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(54) **Tubular knitted fabric having a three-dimensional silhouette shape and method of knitting the same**

Schlauchartig gestrickter Stoff mit dreidimensionaler Form und Verfahren zum Stricken von diesem Stoff

Tricot tubulaire à forme tridimensionnelle et procédé de tricotage

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Description

BACKGROUND OF THE INVENTION

The present invention relates to a tubular knitted fabric in which the circumferential length is varied to form a three-dimensional silhouette shape and a method of knitting the same.

Using a common flat knitting machine provided with two, front and rear, needle beds, a tubular knitted fabric is produced by knitting a front half of the tubular fabric from yarn threaded onto knitting needles of the front needle bed and a back half, which is joined at both side ends to the front half, from the yarn threaded onto the rear needle bed, in which the procedure is repeated a predetermined number of times for forming a tubular shape.

In common, such tubular knitted fabrics are finished as garments, e.g. sweaters, tights, or pants.

The tubular knitted fabric can be adjusted in the size or circumferential length by increasing and/or decreasing the number of the knitting needles to be used or more specifically, by varying the number of wales.

When the circumferential length is lengthened by increasing in steps the number of the knitting needles to be used, the tubular shape can be turned to e.g. a sleeve having a wide cuff.

An example for shortening the circumferential length by decreasing the number of the knitting needles to be used is disclosed in Japanese Patent Laid-open Publication 229248(1990) in which a body portion and two sleeve portions are gradually reduced in the width from the armpits as being knitted separately.

The prior art method is successfully applicable to knitting of a front-to-back asymmetrical shape, e.g. a gourd shape. However, if a tubular fabric is designed for producing a sweater or one-piece garment, it should have a front half raised at the breast for corresponding to a human body while a back half needs no raise. In fact, the tubular fabric is not symmetrical from the front to the back.

When a raise on the front half of the tubular knitted fabric is produced by increasing and then, decreasing the number of wales, a difference in the number of wales is created between the two, front and back, halves. As the result, both side edges of the front half where the wales are increased tend to be stretched towards the back half so that the seams between the two halves become longer.

When a garment, e.g. a sweater, tights, or pants, produced from the tubular knitted fabric in which the seams between two, front and back, halves are elongated is in use, loops of yarn along the seams between the two halves are stressed to loose thus appearing unfavorable.

Also, if the difference in the number of wales between the two, front and back, halves of the tubular knitted fabric is too great, the yarn itself will be broken. Hence, as the difference in the number of wales between the two halves is determined within a specific range, the shape of a raise and variations in the circumferential length will be limited more or less.

The present invention has been introduced for overcoming the foregoing drawbacks and its object is to provide an improved tubular knitted fabric of three-dimensional silhouette shape which ensures a natural fit in use as a garment without impairing an appearance and a method of knitting the same.

The invention provides a method of knitting a tubular fabric of three-dimensional silhouette shape by varying the circumferential length of the tubular fabric and comprising knitting a tubular fabric consisting of front and back halves joined at side ends to each other, with the use of a flat knitting machine having four, upper front, lower front, upper rear, and lower rear, needle beds (FU, FD,BU,BD); characterised by increasing or decreasing the number of wales at one of the two, front and back, halves of the tubular fabric so that a difference in the wale number is given between the two halves; and further characterised by a process of transferring loops of yarn from needles (A and T) of a first needle bed (BD) which carries a greater number of wales to a second needle bed (FD) carrying a lesser number of wales; the process comprising feeding yarn to form loops on the needles (B to S) of the second needle bed (FD) and tucking the yarn on to an unoccupied needle (T) located adjacent needles carrying said loops and feeding yarn to form a row of loops on knitting needles (S to B) of the first needle bed (BD); the method comprising transferring the tucked yarn to a needle (T) of the first needle bed by knocking over during the transfer of loops from needles (N to S) of the second needle bed, so as to eliminate a twist during the process of transferring the loop from said needle (T).

In another aspect the invention provides a method of knitting a tubular fabric of three-dimensional silhouette shape by varying the circumferential length of the tubular fabric and comprising knitting a tubular fabric consisting of front and back halves joined at side ends to each other, with the use of a flat knitting machine having four, upper front, lower front, upper rear, and lower rear, needle beds (FU,FD,BU,BD); characterised by increasing or decreasing the number of wales at one of the two, front and back, halves of the tubular fabric so that a difference in the wale number is given between the two halves; and further characterised by a process of transferring loops of yarn from needles (A and T) of a first needle bed (BD) which carries a greater number of wales to a second needle bed (FD) carrying a lesser number of wales; the method comprising, after the yarn is fed to form loops on needles (T to B) of the first needle bed (BD), feeding yarn in an opposite direction to form another loop on a needle (A) of said needle bed so as to eliminate a twist during the process of transferring the loops from said needle (A).

In yet another aspect the invention provides a tubu-

lar knitted fabric comprising a front and a back half coupled at the side ends to each other, in which the circumferential length is varied by increasing and/or decreasing the number of wales of one of the two, front and back, halves for forming a three-dimensional silhouette shape.

The action of the present invention will now be described.

Using a known "4-bed" knitting machine provided with four, upper-front, lower-front, upper-rear, and lower-rear, needle beds, the front half of e.g. a sweater is knitted on one of the front or rear needle beds while the back half is knitted on the opposite needle bed as being joined to the front half so that a tubular shape can be produced.

For forming a raised breast region of the front half of the tubular shape, the number of wales in the front half is increased in steps by a degree corresponding to the size of a raise while the wales in the back half remain unchanged.

For the purpose of minimizing a difference in the number of wales between the two, front and back, halves, loops at both side edges of the front half are transferred to the back half.

A row of loops is added to the loops transferred to the back half. For averting the twisting of any loop during transfer of the row of loops back to the front half, it is prepared that one loop is intentionally twisted in advance so that it can be returned back to the normal during transfer from the back half to the front half.

Accordingly, no twist on the loops will appear after transferred from the back half to the front half.

The same procedure will be applied in knitting a specific tubular shape by increasing and then, decreasing the number of wales in the front half.

The specifically shaped three-dimensional knitted fabric can thus be produced through increasing and/or decreasing the number of wales in either of the two, front and back, halves.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig.1 illustrates a course of knitting a straight portion of a tubular knitted fabric according to the present invention;

Figs.2 and 3 show courses of preparation for starting a constricted portion in succession to the straight portion;

Figs.4 to 32 show courses of decreasing the number of wales to shorten the circumferential length for knitting a first half of the constricted portion of the tubular knitted fabric;

Figs.33 to 73 show courses of increasing the number of wales to lengthen the circumferential length for knitting a second half of the constricted portion;

Fig.74 is a schematic view of a knitted fabric produced by a method other than the method of the present invention;

Fig.75 is a front view of the constricted portion of the tubular knitted fabric produced by the method of the present invention;

Fig.76 is a front view showing a modification of the constricted portion of the tubular knitted fabric produced by the method of the present invention;

Fig.77 is a front view showing another modification of the constricted portion of the tubular knitted fabric produced by the method of the invention;

Fig.78 is a front view showing a further modification of the constricted portion of the tubular knitted fabric produced by the method of the present invention; and

Fig.79 is a front view showing a still further modification of the constricted portion of the tubular knitted fabric produced by the method of the invention.

Marks which appear in the drawings are explained as follows:

- ○ a missed front stitch
- ʊ knitting of a front stitch
- V making of a front stitch tuck
- ⊗ a new loop
- ɑ knitting of a back stitch
- ʂ split stitch
- ↑ transferring a loop
- ↓ transferring a loop
- Ⓥ a missed front stitch tuck
- ⊽ transferring a stitch tuck.

The invention will now be described by way of example only and with reference to the drawings described above.

As not particularly shown, a knitting machine employed for implementation of the embodiments is a so called "four-bed flat knitting machine" which comprises two pairs of front and rear needle beds arranged upper and lower and a carriage of single lock type having both knitting lock and transfer lock in the same phase.

Fig.1 to 73 illustrate a series of courses for knitting procedure, in which the lower front needle bed is denoted by FD, the upper front needle bed by FU, the lower rear needle bed by BD, the upper rear needle bed by BU. Also the alphabetical letters A to Z represent knitting needles on the lower needle beds and the small letters a to z represent knitting needles on the upper needle beds.

It is assumed that each knitted fabric is fabricated by plain knitting with the use of a minimum number of the knitting needles for ease of description.

According to the present invention, a tubular fabric shaped symmetrical front to rear is knitted using a thread of yarn fed in the counter-clockwise direction. In action, the number of wales of a front half of the fabric is first reduced in steps to shorten the circumferential length and then, increased thus forming a constricted

part of the tubular fabric along a waistline, as shown in Fig.75.

A straight portion of the tubular fabric is produced by coupling both side ends to each other which are hanged on the knitting needles (A and T) of their respective lower needle beds FD and BD, as shown in Fig.2.

In Fig.2, as the carriage runs to the right, the yarn is fed to make a row of loops on the knitting needles A to T of the lower front needle bed FD. Then, as the carriage runs back to the left, another row of loops are produced on the knitting needles T to A of the lower rear needle bed BD, as shown in Fig.3.

After repeating once again the two courses shown in Figs.2 and 3, the loops of yarn on the knitting needles A to G and N to T of the lower front needle bed FD are transferred onto the knitting needles a to g and n to t of the upper rear needle bed BU, as shown in Fig.4.

The repeating of the courses of Figs.2 and 3 is for decrease in at least every two courses in order to avert twisting of loops during transfer from needles to other needles.

As shown in Fig.5, the two rear needle beds BD,BU are moved one knitting needle distance to the right by racking and the loops on the knitting needles a to g of the upper rear needle bed BU are transferred onto the knitting needles B to H of the lower front needle bed FD so that two loops of the yarn overlap with each other on the knitting needle H of the lower front needle bed FD.

Then, the two rear needle beds BD,BU are moved back one knitting needle distance to the left by racking and the loops on the knitting needles n to t of the lower rear needle bed BD are transferred onto the knitting needles M to S of the lower front needle bed FD so that the loop from the knitting needle n of the lower rear needle bed BD can be placed over the loop hanged on the knitting needle M of the lower front needle bed FD, as shown in Fig.6.

In succession, as shown in Fig.7, the yarn is fed to form loops on the knitting needles B to S of the lower front needle bed FD. Accordingly, the loops hanged on the knitting needles A to T of the lower front needle bed FD shown in Fig.1 are reduced by two to hang on the knitting needles B to S.

After the yarn is fed to form loops on the knitting needles T to B of the lower rear needle bed BD as shown in Fig.8, it is threaded back from left to right thus forming a loop on the knitting needle A of the same, as shown in Fig.9.

As shown in Fig.10, the feeder which forms a loop on the knitting needle A of the lower rear needle bed BD is displaced out from the knitting area of the machine and then, the yarn is fed to form a row of loops on the knitting needles B to S of the lower front needle bed FD, as shown in Fig.11, while the knitting needle T remains unoccupied where the yarn is tucked.

Then, the loops on the knitting needles B to G of the lower front needle bed FD are transferred onto the knitting needles b to g of the upper rear needle bed BU, as shown in Fig.12. The two rear needle beds BD,BU are moved one knitting needle distance to the right, as shown in Fig.13, and the loops on the knitting needles b to g of the upper rear needle bed BU are transferred onto the knitting needles C to H of the lower front needle bed FD so that two loops of the yarn overlap with each other on the knitting needle H of the lower front needle bed FD. Simultaneously, the loop on the knitting needle A of the lower rear needle bed BD is transferred onto the knitting needle B of the lower front needle bed FD.

It should be noted that if the yarn is threaded from the knitting needle T to B of the lower rear needle bed BD, as shown in Fig.8, and the knitting procedure shown in Fig.9 is not carried out, the loop on the knitting needles B of the lower front needle bed FD, as shown in Fig.13, becomes twisted as denoted by the arrow x in Fig.74.

As shown in Fig.14, the two rear needle beds BD, BU are then returned one knitting needle distance to the left and the yarn is fed to form a further row of loops on the knitting needles S to B of the lower rear needle bed BD.

The loops on the knitting needles N to S of the lower front needle bed FD are transferred onto the knitting needles n to s of the upper rear needle bed BU, as shown in Fig.15, and also, the tucked yarn shown in Fig. 11 is transferred onto the knitting needle T of the lower rear needle bed BD.

The loops are transferred as knocked over across the loop transferred from the knitting needle T of the lower front needle bed FD to the knitting needle T of the lower rear needle bed BD.

More particularly, if latch needles are used for knitting, the knitting needles for receiving the loops should be arranged to move upward to a height where the loops to be transferred can clear over the distal end of the opening latch of each knitting needle.

If compound needles are used, the loops to be transferred shall be arranged to ride over the slider during the upward movement of the knitting needles for receiving the loops and when the knitting needles move backward, slide on the slider to be knocked over across the tucked yarn.

As shown in Fig.16, the two rear needle bed BD,BU are moved one knitting needle distance to the left by racking and the loops on the knitting needles n to s of the upper rear needle bed BU are transferred onto the knitting needles M to R of the lower front needle bed FD so that two loops overlap with each other on the knitting needle M of the lower front needle bed FD. Simultaneously, the loop on the knitting needle T of the lower rear needle bed is transferred onto the knitting needle S of the lower front needle bed FD.

More particularly, the yarn on the knitting needle T of the lower rear needle bed BD which was not looped at the step of Fig.14 is threaded through the loop carried on the knitting needle T of the lower rear needle bed BD for transfer to the knitting needle S of the lower front

needle bed FD.

As apparent from Figs.11 to 16, the tucked yarn on the knitting needle T of the lower front needle bed FD becomes a loop of the tubular knitted fabric in the end, as shown in Fig.16, like as the other loops. Hence, the feeding length of the tucked yarn is preferably equal to the yarn length which forms a unit loop or stitch.

The yarn is fed to form a row of loops on the knitting needles B to S of the lower front needle bed FD, as shown in Fig.17, and in turn, another row of loops on the knitting needles S to B of the lower rear needle bed BD, as shown in Fig.18. This action shown in Figs.17 and 18 is repeated once more.

As shown in Fig.19, the loops on the knitting needles B to G and N to S of the lower front needle bed FD are then transferred onto the corresponding knitting needles b to g and n to s of the upper rear needle bed BU. The two rear needle beds BD,BU are moved one knitting needle distance to the right by racking and the loops on the knitting needles b to g of the upper rear needle bed BU are transferred onto the knitting needles C to H of the lower front needle bed FD so that two loops overlap with each other on the knitting needle H of the lower front needle bed FD, as shown in Fig.20.

