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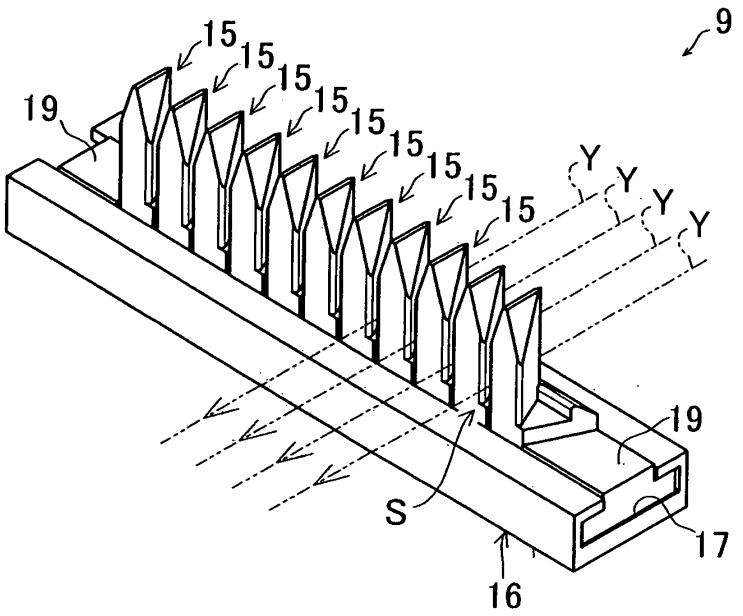
(54) **Multiple yarn guide**

(57) An object of the present invention is to provide a multiple yarn guide which is easy to assemble owing to a reduced number of components required and which is unlikely to be damaged. A multiple yarn guide 9 includes a plurality of guide pieces 15 arranged in a line. A pair of adjacent guide pieces 15 forms a yarn accommodating space S in which a traveling filament yarn Y is accommodated.

FIGURE 2



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Description

Field of the Invention

[0001] The present invention relates a multiple yarn guide.

Background of the Invention

[0002] As a technique of this kind, the Unexamined Japanese Patent Application Publication (Tokkai) No. 2005-179807 discloses an interlacing device including a guide that regulates and holds a path of a traveling yarn. That is, as shown in Figure 3 of the Unexamined Japanese Patent Application Publication (Tokkai) No. 2005-179807, a plurality of cylindrical regulating guides G1 regulating the yarn path are arranged in a line in front of and behind a fluid processing section that carries out a process of interlacing yarns with each other. Moreover, a bar guide G2 shaped like a round bar is provided so as to stride over the plurality of regulating guides G1. The adjacent regulating guides G1 and the round bar-shaped bar guide G2 form the yarn path.

[0003] Furthermore, the Unexamined Japanese Patent Application Publication (Tokkai) No. 2008-504462 discloses yarn guide beams arranged in front of and behind a nozzle block that processes a filament yarn. As shown in Figure 2 of the Unexamined Japanese Patent Application Publication (Tokkai) No. 2008-504462, the yarn guide beam is shaped like a comb in association with a flow of a given number of yarns.

[0004] However, the configuration in the Unexamined Japanese Patent Application Publication (Tokkai) No. 2005-179807 requires the round bar-shaped bar guide G2 to provide the yarn path. Thus, the configuration involves a large number of components and is not easy to assemble. Furthermore, the comb shape employed in the Unexamined Japanese Patent Application Publication (Tokkai) No. 2008-504462 generally tends to be readily damaged.

Summary of the Invention

[0005] The present invention has been made in view of these circumstances. A main object of the present invention is to provide a multiple yarn guide which is easy to assemble owing to a reduced number of components required and which is unlikely to be damaged.

[0006] The problems to be solved by the present invention have been described above. Means for solving the problems and effects of the means will be described below.

[0007] An aspect of the present invention provides a multiple yarn guide configured as described below. That is, the multiple yarn guide includes a plurality of guide members arranged in a line. A yarn accommodating space in which a yarn is accommodated is formed in each of the guide members. Alternatively, a pair of the adjacent guide members forms the yarn accommodating space. Compared to the technique disclosed in Figure 3 of the Unexamined Japanese Patent Application Publication (Tokkai) No. 2005-179807, this configuration eliminates the need for the round bar-shaped bar guide G2. This reduces the number of components required, resulting in easy assembly. Furthermore, this configuration is less likely to be damaged than the comb-shaped yarn guide beam disclosed in Figure 2 of Unexamined Japanese Patent Application Publication (Tokkai) No. 2008-504462. Moreover, if any of the guide members is damaged, only the damaged guide member needs to be replaced with a new one. This enables a reduction in maintenance costs.

[0008] The above-described multiple yarn guide is configured as follows. That is, the multiple yarn guide is configured to allow the number of the plurality of guide members to be increased and reduced. This configuration enables a change in the number of the yarn accommodating spaces.

[0009] The multiple yarn guide is further configured as follows. That is, the multiple yarn guide includes an elongate member. Each of the guide members engages with the elongate member so as to be supported by the elongate member. According to this configuration, the simple arrangements can be used to arrange the plurality of guide members in a line and to increase and reduce the number of the plurality of guide members.

[0010] The multiple yarn guide is further configured as follows. That is, the yarn accommodating space is formed by the pair of the adjacent guide members. Compared to the case in which the yarn accommodating space is formed in each of the guide members, this configuration allows the shape of the guide member to be simplified. Furthermore, the simplified shape of the guide member contributes to reducing the pitch of the yarn accommodating spaces and thus making a facility with the multiple yarn guide compact.

[0011] The multiple yarn guide is further configured as follows. That is, a planar direction of mating surfaces of the pair of the adjacent guide members is inclined to a traveling direction of the yarn accommodated in the yarn accommodating space. This configuration prevents the yarn from falling into a gap between the mating surfaces. Thus, manufacturing costs can be reduced in connection with the processing accuracy of the mating surfaces.

[0012] The multiple yarn guide is further configured as follows. That is, a first projecting portion and a second projecting portion are formed on each of the guide members, the second projecting portion regulating movement of the yarn in a direction perpendicular to the direction of the line of the guide members. The yarn accommodating space is formed by a slit formed by a pair of the adjacent first projecting portions, and the second projecting portion. According to this configuration, the simple arrangements can be used to support the yarn in three directions.

[0013] The multiple yarn guide is further configured as follows. That is, an inclination between the planar direc-

tion of the mating surfaces and the traveling direction of the yarn is configured to be changeable. With this configuration, a change in inclination increases or reduces a distance between the paired adjacent first projecting portions. Thus, according to this configuration, the slit width of the slit can be changed.

[0014] The multiple yarn guide is further configured as follows. That is, a pawl portion is formed on at least one of the pair of the adjacent guide members to prevent the yarn from slipping out from the yarn accommodating space. According to this configuration, the simple arrangements can be used to prevent the yarn from slipping out from the yarn accommodating space.

[0015] The multiple yarn guide is further configured as follows. That is, the yarn accommodating space is formed in each of the guide members. This configuration allows the yarn accommodating space to be formed away from the mating surfaces of the pair of the adjacent guide members.

[0016] The multiple yarn guide is further configured as follows. That is, a slit and a pawl portion are formed in each of the guide members, the slit allowing the yarn accommodating space to communicate with an exterior, and the pawl portion preventing the yarn from slipping out from the yarn accommodating space. This configuration simplifies the arrangement for enabling the yarn to be inserted into the yarn accommodating space and the arrangement for preventing the yarn from slipping out from the yarn accommodating space.

[0017] Other features, elements, processes, steps, characteristics and advantages of the present invention will become more apparent from the following detailed description of preferred embodiments of the present invention with reference to the attached drawings.

Brief Description of the Drawings

[0018]

Figure 1 is a schematic diagram showing a general configuration of a melt-spinning and drawing device (a manufacturing device for synthetic yarn).
Figure 2 is a perspective view of a yarn guide according to a first embodiment of the present invention.
Figure 3 is a diagram which is similar to Figure 2 and in which drawing of a guide rail is omitted for convenience of description.
Figure 4 is an enlarged view of a guide piece.
Figure 5 is a plan view of a yarn guide.
Figure 6 is a plan view of the yarn guide.
Figure 7 is a perspective view of a yarn guide according to a variation of the first embodiment of the present invention.
Figure 8 is an enlarged view of a guide piece according to the variation.
Figure 9 is a plan view of the yarn guide according to the variation.
Figure 10 is a perspective view which is similar to Figure 2 and which shows a yarn guide according to a second embodiment of the present invention.
Figure 11 is an enlarged view of a guide piece.
Figure 12 is an enlarged view of the guide piece.
Figure 13 is a plan view of the yarn guide.
Figure 14 is a perspective view which is similar to Figure 2 and which shows a yarn guide according to a third embodiment of the present invention.
Figure 15 is an enlarged view of a guide piece.
Figure 16 is a front view of the guide piece.

Detailed Description of the Preferred Embodiments

<First embodiment>

[0019] A first embodiment in which a multiple yarn guide according to the present invention is applied to a melt-spinning and drawing device will be described below with reference to Figures 1 to 6. Figure 1 is a schematic diagram showing a general configuration of the melt-spinning and drawing device (a manufacturing device for synthetic yarn).

[0020] In a melt-spinning and drawing device 100 shown in Figure 1, a plurality of filament yarns (yarns) Y in the form of a molten polymer ejected from a spinneret 1 are cooled and solidified by air blown by a cooling device 2. The filament yarns Y are then fed to a yarn heating device 4 via an oiling device 3.

[0021] The yarn heating device 4 includes a pair of rollers 5, 6 arranged in a vertical direction, and heats the filament yarns Y being wound around the rollers 5, 6.

[0022] A take-up roller 7 is provided on a downstream side of the yarn heating device 4 and is composed of a main roller 7a and an auxiliary roller 7b. The main roller 7a is driven by a motor (not shown in the drawings). A predetermined speed difference is set between the peripheral speed of the main roller 7a of the take-up roller 7 and the peripheral speed of the rollers 5, 6 of the yarn heating device 4. Thus, the filament yarns Y are drawn between the yarn heating device 4 and the take-up roller 7.

[0023] An interlacing device 8 is disposed on a downstream side of the take-up roller 7 to simultaneously interlace the plurality of filament yarns Y with one another. Paired yarn guides 9 (multiple yarn guides) are provided over and under the interlacing device 8 to guide the plurality of filament yarns Y.

[0024] A winding device 11 is located on a further downstream side of the interlacing device 8. The winding device 11 includes a spindle 12 on which a plurality of winding bobbins 13 for yarn winding shaped like cylinders can be installed to allow a plurality of yarns to be simultaneously wound. Furthermore, the winding device 11 includes a contact roller 10. The winding device 11 is configured to wind the filament yarns Y around the winding bobbin 13 with the contact roller contacted, under an appropriate contact pressure, with an outer peripheral

surface of the winding bobbin 13 and an outer peripheral surface of a yarn layer formed by winding the filament yarns Y around the winding bobbin 13. In this case, a winding speed is, for example, 6,000 m/min.

