March 5, 1968 E. WANDSCHEER 3,371,434

COMBINED ROTARY AND PUSH TYPE SNOW PLOW

Filed Feb. 5, 1965 4 Sheets-Sheet 1

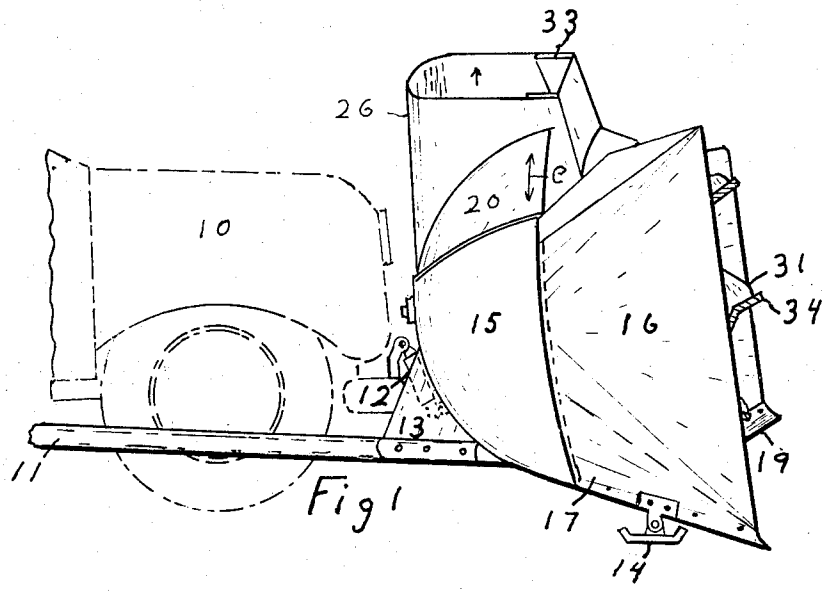

Fig 1

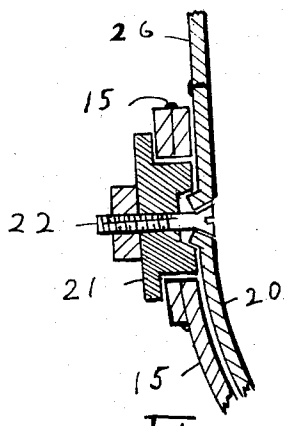

Fig 3

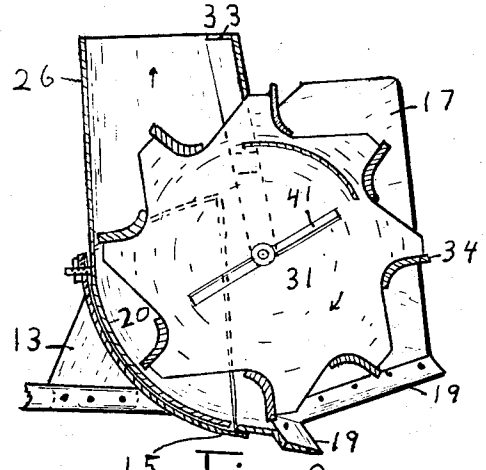

Fig 2

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COMBINED ROTARY AND PUSH TYPE SNOW PLOW

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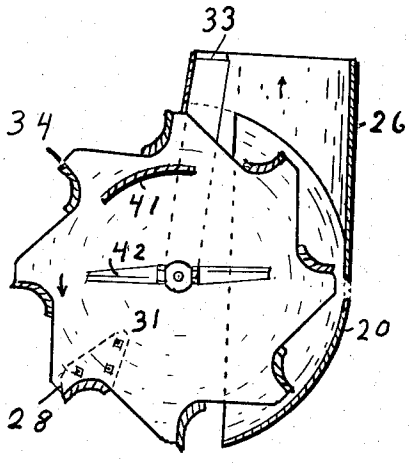

