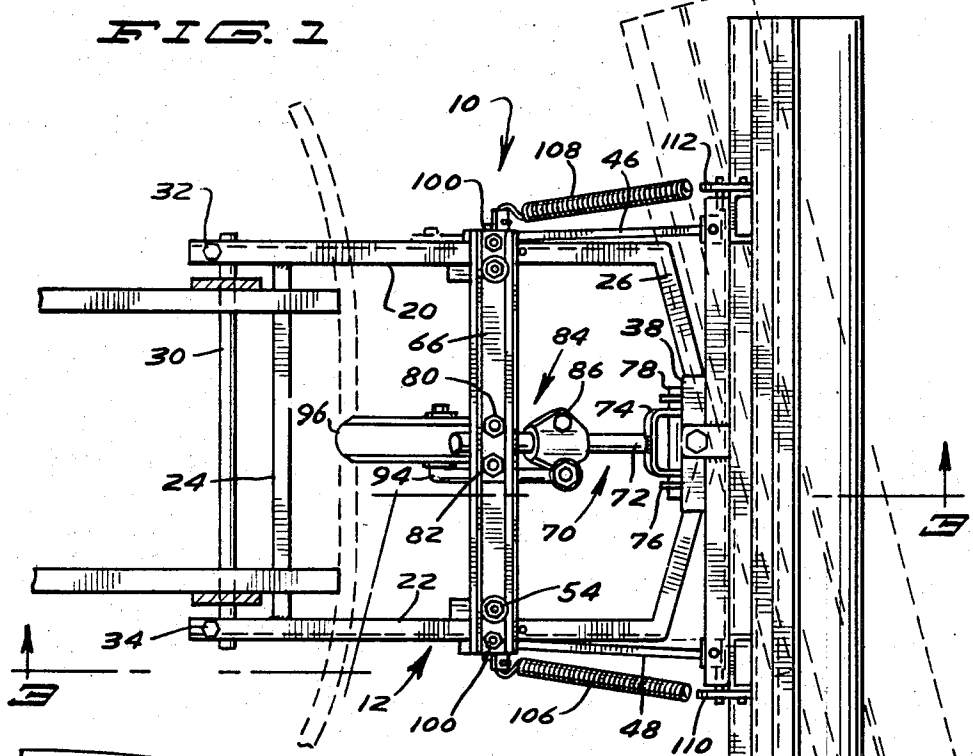
Feb. 11, 1969 J. R. SPITZER 3,426,458

SNOWPLOW CARRIAGE

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FIG. 1



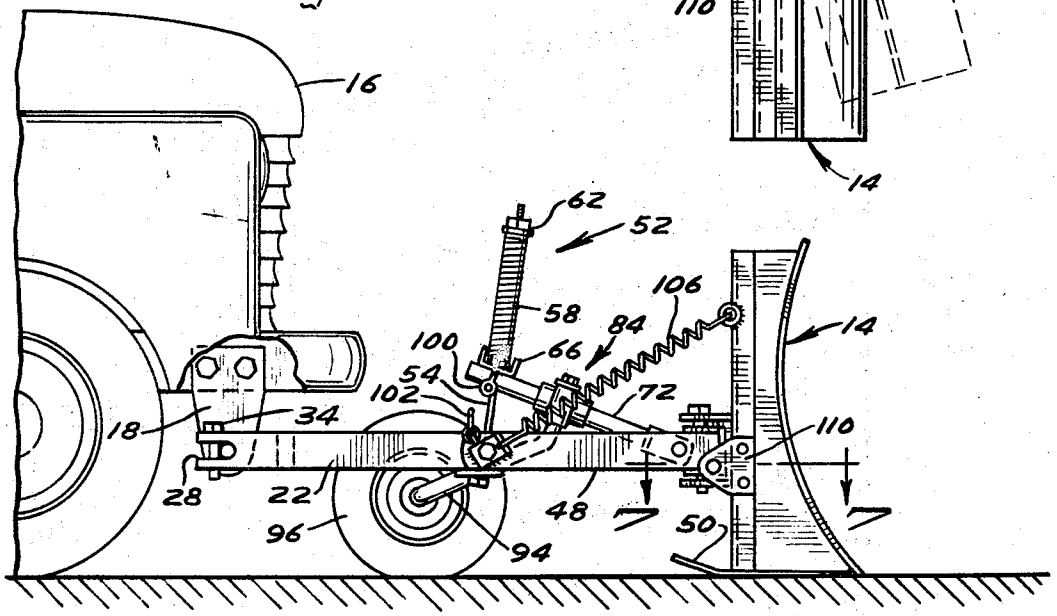


FIG. 2

