

(19)



(11)

EP 2 631 588 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

28.08.2013 Bulletin 2013/35

(51) Int Cl.:

F41B 11/721 (2013.01)

F41B 11/644 (2013.01)

(21) Application number: **13156817.2**

(22) Date of filing: **26.02.2013**

(84) Designated Contracting States:

**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**

Designated Extension States:

BA ME

(30) Priority: **27.02.2012 IT LU20120004**

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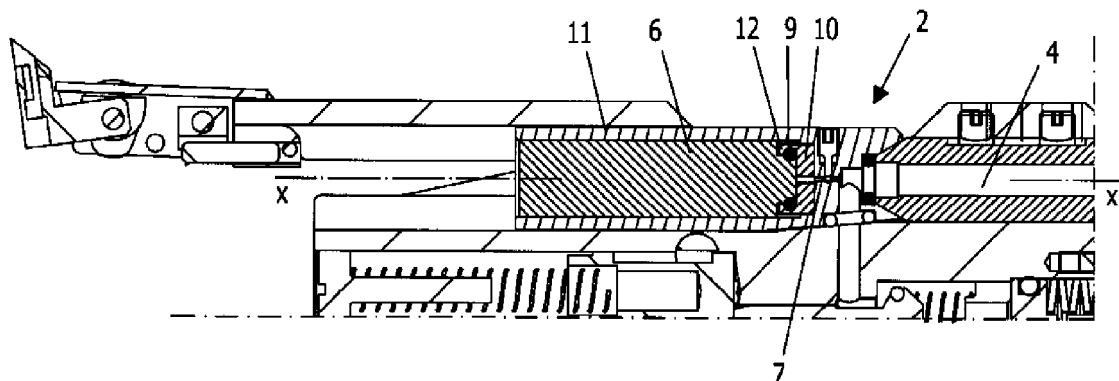
(54) **Compressed gas gun with firing impulse compensation device**

(57) Compressed gas gun (1) with firing impulse compensation device (2) comprising:

- a compressed gas reservoir (3);
- a barrel (4) in which a projectile runs;
- a firing mechanism for said projectile which can be activated by means of a trigger (5) for controlling metered delivery of said compressed gas, wherein said firing impulse compensation device (2) comprises a compensation mass (6) which is kept in the initial position by retain-

ing means and which, during the movement of said projectile through said barrel (4), is pushed in a direction opposite to the projectile and is released by said retaining means at least indirectly by means of the compressed gas acting on the projectile and passing into a connection duct (7) interposed between said barrel (4) and said mass (6), in which the quantity of compressed gas suitable for releasing said mass can be calibrated by means of adjustment means accessible from the outside of said gun (1).

Fig. 2



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Description

[0001] The invention relates to the sector of sport guns.

[0002] More in detail, the invention relates to a compressed gas gun with firing impulse compensation device.

[0003] In this type of gun, the push to launch the projectile is obtained by compressing a gas, which can be air or a different gas, such as carbon dioxide.

[0004] Compression of the gas can take place at the time of firing, or prior to firing, and in this case pulling the trigger causes its sudden expansion, with consequent firing of the projectile.

[0005] The invention is described, purely by way of example, with reference to guns which use special cylinders into which the shooter has already inserted a gas (generally air) with pressure and, each time the trigger is pulled, a valve releases a small quantity of gas sufficient for firing.

[0006] The firing impulse, commonly known as recoil, is the movement made by a weapon at the moment in which a projectile is hurled or exploded, and usually creates unwanted effects for the shooter, also jeopardising the precision of the shot.

[0007] In particular, recoil occurs at the moment in which the action of the force which pushes the projectile starts. In the case of a gun provided with a barrel, as the compressed gas which is released when the trigger is pressed can only expand horizontally, it pushes the projectile forwards and the breech, and consequently the weapon, backwards.

[0008] The use of different firing impulse compensation systems, and which limit the effect of recoil, on compressed gas guns, is known.

[0009] For example, the patent DE 102009011718 A1 discloses a firing impulse compensation system comprising a compensation mass which acts pushed in a direction opposite to that of the fired projectile, balancing the forces acting on the weapon.

