June 1, 1954 G. C. BERGER 2,679,702

ROTARY SNOWPLOW

Filed March 13, 1952 2 Sheets-Sheet 1

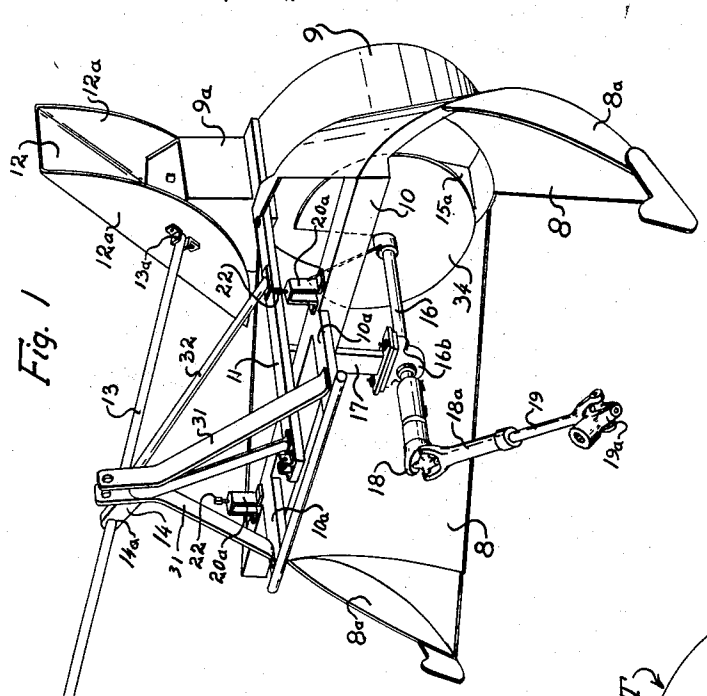


Fig. 1

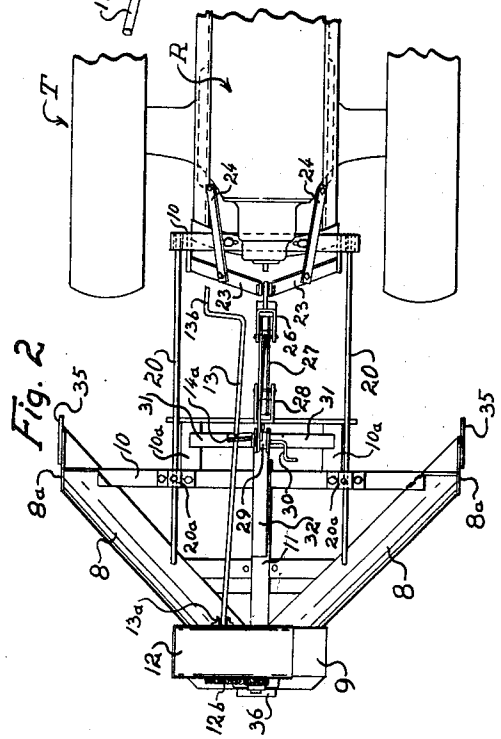


Fig. 2

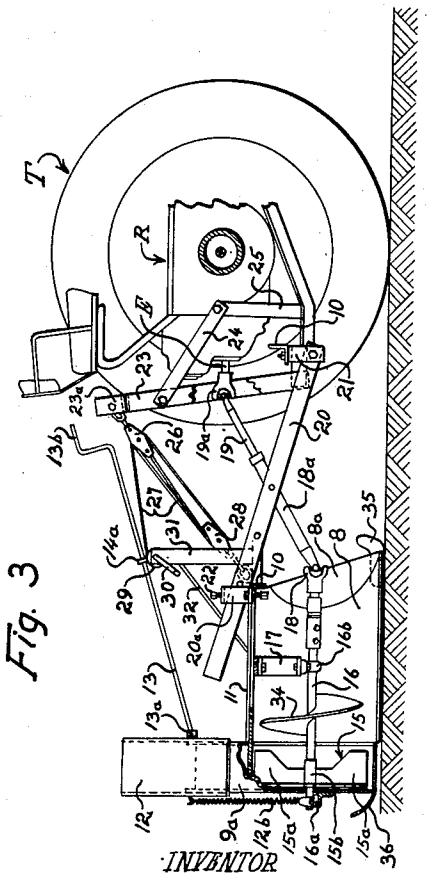


Fig. 3

INVENTOR
GEORGE C BERGER
BY Williamson, Williamson
Schroeder & Adams
ATTORNEYS

June 1, 1954 G. C. BERGER 2,679,702

ROTARY SNOWPLOW

