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(71) Applicant : **CENTO GROUP S.p.A.**
Via Ernesto Rossi
I-52100 Arezzo (IT)

(72) Inventor : **Terziani, Urbano**
I1 Piazzone, 2
Pieve a Maiano, Arezzo (IT)

(74) Representative : **Bardini, Marco Luigi et al**
c/o Società Italiana Brevetti S.p.A. Corso dei
Tintori, 25
I-50122 Firenze (IT)

(54) **Chain structure for ornamental uses and a method of production thereof.**

(57) A structure of chain for ornamental uses comprising a succession of links [1,2,3] in precious or non-precious wire-like metal of ring-like form extended along a longitudinal axis of symmetry, bent in a U transversally and obliquely with respect to said axis so as to originate two non-aligned eyelets [4a,4b] lying side by side on two substantially parallel planes. Each link [1,2,3] is engaged in the two eyelets [4a,4b] of the n-th link from the last link of the already formed chain, where $2 \leq n \leq 5$, and is twisted along the longitudinal axis of the chain which appears substantially flat and comprising a continuous longitudinal sequence of arms of each link [1,2,3] which are oblique and substantially parallel to one another, said sequence occupying the entire median band of each face of the chain. The method for producing the above chain structure comprises the step of engaging the elementary link in the n-th link from the last link of the already formed chain, where $2 \leq n \leq 5$, sustained by means of containment, operating on a plane perpendicular to the axis of the chain.

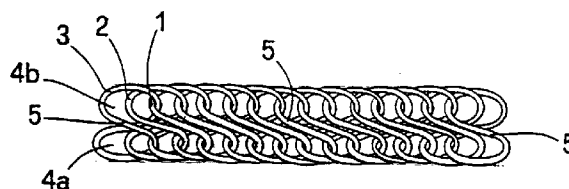


FIG.1

The present invention relates to a new chain structure for ornamental uses utilizable in the precious metals and costume jewelry industries for the production of necklaces, bracelets, and similar pieces of jewelry.

The invention also relates to a method for the production of this new type of chain.

The chain according to this invention is of the type generically known in the jewelry crafting sector as a chain with figure eight links. These chains can be created by manual or mechanical methods. With regard to this see Italian patent No.1225362 and the Italian patent Applications No.1239A/88 and No.9477A/89 which describe apparatuses for the production of this type of chain.

The chain with figure eight links is of a known type and is constituted by a succession of links, in wire-like precious or non-precious metallic material of extended form and bent in the shape of a U around one of their middle transverse axes and twisted around the longitudinal axis of the chain. The production of this chain can be begun with either open links, linear or already twisted into an eight, or link elements in the form of a U. In both cases, said links or link elements are engaged with the last link of the already formed chain and successively closed, bent and twisted according to the individual case.

The chain produced in this way constitutes a base material for the production of the ornamental chains, in the form in which they will then be marketed, by typical processing well known to the person skilled in the art (beating, diamonding, etc.)

The above-described connection of figure eight links, although originating a large number of finished chain models even with equal wire dimensions, as a consequence of the above mentioned processing, does not have the compactness and fullness which is generally in demand nowadays, due to the low density of distribution of the wire per unit of length. It is also important to keep in mind that it is desirable to obtain said results limiting the weight per unit of length of the chain in order to keep the cost from exceeding certain limits. In other words, the large scale marketability of this type of chain depends, among other things, on succeeding in giving it a compact and full look while keeping its weight per unit of length as low as possible.

It has now been found that, in the ambit of the production process of this type of chain, utilizing a different connection of the links, it is possible to obtain a chain structure which is substantially new with respect to the traditional chain with figure eight links which, subjected to the conventional processes of beating, diamonding, and similar, can originate a great number of chains, bracelets, necklaces and other ornamental pieces of jewelry in which the above stated requisite is satisfied in an optimum way for this type of chain. Said finished products present a more delicate devel-

opment and, given the greater surface which they exhibit better design possibilities.

The structure of the chain according to the invention comprises a succession of links in precious or non-precious wire-like material of annular form extended along a longitudinal axis of symmetry and bent into a U transversely and obliquely with respect to said axis, such as to originate two eyelets not aligned and lying on two substantially parallel planes, each link being engaged in two eyelets of the n-th link from the last connected link where n is an integer comprised between 2 and 5, of the chain in formation. Said link is twisted around the longitudinal axis of the chain which appears substantially flat and comprises a continuous longitudinal sequence of oblique and substantially parallel arms of each link, said sequence occupying the entire median band of each face of the chain.

