

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) Publication number:

0 671 598 A1

(12)

EUROPEAN PATENT APPLICATION
published in accordance with Art.
158(3) EPC

(21) Application number: **94916989.0**(51) Int. Cl.⁶: **F42B 7/08**(22) Date of filing: **01.06.94**(86) International application number:
PCT/ES94/00053(87) International publication number:
WO 94/29666 (22.12.94 94/28)(30) Priority: **04.06.93 ES 9301229**(43) Date of publication of application:
13.09.95 Bulletin 95/37(84) Designated Contracting States:
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OFICINA GARCIA CABRERIZO S.L.
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E-28006 Madrid (ES)(54) **TWO-PART CARTRIDGE WAD WITH PNEUMATIC DAMPING.**

(57) Two-part cartridge wad with pneumatic damping intended to the cartridge manufacturing industry, the wad being comprised of two interchangeable parts which are assembled and which correspond to a container (1) and to a damper-seal (8). The container (1) comprises a series of hinged wings (7), as well as a valve (2) for the regulation of the damping and the air injection. Both the container (1) and the damper (8) have side walls (3 and 9) of convex-concave shape, which are intended to absorb radial deformations with respect to the symmetry axis of the wad. The damper (8) has a quadruple function: it withstands the flexion and deformation of the material, the friction against the walls and the compression of air contained.

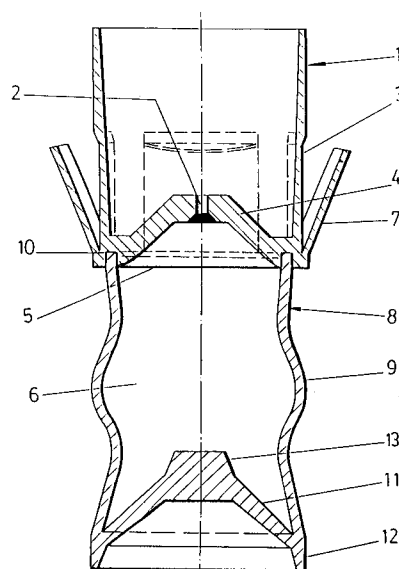


FIG-1

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OBJECT OF THE INVENTION

The object of this application for an Invention Patent is a two-element wad with pneumatic damping, which presents a series of advantages and novel-

BACKGROUND OF THE INVENTION

Currently, and as far as the state of the art is concerned, it should be noted that, within the cartridge sector, wads are usually manufactured from a single piece of deformable material, due to the need to protect the barrel of the gun against the leading or copperizing derived from repeated shots and the enhancement of the pattern and the complete plugging of gases created during the combustion of powder.

However, the use of the current wads presents a series of inconveniences, namely the following ones:

- Lack of pattern uniformity when comparing different shots made with the same cartridge and wad and the same rifle.
- Damping by bending and deformation of the constituent material, therefore producing a non-recoverable energy.
- Sudden deformations when the throttling of the gun is reached. The pellets are embedded within the material.
- The amount of energy consumed during these deformations is high, as well as the friction against the gun barrel.
- Each charge needs a wad with specific dimensions, i.e. each different amount of pellets needs a different wad size, as in the case of different lengths of the cartridge case, even for similar charges.
- The wad has an excessive gunshot, thereby causing appreciation errors to the shooter and third parties.

DESCRIPTION OF THE INVENTION

The two-element wad with pneumatic damping which is the object of this Invention is composed of two interchangeable elements which are joined each other, the case and the damper-shutter.

The case incorporates a series of bendable flaps and a damping regulating and air-injecting valve. Both the case and the damper present a series of cross-section walls of a convexo-concave shape, able to absorb radial deformations with respect to the symmetry axis of the wad.

The damper has a four-fold action; it stands the bending and deformation of the material, the friction against the barrel and the compression of the

air contained.

The main advantages of the preconized cartridge wad, compared with conventional wads, are the following ones:

- Enhancement of the pattern.
- Need of less energy for a given charge drive.
- The same wad can be adapted to different cartridge case lengths, and house different charges within the same cartridge.
- Different cases and dampers can be interchanged.
- Flexibility to adapt to barrel throttle and different bores for the same gun bores.
- Perfect gas plugging with the lesser friction.
- Smaller embedding of small-shots on the wad material, which makes the wad-charge separation easier.
- Smaller range of the wad
- Smoother recoil
- Damping system with energy recovery.

To complement the subsequent description and in an effort to better understand the main characteristics of the invention, a set of drawings is attached to this descriptive report where, as an illustration and without limitation, the most representative details have been included:

DESCRIPTION OF THE DRAWINGS

Figure 1 shows a side sectional view of a preferred execution of the invention.

Figure 2 shows two dihedric views (plan view and side section) of the case.

Figure 3 shows two dihedric views (plan view and side section) of the damper-shutter.

Figures 4, 5 and 6 show a series of figures analogous to those of the above figures 1, 2 and 3, according to another alternative of execution of the invention.

DESCRIPTION OF A PREFERRED EXECUTION

In the light of the above mentioned figures and according to the numbering system adopted, it can be seen how it has been carried out a cartridge wad formed by two independent elements, the case (1) and the damper-shutter (8). Once assembled, both elements form the cartridge wad itself.

