

F. VIANO.
METHOD OF MAKING LINK FABRIC.
APPLICATION FILED OCT. 31, 1908.

934,952.

Patented Sept. 21, 1909.

Fig. 1

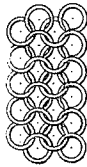


Fig. 2.

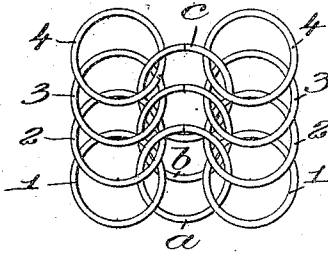


Fig. 3.

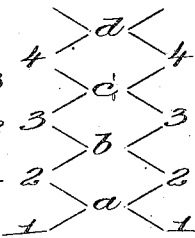


Fig. 4.

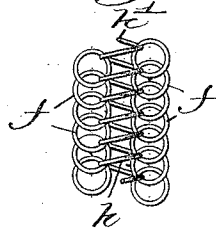


Fig. 6.

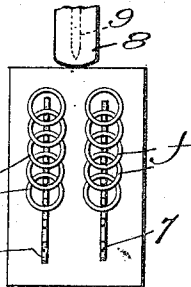


Fig. 5.

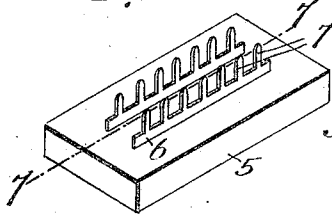


Fig. 7.

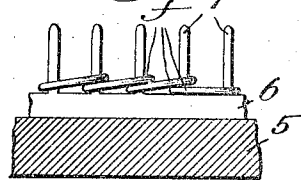


Fig. 8.

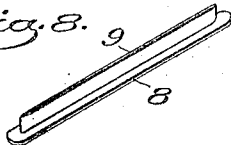
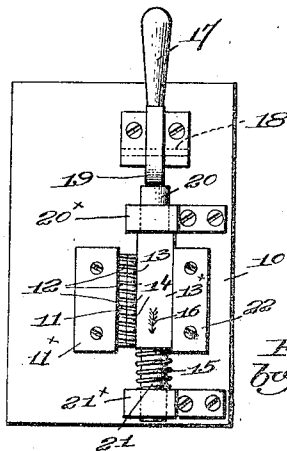


Fig. 9.



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UNITED STATES PATENT OFFICE.

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METHOD OF MAKING LINK FABRIC.

934,952.

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To all whom it may concern:

Be it known that I, FELIX VIANO, a subject of the King of Italy, and resident of Lexington, county of Middlesex, State of Massachusetts, have invented an Improvement in Methods of Making Link Fabric, of which the following description, in connection with the accompanying drawing, is a specification, like characters on the drawing representing like parts.

This invention has for its object the production of a novel method for making a flexible fabric consisting of connected links, preferably metallic, such fabric being used for the manufacture of coin purses and bags, and for other purposes wherein a flexible link fabric is desirable.

Such fabric has heretofore been made by connecting a plurality of closed links with an open link, and then closing the latter, the operation being repeated until a fabric of the desired size is secured. Obviously this mode of procedure is not only laborious but slow and expensive, for considerable skill is required to readily pick up the open links and close the same after being connected with the desired group of closed rings, and as the open links have to be handled separately the process is of necessity slow.

By the novel method of manufacture embodying my present invention, certain preparatory steps can be performed quickly and easily by unskilled labor, and thereafter an assembling step, as it may be termed, is carried out with some slight skill on the part of the operator, and the final operation or step is a combination of manual and mechanical operations.

The link fabric produced by my method is very flexible, uniform in character throughout, and relatively cheap, and the fabric can be turned out with much greater rapidity and ease than is possible by the methods in common use.

The various novel features of my invention will be fully described in the subjoined specification and particularly pointed out in the following claims.

In order that my invention may be fully comprehended, I have herein illustrated one form of apparatus by the aid of which my

method of making the fabric can be carried out in practice with great facility.

Figure 1 is a plan view of a portion of flexible link fabric made in accordance with my present invention; the links being shown as circular; Fig. 2 is an enlarged detail showing two series of originally closed links and the intermediate and finally closed links connecting them; Fig. 3 is a diagrammatic view of Fig. 2, to be referred to; Fig. 4 in plan shows two rows or series of closed links after they have been connected by threading therethrough the coils of a spiral; Fig. 5 is a perspective view of a portion of the device by which the closed links or rings are positioned preparatory to being connected; Fig. 6 is a top plan view thereof showing some links on each of two adjacent and parallel combs; Fig. 7 is a section on the line 7-7, Fig. 5; Fig. 8 is a perspective view of a straightener for the links, turned upside down; Fig. 9 is a plan view of means for simultaneously severing the coils of a connecting spiral and bringing the several ends of each coil together, to thereby form closed links.

