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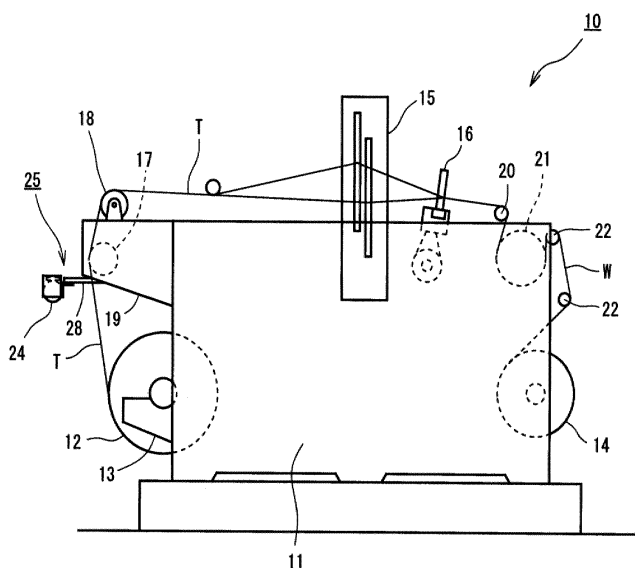
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(54) **SUPPORT APPARATUS FOR RESIDUAL WARP YARN CLEARING BAR OF LOOM**

(57) A support apparatus (25) for a residual warp yarn clearing bar (24) of a loom (10) that is mounted to the loom (10), and includes a support bracket (28) adapted to support the residual warp yarn clearing bar (24) that is configured to guide residual warp yarns (T). The support apparatus (25) includes an elastic member (29, 35, 37, 40) interposed between the residual warp yarn clearing bar (24) and the support bracket (28) and has an upper portion (29A, 35A, 37A, 40A), a lower portion (29B, 35B, 37B, 40B), and an unenclosed space (33, 36,

38, 39, 41) provided between the upper portion (29A, 35A, 37A, 40A) and the lower portion (29B, 35B, 37B, 40B). The elastic member (29, 35, 37, 40) supports the residual warp yarn clearing bar (24) with the upper portion (29A, 35A, 37A, 40A) contacting with the residual warp yarn clearing bar (24) and the lower portion (29B, 35B, 37B, 40B) contacting with the support bracket (28), and with the space (33, 36, 38, 39, 41) deformed between the upper portion (29A, 35A, 37A, 40A) and the lower portion (29B, 35B, 37B, 40B).

FIG. 1



Description

BACKGROUND ART

[0001] The present disclosure relates to a support apparatus for a residual warp yarn clearing bar of a loom, the residual warp yarn clearing bar being configured to clear residual warp yarns that were let off from a warp beam of the loom but were not utilized for weaving.

[0002] Generally, a loom includes a bar for treating or clearing warp yarns that were let off from a warp beam of the loom but were not utilized for weaving, resulting in remainders (the bar is hereinafter referred to as the residual warp yarn clearing bar). The residual warp yarn clearing bar is supported by an apparatus configured to support the residual warp yarn clearing bar. As an example of a conventional support apparatus for a residual warp yarn clearing bar, a support apparatus for an end router stay disclosed in Japanese Examined Utility Model Application Publication No. H07-14377 is known. According to the Publication, an end of each end router stay is closely fitted into a groove formed in an end router bracket via a bushing that is formed of an elastic member. It is to be noted that each end router stay is configured to be mounted with a plurality of end routers, and the end router bracket is fixed to an appropriate frame of the loom. Each bushing formed of an elastic member has a semi-elliptical cross section, whereas ends of the end router each have a substantially elliptical cross section. Each end router bracket has a groove formed to open upward, and a recessed groove formed near the opening of the end router bracket to extend in an axial direction thereof. A projecting portion of the bushing, which is formed on the outside near the opening, is fitted in the axially extending recessed groove.

[0003] According to the support apparatus for the end router stay disclosed in the Publication No. H07-14377, bushings made of an elastic member and having a vibration-absorbing property are interposed between the end router brackets and the end router stay, so that the vibration of the loom is not transmitted completely or directly to the end router stay, and the vibration of the end router stay is effectively reduced.

[0004] According to the support apparatus for the end router stay disclosed in the Publication No. H07-14377, the elastic members have a hardness appropriately selected in accordance with a predetermined rotational speed of the loom. Therefore, vibration of the loom can be reduced when a cloth is woven at the predetermined fixed rotational speed of the loom. Meanwhile, in the case of a cloth, such as a pile fabric, which requires the rotational speeds of the loom to be varied during the operation of the loom, it is difficult to appropriately select the hardness of the elastic members. That is, the varying of the rotational speed of the loom during the operation causes changes in the resonance frequency of the elastic members, which disables the reduction of the vibration of the end router stay that corresponds to the residual warp

yarn clearing bar of the present disclosure.

[0005] The present disclosure, which has been made in view of the above circumstances, is directed to a support apparatus for a residual warp yarn clearing bar of a loom that reduces vibration of the residual warp yarn clearing bar even when weaving a cloth that requires the rotational speed of the loom to be varied during operation.

