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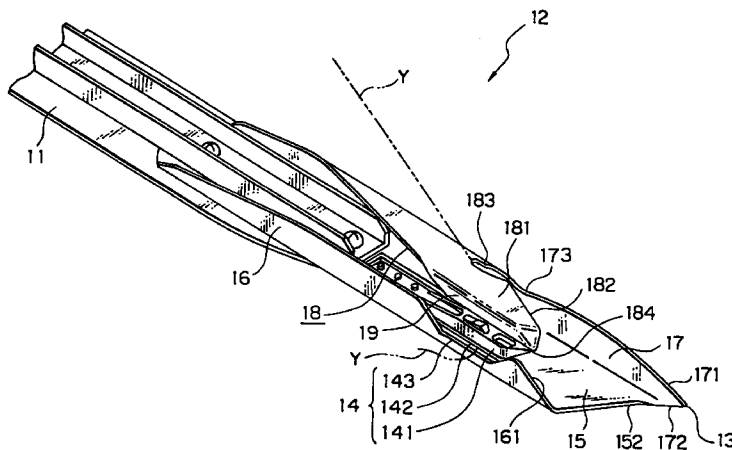
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(54) **Weft inserting apparatus for rapier loom**

(57) A weft feeding rapier head for a weft inserting apparatus of a rapier loom has a warp guiding portion which can be easily shaped so as to ensure a smooth warp guiding action. The weft feeding rapier head (12) is comprised of a guide frame (13) and a gripping mechanism (14) fixedly secured to the guide frame (13). The guide frame (13) is constituted by a bottom wall (15), a vertically upstanding wall (16) disposed erectly at one lateral side of the bottom wall (15), a side wall (17) disposed erectly at the other side of the bottom wall (15), a

top wall (18) extending continuously from the side wall (17) and disposed in opposition to the bottom wall (15) and a vertically suspended wall (19) extending vertically downward from the top wall (18). A warp guiding edge portion (171) formed in the side wall (17) and a weft guiding edge portion (191) formed in the vertically suspended wall (19) are connected continuously to each other by way of a front end edge (182) and a weft position regulating recess (183) formed in the top wall (18).

FIG. 1



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Description

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates generally to a weft inserting apparatus for a rapier loom. More particularly, the invention is concerned with a weft feeding rapier head of a weft inserting apparatus which can ensure a smooth yarn guiding action.

Description of Related Art

A weft feeding head disclosed in Japanese Patent Laid-open No. 4-214439 (functionally corresponding to the weft feeding rapier head according to the present invention) is comprised of a base portion and a main body (functionally corresponding to a guide frame of the weft feeding rapier head according to the invention), wherein the main body includes a pair of side walls. A gripper for holding a weft is fixedly secured to the base portion in such disposition that the weft guided along upper edges of the paired side walls can be introduced into a gripping portion of the gripper. To this end, the gripper is constituted by a rigid clamp jaw equipped with a weft deflecting fin and a resilient tongue member, wherein the weft is held between the rigid clamp jaw and the resilient tongue member. The tip end portion of the resilient clamp jaw is configured so as to guide the weft to the aforementioned gripping portion. In the head structure disclosed in the Publication mentioned above, a weft guide (denoted by reference numeral 10 or 19) has to be indispensably provided in opposition to the rigid clamp jaw in order to realize the aimed operation or function.

It is noted that in the case of the head structure disclosed in the above-mentioned publication, the rigid clamp jaw provided with the weft deflecting fin is formed separately from the main body mentioned above. Consequently, difficulty is encountered in shaping the main body such that the weft guiding action performed by the upper edge of one side wall can be smoothly turned over to the weft guiding action performed by the tip end portion of the rigid clamp jaw. On the other hand, the attempt for providing the weft guide in the side wall or a top wall member (overhanging top wall) will encounter difficulty in properly shaping the edge of the side wall or the edge of the overhanging top wall, giving rise to a problem that weft breakage occurs due to excessive abrasion of the weft upon contacting with the warp and/or the loosened warp may find way to beneath the top wall, incurring ultimately breakage of the warp.

SUMMARY OF THE INVENTION

In the light of the state of the art described above, it is an object of the present invention to provide a weft

feeding rapier head for a weft inserting apparatus of a rapier loom, which head is equipped with a warp guiding portion which can be easily shaped so as to ensure a smooth warp guiding action.

5 The present invention is directed to a weft inserting apparatus for a rapier loom, in which a weft feeding rapier head and a weft receiving rapier head each provided with a weft gripping means are inserted into a shedding formed by warps along a sley or a guide member disposed in a width direction of a woven fabric for transferring the weft from the weft feeding rapier head to the weft receiving rapier head, and then the weft feeding rapier head and the weft receiving rapier head are retracted from the shedding, to thereby effectuate weft insertion.

10 In view of the above and other objects which will become apparent as the description proceeds, there is provided according to a general aspect of the present invention a weft feeding rapier head of the weft inserting apparatus which features that an outer wall of the weft feeding rapier head is constituted by a guide frame composed of a side wall located at the side of a reed, a bottom wall and a warp guiding top wall each extending from the side wall, and a vertically upstanding wall extending from the bottom wall and disposed at the side of a cloth fell with a predetermined distance from the side wall. A vertically suspended wall for guiding the weft is disposed between the side wall and the vertically upstanding wall, wherein the vertically suspended wall is connected to the top wall and extends vertically downward toward the bottom wall. Further, a gripping mechanism for gripping the weft is disposed between the vertically upstanding wall and the vertically suspended wall.

15 In a preferred mode for carrying out the invention, a weft position regulating portion formed in a concave shape may be disposed above the bottom wall at the side of the reed.

20 In another preferred mode for carrying out the invention, there may be formed in a front end portion of the top wall which is located at a position near the cloth fell a forefront edge defining a branching point for allowing the warp to be guided upwardly while allowing the weft to be guided downwardly.

25 In yet another preferred mode for carrying out the invention, a weft guiding edge portion may be formed at a lower end of the vertically suspended wall.

30 In still another preferred mode for carrying out the invention, the weft guiding edge portion may be formed in a shape curved toward the reed from the lower end of the vertically suspended wall.

35 In a further preferred mode for carrying out the invention, the guide frame and the vertically upstanding wall may be formed separately from each other, while a mounting member extending toward the bottom wall may be formed in the vertically upstanding wall, wherein the guide frame and the vertically upstanding wall may be integrally combined with each other by securing the

bottom wall and the mounting member to each other.

In a yet further preferred mode for carrying out the invention, the mounting member of the vertically upstanding wall may be disposed on an upper surface of the bottom wall of the guide frame and fixedly secured thereto.

In a still further preferred mode for carrying out the invention, the mounting member of the vertically upstanding wall may be disposed on a lower surface of the bottom wall of the guide frame and fixedly secured thereto.

In another preferred mode for carrying out the invention, a spacer may be interposed between the bottom wall of the guide frame and the mounting member of the vertically upstanding wall.

In yet another preferred mode for carrying out the invention, a flat surface forming plate may be mounted on a lower surface of the mounting member of the vertically upstanding wall or alternatively on a lower surface of the bottom wall of the guide frame disposed in opposition to the guide member or the sley disposed in the width direction of the woven fabric.

In still another preferred mode for carrying out the invention, the guide frame composed of at least the side wall, the bottom wall and the top wall may be formed by bending and/or folding a single metal sheet.

In a further preferred mode for carrying out the invention, the guide frame and the vertically suspended wall may be formed by bending and/or folding a single metal sheet.

In a yet further preferred mode for carrying out the invention, the guide frame, the vertically suspended wall and the weft guiding edge portion provided at the lower end of the vertically suspended wall may be formed by bending and/or folding a single metal sheet.

In a still further preferred mode for carrying out the invention, the guide frame, the vertically suspended wall and the vertically upstanding wall may be formed by bending and/or folding a single metal sheet.

In another preferred mode for carrying out the invention, the guide frame, the vertically suspended wall, the weft guiding edge portion provided at the lower end of the vertically suspended wall and the vertically upstanding wall may be formed through a precision steel casting process or alternatively by resorting to a powder-metallurgical process.

