United States Patent

Guerster

[15] **3,680,802**

[45] **Aug. 1, 1972**

[54] **DAMPED RESILIENT SELF-ERECTING MEANS**

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[22] Filed: **June 3, 1970**

[21] Appl. No.: **43,103**

[52] **U.S. Cl.** .....**242/54 A,** 52/108, 242/107 R

[51] **Int. Cl.** **H01g 1/10,** H01g 1/28

[58] **Field of Search** .....242/54 R, 54 A, 107, 107.2, 242/107.3, 107.4, 107.6, 117; 52/108; 248/188.8

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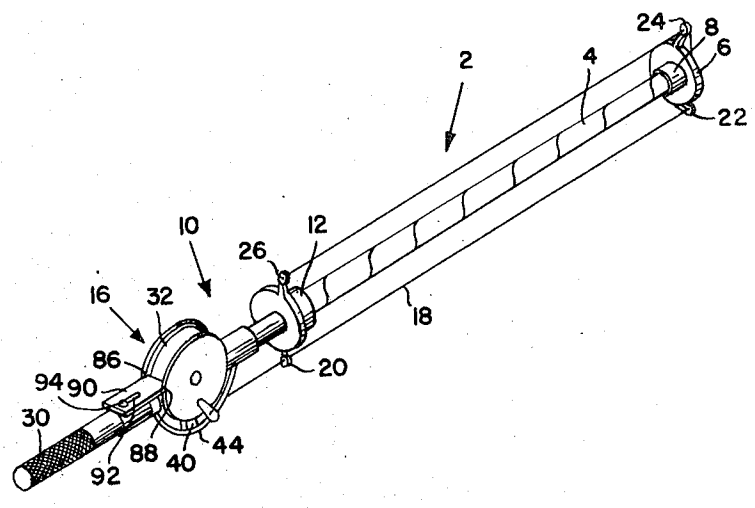
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[57] **ABSTRACT**

A self-erecting tube having a helical axially extending ribbon of spring material with adjacent turns set to coil tightly in overlapping and telescoping engagement is mounted between a pair of support members one of which supports a reel having coiled thereon a line connected to the other support member. A spring motor is connected to the reel in a manner such that as the tube erects the reel is rotated by the line causing the spring motor to be wound and thus retard the speed of erection of the tube. Means to rotate the reel to wind in the line, compress the tube into a storage position, and unwind the spring motor are provided. A second embodiment differs in having ratchet means to retard the erection of the tube. A third embodiment is provided with a dashpot damper to retard the erection of the tube.

6 Claims, 6 Drawing Figures



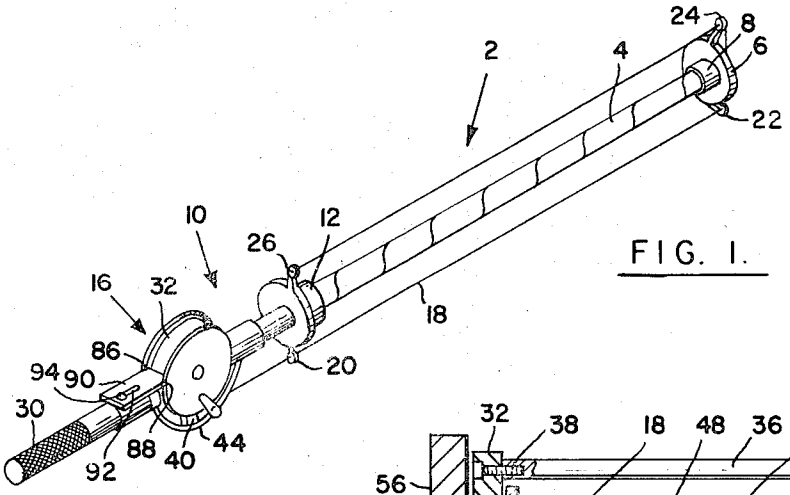


FIG. 1.

