Aug. 1, 1950 O. A. THOMPSON 2,517,055

REELING APPARATUS

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FIG 1

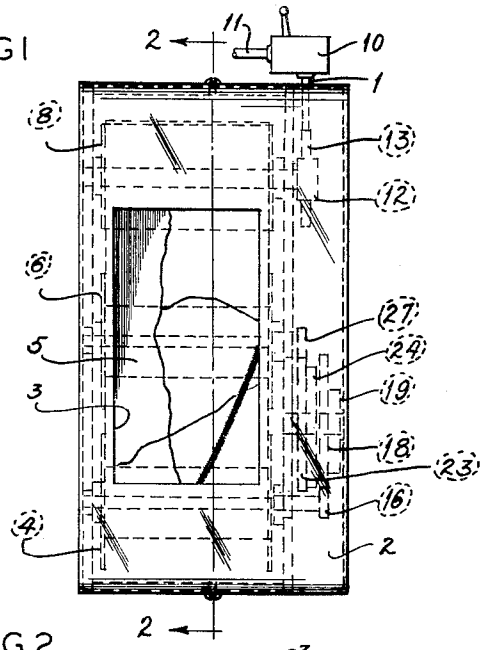


FIG. 2.

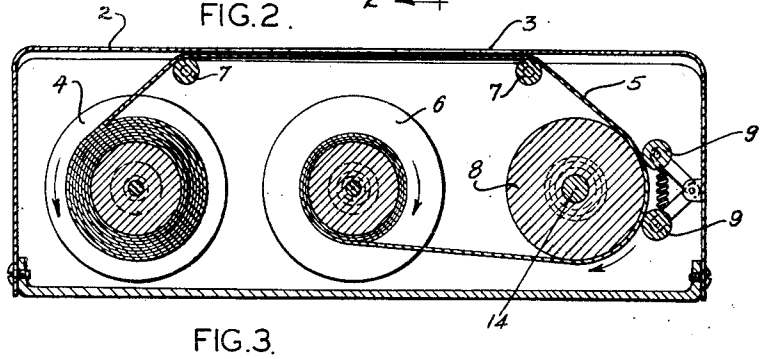
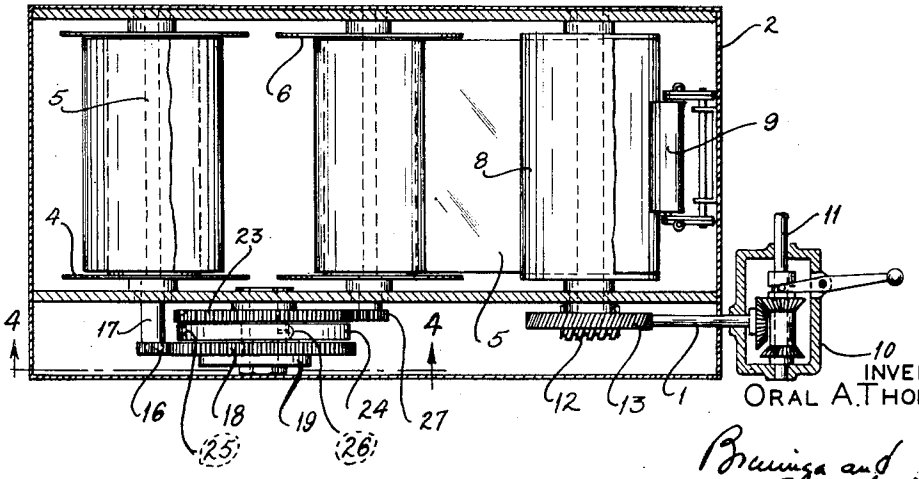


FIG. 3.



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FIG. 4.