[0025] Now, the configuration of the multiple yarn guide 9 will be specifically described. Figure 2 is a perspective view of the yarn guide according to a first embodiment of the present invention. Figure 3 is a diagram similar to Figure 2. For convenience of a description, drawing of a guide rail is omitted in Figure 3. In Figure 3B, the yarn guide is viewed in the direction of arrow b in Figure 3A.

[0026] As shown in Figure 2, the multiple yarn guide 9 includes, as main components, a plurality of guide rails 15 (guide members) arranged in a row and a guide rail 16 (elongate member) that supports the guide pieces 15.

[0027] A dovetail groove 17 with a C-shaped cross section is formed in the guide rail 16. As shown in Figure 3, an engaging projection 18 engaging with the dovetail groove 17 is provided on each of the guide pieces 15. In this configuration, the engaging projection 18 of each of the guide pieces 15 is engaged with the dovetail groove 17 in the guide rail 16. Thus, the plurality of guide pieces 15 are supported by the guide rail 16 and arranged in a line along a longitudinal direction of the guide rail 16. Furthermore, as shown in Figure 2, a pair of stoppers 19 is fitted in the guide rail 16 and arranged at opposite ends of the guide rail 16 so as to sandwich the plurality of guide pieces 15 arranged in a line, between the stoppers 19. The pair of stoppers 19 is fixed to the guide rail 16 with screws (fixing means) (not shown in the drawings) so as to be pressed in a direction in which the stoppers 19 approach each other. Thus, the plurality of guide pieces 15, arranged in a line along the longitudinal direction of the guide rail 16, are tightly contacted with one another. The number of the guide pieces 15 arranged on the guide rail 16 in a row is optional.

[0028] Furthermore, in Figures 2 and 3, the filament yarns Y are shown by an alternate long and two short dashes line. As is apparent from these figures, in the multiple yarn guide 9 according to the present embodiment, a yarn accommodating space S in which the filament yarn Y is accommodated is formed between a pair of the adjacent guide pieces 15.

[0029] Figure 4 is an enlarged view of the guide piece. That is, Figure 4A is a perspective view of the guide piece 15. Figure 4B is a view of the guide piece 15 as viewed in the direction of arrow b. Figure 4C is a plan view of the guide piece 15.

[0030] As shown in Figures 4A and 4B, the guide piece 15 is composed of a base portion 20 including a pair of engaging projections 18 engaging with the guide rail 16, and a guide portion 21 projecting from the base portion 20 to form the yarn accommodating space S. The base portion 20 appears like a parallelogram in the plan view in Figure 4C. An inclination θ between a planar direction Fd of a mating surface F of the guide piece 15 which mates with the adjacent guide piece 15 and the traveling direction Yd of the filament yarn Y is about 25 degrees in the present embodiment.

[0031] The guide portion 21 includes, as main components, a first projecting portion 22 and a second projection portion 23 both projecting perpendicularly upward from the base portion 20. The first portion 22, which is taller than the second projecting portion 23, is formed to have a cross section shaped substantially like an equilateral triangle widening in the same direction as the traveling direction Yd of the filament yarn Y in the plan view of Figure 4C.

[0032] The first portion contacts with the filament yarn Y in a horizontal direction (that is, the longitudinal direction of the guide rail 16 shown in Figure 2; this also applies to the description below). A pair of corner portions 22a of the first portion 22 is sufficiently rounded and polished. Furthermore, as shown in Figures 4A and 4B, a guide surface 22b along which insertion of the filament yarn Y into a slit 24 described below is guided is formed at an upper end thereof. On the other hand, the second projecting portion 23 is positioned on an upstream side of the first projecting portion 22 in the traveling direction Yd of the filament yarn Y. The second projecting portion 23 is formed so as to be displaced from the first projecting direction 22 in the horizontal direction in association with the inclination of the base portion 20 in the traveling direction Yd in the plan view in Figure 4C. In other words, when the guide piece 15 is viewed from the downstream side in the traveling direction Yd of the filament yarn Y, the second projecting portion 23 has a positional relationship with the first projecting portion 22 such that the second projecting portion 23 strides over the corner portions 22a without being completely hidden behind the first projecting portion 22. The second projecting portion 23 contacts the filament yarn Y in the vertical direction (that is, a projecting direction of the first projecting portion 22).

[0033] Figure 5 is a plan view of the yarn guide. That is, Figure 5A is a plan view of the multiple yarn guide 9. Figure 5B is a front view of the multiple yarn guide 9. As shown in Figures 5A and 5B, when the guide pieces 15 are closely laid all over the guide rail 16, a slit 24 with a slit width (w) is formed between the adjacent first projecting portions 22. When the slit 24 is viewed from the downstream side in the traveling direction Yd of the filament yarn Y, the second projecting portion 23 is seen through the slit 24.

[0034] In the above-described configuration, the yarn accommodating space S in the multiple yarn guide 9 according to the present embodiment is formed between the adjacent paired guide pieces 15 as shown in Figure 2. Specifically, the yarn accommodating space S is formed by the slit 24, formed by the adjacent paired first projecting portions 22, and the second projecting portion 23, seen through the slit 24, as shown in Figure 5B. To insert the filament yarn Y into the yarn accommodating space S, the filament yarn Y may be inserted into the slit 24 in the direction of an arrow denoted by reference char-

acter N in Figure 5B. Flapping of the filament yarn Y traveling through the yarn accommodating space S under a desired tension is regulated by the first projecting portion 22 in the horizontal direction and by the second projecting portion 23 in the vertical direction.

[0035] Figure 6 is a plan view of the yarn guide. As shown in this figure, the inclination θ is determined by the planar direction Gd of a mating surface G of the stopper 19 to the mating surface F, described above, and the traveling direction Yd of the filament yarn Y. The inclination θ is dominant on the slit width (w) of the slit 24. Thus, comparison of Figure 6A with Figure 6B indicates that the slit width (w) can be freely changed by selectively using a plurality of stoppers 19 with different planar directions Gd of the mating surface G.

(Summary)

[0036] As described above, in the above-described first embodiment, the multiple yarn guide 9 is configured as follows. That is, the multiple yarn guide 9 includes the plurality of guide pieces 15 arranged in a line. The yarn accommodating space S, in which the traveling filament yarn Y is accommodated, is formed by the pair of the adjacent guide pieces 15. Compared to the technique disclosed in Figure 3 of Unexamined Japanese Patent Application Publication (Tokkai) No. 2005-179807, this configuration enables elimination of the need for the round bar-shaped bar guide G2. This reduces the number of components required, resulting in easy assembly. Furthermore, this configuration is less likely to be damaged than the comb-shaped yarn guide beam disclosed in Figure 2 of the Unexamined Japanese Patent Application Publication (Tokkai) No. 2008-504462. Moreover, if any of the guide members 15 is damaged, only the damaged guide member 15 needs to be replaced with a new one. This enables a reduction in maintenance costs.

[0037] The above-described "guide pieces 15 arranged in a line" includes a case in which the guide pieces 15 are arranged in a perfect line as shown in Figure 2 and a case in which the guide pieces 15 are arranged with slight displacements among the guide pieces 15 rather than being arranged in a perfect line.

[0038] The yarn guide 9 is further configured as follows. That is, the multiple yarn guide 9 is configured to allow the number of the plurality of guide members to be increased and reduced. This configuration enables a change in the number of the yarn accommodating spaces S. To increase or reduce the number of the guide pieces 15, the stopper 19 may be removed from the guide rail 16.

[0039] The multiple yarn guide 9 is further configured as follows. That is, the multiple yarn guide 9 includes the guide rail 16. Each of the guide pieces 15 engages with the guide rail 16 so as to be supported by the guide rail 16. According to this configuration, the simple arrangements can be used to arrange the plurality of guide pieces 15 in a row and to increase and reduce the number of the plurality of guide pieces 15.

[0040] The multiple yarn guide 9 is further configured as follows. That is, the yarn accommodating space S is formed by the pair of the adjacent guide pieces 15. Compared to the case in which the yarn accommodating space S is formed in each of the guide pieces 15, this configuration allows the shape of the guide piece 15 to be simplified. Furthermore, the simplified shape of the guide piece 15 contributes to reducing the pitch of the yarn accommodating spaces S and thus making the melt-spinning and drawing device 10 with the multiple yarn guide 9 compact.

[0041] The multiple yarn guide 9 is further configured as follows. That is, the planar direction Fd of the mating surfaces F of the pair of the adjacent guide pieces 15 is inclined to the traveling direction Yd of the filament yarn Y accommodated in the yarn accommodating space S. This configuration prevents the filament yarn Y from falling into the gap between the mating surfaces F. Thus, manufacturing costs can be reduced in connection with the processing accuracy of the mating surfaces F.

[0042] The multiple yarn guide 9 is further configured as follows. That is, the first projecting portion 22 and the second projecting portion 23 are formed on each of the guide pieces 15, the second projecting portion 23 regulating movement of the filament yarn Y in a direction perpendicular to the direction of the row of the guide pieces 15. The yarn accommodating space S is formed by the slit 24 formed by the pair of the adjacent first projecting portions 22, and the second projecting portion 23. According to this configuration, the simple arrangements can be used to support the filament yarn Y in the three directions.

[0043] The multiple yarn guide 9 is further configured as follows. That is, the inclination θ between the planar direction Fd of the mating surfaces F and the traveling direction Yd of the filament yarn Y is configured to be changeable. With this configuration, a change in inclination θ increases or reduces the distance between the pair of the adjacent first projecting portions 22. Thus, according to this configuration, the slit width w of the slit 24 can be changed.

<Variation of the first embodiment>

[0044] Now, a variation of the first embodiment will be described with reference to Figures 7 to 9. Figure 7 is a perspective view of a yarn guide according to the variation of the first embodiment of the present invention. Figure 8 is an enlarged view of the guide piece according to the present variation. That is, Figure 8A is a plan view of the guide piece 15. Figure 8B is a front view of the guide piece 15. Figure 8C is a perspective view of the guide piece 15. Differences of the present variation from the first embodiment will be mainly described below. Duplicate descriptions will be appropriately omitted.

[0045] Comparison between Figures 4 and 8 indicates that in the above-described first embodiment, the second

projecting portion 23 and the first projecting portion 22 are formed in this order along the traveling direction Yd of the filament yarn Y. In contrast, in the present variation, the first projecting portion 22 and the second projecting portion 23 are formed in this order along the traveling direction Yd of the filament yarn Y.

[0046] In the first embodiment, the base portion 20 appears like a parallelogram in a plan view. In contrast, in the present variation, the base portion 20 appears like a rectangle in a plan view.

[0047] Unlike in the case of the first embodiment, in the present variation, the first projecting portion 22 is formed to stick out from the base portion 20 in the horizontal direction.

