A self tying shoe wherein the weight of a user who, upon sliding his foot inside the shoe will depress a hinged movable inner sole which actuates a mechanism which pulls on the laces so as to close in the tongue of the shoe towards the user’s foot, thus lacing the shoe. The user can simply pump the inner sole or walk a couple of steps to accomplish the lacing of the shoes. Using his other foot, the user can move a knob in either one of two positions, one being for tying and the other being for untieing the shoe. Most of the mechanical components are situated underneath the movable inner sole and are interconnected in a way reminiscent of the cooperating interconnections of clockwork.
SELF TYING SHOE

BACKGROUND OF THE INVENTION

[0001] 1. Field of the invention

The invention relates generally to footwear but more particularly to a system for tying down shoes.

[0002] 2. Background of the Invention

Lacing shoes is boring business and several inventors have tried over the years to simplify the matter.

[0003] U.S. Pat. No. 4,741,115 shows a ski boot with an operating assembly for the closing and adjustment and comprises a power source supported by the ski boot and operating a driving gearwheel which is selectively engageable with driven gearwheels for the winding of cables of closing and/or adjustment devices of the boot.

[0004] U.S. Pat. No. 5,205,055 shows a shoe member including a plurality of securement webs directed about a lacing gap within the shoe upper, wherein the webs are each mounted slidably within associated cavities, with tether lines mounted to the webs operative above a crank pulley, with the crank pulley in operative engagement with a slidable actuator rod to effect projection of the securement webs forcibly within each respective cavity, wherein a gas cylinder is operative to effect rotation of the crank pulley by use of an associated slide rod within a guide cylinder to effect winding of each associated tether line relative to each associated securement web.

[0005] U.S. Pat. No. 5,335,401 shows a device for quickly tightening shoelaces on a shoe and for locking the tightened laces without the need for tying a bow or other knot. The device includes a body unit with a slotted opening formed with chamfered edges along one side of the slot. A rotatable shaft which includes a set of chamfered ridges_laterally across the width of the slot. A shoe lace introduced through the slot becomes pinched between the chamfered edges of the slotted opening and the chamfered ridges of the shaft. The shaft is spring biased to automatically lock the laces in place upon being tightened to the desired tension. A quick release lever retracts the shaft to unpinch the lace.

[0006] U.S. Pat. No. 5,511,325 shows a shoe having a central ratchet closure arranged on the heel of the upper in the area above the location at which the heel bone is received and having at least one tightening element which has a tightening section running from the central ratchet closure towards each side of the shoe. The tightening sections are coupled by a coupling element with at least one strap which runs from each tightening section or coupling element over the instep or/and by the arch to the other tightening section or coupling element.

[0007] U.S. Pat. No. 5,600,874 shows a central closing device for shoes with a rotationally supported cord disc for at least one cord-type tensioning member for closing the shoe in such a way that the number of rotations of the cord disc is limited without any increasing the space required. Both the cord disc and a stationary member each have mutually-cooperating tooth profiles having the same tooth pitch but of different diameters. Located in the intermediate space created due to the different diameters of the tooth profiles is an idling pinion of the same pitch, which meshes with the two tooth profiles. At least one stop is provided to limit the travel of the idling pinion.

[0008] U.S. Pat. No. 5,718,021 shows a device for tying a shoelace on a shoe. The device includes a base and a cover hingedly mounted on the base so as to be pivotable between an open position and a closed position. The base includes a top surface, a bottom surface and first and second holes which are sized and shaped so that the shoelace can be inserted therethrough. The cover includes a top surface, a bottom surface and first and second pins which are aligned so as to project into the first and second holes, respectively, when the cover is in the closed position. The cover also includes a locking tab which engages with a pin on the base to releasably lock the cover in the closed position.

[0009] U.S. Pat. No. 5,839,210 shows a shoe incorporating adjustable straps that are positioned to tighten the shoe casing around a wearer's instep. A retractor mechanism incorporates elastic members. The elastic members are charged when the wearer loosens the shoe by pulling on the straps. The stored energy is released when a catch is disengaged and releases the elastic members to tighten and cinch the shoe on the wearer's foot.

[0010] U.S. Pat. No. 6,202,953 shows a footwear lacing system that includes a lace attached to a tightening mechanism. The lace is threaded through a series of opposing guide members positioned along the top of the foot and ankle portions of the footwear. The lace and guide preferably have low friction surfaces to facilitate sliding of the lace through the guide members so that the lace evenly distributes tension across the footwear member. The tightening mechanism allows incremental adjustment of the tension of the lace. A release mechanism allows a user to quickly loosen the lace.

