

May 17, 1955

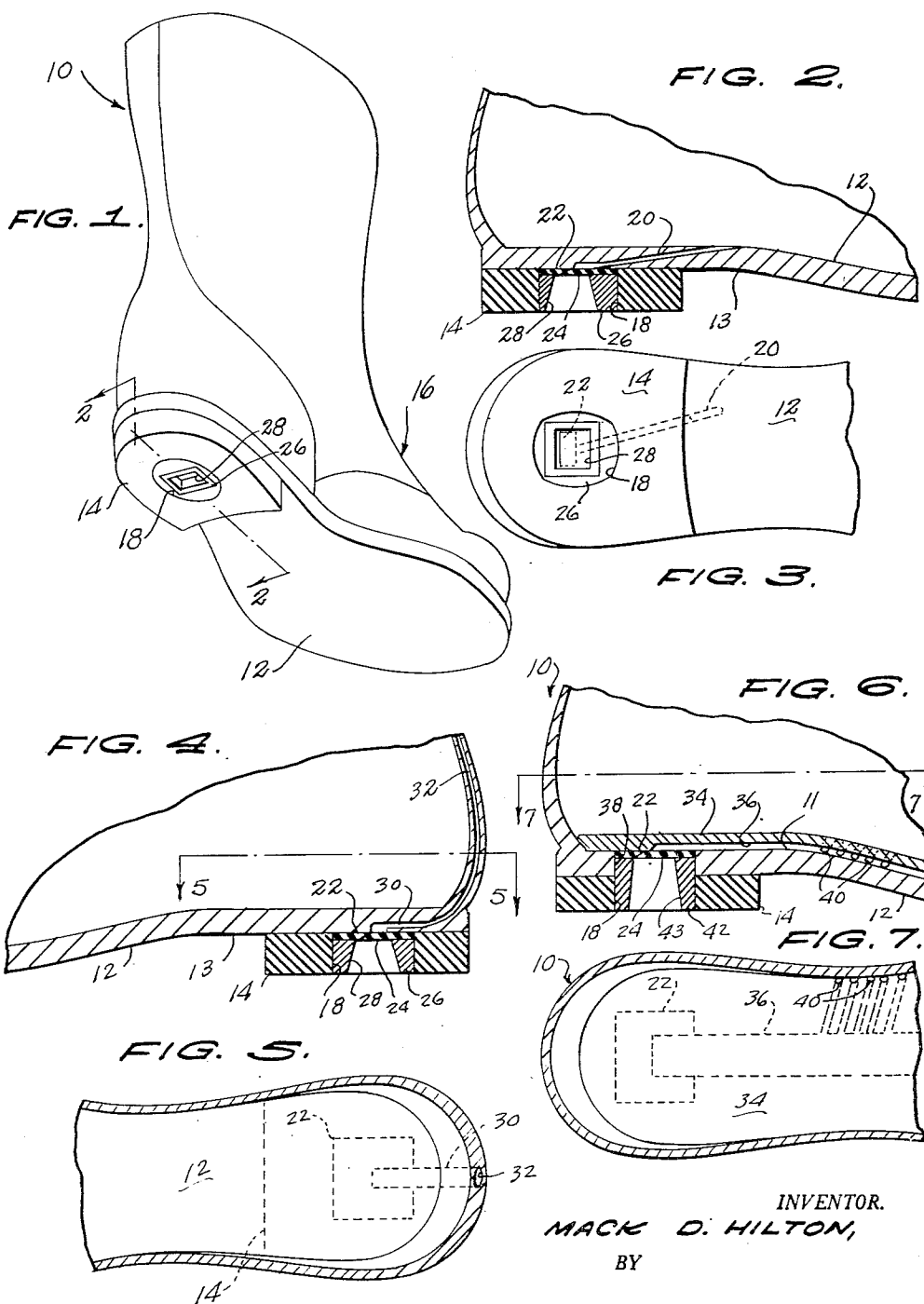
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2,708,320

SUCTION RELIEVING FOOTWEAR

Filed Oct. 22, 1954

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

FIG. 8.