Filed March 13, 1952 2 Sheets-Sheet 2

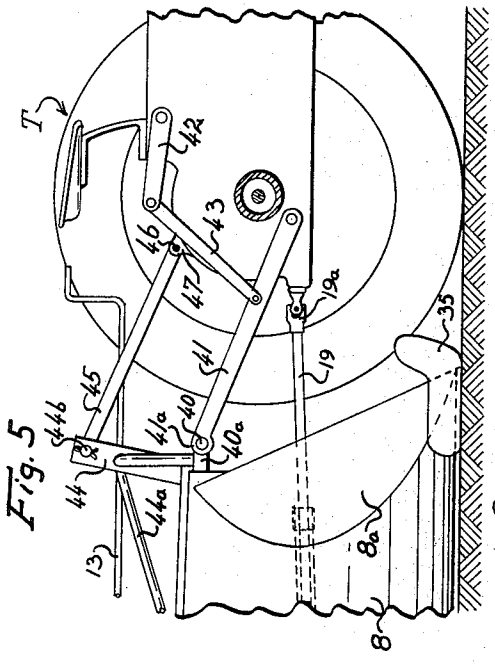


Fig. 5

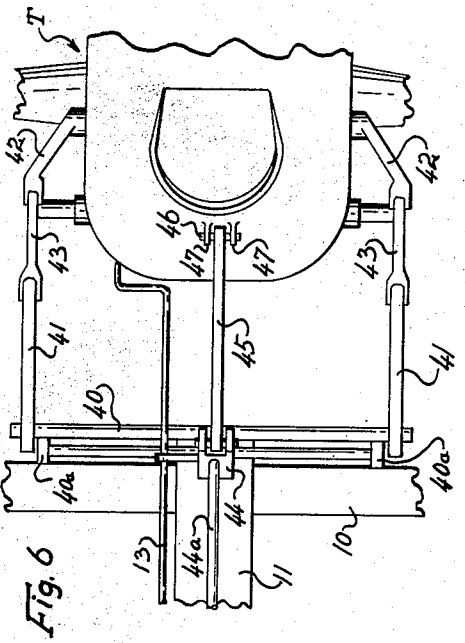


Fig. 6

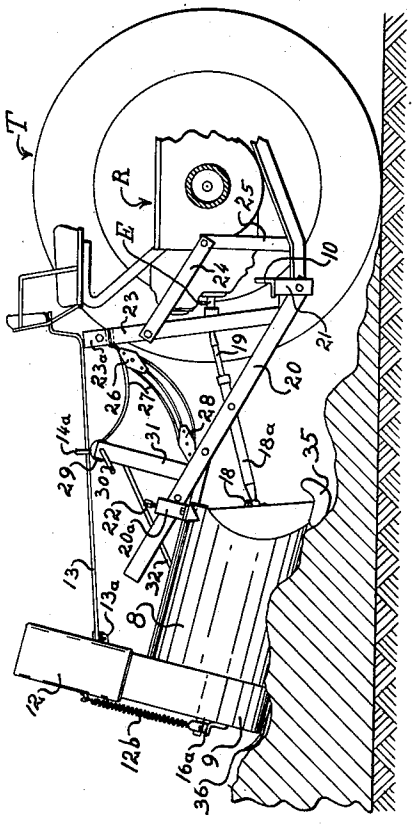


Fig. 4

INVENTOR
GEORGE C BERGER
BY Williamson, Williamson, Schroeder & Adams
ATTORNEYS

Patented June 1, 1954

2,679,702

UNITED STATES PATENT OFFICE

2,679,702

ROTARY SNOWPLOW

George Conrad Berger, Erskine, Minn.

