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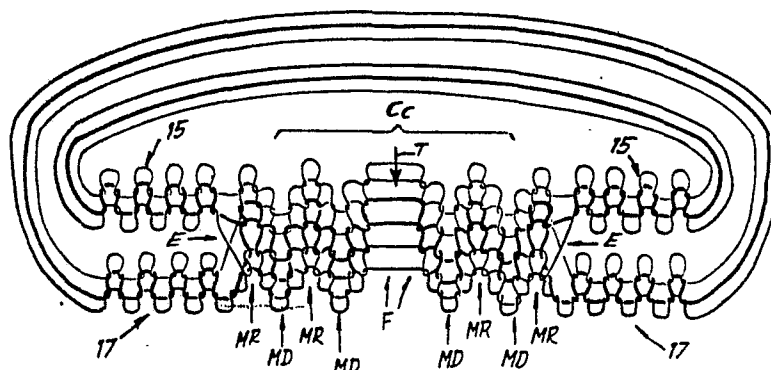
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(54) Procedure which can be carried out on circular knitting machines with two needle bars so as to form a panty-hose product or so-called "tights" with continuous-motion processing.

(57) A panty-hose product (tights) is processed on a two-needle-bar knitting machine with a continuous rotating motion so as to form two tubular product (15-17) at one and the same time with the two needle bars and with different feeds (A) or descents of yarns, whereas the panty portion is formed with a connecting zone (Cc) cut in the lengthwise direction (T); needles (11-13) of the two needle bars are activated in said connecting zone (Cc) so as to form a structure of ribbed stitching with plain (MD) and purl (MR) stitches next to each other.

FIG.3



1. Description of the industrial invention entitled:

"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"

in the name of OFFICINE SAVIO S.p.A. of Italian nationality, at 105 Via Udine, PORDENONE; submitted on the under No.

DESCRIPTION

10. The invention concerns an improved procedure by means of which a panty-hose product or the equivalent can be made directly on a machine by using circular machines which produce stockings or socks and which are of the two-cylinder type or have a cylinder and plate with radial needles but in any event have two needle bars of cooperating needles.

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

As compared to other known embodiments, the invention fulfils its purpose of ensuring greater steadfastness 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.

25. The invention is applied to a procedure for the formation

1. of a panty-hose product or the like by means of knitting
machines with two needle bars and, in particular, with op-
posed cylinders or with needles of one cylinder and radial
needles of a plate, the processing being done with a contin-
uous motion of rotation, whereby two tubular products are
formed at one and the same time with the two needle bars and
with different feeds or descents of yarns, and whereby the
panty portion is formed with parts of tubular products with
a lengthwise connecting zone cut in a lengthwise direction.
10. According to the invention, needles of the two needle bars
are activated in said connecting zone so as to form, with
one feed or a plurality of feeds or even with all the feeds,
a structure of ribbed stitching with plain stitches and
purl stitches next to each other.

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

The connecting zone can be formed of two bands, namely
zones of ribbed stitching separated by a tract having three-
ads which are not knitted, where the cut is made; each band
is formed of some rows of stitches which are alternately
20. plain and purl.

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

25. The invention also concerns a machine to carry out the
aforesaid procedure, said machine being of a type wherein
two needle bars of needles cooperate with cam-wise drive
means that activate the needles of one needle bar in corres-
pondence with some feeds and also the needles of the other
needle bar in correspondence with other feeds, so as to form
30. two products, one inside the other, whereby means are envis-
aged to drive needles of a connecting zone so as to connect
the two products lengthwise, and also to carry out a length-

1. wise cut in said zone in order to form the line of the crutch. According to the invention the machine comprises an arc of corresponding needles in both the needle bars, whereby said needles are intended to form said connecting zone and are suitable for being driven, with one or several feeds or all the feeds, so as to take the thread alternately with needles of one or the other of the needle bars in order to form rows of ribbed stitching.

A further object of the invention is a panty-hose product or the like made with the procedure and with the machine defined hereinbefore.

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

1. Figs. 11 & 12 are like Figs. 9 & 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
5. taking place by means of two sets of needles on two needle
bars.

