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(71) Applicants:

- **YANMAR AGRICULTURAL EQUIPMENT CO.,
LTD.
Osaka-fu 530-0013 (JP)**

- **Yoka Industry Co., Ltd.**

Yabu-gun, Hyogo 667-0024 (JP)

(72) Inventors:

- **Yoneda, Satoru
Yabu-gun, Hyogo 667-0024 (JP)**
- **Morimoto, Minoru
Yabu-gun, Hyogo 667-0024 (JP)**

(74) Representative:

**Henkel, Feiler, Hänzel
Möhlstrasse 37
81675 München (DE)**

(54) **Battery loading structure for snow removing machine**

(57) Onto an auger housing (8) is mounted a battery stand (60) also serving as reinforcement for the stand (60). The stand (60) is provided with snow dropping bores (60e and 60f). A battery (72) is loaded on the stand (60) and covered with a cover (80) having slopes (80a and 80b) used for dropping snow therealong.

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Description

BACKGROUND OF THE INVENTION

Technical Field

[0001] The present invention relates to a battery loading structure of a snow removing machine provided with snow removing means including a snowplow auger, a blower and a snow removing chute and with running means of a crawler or a wheel tire.

Related Art

[0002] Regarding a snow removing machine, conventionally, there has been technology of increasing weight of a snow removing unit of the machine to increase pressure given to snow to thereby improve its snow removing performance.

[0003] For example, the Japanese Utility Model No. Sho 55-50181 discloses a snow removing machine provided at a snow removing unit thereof with a weight support, on which the necessary number of weights detachably mounted to thereby enable the weight of snow removing unit to be adjusted.

[0004] The Japanese Utility Model No. Sho 61-38976 is of the same technology, which loads a hydraulic pump instead of the weights disclosed in the Japanese Utility Model No. Sho 55-50181.

[0005] Among these conventional arts, the former needs the weight of separate parts of the snow removing machine, and it is troublesome to be removed and mounted every time so that the snow removing machine is hard to be compactly arranged from a viewpoint of workability. It is troublesome from the workability that a large number of parts (weights in this case) expect for tools and safety pins necessary for the maintenance are used in the machine.

[0006] Also, in the latter, a compact and inexpensive snow removing machine is difficult to adopt the hydraulic pump because of cost-up. In the conventional art, the hydraulic pump is not covered and mounted onto the rear surface of an auger casing, whereby there is a fear that the hydraulic pump may be badly affected. Even if the hydraulic pump is covered, the cover is subject to snow piling which is hard to be removed unless a snowplow is used therefor.

SUMMARY OF THE INVENTION

[0007] An object of the present invention is to provide a snow removing machine which, in spite of being inexpensive and compact, can surely make the snow removing unit press the snow surface on the ground so as to improve the snow removing performance.

[0008] In order to attain this object, a battery stand is mounted onto an auger housing of a snow removing machine according to the present invention, which is

provided at the forward portion thereof with the auger housing for covering an auger and a blower cover extended backwardly from the auger housing, the battery stand being also used as reinforcement for the auger housing.

[0009] Furthermore, the battery stand is provided with slits through which snow drops off and the battery loaded on the stand is covered at the top thereof with a cover sloped for falling snow thereon.

[0010] These and other objects, features and advantages of the invention will become apparent upon a reading of the following detailed description and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

Fig. 1 is a left side view of a crawler type snow removing machine according to the present invention;

Fig. 2 is a right side view of a wheel type snow removing machine;

Fig. 3 is a perspective front view of the snow removing unit of the present invention;

Fig. 4(a) is an outside view of an auger 24;

Fig. 4(b) is an inside view of the same;

Fig. 5 is a partially side view of a cutout 24j of the same;

Fig. 6 is a sectional front view of a shaft supporting sleeve 26;

Fig. 7 is a side view of the same;

Fig. 8 is a perspective rear view of the snow removing unit in which a battery stand 60 is mounted;

Fig. 9 is a plan view of the battery stand 60;

Fig. 10 is an exploded perspective view of a battery casing 70, a battery 72 and a battery cover 80 as they appear while the battery 72 is inserted into the battery casing 70 and the battery 72 is covered with the battery cover 80;

Fig. 11 is a schematic side view of alternatively modified battery cover 80;

Fig. 12 is a perspective rear view of a snow removing unit on which is mounted a battery stand 111 of a modified embodiment of ;

Fig. 13 is a plan view of battery stand 111;

Fig. 14 is a perspective rear view of the snow removing unit which mounts battery 72 on battery stand 111;

Fig. 15 is a perspective rear view of the snow removing unit which mounts a battery cover 115 on the same;

Fig. 16 is a front view of battery cover 115;

Fig. 17 is a sectional side view of a stepless transmission within transmission housing 1 showing a state where a running clutch is engaged and a parking brake is released;

Fig. 18 is an enlarged sectional side view of a princi-

pal portion of the stepless transmission, showing a state where the running clutch is disengaged and the parking brake is released,

Fig. 19 is sectional rear view of the stepless transmission in the transmission housing 1,

Fig. 20 is an enlarged sectional side view of a principal portion in the transmission housing 1 in a state where the running clutch is disengaged and the parking brake is exerted, and

Fig. 21 is an enlarged sectional side view of the same in a state where the parking brake is intended to be operated while the running clutch is engaged.

DETAILED DESCRIPTION OF THE INVENTION

[0012] At first, explanation will be given on a whole structure of a crawler type snow removing machine provided with the snow removing unit of the present invention in accordance with Fig. 1. The snow removing machine of the invention disposes a snow removing unit A at the front of the machine body and a control unit B at the rear thereof. An engine E is mounted on a transmission housing 1 serving as a main body. A drive axle 11 is rotatably supported by transmission housing 1 and project leftward and rightward therefrom so as to be rotatably supported by respective track roller frames 12. Sprocket wheels 13 are fixed onto both ends of drive axle 11, respectively. An axle 14 on both ends of which track idlers 15 are fixed is not supported by transmission housing 1 but supported by frames 12 behind the rear end of transmission housing 1. Shown sprocket wheels 13 and track idlers 15 are disposed outside frames 12, however, they may be disposed inside the same. A track 16 is wound onto sprocket wheel 13 and track idler 15 on each of left and right sides of the machine body. Axle 11 fixed to sprocket wheels 13 is driven by power of engine E through a transmission mechanism in transmission housing 1 to travel the snow removing machine.

[0013] Snow removing unit A is provided at the front thereof with left and right augers 24 for raking-in snow and an auger housing 8 which covers the top, rear and both lateral sides of augers 24. A blower casing 6 for containing a blower (not shown) is extended backwardly from the lateral middle of rear end of auger housing 8. A chute 7 for exhausting snow, which is capable of whirling at about 180°, projects upwardly from the top of blower casing 6.

[0014] Control unit B comprises a control panel 5, a handle 4, a running speed change lever 18, a lifting lever 19 and the like. Control panel 5 is provided at the respective lateral sides thereof with a running clutch lever 21 and an auger clutch lever 22 both of a deadman clutch lever type. Lifting lever 19 is operated so as to rotate a cam 35 through a rod 33 downwardly extending from control panel 5, thereby raising or lowering the rear end of transmission housing 1, which is vertically rotatable in relative to axle 11. As a result, snow removing unit A is vertically moved together with transmission

housing 1 rotated about axle 11 as a fulcrum.

[0015] Just behind auger housing 8 and at the laterally opposite side of blower casing 6 to a battery stand 60 to be discussed later is disposed a reinforcement member 50 for snow removing unit A, which may be joined to auger housing 8 and blower casing 6.

[0016] Fig. 2 shows a wheel type snow removing machine equipped with snow removing unit A of the invention, which travels with drive wheels 56 mounted on a drive axle 55 corresponding to axle 11 without tracks as shown in Fig. 1. Similarly to those shown in Fig. 1, snow removing unit A, comprising augers 24, auger housing 8, blower casing 6 and chute 7, is disposed at the front portion of machine body and control unit B equipped with handle 4, control panel 5, running clutch lever 21 and auger clutch lever 22 is at the rear portion thereof. Handle 4 is gripped by an operator for properly steering the machine during the running. Instead of lifting lever 19, handle 4 is raised and lowered by the operator's hands so as to vertically rotate the snow removing machine about the fulcrum of wheels 56, thereby enabling snow removing unit A to be adjusted in height.

[0017] Figs. 1 and 2 are side views when viewed from the opposite side to each other, in which parts in common can be presumed in such a manner that the right side view of snow removing machine in Fig. 1 is presumed from Fig. 2 and the left side view of the same in Fig. 2 from Fig. 1.

[0018] The two snow removing machines shown in Figs. 1 and 2 have several differences other than that of driving type between a crawler type and a wheel type. Firstly, as the adjusting means for height, that is, the ground clearance of auger 24, rollers 40 are mounted to the left and right sides of snow removing unit A shown in Fig. 1. Meanwhile, skids 59 are mounted to the left and right sides of the machine shown in Fig. 2. Resulting augers 24 can be rather spaced from the ground by rollers 40 or skids 59.

[0019] Regarding the mounting of rollers 40 in Fig. 1, for example, it is considered that slots are bored at the sides of reinforcement member 50 and battery stand 60 just behind auger housing 8, and brackets carrying respective rollers 40 are tightened by bolts inserted into the slots so that the bolts are changed in position within the slots, thereby adjusting rollers 40 in height. Roller 40 is enough so long as being mounted adjustably in its height.

[0020] Regarding the mounting of skids 59 in Fig. 2, as shown in Fig. 12, it is considered that left and right skids 59 are fixed onto vertical reinforcement ribs 8b formed at the left or right rear surface of auger housing 8, respectively, so as to increase the support strength of skids 59. Skids 59 may be fixed to auger housing 8 by bolts or welding. If they are tightened by bolts, vertical slots may be bored in reinforcement ribs 8b so that the bolts in the slots are vertically adjusted to adjust the height of skids 59, thereby enabling the ground clear-

ance of augers 24 to be adjusted.

[0021] Roller 40, while being superior for smooth movement of the snow removing machine to skid 59, contacts with the ground through a small area thereof almost like a point so that snow removing unit A lacks in stability. On the contrary, skid 59, which presses the ground by its flat surface, is well in stability, but deteriorates in mobility because of its being dragged on the ground.

[0022] It is sufficient for selecting one of the two structures of supporting snow removing unit A against the ground shown in Figs. 1 and 2 that the selected structure agrees with emphasized requirements existing in the entire structure of the snow removing machine as an object, wherein the decision to use roller 40 or skid 59 is not limited by the formation of snow removing machine whether of crawler type or wheel type.

[0023] Regarding the second different point, chute 7 shown in Fig. 1 is provided at the top thereof with a chute cap 90a, which is connected through a wire (not shown) to a lever provided at control unit B. The lever is operated to vertically angularly adjust chute 7 so as to adjust a snow throwing distance.

