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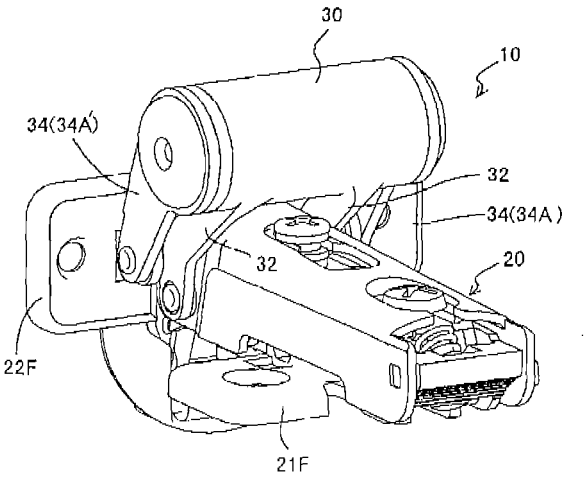
(54) **HINGE WITH DAMPER**

(57) A damper built-in hinge provided with a hinge (20) comprising first and second hinge members (21, 22) pivotally connected with each other and a damper (30) for controlling the opening and closing of the first and second hinge members (21, 22), this damper comprising a first arm having one end pivotally supported on the first hinge member (32), a second arm (34) having one end pivotally supported on the second hinge member (22) and a damper body (41) provided between the other ends of the first and second arms (32, 34), and this damper body being adapted to generate a damper force by relative rotary movement of the first and second arms (32, 34). There is provided the damper built-in hinge adapted to be attached to hinges of various forms without any troublesome assembling of the hinge.

FIG. 2



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Description

TECHNICAL FIELD

[0001] This invention relates to a hinge with a damper which can be suitably used to be attached between a case such as a box etc., for example and a door thereof to moderately open or close the door.

BACKGROUND OF TECHNOLOGY

[0002] There have been proposed various hinges with a damper, which are used to open or close a door in a moderate manner (see patent documents 1 through 3). These prior art hinges with the damper have the damper assembled within component parts of the hinges (see patent documents 1 and 2) or have damper and hinge absolutely independent formed so that the hinge and the damper are separately attached between the case and the door (see patent document 3).

[0003] One example of the hinges with the built-in damper is disclosed in patent document 1 and the hinge is formed by inserting damper parts into a pivotal portion of two hinge members from both sides.

[0004] However, since the hinge of such a construction has the complicated construction and therefore the assembling thereof gets troublesome. In addition thereto, such a hinge is disadvantageously inapplicable to various forms of hinge such as the so-called slide hinge in which two hinge members are connected through a linkage mechanism.

[0005] Another example of the hinges with the built-in damper is disclosed in patent document 2. This hinge comprises a piston type bellows damper attached between a free end of a lever pivotally supported in a hinge arm and the hinge arm.

[0006] Since the hinge with the built-in damper of such a construction has the piston type damper provided between the hinge arm and the lever, the direction in which the hinge moves and the direction in which the damper moves are different from each other and therefore, the damper has the movement disordered out of a linear movement whereby the assembling of the hinge gets troublesome and therefore similarly it can be disadvantageously inapplicable to various forms of hinge.

[0007] As the hinge with the damper is formed by the absolutely independent hinge and damper as shown in patent document 3, they have to be separately attached between the case and the door. Thus, the attachment operation of them requires much labor and if they are attached to incorrect positions, the movement of the hinge and the movement of the damper interfere with each other so that they cannot interlock with each other. This makes the setting of the attachment position troublesome and the attachment operation cannot be effectively made.

[0008]

Patent Document 1: JP 7-233670A
Patent Document 2: JP 2-502933A
Patent Document 3: JP 8-284523A

[0009] An object of the invention is to provide a hinge with a damper adapted to be applicable to various forms of hinge without making troublesome the assembling of the hinge.

[0010] Another object of the invention is to provide a hinge with a damper adapted to easily assemble the damper.

DISCLOSURE OF THE INVENTION

[0011] According to the invention, there is provided a hinge with a damper provided with a hinge comprising first and second hinge members pivotally connected with each other and a damper for controlling the opening and closing of the first and second hinge members, characterized in that the damper comprises a first arm having one end pivotally supported on the first hinge member; a second arm having one end pivotally supported on the second hinge member; and damper force generation means provided between the other ends of the first and second arms and that the damper force generation means is adapted to generate a damper force by relative rotary movement of the first and second arms.

[0012] In the hinge with the damper of the invention, the damper force means may comprise a damper body to generate the damper force between stationery and movable sections, the movable section of the damper body may be in the form of a rotary shaft, the other end of the first arm may be secured to the stationery section of the damper body and the other end of the second arm may be in the form of being secured to the rotary shaft.

[0013] In one form, the second arm may comprise a pair of arm portions connected to each other at their connection and the damper body may be attached through a spacer between the pair of arm portions.

[0014] In this case, the rotary shaft may have a portion slightly protruding from one side of the damper body and the spacer may have a thickness almost corresponding to the length of the protrusion portion of the rotary shaft.

[0015] The rotary shaft and one arm portion of the second arm may be securely connected at their fitting portion and especially the fitting portion may be preferably angular fitting portion.

[0016] The other arm portion of the second arm may be rotatably disposed through a spacer between a fixed cap secured to the stationery section and the spacer. In this case, the arm portion of the first arm on the side of the stationery section may have a fixed cap secured through the spacer to the stationery section of the damper body.

[0017] The first and second hinge members may be pivotally connected through a linkage arm to each other and the damper may be disposed between the first and second hinge members over the linkage arm.

[0018] In another form, the damper may be formed by disposing the movable section within a cylindrical case, which is the stationery section and the movable section may include the rotary shaft to be connected to the second arm. The second arm may include the arm portions disposed on both sides of the cylindrical cases. One end of the rotary shaft may have a head extending through these arm portions to engage with a part of the movable section and the other end of the rotary shaft may have a caulked portion to be forcibly tightened against an escape stopper plate engaging with the arm portion.

[0019] In this manner, since the damper comprises the first arm having one end pivotally supported on the first hinge member, the second arm having one end pivotally supported on the second hinge member, and the damper force generation means provided between the other ends of these first and second arms, the damper can be attached to the hinge members in the state of completion, but not contained in the hinge members and therefore the hinge with the damper can be easily assembled.

[0020] Further, since the damper is attached to the hinge, it may be easily attached to the opening and closing member such as a door or a cover. Since the damper is attached through the two arms to the hinge members, the movement of the hinge members can be converted into the relative rotation of the two arms and since the rotation of the arms induces the buffer function of the damper body, the motion of the hinge and the motion of the damper never interfere with each other and therefore the hinge can smoothly move.

[0021] In one form, as the second arm comprises a pair of arm portions connected to each other at their connection and the damper body is attached through the spacer between the pair of arm portions, the damper body can be easily attached to the second arm. Especially, as the rotary shaft of the damper has the portion slightly protruding from one side of the damper body and the spacer has the thickness almost corresponding to the length of the protrusion portion of the rotary shaft, the damper body and the second arm can be assembled by inserting the damper body including the protrusion portion of the rotary shaft between the pair of arm portions of the second arm, thereafter fitting the protrusion portion of the rotary shaft into the one arm portion of the pair of arm portions and disposing the spacer between the other arm portion and the damper body and therefore the assembling of the damper with the arm can be effectively made.

[0022] In another arm, the second arm has two arm portions engaging with the cylindrical case which is the stationery section into which predetermined parts are inserted and through which passes the rotary shaft, which is a part of the movable section and is caulked thereto to thereby effectively assemble the damper with the arm, similarly.