Fig-7

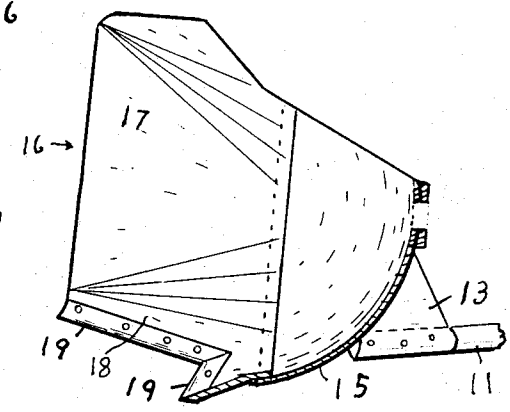

Fig-6

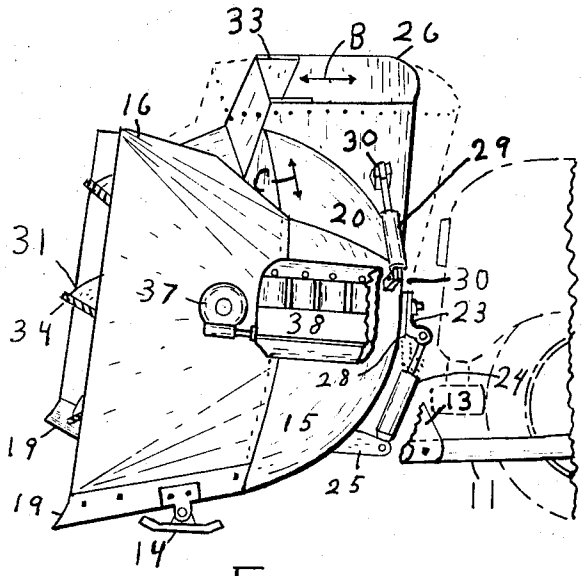

Fig-4

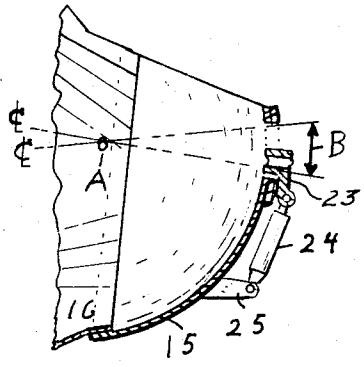

Fig-5

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COMBINED ROTARY AND PUSH TYPE SNOW PLOW

Filed Feb. 5, 1965 4 Sheets-Sheet 3

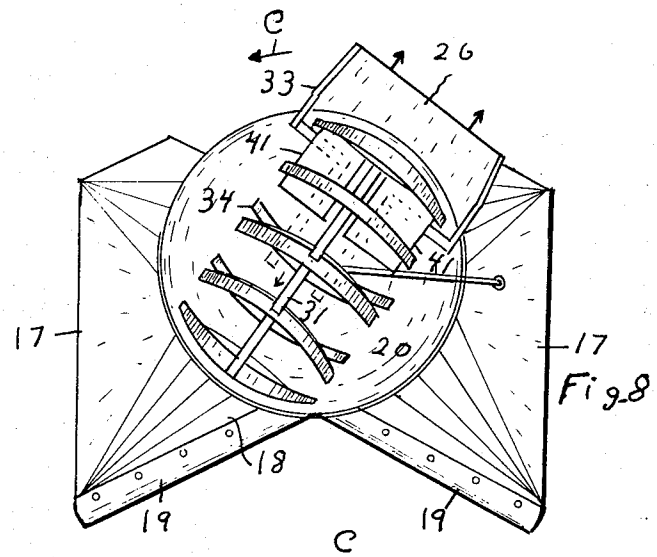

Fig 8

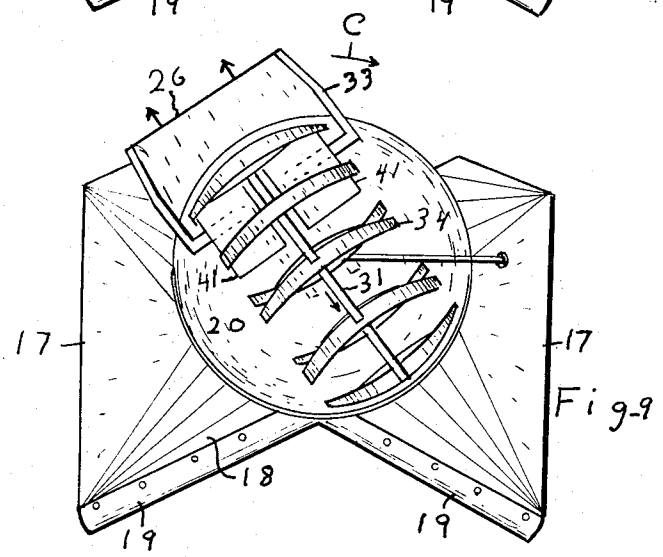

Fig 9

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COMBINED ROTARY AND PUSH TYPE SNOW PLOW