In yet another preferred mode for carrying out the invention, there may be formed by bending and/or folding a single metal sheet the guide frame, the vertically suspended wall and the weft guiding edge portion provided at the lower end of the vertically suspended wall, while the vertically upstanding wall may be formed through a precision steel casting process or alternatively a powder-metallurgical process.

In still another preferred mode for carrying out the invention, a mount base for the gripping mechanism may be formed integrally with the vertically upstanding wall or the mounting member of the vertically upstand-

ing wall or across the vertically upstanding wall and the mounting member.

In a further preferred mode for carrying out the invention, a portion of the top wall may be formed as a reinforcing protrusion.

The above and other objects, features and attendant advantages of the present invention will be more easily understood by reading the following description of the preferred embodiments thereof, only by way of example, in conjunction with the accompanying drawings, being appreciated that many modifications and variations of the present invention are possible in the light of the techniques disclosed herein.

BRIEF DESCRIPTION OF THE DRAWINGS

In the course of the description which follows, reference is made to the drawings, in which:

Fig. 1 is a perspective view showing a structure of a weft feeding rapier head for a weft inserting apparatus of a rapier loom according to a first embodiment of the present invention;

Figs. 2(a) and 2(b) are views showing the weft feeding rapier head in a top plan view and a side elevational view, respectively;

Figs. 3(a) to 3(c) are views showing the weft feeding rapier head in a front end view, a sectional view taken along a line A-A in Fig. 2(b) and a sectional view taken along a line B-B in Fig. 2(b), respectively;

Figs. 4(a) and 4(b) are views showing a weft feeding rapier head for a weft inserting apparatus of a rapier loom according to a second embodiment of the present invention, wherein Fig. 4(a) is a plan view of the same and Fig. 4(b) is a sectional view thereof taken along a line E-E shown in Fig. 4(a);

Figs. 5(a), 5(b) and 5(c) are views showing a weft feeding rapier head for a weft inserting apparatus of a rapier loom according to a third embodiment of the present invention, wherein Fig. 5(a) is a plan view of the same, Fig. 5(b) is a front end view and Fig. 5(c) is a sectional view thereof taken along a line F-F shown in Fig. 5(a);

Figs. 6(a), 6(b), 6(c) and 6(d) are views showing a weft feeding rapier head for a weft inserting apparatus of a rapier loom according to a fourth embodiment of the present invention, wherein Fig. 6(a) is a side elevational view of the same, Fig. 6(b) is a front end view thereof, Fig. 6(c) is a sectional view taken along a line C-C shown in Fig. 6(a), and Fig. 6(d) is a sectional view thereof taken along a line F-F shown in Fig. 6(a);

Figs. 7(a) and 7(b) are views showing a weft feeding rapier head for a weft inserting apparatus of a rapier loom according to a fifth embodiment of the present invention, wherein Fig. 7(a) is a front end view of the same and Fig. 7(b) is a vertical sectional

view thereof;

Fig. 8 is a perspective view showing a weft feeding rapier head for a weft inserting apparatus of a rapier loom according to a sixth embodiment of the present invention;

Figs. 9(a) and 9(b) are views showing the weft feeding rapier head according to the sixth embodiment of the invention, wherein Fig. 9(a) is a front end view of the same and Fig. 9(b) is a vertical sectional view thereof; and

Figs. 10(a) and 10(b) are views showing a weft feeding rapier head for a weft inserting apparatus of a rapier loom according to a seventh embodiment of the present invention, wherein Fig. 10(a) is a front end view of the same and Fig. 10(b) is a vertical sectional view thereof.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention will be described in detail in conjunction with what is presently considered as preferred or typical embodiments thereof by reference to the drawings. In the following description, like reference characters designate like or corresponding parts throughout the several views. Also in the following description, it is to be understood that such terms as "top", "bottom", "vertically", "horizontally", "upper", "lower" and the like are words of convenience and are not to be construed as limiting terms.

Embodiment 1

Now, referring to Figs. 1 to 3, description will be made of a weft inserting apparatus for a rapier loom according to a first embodiment of the present invention.

Referring to Fig. 1, a rapier band 11 is wrapped around a wheel (not shown), and a weft feeding rapier head generally denoted by reference numeral 12 is secured to a tip end portion of the rapier band 11 by means of screws so as to reciprocally move into and out from a shed formed by warps T under reciprocative rotation of the wheel.

Reference is made to Figs. 2(a) and 2(b), in which Fig. 2(a) is a top plan view showing the weft feeding rapier head 12 and Fig. 2(b) is a side elevational view of the same. As can be seen in these figures, the weft feeding rapier head 12 is generally comprised of a guide frame 13 and a gripping mechanism 14 which is secured to the guide frame 13. Further, referring to Figs. 3(a) and 3(b), in which Fig. 3(a) is a front end view of the weft feeding rapier head 12 and Fig. 3(b) is a sectional view of the same taken along a line A-A shown in Fig. 2(b), the gripping mechanism 14 includes a stationary gripping member 141, a movable gripping member 142 which is resiliently deformable or flexible and a leaf spring 143 for resiliently urging the movable gripping

member 142 onto the stationary gripping member 141. The stationary gripping member 141, the movable gripping member 142 and the leaf spring 143 are fixedly stacked together in this order as viewed from the top, whereby a unitary assembly is formed, which is secured to the guide frame 13 by the screws.

The guide frame 13 is constituted by a bottom wall 15, a vertically upstanding wall 16 disposed erectly at one lateral side of the bottom wall 15 (i.e., at the side facing a cloth fell of a woven fabric), a sidewall 17 disposed erectly at the other side of the bottom wall 15 (i.e., at the side of a reed 20 on a sley 10), a top wall 18 extending continuously from the side wall 17 and disposed in opposition to the side wall 17 and a vertically suspended wall 19 extending vertically downwardly from the top wall 18. As can be seen in Fig. 3(c) which shows the weft feeding rapier head in a sectional view taken along a line B-B in Fig. 2(b), the rapier band 11 is secured to a base portion of the bottom wall 15 by means of screws. Mounted fixedly on the upper surface of the bottom wall 15 is a mount base 151 on which a gripping mechanism 14 is secured by means of screws. A flat surface forming plate 21 is secured to the lower surface of the bottom wall 15. In this conjunction, it is to be noted that the lower surface of the flat surface forming plate 21 lies flush with that of the rapier band 11, whereby there can be ensured smoothness in guiding a warp on and along the lower surface of the bottom wall 15 (see Fig. 3(a)). Moreover, the flat surface forming plate 21 can be made of synthetic resin materials or metal materials.

The vertically upstanding wall 16 has an upper edge which is formed continuously by a weft guiding edge portion 161 extending slantly upwardly from the leading end portion of the vertically upstanding wall 16, a weft guiding edge portion 162 extending obliquely downward from the weft guiding edge portion 161 and a weft guiding edge portion 163 extending substantially horizontal. The upwardly sloped weft guiding edge portion 161 is also destined to serve as a weft guiding edge portion. On the other hand, a weft guiding edge portion 191 is formed at the lower end of the vertically suspended wall 19. More specifically, the weft guiding edge portion 191 is bent or curved toward the side wall 17 from the lower edge of the vertically suspended wall 19. With the arrangement described above, the weft Y can be guided into a gripping portion defined between the stationary gripping member 141 and the movable gripping member 142 through cooperation of the weft guiding edge portions 161, 162, 163 and 191.

Formed in upper and lower edge portions of the side wall 17 at locations closer to the leading end thereof are warp guiding edge portions 171 and 172 which are gradually distanced from each other in the direction as viewed from the tip end of the side wall 17. The side wall 17 serves as a guide for grouping the warps T into upper and lower warp layers (T) along the warp guiding edge portions 171 and 172 upon operation

for forming the shedding. The warp guiding action of the warp guiding edge portion 172 is succeeded by a front edge portion 152 of the bottom wall 15 and the bottom surface of the flat surface forming plate 21.