[0024] Chute 7 shown in Fig. 2 is provided at the top thereof with a chute cap 90 which is connected not to control unit B but to a snow throwing distance adjusting lever (chute lever) 93 provided on chute 7. In this regard, chute cap 90 is relatively vertically rotatably mounted to the top end of chute 7 through a hinge 90c. An arm 91 projects backwardly from the rear end of chute cap 90. A bracket 95 is fixed onto the rear surface of chute 7 below arm 91. Chute lever 93 is vertically rotatably supported by bracket 95. A link 92 is pivotally interposed between lever 93 and arm 91. Disc springs are provided between lever 93 and bracket 95 and at the pivots of link 92 to lever 93 and arm 91 so as to hold link 92 and chute cap 90 in their positions located by the lever 93. In addition, at the lower end of bracket 95 is formed a stopper 95a for limiting the downward rotation of lever 93.

[0025] A grip 94 is provided at the rear end of lever 93 so that the operator holds grip 94 to vertically rotate lever 93 and adjust a vertical angle of chute cap 90, thereby adjusting the snow throwing distance.

[0026] The distance between front snow removing unit A and rear control unit B in the wheel type machine shown in Fig. 2 is smaller than that of the crawler type machine as shown in Figs. 1, which has track roller frames 12 and track idlers 15 arranged in left and right longitudinal lines behind sprocket wheels 13. The rear end of resulting chute 7 of the machine shown in Fig. 2 is so close to an operator standing behind control unit B as to come into a range to be handled by the operator. This is the reason why the wheel type snow removing machine shown in Fig. 2 can be provided with lever 93 disposed on the rear surface of chute 7. The machine in Fig. 2 is more advantageous than that in Fig. 1 in that the number of levers in control unit B are reduced so as

to make the machine neat, a space for providing other control means at control unit B can be assured, and a wire is not necessary to be interposed between chute 7 and control unit B.

[0027] Next, the structure of snow removing unit A in common to both the snow removing machines shown in Figs. 1 and 2 will be detailed. In Fig. 3, an opening 8a is bored at the center of the rear surface of auger housing 8 so as to communicate with the interior of blower casing 6. A transmission shaft 28 is forwardly extended from transmission housing 1 into blower casing 6 so as to transmit power of engine E to the blower therein, and further projects forwardly from opening 8a to be fitted into a gear casing 27 which contains a transmission mechanism, such as a bevel gear mechanism or a worm gear mechanism, for driving augers 24. An auger shaft 25 extends leftwardly and rightwardly from gear casing 27 and is rotatably journaled at both outer ends thereof onto the left and right side plates of auger housing 8, respectively. At the left and right sides of gear casing 27 are disposed sleeves 26 as shown in Figs. 6 and 7, and auger rotating shaft 25 perforates therethrough so as to be fixed thereto (in this embodiment, by use of respective keys). The inner end of each sleeve 26 is formed to a flange 26a so as to be relatively rotatably retained to each of the left and right sides of gear casing 27 and to be integrally rotatable with shaft 25. An auger fixing stay 26b bored by a slot 26d radially projects from the outer end of each of sleeves 26.

[0028] Explanation will be given on the structure and disposal of augers 24 in accordance with Figs. 3 and 4. Left and right side augers 24 are provided around auger rotating shaft 25 projecting leftward and rightward from sleeves 26, respectively. Each auger 24 is provided with an axial shaft casing 24a into which shaft 25 axially perforates. A ring 24b is fixed to the outer end of shaft casing 24a through a diametric support 24c. Two spirals 24d are extended from ring 24b toward each of sleeves 26 at a phase shift of 180°. Intermediate supports 24e radially and oppositely project from the half-way portion of shaft casing 24a and are fixed at utmost ends thereof to both of spirals 24d, respectively. As shown in Fig. 4, the inner ends of two spirals 24d of each auger 24 are fixedly connected with each other through a support frame 24f diametrically extending from shaft casing 24a when viewed from side. Support frame 24f is reinforcing-supported by a pair of auxiliary supports 24i extending from shaft casing 24a in the vicinity of basic ends of intermediate supports 24e.

[0029] As shown in Fig. 4, support frame 24f is bored by four pin holes, that is, two pin holes 24g and two pin holes 24h which are symmetrically disposed with respect to shaft casing 24a. Holes 24g are spaced in the same distance from shaft casing 24a, and holes 24h are similar. However, the distance between each hole 24g and shaft casing 24a is shorter than that between each hole 24h and shaft casing 24a. Support frame 24f is made to abut against stay 26c and one pin

hole is selected from the four holes 24g and 24h so that a safety pin 29 is fitted into the one pin hole and slot 26d so as to fix support frame 24f to stay 26b.

[0030] Thus, augers 24 are disposed at the left and right sides of gear casing 27. Spirals 24d of right auger 24 and those 24d of left auger 24 are wound in the opposite direction to each other, so that left and right augers 24 rotating together gather snow toward the lateral center (around gear casing 27). The gathered snow is introduced into blower casing 6 behind auger housing 8 through opening 8a and exhausted by the blower therein through chute 7.

[0031] Auger 24 is fixed not to shaft 25 but to sleeve 26 through safety pin 29. When auger 24 is subject to an excessive load, pin 29 is sheared so that sleeve 26 is cut off from auger 24 so as to prevent the driving system from being damaged by the overload given on sleeve 26 and shaft 25.

[0032] In the case that pin 29 is set into hole 24g apart in a shorter distance from casing 24a, in comparison with setting it into that 24h, even if auger 24 is equally stressed, pin 29 is stressed by a larger shearing force, thereby being easily sheared. Also, even if snow on the ground equally stresses augers 24, the parts of snow removing unit A are more damaged when the snow is mixed with obstacles like much sand or many stones than when the snow is mixed with substantially no obstacle.

[0033] If the snow involving almost no obstacle is to be removed, safety pins 29 are preferably set into pin holes 24h of both augers 24 so as to raise the limit of allowable stress onto pins 29, thereby enabling more snow to be removed. If the snow involving damaging obstacles is to be removed, pins 29 are preferably set into holes 24g so as to enable pins 29 to be sheared by a relatively smaller impact. Thus, the various parts of snow removing unit A including augers 24 can be prevented from being damaged. Also, snow removing unit A can be prevented from small but continuous damages because pin 29 is also sheared even by such continuous damages.

[0034] In addition, auger 24, which is disposed presupposing the shearing of safety pin 29, is required to have a structure which is easy to reset pin 29. Therefore, each auger 24 is provided with two pin holes prepared for each of two kinds 24g and 24h of them having different distances from shaft casing 24a. The two pin holes of each kind are disposed in opposite to each other with respect to shaft casing 24a and in the same distance from casing 24a. Hence, pin 29 may be reset into the pin hole which is nearer to slot 26d of stay 26b than the other of the same kind. If only one pin hole were prepared for each kind of pin holes 24g and 24h, each auger 24 would have to be rotated at the maximum 180° so as to fit the pin hole to slot 26d. In this embodiment, two pin holes having the same distance from shaft casing 24a are prepared in opposite positions, so that each auger 24 is enough to be turned, even at the

maximum, about 90° .

[0035] Cutouts 24j are formed along the outer peripheral edge of each spiral 24d with substantially constant intervals as shown in Figs. 3 and 5. In Figs. 4-(a) and 4-(b), cutouts 24j are omitted for the convenience of description. As best shown in Fig. 5, cutout 24j comprises an arcuate edge 24k having a curvature which is similar to that of spiral 24d, a straight edge (fore edge) 24m which is forward with respect to a rotational direction R of spiral 24d, and a straight edge (rear edge) 24n which is rearward with respect to the direction R. Fore edge 24m makes an angle α together with a phantom line S1 as a diameter of spiral 24d when viewed in side. Phantom line S1 crosses the fore end of arcuate edge 24k close to fore edge 24m. Rear edge 24n makes an angle β together with a phantom line S2 as another diameter of spiral 24d when viewed in side. Phantom line S2 crosses the rear end of arcuate edge 24k close to rear edge 24n. Angle α is larger than that β .

[0036] During the rotation of spiral 24d along the direction R, the larger diametrically peripheral edge (hereinafter, "the outer edge") between adjacent cutouts 24j encroaches into snow on the ground led by rear edge 24n, so as to plow the snow. Fore edge 24m as the rear end of the outer edge passes the snow, and then, the plowed snow escapes so as to enter cutout 24j. Afterward, rear edge 24n as the head of outer edge encroaches therein again. Due to the repeat of such a process, snow on the ground is plowed up and carried by rotating spiral 24d.

[0037] When touching the snow surface on the ground, rear edge 24n having smaller angle β is rather perpendicular to the surface while being rearwardly slant. In the same case, fore edge 24m having larger angle α is rather parallel to the surface, thereby gradually introducing the plowed snow into cutout 24j, whereby the shock to which snow removing unit A is subject when the portion of spiral 24d in the snow on the ground exchanges from the outer edge to cutout 24j is moderated. Cutout 24j shaped as the above-described effects shock absorption especially when the snow on the ground is frozen or in the situation that spiral 24d cannot help encroaching into the ground for such a reason as the snow thereon is thin.

[0038] Next, explanation will be given on the battery loading structure. Fig. 8 shows battery stand 60 as the same as that in Fig. 2, from which a battery 72, a battery casing 70 and the like are removed. In this embodiment, battery stand 60 is fixed onto the rear surface of auger housing 8 by welding. In addition, chute 7 is disposed laterally eccentrically from the middle of blower casing 6 (in this embodiment, at the left side thereof), so that a space for disposing stand 60 is assured at the opposite side of blower casing 6 to chute 7. Chute 7 and stand 60 are not limited to such positional relationship.

[0039] Battery stand 60 is made of a horizontal plate which is downwardly bent so as to form a lateral side surface (in this embodiment, a right side surface)

60a and a rear surface 60b. The front ends of horizontal surface and right side surface 60a are curved along the rear surface of auger housing 8 and welded thereto, and the left side ends of horizontal surface and rear surface 60b are curved along the right side surface of blower casing 6 and welded thereto, thereby serving as a reinforcement member for snow removing unit A (auger housing 8).

[0040] As shown in Fig. 9, the horizontal surface of stand 60 is bored by slots 60e and 60f for dropping out snow. Slot 60e extends approximately parallel to a front edge 60c of the horizontal surface, and slot 60f extends approximately parallel to a left edge 60d of the horizontal surface. A distance X between front edge 60c and slit 60e and that Y between side edge 60d and slit 60f are set so as to ensure the strength of auger housing 8 and that of stand 60 against a battery loaded thereon when stand 60 is welded to auger housing 8 and blower casing 6 through both edges 60c and 60d. A substantially circular opening 60g for mounting therethrough a battery 72, is provided in the vicinity of the center of the horizontal surface of stand 60.

[0041] Slots 60e and 60f and opening 60g are so disposed that, when battery 72 is loaded on stand 60, opening 60g is hidden by battery 72 and slots 60e and 60f are exposed.

[0042] Next, explanation will be given on the construction of battery 72, battery casing 70 and the like in accordance with Fig. 10. A plurality of bolts 70a downwardly project from the bottom surface of upwardly open casing 70. For loading battery casing 70 on stand 60, bolts 70a are inserted into holes 60h bored in stand 60 so as to place the bottom surface of casing 70 onto the upper horizontal surface of stand 60, and then, bolts 70a are tightened by nuts respectively. Thus, an opening 70b bored in the bottom surface of casing 70 is made to coincide with opening 60g.

