

Description

Background of the invention

The present invention relates to an athletic shoe comprising an upper, a resilient sole, receptacle means within said sole, said receptacle means comprising an opening into and a recessed cavity within said sole of said shoe, said cavity being provided for slidably receiving and releasably locking a module therein, a plug-in module slidably received and removably retained in said receptacle means in said sole, said plug-in module comprising a housing or body having an outer face and a generally rectangular body portion with lateral side walls, said body portion being configured to be slidably inserted into the interior of said receptacle means, and complementary engaging means formed on the exterior of said housing and on the interior of said cavity for releasably locking said module in said cavity, whereby said receptacle means further comprise a rigid rectangular structure with side walls, said structure being moulded or bonded into said sole.

There are a number of references in the patent literature that depict various methods for incorporating light emitting elements and batteries to energise them into various portions of a shoe in order, e.g., to provide a visually distinctive shoe. In the majority of the examples found in the prior art, the light emitting device, as well as the batteries, have been incorporated into the heel portion of the sole of a dress shoe. The advantage of this configuration is that the heel of a dress shoe generally provides sufficient volume to easily accommodate the electronic apparatus, and is constructed of a rugged, nonresilient material that protects the light and battery and, in a translucent version, can also serve as a light conductor or spreader.

For example, U.S. Patents No. 4,253,253 and 3,800,133, British Patent No. 444,392, and Belgian Patent No. 570614, all illustrate women's high heel dress shoes incorporating a battery in the hollow interior of the heel of the shoe. Alternatively, U.S. Patent Nos. 1,597,823, 2,931,893, 4,014,115, and 5,052,131, as well as European Patent publication No. EP-A-0 121 026, depict lighted dress and casual shoes incorporating a raised or block-type of heel having a recessed inner portion for receiving the battery.

There may be several reasons for incorporating an active light emitting device into the shoe, e.g., to enhance the night safety of the wearer, to provide special visual effects at entertainment events, or to assist in certain biomechanical testing and measurements.

Thus, while it is known to incorporate passive reflectors, including reflective tapes and the like, on

the equipment or apparel of athletes, such as joggers or bicyclers to increase their visibility, and hence, safety, at night, it is necessary for the purely reflective elements to be illuminated by an external, active light source, such as the beam of an automobile headlight, in order for them to function. Footwear that incorporates its own built-in, active light source, and which, therefore, does not depend on an external source for illumination, can provide a higher level of visibility and safety than those that are purely reflective in nature.

Further, the incorporation of active light sources into the shoes of participants engaged in certain entertainment events, such as those worn by dancers, marching bands, athletes and the like, can achieve special, entertaining visual effects in low light conditions, particularly where it is desired to call attention to the participants' feet. For example, a marching band equipped with such footwear can present an impressive spectacle, as the individually-illuminated feet of its members move in synchronous unison.

The provision of an active light source on the shoes worn by test subjects engaged in certain walking and running motion studies can also enhance the ability of scientists and biomechanical engineers to measure and analyse those activities from a human engineering or sports medicine standpoint. Such studies frequently involve photographing a particular point or reflective target disposed on the foot or ankle of a test subject with high-speed motion picture equipment, then digitising the motion of that point for subsequent analysis with a digital computer. The incorporation of an active point light source on the shoe at the point under examination can enhance the testing procedure because the active light source is photographically more distinct, and hence, easier to photograph. Additionally, the light source can be adapted with a pressure- or acceleration-sensitive switch to illuminate selectively when a certain preset force or acceleration is exerted upon it during a particular activity. Thereby, the forces or accelerations acting on the shoe during various athletic endeavours can be better analysed.

A review of the references in the prior art reveals that the incorporation of a light emitting device into the sole of an athletic shoe is complicated by the specific qualities of resiliency, flexibility, and support required of such a shoe's sole during athletic activities. An improperly designed athletic shoe sole that does not provide the desired degree of support, protection, and comfort for the athlete is unacceptable.

DE-A-28 38 770 (Bott) discloses a usual walking shoe with a non-resilient heel. A through hole extends through the heel in longitudinal direction. A torch-like module comprising a lamp without leads,

a cylindrical battery, and switching means can be directly (i.e. without an additional tray structure) inserted into and retained in the through hole. A pressure-activated switch is not provided for. Because of the non-resilient nature of the heel there are no complementary engaging means for releasably locking the module within the through hole. As the through hole has two apertures the module can simply be pushed out; there are no separate extracting means on the module provided for. The technical solution as a whole is not applicable to athletic shoes with resilient soles.

EP-A-0 121 026 (Dana III) discloses an illuminated sport shoe. LEDs are fixedly installed at the front and the rear of the resilient sole. At the heel portion of the sole an open-topped cavity is provided wherein a module containing an electronic circuit and a battery and a separate pressure-sensitive switch can be removably inserted on top of each other. The module can not be plugged in from outside the shoe so that the wearer has to take off the shoe to remove the module. Pressure-sensitive switch, electronic module and LED are separate elements which have to be interconnected whenever the module is replaced. The only "integrated" embodiment according to Fig. 8 is a commercially available integral push button switch.

DE-A-38 24 352 (Stoschek) which represents the preamble of claim 1 discloses a safety sport shoe wherein a safety box can be removably inserted from outside the shoe into a recessed cavity which is provided in the sole of the shoe. A separate rigid housing within the foamed sole is used to receive the box. To lock the box in the housing a complicated locking mechanism comprising a moveable locking pin, a guiding contour and a plug-in lock is used. A spring plate is used to eject the box. There is no illumination at all.

US-A-2,904,901 (Goldstein) discloses a receptacle heels for ordinary footwear. The rubber heel contains an inner compartment with a front opening, wherein a container can slidably and removably be inserted. The side walls of the container have therein inwardly extending indentures, which receive operatively therein respective tongues located at the side walls of the compartment to lock the container in its slide-in position. To extract the container from the compartment, a finger grip recess is provided in the front wall of the container. There is no illumination at all.

US-A-3,800,133 (Duval) discloses a high-heeled illuminated shoe wherein a pressure-activated light emitting module is inserted into a recessed cavity in the rigid heel from the inside of the shoe. The technology is not applicable to an athletic shoe. The module itself comprises a lamp, a battery and a separate circuit element. The module is too big to be used with the relatively flat sole

of an athletic shoe. There is neither the possibility to use LEDs as light emitting elements nor to deactivate the module by inverting it.

Thus, it is not a simple matter of taking the teachings of the prior art, directed to various types of dress and casual shoes having block or high heels and essentially rigid soles, and incorporating the designs of their lighting device and power sources in generally the same configuration into an athletic shoe.

A further limitation of the designs of the prior art, to the extent that they can be incorporated into athletic shoes, relates to their relative inaccessibility within the shoe, with a concomitant lack of replaceability and maintainability of their various components, including their batteries, light sources, and switching components.

