June 6, 1950 F. O. CARLSON 2,510,939

RULER CONSTRUCTION

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Fig. 1.

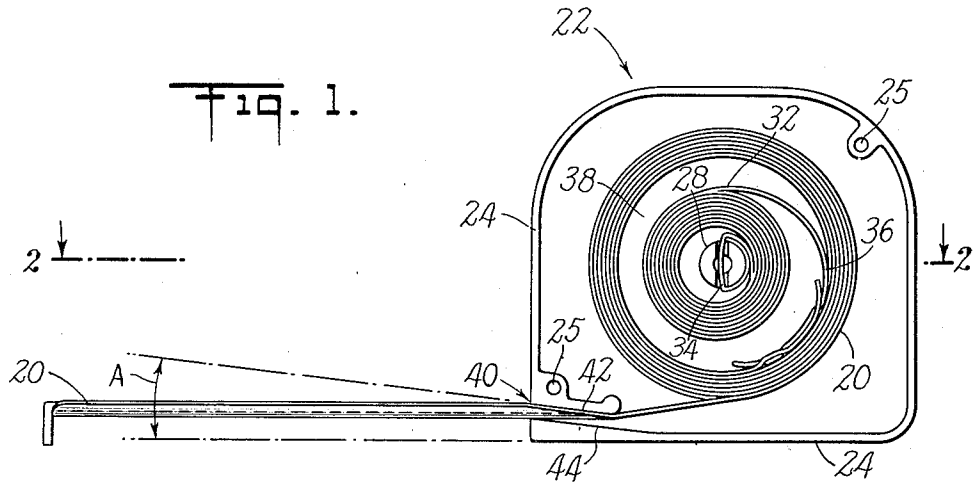
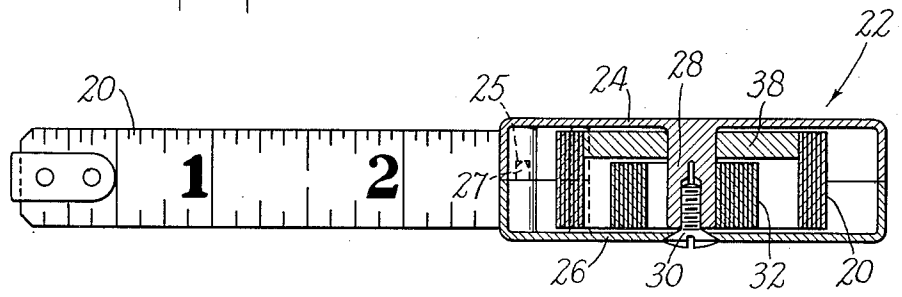


Fig. 2.



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Fig. 3.

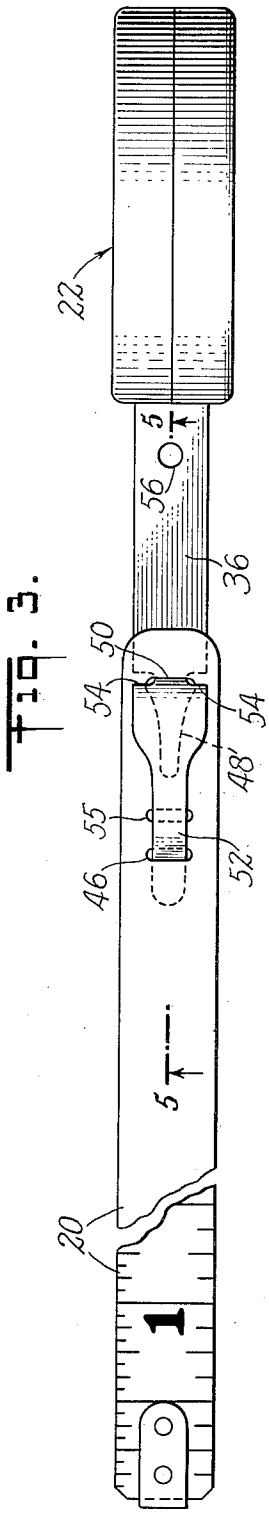


Fig. 4.

