

[54] **ROLLER-BAND DEVICE WITH DIVERGING WALLS BIASING MEANS**

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- [51] Int. Cl. .... **H01h 3/32**
- [58] Field of Search ..... **200/153 R; 308/6; 184/29**

**OTHER PUBLICATION**

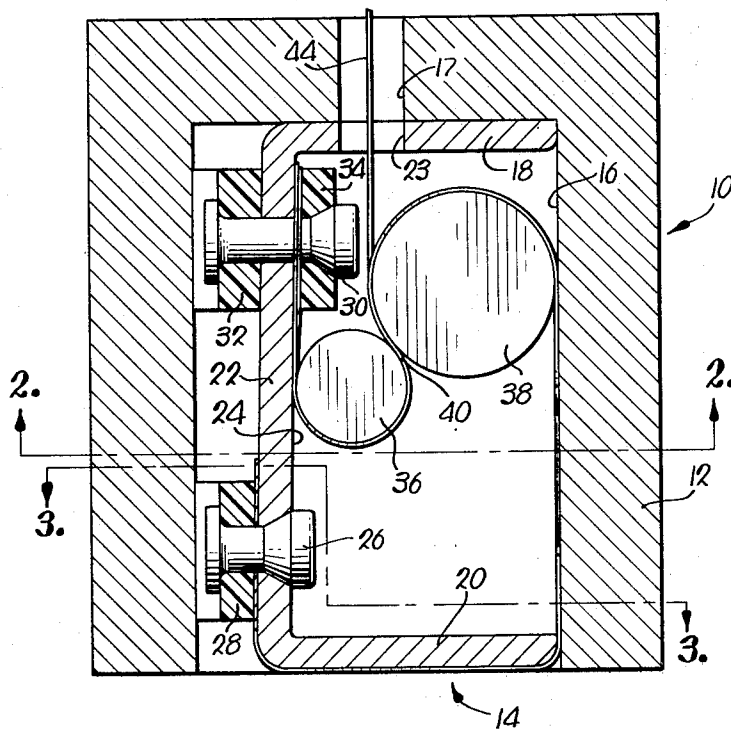
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[57] **ABSTRACT**

A roller-band device of the type wherein a pair of rotatable members are disposed within a housing and a flexible, resilient band is convoluted around the members in S-shaped configuration to maintain their axes parallel as they move within the housing. The housing is comprised of two nonparallel planar sections which diverge as one end of the housing is approached. Since the inherent tendency of the flexible band to return to a linear position decreases with divergence of the planar sections, the two rotatable members are always biased in the direction of divergence of the wall sections. An end wall, which is spaced from the point of closest proximity of the planar sections, is bendable about a fulcrum point and the flexible band is trained around this wall, under tension, when the rotatable members are disposed adjacent thereto. A control band element is coupled to the flexible band for shifting the rollers toward the end of the housing where the opposed planar sections converge. As the members are moved away from the pivotal end wall, tension on the flexible band increases as the end wall is biased about its fulcrum point in the direction of movement of the members. Return movement of the members in the direction of divergence of the planar sections decreases the tension on the flexible band but movement of the end wall assures that the flexible band remains taut.

**13 Claims, 6 Drawing Figures**



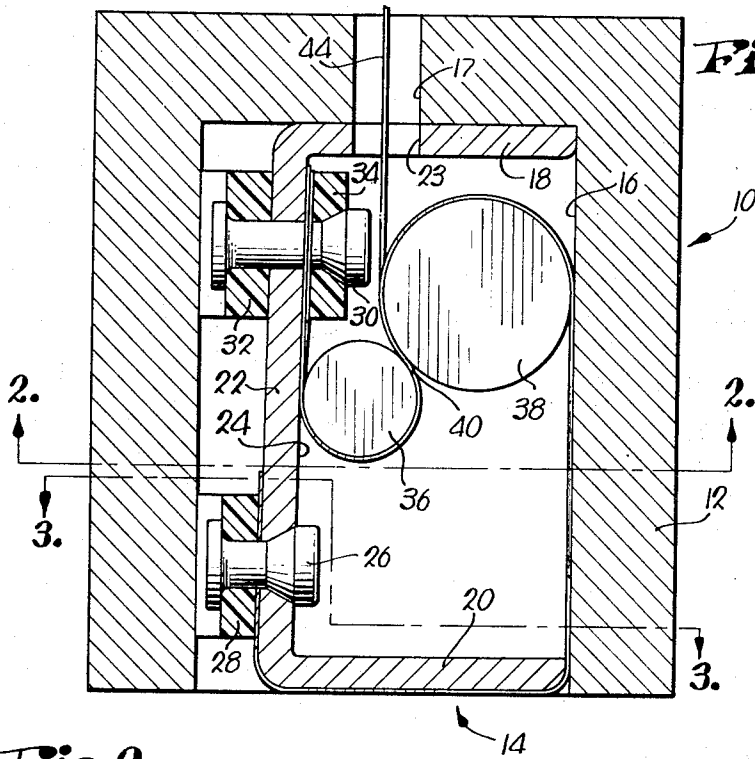


Fig. 1.

