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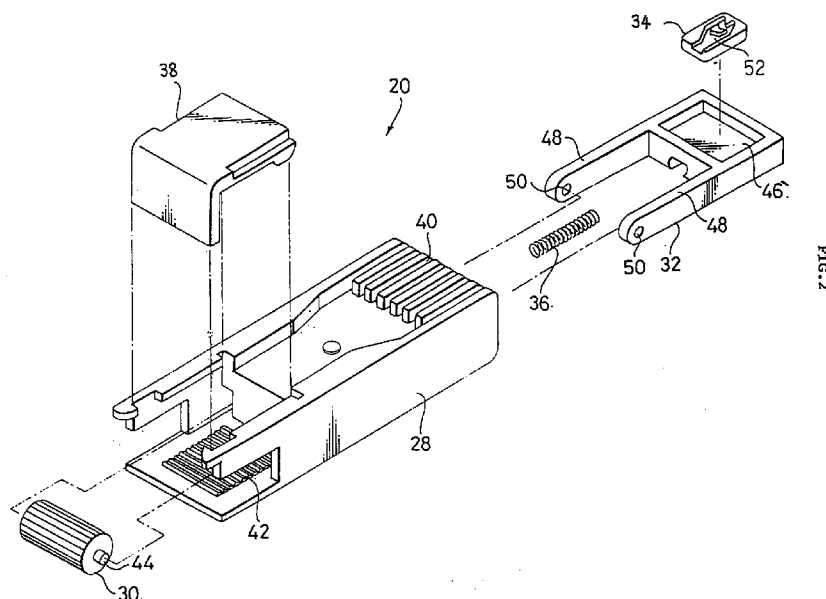
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(54) Pull cord stopper device for use in a blind apparatus

(57) A pull cord stopper device (20) for use in a blind apparatus operative in response to only the pulling of the cord control string of pull cords to control a screen. The pull cord stopper device (20) is disposed in a head box (10) and is adaptive to large-scale blind apparatus. The stopper case (28) of the pull cord stopper device (20) comprises a comb portion (40) for separating the pull cords (16), one from another, a knurled portion (42) for guiding a pinch roller (30), and a pin (54) received in a guide groove (52) formed in a switch member, for guiding the movement of the switch member (34). The slidable block (32) rotatably supports the pinch roller (30), and is operative to move within the stopper case (28) in the direction of movement of the pull cords (16) by means of

rotation of the pinch roller (30). The slidable block (32) supports the switch member (52) which is integrally movable with the pull cords (16) in a direction of its travel, and, at the same time, supports the switch member (52) in a manner that it is relatively movable in a direction transverse to the travel of the pull cords (16). The resilient member (36) is operative to restrain the pull cords (16) by pinching them between the pressure member (38) and the pinch roller (30). The resilient member (36) constantly urges in a manner that the pull cords (16) is pinched between the pinch roller 30 and the pressure member (38).

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Description

The present invention relates to a pull cord stopper device for pleated blinds or Roman shades which are subjected to frequent raise/lower operations.

A typical conventional pull cord stopper device for use in a blind apparatus has been disclosed in Japanese Utility Model Application Hei-63-201199. The conventional pull cord stopper device according to this disclosure is mounted in a head box and is of a type that controls pull cords that are routed through the head box and delivered out of one end of the head box for stop and release operation.

The device according to the disclosure comprises a stopper roller which is designed to keep follow-up contact with the pull cords and which is rotatably supported by a guide member on a floating axis in perpendicular to the direction of routing of the pull cords, and a stopper case which supports the stopper roller and which has on its bottom surface a rotating contact face with the stopper roller. A loop-like guide groove is formed on the side walls of the stopper case above the rotating contact face. A stopper pin is disposed a predetermined distance apart from the guide groove and between the side walls. Also disposed is a restraint contact portion which is extended in parallel with the floating axis and which is radially apart from the guide member on the floating axis beyond the radius of the stopper roller. The restraint contact portion prevents the guide pin from sliding back in the loop guide in the stopper case. When the pull cords are pulled, the guide pin is caught by the restraint contact portion. When the pull cords are let go hold of after pulling the pull cords by some stroke, the guide pin reverts back to its original position after one round of travel in the loop groove.

In the above conventional pull cord stopper device, the head box is naturally subject to a geometrical limitation in its width dimension. When a number of pull cords are used, some of the cords are stacked and it is difficult to evenly space all the pull cords without stacking. In particular, when the pull cords are horizontally arranged across the width of the stopper device, it should be necessary to exploit the full width of the head box. Since the loop-like guide groove is formed on the side wall of the stopper case, the available inner width of the stopper case is accordingly reduced. This limits the number of the pull cords to a small number. The loop-like guide groove formed on the side wall of the stopper case requires that the stopper case be high enough to accommodate the loop-like guide groove. The height of the stopper case should be thus a large dimension. This in turn leads to a large height dimension of the head box.

The above first problem may be resolved by allowing a slidable block to slide by means of the rotation of a pinch roller and a friction with the pull cords in order to suspend or release the pull cords.

The pull cord stopper device of this type, however, is subject to a second problem: aborted or insufficient travel of the slidable block or tangled cords.

The second problem above leads a third problem of inevitable wear of the pull cords.

It is an object of the present invention to at least alleviate the first, second and third problems above.

The present invention is characterized in that a plurality of pull cords are routed in parallel through the stopper device in order to increase the frictional surface between the pull cords and the pinch roller and in order to set pull cords free from mutual entanglement, and that a fully idle rotation range of the pinch roller is set up within the travel of the pinch roller to minimize the wear rate of the pull cords.

To achieve the above object, the pull cord stopper device for use in a blind apparatus according to the present invention includes:

- a head box;
 - a screen, top of which is connected to the head box;
 - a bottom weight connected to the bottom of the screen;
 - pull cords, ends of which are connected to the bottom weight, and the other ends of which are routed along the screen, or routed by through-holes disposed in the screen, then introduced into a head box in a manner that the pull cords are operative to be raised or lowered, and then delivered out of one end of the head box; and
 - a pull cord stopper device capable of restraining movement of the pull cords;
 - said pull cord stopper device comprising:
 - a stopper case, a pinch roller, a slidable block, a switch member and a pressure member;
 - said stopper case comprising:
 - a separation portion for separating the pull cords, one from another;
 - a knurled portion for guiding the pinch roller for its movement; and
 - a pin received by a guide groove formed on the switch member for guiding the switch member;
 - whereby said slidable block rotatably supports the pinch roller and is operative to move in the direction of movement of the pull cords by means of rotation of the pinch roller,
 - supports the switch member which is integrally movable with the pull cords in its direction of movement, and, at the same time, supports the switch member in a manner that it is relatively movable in a direction transverse to the movement of the pull cords; and
 - said pressure member is adaptable to pinch the pull cords between the pinch roller and the pressure member.
- Also, the pull cord stopper device for use in a blind apparatus according to the present invention includes:
- a stopper case, a pinch roller, a slidable block, a switch member and a pressure member;
 - said stopper case comprising:
 - a separation portion for separating the pull cords, one from another;
 - a knurled portion for guiding the pinch roller for its movement; and

a cutout portion for allowing the pinch roller to idly rotate;

said slidable block rotatably supports the pinch roller, and is operative to move in the direction of travel of the pull cords by means of rotation of the pinch roller and friction with the pull cords,

supports the switch member which is integrally movable with the pull cords in its direction of travel, and, at the same time, supports the switch member in a manner that it is relatively movable in a direction transverse to the travel of the pull cords;

said switch member is provided with a guide groove;

said guide groove receives a pin rigidly connected to the stopper case for guiding the movement of the switch member; and

said pressure member is operative to pinch the pull cords between the pinch roller and the pressure member.

The pin may be constantly urged by a resilient member toward the groove of the switch member.

A resilient member may be provided to urge constantly the pressure member in a manner that allows the pull cords are pinched between the pressure roller and the pressure member.

The pressure member may be detachably mounted on the stopper case.

When with the pull cords pinched between the pinch roller and the pressure roller, a cord control string is pulled downward, the pinch roller rotates, is guided by the knurled portion, and moves along with the slidable block in the direction of movement of the pull cords. Along with the slidable block, the switch member moves until the pin reaches a predetermined position in the guide groove. When the pin reaches the predetermined position in the guide groove, the switch member is restrained, and thus movement of the slidable block stops. Since the pinch roller is now spaced apart from the pinching face of the pressure member, the pull cords are free from the pinching engagement between the pinch roller and the pressure member, and are free to move. The pull cord control string can be pulled continuously downward. Thus, the screen is raised continuously.

When the user lets go his or her hold of the pull cord control string, the pull cords move in the opposite direction because of the mass of the bottom weight. This movement causes the pinch roller to rotate in the direction opposite to the first rotational direction above, and the pinch roller is guided by the knurled portion. Along with the slidable block, the switch member moves in the opposite direction until the pin reaches a predetermined position in the guide groove. When the pin reaches the predetermined position in the guide groove, the movement of switch member is restrained, and the slidable block cannot continue its movement any more. Since, in its position, the pinch roller is now spaced apart from the pinching face of the pressure member, the pull cords are not pinched between the pinch roller and the pinching

face of the pressure member. Thus, the pull cords are free to move, and continuously move by the mass of the bottom weight. The screen thus goes downward.

Again the pull cord control string is manually pulled downward, and the pull cords move in the direction of movement of the pull cords. The pinch roller rotates, the slidable block moves in the direction of the movement of the pull cords, and the pin moves to another predetermined position in the guide groove. The movement of the switch member is restrained by the pin, and the slidable block stops.

When the user lets go his or her hold of the control string, the pull cords move because of the mass of the bottom weight. This movement causes the pinch roller to rotate and to move by guide of the knurled portion, along with the slidable block. The movement of the slidable block causes the switch member to move until the pin reaches a predetermined position in the guide groove. When the pin reaches the predetermined position in the guide groove, the movement of the switch member is restrained, and the slidable block cannot continue its movement any more. Since the pinch roller is at the knurled portion, the pull cords are pinched between the pinch roller and the pressure member, the pull cords are restrained.

The switching operation may be performed as follows: the slidable block, while rotating, is guided by the knurled portion in a predetermined portion of the full travel of the slidable block and, in the rest of the travel, the slidable block, while idly rotating, moves by means of friction with the pull cords.

As described above, the switching of the operation of the pull cords between stopping and releasing the pull cords can be controlled by the times of pulling of the cord control string.

Entanglement of the pull cords is prevented by allowing the separation portion to separate the pull cords, one from another.

A number of embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Fig 1 shows generally the blind apparatus according to an embodiment of the present invention.

Fig.2 is an exploded perspective view showing the pull stopper device according to a first embodiment of the present invention, which is to be illustrated in detail in Fig.10.

Fig.3 is a perspective view showing the assembled stopper device.

Fig.4 is a cross-sectional view taken along line 4-4 in Fig.3.

Fig.5 is a cross-sectional view showing the stopper device which restrains the movement of the pull cords.

Fig.6 is cross-sectional view showing the stopper device which sets the pull cords free to move.

Fig.7 is a top view showing that a pin is engaged with a position A in the guide groove of the switch member.

Fig.8 is a top view showing that the pin is engaged with a position B in the guide groove of the switch member.

Fig.9 is a top view showing that the pin is engaged with a position C in the guide groove of the switch member.

Fig.10 is a top view showing that the pin is engaged with a position D in the guide groove of the switch member.

Fig.11 is a perspective view showing the pull cord stopper device according to a second embodiment of the present invention, which is to be illustrated in detail in Fig.21.

Fig.12 is a perspective view showing the pull cord stopper device of Fig.11 with its pressure member opened.

Fig.13 is a cross-sectional view taken along line 13-13 in Fig.12.

Fig.14 is a cross-sectional view showing the pull cord stopper device that restrains the pull cords.

Fig.15 is a cross-sectional view showing the pull cord stopper device that sets the pull cords free to move.

Fig.16 is a cross-sectional view showing another state of the pull cord stopper device that sets the pull cords free to move.

Fig.17 is a cross-sectional view showing yet another state of the pull cord stopper device that sets the pull cords free to move.

Fig.18 is a view showing that the pin is engaged with a position E in the guide groove of the switch member.

Fig.19 is a view showing that the pin is engaged with a position F in the guide groove of the switch member.

Fig.20 is a view showing that the pin is engaged with a position G in the guide groove of the switch member.

Fig.21 is a view showing that the pin is engaged with a position H in the guide groove of the switch member.

Fig.22 shows the pull cord stopper device according to a third embodiment of the present invention, which is to be illustrated in detail in Fig.30.

Fig.23 is a cross-sectional view showing the pull cord stopper device that restrains the pull cords.

Fig.24 is a cross-sectional view showing one state of the pull cord stopper device that sets the pull cords free to move.

Fig.25 is a cross-sectional view showing another state of the pull cord stopper device that sets the pull cords free to move.

Fig.26 is a cross-sectional view showing yet another state of the pull cord stopper device that sets the pull cords free to move.

Fig.27 is a view showing that the pin is engaged with a position W in the guide groove of the switch member.

Fig.28 is a view showing that the pin is engaged with a position X in the guide groove of the switch member.

Fig.29 is a view showing that the pin is engaged with a position Y in the guide groove of the switch member.

