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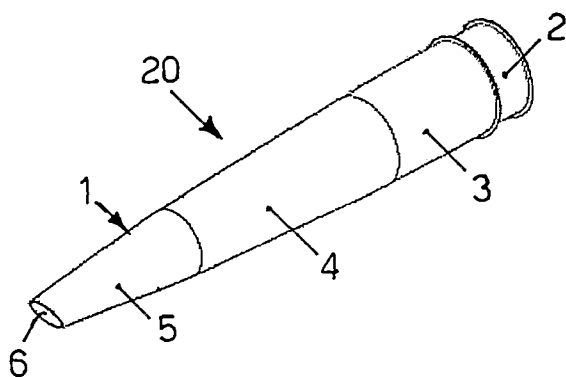
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(54) Title: SURGICAL INSTRUMENT FOR CORNEAL TRANSPLANTS



(57) Abstract: A surgical instrument (20) for manipulating and inserting into an eye a lamina of cells (7), such as a thin stroma support with Descemet membrane and endothelial cells for corneal transplants, or other types of laminas, comprises a hollow tubular body (1) able to contain the lamina of cells (7) immersed in a maintenance solution. The hollow tubular body (1) comprises a distal part (5), tapered and open at the end, and the section of the distal part (5) diminishes towards the end of the hollow tubular body (1) so that, during use, the lamina of cells (7), emerging from the distal part (5), is able to be configured tubularly, adapting to the section of the end of the distal part (5).

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“SURGICAL INSTRUMENT FOR CORNEAL TRANSPLANTS”

* * * * *

FIELD OF THE INVENTION

5 The present invention concerns a surgical instrument for manipulating and inserting into the anterior chamber of the eye a cellular lamina, usable for example for corneal transplants.

BACKGROUND OF THE INVENTION

10 It is known that so-called “corneal endothelial transplants” consist of inserting into the anterior chamber of the eye, after suitable preparation, a thin corneal lamina, with a diameter of about 9 mm, coming from a donor, which is folded and then inserted by means of forceps into the anterior chamber of the receiving eye through a cut made laterally to the cornea, and which adheres to the internal surface of the cornea of the eye. An alternative technique, instead, provides to pull the corneal lamina inside the chamber of the eye, using a suture which
15 anchors the corneal lamina.

In both cases, however, in order to be taken into the intended seating, the lamina has to be folded, with the consequence that the two facing surfaces tend to come into contact with each other.

20 This known technique creates various problems, since bending inevitably causes damage to the endothelial cells, and therefore it is necessary to use a viscoelastic substance which, however, can only reduce the contact between the facing surfaces of the corneal lamina, and which can also impede the adhesion of the lamina to the receiving cornea.

25 Moreover, during insertion with the forceps, a leakage of liquid occurs from the eye through the cut made, which determines a temporary but significant collapse of the anterior chamber.

In practice, once the lamina has been prepared, the cellular surface thereof is covered with the viscoelastic substance, the lamina is folded, and the process is continued by making a cut along the periphery of the cornea and through this
30 corneal or sclerocorneal tunnel the lamina is inserted, grasping it with the forceps.

As will be clear from all the above, it is still possible to perfect the technique of transplanting the cornea.

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Purpose of the present invention is to obviate the shortcomings of the state of the art and to achieve a surgical instrument that allows to manipulate and introduce a corneal lamina of cells into the anterior chamber of the eye without having to fold it over itself, limiting the manipulation thereof as far as possible, and which allows to reduce the temporary collapse of the anterior chamber of the eye during the insertion of the lamina of cells.

The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and obtain this and other purposes and advantages.

10 SUMMARY OF THE INVENTION

The present invention is set forth and characterized in the main claims, while the dependent claims describe other characteristics of the present invention, or variants to the main inventive idea.

15 In accordance with this purpose, a surgical instrument according to the present invention is used to manipulate and insert into the eye a lamina of cells, such as a thin stroma support with a Descemet membrane and endothelial cells for corneal transplants, or other types of laminas.

According to a characteristic feature of the present invention, the surgical instrument comprises a hollow tubular body able to contain the lamina of cells immersed in a maintenance solution.

20 The hollow tubular body comprises a tapered distal part, for example conical, and open at the end. The section of the distal part diminishes towards the end of the hollow tubular body so that, during use, the lamina of cells, emerging from the distal part, is able to be configured tubularly, adapting to the section of the end of the distal part.

25 In this way, when it is inserted, the lamina of cells bends, following the wall of the tubular body, but without its surfaces coming into contact with each other. Therefore, the lamina follows the form of the walls of the instrument, and as it is gradually directed towards the outlet aperture it rolls over on itself without bending and without the various surfaces coming into contact with each other. In other words, the lamina, following its engagement with the internal surface of the wall of the instrument when it is drawn towards the outlet, winds with the cells facing towards the inside, like a tube, without bending.

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Once introduced into the anterior chamber of the eye, the lamina is positioned there against the receiving cornea, already prepared, and adheres to it.

Therefore, the surgical instrument according to the present invention allows to manipulate and introduce the lamina of cells into the anterior chamber of an eye without having to fold it on itself, and limiting, as far as possible, the manipulations. Moreover, the present invention allows to reduce the temporary collapse of the anterior chamber during the insertion of the lamina of cells.

According to the present invention, the distal end of the tubular body is conformed so as to be able to be inserted in a corneal or sclerocorneal tunnel, so as to allow the passage of the cellular lamina from inside the instrument to the anterior chamber of the eye without needing to intervene with instruments such as forceps or others.