[0010] In particular, said compensation mass is kept in an initial position by retaining means comprising a magnet and the magnetic contact produced is then broken by the pushing action of a portion of compressed gas released when the trigger is pressed, which acts, at least indirectly, on said mass.

[0011] Said portion of compressed gas flows into a connection duct which places the barrel of the gun in communication with the compensation mass.

[0012] Once the retaining magnetic contact has been broken, and therefore the compensation mass has been released, this is launched in a direction opposite to the projectile by means of a preloaded coil spring, interposed between said compensation mass and said connection duct.

[0013] A firing impulse compensation device of this type has an evident drawback: the push of the compensation mass is entrusted to additional mechanical elements which are difficult to calibrate, such as the coil

spring, also causing an increase in the weight of the gun, an addition of components which can also be subject to wear and interact with difficulty with one another, also causing friction.

5 **[0014]** Even more disadvantageously, the elasticity of said spring can vary over time, jeopardising the efficacy of the device.

[0015] If the spring were to be replaced, it would be necessary to disassemble and open the whole gun with lengthy and laborious operations, also with the risk of varying the entire constructive balance thereof.

10 **[0016]** Moreover, the efficacy of the absorbing effect of the firing impulse has the disadvantage of depending also on parameters correlated to the projectile used, such as weight, calibre, shape, and on characteristics of the weapon, such as dominating compression, barrel wear, as well as opening time of the discharge valve of the compressed gas. Optimal setting of the gun, and therefore also of the firing impulse compensation device, is therefore extremely difficult and necessarily subject to be varied in time, making it necessary to disassemble and reassemble the weapon, without it being possible to check the new calibration until the weapon is once again completely reassembled.

15 **[0017]** The invention intends to overcome these limits, by producing a compressed gas gun provided with firing impulse compensation device which can be easily adjusted and calibrated in time, is effective, light, precise, which is not subject to wear and which does not cause losses of load of the compressed gas.

20 **[0018]** These aims are achieved with a compressed gas gun with firing impulse compensation device comprising:

- 25
- a compressed gas reservoir;
 - a barrel in which a projectile runs;
 - a firing mechanism for said projectile which can be activated by means of a trigger for controlling metered delivery of said compressed gas,

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40 wherein said firing impulse compensation device comprises a compensation mass which is kept in the initial position by retaining means and which, during the movement of said projectile through said barrel, is pushed in a direction opposite to the projectile and is released by said retaining means at least indirectly by means of the compressed gas acting on the projectile and passing into a connection duct interposed between said barrel and said mass,

45 **characterized in that** the quantity of compressed gas suitable for releasing said mass can be calibrated by means of adjustment means accessible from the outside of said gun.

50 **[0019]** According to a first embodiment of the invention, said adjustment means are arranged along said connection duct to modify the section thereof.

55 **[0020]** In particular, said adjustment means comprise a screw provided with a threaded portion and a smooth

end needle, where the reversible tightening of said screw causes a greater or lesser penetration of said needle into said duct.

[0021] According to a further embodiment of the invention, said retaining means comprise a toroidal gasket made of elastic material and a perforated flange provided with a rim for housing said gasket suitable for retaining said compensation mass in the initial position by interference.

[0022] In particular, said compensation mass, at its end facing towards said barrel, comprises a groove suitable for cooperating with said gasket by interference.

[0023] According to a particularly advantageous embodiment of the invention, said perforated flange has a section at least partly of frustoconical shape, with a flaring increasing towards said compensation mass.

[0024] According to a further embodiment of the invention, said compensation mass, released from the retaining means, is pushed inertially, due to the effect of the impulse of the compressed gas only, into a tubular guide.

[0025] A compressed gas gun provided with firing impulse compensation device according to the invention has many advantages.

[0026] Firstly, the push of the compensation mass is entrusted entirely to the pressing force of the compressed gas which not only releases this mass from said retaining means, but can be suitably metered also to ensure that the mass moves away in a direction opposite to the projectile.

