March 4, 1969 D. E. PERRIN ET AL 3,430,303

LACE WIND

Filed Aug. 11, 1966 Sheet 1 of 2

Fig. 1.

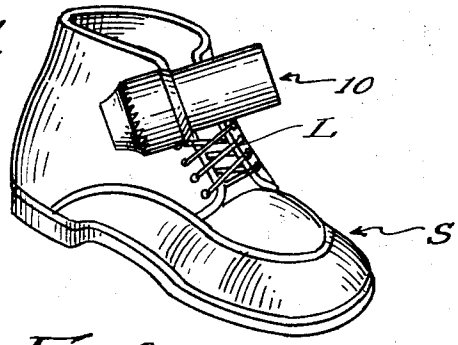


Fig. 2.

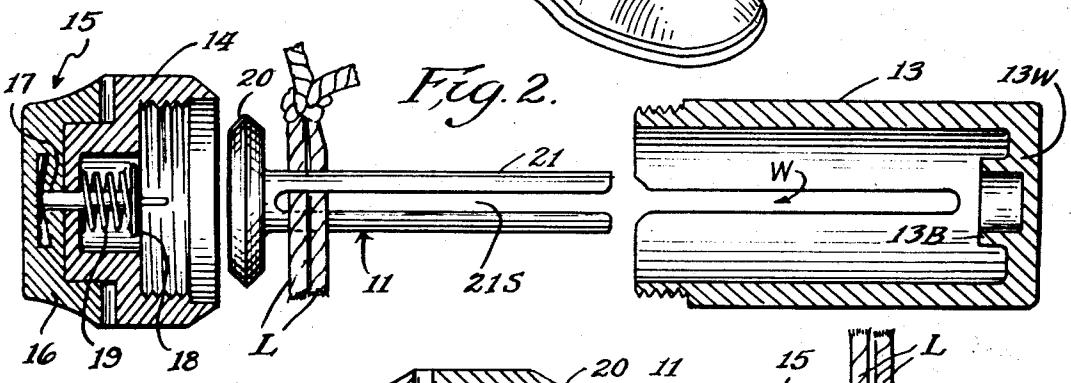


Fig. 3.

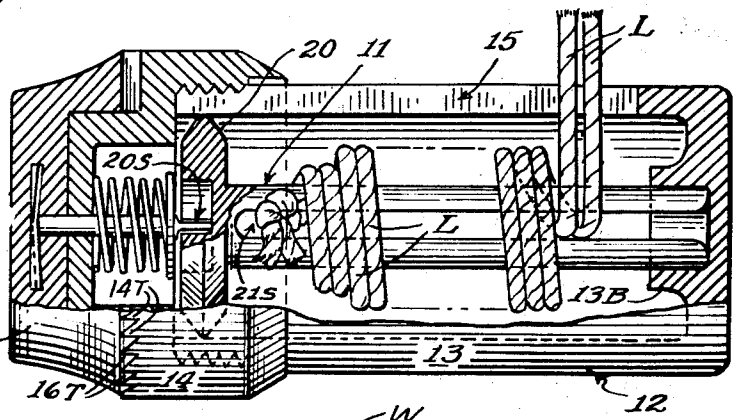
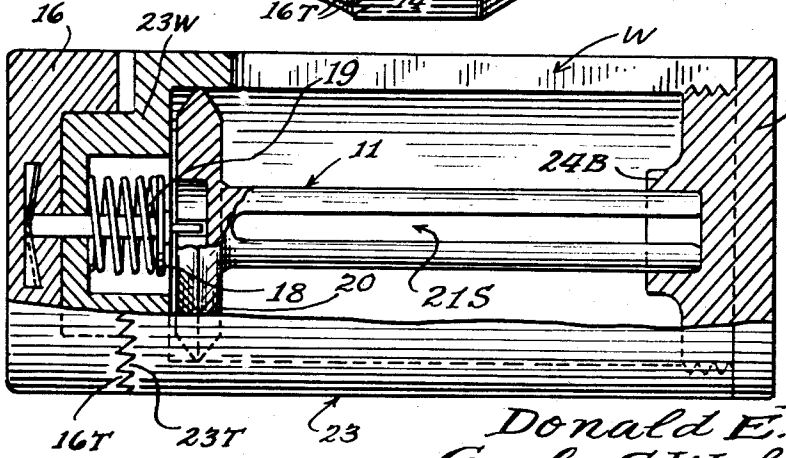


Fig. 4.