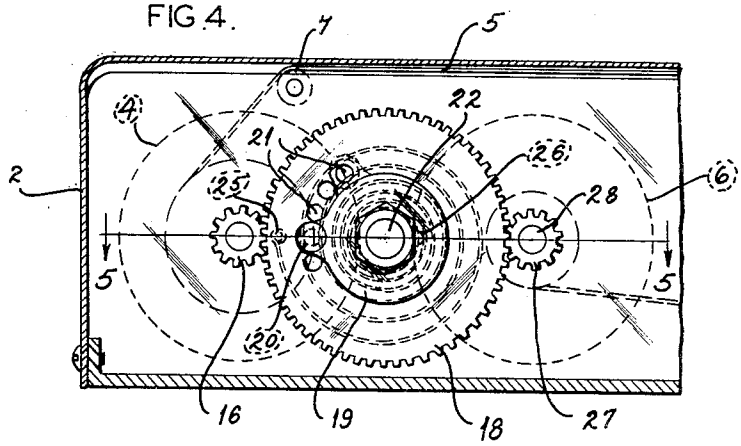


FIG. 6.

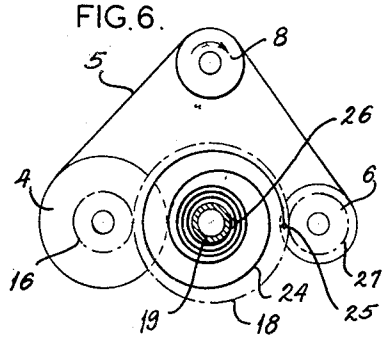


FIG. 5.

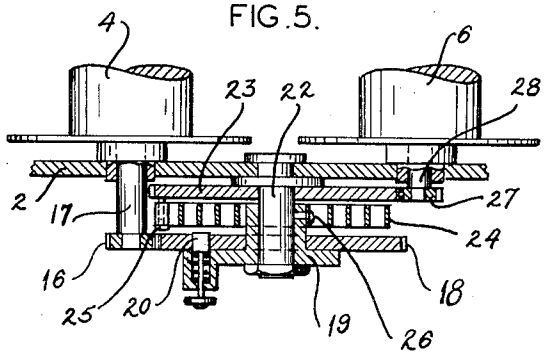


FIG. 7.

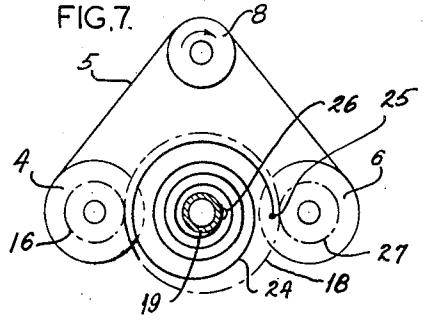
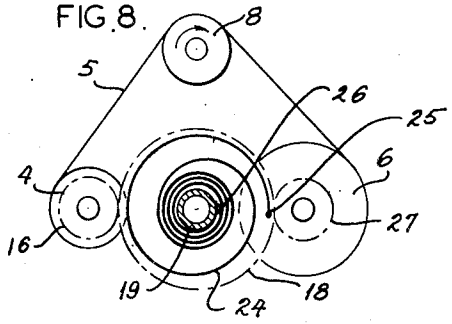


FIG. 8.



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REELING APPARATUS

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5 Claims. (Cl. 40—42)

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This invention relates generally to reeling apparatus and has particular reference to devices of the character wherein a web or tape is unwound from one reel and concurrently wound up on another reel, as, for instance, in automatically operated scroll maps, which gradually advance as a vehicle transverses a given route.

In reeling apparatus of the character referred to, it is a familiar fact that a differential in rotational speed must exist between a near empty receiving reel and a near full delivering reel; that such differential changes continuously throughout the cycle, involving completely unwinding the tape or web from the filled reel and concurrently winding it up on the other. Many efforts have been made to devise apparatus capable of compensating for such differentials in rotational speed, but the use thereof with automatically advancing scroll maps of the character aforesaid is difficult to achieve from the practical standpoint because such known organizations generally involved either a variation in the strain upon the map-strip over such a wide range of magnitudes that the strip was liable to rupture, or involved organizations which were not reversible, or involved organizations wherein the driving of the tape was effected solely through the application of rotational force to one of the reels.

