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(12) # EUROPEAN PATENT SPECIFICATION

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(54) **Procedure which can be carried out on circular knitting machines with two needle bars so as to form a panty-hose product or so-called "tights" with continuous-motion processing.**

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US-A-3 975 924
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Description

The invention concerns an improved procedure by means of which a pantyhose product or the equivalent can be made directly on a machine by using circular knitting machines which produce stockings or socks, for instance, and which are of a two-cylinder type or have a cylinder and a dial with radial needles but in any event have two needle beds of cooperating needles.

The invention also concerns a machine fitted to carry out the method of the invention and concerns also a product obtained with the method in question.

Patent US 3,975,924 (FURIA) is known in which, among other things, there are shown two different and not comparable solutions; these solutions are shown in Figs. 1, 5 and 13 and in Figs. 8, 9, 10 and 12 respectively.

The solutions of Figs. 2, 3 and 6 are technical representations which are not actually embodied.

The first solution of FURIA envisages working in such a way that the needles (Fig. 1) of the cylinder 11, which make the plain stitching 21, are in fact inactive in the tract between A and B. Only the needles of the cylinder 13 (thus only one needle bed) work in this tract, after transfer of the yarn from 11 to 13, as shown clearly in Fig. 13. Thus in the tract A1—B1 there is double processing; by cutting along T the following disadvantages are produced:— an aesthetically ugly tract 151 positioned in two columns at the side of the centre of the panty portion: a very unstable tract 15, the stitches A1 and B1 all being aligned in the same column.

Instead, the second solution (Fig. 12) envisages that the yarn of one stitch passes at A into another stitch (on one needle bed) and is processed therein until B, where it returns to the original stitch (original needle bed).

The same happens with a corresponding yarn in the other stitch, the two yarns being always processed in one and only one needle bed but never both yarns with the two needle beds.

In this case too the disadvantages indicated above follow and indeed become greater.

Next, patents FR 2.109.710 and US 4,011,738, both belonging to the same author and having the same content, are known; these patents envisage the panty portion being made by inversion of the motion, the edges 13 being obtained directly on the machine without connections and without any need for cutting.

This solution is aesthetically and physiologically the best but it is very slow and expensive since the alternating motion with the execution of the edge 13 is very slow.

Lastly, GB—A—2,006,288 is known and teaches the formation of parts that compose a garment. In Fig. 4 this invention envisages tubular elements, already sewn, as being obtained. But this invention cannot be transferred, not even by combining it with the above cited known art, to the execution of pantyhose products in view of the different machines employed and the different working methods needed to obtain one product and the other.

Moreover, the simple statement made in the text (page 3, lines 13 to 18) is only an indication of a wish, but not a teaching of how to obtain the desired union in the example given nor, above all, of how to produce the union when two tubular concentric elements are made with a cylindrical knitting machine with two needle beds.

As compared to other known embodiments, our invention fulfils its purpose of ensuring greater stability in the connections between the two parts of the product along the line of the crutch, of permitting simpler and also faster processing and of obtaining a satisfactory aesthetic appearance.

The invention is obtained with a procedure to form a pantyhose product or the like on a double-cylinder or cylinder-and-dial knitting machine by processing with continuous rotating motion, whereby two tubular products of the panty portion are formed at one and the same time on respective needle beds and with different feeds or descents of yarn, and whereby the panty portion is formed first with parts of tubular material with a lengthwise connecting zone which is subsequently cut in a lengthwise direction, such procedure being characterised by the fact that in the single-layer connecting zone needles of the two needle beds are actuated simultaneously to form with one feed or a plurality of feeds or even with all the feeds such that each yarn is knitted in the connecting zone by needles of both the upper and lower needle beds to form a rib stitch structure with plain stitches and purl stitches next to each other, the needles of one needle bed knitting in the free space left by needles of the opposite needle bed.

The structure of the rib stitching can be of a 1:1 type, namely with one plain stitch and then one purl stitch.

The connecting zone can be formed with two bands, namely zones of rib stitching separated by a tract which has yarns that are not knitted and in which the cut is made; each band is formed with some rows of stitches which are alternately plain and purl.

The connecting zone can be made with a number of courses greater than (two time greater, at the most) that of the neighbouring textures.

The invention also concerns a machine to perform the above procedure, the machine being of a type in which two cylinders or a cylinder and dial cooperate with cam means that actuate the needles of one cylinder or of one of the cylinder or dial in correspondence with certain feeds and actuate the needles of the other needle bed in correspondence with other feeds, so as to form two products, one inside the other, means being provided to drive the needles of a connecting zone so as to connect the two products in a lengthwise direction and also to make a lengthwise cut in the zone in order to form the line of the crutch, the machine being characterised by including an arc of corresponding needles in each

of the two needle beds which are actuated to knit together to form such connecting zone and being capable of being driven at least at one feed so as to take the yarn alternately with needles of one or the other needle bed in order to form rows of rib stitching, means being provided to actuate the needles of one needle bed such that they knit in the free space left by the needles of the opposite needle bed.

A further object of the invention is a pantyhose product or the like obtained with the above procedure and with the machine defined hereinbefore, characterised by the fact that the one single-layer connection zone formed with the needles of both beds is connected tightly to the stitches of the tubular portions of the pantyhose product, whereby the crossed yarns of the wales of stitches forming the connection zone are overlaid on the back of such connection zone on the outside of the pantyhose product.

