

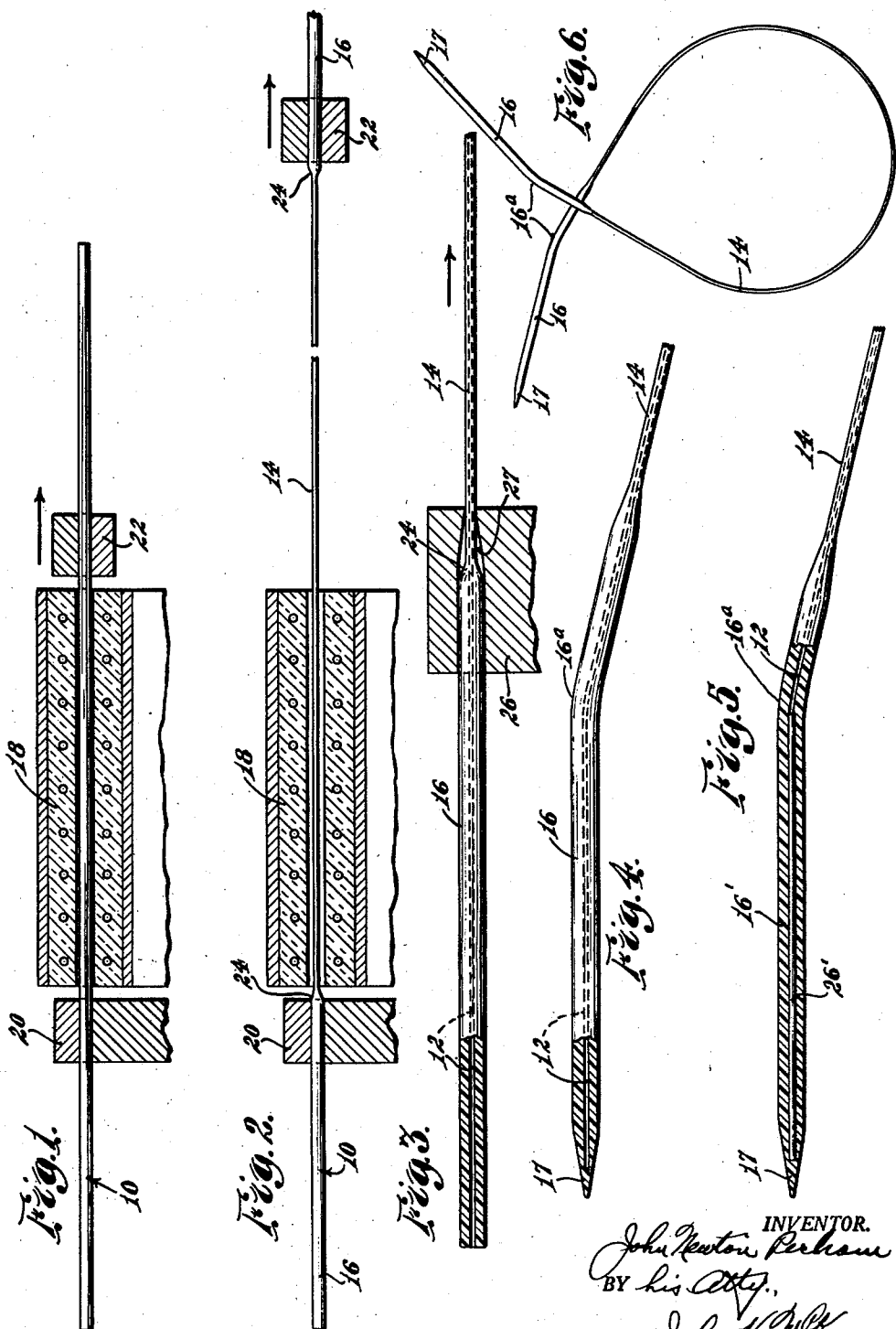
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KNITTING NEEDLE AND METHODS OF PRODUCING IT

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KNITTING NEEDLE AND METHODS OF PRODUCING IT

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This invention relates to improvements in knitting needles and methods of producing them. More particularly it provides improvements in knitting needles of the so-called circular type wherein two relatively rigid end portions or pins are permanently connected together by a flexible central portion. Such needles are suitable for use in knitting dresses, skirts, sleeves, and other items or portions of items having generally circular extent.

