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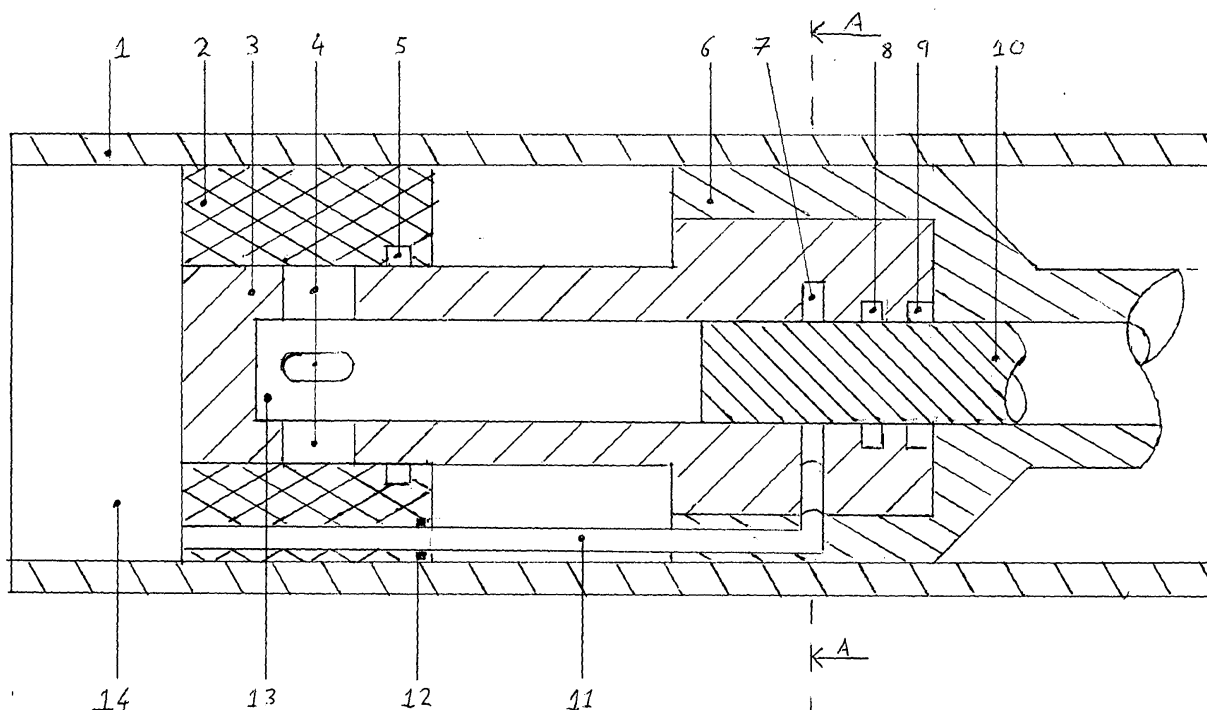
Amended claims in accordance with Rule 86 (2) EPC.

(54) **An improvement to high pressure hydraulic breech mechanisms**

(57) By providing an annular chamber 7 and a vent 11 to the radial gap between bolt 10 and high pressure cylinder 3, located between a seal 8 and a body of fluid 13 the operating range of the seal 8 will not be exceeded. The flow rate of fluid from reservoir 13 into the annular chamber 7 is restricted by the radial gap between bolt 10 and high pressure cylinder 3. The cross sectional

area of both annular chamber 7 and vent 11 are greater than that of the radial gap between bolt 10 and high pressure cylinder 3 therefore fluid cannot enter annular chamber 7 at sufficient rate to cause a pressure rise in annular chamber 7 thus seal 8 is isolated from fluid at pressures above its safe operating range. Similar protection may be applied to any seal in the mechanism.

FIGURE 1



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Description

[0001] An improvement to high pressure hydraulic breech mechanisms .

[0002] The present invention relates to an improvement to high pressure hydraulic breech mechanisms for all classes of firearm .

[0003] In a typical hydraulically locked breech mechanism the forces generated on firing can subject the fluid in the locking mechanism to pressures in excess of 2000 bar for a few milliseconds. This pressure surge is significantly greater than the operating range of conventional seals such as O rings . However by reducing the clearance between components to a minimum , typically 0.005 millimetre fluid migration is effectively prevented. A disadvantage is the high level of precision required in manufacture and assembly required to achieve these small clearances.

