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MATERIAL FOR SURGICAL LIGATURES AND SUTURES

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4 Claims. (Cl. 128—335.5)

The present invention relates to a material for surgical ligatures and sutures.

As a material for producing surgical ligatures and sutures so far in most cases silk, catgut, tendons or like animal materials have been employed. Although these materials provide for mechanically unobjectionable sutures, catgut threads show the disadvantage that they cannot be subjected to the boiling temperature of water and therefore can be kept sterile only with difficulty. Silk can be kept sterile by boiling but silk threads remain as foreign substance within the tissue and thus may lead to complications in the healing process of the wound.

The present invention provides for a material for surgical ligatures and sutures which can be easily sterilized and is resorbed by the tissue and, therefore, does not show the said disadvantages of materials for surgical ligatures and sutures formerly known.

In accordance with the present invention wires or ropes of magnesium or magnesium alloys are used as a sterilizable and resorbable material for surgical ligatures and sutures. Wires or ropes of magnesium or magnesium alloys can be rendered sterile without difficulty by boiling in water and are resorbed by the body. The resorption of the said wires proceeds so slowly that the purpose of the suture, that is, closing of the wound, is attained. The wires or ropes of magnesium or magnesium alloys may also be used for the ligature of blood vessels.

When employing single wires of magnesium or magnesium alloys, the single wire on account of its limited pliability may tend to break on threading, bending to and fro, knotting etc. This disadvantage can be overcome by using ropes which are obtainable by twisting especially thin wires. Wires of a diameter of less than 0.2 mm., particularly those of a diameter of about 0.04 to 0.06 to 0.1 mm. are preferably used for the manufacture of such ropes. A rope made of thin wires is of a considerably greater flexibility and tenacity when knotted than a massive wire of the same cross section as the rope. Such thin wires are prepared in extremely small draw stages, so that the deformability of the material is not exceeded. For instance, a wire of 0.30 mm. diameter is drawn to a wire of 0.1 mm. diameter within the following stages: 0.30, 0.28, 0.26, 0.24, 0.22, 0.20, 0.19, 0.18, 0.17, 0.16, 0.15, 0.14, 0.13, 0.12, 0.11, 0.10 mm.

While in the manufacture of thicker wires of magnesium or magnesium alloys, same as in the manufacture of wires of other metals, after several stages heat treatment is effected, a very frequent heat treatment may be effected in the manufacture of the wires to be used as surgical suture material in accordance with the present invention, in order to remove the draw tensions. In the above indicated example the wires were subjected to heat treatment after each single stage. This case only serves as an example. It is possible, for instance, to proceed without intermediate heating when choosing draw stages from 0.22 to 0.21 mm. and from 0.21 to 0.20 mm. instead of from 0.22 to 0.20 mm. It is also possible to work in somewhat greater draw stages than indicated in the example, so that instead of proceeding from 0.22 to 0.20 mm. the decrease takes place from 0.22 mm. to 0.19 mm. or 0.195 mm. in two or more subdivisions, without intermediate heating. It is essential, however, that the single decreases are relatively small.

In order to avoid pickling which would be necessary after heating, the heating is preferably effected with the exclusion of air, for instance, in an oil bath or in vacuo. The single wires thus prepared may be twisted in the customary manner, for instance, with lay to the left or with lay to the right, twisted in an opposite direction or twisted in the same direction, or as cable-laid rope, whereby the rope may consist of wires of the same or different diameters and the wires may be laid or twisted to strands and the strands to ropes.

As alloy-constituents, iron and the base non-iron metals are to be considered with the exception of those which cause poisonous effects in the human body; for instance, lead, silver, barium, arsenic. Preferably the alloys should contain magnesium in an amount of at least 75% by weight. The most important metal which may be present in the alloys beside the magnesium is aluminium. Advantageously not more than 6.5% of aluminium should be present in the alloys; however, larger amounts up to about 10–15% are also operable. Other metals which may be applied in the magnesium alloys are, for instance, silicon, manganese, zinc and cadmium.

Further suitable alloy-constituents are copper, nickel, cobalt, tin, antimony, bismuth, lithium, sodium, potassium, rubidium, caesium, strontium, titanium, and beryllium. The above-named additions may be added to the magnesium either alone or in admixture.

While we have described our improvements in great detail and with respect to preferred embodiments thereof, we do not desire to limit ourselves to such details or embodiments, since

many modifications and changes may be made and the invention embodied in widely different forms without departing from the spirit or scope of the invention in its broadest aspects. Hence, we desire to cover all modifications and forms within the scope or language of any one or more of the appended claims.

Particularly we wish to point out that in the annexed claims the term "threads" is intended to include smooth wires as well as ropes twisted of very thin wires, wherever it has not been stated otherwise.

Preferred ropes are the following ones:

1. A strand consisting of 7 wires.

2. Three strands consisting of 7 wires twisted in the same direction to a rope.

3. Seven strands consisting of 7 wires twisted to a rope.

4. A strand consisting of 19 wires having a layer of 12 wires placed around a nucleus of 7 wires.

We claim:

1. As a material for ligatures and sutures in human surgery threads of a metal selected from the group consisting of magnesium and resorbable alloys thereof in the form of ropes which consist of single wires of a diameter of about 0.04 to 0.1 mm.

2. As a material for ligatures and sutures in human surgery, threads of a material selected from the group consisting of magnesium and resorbable alloys thereof in the form of ropes which consist of single wires of a diameter of about 0.04 mm.

3. As a material for ligatures and sutures in human surgery, threads of a material selected from the group consisting of magnesium and resorbable alloys thereof in the form of ropes which consist of single wires of a diameter of about 0.06 mm.

4. As a material for ligatures and sutures in human surgery, threads of a material selected from the group consisting of magnesium and resorbable alloys thereof in the form of ropes which consist of single wires of a diameter of about 0.1 mm.

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