A self-inflatable footrest for use in a vehicle or a plane that comprises an elongated body having a floor-rest surface and a foot-supporting surface which is inclined with respect to the floor-rest surface. The footrest consists of an air-proof inner casing filled with plastic foam and provided with a valve for sealing the interior of the inner casing or for opening connection thereof to the atmosphere so that when the valve is opened, the plastic foam can be compressed for displacing air from the cells of the plastic foam with subsequent closing of the valve, whereby the footrest becomes several times smaller in value for convenience of storage and transportation.
SELF-INFLATABLE FOOTREST

FIELD OF THE INVENTION

[0001] The present invention relates to a footrest, in particular to a footrest for use by a passenger of a vehicle or a plane for holding the feet in a comfortable position during long-time travel. More specifically, the invention relates to a self-inflatable footrest that can be deflated in order to reduce its volume to minimum for convenience of storage and transportation and that can be self-inflated without a blow-up method or the use of pumps or other means for inflation.

BACKGROUND OF THE INVENTION AND DESCRIPTION OF THE PRIOR ART

[0002] Individuals who must remain seated for many hours because of their occupation or mode of transportation usually need to rest their feet on a comfortable, supporting surface. In particular, most commercial airline passengers typically are not provided with any comfortable support for their lower legs and feet due to the seating configuration and the narrow space encountered between seat rows. Even when a footrest structure is provided in certain limited seating, such structure may not extend far enough to accommodate full extension of a tall person’s legs.

[0003] Even in everyday life, sitting is our most frequent body posture: we sit at work, at school, and so on. Those who are wheelchair-bound are in sitting positions for entire days.

[0004] A seat should take the weight off one’s feet in order to lessen stress on the legs, and the seat should provide some postural stability while one works or relaxes. One should also be able to relax muscles that are at rest.

[0005] Seat height should not be so high that the occupant’s legs are allowed to dangle, in which case undue pressure can affect the soft tissues under the thighs. This pressure can interfere with the return of blood from the lower limbs, which may cause tingling and numbness in the thighs due to pressure on blood vessels and nerves.

[0006] At the same time, there exists an opinion that prolonged travel in a sitting position can cause venous stasis. Venous stasis refers to loss of proper function of the veins in the legs that normally carry blood back to the heart.

[0007] N. S. Lee, et al., showed in “Review of Selected Literature Related to Seating Discomfort” submitted in 1990 to Ikeda Engineering Corporation, MI, USA that in terms of ml/min/100 ml of body segment, blood flow in the leg of a person (4 ml/min/100 ml) in a seated position is much lower than, e.g., in the arm (10 ml/min/100 ml). This means that the legs of a seated person are to a greater extent subject to phenomenon such as tingling and numbness in the thighs caused by pressure on blood vessels and nerves.

[0008] It is understood that the aforementioned abnormalities of blood circulation are caused by areas on a chair that cause increased pressure on the thighs of the person seated on the chair or on a similar support. In the majority of cases, such areas are the edges of a seat.

[0009] The applicant made an attempt to raise the thigh of a seat occupant, e.g., a vehicle driver, over the edge of the seat in order to reduce pressure on the thigh at this location by using an ergonomic thigh support (see U.S. Pat. No. 7,255,396 issued in 2007 and titled “Ergonomic thigh support and method of uniformly distributing pressure on the thigh surface of a seated person”).

[0010] Although the aforementioned thigh support partially solves the problem of tingling and numbness in the thighs caused by pressure on blood vessels and nerves, it relates mostly to the vehicle driver and does not allow a passenger to support the feet in the most convenient and comfortable position, especially during long flight or travel in a vehicle.

[0011] Heretofore, many attempts have been made to solve the footrest problem, and many footrests have been proposed for the solution of the problem. Some of these devices are described below.

