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(54) CHAIN DRIVEN RECIPROCATING HAMMER WITH AUTOMATIC WORK PIECE INPUT CENTERING AND CLAMPING

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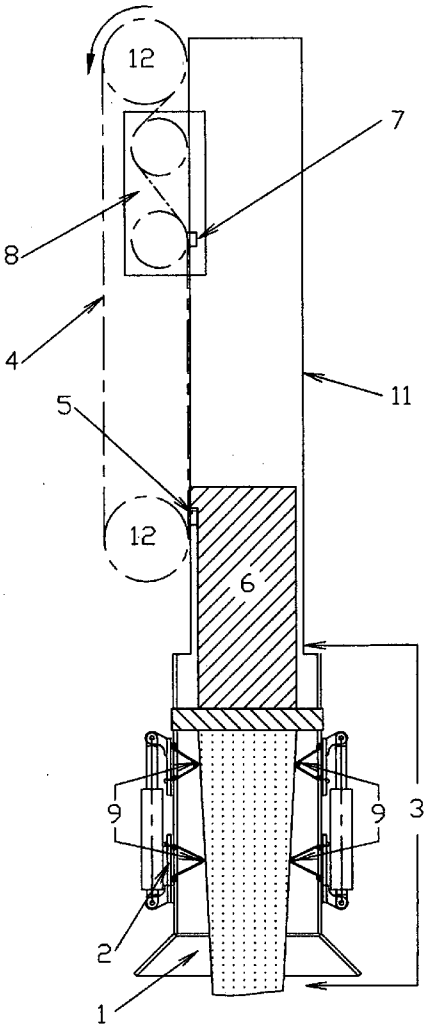
(57) **ABSTRACT**

The Chain Drive Reciprocating Hammer is an apparatus for driving pile, poles pipe etc. that uses a chain lifting system to raise a ram to a predetermined height where the ram is released to free fall. The energy of the pull of gravity is applied to the driving of pile, poles, pipe etc. when the free falling ram strikes the pile, pole, pipe etc. Said apparatus has a mechanism to center and clamp the pile, poles, pipe etc. in a fixed position within the apparatus to maximize the force of the strike and to assist in the more accurate positioning of the pile, pole, pipe etc. prior to and during driving.