[0048] Figure 9 is a plan view of the yarn guide according to the present variation. Figure 9A is a plan view of the multiple yarn guide 9. Figure 9B is a front view of the multiple yarn guide 9. That is, in the guide piece 15 according to the present variation, although the base portion 20 is formed to appear like a rectangle instead of a parallelogram in a plan view as shown in Figure 8A, the first projecting portion 22 is formed to stick out from the base portion 20 in the horizontal direction. Thus, as is the case with the first embodiment, when the yarn guide is viewed from the upstream side in the traveling direction Yd of the filament yarn Y, the second projecting portion 23 is seen through the slit 24 as shown in Figure 9A.

<Second embodiment>

[0049] Now, a second embodiment of the present invention will be described with reference to Figures 10 to 13. Figure 10 is similar to Figure 2 and is a perspective view of a yarn guide according to the second embodiment of the present invention. That is, Figure 10A is a perspective view of the multiple yarn guide 9. Figure 10B is a view of the multiple yarn guide 9 as viewed in the direction of arrow b in Figure 10A. Figures 11 and 12 are enlarged views of the guide piece. Figures 11A and 11B are perspective views of the guide piece 15. Figure 11B is a view of the multiple yarn guide 9 as viewed in the direction of arrow (b) in Figure 11A. Figure 12A is a front view of the guide piece 15. Figure 12B is a left side view of the guide piece 15. Figure 12C is a right side view of the guide piece 15. Figure 12D is a plan view of the guide piece 15. Figure 12D' is a partly enlarged view of a portion (d') of Figure 12D. Differences of the present embodiment from the first embodiment will be mainly described below. Duplicate descriptions will be appropriately omitted.

[0050] As shown in Figures 10A and 10B, in the multiple yarn guide 9 according to the present embodiment, the yarn accommodating space S, in which the traveling filament yarn Y is accommodated, is formed between the pair of the adjacent guide pieces 15 as in the case of the multiple yarn guide 9 according to the first embodiment.

[0051] The yarn guide 9 according to the present embodiment is different from that according to the first embodiment in the configuration of the guide piece 15. The configuration of the guide piece 15 of the multiple yarn guide 9 according to the present embodiment will be described below with reference to Figures 11 to 13.

[0052] As shown in Figures 12A to 12C, the guide portion 21 includes, as a main component, a third projecting portion 30 projecting perpendicularly upward from the base portion 20. As shown in Figure 12D, like the base portion 20, the third projecting portion 30 is formed to appear like a parallelogram and to be symmetric with respect to a point, in a plan view. As shown in Figure 12A, a cutout 31 that is open in the horizontal direction is formed in each of two of the four corners of the parallelogram which are paired and each of which takes the form of an acute angle. In the present embodiment, the cutout 31 is a main portion making up the above-described yarn accommodating space S. Furthermore, a conical tapered surface 32 is formed in the third projecting portion 30 so as to surround the cutout 31 to reduce a contact distance between an inner wall surface of the cutout 31 and the filament yarn Y. A pawl portion 33 is formed opposite the base portion 20 across the cutout 31 as a result of the formation of the cutout 31. The pawl portion 33 is formed so as to cover the cutout 31 in a direction opposite to a projecting direction of the third projecting portion 30. Then, a guide surface 30a is formed which is curved smoothly from the pawl portion 33 toward an upper end of the third projecting portion 30. Furthermore, a slit surface (f) is formed in the third projecting surface 30; the slit surface (f) is parallel to the mating surface F and is connected to the cutout 31. In a macroscopic viewpoint, the slit surface (f) is flush with the mating surface F. In a microscopic viewpoint, as shown in Figure 12D', the slit surface (f) is not flush with the mating surface F but is located inside a contour of the base portion 20 in the plan view.

[0053] Figure 13 is a plan view of the yarn guide. That is, Figure 13A is a plan view of the multiple yarn guide 9. Figure 13B is a front view of the multiple yarn guide 9. Furthermore, Figure 13C is a partly enlarged view of a portion c of Figure 13B. Figure 13D is a partly enlarged view of a portion d of Figure 13A. As shown in Figures 13A and 13B, when the guide pieces 15 are closely laid all over the guide rail 16, the slit 24 is formed between the adjacent third projecting portions 30. Specifically, as shown in Figure 13D, the slit 24 is formed by the pair of slit surfaces f arranged opposite each other at a position where the mating surfaces F of the adjacent third projecting portions 30 are sandwiched between the slit surfaces (f).

[0054] The yarn accommodating space S in the multiple yarn guide 9 according to the present embodiment is formed between the pair of the adjacent guide pieces 15. Specifically, as shown in Figure 13C, the yarn accommodating space S is formed by the cutouts 31 of the pair of the adjacent third projecting portions 30. The pawl portion 33 fulfils a function of preventing the filament yarn Y accommodated in the yarn accommodating space S formed by the pair of cutouts 31 from slipping out from

the yarn accommodating space S. To insert the filament yarn Y into the yarn accommodating space S, the filament yarn Y may be inserted into the slit 24 in the direction of an arrow denoted by reference numeral N in Figure 13B. As shown in Figure 13A, in the present embodiment, the slit 24 is inclined to the traveling direction Yd of the filament yarn Y. Thus, during the insertion, before reaching the yarn accommodating space S, the filament yarn Y is bent once along the inclination of the slit 24. Flapping of the filament yarn Y traveling through the yarn accommodating space S under a desired tension is regulated by an inner wall surface of the cutout 31. In particular, flapping of the filament yarn Y in the vertical direction is effectively regulated by the pawl portion 33.

(Summary)

[0055] As described above, in the present embodiment, the multiple yarn guide 9 is configured as follows. That is, the pawl portion 33 is formed on each of the paired adjacent guide pieces 15 to prevent the filament yarn Y from slipping out from the yarn accommodating space S. According to this configuration, the simple arrangements can be used to prevent the filament yarn Y from slipping out from the yarn accommodating space S.

[0056] In the above-described embodiment, as shown in Figure 13C, the pawl portion 33 is formed on each of the paired adjacent guide pieces 15. However, instead, the pawl portion 33 may be formed on only one of the paired adjacent guide pieces 15. Even in this case, the function of preventing the filament yarn Y from slipping out can be fulfilled.

<Third embodiment>

[0057] Now, a third embodiment of the present invention will be described with reference to Figures 14 to 16. Figure 14 is similar to Figure 2 and is a perspective view of a yarn guide according to the third embodiment of the present invention. Figure 15 is an enlarged view of the guide piece. That is, Figure 15A is a perspective view of the guide piece 15. Figure 15B is a plan view of the guide piece 15. Figure 16 is a front view of the guide piece 15. That is, Figure 16A is a front view of the guide piece 15. Figure 16B is a rear view of the guide piece 15. Differences of the present embodiment from the first embodiment will be mainly described below. Duplicate descriptions will be appropriately omitted.

[0058] As shown in Figure 14, the multiple yarn guide 9 according to the present embodiment is different from that according to the first and second embodiments in that the yarn accommodating space S, in which the traveling filament yarn Y is accommodated, is formed in each of the guide pieces 15.

[0059] The yarn guide 9 according to the present embodiment is different from that according to the first embodiment in the configuration of the guide piece 15. The configuration of the guide piece 15 of the multiple yarn guide 9 according to the present embodiment will be described below with reference to Figures 15 and 16.

[0060] As shown in Figures 16A and 16B, a through-hole 41 extending along the traveling direction Yd of the filament yarn Y is formed in a center, in a front view, of the guide portion 21, projecting perpendicularly upward from the base portion 20. As shown in Figures 15A and 15B, the slit 24 is engraved in the guide portion 21 so as to extend from an upper end of the guide portion 21 toward the base portion 20 and reach the through-hole 41. The slit 24 is inclined at about 45 degrees to the traveling direction Yd of the filament yarn Y in the plan view in Figure 15B. Owing to the presence of the slit 24, a main component of the guide portion 21 is a pair of fourth projecting portions 40 each shaped substantially like a trapezoid or a triangle in the plan view in Figure 15B. As shown in Figures 16A and 16B, a conical tapered surface 42 surrounding the through-hole 41 is formed in each of the fourth projecting portions 41. This reduces a contact distance between an inner wall surface of the through-hole 41 and the filament yarn Y. A pawl portion 43 is formed opposite the base portion 20 across the through-hole 41 as a result of the formation of the through-hole 41 and the slit 24. The pawl portion 43 is formed so as to cover the through-hole 41 in a direction opposite to a projecting direction of the fourth projecting portion 40. A guide surface 40a is further formed which is curved smoothly from the pawl portion 43 toward an upper end of the fourth projecting portion 40. As shown in Figure 15B, like the guide piece 15 according to the second embodiment, the guide piece 15 according to the present embodiment is symmetric with respect to a point in a plan view.

[0061] In the above-described configuration, the yarn accommodating space S in the multiple yarn guide 9 according to the present embodiment is formed in each of the guide pieces 15 as shown in Figure 14. Specifically, as shown in Figures 16A and 16B, the yarn accommodating space S is formed by the through-hole 41. The pawl portion 43 fulfils a function of preventing the filament yarn Y accommodated in the yarn accommodating space S formed by the through-hole 41 from slipping out from the yarn accommodating space S. To insert the filament yarn Y into the yarn accommodating space S, the filament yarn Y may be inserted into the slit 24 in the direction of an arrow denoted by reference numeral N in Figure 15A. As shown in Figure 15B, in the present embodiment, the slit 24 is inclined to the traveling direction Yd of the filament Y, as is the case with the second embodiment. Thus, during the insertion, before reaching the yarn accommodating space S, the filament yarn Y is bent once along the inclination of the slit 24. Flapping of the filament yarn Y traveling through the yarn accommodating space S under a desired tension is regulated by an inner wall surface of the through-hole 41. In particular, flapping of the filament yarn Y in the vertical direction is effectively regulated by the pawl portion 43.

(Summary)

[0062] As described above, in the present embodiment, the multiple yarn guide 9 is configured as follows. That is, the yarn accommodating space S is formed in each of the guide pieces 15. This configuration allows the yarn accommodating space to be formed away from the mating surfaces F of the pair of the adjacent guide pieces 15.

[0063] The yarn guide 9 is further configured as follows. That is, the slit 24 and the pawl portion 33 are formed in each of the guide pieces 15, the slit 24 allowing the yarn accommodating space S to communicate with an exterior, and the pawl portion 33 preventing the filament yarn Y from slipping out from the yarn accommodating space S. This configuration simplifies the arrangement for enabling the filament yarn Y to be inserted into the yarn accommodating space S and the arrangement for preventing the filament yarn Y from slipping out from the yarn accommodating space S.

[0064] The preferred embodiments of the present invention have been described above. However, the above-described embodiments may be changed as follows.

[0065] That is, in the case described above, the multiple yarn guide 9 is applied to the melt-spinning and drawing device 100. However, the application of the multiple yarn guide 9 is not limited to the melt-spinning and drawing device 100. The yarn guide 9 is applicable to a textile machine that handles multiple yarns in a narrow space. Possible textile machines other than the melt-spinning and drawing device 100 include, for example, a warping machine.

