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COMPLETE SPECIFICATION

Improvements in and relating to Elastic Straps or Bracelets

We, RODI & WIENENBERGER AKTIENGESELLSCHAFT, of Bleichstrasse 58-68, Pforzheim, Baden, Germany, a German Company, 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 elastic straps or bracelets which consist of main link elements and intermediate connecting elements which are resiliently connected to each other.

It is an object of the present invention to provide an elastic strap in which the main link and intermediate connecting elements as seen from the narrow sides of the strap are disposed in a zigzag arrangement relative to each other and are pivotally and resiliently connected with each other so that, by such resilient pivotal movement, the individual main link elements tend to engage with each other so as to contact the strap to the shortest possible length, while, when the strap is being expanded, the link and connecting elements are pivoted apart, thereby resiliently increasing the distance between the individual link elements so that the strap, when used, for example, as a bracelet or a watch strap, will adapt itself to the size of the wrist or arm on which it is worn.

Another object of the invention is to provide an elastic strap in which the individual main link elements consist of integrally connected twin or double links forming two layers in different horizontal planes.

A further object of the invention is to provide a new and improved spring construction for resiliently pivoting the individual link and connecting elements of the strap relative to each other.

A further object of the invention is to provide an elastic strap, the resiliency of which is obtained without any separate springs and merely by the self-resiliency of its link members.

A preferred feature of the present invention consists in providing the individual elements in the form of hollow casings which are elongated in the longitudinal direction of the strap but are individually disposed at an oblique angle to the wrist or arm on which the strap is worn. These casings are split apart at one side and one of the free ends which is thus formed is extended into the opposite part of the casing, the free end of which engages over the first free end. The casings are bent so that at least the extended end coming from one part of the casing and projecting into the free end portion of the opposite part forms a spring arm and exerts a spring pressure upon such free end portion, or that both the extended end, as well as the overlapping end portion exert a spring pressure in a direction toward each other. In one preferred embodiment of the invention, the connecting members are made in the form of a rectangular bracket, one cross arm of which is pivotally mounted in the part of the casings opposite to that in which the extended spring end is disposed, while the opposite crossarm is disposed within the opposite part of the adjacent casing and between the mentioned spring arm and the overlapping end. This latter crossarm of the connecting bracket is preferably of a flat shape so that the spring arm and possibly also the overlapping end portion of the casing will exert the greatest possible lever action thereon. This end of the connecting bracket is connected to the pivoting end thereof by a pair of side arms which extend from one to the adjacent casing along the outer ends thereof in the longitudinal direction of the strap. However, since these connecting brackets likewise extend from the lower portion of one casing to the upper portion of the adjacent casing, their general position is likewise oblique with respect to the supporting surface, i.e. the wrist or arm

of the wearer. The flat bracket arm may either extend continuously across the main links from one side arm to the other, or it may consist of a pair of such flat arms which are extending from the side arms sufficiently inwardly and into the open ends of the link casings so that the spring arm, and possibly also the overlapping end portion of the links, can exert their full spring pressure thereon. In this case, the pair of flat arms are securely retained within the link casings due to the fact that the pivotal end of each connecting bracket extends within and entirely across the casings from one side arm of the bracket to the other, and thus also maintains the inwardly extending flat arms in their proper position within the casings. Obviously, instead of extending the pivotal part of the connecting brackets entirely across and within the casings and making the flat bracket arm discontinuous, as just described, the flat bracket arm may form the continuous cross member, while the pivot part of the bracket may be in the form of a pair of pivot pins extending from the side arms into each link casing.

Furthermore, according to the invention, the opposite side arms of the connecting brackets may be extended or enlarged so as to cover completely the open ends of the link casings.

