May 24, 1960 P. W. JACKSON, JR 2,937,853

AUTOMATIC ESCAPE REEL

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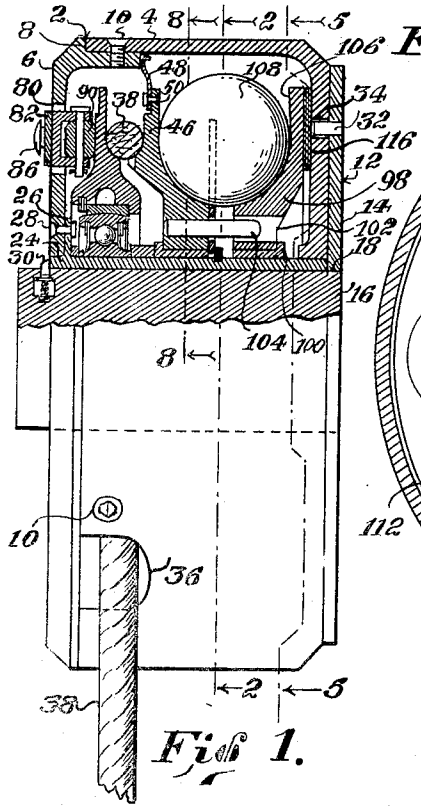


Fig. 1.

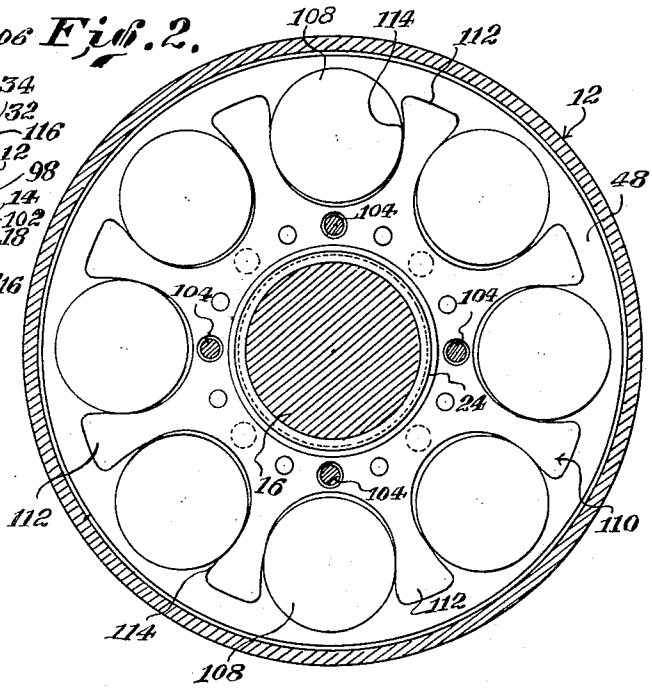


Fig. 2.

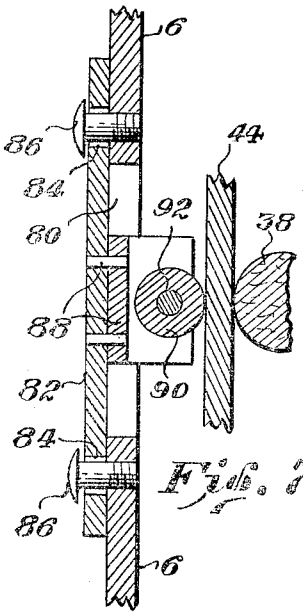


Fig. 7.

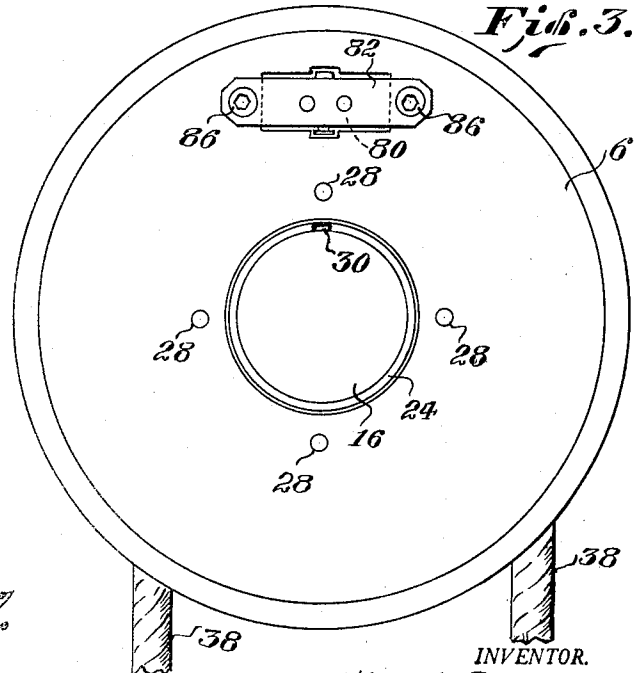


Fig. 3.

