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Blomquist

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[54] **SYSTEM FOR DRIVING OBJECTS USING PRESSURE OR TRACTION FORCES**

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[51] **Int. Cl.** **E02d 7/10**

[58] **Field of Search** 173/127, 131, 134–139, 173/112, 1; 61/53.5

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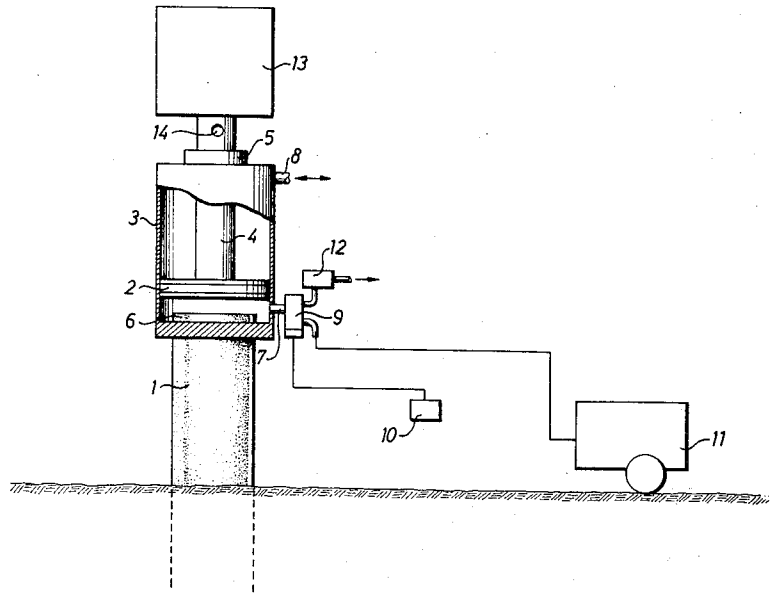
Primary Examiner—Ernest R. Purser

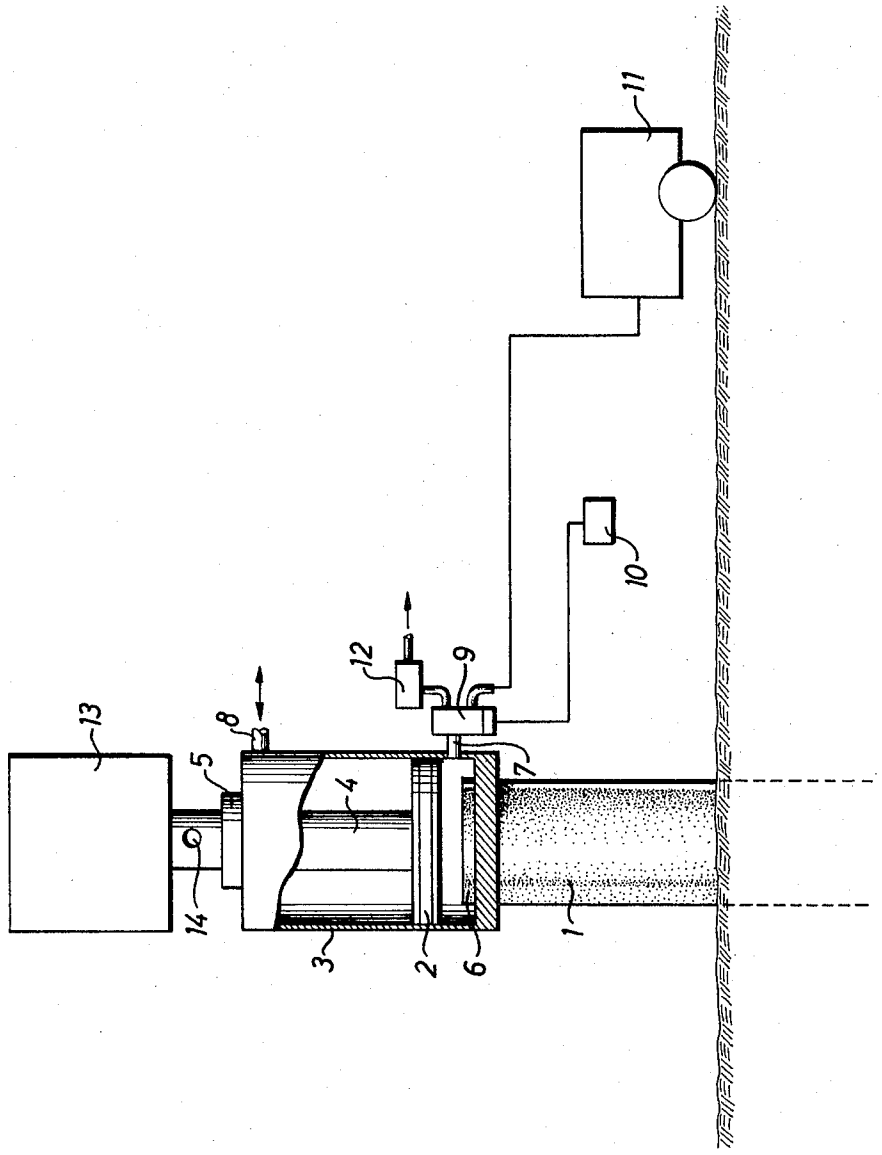
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[57] **ABSTRACT**