The invention will be understood more readily by examining the description and attached figures, wherein a practical but not restrictive example of the invention itself is shown, and wherein:—

Fig. 1 shows diagrammatically a section of the product in the process of being cut, bent outwards, and spread out;

Fig. 2 shows a detail of Fig. 1 after the product has been bent outwards;

Fig. 3 shows a portion of fabric with the progress of the course of stitches corresponding with the connection along the line of the crutch;

Figs. 4 and 5 show in perspective a portion of the product before and while it is bent outwards;

Fig. 6 shows a part of the product after it has been bent outwards;

Figs. 7 and 8 show the position of the needles of two opposed cylinders during two successive moments while the body of the product is being formed;

Figs. 9 and 10 give an elevation and a plan view, both in linear development, of a position of the needles of a cylinder and a dial during a moment in the processing of the body of the product;

Figs. 11 and 12 are like Figs. 9 and 10 but show the position of the needles during a successive moment.

According to the details shown in the attached figures, the formation of a double tubular fabric is envisaged as taking place by means of two sets of needles on two needle beds.

Figs. 9 to 12 inclusive show a lay-out wherein are visualized a needle bed 11 in a cylinder and a needle bed of radial needle hooks 13 in a dial combined with the cylinder.

A1, A2, A3 and A4 indicate four positions of yarn feed with thread guides G1, G2, G3 and G4. When the needles 11 take the yarn, they form plain stitches, whereas when the needles 13 take the yarn, they form purl stitches. Normally, so as to form two semi-finished tubular products 15 and 17 at the same time with continuous motion, the needles 13 take the yarn in correspondence with the feeds A2 and A4, whereas the needles 11 take the yarn in correspondence with the feeds A1 and A3; the two tubular elements, which have the reference numbers 15 and 17 respectively, are thus formed progressively at one and the same time.

To form the body portion of the product (at the beginning or end of formation of the whole product) it is necessary to make a connection between the two fabrics and a cut along a tract of the lengthwise development of the two tubes of fabric, as indicated with T in Fig. 4 and also in Fig. 1, where 15 is the reference number of the tubular fabric formed inside, whereas 17 is that of the tubular fabric formed outside, each of them being formed with the needles 11 or 13 of one of the needle beds. The reference C indicates zones to connect the two elements 15 and 17 separated by a cut T.

In the formation of the body of the product the single-layer connecting zone Cc is made by processing simultaneously with needles 11 and with needles 13 structures of fabric with rib stitching, whereby the needles 11 and needles 13 are actuated at the same time in correspondence with one feed or several feeds or even with all the feeds A1, A2, A3 and A4. A lay-out of this kind is given in Figs. 9—10 and 11—12, which show two moments in the formation of the connecting zones of fabric Cc respectively in front of the feed A1 and feed A2 of a cylinder-and-dial unit with needles.

Figs. 9 and 10 show the momentary condition in which the needles passing before the feed A1 are pre-set to form the zone Cc; therefore, at that moment not all the needles 11 are raised, nor are all the needles 13 kept inside; but rather in front of the feed A1 (which usually serves for the formation of the product with the needles 11), out of all the needles 11, only those indicated with 11A (two pairs in the figure) are raised, while the needles marked 11B and also the two middle needles 11C are kept low; furthermore, in that situation the needles 13 of the dial indicated wiht 13A, which correspond with the unraised needles 11B, are also withdrawn; before the feeds A2 and A4 only the needles 13 come out (to form the fabric 15), while in front of the feed A3 only the needles 11 come out (to form the fabric 17).

Let us now consider the moment shown in Figs. 11 and 12 and observe that only the needles 11 work with the feeds A1 and A3, while only the needles 13 work with the feed A4.

In front of the feed A2 there pass the needles pre-set for formation of the zone Cc, namely the needles 11A, 11B, 11C and 13A, which are once more selected, as already said with regard to Figs. 9 and 10, for the feed A1 in such a way as to form the connecting zone Cc of fabric.

When the needles pre-set to form the connecting zone Cc pass before the feeds A3 and A4, the conditions are repeated which are shown for the feed A1 in Figs. 9 and 10 and for the feed A2 in Figs. 11 and 12.

Figs. 7 and 8 show the lay-out and method of working to obtain the invention in the case of a

machine with two opposed cylinders. The references A11, A12, A13 and A14 indicate the four feeds exemplified (but the lay-out may have any other number of feeds greater than one), whereas G11, G12, G13 and G14 are the respective thread guides. The needles 31 of the lower cylinder work with the feeds A11 and A13 to form the fabric 17, whereas the needles 33 of the upper cylinder work with the feeds A12 and A14 to form the fabric 15. In the connecting zone Cc the needles of the two cylinders are driven in front of all the feeds so as to make the lower needles 31A take the yarn, the needles 31B and also the needle or needles 31C being kept low, and to make the upper needles 33A (corresponding with the needles 31B) take the yarn, the needles 33B and also the needle or needles 33C being prevented from protruding and being kept within the upper cylinder. In Fig. 7 the zone Cc passes before the feed A11, while in Fig. 8 it passes before the feed A12; this function is also repeated in front of the other feeds A13 and A14.

For the drive of the group of needles 31—33 pre-set to form the zone Cc, butts can be envisaged which have a special height or particular levels on the needles or needle jacks in the channels of the said needles, or else other dispositions may be made for the purpose which are well known to experts in this field. It seems to be enough to process the connecting zone Cc with the two feeds A1 and A3 (or A11 and A13) alone.

In this way a structure of fabric, as shown with Cc in Fig. 3, is obtained the courses of which in that zone comprise alternately plain stitches MD and purl stitches MR, namely with a structure of rib stitching; in this way, beginning from the peripheral zones indicated with E, stitches are formed with the yarns of one product 15 together with stitches of yarns forming the other product 17. In a central zone F (and formed through the lack of activity of the needles 11C and 31C—33C) there can be an absence of stitches as none of the needles (11C and the corresponding 13C) is driven to take the yarn and form the stitch.