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AUTOMATIC ESCAPE REEL

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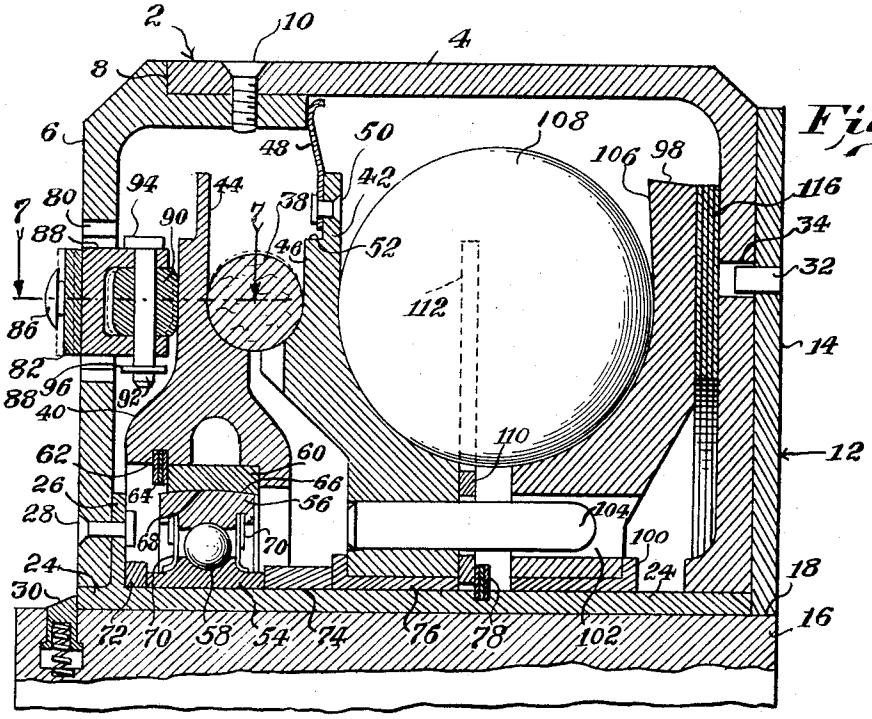


Fig. 4.

Fig. 5.

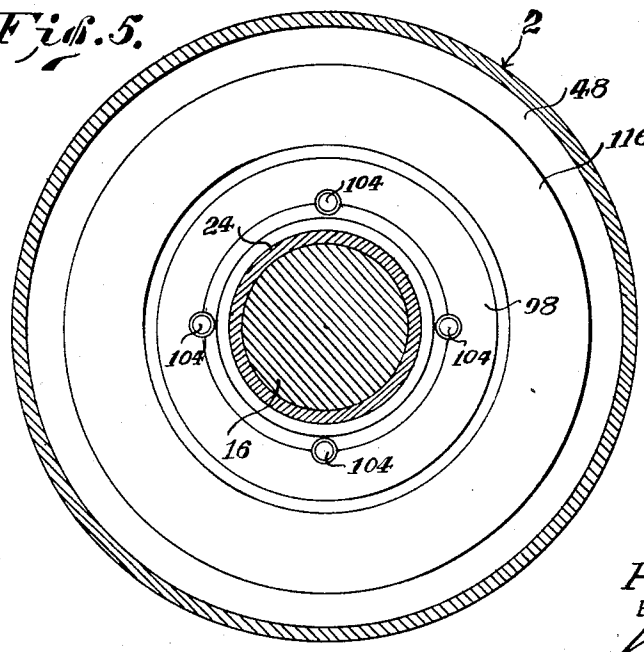
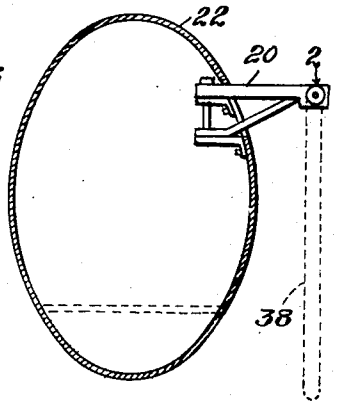


Fig. 6.



