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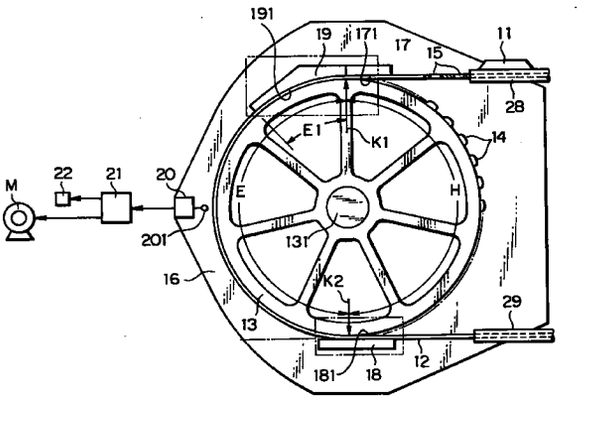
(54) Weft inserting apparatus for rapier loom

(57) A weft inserting apparatus for a rapier loom. By suppressing the tendency of a rapier band to fly radially outwardly from the circumferential surface of a rapier wheel, a large inertial force of a rapier head acting on given driving force receiving holes formed in the rapier band is dispersed to extend the service life of the rapier band. A first position regulating member (17) is disposed in a region extending from a first entrance/exit boundary (K1) to a non- wrapping range (H). A second position regulating member (18) is disposed in a region close to a second entrance/exit boundary (K2). A third position regulating member (19) is disposed in a region extending from the first entrance/exit boundary (K1) into a wrapping range (E). The first position regulating member (17) and the second position regulating member (18) are provided with linear guide surfaces (171, 181), respectively, which are brought into contact with the rapier band (12) in the non-wrapping range (H). The third position regulating member (19) is provided with a curvilinear guide surface (191) adapted to contact with the rapier band (12) in the wrapping range (E). The curvilinear guide surface (191) extends continuously and smoothly to the linear guide surface (171).

FIG. 1(a)



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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention generally relates to a weft inserting apparatus for a rapier loom. More particularly, the invention is concerned with a weft inserting apparatus provided with a facility for regulating the positions of rapier bands which are disposed oppositely to each other and wound partially around rapier wheels, respectively, so that a weft can be inserted into a shedding formed by warps by means of rapier heads mounted at leading end portions of the rapier bands through reciprocative rotations of the rapier wheels.

Description of Related Art

[0002] As disclosed in Japanese Patent Application Laid-open No. 3-180542, a weft inserting apparatus for a rapier loom is known which includes a mechanism comprised of a pair of weft grippers (corresponding to what is called rapier heads in the present application) secured to rapier bands, respectively, and a pair of rapier wheels around which the rapier bands are partially wound, respectively. The rapier wheels each wrapped partially with the rapier band which is susceptible to elastic deformation are disposed in opposition to each other and rotated reciprocatively, whereby the rapier heads or the weft grippers secured to free end portions of the rapier bands wound around the rapier wheels, respectively, are caused to move into a shedding formed by the warps when the rapier wheels are driven forward, respectively. The weft gripped by one of the weft grippers is thus fed into the shedding and transferred to the other weft gripper. Thereafter, both the weft grippers are retracted, whereupon an one-shot weft inserting operation is completed.

[0003] In the conventional weft inserting apparatus such as mentioned above, the position of each of the rapier bands is regulated by means of a shoulder block so that the rapier band is not dislocated from the path extending along and in alignment with the circumferential surface of the rapier wheel. Such positional regulation of the rapier band has to be carried out in the vicinity of a location where the rapier band leaves the circumferential surface of the associated rapier wheel. The shoulder block is implemented in the form of a plate, wherein a flat guide surface of the shoulder block is designed such that the positional regulation of the rapier band is effectuated in a transit region in which transition to a linear movement of the rapier band from a curvilinear movement has to takes place and which intervenes between a wrapping range around the circumferential surface of the rapier wheel where the rapier band wraps the rapier wheel in contact therewith and a non-wrapping range where the rapier band is released from the contact with the circumferential surface of the rapier wheel.

[0004] The rapier wheel is rotated reciprocatively. In this conjunction, it is noted that the inertial force of the weft gripper increases significantly in the vicinity of a location where the weft gripper is retracted completely from the shedding. Further, in the wrapping range mentioned above, the rapier band tends to move away or fly radially outwardly from the circumferential surface of the rapier wheel under the influence of the centrifugal force brought about by the rotation of the rapier wheel. Certainly, in the boundary region in which the weft gripper and the rapier band make transition from the linear path to the arcuate path extending along the circumferential surface of the rapier wheel and which exists between the wrapping range and the non-wrapping range mentioned above, driving force receiving holes formed in the rapier band can mesh positively with driving force transmitting teeth of the rapier wheel under the effect of the aforementioned positional regulation exerted by the shoulder block. However, in the region where the rapier band starts to leave the circumferential surface of the rapier wheel, engagement between the driving force transmitting tooth and the driving force receiving hole becomes loose. As a consequence, the inertial force concentrates on a meshing portion between the driving force transmitting teeth and the driving force receiving holes in the vicinity of the boundary mentioned above. Such concentrative action of the inertial force at the portion of the rapier band at which the driving force transmitting teeth and the driving force receiving holes mesh with each other in the boundary region between the wrapping range and the non-wrapping range promotes fatigue of the driving force receiving holes, as a result of which the service life of the rapier band is shortened.