Then, the two rear needle beds BD,BU are moved back one knitting needle distance to the left by racking and the loops on the knitting needles n to s of the lower rear needle bed BD are transferred onto the knitting needles M to R of the lower front needle bed FD so that the loop from the knitting needle n of the lower rear needle bed BD is placed over the loop on the knitting needle M of the lower front needle bed FD, as shown in Fig.21.

As illustrated in Fig.22, the yarn is fed to from a row of loops on the knitting needles C to R of the lower front needle bed FD. Accordingly, the row of loops on the knitting needles C to R is two loops less than the preceding row of the loops on the knitting needles B to S of the lower front needle bed FD shown in Fig.18.

The yarn is fed from right to left to form a row of loops on the knitting needles S to C of the lower rear needle bed BD, as shown in Fig.23, and then threaded in a reverse direction to form another row of loops starting from the knitting needle B of the lower rear needle bed BD, as shown in Fig.24.

The feeder after threading through the knitting needle A of the lower rear needle bed BD is removed out to the left from the knitting area, as shown in Fig.25, and the yarn is fed to from a row of loops on the knitting needles C to R of the lower front needle bed FD, as shown in Fig.26, while the knitting needle S remains unoccupied where the yarn is tucked.

As shown in Fig.27, the loops on the knitting needles C to G of the lower front needle bed FD are transferred onto the knitting needles c to g of the upper rear needle bed BU. Then, the two rear needle beds BD,BU are displaced one knitting needle distance to the right by racking and the loops on the knitting needles c to g of the upper rear needle bed BU are transferred onto the knitting needles D to H of the lower front needle bed FD so that two loops overlap with each other on the knitting needle H, as shown in Fig.28. Simultaneously, the loop on the knitting needle B of the lower rear needle bed BD is transferred onto the knitting needle B of the lower front needle bed FD.

The two rear needle beds BD,BU are moved back to the left by one knitting needle distance and the yarn is fed to from a row of loops on the knitting needles R to C of the lower rear needle bed BD, as shown in Fig.29.

As shown in Fig.30, the loops on the knitting needles N to R of the lower front needle bed FD are transferred onto the knitting needles n to r of the upper rear needle bed BU. Also, the tucked yarn shown in Fig.26 is transferred onto the knitting needle S of the lower rear needle bed BD.

For transfer, the loops to the knitting needles of the lower rear needle bed BU are knocked over across the tucked loop transferred from the needle bed FD to the needle bed BD in the same manner as described previously.

The two rear needle beds BD,BU are moved one knitting needle distance to the left by racking and the loops on the knitting needles n to r of the upper rear needle bed BU are transferred onto the knitting needles M to Q of the lower front needle bed FD so that two loops overlap with each other on the knitting needle M of the lower front needle bed FD, as shown in Fig.31.

The procedure shown in Figs.1 to 31 is repeated a given number of times to reduce the circumferential length of the tubular knitted fabric. Then, the yarn is fed to from a row of loops on the knitting needles C to R of the lower front needle bed FD, as shown in Fig.32. In succession, the number of wales is increased in the procedure from Fig.33. More specifically, the two loops are transferred by split stitch from the knitting needles H and M of the lower front needle bed FD to the knitting needles h and m of the upper rear needle bed BU respectively, as shown in Fig.33. Then, the loops on the knitting needles C to G of the lower front needle bed FD are transferred onto the knitting needles c to g of the upper rear needle bed BU, as shown in Fig.34.

As shown in Fig.35, the two rear needle bed BD,BU are moved one knitting needle distance to the left by racking and the loops on the knitting needles c to h of the upper rear needle bed BU are transferred onto the knitting needles B to G of the lower front needle bed FD. Simultaneously, the loops on the knitting needles M to R of the lower front needle bed FD are transferred onto the knitting needles n to s of the upper rear needle bed BU.

The two rear needle beds BD,BU are moved back to the right by the same distance and the loops on the knitting needles m to s of the upper rear needle bed BU are transferred onto the knitting needles M to S of the lower front needle bed FD, as shown in Fig.36.

The yarn is fed to form a row of loops on the knitting needles R to C of the lower rear needle bed BD and its

end is tucked on the knitting needle B which remains unoccupied, as shown in Fig.37. Then, the yarn is fed to form a row of loops on the knitting needles C to R of the lower front needle bed FD, as shown in Fig.38.

As shown in Fig.39, the tucked yarn on the knitting needle B of the lower rear needle bed BD is transferred onto the knitting needle B of the lower front needle bed FD. It is then transferred back to the knitting needle B of the lower rear needle bed BD, as shown in Fig.40.

The yarn from the feeder is threaded from right to left to form a loop on the knitting needle S of the lower front needle bed FD, as shown in Fig.41. The feeder is removed out from the knitting area, as shown in Fig.42, and the yarn is fed to form a row of loops on the knitting needles R to B of the lower rear needle bed BD, as shown in Fig.43.

The loop on the knitting needle S of the lower front needle bed FD is transferred onto the knitting needle S of the lower rear needle bed BD, as shown in Fig.44, and the yarn is fed to form another row of loops on the knitting needles C to R of the lower front needle bed FD, as shown in Fig.45.

As the result of action through the courses illustrated in Figs.33 to 45, the number of the wales is increased by two as the loops on the knitting needles C to R of the needle bed BD turn to those on the knitting needles B to S.

The two loops on the knitting needles H and M of the lower front needle bed FD are transferred by split stitch onto the knitting needle h and m of the upper rear needle bed BU respectively, as shown in Fig.46. Then, the loops on the knitting needles C to G of the lower front needle bed FD are transferred onto the knitting needles c to g of the upper rear needle bed BU, as shown in Fig. 47.

The two rear needle beds BD,BU are moved one knitting needle distance to the left by racking and the loops on the knitting needles c to h of the upper rear needle bed BU are transferred onto the knitting needles B to G of the lower front needle bed FD, as shown in Fig.48. Simultaneously, the loops on the knitting needles M to R of the lower front needle bed FD are transferred onto the knitting needles n to s of the upper rear needle bed BU. In succession, the two rear needle beds BD,BU are moved back by one knitting needle distance to the right and the loops on the knitting needles m to s of the upper rear needle bed BU are transferred onto the knitting needles M to S of the lower front needle bed FD, as shown in Fig.49.

As shown in Fig.50, the yarn is fed to form a row of loops on the knitting needles S to B of the lower rear needle bed BD. Then, the yarn is further fed to form another row of loops on the knitting needles B to S of the lower front needle bed FD, as shown in Fig.51, and also, threaded to form a further row of loops on the knitting needles S to B of the lower rear needle bed BD, as shown in Fig.52. Finally, the yarn is fed to form a row of loops on the knitting needles B to S of the lower front needle bed FD, as shown in Fig.53.

As the result, the loops on the knitting needles C to R of the lower front needle bed FD shown in Fig.45 are turned to the loops on the knitting needles B to S, thus increasing the wales by two.

A series of the courses shown in Figs.33 to 52 are repeated from Fig.54 to Fig.73 so that the wales are increased in number.

More particularly, the two loops on the knitting needles H and M of the lower front needle bed FD are transferred by split stitch onto the knitting needle h and m of the upper rear needle bed BU respectively, as shown in Fig.54. Then, the loops on the knitting needles B to G of the lower front needle bed FD are transferred onto the knitting needles b to g of the upper rear needle bed BU, as shown in Fig.55.

The two rear needle beds BD,BU are moved one knitting needle distance to the left by racking and the loops on the knitting needles b to h of the upper rear needle bed BU are transferred onto the knitting needles A to G of the lower front needle bed FD, as shown in Fig.56. Simultaneously, the loops on the knitting needles M to S of the lower front needle bed FD are transferred onto the knitting needles n to t of the upper rear needle bed BU. In succession, the two rear needle beds BD,BU are moved back by one knitting needle distance to the right and the loops on the knitting needles m to t of the upper rear needle bed BU are transferred onto the knitting needles M to T of the lower front needle bed FD, as shown in Fig.57.

As shown in Fig.58, the yarn is fed to form a row of loops on the knitting needles S to B of the lower rear needle bed BD and its end is tucked on the knitting needle A which remains unoccupied. The yarn is then fed to form a row of loops on the knitting needles B to S of the lower front needle bed FD, as shown in Fig.59.

The tucked yarn on the knitting needle A of the lower rear needle bed BD shown in Fig.58 is transferred onto the knitting needle A of the lower front needle bed FD, as shown in Fig.60. It is then transferred back to the knitting needle A of the lower rear needle bed BD, as shown in Fig.62.

The yarn from the feeder is threaded from right to left to form a loop on the knitting needle T of the lower front needle bed FD, as shown in Fig.62. The feeder is rightwardly removed out from the knitting area, as shown in Fig.63, and the yarn is fed to form a row of loops on the knitting needles S to A of the lower rear needle bed BD, as shown in Fig.64.

The loop on the knitting needle T of the lower front needle bed FD is transferred onto the knitting needle T of the lower rear needle bed BD, as shown in Fig.65, and the yarn is fed to form another row of loops on the knitting needles B to S of the lower front needle bed FD, as shown in Fig.66.

As the result of action through the courses illustrated in Figs.54 to 66, the number of the wales is further increased by two as the loops on the knitting needles B

to S of the needle bed BD turn to those on the knitting needles A to T.

Also, the two loops on the knitting needles H and M of the lower front needle bed FD are transferred by split stitch onto the knitting needle h and m of the upper rear needle bed BU respectively, as shown in Fig.67. Then, the loops on the knitting needles B to G of the lower front needle bed FD are transferred onto the knitting needles b to g of the upper rear needle bed BU, as shown in Fig. 68.

The two rear needle beds BD,BU are moved one knitting needle distance to the left by racking and the loops on the knitting needles b to h of the upper rear needle bed BU are transferred onto the knitting needles A to G of the lower front needle bed FD, as shown in Fig.69. Simultaneously, the loops on the knitting needles M to S of the lower front needle bed FD are transferred onto the knitting needles n to t of the upper rear needle bed BU. In succession, the two rear needle beds BD,BU are moved back by one knitting needle distance to the right and the loops on the knitting needles m to t of the upper rear needle bed BU are transferred onto the knitting needles M to T of the lower front needle bed FD, as shown in Fig.70.

As illustrated in Fig.71, the yarn is fed to form a row of loops on the knitting needles T to A of the lower rear needle bed BD. Then, the yarn is further fed to form another row of loops on the knitting needles A to T of the lower front needle bed FD, as shown in Fig.72, and also, threaded to form a further row of loops on the knitting needles T to A of the lower rear needle bed BD, as shown in Fig.73.

As the result, the loops on the knitting needles B to S of the lower front needle bed FD shown in Fig.66 are turned to the loops on the knitting needles A to T, thus increasing the wales by two.

The resultant tubular knitted fabric has a front-to-back asymmetrical shape in which the front half is composed of a less number of wales, as best shown in Fig. 75. The back half has both side ends extending to the front for joining to the front half.

It would be understood that the two front needle beds FD,FU may be moved by racking although the racking movement of the two rear needle beds BD,BU only is implemented in the embodiment.

Although the waist constricted part of the tubular fabric is knitted by decreasing the number of wales at both the side ends of the front half, it may be produced by decreasing the number of wales at one side end of the front half, as shown in Fig.76, by increasing the number of wales at the side end of the same, as shown in Fig.77, or by increasing the number of wales at the two side ends and then, decreasing the same for forming extensions, as shown in Fig.77. Also, a three-dimensional silhouette form of the tubular fabric may be produced using any combination of the foregoing techniques.

Claims

1. A method of knitting a tubular fabric of three-dimensional silhouette shape by varying the circumferential length of the tubular fabric and comprising knitting a tubular fabric consisting of front and back halves joined at side ends to each other, with the use of a flat knitting machine having four, upper front, lower front, upper rear, and lower rear, needle beds (FU,FD,BU,BD);

   characterised by increasing or decreasing the number of wales at one of the two, front and back, halves of the tubular fabric so that a difference in the wale number is given between the two halves;

   and further characterised by a process of transferring loops of yarn from needles (A and T) of a first needle bed (BD) which carries a greater number of wales to a second needle bed (FD) carrying a lesser number of wales;
   the process comprising feeding yarn to form loops on the needles (B to S) of the second needle bed (FD) and tucking the yarn on to an unoccupied needle (T) located adjacent needles carrying said loops and feeding yarn to form a row of loops on knitting needles (S to B) of the first needle bed (BD);
   the method comprising transferring the tucked yarn to a needle (T) of the first needle bed by knocking over during the transfer of loops from needles (N to S) of the second needle bed, so as to eliminate a twist during the process of transferring the loop from said needle (T).

2. A method of knitting a tubular fabric of three-dimensional silhouette shape by varying the circumferential length of the tubular fabric and comprising knitting a tubular fabric consisting of front and back halves joined at side ends to each other, with the use of a flat knitting machine having four, upper front, lower front, upper rear, and lower rear, needle beds (FU,FD,BU,BD) ;

   characterised by increasing or decreasing the number of wales at one of the two, front and back, halves of the tubular fabric so that a difference in the wale number is given between the two halves

   and further characterised by a process of transferring loops of yarn from needles (A and T) of a first needle bed (BD) which carries a greater number of wales to a second needle bed (FD) carrying a lesser number of wales;
   the method comprising, after the yarn is fed to form loops on needles (T to B) of the first needle bed (BD), feeding yarn in an opposite direction to form another loop on a needle (A) of said needle bed so as to eliminate a twist during the process of transferring the loops from said nee-

dle (A).

3. A tubular knitted fabric comprising a front and a back half coupled at the side ends to each other, in which the circumferential length is varied by increasing and/or decreasing the number of wales of one of the two, front and back, halves for forming a three-dimensional silhouette shape.

Patentansprüche

1. Verfahren zum Stricken eines röhrenförmigen Gestricks mit dreidimensionaler Silhouette durch Verändern der Umfangslänge des röhrenförmigen Gestricks, enthaltend die folgenden Schritte:
Stricken eines röhrenförmigen Gestricks, welches aus einer vorderen und einer hinteren Hälfte besteht, die an den Seitenenden miteinander verbunden sind, unter Verwendung einer Flachstrickmaschine, die vier Nadelbetten (FU, FD, BU, BD), ein vorderes oberes Nadelbett, ein vorderes unteres Nadelbett, ein hinteres oberes Nadelbett sowie ein hinteres unteres Nadelbett, aufweist,
gekennzeichnet durch Zu- oder Abnahme der Zahl an Langreihen an einer der beiden Hälften, der vorderen oder der hinteren Hälfte, des röhrenförmigen Gestricks, so daß eine Differenz in der Zahl der Langreihen zwischen den beiden Hälften vorhanden ist, und weiterhin gekennzeichnet durch einen Übertragungsvorgang von Fadenmaschen von Nadeln (A und T) eines ersten Nadelbetts (BD), welches eine größere Zahl an Langreihen trägt, auf ein zweites Nadelbett (FD), welches eine geringere Zahl an Langreihen trägt,

   wobei der Vorgang das Zuführen von Faden zum Bilden von Maschen an den Nadeln (B bis S) des zweiten Nadelbettes (FD), das Fangen des Fadens an einer unbesetzten Nadel (T), die benachbart zu denjenigen Nadeln angeordnet ist, die die Maschen tragen, und das Zuführen von Faden zum Bilden einer Reihe von Maschen an Stricknadeln (S bis B) des ersten Nadelbettes (BD) enthält,
   wobei das Verfahren das Übertragen des gefangenen Fadens auf eine Nadel (T) des ersten Nadelbettes durch Abschlagen während des Übertragens der Maschen von den Nadeln (N bis S) des zweiten Nadelbetts enthält, um so eine Verdrehung während des Übertragungsvorgangs der Masche von der Nadel (T) zu beseitigen.