The characteristics of the structure of chain according to the invention and of the relative method of production will now be illustrated in detail with the following description of one of its possible embodiments, given as an example but not limitative with reference to the attached drawings in which:

- Figure 1 illustrates a first embodiment of the structure of the chain according to the invention in which $n=2$ (chain with double eight links);
- Figure 2 illustrates the structure of the chain according to figure 1 partially subjected to a transversal widening process;
- Figure 3 illustrates a section of chain which can be obtained by means of surface processing of the structure of the chain in figure 2;
- Figures 4 and 5 illustrate two phases of a process for forming the chain according to the invention;
- Figure 6 illustrates a first variation of the process according to the invention;
- Figure 7 illustrates a second variation of the process according to the invention;
- Figure 8 illustrates a second embodiment of the structure of the chain according to the invention in which $n=5$ (chain with quadruple eight links).

With reference to figure 1, the last three connected links of the chain, according to the invention, of indefinite length are indicated by 1, 2 and 3 respectively. The links 1, 2 and 3, just as the other already connected links, are created in a wire-like precious metal, such as gold, or in a non-precious metal. They present an annular form extending along a longitudinal axis of symmetry and are bent substantially in a U around an axis which is transversal and oblique with respect to said longitudinal axis. In that way, the two bent halves of each link come to form two eyelets indicated by 4a and 4b which are not aligned with one another, that is staggered or placed on opposite sides of the middle axis of the chain and substantially on two planes which are parallel to each other. Each link of the succession forming the structure of the chain according

to the invention is engaged in the next to last of the previously connected links, the resulting linked structure being therefore a chain with double eight links.

As shown in figure 1, link 3 is engaged in link 1 and more precisely each of the bent long sides of link 3 engages in a respective eyelet 4a and 4b of link 1. The planes on which the two bent halves or eyelets of each link lie are very close to one another for the effect of an axial torsion of the chain for which it appears substantially flattened and characterized by a continuous longitudinal sequence of arms of each link which are oblique and substantially parallel to one another and occupy the entire middle band of each face of the chain.

The structure of the chain according to the invention constitutes the base for the production of a great number of ornamental chains obtained by means of successive superficial treatments performed directly on it or on its variations obtained from intermediate processing such as axial thickening and/or transversal stretching. In figure 2 a transversely stretched portion of the chain according to this invention is illustrated as an example and indicated by H. Following this additional processing, performed link by link, the arms of link 5 of each of the two faces present a reduced inclination with respect to the horizontal, remaining parallel to one another and thinning out so that the inclined arms on one face can be seen through the band of oppositely inclined arms on the other face.

As an example in figure 3, a portion of finished chain obtained from the transversely stretched chain of figure 2 is illustrated following a gold beating treatment. Upon said treatment a motive for continuous diagonal intertwining in the middle longitudinal band of the chain is formed. Obviously the aesthetic result can vary significantly with the variation in the modality of beating or any other type of processing or surface treatment.

The method for the production of the structure of chain according to this invention presents the characteristic that the elementary link is connected to the n-th link from the last connected link of the forming chain, in which n is an integer comprised between 2 and 5. In the double chain in figure 1, 2 and 3, $n = 2$.

The elementary chain utilized can be a wire-like metallic element M1 shaped in a U obtained from a portion of wire of suitable length. In this case (see figure 4) the U shaped elements are engaged one after the other in the eyelets of the next-to-last link bent into a U, twisted and already connected to the chain being formed, said eyelets protruding from the extremity of a draw-plate T in which the forming chain is placed.

The free ends of the U shaped elements are bent until they meet thus obtaining a closed, elongated link which is then welded at the point of contact of its ends. The chain in formation is then pushed (see figure 5) in the direction of the axis of the draw-plate T forcing with a pusher S the link in which the just closed U

shaped element was engaged, such as to cause the bending in a U of the latter around the major axis of the inlet section of the draw-plate which is transversal and oblique with respect to the direction of engagement of the U-shaped elements in the already connected links. Finally the link bent into a U is twisted around a longitudinal axis of the chain in order to place the eyelets of the last bent link side by side.

It is also possible to begin with an elementary link constituted by an open, un-twisted link, with free ends already bent towards one another, drawn from a spiral forming device, of known type. In this case, (see figure 6) said link is engaged in the next-to-last link of the chain in formation by means of a pincer which advances until putting the link in an intermediate position with respect to the others. Successively a pincer B, aligned and oppositely positioned with respect to pincer A catches the link closing its ends. Pincers A and B turn therefore on their own axis in opposite directions twisting the link. In the drawing the arrows C indicate means of grasp and containment of the already constructed chain in the phases in which it is not held by the two pincers.

