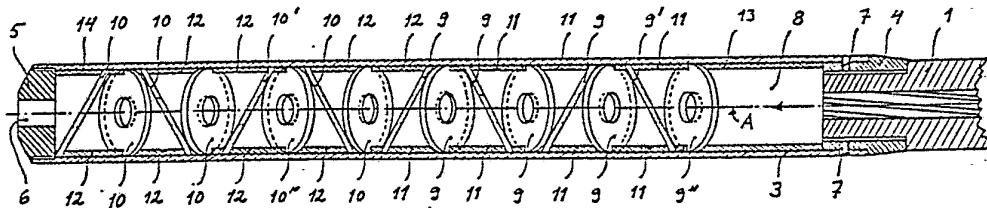




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(54) Title: SILENCER FOR FIREARMS



(57) Abstract

Silencer (2) for firearms comprising a sheath (3), a fixing collar (4) and a muzzle tap (5). Within the sheath (3) there is arranged an expansion chamber (8) and thereafter a plurality of flange-like silencer elements at given intervals from each other. The silencer elements are formed of partition plates (9, 10) located at a given angle, preferably 30°-60° with respect to the silencer axis (A), and each partition plate (9', 10') is turned, in perpendicular plane to the silencer axis (A), at an angle, preferably 90°, with respect to the preceding partition plate. The partition plates are separated from each other as well as from the fixing collar and the muzzle tap by means of intermediate collar (11-14). The inner parts of the silencer are locked into place by means of the muzzle tap. All inner parts of the silencer are changeable. They can be made of aluminium or aluminium commixture; the partition plates can in some cases also be made of plastic.

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SILENCER FOR FIREARMS

The present invention relates to a silencer for firearms, the said silencer comprising a tubular sheath, at one end of which sheath there is attached a fixing collar in order to fix the silencer to the gun barrel and at the other end of which sheath there is attached the muzzle of the silencer provided with a hole wider than the gun calibre, wherein inside the sheath of the silencer there is arranged preferably an expansion chamber immediately behind the fixing collar and thereafter a plurality of flange-like elements, which are placed at certain intervals from each other and provided with a hole slightly wider than the gun calibre.

The purpose of the silencer is to diminish the noise at the muzzle caused by outcoming powder gas, to prevent the flame at the muzzle from being visible when shooting in weak light and to obstruct the air wave off the gun barrel from moving vegetation and from hurling dust and other materials in front of the shooting location, which is important in military practice in order to conceal the position of the shooter.

In prior art are known several firearm silencers which are operated by powder power, for instance the so-called single-chamber silencers. The single-chamber silencer is formed of a tube attached to the gun muzzle and provided with a tap which has a hole slightly larger than the bullet diameter. In the tubular chamber the powder gases expand and the gas flows obstruct each other while the bullet passes through the muzzle tap. A common type of silencer for rimfire rifles is 25 cm long and has an inner diameter of 30 mm. The gap in the muzzle tap is as small as possible, according to the silencer's location in the weapon.

The silencing effect of the above-described silencer is, however, small. The effect can be boosted by placing



in the chamber, behind a suitable expansion space reserved for powder gases, a plurality of silencing elements such as various partition plates or spiral-like members which are naturally provided with a hole in the middle, the hole being
5 wider than the gun calibre.

The German Publication DE-AS 2 229.071 introduces a silencer for firearms, where within the cylindrical sheath of the silencer there is adjusted a tubular member which member has a quadrate cross-section. This member is combined of
10 indential parts attached to each other. The adjacent parts are turned 90° with respect to each other in a plane perpendicular to the silencer axis. Each part is formed of two flap-like plates, which are folded towards each other and towards the silencer axis in order to create a wedge-shaped
15 head against the shooting direction of the bullet. An opening which is larger than the gun calibre is arranged at the wedge-like head of each part. The parts are attached to each other in a partially overlapping fashion for example by welding.

20 Among the drawbacks of the above described silencer can be mentioned that the member located within the silencer sheath has a fixed construction and its singular parts are large. Thus it is impossible to change the separate parts of the silencer, and the device obtains a relatively large size.
25 Moreover, the parts of the said member form such an open system where the powder gases have free entry to the space between the sheath and the said member. In that case the flowing speed of the powder gases does not decrease quickly enough, wherefore the silencer does not function effectively.

