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(71) Applicant: **FORD MOTOR COMPANY LIMITED**
Eagle Way
Brentwood Essex CM13 3BW(GB)

(84) Designated Contracting States:
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(71) Applicant: **FORD-WERKE AKTIENGESELLSCHAFT**
Ottoplatz 2 Postfach 21 03 69
D-5000 Köln 21(DE)

(84) Designated Contracting States:
DE

(71) Applicant: **FORD FRANCE SOCIETE ANONYME**
344 Avenue Napoléon Bonaparte B.P. 307
F-92506 Rueil Malmaison Cedex(FR)

(84) Designated Contracting States:
FR

(72) Inventor: **Easter, Robert Leslie**
4 Curlew Crescent
Kingswood Basildon Essex(GB)

(74) Representative: **Messulam, Alec Moses et al,**
A. Messulam & Co. 24 Broadway
Leigh on Sea Essex SS9 1BN(GB)

(54) **Hand operated inflator.**

(57) An inflator comprises a bulb 10 and a valve member 12. Two one way valves in the valve member 12 enable pumping of air into an inflatable lumbar support cushion (16) of a vehicle seat. A pressure release valve 20 positioned for convenient operation is connected to the inflatable device (16) through a flexible tube 28 in the bulb 10 and a by-pass passage 48 in the valve member 12.

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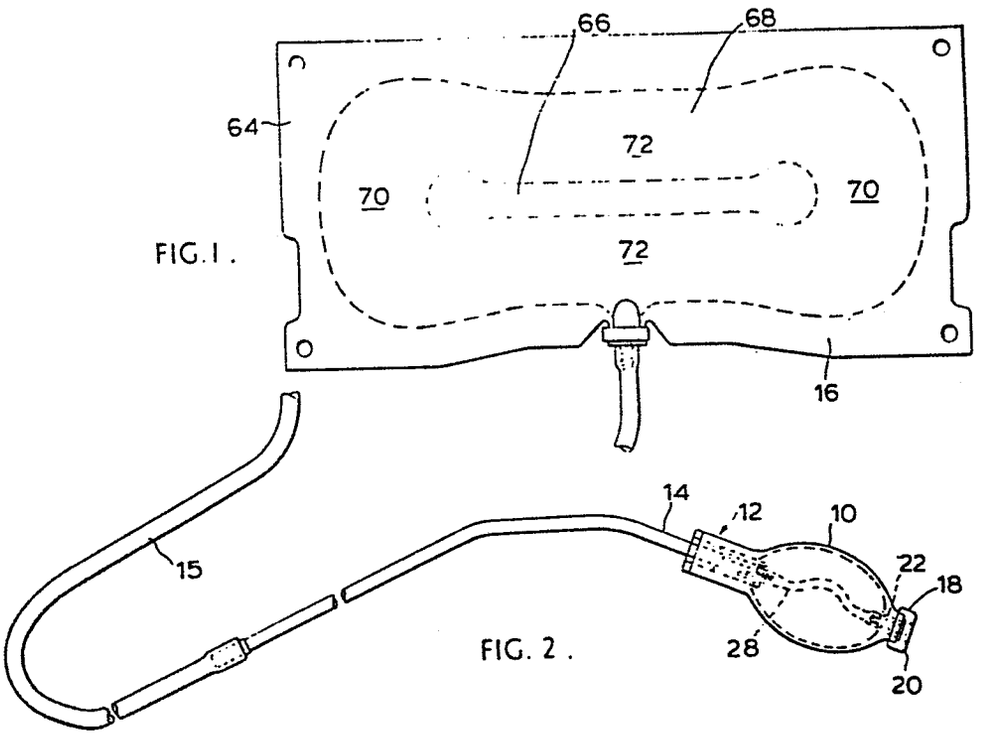


FIG. 1.

FIG. 2.

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HAND OPERATED INFLATOR

This invention relates to a hand operated inflator for pumping air into an inflatable device and for controlled release of air from the device.

The inflator of the present invention was designed for use with an adjustable lumbar support air cushion in a motor vehicle seat. Its compact low cost construction and convenience in operation make it particularly suitable for this application, and the invention also relates to a lumbar support unit including a hand operated inflator.

The invention is applicable to inflators with a resilient bulb and having a first one way valve through which air is pumped into the inflatable device by squeezing the bulb, a second one way valve through which air may enter the bulb as it recovers its shape and a manually operable pressure release valve for releasing air from the inflatable device.