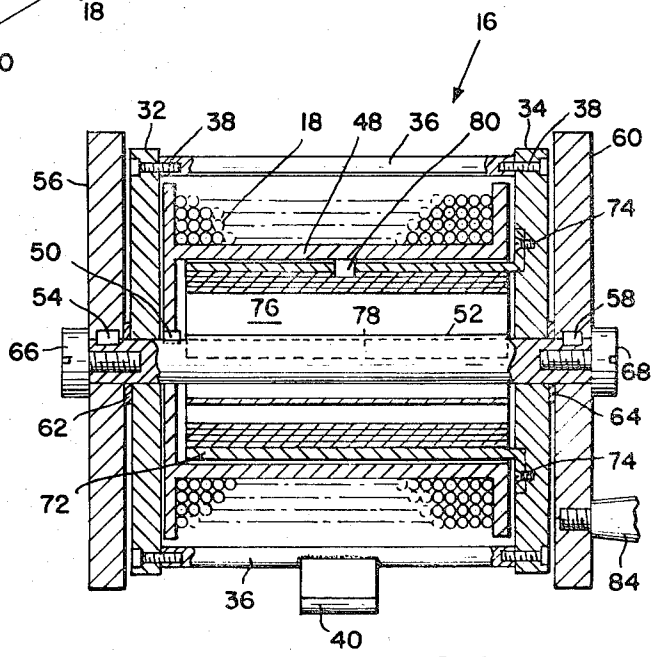


FIG. 2.

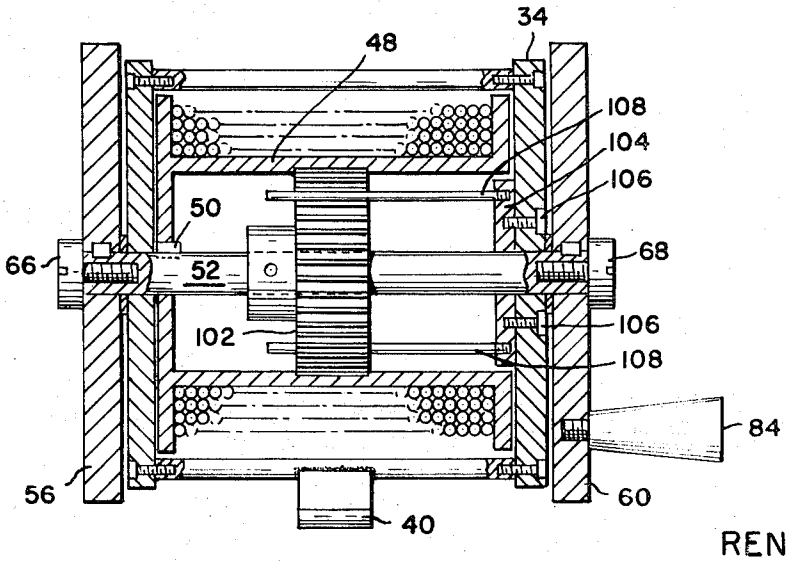


FIG. 3.

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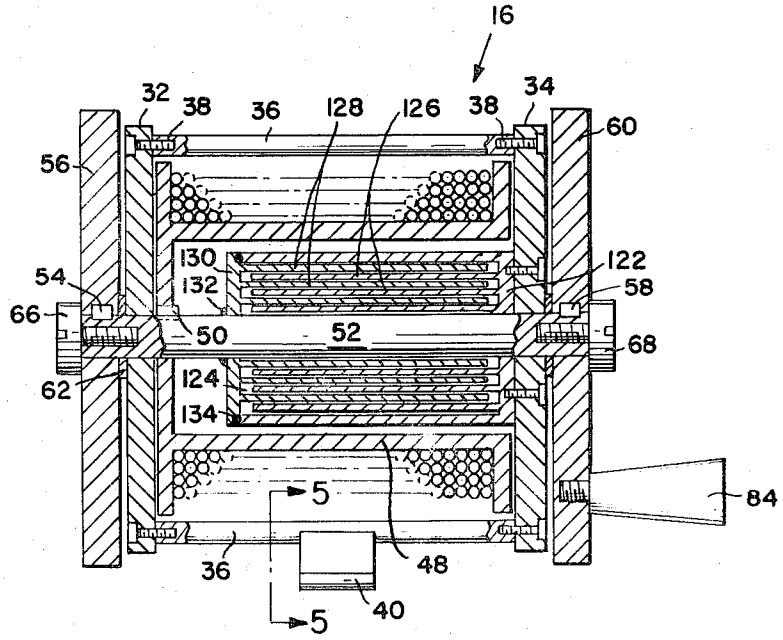


FIG. 4.