SUMMARY

[0006] In accordance with an aspect of the present disclosure, there is provided a support apparatus for a residual warp yarn clearing bar of a loom. The support apparatus for the residual warp yarn clearing bar is mounted to the loom, and includes a support bracket adapted to support the residual warp yarn clearing bar that is configured to guide residual warp yarns. The support apparatus for the residual warp yarn clearing bar includes an elastic member that is interposed between the residual warp yarn clearing bar and the support bracket, and has an upper portion that is contactable with the residual warp yarn clearing bar, a lower portion that is contactable with the support bracket, and an unenclosed space provided between the upper portion and the lower portion. The elastic member supports the residual warp yarn clearing bar with the upper portion contacting with the residual warp yarn clearing bar and the lower portion thereof contacting with the support bracket, and with the unenclosed space deformed between the upper portion and the lower portion.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The disclosure, together with objects and advantages thereof, may best be understood by reference to the following description of the presently preferred embodiments together with the accompanying drawings in which:

FIG. 1 is a side view schematically illustrating a loom according to a first embodiment of the present disclosure;

FIG. 2 is a plan view illustrating a main part of the loom according to the first embodiment of the present disclosure;

FIG. 3 is a perspective view illustrating a main part of a support apparatus for a residual warp yarn clearing bar of the loom according to the first embodiment of the present disclosure;

FIG. 4 is a rear view of the support apparatus for the residual warp yarn clearing bar of the loom according to the first embodiment of the present disclosure;

FIG. 5A is a rear view illustrating an elastic member according to a first modification of the present dis-

closure;

FIG. 5B is a rear view illustrating an elastic member according to a second modification of the present disclosure; and

FIG. 5C is a rear view illustrating an elastic member according to a third modification of the present disclosure.

DETAILED DESCRIPTION OF THE EMBODIMENTS

First Embodiment

[0008] The following will describe a support apparatus for a residual warp yarn clearing bar of a loom according to a first embodiment of the present disclosure with reference to the accompanying drawings. At first, the loom that includes the support apparatus for the residual warp yarn clearing bar will now be described.

[0009] A loom 10 illustrated in FIG. 1 is an air jet loom in which weft yarns (not illustrated) are inserted into and transferred through a shed of warp yarns T using jets of compressed air. The loom 10 includes a pair of right and left side frames 11. It is noted that only one of the side frames 11 is illustrated in FIG. 1. The loom 10 includes a warp beam 12 at a rear part of the loom 10. The warp beam 12 is supported by beam supports 13 fixed at rear parts of the respective side frames 11. Numerous warp yarns T are wound around the warp beam 12. The loom 10 includes, at a front part thereof, a cloth beam 14 supported by the side frames 11. The cloth beam 14 is configured to take up a woven cloth W.

[0010] The loom 10 includes a warp shedding apparatus 15 configured to shed the warp yarns T that are let off from the warp beam 12, and a reed 16 for beating weft yarns inserted into the shed. The warp shedding apparatus 15 is driven by a motor for driving the loom 10 (not illustrated). The driving force of the motor for driving the loom 10 is transmitted to the reed 16, causing the reed 16 to be reciprocated back and forth to beat inserted weft yarns. A cycle of a shedding motion of the warp yarns T by the warp shedding apparatus 15, a weft insertion, and the beating motion of the reed 16 is repeated to thereby weave a cloth.

[0011] A back roller 17 and a tensioning roller 18 are disposed above the warp beam 12. The back roller 17 and the tensioning roller 18 are provided to roller supports 19 that are mounted to the side frames 11. The warp yarns T let off from the warp beam 12 are guided by the back roller 17 and the tensioning roller 18 and fed to the warp shedding apparatus 15.

[0012] A plurality of press rollers 20, a surface roller 21, and a guide roller 22 are disposed above the cloth beam 14. The woven cloth W is guided by the guide roller 22, the surface roller 21, and the press rollers 20, to be wound around the cloth beam 14.

[0013] The loom 10 includes a residual warp yarn

clearing bar 24 and a support apparatus 25 for the residual warp yarn clearing bar 24. The residual warp yarn clearing bar 24 is configured to clear and guide residual warp yarns T of the warp beam 12 that were not utilized for weaving. As illustrated in FIG. 2, the residual warp yarn clearing bar 24 includes a bar main body 26, and a pair of receivers 27 extending out from opposite ends of the bar main body 26 in the longitudinal direction of the bar main body 26. The bar main body 26 is a hollow pipe made of a metal. Each receiver 27 has a plate shape and is welded to the bar main body 26. A guide (not illustrated) for guiding residual or unutilized warp yarns T is fitted to the bar main body 26 of the residual warp yarn clearing bar 24.

[0014] The support apparatus 25 for the residual warp yarn clearing bar 24 includes a pair of right and left support brackets 28 adapted to support the residual warp yarn clearing bar 24, rubber cylindrical members 29 as the elastic members of the present disclosure that are interposed between the residual warp yarn clearing bar 24 and the support brackets 28. Each support bracket 28 includes an arm plate member 30, and a support member 31 attached to the plate member 30. The base portion of each plate member 30 is fastened to the roller support 19 with a bolt. Each support member 31 is fastened to an end portion of the corresponding plate member 30 with a bolt.

