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(56) Documents Cited:
GB 1498386 A
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(58) Field of Search:
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Other:

(54) Abstract Title: **Lifting shackle**

(57) This invention relates to a lifting shackle for use when lifting a pile cage onto or off from a vehicle trailer. The lifting shackle has a first part adapted for connection to a lifting chain or wire connected to a crane, and a second part adapted for connection to a part of a pile cage. The second part can include a latch member which is biased towards the unlatched position, and in use can be held in the latched position by the weight of part of the pile cage, so that the lifting shackle is suitable for lifting a pile cage onto a vehicle trailer. Alternatively the second part can include a latch member which is biased towards the latched position, and in use can be moved to the unlatched position by engagement with part of the pile cage, so that the lifting shackle is suitable for lifting a pile cage from a vehicle trailer.

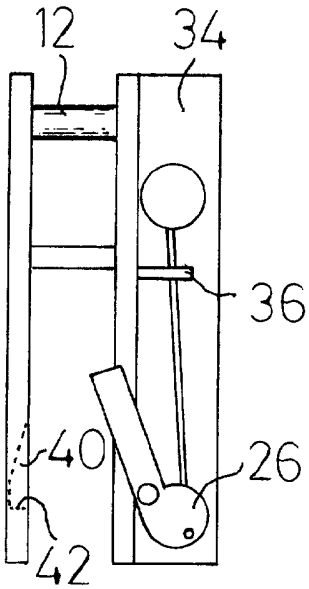


FIG 3

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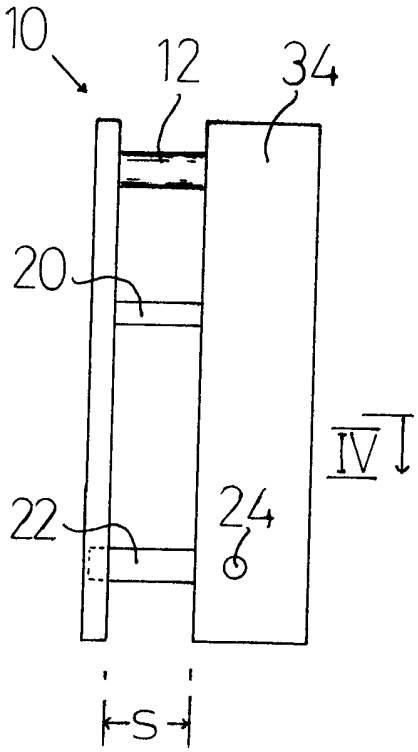


FIG 1

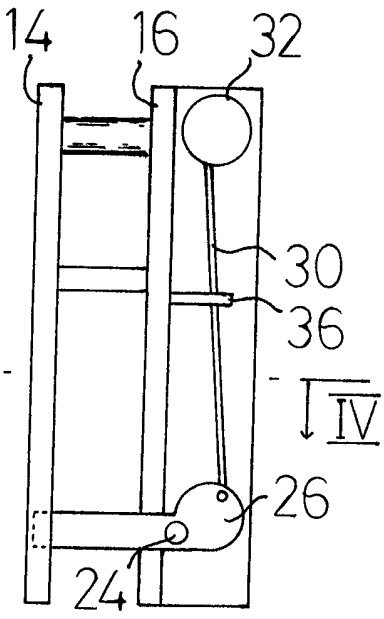


FIG 2

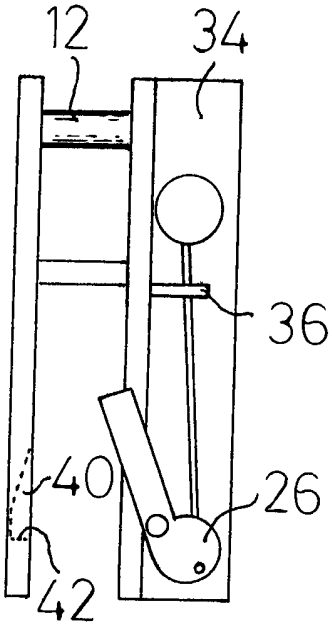


FIG 3

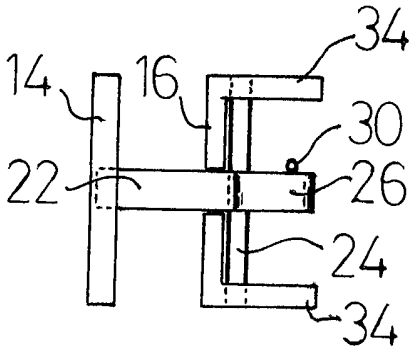


FIG 4

LIFTING SHACKLE

FIELD OF THE INVENTION

This invention relates to a lifting shackle for use when lifting a pile cage onto or off from a vehicle trailer.