The case (1) is characterized because it shows a cylindrical external appearance, with a series of flaps (7) connected to it by its lower part while, in turn, the walls (3) present a series of bores which serve to house such flaps (7).

When the flaps (7) are folded, they are hosed into such holes, and the case presents an external appearance totally cylindrical.

The case (1) presents smooth inner walls of a trunco-conical shape open outwards. The bottom or

base (4) presents a trunco-conical convex shape, ended in a circular ring which is the base of the case itself, where, in turn, the inner walls end.

The lower area of the case presents at the foremost part a ring-shape groove which serves to connect the damper-shutter (8), while the central area presents a trunco-conical concave shape. In turn, the central area of the base or wall which serves as the bottom of it (4) houses a valve (2) formed by two non-passing holes coinciding with a thin membrane (5) made of the same material as the case. The upper hole of the valve can have a cylindrical or prismatic shape, while the lower one can be trunco-conical or of a similar shape. The dimensions and the thickness of the membrane can vary depending on the needs.

It should also be noticed that the membrane can be replaced by a cap able to slide throughout the seat forced by the pressure, and acting similarly to the membrane, or even by a hole regulating the air throttle as needed.

The damper-shutter (8) presents a vase-shape external appearance, with a chamber delimited by bellow-shaped walls (9) or originated by a sinusoidal curve, with slightly rounded inflections. Such wall (9) is supported onto a cross-sectional wall (12) which acts as closure or base of the bellow which, in turn, has a convex-shaped bottom formed by two trunco-conical shapes (11) and (13) connected each other.

The same wall (12) has a concave-shaped bottom formed by the two trunco-conical shapes (11) and (13) connected each other.

The upper part or edge (10) of the damper (8) incorporates a ring-shaped groove. The groove has a double-lip edge to provide a better water-tightness when supported on a flat surface. In turn, there is a ring-shaped rib which matches the case (1) thus preventing that once the damper (8) and the case (1) have been connected, they can be easily detached.

This invention has tried to solve all the inconveniences presented by current wads. For this purpose, a two-element wad has been selected, and both elements will be manufactured by injection or blowing, and will be made of plastic or non-rigid or semi-rigid material.

After both elements of the wad have been assembled, it can already be installed into the cartridge.

When the wad is introduced into the cardboard case, the side flaps will be folded inside their housing, remaining in this condition until the wad comes out from the gun. Then they will unfold to serve as stabilizers and brakes.

When the wad is located inside the case and resting against the powder charge, the damper will be flexed and the air inside the cartridge will be

compressed (such compression being determined by the length of the damper bellow). In this position, the wad receives the small-shot charge on its upper part, and it will be ready to be shot.

Taking all the above into consideration, when the gun is shot the damper will work by flexing the material of its walls (bellow) along with the friction produced against the walls of the case or the gun. When the bellow of the damper is completely folded, the convex cone of the base of the damper will push the folded walls against the concave cone of the wall of the case which produces a deformation until it adapts to the shape of both cones. Then, the air contained and compressed in the chamber (6) will have reached the necessary pressure to open the valve (2) expelling a jet of compressed air which will impel the small-shot charge recovering part of the energy used for the damping and converting it into a useful impulse for the shot. Should this valve be designed so that it opens when it receives the extra pressure from the gun throttle, it will use part of the energy accumulated during the damping to impulse the small-shot charge and, furthermore, it will permit the wad to pass through the gun throttle as the internal resistance to compression decreases.

Since the cross-sectional wall of the case and the closing wall of the damper have a convex-concave shape, they enable to absorb radial contractions to the symmetry axis of the wad thus making the passing of the wad with the small-shot charge through the throttle being smooth and even.

Furthermore, the valve (2) can act either instantaneously or in a progressive way depending on the needs, by simply varying the opening pressure of the valve or the section of the air hole. Under these circumstances, it is easy to make the air flow almost instantaneously or more gradually, thereby achieving the final damping desired.

When the wad comes out from the gun, the flaps tend to unfold. Such unfolding will be favoured by the air which contacts them at a very high speed. Once they have been unfolded, they do not stop the wad, but even they do stabilize its trajectory, making the segregation of the wad and the small-shot charge quick and smooth with a scarce distortion of the trajectory of the small-shot charge.

When the wad is suddenly segregated from the charge, due to the braking effect of the air, it will fall in the nearby of the shooter, and it will not be easy to doubt whether he has reached his target or not.