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Fig. 10.

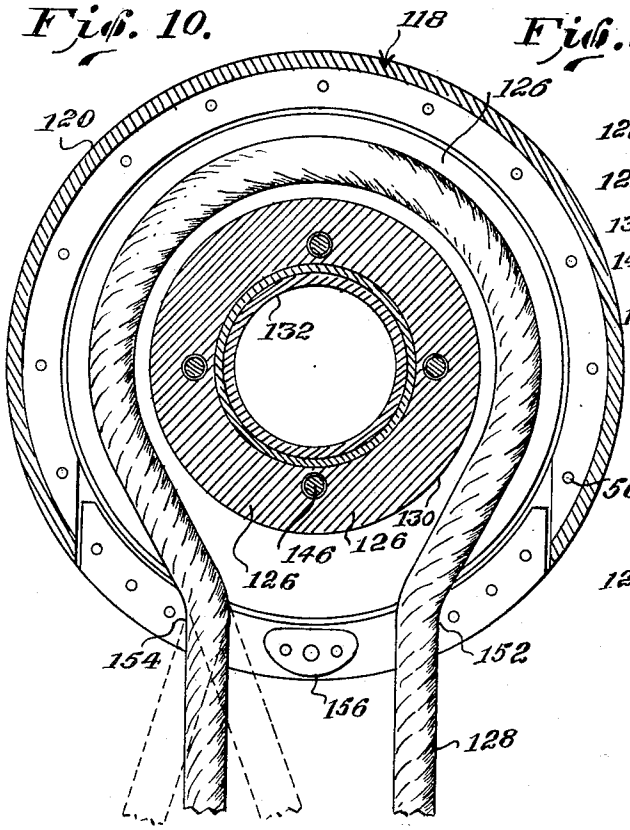


Fig. 9.

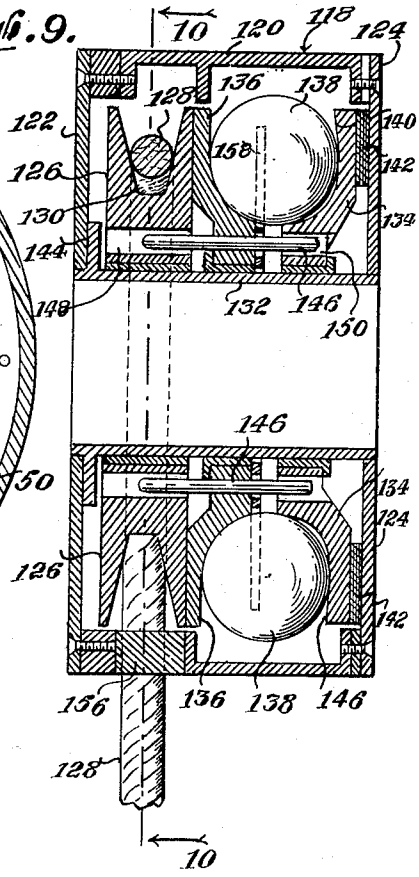
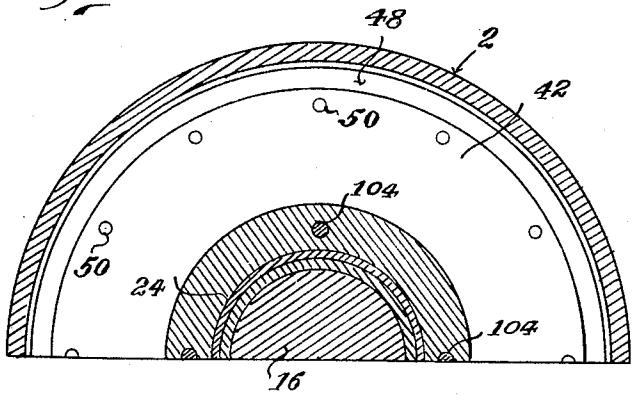


Fig. 8.