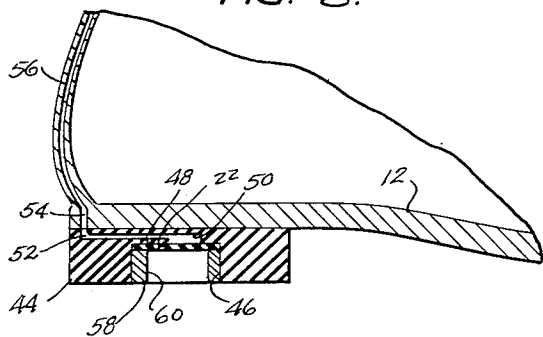


FIG. 9.

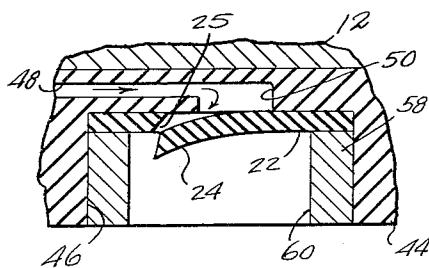


FIG. 10.

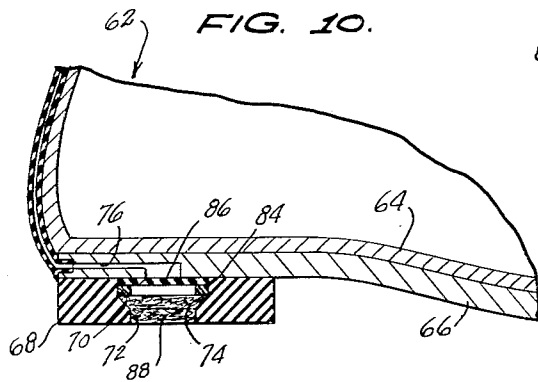


FIG. 11.

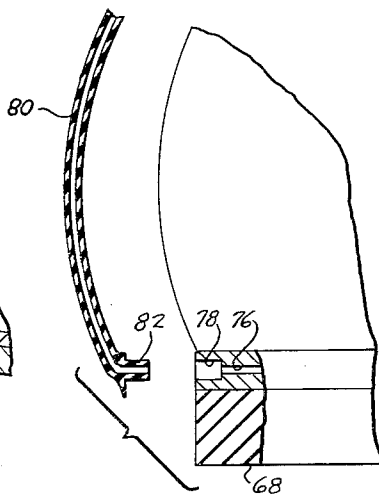


FIG. 12.

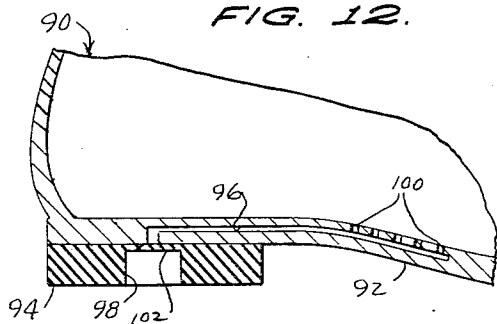


FIG. 13.

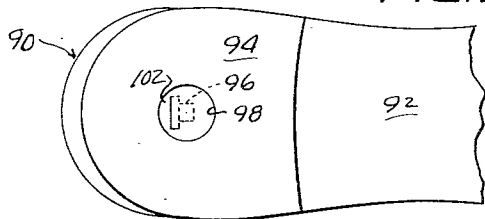
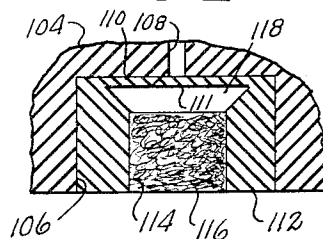


FIG. 14.



