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(71) Applicant: **Cadara N.V.**
1651 Lot-Beersel (BE)

(72) Inventor: **Piot, Marc**
1651 Lot-Beersel (BE)

(74) Representative: **Quintelier, Claude et al**
Gevers & Vander Haeghen
Holidaystraat 5
1831 Diegem (BE)

(54) A perforator

(57) A perforator comprising a set of adjacently and resiliently applied punch elements, said perforator further comprising a drive member provided for driving said punch elements, said drive member comprising a camshaft provided for being rotationally driven over a 360° revolution.

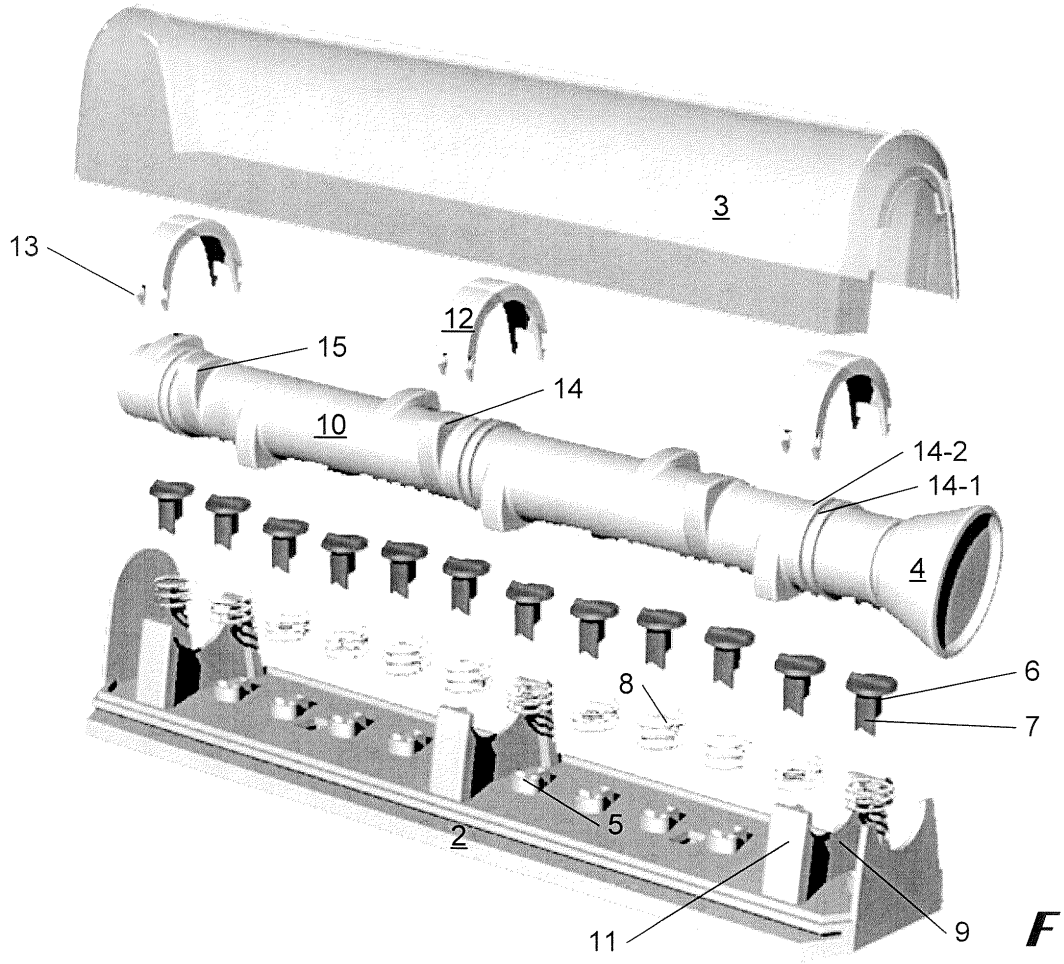

Fig. 2

EP 1 992 459 A1

Description

[0001] The present invention relates to a perforator comprising a set of adjacently and resiliently applied punch elements, said perforator further comprising a drive member provided for driving said punch elements.