30 The drawbacks of the prior art silencers can be summarized in that they are too large and heavy in relation to their efficiency. This hampers their use for example as auxiliary equipment in shooting training. Effective silencers are also complex and therefore expensive. Only few silencers



can be dismantled for cleaning and possible changing of separate parts.

The purpose of the present invention is, among others, to eliminate the above mentioned drawbacks and to realize a silencer which has a simple structure but effective power. This is achieved so that the flange-like silencing elements consists of partition plates placed at an angle other than 90° with respect to the axis and that each partition plate is turned, in perpendicular plane to the silencer axis, a given angle in relation to the previous partition plate

As regards the advantages of the present invention, the following can be stated. The flange-like silencing elements are constructed of partition plates installed within the silencer sheath, the slope of which plates, with respect to the cross-section plane of the silencer, varies regularly. This prevents the reaction effect of the powder gases, which collide against the partition plates, from deviating the gun from the line of aim. Moreover, the gas flow changes its direction constantly owing to the placing of the partition plates. Thus the flowing velocity of the gas flow is effectively diminished. Those partition plates that are placed at an angle with respect to the silencer axis have a larger surface area than those placed vertically to it. If the partition plates are made of a good heat-conducting material such as aluminium, the powder gases are effectively cooled while passing through the silencer, so that no flame is created at the muzzle.

Compared to the silencers in general use, the silencer of the present invention can be constructed smaller in size and lighter in weight. These advantages are achieved by means of the simple structure and the materials used. A silencer with a short diameter does not hinder sighting through the proper aiming devices of the gun in question, as is

the case with many currently used silencers.

The silencer of the present invention, and more particularly a preferred embodiment where the partition plates are separated by means of intermediate collars placed within the sheath, can easily be dismantled for cleaning and possible
5 changing of separate parts. The manufacturing of the partition walls and the intermediate collars is a simple process, wherefore the production costs of the silencer are reasonable, too.

10 The silencer of the present invention is effective. It silences the noise at the gun muzzle up to 90-95% and roughly 80% of all the noise effects caused by a shot. The major part of the remaining noise consists of the noise caused by the bullet, which cannot be silenced by any generally known
15 means. The bullet noise has a high frequency so that it cannot be heard disturbingly loud far at the sides of the shooting place or behind it. The bullet noise also has a remarkable significance in preventing misuse of a silenced gun.

In the following the invention will be described in detail
20 with reference to the appended drawings.

Figure 1 is an illustration of a silencer according to the invention, mounted on a gun.

Figure 2 is an exploded view of the outer parts of the silencer.

25 Figure 3 is a partial cross-section view of one preferred embodiment of the silencer.

Figures 4-8 show the various parts of the silencer of Figure 3, seen both from top (a) and from the side (b).

30 Figure 9 shows how the powder gases flow in the silencer of Figure 3.

Figure 1 shows a gun with a silencer 2 mounted on the barrel 1. The silencer comprises, as can also be seen in Figure 2, the tubular sheath 3, the fixing collar 4, by means of which collar the silencer is attached to the gun, and the muzzle tap 5, which is naturally provided with a hole 6 wider than the gun calibre. The fixing collar 4 can be connected to the sheath 3 for example by threading or by means of lock pins 7. On the outer surface of the gun muzzle, as well as on the inner surface of the fixing collar, there are cut reciprocal threads in order to fix the silencer.

Figure 3 shows that within the sheath 3 of the silencer 2, immediately behind the fixing collar 4, there is arranged an expansion space 8 occupying a relatively large portion of the volume of the sheath 3, and thereafter a plurality of flange-like silencing elements at certain intervals from each other, the said elements being provided with a hole slightly larger than the gun calibre.

The flange-like silencing elements are formed of partition plates 9, 10, which are placed at an angle α other than 90° with respect to the axis A of the silencer 2. Each partition plate is placed at a deviant position with respect to the previous partition plate, so that for example the plate 9' is turned, in vertical plane to the silencer axis A, to form an angle, preferably 90° as is seen in Figure 3, with the plate 9". In this embodiment of the invention the angle $\alpha = 60^\circ$. The partition plates are placed preferably at an angle of 30° - 60° with respect to the axis A.