Known inflators of this kind have the second one way valve mounted on the end of the bulb remote from its connection to the inflatable device and the pressure release valve mounted on a valve member at the other end. Where such an inflator is used in an application such as the vehicle application described where the bulb is normally gripped with the thumb near the second one way valve, the operator has to remove his hand from the bulb to depress the pressure release valve.

The inflator of the present invention seeks to mitigate the above disadvantage.

According to the present invention, there is provided a hand operated inflator for pumping air into an inflatable device and for controlled release of air from

the device, comprising a resilient bulb, a valve member connected to the bulb and having an outlet for connection to the inflatable device, and a first one way valve in said valve member arranged to permit flow of air to the outlet when the bulb is squeezed; characterised by a second one way valve in said valve member communicating with ambient air and arranged to admit air to the bulb so that it can recover its shape after being squeezed, and a passage in the valve member by-passing both the first and second one way valves and connected to a pressure release valve on the bulb remote from the valve member, which can be manually operated to release air from the inflatable device.

The invention also relates to an inflatable lumbar support unit comprising a hand-operated inflator unit as set forth above and a cushion which has an inflatable chamber surrounding an area which is not inflatable, the inflator being arranged to inflate the cushion.

With this construction the pressure release valve can be located on the bulb where it can be depressed by the thumb of the operator without removal of the hand from the bulb. The valve member has a neat and unobtrusive appearance and can be manufactured at low cost.

Various optional features of the invention will be apparent from the dependent Claims 2 to 8 and 11 to 15. Addtionally, the invention provides a motor vehicle seat with a lumbar support unit as set forth above where the cushion is in the seat back rest and the inflator is accessible to an occupant of the seat.

The invention will now be described, by way of example, with reference to the accompanying drawings in which;

Figure 1 shows a lumbar support cushion;

Figure 2 shows a hand operated inflator at the end of a tube connected to the cushion of Figure 1;

Figure 3 is a perspective view, on a larger scale, of a valve block;

Figure 4 is a section through the valve block of Figure 3, on the line IV-IV;

Figure 5 is another section through the valve block of Figure 3, through the two ducts not shown in Figure 4;

Figure 6 is a section through a pressure release valve; and

Figure 7 is a section through the cushion of Figure 1 on the line VII-VII.

An inflator comprises a rubber bulb 10 connected by a valve member 12 to a flexible tube 14 leading to an inflatable lumbar support cushion 16 mounted in a vehicle seat (not shown). The tube has a rigid portion 14 and a flexible portion 15 and extends forwardly along the left or right hand side of the base of the seat so that the bulb 10 can be readily gripped by an occupant of the seat.

A pressure release valve 18 has a spring loaded button 20 located at the forward end of the bulb 10. It is conveniently positioned so that the seat occupant can depress it with his hand and at the same time hold the bulb in his hand.

The pressure release valve comprises a housing 22 and a poppet valve 24 on which is mounted the button 20. An O-ring 25 is supported on the valve 24. A spring 26 normally holds the O-ring 25 on the poppet valve 24 seated on the housing 22 to close the valve. Depression of the button 20 against the force of the spring 26 opens the valve.

The pressure release valve housing 22 is fitted into an aperture at one end of a flexible air release tube 28 within the bulb 10.

The valve member 12 has a valve body 30 which fits into a sleeve at the other end of the bulb 10. The body 30 has a bore 32 at one end which receives the end of the rigid tube portion 14. At the other end of the body 30 are three passages.

The passage 34 admits air into the bulb 10 when the bulb is released after having been squeezed. This passage is shown in more detail in Figure 4. Air from the atmosphere can pass along axial grooves 38 in the surface of the body to an annular groove 40. A flap 42 in the passage 34 allows air to pass from right to left in Figure 4, but not in the opposite direction. A polyester foam filter 44 is also provided in this passage.

The passage 46 allows air to be pumped along the tubes 14,15 to the cushion 16. There is a one way valve 47 in this passage, and the passage communicates with the bore 32. The valve 47 allows air to pass from the bulb 10 to the bore 32, but not in the reverse direction. The passage 48 is connected to the air release tube 28 through a connector 50, and communicates with the bore 32. When the pressure release valve is opened, air can flow from the cushion 16, through the release valve, to the atmosphere.