2. Verfahren zum Stricken eines röhrenförmigen Gestricks mit dreidimensionaler Silhouette durch Verändern der Umfangslänge des röhrenförmigen Gestricks, enthaltend die folgenden Schritte:
Stricken eines röhrenförmigen Gestricks, welches aus einer vorderen und einer hinteren Hälfte besteht, die an den Seitenenden miteinander verbunden sind, unter Verwendung einer Flachstrickmaschine, die vier Nadelbetten (FU, FD, BU, BD), ein vorderes oberes Nadelbett, ein vorderes unteres Nadelbett, ein hinteres oberes Nadelbett sowie ein hinteres unteres Nadelbett, aufweist,
gekennzeichnet durch Zu- oder Abnahme der Zahl an Langreihen an einer der beiden Hälften, der vorderen oder der hinteren Hälfte, des röhrenförmigen Gestricks, so daß eine Differenz in der Zahl der Langreihen zwischen den beiden Hälften vorhanden ist, und weiterhin gekennzeichnet durch einen Übertragungsvorgang von Fadenmaschen von Nadeln (A und T) eines ersten Nadelbetts (BD), welches eine größere Zahl an Langreihen trägt, an ein zweites Nadelbett (FD), welches eine geringere Zahl an Langreihen trägt,
wobei das Verfahren den weiteren Schritt umfaßt, daß, nachdem der Faden zugeführt worden ist, um Maschen an den Nadeln (T bis B) des ersten Nadelbettes (BD) zu bilden, Faden in eine entgegengesetzte Richtung zugeführt wird, um eine weitere Masche an einer Nadel (A) des Nadelbettes zu bilden, so daß eine Verdrehung während des Übertragungsvorgangs der Maschen von der Nadel (A) beseitigt wird.

3. Röhrenförmiges Gestrick, enthaltend eine vordere und eine hintere Hälfte, die an den Seitenenden miteinander verbunden sind, bei dem die Umfangslänge durch Zunahme und/oder Abnahme der Zahl der Langreihen bei einer der beiden Hälften, der vorderen oder der hinteren Hälfte, verändert wird, um eine dreidimensionale Silhouette zu bilden.

Revendications

1. Procédé de tricotage d'un tissu tubulaire de forme tridimensionnelle consistant à faire varier la longueur circonférentielle du tissu tubulaire, et à tricoter un tissu tubulaire se composant de moitiés avant et arrière, assemblées au niveau de leurs extrémités latérales, à l'aide d'une machine à tricoter rectiligne, comportant quatre fontures d'aiguilles avant supérieure, avant inférieure, arrière supérieure et arrière inférieure (FU, FD, BU, BD);
   caractérisé par l'augmentation ou la diminution du nombre de colonnes de mailles au niveau d'une des deux moitiés avant et arrière du tissu tubulaire, de telle sorte que l'on obtienne un nombre de colonnes de mailles différent pour les deux moitiés; et caractérisé, en outre, par un processus de report de boucles de fil depuis les aiguilles (A et T) d'une première fonture d'aiguilles (BD) qui supporte un nombre supérieur de colonnes de mailles, vers

une deuxième fonture d'aiguilles (FD) supportant un nombre inférieur de colonnes de mailles;

le processus consistant à amener le fil pour former des boucles sur les aiguilles (B à S) de la deuxième fonture d'aiguilles (FD) et à charger le fil sur une aiguille inoccupée (T) placée de manière adjacente aux aiguilles supportant lesdites boucles, et à amener le fil pour former une rangée de boucles sur les aiguilles à tricoter (S à B) de la première fonture d'aiguilles (BD);
le procédé consistant à reporter le fil de charge sur une aiguille (T) de la première fonture d'aiguilles par abattage pendant le report des boucles des aiguilles (N à S) de la deuxième fonture d'aiguilles, de manière à supprimer toute torsion pendant le processus de report de la boucle à partir de ladite aiguille (T).

2. Procédé de tricotage d'un tissu tubulaire de forme tridimensionnelle consistant à faire varier la longueur circonférentielle du tissu tubulaire, et à tricoter un tissu tubulaire se composant de moitiés avant et arrière, assemblées au niveau de leurs extrémités latérales, à l'aide d'une machine à tricoter rectiligne, comportant quatre fontures d'aiguilles avant supérieure, avant inférieure, arrière supérieure et arrière inférieure (FU, FD, BU, BD);

caractérisé par l'augmentation ou la diminution du nombre de colonnes de mailles au niveau d'une des deux moitiés avant et arrière du tissu tubulaire, de telle sorte que l'on obtienne un nombre de colonnes de mailles différent pour les deux moitiés; et caractérisé, en outre, par un processus de report de boucles de fil depuis les aiguilles (A et T) d'une première fonture d'aiguilles (BD) qui supporte un nombre supérieur de colonnes de mailles, vers une deuxième fonture d'aiguilles (FD) supportant un nombre inférieur de colonnes de mailles;

le procédé consistant, après avoir amené le fil pour former des boucles sur les aiguilles (T à B) de la première fonture d'aiguilles (BD), à fournir le fil dans un sens opposé pour former une autre boucle sur une aiguille (A) de ladite fonture d'aiguilles, de manière à supprimer toute torsion pendant le processus de report des boucles à partir de ladite aiguille (A).

3. Tissu tricoté tubulaire comprenant une moitié avant et une moitié arrière, assemblées au niveau des extrémités latérales, dans lequel la longueur circonférentielle varie par augmentation et/ou diminution du nombre de colonnes de mailles d'une des deux moitiés avant et arrière pour obtenir une forme tridimensionnelle.