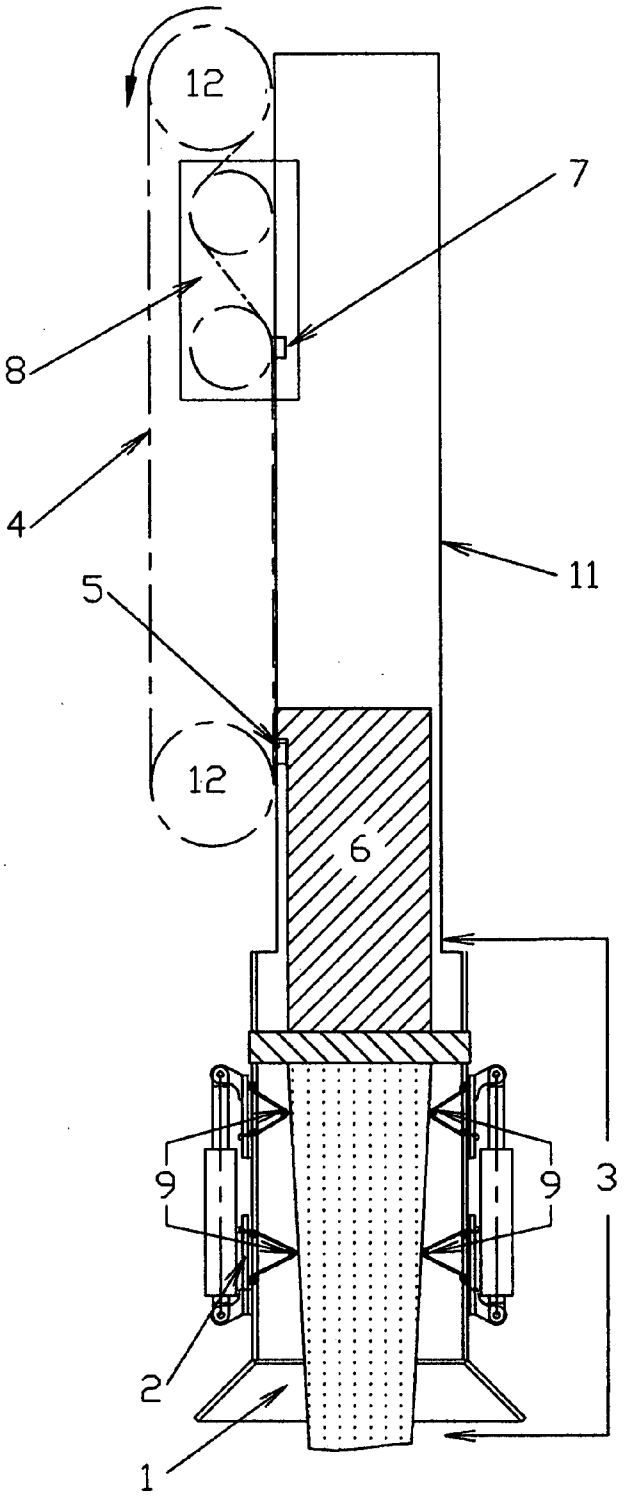


FIG.1

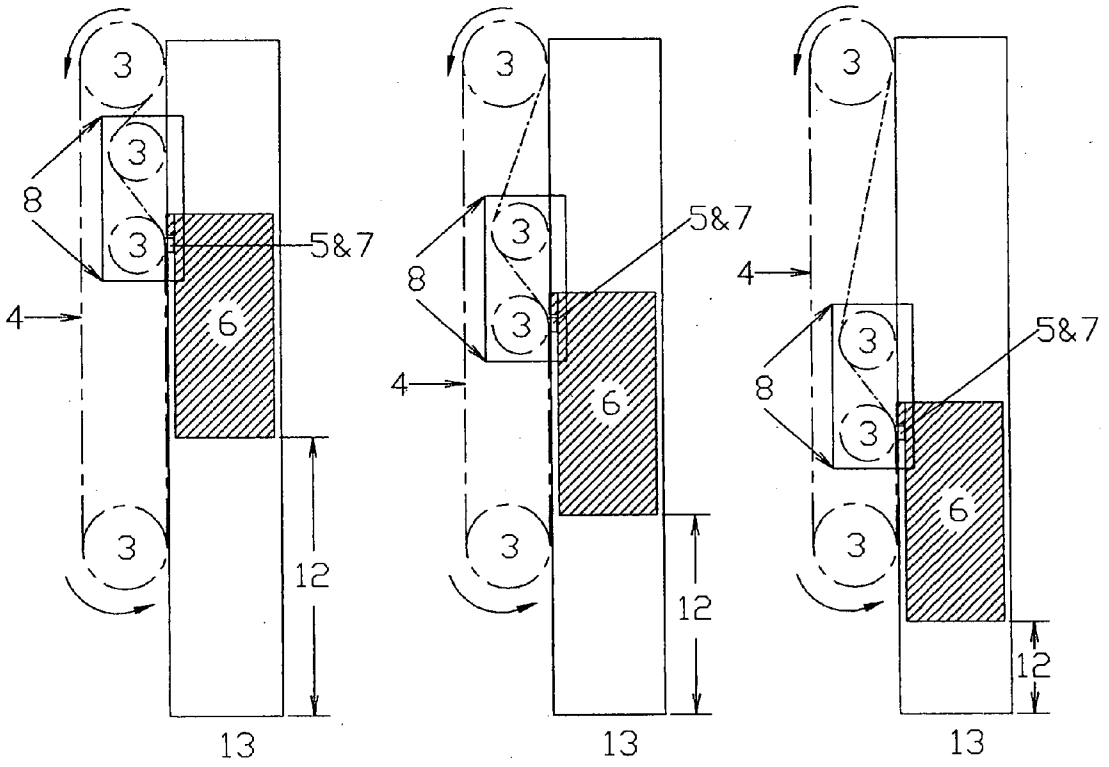
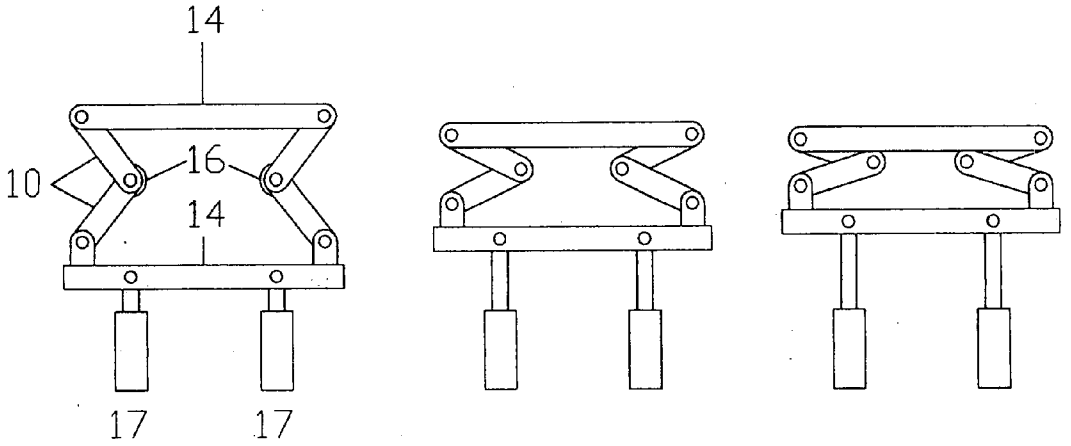