In operation, air is pumped into the inflatable cushion 16 through the passage 46 and the one way valve 47 by squeezing the bulb 10 until the pressure therein exceeds the pressure in the cushion 16. As the bulb recovers its shape ambient air enters through the one way valve 42. If the required pressure is exceeded, air can be released from the cushion 16 by depressing the button 20 of the pressure release valve.

The cushion 16 in the drawings is made from two rectangular sheets 60,62 of rubber. The sheets are bonded together around their periphery 64 and in a central area 66, so that a single inflatable chamber 68 is defined.

The central bonded area 66 has a dog-bone shape, and the inflatable chamber 68 is generally oval; its ends 70, when inflated, being of greater cross-sectional area, or fatter, than its sides. This can be seen in particular in Figure 7. The presence of the central bonded area means that full inflation can be achieved with less air than would be the case without this area. The cushion can therefore be pumped up or deflated quickly. Also, suitable dimensioning of the bonded areas 64 and 66 ensures that the enlarged ends 70 are obtained. This provides a desirable degree of side support for a seat occupant. The spacing apart of the sides 72 of the chamber 68 provides lumbar support over a relatively large area.

The cushion, which can suitably be made of rubber, will be included in the backrest of a motor vehicle seat, normally in front of a wire mat secured to the seat frame and behind the seat upholstery. The cushion has securing holes 74 which are used to hold the cushion in the correct place in the seat.

CLAIMS

1. A hand operated inflator for pumping air into an inflatable device and for controlled release of air from the device comprising:

a) a resilient bulb (10);

b) a valve member (12) connected to the bulb (10) and having an outlet (32) for connection to the inflatable device (16); and

c) a first one way valve (47) in said valve member arranged to permit flow of air to the outlet (32) when the bulb (10) is squeezed;

characterised by:

d) a second one way valve (42) in said valve member (12) communicating with ambient air and arranged to admit air to the bulb (10) so that it can recover its shape after being squeezed; and

e) a passage (48) in the valve member (12) by-passing both the first and second one way valves (47,42) and connected to a pressure release valve (18) on the bulb (10) remote from the valve member (12), which can be manually operated to release air from the inflatable device.

2. An inflator as claimed in Claim 1, in which the release valve is connected to the by-pass passage by a flexible tube within the bulb.

3. An inflator as claimed in Claim 1 or Claim 2, in which the release valve (18) includes a spring-loaded plunger (20) positioned at one end of the bulb (10) so that it can be depressed by an operator's thumb when the operator's hand remains in a convenient position for squeezing the bulb.

4. An inflator as claimed in any one of the preceding claims, wherein a filter (44) is placed in the path of air passing from ambient through the second one way valve (42) to the bulb (10).

5. An inflator as claimed in any one of the preceding claims, wherein the valve member (12) is a single block (30) having a first passage (48) therethrough which by-passes the first and second one way valves (47,42), a second passage (46) therethrough containing the first one way valve (47) and a third passage (34), the third passage containing the second one way valve (42) and communicating with the atmosphere.

6. An inflator as claimed in Claim 5, wherein the first and second passges (48,46) both lead into a common bore (32) in the block.

7. An inflator as claimed in Claim 6, wherein a tube (14) leading to the inflatable device (16) is received in the common bore (32).

8. An inflator as claimed in any one of Claims 5 to 7, wherein the block (30) is received in a sleeve at one end of the bulb (10).

9. An inflatable lumbar support unit comprising a hand operated inflator as claimed in any preceding claim and a cushion (16) which has an inflatable chamber (68) surrounding an area (66) which is not inflatable, the inflator being arranged to inflate the cushion.

10. A unit as claimed in Claim 9, wherein the area (66) of the cushion which is not inflatable is of a dog-bone shape.

11. A unit as claimed in Claim 9 or 10, wherein the chamber (68) is generally oval.

12. A unit as claimed in Claim 11, wherein the ends (70) of the oval are, when inflated, fatter than the sides (72).

13. A unit as claimed in any one of claims 9 to 12, and made of two sheets (60,62) of material selectively bonded together.

14. A unit as claimed in Claim 13, wherein the material is rubber.

15. A motor vehicle seat with a lumbar support unit as claimed in any one of claims 9 to 14, wherein the cushion is in the seat backrest and the hand operated inflator is accessible to an occupant of the seat, for inflating the cushion.