Figs. 9 to 12 inclusive show a lay-out wherein are vi-
sualized a needle bar or bed of needles in a cylinder and
a bar or bed of radial needle hooks 13 in a plate or disk
10. 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 II take the thread, they form plain
stitches, whereas when the needles 13 take the thread, they
form purl stitches. Normally, so as to form two semi-finish-
15. ed tubular products 15 and 17 at the same time with continu-
ous motion, the needles 13 take the thread in correspondence
with the feeds A2 and A4, whereas the needles II take the
thread in correspondence with the feeds A1 and A3; the two
tubular elements having the reference numbers 15 and 17 re-
20. spectively 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
25. a tract of the lengthwise development of the two tubes of
fabric, as indicated with T in Fig. 4 and also in Fig. I,
where 15 is the reference number of the tubular fabric form-
ed inside while 17 is that of the tubular fabric formed out-
side, each of them being formed with the needles 13 or 15
of one of the needle bars. C indicates zones to connect the
30. two elements 15 and 17 separated by the cut T.

In the formation of the body of the product the connect-
ing zone Cc is made, typically, by processing simultaneously

1. with a group of needles II and with a group of needles 13
structures of fabric with ribbed stitching, whereby needles
II and needles 13 are activated at the same time in corre-
spondence with one feed or several or, better still, all the
5. feeds A1, A2, A3, A4. A lay-out of this kind is given in
Figs. 9, 10 and 11, 12, which show two moments in the forma-
tion of the connecting zones of fabric Cc respectively in
front of the feed A1 and feed A2 of a cylinder-and-plate
complex with needles.

10. Figs. 9 and 10 show the momentary condition in which the
needles pass before the feed A1 which are pre-set to form
the zone Cc; therefore, at that moment not all the needles
II are raised, nor are all the needles 13 kept inside, but
rather in front of said feed A1 (which usually serves for
15. the formation of the product with the needles II), out of
all the needles II, only those indicated with IIA (two pairs
in the table) are raised, while the needles marked IIB and
also the two middle needles IIC are kept low; furthermore,
in that situation the needles 13 of the plate indicated with
20. 13A, which correspond with the unraised needles IIB, 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 II come out (to form the fabric 17).

Let us now consider the moment shown in Figs. 11 and 12
25. and observe that only the needles II 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 IIA, IIB,
IIC, and 13A, which are once more selected, as already said
30. 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

1. 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 fulfil the invention in the case of a machine with two opposed cylinders. 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 thread, 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 thread, 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, 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 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,

1. namely with a structure of ribbed stitching; in this way, .
beginning from the peripheral zones indicated with E, stit-
ches are formed with the threads of one product 15 together.
with stitches of threads forming the other product 17. In a
5. central zone marked F (and formed through the lack of activ-
ity of the needles 11C and 31C, 33C) there can be an absence
of stitches as none of the needles (11C and the correspond-
ing 13C) is driven to take the thread and form the stitch. .

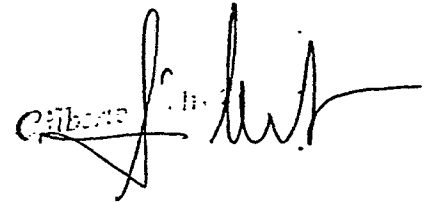
The cut indicated with the arrows T is made in this cen-
10. tral zone F; said cut can be performed in any suitable way, .
for instance with heat applied by a resistance that melts the
yarn, or with cutting devices with blades activated in a .
timely manner, or with elements sliding in the needle seat-
ings and equipped with a blade or other cutting edge caused.
15 to operate when said element is raised, the solution being .
analogous to that of the needles: Thus, the cut can be car-
ried out directly on the machine, whereby the product reach-
es the situation shown in Fig. 4 with one of the tubes 17-15
inserted in the other, for in that condition they are seen as
20 they are formed by the two needle beds or needle bars II and
13.

Having been separated, the product is then spread apart, .
with the fabric 15 bent outwards from the fabric 17 and turn-
ed over, as shown in Fig. 5, so as to reach the situation of
Fig. 6, wherein the connecting zones C, like the so-called
25 "runs" at the end of working, are inside the product. In the
zones C there is a steadfast 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
30 fabric in the zones C consists, as said earlier, of ribbed
stitching and of yarns belonging alternately to one or the
other of the tubular fabrics 15 and 17. For the most part

1. the number of courses in the zones C is twice as many as the
2. number of courses in each of the fabrics 15 and 17 within
3. the same unit of length; this ensures a very effective con-
4. necting structure. From an aesthetic point of view the pro-
5. duct takes on an appearance better than that obtained with
6. products envisaged hitherto in previous solutions.