FIG.1

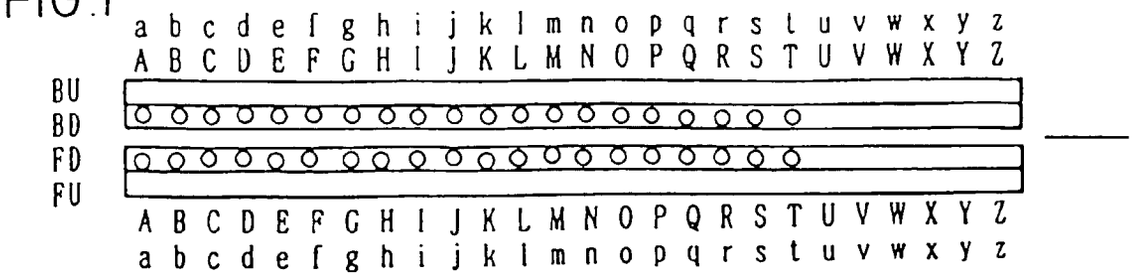


FIG.2

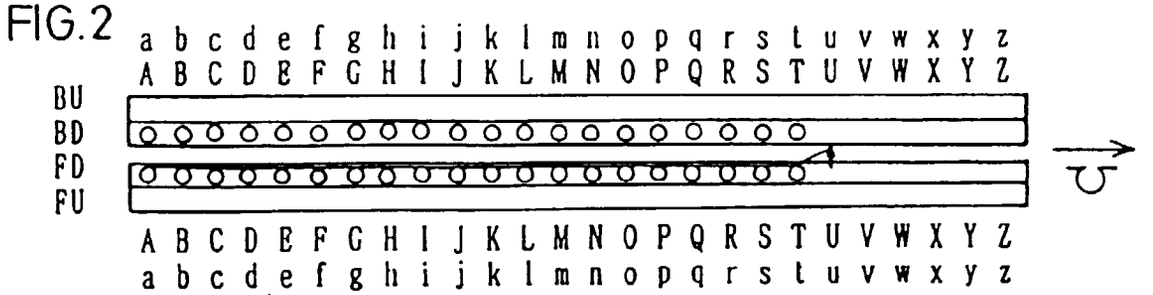


FIG.3

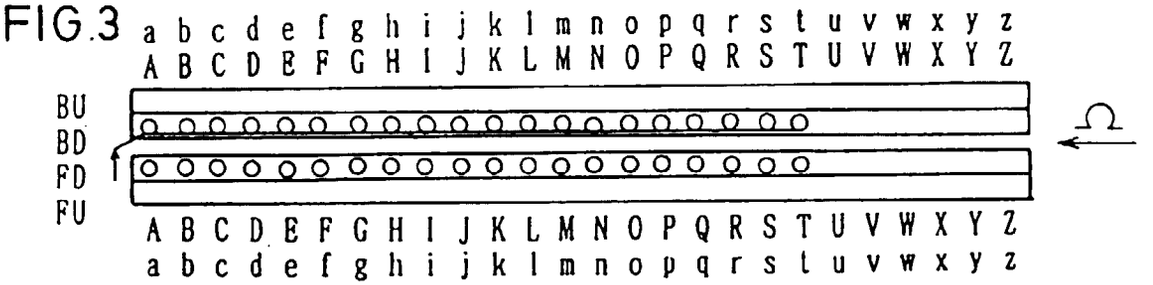


FIG.4

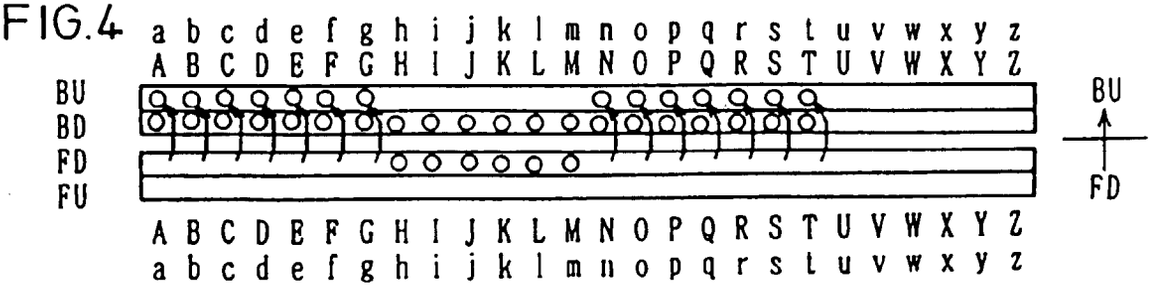


FIG.5

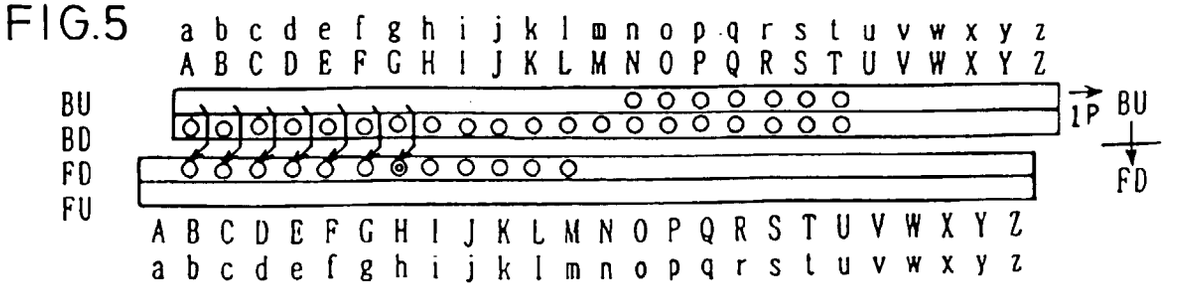


FIG.6

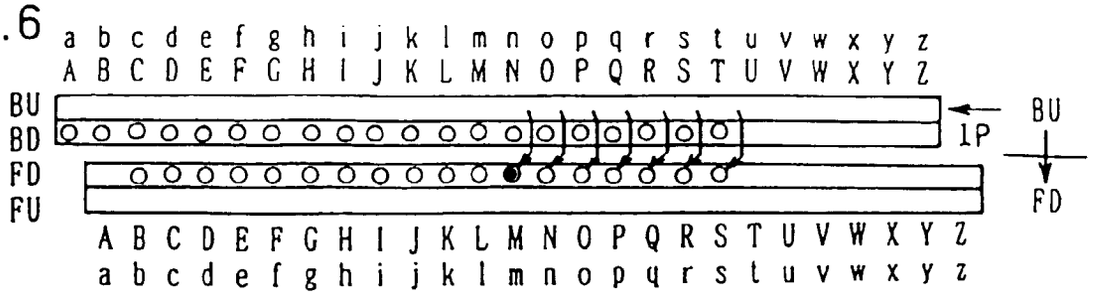


FIG.7

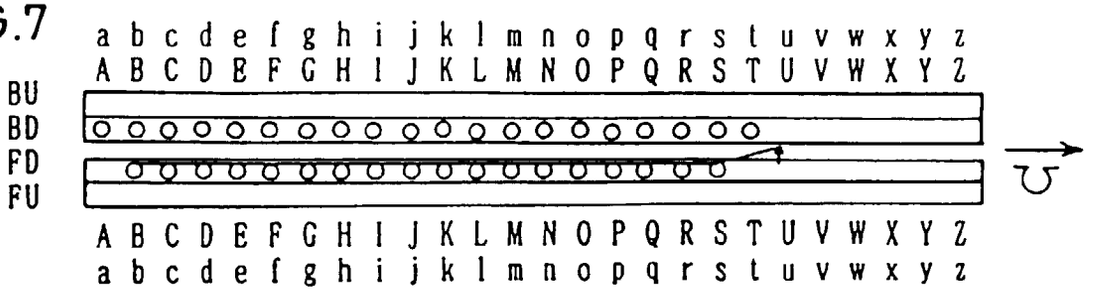


FIG.8

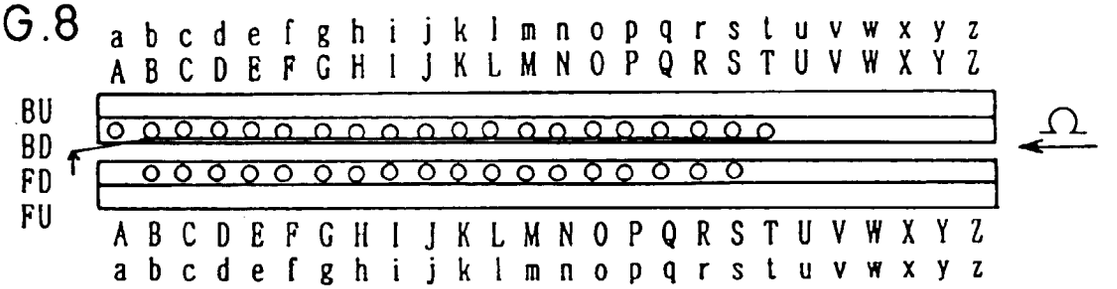


FIG.9

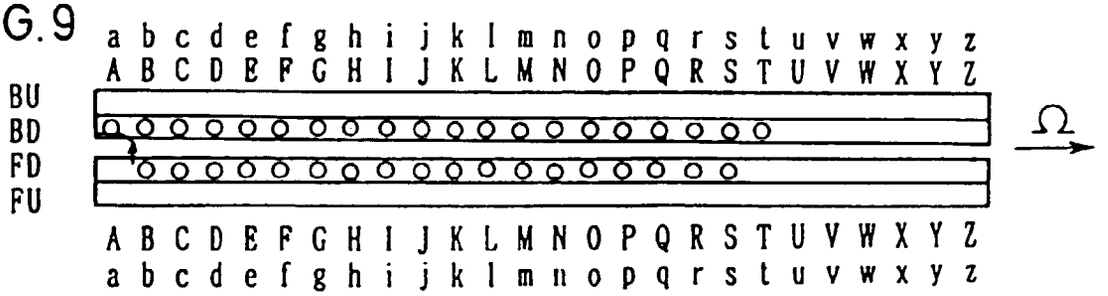


FIG.10

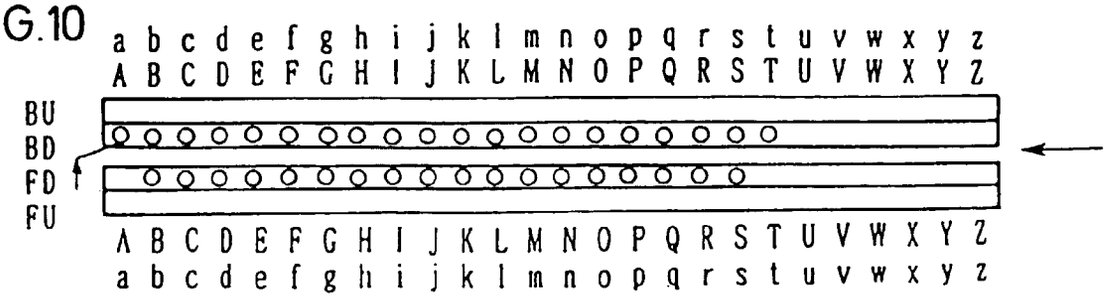


FIG.11

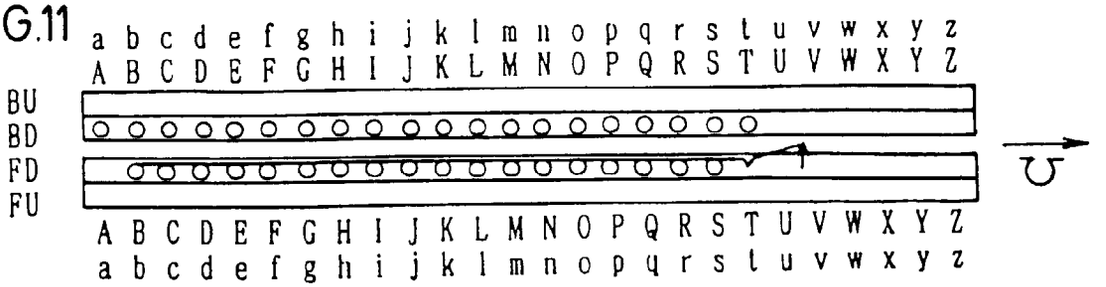


FIG.12

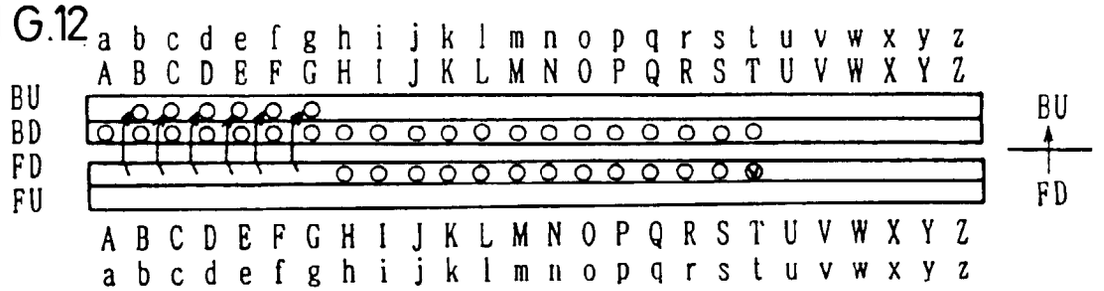


FIG.13

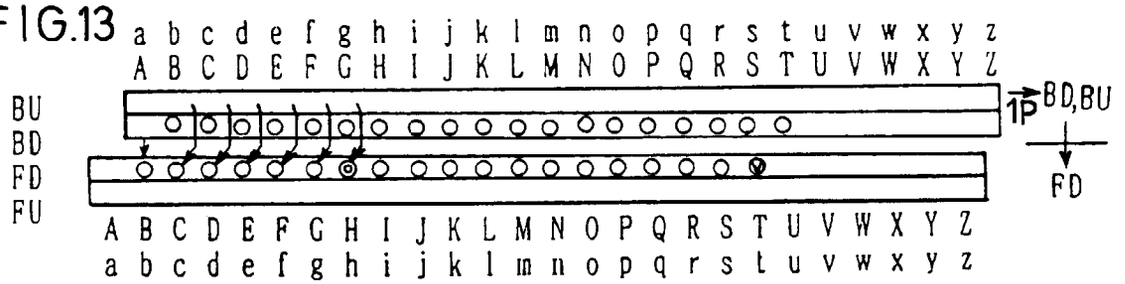


FIG.14

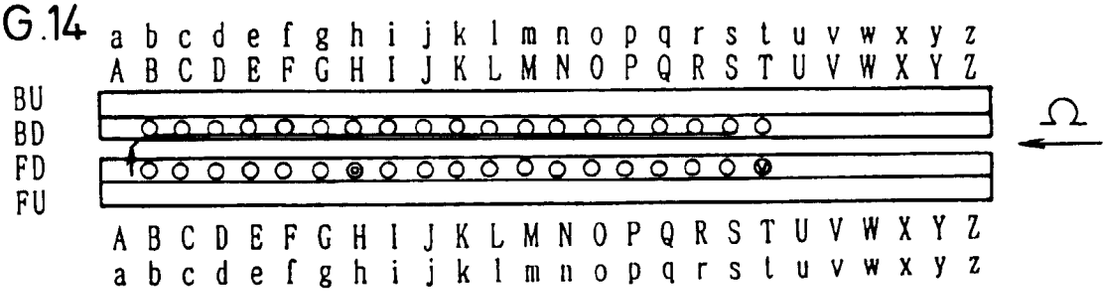


FIG.15

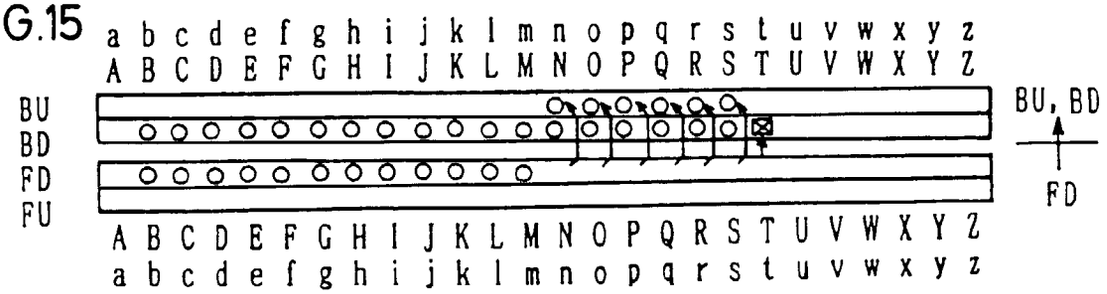


FIG.16

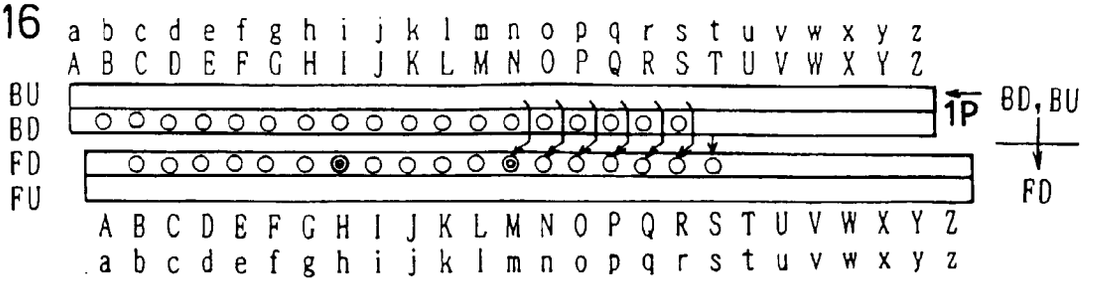