[0011] U.S. Pat. No. 6,467,194 shows an automated tightening shoe with crisscrossed laces and a tightening mechanism which operates in one direction to cause automatic tightening of the crisscrossed laces to tighten the shoe about a wearer's foot, and which can be released easily so that the shoe can be removed from the wearer's foot.

[0012] Some inventions are concerned with maintaining a proper tension to the laces while other systems use straps as means for tying the shoe, the latter being rather restrictive since it limits the outer design choices of the shoe since because of the proprietary straps. Still another system involves the use of pneumatic means which adds undue complexity to the shoes.

SUMMARY OF THE INVENTION

[0013] In view of the foregoing disadvantages inherent in the known devices now present in the prior art, the present invention, which will be described subsequently in greater detail, is to provide objects and advantages which are:

[0014] To provide for fast simple tying and untying of shoe laces.

[0015] To attain this end, the present invention provides for an efficient way of tying shoes using the weight of the user who, upon sliding his foot inside the shoe will depress a hingedly movable inner sole which actuates a mechanism which pulls on the laces so as to close in the tongue of the shoe towards the user's foot, thus lacing the shoe. The user can simply pump the inner sole or walk a couple of steps to
accomplish the lacing of the shoes. Using his other foot, the user can move a knob in either one of two positions, one being for tying and the other for untying the shoe. Most of the mechanical components are situated underneath the movable inner sole and are interconnected in a way reminiscent of the cooperating interconnections of clockwork.

[0018] There has thus been outlined, rather broadly, the more important features of the invention in order that the detailed description thereof that follows may be better understood, and in order that the present contribution to the art may be better appreciated. There are additional features of the invention that will be described hereinafter and which will form the subject matter of the claims appended hereto.

[0019] In this respect, before explaining at least one embodiment of the invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and to the arrangements of the components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments and of being practiced and carried out in various ways. Also, it is to be understood that the phraseology and terminology employed herein are for the purpose of description and should not be regarded as limiting.

[0020] As such, those skilled in the art will appreciate that the conception, upon which this disclosure is based, may readily be utilized as a basis for the designing of other structures, methods and systems for carrying out the several purposes of the present invention. It is important, therefore, that the claims be regarded as including such equivalent constructions insofar as they do not depart from the spirit and scope of the present invention.

[0021] Further, the purpose of the foregoing abstract is to enable the U.S. Patent and Trademark Office and the public generally, and especially the scientists, engineers and practitioners in the art who are not familiar with patent or legal terms or phraseology, to determine quickly from a cursory inspection the nature and essence of the technical disclosure of the application. The abstract is neither intended to define the invention of the application, which is measured by the claims, nor is it intended to be limiting as to the scope of the invention in any way.

[0022] These together with other objects of the invention, along with the various features of novelty which characterize the invention, are pointed out with particularity in the claims annexed to and forming a part of this disclosure. For a better understanding of the invention, its operating advantages and the specific objects attained by its uses, reference should be had to the accompanying drawings and descriptive matter in which there is illustrated preferred embodiments of the invention.

BRIEF DESCRIPTION OF THE PREFERRED EMBODIMENT

[0023] FIG. 1 See through isometric view of the shoe unlaced with the inner sole in an upward position.

[0024] FIG. 2 See through isometric view of the shoe laced with the inner sole in a downward position.

[0025] FIG. 3 Isometric view of the interior mechanism with the inner sole in an upward position.

[0026] FIG. 4 Isometric view of the interior mechanism with the inner sole in a downward position.

[0027] FIG. 5 See through side elevation with the inner sole in a downward position.

[0028] FIG. 6 See through side elevation with the inner sole in an upward position.

[0029] FIG. 7 Exploded view of the interior mechanism.

[0030] FIG. 7bc Side cutaway detail of the peg and sleeve showing the open and closed positions respectively

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0031] FIG. 1 A self tying shoe (30) has an interior mechanism (32) which consists of visible elements such as an inner sole (7) hingedly attached to a base (1) set inside the shoe (30), in this illustration, the inner sole (7) is in an up position. An <M> shaped lace holding rod (20) is integrated within a standard tongue (not shown) typically found on a shoe, at least one long lace or a pair of laces (21) preferably made of a strong resilient material which makes them thinner than laces known in the art. A tying/untying button (14) situated on the side of an outer sole (34) selects the tying or untying mode. The laces (21) pass through ordinary shoe grommets (not shown). The holding rod (20) is a biasing means normally in an outward configuration, as illustrated, and which pulls on the laces (21).

