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(54) **DEVICE FOR DIRECTED SPLITTING OF MONOLITH OBJECTS.**

(57) The device comprises a cylindrical casing (1) with a radial slot (2) over its entire height. In the slot (2) is mounted with the possibility of reciprocating movement a telescopic piston (3), whose parts (4, 5) are U-shaped and have their working surfaces (7, 8) facing the internal surface of the radial slot (2). The end-faces (9, 10) of the lateral walls of said parts (7, 8) of the piston (3) are wedge-shaped. The central part (6) of the piston (3) has the form of a wedge, whose edge is directed outwards of the radial slot (2). The piston (3) is provided with internal cavities (13, 14, 15) each of them being individually con-

EP 0 404 944 A1

nected to a working medium feeding system and being formed by grooves made in the working surfaces (7, 8) of the parts (4, 5) of the piston (3), in the body of the cylindrical casing (1) and in the body of the central part (6).

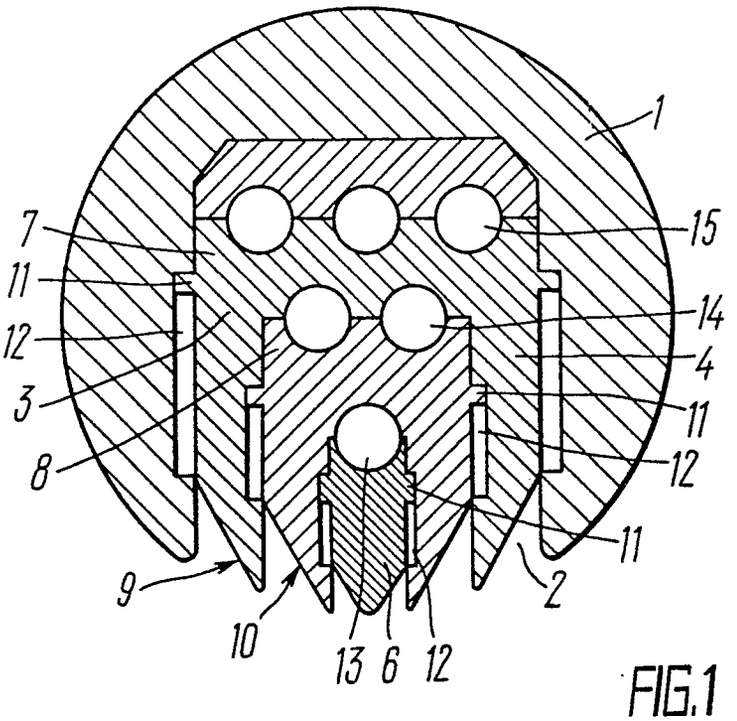

FIG.1

APPARATUS FOR DIRECTIONAL DESTRUCTION OF MONOLITHIC OBJECTS

Technical Field

This invention relates to repair, construction and mining practice and, more particularly, to apparatuses for directional destruction of monolithic objects.

Background of the Invention

Known in the prior art is an apparatus for directional destruction of monolithic objects (SU, A, 315759) comprising a cylindrical shell with a radial slot extending throughout its height and accommodating a piston capable of reciprocating in a lateral direction. The piston has the form of a profiled tyre with extensible strikers rigidly secured thereto. A cavity formed between the walls of the radial slot and the internal surface of the piston tyre is provided with an elastic-wall chamber communicating with the service fluid supply system and contacting with the piston tyre throughout its length. As the fluid is fed under pressure into the chamber, said fluid acts on the piston and pushes out the striker elements which carry out the directional destruction of the solid mass.

The use of an integral piston denies the possibility of applying the force of the piston to the solid mass by stages which is required first for demolishing concrete then for breaking the reinforcing cage in the reinforced--concrete block. Besides, due to the provision of only one chamber, the piston fails to build up sufficient forces for breaking the reinforcing cage.

Another known apparatus for directional destruction of monolithic objects (SU, A, 675183) comprises a cylindrical piston with a radial slot extending throughout its height, a telescopic piston acting on an operating plate, said piston being installed in the radial slot with a provision for limited reciprocating motion in a lateral direction and having an inner cavity communicating with the service fluid supply system.

The telescopic piston is made up of two parts, viz., outer and inner ones, the outer part having the shape of a hollow cylinder with flat end plates while the inner part is made in the form of a rod with an oval head at one of its ends. The outer part of the piston is installed in the radial slot of the shell while the inner part, in the central hole of the outer part, the oval head of the rod being directed towards the operating plate. The inner cavity communicating with the fluid supply system through a passage is formed in the outer part of the piston by a hollow accommodating the flat end of the rod. To limit the stroke of the outer part of the piston, the radial slot of the shell is provided with a ring. The stroke of the inner part of the piston is limited by an external projection on the rod and by a shoulder on the surface of the inner cavity of the piston.

