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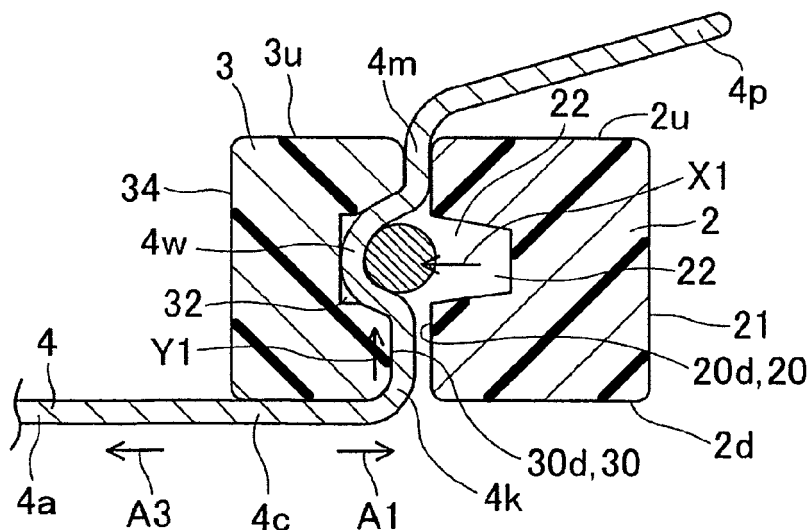
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(54) **Embroidery frame**

(57) An embroidery frame (1) includes an outer frame (2) having an inner circumferential wall surface (20) and an outer groove (22) formed in the inner circumferential wall surface (20), an inner frame (3) including an outer circumferential wall surface (30) and an inner groove (32) formed in the outer circumferential wall surface (30), the outer circumferential wall surface (30) retaining a workpiece cloth (4) together with the inner circumferential wall surface (20) in a condition where the workpiece cloth (4)

is arranged between the inner circumferential wall surface (20) and the outer circumferential wall surface (30), and a movable member (5) movable in a radially inward direction of the outer frame (2) from an initial position to the inner groove (32), the movable member (5) being accommodated in the outer groove (22) when in the initial position, the movable member (5) increasing a tensile force of the workpiece cloth (4) by moving radially inward in a manner to temporarily retain the workpiece cloth (4) between the outer frame (2) and the inner frame (3).

FIG. 5 C



Description

TECHNICAL FIELD

[0001] This disclosure relates to an embroidery frame for retaining a workpiece cloth in a stretched state when the workpiece cloth is being embroidered.

BACKGROUND DISCUSSION

[0002] A known embroidery frame disclosed in JP2006-204595A (hereinafter referred to as Reference 1) includes an upper frame, a lower frame that retains a workpiece cloth together with the upper frame, and an auxiliary frame that is fitted to an inner side of the upper frame to further downwardly press the workpiece cloth accordingly. A known embroidery frame disclosed in JP2006-280900A (hereinafter referred to as Reference 2) is formed by an annular outer frame and an inner frame. The inner frame has an opening that does not restrain a portion of a workpiece cloth. The embroidery frame according to Reference 2 further includes a fastening device arranged between both ends of the inner frame, which face the opening.

[0003] According to Reference 1 or 2, the workpiece cloth may not be retained by the upper and lower frames therebetween or by the outer and inner frames therebetween in an appropriate manner.

[0004] A need thus exists for an embroidery frame, which includes a structure for retaining a workpiece cloth in an appropriate manner.

SUMMARY

[0005] According to an aspect of this disclosure, an embroidery frame comprises an outer frame including an inner circumferential wall surface and an outer groove that is formed in the inner circumferential wall surface and that extends along a circumferential direction, an inner frame including an outer circumferential wall surface and an inner groove that is formed in the outer circumferential wall surface and that extends along a circumferential direction, the outer circumferential wall surface retaining a workpiece cloth to be embroidered, together with the inner circumferential wall surface of the outer frame in a condition where the workpiece cloth is arranged between the inner circumferential wall surface and the outer circumferential wall surface, and a movable member movable in a radially inward direction of the outer frame from an initial position to the inner groove of the inner frame, the movable member being accommodated in the outer groove of the outer frame when in the initial position, the movable member increasing a tensile force of the workpiece cloth by moving toward the radially inward direction in a manner to temporarily retain the workpiece cloth between the outer frame and the inner frame.

[0006] According to the embroidery frame configured as described above, the outer frame and the inner frame

are attached to each other so as to temporarily retain therebetween the workpiece cloth. At this time, the movable member is shifted toward the radially inward direction of the outer frame from the initial position in which the movable member is accommodated in the outer groove of the outer frame, to the inner groove of the inner frame. Then, the movable member engages with a portion of the workpiece cloth, which is positioned between the outer frame and the inner frame. Accordingly, a tensile force of the workpiece cloth may be increased. Thus, the movable member is moved radially inward in a condition where the workpiece cloth is arranged between the outer frame and the inner frame; thereby, the tensile force of the workpiece cloth may be increased.

[0007] According to a further aspect of the disclosure, an adjustment device moving the movable member toward the radially inward direction is arranged at one of the outer frame and the inner frame. When the movable member does not retain the workpiece cloth, the movable member is accommodated in the outer groove of the outer frame. When the workpiece cloth is retained by the outer frame and the inner frame therebetween, a portion of the movable member is supported by the outer frame and the other portion of the movable member is accommodated in the inner groove of the inner frame.

[0008] As described above, when the workpiece cloth is arranged between the outer frame and the inner frame, the movable member is engaged with the outer frame and the inner frame. Accordingly, even when an unexpected external force acts on the embroidery frame, the engagement between the outer frame and the inner frame may not be released.

[0009] In addition, even when the unexpected external force acts on the embroidery frame, the inner frame is refrained from being detached from the outer frame and the tension of the workpiece cloth retained by the outer frame and the inner frame therebetween is appropriately maintained.

[0010] According to another aspect of the disclosure, the movable member is formed in a circular arc by extending along the circumferential direction of the outer frame. The movable member includes a wire member, a diameter of which is reduced toward the radially inward direction.

[0011] As described above, the movable member is arranged along the circumferential direction of the outer frame, therefore being easily accommodated in the outer groove of the outer frame and in the inner groove of the inner frame.

[0012] According to still another aspect of the disclosure, a first end portion of the wire member in an entire circumference is retained by the outer frame and a second end portion of the wire member in the entire circumference is connected to an adjustment device that is retained by the outer frame or the inner frame and that adjusts a size of an inner diameter of the wire member.

[0013] Accordingly, the adjustment device adjusts the size of the inner diameter of the wire member, thereby

shifting the wire member from the outer groove of the outer frame to the inner groove of the inner frame.

[0014] According to a further aspect of the disclosure, the wire member includes a retaining portion at an intermediate portion in the entire circumference. The retaining portion is engaged with the outer frame and thereby prevents the wire member from being loosened from the outer frame.

[0015] Accordingly, the inner frame is prevented by the wire member from being detached from the outer frame.

[0016] According to another aspect of the disclosure, when the inner circumferential wall surface of the outer frame and the outer circumferential wall surface of the inner frame face each other, first and second clearances accommodating therein the workpiece cloth between the outer frame and the inner frame are located at first and second sides, respectively, relative to the outer groove and the inner groove in a cross section cut along radial directions of the outer frame and the inner frame and in a direction parallel to a direction in which central axes of the outer frame and the inner frame extend. When a force for reducing a width of the first clearance is defined as a first force and a force for reducing a width of the second clearance is defined as a second force, the first force is set to be larger than the second force.

[0017] Accordingly, in a case where the movable member moves from the outer groove to the inner groove, a portion of the workpiece cloth, which is located in the second clearance, is stretched by the movable member. Consequently, a tensile force may be applied to the workpiece cloth.

[0018] According to still another aspect of the disclosure, the embroidery frame further includes a lock device locking the movable member so that the movable member is accommodated in the inner groove of the inner frame

[0019] Accordingly, the movable member is locked by the lock device so as to be accommodated in the inner groove of the inner frame.

[0020] According to a further aspect of the disclosure, the lock device includes an operation lever switching the movable member between an initial position in which the movable member is accommodated in the outer groove of the outer frame and an operation position in which the movable member is accommodated in the inner groove of the inner frame, and a biasing member maintaining the operation lever to the initial position and the operation position.

[0021] For example, an orientation of the operation lever is shifted to change an orientation of the biasing member arranged at the operation lever. At this time, a direction of a biasing force of the biasing member is varied, therefore switching the operation lever between the initial position and the operation position.

[0022] According to another aspect of the disclosure, the retaining portion includes a protrusion protruding locally from the wire member toward a radially outward direction of the wire member.

[0023] For example, in a case where the workpiece cloth is retained by the outer frame and the inner frame therebetween, the retaining portion engages with the outer frame. Even when an inner radius of the movable member accommodated in the inner groove is reduced to a minimum value, the retaining portion arranged at the movable member and protruding radially outward therefrom engages with the outer frame. Accordingly, the movable member is refrained from being loosened from the outer frame. Consequently, the inner frame is restrained by the movable member from being detached from the outer frame while the outer frame and the inner frame are fitted to each other.

[0024] According to a still another aspect of the disclosure, an opening of the inner groove of the inner frame faces the outer groove of the outer frame by having a diameter that is larger than a diameter of an opening of the outer groove.

[0025] Accordingly, when the outer member and the inner member face each other, the movable member accommodated in the outer groove may easily move therefrom to the inner groove.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] The foregoing and additional features and characteristics of this disclosure will become more apparent from the following detailed description considered with the reference to the accompanying drawings, wherein:

[0027] Fig. 1 is a perspective view illustrating a whole embroidery frame according to a first embodiment disclosed here;

[0028] Fig. 2 is an exploded perspective view of the embroidery frame according to the first embodiment disclosed here;

[0029] Fig. 3 is a cross-sectional view of an interval adjustment device arranged at an outer frame, according to the first embodiment disclosed here;

[0030] Fig. 4 is a cross-sectional view of an adjustment device adjusting a size of a diameter of a wire member, according to the first embodiment disclosed here;

[0031] Fig. 5A is a cross-sectional view illustrating a condition where an outer groove of the outer frame and an inner groove of an inner frame face each other while a workpiece cloth is not retained by the outer frame and the inner frame therebetween, according to the first embodiment disclosed here;

[0032] Fig. 5B is a cross-sectional view illustrating a condition where the outer groove of the outer frame and the inner groove of the inner frame face each other while the workpiece cloth is retained by the outer frame and the inner frame therebetween, according to the first embodiment disclosed here;

[0033] Fig. 5C is a cross-sectional view illustrating a condition where the outer groove of the outer frame and the inner groove of the inner frame face each other while the workpiece cloth is stretched by the wire member, according to the first embodiment disclosed here;

[0034] Fig. 6A is a cross-sectional view illustrating a condition right before the inner frame is fitted to the outer frame on which the workpiece cloth is arranged, according to the first embodiment disclosed here;

[0035] Fig. 6B is a cross-sectional view illustrating a condition where the inner frame is fitted to the outer frame while the workpiece cloth is retained by the outer frame and the inner frame therebetween, according to the first embodiment disclosed here;

[0036] Fig. 7 is a cross-sectional view taken along a horizontal direction of the outer frame and the inner frame, according to the first embodiment disclosed here;

[0037] Fig. 8 is a plan view of the embroidery frame according to a second embodiment disclosed here;

[0038] Fig. 9 is a cross-sectional view illustrating the outer frame and the inner frame according to a third embodiment disclosed here;

[0039] Fig. 10 is a bottom view of the embroidery frame according to a fourth embodiment disclosed here;

[0040] Fig. 11 is a cross-sectional view illustrating a condition where the wire member is locked radially inward by an operation lever, according to the fourth embodiment; and

[0041] Fig. 12 is a cross-sectional view taken along the line XII-XII shown in Fig. 11.