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SNOWPLOW CARRIAGE

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FIG. 3

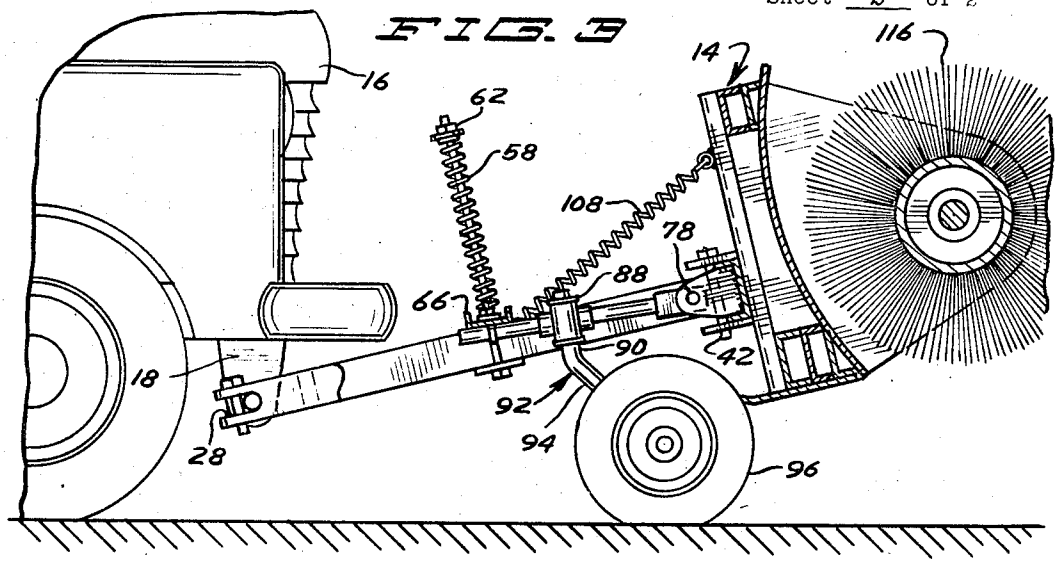
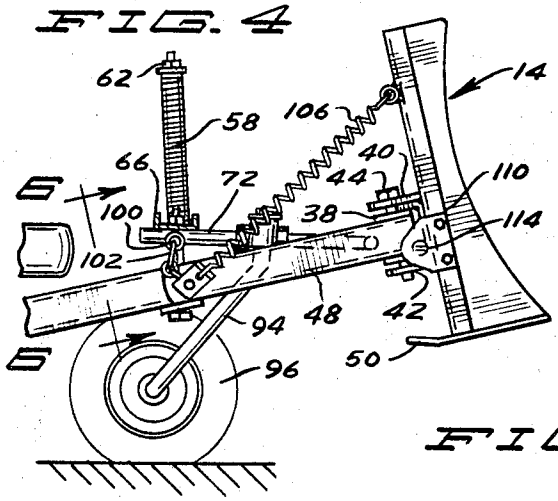


