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(71) Applicant: **ELIVOER INVESTMENTS A.V.V.**
Boliviastraat 9B
Oranjestad (AN)

(72) Inventor: **Pege, Pietro, c/o Porta, Checcacci & Botti S.r.l.**
Viale Sabotino, 19/2
I-20135 Milano (IT)

(74) Representative: **Checcacci, Giorgio**
PORTA, CHECCACCI & BOTTI s.r.l.
Viale Sabotino, 19/2
I-20135 Milano (IT)

(54) Method of customization of an article of sport footwaer and article provided in accordance with said method.

(57) The method is suited to an article of footware in which the padding comprises a blister designed to take on a form corresponding to the anatomy of a user and comprises the following steps:

- including a resin in liquid state in the blister during manufacture of the article,
- providing an injection port in the blister,
- providing an external injection means connectable to the injection port,
- including a hardener for the resin in the injection means,
- connecting the injection means to the injection port,
- operating the injection means to inject the hardener into the blister,
- putting on the article on the user's body,
- wearing the article and keeping it in worn condition until hardening of the resin and hardener mixture.

This method separates the step of insertion of the liquid resin in the blisters (which takes place at the works) from the solidification step thereof which can be readily performed by the user.

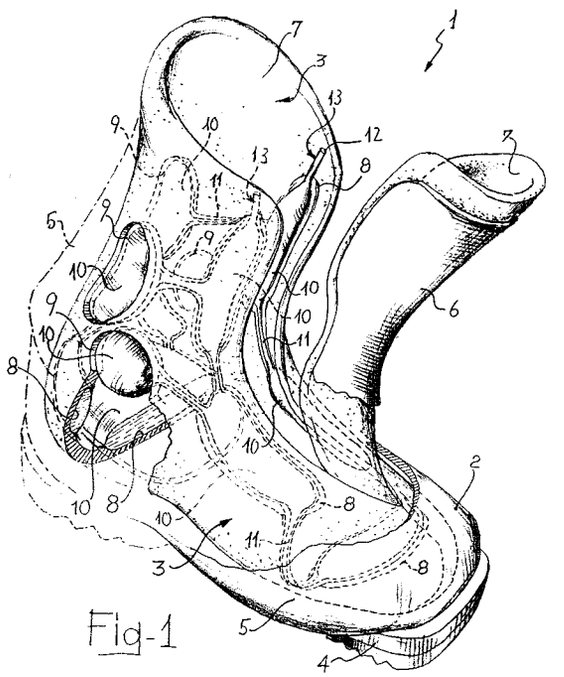


Fig-1

EP 0 683 990 A2

The present invention relates to the permanent customization of articles of footware, namely sport footware, such as ski boots or sport and leisure shoes, i.e. fitting of the padding of said articles to the anatomy of the user's feet. By the term 'padding' is meant either an independent structure inserted in the article (as in the case of a ski boot where the padding consists of a removable slipper) or a portion of said article (as in the case of a sport shoe where the padding is part of the shoe upper).

For these articles there is often felt the need of customization even though the article is mass produced. Indeed, especially in sporting use, the user desires that the worn article be perfectly fitted to his body both for greater convenience and for better protection and for better control of any sport gear, e.g. ski gear, connected with the article.

Various customization methods and devices have been conceived generally based on the presence of a padding which is made to conform more or less permanently to the user's foot.

To achieve this the most common methods provide that the user wear the article to be customized while various types of substances are input into special blisters of the padding with injection machines. By the term 'blister' is meant small sealed pockets of impermeable and significantly deformable material, generally rubber or equivalent.

In accordance with one such method, know from U.S. 3769392, in the padding is injected a pressurized foam which subsequently solidifies thanks to chemical reactions between its components and thanks to evaporation of the solvents. This method is unpleasant because of the complicated equipment necessary for injection of foam under pressure, because of the heat developed during solidification (which can even burn the user) and because of the high pressure which prevents use of said method if the article is not equipped with a particularly strong external containment structure.

In accordance with another method, known from U.S. 5067257, in interstices of the padding (enclosed in a blister) is injected under relatively low pressure a liquid resin with two components (silicone rubber) mixed thoroughly during injection by special injector mixers. The resin fills the blisters causing them to occupy the free space around the user's body. After solidification of the resin the blisters are formed in a manner corresponding to the user's anatomy.

This method overcomes the difficulties of the method indicated above as concerns development of heat and high pressure. Indeed, the relatively low injection pressure does not require special care in design of the external containment structure and the heat developed by the chemical reactions which lead to solidification is practically null. However the equipment necessary for customization of an article is rather complex and certainly not affordable by small shops nor individual users. In addition, input of liquid resin in the blisters is a rather delicate phase which requires the assistance of skilled personnel to make sure distribution of the liquid in the blisters takes place correctly. An error in this phase is very easy and causes damage without remedy.

Another method is known from US 4385024, where a moldable article comprises a substance that can be cured and a curing agent. The latter is housed in a container initially flexible, made then frangible by special treatment, in close proximity to the curable substance but isolated therefrom. In use, the frangible container is ruptured to release the curing agent, and the article - in a first configuration, can be shaped to a second configuration in which it is maintained until the material is cured sufficiently for it to be form-stable in the second configuration.

Another method is known from DE 2926246, where a hardener is housed in a syringe while a resin is housed in sealed blister. Customization is obtained by puncturing the blister with the needle of the syringe and hence injecting the hardener into the blister. The blister must be kneaded thoroughly before inserting it into the shoe.

The problem underlying the present invention is to make available a customization method capable of giving the desired results without requiring special equipment nor skilled personnel.

Consequently, in a first aspect, the present invention concerns a method for mass-producing an article of sport footware with a padding which can be permanently custom fitted, in which the padding comprises a blister designed to take on a form corresponding to the user's anatomy, comprising the following steps:

- including a resin in liquid state in the blister,
- providing an injection port in the blister,
- providing an external injection means connectable to the injection port,
- including a hardener for the resin in the injection means.

In another aspect, the invention concerns a method for permanent customized fitting of a padding for a mass-produced article of sport footware, in which the padding comprises a blister designed to take on a form corresponding to the user's anatomy, comprising the following steps:

- including a resin in liquid state in the blister during manufacture of the article,
- providing an injection port in the blister,
- providing an external injection means connectable to the injection port,
- including a hardener for the resin in the injection means,

- connecting the injection means to the injection port,
- operating the injection means to inject the hardener into the blister,
- putting on the article on the user's body,
- wearing the article and keeping it in worn condition until hardening of the resin and hardener mixture.

