Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).
Description

Technical Field

[0001] The present invention relates to a compound needle comprising a needle body and a slider to be placed on a needle bed of a knitting machine. More particularly, the present invention relates to a compound needle of the type of tongues of a slider being composed of two superposed blades.

Background Art

[0002] A compound needle is known which comprises a needle body having a hook at a front end thereof and a slider and is so structured that the needle body and the slider can move relative to each other to open and close the hook. The applicant of this application previously proposed this type of compound needle in Japanese Patent Application No. Hei 10-109675 in the title of the invention of "Compound Needle of Flat Knitting Machine".

[0003] In the known compound needle, two blades of the slider are accommodated in the superposed state in a blade groove formed in the needle body. The blades are formed to have thickness smaller than width of the groove, so as to define gaps between the blades and side walls of the groove, so that they are supported in the groove in such a manner as to be freely movable forward and backward therealong. This may cause the blades to be unstably positioned with respect to the widthwise direction of the blade groove to only the extent corresponding to the gaps.

[0004] This arises difficulty of centering the blades in the blade groove. This problem becomes prominent particularly when a stitch loop is rested on the tongues at the front ends of the blades that are under large lateral tension to the stitch loop from the knitting fabric.

[0005] When the blades are under unstable centering and are out of position in a lateral direction from the center of the groove, there may arise the problem that when the slider moves forward, the blades may collide with or pass along one side of the hook without being forked by an end of the hook, to hinder the proper action that the tongues are forked at the front ends thereof by abutment with the end of the hook, so as to hold the hook in sandwich relation from both sides thereof and close it. This may arise possible drawbacks in durability of needle and knitting operation.

[0006] Even when the blades are forked by the end of the hook and properly actuated, the forked blades are each extended straight in an oblique direction along the sides of the hook at a loop transferring position into which the blades are further moved forward beyond the hook. As a result of this, the forked blades are expanded right and left at the front end portion thereof in a sector form when viewed from the top. This may arise the following problem when the compound needles thus designed are used with a flat knitting machine having a pair of spaced apart, front and back needle beds on which knitting members such as sinkers and loop pressers are positioned in vicinity of the compound needles and are moved forward and backward with respect to a needle gap between the needle beds. When transferring the loops, the blades come close to the knitting members to occlude the space for the loops rested on the tongues to be transferred to receiving needles and, as a result of this, there may arise a drawback in knitting operation.

[0007] EP-A-0875614 discloses a compound needle which comprises a needle body having a hook at a front end thereof and a slider having tongues formed by two blades being superposed and is so structured that the needle body and the slider can freely be moved forward and backward individually in the state in which the blades of the slider are supported in a blade groove formed in the needle body.

[0008] The invention is characterized in that each blade includes a centering means to bring side surfaces of the blades in the blade groove into press-contact with side walls of the blade groove of the needle body, so as to center the blades with respect to a widthwise direction of the groove.

[0009] An advantage of the centering means is that front end portions of the blades can be held in positions equally divided right and left from a widthwise center of the groove with respect to a widthwise direction of the groove (hereinafter it is referred to as the "centering").

[0010] The centering means is preferably formed by bends provided in the blades.

[0011] The bends are preferably so formed as to be oriented in a direction for them to be away from each other so that when the blades are exposed out from the blade groove and are advanced toward the hook, the blades can open their mouth at the front ends thereof.

[0012] Preferably, the compound needle is formed as a transferring needle that is so designed that the front ends of the blades of the slider are advanced further beyond the hook to transfer a stitch loop at the advanced position, and the bends are so configured as to narrow a space between the front ends of the blades when the front ends of the blades are advanced to the loop transferring position beyond the hook.

[0013] The bends are preferably formed in portions of the blades in which the blades are completely exposed out from the blade accommodating groove in the loop transferring position.

[0014] Preferably, the compound needle is formed as a transferring needle that is so designed that the front ends of the blades of the slider are advanced further beyond the hook to transfer a stitch loop at the advanced position, and the bends are so configured as to be oriented in a direction for them to be pressed with each other, so as to narrow a space between the front ends of the blades when the front ends of the two superposed blades are advanced to the loop transferring position beyond the hook.