Advantageously, the distal end of the tubular body has a bevelled section. In this case it is even more advantageous that the resulting aperture has an elliptical section.

An alternative provides that the distal end of the tubular body has a polygonal section, advantageously hexagonal.

Another solution, which advantageously limits the possibility of any unwanted rotation of the lamina inside the tubular body, provides that the section of the tapered distal part progressively varies, passing from one section, in correspondence with the central zone, formed by a rectilinear segment and by a curvilinear segment on which the lamina rests, for example semi-elliptical or semi-circular, to a completely curvilinear section, for example circular or elliptical, in correspondence with the end aperture.

The instrument according to the present invention thus allows to manipulate the lamina of cells without the latter coming into contact with anything else, except the maintenance liquid. Since it is not necessary to fold the lamina, moreover, it is also not necessary to use viscous-elastic liquids which try to reduce the consequences of contact and rubbing of the walls of the folded lamina but which, subsequently, can have a negative influence on the adhesion of the lamina to the receiving cornea.

According to one embodiment of the present invention, the tubular body is divided into three zones, a first proximal zone to accommodate a closing element,

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a second central zone to contain the lamina of cells in a maintenance liquid, and a third distal zone, tapered, corresponding to said tapered distal part, to remove the rolled lamina of cells as illustrated above.

According to one embodiment of the present invention, said second zone is a
5 hollow tubular shape with a circular section.

Another variant provides to make said second zone of hollow tubular shape with elliptical section.

Alternatively the second zone is a hollow truncated cone.

It is clear that said third zone will have a shape coherent with the shape of the
10 second zone as illustrated above and that, instead, the section of the end of said tapered zone can be chosen from among the sections of the end of the distal part illustrated above, according to operating needs.

The shape described above of the second and third zones is advantageous, since it defines an internal curvilinear surface which is suitable to contain and
15 allow the transit of the lamina of cells.

According to another form of embodiment of the present invention, the surgical instrument also comprises a support able to accommodate the tubular body, for the preparation of the lamina of cells and its insertion inside the instrument itself.

20 BRIEF DESCRIPTION OF THE DRAWINGS

These and other characteristics of the present invention will become apparent from the following description of some preferential forms of embodiment, given as a non-restrictive example with reference to the attached drawings wherein:

- figs. 1 and 2 are two perspective views of the instrument according to the
25 present invention;
- figs. 3, 4 and 5 are three longitudinal sections, along the axis, of the surgical instrument according to the present invention, respectively open, closed with a corneal lamina inside, and during the advance of the latter;
- fig. 6 is a perspective view of a support able to accommodate the instrument
30 shown in the previous figures during the preparation of the lamina;
- fig. 7 is a vertical section of the support in fig. 6;
- fig. 8 is a perspective view of the support, which houses an instrument according to the present invention;

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- fig. 9 is a vertical section of the support in fig. 6 in which the instrument according to the present invention is housed;
- figs. 10, 11 and 12 show different forms of embodiment of the instrument according to the present invention;
- 5 - figs. 13, 13a, 14 and 14a are cross sections of different forms of embodiment of the instrument according to the present invention along planes perpendicular to the axis;
- fig. 15 shows schematically, in section, a detail of another form of embodiment of the instrument according to the present invention;
- 10 - fig. 16 is a diagram of the use of the instrument according to the present invention showing the passage from a first condition of a lamina of cells housed in the instrument according to the present invention to a second condition, rolled, of the lamina of cells in the instrument according to the present invention;
- 15 - fig. 17 is a diagram of a first condition of a lamina of cells housed in the instrument according to the present invention and a second condition, rolled, of the lamina of cells in the instrument according to the present invention;
- fig. 18 is a diagram illustrating the traction of a lamina of cells inside the
20 anterior chamber of an eye;
- fig. 19 is a diagram illustrating the lamina of cells disposed inside the anterior chamber of an eye following the traction in fig. 18;
- fig. 20 is a diagram illustrating a variant of the traction of a lamina of cells inside the anterior chamber of an eye; and
- 25 - fig. 21 is a variant of the support in fig. 6, associated with the instrument according to the present invention.

DETAILED DESCRIPTION OF A PREFERENTIAL FORM OF EMBODIMENT

With reference to figs. 1 to 5, a surgical instrument 20 according to the present
30 invention substantially consists of a hollow tubular body indicated in its entirety by the reference number 1, made of suitable material such as for example sterilizable plastic material, provided with a rear closing stopper 2 for a rear aperture 21. The closing stopper 2 is preferably made as a cylindrical body

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coaxial with the hollow tubular body 1 and able to slide inside it.

The hollow tubular body 1 is preferably divided into three segments, indicated respectively by numbers 3, 4 and 5.

5 The first segment, or rear segment 3, is substantially cylindrical, able to accommodate the closing stopper 2.

The second segment, or central segment 4, is intended to accommodate the lamina to be introduced into the cavity of the eye, and is also cylindrical or, preferably, slightly conical, with a taper comprised between about 1° and about 3° .

10 Finally, the distal part, indicated by the reference number 5, is tapered, with a more accentuated taper than that of the central segment 4 and is for example comprised between about 3° and 10° .

Moreover, the distal segment 5 terminates with an aperture 6, for the passage of the lamina when it is introduced into the eye. Advantageously, the end of the
15 distal segment 5 is bevelled, so that it can easily be introduced into the corneal tunnel when the operation is carried out. Even more advantageously, this bevel determines a substantially elliptical section of the aperture 6, as shown in fig. 1.

