June 26, 1934. E. J. WITCHGER 1,964,280

TAPE MEASURE

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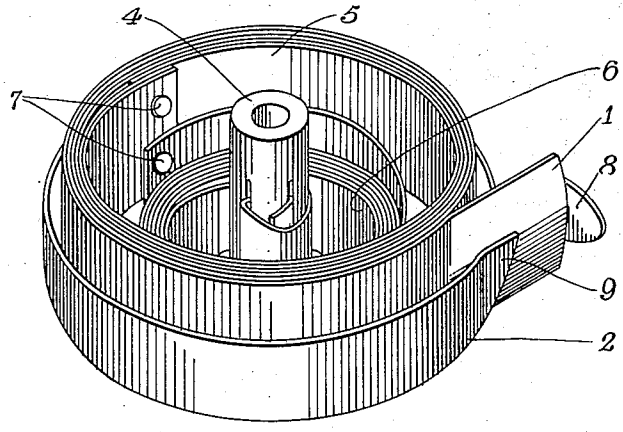

Fig. 1.

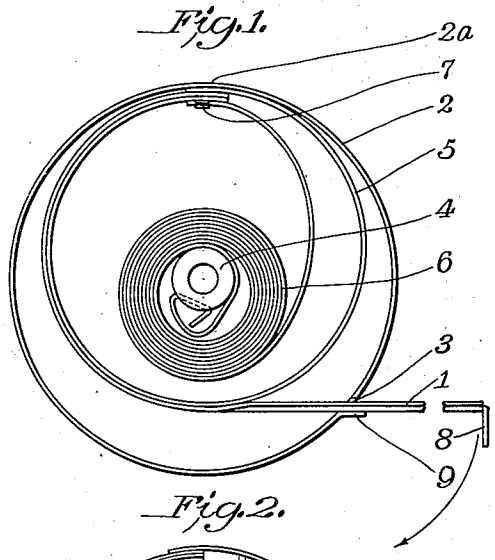

Fig. 2.

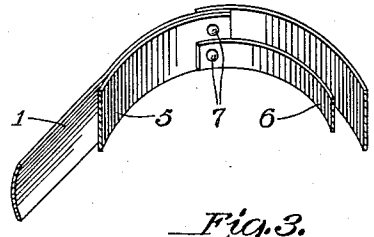

Fig. 3.

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TAPE MEASURE

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14 Claims. (Cl. 33—138)

This invention relates to measuring tapes and the like. The term "tape" is here used to designate a piece of concavo-convex or other suitable non-planar form of ribbon metal, as steel, of suitable length, thickness and curvature to be stiff and straight when extended. These self-straightening tapes are usually four feet to eight or ten feet long and can be used for taking measurements in vertical, inclined or horizontal directions.

The present improvement resides in a novel cooperative arrangement of the concavo-convex tape and a drum, a coil spring and a casing, together constituting a tape controller that enables the user to stow the tape by pushing its straight projecting portion back into the casing either step-wise or all at once, somewhat as a sword is sheathed in its scabbard.

Objects of the control device are to keep the tape in what may be called a neutral condition so it will stay wherever it is put, without undesirable tendency to shift in either direction, and without the use of ratchets, detents or similar devices; to enable the tape to be run out or back from any starting point with a very slight but uniform amount of effort, so that at every part of its length the "feel", by which the user judges the satisfactory operation of the apparatus, will always be the same or substantially so. According to this invention the usual crank for winding the tape and the usual spring-releasing button or thumb-piece are dispensed with.

Further objects are, to simplify the assembly, to minimize the number of working parts and to provide a structure that shall remain in good working order through long use.

With the foregoing and certain other objects in view, which will appear later in the specifications, the invention comprises the devices described and claimed and the equivalents thereof.

Fig. 1 is a perspective view of a tape embodying the invention, the cover of the casing being removed and the tape partly extended.

Fig. 2 is a plan view, showing the tape fully extended.

Fig. 3 is a perspective detail view showing a preferred means for fastening together the drum, the tape and the drum spring.

A tape measure embodying the claimed invention is shown in its preferred form. It consists of certain parts that are already known, namely, the concavo-convex tape 1, the casing 2 having a tape opening 3, a tape anchorage or post 4, and a cover for the casing 2 (not shown), together with certain new features, namely, a spool or drum element 5 characterized by having no bearing or similar attachment to the post, consequently being able to move freely or float within the casing in its own plane in any direction; also a coil spring element 6, preferably lighter than the usual winding spring and of less winding strength than the tape itself, its strength being appropriate to maintain correct operative balance of the tape and so insure desirable ease and smoothness of movement.

Tape 1 when free is of concavo-convex cross section but when wound on a reel or drum takes the form of a coiled flat strip.

