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COMPLETE SPECIFICATION.

Expansible Link Strap.

We, RODI & WIENENBERGER AKTIENGESELLSCHAFT, of Bleichstrasse 56~~-58~~, Pforzheim, Baden, Germany, a German Corporation, 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:—

The present invention relates to improvements in expansible link straps for ornamental and utilitarian purposes and particularly in watch straps of the type which consists of two layers of links forming sleevelike casings, in which each link of one layer is flexibly connected to two adjacent links of the other layer by a pair of substantially rectangular connecting brackets, each of which is interrupted by an opening at one longitudinal side and consists of an arm which extends through the link of one layer, a pair of opposite back portions which are disposed at the longitudinal edges respectively of the link strap and extend from a link of one layer to a link of the other layer, and a pair of short arms which extend from the back portions respectively into the link of the other layer. When such a strap is either expanded or bent, the connecting brackets between the links of the two layers pivot against spring action.

This spring action is produced in the known link straps of the above-mentioned type by leaf springs which are mounted at least within the links of one layer and are tensioned by the short arms of the connecting brackets which extend into each link. For tensioning the leaf springs, these short arms of the connecting brackets are made of a substantially rectangular cross section so that, when they are turned due to the pivoting movement of the brackets when the strap is being expanded, they will take up a greater space between the wall of the respective link and the end of the leaf spring which presses them against that wall even in the contracted position of the strap. Instead of leaf springs, some of these known link straps contain torsion springs, one end of which is nonrotatably connected to one of the short arms of the connecting bracket, while the other end is secured so as not to be rotatable or it is nonrotatably connected to a diagonally opposite short arm of the other connecting bracket so that, when the strap is being expanded, the tensioned springs will also in this case exert upon the brackets a restoring moment which tends to contract the strap to its original position.

It is an object of the present invention to provide a link strap with an improved spring and bracket construction which considerably simplifies the manufacture of the strap and thus also reduces the cost thereof.

A further object of the invention is to provide a link strap which may be expanded to a much greater extent than previous straps of a similar type, namely, to such an extent that the links of one layer will enter between the links of the other layer and all links will therefore be disposed substantially within the same plane when the strap is fully expanded.

This last-mentioned object could previously be attained with straps of this type only if torsion springs, for example, wound coil springs, were provided in the links. Since such torsion coil springs which are made of a relatively thin spring steel wire have a very large surface area as compared with their weight, they are easily subject to corrosion, fatigue, and breakage, even though they might be made of the best stainless steel.

It is therefore another object of the invention to provide a link strap, particularly for a wrist watch, which may be expanded to a very great extent and is of a very

small thickness in the direction perpendicular to the wrist of the wearer, and which contains springs which are not easily subject to corrosion and may be manufactured very easily and inexpensively.

Apart from attaining the aforementioned objects, the link strap should also comply with the requirement that it may be taken apart at any desired point in order to permit it to be extended or reduced in length by the addition or removal of any desired number of links.

With these objects in view, the invention provides an expansible link strap for ornamental and utilitarian purposes, particularly as a watch strap, consisting of two layers of links forming sleeve-like casings staggered relative to each other in the longitudinal direction of the strap by a distance of the width of one-half link when in the contracted condition, in which each link of one layer is pivotably connected with two adjacent links of the other layer by a pair of substantially rectangular resilient connecting brackets pivotable against their spring action when the strap is being expanded or bent, each connecting bracket having an opening along one longitudinal side and consisting of a continuous arm extending through a link of one layer, a pair of opposite back portions disposed at the longitudinal edges respectively of the strap and extending from a link of one layer to a link of the other layer, and two short arms extending from the back portions respectively into the link of the other layer, and in which at least one of the arms of each connecting bracket is bent out of a position along a longitudinal side of the bracket and is retained between opposite walls of the link in which the arm is disposed, in a position under a resilient tension when the strap is in the contracted condition, said walls constraining the arm to cause it, on pivoting movement of the bracket when the strap is being expanded or bent, to assume a position, different from its said position in the contracted condition, in which the arm by its own spring action exerts a restoring torque upon the bracket.