The sizes of the instrument 20 will be suitable to contain a corneal lamina. Indicatively an overall length can be provided of between about 5 cm and 8 cm,
20 an internal diameter comprised between about 5 mm and 8 mm, whereas the diameter, in correspondence with the distal end, indicated by the reference "d" in fig. 3, can be comprised between about 2 mm and about 4 mm.

These measurements, we must point out, are given simply as an indication and to complete the description. Each operator shall then be able to request the
25 instrument with the sizes most suitable according to his own technique and the type of operation to be performed.

The tubular body 1 is filled with a maintenance liquid, after which the lamina is introduced and the tubular body is closed with the closing stopper 2.

The surface tension of the maintenance liquid is sufficient to prevent the latter
30 from leaking from the narrow front aperture 6.

The lamina, the preparation of which we shall describe hereafter, is thus housed in the central segment 4 of the tubular body 1, while the surgeon proceeds with the operations to prepare the eye.

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The lamina, indicated by the reference number 7, has been previously attached by means of a suitable traction element 25, such as a suture thread (figs. 5, 18 and 19), and, once the cut has been made to prepare the corneal tunnel, the surgeon inserts into the anterior chamber 26 of the eye, through this tunnel, the needle that draws the thread connected to the lamina. A variant provides that the traction element 25 to effect the traction of the lamina 7 are micro-forceps, as in fig. 20, or a hook.

The needle is made to exit from the opposite side of the cornea and, once the thread is tense, the surgeon picks up the tubular body 1 with inside it the lamina 7 and inserts the tip of it into the corneal tunnel just made.

During this step, thanks to the fact that the tubular body 1 is closed at its proximal end and is full of maintenance liquid, no significant leakage of liquid occurs from the chamber 26 of the eye. By means of the needle the surgeon pulls the suture thread, which in turn draws with it the lamina 7.

The latter, as can be seen in fig. 4, is already slightly curved, following the form of the internal wall of the central segment 4 of the tubular body 1.

As the lamina is gradually pulled towards the exit, following the direction of the arrow F in figs. 16 and 17, sliding against the walls of the tapered segment 5, it winds over itself more and more, but keeping its substantially curved form without bending and without any contact occurring between two facing surfaces thereof, as can be seen in figs. 16 and 17. In particular, fig. 16 shows the lamina 7 in a lateral view both in correspondence with the central zone 4 and also, by a line of dashes, in a tubular configuration, in correspondence with the aperture 6 of the tapered zone 5. Similarly, fig. 17 shows the lamina 7 schematically in a front view, both in correspondence with the central zone 4, and also in a tubular configuration in correspondence with the aperture 6 of the tapered zone 5.

Figs. 18 and 19 show how the lamina is inserted into the chamber 26, in particular the lamina 7 is pulled by means of the suture thread from the tapered zone 5 (fig. 18), to inside the anterior chamber 26 of the eye (fig. 19). Fig. 20, as we said, shows the alternative use of micro-forceps to pull the lamina 7 into the anterior chamber 26 of the eye.

Once the lamina has reached inside the seating provided in the chamber 26, as can be seen in figs. 19 and 20, it is sufficient to cut the thread and remove it, with

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the lamina being positioned inside the chamber 26 of the eye, where it will be made to adhere to the internal surface of the cornea with traditional techniques.

For the preparation of the instrument and of the lamina, according to the present invention a support is provided, indicated by the reference number 8 in
5 figs. 6 to 9, consisting of a block, again made of sterilizable material, for example metal, plastic, glass or other, in which a seating is made which has a central segment 9, shaped so as to accommodate the tubular body 1, and which proceeds on one side with a channel 10 and a pit 12 and, on the opposite side with a channel 11. A variant, not shown in the drawings, provides not to make this
10 channel 11 and in this case the support 8 terminates in correspondence with the distal part 5.

The seating 9, as can be seen better in figs. 7 and 9, has a shape equal to a section along the axis of the tubular body 1, so that the latter can be housed in the seating, positioned on the bottom thereof.

15 On one side, which corresponds to the rear part of the instrument 20, that is, the tubular body 1, there is a pit 12 which communicates through the channel 10 with the rear aperture 21 of the tubular body 1, whereas on the opposite side the little channel 11 communicates with the aperture 6 in the front part of the tubular body 1.

20 The pit 12 and the channel 10 can be filled with maintenance liquid and serve to house the lamina 7, until the latter is inserted inside the tubular body 1. To this purpose the surgeon can attach the lamina with a suture thread when it is in the pit and then, keeping it always immersed in the liquid that fills the seating 9, the channel 10 and the pit 12, he takes it inside the tubular body 1 after the latter has
25 been located in the seating.

Once the lamina 7 is positioned inside the instrument 20, it is possible to close it by means of the closing stopper 2. To this purpose the length of the channel 10 will be provided of a measurement sufficient to allow to insert the closing stopper 2 and make it slide until it closes the instrument 20.

30 A variant of the support 8, shown in fig. 21 and indicated for convenience by the reference number 108, provides to make thereon a concave seating 22, of a shape able to contain a lamina of cells 7. The concave seating 22 is provided with suction holes 23, so that the lamina 7 adheres well to the seating 22. The seating

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22 is used to effect the punching of the lamina 7, as normally happens to make a corneal graft suitable for a corneal transplant. Punching is done by a circular blade pressing from above, not shown in the drawings, so as to reduce the diameter of the lamina 7 to sizes suitable for the corneal transplant, for example to about 8 mm – 9 mm. In this variant a slide connection 24 is provided, which connects the seating 22 directly with the open zone 19 of the body 1. In this way, the reduced diameter lamina 7 is drawn along the slide 24, inclined towards the open zone 19, and inserted into the body 1 through the latter. In this way, advantageously, the need to manipulate the lamina 7 and possible cell damage are reduced even more.