[0032] FIG. 2 Shows an example of a tied shoe (30) wherein the inner sole (7) is in a downward position and the laces (21) are tied.

[0033] FIG. 3 A biasing means (9) counteracts the downward pressure created by a user and allows for the inner sole (7) to return to its upward position once the weight of the user is removed. The inner sole (7), as stated hereinafter, is hingedly attached to the shoe by mechanical fasteners (19) connected to mechanical fastening holes (500) which provide a limited range of pivoting motion.

[0034] FIG. 7 The interior mechanism (32) has a base (1) within which are found most of the components. A ratcheted wheel (2) acts as a winch to wind the laces (21) which are, as described earlier, very thin so that they can easily be wound around the ratched wheel (2) as it rotates and without taking up too much space. The rotation of the ratched wheel (2) is provided by a power screw (4) which does not rotate when a downward motion is induced to it from the weight of a user as applied on the inner sole (7), this has for effect of inducing a counterclockwise rotation on the top plate (5) which has a central threaded hole (510) so threaded as to match threads of the power screw (4). Since the top plate (5) is mechanically connected to the ratched wheel (2), by stubs (193) engaging notches (194) found on the ratched wheel (2), it causes the ratched wheel (2) to also turn and wind the laces (21). An elastomer absorber (3) is sandwiched between the top plate (5) and the ratched wheel (2) to act as both a cushioning means and biasing means. The ratched wheel (2) is allowed to rotate in only one direction for as long as a lower pawl (15) is engaged to it. A toothed wheel (6) is allowed to rotate in one direction by being locked by a pawl (8) which makes it so that it blocks the power screw (4) from rotating when a downward motion is induced to it as explained hereinafter but when
pressure is released, which involves other steps described hereinafter, the ratcheted wheel (2) and the top plate (5) do not rotate but the power screw (4) does, so it induces rotation onto the toothed wheel (6) which is mechanically connected to the power screw (4) by a multisided top (195) engaging a multisided opening (196) in the toothed wheel (6). At this stage there is more friction on the ratcheted wheel (2) than on the toothed wheel (6) so the rotating toothed wheel (6) allows the rotation of the power screw (4). The toothed wheel (6) frictionally rotates against the smooth surface of a disc (197) extending integrally from underneath the inner sole (7). The function of the toothed wheel (6) is simply to block rotation of the power screw (4) so that the power screw (4) can induce rotation of the ratcheted wheel (2). The rotation of the toothed wheel (6) per se does not accomplish any other function. By being allowed to rotate in only one direction, the ratcheted wheel (2) can only tie down the laces (21). In this arrangement, the absorber (3), the power screw (4), the top plate (5), the toothed wheel (6), and the pawl (8) all cooperate and interact together. When the shoe (30) is sufficiently tied, a balance is reached between the tension applied by the laces (21) to the user’s foot and the biasing means (9) which stops any additional motion from the inner sole (7) so that the power screw (4) can no longer induce rotation of the ratcheted wheel (2).

[0035] A hood (11), mechanically fastened to the base (1) by mechanical fasteners (19") engaging mechanical fastening holes (500") creates a containment within which some of the components such as the ratcheted wheel (2), the lower pawl (15), an actuator (16) and an actuator biasing means (17) are and it also supports a casing (10) fastened on top of it by mechanical fasteners (19") The casing (10) holds within it the components of the tying/untying button (14) which consists of a double pin (12, 13) similar in construction to the mechanism used in ballpoint pens that brings the tip in or out of the pen. The tying/untying button (14), when depressed, pushes against the double pin (12, 13), which in turn pushes on an actuator (16) and the actuator (16) in turn pushes against both the lower pawl (15) and the upper pawl (8) in order to free both the ratcheted wheel (2) and the toothed wheel (6), which releases the laces (21) so that the lace holding rod (20) can pull on the laces (21). Freeing both the lower pawl (15) and the upper pawl (8) allows for the rotation of the power screw (4) briefly discussed herein-above. Pushing once more on the tying/untying button (14) brings the actuator (16) back to its initial configuration which allows for the reengagement of both the lower pawl (15) and the upper pawl (8). An actuator biasing means (17) helps in bringing the actuator to its initial position. A pair of tubes (18) guide the laces (21) to laces passageways (210) and then to the ratcheted wheel (2).