FIG.17

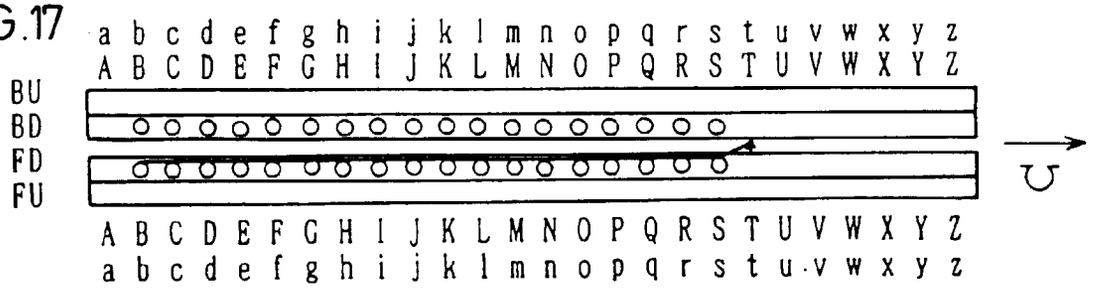


FIG.18

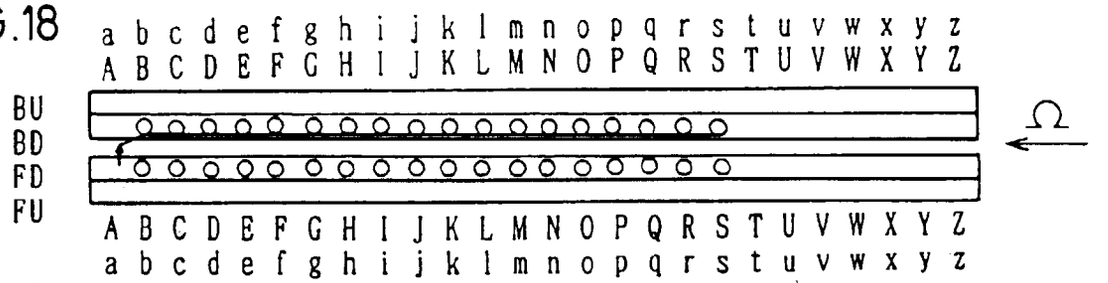


FIG.19

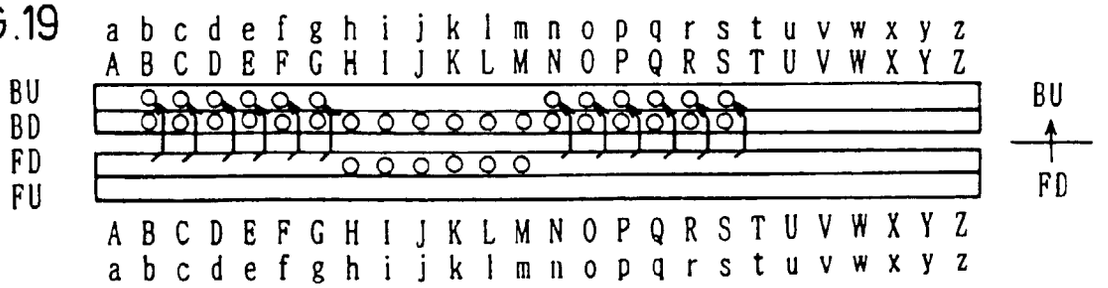


FIG.20

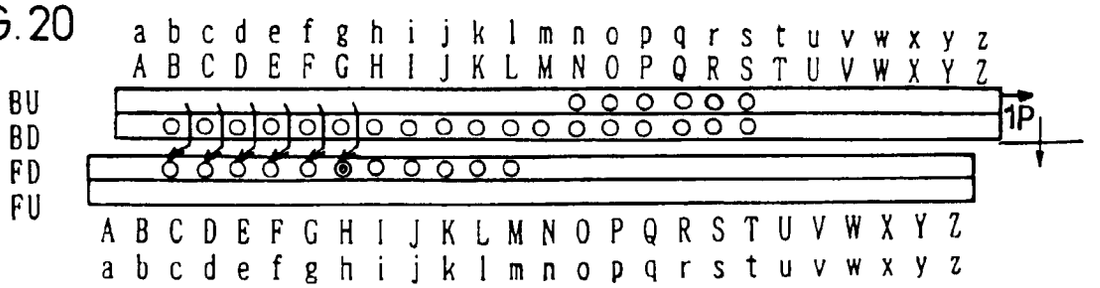


FIG.21

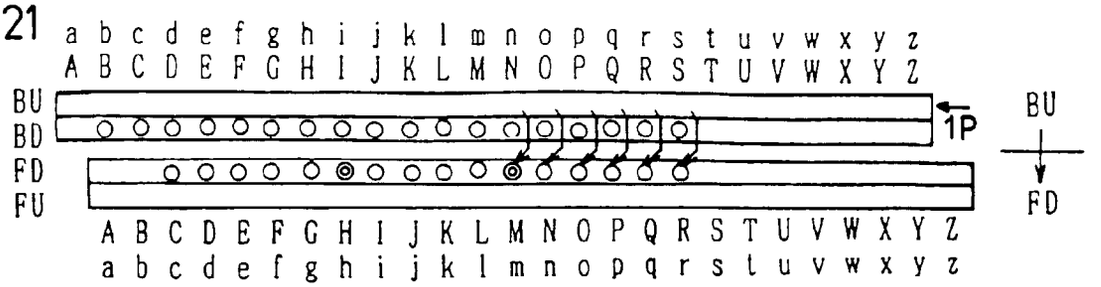


FIG.22

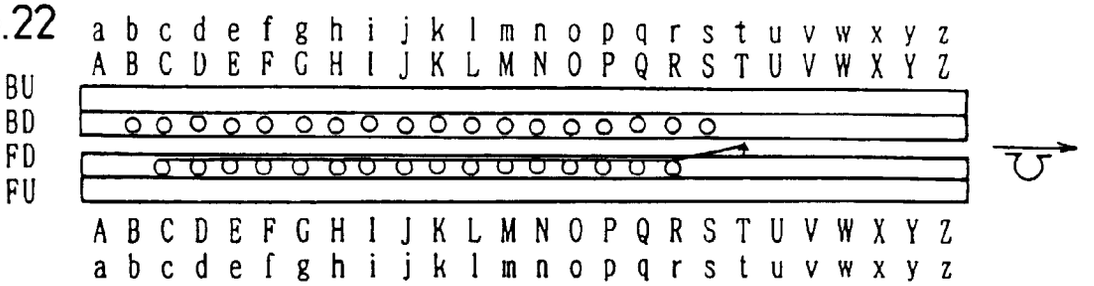


FIG 23

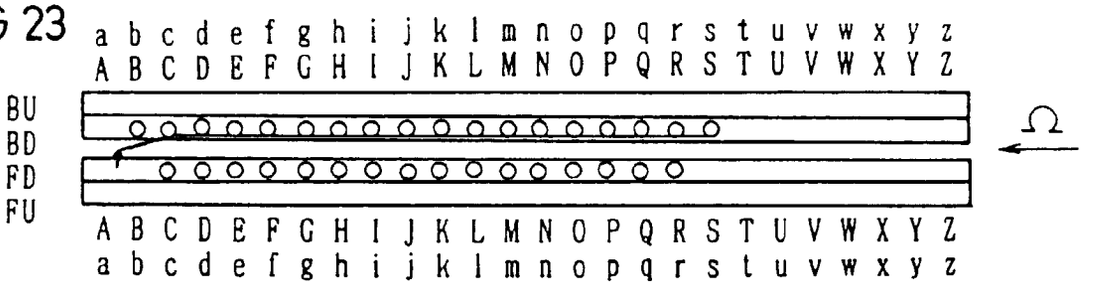


FIG.24

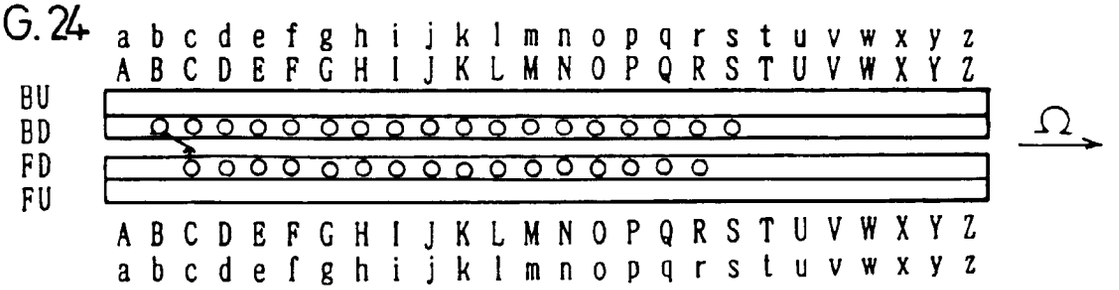


FIG.25

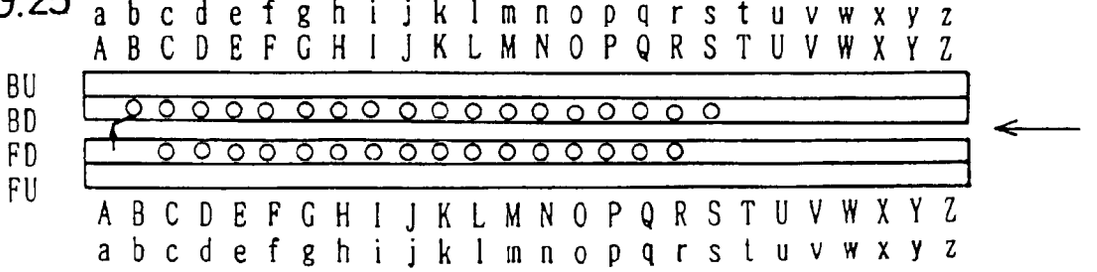


FIG.26

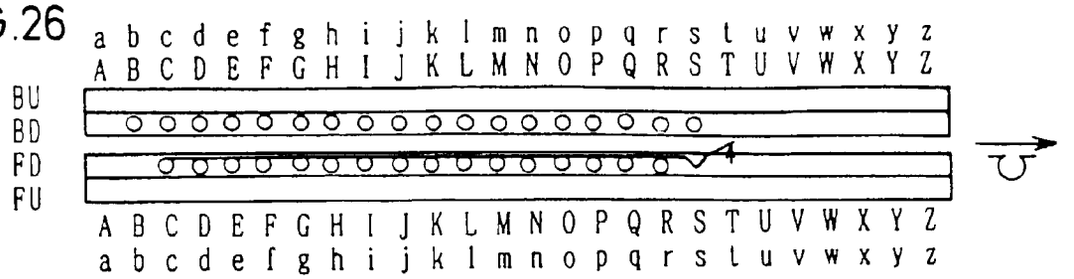


FIG.27

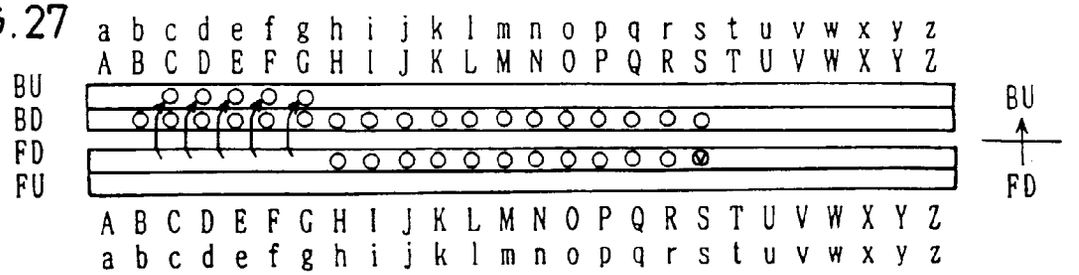


FIG.28

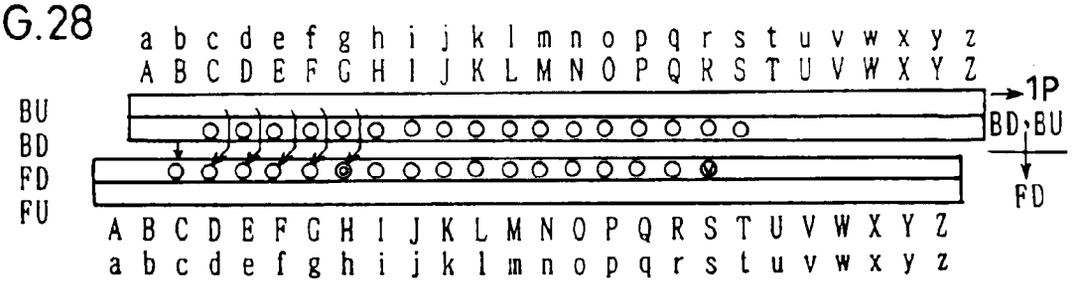


FIG.29

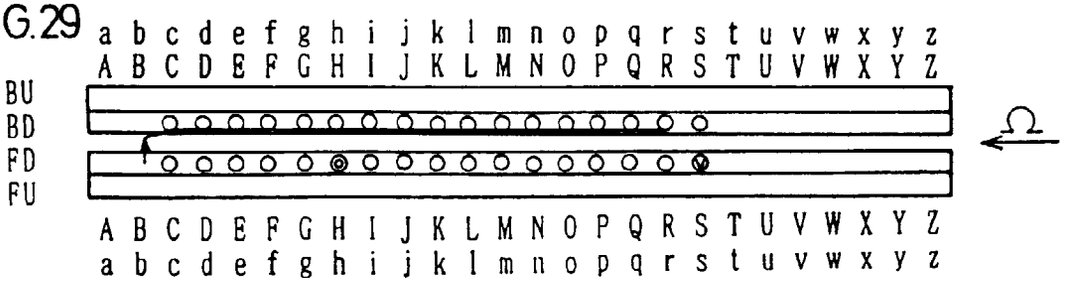


FIG.30

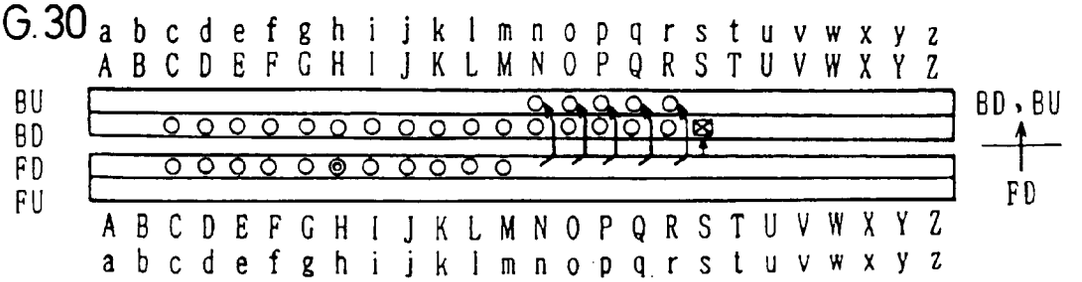


FIG.31

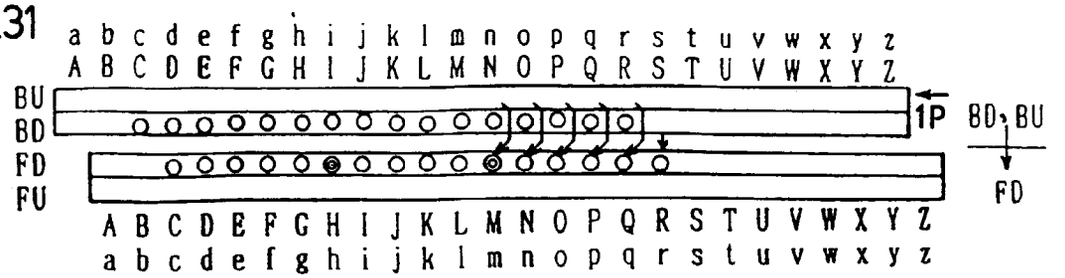


FIG.32

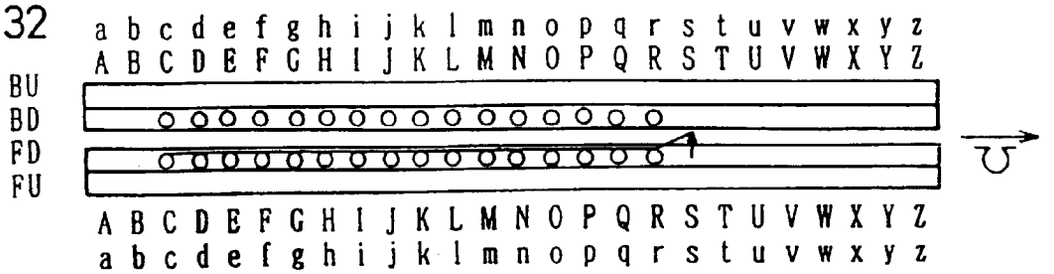


