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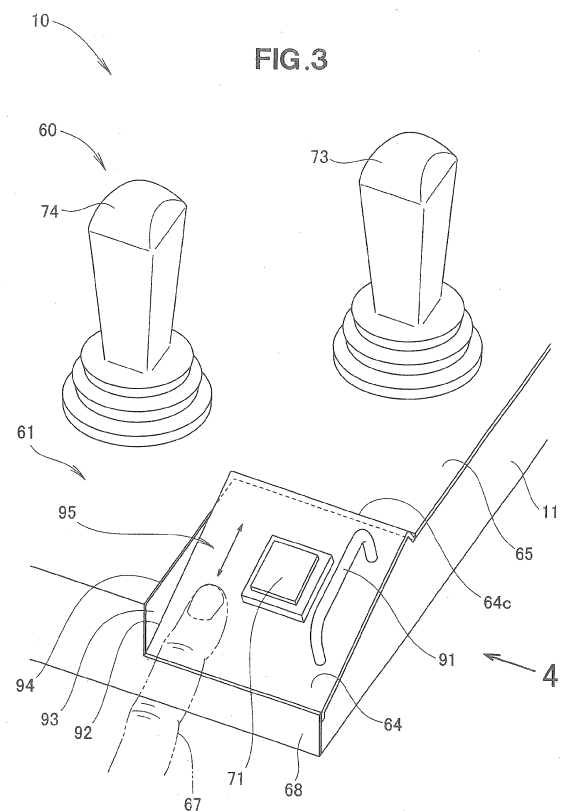
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(54) **Walk-behind snow removal machine**

(57) An auger-switch-disposed surface (64) having an auger switch (71) provided thereon is provided on a rear end portion of an operation panel (61) hollowed downward relative to a general operation surface and slants rearwardly and downwardly relative to the general operation surface (65) having other operating members (73, 74) provided thereon. Thus, snow having fallen on the auger-switch-disposed surface (64) flows down the auger-switch-disposed surface to drop from the operation panel (61). Besides, the auger switch (71) can be discriminated from other operating members with ease.



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Description

[0001] The present invention relates to a walk-behind snow removal machine where a working section using engine power is provided on a machine body and where driving of the working section is turned on/off via an electric switch.

[0002] Among the conventionally-known types of snow removal machines are a type which pushes out snow by means of a snowplow and a type which scrapes out snow by means of an auger. Many of the known walk-behind snow removal machines of the type employing an auger use a belt tension clutch for transmitting power of an engine to the auger. In this case, an arm having a tension roller mounted thereon is pivoted down by a human operator operating a hand lever connected to the arm via a cable, so that the clutch is turned on. Because such a lever requires a great operating load and a great stroke, there is still a room for further improvement in order to enhance operability. Japanese Patent Application Laid-open Publication No. 2007-32209 (hereinafter referred to as "the relevant patent literature"), for example, proposes a walk-behind snow removal machine constructed as follows to achieve an enhanced operability.

[0003] In the walk-behind snow removal machine disclosed in the relevant patent literature, an auger clutch is implemented by an electromagnetic clutch and the hand lever is replaced with a push-button switch in order to enhance ON/OFF operability of the auger clutch.

[0004] Further, an operation panel of the walk-behind snow removal machine disclosed in the relevant patent literature has a general operation surface oriented upward and having various snow removing operating members, such as a direction/speed lever and a shooter operating lever, disposed thereon, and an auger-switch-disposed surface bent downward from a human-operator-side end portion of the general operation surface and having an auger-clutch operating push button switch disposed thereon.

[0005] Further, in the walk-behind snow removal machine disclosed in the relevant patent literature, left and right operating handles extend rearward from the machine body. The human operator can turn on/off the auger clutch by stretching one of its (his or her) hands, gripping the left and right operating handles, to the auger-switch-disposed surface to push the push button switch. Because the auger switch is disposed close to the hand, an enhanced operability can be achieved.

[0006] Further, from the standpoint of operability, some of the known large-size walk-behind snow removal machines employ a loop-shaped operating handle for operating a direction of the machine body in place of the spaced-apart left and right handles. If such a loop-shaped operating handle is employed in the walk-behind snow removal machine disclosed in the relevant patent literature, the auger switch will be difficult to be seen by the human operator, because the loop-shaped operating handle is positioned immediately behind or rearward of

the operation panel and thus tends to become a hindrance. Besides, because it is difficult for the human operator to move the hand to the auger switch from the rear, operation, by the human operator, of the auger switch tends to be difficult.

[0007] In view of the foregoing prior art problems, it is an object of the present invention to provide an improved walk-behind snow removal machine of the type having a loop-shaped operating handle which allows a human operator to see and reach a push-button-type auger switch with ease and thereby operate the auger switch with an enhanced operability.

[0008] In order to accomplish the abovementioned object, the present invention provides an improved walk-behind snow removal machine including a machine body on which are provided: a travel unit; an auger; and an operation panel having a push-button-type auger switch for turning on/off the auger and one or more other operating members for snow removal operation; and a loop-shaped operating handle disposed immediately rearward of the operation panel, a human operator walking behind the operation panel while operating the operating handle, which is characterized in that the operation panel includes, on the upper surface thereof, an auger-switch-disposed surface having the auger switch disposed thereon and a general operation surface having the other operating members disposed thereon, in that the auger-switch-disposed surface is provided on a rear end portion of the operation panel at a position hollowed downward relative to the general operation surface, the auger-switch-disposed surface slanting rearwardly and downwardly relative to the general operation surface, and in that the auger-switch-disposed surface has a projecting portion formed on a front upper end portion thereof and projecting upward beyond the general operation surface, the projecting portion extending along the entire width, in a vehicle width direction (i.e., width direction of the machine), of the auger-switch-disposed surface.

[0009] The operation panel includes, on its upper surface, the auger-switch-disposed surface having the auger switch disposed thereon, and the general operation surface having the other operating members disposed thereon. The auger-switch-disposed surface is provided on a rear end portion of the operation panel at a position hollowed downward relative to the general operation surface and slants rearwardly and downwardly relative to the general operation surface, and thus, the auger switch can be easily seen by the human operator. Further, although the loop-shaped operating handle is provided on the machine body immediately rearward of the operation panel, the operating handle would not become a hindrance when the human operator extends its hand to the auger-switch-disposed surface. Thus, the human operator's hand can easily reach the auger switch, so that operability of the push-button-type auger switch can be enhanced. Further, because the auger-switch-disposed surface slants, snow can easily slide down the surface and drop from the operation panel, with the result that

the push-button-type auger switch can always be maintained in an easy-to-see condition.

[0010] Furthermore, the projecting portion is formed on the front upper end portion of the auger-switch-disposed surface along the entire width of the surface and projects upward beyond the upper surface of the general operation surface. With such a projecting portion, it is possible to dam snow sliding down from the general operation surface and thereby prevent the snow from flowing to the auger-switch-disposed surface. In addition, the human operator can feel for (i.e., find by touch) the position of the auger switch even when snow has lain on the operation panel.

