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2,741,042

SNOW PLOW WITH POWER DRIVEN ROTOR

Filed July 25, 1951

3 Sheets-Sheet 2

Fig. 2.

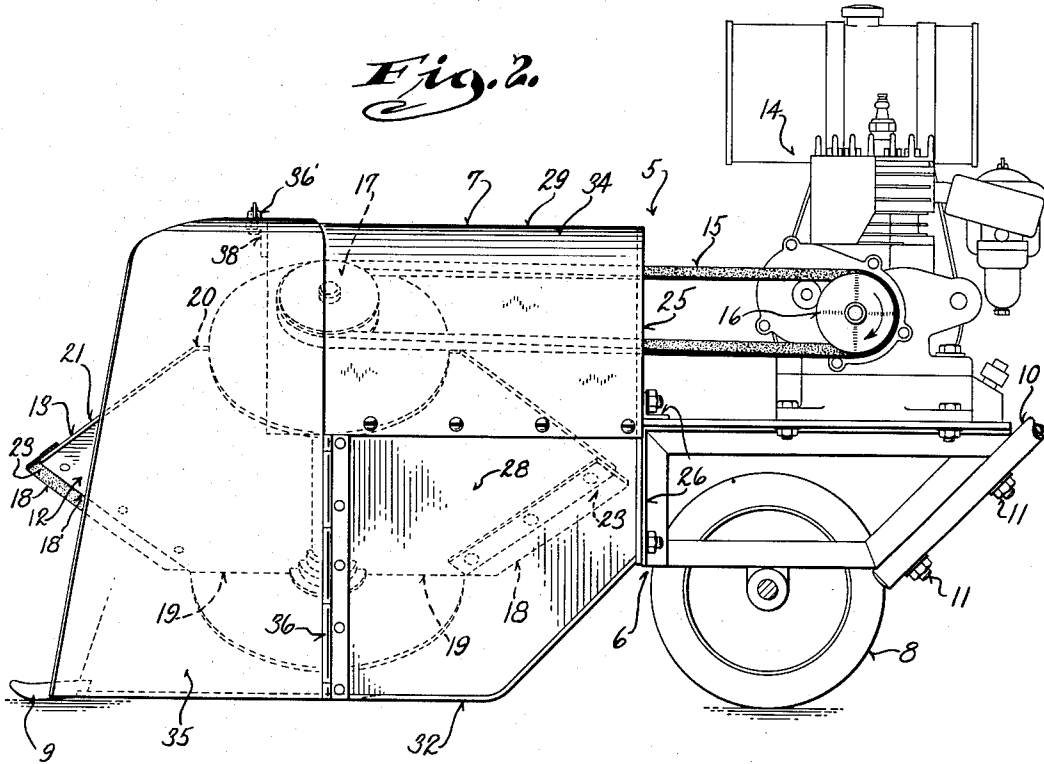
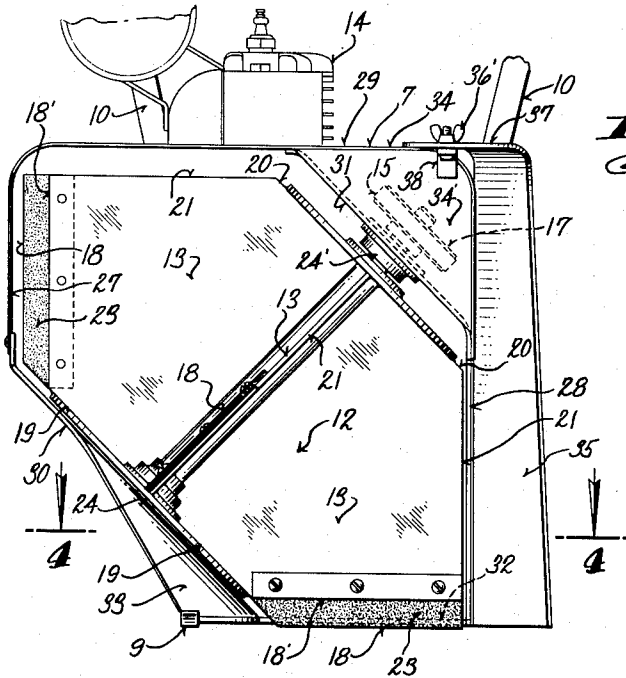


Fig. 3.