[0015] The centering means is preferably formed as
something to bring either of upper edges and lower edges of the blades into press-contact with side walls of the blade groove.

[0016] The centering means is preferably formed by twists provided in the blades.

[0017] According to this invention, in the compound needle comprising the needle body and the slider, the blade parts of the slider are accommodated and supported in the blade groove formed in the needle body. Each blade of the slider is provided with the centering means, and the each blade is provided with a bend serving as the centering means formed in a portion thereof to go in and out from the blade groove. The bends of the blades can bring the side walls of the blades into press-contact with the side walls of the groove, so as to correct the out-of-position of the blades to right or left in the groove resulting from the gaps defined between the blade groove and the blades, so as to always place the blades in the center of the groove.

[0018] According to this invention, when the slider is moved relative to the needle body in a direction for the hook to be closed by the slider, the blades are centered in the groove, and when the front ends of the tongues are abutted with the front end of the hook, the blades can be forked at the front ends thereof to hold the hook in sandwich relation from both sides thereof to close it further reliably.

[0019] The centering means is so configured as to bring either of the upper edges and the lower edges of the blades into press-contact with the side walls of the blade groove, and as such can allow the gaps between the blades and the side walls of the blade groove to be filled in, so as to center the blades. The tongues at the front ends of the blades are expanded by the action of the twists, and as such can allow the blades to be further reliably forked by the hook.

[0020] In the case where the compound needle is formed as a transferring needle that is so designed that the front ends of the blades of the slider can be advanced further beyond the hook, since the bends are so configured as to suppress an expansion of the space between the front ends of the blades when the front ends of the blades are advanced to the loop transferring position beyond the hook, even when the knitting members, such as sinkers and loop pressers, are positioned in vicinity of the compound needles, the knitting problem caused by the blades coming close to the knitting members can be prevented. This can be achieved by the bends on the blades being so configured as to be oriented in a direction for them to be pressed with or away from each other.

Brief Description of the Drawings

[0021] FIG. 1 is a view showing a front end portion of a compound needle according to Embodiment 1 of the present invention which is in the state of being fitted in a needle groove formed in a needle bed. FIG. 2 is a view showing the details of components of the compound needle. FIG. 3a is a view showing one of the blades of a slider taken out from a needle body; FIG. 3b is a view showing the laminated blades; and FIG. 3c-e are illustrations of the shift of the blades from the retracted position to the loop transferring position. FIG. 4 is a variant of the blade having a bend curved largely in the longitudinal direction thereof. FIG. 5 is another variant of the blade having two waveform bends. FIG. 6 is a view of an alteration of the compound needle corresponding to that of FIG. 3. FIG. 7 is a view showing a compound needle according to Embodiment 2 of the present invention.

Best Mode for Carrying out the Invention

Embodiment 1

[0023] A compound needle 1 fitted in a needle groove formed in a needle bed (not shown) comprises a needle body 3 and a slider 5. The needle body 3 comprises a hook member 7 and a jack 9 separate from each other. These may be formed in combination. It should be noted that the needle body 3 defined in the description covers both types of the needle body.

[0024] The hook member 7 includes a hook 15, an accommodating groove 17 for accommodating blades 11, a center body portion 19, a control butt 49 projecting out from near the center portion of the jack, and a control butt 49 projecting out from near the center portion of the jack, so as to be engaged with a cam provided in a cam carriage (not shown). The forward and backward operation of the jack can allow the needle body 3 to move forward and backward.

[0025] The slider 5 comprises blades 11a, 11b and the slider body 13 separate from each other. The blades 11 are formed by superposing two plates having substantially identical configuration and is accommodated in the blade groove 17. The blades 11 have tongues 31a, 31b formed at front ends thereof to be abutted with a front end portion 15a of the hook and also have coupling portions 33a, 33b to be coupled with the slider body 13 which are formed at rear side of the blade groove 17.

[0026] The slider body 13 has thickness identical with that of the needle body 3 and also has at a rear side thereof a control butt 49 projecting out therefrom to control the forward and backward movement. 39 designates a lower arm branched from the slider body and formed to extend into an interior of the center body portion 19 of
the hook member 7. The lower arm 39 has an elongate groove 51 formed by cutting one side surface of the lower arm and a through hole 53 is formed on the elongate groove 51.

