

### [54] MEANS FOR MOUNTING RAMS OR PILE DRIVERS

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### [56] References Cited

#### UNITED STATES PATENTS

|           |        |                 |         |
|-----------|--------|-----------------|---------|
| 2,740,385 | 4/1956 | Haage .....     | 173/134 |
| 2,882,690 | 4/1959 | Frederick ..... | 173/134 |
| 2,904,964 | 9/1959 | Kupka .....     | 173/134 |

### FOREIGN PATENTS OR APPLICATIONS

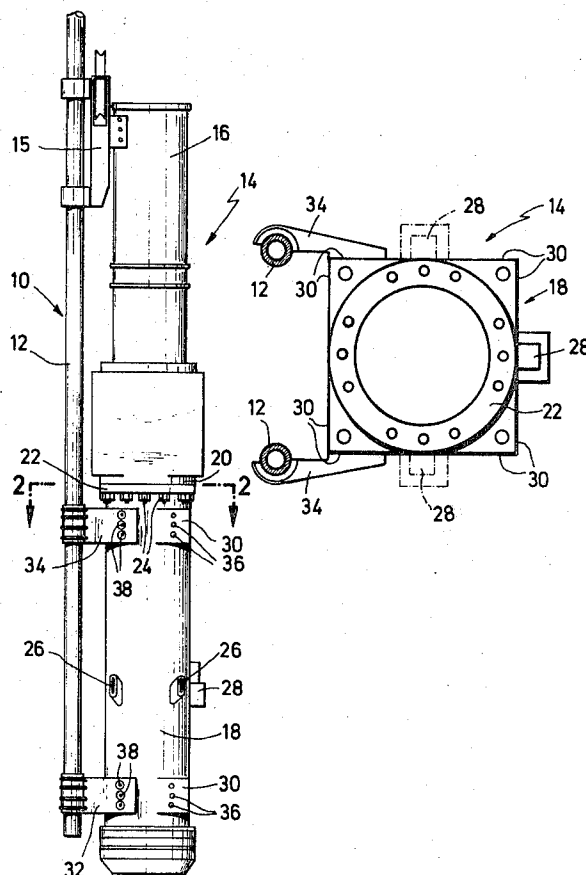
852,985 10/1970 Canada..... 173/134

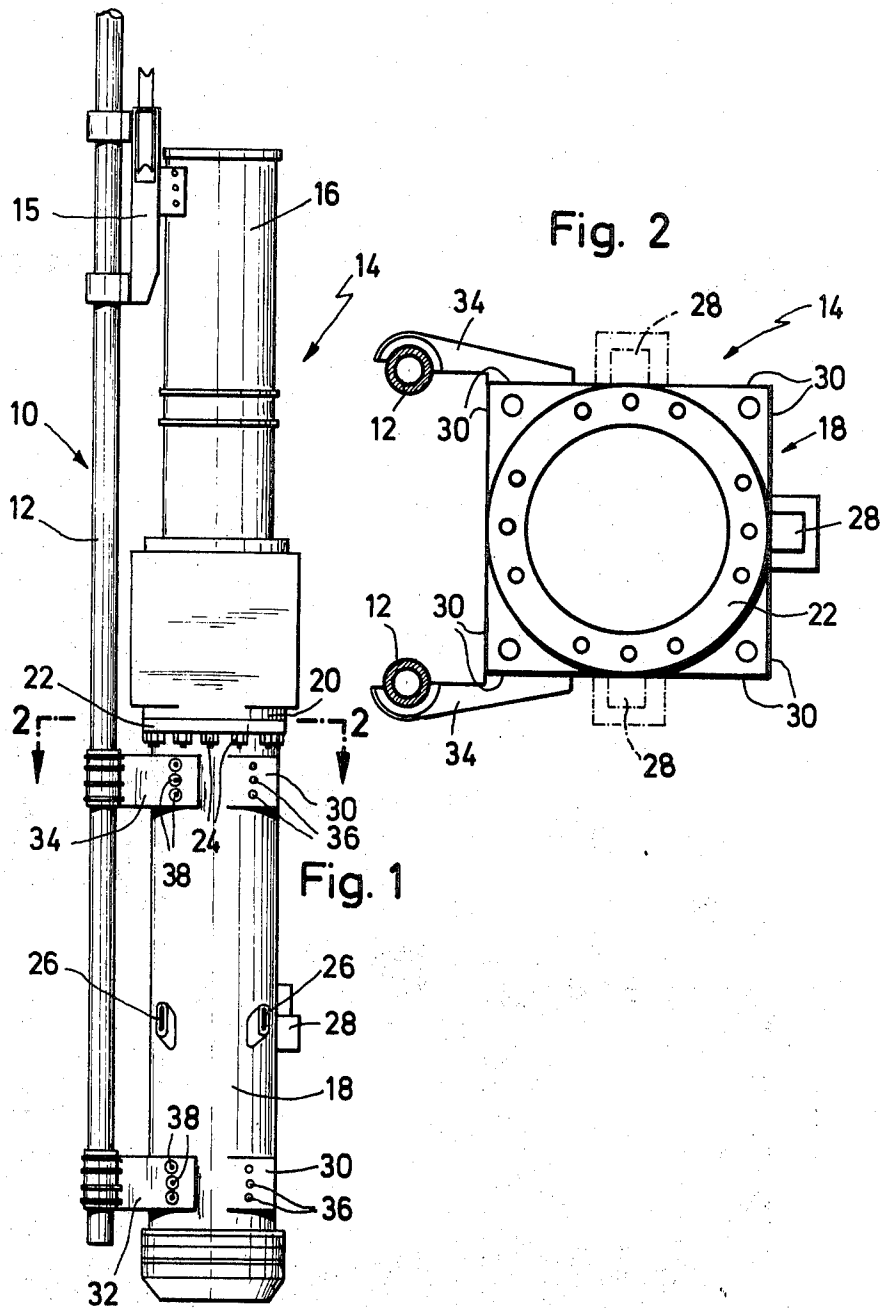
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### [57] ABSTRACT

