

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Expansible Linkage for use in Making Watchband or similar Article of Jewelry

5 We, **TEXTRON INC.** a corporation organised and existing under the Laws of the State of Rhode Island, United States of America, of 10 Dorrance Street, Providence, Rhode Island, 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:—

10 This invention relates to an expansible linkage for use in making a watch band, an identification bracelet or similar articles of jewelry.

15 The most satisfactory type of expansible linkage which has been used for making watch bands since 1952, includes two layers of overlapping staggered links in which each link extends in a direction generally transverse to the length of the band. Interconnecting members having legs located within the links of the upper and lower rows pivotally connect them to each other. A single flat spring is located within each link and extends from an intermediate portion of one wall of the link to engage the legs with an initial deflection. The initial deflection of all of the springs is sufficient normally to urge the links of the band to fully contracted position. The ends of the springs which engage the legs are further deflected when the band is expanded by stretching it to slip a wrist watch and band over the hand of the wearer to his wrist. When the stretching force is released the springs act upon the legs and the legs act upon the links to cause the links to return to a nearly contracted position in which the band grips the wrist with sufficient pressure to prevent movement thereof longitudinally of the wrist but without enough pressure to cause discomfort to the wearer. In removing the watch and band from the wrist the band is expanded by stretching it and the combina-

tion is pulled over the wearer's hand and released, whereupon the band returns to fully contracted position. This type of band is disclosed in United Kingdom Patent Specification No. 697,592 and in the specifications of U.S. Patents 2,799,135 to Dolansky and 2,941,351 to Dolansky. Other modifications are known to persons skilled in the art.

While the aforesaid prior art type of linkage has been entirely satisfactory in the manufacture of men's watch bands which are quite wide, its use in ladies' watch bands has been restricted to bands which are about 0.25 inch in width or greater. This has been necessary because when the width of the band is further reduced the length of the springs must be shortened and this reduces the fatigue life of the springs so much that the bands do not stand up to use and are commercially unacceptable. There has been a recognised long felt need in the art for a much narrower linkage of this type for use in making ladies' watch bands thereby to increase the delicate and attractive appearance thereof.

This invention has solved that long felt want by providing a very durable ladies' watch band which may be only about two-thirds as wide as the narrowest prior art watch band of said type. In addition, this invention provides a ladies' watch band which may be about 20% thinner than prior art watch bands of the aforesaid type, thus further enhancing the delicate and attractive appearance thereof.

One object of this invention is to provide an expansible linkage which may be extremely narrow and at the same time durable in use and therefore attractive for use in making an article of jewelry such as a watch band.

In accordance with the invention it is possible to provide such a narrower linkage which is considerably thinner than prior art linkages of this type and therefore more

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attractive for use in making articles of jewelry as a watch band.

This invention also enables the provision of a durable narrow linkage which when used as a watch band or the like is securely held in its contracted position on the wearer's wrist yet it is comfortable and it is also readily removable therefrom.

In a preferred form of the invention the linkage can be shortened or lengthened by the retail jeweler.

In a preferred embodiment of this invention, the width of the finished watch band is 0.18 inch compared with a width of 0.25 inch of a comparable prior art watch band and with a thickness of the bracelet of about 0.1 inch compared with a thickness of about 0.125 inch of a comparable prior art watch band.

According to the present invention there is provided an expansible linkage including two layers of overlapping staggered links, each link extending in a direction generally transverse to the length of the linkage, means interconnecting the links of one layer with the links of the other layer to allow relative displacement of the links lengthwise of the linkage when the linkage is stretched longitudinally from a contracted to an expanded condition, said interconnecting means including at least one interconnecting member having a leg located within at least one of said links and extending in a direction generally transverse to the length of the linkage, said interconnecting member being rotatably connected to an adjacent link in the other layer of links, and resilient means associated with said one link and capable of resisting relative displacement of said links, said resilient means extending between an intermediate portion of one of the link walls and said leg and being capable of urging said leg away from said one link wall, characterized by said resilient means comprising a plurality of laminar springs, one of said springs engaging said leg, and at least the portions of said springs adjacent to the locality of such engagement with said leg being in face to face engagement with each other.