To build up powerful forces, a number of successively installed pistons are housed in a common shell with partitions and have a common passage for the delivery of service fluid, and are in interaction with a common operating plate.

When the service fluid is delivered under pressure through the passage into the inner cavity of each piston, the parts of the pistons extend as an integral unit, acting on the operating plate by the oval head of the rod. As soon as the outer part of the piston comes all the way to bear against the limiting ring, the inner part of the piston continues to move out, acting on the operating plate with the oval head. The operating plate acts on the walls of the object, thus carrying out directional destruction of the object. Large-size solid masses can be split by increasing the piston stroke.

However, the known apparatus has not been put in wide practice and, in particular, for destroing the reinforced-concrete solid masses because said apparatus produces directional forces limited in the intensity of their action on the object walls because the forces transmitted to the operating plate by the oval head of the rod are originated

by the effect of the fluid applied to the piston parts whose volume is limited by the volume of one inner cavity. If a number of pistons are used simultaneously, the common fluid supply system denies the possibility of moving the pistons one after another.

Summary of the Invention

The main object of the present invention resides in providing an apparatus for directional destruction of monolithic objects wherein the novel design of the telescopic piston would permit increasing its stroke and its forces necessary for breaking the reinforcing cage of a reinforced-concrete mass.

This object is achieved by providing an apparatus for directional destruction of monolithic objects comprising a cylindrical shell with a radial slot extending throughout its height, a telescopic piston installed in the radial slot of the cylindrical shell with a provision for limited reciprocating motion in a lateral direction and having internal cavities communicating with a fluid supply system wherein, according to the invention, the parts of the telescopic piston, excluding the central one, in the section perpendicular to the longitudinal axis of the cylindrical shell are U-shaped corresponding in shape to the radial slot of the cylindrical shell, the mating steps of these parts of the telescopic piston face the internal surface of the radial slot of the cylindrical shell while the outer faces of their side walls are wedge-shaped; besides, the central part of the telescopic piston has the shape of a wedge whose point is directed outward of the radial slot of the cylindrical shell and each internal cavity of the telescopic piston is in individual communication with the service fluid supply system, the internal cavities of the parts of the telescopic piston, except the internal cavities of the end portion, are formed by hollows made in the mating steps of the piston parts and in the body of the central part of the telescopic piston while the inner cavi-

ties of the end portion are formed by hollows made in its step and in the body of the cylindrical shell, the side walls of each part of the tekescopic piston having projections interacting with the internal surface of the side walls of the mating adjacent part of the telescopic piston provided with limiting stops.

It is practicable that the apparatus should be provided with elastic wall chambers accommodated in the internal cavities of the telescopic piston.

It is preferable that the steps of all the parts of the telescopic piston should be magnetized.

The disclosed invention allows for destruction of monolithic masses of reinforced concrete.

Brief Description of the Drawings

Now the invention will described by way of example with reference to the accompanying drawings, in which:

Fig. 1 shows the design of the apparatus for directional destruction of monolithic objects, top view, according to the invention;

Fig. 2 is a general view of the apparatus for directional destruction of monolithic objects located in a blast hole, according to the invention;

Fig. 3 shows a successive connection of two apparatuses for directional destruction of monolithic objects, according to the invention;

Fig. 4 shows the position of the telescopic piston in the working position, according to the invention.

Best Mode of Carrying Out the Invention

The apparatus for directional destruction of monolithic objects, according to the invention, intended, say, for making door and window apertures comprises a cylindrical shell 1 (Fig. 1) with a radial slot 2 extending throughout its length, a telescopic piston 3 accommodated in the slot with a provision for limited reciprocating motion in a lateral direction. In the section perpendicul-