SUMMARY OF THE INVENTION

[0005] In light of the state of the art described above, it is an object of the present invention to provide a weft inserting apparatus for a rapier loom, which apparatus is designed so as to allow the service life of the rapier band to be extended.

[0006] In view of the above and other objects which will become apparent as the description proceeds, the present invention is directed to a weft inserting apparatus for a rapier loom, which apparatus includes a pair of rapier wheels disposed in opposition to each other substantially orthogonally to a direction in which warps extend and each having a plurality of driving force transmitting teeth formed in a circumferential surface thereof, a pair of rapier bands provided in association with the pair of rapier wheels, respectively, and each being susceptible to elastic deformation along the circumferential surface of the associated rapier wheel and elastic restoration to a linear form, each of the rapier bands being formed with a plurality of driving force receiving holes which can mate or mesh with the driving force transmit-

ting teeth of the associated rapier wheel, the rapier bands being partially wound around the rapier wheels, respectively, and a pair of rapier heads mounted at leading end portions of the rapier bands, respectively, wherein the pair of rapier heads are inserted into a shedding formed by the warps oppositely to each other and retracted therefrom through reciprocative rotations of the rapier wheels for thereby inserting a weft into and through the shedding.

[0007] In the weft inserting apparatus of the type mentioned above, it is proposed according to an aspect of the present invention to provide a first position regulating member in association with each of the rapier wheels. The first position regulating member has a linear guide surface which extends linearly toward the rapier head from a location near to a first entrance/exit boundary between a wrapping range over which the rapier band is wound around the rapier wheel and a non-wrapping range in which the rapier band is free from contact with the rapier wheel. The linear guide surface is positioned so as to contact with the rapier band. The first entrance/exit boundary exists at a position near to the rapier head. Further, a second position regulating member is provided in association with each of the rapier wheels and has a linear guide surface which contacts the rapier band at a location in the vicinity of a second entrance/exit boundary between the wrapping range and the non-wrapping range. The second entrance/exit boundary exists at a position remote from the rapier head. Furthermore, a third position regulating member is provided in association with each of the rapier wheels and has a curvilinear guide surface extending curvilinearly along the circumferential surface of the rapier wheel over a portion of the wrapping range from a position corresponding to or in the vicinity of the first entrance/exit boundary. The position of the rapier band relative to the circumferential surface of the rapier wheel is regulated through cooperation of the first position regulating member, the second position regulating member and the third position regulating member mentioned above.

[0008] By virtue of the arrangement described above, the curvilinear guide surface of the third position regulating member serves to suppress the tendency of the rapier band to move away from the circumferential surface of the rapier wheel in a region extending from the first entrance/exit boundary to the wrapping range, as a result of which concentration of large inertial force of the rapier head onto the driving force receiving holes in a particular region can be prevented.

[0009] In a mode for carrying out the invention, the rapier band should preferably contain carbon fibers for reinforcement thereof.

[0010] The reinforcing material formed of the carbon fibers is profitably suited for imparting a flexural rigidity to the rapier band which is required for the rapier band to make transition to the linear state from the curvilinear state.

[0011] In another mode for carrying out the invention, the rapier band should preferably be disposed so as to wrap the rapier wheel over the wrapping range substantially equal to an angular range of 180 degrees and extend from the wrapping range linearly beyond the first and second entrance/exit boundaries, respectively, under guidance by stationary guides, respectively.

[0012] With the arrangement mentioned above, the rapier band having made transition to the linear state from the curvilinear state can be moved along the linear path with high reliability by means of the stationary guide.

[0013] In yet another mode for carrying out the invention, the curvilinear guide surface of the third position regulating member should preferably be designed so as to have a length which does not exceed half of the length of the wrapping range.

[0014] In this conjunction, it is noted that if the curvilinear guide surface is provided so as to extend over the whole wrapping range, frictional resistance acting between the curvilinear guide surface and the rapier band will increase excessively, which in turn incurs not only excessively large power consumption but also generation of a large amount of heat. Further, heat generation due to the friction will degrade the rapier band at a high rate. Thus, use of the third position regulating member having the curvilinear guide surface of an arcuate length not longer than a half of the length of the wrapping range is very advantageous for avoiding the problems of power consumption and degradation of the rapier band due to the frictional heat generation.

[0015] In still another mode for carrying out the invention, the third position regulating member should preferably be provided with a linear introducing surface extending continuously from the curvilinear guide surface in a direction opposite to the first entrance/exit boundary.

[0016] With the arrangement mentioned above, the rapier band flying radially outwardly from the circumferential surface of the rapier wheel can be smoothly introduced between the curvilinear guide surface and the circumferential surface of the rapier wheel by means of the flat introducing surface.

[0017] In a further preferred mode for carrying out the invention, the third position regulating member may be disposed so as to be movable toward and away from the circumferential surface of the rapier wheel.