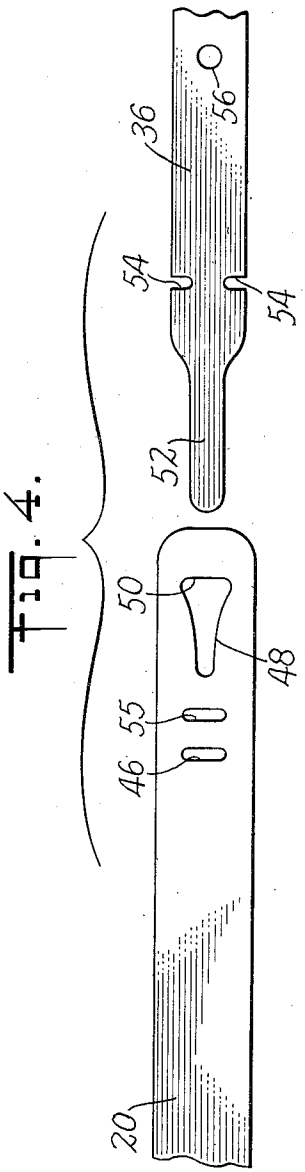
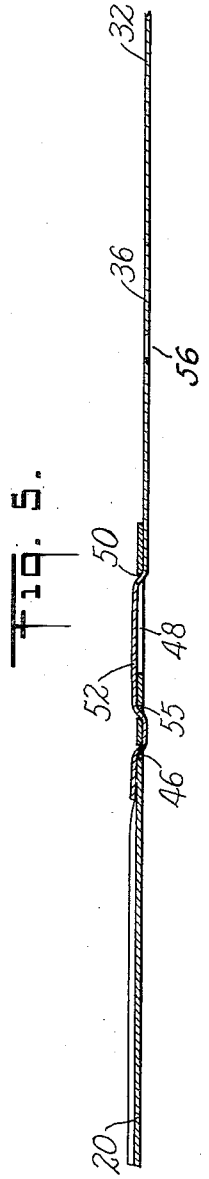


Fig. 5.



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RULER CONSTRUCTION

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Application February 15, 1945, Serial No. 578,036

18 Claims. (Cl. 242—84.9)

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This invention relates to steel rulers. More particularly it pertains to tape-like rulers which are coiled in a case and withdrawn therefrom for use.

Coiled steel rulers and tape measures are well-known. In the past they have taken various forms, sometimes involving a ratchet-wind principle, sometimes depending wholly upon a coiled wind-up spring, and in still other instances they have been so associated with a case as to use no spring characteristic other than that of their own inherent resilience. These constructions have evinced various disadvantages. For example, with the ratchet-wind principle the measuring element itself often was made from linen or some other flexible, relatively nonresilient material in order that the ratchet and spring could control the tape. Nonmetallic rulers are commonly inaccurate because of stretching with use, and the nonresilient rulers are not sufficiently durable nor adequately constituted for use under many conditions. In steel rulers of the type wherein the ruler is constantly urged into the case in coiled formation by means of an inner wind-up spring, either with or without the aid of some braking action, the ruler itself is subjected to substantial wear each time it is withdrawn or rewound because of frictional movement between adjacent surfaces of the individual coils within the ruler case. As the end of such a ruler is withdrawn, the outer loop of the coil tends to tighten on the inner loops, thereby giving a wearing action which in time will remove the printed matter from the surfaces of the ruler. Correspondingly, when the ruler is allowed to return to the case, there is considerable frictional engagement between the various surfaces of the coils as they are wound progressively tighter, one within another.

Still other rulers use a steel concavo-convex tape which depends upon a winding action about a loop at the inside end of the ruler and onto which the ruler is wound. The loop is not mounted upon a fixed center and the ruler winds and unwinds with an eccentric cam-like motion which wipes its surfaces against the interior of the case. This construction also suffers the common disadvantage that the ruler cannot be pulled entirely from the case to make possible an easy ruler replacement. This disadvantage is present in all constructions where the inner end of the ruler is attached to a wind-up drum. This has meant that when a ruler required replacement, it was necessary that the unit be returned to the manufacturer in order that he might open the

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case, disconnect the damaged ruler and attach a new ruler. Such replacements within a factory are not difficult where special tools are available and operators, skillful in the manipulation of the elements, are at hand. But it has long been an inconvenience to the user that neither he nor his dealer was able to effect the replacement himself without delay.