[0043] A battery seat 71 is interposed, in a substantially inverse U-like shape when viewed in side, between the bottom surface of casing 70 and the bottom surface of battery 72. Battery seat 71 is provided at an optional position of a side edge thereof with a cutout 71a. Battery seat 71 can be easily removed from casing 70 by hooking a finger to cutout 71a. Furthermore, cutout 71a assures a route for water to be drained.

[0044] Due to the construction, water which has penetrated into casing 70 is gathered on battery seat 71 and flows therealong and downwardly through cutout 71a so as to be gathered in a space between the bottom surface of battery seat 71 and that of casing 70, and then, falls from stand 60 onto the ground through openings 70b and 60g coinciding with each other, thereby being drained from casing 70.

[0045] Openings 70b and 60g are shifted from cutout 71a when viewed in plan and are intercepted from battery 72 through battery seat 71 interposed between opening 70b and battery 72. Accordingly, even when any obstacle enters from below into casing 70 through

openings 70b and 60g, battery 72 is protected by battery seat 71 from the obstacle.

[0046] On the upper surface of battery seat 71 is stuck a buffer 71b (in this embodiment, two buffers 71b) formed with an elastic body, such as rubber or synthetic resin. Battery 72 is placed on buffer 71b, so that, when stand 60 integral with auger housing 8 and casing 70 fixed onto stand 60 are subjected to an impact caused by gravel or the like encroaching on auger 24 during the snow removing working, transmission of the impact to battery 72 is attenuated by buffer 71b.

[0047] A holder 73 is put on the top of battery 72 in battery casing 70 and cables or the like are connected to battery 72, and then, a battery cover 80 is put and tightened onto the upper edge of casing 70, by use of wing bolts 74.

[0048] Since battery 72 is loaded on stand 60 mounted onto snow removing unit A as the above-mentioned, snow removing unit A can be weighted at low cost without a weight or a hydraulic pump which has been conventionally used. Resulting snow removing unit A sufficiently pressures against the snow surface on the ground, thereby ensuring good snow removing performance.

[0049] Also, stand 60 fixedly jointed between auger housing 8 and blower casing 6 has a function to reinforce these members.

[0050] In the structure as the above-mentioned, around casing 70 (containing battery 72) loaded on stand 60 as shown in Fig. 8, there are some portions where snow is specially easy to pile as discussed below during the snow removing. Snow accumulated on the rear surface of auger housing 8 and on the right hand curved surface of blower casing 6 tends to slide down onto stand 60 in the vicinity of front edge 60c and side edge 60d thereof and be piled thereon because of vibration of auger housing 8 and blower casing 6. Also, if it snows, battery cover 80 tends to be covered with snow.

[0051] The snow piled upon stand 60 in the vicinity of edges 60c and 60d thereof is intended to drop through slits 60e and 60f. The snow piled on cover 80, which is shaped as shown in Fig. 2, is made to slide down along a front slope 80a and a rear slope 80b of cover 80. Front slope 80a is so sloped that snow falls therefrom onto front edge 60c, where the snow joins with that from auger housing 8. Therefore, front slope 80a must be sloped so as to restrict the snow falling therefrom. Meanwhile, rear slope 80b may be sloped so as to allow the snow falling therefrom to be increased to a certain extent because the snow sliding down along rear slope 80b almost falls onto the ground. Hence, slope 80a is made steeper than that 80b, which is made longer than the same to that extent, thereby increasing the snow sliding down along slope 80b more than along slope 80a. Extremely, as shown in Fig. 11, cover 80 may be formed to be vertical at the front surface, so that a downward, rearward slope 80c may be formed throughout the longitudinal length of cover 80.

[0052] In addition, since snow removing unit A vibrates more largely than other parts of the machine, stand 60 largely vibrates so as to accelerate the snow piled thereon to be dropped off. In other words, stand 60 and battery 72 (including casing 70 and cover 80) mounted snow removing unit A have larger snow falling effect than those which are supposed to be mounted onto other portions of the machine.

[0053] From the viewpoint of protecting battery 72 as an electrical equipment from snow, cover 80 and stand 60 which are so constructed and disposed as the above-mentioned are desirable due to their great snow dropping effect, however, they are subject to the large vibration of snow removing unit A. If the vibration is decided to be severe against battery 72, it should be considered such that snow removing unit A is alleviated by adjusting its ground clearance by use of the above means like rollers 40 or skids 59, or by mounting of a buffer like that 71b, thereby limiting the vibration of battery 72 to its allowable level while the above-mentioned snow dropping effect of cover 80 and stand 60 is ensured.

[0054] The above-mentioned loading of battery 72 by use of a battery stand like that 60 as shown in Fig. 8, and alternative embodiments of it shown in Figs. 12-16 as discussed below according to the invention may be equally effectively adapted to any of the two type machines shown in Figs. 1 and 2 whichever type is disclosed in any of Figs. 8, 12, 14 and 15.

[0055] If battery 72 itself is waterproof, corrosion-proof and protective against obstacles, casing 70 is not necessary. In this case, it is considered that battery 72 is mounted on a buffer stuck onto stand 60. Opening 60d may be deleted from stand 60 which is free from the requirement of draining water from casing 70, or that is preferable in order to prevent battery 72 from obstacles from below stand 60.

[0056] Alternative modified embodiments of the invention, in which battery 72 is loaded without use of casing 70, will be explained in accordance with Figs. 12-16.

[0057] Referring to Figs. 12 and 13, a battery stand 111 is fixed at its side edge 111c and front edge 111d to blower casing 6 and auger housing 8, respectively, by welding or the like. Stand 111 is bored in the respective vicinities of edge 111d and a rear edge thereof by holes 111a, into which support rods 112 to be discussed below are inserted. A corner between edges 111c and 111d, as shown in Fig. 12, is slantwise cut so as to provide a gap 111e for draining water (snow) therethrough between blower casing 6 and auger housing 8. Gap 111e replaces slits 60g and 60h of stand 60. Stand 111 is downwardly bent at the rear end thereof to form a vertical edge 111b, thereby ensuring the strength of stand 111 itself for supporting battery 72 loaded thereon.

[0058] Referring to Fig. 14, battery 72 is actually loaded on battery stand 111, wherein a buffer (not shown) may be interposed between battery 72 and

stand 111. Its is enough for decision of whether the buffer is necessary or not to judge the degree of impact actually delivered onto battery 72 from snow removing unit A.

[0059] After battery 72 is loaded on stand 111, two support rods 112 are made to upwardly pass through holes 111a of stand 111 before and behind battery 72, so that the bottom of stand 111 is hooked on substantially V-like bent lower ends of rods 112, whereby rods 112 are prevented from upwardly escaping. The upper ends of rods 112 upwardly pass through front and rear holes of a holder 113 put on the top of battery 72, and then, wing nuts 114 are temporarily screwed onto the upper ends of rods 112. As shown in Fig. 15, battery cables 116 are connected to terminals on the upper surface of battery 72, and then, a battery cover 115 is inserted along an arrow F between holder 113 and battery 72.

[0060] Battery cover 115, as shown in Fig. 16, is of an approximately L-like shape of an elongated portion 115b and a retaining edge 115a when viewed from side. During the insertion of cover 115, elongated portion 115b is laterally inwardly thrust between holder 113 and battery 72 until edge 115a comes into contact with the outer side surface of battery 72. After cover 115 is placed as such, wing nuts 114 are properly tightened so as to press cover 115 against the upper surface of battery 72 through holder 113.

[0061] Next, explanation will be given on a transmission for driving of snow removing unit A and running devices like drive wheels 56 in accordance with Figs. 2 and 17-21. The embodiment shown in Fig. 2 which is discussed hereinafter is employed by the wheel type snow removing machine, but may be adopted to the crawler type snow removing machine shown in Fig. 1.

[0062] Engine E loaded on transmission housing 1 is covered at the front thereof with a belt cover 129. In cover 129 is disposed an output shaft 130 forwardly projecting from engine E. An double output pulley 131 consisting of a running output pulley 132 and a snow removing output pulley 133 is fixed onto shaft 130. In transmission housing 1 just below belt cover 129 are disposed a running drive pulley 136 and a snow removing drive pulley 153. A belt 134 is interposed between pulleys 132 and 136, and a belt 135 is interposed between pulleys 133 and 153.

[0063] A tension pulley (not shown) interlocking with auger clutch lever 22 as a deadman clutch lever is pressed against belt 135 by gripping of lever 22 so as to enable power to be transmitted between pulleys 133 and 153 through belt 135. When an operator releases his or her hand from lever 22, the tension pulley is released from belt 135 by biasing force, so as to loosen belt 135 against pulleys 133 and 153, thereby cutting off the transmission of engine power to the blower and augers 24 of snow removing unit A.

[0064] Regarding the running drive system, as discussed below, is so structured that running clutch lever

21 is operated to move a disk 140 apart from a frictional disk 142 so as to cut off the transmission to axle 55. Instead of this structure, a tension pulley interlocking with running clutch lever 21 may be disposed so as to be pressed against belt 134. In this case, lever 21 is operated to release the tension pulley from belt 134, so as to release belt 134 from pulleys 132 and 135, thereby cutting off the transmission for running.

[0065] Pulley 136 is fixed to one end of a pulley shaft 137. Shaft 137 is perforative-pivotally supported by bearings retained in a bearing holder 139. Bearing holder 139 is fixed to an arm rotating shaft 138 which is pivotally supported by transmission housing 1 so as to be disposed perpendicularly to shaft 137. An arm 141 fixedly projects radially from shaft 138. The other end of shaft 137 projecting from bearing holder 139 is fixed onto the center of disk (first disk) 140.

[0066] In transmission housing 1, as best shown in Fig. 19, a spline shaft 143 is laterally horizontally journaled at the both ends thereof onto the left and right sides of housing 1 through bearings. Frictional disk (second disk) 142 is fixedly provided at the center thereof with a splined sleeve 142a, through which shaft 143 passes axially slidably but not relatively rotatably. A bearing holder 144 disposed beside disk 142 is relatively rotatably mounted on sleeve 142a through its internal bearing. As a result, while disk 142 integral with sleeve 142a axially slides on shaft 143, bearing holder 144 slides integrally with those 142 and 142a. However, bearing holder 144 is not rotated while disk 142 and sleeve 142a are rotated integrally with shaft 143.

[0067] Bearing holder 144 is provided at the front and rear ends thereof with forward and rearward projections 148 and 149. Twin parallel shifter arms 145 (maybe pivotally) engage at their lower ends with respective projections 148 and 149, and are fixedly mounted at their upper ends onto a shifter shaft 150. Shaft 150 interlocks with a running speed changing operation tool (running speed change lever 18 in the embodiment shown in Fig. 1) through something like an arm or a rod. When shaft 150 is rotated by operation of the tool like lever 18, arms 145 are rotated together with shaft 150 as a rotational fulcrum so as to make bearing holder 144 and disk 142 slide along shaft 143.

[0068] Shaft 143 and sleeve 142a, which are spline-fitted together in this embodiment, may be alternatively shaped, for example, to be peripherally polygonal e.g. hexagonal in section. Those fitted together are only required to be not rotatable but slidable in relation to each other.