In view of the fact that such map-strips are generally made of paper, it is evident that, consistent with essential tautness of that portion of the strip being viewed from time to time, the actual tension in the strip can never exceed the tensile strength thereof, else rupture will occur. Consequently, the spring-controlled devices heretofore proposed for the purpose have involved the limitation either of using extremely short strips of map, and hence impractical, or extremely strong, and hence costly, strip material in order to avoid the possibility that, in proceeding between fully wound and fully unwound position on a reel, the tension on the strip will not rupture it.

The object of the present invention, generally stated, is to provide a reeling apparatus wherein the differential in rotational speed between the receiving and the dispensing reels is compensated for in a manner such as to minimize variation in tension on the tape or web being reeled.

Another object of the invention is to provide an apparatus of the character referred to, which is reversible.

Other objects will become apparent to those skilled in the art when the following description

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is read in connection with the accompanying drawings, in which:

Figure 1 is a plan view of an encased automatically operating scroll map embodying the present invention;

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

Figure 3 is a plan view of the operating mechanism contained within the case shown in Figure 1, the web partly broken away;

Figure 4 is a sectional view taken along line 4—4 of Figure 3;

Figure 5 is a sectional view taken along line 5—5 of Figure 4;

Figures 6, 7 and 8, inclusive, are diagrammatic views showing the relation of reels, webs, driving means, and spring compensator at various phases in the cycle of operation from starting position, wherein one reel is fully wound and the other fully unwound, to the position whereat the first reel is fully unwound and the second reel is fully wound.

In accordance with the present invention, a traveling web or tape is payed off one reel and wound upon another reel, while the lineal speed of the web is maintained in fixed proportional relation to a driving member engaging the tape intermediate the reels. The invention is characterized by the feature that the lineal speed of the web is independent of the diameter of the outermost convolution on either reel at any increment of time and, hence, is free from variations due to the constantly changing effective circumference of each reeling surface. The invention especially contemplates that the differential between the rotational speeds of the paying-out and receiving reels be compensated by a spring, acting on each end of the web, and arranged to unwind during a part of the cycle (consisting of completely unreeling a filled reel and concurrently filling an empty reel) and to wind up in another part of the cycle. In the embodiment shown in the accompanying drawings, the spring is "wound up" at the beginning of the cycle, winds down to a minimum condition of tension at an intermediate phase of the cycle, and is rewound at the end of the cycle; said spring tending at all times to keep the web taut.

In the embodiment chosen for illustrative disclosure herein, the reeling apparatus of the present invention is utilized for driving and controlling the automatic advancement of a scroll map in accordance with the travel of a vehicle, such as an automobile, rail vehicle, or the like, over the route represented by the scroll map. The

vehicle to which the device is applied is provided with a power take-off shaft actuated by the turning of the wheels of the vehicle, as, for example, in the case of an automobile, provided as usual with a speedometer, the speedometer shaft may be utilized as the power take-off for the reeling apparatus of the present invention. Similar mechanism arranged to make a predetermined number of revolutions per revolution of the wheel of a railway vehicle is contemplated.

Referring now to the drawings, a driving shaft 1 connected, as aforesaid, so as to be turned in fixed proportion to the speed at which the vehicle is traveling, provides the driving force for the mechanism now to be described.

Suitably mounted in an appropriate case 2, having a viewing aperture 3, is a reel 4, which, as shown in Figure 2, is substantially filled with convolutions of a web 5, the opposite end of which is connected in any suitable manner to the core of a reel 6. Between reels 4 and 6, a reach of web 5 is guided over a pair of rollers 7 and exposed for view within aperture 3. A driving drum 8 is also provided for engagement with the reach of web 5, intermediate reels 4 and 6, and a suitable spring-biased arrangement of pressure rolls 9 may be provided for holding the web 5 in firm engagement with the surface of drum 8. In lieu of the latter, rows of perforations may be provided in web 5 for engagement with pins projecting from the surface of drum 8 in a manner well-known in the art of progressively feeding tapes. It is also contemplated, but not shown on the drawings, that reels 4 and 6 be readily removable from case 2 to facilitate the installation of web 5.

