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(54) **PERISTALTIC PUMP**

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(57) **ABSTRACT**

The invention relates to a peristaltic pump comprising a tube-tube bed unit (**1**) which is connected in a rigid manner to the tube (**3**) in the pressed region (**5**) and which can not be separated from the tube bed (**2**). The tube-tube bed unit (**1**) comprises features or means (**6, 6'**) which enable the pump to be fixed in a simple, precise and reproducible manner in relation to the rotor. In the pressed region (**5**), the tube (**3**) can be effectively prevented from being displaced or stretched corresponding to the decrease in the cross-section due to the tube-tube bed unit (1) and twisting of the tube (**3**) around the longitudinal axis is impossible in principle. The tube-tube bed unit (**1**) comprises a marking area, integrated tube clamping areas and grips (**18, 18'**). Preferably, the tube-tube bed unit (**1**) is produced by firmly and non-detachably connecting a tube bed (**2**), produced according to the inventive method, to a tube, which has a contact surface (**4**) which is adjusted to the tube bed (2), by means of adhesive or welding or by coextruding the tube (**3**) and the tube bed (**2**).

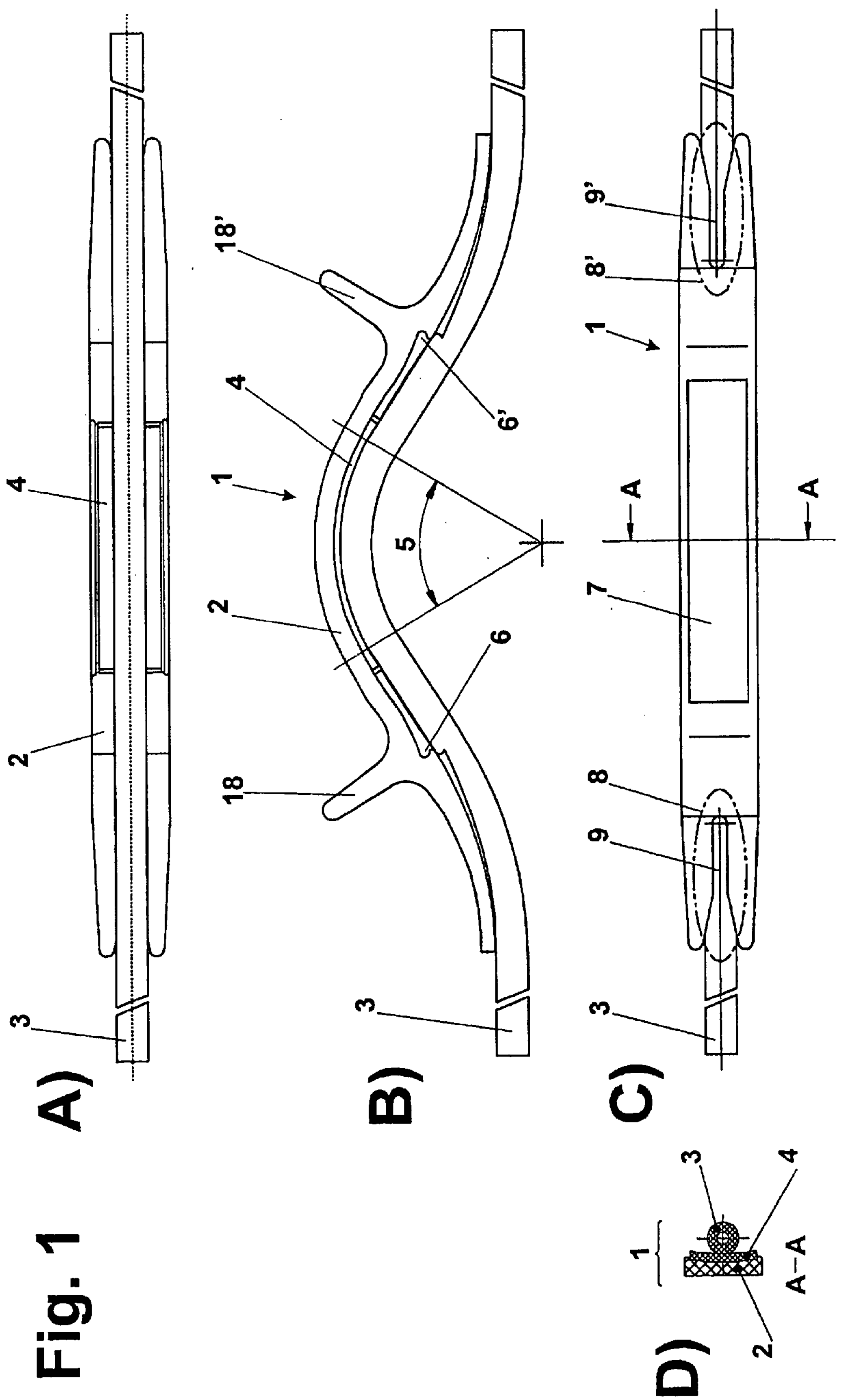


Fig. 1

Fig. 2

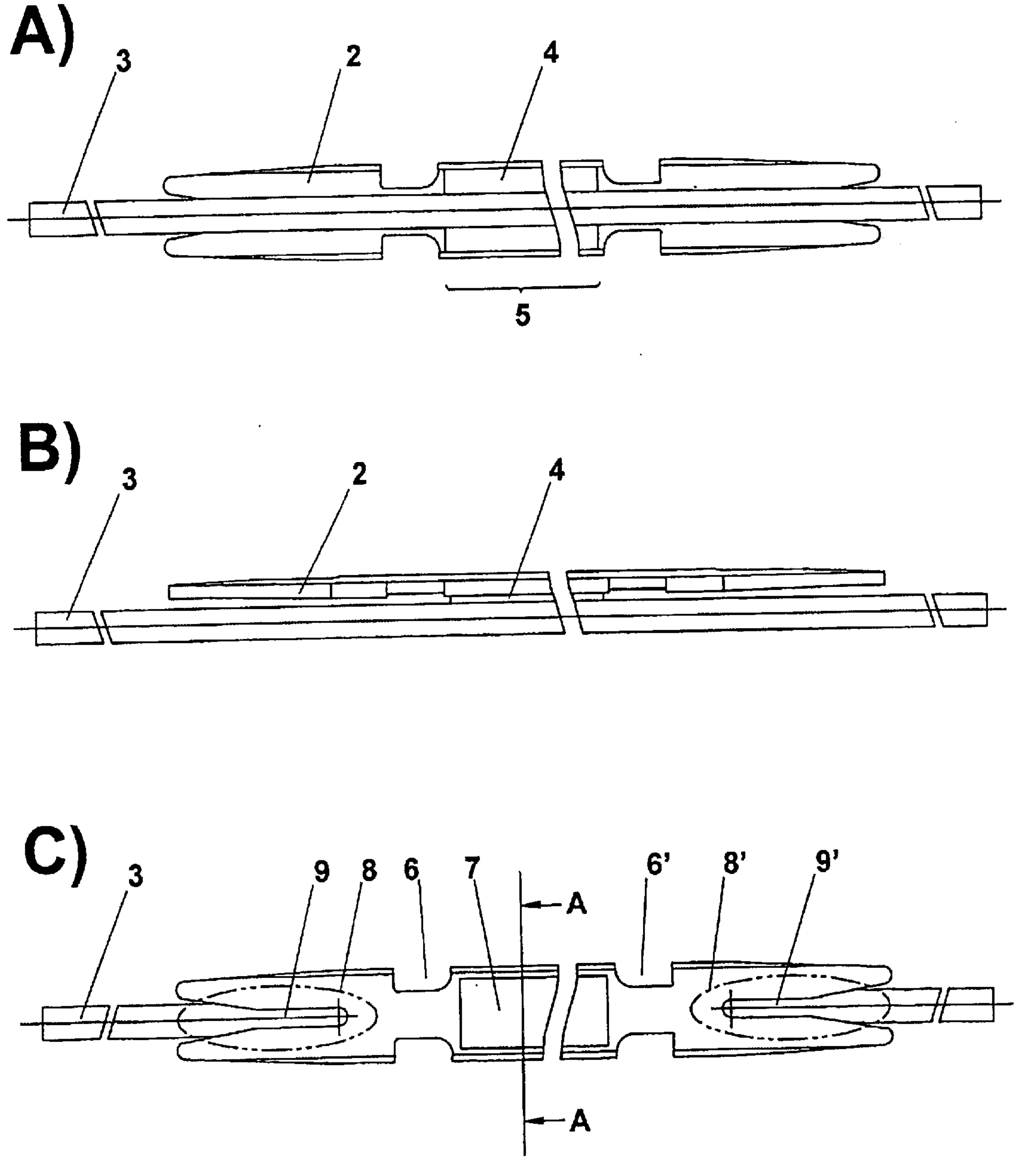


Fig. 3

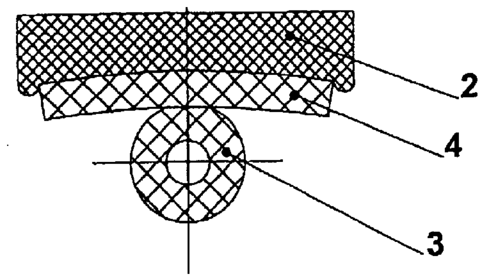


Fig. 4

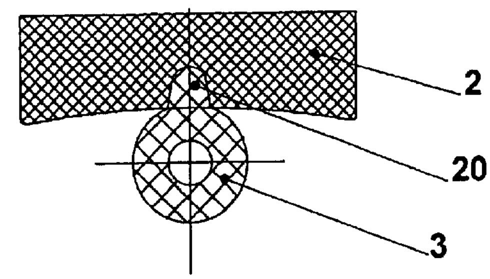


Fig. 5

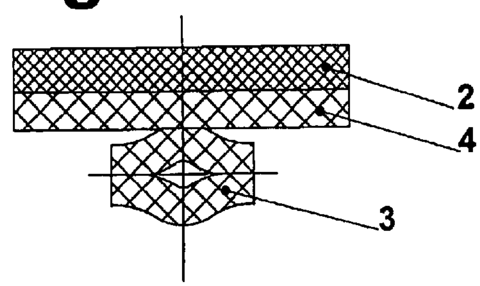


Fig. 6

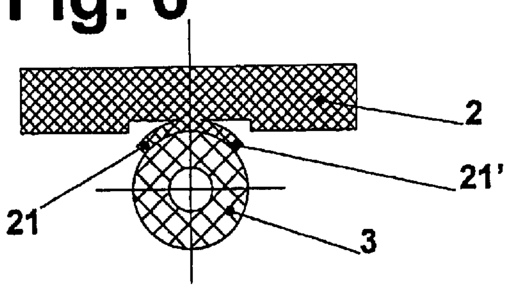


Fig. 7

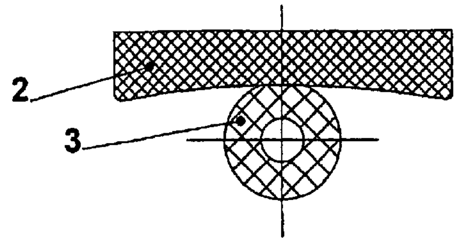


Fig. 8

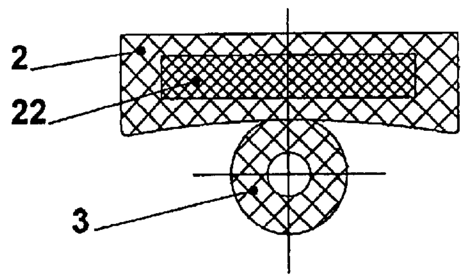


Fig. 9

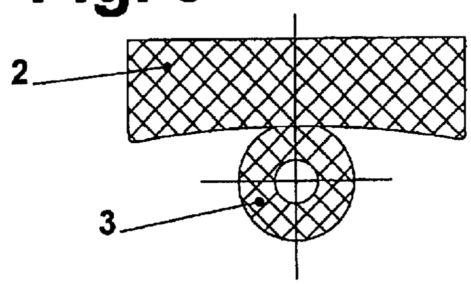


Fig. 10

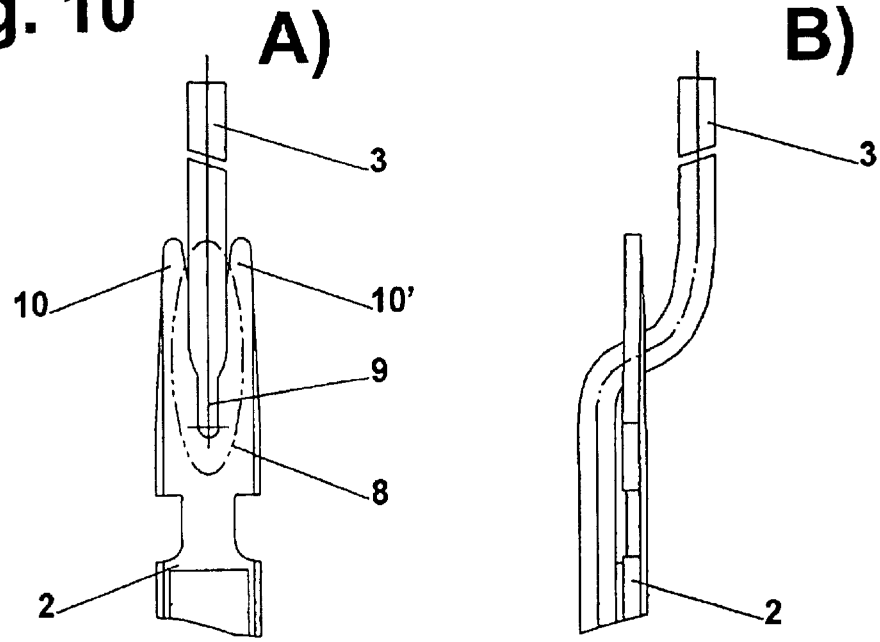


Fig. 11

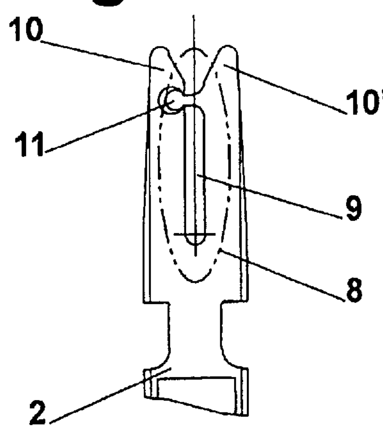
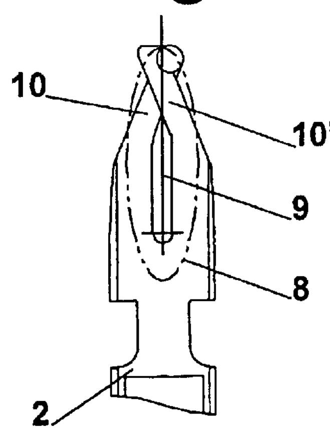