[0027] The projections 33a, 33b of the blades 11 are fixedly coupled with the through hole 53 in the slider body 13 in a proper manner such as caulking. One of the blades 11a extending to the elongate groove 51 is bent at a rear end portion thereof 41 so as to be in press-contact with a side wall of the needle groove so that the slider 5 can be prevented from rash action of moving with the forward and backward movement of the needle body 3. 36a, 36b designate curved portions formed by the front ends of the blades to be abutted with the hook being bent outward, as illustrated. The curved portions serve as guide surfaces for the front ends of the blades when forked by the hook.

[0028] Symmetrical bends 60a, 60b are respectively formed on the blades 11a, 11b as centering means. The bends 60a, 60b act to correct displacement of the blade 11 with respect to the widthwise direction of the groove resulting from the gap created between the blade groove 17 and the blades 11a, 11b, so as to always place the blades in the center of the blade groove. The bends 60a, 60b are so formed as to be away from each other when the blades 11a, 11b are laminated to each other, as shown in FIG. 3. Shown in FIG. 3a is one of the blades taken out from the needle body. Shown in b in the same figure are the blades in the laminated state. Shown in c to e of the same figure are the blades fitted in the blade groove of the needle body. FIG. 3c shows the state in which the slider is retracted and the front ends of the blades 11a, 11b are accommodated in the groove. FIG. 3d shows the state in which the blades 11 are moved forward to the front end of the hook. FIG. 3e shows the state in which the blades are moved forward to a loop transferring position beyond the hook.

[0029] For convenience of explanation, the gaps formed in the groove and the bends of the blades are depicted in an exaggerated form in FIG. 3 for the easy-to-understand sake. 65 denotes a gap between the blades 11a, 11b; 67 a gap between 11a and one side wall of the groove; and 69 a gap between 11b and the other side wall of the groove. The bends 60a, 60b of the blades 11a, 11b are so configured as to be away from each other, so as to be in press-contact with the both side walls of the blade groove 17. By the action of the bends, the blades 11a, 11b are centered in the groove at positions equally divided right and left from a widthwise center of the groove.

[0030] Further, the bends 60a, 60b can act to suppress the outward expansion of the blades 11a, 11b in the loop transferring state, as shown in FIG. 3e. Thus, the provision of the bends can produce suppression of outward expansion of the front ends of the blades, as compared with the conventional type one (broken line). In the case where the bends are formed in an area where the bends 60a, 60b are all exposed out from the groove 17 in the FIG. 3e state, as is the case with this embodiment, it is preferable that width of the space defined between the bends 60a, 60b in the FIG. 3b state should not be made larger than thickness of the hook 13.

Variants and Alteration

[0031] Referring to FIG. 4, there is shown only one blade 11b of a variant having a bend 160b curved largely in the longitudinal direction thereof, which corresponds to that shown in FIG. 3b. In this variant, a part of the bend is in the state of staying in the blade groove even in the loop transferring position. Referring to FIG. 5, there is shown a blade 211b of another variant having two wave-form bends 260b. Both types of blades can produce equivalent effects to those of the previous embodiment.

[0032] Referring now to FIG. 6, there is shown an alteration of the compound needle. In the alteration, the blades 311a, 311b are provided, at front portions thereof, with the bends 360a, 360b which are so configured as to be pressed with each other when the blades are laminated. FIG. 6 corresponds to FIG. 3 of the previous embodiment. 165 designates a gap between the blades 311a, 311b. 167 designates a gap between 311a and one side wall of the groove. 169 designates a gap between 311b and the other side wall of the groove. The bends 360a, 360b of the blades 311a, 311b are pressed with each other and, as a result of this, parts of the blades in which no bends are formed are brought into press-contact with the side walls of the blade groove 17. By this action of the bends the blades 311a, 311b are centered in the groove. Further, in this alteration, the front ends of the blades 311 are expanded by the action of the bends, so that the both blades can easily traverse the hook. For this reason, this alteration can omit the configuration of the previous embodiment that the blades are provided, at the front ends thereof, with the outward curved guide surfaces 36a, 36b.