[0018] With the arrangement mentioned above, the guide position of the curvilinear guide surface of the third position regulating member can be adjusted accurately to a proper or appropriate position.

[0019] In a yet further preferred mode for carrying out the invention, the first position regulating member and the third position regulating member may be formed integrally with each other.

[0020] Owing to this feature, fabrication and installation of the position regulating member can be much facilitated.

[0021] In a still further preferred mode for carrying out the invention, a running position abnormality detector may be disposed closely to a running path of the rapier band within the wrapping range at a location between the third position regulating member and the second entrance/exit boundary.

[0022] In this conjunction, it is noted that when the abrasion of the driving force receiving holes increases, the rapier band will become more likely to fly radially outwardly from the circumferential surface of the rapier wheel under the influence of the centrifugal force. The running position abnormality detector is provided for detecting deviation of the rapier band from the inherent traveling or running path. Thus, the rapier band can be replaced by a new one before it is damaged or broken due to serious abrasion of the driving force receiving holes.

[0023] The above and other objects, features and attendant advantages of the present invention will more easily be understood by reading the following description of the preferred embodiments thereof taken, only by way of example, in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] In the course of the description which follows, reference is made to the drawings, in which:

Fig. 1(a) is a side elevational view showing a weft inserting apparatus for a rapier loom according to a first embodiment of the present invention;

Fig. 1(b) is an enlarged fragmental view of Fig. 1(a) and shows first and third position regulating members employed in the weft inserting apparatus shown in Fig. 1(a);

Fig. 1(c) is an enlarged fragmental view of Fig. 1(a) and shows a second position regulating member employed in the weft inserting apparatus shown in Fig. 1(a);

Fig. 2(a) is a front view showing the weft inserting apparatus according to the first embodiment of the invention;

Fig. 2(b) is an enlarged fragmental view of the same showing a first position regulating member employed in the weft inserting apparatus according to the first embodiment of the invention;

Fig. 3 is an enlarged fragmentary side elevational view showing a mayor portion of a weft inserting apparatus for a rapier loom according to a second embodiment of the present invention; and

Fig. 4 is a side elevational view showing a mayor portion of a weft inserting apparatus for a rapier loom according to a third embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0025] 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.

[0026] In the following description, like reference characters designate like or corresponding parts throughout the several views. Further, it is to be understood that such terms as "left", "right", "upwardly", "downwardly" and the like are words of convenience and are not to be construed as limiting terms.

Embodiment 1

[0027] Now referring to Figs. 1(a) to 1(c) together with Figs. 2(a) and 2(b), description will be made of a weft inserting apparatus for a rapier loom according to a first embodiment of the present invention.

[0028] In the figures, reference numeral 11 denotes a weft feeding rapier head which is adapted to be inserted into a shedding formed by warps (not shown) from a weft-insertion starting side. The weft feeding rapier head 11 is secured to a rapier band 12 at a leading end portion thereof. The rapier band 12 is wound partially around a rapier wheel 13 and secured thereto at the other end. The rapier band 12 should preferably contain carbon fibers for the purpose of reinforcement thereof.

[0029] The rapier wheel 13 is mounted on a supporting shaft 131 so as to be rotatable reciprocatively about the shaft 131 which in turn is driven reciprocatively in synchronism with revolution of the loom. Further, at a weft insertion terminal side, a rapier wheel (not shown) is disposed so as to be driven reciprocatively. A weft receiving rapier head (not shown either) is secured to a rapier band (not shown either) at a leading end thereof. The rapier band is wound around the rapier wheel and secured thereto at the other end. Thus, through reciprocative rotation of both the rapier wheels, both the weft feeding rapier head 11 and the receiving rapier head (not shown) are caused to travel into the shedding in synchronism with each other so that they meet each other at a central location as viewed in the widthwise direction of the woven fabric. The weft transported into the shedding by the weft feeding rapier head 11 is transferred to the receiving rapier head at the central location. Subsequently, both the weft feeding rapier head 11 and the weft receiving rapier head are retracted in the opposite directions, respectively, through the reciprocative rotation of both the rapier wheels. Upon retraction of the receiving rapier head from the shedding, the weft is inserted completely through the shedding formed by the warps.

[0030] The rapier wheel 13 around which the rapier band 12 is wound has the circumferential surface in which a row of driving force transmitting teeth 14 are formed, while a row of driving force receiving holes 15

each of a form substantially complementary to that of the driving force transmitting tooth 14 is formed in the rapier band 12. Within a wrapping range E in which a peripheral or circumferential surface portion of the rapier wheel 13 is wrapped by the rapier band 12, the driving force transmitting teeth 14 and the driving force receiving holes 15 mesh or mate with each other, as a result of which the reciprocative rotation of the rapier wheel 13 is translated into the linear movement of the rapier band 12 through cooperation of the driving force transmitting teeth 14 and the driving force receiving holes 15. At this juncture, it is to be mentioned that the height of the driving force transmitting teeth 14 is greater than the thickness of the rapier band 12

[0031] The supporting shaft 131 is supported on a supporting plate 16 on which a pair of stationary guides 27 and 28 are secured fixedly. (See Fig. 2(a).) The stationary guide 28 serves for guiding the rapier band 12 at a location where the rapier band 12 leaves the circumferential surface of the rapier wheel 13 after having passed through a first entrance/exit boundary K1 between a non-wrapping range H in which the circumferential surface of the rapier wheel 13 is not wrapped by the rapier band 12 and the aforementioned wrapping range E. On the other hand, the stationary guide 29 serves to guide the rapier band 12 at a location where the rapier band 12 leaves the circumferential surface of the rapier wheel 13 after having passed through the other or second entrance/exit boundary K2 defined between the non- wrapping range H and the wrapping range E. In this way, the stationary guides 28 and 29 play a role for determining the linear traveling path for the rapier band 12.

