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(54) **Stone breaking apparatus.**

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Description

The invention relates to a stone breaking apparatus for mounting on the arm of a wheeled loader or similar vehicle.

The apparatus is meant to serve as auxiliary equipment for splitting of large blocks of stone, where the apparatus comprises a fastening means with rapid release coupling for mounting on the arm, and an oblong cylinder to guide therein a sliding, hoistable weight or piston for fall engagement with a hardened impact tool disposed in the lower end section of the cylinder.

In stone breaking operations, there is during blasting always a certain proportion of the rock mass which is too large for further handling. For example, in a blasted rock mass to be sent through a crushing plant, there are always a number of stone blocks that are too large to be received by a stone crusher. Also, there are stone blocks too large for further transport. These must split up prior to further transport or processing. The apparatus could conceivably also be used in breaking or concrete decks, foundations and building elements which must be removed, either where blasting is not desirable or in inhabited areas where it is not allowed.

This problem has previously been solved by means of a compressor/drilling hammer and by explosives, if necessary. This entails efficiency problems, which increase the costs per produced unit of mass. According to German published patent application 2,120,517, meanwhile, there exists a stone breaking apparatus adapted for mounting to the arm of a construction machine or similar vehicle. The stone breaking apparatus comprises an oblong cylinder for guiding a sliding and hoistable weight for direct or indirect impact against the stone block to be parted. This stone breaking apparatus, however, is permanently mounted to the arm of the construction machine. This means that, should the operator "miss" in directing the impact, or should the stone block be split substantially more easily than expected, the impact is transferred directly to the arm of the construction machine, which results in considerable stress on the arm and the components connected thereto.

WO—A—83/01977 discloses a rock breaking apparatus comprising a damping and biasing means between a fixed section and a movable section to absorb applied tool working forces transferred from a tool to the movable section and to provide a restoring force to the movable section for returning the section in return direction upon conclusion of the working stroke of the tool. This damping means comprises elastomeric members constantly in engagement with both the fixed section and the movable section.

FR—A—2 215 293 discloses a hydraulic rapid reciprocating percussion hammer specially for fracturing concrete slabs and the like. This apparatus comprises damping means which does only allow for very short vibrating motions between the working tool and the holder means.

In the stone breaking apparatus according to the invention the drawbacks of the above prior art apparatus are eliminated. Experiments with a prototype have demonstrated that the apparatus of the invention breaks stone blocks of considerable size and functions entirely in accordance with its intended purpose.

According to the invention a stone breaking apparatus as defined in the preamble of claim 1 is characterized in that the fastening means supports and guides the cylinder along a substantial but limited distance in the longitudinal direction of the cylinder by means of at least one externally of the cylinder mounted guiding element.

In addition, between the cylinder and the fastening means there may be mounted one or more shock absorbers, the longitudinal axis thereof running substantially parallel with the longitudinal axis of the cylinder. The stone breaking apparatus is further provided with a rapid release coupling for simple mounting and dismounting to/from the arm of a wheeled loader or similar vehicle.

The stone breaking apparatus will now be described in more detail by means of an embodiment example as illustrated in the attached drawings, where:

Fig. 1 is a side view of the stone breaking apparatus according to the invention,

Fig. 2 shows a horizontal section along the line 1—1 in Fig. 1, and

Fig. 3 shows an enlarged side view of the lower section of the cylinder in Fig. 1.

Fig. 1 shows the stone breaking apparatus 1 which is adapted for mounting on the arm (not shown) of a wheeled loader or similar vehicle. The apparatus 1 is mounted on the vehicle's arm over the fastening means 4 by rapid release couplings 5. The apparatus 1 comprises a cylinder 2 for guidance of the weighted element 6. A hydraulic motor 16 drives a cable pull device 18 by means of a chain transmission 17. The cable pull device 18 is connected to the weighted element 6 by a wire cable 15 for hoisting the weight to an upper position in the cylinder 2. A disconnecting means (not shown) on the cable pull device 18 makes possible disconnection of the weighted element from the hoisting mechanism 18 for an approximate free fall within the cylinder 2. In the lower end section of the cylinder 2, a hardened impact tool 7 is detachably infixed thereto. The impact tool has limited movability in the guide sleeve 12. In Fig. 1 the guide sleeve 12 is shown infixed to the cylinder 2 by means of bolt connections. Between the lower flange on the cylinder 2 and the flange on the guide sleeve 12 are disposed one or more hard rubber liners 21. The impact tool's 7 movement is restricted by means of a blocking bolt 14, which bolt is fastened to the guide sleeve 12. The blocking bolt 14 engages with a worked groove in the upper part of the impact tool 7. Around the lower part of the cylinder 2 there is attached a reinforcing flange 19 extending along the circum-

ference thereof. Onto the cylinder are attached two brackets 10, 11 for fastening one or more guide bars 3. On the lower part of the guide bar 3 is provided a stopper 20. To the upper bracket 10 are attached holders, for example, in the form of H-beams, to anchor the upper section of one or more shock absorbers 8. On the fastening means 4 there are similarly provided holders, e.g. in the form of an H-beam, to anchor the lower section of one or more shock absorbers 8. The fastening means 4 is provided with guide elements 13 for sliding engagement with the guide bars 3.