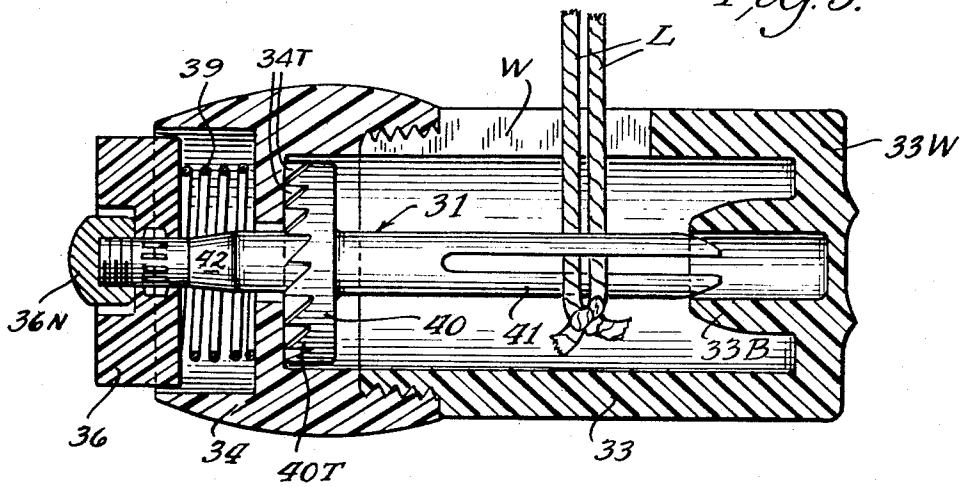
Inventors
Donald E. Perrin
Gayle S. Wakefield
By Dressler, Goldsmith,
Clement & Gordon Attys.

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Fig. 5.



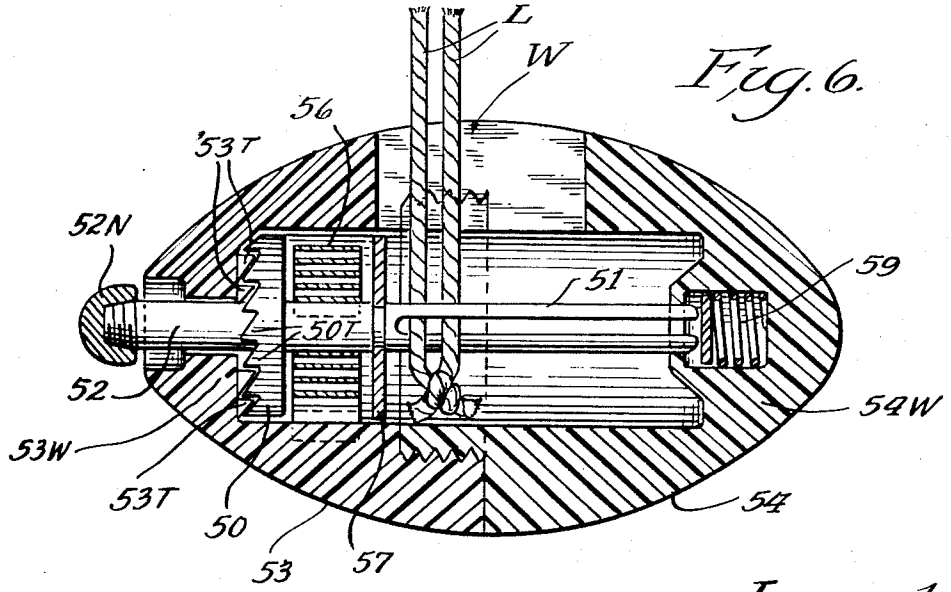


Fig. 6.

Inventors:
Donald E. Perrin
Gayle S. Wakefield
By Dressler, Goldsmith,
Clement & Gordon
Attys.