Formed in a tip end portion of the top wall 18 are a slanted warp guiding surface 181 and a forefront edge 184. The warp guiding action performed by the warp guiding edge portion 171 is smoothly transferred to the warp guiding action of the warp guiding surface 181.

Formed in the upper edge of the side wall 17 in succession to the warp guiding edge portion 171 is a concave-shaped weft guiding edge portion 173 which cooperates with the weft guiding edge portions 161 and 191 to guide the weft Y into the gripping portion of the gripping mechanism 14. Further, formed in a front edge portion 182 of the top wall 18 is a weft position regulating recess 183 which serves as a means for regulating the position of the weft. The weft Y which is in the state gripped by the gripping mechanism 14 can thus be brought into contact with the weft position regulating recess 183. In this way, the path of the weft Y which is in the state held by the gripping mechanism 14 is regulated by the weft position regulating recess 183.

The guide frame 13 is formed by bending correspondingly a single metal sheet (i.e., one and the same metal sheet) so that there are formed in continuation to one another the weft guiding edge portion 161 of the vertically upstanding wall 16, the front edge portion 152 of the bottom wall 15, the warp guiding edge portions 172 and 171 of the side wall 17, the weft guiding edge portion 173 of the side wall 17, the front edge portion 182 of the top wall 18 and the weft guiding edge portion 191 of the vertically suspended wall 19.

Thus, the warp T is guided upwardly at a location of the forefront edge 184, being regulated by the weft guiding edge portion 161 and the warp guiding edge portion 171, to reach the warp guiding surface 181. On the other hand, the weft Y is guided downwardly at a location of the forefront edge 184 under regulation by the weft guiding edge portion 161 and the weft guiding edge portion 173 to reach the weft guiding edge portion 191. In this manner, the forefront edge 184 plays a role as a branching point for setting separately the directions in which the warps T and the weft Y are to be guided, respectively.

The weft feeding rapier head 12 which is gripping and carrying the weft Y encounters a receiving rapier head (not shown) substantially at a central position as viewed in the width direction of the woven fabric, whereby the weft Y gripped by the weft feeding rapier head 12 is transferred to the weft receiving rapier head arrived at a transfer position between the side wall 17 and the vertically suspended wall 19.

With the structure of the weft feeding rapier head for the weft inserting apparatus of the rapier loom according to the first embodiment of the invention described above, there can be obtained advantageous effects mentioned below.

(1-1) The front edge portion 182 of the top wall 18 defines a front-side boundary of the warp guiding surface 181 while the forefront edge 184 of the front edge portion 182 defines a front-side boundary for the weft guiding edge portion 191 of the vertically suspended wall 19. The warp guiding edge portion 171 formed in the side wall 17 and the weft guiding edge portion 191 formed in the vertically suspended wall 19 continue to each other by way of the front edge portion 182 and the weft position regulating recess 183. By virtue of this arrangement, when the weft Y moves underneath the forefront edge 184 upon catching of the weft Y by the weft feeding rapier head 12, the weft Y is guided to the gripping portion of the gripping mechanism 14 and the weft position regulating recess 183 without fail. On the other hand, the warps T running above the forefront edge 184 can be smoothly guided from the position above the warp guiding edge portion 171 of the side wall 17 onto the warp guiding surface 181 of the top wall 18 without fail. Furthermore, the warps T running above the forefront edge 184 can be smoothly moved from the warp guiding edge portion 171 of the side wall 17 onto the warp guiding surface 181 of the top wall 18 with high reliability.

So long as the position of the forefront edge 184 in the longitudinal direction in which the weft feeding rapier head 12 travels, the lateral direction and the vertical direction is set in appropriate or optimal positional relation to the weft guiding edge portion 161, the warp guiding edge portion 171 and the weft guiding edge portion 173, the weft guiding operation as well as the warp guiding operation in the weft feeding rapier head 12 can be smoothly realized owing to the continuous implementation of the warp guiding edge portion 171, the weft guiding edge portion 173, the front edge portion 182, the forefront edge 184 and the weft guiding edge portion 191. Accordingly, there is required proper or positional setting among the forefront edge 184, the weft guiding edge portion 161, the warp guiding edge portion 171 and the weft guiding edge portion 173. Among others, the positional relation between the forefront edge 184 and the weft guiding edge portion 161 has to be established with high precision because of short distance between the forefront edge 184 and the weft guiding edge portion 161 when compared with the others. However, high degree of freedom can be afforded in respect to the curvilinear shape of the weft guiding edge portion 161, the warp guiding edge portion 171 and the weft guiding edge portion 173 as well as the front edge portion 182 constituting a part of the warp guiding portion. Thus, the geometrical configuration of the guiding portions of the weft feeding rapier head 12 for the warp and the weft can be easily realized while ensuring the smooth warp guiding operation.

(1-2) The guide frame 13 which can be formed by bending appropriately a single metal sheet facilitates forming of the guide frame 13.

Embodiment 2

Next, description will turn to a second embodiment of the present invention by reference to Figs. 4(a) and 4(b), in which components or parts same as or equivalent to those mentioned hereinbefore in conjunction with the first embodiment are denoted by like reference numerals, and repeated description thereof is omitted.

In a guide frame 24 of the weft feeding rapier head according to this embodiment, a vertically suspended wall 25 and a top wall 26 are formed integrally with each other as a unitary structure separately from the other guide frame forming portions. The vertically suspended wall 25 and the top wall 26 are formed by bending correspondingly a metal sheet, wherein the top wall 26 is secured to a mounting member 185 formed integrally with the side wall 17. Parenthetically, the top wall 26 and the vertically suspended wall 25 may also be formed through a precision steel casting process typified by a lost-wax process, a sintering process, an injection molding process, a powder-metallurgical process such as an injection molding/sintering process or the like.

With the structure of the weft feeding rapier head according to the second embodiment of the invention described above, there can be obtained advantageous effects mentioned below.

(2-1) Separate implementation of the vertically upstanding wall 16 and the vertically suspended wall 25 facilitates fabrication of the guide frame 24 and the vertically suspended wall 25. Furthermore, by forming separately the forefront edge 184 and the weft guiding edge portion 161 for which severe positional relation is demanded, positional error which may possibly occur in the fabrication of these parts can be corrected or canceled out when these portions are secured integrally with each other, which in turn contributes to improvement of the yield.

(2-2) By forming the vertically suspended wall 25 and the top wall 26 in the integral structure in an angle-like shape separately from the side wall and the bottom through a precision steel casting process typified by a lost-wax process, a powder-metallurgical process such as a sintering process, an injection molding process, an injection molding/sintering process or the like, the position of the top wall 26 in the vertical, horizontal and longitudinal directions, respectively, can be adjusted upon assembling of the rapier head and the weft inserting apparatus, whereby positional error possibly brought about in the fabrication of the unitary structure of the vertically suspended wall 25 and the top wall 26 can be compensated for.

Embodiment 3

Next, description will be directed to a third embodiment of the present invention by reference to Figs. 5(a) to 5(c), in which components or parts same as or equivalent to those mentioned hereinbefore in conjunction with the first embodiment are denoted by like reference numerals.

In a guide frame 27 of the weft feeding rapier head according to this embodiment, a vertically upstanding wall 28 is formed separately by bending a metal sheet. Secured to the lower surface of the bottom wall 15 is a spacer 29 having a bottom surface on which the vertically upstanding wall 28 is secured by means of a mounting member 281. The metal sheet forming the vertically upstanding wall 28 has a same thickness as that of the metal sheet which forms the bottom wall 15. By contrast, the rapier band 11 secured to the lower surface of the bottom wall 15 has a thickness slightly greater than that of the metal sheet mentioned above. Under the circumstances, the spacer 29 is imparted with a thickness which is dimensioned to be equal to a difference in thickness between the bottom wall 15 and the mounting member 281. Thus, the lower surface of the mounting member 281 can be flush with the lower surface of the rapier band 11. Parenthetically, it should be mentioned that provision of the spacer 29 is required when the overall thickness of the bottom wall 15 and the mounting member 281 is smaller than that of the rapier band 11.