Summary of the invention

The disadvantages and limitations of the prior art athletic shoes and pressure-activated light emitting modules for incorporation into the sole of an athletic shoe are obviated by the present invention.

The athletic shoe according to the invention is characterised in that said rigid rectangular structure is a tray structure, said complementary engaging means comprise at least one pair of depressions and one pair of protrusions, said protrusions being configured to engage said depressions in a resilient, camming, overcenter, locking arrangement, and said plug-in module further comprises on said outer face means for extracting said module from said receptacle means, said extracting means comprising a pair of tabs at the edges of said outer face of said module, and said tabs being formed to fit smoothly within a pair of scallops or contoured recesses, said recesses being formed into the outer surface of said sole immediately adjacent the sides of said opening.

Various preferred embodiments of the invention are described in the dependent claims.

Brief description of the Drawings

Figure 1 is a schematic illustration of an athletic shoe according to the present invention, including a plug-in light module assembly;

Figure 2 is an exploded view of the athletic shoe according to **Fig. 1**, illustrating the plug-in light module assembly removed from the retaining slot;

Figure 3 is a top view of the plug-in module observed at a cross-section through the sole of the shoe;

Figure 4 is a cross-sectional view through the plug-in module taken along line 4-4 of **Fig. 3**;

Figure 5 is a cross-sectional view of the plug-in module taken along line 5-5 of **Fig. 4**;

Figure 6 is a cross-sectional view of the plug-in module taken along line 6-6 of **Fig. 4**;

Figure 7 is a cross-sectional view, similar to **Fig. 4**, of a plug-in module including a pressure-actuated switch;

Figure 8 is an alternative view of the plug-in light module removed from the heel portion of the shoe of **Fig. 1**;

Figure 9 is an exploded partial view of an athletic shoe having a different form of sole construction than that illustrated in **Fig. 2**, and which also incorporates the plug-in module of this invention;

Figure 10 is a perspective view of an alternative plug-in module that includes a storage compartment with retention clip; and

Figure 11 is an alternative embodiment of the athletic shoe of the present invention.

Detailed description of the Preferred Embodiment

Fig. 1 illustrates an athletic shoe 20 according to the present invention. The shoe 20 typically includes a resilient sole 22, which may itself further comprise a midsole portion 23 and an outsole portion 24 underlying it, as well as an upper 25, a tongue 26, and fastener means 28, such as the laces illustrated, for securing the shoe to the wearer's foot.

As illustrated in greater detail in **Figs. 2** and **3**, incorporated into the sole 22 of the athletic shoe 20 are receptacle means 30 for receiving and retaining a plug-in module 32 in a slide-in, releasably locking configuration. The receptacle means 30 are preferably disposed in the heel portion 36 of the sole 22, where the sole is typically the thickest, and comprise an opening 40 into, and an internal chamber 42 within, the midsole portion 23 of the sole of the shoe, for allowing insertion, retention, and removal of the plug-in module 32.

As may be appreciated from **Fig. 2**, the receptacle means 30 also preferably include a more rigid, rectangular tray structure that is molded or bonded into the midsole portion 23 of the sole 22 of the shoe. The internal faces of the side walls 43 defining the tray structure of the receptacle means 30 include a pair of depressions 44, the operative function of which is described below.

The plug-in module 32 includes a structure that can be likened to a small cabinet drawer. The plug-in module 32 includes a housing or body 46 having an outer face 50 and a generally rectangular body portion 52 that is configured to be slidably inserted into the interior of the receptacle means 30. Affixed to, or formed as a part of, the lateral side walls of

the rectangular portion is a pair of protrusions 48. These protrusions 48 are configured to engage the depressions 44 in the walls 43 of the receptacle means 30 in a resilient, camming, over-center, locking engagement upon complete insertion of the plug-in module 32 into the receptacle means 30, thereby releasably locking and retaining the plug-in module 32 therein. This releasable locking arrangement prevents inadvertent ejection of the plug-in module 30 from the shoe during vibration, flexure or shock of the shoe, but can be overcome by the user in the manner described below.

The plug-in module 32 is also preferably configured to include a pair of tabs 66 at the edges of the outer face 50. The tabs 66 are formed to fit smoothly within a pair of scallops or contoured recesses 68 formed into the outer surface of the sole 22 immediately adjacent the sides of the opening 40, without exposing any sharp corners. By this co-operative relationship, the scalloped-shaped recesses 68 permit the wearer of the shoe 20 conveniently to grasp the tabs 66 of the plug-in module 32 with his or her fingertips and, by pulling forcefully outward on it, overcome the resilient locking engagement of the module side protrusions 48 within their mating receptacle depressions 44, thereby permitting extraction of the plug-in module 32 from the receptacle means 30.

In the embodiment illustrated in **Figs. 2-7**, the plug-in module 32 preferably includes a light-emitting device, such as a light bulb or a light-emitting diode ("LED") 54 molded, bonded, or otherwise fixed into a bore or aperture 55 that extends through the outer face 50 and into the body 46 of the module 32, such that the bulb or LED 54 is visible to the exterior of the shoe when the module is plugged in. Desirably, the LED 54 is selectably connectable via electrical contacts and circuit elements 58, 60 to a battery 62 disposed within the inwardly-projecting rectangular portion 52 of the plug-in module 32, as shown in **Figs. 4** and **5**.

The plug-in module 32, or alternatively, the receptacle means 30, the sole 22 or the midsole portion 23 may further incorporate a raised, or depressed portion 70, respectively, that is intended to engage and activate a simple pressure-sensitive switch 72 disposed on the top of the plug-in module 32 for completing the electrical connection of the battery 62 with the LED 54, as described in more detail below.

Fig. 6 is a cross-sectional view taken along line 6-6 in **Fig. 4**, and illustrates the electrical elements of the plug-in module 32 in more detail. More particularly, it will be seen that the battery 62, which may be a relatively small, disk-shaped, 3-volt lithium battery, may be positioned and retained by its edges in the body 46 of the module 32 in the orientation shown, i.e., with its oppositely-charged

electrical terminals facing upwardly and downwardly, respectively, by means of a pair of spaced, opposing slots 63 formed into the interior side walls of the module body 46, into which the battery is snapped or slid. The circuit elements 58 and 60 may consist of nothing more than the stock wire leads with which the LED 54 is typically furnished at the factory. In the embodiment illustrated, these are brought through the aperture 55 into the interior of the body 46 to straddle the battery 62 in the manner shown.