At the outer end of shaft 1, a reversing mechanism 10 is provided. The reversing mechanism may be of any suitable well-known character adapted for selective connection between shaft 1 and the power shaft 11 (geared to the speedometer shaft) so as to cause the latter to rotate in the same direction as, or opposite direction from, shaft 1, as desired. Shaft 1 is provided with a worm 12 in engagement with a worm wheel 13 secured to a shaft 14, upon which driving drum 8 is also secured for rotation therewith.

With web 5 installed, as described, it is apparent that a clockwise rotation of driving drum 8 will unreel web 5 from reel 4 and direct it toward reel 6.

In order to drive the reel, which is receiving the web, a pinion 16 fixed to shaft 17 of reel 4 is meshed with a gear 18 rotatably mounted upon a flanged collar 19. While the gear 18 is adjustable relative to flanged collar 19, said parts are interlocked when in operating position, by a spring detent 20 fitting into any one of a series of recessions 21 provided in gear 18. Collar 19 is mounted upon a stub-shaft 22 for free rotation thereon, the shaft 22 being secured to the wall of the case 2. Likewise mounted for free rotation on stub-shaft 22 is a gear 23. Gear 23 is premanently connected to collar 19 through the medium of a convoluted spring 24, said spring being fastened to gear 23 by a pin 25 at the outer end thereof and to collar 19 by a pin 26 at the inner end thereof. Meshing with gear 23 is a pinion 27 secured to shaft 28 upon which reel 6 is fixedly mounted.

With this arrangement of parts it is apparent that if convoluted spring 24 be put in tension, i. e., wound up, that the contained force will act against each end of the spring in a direction to cause it to unwind. Pin 25, gear 23, and pinion 27 cooperate to transmit such force to reel 6 while pin 26, collar 19, spring detent 20, gear 18 and pinion 16 transmit such force to reel 4. From this it follows that if a spring detent 20 is disengaged from its recess 21 in gear 18 and rotated in a counter-clockwise direction, spring 24 will be wound up. Thus pretensioned, spring 24 will move to unwind, urging gear 23 clockwise, and reel 6, through pinion 27 counter-clockwise, and in a direction such as to wind in all slack in attached web 5. Reengaging spring detent 20 in a recess 21 in gear 18 transmits a similar counter-clockwise force to reel 4 through gear 18 and pinion 16. When drum 8 is being driven in a direction such as to draw web 5 from reel 4 the tension applied to the web by reel 4 will be counter to the pull of the drum 8, whereas in the reach of web between drum 8 and reel 6 tension will be maintained solely by the powering force of convoluted spring 24. This dual function of serving as a brake against driving drum 8 and as a positive force for driving reel 6 is an important feature of spring 24 and may be better understood with reference to Figures 6, 7 and 8, which diagrammatically illustrate a cycle of operation of the apparatus.

Referring now to Figure 6, a starting position is shown, wherein reel 4 carries all of the convolutions of the web save that portion threaded through the apparatus and fastened to reel 6. When drum 8 is rotated in the clockwise direction, as shown by the arrow, web 5 is drawn from reel 4 against the resistance of spring 24 applied through collar 19, gear 18 and pinion 16 (arrows, Figure 2). Reel 6, powered by spring 24 (through pin 25, gear 23 and pinion 27) reels in the delivered web. In this phase of the cycle it will be noted that the inner end of spring 24, in geared connection with reel 4, is forced to move counter-clockwise, slowly, so as to wind spring 24. Rotation at this point, however, is not sufficient to counterbalance the unwinding of spring 24, necessitated by the more rapid rotation of reel 6 whose web-convoluted diameter is less than that of reel 4. Spring 24 continues to lose tension so long as the convoluted diameter of reel 4 exceeds that of the convoluted diameter of reel 6.

Figure 7 illustrates the point in the cycle wherein reel 4 and reel 6 carry an identical number of convolutions of web 5, and hence, are moving at the same peripheral rate. This condition of balance is reflected in spring 24 which now has its minimum tension and has its two fixed ends moving counter to one another to wind and to unwind the spring at the same rate.

From this point on, however, until the last of the web has been delivered to reel 6 (Figure 8), reel 6 travels at a progressively slower peripheral rate than does reel 4 since the convoluted diameters are now in inverse relationship to that existing in the first half of the cycle. Here, the condition exists where the inner end of spring 24, geared to reel 4, moves in response to the pull of drum 8, faster than does the outer end geared to reel 6.