DETAILED DESCRIPTION

[0042] A first embodiment of this disclosure will be described as follows with reference to illustrations of Figs. 1 to 7. An embroidery frame 1 according to the first embodiment of the disclosure includes an outer frame 2 and an inner frame 3. As illustrated in Fig. 1, the outer frame 2 and the inner frame 3 are attached to each other. The outer frame 2 having an annular shape includes an upper surface 2u, a lower surface 2d, and an inner circumferential wall surface 20. The inner frame 3 having an annular shape includes an outer circumferential wall surface 30. A workpiece cloth 4 (a cloth to be embroidered) is sandwiched between the inner circumferential wall surface 20 of the outer frame 2 and the outer circumferential wall surface 30 of the inner frame 3 so as to be retained thereby (the workpiece cloth 4 will be hereinafter referred to as an embroidery cloth). Fig. 2 is an exploded perspective view of the embroidery frame 1. As illustrated in Fig. 2, the outer frame 2 is formed in a C-shaped ring having a clearance 26 in a portion in a circumferential direction. A diameter of the outer frame 2 may be enlarged and reduced in the circumferential direction. An outer groove 22 extending along the circumferential direction is formed in the inner circumferential wall surface 20 of the outer frame 2 so as to have a ring shape. The outer groove 22 has an opening facing radially inward.

[0043] As illustrated in Figs. 1 and 2, the outer frame 2 includes first and second facing portions 24 and 25 flanged at one and the other ends, respectively, in the circumferential direction. The first and second facing portions 24 and 25 are positioned at an outer circumferential

side of the outer frame 2. The first and second facing portions 24 and 25 face each other while being adjacent to each other in the circumferential direction in a condition where the clearance 26 is defined between the first and second facing portions 24 and 25. As shown in Fig. 2, the inner frame 3 includes an upper surface 3u, a lower surface 3d, the outer circumferential wall surface 30, and an inner circumferential wall surface 34. Further, the inner frame 3 is formed in a continuous ring shape along a circumferential direction. An inner groove 32 extending along the circumferential direction is formed in the outer circumferential wall surface 30 of the inner frame 3 so as to have a ring shape. The inner groove 32 has an opening facing radially outward. When the outer frame 2 and the inner frame 3 are fitted to each other, the outer groove 22 and the inner groove 32 face each other. In addition, hard resin is applied to a material of each of the outer frame 2 and the inner frame 3. Further, the opening of the inner groove 32 of the inner frame 3 faces radially outward. In particular, a diameter of the opening of the inner groove 32 is set to be larger than a diameter of the opening of the outer groove 22. Such shape of the opening of the inner groove 32 is determined by draft angles of a mold used for molding the inner frame 3 by using resin. Accordingly, after the inner frame 3 is molded by the resin, a process for expanding the opening of the inner groove 32 may be excluded. A metal material may be applied as the material of the inner frame 3 instead of the hard resin. Similarly, the hard resin or the metal material may be applied to the material of the outer frame 2.

[0044] As illustrated in Fig. 2, a wire member 5 serving as a movable member movable radially inward is arranged at the embroidery frame 1. The wire member 5 is formed in a circular arc along the circumferential direction of the outer frame 2. A cross section of a wire rod configuring the wire member 5 is identical to a circular shape but is not limited thereto. Alternatively, the cross section of the wire rod may be an elliptical or polygonal shape. As shown in Fig. 2, the wire member 5 is arranged along the circumferential direction of the outer frame 2 and the inner frame 3. The wire member 5 includes first and second end portions 50 and 52 having loops, respectively. The first end portion 50 of the wire member 5 is engaged with and supported by an engagement portion 23 attached to the first facing portion 24 of the outer frame 2 and having a pin shape. A nut 23v is fixed to the engagement portion 23. The first end portion 50 in a circumferential direction of the wire member 5 is engaged with the engagement portion 23 by the nut 23v, thereby being fixed to the first facing portion 24 of the outer frame 2. A metal material is applied as a material of the wire member 5. Hard resin may be applied to the material of the wire member 5 instead of the metal material.

[0045] An adjustment device 7 adjusting a size of a diameter of the wire member 5 is arranged at the outer frame 2. As illustrated in Fig. 4, the adjustment device 7 includes an adjustment screw 71, a movable body 72,

and a fixing member 73. The adjustment screw 71 has an external thread 71a rotatably inserted into a support hole 25m formed in the second facing portion 25 of the outer frame 2 and having a through-hole. The movable body 72 is formed in an approximate spinning top shape. The movable body 72 includes an internal thread 72c meshing with the external thread 71a of the adjustment screw 71. The second end portion 52 of the wire member 5 is fixed to the movable body 72 by the fixing member 73. As shown in Fig. 4, the fixing member 73 includes a locking portion 74 and a fastening portion 75. The locking portion 74 includes an external thread 74a. The fastening portion 75 having a nut shape includes an internal thread 75c meshing with the external thread 74a of the locking portion 74. The fastening portion 75 is rotated around a central axis P5, thereby engaging the internal thread 75c of the fastening portion 75 with the external thread 74a of the locking portion 74. Accordingly, the second end portion 52 in the circumferential direction of the wire member 5 is supported by the movable body 72. In addition, the second end portion 52 is movably supported by the second facing portion 25 of the outer frame 2 via the movable body 72 and the adjustment screw 71.

[0046] As illustrated in Fig. 4, the adjustment screw 71 is locked to the second facing portion 25 of the outer frame 2 by a retaining ring 76 serving as a retaining member. Accordingly, the adjustment screw 71 is rotatable around a central axis P7 while being prevented from moving along a direction in which the central axis P7 extends (the direction includes first and second directions indicated by arrows L1 and L2, respectively, in Fig. 4). Consequently, a head portion 71h of the adjustment screw 71 is rotated in one direction around the central axis P7, thereby rotating the adjustment screw 71 around the central axis P7 in the same direction as the rotation of the head portion 71h. Then, the movable body 72 moves toward the first direction of the arrow L1 along the circumferential direction of the wire member 5, thereby moving the second end portion 52 of the wire member 5 along with the movable body 72 along the circumferential direction (the first direction of the arrow L1 corresponds to a direction in which the diameter of the wire member 5 is reduced). As a result, the diameter of the wire member 5 is reduced radially inward. Meanwhile, the head portion 71h of the adjustment screw 71 is rotated in the other direction around the central axis P7, thereby rotating the adjustment screw 71 around the central axis P7 in the same direction as the rotation of the head portion 71h. Then, the movable body 72 moves toward the second direction of the arrow L2 that is the opposite direction from the first direction of the arrow L1 along the circumferential direction of the wire member 5, thereby moving the second end portion 52 of the wire member 5 along with the movable body 72 along the circumferential direction (the second direction of the arrow L2 corresponds to a direction in which the diameter of the wire member 5 is enlarged). As a result, the diameter of the wire member 5 is enlarged radially outward. In addition, as shown

in Fig. 4, a guide surface 77 is formed at the second facing portion 25 of the outer frame 2. The movable body 72 is movable in the first and second directions of the arrows L1 and L2, respectively, along the circumferential direction of the wire member 5 while being guided by the guide surface 77 therealong; thereby, a stable movability of the movable body 72 may be secured.

[0047] As illustrated in Fig. 3, the first and second facing portions 24 and 25 face each other in a condition where the clearance 26 is defined between the first and second facing portions 24 and 25. A second movable body 82 having a nut shape is embedded in the second facing portion 25. The second movable body 82 includes an internal thread 82c. An interval adjustment screw 80 is meshed with the internal thread 82c of the second movable body 82 while being inserted through a first insertion hole 241 of the first facing portion 24 to a second insertion hole 252 of the second facing portion 25. Here, when a head portion 80h of the interval adjustment screw 80 is rotated in one direction around a central axis P8, the second movable body 82 moves toward a first direction indicated by an arrow K1 in Fig. 3, along the central axis P8 (the first direction of the arrow K1 corresponds to a direction in which a diameter of the outer frame 2 is reduced). Then, the second facing portion 25 moves toward the first direction of the arrow K1, therefore being positioned close to the first facing portion 24. Accordingly, the clearance 26 defined between the first and second facing portions 24 and 25 is reduced and the diameter of the outer frame 2 is reduced. Meanwhile, when the head portion 80h of the interval adjustment screw 80 is rotated in the other direction around the central axis P8, the second movable body 82 moves in a second direction (indicated by an arrow K2 shown in Fig. 3) that is the opposite direction from the first direction of the arrow K1 along the central axis P8 (the second direction of the arrow K2 corresponds to a direction in which the diameter of the outer frame 2 is enlarged). Further, the second facing portion 25 moves toward the second direction of the arrow K2, therefore separating from the first facing portion 24. Accordingly, the clearance 26 defined between the first and second facing portions 24 and 25 is increased and the diameter of the outer frame 2 is enlarged. Thus, the size of the diameter of the outer frame 2 may be adjusted by the rotation of the interval adjustment screw 80. As a result, a degree with which the embroidery cloth 4 arranged between the outer frame 2 and the inner frame 3 is fastened therebetween may be easily adjusted. As described above, the interval adjustment screw 80 and the second movable body 82 configure an interval adjustment device 8 for adjusting a width of the clearance 26 defined between the first and second facing portions 24 and 25 of the outer frame 2.

[0048] As illustrated in Fig. 5A, the outer groove 22 is formed in the inner circumferential wall surface 20 of the outer frame 2 along the circumferential direction. The outer groove 22 includes a bottom surface 220 and a pair of side surfaces 222. The diameter of the opening of the

outer groove 22 is defined as a diameter E2. A shape of the outer groove 22 is configured so that each of the side surfaces 222 has an inclination increasing from the bottom surface 220 to the inner circumferential wall surface 20. Meanwhile, the inner groove 32 is formed in the outer circumferential wall surface 30 of the inner frame 3 along the circumferential direction. The inner groove 32 is positioned so as to circumferentially face the outer groove 22. The inner groove 32 includes a bottom surface 320 and a pair of side surfaces 322. The diameter of the opening of the inner groove 32 is defined as a diameter E1. A shape of the inner groove 32 is configured so that each of the side surfaces 322 has an inclination increasing from the bottom surface 320 to the outer circumferential wall surface 30. Accordingly, the wire member 5 may be easily moved from the outer groove 22 to the inner groove 32. An outer diameter of the wire rod configuring the wire member 5 is designed so as to be accommodated in the outer groove 22 and the inner groove 32. Fig. 5A shows a condition where the wire member 5 is set in an initial position. As illustrated in Fig. 5A, when the wire member 5 is in the initial position, the diameter of the wire member 5 is enlarged and the wire member 5 is not accommodated in the inner groove 32 of the inner frame 3 but accommodated in the outer groove 22 of the outer frame 2. Further, when the wire member 5 is in the initial position, the wire member 5 accommodated in the outer groove 22 is not projected radially inward from the inner circumferential wall surface 20 of the outer frame 2. At this time, the outer frame 2 and the inner frame 3 may be appropriately fitted to each other.