[0015] As illustrated in FIG. 3, each support member 31 is formed of a bent metal plate. Each support member 31 has an accommodating space 32 capable of accommodating therein one of the rubber cylindrical members 29. Each support member 31 includes a bottom wall portion 31A, a first side wall portion 31B connecting the bottom wall portion 31A and the plate member 30, a second side wall portion 31C facing the first side wall portion 31B, and a third side wall portion 31D located between the first side wall portion 31B and the second side wall portion 31C. Each support member 31 is configured such that the first side wall portion 31B, the second side wall portion 31C, and the third side wall portion 31D cooperate to prevent the rubber cylindrical member 29 accommodated in the accommodating space 32 and the residual warp yarn clearing bar 24 placed on the rubber cylindrical member 29 from slipping off from the support member 31.

[0016] The rubber cylindrical members 29 are cylindrical members formed of a rubber-based material. The rubber cylindrical members 29 are each of a size that is capable of being accommodated in the accommodating spaces 32 of the support members 31. Each rubber cylindrical member 29 has an upper portion 29A that is contactable with the residual warp yarn clearing bar 24, a lower portion 29B that is contactable with the support bracket 28, and an unenclosed space 33 which has a columnar shape and is provided between the upper portion 29A and the lower portion 29B, as illustrated in FIG. 4. The rubber cylindrical members 29 are deformable in a direction in which a vibration is absorbed. In each rubber cylindrical member 29, when a vibration is absorbed

in a radial direction of the rubber cylindrical member 29, the spring constant of the rubber cylindrical member 29 is sufficiently small, as compared with a solid columnar rubber body with no space, such as the space 33, and the rubber cylindrical member 29 is easily deformable in the radial direction. A rubber-based material having a hardness that does not collapse the space 33 is selected as the rubber-based material for the rubber cylindrical members 29.

[0017] In the present embodiment, the rubber cylindrical members 29 are accommodated in the accommodating spaces 32 of the support members 31 so that the axial direction of the rubber cylindrical members 29 coincides with the front-rear or depth direction of the loom 10. As illustrated in FIG. 4, the support brackets 28 support the residual warp yarn clearing bar 24 in such a manner that the support members 31 contact with the lower portions 29B of the rubber cylindrical members 29 and the receivers 27 of the residual warp yarn clearing bar 24 contact with the upper portions 29A of the rubber cylindrical members 29. In other words, the rubber cylindrical members 29 support the residual warp yarn clearing bar 24 with the upper portions 29A contacting with the residual warp yarn clearing bar 24 and the lower portions 29B contacting with the support members 31, and with the unenclosed spaces 33 deformed between the upper portions 29A and the lower portions 29B. Thus, the residual warp yarn clearing bar 24 is not attached to the support brackets 28 or the rubber cylindrical members 29 but is placed on the rubber cylindrical members 29. Accordingly, the residual warp yarn clearing bar 24 and the rubber cylindrical members 29 are mountable on and removable from the support brackets 28 easily. It is to be noted that FIG. 4 illustrates the support apparatus 25 for the residual warp yarn clearing bar 24 as viewed from the rear side of the loom 10. It is also to be noted that, in FIG. 4, the support brackets 28 are illustrated partially broken.

[0018] When the residual warp yarn clearing bar 24 is supported by the support brackets 28, the rubber cylindrical members 29 are elastically deformed in the radial direction of the rubber cylindrical members 29 by the weight of the residual warp yarn clearing bar 24. By the elastic deformation of the rubber cylindrical members 29, the columnar spaces 33 of the rubber cylindrical members 29 are deformed accordingly. As a result, each of the rubber cylindrical members 29 is deformed into a cylinder having an elliptic cross section, the longer axis of which extends in the right-and-left direction or the width direction of the loom 10.

[0019] Subsequently, reduction of the vibration of the residual warp yarn clearing bar 24 by the support apparatus 25 for the residual warp yarn clearing bar 24 according to the present embodiment will now be described. The support apparatus 25 for the residual warp yarn clearing bar 24 includes the rubber cylindrical members 29 that are interposed between the residual warp yarn clearing bar 24 and the support brackets 28. Each of the

rubber cylindrical members 29 has the unenclosed space 33 between the upper portion 29A that is contactable with the residual warp yarn clearing bar 24 and the lower portion 29B that is contactable with the support bracket 28. In the present embodiment, the direction in which a vibration is absorbed is the vertical direction as indicated by an arrow F in FIG. 4.

[0020] Although the vibration of the loom 10 is still transmitted to the support brackets 28, the rubber cylindrical members 29 interposed between the residual warp yarn clearing bar 24 and the support brackets 28 are elastically deformed in accordance with the vibration of the loom 10 to thereby absorb the vibration of the loom 10. With this operation, the vibration received at the support brackets 28 is prevented from being further transmitted to the residual warp yarn clearing bar 24.