Fig.30 is a view showing that the pin is engaged with a position Z in the guide groove of the switch member.

Fig.31 shows the head box from the pull cord stopper device to the pull cord exit opening, according to a fourth embodiment of the present invention.

Fig.32 is a horizontal cross-sectional view showing the interior of the head box.

Fig.33 is a view similar to that in Fig.32, but according to a fifth embodiment of the present invention.

Fig.1 shows generally a blind apparatus 11 according to an embodiment of the present invention. The top edge of screen is connected to the bottom of a head box 10. A bottom weight 14 is connected to the bottom edge of the screen. One end of each pull cord 16 is routed vertically up through through-holes 18 disposed in the screen 12, is introduced into the head box 10, then runs horizontally along a cord guide 26, and then reaches near the right-hand end of the head box 10 in Fig.1, passes through a pull cord stopper device 20 which can stop the movement of the pull cord 16, and then comes out of the head box 10. The end of each pull cord 16 extended from the head box 10 is connected to a cord binder 22. Also connected to the cord binder 22 is one end of a cord control string 24 which is operative to raise or lower the pull cord 16, and the other end of the cord control string 24 is connected to the bottom weight 14 at its one side.

Fig.2 is an exploded perspective view of a pull cord stopper device 20 according to the present invention. The cord stopper device 20 comprises a stopper case 28, a pinch roller 30, a slidable block 32, a switch member 34, a resilient member 36, and a pressure member 38. The stopper case 28 has on its one end portion a comb portion 40 where longitudinally extending recess and projection alternate transversely. Each recess of the comb portion 40 allows one cord to pass therethrough, separating the pull cords 16 as in Fig.3. The stopper case 28 has on the other end portion a knurled portion 42 where a transversely extending sawtooth projection, if viewed in a longitudinal cross-section, is repeated longitudinally in a sawtooth-like manner. The sawtooth of the knurled portion 42 is meshed with the sawtooth-like circumference of the pinch roller 30, causing the pinch roller 30 to move. The stopper case 28 has a pin 54 projected downward from the top inner wall as shown in Fig.5. The pinch roller 30 has on its both ends projections 44. The slidable block 32 is made of a support 46 for supporting the switch member 34 and arms 48 extended from both

ends of the support 46. The end portion of each arm 48 has a through-hole 50 that rotatably receives and supports the projection 44 of the pinch roller 30. The pressure member 38 is mounted over the knurled portion 42 of the stopper case 28 as shown in Fig.2, and the pressure member 38 has a projection 39 extended toward the comb portion 40 of the stopper case 28 as shown in Fig.4. The resilient member 36, on its one end, engaged with the projection 39 of the pressure member 38, is disposed between the pressure member 38 and the slidable block 32. The resilient member 36 constantly urges the slidable block 32 so that the pull cords 16 is pressed between the pinch roller 30 and the pressure member 38. The switch member 34 is provided with a guide groove 52 on its top surface.

Fig.3 is a perspective view showing an assembled pull cord stopper device 20, and Fig.4 is a cross-sectional view taken along line 4-4 in Fig.3. The slidable block 32 is inserted into the stopper case under its comb portion 40 in a manner that the arms 48 of the slidable block 32 come toward the knurled portion 42. The pinch roller 30 is mounted on the arms 48 with its projections 44 rotatably received at the through-holes 50. The pinch roller 30 is engaged with the stopper case 28 with its knurled portion 42 meshed with the circumferential saw-teeth on the pinch roller 30. When the pinch roller 30 rotates, the knurled portion 42 moves its because of meshing engagement, and then the pinch roller 30 along with the slidable block 32 moves the longitudinal direction of the stopper case 32. When the pinch roller 30 reaches the end of the knurled portion 42 at the comb portion 40 side, the pinch roller 30 presses the pull cords 16 against the pinching face of the pressure member 38, and thus restrains the motion of the pull cords 16. As already described, the resilient member 36 is disposed between the slidable block 32 and the pressure member 38. The switch member 34 is mounted, with its guide groove 52 looking upward, on the support 46 of the slidable block 32 in a manner that the switch member 34 is slidable in a direction perpendicular to the direction of motion of the slidable block 32, as shown in Fig.4. The guide groove 52 receives the pin 54 in a manner that allows the switch member 35 to move. The pull cords 16 enter the stopper case 28 with each routed through the corresponding recess of the comb portion 40, pass on top of the middle portion of stopper case 28 and on the pinch roller 30, and then exit the stopper case 28.

The operation of this embodiment of the present invention is now discussed.

When the blind apparatus 11 is set stationary, the slidable block 32 of the pull cord stopper device 20 is kept more toward the left as Fig.5 until the pin 54 is caught by a position A of the guide groove 52 of the switch member 34 as shown in Fig.7. The pinch roller 30 is positioned at the left-hand end of the knurled portion 42, and presses the pull cords 16 against the pressure member 38.

When a user pulls downward the pull cord control string 24, the pull cord 16 moves rightward in Fig.5. This pulling motion causes the pinch roller 30 to rotate clock-

wise in Fig.5 and to move rightward by means of guide of the knurled portion 42. Along with the pinch roller 30, the slidable block 32 moves rightward as well as shown in Fig.5. Along with the slidable block 32, the switch member 34 moves rightward in Fig.5, and downward in Fig.4 as well, until the pin 54 reaches a position B of the guide groove 52 in Fig.8. When the pin 54 reaches the position B of the guide groove 52, the further rightward movement of the switch member 34 in Fig.5 is restrained, and thus the slidable block 32 is unable to move rightward further in Fig.5, and stops there. The pinch roller 30 is thus positioned clear of the pinching face of the pressure member 38. The pull cords 16 are disengaged out of pinching engagement between the pinch roller 30 and the pinching face of the pressure member 38, and the control string 24 is now free to be pulled downward. This further pulling motion allows the screen 12 to be raised.

When the user lets go his or her hold of the control string 24, the pull cords 16 move leftward in Fig.6 because of the mass of the bottom weight 14. This movement causes the pinch roller 30 to rotate counterclockwise in Fig.6 and to move leftward by guide of the knurled portion 42. Since the slidable block 32 is under the urging of the resilient member 36 in Fig.6, the slidable block 32 moves leftward in Fig.6. Along with the slidable block 32, the switch member 34 moves leftward in Fig.6 and upward in Fig.4 as well, until the pin 54 reaches a position C of the guide groove 52 in Fig.9. When the pin 54 reaches the position C of the guide groove 52, the leftward movement of the switch member 34 is restrained, and the slidable block 32 cannot continue its leftward movement any more. The slidable block 32 stops as shown in Fig.6. Since, in its position, the pinch roller 30 is spaced apart from the pinching face of the pressure member 38, the pull cords 16 are not pinched between the pinch roller 30 and the pinching face of the pressure member 38. Thus, the pull cords 16 are free to move, and continuously move leftward in Fig.6 by the mass of the bottom weight 14. The screen 12 thus go downward.

When the control string 24 is manually pulled downward, the pull cords 16 move rightward in Fig.6. This causes the pinch roller 30 to rotate clockwise, and move rightward through guide of the knurled portion 42 in Fig.6. Along with the pinch roller 30, the slidable block 32 also moves rightward in Fig.6. The rightward movement of the slidable block 32 causes the switch member 34 to move rightward in Fig.6 and upward in Fig.4 as well, until the pin 54 reaches a position D of the guide groove 52 in Fig.10. When the pin 54 reaches the position D of the guide groove 52, the rightward movement of the switch member 34 is restrained in Fig.6. Then, the slidable block 32 cannot move any more rightward in Fig.6 and stops.

When the user lets go his or her hold of the control string 24, the pull cords 16 move leftward in Fig.6 because of the mass of the bottom weight 14. This movement causes the pinch roller 30 to rotate counterclockwise in Fig.6 and to move leftward by guide of the knurled

portion 42. Since the slidable block 32 is under the urging of the resilient member 36 in Fig.6, the slidable block 32 moves leftward in Fig.6. Along with the slidable block 32, the switch member 34 moves leftward in Fig.6 and downward in Fig.4 as well, until the pin 54 reaches the position A of the guide groove 52 in Fig.7. When the pin 54 reaches the position A of the guide groove 52, the leftward movement of the switch member 34 is restrained in Fig.6, and the slidable block 32 cannot continue its leftward movement any more in Fig.6. The slidable block 32 stops as shown in Fig.5. Namely, the pinch roller 30 is at the left end of the knurled portion 42, and the pull cords 16 are pinched between the pinch roller 30 and the pressure member 38, restraining the motion of the cords 16. The bottom weight 14 now stops midway.

As described above, the pull cord stopper device 20 can switch between engagement and release of engagement of the pull cords 16 depending on how many times the control string has been pulled before the current pulling.

Figs.11, 12 and 13 show a second embodiment of the present invention. A pull cord stopper device 60 comprises a stopper case 62, a pinch roller 64, a slidable block 66, a switch member 68, and a pressure member 70. The stopper case 62 has on its one end a comb portion 72 where a longitudinal recess and a longitudinal projection alternate transversely. As shown in Fig.11, the comb portion 72 separate pull cords 16 by allowing each cord to pass through the corresponding recess. The stopper case 62 has on its inside bottom surface on its longitudinally midway portion a knurled portion 74 where a transversely extending sawtooth projection, if viewed in a longitudinal cross-section, is repeated longitudinally in a sawtooth-like manner. The sawteeth on the knurled portion 74 are meshed with the circumferential sawteeth on the pinch roller 64. The stopper case 62 has on its bottom a cutout 75 from its end to the end of the knurled portion. As shown in Fig.12, the stopper case 62 has a pin 76 extended downward. The slidable block 66 comprises a support 78 that supports the switch member 68 in a manner that allows the switch member 68 to move in a direction perpendicular to the direction of the movement of the slidable block 66, arm portions 80 that rotatably support the pinch roller 64, and a contact portion 81 which transversely connects the ends of the arm portions 80 and which has a curved face on its underside so that the pull cords 16 are guided thereunder. The slidable block 66 is mounted inside the stopper case 62 in a manner that its support 78 comes to the pin 76 side and its arm portions 80 come to the knurled portion 74 side. The pinch roller 64 is engaged with the knurled portion 74, with the pinch roller's sawtooth circumference meshed with sawtooth of the knurled portion 74. When rotated, the pinch roller 64 along with the slidable block 66 moves in its longitudinal direction according to the guiding of the knurled portion 74. The switch member 68 has a guide groove 82 on its surface. As shown in Fig.13, the switch member 68 is supported by the support 78 in a manner that the guide groove 82 looks upward. The guide groove

82 receives the pin 78 in a manner that the switch member 68 is guided. About its one end, the pressure member 70 is pivotally supported by the stopper case 62 at its ends on both sides of the cutout 75. The pressure member 70 longitudinally extends where its other end comes above the left-hand end of the knurled portion 74 in Fig.11. When the pinch roller 64 reaches the other end of the pressure member 70, the pressure member 70 pinches the pull cords 16 to restrain their movement. The pull cords 16 are introduced by the comb portion 72 into the stopper case 62 by routing each cord through the corresponding recess of the comb portion 72, routed on the top surface of the stopper case 62 and the pinch roller 64, and then under the contact portion 81 along its curved face, and are delivered out of the stopper case 62 at a slight upward inclination. Namely, the pull cords 16 are delivered out at a slightly curled state provided by the contact portion 81 rather than delivered out at a tangential angle, i.e., a horizontal angle, of the curved face of the contact portion 81 at its lowermost point.

The operation of the second embodiment is now discussed.

When the blind apparatus 11 is set stationary, the slidable block 66 of the pull cord stopper 60 is restrained with the guide groove 82 of the switch member 68 is locked at its position E by the pin 76 as in Fig.18, and the slidable block 66 is thus positioned to the left as shown in Fig.14. The pinch roller 64 is positioned at the left end of the knurled portion 74 in Fig.14, pinching the pull cords 16 against the pressure member 70.

When the control string 24 is manually pulled downward, the pull cords 16 move rightward in Fig.14. This causes the pinch roller 64 to rotate clockwise, and move rightward through guide of the knurled portion 74 in Fig.6. Along with the pinch roller 64, the slidable block 66 also moves rightward in Fig.14. When the pinch roller 64 gets out of engagement with the knurled portion 74 and goes into the cutout 75, it begins to idly rotate. When the pinch roller 64 idly rotates, the contact portion 81 moves rightward in Fig.14 because of its friction with the pull cords 16. Thus, the slidable block 66 along with the pinch roller 64 moves rightward in Fig.14. The rightward movement of the slidable block 66 causes the switch member 68 to move rightward in Fig.14 and upward in Fig.13 as well, until the pin 76 reaches a position F of the guide groove 82 in Fig.19. When the pin 76 reaches the position F of the guide groove 82, the rightward movement of the switch member 68 is restrained in Fig.14. Then, the slidable block 66 and the pinch roller 64 cannot move any more rightward as shown in Fig.15 and stop. The pull cords 16 are not pinched between the pinch roller 64 and the pressure member 70, the control string 24 can be continuously pulled downward. The screen 12 is thus continuously raised.

