# United States Patent

**Tucker**

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[54] **WINCH CARRYING SNOW GROOMING VEHICLE SUPPORTED BY SKIDS AND POWERED BY AN ANCHORED DRAWLINE**


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[52] **U.S. Cl.** .....**172/23,** 172/170, 172/190, 172/199, 172/781, 104/173 ST, 180/5 R, 242/157.1, 254/166, 280/12 R

[51] **Int. Cl.**.....**E01h 4/00,** B61b 11/00

[58] **Field of Search**.....172/23, 195, 199–200, 172/784, 170, 387; 37/1, 10; 94/50; 180/3, 5, 7, 53 FE; 280/12 R, 12 E, 12 M, 18, 19; 242/86.5, 86.51, 86.7, 157.1; 104/173 ST; 254/166



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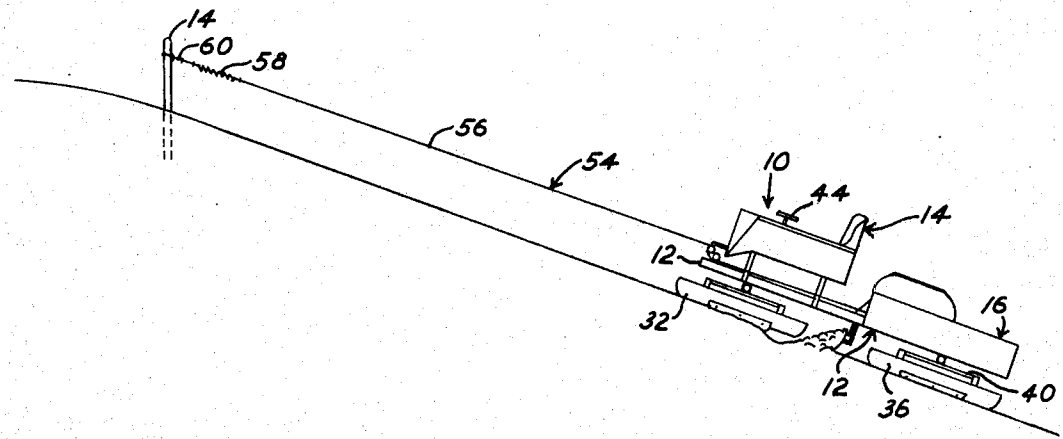
[57] **ABSTRACT**

A novel ski slope grooming method, similar to an ironing procedure in which the iron is caused to glide smoothly over the surface to be smoothed and compressed, is carried out through the employment of a novel snow-riding vehicle, having the following characteristics: (a) the light vehicle rides on the snow, distributing its weight through a series of long and broad, smooth-bottomed skids, so that the skids carry the entire weight of the vehicle and its load, substantially evenly distributed on the surface of the snow; (b) the vehicle exerts no driving traction or braking traction upon the surface of the snow, there being no drive wheels or caterpillar treads; (c) the vehicle accomplishes its work of evening and compacting the snow with efficiency and thoroughness while pulling itself uphill through an anchored draw-line and while coasting downhill under the pull of gravity but restrained by the draw-line; (d) the vehicle includes an optionally usable scraper blade which can be set at various heights for breaking up lumps and evening the surface of the snow, but no other structure which could oppose a significant resistance to the progress of the vehicle over the snow; and (e) provision is made for a single operator, riding the vehicle, to steer the vehicle, to control a drive motor through which the draw-line can be reeled in, and to control a reel brake for paying out the draw-line and thereby controlling the rate at which the vehicle coasts downhill.


**11 Claims, 10 Drawing Figures**



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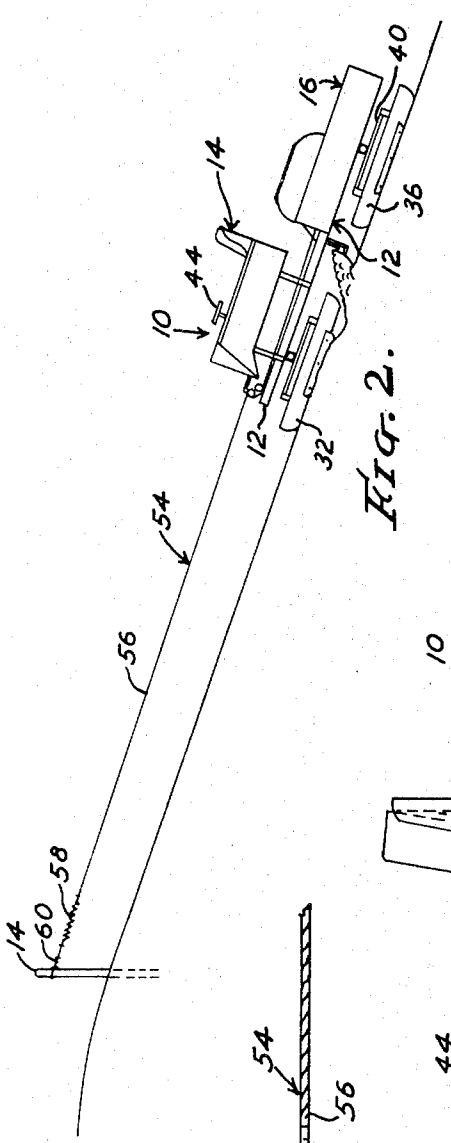

FIG. 2.