Fig. 4.

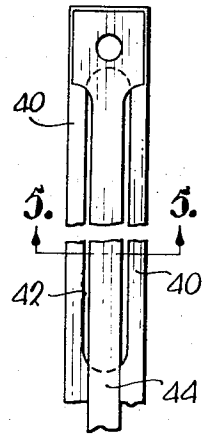


Fig. 5.

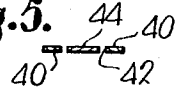


Fig. 2.

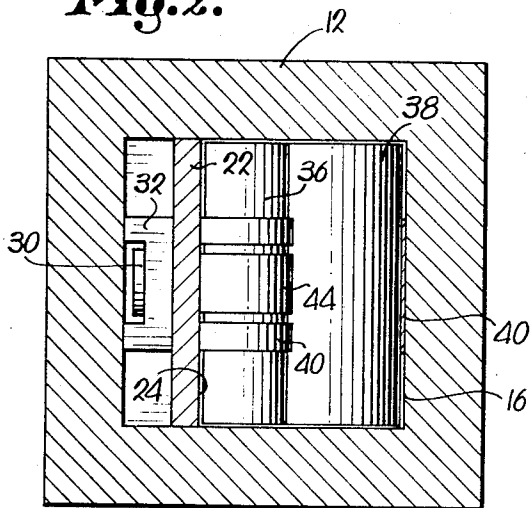


Fig. 3.

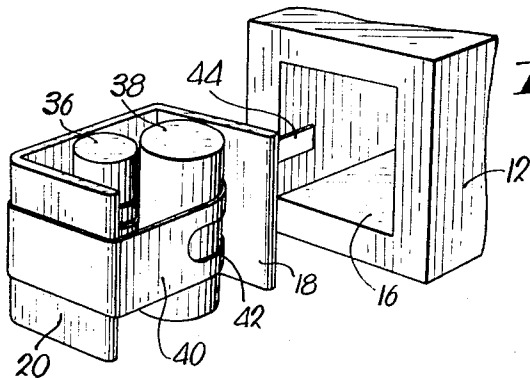
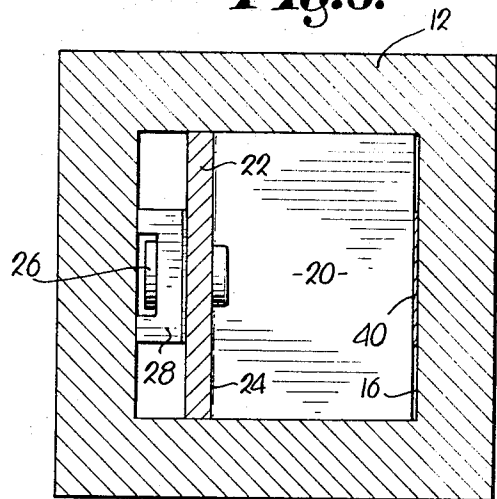


Fig. 6.

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## ROLLER-BAND DEVICE WITH DIVERGING WALLS BIASING MEANS

This invention relates to roller-band devices of the type disclosed in U.S. Pat. No. 3,452,175, and the same is incorporated herein by reference as may be necessary for full understanding of the nature and operation of the present invention. Roller-band devices of the type disclosed in the above patent have found widespread usage in numerous electrical and mechanical applications because of their low friction and reliability. In the majority of these applications however, it is necessary to bias the rotatable members in one direction to assure their retention in a given position. This position could be the normally closed position of an electrical switch or a flow control valve. When such devices are constructed in miniature, it is extremely difficult to assemble a return spring within the device for the purposes discussed above. Additionally, the tolerances involved are normally very critical, further complicating inclusion of a return spring and increasing assembly costs.

It is, therefore, the primary object of the present invention to provide a roller-band device wherein the rotatable members are biased into a "normal" position without the need for auxiliary springs, but with a control band element being operably coupled to the main flexible roller band to permit selective shifting of the rollers to an "operated" position.