[0023] As the damper has the form of having the first and second arms, the hinge with the damper can be applied to various forms of hinge and therefore, its usage for general purposes can increase.

BRIEF DESCRIPTION OF THE DRWAINGS

[0024]

Fig. 1 is a side elevational view of a hinge with a damp according to one form of embodiment of the invention in the state where a storage case with a door on which the hinge with the damper is installed is closed by the door,

Fig. 2 is a perspective view of the hinge with the damper when it is viewed from the right side of Fig. 1;

Fig. 3 is a perspective view of the hinge with the damper when it is viewed from the left side of Fig. 1;

Fig. 4 is a side elevational view of the hinge with the damper of Fig. 1 in the state where the door of the storage case with the door is opened;

Fig. 5 is a perspective view of the hinge with the damper when it is viewed from the right side of Fig. 2;

Fig. 6 is a perspective view of the hinge with the damper when it is viewed from the left side of Fig. 2;

Fig. 7 is an exploded perspective view of the hinge with the damper of the invention;

Fig. 8 is a cross sectional view of the damper used for the invention;

Fig. 9 is an exploded perspective view of the movable section of the damper of Fig. 4;

Fig. 10 illustrates a first arm of the damper of Fig. 4, wherein Fig. 10(A) is a front view thereof, Fig. 10(B) is a left side elevational view thereof, Fig. 10(C) is a right side elevational view thereof and Fig. 10(D) is a bottom view thereof,

Fig. 11 illustrates a second arm of the damper of Fig, 8, wherein Fig. 11(A) is a front view thereof, Fig. 11 (B) is a left side elevational view thereof and Fig. 11 (C) is a right side elevational view thereof;

Fig. 12 illustrates a fixed cap used in the damper of Fig. 8, wherein Fig. 12(A) is a front view thereof, Fig. 12(B) is a left side elevational view thereof, Fig. 12 (C) is a right side elevational view thereof and Fig. 12(D) is a cross sectional view taken along the line D-D of Fig. 12(C);

Fig. 13 is an exploded perspective view of a hinge with a damper according to another form of embodiment of the invention;

Fig. 14 is an enlarged cross sectional view of the damper of the hinge with the damper of Fig. 13;

Fig. 15 is a side cross sectional view of the hinge with the damper according to the form of embodiment of Figs. 13 and 14 with the operation position of the damper shown to be taken along the line A-A of Fig. 14 when the door to which the hinge with the damper is attached is fully closed;

Fig. 16 is similar to Fig. 15, but is a side cross sectional view of the hinge with the damper showing the operation position thereof in the state where the door is half-opened from the closed state of Fig. 15;

Fig. 17 is similar to Fig. 15, but is a side cross sectional view of the hinge with the damper showing the operation position thereof in the state where the door is further half-opened from the half-opened state of Fig. 16; and

Fig. 18 is similar to Fig. 15, but is a side cross sectional view of the hinge with the damper showing the operation position thereof in the state where the door is fully opened from the half-opened state of Fig. 17.

BEST MODE OF EMBODIMENT OF INVENTION

[0025] Describing the forms of embodiment of the invention with reference to the drawings, Figs. 1 through 7 illustrate a hinge with a damper or a damper built-in hinge 10 according to one form of embodiment of the invention. This damper built-in hinge 10 is provided with a hinge 20 comprising first and second hinge members 21 and 22 pivotally connected to each other and a damper 30 for controlling the pivotal movement of the first and second hinge members 21 and 22.

[0026] As shown in Figs. 1 through 7, the first hinge member 21 of the hinge 20 has a pair of mount flanges 21F to be engaged with and secured by not shown screws to an opening end face 12E of a case 12 and, in the illustrated form, the second hinge member 22 of the hinge 20 has the form of a cup engaged in a recess 14R in a door 14 and also has a mount flange 22F to be secured to a back face 14B of the door by not shown screws.

[0027] In the illustrated form, a linkage arm 23 comprising upper and lower pairs of arm portions (see Fig. 4) is disposed between the first and second hinge members 21 and 22 of the hinge 20. One end of the linkage arm 23 is pivotally supported by a pivot pin 25 on and between a pair of side arms 24 and 24' of the first hinge member 21 (see Fig. 4) while the other end of the linkage arm 23 is pivotally supported by a pivot pin 26 on the second hinge member 22 within the recess 22R therein (see Fig. 7).

[0028] As shown in Figs. 1 through 3, in the state where the door 14 is closed, the hinge 20 is folded so that the linkage arm 23 is inserted into the cup-like second hinge member 22 whereby the first and second hinge members 21 and 22 are disposed at a right angle. As shown in Figs. 4 through 6, in the state where the door 14 is opened, the hinge 20 is developed so that the linkage arm 23 is removed out of the cup-like second hinge member 22 whereby the first and second hinge members 21 and 22 are disposed at an angle of 180 degree.

[0029] As particularly noted from Figs. 4 through 6, the damper 30 comprises a first arm 32 having one end pivotally supported on the pair of side arms 24 and 24' of the first hinge member 21 by a pivot pin 31, a second arm 34 having one end pivotally supported by a pivot pin 33 on attachment flanges 27 and 27' of the second hinge member 22 and damper force generation means 40 provided between the other ends of the first and second arms 32 and 34. In the illustrated form, one end of the first arm 32 is pivotally supported on a pivotal portion of the lower arm portion of the linkage arm 23 so that the pivot pin 31 also serves as a pivot pin 25 for the lower arm portion, but the pivotal portion of the first arm 32 and the pivotal portion of the linkage arm 23 may be located at different places. In Fig. 7, reference numerals 24H and 24'H (the latter not shown) designate pin through-holes which are provided in the side arms 24 and 24' and through which the pivot pin 31 extends and a reference numeral 31W designates a synthetic resin washer fitted onto the pivot pin 31.

[0030] In the illustrated form, the damper force generation means 40 comprises a damper body 41 to generate a damper force between a stationery section 42 and a movable section 43, which are described in details later. One end of a rotary shaft 43S (see Fig. 8), which is a part of the movable section 42 of the damper body 41, slightly protrudes from the stationery section 42 and the other end of the second arm 34 is secured to the protrusion portion 43P of the rotary shaft 43S of the damper body 41 as described in details later, the other end of the first arm 32 is integrally secured to the stationery section 42 (see Figs. 2, 5 and 11) whereby the damper force is generated by the relative rotation of the first and second arms 32 and 34.

[0031] In the illustrated form, the stationery section 42 of the damper body 41 comprises a cylindrical case 42C as shown in Fig. 8 and the movable section 43 of the damper body 41 comprises a rotary shaft 43S rotatably disposed within the cylindrical case 42c which is the stationery section 42, a resistance piece 43R secured to the rotary shaft 43S and expanded in a blade-like manner around the rotary shaft 43S and a viscous fluid (not shown) filled within the cylindrical case 42C. A hook-like stationery piece 43RP is provided integrally to one end of the resistance piece 43R and the resistance piece 43R is secured to the rotary shaft 43S by engaging the stationery piece 43R into a notch 43N in a large diametrical portion 43SL provided one end of the rotary shaft 43S. As already described, the one end 43SP of the rotary shaft 43S slightly protrudes from the corresponding end of the cylindrical case 42C.

[0032] When the movable section 43 tries to rotate relative to the stationery section 42, the damper 30 generates the damper force because the resistance piece 43R of the movable section 43 receives the resistance within the viscous fluid whereby the relative rotation is braked from being rapidly made.

[0033] As shown in Figs. 7 and 10, the second arm 34 comprises a pair of arm portions 34A and 34A connected to each other at their connection 34C and the damper body 41 is attached through a spacer 35 between the pair of arm portions 34A and 34A'. The spacer 35 has a thickness almost corresponding to the length of the protrusion portion of the rotary shaft 435.