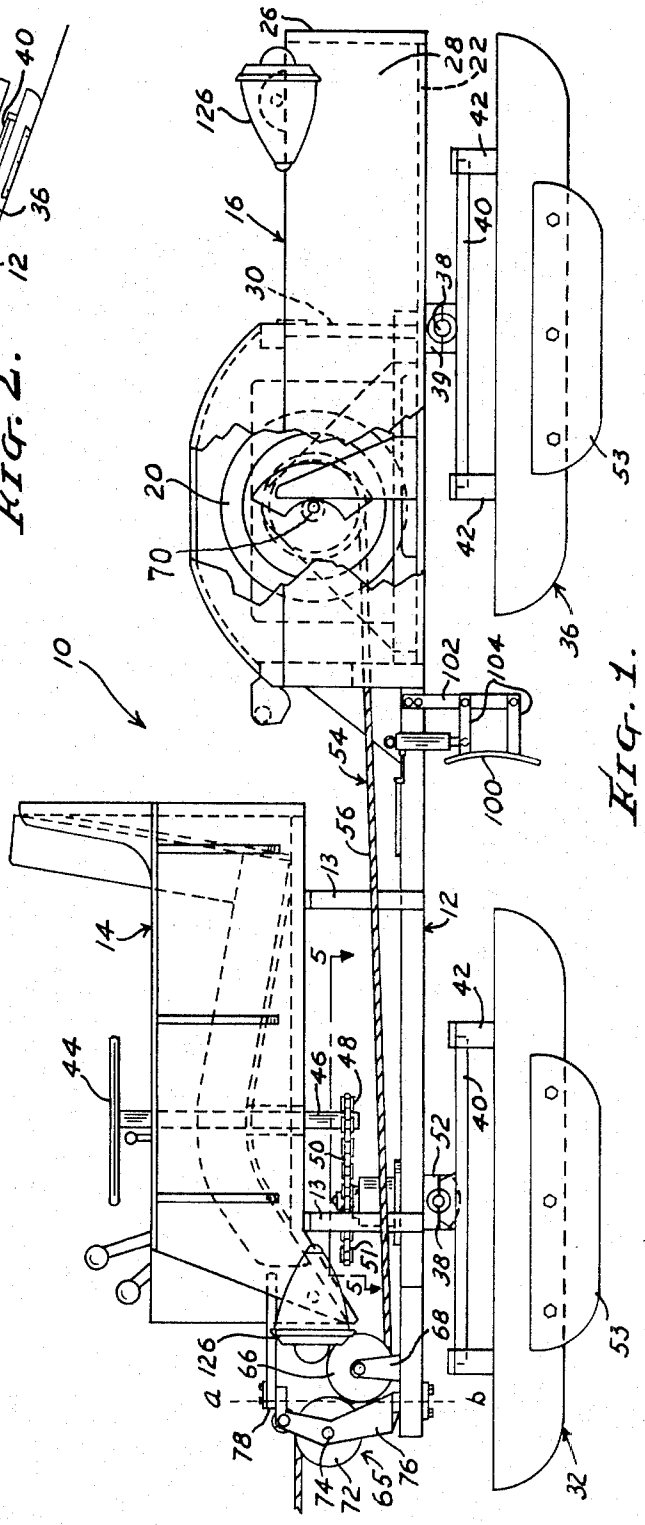

FIG. 1.

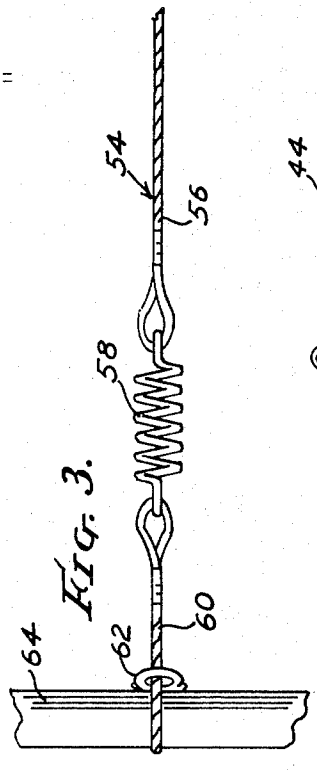

FIG. 3.

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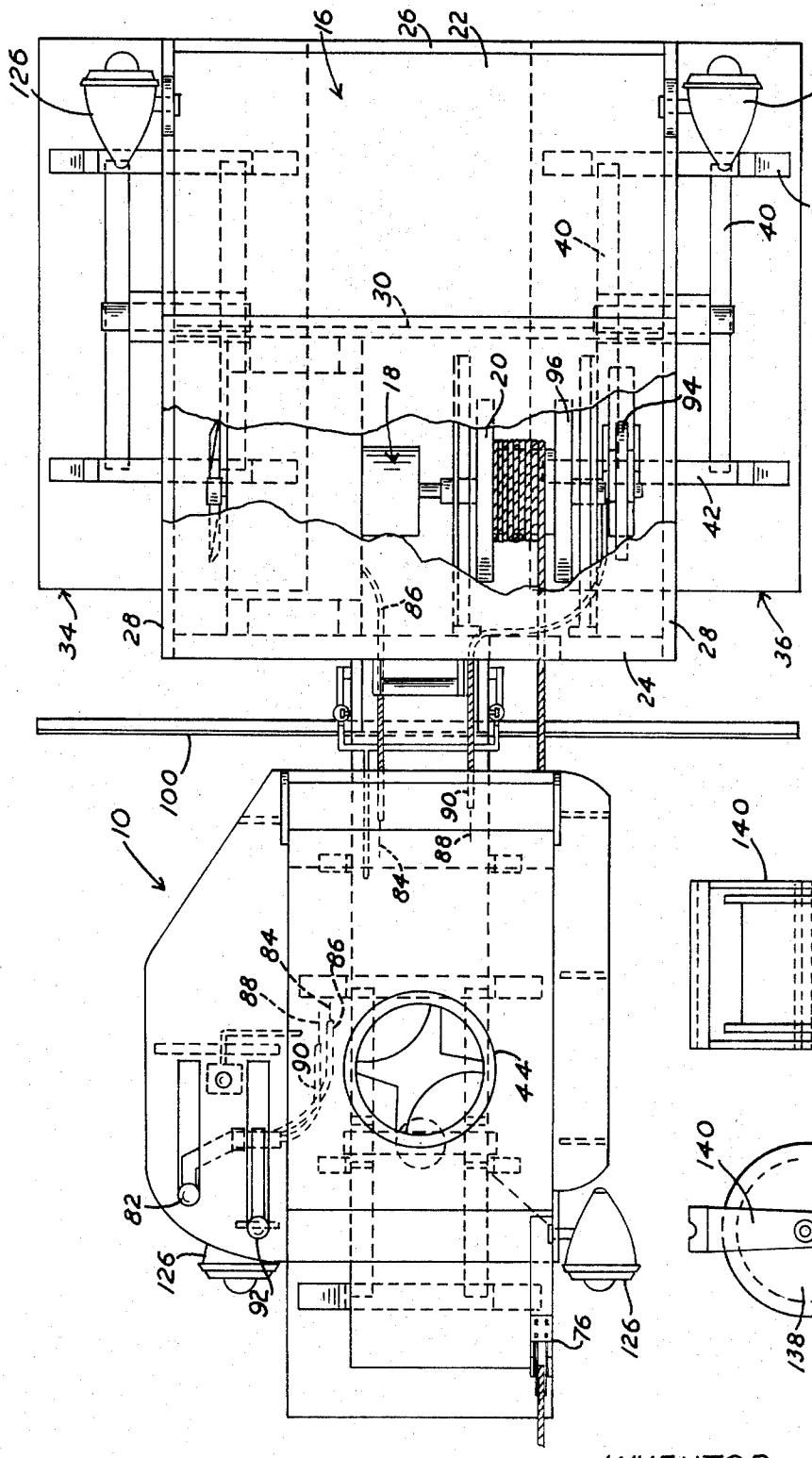