The partition plates 9, 10 can be fitted within the sheath so that each partition plate, compared to the previous plate, is placed, in perpendicular plane to the silencer axis A, only at an angle of 90° turned either clockwise or counter-clockwise, as respectively the plates 9' and 9" in Figure 3, when the partition plates are observed in the bullet's shooting direction.

The partition plates can be divided into groups, as in Figure 3. In the first group the plates 9' are turned 90° counterclockwise with respect to the previous plates 9" in a plane vertical to the silencer axis A. In the second group the partition plates 10' and 10" are respectively turned clockwise. There can be several such groups in the silencer.

In the silencer of the invention the powder gases following the bullet 15 are set into screwlike and/or spiral-like motion immediately after the expansion space 8, owing to the partition plates 9, 10, as is seen in Figure 9. The gases burst out for example from the intermediate space 11 through the gap 18, mainly in vertical direction towards the partition plate 9 and flow to the next intermediate space 17 so that they do not pass directly through the hole 19 but are compelled to flow round through the junction of the partition plate and the sheath 3. Thus the gases receive a rotating, screwlike and/or spiralling motion. The rotating direction of the progressing gases can be either clockwise or counterclockwise, depending on which direction the partition plates are turned with respect to each other, in vertical plane to the silencer axis. An effective silencing is achieved by using a silencer where the rotating direction of gases changes in turns from clockwise to counterclockwise. In this case the kinetic energy of powder gases is effectively absorbed in the silencer.

The partition plates 9, 10 have the shape of elliptic plates, provided with a hole for the bullet in the middle, as is apparent from Figure 7. Figure 7a shows the partition plate seen directly from the side and Figure 7b directly from the front. Because the partition plates within the sheath 3 are turned in a slanted position with respect to its axis A, the edges of the partition plates 9, 10 as well as the edges of the holes 18 are worked to be parallel to

the axis A. All partition plates are equal.

The partition plates 9, 10 of the silencer can be kept apart by means of suitable intermediate members. These are suitably collar-like or tubular members, hereinafter called
5 intermediate collars 11, 12. They are fitted within the sheath 3 in between the partition plates in order to support them. In the preferred embodiment of Figure 3 are utilized two types of intermediate collars, the first 11 of which, according to Figure 6, are used to separate such partition
10 plates 9', which are turned, in vertical plane to the silencer axis A, 90° counterclockwise with respect to the preceding partition plates 9'' and the second 12 of which, according to Figure 5, are used to separate such partition plates 10' that are respectively turned 90° clockwise
15 wise in relation to the preceding partition plates 10''.

The expansion chamber 8 is arranged in the silencer for example by means of a suitable intermediate member such as an intermediate collar or a tubular member 13. The intermediate collar 13 is cut vertically at the end resting against
20 the fixing collar 4, whereas the other end supporting the first partition plate 9'' is cut at a desired angle $\alpha = 60^{\circ}$ with respect to the silencer axis. The fitting member 14 matching the intermediate collar 13 is also placed between the last partition plate and the muzzle tap 5. It has a similar
25 construction as the intermediate collar 13 of the expansion chamber, but it is remarkably shorter, having the same length as the intermediate collars 11, 12.

The above described partition plates 9, 10 and the intermediate collars 11, 12, 13 and 14 have such measures that
30 they can without difficulty be fed in due order into the silencer sheath 3. The inner members of the silencer are locked into place by screwing the muzzle tap 5 onto the muzzle. Now the muzzle tap presses the inner members against

the silencer fixing collar 4.

All partition plates 9, 10 and the intermediate collars 11-14 can be fed out of the sheath 3 after the muzzle tap 5 has been removed. This makes it possible to clean the inner members 9-14 and the inner surface of the sheath as well as to change the damaged parts. Because all parts can be separate, their maintenance and care is utterly simple and easy.

The partition plates 9, 10 and the intermediate collars 11-14 can be made preferably of aluminium or a suitable aluminium commixture, in which case the silencer is built light in weight. This also makes it easy to work the parts. In silencers meant for small-calibre firearms the partition plates can be made of a suitable plastic material.