[0011] Preferably, the auger-switch-disposed surface has an upwardly- and laterally-open groove portion formed immediately forward of the projecting portion, the groove portion being located lower than the general operation surface and extending at least along the entire length, in the vehicle width direction, of the projecting portion, and one end, in a longitudinal direction, of the groove portion opens laterally outward of a lateral side end, in the vehicle width direction, of the operation panel. The upwardly- and laterally-open groove portion is formed immediately forward of the projecting portion and along the projecting portion. The laterally-open groove portion is located lower than the general operation surface and extends at least along the entire length of the projecting portion. Water flowing from the general operation surface flows into the laterally-open groove portion. Because one end, in the longitudinal direction, of the groove portion opens laterally outward of the lateral side end of the operation panel, water having flown into the laterally-open groove portion can be discharged laterally outward from the lateral side end of the operation panel.

[0012] The following will describe embodiments of the present invention, but it should be appreciated that the present invention is not limited to the described embodiments and various modifications of the invention are possible without departing from the basic principles. The scope of the present invention is therefore to be determined solely by the appended claims.

[0013] Certain preferred embodiments of the present invention will hereinafter be described in detail, by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 is a side view of an embodiment of a walk-behind snow removal machine of the present invention;

Fig. 2 is a perspective view explanatory of an operation panel of the walk-behind snow removal machine shown in Fig. 1;

Fig. 3 is a perspective view explanatory of principal sections of the operation panel shown in Fig. 2;

Fig. 4 is a view taken in a direction of arrow 4 in Fig. 3; Fig. 5A is a view showing an example of a conventionally-known operation panel, and Fig. 5B is a view showing another example of a conventionally-known

operation panel;

Fig. 6 is a view explanatory of a modification of the operation panel shown in Fig. 4; and

Fig. 7 is a view explanatory of another modification of the operation panel shown in Fig. 4.

[0014] In the following description, the terms "front", "rear", "forward", "rearward", "left", "right", "upward", "downward" etc. are used to refer to directions as viewed from a human operator operating a walk-behind snow removal machine of the present invention.

[0015] As shown in Fig. 1, an embodiment of the walk-behind snow removal machine of the present invention is a crawler vehicle which includes: a crawler (hereinafter referred to as "travel unit") 13 mounted on a crawler frame 12 provided on a lower portion of a machine body 11; a machine frame 21 vertically pivotably connected via a pivot shaft 14 to a rear portion of the crawler frame 12; a snow removal section 30 mounted on a front portion of the machine frame 21; and an engine 22 (power source 22) mounted on the machine frame 21.

[0016] The engine 22 is located substantially centrally on the machine body 11, and an auger-height adjusting hydraulic cylinder 23 is provided beneath the engine 22.

[0017] The snow removal section 30 includes, as its primary elements, an auger 31 drivable by the engine 22, a blower 32, an auger housing 33 and a shooter 34. Driving power of the engine 22 is transmitted via an electromagnetic clutch 35 and a drive shaft 36 to the auger 31. Thus, the auger 31 is rotated to gather snow on a road surface and sends the gathered snow to the blower 32, so that the snow can be thrown away through the shooter 34 by centrifugal force of the blower 32.

[0018] Namely, the electromagnetic clutch 35 that is turned on/off via an auger switch 71 is provided in a snow-removing power transmission system 41 for transmitting the driving power of the engine 22 to the auger 31 and the blower 32 as loads of the engine 22.

[0019] The walk-behind snow removal machine 10 travels on the road surface by the driving force of the engine 20 being transmitted via a traveling power transmission mechanism 42 to drive the travel unit 13.

[0020] An operation section 60 for operating the snow-removing power transmission system 41, the travel unit 13, etc. is provided on a rear portion of the machine body 11.

[0021] As shown in Figs. 1 and 2, the operation section 60 includes an operation panel 61, and a loop-shaped operating handle 62 disposed immediately behind or rearward of the operation board 61. As viewed in plan, the loop-shaped operating handle 62 is formed in a substantially U shape extending rearward from the rear end of the machine body 11. The operation panel 61 includes the push-button type auger switch 71 operable to turn on/off the auger 31, and other operating members than the auger switch 71, such as a plurality of operating levers, knobs and switches.

[0022] Further, the operation panel 61 includes, on its

upper surface 63, a surface 64 where the auger switch 71 is disposed (i.e., auger-switch-disposed surface 64), and a general operation surface 65 where other operating members for snow removal operation than the auger switch 71 are disposed. An upper operation surface 66 is provided in front of the operation panel 61 and located remotest from the human operator, and, among other things, an engine switch 75 having relatively low frequency of use during operation of the snow removal machine is disposed on the upper operation surface 66.

[0023] Because the upper operation surface 66 slants with a relatively steep angle, it can be easily seen by the human operator from a distance, and thus a display section 76 can be suitably disposed on the upper operation surface 66. The engine 22 can be activated by the human operator turning the engine switch 75 into an ON position.

[0024] The other operating members disposed on the general operation surface 65 include a snow-removing shooter-direction adjusting lever 73 and auger-housing adjusting lever 74, and a traveling gear-shift operating lever 77 and turning operating levers 78 and 79. The general operation surface 65 slightly slants upwardly and forwardly with a smaller slant angle than the upper operation surface 66.

[0025] The shooter-direction adjusting lever 73 is an operating member for adjusting an operating direction of the shooter 34 to change a snow throwing direction. The auger-housing adjusting lever 74 is an operating member for changing a vertical height etc. of the auger housing 33. Further, the gear-shift operating lever 77 is an operating member for not only selecting a traveling state or a working state of the machine body 11 but also adjusting a forward traveling speed or a rearward traveling speed.

[0026] The turning operating levers 78 and 79 are operating members for controlling rotating directions of left and right crawler belts of the travel unit 13. When the two turning operating levers 78 and 79 are both in a forward-pivoted-down position, the machine body 11 travels straight forward. If the left turning operating lever 78 is pivoted down rearward from the forward-pivoted-down position, the machine body 11 turns left. If the right turning operating lever 79 is pivoted down rearward from the forward-pivoted-down position, the machine body 11 turns right. Namely, when the two turning operating levers 78 and 79 are both in the forward-pivoted-down position, the travel unit 13 is kept connected via clutches.

[0027] If one of the two turning operating levers 78 and 79 is pivoted down rearward, the clutch corresponding to the pivoted-down turning operating levers 78 or 79 is disconnected, so that the driving power is not transmitted any longer, during which time the clutch corresponding to the other turning operating lever 79 or 78 is maintained in a connected state. In this manner, the machine body 11 is caused to turn left or right.

[0028] The push-button type auger switch 71 disposed on the auger-switch-disposed surface 64 switches between ON and OFF states of the electromagnetic clutch 35 that transmits the driving power of the engine 22 to

the auger 31. Because only the auger switch 71 is disposed on the auger-switch-disposed surface 64, it is readily distinguishable. Although the following description is made in relation to the case where only the auger switch 71 is disposed on the auger-switch-disposed surface 64, the present invention is not so limited, and one or more other switches in addition to the auger switch 71 may be disposed on the auger-switch-disposed surface 64 as long as the auger switch 71 is readily distinguishable.

