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(58) Field of Search:
INT CL **A43C**
Other: **WPI, EPODOC**

(54) Abstract Title: **A motorised shoe lace fastening system**

(57) A powered fastening system for footwear that allows the user to tighten and loosen a shoe lace as required. The system comprises a single lace cord 7a that runs through lace guiding means on the upper part of the shoe e.g. shoe lace eyelets 16, loops 18 and guide tubes 17, 11, where one end of the lace is secured to the upper of the shoe e.g. a lace loop, and the other attached to a battery powered winder 8 located in the heel of the footwear. Alternatively both ends of the lace are attached to the battery powered winder 8. When activated the battery powered winder 8, winds in the cord which is held at the desired tension by a clamp 21 that can be manually released to loosen or undo the shoe, or by the battery powered winder 8 that can be operated in reverse to loosen or undo the shoe. Preferably the motorised fastening means comprises a winding spool 8, winding motor 2 and battery power source 3. The lace cord may be made from a nylon monofilament, braided line or wire. Preferably the shoe lace, lace eyelets, loops and guiding tubes are preferably made from a material with minimal frictional properties. The shoe may have lighting or sounding means to indicate the operation of the motor to the user.

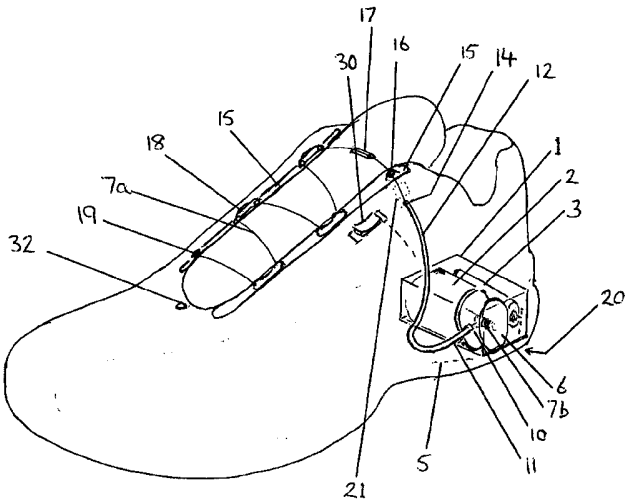

FIGURE 1

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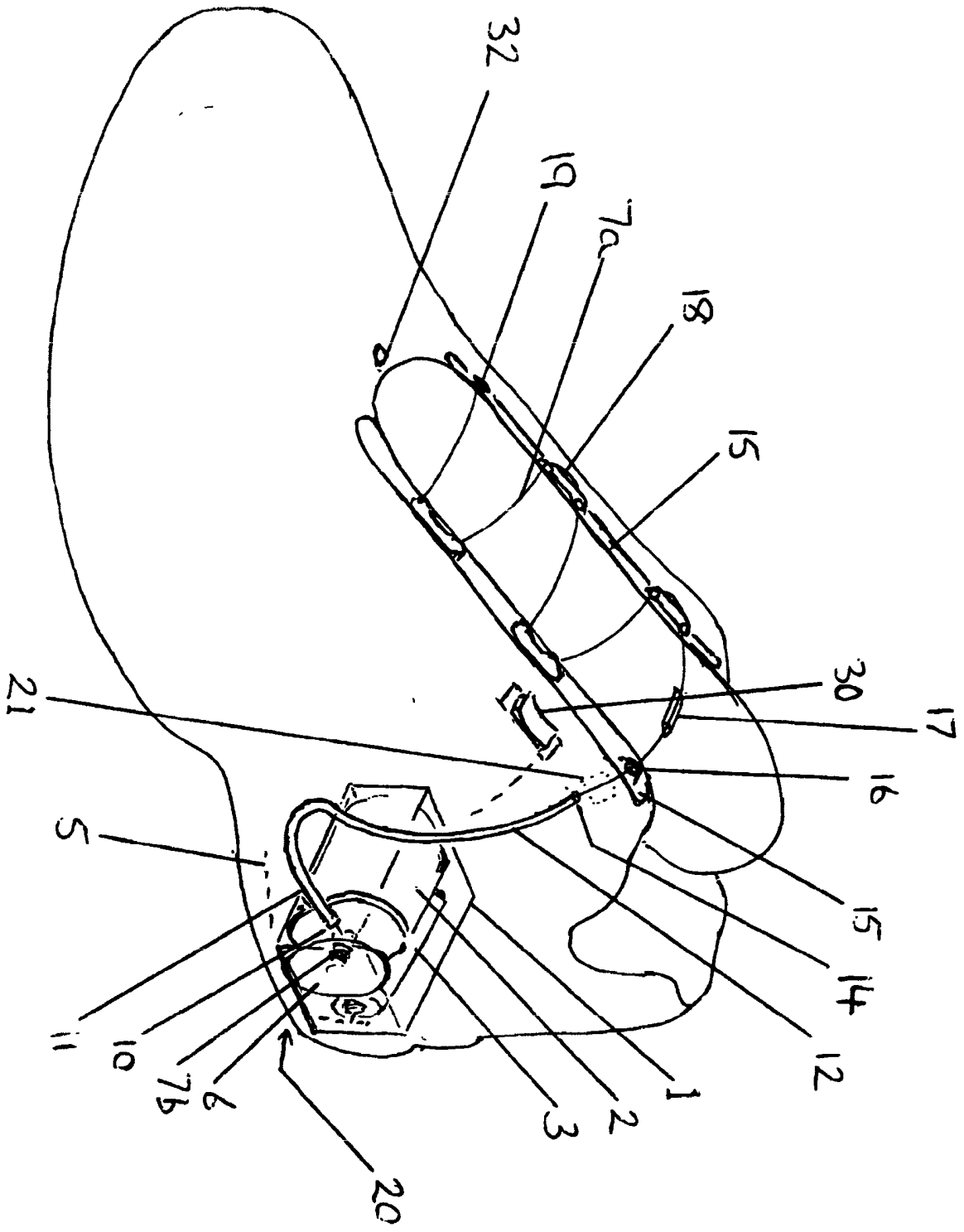

