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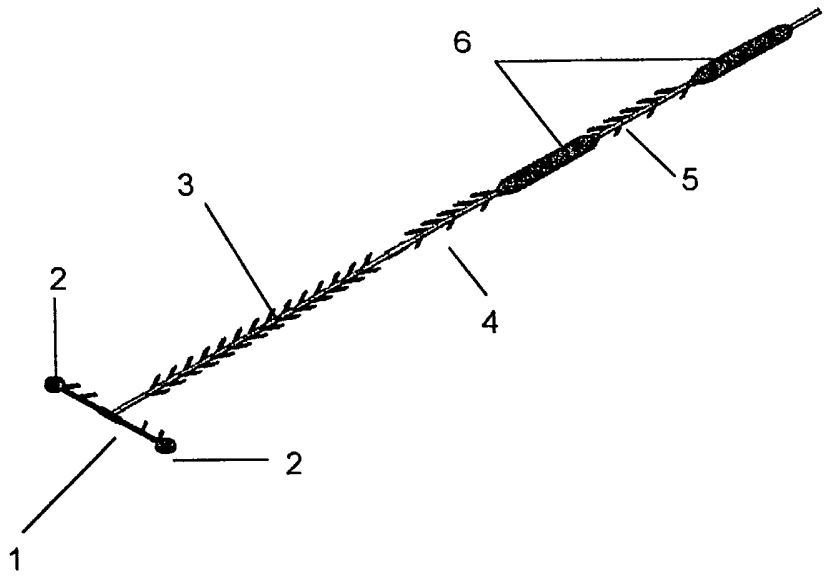
(54) Title: SURGERY THREAD AND SURGERY THREAD MANUFACTURING DEVICE



(57) Abstract: The present invention refers to a surgery thread made of flexible resistant and inert plastic material wherein the threads are employed in esthetical surgeries for reverse aging signals and in correction surgeries for correction effects of motion injury. The present invention also refers to a surgery thread manufacturing device which permits the production of a thread arrangement for lifting of flacid tissue.

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SURGERY THREAD AND SURGERY THREAD MANUFACTURING DEVICE

The present invention refers to a surgery threads made of flexible, resistant and inert plastic material wherein the threads are employed in aesthetical surgeries for reverse ageing signals and in correction surgeries for correction effects of motion injury.

The present invention also refers to a surgery thread manufacturing device which permits the production of a thread arrangement for lifting of flacid tissue.

BACKGROUND OF THE INVENTION

The Medical Progress is to be seen as a very remarkable development when considered the necessary time for its accomplishment. Some diseases and surgery limitations, critical problems in the past, are now easily overcame, therefore, the Health quality and lifetime of the Human being have been increased due to the Medical advance but, much more of such Progress is to be reached.

One of the most developed Medical field comprises the Aesthetical/Corrective Surgery. Aesthetical surgeries comprise a set of medical procedures for correct ageing signals or physical complaints which correspond to a physical limitation or a Social barrier to individuals. Many physical complaints are scar type and they tend to lower the self respect of the patient and may cause social rejection and social stigmatizing.

Most of such physical complaints are caused by mechanical origin accidents such as falling, shock and several physical kinds of trauma. In some cases, physical complaints have genetic or ever acquired origin; the former requests surgical correction as in the *cleft lips*; the latter comprises the most common case, for example, brain injury can cause movement limitations, loss of the local muscular control and local degeneration as in facial paralysis or paraplegia. The loss of the motion ability causes the muscular atrophy and the body shape tend to be assynmetrical; Although the physical restoring is

considered an important part of the patient healing in the cases of physical complaint, emotional support for self respect restoration is also a valuable part in the patient healing program. Corrective surgeries can provide physical restoration and emotional support to the patient.

The synmetry restoration of the damaged área offers to the patient a feeling of comfort and redution of the lesion effects. This feeling is important for the complementary therapy success applied during the patient healing.

Other important contribution of the Aesthetical/Correction surgeries is the ageing signals prevention. Some individuals tend to acquire more ageing signals than the others and it comprise the enhancing of the face signals such as facial foldings and flaccid skin, in many situations such signals appear before the due time. Therefore, as in the above discussed processes, the degeneration process (natural or not) influence the emotional balance; the self respect of an individual is crucial for the maintenance of the metabolic process, particularly the immunological system at acceptable levels.

The physical degradation sensation has a strong effect in the regulation functions of the body metabolism; In many cases one can notice increasing of infectious diseases or others caused by the continous lower of the self respect of an individual when he strongly believes in a quick body degradation and so permits a desease raising.

Once more, the reduction of such signals provide an enhacing of the self respect levels of a patient and avoid that an effective body degradation process be started just the ageing became.

