(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 238 917**
A1

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **87103253.8**

(22) Date of filing: **06.03.87**

(51) Int. Cl.⁴: **B 25 C 1/12**

(30) Priority: **25.03.86 IT 6723586**

(43) Date of publication of application: **30.09.87**
Bulletin 87/40

(84) Designated Contracting States: **AT BE DE ES FR GB GR SE**

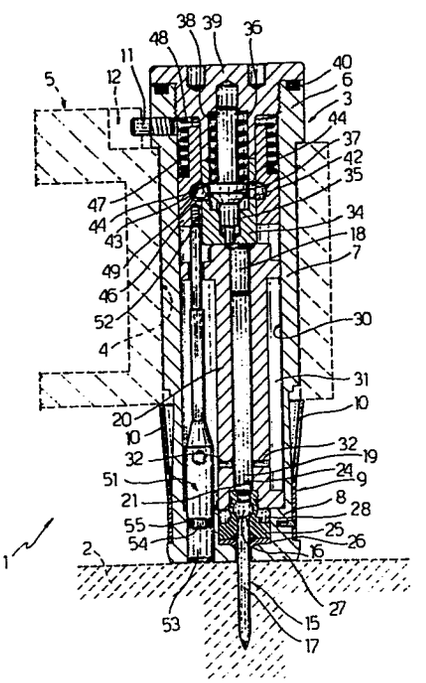
(71) Applicant: **VALSELLA MECCANOTECNICA S.p.A., Località Fascia d'Oro, I-25014 Castenedolo (IT)**

(72) Inventor: **Topa, Ferdinando, Via Fenaroli, 2, I-25014 Castenedolo (IT)**

(74) Representative: **Prato, Roberto et al, c/o Ing. Carlo e Mario Torta Via Viotti 9, I-10121 Torino (IT)**

(54) A device provided with means for fixing it to a support wall.

(57) The device (1) essentially comprises a nail (15) which is driven into a support wall (2) by the gases developed by an explosive cartridge (18), and deformable braking means (25) which, during the translation of the nail (15) towards the wall (2), retain the head (16) and a part of the shank (17) of the nail (15) whilst the other part of the shank (17) is allowed to pass out of the body (3) of the device (1) to drive itself into the said wall (2).



EP 0 238 917 A1

0238917

A DEVICE PROVIDED WITH MEANS FOR FIXING IT TO A SUPPORT WALL

The present invention relates to a device provided with means for fixing it to a support wall. Particularly, but not exclusively, the device according to the present invention has the purpose of anchoring itself as well as an object connected to it, such as for example an explosive charge, to a wall of a ship or a submerged structure with the maximum possible discretion. Currently the fixing of an explosive charge to the hull of a ship is effected by means of the use of suitable suction or magnetic systems; the effectiveness of the fixing in this case is not, however, reliable, especially when the surface of the hull is not smooth but has encrustations of various type due for example to the presence of shellfish, or else the fixing cannot be made in that the hull is made of a material other than steel such as light alloy or composite material. The object of the present invention is that of providing a device which can fix itself to a support wall of a structure, preferably a submerged structure, and which is able to effect a secure mechanical connection with the maximum containment of noise or other signals which become manifest during the fixing operations.

The said object is achieved with the present invention in that it relates to a fixing device for mechanically connecting itself to a support wall of appropriate material, characterised by the fact that it includes a nail provided with a head and a shank, which can be thrust towards the said wall by the action exerted by gases developed by an explosive cartridge; the said device further including braking means operable, by deforming, to absorb a part of the kinetic energy associated in use with the said nail, in such a way as to retain this latter in a predetermined position in which the head and an adjacent part of the shank are rigidly connected to the body of the said device whilst an end part of the shank

projects from the body of the said device to be driven into the said wall without the escape of gases and therefore without noise.

For a better understanding of the present invention a preferred embodiment is now described purely by way of non-limitative example and with reference to the attached drawings, in which:

Figure 1 is a longitudinal section of a fixing device formed according to the present invention; and

Figure 2 illustrates the same fixing device as in Figure 1, coupled to a predetermined support wall.