By the term resin is meant a preparation which is normally found in liquid state and which is capable of solidifying following mixing with another preparation, the hardener.

This method separates the phase of insertion of the liquid resin in the blisters (which takes place at the works) from the solidification phase thereof. The first phase, filling of the blisters with the liquid resin, takes place at the works during manufacture of the article. Filling can then be readily controlled with equipment affordable in an industrial plant. The second phase is left to the user (optionally but not necessarily assisted by the shop keeper) and does not require any special equipment.

Preferably the resin is a silicone compound which when mixed with the hardener hardens by polyaddition or polycondensation. A resin of this type is readily injected, solidifies rapidly once placed in contact with its hardener, does not produce heat during solidification, is non-toxic and perfectly sanitary, once solidified satisfies the requirements of fitting to the anatomy of the body part involved, supplies a significant contribution to thermal insulation of the article (something especially welcome for articles designed for winter sports such as ski boots or ice skates).

Examples of silicone compounds are alpha-omega polyvinylxyloxane which hardens by polyaddition in contact with a hardener formed of a platinum complex, or the alpha-omega polymethyldixyloxane hydroxylate, which hardens by polycondensation in contact with a hardener formed of tin salts.

In another aspect, the present invention relates to an article of sport footware, comprising:

- an outer shell,
- a padding mounted inside the shell,
- a blister included in the padding, designed to take on a form corresponding to the user's anatomy,
- a resin in liquid state in the blister,
- a hardener for the resin, stored separately from the resin,

characterized by further comprising:

- an injection port in the blister,
- separate injection means housing the hardener, connectable to the injection port of the blister for injection of the hardener thereinto.

Such an article permits customization in accordance with the methods of the present invention. Indeed, in it the resin in liquid state is inserted in the blister in the manufacturing phase of the article but is designed to remain in the liquid state until a suitable hardener is input by the injection means through the injection ports. Therefore in the entire distribution chain of the article from the manufacturer to the final user the resin in the blister remains liquid.

After purchasing the article the user can easily proceed with customization by injecting the hardener and putting on the article.

The blister can be arranged in various manners in the padding. Preferably the padding comprises a layer of deformable material, a plurality of recesses formed in the layer of deformable material opposite the predetermined anatomical points and a plurality of blisters housed in the recesses. The recesses can be actual openings passing through the layer of deformable material or mere niches preferably turned towards the body of the wearer of the article.

In this manner customization is allowed in the more critical anatomical zones while keeping a general stability of the padding. In some cases indeed excessive extension of the blisters could lead to uncertain positioning during the customization phase with consequent forming of a padding not corresponding to the real requirements and expectations of the user.

The blisters, if present in numbers greater than one, can be separated from each other and each one provided with its own injection port. In alternative, the various blisters can be connected together by a tubing leading to one or more injection ports. This facilitates injection and correct distribution of the hardener.

By way of example a detailed description is given below of a ski boot and of a trekking shoe provided in accordance with the present invention. Said description makes reference to the illustrations contained in the annexed figures wherein:

FIG. 1 is a partially cross sectioned perspective view of a sky boot provided in accordance with the present invention with partially separated parts,

FIGS. 2 to 4 are cross sections of a zone of the boot of FIG. 1 before, during and after customization,

FIG. 5 is a partially cross sectioned perspective view of a trekking shoe provided in accordance with the present invention,

FIG. 6 and 7 are sectional views of a first embodiment of valve means for the injection ports of an article according to the invention, in two different operative conditions,

FIG. 8 and 9 are sectional views of a second embodiment of valve means for the injection ports of an article according to the invention, in

two different operative conditions,

FIG. 10 is a view of a first embodiment of injection means of an article according to the invention,

FIG. 11 and 12 are sectional views of a second embodiment of injection means of an article according to the invention.

With reference to the figures, reference number 1 indicates a ski boot as a whole comprising a substantially rigid outer shell 2 and an inner padding 3 in the form of a slipper.

The shell 2 comprises a sole 4 and side walls 5 formed in a single piece as well as a front tongue 6 hinged or in any case hooked to the rest of the shell 2 near the tip of the boot 1. All the elements making up the shell 2 are made of suitable rigid plastic material, e.g. polyurethane resin.

The padding 3 comprises a layer 7 of deformable material shaped in such a manner as to fit substantially the shape of a foot P as well as the interior of the shell 2. Said material is e.g. a normal agglomerate for padding.

The layer 7 is provided with recesses opposite some critical points of the foot P, i.e. points where the greatest anatomical differences are found between different persons: malleoli, instep, base of the shins, zone around the heel, rear zone above the malleoli, and sole of the foot. The recesses comprise niches 8 and openings 9 passing through the layer 7. The niches 8 are turned inward of the boot 1.

In the niches 8 and the openings 9 are placed respective blisters 10 of deformable and impermeable material such as for example PVC (polyvinyl chloride), PU (polyurethane), PE (polyethylene), PEHD (high density polyethylene) or the like. All the blisters 10 are connected together by a series of tubes which as a whole make up a tubing 11. The tubing 11 is made advantageously of the same material as the blisters 10.

The tubing 11 leads to a pair of injection ports 12 which comprise ducts 13 for access to the interior of the system made up of the blisters 10 and tubing 11. Injection ports 12 are closed by openable valve means generally indicated with 14 and can be removably connected to external injection means 15.

Inside the system made up of the blisters 10 and the tubing 11 there is a resin in liquid state as shown in FIGS. 2 and 3 by special cross hatching. The resin is such as to remain in the liquid state until it is placed in contact with its specific hardener. For example, the resin is a mixture of alpha-omega polyvinylxyloxane while the hardener is a platinum complex. As an alternative the resin is e.g. a mixture of alpha-omega polymethyldixyloxane hydroxylate while the hardener is made up of tin salts. The hardener is contained in the external injection means.

The boot 1 comprises an inner lining 16 and conventional closing means not shown in the figures because quite irrelevant for the invention.

Valve means 14 are such as to keep the blisters 10 and the tubing 11 firmly closed, preventing any leakage of the resin, and to permit injection of the hardener. Two embodiments of valve means are shown in figures 6 and 7 and in figures 8 and 9 respectively; the first embodiment is valve 14a, the second is valve 14b.