[0049] A case where the embroidery cloth 4 is set between the outer frame 2 and the inner frame 3 will be described as follows. First, a user of the embroidery frame 1 rotates the interval adjustment screw 80 in the other direction around the central axis P8 with the fingertips or the like to enlarge the diameter of the outer frame 2; thereby, the clearance 26 between the first and second facing portions 24 and 25 is expanded. At this time, it is recommended that a value calculated by adding a dimension value of a thickness of the embroidery cloth 4 to a dimension value of an outer diameter of the inner frame 3 may conform to a dimension value of an inner diameter of the outer frame 2. In addition, the user rotates the adjustment screw 71 in the other direction around the central axis P7 with the fingertips or the like as required, thereby enlarging the diameter of the wire member 5. Accordingly, the wire member 5 is set in the initial position so as to be accommodated in the outer groove 22 of the outer frame 2. Next, as illustrated in Fig. 6A, the embroidery cloth 4 is placed on the upper surface 2u of the outer frame 2. At this time, the inner frame 3 is moved close to the outer frame 2 and pressed to an inner circumferential side of the outer frame 2. As a result, the embroidery cloth 4 is positioned between the inner circumferential wall surface 20 of the outer frame 2 and the outer circumferential wall surface 30 of the inner frame 3 as illustrated in Fig. 6B. At this time, the diameter of the wire

member 5 is not reduced; therefore, the embroidery cloth 4 is not firmly supported by the inner circumferential wall surface 20 of the outer frame 2 and the outer circumferential wall surface 30 of the inner frame 3 therebetween and a tensile force of the embroidery cloth 4 is relatively weak. In addition, an excessive force is not acting on the embroidery cloth 4; thereby, the embroidery cloth 4 may be refrained from being affected by the excessive force.

[0050] Afterward, the user rotates the head portion 71 h of the adjustment screw 71 in the one direction around the central axis P7 to rotate the adjustment screw 71 around the central axis P7 in the same direction as the rotation of the head portion 71 h. Accordingly, the movable body 72 moves in the first direction of the arrow L1 along the circumferential direction of the wire member 5 to reduce the diameter of the wire member 5 radially inward. Thus, the wire member 5 moves from the outer groove 22 to the inner groove 32 in accordance with the radially inward movement as shown in Figs. 5B and 5C. Consequently, the wire member 5 engages with a portion 4w of the embroidery cloth 4, which is positioned between the inner circumferential wall surface 20 of the outer frame 2 and the outer circumferential wall surface 30 of the inner frame 3 (the portion 4w of the embroidery cloth 4 faces the outer groove 22 and the inner groove 32 therebetween). As a result, as seen from Figs. 5B and 5C, a portion 4c of the embroidery cloth 4, which is positioned further radially inward than the outer circumferential wall surface 30 of the inner frame 3, is stretched in a direction indicated by an arrow A1 shown in Figs. 5B and 5C to thereby increase a tensile force of a portion 4a of the embroidery cloth 4, which is surrounded by the inner frame 3. Thus, the portion 4a of the embroidery cloth 4 is strongly stretched.

[0051] Even in a condition where the wire member 5 is moved from the outer groove 22 to the inner groove 32 as described above, the second end portion 52 of the wire member 5 is retained to the movable body 72 of the outer frame 2 by the fixing member 73. Further, even in a condition where an inner diameter of the wire member 5 accommodated in the inner groove 32 is set to be a minimum value and the tensile force of the embroidery cloth 4 retained between the outer frame 2 and the inner frame 3 of the embroidery frame 1 is increased, the wire member 5 is engaged with the outer frame 2 and the inner frame 3. Accordingly, for example, even when an unexpected external force acts on the embroidery frame 1 or when the embroidery frame 1 is accidentally dropped on a floor by the user in a condition where the embroidery cloth 4 is strongly stretched, the inner frame 3 may be prevented from being loosened from the outer frame 2. According to the embroidery frame 1 configured above, for example, even a user such as a woman who does not have a strong gripping force or the like rotates the head portion 71 h of the adjustment screw 71, thereby easily increasing the tension of the embroidery cloth 4 suitably for the user to do embroidery with the embroidery cloth 4. In addition, for example, in a case where a diam-

eter of the head portion 71 h of the adjustment screw 71 is designed to have a large size and a diameter of the head portion 80h of the interval adjustment screw 80 is designed to have a large size, even the user who does not have the large gripping force or the like may easily apply a tensile force to the embroidery cloth 4. Moreover, the embroidery frame 1 is configured so that the tension of the embroidery cloth 4 is adjustable by the rotation of the head portion 71 h of the adjustment screw 71; therefore, the tensile force may be adjusted continuously in a non-stepwise manner. Accordingly, various materials may be applied to the embroidery cloth 4.

[0052] As clearly seen from the first embodiment, setting of the embroidery cloth 4 to the embroidery frame 1 includes the following two operations: an operation for allowing the embroidery cloth 4 to be temporarily retained by the outer frame 2 and the inner frame 3 therebetween, and an operation for reducing the diameter of the wire member 5 in accordance with the rotation of the adjustment screw 71 and applying the tensile force to the embroidery cloth 4 so that the embroidery cloth 4 is strongly stretched. Thus, the embroidery cloth 4 may be easily set to the embroidery frame 1 in the stretched state to be therefore prevented from being damaged, i.e., the embroidery cloth 4 may be appropriately protected from being worn or torn. Each of Figs. 5A to 5C illustrates a cross-sectional view cut along a radial direction of each of the outer frame 2 and the inner frame 3 when the inner circumferential wall surface 20 of the outer frame 2 and the outer circumferential wall surface 30 of the inner frame 3 face each other. In Fig. 5A, as described above, the diameter of the opening of the inner groove 32 in the vicinity of the outer circumferential wall surface 30 is defined as the diameter E1 and the diameter of the opening of the outer groove 22 in the vicinity of the inner circumferential wall surface 20 is determined as the diameter E2. The diameter E1 is set to be larger than the diameter E2 ($E1 > E2$). In a case where the diameter E1 is larger than the diameter E2 ($E1 > E2$), the outer frame 2 and the inner frame 3 face each other to therefore easily move the wire member 5 accommodated in the outer groove 22 to the inner groove 32.

[0053] In a condition where the outer frame 2 and the inner frame 3 face each other, a line in parallel with a direction in which a central axis PA of the inner frame 3 (see Fig. 6) extends, in the cross-sectional view (in Fig. 5A) cut along the radial direction of each of the outer frame 2 and the inner frame 3, is defined as a direction indicated by an arrow PB shown in Fig. 6. A clearance between the outer frame 2 and the inner frame 3, which is located at a first side P1 (an upper side) in the direction of the arrow PB, is defined as a first clearance t1. The embroidery cloth 4 is inserted in the first clearance t1 between the outer frame 2 and the inner frame 3 so as to be sandwiched therebetween. A clearance between the outer frame 2 and the inner frame 3, which is located at a second side P2 (a lower side) in the direction of the arrow PB, is defined as a second clearance t2. The em-

broidery cloth 4 is inserted in the second clearance t2 between the outer frame 2 and the inner frame 3 so as to be sandwiched therebetween. Here, as illustrated in Figs. 5B and 5C, the first side P1 is adjacent to an outer edge portion 4p of the embroidery cloth 4 sandwiched between the outer frame 2 and the inner frame 3. The first side P1 is located relatively away from the portion 4a to be embroidered. Meanwhile, the second side P2 is located relatively adjacent to the portion 4a. Accordingly, the first clearance t1 is defined by an inner circumferential wall surface portion 20u of the inner circumferential wall surface 20, which is located at the first side P1 relative to the outer groove 22 of the outer frame 2, and an outer circumferential wall surface portion 30u of the outer circumferential wall surface 30, which is located at the first side P1 relative to the inner groove 32 of the inner frame 3. Further, the second clearance t2 is defined by an inner circumferential wall surface portion 20d of the inner circumferential wall surface 20, which is located at the second side P2 relative to the outer groove 22 of the outer frame 2, and an outer circumferential wall surface portion 30d of the outer circumferential wall surface 30, which is located at the second side P2 relative to the inner groove 32 of the inner frame 3. Here, the first clearance t1 is set to be smaller than the second clearance t2 ($t2 > t1$).

[0054] A width of the first clearance t1 located at the first side P1 between the outer frame 2 and the inner frame 3 is reduced, for example, by a first force F1 as shown in Fig. 5A. A width of the second clearance t2 located at the other side P2 between the outer frame 2 and the inner frame 3 is reduced, for example, by a second force F2 as shown in Fig. 5A. The first clearance t1 is set to be smaller than the second clearance t2 ($t2 > t1$) as described above and the first force F1 is set to be larger than the second force F2 ($F1 > F2$). Accordingly, when the wire member 5 is moved in a direction indicated by an arrow X1 from the outer groove 22 of the outer frame 2 to the inner groove 32 of the inner frame 3, a portion 4k of the embroidery cloth 4, which is located in the second clearance t2, is stretched by the wiring member 5 in the direction of the arrow A1 and in a direction indicated by an arrow Y1 (see Figs. 5B and 5C). Consequently, a large tensile force may be applied to the embroidery cloth 4. Here, the wire member 5 is arranged along the circumferential direction between the outer frame 2 and the inner frame 3; thereby, the approximately entire diameter of the wire member 5 is reduced in the circumferential direction. In addition, a circumferential length of the portion 4w retained by the wire member 5 and an area of a surface of the portion 4w retained by the wire member 5 may be increased. As a result, loosening of the embroidery cloth 4 from the embroidery frame 1 is effectively restricted; therefore, the embroidery cloth 4 may be retained in the stretched state between the inner circumferential wall surface 20 of the outer frame 2 and the outer circumferential wall surface 30 of the inner frame 3. Thus, the stretched state of the embroidery cloth 4 is secured, thereby enabling the user to

appropriately do embroidery with the embroidery cloth 4. For example, in a case where a portion 4m of the embroidery cloth 4, which is located in the first clearance t1, is excessively stretched by the wire member 5 when the wire member 5 moves in the direction indicated by the arrow X1 (see Figs. 5B and 5C) from the outer groove 22 of the outer frame 2 to the inner groove 32 of the inner frame 3, the tensile force applied to the portion 4a of the embroidery cloth 4 is refrained from increasing, therefore the tensility of the portion 4a of the embroidery cloth 4 may not be easily obtained. As a result, as described above, it is recommended that the first force F1 reducing the first clearance t1 between the outer frame 2 and the inner frame 3 be set to be larger than the second force F2.

[0055] In a case where the embroidery cloth 4 retained by the outer frame 2 and the inner frame 3 therebetween is being embroidered, the embroidery cloth 4 is biased by an embroidery needle toward a direction indicated by an arrow A3 in Figs. 5B and 5C. At this time, the embroidery cloth 4 is stretched in the direction of the arrow A3 in which the embroidery cloth 4 in the stretched state is released therefrom. According to the embroidery frame 1 of the first embodiment, the approximately entire circumference of the wire member 5 is mechanically engaged with the portion 4w of the embroidery cloth 4, therefore increasing the area of the engaged surface of the portion 4w with the wire member 5. Accordingly, the embroidery cloth 4 is refrained from being released from the stretched state. Moreover, as described above, the first force F1 for reducing the width of the first clearance t1 between the outer frame 2 and the inner frame 3 is set to be larger than the second force F2 ($F1 > F2$); thereby, the embroidery cloth 4 is refrained by the first force F1 from being released from the stretched state.

[0056] In a case where the embroidery cloth 4 is detached from the outer frame 2 and the inner frame 3 after being embroidered, the user rotates the head portion 71h of the adjustment screw 71 in the other direction around the central axis P7 with the fingertips or the like; thereby, the movable body 72 is moved in the second direction of the arrow L2 along the circumferential direction to enlarge the diameter of the wire member 5 radially outward. Accordingly, the wire member 5 moves from the inner groove 32 to the outer groove 22. Consequently, the engagement between the wire member 5 and the portion 4w of the embroidery cloth 4 located between the inner circumferential wall surface 20 of the outer frame 2 and the outer circumferential wall surface 30 of the inner frame 3, is released. Furthermore, the user rotates the head portion 80h of the interval adjustment screw 80 in the other direction around the central axis P8, thereby enlarging the diameter of the outer frame 2 and disengaging the inner frame 3 from the outer frame 2. As a result, the outer frame 2 and the inner frame 3 attached to each other may be easily separated.