As will be appreciated, for a simple LED-battery circuit, all that is required to complete the circuit is to bring appropriate ones of the LED leads 58, 60 into simultaneous contact with respective ones of the terminals of the battery 62, which, in the exemplary embodiment illustrated, is accomplished without need for any soldering or elaborate electromechanical contacts as follows: The lower one 60 of the LED leads is brought forward along the upper surface of the floor, or bottom wall, of the body 46 of the module 32 until it underlies the battery 62. The lead 60 may be fixed in this position by bending its free end downwardly, feeding it through a small aperture 64 in the floor of the body 46, then nipping it off flush with the underside of the body, but this latter refinement is not necessary to the desired result: The LED lead 60 is sized, and the position of the battery 62 is controlled such that, when the battery is snapped or slid into place in the module, its lower surface, comprising one of its electrical terminals, is maintained in constant electrical contact with the lead 60.

A similar arrangement may be adopted with the upper lead 58 of the LED, except that, here, it is brought forward along the lower surface of a cantilevered arm 74 extending forwardly from the upper surface of the body 46 of the module 32 to overlay the battery 62 and its second, upwardly-facing electrical terminal (see Fig. 3). If desired, the lead 58 may be fixed in a manner similar to that described above by bending its loose end upwardly and feeding it through a small aperture 65 through the arm 74, then terminating it flush with the body 46, but again, it has been found that this is unnecessary to the resulting switching function.

Indeed, in a more elaborate version, the upper surface of the floor of the module 32 and the lower surface of the arm 74, respectively, may each be provided with an electrical contact to which respective ones of the LED leads are soldered or crimped, the contacts being disposed appropriately with respect to the battery to contact respective ones of the battery's terminals under the appropriate conditions. However, as indicated above, these additional components and connections can result in an increased cost for the module without

an attendant gain in reliability of function.

The position of the arm 74 can be adjusted such that, in one configuration, each of the leads 58, 60 of the LED are in simultaneous electrical contact with respective ones of the battery terminals whenever the battery is slid or snapped into place in the module 32. In this configuration, the LED is continuously "ON" whenever the battery 62 is installed in the module 32, regardless of whether the module 32 is plugged into the receptacle means 30 or not.

Alternatively, and more preferably, the position of the cantilevered arm 74 can be adjusted such that the upper lead 58 is spaced slightly apart from the upper terminal of the battery 62. In this embodiment, the circuit is "open", and the LED "OFF", until the arm 74 is forced downwardly such that the upper lead 58 makes forceful contact with the upper terminal of the battery, thereby completing the circuit and switching the LED "ON". In one embodiment, this may be accomplished by simply plugging the module 32 into the receptacle means 30, provided that the arm 74 is positioned appropriately relative to the upper, interior surface of the receptacle means 30 so that the former is forced downwardly by the latter when the module 32 is plugged into the receptacle means 30. In this embodiment, the LED is switched "ON" whenever the module 32 is plugged into the shoe 20, and "OFF" when the module is withdrawn.

In yet another embodiment, as illustrated in Fig. 7, the arm 74 can be disposed, relative to the upper, interior surface of the receptacle means 30, to require the wearer of the athletic shoe 20 to exert an additional, downward force or pressure on the arm 74, through the agency of a layer of the midsole 23 overlying it, such as that exerted on it by the heel of the wearer's foot during walking or running, in order to perfect the electrical contact of the lead 58 and energize the LED 54. Thus, it will be seen that, in this arrangement, the arm 74 functions as a simple, inexpensive, but effective means for implementing the pressure-sensitive switch 72 discussed above, and the athletic shoe 20 may thereby be equipped with a pressure sensitive light emitting device.

Fig. 8 illustrates an exploded view of the receptacle means 30 and plug-in module 32 of Figure 1. The plug-in module 32 is preferably configured to be insertable into the receptacle means 30 in either a right-side-up orientation, as seen in Fig. 2, or an inverted orientation, as shown in Fig. 8. By this arrangement, the position of switch 72 or arm 74, or alternatively, the upper and lower internal surfaces of the receptacle means 30, can be configured, relative to each other, such that the module is in the always-"ON" mode, or alternatively, in the mode that is "ON" in response to foot pressure,

both described above, whenever the plug-in module 32 is inserted in the receptacle means 30 in the right-side-up orientation, and always "OFF" otherwise.

This embodiment permits the plug-in module 32 to be removed from the shoe 20 by the user, turned over, and re-inserted into the receptacle means 30 without the LED 54 being energized, or alternatively, without the switch 72 being operationally responsive to foot pressure to switch the LED "ON", even when the module 32 is plugged in and pressure is being exerted on the module by the wearer's foot. Thus, when the wearer of the athletic shoe does not wish to have the light "ON", or alternatively, "ON"-responsive to foot pressure, he or she may simply remove the plug-in module 32 and reinsert it back into the receptacle means 30 in the inverted position. This permits the module 32 to be lockingly retained in the shoe 20, but in the always-"OFF" mode, and thereby prevents the likelihood that the plug-in module 32 might become separated from the shoe and lost.

For an athletic shoe, it is important to appreciate that the midsole portion 23 of the sole 22 frequently is formed from a molded piece of foamed elastomeric material, such as ethylene vinyl acetate ("EVA") or polyurethane ("PU"), whereas, the outsole 24 is typically a harder, non-foamed elastic material, such as synthetic rubber. These structures, acting in cooperation with each other and the remaining elements of the shoe, are required to provide resilient support of all of the structural elements of the foot, and in particular, the heel bones and the bones of the balls and toes of the foot, which take the brunt of impact shock during any particular athletic activity that involves running or jumping. Indeed, the sole 22 is required to absorb and recoil from impact and shock, yet be sufficiently flexible to allow the flexure and return required by the heel-to-toe progression that occurs during walking or running, and also to absorb lateral forces resulting from the various types of rotational motion that may be imparted by the wearer during various other kinds of athletic activities.

Accordingly, it will be understood that the resilient support nature of the sole 22, particularly the midsole portion 23 of the athletic shoe 20, must adhere to particular design constraints, even though it may also be desirable to incorporate within it a plug-in module arrangement of the type described herein.

In the cross sectional view of Fig. 4, the receptacle means 30 are illustrated as being spaced between top and bottom layers of the midsole portion 23 of the sole 22. More particularly, for a midsole 23 having a base thickness D_1 , and wherein the thickness of the receptacle means is T_1 , the thickness of the resilient portion of the

midsole 23 above the receptacle means 30 will be D_2 , and the thickness of the resilient midsole element below the receptacle means 30 will be D_3 . It has been discovered that, for a midsole having typical hardness characteristics and a thickness of D_1 in the range of between 15 and 22 millimeters, the ratio of D_2 to D_1 will preferably be in the range of between about 0.09 and 0.2 to achieve successful incorporation of a plug-in module of the general type described herein within the midsole, yet retain the desired athletic shoe sole shock and flexibility characteristics. Further, the preferred ratio of D_3 to D_1 will be in the range of between about 0.2 and 0.5, and the ratio of the thickness T_1 of the receptacle means to the thickness of the sole D_1 will preferably be in the range of between about 0.45 and 0.8.