The basic link adopted in the process according to the invention can be an open link already twisted around an oblique transverse axis. Said link, indicated by M3, is connected to the next-to-last link of the chain in formation engaging one of its free ends in one of the eyelets of the next-to-last link and making it advance along in a direction substantially coplanar to the middle plane on which the chain lies and orthogonal to the longitudinal axis of the chain itself, and simultaneously turning it around said direction of advancement. The link to be connected is sustained by a pincer D while the already formed chain is sustained by pincer E aligned and oppositely positioned with the preceding one. Upon insertion of the M3 link, pincer E which sustained the already made chain, lets go of it in order to grasp the M3 link just connected from the opposite side of pincer D performing the closing of the ends of the M3 link and retaining it, such as to allow pincer D to grasp a new link to be mounted.

The above described method can be carried out manually or, much more advantageously, by means of equipment suitable to the production of chains of figure eight link type such as that described in Italian patent No. 1225362, suitably modifying its operative cycle, as will appear clear from the preceeding description to a person skilled in the art.

The chain obtained with the above-described method can be used directly for the production of ornamental articles, or subjected further treatment as already described. In particular it can be submitted to the stretching in a transverse direction of each link by means of, for example, a pincer which works with the ends of its arms in the eyelets of each link and successively opens obtaining the result illustrated in figure 2.

In figure 8 another possible embodiment of the invention is illustrated in which $n = 5$. The last five already connected links are indicated respectively by 1, 2, 3, 4 and 5 and the new link just connected is indicated by 6.

As illustrated, link 6 is engaged in the fifth to last link, namely link 1. The resulting linked structure is that of a quintuple chain. As the number of preceeding links with which the new link engages increases, so do the fullness and width of the resulting chain.

The method of production of the linked structures according to the captioned invention remains the same as that previously described and illustrated in figures 4, 5, 6 and 7 when $n > 2$, with the difference that the new link is connected with the third-to-last, fourth- to-last, fifth-to-last link of the already formed chain in order to originate a respectively triple, quadruple, or quintuple chain. It is useful to observe that, both for the increasing difficulty of connection and for the greater weight per unit length, ratios of connection greater than 5, even if possible, in practice do not have a marketable interest as will be clear to a person skilled in the field.

Variations and/or modifications can be brought to the structure of the chain for ornamental uses and to its method of production as above described and illustrated, without departing from the scope of the invention itself.

Claims

1. Structure of chain for ornamental uses characterized by the fact of comprising a succession of links in precious or non-precious wire-like metallic material of ring-like form extended along a longitudinal axis of symmetry, bent in a U transversely and obliquely with respect to said axis so as to originate two non-aligned eyelets lying side by side on two substantially parallel planes, each link being engaged in the two eyelets of the n -th link from the last link of the already formed chain, where n is an integer comprised between 2 and 5, and being twisted along the longitudinal axis of the chain which appears substantially flat and comprising a continuous longitudinal sequence of arms of each link which are oblique and substantially parallel to one another which occupies the entire median band of each face of the chain.
2. Structure of chain according to claim 1, in which said arms of each link positioned along said middle band of each face of the chain are spaced from one another.
3. Method for the production of a structure of chain according to claim 1 comprising the steps of:
 - forming an elementary link in precious or non

precious wire-like metallic material, open and extended along a longitudinal axis of symmetry;

- engaging said elementary link in the n -th link from the last link of the already formed chain, where n is an integer comprised between 2 and 5, sustained by means of containment, operating on a plane which is substantially perpendicular to the longitudinal axis of the chain;

- closing said elementary link making the two ends meet and welding them;

- twisting said closed link in order to form two eyelets placed side by side, not aligned and lying on two planes which are parallel to the middle plane on which the chain lies.

4. The method according to claim 3, in which said elementary link and a U-shaped wire-like element, after being engaged in said n -th link, is twisted forcing it to pass through a section substantially equal to the external encumbrance of the chain, lying on a plane orthogonal to the longitudinal axis of the chain and inclined with respect to the direction of engagement of said U-shaped element in said n -th link.
5. The method according to claims 3 and 4, in which in order to twist said elementary link said n -th link is axially forced.
6. The method according to claim 3, in which said elementary link is an open link with free ends already bent towards one another and is engaged in said n -th link up to half of its length after which it is twisted with counter-rotating pincers, aligned and oppositely positioned.
7. The method according to claim 3, in which said elementary link is an open link already twisted around an oblique transversal axis which is engaged with one of its free ends in an eyelet of said n -th link upon both an advancement in a direction substantially coplanar to the middle plane on which said chain lies and orthogonal to the longitudinal axis of the chain, and a simultaneous rotation around said direction of advancement.
8. The method according to any of the claims from 3 to 7, also comprising the step of:
 - stretching transversally each link of the chain thus formed.