I have devised a type of construction using a ruler case of conventional size and shape and a steel ruler of the concavo-convex type wherein the ruler may be withdrawn freely and smoothly from the case without friction between adjacent coils of the ruler or between the ruler and interior portions of the case, and wherein the ruler may be entirely withdrawn from the case so that a replacement of the ruler may be made easily without resorting to the present practice of returning the ruler unit to the factory. My ruler is carried in the case in a compact coil of a predetermined size and it is connected to a wind-up spring which tends to keep the tape coiled within the case. The relationship between the compact coil and the opening in the case through which the end of the ruler is drawn is such that the ruler will remain in any desired withdrawn position. The case is arranged to provide a slight braking action on the ruler, which action may readily be removed to permit the ruler to return to the case under the power of the wind-up spring. And the entire case is such that it may be made from two simple die castings secured together by a single screw.

It is an object of the present invention to provide a device of the character described having to a notable extent the characteristics and capabilities above set forth. Another object is the provision of a steel ruler of the windable type wherein friction between adjacent loops of the ruler is eliminated, thus avoiding wear upon the printed matter thereon. A further object is to prevent friction between the coiled ruler and its case. Another object is the provision of a coiled steel ruler and case assembly having a free and smooth ruler winding action. An additional object is the provision of a steel ruler and case assembly wherein the ruler may be wholly uncoiled and withdrawn from the case and disconnected therefrom without resorting to opening the case. A still further objective resides in the provision of a special connection between ruler and wind-up spring which may be made easily without special skills or tools. Other objects will be in part pointed out as the description proceeds and will in part become apparent therefrom.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts as will be exemplified in the structure to be hereinafter described and the scope of the application of which will be set forth in the accompanying claims.

In the accompanying drawings a preferred embodiment of the invention is illustrated in which:

Figure 1 is an elevational view of the ruler and case, the cover of the case having been removed;

Figure 2 is a sectional plan view through the case taken along the line 2—2 of Figure 1;

Figure 3 is a plan view of the structure of Figure 1, showing the ruler extended to expose a detachable connection with the wind-up spring;

Figure 4 is a fragmentary detail showing the ruler and spring disassembled; and

Figure 5 is a sectional view taken along the line 5—5 of Figure 3.

A concavo-convex steel tape ruler 20 is shown in assembled position within a case generally indicated at 22. The case consists of a base plate 24 and a cover plate 26 (see Figure 2). Base plate 24 is provided with base seats 25 and cover plate 26 is provided with cover studs 27 so that the two case plates may always be assembled and held in correct alignment with respect to each other.

Base plate 24 is provided with a center post 28 which is cored or tapped for the reception of an assembly screw 30. A wind-up spring 32 is positioned around center post 28 with its inner end 34 rigidly fixed therein. The outer end 36 of wind-up spring 32 is connected in a manner to be described hereinafter to the interior end of steel ruler 20.

A roller 38 is journaled upon center post 28 and is positioned beside wind-up spring 32 (see Figure 2). Steel ruler 20 is wound about the periphery of roller 38. As shown, ruler 20 has a width approximately equal to the combined widths of wind-up spring 32 and roller 38.

The outer end of ruler 20 is brought through an opening generally indicated by 40 within case 22. Opening 40 is associated with an upper ruler guide 42 and a lower ruler guide 44 which in the embodiment shown take the form of a pair of parallel, ramp-like surfaces between which the ruler passes. It is to be observed that these guides are set at a slight angle with respect to the plane determined by the bottom of the case. This angle is indicated by A. In the construction shown angle A is on the order of 6°. It is further to be observed that the flight of the tape between the point where it comes into contact with upper guide 42 and the point at which it is tangent to the ruler coil forms a small angle with respect to the plane determined by the bottom of the case. This angle in the present embodiment also is on the order of 6° or 7°. Attention is directed to the fact that as the ruler is withdrawn, the pull of the wind-up spring increases, but that simultaneously this last-mentioned angle correspondingly increases as the ruler coil grows smaller, thus giving an increased cramping action against the ruler guides to counter act the increase of the pull of the spring. Hence a balance between spring pull and ruler guide friction is at all times assured. The optimum ruler cramping angles for different combinations will depend, among other factors, upon the strength of the wind-up spring, the inherent resilience of the ruler, and the contact areas between ruler and case.