Heretofore, circular knitting needles have been made by forming the relatively rigid end portions or pins and the flexible central portion as separate elements with a mechanical connection of each end of the central portion to a different one of the end portions or pins, and this has provided two points of relative weakness at the junctures of the central flexible portion with the relatively rigid end portions or pins, at which points the prior needles frequently fail or break following relatively short periods of use of the needles. Various proposals have been advanced for strengthening these points of weakness in the prior needles but none of the mechanically joined needles of which I am aware has satisfactorily solved the problem of premature failures of the needles at one or the other of the joints.

It is among the objects of the present invention to provide a knitting needle of the mentioned circular type wherein there is no mechanical joint and, hence, no point of relative weakness. According to the invention, an initially relatively stiff cross-sectionally round strip of suitable material, such as nylon or a comparable synthetic plastic material, is drawn to a substantially reduced diameter centrally between two end portions thereby to provide a flexible central portion of desired length integral with two end portions which continue relatively stiff and un-reduced, and which may be suitably pointed for constituting the relatively stiff end portions or pins of a circular knitting needle.

Another object of the invention is to provide an improved method of producing a circular knitting needle having relatively stiff end portions or pins which are integral with a connecting flexible central portion of the needle, both the end portions or pins and the central flexible portion being formed from a single continuous strip of nylon or the like.

Yet another object of the invention is to provide an all-nylon circular knitting needle wherein the central flexible portion of the needle is a drawn and reduced and extended central portion of a relatively stiff cross-sectionally round strip of nylon whose end portions are substantially unaffected by the said drawing of the central portion, whereby they are available in their initial relatively stiff condition for constituting the relatively stiff end portions or pins of the knitting needle, at opposite ends of the drawn and flexible central portion.

A further object of the invention is to provide an improved method of producing circular knitting needles by reducing a central portion of a relatively stiff strip of nylon to provide a flexible central portion integral with two relatively stiff un-reduced end portions with gradually

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tapering junctures of the drawn central portion with the relatively stiff end portions.

It is, moreover, my purpose and object generally to improve upon prior circular knitting needle structures and prior methods of producing circular knitting needles.

In the accompanying drawing:

Fig. 1 is a diagrammatic view of a fixed clamp and a movable clamp gripping a strip or rod of nylon or the like at spaced points inward from the opposite ends of the strip or rod, with means for heating the strip or rod between the clamps for conditioning the heated portion of the strip or rod for being drawn to a uniformly reduced diameter when the movable clamp moves to the right in Fig. 1;

Fig. 2 is a view generally similar to Fig. 1 but showing the movable clamp moved a substantial distance to the right from its position of Fig. 1, and showing the portion of the nylon strip or rod drawn to a substantially reduced diameter;

Fig. 3 shows a left hand end portion of the strip or rod of Fig. 2, on a larger scale in the process of having the relatively abrupt shoulder at the juncture of the drawn and un-drawn portions converted to a smooth and tapering juncture;

Fig. 4 is an elevational view of the portions of the strip or rod shown in Fig. 3 with its juncture nicely tapering and with the end portion of the strip or rod tapering to a point, the un-drawn portion of the strip or rod also having a slight bend introduced therein;

Fig. 5 is a view generally similar to Fig. 4 but showing the un-drawn portion of the strip or rod axially stiffened by an inserted metallic core element, portions of the strip or rod being in cross-section; and

Fig. 6 is an elevational view of a completed circular knitting needle, on a reduced scale, made in accordance with my improved method.

Referring to the drawing, a relatively stiff strip or rod 10 of synthetic plastic material, such as nylon or the like, preferably has uniformly round cross-section from end to end, and preferably has a relatively minute axial hole therethrough as best seen at 12 in Figs. 3 and 4.