Application March 13, 1952, Serial No. 276,323

4 Claims. (Cl. 37—43)

1

This invention relates to rotary snow plows adapted to efficiently plow and cast snow and particularly to a plow adapted for farm use as an attachment to farm tractors employed as the propelling vehicle and also as the source of power for the rotor of the snow plow.

I have found that the small tractors generally used on farms lack sufficient power and weight to effectively remove snow when equipped with conventional snow plow apparatus such as the displacement or push plow type. I have further ascertained that conventional apparatus known as "snowblowers" are generally too cumbersome and inefficient for use on small tractors and lack the essential features found in my invention.

This application is a continuation in part of my allowed application, S. N. 80,370, filed March 9, 1949, now abandoned.

It is an object of my invention to provide a simple but highly efficient rotary snow plow for a tractor, having mold board wings diverging forwardly from a snow-removal rotor and delivering by a rolling action of the snow rearwardly and centrally, to said rotor which is axially disposed with reference to the line of travel of the plow. A fast rotating auger disposed forwardly and preferably axially of the rotor closely cooperates to disintegrate the plowed snow and to uniformly feed the same to the rotor which in turn casts the snow to one or the other sides of the cut or path formed.

It is another object to provide a simplified, pull-type, rotary snow plow for tractors and the like wherein the rotor, rotor housing and mold boards and reinforcements act as the structural frame of the plow.

A further object is the provision of a tractor pulled and powered, rotary snow plow wherein forwardly diverging mold boards are shaped and constituted with a centrally disposed rotor housing to provide a concave surface affording a downward shearing action when the plow is travelling forward and also presenting a convex "toboggan" like rearward surface to cause the plow to ride up independently of the tractor when the tractor is backed into a deep drift of snow. The combination of concavo-convex mold boards with the central rotor housing disposed at the apex of said mold boards effects an efficient removal of deep drifts of snow by backing in the plow and driving out forwardly to cut an initial path through deep snow which may be subsequently widened out after the initial cut is made.

I have found that prior art snow removal apparatus using forwardly diverging mold boards is very inefficient, especially in wet snow because accumulated snow will bridge near the apex of the mold boards ahead of the blower, thus blocking the free entry of snow into the blower. To overcome this objection to the type of snow plow

2

described, I have provided a circular and fragmentary spiral snow-disintegrator and agitator directly ahead of the blower near the apex of the mold boards which not only prevents bridging of snow between the mold boards but also controls the amount of snow entering the blower to prevent the blower from plugging when the tractor is driven ahead at a faster rate of speed than the size and speed of the blower could normally handle.

A further object of the invention is the provision of a rotary snow plow of the class described wherein said forwardly diverging mold boards are built into a unitary structure with a centrally disposed rotor housing at the apex thereof and wherein said housing has its axis substantially bisecting the angle formed by said mold boards and extending at its lower portion to substantially the lower edges of said mold boards and the cutting edges thereon and having a single rotor mounted in said housing provided with a plurality of efficient blades which revolve in an orbit in close working clearance to said rotor housing so that snow will be rolled by the mold boards from the outer sides of the plows inwardly and centrally towards the opening in the rotor housing and most efficiently and immediately removed and cast by the revolving rotor blades which act as shovels and disintegrators.

Another object of the invention is to provide a pull-type rotary snow-casting plow embodying draft-connected mechanism for cooperation with a conventional tractor adaptable for connection with the conventional, hydraulic lift arms of a tractor whereby the plow may be bodily and variably elevated above the ground and supported by the tractor for a number of functional uses including transportation to areas which require plowing and including a backing of the tractor and plow into deep drifts to subsequently bite and remove heavy cuts of snow from such accumulated masses of snow.

The foregoing and other objects of the invention will more fully appear from the following description made in connection with the accompanying drawings wherein like reference characters refer to several parts throughout the several views and in which:

Fig. 1 is a front perspective view of an embodiment of my snow plow detached or uncoupled from a tractor;

Fig. 2 is a top plan view of the snow plow shown in Fig. 1, coupled to the rear of a conventional tractor of a type not equipped with hydraulic lift arms;

Fig. 3 is a side elevation of the plow of Figs. 1 and 2 connected with a tractor for plowing snow upon a substantially level or horizontal plane;

Fig. 4 is a side elevation of the plow shown in

Figs. 1 to 3 being backed by a tractor and riding or "tobogganing" over the surface of a deep drift to position the plow for subsequently downward biting and removal of a substantial slice of said drift in the subsequent forward travel of the plow;

Fig. 5 is a side elevation showing the draft and elevating connections of a form of my invention with a conventional tractor of the type having hydraulic lift arms associated with the rear end thereof; and

Fig. 6 is a plan view showing the draft and elevating connections between my rotary snow plow and the lift arms of a conventional tractor.