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United States Patent Office 2,937,853 Patented May 24, 1960

2,937,853

AUTOMATIC ESCAPE REEL

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Filed Nov. 20, 1956, Ser. No. 623,460

3 Claims. (Cl. 254—159)

This invention relates to an escape reel which may be used under conditions of emergency to allow persons to lower themselves from downed aircraft or from building structures.

The principal object of this invention is to provide an escape reel which will allow the person using the same to descend safely and quickly from an aircraft or building structure.

Another object of this invention is to provide an escape reel with an automatic braking means.

A still further object of this invention is to provide a reel which may be quickly and easily attached and detached from its supporting means.

Other objects of the invention will appear hereinafter throughout the specification.

Referring to the drawings:

Figure 1 is a side edge view of my escape reel, partly in section, and showing the reel mounted on its support.

Figure 2 is a vertical sectional view taken on the line 2—2 of Figure 1, and showing the centrifugally operated balls, used to operate the braking means, and their mounting means.

Figure 3 is a side elevation of the outer side of the reel as viewed in Figure 1.

Figure 4 is a vertical sectional view on an enlarged scale of that portion of the reel shown in section in Figure 1.

Figure 5 is a vertical sectional view taken on the line 5—5 of Figure 1.

Figure 6 is a detail view, partly in section, showing how my reel may be supported on a supporting arm which may be pivoted on an aircraft in a position to swing outwardly through an opening therein.

Figure 7 is a detail view in horizontal section taken on the line 7—7 of Figure 4.

Figure 8 is a vertical section taken on the line 8—8 of Figure 1, with the balls omitted.

Figure 9 is a vertical sectional view through a modified form of my reel, and

Figure 10 is a vertical sectional view taken on the line 10—10 of Figure 9.

Referring now to the several figures of the drawing, and particularly Figures 1 to 8, inclusive, 2 represents a hollow cylindrical casing made up of the main and cover sections 4 and 6, respectively, the section 4 having an open end into which the cover section 6 telescopes. As clearly shown in Figures 1 and 4, the cover section 6 has an annular shoulder 8 which abuts the adjacent peripheral edge of the main section 4 when the sections are in their assembled condition. Screws 10 or some similar fastening means are used to secure the casing sections together.

As shown in Figures 1 and 4, the casing is non-rotatably carried on a supporting member 12 which comprises a flat plate 14 and a laterally extending shaft member 16 which is rigidly attached to the plate 14 at 18. The shaft member 16 is cylindrical in cross-section

and is adapted to removably support the reel casing 2, as clearly shown in Figures 1, 2, 3, 4, 5 and 8. The plate 14 may be secured to any suitable supporting structure, as for example, a building construction or, as shown in Figure 6, to an arm 20 adapted to be pivoted on a vertical axis on an aircraft 22. As clearly shown in Figure 4, for example, the central portion of the casing 2 is provided with an axially arranged bearing member 24 which is provided at its outer end with a peripheral flange 26 which is rigidly attached to the cover section 6 by bolts or other suitable securing means 28. The outer end of the shaft 16 projects beyond the adjacent side of the reel casing and is provided with a spring pressed detent 30. The outer end of this detent is inclined inwardly and toward the outer end of the shaft so that when the reel casing is slid onto the shaft its leading side will depress the detent and hold it in this position until the casing abuts the plate 14 at which time the detent is released and will snap out past the edge of the bearing member 24 thus releasably locking the reel on the shaft. While only one detent has been shown in the drawing, it will be understood that a plurality of such detents may be used, if desired. The casing 2 is locked against rotation on the plate 14 by the pins 32 carried by the plate 14 and engaging in recesses 34 in the adjacent wall of the casing section 4.