ar to the longitudinal axis of the shell 1, the parts 4, 5 of the piston 3 are U-shaped corresponding to the shape of the radial slot 2 while the central part 6 of the piston has the shape of a wedge whose point is directed outward of the radial slot 2. The steps 7, 8 of the parts 4 and 5 face the internal surface of the radial slot 2 and the outer face ends 9, 10 of the side walls of these parts 4 and 5 are wedge-shaped. The stroke of the piston 3 is limited by providing its parts 4, 5, 6 with projections 11 entering the closed slots 12 made on the internal surfaces of the side walls of the parts 4 and 5 and of the radial slot 2 respectively, and functioning as limiting stops. The central part 6 of the piston 3 has, for example, one internal cavity 13 formed by the hollows in the body of the part 6 and in the mating step 8 of the part 5. The part 5 has two internal cavities 14 formed by the hollows made in the mating steps 7, 8 of the parts 4, 5. The end portion 4 has, for example, three internal cavities 15 formed by hollows in its step 7 and in the body of the cylindrical shell 1. The cavities 13, 14, 15 are provided with pipe unions 16, 17 (Fig. 2) and each of these cavities is in individual communication with the service fluid supply system (not shown in the drawing). The pipe unions 17 are provided with plug nuts 18 (Figs 2, 3). For fixing together all the parts 4, 5, 6 (Fig. 1) of the piston 3, the steps 7, 8 should better be magnetized. Besides, it is good practice to install elastic-wall chambers 19 (Fig. 2) in the cavities 13, 14, 15, fixing the ends of said chambers on the pipe unions 16, 17.

The disclosed apparatus for directional destruction of monolithic objects functions as follows.

The apparatus is introduced into a hole drilled in the monolith. The service fluid, e.g. oil, is delivered under a pressure of 100 MPa from the hydraulic plant (not shown in the drawing) through pipe unions 16 into the cavities 13, 14, 15 or into their chambers 19 (Fig. 2). The chambers 19 (Fig. 2) grow in volume gradually and move the parts 4, 5 and 6 (Fig. 1) of the piston 2.

When the service fluid is delivered into all chambers 19 (Fig. 2) at once, the parts 4, 5 and 6 (Fig. 1) of the piston 3 moving simultaneously, destroy the monolith. When the fluid is delivered into the cavity 13 with chamber 19 (Fig. 2), this moves the central part 6 which cuts into the reinforced-concrete mass and produces a crack. Then the fluid is delivered into the cavities 14 (Fig. 1) with chambers 19 (Fig. 2) which move the part 5 (Fig. 1); said part penetrates into the crack, enlarges it in the solid mass of reinforced concrete and spreads apart the reinforcement; meanwhile, pressure in the cavity 13 of the part 6 may be thrown off. When the service fluid is delivered into the cavities 15 with chambers 19 (Fig. 2) this moves the end portion 4 (Fig. 1) which cuts into the crack, and breaks the reinforcing cage; meanwhile, pressure in the cavities 13 and 14 of the parts 6 and 5 may be thrown off.

As the pressure is relieved, the parts 6, 5 and 4 come back to the initial position. The apparatus is transferred into the next hole and the cycle is repeated over again.

If necessary, it is possible to install several apparatuses into one hole, connecting them in succession in which case the plug nuts 18 (Fig. 3) are installed on the lower apparatus only.

The given design permits destroying the solid mass in one direction from the apparatus which is required for making apertures for doors, windows and the like and develops the required forces and stroke of the piston 3 (Fig. 1) for breaking the reinforcing cage in solid reinforced concrete because extension of all the parts 4, 5, 6 of the piston 3 forms a wedge and because each part 4, 5, 6 of the piston 3 provided with one or more cavities 19 (Fig. 2) acting individually on the parts 4, 5, 6 of the piston 3, builds up forces applied to the solid mass.

Industrial Applicability

The invention will be used most successfully in construction practice as an apparatus for destroying reinforced concrete in one direction thereby forming door, window apertures and the like.

CLAIMS:

1. An apparatus for directional destruction of monolithic objects comprising a cylindrical shell (1) with a radial slot (2) extending throughout its height, a telescopic piston (3) installed in the radial slot (2) of the cylindrical shell (1) with a provision for limited reciprocating motion in a lateral direction and provided with internal cavities (13, 14, 15) communicating with a fluid supply system, c h a r a c t e r i z e d in that the parts (4, 5) of the telescopic piston (3), excluding the central part, in a section perpendicular to the longitudinal axis of the cylindrical shell (1) are U-shaped corresponding to the shape of the radial slot (2) of the cylindrical shell (1), the steps (7, 8) of these parts (4, 5) of the telescopic piston (3) are directed towards the internal surface of the radial slot (2) of the cylindrical shell (1) and the outer end faces (9, 10) of their side walls are wedge-shaped; besides, the central portion (6) of the telescopic piston (3) has the shape of a wedge whose point is directed outward of the radial slot (2) of the cylindrical shell (1) and each internal cavity (13, 14, 15) of the telescopic piston (3) is in individual communication with the fluid supply system and the internal cavities (13, 14) of the parts (5, 6) of the telescopic piston (3) except the internal cavities (15) of the end part (4) are formed by the hollows made in the mating steps of the parts (4, 5) and in the body of the central part (6) while the internal cavities (15) of the end part (4) are formed by the hollows made in its step (7) and in the body of the cylindrical shell (1), the side walls of each part (4, 5, 6) of the telescopic piston (3) having projections (11) interacting with the internal surface of the side walls by the mating adjacent part (4, 5, 6) of the telescopic piston (3) provided with limiting stops.