Floating drum 5 has the form of a circular hoop and preferably is made of flexible ribbon metal that can yield to some extent during the winding and unwinding actions of tape 1 and spring 6, changing its shape from circular to somewhat elliptical. It may be constructed by bending the end of the tape into the form of a loop and fastening by an eyelet 7. If desired the drum may be made inflexible radially.

Spring 6 is connected at one end to post 4 in the usual manner and its other end is fastened to tape 1 and, in the preferred form illustrated, to drum 5. Rivets or eyelets 7 are preferably used to fasten the end of the tape to the outside of the drum and also to secure the end of the spring to the inside of the drum, as shown in Fig. 3.

Tape 1 and spring 6 are secured to drum 5 in opposite sense so that when the tape 1 is drawn out and unwinds from the drum the spring 6 winds up within the drum and vice versa.

A tape hook 8 is preferably provided at the end of the tape. At the edge of the opening 3 of the casing is an outwardly projecting lip 9 whose inner face constitutes a bearing surface upon which the convex face of the tape slides as it passes in and out. The outer end of lip 9 stops the inward movement of hook 8 when the tape is fully wound. The outer inclined face of lip 9 guides the operator's finger against the hook 8 to commence unwinding. The lip 9, however, is not essential to the operation of tapes made according to my invention in its broader aspects, as the effect of preventing unwinding, herein referred to, is imparted by that edge of the opening with which the tape normally contacts.

As regards its mode of operation this invention is characterized by utilizing the inherent tendency of a coiled concavo-convex tape to unwind its outermost coil with a rotary angular sweeping movement of its free end, as indicated by the arrow in Fig. 2. Since the free end of the coil

projects out through the opening 3 of the casing it can not sweep around, but by its reactionary force it shifts the floating drum 5 sidewise, compelling the drum, or the outermost convolution of the tape, to bear frictionally against the remote inner wall 2a of casing 2. A braking pressure is thus applied to the tape.

The function of spring 6 is to maintain a winding-up tendency sufficient to prevent the tape from buckling or choking when pushed into the casing by hand, but not sufficient to overcome the friction within and exerted upon the tape and so pull the tape into the casing unaided.

Spring 6 is differentiated from the tape actuating springs of known tape measures in that the earlier power spring actuated the drum to suddenly and forcibly pull the tape into the casing whenever the drum was released by pressing a button located on the side, whereas according to this invention a spring 6 is selected whose winding strength is insufficient to overcome the braking effort that is caused by the tape itself. Consequently the tape will tend to stay in any extended position in which it is put.

Pulling the tape outwardly from the drum automatically relieves the frictional pressure at 2a and winds up spring 6.

Pushing the tape into the casing 2 through opening 3 overcomes the braking friction at 2a and is assisted by the tendency of spring 6 to wind the tape on the drum.

The force required to move the tape in or out is always slight and is practically a constant amount. It has been proven in practice that this invention renders it impossible for the tape to bulge and lock or choke in the casing at any stage of the coiling operation, regardless of the thickness or thinness of the accumulated coil.

The embodiment which I have illustrated is preferred because the end-fastened loop constituting the drum element 5 imparts to the tape throughout its whole working range a very accurately balanced and smooth push-pull operation. However, with the loop-fasteners omitted the first few convolutions of the tape itself, when encircling the spring 6, are substantially like the drum 5 in their mode of operation, and the omission of the loop-fasteners slightly decreases the cost of manufacture.

In the appended claims, I have pointed out the essential elements of my invention, it being understood, however, that the claims are not intended to be limited to the form of the parts illustrated and described further than a limitation to the described form is necessary to distinguish them from the prior art.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In combination a casing having a tape opening in its peripheral wall and a central post, a drum adapted for translatory and rotary shifting movements in its own plane relatively to the casing, a coil spring secured at its ends to the drum and to the post respectively, a resilient tape of normally concavo-convex cross sectional shape having an end secured to said drum for winding flatwise thereon and having a hook at its other end, said tape projecting through said opening, and an outwardly projecting lip at the margin of said opening.

2. In combination a casing having a tape opening in its peripheral wall, a drum adapted for shifting movements in its own plane inside the casing, a resilient tape of normally concavo-convex cross sectional shape having an end secured to said drum for winding flatwise thereon, said tape projecting through said opening and there engaging the peripheral wall of the casing whereby resilient stresses within the tape normally tending to unwind it from the drum are directed to yieldingly urge the drum toward the wall of the casing remote from the tape opening, and spring means within the drum tending to wind the tape thereon, the strength of said spring means being such that its maximum tension is insufficient to overcome the friction between said drum and the wall of the casing.

3. A tape measure having, in combination, a casing, a floating rotatable drum therein, a resilient concavo-convex tape secured to said drum, an abutment for said tape associated with the casing and constraining the tape against normal tendency to straighten and a winding spring for said tape operative within said drum, the strength of said spring being insufficient to wind the tape unaided.