During operation, the stone breaking apparatus is brought to a suitable place on the stone block which is to be split. The apparatus is manoeuvred and positioned by means of the various functions which can be executed by the arm of a wheeled loader or similar vehicle. The cylinder 2 is positioned substantially vertically on the stone block. With the impact tool 7 resting against the stone block, the fastening means 4 is brought down toward, but not necessarily into, the stopper 20. The motor 16 is supplied with hydraulic fluid via hoses from the vehicle's hydraulic system. The hydraulic motor 16 drives the cable pull device 18 and thereby hoists the weighted element to the desired height. The height of the weighted element 6 in the cylinder is determined on the basis of the stone block to be split, based on both the size, form, and material character of the block. A disconnecting means or clutch in the cable pull device 18 makes possible a free-fall movement of the weighted element 6 in the cylinder 2. The weighted element 6 impinges on the hardened impact tool 7, and the shock-like impact thereof against the stone block splits the block. Any "residual forces" remaining after the stone is split are absorbed by the shock absorber 8. If the tool is inaccurately placed, or the stone block is able to be split considerably more easily than expected, the substantial portion of the impact is received by the shock absorber 8, so that the wheeled loader arm and its components are spared the direct stresses of the shock impact.

The displacement of the cylinder 2 in relation to the fastening means 4 may be as much as 70—80 cm. When the stone is split, the impact tool 7 and the cylinder 2 usually will be retarded rapidly down through the split stone, so that the stone breaking apparatus 1 might also be used without the shock absorber 8. In that case the guide bar 3 must also be equipped with an upper stopper against which the cylinder 3 rests during movement of the apparatus 1 from one place to another. When the stone breaking apparatus is used with the shock absorber, this takes up the weight of the cylinder 3 during transfer movement and thereby functions as an upper stopper.

Claims

1. Stone breaking apparatus (1) intended for splitting stones in single blows, including a fastening means (4) mountable on the arm of a wheeled loader or similar vehicle, as auxiliary equipment, and an oblong cylinder (2) for guiding therein a sliding hoistable weighted element (6) or piston for fall engagement with a hardened impact tool (7) disposed in the lower end section of the cylinder (2), which cylinder (2) during stone splitting operations assumes a substantially vertical position, characterized in that the fastening means (4) supports and guides the cylinder (2) along a substantial but limited distance in the longitudinal direction of the cylinder by means of at least one externally of the cylinder mounted guiding element (3, 13).

2. Stone breaking apparatus according to claim 1, characterized in that between the cylinder (2) and the fastening means (4) there are mounted one or more shock absorbers (8), the longitudinal axis(es) of which extend substantially parallel with the longitudinal axis of the cylinder.

3. Stone breaking apparatus according to claim 1, characterized in that the cylinder includes one or more externally mounted brackets (10, 11) for attachment of the guide element(s) (3).

4. Stone breaking apparatus according to any of claims 1—3, characterized in that the fastening means (4) includes a rapid release coupling (5) and one or more guide channels (9) for engagement with the guide element(s) (3) of the cylinder.

5. Stone breaking apparatus according to any of claims 1—4, characterized in that between an upper bracket (10) infixed to the cylinder and the fastening means (4) there are mounted one or more shock absorbers (8).

6. Stone breaking apparatus according to claim 4, characterized in that the guide channel (9) in the fastening means (4) is U-shaped.

7. Stone breaking apparatus according to any of claims 1—6, characterized in that the shock absorber (8) is single-acting or double-acting.

