(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 043 171 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
11.10.2000 Bulletin 2000/41

(51) Int. Cl.[7]: **B42F 13/36**

(21) Application number: **00106760.2**

(22) Date of filing: **29.03.2000**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **31.03.1999 JP 9378599**

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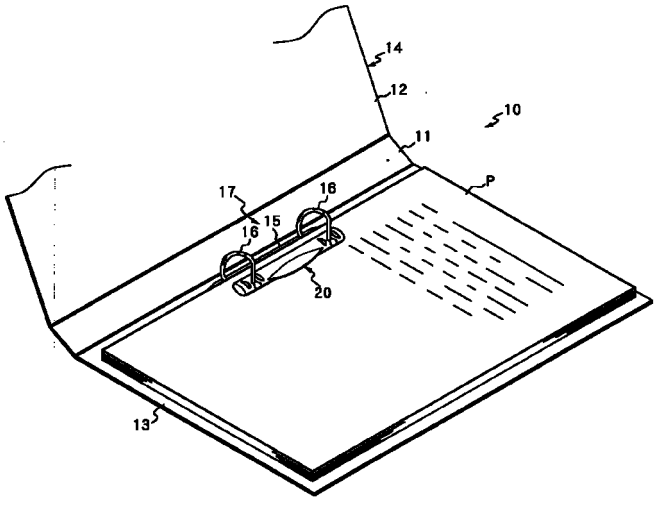
(54) Locking follower for ring binder

(57) A paper retainer 20 is detachably attached to a binder 17 provided with binding legs 16 erecting from an upper surface of a base 15. The paper retainer 20 includes a bar-like body portion 30. At both lengthwise ends of the body portion 30, there are formed first opening areas 33, 33 extending obliquely and allowing insertion of the binding legs 16, 16 therethrough, and second opening areas 34, 34 formed continuously to the first opening areas and being able to clamp the binding legs 16, 16 in the radial direction. By pressing an operating tab portion 31 included in the body portion 30 with the binding legs 16, 16 inserted respectively through the first opening areas 33, 33, the body portion 30 is rotated to forcibly position the binding legs 16, 16 into the second opening areas 34, 34, thereby fixedly holding the paper retainer 20 in place.

FIG.1



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Description

DETAILED DESCRIPTION OF THE INVENTION

FIELD OF THE INVENTION

[0001] The present invention relates to a paper retainer, and more particularly to a paper retainer capable of binding sheets of paper, which are inserted through binding legs, in a condition free from fluttering.

RELATED ART

[0002] Heretofore, ring files or binders have been widely employed which can bind sheets of paper together by inserting binding legs provided on a cover member through binding holes formed in the sheets of paper. When the number of sheets of paper to be bound is relatively small, there is a fear that the sheets of paper may flutter within a file and may be damaged. For that reason, a paper retainer 50, shown in Fig. 18, capable of pressing a binding area of sheets of paper against the inner surface of a file cover member and holding the sheets of paper in a tightly bound state has been proposed.

[0003] The paper retainer 50 is constructed of a plate-like member 52 having two elongate holes 51 through which two binding legs 60 are inserted respectively. Each of the elongate holes 51 has a first hole 53 that is extended in the lengthwise direction of the plate-like member 52 and has a width larger than a stem diameter of the binding leg 60, and a second hole 54 that is extended from the first hole 53 and has a width slightly smaller than the stem diameter of the binding leg 60, the first and second holes 53, 54 being formed continuously. The sheets of paper bound by the binding legs 60 are tightly gripped using the paper retainer 50 between it and the cover member (not shown) as follows. First, the paper retainer 50 is inserted through the binding legs and is pressed against the sheets of paper in a direction perpendicular to the paper surface. Then, the paper retainer 50 is slid from a condition shown in Fig. 8(A) in a direction of arrow A to a position shown in Fig. 8(B). In the position shown in Fig. 8(B), movement of the paper retainer 50 is restricted due to correlation between the outer diameter of the binding leg 60 and the width of the second hole 54. As a result, the sheets of paper are prevented from fluttering in the binding area.

[0004] With the above-described construction of the paper retainer 50, however, users must apply forces in two directions when tightly gripping sheets of paper. More specifically, users must apply a pressing force in the direction perpendicular to the paper surface and a sliding force in a direction along a flat surface of the paper retainer 50. This results in a problem of making the binding operation troublesome or difficult. Another problem is that, because forces must be applied in the two directions at the same time, the pressing force tends to become relatively weak and the sheets of paper cannot be sometimes tightly gripped between the paper retainer 50 and the cover member.

SUMMARY OF THE INVENTION

[0005] The present invention has been accomplished in view of the problems set forth above, and an object of the invention is to provide a paper retainer which gives users a simple operating feel by making a direction to apply a pressing force coincident with a direction to apply a gripping force, and which can surely maintain sheets of paper in a gripped posture.

[0006] To achieve the above object, according to the present invention, in a paper retainer fitted to binding legs erecting from a predetermined base surface and being able to grip sheets of paper between the paper retainer and the base surface,

the paper retainer includes a body portion having holes through which the binding legs can be inserted, and
the holes are formed such that, when the body portion is pressed toward the base surface and displaced through a predetermined extent, the paper retainer is held in a stationary state by the binding legs. With this arrangement, sheets of paper can be gripped just by simply pressing the body portion without troublesome operation of applying forces in two directions as required conventionally.

[0007] Also, according to the present invention, in a paper retainer fitted to binding legs erecting from a predetermined base surface and being able to grip sheets of paper between the paper retainer and the base surface,

the paper retainer includes a body portion having holes through which the binding legs can be inserted,
each of the holes is made up of a first opening area through which the binding leg can be loosely inserted, and a second opening area formed continuously to the first opening area and being able to clamp the binding leg in a radial direction, and
when the body portion is pressed toward the base surface with the binding legs inserted through the first opening areas, the binding legs are forced to position in the second opening areas and the paper retainer is fixedly held while the second opening areas are clamping the binding legs. With this arrangement, by operating the body portion to be pressed against the top surface of sheets of paper in a condition where the binding legs are inserted through the first opening areas, the binding legs can be moved into the second opening areas without difficulty, which are formed continuously to the

first opening areas. On this occasion, since movement of the body portion is restricted by a reaction developed upon the second opening areas applying clamping forces to the binding legs, users can simply and quickly perform the operation of gripping the sheets of paper. Further, since it is only required to apply a force in the direction of gripping the sheets of paper, the problem in operation can also be overcome.

[0008] In the present invention, preferably, the body portion has a shape extending in a lengthwise direction of the paper retainer, the first opening area is extended in an oblique direction with respect to an imaginary plane extending in a direction of short width of the body portion, the first opening area penetrating the body portion to be open at both opposite sides thereof, and the second opening area is extended in a direction substantially perpendicular to the imaginary plane, the second opening area penetrating the body portion to be open at both opposite sides thereof. With this arrangement, when the binding legs are inserted through the first opening areas, the body portion takes a tilted posture, allowing users to easily apply a pressing force for moving the binding legs to position in the second opening areas.