Claims

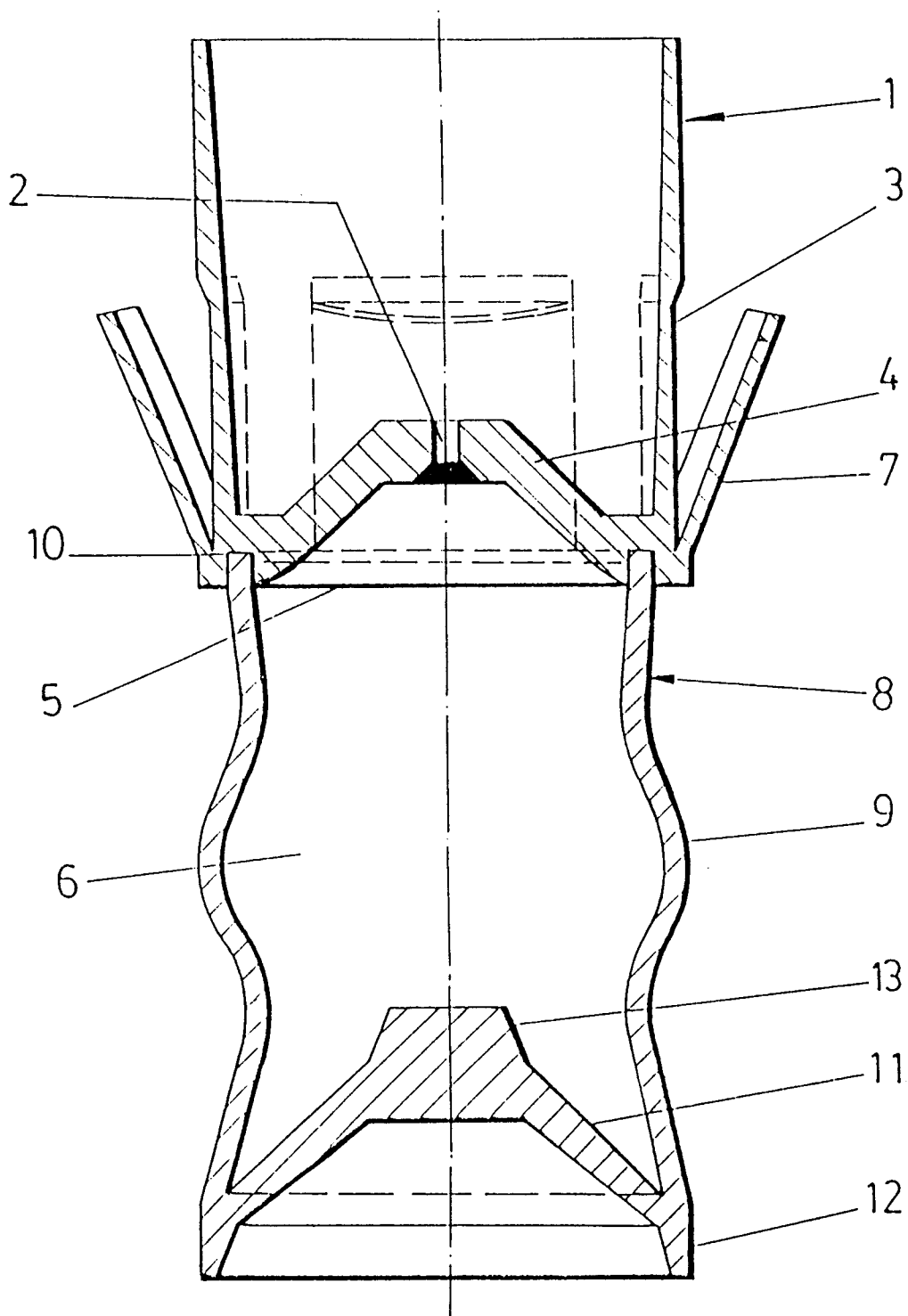
1. Two-element wad with pneumatic damping, designed to be used with fire weapons cartridges and similar, essentially characterized

because it is formed by two interchangeable elements which are joined each other, a case (1) and a damper-shutter (8), manufactured by injection or blowing, and made of plastic or any other non-rigid or semi-rigid material, so that the case incorporates a series of peripheral flaps (7) foldable and able to unfold when the wad comes out from the gun, thus stopping the wad quickly and stabilizing its trajectory, thereby enabling a quick and smooth segregation of the wad and the small-shot charge, with small distortion of the trajectory.

2. Two-element wad with pneumatic damping, according to the previous claim, essentially characterized because the case (1) adopts a cylindrical shape with the flaps (7) protruding from the base. The flaps are connected to the wad by their lower part, and they are housed in a folded position inside a series of grooves coinciding with the walls (3) which are flat and of trunco-conical shape open outwards, with the bottom or base (4) being of a convex trunco-conical shape ended on a circular ring which serves as a base for the case. The lower area of the case presents at the outmost part a ring-shaped grooves able to receive and couple the damper-shutter (8), while the central area presents a concave trunco-conical shape. The central part of the base (4) presents a valve (2) formed by two holes joined by a thin membrane (5) made of the same material of the case, which can be replaced by a cap sliding in its seat by means of the pressure, or by a hole regulating the air output as needed.
3. Two-element wad with pneumatic damping, according to claims 1 and 2 characterized because the damper-shutter (8) is vase-shaped with a chamber (6) surrounded by walls (9) with the shape of a bellow fixed to a cross-sectional wall (12) which forms the closure or base of such wall (9) and formed by two trunco-conical elements (11) and (13). The upper part (10) of the damper (8) incorporates a ring-shaped groove which determines a double-lip edge that guarantees the necessary water-tightness since it rests on a flat surface. Furthermore, a ring-shaped recess on the upper part is housed inside such case (1) preventing the segregation of the damper (8) and the case (1). Such damper (8) can support the flexion and bending of the material, the friction against the walls and the compression of the air contained during the shot.
4. Two-element wad with pneumatic damping, according to claims 1 to 3 characterized because

since the wad is housed inside the case and resting against the small-shot charge it has been foreseen that it originates a flexion of the damper (8) with the subsequent compression of the air contained inside it. In this position, the wad receives the small-shot charge at its upper part and the cartridge is ready to be shot.

