

(19)



(11)

EP 2 530 196 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

05.12.2012 Bulletin 2012/49

(51) Int Cl.:

D04B 1/22 (2006.01)

(21) Application number: **12003834.4**

(22) Date of filing: **15.05.2012**

(84) Designated Contracting States:

**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**

Designated Extension States:

BA ME

(30) Priority: **02.06.2011 JP 2011123962**

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(54) **Knitting method of knitted fabric with hole and knitted fabric**

(57) To provide a knitted fabric with a hole in which the knitting yarn is less likely to break.

Stitches are knitted only for a hole forming portion so that a wale direction of a stitch row is folded back near a middle of the hole forming portion, and a hole (3) is formed while being sandwiched by the hole forming portion. A pickup stitch is formed while moving toward an

exterior side of the knitted fabric of a side end portion (5) of the knitted fabric (1), the hole forming portion is knitted at the same position, and thereafter, it is folded back and returned to the original position while repeating the formation of the double stitches and the knitting by the movement toward an interior of the knitted fabric.

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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a knitting method of a knitted fabric with a hole, and the knitted fabric.

Description of the Related Art

[0002] Conventionally, a hole is simultaneously knitted while knitting a knitted fabric using a flat knitting machine. A buttonhole is known to use a hole. For instance, Patent Document 1 shows a knitted fabric with a buttonhole of a lateral hole, and a knitting method thereof. A buttonhole of a longitudinal hole also exists. A knitted fabric 30 shown in Fig. 9 is branched into two at a lower end portion 32 of a buttonhole 33, and return knitting is carried out with different knitting yarns respectively with such a branched point as a boundary. After a hole of a size that matches the button is formed, the adjacent stitches are overlapped and joined at an upper end portion 34 of the buttonhole 33.

PRIOR ART DOCUMENT

PATENT DOCUMENT

[0003] [Patent Document 1] Japanese Patent Publication No. 2573101

SUMMARY OF THE INVENTION

[0004] However, in such a buttonhole 33, forces applied on the lower end portion 32 and the upper end portion 34 of the buttonhole 33, and the stitches at both ends thereof overlap when buttoning and unbuttoning are repeated, which may cause a yarn breakage from the force of pulling outward when wearing. Such a yarn breakage is a problem caused by lack of strength, and may occur not only with the buttonhole but also when the hole is used for inserting a belt, string, or the like.

[0005] The present invention has been made in view of the above circumstances and an object of the present invention is to provide a knitting method of a knitted fabric with a hole in which a force applied on the stitches positioned at the peripheral edge of the hole is distributed so that the knitting yarn is less likely to break, and the knitted fabric.

[0006] The present invention relates to a knitting method of a knitted fabric with a hole using a flat knitting machine including at least a pair of front and back needle beds and in which stitches are transferrable, the hole including a hole forming portion in which a periphery of the hole is formed with a stitch row including at least one or more wales; the knitting method including:

step 1 of repeatedly carrying out moving of the hole forming portion in a lateral direction and forming of a widening stitch on a side opposite to the moving direction and a new stitch row following a stitch row of the moved hole forming portion to form a starting end of the hole forming portion;

step 2 of repeatedly forming a stitch row of the hole forming portion following the step 1; and

step 3 of repeatedly carrying out forming of a double stitch with the widening stitch formed in the step 1 while moving the hole forming portion in a direction opposite to the moving direction in the step 1 and forming of a new stitch row following the moved stitch row to join the starting end and a terminating end of the hole forming portion while forming the terminating end of the hole forming portion.

[0007] In the present invention, flechage knitting is sequentially carried out before the step 1 and after the step 3 so that a stitch row of the starting end and the terminating end of the hole forming portion inclines.

[0008] In the present invention, the steps 1 to 3 are performed after the step 2 and before the step 3 to form a plurality of holes, the starting end and the terminating end of the hole forming portion being joined at a plurality of areas to form the hole.

[0009] A knitted fabric of the present invention relates to a knitted fabric with a hole knitted in a seamless manner using a flat knitting machine including at least a pair of front and back needle beds and in which stitches are transferrable, wherein a periphery of the hole is formed using a hole forming portion formed with a stitch row including at least one or more wales, the hole forming portion continued in a wale direction being folded back at a substantially intermediate position, the hole forming portion facing each other with the hole in between having a wale direction of the stitch row in opposite directions and having a starting end formed by a widening stitch and a terminating end formed by a stitch of the opposing hole forming portions joined other than at the hole.

[0010] According to the present invention, the hole forming portion forming the periphery of the hole has stronger strength since the force is distributed when the pulling force is applied on the stitches at the peripheral edge of the hole since the starting end and the terminating end thereof are joined while forming a plurality of double stitches.

[0011] According to the present invention, the flechage knitting is sequentially carried out on the stitch row continuing to the starting end and the terminating end of the hole forming portion, so that the hole forming portion branched from the knitted fabric is smoothly bent and protrusions of the stitches can be prevented.

[0012] Furthermore, according to the present invention, two or more holes can be lined in the knitted fabric projected out from the side end portion of the knitted fabric. The buttonhole of a new design can be formed, and use can also be made to insert a belt, string, or the like.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013]

Fig. 1 is a schematic diagram of a knitted fabric 1 with a hole shown as embodiment 1 of the present invention;

Fig. 2 is a knitting diagram of the knitted fabric 1 with the hole shown as embodiment 1 of the present invention;

Fig. 3 is a knitting diagram of the knitted fabric 1 with the hole shown as embodiment 1 of the present invention, following Fig. 2;

Fig. 4 is a knitting diagram of the knitted fabric 1 with the hole shown as embodiment 1 of the present invention, following Fig. 3;

Fig. 5 is a schematic diagram of a knitted fabric 10 with a hole shown as embodiment 2 of the present invention;

Fig. 6 is a knitting diagram of the knitted fabric 10 with the hole shown as embodiment 2 of the present invention;

Fig. 7 is a schematic diagram of a knitted fabric 20 with a hole shown as embodiment 3 of the present invention;

Fig. 8 is a knitting schematic diagram of the knitted fabric 20 with the hole shown as embodiment 3 of the present invention; and