[0009] Preferably, the body portion is formed into a shape having a curved outer periphery at least in areas where the holes are formed, and the body portion includes an operating tab portion for moving the body portion such that the binding legs are moved from the first opening areas to the second opening areas. With this arrangement, users can smoothly perform the operation of moving the body portion downward while rotating it, and can be given a lighter operating feel because of the presence of an area to which the pressing force is to be applied. On the other hand, when detaching the paper retainer, it is only required to put a finger under the operating tab portion and lifting it upward. The burden imposed on users in the operation of attaching and detaching the paper retainer can therefore be reduced.

[0010] Alternatively, the body portion may have an elongated elliptical contour lying over the base surface in cross-section at least in areas where the holes are formed, and the body portion may include an operating tab portion for moving the body portion such that the binding legs are moved from the first opening areas to the second opening areas.

[0011] Further, in addition to the above arrangement, deformation allowances are preferably formed in the body portion at positions adjacent to the holes for allowing the second opening areas to slightly spread when the binding legs are moved from the first opening areas to the second opening areas. With this arrangement, when the binding legs are moved to position in the second opening areas, elastic deformation of the second opening areas is allowed without undue strains to give users a lighter operating feel, while stronger clamping forces for the binding legs can be developed.

[0012] Preferably, rotation position elevating means for causing the body portion to rotate at an elevated level is formed on the side of the body portion opposed to the operating tab portion. With this arrangement, in the case where a ring-shaped portion is formed around base ends of the binding legs as a result from, for example, caulking them, the paper retainer can be fitted in a position just above the ring-shaped portion out of interference with the same, and a fear of damaging the opening areas can be avoided. Further, a paper retainer having versatility can be provided which is applicable to any binder types regardless of shapes of the base ends of the binding legs.

[0013] Additionally, the rotation position elevating means is formed by a lug member projecting in a direction substantially perpendicular to the lengthwise direction of the body portion, and the lug member has a distal end positioned to contact the base surface in a condition where the binding legs locate in the first opening areas, the distal end of the lug member forming a center of rotation to elevate the body portion when the binding legs inserted through the first opening areas are moved into the second opening areas. With this arrangement, just by applying the pressing force to the operating tab portion, the body portion is automatically caused to rotate at a position elevated along axes of the binding legs. As a result, the paper retainer can be fitted in the elevated position with a very simple construction.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] Fig. 1 is a schematic perspective view of a ring notebook using a paper retainer according to a first embodiment, Fig. 2 is a schematic perspective view of the paper retainer, Fig. 3(A) is an enlarged left side view of Fig. 2, Fig. 3(B) is an enlarged sectional view taken along line A - A in Fig. 2, viewing in a direction of arrows, Fig. 4(A) is a plan view of the paper retainer in a condition where an operating tab portion is in a posture facing upward, Fig. 4(B) is a plan view of the paper retainer in a condition where the operating tab portion is in a horizontal posture, Fig. 5(A) is a partial cross-sectional view of the ring notebook, showing an initial operating state of the paper retainer, Fig. 5(B) is a partial cross-sectional view of the ring notebook, showing a tightly gripping state of the paper retainer, Fig. 6 is a plan view of a paper retainer according to a second embodiment of the present invention, Fig. 7 is a front view of Fig. 6, Fig. 8 is a rear view of Fig. 6, Fig. 9 is an enlarged sectional view taken along line B - B in Fig. 6, viewing in a direction of arrows, Fig. 10 is an enlarged sectional view taken along line C - C in Fig. 6, viewing in a direction of arrows, Fig. 11 is an enlarged sectional view taken along line D - D in Fig. 6, viewing in a direction of arrows, Fig. 12 is an enlarged sectional view taken along line E - E in Fig. 6, viewing in a direction of arrows, Fig. 13 is an enlarged sectional view taken along line F

- F in Fig. 6, viewing in a direction of arrows, Fig. 14 is a partial cross-sectional view of a ring notebook, showing an initial fitting operation state at the paper retainer according to the second embodiment, Fig. 15 is a partial cross-sectional view of the ring notebook, showing a condition immediately before applying a pressing force to the paper retainer according to the second embodiment, Fig. 16 is an enlarged sectional view of a principal part of Fig. 15, Fig. 17 is a partial cross-sectional view of the ring notebook, showing a condition where sheets of paper are tightly gripped by the paper retainer according to the second embodiment, and Figs. 18(A) and 18(B) are plan views of a conventional paper retainer, showing conditions in use at successive steps.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0015] Embodiments of the present invention will be described below with reference to the drawings.

[FIRST EMBODIMENT]

[0016] Fig. 1 is a schematic perspective view of a ring file to which a paper retainer according to a first embodiment of the present invention is applied. Referring to Fig. 1, a ring file 10 comprises a cover member 14 made up of a front cover 12 and a rear cover 13 which are connected to lie respectively on the left and right sides through a backbone 11, a base 15 arranged on an inner surface of the rear cover 13 on the side close to the backbone 11, and a binder 17 supported by the base 15 and having binding legs 16 each capable of jointing and separating at an upper position to close and open a loop. Sheets of paper P are bound by being inserted through the binding legs 16, and a paper retainer 20 is fitted to the binding legs 16 in contact with a top surface of the sheets of paper P.

[0017] The paper retainer 20 is, though not particularly limited, formed of a one-piece molding produced using a resin, such as polyacetal (POM), polystyrene or ABS, as a molding material in this embodiment. As shown in Figs. 2 and 3, the paper retainer 20 comprises a body portion 30 that is in the form of a bar as a whole, has an elongated elliptical contour lying over the sheets of paper P in cross-section and has a curved outer periphery, and an operating tab portion 31 provided on the side of an upper surface 30A of the body portion 30. Holes 32, 32 allowing insertion of the binding legs 16, 16 are formed in positions near both lengthwise ends of the body portion 30, respectively.

[0018] The operating tab portion 31 comprises, as shown in Fig. 3, a pressing surface 31A projecting from a top position of the upper surface 30A of the body portion 30 substantially horizontally and extending substantially parallel to the direction of a long axis of the elongated ellipse, and a finger picking-up surface 31B extending from an outer edge of the pressing surface 31A obliquely toward a lower right part of the body portion 30 in Fig. 3.

[0019] The hole 32 is, though actually formed by molding with a specific mold, formed into a shape resulted as if the body portion 30 is drilled in two directions to provide through holes having axes to cross each other. More specifically, as shown in Fig. 3(B), the hole 32 is made up of a first opening area 33 which is extended in an oblique direction C1 rising toward the right with respect to a maximum diameter D of the body portion 30 corresponding to a direction substantially parallel to an imaginary horizontal plane, the first opening area 33 penetrating the body portion 30 to be open at both lateral sides thereof, and a second opening area 34 which is extended in a direction substantially perpendicular to the imaginary horizontal plane, i.e., a vertical direction C2 substantially perpendicular to the direction of the maximum diameter D, the second opening area 34 penetrating the body portion 30 to be open at the upper and lower sides thereof. Looking at the first and second opening areas 33, 34 from above in Fig. 2, therefore, these areas appear like a gourd in shape.