BACKGROUND TO THE INVENTION

Reinforced concrete piles are known for use in the foundations of roadway bridges and the like. The piles are sunk deep into the ground and can for example provide a link between the bridge supports and the underlying rocks. The pile comprises a metallic pile cage embedded in concrete, the pile cage acting both as a reinforcement for the concrete and also as a means to tie the bridge support or the like to the pile. The cage comprises a number of bars which in use are arranged to lie substantially along the longitudinal axis of the pile. The bars are interconnected so as to maintain their separation and alignment. In many designs of pile cage the bars are interconnected by a helical wire.

Often the cage is assembled off-site at a dedicated manufacturing plant, and is delivered to the site for insertion into the hole created for the pile.

DESCRIPTION OF THE PRIOR ART

Typically, several pile cages will be delivered together to the site, usually carried on the trailer of an articulated vehicle. The cages are typically stacked up on the trailer, the length of the cages usually requiring their longitudinal axes to lie substantially parallel to the longitudinal axis of the trailer. To prevent the cages rolling sideways off the side of the trailer support members are typically provided at spaced locations along the trailer.

It will be understood that the pile cages are not rigidly supported upon the trailer, but instead rest against and upon each other, and also against the support members. In addition, during movement of the trailer from the manufacturing location to the site of use, adjacent pile cages may move sufficiently relative to

one another so that they become temporarily stuck together.

The pile cages are unloaded from the trailer at the site by crane. In order to connect the lifting chains by which a pile cage will be lifted, it is usually necessary for a person to climb onto the trailer, and onto the top row of pile cages, to affix the chains. When in a position to affix the chains to the pile cage, the person will typically be standing over two metres above the ground.

The unloading of one pile cage may cause other pile cages to move, particularly if two or more pile cages are temporarily stuck together. Even if the pile cages have not become stuck together, unloading one pile cage may remove the support from an adjacent pile cage. In each case, the pile cages remaining upon the trailer, and upon which the person affixing the chains may be standing, are caused to move, representing a significant danger to that person.

The person could of course climb down from the trailer whilst each pile cage is unloaded, but climbing onto and off from a trailer is itself a difficult procedure not without danger, and so typically the person will seek to balance upon the stack whilst all of the pile cages are unloaded.

The situation is somewhat similar at the dedicated manufacturing plant where the pile cages are loaded onto the trailer. Whilst the lifting chains can be secured to the pile cages at ground level, a person typically has to climb onto the trailer (and perhaps also onto the already loaded pile cages) in order to release the lifting chains from the loaded pile cage.

Accordingly, there is a significant danger to the person climbing onto the trailer that he or she will fall from the trailer and suffer serious injury. For this reason, in the UK at least, Health and Safety personnel are becoming increasingly concerned with this method of operation, and are increasingly demanding that pile cage manufacturers and users adopt alternative practices.

Our copending UK patent application 2,402,121 seeks to avoid the dangers involved in the above-described practices by providing a "cradle" for all of the pile cages upon the trailer, the cradle providing lifting points to which a crane can readily be connected and allow the lifting of the cradle (and hence also all of the pile cages) onto, or down from, the trailer in one operation. Individual pile cages

can either be added to, or removed from, the cradle as required, without a person having to climb onto the trailer, or onto any other of the pile cages.

Despite the widespread acceptance of this solution to the above-stated problem, it is not acceptable in all circumstances, and some pile cage manufacturers and users still require a safer means of lifting individual pile cages onto and off from a vehicle trailer. The object of the present invention is to seek to provide that safer means of lifting individual pile cages.