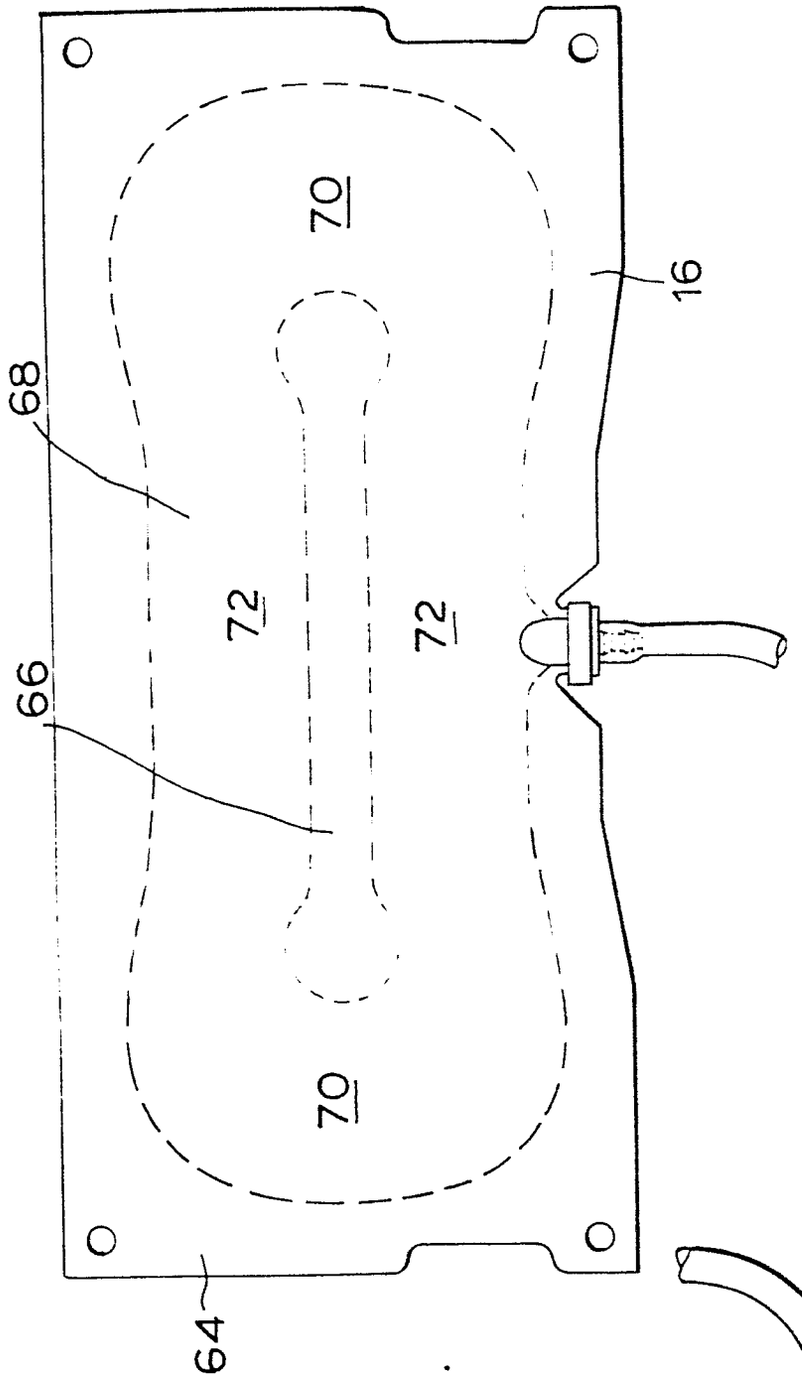


FIG. 1.