In a preferred embodiment, the springs are of generally arcuate shape between their localities of engagement with the leg and the link wall and the springs are also in face to face engagement with each other between said localities.

By using two very thin springs in each link instead of one thicker spring as in the prior art, by making each spring considerably thinner than the prior art spring and by arranging the two springs in face to face engagement, new and surprising results have been accomplished in that both an adequate linkage contracting force is provided and great durability of the linkage is also provided.

With two thinner springs in the particular arrangement claimed in this application (1) the amount of plastic deflection of each thinner

spring is less than the amount of plastic deflection with a thicker spring of the prior art and (2) the stress range, (the number of pounds per square inch of tension and of compression) to which each thinner spring is subjected during its movements from unloaded height to loaded height and from loaded height to fully deflected position is considerably less than with the single prior art spring. These two facts combine to provide greater fatigue life than with a single thicker prior art spring of the same arcuate shape and of the same length. With a single prior art spring in each link reduced to the length necessary to provide such a narrower linkage, the linkage fails after a relatively few expansions and contractions and is completely unsatisfactory, whereas with a linkage constructed according to the present invention of the same narrower width the linkage may be subjected to many thousands of expansions and contractions without failure.

Further objects and advantages of the invention will be apparent to persons skilled in the art from the following description and the accompanying drawings which describe and show for illustrative purposes only, one embodiment of the invention.

In the drawings:

Fig. 1 is a side view of a segment of a linkage embodying the present invention with the parts shown in contracted positions and partly in section, the section being taken on the line 1-1 of Fig. 7.

Fig. 2 is a view like Fig. 1, but with the parts shown in expanded position, the section being taken on the line 2-2 of Fig. 8.

Fig. 3 is a plan view of the segment of the linkage with the parts shown in fully contracted position and partly in section, the section being taken on the line 3-3 of Fig. 1.

Fig. 4 is a plan view of a segment of the linkage with the parts shown in expanded position and partly in section, the section being taken on the line 4-4 of Fig. 2.

Fig. 5 is a side view of two thin flat springs arranged in face-to-face engagement with each other at their unloaded heights, but before insertion in a link.

Fig. 6 is an enlarged view in perspective of one of the U-shaped interconnecting members.

Fig. 7 is an enlarged section taken on the line 7-7 of Fig. 1.

Fig. 8 is an enlarged section taken on the line 8-8 of Fig. 2.

Fig. 9 is an enlarged view in perspective of one of the top links turned upside down so as to show the inwardly bent tabs of the top shell which secure it to the link.

Fig. 10 is an enlarged section taken on the line 10-10 of Fig. 7.

Fig. 11 is a plan view of one end of the blank from which the top link is formed.

Fig. 12 is a plan view of one end of the blank from which the bottom link is formed.

Fig. 13 is a plan view of one side of the blank from which the ornamental top shell is formed.

Fig. 14 is an enlarged view in perspective of one of the bottom links turned upside down with the interconnecting members and spring removed.

10 The linkage comprises a row of top links 4 and a row of bottom links 5 pivotally connected together by U-shaped interconnecting members 8 which have legs 8A and 8B connected together by the end piece 8C.

15 Each top link 4 has an ornamental shell 11 attached thereto by the tabs 11A which are received in the cut-outs 4A of the top link (see Figs. 9 and 11).

20 The links 4 of the top row of links are staggered with relation to and overlap the bottom links 5 lengthwise of the linkage. The links of both rows extend in a direction generally transverse to the length of the linkage when viewed from the top as in Figs. 3 and 25 4.

The top and bottom links 4 and 5 may be made from stainless steel or any other suitable material.

30 The top link is formed from the blank shown in Fig. 11 and the bottom link from the blank shown in Fig. 12. The blank of the bottom link is formed with outwardly extending tabs 5A which during assembly of the linkage are bent upwardly to hold in and partially conceal the lower portion of the end pieces 8C of the interconnecting members.

35 The ornamental top shell 11 may be made from a blank of gold-filled stock or of stainless steel stock or any other suitable material. 40 When assembled about the top link 4, its top wall overlies the top wall of the link, its depending side walls extend along the outside of the side wall of the link and the tabs 11A hold the top shell in this relationship with the link. The top shell is also provided with end tabs 11B and in the final assembled linkage they serve to conceal the upper portions of the end pieces 8C of the interconnecting members.