According to one preferred embodiment of the invention, at least one of the two short arms of each connecting bracket which is made of spring wire is extended, and this extension is bent out of the general plane of the bracket and also in the direction toward the continuous bracket arm opposite to the two short arms.

If such connecting bracket, which at the same time forms the spring element, is inserted into a link casing, the free end of the extension of the one short bracket arm which serves as a spring will at first be bent away from the opposite continuous bracket arm so that this spring arm will be given an initial tension. Since the end of this extension or spring arm engages with and acts upon a wall of the link casing at a point outside of the general plane of the remainder of the connecting bracket, the spring action produces a torque upon the bracket. If the spring extension of the short bracket arm, the free end of which is retained between the walls of the link casing, is bent out of its initial position by the pivoting movement of the bracket which is caused by the expansion of the strap, its spring force will increase and thereby produce a restoring moment of a strength which increases the more the strap is being expanded.

The inventive feature of combining the spring with the connecting bracket so as to form an integral element made of one piece of material has considerable advantages, particularly insofar as its manufacture is concerned, especially since these brackets are generally mass-produced by automatic machines. The entire connecting bracket including the extension of the one short arm which serves as a spring is preferably made of round spring wire, and the two back portions of the bracket which connect the short arms with the continuous arm are preferably flattened so as to give a better appearance since they are disposed along the longitudinal edges of the strap and slide along the open ends of the link casings. The use of a round spring wire has the advantage that such a cross section is least affected by corrosion so that there will be no danger of any breakage or fatigue of the spring even after a long use of the strap under unfavorable conditions such as a high humidity, strong perspiration, or the like.

According to another feature of the invention, the free end of the spring extension of the one short arm of each connecting bracket is preferably bent out of the general plane of the bracket for a distance equal to the diameter of the spring wire, and the spring extension is preferably made of a length so that its free end overlaps the end of the other short bracket arm so that this end can never be forced back into the general plane of the bracket. It is further advisable to make the inner width of each link casing containing the spring extension, as seen in the longitudinal direction of the strap, of a size corresponding to three times the diameter of the spring wire of the bracket plus the clearance space required for the rotary movement of the brackets within the link casing, but to make the inner height of each link casing of both layers only of a size substantially corresponding to one wire diameter, so that the short arms and the continuous arm of each connecting bracket will have just sufficient clearance within the link casings of both layers so as to be freely rotatable.

Since the inner width of each link casing of one layer is only slightly larger than the distance of three times the diameter of the wire, the free end of the spring extension of a connecting bracket will be disposed between the other short arm of the same bracket and the diagonally opposite short arm of the second bracket within the same link casing which is likewise extended to form a spring arm. The free ends of the two parallel spring extensions or spring arms which extend from opposite sides obliquely through each link casing are therefore securely guided between two adjacent short arms.

According to two further embodiments of the invention, the continuous arm of each connecting bracket is provided with a shallow V-shaped bend so that the apex of the wide angle thus formed in the continuous arm will be disposed outside of a straight line connecting the two ends of this arm.

According to one of these further embodiments of the invention, the continuous arm of each bracket is made of a rectangular cross section and it is bent like a leaf spring within the general plane of the bracket to have a V-shape with the apex thereof pointing inwardly in the direction toward the two short arms of the bracket. In the case of this second embodiment it is advisable to make the entire bracket of spring wire of a rectangular cross section, in which event the short bracket arms should also be bent in the direction toward the continuous arm so that, when the strap is in the contracted position the sleevelike link casings into which the short bracket arms extend will be held under an initial tension.

The third embodiment of the invention consists in making the continuous arm of spring wire of a round cross section and in bending it laterally out of the general plane of the connecting bracket into a V-shape, and also in the direction toward the short arms, and in mounting it with an initial tension between the inner and outer walls of the link casing, the inner height of which substantially corresponds to the diameter of the wire. The sleevelike links therefore only need in this case to be made of an inner height corresponding to the diameter of the wire of which the bracket is made. The strap therefore becomes very thin. This last-mentioned embodiment also has the advantage that the connecting brackets may be very easily inserted into the links or unhooked therefrom by providing the links into which the short bracket arms extend with a pair of cutouts at their inner walls. Each individual link of this embodiment may also be bent from a single piece of flat metal since no more than the mentioned cutouts are required for shortening or lengthening the strap. However, it is necessary to limit the extensibility of the strap which may be done in a very simple manner by extending the outer walls of the link casings beyond the back portions of the brackets and by bending the projecting ends over the back portions, and by further providing the transverse side walls of the links of at least one layer within the pivoting range of the brackets with cutouts of such a depth that the edges of the remaining portions will serve as abutments to limit the pivoting angle of the connecting brackets.