A further disadvantage is that reciprocating parts have a thin film of fluid on them that attracts sand , mud and similar abrasive substances causing wear and eroding the close tolerances leading to excess fluid migration .

[0004] According to the present invention there is provided an annular chamber or enlargement of the clearance between two components of a high pressure hydraulic breech, located between a body of fluid and a sealing means for containing the fluid, provided with a vent such that fluid migrating along clearance void between two components will on entering the annular chamber no longer be subject to high pressures and therefore cannot subject the sealing means to high pressures .

Providing the cross sectional area of both the annular chamber and vent are greater than that of clearance void between two components then the flow rate of fluid through the void is less than that which can be achieved through the annular chamber and vent . Therefore pressure on the fluid in the void is released upon the fluid entering the annular chamber, thus the sealing means are protected by the pressure reducing effect of the vented annular chamber. Using conventional sealing means the clearance between components may be increased up to 0.02 millimetre and even at this size sufficient flow rate along the void, during the few milliseconds of peak pressure, to permit unsafe movement of the bolt in relation to the barrel cannot be achieved .

Advantageously the use of conventional sealing means eases manufacture by increasing acceptable tolerances .

Another advantage is that seals will remove the fluid film from reciprocating parts and wipe off any foreign matter preventing the ingress of damaging material into the hydraulic mechanism .

[0005] In one embodiment the annular chamber communicates via the vent directly or indirectly with the low pressure reservoir of the hydraulic breech mechanism so that any fluid passing through the annular chamber is returned to the reservoir .

In a second embodiment the vent discharges any fluid

outside the envelope of the breech mechanism .

In a third embodiment the vent discharges into a separate reservoir .

[0006] The present invention will now be described by way of example with reference to the accompanying drawings in which :-

Figure 1 is a schematic cross section through a hydraulic breech mechanism in the locked position.

Figure 2 is a schematic cross section through a hydraulic breech mechanism along the line A--A .

[0007] A typical high pressure hydraulic breech mechanism is shown in figure 1 and comprises an outer casing 1 forming the wall of a low pressure reservoir 14, the high pressure cylinder 3 defines a high pressure reservoir 13 and a sleeve valve 2 closes ports 4 separating the high pressure reservoir 13 from low pressure reservoir 14 . The barrel extension 6 is secured to the high pressure cylinder 3 and the incompressible nature of the fluid sealed in high pressure reservoir 13 will secure or lock the bolt 10 in relation to the barrel extension 6 against the forces of firing . On firing a force will be applied to the bolt 10 due to gas pressure generated by the cartridge and the bolt 10 will that force to the fluid in high pressure reservoir 13 . The fluid being incompressible will tend to migrate along the radial gap between the bolt 10 and the high pressure cylinder 3, fluid in the radial gap will be subject to the same pressure as that in the high pressure reservoir 13 . On entering the annular chamber 7 the pressure is released as the fluid is no longer confined but can flow freely through the vent 11 back into the low pressure reservoir 14 . The annular chamber 7 by separating seal 8 and wipe ring 9 from the region of high pressure permits seal 8 and wipe ring 9 to operate within acceptable pressure limits.

Any other seals such as at 5 may be protected in a similar way. A seal 12 permits the vent tube 11 to reciprocate without fluid migrating from the low pressure reservoir 14 .

Claims

1. An annular chamber or enlargement of the clearance void between two components of a high pressure hydraulic breech mechanism, located between a body of fluid and a sealing means for containing the fluid, and provided with a vent such that fluid migrating along the clearance void between two components will, on entering the annular chamber, no longer be subject to high pressures and cannot therefore subject the sealing means to high pressures .
2. An annular chamber and vent as claimed in claim 1 wherein the vent communicates directly or indirectly with the low pressure reservoir of a hydraulic breech

mechanism such that any fluid passing through the vent is returned to the low pressure reservoir

3. An annular chamber and vent as claimed in claim 1 wherein the vent discharges any fluid outside the envelope of the breech mechanism . 5
4. An annular chamber and vent as claimed in claim 1 wherein the vent communicates with a discreet reservoir that collects any fluid discharged from the vent . 10

Amended claims in accordance with Rule 86(2) EPC.