FIG. 4



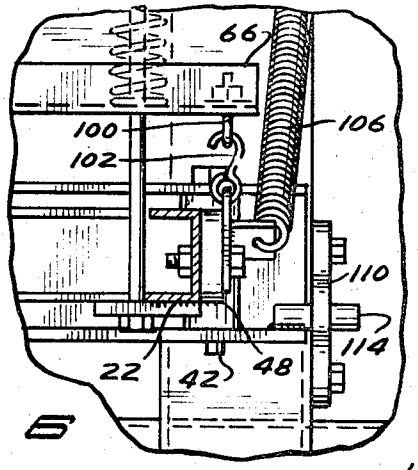


FIG. 6

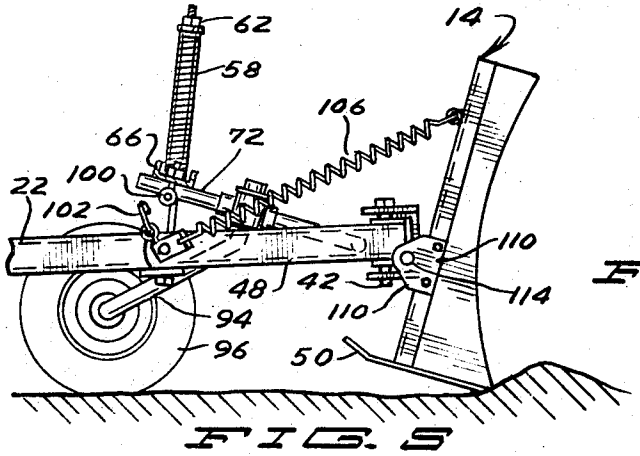


FIG. 5

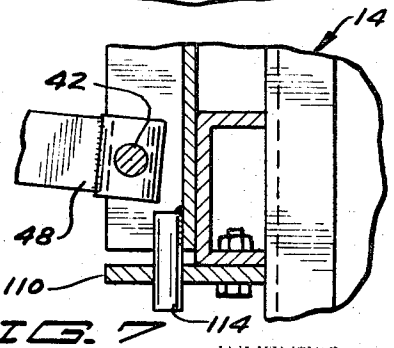


FIG. 7

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3,426,458

SNOWPLOW CARRIAGE

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U.S. Cl. 37—42 10 Claims
Int. Cl. E01h 5/04

ABSTRACT OF THE DISCLOSURE

A surface treating apparatus such as a snowplow, broom carrying mechanism, or the like having a support mechanism therefor which permits the surface treating apparatus to run at a controlled elevation in the forward direction, and upon reversing, the surface treating apparatus will be carried at an elevated disposition. Means are provided for locking the surface treating apparatus in an elevated disposition for purposes of transport.

The present invention relates generally to surface treating apparatus such as a snowplow or the like, and more particularly to an apparatus for supporting, carrying and controlling the elevation of the blade portion of such a surface treating member relative to the surface being treated.

Surface treating apparatus such as snowplows generally require means for mechanically controlling the elevation or attitude of the blade relative to the surface being treated. These units normally require that the blade portion or other working portion of the surface treating apparatus be capable of being raised or lowered relative to the surface by separate mechanism or means, frequently by a hydraulically actuated mechanism or the like. The raising and lowering of any snowplow blade is essential to proper control and operation of the snow removal equipment, and further is desirable for transporting or moving the equipment from one location to another. In equipment designed for typical snow removal operation, for example, the blade is coupled to a propelling type carrier vehicle such as a pickup truck or the like, through a frame linkage. The plow blade together with the frame linkage, normally constitute a forward extension of the vehicle, however, the blade may be mounted to the rear of a propelling vehicle, if desired. The frame is provided with means adapted to raise and lower the blade as required during operation. Since snow is generally pushed to an edge or side of the area being cleared, the blade is dropped to a plowing position during forward travel intervals and to an elevated or raised position during reverse travel intervals. Since the blade may be coupled to either the forward or rear end of the propelling vehicle, the direction of travel has reference to the direction of travel of the blade portion of the mechanism per se, and not necessarily of the propelling vehicle or carrier. Thus, simple up-and-down action of the blade will accommodate most normal snow removal operations, and virtually all snow removal operations of driveways, parking lot areas, and the like.

