Jan. 28, 1969 A. C. IBISCH 3,423,857

SNOW BLOWER ROTOR

Filed Dec. 9, 1966

Sheet 1 of 2

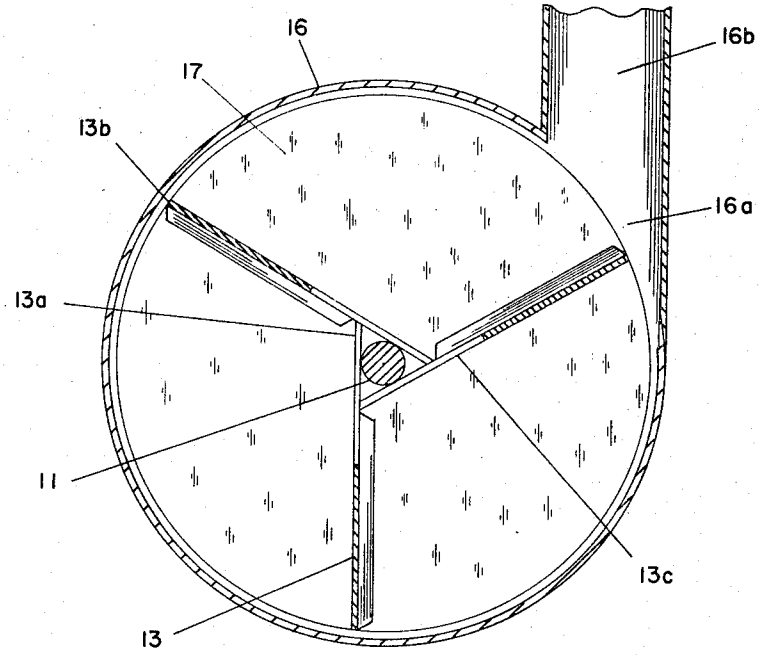


Fig. 4

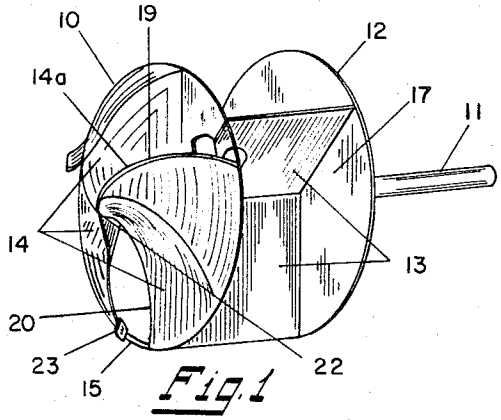


Fig. 1

INVENTOR
ALVIN C. IBISCH
BY Joseph G. Werner
ATTORNEY

Jan. 28, 1969 A. C. IBISCH 3,423,857

SNOW BLOWER ROTOR

Filed Dec. 9, 1966 Sheet 2 of 2

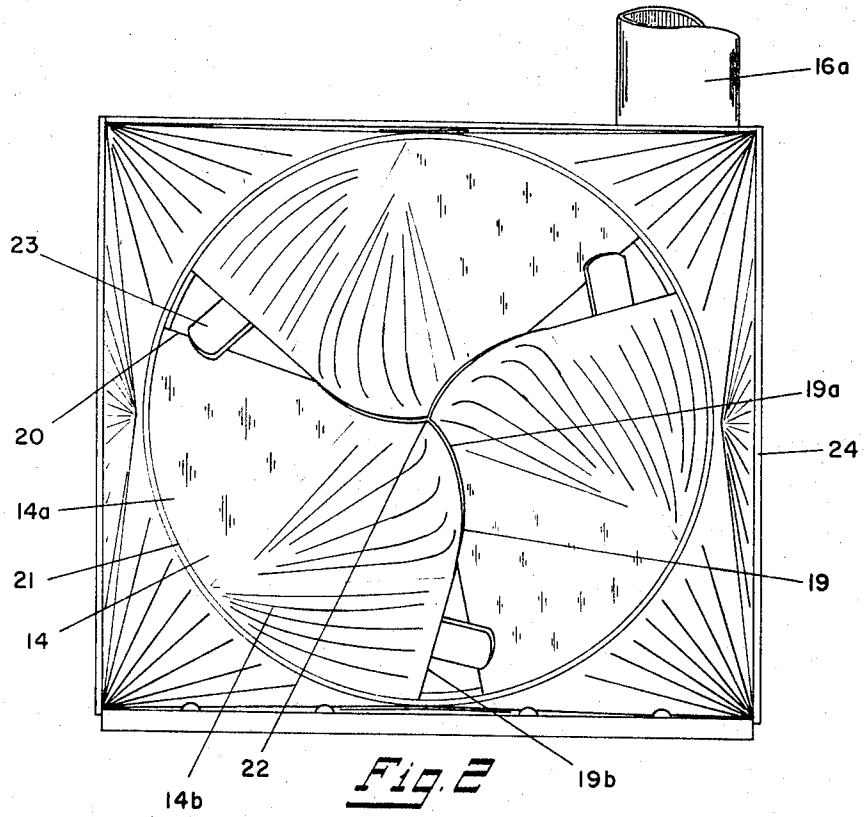


Fig. 2

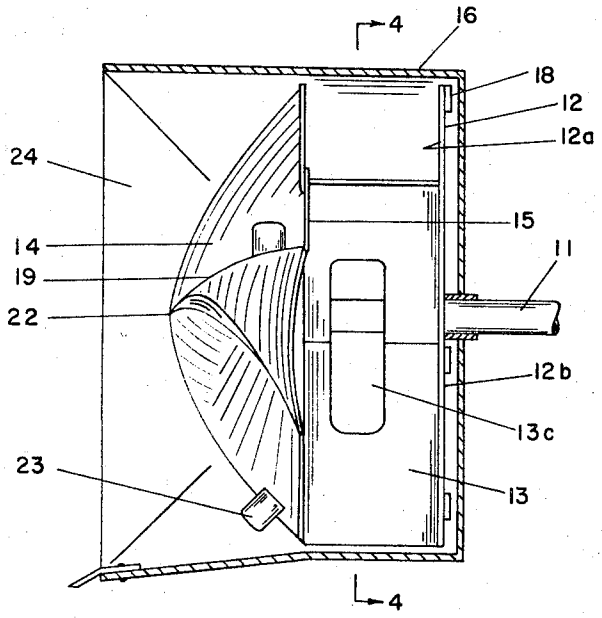


Fig. 3

INVENTOR
ALVIN C. IBISCH
BY Joseph G. Werner
ATTORNEY

United States Patent Office 3,423,857
Patented Jan. 28, 1969

3,423,857

SNOW BLOWER ROTOR

Alvin C. Ibisch, 347 Middleton Road,
Columbus, Wis. 53925

Filed Dec. 9, 1966, Ser. No. 600,639
U.S. Cl. 37—43 1 Claim
Int. Cl. E01h 5/09

ABSTRACT OF THE DISCLOSURE

A snow blower rotor having a plurality of cutting blades extending forwardly at the rotational axis of the rotor and curving backwardly therefrom for drawing snow into rearward rotor pockets formed between impeller paddles for discharge from the blower. The blades each have a reverse curved portion forming a cutting edge and a substantially flat portion. The flat portion of each of the cutting blades extends perpendicular to the impeller paddles and is fixedly attached to the front edge of the paddles to prevent snow from escaping forwardly of the blower.

Cross reference to related application

This application is directed to an improved rotor construction for rotary snow blowing apparatus such as described in my copending application, Ser. No. 359,254 filed Apr. 13, 1964, now U.S. Patent No. 3,299,546, issued Jan. 24, 1967.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates generally to snow blowers and more particularly to an improved rotor construction for snow blowers.

Description of prior art