Fig. 9 is a schematic diagram of a knitted fabric 30 with a conventional buttonhole.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0014] A knitted fabric with a hole according to embodiments 1 to 3 of the present invention will be hereinafter described. A flat knitting machine used for the knitting is a two-bed flat knitting machine including a pair of front and back needle beds, and performs knitting using every other needles. Although not illustrated, a hole can be formed in a cardigan serving as a tubular knitted fabric. An empty needle may not be set and successive knitting needles may be used to perform the knitting in the case of a single layer knitted fabric. The flat knitting machine also includes a plurality of yarn feeders on the upper side of the needle beds, where the back needle bed is capable of being racked with respect to the front needle bed. The knitted fabric to be knitted is assumed to be entirely made of plain stitches, and the number of needles shown in the knitting diagram is less than that in the actual knitting for the sake of convenience of explanation. The knitted fabric may, of course, be knitted using structures other than plain stitches. Holes 3, 13, 23 shown in the present embodiment are buttonholes, but may be applied as holes for inserting a belt, a string-like fashion item, or the like.

[0015] The knitting diagrams of Figs. 2 to 4, and Fig. 6, to be described later, are shown with the following contents. "S(T) + number" in the left column in the draw-

ing indicates a step number. A to S in the right column in the drawing indicate knitting needles of a front needle bed (hereinafter referred to as FB) and a to s indicate knitting needles of a back needle bed (hereinafter referred to as BB), ○ indicates an old stitch, • indicates a new stitch knitted in each step, ⊙ indicates double stitches, and V-letter indicates a pickup stitch or a tuck stitch, where the portion subjected to the knitting operation in each knitting step is shown with a solid line. Furthermore, the arrow in the left and right direction in the middle column in the drawing indicates a knitting direction, the arrow in the up, down, and diagonal direction indicates performing transfer, and the operation on the lower side in the plane of drawing is carried out first. With respect to the arrow in which up, down, and diagonal directions are combined, the steps in the middle are omitted.

[0016] Fig. 1 is a schematic diagram of a knitted fabric 1 with a hole 3 shown as embodiment 1. The knitted fabric 1 with the hole 3 of the present embodiment is knitted in a direction shown with an arrow from the lower side to the upper side in the drawing. A hole forming portion 1a branched from a side end portion 5 on the right side of the knitted fabric 1 is projected out to the exterior of the knitted fabric and then folded back. The hole forming portion 1a formed by a stitch row including at least one or more wales has the wale directions of the stitches opposing with the hole 3 in between as reverse directions. Other than at the hole 3, a starting end 8 and a terminating end 9 of the hole forming portion 1a that oppose each other are joined with a pickup stitch, to become a widening stitch, at a stitch. The widening stitch may be a pickup stitch or a stitch formed by split knitting or twist knitting. The hole forming portion 1a is folded back and joined at a plurality of areas, so that the force is distributed and the strength is increased even when the pulling force is applied on the hole 3.

[0017] The hole forming portion 1a shown in Fig. 1 has a shape projecting out to the exterior of the knitted fabric as a great number of stitches is knitted alone while the knitting of the stitches other than of the hole forming portion 1a is in pause, as shown with the number of arrows. The hole forming portion 1a is folded back near the middle in the wale direction, and the hole 3 has a shape of being sandwiched by the hole forming portion 1a formed with the stitch row including at least one or more wales.

[0018] The knitting steps of the knitted fabric 1 will now be described with the knitting diagrams of Figs. 2 to 4. In the drawing, the position of the side end portion 5 of the knitted fabric 1 is shown with a solid line. In the steps of S1 to S6, to be described later, the stitch row of before forming the starting end 8 of the hole forming portion 1a by flechage knitting is inclined so that the bend of the stitch row to be formed continuously is made smooth to suppress the protrusions of the stitches. S0 in Fig. 2 shows the knitting of a knitted fabric 1b of before forming the starting end 8 of the hole forming portion 1a, where stitches are formed on the knitting needles K, I, G, E, C, A of the FB.

[0019] In S1, a yarn feeder is moved in the rightward direction in the plane of drawing, and stitches are formed on the knitting needles A, C, E, G of the FB. In S2, a tuck stitch is formed on the knitting needle K of the FB, and stitches are formed on the knitting needles I, G, E, C, A. In S3, stitches are formed on the knitting needles A, C, E of the FB. Furthermore, in S4, the tuck stitch is formed on the knitting needle I of the FB and the stitches are formed on the knitting needles G, E, C, A in the leftward direction. After performing the knitting similar to S3 and S4 one time each, the stitch is formed on the knitting needle A of the FB in S5. Furthermore, in S6, a tuck stitch is formed on the knitting needle E of the FB and the stitches are formed on the knitting needles C, A in the leftward direction.

[0020] An inclined portion 7a in which the stitches are gradually reduced through steps S1 to S6 is shown in the knitted fabric 1 of Fig. 1. Although not shown in the knitting diagram, an inclined portion 7b is formed through flechage knitting in the knitted fabric 1 after forming the terminating end 9 of the hole forming portion 1a. The inclined portion 7b in which the stitches are gradually increased (after S21 to be described later) is formed symmetric to the inclined portion 7a. Similar to the inclined portion 7a, the inclined portion 7b makes the bend of the stitch rows to be formed continuously smooth to suppress the protrusions of the stitches.

[0021] In S7 of Fig. 3, the stitches are formed on the knitting needles A, C, E, G, I, and K of the FB. A stitch is also formed on the tuck stitch formed from S2 in this knitting. In S8, the stitches held on the knitting needles G, K of the FB are transferred to the knitting needles g, k of the BB, and then the stitches are formed on the knitting needles k, g of the BB and the knitting needle E of the FB in the leftward direction. After S8, the knitting of the knitted fabric 1b excluding the hole forming portion 1a is paused near the side end portion 5 of the knitted fabric 1, and the knitting of the hole forming portion 1a alone is continued. In S9, the tuck stitch is formed on the knitting needle C of the FB and the stitches are formed on the knitting needles E, I. A tubular structure is formed in S8 and S9. In S7, the stitches are formed on the knitting needles C, E, G, I, K of the FB to form the hole forming portion 1a with the stitch row including a wale of five stitches, but merely needs to be one or more stitches and not limited to five stitches. If the number of stitches is few, three or more widening stitches, to be described later, are preferably formed to increase the strength.