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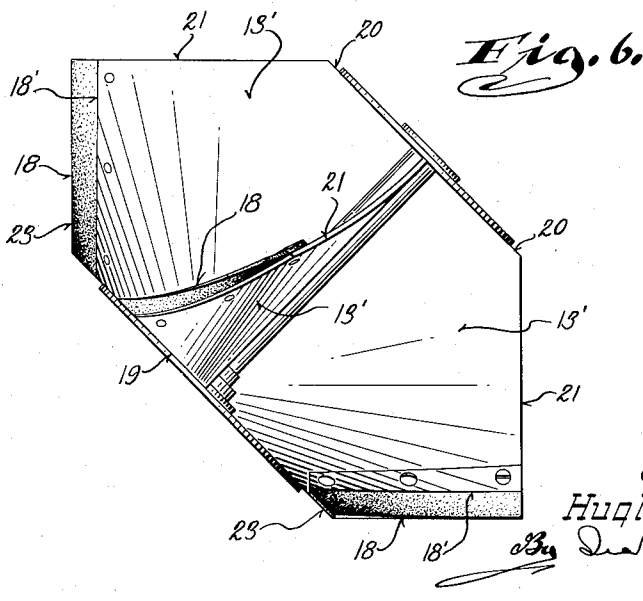
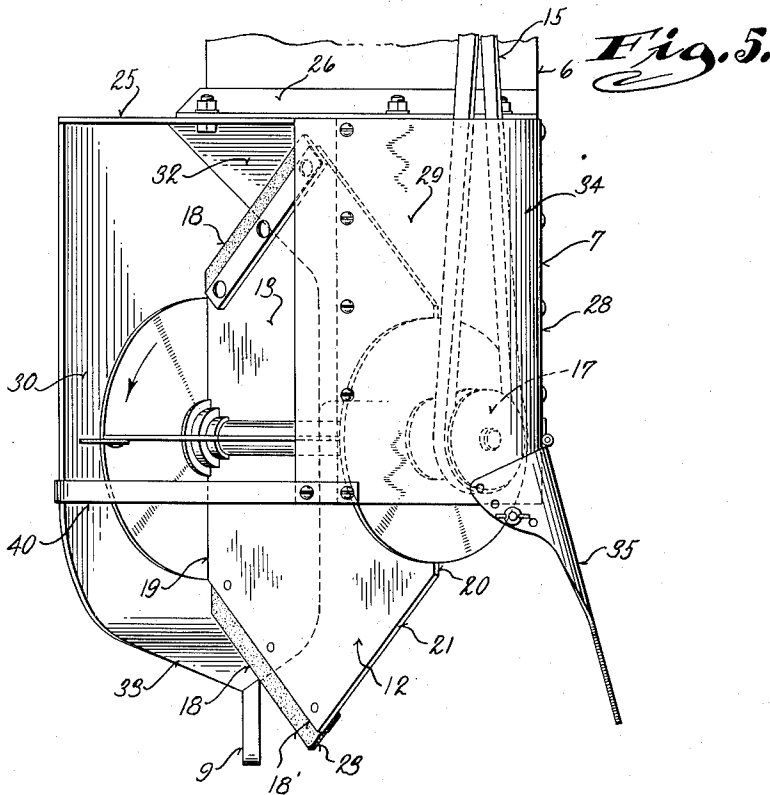
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3 Sheets-Sheet 3



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SNOW PLOW WITH POWER DRIVEN ROTOR

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5 Claims. (Cl. 37-43)

This invention relates to snow plows of the type having a power driven rotor and relates more particularly to a small snow plow of the type which might be referred to as a "mechanical shovel" and which is especially suitable for use in clearing sidewalks, driveways and the like.

Relatively small snow plows of the type here under consideration are normally powered by a single-cylinder internal combustion engine, and they are useful to householders and to filling station operators and other merchants who have sidewalk and driveway areas which must be cleared of snow from time to time and which are too large to be conveniently cleared with a shovel, but are, nevertheless, too small to be economically plowed with the type of equipment usually used for clearing streets and highways. A snow plow for this purpose should be relatively light and easily handled and should be inexpensive to purchase and operate, but it should nevertheless do its work quickly and efficiently. Such a snow plow must also be ruggedly constructed and dependable in operation so that it will not need frequent or costly repairs. It is also important that it be capable of being stored in a relatively small space during the major portion of the year when it is not being used.

It is thus an object of this invention to provide a small and efficient snow plow of the character described which is especially suited for clearing sidewalk and driveway areas that are too large to be conveniently cleaned with a shovel and too small to justify the use of ordinary snow plow equipment.