With the arrangement illustrated the outer end of ruler 20 may be withdrawn from the case any desired amount and thereafter the cramping action upon the ruler by the upper and lower guides is sufficient that wind-up spring 32 will not draw the ruler into its coiled position. However, spring 32 is sufficiently strong that if the advanced end of ruler 20 is lifted slightly, so that it no longer engages ruler guide 44, or engages this guide to a sufficiently reduced degree, spring 32 will draw the ruler into its coiled position within the case. This may be effected in some embodiments by turning the unit upside down so that the force of gravity sufficiently removes the contact between the convex side of the ruler and ruler guide 44. Thus the case includes a built-in ruler control having no moving parts nor any fragile nor easily broken construction. The two case plates may be made commercially as simple castings.

In order that easy replacement of a rule may be made I have provided a detachable connection between ruler and wind-up spring which is of particular utility, in the sense that it may be made without special tools or skills and operates equally well regardless of which of the two possible assembled relationships is used, and at the same time may be so constructed and arranged that it will pass readily through the ruler guides to the exterior of the case without danger of catching or jamming. The interior end of ruler 20 (see Figure 3) is provided with a cross slot 46 and an elongated hole 48 having an abutment edge 50. The outer end 36 of wind-up spring 32 is provided with a tongue 52 and notches or recesses 54, forming a shouldered portion. With the arrangements of parts illustrated, ruler 20 may be attached to wind-up spring 32 by passing tongue 52 through hole 48 at an angle to the ruler and thereafter positioning the spring and ruler in alignment with each other with slots 54 in holding engagement with abutment edge 50 of hole 48. Tongue 52 may then be sprung slightly and passed downwardly, as shown in Figure 3, through cross slot 46. To enhance the facility with which the connection may pass to or from the case, a second cross slot 55 may advantageously be employed as shown in Figure 5, with tongue 52 interlaced downwardly through slot 55 and upwardly through slot 46. The resulting compound connection between spring and ruler assumes a substantially flat configuration as indicated in Figure 5 and it is sufficiently flexible that it may be repeatedly rolled and unrolled on the coil within case 22 without undue wear between the parts and without danger of becoming disconnected. Furthermore, it is immaterial whether the connection is made with tongue 52 on top, as in Figure 3, or on the bottom. In either event a connection is made which remains substantially smooth and flat through all degrees of flexing encountered during operation.

I have found it convenient to provide a locking hole 56 spaced inwardly from the outer end of wind-up spring 32 so that when the outer end of the spring is withdrawn from the case a pencil point, wooden match, or paper clip, or other suitable small object may be pushed through the hole to form a locking pin preventing the end of the spring from slipping back into the case. Thus it is an easy matter to lock the outer end of the spring on the exterior of the case so that the case may be readily disconnected from the ruler

without danger of the spring snapping into an inaccessible position inside the case. It is apparent that the coiling of the wind-up spring necessarily must be such that the outer end of the spring can be withdrawn from the case before the coils become so tightly wound as to prevent further withdrawal if the ruler replacement feature of my invention is to be employed.

From the foregoing it will be seen that a ruler construction made in accordance with the present invention is well adapted to attain the ends and objects hereinbefore set forth and to be economically manufactured, since the entire mechanism is suited to common production methods and is susceptible of a wide latitude of variations as may be desirable in adapting the invention to different applications.