[0002] Such a perforator is well known and serves to apply a series of perforations into a carrier such as a paper or cardboard sheet. By applying a force on the drive member, the punch elements are driven in order to punch a set of holes into the carrier. The number and the shape of the holes applied into the carrier are dependent on the document file in which the carrier has to be stored. So, for example only two circular holes could be applied in the left margin of the carrier or a plurality of particular shaped holes could be applied.

[0003] A drawback of the known perforators is that, in particular when a plurality of holes have to be punched into a carrier, it requires a rather high force to punch the holes. To generate this force, use can be made of an electric motor or from a cantilever mechanism. The use of an electric motor has the drawback that it makes the perforator expensive, in particular for private use. The use of a cantilever mechanism has the drawback that a rather long arm is required to obtain the required torque. Such a long arm gives a non esthetical character to the perforator and makes it therefore not suitable for private use.

[0004] It is an object of the present invention to realise a perforator suitable for applying a set of adjacent holes in a carrier without requesting a high force.

[0005] For this purpose, a perforator according to the present invention is characterised in that said drive member comprises a camshaft provided for being rotationally driven over a 360° revolution. The use of a camshaft which can be rotated over 360° enables to drive the punch elements by means of a rotational movement. In such a manner, the punch elements are not all driven at a same moment as their activation is spread over the time during which the camshaft makes a complete rotation. Consequently, the force to be applied is also spread in time and the instantaneous forces are much less, which provides a more user friendly solution.

[0006] A first preferred embodiment of a perforator according to the present invention is characterised in that each punch element is driven once during said 360° revolution. The force is thus equally spread.

[0007] A second preferred embodiment of a perforator according to the present invention is characterised in that said camshaft comprises a set of cams applied over the length of it, in such a manner that the subsequent cams are each time angularly shifted with respect to each other. In such a manner, the cams subsequently drive a punch element and care is taken that the force is spread over the whole revolution of the camshaft.

[0008] A third preferred embodiment of a perforator according to the present invention is characterised in that said camshaft comprises a first and a second segment applied subsequent to each other, said first and second segment each comprising a sub-set of cams of said set of cams, said sub-set of cams of said first and second segment being angularly shifted with respect to each other. The two segments solution provides an easier manufacturing of the camshaft.

[0009] Preferably said camshaft is applied on at least two bearings, said camshaft being provided with bearing rings circumferentially applied thereon, in such a manner as to contact said bearings. An appropriate bearing for the camshaft is thus obtained.

[0010] Preferably said camshaft is hand-driven. A cheap and reliable perforator, suitable for private use is thus obtained.

[0011] The invention will now be described with reference to the drawings showing a preferred embodiment of a perforator according to the invention. In the drawings :

- figure 1 shows an overall view of a perforator according to the present invention;
- figure 2 shows an exploded view of a perforator according to the present invention;
- figure 3 shows the perforator of figure 1 but with a removed cover; and
- figure 4 shows another embodiment of a perforator according to the present invention.

[0012] In the drawings, a same reference sign has been allocated to a same or analogous element.

[0013] The perforator 1 of the present invention and shown in figure 1 comprises a base member 2 on which a tunnel shaped cap 3 rests. The perforator is preferably made of plastic material, but it will be clear that other materials such as steel can also be used.

[0014] The perforator comprises a handle 4 which can be conically shaped, such as illustrated in the figures 1, 2 and 3 or knob shaped, such as shown in figure 4. Of course other shapes as the one illustrated in the drawings are possible. Moreover, it could also be envisaged to use a motor driven perforator in which case the handle is replaced by a motor, preferably an electric motor.

[0015] As illustrated in figure 2, the base member 2 comprises a set of holes 5 applied adjacent to each other along a line. In the drawings, the holes are mushroom shaped since the perforator is intended for perforating carriers to be applied in a booklet where the carriers are kept together by means of rings. Of course, the present invention is not limited to perforators with mushroom shaped holes and other geometrics for the holes such as circular or oval holes are also possible. The distance between the successive holes is preferably the same, in such a manner as to apply equi-distant perforations into the carrier.