When the user lets go his or her hold of the control string 24, the pull cords 16 move leftward in Fig.15 because of the mass of the bottom weight 14. The contact portion 81 provides a slight forced contact on its right half of its curved face opposite the pinch roller 64 side in

Fig.15. This contact provides friction with the pull cords 16, causing the contact portion 81 to move leftward. An idling pinch roller 64 along with the slidable block 66 moves leftward in Fig.15. Along with the slidable block 66, the switch member 68 moves leftward in Fig.15 and upward in Fig.13 as well, until the pin 76 reaches a position G of the guide groove 82 in Fig.20. When the pin 76 reaches the position G of the guide groove 76, the leftward movement of the switch member 68 is restrained, and the slidable block 66 cannot continue its leftward movement any more in Fig.15. The slidable block 66 and the pinch roller 64 stop as shown in Fig.16. The pinch roller 64 is in the space of the cutout 75, and the pull cords 16 are not pinched between the pinch roller 64 and the pressure member 70. The pull cords 16 are free to move, and continuously move leftward in Fig.6 by the mass of the bottom weight 14. The screen 12 is thus continuously lowered.

When the control string 24 is manually pulled downward again, the pull cords 16 move rightward in Fig.16. The contact portion 81 moves rightward in Fig.16, and the pinch roller 64, while rotating idly, moves rightward along with the slidable block 66 in Fig.16. The rightward movement of the slidable block 66 causes the switch member 68 to move rightward in Fig.16 and upward in Fig.13 as well, until the pin 76 reaches a position H of the guide groove 82 in Fig.21. When the pin 76 reaches the position H of the guide groove 82, the rightward movement of the slidable block 66 is restrained in Fig.16, and then, the slidable block 66 stops as in Fig.17.

When the user lets go his or her hold of the control string 24, the pull cords 16 move leftward in Fig.17 because of the mass of the bottom weight 14. The contact portion 81 moves leftward in Fig.17, and thus the pinch roller 64, while rotating idly, moves leftward along with the slidable block 66 in Fig.17. Along with the slidable block 66, the switch member 68 moves leftward in Fig.17 and downward in Fig.13 as well, until the pin 76 reaches a position E of the guide groove 82 in Fig.18. In this case, the pinch roller 64, while rotating idly in the space of the cutout 75, moves leftward in Fig.17 to the knurled portion 74. Thereafter, the pinch roller 64 continues to move leftward under the guiding of the knurled portion 74 in Fig.17. When the pin 76 reaches the position E of the guide groove 76, the leftward movement of the switch member 68 is restrained, and the slidable block 66 cannot continue its leftward movement any more in Fig.17. The slidable block 66 and the pinch roller 64 stop as shown in Fig.14. Since the pinch roller 64 is positioned at the end of the knurled 70, the pull cords 16 are pinched between the pinch roller 64 and the pressure member 70. The movement of the pull cords 16 is restrained, and the bottom weight 14 stops midway.

As described above, the pull cord stopper device 60 can switch between engagement and release of engagement of the pull cords 16 depending on how many times the control string has been pulled before the current pulling.

Fig.22 shows a third embodiment of the present invention. A stopper device 90 comprises a stopper case 92, a pinch roller 94, a slidable block 96, a switch member 98, a pressure member 100, a pin 102, and a leaf spring 104. The stopper case 92 has on its one end portion a comb portion (not shown) of longitudinally extending recesses and projections in the same manner as in the first embodiment and second embodiment. Each recess allows the corresponding pull cord 16 to pass there-through to separate the pull cords 16. The stopper case 92 has longitudinally midway on its inner bottom surface a knurled portion 106 where transversely extending sawtooth projection, if viewed in a longitudinal cross-section, is repeated longitudinally in a sawtooth-like manner as shown in Fig.23. The knurled portion 106 is meshed with the circumferential sawteeth on the pinch roller 94. The stopper case 92 has on its bottom surface a cutout 108 that extends from the end of the knurled portion 106 to one end of the stopper case 92. The stopper case 92 has on its bottom surface a through-hole 110 opposite to the cutout 108 with respect to the knurled portion 106. As shown in Fig.23, the pin 102 is inserted into the through-hole 110 from below the stopper case 92. A longitudinally extending groove 112 is formed on the bottom side of the stopper case 92 where the through-hole 110 is drilled. As shown in Fig.23, the leaf spring 104 is fitted into the groove 112, constantly urging the pin 102 upward. The slidable block 98 comprises a support 114 that supports the switch member 98 in a manner that allows the switch member 98 to move in a direction transverse to the direction of the movement of the slidable block 96, arm portions 116 for rotatably supporting the pinch roller 94, and a contact portion 118 which transversely connects the ends of the arm portions 116 and which has a curved face on its underside so that the pull cords 16 are guided thereunder. The slidable block 96 is mounted inside the stopper case 92 in a manner that its support 114 comes to the pin 102 side and its arm portions 116 come to the knurled portion 106 side. The pinch roller 104 is engaged with the knurled portion 106, with the pinch roller's sawtooth circumference meshed with sawtooth of the knurled portion 106, as shown in Fig.23. When rotated, the pinch roller 94 along with the slidable block 96 moves in its longitudinal direction according to the guiding of the knurled portion 106. The switch member 98 has a guide groove 120 on its surface as shown in Fig.27. In the groove 120, a portion I is a deep groove portion, a portion J is a ramp groove portion that gradually rises from the portion I to the border between a portion K and the portion I, the portion K is again deep, with a step formed at the border between the portion K and the portion I, a portion L is a ramp portion that gradually rises from the portion K to the border between the portion L and a portion M, the portion M is deep again, with a step formed at the border between the portion L and the portion M, a portion N is a ramp that gradually rises from portion M to the border between the portion N and a portion O, the portion O is again deep, with a step formed at the border between the portion N and the portion O, a portion P is

a ramp that gradually rises from the portion O to the border between the portion P and a portion Q, and the portion Q is as shallow as the highest position of the portion P. The switch member 98 is mounted on the support 114 in a manner that the guide groove 120 looks downward in the stopper case 92 as in Fig.23. The guide groove 120 receives the pin 102 in a manner that allows the switch member 98 is slidable. The pin 102 is urged against the switch member 98 by the leaf spring 104 in order to control looseness. About its one end, the pressure member 100 is pivotally supported by the stopper case 92 at its ends on both sides of the cutout 108. The pressure member 100 longitudinally extends where its other end comes above the left-hand end of the knurled portion 106 in Fig.23. When the pinch roller 94 reaches the left-hand end of the knurled portion 106 in Fig.23, the pressure member 100 in cooperation with the pinch roller 94 pinches the pull cords 16 to restrain their movement. The pull cords 16 are introduced by the comb portion side into the stopper case 92 by routing each cord through the corresponding recess of the comb portion, routed on the top surface of the stopper case 92 and the pinch roller 94, and then under the contact portion 118 along its curved face, and are delivered out of the stopper case 92 at a slight upward inclination. Namely, the pull cords 16 are delivered out at a slightly curled state provided by the contact portion 118 rather than delivered out at a tangential angle, i.e., a horizontal angle, of the curved face of the contact portion 118 at its lowermost point.

The operation of the third embodiment of the present invention is discussed now.

When the blind apparatus 11 is set stationary, the slidable block 96 of the pull cord stopper device 90 is kept more toward the left as Fig.23 with the pin 102 restrained by a position W of the guide groove 120 of the switch member 98 in Fig.27. The pinch roller 94 is positioned at the left end of the knurled portion 106 as in Fig.23, and pinches the pull cords 16 against the pressure member 100.

When the control string 24 is manually pulled downward, the pull cords 16 move rightward in Fig.23. This causes the pinch roller 94 to rotate clockwise, and move rightward through guide of the knurled portion 104 in Fig.23. Along with the pinch roller 94, the slidable block 96 also moves rightward in Fig.23. When the pinch roller 94 gets out of engagement with the knurled portion 104 and goes into the cutout 108, it begins to idly rotate. When the pinch roller 94 idly rotates, the contact portion 118 moves rightward in Fig.24 because of its friction with the pull cords 16. Thus, the slidable block 96 along with the pinch roller 94 moves rightward in Fig.24. The rightward movement of the slidable block 96 causes the switch member 96 to move rightward in Fig.24 until the pin 102 goes over the portion L in the guide groove 120 and reaches a position X in the portion M in Fig.28. When the pin 102 reaches the position X of the guide groove 102, the rightward movement of the switch member 98 is restrained in Fig.24. Then, the slidable block 96 cannot

move any more rightward as shown in Fig.24. The slidable block 96 and the pinch roller 94 stop as shown in Fig.24. The pull cords 16 are not pinched between the pinch roller 94 and the pressure member 100, the control string 24 can be continuously pulled downward. The screen 12 is thus continuously raised.

When the user lets go his or her hold of the control string 24, the pull cords 16 move leftward in Fig.24 because of the mass of the bottom weight 14. The contact portion 118 provides a slight forced contact on its right half of its curved face opposite the pinch roller 94 side in Fig.24. This contact provides friction with the pull cords 16, causing the contact portion 118 to move leftward. The pinch roller 94, while idly rotating, moves leftward along with the slidable block 96 in Fig.24. Along with the slidable block 96, the switch member 98 moves leftward in Fig.24 and at the same time approaches the reader in perpendicular to the plane of Fig.24 as well, until the pin 102 goes over the portion N in the guide groove 120 and reaches a position Y in the portion O in the guide groove 120 in Fig.29. When the pin 102 reaches the position Y of the guide groove 120, the leftward movement of the switch member 98 is restrained in Fig.24, and the slidable block 96 cannot continue its leftward movement any more in Fig.24. The slidable block 96 and the pinch roller 94 stop as shown in Fig.25. The pinch roller 94 is in the space of the cutout 108, and the pull cords 16 are not pinched between the pinch roller 94 and the pressure member 100. The pull cords 16 are free to move, and continuously move leftward in Fig.25 by the mass of the bottom weight 14. The screen 12 is thus continuously lowered.

When the control string 24 is manually pulled downward again, the pull cords 16 move rightward in Fig.25. The contact portion 118 moves rightward in Fig.25, and the pinch roller 94, while rotating idly, moves rightward along with the slidable block 96 in Fig.25. The rightward movement of the slidable block 96 causes the switch member 98 to move rightward in Fig.25 and moves at the same time approaches the reader perpendicular to the plane of Fig.25 as well, until the pin 102 goes over the portion P or portion Z and reaches a position Z in the portion I of the guide groove 120 in Fig.30. When the pin 102 reaches the position Z of the guide groove 102, the rightward movement of the slidable block 96 is restrained in Fig.25, and then, the slidable block 96 stops as in Fig.26.

When the user lets go his or her hold of the control string 24, the pull cords 16 move leftward in Fig.26 because of the mass of the bottom weight 14. The contact portion 118 moves leftward in Fig.26, and thus the pinch roller 94, while rotating idly, moves leftward along with the slidable block 96 in Fig.25. Along with the slidable block 96, the switch member 98 moves leftward in Fig.26 and at the same time moves away from the reader perpendicular to the plane of Fig.26 until the pin 102 goes over the portion J in the guide groove 120 and reaches a position W in the portion K in the guide groove 120 in Fig.27. The pinch roller 94, while rotating idly in

the space of the cutout 108, moves leftward and reaches the knurled portion 106. Thereafter, the pinch roller 94 continues to move leftward under the guiding of the knurled portion 106 in Fig.26. When the pin 102 reaches the position W of the guide groove 120, the leftward movement of the switch member 98 is restrained, and the slidable block 96 and the pinch roller 94 cannot continue its leftward movement any more in Fig.26. The slidable block 96 and the pinch roller 94 stop as shown in Fig.23. Since the pinch roller 94 is positioned at the end of the knurled 100, the pull cords 16 are pinched between the pinch roller 94 and the pressure member 100. The movement of the pull cords 16 is restrained, and the bottom weight 14 stops midway.

As described above, the pull cord stopper device 90 can switch between engagement and release of engagement of the pull cords 16 depending on how many times the control string has been pulled before the current pulling.

In both the first and second embodiments, the depth of the guide groove of the switch member is constant in any location within, and in the third embodiment, the depth of the guide groove of the switch member is varied. The present invention is not limited to these embodiments, and other form of the guide groove is optional.

In these embodiments, the comb portion that separate the pull cords is disposed on the entry side (pin side) of the stopper case. Alternatively, it may be disposed on the exit side of the stopper case, or two comb portions may be disposed, one for each of the entry and exit sides.

Since the present invention employs the arrangement in which the switching of the pull cords between release and stop is performed by horizontally moving back and forth the pinch roller, a reduced height dimension is possible in the pull cord stopper device. Thus, the pull cord stopper device according to the present invention presents no difficulty in its installation in the head box.

Since the pull cord stopper device is operated by pulling down the control string, its operation is simple, and not so confusing as in the conventional type in which the control string needs swinging horizontally before raise or lower operation. Since a compact exit opening of the pull cords is allowed, the present invention offers an aesthetically excellent appearance.

The pressure member is detachably mounted into the stopper case, and thus routing the pull cords is easy.

In the second and third embodiments, the knurled portion is disposed where the pull cords are pinched between the pinch roller of the stopper case and the pressure member, and the cutout is disposed where the pinch roller moves back and forth. When the control string is pulled down to raise the screen, the pinch roller simply rotates idly in the cutout portion. Thus, wear of the pull cords is prevented in a long time of service life.