7. It is to be understood that the figures show only one
8. example, which is given as a practical demonstration of the
9. invention, but the invention can be varied as regards forms.
10. and lay-outs without departing thereby from the scope of
11. the concept which inspires the invention itself. Obviously
12. there is no limit to the length of the connecting zones or,
13. therefore, to the vertical development of the body of the
14. product.

15. It should be noted that, as said earlier, the connect-
16. ions can be made with all the feeds or with a reduced num-
17. ber of feeds. If we consider the case of four feeds A1-A2-
18. A3-A4, the use of all these feeds to make the connection
19. enables the cross-wise stresses to be reduced, as the connect
20. ing zone will thus have a number of courses twice as great
21. as the number of courses in the neighbouring fabrics; a con-
22. nection made with only two feeds is performed with the same
23. number of courses as that of the neighbouring fabrics and
24. permits a given mechanical simplification.

25. 

C L A I M S

1. Procedure to form a panty-hose product or the like on a knitting machine with two needle bars and, in particular, with opposed cylinders or with needles (11) of a cylinder and radial needles (13) of a plate, by processing with continuous rotating motion, whereby two tubular products (15-17) are formed at one and the same time with the two needle bars and with different feeds (A) or descents of yarn, and whereby the panty portion is formed with parts of tubular material (15-17) with a lengthwise connecting zone (Cc) cut in a lengthwise direction, said procedure being characterised by the fact that in said connecting zone (Cc) needles (11-13) of the two needle bars are activated to form with one feed or a plurality of feeds (A) or even with all the feeds (A) a ribbed stitching structure with plain stitches (MD) and purl stitches (MR) next to each other.
2. Procedure, as in Claim 1, characterised by the fact that the structure of the ribbed stitching is of a I : I type, namely with one plain stitch (MD) and then one purl stitch (MR).
3. Procedure, as in the Claims hereinbefore, characterised by the fact that the connecting zone (Cc) is formed of two bands or zones of ribbed stitching separated by a tract (F) having threads not knitted, wherein the cut (T) is made, whereby each band is formed of some rows of alternate plain (MD) and purl (MR) stitches.
4. Procedure as in Claims 1 to 3 inclusive, characterised by the fact that the connecting zone (Cc) is made with a number of courses greater (at least twice as many) than that of the neighbouring fabrics.
5. Procedure as described and shown.
6. Machine to perform the procedure of the Claims hereinbefore, being of the type wherein two needle bars of needles

Gilbert Pérez

1. (11-13) cooperate with cam-wise drive means that activate the
needles (13) of one needle field in correspondence with cer-
tain feeds (A) and activate the needles (11) of the other
needle field in correspondence with other feeds (A), so as
5. to form two products (15-17), one inside the other, whereby
means are envisaged to drive the needles of a connecting zone
(Cc) so as to connect the two products (15-17) in a length-
wise direction and also to make a lengthwise cut (T) in said
zone (Cc) in order to form the line of the crutch, said ma-
10. chine being characterised by including an arc of correspond-
ing needles (11-13) in each of the two needle bars, said
needles being intended to form said connecting zone (Cc) and
being capable of being driven at one or more feeds or all the
feeds (A) so as to take the thread alternately with needles
15. (11-13) of one or the other needle bar in order to form rows
of ribbed stitching.
7. Machine as described and shown.
8. Panty-hose product or the like, made in the way described
and shown.