Valve 14a is an automatic valve and comprises a tubular sleeve 21 inserted in and secured to the duct 13 of the injection port 12. The sleeve 21 has a passage 22 removably closed by a shutter 23 mounted on a plunger 24. The plunger 24 is axially driven within the sleeve 21 and is elastically biased by a compressed helical spring 25 in the sense of pushing the shutter 23 in a closure position against the passage 22 (figure 6). Orientation of the valve 14a in the injection port 12 is such that displacement of the shutter 23 away from the closure position is against outflowing of the resin from inside the blisters 10. Thus, any pressure exerted by the resin in the blisters 10 can not open the valve 14a, while a sufficiently high pressure exerted from outside can open the valve 14a (figure 7); the minimum pressure which can open the valve 14a is determined by the flexibility of the spring 25 and can be varied by selecting a suitable spring. Injection of the hardener through the valve 14a into the duct 13 and so into the blisters 10 can be obtained either by injecting the hardener at a pressure higher than said minimum pressure, or by mechanically pushing the plunger 24 with a suitable tool (for example an axial spike) included in the injection means 15.

Valve 14b is a manually operated valve and comprises a sleeve body 31 provided with a passage 32 and a shutter body 34 provided with a shutter 33 for the passage 32. The duct 13 of the injection port 12 is cut into an inner portion 13a, to which sleeve body 31 is mounted, and an outer portion 13b, to which shutter body 34 is mounted. Sleeve body 31 is provided with a cylindrical wall 35 defining a chamber 36 in front of the passage 32; an internal thread 37 and an external thread 38 are provided on the wall 35. Shutter body 34 has an enlarged middle portion 39, provided with an external thread 40 mating the internal thread 37 of the sleeve body 31, and a front portion 41 holding the shutter 33. An axial hole 42 extends through the whole shutter body 34, with the exception of the front portion 41; a transverse hole 43 communicating with the axial hole 42 at the end thereof is formed in the front portion 41 of the shutter body 34, behind the shutter 33. Bodies 31 and 34 are in screw engagement through threads 37 and 40;

thus, transverse hole 43 opens into the chamber 36. With the shutter body 34 completely screwed into the sleeve body 31, the shutter 33 closes the passage 32, preventing any leakage of resin from the blisters 10 (figure 8). With the shutter body 34 partially unscrewed from the sleeve body 21, the shutter 33 leaves the passage 22 open, in communication with the exterior through the chamber 36, the transverse hole 43, the axial hole 42 and the outer portion 13b of the duct 13 (figure 9). A safety cap 44 is removably screwed onto the external thread 38 to prevent unadvertent unscrewing of the shutter body 34 from the sleeve body 31.

Injection means 15 are such as both to store the hardener and to allow injection of the same into the blisters 10. Two embodiments of injection means are shown in figures 10 and in figures 11 and 12 respectively; the first embodiment is dispenser 15a, the second is dispenser 15b.

Dispenser 15a is a dose dispenser of the type capable of dispensing a constant quantity of a liquid or doughy substance. Dose dispensers of this type are known per se, used in medical field to administer medicines; an example of this type of dispenser is sold under the name of "Englass Swift Doser" by English Glass Company Ltd. Dispenser 15 comprises a container 51 where the hardener is stored, a pump body 52 and a nozzle 53, protected by a cap 54. Internal parts of the dispenser 15 are not shown in the drawings nor described, being per se known. The nozzle 53 of the dispenser 15a can be connected to an injection port 12 of the ski boot 1; by operating the dispenser 15a, a predetermined quantity of hardener is injected into the blisters 10 and mixed to the resin contained therein.

Dispenser 15b comprises a container 61 and a valve cap 62. Container 61 has a bellow portion 63, which allows squeezing of the container 61 and a projecting outlet 64. Valve cap 62 comprises a cap body 65, mounted on the outlet 64 and movable with respect to the outlet 64 itself between a closure position (figure 11) and an opening position (figure 12), and a tubular projecting outlet 66; inside the cap body 65, in front of the outlet 64, a structure including a disc 68 mounted on pillars 69 around the outlet 66 controls the outlet 64: in closure position, outlet 64 is kept closed by the disc 68, while in opening position outlet 64 is free and the hardener can exit the container 61 passing through the outlet 64, in the cap body 65, between the pillars 69 and through the outlet 66. Outlet 66 can be connected to an injection port 12 of the ski boot 1; by shifting the cap body 65 from the closure to the opening position and by squeezing the container 61, a predetermined quantity of hardener is injected into the blisters 10 and mixed to the resin contained therein.

Customization of the boot 1, shown in its phases in FIGS. 2 to 4 with reference to only one zone of the foot, takes place in the following manner starting from the initial conditions of a new boot shown in FIG. 2.

Before putting on the boot 1, the user inject the hardener into the injection ports 12, as explained above with reference to the various embodiments.

Subsequently the user may massage the padding to aid mixing of the resin and hardener. Given the not very fast hardening times (on the order of 5-15 minutes) this operation can be carried out with no need for particular speed.

The user then puts on the boot 1, closes it as though he were going to use it, and awaits solidification of the resin without moving his foot.

This phase of waiting for hardening is shown in FIG. 3 in which the resin is shown with the same cross hatching as in FIG. 2 to make clear that it is still liquid.

Finally, after solidification, the user can take off the boot 1. The blisters 10 will thus be formed in accordance with the anatomy of the user's foot P. At the end, the boot 1 appears as shown in FIG. 4 where the resin is shown by a different cross hatching to make clear solidification.

The padding 3 is thus customized for the user.

Attention is drawn to the great simplicity of the operations necessary for obtaining customization, operations which do not require any special equipment nor special skill. Each user can thus customize his own boots alone.

In addition, attention is drawn to the manner in which the boot can be used immediately even without being customized, i.e. keeping the resin in the liquid state. Naturally, in this condition the perfect anatomical fit desired by the user is lacking. This use is therefore seen as a simple possibility of immediate employment of the boot while waiting to perform the customization operation. In this condition of use the liquid resin contributes anyway to absorption of blows.

FIG. 5 shows another article of sport footware, namely a sport shoe 71, specifically a trekking shoe, which comprises a sole 72 and an upper 73.

In the shoe 71 are provided two blisters 74 each provided with a respective injection port 75 made up of a duct accessible outside the boot 1 and provided with valve means such as valves 14a or 14b.