FIG. 4.




FIG. 10.




FIG. 9.

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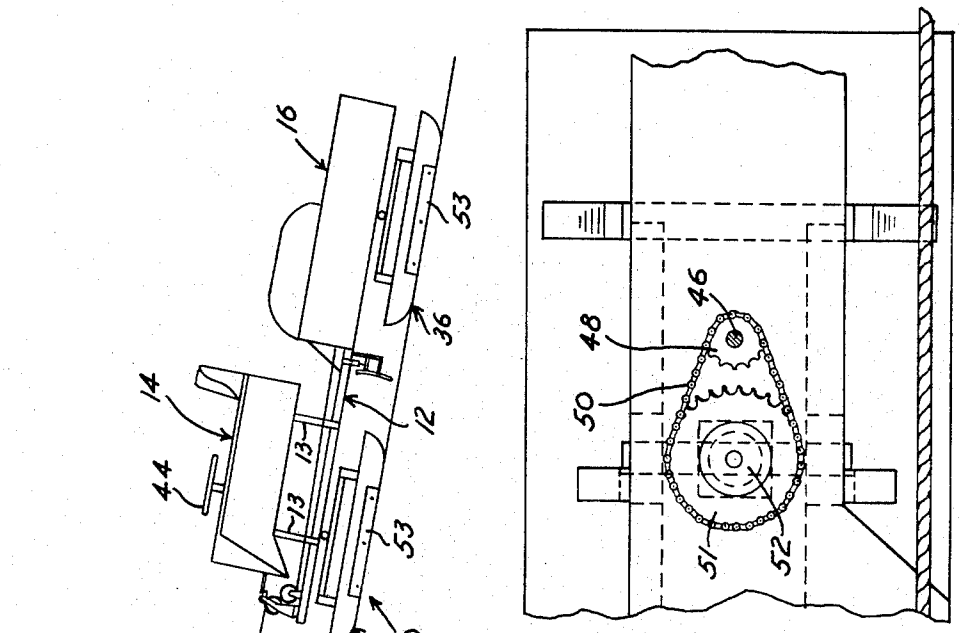


Fig. 5.

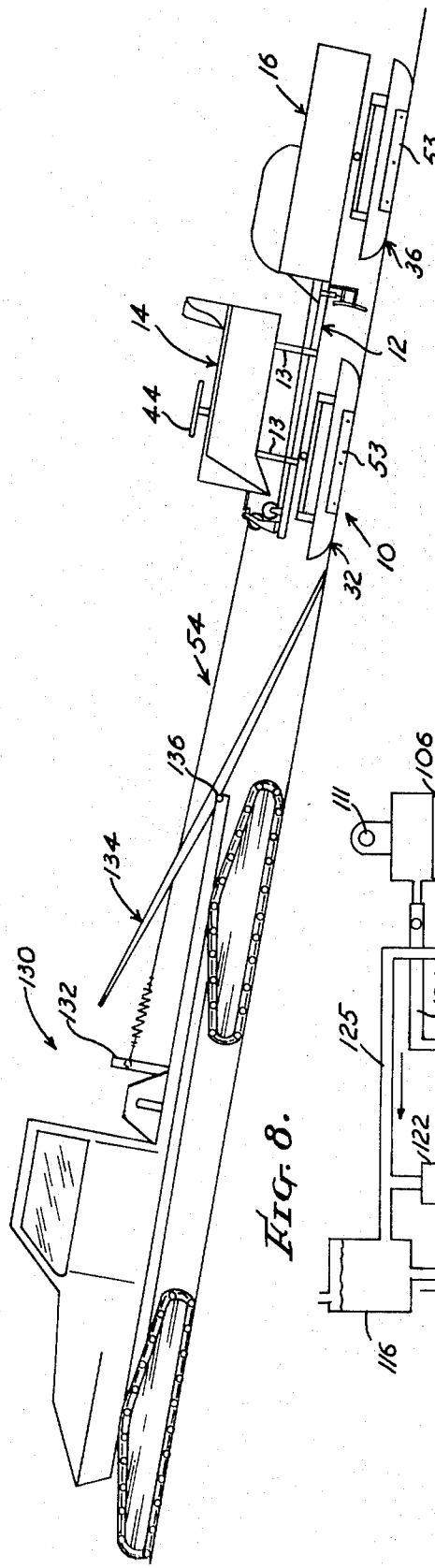


Fig. 8.

