Aug. 10, 1954 K. O. DUNCAN 2,686,047

PRESSURE EXERTING DEVICE

Filed Feb. 27, 1950

Fig. 1.

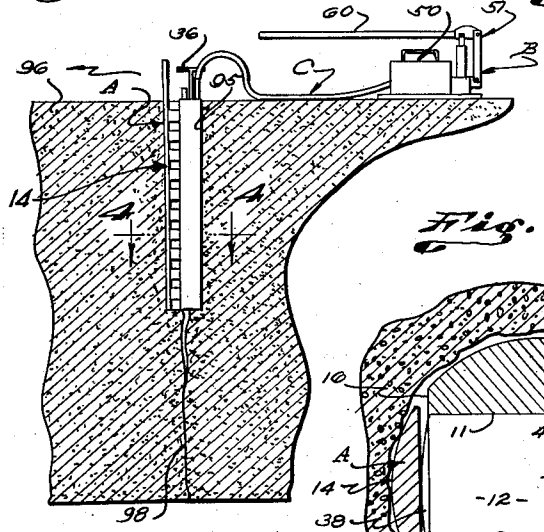


Fig. 2.

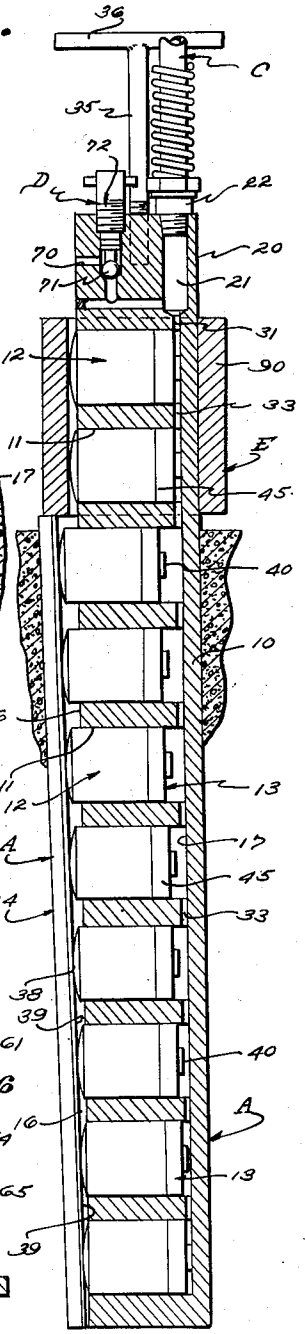


Fig. 3.

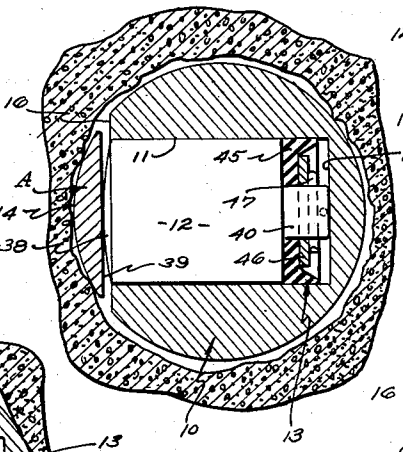


Fig. 4.

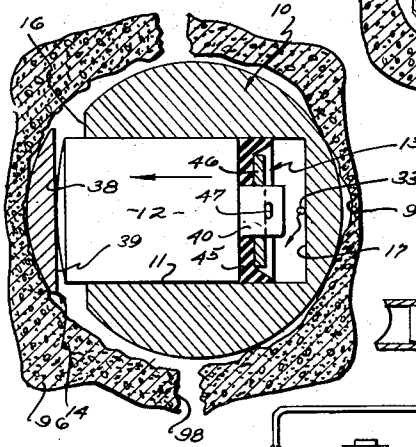


Fig. 5.