[0021] Furthermore, the rubber cylindrical members 29 each have the unenclosed columnar space 33, which provides the rubber cylindrical members 29 with a spring constant that is sufficiently smaller as compared with that of a rubber member having a solid columnar shape with no internal space, such as the space 33. With this configuration, the rubber cylindrical members 29 are easily deformable in the radial direction thereof. In other words, the resonance frequency of the rubber cylindrical members 29 may be reduced without relying on the material of the rubber cylindrical members 29. As a result, the vibration of the residual warp yarn clearing bar 24 is reduced effectively even when weaving a cloth that requires the rotational speed of the loom 10 to be varied during operation. Furthermore, even when the rubber cylindrical members 29 are elastically deformed in accordance with the vibration of the loom 10, the spaces 33 of the rubber cylindrical members 29 are not collapsed completely.

[0022] Meanwhile, when the warp yarns T of the warp beam 12 have been used up for weaving, the empty warp beam 12 is replaced with a new warp beam 12. In this case, since the residual warp yarn clearing bar 24 is placed on the rubber cylindrical members 29, a worker can remove the residual warp yarn clearing bar 24 from the loom 10 pretty easily. Thus, the residual warp yarn clearing bar 24 does not hinder the replacement work of the warp beams 12.

[0023] The support apparatus 25 for the residual warp yarn clearing bar 24 of the loom 10 according to the present embodiment offers the following effects.

- (1) The rubber cylindrical members 29 support the residual warp yarn clearing bar 24 with the upper portions 29A contacting with the residual warp yarn clearing bar 24 and the lower portions 29B contacting with the support brackets 28, and with the unenclosed spaces 33 provided between the upper portions 29A and the lower portions 29B deformed. Thus, even when weaving a cloth that requires the rotational speed of the loom 10 to be varied during operation, the rubber cylindrical members 29 having

the unenclosed spaces 33 are elastically deformed easily as compared with rubber columnar members as the elastic members that are solid and simply interposed in the same manner as the rubber cylindrical members 29 of the present embodiment. That is, the resonance frequency of the rubber cylindrical members 29 may be reduced without relying on the material of the rubber cylindrical members 29, so that the vibration of the residual warp yarn clearing bar 24 may be reduced effectively.

(2) Each rubber cylindrical member 29 is a cylindrical body having therein the columnar space 33. Thus, elastic members of a simple configuration may be obtained. Furthermore, radial positioning of the rubber cylindrical members 29 relative to the support brackets 28 need not be taken into consideration, which makes it easier to dispose the rubber cylindrical members 29 between the residual warp yarn clearing bar 24 and the support brackets 28.

(3) Since a rubber-based material is used for the rubber cylindrical members 29 as the elastic members, the rubber cylindrical members 29 may be manufactured relatively easily at a lower cost.

(4) With the unenclosed spaces 33, the spring constant of the rubber cylindrical members 29 may be reduced without relying solely on the elasticity of the rubber-based material forming the rubber cylindrical members 29. Therefore, for example, other inexpensive materials having an elasticity equivalent to that of the rubber-based material may be used alternatively to the rubber-based material used for the rubber cylindrical members 29, so that the freedom of material selection is increased.

First to Third Modifications

[0024] The following will describe first to third modifications of the elastic members according to the present embodiment. As illustrated in FIG. 5A, elastic members according to a first modification are cylindrical members 35 each formed of a rubber-based material and having a C-shaped cross section. Each of the cylindrical members 35 supports the residual warp yarn clearing bar 24 with an upper portion 35A contacting with the residual warp yarn clearing bar 24 and a lower portion 35B contacting with the support members 31, and with an unenclosed space 36 provided between the upper portion 35A and the lower portion 35B deformed. The direction in which the vibration is absorbed is the vertical direction as indicated by an arrow F in FIG. 5A.

[0025] As illustrated in FIG. 5B, elastic members according to a second modification are bent members 37 formed of a rubber-based material and each having an S-shaped cross section. Each of the bent members 37 supports the residual warp yarn clearing bar 24 with an

upper portion 37A contacting with the residual warp yarn clearing bar 24 and a lower portion 37B contacting with the support members 31, and with an unenclosed space 38 and an unenclosed space 39 provided between the upper portion 37A and the lower portion 37B deformed. The direction in which the vibration is absorbed is the vertical direction as indicated by an arrow F in FIG. 5B.

[0026] As illustrated in FIG. 5C, elastic members according to a third modification are bag members 40 formed of a rubber-based material. Each of the bag members 40 supports the residual warp yarn clearing bar 24 with an upper portion 40A contacting with the residual warp yarn clearing bar 24 and a lower portion 40B contacting with the support members 31, with an unenclosed space 41 provided between the upper portion 40A and the lower portion 40B deformed. The direction in which the bag members 40 are deformed coincides with the direction in which the vibration is absorbed as indicated by an arrow F, i.e., the vertical direction.

[0027] It is to be noted that each of the above embodiment and the modifications thereof exemplifies an embodiment of the present disclosure. The present disclosure should not be construed as limited to the above embodiment and the modifications thereof, and may variously be modified within the gist of the present disclosure.

[0028] In the above embodiment, although the elastic members are cylindrical members each having a circular cross section, the elastic members of the present disclosure are not limited thereto. For example, the elastic members may be polygonal tubular members each having a polygonal cross section, such as a square, or, alternatively, the elastic members may be elliptic tubular members each having an elliptic cross section.