Fig. 5 illustrates a cross-sectional view taken along line 5-5 of Fig. 4. In Fig. 5, the outer portion of the receptacle means 30 is illustrated, as is the cross-section through the plug-in module 32 depicting the LED 54 in the center thereof. In addition, the relative thickness of the material of the midsole in the space above the plug-in module 32 is again illustrated. For purposes of maintaining the proper distance, this thickness of the midsole should preferably be in the range of 2 to 5 millimeters for elastomeric materials having a hardness of about 55 to 60 Shore-C.

However, it should not be presumed from the preceding discussion that the plug-in module 32 of the present invention is necessarily limited to athletic shoes having separate, layered midsoles and outsoles of solid or foamed resilient materials, as described above. Fig. 9 illustrates an alternative form of sole construction for an athletic shoe that is frequently referred to as a "cupsole unit bottom" 75. Here, the outsole element 24 of the shoe is typically molded of a resilient rubber material to include an upwardly-wrapping sidewall 76 that defines an upwardly-facing "cup" 77, into which the upper 24 of the shoe is received and fastened.

In such construction, it is possible to include a conventional midsole structure, either in a pre-molded, drop-in form, or by directly molding it therein, prior to attachment of the upper. Alternatively, and usually as a cost- and/or weight-saving feature, the midsole may be omitted altogether in preference to the "bridgework" type of structure illustrated, comprising a plurality of upstanding, interconnected walls 78 that are integrally molded into the cupsole structure, and which define between them a plurality of open-topped, unconnected, hollow cavities. These cavities are subsequently "closed" when the upper is bonded into the cup, which typically involves the placement and bonding of a "lasting board", incorporated into the bottom of the upper, onto the upper surface of the cavities.

As will be seen, this alternative form of sole construction can easily accommodate the plug-in module 32 of the present invention, provided certain provisions are made to accommodate it. Thus, in the bridgework-type of cupsole construction illustrated in Fig. 9, a cavity 42A that conforms to the outer length and width dimensions of the receptacle means 30 is formed into the cupsole 75 at the time of its initial molding. The upstanding sidewall 76 includes an opening 40 extending through it and into the cavity 42A, similar to that found in the midsole-equipped shoe of Fig. 2.

The height C_1 of the cavity 42A, however, exceeds the thickness T_1 of the receptacle means 30, and is typically on the order of about 12-18 millimeters (mm). Accordingly, to accommodate this difference in dimensions, and to ensure functional equivalency with the resilient midsole-equipped shoe having a plug-in module of the type discussed above, top and bottom die-cut, resilient foam inserts 79A and 79B having a hardness in the range discussed above in connection with foamed midsole materials are disposed above and below the receptacle means 30, respectively, within the cavity 42A to form a layered sandwich therein. The layers of the sandwich are then adhesively bonded to each other and to the sidewalls and floor of the cavity to hold the receptacle means 30 in place.

To arrive at the appropriate thicknesses C_2 and C_3 of the top and bottom inserts 79A and 79B, respectively, it is necessary first to subtract the thickness T_1 of the receptacle means 30 from the height C_1 of the cavity 42A. The difference is then preferably apportioned between C_2 and C_3 in the ratio of 60% to 40%. Thus, in a preferred embodiment, and where the cavity height C_1 is about 12 - 18 mm, the thickness C_2 of the top insert 79A will be about 2 - 4 mm, and the thickness C_3 of the bottom insert 79B will measure about 1-3 mm, all other things remaining the same. Likewise, the ratio of C_2 to C_1 will preferably be in the range of about 0.11 - 0.33, and the ratio of C_3 to C_1 will be about 0.05 - 0.25.

Our tests have shown that, provided these guidelines are adhered to, there is essentially no difference in plug-in module implementation and performance between shoes equipped with solid, layered midsoles, such as that illustrated in Fig. 2, and those equipped with open-bridgework cupsoles, as illustrated in Fig. 9. Indeed, the plug-in modules are completely interchangeable between the two in terms of form, fit and function.

The components of the receptacle means 30, as well as the plug-in module 32, are preferably formed from an inexpensive, yet durable plastic material, such as an acetyl resin for colored parts, or a polycarbonate for clear parts. These materials provide adequate rigidity and durability, yet are

sufficiently resilient to permit the spring-like flexure of, for example, the complementary locking engagement means 44, 48 and the cantilevered switch arm 74 features discussed above, and also conform well to the rigors of the intended environment.

Fig. 10 depicts an alternative embodiment of a plug-in module 80 having a different function than that described above. The module 80 is generally sized the same as the plug-in module 32 of Figs. 1-7; however, in this embodiment, the circuit elements, such as a battery or an LED, are omitted. Instead, the module 80 is adapted to provide a small, personal storage compartment 82 having an open top, and optionally, a retaining clip 84 in its internal recess 86. The compartment 82 is closed when the module is plugged into the shoe 20, and by this arrangement, as opposed to the lighting function of the plug-in module 32, functions as a small, portable, enclosed storage compartment for take-along storage of small personal articles of the wearer, such as money, or a locker or house key.

Fig. 11 depicts an alternative configuration of the present invention, in which an athletic shoe 102 includes the receptacle means 30 and plug-in module 32 generally equivalent to that seen in Figs. 1-7, and additionally, a plurality of LED's 104, 106, 108 spaced about and incorporated into the sole 22 of the shoe. The plurality of LEDs are connected via electrical conductors 110 to a point proximate the electrical conductors or circuit elements 58, 60 of the plug-in module 32 by, for example, simple contacts on the top and bottom or on the sides of the plug-in module. By this configuration, the benefits of being able quickly to remove and replace the battery in the plug-in module, and the attendant design advantages thereof, can be utilized for powering a number of LEDs spaced remotely about the shoe 102. Further, if desired, the LEDs could be spaced at various locations other than in the sole 22 of the shoe 102 and interconnected via electrical conductors to the plug-in module 32.

Indeed, the skilled practitioner will by now recognize that many variations and modifications of the plug-in module for an athletic shoe described herein are possible in terms of function, materials, configuration, and mode of operation, depending on the particular problem at hand. Accordingly, the embodiments described herein should be taken as exemplary in nature only, and the scope of the present invention limited only by the proper interpretation of the claims appended hereafter.

Claims

1. An athletic shoe comprising:
an upper (25);
a resilient sole (22);



As will be seen, this alternative form of sole construction can easily accommodate the plug-in module 32 of the present invention, provided certain provisions are made to accommodate it. Thus, in the bridgework-type of cupsole construction illustrated in Fig. 9, a cavity 42A that conforms to the outer length and width dimensions of the receptacle means 30 is formed into the cupsole 75 at the time of its initial molding. The upstanding sidewall 76 includes an opening 40 extending through it and into the cavity 42A, similar to that found in the midsole-equipped shoe of Fig. 2.

