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## PROCESS OF MANUFACTURING SLIDING CLASP FASTENERS

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This invention relates to the manufacture of sliding clasp fasteners.

Sliding clasp fasteners of which the elements each consist of a helix or coil of a thermoplastic plastic with locking projections formed thereon have so far been produced by winding helices or coils of thermoplastic on a rod where they are heated while the locking projections are formed on the wire in order that the material of the wire may be heat set to the required shape. These rows of elements are then sewn onto the supporting bands or stringers.

Great care is required in this connection in order to overcome the difficulties which are due to the tolerances of the wire cross-section, the dimensional changes under the influence of the deformation temperature, and the like.

The shape of the row of plastic elements, as it comes from the shaping arrangement, determine the possibilities of the fixing thereof to the stringers and thus the properties of the completed sliding clasp fasteners as regards the final shape, the longitudinal and transverse strength factors and the bending strength, as well as the opening resistance. It is not possible by the known production methods to produce helical wires with short locking arms which are stable in operation and which do not tend to bend as do long locking arms. Care has to be taken during the attachment of the rows of elements to the stringers in the sewing operation to ensure that the successive convolutions have an adequate spacing from one another in order to allow the passage of the needle. However, since the threads always have a smaller cross-section than the needle used for the sewing operation, there is still a certain clearance longitudinally of the sliding clasp fastener for each convolution, even after being attached by sewing to the stringer, and this clearance impairs the efficiency of the interlocking of the two rows of elements formed by the helical wires sewn onto the stringers. Filler cords which have sometimes been provided do not give any full compensation for this clearance.

In general it has not been possible with sliding clasp fasteners consisting of interlocking helices of thermoplastic plastic wire, as manufactured by known processes, to achieve a connection of the rows of elements such that they are safe-guarded against inadvertent opening.

The object of the present invention is to reduce or eliminate the above disadvantages by shaping the wires into helical form and forming the locking arms at a comparatively low temperature which is sufficient for the dimensional stability of the thermoplastic material of the wires, the final setting of the rows of elements at a higher temperature only being carried out after the rows of elements have been sewn onto the stringers.

According to the invention there is provided a process for the manufacture of sliding clasp fasteners having interlocking wire helices which comprises heating wires of thermoplastic material while shaped into helices to a temperature ensuring their approximate dimensional stability, sewing the helical wires into stringers, and then finally setting the helical wires by heating them to a setting temperature which is near the melting temperature of the thermoplastic material comprising the wires. Preferably the final heat setting is carried out with the two rows of elements in a closed condition. The final heating may conveniently be carried out in the vicinity

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of the melting temperature of the synthetic plastics material of the wires.

When using dry heat, care must be taken that the stringers and the sewing threads are not affected. It is therefore more expedient to use moist heat provided from superheated steam of hot liquid baths consisting of liquids with a high boiling temperature. These liquids are preferably soluble in water in order that they may be easily washed or flushed out of the stringers. Conveniently, the final heating may take place in a bath of a liquid having a boiling point above the final setting temperature of the thermoplastic material.

Due to this subsequent heating of the rows of elements on the finished sliding clasp fastener, the rows only shrink in the position in which they are retained on the stringers, so that the individual convolutions tightly adjoin the sewing threads. At the same time, the clearance between the interengaging locking arms is reduced without the basic shape of the rows of elements being changed. The cross-section of the wire is always increased where it can find space, due to previous clearance or play relatively to those parts of the other row of elements which is in engagement therewith. On account of this shifting of the heating of the rows of elements to the setting temperature after the rows of elements have been sewn onto the stringers and in a closed condition, there is provided a better adhesion of the rows of elements on the stringers and a better locking of the locking projections with one another, than when the final thermosetting of the rows of elements takes place during their shaping before they are sewn to the stringer.

The heating during the shaping need only be to such a degree that the rows of elements no longer spring up and thus retain the helical form. They are preferably only given the final setting after having been sewn onto the stringers and in the closed condition, whereby any irregularities which impair the connection are compensated for.

Advantageously the final setting may take place by heating in a glycerine bath so that the rows of interlocking plastic elements, during the subsequent dyeing of the finished sliding clasp fasteners, are more ready to absorb dyestuff. This facilitates the uniform dyeing of the rows of plastic elements with the stringers.

What I claim is:

1. A process for the manufacture of sliding clasp fasteners having interlocking wire helices which comprises heating wires of thermoplastic material while shaped into helices to a temperature ensuring their approximate dimensional stability, sewing the helical wires into stringers, and then finally setting the helical wires by heating them to a setting temperature which is near the melting temperature of the thermoplastic material comprising the wires under moist conditions.

2. A process according to claim 1, wherein the helical wires sewn to two stringers are interlocked into closed condition before the helical wires are finally heated to the setting temperature.

3. A process according to claim 1, wherein the heating to the setting temperature is carried out in a liquid having a boiling temperature above the setting temperature for the thermoplastic material.

4. A process according to claim 1, wherein the heating to the setting temperature is carried out in a bath of glycerine.

5. A process according to claim 2, wherein the heating to the setting temperature is carried out in a liquid having a boiling temperature above the setting temperature for the thermoplastic material.

6. A process according to claim 1, wherein the heating to the setting temperature is carried out in a liquid which is soluble in water, said liquid having a boiling tem-

perature above the setting temperature for the thermoplastic material.

7. A process according to claim 2, wherein the heating to the setting temperature is carried out in a liquid which is soluble in water, said liquid having a boiling temperature above the setting temperature for the thermoplastic material.

8. A process according to claim 2, wherein the heating to the setting temperature is carried out in a bath of glycerine.

9. A sliding clasp fastener in accordance with the process of claim 1.

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