Patentansprüche

1. Steinbrechgerät (1) zum Zerkleinern von Steinen mit Einzelschlägen mit einem am Arme eines mit Rädern versehenen Baggers oder eines ähnlichen Fahrzeugs als Hilfsausrüstung montierbaren Befestigungsmittel (4) sowie einem länglichen Zylinder (2) zur Führung darin von einem gleitenden, hochziehbaren Gewicht (6) oder Kolben für Falleingriff mit einer gehärteten Schlageeinrichtung (7), die im unteren Endteile des Zylinders (2) vorgesehen ist, wobei der Zylinder (2) im Laufe der Zerkleinerungsvorgänge eine wesentlich vertikale Lage einnimmt, dadurch gekennzeichnet, dass das Befestigungsmittel (4) den Zylinder (2) längs eines wesentlichen aber begrenzten Abstands in der Längsrichtung des Zylinders mittels mindestens eines ausserhalb des Zylinders montierten Führungselements (3, 13) unterstützt und führt.

2. Steinbrechgerät nach Anspruch 1, dadurch gekennzeichnet, dass ein oder mehrere Stossdämpfer (8) zwischen dem Zylinder (2) und dem Befestigungsmittel (4) montiert sind, deren Längsachse oder Längsachsen wesentlich parallel zur Längsachse des Zylinders verlaufen.

3. Steinbrechgerät nach Anspruch 1, dadurch gekennzeichnet, dass der Zylinder einen oder mehrere auf der Aussenseite montierte Träger (10, 11) zur Befestigung des Führungselements oder der Führungselemente (3) umfasst.

4. Steinbrechgerät nach einem der Ansprüche 1—3, dadurch gekennzeichnet, dass das Befestigungsmittel (4) eine Kupplung (5) mit Schnellauslösung und einen oder mehrere Führungskanäle (9) zum Eingriff mit dem Führungselement oder den Führungselementen (3) des Zylinders umfasst.

5. Steinbrechgerät nach einem der Ansprüche 1—4, dadurch gekennzeichnet, dass ein oder mehrere Stossdämpfer (8) zwischen einem am Zylinder befestigten oberen Träger (10) und dem Befestigungsmittel (4) montiert sind.

6. Steinbrechgerät nach Anspruch 4, dadurch gekennzeichnet, dass der Führungskanal (9) im Befestigungsmittel (4) U-förmig ist.

7. Steinbrechgerät nach einem der Ansprüche 1—6, dadurch gekennzeichnet, dass der Stossdämpfer (8) einfachwirkend oder doppeltwirkend ist.

Revendications

1. Appareil (1) pour concasser des pierres destiné à fendre les pierres par frappe coup par coup, comprenant un dispositif de fixation (4) montable sur le bras d'un chargeur à roues ou d'un véhicule semblable, en tant qu'équipement auxiliaire, et un cylindre allongé (2) permettant de guider, à l'intérieur de ce dernier, un élément pesant coulissant levable (6), ou piston, venant en contact, par chute, avec un outil percutant trempé (7) disposé dans la partie extrême inférieure du cylindre (2), ledit cylindre (2) occupant une position sensiblement verticale pendant les opérations de fendage des pierres, caractérisé en ce que le dispositif de fixation (4) supporte et guide le cylindre (2) sur une distance considérable mais limitée dans le sens longitudinal du cylindre au moyen d'au moins un élément de guidage (3, 13) monté à l'extérieur du cylindre.

2. Appareil pour concasser des pierres selon la revendication 1, caractérisé en ce qu'on a monté, entre le cylindre (2) et le dispositif de fixation (4), un ou plusieurs amortisseurs (8) dont l'axe longitudinal (les axes longitudinaux) s'étend(ent) sensiblement parallèlement à l'axe longitudinal du cylindre.

3. Appareil pour concasser des pierres selon la revendication 1, caractérisé en ce que le cylindre comprend un ou plusieurs supports (10, 11) montés à l'extérieur et permettant de fixer le(s) élément(s) de guidage (3).

4. Appareil pour concasser des pierres selon une quelconque des revendications 1 à 3, caractérisé en ce que le dispositif de fixation (4) comprend un accouplement à déclenchement instantané (5) et un ou plusieurs canaux de guidage (9) coopérant avec le(s) élément(s) de guide (3) du cylindre.

5. Appareil pour concasser des pierres selon une quelconque des revendications 1 à 4, caractérisé en ce qu'on a monté, entre un support supérieur (10) fixé dans le cylindre et le dispositif de fixation (4), un ou plusieurs amortisseurs (8).

6. Appareil pour concasser des pierres selon la revendication 4, caractérisé en ce que le canal de guidage (9) prévu dans le dispositif de fixation (4) est en U.

7. Appareil pr concasser des pierres selon une quelconque des revendications 1 à 6, caractérisé en ce que l'amortisseur (8) est à simple ou à double effet.