[0066] Furthermore, in the above-described embodiments, the yarn is the filament yarn Y by way of example. However, the multiple yarn guide 9 is applicable to yarns other than the filament yarn Y. The yarns other than the filament yarn Y include spun yarns such as a cotton yarn and a wool yarn.

[0067] Additionally, in the above-described embodiments, the multiple yarn guide 9 is provided close to the interlacing device 8 as shown in Figure 1. However, the present invention is not limited to this. The yarn guide 9 may be located away from the interlacing device 8.

[0068] Finally, the number of the filaments yarns Y is much smaller than that of the guide pieces 15 disposed, in, for example, Figure 2. This is simply for convenience of description.

[0069] While the present invention has been described with respect to preferred embodiments thereof, it will be apparent to those skilled in the art that the disclosed invention may be modified in numerous ways and may assume many embodiments other than those specifically set out and described above. Accordingly, it is intended by the appended claims to cover all modifications of the present invention that fall within the true spirit and scope of the invention.

Claims

1. A multiple yarn guide **characterized by** comprising a plurality of guide members arranged in a line, and in that a yarn accommodating space in which a yarn is accommodated is formed in each of the guide members, or a pair of the adjacent guide members forms the yarn accommodating space.

2. The multiple yarn guide according to Claim 1, **characterized by** being configured to allow the number of the plurality of guide members to be increased and reduced.

3. The multiple yarn guide according to Claim 2, **characterized by** comprising an elongate member, and in that each of the guide members engages with the elongate member so as to be supported by the elongate member.

4. The multiple yarn guide according to any one of Claims 1 to 3,
characterized in that the yarn accommodating space is formed by the pair of the adjacent guide members.

5. The multiple yarn guide according to Claim 4, **characterized in that** a planar direction of mating surfaces of the pair of the adjacent guide members is inclined to a traveling direction of the yarn accommodated in the yarn accommodating space.

6. The multiple yarn guide according to Claim 4 or Claim 5, **characterized in that** a first projecting portion and a second projecting portion are formed on each of the guide members, the second projecting portion regulating movement of the yarn in a direction perpendicular to the direction of the row of the guide members, and
the yarn accommodating space is formed by a slit formed by a pair of the adjacent first projecting portion and the second projecting portion.

7. The multiple yarn guide according to Claim 6, **characterized in that** an inclination between the planar direction of the mating surfaces and the traveling direction of the yarn is configured to be changeable.

8. The multiple yarn guide according to Claim 4 or Claim 5, **characterized in that** a pawl portion is formed on at least one of the pair of the adjacent guide members to prevent the yarn from slipping out from the yarn accommodating space.

9. The multiple yarn guide according to any one of Claims 1 to 3,
characterized in that the yarn accommodating space is formed in each of the guide members.

10. The multiple yarn guide according to Claim 9, **characterized in that** a slit and a pawl portion are formed in each of the guide members, the slit allowing the yarn accommodating space to communicate with an exterior, and the pawl portion preventing the yarn from slipping out from the yarn accommodating space.