FIGURE 1

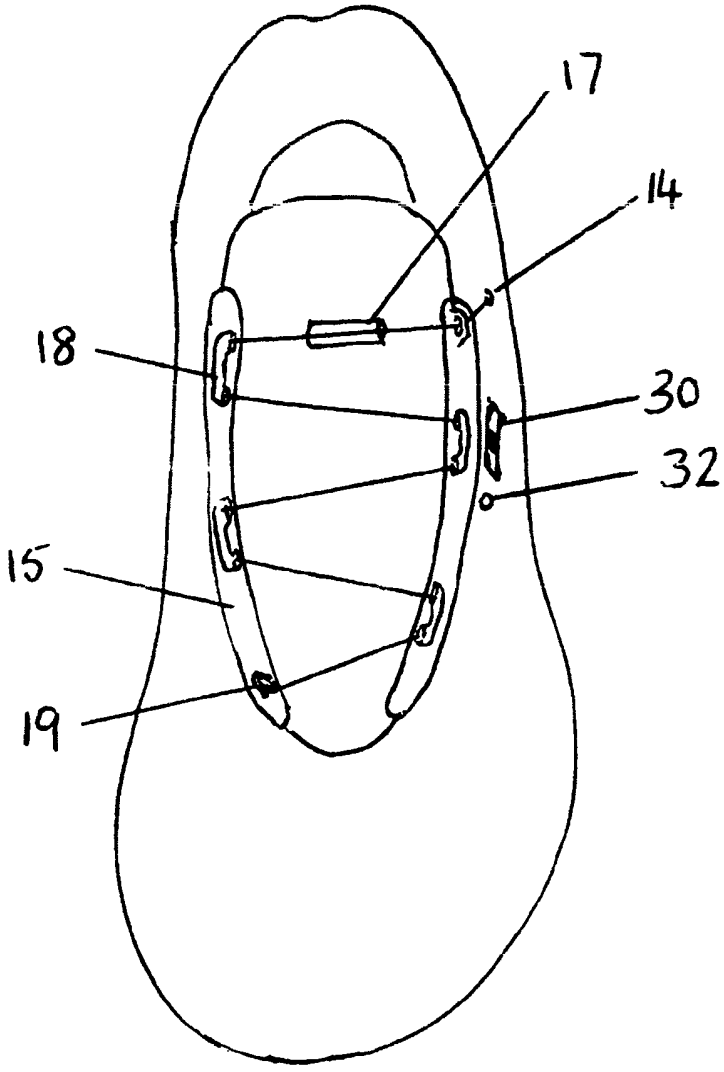

FIGURE 2a

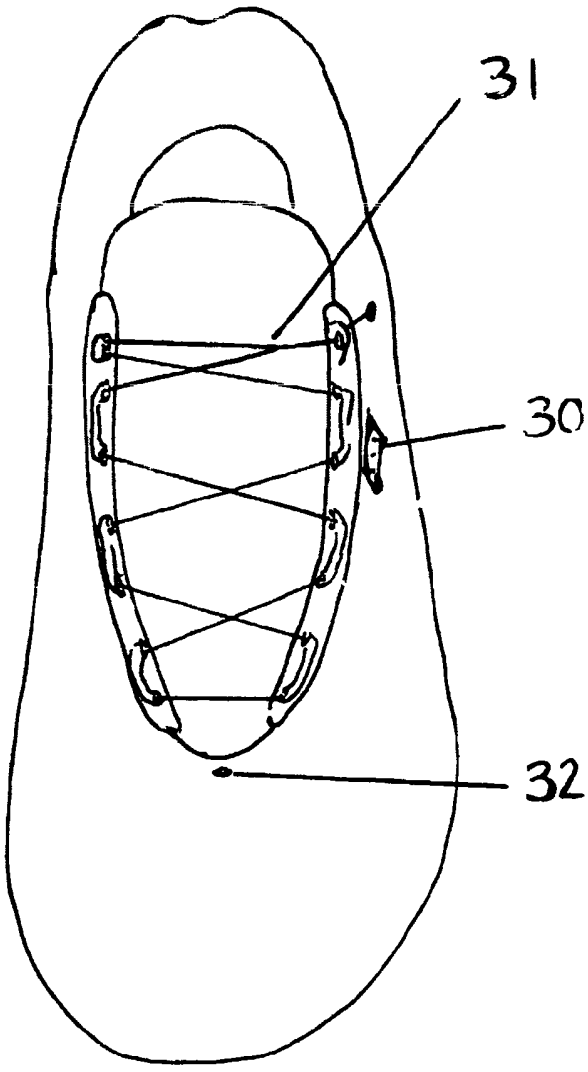

FIGURE 2b

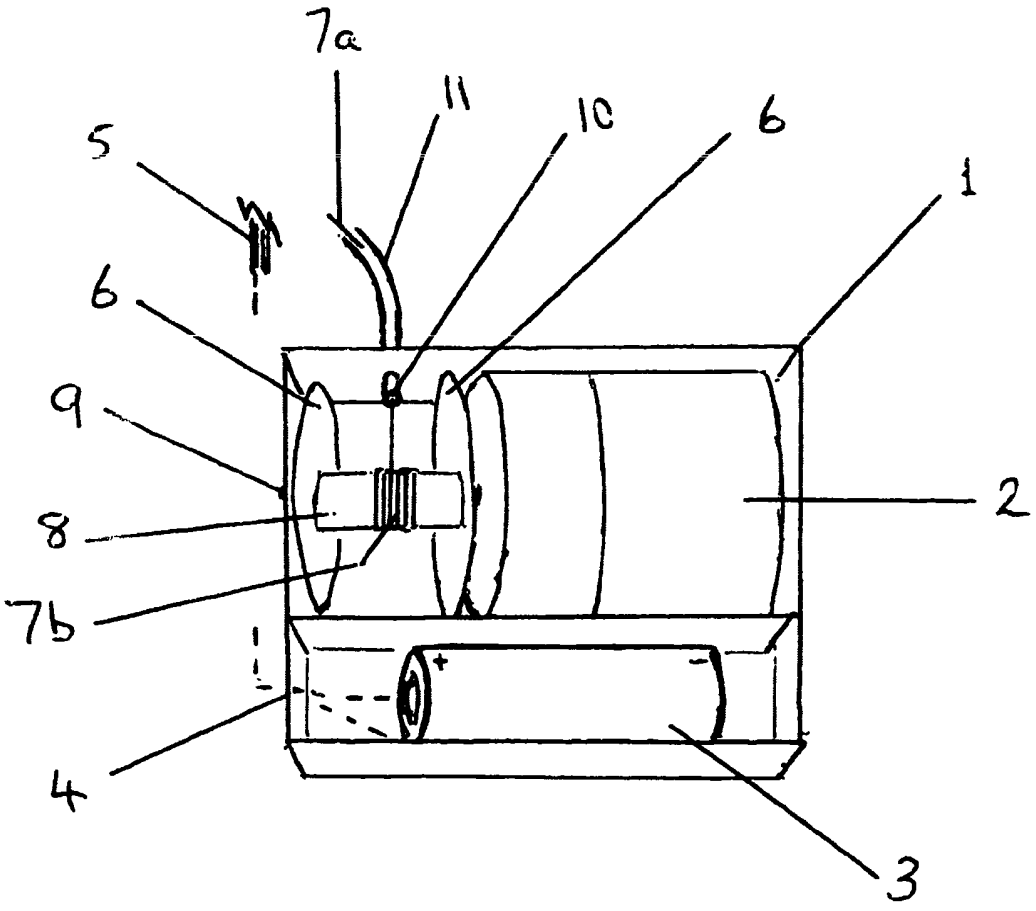

FIGURE 3

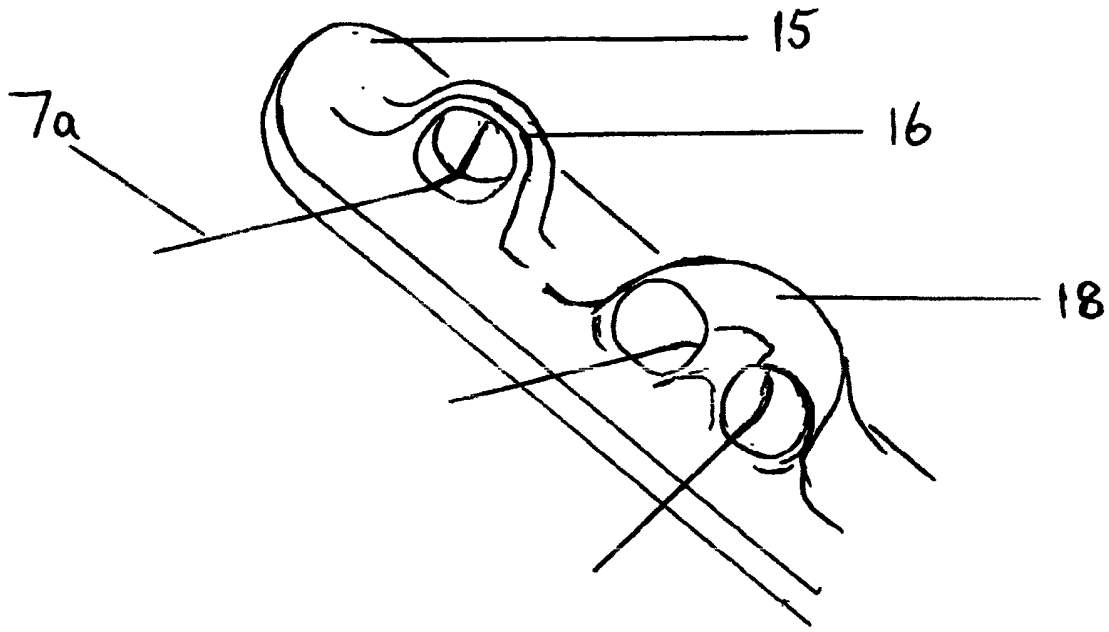

FIGURE 4

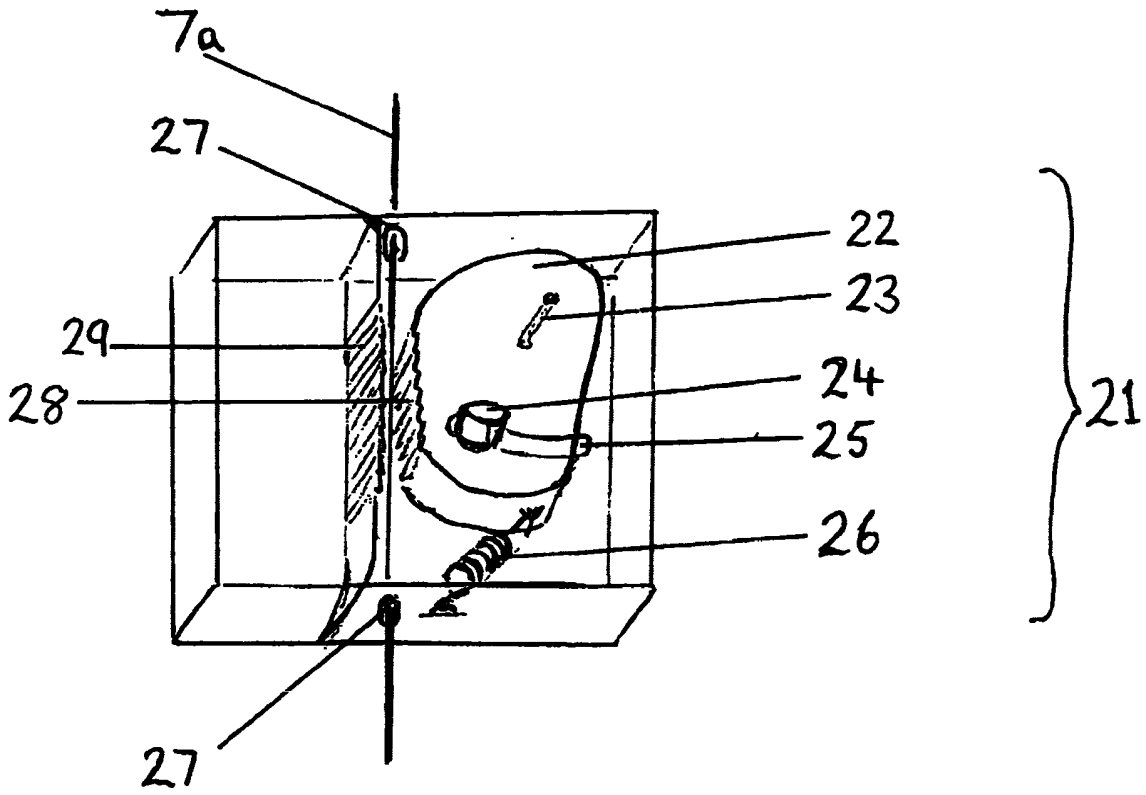

FIGURE 5

TITLE

Powered shoe lace cord guiding system.

BACKGROUND OF THE INVENTION

In response to the search results from the previous application of a similar design, this patent application claims priority for most of its features from application number GB0710404.5 filed 31st May 2007, and has now addressed the uniqueness of this new application with strengthened and additional claims.