According to the invention, the central region of the strip or rod 10 is drawn to a reduced diameter to provide a flexible portion 14 of predetermined length integral at its ends with relatively stiff non-drawn end portions 16. The drawing and conversion of the central portion 14 may be accomplished in any suitable manner and by any suitable means. As herein represented, the strip or rod 10 is shown passing loosely through a heating means 18 and gripped in two clamps 20, 22 located at opposite ends of the heating means 18. The clamp 20 may be at a fixed location but clamp 22 is movable in directions axially of the strip or rod 10. Hence, assuming the region of strip or rod 10 between the clamps in Fig. 1 to be heated to a suitable temperature by the heating means 18, such as to a temperature of around 350 degrees Fahrenheit, for example, a movement of clamp 22 to the right in Fig. 1 will draw the heated portion of the strip or rod 10 to the reduced diameter as at 14. It is a characteristic of the plastic material of which the strip or rod 10 is made that when the material is heated and subjected to substantial axially applied tension, it draws out relatively uniformly, maintaining approximately uniform reduced cross-section throughout the extent of the drawn portion 14 of the strip or rod. Also, it is characteristic of the material, which may be nylon or any other synthetic material having the properties of nylon, that the surface of the drawn portion 14 will be smooth if the surface of the strip or rod 10 was smooth and will be rough if the surface of strip or rod 10 was rough. Hence,

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by selecting an initial strip or rod 10 of desired surface smoothness, this strip or rod 10 may be drawn to provide the reduced flexible portion 14 with assurance that the reduced portion 14 will have a desirably smooth surface.

As will be apparent from Figs. 2 and 3, a relatively abrupt shoulder 24 is formed adjacent each of the clamps 20, 22 as a result of the step of drawing the central portion of the strip or rod 10 to the reduced diameter at 14. Preferably each shoulder 24 is reduced to a smoothly tapering form by inserting each juncture portion in a mold 26 as seen in Fig. 3, the said juncture portion engaging relatively loosely in the tapering mold cavity 27 so that it may be drawn sharply to the right in Fig. 3 to reduce the abrupt shoulder 24 to the smoothly tapering contour of the mold cavity 27. The juncture portion will be suitably heated prior to entering mold 26, or while within the mold, to condition it for conforming to the contour of the mold cavity.

Completion of the knitting needle involves pointing of the free ends of the relatively stiff end portions 16, as at 17, this being accomplished in any suitable manner and by any suitable means, such as by a suitable heating and molding of the ends with simultaneous closing of the minute axial passage 12. Also, if desired, a slight bend may be provided at 16a in each end portion or pin 16, as by heating the portions at which the bends are to be introduced, and bending the end portions or pins by any suitable means, and the end portions or pins 16, when cooled, become relatively rigid in their bent condition.

In some cases, it may be desirable to introduce an axial stiffener in each end portion or pin 16, as illustrated at 26 in Fig. 5. The small axial hole 12 may be reamed, or otherwise enlarged slightly, to accommodate the stiffening element 26', which extends throughout the straight part of each end portion 16 adjacent to the point 17.

It will be apparent from the foregoing description in connection with the drawing, that I have provided an improved knitting needle which has two similar relatively stiff end portions or pins 16 or 16' connected by a flexible portion 14 of suitable length, wherein both the relatively rigid end portions or pins and the flexible portion are integrally formed from a single strip or rod of nylon or of a comparable synthetic plastic material, with no mechanical connection at the junctures of the end portions or pins with the flexible portion. Hence, I have effectively eliminated the points of weakness which have been the cause of premature failure of the prior comparable knitting needles. My improved needles withstand flexings in use indefinitely without failure at the said junctures, each of which may be smoothly tapered from the larger to the smaller diameter to facilitate transfer of stitches from the end portions or pins to the flexible connecting portion, and vice versa.

I have disclosed what I presently consider to be preferred structural embodiments of the invention and a preferred method of producing my improved knitting needles, but it will be understood that various changes may be made within the spirit and scope of the appended claims and it is intended that the patent shall cover, by suitable expression in the appended claims, whatever features of patentable novelty exist in the invention disclosed.

I claim as my invention:

1. The method of making a knitting needle comprising gripping a substantially round relatively rigid rod of synthetic material at two separated locations substantially inward from one end of the rod, heating the portion of said rod which extends between said separated locations of gripping, and then moving the gripping means at said two locations relatively apart to draw said heated portion of the rod through free space to a substantially in-

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creased length and reduced diameter thereby to provide a reduced and extended relatively flexible portion integral with an end portion of said rod which continues in its initial relatively rigid condition, followed by heating said relatively rigid end portion and said relatively flexible portion at the region of their juncture and molding the heated material to provide a gradually tapering juncture portion having substantial smoothly tapering extent between said relatively rigid end portion and said relatively flexible portion of the knitting needle.