In both of these embodiments, that is, in that with a V-shaped bracket arm of a rectangular cross section which is inwardly bent within the plane of the bracket, as well as in that with a V-shaped bracket arm of a round cross section which is bent outwardly of the plane of the bracket, these bent portions will be pressed out flat when the strap is being expanded because of the rotation of the continuous brackets relative to the sleevelike links. In the bracket which is made of a flat wire, the restoring force will act thereon at a point outside the central plane of the bracket since, due to the rectangular cross section of the bracket, the diagonally opposite edges thereof rest against the two opposite walls of the sleevelike links. The maximum extent of the pivoting movement of the bracket arms and thus the maximum expansion of the strap is in this case determined by the fact that, after the V-shaped bend of the continuous arm of the bracket has been pressed flat, the bracket will be prevented from any further turning by the two opposite walls of the link casing. In the bracket which is made of a round wire and has a V-shaped lateral bend, this bend will likewise be straightened out flat until the strap is in the fully extended position in which the brackets are pivoted at an angle of 90°. Also in this case, the restoring force due to the resilience of the bracket will act outside the plane of the bracket and produce the restoring moment. However, the pivoting angle of the brackets must be limited in the manner as above described to less than 90° since, at a turn of 90°, the restoring moment will become zero and would even attain a negative value if the brackets were turned more than 90°.

In order to permit the connecting brackets of the first and second mentioned embodiments together with their short arms to be easily inserted into the link casings and to permit the strap to be taken apart at any desired place without the need of any tools, the link casings of one layer are preferably of the type as frequently used in link straps of a similar kind, and each of them consists of a substantially rectangular casing which is provided with a slot extending transverse

to the direction of expansion of the strap through which the short bracket arms may be inserted into the link casing, and each link casing further consists of a bottom plate or a U-shaped member which is slipped from one side into the casing and then covers up the slot in the latter from the inside. These bottom plates or U-shaped members which are inserted at least into the sleeves of one layer of links are preferably provided at their open outer ends with a tonguelike projection which serves as an abutment to limit the pivoting movement of the connecting brackets. The links of the other layer may also similarly be made of two parts, and even in the third embodiment of the invention two-piece links may be applied.

The open ends of the link casings and the back portions of the connecting brackets may also be covered in the usual manner by bent-over tabs extending from a wall of each link casing in order to round off the longitudinal edges of the strap and cover up the back portions of the brackets. It is also possible to make the link casings of the lower layer narrower than those of the upper layer, as seen in the longitudinal direction of the strap so that, when the strap is in the contracted position, gaps will remain between the adjacent links of the lower layer in order to prevent any hairs on the wrist of the wearer of the strap from being caught and pulled when the strap is being slipped upon the wrist.

The links of the upper layer may also be covered in a known manner by ornamental shell-like members which may at the same time also cover the end openings of the links and the back portions of the connect-brackets.

The back portions of the brackets are made of a height so that when the strap is being expanded, the links of the upper layer will be able to slide along and past the links of the lower layer and to enter into the gap between two adjacent links of the lower layer, so that the strap may be stretched to a position in which the links of the upper layer will be disposed between the links of the lower layer and the links of both layers will be substantially within the same plane.

