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(54) **TOOL FOR LIFTING AND HANDLING REINFORCEMENT STEELS**

(57) According to an example aspect of the present invention, there is provided a tool for lifting, especially for handling reinforcement steels, comprising a body rod (1), a pivot point (2) at one end of the body rod (1), a lever (3) attached pivotably to the pivot point (2) so that the lever (3) extends to opposite directions from the pivot point (2) and an operating arm (4) connected pivotably to one end of the lever (3), the operating arm (4) extending from the one end of the lever (3) first towards the body rod (1) and then parallel to the body rod (1) and having a hook (5) at the end opposite to the end connected to the lever (3). The body rod (1) has one part of cross section that runs unaltered from the pivot point (2) to the opposite end of the body rod (1), the cross section having an outer surface that embeds the central axis of the body rod (1), and a guide element (6) on the outer surface of the body rod (1) for guiding the part (10) of the operating arm (4) running parallel to the body rod (1).

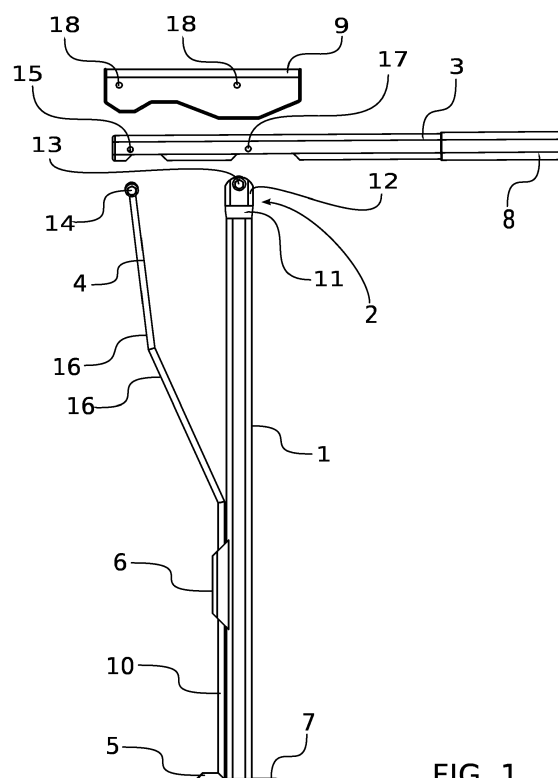


FIG. 1

Description**BACKGROUND**

[0001] The invention relates to lifting, mainly handling of reinforcement steels during casting of reinforced concrete structures. The main purpose of the tool is to lift reinforcements steel structures such as steel bars and grids to a proper position during casting of concrete.

[0002] Reinforced concrete structures are reinforced with various types of steel bars, weds, grids or lattices that are dimensioned and positioned within the concrete according to design plan. The reinforcements and type of cast is designed to carry loads directed to the structure and the latticework needed may be complicated. The reinforcements have to be placed accurately to correct locations within the cast in order to enable the cast to withstand the intended loads. Correct positioning to the reinforcements is essential. Especially at the bottom and top surfaces the reinforcements have to be at a certain distance from the surface in order to ascertain protection from corrosion.

[0003] Correct positioning of the reinforcements requires lifting of the reinforcement structure from the bottom of the mould space. Since the steel structures are inevitably heavy, lifting the structures is highly straining work. The strain and difficulty of the work is increased during the casting when concrete is poured in the mould and lifting has to be done partially within the concrete mass. In order to facilitate lifting or the reinforcements tools like crow bars can be used and even specialized tools have been proposed but these are complicated and awkward to use.

[0004] One useful tool for lifting and positioning of the reinforcement structures is described in Finnish utility model 9920. The tools described therein is simple and useful but as the operating arm of the tool is placed partially within the body rod of the tool, the body rod has to be partially cut open in order to allow the operating arm to move within the body rod. This decreases inherently the strength of the body rod. Thus the lifting capacity of the tool is limited or the tool has to be made heavier to withstand the stresses in use. The cuts in the body rod form stress points in the body rod that may lead to breakage of the tool if not used properly or stressed too much by lifting too heavy loads.