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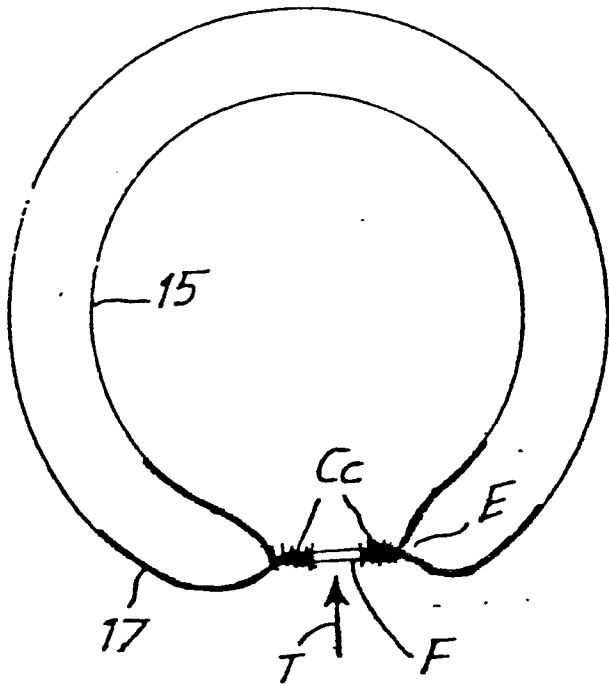


FIG 1

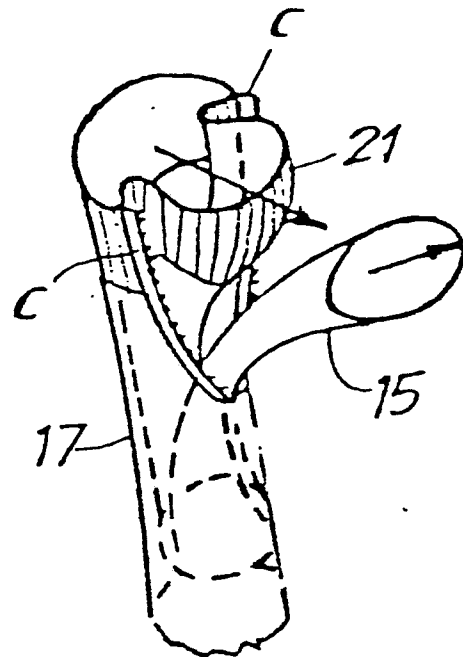
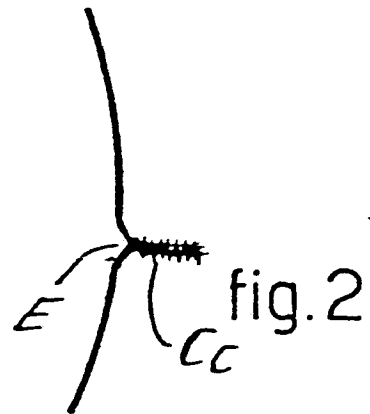