Snow blowers of the type considered herein generally comprise essentially a housing, a cylindrical rotor mounted therein, a power source, and various auxiliary devices assisting in the basic operation. The housing has a side opening in the wall thereof and a duct to convey the snow from the rotor. While these devices are commonly referred to as "blowers," they rely largely on centrifugal force, imparted to the snow by means of radially disposed impellers or paddles within the rotor. Snow is drawn into the impeller portion of the rotor by cutting blades affixed to the forward portion of the rotor. The blower assembly is pushed through snow with the axis of rotation of the rotor extending along the line of advance. Usually, some form of scoop is affixed to the forward portion of the blower housing to increase the effective removal area by funneling the snow into the rotor as the assembly is advanced through the snow.

The most important part of a snow blower is the rotor. Its design and operation will generally determine the capacity and speed of snow removal, as well as the overall efficiency of operation. The size, weight and corresponding torque requirements for a rotor of a given capacity are also largely determined by the design thereof. Substantial savings therefrom are to be realized with a properly designed rotor, both from the standpoint of power consumption and from the improved operating characteristics of the blower apparatus.

In most known rotors, the blades occupy only a portion of the radius of the circle defined by the blades, a substantial portion of the center generally being used as a structural connecting member for the blades and providing little or no cutting action. This disadvantage may not substantially effect operating efficiency where

the rotor is quite large and where the snow to be removed is relatively shallow in comparison thereto, however, where the snow is as deep as the diameter of the rotor, the operating efficiency is markedly decreased, since only a portion of the rotor face is effectively drawing snow directly into the paddles for discharge.