The cut indicated with the arrows T is made in this central zone F; this cut can be performed in any suitable way, for instance with heat applied by a resistance that melts the yarn, or with a cutter device with blades actuated in a suitable manner, or with elements sliding in the needle seatings and equipped with a blade or other cutting edge caused to operate when such element is raised, the solution being analogous to that of the needles. Thus the cut can be made directly on the machine, and the product therefore reaches the situation shown in Fig. 4 with one of the tubular products 17—15 inserted in the other, for in that condition they are seen as they are formed by the two needle beds 11 and 13.

Having been separated, the product is then spread apart, with the fabric 15 bent outwards from the fabric 17 and turned over, as shown in Fig. 5, so as to reach the situation of Fig. 6, in which the connecting zones C, like the so-called "runs" at the end of working, are inside the product. In the zones C there is a stable union of the product along the line of the crutch, as is shown in Fig. 6 where it can be seen clearly that the parts C form the connection between the two fabrics of the sides of the body of the product. The fabric in the zones C consists, as said earlier, of rib stitching and of yarns belonging alternately to one or the other of the tubular fabrics 15 and 17. For the most part of the number of courses in the zones C is twice as many as the number of courses in each of the fabrics 15 and 17 within the same unit of length; this ensures a very effective connecting structure. From an aesthetic point of view the product takes on an appearance better than that obtained with products envisaged hitherto in previous solutions.

It is to be understood that the figures show only one example, which is given as a practical embodiment of the invention, but this embodiment can be varied as regards forms and lay-outs within the scope of the appended claims. Obviously there is no limit to the length of the connecting zones or, therefore, to the vertical development of the body of the product.

It should be noted that, as said earlier, the connections can be made with all the feeds or with a reduced number of feeds. If we consider the case of four feeds A1—A2—A3—A4, the use of all these feeds to make the connection enables the crosswise stresses to be reduced, as the connecting zone will thus have a number of courses twice as great as the number of courses in the neighbouring fabrics; a connection made with only two feeds is performed with the same number of courses as that of the neighbouring fabrics and permits a given mechanical simplification.

Claims

1. Procedure to form a panty-hose product or the like on a double-cylinder or cylinder-and-dial knitting machine by processing with continuous rotating motion, whereby two tubular products (15—17) of the panty portion are formed at one and the same time on respective needle beds and with different feeds (A) or descents of yarn, and whereby the panty portion is formed first with parts of tubular material (15—17) with a lengthwise connecting zone (Cc) which is subsequently cut in a lengthwise direction, such procedure being characterised by the fact that in the single-layer connecting zone (Cc) needles (11—13) of the two needle beds are actuated simultaneously to form with one feed or a plurality of feeds (A) or even with all the feeds (A) such that each yarn is knitted in the connecting zone by needles of both the upper and lower needle beds to form a rib stitch structure with plain stitches (MD) and purl stitches (MR) next to each other, the needles of one needle bed knitting in the free space left by needles of the opposite needle bed.

2. Procedure as in Claim 1, characterised by the fact that the structure of the rib stitching is of a 1:1

type, namely with one plan stitch (MD) and then one purl stitch (MR).

3. Procedure as in the preceding claims characterised by the fact that the connecting zone (Cc) is formed with two bands or zones of rib stitching separated by a tract (F) having yarns not knitted in which the cut (T) is made, each band being formed with some rows of alternate plain (MD) and purl (MR) stitches.

4. Procedure as in Claims 1 to 3, characterised by the fact that the connecting zone (Cc) is made with a number of courses greater (twice as many, at the most) that of the neighbouring fabrics.

5. Machine to perform the procedure of any of claims 1 to 4, being of a type in which two cylinders or a cylinder and dial cooperate with cam means that actuate the needles (13) of one cylinder or of one of the cylinder or dial in correspondence with certain feeds (A) and actuate the needles (11) of the other needle bed in correspondence with other feeds (A), so as to form two products (15—17), one inside the other, means being provided to drive the needles of a connecting zone (Cc) so as to connect the two products (15—17) in a lengthwise direction and also to make a lengthwise cut (T) in the zone (Cc) in order to form the line of the crutch, the machine being characterised by including an arc of corresponding needles (11—13) in each of the two needle beds which are actuated to knit together to form such connecting zone (Cc) and being capable of being driven at least at one feed (A) so as to take the yarn alternately with needles (11—13) of one or the other needle bed in order to form rows of rib stitching, means being provided to actuate the needles of one needle bed such that they knit in the free space left by the needles of the opposite needle bed.

6. A pantyhose product or the like obtained with the procedure of any one of Claims 1 to 4, characterised by the fact that the one single-layer connection zone (Cc) formed with the needles of both beds is connected tightly to the stitches of the tubular portions (15—17) of the pantyhose product, whereby the crossed yarns (E) of the wale of stitches forming the connection zone (Cc) are overlaid on the back of such connection zone (Cc) on the outside of the pantyhose product.