[0034] As shown in Figs. 7 and 10, the one arm portion 34A of the second arm 34 has a non-circular fitting hole 34AH into which a non-circular outer face of the protru-

sion portion 43SP of the rotary shaft 43S is fitted and the second arm 34 and the rotary shaft 43S are securely connected at this non-circular fitting portion. In this manner, as the fitting portion is the non-circular fitting hole, the second arm 34 can preferably rotate together with the rotary shaft 43S without being secured to the rotary shaft 43S by screws etc. The term "non-circular" of the non-circular fitting hole 34AH and the non-circular fitting portion typically means "angular", but includes "ellipse" or modified circle having a partial circle or other voluntarily form other than "angular" as long as both of the rotary shaft 48S and the second arm 34 can rotate together.

[0035] As shown in Figs 7 and 8, the other arm portion 34Λ' of the second arm 34 is rotatably disposed between a fixed cap 36 fixed through a spacer 35 to the stationery section 42 of the damper body 41 and the spacer 35. Especially as shown in Figs. 8 and 12, the fixed cap 36 has a shaft portion 36S passing through the through-hole 35H (see Fig. 7) of the spacer 35 and a through-hole 34A'H (see Figs. 8 and 10) of the arm portion 34A' of the second arm 34, two rotation stop pins 36P protruding from the shaft portion 36S and a through-hole 36H which extends through the shaft portion 36S in the center thereof and through which a stop screw 37 passes. The cylindrical case 42C has a closure end plate 42CC including a screw portion 42CT which is protruded inward and into which the stop screw 37 is threaded. Therefore, the arm portion 34A' is rotatably supported on the shaft portion 36S of the fixed cap 36.

[0036] The rotary shaft 43S, which is the movable section has a bearing recess 43SR in which the screw portion 42CT is engaged so that the rotary shaft 43S is rotatably supported on the cylindrical case 42C. The cylindrical case 42C has a bearing portion 42CB provided within the opposite end thereof. The opposite end of the rotary shaft 43S is rotatably supported on the bearing plate 42CB. The bearing portion 42CB has a groove 42CG in which an O-ring 38 is contained around the rotary shaft 43S to thereby prevent the viscous fluid within the cylindrical case 42C from being leaked. Thus, it will be noted that the rotary shaft 43S, which is the movable section 43 of the damper 30, is rotatably supported on the screw part 42CT and the bearing portion 42CB of the cylindrical case 42C. In order to prevent the arm portion 34A of the second arm 34 from being removed out of the rotary shaft 34S, the a rod portion 39R of the fixed cap 39 is engaged with the outer side face of the arm portion 34A and forcibly fitted into a recess in an end of a protrusion end 43SP of the rotary shaft 43S.

[0037] The damper 30 is assembled as follows; As shown in Fig. 7, the damper body 41 of the damper 30 is inserted between the pair of arm portions 34A and 34A' of the second arm 34, the protrusion end 43SP of the rotary shaft 43S of the movable section 43 of the damper body 41 is fitted into the angular fitting hole 34AH of the arm portion 34A and the fixed cap 39 is attached to the rotary shaft 43S and to the outer face of the arm portion 43A. Thereafter, the spacer 35 is inserted into the gap between the opposite arm portion 34A' and the damper body 41 and the fixed cap 36 is attached thereto from the outer sides of the arm portion 34A'. As already described, since the spacer 35 has the thickness almost corresponding to the protrusion length of the protrusion end 43SP of the rotary shaft 43A, the spacer 35 corresponds to the gap between the arm portion 34A' and the damper body 41 and therefore the damper body 41 can be easily attached to the second arm 34.

[0038] As shown in Figs. 1 through 3 and Figs. 4 through 6, since the damper built-in hinge 10 of the invention has the damper 30 attached to the hinge 20, the damper built-in hinge 10 can be installed only by attaching the first and second arm members 21 and 22 of the hinge 20 to the case 12 and the door 14. As shown in Figs. 1 through 3, as the door 14 is closed, the linkage arm 23 is inserted within the cup-like portion of the second hinge member 22 while the first and second hinge members 21 and 22 are folded approximately at a right angle. As shown in Figs. 4 through 6, as the door 14 is opened, the linkage arm 23 is removed out of the cup-like portion of the second hinge member 22 while the first and second hinge members 21 and 22 are developed approximately at an angle of 180 degree. Accompanying this opening and closing operation, the damper 30 having the first and second arms 32 and 34 pivotally supported on the first and second hinge members 21 and 22, respectively, is subject to resistance of the viscous fluid between the stationery section 42 and the movable section 43 by means of the relative rotation of the first and second arms 32 and 34 whereby the operation of opening and closing is buffered.

[0039] As noted from Figs. 1 through 3 and Figs. 4 through 6, in the state where the door is closed, the damper 30 just slightly protrudes into the inside of the case from the space in which the first and second hinge members 21 and 22 are angularly disposed and in the state where the door is opened, the damper 30 is disposed almost in parallel to the development state of the first and second hinge members 21 and 22. Thus, it will be noted that the occupancy volume within the case can be reduced only by a smaller degree.

[0040] As aforementioned, the damper 30 is attached to the hinge 20 in a completed state and therefore, it will be noted that it is not of type in which the damper is contained in the hinge and that the damper built-in hinge can be easily assembled.

[0041] It will be noted that since the damper 30 is attached through the two arms 32 and 34 to the hinge members 21 and 22, the motion of the hinge members 21 and 22 is converted into the relative rotation of the two arms 32 and 34 and since the rotation of the two arms 32 and 34 induces the buffering action of the damper body 41, the motion of the hinge 20 and the motion of the damper 30 never interfere with each other whereby the hinge 23 can be smoothly operated.

[0042] As already described, since the rotary shaft 43S

of the damper 30 has the portion slightly protruding from the one side of the damper body 41 and the spacer 35 has the thickness almost corresponding to the length of the protrusion end 43SP of the rotary shaft 43S, the damper body 41 and the second arm 34 can be effectively assembled by inserting the damper body 41 including the protrusion end 43SP of the rotary shaft 43S between the pair of arm portions 34A and 34A' of the second arm 34, thereafter fitting the protrusion end 43SP of the rotary shaft 43S into the one arm portion 34A of the pair of arm portions 34A and 34A and disposing the spacer 35 between the other arm portion 34A' and the damper body 41 and therefore the damper built-in hinge 10 can be effectively assembled.

[0043] In the aforementioned form of embodiment, the hinge 20 has the linkage arm 23 provided between the first and second hinge members 21 and 22, but the invention can be applied to the form in which the first and second hinge members 21 and 22 are pivotally supported in a direct manner.

[0044] The damper built-in hinge 10 according to another form of the invention is shown in Fig. 13 and the figures following Fig. 13. The same reference numerals designate the same components.

[0045] In this form of embodiment, the stationery section 42 of the damper body 11 comprises the cylindrical case 42C in the same manner as in the aforementioned form of embodiment, but as shown inn Figs. 13 and 14, the movable section 43 of the damper body 41 comprises the rotary shaft 43S rotatably supported on an inner cylindrical portion 42CI of the cylindrical case 42C of the stationery section 42, a resistance body 43R securely attached to the rotary shaft 438 and the viscous fluid 43F (see Figs. 15 through 18) filled within the cylindrical case 42C.