Traditional tie up shoe lace cords can be difficult to manually tie effectively, consistently and quickly. This is constraining for wearers and children who have not learnt to tie traditional laces into bows/knots or for people with physical handicaps, arthritis or disabilities. Furthermore lace bows/loops and lace ends being positioned on the outside of the shoe can come undone, dirty easily, wear loose or catch on something potentially causing the wearer to trip.

STATEMENT OF THE INVENTION

To overcome these problems this power lace invention allows the shoe wearer to tighten and loosen each shoe's lace cord with the touch of a button. The lace cord runs inside smooth gliding tubes woven into the uppers or positioned on a lace loop plate running down the lace cord edges on the uppers. One or more guiding tubes can also be sited on the top of the shoe's tongue.

A push button switch or on-off-on rocker switch is located on the shoe's upper, which when pressed activates a small geared low RPM high torque motor winder in the heel, the battery is also sited with the motor in the heel. The motor winds in the cord which is held at the desired tension when the motor ceases to be activated and is resting by its gearing mechanism, alternatively if a motor is used where its mechanism when resting cannot hold the tension then a small sprung loaded clasp on the upper through which the cord runs grips and holds the cord until manually released, allowing for a fast and convenient method for all people to have the properties of traditional lace fitted shoes without having to tie a bow/knot.

The motor can be activated in the reverse direction using the double pole double throw centre off rocker switch thereby unwinding and releasing the lace cord to loosen the shoe for the wearer until at the desired looseness.

The lace cord is attached to the motor winder spool, with the other end either anchored near the bottom of the shoe upper perhaps on the lace loop plate thus when the motor draws in the other end the two sides of the shoe upper are drawn together evenly,

alternatively the lace cord travels through the lace looping system and both ends of the cord are attached either at the point of and to the motor winder spool or between the winder spool and the lacing area of the shoe upper.

ADVANTAGES

The advantages of this invention are that the wearer can tighten and 'do up' each shoe and loosen and 'undo' each shoe without having to manually pull or tie string laces together into a knot or bow.

By pressing a switch/button on the top of the shoe the lace cord is automatically pulled into the heel by the powered rotating motor winder spool. The lace cord glides easily through the lace plate eyelet and loops, and optionally through one or more tongue guiding tubes and down a further single guiding tube from the upper into the motor housing in the heel.

The lace cord is automatically held at the desired tension by the resting motor which with its necessary low gearing assembly makes the motor shaft and spool almost immovable when not activated and powered.

Alternatively should a movable resting motor be utilised then the lace cord is automatically held in place at the desired tension by means of the sprung loaded cord clamp which the cord passes through which allows the one-way passage and tightening of the cord at any time, and can be released manually to free the lace cord to loosen or undo the shoe. The clasp is sited preferably in between where the lace cord exits the upper out from its guiding tube running up the side of the shoe and where the cord then enters the first guiding eyelet on the lace loop plates.

Whilst the lace cord is 'done up' and the shoe is used, there are no loose or protruding lace ends or bows which could either get snagged, become undone or trip the wearer.

There are no free lace ends and no bows or knots need be manually tied by the wearer. Also the tightening of the cords are done by the motor thus the wearer does not have to exert any pull force themselves. These benefits are helpful to those unable to manually tie shoe laces.

A small battery powered motor installed in the shoe's heel is activated to automatically tighten and loosen the lace cord so the cord does not have to be gripped or pulled manually.

The motor is activated by a push button switch or preferably a double pole double throw centre off rocker switch sited on the shoe's upper which allows the wearer convenient access to said switch to do up and undo the lace cord and therefore the shoe. By pressing the 'do up' side of the rocker switch the motor is activated and the cord wound in around

the shaft spool thus tightening the cord around the shoe to the desired tension. When the operator takes their finger off the rocker switch it returns to the centre off position and the motor ceases to be powered and the resting motor then holds the cord running through the shoe at that desired tension and tightness. By pressing the other 'undo' side of the switch the motor is activated to unwind and let out the cord thereby loosening the shoe.

Preferably the lace cord specification encompasses a thin nylon monofilament, braided line or wire that is durable and strong enough to hold the tension of the cord being tightened by the motor across the shoe so it will not stretch, fray or weaken when reasonably used and being held repeatedly by the holding clamp mechanism.

Preferably the cord may either be of a stronger substance at the point where it will be held by the clasp or the holding clasp may have the cord's guiding tube also passing through it so as not to unduly wear or damage said cord and preferably the lace cord specification is entirely smooth in nature to allow it to glide through the guiding tubes and loops with the least friction possible. Preferably it may be suitable in order to enhance the cord's ability to glide effortlessly through its guiding tubes and loops to lightly lubricate said cord, tubes and loops.

One end of the lace cord is attached to the motor winder shaft spool in the heel. The other end of the lace cord is attached at the bottom end of the lower part of one of the lace loop plates on the upper. By fixing the end of the lace, when the motor is activated and draws into the heel the lace cord, as the other end is fixed, the tightening cord will then draw together evenly the two sides of the shoe's uppers through which the cord is passing in a zig-zag form through the lace cord loops until the motor is deactivated and the cord ceases being tightened.

Alternatively the other end of the lace cord to that end fixed to the motor winder spool, is looped round the lace cord loop system on both sides of the shoe's upper and is either also fixed to the motor winder spool or it is fixed to a part of its own lace cord sited preferably between the motor heel housing and the first of the lace loops on the uppers, thus effectively the winding motor spool is drawing in both end of the lace cord thus tightening the shoe's closure and two sides of the uppers.

Preferably the lace cord guiding tubes fixed across the shoe's tongue will be of a length allowing for the shoe to be closed without the uppers crossing over the said tongue lace tube ends and hindering the movement of the cord, so said tongue tubes will be sited down the middle of the tongue and not across the entirety of the tongue.

The motor torque, gearing and strength is of a suitable level so as to be able to instantly, consistently and at a comfortable and controllable speed wind in the lace cord when activated. Preferably the motor will be of a small light weight size, likely 6v or 12v with a gearing mechanism built into the motor casing giving the shaft spool speed approx 10-20 revolutions per minute. The speed with which the lace cord is wound in or out can be adjusted by using varying gearing in the motor to change the rpm and by using a varying diameter of the winding spool onto which the lace cord is wound round.

The battery will preferably by a small hi powered 6v or 12v type similar to those used in say cameras and of sufficient power to activate the motor consistently for an acceptable period of average usage and is sited in an appropriately sized battery holder clip in the heel housing compartment so that the wearer can easily remove and replace the battery when required to.