[0069] On the outer periphery of disk 142 is stuck a friction member in contact with the disk 140. Hence, disk 142 follows up the rotation of disk 140 and shaft 143 rotates integrally with disk 142 so that rotation of shaft 143 is transmitted to axle 55 and wheels 56.

[0070] Bearing holder 139 for supporting disk 140 is fixed to arm 141, which is downwardly biased to rotate in a direction L as shown in Fig. 17 by biasing means

like a spring (not shown). Accordingly, bearing holder 139 is biased in the direction L at the fulcrum of arm rotating shaft 138.

[0071] A wire (not shown) extending from running clutch lever 21 is connected to arm 141. When lever 21 as a deadman clutch lever is gripped so as to pull the wire, arm 141 is upwardly rotated in a direction U as shown in Fig. 17, so that the flat surface of disk 140 abuts against one point on the outer periphery of disk 142. Thus, the rotation of disk 140 is transmitted to disk 142, in other words, the running clutch is engaged. When an operator releases his or her hand from lever 21, arm 141 is rotated downwardly by biasing force in the direction L so as to separate disk 140 from disk 142, thereby cutting off the power transmission therebetween, in other words, disengaging the running clutch. Fig. 18 shows the state of disengaged running clutch wherein there is a gap G between disk 140 and disk 142.

[0072] The degree of upward rotation of arm 141 in the direction U which is forced by operation of lever 21 against the biasing force may be adjustable so as to regulate the pressure of disk 140 against disk 142.

[0073] The degree is determined in the assumption that disk 142 is removed. In this regard, it is considered that the degree of movement of the wire between lever 21 and arm 141 during the switching of lever 21 is adjustable.

[0074] Alternatively, arm 141 may be biased so as to be rotated upwardly in the direction U. In this case, the biasing force of arm 141 is utilized so as to engage the running clutch, so that lever 21 is preferably replaced with an alternative lever which is not a deadman clutch lever. The alternative lever is released from the operator's hand so as to make disk 140 contact with disk 142 by the biasing force.

[0075] When the lever is gripped, arm 141 is downwardly rotated in the direction L against the biasing force so as to separate disk 140 from disk 142. Furthermore, the biasing force may be adjustable so as to regulate the pressure of disk 140 against disk 142.

[0076] One or both of the flat surface of disk 140 and the outer peripheral surface of disk 142 in contact with each other are preferably made of material like rubber, thereby absorbing the error on assembly and changing the crimping force between both of the surfaces. Especially, the change of crimping force relates to adjustment of efficiency of power transmission. Furthermore, it means that, when wheels 56 are excessively loaded, the outer peripheral surface disk 142 which is reduced in rotation according to overloaded axle 55 is allowed to slip against the flat surface of disk 140, thereby preventing the primary driving system previous to disk 142 from being damaged by the overload.

[0077] While there is made gap G between disks 140 and 142 as shown in Fig. 18, the secondary driving system from disk 142 to wheels 56 is idle, which means that an operator can make the machine run by pushing

with his or her hands and without the power of a prime mover (in this embodiment, engine E), thereby being advantageous for maintenance when the prime mover is troubled. However, if the machine is left on a slope while wheels 56 are idle, it freely descends. Hence, the machine needs a parking brake system.

[0078] The snow removing machine according to the embodiment employs a simple and inexpensive parking system for its running transmission including disks 140 and 142 in consideration of such a situation.

[0079] In this regard, as shown in Fig. 17, onto housing 1 is pivoted a brake fulcrum shaft 170 in parallel to shaft 143. A brake plate 171 is fixed onto shaft 170 so as to abut against the outer peripheral surface of disk 142. Plate 171 extends in parallel to shaft 143 and has a length W, which is so set that the end of outer periphery of disk 142, even when shifted to whichever position on shaft 143, can abut against plate 171.

[0080] A spring 172 retained at one end thereof to plate 171 and upwardly extends to be hooked at the other end thereof on one end of a brake lever 174. Brake lever 174 is rotatably mounted at the intermediate portion thereof to a lever fulcrum shaft 173 projecting in parallel to shaft 170 from housing 1. Brake lever 174 extends rearwardly outwardly from housing 1, whereby an operator standing behind control unit B with handle 4 can operate brake lever 174 easily. In addition, a stopper 150a projects from shifter shaft 150 so as to limit the rotation of brake lever 174.

[0081] In Figs. 17 and 18, a knob 174a of brake lever 174 is upwardly pushed so that brake lever 174 abut at the upper end of intermediate portion thereof against stopper 150a. In this state, spring 172 functions as the downward biasing force to hold brake plate 171 apart from the lower end of disk 142, in other words, the brake is kept to be released. Meanwhile, the biasing force of spring 172 acts upwardly onto the rear end of brake lever 174 which is opposite to spring 172 with respect to shaft 173, so as to press the top of intermediate portion of lever 174 against stopper 150a.

[0082] When brake lever 174 is rotated in a direction D in the state where gap G is provided so as to cut off the power transmission (running clutch) as shown in Fig. 18, the connecting point of lever 174 in contact with the upper end of spring 172 moves over shaft 173 as the fulcrum for rotation of lever 174 so as to come behind shaft 173, so that lever 174 itself is subject to the biasing force in the direction D. Finally, brake plate 171 is pressed against disk 142 as shown in Fig. 20, that is, the braking state is obtained. The braking efficiency is raised in proportion to the press-contact load of plate 171 against disk 142.

[0083] This braking device is desirable to be used as a parking brake. Due to overcenter spring 172, brake plate 171 is exchanged only between the brake releasing position shown in Fig. 18 and the braking position shown in Fig. 20 so as not to be held at the intermediate portion therebetween. Especially in the braking position

shown in Fig. 20, there is a certain pressure applied between plate 171 and disk 142 against each other in consideration of braking efficiency. Thus, if brake layer 174 is carelessly operated for braking while both disks 140 and 142 in contact with each other, as shown in Fig. 17, are rotated, or conversely, if the running clutch is engaged while lever 174 is in the braking position as shown in Fig. 20, there is a fear of damaging plate 171, disk 142 or the like.

[0084] Therefore, a protecting structure is adopted, in which the brake is not exerted in the state where the running clutch is engaged. In this regard, as shown in Fig. 17, a check arm 180 integrally projects rearwardly from bearing holder 139 toward the space above shaft 170. Meanwhile, a check plate 181 integrally projects approximately upwardly from shaft 170.

[0085] Referring to Fig. 21, the parking brake is intended to be exerted from the state during the engagement of running clutch as shown in Fig. 18, in other words, brake lever 174 is intended to be rotated in the direction D while disks 140 and 142 contacts with each other and brake plate 171 is apart from disk 142. In spite of the intention, plate 181 comes to abut at the upper end thereof against arm 180. Disk 140, which is integral with arm 180 in rotation about shaft 138 as a fulcrum, is kept to be pressed against disk 142, so that plate 181 integral with brake plate 171 is checked in its further upward motion by arm 180. Resulting plate 171 interlocking with lever 174 is stopped just before contacting with disk 142. Accordingly, the parking brake cannot be exerted while the running clutch is engaged.

[0086] Conversely, from Fig. 21 can also be described that the running clutch is intended to engage from its disengaging state while the parking brake is exerted as shown in Fig. 20, in other word, running clutch lever 21 is intended to be gripped in the state where there is a gap G between disks 140 and 142 and plate 171 is pressed against disk 142. In spite of the intention, arm 180 comes to abut against the upper end of plate 181 which is integral with plate 171 contacting with disk 142, so that arm 180 is checked in its further downward rotation by plate 181. Resulting disk 140, which swings integrally with bearing holder 139 and arm 180 around shaft 138 as a fulcrum, is blocked just before contacting with disk 142. Accordingly, while the parking brake is exerted, the running clutch cannot be engaged.

[0087] Thus, the machine is prevented from the fear that the parking brake is exerted during running which causes to damage some parts of the machine.

[0088] Although the invention has been described with reference to several different embodiments, these embodiments are merely exemplary and not limiting of the invention which is defined solely by the appended claims.

Claims

1. A battery loading structure for a snow removing machine comprising an auger housing which covers an auger, characterized in that a stand for loading a battery thereon is mounted onto said auger housing. 5
2. The battery structure for snow removing machine as set forth in claim 1, further comprising a blower casing is connected to said auger housing, characterized in that said stand is also connected to said blower casing. 10
3. The battery loading structure for a snow removing machine as set forth in any of claims 1 and 2, characterized in that said stand is structured to function as reinforcement for said auger housing. 15
4. The battery loading structure for a snow removing machine as set forth in any of claims 1, 2 and 3, characterized in that said stand is provided with a bore for dropping snow therethrough. 20
5. The battery loading structure for a snow removing machine as set forth in any of claims 1 through 4, characterized in that a cover sloped for dropping therealong is put on a battery loaded on said stand. 25