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2,708,320

## SUCTION RELIEVING FOOTWEAR

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3 Claims. (Cl. 36—1)

This invention relates to footwear, and more particularly to footwear of the type where suction created under the footwear when walking in mud or other soft surfaces will be relieved.

It is common experience that when wearing footwear and walking in mud or upon other soft ground surfaces, wherein the sole of the footwear sinks into the mud, there is a tendency to create a vacuum or suction under the sole of the footwear, the suction having the effect of pulling the boot or footwear from the foot of the wearer.

It is therefore the principal object of this invention to provide footwear which will permit the use of the footwear in mud or upon soft ground surfaces and which will relieve the vacuum or suction effect created under the sole of the footwear under such conditions of use.

It is a further object of this invention to provide in footwear of the character described means which is responsive to the suction or vacuum action created on the underside of the footwear to destroy the suction or vacuum, and thus facilitate lifting of the footwear from the soft ground surface into which it has been embedded.

Other important objects and advantages will become apparent from a consideration of the following detailed description, forming the specification, and taken in conjunction with the accompanying drawings, in which:

Figure 1 is a perspective view of one type of footwear embodying this invention;

Figure 2 is a vertical, longitudinal, cross sectional view taken substantially along line 2—2 of Figure 1;

Figure 3 is a bottom plan view of Figure 2;

Figure 4 is a vertical, longitudinal, cross sectional view of a portion of a shoe showing a modified form of the invention;

Figure 5 is a cross sectional view taken substantially on line 5—5 of Figure 4 and looking in the direction of the arrow;

Figure 6 is a vertical, longitudinal, cross sectional view of a portion of a shoe showing a still further modification of the invention;

Figure 7 is a cross sectional view taken substantially along line 7—7 of Figure 6 and looking in the direction of the arrows;

Figure 8 is a cross sectional view similar to Figure 6, but showing a still further modification;

Figure 9 is a fragmentary, enlarged, cross sectional view of a portion of the form of the invention shown in Figure 8;

Figure 10 is a cross sectional view similar to Figures 6 and 8, but showing another form of the invention;

Figure 11 is an exploded, side elevational view, partially broken away, of the form of the invention shown in Figure 10;

Figure 12 is a cross sectional view similar to Figure 10 but illustrating yet another modification;

Figure 13 is a bottom plan view of the form of the invention shown in Figure 12; and

Figure 14 is a fragmentary, enlarged, cross sectional view of a heel portion which may be integrally formed

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with the sole of the footwear at one end thereof, showing a form of the invention to be applied to the footwear.

With continued reference to the drawings, there is shown in Figure 1 foot wear of the boot structure type, a boot being generally indicated at 10. The footwear or boot structure 10 includes a sole 12, a heel 14 carried thereby, and an upper, generally indicated at 16.

The heel 14 which is attached to the sole 12 has a recess 18 extending transversely therethrough and opening to the bottom thereof. The sole 12 is provided with a tube-like passage 20 therein. The passage 20 is in communication at one end with the recess 18 and opens to the atmosphere at its other end. In the form of the invention shown in Figures 1 to 3, the other end of the passage opens to the interior of the article of footwear 10.

A valve 22 is disposed across the end of the recess 18 remote from the end opening to the bottom of the heel and is interposed between the one end of the passage in communication with the recess 18 and the recess. The valve 22 is in the form of a membrane which may be made of any resilient material having the property of stretching under tension and returning to its original position when the tension or stress is removed, and may be of any suitable shape and thickness conducive to easily flexing toward the bottom surface of the heel and away from the tube-like passage 20. The valve 22 is provided with an oblique cut or slit transversely therethrough to define a flap 24 which may resiliently be moved away from the one end of the passage 20. Thus, the valve 22 may be considered to be of the flap type.

A valve support member 26 having an opening 28 therethrough is carried by the heel 14 and is disposed within the recess 18 with the opening 28 extending from the valve 22 to the bottom of the heel 14. Also, as will be noted in Figure 2, the opening 28 may have inclined side walls diverging toward the bottom of the heel 14.

