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(54) COILABLE RULE

(71) We, THE STANLEY WORKS, a Corporation organised and existing under the Laws of the State of Connecticut, United States of America, of 195 Lake Street, New Britain, State of Connecticut, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to coilable rules which utilize a coilable measuring tape and is particularly concerned with the provision of such a rule incorporating a control for controlling the speed of retraction of tape when oscillations of the tape occur.

Springs used in coilable rules for the automatic retraction of measuring tapes have considerable torque, and as a result, the hook at the end of the tape normally engages the tape casing at the end of retraction with considerable impact. While springs used in such rules are designed to provide a lessening torque as the retraction of the tape approaches the termination of retraction, there is a substantial amount of shock impact on the hook as it strikes the casing to suddenly absorb the momentum of the rotating convolutions of coiled tape.

The present invention provides a coilable rule comprising a rigid casing having a mouth, a coilable measuring tape of concavo-convex cross-section, a spring having one end secured within said casing and the other end secured to said tape, said spring being operable for the automatic retraction of said tape into said casing through said mouth, a stop at the free end of said tape for preventing the tape from being fully retracted into the casing, fixed guide means disposed within the casing in alignment with said mouth for guiding the tape through said mouth, and a decelerator positioned between the mouth and said fixed guide means and comprising a soft resilient member within the casing adjacent the path of travel of the tape which is frictionally engageable therewith during retraction if the tape oscillates as it approaches the end of retraction, said decelerator having upper and lower

curved surfaces to define with the fixed guide means a tunnel aperture crescent shaped in transverse cross-section for the passage of the tape, said guide means having a rigid surface positioned to hold the tape out of contact with the decelerator except during the oscillation of the tape.

A better understanding of the invention will be obtained from the following detailed description and the accompanying drawing of illustrative embodiments of the invention.

In the Drawing:

Fig. 1 is a side elevational view of a coilable rule, partly broken away, according to one form of the present invention;

Fig. 2 is an enlarged fragmentary front elevational view of the coilable rule of Fig. 1;

Fig. 3 is a fragmentary cross-sectional view taken along the lines 3—3 of Fig. 2;

Fig. 4 is a perspective view of a decelerator utilized in the practice of this invention; and

Fig. 5 is a fragmentary cross-sectional view similar to Fig. 3 showing another preferred form of decelerator.

Referring now more particularly to the accompanying drawing, the coilable rule as shown comprises a two-piece molded rigid plastic casing 10 mounting a central fixed shaft 12 to which one end of a coiled spring 14, which serves as a drive spring is fixed. The spring 14 is stressed to return the coilable measuring tape 16 into a recoiled position within the casing 10. A latching brake 18 is shown as being provided to releasably secure the tape 16 in any extended position. The tape 16 is of concavo-convex cross-section.

A tape hook 22 is provided at one end of the measuring tape 16 for preventing the tape from being fully retracted into the casing and is secured thereto by any suitable means such as rivets, not shown. The measuring tape 16 is extendible and retractable out of the tape casing 10 through a mouth 24 formed in the front wall of the casing adjacent the bottom wall of the casing. Tape 16 is formed of a suitable material, such as spring steel, and its innermost end

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is suitably connected to the spring 14 so as to automatically be driven thereby into retracted position in the casing 10 when the measuring tape is released from any extended position.

As so far described, the coilable rule is more fully disclosed and claimed in U.S. Patent Specification 3,214,836.

A shaped tunnel within the casing adjacent the mouth 24 provides a path for the passage of the tape into and out of the casing 10. The shaped tunnel is formed by guide means comprising a pair of curved inclined upper surfaces 20 which are molded integrally with the casing and extend from the side walls thereof, and a decelerator 26 disposed between the surfaces 20 and the mouth 24 formed in the front wall of the casing. The decelerator provides curved walls or surfaces 27, 29 to form with the surfaces 20 a crescent shaped tunnel aperture 28 through which the measuring tape 16 passes. The decelerator is formed of a suitable soft natural or synthetic resilient material having a high coefficient of friction, such as a urethane elastomer or a soft vinyl or natural or synthetic rubber, preferably having a Shore "A" durometer hardness of about 70—75. As shown in Fig. 2, the inclined surfaces 20 are disposed intermediate the curved walls 27, 29 of decelerator 26 which are spaced so as to freely permit the extension of the tape 16 for making a measurement and so that the surfaces 20 normally hold the tape out of contact with walls 27, 29. The curvature of the cross-section of the tape 16 is slightly greater than that of curved walls 27, 29 of the decelerator 26 and slightly less than that of the inclined surfaces 20.

During retraction, the spring 14 imparts an accelerating force on the tape 16 while retracting the same. It will be apparent that the force, which is stored in the spring as the tape is extended, is dissipated as the successive convolutions of the tape are retracted and is concurrently converted, in part, to an increased momentum of the rotating coiled portion of the tape.

Due to the varying camber, gravity and other forces acting on the extended portion of the tape in a direction normal to its path of retraction, there occurs, during retraction, a deviation in the position of the tape from the central axis of the tunnel aperture 28 in the vertical and/or the lateral directions as viewed in Fig. 2. Since the tape is a resilient member and is of concavo-convex cross-section, any such deviation of the extended portion of the tape will cause it to oscillate to-and-fro vertically and/or laterally relative to such axis during retraction due to reaction forces with the rigid surfaces 20.