[0029] In the above embodiment and the modifications thereof, although the material for the elastic members is a rubber-based material, the material for the elastic members need not necessarily be the rubber-based material, and the elastic members may be formed of a metal, for example. In this case, metallic elastic members are selected that are capable of supporting the residual warp yarns clearing bar with upper portions of the elastic members contacting with the residual warp yarn clearing bar and lower portions of the elastic members contacting with the support brackets, and with unenclosed spaces provided between the upper portions and the lower portions deformed. In addition, a metal having a hardness that does not cause the spaces to be completely collapsed is selected for the metallic elastic members.

[0030] The elastic members of the present disclosure are not limited to those described in the above embodiment and the modifications thereof. Each elastic member may have at least one unenclosed space between an upper portion that is contactable with the residual warp yarn clearing bar and a lower portion that is contactable with the support bracket, or otherwise, each elastic member may have three or more unenclosed spaces. For example, the elastic members may each have an X-shaped cross section. In this case, each of the elastic members

has four unenclosed spaces.

[0031] In the above embodiment, although the cylindrical members as the elastic members having a circular cross section are accommodated in the accommodating spaces of the support brackets in such a manner that the axial direction of the cylindrical members coincide with the front-rear or the depth direction of the loom, the orientation of the elastic members in the accommodating spaces are not limited thereto. For example, the cylindrical members may be accommodated in the accommodating spaces of the support brackets by turning the cylindrical members by 90 degrees in the horizontal direction so that the axial direction of the cylindrical members are parallel to the weft insertion direction of the loom. In this case, the elastic members are still deformed in the direction in which the vibration is absorbed. In the first to third modifications also, the elastic members may be accommodated in the accommodating spaces of the support brackets by turning the cylindrical members by 90 degrees in the horizontal direction.

[0032] A support apparatus (25) for a residual warp yarn clearing bar (24) of a loom (10) that is mounted to the loom (10), and includes a support bracket (28) adapted to support the residual warp yarn clearing bar (24) that is configured to guide residual warp yarns (T). The support apparatus (25) includes an elastic member (29, 35, 37, 40) interposed between the residual warp yarn clearing bar (24) and the support bracket (28) and has an upper portion (29A, 35A, 37A, 40A), a lower portion (29B, 35B, 37B, 40B), and an unenclosed space (33, 36, 38, 39, 41) provided between the upper portion (29A, 35A, 37A, 40A) and the lower portion (29B, 35B, 37B, 40B). The elastic member (29, 35, 37, 40) supports the residual warp yarn clearing bar (24) with the upper portion (29A, 35A, 37A, 40A) contacting with the residual warp yarn clearing bar (24) and the lower portion (29B, 35B, 37B, 40B) contacting with the support bracket (28), and with the space (33, 36, 38, 39, 41) deformed between the upper portion (29A, 35A, 37A, 40A) and the lower portion (29B, 35B, 37B, 40B).

with the residual warp yarn clearing bar (24), a lower portion (29B, 35B, 37B, 40B) that is contactable with the support bracket (28), and an unenclosed space (33, 36, 38, 39, 41) provided between the upper portion (29A, 35A, 37A, 40A) and the lower portion (29B, 35B, 37B, 40B), and the elastic member (29, 35, 37, 40) supports the residual warp yarn clearing bar (24) with the upper portion (29A, 35A, 37A, 40A) contacting with the residual warp yarn clearing bar (24) and the lower portion (29B, 35B, 37B, 40B) contacting with the support bracket (28), and with the space (33, 36, 38, 39, 41) deformed between the upper portion (29A, 35A, 37A, 40A) and the lower portion (29B, 35B, 37B, 40B).

2. The support apparatus (25) for the residual warp yarn clearing bar (24) according to claim 1, **characterized in that** the elastic member (29) is a cylindrical body.
3. The support apparatus (25) for the residual warp yarn clearing bar (24) according to claim 1 or 2, **characterized in that** the elastic member (29, 35, 37, 40) is formed of a rubber-based material.

Claims

1. A support apparatus (25) for a residual warp yarn clearing bar (24) of a loom (10), the support apparatus (25) being mounted to the loom (10), the support apparatus (25) comprising:
 - a support bracket (28) adapted to support the residual warp yarn clearing bar (24) that is configured to guide residual warp yarns (T), **characterized in that**
 - the support apparatus (25) includes an elastic member (29, 35, 37, 40) that is interposed between the residual warp yarn clearing bar (24) and the support bracket (28), and has an upper portion (29A, 35A, 37A, 40A) that is contactable