When walking in mud, wet clay, mossy ground, or other types of soft, yielding ground surfaces, a vacuum or suction is created under the heel 14 as well as the sole 12, especially under the arch portion 13 of the sole adjacent the inner transverse edge of the heel. Unless this suction is relieved, the article of footwear will tend to pull away from the foot of the wearer, but when air is admitted under the heel of the article of footwear, this suction will be alleviated to facilitate lifting of the article of footwear or boot from the soft, yielding ground surface.

Therefore, in use the article of footwear constructed as hereinbefore described, the pull of the wearer on the article of footwear in the soft, yielding ground surface will cause the flap 24 of the valve 22 to open and allow air to pass down through the passage 20 into the recess 18, and more specifically through the opening 28 of the valve support member 26, and under the heel 14 to relieve the suction formed thereabout. As the suction is relieved, it will be apparent that the flap 24 will return to its normally closed position due to its inherent resilience and will again operate when the footwear is once more embedded in the soft, yielding ground surface.

In the form of the invention shown in Figures 4 and 5, the passage provided in the sole 12, as indicated at 30, is in communication with the recess in the heel 14, but differs from the passage 20 in that there is further provided a tube-like conduit or passage 32 extending upwardly through the back of the article of footwear as an extension of the passage 30 and opens to the atmosphere at a location remote from and above the heel 14. It will be apparent that this construction will function in the same way as the construction of the form of the invention shown in Figures 1 to 3.

In Figures 6 and 7, the article of footwear comprising

the boot structure 10 includes an inner sole 34 having a recess 36 in the underside thereof and extending longitudinally of the innersole. The inner sole 34 is disposed within the footwear in overlying relation to the sole so that the recess 36 defines along with the inner surface 11 of the sole a passage which is in communication with an opening 38 transversely through the sole 12. The opening 38 is adapted to register with the recess 18 through the heel 14 at the end thereof remote from the end opening to the bottom of the heel.

The innersole 34 is provided with a plurality of spaced, tube-like openings 40 extending obliquely and transversely therethrough with each of the openings 40 being in communication at one end with the passage 36 and opening to the atmosphere at its other end within the article of footwear 10 and along one peripheral edge of the innersole 34 adjacent its upper side or surface.

The valve 22 is disposed, as in the previous forms of the invention, between the one end of the passage 36 opening to the recess 18 through the opening 38, and the registering opening 38 and recess 18. The valve 22 is maintained at the upper end of the opening 38 by a valve support member 42 having an opening 44 longitudinally therethrough and disposed within the registering opening 38 and recess 18.

The operation in use of the construction shown in Figures 6 and 7, will be the same as that described in connection with the construction of the invention illustrated in Figures 1 through 3. Also, it will be observed that the sole 12 has the passage 36 in connection therewith which will open at one end to the recess 18 so as to be in communication therewith and to the atmosphere adjacent its other end through the openings 40.

With reference to the form of the invention shown in Figures 8 and 9, it will be observed that a modified form of heel 44 has been provided, and in which there is provided a recess 46 opening to the bottom of the heel and a passage 48 extending longitudinally of the heel adjacent its upper end and in communication at one end with the recess 46 through a narrow opening 50. The other end 52 of the passage 48 opens to the upper end of the heel 44 adjacent the rear of the article of footwear and is in communication with one end of a passage 54 in the sole 12 which is part of a continuing conduit or passage 56 extending along the back of the article of footwear 10, similar to the conduit or passage 32, and which opens to the atmosphere at a location along the back of the article of footwear 10 at a location remote from the heel 44.

A valve support member 58, similar to the support members 26 and 42, having an opening 60 is disposed within the recess 46 so as to maintain the valve 22 in position wherein it is interposed between the passage 48 and the passages 54 and 56 to permit the article of footwear to function in the manner described in connection with the form of the invention of Figures 1 through 3.