FIG.2



A B C

FIG.3
A, B, C

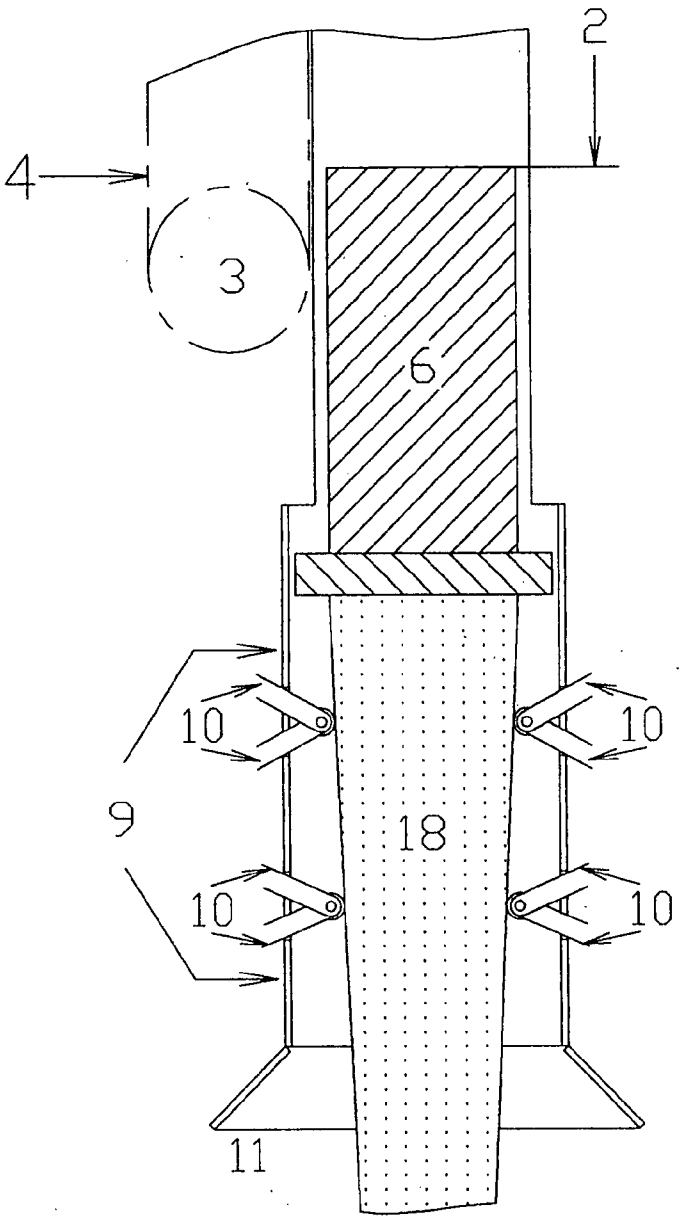


FIG.4

CHAIN DRIVEN RECIPROCATING HAMMER WITH AUTOMATIC WORK PIECE INPUT CENTERING AND CLAMPING

BACKGROUND OF THE INVENTION

[0001] Free fall or drop type hammers have been used and are still being used for driving pile, poles, pipe etc. Hammer rams have historically been lifted to free fall (drop height) by manual labor, winch and cable systems, compressed air, hydraulic fluid under pressure and the explosive force of diesel fuel combustion. All of these systems have been and are still employed to raise a ram to a predetermined height for release into free fall or drop; the pull of gravity in relation to ram mass releases a driving force upon impact with the object (pile, poles, pipe etc.) that is being driven.

[0002] The above mentioned methods of raising a ram are energy intensive and require a heavy supporting structure. The Chain Drive Reciprocating Hammer with automatic work piece centering and clamping has a greatly reduced energy requirement to raise a given ram weight to a given free fall or drop height. The Chain Drive System also allows for a reduced overall hammer height.

[0003] Conventional pile, pole, pipe etc. driving systems require ancillary work piece positioning systems i.e.: leads, pull ropes, etc. to accurately position and hold the driving hammer and work piece in a linear configuration perpendicular to the substrate i.e.: ground, beach etc. that the driven piece i.e.: pile, pole, pipe etc. is being driven in to. The Chain Drive Reciprocating Hammer with work piece centering and clamping eliminates or greatly lessons the need for afore mentioned ancillary work piece positioning systems i.e.: leads, pull ropes, etc. Furthermore, it maximizes the force of the ram impact to the work piece by ensuring and maintaining centering between the ram and the work piece. The relationship established and maintained by the automatic work piece input centering and clamping mechanism does not allow any energy (force of impact between ram and work piece) to be diverted via a side or glancing blow. Pile driving hammers with conventional bells, bonnets, etc. cannot adjust their internal inlet diameter to the multitude of outside diameters found with work output such as wooden pile or poles. Although wooden pile or poles have a consistent overall length their outside diameters at the driven end can, and most often vary with each individual pile or pole.