Where lateral to-and-fro oscillations have

sufficient amplitude, the edges of the upper surface of the tape 16 will engage the convex surface 27 of the decelerator which, in addition to impeding further lateral movement of the tape, provides a friction force acting to retard the retraction speed of the tape. It will be apparent that such a frictional force increases as the amplitude of oscillation increases.

Similarly, vertical oscillations, or whipping, of the tape will cause, when the tape is deflected upwardly as indicated by the broken lines of Fig. 3, the tape to engage the convex upper surface 27 of the decelerator or to limit the amplitude of the deflection of the tape and provide a frictional retarding force. When the tape deflects downwardly an amount sufficient to engage the top edge of the braking surface 29 of the decelerator, a decelerating force is also applied to the tape.

As the extended portion of the tape 16 diminishes in length, to say, about a foot or so, the extended portion of the tape becomes relatively stiffer as the mass and the moment arm of the center of mass of the extended portion of the tape decreases. The tape will extend at an increased angle with respect to the central axis of the tunnel aperture 28 as the extended portion of the tape shortens so that an increasing retarding force is applied as the tape approaches the termination of retraction. As a result, the momentum of the rotating coiled portion of the tape is absorbed and the speed at which the hook engages the casing is significantly reduced so that the shock impact imposed on the hook is minimized.

In the embodiment of Figs. 1 and 4, the decelerator includes a forwardly extending portion 23 which is engaged by the hook 22 to cushion the termination of retraction.

The effectiveness of the decelerator 26 in absorbing the momentum of the rotating convolutions of the tape prior to the termination of retraction is such that the need to cushion the engagement of the hook 22 and casing 10 is minimized.

Accordingly, in the alternative preferred embodiment of Fig. 5 the front wall of the casing has a bottom portion 30 which projects in front of the decelerator 26a so that the hook, after being slowed down by the decelerator comes to rest directly against the rigid casing 10.

As will be apparent to persons skilled in the art, various modifications, adaptations and variations of the foregoing specific disclosure can be made without departing from the scope of the present invention as defined in the appended claims.

WHAT WE CLAIM IS:—

1. A coilable rule comprising a rigid casing having a mouth, a coilable measuring

is suitably connected to the spring 14 so as to automatically be driven thereby into retracted position in the casing 10 when the measuring tape is released from any extended position.

As so far described, the coilable rule is more fully disclosed and claimed in U.S. Patent Specification 3,214,836.

A shaped tunnel within the casing adjacent the mouth 24 provides a path for the passage of the tape into and out of the casing 10. The shaped tunnel is formed by guide means comprising a pair of curved inclined upper surfaces 20 which are molded integrally with the casing and extend from the side walls thereof, and a decelerator 26 disposed between the surfaces 20 and the mouth 24 formed in the front wall of the casing. The decelerator provides curved walls or surfaces 27, 29 to form with the surfaces 20 a crescent shaped tunnel aperture 28 through which the measuring tape 16 passes. The decelerator is formed of a suitable soft natural or synthetic resilient material having a high coefficient of friction, such as a urethane elastomer or a soft vinyl or natural or synthetic rubber, preferably having a Shore "A" durometer hardness of about 70—75. As shown in Fig. 2, the inclined surfaces 20 are disposed intermediate the curved walls 27, 29 of decelerator 26 which are spaced so as to freely permit the extension of the tape 16 for making a measurement and so that the surfaces 20 normally hold the tape out of contact with walls 27, 29. The curvature of the cross-section of the tape 16 is slightly greater than that of curved walls 27, 29 of the decelerator 26 and slightly less than that of the inclined surfaces 20.

During retraction, the spring 14 imparts an accelerating force on the tape 16 while retracting the same. It will be apparent that the force, which is stored in the spring as the tape is extended, is dissipated as the successive convolutions of the tape are retracted and is concurrently converted, in part, to an increased momentum of the rotating coiled portion of the tape.

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As will be apparent to persons skilled in the art, various modifications, adaptations and variations of the foregoing specific disclosure can be made without departing from the scope of the present invention as defined in the appended claims.

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tape of concavo-convex cross-section, a spring having one end secured within said casing and the other end secured to said tape, said spring being operable for the automatic retraction of said tape into said casing through said mouth, a stop at the free end of said tape for preventing the tape from being fully retracted into the casing, fixed guide means disposed within the casing in alignment with said mouth for guiding the tape through said mouth, and a decelerator positioned between the mouth and said fixed guide means and comprising a soft resilient member within the casing adjacent the path of travel of the tape which is frictionally engageable therewith during retraction if the tape oscillates as it approaches the end of retraction, said decelerator having upper and lower curved surfaces to define with the fixed guide means tunnel aperture crescent shaped in transverse cross-section for the

passage of the tape, said guide means having a rigid surface positioned to hold the tape out of contact with the decelerator except during the oscillation of the tape.

2. The rule of claim 1 wherein the decelerator is provided with a forwardly projecting portion engageable with said stop at the end of retraction.

3. The rule of claim 1 and wherein the guide means comprises a pair of inclined curved surfaces having a greater curvature than that of said tape.

4. The rule of claim 3 wherein the curvature of the tape is greater than that of the upper and lower curved surfaces of the decelerator.

5. A coilable rule substantially as herein described with reference to Figs. 1 to 4 or Fig. 5 of the accompanying drawings.

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