FIG.33

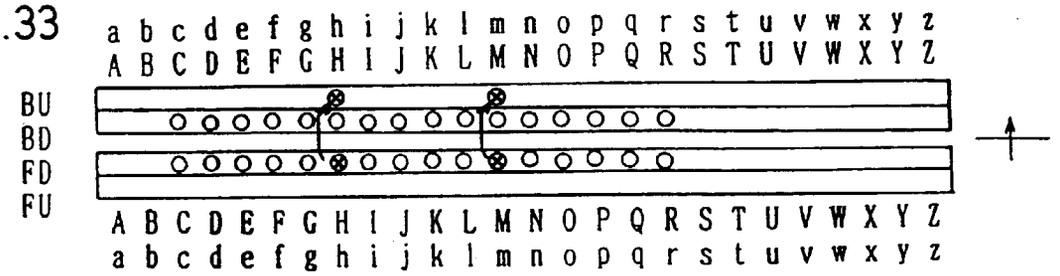


FIG.34

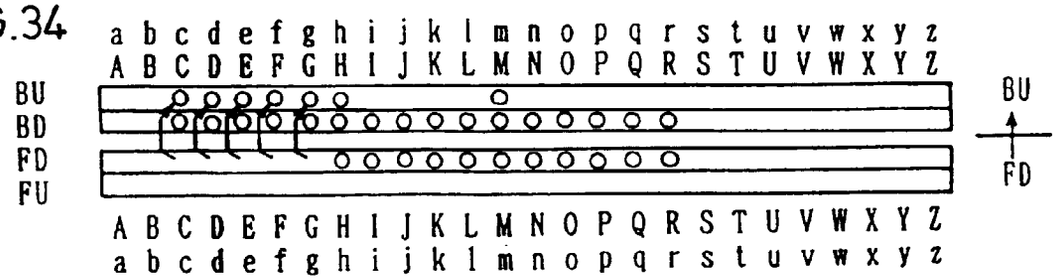


FIG.35

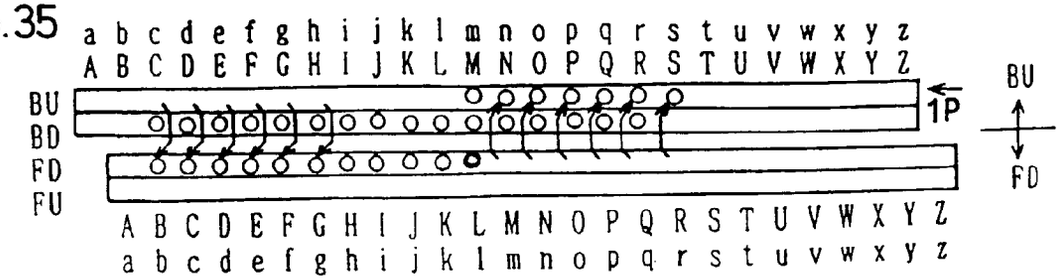


FIG.36

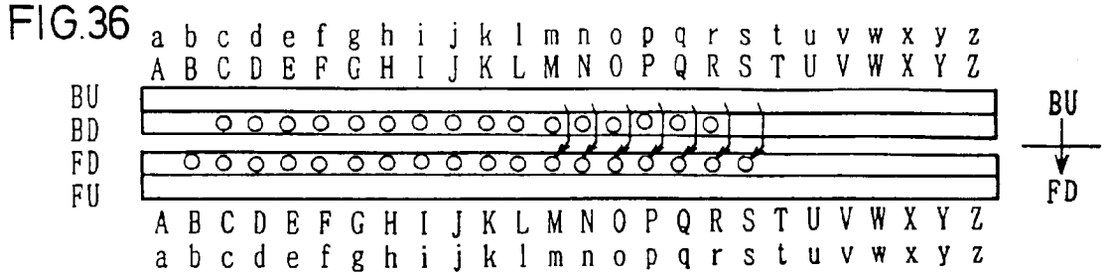


FIG.37

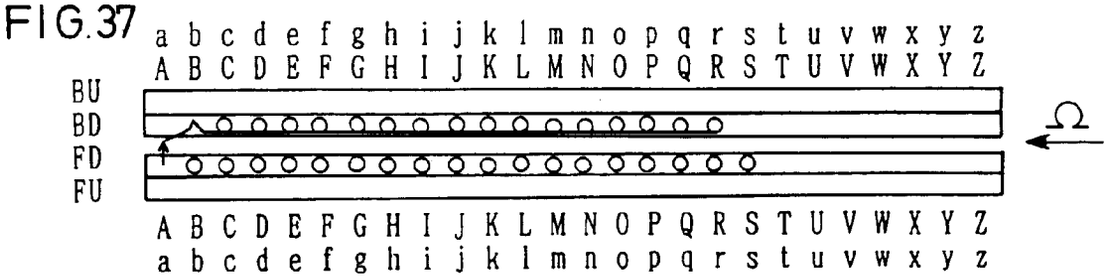


FIG.38

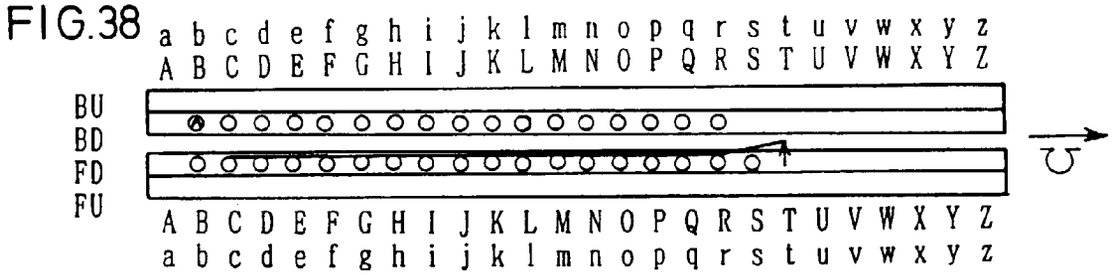


FIG.39

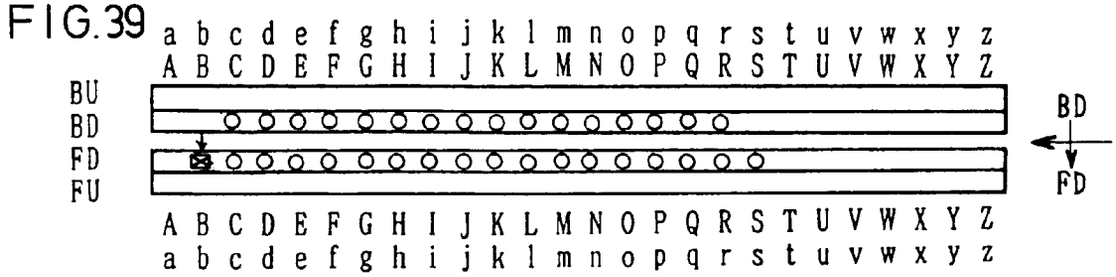


FIG.40

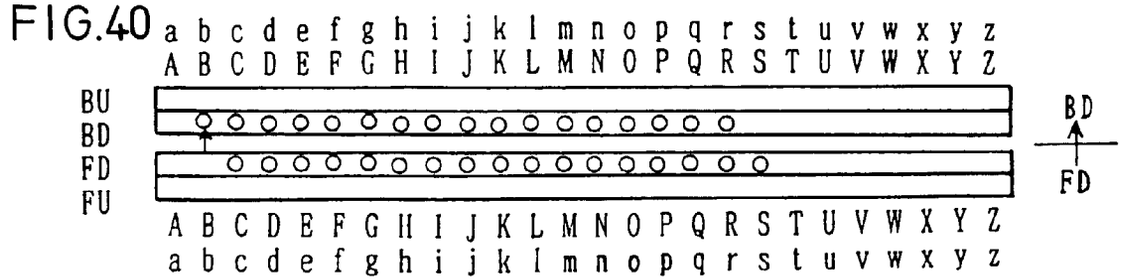


FIG.41

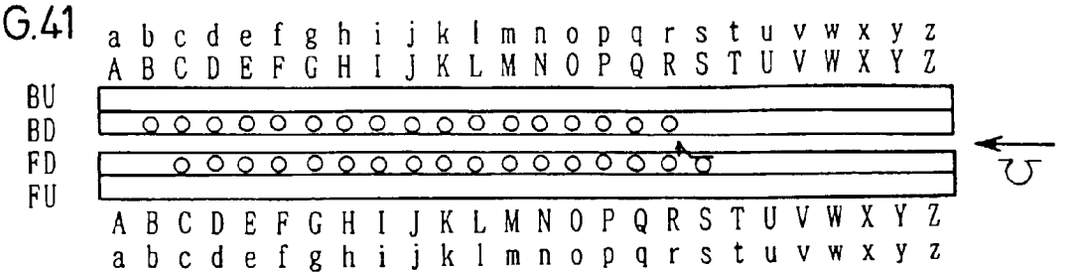


FIG.42

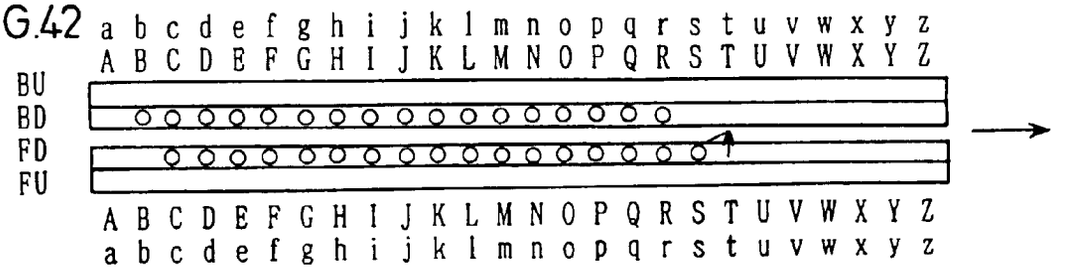


FIG.43

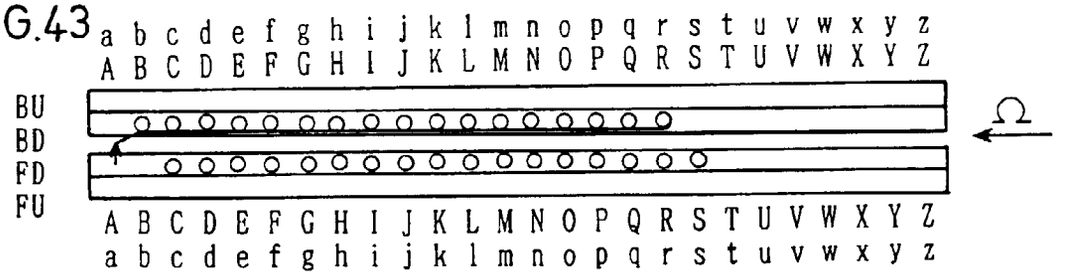


FIG.44

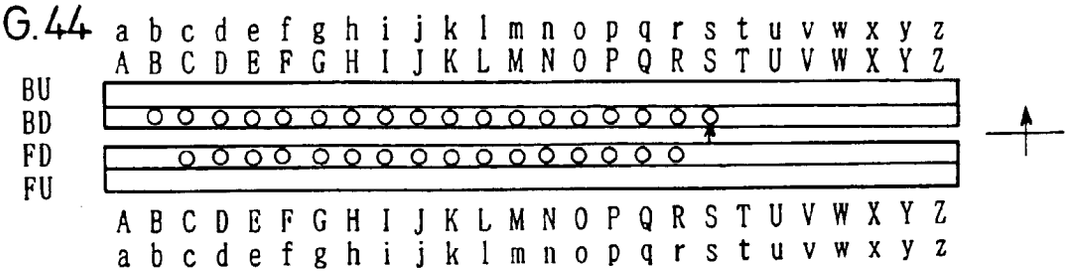


FIG.45

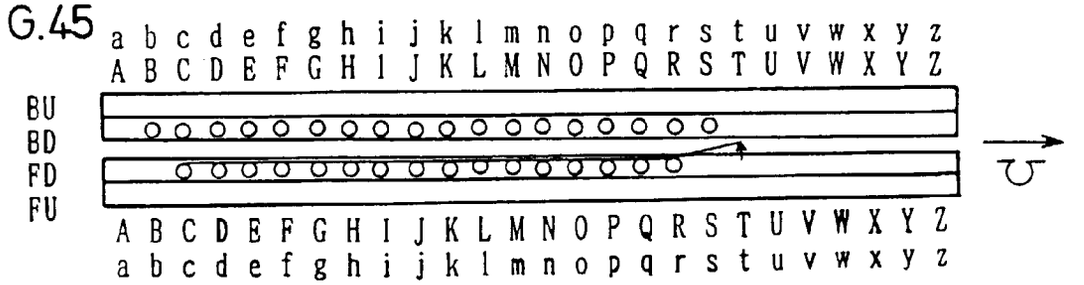


FIG.46

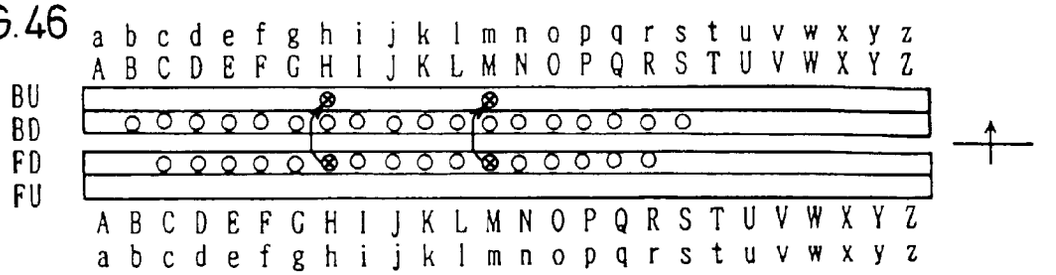


FIG.47

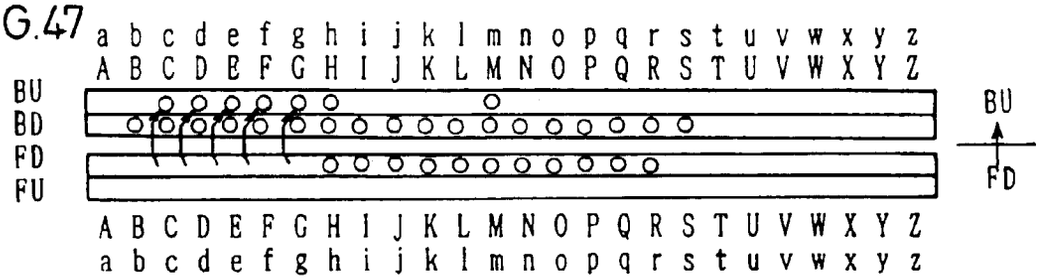


FIG.48