The instrument 20 according to the present invention can be produced for example by molding plastic material and is extremely economical, to the point where it may be considered a single-use instrument.

The instrument 20 offers considerable advantages. First of all, it means that the lamina 7 does not need to be folded, thus avoiding the risk of contact between two opposite surfaces, it simplifies the manipulation operations and makes both preparation and the operation itself more rapid.

Moreover, the present invention ensures the perfect preservation of the lamina 7 while the surgeon prepares the eye, and prevents the liquid present in the anterior chamber from being able to leak when the instrument 20 is inserted into the corneal tunnel, for the operation.

According to another form of execution of the present invention, it will be possible to provide in the instrument 20 an open zone, or loading zone, 19, upwards (figs. 10, 11, 16, 18, 19, 20 and 21), for the preparation of the lamina 7, in which case the support would serve only to keep the instrument still.

The open zone 19, advantageously made during the molding of the tubular body 1, is shaped so as to have a size such as to accommodate adequately the lamina of cells 7 which is loaded, directing it towards the inside of the tubular body 1.

According to one embodiment of the invention, the open zone 19 is shaped concave, as can be seen in fig. 16. Advantageously, the open zone 19 has a curvilinear section, more elongated in the direction of the longitudinal axis of the tubular body 1, sort of elliptical.

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A variant provides that the open zone 19 is curvilinear only in the segments orthogonal to the longitudinal axis of the body 1.

Another variant provides that the open zone 19 is curvilinear both in the orthogonal segments and also in the segments parallel to the longitudinal axis of the body 1, following curves that can be the same or different, according to necessity.

The open zone 19 could be either at the proximal end 3 (rear) of the instrument, or made in the intermediate zone 4 (fig. 10). In this latter case the closing stopper 2 could already be inserted into the proximal end 3, and made to advance through the open or preparation zone until it is inserted in the most forward portion, as visible in figs. 10 and 11, also closing the wall of the instrument.

According to another version of the present invention, the instrument can be equipped with a system to irrigate the anterior chamber of the eye.

For example, it will be possible to provide a thin tube 13 (diameter about 1 mm) made in the wall (lower, when the instrument is positioned on the eye) of the instrument and connected to the container for the irrigation liquid with a flexible drip-feed tube 14, as visible in fig. 12. This would allow to completely avoid, during the operation, the preliminary positioning of an irrigation system (the so-called "anterior chamber maintainer"), making it even quicker and simpler.

A variant embodiment, not shown in the drawings, provides that the irrigation system connects directly with the inside of the hollow tubular body 1, once the latter is closed at the rear and that it is inserted into the corneal or sclerocorneal-tunnel.

Finally, on the internal wall of the instrument ribs or shapings 15 may be provided, of different shapes and positions, as shown as a non-restrictive example in figs. 13, 13a and 14, 14a, to promote the rolling of the lamina or to keep it in a determinate position. In particular, the solution shown in figs. 13 and 13a allows to limit the rotation of the lamina 7 inside the tubular body 1, whereas figs. 14 and 14a show a solution which facilitates the rolling on itself of the lamina 7. Figs. 13a and 14a are sections of a slightly smaller diameter with respect to the corresponding figs. 13 and 14, since they are obtained in correspondence with a

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more distal portion along the taper of the body 1.

According to another preferred version of the present invention (fig. 15), it is provided to incorporate into the wall of the instrument a sliding tongue 16, provided in the front portion with one or more forwardly inclined micro-hooks 5 17, which can attach and create traction on the cellular lamina, providing a cursor 18 in the rear part, protruding outside, which allows to thrust the tongue, even though the effect on the lamina would still be one of traction.

The tongue 16 would enter partly into the eye, pulling the lamina 7 and could exit without drawing the lamina 7 backwards, since the inclined micro-hooks 17 10 pull in one direction only.

This would allow to prevent the attachment, relatively laborious, of the lamina 7 by means of the thread, with a further simplification of the procedure.

In the description we have referred specifically to corneal transplants, but the instrument according to the present invention is also suitable to be used to insert 15 different laminas other than cellular laminas, for example laminas of polymers loaded with growth factors or colored flexible laminas to be used as iris prostheses, or to insert drugs or vectors for gene therapy.

It is clear that modifications and/or additions may be made to the surgical instrument 20 according to the present invention, without departing from the field of the present invention.

It is also clear that, although the invention has been described with reference to specific examples, a person of skill in the art shall certainly be able to achieve many other equivalent forms of surgical instrument, all coming within the field of the present invention.