These and other features and advantages of the present invention will become more apparent from the following description of several preferred embodiments thereof when read with reference to the accompanying drawings in which:—

Figure 1 shows a side view of a part of a link strap according to a first embodiment of the invention in the contracted position;

Figure 2 shows a side view of the same part of a link strap in the expanded position;

Figure 3 shows an enlarged longitudinal section taken along line III—III of Figure 7 of a link of the upper layer and of an adjacent link of the lower layer in the contracted position of the strap;

Figure 4 shows a longitudinal section similar to Figure 3, but with the same links in the expanded position of the strap;

Figure 5 shows a perspective view of several links of both layers, with parts thereof being cut away to show the inner details thereof;

Figure 6 shows a side view similar to Figures 1 and 2, but with the strap in the fully expanded position;

Figure 7 shows several links partly in a top plan view and partly in a horizontal section taken along line VII—VII of Figure 1;

Figure 8 shows a perspective view of one of the connecting brackets;

Figure 9 shows a perspective view of the connecting bracket in its inclined or pivoted position in a link;

Figure 10 shows a cross section taken along line X—X of Figure 8;

Figure 11 shows a side view of a modification of the invention forming a second embodiment of the strap, a part of which is illustrated in the contracted position;

Figure 12 shows a side view of the strap portion according to Figure 11 in the expanded position;

Figure 13 shows a perspective view, partly in section, of the embodiment according to Claim 11;

Figure 14 shows a perspective view of a connecting bracket as applied in the embodiment according to Figure 13;

Figure 15 shows a perspective view of a modification of the connecting bracket according to Figure 14;

Figure 16 shows a cross section taken along line XVI—XVI of Figure 11;

Figure 17 shows a cross section taken along line XVII—XVII of Figure 12;

Figure 18 shows a side view, partly in section, of a further modification of the invention forming a third embodiment of the strap, a part of which is illustrated in the contracted position;

Figure 19 shows a side view similar to Figure 18, but with the strap in the expanded position;

Figure 20 shows a perspective view, partly in section, of the embodiment according to Figure 18;

Figure 21 shows a perspective view of a connecting bracket as applied in the embodiment according to Figures 18 to 20;

Figure 22 shows a top plan view of the bracket according to Figure 21;

Figure 23 shows a cross section taken along line XXIII—XXIII of Figure 18; while

Figure 24 shows a cross section taken along line XXIV—XXIV of Figure 19.

Referring to the drawings, and first particularly to Figures 1 to 10, the flexible link strap according to the first embodiment of the invention consists of a plurality of links 10 forming an upper layer and of links 20 forming a lower layer. As illustrated particularly in Figures 3 and 4, each link 10 and 20 of each layer forms a substantially rectangular casing with open ends and is made of two parts consisting of a casing 11 or 21 with a relatively wide slot on its inner sides and a U-shaped member 12 or 22 inserted into casing 11 or 21, respectively, so as to close the slot in the latter from the inside. The central parts of the U-shaped members 12 which are inserted into casings 11 of the upper layer 10 have outwardly projecting tongues 13 on their ends serving as abutments to limit the pivoting movement of the connecting brackets 30.

Each of these connecting brackets 30, as illustrated particularly in Figures 8 and 9, consists of round spring wire and is bent to a rectangular shape consisting of a continuous arm 31, a pair of flattened back portions 32, and two short arms 33 and 34. Arm 34 has an extension 35 which forms a spring and has a length so that its free end 36 extends slightly beyond the end of the shorter arm 33. As shown particularly in Figure 7, this arm 34 and extension 35 are bent slightly out of the common plane of the other arms of the bracket so that the free end of extension 35 will be disposed at a distance of approximately one wire diameter outside of said plane, and it is also bent inwardly in the direction toward the opposite continuous arm 31.