[0027] The quantity of compressed gas suitable for releasing and moving said mass can, in fact, be calibrated by means of specific adjustment means that are advantageously accessible from the outside of the gun and which therefore make it possible for the gun to be constantly adjusted, without the need to disassemble and reassemble it.

[0028] The user of the gun, by acting on said adjustment means, can modify the quantity of compressed gas acting on the compensation mass, to take account of a variety of disturbing environmental factors or wear factors which may occur and which can interfere with the firing precision and with the efficacy of the firing impulse compensation device.

[0029] The arrangement of said adjustment means along the connection duct between the barrel and the compensation mass makes adjustment directly effective on the retaining means.

[0030] Adjustment advantageously takes place promptly and precisely, also due to the type of screw selected: by modifying the section of the connection duct with the smooth end needle, this ensures a micrometric modification of the area of said duct, due to the pitch of the thread of the screw.

[0031] To facilitate release of the compensation mass from the retaining means and optimise the action of the compressed gas acting on this mass, the flange is provided with a frustoconical shaped flaring. This design choice increases the pushing surface on which the gas

acts, thus making increasingly small quantities of gas necessary for the release and movement of said mass, being said quantities of gas well directed.

[0032] The advantages of the invention will be more apparent below, in the description of a preferred embodiment, provided by way of non-limiting example, and with the aid of the drawings, wherein:

Fig. 1 represents, in a longitudinal section, a compressed gas gun provided with firing impulse compensation device according to the invention;

Figs. 2 and 3 represent, in a longitudinal section, a detail of the gun of Fig. 1 in two operating steps of the firing impulse compensation device;

Figs. 4 and 5 represent, in a longitudinal section, a detail of the firing impulse compensation device according to the invention in two possible adjustment steps.

[0033] With reference to Fig. 1, there is shown a compressed gas gun 1 with firing impulse compensation device 2 according to the invention.

[0034] Said gun 1 substantially comprises:

- a compressed gas reservoir 3;
- a barrel 4 provided with a longitudinal axis x in which a projectile runs;
- a firing mechanism for said projectile which can be activated by means of a trigger 5 for controlling metered delivery of said compressed gas.

[0035] A firing impulse compensation device 2 is mounted on said gun 1.

[0036] With particular reference to Figs. 2 and 3, said device 2 comprises a compensation mass 6, cylindrical in shape, which slides inside a specific tubular guide 11, arranged on the weapon 1 on the opposite side with respect to said barrel 4 and aligned along its longitudinal axis x.

[0037] In the initial condition represented in Fig. 2, i.e. before firing, said mass 6 is kept in the initial position, namely in physical contact with the portion of said guide 11 closest to the barrel 4 of the gun, by means of retaining means.

[0038] Said retaining means, as illustrated, comprise a toroidal gasket 9 made of elastic material, of known O-Ring type, and a perforated flange 10.

[0039] In particular, said flange 10 is provided with a rim 12 for housing said gasket 9.

[0040] Said gasket 9 is suitable for retaining, by interference, said compensation mass 6 which is provided, in its end facing towards said barrel 4, with a groove 13 to contain said gasket 9.

[0041] In the final condition represented instead in Fig. 3, i.e. after firing of the shot, said mass 6 has varied its position, released from said retaining means and launched inside said guide 11 in a direction opposite to that of the projectile, and thus moved away from the barrel

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[0042] Both the release of the mass 6 from the gasket 9, and its thrust and its inertial motion are caused due to the impulse of the compressed gas.

[0043] In fact, a connection duct 7 is arranged between said barrel 4 and said guide 11, aligned along said longitudinal axis x, having a capillary section if placed in relation to the diameters of said barrel 4 and of said guide 11.

[0044] Said connection duct 7 is suitable for enabling the passage of a metered quantity of compressed gas, coming from said reservoir 3 and released by means of said firing mechanisms, towards said compensation mass 6.

[0045] Said flange 10, interposed between said guide 11 and said connection duct 7, is suitably perforated to also enable the passage of said gas.

[0046] In a possible embodiment, not shown, the hole of said flange has a section at least partially of frustoconical shape, with a flaring with increasing section facing towards said compensation mass.