FIG.5

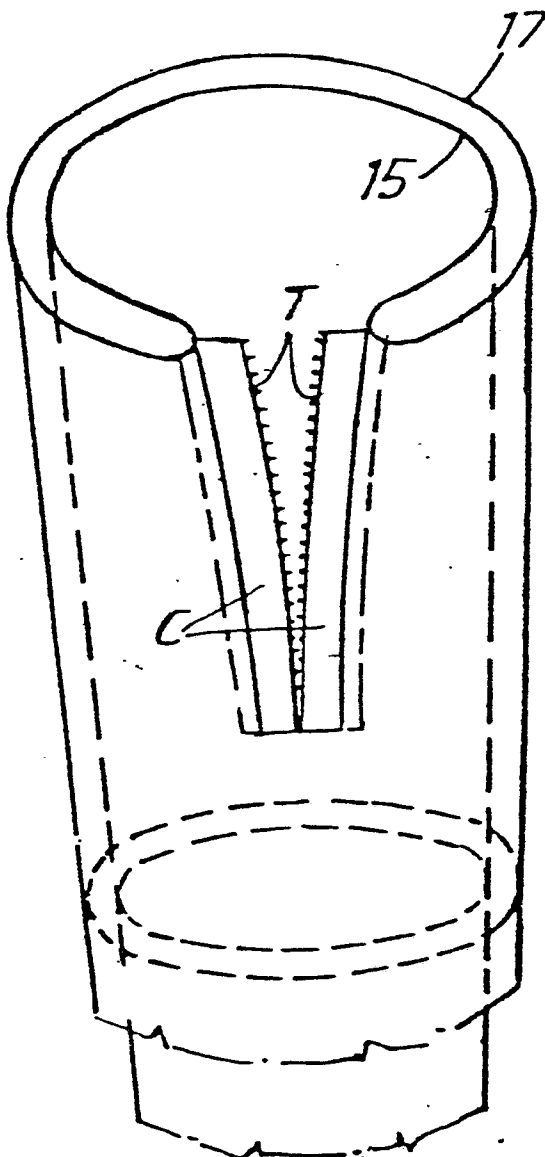


FIG.4

FIG 6

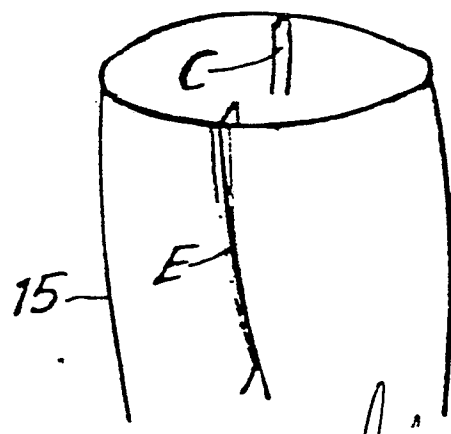