SUMMARY OF THE INVENTION

[0005] The invention is defined by the features of the independent claims. Some specific embodiments are defined in the dependent claims.

[0006] According to a first aspect of the present invention, there is provided a tool for lifting, especially for handling reinforcement steels comprising a body rod, a pivot point at one end of the body rod, a lever attached pivotably to the pivot point so that the lever extends to opposite directions from the pivot point and an operating arm connected pivotably to one end of the lever, the operating arm extending from the one end of the lever first towards the body rod and then parallel to the body rod and having a hook at the end opposite to the end connected to the lever. The body rod has one part of cross section that runs unaltered from the pivot point to the opposite end of the body rod, the cross section having an outer surface that embeds the central axis of the body rod and a guide element on the outer surface of the body rod for guiding the part of the operating arm running parallel to the body rod.

[0007] According to a second aspect of the present invention, there is provided a tool that comprises a support plate at the end of the body rod that is opposite to the pivot point.

[0008] According to a third aspect of the invention, the lever includes at least two pivot elements placed at a distance from each other for connecting the lever to the body rod.

[0009] According to a fourth aspect of the invention, the body rod is made of a profile chosen from a group including: closed tubular profiles, tubular profiles including extension or extensions on the outer surface, solid closed profiles, solid closed profiles including extension or extensions on the outer surface.

[0010] According to a fifth aspect of the invention, at least the body rod of the tool is made of composite material.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIGURE 1 illustrates a tool in accordance with at least some embodiments of the present invention.

EMBODIMENTS

[0012] The invention relates to a tool for lifting reinforcement steels of concrete structures. During casting of reinforced concrete structures the reinforcement steel grids have to be placed on exactly defined positions within the cast in order to obtain the desired strength and durability. One task that is needed is lifting the reinforcement structure from the bottom of the mould space to a defined distance from the bottom surface. The bottom surface is of the insulating material such as foamed plastic. The reinforcements should be lifted upwards only without moving them sideways so that the positioning of the reinforcements is altered. Therefore it is important that lifting can be performed only upwards as correctly as

possible. The structures to be lifted are often heavy, whereby auxiliary tools are used. Crowbars and similar are awkward to use and push the reinforcements easily sideways compromising their positioning. The embodiments of the invention provide a simple tool for lifting the reinforcements. The embodiments of the invention may have other uses in similar lifting task.

[0013] FIGURE 1 illustrates one tool in accordance with at least some embodiments of the present invention. The tool for handling reinforcement steels shown herein is built on a body rod 1. This body rod 1 is made of a tube profile that has unbroken, or continuous outer surface. The profile used is preferably a hollow tube profile that has a oval or circular cross section. Angular cross sections like rectangular, hexagonal or multifaceted can be also contemplated. The material of the body rod 1 can be metal sheet, for example steel sheet, steel tube or a similar structure of aluminium or other metals. Composite materials like glass reinforced or other reinforced composites are readily available as suitable profiles and may be used alternatively. The body rod used herein is designed to minimize discontinuities such as openings or cuts on the body rod so that rigidity of the body rod is not compromised. This provides for good weight to stiffness ratio and decreases possible inclination to sudden collapse caused by concentration of stresses. The body rod 1 has one part of cross section that runs unaltered from the pivot point 2 to the opposite end of the body rod 1, the cross section having an outer surface that embeds the central axis of the body rod 1. This cross section form the main part of the body rod 1. If desired, this main cross section may have grooves or extensions on its surface for providing additional stiffness. Grooves are formed between the extensions. Such grooves or extensions may be used for attachment of auxiliary parts of for forming a guide element 6. In FIGURE 1 the guide element 6 is groove made of sheet metal and attached on the outer surface of the body rod 1 for guiding the part 10 of the operating arm running parallel to the body rod 1. The central axis is defined herein to be an axle running through the central point of the area of the cross section or, neutral axle of the second moment of rotation of the cross section.