5. Two-element wad with pneumatic damping, according to claims 1 to 4 characterized because the damper (8) - after the shot - acts through the flexion of the material of its walls (9) along with the friction against the walls (3) of the case (1) or the gun so that when the bellow of such walls is completely folded, the convex cone of the damper base will push the folded walls against the concave cone of the case wall thus deforming them until they adapt themselves to the shape of both cones.
6. Two-element wad with pneumatic damping, according to claims 1 to 5 characterized because it has been foreseen that the compressed air contained inside the chamber (6) reaches sufficient pressure to open the valve (2) expelling a jet of compressed air to impel the small-shot charge thus recovering part of the energy used for the damping converting it in a useful impulse for the shot irrespective of the fact that such valve (2) is designed or not to be opened when it receives the extra pressure from the gun throttle thus enabling the wad to pass through the gun throttle reducing its internal resistance to compression. The size of the valve can vary.
7. Two-element wad with pneumatic damping, according to claims 1 to 6 characterized because the cross-sectional wall of the case and that of the damper closing have the adequate convex-concave shape to absorb the radial deformations to the symmetry axis of the wad enabling a perfect shutting for different bore diameters as well as the smooth and even passing of the wad through the gun throttle.



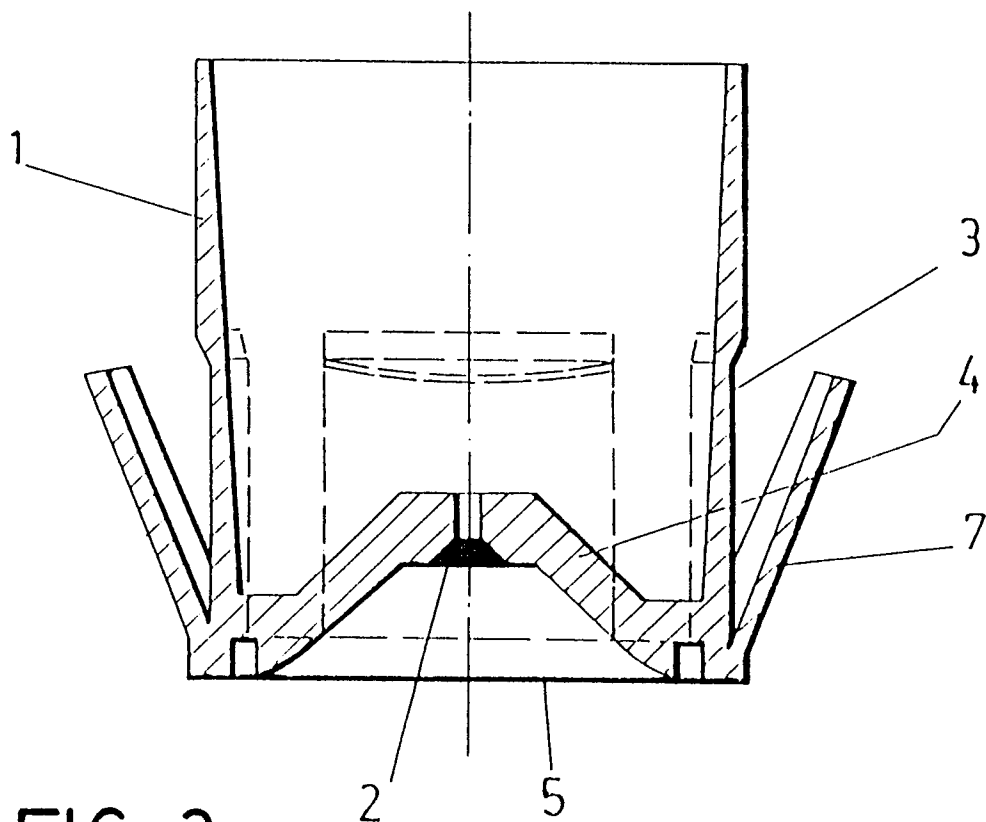
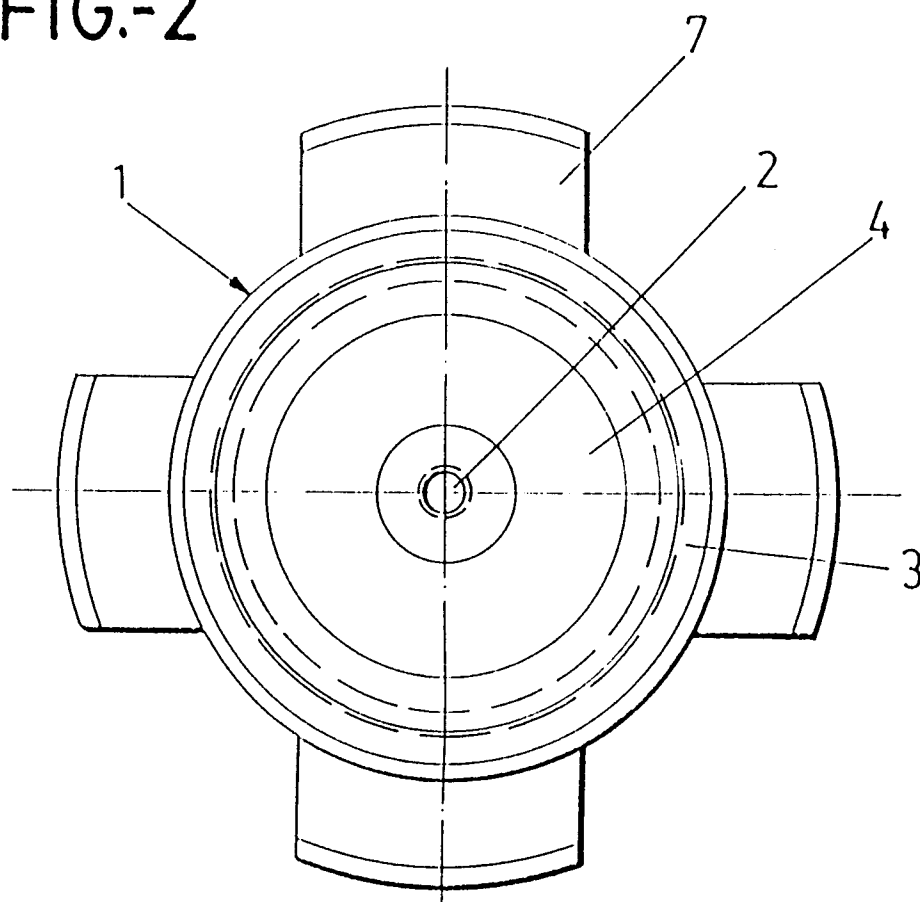


