METHOD AND APPARATUS TO MOLD BARBED SUTURES

FIELD OF THE INVENTION

This invention relates to a method and apparatus to form a 2-barbs and 4-barbs barbed suture as well as multiple various orientation barbed sutures along the length of suture string circumference by molded process.

BACKGROUND OF THE INVENTION

A barbed suture is a suture string with barbs molded surrounding the suture strong circumference through along its length. Sutures had been used to close wounds and, more recently, suture is being transformed with bards to effect tissue lifts in medical aesthetics procedures that are rapidly gaining in popularity world-wide.

There is thus a need for a method and apparatus for molding barbed sutures in a cost effective and time efficient way to produces robust sutures having uniformly barbed suture thereon, in order to meet the demand for barbed sutures in the medical aesthetics industry as well as for other medical uses.

SUMMARY OF INVENTION

There is a set of mould that shall be used to create the barbed suture along the length and surround the suture string circumference through linear movement of core and cavity side and thermoforming; a cartridge consisting of pathways and pins to align the strings in place; a string of suture with certain size that will be formed through molding process into variations of barbed sutures; a sliding mechanism consisting of the mould and pistons of a certain size to allow core and cavity mould to move as willed; a pneumatic press to mount the core and cavity side of the mould; a heating element that can be controlled with consisting of heating material and power supply.

Core side of mold may comprise but not limited to separated pieces of inserts that will mold the profile of the barbed sutures; temperature resistant framing of the mold; separate pieces of insert when joined may comprise of channels for the heating element; channels for air cooling system.

The inserts may comprise but not limited to separate pieces that come together to mold the profile of the barbed sutures.

Cavity side of mold may comprise but not limited to separated pieces of inserts that will mold the profile of the barbed sutures; temperature resistant framing of the mold; separate pieces of insert when joined may comprise of channels for the heating element; channels for air cooling system.

Heating element may consist flexible tubular heater that consist of wiring that has teflon shrink tube, fiberglass insulation tube and teflon wiring with pure nickel lug.

Air cooling system may consist of channels that are machined into the steel inserts and an air flow source via air jet.

Framing of the mould may consist of heat resistant compound polymer.

BRIEF DESCRIPTION OF FIGURES

In order that the invention may be fully understood and readily put into practical effect there shall now be described by way of non-limitative example only exemplary embodiments of the present invention, the description being with reference to the accompanying illustrative drawings.

Fig. 1 a plan view of the possible but not limited to variations molded barbed suture.

Fig. 2 a side view of the possible but not limited tovariations of molded barbed suture.

Fig. 3 ‘10’ is a perspective view of the exemplary apparatus before initiating a moulding process.

Fig. 4 is a assembly wireframe view ‘10’ of an exemplary apparatus of the present invention.

Fig. 5 ’63.5’ is a perspective view of apparatus after moulding process

DETAILED DESCRIPTION

Exemplary embodiments of the process to form the barbed sutures and apparatus 10 will be described below.

The forming comprises of a removable string cartridge and apparatus 10. The apparatus 10 also comprises of guide pins 15 configured for guiding and aligning string cartridge for formation of barbs from raw string via compressing down of one predetermined position to another.

The string cartridge consists of a set of stringing pins, which will be used to align the raw string in place and string cartridge frame. The raw string will first be tied a knot at the starting end, following which it will be aligned via pressing against the guiding pins . Mentioned sequence will be the string cartridge stringing method.

Clamping beams will then press down on the strings using set of pins on the string cartridge as guiding. Each clamping beam has cut off profile that coincides with set of guiding pins.

Apparatus 10 comprises of cavity baseplate 11, heater backing plate 12, flexible heating element 13, main guide pins 14, cavity 20. Core 30, cartridge guide pin 15 and core baseplate 16.

Cavity will be mounted on to the top of the pneumatic press via screws after securing 11, 12, 13, 14 and 20 together. Whereas Core subassembly 90 will be mounted on to the bottom of the pneumatic press after securing 12,16, 15 and 30 together.

Cavity consist of cavity baseplate 11, heater backing plate 12, flexible heating element 13, main guide pins 14, cavity insert 20. Cavity Baseplate 11 has various holes positioned to secure heater backing 12 to it via screws and hold flexible heating element in 12 by securing 20 towards 11 via screws. Main guide pin 14 will be pushed downwards to wards a counterbore hole in 20 by 12 when the screw in cavity baseplate 11 pulls 20 upwards.

Cavity insert 20 consist of cavity inserts which will be secured together by screws. Cavity inserts will have 3 holes which will be threaded thus the inserts will be pulled together by screw that is inserted in counterbore hole at cavity insert. There will be 2 guiding pins to make sure that cavity inserts will be well aligned.