[0014] The body rod 1 has a pivot point 2 at one end of the body rod 1. This pivot point 2 has a seat part 11 for attachment to the body rod 1 and a bracket 12 with a hole 13. The bracket 12 is used for connecting a lever 3 to the body rod 1. The lever 3 is attached pivotably to the pivot point 2 so that the lever 3 extends to opposite directions from the pivot point 2. On one end of the lever is a handle 8 for operating an operating arm 4. The handle can be made of a material that provides good grip and is comfortable to use. The operating arm 4 is connected pivotably to one end of the lever 3 by and eye 14 and pin 15 connection that allows relative movement of operating arm 4 and the lever 3 around the pin 15. The operating arm 4 extends and an angular part 16 from the one end of the lever 3 first towards the body rod and then turns to part 10 parallel to the body rod 1. The operating arm 4 has a hook 5 at the end opposite to the end connected to the lever 3. This hook 5 is used for lifting the reinforcement steels and can be formed for that purpose. The L-shape shown is usable.

[0015] The embodiment shown above has only one connecting hole 17 on the lever 3 for joining it with the body rod 1. Two or more holes placed at a distance from each other would provide adjustment of the relative lengths of the ends of the lever. This would allow adjustment of the operating force in relation to the lifting force.

[0016] On the top of the lever 3 attached to the pin 15 and connecting hole 17 through assembly holes 18 is a protective cover 9. This protective cover 18 is added to the construction for decreasing possible risk of the body parts of the operator to get pinched between the moving parts of the tool during operating the tool.

[0017] The body rod 1 has a support plate at the end opposite to the lever. This support plate is for preventing the tool to press into a soft underlying material such a insulation during operation. It can be used also for steadying the tool by foot of the operator.

[0018] The body rod can be made of a profile chosen from a group including: closed tubular profiles, tubular profiles including grooves or extensions on the outer surface, solid closed profiles, solid closed profiles including grooves or extensions on the outer surface.

[0019] The body rod of the tool can made of metals such a steel, aluminium or brass or of a composite material such a s glass, organic or carbon fibre reinforced composites. The selection of materials can be based on costs and material strength as well as visual appearance of the product. The tool can be dimensioned for different loads and the dimensioning for different loads of weights may affect the choice of material. The tool is a universal lifting tool and can be used for other lifting purposes than for lifting reinforcement steel structures.

[0020] It is to be understood that the embodiments of the invention disclosed are not limited to the particular structures, process steps, or materials disclosed herein, but are extended to equivalents thereof as would be recognized by those ordinarily skilled in the relevant arts. It should also be understood that terminology employed herein is used for the purpose of describing particular embodiments only and is not intended to be limiting.

[0021] 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, 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. Where reference is made to a numerical value using a term such as, for example, about or substantially, the exact numerical value is also disclosed.

[0022] As used herein, a plurality of items, structural elements, compositional elements, and/or materials may be

presented in a common list for convenience. However, these lists should be construed as though each member of the list is individually identified as a separate and unique member. Thus, no individual member of such list should be construed as a de facto equivalent of any other member of the same list solely based on their presentation in a common group without indications to the contrary. In addition, various embodiments and example of the present invention may be referred to herein along with alternatives for the various components thereof. It is understood that such embodiments, examples, and alternatives are not to be construed as de facto equivalents of one another, but are to be considered as separate and autonomous representations of the present invention.

[0023] Furthermore, the described features, structures, or characteristics may be combined in any suitable manner in one or more embodiments. In this description, numerous specific details are provided, such as examples of lengths, widths, shapes, etc., to provide a thorough understanding of embodiments of the invention. One skilled in the relevant art will recognize, however, that the invention can be practiced without one or more of the specific details, or with other methods, components, materials, etc. In other instances, well-known structures, materials, or operations are not shown or described in detail to avoid obscuring aspects of the invention.