[0020] Next, dimensional conditions of the binding legs 16 and the first and second opening areas 33, 34 will be described with reference to Figs. 4(A) and 4(B). Fig. 4(A) is a plan view showing an initial condition where the paper retainer 20 is inserted through the binding legs 16, and Fig. 4(B) is a plan view showing a condition where the sheets of paper P are tightly gripped by the paper retainer 20. Note that Figs. 4(A) and 4(B) represent the paper retainer 20 shown in Figs. 5(A) and 5(B) and viewed from above, respectively.

[0021] Referring to Fig. 4, an inner diameter D1 of the first opening area 33 is set to be greater than an outer diameter D2 of the binding leg 16, while an inner diameter D3 of the second opening area 34 is set to be slightly smaller than the outer diameter D2. By so setting, the first opening area 33 is formed so as to freely fit with the binding leg 16. On the other hand, when the binding leg 16 is forcibly pushed to come into the second opening area 34, the second opening area 34 is elastically deformed to enlarge its own opening area to some extent, and at the same time exerts an appropriate clamping force to the binding leg 16. In order to allow elastic deformation of the second opening area 34 without difficulty, slot holes 35, 35 are formed to serve as deformation allowances. The slot holes 35, 35 are formed in positions that locate on both sides of each of the holes 32, 32 at the center and are adjacent to it. The slot holes 35, 35 are substantially in the form of elongate holes extending in the direction of short width of the body portion 30.

[0022] With the above construction, as shown in Fig. 5, the paper retainer 20 of this embodiment can tightly grip the sheets of paper P together in a binding area under cooperation with the base 15 by pressing the body portion 30 against the sheets of paper P in a condition where the holes 32 are inserted through the

binding legs 16. More specifically, since the first opening area 33 is formed to extend in the oblique direction as described above, the paper retainer 20 is first arranged on the sheets of paper P in a tilted state, i.e., in a posture of the operating tab portion 31 facing upward. Then, the pressing surface 31A is pressed so that the body portion 30 is rotated in a direction of arrow B in Fig. 5(A) to take a position shown in Fig. 5(B). The binding legs 16 are thereby forcibly moved into the second opening areas 34, causing clamping forces to act on the binding legs in the radial direction. As a result, subsequent movement of the paper retainer 20 is restricted and the sheets of paper P can be maintained in a tightly gripped state in the binding area. In the above operation, since the paper retainer 20 is arranged on the sheets of paper P in the tilted state, the direction to apply a pressing force is applied and the direction to apply a tightly gripping force are substantially coincident with each other. Accordingly, the paper retainer 20 can be surely maintained in a posture tightly gripping the sheets of paper P, while users can be given a simple operating feel.

[0023] The operation of releasing the sheets of paper P from the tightly gripped state is as follows. By rotating the paper retainer 20 in a direction opposed to the direction of arrow B, i.e., by putting a finger under the finger picking-up surface 31B and lifting the operating tab portion 31 upward, the binding legs 16 are dislodged from the second opening areas 34 to move into the first opening areas 33, whereupon the sheets of paper P can be released from the tightly gripped state.

[0024] Thus, the first embodiment described above can provide such an advantage that the operation of tightly gripping and releasing the sheets of paper P can be very simply and quickly effected just by rotating the paper retainer 20. In addition, since the tightly gripping operating is achieved by rotating the body portion 30 only in the same direction as pressing the sheets of paper P downward, the sheets of paper P can be tightly gripped while being surely pressed downward. The paper retainer 20 is therefore free from a fitting failure.

[SECOND EMBODIMENT]

[0025] A second embodiment of the present invention will be next described with reference to Figs. 6 to 17. In the following description, the same or equivalent components to those in the above first embodiment are denoted by the same numerals as needed, and explanation of those components is omitted or simplified.

[0026] As shown in Fig. 16 in enlarged scale, this second embodiment is featured in that a paper retainer 20 is also applicable to a binder 17 of the type wherein a base end 16A of a binding leg 16 is fixed to a base 15 by caulking and a ring-shaped portion 38 is formed around the base end 16A of the binding leg 16. Concretely, a lug member 39 is provided on the side of a body portion 30 opposed to an operating tab portion 31, and serves as a means for causing the body portion 30 to rotate at an elevated level (i.e., rotation position elevating means). The lug member 39 is provided to have a width shorter than the width of the operating tab portion 31 in the right and left direction in Fig. 7. Therefore, the lug member 39 is allowed to contact the top surface of sheets of paper in a position not interfering with the binding legs 16, when the paper retainer 20 is fitted on the binding legs 16. Note that the width of the lug member 39 is not particularly limited so long as it is shorter than the length between the base ends of the binding legs 16, 16. Also, as shown in Fig. 9, the lug member 39 is provided in the form to extend downward from a left end of the body portion 30, as viewed in Fig. 9, substantially in the vertical direction, i.e., in a direction substantially perpendicular to the direction of short width of the body portion 30 (the right and left direction in Fig. 9). Then, as shown in Fig. 16, a distal end 39A of the lug member 39 is set to have such a length that, when the paper retainer 20 is entirely in the tilted state with the binding legs 16 positioned in the first opening areas 33, the distal end 39A is able to contact the surface of the base 15. In areas at both lengthwise ends of the body portion 30 where the holes 32 and the slot holes 35 are formed, the body portion 30 has an elongated elliptical contour having a curved outer periphery. On the other hand, in an area of the body portion 30 between the two slot holes 35, 35 that are inner ones among the total four slot holes 35, 35 every two of which are formed at each of both the lengthwise ends of the body portion 30, the body portion 30 is in the form of an arc-shaped piece connecting to the operating tab portion 31. Further, voids 40 (see Figs. 8 and 13) are formed in lower parts of the body portion 30 near the both ends thereof. Such a structure contributes to cutting down the amount of a material used and reducing the weight of the paper retainer as a whole.

[0027] In the second embodiment, sheets of paper P are bound and gripped with the paper retainer 20 essentially in the same manner as in the first embodiment. When the paper retainer 20 is set as shown in Fig. 16 and the operating tab portion 31 is pressed to apply a force for rotating the paper retainer 20, the body portion 30 is rotated while the distal end 39A of the lug member 39 is held in contact with the top surface of the sheets of paper P at an initial stage of the rotating operation, because the distal end 39A of the lug member 39 has a length being able to contact the surface of the base 15. It is therefore possible to suppress a further descent of the body portion 30 and to avoid a fear that the first opening areas 33 may bite into the ring-shaped portion 38 to disable further rotation of the paper retainer 20. Then, as shown in Fig. 17, when the operating tab portion 31 is rotated to a position where it lies substantially parallel to the surface of the base 15, the binding legs 16 are positioned in the second opening areas 34 just above the ring-shaped portion 38 in close relation.

[0028] Accordingly, this second embodiment described above can provide such an advantage that the paper retainer 20 is applicable even to the binder which has a structure of caulking the base ends 16A of the binding legs 16 and has the larger-diameter ring-shaped portions 38 around the base ends 16A.