Tension is thereby restored to spring 24 until, at the completion of the cycle or end of the route, spring 24 has repossessed the contained force originally imparted by the pretensioning operation.

The action of this apparatus is truly reversible. If the starting point were as shown in Figure 8, and the direction of rotation of drum 8 reversed, as would be the case with a railroad car shunted at the end of the route and carried back along

the same track without turning around, the driving drum 8 would deliver the web from reel 6 to reel 4 and spring 24 would progressively equate the differences in the peripheral rates of the reels and would repeat the cycle of losing and regaining tension until reel 4 once again contained all of the convolutions of the web.

Webs installed in this device are properly inscribed with data descriptive of a particular route. It is contemplated that the reels be interchangeable in a manner well-known in the art. When installed as hereinbefore described, sufficient web is threaded through the instrument from the delivery reel to the receiving reel to secure the free end and to properly position the indicia representing the beginning of the route in the viewing aperture. Pretensioning of convoluted spring 24 and engagement of clutch 10 with the motivating source of power, as previously described, puts the instrument in full operation.

It is understood that the embodiment of the invention described herein lends itself to considerable modification and may be installed in a variety of conveyances including those which are not limited to a fixed route. Where use of the instrument is associated with an automobile or similar vehicle it is possible to record a trip with reference to instant speedometer readings. A simple reversal of the reels upon the return journey will present the recorded log to the observer and preclude misdirection.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:

1. A reeling device of the character described comprising, a delivery reel, a receiving reel, a web convoluted upon both reels and having an intermediate reach between said reels, means engaging said web at the intermediate reach for drawing the same from the delivery reel, power transmitting connection between said delivery reel and said receiving reel for rotating the latter, said connection including a resilient member having a neutral position from which it yields to permit the delivery reel to lag and to lead the rotational speed of the receiving reel as the diameter of the outermost convolution of each reel varies in the unwinding and winding of the web.

2. A reeling device of the character described comprising, a web, a delivery reel for the web, a receiving reel, rotatable means for driving the web at a lineal speed in fixed proportion to the driving means, power transmitting connection between said delivery reel and the receiving reel, said connection including an adjustable resilient member having a neutral position from which it yields to permit the reel to lag and to lead the receiving reel as the peripheral speed of each reel varies in the unwinding and winding of the web respectively.

3. A reeling device of the character described comprising, a delivery reel, a similar receiving reel, a web convoluted upon both reels and having an intermediate reach between said reels, means engaging said web at the intermediate reach for drawing the same from the delivery reel, power transmitting connection between said delivery reel and said receiving reel for rotating the latter, said connection including a resilient member having a maximum condition of tension when either reel has all of the convolutions of the web wound upon it, and a minimum condition of tension when the convolutions of the web upon each reel are identical.

4. A reeling device of the character described comprising, a delivery reel, a similar receiving reel, a web convoluted upon both reels and having an intermediate reach between said reels, means engaging said web at the intermediate reach for drawing the same from the delivery reel, power transmitting connection between said delivery reel and said receiving reel for rotating the latter, said connection including a convoluted spring, one end of which moves to wind said spring, whereas the other end moves to drive said receiving reel, the tension in said spring varying between a maximum when either reel contains all of the convolutions of said web and a minimum when each reel contains the same number of convolutions of said web and means for adjusting said maximum tension in said spring to continuously drive said receiving reel at all variations in tension from said maximum to said minimum.

5. Apparatus of the character described comprising, two rotatable shafts each respectively mounting a web reel, pinions fixed on each of said shafts so as to rotate at all times with the reel mounted thereon, a pair of coaxial gears rotatable independently of each other and meshed respectively with said pinions, a single coil spring having its opposite ends connected to said coaxial gears, respectively, a drum, a reach of web extending between said reels and frictionally engaging the surface of said drum, and externally powered means for rotating said drum to transfer web from one reel to the other, said means being connected to impart rotating force to a reel only through draft upon the web.

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