As various embodiments may be made of the above invention and as changes might be made in the embodiment above set forth, it is to be understood that all matter hereinbefore set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. A case for a steel ruler of the concavo-convex type including a roller rotatable upon a fixed axis and adapted to serve as a spool upon which a ruler may be wound, said case having an opening through which the ruler may pass, and ruler guide means associated with said opening; said guide means being shaped and positioned to define a ruler passageway having an axis lying at a small angle with respect to a line drawn from said case opening tangent to the circle defined by the outer coil of the ruler when fully wound on said roller and lying at a slightly greater angle with respect to a line drawn from said case opening tangent to the circle defined by the roller, whereby the ruler portion occupying at any given time said passageway is subjected to a slight bend which is least when the ruler is fully coiled within the case and becomes progressively greater as the ruler is withdrawn, and whereby said imposed bend serves to resist the inherent tendency of the coiled ruler to move.

2. A case for a coiled steel ruler of the concavo-convex type including an opening through which the ruler may pass as it is uncoiled, and ruler guide means associated therewith; said guide means including a lower surface adapted to engage a portion of one side of the ruler and an upper surface spaced therefrom and adapted to engage a portion of the other side of the ruler, said surfaces defining a ruler passageway having an axis positioned at a small angle with respect to a line drawn from said case opening tangent to the circle defined by the outer coil of the ruler when fully contained within said case and positioned at a slightly greater angle with respect to a line drawn from said case opening tangent to the circle defined by the inner coil of the ruler, whereby a bend is imposed upon the ruler and serves to resist the inherent tendency of the coiled ruler to move.

3. In measuring devices of the character described, the combination including a case having a ruler opening and a center post therein, a roller rotatable upon said center post and adapted to serve as a spool upon which to wind a tape-like ruler, a wind-up spring beside said roller and coiled about said center post having its inner end affixed with respect thereto, and a tape-like ruler wound upon said roller and having its inner end affixed to the outer end of said wind-up

spring and having its outer end passing through said ruler opening; the combined width of said roller and wind-up spring being approximately equal to the width of said ruler, whereby the entire ruler and the outer end of said wind-up spring may be withdrawn from the case through said opening.

4. A case for a steel ruler of the concavo-convex type including a center post therein, a roller freely rotatable upon said center post and adapted to serve as a spool upon which to wind a tape-like ruler, and a wind-up spring coiled about said center post and having its inner end fixed with respect thereto, and having a locking hole positioned in spaced relationship with respect to its outer end; said case having a ruler opening of predetermined cross-sectional dimensions for the passage of the ruler into and out of the case, the cross-sectional dimensions of the outer end portion of said spring being less than those of said opening and said wind-up spring being of sufficient length to enable its outer end and said locking hole to be drawn by the ruler through said ruler opening to a point outside of said case before the coiled spring portion within the case reaches a tightly-wound condition.

5. In measuring devices of the character described the combination including a case having a ruler opening and a center post therein, a roller rotatable upon said center post and adapted to serve as a spool upon which to wind a tape-like ruler, a wind-up spring beside said roller and coiled about said center post and having its inner end fixed with respect thereto and having a locking hole adjacent its outer end, and a tape-like ruler wound upon said roller and having its inner end detachably affixed to the outer end of said wind-up spring and having its outer end passing through said ruler opening; the combined width of said roller and wind-up spring being approximately equal to the width of said ruler, whereby the entire ruler and the outer end of said wind-up spring may be withdrawn from the case through said opening and thereafter may be locked with respect thereto by means of a pin through said locking hole.

6. In a ruler construction of the character described, a wind-up spring including a tongue and slot arrangement in its outer end adapted to cooperate with a steel ruler in making a renewable connection therewith.

7. In a ruler construction of the character described, a wind-up spring including a tongue and slot arrangement in its outer end adapted to cooperate in making a renewable connection with a steel ruler, and a locking hole spaced inwardly along the spring from said tongue and slot arrangement.

8. A ruler construction of the character described and including, in combination, a case having a ruler opening therein, a wind-up spring member attached at its inner end to the interior of the case and having attachment means at its outer end adapted to pass through said ruler opening to the exterior of the case, and a ruler member having cooperating attachment means at its inner end adapted to engage with the attachment means of said spring member in a replaceable connection and to pass through said ruler opening to the interior of the case; said attachment means comprising an interlocking slot construction, and additionally including an interlaced tongue construction, whereby the slot construction may be flexed in either direction

without causing objectionable projection of a free end of one of said members.