With particular reference to Figure 1 the reference numeral 1 generally indicates a device which can be fixed to a support wall 2, such as, for example, the outer wall of a ship or a submerged structure in general. Conveniently the device 1 has a hollow body 3 of essentially cylindrical structure, which is mechanically coupled with a cylindrical seat 4 formed in a handle 5 which, in a manner not illustrated, extends from the body of an explosive charge also to be fixed to the said wall 2. In particular, it is to be observed that the body 3 of the device 1 has a head portion 6 of enlarged section which rests on the upper surface of the handle 5, an intermediate portion 7 which is received within the interior of the cylindrical seat 4,and an end portion 8 which extends beyond the handle 5 on the side opposite the head portion 6. The portion 8 is coupled to the handle 5 by means of an annular band 9 fitted around the portion 8 itself, and from which extend a plurality of elastically deformable tongues 10 facing outwardly in the direction of the head portion 6, in such a way as to interfere with the facing surface of the handle 5. To the head portion 6 of the body 3 there is further screwed a reference peg 11, extending radially and able to cooperate with a radial seat 12 in the handle 5 for the purpose of ensuring correct relative positioning of the body 3 of

the device 1 with respect to the said handle 5.

According to the present invention the device 1 essentially comprises a nail 15 provided with a head 16 and a shank 17, which can be thrust in the direction of the wall 2 by the action exerted by the gases developed by an explosive cartridge 18. The nail 15 and the cartridge 18 are housed within a cylindrical bore 19 of a barrel 20 and between them there is interposed a seal 21 in the form of a flat disc which is slidable along the barrel 20 and which has the purpose of preventing gases developed by the cartridge 18 from being able to escape past the head 16 of the nail 15 and therefore reduce the effectiveness of the thrust transmitted to the nail itself. The tip of this latter is covered by a cap 22, conveniently made of a plastics material, the purpose of which is that of maintaining the nail 15 correctly positioned with respect to the bore 19 of the barrel 20. According to the present invention the device 1 further includes a bush 25, close to an outlet opening 24 of the barrel 20, which rests by means of a metal disc 26 on a bottom wall 27 of the body 3 of the device 1. The bush 25 is made of plastically deformable material and, between it and the facing surface of the end portion 8 of the body 3 there is provided an expansion chamber 28 which, in use, is partially occupied by the bush 25 deformed essentially by the head 16 of the nail 15 (see also Figure 2). The object of the bush 25 is therefore that of absorbing, by deformation, a part of the kinetic energy associated in use with the nail 15 in such a way as to retain this latter in a predetermined position in which the head 16 and a part of the shank 17 adjacent to it are rigidly connected to the body 3 of the device 1, whilst an end part of the shank 17 projects from the body 3, after having pierced the disc 26 and the bottom wall 27, to drive itself into the said support wall 2.

Finally, it is observed that the barrel 20 is housed within a

cylindrical seat 30 presented by the body 3 and defining with this latter a chamber 31 communicating with the internal cylindrical bore of the barrel 20 through a plurality of radial through holes 32 of the barrel 20, essentially at its outlet opening 24.

On the barrel 20, on the end opposite that having the said outlet opening 24, rests a tubular shutter 34 within which a striker 35 is axially slidable against the action of a coil spring 36; in more detail, the opposite ends of the coil spring 36 cooperate, respectively, with a radial annular projection 37 of the striker 35 and a stop portion 38 of a plug 39 which sealingly closes the top of the body 3 with the interposition of an annular seal 40.

The projection 37 of the striker 35 has, on the side facing the barrel 20, a frustoconical surface 42 which cooperates with at least one ball 43 partially housed within an associated radial recess 44 in the shutter 34. Externally of this a sleeve 46 is axially slidable against the resilient action exerted by a coil spring 47 the opposite end portions of which rest respectively on the sleeve 46 itself and on a surface 48 of the plug 39. On the side facing the shutter 34 the sleeve 46 has an annular seat 49 with an essentially hemispherical transverse section which, in the course of the said longitudinal sliding, can line up with the radial recess 44 to receive the ball 43. The axial displacement of the sleeve 46 is controlled by a small piston 51 the axis of which is parallel to the axis of the barrel 20 and which has a threaded end 52 which engages a corresponding threaded hole in the sleeve 46, and an opposite end 53 which projects from the body 3 of the device 1 through the said bottom wall 27. At the end 53 the small piston 51 has a portion 54 of reduced section around which is disposed a toroidal seal 55. The end portion 53 of the small piston 51 further has a radial through hole 57 which is engaged by a cotter pin 58 carrying at one end a ring 59 and defining with this

latter a safety mechanism 60 tending to prevent the accidental and unwanted displacement of the small piston 51.