FIG. 1

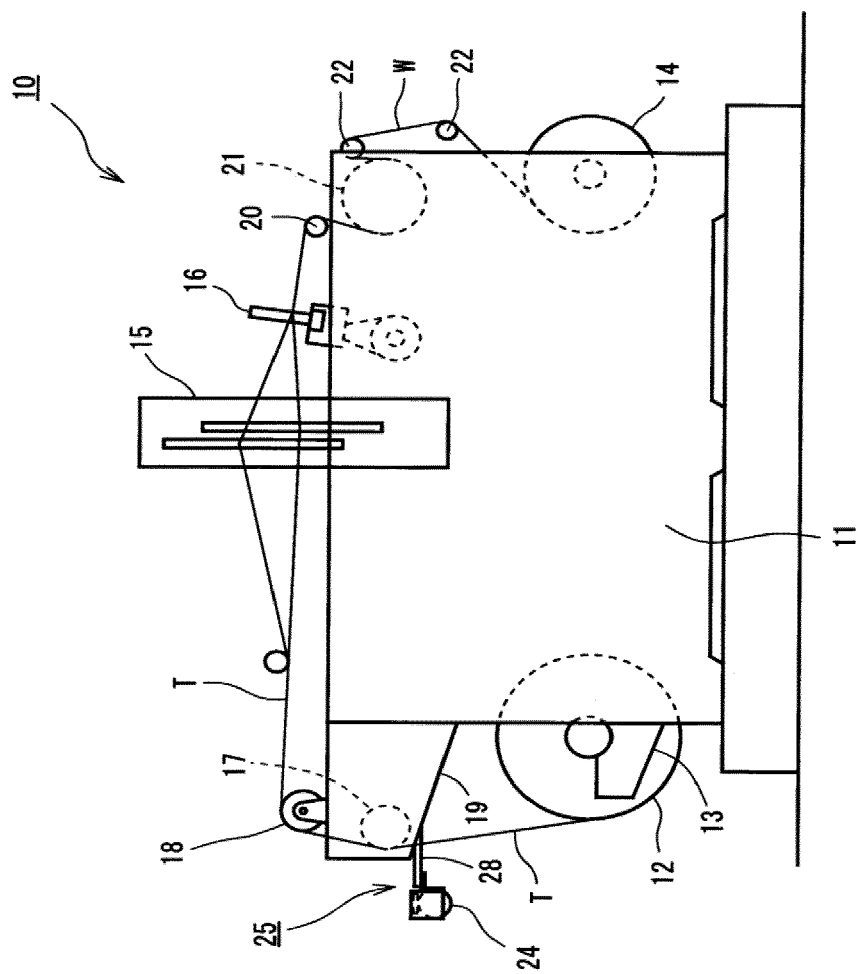


FIG. 2

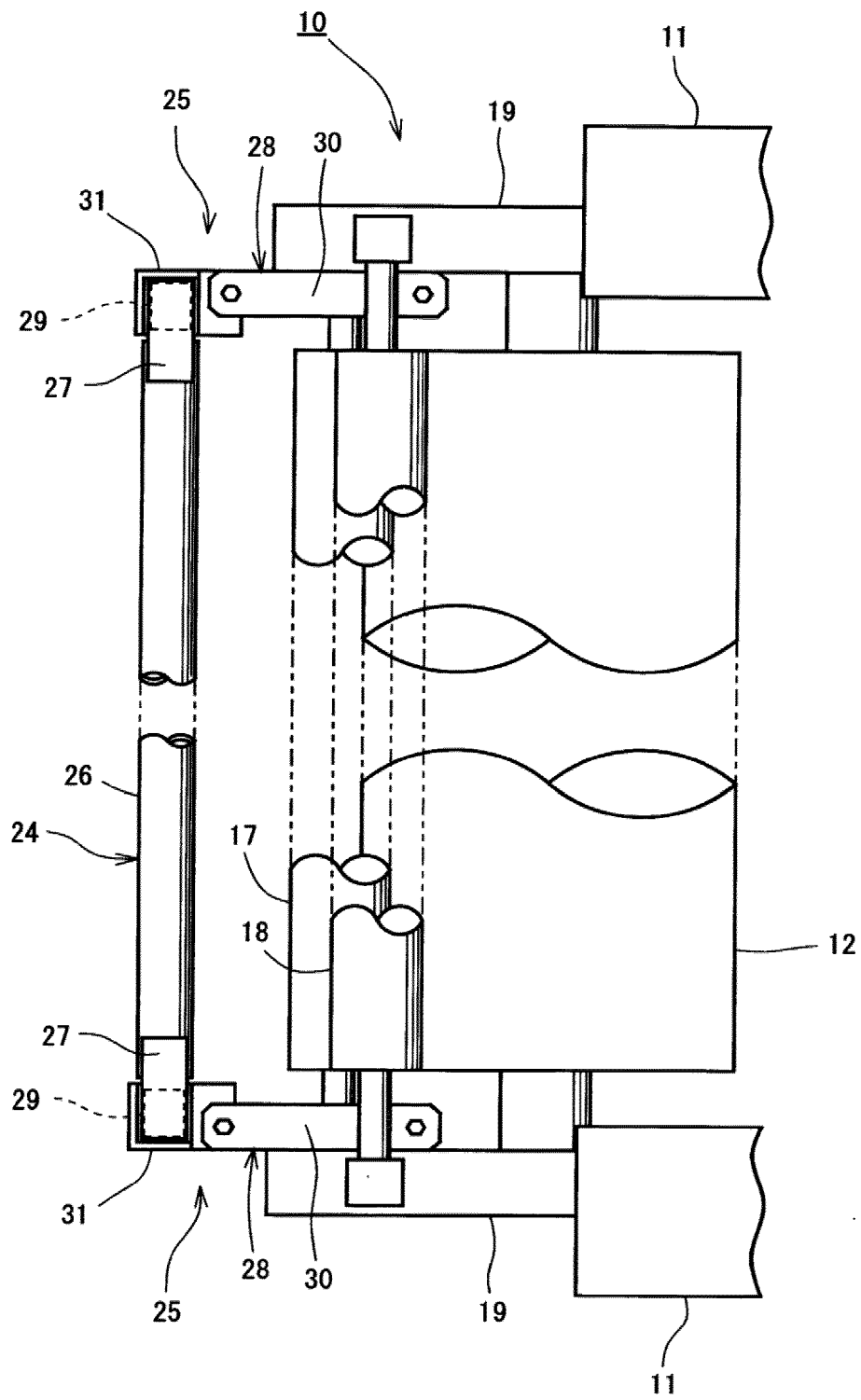


FIG. 3

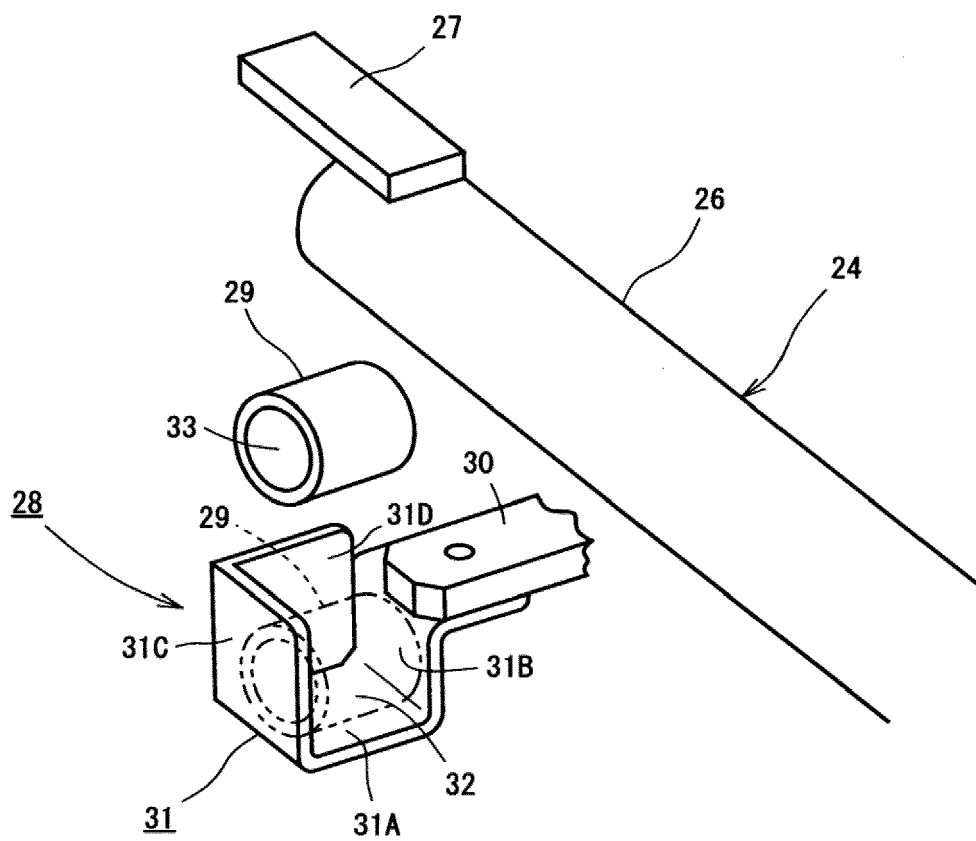


FIG. 4

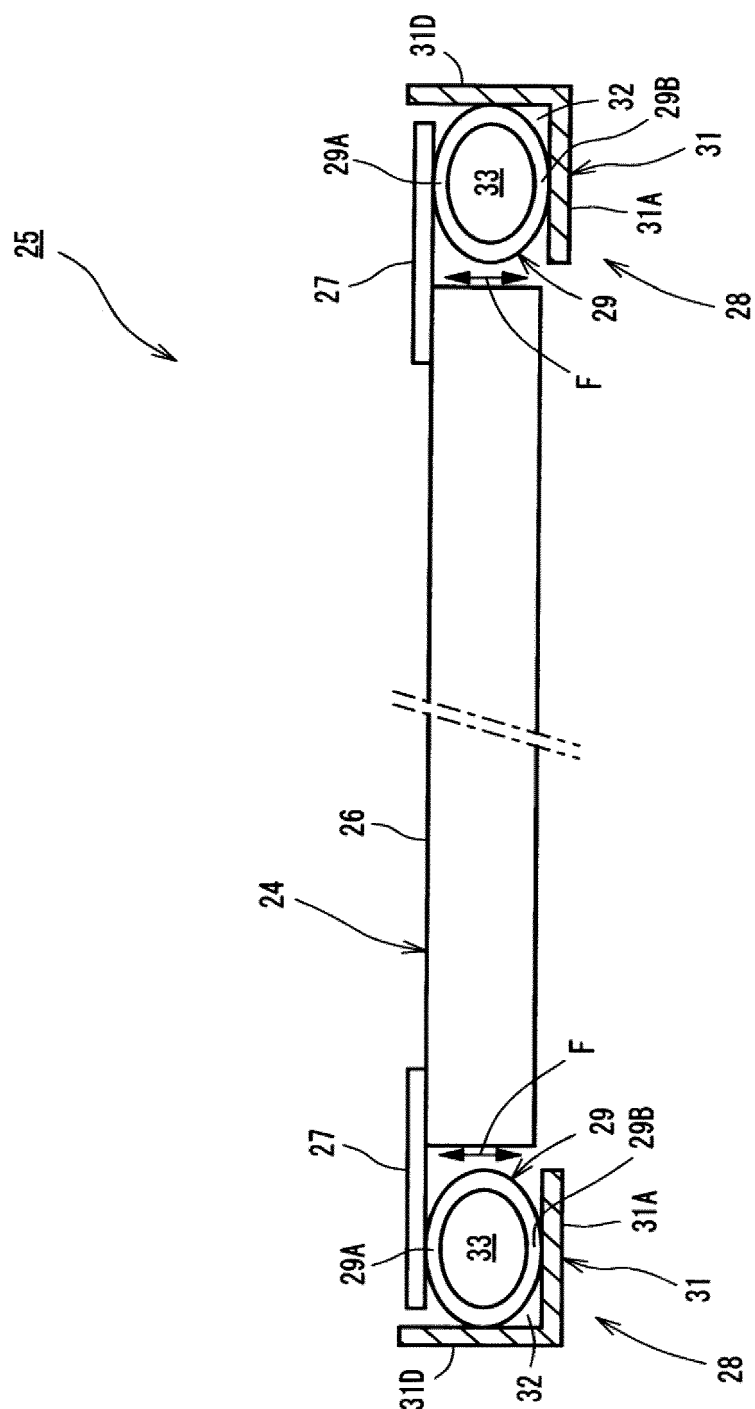


FIG. 5A

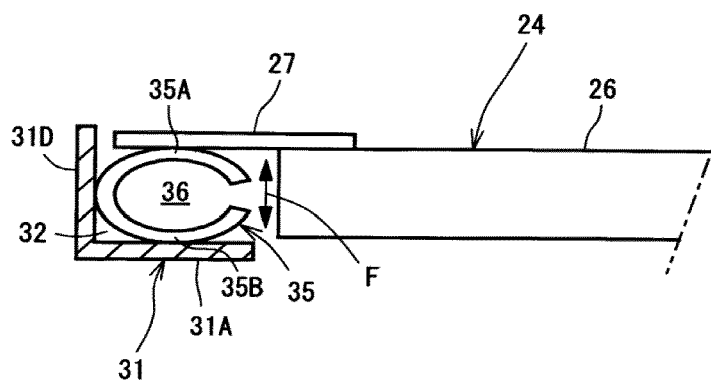