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Fig. 1

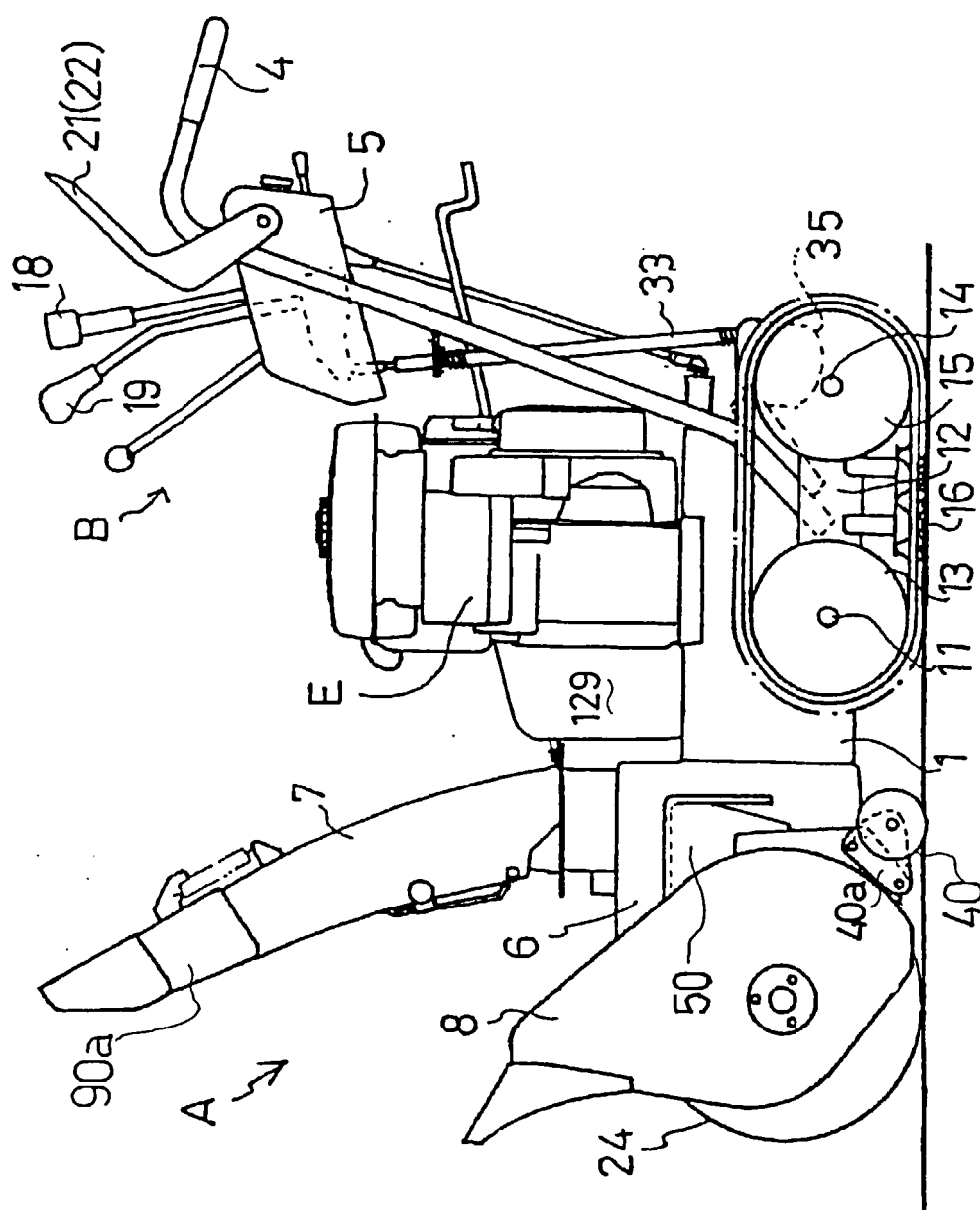


Fig.2

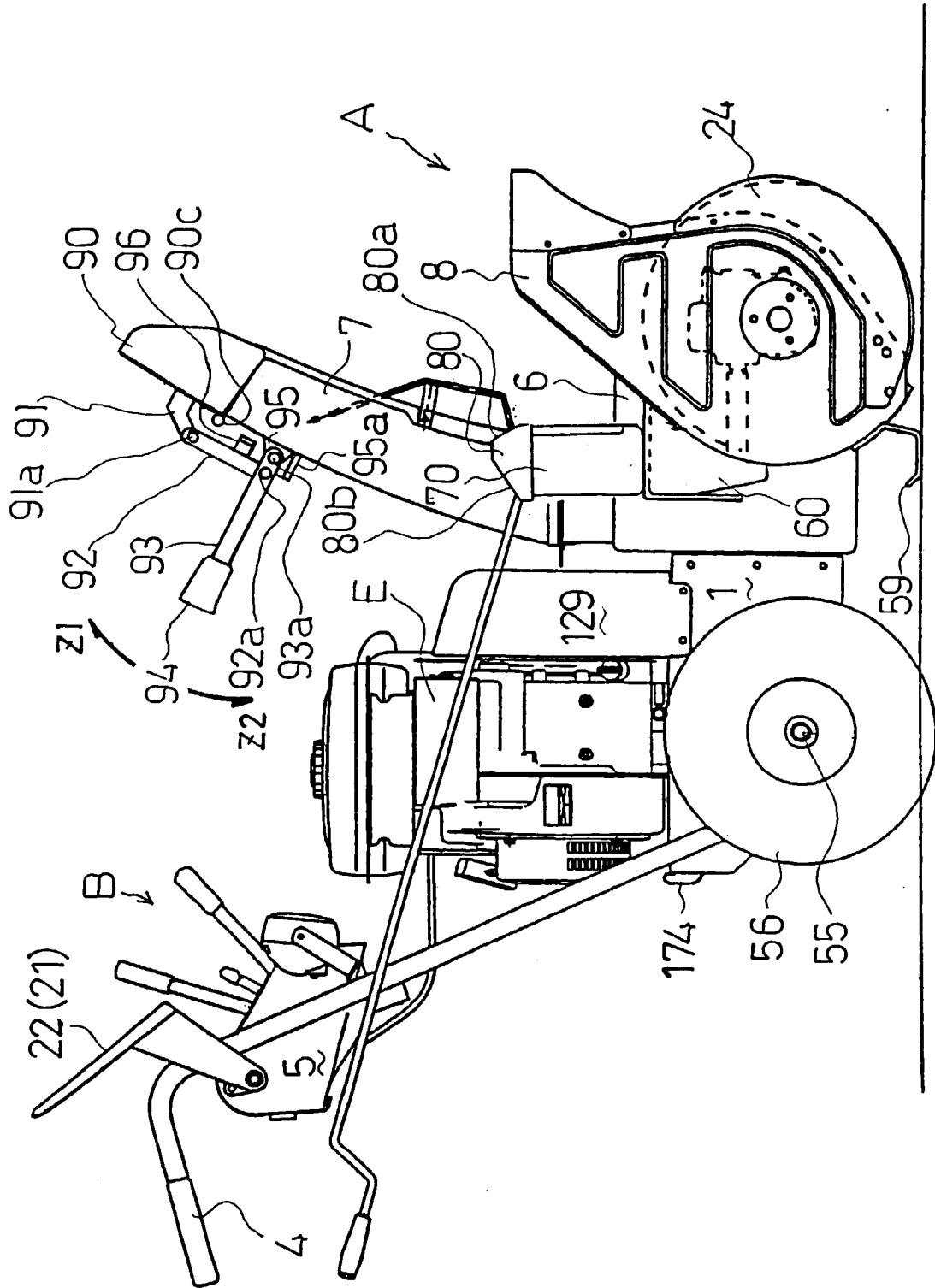


Fig.3

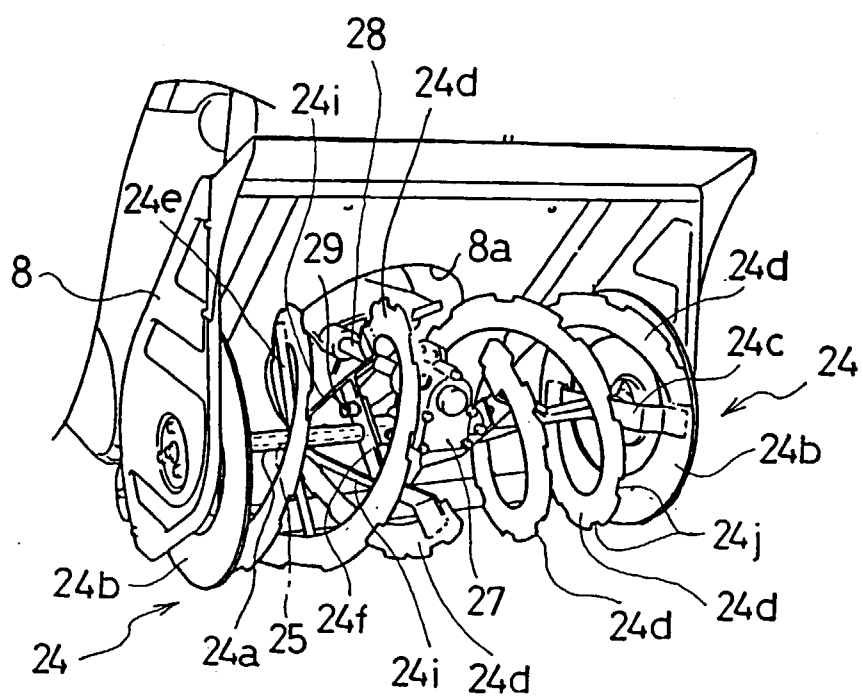


Fig.4(a)

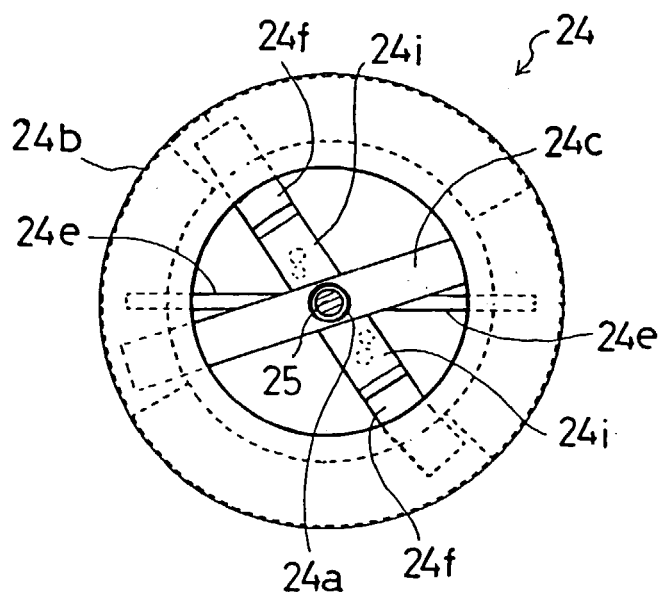


Fig.4(b)