The device 1 operates as follows. It is first of all observed that in Figure 1 the device 1 is illustrated in the safety position. In fact, by reason of the cotter pin 58 of the mechanism 60 the piston 51 cannot move upwardly to carry the seat 49 of the sleeve 46 into correspondence with the ball 43. This latter therefore prevents the downward movement of the striker 35.

The removal of the cotter pin 58, effected for example by means of the ring 59, does not cause any relative displacement of the various members with respect to that described above in that the piston 51 is maintained in the position illustrated in Figure 1 by the spring 47.

With particular reference to Figure 2, placing the device 1 on the surface of the wall 2 causes translation of the piston 51 and consequent displacement of the annular seat 49 of the sleeve 46 into correspondence with the radial recess 44 housing the ball 43. This latter, by the action of the radial thrust component which is transmitted to it by the surface 42 of the projection 37 of the striker 35, biased by the spring 36, is moved at least partly into the interior of the said annular seat 49. Consequently the striker 35 moves freely downwardly under the thrust of the associated spring 36 and acts against the cartridge 18 causing it to explode.

As already partially described hereinabove, the gases developed by the cartridge 18 cause expulsion of the nail 15 the tip of which traverses the bush 25, pierces the metal disc 26 and the bottom wall 27 of the body 3, driving itself into the wall 2. As soon as the head 16 of the nail 15 has passed the radial holes 32 the gases developed by the cartridge 18 can also flow out into the interior

of the chamber 31 so that the pressure exerted by these latter on the head 16 of the nail 15 falls rapidly. Simultaneously, the head 16 of this nail deforms part of the bush 25 which is dimensioned in such a way as to retain the said head 16 as well as a portion of the shank 17 adjacent to it. In this way the nail 15 performs the function of a mechanical connection element between the device 1 and the facing wall 2.

From a study of the characteristics of the device formed according to the present invention the advantages which it allows to be obtained are evident. First of all the retention of the head 16 of the nail 15 within the device 1 by gradual braking of the nail, essentially obtained by means of the bush 25, makes it possible not to break the nail and therefore form a stable attachment of the device 1, and the possible explosive charge connected to it, to the wall 2. The fixing is in this way independent of the material from which the wall is made and can be achieved even in the presence of possible encrustations on the surface 2, which would have prevented any fixing with suckers, obviously as long at the thickness of such encrustations is not greater than the length of the part of the nail which projects from the device 1. It is further observed that the gases produced by the cartridge 18 are retained within the interior of the body 3 of the device 1 and this is achieved essentially by means of the disc 26 perforated by the nail 15 in the course of the translation of this latter towards the wall 2. In any case, even the gases present in the chamber 31 cannot escape from the body of the device 1 in that, in correspondence with the two possible escape routes (plug 39 and piston 51) there are disposed corresponding seals respectively indicated 14 and 55.

Moreover, the correct fixing of the device 1 to the wall 2 is guaranteed by the fact that the activation of the cartridge 18 takes place only when the end 53 of the piston 51 is thrust

upwardly by the wall 2 itself and has performed the required translation.

Finally, it is clear that the device 1 described above can be modified and varied without by this departing from the present invention. In particular, the use of the device 1 to fix an explosive charge to the wall of the hull of a ship must not be considered as limitative: in fact, this device could advantageously be utilised to fix the explosive charge at the base of columns made of reinforced concrete or, indeed, to fix any object to a wall of suitable material.

CLAIMS

1. A fixing device for mechanically attaching itself to a support wall (2) of suitable material, characterised by the fact that it comprises a nail (15) having a head (16) and shank (17) which can be thrust towards the said wall (2) by the action exerted by gases developed by an explosive cartridge (18): the said device further including braking means (25) operable, by deforming, to absorb a part of the kinetic energy associated in use with the said nail (15) in such a way as to retain this latter in a predetermined position in which the head (16) and a part of the shank (17) adjacent to it are rigidly connected to the body of the said device, whilst an end part of the shank (17) projects from the body (3) of the said device to drive itself into the said wall (2).

2. A device according to Claim 1, characterised by the fact that it includes guide means (20) housing the said cartridge (18) at a first end, the said nail (15) in an intermediate position and having an outlet opening (24) which face towards the said braking means (25).