Several surgery approaches are known in the art. For ageing cases, local teraphy based on bacterial toxins, particularly the botulism bacterial toxins, having a skin hardening effect provide a kind of self support of the flaccid tissue and a less aged/tired look. Also some injection based fill -treatment in which collagen/silicone containing solution (Medical quality) are injected into the skin folds caused by the ageing process and the results are partially satisfactory. In

these cases, additional treatments are periodically necessary and the term of the additional treatment is considerably short and the cost of it is considerably high. Further, many patients complains of the pain caused by the injection treatment in more sensitive parts, as in the *sinus* bone, or around the eyeball cavity.

Other embodiments comprise prosthesis treatments. Such prosthesis are very common in the cases of breast surgery ou in injuries located in the face or in the rump. The approaches of such procedure are very known in the Medical Art. However, such approaches are extremely invasive, contribute for surgical shock situations and the healing time is considerably large. Another aspect related to the referred approaches comprises periodical inspection and the risk of body rejection; furthermore the aesthetic effect is quite dependent of the material quality, *i.e.*, the prosthesis instrument can be misadjusted the local body part and the effect will be not satisfactory.

Another embodiment comprise surgical threads for flaccid tissue lifting; such approach is known as *surgical thread lifting*. The surgical thread is applied under the skin through the fat tissue performing a cohesive lifting effect. One advantageous feature of the above mentioned approach is that it is less invasive than the above mentioned invasive alternatives, reducing the not desired effects previously discussed; the surgical threads - inserted under the sking in the fat tissue – permit a better positioning during the correction surgery providing an enhanced aesthetic effect; the tensile strengh and the lenght of the thread can be defined by the surgeon.

However, the surgical threads of the art has a fragile tensile strengh when they are submitted to mecanical tension, therefore the resulting effect is not satisfactory and another correction procedure will be necessary. Another limiting aspect of the art comprise the fragility of the hooks. Threads of the art have hooks which is inclined in relation to the thread axis and it comprises a fragile point of the structure. The hooks of such known threads commonly

collapses in a progressive effect, therefore a loss of tissue lifting feature is verified.

Some examples of the art are presently cited as follows:

The patent document WO02004006086 refers to a lifting strap for flaccid tissues - "endoprosthesis" – comprising an inert material strap in which in the strap surface a set of arrow point type hooks are provided for support the flaccid is retained and supported; as seen in the referred document, the "endoprosthesis" is directed to breast and/or nose correction procedudes. The "endoprosthesis" strap comprises a piece having large size which causes a big sliding under the skin, i.e., in the case in that the patient moves, all this piece would move producing an under-skin-movement and a non aesthetic, non natural movement.

The patent document WO03103733 refers to a thread for correction surgery which comprises inclined hooks having conical shape and such hooks are placed in series alongside the thread axis and the edge of the hooks are sharpened and flexible. The hooks are suitably placed in the thread surface (laterally or in the whole axis). The referred thread has a monotone hook arrangement in over the cilindrical body of the thread axis causing a poor aesthetic effect even such effect show some effectiveness. The lifting effect of this invention causes a loss of free movement which is responsible for a natural movement effect, therefore the advantageous feature of the mechanical resistance of the hooks arrangement is not reached. As in the previous dicussed document, the hooks are undully described as being conical, however, the Figures of the referred invention denies such conical shape; both in the strap and in the thread discussed above the hooks comprises are limited to planar projections having an arrow point shape.

The patent document EP1075843 refers to a surgical thread for flaccid tissue lifting in which hooks placed alongside the thread body are sequencially oriented and in an opposed direction in relation to the thread traction sense. A

first hook arrangement is placed in a direction while the second arrangement is placed in the opposed direction for avoid displacement of the thread under the skin. Also, is provided a method for manufacturing a thread which is able to be inserted in a single thread direction. As in the previous case, the most enhanced is the lifting effect, the less enhanced is the natural movement effect.

The document US 5584859 refers to a surgery thread which is biologically absorbed by the organism and have a set of hooks placed in the corresponding cilindrical body and a central member from which a network is built as a fabric for permit tissues be united during the cicatrix process. Even the present surgical thread has a similar shape in relation to the previously disscussed cases, such thread is directed to a particular end: to favor the cicatrix procedure and after this procedure the thread is absorbed by the organism.

OBJECTIVES OF THE INVENTION

One objective of the present invention is to solve the above discussed problems. In this sense, the present invention refers to a surgery thread comprising a cilindrical body having a set of claws defining an arrangement which is particularly suitable for correction surgeries when a tissue correction and/or lifting and a normal appearance is desired.

Another objective of the present invention is to provide a device for the manufacture of surgery thread in which such device provide a claw arrangement having some mechanical properties useful in aesthetical surgery.