FIG.-2



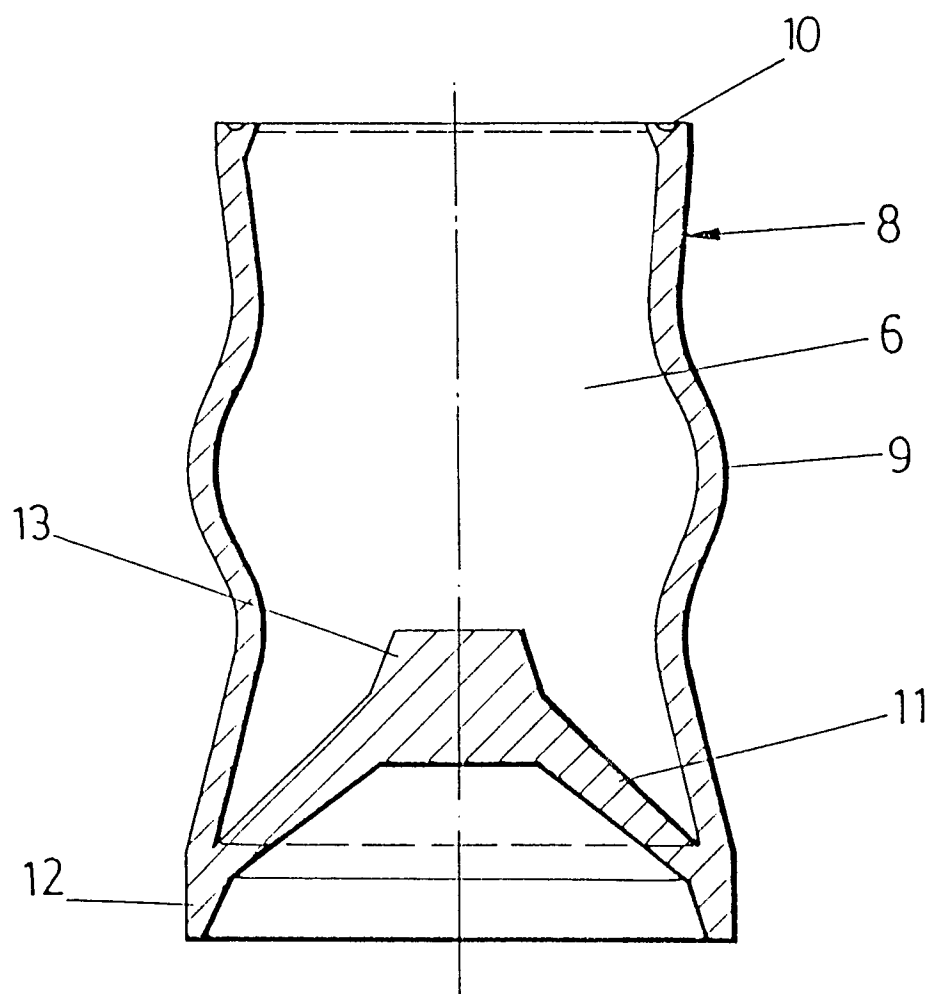
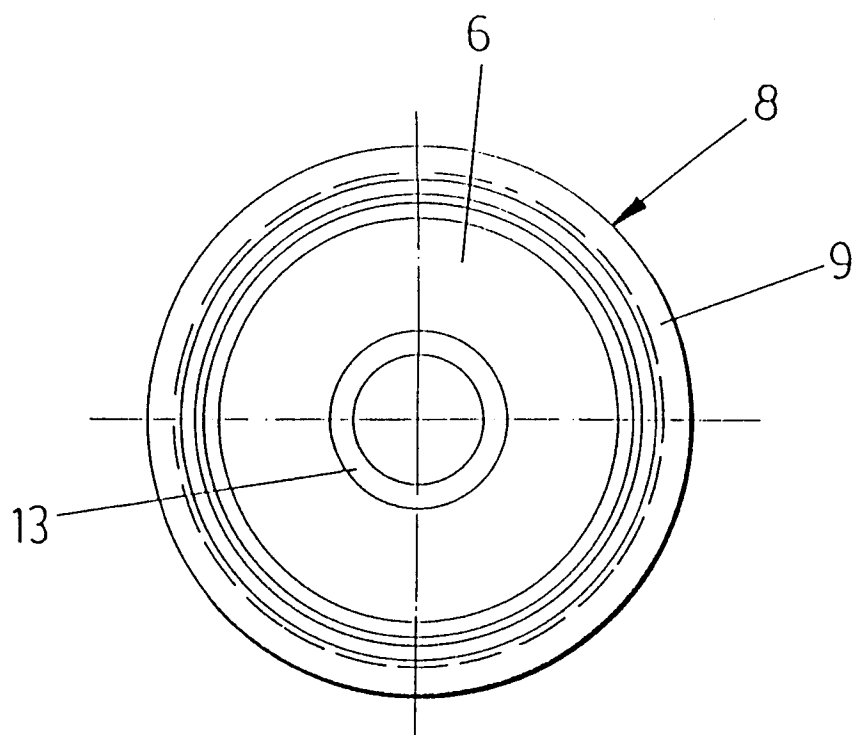