Next fourth and fifth embodiments are characterized in that the separation between the stopper device and the cord exit opening of the head box is adjustable in a head box. These embodiments has a comb member

between the stopper device and the exit opening for keep pull cords separated, one from another.

When the number of pull cords is large, a pull cord stopper device is installed apart from the pull cord exit opening of the head box. With a bottom weight at its almost lowest position, the cord binder comes close to the cord exit opening. The pull cords may get tangled near the cord binder. Even if the pull cords have a tangled portion formed at the pull cord exit opening, however, that portion may be disentangled before it reaches the stopper device. Therefore, entangled cords are not introduced into the stopper device.

When the number of pull cords is small, the stopper device may be installed close to the cord exit opening. When the cord binder gets near the pull cord exit opening, the pull cords may get tangled. The tangled portion is of short-length, and relatively rapidly disentangled. Therefore, entangled cords are not introduced into the stopper device.

The comb portion, disposed between the stopper device and the pull cord exit opening, serves to disentangle the tangled portion of the cords before it is introduced into the comb portion. Therefore, entangled cords does not get jammed in the comb member.

Figs.31 and 32 show part of the head box 210 from the mounting position of the pull cord stopper device 220 to the pull cord exit opening 228. The stopper device 220 comprises a stopper case 230, a pinch roller 232, a slidable block 234, a switch member 236 and a pressure member 238. The stopper case 230 has on its one end portion a comb portion 240 of longitudinally extending recesses and projections. Each recess of the comb portion 240 allows the corresponding pull cord 216 to pass therethrough to separate the pull cords 216 as shown in Fig.32. The stopper case 230 has longitudinally midway on its inner bottom surface a knurled portion 242 where transversely extending sawtooth projection, if viewed in a longitudinal cross-section, is repeated longitudinally in a sawtooth-like manner. The knurled portion 242 is meshed with the sawtooth circumference of the pinch roller 232. The stopper case 230 has on its bottom surface a cutout 244 that extends from the end of the knurled portion 242 to one end of the stopper case 230. The stopper case 230 is provided with a pin 246 that is projected downward as shown in Fig.31. The slidable block 234 comprises a support 248 that supports the switch member 236 in a manner that allows the switch member 236 to move in a direction transverse to the direction of the movement of the slidable block 236, arm portions 250 for rotatably supporting the pinch roller 232, and a contact portion 252 which transversely connects the ends of the arm portions 250 and which has a curved face on its underside so that the pull cords 216 are guided thereunder. The slidable block 234 is mounted inside the stopper case 230 in a manner that its support 248 comes to the comb portion 240 side and its arm portions 250 come to the knurled portion 242 side. The pinch roller 232 is engaged with the knurled portion 242, with the pinch roller's sawtooth circumference meshed with sawtooth of

the knurled portion 242. When rotated, the pinch roller 242 along with the slidable block 234 moves in its longitudinal direction according to the guiding of the knurled portion 242. The switch member 236 has a guide groove 254 on its surface and is mounted on the support 248 with its guide groove 254 looking upward relative to the stopper case 230 as shown in Fig.31. The guide groove 254 receives the pin 246 in a manner that allows the switch member 236 is slidable. About its one end, the pressure member 238 is pivotally supported by the stopper case 230 at its ends on both sides of the cutout 244. The pressure member 238 longitudinally extends where its other end comes above the left end of the knurled portion 242 in Fig.31. When the pinch roller 232 reaches the left-hand end of the knurled portion 242, the pressure member 238 in cooperation with the pinch roller 232 pinches the pull cords 216 to restrain their movement. The raise/lower cords 216 are introduced by the comb portion 240 into the stopper case 230 by routing each cord through the corresponding recess of the comb portion 240, routed on the top surface of the stopper case 230 and the pinch roller 232, and then under the contact portion 252 along its curved face, and are delivered out of the stopper case 230 at a slight upward inclination. Namely, the pull cords 216 are delivered out at a slightly curled state provided by the contact portion 252 rather than delivered out at a tangential angle, i.e., a horizontal angle, of the curved face of the contact portion 252 at its lowermost point.

The comb member 256 is disposed between the pull cord stopper device 220 and the pull cord exit opening 228. Like the comb portion 240 in the pull cord stopper device 220, the comb member 256 has also longitudinally extending recesses and projections alternately arranged transversely, with each recess allowing the corresponding cord to pass therethrough, in order to separate the pull cords 216. The comb member 256 is particularly useful when a number of cords 216 are used.

The pull cords 216 passing the comb member 256 routed through a guide roller 258 disposed near the cord exit opening 228 inside the head box 210. The guide roller 258 changes the direction of the pull cords 256 to deliver them out of the pull cord exit opening 228.

Alternatively, the pull cord stopper device 220 may be designed as follows: the pin disposed into the stopper case 230 is urged by a spring so that it is kept projected from below, and the support 248 of a switch member is arranged so that its guide groove looks downward relative to the stopper case 230.

The guide groove may be provided with a step which regulates the sliding motion of the slidable block by preventing the pin from sliding back.

The operation of the fourth embodiment of the present invention is now discussed.

The pinch roller 232 of the pull cord stopper device 220 is positioned at the left end of the knurled portion 242 in Fig.31, and pinches the pull cords 216 against the pressure member 238.

When the control string 24 is manually pulled downward, the pull cords 216 move rightward in Fig.31. This causes the pinch roller 232 to rotate clockwise, and move rightward through guide of the knurled portion 242 in Fig.31. Along with the pinch roller 232, the slidable block 234 also moves rightward in Fig.31. When the pinch roller 232 gets out of engagement with the knurled portion 242 and goes into the cutout 242, it begins to idly rotate. When the pinch roller 232 idly rotates, the contact portion 252 is drawn rightward in Fig.31 because of its friction with the pull cords 216. Thus, the slidable block 234 along with the pinch roller 232 moves rightward in Fig.31. The rightward movement of the slidable block 234 causes the switch member 236 to move rightward until the pin 246 reaches the predetermined position in the guide groove 254. When the pin 246 reaches the predetermined position in the guide groove 254, the rightward movement of the switch member 236 is restrained in Fig.31. Then, the slidable block 234 cannot move any more rightward as shown in Fig.31. The slidable block 234 and the pinch roller 232 stop. The pull cords 216 are not pinched between the pinch roller 232 and the pressure member 238, the control string 24 can be continuously pulled downward. A plurality of pull cords 216 sliding in the head box 210 are separated one from another through the comb portion 240 in the stopper device 220, routed along on the pinch roller 232 and under the contact portion 252, delivered out of the stopper device 220, and again separated one from another through the comb member 256, guided by the guide roller 258 toward the pull cord exit opening 228, and then routed out of the head box 210 through the exit opening 228. The screen 12 is thus raised.

When the user lets go his or her hold of the control string 24, the pull cords 216 move leftward in Fig.31 because of the mass of the bottom weight 14. The contact portion 252 provides a slight forced contact on its right half of its curved face opposite the pinch roller 232 side. This contact provides friction with the pull cords 216, causing the contact portion 252 to move leftward. The pinch roller 232, while idly rotating, moves leftward along with the slidable block 234. Along with the slidable block 234, the switch member 236 moves leftward until the pin 246 reaches to a predetermined position in the guide groove 254. When the pin 246 reaches the predetermined position in the guide groove 254, the leftward movement of the switch member 236 is restrained in Fig.31, and the slidable block 234 cannot continue its leftward movement any more in Fig.31. The slidable block 234 and the pinch roller 232 stop. The pinch roller 232 is in the space of the cutout 244, and the pull cords 216 are not pinched between the pinch roller 232 and the pressure member 238. The pull cords 216 are free to move, and continuously move leftward in Fig.31 by the mass of the bottom weight 14.

A plurality of pull cords 216 sliding in the head box 210 are separated one from another through the comb portion 240 in the stopper device 220, routed along on the pinch roller 232 and under the contact portion 252,

delivered out of the stopper device 220, and again separated one from another through the comb member 256, guided by the guide roller 258 toward the pull cord exit opening 228, and then routed out of the head box 210 through the exit opening 228. The screen 12 is thus raised.

The paid-out portion of the pull cords 216 out of the exit opening 228 is then pulled via the exit opening 228. The pull cords 216 are then routed by the guide roller 258 toward the comb member 256, separated by the comb member 258, one from another, and run through the pull cord stopper 220. The screen 12 is thus continuously lowered. When the bottom weight 14 is lowered almost to its lower limit, the cord binder 22 is raised close to the pull cord exit opening 228. Although the pull cords 216 may get tangled in the vicinity of the cord binder 22, they are disentangled in the travel between the exit opening 228 and the comb member 256. This travel is long enough to disentangle the pull cords 216, and it is not likely that the tangled pull cords 216 will get jammed.

When the control string 24 is manually pulled downward again, the pull cords 216 move rightward in Fig.31. The contact portion 252 moves rightward in Fig.31, and the pinch roller 232, while rotating idly, moves rightward along with the slidable block 234 in Fig.31. The rightward movement of the slidable block 234 causes the switch member 236 to move rightward until the pin 246 reaches a predetermined position in the guide groove 254. When the pin 246 reaches the predetermined position in the guide groove 254, the rightward movement of the slidable block 234 is restrained in Fig.31, and then, the slidable block 234 stops. In this state, the control string 24 can be pulled down, and the screen 12 can thus be raised.

When the user lets go his or her hold of the control string 24, the pull cords 216 move leftward in Fig.31 because of the mass of the bottom weight 14. The contact portion 252 moves leftward in Fig.31, and thus the pinch roller 232, while rotating idly, moves leftward along with the slidable block 234 in Fig.31. Along with the slidable block 234, the switch member 236 moves leftward until the pin 246 reaches a predetermined position in the guide groove 254. The pinch roller 232, while rotating idly in the space of the cutout 244, moves leftward and reaches the knurled portion 242. Thereafter, the pinch roller 232 continues to move leftward under the guiding of the knurled portion 242 in Fig.31. When the pin 246 reaches the predetermined position in the guide groove 254, the leftward movement of the switch member 236 is restrained, and the slidable block 234 and the pinch roller 232 cannot continue its leftward movement any more in Fig.31. The slidable block 234 and the pinch roller 232 now stop. Since the pinch roller 232 is positioned at the end of the pressure member 238, the pull cords 216 are pinched between the pinch roller 232 and the pressure member 238. The screen thus stops midway.

Fig.33 shows a fifth embodiment of the present invention. The fifth embodiment is identical to the fourth

embodiment in construction except that the comb member 256 is removed from between the pull cord stopper device 220 and the pull cord exit opening 228 and that the pull cord stopper device 220 is installed closer to the pull cord opening 228. This embodiment is particularly useful when the number of pull cords 216 is small. When the number of pull cords 216 is small, the possibility of tangling is accordingly small. If tangled, the cords may be relatively rapidly disentangled. Even if the stopper device 220 is mounted close to the pull cord exit opening 228, the tangled portion of the cords 216 is disentangled before it reaches the pull cord stopper device 220. The operation of the present embodiment is identical to the fourth embodiment except the comb member 256.

According to the present invention, the user can easily operate the pull cord stopper device simply pulling or let go his or her hold of the cord control string even if the screen is not cleared of obstacles in front or on the side thereof.

According to the present invention, furthermore, the stopper case is designed to arrange the pull cords on the same flush level in a belt-like fashion in their path. Therefore, the more the number of cords the more the frictional surface results. This means that the sliding motion of the slidable block and switching operation of the switch member are performed in an assured manner. The present invention is thus adaptable to large-scale blind apparatus design.

Claims

1. A pull cord stopper device for use in a blind apparatus including:
 - a head box (10);
 - a screen (12), the top of which is connected to the head box (10);
 - pull cords (16), one ends of which are connected to the bottom end of the screen, and the other ends of which are routed into the head box (10) and delivered out from near one end of the head box (10); and
 - the pull cord stopper device (20) capable of restraining movement of the pull cords (16);
 - said pull cord stopper device (20) comprising:
 - a stopper case (28), a pinch roller (30), a slidable block (32), a switch member (34) and a pressure member (38);
 - said stopper case (28) comprising:
 - a separation portion (40) for separating the pull cords (16), one from another;
 - a knurled portion (42) for guiding the pinch roller (30) for its movement; and
 - a pin (54) received by the guide groove (52) formed on the switch member (34) for guiding the switch member (34);
 - whereby said slidable block (32) rotatably supports the pinch roller (30) and is operative to move in the direction of movement of the pull cords (16) by means of rotation of the pinch roller (30),

supports the switch member (34) which is integrally movable with the pull cords (16) in their direction of movement, and, at the same time, supports the switch member (34) in a manner that it is relatively movable in a direction transverse to the movement of the pull cords (16); and

said pressure member (38) is operative to pinch the pull cords (16) between the pinch roller (30) and the pressure member (38).