[0032] Further secured to the supporting plate 16 are a first position regulating member 17, a second position regulating member 18 and a third position regulating member 19, respectively. The first position regulating member 17 is disposed in a region extending from the first entrance/exit boundary K1 to the non-wrapping range H. The second position regulating member 18 is disposed in a region extending across the wrapping range E and the non-wrapping range H. On the other hand, the third position regulating member 19 is disposed in a region extending from the first entrance/exit boundary K1 to the wrapping range E. The first position regulating member 17 and the second position regulating member 18 are provided with linear guide surfaces 171 and 181, respectively, each of which is designed so as to be brought into contact with the rapier band 12 in the non- wrapping range H. On the other hand, the third position regulating member 19 is provided with a curvilinear guide surface 191 which is adapted to contact with the rapier band 12 within the wrapping range E. It should be noted that the curvilinear guide surface 191 extends continuously and smoothly to the linear guide surface 171 of the first position regulating member 17. In other words, the linear guide surface 171 represents a plane tangential to the curvilinear guide surface 191.

[0033] As can be seen in Figs. 1(b) and 1(c) and Figs. 2(a) and 2(b), the linear guide surfaces 171 and 181 and the curvilinear guide surface 191 are each formed with clearance grooves 172, 182 and 192, respectively, so that top portions 141 of the driving force transmitting teeth 14 projecting beyond the driving force receiving holes 15 formed in the rapier band 12 can be received by the clearance grooves 172, 182 and 192, respectively.

[0034] The portion of the rapier band 12 which is about to take off from the circumferential surface of the rapier wheel 13 tends to float or fly radially outwardly from the intrinsic linear traveling path under the action of centrifugal force and the elastic restoration effect of the rapier band. In this conjunction, it should be noted that the linear guide surface 171 which extends linearly from the entrance/exit boundary K1 toward the weft feeding rapier head 11 serves for regulating the position of the rapier band 12 relative to the circumferential surface of the rapier wheel 13 while contacting the rapier band 12. On the other hand, in the region covering the boundary K2, the linear guide surface 181 regulates or controls the position of the rapier band 12 relative to the circumferential surface of the rapier wheel 13 while contacting the rapier band 12. In other words, the first position regulating member 17 and the second position regulating member 18 are effective for suppressing the tendency of the rapier band 12 to fly outwardly from the intrinsic linear traveling path when the rapier band 12 is about to leave or take off the rapier wheel 13.

[0035] On the other hand, the curvilinear guide surface 191 which extends curvilinearly along the circumferential surface of the rapier wheel 13 partially over the wrapping range E functions to regulate the position of the rapier band 12 relative to the circumferential surface of the rapier wheel 13 while contacting the rapier band 12. In the case of the weft inserting apparatus now under consideration, the arcuate length of the curvilinear guide surface 191 is dimensioned to be one forth of the extension of the wrapping range E.

[0036] A running position abnormality detector 20 of a limit switch type is disposed within the wrapping range E located between the third position regulating member 19 and the second entrance/exit boundary K2. The running position abnormality detector 20 has a sensor probe 201 which is disposed closely to the running path of the rapier band 12 within the wrapping range E. When the running position abnormality detector 20 outputs an abnormality signal (i.e., when the switch constituting the running position abnormality detector 20 is closed or turned on), an abnormality signal is output from the running position abnormality detector 20 to be supplied to a controller 21. In response to the abnormality signal, the controller 21 can activate an alarm device 22 while stopping operation of a loom driving motor M.

[0037] At this juncture, it should be added that a similar guide/control arrangement or mechanism as described above is provided in association with the weft

receiving rapier head 1, being mounted on a similar supporting plate as the plate 16, although not shown in the drawings.

[0038] The weft inserting apparatus according to the first embodiment of the present invention described above can provide the advantageous effects mentioned below.

(1-1) At a time point substantially corresponding to completion of retraction of the weft feeding rapier head 11 from the shedding, the rate of change in the angular velocity of the rapier wheel 13 will increase significantly, which naturally results in the inertial force imposed on the weft feeding rapier head 11 increasing correspondingly. Further, within the wrapping range E, the rapier band 12 tends to float or fly radially outwardly from the circumferential surface of the rapier wheel 13 under the action of centrifugal force. In that case, the curvilinear guide surface 191 prevents the rapier band 12 from deviation from the path extending along the circumferential surface of the rapier wheel 13 within an arcuate region E1 extending from the first entrance/exit boundary K1 partially into the wrapping range E. Thus in the arcuate region E1, the driving force transmitting teeth 14 are forced to positively mate with the counterpart driving force receiving holes 15, whereby the inertial force imposed onto the weft feeding rapier head 11 is borne distributively by the mating portions between the driving force transmitting teeth 14 and the driving force receiving holes 15. Thus, an inertial force as large as imposed on the weft feeding rapier head 11 can be kept from being concentrated on the driving force receiving holes 15 in a particular region. In this manner, the driving force receiving holes 15 are protected against injury or damage, as a result of which the service life of the rapier band 12 can be extended.