An arrangement for driving objects, such as piles for example, into a receiving surface by pressure or traction forces is herein disclosed. The arrangement includes a piston-cylinder arrangement one end of which is in force transmitting engagement with an object to be driven into a receiving surface and the other end of which is loaded with an anvil means. The cylinder space on one side of the piston is in communication with a supply source of pulsating working medium and the cylinder space on the other side of the piston communicates with an outlet to enable free entry and discharge of the working medium.

4 Claims, 1 Drawing Figure




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SYSTEM FOR DRIVING OBJECTS USING PRESSURE OR TRACTION FORCES

The present invention relates to a system for driving an object, using pressure or tractive forces, and more particularly to a system for driving an object into dense material and for withdrawing an object from such material, as with ground pile-driving operations for example.

Pile driving, paling and like operations are encumbered with a number of serious disadvantages. For example, the material is often subjected to rough treatment, and in extreme cases is broken. Further, such operations create a serious noise problem. Pneumatic hammers are the machines most often used for pile driving operations, especially when driving steel piles. Other machines used in such operations include drop hammers or vibration hammers. The drop hammer is quieter in operation than the pneumatic hammer, having a noise output of about 95 dB as opposed to 100 dB.

The object of the present invention is to solve the aforementioned problems and to provide a machine which is more economical, smoother running and quieter than known machines and which is more versatile in operation than said machines. This object is obtained with the machine of the present invention, which is mainly characterized by a piston-cylinder arrangement one end of which is in force transmitting engagement with an object to be driven into a receiving surface and the other end of which is loaded with an anvil means, the cylinder space on one side of the piston being in communication with a supply source of pulsating working medium and the cylinder space on the other side of the piston communicating with a chamber to enable free entry and exit of the working medium.

The invention will now be described in more detail with reference to the accompanying drawing, the single FIGURE of which illustrates diagrammatically a partially cut away vertical view of a machine constructed in accordance with the invention.

In the illustrated example, the machine is used for driving a pile **1** into the ground. The machine comprises a piston-cylinder arrangement having a piston **2** arranged for movement relative to a cylinder **3.** The piston is provided with a piston rod **4** mounted in a guide **5** arranged in one end wall of the cylinder. Arranged on the other end wall of the cylinder is a pad **6** of sound absorbing material. At the lower end of the cylinder there is arranged a conduit **7** which connects with a source of pressure medium, in the present instance air. Arranged at the top of the cylinder is a conduit **8** which connects the cylinder chamber above the piston with the surroundings, in the present instance the atmosphere.