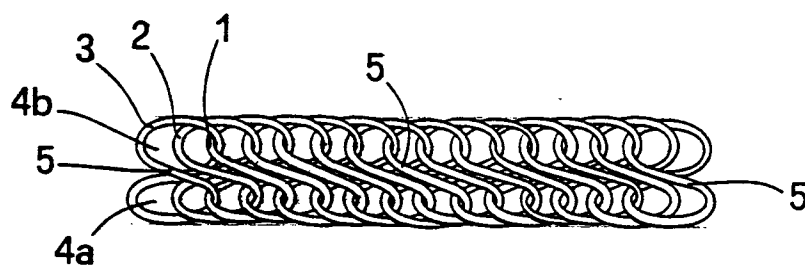


FIG. 1

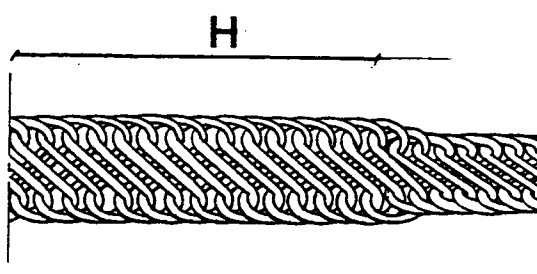


FIG. 2

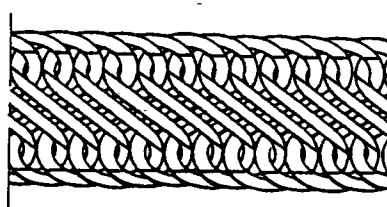


FIG. 3

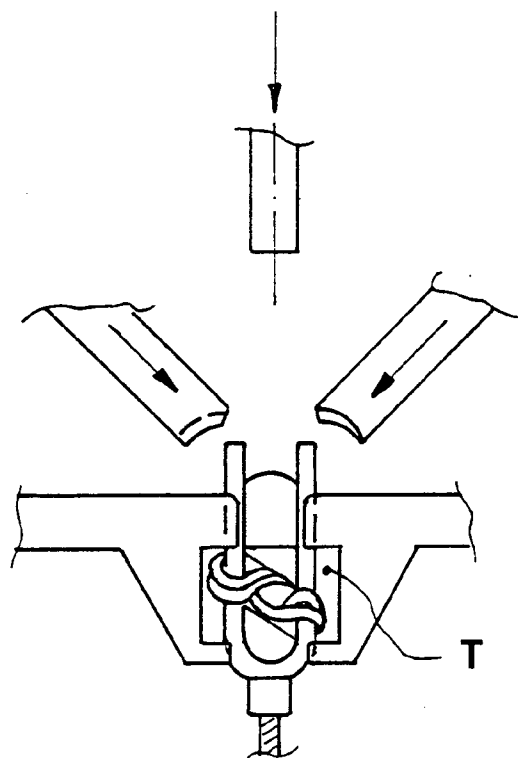


Fig. 4

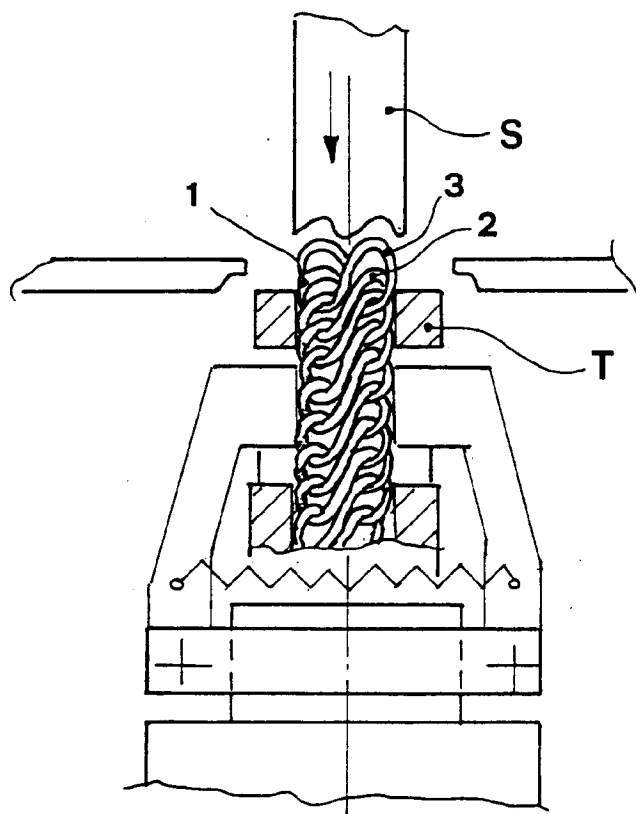


Fig. 5

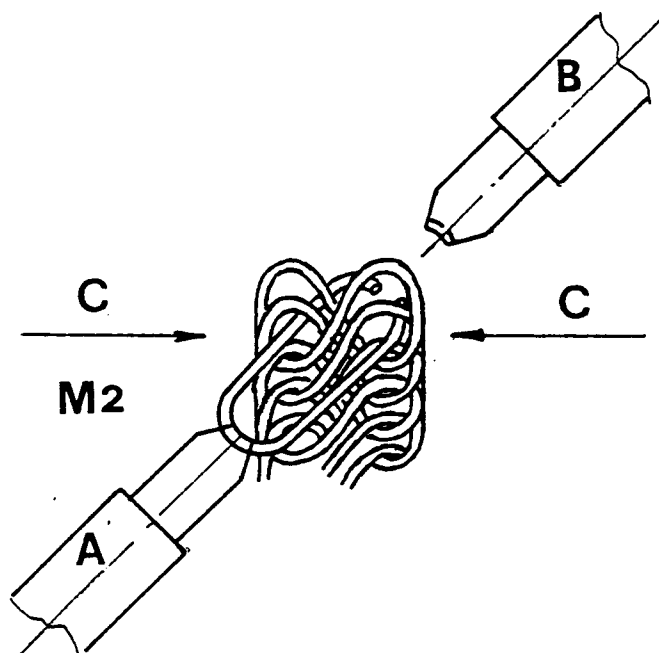


Fig. 6

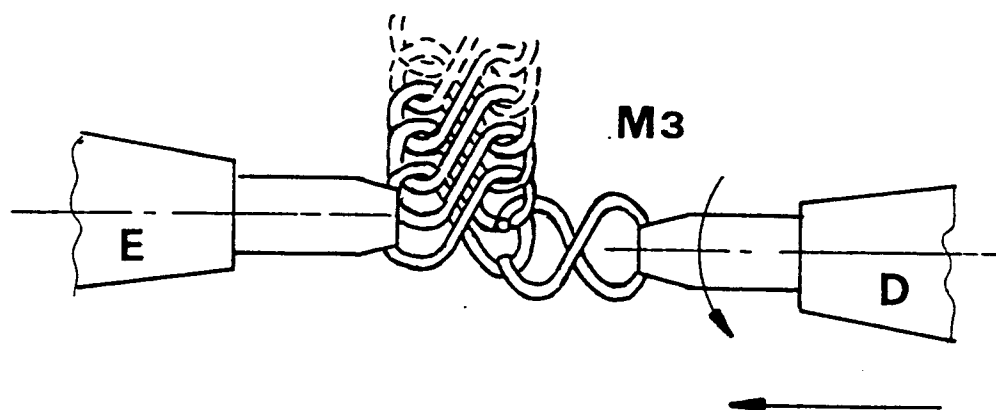


Fig. 7

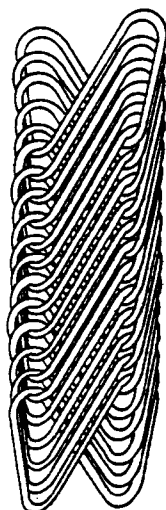


FIG.8



European Patent
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EUROPEAN SEARCH REPORT

Application Number

EP 92 83 0023

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	DE-C-274 146 (RODI UND WIENENBERGER) * the whole document *	1-8	A44C11/00 B21L11/00
A	--- JOURNAL SUISSE D'HORLOGERIE ET DE BIJOUTERIE EXPORT vol. 3, 1989, pages 639 - 646 JACQUES LENFANT	1	
A	--- DE-C-235 980 (WACKER UND HILDENBRAND) * figures 1-15 *	1,3	
A	--- EP-A-0 359 722 (C.M.S. S.P.A. COSTRUZIONE MACCHINE SPECIALI)		
A	--- DE-A-3 209 709 (B. RENZO) -----		
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			A44C B21L
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 06 OCTOBER 1992	Examiner FAIRBANKS S.A.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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