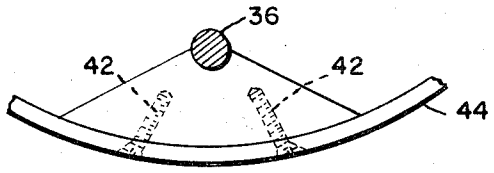


FIG. 5.

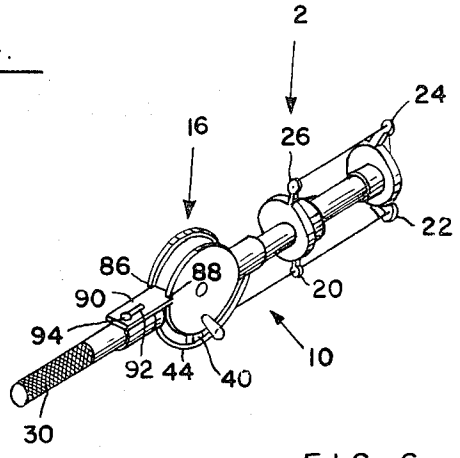


FIG. 6.

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DAMPED RESILIENT SELF-ERECTING MEANS

BACKGROUND OF THE INVENTION

Resilient self-erecting means are well known in the art. Reference may be had for example, to U.S. Pat. No. 3,467,329 issued Sept. 16, 1969 which discloses a helical axially extending ribbon of spring material having adjacent turns set to coil in tight overlapping and telescoping engagement. This and other resilient self-erecting devices generally erect in a relatively violent manner which is detrimental in many uses of these devices. Thus, for example, they can be employed to extend delicate equipment from a space capsule. They are useful for elevating a camera to inspect a region which is unhealthy for humans to enter. In such cases, a violent erection is undesirable. For example, in the case of a camera it is not only undesirable from the point of view of protecting the camera from damage, but it is also undesirable if the camera is to scan during the erection. In this invention the erection of a resilient self-erecting device is retarded by the employment of damping means.

SUMMARY OF THE INVENTION

Elongated resilient self-erecting means has its inner end secured to support means carrying damping means operatively connected to the outer end of the self-erecting means for retarding the erection of the resilient self-erecting means. Advantageously, there is provided means to collapse the resilient self-erecting means from its erected position to a stored position.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side perspective view of a device in accordance with the invention;

FIG. 2 is an enlarged vertical section of the reel of the device of FIG. 1;

FIG. 3 is a vertical section of an alternative reel;

FIG. 4 is a vertical section of an alternative reel;

FIG. 5 is an enlarged view, partially broken away, of the means for securing the reel of the device of FIG. 1 to a support member; and

FIG. 6 is a side perspective view of the device of FIG. 1 in the collapsed or storage position.

PREFERRED EMBODIMENT

Referring first to FIG. 1, a device 2 in accordance with the invention has a self-erecting tube 4 of the type disclosed in U.S. Pat. No. 3,467,329 as discussed above. Tube 4 abuts against a member 6 which is provided with a cup-shaped portion 8 to receive the outer end of tube 4 and also abuts against member 10 which has a cup-shaped portion 12 for the reception of the inner end of tube 4. Mounted on member 10 is a reel 16 on which is wound a flexible line 18 (FIG. 2) which passes from reel 16 through an eye fitting 20 on member 10, eye fittings 22 and 24 on member 6 to a fitting 26 on member 10 to which the line is tied. The end 30 of member 10 is circular in cross section and suitable for insertion in a supporting socket (not shown).

Referring now to FIG. 2, reel 16 is constructed generally in the manner of a fishing reel having side plates 32 and 34 tied together by bars 36 which are secured by means of machine screws 38. The lowest tie

bar 36 as viewed in FIG. 2 has fixedly secured thereto an arcuate mounting bracket 40 which is secured by screws 42 to a recessed arcuate portion 44 of member 10 (FIG. 5).

Mounted between plates 32 and 34 is a drum 48 which carries line 18. Drum 48 is keyed at 50 to a shaft 52 which is mounted for free rotation in plates 32 and 34. Shaft 52 is keyed at 54 to a plate 56 and is keyed at 58 to a plate 60. A washer 62 separates plate 56 from plate 32 and a washer 64 separates plate 60 from plate 34. The assembly is held together by means of shaft end screws 66 and 68 threadably secured to shaft 52. A spring motor housing 72 is secured to the inner side of plate 34 by means of screws as shown at 74. A reverse wound spring 76 of the type disclosed in U.S. Pat. No. 2,833,534 issued May 6, 1958 and sold under the trademark "SPIRATOR" has one end secured in a slot 78 in shaft 52 and the other end secured to inside of spring motor housing 72 as indicated at 80.