9. A case for a steel ruler of the concavo-convex type including a center post therein, a roller freely rotatable upon said center post and adapted to serve as a spool upon which to wind a tape-like ruler, and a wind-up spring coiled about said center post and having its inner end fixed with respect thereto, and having attachment means at its outer end; said case including a ruler opening of predetermined cross-sectional dimensions for the passage of the ruler into and out of the case and the cross-sectional dimensions of the outer end portion of said spring being less than those of said opening, and said wind-up spring being of sufficient length to enable its outer end to be drawn through said ruler opening to a point outside of said case before the coiled spring portion within the case reaches a tightly-wound condition.

10. In a ruler construction: a case, and a ruler wind-up spring normally coiled and contained within the case; the inner end of said spring being fixed within the interior of the case, the outer end of said spring including one part of a coupling shaped to interlock with a corresponding part of a steel ruler to form a renewable connection therewith, said one part embodying a transversely disposed edge portion forming an abutment facing away from the outer end of the spring and adapted to engage in pulling relationship with an abutment on said corresponding part, and said wind-up spring being of sufficient length to enable its outer end to be drawn from the case before the coiled remainder within the case reaches a tightly-wound condition.

11. A ruler construction including a case having a ruler opening of predetermined size, a wind-up spring member fixed at its inner end to the interior of the case and having coupling means at its outer end, a ruler member having cooperating coupling means at its inner end, said two coupling means normally being joined to secure said ruler member to said spring member in overlapping position, the over-all dimensions of said joined couplings being less than those of said opening whereby the joint may pass through said opening, said spring member being of sufficient length to permit its outer end to be withdrawn from the case by said ruler member before the coiled remainder of said spring member within the case becomes tightly wound; one of said coupling means including a hole, the other including a shouldered portion, said shouldered portion being adapted to pass through and interlock with said hole; and one of said members having a bendable tongue at its end adapted to extend into contact with and bear against the opposite surface of said other member to bias said members together in a relatively flat surface-to-surface configuration.

12. A ruler construction including a case, a wind-up spring member, normally coiled within said case, having its inner end attached to an interior portion of said case and having coupling means at its outer end, an opening in said case, a ruler guide incorporated in said case defining a ruler passageway leading to said opening, a ruler member coilable within said case around said spring member, coupling means operatively integral with said ruler member at its inner end normally joined to the coupling means of said spring member, said ruler member being led through said passageway, its free end lying outside of said opening, so that as the ruler member is withdrawn it passes progressively through said passageway, said ruler member being provided with an abutment at its outer end serving to prevent that end of said ruler member from being drawn into the case; said passageway being so disposed that its axis lies at a small angle to a line drawn from said opening tangent to the outermost coil of said ruler member when the latter is fully coiled therein, and at a greater angle to a line drawn from said opening tangent to the outermost coil of said spring member, whereby limited frictional resistance to movement is imposed by the passageway upon the ruler member; one of said coupling means including a hole, the other including a shouldered portion, said shouldered portion being adapted to pass through and interlock with said hole; and one of said members having a bendable tongue at its coupling end adapted to be bent into contact with and bear against the surface of said other member opposite to that occupied by said shouldered portion to bias said members together in a relatively flat surface-to-surface configuration, the over-all dimensions of said couplings when joined being less than those of said opening and less than those of said passageway, whereby the joint may pass through said passageway and said opening into and out of the case, and said wind-up spring member being of sufficient length to permit its outer end to be drawn from the case by said ruler member.

13. In a ruler construction: a case, and a spring-powered wind-up device within the case having a free end capable of attachment to the end of a flexible ruler; said free end including one part of a coupling shaped to interlock with a corresponding part of a steel ruler to form a removable connection therewith, said first-named part embodying a recessed edge therein formed to present a shoulder, and said device having an effective length sufficient to enable its free end to be drawn from the case.

14. In a ruler construction: a case, a spring-powered wind-up device within the case having a free end provided with coupling means for attachment to the end of a flexible ruler, a ruler coiled about the wind-up device provided at its inner end with coupling means joined to the coupling means of said device, an opening in the case through which the outer end of said ruler passes, said opening being large enough for the joined coupling means to pass therethrough, and said device having an effective length sufficient to enable its free end to be drawn from the case through said opening.