Filed Feb. 5, 1965 4 Sheets-Sheet 4

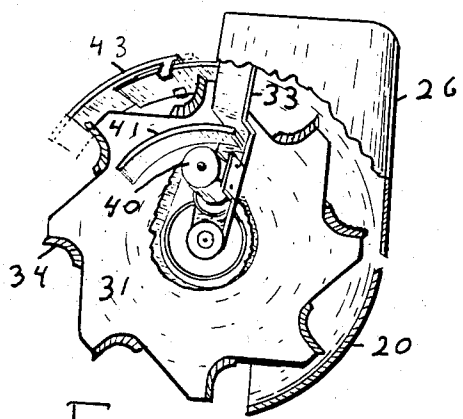

Fig-13

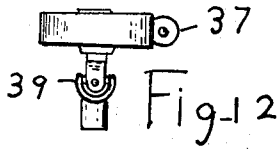

Fig-12

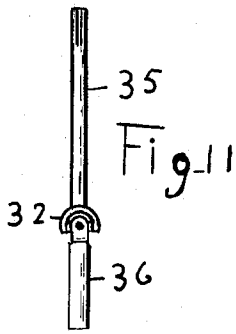

Fig-11

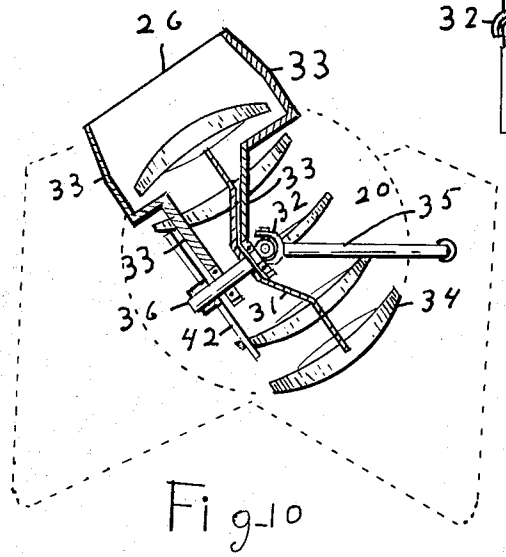

Fig-10

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United States Patent Office

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Patented Mar. 5, 1968

3,371,434

COMBINED ROTARY AND PUSH TYPE SNOW PLOW

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Filed Feb. 5, 1965, Ser. No. 430,723
12 Claims. (Cl. 37—43)

ABSTRACT OF THE DISCLOSURE

A snow plow having an impeller mounted for rotation in a plane parallel to the line of travel. The impeller is mounted in an inner shell which, in turn, is pivotally mounted in an outer shell. The inner shell can, therefore, be rotated relative to the outer shell, and means is also provided to pitch the inner shell relative to the outer shell.

This invention pertains to snow removal equipment and more particularly to a combination rotary and push plow to be attached to a highway motor truck or the like.

In the clearing of snow from highways, streets and the like the usual technique is simply to push the snow from the roadway over to the edge of the road. This results in the piling up of snow into snow ridges all along the roadway. To the public driver these snow ridges are extremely bothersome and may be dangerous. With additional snowfall and wind, these existing snow ridges catch the drifting snow and deposit the added snow on the roadway. The roadway may be cleared again, but the snow ridges are forced higher. As winter continues this accumulation together with snow drifts resulting from protected areas causes the snow removal situation to grow steadily worse.

By my invention I provide a machine in which the snow is directed into the center of my machine, and is discharged by means of a rotating impeller and guided by its chute throwing the snow to the right or left of the roadway into an area completely away from the roadway.

The object of my invention is to utilize the forward momentum of the motor truck, whereby the force of the snow into the center of my machine is coordinated with the impeller in such a manner that the course of the snow follows along the sides of the push plow area and directly into the area along the perimeter of the said impeller. The course of the snow does not make any abrupt change in direction, thereby requiring less power consumption. Accordingly, more truck power is available to allow the motor truck snow plow to travel at proper highway speeds.