FIGURE 1

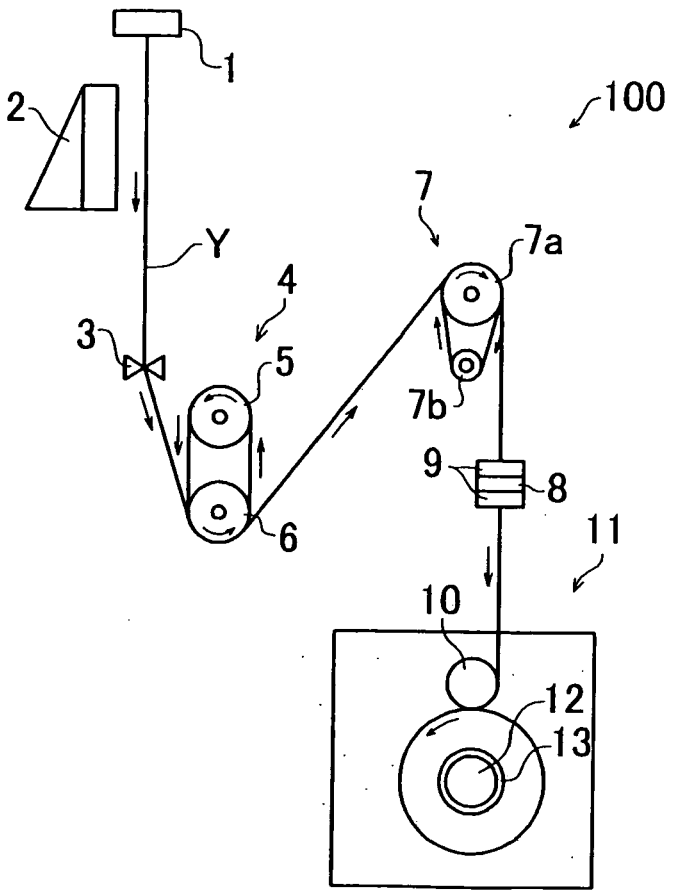


FIGURE 2

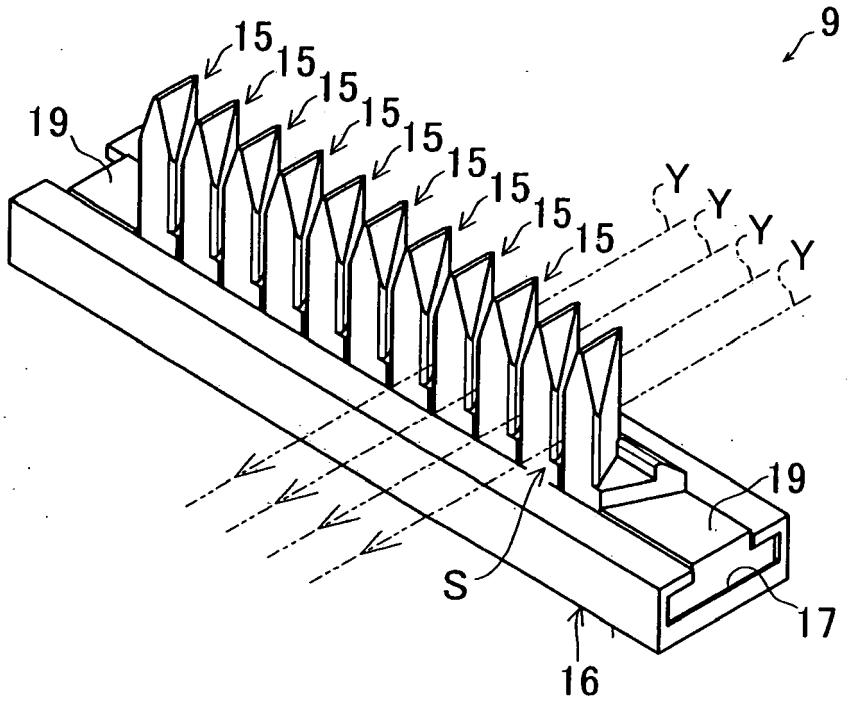


FIGURE 3A

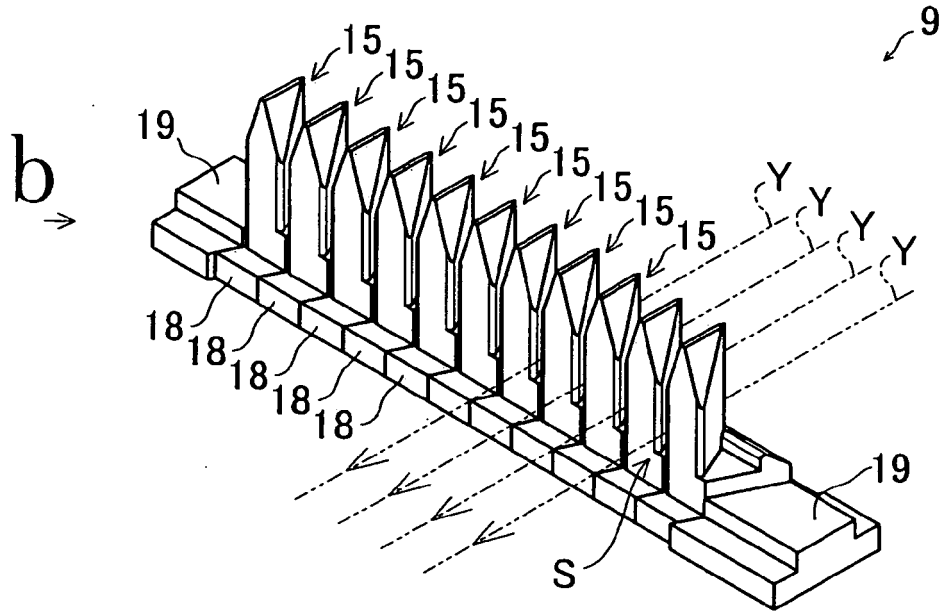


FIGURE 3B

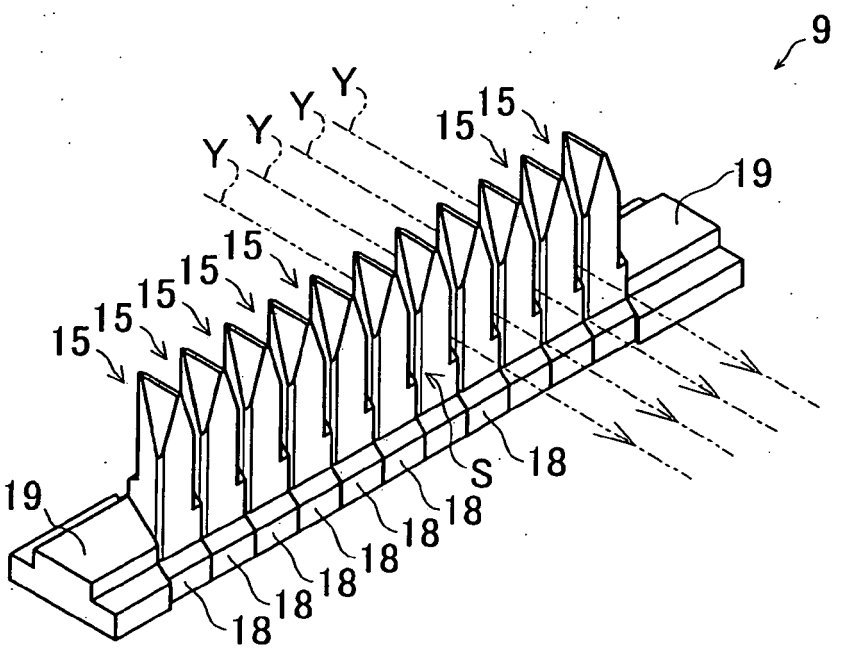


FIGURE 4A

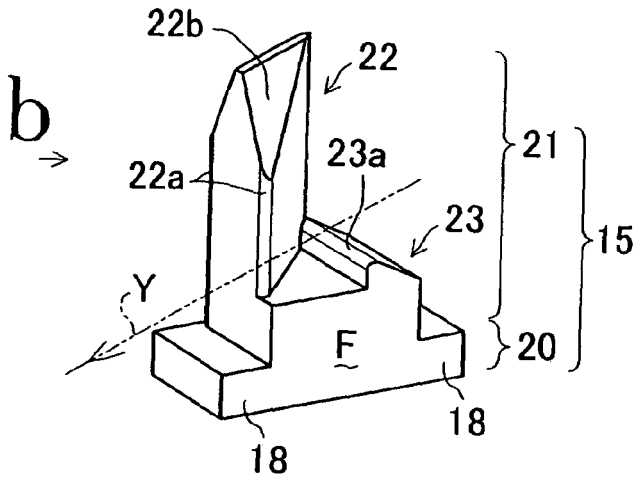


FIGURE 4B

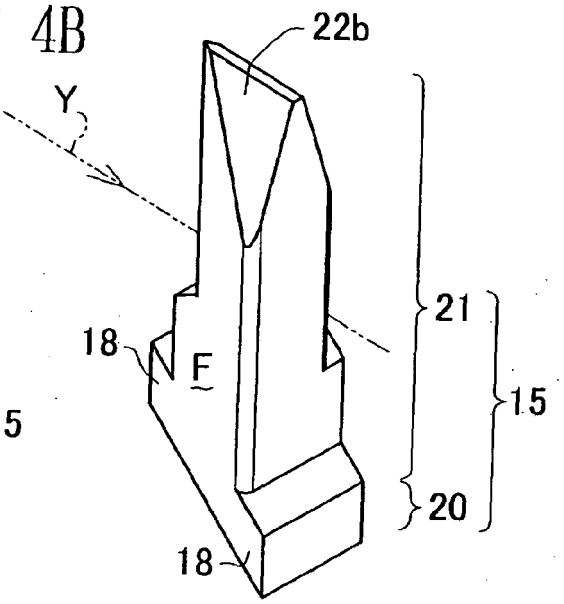


FIGURE 4C

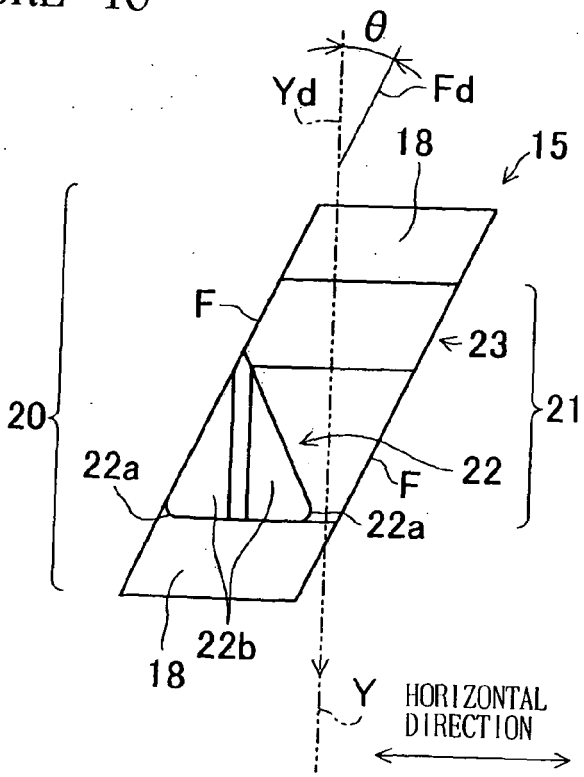


FIGURE 5A

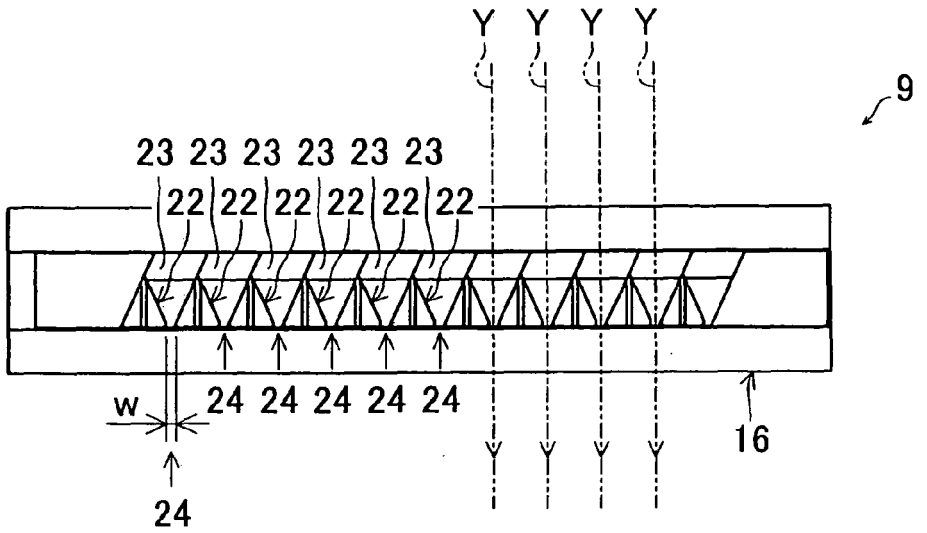


FIGURE 5B

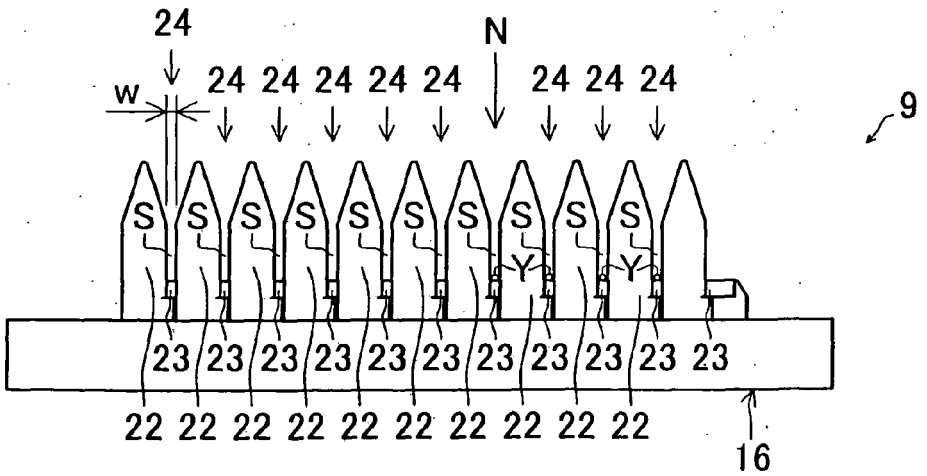
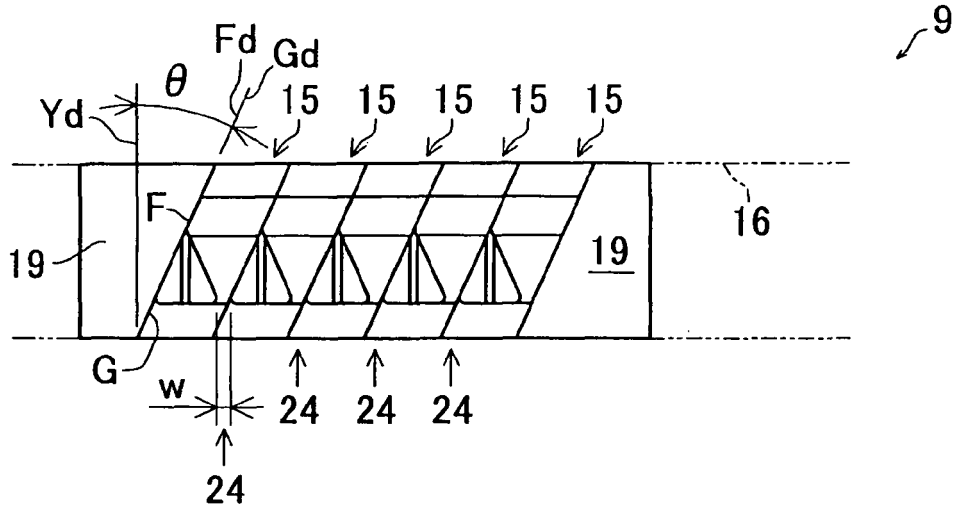