[0029] It is to be noted that the number of the holes 32 formed in the paper retainer 20 is not limited to the number in the illustrated construction, but may be increased as needed. Thus, it is sufficiently satisfied in the present invention that the number of the formed holes is determined depending on the number of the binding legs, the length of the binder, and so on.

[0030] Also, while the above embodiments show a structure in which the opening areas for insertion of the binding legs therethrough are completely enclosed, the present invention is not limited to such a structure. As an alternative, the opening area may be formed into such a cutout shape that the body portion is partly cut from the opening area toward an outer edge thereof. Thus, it is essential in the present invention that the opening area has such a shape as enabling the paper retainer to be fitted to the binding legs in a stationary state upon displacement of the body portion.

[0031] According to the paper retainer of the present invention, as described above, since the body portion is displaced and securely held on the binding legs by operating the body portion to be pressed against the paper surface, sheets of paper can be gripped with very simple operation.

[0032] Also, since the binding legs are moved from the first opening areas to the second opening areas where clamping forces are imposed on the binding legs, a hole structure is very simple and the paper retainer can be kept in a fitted position with stability.

[0033] Further, with such an arrangement that the body portion has a shape extending in a lengthwise direction of the paper retainer, the first opening area is extended in an oblique direction with respect to an imaginary plane extending in a direction of short width of the body portion, and the second opening area is extended in a direction substantially perpendicular to the imaginary plane, the body portion takes a tilted posture when the binding legs are inserted through the first opening areas, allowing users to easily apply a pressing force for moving the binding legs to position in the second opening areas.

[0034] Still further, since the body portion has a curved outer periphery in areas where the holes are formed and the body portion includes an operating tab portion for moving the body portion to rotate, users can smoothly perform the operation of moving the body portion downward while rotating it, and can be given a lighter operating feel because of the presence of an area to which the pressing force is to be applied. In addition, when detaching the paper retainer, it is only required to put a finger under the operating tab portion and lifting it upward. The burden imposed on users in the operation of attaching and detaching the paper retainer can therefore be reduced.

[0035] Still further, with such an arrangement that deformation allowances are formed at positions adjacent to the holes, resistance developed upon the binding legs being moved to position in the second opening areas can be weakened so that users are given a lighter operating feel, while stronger clamping forces for the binding legs can be developed.

[0036] Still further, with such an arrangement that the rotation position elevating means is formed by a lug member projecting in a direction substantially perpendicular to the lengthwise direction of the body portion, and the lug member has a distal end forming a center of rotation to elevate the body portion when the body portion is rotated, the body portion is automatically caused to rotate at a position elevated along axes of the binding legs just by applying the pressing force to the operating tab portion. As a result, the paper retainer can be fitted in the elevated position with a very simple construction.

Claims

1. A paper retainer fitted to binding legs erecting from a predetermined base surface and being able to grip sheets of paper between said paper retainer and said base surface,
   wherein said paper retainer includes a body portion having holes through which said binding legs can be inserted, and

   said holes are formed such that, when said body portion is pressed toward said base surface and displaced through a predetermined extent, said paper retainer is held in a stationary state by said binding legs.

2. A paper retainer fitted to binding legs erecting from a predetermined base surface and being able to grip sheets of paper between said paper retainer and said base surface,
   wherein said paper retainer includes a body portion having holes through which said binding legs can be inserted,

   each of said holes is made up of a first opening area through which said binding leg can be loosely inserted, and a second opening area formed continuously to said first opening area and being able to clamp said binding leg in a radial direction, and
   when said body portion is pressed toward said base surface with said binding legs inserted through said first opening areas, said binding legs are forced to position in said second opening areas and said paper retainer is fixedly held while said second opening areas are clamping said binding legs.

3. A paper retainer according to Claim 2, wherein said body portion has a shape extending in a lengthwise direction of said paper retainer, said first opening area is extended in an oblique direction with respect to an imaginary plane extending in a direction of short width of said body portion, said first opening area penetrating said body portion to be open at both opposite sides thereof, and said second opening area is extended in a direction substantially perpendicular to the imaginary plane, said second opening area penetrating said body portion to be open at both opposite sides thereof.

4. A paper retainer according to Claim 2 or 3, wherein said body portion is formed into a shape having a curved outer periphery at least in areas where said holes are formed, and said body portion includes an operating tab portion for moving said body portion such that said binding legs are moved from said first opening areas to said second opening areas.

5. A paper retainer according to Claim 2 or 3, wherein said body portion has an elongated elliptical contour lying over said base surface in cross-section at least in areas where said holes are formed, and said body portion includes an operating tab portion for moving said body portion such that said binding legs are moved from said first opening areas to said second opening areas.

6. A paper retainer according to any one of Claims 2 to 5, wherein deformation allowances are formed in said body portion at positions adjacent to said holes for allowing said second opening areas to slightly spread when said binding legs are moved from said first opening areas to said second opening areas.

7. A paper retainer according to Claim 5 or 6, wherein rotation position elevating means for causing said body portion to rotate at an elevated level is formed on the side of said body portion opposed to said operating tab portion.

8. A paper retainer according to Claim 7, wherein said rotation position elevating means is formed by a lug member projecting in a direction substantially perpendicular to the lengthwise direction of said body portion, and said lug member has a distal end positioned to contact said base surface in a condition where said binding legs locate in said first opening areas, thereby suppressing a descent of said body portion when said operating tab portion is operated.