At the present time, the elevation control of the blade is generally accomplished by hydraulic linkages which are adapted to raise and lower the blade as required for the individual plowing operation. These hydraulic assemblies include many expensive components which are normally relatively costly to install in the equipment. This equipment also introduces frequent time delays which are required while the hydraulic equipment is engaged in the process of either raising or lowering the blade. Thus, prior to pushing snow, for example, the operator must initially lower the blade to a plowing position, after which he may move forwardly with the blade in position to

plow a certain area. He then stops, raises the blade, and moves in reverse to the next starting point or position. In accordance with the present invention, this entire operation is simplified since means are provided for automatically raising and lowering the blade in response to the direction of travel or motion of the surface treating apparatus such as a blade or other treating equipment.

Briefly, the apparatus of the present invention includes a blade or other surface treating equipment to which is secured a frame means which couples the blade to the propelling vehicle, the frame means being adapted to accommodate reciprocal arcuate up and down motion or movement of the blade relative to the vehicle and the surface being treated. In addition, elevation control means are provided in combination with the frame means in order to control elevation or attitude of the blade relative to the surface being treated in response to the direction of movement of the vehicle. The elevation control means includes a castor support member which is coupled to the frame at spaced points, one portion being pivotally attached or coupled to the frame means at a forward location, and a second portion, spaced from said first end and coupled preferably through a resilient member to the frame at a point to the rear of the first point of attachment. A castor wheel is journaled for pivotal rotation about an axis provided in the castor support member. This axis may rock or shift about a perpendicular disposition, depending on the attitude or elevation of the surface treating means. The castor wheel is journaled for rotation of a shaft coupled to a support post or the like, the support post having an offset shank portion which is disposed at an angle to the axis about which the castor assembly pivots. It is a further feature of the assembly, and requisite for operation thereof, that the castor support member be disposed at an angle, preferably an acute angle to the horizontal plane of the frame. The rear position of the castor support member is preferably resiliently coupled to the frame means, the coupling being disposed at a point intermediate the length of the frame means and rearwardly of the point where the other end of the castor support member is secured to the frame. Therefore, when in the forward traveling direction. the castor trails the blade by a sufficient distance to provide a distribution of weight which will maintain the base of the blade at an elevation which is substantially at the level of the supporting surface. However, when the unit is being backed, the castor pivots to a second or reverse position which tends to elevate or raise the castor support and provide a distribution of weight which will relieve the forces on the resilient coupling means between the castor support and the frame. The effect, of course, is to raise or elevate the base of the blade from the surface being treated. In order to transport the blade in elevated position, means are provided to releasably lock the castor mounting member to the frame in order to retain the castor support in a generally horizontal disposition with the upper portion of the castor support post disposed generally normal to the plane of the support surface. Thus, in this position the castor is free to pivot about its mounting axis without changing the elevation of the blade and always maintaining the blade in a constant elevated position.

Therefore, it is an object of the present invention to provide an improved means for supporting and transporting surface treating apparatus such as snowplows or the like, the attitude of the surface treating apparatus being determined by the direction of travel over the surface being treated.

It is a further object of the present invention to provide an improved frame means for supporting surface treating apparatus, the frame means including means to which se-

sured an offset castor arrangement may be coupled, the castor arrangement being specifically adapted to lower the surface treating apparatus when moving in a forward direction, and elevate the surface treating apparatus when moving in a reverse direction.

It is yet a further object of the present invention to provide an improved surface treating apparatus having frame support means which includes an offset castor wheel assembly, and which further includes means for locking the castor wheel support to the main frame member, thereby eliminating reciprocatory up-and-down movement of the frame in response to the direction of travel of the assembly.