3. A device according to Claim 2, characterised by the fact that the said guide means are essentially constituted by a barrel (20) housed within the interior of the said body (3).

4. A device according to Claim 3, characterised by the fact that the said barrel (20) has a cylindrical bore (19) the diameter of which is substantialy identical to the diameter of the head (16) of the said nail (15).

5. A device according to Claim 4, characterised by the fact that the shank (17) of the said nail (15) has a diameter less than the diameter of the said cylindrical bore (19); a positioning cap (22)

the outer diameter of which is substantially identical to the diameter of the said cylindrical bore (19) being positioned on the tip of the said shank (17).

6. A device according to any of Claims from 3 to 5, characterised by the fact that slidable sealing means (21) are interposed between the said cartridge (18) and the head (16) of the said nail (15).

7. A device according to Claim 6, characterised by the fact that the said slidable sealing means are essentially constituted by a circular seal (21) the outer diameter of which is essentially identical to that of the said cylindrical bore (19).

8. A device according to any of Claims from 3 to 7, characterised by the fact that the said barrel (20) is housed within the said body (3), and by the fact that this latter defines, with the said barrel (20), an annular chamber (31).

9. A device according to Claim 8, characterised by the fact that the said barrel (20) has at least one through hole (32), essentially in correspondence with the said outlet mouth (24), which puts the said cylindrical bore (19) into communication with the said chamber (31).

10. A device according to any of Claims from 2 to 9, characterised by the fact that the said braking means are essentially constituted by a bush (25) mounted downstream of the said guide means (20) and made of a deformable plastics material.

11. A device according to Claim 10, characterised by the fact that downstream of the said bush (25) with respect to the direction of advance of the said nail (15), there is housed a sealing disc

(26) pierced, in use, by the said nail (15) during advance of this latter towards the said wall (2).

12. A device according to Claim 11, characterised by the fact that the said disc (26) is mounted between the said bush (25) and a bottom wall (27) of the said body (3) which is also pierced, in use, by the said nail (15).

13. A device according to any preceding Claim, characterised by the fact that it includes means (35) for firing the said cartridge (18).

14. A device according to Claim 13, characterised by the fact that the said firing means are essentially constituted by a striker (35) slidable longitudinally within a shutter (34) under the action exerted by resilient means (36).

15. A device according to Claim 14, characterised by the fact that it includes a control unit for the said striker (35), the said unit being essentially constituted by an element (46) slidable with respect to the said shutter (34), and by interference means (43) movable radially with respect to the said striker between a striker locking position and a position engaged in a recess (49) of the said sidable element (46) in which the said striker (35) is disengaged.

16. A device according to Claim 15, characterised by the fact that the said slidable element is essentially constituted by a sleeve (46) having a seat (49) for receiving the said interference means (43).

17. A device according to Claim 16, characterised by the fact that the said interference means (43) are essentially constituted

by at least one ball.

18. A device according to any of Claims from 15 to 17, characterised by the fact that it includes means for controlling the displacement of the said slidable element (46).

19. A device according to Claim 18, characterised by the fact that the said means for controlling the said slidable element (46) essentially comprise a piston (51) one end (52) of which is fixed to the said slidable element (46) and an opposite end (53) of which projects out of the said body (35).

20. A device according to Claim 19, characterised by the fact that the said second end of the said piston (51) projects from the bottom wall (27) of the said body (3).

21. A device according to Claim 19 or Claim 20, characterised by the fact that it includes a removable safety mechanism (60) which blocks the translation of the said piston (51) connected rigidly to the said slidable element (46).

22. A device according to Claim 21, characterised by the fact that the said safety mechanism (60) essentially comprises a cotter pin (58) which engages a corresponding radial through hole (57) in the said second end (53) of the said piston (51).

23. A device according to any preceding Claim, characterised by the fact that it includes means (9, 10) for coupling the body (3) of the said device to one end (5) of an auxiliary device (handle).

24. A device according to Claim 23, characterised by the fact that the said coupling means (9, 10) essentially comprise an annular band (9) disposed around a portion of the said body (3) and

having at least one resiliently deformable tongue (10) snap-engageable with a surface of the said auxilliary device (5).

25. A device according to Claim 23 or Claim 24, characterised by the fact that the said auxilliary device is constituted by an explosive charge.