Upon a suitable base 5 are arranged a series of upright, parallel combs each comprising a back 6 and a series of upturned, parallel teeth or tires 7, the combs being conveniently made of sheet metal and suitably attached to the base 5. As many combs will be used as there are to be rows or series of closed links to be connected, and upon each of the combs are laid a series of closed links *f*, herein shown as closed rings, preferably made of wire and in any suitable manner, each link embracing two teeth 7 of a comb and being laid to overlap each other, as shown in Figs. 6 and 7. The length of each series of separate, overlapped links determines the width of the fabric thereat.

As shown in Fig. 7 the overlapping series of links is held elevated above the base 5 by the comb back 6, the teeth 7 passing through the links along their median line, Fig. 6, and to position two adjacent series for the next step I use a straightening device, Fig. 8, consisting of a piece of flat metal forming a head 8 with a longitudinal, central fin 9 on its under side. The fin 9 is

inserted between the inner peripheries of the two adjacent series of links, and the straightener is moved longitudinally between the series, the head 8 fitting between the two sets of comb-teeth 7. This serves to bring the inner peripheries of the links of a series substantially tangent to a common plane, and also holds the links in position until the next step in the method is taken. To connect the two series of links thus positioned and supported above the base 5 I take a spiral *h*, Fig. 4, made of wire, and beginning at one end of the two adjacent rows or series of links *f*, I thread the coils of the spiral through the said links, by rotating the spiral and advancing the same longitudinally between the two rows. Before this threading step is begun the straightening device 8, 9 is removed. As the spiral is rotated its leading end *h'*, Fig. 4, passes downward through two juxtaposed links *f* of one series and then up through two juxtaposed links of the other series, then it again engages the first series, and so on, until all have been threaded onto the coils, as shown in Fig. 4.

In the body of the fabric each coil of the spiral passes through two links of each series, and each link of a series embraces two adjacent coils, so that a complete connection is formed between the spiral and the two series of separate links, one on each side of the spiral.

After all of the rows or series have been connected by spirals as described the spirals must be acted upon to sever the coils thereof between the connected series of separate links, and the severed coils closed, but before referring briefly to the device for effecting this severing and closing, I will refer to Figs. 2 and 3.

In Fig. 2 I have shown four closed and overlapped links 1, 2, 3, 4 in each series, and three coils are indicated by *a*, *b* and *c*, as they appear after they have been severed and closed. Upon examination it will be seen that coil *a* passes through links 1 and 2 of each series; coil *b* through links 2 and 3; coil *c* through links 3 and 4, and so on, and the closed links 2 pass through coils *a* and *b*, links 3 through coils *b* and *c*, links 4 through coil *c* and the next one, and correspondingly for the entire width of the fabric. This is shown diagrammatically in Fig. 3, the numbers indicating closed links and the letters *a*, *b*, *c*, *d*, the coils. This interconnection serves to intermesh the various links of the fabric securely and uniformly while giving the greatest flexibility, and in the fabric illustrated the original closed links *f* are of the same diameter as the connecting links formed from the coils of the connecting spirals.

If the links were so laid on the combs that

each coil would pass through but one link or each series, then when the coils were severed and closed up a series of separate chains would be produced, extending lengthwise of the base 5, but by the overlapping of the links to cause each coil of the spiral to pass through two juxtaposed links I connect these chains during the process.

Supposing, now, that a length of fabric has been partially completed by threading a plurality of spirals as *h*, Fig. 4, into the links composing a series of overlapped, separate and closed links, (such rows or series being one greater in number than the number of spirals) the fabric must be finished by severing the coils of each spiral between the two rows of links, as *f*, connected thereby, and the severed coils must be straightened and closed by bringing their severed ends together. This may be done in various ways, but by a device such as shown in Fig. 9 the operation is effected expeditiously and effectively. This device comprises a bed 10 on which is sustained a fixed die member 11 having a series of diagonal, parallel seats or slots 12, spaced apart equal to the space between adjacent coils of a spiral. A cooperating die member 13 is longitudinally movable on the bed 10 and is provided with diagonal slots 14 corresponding to the slots 12 when the device is in normal position, a spring 15 keeping the movable die in position so that the series of slots 12 register with the series of slots 14, as shown. The operator now takes the partially completed fabric and lays one of the spirals on the die members, pressing the lower parts of the coils into the registering slots 12 and 14, the angle of the slots corresponding to the angularity of the coils in the spiral. As the coils are thus positioned they are gripped or held in place by the die members, and then the operator moves the die member 13 longitudinally in the direction of arrow 16, so that the adjacent flat faces of the members 11 and 13 are moved one past the other. This relative movement severs each coil at the junction of the corresponding pair of slots 12 and 14, and the severed end of each coil in the die member 13 is moved ahead far enough to bring it opposite the severed end of the same coil held fast in the fixed die member 11. This relative movement of the dies thus not only severs the coils of the spirals but also flattens or straightens each severed coil and brings its sheared or severed ends opposite each other, closing the coil. While the die members are in abnormal position the severed coils, which now are closed and separate links, are withdrawn from the said members by lifting the fabric, the die member 13 is returned to normal position, and the next

spiral is similarly acted upon, the operation being continued until all of the interthreaded spirals have been treated. The fabric is now complete save for such polishing, plating, or other treatments which may be desired have been imparted thereto.