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Our tests have shown that, provided these guidelines are adhered to, there is essentially no difference in plug-in module implementation and performance between shoes equipped with solid, layered midsoles, such as that illustrated in Fig. 2, and those equipped with open-bridgework cupsoles, as illustrated in Fig. 9. Indeed, the plug-in modules are completely interchangeable between the two in terms of form, fit and function.

The components of the receptacle means 30, as well as the plug-in module 32, are preferably formed from an inexpensive, yet durable plastic material, such as an acetyl resin for colored parts, or a polycarbonate for clear parts. These materials provide adequate rigidity and durability, yet are

sufficiently resilient to permit the spring-like flexure of, for example, the complementary locking engagement means 44, 48 and the cantilevered switch arm 74 features discussed above, and also conform well to the rigors of the intended environment.

Fig. 10 depicts an alternative embodiment of a plug-in module 80 having a different function than that described above. The module 80 is generally sized the same as the plug-in module 32 of Figs. 1-7; however, in this embodiment, the circuit elements, such as a battery or an LED, are omitted. Instead, the module 80 is adapted to provide a small, personal storage compartment 82 having an open top, and optionally, a retaining clip 84 in its internal recess 86. The compartment 82 is closed when the module is plugged into the shoe 20, and by this arrangement, as opposed to the lighting function of the plug-in module 32, functions as a small, portable, enclosed storage compartment for take-along storage of small personal articles of the wearer, such as money, or a locker or house key.

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Indeed, the skilled practitioner will by now recognize that many variations and modifications of the plug-in module for an athletic shoe described herein are possible in terms of function, materials, configuration, and mode of operation, depending on the particular problem at hand. Accordingly, the embodiments described herein should be taken as exemplary in nature only, and the scope of the present invention limited only by the proper interpretation of the claims appended hereafter.

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an upper (25);
a resilient sole (22);



receptacle means (30) within said sole (22), said receptacle means (30) comprising an opening (40) into and a recessed cavity (42) within said sole (22) of said shoe (20), said cavity (42) being provided for slidably receiving and releasably locking a module (32) therein;

a plug-in module (32) slidably received and removably retained in said receptacle means (30) in said sole (22), said plug-in module (32) comprising a housing or body (46) having an outer face (50) and a generally rectangular body portion (52) with lateral side walls, said body portion (52) being configured to be slidably inserted into the interior of said receptacle means (30);

complementary engaging means (44, 48) formed on the exterior of said housing (46) and on the interior of said cavity (42) for releasably locking said module in said cavity;

whereby said receptacle means (30) further comprise a rigid rectangular structure with side walls (43), said structure being moulded or bonded into said sole (22);

characterised in that:

said rigid rectangular structure is a tray structure;

said complementary engaging means (44, 48) comprise at least one pair of depressions (44) and one pair of protrusions (48), said protrusions (48) being configured to engage said depressions (44) in a resilient, camming, overcenter, locking arrangement; and

said plug-in module (32) further comprises on said outer face (50) means for extracting said module (32) from said receptacle means (30), said extracting means comprising a pair of tabs (66) at the edges of said outer face (50) of said module (30), and said tabs (66) being formed to fit smoothly within a pair of scallops or contoured recesses (68), said recesses being formed into the outer surface of said sole (22) immediately adjacent the sides of said opening (40).

2. The athletic shoe (20) of claim 1, characterised in that:

said sole (22) further comprises a midsole portion (23) and an outsole portion (24) underlying said midsole portion (23); and

said receptacle means (30) are disposed in the heel portion (36) of said midsole portion (23).

3. The athletic shoe (20) of claim 1, characterised in that:

said pair of depressions (44) is positioned on the internal faces of said side walls (43) of

said tray structure of said receptacle means (30); and

said pair of protrusions (48) is positioned at the lateral side walls of said rectangular body portion (52).

4. The athletic shoe (20) of claim 1, characterised in that:

said module (32) further comprises a source of electrical energy (62), means for emitting visible light (54) in response to energization thereof by said source of electrical energy (62), and electrical circuit means (58, 60) for electrically interconnecting said electrical energy source (62) and said light emitting means (54).

5. The athletic shoe (20) of claim 4, characterised in that:

said plug-in module (32) further comprises switch means (72) for closing said electrical circuit means (58, 60) in response to pressure exerted by the wearer of the athletic shoe (20); and

said electrical energy source (62) is a small, disk-shaped battery, said battery being positioned in said body (46) of said module (32) in an orientation with its oppositely-charged electrical terminals facing upwardly and downwardly, respectively.

6. The athletic shoe (20) of claim 5, characterised in that:

said switch means (72) can be disabled by removing said plug-in module (32), inverting it, and re-inserting it in said shoe (20) in said inverted position.

7. The athletic shoe (20) of one of the claims 5 and 6, characterised in that:

said light emitting means (54) comprises a pair of stock wire leads (58, 60) and is molded, bonded, or otherwise fixed into the body (46) of said plug-in module (32), such that said light emitting means (54) is visible to the exterior of said plug-in module (32); and

said electrical circuit means comprise said stock wire leads (58, 60) of said light emitting element, which wire leads are brought into the interior of said body (46) to straddle said battery (62).

8. The athletic shoe of claim 7, characterised in that:

the lower one (60) of said wire leads is brought forward along the upper surface of the bottom wall, of said body (46) of said plug-in module (32) until it underlies said battery (62),



such that the lower surface of said battery (62), comprising one of its electrical terminals, is maintained in constant electrical contact with said lower lead (60); and,

for constituting said switch means (72), the upper one (58) of said pair of wire leads is brought forward along the lower surface of a cantilevered arm (74) extending forwardly from the upper surface of said body (46) of said module (32) to overlay said battery (62) and its second, upwardly-facing electrical terminal, such that said upper lead (58) is spaced slightly apart from the upper terminal of said battery (62) and makes forceful contact with said upper terminal, if said arm (74) is forced downwardly by a pressure exerted thereon.

9. The athletic shoe of one of the claims 5 to 8, characterised in that:

said battery (62) is retained and positioned by its edges in said body (46) of said plug-in module (32) by means of a pair of spaced, opposing slots (63) formed into the interior side walls of said body (46), into which said battery (62) is snapped or slit.

10. The athletic shoe (20) of claim 2, characterised in that:

said midsole portion (23) is formed of a foamed elastomeric material having a hardness of about 55 to 60 Shore C; and

said plug-in module (32) is formed of a material having a hardness in the range of between 55 Shore C and 60 Shore D2.

11. The athletic shoe (20) of claim 1, characterised in that:

the structural elements of said plug-in module (32) and said receptacle means (30) are formed from an acetyl resin or polycarbonate.