Another difficulty is presented with known rotors where deep snow is encountered and funneling means such as a scoop are used to direct an expanded cross-sectional area of snow into the rotor, particularly where the snow is wet and heavy. Such snow readily coheres under slight pressure and forms a compacted mass. The sides of the scoop generally present an angle of about 30° to the axis of advance and create a sufficient vectorial friction force to compact a quantity of snow directly in front of the scoop surface and assuming the general configuration of the scoop.

SUMMARY OF THE INVENTION

Generally, the concept of my invention is to provide a snow blower rotor having the central portions of its cutting blades extending substantially forward of the outer portions of the blades and the front edge of the cylindrical rotor housing for removing a core of snow within the volume subtended by the scoop and for directing incoming snow to the periphery of the rotor.

I have found that a rotor blade design having, in side elevation, a generally parabolic configuration with the apex projecting forward at the axis of rotation is uniquely suitable for efficient operation.

My particular rotor construction also results in the peripheral portions of the cutting blades being angularly disposed toward the circumference of the rotor, thereby presenting outwardly extending cutting edges for cutting into the snow which is being funneled inwardly toward the circumference of the rotor by the scoop of the snow blower.

Other objects, features and advantages of my invention will be apparent from the following detailed description taken in conjunction with the accompanying drawings, wherein a preferred embodiment of the principles of my invention has been selected for exemplification.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a snow blower rotor embodying my invention.

FIG. 2 is a front elevation view of the rotor of FIG. 1 mounted in a typical blower assembly having a rectangular scoop.

FIG. 3 is a side view of the rotor of FIG. 1 in a cylindrical rotor housing with a forward projecting scoop, the housing and scoop being shown in section.

FIG. 4 is a sectional view of the rotor of FIG. 1 taken along section line 4—4 of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring more particularly to the drawings wherein like numerals refer to like parts throughout the several views, my novel rotor is generally shown at **10** in FIG. 1. The rotor **10** basically comprises a drive shaft **11**, a circular back plate **12**, a plurality of generally radially disposed paddles **13**, a plurality of forward cutting blades **14**, and circumferential connecting members **15**. The various parts of my rotor are preferably constructed of steel and are rigidly connected together by any suitable means, such as welding, bolting, riveting or the like.

As best seen in FIGS. 2–4, the back plate **12** is substantially flat and circular and is slightly smaller in diameter than the cylindrical rotor housing **16** in which it rotates. The rotor housing has a tangential discharge opening

16*a* and discharge pipe 16*b* for discharging snow from the rotor housing.

The paddles 13 are substantially rectangular in configuration and are affixed to the forward face 12*a* of the back plate 12 at their rear edges by welding or other suitable means. Three such paddles are shown in the drawings but the invention is not limited to that number. The paddles are spaced equaly on the forward face 12*a* of the back plate 12 and are substantially perpendicular to it. The paddles extend tangentially about the drive shaft 11 and are affixed thereto by welding or other suitable means. The paddles are somewhat longer than the radius of the back plate 12 and the inner edges 13*a* thereof extend beyond the point of tangential contact with the drive shaft 11 and abut the face of the next adjoining paddle. The paddles 13 are connected to each other at this point of contact by welding or other suitable means. Pockets 17 having the approximate configuration of a section of a cylinder are formed between adjacent paddles.

The tangential relation of the paddles 13 to the rotating shaft 11 serves two distinct functions. Firstly, such construction permits each of paddles 13 to be fixedly joined to the rotating shaft 11 and to one of the adjacent paddles adding materially to the strength of the rotor structure. Secondly, the tangential placement of the paddles angles them from a radial line drawn between the center of the rotating shaft 11 and the outer edge 13*b* of a paddle. With the direction of rotation as indicated by the arrow in FIG. 4, the paddles are forwardly disposed, using the terminology generally applied to centrifugal fans. The vector analysis applied to air flow from the blades in centrifugal fans clearly indicates that the resultant velocities are greater from forwardly disposed blades than from those which are rearwardly disposed. The snow flow from my rotor is considerably increased by the particular forwardly disposed paddles arrangement shown.

Another important feature of my rotor 10 is the opening 13*c* provided in the inner portion of each paddle. Preferably, these openings 13*c* are approximately one-half the width of the paddles 13 and extend about one-third of the length thereof. The openings 13*c* permit incoming snow to be distributed to adjacent pockets. This feature materially reduces vibration during operation and assures a more uniform flow of snow from the blower. A further advantage attributed to the openings 13*c* is that the moment of inertia of the rotor is moved outwardly, increasing the angular momentum and generally making the speed of rotation more uniform under constantly varying loads.

A plurality of small fins 18 are secured at equally spaced intervals around the rear face 12*b* of the back plate 12, as shown in FIG. 3. These fins 18 help expel any snow that may seep behind the back plate 12, thus, eliminating a source of friction.