Fig. 12



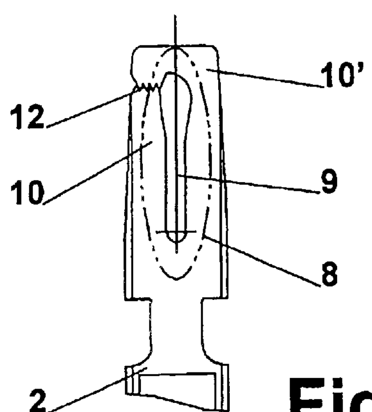


Fig. 13

Fig. 14

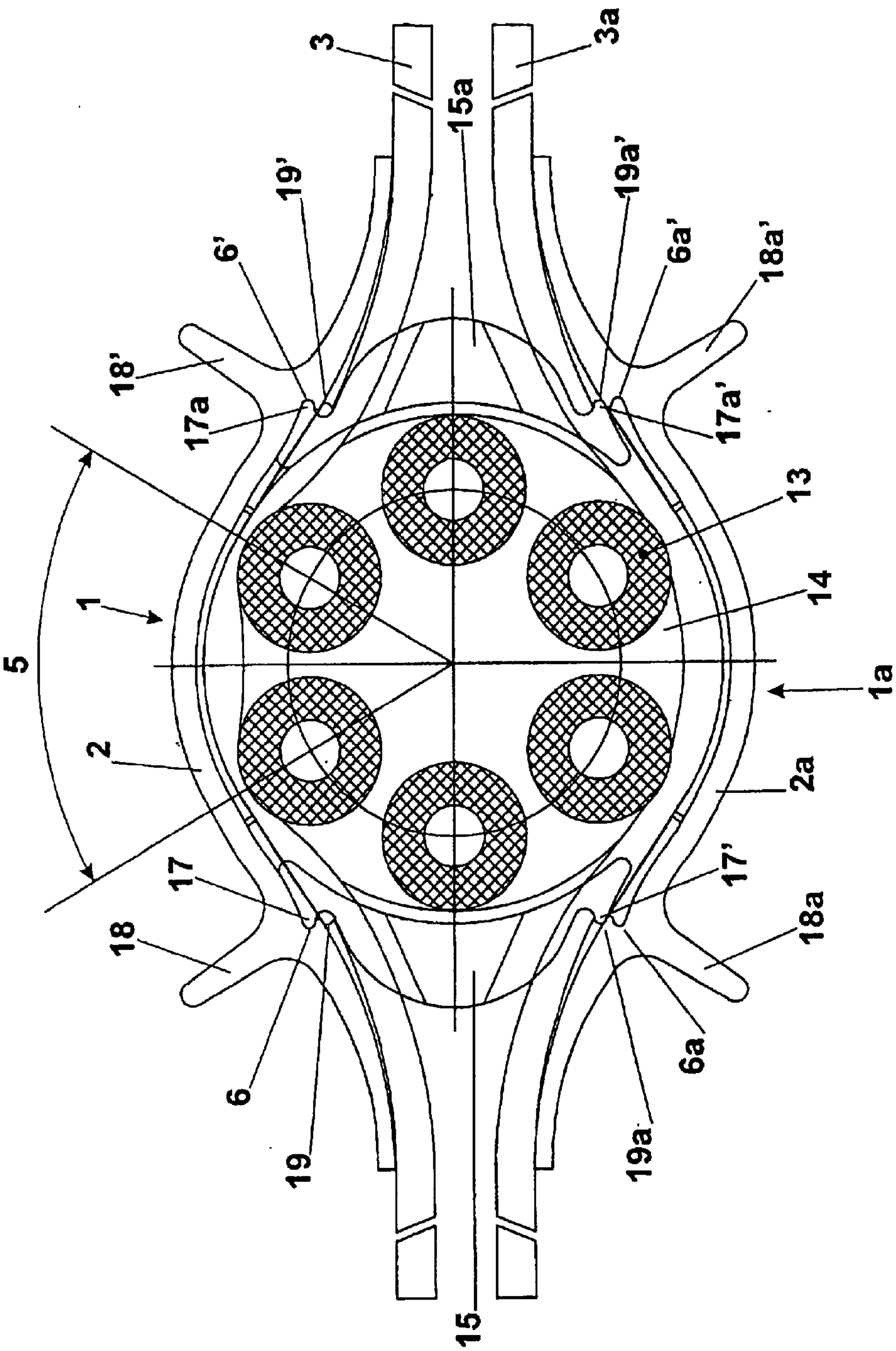

3
3a
15a
19'
19a'
6'
6a'
18a'
18'
17a
17a'
13
5
1
14
1a
2
2a
17
17'
18
18a
6
6a
19
19a
15

Fig. 15

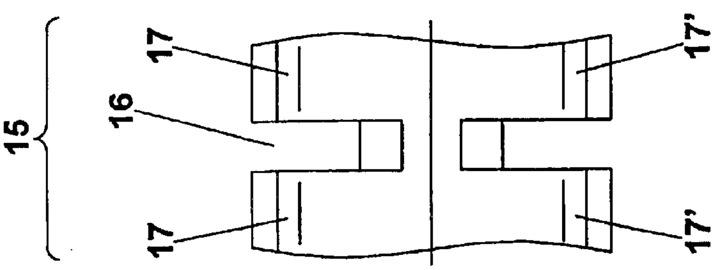
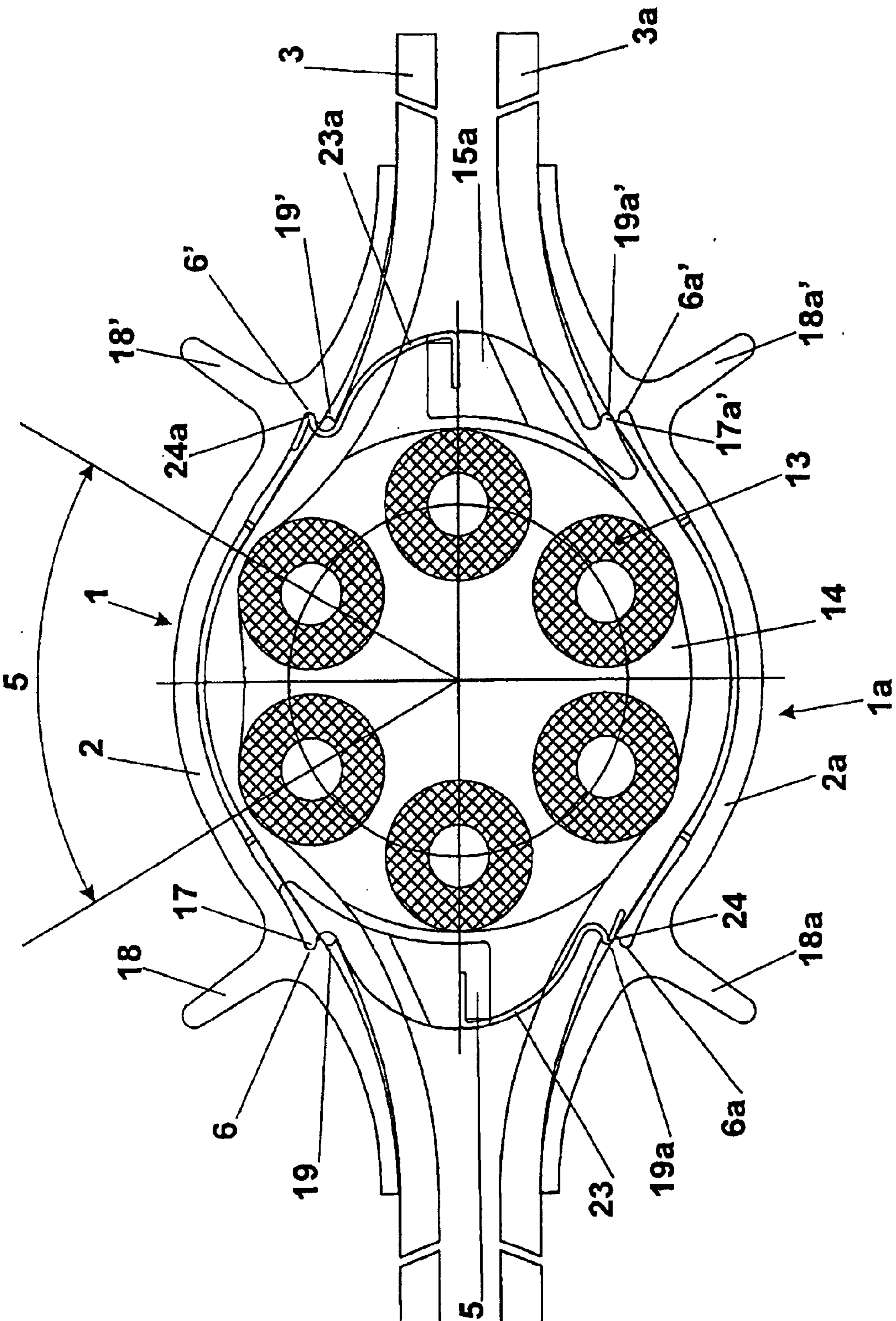

15
16
17
17
17'
17'

Fig. 16


3
3a
23a
15a
19'
19a'
6'
6a'
18'
18a'
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17a'
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14
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5
1a
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2a
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24
18
18a
6
6a
19
19a
23
15

PERISTALTIC PUMP

[0001] The invention relates to a peristaltic pump according to the preamble of claim **1**.