With the structure of the weft feeding rapier head according to the third embodiment described above, there can be achieved the following advantageous effects.

(3-1) By providing separately the vertically upstanding wall 28 equipped with the mounting member 281 which also serves for the function of the flat surface forming plate 21 in the weft feeding rapier head according to the first embodiment, fabrication of the guide frame 27 can be much facilitated.

(3-2) By forming as separate portions the forefront edge 184 and the weft guiding edge portion 161 for which severe positional relation is demanded, positional error which may possibly occur in the fabrication of these portions can be corrected or canceled out when they are secured integrally to each other, which contributes to improvement of the yield.

Embodiment 4

Next, description will turn to a fourth embodiment of this invention by reference to Figs. 6(a) to 6(d), in which components or parts same as or equivalent to those mentioned hereinbefore in conjunction with the first embodiment are denoted by like reference numerals.

In a guide frame 23 of the weft feeding rapier head according to this embodiment, a vertically upstanding

wall 22 is formed separately through a precision steel casting process typified by a lost-wax process, a powder-metallurgical process such as a sintering process, an injection molding process, an injection molding/sintering process or the like. The vertically upstanding wall 22 is secured to the upper surface of the bottom wall 15 by means of a mounting member 221. Formed integrally on the upper surface of the mounting member 221 is a mount base 222 on which the gripping mechanism 14 is mounted.

With the structure of the weft feeding rapier head according to the fourth embodiment described above, there can be obtained advantageous effects mentioned below.

(4-1) When compared with the case where the guide frame 13 is formed in an integral structure, separate structure of the vertically suspended wall 25 and the other guide frame forming portions facilitates fabrication of the guide frame 23 and the vertically suspended wall 25. Furthermore, by forming separately the forefront edge 184 and the weft guiding edge portion 161 for which severe positional relation is demanded, positional error which may possibly occur in the fabrication of these portions can be corrected or canceled out when they are secured together, which contributes to improvement of the yield.

(4-2) The vertically upstanding wall 22 in an angle-like shape can be formed through a precision steel casting process typified by a lost-wax process, a powder-metallurgical process such as a sintering process, an injection molding process, an injection molding/sintering process or the like. Similarly, the mount base 222 for securing the gripping mechanism 14 by the screws can be formed through a precision steel casting process typified by a lost-wax process, a powder-metallurgical process such as a sintering process, an injection molding process, an injection molding/sintering process or the like as well. Thus, separate structure of the vertically upstanding wall 22 can facilitate realization of the shape of the vertically upstanding wall 22 which is suited for mounting the gripping mechanism 14.

(4-3) Formation of the mount base 222 for mounting thereon the gripping mechanism 14 can also be facilitated.

Embodiment 5

Next, description will turn to a fifth embodiment of the present invention by reference to Figs. 7(a) and 7(b), in which components or parts same as or equivalent to those mentioned hereinbefore in conjunction with the third embodiment are denoted by like reference numerals.

In a guide frame 30 of the weft feeding rapier head according to this embodiment, a vertically upstanding

wall 31 is formed separately through a precision steel casting process typified by a lost-wax process, a powder-metallurgical process such as a sintering process, an injection molding process, an injection molding/sintering process or the like. A mounting member 311 of the vertically upstanding wall 31 is secured on the lower surface of the bottom wall 15. The mounting member 311 has a same thickness as that of the rapier band 11 which is thicker than the vertically upstanding wall 31, wherein the lower surface of the mounting member 311 lies flush with the lower surface of the rapier band 11. Formed integrally on the upper surface of the mounting member 311 of the vertically upstanding wall 31 is a mount base 151 on which the gripping mechanism 14 is mounted.

With the structure of the weft feeding rapier head according to the fifth embodiment described above, there can be achieved the advantageous effects mentioned below.

(5-1) By providing separately the vertically upstanding wall 31 equipped with the mounting member 311 which also serves for the function of the flat surface forming plate 21 in the weft feeding rapier head according to the first embodiment, fabrication of the guide frame 30 can be much facilitated. Further, by forming as separate portions the forefront edge 184 and the weft guiding edge portion 161 for which severe positional relation is demanded, positional error which may possibly occur in the fabrication of these portions can be corrected or canceled out when they are secured together, which contributes to enhancement of the yield.

(5-2) For the formation of the vertically upstanding wall 31 of the integral structure having the thickness which varies in dependence on the locations, a precision steel casting process typified by a lost-wax process, a powder-metallurgical process such as a sintering process, an injection molding process, an injection molding/sintering process or the like is suited.

(5-3) By forming the vertically upstanding wall 31, the flat surface forming plate 21 and the mount base 151 integrally with one another, the number of the constituent parts for the weft feeding rapier head can be decreased while ensuring high reliability in the operation of the weft feeding rapier head. Additionally, the manufacturing cost thereof can be reduced, to another advantage.

Embodiment 6

Next, description will turn to a sixth embodiment of the present invention by reference to Figs. 8, 9(a) and 9(b) in which components or parts same as or equivalent to those mentioned hereinbefore in conjunction with the first embodiment are denoted by like reference numerals.

In the weft feeding rapier head according to this embodiment, a protruding portion 186 is formed integrally with the top wall 18 so that the former projects upwardly. More specifically, the protruding portion 186 extends in the longitudinal direction of the weft feeding rapier head 12 so as to cover the weft position regulating recess 183 as viewed in the width direction of the rapier band 11. The front end portion of the top wall 18 is likely to be deformed because the weft position regulating recess 183 is formed in the top wall 18. When the front end portion of the top wall 18 is flexibly deformed, the vertical position of the forefront edge 184 will change, giving rise to such possibility that the warps and the weft can not be assorted. The protruding portion 186 is provided as a reinforcing means for preventing such deformation of the top wall 18.

The protruding portion 186 can be formed by resorting to a drawing process when the top wall 18 is formed by bending a metal sheet. On the other hand, when the top wall 18 is formed through a precision steel casting or a powder-metallurgical process, the protruding portion 186 can be easily formed integrally with the top wall 18 in a unitary cast structure.

Embodiment 7

Next, description will turn to a seventh embodiment of the present invention by reference to Figs. 10(a) and 10(b) in which components or parts same as or equivalent to those mentioned hereinbefore in conjunction with the sixth embodiment are denoted by like reference numerals.

In the weft feeding rapier head according to this embodiment, a protruding portion 187 is formed integrally with the top wall 18 so that the former projects downwardly. More specifically, the protruding portion 187 extends in the longitudinal direction of the weft feeding rapier head 12 so as to cover the weft position regulating recess 183 as viewed in the width direction of the rapier band 11. The protruding portion 187 is provided as a reinforcing portion for preventing such deformation of the top wall 18, similarly to the protruding portion 186 provided in the rapier head according to the sixth embodiment of the invention.

The protruding portion 187 can be formed by resorting to a drawing process when the top wall 18 is formed by bending a metal sheet. On the other hand, when the top wall 18 is formed through a precision steel casting or a powder-metallurgical process, the protruding portion 187 can easily be formed integrally with the top wall 18 in a unitary cast structure.

As is apparent from the foregoing description, in the weft feeding rapier head according to this invention, the warp guiding edge portion formed in the side wall of the guide frame and the weft guiding edge portion formed in the vertically sustained wall are connected together by way of the front edge portion of the top wall. Thus, a smooth warp guiding action can be ensured, whereby

the warp is positively protected against breakage, to a great advantage.

Furthermore, because the weft guiding edge portion is implemented integrally with lower edge of the vertically suspended wall connected to the top wall of the rapier head, there arises no need for providing the yarn deflecting fin in association with the weft gripping mechanism, differing from the conventional rapier head. Thus, the gripping mechanism of a simple geometry known per se can be used intactly. Furthermore, because the positional relationship among the forefront edge, the weft guiding edge portion and the warp guiding edge portion can remain unaltered, the mounting position of the gripping mechanism can be freely changed. In other words, the gripping mechanism can be installed at a position where the weft can be gripped most stably.