Each link 10 of the upper layer contains the continuous arms 31 of two connecting brackets 30, while the short arms 33 and 34 thereof are inserted into two adjacent links 20 of the lower layer. The inner height of each link 10 of the upper layer as well as of each link 20 of the lower layer corresponds to the diameter of the spring wire forming the connecting bracket 30, so that the continuous arm 31 and the short arms 33 and 34 will be able to rotate within the respective links of each layer. When the strap is in the assembled condition, each spring arm 34 and extension 35 which is normally bent toward the continuous arm 31, is bent so far toward the short arm 33 that the free end 36 is at the same level as arm 33 but adjacent to it within a link casing 20 of the lower layer, so that this free end 36 resiliently engages with the central part of the U-shaped member 22 within this link casing. This position of spring arm extension 35 is indicated by dot-and-dash lines in Figure 8. In Figure 10 the free end of spring arm extension 35 is similarly indicated in the released positions at 36, while when the connecting bracket is inserted into a link of the lower layer and the strap is in the contracted position, the free end of spring arm extension 35 will be in the full-line position at 36*a*. As illustrated in Figure 7, the two brackets, the short arms 33 and 34 of which engage into a link casing 20 of the lower layer, are inversely turned relative to each other so that the spring arm 35^1 of one bracket extends from one longitudinal side of the strap toward the other side, while spring arm 35^2 of the other bracket extends from this other side toward the first side. The end 36 of each of these arms then lies between a short arm 33 of one bracket and the extended arm 34 of the other bracket. The inner width of links 20 of the lower layer amounts to a distance of approximately three times the diameter of the wire so that arms 33 and 34 and the end 36 of spring arm extension 35 between these arms will just fill the inner width of the link casing. The free end 36 of one bracket is thus retained between the two short arms 33 and 34 of this and the adjacent bracket, and cannot get out of this position even when the strap is being expanded. At such a time, the back portions 32 of the connecting brackets 30 will turn to an inclined position, as shown in Figure 2, and the continuous arms 31 and the short arms 33 and 34 will therefore turn relative to links 10 and 20. Since the end 36 of each spring arm extension 35 must remain in position between the short arms 33 and 34 when the strap is being expanded, it will move relative to the turning short arm 33 and around the same, as illustrated in Figures 9 and 10, and it will assume the position 36*b* as indicated in Figure 10 when connecting brackets 30 have been pivoted about an angle of 90°, which corresponds to the fully expanded position of the strap as shown in Figure 6.

Since in the assembled and contracted position of the strap, the end 36 of spring arm extension 35 is already bent from the free position marked 36, as shown in Figure 10, to the position 36*a*, a spring force acts upon the connecting bracket. This spring force will exert itself in the form of a torque since the reaction force is disposed outside of the plane of bracket 30. This reaction force and thus also the restoring moment increases when the strap is being expanded, because by the pivoting movement of the connecting bracket, the position of the free end of spring arm extension 35 relative to the short arm 33 is shifted from the position 36*a* to the position 36*b*, as shown in Figure 10. Spring arm extension 35 on each bracket 30 therefore insures that, because of the restoring moment acting upon the bracket, the strap will always tend to contract and that even when the strap is in

the fully contracted position, there will still be an active spring force which is sufficiently strong to press the links 10 of the upper layer resiliently against each other.

According to the second embodiment of the invention as illustrated in Figures 11 to 17, the flexible link strap consists of a plurality of sleevelike links 40 forming an upper layer and of similar links 50 forming a lower layer. As illustrated particularly in Figure 13, each link 40 and 50 of both layers is made of two parts and consists of a casing 41 or 51, respectively, which is provided with a relatively wide slot on its inner side facing toward the other layer. This slot is covered by the insertion of a bottom plate 42 or 52, respectively. The connecting brackets 60 which connect the links 40 and 50 of both layers to each other are each made of a bent spring wire of a rectangular cross section. The continuous arm 61 of each bracket is bent inwardly within the general plane of the bracket like a leaf spring to form a wide-angular V so that the apex 64 of this arm will be disposed outside of the straight line connecting the ends of arm 61. The short arms 62 of each bracket are bent toward the continuous arm 61. The back portions 63 of each bracket lie outside the edges of both layers of the links which form the longitudinal edges of the strap. Each link 40 of one layer is pivotably connected by a pair of brackets according to Figure 14 to two adjacent links 50 of the other layer. The inner height of each link 40 and 50 is made of such a size that the apex 64 of the V-shaped continuous arm 61 and the free ends 65 of the short arms 62 engage with an initial tension with the two bottom plates 42 and 52 of the respective links 40 and 50, as also indicated in Figure 16. This initial tension is adapted to maintain the link strap in the contracted position. If the strap is being expanded, as illustrated in Figure 12, the continuous arms 61 and the short arms 62 will rotate within the respective links of each layer, which necessarily results in the bend in the continuous arms 61 and the inwardly bent short arms 62 being straightened out. This spring force, acting only toward one side, exerts a restoring moment on the brackets which tends to contract the strap.