[0057] According to the embroidery frame 1 of the first embodiment, when the wire member 5 is in the initial position while not retaining the embroidery cloth 4, the

wire member 5 is accommodated in the outer groove 22 as illustrated in Fig. 5A. When the wire member 5 retains the embroidery cloth 4 by using the outer frame 2 and the inner frame 3 therebetween, the wire member 5 is shifted from the outer groove 22 to the inner groove 32 so as to be accommodated therein while the first end portion 50 (a portion of) of the wire member 5 is connected to and retained by the engagement portion 23 and the other portion of the wire member 5 is shifted to the inner groove 32 of the inner frame 3 so as to be accommodated therein in an engaged manner. In particular, when the embroidery cloth 4 is retained by the outer frame 2 and the inner frame 3 therebetween by utilizing the wire member 5, the portion (the first end portion 50) of the wire member 5 is supported by the outer frame 2 and the other portion of the wire member 5 is accommodated in the inner groove 32 of the inner frame 3 so as to be engaged therewith. Accordingly, for example, even when the embroidery frame 1 is accidentally dropped on the floor by the user and an external force, which may remove the inner frame 3 from the outer frame 2, acts on the embroidery frame 1, the inner frame 3 may be refrained from being detached from the outer frame 2. In addition, the tensile force of the embroidery cloth 4 retained by the outer frame 2 and the inner frame 3 therebetween may be appropriately maintained.

[0058] According to the embroidery frame 1 of the first embodiment, the wire member 5 extends along the circumferential direction of the outer frame 2 while the diameter of the wire member 5 may be reduced radially inward. Accordingly, the wire member 5 may be easily accommodated in the outer groove 22 of the outer frame 2 and the inner groove 32 of the inner frame 3. Further according to the embroidery frame 1 of the first embodiment, the first end portion 50 of the wire member 5 in the entire circumference is retained by the engagement portion 23 of the outer frame 2 while the second end portion 52 of the wire member 5 is connected to the movable body 72 retained by the second facing portion 25 of the outer frame 2. Accordingly, the inner diameter of the wire member 5 is adjusted by the adjustment screw 71. Consequently, the wire member 5 is easily shifted from the outer groove 22 of the outer frame 2 to the inner groove 32 of the inner frame 3, thereby being accommodated therein.

[0059] For example, in a case where the tensile force acting on the embroidery cloth 4 is suddenly increased in order to set the embroidery cloth 4 to the embroidery frame 1 so that the embroidery cloth 4 is in the stretched state, the embroidery cloth 4 may be damaged depending on types of materials. According to the embroidery frame 1 of the first embodiment, when the circumferential length of the wire member 5 is defined as "LA" and a radius of the wire member 5 is defined as "r", it is assumed that the formula: $LA \approx 2\pi r$ and the formula: $\Delta LA \approx 2\pi \cdot \Delta r$ are established. Accordingly, when the amount of diameter reduction Δr is 0.1 millimeter ($\Delta r = 0.1 \text{ mm}$), a moving distance of the movable body 72: ΔLA is obtained by

multiplying 2π times Δr and is therefore determined as 0.628 millimeters ($\Delta LA \approx 2\pi \cdot \Delta r \approx 0.628$ mm). Thus, when the radius of the wire member 5 is reduced by 0.1 millimeter, the movable body 72 is moved through a distance six times as long as the amount of diameter reduction: 0.1 millimeter along the circumferential direction of the wire member 5. Consequently, the radius of the wire member 5 may be fine adjusted to appropriately fine adjust the tension of the embroidery cloth 4; therefore, the embroidery cloth 4 is easily refrained from being damaged by the external force applied to the embroidery frame 1.

[0060] Additionally, the adjustment device 7 applies a screw mechanism. In other words, for example, in a case where the head portion 71 h of the adjustment screw 71 is rotated by 360 degrees around the central axis P7, the adjustment screw 71 moves through a distance corresponding to one pitch along the central axis P7. The external thread 71a of the adjustment screw 71 configuring a portion of the adjustment device 7 and the internal thread 72c of the movable body 72 configuring a portion of the adjustment device 7 form a speed reduction mechanism. Accordingly, for example, in a condition where the movable body 72 is moved through a distance of 1 millimeter along the circumferential direction of the wire member 5, the head portion 71 h of the adjustment screw 71 of the adjustment device 7 needs to be rotated around the central axis P7 several times as many as the aforementioned 360-degree rotation. Consequently, in a case where the diameter of the wire member 5 is reduced to shift the wire member 5 from the outer groove 22 to the inner groove 32, the speed reduction mechanism formed by the external thread 71 a and the internal thread 72c may fine adjust the size of the diameter of the wire member 5.

[0061] A second embodiment of the disclosure will be described as follows. Fig. 8 illustrates the embroidery frame 1 according to the second embodiment. The embroidery frame 1 according to the second embodiment has similar effects and configuration as those of the embroidery frame 1 according to the first embodiment. Multiple retaining portions 55 having protrusions are formed at an intermediate portion in the entire circumference of the wire member 5. The retaining portions 55 locally protrude from the wire member 5 toward a radially outward direction of the wire member 5. A single retaining portion 55 may be formed at the wire member 5 instead of the multiple retaining portions 55. Multiple engagement portions 27 having bores are formed in the inner circumferential wall surface 20 of the outer frame 2. Each of the retaining portions 55 engages with each of the engagement portions 27. The engagement portion 27 is configured to have an opening 27e formed in an outer circumferential wall surface 21 of the outer frame 2 because a radial thickness t_w of the outer frame 2 is limited radially outwardly. The user may visually confirm the engagement portion 27 through the opening 27e to thereby check the engaged state between the retaining portion 55 and

the engagement portion 27. Alternatively, the engagement portion 27 may not have the opening 27e according to circumstances.

[0062] For example, in a case where the embroidery cloth 4 is retained by the outer frame 2 and the inner frame 3 therebetween, the retaining portions 55 engage with the engagement portions 27. Even when the inner radius of the wire member 5 accommodated in the inner groove 32 is reduced to the minimum value, the retaining portions 55 arranged at the wire member 5 and protruding radially outward therefrom engage with the engagement portions 27 formed in the inner circumferential wall surface 20 of the outer frame 2. Accordingly, the wire member 5 is prevented from being loosened from the outer frame 2. Consequently, the inner frame 3 is restrained by the wire member 5 from being detached from the outer frame 2 while the outer frame 2 and the inner frame 3 are fitted to each other. Loosening of the wire member 5 from the outer frame 2 is prevented as described above; therefore, each of the outer frame 2 and the inner frame 3 may be formed so as to have a planar or perfect circular shape according to circumstances. In addition, each of the outer frame 2 and the inner frame 3 may be formed so as to have an elliptical, oval, or substantially rectangular shape.

[0063] A third embodiment of the disclosure will be explained as follows. Fig. 9 illustrates the embroidery frame 1 according to the third embodiment. The embroidery frame 1 according to the third embodiment has similar effects and configuration as those of the embroidery frame 1 according to the first and second embodiments. As shown in Fig. 9, a convex portion 290 is formed at the inner circumferential wall surface portion 20u located at the first side P1 relative to the outer groove 22 of the inner circumferential wall surface 20 of the outer frame 2 and facing the outer circumferential wall portion 30u located at the first side P1 relative to the inner groove 32 of the outer circumferential wall surface 30 of the inner frame 3. The convex portion 290 includes a pressing point by which the embroidery cloth 4 is firmly pressed between the outer frame 2 and the inner frame 3. Similar to the first embodiment, the first force F_1 is larger than the second force F_2 ($F_1 > F_2$). Further, a gripping force for gripping a portion of the embroidery cloth 4, which is positioned in the first clearance t_1 , may be further increased by the convex portion 290. As a result, a large tensile force may be applied to the embroidery cloth 4.

[0064] A fourth embodiment of the disclosure will be described as follows with reference to Figs. 10 to 12. The embroidery frame 1 according to the fourth embodiment has similar effects and configuration as those of the embroidery frame 1 according to the first, second, and third embodiments. Fig. 10 illustrates the embroidery frame 1 seen from a lower side. As shown in Fig. 10, a single-operation lock device 100 is arranged at the embroidery frame 1. The lock device 100 locks the wire member 5 (serving as the movable member) so that the wire member 5 is accommodated in the inner groove 32. The lock

device 100 includes an operation lever 110 and a biasing member 130. The operation lever 110 is switchable between an initial position MA where the wire member 5 is accommodated in the outer groove 22 of the outer frame 2 and an operation position MB where the wire member 5 is accommodated in the inner groove 32 of the inner frame 3. The biasing member 130 allows the operation lever 110 to be maintained in the operation position MB and the initial position MA (see Fig. 10), respectively.

[0065] Details of the embroidery frame 1 according to the fourth embodiment will be described as follows. As shown in Fig. 11, a guide groove 280 formed in a rectangle and having an inner wall surface 282 is formed in the second facing portion 25 approximately along a tangent direction relative to the outer frame 2. The guide groove 280 extends substantially along the tangent direction relative to the outer frame 2 while including first and second ends 280a and 280c facing each other in the tangent direction. An engagement groove 283 (see Fig. 11) is formed in a portion of the guide groove 280 formed in the second facing portion 25, which is adjacent to the first facing portion 24. A movable body 82B having a pin shape is arranged at the second facing portion 25 of the outer frame 2. The head portion 80h of the interval adjustment screw 80 is rotated in the one direction around the central axis P8 to thereby move the movable body 82B in the first direction indicated by an arrow K1 in Fig. 11. Accordingly, the second facing portion 25 is moved toward the first facing portion 24 so as to be positioned close thereto, thereby reducing the clearance 26. Meanwhile, the head portion 80h of the interval adjustment screw 80 is rotated in the other direction around the central axis P8 to thereby move the movable body 82B in the second direction indicated by an arrow K2 in Fig. 11. Accordingly, the second facing portion 25 is moved away from the first facing portion 24, thereby increasing the clearance 26. Thus, the width of the clearance 26 between the first and second facing portions 24 and 25 is adjusted by the rotating operation of the interval adjustment screw 80.

[0066] As illustrated in Fig. 11, the operation lever 110 includes a holding portion 111 and a long groove 112 having a circular arc shape. The movable body 82B is fitted or connected in the long groove 112 so as to be guided therealong. The orientation of the operation lever 110 is regulated by the connection between the long groove 112 and the movable body 82B. As illustrated in Figs. 10 and 11, the first end portion 50 having the loop shape in the entire circumference of the wire member 5 is connected to an engagement portion 23B of the first facing portion 24 of the outer frame 2. The second end portion 52 having the loop shape in the entire circumference of the wire member 5 is connected to an engagement member 74B slidably arranged at the second facing portion 25 of the outer frame 2. The engagement member 74B having a boss shape is slidable in first and second directions indicated by arrows D1 and D2, respectively, along a longitudinal direction of the guide groove 280 of

the outer frame 2. The movable member 74B moves in the second direction of the arrow D2 to thereby engage with the engagement groove 283.