[0024] While the forgoing examples are illustrative of the principles of the present invention in one or more particular applications, it will be apparent to those of ordinary skill in the art that numerous modifications in form, usage and details of implementation can be made without the exercise of inventive faculty, and without departing from the principles and concepts of the invention. Accordingly, it is not intended that the invention be limited, except as by the claims set forth below.

[0025] The verbs "to comprise" and "to include" are used in this document as open limitations that neither exclude nor require the existence of also un-recited features. The features recited in depending claims are mutually freely combinable unless otherwise explicitly stated. Furthermore, it is to be understood that the use of "a" or "an", that is, a singular form, throughout this document does not exclude a plurality.

INDUSTRIAL APPLICABILITY

[0026] At least some embodiments of the present invention find industrial application in building industry.

REFERENCE SIGNS LIST

	Definition
1	body rod
2	pivot point
3	lever
4	operating arm
5	hook
6	guide element
7	support plate
8	handle
9	protective cover
10	part of operating arm running parallel to the body rod
11	seat part
12	bracket
13	hole
14	eye
15	pin
16	angular part
17	connecting hole

Claims

1. A tool for lifting, especially for handling reinforcement steels, comprising:

- a body rod (1),
- a pivot point (2) at one end of the body rod (1),
- a lever (3) attached pivotably to the pivot point (2) so that the lever (3) extends to opposite directions from the pivot point (2),
- an operating arm (4) connected pivotably to one end of the lever (3), the operating arm (4) extending from the one end of the lever (3) first towards the body rod (1) and then parallel to the body rod (1) and having a hook (5) at the end opposite to the end connected to the lever (3),

characterized in that

- the body rod (1) has one part of cross section that runs unaltered from the pivot point (2) to the opposite end of the body rod (1), the cross section having an outer surface that embeds the central axis of the body rod (1), and
- a guide element (6) on the outer surface of the body rod (1) for guiding the part (10) of the operating arm (4) running parallel to the body rod (1).