Another object of the invention is to provide a roller-band device as aforesaid wherein the rotatable members are biased in one direction by nonparallel planar sections which provide the surfaces along which the members roll while retaining the function of being selectively returnable to a location at the opposite end of the housing therefor.

Still another object of the invention is to enhance the adaptability of roller-band devices to mass production through easier assembly by providing a pair of interengageable housing elements for the two rotatable members.

Another aim of the invention is to provide a roller-band device as set forth in the foregoing object wherein all of the components of the device may be assembled with one of the housing elements and the latter then inserted within the other housing element to complete the assembly.

A further important object of the invention is to provide a roller-band device which utilizes nonparallel planar sections to bias the rotatable members in one direction, thereby eliminating critical tolerances and return springs previously utilized for the same purpose.

In the drawing:

FIG. 1 is a vertical cross-sectional view of a roller-band device constructed according to the present invention;

FIG. 2 is a cross-sectional view, on a reduced scale, taken along line 2—2 of FIG. 1;

FIG. 3 is a cross-sectional view, on a reduced scale, taken along line 3—3 of FIG. 1;

FIG. 4 is a partial plan view on a greatly reduced scale of the two overlying flexible bands for the cylindrical rollers as the bands would appear lying along a planar surface;

FIG. 5 is a cross-sectional view taken along line 5—5 of FIG. 4; and

FIG. 6 is a partial perspective exploded view of the roller-band device as it would appear just prior to the final stage of assembly.

Referring initially to FIGS. 1—3 wherein the roller-band device is designated generally by the numeral 10, it is seen that a first housing component in the form of an open-ended, rectangular element 12 receives a second housing component in the form of a U-shaped element 14. Both of the elements 12 and 14 have a width somewhat less than their length as is apparent from viewing FIG. 6. One wall of the rectangular elements 12 presents a planar section 16 and an adjacent perpendicular wall of the element has an opening 17 therein.

The U-shaped element 14 includes legs 18 and 20 of unequal lengths which are interconnected by a bight portion 22. The shorter leg 18 has an opening 23 therein which communicates with the opening 17.

The bight portion 22 presents a second planar section 24 disposed in nonparallel, diverging relationship to the section 16 from a point of closest proximity which is represented by the leg 18. The longer leg 20 presents an end wall intermediate the sections 16 and 24, and spaced from the point of closest proximity of the two sections. This end wall is integral with the bight portion 22 but the element 14 is constructed from a material such that the end wall is movable, to a limited degree, about a fulcrum point defined by the point of interconnection of the leg 20 and the bight portion 22. A rivet 26 at one end of the bight portion 22 mounts a yieldable pad 28, and a second rivet 30 of somewhat longer lengths mounts a second resilient pad 32 as well as a retaining washer 34.

A pair of cylindrical, rotatable members 36 and 38, each having a circular cross section with the sum of the diameters of the members being greater than the distance between the sections 16 and 24, are disposed intermediate the sections for movement therealong. A flexible band 40 is secured to the surface of the section 24 by the rivet 30 and the retaining washer 34, and is convoluted around the members 36 and 38 in an S-shaped configuration. The band 40 continues along the surface of the section 16 and is trained over the leg 20 and secured to the bight portion 22 by the rivet 26 and yieldable pad 28, the latter serving as a retainer washer in the same manner as washer 34.

Referring additionally now to FIGS. 4 and 5, the flexible band 40 has a slot 42 therein for receiving a second flexible band 44 which is also held in place by rivet 30. The band 44 is convoluted around the rotatable member 36 and extends through the openings 23 and 17 in the elements 14 and 12 respectively.

Assembly of the device 10 is greatly facilitated by the nature of the interengageable housing elements 12 and 14. The rotatable members 36 and 38 are positioned relative to the bands 40 and 44 and the latter are secured to the element 14 at respective overlapped ends thereof by the rivet 30. The members 36 and 38 are positioned adjacent the leg 20 and the band 40 is trained over this leg under tension after which it is secured to the bight portion 22 by the rivet 26. The U-shaped element 14 is then inserted within the element 12 through the open end of the latter. The yieldable pads 28 and 32 assure tight interengagement of the elements 12 and 14 with the leg 20 holding the band 40 against the planar section 16 of the element 12.