Patentansprüche

1. Verfahren zur Bildung eines Strumpfhosenerzeugnisses oder dergleichen auf einer Doppelzylinder- oder Zylinder-und-Tellerstrickmaschine mit kontinuierlicher Kreisbewegungsbearbeitung, wobei zwei rohrformige Erzeugnisse (15—17) des Hosenteils auf entsprechenden Nadelbetten und mit verschiedenen Zuführungen (A) oder Garnfallen gleichzeitig gebildet werden und wobei der Hosenteil zuerst mit Teilen aus rohrformigen Material (15—17) mit einer longitudinalen Verbindungszone (Cc) gebildet wird, die anschließend der Länge nach geschnitten wird, wobei dieses Verfahren dadurch gekennzeichnet ist, daß Nadeln (11—13) der zwei Nadelbetten in der einschichtigen Verbindungszone (Cc) gleichzeitig betätigt werden, um mit einer oder mit einer Mehrzahl Zuführungen (A) oder auch mit allen Zuführungen (A) so zu bilden, daß jeder Faden in der Verbindungszone durch Nadeln sowohl des oberen Nadelbettes als auch des unteren Nadelbettes eingemascht ist, um eine Rippenmaschenstruktur durch nebeneinanderliegende gerade (MD) und linke Maschen (MR) zu bilden, wobei die Nadeln eines Nadelbettes im vom gegenüberliegenden Nadelbett freigelassenen Raum arbeitet.

2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die Struktur der Rippenmaschen des Typs 1:1 ist, d. h. mit einer geraden Masche (MD) und dann mit einer linken Masche (MR).

3. Verfahren nach den vorhergehenden Ansprüchen, dadurch gekennzeichnet, daß die Verbindungszone von zwei Rippenmaschenstreifen oder -zonen gebildet ist, die durch einen Teil (F) mit nicht eingemaschten Fäden getrennt sind, wo der Schnitt (T) erfolgt, wobei jeder Streifen von einigen Reihen abwechselnd gerader (MD) und linker Maschen (MR) gebildet ist.

4. Verfahren nach Anspruch 1 bis 3, dadurch gekennzeichnet, daß die Verbindungszone (Cc) mit einer größeren (höchstens doppelter) Zahl Reihen als die der naheliegenden Gewebe durchgeführt ist.

5. Maschine zur Durchführung des Verfahrens nach irgendeinem der Ansprüche 1 bis 4, in der zwei Zylinder oder ein Zylinder und Teller mit Nockenmitteln mitwirken, die die Nadeln (13) eines der beiden Zylinder oder eines zwischen einem Zylinder und einem Teller bei einigen Zuführungen (A) und die Nadeln (11) des anderen Nadelbettes bei anderen Zuführungen (A) betätigen, um zwei Erzeugnisse (15—17), eines im anderen, zu bilden, wobei Mittel vorgesehen sind, um die Nadeln einer Verbindungszone (Cc) so anzutreiben, daß die zwei Erzeugnisse (15—17) der Länge nach verbunden werden und um einen longitudinalen Schnitt (T) in der Zone (Cc) durchzuführen, um die Schrittlinie zu bilden, wobei die Maschine dadurch gekennzeichnet ist, daß sie einen entsprechenden Nadelbogen (11—13) in jedem der beiden Nagelbetten enthält, die betätigt werden, um diese Verbindungszone (Cc) zu bilden und die dazu geeignet sind, mindestens bei einer Zuführung (A) angetrieben zu werden, so daß sie abwechselnd mit Nadeln (11—13) des einen oder des anderen Nadelbettes den Faden fangen, um Reihen von Rippenmaschen zu bilden, wobei Mittel zur Betätigung der Nadeln eines Nadelbettes vorgesehen sind, so daß sie im von den Nadeln des gegenüberliegenden Nadelbettes freigelassenen Raum arbeiten.

6. Strumpfhosenerzeugnis oder dergleichen, das durch das Verfahren nach irgendeinem der vorhergehenden Ansprüche von 1 bis 4 erhalten wurde, dadurch gekennzeichnet, daß die einschichtige Verbindungszone (Cc), die von dem Nadeln der beiden Nagelbetten gebildet ist, mit den Maschen der rohrförmigen Teilen (15—17) des Strumpfhosenerzeugnisses eng verbunden ist, wobei die gekreuzten Fäden (E) der Maschen-

reihe, die die Verbindungszone (Cc) bildet, auf der Rückseite dieser Verbindungszone (Cc) außerhalb des Strumpfhosenerzeugnisses bedeckt sind.

Revendications

1. Procédé de formation d'un collant ou produit similaire sur une machine à tricoter à double cylindre ou à cylindre et plateau, par traitement avec mouvement de rotation continu, de sorte que l'on forme en même temps deux produits tubulaires (15, 17) de la partie de slip sur des fontures respectives et avec des chutes (A) ou descentes différentes de fil, et de sorte que l'on forme la partie de slip d'abord avec des parties de matière tubulaire (15, 17) présentant une zone de liaison longitudinale (Cc) que l'on coupe ensuite en direction longitudinale, ce procédé étant caractérisé par le fait que dans la zone de liaison à une seule couche (Cc), des aiguilles (11, 13) des deux fontures sont actionnées simultanément pour former une seule chute ou de multiples chutes (A), ou même toutes les chutes (A), de sorte que chaque fil est tricoté dans la zone de liaison par des aiguilles des deux fontures, supérieure et inférieure, pour former une structure de mailles à côte avec des mailles unies (MD) et des mailles perlées (MR) proches les unes des autres, les aiguilles d'une fonture tricotant dans l'espace libre laissé par les aiguilles de la fonture opposée.

2. Procédé selon la revendication 1, caractérisé par le fait que la structure du tricot à côte est d'un type 1:1, à savoir avec une maille unie (MD) et ensuite une maille perlée (MR).

3. Procédé selon les revendications précédentes, caractérisé par le fait que l'on forme la zone de liaison (Cc) avec deux bandes ou zones de tricot à côtes séparées par une région (F) présentant des fils non tricotés, dans laquelle on fait la coupe (T), chaque bande étant formée de quelques rangées de mailles unies (MD) et de mailles perlées (MR) alternées.