Another object of this invention resides in the provision of a snow plow of the character described having a novel power driven rotor which will throw snow a substantial distance to one side of the plow, rather than pushing it into a deep drift immediately adjacent to the plowed swath as is the case with a fixed-blade type snow plow.

Another object of the present invention resides in the provision of a hand propelled snow plow which will clear a relatively wide swath on a snow covered surface and which has provision for adapting it to various conditions of depth and consistency of snow to be removed.

With the above and other objects in view, which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate two complete examples of the physical embodiment of the invention constructed according to the best modes so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a top view of the snow plow of this invention, a portion of the housing being cut away to illustrate rotor detail;

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Figure 2 is a side elevational view of the snow plow of this invention;

Figure 3 is a front elevational view of the snow plow;

Figure 4 is a sectional view through the housing of the snow plow of this invention, taken along the line 4-4 in Figure 3;

Figure 5 is a top view of a modified embodiment of the snow plow of this invention; and

Figure 6 is a perspective view of a modified rotor.

Referring now to the accompanying drawings, in which like numerals designate like parts throughout the several views, the numeral 5 designates generally a carriage for the snow plow of this invention, comprising a frame 6 and a housing 7 mounted at the front of the frame. A pair of wheels 8, directly under the frame, and a skid 9, at the front of the housing, mount the carriage for forward movement across a driveway, sidewalk or other surface to be plowed. Handles 10 are secured to the frame to enable the operator to push the plow along, wheelbarrow fashion, and these handles are preferably held in place by means such as nuts and bolts 11 which permit them to be readily removed so as to reduce the storage space required by the plow.

As the snow plow is moved along, a rotor 12 mounted in the housing 7 and having paddle-like blades 13, acts upon the snow in its path to lift the same and throw it to one side of the plow. The rotor is actuated by an internal combustion engine 14, or other suitable prime mover, mounted on the frame and drivably connected with the rotor as by means of a belt 15 trained over driving and driven pulleys 16 and 17, respectively, on the motor and rotor shaft. The rotor imparts upward and sideward acceleration to snow engaged by it in such a way as to throw such snow well clear of the path of the plow, and the peculiar shape of the rotor blades and novel disposition of the rotor axis are in large part responsible for the efficiency of the plow of this invention.

The rotor is mounted in the housing with one end of its axis considerably higher than the other so that the rotor axis may be said to define an acute angle to the horizontal or to the surface to be plowed, but it is nevertheless disposed transversely to the direction of motion of the plow. Eminently satisfactory results are obtained with four flat rotor blades of metal or other suitable material, but if desired blades 13' (see Fig. 6) may be employed which are curved in cross section. In either case it is of course essential that the edge 18 of each rotor blade which sweeps across the surface to be plowed should be parallel to such surface at the bottom of its orbit, and the edge 18 must therefore taper or converge toward the low end of the rotor axis as best seen in Figure 3. In other words, the surface-engaging edge 18, whether straight or curved along its length, must lie in a plane disposed at an acute angle to the rotor axis and corresponding substantially to the plane of the surface to be cleared.

In order to hold the blade area and the housing size down to reasonable limits the blades are pentagonal with side edges 19 and 20 of each blade preferably perpendicular to the rotor axis, and with an edge 21 at right angles to the surface engaging edge 18 and at an obtuse angle to the side edge 20 at the high end of the rotor axis.

While the most efficient cleaning action is obviously obtained when the surface-engaging edge 18 of each of the rotor blades actually touches the surface to be cleared at the bottom of its orbit, it will be seen that this is normally impracticable since small irregularities in the sidewalk or other surface to be plowed would either obstruct the rotation of the blade or seriously damage its edge. To circumvent this difficulty, the edge 18' of the metal blade proper clears the surface by a substantial distance, and a strip 23 of rubber or other resilient material secured to said edge of the blade forms a flexible

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blade extension which will yieldingly pass over irregularities in the surface without damage either to itself or the surface to be cleared, while at the same time enabling the plow to remove snow clear down to the pavement.