FIG.1

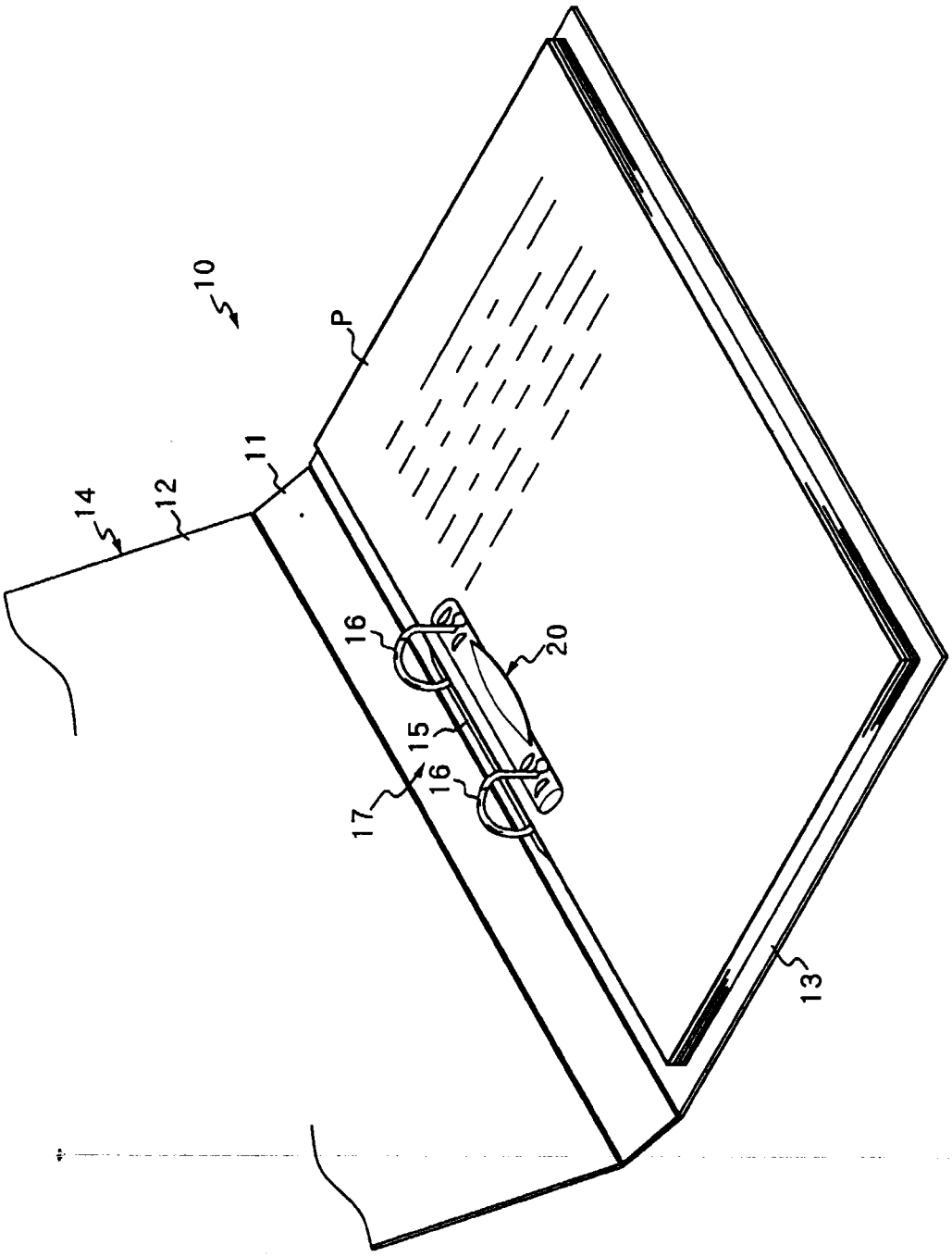


FIG.2

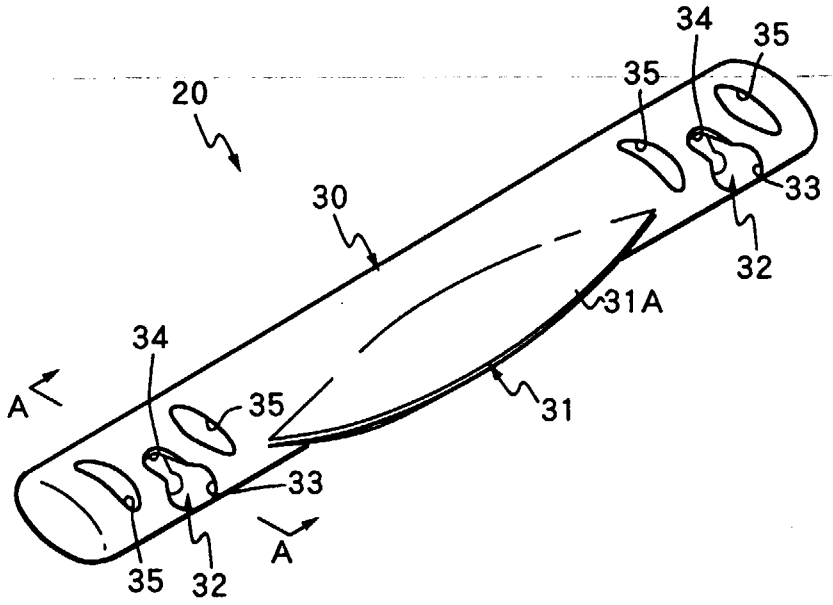


FIG.3 (A)

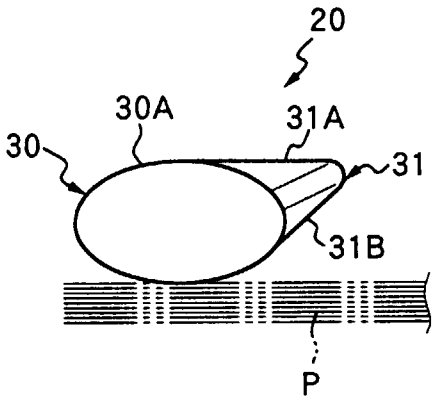


FIG.3 (B)

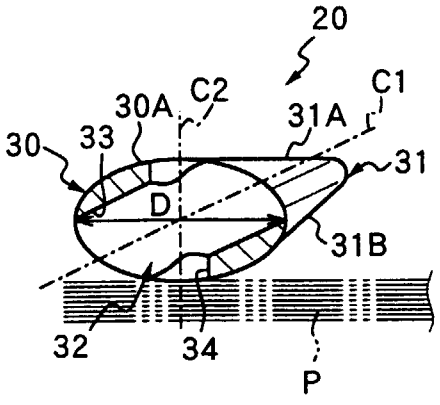
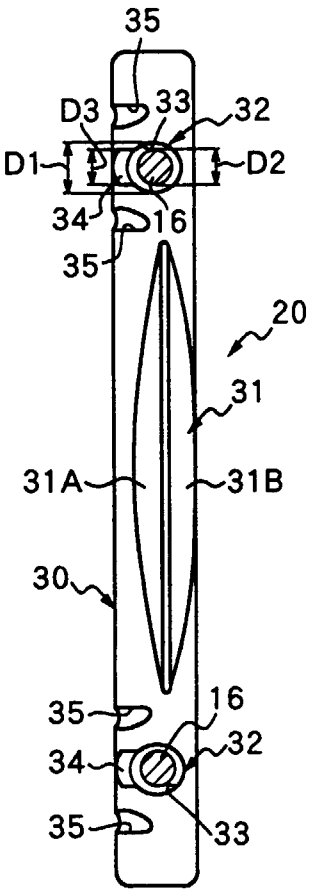


FIG.4 (A)


35
D3
33
32
D1
D2
34
16
35
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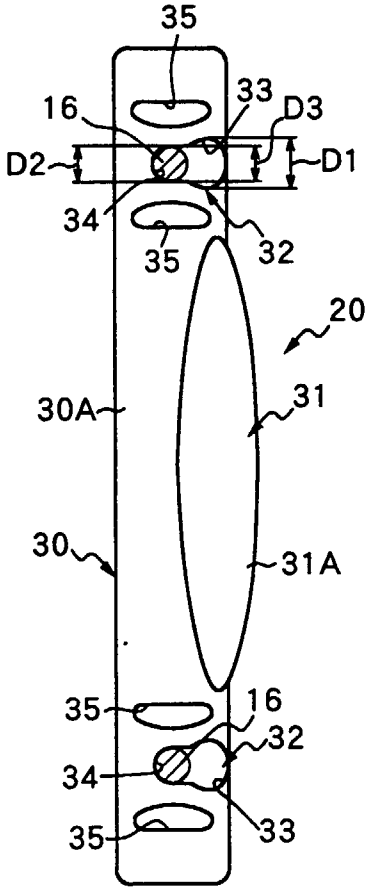
31
31A
31B
30
35
16
34
32
35
33