1. An annular chamber (7), provided with a vent (11), formed circumferentially round a component (10) that enters a body of liquid under pressure (13) via a sealing means (8), the annular chamber (7) being located between the sealing means (8) and the body of liquid under pressure (13) such that there is a wall of the annular chamber (7) between the annular chamber (7) and the body of liquid under pressure (13) and the opposite wall of the annular chamber (7) is between the annular chamber (7) and the sealing means (8), the cross-sectional area of the annular chamber (7) and the vent (11) are both greater than that of the circumferential clearance between the component (10) entering the body of liquid under pressure (13) and the wall of the annular chamber (7) between the annular chamber (7) and the body of liquid under pressure (13), thus liquid on entering the annular chamber (7) is no longer subject to high pressures by virtue of the vent. 15
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2. An annular chamber and vent as claimed in claim 1 wherein the vent communicates directly or indirectly with the low pressure reservoir of a hydraulic breech mechanism such that any liquid passing through the vent is returned to the low pressure reservoir. 35
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3. An annular chamber and vent as claimed in claim 1 wherein the vent discharges any liquid outside the envelope of the breech mechanism. 45

4. An annular chamber and vent as claimed in claim 1 wherein the vent communicates with a discreet reservoir that collects any liquid discharged from the vent. 50
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FIGURE 1