[0046] In the illustrated form, the inner cylindrical portion 42CI of the cylindrical case 42C is formed integrally with the main portion 42CB of the cylindrical case 42C through an end wall 42CW. The one end of the rotary shaft 43S is prevented from being removed out of the cylindrical case 42C by a removal stopping plate 43W rotatably supported in a recess 42CR in the inner cylindrical portion 42CI of the cylindrical case 42C. The resistance body 43R is attached to the other end of the rotary shaft 43 and is disposed on the side opposite to the removal stopping plate 45 so as to have a function of removal stopping. As noted from Fig. 14, on the end of the rotary shaft 43S on the side of the resistance body 43R is provided a head 43SH to be engaged in a recess 43RR in the resistance body 43R and on the opposite end of the rotary shaft 43S is provided a caulking portion 43ST to be engaged against the bottom portion of the recess 43WR of the removal stopping plate 43W. Thus, as the second arm 34 rotates when the door is opened or closed, the rotary shaft 43S rotates together with the resistance body 43R while it is subject to resistance of the viscous fluid 43F relative to the stationery section 42 whereby a damper action is imparted to the opening and closing of the door 14.

[0047] In this form of embodiment, the resistance body 43R of the damper 30 is provided with a switching mechanism 44 to switch a damper stroke portion for imparting the damper action to the opening and closing of the door 14 and a free stroke portion for releasing the damper action.

[0048] As shown in Fig. 14, this switching mechanism 44 comprises an intermediate annular member 44M disposed between a middle cylindrical portion 42CM securely attached to and in parallel to the inner cylindrical portion 42CI within the cylindrical case 42C and the main body 42CB of the cylindrical case 42C and rotatably supported on the main body 42CB and the inner cylindrical portion 42CI of the cylindrical case 42C by inner and outer O-rings 42IB and 420B and a pair of key members 44K engaged in engagement grooves 44ME extending through the intermediate annular member 44M in a radial direction to be displaced so as to switch the intermediate annular member 44M to either of the side of the cylindrical case 42C and the side of the resistance body 43R. In Figs. 13 and 14, a reference numeral 42BM designates an inner cylindrical portion of the movable section 43, which is securely attached to the intermediate annular member 44M and disposed between the inner cylindrical portion 42CI and the middle cylindrical portion 42CM of the stationery section 42. The viscous fluid 43F is also filled between the inner cylindrical portion 42BM and the inner cylindrical portion 42CI and between the inner cylindrical portion 42BM and the middle cylindrical portion 42CM.

[0049] As shown in Figs. 15 through 18, the resistance body 43R has a pair of engagement pieces 43RP engaged in a pair of arc-like grooves 44MG provided inside of the intermediate annular member 44M and the intermediate annular member 44M has a pair of engagement pieces 44MP engaged in a pair of arc-like grooves 42CG formed in the inner face of the cylindrical case 42C. These engagement pieces 43RP and 44MP and the arc-like grooves 44MG and 42CG allow the resistance body 42R and the intermediate annular member 44M or the intermediate annular member 44M and the cylindrical case 42C to relatively rotate within a range of predetermined angle due to the direction of the relative rotation of the stationery section 42 and the movable section 43, respectively.

[0050] The pair of key members 44K comprises a cylindrical solid body having an outer diameter slightly larger than the thickness of the intermediate annular member 44M (see Fig. 15) and are so set as to be engaged in either of a pair of arc-like cam recess face 43RC provided in the outer face of the resistance 43R and a pair of arelike cam recess face 42CC provided in the inner face of the cylindrical case 42C while being shifted from the cam recess face 43RC in the peripheral direction. As the key members 44K engages the arc-like recess face 43RC of the resistance body 43R of the movable section 43 (see Figs. 15 and 16), the intermediate annular member 44M

is connected to the resistance body 43R and as the key members 44K engages the arc-like recess face 42CC of the cylindrical case 42C of the stationery section 42, the intermediate annular member 44M is connected to the cylindrical case 42C of the stationery section 42.

[0051] The viscous fluid 43F of the damper 30 is filled between the cylindrical case 42C and the intermediate annular member 44M of the switching mechanism 44 (see Figs. 15 through 18). Thus, as the relative peripheral movement occurs between the cylindrical case 42C and the intermediate annular member 44M, the damper action is generated by resistance of the viscous fluid 43F, but even though there is the relative rotation of the first and second arms 21 and 22, no damper action is generated unless there occurs the relative movement of the cylindrical case 42C and the intermediate annular member 44M.

[0052] The damper built-in hinge 10 according to this form of embodiment is assembled as follows; Into the cylindrical case 42C of the damper 30 are inserted the middle cylindrical portion 42CM, the inner cylindrical portion 42BM and the intermediate annular member 44M having the key members 44K, which are the component parts for the switching mechanism 44. The cylindrical case 42C having various parts contained therein in this manner is disposed between the pair of arm portions 34A and 34A' of the second arm 34 and then the removal stop plate 43W and the resistance body 43R are engaged from the outside of the pair of arm portions 34A and 34A'. Finally, the rotary shaft 43S is inserted into the cylindrical case and the head 43H thereof is engaged with the resistance body 43R while the opposite end thereof is caulked against the end face of the removal stop board 43W to thereby form the caulked end 43ST whereby the assembling is completed.

[0053] In the damper built-in hinge 10 according to this form of embodiment, when the door 14 is closed, the linkage arm 23 falls within the cup-like portion of the second hinge member 22 as shown in Fig. 15 whereby the first and second hinge members 21 and 22 are folded so that they get right-angled. When the door 14 is opened, the linkage arm 23 is removed out of the cup-like portion of the second hinge member 22 as shown in Fig. 18 whereby the first and second hinge members 21 and 22 are developed so that they get 180 degree. These states are identical to those of Figs. 1 and 4 in the damper built-in hinge 10 according to form of embodiment of Figs. 1 through 12.

[0054] Following this opening and closing operation, since the damper 30 having the first and second arms 32 and 34 pivotally supported on the first and second hinge members 21 and 22 is subject to resistance by the viscous fluid 43F between the stationery section 42 and the movable section 43 by means of the relative rotation of the first and second arms 32 and 34, the opening and closing operation is moderated, but this action varies on the opening position of the door.

[0055] More particularly, as shown in Fig. 15, in the complete closing state of the door, the key members 44K are engaged in the arc-like cam recess face 43RC of the resistance body 43R. Therefore, as the door is opened from this state, the second hinge member 22 moves diagonally in a rightward direction far away from the first hinge member 21 and therefore the second arm 34 of the damper 30 rotates in a counterclockwise direction about the axis of the rotary shaft 43S from the state of Fig. 15 to the position of Fig. 16.

[0056] As already described, since the resistance body 43R and the intermediate annular member 44M are bonded by the key members 44K, when the hinge 10 is moved from the position of Fig. 15 to the position of Fig. 16, the resistance body 43R and the intermediate annular member 44M rotate in a counterclockwise direction along the inner face of the cylindrical case 42C of the stationery section 42 in accordance with the rotation of the second arm 34 while they are subject to resistance by the viscous fluid 43F and the key members 44K of the switching mechanism 44 get faced to the arc-like cam recess face 42CC of the cylindrical case 42C of the stationery section 42.

[0057] As a result, the key members 44K which are engaged in the are-like cam recess face 43RC of the resistance body 43R of the movable section 43 until now are forcibly pushed in an outward direction by the raising cam face portion of the arc-like can recess 43RC on the side of resistance body 43R to be thereby released from the arc-like cam recess face 43RC whereby the key members 44K fall within the arc-like recess face 42CC of the stationery section 42 as shown in Fig. 17. Thus, since the resistance body 43R is released from the intermediate annular member 44M of the switching mechanism 44, the resistance body 43R moves along the intermediate annular member 44M of the switching mechanism 44 by the relative rotation of the first and second arm members 21 and 22. At this time, since there is no relative movement between the cylindrical case 42C of the stationery section 42 and the intermediate annular member 44M of the switching mechanism 44, the viscous fluid is never subject to resistance and therefore the damper action never works.