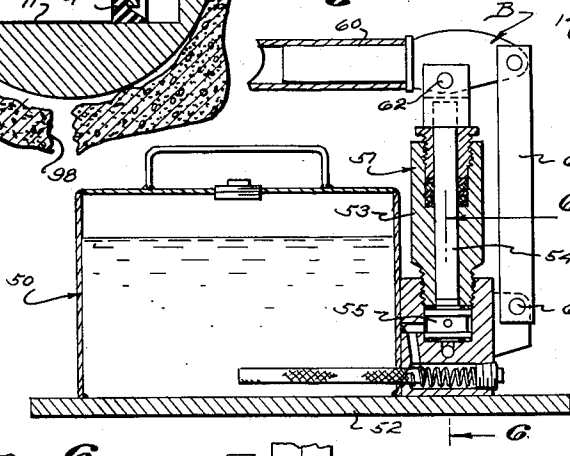
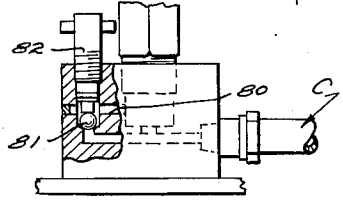


Fig. 6.



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PRESSURE EXERTING DEVICE

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2 Claims. (Cl. 262—12)

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This invention has to do with a pressure exerting device and it is a general object of the invention to provide a simple, dependable, highly effective structure, practical where it is desired to exert great force or pressure to spread or break objects or materials.

The device or equipment provided by the present invention is useful in various situations and it is particularly useful and practical in carrying out demolition operations. It is frequently necessary to demolish structures of various kinds such, for example, as machinery foundations, walls, abutments, revetments, piers, and like structures such as are usually made up largely, if not entirely, of concrete. In other cases rocks or rock formations must be reduced or cut away. It is common in such cases to use explosives or hammering devices for demolition operations, but these methods are not always safe or practical.

It is a general object of the present invention to provide an easily operated structure serving to exert great pressures such as are required to break or crack masses of concrete, rock, or like structures or formations.

Another object of this invention is to provide a structure of the general character referred to in which the action of a plurality of spaced rams is coordinated so that a properly directed and distributed thrust is delivered.

A further object of this invention is to provide a device in which the ram unit that is applied to the material to be broken is light and simple to handle and can be operated safely and rapidly.

A further object of the invention is to provide a device of the general character referred to having a release means that provides for simple, quick release of the ram unit from operating position following the application of pressure thereto.

Another object of the invention is to provide a structure of the general character referred to in which two units, one a ram unit and the other a pressure generator, are connected by a single flexible connection that permits of free relative movement between the units within practical limits.

The structure in which the present invention is employed involves, generally, a fluid pressure actuated ram unit, a pressure generator and a flexible connection between the ram unit and the generator. The ram unit is characterized by an elongate body with lateral cylinder openings connected by ports. Rams slide in the cylinder openings and project laterally from the body, the outer ends of the rams being curved so that they are convex in form. A pressure plate extends parallel with the body at the side from which the rams project and the several rams engage the inner side of the pressure plate while the outer side of the pressure plate, which is curved, engages the formation which is to be acted upon. A head end of the body has a chamber communicating with the cylinders of the body and the flexible connection is joined to this chamber by a suitable fitting. Each ram carries a packing or sealing means at its inner end and has a projecting stud that spaces the sealing means from the inner end of the cylinder when the ram is in an innermost position.

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The pressure generator involves a reservoir supplying fluid and a pump, preferably manually operable, serving to deliver fluid under pressure to the flexible connection which is a simple, flexible conduit that extends to the head of the ram unit. A pressure relief means is provided by which fluid may be allowed to escape at the head of the ram unit or at the pressure generator, freeing the apparatus of pressure so that the rams can be moved inwardly in the cylinders. A retainer is also provided engageable over one group of rams rendering them inoperative when it is necessary or convenient to thus take certain of the rams out of service.

The various objects and features of my invention will be fully understood from the following detailed description of a typical preferred form and application of the invention, throughout which description reference is made to the accompanying drawings, in which:

Fig. 1 is a sectional view of a body of concrete showing the equipment of the present invention applied thereto and having been operated to crack such body of concrete. Fig. 2 is an enlarged longitudinal sectional view of the ram unit including the present invention showing a retainer rendering certain rams inoperative and showing a pressure plate of suitable length engaged by the other rams and angularly related to the body. Fig. 3 is an enlarged detailed sectional view taken in the direction indicated by line 4—4 on Fig. 1 prior to the unit being actuated. Fig. 4 is a view similar to Fig. 3 showing operation of the device. Fig. 5 is an enlarged vertical sectional view of the pressure generating unit provided by the present invention and Fig. 6 is a detailed sectional view taken as indicated by line 6—6 on Fig. 5.