[0016] The perforator further comprises a set of adjacently applied punch elements 6. To each hole 5, there is associated a punch element 6 having a shape which matches with the one of the hole, in such a manner that

the punch element enters into the hole, thereby substantially filling the hole. The punch elements are stamp shaped and their downwards extending extremity 7 is provided with a cutting edge. Around each punch element 6, there is applied a spring 8 in order to provide resilient properties to the punch element. Instead of having the spring wrapped around the punch element, it could also be possible to apply the spring on top of the punch element.

[0017] On the base member 2, there are further applied at least two bearings 9, provided for bearing a camshaft 10. The lateral sides of the bearings are provided with shields 11, which frictionally engage with the cap 3. If the perforator is made of plastic material, the bearings preferably are integrally made with the base member, for example by means of a moulding method.

[0018] The camshaft 10 rests on the bearings 9 and is kept in place by means of caps 12 which are provided with hooks 13 engaging into the bearings. The camshaft is preferably provided with bearing rings 14 circumferentially applied thereon, in such a manner as to contact the bearings 9. The caps 12 thus cover the camshaft at the place where the bearing rings 14 are applied, thereby providing an appropriate fitting of the camshaft on the bearings without affecting the rotation of the camshaft. The bearing rings preferably have a stepwise profile where a smaller ring 14-1 precedes a larger one 14-2, when considered in a direction extending lengthwise as from the handle. The smaller ring 14-1 rests on the bearing whereas the larger ring 14-2 contacts an outer wall of the bearing, thereby fixing the lengthwise position of the camshaft with respect to the bearings.

[0019] The camshaft 10 is provided for being rotationally driven over a 360° revolution. The camshaft comprises a set of cams 15 applied over the length of it, in such a manner that the subsequent cams are each time angularly shifted with respect to each other. The cams are applied in such a manner over the length of the camshaft that during one revolution each cam contacts a punch element and drives the latter into a downwards movement. The cams are applied on the camshaft in an angularly shifted manner, in such a way that they do not all together drive the punch elements. Preferably the cams are each time angularly shifted over a same angle with respect to each other as this provides a uniform distribution of the force to be applied. So, for example, when twelve punch elements and twelve cams are present, these cams are each time shifted over an angle of 15°. Of course it could also be possible to have a 30° angle and drive two cams simultaneously.

[0020] In the embodiment shown in figure 2, the camshaft comprises a first and a second segment applied subsequent to each other. The first and second segment each comprise a sub-set of the set of cams, each sub-set of cams of the first and second segment being each time angularly shifted with respect to each other. In such a manner, the camshaft can be made of two equal parts which render the manufacturing thereof cheaper as a less complicated mould has to be built. In the shown embodiment the first and second segment are angularly shifted with respect to each other so that only one cam at a time during a complete rotation is activated.

[0021] In use, the user will turn the handle 4, thereby imposing a rotational movement on the camshaft. The rotation of the camshaft will cause a first cam to contact the punch elements and apply a pressure thereon. This pressure will cause a downwards movement of the activated punch element and a compression of the spring. The downward movement of the punch element will cause the latter to perforate the carrier (not shown) by means of its cutting edge 7. The further rotation of the camshaft will on its turn cause the cam to leave the activated punch element, thereby releasing the pressure thereon. The spring will cause the punch element to return to its initial rest position due to its resilient force. The further rotation of the camshaft will cause the different punch elements to be activated, so that during a 360° rotation they will each have been activated once and apply a hole into the carrier. As the punch elements are successively activated by the rotation of the camshaft, the force to be applied is spread over the whole rotation, thereby reducing the instantaneous force which would have to be applied if all the punch elements would have been activated simultaneously.

Claims

1. A perforator comprising a set of adjacently and resiliently applied punch elements, said perforator further comprising a drive member provided for driving said punch elements, **characterised in that** said drive member comprises a camshaft provided for being rotationally driven over a 360° revolution.

2. The perforator as claimed in claim 1, **characterised in that** each punch element is driven once during said 360° revolution.

3. The perforator as claimed in claim 1 or 2, **characterised in that** said camshaft comprises a set of cams applied over the length of it, in such a manner that the subsequent cams are each time angularly shifted with respect to each other.