[0036] FIGS. 7a to 7b In order to limit vertical motion of the inner sole (7), mechanical fastener (400) is fastened to a peg (192) and is allowed to slide within sleeve (191) which has a narrow opening (190) through which the head (189) of mechanical fastener (400) cannot pass, thus limiting vertical motion of the inner sole (7).

[0037] As to a further discussion of the manner of usage and operation of the present invention, the same should be apparent from the above description. Accordingly, no further discussion relating to the manner of usage and operation will be provided. With respect to the above description then, it is to be realized that the optimum dimensional relationships for the parts of the invention, to include variations in size, materials, shape, form, function and manner of operation, assembly and use, are deemed readily apparent and obvious to one skilled in the art, and all equivalent relationships to those illustrated in the drawings and described in the specification are intended to be encompassed by the present invention.

[0038] Therefore, the foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

1. A self tying shoe comprising:
a lace holding rod integrated within a standard shoe tongue;
at least one set of lace;
a tying/untying button situated on the side of an outer sole to select a tying or an untieing mode;
said lace holding rod being a biasing means normally in an outward configuration so as to pull on said lace;
an inner sole hingedly attached to a base by mechanical fasteners connected to mechanical fastening holes which provide a limited range of pivoting motion;
said base set inside said shoe;
a biasing means to counteract the downward pressure created by a user and allowing for said inner sole to return to an upward position once the weight of said user is removed;
a ratcheted wheel acting as a winch to wind said lace around itself;
a power screw inducing rotation to a top plate having a central threaded hole so threaded as to match threads of said power screw;
rotation of said top plate being mechanically connected to said ratcheted wheel inducing rotation of said ratcheted wheel;
mechanical connection of said top plate to said ratcheted wheel being by way of stubs engaging notches situated on said ratcheted wheel;
an elastomer absorber being sandwiched between said top plate and said ratcheted wheel to act as both a cushioning means and biasing means;
a lower pawl interacting with said ratcheted wheel to limit said ratcheted wheel to only one rotational direction for as long as said lower pawl is engaged to said ratcheted wheel;
a pawl interacting with a toothed wheel to limit said toothed wheel to only one rotational direction for as long as said pawl is engaged to said toothed wheel;
said power screw inducing rotation onto said toothed wheel which is mechanically connected to said power screw by a multisided top engaging a multisided opening in said toothed wheel;
said toothed wheel frictionally rotating against the surface of a disc extending integrally from underneath said inner sole.

a hood mechanically fastened to said base by mechanical fasteners engaging mechanical fastening holes to create a containment within which are said ratcheted wheel, said lower pawl, an actuator, and an actuator biasing means;
said hood also supporting a casing fastened on top of said hood by said mechanical fasteners;
said casing holding within it a double pin;
a tying/untying button pushing against said double pin when depressed;
said tying/untying button also pushing on an actuator and said actuator in turn pushing against both said lower pawl and said upper pawl in order to free both said ratcheted wheel and said toothed wheel;
said released ratcheted wheel releasing said lace.

2. A self tying shoe having an inner sole, a top plate and a power screw having the following method of use:
the weight of a user is applied on said inner sole, this has for effect of inducing rotation of said top plate;
said power screw not rotating when said inner sole inducing a downward motion onto it but inducing rotation to said top plate having a central threaded hole so threaded as to match threads of said power screw;
rotation of said ratcheted wheel being provided by said top plate mechanically connected to said ratcheted wheel by stubs engaging notches found on said ratcheted wheel;
said ratcheted wheel winding at least one lace around itself;
winding said lace causing tying of said shoe;
when said shoe is sufficiently tied, a balance is reached between the tension applied by the lace to the user’s foot and a biasing means stops any additional motion from said inner sole so that said power screw no longer induces rotation of said ratcheted wheel;
a tying/untying button, when depressed, pushes against a double pin, which in turn pushes on an actuator and said actuator in turn pushes against both a lower pawl engaging said ratcheted wheel and an upper pawl engaging said toothed wheel in order to free both said ratcheted wheel and said toothed wheel, which releases said lace so that a lace holding rod can pull on said lace;
pushing once more on said tying/untying button brings said actuator back to its initial configuration which allows for the reengagement of both said lower pawl and said upper pawl.

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