PATENT CLAIMS

1. A silencer (2) for firearms, comprising a tubular sheath (3), at one end of which sheath is attached a fixing collar (4) in order to mount the silencer onto the gun barrel (1) and at the other end a muzzle tap (5) provided with a hole (6) wider than the gun calibre, within the sheath of which silencer (3) there is arranged profitably an expansion chamber (8) immediately behind the fixing collar (4) and thereafter a plurality of flange-like silencing members provided with a hole slightly wider than the gun calibre, the said silencing elements being arranged at certain intervals from each other, characterized in that the flange-like silencing elements consist of partition plates (9, 10) placed at an angle (α) other than 90° with respect to the axis (A) and that each partition plate (9', 10') is turned, in perpendicular plane to the silencer axis (A), a given angle in relation to the previous partition plate (9'', 10'').
2. The silencer of Claim 1, characterized in that the partition plates (9, 10) are preferably at an angle of 30° - 60° with respect to the silencer axis (A).
3. The silencer of Claim 1 or 2, characterized in that each partition plate (9', 10') is turned, in perpendicular plane to the silencer axis, 90° with respect to the previous partition plate (9'', 10'').
4. The silencer of Claim 3, characterized in that all partition plates are turned, in perpendicular plane to the silencer axis (A), only 90° either clockwise or counterclockwise with respect to the preceding partition plates.
5. The silencer of Claim 3, characterized in

that the partition plates are arranged at least in two groups (9, 10), in the first of which the partition plates (10') are turned, perpendicular plane to the silencer axis (A), 90° clockwise with respect to the preceding partition plates (10"), and in the second of which the partition plates (9') are respectively turned 90° counterclockwise with respect to the preceding partition plates (9").

6. The silencer of any of the claims 3, 4 or 5, characterized in that the partition plates (9, 10) are separated preferably by means of collar-like intermediate members (11, 12) located within the sheath (3).

7. The silencer of Claim 6, characterized in that the partition plates (9, 10) and the intermediate members (11, 12) are separated from the fixing collar (4) and the muzzle tap (5) by means of auxiliary members located within the sheath (3), preferably by collar-like intermediate members (13, 14).

8. The silencer of Claim 6 or 7, characterized in that the partition plates (9, 10) together with the intermediate members (11-14) are locked into place by means of the muzzle tap (5).

9. The silencer of Claim 8, characterized in that the partition plates (9, 10) and the intermediate members (11-14) are changeable parts.

10. The silencer of Claim 9, characterized in that the partition plates (9, 10) and the intermediate members (11-14) are manufactured of aluminium or aluminium commixture.