[0029] The auger-switch-disposed surface 64 slants rearwardly and downwardly with a greater slant angle than the general operation surface 65. By the slant angle of the auger-switch-disposed surface 64 being made different from the slant angle of the general operation surface 65, the auger-switch-disposed surface 64 can be differentiated. Because only the auger switch 71 is disposed on the auger-switch-disposed surface 64, the auger switch 71 can be discriminated with ease.

[0030] Because the auger-switch-disposed surface 64 slants in such a manner that it confronts an eye line of the human operator viewing the auger switch 71, it can be easily found even if it is a button of a smaller size than the snow-removing shooter-direction adjusting lever 73 etc. Therefore, even where the auger 31 is frequently turned on and off, an enhanced operability can be achieved.

[0031] Further, because the auger-switch-disposed surface 64 is located closest to the human operator on the upper surface 63 of the operation panel 61 and near the loop-shaped operating handle 62, the human operator can readily reach the surface 64, so that even further enhanced operability can be achieved.

[0032] The operation section 60 further includes a loop-shaped clutch lever 81 provided, immediately rearward of the operation panel 61 and forward and upward of the loop-shaped operating handle 62, for turning on/off the clutches of the travel unit 13. The loop-shaped clutch lever 81 is a so-called dead man switch that is pivotably mounted on the machine body 11 and that turns on the clutch of the travel unit 13 when the human operator has pivoted down rearward the clutch lever 81 and then gripped the operating handle 62 together with the clutch lever 81.

[0033] Further, on a rear portion of the machine body 11, a loop-shaped stop lever 82 is provided beneath the operating handle 62 and projecting rearward beyond the operating handle 62. The stop lever 82 stops the walk-behind snow removal machine 10 in response to being pushed by the human operator. The loop-shaped clutch lever 81 and stop lever 82 each have a substantially U shape lying generally along the loop-shaped operating handle 62.

[0034] The following describe behavior of the above-described embodiment of the walk-behind snow removal machine 10. As shown in Figs. 3 and 4, the auger-switch-disposed surface 64 is provided on a rear end portion of the operation panel 61 at a position hollowed downward

relative to the general operation surface 65 and slants rearwardly and downwardly relative to the general operation surface 65. Thus, when the human operator clears away snow lying on the general operation surface 65, a human operator's hand clearing away the snow can be effectively prevented from touching the auger-switch-disposed surface 64. Therefore, the hand can be reliably prevented from accidentally touching and pushing the push-button-type auger switch 71.

[0035] The auger-switch-disposed surface 64 is located rearward of the shooter-direction adjusting lever 73 and to the right of the auger housing adjusting lever 74 and slants rearwardly and downwardly relative to the general operation surface 65 with a steeper slant angle than the general operation surface 65. Because the auger-switch-disposed surface 64 slants with a steep slant angle, snow having fallen on the surface 64 can easily flow down the surface 64.

[0036] The push-button-type switch has a lower height from the upper surface 63 than the operating levers and would be easily buried in snow. However, in the instant embodiment, snow can be effectively caused to flow down the auger-switch-disposed surface 64, having the auger switch 71 disposed thereon, without staying or lying on the surface 64. As a consequence, there is no need to frequently clear away snow in the neighborhood of the auger switch 71, which contributes to enhancement of the operability.

[0037] Further, the auger switch 71 is located centrally on the auger-switch-disposed surface 64, and a protector member 91 of a substantially inverted-U shape elongated in a front-rear direction of the machine as viewed in a width direction of the operation panel 61 is disposed to the left of the auger switch 71. Note that the protector member 91 may be formed in a substantial arch shape as viewed in the width direction of the operation panel 61.

[0038] The protector member 91 can protect the auger switch 71 from a touch from the outside. The protector member 91 is formed of a rod-shaped material having greater rigidity than a plate-shaped material and hence suitable as a protecting component part.

[0039] Because the protector member 91 is formed by merely bending the rod-shaped material, it can be manufactured with ease at lost cost. Further, because the protector member 91 is formed by bending the rod-shaped material into a substantially inverted-U shape, snow can easily flow down through between opposed vertical leg portions of the protector member 91, so that snow can be prevented from remaining on the auger-switch-disposed surface 64. In case snow has lain in the neighborhood of the protector member 91, the human operator can easily clear away, with the finger 67, the snow through between the opposed vertical leg portions of the protector member 91.

[0040] Further, the auger-switch-disposed surface 64 is located on a right side end portion, in the width direction, of the machine body 11, and opens laterally outward at its right side end so that snow can also be cleared

downward through the open right side end.

[0041] A vertical wall 93 of a triangular shape is formed to project upward from a left end portion 92 of the auger-switch-disposed surface 64, and it has an upper end portion 94 connecting to the general operation surface 65. Thus, there is no gap between the auger-switch-disposed surface 64 and the general operation surface 65, so that snow can be reliably prevented from entering inside of the operation board 61.

[0042] The auger-switch-disposed surface 64 has a finger entry space 95 located to the left of the auger switch 71 and having a size large enough to permit entry therein of a human operator's finger. Because of the provision of such a finger entry space 95, the human operator can clear away or remove, with the finger 67, snow staying between the auger switch 71 and the vertical wall 93.

[0043] The operation panel 61 further has an end surface 68 bent downward from the rear end of the general operation surface 65. The auger-switch-disposed surface 64 has a front upper end portion 64a welded to the inner surface of a rear end portion of the general operation surface 65, and a lower end portion 64b welded to the inner surface of an intermediate portion of the rear end surface 68.

[0044] The auger-switch-disposed surface 64 and the general operation surface 65 both slant rearwardly and downwardly and open at their lower ends so that snow is allowed to drop via a lower end side of the operation panel 61. Particularly, because the auger-switch-disposed surface 64 slants more steeply than the general operation surface 65, snow is allowed to easily flow down via the lower end.

[0045] The auger-switch-disposed surface 64 has an projecting portion 64c formed along the entire width, in the vehicle width direction, of the auger-switch-disposed surface 64 and projecting upward beyond the upper surface of the operation panel 61 (general operation surface 65).

[0046] The projecting portion 64c functions like a weir for damming snow and water flowing from above the auger-switch-disposed surface 64 along the general operation surface 65 and thereby preventing the snow and/or water from flowing down to the auger-switch-disposed surface 64. Further, with the auger-switch-disposed surface 64 slanting downward relative to the general operation surface 65 and having the projecting portion 64c, the human operator can easily feel for (i.e., find by touch) the position of the auger switch 71 even when snow has lain on the operation panel 61.

[0047] Further, the projecting portion 64c is formed by merely bending the front end portion 64a of the auger-switch-disposed surface 64 formed of a plate-shaped material, and thus, the projecting portion 64c can be formed with ease, which thereby can reduce the necessary manufacturing cost.

[0048] The following describe differences between examples of conventionally-known operation panels and the operation panel 61 employed in the instant embodi-

ment of the snow removal machine 10. Fig. 5A shows an example of a conventionally-known operation panel ("Conventional Example 1") 100 which includes a general operation surface 101 and a switch-disposed surface 102 formed as a slant surface by denting a part of the general operation surface 101. Only an auger switch 103 is disposed on the switch-disposed surface 102. A vertical wall 104 is provided to the left of the auger switch 103, and a side vertical wall 105 of a machine body 106 extends along the right side surface of the auger switch 103.