FIGURE 6A



FUGURE 6B

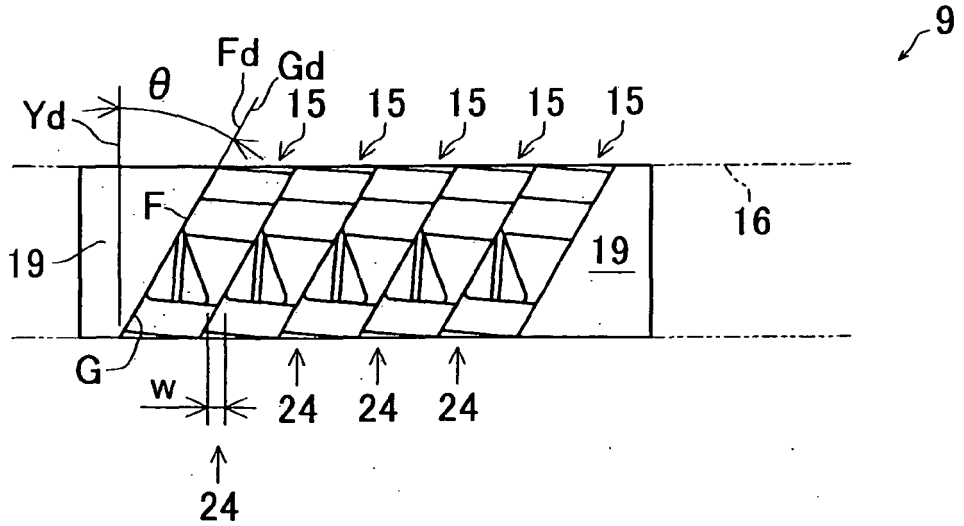


FIGURE 7

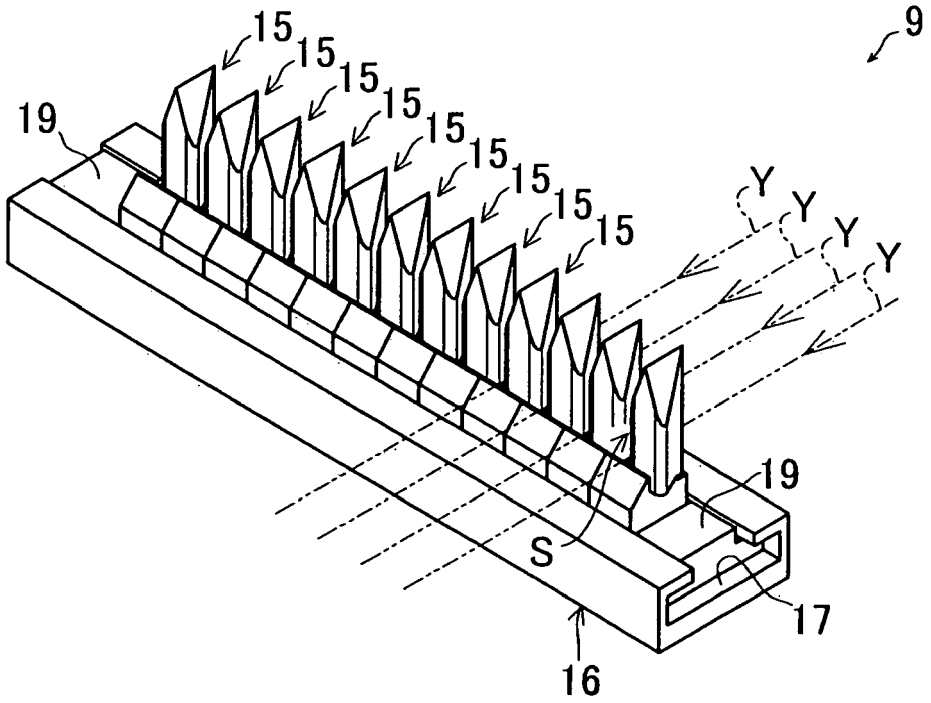


FIGURE 8A

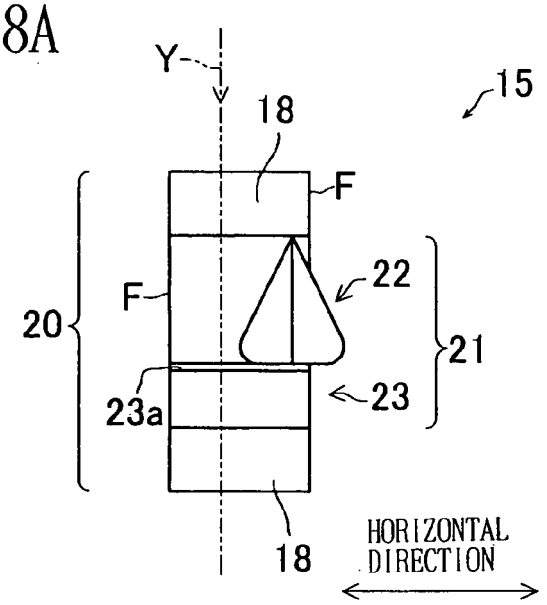


FIGURE 8C

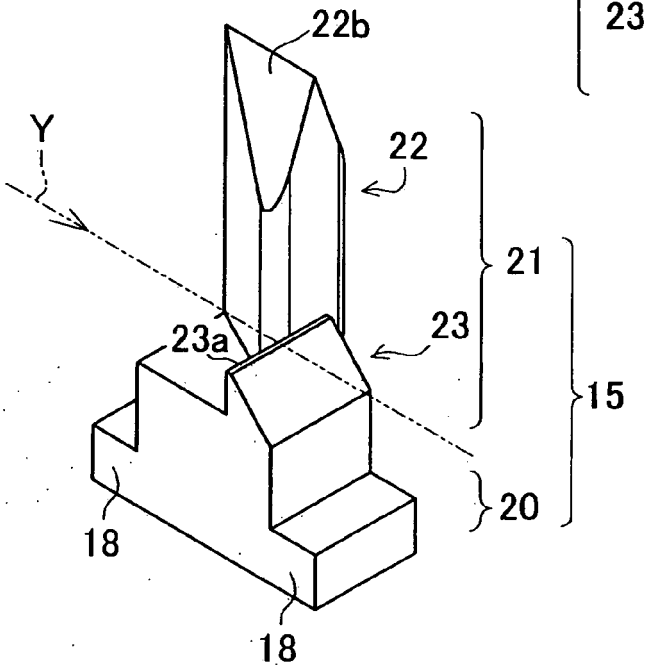


FIGURE 8B

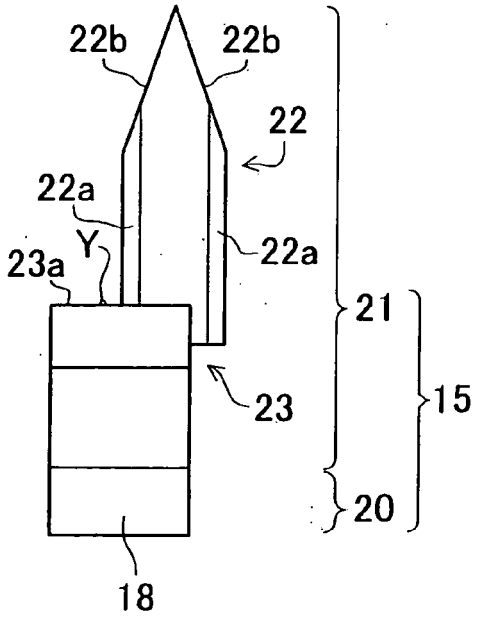


FIGURE 9A

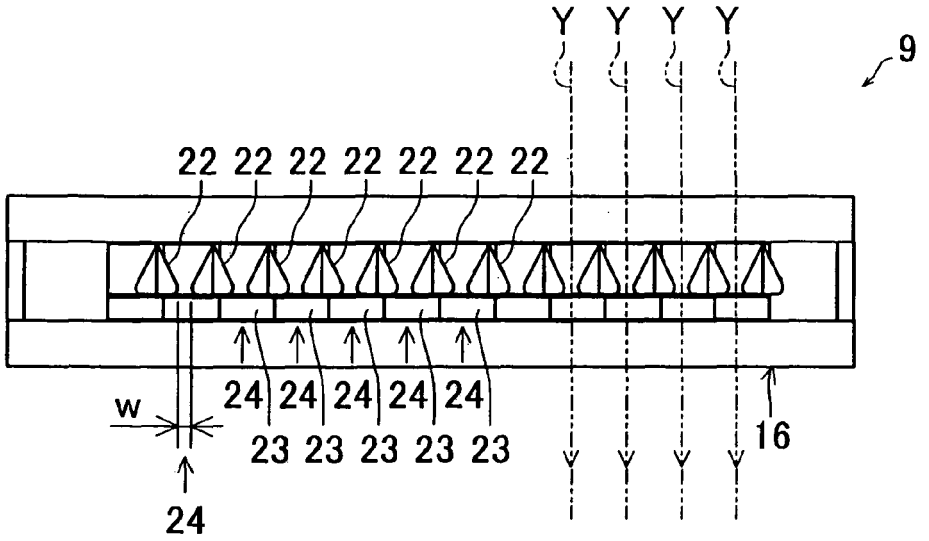


FIGURE 9B

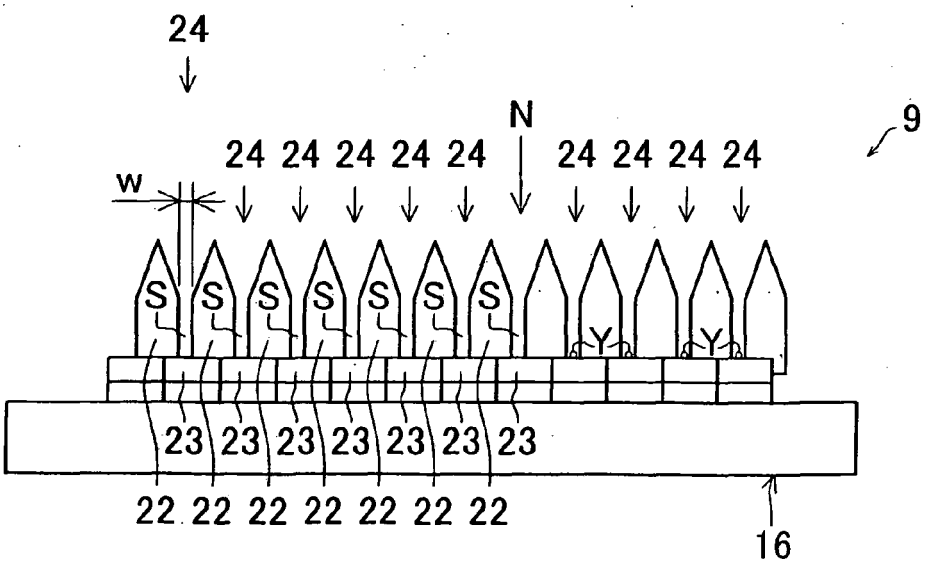
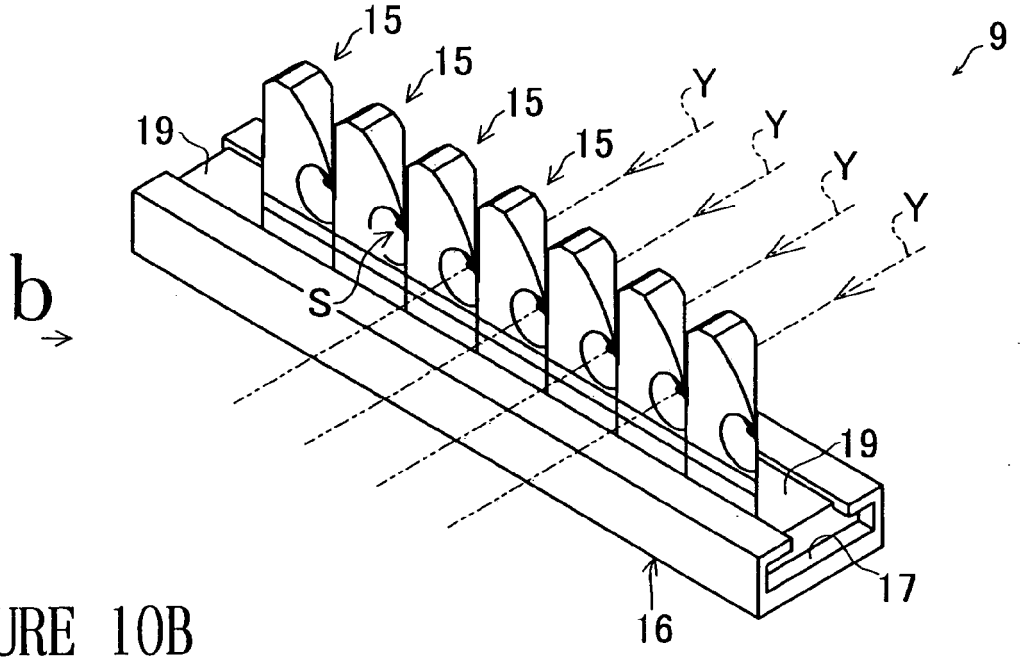