11. The silencer of Claim 9, characterized in that the partition plates (9, 10) are made of plastic.



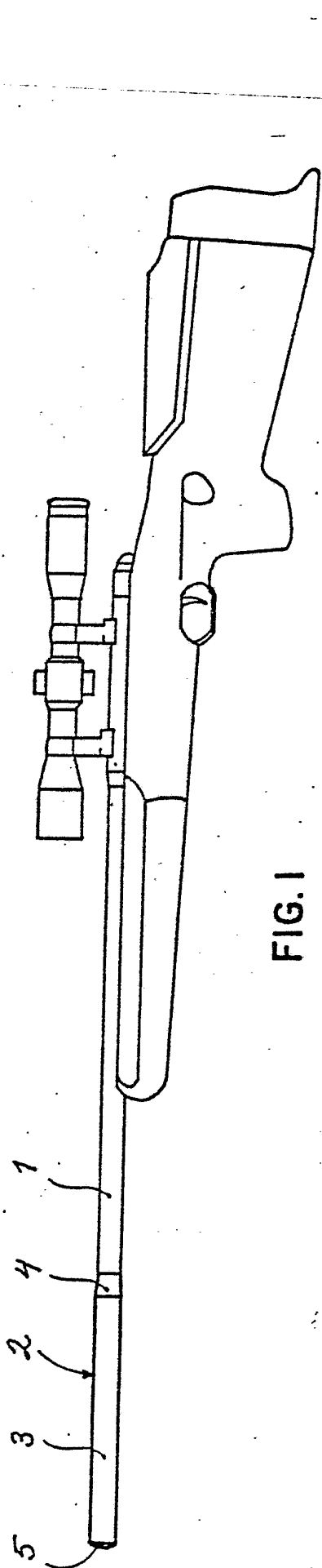


FIG. 1

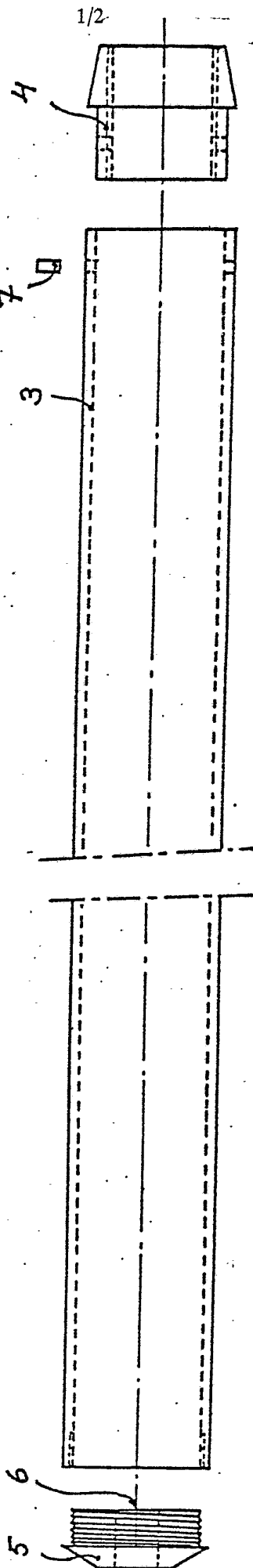


FIG. 2

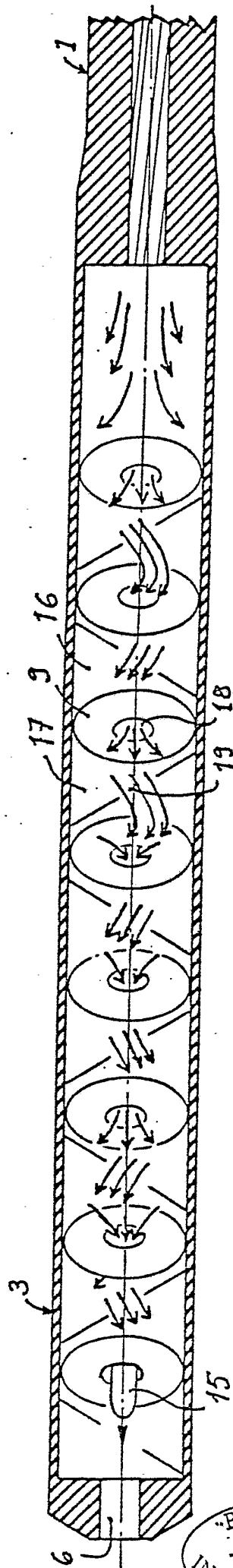


FIG. 9

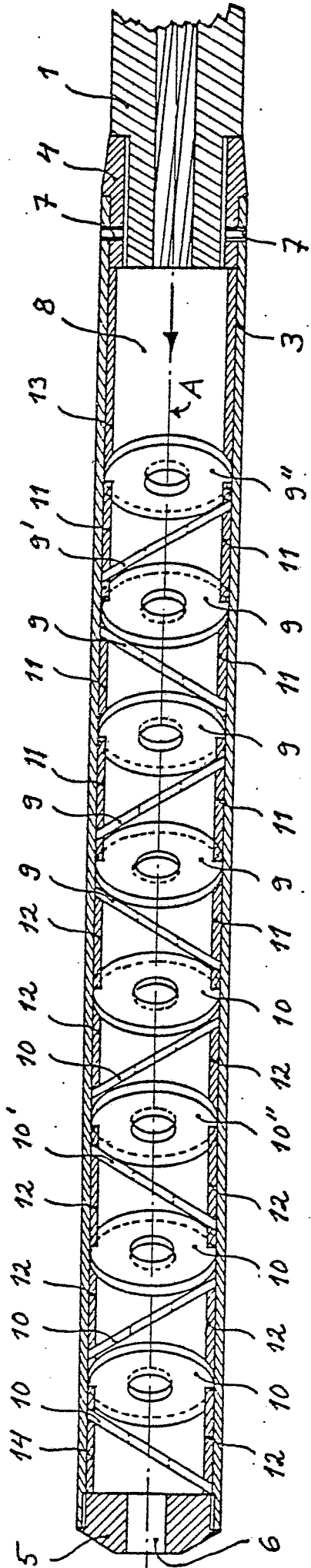


FIG. 3

FIG. 4

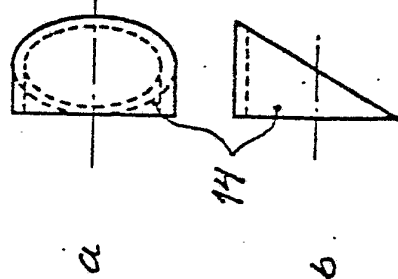


FIG. 5

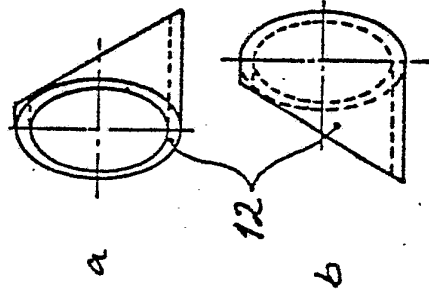


FIG. 6

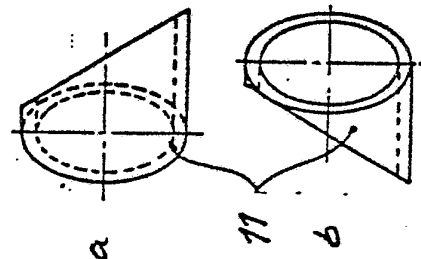


FIG. 7

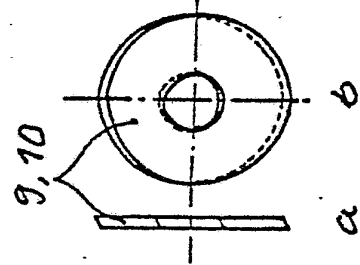
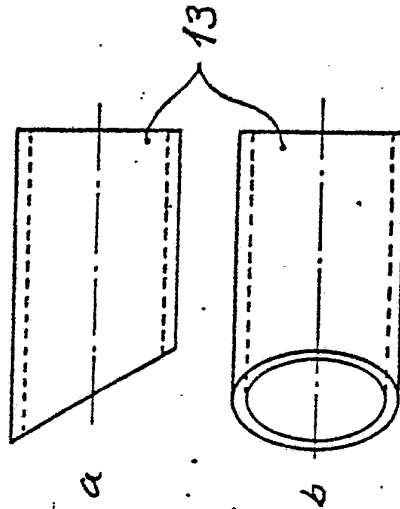
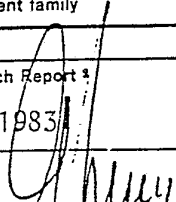


FIG. 8



INTERNATIONAL SEARCH REPORT

International Application No PCT/FI 82/00052

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ³		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC ³ : F 41 C 21/18		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁴		
Classification System	Classification Symbols	
IPC ³	F 41 C; F 41 F; F 01 N	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁵		
III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴		
Category *	Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No. ¹⁸
Y	CH, A, 150961 (SCHÄDLER) 1 February 1932, see the entire document --	1,2