12. The athletic shoe (20) of claim 4, characterised in that said light emitting means (54) further comprise:

a plurality of light emitting devices (104, 106, 108) located on and spaced about said shoe (20); and

electrical connector means (110) for electrically connecting said plurality of light emitting devices and said plug-in module (32).

13. The athletic shoe (20) of claim 1, characterised in that said plug-in module (80) further comprises:

a generally rectangular portion (52) defining an open cavity, said cavity forming a closed storage compartment (82) upon inser-

tion of said module (80) into said receptacle means (30) in said sole (22).

14. The athletic shoe (20) according to claim 13, characterised in that:

said storage compartment (82) has an open top and a retaining clip (84) in its internal recess (86).

15. The athletic shoe (20) of claim 2, characterised in that:

said midsole portion (23) of said sole (22) has a first thickness (D_1);

said receptacle means (30) have a second thickness (T_1) smaller than said first thickness (D_1);

a resilient portion of said midsole (23) above said receptacle means (30) has a third thickness (D_2);

a resilient portion of said midsole (23) below said receptacle means (30) has a fourth thickness (D_3); and

the ratio of said third thickness (D_2) to said first thickness (D_1) is in the range of between about 0.09 and 0.2, the ratio of said fourth thickness (D_3) to said first thickness (D_1) is in the range of between about 0.2 and 0.5, and the ratio of said second thickness (T_1) to said first thickness (D_1) is in the range of between about 0.45 and 0.8.

Patentansprüche

1. Ein Sportschuh, umfassend:

ein Oberteil (25);

eine elastische Sohle (22);

Aufnahmemittel (30) innerhalb der Sohle (22), welche Aufnahmemittel (30) eine Öffnung (40) und einen zurückgesetzten Hohlraum (42) in der Sohle (22) des Schuhs (20) umfassen, welcher Hohlraum (42) für die gleitende Aufnahme und lösbare Verrastung eines Moduls (32) vorgesehen ist;

ein gleitend in die Aufnahmemittel (30) in der Sohle (22) eingeführtes und dort herausnehmbar gehaltenes Einsteckmodul (32), welches Einsteckmodul (32) ein Gehäuse oder Körper (46) mit einer Frontseite (50) und einer im wesentlichen rechteckigen Körperpartie (52) mit seitlichen Wänden umfasst, wobei die Körperpartie (52) zum gleitenden Einschleiben in das Innere der Aufnahmemittel (30) ausgebildet ist;

komplementäre Eingriffsmittel (44, 48), welche zur lösbaren Verrastung des Moduls in dem Hohlraum auf der Aussenseite des Gehäuses (46) und der Innenseite des Hohlraums ausgebildet sind;



- wobei die Aufnahmemittel (30) weiterhin eine starre rechteckige Struktur mit Seitenwänden (43) umfassen, welche Struktur in die Sohle (22) eingegossen oder eingeklebt ist; dadurch gekennzeichnet, dass die starre rechteckige Struktur die Struktur einer Schale hat; die komplementären Eingriffsmittel (44, 48) wenigstens ein Paar Vertiefungen (44) und ein Paar Ausbuchtungen (48) umfassen, welche Ausbuchtungen (48) so ausgebildet sind, dass sie in einer elastischen,nockenartigen, zentrierenden und einrastenden Weise in die Vertiefungen (44) eingreifen; und das Einsteckmodul (32) weiterhin auf seiner Frontseite (50) Mittel zum Herausziehen des Moduls (32) aus den Aufnahmemitteln (30) aufweist, welche Herausziehmittel ein Paar Vorsprünge (66) an den Ecken der Frontseite (50) des Moduls (30) umfassen, wobei die Vorsprünge (66) so geformt sind, dass sie sich sanft in ein Paar Muscheln oder geformte Vertiefungen (68) einpassen, welche in die Aussenseite der Sohle (22) in unmittelbarer Nähe der Seiten der Oeffnung (40) eingeformt sind.
2. Der Sportschuh (20) nach Anspruch 1, dadurch gekennzeichnet, dass die Sohle (22) weiterhin einen Mittelsohlenteil (23) und einen unter dem Mittelsohlenteil (23) liegenden Aussensohlenteil (24) umfasst; und die Aufnahmemittel (30) in Hackenabschnitt (36) des Mittelsohlenteils (23) angeordnet sind.
3. Der Sportschuh (20) nach Anspruch 1, dadurch gekennzeichnet, dass das Paar Vertiefungen (44) auf den Innenflächen der Seitenwände (43) der Schalenstruktur der Aufnahmemittel (30) angeordnet ist; und das Paar Ausbuchtungen (48) auf den Seitenwänden der rechteckigen Körperpartie (52) angeordnet ist.
4. Der Sportschuh (20) nach Anspruch 1, dadurch gekennzeichnet, dass das Modul (32) weiterhin eine Quelle elektrischer Energie (62), Mittel (54), welche als Folge einer Energiezufuhr aus der Quelle elektrischer Energie (62) sichtbares Licht emittieren, und elektrische Schaltkreismittel (58, 60) umfasst, welche die elektrische Energiequelle (62) und die Licht emittierenden Mittel (54) miteinander elektrisch verbinden.
5. Der Sportschuh (20) nach Anspruch 4, dadurch gekennzeichnet, dass das Einsteckmodul (32) weiterhin Schaltmittel (72) umfasst, welche die elektrischen Schaltkreismittel (58, 60) als Reaktion auf einen von Träger des Sportschuhs (20) ausgeübten Druck schliessen; und die elektrische Energiequelle (62) eine kleine, scheibenförmige Batterie ist, welche Batterie im Körper (46) des Moduls (32) so angeordnet ist, dass die gegensätzlich geladenen elektrischen Anschlüsse nach oben bzw. nach unten ausgerichtet sind.
6. Der Sportschuh (20) nach Anspruch 5, dadurch gekennzeichnet, dass die Schaltmittel (72) dadurch wirkungslos gemacht werden können, dass das Einsteckmodul (32) herausgezogen, umgedreht und im umgedrehten Zustand wieder in den Schuh (20) eingesteckt wird.
7. Der Sportschuh (20) nach einem der Ansprüche 5 und 6, dadurch gekennzeichnet, dass die Licht emittierenden Mittel (54) ein Paar fabrikmässige Anschlussdrähte (58, 60) umfassen und so in den Körper (46) des Einsteckmoduls (32) eingegossen, eingeklebt oder anderweitig befestigt sind, dass die Licht emittierenden Mittel (54) zum Aeusseren des Einsteckmoduls (32) hin sichtbar sind; und die elektrischen Schaltkreismittel die fabrikmässigen Anschlussdrähte (58, 60) des Licht emittierenden Elements umfassen, welche Anschlussdrähte so in das Innere des Körpers (46) geführt sind, dass sie die Batterie (62) zwischen sich haben.
8. Der Sportschuh nach Anspruch 7, dadurch gekennzeichnet, dass der untere (60) der Anschlussdrähte entlang der oberen Fläche der Bodenwand des Körpers (46) des Einsteckmoduls (32) so weit nach vorne geführt ist, dass die untere Fläche der Batterie (62), welche einen ihrer elektrischen Pole umfasst, in ständigem elektrischen Kontakt mit dem unteren Anschlussdraht gehalten wird; und zum Aufbau der Schaltmittel (72) der obere (58) der beiden Anschlussdrähte entlang der unteren Fläche eines sich von der oberen Fläche des Körpers (46) des Moduls (32) nach vorne erstreckenden Hebelarms (74) nach vorne geführt ist und über der Batterie (62) und ihrem zweiten, nach oben gerichteten elektrischen Pol liegt, derart, dass der obere Anschlussdraht (58) vom oberen Pol der Batterie (62) etwas beabstandet ist und den oberen Pol