DESCRIPTION OF THE DRAWINGS

Figures 1A – 1D illustrate views of a first embodiment of a "T" shaped surgery thread of the present invention and comprising a first set of claws;

Figures 2A-2D illustrate views of a second embodiment of surgery thread according to the present invention;

Figures 3A-3D illustrate views of a surgery thread according to another embodiment of the present invention;

Figures 4A-4D illustrate views of a surgery thread according to another embodiment of the present invention;

Figures 5A-5E illustrate side views of a manufacture device for a surgery thread according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The present invention is disclosed in terms of its preferred embodiments, however, such embodiments do not comprise any kind of limitation for the scope of the present invention.

T SHAPED SURGERY THREAD

Referring to Figures 1A-1D, one embodiment of surgery thread of the present invention comprises a thread arrangement in which one of the thread extremities has a fixing means (1) transversally placed in relation to the thread axis and having orifices or rings (2) at the ***T*** top extremities and two pairs of converging claws (7) directed to the thread axis.

Traction claws (called DD claws and indicated by the number 3) are placed alongside the axis and forming a traction segment; another set of not continous claws, DF claws (4), comprising an arrangement in which the claws are positioned in opposition to the DD claws (3) is provided; the DF claws (4) is separated from the DD claws (3) by a first plate containing three orifices (6).

This embodiment defines a thread arrangement as follows: ***T*** top, DD segment, DF segment, fixing plate having three orifices for receive suture threads.

After the second DF segment be positioned alongside the thread axis, a second plate having three orifices is provided. As above mentioned, the orifices are provided for receive suture threads.

Table 1: Design Parameter of T shaped Thread

Parameter	Range
Total lenght	55mm-90mm
Lenght up to the first plate	30mm-55mm

Number of DD claws	18-35 claws
Number of DF claws	12-20claws
Claw height	0,5mm-0,7mm
Traction area	mm^2
Support area	mm^2

The above surgery thread is applied in surgeries for correction of facial upper third ptosis; the ***T*** top is inserted in the lower part of subcutaneous tissue which will be lifted and sutured in the skin with a nylon suture thread, nylon 4.0 is preferred. The fixing plate having three orifices at its upper extremity (near to the DF claws segment is sutured in the aponeurosis with a suture thread as mentioned above.

In another embodiment (Fig. 2A-2D), the ***T*** shaped thread comprises a ***T*** top (1) having orifices (2), respectively, at its extremities and two pairs of converging claws (7) directed to the thread axis, a DD claw (3) traction segment, a DF claw (4) segment and a support plate (6) having three orifices.

This embodiment defines a thread arrangement as follows: ***T*** top, DD segment, DF segment, one support plate having three orifices for receive suture threads. This second embodiment has a design difference in relation to the first embodiment; the first embodiment comprise two support plates and the second embodiment comprises one. Other difference comprise thread applications: the second embodiment is applied for facial upper third ptosis correction when the patient has a large forehead; for restore the original position of the eyebrow by means of a suture in which the ***T*** top is sutured in the adipous tissue and inserted in the inferior portion of the subcutaneous tissue to be lifted. The ***T*** top is fixed by means a nylon 4.0 suture thread and the support plate having three orifices in the upper extremity (joined the DF claws) is sutured in the aponeurosis with nylon 4.0 suture thread.

Table 2: Design parameters of the second embodiment of the T shaped Thread

Parameter	Range

Number of DD claws	35-55 claws
Number of DF claws	25-45 claws
Traction area	mm^2
Support área	mm^2
Claw height	0,5mm-0,7mm

Another embodiment of T shaped thread (Fig. 3A-3D) comprises a T top (1) having two orifices (2) respectively at its extremities for receive sutur threads, 3 pairs of converging claws (7) directed to the thread axis, 2 DF (4) claws (4) segments, 1 DD claw (3) segment, a support plate having three orifices (6), a DD claw (3) segment, one support plate having three orifices (6) and one DD claw (3) traction segment.

The claws are positioned alongside the thread according to the following order: T top; two DF claws support segment; a DD claw segment; a first support plate; a DD claw segment; a second support plate a white welding having two pairs of DD claws; a third support plate; a DD claws segment; a fourth support plate; 4 DD claws. The DF claws of one half of the thread are opposed to the DF claws of the other half of the thread.

The above mentioned embodiment is applied in surgeries for correction of umbilical ptosis (applied in the central axis) in which the T top is sutured in the umbilical adipous tissue by means of a nylon 4.0 suture thread with a support plate sutured in the aponeurosis of the xiphoid apendix. This is applied with four polypropylene converging threads radially positioned and forming pairs at the side of the central axis. It is also applied in correction surgery of facial paralysis. The T top is sutured in the adipous tissue and the support plate is sutured in the tempora-parietal aponeurosis.

Table 3: Design Parameter of a T shaped thread embodiment.