4. The perforator as claimed in claim 3, **characterised in that** said cams are angularly shifted over a same angle.

5. The perforator as claimed in claim 3 or 4, **characterised in that** said camshaft comprises a first and a second segment applied subsequent to each other, said first and second segment each comprising a sub-set of cams of said set of cams, said sub-set of cams of said first and second segment being angularly shifted with respect to each other.

6. The perforator as claimed in any one of the claims 1 to 5, **characterised in that** said camshaft is applied on at least two bearings, said camshaft being provided with bearing rings circumferentially applied thereon in such a manner as to contact said bearings.

7. The perforator as claimed in claim 6, **characterised in that** said bearing rings are bridged by caps engaging with said bearings.

8. The perforator as claimed in any one of the claims 1 to 7, **characterised in that** said punch elements are mushroom shaped, said perforator comprising a base member provided with a further set of holes for receiving said punch elements.

9. The perforator as claimed in any one of the claims 1 to 8, **characterised in that** said perforator comprises a tunnel shaped cap for covering said camshaft and said punch elements.

10. The perforator as claimed in any one of the claims 1 to 9, **characterised in that** said camshaft is hand-driven.

11. The perforator as claimed in any one of the claims 1 to 9, **characterised in that** said camshaft is motor-driven.

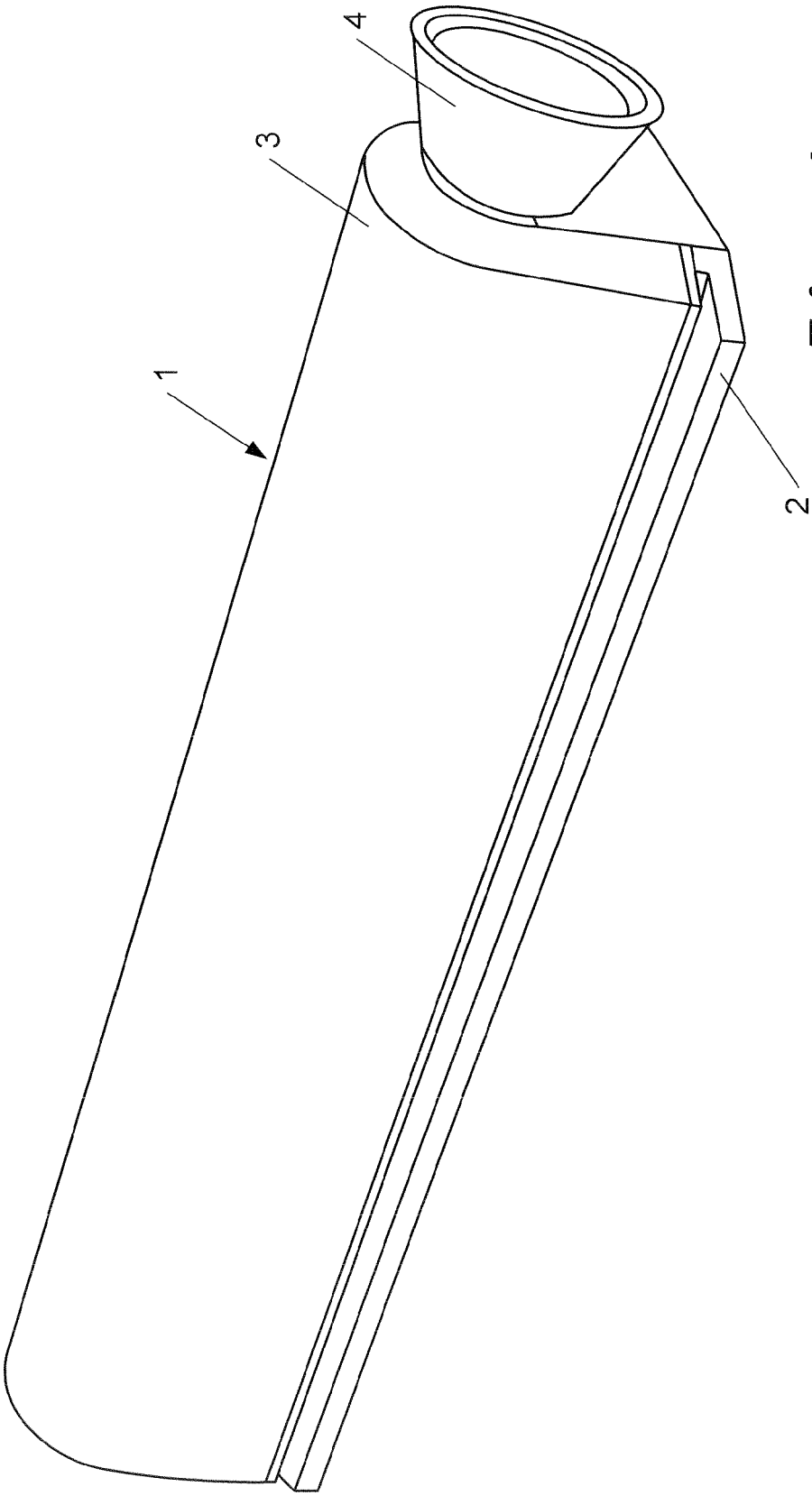

Fig. 1

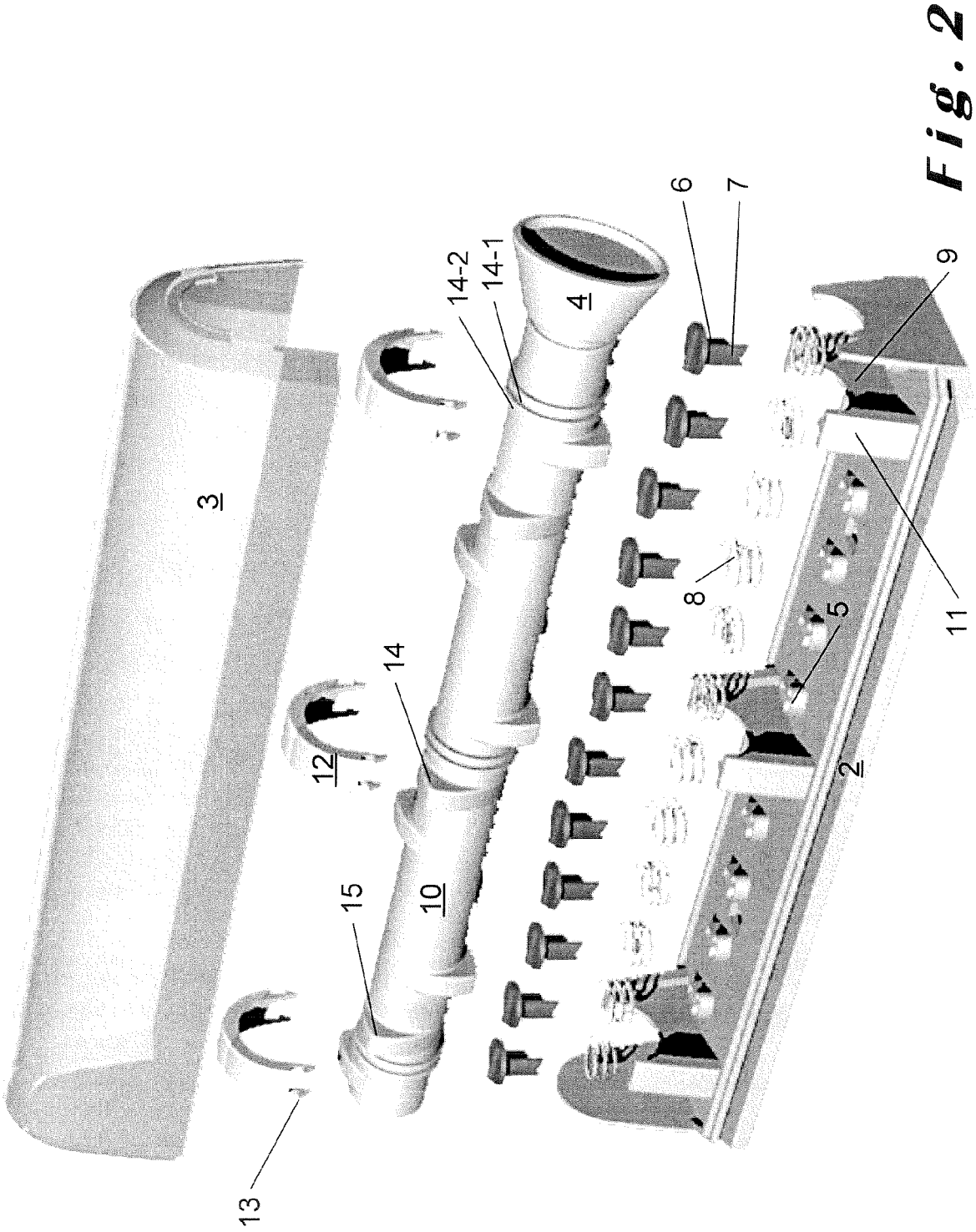