FIGURE 10A



FUGURE 10B

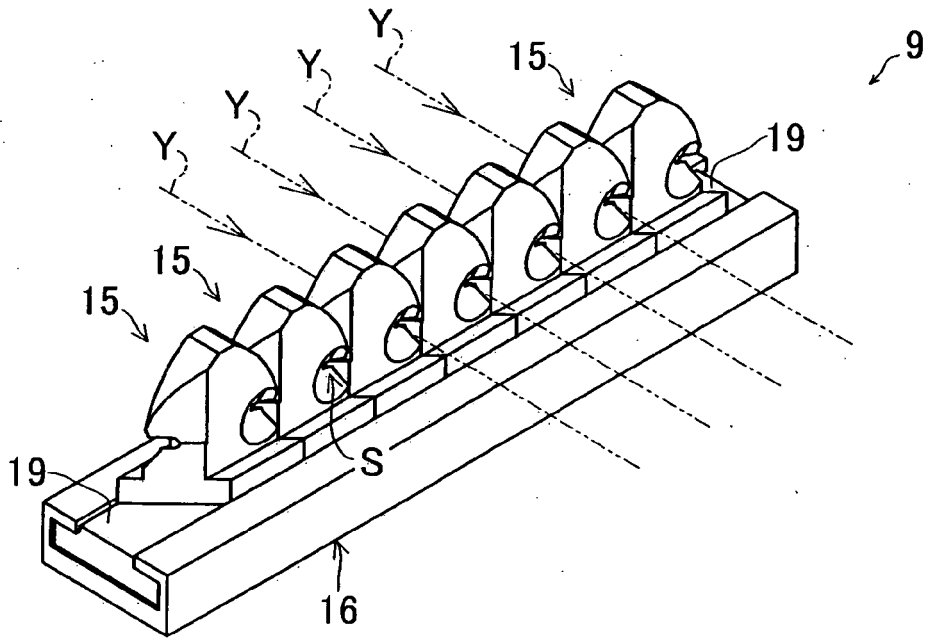
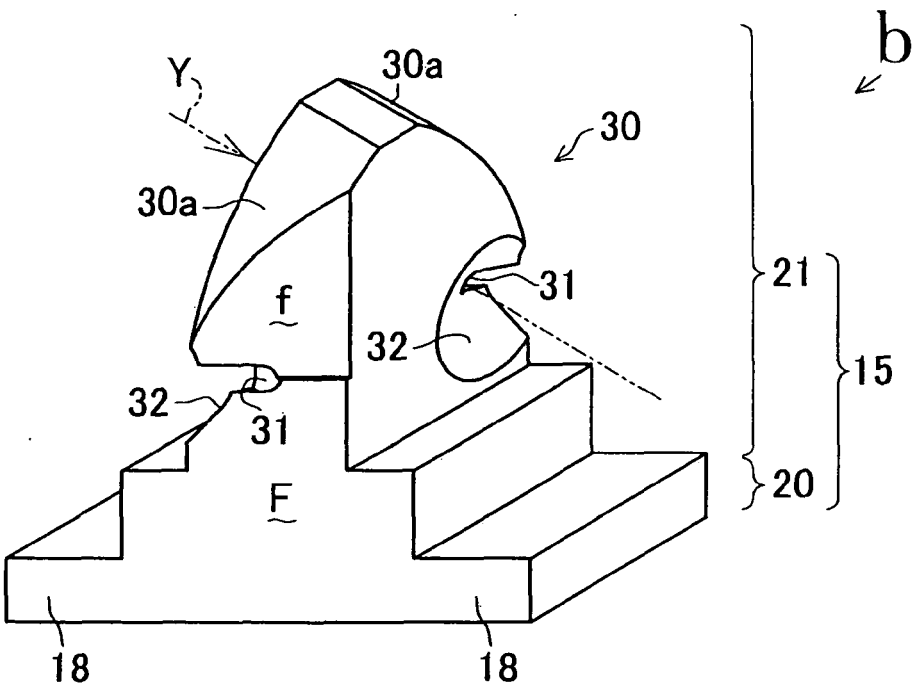
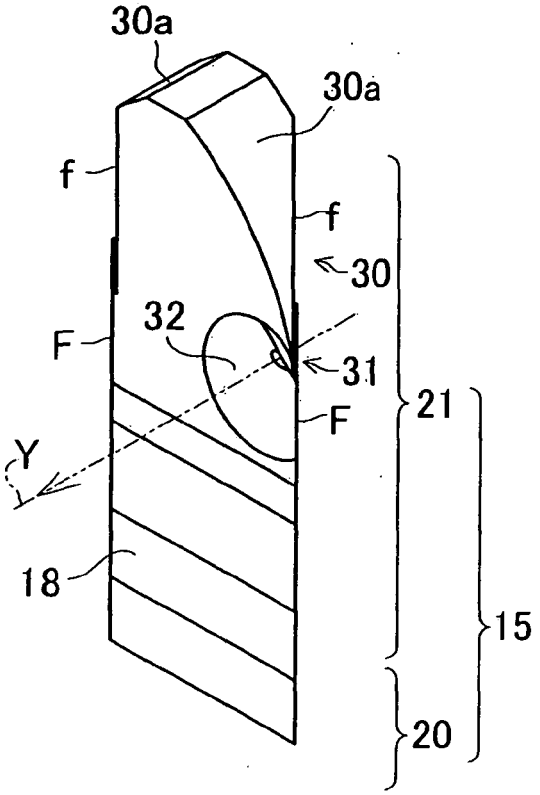


FIGURE 11A



FUGURE 11B



FUGURE 12D'

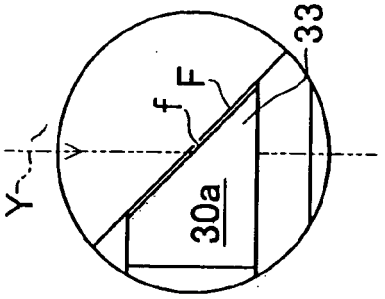


FIGURE 12D

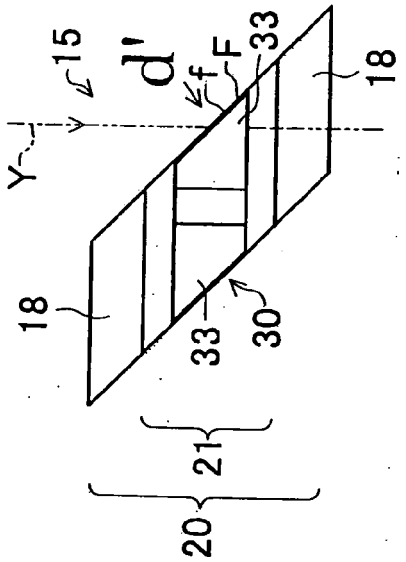


FIGURE 12C

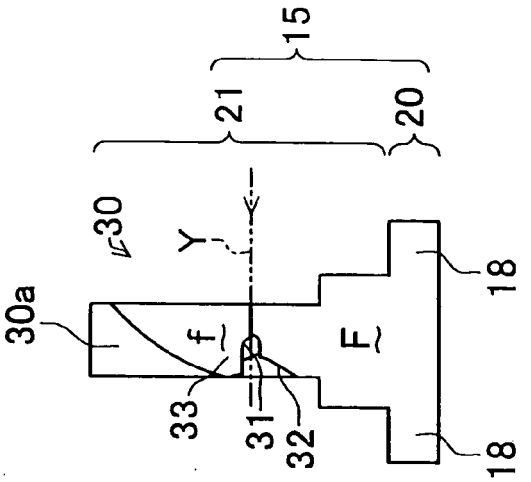
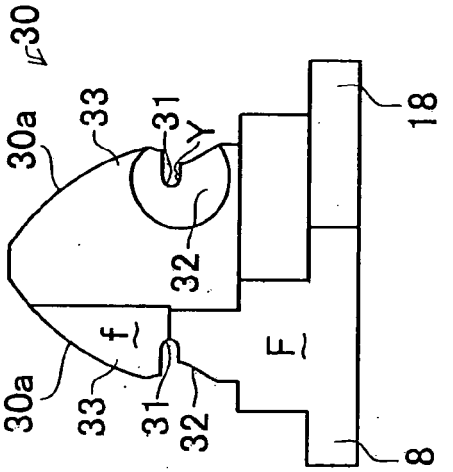
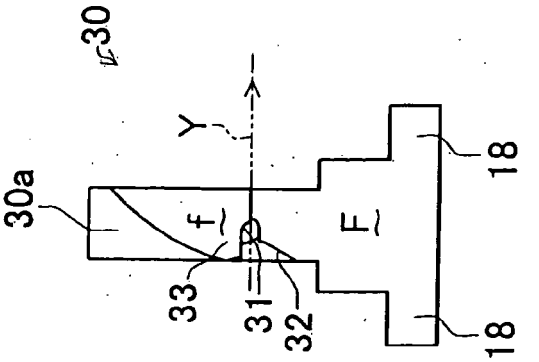


FIGURE 12A



FUGURE 12B



FUGURE 13A

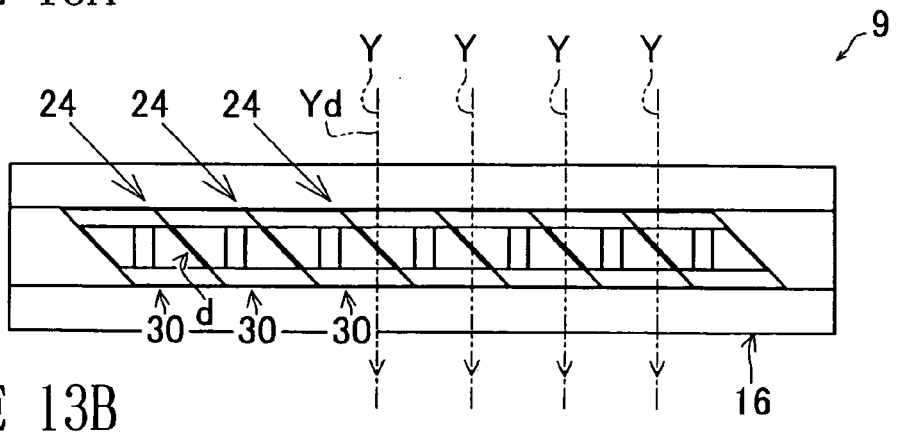
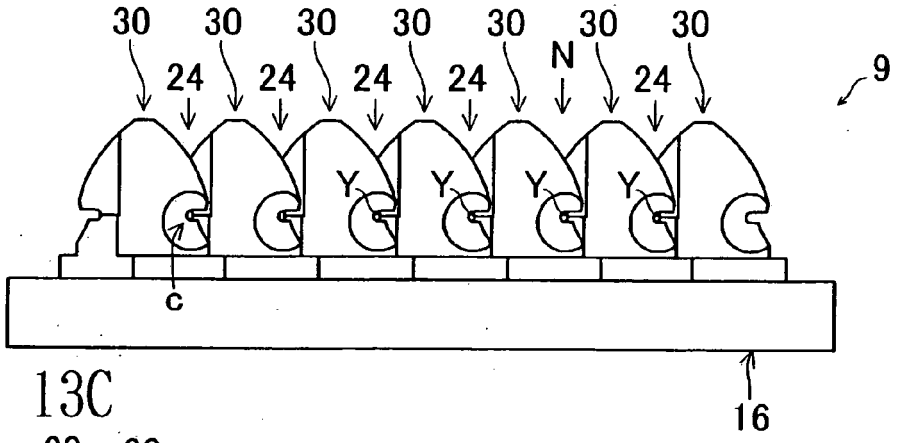
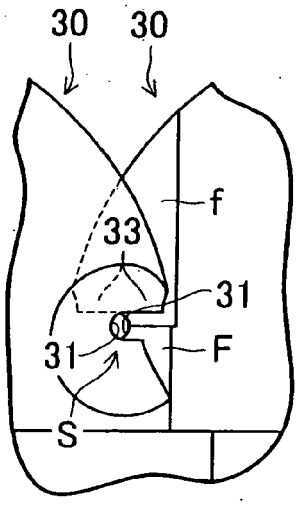