2. A pull cord stopper device for use in a blind apparatus including:

a head box (10);

a screen (12), the top of which is connected to the head box (10);

pull cords (16), one ends of which are connected to the bottom end of the screen, and the other ends of which are routed into the head box (10) and delivered out from near one end of the head box (10); and

the pull cord stopper device (60) capable of restraining movement of the pull cords (16);

said pull cord stopper device (60) comprising:

a stopper case (62), a pinch roller (64), a slidable block (66), a switch member (68) and a pressure member (70);

said stopper case (62) comprising:

a separation portion (72) for separating the pull cords (16), one from another;

a knurled portion (72) for guiding the pinch roller (64) for its movement; and

a cutout portion (75) for allowing the pinch roller (64) to idly rotate;

said slidable block (66) rotatably supports the pinch roller (64), and is operative to move in the direction of travel of the pull cords by means of rotation of the pinch roller (64) and friction with the pull cords (64),

supports the switch member (68) which is integrally movable with the pull cords (16) in their direction of travel, and, at the same time, supports the switch member (68) in a manner that it is relatively movable in a direction transverse to the travel of the pull cords (16);

said switch member (68) is provided with a guide groove (82);

said guide groove (82) receives a pin (76) rigidly connected to the stopper case (62) for guiding the movement of the switch member (68); and

said pressure member (70) is operative to pinch the pull cords (16) between the pinch roller (64) and the pressure member (70).

3. The pull cord stopper device for use in the blind apparatus according to claim 2, wherein said pin is constantly urged by a resilient member toward the guide groove of the switch member.

4. The pull cord stopper device for use in the blind apparatus according to any of claims 1 through 3, wherein a resilient member (36) is provided such that the slidable block (32) is urged in a manner that pinches the pull cords (16) between the pinch roller (30) and the pressure member (38).

5. The pull cord stopper device for use in the blind apparatus according to any of claims 1 through 4, wherein the pressure member is mounted to the stopper case in a manner that allows the pressure member is opened/closed relative to the stopper case.

6. A pull cord stopper device for use in a blind apparatus including:

a head box (10);

a screen (12), the top of which is connected to the head box (10);

pull cords (16), one ends of which are connected to the bottom end of the screen, and the other ends of which are routed into the head box (10) and delivered out through a pull cord exit opening (28) disposed near one end of the head box (10); and

a pull cord stopper device (20) capable of restraining movement of the pull cords (16);

said pull cord stopper device (20) is mounted in the head box (10) in a manner that the separation between the stopper device and the pull cord exit opening (28) of the head box is adjustable in the head box.

7. The pull cord stopper device for use in the blind apparatus according to claim 6, wherein a comb member (56) capable of separating the pull cords (16), one from another, is disposed between the pull cord stopper device (20) and the pull cord exit opening (28).

8. A pull cord stopper device including means (40) for routing a plurality of pull cords (16) through the stopper device (20).

9. A pull cord stopper device including a pinch roller (30) mounted for rotation within a stopper case (28), means (74) for causing rotation of the pinch roller (20) to move the pinch roller (30) to a position in which the pinch roller (30) restrains the motion of at least one pull cord (16), and means (32, 52, 54) for enabling the pinch roller (30) to move within the stopper case (28) away from said position without rotation.