A first blister 74 is provided on the sole 72 covered then by one or more inner soles 76. A second blister 74 is provided in the upper 73, in the rear zone of the shoe 71. Said blister 74 is shaped in the manner illustrated to conform to the anatomy of the rear part of the foot.

In the blisters 74 is included a resin of the type indicated above and designed to harden when

mixed with a specific hardener supplied separately from the shoe 71, within injection menas 15.

The shoe 71 can be customized in a manner similar to that illustrated for the ski boot 1.

Claims

1. Method for mass-producing an article of sport footware with a padding which can be permanently custom fitted, in which the padding comprises a blister designed to take on a form corresponding to the user's anatomy, comprising the following steps:
   - including a resin in liquid state in the blister,
   - providing an injection port in the blister,
   - providing an external injection means connectable to the injection port,
   - including a hardener for the resin in the injection means.

2. Method in accordance with claim 1 in which the resin is a silicone compound which when mixed with the hardener hardens by polyaddition or polycondensation.

3. Method in accordance with claim 2 in which the resin is a mixture of alpha-omega polyvinylxyloxane and the hardener is a platinum compound.

4. Method in accordance with claim 2 in which the resin is a mixture of alpha-omega polymethyldixyloxane hydroxylate and the hardener is made up of tin salts.

5. Method for permanent customized fitting of a padding for a mass-produced article of sport footware, in which the padding comprises a blister designed to take on a form corresponding to the user's anatomy, comprising the following steps:
   - including a resin in liquid state in the blister during manufacture of the article,
   - providing an injection port in the blister,
   - providing an external injection means connectable to the injection port,
   - including a hardener for the resin in the injection means,
   - connecting the injection means to the injection port,
   - operating the injection means to inject the hardener into the blister,
   - putting on the article on the user's body,
   - wearing the article and keeping it in worn condition until hardening of the resin and hardener mixture.

6. Method in accordance with claim 5, further comprising the step of:
   - massaging the blister after injecting the hardener and before wearing the article, to aid mixing of resin and hardener.

7. Method in accordance with claim 5 in which the resin is a silicone compound which when mixed with the hardener hardens by polyaddition or polycondensation.

8. Method in accordance with claim 7 in which the resin is a mixture of alpha-omega polyvinylxyloxane and the hardener is a platinum compound.

9. Method in accordance with claim 7 in which the resin is a mixture of alpha-omega polymethyldixyloxane hydroxylate and the hardener is made up of tin salts.

10. Article of sport footware, comprising:
    - an outer shell,
    - a padding mounted inside the shell,
    - a blister included in the padding, designed to take on a form corresponding to the user's anatomy,
    - a resin in liquid state in the blister,
    - a hardener for the resin, stored separately from the resin,

    characterized by further comprising:
    - an injection port in the blister,
    - separate injection means housing the hardener, connectable to the injection port of the blister for injection of the hardener thereinto.

11. Article in accordance with claim 10 in which the padding comprises a layer of deformable material, a plurality of recesses formed in the layer of deformable material opposite predetermined anatomical points and a plurality of blisters housed in the recesses.

12. Article in accordance with claim 11 in which the blisters are connected together by tubing leading to one or more injection ports.