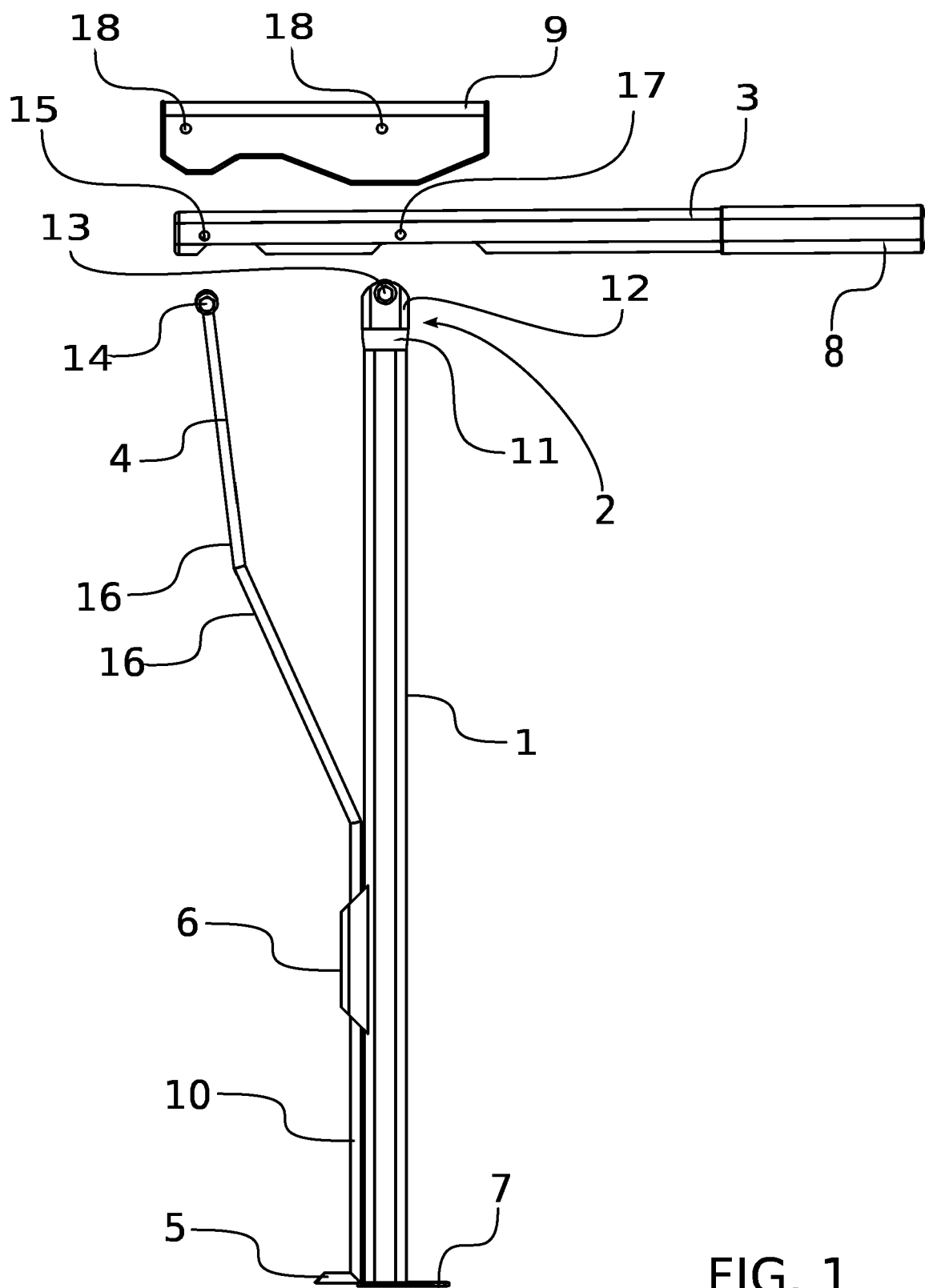
2. A tool according to claim 1, **characterized in that** the tool comprises a support plate (7) at the end of the body rod (1) that is opposite to the pivot point (2).

3. A tool according to claim 1, **characterized in that** the lever (3) includes at least two connecting holes (17) placed at a distance from each other for connecting the lever (3) to the body rod (1).

4. A tool according to claim 1, **characterized in that** the body rod (1) is made of a profile chosen from a group including: closed tubular profiles, tubular profiles including extension or extensions on the outer surface, solid closed profiles, solid closed profiles including extension or extensions on the outer surface.

5. A tool according to claim 1, **characterized in that** the body rod (1) is made of a profile chosen from a group including: closed tubular profiles, tubular profiles including extension or extensions on the outer surface, solid closed profiles, solid closed profiles including extension or extensions on the outer surface.

6. A tool according to claim 1, **characterized in that** at least the body rod (1) of the tool is made of composite material.





EUROPEAN SEARCH REPORT

 Application Number
 EP 17 15 8079

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	FI 9 920 U1 (JUSSILA HENRI [FI]) 21 December 2012 (2012-12-21) * figure 1 *	1-6	INV. E04G21/16 E04G21/12
A	JP 2005 105800 A (KUMADA ISAO; KUMADA SANAÉ) 21 April 2005 (2005-04-21) * figures 4-5 *	1	
A	CN 205 773 178 U (LI BINGJING) 7 December 2016 (2016-12-07) * figure 1 *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			E04G
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		8 August 2017	Demeester, Jan
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			

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 EPO FORM 1503 03/82 (P04C01)

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

EP 17 15 8079

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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08-08-2017

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FI 9920	U1	21-12-2012	NONE
JP 2005105800	A	21-04-2005	NONE
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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