[0022] In S10, the stitches held on the knitting needles E, I of the FB are transferred to the knitting needles G, K of the FB and the stitches held on the knitting needles g, k of the BB are transferred to the knitting needles i, m of the BB, and thereafter the stitches are formed on the knitting needles m, i of the BB and the knitting needle G of the FB in the leftward direction. In S11, a pickup stitch to become the widening stitch is formed on the knitting needle E of the FB on the side opposite to the moving direction in S10, and the stitches are formed on the knit-

ting needles G, K for holding the moved stitches. The stitch row configuring the hole forming portion 1a is moved toward the lateral direction, and a pickup stitch is formed on an empty needle formed by the movement and a new stitch row is formed following the moved stitch row. Thereafter, the knitting of S10 and S11 is repeated two times, where S12 shows the state after the repeated knitting. In S12, a pickup stitch is formed on the knitting needle I of the FB and the stitches are formed on the knitting needles K, O. The pickup stitches formed from S11 become three widening stitches worth the number of movements. The widening stitch to form is not limited to three, and merely needs to be two or more. The force becomes more distributed and the strength becomes stronger as the number of widening stitches increases.

[0023] In S13, the stitches are formed on the knitting needles q, m of the BB. In S14, the stitches are formed on the knitting needles K, O of the FB. In the knitting of S13 and S14, the stitch row configuring the hole forming portion 1a is knitted. The strength is increased by forming the tubular structure, and a satisfactory appearance is also realized as it can be seen similarly from both sides. The size of the hole 3 is adjusted by the number of times to repeat the steps of S13 and S14, where the steps are repeated ten times herein. The hole 3 projecting out to the exterior of the knitted fabric from the side end portion 5 of the hole forming portion 1a is formed.

[0024] In S15 of Fig. 4, the stitches held on the knitting needles K, O of the FB are transferred to the knitting needles I, M of the FB, and the stitches held on the knitting needles m, q of the BB are transferred to the knitting needles k, o of the BB. The double stitches including the pickup stitch and the stitch are formed on the knitting needle I of the FB by such transfer. It is moved in the direction opposite to when the starting end 8 of the hole forming portion 1a is formed, and is joined with the starting end 8 of the hole forming portion 1a by the widening stitch while forming the terminating end 9 of the hole forming portion 1a. In S16, the stitches are formed on the knitting needles o, k of the BB and the knitting needle I of the FB in the leftward direction. One part of the starting end 8 and the terminating end 9 of the hole forming portion 1a are joined. In S17, the stitches are formed on the knitting needles I, M of the FB. The knitting similar to S15 to S17 is repeated one time, and the formation of the double stitches and the joining are performed.

[0025] In S18, the stitches held on the knitting needles G, K of the FB are transferred to the knitting needles E, I of the FB, and the stitches held on the knitting needles i, m of the BB are transferred to the knitting needles g, k of the BB. The double stitches including the pickup stitch and the stitch are formed on the knitting needle E of the FB. In S19, the stitches are formed on the knitting needles k, g of the BB and the knitting needle E of the FB in the leftward direction. In S20, the stitches are formed on the knitting needles E, I of the FB. In S21, the stitches held on the knitting needles g, k of the BB are transferred to the knitting needles G, K of the FB, and thereafter the

stitches are formed on the knitting needles K, I, G, E, C, A of the FB.

[0026] In S10 to S12, the starting end 8 of the hole forming portion 1a is formed. The stitch row configuring the hole forming portion 1a forms the widening stitch and the stitch while moving toward the lateral direction to the exterior side of the knitted fabric of the side end portion 5 of the knitted fabric 1. The stitch row of the peripheral edge portion of the hole 3 is formed by repeating S13 and S14. Furthermore, in S15 to S20, the hole forming portion 1a is folded back, and the movement and the knitting toward the interior of the knitted fabric are repeated. The hole forming portion 1a is returned to the original position while forming the terminating end 9, and the terminating end 9 is joined with the starting end 8 to form the hole 3.

[0027] Fig. 5 is a schematic diagram of a knitted fabric 10 with a hole 13 shown as embodiment 2 of the present invention. Fig. 6 is a knitting diagram of the knitted fabric 10 with the hole 13 shown as embodiment 2 of the present invention. The knitting method of the knitted fabric 10 in which positions of a starting end 18 of a hole forming portion 11a and the hole 13 are further on the interior side than embodiment 1 will be described with reference to Fig. 5 and Fig. 6. In embodiment 1, the hole 3 is formed from the position where the hole forming portion 1a is adjacent to the side end portion 5 shown in Fig. 1. In embodiment 2, however, the hole forming portion 11a forms the starting end 18 from the position on the interior side of a knitted fabric 10b adjacent to the side end portion 15 to form the hole 13.

[0028] The hole forming portion 11a in embodiment 2 is moved toward the exterior side of the knitted fabric while forming and joining a terminating stitch 14 of the knitted fabric 10b on the side end portion 15 side and the double stitches. Similarly with embodiment 1, when forming a stitch row of the peripheral edge portion of the hole 13 and then folding back to return back to the original position, a widening stitch to continue to a starting stitch 17 of a knitted fabric 10c adjacent to the side end portion 15 is formed. The starting end 18 and the terminating end 19 of the hole forming portion 11a may start to be joined from the interior side of the knitted fabric, and the hole 13 can be easily formed on the interior side of the knitted fabric 10, as shown in Fig. 5.

[0029] In the knitting diagram of Fig. 6, the knitting from the position to start the branching is shown with T1 to T9. The position of the side end portion 15 of the knitted fabric 10 is shown in the drawing. In T1, the stitches are formed on the knitting needles A, C, E, G, I, K, M, O, Q of the FB in the rightward direction. The stitches held on the knitting needles A, C indicate the knitted fabric 10a, the stitches held on the knitting needles E, G, I, K indicate the hole forming portion 11a, and the stitches held on the knitting needles M, O, Q indicate the knitted fabric 10b. In T2, the stitches held on the knitting needles E, G, I, K of the FB are transferred to the knitting needles G, I, K, M of the FB, and then new stitches are formed on the

knitting needles Q, O, M, K, I, G of the FB and a pickup stitch is formed on the knitting needle E, which became an empty needle.