[0002] Peristaltic pumps essentially comprise a tube bed as a support for the tube and at least one element which squeezes the tube in a partial region. The pump action is produced by the fact that the squeezing element is moved in the longitudinal direction relative to the tube. Rams, fingers or rollers on a rotor are known as squeezing elements. The capacity of peristaltic pumps is chiefly determined by the structural design of the pump, by the tube dimension, by the tube material and by the pumped medium and the conditions of use. Decisive factors for the pump operation and the service life of the tubes are the dynamic-elastic properties, the creep resistance and alternating bending strength as well as the compressive and tensile permanent set of the tube material. These properties, for their part, are dependent on the pumped medium, on the specific conditions of use such as temperature and pressure, as well as the in-service age of the tubes, i.e. the number and the dynamics of the squeezing operations already performed in a specified time period. On account of the large number of influencing factors, in some cases time-dependent, it is very difficult to produce constant flow rates with peristaltic pumps. In practice, these flow rates generally diminish with time, whereby the trend over time and the extent of the drift are application-specific and cannot generally be predicted. Even under ideal conditions, therefore, a constant flow rate can only be produced over a period of minutes up to hours with known peristaltic pumps and tube materials. Two major effects are responsible for the drift in the flow rate. On the one hand, the tube material suffers from fatigue due to repeated squeezing, so that the tube cross-section and therefore the tube volume in the squeezing region increasingly diverges from the initial state over time. On the other hand, especially with pumps with a rotor, the rollers exert a tensile force on the tube, which increasingly stretches the latter in the longitudinal direction, so that in the squeezed region the tube cross-section and the tube volume diminish over time. The greater the contact pressure of the rollers on of the tube, the greater the tensile force acting on the tube will usually be, and the tube stretching resulting therefrom.

[0003] Generally, the structure of peristaltic pumps is aimed at generating flow rates with a specific design of pump and a specific tube which, under identical conditions of use, can be predicted within narrow limits, and are reproducible and constant.

[0004] Especially in the case of pumps with a rotor, it is necessary to prevent the tube in the squeezed region from being displaced in the longitudinal direction due to the tensile force of the rollers exerted on it. Pumps for tubing sold by the metre therefore usually have retaining devices for the tube, designed as clamps for example, on both sides of the tube bed. If the tube bed is designed as a tube cassette separable from the pump, said cassette often has lateral recesses for the accommodation of stoppers rigidly connected to the tube. Such retaining devices prevent the tube from being displaced in the pump, but do not prevent it from being stretched in the longitudinal direction in the squeezed region due to the tensile force of the rollers exerted on it.

[0005] In order to prevent this, the tube in WO 95/11383 (D1) has a perforated longitudinal rib, which is rigidly screwed to a two-part tube bed. In this way, both the displacement of the tube in the tube bed and the stretching in the squeezing region is prevented. The assembly of the tube on the pump, however, is costly, and in the case of small tubes it is difficult to carry out. Furthermore, multi-channel pumps with such a structure can only be produced with difficulty.

[0006] U.S. Pat. No. 4,494,285 (D2) describes a method for the production of an elastic lumen, which is injection-moulded directly onto a tube bed. The stretching of the lumen in the longitudinal direction is thus prevented. Widespread use of this solution, however, is opposed by the fact that the production method is costly and small lumina or multi-channel designs, for example, are only possible to a limited extent. For the assembly of the lumen, moreover, the whole pump unit with the rotor has to be dismantled.

[0007] Despite their specific advantages, the solutions described in D1, D2 are scarcely used in practice, since they do not meet present-day demands for simplicity and reliability, as well as flexibility and rapid tube replacement, with at the same time lower production costs.

[0008] Pumps with tube cassettes or tubes with stoppers such as described in EP 1 400 691 (D3) find widespread use, wherein the tube is not fixed in the squeezing region. With these and similar solutions, the tube is stretched by approx. 10-30% in the longitudinal direction when it is inserted into the tube cassette and also when the tube cassette is fixed onto the pump. This prestressing is able to reduce somewhat the additional longitudinal stretching of the tube caused by the tensile force of the rollers, but it cannot prevent it, so that the tube cross-section and the flow rate diminish with increasing longitudinal stretching. On the basis of the principle, therefore, the reproducibility of flow rates produced with tube cassettes and tubes with stoppers cannot be better than the reproducibility of the tube prestressing. And the constancy of the flow rate is at best as good as the temporal progression of the tube stretching in the squeezing region.

[0009] The reproducibility of the tube prestressing in tube cassettes is adversely affected by the following inadequacies: in the first place, the stoppers usually vary in size depending on the tube dimension, so that their position in the recesses of the tube cassettes designed for the largest stoppers is often not defined sufficiently precisely. In the second place, the tubes may be inserted into the tube cassette twisted about their longitudinal axis. In the third place, the preset spacing between the stoppers often cannot be complied with sufficient reproducibility using present-day production methods and in the fourth place the different tube materials and dimensions would require an optimised prestressing with a specific stopper spacing, something which is usually discounted in favour of standardised production. Since tube cassettes are also fitted repeatedly with new tubes and used again, their properties can change over time due to fatigue, defect or the influence of chemicals, as a result of which the reproducibility and the constancy of the flow rates produced are also adversely affected. There is also the risk of the unfixed tube in the tube bed being nipped and damaged due to operator error when the tube cassette is fitted onto the pump.

[0010] Since the reproducibility and the constancy of the flow rates produced with known peristaltic pumps, especially of those with tube cassettes as a tube bed and rollers on a rotor as squeezing elements, are often inadequate for special requirements, the desired flow rate regularly has to be re-established by changing the rotor speed. This is not possible in the case of pumps with a constant, non-variable speed, and only to a limited extent in the case of multi-channel pumps with a common drive for all channels.

[0011] To sum up, it can be stated that, for special requirements, it is only possible to a limited extent with peristaltic pumps having the present design to achieve desired flow rates with the necessary reproducibility and constancy.