Figure 15 illustrates that at least one of the short arms 62 of the connecting bracket may also be provided with an extension 66 which preferably extends beyond the center of the bracket.

According to the third embodiment of the invention, as illustrated in Figures 18 to 24, links 70 of the upper layer and the corresponding links 80 of the lower layer are each made of a single piece of material and may either be made of drawn material or by bending a blank of flat metal to the desired shape. The outer walls 71 and 81 of the links 70 and 80, respectively, extend beyond the back portions 93 of the connecting brackets 90 which are disposed within the longitudinal edges of the strap, and their overlapping ends 72 and 82 are bent over so as to cover the back portions of the brackets substantially or entirely. The transverse side walls 83 of links 80 of the lower layer are provided with cutouts 84 within the plane of the pivoting movement of connecting brackets 90, and these cutouts 84 are made of such a depth that the remaining parts 85 form abutments for limiting the pivoting movement of connecting brackets 90. For inserting the short arms 92 of the connecting brackets into the link casings 80 of the lower layer and for removing them therefrom, a pair of opposite notches 87 are provided in the inner wall 86 of these links.

The connecting brackets 90 are made, like those of the first embodiment according to Figures 1 to 10, of spring wire of a round cross section. As clearly shown in Figure 22, the continuous arm 91 of each bracket is bent laterally out of the general plane of the bracket so that it will have a wide-angular lateral V-shape and the apex 94 of arm 91 will be disposed outside of the straight line connecting its ends. This laterally bent arm 91 is further bent slightly in the direction toward the short bracket arms 92, as indicated in Figure 21. The continuous bracket arms 91 are therefore bent both laterally as well as inwardly. Each link 70 of the upper layer which has an inner height corresponding to the wire diameter of brackets 90 contains a pair of these bent continuous arms 91. Due to the fact that arm 91 is also bent slightly toward the short bracket arms, the brackets engage with the inner walls of links 70 with a certain initial tension. The short arms 92 of the pair of brackets within each link 70 of the upper layer engage into two adjacent links 80 of the lower layer and are adapted to be inserted into or to be removed from these links through the notches 87. Since the inner height of link casings 80 of the lower layer also corresponds to the wire diameter of the connecting brackets, the brackets may be easily rotated within these casings.

When the strap is being expanded, the connecting brackets also of this embodiment are turned to an oblique angle whereby the continuous bracket arms 91 will be turned in links 70 of the upper layer. Since these arms 91 already engage with an initial tension in links 70 through their inward bend, the lateral V-shaped bend will be straightened out due to the resilience of the bracket material. The spring force which is thereby produced will act outside the common plane of the bracket and thereby exert a

restoring moment upon the bracket arms so that the strap also according to this embodiment will again tend to contract due to the inherent resilience of the brackets. Figure 24 illustrates the connecting brackets 91 in the nearly straightened position when the strap is expanded.

WHAT WE CLAIM IS:—

1. An expansible link strap for ornamental and utilitarian purposes, particularly as a watch strap, consisting of two layers of links forming sleeve-like casings staggered relative to each other in the longitudinal direction of the strap by a distance of the width of one-half link when in the contracted condition, in which each link of one layer is pivotably connected with two adjacent links of the other layer by a pair of substantially rectangular resilient connecting brackets pivotable against their spring action when the strap is being expanded or bent, each connecting bracket having an opening along one longitudinal side and consisting of a continuous arm extending through a link of one layer, a pair of opposite back portions disposed at the longitudinal edges respectively of the strap and extending from a link of one layer to a link of the other layer, and two short arms extending from the back portions respectively into the link of the other layer, and in which at least one of the arms of each connecting bracket is bent out of a position along a longitudinal side of the bracket and is retained between opposite walls of the link in which the arm is disposed, in a position under a resilient tension when the strap is in the contracted condition, said walls constraining the arm to cause it, on pivoting movement of the bracket when the strap is being expanded or bent, to assume a position, different from its said position in the contracted condition, in which the arm by its own spring action exerts a restoring torque upon the bracket.