Plate 60 is provided with a handle 84 for the rotation of the drum 48.

Plate 56 and 60 are supplied with opposed slots 86 and 88 (FIG. 1) which are adapted to receive a slide plate 90 slideably mounted on member 10 and having a slot 92 for the reception of a guide screw 94.

OPERATION

Assuming the device 2 to be in the compressed or storage position as shown in FIG. 6, erection is accomplished by drawing plate 90 out of slots 86 and 88 to permit plate 56 and 60, shaft 52 and drum 48 to rotate. Just before rotation, the condition of reel 16 is as shown in FIG. 2, that is to say, spring 76 is in the unwound condition and line 18 is largely coiled on drum 48. The release of drum 48 for rotation permits line 18 to pay out which in turn permits tube 4 to erect while rotating freely within cups 8 and 12. As tube 4 erects and pulls line 18 from drum 48, the resultant rotation of drum 48 causes shaft 52 to rotate and wind up the reverse coil spring 76 which is selected to exert a force less than the force exerted by tube 4 on erecting, the precise force exerted by spring 76 may vary widely being chosen depending upon the speed of erection of tube 4 desired. Generally, the force exerted by spring 76 will be in the range of from about 30 percent to about 50 percent of the force exerted by tube 4 on erecting. The winding of spring 76 retards the rate of erection of tube 4 until the tube is fully erected as shown in FIG. 1. When erected tube 4 can be removed, if desired, from cups 8 and 12 by extending cup 8 by hand clear of tube 4 which can then be used, for example, as a support member.

Tube 4 can be collapsed and placed in the storage position again by means of rotating handle 84 thus rotating plate 60, shaft 52 and drum 48 to wind in line 18 and, of course, unwind spring 76 preparing it for the next erection of tube 4. When tube 4 has been collapsed the desired amount, plate 90 is advanced into slots 86 and 88 to hold the assembly in the collapsed or storage position.

ALTERNATIVE EMBODIMENT

As shown in FIG. 3, damping or retarding action can be accomplished by employing a drag in lieu of a spring motor. The reel of FIG. 3 is the same as reel 16 but is

modified within the drum **48** to eliminate the spring motor of reel **16** and substitute a toothed wheel **102** fixedly secured to shaft **52**. A plate **104** is secured to plate **34** by means of screws **106**. Plate **104** has a plurality of spring steel rods **108** which engage between the teeth of the tooth wheel **102**. The displacement of the rods **108** as the toothed wheel **102** rotates acts as a drag when drum **48** is rotated to rotate shaft **52** as tube **4** erects.

An alternative dashpot drag is shown in FIG. **4**. Here a cup-shaped casing **122** containing a hydraulic fluid **124** has arcuate blades **126** cooperatively arranged with blades **128** secured to a plate **130** which is brazed at **132** to shaft **52**. An O-ring **134** forms a seal between the relatively moving casing **122** and plate **130**. In this embodiment, any rotation of shaft **52** causes the rotation of plates **130** and the result is rotation of blades **128** relative to blades **126** and provides the desired drag to retard erection of tube **4**.

I claim:

1. Resilient self-erecting means comprising a helical axially extending ribbon of spring material with adjacent turns set to coil tightly in overlapping and telescoping engagement and having an inner end and an outer end,

support means to support the inner end of the self-erecting means, and

damping means mounted on said support means and connected to the outer end of the self-erecting means for retarding the erection of the self-erecting means.

2. A device in accordance with claim **1** in which the damping means comprises a drum, the connecting means is a flexible line connected to the drum and windable on the drum, and a spring motor is connected to the drum for the winding of the motor as the self-erecting means erects.

3. A device in accordance with claim **2** having means to rotate the drum to compress the self-erecting means to a storage position.

4. A device in accordance with claim **1** in which the damping means comprises a drag.

5. A device in accordance with claim **4** in which the drag is a hydraulic drag.

6. A device in accordance with claim **4** in which the drag is a ratchet drag.

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