Preferably the radius of the winding spool on the motor is of a size that compliments the motor winding speed so that the lace cord is tightened at a controllable speed allowing the wearer to comfortably assess when the shoe is at the desired fit or tightness.

Preferably the cover plate of the battery and motor housing in the shoe's heel will be of similar external look, material and design to the rest of the shoe's sole.

Preferably a small diode light is fitted to and protrudes from the shoe upper preferably near the switch or near the base of the tongue which lights up or flashes when any power is switched to the motor to activate it in either direction. This light will then indicate to the user that the motor is being activated and prevent accidental overtightening of the lace cord and therefore the shoe or the motor being left on or damage, stretching or breaking of the lace cord and also show the wearer that the cord is being loosened. Preferably there may be a small light indicator and/or sound emitting tone or beeping fitted to the switch and motor activation circuit to indicate to the wearer that the motor and therefore tightening mechanism is being activated and the shoe is being tightened.

Preferably the motor and battery housing sited in the heel will be of a sturdy and strong material so as not to be damaged by normal expected wear and tear and usage of a sports shoe and the motor and battery within will be entirely accessible by means of removing the compartment's cover sole preferably by having to undo the securing screws whereby the outer cosmetics of this housing cover will look similar to the overall design of the shoe's under sole, and when sealed will provide a watertight seal to the motor and battery housing.

The motor is also activated in the reverse direction to that of winding in the lace cord in order to let out the lace cord thus allowing the wearer to open and loosen the shoe's uppers in order to loosen and remove the shoe.

Preferably the lace cord is fixed to the motor winder spool and if utilised the bottom of the shoe's upper or lace plate in such a way that can allow the wearer to themselves replace this entire lace cord should the cord wear or break.

Preferably the type and size of the battery or batteries used will be of a size so as to fit into the motor and battery housing and of a power/voltage so as to compliment the motor's power requirements.

Preferably the battery and the motor should be firmly fixed or fit into their separate sections within their housing box in the heel so as not to be able to move or dislodge when the shoe is being used.

Preferably the lace loop plates are fixed firmly to the inside edges of the two sides of the uppers adjacent to the tongue either being fixed on top, underneath or whereby the edge of the uppers slot inside a groove within the plate and are then fixed, glued, sewn in or otherwise to ensure the plates will firmly draw the shoe closed when the tightening mechanism is activated.

Preferably the distance across the tongue between the two lace plates is minimised so as to minimise the width and travel of the lace cord across the top of the wearers foot and also to reduce the angle of the lace cord's turns where it zig-zags through the plate loops.

Preferably the angle and curve of the inside of the lace loops fixed to the top of the lace plate is of a gentle nature so as to lessen the strain on the cord, minimise any sharp acute angles of the cord's passage and lessen the strain on the winding motor and minimise the turns and tension required to effectively draw the cord through the shoe and guiding tubes and loops.

Preferably the lace tubes, eyelets and loops are of a smooth material so as to aid the easy gliding with least friction of the cord passing through, inside and around them.

Preferably the holding clamp will be sprung loaded to ensure that the clamp edging through which the cord passes only holds the cord from loosening unless released manually.

INTRODUCTION TO DRAWINGS

FIGURE 1 shows the entire view of a left shoe from the front outer side encompassing the motor and battery inside its heel housing from which a guiding tube guides the lace cord from the motor winder spool through the heel and up round the lining of the side of the shoe where the cord exits the upper just prior to feeding through the first guiding eyelet on the lace loop system. The lace loop plates run down the upper's edges upon which the guiding loops are fixed through which the lace cord passes being guided down and across the top of the shoe and tongue. The lace cord is attached to the base of one of the loop plates. The rocker switch is attached to the shoe's upper and a small diode is also visible on the shoe's upper to indicate when the motor is being activated. Alternatively if the cord clasp is utilised the position of this is also indicated.

FIGURE 2a shows the view of a left shoe from above with the lace cord running through the ringlet and guiding loops on the plates on each side of the upper next to the tongue and a guiding tube woven into the tongue top and the cord end fixed near the base of one of the lace plates. The motor activation rocker switch, indicating light and cord exit point are also shown.

FIGURE 2b shows the same view from above a shoe with the alternative of the lace cord end returning to and attached to itself at the top of the lacing system or alternatively to the motor winder so that effectively both ends of the lace cord are attached to and being wound in and out by the motor.

FIGURE 3 shows the motor and battery housing box in the heel from above with the lace cord being guided onto the motor shaft winder spool by the guiding feeder tube and spool guards. The battery is also located within this compartment with the necessary wiring to and from the battery, switch and motor.

FIGURE 4 shows the top end of a lace cord loops plate which is attached to the uppers each side of the tongue, with the first eyelet hole for the cord to pass through and one of the subsequent loop tubes guiding the cord's turn across the shoe from side to side.

FIGURE 5 shows the lace cord holding clasp through which the cord passes freely when being tightened (cord moving downwards) and is held from loosening (cord moving upwards) by the sprung loaded grip edged clasp which is manually releasable.

DETAILED DESCRIPTION

An example of the power lace invention will now be described by referring to the accompanying drawings;

The single housing case 1 for both the motor 2 and the battery 3 is fixed within a recess in the shoe's heel and covered with a detachable plate or lid 20 likely to be in the style of the rest of the shoe's sole and removable via screws for access to the motor 2 and battery 3 for the purposes of repair and battery replacement. The battery is likely to be either 6v or 12v small sized similar to a camera battery with power to compliment the motor and power it consistently for an acceptable usage time. The motor 2 is fixed in place and the battery 3 inserted into a battery holder/clip so as not to dislodge when the shoe is in use.

The wires 5 connect the battery 3 to the activation push button 13 or rocker switch 30 and back to the motor and enter and exit the housing 1 via a hole 4. The wires 5 travel up the outer side of the shoe and are concealed in between the outer upper and inner lining. Wires will also connect the motor power feeds to a small diode light 32 located in a visible area on the upper so as to indicate to the wearer when the motor is being activated. This diode may flash and could be accompanied by a small beeper.

The small motor 2 is likely to be a 6v or 12v DC and with built in gearing will have a slow speed of approx 10-20 revolutions per minute with instant consistent torque (pull strength) and will turn in either direction when activated by the rocker switch 30. The lace cord 7a is attached to a small winding spool 8 on the motors rotary spindle/shaft, round which the cord 7b wraps when the motor and is activated and the cord wound in and let out when the motor is reversed.