Parameter	Range
Total lenght	150mm-250mm
Lenght up to the first plate	mm

Lenght up to the second plate	mm
Lenght up to the third plate	mm
Lenght up to the fourth plate	mm
Number of DD claws	
Number of DF claws	
Traction area	mm^2
Support area	mm^2
Claw height	0,7mm

MASTER THREAD

Comprises a surgical thread (Fig. 4A-4D) having four support plates having three orifices (6), separated by a thread body with two pairs of DD traction claws white welding with two pairs of DD claws, a downward positioned DD traction claws, one upward positioned DD traction claws.

The master thread defines the following arrangement: two converging segments of DD traction claws; white welding having opposed DD claws; a first support plate; two opposed simple claws; second support plate; white welding with two opposed simple claws; a third support plate; two opposed simple claws and a fourth support plate is sutured in the tempora-parietal aponeurosis.

Table 4: Design Parameter of Master Thread

Parameter	Range
Thread lenght	150mm-250mm
Lenght up to the first plate	mm
Lenght up to the second plate	mm
Lenght up to the third plate	mm
Lenght up to the fourth plate	mm
Number of DD claws	mm
Number of DF claws	
Traction area	mm^2
Support area	mm^2

TRIDIMENSIONAL THREAD

Comprises a surgery thread (Figures 5A-5E) having two segments of upward oriented tridimensional claws (8) separated one in relation to the other by a white welding, two segments having downward oriented tridimensional claws (9) separated one in relation to the other by a white welding and a last white welding separating the upward oriented claw set and the downward oriented claw set.

The tridimensional thread arrangement is defined as follows: four pairs of claws segments; two pairs of tridimensional upward claws and two pairs of tridimensional downward claws positioned in the thread axis in an opposition configuration.

This embodiment of thread is applied in surgery for facial ptosis correction in the same insertion axis of the double convergent master threads when more traction and support forces are needed for position adipous tissue support (fat faces).

Flexible threads, as mentioned above, comprise the preferred embodiments which are not limiting of the scope of the present invention and such threads can be provided from a manufacturing device. Normally, flexible threads are made of plastic material such as polypropylene and/or polyethylene, known in the art. However, the present inventive step comprise claws arrangements positioned in the cilindrical body of the thread; structural features form these configurations permit that novel advantageous and efficient aesthetical/functional results can be achieved

The threads of the present invention are produced by means of an injection molding technique wherein the thread mould is eroded in order to produce the counter form, i.e., a cavity to be filled with molten plastic material of the thread.

Several mould excavation techniques are known in the art, but in the present invention the electrical erosion is most preferred. As stated above, the

erosion technique defines a counter form to be filled with plastic material for provide the claw arrangement of the invention.

Therefore, the preferred counter form of the present invention comprise the counter form of a first claw arrangement of the T shaped thread being defined by : ***T*** top, DD segment, DF segment, fixing plate having three orifices for receive suture threads.

Other counter forms of the present invention are also preferred. For example, a counter form of a ***T*** top, DD segment, DF segment, one support plate having three orifices for receive suture threads as another embodiment of T shaped thread .

Another counter form of the present invention comprises a third arrangement of T shaped tread which defines T top; two DF claws support segment; a DD claw segment; a first support plate; a DD claw segment; a second support plate a white welding having two pairs of DD claws; a third support plate; a DD claws segment; a fourth support plate; 4 DD claws. The DF claws of one half of the thread are opposed to the DF claws of the other half of the thread.

Another counter form of the present invention comprises the arrangement of the Master Thread which is defined as follows: two converging segments of DD traction claws; white welding having opposed DD claws; a first support plate; two opposed simple claws; second support plate; white welding with two opposed simple claws; a third support plate; two opposed simple claws and a fourth support plate is sutured in the tempora-parietal aponeurosis

Another embodiment of counter form of the present invention comprises the tridimensional thread arrangement which is defined as follows: four pairs of claws segments; two pairs of tridimensional upward claws and two pairs of tridimensional downward claws positioned in the thread axis in an opposition configuration.

The counter form definition made by means of a injection mould excavation and in accordance to a electric erosion permits a precise excavation for avoid a thread having barbs and other not regular shapes which can induce fragile points and therefore serious problems to the patient.

The present invention has been disclosed in terms of its preferred embodiments, but some variations and/or modifications are be considered obvious for a skilled person and all these variations/modification are included in the scope of the present invention.

CLAIMS

1-Surgery thread comprising a surgery thread configuration in which one of its extremities has a T top (1) transversally positioned to the thread axis and having two orifices or rings (2) at the T top extremities and two pairs of converging claws (7) directed to the thread axis.

2-Surgery thread, according to claim 1, wherein DD traction claws (3) are provided defining a traction segment at the side of a first set of DF claws (4) in a such manner that the DD claws (3) are placed in opposition to the DF claws (4).

3-Surgery thread, according to claim 2, wherein the first DF claw (4) segment is separated from the second DF claw segment (5) by means of a three orifice containing plate (6).

4-Surgery thread, according to claim 2, wherein a T shaped thread is defined by a ***T*** top, DD segment, DF segment, fixing plate having three orifices for receive suture threads.