(1-2) The rapier band 12 which has to restore the linear state from the curvilinear state upon transition to the linear traveling path from the curvilinear state within the wrapping range E of the rapier wheel 13 has to be implemented with high flexural rigidity. In this conjunction, it is noted that the reinforcement of the rapier band 12 with the carbon fibers is very preferable for imparting to the rapier band 12 a sufficient flexural rigidity required for the rapier band 12 to restore speedily the linear state from the curvilinear state.

(1-3) If the curvilinear guide surface 191 is provided so as to extend over the whole wrapping range E, the area over which the curvilinear guide surface 191 and the rapier band 12 contact slidingly with each other will increase remarkably. Besides, the place for affording the flexure deformation of the rapier band 12 becomes unavailable within the wrapping range E. For these reasons, frictional resistance between the curvilinear guide surface 191 and the rapier band 12 will increase excessively, which in turn will incur not only excessively large power consumption but also generation of large amount of heat. As can be readily appreciated, heat generation due to the friction will degrade the rapier band 12 at a high rate. Thus, the arrangement in which the third position regulating member 19 having the curvilinear guide surface 191 of the arcuate length shorter than a half of the extension of the wrapping range E is very advantageous for avoiding the problems of power consumption and degradation of the rapier band 12 due to the frictional heat generation.

(1-4) When the abrasion of the driving force receiving hole 15 increases, the tendency of the rapier band 12 to float or fly radially outwardly from the circumferential surface of the rapier wheel 13 within the wrapping range E will become more significant. In the weft inserting apparatus according to the first embodiment of the invention, the running position abnormality detector 20 is provided for detecting deviation of the rapier band 12 from the inherent traveling or running path within the wrapping range E. Thus, it is possible to replace the rapier band 12 with a new one before the rapier band 12 is damaged or broken due to serious abrasion of the driving force receiving holes 15.

Embodiment 2

[0039] Next, description will be made of a weft inserting apparatus according to a second embodiment of the present invention by reference to Fig. 3, in which components the same as or equivalent to those of the weft inserting apparatus according to the first embodiment are denoted by like reference characters.

[0040] Referring to Fig. 3, the third position regulating member 23 is provided with a curvilinear guide surface 231 and a flat introducing surface 232. The flat introducing surface 232 extends tangentially to the curvilinear guide surface 231 and serves to introduce the rapier band 12 smoothly between the curvilinear guide surface 231 and the circumferential surface of the rapier wheel 13 while keeping the rapier band 12 from flying radially outwardly from the circumferential surface of the rapier wheel 13.

Embodiment 3

[0041] Next, description will be made of a weft inserting apparatus according to a third embodiment of the present invention by reference to Fig. 4, in which components the same as or equivalent to those of the weft inserting apparatus according to the first embodiment are denoted by like reference characters.

[0042] In the weft inserting apparatus according to the instant embodiment of the invention, the third position

regulating member 19 is rotatably mounted on a supporting shaft 24. A supporting block 25 is fixedly secured onto the supporting plate 16. A position regulating screw 26 mounted screwwise in the supporting block 25 and has a head 261 which is so disposed as to bear against a back surface of the third position regulating member 19. A lock nut 271 meshes with the position regulating screw 26. By clamping the lock nut 271, the position regulating screw 26 is secured onto the supporting block 25. As the position regulating screw 26 is displaced screwwise from the supporting block 25, the third position regulating member 19 is urged to move toward the circumferential surface of the rapier wheel 13. In this way, the guiding position of the curvilinear guide surface 191 formed in the third position regulating member 19 can undergo fine adjustment so that the proper guiding position can be realized.

[0043] In the weft inserting apparatuses described above, the first position regulating member 17 and the third position regulating member 19 are provided separately. However, these members can be combined together in an integral structure. Further, such arrangement may be adopted that the third position regulating member 19 is pressed against the rapier band 12 under a spring force. Furthermore, the present invention can equally be applied to the weft inserting apparatus in which the rapier band containing aramid fibers and/or glass fibers as the reinforcing material are employed.

[0044] As will now be appreciated from the foregoing description, in the weft inserting apparatuses according to the present invention, the rapier band 12 is regulated by means of the third position regulating member 19 with regard to the position relative to the circumferential surface of the rapier wheel over the range extending substantially from a location near to the entrance/exit boundary K1 between the wrapping range E and the non-wrapping range H partially into the wrapping range E. By virtue of this arrangement, the service life of the rapier band 12 can be significantly extended, to an excellent advantage.