10. A blind apparatus including a pull cord stopper device (20) according to any one of the preceding claims.

FIG. 1

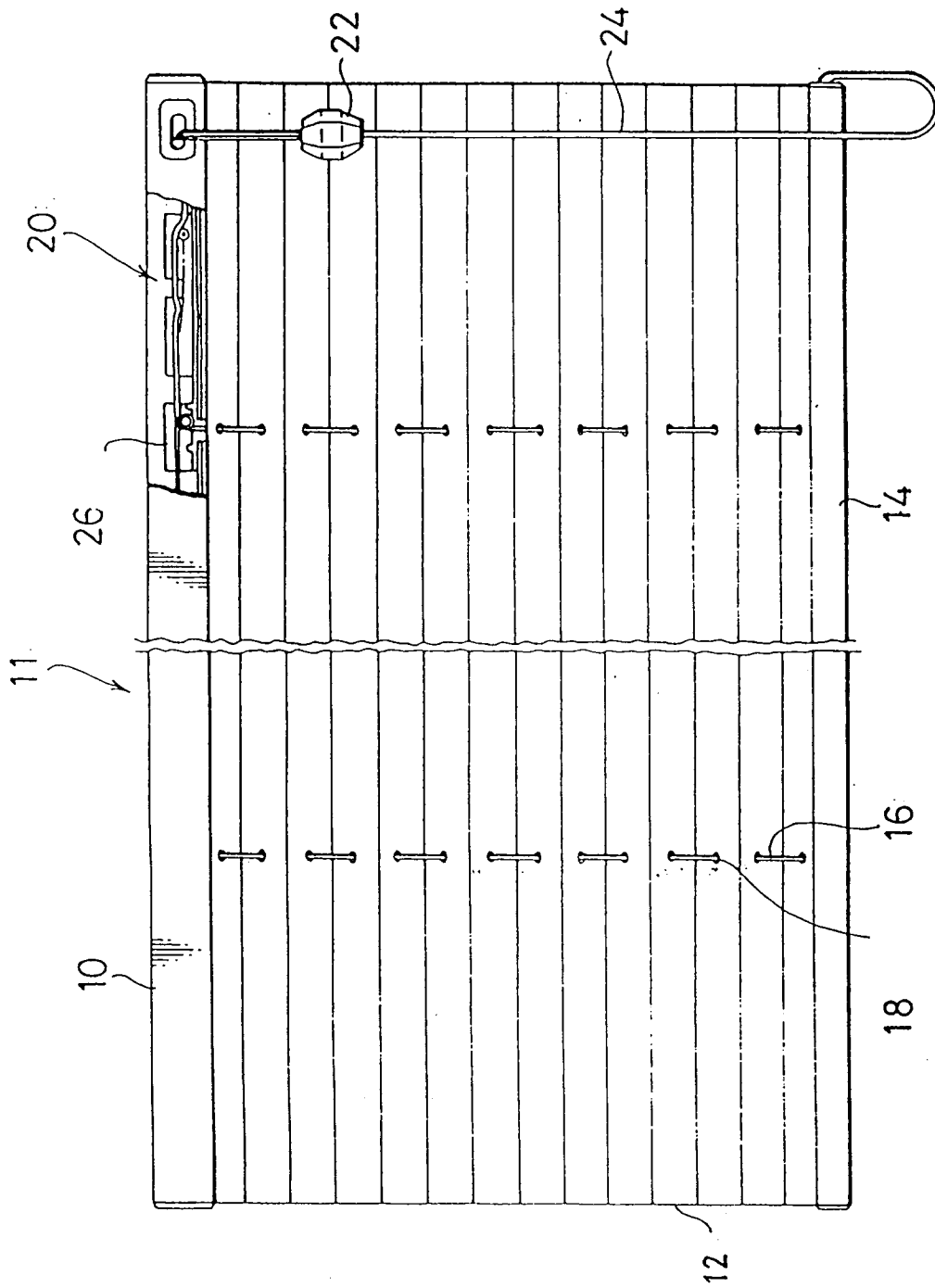


FIG. 2

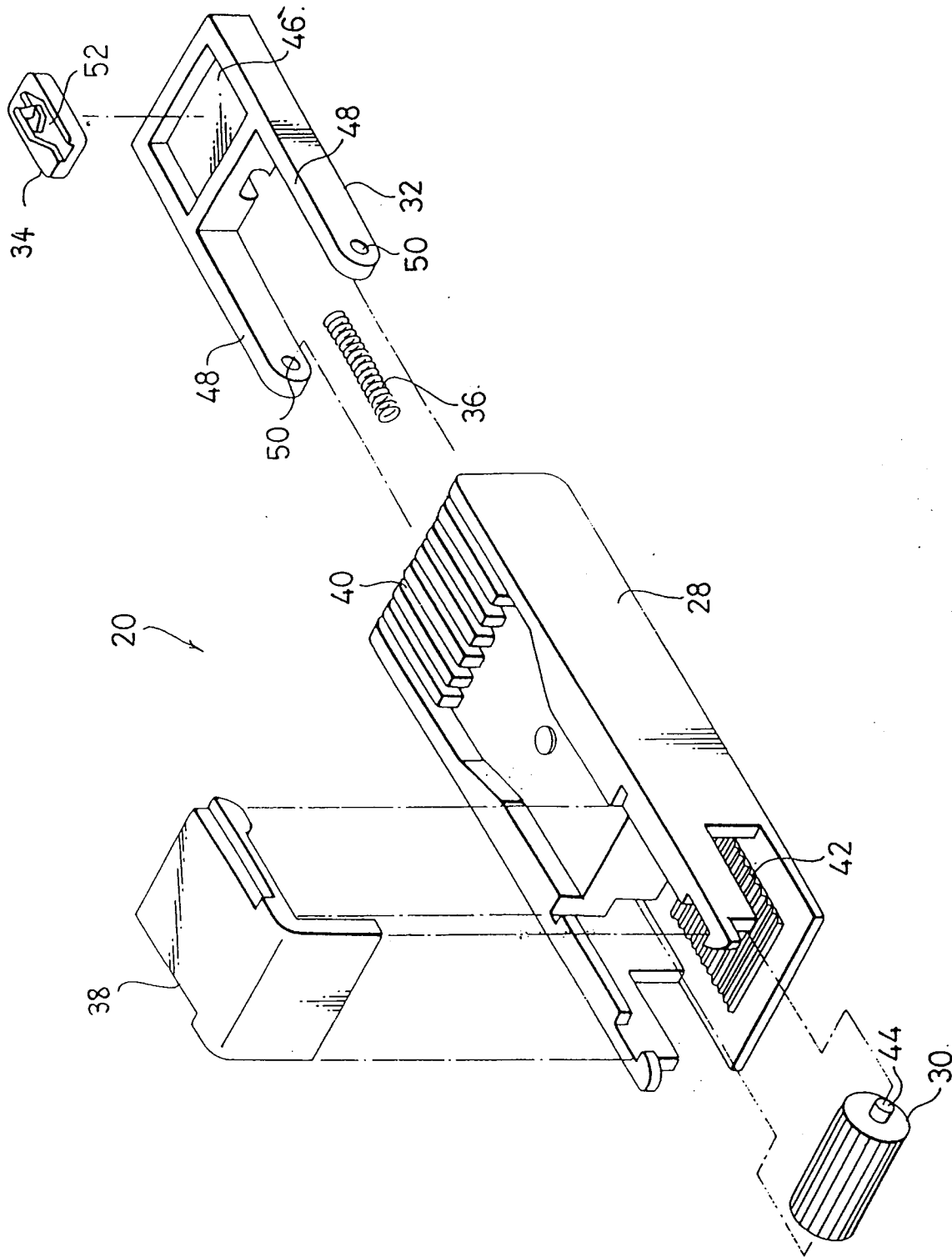


FIG. 3

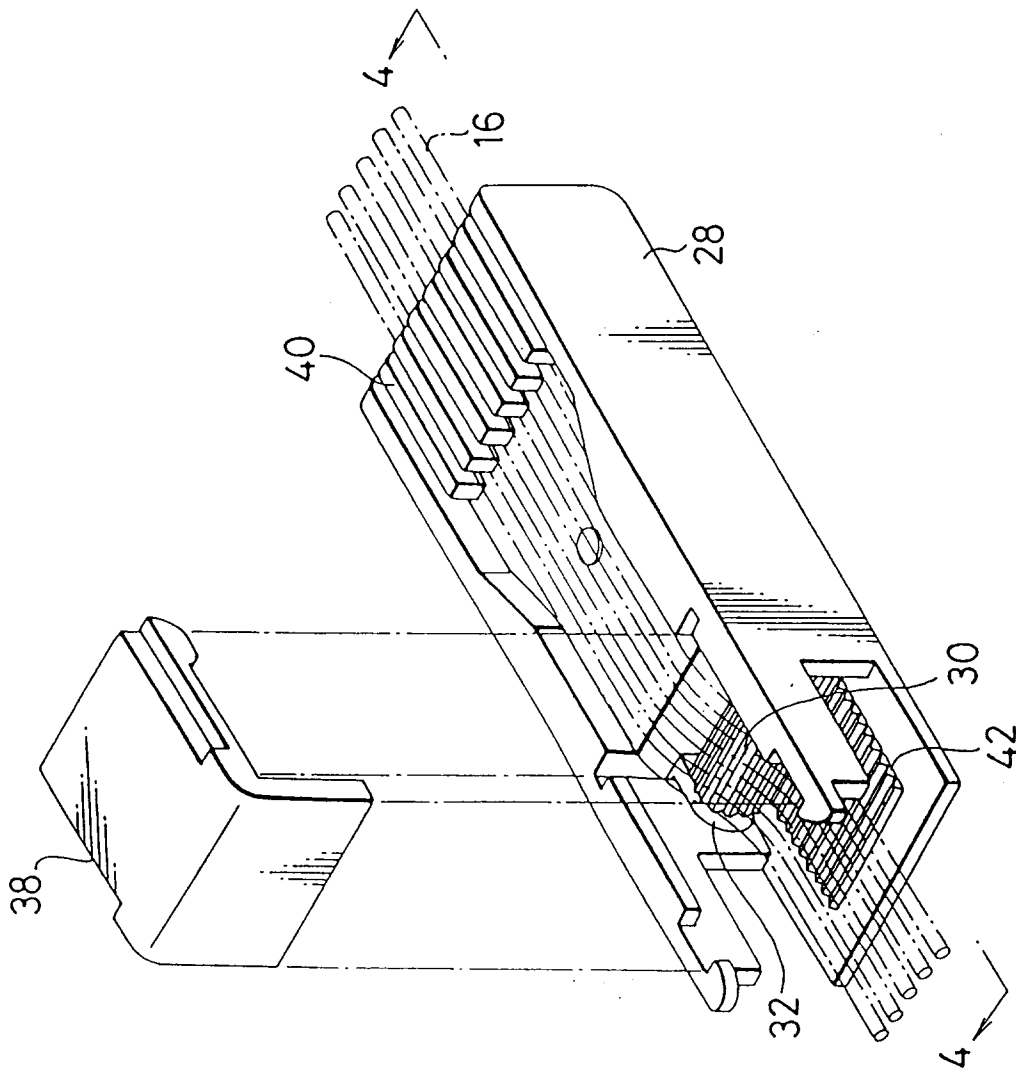


FIG. 4

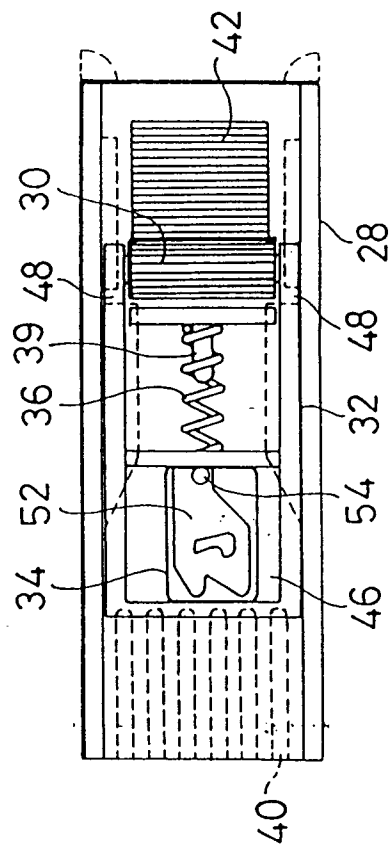


FIG. 5

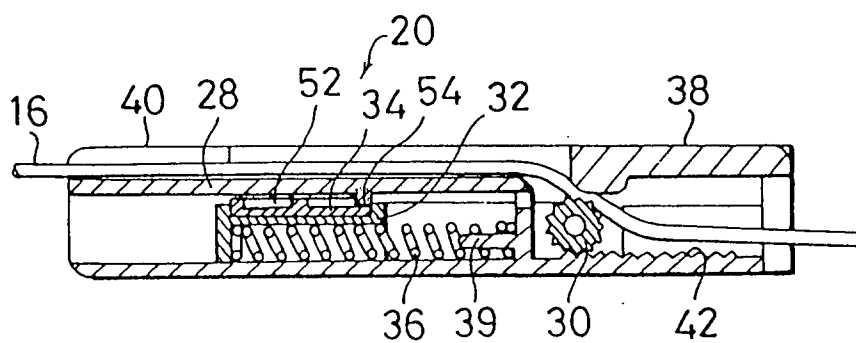


FIG. 6

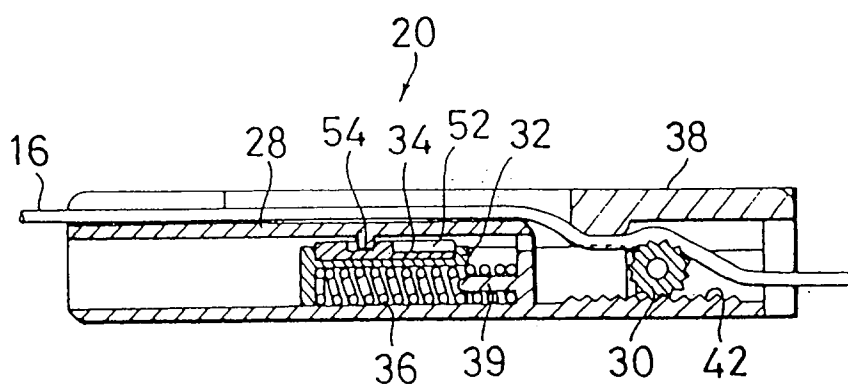


FIG. 7

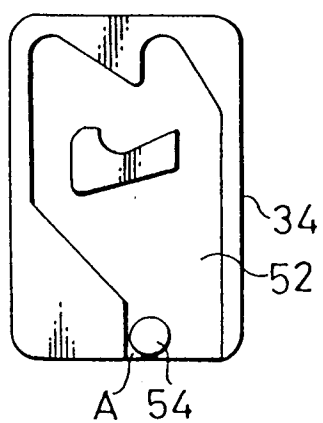


FIG. 8

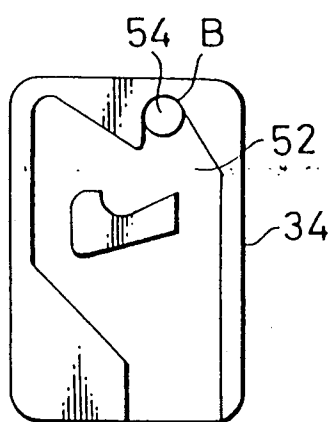


FIG. 9

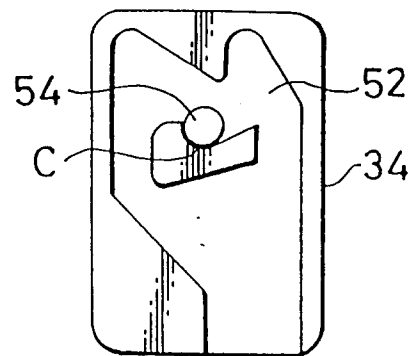


FIG. 10

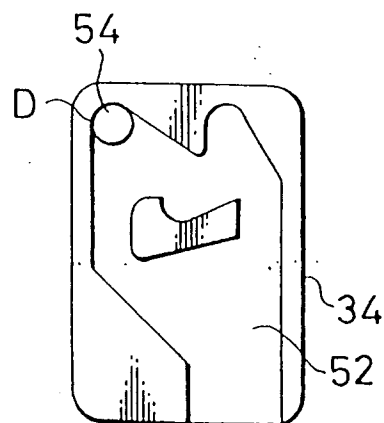


FIG. 11

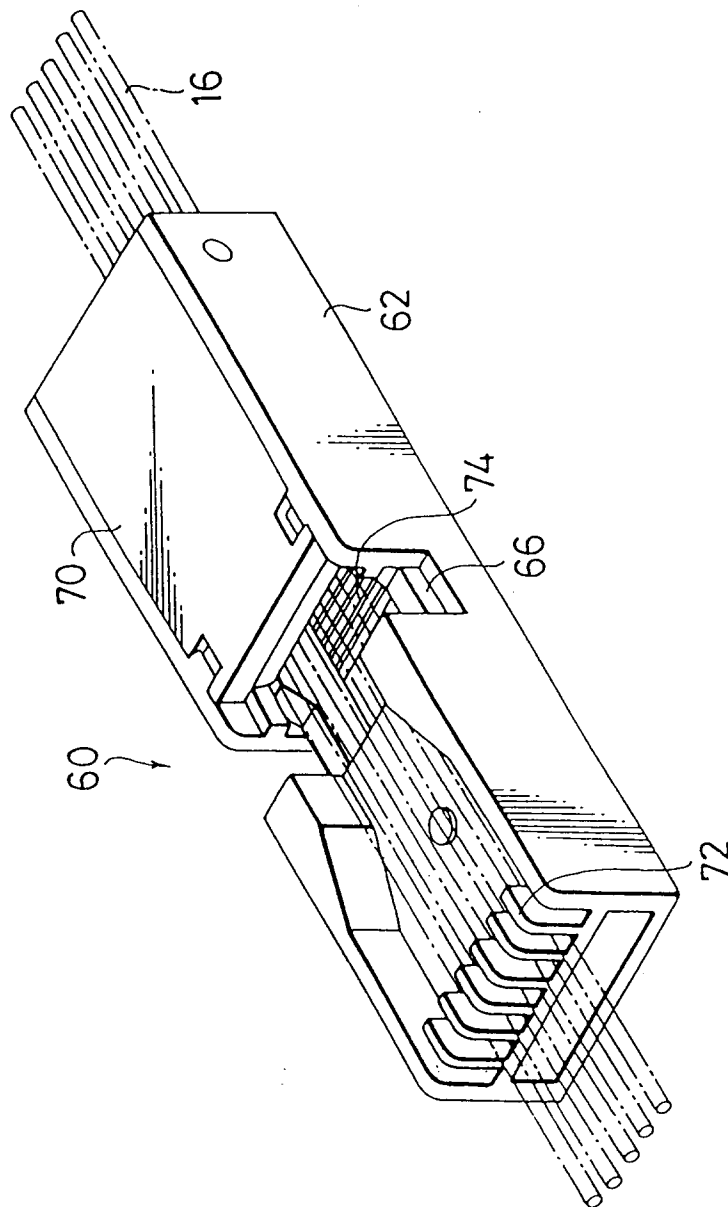


FIG. 12

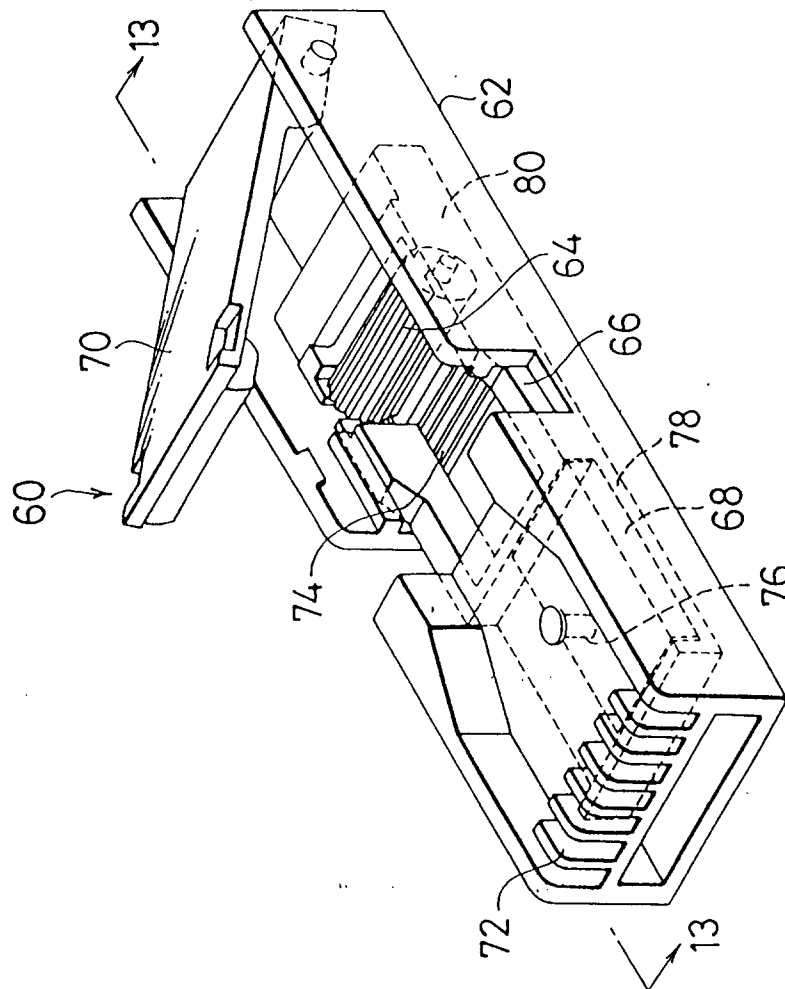


FIG. 13

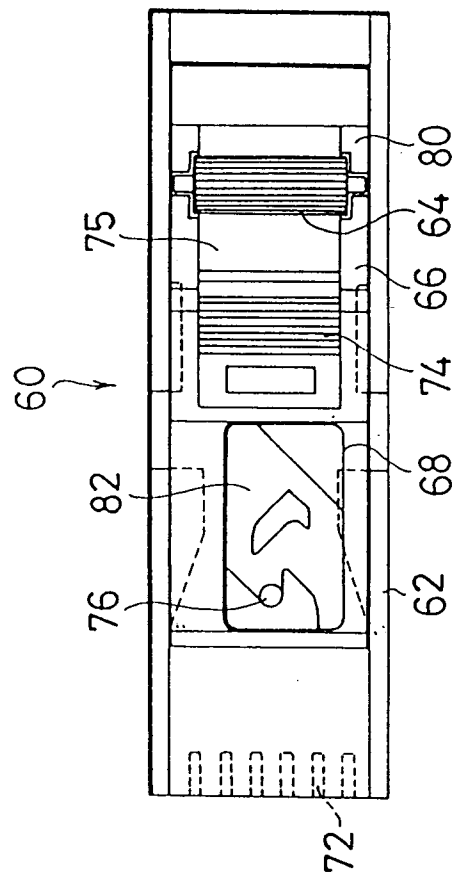


FIG. 14

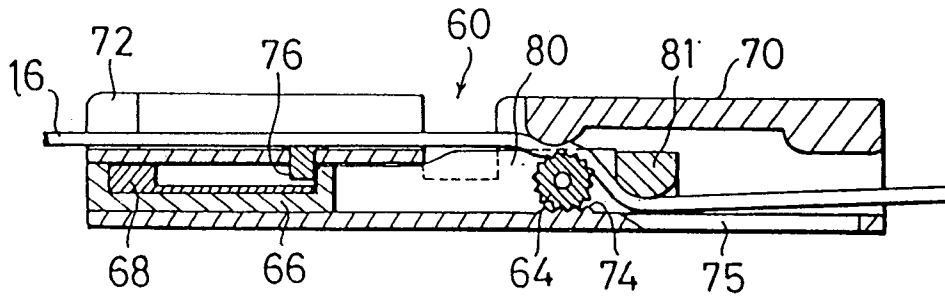


FIG. 15

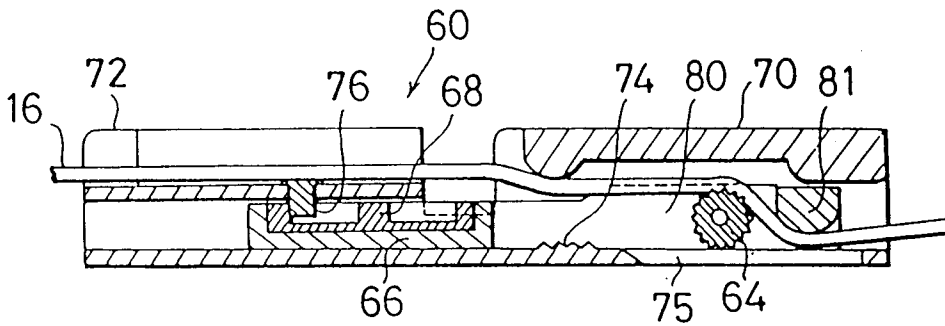


FIG. 16