15. In a ruler construction: a case, a spring-powered wind-up device within the case having a free end provided with coupling means for attachment to the end of a flexible ruler, a ruler coiled about the wind-up device provided at its inner end with coupling means joined to the coupling means of said device, an opening in the case through which the outer end of said ruler passes, a pair of opposing surfaces within the case defining a ruler passageway leading to said opening, said opening and said passageway being large enough for the joined coupling means to pass therethrough, said passageway having an axis lying at a small angle with respect to a line drawn from said opening tangent to the circle defined by the outer coil of the ruler and lying at a slightly greater angle with respect to a line drawn from said opening tangent to the circle defined by the inner coil of the ruler, whereby the ruler portion occupying at any given time said

passageway is subjected to a slight bend which is least when the ruler is fully coiled within the case and becomes progressively greater as the ruler is withdrawn, and said device having an effective length sufficient to enable its free end to be drawn from the case through said opening.

16. A measuring device comprising a case for a coiled steel ruler of the concavo-convex type including an opening through which the ruler may pass as it is uncoiled, ruler guide means associated therewith including a lower surface adapted to engage a portion of one side of the ruler and an upper surface fixedly spaced therefrom and adapted to engage a portion of the other side of the ruler, and a concavo-convex steel ruler partially coiled and mounted to wind and unwind within the case and having a portion extending from the coil and through the guide means and opening to a point of access outside of the case, the ruler coil being so positioned that one side of the ruler as it passes through the guide means is constrained into contact with the lower guide surface and the other side of the ruler as it passes through the guide means is constrained into contact with the upper guide surface, the ruler-to-guide surface contacts thus resulting creating frictional resistance to free passage of the ruler through the guide means, the axis of the uncoiled ruler portion lying at any time in the guide means defining an angle less than a straight angle with reference to that portion of the ruler extending between the upper guide surface and the coiled ruler portion, which angle decreases as more of the ruler is drawn from the coil through the guide means.

17. A ruler construction including a case having a ruler opening of predetermined size, a wind-up spring member fixed at its inner end to the interior of the case and having coupling means at its outer end, a ruler member having cooperating coupling means at its inner end, said two coupling means normally being joined to secure said ruler member to said spring member in overlapping position, the over-all dimensions of the joined couplings being less than those of said opening whereby the joint may pass through said opening, said spring member being of sufficient length to permit its outer end to be withdrawn from the case by said ruler member before the coiled remainder of said spring member within the case becomes tightly wound, one of said coupling means including an elongated hole having one dimension across the hole greater than another, the other coupling means including a shouldered portion, said shouldered portion being adapted to pass through said hole at its one dimension and to interlock with the edges defining said hole in the region of its lesser dimension, and said outer end of said wind-up spring including a locking hole spaced inwardly along the spring from the coupling means and adapted to receive a locking pin for holding the coupling means against retraction into the case.

18. A ruler construction including a case having a ruler opening of predetermined size, a wind-up spring member fixed at its inner end to the interior of the case and having coupling means at its outer end, a ruler member having cooperating coupling means at its inner end, said two coupling means normally being joined to secure said ruler member to said spring member in overlapping position, the over-all dimensions of the joined couplings being less than those of said opening whereby the joint may pass through said opening, said spring member being of sufficient length to permit its outer end to be withdrawn from the case by said ruler member before the coiled remainder of said spring member within the case becomes tightly wound, one of said coupling means having an inner face on one side and an outer face on the other side and including an elongated hole therethrough having one dimension across the hole greater than another, the other coupling means including a shouldered portion, said shouldered portion being adapted to pass from the inner face side of said one coupling means through said hole at its one dimension and to interlock with the edges defining said hole on its outer face side in the region of its lesser dimension, said one coupling means additionally including a second hole, said other coupling means additionally including a second portion, said second portion being adapted to pass through said second hole into engagement with the outer face of said one coupling means, and said outer end of said wind-up spring including a locking hole spaced inwardly along the spring from the coupling means and adapted to receive a locking pin for holding the coupling means against retraction into the case.

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