25

CLAIMS

1. Surgical instrument for manipulating and inserting into an eye a lamina of cells (7), such as a thin stroma support with a Descemet membrane and endothelial cells for corneal transplants, or other types of laminas of cells, characterized in
5 that it comprises a hollow tubular body (1) able to contain said lamina of cells (7) immersed in a maintenance liquid, that said hollow tubular body (1) comprises a distal part (5), tapered and open at the end, and that the section of said distal part (5) diminishes towards the end of said hollow tubular body (1) so that, during use, said lamina of cells (7), emerging from said distal part (5), is able to be
10 configured tubularly, adapting to the section of the end of said distal part (5).
2. Instrument as in claim 1, characterized in that said hollow tubular body (1) comprises a proximal part (3), which is able to be closed by means of a corresponding closing element (2).
3. Instrument as in claim 1 or 2, characterized in that said distal part (5) is able,
15 during use, to be partly inserted into a corneal tunnel and to allow the direct passage of said lamina of cells (7) inside the relative anterior chamber of the eye.
4. Instrument as in claim 3, characterized in that the end of said distal part (5) is bevelled.
5. Surgical instrument for manipulating and inserting into an eye a lamina of cells
20 (7), such as a thin stroma support with a Descemet membrane and endothelial cells for corneal transplants, or other types of laminas of cells, characterized in that it comprises a hollow tubular body (1) which is able to contain said lamina of cells (7) immersed in a maintenance liquid, that it is divided into a first zone (3), a second zone (4) and a third zone, or distal part (5), which is tapered and open at
25 the end so that, during use, said lamina of cells (7), emerging from said distal part (5), is able to be configured tubularly, adapting to the section of the end of said distal part (5).
6. Instrument as in claim 5, characterized in that said first zone (3) is able to accommodate a closing element (2).
- 30 7. Instrument as in claim 5 or 6, characterized in that said second zone (4) is able to contain said lamina of cells (7) immersed in said maintenance liquid.
8. Instrument as in claim 5, 6 or 7, characterized in that said second zone (4) of said hollow tubular body (1) is slightly tapered.

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9. Instrument as in claim 2 or 6, characterized in that on the wall of said hollow tubular body (1) it comprises an open zone (19), for the introduction and preparation of said lamina of cells (7), which is able to be selectively closed by means of said closing element (2).
- 5 10. Instrument as in any claim hereinbefore, characterized in that in correspondence with the wall of said hollow tubular body (1), it comprises a pipe (13) connected to a container for an irrigation liquid and in correspondence with said distal part (5).
- 10 11. Instrument as in any claim hereinbefore, characterized in that it comprises, on the internal surface of said hollow tubular body (1), ribs or shapings (15) able to facilitate the rolling of said lamina of cells (7) or to keep said lamina of cells (7) in a determinate position.
- 15 12. Instrument as in any claim hereinbefore, characterized in that it comprises a support (8) in which a seating (9) is made, able to contain said hollow tubular body (1), said seating (9) communicating directly with a preparation pit or chamber (12) for said lamina of cells (7), wherein said preparation pit or chamber (12) is able to communicate directly with the inside of said hollow tubular body (1), through a rear aperture (21).
- 20 13. Instrument as in claims 2 and 12, or 6 and 12, characterized in that it comprises, between said preparation pit or chamber (12) and said seating (9) able to contain said hollow tubular body (1), a channel (10) having a length sufficient to allow to introduce said closing element (2).
- 25 14. Instrument as in claim 12, characterized in that said support (8) comprises a concave seating (22) able to house said lamina of cells (7) and to function as a punching seating for said lamina of cells (7), and a connection surface (24) able to connect said concave seating (22) with said hollow tubular body (1).
- 30 15. Instrument as in any claim hereinbefore, characterized in that it comprises, in the wall of said hollow tubular body (1), a sliding tongue (16) which, on the surface facing towards the inside of said hollow tubular body (1), has one or more micro-hooks (17) able to attach and draw said lamina of cells (7) when said sliding tongue (16) slides in one direction and to detach from said lamina of cells (7) when said sliding tongue (16) slides in the opposite direction.
16. Method for performing corneal transplants, characterized in that it comprises

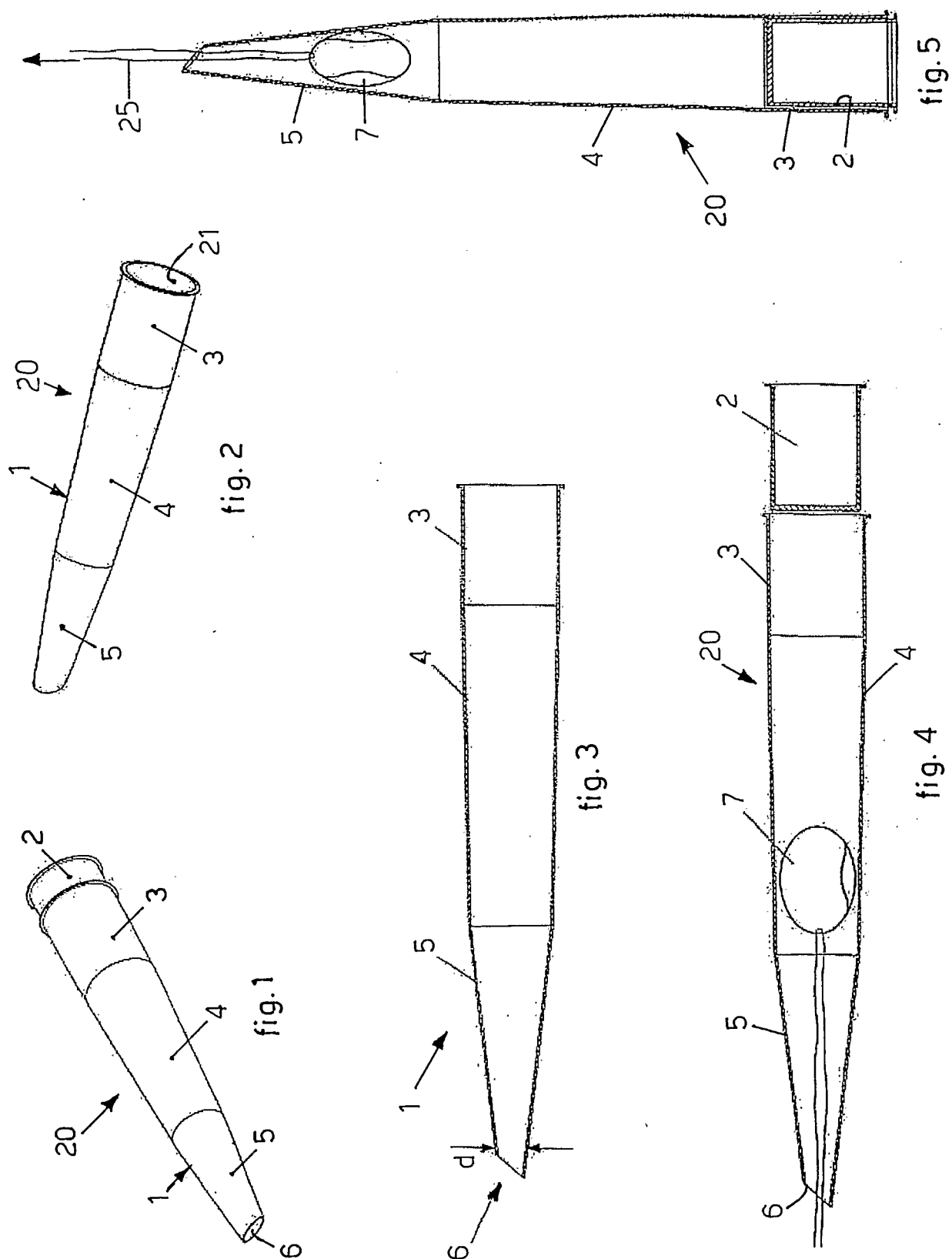
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the following steps:

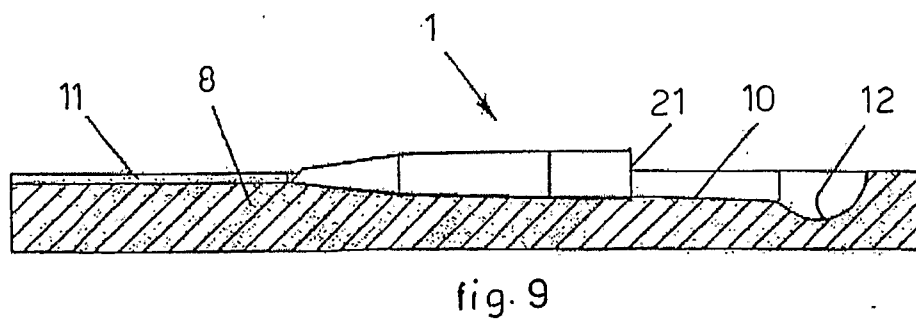
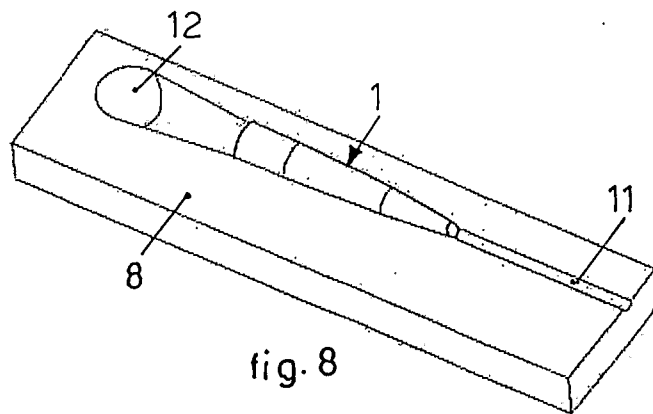
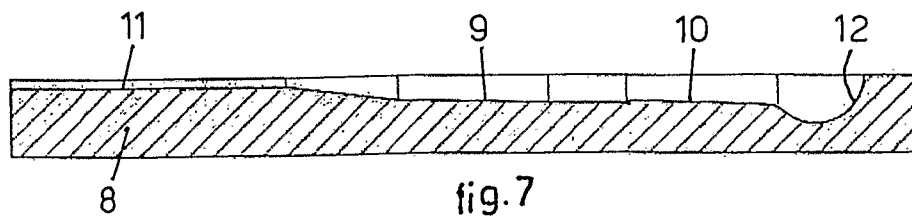
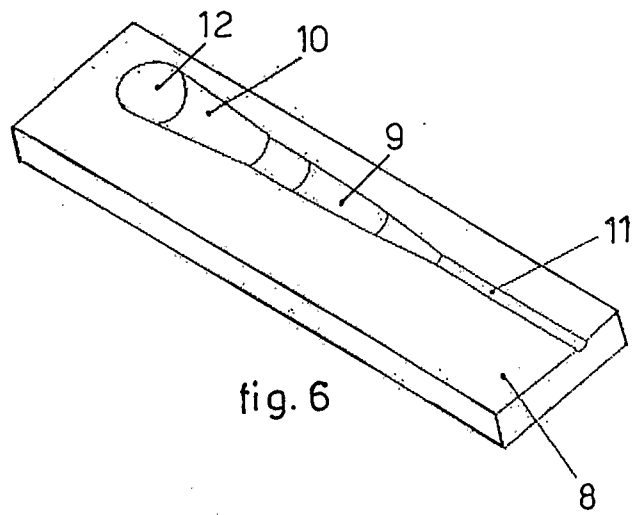
- a first step of inserting a corneal lamina (7) to be transplanted, in an instrument consisting of a hollow tubular body (1) filled with maintenance liquid, wherein said hollow tubular body (1) has, at one end, a tapered segment (5) which
5 terminates with an aperture (6) for the passage of said corneal lamina (7) inside an eye;
- a second step of making a cut in correspondence with the zone on the periphery of said cornea;
- a third step of inserting, into said cornea, traction means (25) connected with
10 said corneal lamina (7) to be transplanted;
- a fourth step of inserting said tapered segment (5) into the corneal tunnel thus obtained;
- a fifth step of transferring said corneal lamina (7) by means of said traction
15 means (25) from said hollow tubular body (1) inside the chamber of the eye through said corneal tunnel.