FIG.4 (B)


35
16
33
D3
D2
D1
34
35
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20
30A
31
30
31A
35
16
34
32
35
33

FIG.5 (A)

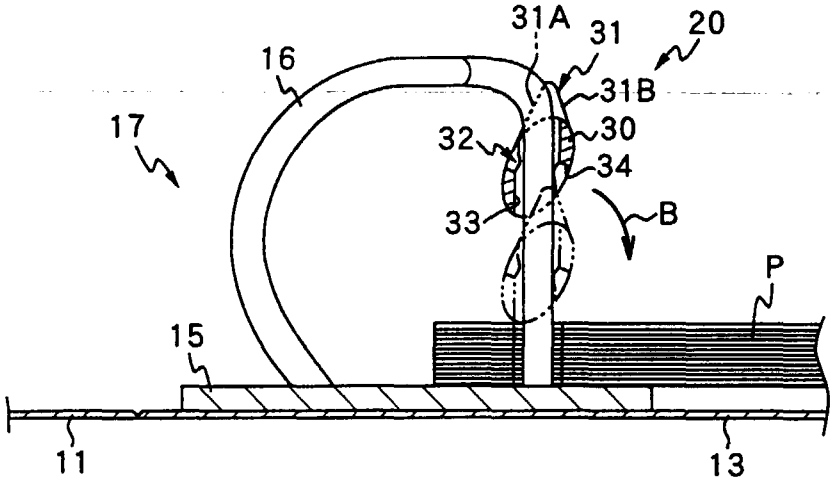
31A
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FIG.5 (B)

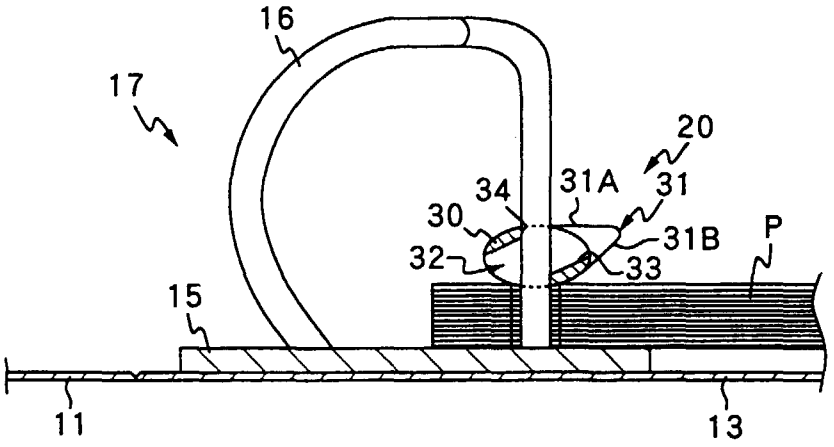
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FIG.6