[0049] In the conventionally-known operation panel 100 shown in Fig. 5A, the auger switch 103 can be readily discriminated or differentiated from other operating members. However, if snow lies on the switch-disposed surface 102, the snow cannot be removed rightward because a right side end portion located to the right of the auger switch 103 is closed with the side vertical wall 105 of the machine body 106. Further, snow and water flowing from the general operation surface 101 cannot be prevented from entering the switch-disposed surface 102 because no projecting portion functioning like a weir is provided between the general operation surface 101 and the switch-disposed surface 102.

[0050] Fig. 5B shows another example of a conventionally-known operation panel ("Conventional Example 2") 110 which includes a general operation surface 111 and a switch-disposed surface 112 formed as a slant surface by denting a part of the general operation surface 111. Only an auger switch 113 is disposed on the switch-disposed surface 112. A vertical wall 114 is provided to the left of the auger switch 113, and a right side end portion located to the right of the auger switch 113 opens laterally rightward.

[0051] In the other example of the conventionally-known operation panel 110 shown in Fig. 5B, snow can be cleared away through the right side end portion located to the right of the auger switch 113, but a gap between the auger switch 113 and the vertical wall 114 is so small that a human operator's finger cannot be put therein. Thus, snow having lain on the switch-disposed surface 112 between the vertical wall 114 and the auger switch 113 cannot be removed easily, which is not preferable at all. Further, snow and water flowing from the general operation surface 111 cannot be prevented from entering the switch-disposed surface 112 because no projecting portion functioning like a weir is provided between the general operation surface 111 and the switch-disposed surface 112.

[0052] By contrast to the aforementioned conventionally-known operation panels 100 and 110, the operation panel 61 in the instant embodiment of the invention allows snow present between the auger switch 71 and the vertical wall 93 to be removed with the finger 67 because the space between the auger switch 71 and the vertical wall 93 is large enough to allow the finger 67 to be put therein. Further, because the right side end portion located to the right of the auger switch 71 opens laterally rightward, snow can be cleared away via the right side

end portion of the auger-switch-disposed surface 64. Furthermore, with the projecting portion 64c formed on the front upper end portion 64a of the auger-switch-disposed surface 64, snow and water flowing from the general operation surface 65 can be prevented from entering the auger-switch-disposed surface 64. In addition, because only the auger switch 71 is disposed on the auger-switch-disposed surface 64, it can be reliably differentiated.

[0053] Next, with reference to Fig. 6, a description will be given about a modification of the operation panel 61 shown in Fig. 4, where similar elements to those in Fig. 4 are indicated by the same reference numerals as used in Fig. 4 and will not be described here to avoid unnecessary duplication. In the modification, as shown in Fig. 6, the projecting portion 64c is formed on the front upper end portion 64a of the auger-switch-disposed surface 64, and an upwardly- and laterally-open groove portion 64d is formed immediately forward of the projecting portion 64c and extending along the projecting portion 64c.

[0054] Thus, snow flowing from above the front upper end portion 64a along the general operation surface 65 can be directed into the laterally-open groove portion 64d and then easily directed laterally (in the vehicle width direction) outward of the machine body 11 through a laterally-open end of the groove portion 64d. In this way, the instant modification can prevent water from flowing to the auger-switch-disposed surface 64.

[0055] Next, with reference to Fig. 7, a description will be given about a further modification of the operation panel 61 shown in Fig. 4, where similar elements to those in Fig. 4 are indicated by the same reference numerals as used in Fig. 4 and will not be described here to avoid unnecessary duplication. In the modification, as shown in Fig. 7, the projecting portion 64c is formed on the front upper end portion 64a of the auger-switch-disposed surface 64, and an eave portion 64e is formed integrally with the projecting portion 64c by bending the plate-shaped material. By the eave portion 64e being thus formed, the projecting portion 64c can have an increased projecting amount from the general operation surface 65 while the auger-switch-disposed surface 64 is maintained constant.

[0056] Thus, the instant modification can even more reliably prevent water flowing from above the front upper end portion 64a along the general operation surface 65 from getting over the projecting portion 64c. Further, because the eave portion 64e is formed by merely bending the plate-shaped material, the projecting amount of the eave portion 64e from the general operation surface 65 can be adjusted with ease.

[0057] The above-described walk-behind snow removal machine 10 can be summarized as follows.

[0058] As shown in Figs. 2 to 4, the operation panel 61 includes, on its upper surface 63, the auger-switch-disposed surface 64 having the auger switch 71 disposed thereon, and the general operation surface 65 having other operating members than the auger switch 71 disposed thereon. The auger-switch-disposed surface 64 is

provided on a rear end portion of the operation panel 61 at a position hollowed downward relative to the general operation surface 65 and slants rearwardly and downwardly relative to the general operation surface 65, and thus, the push-button-type auger switch 71 on the surface 64 can be easily seen by the human operator.

[0059] Further, although the loop-shaped operating handle 62 is provided on the machine body 11 immediately rearward of the operation panel 61, the operating handle 62 would not become a hindrance when the human operator extends its hand to the auger-switch-disposed surface 64. Thus, the human operator's hand can easily reach the auger switch 71, so that operability of the auger switch 71 can be enhanced.

[0060] Further, because the auger-switch-disposed surface 64 slants as above, snow can easily slide down the surface 64 and thus can be easily cleared from the surface 64, with the result that the auger switch 71 can always be maintained in an easy-to-see condition.

[0061] Furthermore, the projecting portion 64c is formed on the front upper end portion 64a of the auger-switch-disposed surface 64 along the entire width, in the vehicle width direction, of the surface 64 and projects upward beyond the upper surface of the general operation surface 65. With such a projecting portion 64c, it is possible to dam snow sliding down from the general operation surface 65 and thereby prevent the snow from flowing to the auger-switch-disposed surface 64.

[0062] Furthermore, as shown in Fig. 6, the upwardly- and laterally-open groove portion 64d is formed immediately forward of the projecting portion 64c and along the projecting portion 64c. The laterally-open groove portion 64d is located lower than the general operation surface 65 and extends at least along the entire length, in the vehicle width direction, of the projecting portion 64c. Water flowing down from the general operation surface 65 is directed into the laterally-open groove portion 64d. Because one end, in a longitudinal direction, of the laterally-open groove portion 64d opens laterally outward of the lateral side end (in the vehicle width direction) of the operation panel 61, water having flown into the laterally-open groove portion 64d can be discharged laterally outward from the lateral side end of the operation panel 61.

[0063] Note that, whereas the auger-switch-disposed surface 64 in the above-described embodiment has been shown and described as disposed on a right side end portion, in the vehicle width direction, of the machine body 11, the surface 64 may be disposed on a left side end portion, in the vehicle width direction, of the machine body 11. Furthermore, whereas the walk-behind snow removal machine 10 of the present invention has been described above in relation to the case where the operation panel 61 includes the auger-switch-disposed surface 64, the general operation surface 65 and the upper operation panel, the present invention is not so limited, and the basic principles of the present invention may be applied to walk-behind snow removal machines where the operation panel does not include the upper operation surface.

[0064] The basic principles of the present invention, more particularly, arrangements pertaining to the auger-switch-disposed surface, are well suited for application to walk-behind snow removal machines.