Fig. 2

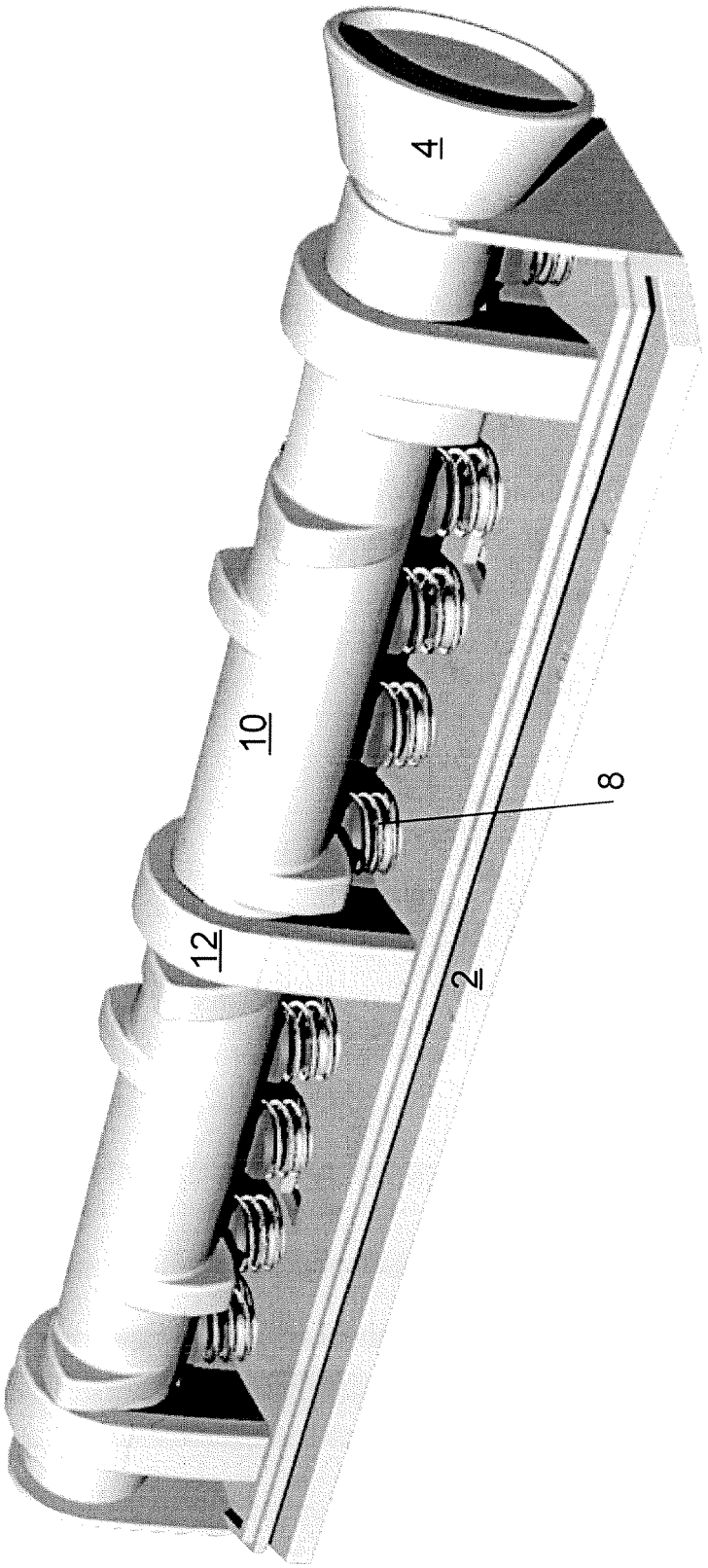

Fig. 3

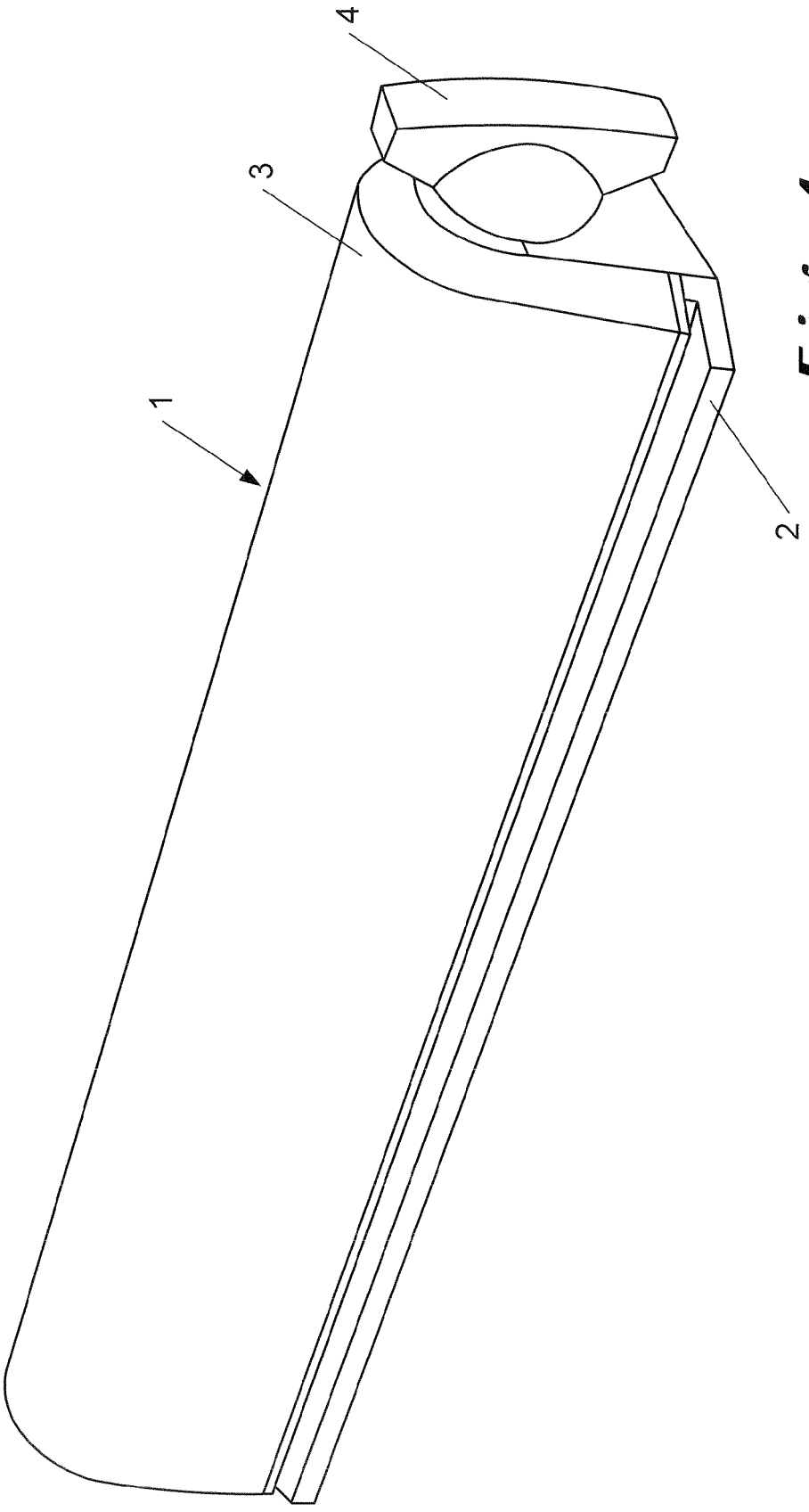

Fig. 4

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 10 8399

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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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B26D
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	3 August 2007	Wimmer, Martin

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 07 10 8399

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