4. In combination a casing having a tape opening in its peripheral wall, a drum adapted for shifting movement in its own plane inside the casing, a resilient tape of normally concavo-convex cross sectional shape having an end secured to said drum for winding flatwise thereon, said tape projecting through said opening and there engaging the casing whereby resilient stresses within the tape normally tending to unwind it from the drum are directed to yieldingly urge the tape wound on the drum into frictional engagement with the wall of the casing at a place remote from the tape opening.

5. In combination a casing, a floating drum inside the casing, a resilient tape of normally concavo-convex cross sectional shape having an end secured to said floating drum for winding thereon, a part of said tape projecting from said casing and engaging therewith, whereby the floating drum and the tape thereon are urged frictionally against the said casing and the tape is constrained against normal tendency to unwind from said drum.

6. In combination a casing having a tape opening, a drum adapted for sidewise shifting movements in its own plane inside the casing, a resilient tape of normally concavo-convex cross sectional shape having an end secured to said drum for winding thereon, said tape projecting from said opening and engaging the peripheral wall of said casing, the arrangement being such that the stresses within the tape normally tending to straighten it when coiled are caused to urge the drum toward the periphery of the casing and to force the tape yieldingly against the wall of the casing remote from the tape opening.

7. A tape measure having, in combination, a casing, a winding spring within the casing and anchored at one end thereto, a concavo-convex tape, means securing said tape to said spring, an abutment on the casing adapted to constrain the tape against its normal tendency to straighten, the spring tending to hold the tape in its wound position and being of a strength insufficient to wind the tape unaided.

8. In combination with a casing having a tape opening, a resilient measuring tape of concavo-convex cross-sectional shape and a coil spring anchored at its inner end to the casing, means operatively connecting the tape to the spring, the arrangement being such that the tape when being pulled out from the casing serves to wind the spring upon itself, the strength of said spring tending to hold the tape in its wound position and

being insufficient to wind the tape unaided but sufficient to facilitate the winding of said tape into a coil when the extended portion of the tape is pushed into the casing.

9. In combination with a casing having a tape opening, a resilient measuring tape of concavo-convex cross-sectional shape and a coil spring anchored at its inner end to the casing, its outer end being operatively secured to the tape, and tending to hold the tape in its wound position, the arrangement being such that the tape when being pulled out from the casing serves to wind the spring upon itself, the resilience of the tape and the resilience of the spring being so correlated that the strength of the spring is sufficient to facilitate the coiling of said tape, when the extended portion of the tape is fed into the casing by exerting thereon lengthwise thrust, whereby any undesirable degree of frictional engagement between the convolutions of the tape and the wall of the casing is avoided.

10. A casing having a peripheral opening, a concavo-convex rule adapted to be wound into an externally wound coil within the casing and having an inherent tendency to uncoil and assume a rectilinear rod-like state, and a coil spring within the casing and rule coil, said spring having its inner end anchored to the casing and its outer end operatively connected to the inner end of the measuring rule, and tending to hold the tape in its wound position, the tension of said spring and the friction of the associated parts being so related as to approximately counterbalance the tendency of the measuring rule to uncoil.

11. In a tape measure having a casing with a tape opening and a spring-anchoring means and a resilient tape of non-planar cross sectional shape, a winding spring element of a strength insufficient to wind the tape unaided, said spring element being interposed between and operatively connecting the anchoring means and the tape and tending to hold the tape in its wound position so that there is imparted to the tape a tendency to remain in approximately whatever extended situation it may be placed by pushing or pulling efforts applied to the extended portion of the tape in the direction of its length.

12. In a tape measure, a means for keeping a tape of the non-planar push-pull type in neutral condition with respect to forces that tend to produce undesirable creeping movements thereof, said means comprising a winding spring anchored to the casing and mounted within the convolutions of the tape and operatively connected thereto, and tending to hold the tape in its wound position, the winding strength of said spring being insufficient to wind the tape unaided, but sufficient to effect the winding of the inner convolutions of the tape when its outer end is manually pushed in the direction of its length toward said spring.

13. In combination, a casing, a free floating drum element without any direct attachment to the casing and adapted for sidewise shifting movements in its own plane inside the casing, a resilient tape of normally non-planar cross-sectional shape, having an end secured to said drum element for winding thereon, a part of said tape projecting from said casing, abutment means adapted to be contacted by the tape and to constrain the wound portion of the tape from its normal tendency to assume a straight position.

14. In combination, a casing formed with a tape opening, a winding spring within the casing and anchored at one end thereto, a self-straightening tape of non-planar cross-section secured at one end to said spring, an edge of the tape opening in the wall of the casing being adapted to constrain the tape against its normal tendency to straighten, said spring tending to hold the tape in its wound position but being of insufficient strength to wind the tape unaided.

EUGENE J. WITCHGER.