FIGURE 13B



FUGURE 13C



FUGURE 13D

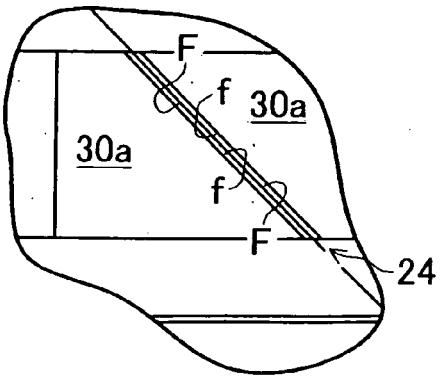
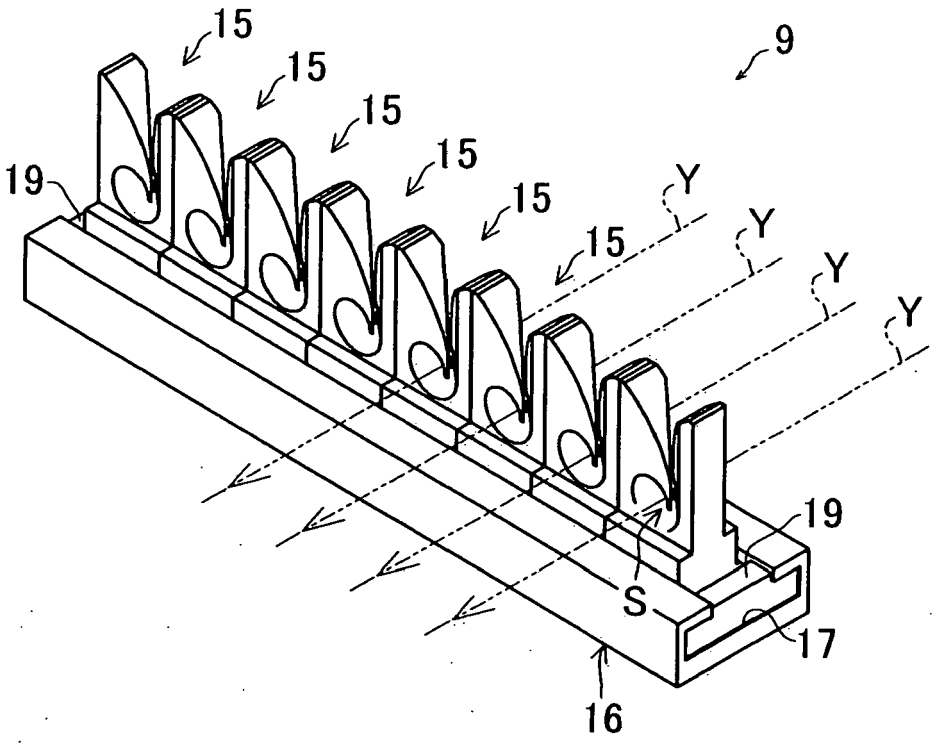


FIGURE 14



FUGURE 15A

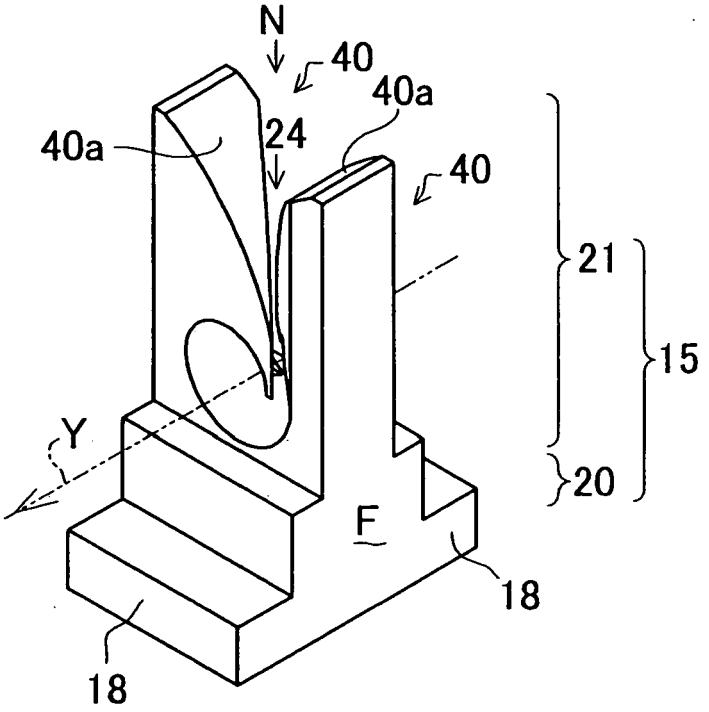
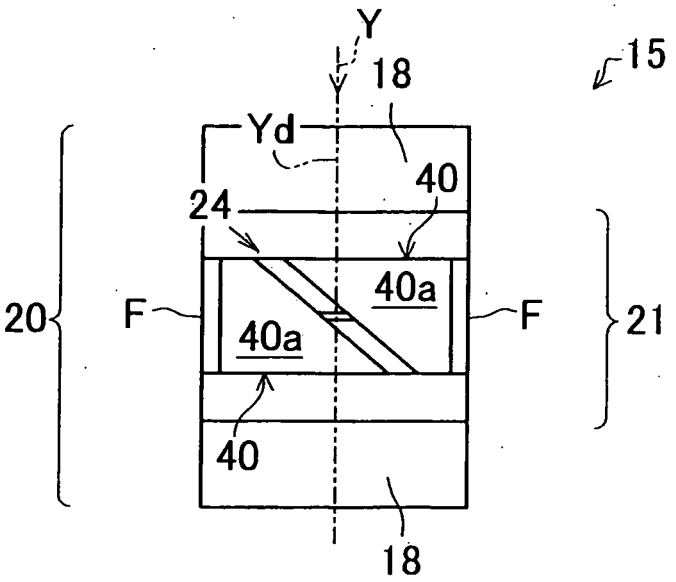


FIGURE 15B



FUGURE 16A

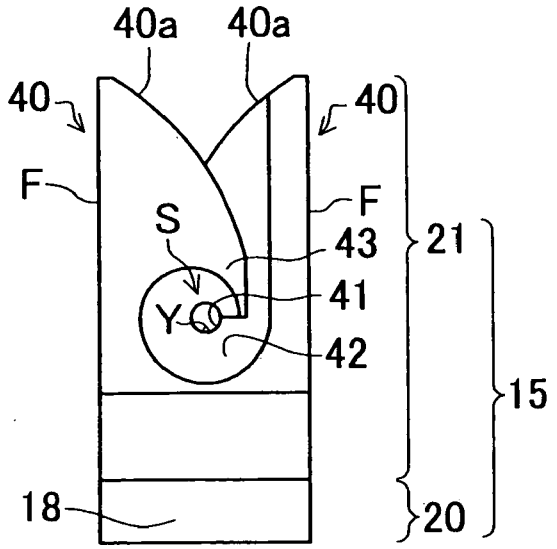
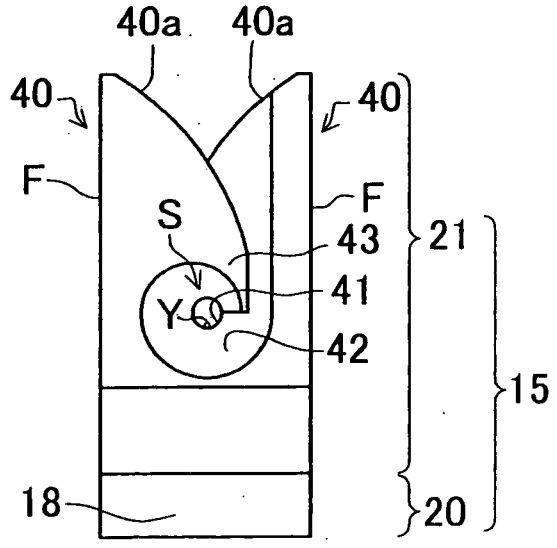


FIGURE 16B



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EUROPEAN SEARCH REPORT

Application Number
EP 09 00 1222

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 3 734 374 A (PERRY C) 22 May 1973 (1973-05-22) * figures 1,3 * -----	1-6,8	INV. B65H57/06 B65H57/16
X	DE 200 10 219 U1 (DO CERAM INGENIEURKERAMIK GMBH [DE]) 21 September 2000 (2000-09-21) * figures 1-4 * -----	1-4,6, 8-10	
X	US 2002/069928 A1 (CHIANG CHUAN CHIN [TW]) 13 June 2002 (2002-06-13) * figures 1-6 * -----	1-3,9-10	
X	DE 21 24 486 B1 (PAUL RAUSCHERT KG) 14 December 1972 (1972-12-14) * figures 2a,2b * -----	1-3,9-10	
X	GB 269 717 A (GRINDROD KERSHAW) 28 April 1927 (1927-04-28) * figures 11-20 * -----	1-4,8-10	
X	US 3 277 537 A (ROEDER RICHARD M ET AL) 11 October 1966 (1966-10-11) * figures 2,3 * -----	1-3,9	TECHNICAL FIELDS SEARCHED (IPC) B65H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	2 December 2009	Pussemier, Bart

CATEGORY OF CITED DOCUMENTS

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02-12-2009

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3734374 A	22-05-1973	DE 2245215 A1	02-08-1973
		GB 1401696 A	30-07-1975
		JP 48080844 A	29-10-1973
		JP 53078240 U	29-06-1978
DE 20010219 U1	21-09-2000	NONE	
US 2002069928 A1	13-06-2002	TW 465584 Y	21-11-2001
DE 2124486 B1		NONE	
GB 269717 A	28-04-1927	NONE	
US 3277537 A	11-10-1966	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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Patent documents cited in the description

- JP 2005179807 A **[0002] [0004] [0007] [0036]**
- JP 2008504462 A **[0003] [0004] [0007] [0036]**