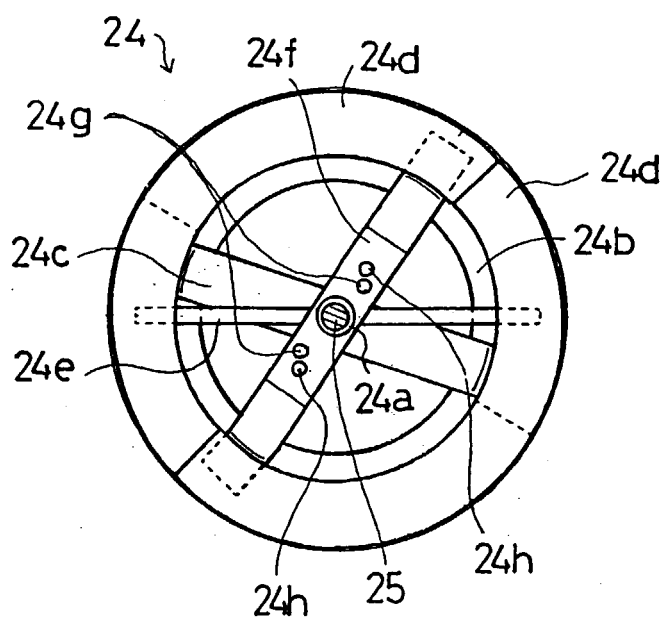


Fig.5

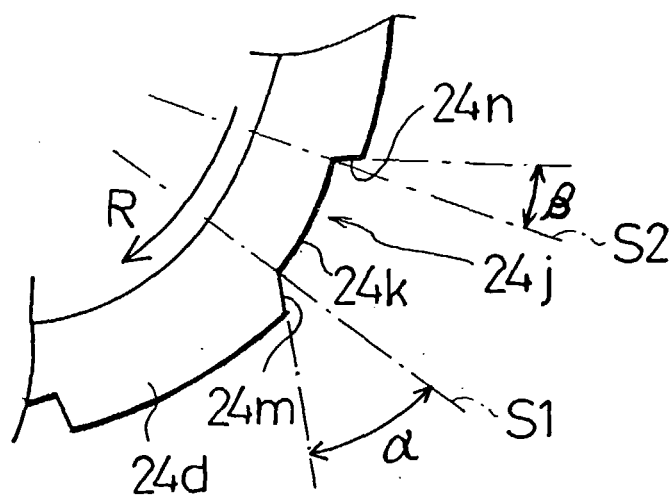


Fig.6

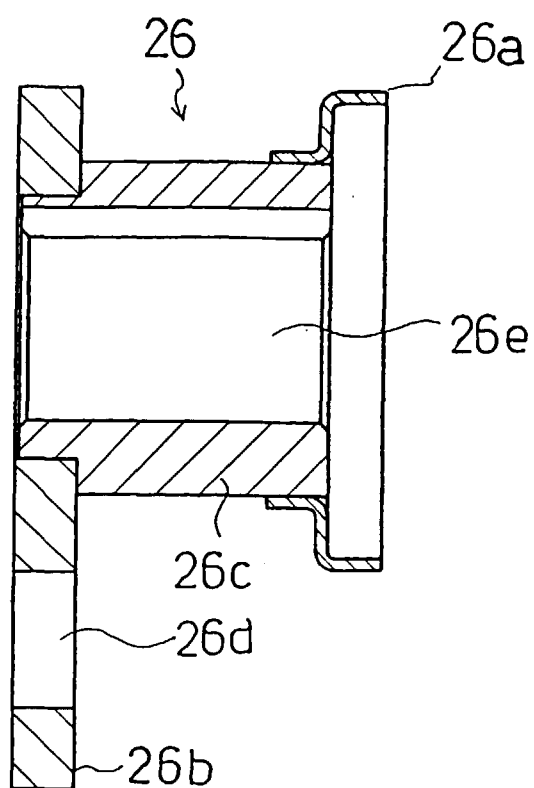


Fig.7

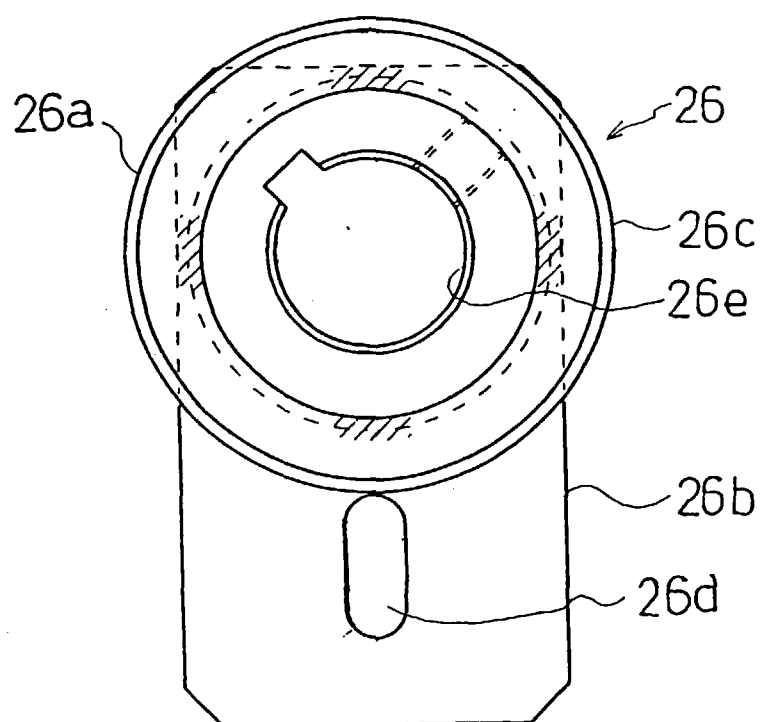


Fig.8

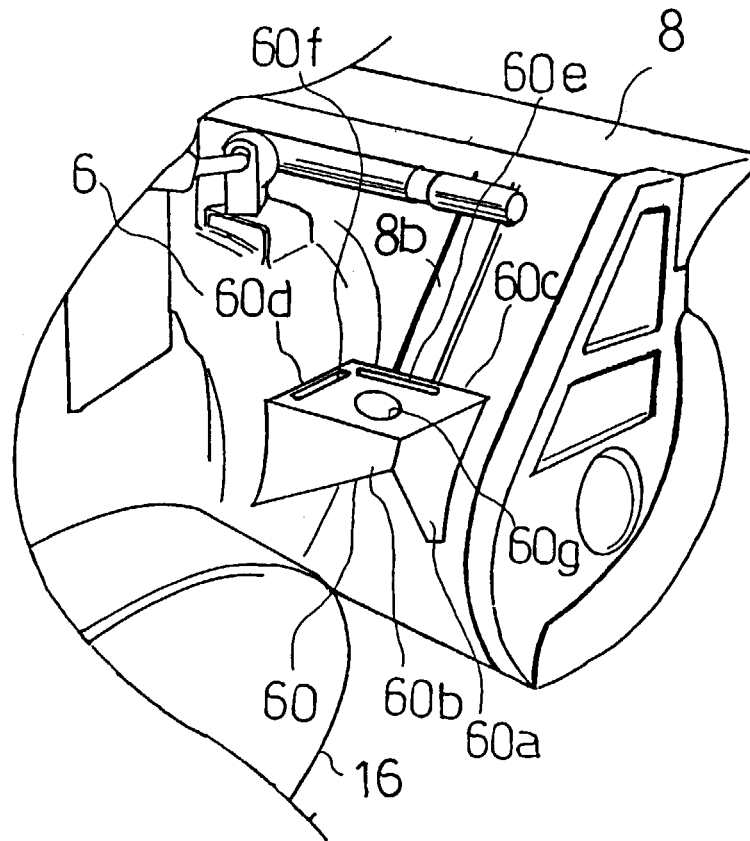


Fig.9

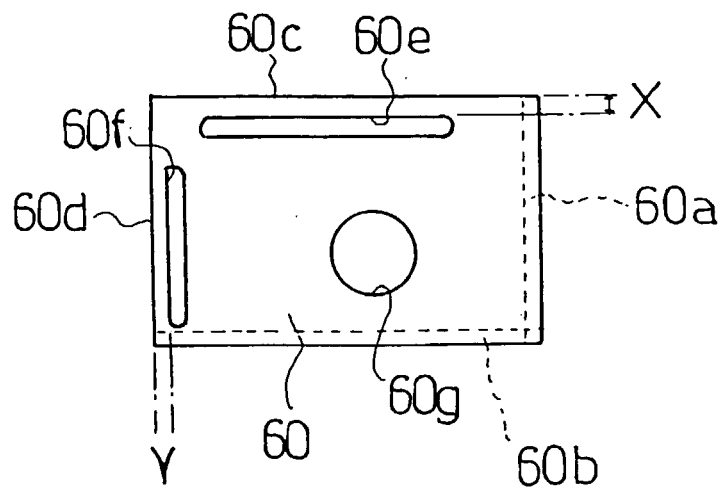