4. Procédé selon l'une des revendications 1 à 3, caractérisé par le fait que l'on forme la zone de liaison (Cc) avec un nombre de rangées plus grand (au maximum deux fois plus grand) que celui des étoffes voisines.

5. Machine pour la mise en oeuvre du procédé selon l'une quelconque des revendications 1 à 4, étant d'un type dans lequel deux cylindres ou un cylindre et un plateau coopèrant avec des moyens à came qui actionnent les aiguilles (13) d'un cylindre, ou celles du cylindre ou du plateau, à l'endroit de certaines chutes (A) et actionnent les aiguilles (11) de l'autre fonture à l'endroit d'autres chutes (A), de manière à former deux produits (15, 17), l'un à l'intérieur de l'autre, des moyens étant prévus pour entraîner les aiguilles d'une zone de liaison (Cc) de manière à relier les deux produits (15, 17) dans une direction longitudinale et aussi à faire une coupe longitudinale (T) dans la zone (Cc) afin de former la ligne d'entrejambe, la machine étant caractérisée par le fait qu'elle comprend un arc d'aiguilles correspondantes (11, 13) dans chacune des deux fontures que l'on actionne de manière à tricoter ensemble pour former cette zone de liaison (Cc) et qui sont susceptibles d'être entraînées au moins à une chute (A) de manière à prendre le fil alternativement avec des aiguilles (11, 13) de l'une ou de l'autre fonture, afin de former des rangées de tricot à côtes, des moyens étant prévus pour actionner les aiguilles de l'une des fontures de telle sorte qu'elles tricotent dans l'espace libre laissé par les aiguilles de la fonture opposée.

6. Collant ou produit similaire obtenu avec le procédé selon l'une quelconque des revendications 1 à 4, caractérisé par le fait que la zone de liaison à une seule couche (Cc) formée avec les aiguilles des deux fontures est reliée étroitement aux mailles des parties tubulaires (15, 17) du collant, de sorte que les fils croisés (E) des rangées longitudinales de mailles formant la zone de liaison (Cc) sont recouvertes sur le dos de cette zone de liaison (Cc) à l'extérieur du collant.