Other and further objects of the present invention will become apparent to those skilled in the art upon study of the following specification, appended claims, and accompanying drawings, wherein:

FIGURE 1 is a top plan view of a surface treating apparatus in the form of a snowplow prepared in accordance with the present invention, the assembly being shown coupled to the carriage of a propelling vehicle and with the unit being shown in forward moving disposition;

FIGURE 2 is a side elevational view of the apparatus shown in FIGURE 1, with portions of the propelling vehicle being shown broken away;

FIGURE 3 is a side elevational view of the apparatus shown in FIGURE 1, and illustrating, in addition, the mounting of a broom mechanism on the plow blade, and further illustrating the disposition of the assembly when in a rearwardly moving disposition, with a portion being shown in a vertical section taken along the line and in the direction of arrows 3—3 of FIGURE 1;

FIGURE 4 is a detail elevational view of a portion of the plow mechanism, and showing the blade with the frame being locked in elevated transport disposition;

FIGURE 5 is a detail side elevational view of the plow or surface treating apparatus and showing the reaction of the assembly upon striking an immovable object;

FIGURE 6 is a detail vertical sectional view taken along the line and in the direction of the arrows 6—6 of FIGURE 4;

FIGURE 7 is a detail horizontal sectional view taken along the line and in the direction of the arrows 7—7 of FIGURE 2.

In accordance with the preferred modification of the present invention, reference is made to the drawings wherein there is shown a surface treating apparatus in the form of a snowplow generally designated **10** which includes a frame assembly generally designated **12** together with a forwardly disposed blade member shown generally at **14**. The plow assembly **10** is coupled to the forward portion of the chassis or undercarriage of the truck **16**, by means of the bracket **18**, the bracket **18** preferably being secured to the chassis portion of the truck **16** because of the magnitude of the forces which may be encountered during operation of the apparatus.

The frame assembly **12** includes a pair of main side frame members **20** and **22** which extend forwardly of the front of the truck **16** and actually constitute a forward extension thereof. The side members **20** and **22** are joined together by a lateral cross-brace **24** and a front cross-member and mounting bracket member **26**. The rear portion of each of the side frame members **20** and **22** is provided with a bifurcated or other suitable pivot coupling such as is shown at **28**, the bifurcated area being adapted to receive the push-rod **30** therein push-rod **30** being coupled to the chassis **16**. In order to effectively couple the bifurcated area **28** to the rod **30**, vertically disposed locking pins such as the pins **32** and **34** are dropped in place through vertically aligned bores formed in the side frame members **20** and **22**, respectively. This mounting permits vertical arcuate pivotal rotation of the frame about the axis of the rod **30**.

In order to couple the blade **14** to the forward end of the frame member **12**, the front cross-member **26** is provided with a blade mounting in the center thereof. In this mounting assembly, a pair of vertically aligned pin receiving bores are formed in the front cross-member **26**, and in order to provide sufficient strength at this point, a reinforcing member such as is shown at **38** is provided, the reinforcing member also having vertically aligned pin receiving bores therein. The blade member **14** is provided with a pair of flange members **40** and **42** which extend from the rear surface thereof, these flanges having vertically aligned pin receiving bores therein for permitting passage of the pin member **44** through the assembly including the flange members **40** and **42**, the reinforcing member **38**, and the cross-member **26**. This mounting arrangement permits the blade **14** to be pivoted about the axis of the pin **44** in a manner shown in phantom in FIGURE 1. In order to aid in the support, bracing and control of the disposition of the blade member **14** about pin **44**, a pair of lateral struts **46** and **48** are provided. These struts are adapted to engage the side frame members **20** and **22**, and are preferably provided with locking pins or the like for firmly coupling the struts **46** and **48** to the side frame members **20** and **22** respectively at predetermined spaced points therealong. In any disposition of the blade **14**, the struts **46** and **48** are coupled where indicated along the side frame members **20** and **22**, and are adapted to receive and transmit certain of the forces from the blade to the side frame members. At a point intermediate the longitudinal ends of the side frame members **20** and **22**, a transverse or lateral compression spring assembly is provided for relieving a portion of the load of the blade **14** from the base thereof, such as, for example, from the skids **50**. The compression spring assembly such as is shown at **52** includes a pair of substantially vertically disposed rod members **54** and **56** which are adapted to be received within appropriate mounting means, such as for example, holes formed in the side frame members **20** and **22**. The compression spring members **58** and **60** are received concentrically on the threaded rods **54** and **56** respectively, resting on a cross-member **66**, and are adapted to be held under predetermined compressive loads on the rods by means of the threaded nuts **62** and **64**. Thus, depending upon the load desired on the blade member **14** of the assembly, the compressive forces applied to the springs **58** and **50** can be matched to the requirements of the unit. As is conventional, the cross-member **66** is provided between the individual rods **54** and **56**.