kraftvoll kontaktiert, wenn der Arm (74) durch einen auf ihn ausgeübten Druck nach unten gedrückt wird.

9. Der Sportschuh nach einem der Ansprüche 5 bis 8, dadurch gekennzeichnet, dass
die Batterie (62) an ihren Kanten in dem Körper (46) des Einsteckmoduls (32) durch ein Paar voneinander beabstandete, gegenüberliegende Schlitze (63) gehalten und positioniert wird, welche in die inneren Seitenwände des Körpers eingeformt sind, und in welche die Batterie (62) eingeschnappt oder eingeschoben wird. 5
10. Der Sportschuh (20) nach Anspruch 2, dadurch gekennzeichnet, dass
der Mittelsohlenteil (23) durch ein geschäumtes elastomeres Material gebildet ist, welches eine Härte von etwa 55 bis 60 Shore C aufweist; und
das Einsteckmodul (32) aus einem Material besteht, welches eine Härte im Bereich zwischen 55 Shore C und 60 Shore D2 aufweist. 10
11. Der Sportschuh (20) nach Anspruch 1, dadurch gekennzeichnet, dass
die strukturellen Elemente des Einsteckmoduls (32) und der Aufnahmemittel (30) aus einem Acetylharz oder einem Polycarbonat bestehen. 15
12. Der Sportschuh (20) nach Anspruch 4, dadurch gekennzeichnet, dass die Licht emittierenden Mittel (54) weiterhin umfassen:
eine Mehrzahl von Licht emittierenden Vorrichtungen (104, 106, 108), welche am Schuh (20) und im Abstand um den Schuh (20) herum angeordnet sind; und
elektrische Verbindungsmittel (110) zur elektrischen Verbindung der Mehrzahl von Licht emittierenden Vorrichtungen und dem Einsteckmodul (32). 20
13. Der Sportschuh (20) nach Anspruch 1, dadurch gekennzeichnet, dass das Einsteckmodul (80) weiterhin umfasst:
einen im wesentlichen rechteckigen Teil (52) welcher einen offenen Hohlraum definiert, der beim Einschieben des Moduls (80) in die Aufnahmemittel (30) in der Sohle (22) einen geschlossenen Aufbewahrungsbehälter (82) bildet. 25
14. Der Sportschuh (20) nach Anspruch 13, dadurch gekennzeichnet, dass
der Aufbewahrungsbehälter (82) oben offen ist und eine Halteklammer (84) in seiner 30

inneren Vertiefung (86) aufweist.

15. Der Sportschuh (20) nach Anspruch 2, dadurch gekennzeichnet, dass
der Mittelsohlenteil (23) der Sohle (22) eine erste Dicke (D_1) hat;
die Aufnahmemittel (30) eine zweite Dicke (T_1) haben, welche kleiner ist als die erste Dicke (D_1);
ein elastischer Teil der Mittelsohle (23) oberhalb der Aufnahmemittel (30) eine dritte Dicke (D_2) hat;
ein elastischer Teil der Mittelsohle (23) unterhalb der Aufnahmemittel (30) eine vierte Dicke (D_3) hat; und
das Verhältnis der dritten Dicke (D_2) zu der ersten Dicke (D_1) im Bereich zwischen etwa 0,09 und 0,2 liegt, das Verhältnis der vierten Dicke (D_3) zu der ersten Dicke (D_1) im Bereich zwischen etwa 0,2 und 0,5 liegt, und das Verhältnis der zweiten Dicke (T_1) zu der ersten Dicke (D_1) im Bereich zwischen etwa 0,45 und 0,8 liegt. 35

Revendications

1. Chaussure de sport (20) comportant:
une empeigne (25);
une semelle élastique (22);
des moyens formant réceptacle (30) à l'intérieur de ladite semelle (22), lesdits moyens formant réceptacle (30) comprenant une cavité creuse (42) interne à ladite semelle (22) de ladite chaussure (20) et une ouverture (40) vers cette cavité, ladite cavité (42) servant à y recevoir d'une manière coulissante et y bloquer d'une manière libérable un module (32);
un module enfichable (32) reçu de manière coulissante et retenu de manière amovible dans lesdits moyens formant réceptacle (30) dans ladite semelle (22), ledit module enfichable (32) comprenant un logement ou corps (46) présentant une surface extérieure (50) et une partie globalement rectangulaire (52) avec des parois latérales, ladite partie (52) étant formée pour être insérée de manière coulissante à l'intérieur desdits moyens formant réceptacle (30);
des moyens d'engagement complémentaires (44, 48) formés sur l'extérieur dudit logement (46) et sur l'intérieur de ladite cavité (42) afin de bloquer de manière libérable ledit module dans ladite cavité;
lesdits moyen formant réceptacle (30) comprenant en outre un élément rectangulaire rigide avec des parois latérales (43), ledit élément étant moulé ou collé dans ladite semelle (22); 40



