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SURGICAL AND LIKE NEEDLE AND ITS MANUFACTURE

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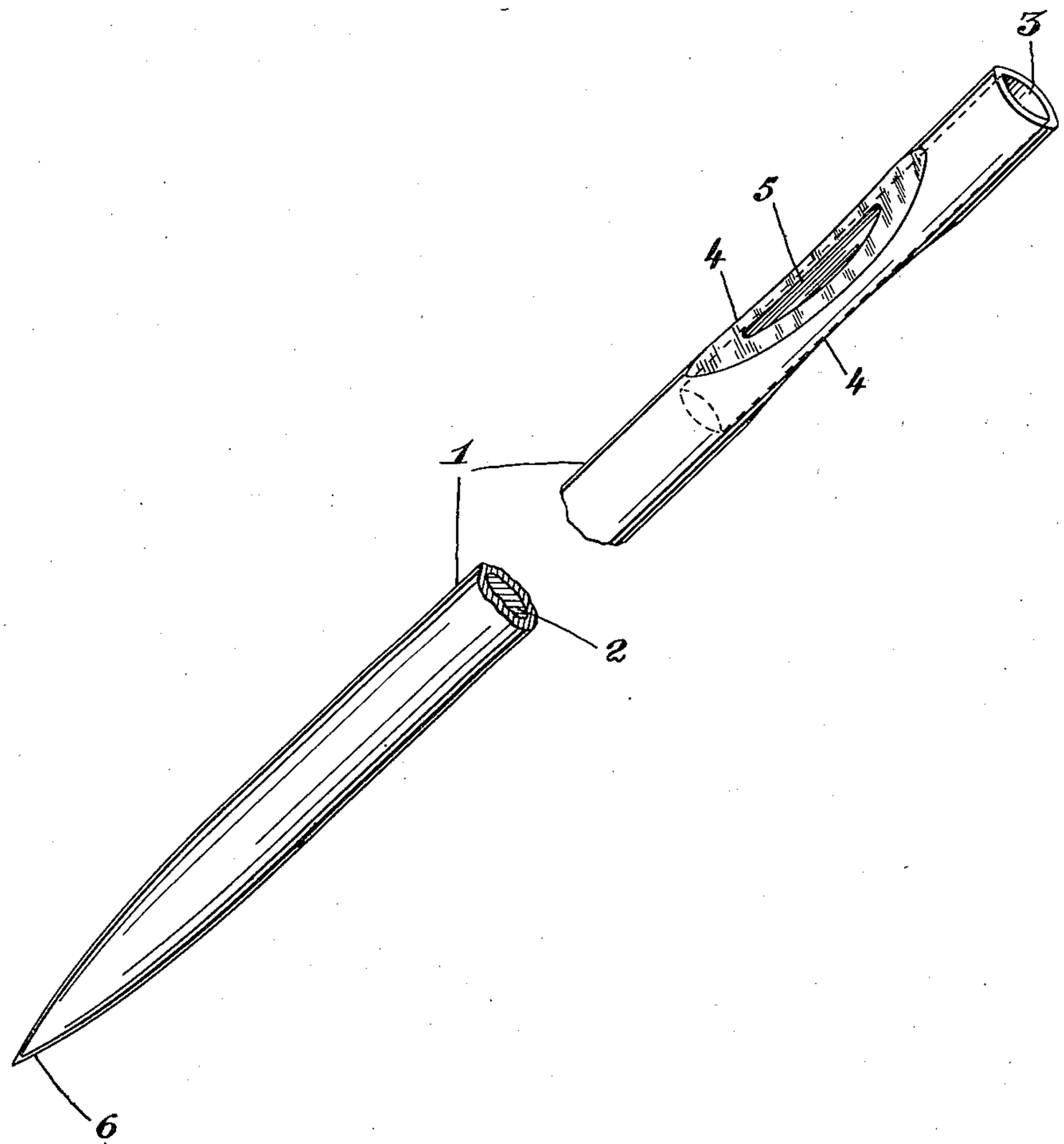


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## SURGICAL AND LIKE NEEDLE AND ITS MANUFACTURE

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8 Claims. (Cl. 29—148.2)

This invention relates to improvements in surgical and like needles and to a process for manufacturing the same and like articles of very small gauge which are hollow at one end. It is extremely difficult, if not impossible, to produce such small gauge articles by drilling the end thereof, especially with the relatively tough and difficult metals commonly used for suture needles. The principal object of the invention is to provide a simple and inexpensive method of manufacturing such needles which does not require particularly skilled or trained labour for its performance. A further object is to provide suture needles which can be produced simply and inexpensively without external roughness or undue weakness at the point where the suture is attached.

With these objects in view, according to the present invention, such needles are manufactured by a method which consists briefly in producing the same from composite wire comprising a tubular metal shell and a metal core, and in removing the core material from the end part of the needle. The material of the tubular shell will be chosen to provide the desired characteristics of the final needle. Generally it will comprise a stainless steel, a carbon steel, a nickel-chromium alloy or another alloy which is capable either of being hardened and tempered by heat treatment or of being given a spring temper by cold working. The core material will be selected for properties which will facilitate the ease of its ultimate removal, for example a metal, alloy or composition soluble in acid which does not attack the shell material.