[0045] Many features and advantages of the present invention are apparent form the detailed specification and thus it is intended by the appended claims to cover all such features and advantages of the weft inserting apparatuses for rapier loom which fall within the true spirit and scope of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact constructions and operations illustrated and described. Accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

Claims

1. A weft inserting apparatus for a rapier loom including a pair of rapier wheels (13) disposed in opposition to each other substantially orthogonal to a direction in which warps extend and each having a plurality of driving force transmitting teeth (14) formed in a circumferential surface thereof, a pair of rapier bands (12) provided in association with said pair of rapier wheels (13), respectively, and each being susceptible to elastic deformation along the circumferential surface of the associated rapier wheel (13) and elastic restoration to a linear form, each of said rapier bands (12) being formed with a plurality of driving force receiving holes (15) which can mesh with said driving force transmitting teeth (14) of the associated rapier wheel (13), said rapier bands (12) being partially wound around said rapier wheels (13), respectively, and a pair of rapier heads (11) mounted at leading end portions of said rapier bands (12), respectively, wherein said pair of rapier heads (11) are inserted into a shedding formed by said warps opposite to each other and retracted therefrom through reciprocative rotations of said rapier wheels (13) for thereby inserting a weft into and through said shedding,

characterized in that said weft inserting apparatus further comprises:

a first position regulating member (17) provided in association with each of said rapier wheels (13), said first position regulating member (17) having a linear guide surface (171) which extends linearly toward said rapier head (11) from a location near a first entrance/exit boundary (K1) between a wrapping range (E) over which said rapier band (12) is wound around said rapier wheel (13) and a non-wrapping range (H) in which said rapier band (12) is not wound around said rapier wheel (13), said linear guide surface (171) being positioned so as to contact with said rapier band (12), said first entrance/exit boundary (K1) being located at a position near said rapier head (11);

a second position regulating member (18) provided in association with each of said rapier wheels (13) and having a linear guide surface (181) which contacts said rapier band (12) at a location in the vicinity of a second entrance/exit boundary (K2) between said wrapping range (E) and said non-wrapping range (H), said second entrance/exit boundary (K2) being located remotely from said rapier head (11); and

a third position regulating member (19) provided in association with each of said rapier wheels (13) and having a curvilinear guide surface (191) extending curvilinearly along the circumferential surface of said rapier wheel (13) over a portion of said wrapping range (E) from a position corresponding to or in the vicinity of said first entrance/exit boundary (K1);

wherein the position of said rapier band (12) relative to the circumferential surface of said

rapier wheel (13) is regulated through cooperation of said first position regulating member (17), said second position regulating member (18) and said third position regulating member (19).

2. A weft inserting apparatus for a rapier loom as set forth in claim 1, characterized in that said rapier band (12) contains carbon fibers for reinforcement thereof.

3. A weft inserting apparatus for a rapier loom as set forth in claim 1 or 2, characterized in that said rapier band (12) wraps said rapier wheel (13) over said wrapping range (E) substantially equal to an angular range of 180 degrees and extends from said wrapping range (E) linearly beyond said entrance/exit boundaries (K1, K2), respectively, under guidance by stationary guides (28, 29), respectively.

4. A weft inserting apparatus for a rapier loom as set forth in any one of claims 1 to 3, characterized in that said curvilinear guide surface (191) of said third position regulating member (19) has a length which does not exceed a half of the length of said wrapping range (E).

5. A weft inserting apparatus for a rapier loom as set forth in claim 4, characterized in that said third position regulating member (23) has a linear introducing surface (232) extending continuously from said curvilinear guide surface (231) in a direction opposite to said first entrance/exit boundary (K1).

6. A weft inserting apparatus for a rapier loom as set forth in claim 4 or 5, characterized in that said third position regulating member (19) is disposed so as to be movable toward and away from the circumferential surface of said rapier wheel (13).

7. A weft inserting apparatus for a rapier loom as set forth in any one of claims 1 to 6, characterized in that said first position regulating member (17) and said third position regulating member (19, 23) are formed integrally with each other.

8. A weft inserting apparatus for a rapier loom as set forth in any one of claims 1 to 7, characterized in that a running position abnormality detector (20) is disposed closely to a running path of said rapier band within said wrapping range (E) at a location between said third position regulating member (19) and said second entrance/exit boundary (K2).

FIG. 1(a)