A further object of my invention is to provide an impelled fixed within a shell in the form of the lesser segment of a sphere whereby the entire mechanism is designed to be rotated to the right or left in such a manner as to allow the snow to follow through the machine with a minimum amount of change in direction. Accordingly the natural flow of the snow will follow gradually into the discharge chute. My combination rotary-push snow plow thus utilizes the speed of the motor truck to deliver the snow into a tilted impeller with no decrease in the movement of the flow of snow into the impeller, and further in deep snow drifts the flow of the snow is only increased or accelerated by means of the said impeller.

A more complete understanding of my invention in its embodiment may be had from a study of the following specifications and figures in which:

FIG. 1 is a side elevational view of a combination rotary-push snow plow embodying my invention,

FIG. 2 is a sectional view longitudinally of the device of FIG. 1, separated from the truck,

FIG. 3 is an enlarged sectional view of a small part of the rear of the housing,

FIG. 4 is a side elevational view opposite of that of FIG. 1, showing rotating and tilting mechanics for a modified housing,

FIG. 5 is a fragmentary sectional view of the tilting mechanism for the movable housing,

FIG. 6 is a sectional view similar to FIG. 2 from the opposite direction and with the impeller and inner housing removed,

FIG. 7 is a sectional view of the inner movable housing and its impeller as removed from the part shown in FIG. 5,

FIG. 8 is a front view of my snow plow showing the impeller and its related housing with discharge chute shown in section and rotated to the right,

FIG. 9 is a front view of my snow plow showing the impeller and its related housing with discharge chute shown in section and rotated to the left,

FIG. 10 is a fragmentary lateral sectional view showing of the impeller and its fork member support and drive means,

FIG. 11 is an enlarged view of the impeller axle, knuckle and drive shaft removed from my device,

FIG. 12 is an enlarged view of the worm gear and knuckle that is related to parts in FIG. 11, and

FIG. 13 is a fragmentary sectional view of the rotor and its housing removed from the snow plow showing the motivating power source.

Briefly my device comprises a snow plow having a body adapted to collect snow into the body and a power driven throwing means mounted within the body. The entire throwing means is so mounted that it can be tilted to throw the snow to either side of the road being cleared.

More specifically and referring to the drawings I have illustrated my device as mounted on a truck **10**. It will soon be apparent that the device could be mounted on a tractor or any other mobile vehicle as well. A mounting means **11** of the type conventionally used is adapted to carry the plow. Raising or lowering of the mounting means is conventionally accomplished by use of a hydraulic cylinder **12** under control of the operator of the vehicle. The mounting of the device is strengthened by use of gusset plates **13** between the mounting means **11** and the outer shell of the body of the device.

The outer shell, as best shown in FIG. 6, is formed of a rear portion **15** shaped as the lesser segment of a sphere to which is fixed a forward portion **16** having side wings **17** which are overturned slightly to prevent snow from flying out of the top of housing. The bottom **18** of the forward part is formed in V-shape to guide the snow into the housing. Blades **19** of hardened steel or the like may be bolted onto the edges of the V-shape in customary manner. An adjustable shoe **14** (FIG. 1 or 4) is provided on which the device may rest or slide when in use.

The inner shell **20** of the housing is also of segmented spherical shape adapted to rest within the rear portion **15** of the outer shell. In order to provide for tilting motion of the inner shell, I provide for fastening the two portions together at a single pivot point (FIG. 3). At this point the outer shell may be reinforced as shown and a bolt **22** extending through the two shells provides the fastening holding them together. In order to provide for ease of tilting, I provide a bearing means **21** fixed to the inner shell **20** and journalled in the reinforced outer shell **15** although such bearing is not essential to the operation of my device. It will be apparent that the bearing means might also be carried by a framework adapted to support it.

In addition to the motion of the device as provided by the construction shown in FIG. 3, I also envision that it

may be desirable to pitch my device forward or backward as well as tilting it to one side or the other. Because of the spherical surfaces used on the shells, this is easily possible by the alternative structure as best shown in FIGS. 4 and 5. In order to accomplish this result I provide a plate **23** slidable in a substantially vertical direction, and which may be held in place by an arcuate gib and way type of construction. This plate then provides the pivot point for tilting the inner shell. Control of the position of such plate is accomplished by use of hydraulic control means including an hydraulic piston-cylinder assembly **24** mounted to a bracket **25** on the outer shell **15** and connected to the plate **23**. A chute **26** to direct the flow of snow from my device is also formed as a part of the inner shell.