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LACE WIND

Donald E. Perrin, 14445 Woodlawn Ave., Dolton, Ill. 60419, and Gayle S. Wakefield, 16325 California Ave., Markham, Ill. 60426

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Int. Cl. A43c 11/00

ABSTRACT OF THE DISCLOSURE

A shoe lace coiler for piggy-back mounting upon a shoe is disclosed for coiling and releasably holding the lace tightly drawn upon the shoe. The coiler comprises a coiling motor in the form of a spindle having a length several times its diameter and having a slot for receiving the lace ends in gripping relation, a housing journaling the rotor therein to define an annular lace storage chamber, the housing having a window for lace travel, and a winding control engageable with the rotor and the housing for turning the rotor in a lace take-up direction, the control including a ratchet wheel rotatable with the rotor and selectively engageable with ratchet teeth on the housing for holding the rotor against reverse rotation.

This invention relates to a lacing method and to a lace coiler applicable to the loose ends of shoe laces for coiling and releasably holding the lace ends tightly drawn upon the shoe. When the lace ends are fully wound, the coiler is disposed in adjacent piggy-back relation upon the shoe.

The shoe lace coiler of this invention is provided for eliminating need for tying and untying the usual bow knot employed in shoe laces. The coiler has particular advantage as applied to children's shoes where the knot tying and untying operation is an ever present problem.

The shoe lace coiler disclosed herein is comprised of an internal coiling rotor arranged to receive and grip the extremities of the loose lace ends, the rotor being journaled in a surrounding housing which has a medial access window for travel of the lace ends during take-up and pay-out rotation of the rotor. Winding control means are provided for turning the rotor in a lace take-up direction until the entire unit rests in snug piggy-back relation upon the shoe. The winding control means are effective to hold the rotor against unwinding to maintain this piggy-back position and thereby prevent loosening of the lace binding action on the shoe. Loosening of the laces for removal of the shoe is accomplished by shifting the coiler away from the shoe to impart lace pay-out rotation to the rotor. The lace ends are conveniently retained engaged with the coiler for subsequent tightening of the shoe laces.

In the particular embodiments illustrated herein, the control means includes cooperating ratchet teeth relatively rotatably reacting between the rotor and the housing structure and normally interengaging to prevent lace pay-out rotation of the rotor. A manually controllable actuating means is provided to disengage the ratchet teeth.

In some forms, a manual winding knob is provided for turning the rotor and, in another form, a winding spring automatically acts to turn the rotor in the lace take-up direction.

The rotor is removably insertable in the housing structure and as disclosed herein has a spindle open at one end so that the lace extremities may be knotted and inserted edgewise into the spindle, with the rotor thereafter being inserted into the housing so that the lace enters edgewise into the housing access window. The rotor has spaced regions journaled in the housing and the housing is of two-piece construction to enable assembly and disassembly of the unit.

Other features and advantages of the invention will be apparent from the following description and claims, and are illustrated in the accompanying drawings which show an illustrative embodiment of the present invention.

In the accompanying drawings forming a part of the specification, and in which like numerals are employed to designate like parts throughout the same,

FIG. 1 is a perspective view illustrating a shoe lace coiler in piggy-back position upon a shoe for holding coiled lace ends tightly drawn upon the shoe;

FIG. 2 is an exploded sectional view illustrating the principal parts of the coiler assembly illustrated in FIG. 1;

FIG. 3 is a lengthwise section through the coiler assembly; and

FIGS. 4, 5 and 6 are lengthwise sections each illustrating a different embodiment of a coiler in accordance with the present invention.

Referring now to the drawings, a shoe is designated generally at S in FIG. 1 and, as illustrated, has a shoe lace L threaded therein in the usual way and engaged and stored in coiled relation within a coiler device **10** constructed in accordance with this invention. The coiler device **10** functions to hold the lace L tightly drawn upon the shoe with the coiler riding in piggy-back relationship upon the shoe. One embodiment of the coiler device is illustrated in FIGS. 2 and 3 and various different embodiments are illustrated in each of FIGS. 4, 5 and 6.

In the embodiment of FIGS. 2 and 3, the coiler includes a rotor **11** arranged to receive and grip the lace ends L adjacent extremities thereof and surrounding housing structure **12** journaling the rotor **11** therein at spaced regions and defining a lace storage chamber C. The housing **12** is a two-piece assembly consisting of a sleeve like main body or cylinder **13** and a cup-shaped end body or cap **14** threadedly engaged thereon. The housing structure **12** has a medial access window W provided by an axially elongated slot located in the cylinder **13** for travel of the lace during take-up and pay-out rotation of the rotor. Winding control means as designated generally at **15** is provided for turning the rotor in a lace take-up direction and for holding the rotor against reverse rotation.