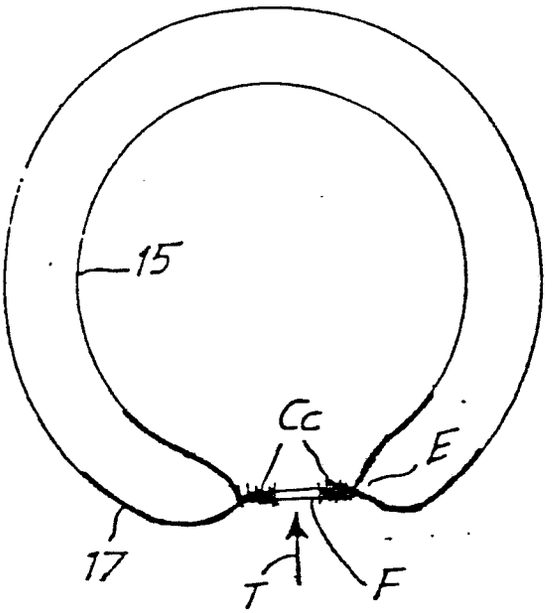


FIG 1

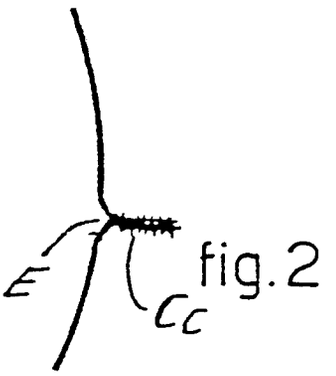


fig. 2

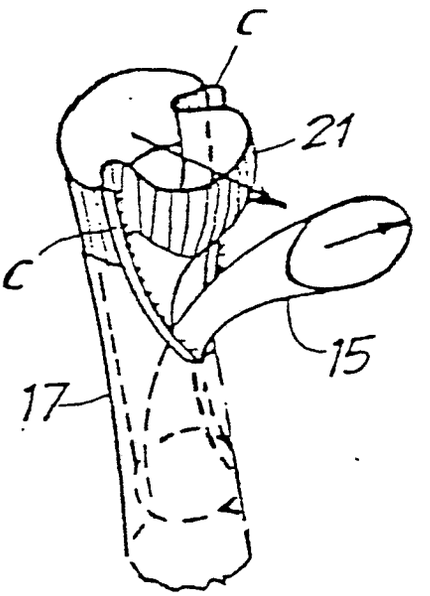


FIG.5

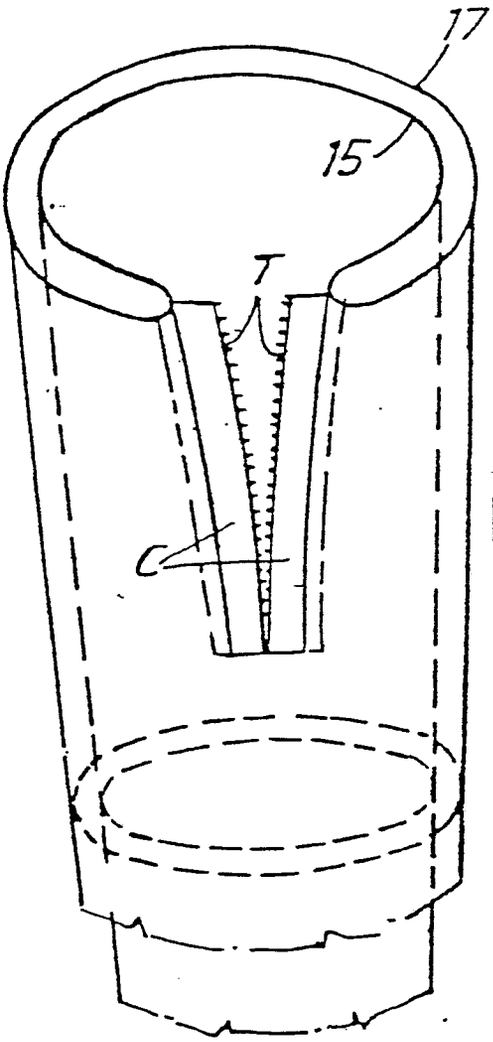


