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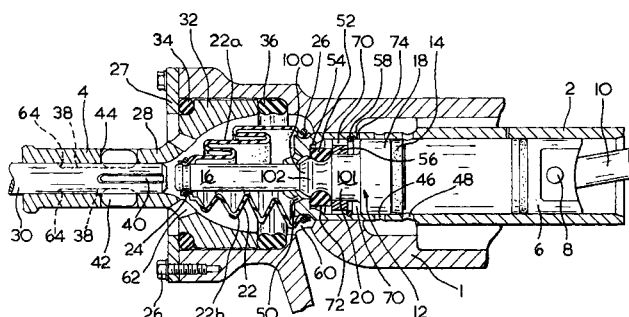
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(54) **Rotary hammer**

(57) A hammer that is capable of receiving a tool bit (30) for acting on a workpiece, and includes an air cushioning hammering mechanism that comprises a cylinder (2), a piston (6) that can be caused to reciprocate within the cylinder, and an impact member (12) that is slidably located within the cylinder and can be caused to move in response to reciprocation of the piston by means of an air cushion between the piston and the impact member so that the impact member can strike the end of a bit (30) that is held in the hammer. The hammer includes a web (22) of flexible impervious material that extends from the impact member to prevent ingress of dust from the region of the bit to the cylinder. A hammer is also provided which includes an arrangement for arresting the impact member in its forward position, which comprises a resilient ring (52) that is located within the cylinder and extends around the impact member, the impact member (12) having an intermediate portion (100)

of varying diameter so that, at a given position of the impact member in the cylinder, the intermediate portion (100) of the impact member touches the resilient ring (52) and a substantially closed chamber is formed within the cylinder (2) that extends around the resilient ring (52), further forward movement of the impact member reducing the volume of the chamber (70) and causing the resilient ring (52) to constrict the impact member. A hammer is also provided which includes a housing (1) and a tool holder (4) that can receive a tool bit (30) for acting on a workpiece, in which the bit (30) is retained in the tool holder by means of one or more locking elements (42) and the hammer includes one or more cushioning elements (34, 36) located between the tool holder (4) and the housing (1) so that impacts that are reflected by the workpiece back along the bit (30) are transmitted to the housing via the tool holder (4) and the cushioning element(s) (34, 36).



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EUROPEAN SEARCH REPORT

Application Number
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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.7)
X	GB 2 136 725 A (BOSCH GMBH ROBERT) 26 September 1984 (1984-09-26) * page 3, line 28 - line 63 * * figure 2 *	1, 2, 4	B25D17/06 B25D11/04
Y	---	5	
Y	US 4 276 941 A (WANNER KARL ET AL) 7 July 1981 (1981-07-07) * column 2, line 3 - line 18 * * column 2, line 59 - line 64 * * column 3, line 4 - line 9 * * figure 1 *	5	
Y	---	12	
A	---	1-4	
A	US 3 921 729 A (SCHMUCK PETER) 25 November 1975 (1975-11-25) * column 1, line 20 - line 25 * * column 4, line 19 - line 54 * * column 5, line 55 - line 69 * * figure 1 *	1-5	
A	US 1 594 228 A (TUTTLE GROVER G) 27 July 1926 (1926-07-27) * the whole document *	1-5	TECHNICAL FIELDS SEARCHED (Int.Cl.7) B25D
X	US 4 442 906 A (SIMPSON FRANK F) 17 April 1984 (1984-04-17) * column 3, line 34 - line 61 * * figures 1-2C *	6-9	
A	---	10	
X	US 4 284 148 A (WANNER KARL ET AL) 18 August 1981 (1981-08-18) * column 2, line 25 - line 35 * * column 5, line 16 - line 29 * * column 7, line 10 - line 15 *	6-8	

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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 27 May 2002	Examiner Fiorani, G
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			

EPC FORM 1503 03.82 (P04001)



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Application Number

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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- ☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:



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EUROPEAN SEARCH REPORT

Application Number
EP 00 30 3158

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.7)
X	GB 810 464 A (ELMAR WITTKOP; ARNO JOCHUMS) 18 March 1959 (1959-03-18) * page 2, line 26 - line 52 * * figure 1 *	11, 12	
X	DE 35 20 036 A (FROELICH & KLUEPFEL DRUCKLUFT) 4 December 1986 (1986-12-04) * page 15, line 21 - line 26 * * figure 1 *	11	
Y		12	
A		13	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
Place of search		Date of completion of the search	Examiner
THE HAGUE		27 May 2002	Fiorani, G
<p>CATEGORY OF CITED DOCUMENTS</p> <p>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</p> <p>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</p>			

EPO FORM 1503 03/82 (P04C01)



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**LACK OF UNITY OF INVENTION
SHEET B**

Application Number
EP 00 30 3158

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims: 1-5

Hammer with dust cover

2. Claims: 6-10

Hammer with a stop for the impact member

3. Claims: 11-13

Hammer with means of reducing the effect of reflected impacts

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 00 30 3158

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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27-05-2002

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
GB 2136725	A	26-09-1984	DE	3309187 A1	20-09-1984
			CH	662976 A5	13-11-1987
US 4276941	A	07-07-1981	DE	2844086 A1	30-04-1980
			GB	2031784 A	30-04-1980
US 3921729	A	25-11-1975	DE	2158503 A1	30-05-1973
			AT	324244 B	11-08-1975
			AU	4907272 A	23-05-1974
			BE	791135 A1	01-03-1973
			CA	973034 A1	19-08-1975
			CH	550644 A	28-06-1974
			FI	59044 B	27-02-1981
			FR	2162883 A5	20-07-1973
			GB	1365574 A	04-09-1974
			IE	36789 B1	16-02-1977
			IE	36789 L	25-05-1973
			IT	968498 B	20-03-1974
			NL	7214099 A	29-05-1973
			NO	135190 B	15-11-1976
			SE	397650 B	14-11-1977
US 1594228	A	27-07-1926	NONE		
US 4442906	A	17-04-1984	AT	11750 T	15-02-1985
			DE	3168959 D1	28-03-1985
			EP	0052507 A1	26-05-1982
US 4284148	A	18-08-1981	DE	2820128 A1	22-11-1979
			CH	637056 A5	15-07-1983
GB 810464	A	18-03-1959	NONE		
DE 3520036	A	04-12-1986	DE	3520036 A1	04-12-1986