Embodiment 2

[0033] Next, another embodiment of the compound needle of the present invention will be described with reference to FIG. 7. As the needle body and the slider except the blades in this embodiment are identical in configuration with those of the above-mentioned embodiment, the description thereon is omitted. Shown in FIG. 7a is one of the blades 411a of the slider taken out from the needle body. Shown in FIG. 7b is the other blade 411b as viewed from the side. Shown in FIG. 7c is the laminated state of the blades of the slider taken out from the needle body. Shown in FIG. 7d is a sectional view taken along the line d-d of FIG. 7c. Shown in FIG. 7e is the state in which the blades are moved forward to the hook. 432a and 432b denote upper surfaces of the tongues and 434a, 434b denote lower edges of the blades, respectively.

[0034] In this embodiment, the centering means for the
blades is formed by the blades being twisted along lines 450a, 450b so that the upper surfaces of the blades can be oriented to the middle of the groove in the state in which the blades are accommodated in the groove, so that the lower edges of the blades can be put into press-contact with the confronting side walls of the groove. This configuration that the blades are partly twisted at an angle with a plane parallel to the side walls of the blade groove enable the gap between the blades and the blade groove to be filled in, so as to center the blades, as is the case with the previous embodiment. Further, in this embodiment, since the tongues at the front ends of the blades are expanded by the action of the twisted blades, as shown in FIG. 7e, the blades can be forked by the hook further reliably.

[0035] While in the embodiment mentioned above, the blades are twisted at the front end portions thereof so that the upper surfaces of the blades can be oriented to the middle of the groove, alteration of that structure may be adopted wherein coupling portions of the slider body to be coupled with the blades are formed to have tapered surfaces and the blades are coupled with those tapered surfaces. Also, the twisted portions of the blades may be turned upside down so that the lower surfaces of the blades can be oriented to the middle of the groove.

Capabilities of Exploitation in Industry

[0036] The objective of the present invention is to make it more reliable to center the blades of the compound needle in the blade groove formed in the needle body. In addition, the objective of the present invention is to suppress outward expansion of the front end portions of the blades when guided to the loop transferring position beyond the hook.

Claims

1. A compound needle which comprises a needle body (3) having a hook (15) at a front end thereof and a slider (5) having tongues formed by two blades (11a, 11b) being superposed and is so structured that the needle body (3) and the slider (5) can freely be moved forward and backward individually in the state in which the blades (11a, 11b) of the slider (5) are supported in a blade groove (17) formed in the needle body (3), characterized in that each blade (11a, 11b) includes a centering means (60a, 60b) to bring side surfaces of the blades (11a, 11b) in the blade groove (17) into press-contact with side walls of the blade groove (17) of the needle body (3), so as to center the blades (11a, 11b) with respect to a width-wise direction of the groove (17).

2. The compound needle as set forth in Claim 1, wherein the centering means (60a, 60b) is formed by bends provided in the blades (11a, 11b).

3. The compound needle as set forth in Claim 2, wherein the bends (60a, 60b) are so formed as to be oriented in a direction for them to be away from each other so that when the blades (11a, 11b) are exposed out from the blade groove (17) and are advanced toward the hook (15), the blades (11a, 11b) can open their mouth at the front ends thereof.

4. The compound needle as set forth in Claim 3, wherein the compound needle is formed as a transferring needle that is so designed that the front ends of the blades (11a, 11b) of the slider (5) are advanced further beyond the hook (15) to transfer a stitch loop at the advanced position and wherein the bends (60a, 60b) are so configured as to narrow a space between the front ends of the blades (11a, 11b) when the front ends of the blades (11a, 11b) are advanced to the loop transferring position beyond the hook (15).

5. The compound needle as set forth in Claim 4, wherein the bends (60a, 60b) are formed in portions of the blades (11a, 11b) in which the blades (11a, 11b) are completely exposed out from the blade groove (17) in the loop transferring position.