[0030] Similar to T2, in T3, the stitches held on the knitting needles G, I, K, M of the FB configuring the hole forming portion 11a are transferred to the knitting needles I, K, M, O of the FB, and then a pickup stitch is formed on the knitting needle G of the FB, which became an empty needle, and stitches are formed on the knitting needles I, K, M, O. Furthermore, the knitting similar to T3 is repeated two times, so that one part of the hole forming portion 11a projects outside from the side end portion 15. The hole 13 without the projection from the knitting fabric 10 is formed if such repetition is not carried out or carried out once. The hole forming portion 11a may be set further on the interior side. In T4, the stitches are formed on the knitting needles S, Q, O, M of the FB, and in T5, the stitches are formed on the knitting needles M, O, Q, S of the FB. The size of the buttonhole 13 is adjusted with the number of times to repeat steps of T4 and T5. In the present embodiment, the number of times to repeat the steps is ten, but may be changed in accordance with the thickness of the yarn or the loop length.

[0031] In T6, the stitches held on the knitting needles M, O, Q, S of the FB configuring the hole forming portion 11a are transferred to the knitting needles K, M, O, Q of the FB, and then the stitches are formed on the knitting needles Q, O, M, K of the FB. The double stitches of the knitting needle K formed in the transfer is resolved, and the starting end 18 and the terminating end 19 of the hole forming portion 11a are joined. In T7, the pickup stitch is formed on the knitting needle p of the BB and the stitches are formed on the knitting needles O, M, K, I of the FB to form the stitches following the knitted fabric 10c. In T8, the knitting similar to T7 is repeated two times, and the stitches are formed on the knitting needles K, I, G, E, C, A of the FB. In T9, the pickup stitches held on the knitting needles 1, n, p of the BB are transferred to the knitting needles M, O, Q of the FB, and then the stitches are formed on the knitting needles A, C, E, G, I, K, M, O, Q of the FB. Among them, the stitches held on the knitting needles M, O, Q become the starting stitches 17 of the knitted fabric 10c.

[0032] Fig. 7 is a schematic diagram of a knitted fabric 20 with a hole 23 shown as embodiment 3 of the present invention. Fig. 8 is a knitting schematic diagram of the knitted fabric 20 with the hole 23 shown as embodiment 3 of the present invention. The knitting method of the knitted fabric 20 formed with two holes 23 will be described with reference to Fig. 7 and Fig. 8. Two holes 3 shown in Fig. 1 are formed by a hole forming portion 21a, where the knitting steps are the same if each one is considered one hole. The length of the joint portion between the holes 23 projecting out from the side end portion 25, the size of the hole 23, and the like also can be easily adjusted similar to the other embodiments. The hole can be further added, and a buttonhole of a new design, or the like may be formed.

[0033] In Fig. 8, the knitting is performed from the lower side to the upper side. A step (S1) of repeatedly carrying out the moving of the stitch row configuring the hole forming portion 21a toward the exterior of the knitted fabric and the forming of a widening stitch to the side opposite to the moving direction and a new stitch row following the moved stitch row, a step (S2) of repeatedly forming a stitch row configuring the hole forming portion 21a, and a step (S3) of repeatedly carrying out the moving of the stitch row configuring the hole forming portion 21a toward the opposite direction of S1 to form double stitches with the widening stitch and forming a new stitch row following the moved stitch row are shown.

[0034] As also shown in embodiments 1 and 2, the pickup stitch of S1 and the stitch of S3, which is in an up and down relationship opposing the pickup stitch, are joined in the drawing, where two groups of S1 to S3 exist since the stitch row is repeatedly formed to form the hole at the same position of S2. After the knitting of S1, S2 of the first time of a first group, the knitting of S1 to S3 of a second group is performed, and then, S2 of the second time and S3 of the first time of the first group are carried out. S2 carried out in two times is the number of knitting courses the same as S2 of the second group when combined. The dotted line of S1 indicates the formation of the pickup stitch, the thick solid line of S3 indicates the formation of the double stitches, the arrow indicates the moving direction, and S1 to S3 indicate the position to carry out the steps described above.

[0035] The present invention is not limited to the embodiments described above, and may be appropriately changed and implemented within a scope not deviating from the gist of the invention.

Claims

1. A knitting method of a knitted fabric with a hole using a flat knitting machine including at least a pair of front and back needle beds and in which stitches are transferrable, the hole including a hole forming portion in which a periphery of the hole is formed with a stitch row including at least one or more wales; the knitting method comprising:

step 1 of repeatedly carrying out moving of the hole forming portion in a lateral direction and forming of a widening stitch on a side opposite to the moving direction and a new stitch row following a stitch row of the moved hole forming portion to form a starting end of the hole forming portion;
step 2 of repeatedly forming a stitch row of the hole forming portion following the step 1; and
step 3 of repeatedly carrying out forming of a double stitch with a widening stitch formed in the step 1 while moving the hole forming portion in a direction opposite to the moving direction in

the step 1 and forming of a new stitch row following the moved stitch row to join the starting end and a terminating end of the hole forming portion while forming the terminating end of the hole forming portion.

2. The knitting method of the knitted fabric with the hole according to claim 1, **characterized in that** flechage knitting is sequentially carried out before the step 1 and after the step 3 so that a stitch row of the starting end and the terminating end of the hole forming portion inclines.
3. The knitting method of the knitted fabric with the hole according to claim 1 or 2, **characterized in that** the steps 1 to 3 are performed after the step 2 and before the step 3 to form a plurality of holes, the starting end and the terminating end of the hole forming portion being joined at a plurality of areas to form the hole.
4. A knitted fabric with a hole knitted in a seamless manner using a flat knitting machine including at least a pair of front and back needle beds and in which stitches are transferrable, **characterized in that** a periphery of the hole is formed using a hole forming portion formed with a stitch row including at least one or more wales, the hole forming portion continued in a wale direction being folded back at a substantially intermediate position, the hole forming portion facing each other with the hole in between having a wale direction of the stitch row in opposite directions and having a starting end formed by a widening stitch and a terminating end formed by a stitch of the opposing hole forming portions joined other than at the hole.