The rotor is of course so connected to the motor as to be rotated in the direction indicated by the arrow (see Figure 1) or, specifically, in a direction such that each rotor blade moves forwardly and upwardly from the position at the bottom of its orbit wherein it engages the surface to be cleared, to thereby propel snow engaged by the blade upwardly and to the side of the snow plow. It will be seen that the tilted disposition of the rotor axis causes every point along the surface engaging edge 18 of the rotor blade to be moved upwardly and toward that side of the plow corresponding to the low end of the rotor axis as the blade passes the lowermost point in its orbit, and because of this sideward motion of the blade the snow engaged thereby will be propelled to said side of the plow. It will also be seen that as a consequence of this tilted disposition of the rotor axis and the taper of the surface engaging edge 18 of the blades, the outer end of each blade edge 18 (i. e., that end which is at the side of the rotor corresponding to the high end of its axis) will be moving faster than the inner end thereof, due to its larger rotational orbit, and consequently the snow engaged by the outer end of the blade will be accelerated more rapidly and thrown farther than that engaged by the inner end. Thus assurance is had that all of the snow engaged by the rotating rotor blades will be thrown well clear of the track of the advancing plow.

The rotor is journaled in bearings 24 and 24' secured to a pair of opposite walls of the housing now about to be described. The housing serves to prevent snow engaged by the rotor blades from being thrown in any direction except forwardly and to the side of the snow plow, and to achieve its purpose comprises a rear wall 25 which is bolted or otherwise secured to flanges 26 on the front of the frame 6, side walls 27 and 28, a top wall 29, bearing walls 30 and 31 and a bottom wall 32, all of said walls being joined to the rear wall. The housing is of course open at its front. The cross sectional shape defined by these several walls is such that substantially the entire inside of the housing is swept by the rotor blades in the course of their rotation to thereby prevent accumulations of snow inside the housing.

The forward portion of the bottom wall of the housing extends from a line below and slightly to the rear of the rotor axis straight rearwardly, parallel to the ground, for about half its length, and thence extends upwardly at an obtuse angle to join the bottom of the rear wall and to thus conform substantially to the lower portion of the rotor blade orbit in the area behind the line along which the blades engage the surface to be cleared. The side wall 28 at the high side of the rotor axis extends substantially vertically upwardly from the bottom wall for about half its height and thence is turned inwardly at an obtuse angle to its upright portion to provide the upper bearing wall 31 to which the upper rotor bearing 24' is secured. The opposite side wall 27 is preferably integral with the top wall and extends substantially vertically downwardly therefrom for about half the height of the housing to its intersection with the lower bearing wall 30; and the lower bearing wall, to which the lower rotor bearing 24 is of course secured, connects said side wall 27 with the bottom wall.

The two bearing walls are parallel to one another and lie in planes disposed at an acute angle to the horizontal and parallel to the direction of motion of the plow, or in other words are normal to the rotor axis. The lower bearing wall 30 extends forwardly of the rotor axis a substantial distance and is flared outwardly, as at 33, with its bottom edge parallel to the surface to be plowed, to provide a scoop whereby snow at the low side of the

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rotor axis is deflected into the rotor. The skid 9 is secured to the front bottom of this scoop.

Preferably the upper bearing wall 31 is integral with the side wall 28 and comprises an inward and upward extension thereof, and the top wall 29 extends horizontally over the upper bearing wall and thence substantially vertically downwardly to overlap the side wall 28 just below the line along which it is bent to define the upper bearing wall. The portion of the top wall which thus extends across the upper bearing wall cooperates with the latter to define a housing or guard 34 for the belt 15. The front end of this guard is closed by a triangular wall 34' which prevents snow and other foreign matter from entering the guard and fouling the drive mechanism.

The side wall 28 extends forwardly from the rear wall substantially to a line which intersects the rotor axis, and an extension 35 is hingedly connected to the side wall along this line. This extension 35 may be swung to various positions about its hinge 36 or pivot axis, from an innermost position in which it forms a substantially straight-forward extension of the side wall 28 to an outermost position in which it diverges from the rotor at a substantial angle to the side wall to thus provide a scoop which engages snow at the side of the rotor orbit and scoops it into the rotor as the plow is moved ahead.

The scoop-like extension 35 can be held in any of several positions of adjustment by means of a bolt and wing nut 36' secured in one of a series of holes on a flange 37 on the top of the scoop, registering with a hole in a tab 38 on the front wall 34' of the belt guard portion of the housing. Adjustment of this scoop accommodates the plow to varying snow conditions. If, for example, the snow to be plowed is unusually deep or very wet, the plow can be pushed more easily by the operator if a narrower swath is plowed and accordingly the scoop-like extension will be adjusted to a position in which it is more nearly aligned with the side wall.