17. Method as in claim 16, characterized in that, after the corneal lamina (7) has been inserted into said instrument, the hollow tubular body (1) is closed at one end, opposite the end with the tapered segment (5).

1/5



2/5



3/5

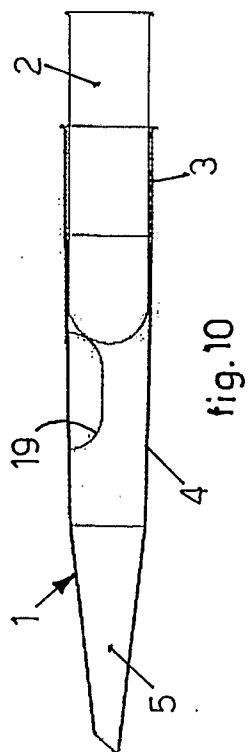


fig. 10

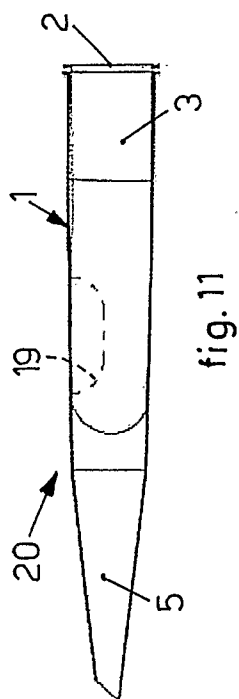


fig. 11

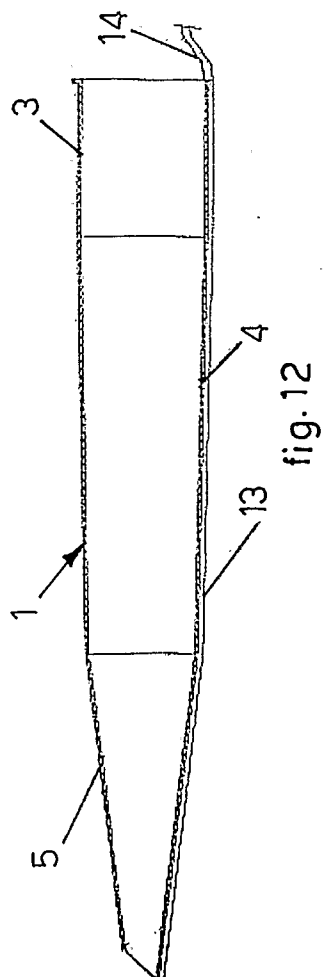


fig. 12

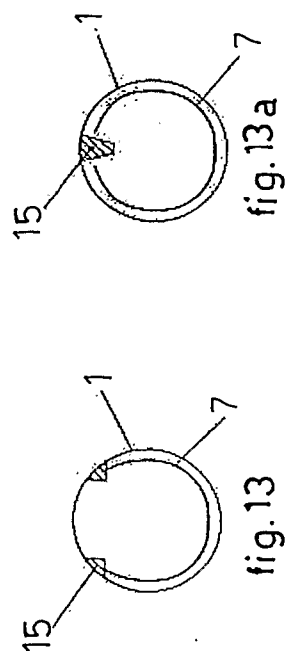


fig. 13