[0058] Since this switching state is maintained from the position of Fig. 17 to that of Fig. 18 (the position corresponding to the complete opening position of the door), the door can be opened without any resistance.

[0059] As the door is closed from the complete opening position of Fig. 18, the complete door closing position of Fig. 15 is reached through the position of Fig. 17 and that of Fig. 16. In this case, the damper action never works from the position of Fig. 18 to that of Fig. 17 for the same reason as aforementioned, but the damper action works from the position of Fig. 16 to the door complete closing position of Fig. 15 whereby the door is prevented from being closed in a shocked manner.

[0060] The angle from the door complete closing position of Fig. 15 to the door half-opening position of Fig. 16 where the damper action works can be set at 30 de-

gree, for instance. In this manner, the door is subject to some resistance when the door starts to be opened, but when the door should be closed, the door starts to be closed without any resistance and just before the door is completely closed, the damper action works. Thus, the opening and closing operation of the door can be preferably performed in a smooth manner.

[0061] The damper built-in hinge 10 according to the form of embodiment of Fig. 13 and the succeeding figures can have less degree of reduction of the occupancy volume in the same manner as the damper built-in hinge 10 according to the form of embodiment of Figs. 1 through 12 and since the damper 30 is assembled to the hinge 20 in the state of completion, the damper built-in hinge 10 can be easily assembled.

[0062] The damper built-in hinge 10 of this form of embodiment has the damper 30 attached through the two arms 32 and 34 to the hinge members 21 and 22 in the same manner, the movement of the hinge members 21 and 22 is converted into the relative rotation of the two arms 32 and 34 of the damper 30 and this rotation induces the shock absorbing action of the damper body 41. Thus, it will be understood that the movement of the hinge 20 never interferes with the movement of the damper 30 and the hinge 23 can move smoothly.

[0063] Furthermore, the damper 30 having the arms attached thereto can be effectively and assembled by inserting the rotary shaft 435, the intermediate annular member 44M including the key members 44K of the switching mechanism 44 etc., , which are the component parts of the movable section into the cylindrical case 42C which is the stationery section 42, then inserting the rotary shaft 43S and caulking the rotary shaft.

[0064] Although, in two forms of embodiment, the hinge 20 has the linkage arm 23 provided between the first and second hinge members 21 and 22, the invention can be applied to the form in which the first and second hinge members 21 and 22 are pivotally supported on each other in a direct manner

POSSIBILITY OF UTILIZATION IN INDUSTRIES

[0065] According to the damper built-in hinge of the invention, since the damper in the completed form is attached to the hinge members and is never contained within the hinge members, the damper built-in hinge can be easily assembled. Especially, the operation of attaching the arms to the damper can be effectively performed and the damper built-in hinge can be inexpensively provided with the result that the possibility of utilization in industries can be improved.

Claims

1. A hinge with a damper provided with a hinge comprising first and second hinge members pivotally connected with each other and a damper for controlling the opening and closing of said first and second hinge members, **characterized in that** said damper comprises a first arm having one end pivotally supported on said first hinge member; a second arm having one end pivotally supported on said second hinge member; and damper force generation means provided between the other ends of said first and second arms and that said damper force generation means is adapted to generate a damper force by relative rotary movement of said first and second arms.

2. A hinge with a damper as set forth claim 1 and wherein said damper force means comprises a damper body to generate said damper force between stationery and movable sections, the other end of said first arm is secured to said stationery section of said damper body and the other end of said second arm is secured to said movable section.

3. A hinge with a damper as set forth claim 2 and wherein said second arm comprises a pair of arm portions and said damper body is attached through a spacer between said pair of arm portions.

4. A hinge with a damper as set forth claim 3 and wherein said movable section has a portion slightly protruding from one side of said damper body and said spacer has a thickness almost corresponding to the length of said protrusion portion of said movable section.

5. A hinge with a damper as set forth claim 3 or 4 and wherein said pair of arm portions are connected at their connection to each other.

6. A hinge with a damper as set forth claim 4 or 5 and wherein said movable section and the one portion of said second arm are securely connected at their fitting portion.

7. A hinge with a damper as set forth claim 6 and wherein said fitting portion is angular fitting portion.

8. A hinge with a damper as set forth in either of claims 4 through 7 and wherein the other arm portion of said second arm is rotatably disposed through said spacer between a fixed cap secured to said stationery section of said damper body and said spacer.

9. A hinge with a damper as set forth in claim 8 and wherein said arm portion of said first arm on the side of said stationery section has a fixed cap secured through said spacer to said stationery section of said damper body.

10. A hinge with a damper as set forth in either of claims 1 through 9 and wherein said first and second hinge

members are pivotally connected through a linkage arm to each other and said damper is disposed between said first and second hinge members over said linkage arm.

11. A hinge with a damper as set forth in claim 1 and wherein said damper is formed by disposing said movable section within a cylindrical case which is said stationery section, said movable section includes a rotary shaft to be connected to said second arm, said second arm includes said arm portions disposed on both sides of said cylindrical cases, one end of said rotary shaft has a head extending through said arm portions to engage with a part of said movable section and the other end of said rotary shaft has a caulked portion to be caulked aganist an escape stopper plate engaging with said arm portion.

FIG. 1

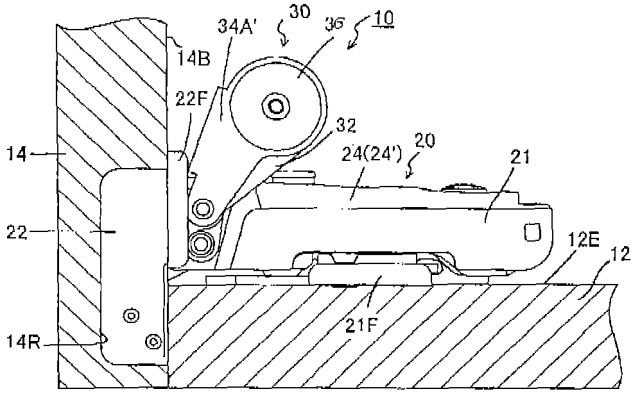

34A'
30
36
10
14B
22F
32
24(24')
20
21
14
22
12E
12
21F
14R

FIG. 2

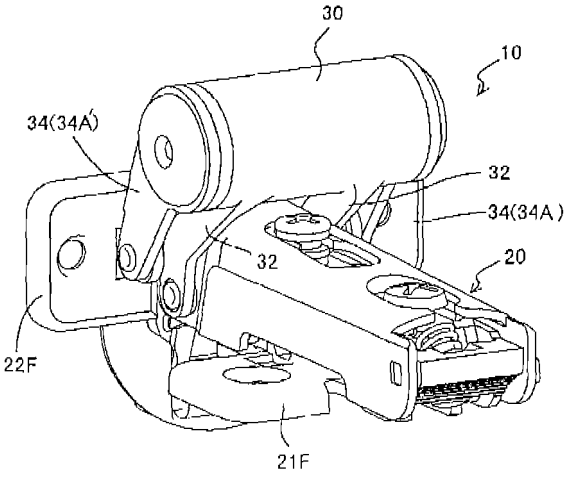
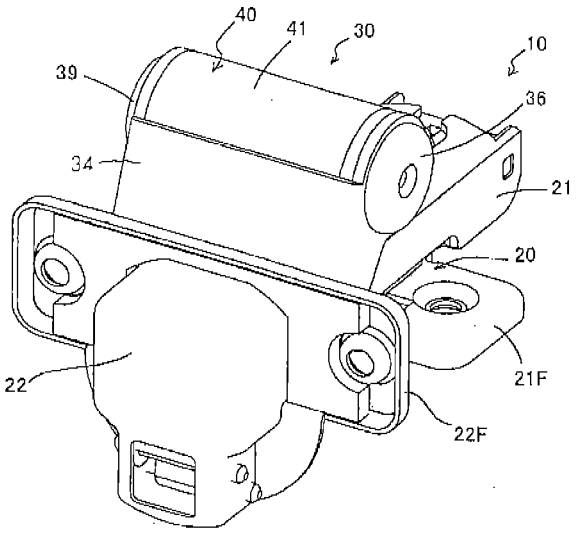