As shown in Figure 9, a flap 24 will be caused to move away from the horizontal plane in which it is normally disposed so as to provide an opening 25 when the footwear is held by suction in soft, yielding ground surfaces to permit a flow of air to enter through the passages 56, 54 and 48 and into the recess 46, and more particularly to the opening 60 of the valve support member 58 which may be disposed generally concentric with the recess 46. Thus, with the introduction of air through the passages and the valve 22, with the flow of air proceeding in the direction indicated by the arrows in Figure 9, the suction grip of the article of footwear will be broken to thus facilitate lifting of the article of footwear and the foot of the user from the soft, yielding ground surface.

As the shoe or article of footwear is removed from the soft ground surface, the flap 24 of the valve 22 will again assume its normally closed position.

In Figures 10 and 11, the article of footwear, generally indicated at 62, comprises a double sole having inner

and outer portions 64 and 66 respectively, with the double sole carrying a heel 68 which is attached thereto at one end thereof in the usual manner.

The heel 68 has a recess 70 transversely therethrough opening to the bottom of the heel with a narrower portion 72 of the recess and the sloping shoulder 74 connecting the narrow portion 72 with the larger portion of the recess 70.

The sole is provided with a passage 76 therein in communication with the recess 70 at one end thereof and having an enlarged counterbore 78 formed at its other end thereof which opens to the atmosphere at the rear of the sole. It will be noted that the passage 76 is provided in the outer portion 66 of the sole.

A tube 80, which may be of any suitable resilient material, has a nipple 82 projecting laterally therefrom at one end thereof to be received within the counterbore 78 at the body of the tube 80 so formed as to conform to the exterior contour of the back of the article of footwear 62 and extend upwardly therealong. The other end of the tube remote from the nipple is open to the atmosphere at a suitable location remote from the heel 68.

Within the recess 70 in the heel, there is provided a valve support member 84, which may be in the form of a collar extending peripherally about the recess, to maintain the flap valve 86 similar to the valve 22 in all respects, in a position within the recess 70 adjacent the upper end thereof and interposed between the one end of the bore or passage 76 and the recess 70.

Also within the recess 70, and held therein by abutment against the shoulder 74, is a filter 88 of very coarse porous material to allow rapid passage of air therethrough to the outer surface of the heel and yet prevent dirt or other foreign matter from entering the recess 70 and the passage 76.

The operation of the suction relief feature of the article of footwear 62 will be the same as that of the article of footwear 10. In addition, the tube 80 is removably carried by the sole of the article of footwear 62 and is disposed along the rear of the article of footwear and extends upwardly therefrom opening to the atmosphere adjacent the upper end of the article of footwear at a location remote from the heel 68.

The article of footwear, generally indicated at 90, shown in Figures 12 and 13, includes a sole 92 having a heel 94 attached thereto at the back end thereof in the usual manner and location.

The sole 92 is provided with a passage 96, in the form of a tube, which extends longitudinally therein and is in communication with a recess 98 extending transversely through the heel 94. A plurality of openings 100, in spaced relation to each other, is provided in the sole 92 adjacent the other end of the passage 96 remote from the end in communication with the recess 98. The openings 100 communicate between the passage 96 and the interior of the article of footwear 90 so that the passage 96 is opened to the atmosphere adjacent its end remote from the end in communication with the recess 98.

The heel 94 is so constructed as to include as an integral part thereof a flap-type valve 102 extending across the recess 98 at the end thereof remote from the end opening to the bottom of the heel with the body or remainder, of the heel defining a valve support member to maintain the valve 102 in a position interposed between the passage 96 and the recess 98.

In use, the article of footwear 90 will function in the same manner as the article of footwear 10 when the wearer thereof is traveling across soft, yielding ground surfaces so as to break the suction formed under the heel and sole of the article of footwear.

In Figure 14, there is shown the rear portion of a sole 104 of an article of footwear which is provided with a recess 106 opening to the bottom thereof, with that portion 104 in which the recess 106 is provided being at the

rear end thereof to normally define a heel. The sole is also provided with a tube-like passage 108 which is in communication with the recess 106 at one end with the atmosphere adjacent its other end.