The lower portion of the casing is provided with a pair of openings 36 to receive an endless rope 38 which is trained over a two-part pulley mounted to rotate on the bearing member 24. As clearly shown in Figure 4, the pulley comprises an idler section 40 which is both rotatable and tiltable on the bearing member 24, and a drive section 42 which is rotatable around the bearing member 24. Each of the pulley sections 40 and 42 is recessed adjacent its periphery to form a pulley groove to receive the cable 38, the section 40 being recessed at 44 and the section 42 at 46 as clearly shown in Figure 4. Projecting outwardly from the periphery of the pulley section 42 is a relatively thin spring-like plate 48 which is adapted to bear against the adjacent edge portion of the cover member 6 and serve as a shield to prevent the rope passing between the pulley section 42 and the adjacent wall of the casing. This shield is secured to the section 42 by rivets 50 or any other suitable fastening means, the section 42 being further recessed at 52 to receive the inner edge of the shield. Mounted centrally within the pulley section 40 and around the bearing member 24 is a ball bearing which comprises an inner race 54 which is rigidly secured to the bearing member 24 and an outer race 56, both races being grooved to receive the bearing balls 58. Tiltable on the outer race 56 is the annular bearing member 60 which is rigidly secured within a centrally disposed opening 62 in the pulley section 40 by a retaining ring 64. As clearly shown in Figure 4, the inner face 66 of the bearing member 60 is slightly concave in cross section to conform to the convex face 68 on the outer race 56 so that pulley section 40 may tilt or rock slightly toward or away from the rope 38 and the pulley section 42. The spaces between the ball races 54 and 56 are closed by the closure members 70 which are rigidly attached to the outer race and have a sliding engagement with the inner race which is positioned on the bearing member 24 by the spacing members 72 and 74, the former being abutted against the flange 26 and the latter against a bearing sleeve 76 mounted between the bearing member 24 and the pulley section 42. The inner race 54, the spacing members 72 and 74, and the sleeve 76 are all locked against axial movement by a retaining ring 78 seated in a groove in the bearing member 24.

As pointed out above, the pulley section 40 is mounted to tilt or rock on the outer bearing race 56 so that the upper bight portion of the rope may be tightly gripped

between the pulley sections 40 and 42. To bring such tilting action about, the upper portion of the cover member 6 is provided with an opening 80 which is spanned by a spring strip 82 provided adjacent its ends with slots 84 which loosely receive bolts or other suitable fastening means 86 anchored in the cover member as shown in detail in Figure 7.

Rigidly attached to the inner face of the strip 82 is a U-shaped bracket member 88 between the legs of which a roller 90 is mounted. This roller is secured in place by a bolt 92 which has a head 94 at its upper end and a retaining member 96 at its lower end, as clearly shown in Figures 1, 4 and 7. Due to the spring action of the strip 82, the roller will always be forced against the pulley section 40 which in turn presses the cable 38 against the pulley section 42. The action of the spring strip will insure that the rope will always be firmly gripped by the pulley sections regardless of small variations in the size of the rope.

The braking mechanism for the reel comprises a brake disk 98 which is axially slidable on the bearing member 24 by means of a centrally arranged sleeve 100 mounted therein and is provided with a plurality of circumferentially disposed openings 102 to slidably receive pins 104 carried by the pulley section 42 adjacent the bearing member 24. The upper surface of the disk 98 is slightly inclined upwardly and toward the pulley section 42 to form a cam face 106 as shown in Figures 1 and 4. As clearly shown in Figures 1 and 4, the pulley section 42 and the brake disk 98 are shaped to form a groove in which a plurality of balls 108 are slidably and rotatably mounted. Also mounted substantially centrally of this groove is a ball cage 110 of generally disk-like form but having a plurality of radially extending projections 112 one of which is positioned between two adjacent balls as indicated in Figure 2. The projections 112 serve to properly space the balls 108 and form U-shaped grooves 114 in which the balls may move outwardly by centrifugal action while at the same time bearing against the cam face 106 to bring about a braking action between the brake disk 98 and the adjacent wall of the casing section 4, the brake disk being provided with a brake ring 116 to directly engage the casing wall. The cage 110 is loosely mounted on the pins 104 but is held against the pulley section 42 by the retaining ring 78 and rotates with the pulley sections and the brake disk.

In the operation of my escape reel to lower a person from a downed aircraft or from a building structure, he may grasp one of the depending lengths of the rope 38 and his weight will cause the idler and drive pulley sections 40 and 42, the ball cage 110 and the brake disk 98 to rotate around the bearing member 24. The rotation of these elements will cause the balls 108 to fly outwardly under the action of centrifugal force thereby bringing them into engagement with the cam face 106 thus forcing the brake ring against the adjacent side of the casing and bringing about a sufficient braking action to sufficiently retard the movement of the rope to allow a person to reach the ground or other landing place in safety.