30
10
34(34A')
32
34(34A)
32
20
22F
21F

FIG. 3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41
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10
39
36
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21
20
22
21F
22F

FIG. 4

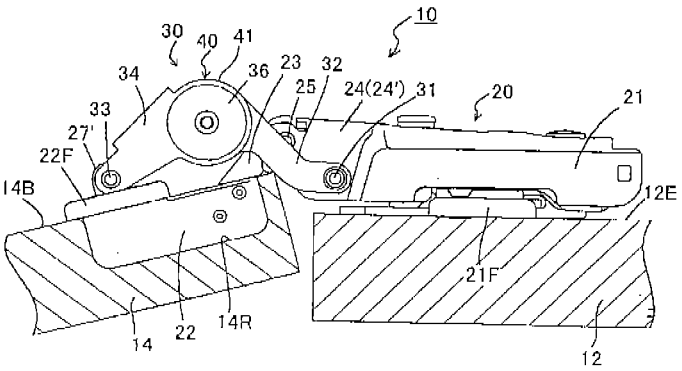

10
30
40
41
34
36
23
32
25
24(24')
31
20
21
33
27'
22F
14B
12E
21F
14
22
14R
12

FIG. 5

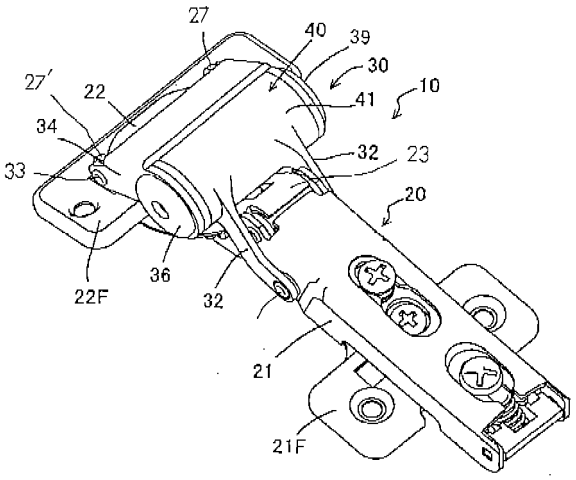
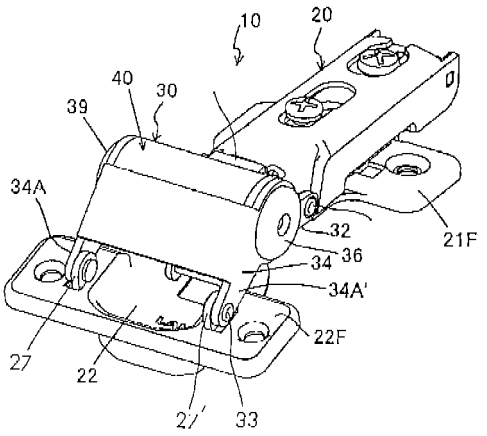

27
40
39
30
10
27'
22
41
34
32
23
33
20
36
22F
32
21
21F

FIG. 6


10
20
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30
39
34A
32
21F
34
36
34A'
22F
27
22
27'
33

FIG. 7

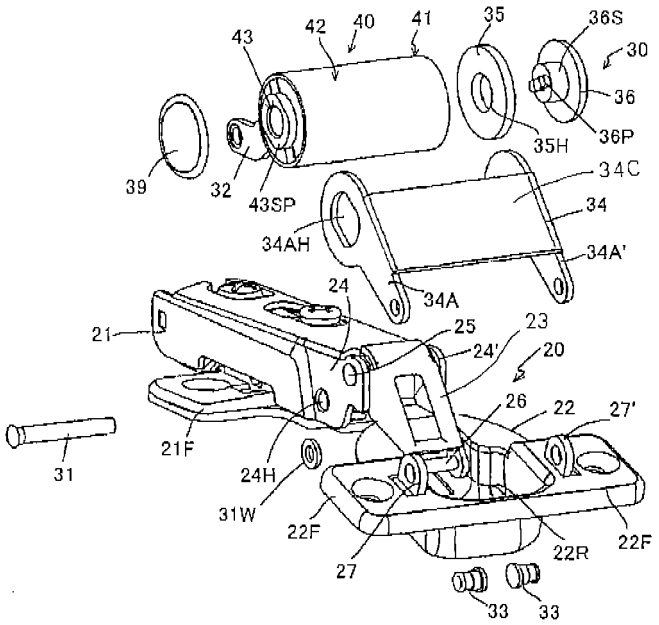
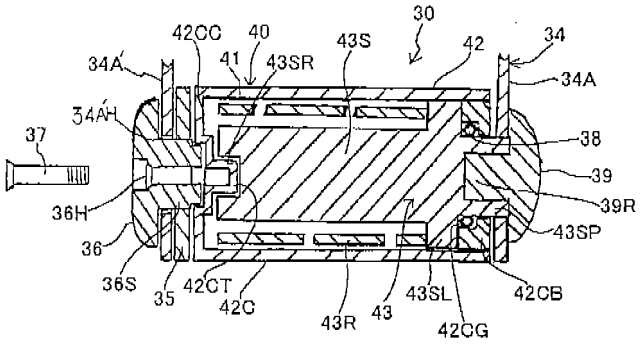

43
42
40
41
35
36S
30
36
36P
35H
39
32
43SP
34C
34
34AH
34A'
34A
24
25
23
24'
20
21
21F
26
22
27'
31
24H
31W
22F
22R
22F
27
33
33

FIG. 8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42CC
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43S
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34
34A
41
43SR
34A
34AH
37
38
39
36H
39R
43SP
36
36S
35
42CT
42C
43R
43
43SL
42CB
42CG