Referring now to the form of the invention shown in Figs. 1 to 4, my rotary plow or snow-removal apparatus is attached by draft or pull connection with a conventional type of tractor T having the usual rear end and differential housing R disposed substantially in alignment with a rearward power take-off shaft E.

My rotary plow comprises a minimum number of parts cooperatively related so that rigid, forwardly converging mold boards and a central rotor housing with forward bracing means may constitute the full plow frame without requirement of mounting members, thrust or pull skeleton frame or the equivalent thereof. To this end, I provide a pair of heavy, forwardly and outwardly diverging mold board wings 8 of concavo-convex cross section and merging at their inner or rear ends with a heavy, cylindrical rotor housing 9, said housing extending substantially the full height of the mold boards and to approximately the lower or cutting edges thereof and having an open front end positioned with its axis disposed centrally in the line of travel of the plow. The mold board wings 8 and housing 9 may be constructed of tough steel or other suitable metal and the rearward ends of the wings are rigidly affixed preferably by welding to the sides of the rotor housing forming therewith, a very rigid construction sufficing as the main frame as well as the plowing removal and casting medium of the plow. The forward or outer ends of the mold board wings are preferably provided with segmental cutting edges 8*a* disposed in vertical planes extending parallel to the axis of the rotor housing.

The structure is reinforced by a horizontal forward angle bar 10 which is welded or otherwise rigidly affixed to the forward and upper portions of the wings 8 traversing the same and serving as a support for certain mechanism and members to be later described. A longitudinal, rigid top bar 11 rigidly connects the medial portion of transverse angle bar 10 with the top and central portion of the rotor housing 9.

Rotor housing 9 has affixed to the upper portion thereof a short, tangential snow-delivery chute 9*a* of rectangular cross section and which extends a short distance above the rear end of longitudinal bar 11 having an open upper end provided with a swingable casting plate 12 which has a pair of parallel perpendicular, segmental sides 12*a*, the medial portions of which are hinged to chute 9*a* for shifting of the plate from one side to the other to deflect and cast snow to one or the other sides of the path cut. The casting plate may conveniently be shifted from a position forwardly of the plow such as the driver's seat of a tractor by means of an elongated crank rod 13 which is hingedly connected at its rear end with a bracket 13*a* on one of the segmental

sides of the casting plate while its forward end projects through a suitable bearing 14*a* carried by a diagonal bracket arm 14 affixed to the superstructure above the frame. The forward end of rod 13 is provided with a crank handle 13*b* for facilitating turning of the crank rod and consequent shifting of the casting plate. The snow casting plate 12 is retained in either right or left hand positions by suitable means such as an over-dead-center spring 12*b* which has its upper end affixed to a central portion of the rear segmental side 12*a* at some distance above the axial hinge of the plate and which has its lower end anchored to a central portion of the rear of the rotor housing.

A rotor 15 is mounted almost concentrically within housing 9 comprising as shown a plurality of substantially straight radial blades 15*a* affixed to a hub 15*b* which in turn is secured to a rigid, substantially horizontal, driven shaft 16 journaled at its rear end in a suitable bearing 16*a* mounted upon the closed rear end of housing 9 and intermediately journaled at a point somewhat forward of the rotor 15 in a bearing 16*b* which is supported as shown, from a depending, rigid bar 17 having its upper end firmly attached to the medial portion of the longitudinal frame bar 11. The forward end of the driven rotor shaft 16 has detachably affixed thereto a universal coupling 18 which in turn is affixed to a squared tube shaft 18*a* having slidably mounted therein a squared shaft 19 which may be connected by universal joint 19*a* to the power take-off of a tractor T.