Particular attention is now directed to FIGURES 1, 2, and 3 which disclose the operating details of the elevation control means generally designated **70**. The elevation control means **70** has for its primary function, the determination of the attitude of the blade means and frame means relative to the carrier and relative to the direction which the carrier is moving the blade. The elevation control means **70** includes a castor support means comprising an elongated arm member **72** which is pivotally coupled at its forward end by means of its forked assembly or extension **74** to a mating forked assembly **76** secured to the front cross member **26**. The forked assemblies **74** and **76** are provided with horizontally aligned bores for receiving the coupling pin **78** therewithin. It is, of course, necessary that the coupling arrangement formed by the forked assemblies **74** and **76** provide a pivotal coupling between the arm **72** and the front cross-member **26**, the reasons becoming more apparent hereinafter. The opposite end of the elongated arm **72** is coupled to the lateral bracket **66** by suitable means such as a U bolt with a pair of nuts **80** and **82** which firmly retain the periphery of the elongated arm **72**. Intermediate the ends of the elongated arm **72**, there is disposed in clamped relationship therewith, a castor retaining hub or bracket generally designated **84**. This castor hub **84** may be firmly clamped to the arm **72** by any suitable means, such as, for example, by the through-bolt shown at **86**. The castor hub **84** is provided with a castor re-

ceiving sleeve **88** which is adapted to retain the upper shank portion **90** of the offset castor post or castor support arm generally designated **92** as a spindle therein. Suitable bearing means are provided within the sleeve **88** to accommodate the castor post **92** in free pivotal relationship therewithin. At the lower end of the offset shank portion **94** of the castor support arm **92**, the castor wheel **96** is disposed which is journaled for free rotation about an axle shaft or spindle coupled to the lower portion of the castor support arm **92**. It will be observed that the effective length of the support linkage between the axle of the castor wheel **96** and the blade **14** is substantially longer when in the trailing position shown in FIGURES 1 and 2 than when in the opposite disposition shown in FIGURE 3; thus accounting for differences in load distribution on the wheel **96** and the compression springs **56** and **58** when the wheel **96** is shifted between the dispositions shown in FIGURES 1 and 2, and shown in FIGURE 3.

While the support arm **92** is shown in the form of a shaft, it will be appreciated that other conventional arrangements may be utilized as well. For example, the support arm **92** may comprise a pair of parallelly arranged spaced supporting arms disposed on oposite sides of the wheel **96**.

In addition, the elevation control means is provided with a locking mechanism which will permit the assembly to be transported from one location to another in an elevated position. Particular attention is directed to FIGURES 2, 4, 5, and 6 for an illustration of the transport locking means. An eyebolt shown at **100** is disposed immediately above a locking hook **102**, one hook such as the hook **102** being provided for each of the side frame members **20** and **22**. In normal working position each of the hooks **102** is disconnected from its associated eyebolt **100**. However, in order to maintain the blade **14** in an elevated or transport positon, the hooks **102** are coupled to the eyebolts **100** as in FIGURE 4, thus maintaining the elongated arm **72** in substantially horizontal disposition relative to the running surface. When in this disposition, the upper shank portion **90** of the castor support arm **92** is disposed substantially vertically, thus raising the elevation of the blade **14** relative to the vehicle **16**, and thus providing ordinary pivotal or rotational castor operation for the castor assembly **70** upon the running surface. For a more detailed view, attention is directed to FIGURE 6 where the transport locking arrangement including the hook **102** and the eye **100** is shown on a slightly enlarged scale.