At both sides of the winding spool 8 are circular cord guides or guards 6 fixed to the spool with a circumference almost as large as the housing 1 will allow so as to ensure the cord 7b is wound directly onto the spool 8 without cause to slip onto the inner spindle of the motor and spool and clog the operation and ensure collection of the cord is maintained onto the spool.

The motor casing and/or base is secured to the housing 1 so the motor cannot move when operating and winding and possibly the end of the motor shaft may also be secured whilst able to rotate with it protruding through a fixing hole 9 in the side of the housing 1.

A likely double pole double throw centre off small rocker switch 30 with a flat base is positioned at an accessible point on and through the shoe upper likely on the outer top side and will activate when pressed forwards or backwards the motor to turn in either direction being that pushed down on one side of the switch will cause the motor to wind in the cord therefore tightening the shoe and 'doing it up' and activation of the motor in the opposite direction by pressing down the other side of the switch will cause the motor to turn the other way and let out the cord therefore loosening the shoe and 'undoing' it. When the rocker switch is not pressed it returns to its centre off position and the motor is not activated at all and holds the cord at that tension.

In order to indicate to the wearer when the motor is being activated and winding in or out the lace cord the power feed to the motor 2 will also power via wires a small diode light 32 which may flash or be consistently on so as to alert the wearer the motor is turning and avoid over tightening A small buzzer or bleeper could also be used to enhance this warning effect.

The 'lace cord' 7a is made of strong smooth plastic such as nylon monofilament or braided line or possibly wire and is of a material so as to minimise its friction against its guiding tubes and loops likely of plastic. The lace cord fixings to either the motor winder, the shoe upper or loop plate should be such that the wearer can undo and replace said lace cord in the event of wear and tear or breakage.

The cord 7a enters the battery/motor housing case 1 through a hole 10 whereby it is guided through a tube 11 which passes into and just through the housing 1 and is aligned to ensure the cord stays fed directly and centrally onto and off the winder spool 8. The cord 7a then passes through the first part of the guiding tube 11 which passes through the remainder of the heel and then up the outer side of the shoe in its guiding tube 12 round the wearers foot with said plastic guiding tube 12 woven into the shoe's lining/upper.

The cord 7a exits both the guiding tube 12 and the shoe's upper exterior at 14 where said lace cord then passes through the first eyelet 16 which may be fixed to a lace loop plate 15.

The gearing mechanism of the motor 2 prevents the free movement or turning of the motor and its shaft and winding spool which are thus immovable and can only be turned or wound if the motor is power activated. Therefore when the wearer has attained their desired tension or tightness of the shoe or released enough of the cord to loosen and undo the shoe the desired tension and position of the cord is held firmly in place by the 'stopped' motor when the activation switch is not pressed thus ceasing activation of the motor which is then in an unpowered resting state.

Alternatively where the motor 2 is only being used to wind in and tighten the cord and shoe then a single push on button switch 13 placed on the upper is used to activate when depressed the motor 2 in only one direction to wind in the cord. The motor gearing may not be able to hold the tension of the cord when the motor is resting thereby requiring a small clasp 21 to be used. The cord 7a passes through the holding clamp 21 which is fixed to the shoe upper directly between the cord's exit point 14 and the first eyelet 16 of the lacing system via the entry and exit guide holes 27 and runs past a fixed serrated edge 29. On the other side of the cord is a sprung loaded clasp 22 which also has a serrated edge 28 running next to the passing cord 7a. The clasp 22 is drawn towards and against the cord and the fixed serrated edge 29 by a small spring 26 attached to the clasp 22 and the inside of the clamp's case 21. The serrated edges or small teeth are pointing downwards in the direction of the cords passage when being tightened so that the cord will pass through the two serrated edges 28 and 29 freely at any time. Once the lace cord reaches the desired tension and fit of the shoe for the wearer the motor 2 activation switch 13 is released and the cord's position is held firmly in place by the clamp 21, which is positioned on the top

outside upper of the shoe. The clasp 22 inside the clamp 21 casing is fixed with a small pin which passes through said clasp and above and below the clamp's 21 case allowing it to move its serrated edge 28 towards and slightly away from the other fixed serrated edge 29. To release the cord tension the wearer moves the clasp 22 away from its clamping position by pushing the release knob 24 along its guide hole 25 thus parting the two serrated edges 28 and 29 inside and allowing the cord to pass freely through the clamp 21

The cord guiding system including the eyelet 16, loop tubes 18 and anchor point 19 may either be fixed to the uppers edge adjacent to the tongue slot or preferably the eyelet, loop tubes and anchor point will be fixed on top of the lace loop plate 15 sited on the outer edge of the upper adjacent to the tongue. The lace plate 15 runs down each side of the uppers edge adjacent to the tongue in place of the traditional lace holes giving strength to the closing of the two shoe uppers and ensuring an even, comfortable and consistent closure of the shoe.

The cord 7a having passed through the first guiding eyelet 16 then passes through a number of the hard plastic tube loops 18 which are of a widened 'U' shape promoting the smooth passage of the cord with no sharp turns and which are fixed alternatively on either side of the uppers running down the shoe towards the toe end thus guiding the cord and assisting the 'turning' of the lace cord direction so that the cord proceeds down the shoe in a zig-zag format across the top of the shoe and tongue and redirecting said cord back towards the other side and into the next guiding loop tube.

It is likely that one or more cord guiding tubes or loop may be attached to the top of the shoe's tongue 17 to assist guiding the cord over and across the tongue and to hold the tongue up when the shoe is empty and the wearer wishes to insert their foot into the empty shoe. The tongue tube is of a much lesser width than the tongue so as to allow for the shoe's uppers being drawn closer together as the shoe tightens so as not to pass over of hinder the cord passing cleanly through the ends of the tongue guiding tubes 17.

One end of the lace cord 7a is attached to the winder spool 8 of the motor 2 in the heel. The other end of the cord 7a having passed through the cord guiding and tube loops system is finally attached 19 to the bottom of the shoe's upper near the base of the tongue or preferably attached to the bottom of one of the lace plates 15. Thus when the motor 2 winds in and tightens the cord 7a, as the other end is immovable and anchored to the base of the upper, the tightening cord running through the guiding loops across the top of the shoe consistently and evenly draws the two sides of the uppers together thus tightening and 'doing up' the shoe for the wearer to the desired tension.