Claims

1. A weft inserting apparatus for a rapier loom, in which a weft feeding rapier head (12) and a weft receiving rapier head each provided with weft gripping means are inserted into a shedding defined by warps along a sley (10) or a guide member disposed in a width direction of a woven fabric, a weft (Y) is transferred from said weft feeding rapier head (12) to said weft receiving rapier head and then said weft feeding rapier head (12) and said weft receiving rapier head are retracted from said shedding, to thereby effectuate weft insertion, characterized in that:

an outer wall of said weft feeding rapier head (12) is constituted by a guide frame (13) composed of a side wall (17) located at the side of a reed (20), a bottom wall (15) and a warp guiding top wall (18) each extending from said side wall (17), and a vertically upstanding wall (16) extending from said bottom wall (15) and disposed at the side of a cloth fell with a predetermined distance from said side wall (17), a vertically suspended wall (19) for guiding said weft (Y) is disposed between said sidewall (17) and said vertically upstanding wall (16), said vertically suspended wall (19) being connected to said top wall (18) and extends vertically downward toward said bottom wall (15); and a gripping mechanism (14) for gripping said weft (Y) is disposed between said vertically upstanding wall (16) and said vertically suspended wall (19).

2. A weft inserting apparatus for a rapier loom as set forth in claim 1,

characterized in that a weft position regulating portion (183) formed in a concave shape is disposed above said bottom wall (15) at the side of

said reed (20).

3. A weft inserting apparatus for a rapier loom as set forth in claim 1 or 2,
characterized in that a forefront edge (184) 5
defining a branching point for allowing said warp (T) to be guided upwardly while allowing said weft (Y) to be guided downwardly is formed in a front end portion of said top wall (18) which is located at a position near the cloth fell. 10
4. A weft inserting apparatus for a rapier loom as set forth in any one of claims 1 to 3,
characterized in that a weft guiding edge portion (191) is formed at a lower end of said vertically suspended wall (19). 15
5. A weft inserting apparatus for a rapier loom as set forth in claim 4,
characterized in that said weft guiding edge portion (191) is formed in a shape bent toward the reed (20) from the lower end of said vertically suspended wall (19). 20
6. A weft inserting apparatus for a rapier loom as set forth in any one of claims 1 to 5,
characterized in that said guide frame and said vertically upstanding wall (16) are formed separately from each other, while a mounting member (221; 281) extending toward the bottom wall (15) is formed in said vertically upstanding wall (22; 28), and in that said guide frame (23; 27) and said vertically upstanding wall are integrally combined with each other by securing said bottom wall (15) and said mounting member (221; 281) to each other. 25 30 35
7. A weft inserting apparatus for a rapier loom as set forth in claim 6,
characterized in that said mounting member (221) of said vertically upstanding wall (22) is disposed on an upper surface of said bottom wall (15) of said guide frame (23) and fixedly secured thereto. 40
8. A weft inserting apparatus for a rapier loom as set forth in claim 6,
characterized in that said mounting member (281) of said vertically upstanding wall (28) is disposed on a lower surface of said bottom wall (15) of said guide frame (27) and fixedly secured thereto. 45 50
9. A weft inserting apparatus for a rapier loom as set forth in claim 7 or 8,
characterized in that a spacer (29) is interposed between said bottom wall (15) of said guide frame (27) and said mounting member (281) of said vertically upstanding wall (28). 55
10. A weft inserting apparatus for a rapier loom as set forth in any one of claims 1 to 9,
characterized in that a flat surface forming plate (21) is mounted on a lower surface of the mounting member of said vertically upstanding wall or alternatively on a lower surface of said bottom wall (15) of said guide frame (13) disposed in opposition to said guide member or said sley (10) disposed in the width direction of the woven fabric.
11. A weft inserting apparatus for a rapier loom as set forth in any one of claims 1 to 10,
characterized in that the guide frame (13) composed of at least said side wall (17), said bottom wall (15) and said top wall (18) is formed by bending and/or folding a single metal sheet.
12. A weft inserting apparatus for a rapier loom as set forth in any one of claims 1 to 10,
characterized in that said guide frame (13) and said vertically suspended wall (19) are formed by bending and/or folding a single metal sheet.
13. A weft inserting apparatus for a rapier loom as set forth in any one of claims 1 to 10,
characterized in that said guide frame (13), said vertically suspended wall (19) and the weft guiding edge portion (191) provided at the lower end of said vertically suspended wall are formed by bending and/or folding a single metal sheet.
14. A weft inserting apparatus for a rapier loom as set forth in any one of claims 1 to 10,
characterized in that said guide frame (13), said vertically suspended wall (19) and said vertically upstanding wall (16) are formed by bending and/or folding a single metal sheet.
15. A weft inserting apparatus for a rapier loom as set forth in any one of claims 1 to 10,
characterized in that said guide frame (13), said vertically suspended wall (19), the weft guiding edge portion (191) provided at the lower end of said vertically suspended wall and said vertically upstanding wall (16, 22) are formed through a precision steel casting process or a powder-metallurgical process.
16. A weft inserting apparatus for a rapier loom as set forth in any one of claims 1 to 13,
characterized in that said guide frame (13), said vertically suspended wall (19) and the weft guiding edge portion (191) provided at the lower end of said vertically suspended wall (19) are formed by bending and/or folding a single metal sheet while said vertically upstanding wall (22) is formed through a precision steel casting process or a powder-metallurgical process.

17. A weft inserting apparatus for a rapier loom as set forth in claim 15 or 16,
characterized in that a mount base (222) for said gripping mechanism (14) is formed integrally with said vertically upstanding wall (22) or the mounting member (221) of said vertically upstanding wall (22) or across said vertically upstanding wall (22) and said mounting member (221). 5
18. A weft inserting apparatus for a rapier loom as set forth in any one of claims 1 to 17, 10
characterized in that said top wall (18) is partially formed with a reinforcing protrusion (186; 187). 15
19. A weft inserting apparatus for a rapier loom as set forth in claim 10,
characterized in that said flat surface forming plate (21) is made of synthetic resin materials. 20