In operation, because of the divergence of the planar sections 16 and 24, the members 36 and 38 are always biased in the direction of the leg 20. However, since the leg 20 is movable to a limited degree, the band 40 is always maintained taut even when the members are adjacent the leg 20. Movement of the rotatable members away from the leg 20 is effected by applying a force on the band 44 in a direction away from the housing (indicated by the arrow in FIG. 1). This increases the tension on the band 40 and causes the leg 20 to move in the direction of the rotatable members 36 and 38. It will be appreciated that by virtue of the band 40 extending around the fulcrum point of the leg 20 the bias resulting from the combined resiliency of the leg 20 and band 40, as well as their inherent "memory," enhances the forces tending to shift the rollers away from wall 18. As soon as the force on the band 44 is released, the rotatable members are returned to their "normal" positions adjacent the leg 20.

From the foregoing, it is apparent that the present invention contemplates a roller-band device having the low-friction advantages of such prior devices but which eliminates all need for internally-disposed return springs and which is readily adapted to quick assembly on a mass production basis.

It is also apparent from the foregoing that the force on the band 44 which is required to move the rotatable members 36 and 38 from their "normal" position into the "operated" position can vary with the angle of divergence specific for one particular design.

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

1. A roller-band device comprising:

first and second nonparallel planar sections disposed in diverging relationship from a point of closest proximity; a pair of rotatable members disposed intermediate said planar sections,

each of said members having a circular cross section and the sum of the diameters of said members being greater than the distance between said sections; and

flexible band means disposed along the diverging surfaces of said sections and convoluted around said members in an S-shaped configuration for maintaining the axes of said members parallel as the latter rotate over the respective surfaces of said planar sections, said planar sections diverging throughout the length thereof engaged by said band means whereby said rotatable members are biased in the direction of divergence of said planar section by said flexible band means.

2. A device as set forth in claim 1, wherein is included means for maintaining said flexible band means taut as said members move in the direction of divergence of said planar sections.

3. A device as set forth in claim 1, wherein is provided a control element operably associated with said rotatable members and extending in a direction away from the point of greater divergence of the planar sections to permit selective shifting of the rotatable members away from said direction of bias thereon.

4. A device as set forth in claim 3, wherein said control element comprises a second flexible band trained around one of the rotatable members.

5. A device as set forth in claim 4, wherein said second flexible band is trained around the rotatable member in closest proximity to the point of greatest divergence of said planar sections.

6. A device as set forth in claim 2, wherein is provided a second flexible band trained around the rotatable member in closest proximity to said means for maintaining the first-mentioned flexible band taut, and extending in a direction away from the point of greatest divergence of the planar sections to permit selective shifting of the rotatable members away from said direction of bias thereon.

7. A roller-band device comprising:

first and second nonparallel planar sections disposed in diverging relationship from a point of closest proximity; a pair of rotatable members disposed intermediate said planar sections,

each of said members having a circular cross section and the sum of the diameters of said members being greater than the distance between said sections;

flexible means disposed along the surface of each of said

sections and convoluted around said members in an S-shaped configuration for maintaining the axes of said members parallel as the latter rotate over the respective surfaces of said planar sections, whereby said rotatable members are biased in the direction of divergence of said planar sections by said flexible band means; and

means for maintaining said flexible band means taut as said members move in the direction of divergence of said planar sections,

said means for maintaining said flexible band means taut comprising an end wall intermediate said sections and spaced from said point of closest proximity,

said end wall projecting outwardly from one of said sections and being movable about a fulcrum point,

said flexible band means being trained around said wall under tension when said members are positioned adjacent the wall whereby when said members are moved away from said wall the tension on said band means increases and said wall is moved about the fulcrum point in the direction of movement of said rotatable members.

8. A device as set forth in claim 7, and means for moving said rotatable members away from said end wall.

9. A device as set forth in claim 7, wherein is included:

a first housing component presenting said first planar section;

a second housing component removably received within said first component presenting said second planar section,

said second housing component having a leg which presents said end wall.

10. A device as set forth in claim 9,

wherein said first housing component comprises an open-ended, rectangular element,

said second housing component comprises a U-shaped element having legs of unequal length, and

said second planar section is presented by the bight portion of said U-shaped element.

11. A device as set forth in claim 10, wherein the longer leg of said second components presents said end wall and holds said band means against said first planar section.

12. A device as set forth in claim 11, wherein said band means extends around the longer leg of said U-shaped element and is secured to the bight portion thereof.

13. A device as set forth in claim 12, wherein is included yieldable means on the bight portion of said U-shaped element for engagement with said rectangular element as said U-shaped element is received within the latter for assuring tight interengagement of said elements.

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