Any suitable means may be employed for effecting the relative movement of the die members, and herein I have shown a handle 17 pivoted at 18 and provided with a cam-shaped end 19 to bear against the end of the shank 20 of the backing 13* for the movable die member 13, said shank 20 and a similar shank 21 at the other end of said member being slidably mounted in heavy bearings 20*, 21* on the bed 10.

By lifting the free end of the handle 17 the cam-shaped end 19 acts against the shank 20, pushing it ahead in the direction of arrow 16 to effect the result before explained.

The die member 11 is supported in a backing 11* secured to the bed 10, and a guide 22 rigidly secured to the bed is in sliding engagement with the movable backing 13* to maintain it firmly in proper position during the severing and coil-closing operation.

The apparatus herein illustrated is not claimed herein as this application is restricted to the method of making the fabric, but in order to facilitate the complete understanding of such method the devices employed in carrying it out conveniently and quickly have been shown and described.

So far as my invention is concerned the closed links may vary in shape so long as the rotative and angular threading movement of the connecting spirals effects the desired result.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. The method of making flexible link fabric which consists in positioning in parallelism a plurality of rows of overlapping closed links; rotatively threading the coils of a spiral into the links of two adjacent rows, to connect the same, and forming the coils of the connecting spiral into separate, closed links.

2. The method of making flexible link fabric, which consists in positioning in parallelism a plurality of rows of overlapping closed links, rotatively threading the coils of a spiral into the links of two adjacent rows, to connect the same, severing the coils of the connecting spiral between the rows of links connected thereby, and bringing together the severed ends of each coil to thereby form closed links.

3. The method of making flexible link fabric, which consists in positioning in parallelism a plurality of rows of overlapping and

separate closed links; connecting the links of two adjacent rows by rotatively threading the coils of a metallic spiral thereinto, starting at one end of the two rows and gradually advancing the spiral longitudinally; and separating the coils of the spiral and closing the ends of such separated coils to form separate, closed links.

4. The method of making flexible link fabric, which consists in positioning in parallelism a plurality of rows of overlapping and separate closed links; rotatively threading the coils of a metallic spiral through the links of two adjacent rows, each coil passing through two juxtaposed links in each row, to thereby connect the rows of links; and forming the coils of the spiral into separate, closed links, each coil of the spiral passing through four of the primarily separate links.

5. The method of making flexible metal-link fabric, which consists in supporting in elevated position and in parallelism a plurality of series of separate and overlapping, closed links; rotating and longitudinally advancing a metallic spiral between two adjacent series of overlapped links and threading the coils thereinto, each coil passing through two juxtaposed links in each series, to connect the same; and thereafter severing and closing up the coils of the connecting spiral.

6. The method of making flexible metal-link fabric, which consists in supporting in elevated position on each of a plurality of parallel upright combs a series of separate and overlapped closed links, each tooth passing through a plurality of links in the median line thereof; rotating and longitudinally advancing a metallic spiral between two adjacent series of the supported links and threading the coils therethrough, each coil passing through a plurality of links in each series and each link in a series coöperating with a plurality of coils; severing the coils between the two connected series of supported links, and bringing together the severed ends of each coil to thereby close the same.

7. The method of making flexible metal-link fabric, which consists in supporting loosely in elevated position and in parallelism a plurality of series of separate and overlapped closed links; positioning the links of two adjacent series so that the peripheral portions of the links of each series lie substantially tangent to a common plane; passing each coil of a metallic spiral through two juxtaposed links in one series and then through two juxtaposed links in the adjacent series and repeating the operation by rotating and longitudinally advancing the spiral, whereby each link in a series coöperates with two coils; severing the coils

between the connected series of links, and finally closing the coils.

8. In the art of making link fabric, positioning in parallelism a plurality of rows of
5 overlapped, closed links; passing the coils of a spiral through the links in adjacent rows, in alternation, by rotating and longitudinally advancing the spiral between the rows,
10 each coil thereby connecting a plurality of closed links; severing the coils between the

rows of said links, and bringing together the severed ends of each coil to thereby form closed links.

In testimony whereof, I have signed my name to this specification, in the presence of 15 two subscribing witnesses.

FELIX VIANÓ.

Witnesses:

JOHN C. EDWARDS,

FREDERICK S. GREENLEAF.