2. A link strap as defined in Claim 1, characterized by the fact that at least one of the two short arms of each connecting bracket which is made of spring wire has an extension which is bent toward one side of the general plane of the connecting bracket and also in the direction toward the continuous bracket arm opposite to said two short arms.

3. A link strap as defined in Claim 2, characterized by the fact that each of the connecting brackets is made of spring wire of a round cross section, and that the parts thereof forming the back portions connecting the short arms to the continuous arm are flattened.

4. A link strap as defined in Claim 3, characterized by the fact that the free end of the extension of the one short arm serving as a spring is bent out of the general plane of the bracket for a distance equal to the diameter of the wire, and that it overlaps the end of the other short arm.

5. A link strap as defined in Claim 4, characterized by the fact that each link casing containing the resilient extensions of the short arms of two adjacent connecting brackets has an inner width as seen in the longitudinal direction of the strap, which substantially corresponds to three times the diameter of the spring wire, and that the inner height of each link of both layers corresponds to the diameter of the wire plus a clearance necessary for the rotary movement of the brackets within the link casing.

6. A link strap as defined in Claim 1, characterized by the fact that the continuous arm of each connecting bracket is bent to form a shallow, wide-angular V-shape having an apex disposed outside of a straight line connecting the ends of said continuous bracket.

7. A link strap as defined in Claim 6, characterized by the fact that the continuous bracket arm consists of spring wire of a rectangular cross section, and that said arm is bent like a leaf spring within the general plane of the bracket to a V-shape having an apex pointing inwardly toward the two short arms of the bracket.

8. A link strap as defined in Claim 7, characterized by the fact that the short bracket arms are likewise of a rectangular cross section and are bent inwardly toward said continuous arm.

9. A link strap as defined in Claim 8, characterized by the fact that the apex of the continuous arm and the free ends of the inwardly bent short arms of each bracket engage under initial tension against the inner walls of the links.

10. A link strap as defined in Claims 7 to 9, characterized by the fact that at least one of the inwardly bent short arms has an extension projecting beyond the center of the bracket.

11. A link strap as defined in Claim 6, characterized by the fact that the continuous arm consists of spring wire and has a round cross section, that said arm is bent laterally out of the general plane of the bracket to a V-shape and also in the direction toward the short bracket arms, that said continuous arm is mounted with initial tension between the outer and inner walls of the associated link, and that said link has an inner height substantially equal to the diameter of the short bracket arms.

12. A link strap as defined in Claim 11, characterized by the fact that the short bracket arms also have a round cross section and that the link which is adapted to receive the short arms has a height substan-

restoring moment upon the bracket arms so that the strap also according to this embodiment will again tend to contract due to the inherent resilience of the brackets. Figure 24 illustrates the connecting brackets 91 in the nearly straightened position when the strap is expanded.

WHAT WE CLAIM IS:—

1. An expansible link strap for ornamental and utilitarian purposes, particularly as a watch strap, consisting of two layers of links forming sleeve-like casings staggered relative to each other in the longitudinal direction of the strap by a distance of the width of one-half link when in the contracted condition, in which each link of one layer is pivotably connected with two adjacent links of the other layer by a pair of substantially rectangular resilient connecting brackets pivotable against their spring action when the strap is being expanded or bent, each connecting bracket having an opening along one longitudinal side and consisting of a continuous arm extending through a link of one layer, a pair of opposite back portions disposed at the longitudinal edges respectively of the strap and extending from a link of one layer to a link of the other layer, and two short arms extending from the back portions respectively into the link of the other layer, and in which at least one of the arms of each connecting bracket is bent out of a position along a longitudinal side of the bracket and is retained between opposite walls of the link in which the arm is disposed, in a position under a resilient tension when the strap is in the contracted condition, said walls constraining the arm to cause it, on pivoting movement of the bracket when the strap is being expanded or bent, to assume a position, different from its said position in the contracted condition, in which the arm by its own spring action exerts a restoring torque upon the bracket.

2. A link strap as defined in Claim 1, characterized by the fact that at least one of the two short arms of each connecting bracket which is made of spring wire has an extension which is bent toward one side of the general plane of the connecting bracket and also in the direction toward the continuous bracket arm opposite to said two short arms.