5 An auger-switch-disposed surface (64) having an auger switch (71) provided thereon is provided on a rear end portion of an operation panel (61) hollowed downward relative to a general operation surface and slants rearwardly and downwardly relative to the general operation surface (65) having other operating members (73, 74) provided thereon. Thus, snow having fallen on the auger-switch-disposed surface (64) flows down the auger-switch-disposed surface to drop from the operation panel (61). Besides, the auger switch (71) can be discriminated from other operating members with ease.

Claims

- 20 1. A walk-behind snow removal machine (10) including a machine body (11) on which are provided: a travel unit (13); an auger (31); and an operation panel (61) having a push-button-type auger switch (71) for turning on/off the auger (31) and one or more other operating members (73, 74) for snow removal operation; and a loop-shaped operating handle (62) disposed immediately rearward of the operation panel (61), a human operator walking behind the operation panel while operating the operating handle,
- 25 **characterized in that** the operation panel (61) includes, on an upper surface thereof, an auger-switch-disposed surface (64) having the auger switch (71) disposed thereon and a general operation surface (65) having the other operating members disposed thereon,
- 30 **in that** the auger-switch-disposed surface (64) is provided on a rear end portion of the operation panel (61) at a position hollowed downward relative to the general operation surface (65) in such a manner that the auger-switch-disposed surface (64) slants rearwardly and downwardly relative to the general operation surface (65), and
- 35 **in that** the auger-switch-disposed surface (64) has a projecting portion (64c) formed on a front upper end portion (64a) thereof and projecting upward beyond the general operation surface (65), the auger-switch-disposed surface (64) extending along an entire width, in a vehicle width direction, of the auger-switch-disposed surface (64).
- 40
- 45 2. The walk-behind snow removal machine according to claim 1, wherein the auger-switch-disposed surface (64) has an upwardly- and laterally-open groove portion (64d) formed immediately forward of the projecting portion (64c), the groove portion (64d) being located lower than the general operation surface (65) and extending at least along an entire length, in the vehicle width direction, of the projecting portion
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(64c), and
wherein one end, in a longitudinal direction, of the
groove portion (64d) opens laterally outward of a lateral
side end, in the vehicle width direction, of the
operation panel (61).

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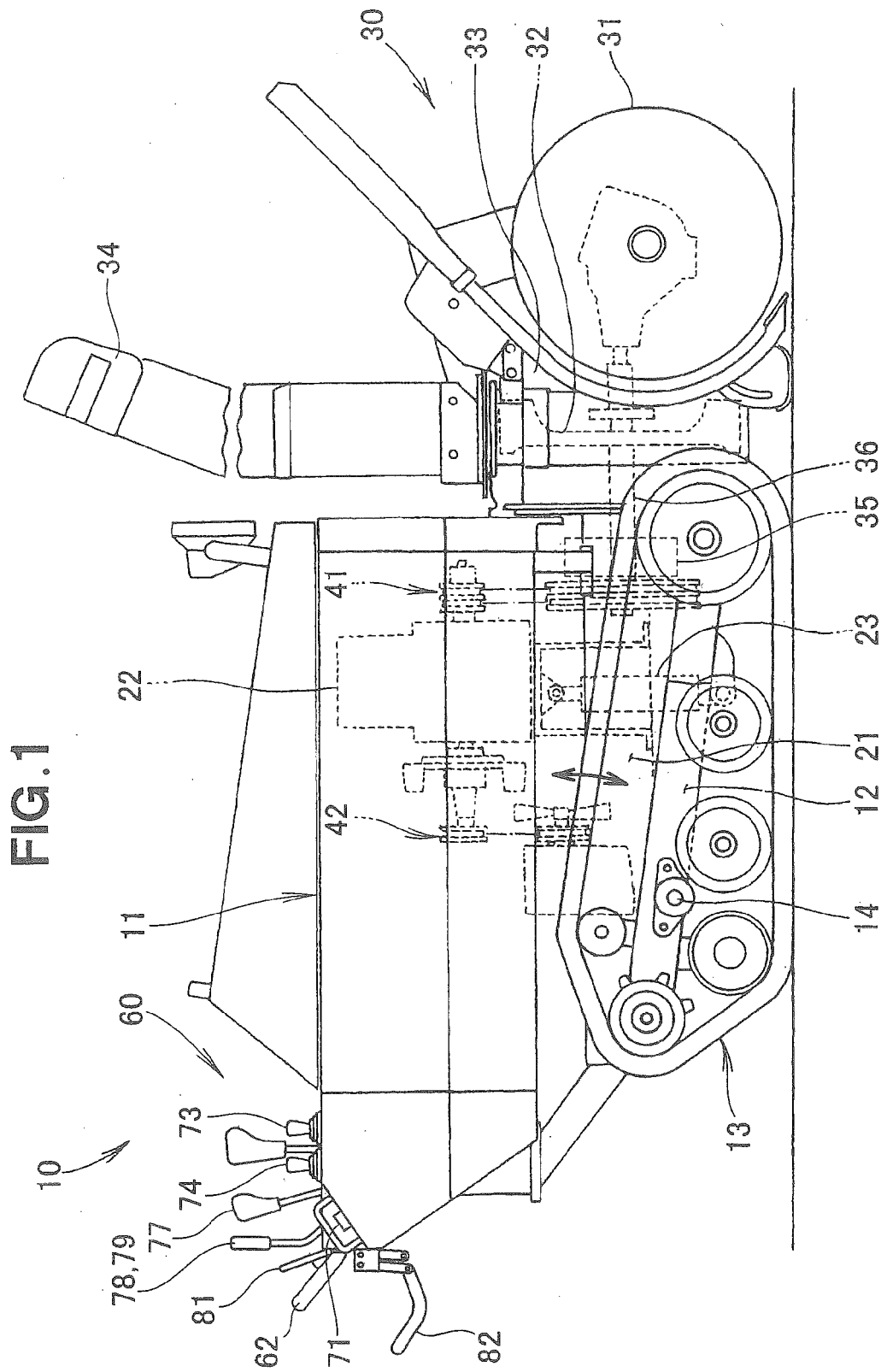
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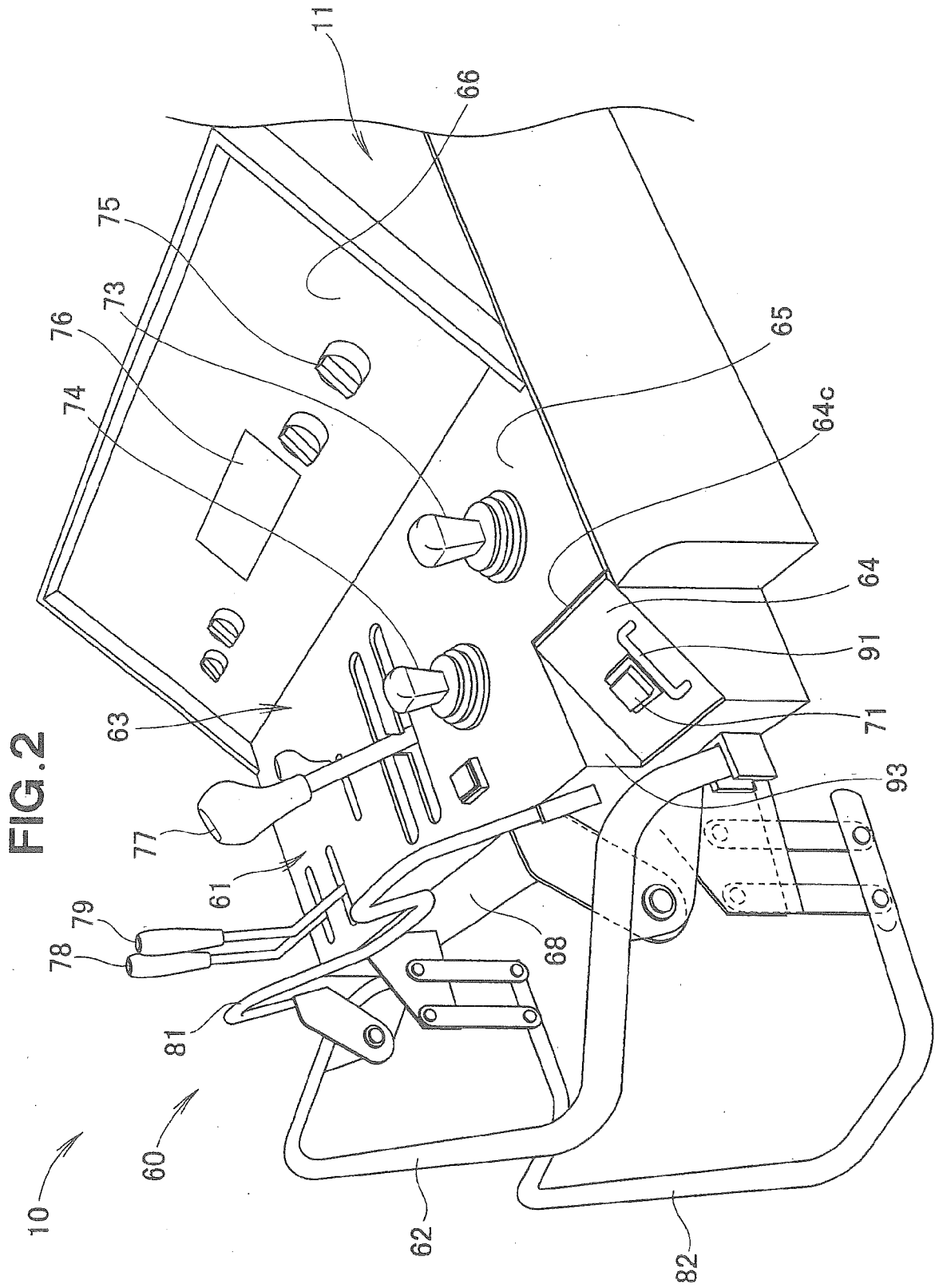