DISCLOSURE OF THE INVENTION

According to the first variant of the invention there is provided a lifting shackle for use in lifting a pile cage onto a vehicle trailer, the shackle having a first part adapted for connection to a lifting chain or wire connected to a crane, and a second part adapted for connection to a part of a pile cage, characterised in that the second part includes a latch member which is biased towards the unlatched position, but can be held in the latched position by the weight of part of the pile cage.

In this variant, the lifting shackle is suited to use at the site of manufacture of the pile cage. The lifting shackle will be connected to the lifting chain or wire of the crane and will be connected to the pile cage at ground level. As the pile cage is lifted from the ground the weight of the part of the pile cage which is supported by the lifting shackle will keep the latch member in its latched position so that the pile cage can be safely lifted. However, when the pile cage is lowered onto the trailer and the weight of the part of the pile cage is removed from the latch mechanism the latch member automatically moves to its unlatched position and is released from the pile cage without requiring intervention by the operator.

According to the second variant of the invention there is provided a lifting shackle for use in lifting a pile cage off from a vehicle trailer, the shackle having a first part adapted for connection to a lifting chain or wire connected to a crane, and a second part adapted for connection to a part of a pile cage, characterised in that the second part includes a latch member which is biased towards the latched position, but can be moved to the latched position by engagement with part of the pile cage.

In this variant, the lifting shackle is suited to use at the site of use of the pile cage. The lifting shackle will be connected to the lifting chain or wire of the crane and will be lowered over the pile cage on top of the vehicle trailer. As the latch member engages a part of the pile cage the latch will be forced to its unlatched position and can subsequently become automatically latched to the pile cage. The lifting shackle remains latched as the pile cage is lifted from the trailer, and when the pile cage has been lowered onto the ground (or other desired position) the operator may overcome the biasing force and move the latch member to its unlatched position allowing release of the pile cage.

The lifting shackles of the two variants therefore differ only in the action of the bias upon the latching member; in the first variant the latch member is biased into the unlatched position and in the second variant it is biased into the latched position.

In both cases, when the lifting shackle is in use and supporting (part of) the weight of a pile cage, the weight of the pile cage acts to keep the latch member in its latched position.

Preferably, the bias is provided by gravity, i.e. the weight of part of the lifting shackle urges the latch member towards its unlatched or latched position, respectively. Alternatively of additionally, the bias can be provided partly or wholly by a resilient biasing member, such as a torsion spring.

Desirably, the latch member is a pivoting bar, the shape of the bar and the position of the pivot in relation to the bar determining whether the bar is biased towards the latched position or the unlatched position.

Preferably, the latching member is connected to an operating mechanism, the operating mechanism having a handle which can be grasped by the operator to move the latching member into its latched position (in the first variant), and to its unlatched position (in the second variant).

Desirably, the lifting shackle includes a shroud member which obscures all of part of the operating mechanism. This is advantageous in allowing the operator to keep his hand(s) away from the lifting chain, wire and/or hook during manipulation of the operating mechanism.

Preferably, the first part of the lifting shackle comprises a peg around which a hook connected to the crane can be fitted.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Fig.1 shows a side view of a lifting shackle according to the first variant of the invention, in its latched position;

Fig.2 shows a sectional view as Fig.1;

Fig.3 shows a sectional view, similar to Fig.2, but in the unlatched position; and

Fig.4 shows a cross-sectional view along the lines IV-IV of Fig.2.

DESCRIPTION OF THE EXEMPLARY EMBODIMENTS

The lifting shackle 10 shown in Figs. 1-4 is constructed as a fabrication of metallic parts and is suited to lifting the loads typically encountered with pile cages, up to several tonnes in some examples. It will be understood that in use two or more lifting shackles are used, one for each of the lifting lines (not shown) by which the crane (also not shown) is connected to the pile cage (also not shown). Typically, heavier pile cages will require more lifting lines and therefore more lifting shackles.

The lifting shackle 10 has a first part 12 in the form of a peg of substantially circular cross-section, which peg is suitable for connection to a hook connected to the lifting chain or wire.

The peg 12 is mounted between two plates 14 and 16, suitably being welded into holes punched or otherwise formed through these plates.