[0067] As shown in Fig. 11, the biasing member 130 serving as a coil spring is arranged between the operation lever 110 and the second facing portion 25 of the outer frame 2. One end portion of the biasing member 130 is hooked and connected to a seating portion 25x formed at the second facing portion 25 of the outer frame 2. The other end portion of the biasing member 130 is hooked and connected to a seating portion 110x formed at the operation lever 110. The biasing member 130 serves as the tensile coil spring consistently generating a tensile force. Accordingly, when the operation lever 110 is in the operation position MB, the biasing member 130 is set in an operation position 130a to generate a biasing force FA biasing the seating portion 110x (a movable side) toward the seating portion 25x (a fixing side) of the outer frame 2 along an imaginary line fa (seen in Fig. 11). The operation lever 110 is moved by the biasing force FA toward the first facing portion 24 along the imaginary line fa. In addition, the engagement member 74B arranged at the operation lever 110 moves along the guide groove 280 in the second direction of the arrow D2, thereby being fitted to and engaged with the engagement groove 283. Accordingly, the second end portion 52 of the wire member 5 is pulled in a direction indicated by an arrow A7 (along the circumferential direction of the wire member 5). Consequently, the diameter of the wire member 5 is reduced and the wire member 5 is moved from the outer groove 22 of the outer frame 2 to the inner groove 32 of the inner frame 3 so as to be fitted thereto. As a result, the wire member 5 supports the embroidery cloth 4 retained by the outer frame 2 and the inner frame 3 therebetween and maintains the embroidery cloth 4 in the stretched state.

[0068] In addition, as seen from Fig. 11, when being released from the engaged state with the engagement groove 283, the engagement member 74B needs a force larger than the biasing force of the biasing member 130. Accordingly, the biasing member 130 is positioned so that an angle formed by the imaginary line fa and a line perpendicular to a line XII-XII is larger than an angle formed by the imaginary line fa and the line XII-XII, thereby increasing a pressing force acting on the engagement member 74B in the second direction of D2. As a result, the engagement member 74B is refrained from easily disengaging from the engagement groove 283.

[0069] For example, in a case where the inner frame 3 is separated from the outer frame 2, the user rotates the operation lever 110 set in the operation position MB, to a direction indicated by an arrow CA seen in Fig. 11. Then, the user moves the operation lever 110 to the initial position MA (indicated by imaginary lines in Fig. 10). When the operation lever 110 is shifted from the operation position MB to the initial position MA, the seating portion 110x of the operation lever 110 is moved adjacent to the first facing portion 24 as shown in Fig. 10. Accord-

ingly, the orientation of the biasing member 130 is shifted to an initial position 130c. In a condition where the biasing member 130 is set in the initial position 130c, the biasing member 130 generates a biasing force FB biasing the seating portion 110x (the movable side) of the operation lever 110 toward the seating portion 25x (the fixing side) of the outer frame 2. That is, the biasing member 130 generates the biasing force FB biasing the seating portion 110x in an imaginary line fb shown in Fig. 10 (along a central axis of the biasing force 130). The engagement member 74B is disengaged from the engagement groove 283 of the guide groove 280 by the biasing force FB, therefore moving in the first direction of the arrow D1 (corresponding to a direction in which the movable member 74B separates away from the first facing portion 24). Then, the engagement member 74B reaches the first end portion 280a of the guide groove 280. In other words, the operation lever 110 in the initial position MA moves along the imaginary line FB so as to be located away from the first facing portion 24. At this time, the wire member 5 is moved radially outward toward the outer groove 22, not moved radially inward toward the inner groove 32 of the inner frame 3. Accordingly, the inner frame 3 is disengaged from the outer frame 2. Thus, according to the embroidery frame 1 of the fourth embodiment, the user moves the operation lever 110 from the initial position MA to the operation position MB, thereby changing the orientation of the biasing member 130. Consequently, the engagement member 74B of the operation lever 110 is automatically moved to the engagement groove 283 by the biasing force FA of the biasing member 130 (see Fig. 11). In addition, the wire member 5 is automatically moved from the outer groove 22 to the inner groove 32. Meanwhile, the user moves the operation lever 110 from the operation position MB to the initial position MA, thereby changing the orientation of the biasing member 130. Consequently, the engagement member 74B of the operation lever 100 is automatically released from the engagement groove 283. In addition, the wire member 5 is automatically moved from the inner groove 32 to the outer groove 22.

[0070] According to the first, second, third, and fourth embodiments, the wire member 5 formed in the circular arc serves as the movable member and the wire member 5 is deformed radially inward from the outer frame 2 so as to be positioned in the inner groove 32. Alternatively, a movable member having a block shape or an arc shape seen in a plan view and retained by the outer frame 2 may be deformed radially inward from the outer groove 22 to the inner groove 32. Moreover, a depth of the inner groove 32 may be the same as a depth of the outer groove 22 or may be shorter or longer than the depth of the outer groove 22. In addition, the embroidery frame 1 of the disclosure is not limited to the first, second, third, and fourth embodiments illustrated in the accompanying drawings and may be applied to other embodiments as long as not departing from the purpose of the disclosure.

Claims

1. An embroidery frame (1), comprising:

an outer frame (2) including an inner circumferential wall surface (20) and an outer groove (22) that is formed in the inner circumferential wall surface (20) and that extends along a circumferential direction;
 an inner frame (3) including an outer circumferential wall surface (30) and an inner groove (32) that is formed in the outer circumferential wall surface (30) and that extends along a circumferential direction, the outer circumferential wall surface (30) retaining a workpiece cloth (4) to be embroidered, together with the inner circumferential wall surface (20) of the outer frame (2) in a condition where the workpiece cloth (4) is arranged between the inner circumferential wall surface (20) and the outer circumferential wall surface (30); and
 a movable member (5) movable in a radially inward direction of the outer frame (2) from an initial position to the inner groove (32) of the inner frame (3), the movable member (5) being accommodated in the outer groove (22) of the outer frame (2) when in the initial position, the movable member (5) increasing a tensile force of the workpiece cloth (4) by moving toward the radially inward direction in a manner to temporarily retain the workpiece cloth (4) between the outer frame (2) and the inner frame (3).

2. An embroidery frame (1) according to Claim 1, wherein an adjustment device (7) moving the movable member (5) toward the radially inward direction is arranged at one of the outer frame (2) and the inner frame (3), and
 wherein when the movable member (5) does not retain the workpiece cloth (4), the movable member (5) is accommodated in the outer groove (22) of the outer frame (2), and when the workpiece cloth (4) is retained by the outer frame (2) and the inner frame (3) therebetween, a portion of the movable member (5) is supported by the outer frame (2) and the other portion of the movable member (5) is accommodated in the inner groove (32) of the inner frame (3).

3. An embroidery frame (1) according to Claim 1 or 2, wherein the movable member (5) is formed in a circular arc by extending along the circumferential direction of the outer frame (2), the movable member (5) including a wire member, a diameter of which is reduced toward the radially inward direction.

4. An embroidery frame (1) according to Claim 3, wherein a first end portion (50) of the wire member (5) in an entire circumference is retained by the outer

- frame (2) and a second end portion (52) of the wire member (5) in the entire circumference is connected to an adjustment device (7) that is retained by the outer frame (2) or the inner frame (3) and that adjusts a size of an inner diameter of the wire member (5). 5
5. An embroidery frame (1) according to Claim 3 or 4, wherein the wire member (5) includes a retaining portion (55) at an intermediate portion in the entire circumference, the retaining portion (55) being engaged with the outer frame (2) and preventing the wire member (5) from being loosened from the outer frame (2). 10
6. An embroidery frame (1) according to any one of Claims 1 to 5, wherein when the inner circumferential wall surface (20) of the outer frame (2) and the outer circumferential wall surface (30) of the inner frame (3) face each other, first and second clearances (t1, t2) accommodating therein the workpiece cloth (4) between the outer frame (2) and the inner frame (3) are located at first and second sides (P1, P2), respectively, relative to the outer groove (22) and the inner groove (32) in a cross section cut along radial directions of the outer frame (2) and the inner frame (3) and in a direction (PB) parallel to a direction in which central axes of the outer frame (2) and the inner frame (3) extend, and wherein when a force for reducing a width of the first clearance (t1) is defined as a first force (F1) and a force for reducing a width of the second clearance (t2) is defined as a second force (F2), the first force (F1) is set to be larger than the second force (F2). 15 20 25 30
7. An embroidery frame (1) according to any one of Claims 1 to 6, further comprising a lock device (100) locking the movable member (5) so that the movable member (5) is accommodated in the inner groove (32) of the inner frame (3). 35 40
8. An embroidery frame (1) according to Claim 7, wherein the lock device (100) includes an operation lever (110) switching the movable member (5) between an initial position (MA) in which the movable member (5) is accommodated in the outer groove (22) of the outer frame (2) and an operation position (MB) in which the movable member (5) is accommodated in the inner groove (32) of the inner frame (3), and a biasing member (130) maintaining the operation lever (110) in the initial position (MA) and the operation position (MB). 45 50
9. An embroidery frame (1) according to Claim 5, wherein the retaining portion (55) includes a protrusion protruding locally from the wire member (5) toward a radially outward direction of the wire member (5). 55
10. An embroidery frame (1) according to Claim 1, wherein an opening of the inner groove (32) of the inner frame (3) faces the outer groove (22) of the outer frame (2) by having a diameter (E1) that is larger than a diameter (E2) of an opening of the outer groove (22).