One manner of producing the composite wire will first of all be described by way of example:

A solid billet of the shell material is drilled out to receive a solid billet of the core material making a push fit therein, a flux being coated upon the outer surface of the core before its introduction, if desired. By way of example, the external diameter of the drilled billet might be $\frac{7}{16}''$ and its internal diameter $\frac{5}{16}''$. Naturally instead of drilling a solid billet of the shell material, a tube might be used. The composite billet is reduced to the required diameter by swaging, rolling or drawing. This may be followed by a heat treatment which has a dual purpose: Firstly it assists in uniting the core and shell and secondly it may be made to put the shell in a desired condition, for example, of temper and, if the shell material is susceptible to hardening by heat treatment, of hardness. Particularly if the shell material is an austenitic steel of, for example the "Staybrite" or "Contracid" varieties, annealing or other heat treatment may be performed in the course of the reduction.

For suture needles, needle lengths, preferably double needle lengths, are next cut from the composite wire and roughly fashioned and bent to a curved shape, if this is required. These steps may, if preferred, precede the heat treatment. A portion of the core material is then removed from each end of the double length in one of the manners hereinafter described. For example, and preferably, the core material might be dissolved out by a chemical agent which does not attack the shell material. Thus hot concentrated nitric acid can be employed for dissolving a nickel or nickel-silver core out of a "Staybrite" steel shell. Alternatively the core material might be dissolved out by an electrolytic action in which said material acts as anode. For instance, a nickel core may be so removed from a shell of stainless steel of the so-called "cutlery" variety. With these methods, naturally, the solution process is discontinued when the core material has been removed to the desired depth from the ends of the double needle length.

Instead of chemical actions, mechanical processes may be used. Thus the core material may be drilled out. For this purpose a relatively soft core material, for instance, a brass core in a carbon steel shell, is used to facilitate the drilling and obviate the difficulty, experienced hitherto, of satisfactorily drilling such a fine hole in a relatively hard material. Alternatively, a portion of the core material may be drawn out. For this purpose, the needle is first squeezed a short distance from the end to sever or partially sever the core material. Only a relatively short length of core can be removed by this means, for example about $\frac{1}{8}''$. In this case a core material will be chosen which is capable of stretching considerably.

The double needle lengths are finally polished, divided and pointed. A finished needle is illustrated in the drawing in which **1** is the shell, **2** the core and **3** the longitudinal hole produced at the blunt end by the removal of the core. The diameter of the core **2** is made such that the hole **3** resulting from its removal is approximately of the same diameter as the suture which it is proposed should be used therewith. The suture may be secured in the needle by slightly crushing the hollow shell-wall around it with pliers or the like. If the core is of sufficiently hard material, for example, nickel, the point **6** may be formed thereon, as shown. If, however, the core is of

a relatively soft material such as brass, the pointing may be performed in such a manner as to form the point on the hard shell to one side of the axis of the core. Said point may then, if desired, be brought into the axis by subsequent bending.

A further improvement may be effected by producing as by grinding, one or more shallow transverse recesses or grooves **4** at the hollow end of the needle. This recess or recesses should preferably be deep enough to intersect the central bore **3** and may serve two purposes: In the first place the partial weakening where the recess or recesses are provided facilitates the firm nipping of the hollow needle-end upon the suture and in the second place a window **5** may be provided through which it can be seen that the suture is fully introduced into the needle-end before it is secured therein. Preferably two such recesses are provided at diametrically opposite points, as shown.

The above described methods of manufacture may be applied also to suture needles of the kind having a terminal slot instead of a hole, for example as described in the specification of patent application Serial No. 569,316 (S. J. Everett) filed October 16, 1931. For this purpose it is only necessary, in addition, to grind away part of the shell-wall of the hollow end of the needle, the required slot formation being thereby produced.

I claim:—

1. Small gauge article such as a suture needle, comprising a length of composite wire and consisting of a tubular shell of hard metal and a solid metal core firmly united with said shell but terminating short of one end thereof to leave said shell hollow at said end.

2. Suture or like small gauge needle, comprising a length of composite wire pointed at one end and consisting of a tubular shell of stainless steel and a solid metal core firmly united with said shell but terminating short of the unpointed end to leave said shell hollow at that end.

3. Suture or like small gauge needle, comprising a length of composite wire pointed at one end and consisting of a tubular shell of hard metal and a solid metal core firmly united with said shell but terminating short of the unpointed end to leave said shell hollow at that end for the reception of a thread, the walls of the hollow end of the shell being formed with two diametrically opposed recesses which facilitate nipping of said hollow end to grip the thread.

4. Method of manufacturing a small gauge needle such as a suture needle, comprising producing said needle from a composite wire consisting of a tubular shell of hard metal and a solid metal core firmly united with said shell, and removing the core at one end to leave the shell hollow at said end for the reception of a thread.

5. Method of manufacturing a small gauge needle such as a suture needle, comprising producing said needle from a composite wire consisting of a tubular shell of hard stainless base-metal and a solid metal core firmly united with said shell, and dissolving the core-metal out of the shell at one end to leave said end hollow for the reception of a thread.

6. Method of manufacturing a small gauge needle such as a suture needle, comprising producing said needle from a composite wire consisting of a tubular shell of stainless steel and a nickel-silver core firmly united with said shell, and removing the core from one end of the shell by dissolving it therefrom with nitric acid to leave said end hollow for the reception of a thread.

7. Method of manufacturing a small gauge needle-shaped article which is solid for the greater part of its length but is hollow for a substantial length at one end, such as a suture needle, comprising producing a composite wire with a sheath of hard metal appropriate for the exterior of the article and a metal core, and removing the core-metal from the end of the sheath by the assistance of chemical action.

8. Method of manufacturing a needle such as a suture needle, comprising producing the needle from a composite wire consisting of a hard metal shell and a metal core, weakening the core at a short distance from one end of the needle, and drawing out the end portion of the core to leave the shell hollow at that end.

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