupling means (cf. fig. 1), provided on the shaft (12, 14); and
- a mounting assembly (20) (cf. col.6/l.30-51).

2.1 The forkhead of D1 is furthermore perfectly suitable for the non-distinctive characteristics of intended use mentioned in claim 1; claim 1 therefore lacks novelty.

3 The dependent claims 2, 3, 6-12 do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of novelty and/or inventive step, the reasons being as follows:

3.1 D1, ibidem, already discloses the features of claims 3, 6.

3.2 In claims 2, 7-12 a slight constructional change in the forkhead/assembly/ frame is defined which comes within the scope of the customary practice followed by persons skilled in the art, especially as the advantages thus achieved can readily be foreseen. Consequently, the subject-matter of these claims also lacks an inventive step.

4 It is noted that the axial ledger connection range is presently formulated as a non-distinctive characteristic of intended use (cf. claim 1 "configured to connect ... ledger connection range"). It is therefore presently unclear if this range is actually a techical part of the forkhead, and should it be, how it is technically defined with respect to the forkhead's features.

4.1 Should this "axial connection range" however be formulated as a technical feature of the forkhead, i.e. cf. for instance the formulation of description p.4/l. 4-5, the combination features of claims 1+3 would seem a promising starting point for a subject matter meeting the criteria of patentability (for solving the problem defined in description p.5). Indeed, D1 does not show this combination and hints away from it.