FIG. 5B

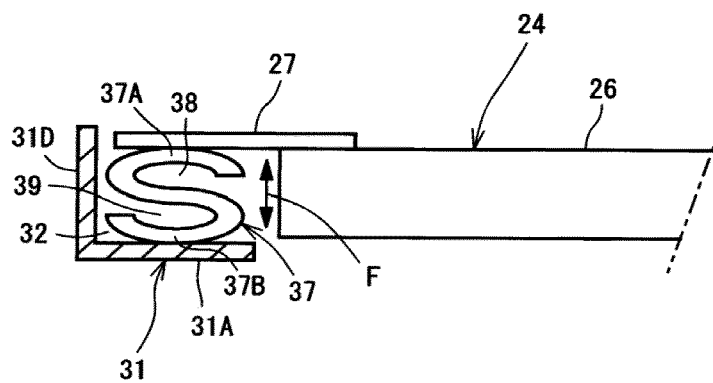
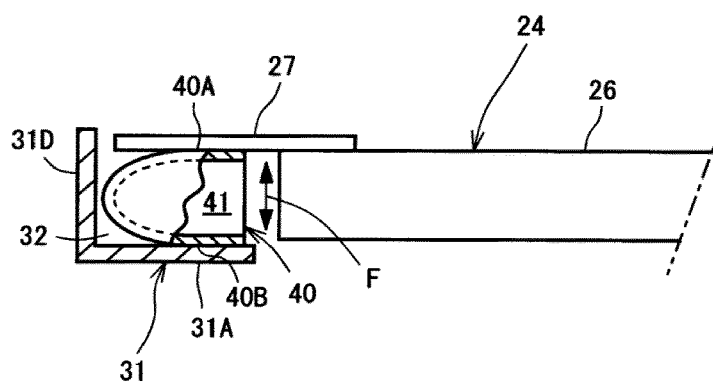


FIG. 5C





EUROPEAN SEARCH REPORT

Application Number
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DOCUMENTS CONSIDERED TO BE RELEVANT			
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Place of search Munich		Date of completion of the search 3 February 2020	Examiner Louter, Petrus
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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