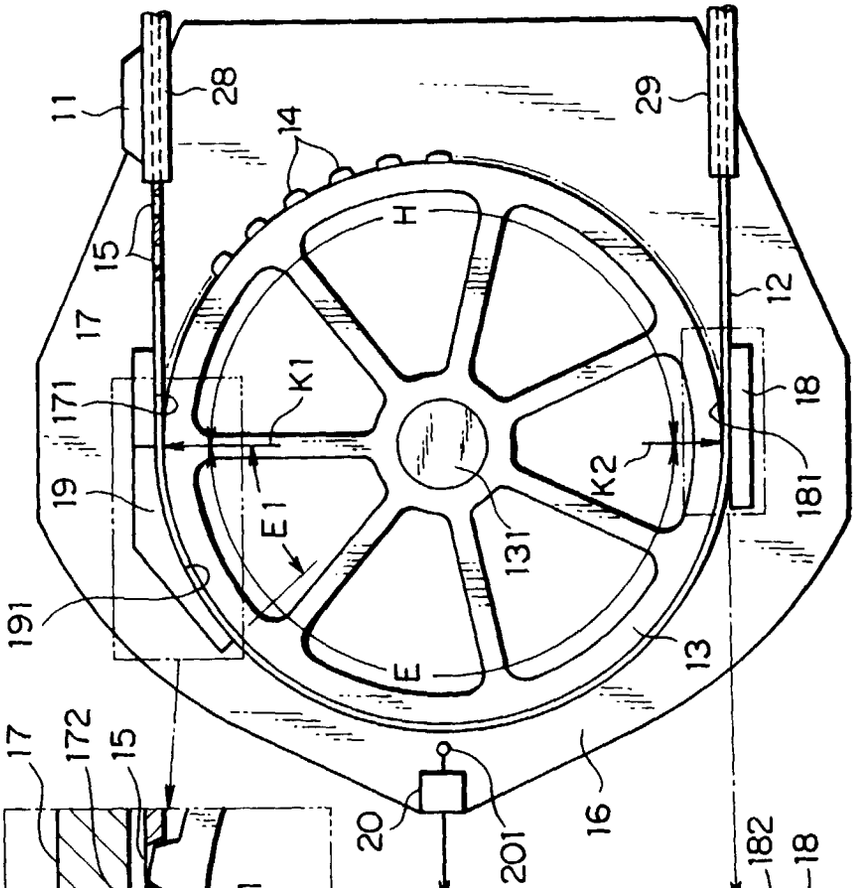

FIG. 1(b)

FIG. 1(c)

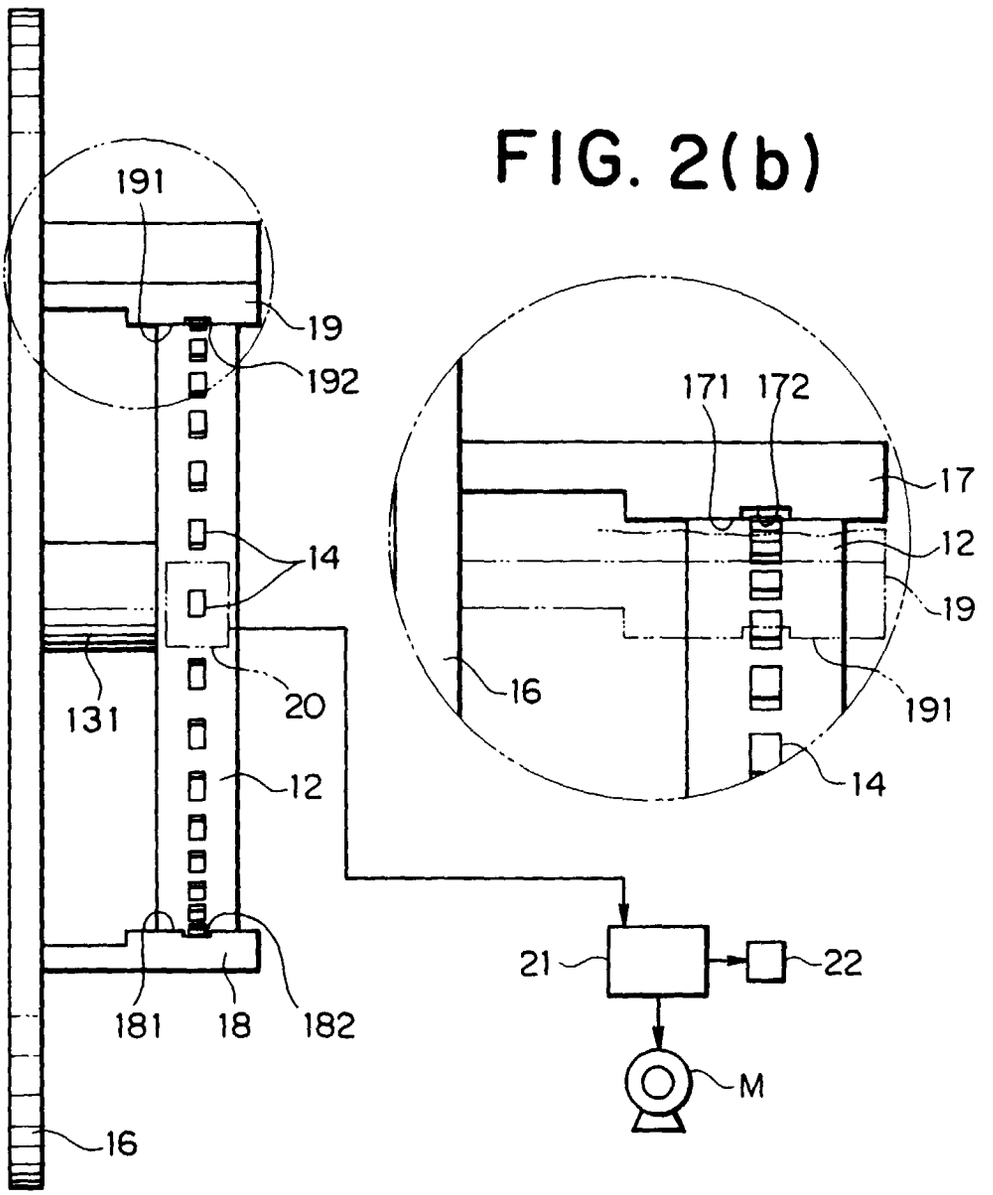
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FIG. 2(b)