There is also provided a support plate 20 which interconnects the plates 14 and 16, and serves to stabilise the plates during the lifting operation, and so strengthen the lifting shackle. The position and form of the support plate 20, and whether one or more support plates are used in a particular embodiment, can be chosen as desired.

The two plates 14 and 16 are separated by a spacing s, which is designed to be large enough to accommodate the cage bar or other component of the pile cage (not shown) which is to be connected to the lifting shackle.

Also lying between the plates 14, 16 is a second part or latch member 22. The latch member 22 is mounted upon a pivot pin 24 and can pivot between a latched position shown in Figs. 1, 2 and 4, and an unlatched position as shown in Fig.3.

The latch member 22 is connected to a counter-weight 26, and the counterweight 26 is connected to an operating mechanism comprising an operating rod 30 and an operating handle 32.

In this variant the lifting member 22 is biased to its unlatched position, so that the moment generated by the weight of the latch member 22 about the pivot 24 is not as great as the moment generated by the counterweight 26 and the operating mechanism 30, 32. Accordingly, the latch member 22 is biased towards its unlatched position as shown in Fig.3.

It will be understood that by reducing the weight of the counterweight, and/or by changing the position of the pivot, the latch member can become biased towards its latched position. Accordingly, only a small part of the lifting shackle must be modified between the first and second variants, and most of the componentry can be common to both variants.

It will therefore be understood that in this embodiment the biasing of the latch member 22 is achieved by gravity acting upon the latch member. In another embodiment, the latch member can be biased by a resilient biasing member such as a torsion spring. The torsion spring can act in addition to, or opposed to, the biasing force of gravity, as desired.

In another embodiment, the latch member can be biased towards the unlatched position by gravity as in the embodiment shown, but the lifting shackle can additionally include a torsion spring which can overcome the gravity bias and bias the latch member towards the latched position. If it is arranged that the torsion spring can be activated or deactivated the operator can then decide whether the lifting shackle operates as the first variant (with the torsion spring deactivated) or as the second variant (with the torsion spring activated).

As shown in Fig.4, the plate 16 is connected to two side plates 34. The side plates serve to locate the ends of the pivot 24, and also to provide a shroud for the operating mechanism 30, 32. Such a shroud is desired since this will ensure that the operator's hands are protected from the peg 12 and the lifting hook connected thereto.

The operating rod 30 is arranged to be substantially rigid, so that a staple 36 can be used to keep the operating rod 30 (and hence the operating handle) between the side plates 34. Also, making the operating rod 30 substantially rigid allows the same rod to be used in both of the first and second variants, it being recognised that in the second variant the rod is required to be pushed downwardly to unlatch the latch member.

As shown in Fig.3, the plate 14 has a cut-out 40 which provides a ledge 42 upon which the end of the latch member 22 rests in the latched position. The cut-out can be a hole through the plate, or a depression formed in the plate.

To operate the lifting shackle shown in the drawings, the crane is connected by way of a hook and lifting chain or wire to the peg 12. The lifting shackle is then lifted by the crane to overlie a cage bar or other part of a pile cage which is to be lifted. At this time the pile cage will be on the ground (or perhaps on a bed of the manufacturing plant where the pile cage has been assembled), and the latch member will be in the unlatched position shown in Fig.3. The lifting shackle is lowered until the chosen part of the pile cage passes between the plates 14 and 16, and lies close to the support plate 20. The operator then grasps the operating handle and lifts this to cause the latch member 22 to pivot to the position shown in Figs. 1, 2 and 4. The lifting shackle is then lifted by the crane so that the part of the pile cage engages the top of the latch member 22 and holds the latch member in its latched position.

The process is repeated for each of the lifting shackles used with the particular pile cage.

The pile cage can then be lifted over a trailer (for example) and lowered thereonto. After the weight of the pile cage has been released from the lifting shackle 10, the lifting shackle continues to be moved downwardly so that the part of the pile cage moves towards the support plate 20 and allows the latch member 22 to pivot to its unlatched position. When the latch member 22 has assumed a position close to that shown in Fig.3, the lifting shackle can then be lifted to release the pile cage.