In the form of the invention shown in Figs. 1 to 4 inclusive, the plow is adapted for draft attachment to a type of tractor which is not equipped with conventional hydraulic lift mechanism. Its draft connection as shown, is accomplished by a pair of elongated, parallel, rigid draft links 20 pivotally connected at the forward ends thereof with the ends of the heavy, transverse draft bar 21 provided at the lower rear of the type of tractor illustrated. The rear of the draft links 20 extend through inverted, rigid U-shaped brackets which are rigidly affixed to the cross angle bar 10 of the plow frame and adjustment in the length of the effective draft may be made by sliding relation of the draft links 20 to the brackets 20*a*, the links being rigidly affixed in a desired, adjusted position by heavy set screws 22.

An upstanding bifurcated mounting post comprising a pair of rigid legs 23 is rigidly affixed to the rear end of tractor T, said legs having upstanding abutting portions 23*a* at their upper ends and diverging outwardly and downwardly for rigid attachment to the rear and lower portion of the tractor frame at their lower ends. Legs 23 are braced and reinforced at each side of the tractor by brace links 24 and 25 respectively. The upper end of the post formed by the legs 23*a* has swingably secured thereto a pulley 26 over which a flexible cable 27 is trained, the inner end of said cable being affixed to the frame of pulley 26 and then being trained about a pulley 28 swingably affixed to the central portion of the transverse angle bar 10 of the plow frame. Thereafter the cable is trained about the pulley 26 and has the free end thereof affixed to a small winch drum 29 mounted on a horizontal crank shaft 30 which shaft is journaled between a pair of rigid, upstanding bars 31 having downwardly and outwardly diverging legs which are affixed to forward horizontal rigid

extensions 10*a* of the upper transverse bar 10 of the frame. The upstanding bars 31 are centrally braced by a heavy diagonal brace rod 32 and form a rigid tilt post for the entire plow. The winch drum 29 has a suitable ratchet and pawl mechanism not shown, for locking the drum when the plow is raised by winding upon the outer portion of the flexible cable 27.

A multipurpose, preferably helical auger 34 is fixed to the driven rotor shaft 16 just forwardly of the open end of the cylindrical rotor casing 9. This auger preferably comprises only one helical convolution broken at radial edges as shown in Fig. 1 and having a diameter somewhat less than the internal diameter of the rotor housing 9. This auger section disintegrates the plowed snow through its fast rotation and uniformly feeds the same to the rotor and in addition, serves as a damming member to prevent undue bridging or accumulation of snow across and into the open front of the rotor housing.

I prefer to provide the front ends and lower portions of the mold boards 8 with runner sections 35 which may be in the form of angled vertical plates attached to the vertical cutting ends forming the front extremities of the mold boards proper. The lower edges of the plates 35 extend over slightly below the cutting edges of the mold boards and the upturned portions are inclined to facilitate guidance of the plow over the ground and snow.

At the rear of the plow, I preferably provide a substantially flat runner 36 secured beneath the lower center of the rotor housing 9 and having its rear end extended and upturned to assist in guidance and toboggan action of the snow plow when the plow is moved rearwardly.

Operation

In operation the plow drawn behind the tractor is normally urged downwardly into the snow by its draft attachment and the forwardly diverging relation of the mold board blades 8 and by the fact that the mold boards 8 are concavo-convex in cross section with the lower portion and cutting edge being inclined rearwardly relative to the travel of the plow. Snow is cut by the forward ends 8*a* of the mold board and by the cutting edges of the plow and is rolled inwardly from both sides of the structure, rearwardly and centrally to the fast-revolving auger 34 and rotor housing 9. The mold boards 9 merge at their rear ends into the contour of the open ended cylindrical rotor housing and this housing at its open end extends from substantially the lower cutting edges of the mold board to at least substantially the full height of the mold board sections. The auger 34 disintegrates chunks and ice and in its fast rotation, uniformly feeds and controls the feeding of the rolled snow into relatively large rotor housing whereby bridging of snow is materially prevented at the apex of the mold boards and the rotor blades or shovels 15*a* are permitted to very rapidly and immediately discharge snow centrifugally through the discharge chute comprising the chute 9*a* and the shaft deflector 12. This results in a very rapid and forcible discharge of the plowed snow, the machine in actual practice casting a stream of snow 40 or 50 feet.