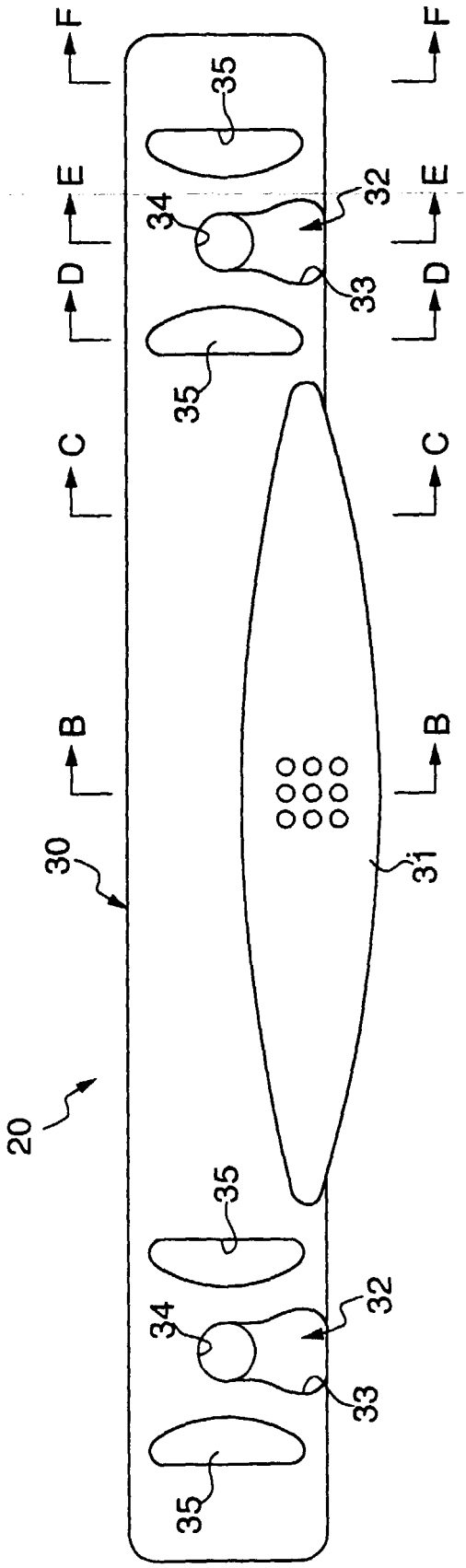

FIG.7

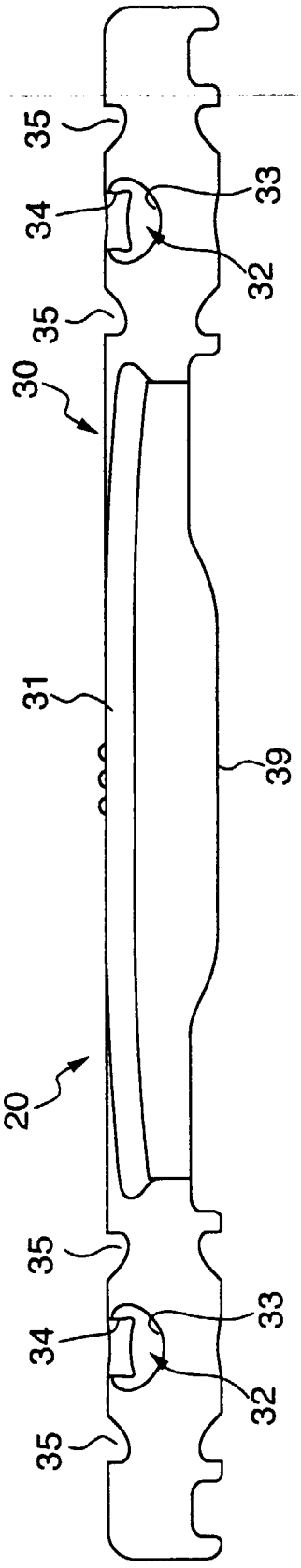

FIG.8

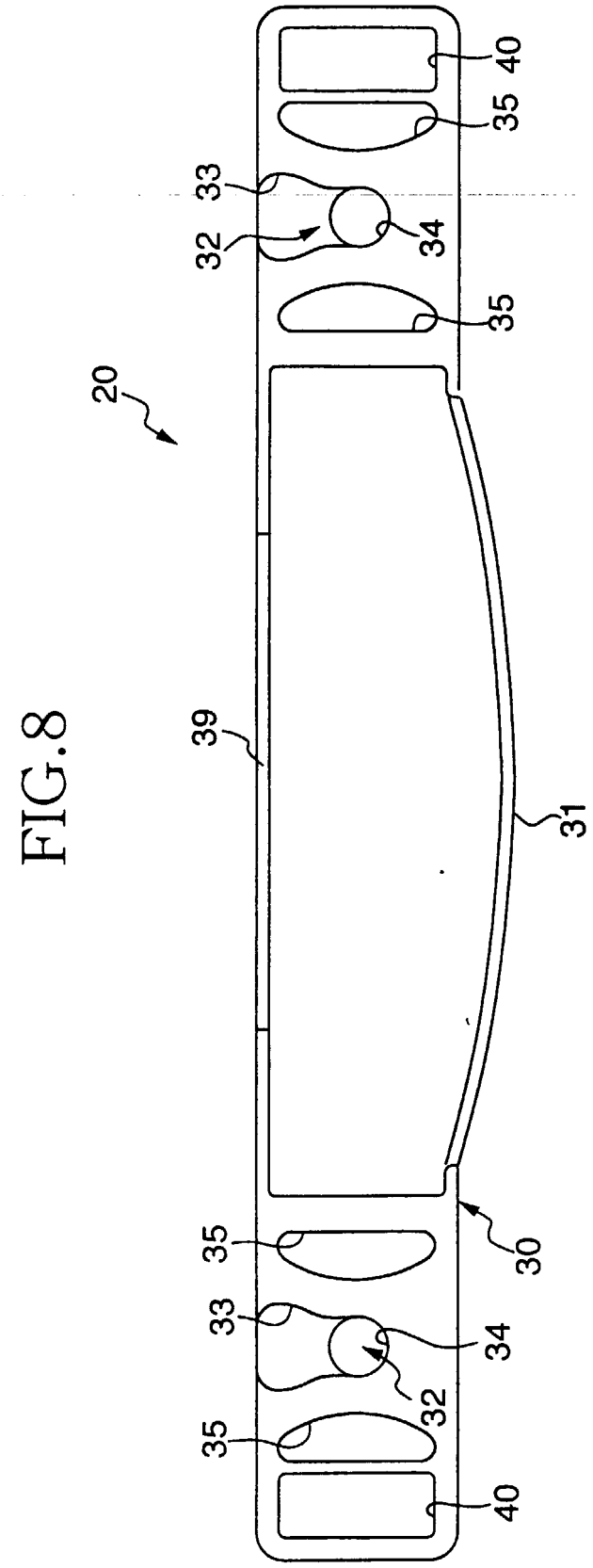

FIG.9

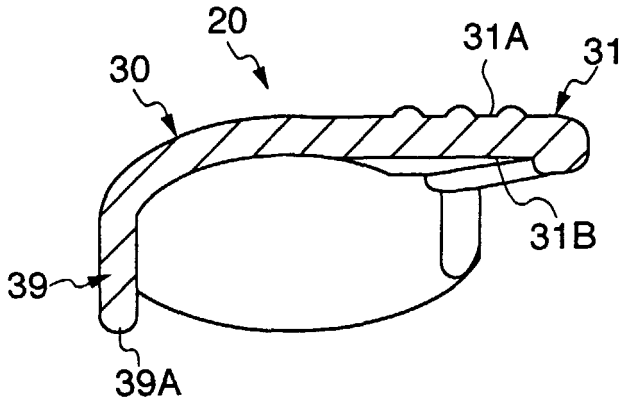

FIG.10

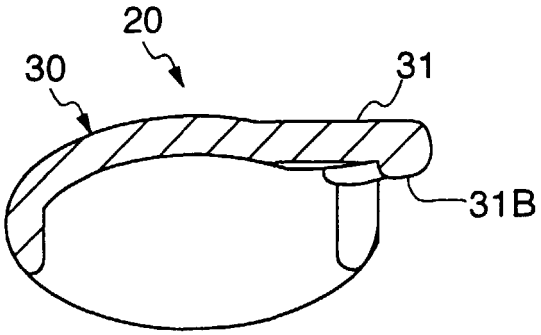

FIG.11

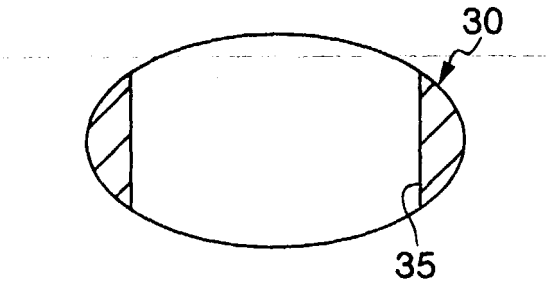

FIG.12

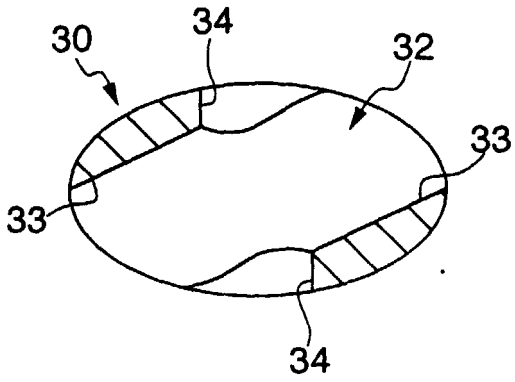

FIG.13

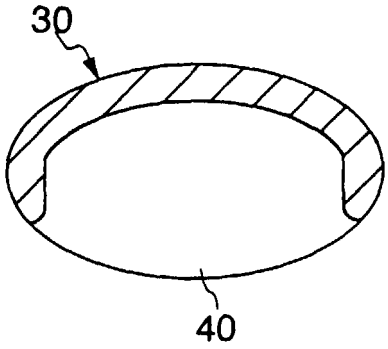

FIG.14

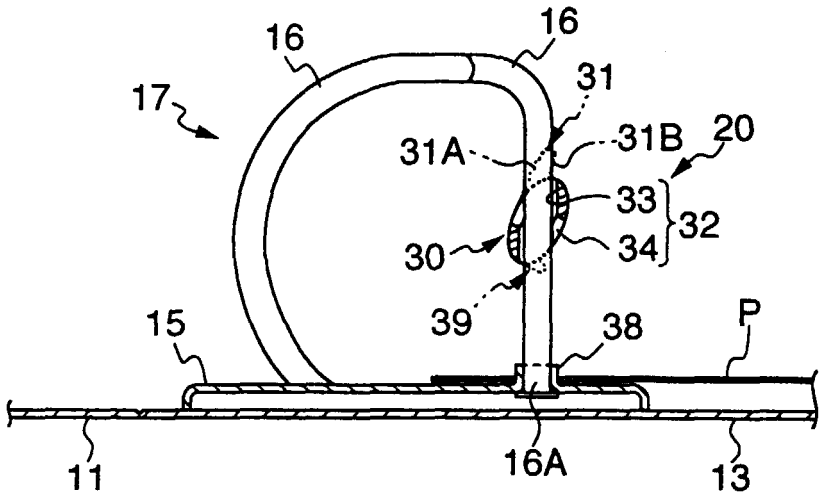
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FIG.15