To operate the lifting shackle according to the second variant to remove a pile cage from a vehicle trailer, the lifting shackle is moved over the pile cage and lowered until the latch member (which is biased into its latched position) engages a part of the pile cage. The lifting shackle continues to be lowered and it is arranged that the weight of the lifting shackle exceeds the bias on the latch member so that the latch member is forced towards the position shown in Fig.3. When the part of the pile cage passes the end of the latch member the latch member automatically moves back to the latched position. The lifting shackle can then be lifted again to lift the pile cage from the trailer.

When the lifting cage has been placed upon the ground or other chosen surface, the part of the pile cage will engage the support plate. The operator can then press down the operating handle to pivot the latch member to its unlatched position, allowing the lifting shackle to be lifted away from the pile cage.

CLAIMS

1. A lifting shackle for use in lifting a pile cage onto a vehicle trailer, the shackle having a first part adapted for connection to a lifting chain or wire connected to a crane, and a second part adapted for connection to a part of a pile cage, in which the second part includes a latch member which is biased towards the unlatched position, but in use can be held in the latched position by the weight of part of the pile cage.

2. A lifting shackle for use in lifting a pile cage off from a vehicle trailer, the shackle having a first part adapted for connection to a lifting chain or wire connected to a crane, and a second part adapted for connection to a part of a pile cage, in which the second part includes a latch member which is biased towards the latched position, but in use can be moved to the latched position by engagement with part of the pile cage.

3. The lifting shackle of Claim 1 or Claim 2 in which the bias is provided by gravity.

4. The lifting shackle of Claim 1 or Claim 2 in which the bias can be provided partly or wholly by a resilient biasing member

5. The lifting shackle of Claim 4 in which the bias is provided by gravity and by the resilient biasing member, gravity acting to bias the latch member towards the unlatched position and the resilient biasing member acting to bias the latch member towards the latched position, the resilient biasing member having an activated position in which it acts to overcome the gravity bias and the latch member is biased towards the latched position, and a deactivated position in which it does not overcome the gravity bias and the latch member is biased towards its unlatched position.

6. The lifting shackle of Claim 4 or Claim 5 in which the resilient biasing member is a torsion spring.

7. The lifting shackle of any one of Claims 1-6 in which the latch member is a pivoting bar.

8.. The lifting shackle of any one of Claims 1-7 in which the latch member is connected to an operating mechanism, the operating mechanism having a handle which can be grasped by an operator to move the latch member into its latched position or to its unlatched position, as required.

9. The lifting shackle of Claim 8 in which the lifting shackle includes a shroud member which obscures all of part of the operating mechanism.

10. The lifting shackle of any one of Claims 1-9 in which the first part of the lifting shackle comprises a peg around which a hook connected to the crane can be fitted.

11. A lifting shackle constructed and arranged substantially as described in relation to Figs. 1-4 of the accompanying drawings.

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Application No: GB0607498.3 **Examiner:** Dr Mark Shawcross

Claims searched: 1-10 **Date of search:** 8 August 2006

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1-8 & 10	US 4765667 A (HAMRIN) col.1 lines 51-66, col.5 line 34 to col.7 line 1 & figures 7-11
X	1, 4 & 6-10	GB 910904 A (RFD COMPANY) page 1 lines 32-53, page 2 lines 5-32 & page 3 lines 78-85
X,P	1, 4, 6-7 & 10	EP 1547962 A2 (YAZAKI) paragraphs [0012-0015, 0021] & figures 4-9
X	1, 3, 7 & 10	GB 1498386 A (KUMPULAINEN) page 1 lines 37-80 & page 2 line 113 to page 3 line 3 and figures 3 & 4
X	1, 3 7 & 10	SU 1555258 A1 (DOLKIN) see EPO and WPI abstracts & figure 1
X	1, 3, 7 & 10	SU 1235809 A1 (LVOVSKIJ) see EPO & WPI abstracts & figure 1
X	1, 3, 7 & 10	DE 3111634 A1 (SCHWOERER) see EPO & WPI abstracts & figures

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
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&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

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Worldwide search of patent documents classified in the following areas of the IPC

12

B66C; F16B; F16G

The following online and other databases have been used in the preparation of this search report

Online: EPODOC, WPI