The depending bearing 16*b* supported from the cross bracing structure of the plow smoothly journals the rotor shaft 16 and in addition, prevents disconnection of the power take-off shaft

which includes the two universal joints and the telescoped sections 18*a* and 19.

When it is desired to remove deep drifts of snow, the tractor may be backed into the drift and because of the concave toboggan-like contour at the rear of the moldboards 8 and the merging of the cylindrical housing 9 therewith, the plow will ride upwardly upon the drift and then when the tractor is moved forwardly, will be directed downwardly to take a substantial portion of the drift, thus cutting an initial path through deep snow which may be subsequently widened out after the initial cut is made.

In Fig. 4 of the drawing, the tractor is shown being backed and the plow in toboggan-like manner is riding upwardly upon the drift for positioning to take a deep bite when the tractor is thereafter driven forwardly.

The auger 34, it will be noted, being of less diameter than the substantially concentric forward open end of the rotor, in addition to feeding snow uniformly to the rotor, permits entrance of a certain amount of snow to the tip portions of the rotor blades.

The operation of my draft type plow is efficient in all conditions of snow, wet or dry and one of the very important features is that snow is not compacted and accumulated or bridged at the entrance of the discharge motor but is fed uniformly so that the individual blades or paddles of the rotor have fast and free discharge action to centrifugally cast and eject the snow.

In the form of snow plow shown in Figs. 5 and 6, the construction of the mold boards, their connection and merging into the sides of the cylindrical rotor housing and the provision of the flattened forward ends 8*a* of the mold boards and connection and bracing of the forward ends of the mold boards by the channel member 10 is similar to that of the form first described and identical parts are therefore numbered similarly in both forms of the invention as shown in the drawings. The longitudinal top bar 11 of the plow of Fig. 5 and Fig. 6 is similar to that of the form first described, this bearing serving to transmit pull to the upper portion of the rotor and triangulated bracing connections of the general frame or construction of plow which includes the mold boards 8 and rotor casing 9.

In this second form of the invention however, provision is made for draft connection and automatic lifting of the plow through the conventional hydraulic lift mechanism provided in several types of conventional tractors.

To this end, a transverse, heavy draft connection shaft 40 is rigidly affixed by reinforced brackets 40*a* to the front of the heavy angle or channel bar 10 spanning the upper forward edges of the mold boards, the ends of the draft connection shaft extending as trunnions beyond the brackets or lugs 40*a* for connection and journaling in the bearing eyes 41*a* of the hydraulically operated draft and lift structure of a conventional tractor. The usual draft bar furnished with the tractor is of course removed as in the case of numerous draft and lift connection of the tractor with several types of farm implements.

The conventional hydraulic lift and draft mechanism of the tractor comprises the relatively short upper arms 42 disposed at the sides of the differential and hydraulic mechanism housing. The outer ends of these short arms 42 are connected by straight lift links 43 with intermediate portions of the lower lift arms 41. To the front of the plow structure, a heavy central

upwardly extending channel post 44 is provided rigidly affixed to the upper transverse angle bar 19 which connects the forward ends of the mold boards and braced by a diagonal brace bar 44a. A heavy, connector link 45 is pivotally connected at its rear end to the upper portion of channel post 44 by a detachable pivot pin 44b and has its forward end swingably connected by a transverse pin 46 with a pair of spaced attachment lugs 47 provided at the upper rear portion of the heavy housing which surrounds the differential and hydraulic mechanism at the rear of the tractor.

The connector link 45 with the elongated lift arms 41 of the tractor lift mechanism produces a parallelogram draft and lift connection between the tractor and the upper forward portion of my plow, as shown in Figs. 5 and 6.

With the structure described, the entire plow may be partially or wholly supported from the rear end of the tractor through the draft and lift mechanism, thus enabling the plow to be transported without being drawn upon the ground from place to place and further, by adjustment of the hydraulic lift mechanism, the level of the lower edges of mold boards 8 may be adjusted within a wide range to plow slices off of the top of deep snow.

In many cases, the placing of additional weight upon the rear wheels of a conventional tractor is desired to obtain greater traction power for plowing, which may be attained by partially or wholly supporting the plow in a slightly elevated position.