An internal combustion diesel assisted pile driver or ram having at least an upper section and separable lower section, is provided in the surface of the lower section with a plurality of mounting surfaces. Connecting guide elements are removably secured to the mounting surfaces at one end and to a vertical supporting standard at the other end permitting the lower sections to be moved up or down the standard. The mounting surfaces are formed in an approximate quadratic or rectangular cross-section and is provided on all four sides with similar mounting positions or places to which the guide elements can be fastened. In this manner the lower section of the body can be turned on its longitudinal central axis, in 90° angles so as to be connected to the supporting standard in at least four positions.

8 Claims, 2 Drawing Figures





## MEANS FOR MOUNTING RAMS OR PILE DRIVERS

The present invention relates to a Diesel and/or internal combustion assisted pile driver or ram and in particular to the mounting thereof in connection with a vertical supporting standard.

Diesel-assisted or internal combustion assisted pile drivers, hammers, or the like (the terms are used interchangeably) are well known. Briefly, such apparatus comprises a housing mounted to be adjustable and/or movable on a vertical standard or scaffold. The housing defines a ram cylinder having a percussion piece at one end adapted to strike the pile or other work piece and ram piston movable to strike the percussion piece. The ram piston is generally lifted by a hoist or other pulley system and allowed to drop on the percussion piece. In diesel-assisted rams, a combustion fuel is sprayed into the cylinder and is compressed by the downwardly moving ram piston until it explodes. The explosion forces the percussion piece with greater force onto the pile or workpiece while simultaneously lifting the ram piston upwardly, preparatory to another cycle.

Known rams of this type are generally movably mounted on a vertical standard and to this end the pile driver housing has suitable slidable guide elements connected to it. In heavy duty rams or pile drivers, stress of the working lever often causes the guide element to twist and become deformed, damaging the seat or position on the cylinder housing to which it is attached. As a result it is very often necessary to reweld the connections, or the mounting seat immediately at the work sites, or in extreme cases to replace the entire lower section of the pile driver. Another disadvantage of the known diesel assisted type rams arises from the fact that the fuel injection pump is not adjustably mounted and is normally situated on the exterior of the ram body, on the side diametrically away from the vertical supporting standard so that should the standard be mounted on the water edge of a pier, to drive a pile into the water, then the injection pump can only be reached by boat. An attempt to overcome this difficulty was made in German patent 7,030,915. In this patent, it was suggested to provide the ram cylinder with a plurality of intake positions arranged about its circumference for the injection of the fuel from the pump and for the means to actuate the pump by engagement with the ram piston. This, however, unnecessarily weakened the structure of the cylinder and lead to much difficulty and hazard during operation.

It is the object of the present invention to provide a ram or pile driver of the type described which overcomes the prior art disadvantages.

It is another object to provide a pile driver which does not have to be immediately repaired or replaced should one or more of the mountings break.

It is another object to provide a pile driver in which the ram cylinder, outer housing or the like is provided with means by which it may be repositioned in place on having one or more of its connections damaged.