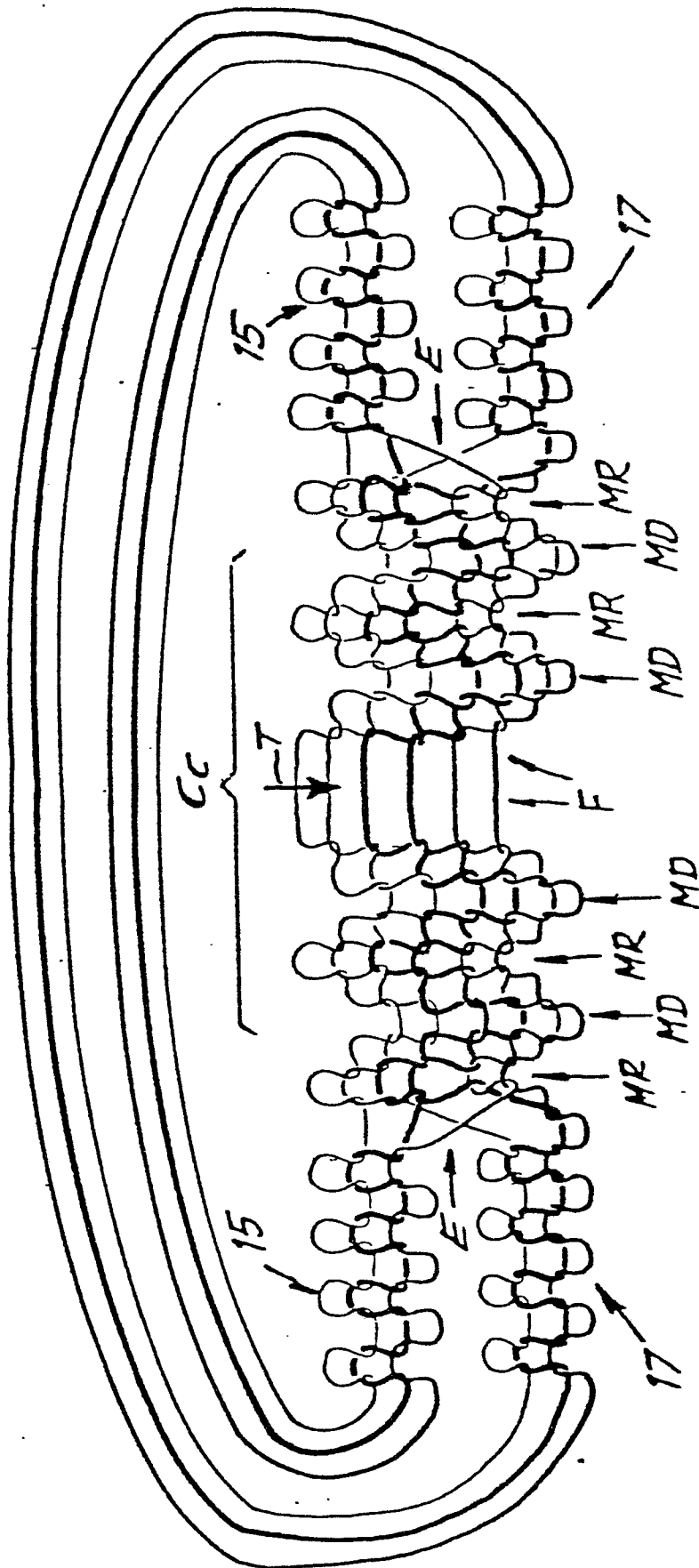
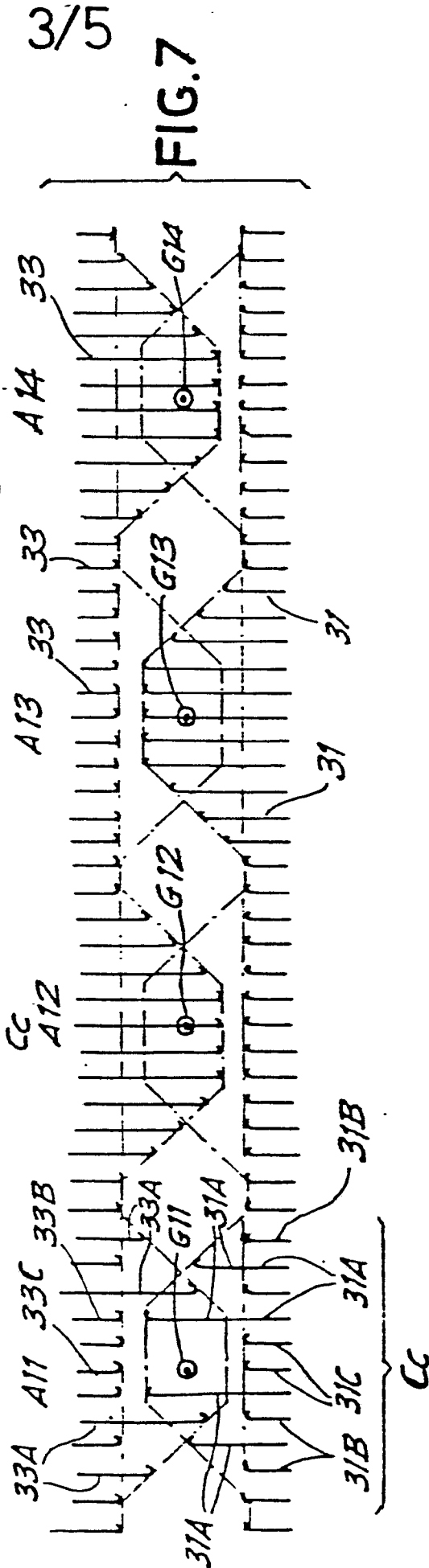
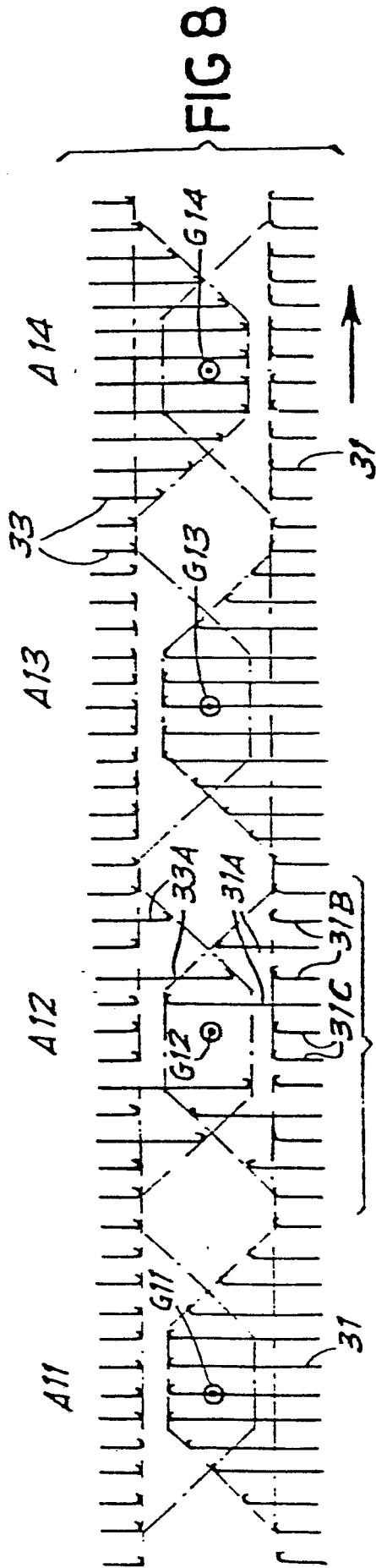