2. An apparatus for directional destruction of monolithic objects according to Claim 1, c h a r a c t e r i z e d in that it is provided with elastic-wall chambers (19)

located in the internal cavities of the telescopic piston (3).

3. An apparatus for directional destruction of monolithic objects according to Claim 1, c h a r a c t e r i z e d in that the steps (7, 8) of all the parts (4, 5, 6) of the telescopic piston (3) are magnetized.

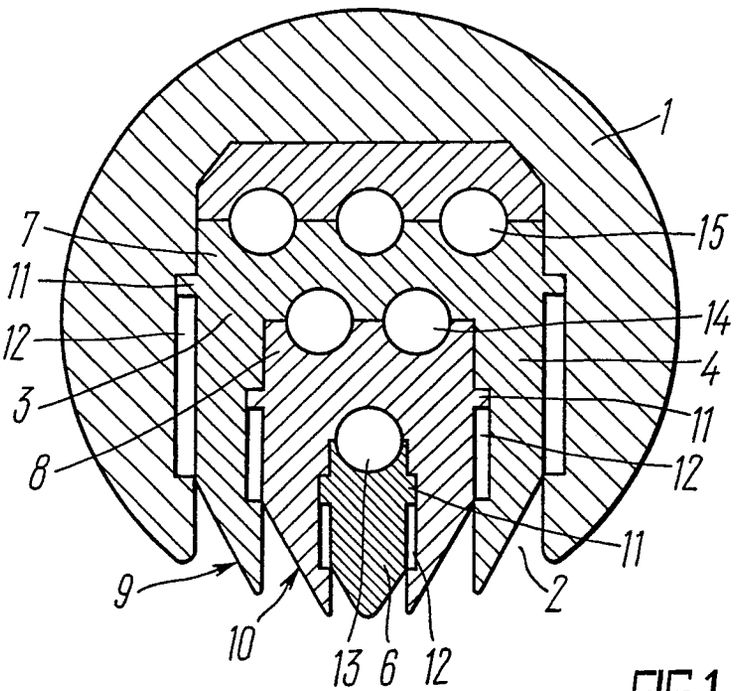

FIG.1

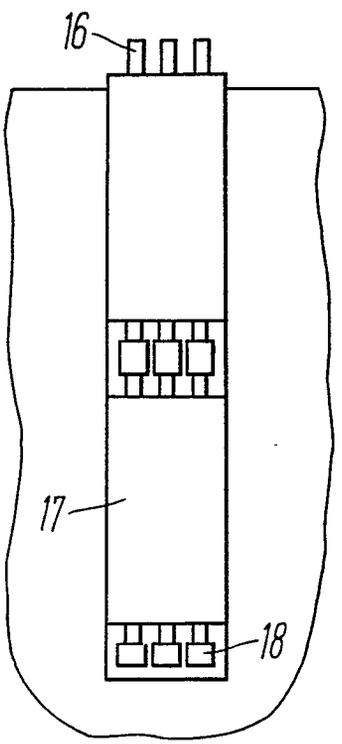

FIG.3

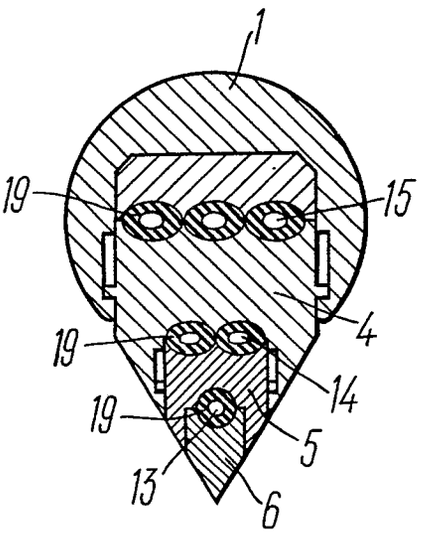

FIG.4

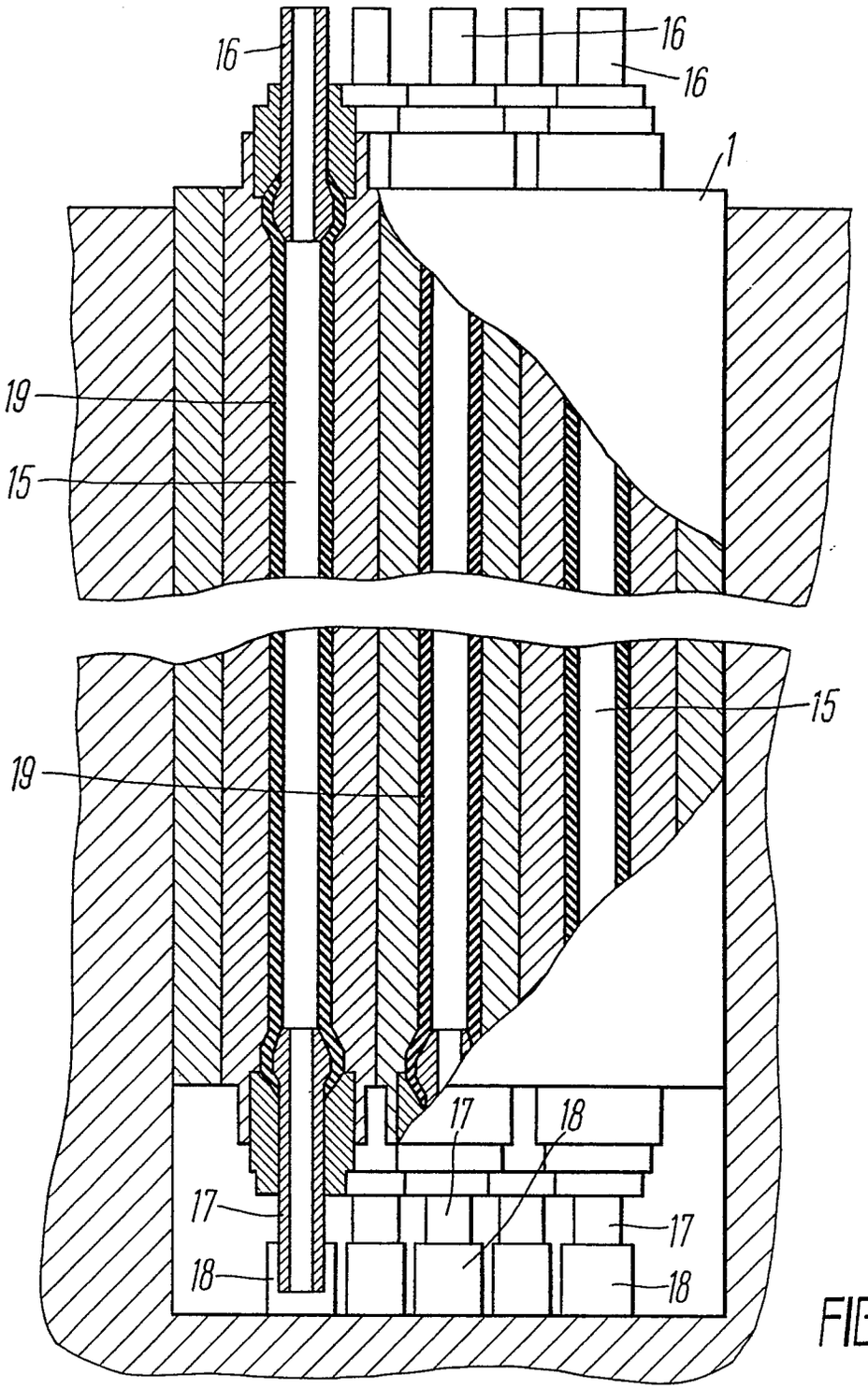

FIG. 2

INTERNATIONAL SEARCH REPORT

International Application No IPC/SU 89/00010

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl.[5] E 21 C 37/08, 37/02

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
5 Int. Cl.	E 21 C 37/00, 37/02, 37/04, 37/08, 37/10

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
A	US, A, 4114951 (EDWARD R LANGFIELD) 19 September 1978 (19.09.78), figure 27-28, column 14, lines 60-65, column 15, lines 1-25	1
A	FR, A1, 2288849 (VILLARD ANDRE) 21 May 1976 (21.05.76) figure 4, page 8, lines 15-40, pages 9-10	1
A	DE, A1, 3219618 (OSAKEYHTIO TAMPELLA) 5 January 1983, (05.01.83), figure 2, pages 5-6	1-2

* Special categories of cited documents: [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
23 August 1989 (23.08.89)	2 October 1989 (02.10.89)
International Searching Authority	**Signature of Authorized Officer**
ISA/SU	