6. The compound needle as set forth in Claim 5, wherein the compound needle is formed as a transferring needle that is so designed that the front ends of the blades (11a, 11b) of the slider (5) are advanced further beyond the hook (15) to transfer a stitch loop at the advanced position and wherein the bends (60a, 60b) are so configured as to be oriented in a direction for them to be pressed with each other, so as to narrow a space between the front ends of the blades (11a, 11b) when the front ends of the two-ply blade (11) are advanced to the loop transferring position beyond the hook (15).

7. The compound needle as set forth in Claim 1, wherein the centering means (60a, 60b) is formed as something to bring either of upper edges and lower edges of the blades (11a, 11b) into press-contact with side walls of the blade groove (17).

8. The compound needle as set forth in Claim 7, wherein the centering means (60a, 60b) comprises twists provided in the blades (11a, 11b).

Patentansprüche

1. Verbundnadel, die aufweist: einen Nadelkörper (3) mit einem Haken (15) an einem vorderen Ende davon; und einen Schieber (5) mit Zungen, die durch zwei Blätter (11a, 11b) gebildet werden, die überlagert und so konstruiert sind, dass der Nadelkörper (3) und der Schieber (5) ungehindert einzeln nach vorn und nach hinten in dem Zustand bewegt werden
können, in dem die Blätter (11a, 11b) des Schiebers (5) in einer Blattnut (17) getragen werden, die im Nadelkörper (3) gebildet wird, dadurch gekennzeichnet, dass jedes Blatt (11a, 11b) ein Zentrierzmittel (60a, 60b) umfasst, um die Seitenflächen der Blätter (11a, 11b) in der Blattnut (17) in einen Presskontakt mit den Seitenwänden der Blattnut (17) des Nadelkörpers (3) zu bringen, um so die Blätter (11a, 11b) mit Bezugnahme auf eine Breitenrichtung der Nut (17) zu zentrieren.

2. Verbundnadel nach Anspruch 1, bei der das Zentrierzmittel (60a, 60b) durch Biegungen gebildet wird, die in den Blättern (11a, 11b) vorhanden sind.

3. Verbundnadel nach Anspruch 2, bei der die Biegungen (60a, 60b) so ausgebildet sind, dass sie in einer Richtung ausgerichtet werden, damit sie voneinander weg sind, so dass, wenn die Blätter (11a, 11b) aus der Blattnut (17) freigegeben und in Richtung des Hakens (15) weiterbewegt werden, die Blätter (11a, 11b) ihre Öffnung an deren vorderen Enden öffnen können.

4. Verbundnadel nach Anspruch 3, bei der die Verbundnadel als eine Übertragungsnadel ausgebildet ist, die so konstruiert ist, dass die vorderen Enden der Blätter (11a, 11b) des Schiebers (5) weiter über den Hakens (15) hinaus bewegt werden, um eine Maschenschlinge in die weiterbewegte Position zu übertragen, und bei der die Biegungen (60a, 60b) so ausgebildet sind, dass ein Zwischenraum zwischen den vorderen Enden der Blätter (11a, 11b) verengt wird, wenn die vorderen Enden der Blätter (11a, 11b) in die Schlingenübertragungsposition über den Haken (15) hinaus weiterbewegt werden.

5. Verbundnadel nach Anspruch 4, bei der die Biegungen (60a, 60b) in den Abschnitten der Blätter (11a, 11b) ausgebildet sind, in denen die Blätter (11a, 11b) vollständig aus der Blattnut (17) in der Schlingenübertragungsposition freigelegt sind.

6. Verbundnadel nach Anspruch 5, bei der die Verbundnadel als eine Übertragungsnadel ausgebildet ist, die so konstruiert ist, dass die vorderen Enden der Blätter (11a, 11b) des Schiebers (5) weiter über den Hakens (15) hinaus bewegt werden, um eine Maschenschlinge in die weiterbewegte Position zu übertragen, und bei der die Biegungen (60a, 60b) so ausgebildet sind, dass sie in einer Richtung ausgerichtet werden, damit sie miteinander gepresst werden, um so einen Zwischenraum zwischen den vorderen Enden der Blätter (11a, 11b) zu verengen, wenn die vorderen Enden des Zwiefachblattes (11) in die Schlingenübertragungsposition über den Haken (15) hinaus weiterbewegt werden.