It is still another object of the invention to provide an elastic strap of the type as described and to be used particularly as an article of jewellery, such as a bracelet, or as a watch strap, the upper or ornamental surface of which appears to form a substantially unbroken surface when the strap is in the contracted or released position. In one embodiment of the invention in which the link casings each consists of two substantially cylindrical parts which are obliquely disposed to each other and integrally connected with each other, such unbroken upper or ornamental surface of the strap when seen from the narrow sides thereof forms an undulating line, while in the second embodiment using substantially rectangular casings which are likewise bent so that the upper and lower parts thereof are in an oblique or offset position to each other, the upper unbroken ornamental surface of the strap when contracted is smooth and flat. Obviously, both embodiments may be easily modified in shape, for example, by making the link casings of the first embodiment of a more oval or even angular shape, or by making the link casings of the second embodiment, and particularly the upper surface thereof, of a curved or rounded shape.

Thus, it will be understood that by clamping the flat crossarms of the connecting brackets between the spring arm and the overlapping arm of the main links, each link will tend to pivot toward the adjacent link. Since the wall portions of the links thus themselves form the resilient elements, no separate springs will be required to act upon the pivoting connecting brackets. This means a considerable saving in material as well as in the labour usually required in installing the separate springs in the link casings. Thus, the entire construction of the strap is simplified since it consists of no more than two different kinds of parts, namely, the main links and the connecting brackets.

Although the self-resiliency of the main links constitutes an important feature of the present invention in order to obtain the desired resiliency of the strap, separate springs may also be mounted within the links so as to act upon the connecting brackets. In such case, the separate springs may either be provided to augment the spring action with is exerted by the mentioned spring arms of the links themselves, or these spring arms may be omitted entirely and be replaced by such separate springs which are mounted within the link casings.

Another considerable advantage of the new elastic strap is the fact that its total length may be easily shortened or lengthened since the connecting elements may be inserted and locked into or unhooked from the main links against the spring action of the respective link portions, which form a snap hook.

Further objects, features, and advantages of the present invention will be apparent from the following detailed description thereof, particularly when read with reference to the accompanying drawings, in which:

Fig. 1 shows a cross section through an elastic strap according to one preferred embodiment of the invention in the expanded position, such section being taken along line 1—1 of Fig. 2;

Fig. 2 shows a cross section taken along line 2—2 of Fig. 1;

Fig. 3 shows a cross section of an elastic strap according to a second embodiment of the invention in the expanded position, such section being taken along line 3—3 of Fig. 4; while

Fig. 4 shows a cross section taken along line 4—4 of Fig. 3.

Referring to the drawings, and first particularly to Figs. 1 and 2, the new elastic strap or bracelet according to the first embodiment of the invention consists of a plurality of hollow main link elements *a* of substantially cylindrical shape and extending in a direction transverse to the longitudinal direction of the entire strap and intermediate connecting elements *f*. These cylindrical link elements *a* as seen individually, are split at one side, so that each of them thus has substantially the cross-sectional shape of the letter "c". Each two adjacent C-shaped members are turned so that their open ends

face each other, and form an interconnected pair a' and a'' by being integrally connected to each other at one of the opposite open ends of each "c". This connecting portion b forms a rounded trough-shape. As shown particularly in Fig. 1, the other free and inwardly curving end e of the upper member a'' curls over the free end of the lower member a' which, for this purpose, after curving inwardly, is extended, and such extended portion d is bent outwardly at c toward the upper member a'' and projects like an arm into the open end thereof. The lower member a' including its straight arm d is bent so as to have an initial spring tension which tends to turn the arm d in the clockwise direction so that the latter will rest under pressure against the inside of the end portion e of the upper member a''. This overlapping end portion e may also exert a spring pressure inwardly and toward the arm d.