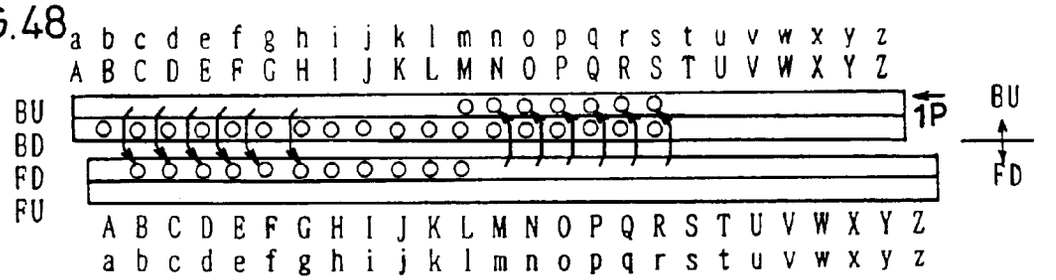


FIG.49

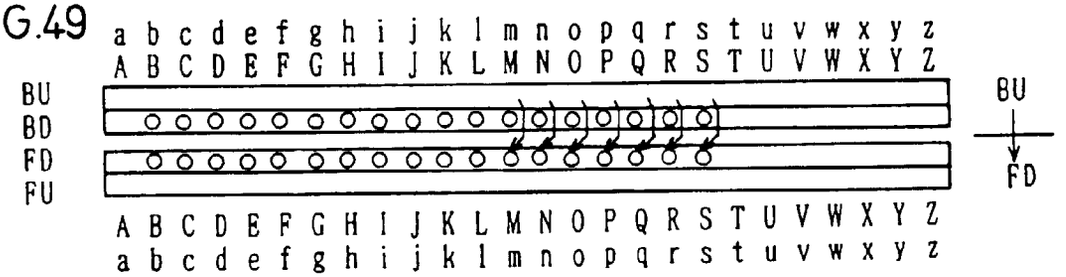


FIG.50

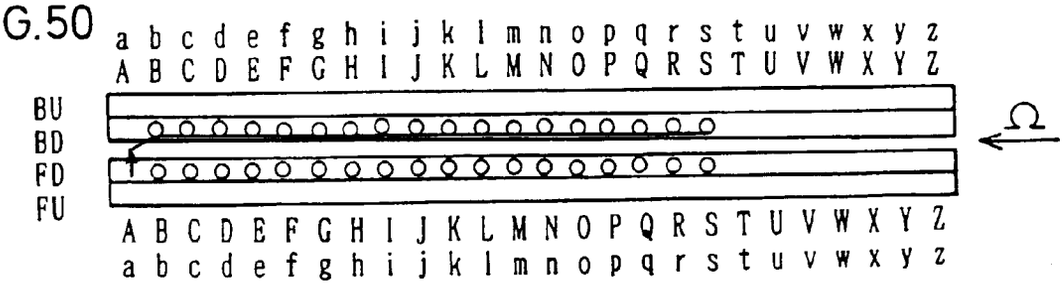


FIG.51

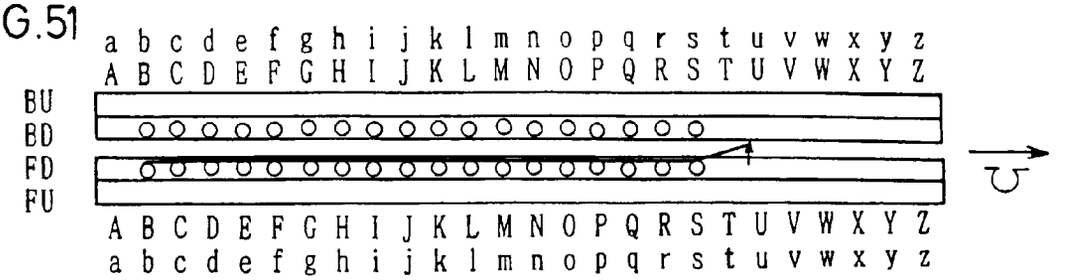


FIG.52

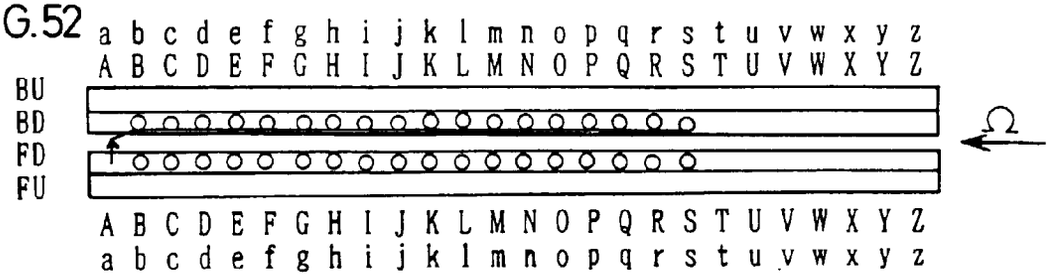


FIG.53

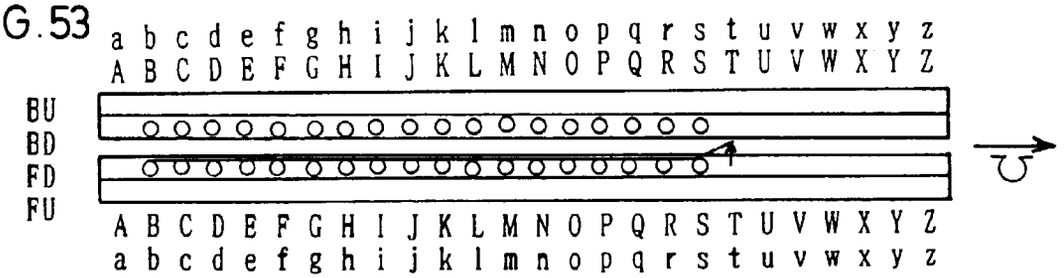


FIG.54

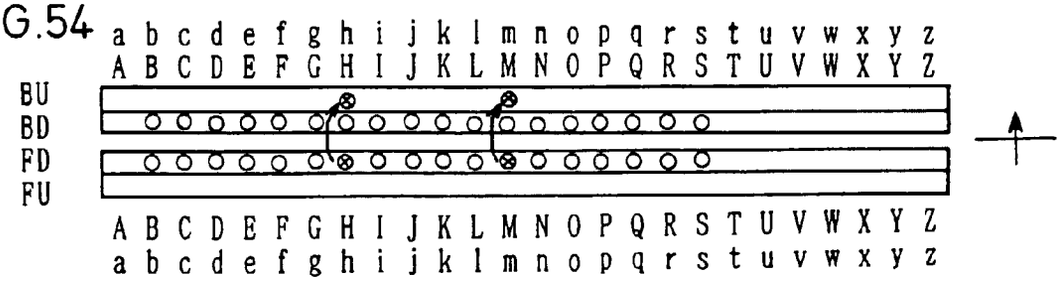


FIG.55

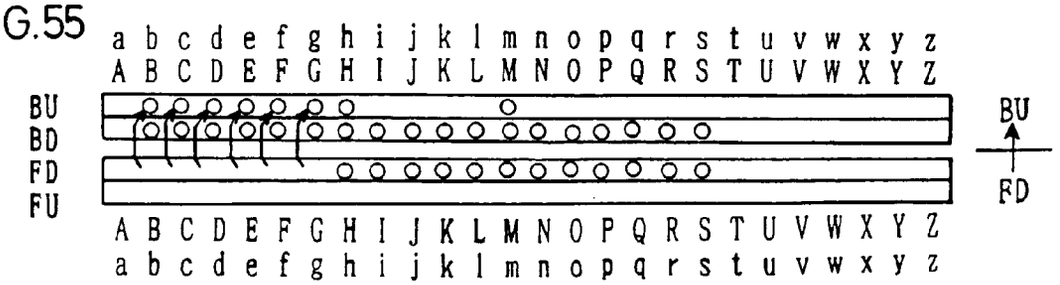


FIG.56

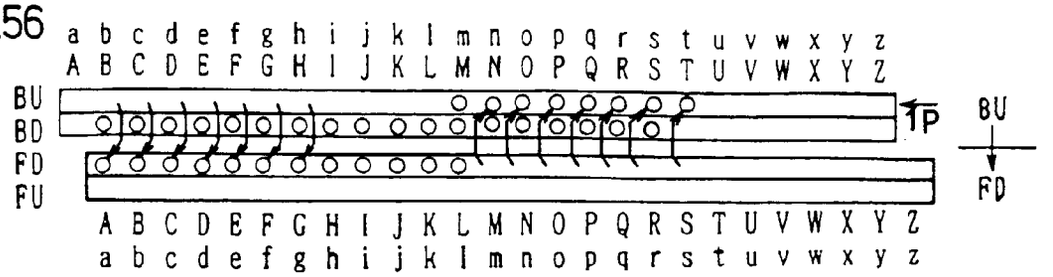


FIG.57

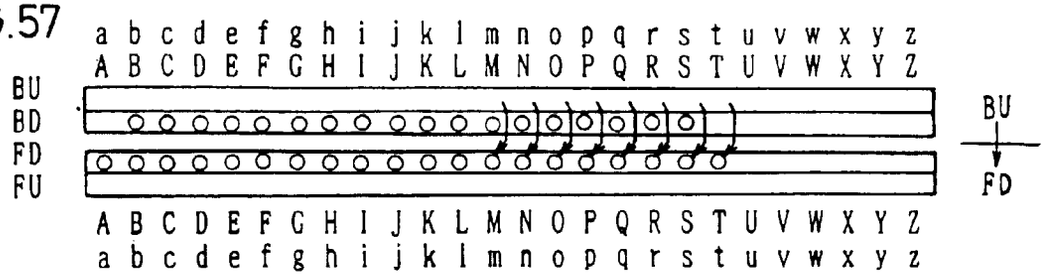


FIG.58

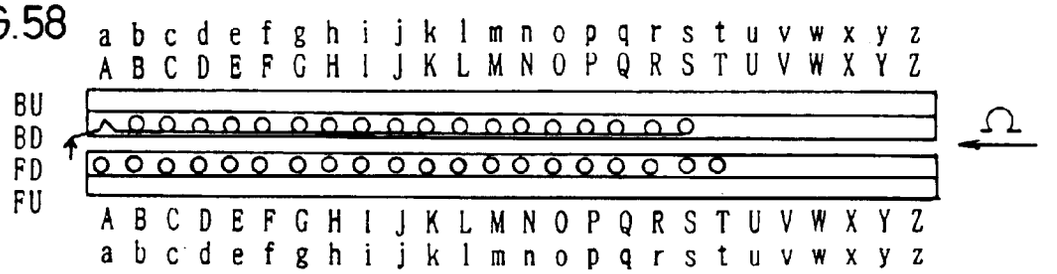


FIG.59

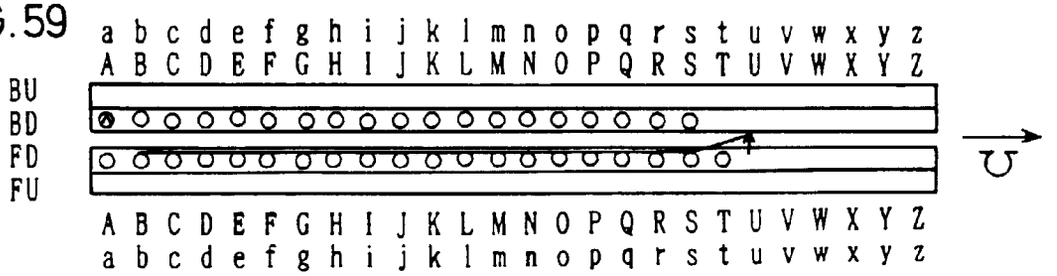


FIG.60

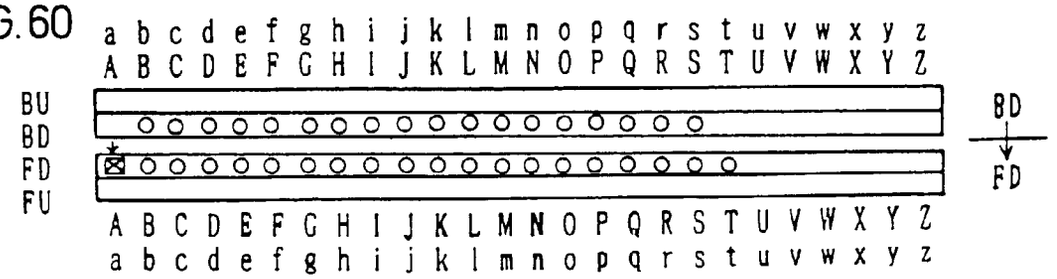


FIG.61

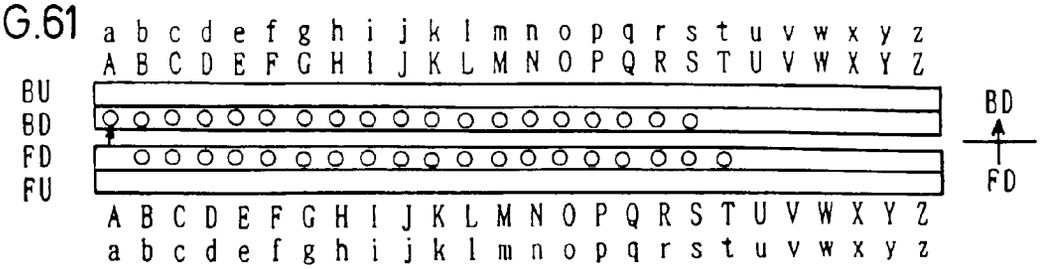


FIG.62

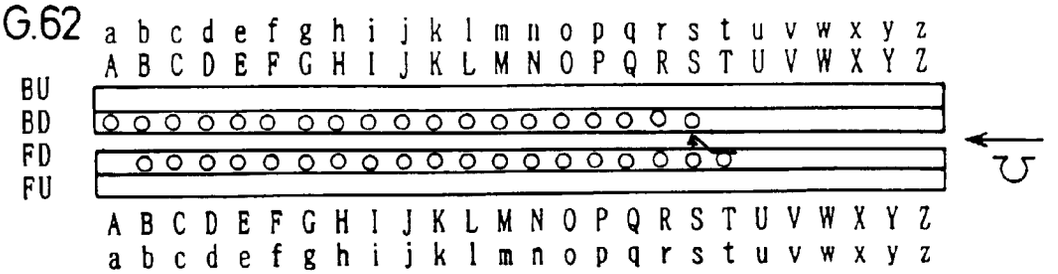


FIG.63

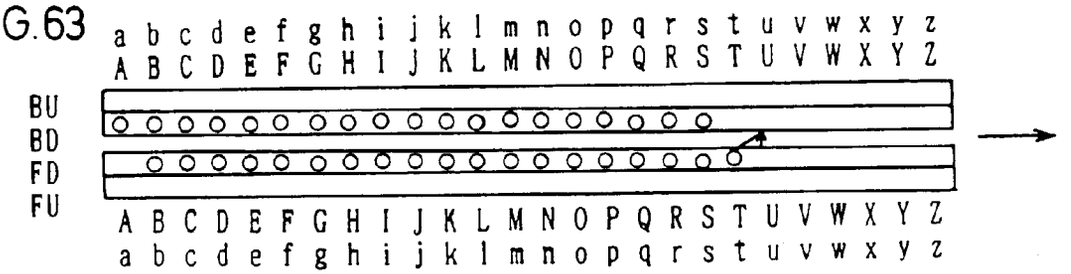


FIG.64