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FIG. 1

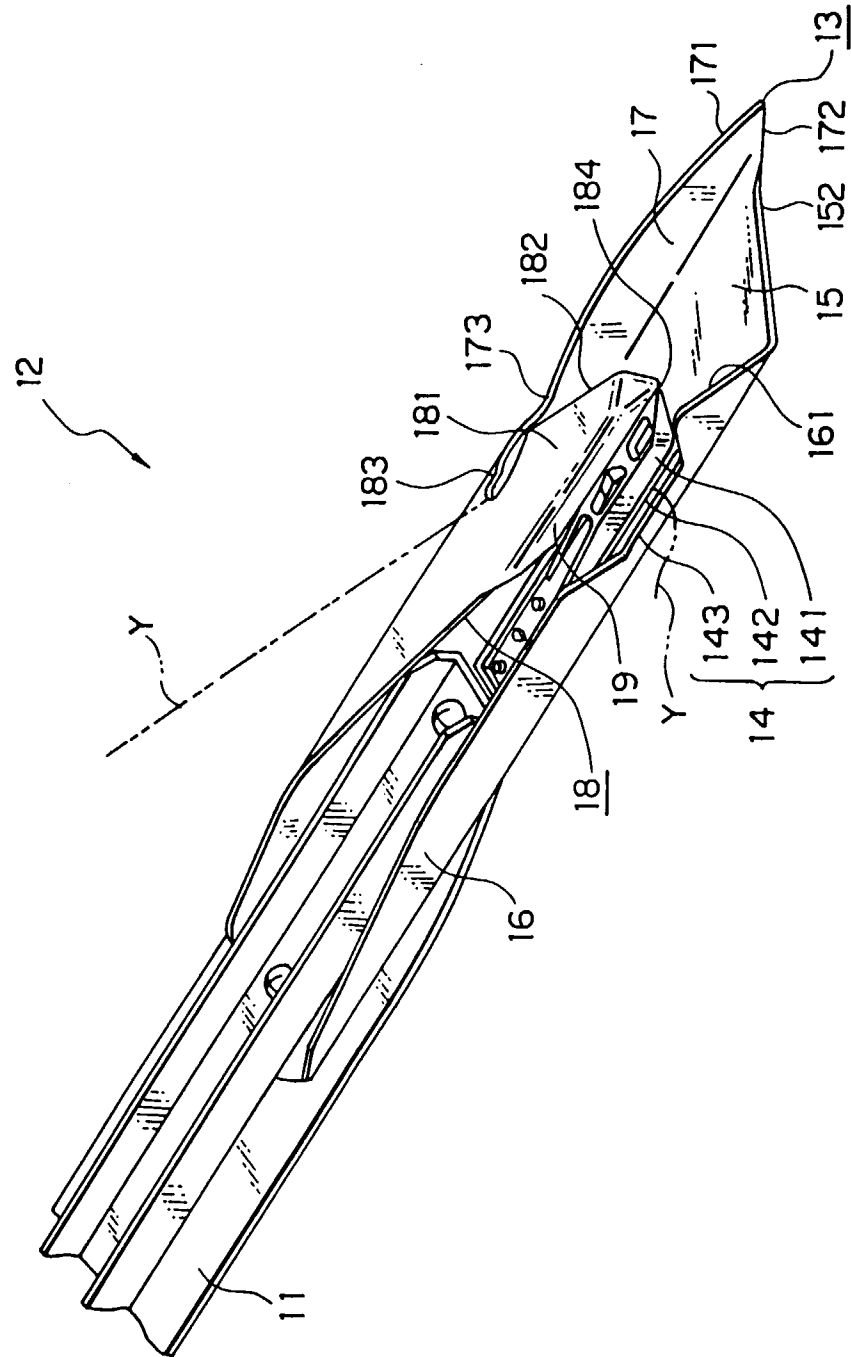


FIG. 3(a)

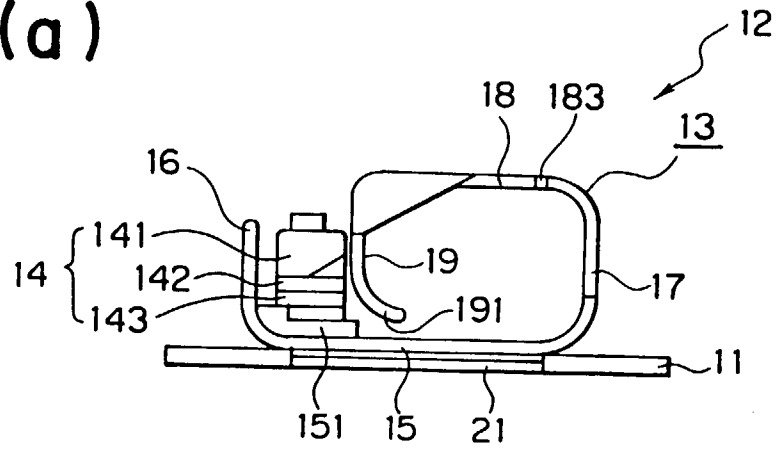


FIG. 3(b)

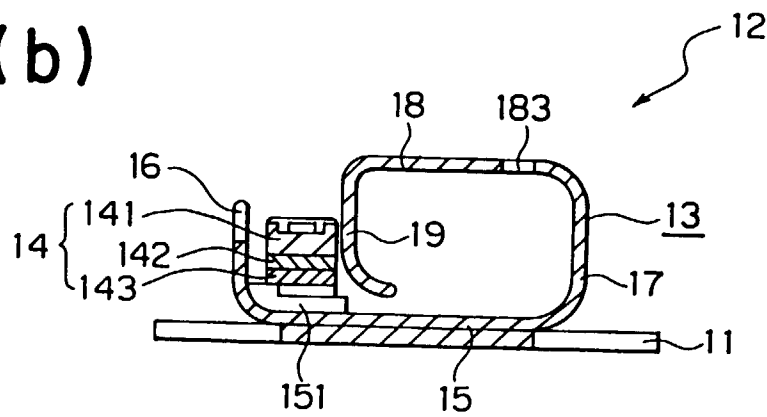


FIG. 3(c)

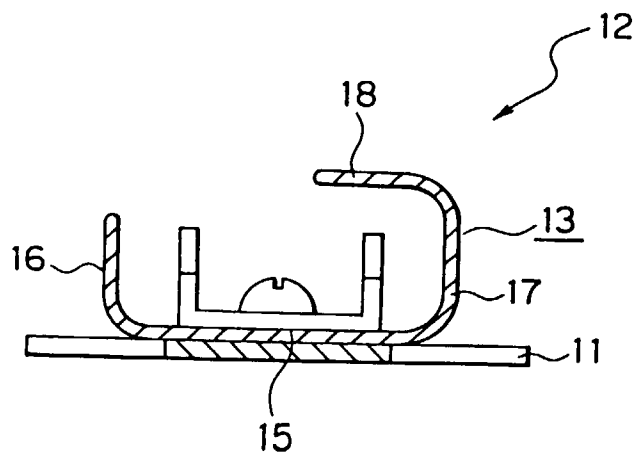


FIG. 4(a)

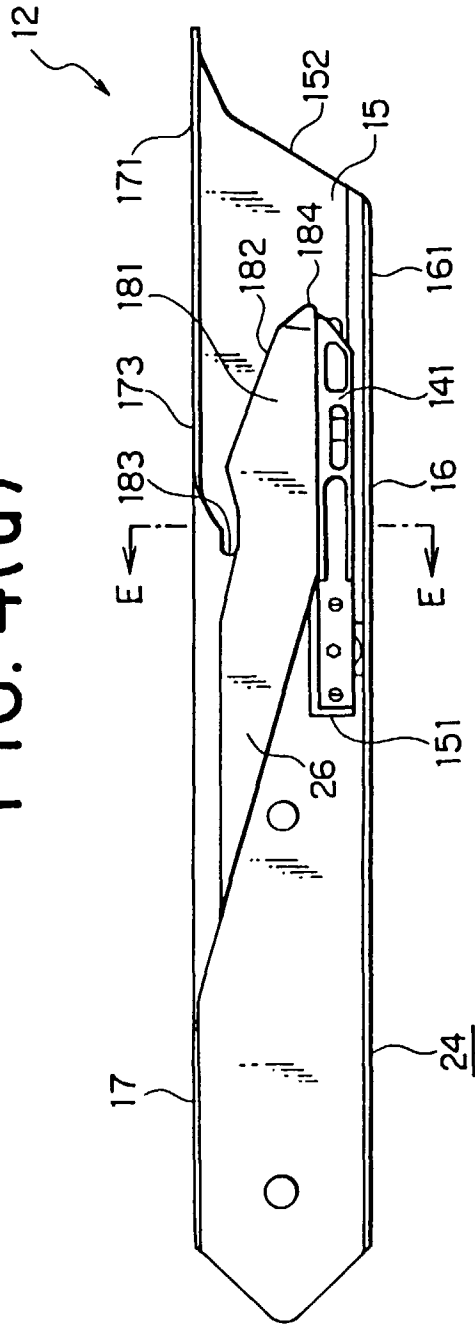


FIG. 4(b)

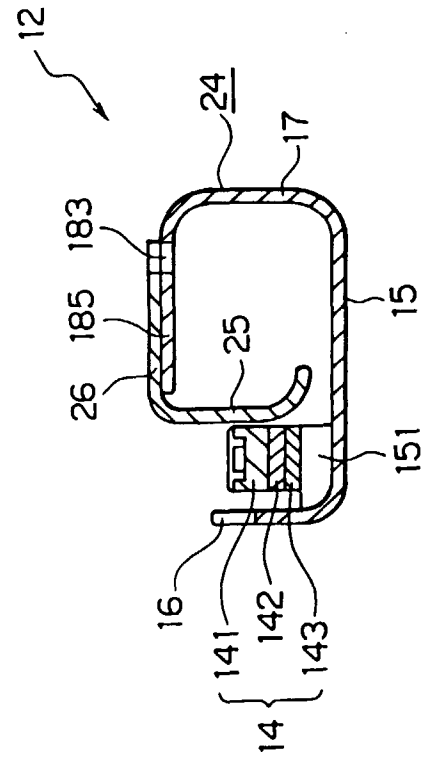


FIG. 6(a)