When cavity is joined together, a portion of the barbed suture can be seen. The profile will form half of the barb suture whereas the other portion will be formed by the core.

Core consist of Core insert 30, cartridge guide pin 15 and core baseplate 16. Core Baseplate 16 has various holes positioned to secure heater backing 12 to it via screws and hold flexible heating element in 13 by pulling 30 towards 16 via screws.

Core insert 30 consist of core inserts, which will be secured together by screws. Core insert 30 will have 3 holes which will be threaded thus the inserts will be pulled together by screw that is inserted in counterbore hole at cavity insert. There will be 2 guiding pins to make sure that cavity insert will be well aligned.

The core and cavity insert will have a channels that will be machined to allow air jet to cool down the molded barbed suture.

Step one of forming process will be to open the core and cavity , second step would be to align string cartridge down on core with guiding pins as guiding. While string cartridge is placed down on core, core and cavity will both be heated predetermined temperature. As raw string is suspended on string cartridge, it will not touch core insert, which is heated up. However, the ambient heat generated will soften and make the raw string more malleable to mold. Third step would be to slowly move cavity down to press on core. As cavity moves to cavity, Cavity insert 20 will press down on raw string and onto core insert 30. This would result in raw string slowly being compression moulded into a barbed suture after which air will be jetted into the air channels which will drop the temperature down hardening the molded barbed suture. Fourth Step would be to open core and cavity into predetermined position.

CLAIMS

1. An apparatus for forming barbed sutures, the apparatus comprising:
    - a pneumatic press for moving the core and cavity side of the mould and compressing them together to form the sutures;
    - a core side of the mould with heating elements, air cooling channels, steel inserts to form the profile of the barbed sutures and temperature resistant mould framing;
    - a cavity side of the mould with heating elements, air cooling channels, steel inserts to form the profile of the barbed sutures and temperature resistant mould framing;
    - an air jet to supply air to the air channels to cool down the thermoformed;
    - a biodegradable thermo plastic string of a certain size;
    - a cartridge consisting of pathways and pins to align the strings in place

2. The apparatus of claim 1, wherein the core and cavity side of the mould comprises of;
   a heat resistant frame to hold the steel inserts;
   steel inserts that form the profile of the barbed sutures when held together; when joined via screws, it will form air channels with the holes and profiles machined into it. Steel inserts will also comprise of the channels that will be used to house the flexible tubular heating element.

3. The apparatus of claim 2, wherein the steel inserts will each form a quarter of the barbed suture's profile when both core and cavity side of the mould is pressed on to the biodegradable thermo string which is hung and aligned on the cartridge.

4. The apparatus of claim 3, wherein the cartridge is made to have pathways and pins to align the strings in the right orientation and position while waiting to be preheated and compressed thermoformed.

5. The apparatus of claim 4, wherein the heating of the string is configured to such a way whereby the string will be preheated to a certain temperature so as to increase its malleability via the core and cavity side of the mould coming moving near to the biodegradable thermo string at a slow speed.

6. The apparatus of claim 5, where in the string used will be biodegradable, able to dissolve inside the human tissue.

7. The apparatus of any preceding claim, wherein the core cavity compression thermoforming process includes a preheat timing, whereby the core and cavity side of the mold moves a certain distance away from the string with the heat on at a predetermined temperature.

8. The apparatus of any preceding claim, process of thermoforming is configured to have the core and cavity side of the mould compress down slowly for 15 seconds till both sides are pressed fully against each other.

9. The apparatus of claim 8, wherein after fully pressed air channels will have air jetted thru them to drop the temperature to a predetermined temperature to allow hardening of barbed sutures.

10. A method of forming barbed sutures, the method comprising the steps of:
    a) Laying out the biodegradable string on the cartridge and position them.
    b) Heating up the mould to predetermined temperature.
    c) Placing the cartridge on the core side of the mould.
    d) Lay the cartridge on the core side to let it preheat
    e) Move the cavity mould to the cartridge via force through the pneumatic press.
    f) Hold the cavity a certain distance away from the string for certain period for preheating purposes
    g) Compress the biodegradable thermo plastic string into the barbed sutures by moving the cavity onto the core side of the mould and hold it there for a certain period of time.
    h) Jet air into the air channels to cool and harden the barbed sutures.
    i) Open the mould and remove cartridge that has barbed sutures on it.

11. The method of claim 11, further comprising, prior to an initial step of bending the plurality of lengths of suture, mounting the plurality of lengths of sutures on a suture frame comprising opposing side bars and opposing end bars that are connected to define a space therewithin by winding a single length of suture in a zig-zag manner from one of the end bars to the other of the end bars about successive dowel pins provided on the opposing end bars such that the plurality of lengths of suture are provided in the space.