In the event that the blade mechanism strikes a relatively immovable object, attention is directed to FIGURE 5 of the drawings wherein the disposition of the blade upon occurrence of such an event is shown. The spring members **106** and **108** which are provided laterally of the plow assembly and are coupled between the side frame members **20** and **22** and a point along the back of the blade assembly **104**. A second pivotal mounting assembly is provided along the back surface of the blade **14**, this including a pair of outwardly extending brackets **110** and **112**, along with the transverse pivot or rocking rod member **114**. Thus, sufficient tension is provided in the individual spring members **106** and **108** to maintain the blade assembly in a normally upright position. This tension is, of course, adapted to be increased to permit the blade to rock about the pivot or rocking rod member **114** whenever a stationary or heavy object is struck by the blade **14**.

Turning now to the operation of the elevation control means, particular attention is directed to FIGURES 2, 3, and 4 wherein this function is illustrated with clarity. In the normal running configuration such as shown in FIGURE 2, the castor wheel **96** and its associated support arm **92** trails the castor hub **84** by virtue of the offset shank **94** provided in the castor support arm **92**. The elongated arm **72** is in a downwardly forwardly sloping disposition, with the pivot axis of the castor hub **84** normal to the axis of the arm **72**. The load distribution on the castor wheel is at a minimum for this assembly when the wheel is in the trailing position as shown in FIGURE 2, the distance between the load provided by the blade **14** and the support provided by the castor wheel **96** being at a maximum when the composite linkage is at its maximum length. This composite linkage includes the forward portion of the elongated arm **72** and the horizontal component of the castor support arm **92**. This situation is different when the castor assumes the reverse configuration shown in FIGURE 3, this being by virtue of the effective shortening of this composite linkage between the blade load and the support provided by the castor wheel **96**. Thus, the load distribution system is significantly different when the castor wheel is in the configuration shown in FIGURE 3, with a greater portion of the load being taken by the castor **96**, and a lesser force being transmitted to the side frame members **20** and **22** through the compressive spring members **58** and **60**. Therefore, when in this position, the blade is elevated by a combination of two factors, the first being the greater elevation achieved by the mechanical pivot motion of the offset castor arrangement, the second being the added elevation achieved by virtue of the expansion of the compressive springs **58** and **60**. Of course, when the structure is in the disposition shown in FIGURE 3, it becomes a simple matter to secure the locking means **100** and **102** together in order to retain the blade in an elevated or transport position.

The disclosure hereinabove has been directed to the use of the blade in the environment of a snowplow. With attention being directed to FIGURE 3, will be observed that the system may be used in combination with other surface treating apparatus. For example, the rotating broom assembly shown in FIGURE 3 illustrates one of these other surface treating apparatus. The broom **116** may, if desired, be rotated by means of a separate power mechanism or drive linkage, not shown, as is conventional in the art.

It will, of course, be understood that various changes may be made in reform, details, arrangements, and relative portions of these parts without actually departing from the scope of the invention set forth in the appended claims.

What is claimed is:

1. In combination with surface treating apparatus:

(a) frame means having a surface treating member at the forward end thereof and frame support means at the other end thereof for coupling said frame means to a carrier device for arcuate pivotal rotation of said frame means about a generally horizontal axis of said frame means extending generally transversely to the longitudinal axis of said frame means;

(b) elevation control means for determining the attitude of said frame means about the horizontal axis of said frame support means, said elevation control means comprising castor mounting means pivotally mounted for swinging movement on said frame means at spaced points along the longitudinal axis thereof, and a castor support arm coupled in depending relationship to said castor mounting means and having a castor wheel journaled for axial rotation adjacent the base thereof for running contact with a supporting surface, said castor support arm having first and second shank portions, the first shank portion being coupled to said castor mounting means and being arranged for pivotal rotation about an axis disposed at an angle intersecting the surface other than a right angle and in spaced relationship to and generally transverse to the horizontal axis of said frame support means, said second shank portion being elongated and extending to the base of said castor support arm and having an axis which is angularly disposed to the axis of said first shank portion and disposed at a substantially obtuse angle thereto.