FIG. 3

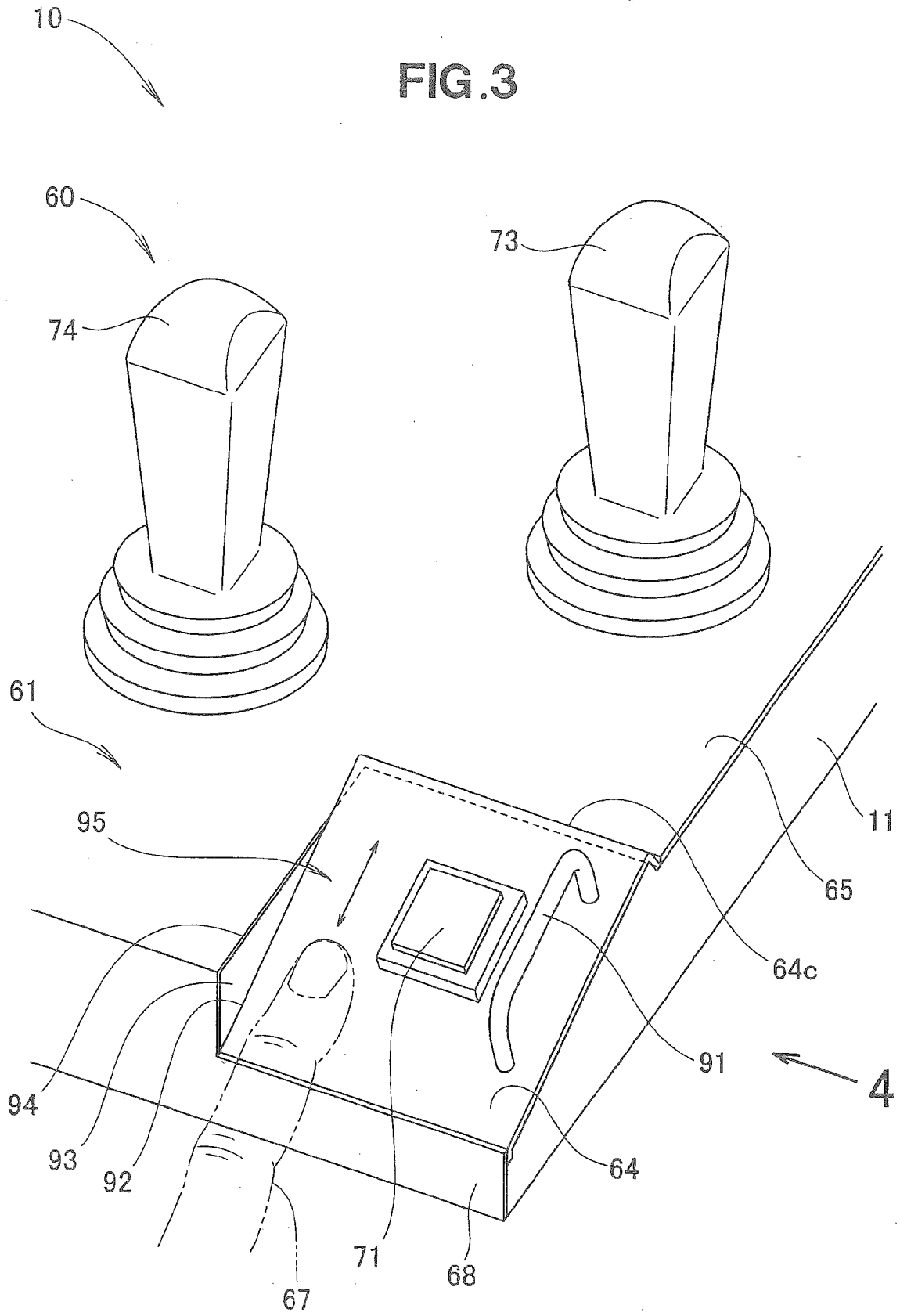


FIG. 4

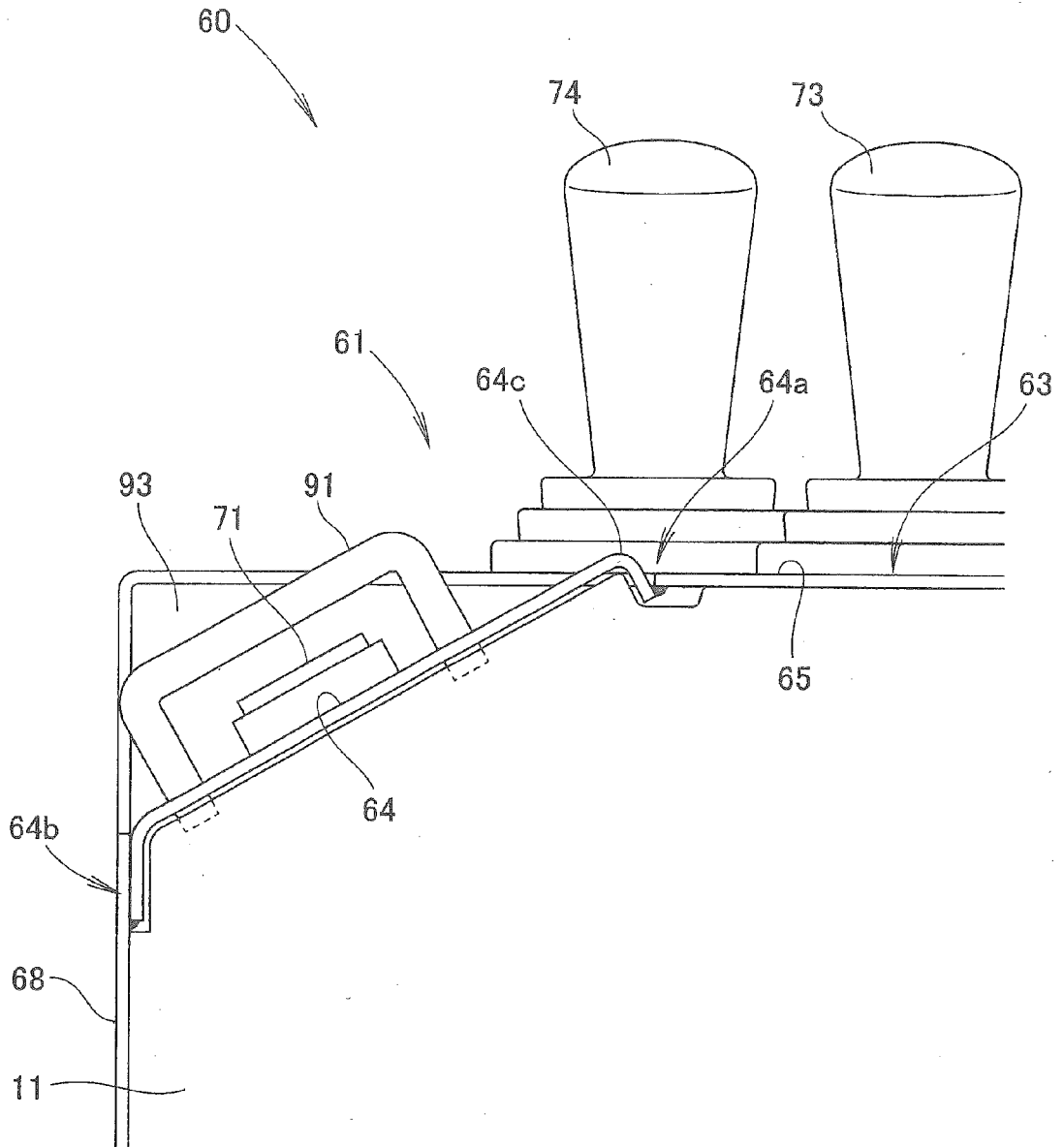


FIG. 5A

(CONV.EX.1)

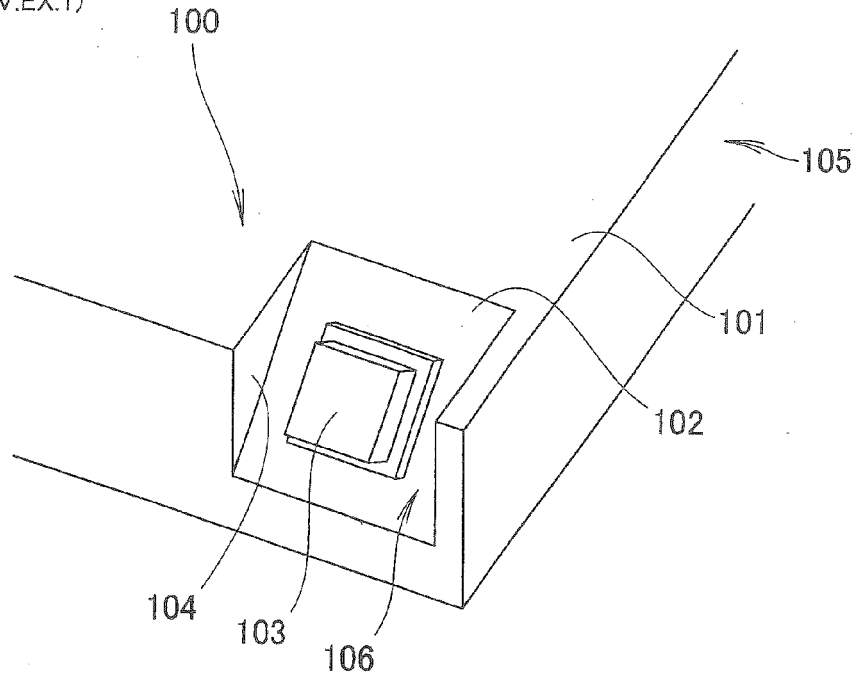


FIG. 5B

(CONV.EX.2)