FIG. 2(a)

FIG. 3

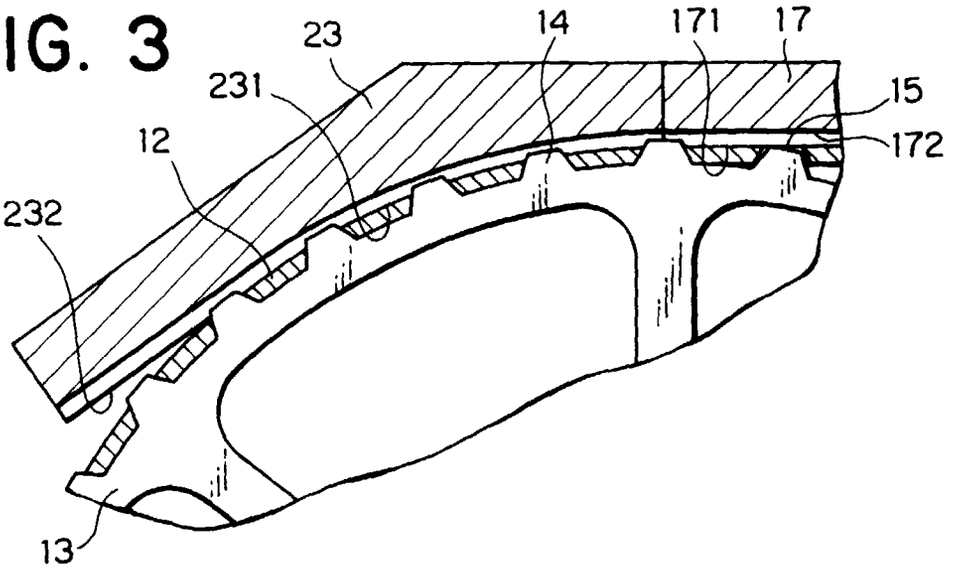
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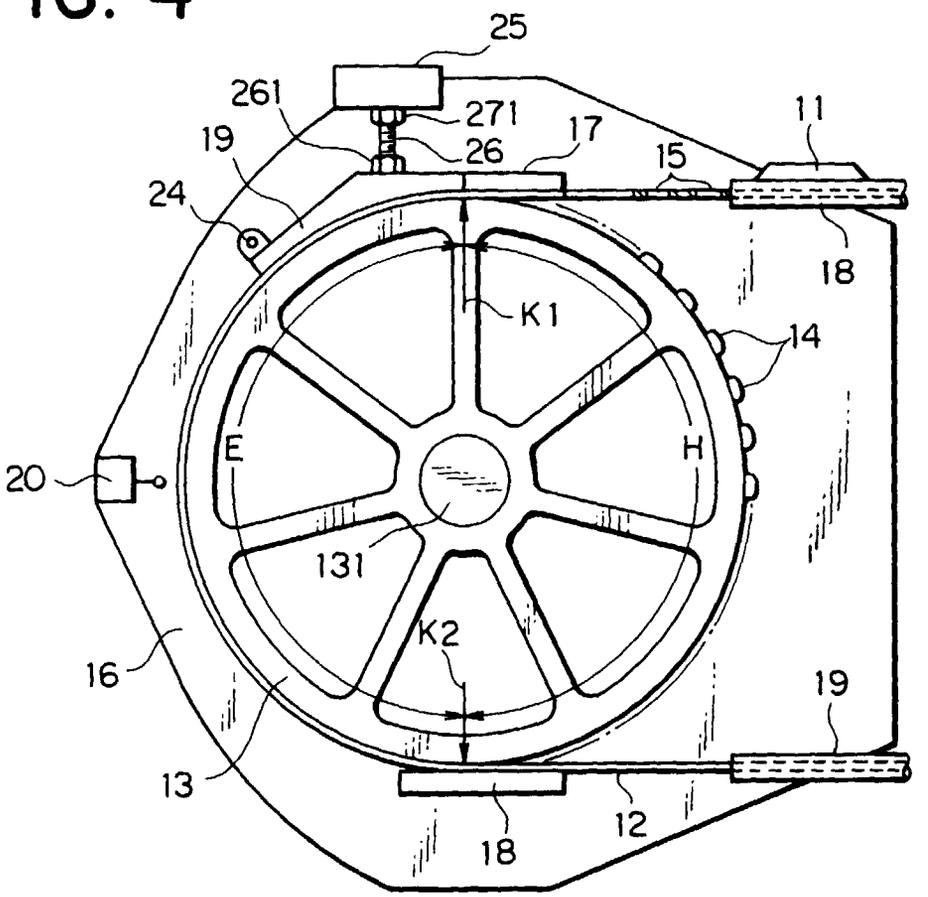
FIG. 4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K2
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EUROPEAN SEARCH REPORT

Application Number
EP 98 11 8019

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	11 January 1999	Boutelegier, C

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