According to the present invention a diesel assisted or internal combustion type pile driver or ram having at least an upper section and separable lower section is provided with a plurality of mounting surfaces on its lower section and connecting guide elements. The guide elements are elongated bracket members removably secured to the mounting surfaces at one end and

to the vertical supporting standard at the other end. The other end of the brackets have slide surfaces permitting the lower sections to be moved up or down on the standard. The mounting surfaces on the cylinder housing are formed in an approximate quadratic or rectangular cross-section. The cylinder housing is provided on all four sides with similar mounting positions or places to which the guide elements can be fastened. The mounting surfaces are uniformly and symmetrically arranged so that the lower section of the body can be turned on its longitudinal central axis, in 90° angles so as to be connected to the supporting standard in at least four positions.

The mounting surfaces may be machined on the surface of the ram cylinder, or they may be made by angle piece brackets welded to the surface. The guide elements may be brackets which are permanently attached to each of the mounting surfaces or they may be removable. In either case, however, even with the damaging of one or more of the guide elements, the lower section may be easily repositioned, to present a new mounting position to the standard.

Full details of the present invention are set forth in the following description and will be seen in the attached drawings.

In the accompanying drawings:

FIG. 1 is a vertical side view of a vertical supporting standard on which a diesel type ram is mounted; and

FIG. 2 is a sectional view taken along line 2—2 of FIG. 1.

Before turning to the description of the preferred embodiment of this invention, reference is made and incorporation made of copending applications of the assignee hereto, Ser. No. 303,394 and Ser. No. 303,397, both filed on even date hereof, corresponding respectively to German Applications P 21 55 310.6 and P 21 55 306.0 which show other aspects of a ram or pile driver of type hereunder discussion. Reference can also be made to the application of Rudolf Hennecke et al., Ser. No. 258,896, filed June 1, 1972, as well as to German Patents 2,040,924 and 7,030,915.

While in general, the present invention may be applied to conventional apparatus of type earlier described, reference can be made to the above for any other details not deemed necessary to be shown herein.

In FIG. 1 there is shown a side view of the apparatus comprising a vertical supporting standard or frame generally depicted by the numeral 10 comprising a pair of parallel spaced poles 12 (formed of tubular pipe or stock material) on which a diesel or other internal combustion pile driver, generally depicted by the numeral 14 is supported; the upper end of which being secured to a carriage 15 fitting over the pipes 12. Reference can be made to the aforementioned application of Rudolf Hennecke et al., Ser. No. 258,896, filed June 1, 1972.

The pile driver or ram comprises a body housing having upper section 16 and a lower section 18 in axial end relationship and which is removably secured by mating flanges 20 and 22 which are fastened together by removable bolts 24. A plurality of inlet and/or exhaust openings 26 are provided radially about the lower section 18 leading from its interior, while an injection spray pump 28 is mounted on the face of the lower section over one of the inlet/exhaust openings 26. The construction and operation of ram injection pumps, etc. may be of the conventional variety and need not be further described herein. However, in the aforemen-

tioned copending applications and patents there are shown various details of rams which may themselves be utilized in the device shown here.

At each end of the lower section 18 of the ram cylinder housing 18, there is provided four mounting surfaces comprising flanges 30 arranged in a set uniformly radially about the circumference. The respective mounting flanges 30 at each end are arranged in axial planes transverse to the central axis so that four pair of upper and lower mounting flanges 30 are provided.

The mounting flanges are right angle corner pieces as seen in FIG. 2 and have perpendicular flat faces on two sides so that in combination the four members of each set form a quadratic (square or rectangular) configuration proscribed about the circumference of the lower cylinder section 18. They are uniformly symmetrical from all sides about the central axis of the lower section. The mounting flanges 30 are adapted to be fastened pairwise to a lower guide brackets 32 and upper guide brackets 34 which themselves clamp onto each of the vertical poles 12. The guide brackets 32 and 34 may be secured to the mounting plates on any one of its four sides. The mounting flanges are provided with threaded holes 36 in which conforming bolts 38 or other suitable fastening means are inserted. It will thus be obvious that for each rotation of the lower section of only 90° about its central axis, a new mounting position is obtained.

The guide brackets 32 and 34 are similar in construction and as seen in FIG. 2 comprise an elongated arm which at the rear end of is formed as a semi-circular hasp adapted to partially encircle the pole 12, and at its front or the other end is adapted to be contiguous with the mounting plate and which is itself provided with suitable holes through which the bolts 38 extend. The guide bracket is shaped so that when securely fastened to the mounting plate, the rear semi-circular hasps of each transverse pair squeeze against the poles 12 in jaw-like fashion to hold the lower section in place for the proper guide arrangement. The hasps may be provided with suitable slide inserts.