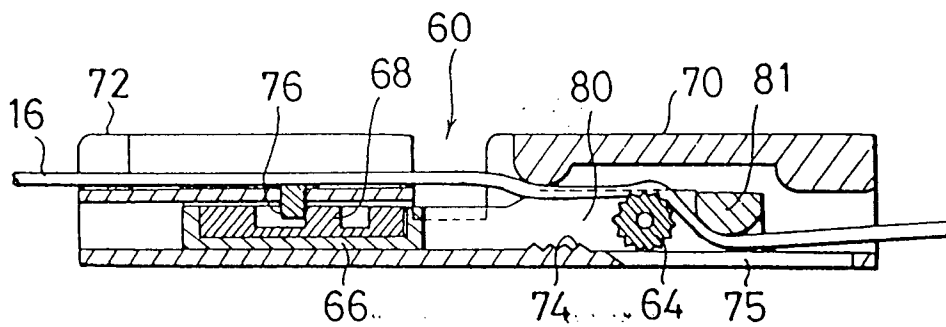


FIG. 17

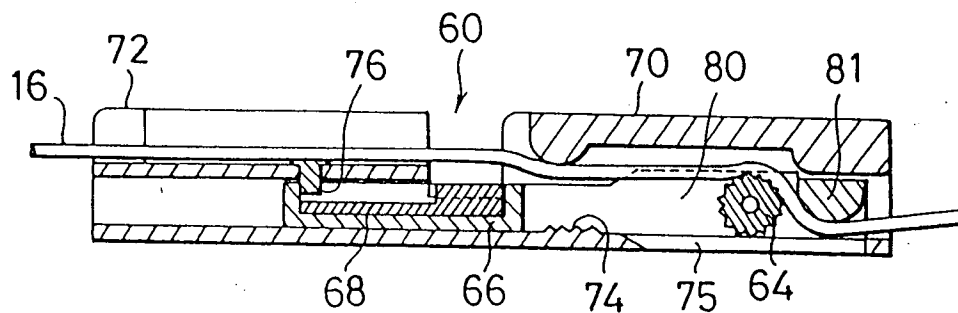


FIG. 18

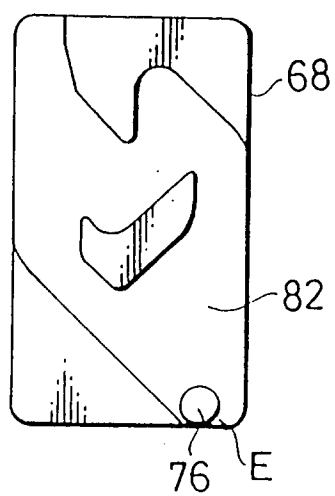


FIG. 19

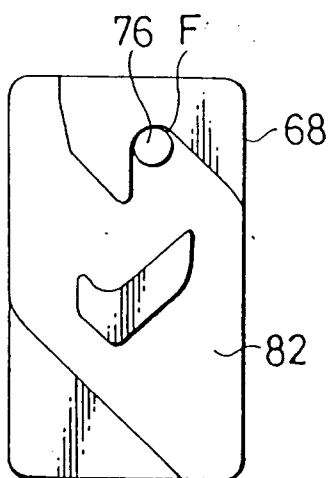


FIG. 20

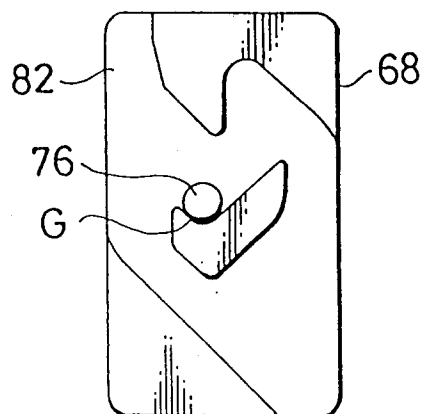


FIG. 21

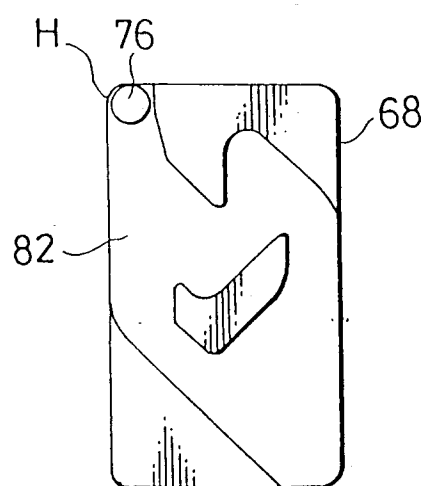


FIG. 22

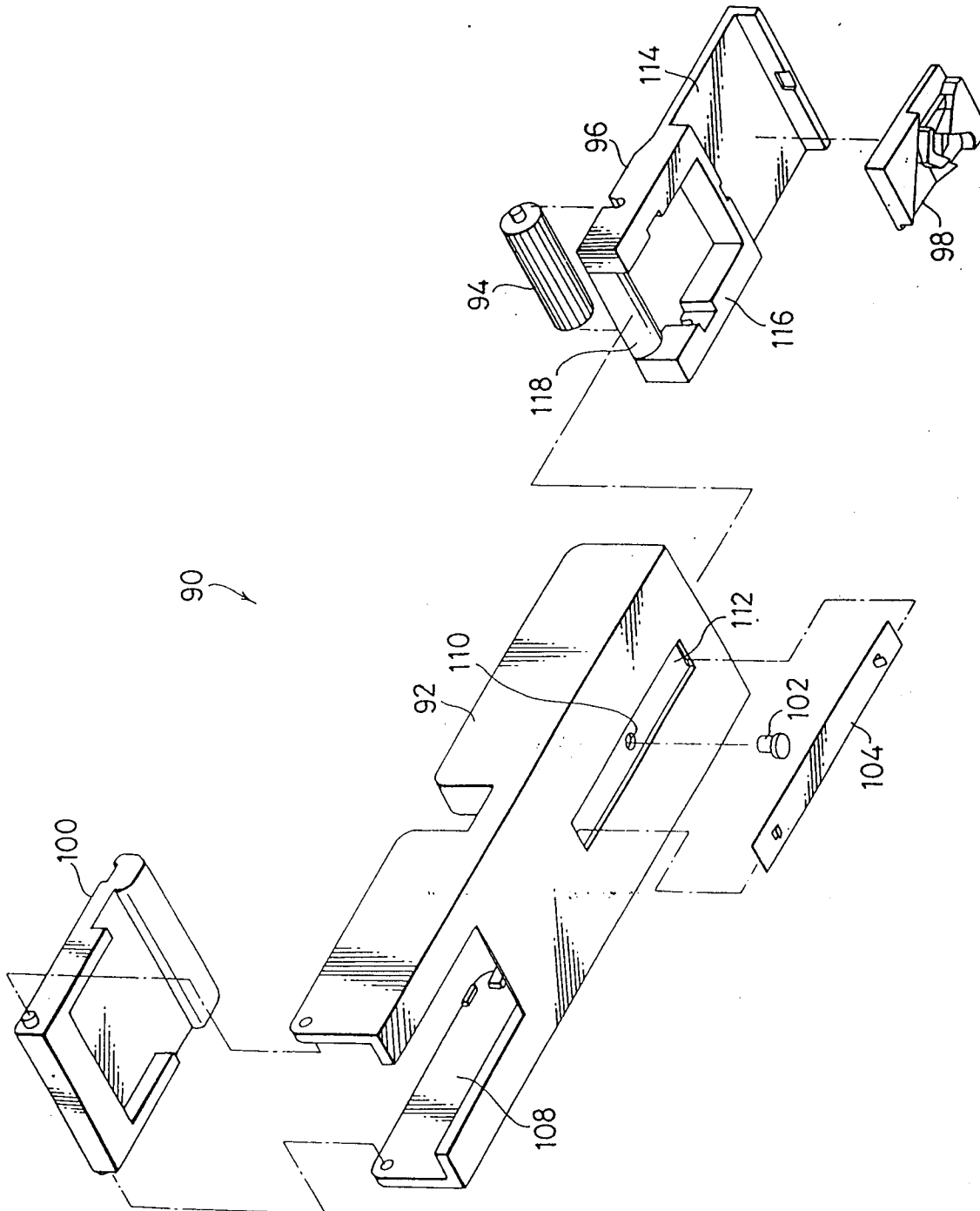


FIG. 23

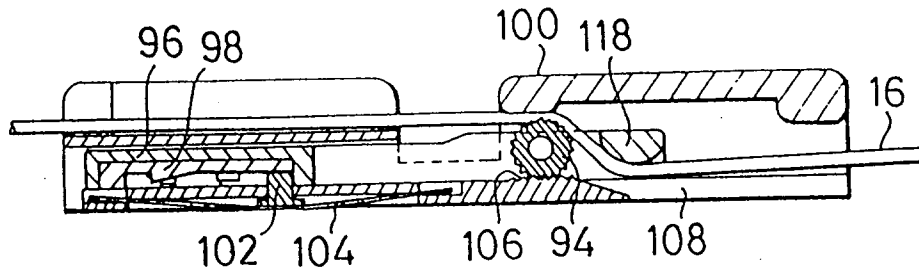


FIG. 24

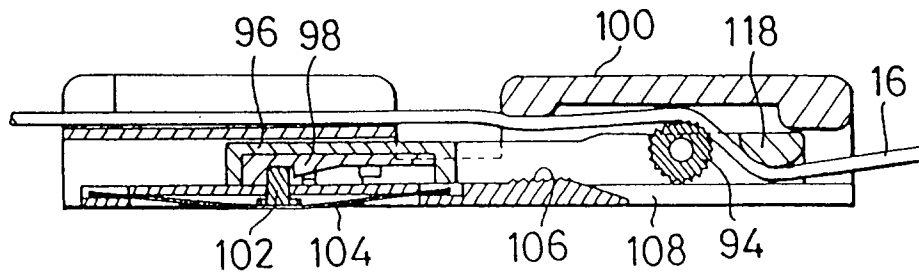


FIG. 25

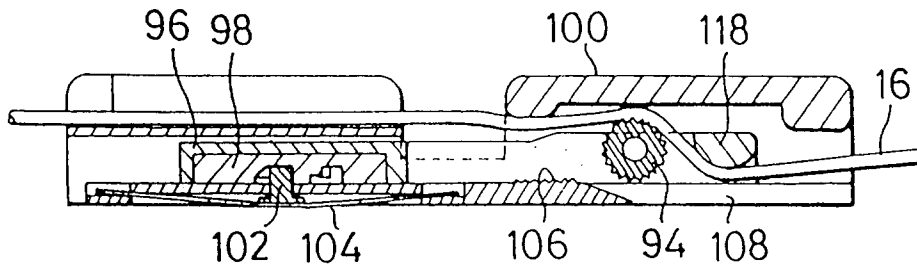


FIG. 26

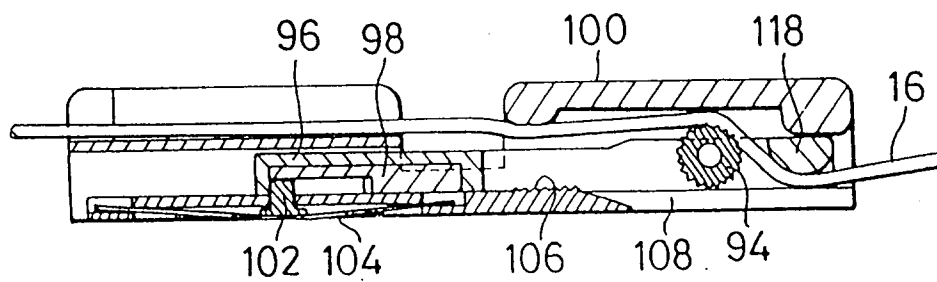


FIG. 27

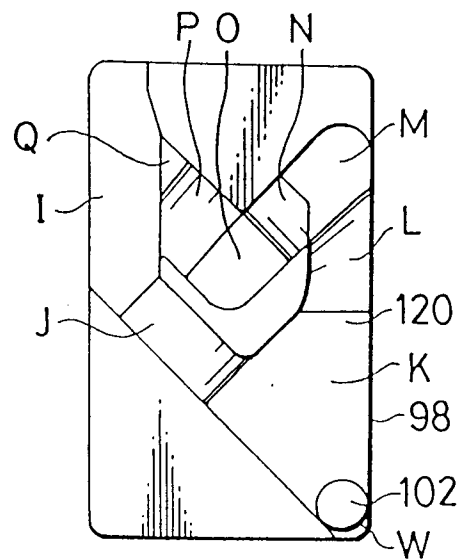


FIG. 28

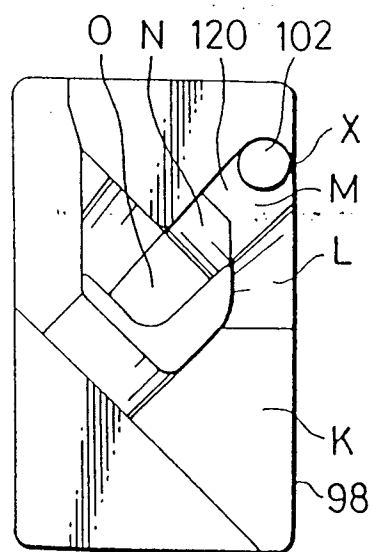


FIG. 29

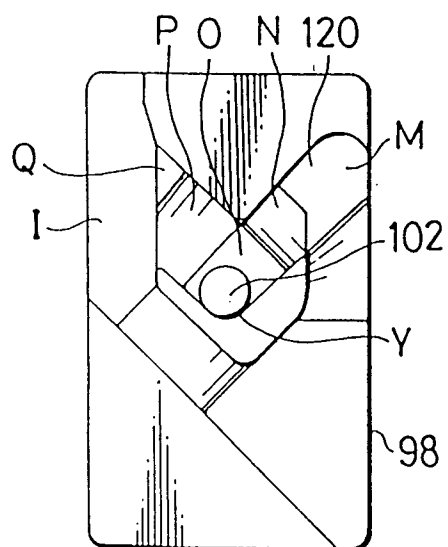


FIG. 30

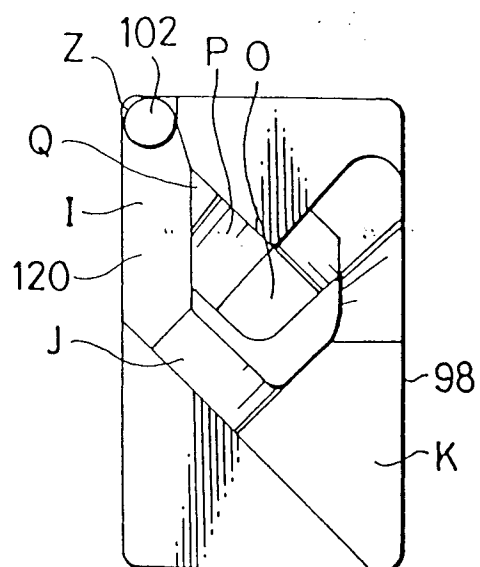


FIG. 31

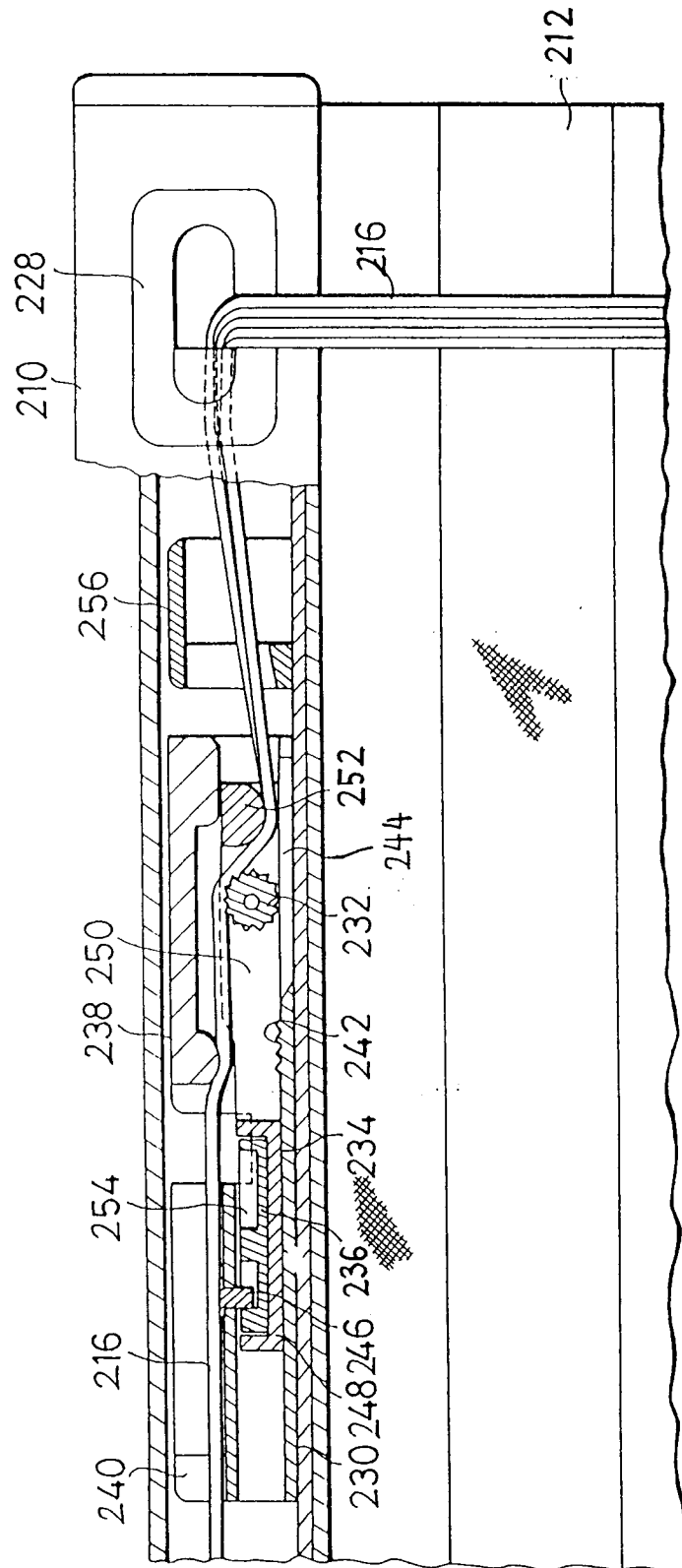


FIG. 32

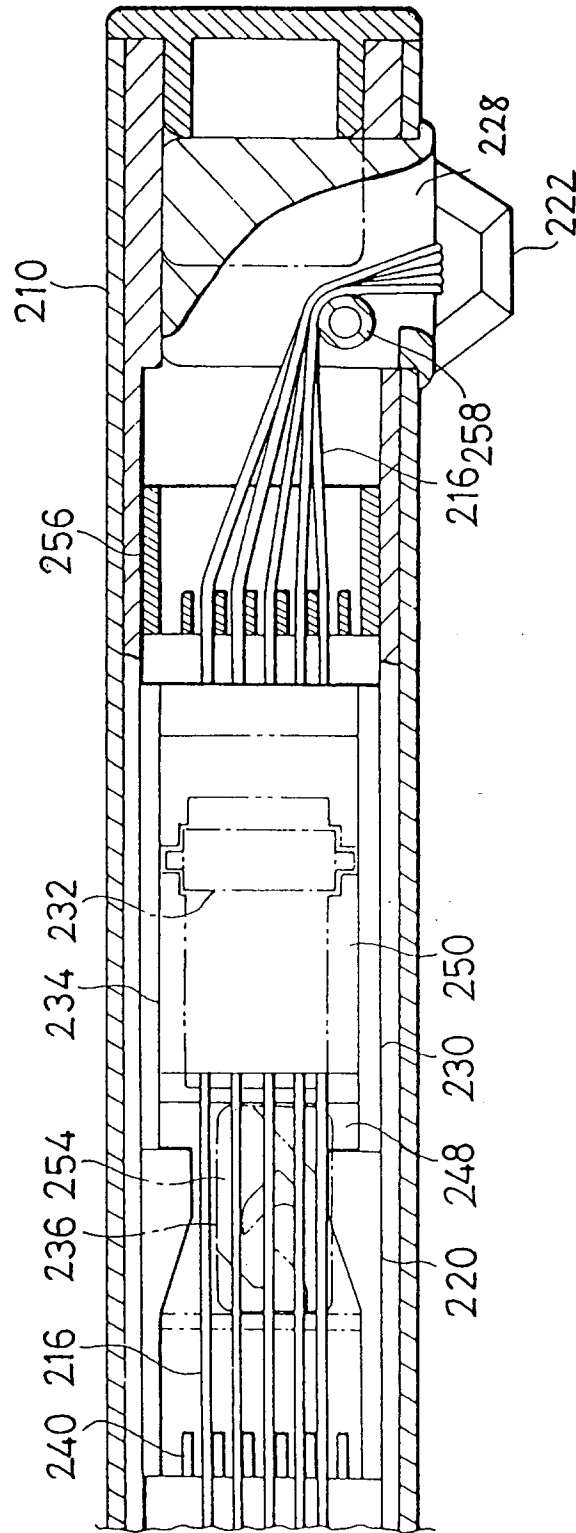
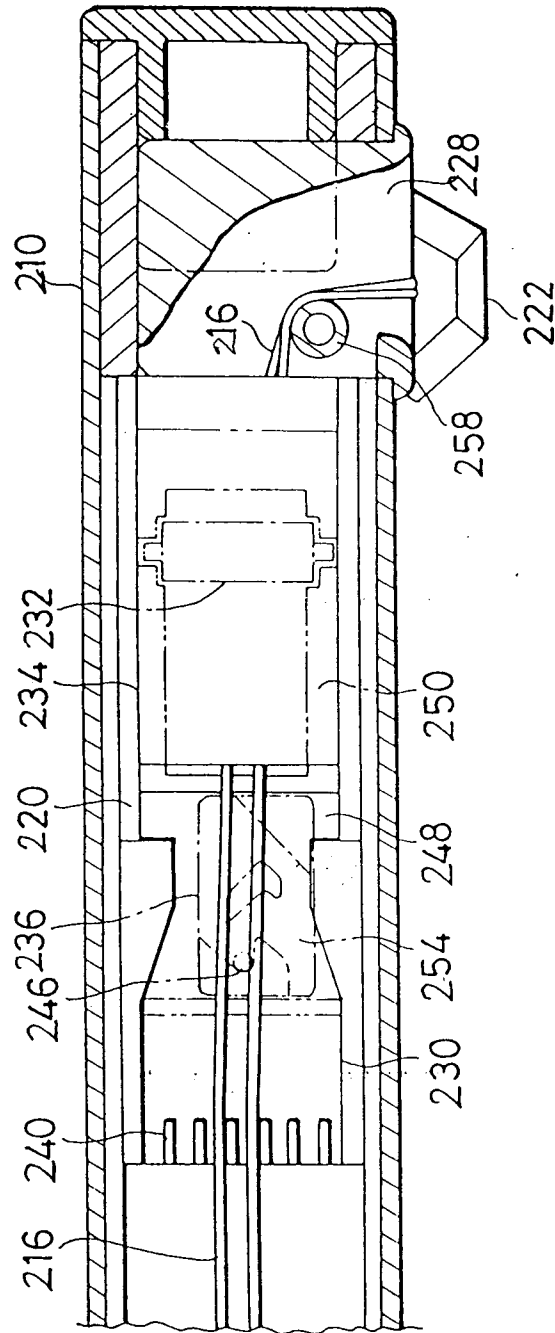


FIG. 33





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 30 9245

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	JP-A-06 200 686 (NICHIBEI CO LTD) * figures * ---	1,2,6	E06B9/324 E06B9/323
A	JP-A-06 117 170 (NICHIBEI CO LTD) * figures * ---	1,2,6	
A	JP-A-06 200 688 (NICHIBEI CO LTD) * figures * ---	1,2,6	
A	PATENT ABSTRACTS OF JAPAN vol. 018 no. 563 (M-1693), 27 October 1994 & JP-A-06 200687 (NICHIBEI CO LTD) 19 July 1994, * abstract * ---	1,2,6	
X	US-A-4 947 921 (HUANG CHUN-CHENG) * column 2, line 49 - line 51; figures 2,4 *	8	
X	US-A-4 180 118 (VECCHIARELLI) * column 4, line 47 - line 49 * * column 5, line 5 - line 12; figures 2-5 * -----	9	TECHNICAL FIELDS SEARCHED (Int.Cl.6) E06B A47H
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 2 June 1995	Examiner Fordham, A
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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