3. A link strap as defined in Claim 2, characterized by the fact that each of the connecting brackets is made of spring wire of a round cross section, and that the parts thereof forming the back portions connecting the short arms to the continuous arm are flattened.

4. A link strap as defined in Claim 3, characterized by the fact that the free end of the extension of the one short arm serving as a spring is bent out of the general plane of the bracket for a distance equal to the diameter of the wire, and that it overlaps the end of the other short arm.

5. A link strap as defined in Claim 4, characterized by the fact that each link casing containing the resilient extensions of the short arms of two adjacent connecting brackets has an inner width as seen in the longitudinal direction of the strap, which substantially corresponds to three times the diameter of the spring wire, and that the inner height of each link of both layers corresponds to the diameter of the wire plus a clearance necessary for the rotary movement of the brackets within the link casing.

6. A link strap as defined in Claim 1, characterized by the fact that the continuous arm of each connecting bracket is bent to form a shallow, wide-angular V-shape having an apex disposed outside of a straight line connecting the ends of said continuous bracket.

7. A link strap as defined in Claim 6, characterized by the fact that the continuous bracket arm consists of spring wire of a rectangular cross section, and that said arm is bent like a leaf spring within the general plane of the bracket to a V-shape having an apex pointing inwardly toward the two short arms of the bracket.

8. A link strap as defined in Claim 7, characterized by the fact that the short bracket arms are likewise of a rectangular cross section and are bent inwardly toward said continuous arm.

9. A link strap as defined in Claim 8, characterized by the fact that the apex of the continuous arm and the free ends of the inwardly bent short arms of each bracket engage under initial tension against the inner walls of the links.

10. A link strap as defined in Claims 7 to 9, characterized by the fact that at least one of the inwardly bent short arms has an extension projecting beyond the center of the bracket.

11. A link strap as defined in Claim 6, characterized by the fact that the continuous arm consists of spring wire and has a round cross section, that said arm is bent laterally out of the general plane of the bracket to a V-shape and also in the direction toward the short bracket arms, that said continuous arm is mounted with initial tension between the outer and inner walls of the associated link, and that said link has an inner height substantially equal to the diameter of the short bracket arms.

12. A link strap as defined in Claim 11, characterized by the fact that the short bracket arms also have a round cross section and that the link which is adapted to receive the short arms has a height substan-

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tially equal to the diameter of said short arms.

13. A link strap as defined in Claims 11 and 12, characterized by the fact that each of the links adapted to receive the short bracket arms has a pair of opposite cutouts in its inner wall for inserting and removing said short arms.

14. A link strap as defined in Claims 11 to 13, characterized by the fact that the outer walls of the links project beyond the back portions of the brackets and the projecting portions are bent over so as substantially to cover the back portions, that the transverse walls of the links of at least one layer have cutouts within the path of the pivoting movement of the back portions, and that the cutouts have such a depth that the edges of the remainder of the transverse wall portions containing the cutouts form abutments to limit the extent of the pivoting movement of the brackets.

15. A link strap as defined in any one of the preceding claims, characterized by the fact that each link consists of a substantially rectangular sleevelike casing having a slot extending transverse to the direction of expansion of the strap, and of a bottom plate inserted into said casing and covering up said slot from the inside of said casing.

16. A link strap as defined in Claim 15, characterized by the fact that the bottom plate has lateral walls of a height corresponding to the inner height of the casing and forms a U-shaped member.

17. A link strap as defined in Claim 15 or 16, characterized by the fact that each bottom plate or U-shaped member which is inserted into a casing of one layer has a projection on each end serving as an abutment to limit the pivoting movement of the connecting brackets within that casing.

18. An expansible link strap substantially as hereinbefore described with reference to and as illustrated in Figures 1 to 10 of the accompanying drawings.

19. An expansible link strap substantially as hereinbefore described with reference to and as illustrated in Figures 11 to 14, 16 and 17 of the accompanying drawings.

20. A modification of a link strap as claimed in Claim 19 substantially as hereinbefore described with reference to and as illustrated in Figure 15 of the accompanying drawings.

21. An expansible link strap substantially as hereinbefore described with reference to and as illustrated in Figures 18 to 24 of the accompanying drawings.

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