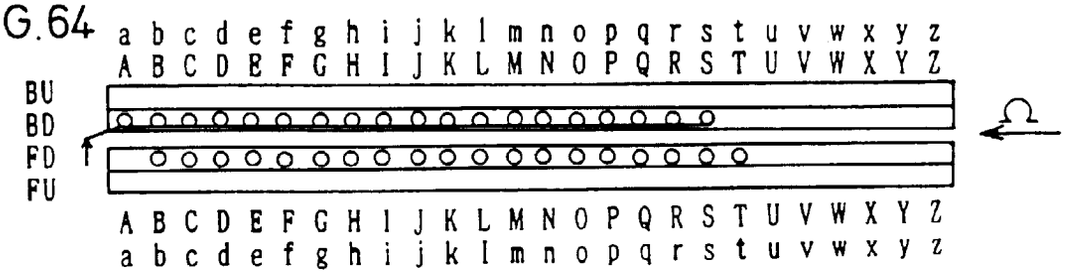


FIG.65

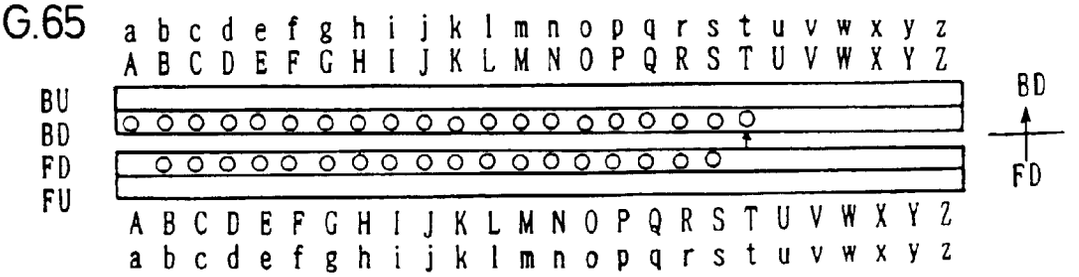


FIG.66

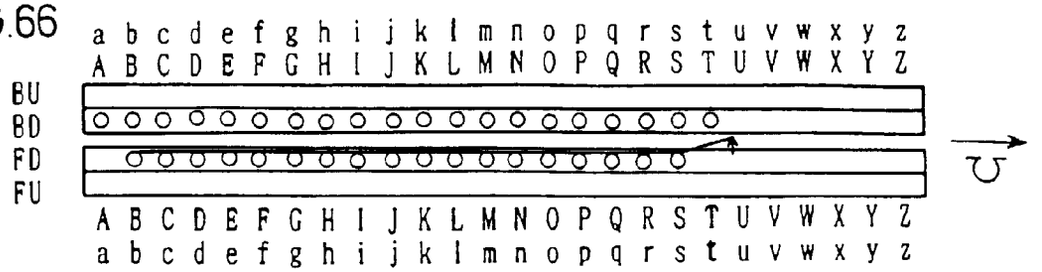


FIG.67

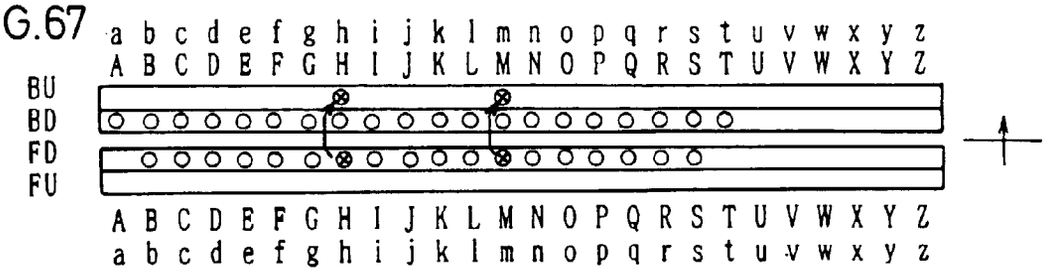


FIG.68

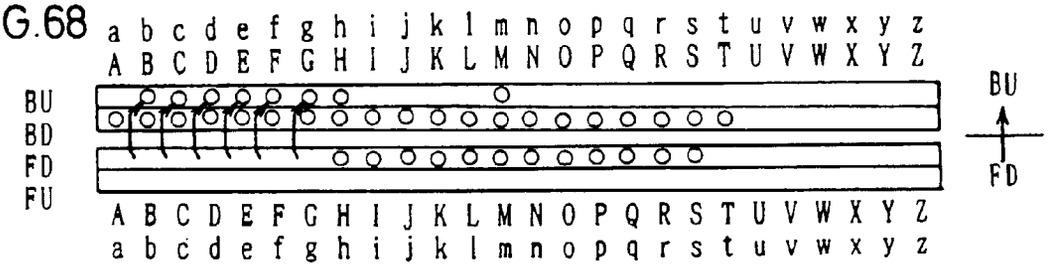


FIG.69

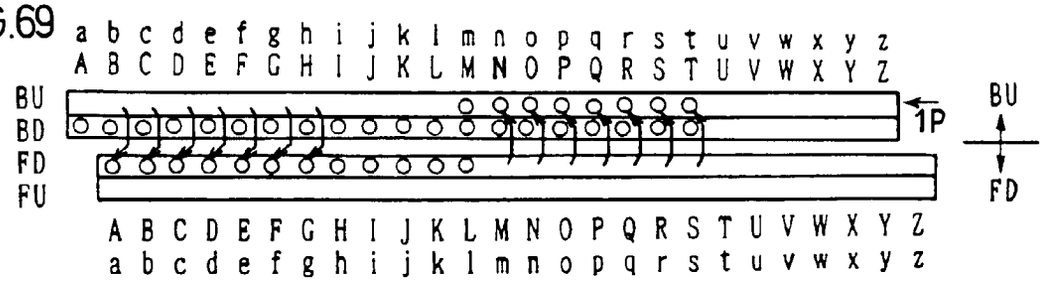


FIG.70

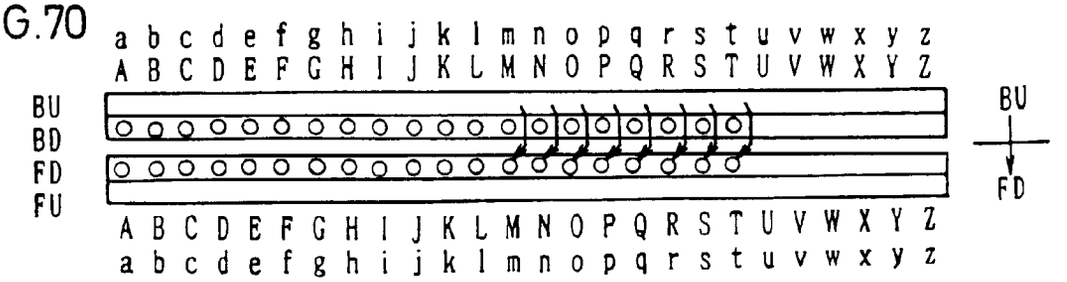


FIG.71

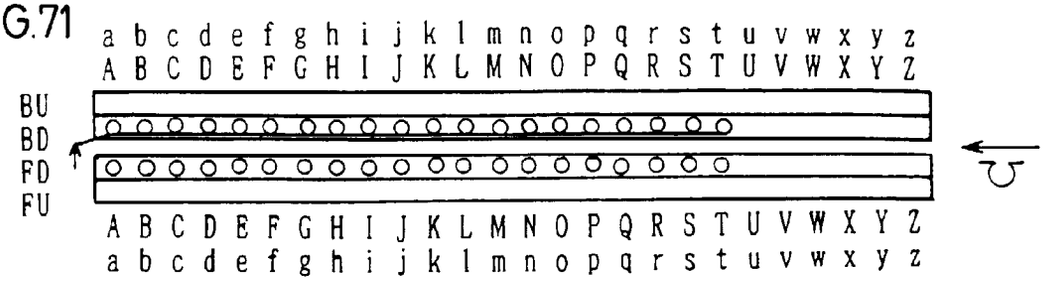


FIG.72

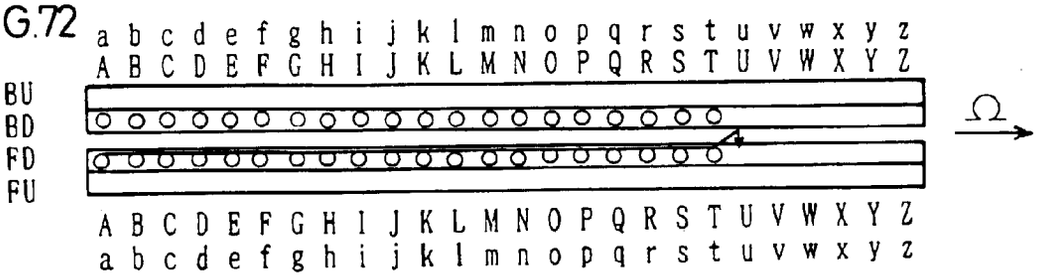


FIG.73

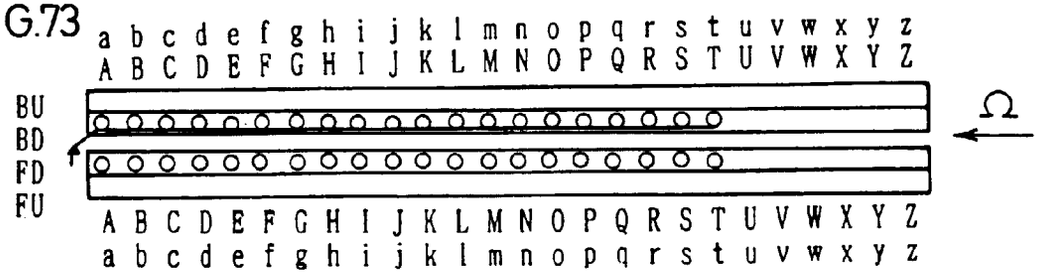
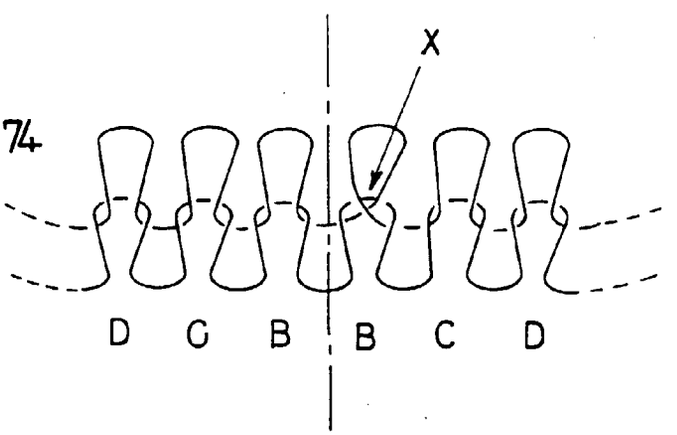


FIG.74



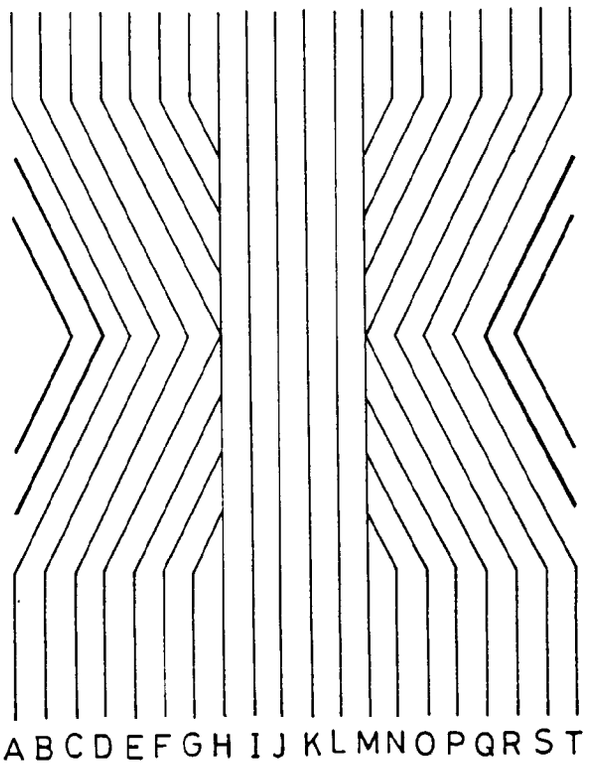


FIG.75

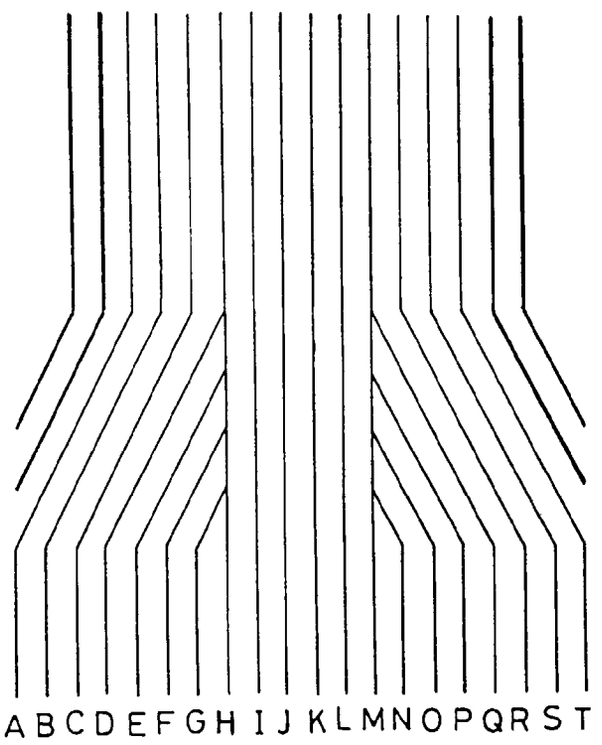


FIG.76

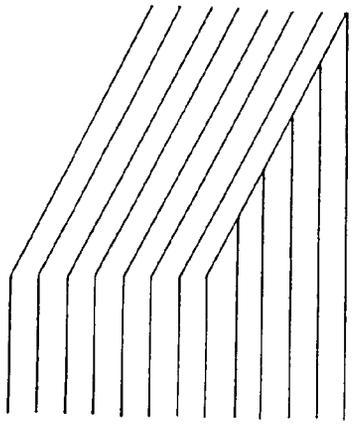


FIG.77

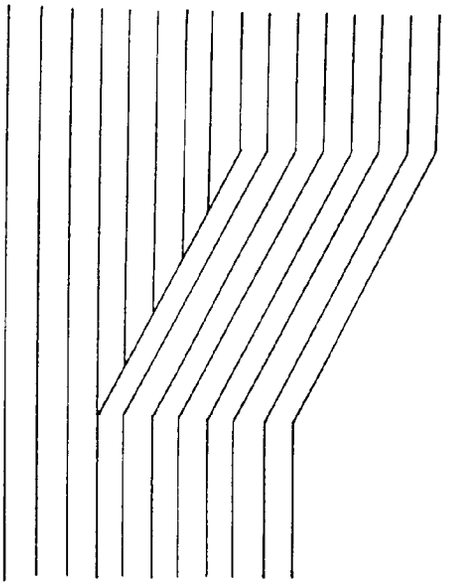


FIG.78

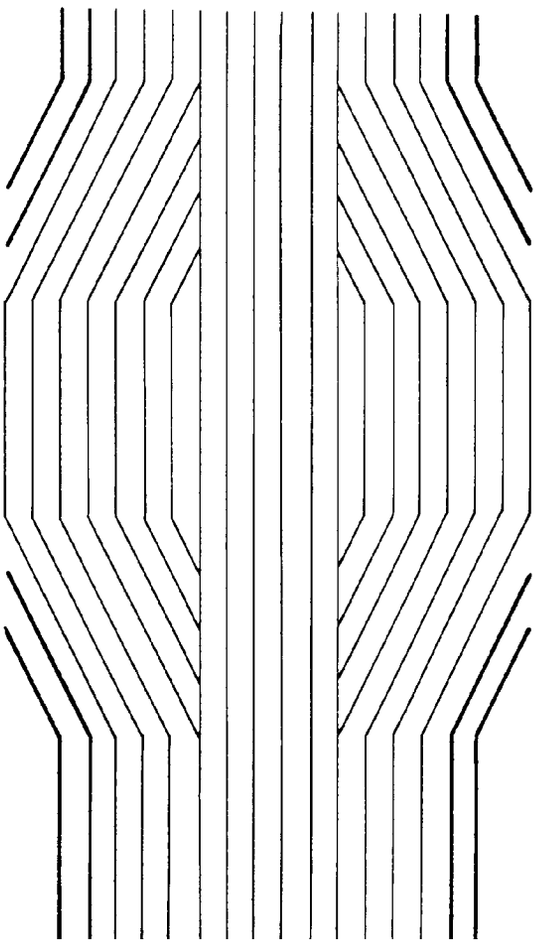


FIG.79