5-Surgery thread comprising a T top (1) having two orifices (2) at the T top extremities and two pairs of converging claws (7) directed to the thread axis, second DD claw (3) traction segment, a DF claw (4) support segment and a support plate with three orifices (6).

6-Surgery thread, according to claim 5, wherein a T shaped thread is defined by ***T*** top, DD segment, DF segment, one support plate having three orifices for receive suture threads.

7-Surgery thread comprising a ***T*** top (1) having two orifices (2) at the T top extremities, 3 pairs of converging claws (7) directed to the thread axis, 2 support segments of DF claws (4), a traction segment of DD claws (3), a support plate with three orifices (6), white welding with two pairs of DF claws (4), a support plate having three orifices (6), a traction segment of DD claws (3), a support plate with three orifices (6) and a traction segment of DD claws (3).

8-Surgery thread as in claim 7, wherein the claws are placed in a such manner that an arrangement comprising a T top; two DF claws support segment; a DD claw segment; a first support plate; a DD claw segment; a second support plate a white welding having two pairs of DD claws; a third support plate; a DD claws segment; a fourth support plate; 4 DD claws. The DF claws of one half of the thread are opposed to the DF claws of the other half of the thread.

9-Surgery thread, according to claim 8, wherein the DF claws in a half part of the thread is positioned in opposition to the DF claws in the other half part of the thread.

10-Surgery thread comprising four support plates having three orifices (6), separated by a thread body with two pairs of DD traction claws white welding with two pairs of DD claws, a downward positioned DD traction claws (3), one upward positioned DD traction claws (3).

11-Surgery thread, according to claim 10, wherein The master thread defines an arrangement comprising two converging segments of DD traction claws (3); white welding having opposed DD claws (3); a first support plate (6); two opposed simple claws; second support plate (6); white welding with two opposed simple claws; a third support plate; two opposed simple claws and a fourth support plate (6) .

12-Surgery thread comprising two segments of upward oriented tridimensional claws (8) separated one in relation to the other by a white welding, two segments having downward oriented tridimensional claws (9) separated one in relation to the other by a white welding and a last white welding separating the upward oriented claw set and the downward oriented claw set.

13-Surgery thread, according to claim 12, wherein the thread parts define an arrangement comprising four pairs of claws segments; two pairs of tridimensional upward claws and two pairs of tridimensional downward claws positioned in the thread axis in an opposition configuration.

14-Surgery thread manufacturing device wherein a metallic injection mould in which excavation is made by means of an electrical erosion, providing a counter form of T shaped thread being defined by : *T* top, DD segment, DF segment, fixing plate having three orifices for receive suture threads.

15- Surgery thread manufacturing device wherein a metallic injection mould in which excavation is made by means of an electrical erosion, providing a counter form of T shaped thread being defined by a *T* top, DD segment, DF segment, one support plate having three orifices for receive suture threads as another embodiment of T shaped thread .

16- Surgery thread manufacturing device wherein a metallic injection mould in which excavation is made by means of an electrical erosion, providing a counter form of a T top; two DF claws support segment; a DD claw segment; a first support plate; a DD claw segment; a second support plate a white welding having two pairs of DD claws; a third support plate; a DD claws segment; a fourth support plate; 4 DD claws; the DF claws of one half of the thread are opposed to the DF claws of the other half of the thread.

17- Surgery thread manufacturing device wherein a metallic injection mould in which excavation is made by means of an electrical erosion, providing a counter form of two converging segments of DD traction claws; white welding having opposed DD claws; a first support plate; two opposed simple claws; second support plate; white welding with two opposed simple claws; a third support plate; two opposed simple claws and a fourth support plate .

18- Surgery thread manufacturing device wherein a metallic injection mould in which excavation is made by means of an electrical erosion, providing a counter form of four pairs of claws segments; two pairs of tridimensional

upward claws and two pairs of tridimensional downward claws positioned in the thread axis in an opposition configuration.

19-Use of surgery threads in correction and aesthetical surgeries of flacid tissues ou tissues having motion limitations comprising the application of one or more threads according to any one of the claims 1 to 13.

20- Use of surgery threads in correction and aesthetical surgeries of flacid tissues ou tissues having motion limitations comprising one or more counter forms according to any one of claims 14 to 19.