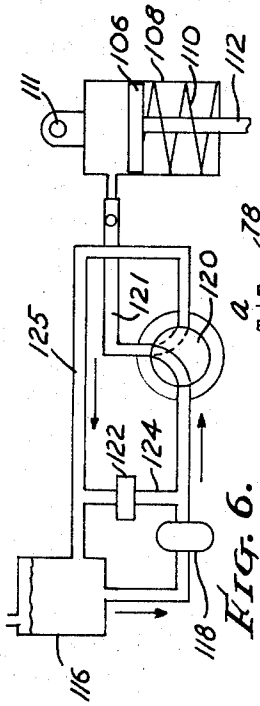


Fig. 6.

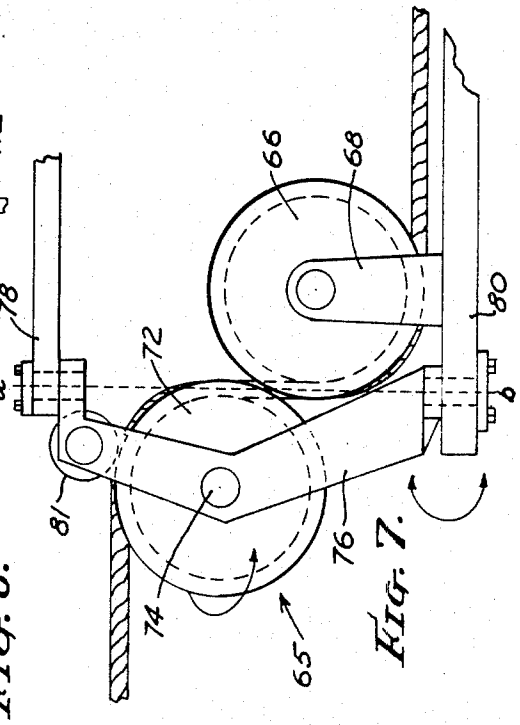


Fig. 7.

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# WINCH CARRYING SNOW GROOMING VEHICLE SUPPORTED BY SKIDS AND POWERED BY AN ANCHORED DRAWLINE

This invention relates to a novel method of grooming ski slopes, and to a novel machine ideally adapted for use in the practicing of the method, whereby the snow is compacted substantially evenly and to a properly limited extent by a simple ironing type of operation, and without any eroding treatment which might chew holes in the snow and possibly expose the bare ground.

I have been associated with the problems of grooming ski slopes from a very early age, and am therefore familiar with all the problems caused by nature, by the skiers, themselves, and by conventional track vehicles used for grooming purposes.

There has never been a snow grooming method of the kind disclosed herein. Neither has there ever been a snow grooming vehicle which glides over the snow to compress and even the snow. There is a desperate need for such a method and for such a vehicle.

In order to understand and appreciate the invention, it is necessary first to know the unique requirements imposed by varying weather and by the rough treatment to which the snow is subjected under conditions of normal use.

Ski slopes are usually developed high in the mountains where snowfalls are likely to be frequent and abundant, but may be highly variable in frequency and depth. Mountain snowfalls are generally light, dry and flocculent in character. In the most satisfactory climates, and at the coldest time of the year, the temperature may remain dependably below the freezing point of water, so that there is no alternate thawing and freezing because of temperature fluctuations. Neither is snow converted to ice through regelation as ski pressure is applied and then relieved.

Conditions are not uniformly favorable, however. A snowfall may be soggy and wet. There may alternate thawing and freezing. The slope is always subjected to punishing treatment. At the turns, moguls are formed which provide jumps for the expert and bone-breakers for the novice.

At high altitudes, winds may be severe, tending to blow light, fluffy, new-fallen snow off the active ski area and into ravines, if the snow is not promptly compacted on the slope to a sufficient extent to hold it in place and to make it serviceable. Such holding in place not only causes the snow to be beneficially retained, but it greatly improves the condition of the retained snow for skiing purposes.

It is not essential that ideal conditions be established and maintained, but since the usual ski slope is generally frequented by users at all levels of capability from experts down to comparative novices, it is desirable that conditions be maintained which will not subject even the novice to serious liability or injury.

When there is a considerable interval between snowfalls, the use of the slope tends to disarrange and to locally compress the snow, producing ruts, ridges, moguls and icy lumps, and providing areas where the snow is so tightly packed, and so nearly approaches the condition of solid ice, that the snow is not as responsive as it should be to normal ski manipulation.

Irregularities created by the skiers greatly increase the surface area of the snow exposed to direct sunlight, thereby increasing the loss of snow through melting and the solidifying of snow through melting followed by freezing. All track vehicles heretofore used for ski slope grooming promote loss of snow through melting because they increase the exposed surface area of the snow.



In the circumstances described, a scraper for breaking up half-frozen snow and for redistributing such snow, and other snow as well, can, from time to time, be very useful, and such a scraper is made available in my novel vehicle. At times, an increased compacting weight may be desirable, and this may be provided by adding dead weight to the vehicle or by carrying passengers on the uphill run.

My novel vehicle desirably includes a rigid body, carried exclusively on three spread out, flat bottomed skids which support the vehicle and its load substantially evenly and over a wide area from the surface of the snow.

Not only should the load be distributed in a substantially even manner during preliminary treatment, but the pressure should be limited in intensity, and this is taken care of by the novel vehicle.

In other words, given substantially the known weight of the vehicle and the limits of its load, the total load bearing area of the skids should be so proportioned to the range of weight that the average pressure per square foot will be confined within definite limits, and this pressure per square foot will be generally or roughly the same throughout all three skids. After the preliminary compacting, the requirements are not so exacting.

In order to avoid the possibility of chewing up the snow or scraping it away right down to the bare ground in spots, all driving and braking traction between the snow and the vehicle is avoided by providing a "dead man" anchorage for the vehicle at the top of the slope, or of a slope section under treatment, a draw-line connectible to the anchorage, and a motor driven winch on the vehicle for reeling in and paying out the draw-line.

The use of power driven, vehicle carried, winches in connection with "dead man" anchorages is not broadly new in other and irrelevant operations, but so far as I am aware, it is an absolute novelty in a skid supported vehicle whose very purpose is to utilize the skids for ironing out a vehicle supporting snow surface.