FIG. 9

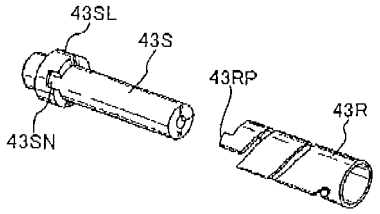

43SL
43S
43RP
43R
43SN

FIG. 10

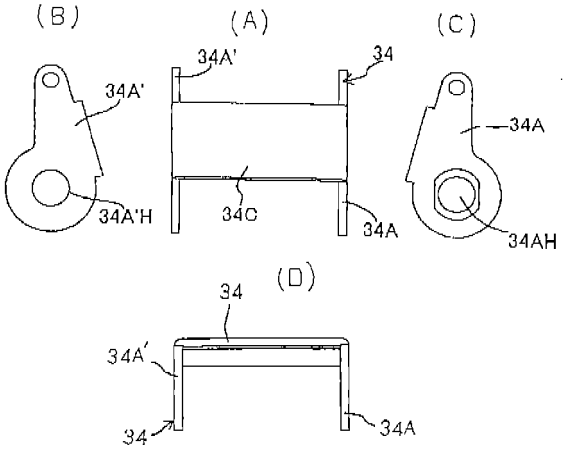

(B)
(A)
(C)
34A'
34
34A'
34A
34A'H
34C
34A
34AH
(D)
34
34A'
34
34A

FIG. 11

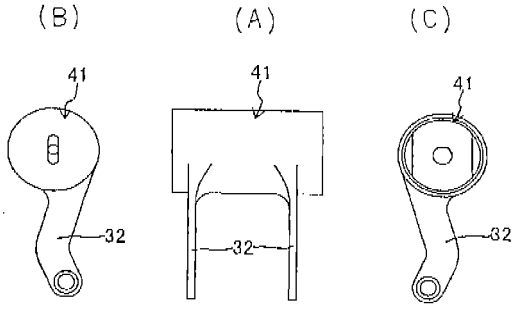

(B)
(A)
(C)
41
41
41
32
32
32

FIG. 12

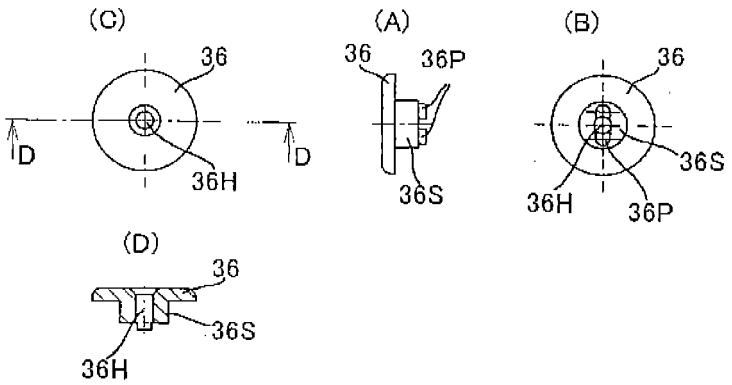
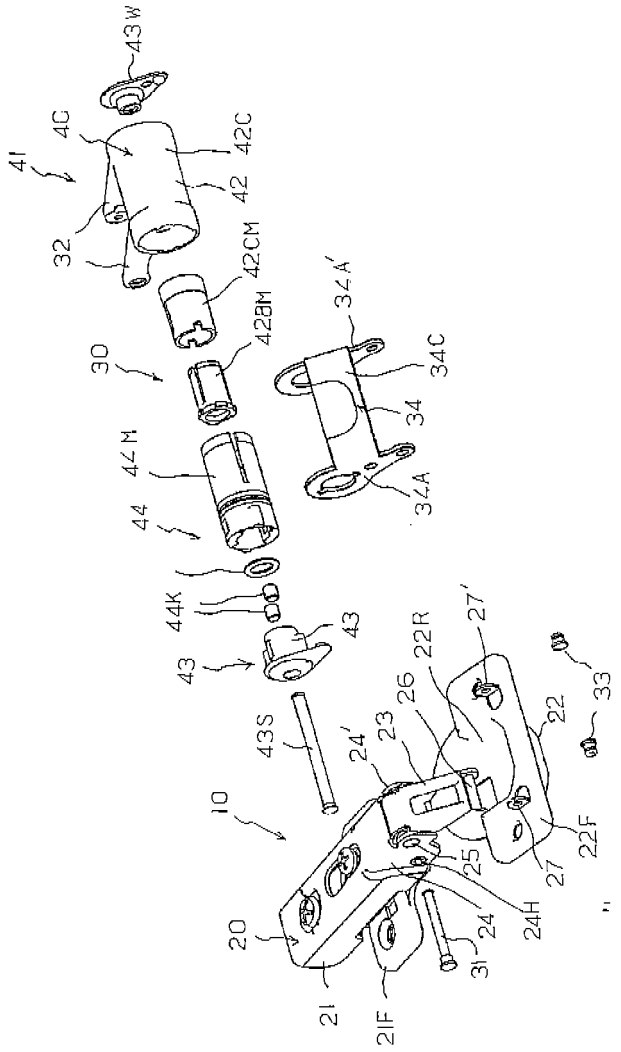


FIG. 13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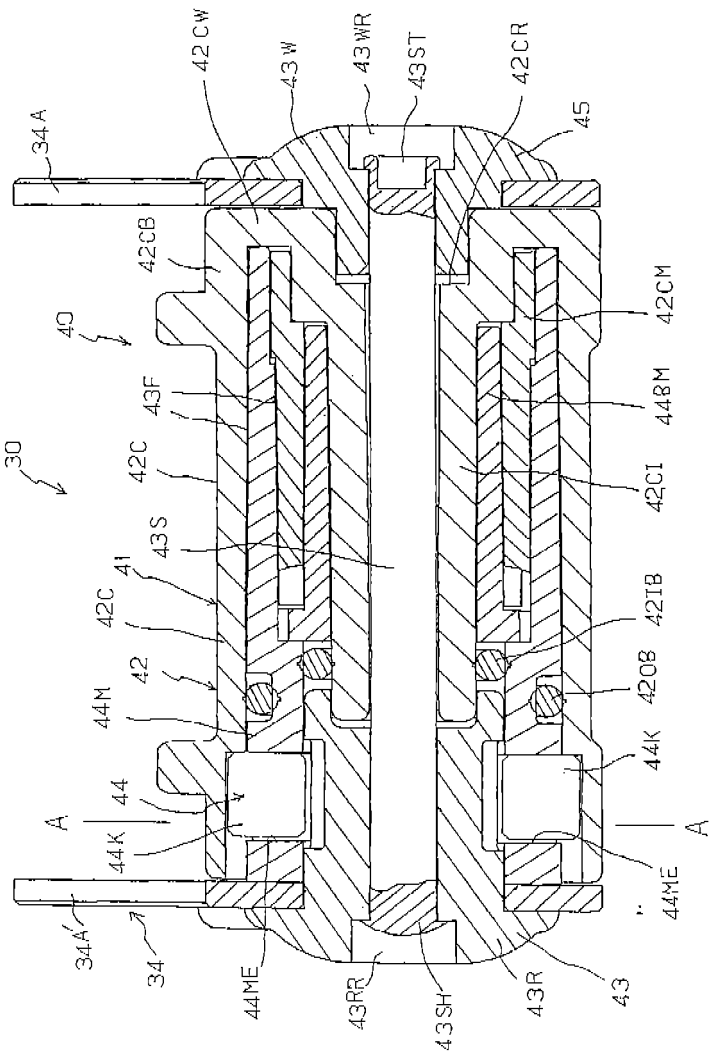
4C
41
42C
42
32
42CM
42BM
30
34A'
34C
34
34A
44H
44
44K
43
43
43S
24'
23
26
22R
27'
22
33
10
22F
27
25
24H
24
31
20
21
21F

FIG. 14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43WR
43ST
42CR
45
34A
42CB
40
42CM
43F
448M
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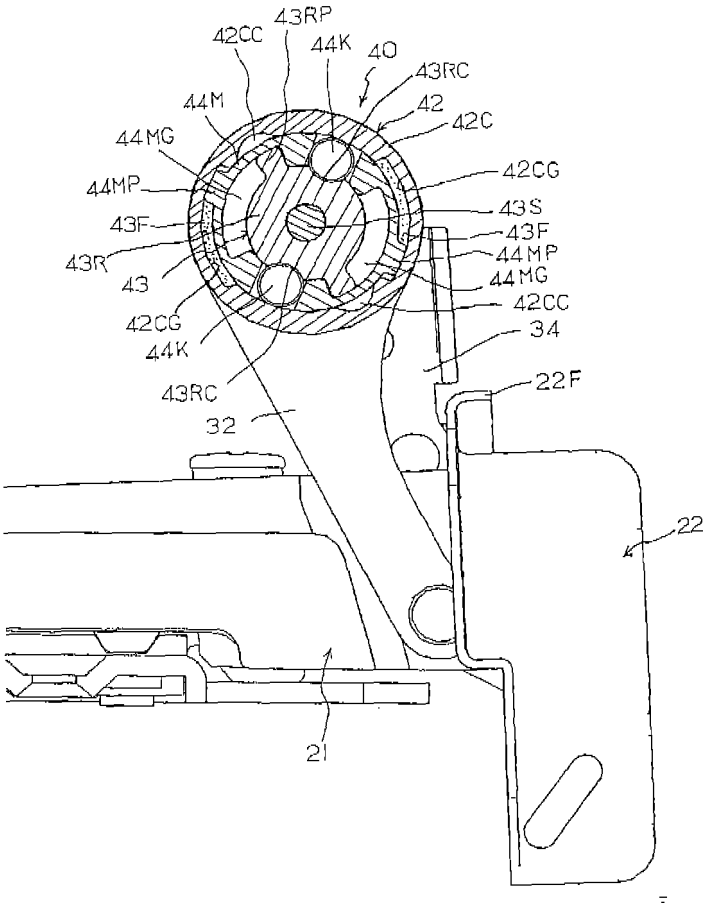
42C
42CI
43S
41
42C
42IB
42
42OB
44M
44K
44
A
A
44K
44ME
34A
34
44ME
43RR
43SH
43R
43