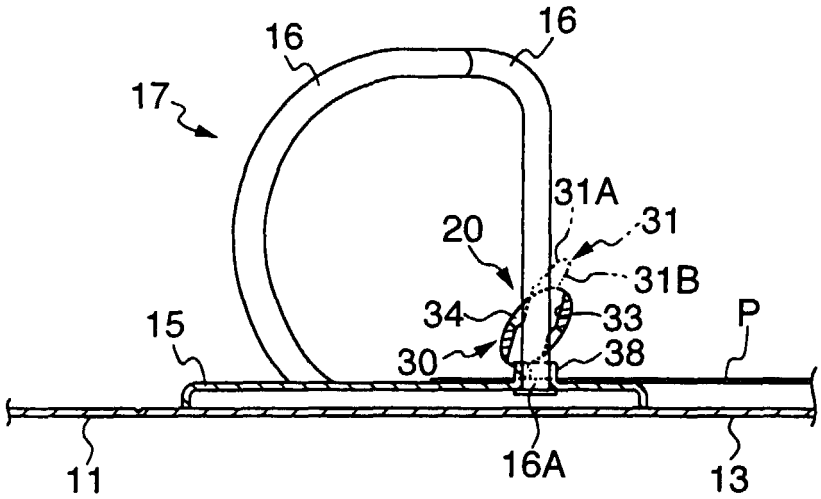
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FIG.16

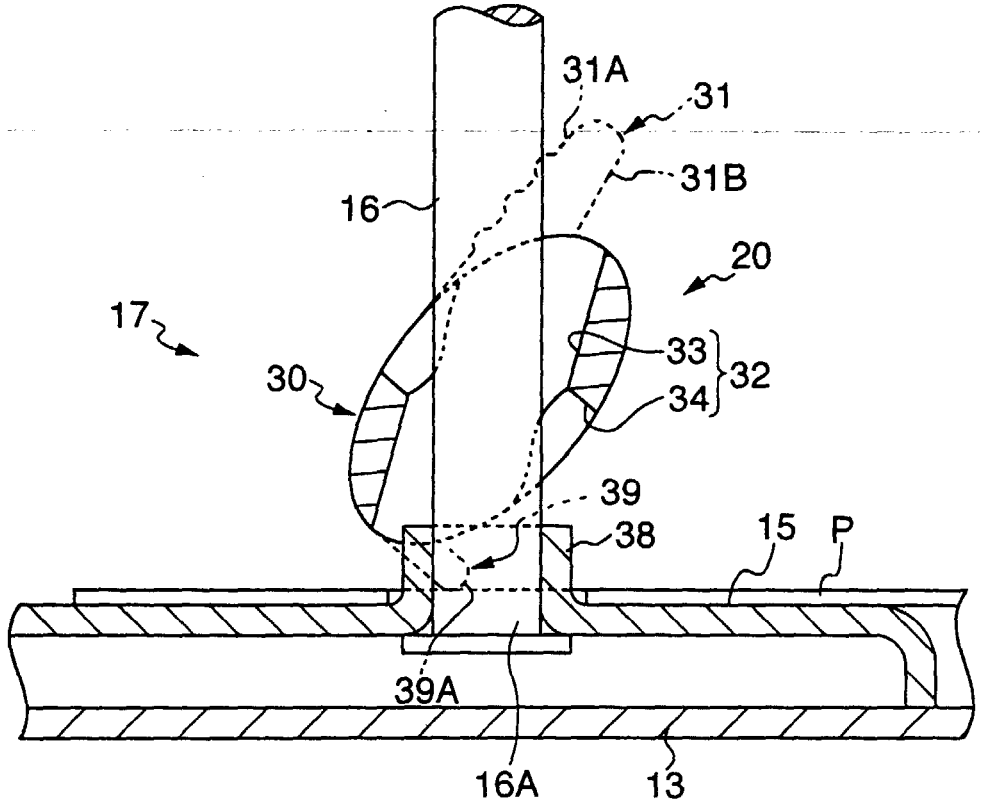
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FIG.17

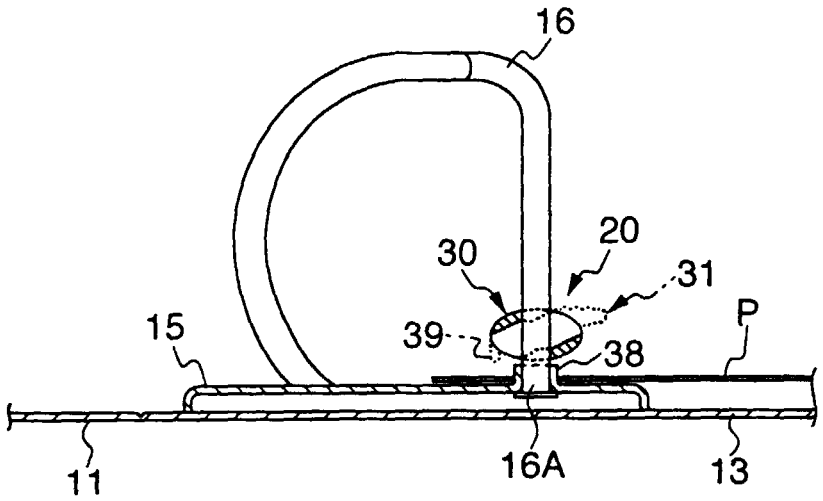
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FIG.18 (A)

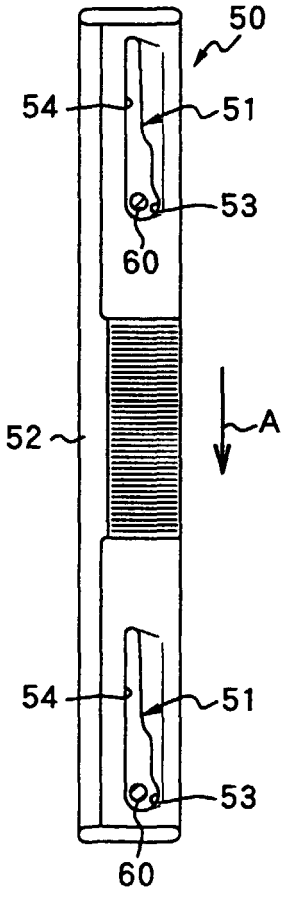

FIG.18 (B)