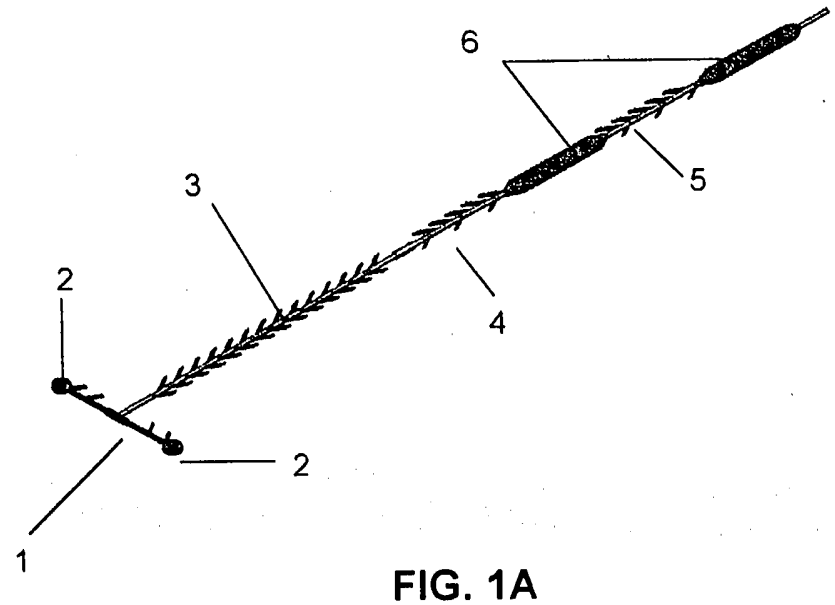


FIG. 1A

FIG. 1B FIG. 1C

FIG. 1D

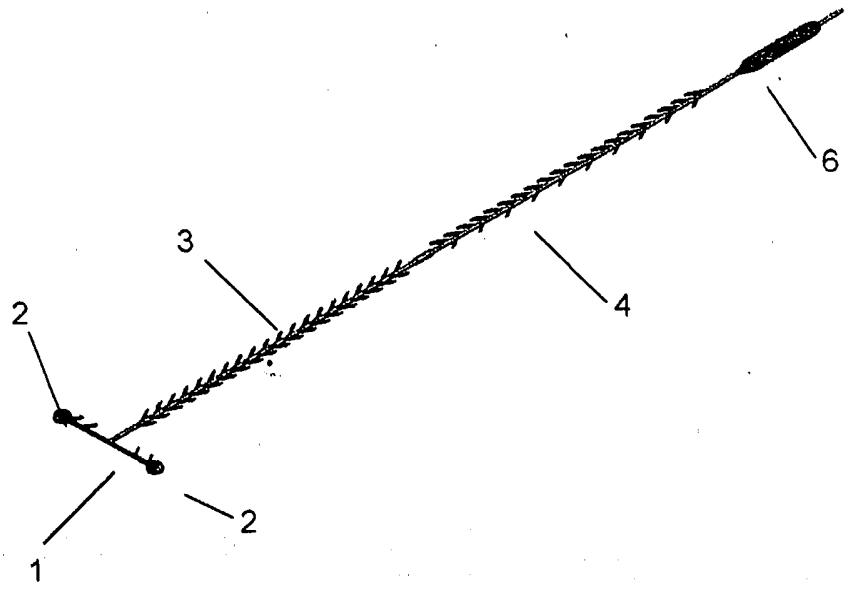


FIG. 2A

FIG. 2B

FIG. 2C

FIG. 2D

FIG. 3A

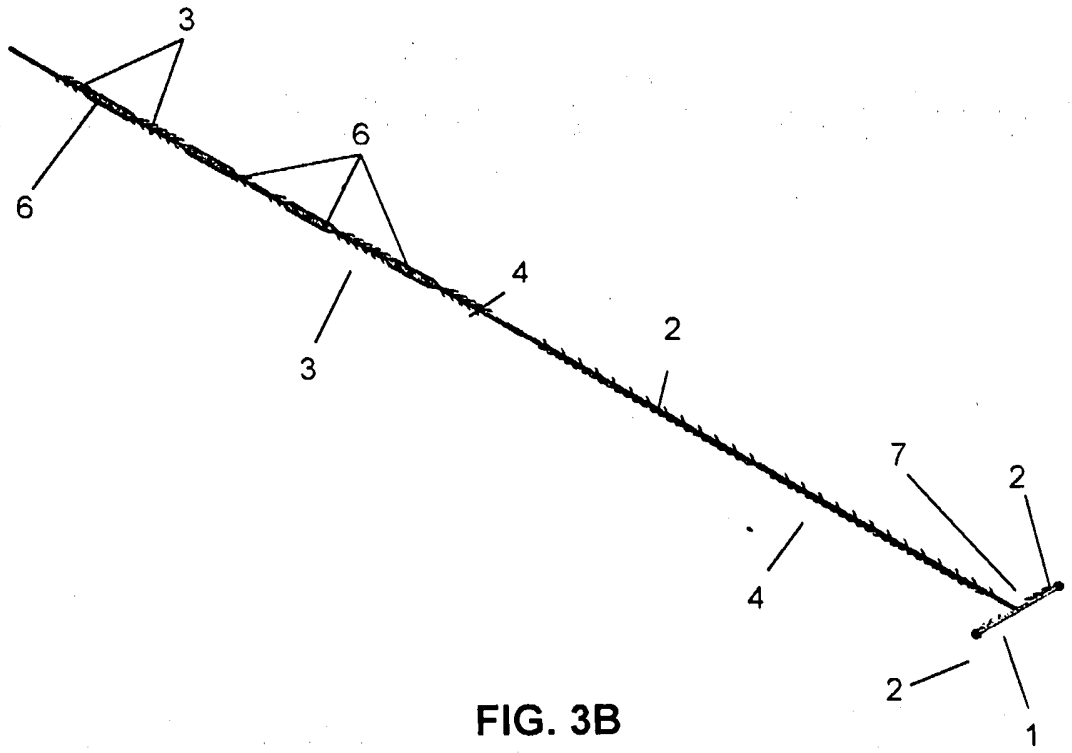


FIG. 3B