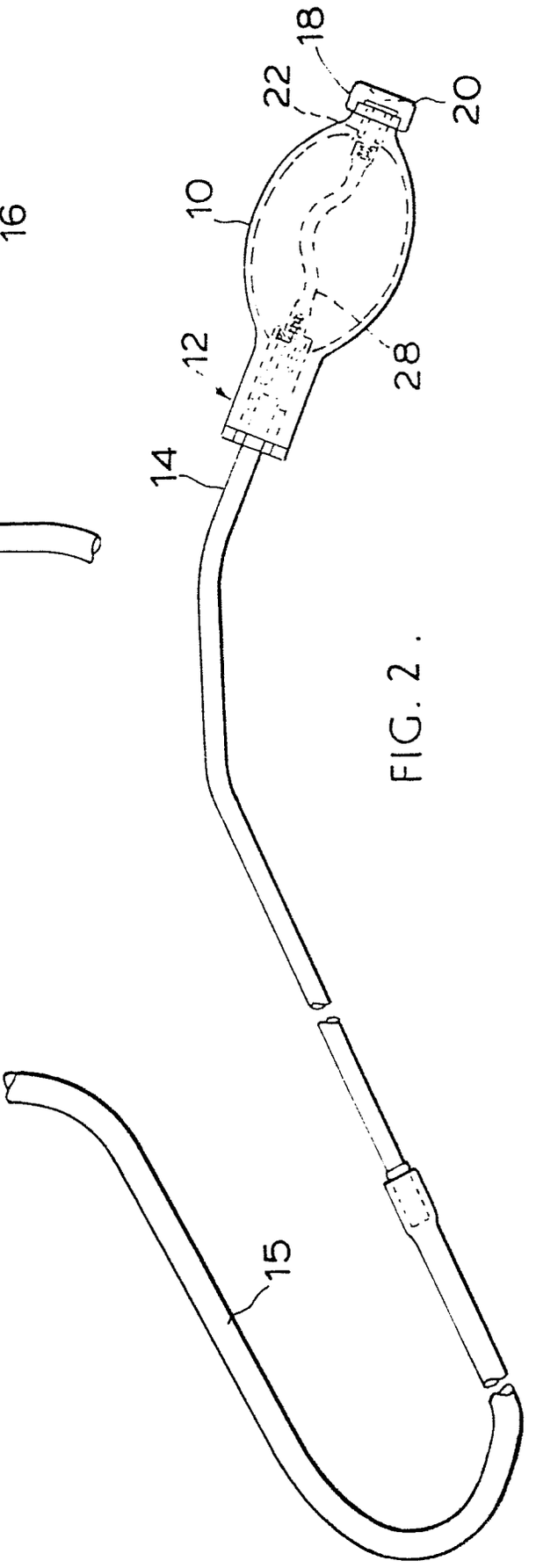


FIG. 2.

FIG. 3.

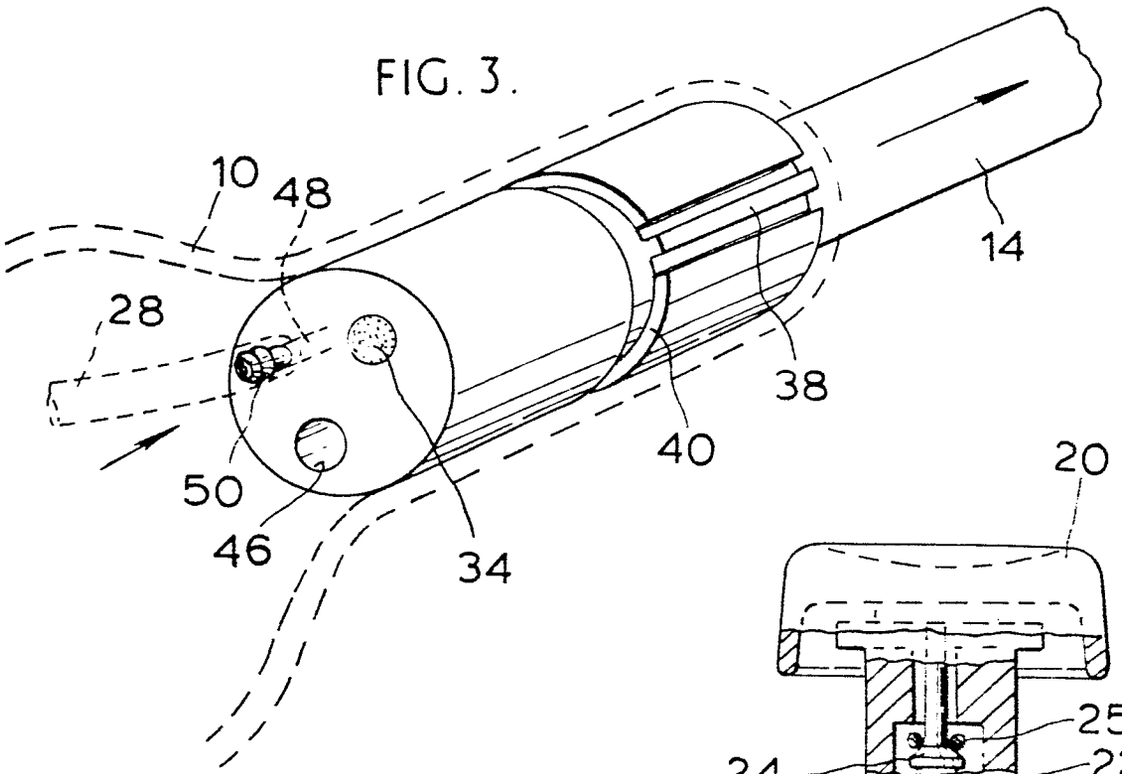
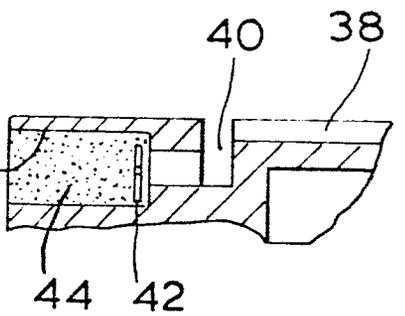