In both forms of the invention disclosed a rotary snow-disintegrating and feeding element preferably in the form of an auger section, is disposed coaxially directly in front of the open end of the forwardly facing rotor casing 9, fixed to the rotor shaft. With such structure, snow is comminuted or pulverized and delivered proportional to discharge rotation to the space rearwardly of said auger within rotor casing 9. The form of snow disintegrating and feeding rotor may be constructed from a circular blade having a slit at one side and canted or offset to form a convolution of a helix and having a thrust surface to dispense snow substantially uniformly around the discharge rotor 15.

It will of course be understood that various changes may be made in the form, details, arrangements and proportions of the parts without departing from the scope of my invention.

What I claim is:

1. A pull-type rotary snow plow for a tractor having the conventional power take-off and conventional hydraulic lift arms and implement-draft mechanism at the rear thereof, said plow comprising a rotor housing having an open front and mounted with its axis disposed in the line of travel of the plow, mold board structure having rear ends built around and affixed to said rotor housing and having side portions which diverge outwardly and forwardly from the sides of said housing to cause snow to be rolled rearwardly and inwardly towards the open end of said housing, a rotor mounted substantially concentrically within said housing, means for connecting the rotor with the power take-off of a tractor, and draft-connection mechanism interconnected with forward portions of said mold board structure including a transversely disposed draft bar having its opposite end portions secured to the mold boards adjacent the free ends thereof, a longitudinally extending bar secured to said transverse draft bar substantially centrally thereof and also connected to the upper portion of said rotor housing, a pair of draft connector elements carried by said transverse draft bar and disposed adjacent the ends of said draft bar adapted for interconnection with the conventional hydraulic lift arms, whereby the plow may be bodily and variably elevated above the ground and supported entirely by the tractor.

2. A snow plow as defined in and by claim 1, wherein there is an upwardly extending post fixedly mounted substantially centrally of the transverse draft bar and a longitudinally extending connector link connected at its rear end with said post and having means at its forward end for pivotal connection with the rear end of a tractor at a point above the tractor connection of the hydraulic lift arms.

3. A rotary snow plow comprising a pair of angularly related, mold board wings diverging forwardly from a centrally disposed rotor housing, a substantially cylindrical rotor housing having an open front extending substantially the full diameter thereof, said housing being affixed to the inner converging ends of said mold board wings and having its lower edge disposed at the level of the lower edges of said wings and having its axis substantially bisecting the angle of said wings, said housing having a peripheral discharge opening through the upper portion thereof, a discharge rotor mounted substantially concentrically within said housing and having a forwardly extending rotor-driving shaft, means for journaling said rotor-driving shaft including a depending bearing supported from the wings of said plow, a rotory snow disintegrating and feeding means of smaller orbital extent than said rotor carried by said rotor-driving shaft just forwardly of said rotor, means for driving said rotor-driving shaft, said mold board wings being of concavo-convex vertical cross sectional shape throughout having a vertical extent equal to the height of said housing and merging into said sustantially cylindrical rotor housing and said mold board wings terminating in forwardly declined cutting edges, whereby when the plow is backed, said mold board wing and rotor housing structure will lift and ride a snow drift upwardly in the manner of a toboggan and thereafter, when said plow is moved forwardly, the forwardly declined cutting edges will cause the plow to bite into the snow and to be urged downwardly.

4. The structure set forth in claim 3, means at the lower edges of the forward portions of said mold board wings for at least partially supporting the plow upon a surface such as the ground, and a longitudinal runner secured to the bottom of said rotor housing and having a rearwardly and upwardly curved runner tip to facilitate backing of said plow and upwardly riding thereof over a snow drift.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,563,920	Peters	Dec. 1, 1925
1,824,662	Davidson	Sept. 22, 1931
2,075,530	Jeswine	Mar. 30, 1937
2,154,353	Ploetz	Apr. 11, 1939
2,223,002	Ferguson	Nov. 26, 1940
2,281,289	Hewitt	Apr. 28, 1942
2,309,750	Carrington	Feb. 2, 1943
2,315,007	Morse et al.	Mar. 30, 1943
2,360,827	Cole	Oct. 24, 1944