7. Verbundnadel nach Anspruch 1, bei der das Zentrierzmittel (60a, 60b) als etwas ausgebildet ist, um beide von oberen Rändern und unteren Rändern der Blätter (11a, 11b) in einen Presskontakt mit den Seitenwänden der Blattnut (17) zu bringen.

8. Verbundnadel nach Anspruch 7, bei der das Zentrierzmittel (60a, 60b) Verdrehungen aufweist, die in den Blättern (11a, 11b) vorhanden sind.

**Revendications**

1. Aiguille composite comprenant un corps d’aiguille (3) comportant un crochet (15) au niveau de son extrémité avant et un coulisseau (5) comportant des languettes formées par deux lames (11a, 11b) superposées, et structurée de sorte que le corps de l’aiguille (3) et le coulisseau (5) peuvent être déplacés librement vers l’avant et vers l’arrière, de manière individuelle, dans l’état où les lames (11a, 11b) du coulisseau (5) sont supportées dans une rainure à lames (17) formée dans le corps de l’aiguille (3), caractérisée en ce que chaque lame (11a, 11b) englobe un moyen de centrage (60a, 60b) pour entraîner un contact par pression entre les surfaces latérales des lames (11a, 11b) dans la rainure à lames (17) et les parois latérales de la rainure à lames (17) du corps de l’aiguille (3), de sorte à centrer les lames (11a, 11b) par rapport à une direction de la largeur de la rainure (17).

2. Aiguille composite selon la revendication 1, dans laquelle le moyen de centrage (60a, 60b) est constitué par des coudes formés dans les lames (11a, 11b).

3. Aiguille composite selon la revendication 2, dans laquelle les coudes (60a, 60b) sont formés de sorte à être orientés dans une direction les écartant les uns des autres, de sorte que lorsque les lames (11a, 11b) sont exposées hors de la rainure à lames (17) et avancées vers le crochet (15), les lames (11a, 11b) peuvent ouvrir leur embouchure au niveau de leurs extrémités avant.

4. Aiguille composite selon la revendication 3, dans laquelle l’aiguille composite a la forme d’une aiguille de transfert, conçue de sorte que les extrémités avant des lames (11a,11b) du coulisseau (5) sont avancées davantage au-delà du crochet (15) pour transférer une boucle de maille au niveau de la position avancée, les coudes (60a, 60b) étant configurés de sorte à rétrécir un espace entre les extrémités avant des lames (11a, 11b) lorsque les extrémités avant des lames (11a, 11b) sont avancées vers la position de transfert des boucles, au-delà du crochet (15).
5. Aiguille composite selon la revendication 4, dans laquelle les coudes (60a, 60b) sont formés dans des parties des lames (11a, 11b) dans lesquelles les lames (11a, 11b) sont complètement exposées hors de la rainure à lames (17) dans la position de transfert des boucles.

6. Aiguille composite selon la revendication 5, dans laquelle l’aiguille composite a la forme d’une aiguille de transfert conçue de sorte que les extrémités avant des lames (11a, 11b) du coulisseau (5) sont avancées davantage au-delà du crochet (15) pour transférer une boucle de maille au niveau de la position avancée, les coudes (60a, 60b) étant configurés de sorte à être orientés dans une direction les pressant les uns contre les autres, de sorte à rétrécir un espace entre les extrémités avant des lames (11a, 11b) lorsque les extrémités avant de la lame à deux couches (11) sont avancées vers la position de transfert des boucles, au-delà du crochet (15).

7. Aiguille composite selon la revendication 1, dans laquelle le moyen de centrage (60a, 60b) est formé de sorte à entraîner un contact par pression entre les bords supérieurs ou les bords inférieurs des lames (11a, 11b) et les parois latérales de la rainure à lames.

8. Aiguille composite selon la revendication 7, dans laquelle le moyen de centrage (60a, 60b) comprend des éléments de torsion formés dans les lames (11a, 11b).
Fig. 4
Fig. 5
Fig. 6
REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description