Fig.1

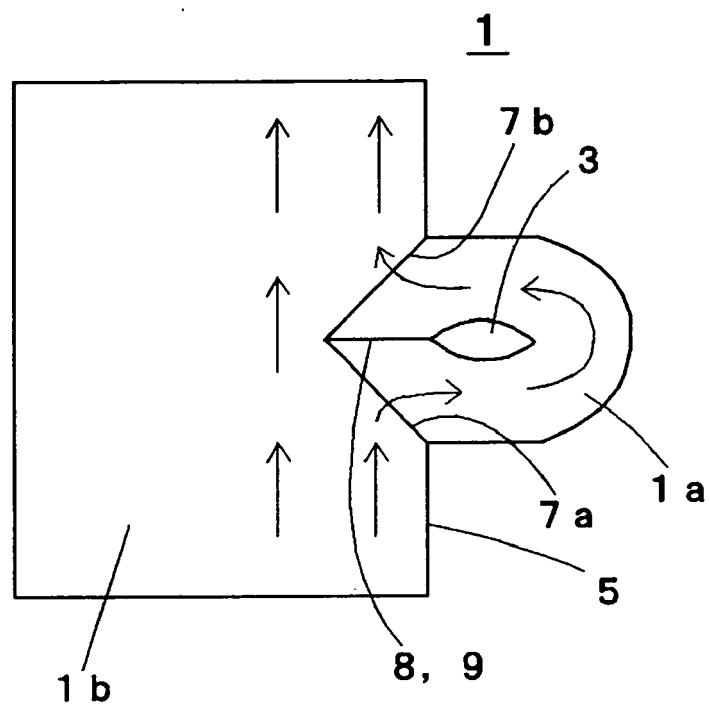


Fig.2

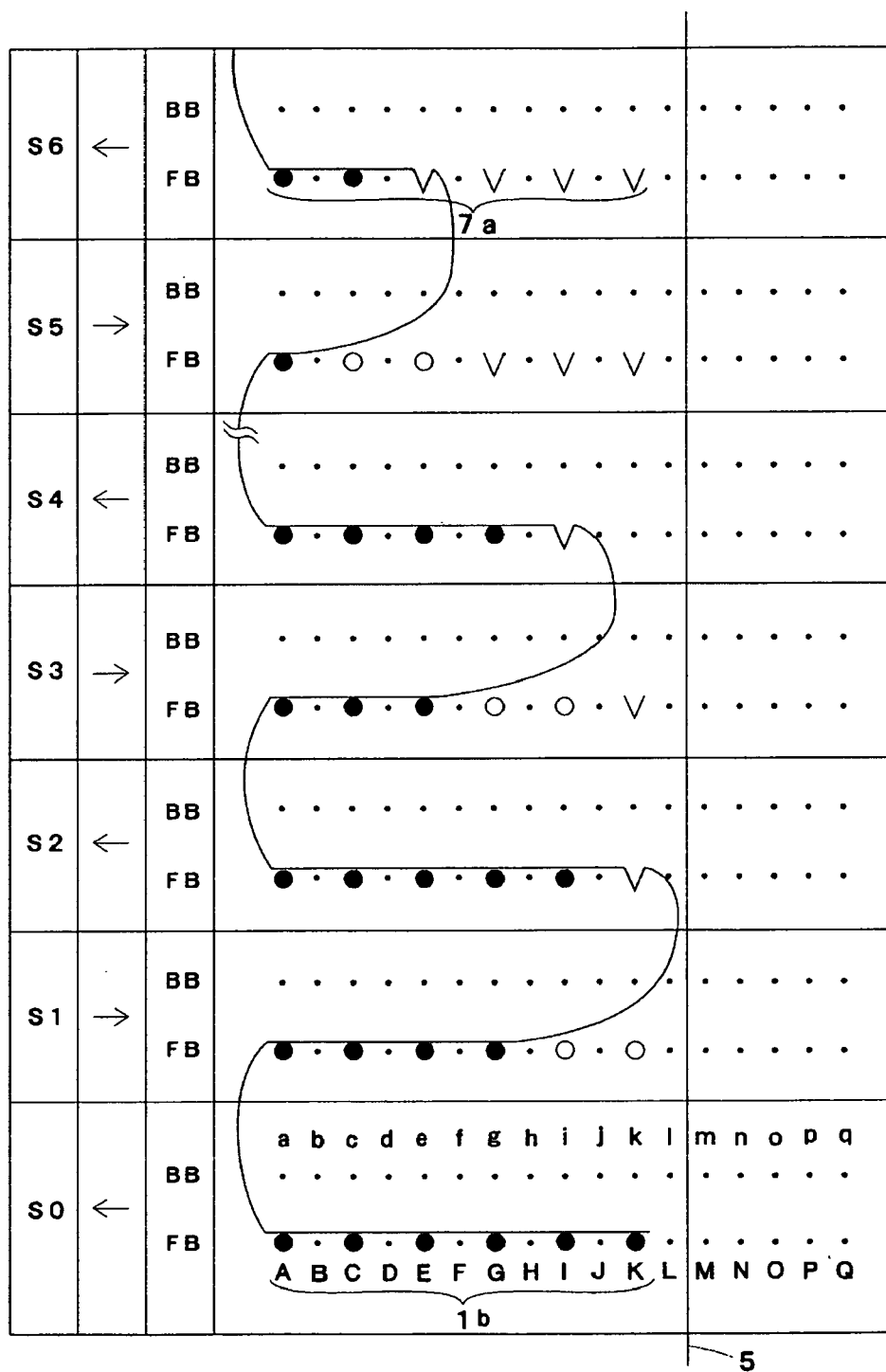


Fig.3

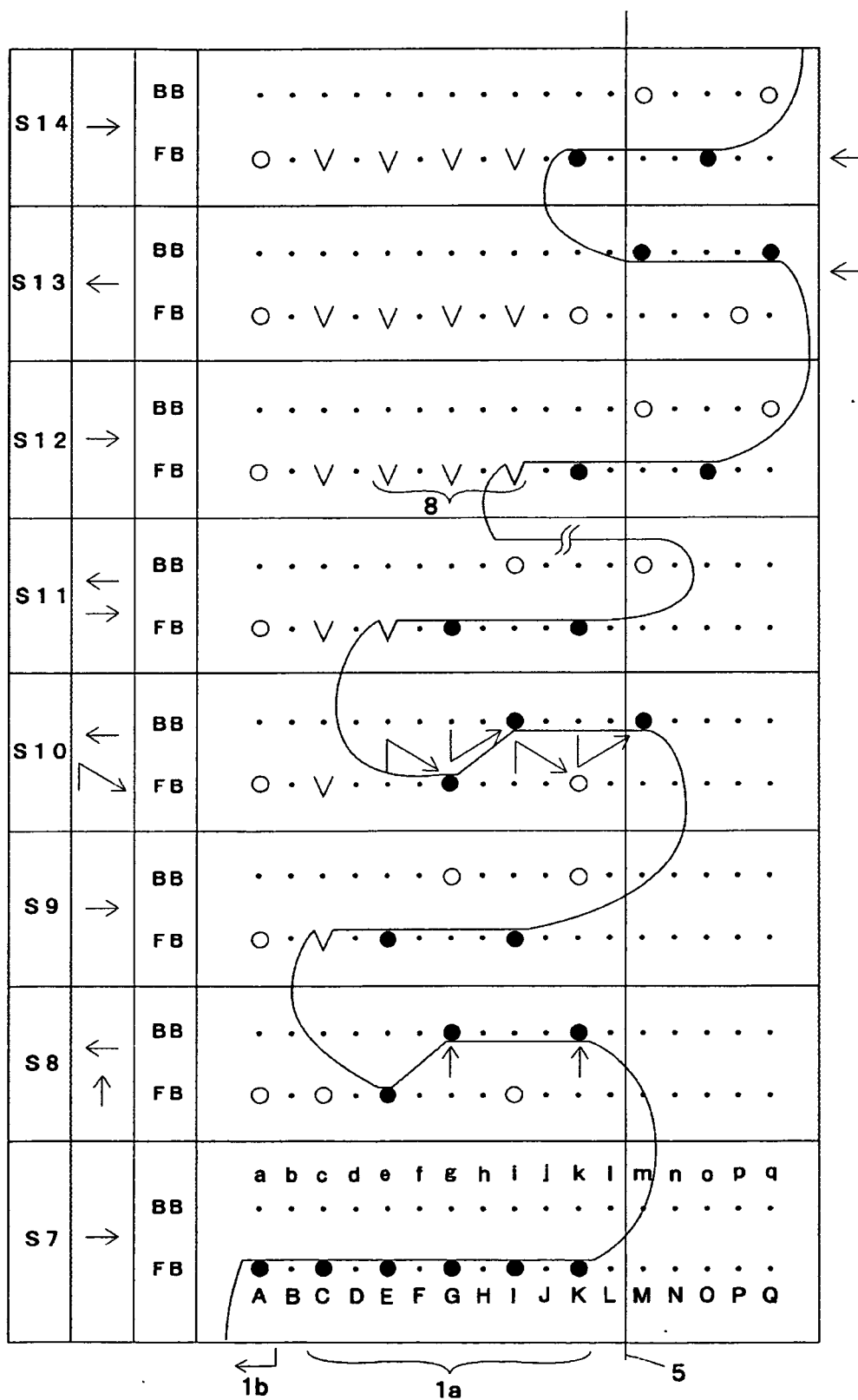


Fig.4

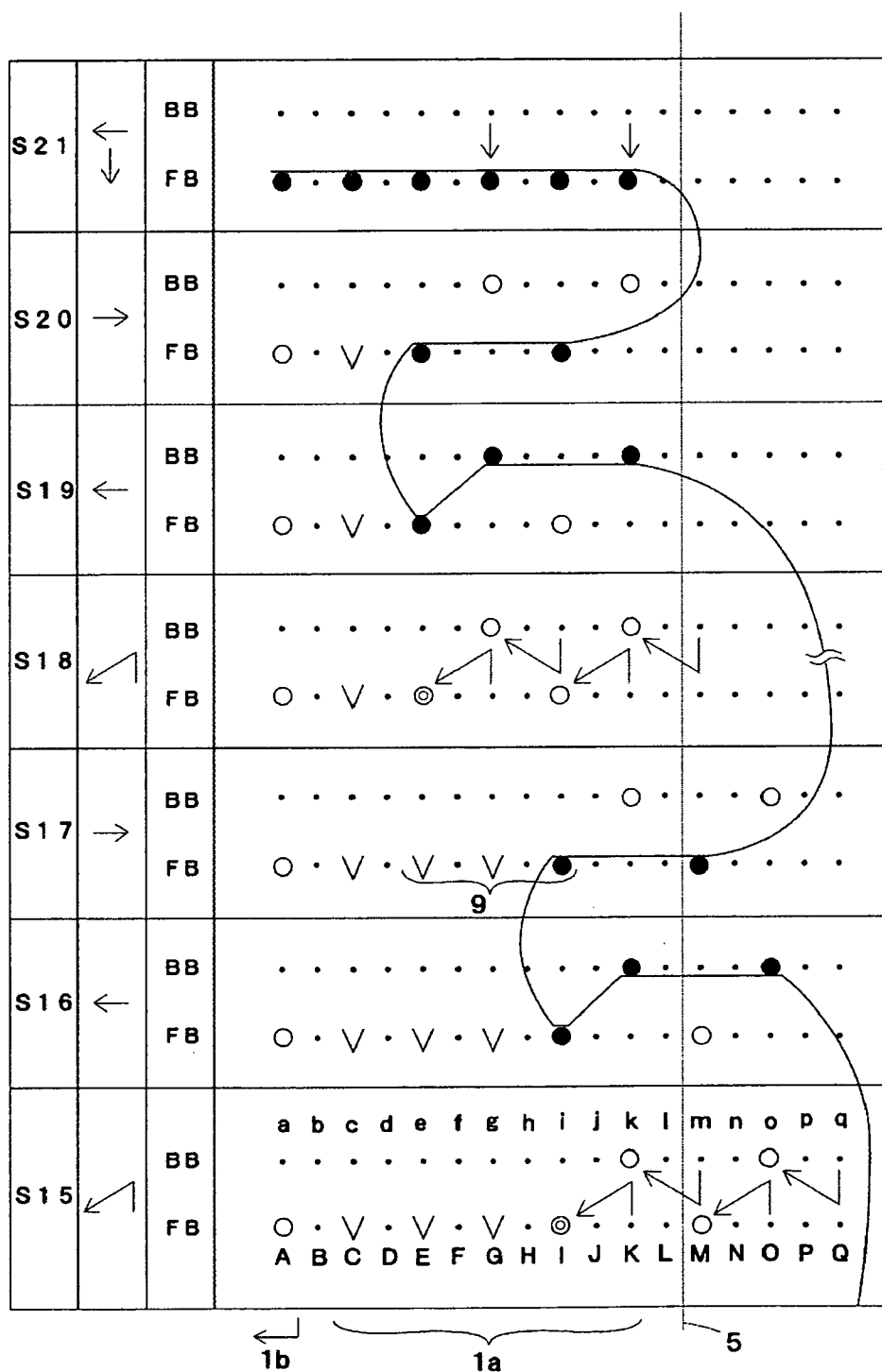


Fig.5

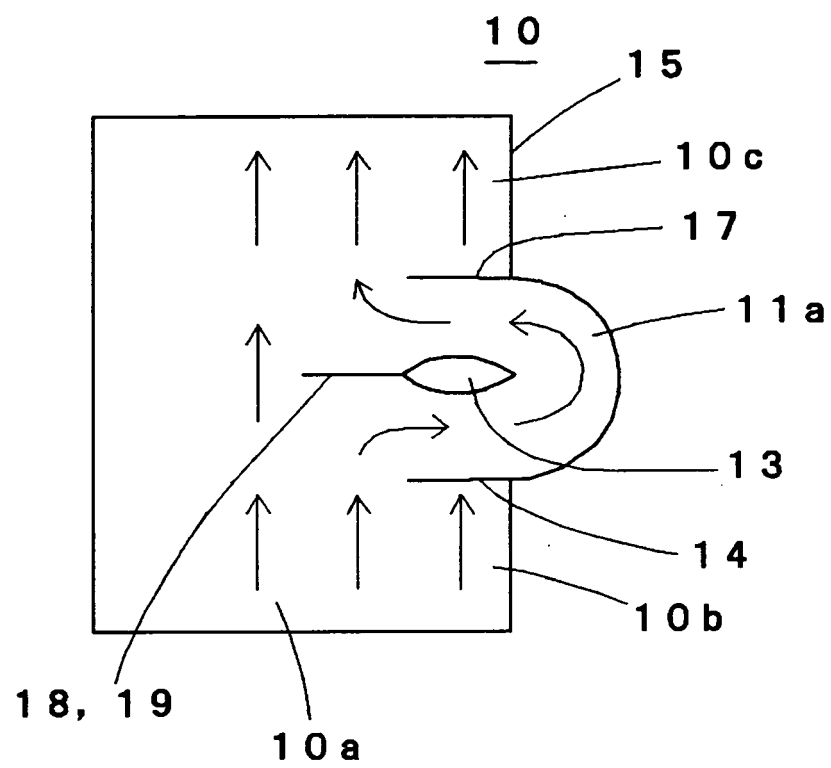


Fig.6

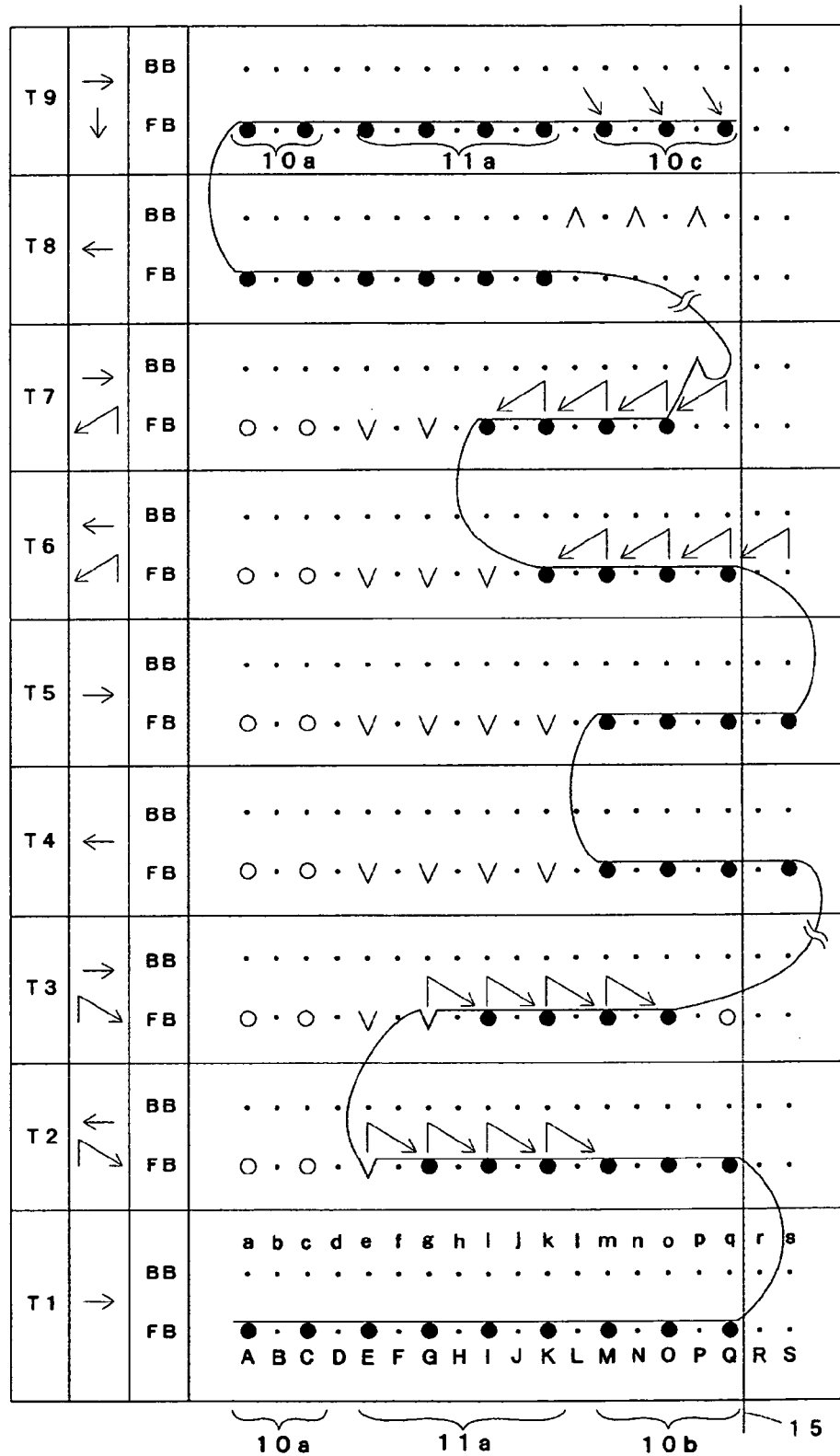


Fig.7

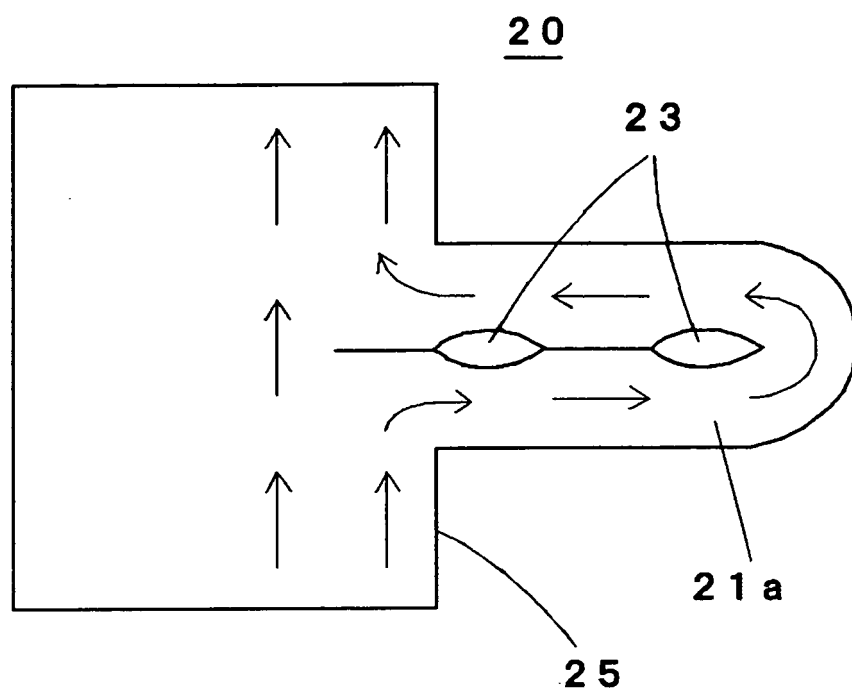