FIG.-3



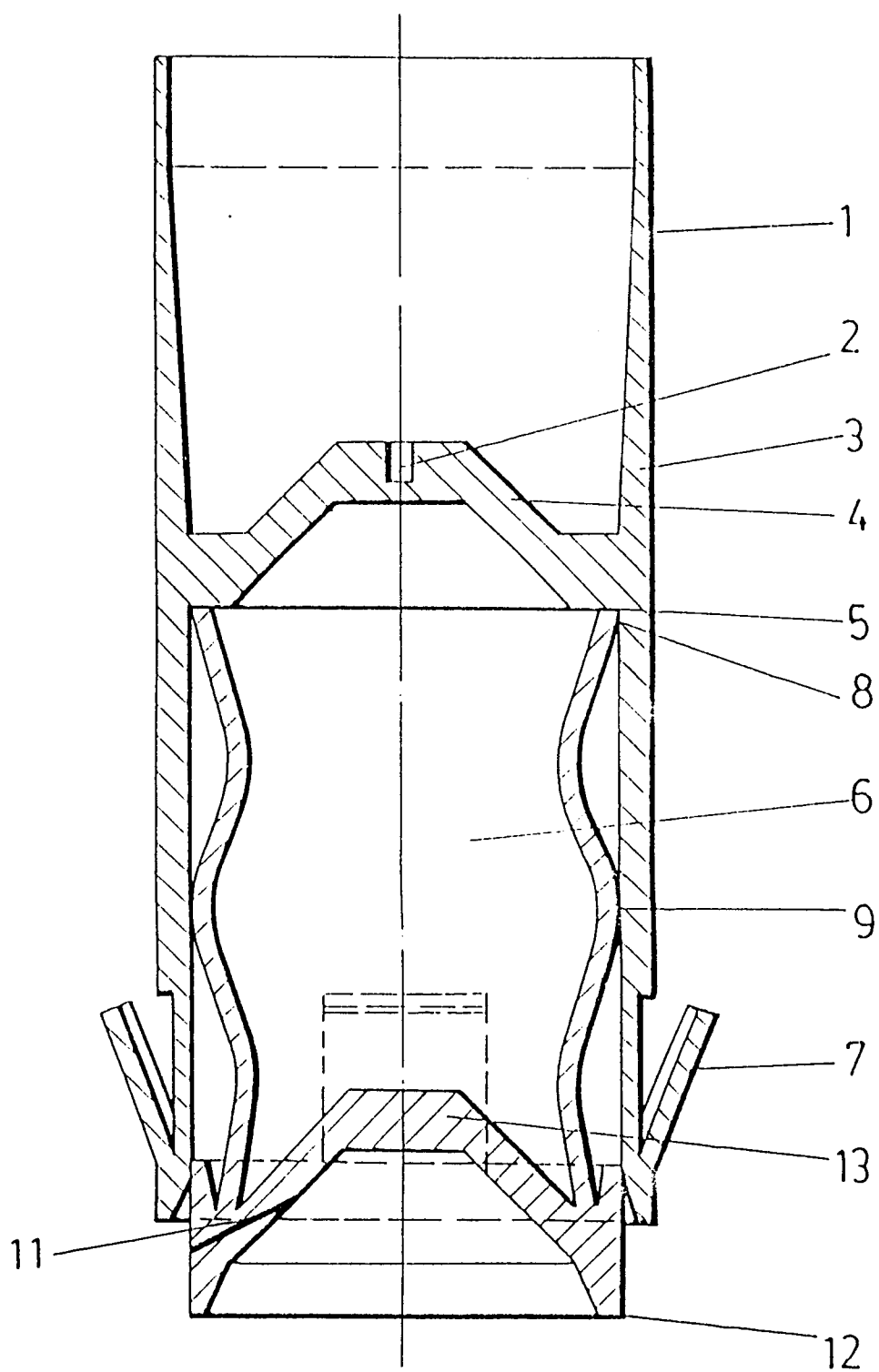


FIG.-4