[0047] With particular reference to Figs. 4 and 5, adjustment means are arranged along said connection duct 7, orthogonally to its axis x, said adjustment means being suitable for modifying the dimension of the section of said connection duct.

[0048] Said adjustment means comprise a screw 8 suitable for cooperating with a micrometric thread obtained in a seat 7'.

[0049] In particular, said screw 8 is provided with a threaded portion 8' cylindrical in shape and headless, and with a smooth end needle 8", suitable for sliding in a specific seat 7" obtained in said duct 7.

[0050] Tightening or loosening of said screw 8, which can be obtained by means of a hexagonal key acting directly from the outside of the gun, respectively causes a greater (Fig. 4) or lesser (Fig. 5) penetration of said needle 8" into said duct 7 and therefore a narrowing or widening of its free section.

[0051] Operation of the firing impulse compensation device 2 according to the invention is described below.

[0052] To calibrate the firing impulse compensation device, the user, in relation to his/her experience, to the features of the gun, to the type of projectile used, to external environmental factors, etc., acts on the adjustment means, tightening or loosening the corresponding screw 8 to decrease or increase the section of the connection duct 7 for passage of the compressed gas.

[0053] When the user presses the trigger 5, a part of the compressed gas provided in the reservoir 3 is expelled and directed inside the barrel 4 of the gun and, expanding, strikes the projectile exerting the firing force thereon.

[0054] In the passage from the reservoir 3 to the barrel 4 of the gun, a quantity of compressed gas, suitably metered and calibrated by means of said adjustment means, passes through said connection duct 7 reaching the compensation mass 6.

[0055] The force of the compressed gas releases the mass 6 from the O-Ring retaining gasket.

[0056] Subsequently, the compensation mass 6 is pushed inertially, due to the effect of the impulse of the compressed gas only, and moves in the guide 11 from the initial position represented by Fig. 2 to the final position represented by Fig. 3.

[0057] The air present in the guide 11 and shifted from the compensation mass 6 is discharged from the gun 1 directly from the bottom opening of said guide.

[0058] Before firing again, the user restores the interference between the compensation mass 6 and the retaining means by acting on the loading lever, to simultaneously move the guide 11, the flange 10 and the gasket 9 back towards the end portion of the gun in which the compensation mass 6 is located, so that it is once again coupled and at the same time frees the entrance of the barrel 4 for positioning of a new projectile.

[0059] Once the interference has been restored between the flange 10 and the gasket 9 with the compensation mass 6, acting in the opposite direction on the same lever, the compensation mass 6 is moved back towards the barrel 4, i.e. to its initial position prior to firing.

[0060] Finally, if necessary, the user also acts on the screw adjustment means 8 to vary and optimise compensation of the firing impulse for the next shot.

Claims

1. Compressed gas gun (1) with firing impulse compensation device (2) comprising:

- a compressed gas reservoir (3);
- a barrel (4) in which a projectile runs;
- a firing mechanism for said projectile which can be activated by means of a trigger (5) for controlling metered delivery of said compressed gas, wherein said firing impulse compensation device (2) comprises a compensation mass (6) which is kept in the initial position by retaining means and which, during the movement of said projectile through said barrel (4), is pushed in a direction opposite to the projectile and is released by said retaining means at least indirectly by means of the compressed gas acting on the projectile and passing into a connection duct (7) interposed between said barrel (4) and said mass (6), **characterized in that** the quantity of compressed gas suitable for releasing said mass can be calibrated by means of adjustment means accessible from the outside of said gun.

2. Compressed gas gun (1) with firing impulse compensation device (2) according to claim 1, **characterized in that** said adjustment means are arranged along said connection duct (7) to modify the section thereof.