[0012] U.S. Pat. No. 7,066,547 issued to Russell, et al., in 2006 discloses a portable and stabilized footrest that is positioned on a supporting surface, such as a floor, or the like. The footrest generally comprises a rectangular-shaped housing with a pair of V-configured legs recessible within the housing when stored or transported and extendible for use in the foot-supporting mode. Plural releasable locking mechanisms are provided to secure the footrest in the respective modes.

[0013] U.S. Pat. No. 6,951,360 issued to Nabet, et al., in 2005 discloses a footrest that can be mounted on the floor of a motor vehicle and that has a foundation with a mounting surface, a footboard, and a fastening apparatus between the foundation and the footboard that holds the footboard on the mounting surface. The fastening apparatus has a lower, first fastening element constructed in the form of a rigid back-reaching element and an upper, second fastening element. For short installation times of the footboard on the foundation, the fastening apparatus is additionally provided with a third fastening element constructed as a rigid back-reaching element, and the upper fastening element is constructed as a slide-blocking element that blocks relative displacement between the footboard and the mounting surface.

[0014] U.S. Pat. No. 6,532,682 issued in 2003 to Futschik, et al., discloses a ventilated footrest for a motor vehicle, in particular, for a passenger vehicle. The device has a housing that contains at least one air-inlet opening and at least one air-outlet opening and that has a foot-depositing board on its upper side. In order to better use this footrest, it is proposed to form a storage space and at least two flow paths that are independent of each other in the housing. The first flow path ventilates the storage space, while the second flow path bypasses the storage space and ventilates the foot-depositing board.

[0015] U.S. Pat. No. 6,318,785 issued in 2001 to Toussignant discloses a motor vehicle footrest that includes a movable footrest panel, a driving mechanism, and an actuator. In another aspect of the present invention, a flexible and linearly movable cable pushes or pulls a linearly movable slide capable of raising or lowering a footrest panel. A further aspect of the present invention provides a linearly movable slide which is coupled to an elongated and relatively stationary track.

[0016] U.S. Pat. No. 6,241,301 issued in 2001 to Speth, et al., discloses a motor vehicle that includes an occupant compartment and a footrest. The occupant compartment is partially defined by the floor. The footrest is interconnected with the floor for movement between the first position and the second position. An upper surface of the footrest is flush with the floor when the footrest is in the second position. The upper surface extends above the floor when the footrest is in the first position.

[0017] In recent years, since the advent of automatic drive in most types of automotive vehicles, including passenger
vehicles as well as trucks and the like, the left leg of the driver is, under most circumstances, totally unnecessary to effect normal driving of the vehicle. Accordingly, the left leg is relatively inactive, while the right leg actuates both the brake pedal as well as the accelerator pedal. Under such circumstances, the right leg experiences at least a limited amount of exercise during the time the left leg is inactive.

[0018] Medical evidence indicates that when people who are particularly afflicted with circulatory problems maintain any of their limbs inactive for a substantial period of time, the situation becomes more aggravated and sometimes leads to permanent difficulty, which may result in permanent impairment of the afflicted limb over a period of time. Thus, it readily can be seen that persons such as salesmen, delivery men, truck and bus drivers, taxi drivers, as well as other persons who drive as much as 40,000 to 50,000 or more miles per year in vehicles having automatic drives experience long periods when, for example, their left leg is inactive. If such persons have circulatory problems, and even if they are in normal health, maintaining the left leg inactive for long periods of time can result in the commencement of a problematic condition.

[0019] In view of the above, a device described in U.S. Pat. No. 4,013,287 issued in 1977 to Dickman offers a combined leg exercise and footrest for automotive vehicles. The device has an attaching member secured to the lower part of an automobile dash panel to support the upper end of freely extendible elastic means that has foot-engageable means on the lower end thereof so that especially the driver of the vehicle can exercise and rest the left leg by swinging it and/or extending and contracting the elastic member to exercise, and thereby restore circulation in the inactive leg during long periods of driving the vehicle.