A primary purpose of the invention is to provide a gliding snow compacting vehicle which is steerable by a vehicle riding operator. For steering purposes, the skids are provided with very thin runners or keels of substantial length, which project considerably below the working surfaces of the respective skids but are so narrow that the grooves cut in the snow by them are of negligible width. At the same time the keels have substantial keel plane area and are essential to practical steering. One of the skids, illustratively an uphill, centrally disposed skid, is mounted for movement about a vertical axis, but the others are fixed against transverse movement relative to the frame, so that the angular relation of the keels on the turnable skid to the keels on the fixed skids is definitely under the control of the operator.

The keel equipped skids enable the vehicle to be operated in directions which differ radically from a line drawn directly from the vehicle to the anchorage of the

draw-line. They even enable the vehicle to be lodged at right angles to the direction of the slope, so that the vehicle can be parked on a slope and will remain stationary while the draw-line is transferred from one anchorage to another.

A further advantage of making the vehicle steerable, by making one of the keel equipped skids turnable, is that in case of the draw-line breaking, the vehicle may be prevented from running away wildly by zigzagging the vehicle downhill, or even by turning the vehicle through 180°, thereby causing the vehicle to run uphill for a space to kill the kinetic energy before squaring the vehicle around to a position at right angles to the slope.

A further feature contributing importantly to the steerable feature has to do with the provision of a swivel fair lead for causing the draw-line to wind evenly and regularly onto the winch drum, even when the direction of vehicle travel differs markedly from the direction in which the draw-line extends.

All controls are mounted on the vehicle in a position conveniently accessible to the vehicle riding operator. This is advantageous because the riding operator can see what he is accomplishing. He can retrace a portion of his course or work it again and again whenever he sees that the results are not satisfactory. He can regulate the speed at which the winch winds in the cable when pulling the vehicle uphill. He can regulate a brake to control the rate at which the cable is paid out as the vehicle coasts downhill. The vehicle is equally effective when coasting downhill or when being pulled uphill.

It is important that the winch be carried on the vehicle. If it were located adjacent to the "dead man" at the top of the run, the draw-line would rub against any tree or boulder which it might be wrapped partway around and would soon be worn through. This would involve an important item of expense and would present an intolerable hazard. It would be essential in any circumstances to provide a rider on the vehicle in a position to observe local conditions such as a skier in distress, in order to avoid catastrophic accidents. A vehicle riding operator having the means for managing all controls is essential to sound and economical procedure.

It is a feature that the several skids traverse contiguous paths, so there will not be alternate treated and untreated strips.

While it is important that the several skids compress the snow equally, or nearly so, on the first run over new-fallen snow, the situation is not so critical on subsequent passes. It is feasible, therefore, to carry passengers uphill after one compacting pass over new-fallen snow. Where this detail is of real importance, as on a private estate or at a club of small membership, a modified vehicle generally like the one disclosed herein but of longer and wider design, and having increased tread surfaces may be provided.

Should the brake fail on the downward trip, there should be an alternate means of arresting the vehicle. For this purpose provision is desirably made of a centrifugal clutch for coupling the motor to the winch. The motor is caused to run unconnected and at idling speed as the vehicle travels downhill. With this kind of arrangement the motor can be made active the instant that the vehicle threatens to go out of control simply by advancing the throttle.

There is unlimited variety to the vagaries of nature. In places the ski run may widen considerably, and in places there may be sharp turns. In places, because of such turns the draw-line will wrap partway around a tree. Because of this, it is very important that the winch be located on the vehicle, rather than at the top of the run, so that there will be no rubbing of the draw-line against the tree. The same situation may prevail with respect to boulders.

Where the run broadens it is desirable to work the vehicle up and down in alternate short runs while shifting it laterally until the entire area of interest is covered, rather than to perform a mere series of complete runs in alternation from top to bottom and from bottom to top.

As the vehicle moves uphill, the cable is accumulated on the drum and the vehicle weight is accordingly materially increased, causing the snow to be packed more firmly. This presents no problem because the change is gradual, and there is a considerable range of tolerance between the minimum firmness with which the snow must be packed to retain it in place in a useful and operative condition, and the maximum firmness which is tolerable and useful. It is abrupt and radical changes of contour and of firmness which ought particularly to be avoided.

It is a further object of the invention to provide dependable means for limiting and controlling the rate of downhill coasting of the vehicle. Such means desirably involves winch braking means under the control of the vehicle riding operator, supplemented by a centrifugal clutch for instantaneously connecting the motor drive to the winch drum, in response to a mere speeding up of the constantly running motor.

As the vehicle moves uphill, winding in the draw-line, the radius about which the line is reeled increases, thereby changing the mechanical advantage and increasing the load imposed upon the motor. To offset this, an automatic change gear unit of conventional design is desirably interposed in the transmission line between the motor and the drum for increasing the input-output ratio in response to increasing resistance.

It is very important that the gliding vehicle of the present invention can be made at a fraction of the cost of existing caterpillar tread grooming vehicles.

It is a further important point that my light grooming vehicle, because of its simplicity, can be operated at a fraction of the cost of operation of existing track vehicles. The track vehicles are heavier, are more complex in structure, and have a multiplicity of parts which are subject to breakdown and repair or replacement.

Other objects and advantages will hereinafter appear.