Connected to the conduit **7** is a valve **9** which is guided by a pulse transmitting means **10.** The valve **9** is connected to a compressor **11** and to an outlet provided with a silencer **12.**

The machine operates in the following manner: The machine is placed opposite the object, e.g. a pile, paling or the like **1** to be driven into a receiving surface, such as the ground. An anvil **13,** having the form of a hammer for example, is arranged against the piston rod **4,** to provide the desired pulse resistance while the machine is working. Subsequent to starting the compressor **11,** the pulse transmitting means, which has an adjustable frequency, controls the valve **9** in a manner such that the conduit **7** in placed alternately in communication with the compressor **11** and the outlet **12.** In this way pressure changes are created beneath the piston which cause the piston the move against the weight of the mass **13,** whereafter the pressure is decreased and the piston is thrown down against the pad of sound absorbing material. Alternatively, the pressure pulses can be adjusted in a manner to form a cushion of air beneath the piston at its bottom position, this cushion of such magnitude as to prevent contact between the piston and the pad **6.**

In distinction to known methods, the mass applies a constant load, e.g. 5 tons, to the pile **1** throughout the entire pile driving operation, via the piston-cylinder arrangement. In addition, through the pulsating air pressure, the kinetic energy of the mass is used for driving the pile. The movement of the piston has a frequency determined by the pulse transmitting means **10** and is suitably variable between 40 and 160 Hz, depending on the nature of the surface into which the pile is to be driven.

Thus the above arrangement provides a machine with which the pile is treated more gently than with known pile driving machines. Further, in contradistinction to known machines the hammer does not strike directly against the pile, nor is the pile alternately relieved of the load acting thereon, but that the pile is constantly acted upon by the load of the hammer. The noise level reached with the machine of the present invention lies in the region of 75 dB, which is an appreciable reduction in the environmental noise nuisance conditions.

When withdrawing, for example, pilot piles from the ground, the piston rod is hung from a hole in a lifting device and the supply of air under pressure is moved to the connection **8,** whereby the pilot pile attached to the cylinder can be pulled from the ground with small jerks. Although the illustrated machine has been described with reference to air under pressure as the working medium, it will readily be perceived that any suitable working medium can be used.

Further, although the illustrated machine has been described with the cylinder facing the object to be driven, there is nothing to prevent the position of the piston-cylinder arrangement from being changed so that the piston rod faces the object instead. The machine may be arranged to work in an inclined or upright position and is not restricted for use in pile driving operations, but can also be used as a jacking means for example.

I claim:

1. An arrangement for driving objects by pressure or traction forces, for instance for pile-driving into the ground, said arrangement comprising: a piston-cylinder driving means including a piston adapted to reciprocate in a cylinder; force transmission means comprising a wall of said cylinder at one end of said driving means for maintaining said driving means by gravity in permanent force transmitting engagement with an object to be driven; an inertial mass associated with said driving means through said piston for developing a force for permanent gravitational transmission to said object; a cylinder space on the side of the piston toward said object for communicating with a source of pulsating supply of driving medium; valve means for opening and closing communication between said cylinder space and said source of pulsating supply for initially raising

said inertial mass against the force of gravity and away from said object, for then releasing said inertial mass to enable the same to fall by gravity in the direction of said object, and for then again raising said inertial mass for another driving cycle, so that the gravitational weight and kinetic energy of said inertial mass combine to drive the associated object when said inertial mass moves in the direction of said object under the influence of gravity and impacts against said object through said force transmission means; and a cylinder space on the other side of the piston for communicating with an outlet; whereby, in use, the object to be driven is maintained permanently loaded by a gravitational force including that of said inertial mass and is driven by a pulsating force superposed on said permanent force, including kinetic energy in said inertial mass developed by the gravitational pull on said inertial mass when said

valve means enables said inertial mass to fall by gravity and impact against said object.

2. An arrangement according to claim **1**, characterized in that said source of pulsating supply has the form of a compressed-air compressor connected to an inlet line to the cylinder via a valve controlled by a pulse transmitting means.

3. An arrangement according to claim **1**, characterized in that the inner surface of the end wall of the cylinder adjacent said object is provided with means for absorbing piston impact.

4. An arrangement according to claim **1**, wherein said source of driving medium is connected to an inlet line to the cylinder via a valve controlled by a pulse generator.

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