Alternatively both ends of the lace cord 7a are attached to the winder spool 8 of the motor 2 in the heel or are attached to one another 31 at a point between the motor and the start of the lace loop and tube system on the upper, thereby effectively the motor is winding in both ends of the cord. The cord 7a passes through its guiding loops running down either side of the uppers and then returns back up the shoe uppers passing through more alternatingly positioned loop tubes in a similar zig-zag form thus returning the lace end back up the shoe where it is fixed either to the motor winder or to itself, the cord. When

the motor is then activated the entire lace cord being both ends are drawn in and onto the motor winder spool thus closing the shoe uppers evenly and consistently across the top of the shoe.

In summary the motor 2 is used to both wind in and let out the lace cord 7a when activated in alternate directions. The lace cord is either anchored to the motor winder spool 8 and to the base of the upper 19, alternatively both cord ends are attached 31 to and wound in or let out by the motor winder. The motor is activated in wind in or let out directions by use of the small double pole double throw centre off type or similar rocker switch 30 positioned on the upper for easy access by the wearer. The lace cord is held at the desired tension by the gearing mechanism of the resting inactive motor which does not allow for the cord to be freely pulled out unless the motor is power activated in one direction or the other. The cord passes across the shoe uppers from side to side through a guiding tube 11 and 12, and eyelet 16, tongue tube 17 and tube loops 18 the latter which may be fixed either to the uppers or a lace loop plate. For safety reasons so as to alert the wearer when the motor is being activated and avoid any over tightening a small diode light 32 is sited on the upper where it is activated and lit by the same power activating the motor to show the wearer that the motor is running.

The following information explains what is unique and different in this design to those designs which were exampled in the initial search from the previous priority application; No other design combines all the elements in this design together. This design draws together the two sides of the uppers by the tightening of the lace cord running through the loop and tube guiding system. This design has its motor activated by a push button or rocker switch located on the upper, whereby the rocker switch uses a double pole double throw centre off rocker switch to activate the motor to both wind in and let out the cord thus tightening and loosening the shoe fit. This design feeds the cord onto and from the motor winder shaft spool via the cord passing through a guiding tube which protrudes into the motor and winder housing and directs the cord directly onto the winder spool. This design has the cord fed from the heel housing up to the cord's exit point from between the shoe's lining and upper on the side of the outer upper via a guiding tube. This design uses the motor winder to both wind in and let out the cord and also uses the resting motor gearing immovability to hold the cord at the desired tension for the wearer until the motor is activated. This design anchors the cord to the lower part of the upper for the motor to then draw in the other cord end to tighten the lace system. This design can also draw in both ends of the lace cord through the loops and onto the motor or attached together prior to being wound onto the motor spool. This design fixes the eyelets and cord loops to a lace loop plate, alternatively the eyelets and loop tubes are fixed directly to the shoe's upper. This design can use a clasp in order to hold the cord at a desired tightening tension which can be released manually. This design requires no manual intervention or touching of the lace cord when doing up the shoe or loosening it, only the motor activation switch is required to be touched.

CLAIMS

I claim,

1 A shoe lacing system characterized by and comprising;

a battery powered motor in a housing compartment inside the heel sole of the shoe and including
a housing,
a removable compartment cover,
a battery to power the motor,
a motor including its shaft upon which is a winder spool and

a lace cord with one end anchored to the motor winder spool and the other end anchored to the upper of the shoe or lace loop plate near the toe end of the upper and

a guiding tube from the motor and battery heel housing through which the cord is fed to a point on the upper where the cord exits the upper and

a push button or rocker switch located on and through the upper which activates the motor winder in one or either direction of turning and

a number of eyelets and tube loops positioned down the edges of the upper adjacent to the tongue recess including
one or more circular guiding eyelets,
a number of lace loop directional change guiding tubes,
one or more lace loop straight guiding tubes fixed to the top of the tongue,
with said eyelet and directional guiding tubes either fixed to the uppers or with a lace loop plate running down the edge of each of the two sides of the upper adjacent to the tongue recess upon which the eyelets and directional change tubes are fixed and

which guide the cord around, over and across the top of the shoe from side to side in order that when the motor is activated by the switch the shoe lace cord is drawn in and onto the motor winder spool thus tightening the shoe uppers closure or the shoe lace cord is let out and unwound from the motor winder spool either manually or by operating the motor in the alternative direction in order to slacken and loosen the shoe lace cord thus loosen the shoe or the shoe lace cord is held at the desired tension by the resting inoperative immovable motor or a cord gripping sprung loaded clasp which can be manually released.

2 A shoe lacing system according to Claim 1 whereby the motor is activated and thus powered by way of depressing a push button or rocker switch preferably a double pole double throw centre off type which is positioned on the shoe upper allowing easy access to the switch.

3 A shoe lacing system according to Claim 1 and 2 whereby the rocker switch is pressed to activate the motor shaft and winder spool in one direction so as to wind in the lace cord thus tightening the shoe and also when depressed the alternative way does activate the motor shaft and winder spool to turn in the opposite direction thus letting out, unwinding

the lace cord which loosens the shoe and when the rocker switch is not pressed it returns to its off position where the motor is not activated.

4 A shoe lacing system according to Claim 1 whereby the motor is of sufficient power and torque to consistently and immediately wind in the shoe's lace cord through the lace system.

5 A shoe lacing system according to Claim 4 whereby the motor will be appropriately geared within its casing mechanism so as to wind in the lace cord at a slow and acceptable speed of approx 10-20 revolutions per minute.

6 A shoe lacing system according to Claim 1 whereby the motor likely as a result of its slow gearing mechanism or other mechanical reason will not be moved or turned whilst no power is being applied to said motor so that when said motor is in a resting inoperative state the winder shaft and spool shall not turn freely thereby holding the lace cord in place and thus the shoe fitting at that desired tension and fit until further tightened or released.

7 A shoe lacing system according to Claim 1 whereby the guiding tube which directly feeds the lace cord onto the motor winder spool protrudes through and slightly into the heel motor and battery housing so as to ensure the cord if fed directly onto the motor winder spool.

8 A shoe lacing system according to Claim 7 whereby the motor winder spool has a circular disc guard on both ends of the winder spool area which collects the wound in cord of such a diameter so as to further in addition to Claim 7 ensure that the cord if fed onto the winder spool.

9 A shoe lacing system according to Claim 1 whereby the motor when activated and powered will rotate its shaft winder spool in one direction causing the attached lace cord to wrap and wind round the spool thus drawing in onto the spool the cord thereby drawing the cord tighter across and around the shoe whereby said other cord end is fixed at the other end to the shoe.

10 A shoe lacing system according to Claim 1 whereby the motor when activated and powered in the alternative direction to that of Claim 9 will rotate its shaft winder spool in the alternate direction causing the attached lace cord to unwind and be let out from the winder spool thus feeding out and back onto the shoe upper the cord thereby loosening and slackening the shoe fit and uppers.