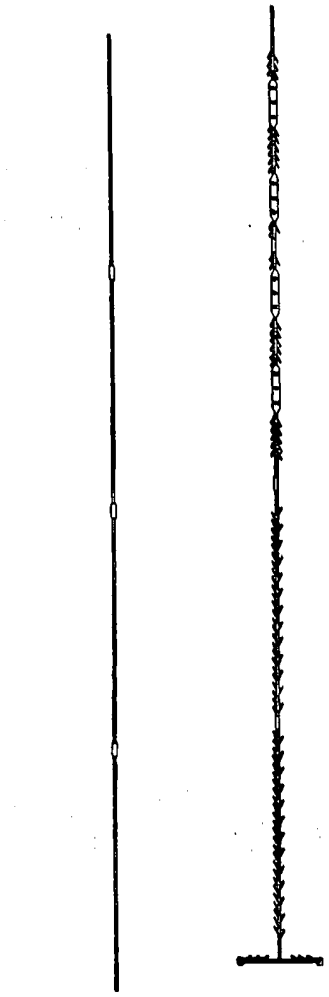


FIG. 3C FIG. 3D

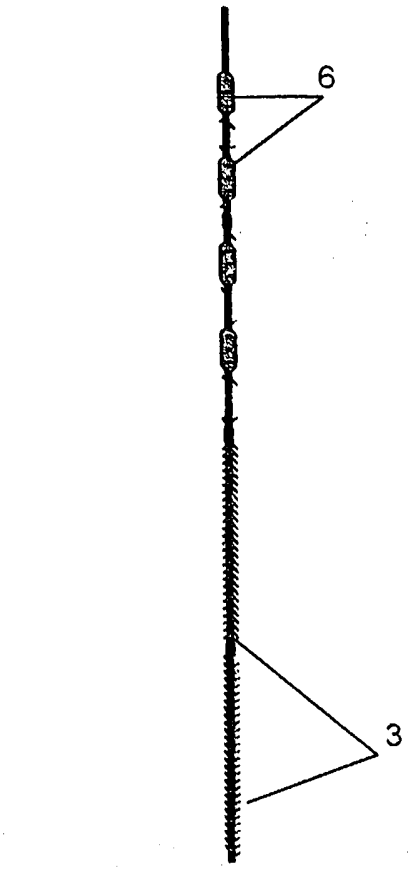


FIG. 4A

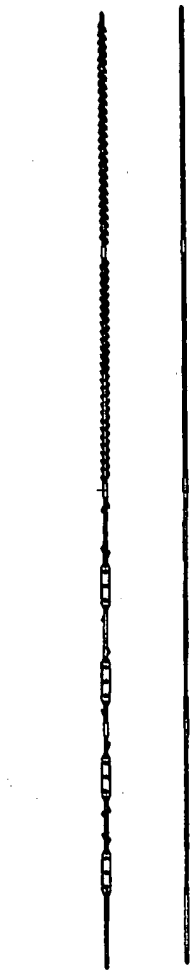


FIG 4B FIG. 4C

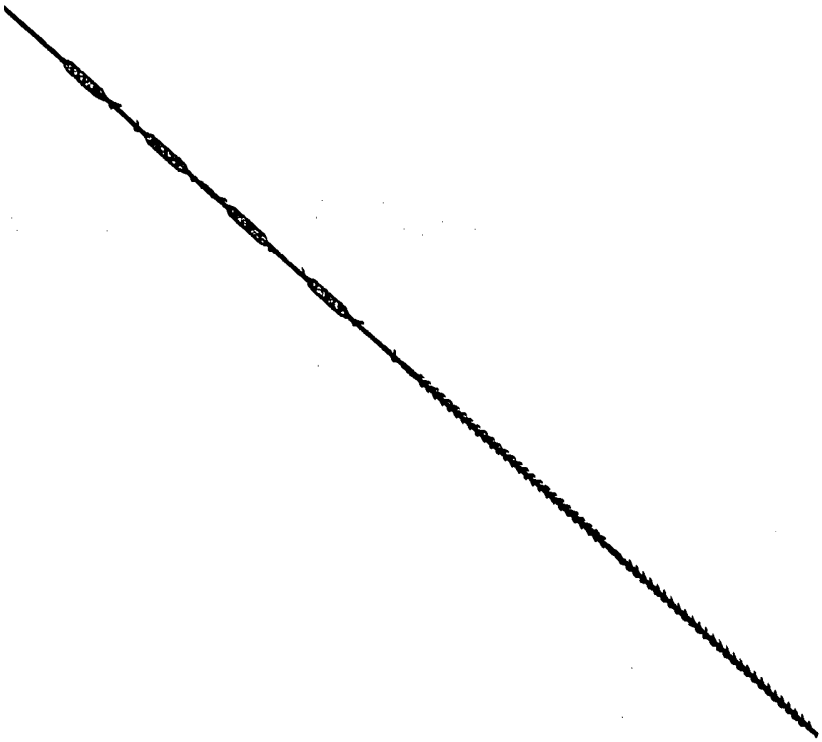


FIG. 4D

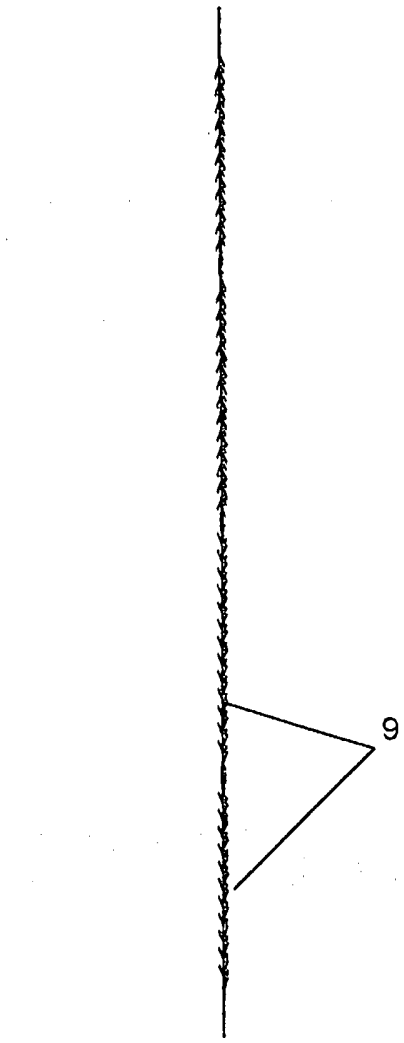