From the foregoing description it will be evident that I have provided for pitching the inner shell about the pivot point A which is the center of the concentric spherical shells either through the arc B (FIG. 4) or B' (FIG. 5) or tilting it sideways through the arc C (FIG. 4) about the same point. The pitching of the chute through arc B or B' makes possible the directing of the thrown snow to either side of an intersection. For example, as the intersection is approached, the chute is directed rearwardly as far as possible. As soon as the snow being thrown hits the edge of the intersection, the chute is pitched forward to its extreme forward position thus directing snow beyond the intersection. Also, the tilting of the movable shell **20** and chute **26** to either side makes possible the throwing of snow to either side of the road being cleared. Control of the sidewise motion may also be accomplished through the hydraulic piston and cylinder assembly **29** fixed to the two shells **15** and **20** by means of conventional pivotal brackets **30**.

Within the inner shell **20** is mounted a snow throwing device. This device consists principally of a driven impeller. My preferred form of the impeller is illustrated, although it will be understood that other possible constructions and formations may be used. For my preferred embodiment I form my impeller of a web **31** having an axle **36** journalled in a fork member **33**. The fork **33** is fixed to the inner shell in the region of the chute **26** as best shown in FIG. 10. As shown in that figure, the web **31** is dished so that a single knuckle **32** located at the center of motion of the inner shell may be used to allow for tilting or pitching of the impeller about that center. It should be obvious that as the inner shell is tilted or pitched in any direction, it carries the impeller with it since the fork **33** is incorporate part fixed to the inner shell **20**. In spite of any movement of the inner shell the drive remains proper because of the location of the knuckle **32** at the center of movement.

At its periphery, the web **31** is shaped to carry blades or vanes **34** extending transversely of the web. These blades may be of cup shape as shown, and are formed with a peripheral edge conforming to the spherical shape of the inner shell. The cup shape is useful to contain the snow picked up by the blades and to compact it slightly so that it will be more efficiently thrown by the blades. Also, I have discovered that a slightly trailing rake to the blades works also to compact the snow between the blades and the inner shell resulting in better throwing of the snow. These blades **34** may be removably affixed to the impeller as is shown in FIG. 7. A gusset plate **28** is fixed to the blade or formed as a part thereof. This gusset is, in turn, bolted to the impeller as shown. Other possible removable blade mechanisms will be apparent to those skilled in the art.

Any of a number of devices may be used to drive the impeller. I have illustrated two possibilities but many more will be envisioned by those skilled in the art. In FIG. 4 I have illustrated the use of an auxiliary internal combustion engine **38** mounted on the outer shell **15** driving a reduction gear assembly **37**. As shown in FIG. 12 this assembly drives a driving knuckle **39** which may be provided with an internal spline adapted to engage the

splined end of shaft **35**. The second possibility is to mount an electric or hydraulic motor **40** on the impeller fork **33** adapted to drive the impeller directly, or preferably through speed reduction means. This latter means does away with the use of the long shaft **35** and the drive knuckles **32** and **39**, and utilizes flexible tubes or wires to accommodate the motion of the inner shell **20** relative to the carrying vehicle **10**.

Additional refinements for more efficient operation of my device may also be provided. For example, in order to prevent the snow which might be carried beyond the chute **26** by the blades **34** from falling into the operating mechanism of the impeller or onto the snow being picked up, I provide a pair of arcuate vanes **41**, one on each side of the impeller. These are fastened to the fork **33** and are carried thereby through whatever motion of the inner shell **20** is provided. Also, a side cutting blade **42** is provided to cut snow away from the side of the fork **33** and to avoid undue compaction of the snow in the side of the housing. An adjustable cover shield **43** may also be provided at the top of the device to prevent the throwing of small amounts of carried over snow upward in front of the driver of the carrying vehicle thus blinding the driver.

It should be noted that my device utilizes the centrifugal force on the snow on the impeller to throw the material as contrasted to blowing it. Thus, the impeller is not driven at high speed to create a wind, but is driven only fast enough to throw the snow. The peripheral speed should always be somewhat higher than the forward speed of the device so that snow picked up by the blades **19** will be carried away by the impeller without jamming it. However, it should be noted here that the forward speed of the device is utilized to carry the snow into the impeller, thus requiring considerably less power to drive it than would be necessary to pick up the snow from a stationary position.