fig. 13a

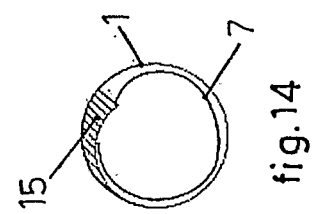


fig. 14

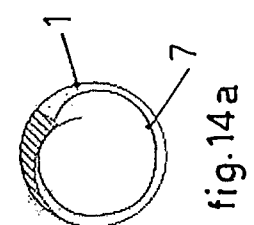


fig. 14a

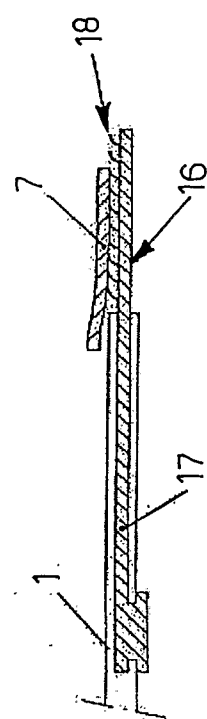
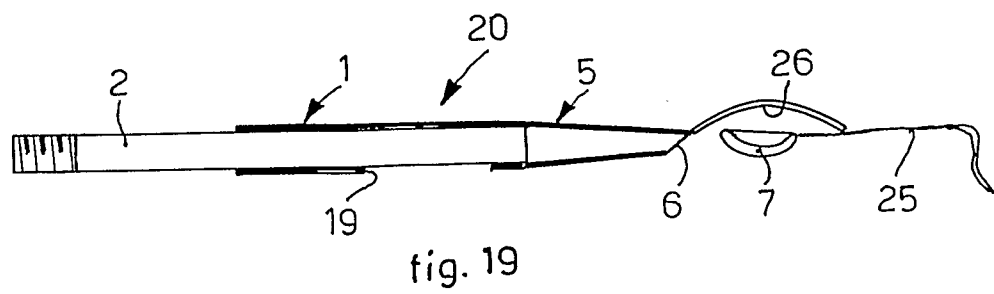
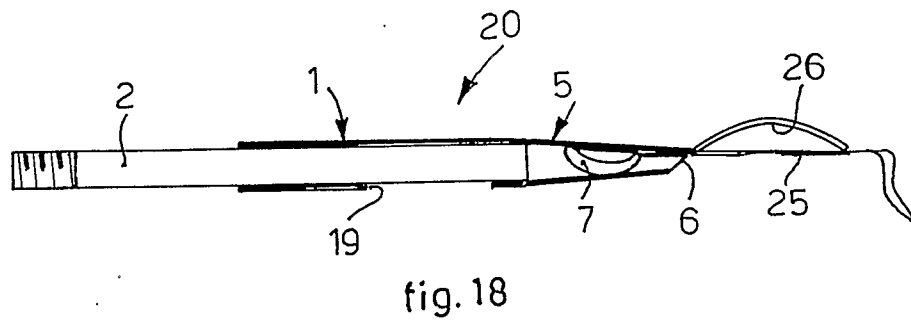
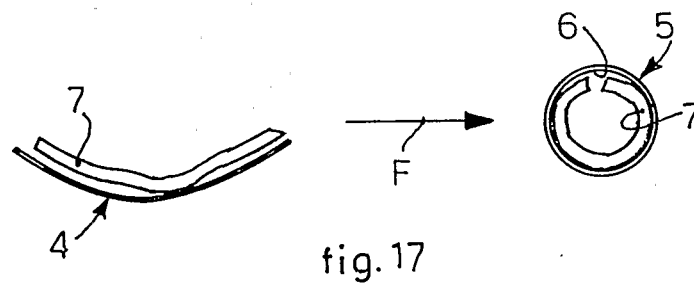
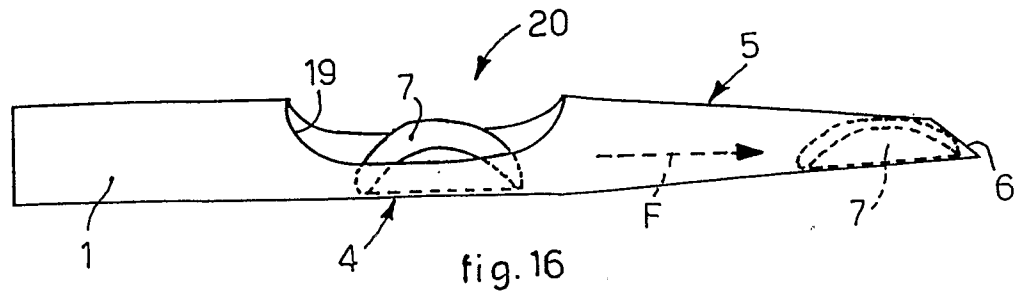


fig. 15

4/5



5/5

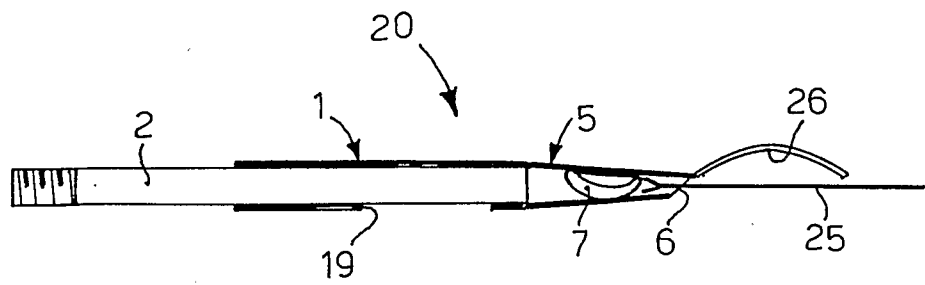


fig. 20

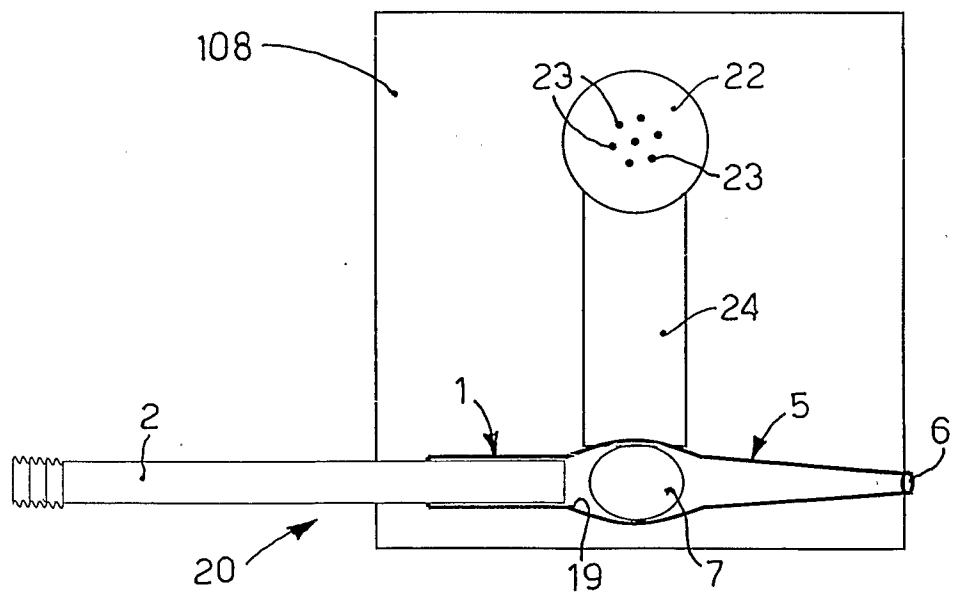


fig. 21