Referring now to the modified form of Figures 9 and 10, the reel casing 118 is of substantially the same shape as that of Figures 1 to 8, inclusive, and differs therefrom principally in its wall construction. In this form, both ends are separate from the cylindrical portion 120 and are rigidly attached thereto by screws or other suitable fastening elements. As shown in Figure 9, a cover 122 closes one end of the casing and a plate 124 the other. Mounted within the casing is a one-piece pulley 126 over which the rope 128 is trained, the pulley having a substantially V-shaped groove 130 to increasingly grip the sides of the rope as the load increases. The rope should be of such a diameter and material that the load thereon will never cause it to engage the bottom of the groove and thereby lose all or a substantial part of the gripping action of the inclined sides of the groove thereon. In this form of the invention, the pulley 126 has a limited axial sliding movement on the bearing member 132 which is similar to the bearing member 24 and may be supported on a shaft similar to the shaft 16 on the first form or any other suitable means. Also mounted on the bearing member 132 for axial sliding movement is a brake disk 134 and an intermediate disk 136 which together with the brake disk form an annular groove to receive the centrifugally operated balls 138 so that when the balls move outwardly under centrifugal action as the pulley and disks are rotated on the bearing member 132 they will engage the cam surface 140 on the brake disk, as in the first form of the invention, thereby forcing the brake ring 142 against the end plate 124 of the reel casing, and the disk 136 against the adjacent side of the pulley forcing it against the annular flange 144 on the bearing member 132 thus still further enhancing the braking action on the rotatable members. In order to cause the pulley and the disks to rotate together they are connected by pins 146 which are carried by the disk 136 and loosely engaged in openings 148 and 150 in the pulley and brake disk, respectively.

The lower part of the casing 118 is provided with spaced guide members 152 and 154 on which the rope bears as it is moved around the pulley. These guides are spaced apart a distance appreciably less than the diameter of the pulley at the bottom of the groove so that the rope is distorted at the guides thereby tending to slow its movement. A spacer member 156 is secured to the casing between the guide members 152 and 154 as clearly shown in Figure 10. As in the first form, a ball cage 158 is provided to properly position and guide the balls as they move to and from their brake operating positions.

From the description of the specific details given above, it is not considered that a statement of the operation of the device shown in Figures 9 and 10 is necessary except to point out that in this form the disk member 136 is slidable axially on the bearing member 132 so that outward movement of the balls and their engagement with the cam face 140 may also force the pulley 126 against the flange 144 on the bearing member thereby increasing the braking action of the reel.

The above description and drawing disclose two embodiments of the invention, and specific language has been employed in describing the figures. It will, nevertheless, be understood that no limitations of the scope of the invention are thereby contemplated, and that various alterations and modifications may be made as would occur to one skilled in the art to which the invention relates.

I claim:

1. An escape reel comprising a casing having two substantially parallel opposite sides, a bearing member extending between and rigidly connected to said sides, a pulley rotatable on said bearing member, said pulley having a groove in its outer periphery to receive an endless cable, a brake disk rotatable and axially slidable on said bearing member adjacent one of said sides, said brake disk comprising a brake ring adapted to bear against said one of said sides, a ball cage rotatable on said bearing member and interposed between said pulley and said brake disk, means operatively connecting said pulley, said brake disk, and said ball cage to cause them to rotate in unison, a plurality of circumferentially spaced balls slidable radially in said cage, the side of said brake disk adjacent said cage having an annular surface inclined outwardly and toward said pulley to form a cam surface for engagement with said balls as they move outwardly due to centrifugal force as said brake disk, said pulley and said cage rotate on said bearing member to force said brake ring into braking engagement with said one of

said sides, said pulley comprising a pair of relatively movable disk sections each provided adjacent its periphery with a recess, said recesses forming said groove, and said pulley section adjacent said brake disk together with said brake disk forming an annular recess to receive said balls.

2. An escape reel as defined in claim 1, and means for rockably mounting the other pulley section on said bearing member for rocking movement toward and away from said first mentioned section, and spring means carried by said casing to urge said other pulley section toward said first mentioned section to yieldingly grip said cable.

3. An escape reel as defined in claim 2, and an opening in said other of said sides, said spring means comprising a spring plate secured at its ends to said casing and spanning said opening, a bracket projecting laterally from the central portion of said plate and toward said other pulley section, and a roller carried by said bracket and engaging said other pulley section.

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