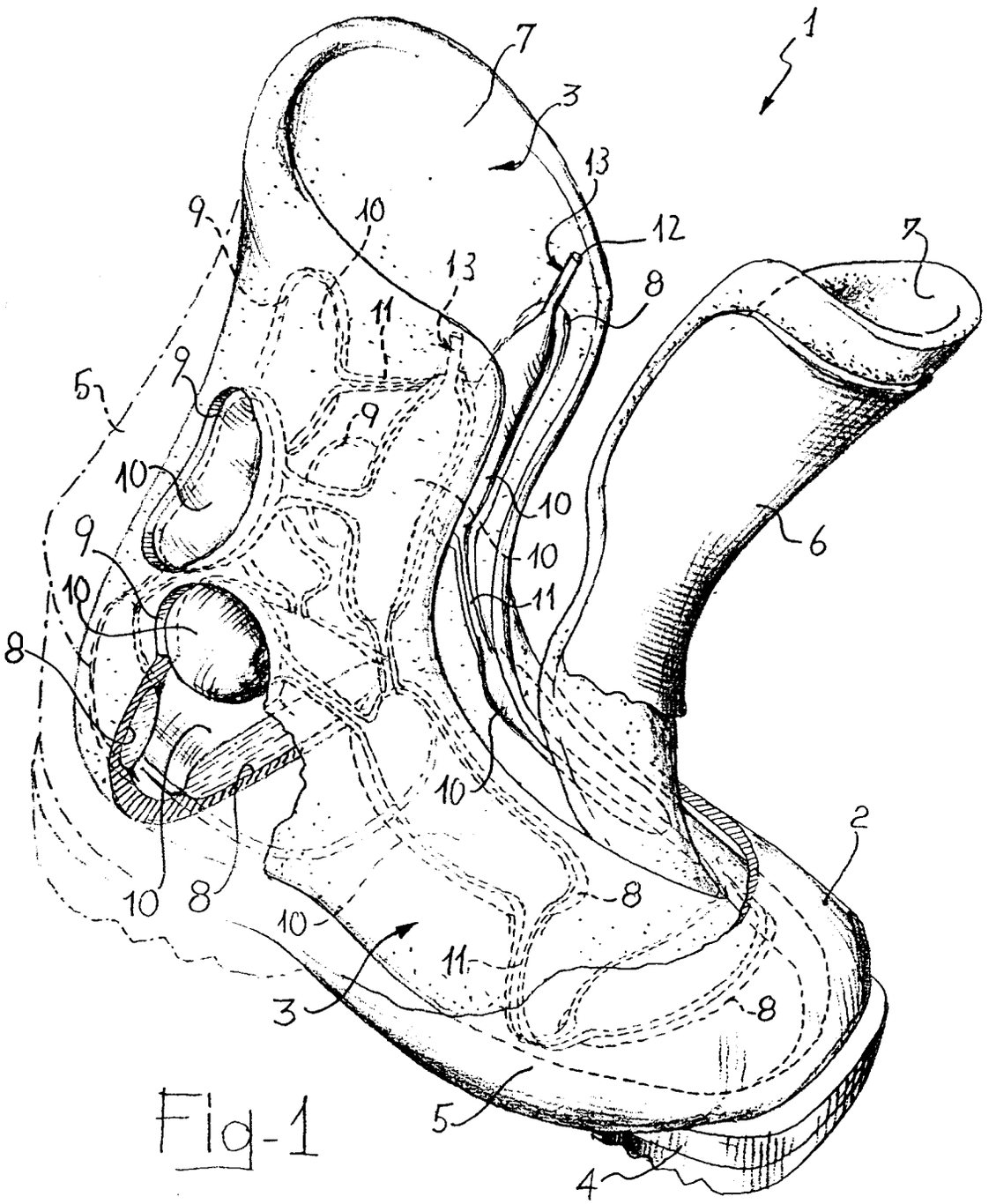


Fig-1

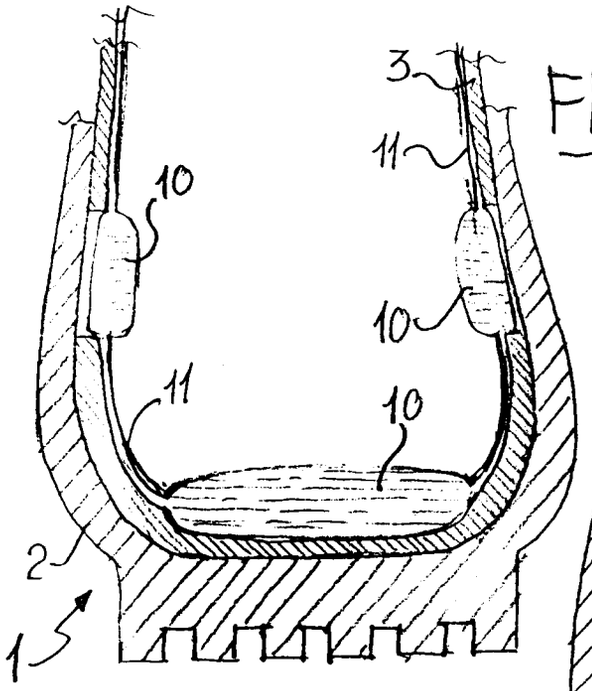


Fig-2