In the drawing forming part of this specification,

FIG. 1 is a view in side elevation of a practical and advantageous snow grooming machine for use on ski slopes which embodies features of the invention;

FIG. 2 is a small scale, more or less diagrammatic view, showing the vehicle of FIG. 1 anchored to an uphill "dead man" through a draw-line which includes a shock absorbing spring;

FIG. 3 is a fragmentary, detail view showing the anchoring and the shock absorbing spring of FIG. 2;

FIG. 4 is a plan view of the vehicle of FIG. 1;

FIG. 5 is a fragmentary view showing a steering transmission detail;

FIG. 6 is a detail, diagrammatic view of an illustrative hydraulic system for setting a snow-shifting scraper bar at various desired heights;

FIG. 7 is a fragmentary view in side elevation showing details of a swiveling fair lead whereby the draw-line is fed evenly and dependably between the "dead man" anchorage and the winch drum;

FIG. 8 is a view showing how a "dead man" equipped snow vehicle may be used either as a "dead man" for anchoring the distal end of the line in special circumstances, or for enabling the grooming vehicle to pull itself onto the snow vehicle for transportation to another slope;

FIG. 9 is a view in side elevation of a roller and bearing unit of a design such that a unit of this kind can, in suitable circumstances, be substituted for each skid; and

FIG. 10 is a view in front elevation of the structure of FIG. 9.

A snow grooming vehicle **10** comprises a long and broad rigid body **12** which extends for substantially the full length of the vehicle and which carries at what will be arbitrarily referred to as the front, or forward end, through a suitable framing which includes upright members **13**, a seat **14** for the operator and suitable manual controls which will be explained as the description proceeds. The body **12** may fixedly support, or form part of, a rear tray member **16** in which a combined internal combustion engine and automatic gear shift transmission unit **18**, a drum or reel **20** and associated parts are fixedly mounted.

The tray **16** desirably includes a floor structure **22**, front and rear upright transverse members **24** and **26**, side members **28**, and a transverse divider **30**.

At the forward or normally uphill end of the vehicle, provision is made of a load bearing skid **32** which glides upon the surface of the snow, applying roughly one-third of the weight of the vehicle and the vehicle carried load to the snow surface. At the rear or normally downhill end of the vehicle, provision is made of two laterally separated load bearing skids **34** and **36**. Only the three skids bear on the snow. They jointly sustain the entire weight of the vehicle from the snow surface and compact the snow through an ironing action, thus performing the principal work for which the vehicle is designed.

The skids **34** and **36** are laterally spaced, are desirably of identical construction, and are mounted without capacity for turning relative to the body, at opposite sides of the vehicle. As seen in FIG. **2** the mounting of the skid **36** includes a transverse axle **38**, bearing means **39** surrounding the axle and unitary with longitudinally extending skid members **40**. The members **40**, through transverse members **42**, are rigidly connected to the skid proper **36**. Thus, the skid **36** is free to rock fore and aft, but it cannot turn about a vertical axis relative to the body of the vehicle. The skid **34** is of the same construction and is identically supported.

As is apparent from the drawing, each skid takes the form of a hollow body having a flat bottom. Each skid is rockable about a transverse axis and is rounded at its forward and rear ends for ready accommodation to variations of snow surface contour, the purpose of the rounding being to avoid gouging of the snow and nosing of the skid into the snow.

The three skids are all alike in physical construction and mounting with this exception, that the skids **34** and **36** cannot be turned relative to the vehicle body about vertical axes, but the skid **32** can be so turned for steering purposes. For good steering the fixity of the skids **34** and **36** is just as important as the controlled rotation of the skid **32**.

As shown in FIG. **4**, the skids **32**, **34** and **36** are of identical dimensions (though this is not an essential requirement). It is important, however, that the skids **34** and **36** should be spaced laterally from one another by a distance not greater than, and desirably somewhat less than, the width of the forward, centrally located skid **32**. With this kind of arrangement, the three skids combined will, when the vehicle is travelling in a straight line, compact the snow along an uninterrupted width equal substantially to the combined widths of the three skids.

Associated with the driver's seat **14** are the several essential controls, one of which is a steering wheel **44** fast on the upper end of a rotatable steering shaft **46**, which shaft has fast on its lower end a relatively small sprocket **48**. The sprocket **48**, through a chain **50**, drives a relatively large sprocket **51**, the latter sprocket being fast on a rotatably mounted member **52** in which the supporting shaft **38** of skid **32** is supported.

Each of the three skids **32**, **34**, **36** has parallel keels **53** affixed to its opposite sides. Each keel is very thin, being desirably only about one-eighth inch thick. As shown, each keel extends for about one-half the length of the skid on which it is carried and extends several inches below the under-surface of the skid. The purpose of the keels is to make the vehicle dependably responsive to the steering wheel. Each keel has a substantial keel plane area which is advantageous for steering purposes, but it is made so thin that the groove which it cuts in the snow will have a negligible effect upon the evenness of the snow surface for skiing purposes.

A draw-line **54** includes a flexible cable **56** which is connected at its outer end, through a shock absorbing spring **58**, to an anchor cable **60**. The cable **60**, as shown, includes a loop at one end through which it is connected to the spring **58** and a snap fastener **62** at the other. As shown in FIG. **3**, the cable **60** is passed around a "dead man" anchorage **64** and is confined in the snap fastener **62**.

For automatically guiding the cable **54** smoothly and regularly onto the winch drum or reel **20**, a swivelling fair lead **65** is provided at the forward extremity of the supporting vehicle body **12**. The fair lead comprises a pulley **66** mounted on the body in fixed standards **68** for rotation abut a fixed, transverse, horizontal axis that extends parallel to the axis **70** of the winch drum. The pulley **66** is mounted far in front of the winch drum but between the ends thereof so that the cable will be caused to wind evenly onto the drum first in one direction lengthwise of the drum and then in the opposite direction.

A terminal pulley **72** is mounted for rotation about a horizontal axis **74** in a swivel frame **76**. The frame **76** is supported with freedom for rotation about a vertical axis in an upper fixed bearing member **78** and a lower fixed bearing member **80**, the axis of rotation being indicated by a line *a–b*. The line *a–b* is, in a sense, always

tangent to the pulley **72** and to the pulley **66** regardless of the direction in which the vehicle is pointed relative to the "dead man," or to a tree or boulder around which the cable may be partially wrapped between the vehicle and the "dead man" anchorage. Actually, the center line of the cable always leaves one of the pulleys along the axial line *a–b* and approaches and feeds onto the other pulley along that line. A small keeper pulley **81** is mounted on the swivel frame **76** for rotation about a horizontal axis parallel to the axis of the terminal pulley **72**. The pulley **81**, which is grooved similarly to the pulley **72**, is substantially tangent to the pulley **72** at or near the top thereof. The draw-line can never be lost by the terminal pulley **72**.