FIG. 5A

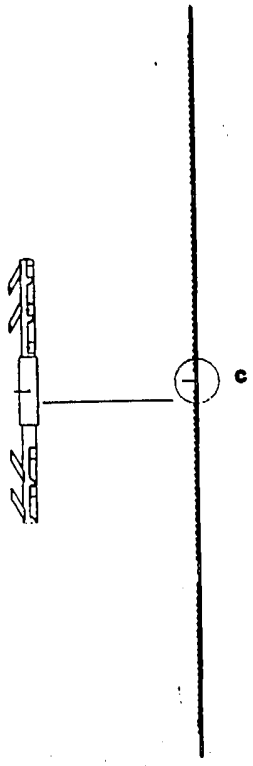


FIG. 5B

FIG. 5C

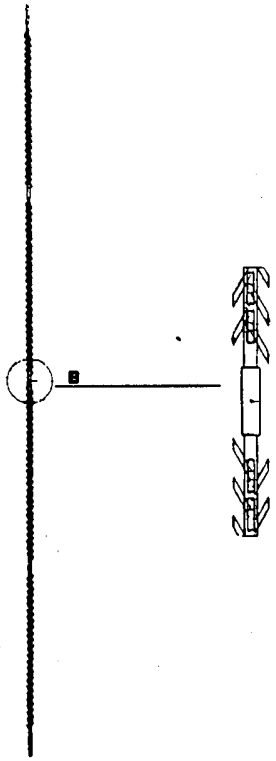
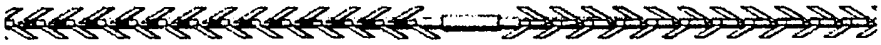


FIG. 5D



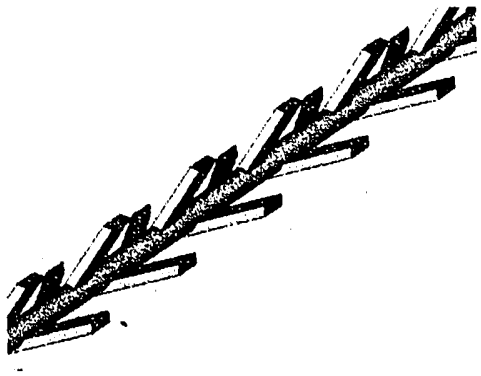


FIG. 5E