3. Compressed gas gun (1) with firing impulse compensation device (2) according to claim 1, **characterized in that** said adjustment means comprise a screw (8), provided with a threaded portion (8') and a smooth end needle (8''), where the reversible tightening of said screw (8) causes a greater or lesser penetration of said needle (8'') into said duct (7). 5
4. Compressed gas gun (1) with firing impulse compensation device (2) according to claim 1, **characterized in that** said retaining means comprise a toroidal gasket (9) made of elastic material and a perforated flange (10) provided with a rim (12) for housing said gasket suitable for retaining said compensation mass (6) in the initial position by interference. 10 15
5. Compressed gas gun (1) with firing impulse compensation device (2) according to claim 5, **characterized in that** said compensation mass (6), at its end facing towards said barrel (4), comprises a groove (13) suitable for cooperating with said gasket (9) by interference. 20
6. Compressed gas gun (1) with firing impulse compensation device (2) according to claim 4, **characterized in that** said perforated flange (10) has a section at least partially of frustoconical shape, with flaring increasing towards said compensation mass (6). 25 30
7. Compressed gas gun (1) with firing impulse compensation device (2) according to claim 1, **characterized in that** said compensation mass (6), released from the retaining means, is pushed inertially, due to the effect of the impulse of the compressed gas only, into a tubular guide (11). 35