Fig.8

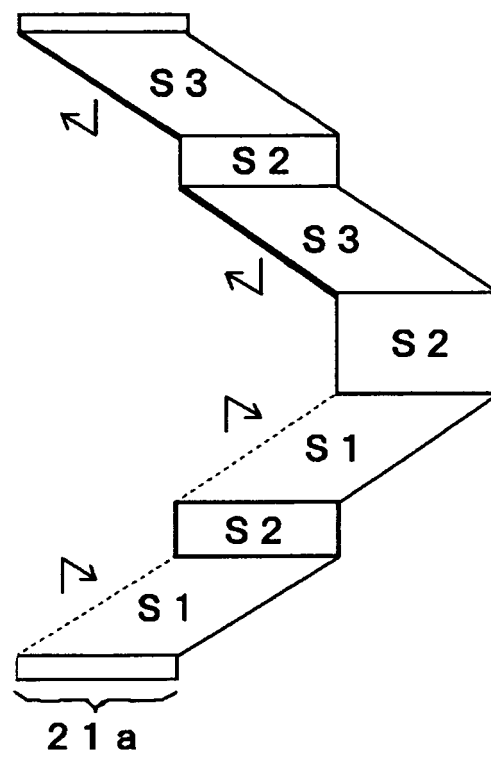
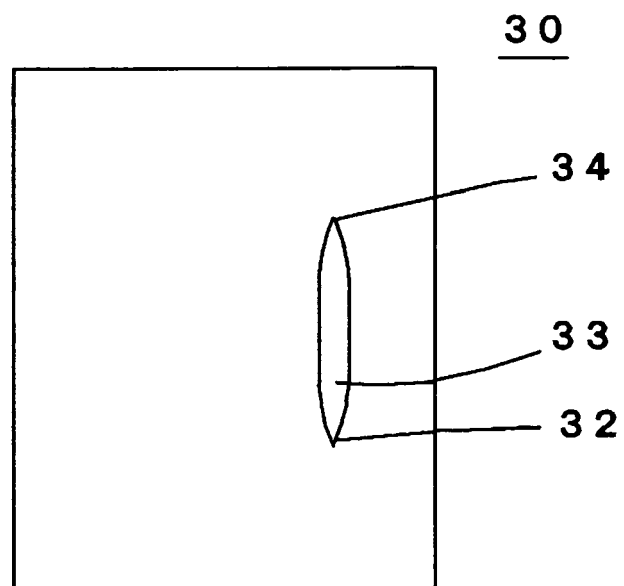


Fig.9





EUROPEAN SEARCH REPORT

Application Number
EP 12 00 3834

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 6 301 939 B1 (KIMMICH ULRICH [DE] ET AL) 16 October 2001 (2001-10-16) * column 2, line 34 - column 5, line 3; claims 5, 6, 10; figures 1-5, 7 *	1,4	INV. D04B1/22
A	DE 92 13 884 U1 (WÄRME- UND ELEKTROTECHNIK B. RUTHENBERG GMBH) 11 March 1993 (1993-03-11) * page 6, paragraph 5; claim 5; figure 7 * * page 3, paragraph 7 - page 4, paragraph 1 *	4	
A	DE 25 02 574 A1 (DUBIED & CIE SA E) 31 July 1975 (1975-07-31) * page 11, line 1 - page 13, line 4; claims 1, 4; figures 1, 3a, 3b *	1,4	
A	US 2 858 685 A (SOMMERS LYLE E) 4 November 1958 (1958-11-04) * column 3, lines 7-30; claim 2; figures 2, 3, 5, 8 *	4	
			TECHNICAL FIELDS SEARCHED (IPC)
			D04B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 15 October 2012	Examiner Sterle, Dieter
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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