A most important novel aspect of my rotor is the design of the cutting blades 14. In side elevation, the blades 14 extend parabolically outward in front of the rotor housing 16. As best seen in FIGS. 1 and 2, the cutting edges 19 of the blades 14 extend across the entire width of the rotor face. The blades 14 are curved to direct the incoming snow toward the outermost portion of the rotor paddles 13. Each blade 14 has a leading or cutting edge 19, a trailing edge 20, and a circumferential edge 21. The blades 14 have a first substantially flat portion 14*a* adjacent to the trailing edge 20 and approximately parallel to the back plate 12. The second portion 14*b* is adjacent to and includes all of the cutting edge 19 and has a generally reverse curve configuration. The inner or central portions 19*a* of cutting edges 19 are disposed substantially forward and curve backwardly into outer edge portions 19*b* which face outwardly toward the side of the rotor. The blades 14 are joined at the center 22 of the rotor by welding or other suitable attaching means. It is readily seen that the cutting edges 19 of my novel rotor sweep over substantially the entire circular area of the rotor; which is a distinct advantage over present rotors, which generally have substantial nonfunctional center portions. In addition, having the central portion of the rotor projecting forwardly of the outer portion causes the core of the snow encountered to be removed, thus greatly enhancing the efficiency of operation.

The reverse curve configuration of portions 14*b* of the blades 14 directs the incoming snow toward the outer portions of the pockets 17 formed by the paddles 13 to reduce the amount of work which must be done by the paddles.

That portion of the trailing edge 20 defined by the flat portion 14*a* of each blade 14 is connected to the forward edge of an adjacent paddle 13 by welding or other suitable means.

As best seen in FIG. 2, the outer portion 19*b* of the cutting edges 19 follow the trailing edge 20 of the blades immediately preceding it. The cutting and trailing edges of adjacent blades are joined by circumferential connecting rods 15. These rods 15 are curved to the general circumference of the rotor and may be connected by welding or other suitable means to the backside of the flat portions 14*a* along the circumferential edges 21 of one blade and to the portion 14*b* of the following blade.

Cutting teeth 23 may be provided on each of the blades 14 to assist in cutting snow from the volume subtended by the funneling scoop 24 attached to the front of the cylindrical rotor housing 16. The teeth 23 protrude outwardly from the cutting edge 19 of each blade 14. The teeth 23 are positioned near the circumferential edges of the blades 14 so their cutting is directed at an outward angle. The teeth may extend radially outward to a point generally coincident with the circumference of the rotor or beyond if desired since they are forward of the rotor housing. The cutting action of the teeth 23 is particularly helpful where deep compacted snow is being directed into the periphery of the rotor by the scoop 24. In combination with the forward projecting blades 14, the teeth 23 create a cavity in front of the rotor housing 16 into which snow may be funneled from all directions without obstruction. While a single tooth is shown on each of blades 14 a plurality of teeth may be employed if desired.

It is understood that my invention is not confined to the particular construction and arrangement of parts illustrated and described, but embraces all such modified forms thereof as come within the scope of the following claims.

I claim:

1. In a rotary snow blower having a substantially cylindrical rotor housing, a rotor comprising:

(a) drive shaft extending along the axis of rotation of said rotor,

(b) a substantially circular back plate having a front face and a rear face and extending perpendicular to said drive shaft,

(c) a plurality of paddles having a front edge and a rear edge and being secured at said rear edge to the front face of said back plate in substantially perpendicular relation to form a plurality of outwardly opening pockets, and

(d) a plurality of cutting blades for drawing snow into said pockets,

(i) said cutting blades each having a reversed curved portion forming a cutting edge and having a substantially flat portion extending perpendicular to said paddles and being fixedly attached to the front edge of said paddles to prevent snow from escaping forwardly of the blower,

(ii) the cutting edges of said blades being joined together at the axis of rotation of said rotor and extending outwardly and rearwardly therefrom to the circumference of the rotor,

(iii) said cutting edges facing substantially to the front along approximately the inner one-half of their length and substantially sidewardly along approximately the outer one-half of their length.

References Cited

UNITED STATES PATENTS

436,204	9/1890	Bergendahl	37—21
1,698,901	1/1929	Zinn	37—43
2,047,659	6/1936	Zaremba	37—43
2,269,326	1/1942	Wandscheer	37—43
2,681,516	6/1954	Bourne	37—43
3,299,546	1/1967	Ibisch	37—43

FOREIGN PATENTS

313,929	7/1956	Switzerland.
739,159	7/1966	Canada.

ROBERT E. PULFREY, *Primary Examiner.*

EUGENE H. EICKHOLT, *Assistant Examiner.*

U.S. Cl. X.R.

302—38