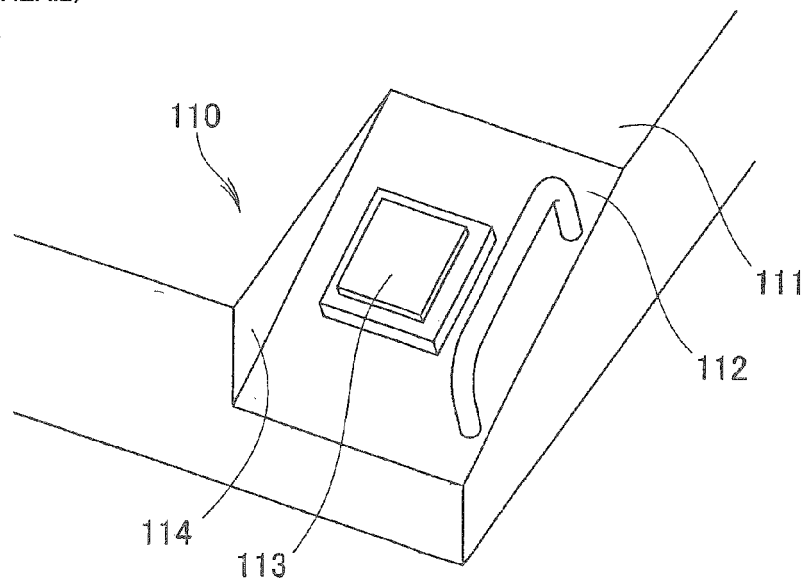


FIG. 6

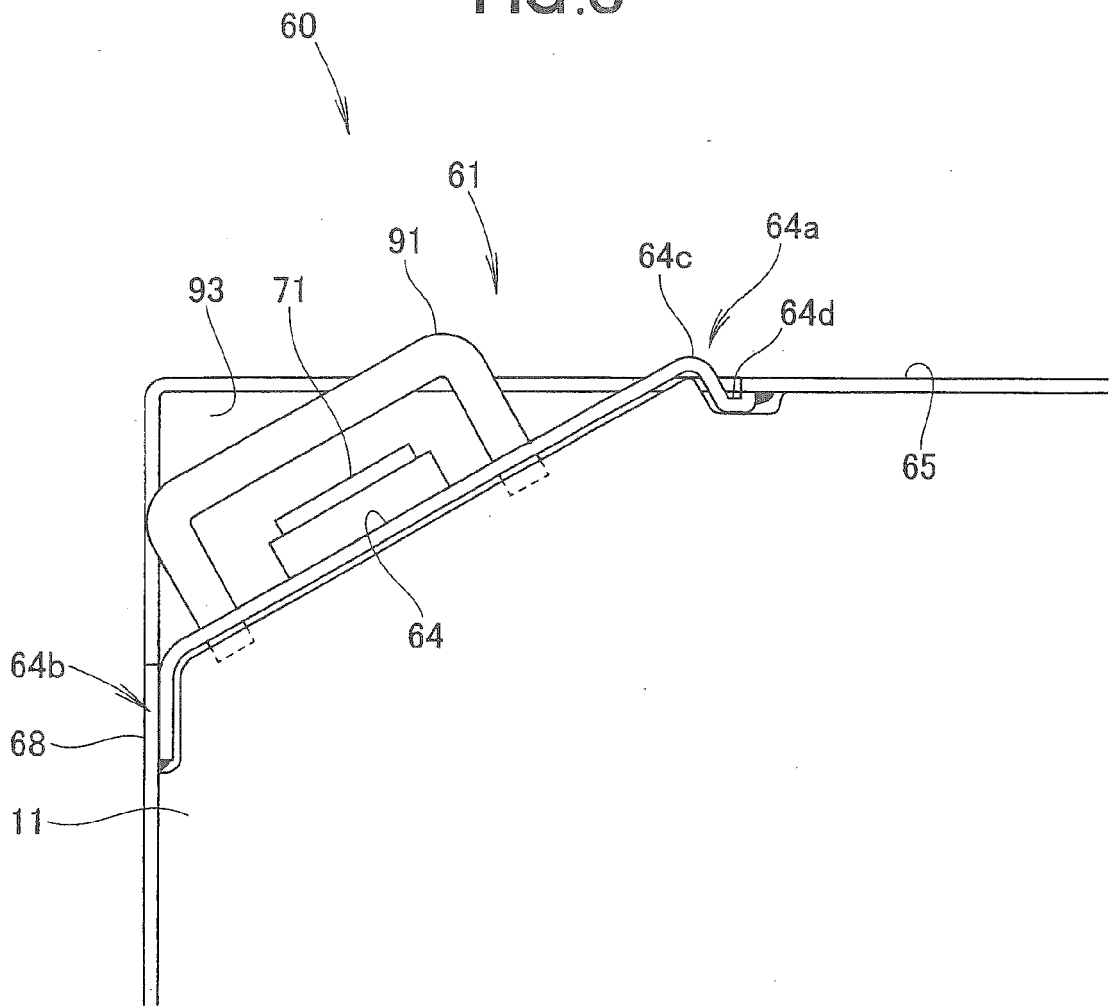
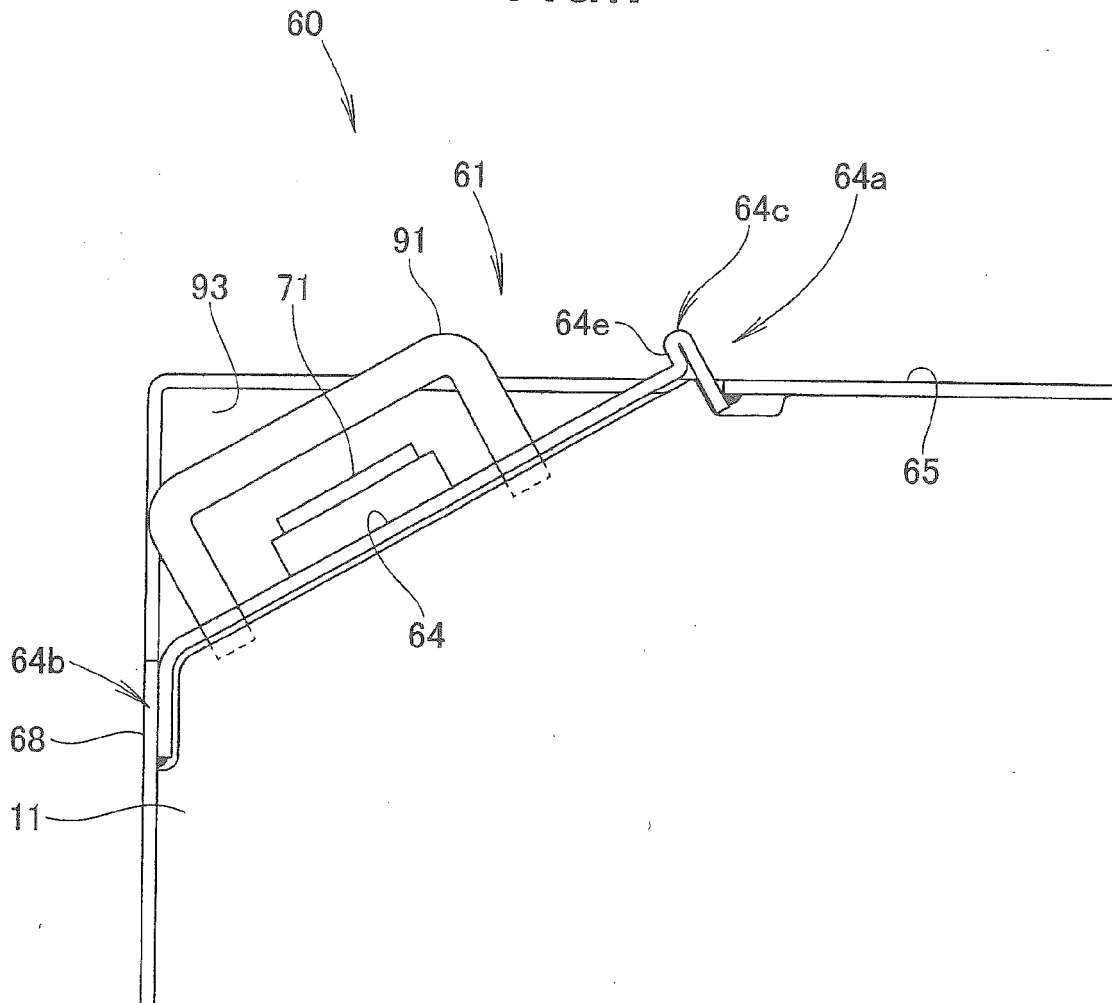


FIG. 7





EUROPEAN SEARCH REPORT

Application Number
EP 14 16 7047

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			E01H
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Place of search		Date of completion of the search	Examiner
Munich		10 October 2014	Saretta, Guido
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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