In the modified embodiment of the snow plow of this invention shown in Figure 5, the rotor revolves in the opposite direction from that in the form of the invention discussed above, i. e., the blades move rearwardly and upwardly from their surface engaging positions. This achieves the advantage of not throwing snow ahead of the plow, where it might accumulate against a doorway or in an area which is not intended to be plowed but in which a drift would be undesirable.

In this modified version of the snow plow the top wall of the housing is omitted so that snow carried rearwardly by the rotor can be thrown upwardly and to the side of the housing. The rear wall 25 of the housing will of course prevent snow from being thrown rearwardly, back over the plowed swath. The housing is strengthened, in the absence of the top wall, by means of a suitable rigid band or strap 40 which is connected at its ends to the side wall 27 and upper bearing wall 31, at the front of the housing.

From the foregoing description, taken together with the accompanying drawings, it will be readily apparent that this invention provides an unusually simple, compact and efficient hand propelled snow plow or mechanical shovel and that by reason of its novel rotor the snow plow of this invention will throw snow well to the side of its path rather than pushing it into a deep drift immediately adjacent to its swath.

What I claim as my invention is:

1. In a snow plow: a carriage movable across a surface to be plowed; a rotor having a spindle; means rotatably mounting said rotor on the carriage with the spindle axis normal to the direction of carriage travel and with one end of the spindle lower than the other; and a plurality of circumferentially equispaced paddle-like blades on the rotor, each having an inner portion edgewise secured to the spindle and substantially parallel thereto, and having an outer portion provided with an edge spaced from the spindle and tapering toward a point on its axis spaced be-

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neath the low end of the spindle, said edges of the blades travelling in an orbit the bottom of which is tangent to a horizontal plane, and said edges being so arranged that points thereon closest to the spindle will pass through a vertical plane containing the rotor axis not later than points along the outer portions of said edges during rotation of the rotor in one direction; and means for rotating the rotor in said one direction so that the blades will throw snow which has been flatwise engaged by them near the bottom of their orbits upwardly and to one side of the path of movement of the carriage.

2. In a snow plow of the character described: a rotor housing open at its front and having an upright rear wall, spaced apart substantially upright side walls, spaced apart substantially horizontal top and bottom walls, and a pair of spaced apart, angularly disposed, substantially parallel bearing walls, one of which connects said bottom wall with one side wall and the other of which connects said top wall with the other side wall; a rotor in said housing journaled in said bearing walls with its axis normal to them and parallel to the rear wall so that the end of the rotor adjacent said one side wall is lower than the other end thereof; a plurality of blades on said rotor, disposed paddle-wise about its axis for flatwise rotation and each having an edge spaced from the rotor axis and converging toward the lower end of the rotor so that all points on said edge of the blade are substantially parallel to the bottom wall of the housing when the blade is at the bottom of its orbit; the convergent edge portion of each blade being so disposed that points thereon closest to the rotor axis will sweep across said surface not later than points thereon farther from the axis; means mounting the housing for forward movement across a surface to be plowed with its rear wall normal to the direction of motion and the bottom wall parallel to said surface and the rotor at a height above the surface such that said edge of each rotor blade sweeps flat-wise across said surface, closely adjacent thereto, at the bottom of its orbit; and motor means mounted on said mounting means and drivingly connected with the rotor to rotate the latter in a direction to carry the blades of the rotor flat-wise forwardly and upwardly from the bottom of their orbit, so that snow en-

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gaged by each blade will thereby be thrown upwardly and to the low side of the rotor.

3. The snow plow of claim 2 further characterized by a forward extension of said other side wall of the housing, diverging laterally outwardly from the neighborhood of its intersection with a vertical plane through the axis of the rotor blade orbit and extending downwardly substantially to the plane of said bottom wall, so as to scoop snow at said side of the housing into the orbit of the rotor blades.

4. The snow plow of claim 2 further characterized by the fact that the marginal portion of said converging edge of each rotor blade comprises resilient material adapted to be yieldingly deflected by small irregularities in the surface to be plowed, without permanently deforming the blade.

5. The snow plow of claim 2 further characterized by the fact that said motor means is drivingly connected with the rotor by means of a belt trained over a driving pulley on the motor means and a driven pulley on the rotor on the outer side of said other bearing wall; and further characterized by the provision of guard means for the driven pulley and belt, said guard means being fixed to the housing and of angled cross section and having its legs defined by surfaces substantially coplanar with the top wall and said other side wall.

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