

FOOTWEAR WITH PUMP ✓**FIELD OF THE INVENTION**

The present invention is related to footwear. In particular, the present
5 invention is related to footwear such as shoes and boots which can actively
eliminate fluid trapped therein.

BACKGROUND OF THE INVENTION

Much effort has been put into the development of leak-proof footwear
such as shoes and boots which do not allow water to leak inside. However,
10 even with completely leak-proof footwear, water often get in from the top, for
example when the wearer is walking in a deep stream. Once the fluid gets
into the leakproof boots, there is no mechanism to remove the trapped fluid.
German patent DE 296 20 436 teaches the use of holes in the sole of the
shoe, together with open channels at the side of the sole to allow water to
15 leak out. This design does not function well, because the fluid inside the
footwear can only drain out in a passive manner, and the presence of the
open holes allow water outside from seeping in. The patent suggests the
use of one way valves to solve the problem of external water seeping in, but
does not teach how small amounts of fluid within the footwear may be
20 eliminated using such a simple and passive method. Furthermore, even if
the wearer is, for example, walking through a water layer below the top of
the boot, the pressure created by the external environment would prevent
any water inside the footwear from being eliminated effectively.

OBJECT OF THE INVENTION

It is therefore an object of the present invention to provide a footwear with an efficient fluid elimination feature to overcome the shortcomings as stated above.

- 5 It is another object to provide a footwear with an active water elimination feature.

SUMMARY OF THE INVENTION

The footwear according to the present invention is provided with a bottom such as a sole having a channel adapted for one-way fluid drainage.

- 10 The channel comprises a fluid retention cavity, and a draining end. The fluid retention cavity has a flexible cap with pores, and is preferably positioned at the heel of the footwear. The draining end has an opening preferably at the side of the heel, and has a one-way valve to allow fluid to drain out of the footwear. The present invention allows fluid inside the footwear to
- 15 spontaneously seep down through the pores of the cap into the retention cavity as the wearer lifts up his foot to make a step. As the wearer steps onto the ground, the downward movement of the foot on the cap compresses the cap, which acts as an effective pump to force fluid out via the draining end.

20 BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a side perspective view of a boot according to the present invention, with part of the heel and front cut away to show details of the pump system.

Figure 2 is a side cross-sectional view of a heel of a footwear according to the present invention.

Figure 3 is a top plan view of the cap.

Figure 4 is a side cross-sectional view of an example of a one-way valve.

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DESCRIPTION OF THE INVENTION

The footwear of the present invention is provided with a weight-activated pump which actively pumps trapped fluid from inside the footwear to the exterior.

- 10 The most preferred way of practicing the present invention is shown in Figure 1. This embodiment is a boot with a top **20** and a bottom **22**. The top **20** may be made from any well-known upper material, and may comprise two layers, such as a waterproof leather upper **26**, and a breathable lining **24**. The bottom **22** comprises a front sole portion **28** and a heel portion **30**.
- 15 According to the present invention, this heel is provided with a cylindrical cavity **32** which opens into the interior of the boot. This opening is covered by a flexible cap **34** with pores **36**, which allows fluid within the shoe to drain into the cavity.

- 20 Figure 2 shows in greater detail the cavity and the draining end. In this embodiment, the cavity **32** provided within the heel **30** has a downward slopping bottom **38** which allows fluid to be collected and drained out by gravity from the draining end **40** below. The cap **34** has a slight concave contour to facilitate the pressing motion (as shown by arrow **38**) of the

system. This contour also acts as a comfortable cushion for the heel of the wearer. Figure 3 shows the top plan view of the cap **34** and a preferred arrangement of the pores or holes **36** for fluid drainage. Using this system, the fluid would spontaneously flow into the cavity when the wearer's foot is not pressing on the pores **36**. Due to the positional arrangement of the draining end **40** which is preferably below the level of the bottom of the cavity, fluid would automatically be drained out (as shown by arrow **42**), even without applied forces. In addition, the system provides for forced ejection of the fluid by using the flexible cap to create a pumping action. Thus, even if the wearer is walking along a stream of water, and the pressure of the water on the exterior prevents drainage by gravity, the pumping action of the cap creates an active pumping force (as shown by arrow **38**) that would continue to facilitate fluid removal.

Figure 4 shows a one-way valve commonly used for one-way fluid delivery, with end **48** communicating with the exterior and end **50** communicating with the interior of the boot. A thin Teflon sheet **46** is inserted into the valve and is adapted to form a waterproof seal with the wall **44** of the valve as shown in Figure 4 when water from the exterior presses on it. When fluid is present in space **52**, the Teflon sheet is pressed onto pins **54** on the exterior end of the valve, which allows the water to flow out. A groove **56** is preferably provided on the wall of the valve, which corresponds to thread **58** (Figure 2) in the draining end of the channel. The groove and the thread acts as a reversible locking and waterproof mechanism to keep the valve fixed onto the draining end of the channel

without the use of adhesives. As a result, the wearer may remove the valve when it becomes clogged, and replace it with a new one with ease.

While the present invention has been described particularly with references to Figs 1 to 4 with emphasis on a pump system for fluid removal located at the heel of a boot, it should be understood that the figures are for illustration only and should not be taken as limitation on the invention. In addition it is clear that the method and apparatus of the present invention has utility in many applications where fluid or gas removal in footwear is required. It is contemplated that many changes and modifications may be made by one of ordinary skill in the art without departing from the spirit and the scope of the invention described.

The cap may be made from any material which has a measure of resilience to create a small pumping action, such as PVC, TPU or other moldable polymers. The valve contains a Teflon sheet, but the sheet may be any material which is strong and provides a good waterproof seal with the wall of the valve. The cavity is preferably provided at the heel of the footwear, because the height of the heel provides space for the cavity to be created. However, when the sole of the footwear is thick enough, it is contemplated that the cavity and the cap may be provided at the sole portion of the bottom. The pores or holes of the cap may be of any size which allow for flow of fluid, and may be arranged in any pattern. Other types of one-way valves may also be used instead of the one shown in Figure 4.

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REPLACED

CLAIMS

- 1 1. A footwear comprising :
- 2 a top and
- 3 a bottom, said bottom provided with at least one channel, said
- 4 channel having a fluid retention cavity and a draining end, said fluid
- 5 retention cavity having a flexible cap with pores, said draining end
- 6 having a one-way valve to allow fluid and gas to drain out of the
- 7 footwear, such that fluid inside the footwear will seep through said
- 8 pores into said retention cavity, and the foot of the wearer
- 9 compressing the cap will force the fluid and gas inside the retention
- 10 cavity out of the footwear via the one-way valve.
- 1 2. A footwear according to claim 1 wherein said bottom includes a sole
- 2 and a heel, and said cavity is inside said heel.
- 1 3. A footwear according to claim 1 or 2 wherein said one-way valve has
- 2 a groove on its outer wall which corresponds to a thread in the
- 3 draining end, such that the one-way valve can be tightly inserted into
- 4 said draining end without adhesives.
- 1 4. A footwear according to any of the preceding claims wherein the cap
- 2 forms a contour cushion for the sole of the wearer.
- 1 5. A footwear according to any of the preceding claims wherein the
- 2 bottom is made from a moldable rubber.
- 1 6. A footwear according to any of the preceding claims wherein the cap
- 2 is made from a moldable polymer.

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