Should one of the guide brackets 32 or 34 break, or should one of the mounting flanges break or become distorted, or even if one of the threaded bores holding the bolts 38 should be stripped, then it is only a simple matter to separate the lower section 18 from the upper section 16 and to turn the lower section 90° or 180° so that it may be repositioned and immediately replaced in working condition. Thus, it is unnecessary to exchange one ram or pile driver for another, merely because of a minor breakdown in the mounting means nor is it necessary to undertake costly repair or welding of the apparatus at the site or work location.

Similar advantage arises with respect to the use of the inlet spray pump 28. Since at least three inlet/exhaust openings are provided in the lower cylinder section 18, it is merely a simple matter to switch the pump from one to another without any serious delay or breakdown in the work schedule.

It will also be obvious that the guide elements (brackets 32 and 34) and the mounting flanges 30 may be varied or modified from that shown without departing from the present invention. For example, all four sides of the lower section 18 may be initially provided with guide elements. Also, the guide elements and the supporting frame for guiding the ram pile driver, may also be formed so that for each position at which the ram

cylinder is guided only one guide element is necessary. Still further, the position of mounting flanges on the lower section 18 can be modified and they may be placed in other relative axial or radial areas, than those shown.

In accordance with the present invention, however, it is only necessary that the arrangement of mounting surfaces or plates and guide elements brackets be such that for any one of the sides, of the lower cylinder section 18 presented to the supporting frame 12, that the lower section be fully capable of being supported and guided. Since the mounting surfaces are similar, only one type of guide element is necessary.

In accordance with the present invention the arrangement of several injection pumps about the circumference of the ram body is possible without the necessity of providing the several slots in the body for the activation of the pump. Since by rotating the lower cylinder portion of the ram body relative to the upper portion the pump may be positioned at any one of the inlet/exhaust openings on the respective four sides. Therefore, the upper part of the ram body can remain in its fixed position relative to the vertical standard. This is essential since the vertical standard is provided with a movable trolley carriage having a nose which enters into a slot in the upper part of the ram piston so as to cause the piston to raise or boost the ram.

The mounting surfaces may be directly machined on the cylinder 18; however, it is self-evident that the lower portion of the ram body need not be square or quadratic along its entire length. It is also not necessary to make the entire circumference lie in a square or rectangular cross-section but only those surfaces to which the guide elements are actually secured. Lastly, it will be understood that the lower portion of the ram body can be made in several parts which are fastened or secured together.

Various modifications and changes are suggested herein. Others will be apparent to those skilled in this art. Accordingly, it is intended that the present disclosure be illustrative only and not limiting of the present invention.

What is claimed:

1. A diesel/internal combustion assisted pile driver, ram or the like comprising a body having at least an upper section and a separable lower section, said lower section being provided with at least one guide bracket for connection to a vertical standard, mounting surfaces formed on the lower section in a uniform quadratic cross-section, means for fastening said guide bracket on the mounting surfaces of a selected one of the four sides, whereby said lower section may be fastened relative to the upper section in at least four positions at 90° intervals.

2. Apparatus according to claim 1 including at least two inlet/exhaust means formed about the circumference of said lower section, said inlet/exhaust means being adapted to selectively mount a fuel injection pump in association with a selected side.

3. In combination with a pile driver having a body formed of an upper section and a separable lower section having a central axis, means for mounting said lower section to a vertical standard, comprising a plurality of mounting surfaces arranged in a set uniformly about the circumference of the lower section in a plane transverse to the central axis and at least one bracket associated with said set, said bracket being adapted to

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be connected at one end to said standard and to be secured at the other end to a selected one of said mounting surfaces whereby the position of said lower section may be varied relative radially to said central axis.

4. The combination according to claim 3 wherein the mounting surfaces are flat and form a substantial quadratic cross-section whereby said lower section may be positioned relative to said central axis at 90° intervals.

5. The combination according to claim 3 including two sets of uniformly spaced circumferential mounting surfaces, said sets being axially spaced from each other, and at least one bracket associated with each set.

6. The combination according to claim 5 wherein

said brackets are slidably connected to said standards to permit adjustment of the position of said lower section thereon.

7. The combination according to claim 3 wherein said brackets associated with each set are provided in pairs, each of said pairs of brackets being arranged on opposite sides of said standard and are adapted to be removably clamped thereto on fastening of said brackets to said associated mounting surface.

8. The combination according to claim 7 wherein said standards comprises a pair of horizontally spaced parallel poles, each of said pair of brackets being adapted to clamp on to a respective one of said poles.

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