FIG. 1

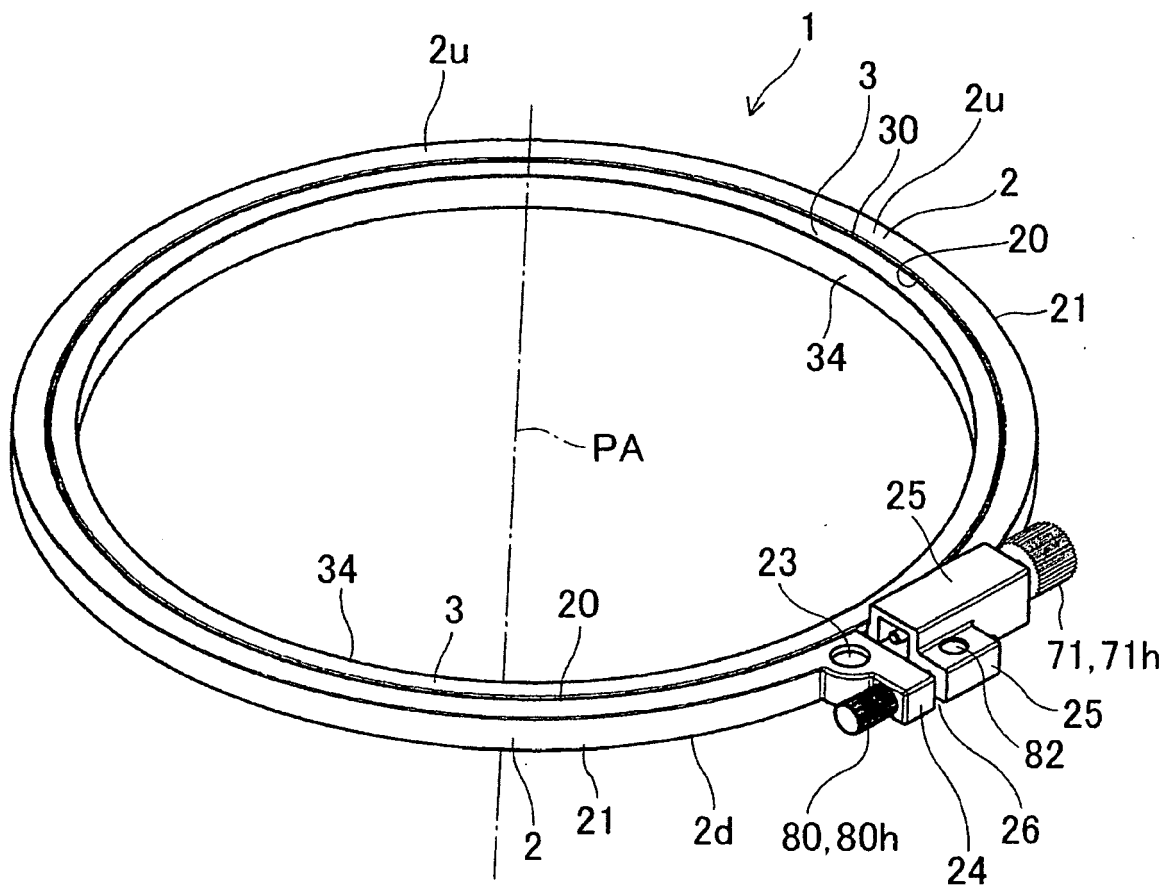


FIG. 2

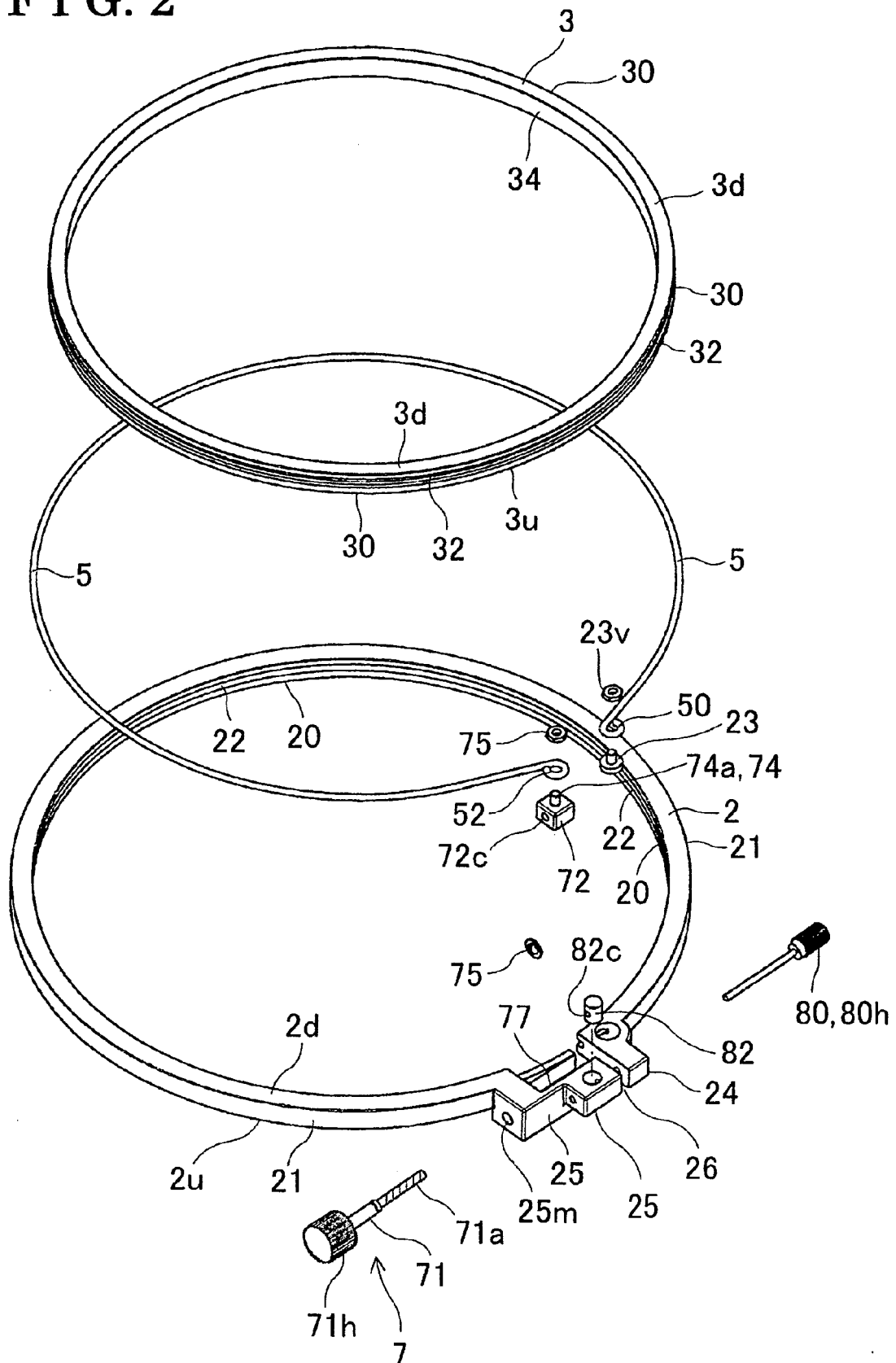


FIG. 3

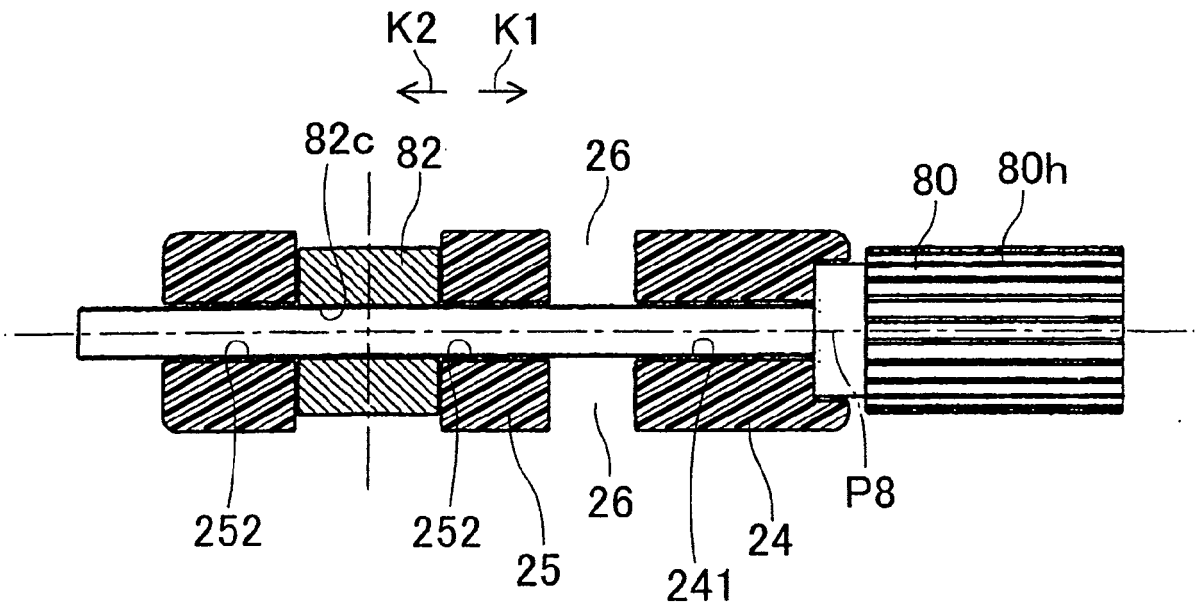


FIG. 4

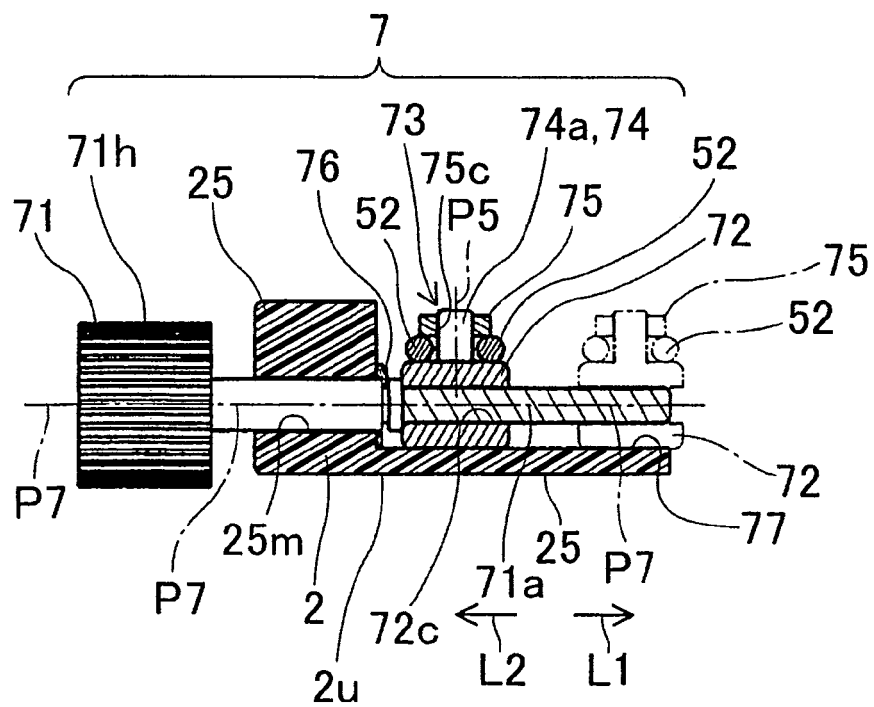


FIG. 5 A

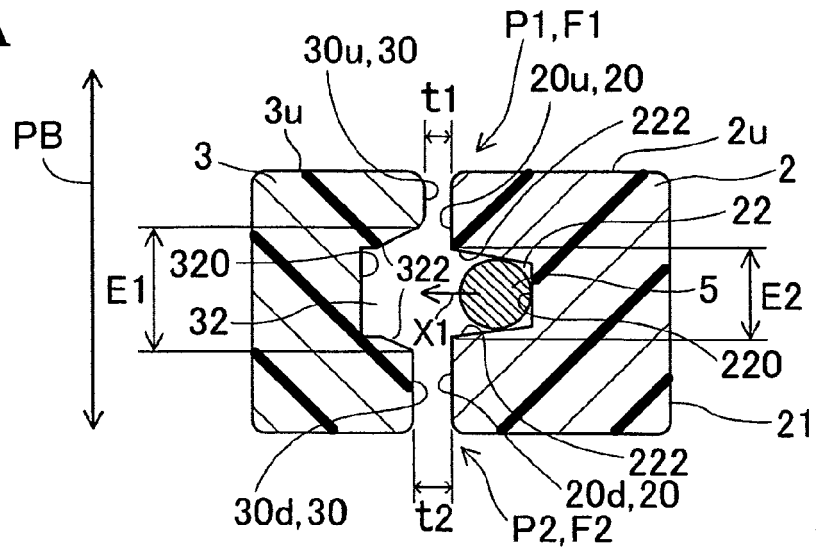


FIG. 5 B

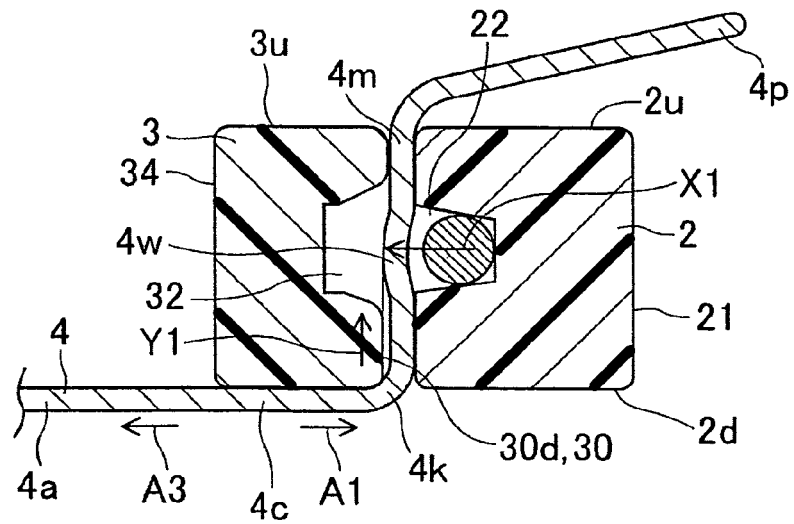


FIG. 5 C

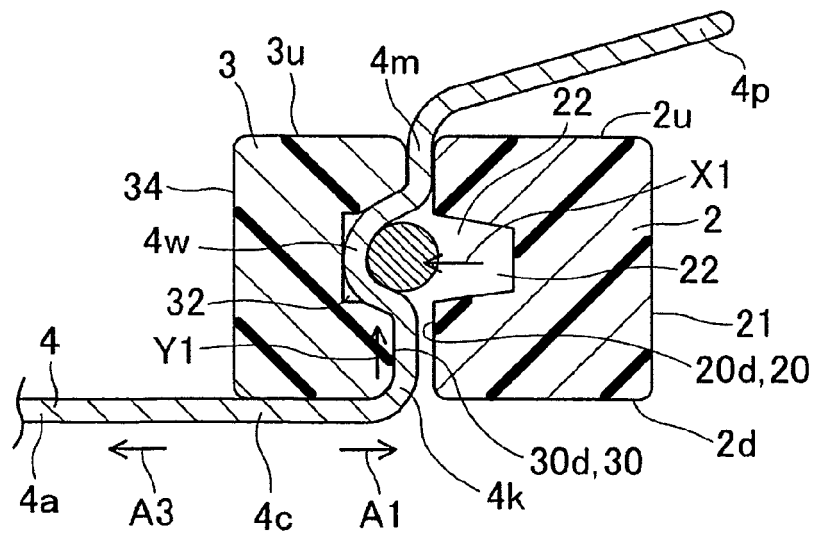


FIG. 6A

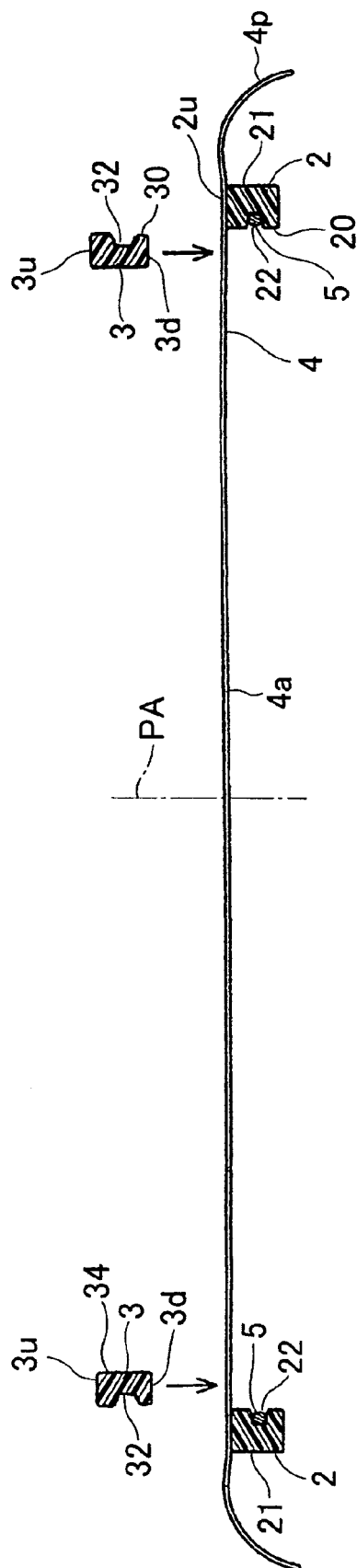