The winding control mechanism **15** includes a ratchet wheel **16** having ratchet teeth **16T** axially shiftably mounted in rotatable relation on one end of the housing structure to be selectively engageable with ratchet teeth **14T** provided on the cap **14**. In this form, the ratchet wheel **16** is in the form of a hand knob that has a drive pin **17** embedded therein and projecting therethrough and therebeyond to be releasably keyed into the rotor **11** for turning the rotor by means of the knob. The drive pin **17** projects through the end of the cap **14** and mounts a washer-like spring seat **18** to hold the ratchet wheel **16** in captive relation on the cap **14**. A spring **19** reacts between the wheel **16** and cap **14** normally to bias the same so that the ratchet teeth engage and the drive pin **17** keys with the rotor **11**.

The rotor **11**, as illustrated herein, has an enlarged head **20** serving as a bearing hub journaled in the cylinder **13**, with the rotor having a reduced spindle section **21** provided along slot **21S** that opens axially through the spindle end which is to be journaled in an integral internal boss **13B** provided on a cross wall **13W** of the housing structure. Thus, both ends of the rotor are supported by the housing structure for free rotation. The open ended spindle slot enables the laces to be applied by first aligning and knotting the extremities of the lace ends and thereafter inserting the lace edgewise into the spindle slot

to be retained by engagement of the knotted lace ends. The rotor is assembled into the cylinder **13** following engagement of the lace ends therein and, for this purpose, the cylinder **13** has a medial access window extending lengthwise thereof and opening through the open end thereof for receiving the gripped laces edgewise during insertion of the rotor.

In the embodiment illustrated in FIGS. 2 and 3, the end cap **14**, which carries the ratchet wheel **16**, is threaded onto the open end of the cylinder **13** to complete the housing structure to complete the unit and bring the end of the pin **17** into keying engagement with a socket **20S** in the rotor head **20**.

As indicated previously, the lace ends are aligned, knotted and gripped by the spindle **21** as a preliminary to final assembly. After assembly, the knob-like ratchet wheel **16** is turned in a lace take up direction to wind the lace upon the rotor (see FIG. 3) until the lace is fully coiled and the coiler is snugly seated in piggy-back relation upon the top of the shoe S (see FIG. 1). At each stage of turning the spring **19** maintains the ratchet teeth biased towards engagement to prevent rotation in a lace pay out direction. In addition, the ratchet teeth hold the lace in fully wound condition to prevent accidental loosening of the lace.

To loosen the lace for removing the shoe, the ratchet wheel **16** is shifted axially on the end cap **14** to free the ratchet teeth and retract the drive pin **17** until the rotor **11** is disengaged and ready for free wheeling rotation within the housing. The coiler unit is then moved away from the shoe to rotate the rotor and pay out the coiled lace. In normal use, the lace ends remain gripped on the rotor spindle as there is sufficient free lace available to facilitate loosening and removal of the shoe.

In the embodiment illustrated in FIG. 4, the housing structure is somewhat modified but the essential functioning of the coiler unit is the same. Thus, the housing structure consists of a sleeve like main body **23** provided with an access window W and threaded at its open end to cooperate with an end cap **24**. The end cap **24** has an internal boss **24B** for rotatably supporting the spindle end of the rotor **11** while the bearing hub of the rotor rides in the closed end of the main body adjacent a integral cross wall **23W**. The knob-like ratchet wheel **16** is mounted in captive axially shiftable relation on the cross wall and has ratchet teeth **16T** engageable with ratchet teeth **23T** provided externally on the cross wall **23W**.

The rotor **11** is bodily removable from the housing structure by removal of the end cap **24**, however, in this form the lace ends may be knotted and secured in gripped relation on the spindle merely by removing the end cap **24**. The rotor winding and unwinding action is controlled in the same fashion by the ratchet wheel **16**.

A modified form of coiler as illustrated in FIG. 5 incorporates a number of additional important features. In this form, the housing structure consists of a main body cylinder **33** having a medial access window W and a threaded end cap **34** for closing the open end of the main body. A one-piece rotor **31** is removably journaled in the housing structure, the rotor **31** having an enlarged head **40** intermediately of a winding spindle **41** and a drive stem **42**. The enlarged head **40** is provided with ratchet teeth **40T** engageable with ratchet teeth **34T** provided internally on the end cap to complete an internal ratchet system.