Each intermediate connecting element f which connects the adjacent pairs of cylindrical members a', a'', with each other is of substantially rectangular framelike shape, and the two short arms g of which may, for example, be of curved shape like a sickle, the wider ends of which are connected by a cylindrical member h while the narrower ends thereof are connected by a flat bar i. The cylindrical member h of each intermediate connecting element f is pivotally mounted within the lower substantially cylindrical member a' of each main double-link element a, and the flat bar i thereof extends between the overlapping end portions d and e within the upper member a'' of the adjacent double link a. When the strap is in the released position, the side walls of the adjacent double links a are in close engagement with each other and the flat bars i of the connecting elements f then extend substantially parallel to the straight arms d and rest closely against the inside of the enclosing end portion e of the upper member a'', and, due to the oppositely directed spring action of portions d and e, arms d are clamped between these portions at such time so that the double-links a will be maintained in close engagement with each other, thus reducing the length of the strap to a minimum. When the strap is being expanded, the main double-links a, and the intermediate elements f, which are thus connected with each other in zigzag formation, are pivoted apart and in the opposite directions. The flat bars i of the connecting members f then turn counterclockwise against the spring action of portions d and e and thereby force these portions apart. The spring force which is thus being accumulated in portions d and e, then tends to turn the flat bar i of connecting elements f back to its original position substantially parallel to portion d, and it thus exerts a torque upon the flat bar i whereby, when the strap is released, the connecting elements f again turn in the clockwise direction and thereby move the upper and lower link members a', a'', of one double link a into engagement with those of the adjacent double link a.

Obviously, in place of or in addition to the use of the arm d as a spring member, a separate spring may be mounted within the upper cylindrical members a'' to exert a spring pressure upon the flat arm i under the action of the arm d. Also the bar i itself or in connection with the bracket arms g may be designed as a spring member, for example, by forming a torsion-bar spring. Furthermore, the shape of the double-link elements a is by no means limited to a double-cylindrical shape, and particularly the upper link members a'' which form the upper surface of the strap at least when the strap is in the contracted position may be of different shape or style to suit the fancy of different purchasers.

Thus, for example, the embodiment of the invention as shown in Figs. 3 and 4 functions according to the same principle as the first-described embodiment, although in this case the main double-links k are of angular zigzag or stepped shape. Similar to the constriction b on the double links a as shown in Fig. 1, the double links k are bent so as to form a constriction intermediate their upper and lower portions k' and k''. These upper and lower portions are each of substantially rectangular shape in cross section, as shown particularly by the double link k farthest to the right in Fig. 3, and they are disposed at two different levels and substantially parallel to each other. The lower portion k' has a lower flange-like side wall m', a bottom wall n', a second side wall o', and a top wall p', while the upper link portion k'' consists of a side wall m'', a top wall n'', a second side wall o'' which is slightly lower than the opposite side wall m'', and a lower wall p''. The two superimposed side walls m' and m'' are slightly offset laterally relative to each other so that an intermediate gap will be formed between the vertical planes drawn along the adjacent edges of walls m' and m'', in which the vertical portion q of an angular arm q—r extends downwardly from the inner end of the lower wall p'', while its horizontal arm portion r then extends substantially parallel to the bottom wall n' of the lower link portion k'. The wall portions o'', p'', q, and r are bent so as to have an initial spring tension which tends to press the arm r downwardly and against the bottom wall n' of the lower link portion k'.

The connecting elements s form brackets of angular, substantially U-shaped design. The two parallel arms t' and t'' project from the central arms s' thereof into the superim-

posed link portions k' and k'' of two adjacent double-links k, and the lower arm t' is interposed between the arm r and the bottom wall n'. The spring pressure exerted by the arms r upon the arms t' of connecting brackets s therefore tends to pivot the brackets to a vertical position and thereby tends to draw the adjacent main links k toward each other so that, when the strap is released, the wall portions o'' of the upper link portions k'' move toward and into engagement with the wall portions m'', while the wall portion o' of the lower link portions k' move toward and into engagement with the low flange-like wall portion m'. When, on the other hand, the strap is being expanded and the main links k are drawn apart from each other, the connecting brackets s will be pivoted from their vertical rest position against the spring action of the entire spring arm o'', p'', r of each main link k to the position shown in Fig. 3 by all except the right-hand connecting elements s. The spring force which is thus accumulated will then return the connecting brackets s to their normal vertical position when the strap is released, so that the latter will again be contracted to its minimum length.