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Fig. 1

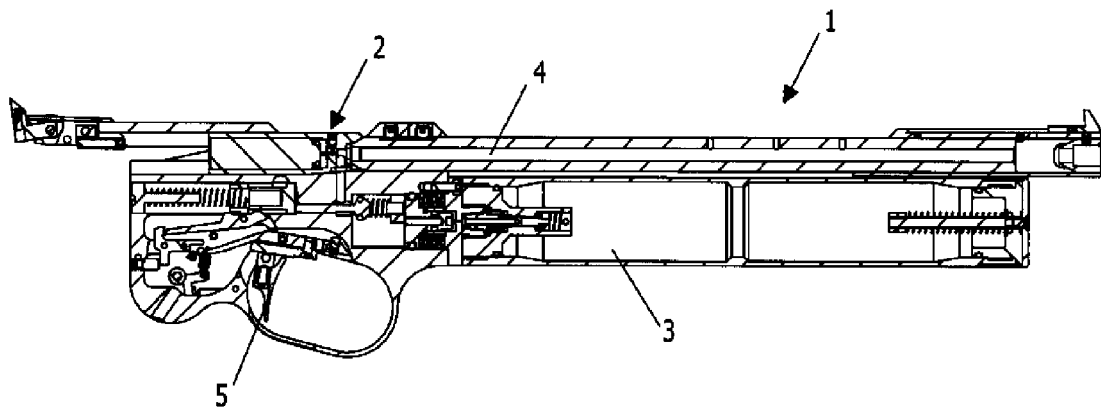


Fig. 2

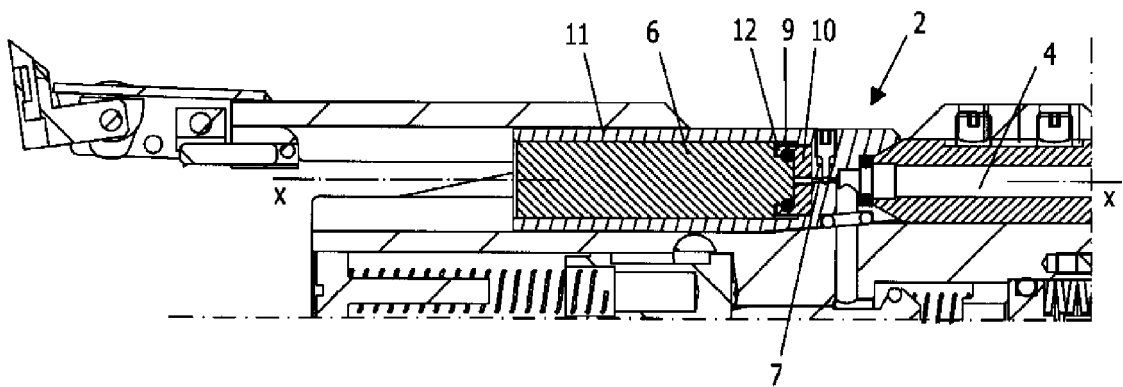


Fig. 3

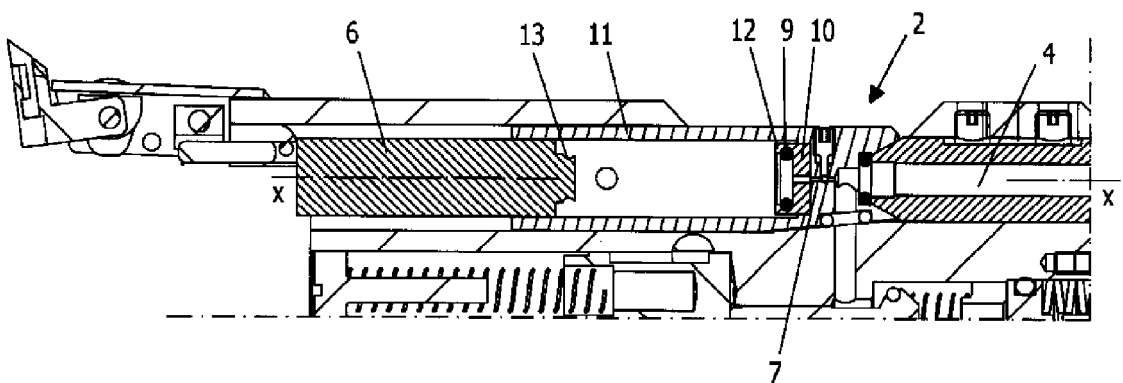


Fig. 4

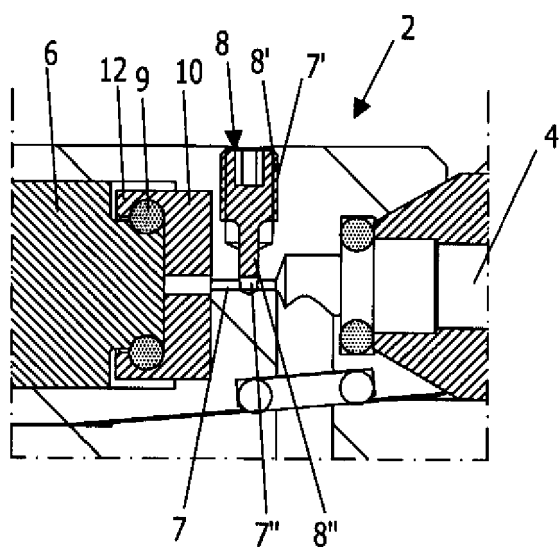
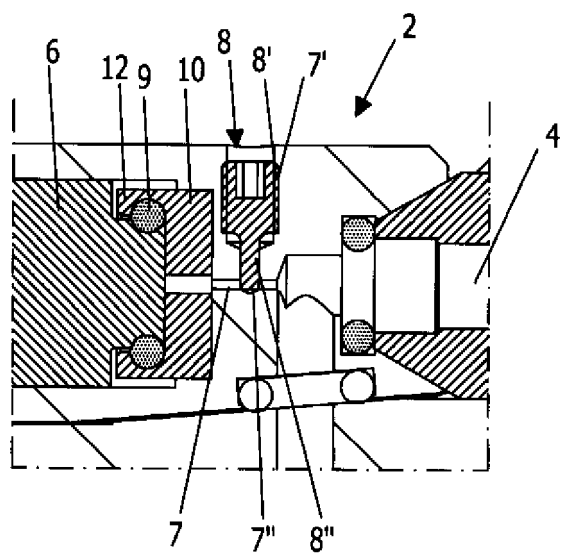


Fig. 5





EUROPEAN SEARCH REPORT

Application Number
EP 13 15 6817

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Y	* paragraphs [0027] - [0032] * * figures 1,2 *	2-6	
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Y	DE 197 47 586 A1 (ANSCHUETZ GMBH J G [DE]) 29 April 1999 (1999-04-29) * column 4, line 19 - column 6, line 19 * * figures *	4-6	
A	EP 0 785 405 A2 (GERAETEBAU GMBH [DE]) 23 July 1997 (1997-07-23) * the whole document *	1-7	
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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 23 May 2013	Examiner Gex-Collet, A
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			

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EPO FORM 1503 03/02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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