The rotor drive stem **42** projects through and beyond the end cap **34** to receive a winding knob **36** held in splined engagement thereon by a cap nut **36N**. An integral cross wall **33W** has an internal boss **33B** for rotatably supporting the spindle end of the rotor while also accommodating axial shifting of the rotor to enable engagement and disengagement of the ratchet system.

A coil spring **39** reacts between end cap **34** and the winding knob **36** normally to bias the rotor to the position illustrated in FIG. 5 wherein the ratchet system is engaged. In this position, the winding knob **36** can be rotated to turn the rotor in a lace take up direction, with the ratchet system serving to prevent reverse rotation and to hold the fully coiled lace tightly drawn upon the shoe. To unwind the coiled lace, the thumb and finger are pinchingly engaged on the cross wall **33W** and the cap nut **36N** to shift the rotor free of the ratchet system while the entire coiler is shifted away from the shoe to cause the rotor to free wheel in a lace payout direction. Manipulation of the coiler for lace payout is thus facilitated in this form, in that a one handed pinching action serves both to disengage the internal ratchet and to shift the coiler to produce unwinding of the rotor.

Another aspect of the coiler structures of this invention resides in the fact that the external appearance of the unit may be easily varied to resemble any one of a number of toys. This is accomplished simply by appropriate decorating and contouring of the housing structure. This feature makes the coiler particularly appealing to children. For example, the coiler illustrated in FIG. 6 is arranged to simulate a football.

A unique winding control arrangement is utilized in the coiler of FIG. 6. A coil spring drive **56** is utilized in place of a manual winding knob. The housing structure is comprised of mating halves **53** and **54** threadedly engaged and jointly mounting a one piece rotor having an enlarged head **50** intermediately of a winding spindle **51** and a control stem **52**. The enlarged head **50** is provided with ratchet teeth **50T** engageable with ratchet teeth **53T** provided internally on the housing structure.

The housing structure incluldes integral end walls **53W** and **54W**, with the rotor being mounted in these end walls in axially shiftable relation. A spring **59** is recessed in an internal socket provided in the cross wall **54W** and normally urges the ratchet wheel into engagement with the ratchet teeth **53T**. A cap nut **52N** fixed externally on the control stem is manually engageably to shift the rotor against the spring **59** for disengaging the rotor from the ratchet system.

The drive spring **56** is in the form of a coiled band having one end engaged to the spindle and the other end engaged to the housing **53**, with the spring **56** normally acting to drive the rotor in a lace take up direction. A washer **57** is mounted on the spindle alongside of the spring **56** to prevent fouling of the lace in the turns of the spring. The spring **56** can rotate the rotor while the ratchet system is engaged, with reverse or lace pay out rotation normally being prevented both by the spring action and by the ratchet action.

The embodiment of FIG. 6 is also operable by a simple one hand pinching action. The knotted lace ends are engaged in the spindle when the drive spring **56** is maintained tightly wound. The spring **56** then turns the rotor in a lace take-up direction to coil the lace about the spindle and draw the coiler into snug piggy-back relation upon the shoe. The spring tension then serves to maintain the lace tightly drawn upon the shoe and the ratchet system also aids in preventing accidental unwinding.

To loosen the lace the thumb and finger pinch against the cap nut **52N** and the housing **54** to the rotor axially and disengage the ratchet teeth. While this pinching action is maintained the coiler is shifted bodily away from the shoe to pay out lace and rewind the drive spring.

Thus, while preferred constructional features of the invention are embodied in the structure illustrated herein, it is to be understood that changes and variations may be made by those skilled in the art without departing from the spirit and scope of the appended claims.

What is claimed is:

1. A shoe lace coiler for piggy-back mounting upon a shoe having loose lace ends, said coiler serving to coil and releasably hold the lace ends tightly drawn upon the shoe, said coiler comprising a coiling rotor having a coil forming spindle portion that includes an elongated slot means extending to one of its ends for generally axially slidably receiving and gripping the lace ends adjacent

extremities thereof, said spindle portion having a length several times its diameter, surrounding tubular housing structure journaling the rotor therein and separable therefrom, said tubular housing cooperatively defining an annular lace storage chamber around the spindle portion, said housing structure having a medial access window extending axially a major portion of the length of the housing structure for lace travel during take-up and pay-out rotation of the rotor, the width of said window being only slightly larger than the dimension of said lace for preventing manual access to said chamber, and winding control means carried by and operatively engaging said rotor and said housing structure for turning the rotor in a lace take-up direction and for holding the rotor against reverse rotation.