FIG. 6B

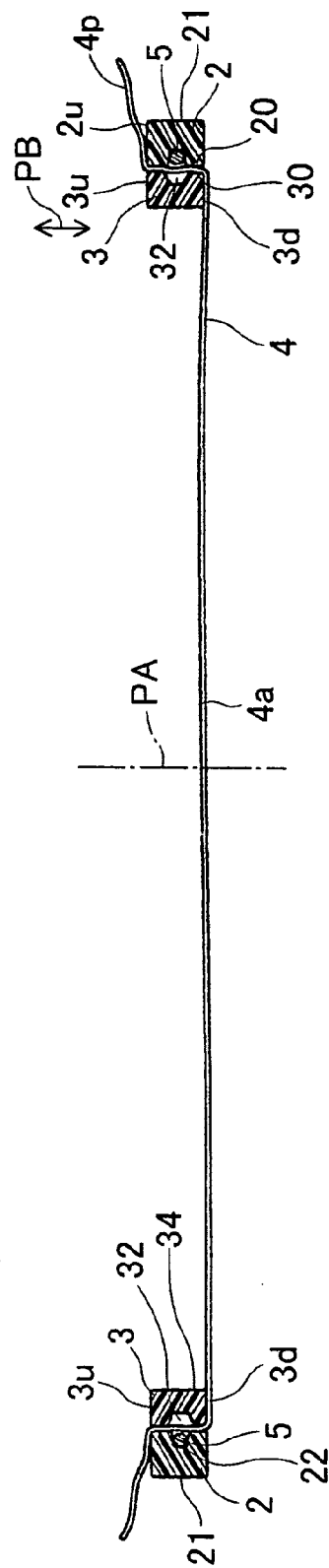


FIG. 7

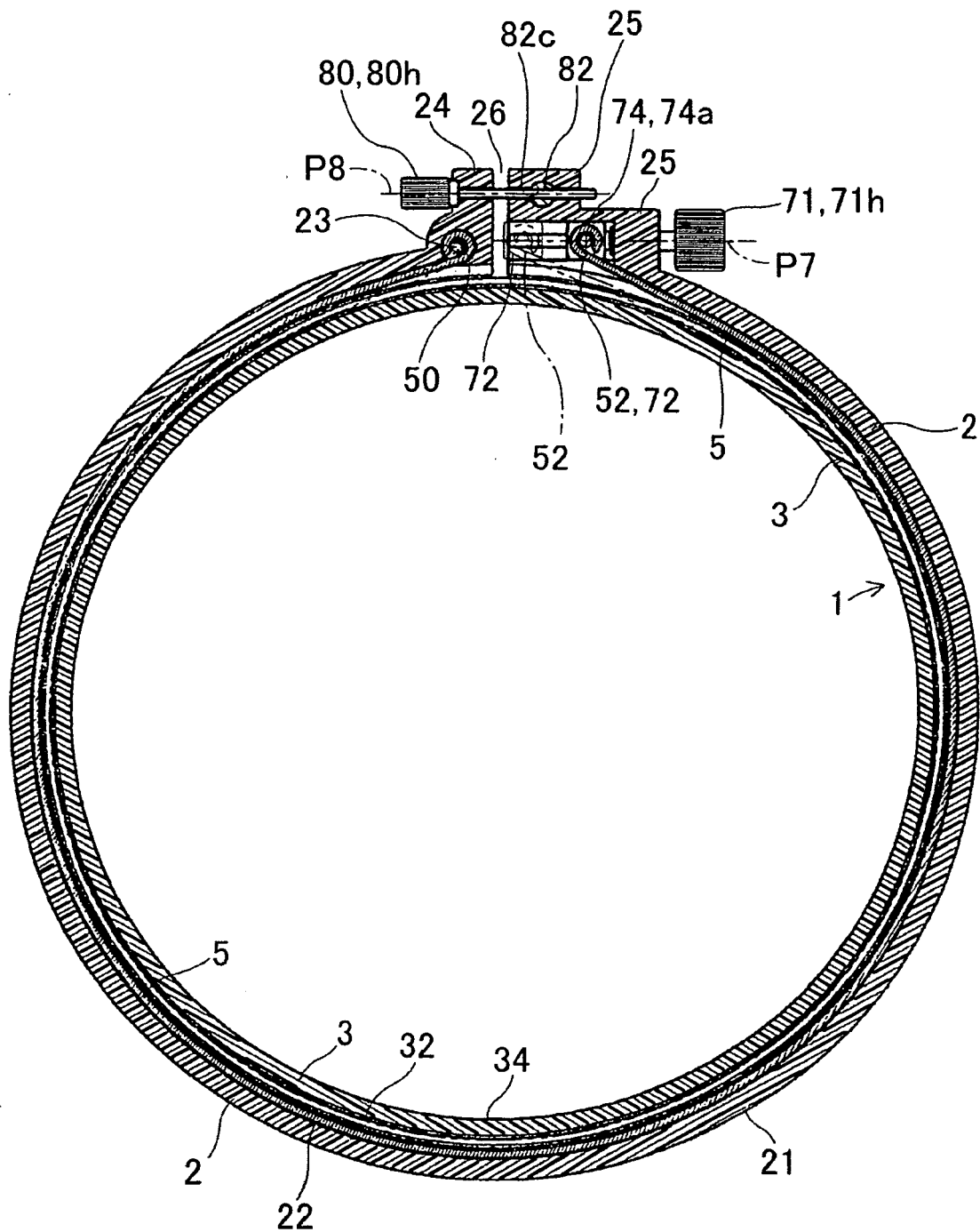


FIG. 8

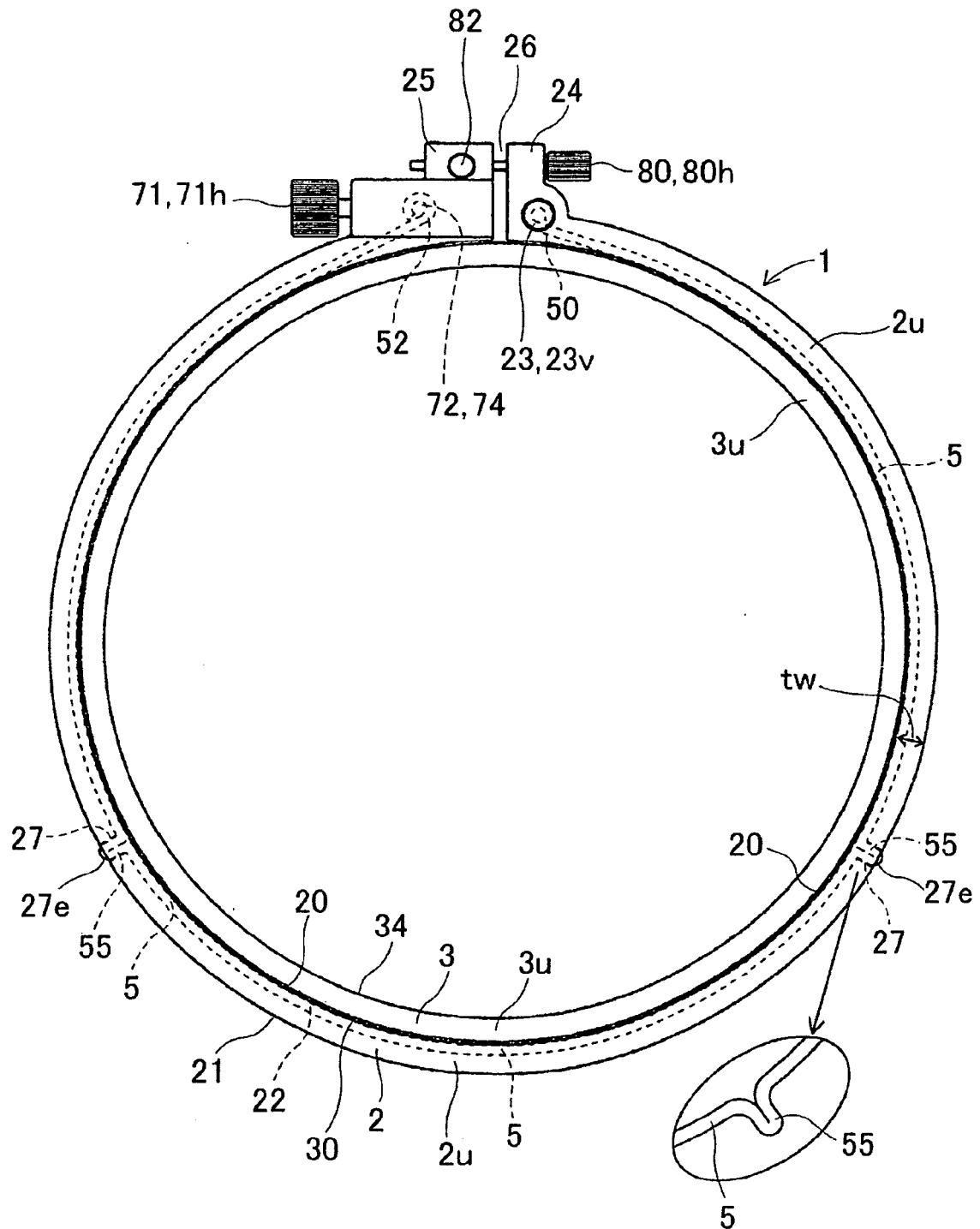


FIG. 9

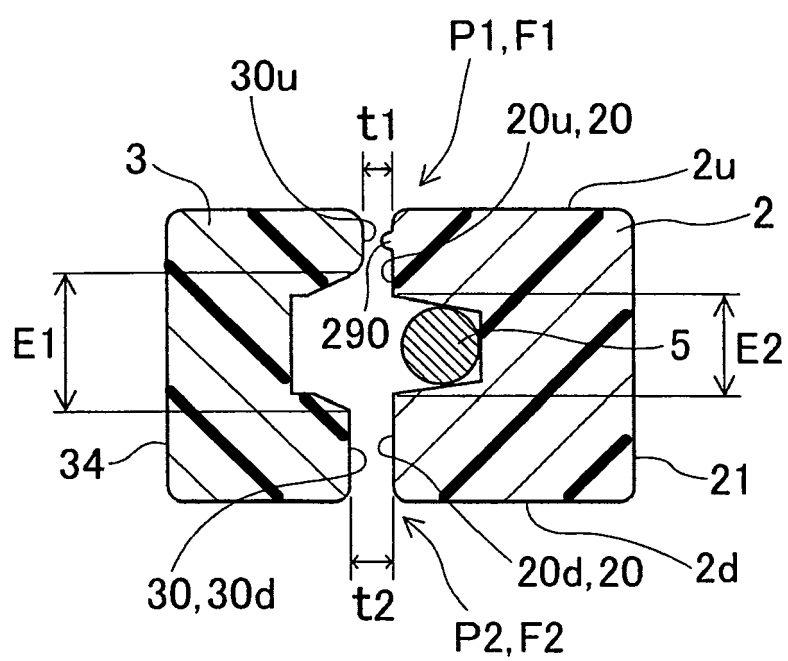


FIG. 10

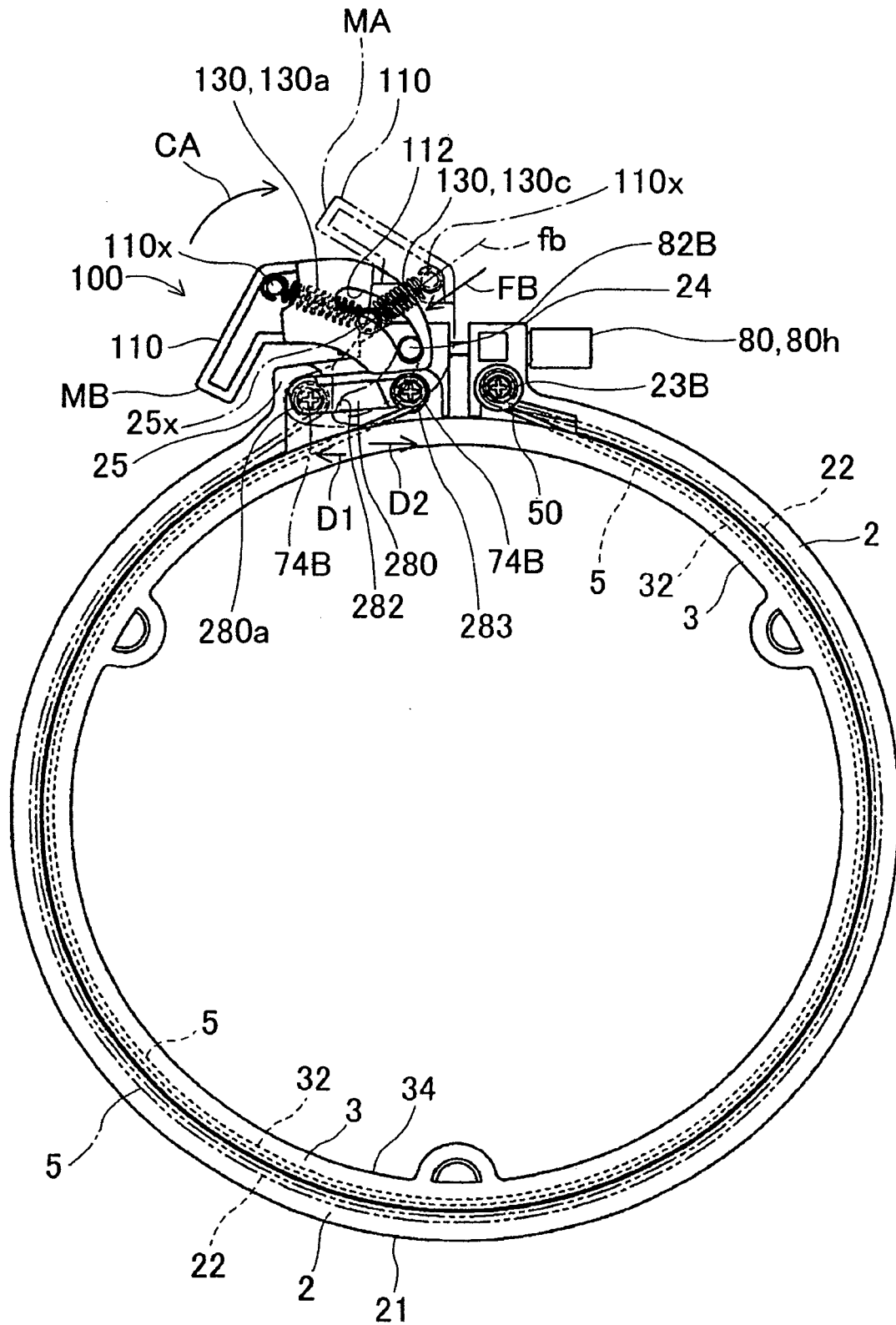


FIG. 11

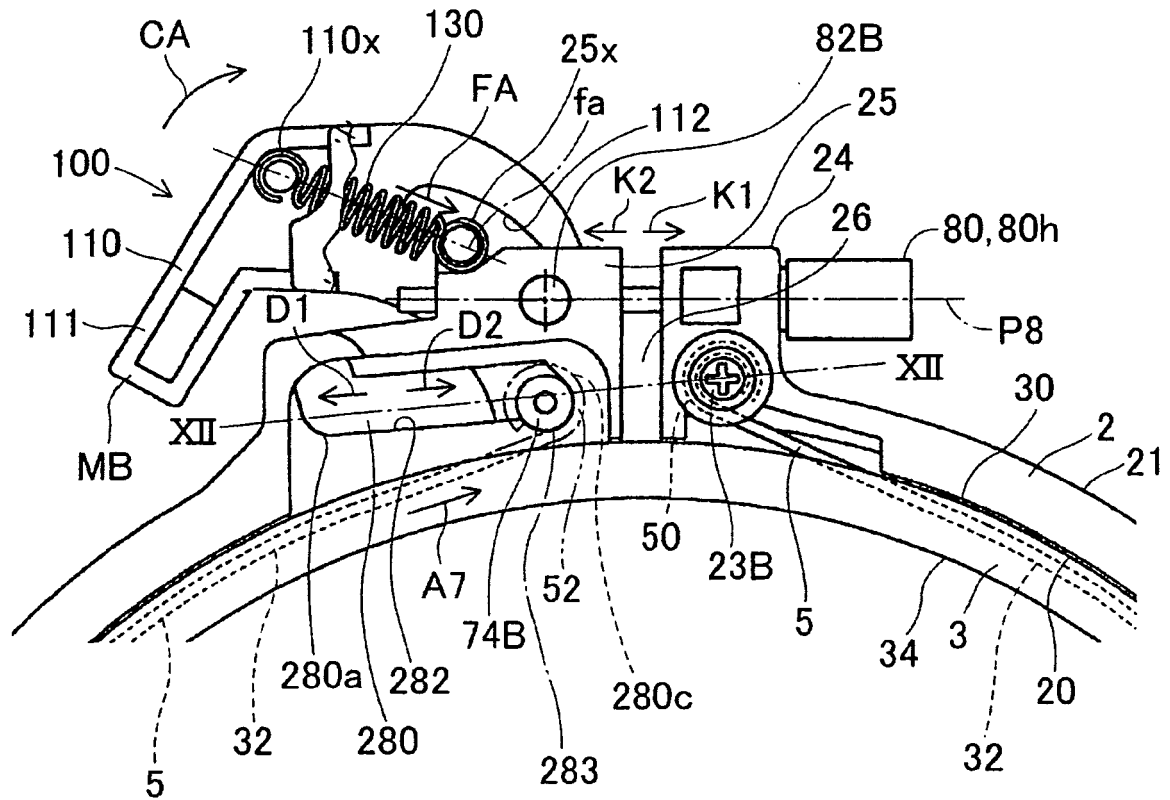
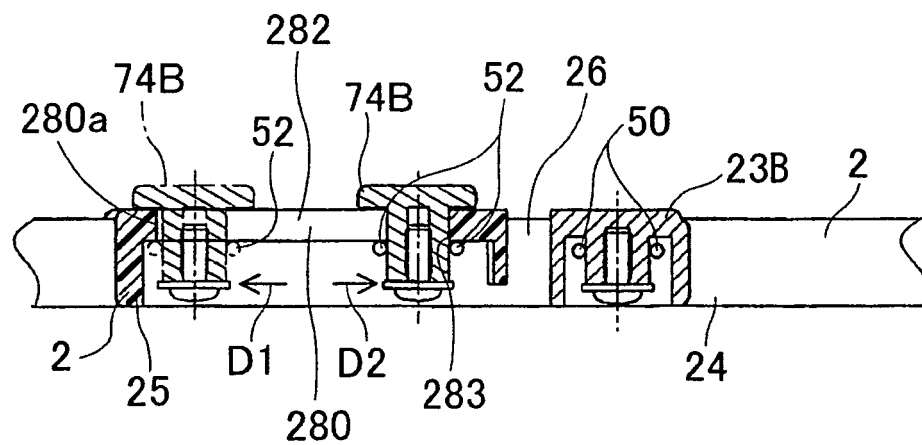


FIG. 12





EUROPEAN SEARCH REPORT

Application Number
EP 11 00 1892

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			D05C
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 21 July 2011	Examiner Herry-Martin, D
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21-07-2011

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REFERENCES CITED IN THE DESCRIPTION

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