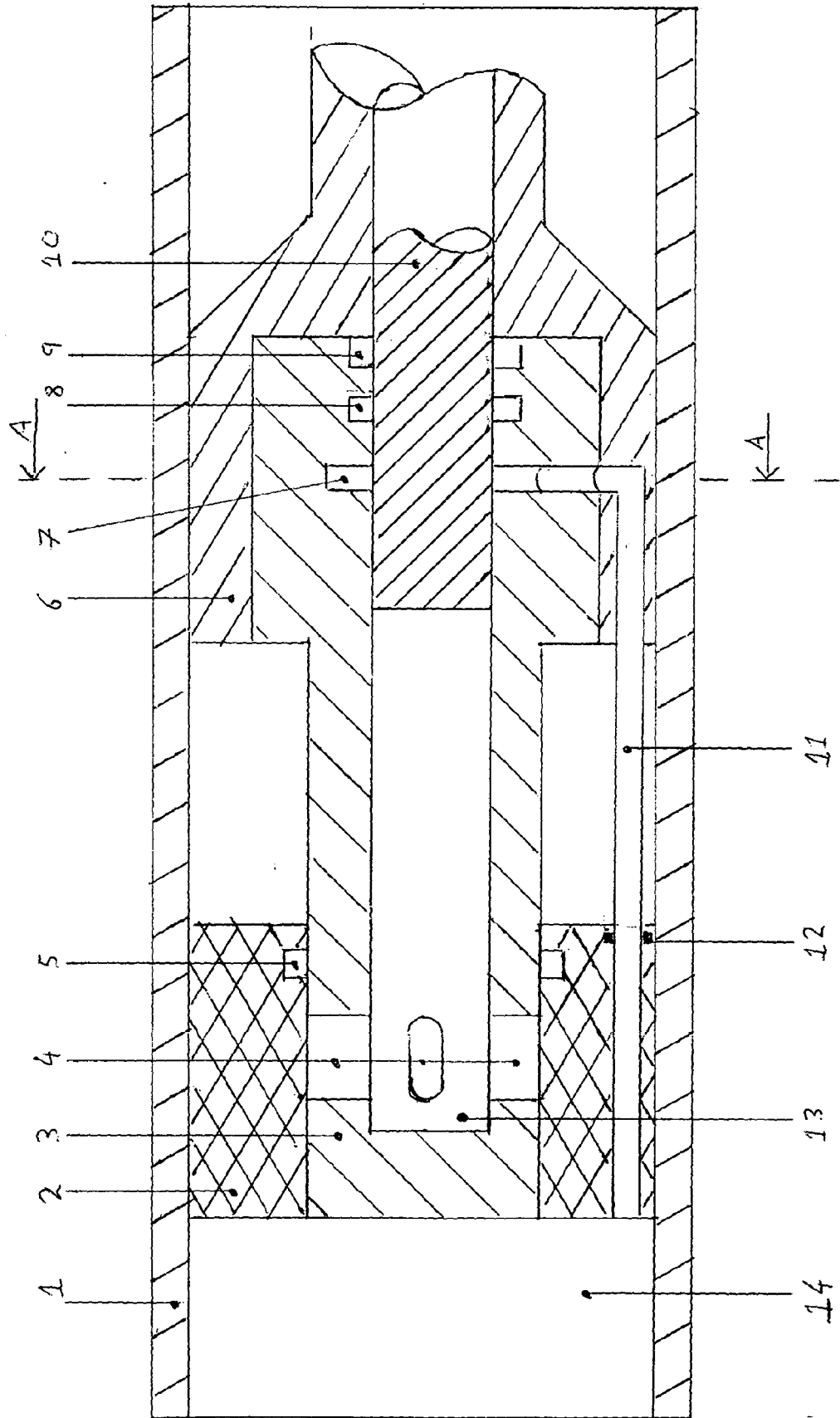
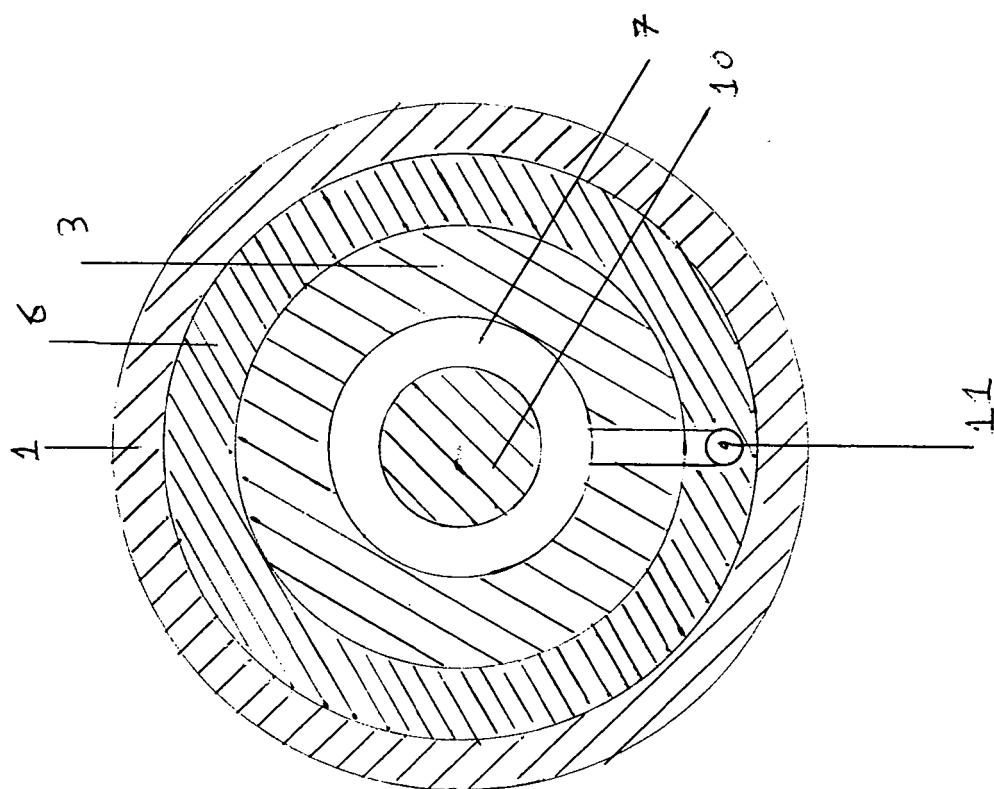


FIGURE 2





DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 737 264 C (FRIED. KRUPP AG) 9 July 1943 (1943-07-09) * page 2, lines 88-91 * * page 3, lines 23-107 * * figure 1 *	1-4	INV. F41A3/90
A	----- GB 139 541 A (HUGH WILLIAM MAUNSELL GABBETT-FAIRFAX) 11 March 1920 (1920-03-11) -----		
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			TECHNICAL FIELDS SEARCHED (IPC)
			F41A
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 15 August 2006	Examiner Lostetter, Y
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			

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

EP 06 00 7489

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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15-08-2006

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