SUMMARY OF THE INVENTION

[0004] The present invention is premised on the realization that energy efficient driving of piles, poles, pipe etc. can best be accomplished with a chain ram lifting system and mechanism to hold the work piece i.e.: pile, pole, pipe etc. securely and correctly for maximum energy (force of ram impact) transfer. The present invention does not require the mass (weight) of an: air cylinder, hydraulic cylinder or diesel/fuel/combustion mechanism to raise the ram to an adequate drop (free fall) height. A light weight air, electric or hydraulic motor is used to rotate a simple roller chain that has one or more grab links. The grab link meshes with the ram and as the roller chain travels in both a linear and vertical path, the ram is lifted to a pre-selected drop (free fall) height and released.

[0005] The present invention also incorporates a mechanism that upon activation centers the work piece i.e.: pile, pole, pipe etc. by being centered and securely clamped, becomes in effect and extension of the hammer. The hammer/work piece unit is now easily maneuvered to the desired point of substrate i.e.: ground, beach etc. and driven (hammered) to an adequate depth for proper load bearing. Also, due to the centered condition of the work piece, the energy of the ram blow (strike, etc.) is better transferred from the ram to the work piece. This reduces energy loss caused by a side or glancing blow from the ram to the work piece.

BRIEF DESCRIPTION OF THE DRAWING

[0006] The figure is a diagrammatic depiction of the apparatus showing the chain drive and the automatic centering and clamping mechanism. It shows how the work input is held securely and maintains a center line relationship with the ram.

DETAILED DESCRIPTION

[0007] As shown in the drawing, the work piece **2** i.e.: pile, pole, pipe etc. is positioned within the throat **1** of the self centering and clamping bell (bonnet) **3**. The centering/clamping cylinders **10** are activated causing the articulated links **9** to move towards and engage the work piece **2** while automatically by virtue of design centering the work piece to **2** to the bell (bonnet) **3**. Adequate force is applied by the articulating links **9** to ensure adequate gripping of the work piece **2** so accurate maneuvering and positioning of the work piece **2** can take place. Once the work piece **2** is correctly clamped and centered and is secure so as to comprise an effective hammer/work piece unit properly positioned in relation to the ground, beach etc. hammering/driving can now commence. Power (air, electricity, hydraulics, etc.) to rotate the driven sprocket **3** is applied. The driven sprocket **3** rotates with torque causing the roller chain **4** to move linearly and parallel with the ram guide tube **11** in a direction opposite to the pull of gravity. The roller chain **4** has one or more lift/grab links **7** that mesh with the ram **6**. As the roller chain **4** with the ram **6** in tow travels linearly between the driven sprocket **3** and the tandem release sprocket assembly **8**, the ram is raised to a release point pre-selected by the location of the tandem release sprocket assembly **8**.

[0008] Note: The tandem release sprocket assembly's position can be adjusted up or down on the work side that grabs the ram so that the ram free fall/drop length can be matched to the requirement of the specific hammer/driving job.

[0009] The roller chain **4** with the ram **6** in tow will follow a vertical path parallel with the ram guide tube **11** to a pre-selected release point as determined by the position where the roller chain **4** rotates around the tandem release sprocket assembly **8**. Upon reaching this release point, the grab chain link will un-mesh with the ram **6**. The ram will now free fall (drop) and apply energy (impact force) to the work piece **2** thus hammering (driving) it.

I claim:

1. An apparatus for driving pile, pole, pipe etc. that uses a chain system for lifting the ram to a pre selected drop point.

2. An apparatus utilizing a mechanism for adjusting the drop point of a ram in a pile, pole, pipe etc. driving application with a hammer using a moveable and adjustable tandem set of sprockets.

3. An apparatus utilizing a mechanism for centering and clamping a pile, pole, pipe etc. in the center bell (bonnet) of a pile driving hammer. Said mechanism incorporates an apparatus that increases or decreases the area within the bell (bonnet). Said mechanism adjusts automatically upon activation, the inside diameter of the bell (bonnet) to the outside diameter of the work piece input, while simultaneously maintaining a positive center line relationship between the ram and the work piece. This ensures that maximum energy transfer takes place from the falling ram mass upon impact to the work piece i.e. pile, pole, pipe etc.

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