FIG. 6.

FIG. 4.



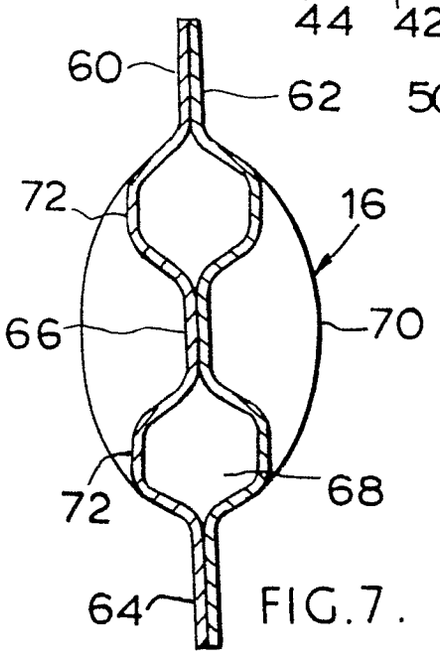


FIG. 7.

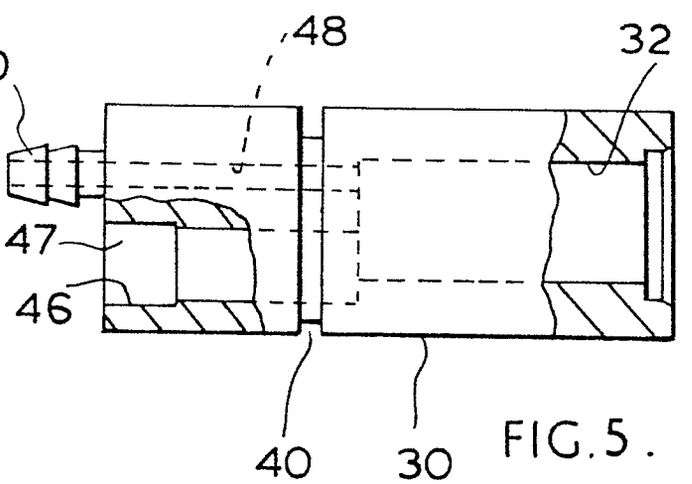


FIG. 5.

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EUROPEAN SEARCH REPORT

0166828

. Application number

EP 84 30 4508

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	US - A - 4 037 587 (KANEDA) * Column 3, lines 8-44, column 4, lines 10-37; figures 1-3 *	1	F 04 B 33/00 F 04 B 45/02 A 61 B 5/02 B 60 N 1/02 A 47 C 7/46
A	CH - A - 326 759 (CAHEN-CASAL) * Page 3, lines 5-17, 42-45; figure 4 *	1	
A	FR - A - 1 339 304 (PIRELLI) * Page 2, left-hand column, paragraph 2 - right-hand column, paragraph 2; figures 1-3 *	1	
A	GB - A - 740 044 (FRASER) * Page 2, lines 40-56; figure 1 *	1,4	F 04 B B 05 B A 61 B A 47 C

TECHNICAL FIELDS SEARCHED (Int. Cl 4)

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

Place of search	Date of completion of the search	Examiner
The Hague	13-02-1985	VON ARX

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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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

☐ All claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for all claims.

☐ Only part of the claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid,

namely claims:

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

☒ LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirement of unity of invention and relates to several inventions or groups of inventions,
namely:

1) Claims 1-8: Hand operated inflator
2) Claims 9-15: Inflatable lumbar support

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid,

namely claims:

☒ None of the further search fees has been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims,

namely claims: 1-8