Having thus described my invention in its embodiment I am aware that further and extensive variations may be made therefrom without departing from the spirit and scope of my invention as limited only by the following claims.

I claim:

1. A snow plow adapted to be carried by carrying means along a designated line of travel comprising mounting means on said carrying means, outer shell means fixed to said mounting means, said outer shell means including side walls and a bottom, inner shell means, pivot means connected between said inner shell means and said outer shell means whereby said inner shell is pivotally movable relative to said outer shell on an axis approximately parallel to said line of travel, fork means mounted on said inner shell means, driven impeller means journalled on said fork means transversely of said inner shell means, and between the legs of said fork means whereby said impeller rotates in a plane substantially parallel to said line of travel.

2. The device of claim **1** in which controlled power means is connected between said inner and outer shell means to move said inner shell means pivotally relative to said outer shell means in a controlled manner.

3. The device of claim **2** in which drive means is mounted on said outer shell and connected to said impeller by shaft means.

4. The device of claim **2** in which said inner shell means is of substantially segmented spherical shape, said impeller carrying blades having peripheral edges of shape concentric to said inner shell means.

5. The device of claim **4** in which said blades are removably attached to said impeller.

6. The device of claim **4** in which said blades are disposed on said impeller with a slightly trailing rake.

7. A snow plow adapted to be carried by a carrying means along a designated line of travel comprising mounting means adapted to be mounted on said carrying

means, an outer shell fixed to said mounting means, said outer shell having a rear portion shaped as a parti-sphere, side walls and a bottom extending from said rear portion forming an open end, pivot means on said outer shell means, an inner shell of parti-spherical shape concentric with said rear portion of said outer shell, chute means extending from said inner shell, said inner shell being pivotally connected to said outer shell through said pivot means on an axis approximately parallel to said line of travel, a power driven impeller journalled on said inner shell on an axis transverse of said line of travel whereby said impeller rotates in a plane substantially parallel to said line of travel, blades on said impeller having peripheral edges of shape concentric to the spherical shape of said inner shell, said impeller being placed in said inner shell in position to always discharge into said chute means.

8. The device of claim **7** in which an adjustable cover shield is slidably disposed on said inner shell above said impeller.

9. A snow plow adapted to be carried by carrying means along a designated line of travel comprising mounting means on said carrying means, outer shell means fixed to said mounting means, said outer shell means including side walls and a bottom, inner shell means, pivot means on said inner shell means movably mounted on said outer shell means thereby providing for pivotal mounting of said inner shell relative to said outer shell, said pivot means also being movable relative to said outer shell in an arcuate path to pitch said inner shell means upward and downward relative to the line of travel, driven impeller means journalled on said inner shell means transversely thereof whereby said impeller rotates in a plane substantially parallel to said line of travel.

10. The device of claim **9** in which controlled power means is connected between said pivot means and said outer shell means to provide for controlled movement between said outer shell means and said pivot means, whereby the flow of the discharged snow is altered to advance or retarded angle from perpendicular to the line of travel.

11. A snow plow adapted to be carried by carrying means along a designated line of travel comprising mounting means on said carrying means, outer shell means fixed to said mounting means, said outer shell

means including side walls and a bottom, inner shell means, pivot means connected between said inner shell means and said outer shell means whereby said inner shell is pivotally movable relative to said outer shell on an axis approximately parallel to said line of travel, driven impeller means journalled on said inner shell means transversely thereof, whereby said impeller rotates in a plane substantially parallel to said line of travel, drive means mounted on said outer shell and connected to said impeller by shaft means, said impeller being dished, driving knuckle means included in said shaft means, said knuckle means being located at the center of movement of said inner shell means relative to said outer shell means.

12. A snow plow adapted to be carried by carrying means along a designated line of travel comprising mounting means on said carrying means, outer shell means fixed to said mounting means, said outer shell means including side walls and a bottom, inner shell means, pivot means connected between said inner shell means and said outer shell means whereby said inner shell is pivotally movable relative to said outer shell on an axis approximately parallel to said line of travel, driven impeller means journalled on said inner shell means transversely thereof, whereby said impeller rotates in a plane substantially parallel to said line of travel, drive means mounted on said inner shell in direct driven relationship to said impeller and flexible power transmission means extending from said drive means whereby power is transmitted to said drive means.

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