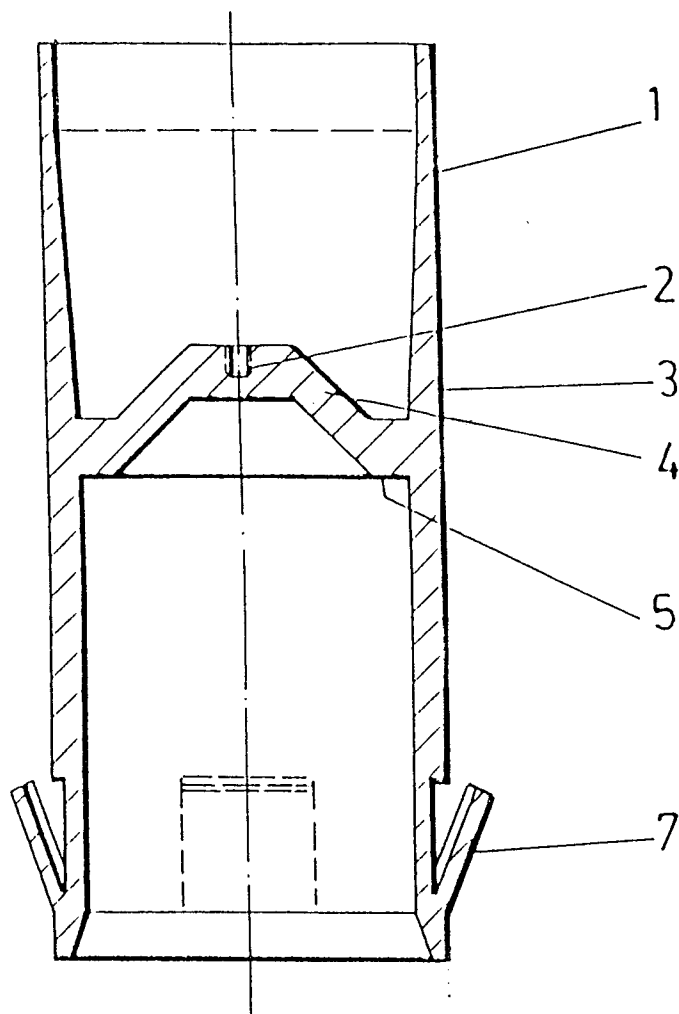
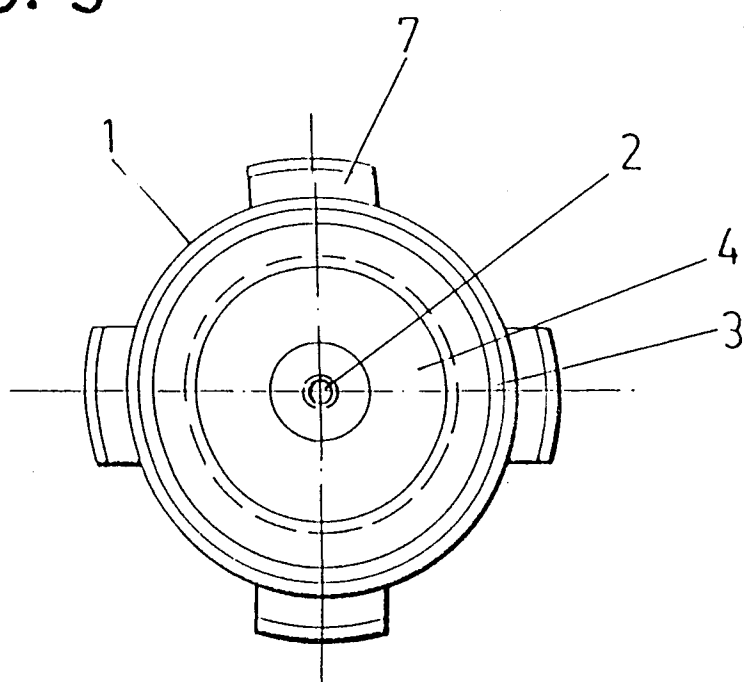