The U-shaped connecting bracket s may be retained or secured within the main links k in any suitable manner. Thus, for example, in the embodiment of the invention as shown in Figs. 3 and 4, the lower arm t' of the U-shaped connecting bracket s is provided with a flange v which projects upwardly and into an aperture u of the arm r of the main link k, while the upper arm t'' has an extention x which projects toward the left into an aperture w in the side wall o'' of the main link k. The projecting portions v and x are always automatically maintained in engagement within the apertures u and w, respectively, by the spring pressure of the spring arm o'', p'', q, r, acting upon the lower arm t' of the connecting members s, and by the pivotal movement of the latter which is produced by such spring pressure.

Suitable means may also be provided to cover up the open ends of the links. Thus, for example, as illustrated in dotted lines in Fig. 1, the side arms g of the connecting elements may be made of a shape similar to the link elements a but without any central constriction b. In such case, the open ends, as well as the split between the portions c and e will be covered, and the strap will have a closed appearance even when looked upon at the narrow sides thereof.

Although in the two embodiments of the invention, as shown in the drawings, the links and connecting elements a and f, and k and s, respectively, are of relatively great length transversely to the strap and their upper ornamental surfaces are parallel to each other as seen from the top, while the zigzag arrangement of the links and connecting elements will be noticeable only when the strap is viewed at the narrow sides thereof, the links and connecting elements may also be made very short and so as to extend at right angles to the formerly described embodiments so that the upper ornamental surface of the strap will then show the zigzag structure, while the longitudinal sides of the strap when in the contracted position will show an unbroken slightly undulated or flat surface.

WHAT WE CLAIM IS:—

1. An elastic link strap for ornamental or utilitarian purposes, for example, for use as a bracelet or watch strap, and consisting of main link elements and intermediate connecting elements arranged in zigzag formation relative to each other and pivotally connected with each other near their opposite ends, and resilient means acting upon the link and connecting elements so as to permit said elements to pivot apart when said strap is being expanded and to pivot toward each other when said strap is being released, characterised by the fact that the link elements are of substantially elongated shape transversely thereof and each forms a pair of opposite hollow portions integrally connected with each other at one side thereof and disposed substantially in two different parallel planes, and those at one side being superimposed to those at the other side at least when said strap is in the released position, and wherein each connecting element has opposite lateral parts, one of which is pivotally connected to one lateral portion at one side of one link element, while the other is pivotally connected to the other lateral portion at the other side of the adjacent link element, and wherein at least one of said lateral parts of said connecting elements is shaped so as to exert a camlike action when being pivoted, and wherein said resilient means are provided in at least one of said hollow portions of said link elements and act upon said camlike part and tend to pivot said connecting elements so as to draw the adjacent link elements toward each other.

2. An elastic link strap as defined in Claim 1, characterised by the fact that the resilient means comprise at least one leaf spring in at least one of the hollow portions of the link elements and acting upon said camlike part and tending to pivot said connecting elements so as to draw the adjacent link elements toward each other.

3. An elastic link strap as defined in Claim 1, characterised by the fact that the resilient means are formed by the resiliency of the material of at least one of said lateral portions of said link elements acting upon said camlike part and tending to pivot said connecting elements so as to draw said adjacent link elements toward each other.

posed link portions k' and k'' of two adjacent double-links k, and the lower arm t' is interposed between the arm r and the bottom wall n'. The spring pressure exerted by the arms r upon the arms t' of connecting brackets s therefore tends to pivot the brackets to a vertical position and thereby tends to draw the adjacent main links k toward each other so that, when the strap is released, the wall portions o'' of the upper link portions k'' move toward and into engagement with the wall portions m'', while the wall portion o' of the lower link portions k' move toward and into engagement with the low flange-like wall portion m'. When, on the other hand, the strap is being expanded and the main links k are drawn apart from each other, the connecting brackets s will be pivoted from their vertical rest position against the spring action of the entire spring arm o'', p'', r of each main link k to the position shown in Fig. 3 by all except the right-hand connecting elements s. The spring force which is thus accumulated will then return the connecting brackets s to their normal vertical position when the strap is released, so that the latter will again be contracted to its minimum length.