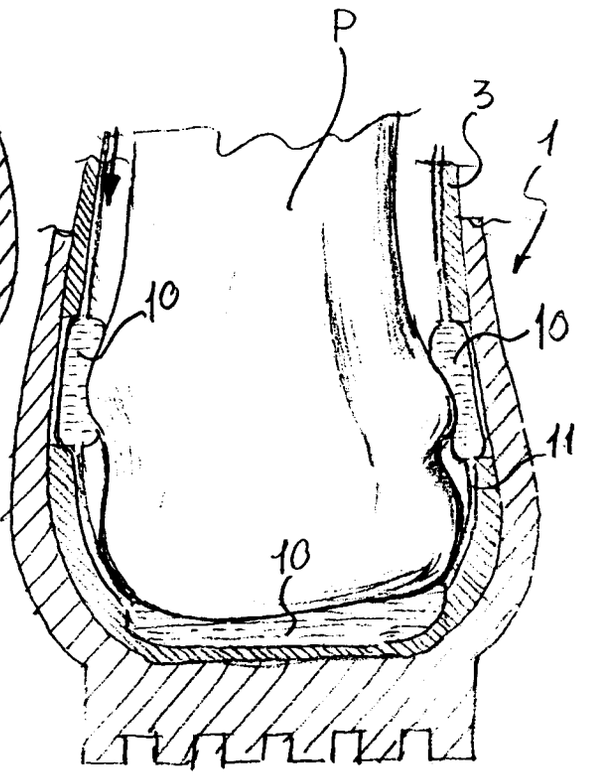


Fig-3

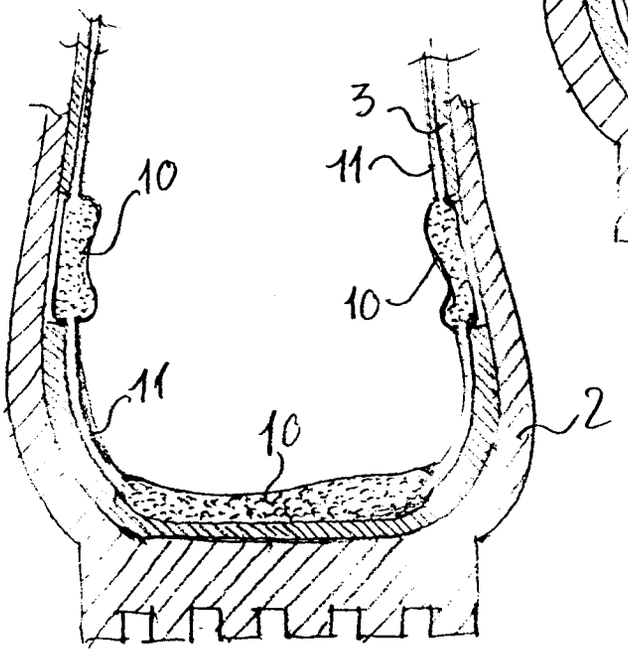
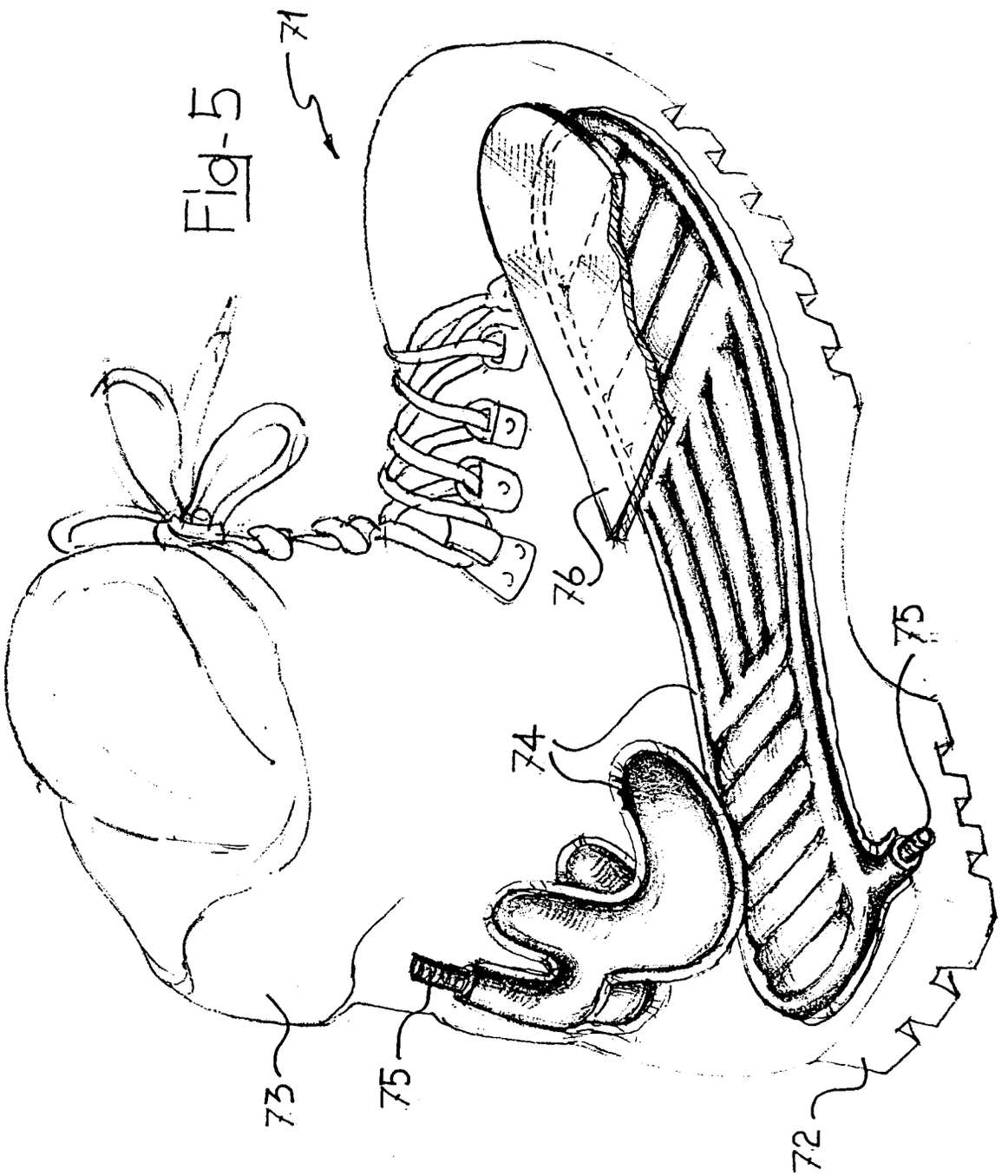