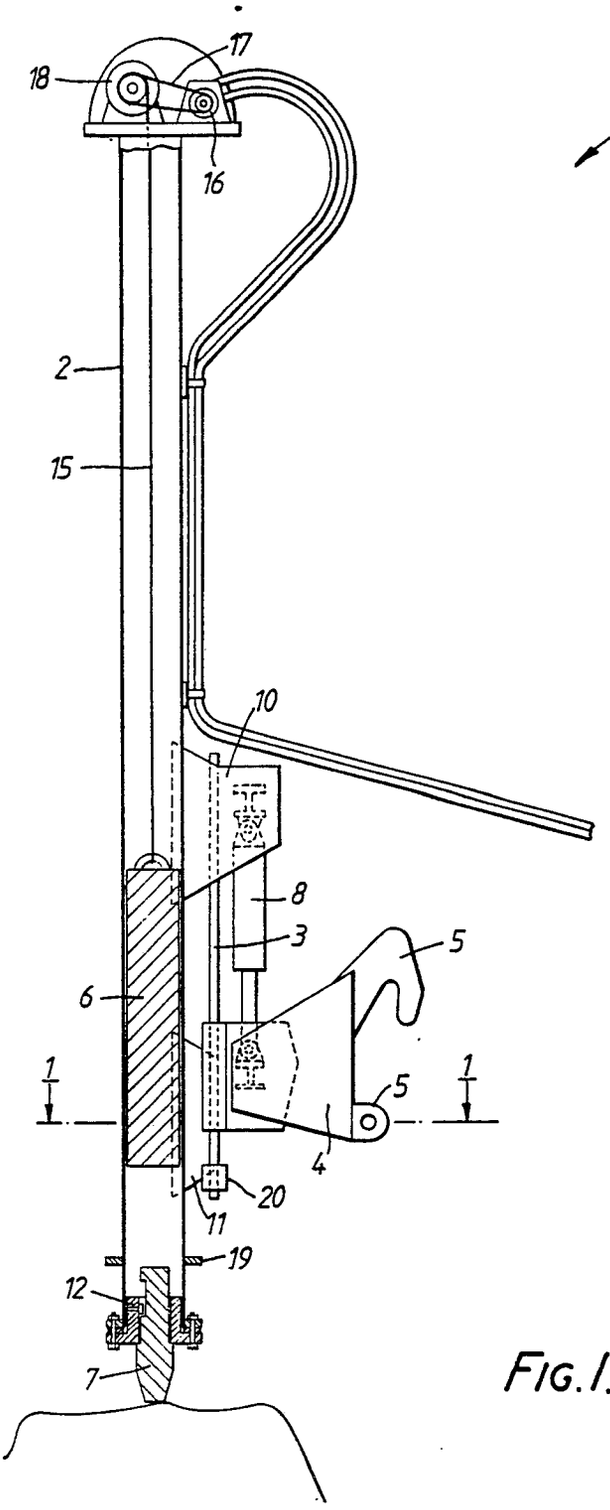


FIG. 1.

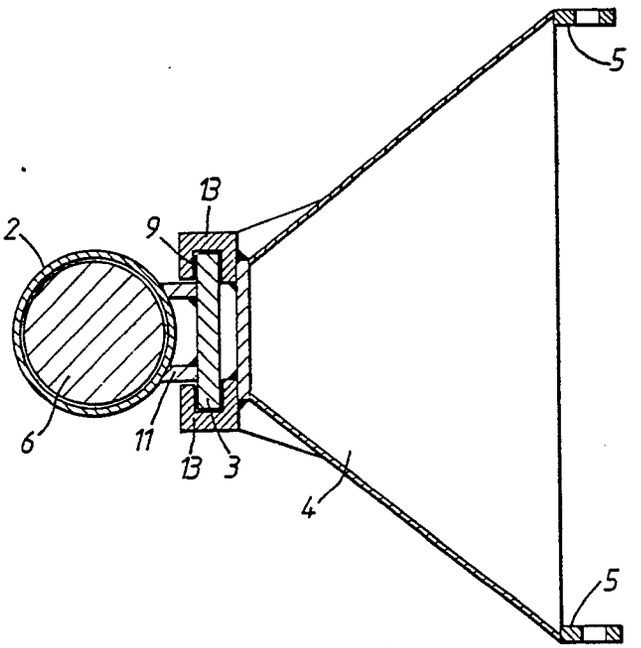


FIG.2.

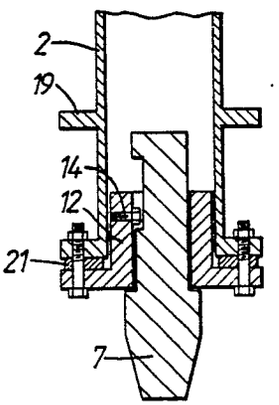


FIG. 3.