FIG.4

FIG 6

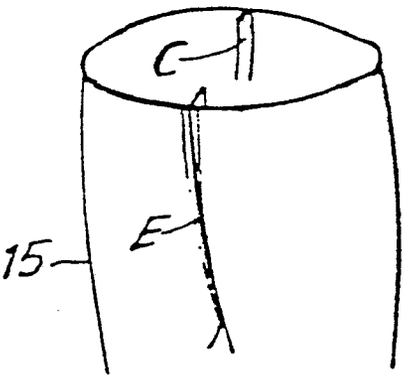


FIG.3

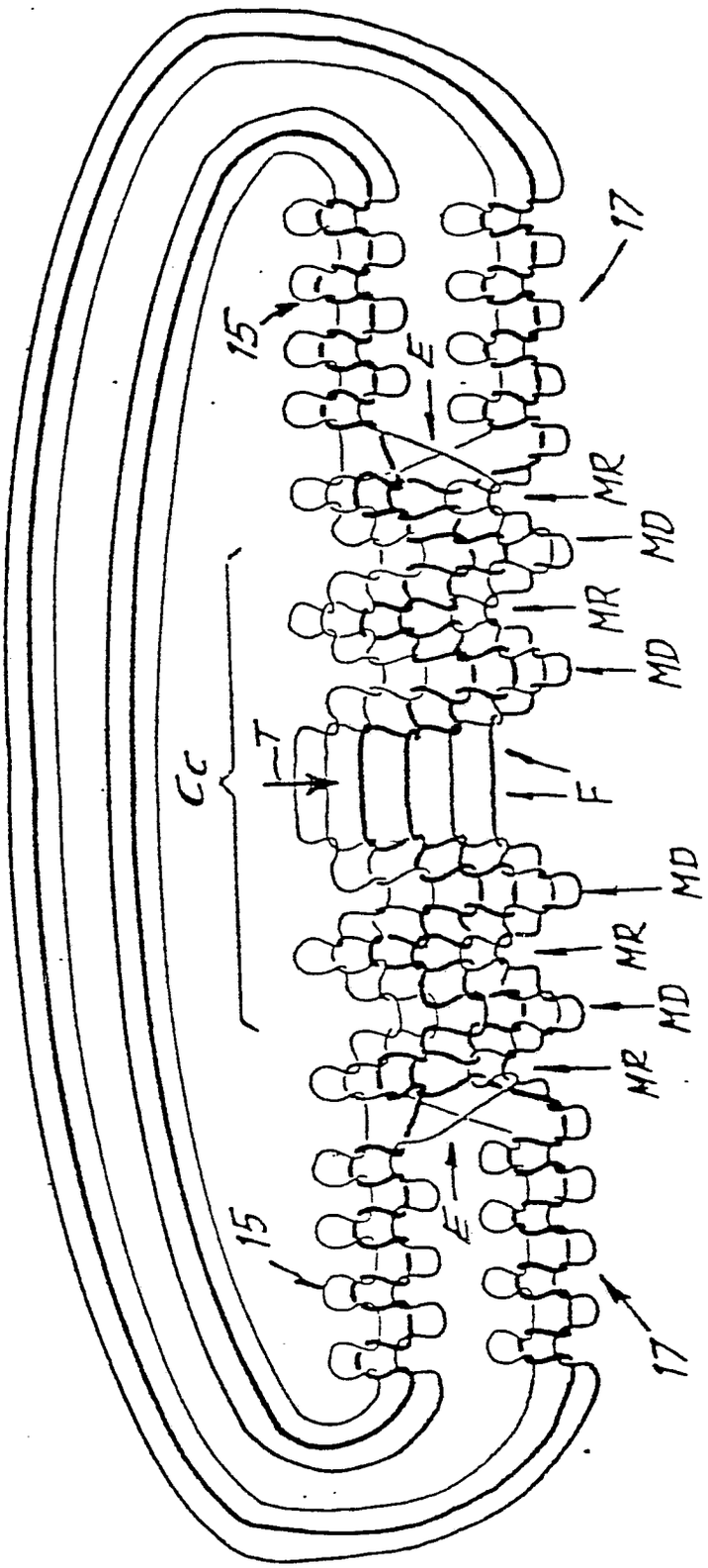


FIG 8

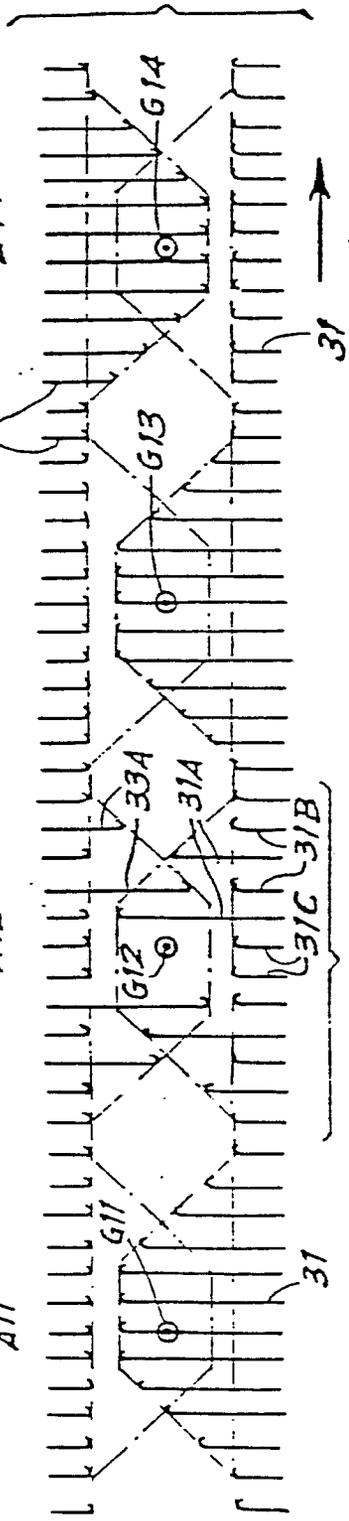
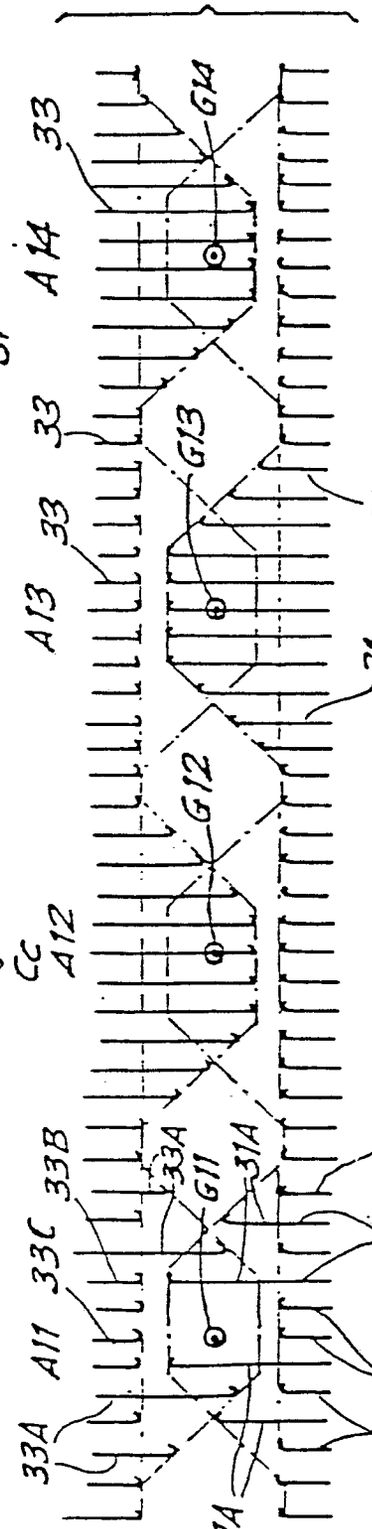