2. A shoe lace coiler as defined in claim **1** and wherein said control means includes cooperating ratchet teeth relatively rotatably reacting between said rotor and said housing structure and normally interengaging to prevent rotation of the rotor in a lace pay-out direction and selectively operable actuator means engageable to effect axial shifting and disengagement of said ratchet teeth.

3. A shoe lace coiler as defined in claim **1** and wherein said control means includes a manually engageable ratchet wheel of greater diameter than the maximum coil diameter of the lace coiled on said spindle portion and axially shiftably mounted in rotatable relation on said housing structure to be selectively engageable with ratchet teeth on said housing structure and drive means establishing rotary driving engagement between said ratchet wheel and said rotor.

4. A shoe lace coiler as defined in claim **3** and wherein said rotor is journaled in axially restrained relation in said housing structure and wherein said drive means is carried by said ratchet wheel and spring means react between said housing structure and said ratchet wheel normally to bias the ratchet wheel into unidirectionally rotatable engagement with the housing structure and to bias the drive means into said rotary driving engagement.

5. A shoe lace coiler as defined in claim **1** and wherein said control means includes a ratchet wheel axially shiftably mounted in rotatable relation with said rotor to be selectively engageable with ratchet teeth on said housing structure.

6. A shoe lace coiler as defined in claim **5** and wherein said rotor is journaled in axially shiftable relation in said housing structure, said control means includes an external winding knob in rotary driving and axially shifting engagement with said rotor and spring means react between said housing structure and said rotor normally to bias the ratchet wheel into unidirectionally rotatable engagement with the housing structure.

7. A shoe lace coiler as defined in claim **1** wherein said control means includes rotary spring means reacting between said housing structure and said rotor normally to urge said rotor in a lace take-up direction.

8. A shoe lace coiler as defined in claim **7** wherein said rotor is journaled in axially shiftable relation in said housing structure, said control means includes a ratchet wheel axially siftably mounted in rotatable relation with said rotor to be selectively engageable with ratchet teeth on said housing structure and spring means reacting axially between said rotor and said housing structure normally to bias said ratchet wheel against said ratchet teeth to resist rotation of the rotor in a lace pay out direction.

9. A shoe lace coiler as defined in claim **6** wherein said rotor has a spindle portion provided with a cross slot opening axially at one end thereof, said one end being journaled in said housing structure to prevent endwise escape of lace ends extending through said slot.

10. A shoe lace coiler as defined in claim **4** wherein said rotor has an enlarged head provided with an axial socket and has a reduced spindle rotatably journaled in spaced regions of the housing structure and wherein said ratchet wheel has an axial drive pin removably projecting into rotatably keyed engagement in said socket.

11. The combination with a shoe and a lace threaded in said shoe and having loose lace ends, of a lace coiler to coil and releasably hold the lace tightly drawn upon the shoe to dispose the coiler in piggy-back mounting upon the shoe, said coiler comprising a coiling rotor having a coil forming spindle portion that includes an elongated slot means extending to one of its ends for generally axially slidably receiving and gripping the lace ends adjacent extremities thereof, surrounding tubular housing structure journaling the rotor therein and separable therefrom, said tubular housing cooperatively defining an annular lace storage chamber about the spindle portion, said housing structure having a medial access window extending axially a major portion of the length of said housing structure and opening radially into said chamber for lace travel during take-up and pay-out rotation of the rotor, the width of said window being only slightly larger than the dimension of said lace for preventing manual access to said chamber, and winding control means carried by and operatively engaging said rotor and said housing structure for turning the rotor in a lace take-up direction and for holding the rotor against reverse rotation, said winding control means including a ratchet wheel axially shiftably mounted in rotatable relation with said rotor to selectively engage ratchet teeth on said housing structure.

12. The arrangement of claim **11** and wherein said spindle portion has a length several times its diameter and said ratchet wheel is of greater diameter than the coil diameter of the lace on said spindle portion.

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BERNARD A. GLEAK, *Primary Examiner.*