0238917

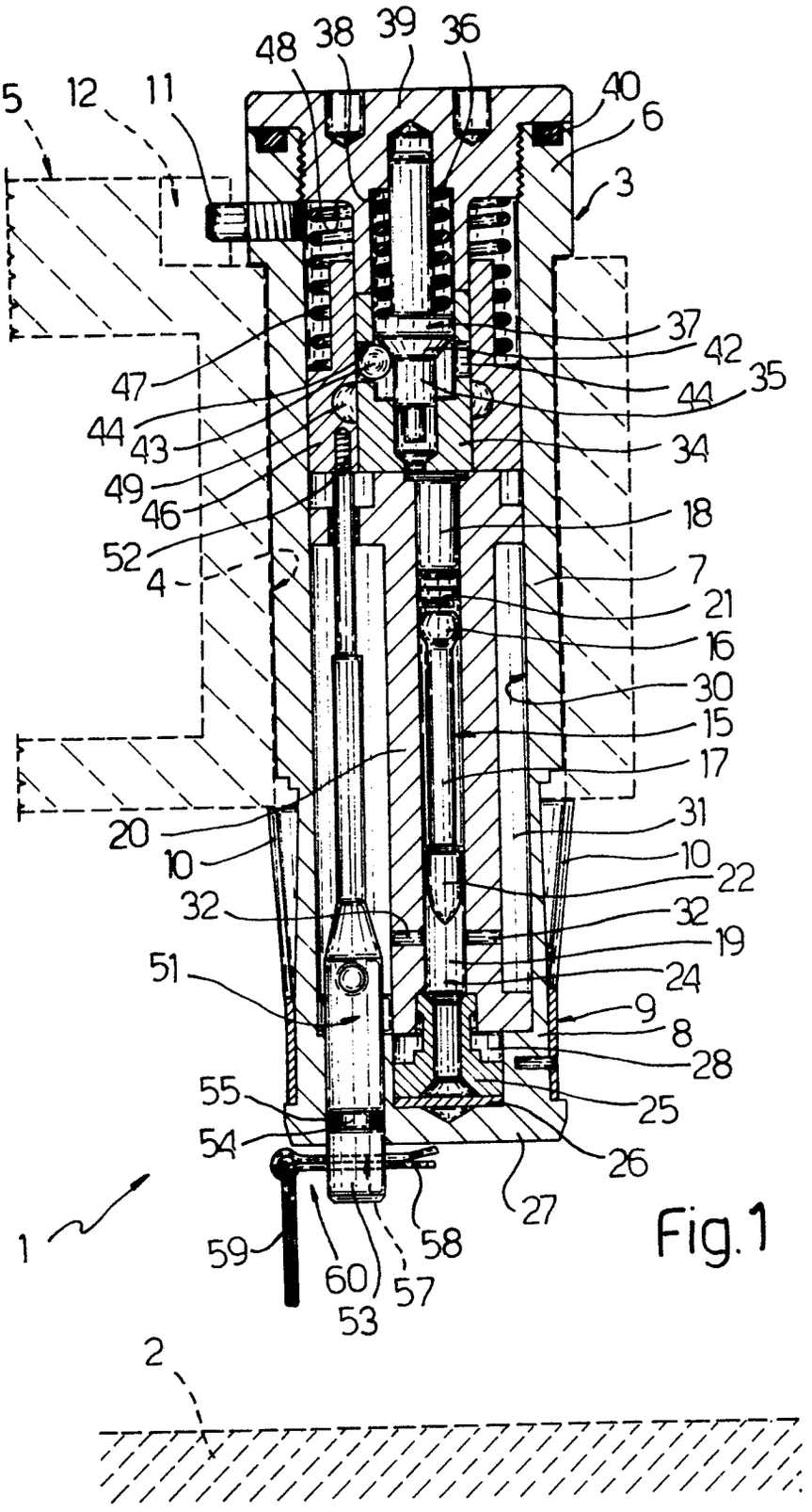


Fig.1

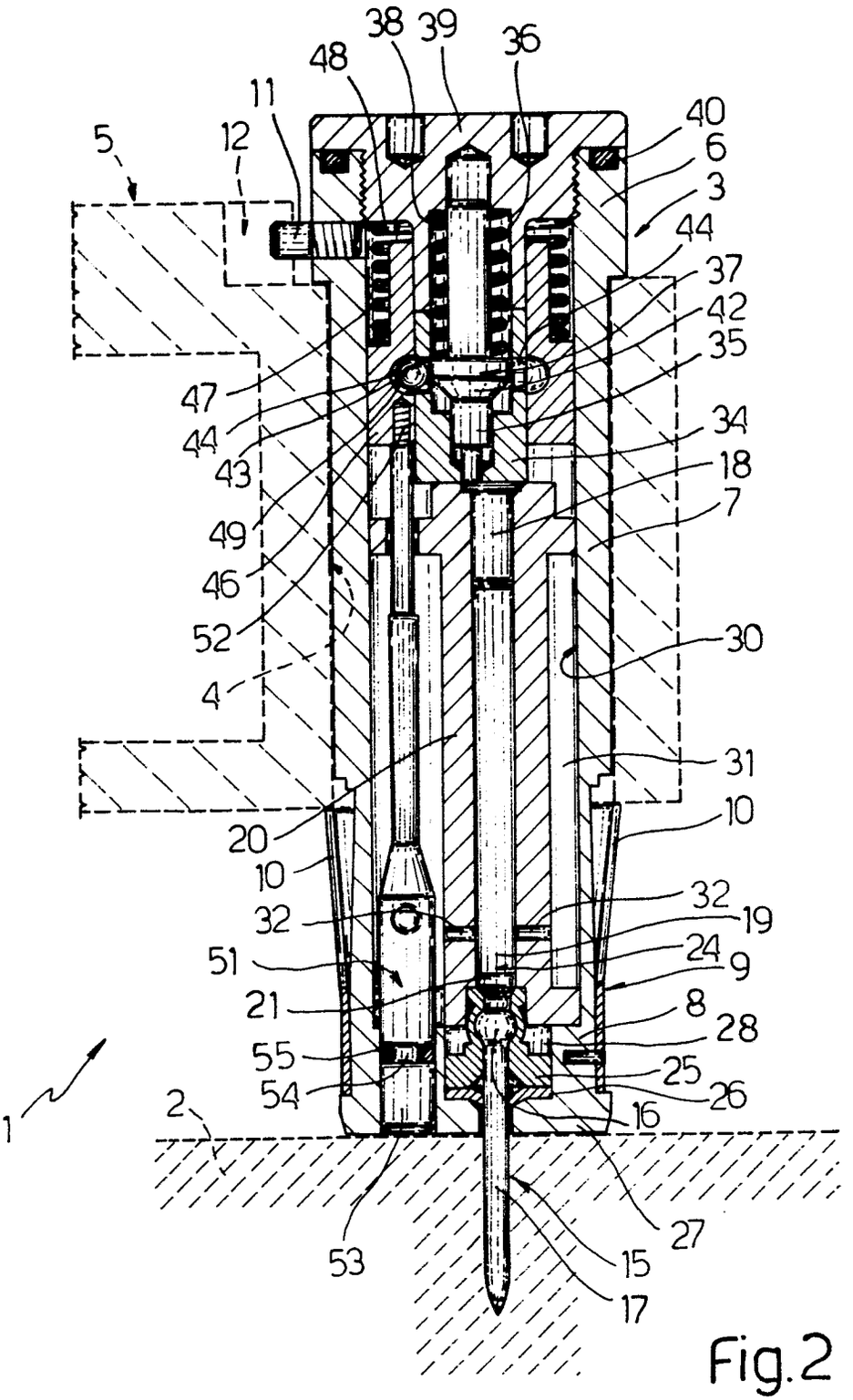

38
39
36
48
11
40
5
12
6
3
44
37
42
35
47
44
34
43
18
7
49
46
52
30
4
31
20
10
10
32
32
19
24
51
9
21
8
28
55
25
54
26
2
16
1
27
53
15
17

Fig.2

European Patent Office

EUROPEAN SEARCH REPORT

0238917
Application number

EP 87103253.8

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	US - A - 3 565 312 (TEMPLE) * Totality * --	1-3,8, 10,13-15	B 25 C 1/12
A	DE - A - 1 503 034 (RHEINMETALL) * Fig. 1-4; page 5 - page 7, 1st paragraph * --	1,15, 17,18	
A	US - A - 4 060 188 (MONSON) * Fig. 1,2; column 3, 4th paragraph * ----	1,21, 22	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 25 C 1/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	13-05-1987	KNAUER

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO Form 1503 03.82