The structure in which the present invention

is embodied includes, generally, a ram unit A, a pressure generator B, and a flexible connection C between the unit A and the generator B. In its preferred form the invention further provides pressure releasing means D and a retainer E, the actions of which will be hereinafter described.

The ram unit A best illustrated in Fig. 2 of the drawings involves, generally, an elongate body 10 with a plurality of cylinder openings 11, rams 12 operating in the cylinder openings or body, sealing means 13 acting between the rams and the walls of the cylinder openings, and a pressure plate 14 engaged by the rams.

The body 10 in its preferred form is elongate and is a unitary or integral member formed of a single body or bar of stock, preferably round in cross sectional configuration. In the preferred form of the invention illustrated the elongate body 10 has a flattened side 16 and the cylinder openings 11 are in a series extending longitudinally of the body and enter it from the side 16 and extend a substantial distance into the body so that their inner or bottom ends 17 terminate short of, but close to, the side of the body 10 opposite the flattened side 16. The upper end portion of the body projects a substantial distance above the uppermost cylinder opening 11 to form what will be termed a head 20 which head is formed or provided with a fluid handling chamber 21 which is in communication with the flexible connection C through a suitable fitting 22.

In the preferred form of the invention the several cylinder openings 11 are of like size and are in the nature of straight cylindrical bores that enter the body 10 from the flattened side 16 to terminate at flat bottoms 17. A fluid handling port 31 connects chamber 21 with the uppermost cylinder opening adjacent the bottom 17 thereof and connecting ports 33 join adjacent cylinder openings adjacent the bottoms thereof so that all of the cylinder openings are in communication with each other and with the chamber 21.

The head 20 in its preferred form is provided with an extension in the form of a shank 35 having a cross arm 36 at its upper end which shank and cross arm form a handle by which the body can be conveniently manipulated.

The rams 12 are slidable in the cylinder openings 11 and as shown in the drawings they may be alike and each may be provided at its outer end with a convexly curved end portion 38. It is the convex end of each ram that engages the inner side 39 of pressure plate 14.

In accordance with the preferred form of the invention a boss or stud 40 projects from the inner end of each ram 12 and when the ram is in its innermost position the stud abuts the bottom 17 of the cylinder opening carrying the ram to space the inner end of the ram from the bottom.

The sealing means 13 provided to act between each ram and the wall of the cylinder opening in which the ram operates preferably involves a sealing disc 45 which may be retained at the inner end of the ram by a retainer 46 carried on the stud 40 and retained by a key 47. The parts are arranged and related so that when the ram is in the innermost position its sealing member 45 is spaced from the bottom 17 of the cylinder opening so that the ports 33 communicating with the cylinder opening are left uncovered for free passage of fluid between adjoining cylinder openings. In practice the sealing disc or member 45 is such as to fit tightly in the cylinder opening that carries the plunger, making it unnecessary to provide any separate or independent means for retaining the plunger in the cylinder opening.

The pressure generating unit involves, generally, a fluid supply means provided by a reservoir 50 and a pump 51 which receives fluid from the reservoir and delivers it to the flexible connection C for communication to the cylinders of the ram unit A. In the case illustrated a common base 52 carries the reservoir 50 and the pump 51, and the pump 51 is a simple or conventional pressure pump in which there is a cylinder 53 having a piston 54 operating therein and the fluid is handled by a suitable valve assembly at 55 so that as the piston is reciprocated in the cylinder fluid is drawn into the cylinder and then forced therefrom out through the flexible connection C. The operating means provided for gaining the desired reciprocation of the piston 54 is shown as involving an operating lever 60 carried by a link 61 and connected to the piston 54 by a pivot pin 62. The link is shown pivoted to the pump structure by a pivot pin 65. From Fig. 5 of the drawings it will be apparent that suitable reciprocation of the pump lever or handle 60 causes reciprocation of the piston 54 so that fluid is circulated to the ram unit in the desired manner. It is to be understood, of course, that any suitable valve construction or mechanism may be provided at 55 to gain the proper circulation of fluid under the influence of the piston action above described.