[0012] The problem of the invention is to improve peristaltic pumps according to the preamble of claim **1** in such a way that, with low structural and production outlay, straightforward and reliable handling and a maximum of reproducibility and constancy of the flow rate are achieved at the same time.

[0013] The solution to the problem is set out in the characterising part of claim **1** in terms of its main features, and in the further claims in terms of further advantageous developments.

[0014] The invention is explained below with the aid of the appended drawings. In the drawings:

[0015] **FIG. 1A**-D tube/tube-bed unit with tube bed produced by injection moulding in view from beneath, plan view, view from above and in cross-section,

[0016] **FIG. 2A**-C tube/tube-bed unit with tube bed made from strip material in view from beneath, plan view and view from above,

[0017] **FIG. 3** cross-section of a first example of embodiment of the tube/tube-bed unit,

[0018] **FIG. 4** cross-section of a second example of embodiment of the tube/tube-bed unit,

[0019] **FIG. 5** cross-section of a third example of embodiment of the tube/tube-bed unit,

[0020] **FIG. 6** cross-section of a fourth example of embodiment of the tube/tube-bed unit,

[0021] **FIG. 7** cross-section of a fifth example of embodiment of the tube/tube-bed unit,

[0022] **FIG. 8** cross-section of a sixth example of embodiment of the tube/tube-bed unit,

[0023] **FIG. 9** cross-section of a seventh example of embodiment of the tube/tube-bed unit,

[0024] **FIG. 10A**-B a first example of embodiment of the tube clamping region in view from above and side view,

[0025] **FIG. 11 a** second example of embodiment of the tube clamping region in view from above,

[0026] **FIG. 12 a** third example of embodiment of the tube clamping region in view from above,

[0027] **FIG. 13 a** fourth example of embodiment of the tube clamping region in view from above,

[0028] **FIG. 14 a** first example of embodiment of a tube/tube-bed unit with retaining device and rotor in plan view,

[0029] **FIG. 15 a** retaining device of the first example of embodiment in side view,

[0030] **FIG. 16 a** second example of embodiment of a tube/tube-bed unit with spring-mounted retaining device and rotor in plan view.

[0031] The embodiment of a tube/tube-bed unit **1** represented in **FIGS. 1A** to 1D in a view from beneath, a plan view, a view from above and in cross-section comprises a tube bed **2** produced by injection moulding and a tube **3** connected rigidly and non-separably to tube bed **2** in a squeezing region **5** via a contact face **4**. Tube/tube-bed unit **1** has recesses **6**, **6'** as fixing means, said recesses being matched to corresponding cams as a retaining device to the pump. Further features of this embodiment are handles **18**, **18'** and extensions of tube bed **2**, which are designed as tube clamping regions **8**, **8'**, as well as an inscription region **7**. Inscription region **7** provides space for information concerning the pumped medium, the date of commissioning or other information important for quality assurance and traceability. The advantage of a tube bed **2** produced by injection moulding consists above all in the fact that its curvature can be adapted in the optimum manner to the radius of a rotor. This method of production also permits a certain freedom of design of fixing means, operating elements and surface structure of tube/tube-bed unit **1**.

[0032] The embodiment of tube/tube-bed unit **1** represented in **FIGS. 2A** to **2C** in a view from beneath, a plan view and a view from above comprises a tube bed **2** produced from strip material and a tube **3** connected rigidly and non-separably to tube bed **2** in a squeezing region **5** via a contact face **4**. Tube/tube-bed unit **1** has, for example, recesses **6**, **6'** as fixing means, said recesses being matched to corresponding retaining devices on the pump. Further features of this embodiment are extensions of tube bed **2**, which are designed as tube clamping regions **8**, **8'**, as well as an inscription region **7**.

[0033] The advantage of a tube bed **2** made from strip material consists above all in the fact that specific lengths of tube/tube-bed unit **1** adapted to different rotor sizes can also be produced cost-effectively in small-lot production. The strip material for tube bed **2** should preferably be selected such that the latter has sufficient tensile strength in the longitudinal direction and at the same time a bending stress as small as possible when wrapping it around the rotor. Recesses **6**, **6'** serving for example as fixing means and tube clamping regions **8**, **8'** of tube/tube-bed units **1** of strip material are preferably produced by stamping. FIGS. **3** to **9** show the cross-sections of different embodiments of tube/tube-bed unit **1** in squeezing region **5**. All the variants have in common the fact that, in the first place, tube bed **2** is connected rigidly and non-separably to tube **3** at least in squeezing region **5** and, in the second place, the material and/or the cross-section of tube bed **2** are suitable for reducing the stretchability of tube/tube-bed unit **1** in the longitudinal direction in squeezing region **5**, in such a way that it is lower compared to tube **3** alone. Analogously, all embodiments exhibiting these features that emerge through a combination or modification of the embodiments represented in **FIGS. 3-9** fall within the idea of the invention. Tube/tube-bed unit **1** is preferably produced such that tube bed **2** and tube **3** are manufactured separately and then connected rigidly and non-separably for example by gluing or welding (**FIGS. 3-6**) or with a combined hard/soft injection moulding method or extrusion method in which the lamination takes place during production (**FIGS. 7, 8**).

[0034] **FIG. 3** shows the cross-section of an embodiment of tube/tube-bed unit **1**, comprising a, for example, concavely curved tube bed **2** and a tube **3** with a tangential contact face **4**, which is glued or welded, for example, to tube bed **2**. The concave curvature of tube bed **2** and contact face **4** centres tube **3** in the middle of tube bed **2** and prevents a lateral tilting during the squeezing operation. An advantage of this embodiment further consists in the fact that contact face **4** is made from the same elastomer material as tube **3**, it acts as a spring and, as a result, tolerances in the occlusion and in the contact pressure can be compensated for within a certain range.

[0035] **FIG. 4** shows the cross-section of an embodiment of tube/tube-bed unit **1**, wherein a longitudinal rib **20** of tube **3** is glued into a corresponding recess of tube bed **2** or is welded to the latter.