The U-shaped connecting bracket s may be retained or secured within the main links k in any suitable manner. Thus, for example, in the embodiment of the invention as shown in Figs. 3 and 4, the lower arm t' of the U-shaped connecting bracket s is provided with a flange v which projects upwardly and into an aperture u of the arm r of the main link k, while the upper arm t'' has an extention x which projects toward the left into an aperture w in the side wall o'' of the main link k. The projecting portions v and x are always automatically maintained in engagement within the apertures u and w, respectively, by the spring pressure of the spring arm o'', p'', q, r, acting upon the lower arm t' of the connecting members s, and by the pivotal movement of the latter which is produced by such spring pressure.

Suitable means may also be provided to cover up the open ends of the links. Thus, for example, as illustrated in dotted lines in Fig. 1, the side arms g of the connecting elements may be made of a shape similar to the link elements a but without any central constriction b. In such case, the open ends, as well as the split between the portions c and e will be covered, and the strap will have a closed appearance even when looked upon at the narrow sides thereof.

Although in the two embodiments of the invention, as shown in the drawings, the links and connecting elements a and f, and k and s, respectively, are of relatively great length transversely to the strap and their upper ornamental surfaces are parallel to each other as seen from the top, while the zigzag arrangement of the links and connecting elements will be noticeable only when the strap is viewed at the narrow sides thereof, the links and connecting elements may also be made very short and so as to extend at right angles to the formerly described embodiments so that the upper ornamental surface of the strap will then show the zigzag structure, while the longitudinal sides of the strap when in the contracted position will show an unbroken slightly undulated or flat surface.

WHAT WE CLAIM IS:—

1. An elastic link strap for ornamental or utilitarian purposes, for example, for use as a bracelet or watch strap, and consisting of main link elements and intermediate connecting elements arranged in zigzag formation relative to each other and pivotally connected with each other near their opposite ends, and resilient means acting upon the link and connecting elements so as to permit said elements to pivot apart when said strap is being expanded and to pivot toward each other when said strap is being released, characterised by the fact that the link elements are of substantially elongated shape transversely thereof and each forms a pair of opposite hollow portions integrally connected with each other at one side thereof and disposed substantially in two different parallel planes, and those at one side being superimposed to those at the other side at least when said strap is in the released position, and wherein each connecting element has opposite lateral parts, one of which is pivotally connected to one lateral portion at one side of one link element, while the other is pivotally connected to the other lateral portion at the other side of the adjacent link element, and wherein at least one of said lateral parts of said connecting elements is shaped so as to exert a camlike action when being pivoted, and wherein said resilient means are provided in at least one of said hollow portions of said link elements and act upon said camlike part and tend to pivot said connecting elements so as to draw the adjacent link elements toward each other.

2. An elastic link strap as defined in Claim 1, characterised by the fact that the resilient means comprise at least one leaf spring in at least one of the hollow portions of the link elements and acting upon said camlike part and tending to pivot said connecting elements so as to draw the adjacent link elements toward each other.

3. An elastic link strap as defined in Claim 1, characterised by the fact that the resilient means are formed by the resiliency of the material of at least one of said lateral portions of said link elements acting upon said camlike part and tending to pivot said connecting elements so as to draw said adjacent link elements toward each other.

* C L M S *

4. An elastic link strap as defined in Claims 1 to 3, characterised by the fact that one of the lateral parts of the connecting elements is pivotally connected at one side to a first portion at one side of each link element and that the camlike part is formed by at least one substantially flat bar at the opposite side, and wherein the resilient means comprise a spring arm which is integral with and forms the free end of the first portion of each link element, and extends into a second portion thereof and is being overlapped by and pressed toward the free end of said second portion, and wherein said flat bar is interposed between said spring arm and said overlapping portion of the adjacent link element and is disposed at an angle to said spring arm when said strap is in the expanded position, and substantially parallel to said spring arm when said strap is in the released position, said spring arm acting upon said flat bar tending to pivot the same to a position parallel to said spring arm and thereby toward said second portion of said link element, and thus to draw the adjacent link elements toward each other.