Fig-4

Fig-5



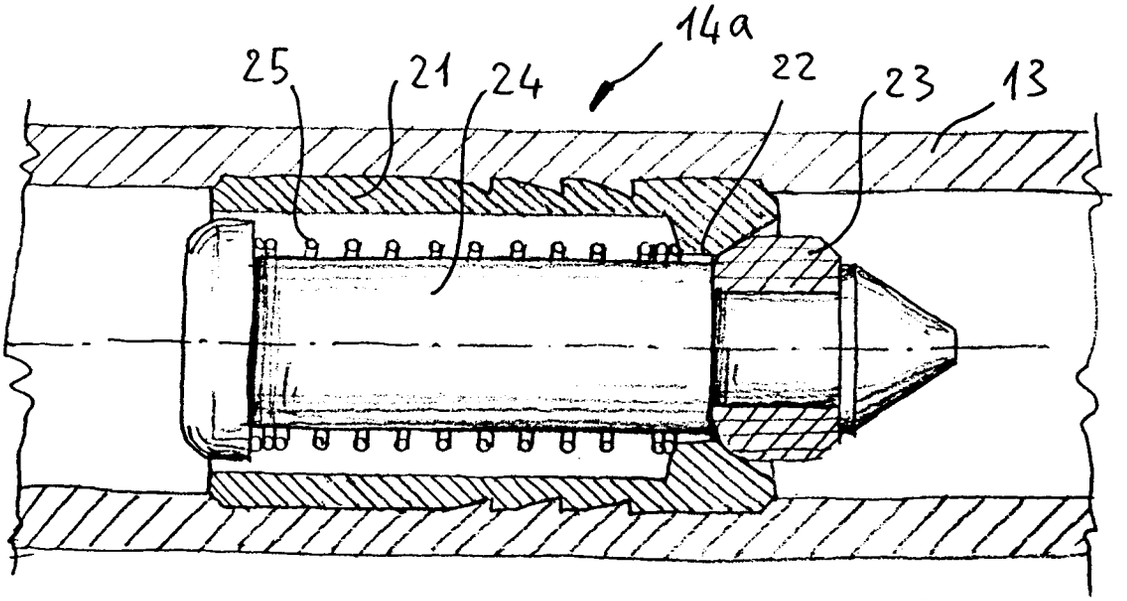


Fig-6

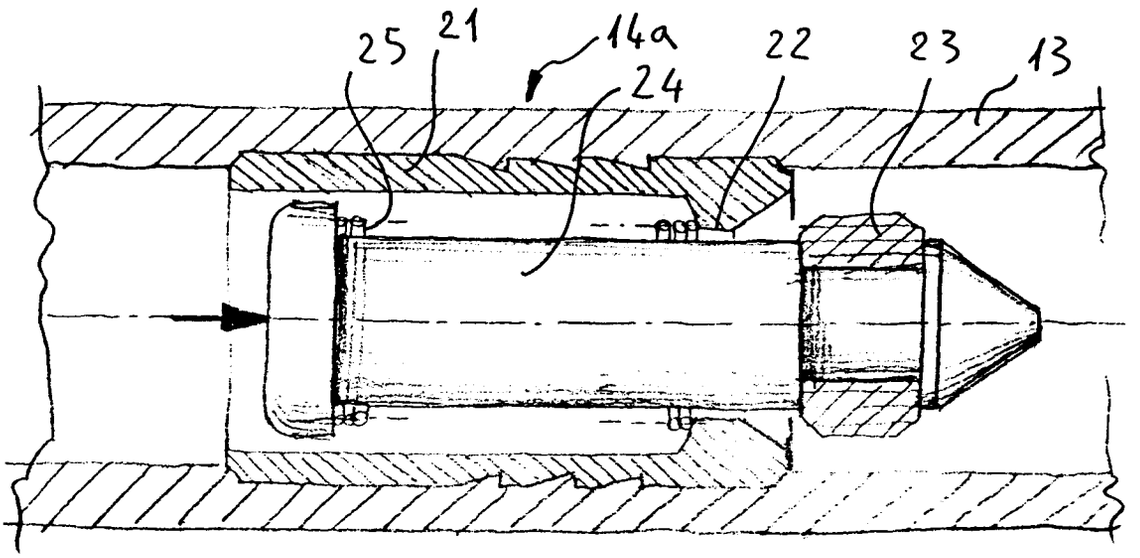
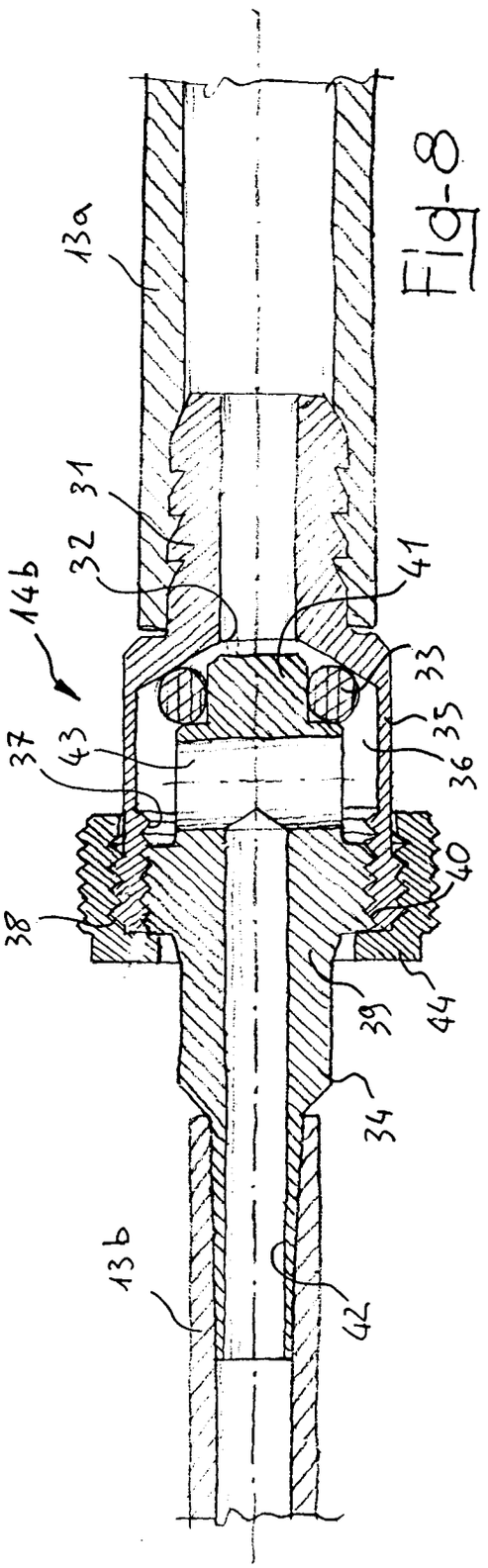


Fig-7


13a
14b
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13b
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Fig-8

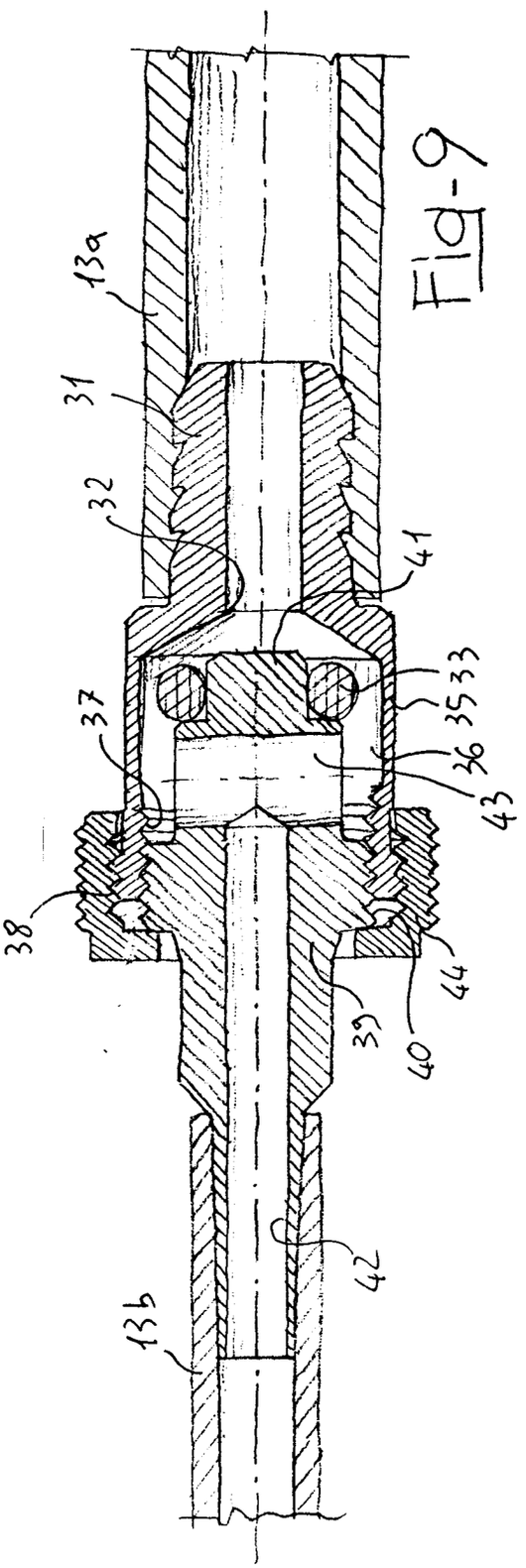
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Fig-9