Fig.10

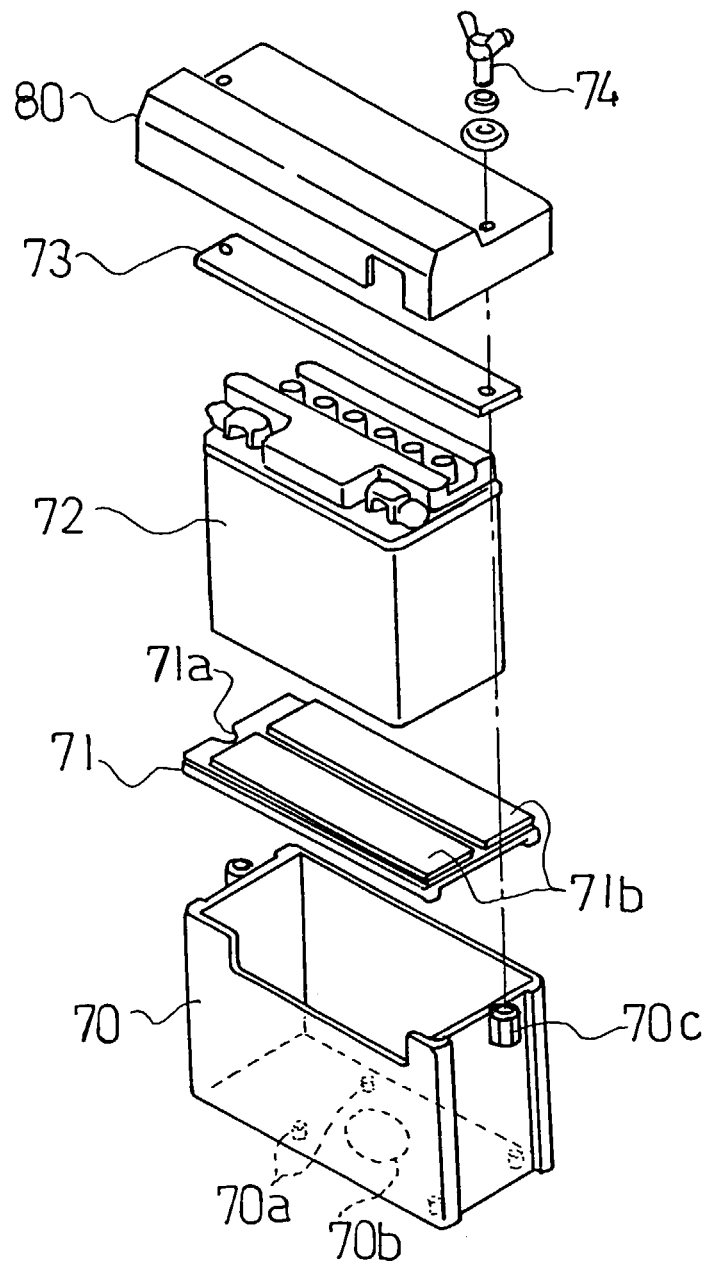


Fig.11

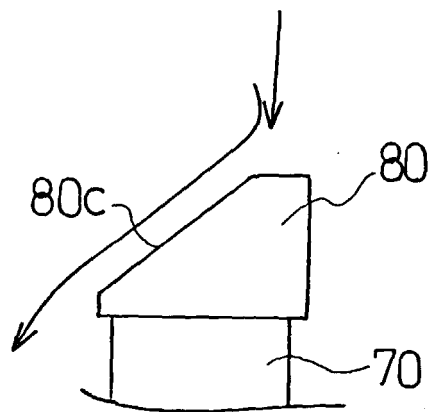


Fig.12

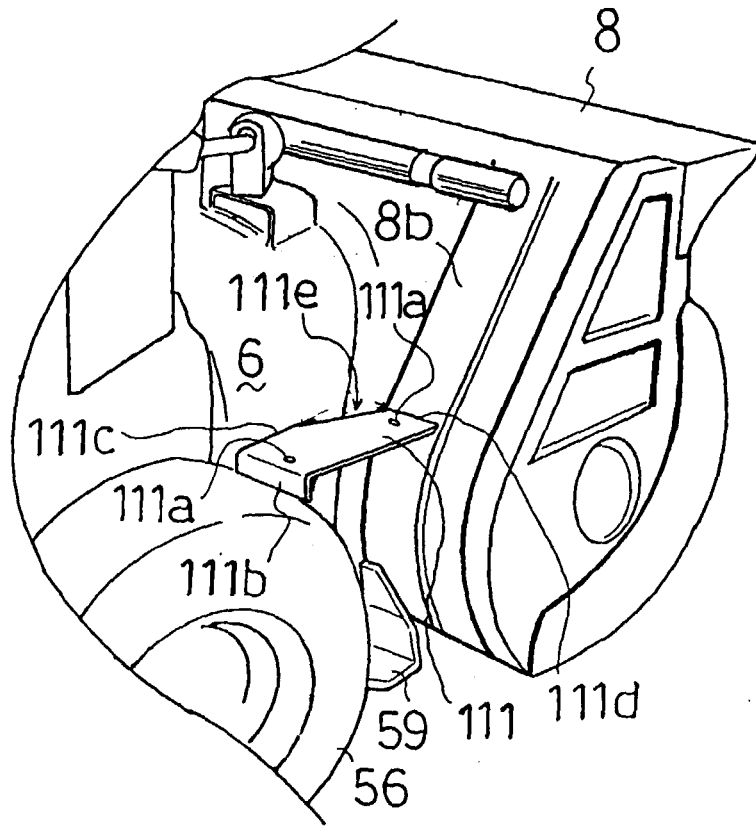


Fig.13

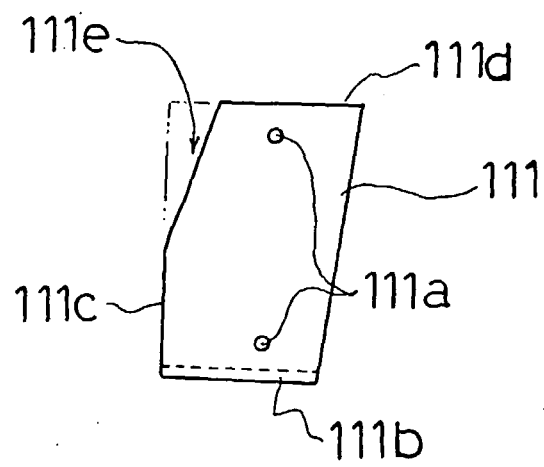


Fig.14

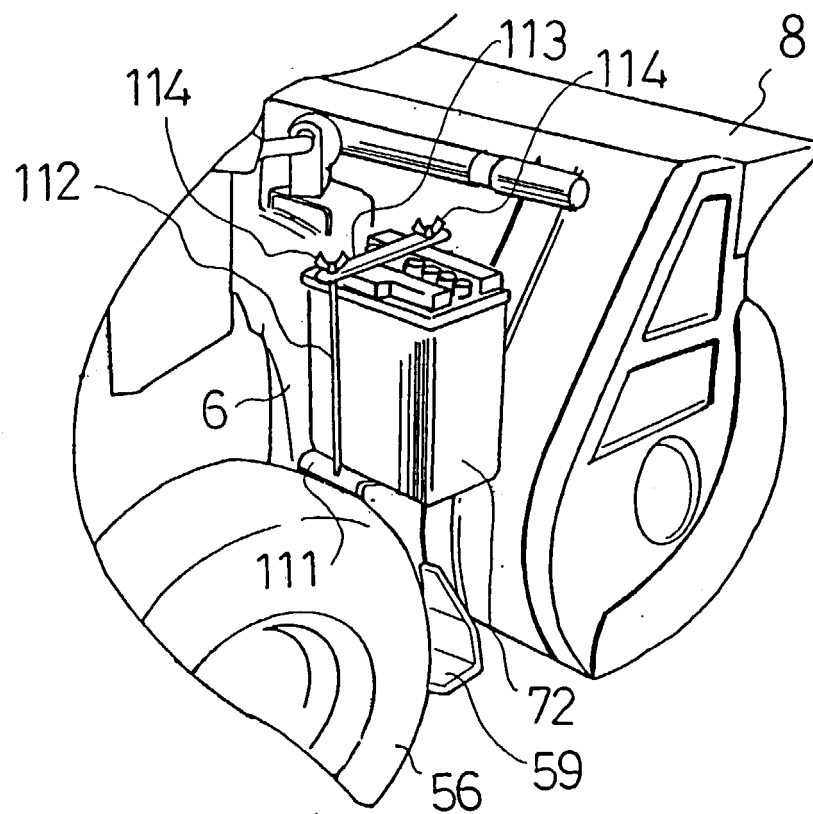


Fig.15