[0036] **FIG. 5** shows the cross-section of an embodiment of tube/tube-bed unit **1**, wherein tube **3** has a non-circular cross-sectional face internally and externally. All the embodiments of tube/tube-bed unit **1** according to the invention have in common the fact that the rigid, non-separable connection of tube bed **2** to tube **3** uniquely determines the torsional position of tube **3** in the longitudinal direction. As a result, the shape of the cross-sectional face of tube **3** internally and externally can in principle be freely selected and can, for example, be optimised for a long service life or for gentle pumping action.

[0037] **FIG. 6** shows the cross-section of an embodiment of the tube/tube-bed unit, wherein tube bed **2** has flexible extensions **21**, **21'** as an accommodation for tube **3**. Extensions **21**, **21'** are rigidly and non-separably connected to tube **3**, for example by gluing or welding. This embodiment has the advantage that existing tubing sold by the metre with a circular internal and external cross-section can be used.

[0038] **FIG. 7** shows the cross-section of an embodiment of tube/tube-bed unit **1**, wherein tube bed **2** and tube **3** are co-extruded as a hard/soft laminate. The extrudate is cut, tube bed **2** is shortened to the required length and provided with suitable fixing means.

[0039] **FIG. 8** shows the cross-section of an embodiment of tube/tube-bed unit **1**, wherein tube bed **2** contains reinforcing elements **22** such as films, strips, filaments or fibres, which are suitable for lowering the stretchability of tube/tube-bed unit **1** in the longitudinal direction, in such a way that it is lower compared to tube **3** alone. The production of this embodiment preferably takes place by the fact that reinforcing elements **22** are added as a filler to tube bed **2** during extrusion. The extrudate is cut, tube bed **2** is shortened to the required length and provided with suitable fixing means.

[0040] **FIG. 9** shows the cross-section of an embodiment of tube/tube-bed unit **1**, wherein tube bed **2** and tube **3** are made from the same material and do not contain any additional reinforcing element **22**. This embodiment only permits an appreciable reduction in the stretchability of tube **3** in the longitudinal direction when the cross-section of tube bed **2** is larger than the material cross-section of tube **3**.

[0041] **FIGS. 10-13** show different embodiments of extensions of tube bed **2** of tube/tube-bed unit **1**, said extensions being designed as tube clamping region **8**. Common to all the embodiments are two legs **10**, **10'**, which form a, for example, parallel slot **9**, which is at least as long as half the circumference of the internal cross-section and less wide than double the wall thickness of the largest tube **3** to be squeezed.

[0042] **FIG. 10A**,B shows the embodiment of a tube clamping region **8** already shown in **FIG. 2**, with tube **3** clamped and squeezed in slot **9**, in a view from above and a side view. The distance between the inner flanks of legs **10**, **10'** of tube clamping region **8** diminishes continuously from the exterior and transforms into a preferably constant width of slot **9**. This promotes a straightforward and trouble-free introduction of tube **3** from the exterior into slot **9**, to an extent such that tube **3** is squeezed to the desired extent and the through-flow of medium is partially or wholly stopped.

[0043] **FIG. 11** shows, in a view from above, a closed, arrestable embodiment of a tube clamping region **8** with a leg **10'**, which has an extension **11** which engages in a matching opening on opposite leg **10**, the effect of which is to prevent the two legs **10**, **10'** from being able to open due to the pressure of clamped-in tube **3** over time. An arrestable embodiment is especially suitable for hard tube materials or when tube **3** has to remain reliably squeezed over a long time. Tube clamping region **8** is opened by the fact that one of legs **10**, **10'** is moved out of the common plane, as a result of which extension **11** jumps out of the opening in leg **10**.

[0044] **FIG. 12** shows, in a view from above, a further closed, arrestable embodiment of a tube clamping region **8** with two legs **10**, **10'**, which can clasp into one another overlapping, the effect of which is to prevent the two legs **10**, **10'** from being able to open due to the pressure of clamped-in tube **3** over time.

[0045] **FIG. 13** shows, in a view from above, a further closed, arrestable embodiment of a tube clamping region **8**, wherein legs **10**, **10'** have self-arresting teeth **12** engaging into one another. The width of slot **9** can be reduced stepwise by pressure on the outer side of the legs **10**, **10'**, until such time as tube **3** is squeezed to the desired extent and the through-flow of medium is partially or wholly stopped. Tube clamping region **8** is opened by the fact that one of legs **10**, **10'** is moved out of the common plane, as a result of which teeth **12** are released.

[0046] **FIG. 14** shows tube/tube-bed unit **1** known from **FIG. 1**, with a tube bed produced by injection moulding, together with retaining devices **15**, **15***a* and rollers **13** of a rotor **14** as squeezing elements, in plan view. Analogously, the following statements also apply to tube/tube-bed units **1** with a tube bed **2** made from strip material according **FIG. 2**.

[0047] The fixing of tube/tube-bed unit **1** according to **FIG. 1** to the pump takes place by the fact that tube **3** is inserted on both sides into a slot **16** of a retaining device **15**, **15***a* and the pressure on tube/tube-bed unit **1** is increased via the inside of handles **18** and **18'** until such time as cams **17** and **17***a* of retaining device **15**, **15***a* lock into recesses **6**, **6'** of tube bed **2**, said recesses serving as fixing means. Tube/tube-bed unit **1** is fixed in a unique position relative to rollers **13**, as a result of which a defined and reproducible contact pressure on tube **3** is established. Tube/tube-bed unit **1** can be separated from the pump by the fact that, by simultaneous pressure on the outside of handles **18** and **18'**, recesses **6**, **6'** of tube bed **2** serving as fixing means are removed from cams **17**, **17***a* of retaining devices **15**, **15***a*, and as a result the connection of tube/tube-bed unit **1** to retaining device **15**, **15***a* is released. It emerges from **FIG. 14** that the preferred embodiment of retaining device **15**, **15***a* permits the simultaneous fixing of two tube/tube-bed units **1** lying opposite one another. With such an arrangement, the radial forces acting on rotor **14** from tube/tube-bed units **1** and **1***a* via tubes **3** and **3**a are largely removed, which permits the use of less costly bearings for rotor **14** and twice the number of channels for a specific overall depth of rotor **14**.