[0020] U.S. Pat. No. 6,478,380 issued in 2002 to Ehrlich describes a portable leg and footrest that has an inflatable main body of flexible sheet material that, when inflated, forms (a) a major rest surface, (b) a bottom surface, (c) a pair of side walls that extend between the rest surface and the bottom surface, and (d) a rear wall that extends between the rest surface and the bottom surface. The first portion of the rest surface slopes downward from the rear wall to define the first surface for supporting a person's calves and heels, and the second portion of the rest surface, which is contiguous to the first portion, rises upward from the first portion to define the second surface for supporting the soles of a person's feet.

[0021] However, none of the aforementioned footrests can be completely collapsed or folded to a condition convenient for traveling and storage, e.g., for packing into a suitcase or handbag.

[0022] Also known in the art are inflatable footrests, e.g. of the type produced and distributed by Custom Cushion Company, TX, USA (http://www.google.com/products?hl=en&q=%22inflatable+foot+rest%22&um=1&ie=UTF-8). Dimensions of the inflated footrest are 430×254×254 mm, and dimensions of the deflated footrest are 200×240×58 mm. However, the inflating method has been a shortcoming in the design of air-fillable products. Most air-fillable products assume the use of common inflating methods: (A) blow-up valve systems, or (B) pump and compressor systems. There are many negative characteristics of blow-up valve systems. First, putting a blow-up valve in one's mouth is unhygienic. This is true even if the article is used exclusively by a single person, especially in case of a footrest that is placed on the floor and in which the blow-up valve can be easily contaminated. It is difficult to keep the floor-positioned footrest in a clean state. Second, the blower's ears can experience popping and discomfort during inflation. Third, depending on the volume of air required to fill the article, the blower may be subject to hyperventilation. Fourth, also depending on the volume of air required, blowing up an inflatable article can be too time-consuming. Pump and compressor systems have their own negative characteristics. First, these tend to be expensive and can add considerably to the cost of an inflatable article. A pump or compressor can often make an inflatable article uneconomical to produce and sell. Second, pumps and compressors can be heavy and usually tend to be bulky. These qualities are especially negative when associated with inflatable articles. Inflatable articles are often used precisely because they are light and collapsible.

[0023] Another disadvantage of known footrests is that they are made in the form of a single piece for both feet and limit positions of the feet by their dimensions so that feet cannot be moved beyond the limits of the footrest dimensions.

OBJECTS AND SUMMARY OF THE INVENTION

[0024] It is an object of the present invention to provide a footrest that has a collapsible and self-inflatable structure that allows deflating of the support by expelling air from the sealed interior thereof for convenience of storage or transportation in a collapsed state or filling the interior of the support with air due to self-expandable properties of its interior and then sealing the interior for maintaining the footrest at a predetermined rigidity and in a predetermined shape. It is a further object to provide the self-inflatable footrest of the aforementioned type that can be compressed to a low volume for convenience of storage and transportation. It is a further object to provide a self-inflatable footrest that can be separated into two independent parts for providing a separate support for each foot independently and thus providing freedom of movement for both feet in a state supported by the footrest.

[0025] The self-inflatable footrest of the invention comprises an elongated body of a substantially triangular cross section which contains an inner air-proof shell or casing made from a non-stretchable flexible materials, such as rubberized fabric, plastic, or reinforced rubber, and a plastic-foam inner filler made e.g., of polyurethane foam that fills the entire interior of the inner casing. The inner casing is provided with a valve capable of either closing the sealed interior of the casing or opening it to the surrounding atmosphere, which may be needed during compression of the footrest or during expansion and self-inflation for filling the cells of the plastic foam with air. The inner casing, in turn, may be placed into an external casing made from a spot-cleanable or washable material that is closed by a zipper-type fastener, buttons, or the like, and that can be opened for extraction of the casing with plastic foam for replacement or for cleaning the outer casing. The outer casing can be made from velvet or a similar material. On the surface intended for contact with the floor, the footrest is provided with means for connection to the surface of the floor such as friction strips or tiny hooks and loops known under the trademark Velcro® and produced by FastenNation, Inc., NJ, USA.