2. The method of making a knitting needle comprising gripping a substantially round relatively rigid tube of synthetic material at two separated locations substantially inward from one end of the tube, heating the portion of said tube which extends between said separated locations of gripping, moving the gripping means at said two locations relatively apart to draw said heated portion of the tube through free space to a substantially increased length and reduced diameter thereby to provide a reduced and extended relatively flexible tubular portion integral with a tubular end portion of said tube which continues in its initial relatively rigid condition, followed by heating opposite ends of said relatively rigid end portion and molding the heated material at one end to provide a gradually tapering juncture portion having substantial smoothly tapering extent between said relatively rigid end portion and said relatively flexible portion, and molding the heated material at the other end to close this end of said relatively rigid end portion and to provide a gradually tapering tip portion having substantial smoothly tapering extent to a point.

3. The method of making a knitting needle comprising gripping a substantially round relatively rigid tube of nylon at two separated locations substantially inward from one end of the tube, heating the portion of said tube which extends between said separated locations of gripping, moving the gripping means at said two locations relatively apart to draw said heated portion of the tube through free space to a substantially increased length and reduced diameter thereby to provide a reduced and extended relatively flexible tubular portion integral with a tubular end portion of said tube which continues in its initial relatively rigid condition, heating the region of juncture of said relatively rigid and relatively flexible portions and molding the nylon material at said region of juncture to provide gradual taper from the larger to the smaller diameters of said portions, and pointing and closing the free end of said relatively rigid tubular end portions of the needle.

4. The method of making a knitting needle comprising gripping a substantially round relatively rigid tube of nylon at two separated locations substantially inward from each end of the tube, heating the portion of said tube which extends between said separated locations of gripping, moving the gripping means at said two locations relatively apart to draw said heated portion of the tube through free space to a substantially increased length and reduced diameter thereby to provide a reduced and extended relatively flexible tubular portion integral with and extending between tubular end portions of said tube which continue in their initial relatively rigid condition, followed by heating opposite ends of each of said relatively rigid end portions and molding the heated nylon at one end of said relatively rigid end portions to provide a gradually tapering juncture portion having substantial smoothly tapering extent between the adjacent relatively rigid end portion and said relatively flexible portion, and molding the heated nylon at the other end of each of said relatively rigid end portions to close the free end of each of said relatively rigid end portions and to provide on each a gradually tapering tip portion having smoothly tapering extent to a point.

5. A knitting needle comprising a unitary relatively rigid tube of nylon having a predetermined substantially round cross-section and substantially uniform smooth-

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ness of exterior surface, one substantial portion of said tube substantially inward from each end of the tube being drawn out to a substantially increased length and reduced diameter and constituting a relatively flexible integral tubular extension of two end portions of said tube which continue in their initial relatively rigid condition, said nylon tubing having the character that the said drawn relatively flexible extension portion naturally acquires substantially uniform smoothness of surface comparable to that of the initial relatively rigid tube, opposite substantial terminals of each of said two relatively rigid end portions of said tube having molded gradually diminishing taper in generally opposite directions, one of said terminals of each of said relatively rigid end portions providing a smoothly tapering juncture between said reduced diameter relatively flexible extension portion and the adjacent relatively rigid end portion, and the other of said terminals of each of said relatively rigid end portions providing a needle tip tapering smoothly to a point.

6. A knitting needle comprising a unitary relatively rigid rod of synthetic material having a predetermined substantially round cross-section and substantially uniform smoothness of exterior surface, one substantial portion of said rod substantially inward from each end of the rod being drawn out to a substantially increased length and reduced diameter and constituting a relatively flexible integral extension of two end portions of said rod which continue in their initial relatively rigid condition, said rod having the character that the said drawn relatively flex-

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ible extension portion naturally acquires substantially uniform smoothness of surface comparable to that of the initial relatively rigid rod, opposite substantial terminals of each of said two relatively rigid end portions of said rod having molded gradually diminishing taper in generally opposite directions, one of said terminals of each of said relatively rigid end portions providing a smoothly tapering juncture between said reduced diameter relatively flexible extension portion and the adjacent relatively rigid end portion, and the other of said terminals of each of said relatively rigid end portions providing a needle tip tapering smoothly to a point.

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