5. An elastic link strap as defined in Claims 1 to 4, characterised by the fact that each of the link elements has a constriction intermediate the hollow portions, and that each connecting element has end portions engaging the outer ends of the link elements and at least one pivot member at one side of each connecting element engaging into the first hollow portion of the link elements and being retained therein by said constriction.

6. An elastic link strap as defined in Claims 1 to 4, characterised by the fact that each of the two hollow portions of each link elements is of substantially cylindrical shape and integrally connected with each other by an inwardly bent trough-shaped portion, and that said cylindrical portions are split apart at one side to form free ends facing towards each other, and further that the free end of a first cylindrical portion is extended to form said spring arm which projects under spring tension into a second cylindrical portion and is overlapped by and pressing toward the free end of the second cylindrical portion, and that said connecting elements are of frame like construction and have a pair of outer end portions engaging the open outer ends of the link elements and each of them has at least one pivot member at one side engaging into said first portion of said link element and being retained therein by said trough-shaped portion, and wherein said flat bar at the other side connects the outer end portions of each connecting element and is resiliently acted upon from opposite directions by both said spring arm and said overlapping portion.

7. An elastic link strap as defined in Claim 6, characterised by the fact that the pair of outer end portions of said framelike connecting elements gradually converges from one wider side toward the other narrower side, and that said pivot member comprises a tubular member connecting said wider sides and pivotally mounted within said first cylindrical portion of one link element, while said flat bar connects said narrower sides of said connecting elements.

8. An elastic strap as defined in Claims 1 to 5, characterised by the fact that each of the two hollow portions of each link element is of substantially rectangular shape with top, bottom, and side walls, the bottom wall of the second portion and the top wall of the first portion being split apart near one lateral edge so as to form a gap and being integrally connected with each other adjacent to one edge of each gap and disposed in a steplike offset relation to each other in the longitudinal direction of said strap and in two different parallel planes, and that said second portion has an extension at the free bottom edge which is of 'Z'-form and extending into the first portion through the gap in the top wall thereof and then in a direction substantially parallel to the bottom wall thereof, said extension forming said spring arm pressing in the direction toward said last bottom wall, and further that said connecting element is of bracketlike shape and has end portions engaging the open outer ends of said link elements, and at least one arm extending from said end portions into the open end of said first portion of one link element, and at least one flat arm extending from said end portions into the open end of the first portion of the adjacent link element and between said bottom wall thereof and said spring arm in said first portion, and wherein said spring arm presses upon said flat arm and tends to pivot the same to a position parallel to said spring arm and said bottom wall, and thereby to pivot said first arm in said second portion of one link element against one side wall thereof to urge the same toward the opposite side wall of the second portion of the adjacent link element.

9. An elastic link strap as defined in Claim 8, characterised by the fact that said bracketlike connecting element is substantially U-shaped and both arms of said element are flat and substantially parallel to each other, and that means are provided on each connecting element for maintaining said arms within said link elements.

10. An elastic link strap as defined in Claims 8 and 9, characterised by the fact that said last means comprise an aperture in the last-mentioned side wall and in said spring arm, and a projection on each of said arms which are pivoted upwardly when said strap is being expanded, and that said projections extend into said apertures to maintain said



arms within said link elements.

11. An elastic link strap as defined in one or more of Claims 1 to 10, characterised by the fact that said connecting elements have end portions connecting said lateral portions thereof adjacent to the open ends of said link elements and substantially covering said open ends.

12. An elastic link strap as defined in one or more of Claims 1 to 11, characterised by the fact that the upper walls of said link elements form a substantially continuous surface when said strap is in the released position, and that the zigzag formation of said link and connecting elements is noticeable only when said strap is viewed at the narrow side thereof.

13. An elastic link strap as defined in one or more of Claims 1 to 10, characterised by the fact that the outer walls of said link elements are relatively short and form the lateral walls of said strap, and that said connecting elements have end portions at least at the upper ornamental side of the strap for connecting said lateral portions thereof adjacent to the open ends of said link elements and substantially covering said open ends.

14. An elastic link strap substantially as described in the foregoing specification and illustrated in the accompanying drawings.

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