FIG. 3

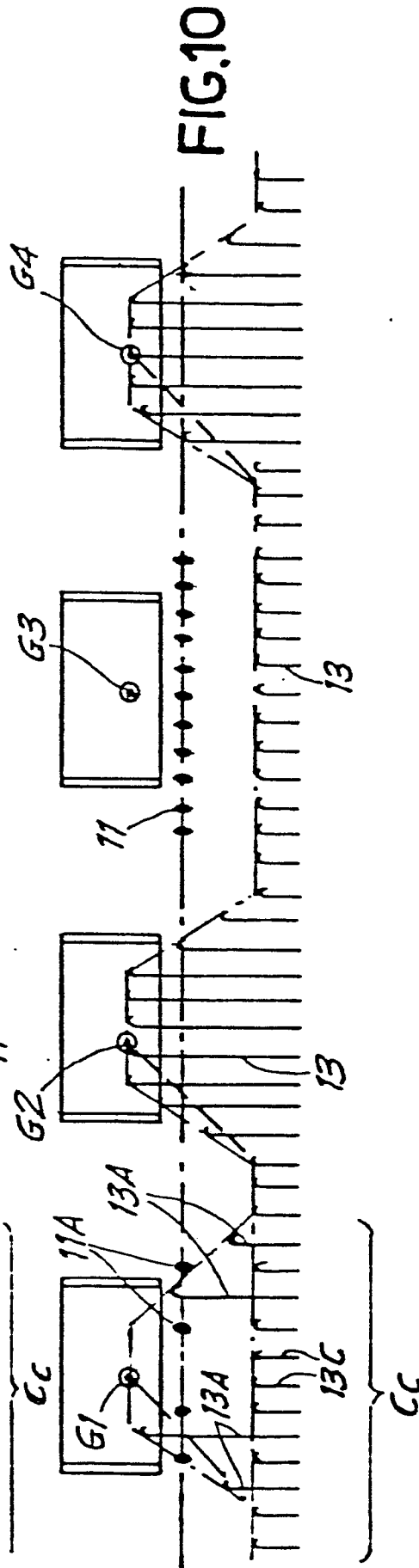
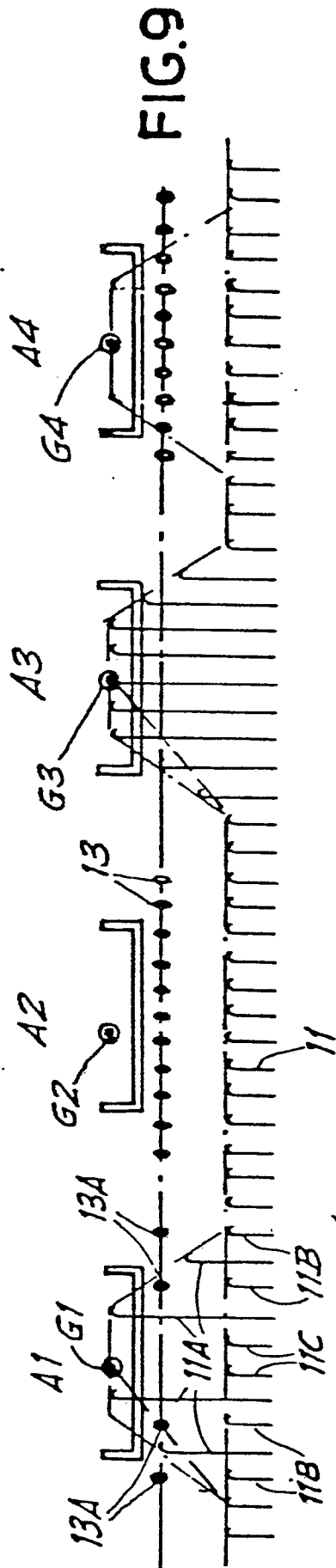