The winch drum **20** is driven from the motor **18** through any suitable gearing (not shown) which may include an automatic change speed gearing suitable to prevent stalling when the slope is steep and the cable **56** has attained a large radius on the drum **20**.

The motor itself is desirably a conventional internal combustion motor which requires no detailed description. The throttle of the motor is operated by remote control from a hand lever **82** which will remain in any position to which it may be operated. The lever is connected through a Bowden wire type of operator which consists of a wire **84** surrounded by a flexible sheath **86**, the sheath being anchored against movement at its opposite ends.

A similar remote control means consisting of a wire **88** housed in a sheath **90** runs from a hand operated lever **92** to a drum brake **94**. In this instance the member **92** is biased by a spring (not shown) to the ineffective forward position in which it it shown in FIG. **4**.

The motor is normally operated at idling speed as the vehicle coasts downhill, in which condition it is unconnected to the winch. Should the brake fail or prove inadequate on the downward journey, a slight speeding up of the motor will quickly make a centrifugal clutch **96** effective to prevent runaway movement and even to reverse the direction of movement if desired. In other words, the centrifugal clutch may serve both for effecting the normal uphill run, and as an auxiliary or emergency brake during the downhill run.

An optionally usable, snow spreading and ice breaking bar **100** is provided behind the skid **32** and in front of the skids **34** and **36**. The bar **100** is carried from the frame **12** through two stationary depending arms **102** and two pairs of parallel links **104**.

The bar is normally maintained in an inactive position as shown. It can be lowered far enough to locate its lower edge several inches below the bottom faces of the skids.

Details of a practical and advantageous hydraulic means for controlling the level at which the bar **100** is set are shown in Flg. **6**, reference being also had to FIGS. **2** and **4**. Two pistons **106**, operable in hydraulic cylinders **108**, are urged upward by springs **110** contained in the lower ends of the respective cylinders. The cylinders are pivotally supported from the frame through stub shafts **111**. Piston rods **112**, rigid with the pistons **106**, extend downward through the lower ends of the cylinders **108** and each rod is pivotally connected at its lower end to the upper link of a pair of the links **104**.

A reservoir **116** furnishes hydraulic fluid to a manually operable pump **118** whereby the fluid is delivered through a manually operable valve **120** and a branching line **121** to the upper ends of the cylinders for forcing the pistons **106** downward against the resistance of the springs **110**. This causes the bar **100** to be depressed to the desired level and to be positively maintained at that level, subject to relief at a predetermined excessive pressure by a relief valve **122** which is located in a by-pass **124**. The valve **120** is shown in its active position in FIG. **6**, and it will be maintained in that position so long as a depressed position of the bar **100** is desired.

When the depression of the bar is no longer wanted, the valve **120** is manually operated clockwise to the dotted line position indicated, permitting the fluid under pressure to be forced out of the cylinders **108** and through a return line **125** to the reservoir **116**. The pump **118** and the valve **120** are desirably located within convenient reach of the operator, so that all control manipulations can be effected from the operator's seat.

The vehicle is desirably equipped with headlights **126** at both of its ends.

The tray **16** can be used for carrying spare fuel, or dead weight, or for carrying passengers uphill. It would not be desirable to carry any substantial weight in the tray during a first pass over new-fallen snow because the vehicle is properly designed for substantially even distribution of pressure on the skids without any substantial weight added other than that of the driver, himself, and a normal fuel load.

In any subsequent treatment of the slope, however, an even distribution of weight is not so critical, and the tray can be used for any of the supplementary purposes hereinbefore referred to.

As a matter of fact, snow which is already firm can in some circumstances bear with advantage the more concentrated pressure of hollow metallic rollers **138** (see FIG. **9**) in place of the skids. The rollers are desirably of the same length as the width of a skid so that they traverse paths which overlap to the same extent as the skid paths. A bearing frame **140** associated with each roller is adapted to be substituted for the lower portions of the split bearings **39**. Each roller is desirably equipped at its ends with thin flanges for steering purposes. In all other respects the vehicle remains unaltered in structure and operation. The rollers serve better than the skids for breaking up lumps and, like the skids, they exert no braking or driving traction on the snow.

While the vehicle described is self-propelled uphill, it is not an "automotive" vehicle in the usual meaning of that term. It cannot be driven from one ski slope to another. Neither can it be used from end to end on a slope which is longer than the available draw-line. The draw-line cannot, of course, be made longer than the available capacity of the winch drum.

At nearly every ski resort some track vehicles are employed. The present vehicle is designed and intended to supersede these vehicles to a material extent. It may also be caused to cooperate usefully with a track vehicle as illustrated in FIG. **8**.

In FIG. **8** a track vehicle **130** is shown as equipped with a "dead man" anchorage **132** to which the draw-

line **54** of the vehicle **10** may be anchored. The track vehicle can readily be moved under its own power to various points on a long slope and parked for "dead man" anchorage.

The particular track vehicle shown is modified in construction, moreover, to provide a tiltable support for the vehicle **10**. This support consists of a platform **134** mounted for rocking movement on the track vehicle about a transverse axis **136**. The left hand end of the platform is divided to accommodate the draw-line **54**. The vehicle **10** can pull itself onto the platform **134** for transportation by the track vehicle to another slope. When the new scene of operations is reached, paying out of the line **54** will enable the vehicle **10** to slide off of the platform. In this new location the track vehicle may be used for anchorage or the draw-line may be transferred to another anchorage.

Ordinarily the track vehicle would transport the vehicle **10** from one"dead man"anchorage to another, so that one track vehicle could be used to service several of my novel vehicles. Even if each of my vehicles were regularly anchored to a track vehicle, however, a great economy would be realized, because the track vehicle has a multiplicity of operating parts, all subject to damage and malfunction. My vehicle is relatively simple, sturdy and dependable, and can be used with very much less operating cost and with much less service and repair cost. The initial cost of my machine is very much less than that of a track vehicle.