FIG. 15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42CC
44K
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43RC
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42C
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44MP
43F
43R
43
42CG
44K
43RC
32
42CG
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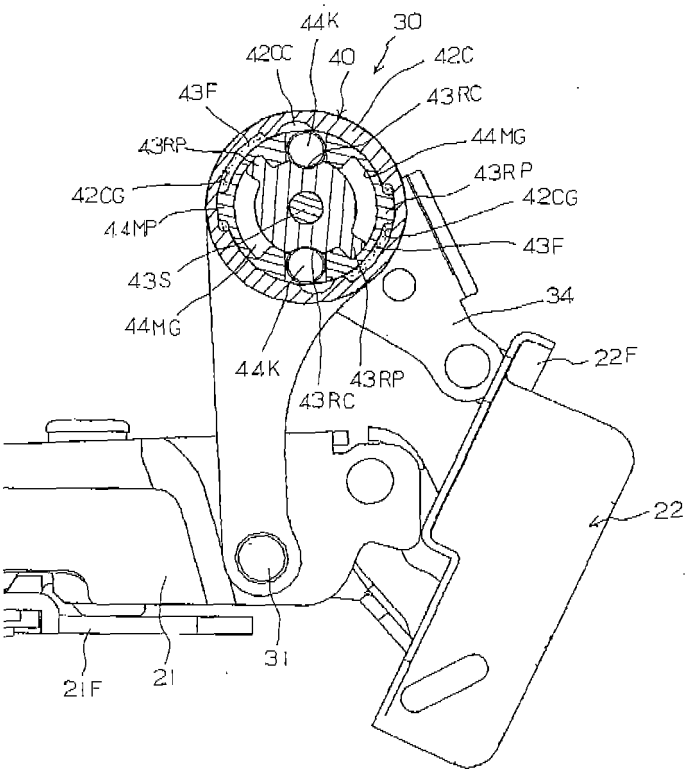
43F
44MP
44MG
42CC
34
22F
22
21

FIG. 16


44K
30
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42C
43F
43RC
43RP
44MG
43RP
42CG
42CG
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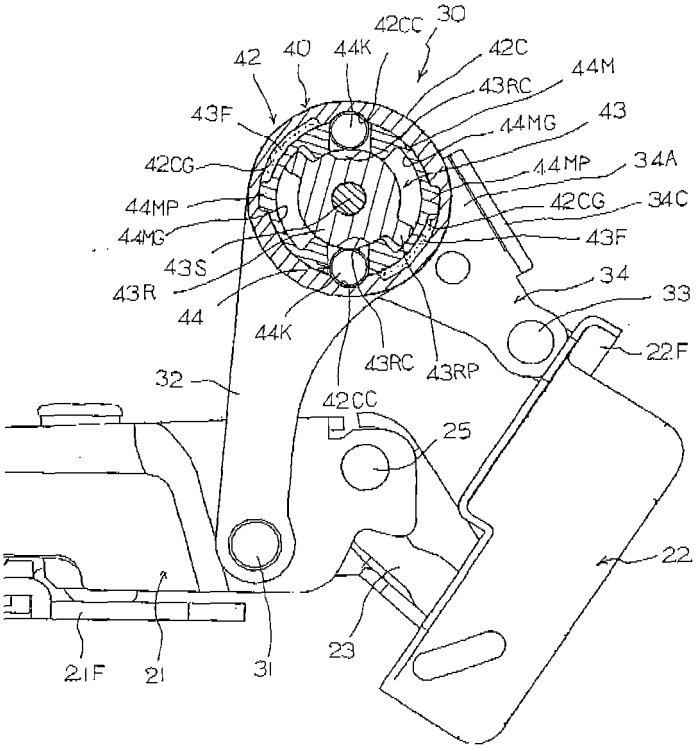
44MG
22F
44K
43RP
43RC
22
21F
21
31

FIG. 17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43F
43S
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43RP
32
42CC
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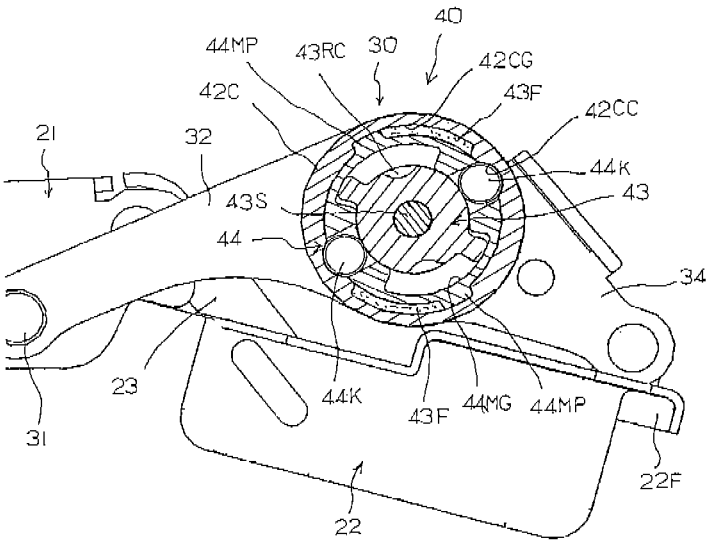
23
21F
21
31

FIG. 18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44K
43F
44MG
44MP
31
22F
22

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2005/006400

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] E05D7/086, E05F3/20

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl[7] E05D7/00-7/14, E05F3/20, F16C11/04

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2005
Kokai Jitsuyo Shinan Koho	1971-2005	Toroku Jitsuyo Shinan Koho	1994-2005

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 3368376 B2 (Nippatsu Hanbai Kabushiki Kaisha), 20 January, 2003 (20.01.03), Full text; all drawings (Family: none)	1-11
A	JP 2516988 Y2 (Park Kabil), 13 November, 1996 (13.11.96), Full text; all drawings & US 5437079 A & KR 9505600 Y	1-11
A	JP 3056132 U (Kabushiki Kaisha Shimonishi Seisakusho), 12 February, 1999 (12.02.99), Full text; all drawings (Family: none)	1-11

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"O" document referring to an oral disclosure, use, exhibition or other means
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Date of the actual completion of the international search	Date of mailing of the international search report
22 April, 2005 (22.04.05)	24 May, 2005 (24.05.05)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2005/006400

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 36-4285 B1 (Kokichi ONO), 28 April, 1961 (28.04.61), Full text; all drawings (Family: none)	1-11
A	JP 2002-81433 A (Nippon Pop Rivets and Fasteners Ltd.), 22 March, 2002 (22.03.02), Full text; all drawings & US 2002-0046443 A & EP 1184531 A2	1-11

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Patent documents cited in the description

- JP 7233670 A **[0008]**
- JP 2502933 A **[0008]**
- JP 8284523 A **[0008]**