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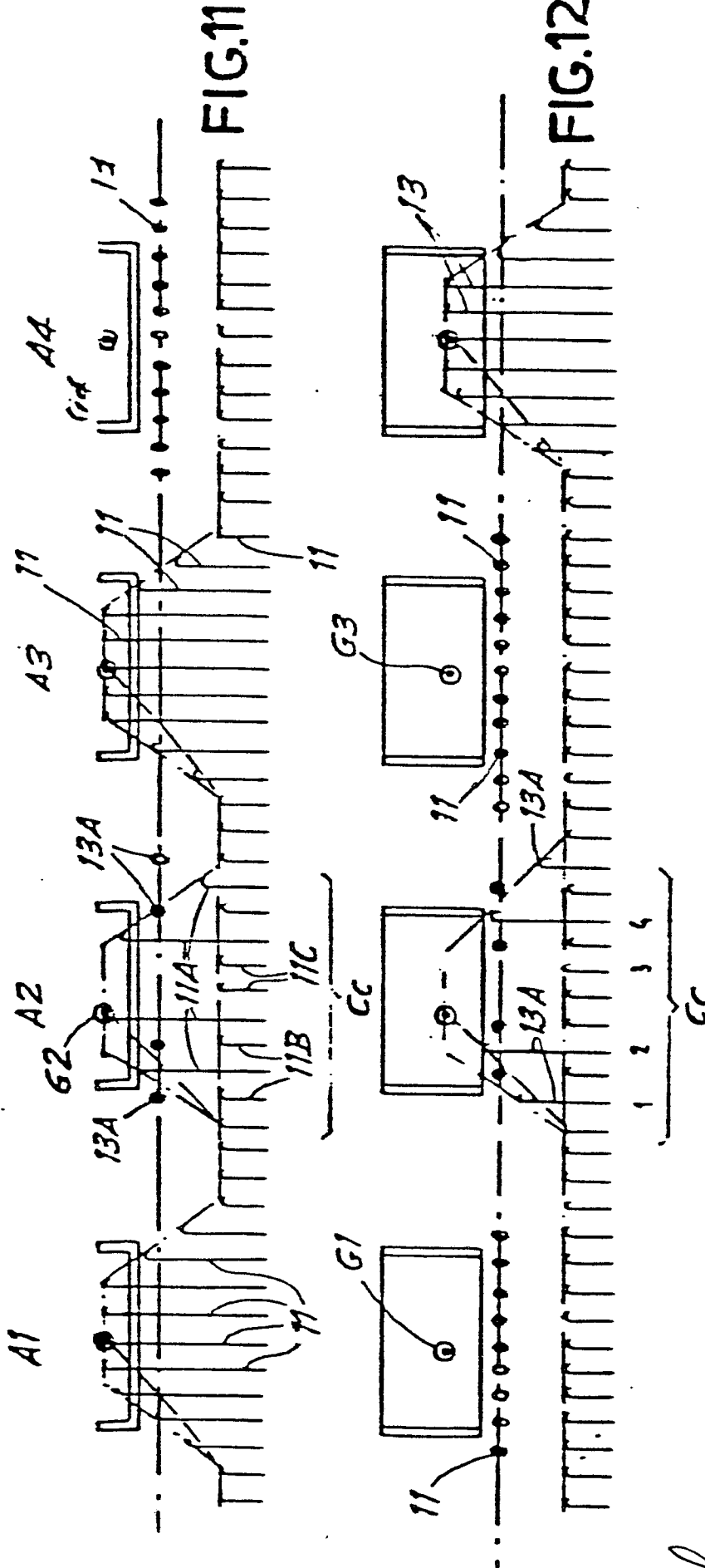


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EUROPEAN SEARCH REPORT

0046737
Application number
EP 81 83 0142

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
	US - A - 3 975 924 (FURIA) * Column 4, lines 12-19; column 4, line 53 - column 5, line 2; figures 1-13 *	1,4,5,8	D 04 B 1/24
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	GB - A - 2 006 288 (COURTAULDS) * Page 3, lines 12-18; figure 1 *	1,2	
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A	US - A - 4 011 738 (FURIA) * The whole document *	1	TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
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A	FR - A - 2 109 710 (SOLIS) * The whole document *	1	D 04 B

			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
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The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
The Hague	12-11-1981	V. GELDER	