A11
A12
A13
A14
G11
G12
G13
G14
31
31A
31B
31C
33
33A
33B
33C
Cc

FIG.7


A11
A12
A13
A14
G11
G12
G13
G14
31
31A
31B
31C
33
33A
33B
33C
Cc

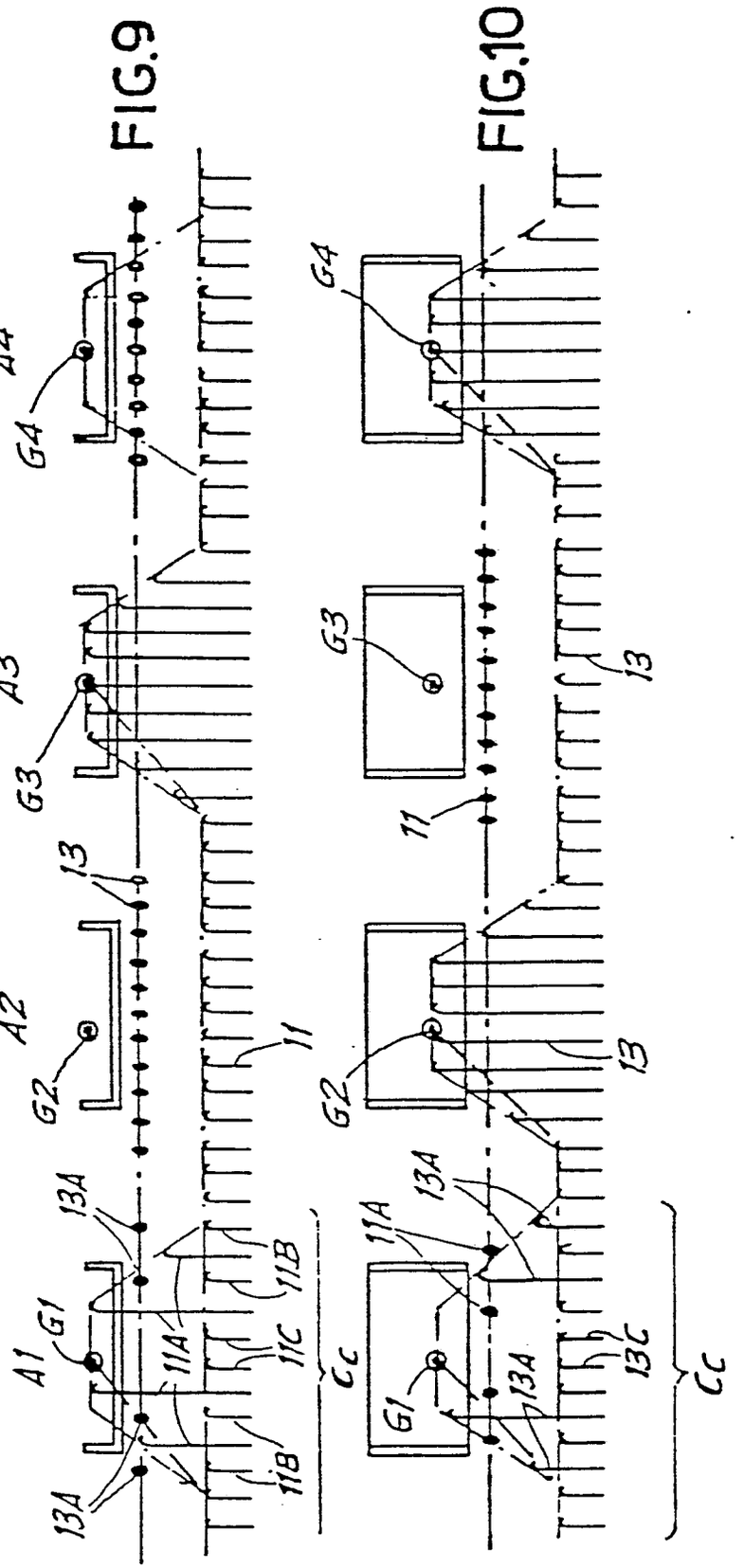

A1
G1
13A
11A
11B
11C
11B
Cc
A2
G2
13
11
A3
G3
A4
G4
13A
11A
G1
13A
13C
Cc
G2
13
11
G3
13
G4

FIG.9

FIG.10

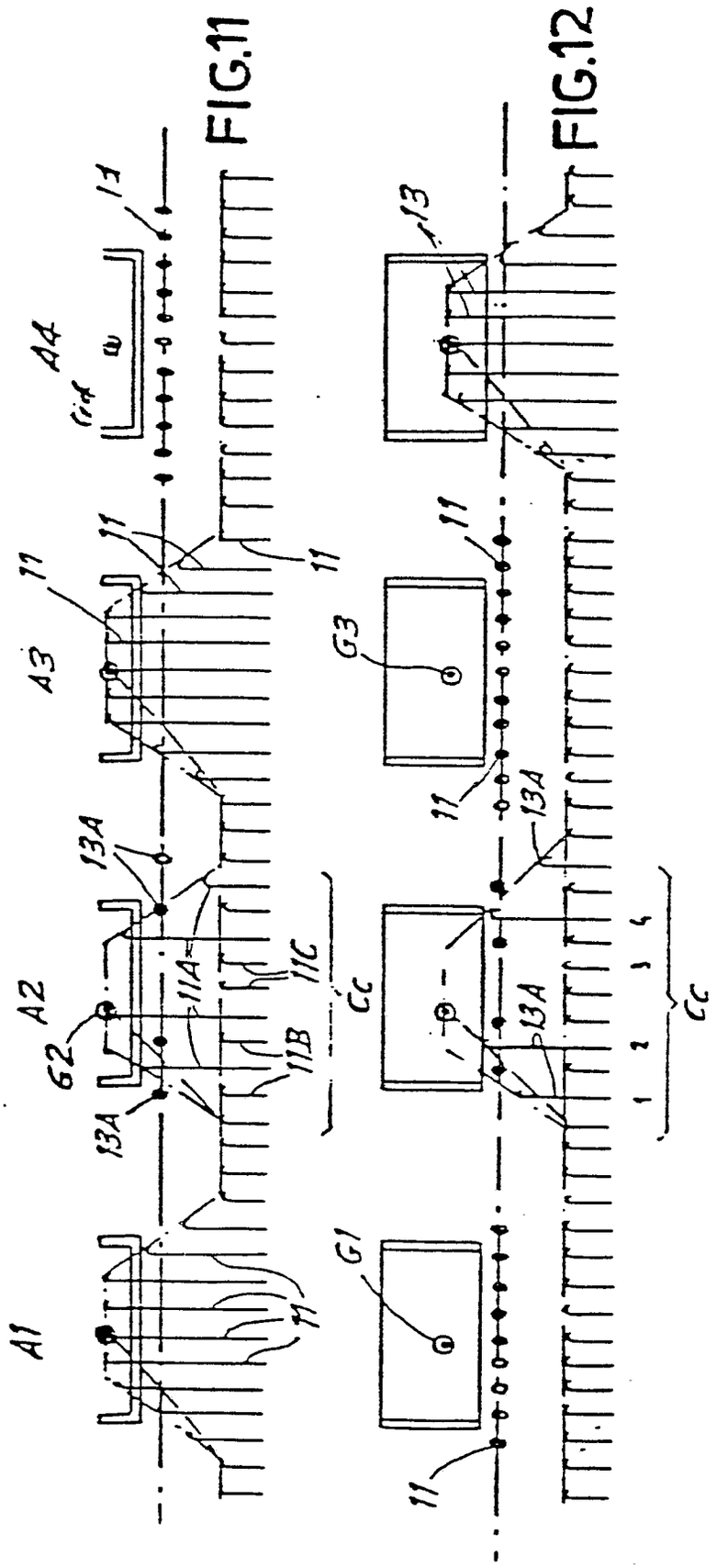


FIG.11

FIG.12