FIG.-5



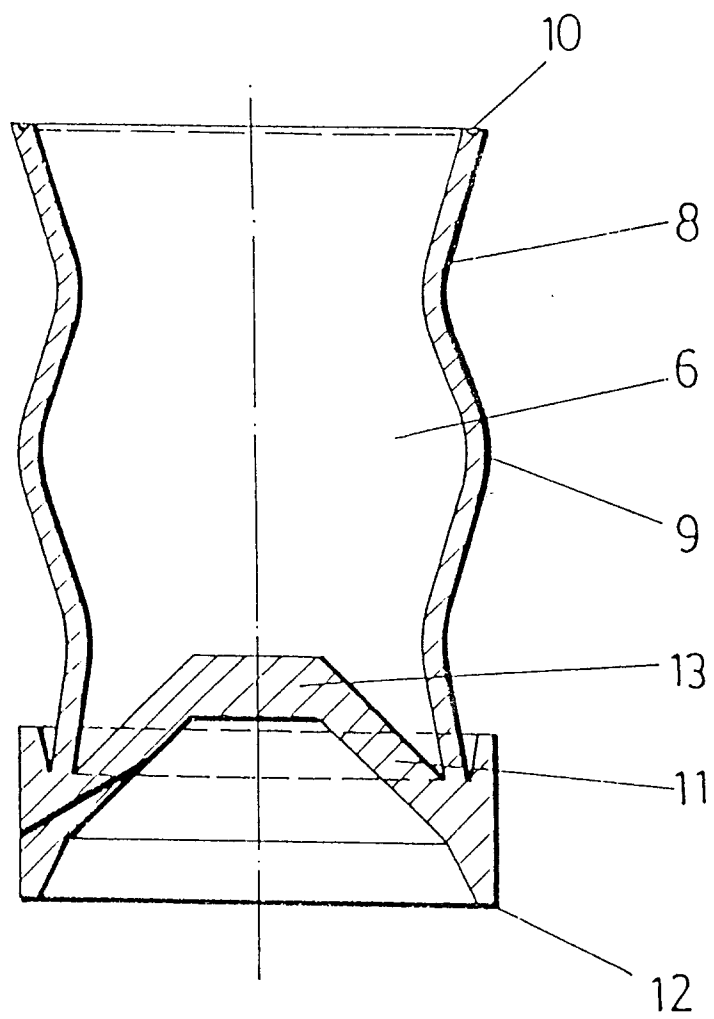
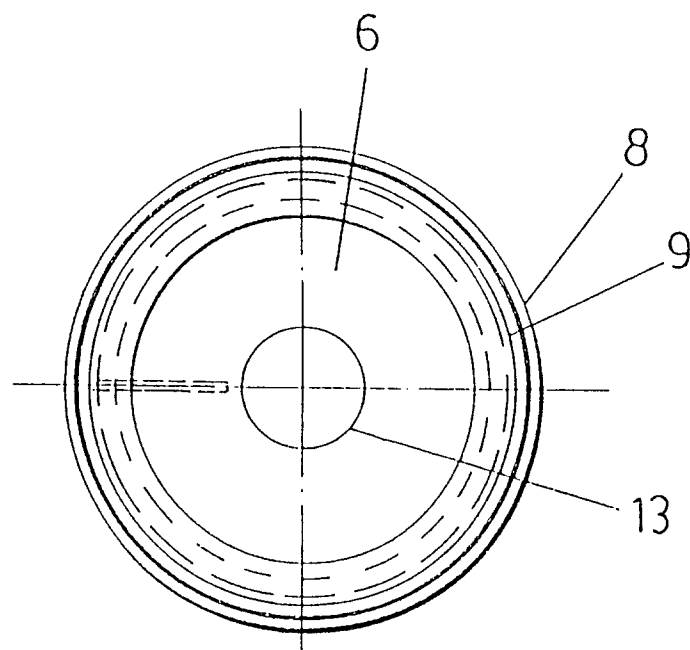


FIG.-6



INTERNATIONAL SEARCH REPORT

Internat Application No
PCT/ES 94/00053

A. CLASSIFICATION OF SUBJECT MATTER IPC 5 F42B7/08		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) IPC 5 F42B		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	BE,A,702 530 (HIRTENBERG PATRONEN-ZUNDHUTCHEN- UND METALLWARENFABRIK AG) 15 January 1968 see page 4, last paragraph - page 5, paragraph 2; claims; figures ---	1
Y	DE,C,171 410 (SCHELLING) 1900 see the whole document ---	1
A	AU,B,422 052 (FEDERAL CARTRIDGE CORPORATION) 3 March 1972 see page 10, paragraph 1 - page 12, paragraph 1; figures ---	1-3,6
A	LU,A,59 337 (GEVELOT SA) 7 January 1970 see page 4, line 3 - page 6, line 16; figures ---	1-3
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☒ Further documents are listed in the continuation of box C. ☒ Patent family members are listed in annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "&" document member of the same patent family		
Date of the actual completion of the international search 13 September 1994		Date of mailing of the international search report 23.09.94
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+ 31-70) 340-3016		Authorized officer Douskas, K

INTERNATIONAL SEARCH REPORT

Internat Application No
PCT/ES 94/00053

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR,A,2 343 219 (PIEGAY) 30 September 1977 see page 4, line 3 - page 8, line 24; figures ---	1,3-5,7
A	FR,A,2 070 268 (DELAGE-BEAUDEUF) 10 September 1971 see claims; figures -----	2,6