[**0048**] Tube/tube-bed unit la with recesses **19***a*, **19***a*' on cams **17**', **17***a*' of retaining device **15**, **15***a* is shown in **FIG. 14**. In this position, tube/tube-bed unit **1***a* is fixed to the pump, but tube **3***a* is largely relieved of the pressure of rollers **13**. With this adjustment, the elastomer properties of tube **3***a* can be preserved with a lengthier standstill of the pump, without tube/tube-bed unit la having to be completely separated from the pump. It goes without saying that the contact pressure becomes adjustable stepwise with a tube/tube-bed unit **1** which has several, possibly finer recesses of type **6**, **6**' and **19**, **19**'. The contact pressure of tube/tube-bed unit **1** on the squeezing elements, for example, can thus be adjusted according to the pressure to be produced. It is not important to the idea of the invention whether the means for a stepped or stepless adjustment of the contact pressure are fitted to tube/tube-bed unit **1** or to the retaining devices on the pump, or whether they act directly or indirectly via levers, wedges, screws or other adjustment elements.

[**0049**] **FIG. 15** shows retaining device **15** in a side view.

[**0050**] **FIG. 16** shows tube/tube-bed unit **1** already known from **FIG. 1**, with a retaining device **15**, **15***a* designed spring-mounted and rollers **13** of a rotor **14** as squeezing elements in plan view. Springs **23**, **23***a* have cams **24**, **24***a*, which are matched to recesses **6**, **6**' of tube bed **2**. Spring **23***a* places tube/tube-bed unit **1** under a certain tensile stress, which brings about a corresponding contact pressure of tube/tube-bed unit **1** on rollers **13** of rotor **14**. Retaining device **15**, **15***a* can have springs on one side or both sides, said springs also being able to be designed replaceable for different contact pressures. As already in **FIG. 14**, tube/tube-bed unit **1***a* is also shown here relieved of the contact pressure, cam **24** of spring **23** engaging in recess **19***a* and cam **17***a*' of retaining device **15***a* in recess **19***a*'. With a retaining device **15***a* designed spring-mounted, the pressure occurring in tube **3**, for example, can reliably be limited. As soon as the internal pressure exceeds a certain value, the contact pressure on the squeezing elements determined by spring **23***a* and acting on tube **3** from tube bed **2** can no longer close the tube lumen completely, as a result of which a back-flow occurs and the pump action correspondingly declines. It goes without saying that, for the idea of the invention, it is not important whether the spring-mounted element is designed as a part of retaining device **15***a* or as a part of tube/tube-bed unit **1** or whether it acts indirectly via further elements on tube/tube-bed unit **1**.

[**0051**] As a disposable article, each new tube/tube-bed unit **1** not only comprises a new tube **3**, but always a new tube bed **2** too. Irrespective of the embodiment, reproducible initial conditions are thus always ensured.

[**0052**] Although tube/tube-bed unit **1** is preferably described here in connection with pumps which have a rotor and rollers as squeezing elements, it is not bound to a specific type, design or dimension of squeezing elements and can be used for example with finger or ram pumps. It also goes without saying that, as means for a detachable fixing of tube/tube-bed unit **1** to the pump, a large number of geometrical shapes can be selected, such as for example eyelets, protuberances, grooves, extensions or recesses of varying number and combination with matched elements on the pump, such as for example hooks, bolts, clasps or clamps according to the requirement, and tube/tube-bed units **1** with indirect fixing means other than those mentioned here or additional ones, such as for example clamps or cassettes, fall within the idea of the invention. With a sufficiently rigid and stiff tube bed, a single retaining device for example is sufficient to press a tube/tube-bed unit **1** onto the squeezing elements. Embodiments of peristaltic pumps, in which tube/tube-bed unit **1** is connected with one or more than two retaining devices, are thus also in accordance with the invention.

1. A peristaltic pump comprising:

at least one tube bed;

at least one tube;

at least one squeezing element, wherein the at least one squeezing element is led over the at least one tube bed;

wherein the squeezing element is adapted to squeeze squeezes the latter in a squeezing region against the at least one tube bed with at least one retaining device for fixing the at least one tube bed with respect to the at least one squeezing elements;

the at least one tube bed and the at least one tube are connected to one another rigidly and non-separably in the squeezing region to and form together a tube/tube-bed unit; and

at least one suitable means for detachably fixing of the is tube/tube-bed unit to the at least one retaining device.

2. The peristaltic pump according to claim 1, wherein the at least one tube bed of the tube/tube-bed unit has a lower stretchability than the at least one tube.

3. The peristaltic pump according to claim 1, wherein the tube/tube-bed unit has at least one region designed as a handle for operating of the at least one means.

4. The peristaltic pump according to claim 1, wherein the tube/tube-bed unit has at least one tube clamping region.

5. The peristaltic pump according to claim 4, wherein the at least one tube clamping region of the tube/tube-bed unit is designed as a slit.

6. The peristaltic pump according to claim 1, wherein the at least one means is formed by at least one region or extension of the at least one tube bed designed as a recess, eyelet, cam, protuberance or tooth.

7. The peristaltic pump according to claim 1, wherein the at least one means is designed as a clamp, holding device or cassette.

8. The peristaltic pump according to claim 1, wherein the at least one means is designed in such a way that a contact pressure of the tube/tube-bed unit on the at least one squeezing element is adjustable.

9. The peristaltic pump according to claim 1, wherein the at least one means contains at least one spring-mounted element, wherein the spring-mounted element is adapted to bring about a contact pressure of the tube/tube-bed unit on the at least one squeezing element, the contact pressure corresponding to its spring power.

10. The peristaltic pump according to claim 1, wherein a fixed, non-separable connection of the at least one tube bed and the at least one tube in the tube/tube-bed unit is produced by gluing, welding, injection-moulding or extrusion.

11. The peristaltic pump according to claim 10, wherein the at least one tube bed and the at least one tube of the tube/tube-bed unit are produced by means of two-component injection moulding.

12. The peristaltic pump according to claim 10, wherein the at least one tube bed and the at least one tube of the tube/tube-bed unit are produced by means of co-extrusion.

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