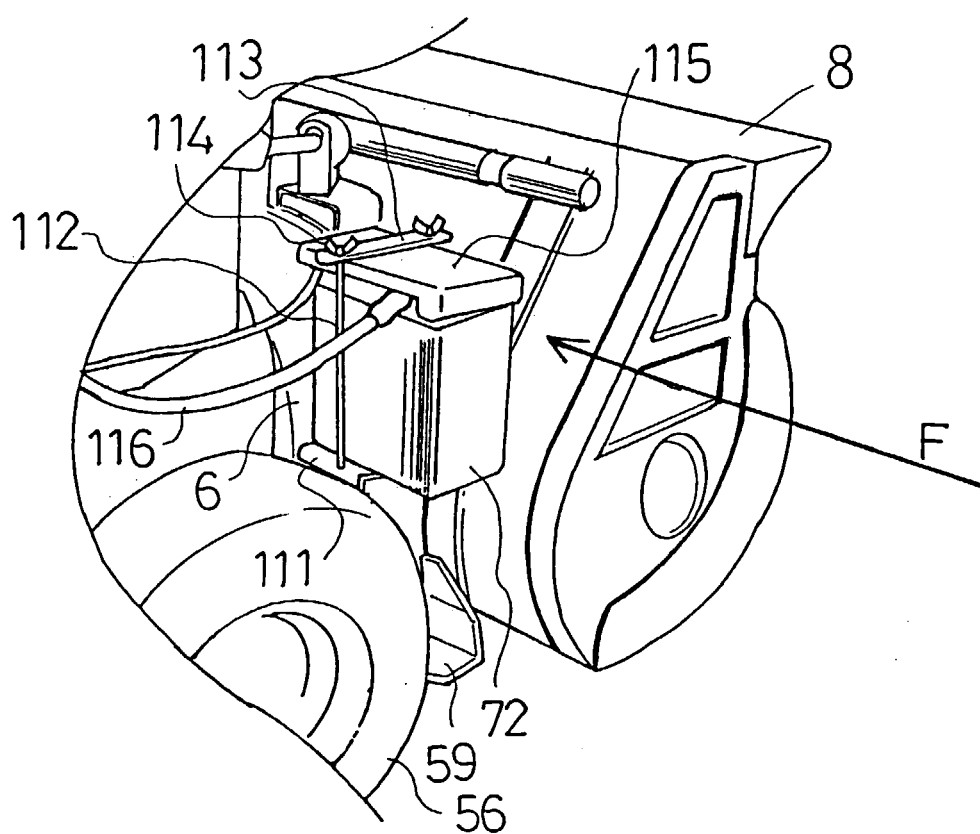


Fig.16

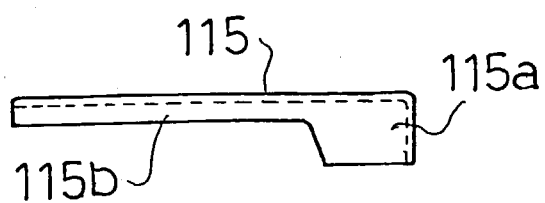


Fig.17

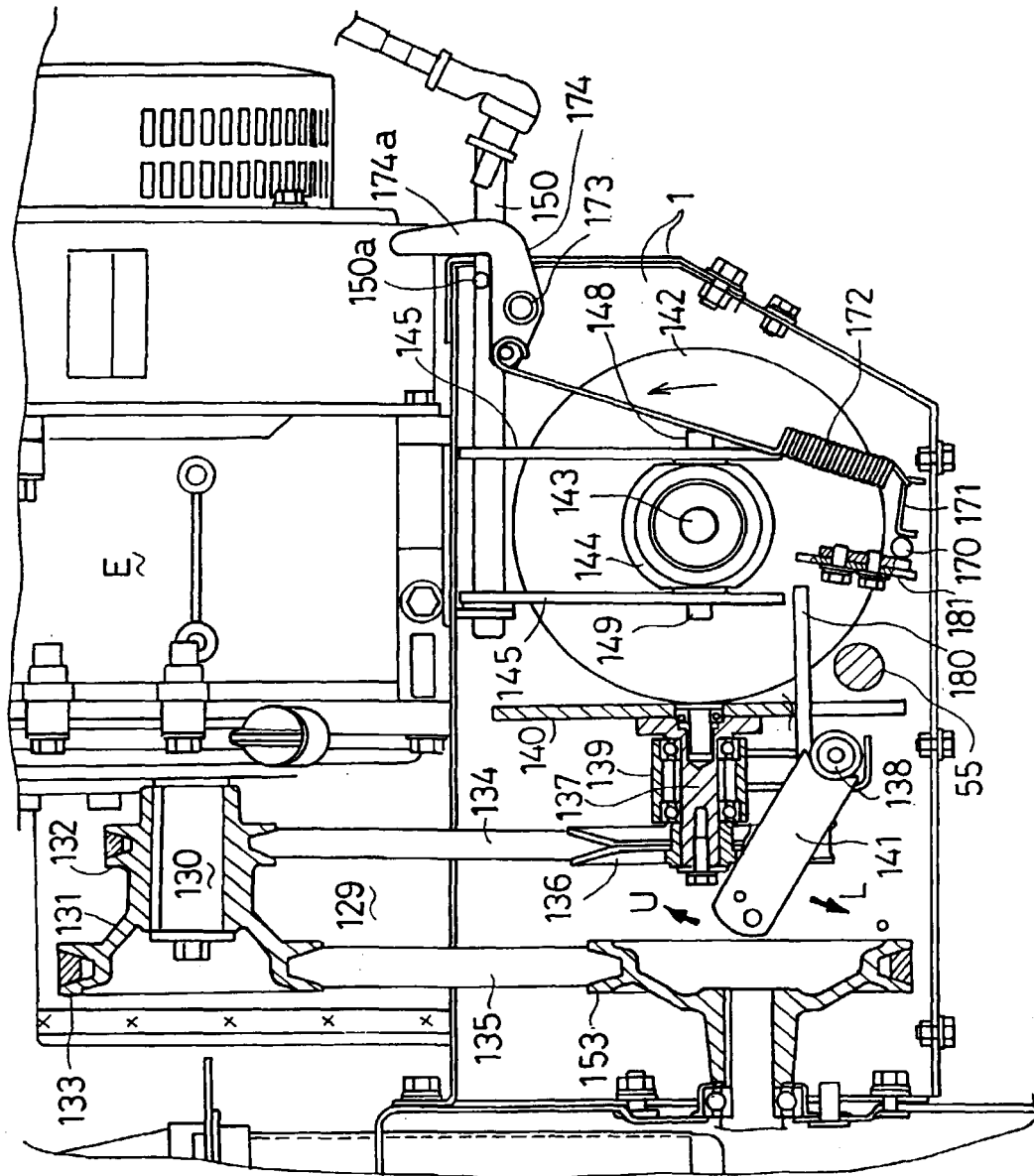


Fig.18

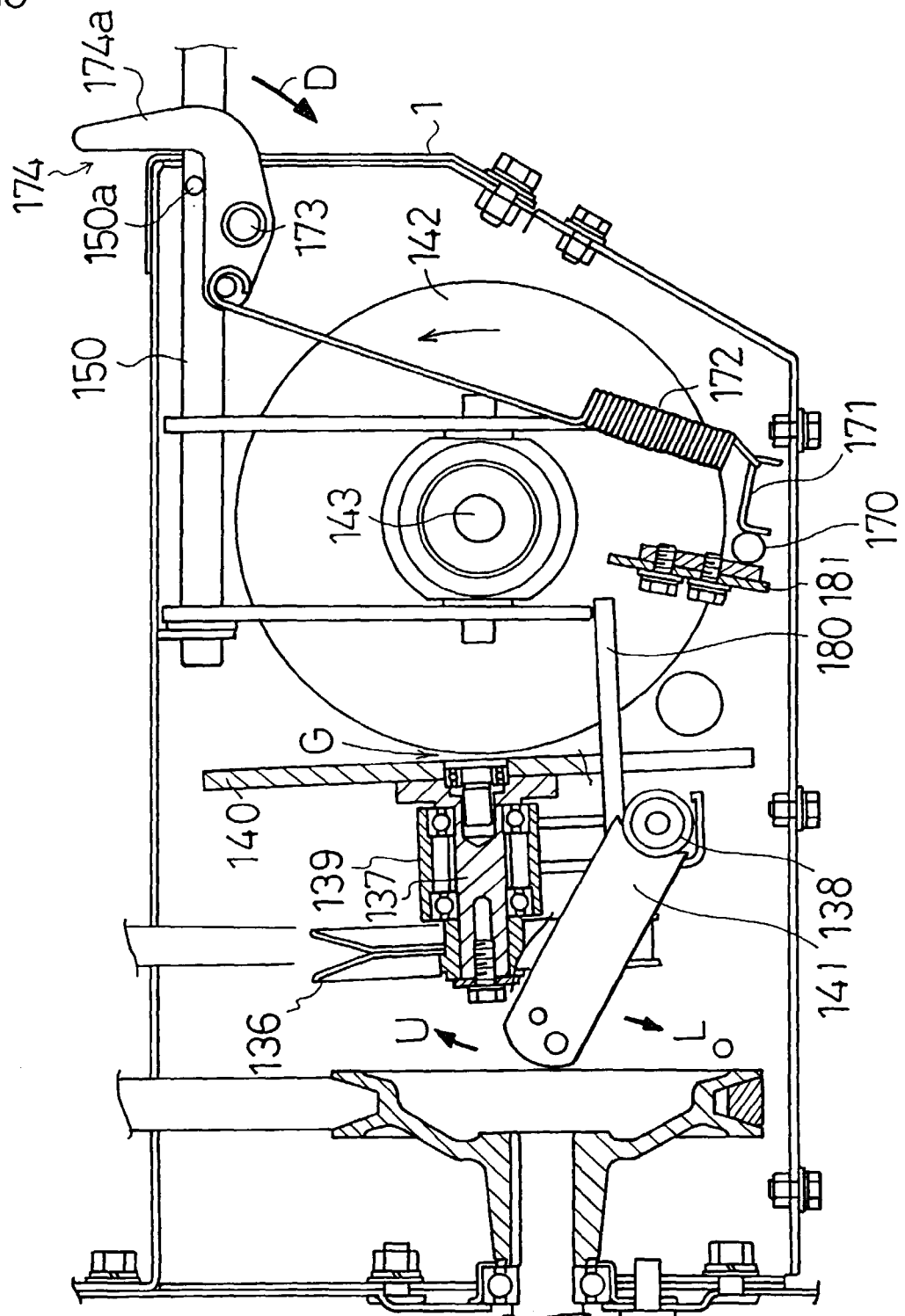


Fig.19

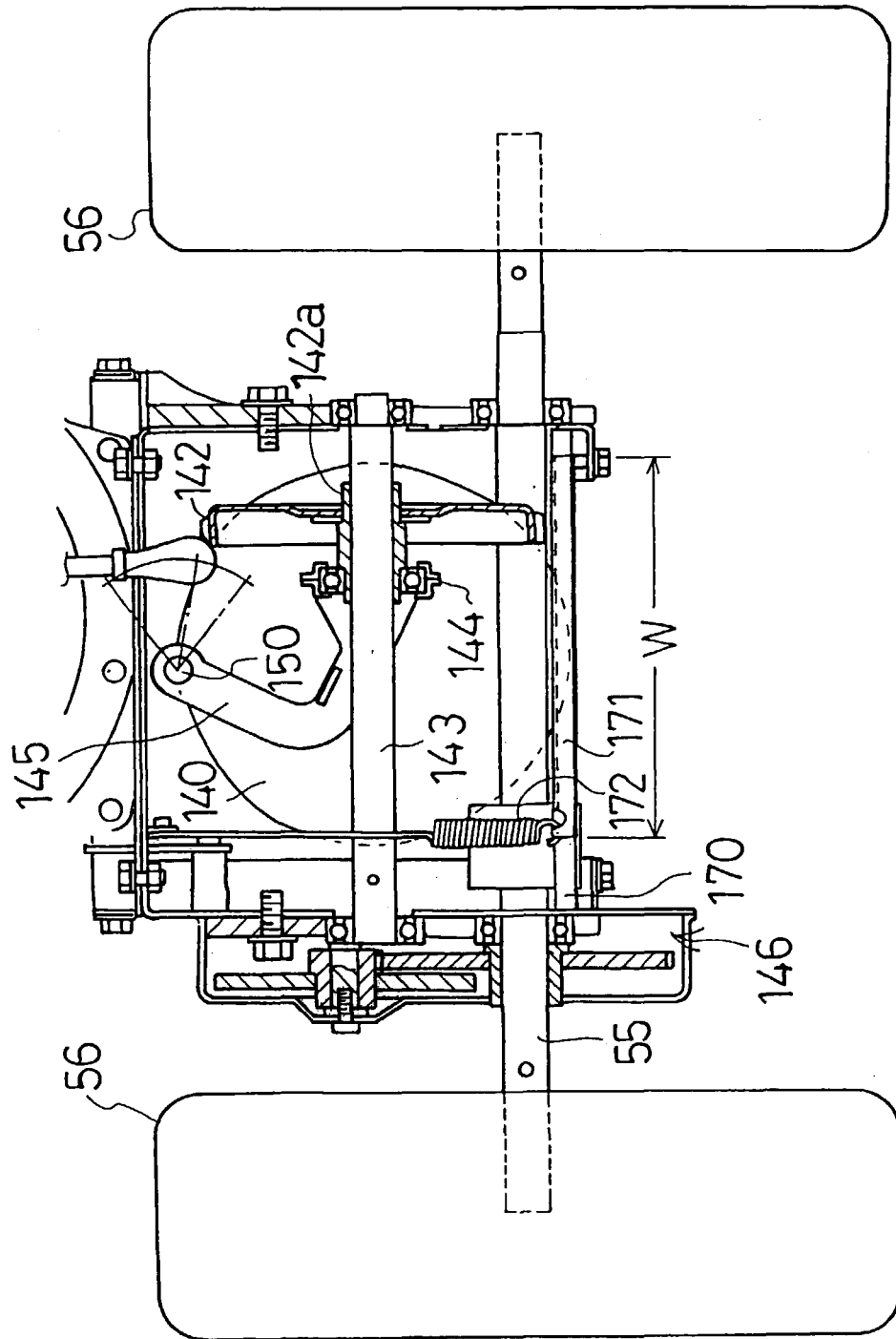


Fig.20

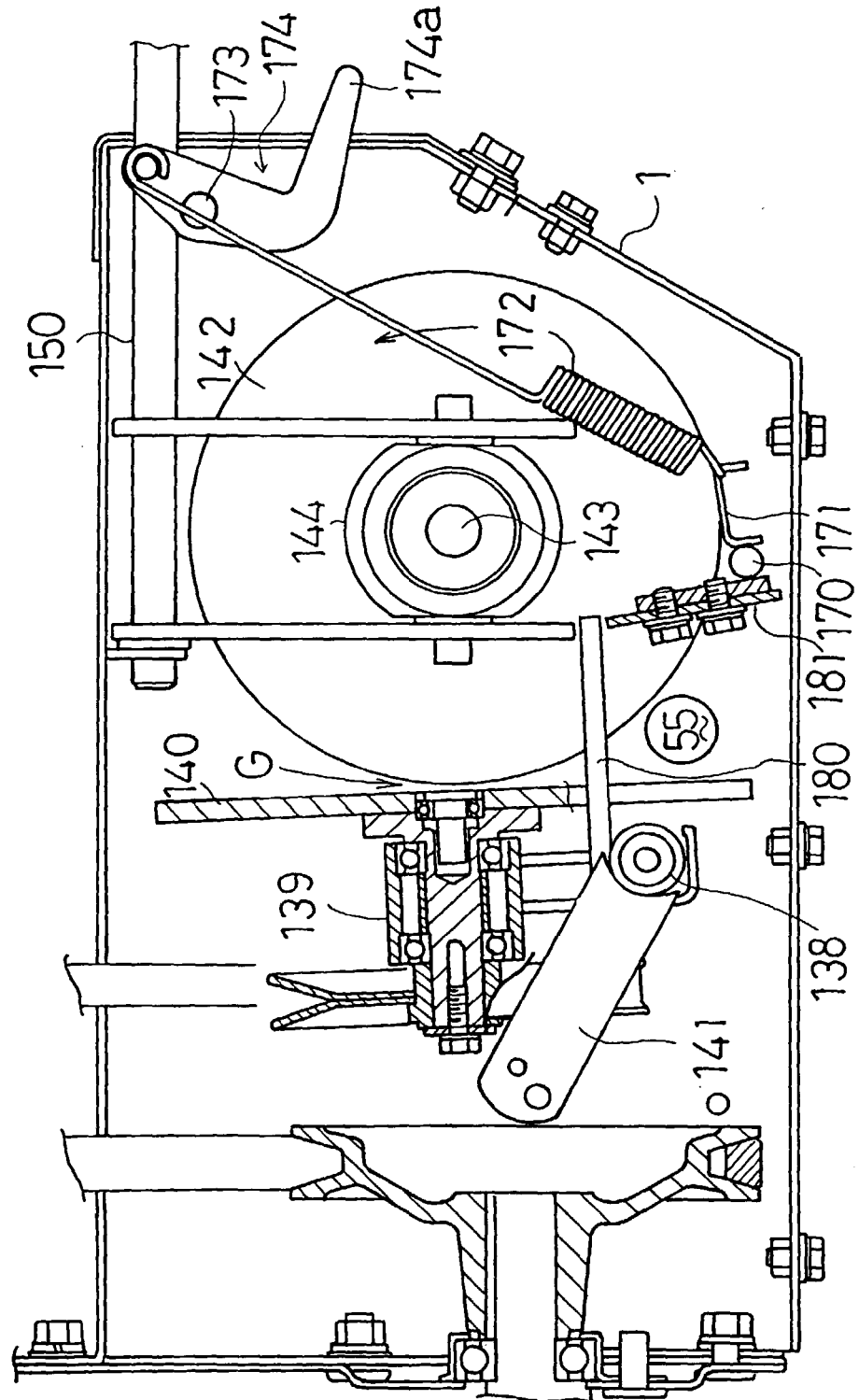


Fig.21