I have described what I believe to be the best embodiments of my invention. What I desire to cover by letters patent is set forth in the appended claims.

I claim:

**1**. A steerable, snow grooming vehicle for ski slopes comprising, in combination, a rigid body, and a series of widely spaced skids of large supporting area connected to the body and constituting the sole support therefor, and normally the sole work-effecting instrumentality of the vehicle, said skids including a single, centrally disposed, skid at one end of the vehicle which is rotatively mounted for steering purposes, and two fixed, laterally spaced skids at the opposite end of the vehicle, all of said skids being equipped with very narrow, longitudinally extending, downwardly protruding keels of substantial keel plane area for steering and other control purposes, the construction and arrangement being such that the combined weight of the vehicle and its load is distributed to the skids substantially in proportion to their weight supporting areas, and the spacing and location of the fixed skids relative to one another and to the steerable skid being such that an uninterrupted width of snow is normally compacted substantially evenly at a single pass, equal, substantially, to the combined widths of the skids, and means on the vehicle and connectable with a stationary anchor for adequately controlling the rate of coasting of the vehicle downhill and the rate of pulling of the vehicle uphill, without the exertion of any driving or braking traction between the vehicle and the snow.

**2**. A steerable snow grooming vehicle as set forth in claim **1** in which the skids are rounded at their opposite ends to promote smooth gliding of the skids on the surface of the snow in either the uphill or the downhill direction of travel.

**3**. A steerable snow grooming vehicle as set forth in claim **2** which includes mounting means for each skid constructed and arranged to support the skid for rocking movement about a transverse, horizontal axis located substantially midway of its length.

**4**. A steerable snow grooming vehicle as set forth in claim **3** in which the means for controlling the pulling of the vehicle uphill, and the coasting of the vehicle downhill comprises a draw-line adapted for "dead man" anchorage at the top of a slope section undergoing treatment, a vehicle carried winch upon which the draw-line is adapted to be wound and from which it is adapted to be paid out, a motor for driving the winch to reel in the draw-line, a brake operable on the winch to limit the rate at which the draw-line may be paid out, and means under the control of the operator for steering the vehicle, for adjusting the speed at which the motor drives the vehicle uphill, and for adjusting the speed at which the winch pays out the draw-line as the vehicle coasts downhill.

**5**. A steerable snow grooming vehicle as set forth in claim **4** in which a centrifugal clutch is included in the motor-winch driving connection, whereby the motor can be made instantaneously effective to supplement or replace the braking means if the braking means proves inadequate on the downhill run.

**6**. A steerable snow grooming vehicle as set forth in claim **4** in which the draw-line includes a spring device at its outer end for relieving strain on the draw-line and the vehicle parts when positive or negative acceleration of the vehicle is required.

**7**. A steerable snow grooming vehicle as set forth in claim **4** in which a swivelling fair lead for the draw-line is provided on the vehicle including a first draw-line pulley which is mounted for rotation about a fixed horizontal axis parallel to the winch axis, and is located in line with the winch intermediate the ends thereof and at a substantial distance from the winch, a second, roving draw-line pulley adapted to be pointed by the draw-line toward the "dead man" anchorage or toward any draw-line deflecting obstruction located between the anchorage and said pulley, and a frame supporting the roving pulley for rotation about a horizontal axis, and itself supported for pivotal movement about a vertical axis which is at all times effectively tangent to both pulleys so that the draw-line, regardless of the direction in which it extends, and in which it causes the second pulley to extend with reference to the vehicle, is always in position to direct the draw-line dependably onto the first pulley or to receive the draw-line dependably from the first pulley.

**8**. A steerable snow grooming vehicle as set forth in claim **1** which has a substantial passenger carrying capacity, the construction and arrangement being such that the snow compacted by the vehicle on a downhill run may be further compacted when the downhill path is retraced after taking on passengers for the uphill run.

**9**. A steerable, snow grooming vehicle as set forth in claim **1** which further includes an optionally usable scraper blade that extends for at least the full width of the vehicle, and means for setting and maintaining the blade at different selected levels so that it may remain idle or may dislodge the snow for redistribution, within limits, to any depth desired.

10. The combination of a first steerable, snow grooming vehicle as set forth in claim 2 with a second snow-traversing automotive vehicle of the caterpillar-tread-propelled type, the second vehicle including a "-dead man" hitch to which the draw-line of the first vehicle may be anchored, whereby the second vehicle may, remaining stationary, serve as a "dead man" anchorage for the draw-line of the first vehicle, or may serve to tow the first vehicle to a new location.

11. A combination of first and second vehicles as set forth in claim 10 in which the "dead man" hitch is mounted on a top central portion of the second vehicle, and the second vehicle includes a tiltable platform onto which the first vehicle may pull itself for transportation by the second vehicle to another slope.

* * * * *

# UNITED STATES PATENT OFFICE
# CERTIFICATE OF CORRECTION

Patent No. 3,692,119 Dated September 19, 1972

Inventor(s) Jasper J. Tucker

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the cover sheet "11 Claims, 10 Drawing Figures" should read -- 12 Claims, 10 Drawing Figures --.

Column 1, after the title, insert the following:

-- The method of grooming ski slopes disclosed in this specification is not claimed herein, but it is claimed in my divisional application Serial No. 280,345, filed August 14, 1972 for Method of Grooming Ski Slopes. --

Column 12, after claim 11, insert the following claim:

12. A steerable snow grooming vehicle for ski slopes as set forth in claim 1 in which bearings are provided for the mounting of the skids, and quick detachable means are provided for the mounting of the skids on the bearings, the construction and arrangement being such that the skids may be readily detached for enabling temporary substitution on the bearings of wheels or rollers.

Signed and sealed this 27th day of November 1973.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

RENE D. TEGTMEYER
Acting Commissioner of Patents

FORM PO-1050 (10-69)

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