- caractérisé en ce que:
 ledit élément rectangulaire rigide est un élément formant plateau;
 lesdits moyens d'engagement complémentaires (44, 48) comprennent au moins deux enfoncements (44) et deux saillies (48), lesdites saillies (48) étant formées de manière à s'engager dans lesdits enfoncements (44) selon un système de verrouillage à came, à passage brusque et élastique; et en ce que
 ledit module enfichable (32) comprend de plus des moyens sur la face extérieure (50) destinés à l'extraction dudit module (32) hors des moyens formant réceptacle (30), lesdits moyens d'extraction comportant deux pattes (66) sur les bords de ladite face extérieure (50) dudit module (32), et lesdites pattes (66) étant formées de manière à s'insérer sans résistance dans deux échancrures ou creux profilés (68), lesdits creux étant formés sur la surface extérieure de ladite semelle (22) de manière immédiatement adjacente aux côtés de ladite ouverture (40).
2. Chaussure de sport (20) selon la revendication 1, caractérisée en ce que:
 ladite semelle (20) comporte de plus une semelle intermédiaire (23) une semelle d'usure (24) sous-jacente à ladite semelle intermédiaire (23); et en ce que
 lesdits moyens formant réceptacle (30) sont placés dans la partie formant talon (36) de ladite semelle intermédiaire (23).
3. Chaussure de sport (20) selon la revendication 1, caractérisée en ce que:
 ladite paire d'enfoncements (44) est située sur les faces internes desdites parois latérales (43) dudit élément formant plateau desdits moyens formant réceptacle (30); et en ce que
 ladite paire de saillies (48) est située sur les parois latérales de ladite partie rectangulaire (52) du corps.
4. Chaussure de sport (20) selon la revendication 1, caractérisée en ce que:
 ledit module (32) comporte de plus une source d'énergie électrique (62), un moyen émettant une lumière visible (54) en réponse à son alimentation en énergie par ladite source d'énergie électrique (62), et des moyens formant circuit électrique (58, 60) pour l'interconnexion électrique de ladite source d'énergie électrique (62) et dudit moyen d'émission de lumière (54).
5. Chaussure de sport (20) selon la revendication 4, caractérisée en ce que:
 ledit module enfichable (32) comporte de plus des moyens de commutation (72) pour la fermeture desdits moyens formant circuit électrique (58, 60) en réponse à une pression exercée par le porteur de la chaussure de sport (20); et en ce que
 ladite source d'énergie électrique (62) est une petite pile en forme de disque, ladite pile étant placée dans ledit corps (46) dudit module (32) dans un sens faisant que ses raccords électriques terminaux de charge opposée sont respectivement tournés vers le haut et vers le bas.
6. Chaussure de sport (20) selon la revendication 5, caractérisée en ce que:
 lesdits moyens de commutation (72) peuvent être invalidés en enlevant ledit module enfichable (32), en l'inversant et en le réinsérant dans ladite position inversée dans ladite chaussure (20).
7. Chaussure de sport (20) selon l'une des revendications 5 et 6, caractérisée en ce que:
 ledit moyen d'émission de lumière (54) comporte une paire de connexions à fil courantes (58, 60) et est moulé, collé ou fixé d'une autre manière sur le corps (46) dudit module enfichable (32) de manière à ce que le moyen d'émission de lumière (54) soit visible de l'extérieur dudit module enfichable (32); et en ce que
 lesdits moyens formant circuit électrique comportent lesdites connexions par fil courantes (58, 60) dudit élément d'émission de lumière, dont les connexions par fil sont amenées à l'intérieur dudit corps (46) pour chevaucher ladite pile (62).
8. Chaussure de sport (20) selon la revendication 7, caractérisée en ce que:
 la connexion inférieure (60) desdites connexions à fil est tirée le long de la surface supérieure de la paroi de fond dudit corps (46) dudit module enfichable (32) jusqu'à ce qu'elle soit sous-jacente à ladite pile (62), de manière à ce que la surface inférieure de ladite pile (62), comportant un des raccords électriques terminaux de celle-ci, soit maintenue en contact électrique constant avec ladite connexion inférieure (60); et en ce que,
 pour constituer lesdits moyens de commutation (72), on tire ladite connexion supérieure (58) de ladite paire de connexions à fil le long de la surface inférieure d'un bras en porte à faux (74) se prolongeant vers l'avant à partir de la surface supérieure dudit corps (46) dudit module (32) pour recouvrir ladite pile (62) et



- son second raccord électrique terminal tourné vers le haut, de manière à ce que ladite connexion supérieure (58) soit légèrement écartée du raccord électrique terminal supérieur de ladite pile (62) et entre par la force en contact avec le dit raccord terminal supérieur, lorsque ledit bras (74) est poussé vers le bas par une pression exercée sur lui.
9. Chaussure de sport selon l'une des revendications 5 à 8, caractérisée en ce que:
 ladite pile (62) est retenue et positionnée par ses bords dans ledit corps (46) dudit module enfichable (32) au moyen d'une paire de fentes (63) espacées et se faisant face, formées dans les parois latérales intérieures dudit corps (46), dans lesquelles ladite pile (62) est buterollée ou coulissée.
10. Chaussure de sport (20) selon la revendication 2, caractérisée en ce que:
 ladite semelle intermédiaire (23) est réalisée en un matériau élastomère expansé ayant une dureté Shore C d'environ 55 à 60; et en ce que
 ledit module enfichable (32) est réalisé en un matériau ayant une dureté comprise entre environ Shore C 55 et Shore D2 60.
11. Chaussure de sport (20) selon la revendication 1, caractérisée en ce que:
 les éléments de construction dudit module enfichable (32) et lesdits moyens formant réceptacle (30) sont réalisés en résine d'acétyle ou en polycarbonate.
12. Chaussure de sport (20) selon la revendication 4, caractérisée en ce que ledit moyen d'émission de lumière (54) comporte en outre:
 une pluralité d'appareils émetteurs de lumière (104, 106, 108) placés et répartis de manière espacée sur ladite chaussure (20); et
 des moyens de connexion électrique (110) pour connecter électriquement ladite pluralité d'appareils émetteurs de lumière et ledit module enfichable (32).
13. Chaussure de sport (20) selon la revendication 1, caractérisée en ce que ledit module enfichable (80) comporte en outre:
 une partie globalement rectangulaire (52) définissant une cavité ouverte, ladite cavité formant un compartiment de rangement (82) fermé au moment de l'insertion dudit module (80) dans lesdits moyens formant réceptacle (30) de ladite semelle (22).
14. Chaussure de sport (20) selon la revendication 13, caractérisée en ce que:
 ledit compartiment de rangement (82) est ouvert en haut et est pourvu d'un étrier de retenue (84) dans son creux interne (86).
15. Chaussure de sport (20) selon la revendication 2, caractérisée en ce que:
 ladite semelle intermédiaire (23) de ladite semelle (22) est d'une première épaisseur (D_1);
 lesdits moyens formant réceptacle (30) sont d'une deuxième épaisseur (T_1) inférieure à la première épaisseur (D_1);
 une partie élastique de ladite semelle intermédiaire (23) au-dessus desdits moyens formant réceptacle (30) est d'une troisième épaisseur (D_2);
 une partie élastique de ladite semelle intermédiaire (23) en-dessous desdits moyens formant réceptacle (30) est d'une quatrième épaisseur (D_3); et en ce que
 le rapport entre ladite troisième épaisseur (D_2) et ladite première épaisseur (D_1) est compris entre environ 0,09 et 0,3, le rapport entre ladite quatrième épaisseur (D_3) et ladite première épaisseur (D_1) est compris entre environ 0,2 et 0,5, et le rapport entre ladite deuxième épaisseur (T_1) et ladite première épaisseur (D_1) est compris entre environ 0,45 et 0,8.