11 A shoe lacing system according to Claim 1 whereby the opposite end of the lace cord to the end attached to the motor winder spool is anchored and fixed to the upper near the base of the tongue recess so that when the cord is drawn in through the lacing area guiding tubes the shoe is tightened as this end is fixed.

12 A shoe lacing system according to Claim 1 and as an alternative to Claim 11 whereby both ends of the cord are drawn in by the motor winding onto either one or two shaft

winder spools where the cord ends may be attached directly to the motor winder spool or one cord end is attached to the spool whilst the other end is attached to the first cord near to the point it is attached to the spool and the entire cord between its ends is guided around and across the shoe's lacing guides, loops and tube so that as both cord ends are either drawn into or let out from the motor winder spool this causes the shoe to be respectively tightened and loosened.

13 A shoe lacing system according to Claim 2 whereby a small diode light is positioned on the upper and is powered when the motor is powered in either direction so that said light illuminates whenever the motor is running to indicate to the wearer that the motor is being activated so as to avoid possible over tightening of the cord and shoe and that said light may also be accompanied by a noise emitting device so the indication to the wearer that the motor is in operation is further enhanced in addition to or instead of the light illuminating.

14 A shoe lacing system according to Claim 1 whereby the motor is fixed to the sole heel housing in such a way that it cannot be moved by the expected use of a shoe and cannot be moved by the force exerted on the motor by the action of it winding in the lace cord through the lace system.

15 A shoe lacing system according to Claim 2 and 6 whereby the use of a motor which does not hold firm the tension of the cord when inoperative necessitates a push button switch located on the upper which when depressed activates and powers the motor to turn in one direction only to draw in and tighten the lace cord onto the winder shaft spool to the desired tension whereby
the cord passes through a clasp which allows the passage of the cord through said clasp when travelling in the tightening wind in direction but will hold and prevent the cord freely travelling through said clasp in the other loosening direction thus holding the cord at the desired tension upon deactivation of the motor winder.

16 A shoe lacing system according to Claim 15 whereby the cord clasp is positioned between the motor heel housing and the first of the lacing eyelet or loop tubes on the upper and likely positioned between said eyelet or loop tubes and the cord's exit point from the lining of the upper on the top outer side.

17 A shoe lacing system according to Claim 1 whereby the lace cord is guided across and from side to side of the uppers on either side of the shoe top by passing through guiding lace cord tube loops which run down the edges of the two uppers adjacent to the tongue recess and are positioned apart whereby the cord passes through one tube and is then redirected through the tube end towards the other side of the upper where it passes into the next guiding tube loop and so on where the lace tie system may have a varying number of said loop tubes and circular ring eyelets in order to guide the lace cord across and around the shoe in order to tighten the shoe when the lace cord is wound in by the motor.

18 A shoe lacing system according to Claim 1 and 17 whereby the lace cord passed down and across the shoe uppers in a single zig-zag form from the top of the tongue down to the lace cord end's anchor point on the upper or lace loop plate, and alternatively if both ends of the lace cord are attached to or near the motor and are both being drawn in by the motor then the lace cord will pass down the tongue lacing area of the shoe in a zig-zag form and will pass across the bottom of the tongue lacing area from one side of the uppers to the other side and then travel in a mirrored zig-zag pattern back up the lacing area in an opposing form, passage, direction and guide loops so as to complete the even lacing of the shoe so as when the ends of this lace cord are drawn in by the motor the shoe is done up and tightened on bothe sides of the upper in an even and consistent manner.

19 A shoe lacing system according to Claim 11 and 17 whereby one or more lace cord guiding loops or tubes are positioned on the top of the tongue through which the lace cord passes when crossing over the tongue and travelling from one side of the upper to the other side so as to further guide the cord across the top of the shoe and hold the tongue up near the top of the shoe making insertion of the foot into the shoe easier.

20 A shoe lacing system according to Claim 1 and 17 whereby the lace loop tubes and ring eyelets may be attached directly to the shoe but preferably are attached to lace loop plates being a consistent strip of material or plastic which runs down the edge of the two uppers of the shoe adjacent to the tongue recess where the traditional lace holes would run with the various lace loop guiding tubes and eyelets attached to said lace loop plate in order to provide some sturdiness to the lace tie system and draw together in an even fashion the two uppers when tightening the lace cord and thus shoe.

21 A shoe lacing system according to Claim 17 whereby the guiding tubes, loops, rings and eyelets through which the lace cord passes are all made of a material likely plastic which has minimal frictional properties and therefore allows the easy, smooth and unhindered passage of the lace cord through the entire lace tie guiding system of the shoe.

22 A shoe lacing system according to Claim 1 whereby the lace cord is made of a fine, strong material likely braided line with minimal frictional properties and therefore allows the easy, smooth and unhindered passage of the lace cord through the entire lace tie guiding system of the shoe.

23 A shoe lacing system according to Claim 22 whereby the lace cord is attached to the motor and its anchor point on the upper in such a way that can easily be undone or removed by the wearer in the event the lace cord breaks and the wearer can then re-attach a new lace cord to the motor spool and upper anchor point.

15

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Claims searched: 1 - 23 **Date of search:** 15 February 2008

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1 at least	DE19833801 A1 (BROSIG) WPI Abstract Accession No. 2000/138084-13 and all figs
X	1 at least	EP1440627 A1 (LIU) see all figs, abstract and paras 0017 - 0019
X	1 at least	DE10109673 A1 (STOESS) WPI Abstract Accession No. 2002/629267-68 and all figs
X	1 at least	DE29817003 U1 (SCHNEIDER) WPI Abstract Accession No. 1999/230882-20 and all figs
A	-	DE3101952 A1 (REIM) WPI Abstract Accession No. 1982/L7051E-36 and all figs
A	-	US5471769 A1 (SINK) see fig 1 and abstract
A	-	FR2586343 A1 (SPORTEC SA) WPI Abstract Accession No. 1987/095885-14 and fig 1
A	-	US6052921 A1 (ORECK) see all figs and abstract
A	-	WO01/15559 A1 (BOA TECHNOLOGY) see all figs and abstract
A	-	EP0221483 A3 (NORDICA) see figs 7 & 8 and abstract

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Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

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A43C

The following online and other databases have been used in the preparation of this search report

WPI, EPODOC

International Classification:

Subclass	Subgroup	Valid From
A43C	0011/00	01/01/2006
A43C	0001/00	01/01/2006
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