A valve, of the flat type, similar to the valve 22, indicated at 110, is interposed between the passage 108 and the recess 106. The valve 110 is carried by and integral with the valve support member 112 having an opening 114 therethrough with the valve extending across the upper end of the member 112, and the member 112 disposed within the recess 106 with the opening 114 generally concentric with the recess 106 so that the flow of air through the passage 108 may enter the opening 114 in the recess 106 when the flap 111 of the valve 110 is open to permit breaking of the suction beneath the sole of the article of footwear. Also, there may be provided a plug 116 of very coarse porous material to define a filter disposed within the opening 114 and extending from the end thereof opening to the bottom of the rear portion 104 of the sole and to a location spaced from the valve 110. The opening 114 being provided with an enlarged air chamber 118 at the end thereof adjacent the valve 110 by having the walls of the opening 114 incline divergently toward the valve 110.

A filter of coarse porous material, such as the plug 116 or filter 88 may be employed with any of the forms of the invention hereinbefore described.

From the foregoing, it will be seen that there has been provided in all of the forms of the invention herein illustrated and described, an article of footwear comprising a boot structure including a heel having a recess therein opening to the bottom thereof. In this latter regard, the rear portion 104 of the sole, shown in Figure 14, will define a heel. The article of footwear is also provided with a sole having a passage therein in communication with the recess in the heel at one end and opening to the atmosphere at its other end, or adjacent its other end. A valve is interposed between the one end of the passage in the sole which is in communication with the recess in the heel, and disposed within the recess extending transversely thereof adjacent the top and below the one end of the passage to bridge the recess in closing relation thereto. The valve being normally closed and responsive to suction created under the article of footwear to open the valve for admitting air from the passage into the recess and into the heel of the article of footwear to relieve the suction and thereby facilitate removal of the article of footwear from a soft, yielding ground surface. Also, in every form of the invention, there is provided a support member for the valve, this support member having opening therethrough and the member being carried by the heel and disposed within the recess, with the heel 94 itself constituting such support member in the form of Figures 12 and 13.

While there are shown and described the preferred embodiments of the invention, it is to be understood that the structure is susceptible to change and modification within the practicability of the invention, and therefore should be limited only by the scope of the appended claims.

What is claimed is:

1. An article of footwear comprising a boot structure, a heel carried by said structure, said heel having a recess therein extending inwardly from the bottom to the top thereof, said structure having a passage extending therethrough communicating at one end with said recess adjacent the top thereof and opening to the atmosphere at its other end, and a valve disposed within said recess extending transversely thereof adjacent the top thereof and below said one end of the passage to bridge said recess in closing relation thereto, said valve being normally closed and being responsive to suction created under the boot structure to open for admitting air from said passage into said recess and under the heel of said footwear.

2. An article of footwear comprising a boot structure, a heel carried by said structure, said heel having a recess therein extending inwardly from the bottom to the top thereof, said structure having a passage extending therethrough communicating at one end with said recess adjacent the top thereof and opening to the atmosphere at its other end, and a valve disposed within said recess extending transversely thereof adjacent the top thereof and below said one end of the passage to bridge said recess in closing relation thereto, said valve being normally closed and being responsive to suction created under the boot structure to open for admitting air from said passage into said recess and under the heel of said footwear, and a valve support member having an opening transversely therethrough carried by said heel and disposed within said recess.

3. An article of footwear comprising a boot structure, a heel carried by said structure, said heel having a recess therein extending inwardly from the bottom to the top thereof, said structure having a passage extending therethrough communicating at one end with said recess adjacent the top thereof and opening to the atmosphere at its other end, and a valve disposed within said recess extending transversely thereof adjacent the top thereof and below said one end of the passage to bridge said recess in closing relation thereto, said valve being normally closed and being responsive to suction created under the boot structure to open for admitting air from said passage into said recess and under the heel of said footwear, and a filter element disposed within said recess adjacent the bottom of said heel.

No references cited.