[0026] During use, the footrest is allowed to expand by opening the valve, and, after self-inflation to a full-volume state with air that fills the cells of the plastic foam interior, the valve is closed, thus sealing the air of the plastic-foam cells in
the interior of the inner air-proof casing. If necessary, rigidity and height of the footrest can be adjusted by opening the valve and compressing the footrest to the degree required for obtaining a predetermined rigidity of the footrest. The valve is then closed.

According to one modification, the self-inflatable footrest is a single piece used for supporting both feet.

According to another modification, the self-inflatable footrest consists of two disconnectable parts that are connected, e.g., by a zipper, buttons, hooks and loops, or the like, and that can be disconnected for supporting each foot separately, thus providing the feet with freedom of movement in any direction. For convenience of attachment to the foot, each individual part of the footrest has a strap of the type used in slippers or sandals. The end of the strap can be secured in position by tiny hooks and loops known as Velcro®.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1A is an end view of the self-inflatable footrest of the invention.

FIG. 1B is a three-dimensional view of the self-inflatable footrest of FIG. 1A.

FIG. 2 is a fragmental view that illustrates the structure of the self-inflatable footrest of the invention.

FIG. 3A is a view of the self-inflatable footrest of the invention in a compact, deflated state for storage or transportation.

FIG. 3B is a view of the bag used to store the self-inflatable footrest of the invention in the deflated state.

FIG. 4 is a side view of the self-inflatable footrest of the invention composed of two disconnectable parts.

FIG. 5 is a side view of the self-inflatable footrest of FIG. 4, with the footrest parts disconnected from each other.

FIG. 6 is a three-dimensional view of the self-inflatable footrest of the invention consisting of two disconnectable parts having foot-securing straps.

FIG. 7 is a view that shows the user's feet on the self-inflatable foot-rest parts of FIG. 6 in positions secured by the straps.

DETAILED DESCRIPTION OF THE INVENTION

As shown in FIGS. 1A and FIG. 1B, which are a side view and a three-dimensional view of the self-inflatable footrest 20 of the invention, the footrest 20 comprises an elongated body of a substantially triangular cross section. The footrest 20 has a foot-supporting surface 22 and a floor-rest surface 24. The foot-supporting surface 22 is inclined with respect to the floor-rest surface 24. The latter may have friction straps or a friction coating 26 in the form of tiny hooks and loops known under trademark Velcro® and produced by FastenNation, Inc., NJ, USA. In FIG. 1A, reference numeral 25 designates a user's foot.

FIG. 2 is a sectional view that shows the structure of the self-inflatable footrest 20. It can be seen that structurally, the footrest 20 contains a sealed inner air-proof shell or casing 28 made from a non-stretchable flexible materials, such as rubberized fabric, plastic, e.g., polyvinylchloride, or reinforced rubber, and a plastic foam inner filler 30 made e.g., of polyurethane foam that fills the entire interior of the inner casing 28. The inner casing 28 is provided with a valve 32 capable of either closing the sealed interior of the casing 28 or opening it to the surrounding atmosphere, which may be necessary during compression of the footrest 20 or during expansion and self-inflation for filling the cells of the plastic foam 30 with air. The inner casing, 28, in turn, may be placed into an external casing 34 made from a spot-cleanable or washable material that is closed by a zipper-type fastener, buttons, or the like (not shown) and that can be opened for extraction of the inner casing 28 with plastic foam 30 for replacing or for cleaning the external casing. The external casing 34 can be made from velvet or a similar material.

The valve 32 may have the construction as one used in a self-inflatable mattress described in U.S. Pat. No. 4,694,515 issued in 1987 to Rogers, Jr. In general, the valve is made as a rotating plug with an opening that is either open or closed, depending on the rotary and axial position of the plug stem.