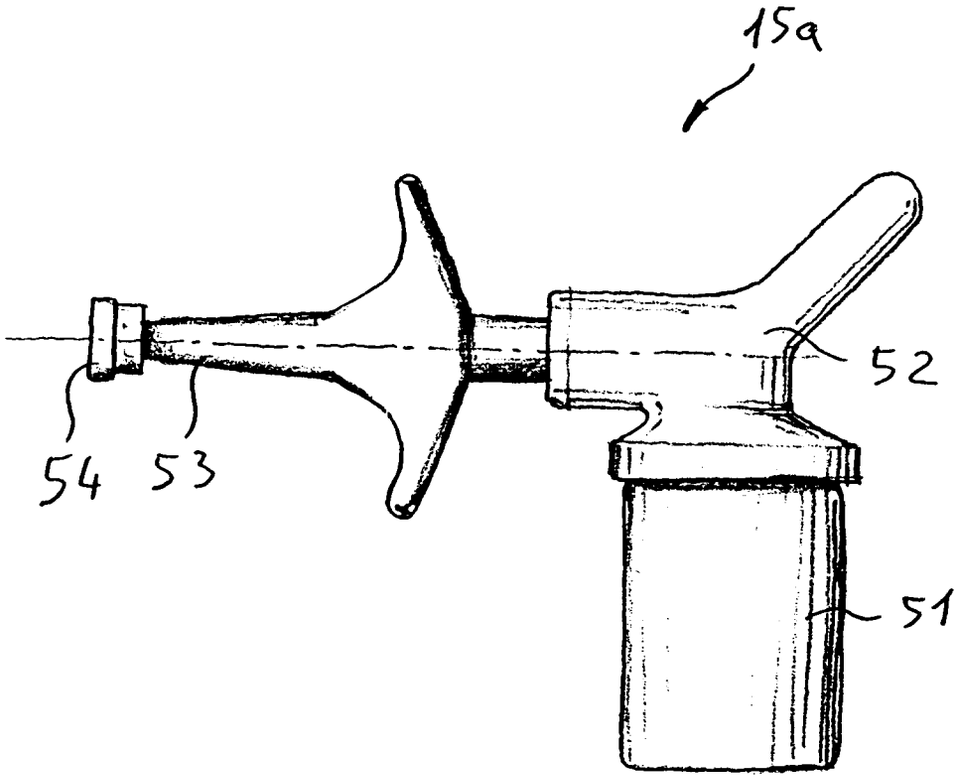

Fig-10

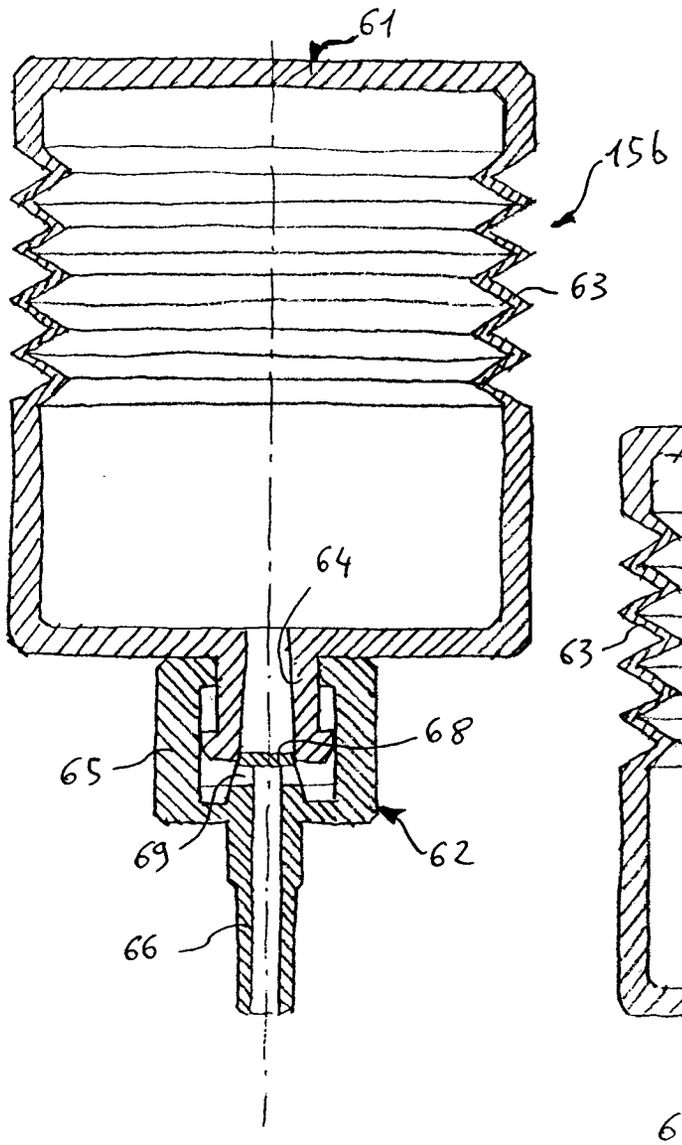

Fig-11

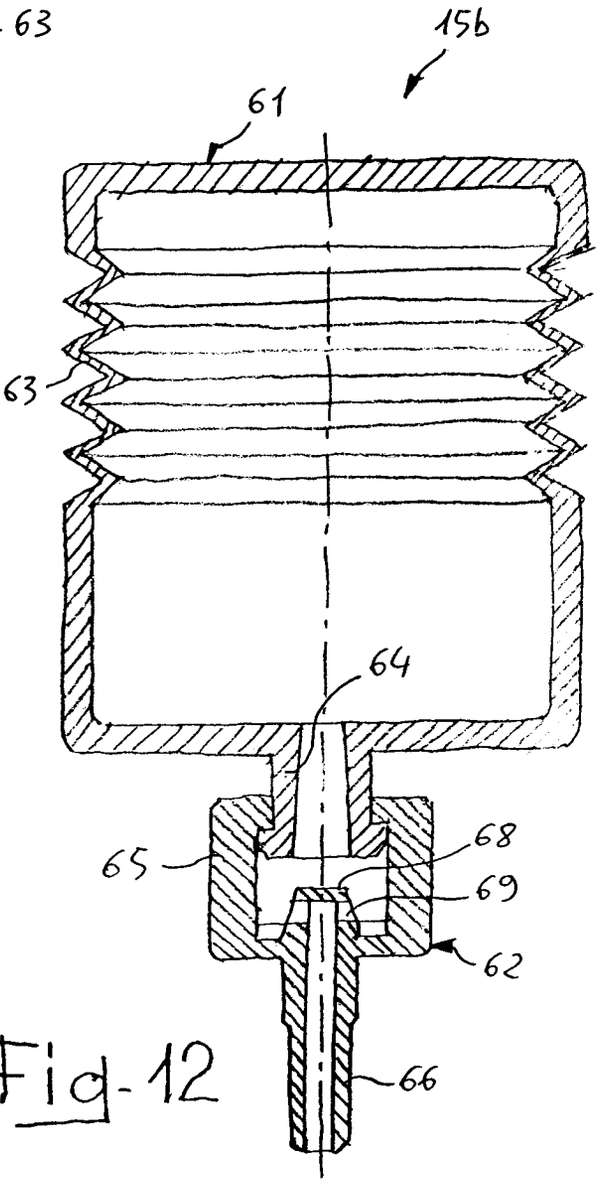

Fig-12