50 The ornamental top shells may be omitted and the top link formed with the desirable ornamental appearance without departing from this invention.

55 Each link of each row is pivotally connected with the two adjacent links of the adjacent row by means of four interconnecting members 8.

60 In assembled condition, the legs 8A and 8B of the connecting members extend within the links in a direction generally transverse to the length of the linkage. A leg of each of two of the four connecting members is located within a link of the top row near one side thereof, the other leg of one of

65 these connecting members is located within one adjacent link of the bottom row and the other leg of the other connecting member is located within another adjacent link in the bottom row. The legs of the other two connecting members are similarly located in the 70 links at the opposite side of the linkage.

The laminar springs 13, 14 may be made of any suitable corrosion, set and fatigue resistant material such as stainless steel, a cobalt nickel alloy of the type disclosed in the specification of U.S. Patent No. 2,524,661, or the like. 75

We have found that a narrow, thin, durable ladies' watch band may be made in which the springs 13 and 14 are of stock which is 0.002 inch thick and 0.062 inch wide, with a distance between the bends 15 and 16 of about 0.103 inch in the unloaded condition of Fig. 5. When used in links which have an inside height of about 0.028 inch, a linkage which is about 0.180 inch wide and about 0.100 inch thick is provided which will withstand more than 50,000 expansions and contractions, before failure of a spring. 80

To assemble the linkage, pairs of springs 13, 14 are inserted in the top and bottom links. This causes the ends of the springs to be deflected from their unloaded height of Fig. 5 to a partially loaded height. The legs of the connecting members are then inserted 85 between the bends 15 and 16 of the springs and the outer walls of the links. This causes the ends of the springs to be further deflected to their working height shown in Fig. 7 and the linkage is in the fully contracted position of Figs. 1, 3 and 7. Then the tabs 5A of the bottom links are bent upwardly to the positions shown in Fig. 7, and the top shells are assembled to the top links. 90

95 Such linkage is formed of the desired length, and connecting members are attached to the ends of such length of linkage for use in attaching it to a wrist watch and the resultant watch band is cleaned and polished in any suitable manner. 100

105 In the contracted position of Fig. 7, the crown 17 of each pair of nested springs bears against an intermediate portion of one wall of a link and the bends 15 and 16 engage one leg of a pair of connecting members, thus resiliently urging the linkage to its fully contracted position shown in Figs. 1, 3 and 7. 110

115 When the linkage is expanded from the position shown in Figs. 1, 3 and 7 to the position shown in Figs. 2, 4 and 8, ends of the springs are further deflected from their working height to their full deflection as shown in Fig. 8 and in this position they are bottomed out against the inner wall. This deflection of the springs is caused by the turning movements of the legs. 120

125 Because the crown 17 of the springs is generally arcuate rather than angular or V-shaped, as this working deflection increases

a reverse curve 17A (Fig. 8) is formed in the arcuate crown and the load is no longer concentrated at this crown but divides into loads at either side thereof. As the deflection increases, the reverse curvature increases and the points at which the loads are applied moves farther away from the crown. Between the two loads, the bending moment in the spring is constant and when this amount reaches the plastic flow moment the entire center portion of each spring becomes plastic so that any further deflection occurs as plastic deformation of this center region.

With a V-shaped spring, on the other hand, the reverse curvature will not occur, with the result that the maximum moment occurs at the V-shaped crown and a plastic hinge forms at this crown at a smaller deflection than with the arcuate spring and therefore undergoes a greater total plastic deflection. Consequently the fatigue life of the V-shaped spring is considerably smaller than that of the arcuate shaped spring.

Cut-out portions are provided in the ends of the inner walls of the top and bottom links to receive the bent ends 18 and 19 of the springs as they are deflected from their positions of Fig. 7 to their positions of Fig. 8.

As is well known in the prior art, connecting members having legs of different cross sections may be used. Connecting members may also be used in which the legs of a pair of U-shaped members are connected together to form connecting members of either C-shape or rectangular shape.

The U-shaped connecting members may be provided with notches in the inner surfaces of their legs and held in by bends provided near the ends of the springs as in U.K. Patent Specification No. 697,592, engaging in the notches thus to eliminate the use of tabs such as 5A on the links to hold the U-shaped connecting members in the linkage.