For use, the footrest 20 is allowed to expand by opening the valve 32, and, after self-inflation to full the volume of air that fills the cells of the plastic foam 30 of the inner air-proof casing, the valve 32 is closed, thus sealing the air in the cells of the plastic foam 30 in the interior of the inner air-proof casing 28. If necessary, rigidity and height of the footrest can be adjusted by opening the valve 32 and compressing the footrest 20 to the degree required for obtaining a predetermined rigidity of the footrest 20. Then the valve is closed. FIG. 3A shows the footrest 20 in the compressed condition which is obtained by squeezing the footrest when the valve 32 is opened and when two opposite forces F1 and F2 are applied to side end faces 23a and 23b of the footrest 20 (FIGS. 1A, 1B, and 3A). The imaginary lines in FIG. 3A show the shape of the footrest 20 in the self-inflated state. After self-inflation to the required volume, the valve 32 is closed. It can be seen that in the deflated state shown in FIG. 3A, the volume of the footrest 20 may be significantly reduced over the inflated state to the extent that the footrest 20 can be placed into a small bag shown in FIG. 3B and then stored or placed in a suitcase, handbag, or the like.

According to one modification, the self-inflatable footrest used for supporting both feet is a single piece of the type shown in FIGS. 1A through 3.

According to the modification shown in FIG. 4, the self-inflatable footrest 120 consists of two disconnectable footrest parts 122a and 122b for use in association with the left and right foot. The foot-rest parts 122a and 122b can be connected to each other, e.g., by a zipper, buttons, hooks and loops, or another fastener 124 and can be disconnected for supporting each foot separately, thus providing the feet with freedom of movement in any direction.

In FIG. 4, reference numerals 127a and 127b designate two parts of a fastener, e.g., a zipper-type fastener, for closing openings 129a and 129b of the external casings 134a and 134b in order to extract the inner casing 28 with the plastic-foam filler 30 (FIG. 2) for cleaning or washing the external casings 129a and 129b. It is understood that the external casings 134a and 134b (FIG. 4), the inner casings, and the plastic-foam fillers (not shown in FIG. 4) of the footrest parts 122a and 122b may be the same as the external casing 34, the inner casing 28, and the plastic-foam filler 30 of the modification shown in FIG. 2. A similar fastener 27 is shown in the single-piece footrest of FIG. 1B.

FIG. 5 illustrates two foot-rest parts 122a and 122b separated from each other. Reference numerals 124a and 124b show mutually connectable members of a conventional zipper-type fastener. The parts 122a and 122b have the same structure as the one shown in FIG. 2 and are provided with valves 126a and 126b, respectively.
FIG. 6 is a three-dimensional view of a footrest 220, which, similar to the footrest 120 of FIGS. 4 and 5, consists of two self-inflatable, disconnectable parts 222a and 222b with respective valves 224a and 224b. However, in addition to the structure of FIG. 4, the foot-rest parts 222a and 222b have straps 226a and 226b of the type used in slippers or sandals. The strips can be made from rubber bands or may be secured in the required position by tiny hooks and loops 228a and 228b, respectively, known as Velcro® and produced by Fastenation, Inc., NJ, USA.

It is understood that the footrest parts 222a and 222b also have external casings that can be provided with zipper-type fasteners for extraction of the inner casings with the plastic foam.

FIG. 7 shows the user’s footwear 230a and 230b on the self-inflatable foot-rest parts 222a and 222b in positions secured by straps 226a and 226b. In the modifications of FIGS. 4 through 7, the self-inflatable foot-rest parts 122a, 122b, and 222a, 222b should not have friction layers or strips on the floor-resting surfaces in order to provide freedom of movement of the feet with the foot-rest parts in any direction.