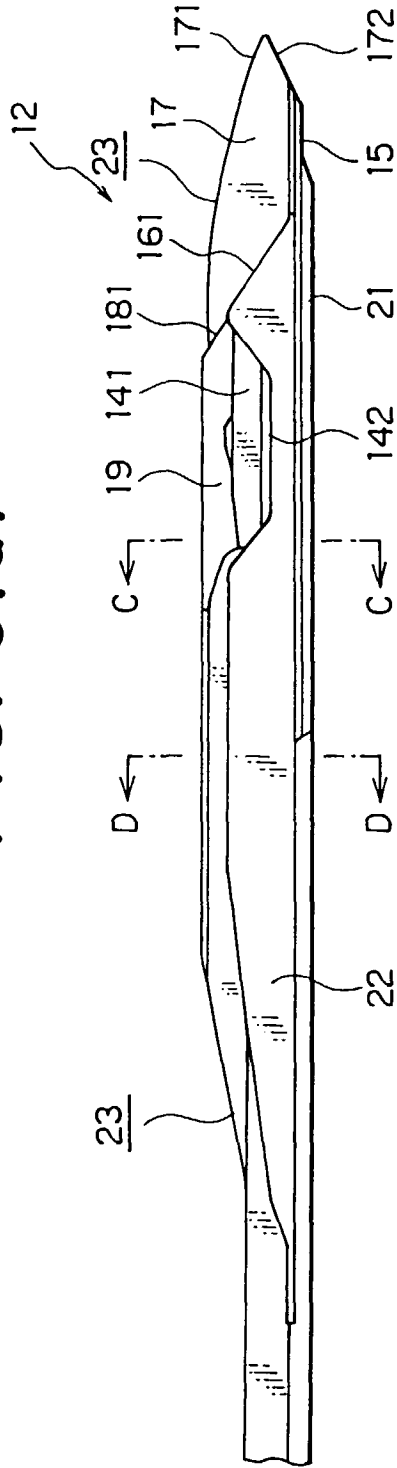


FIG. 6(b)

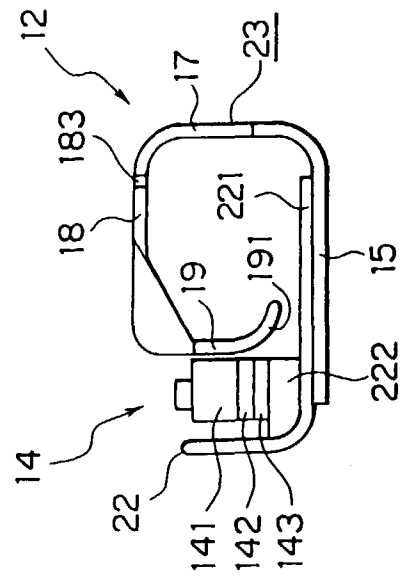


FIG. 6(c)

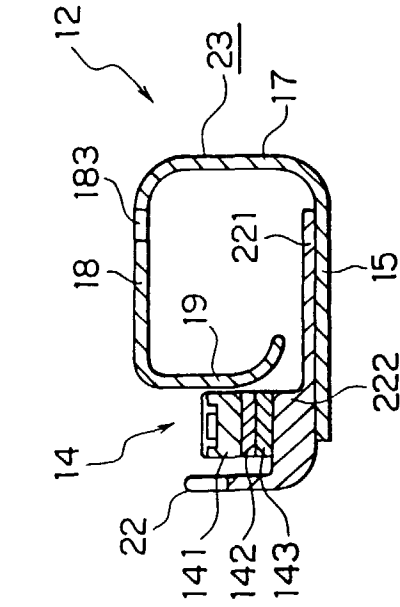


FIG. 6(d)

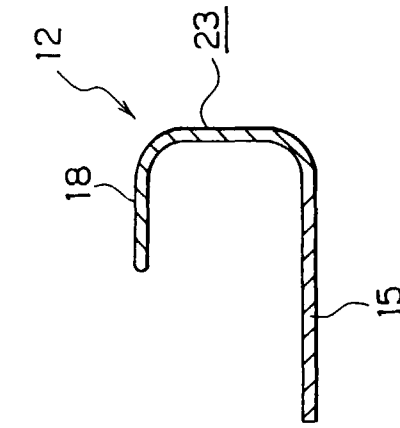


FIG. 7(a)

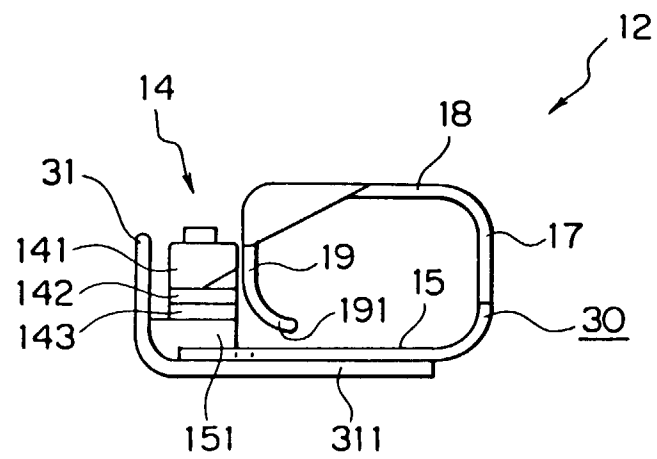


FIG. 7(b)