To shorten a linkage such as is disclosed in the drawings, the tabs of pairs of top shells and bottom links are bent outwardly, the intervening section of links is removed and the linkage is reconnected by inserting the legs of the thus free connecting members into the appropriate links and rebending the tabs in their original positions.

The linkage may be lengthened by opening the ends of top and bottom links, adding one or more additional links to the linkage and rebending the tabs to their original positions.

While one desirable embodiment of the invention has been shown in the drawings, it is to be understood that this disclosure is for the purpose of illustration only and that various changes in shape, proportion and arrangements of parts as well as the substitution of equivalent elements for those shown herein

and described, may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

WHAT WE CLAIM IS:—

1. An expansible linkage including two layers of overlapping staggered links, each link extending in a direction generally transverse to the length of the linkage, means interconnecting the links of one layer with the links of the other layer to allow relative displacement of the links lengthwise of the linkage when the linkage is stretched longitudinally from a contracted to an expanded conditions, said interconnecting means including at least one interconnecting member having a leg located within at least one of said links and extending in a direction generally transverse to the length of the linkage, said interconnecting member being rotatably connected to an adjacent link in the other layer of links, and resilient means associated with said one link and capable of resisting relative displacement of said links, said resilient means extending between an intermediate portion of one of the link walls and said leg and being capable of urging said leg away from said one link wall, characterised by said resilient means comprising a plurality of laminar springs, one of said springs engaging said leg, and at least the portions of said springs adjacent to the locality of such engagement with said leg being in face to face engagement with each other.

2. An expansible linkage according to claim 1, characterised in that said plurality of laminar springs are in face to face engagement with each other from said intermediate portion of said one link wall to the locality of engagement of said one spring with said leg.

3. An expansible linkage according to claim 1 or 2, characterised in that each spring of said plurality of laminar springs is of generally arcuate shape when viewed from the side at least in the portion thereof which extends from said locality of engagement with said leg to said intermediate portion of said one link wall.

4. An expansible linkage according to any one of the preceding claims, including a plurality of interconnecting members having legs located within each of said links interconnecting each of said links of one layer of links with adjacent links in the other layer of links, characterised in that in each link there is provided a similar set of said plurality of laminar springs with one spring of each set engaging the legs in the links in which it is disposed, and at least the portions of each set of springs adjacent to the locality of such engagement with said legs being in face to face engagement with each other.

5. An expansible linkage according to claim



a reverse curve 17A (Fig. 8) is formed in the arcuate crown and the load is no longer concentrated at this crown but divides into loads at either side thereof. As the deflection increases, the reverse curvature increases and the points at which the loads are applied moves farther away from the crown. Between the two loads, the bending moment in the spring is constant and when this amount reaches the plastic flow moment the entire center portion of each spring becomes plastic so that any further deflection occurs as plastic deformation of this center region.

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The U-shaped connecting members may be provided with notches in the inner surfaces of their legs and held in by bends provided near the ends of the springs as in U.K. Patent Specification No. 697,592, engaging in the notches thus to eliminate the use of tabs such as 5A on the links to hold the U-shaped connecting members in the linkage.

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and described, may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

WHAT WE CLAIM IS:—

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2. An expansible linkage according to claim 1, characterised in that said plurality of laminar springs are in face to face engagement with each other from said intermediate portion of said one link wall to the locality of engagement of said one spring with said leg.

3. An expansible linkage according to claim 1 or 2, characterised in that each spring of said plurality of laminar springs is of generally arcuate shape when viewed from the side at least in the portion thereof which extends from said locality of engagement with said leg to said intermediate portion of said one link wall.

4. An expansible linkage according to any one of the preceding claims, including a plurality of interconnecting members having legs located within each of said links interconnecting each of said links of one layer of links with adjacent links in the other layer of links, characterised in that in each link there is provided a similar set of said plurality of laminar springs with one spring of each set engaging the legs in the links in which it is disposed, and at least the portions of each set of springs adjacent to the locality of such engagement with said legs being in face to face engagement with each other.

5. An expansible linkage according to claim



1 substantially as described herein with reference to the accompanying drawings.

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