2. The combination as defined in claim 1 being particularly characterized in that:

(a) said castor mounting means includes an elongated arm having a forward portion coupled to said frame means at a first longitudinal point therealong, and having a rearward portion spaced from said forward portion coupled to said frame means at a point rearwardly of said first longitudinal point, the axis of said elongated arm being inclined downwardly toward the forward end thereof and being disposed at an acute angle to the plane of the supporting surface with said castor wheel disposed in the forward running position, and being disposed generally parallel to the supporting surface with said castor wheel disposed to the reverse running position.

3. The combination as defined in claim 2 being particularly characterized in that said castor mounting means are resiliently coupled to said frame means with resilient means being adapted to permit relative generally vertical movement between said castor mounting means and said frame means.

4. The combination as set forth in claim 2 being particularly characterized in that said surface treating apparatus is a plow blade.

5. The combination as set forth in claim 4 being particularly characterized in that said plow blade is coupled to the frame means at a point adjacent the intersection of the forward end and the central longitudinal axis of said frame means, and is arranged to be adjustably mounted in pivotal relationship about a substantially vertical axis through said coupling point.

6. The combination as defined in claim 3 being particularly characterized in that locking means are provided for securing said castor mounting means to said frame means with releasable coupling means, said locking means being arranged to retain said castor mounting means in fixed relationship to the general horizontal axis of said frame means.

7. In combination with surface treating apparatus;

(a) frame means having a surface treating member at the forward end thereof and frame support means at the other end thereof for coupling said frame means to a carrier device for arcuate pivotal rotation of said frame means about a generally horizontal axis of said frame support means, the horizontal axis of said frame support means extending generally transversely to the longitudinal axis of said frame means;

(b) support means adjacent the forward end of said frame means for supporting said surface treating apparatus and frame means along the surface to be treated,

(c) elevation control means for determining the attitude of said frame means about the horizontal axis of said frame support means, said elevation control means comprising an elongated arm coupled to said frame means at spaced points along the longitudinal axis thereof and including a forward mounting point and a second mounting point disposed rearwardly of said forward mounting point,

(d) resilient coupling means for coupling said second point of said elongated arm to said frame means, the resilient coupling means being adapted to permit relative generally vertical arcuate pivotal movement between said elongated arm and said frame means, and about said forward mounting point,

(e) locking means for engaging said elongated arm in fixed pivotal relationship with said frame means, and

(f) a castor support arm journaled in depending pivotal relationship to said elongated arm and having a castor wheel journaled for axial rotation adjacent the base thereof and in running contact with said surface to be treated, said support arm having first and second shank portions, the first shank portion being coupled to said elongated arm and being arranged for pivotal rotation about an axis disposed in spaced relationship and generally transverse to the horizontal axis of said frame support means, said second shank portion extending to the base of said castor support post and having an axis which is angularly disposed to the axis of said first shank portion at a substantially obtuse angle thereto; the arrangement being such that when said locking means are engaged, the axis of said first shank portion is generally perpendicular to the plane of the surface being treated.

8. The combination as defined in claim 7 being particularly characterized in that said elongated arm is disposed at an acute angle to the axis of said frame means.

9. The combination as defined in claim 8 being particularly characterized in that the forward end of said elongated arm is pivotally coupled to a forward end portion of said frame.

10. The combination as defined in claim 7 being particularly characterized in that when said castor wheel is in the reverse castor traveling direction, the axis of said first shank portion is generally normal to the plane of the surface being treated.

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