Y	FR, A, 981869 (MOURET) 31 May 1951, see the entire document --	1,2,3,4,6, 7 8,9
A	FR, A, 1387637 (MENDIOLA TRIGUERO) 21 Decem- ber 1964, see the entire document --	3,4
Y	US, A, 2375617 (BOURNE) 8 May 1945, see page 1, lines 26-55; figures 1 and 2 --	6,7,8,9
Y	US, A, 1482805 (MAXIM) 5 February 1924, see page 1, lines 32-73; figure 1 --	8,9
A	Waffenrevue, no. 28, March-May 1978 Journal-Verlag Schwend, Schwäbische Hall DE) "Britische Schnelldämpferpistole WELROD" see pages 4417-4428, especially page 4426 --	10,11
	--	./.
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IV. CERTIFICATION		
Date of the Actual Completion of the International Search ¹⁹	Date of Mailing of this International Search Report ¹⁹	
20th January 1983	10th February 1983	
International Searching Authority ¹	Signature of Authorized Officer ²⁰	
EUROPEAN PATENT OFFICE	 G.L.M. Kruijdenberg	

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No ¹⁸
A	US, A, 4167987 (TURNER) 18 September 1979 --	
A	GB, A, 122613 (BASSIE) 30 January 1919 --	
A	US, A, 3500955 (WERBELL) 17 March 1970 --	
A	GB, A, 30240 AD1909 (BIRMINGHAM SMALL ARMS) 28 December 1910 -----	