Thus, it has been shown that the present invention provides a footrest that has a collapsible and self-inflatable structure that allows deflating of the support by expelling air from the sealed interior thereof for convenience of storage or transportation in the collapsed state or filling the interior of the support with air due to self-expandable properties of its interior and then sealing the interior for maintaining the footrest at a predetermined rigidity and in a predetermined shape. The self-inflatable footrest of the invention can be compressed to a low volume for convenience of storage and transportation. The footrest of the invention can be separated into two independent parts to provide a separate support for each foot independently and thus to provide freedom of movement for both feet when supported by the footrest.

Although the invention has been shown and described with reference to specific examples, it is understood that these examples should not be construed as limiting the invention and that any changes and modifications can be made with regard to materials, shapes, and other features of the illustrated embodiments without departure from the scope of the patent claims. For example, the footrest may have a square, rectangular, or any other suitable configuration. The straps 226a and 226b may be made in a form different from one shown in the drawing. The foot-supporting surface of the footrest may have recesses in order to more conveniently accommodate footwear, etc. Means for securing the feet to the foot-rest parts need not necessarily be straps and may comprise mechanical fixtures or the like.

1. A self-inflatable footrest comprising at least one elongated body having a floor-rest surface and a foot-supporting surface which is inclined with respect to the floor-rest surface, the aforementioned elongated body comprising: an inner casing made from a sealed, flexible air-proof material and having a sealed interior, a plastic-foam inner filler that fills the aforementioned elongated body; and a valve connected to the inner casing for closing the sealed interior of the inner casing or opening thereof to the surrounding atmosphere.
2. The self-inflatable footrest of claim 1, further comprising an external casing made from a spot-cleanable or washable material that covers the aforementioned inner casing.
3. The self-inflatable footrest of claim 2, further provided with a friction layer on the floor-rest surface.
4. The self-inflatable footrest of claim 1, wherein the aforementioned plastic foam is polyurethane foam.
5. The self-inflatable footrest of claim 2, which consists of two separate and disconnectable foot-rest parts for use in association with the left and right foot of the user, each of said two foot-rest parts comprising: a body having a floor-rest surface and a foot-supporting surface which is inclined with respect to the floor-rest surface, the aforementioned elongated body comprising: an inner casing made from a sealed flexible air-proof material and having a sealed interior; a plastic-foam inner filler that fills the aforementioned elongated body; an external casing that coats the inner casing; and a valve connected to the inner casing for closing the sealed interior of the inner casing or opening thereof to the surrounding atmosphere.
6. The self-inflatable footrest of claim 5, wherein each of said two foot-rest parts has a fastener for mutual connection or disconnection of these two foot-rest parts.
7. The self-inflatable footrest of claim 5, wherein the aforementioned plastic foam is polyurethane foam.
8. The self-inflatable footrest of claim 6, wherein the aforementioned plastic foam is polyurethane foam.
9. The self-inflatable footrest of claim 5, wherein each of said two foot-rest parts further comprises means for securing the footrest part to the user’s foot.
10. The self-inflatable footrest of claim 6, wherein each of said two foot-rest parts further comprises means for securing the footrest part to the user’s foot.
11. The self-inflatable footrest of claim 7, wherein each of said two foot-rest parts further comprises means for securing the footrest part to the user’s foot.
12. The self-inflatable footrest of claim 2, wherein the aforementioned external casing further comprises an opening for extraction of the inner casing with the plastic-foam filler and a fastener for closing the aforementioned opening.
13. The self-inflatable footrest of claim 12, wherein the fastener for closing the aforementioned opening is a zipper.
14. The self-inflatable footrest of claim 5, wherein the aforementioned external casing further comprises an opening for extraction of the inner casing with the plastic-foam filler and a fastener for closing the aforementioned opening.
15. The self-inflatable footrest of claim 14, wherein the fastener for closing the aforementioned opening is a zipper.
16. The self-inflatable footrest of claim 6, wherein the aforementioned external casing further comprises an opening for extraction of the inner casing with the plastic-foam filler and a fastener for closing the aforementioned opening.
17. The self-inflatable footrest of claim 16, wherein the fastener for closing the aforementioned opening is a zipper.

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