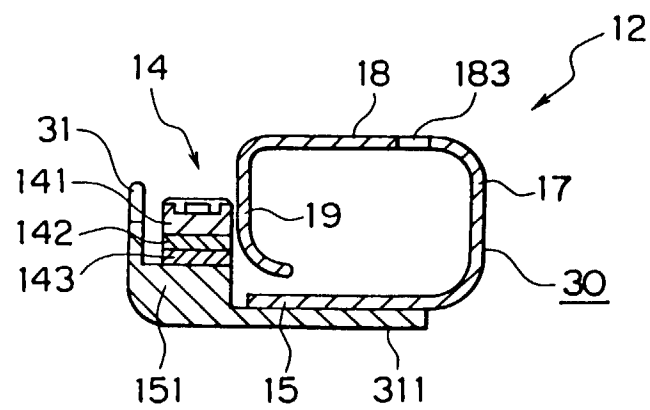


FIG. 8

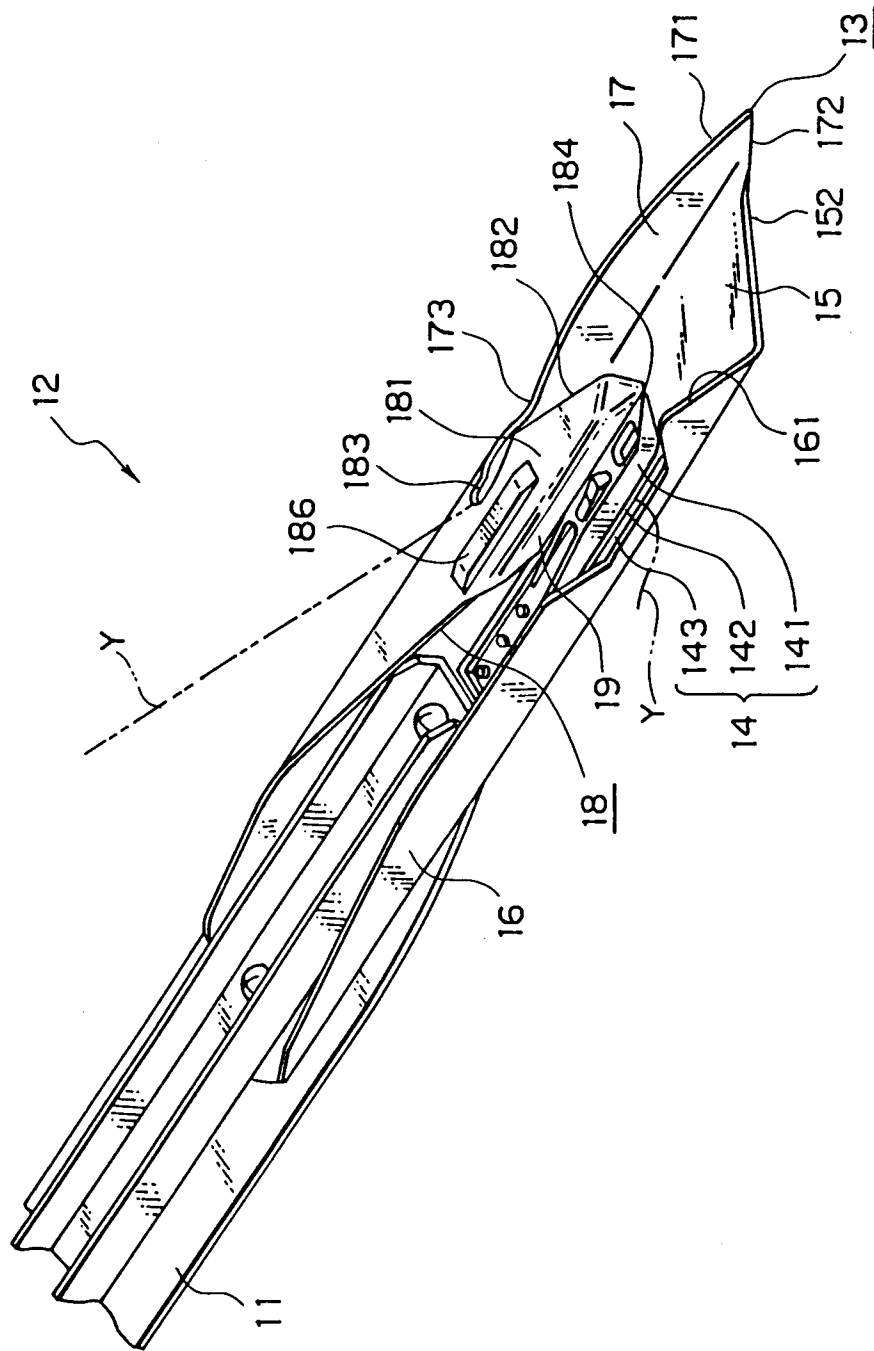


FIG. 9(a)

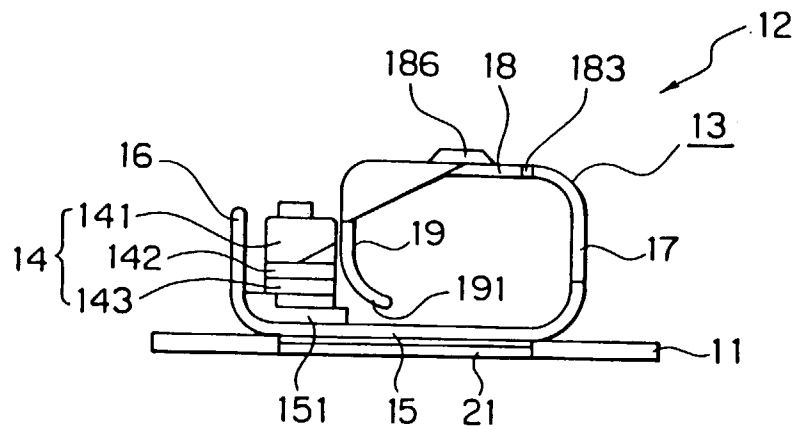


FIG. 9(b)

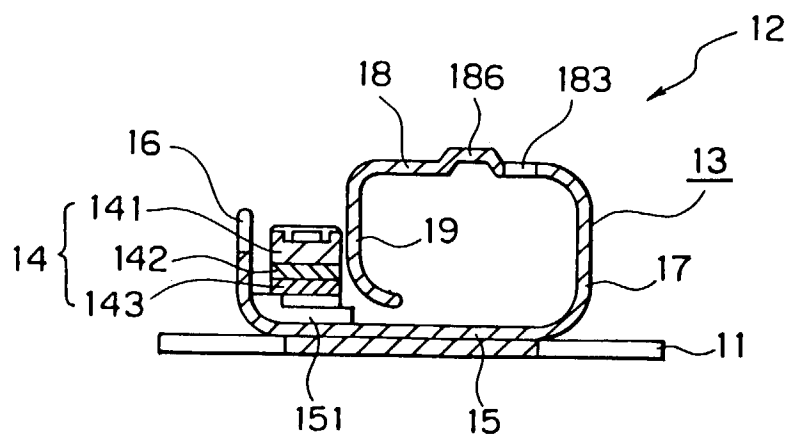


FIG. 10(a)

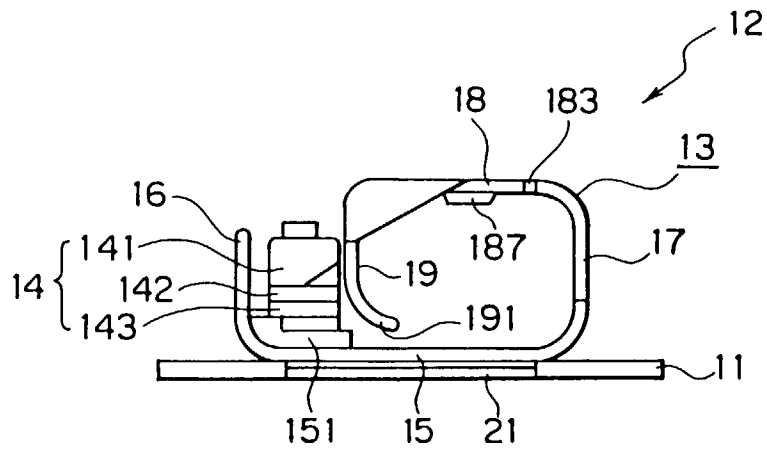
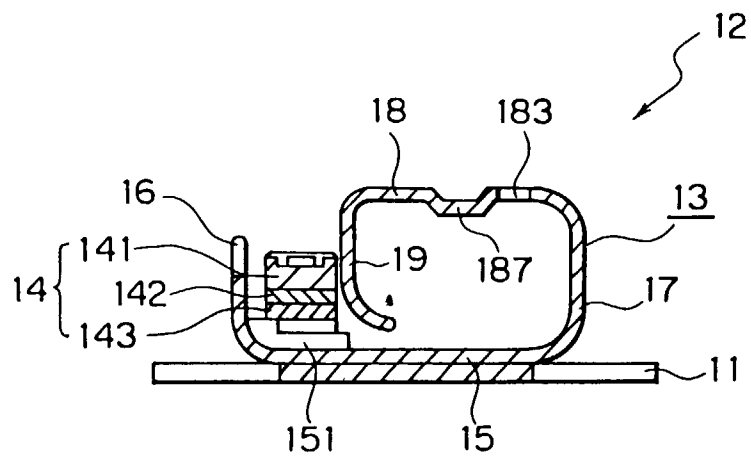


FIG. 10(b)





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 11 2299

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	EP 0 441 099 A (SULZER AG) 14 August 1991	1-3, 11, 12, 14	D03D47/23
Y	* column 5, line 12 - line 19; figures 4A, 4B *	15	
D	* column 2, line 26 - line 28 * & JP 40 214439 A * figures *		
P, X	EP 0 792 961 A (NUOVO PIGNONE SPA) 3 September 1997 * column 3, line 12 - line 57; figures 1, 2 *	1-5	
Y	US 4 071 055 A (HALTMEIER PAUL ET AL) 31 January 1978 * column 4, line 46 - line 49 *	15	
A	EP 0 624 671 A (RUETI AG MASCHF) 17 November 1994 * column 5, line 10 - line 21; figure 7 *	1-3	
A	GB 2 018 307 A (SOMET SOC MEC TESSILE) 17 October 1979 * figures *	1	TECHNICAL FIELDS SEARCHED (Int.Cl.6)
A	FR 2 222 467 A (ROCKWELL INTERNATIONAL CORP) 18 October 1974		D03D
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 1998	Rebiere, J-L
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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