The flexible connection C, as provided by the present invention, is characterized by a single flexible member or duct one end of which is joined to the outlet of the pump 51 while the other end is joined to the end of the body of the ram unit A. In practice the connection C may be of any suitable length, it being preferred ordinarily that it be sufficiently long so that when the ram unit is in operating position, as shown in Fig. 1, the pressure generating unit B can be suitably spaced therefrom in a manner to be operated most advantageously.

The pressure release means D is provided for relieving pressure from the apparatus thus far described in order to allow for retraction of the rams in the cylinder openings after they have been moved outwardly therein by the fluid. In the form illustrated the means D involves structure for relieving pressure at the ram unit and also at the pump or pressure generator. At the head of the ram unit there is a fluid outlet opening 70 normally closed by a valve member 71 under control of a screw 72. The port 70 is in communication with the chamber 21 and when it is desired to relieve pressure from the ram unit and to allow the rams to retract the member 72 can be operated to open the valve 71, allowing enough fluid to escape so that the rams return to their inner or retracted positions. In the case illustrated a relief port 80 is provided in the pump and is normally closed by a valve 81 operated by a screw member 82. If desired the valve 81 can be opened allowing fluid to escape through the port 80 back to oil reservoir 50. In practice either one or both of the pressure relieving means just described can be resorted to as circumstances require.

The retaining means E provided by the present invention involves a member 90 engageable with, preferably around, the body, and operable to engage over one or more of the rams carried by the body. In the case illustrated the retainer E is in the form of a sleeve engaged around the body

and it engages a group of two rams leaving the other rams of the unit A to operate on the pressure plate 14. In practice the retainer E can be used or not, as circumstances require. The pressure plate 14 may be made of sufficient length so that all of the several operable rams can simultaneously engage it, as shown in Fig. 1, if full operation is desired, or it may be shorter to cooperate with the retainer as shown in Fig. 2.

In the case of a normal and typical operation of the structure provided by the invention a suitable bore 95 is provided in the block or body 96 of concrete or rock to be deflected or split. The ram unit A is inserted in the bore 95 with the side of the body 10 opposite the flattened side 16 bearing against one wall of the bore, while the pressure plate 14 bears on the other wall. It is preferred that the pressure plate 14 be so formed that its outer side be convex to seat in the bore 95 while its inner side 39 is flat and is engaged by the convex ends of the rams. When the ram unit is in position, as shown in Fig. 3, the pressure generator B located remote from the ram unit, as shown in Fig. 1, is suitably operated so that the rams are forced outwardly in their cylinders and as this operation is continued great pressure develops between the body 10 and the pressure plate. When sufficient pressure has been thus developed the body or formation 96 will break or crack, as at 98, whereupon the relief means D can be operated relieving the rams so that they can be retracted and the ram unit withdrawn for a next operation. As above described, if all of the rams are not desired a retainer E can be employed in a manner such as is indicated in Fig. 2 of the drawings, and it will be apparent that by employing a retainer E of suitable length any desired number of rams can be taken out of service, as circumstances require.

Having described only a typical preferred form and application of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may

appear to those skilled in the art and fall within the scope of the following claims.

Having described my invention, I claim:

1. A ram unit of the character described including, an elongate body substantially round in cross section and having cylindrical openings extending into it from one side and spaced apart longitudinally of the body, there being ports connecting the inner ends of the openings, rams round in cross section and slidable in the openings and having convex outer ends, the rams being substantially coextensive in length with the said openings, a retainer engaged with the body and selectively engaged with some only of the rams, and a pressure plate extending lengthwise of the body and engaged by the outer ends of the rams other than those engaged by the retainer.

2. A ram unit of the character described including, an elongate body substantially round in cross section and having cylindrical openings extending into it from one side and spaced longitudinally thereof, there being ports connecting the inner ends of the openings, rams slidable in the openings and having projecting convex outer ends, an annular retainer engaged around the body and selectively engaged with some only of the rams to hold them inactive, and a pressure plate extending lengthwise of the body and engaged by the outer ends of the rams other than those engaged with the retainer.

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