March 29, 1966 W. W. KEUSDER 3,242,995

SCARIFIER ARRANGEMENT

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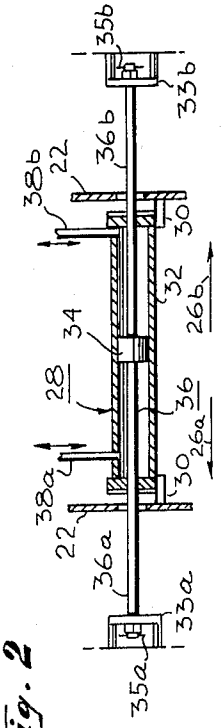


Fig. 2

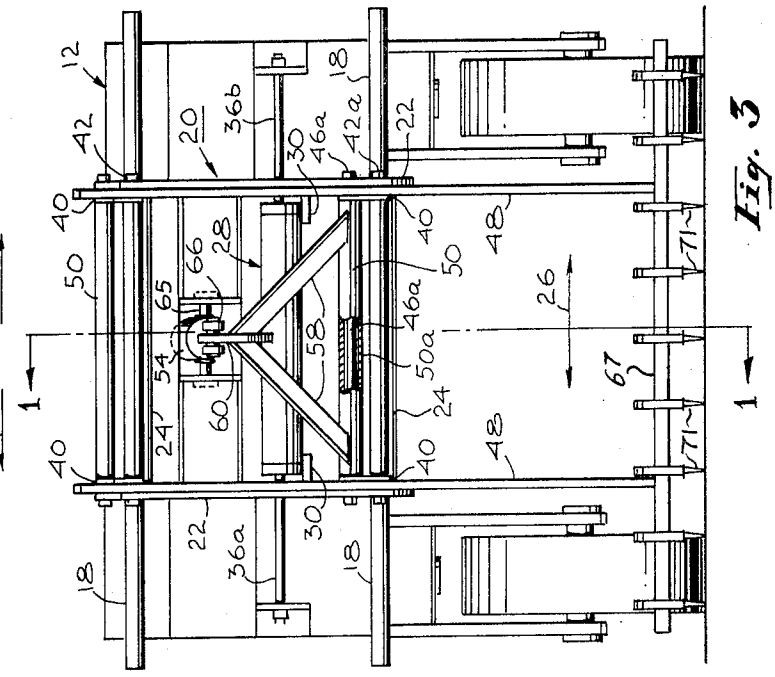


Fig. 3

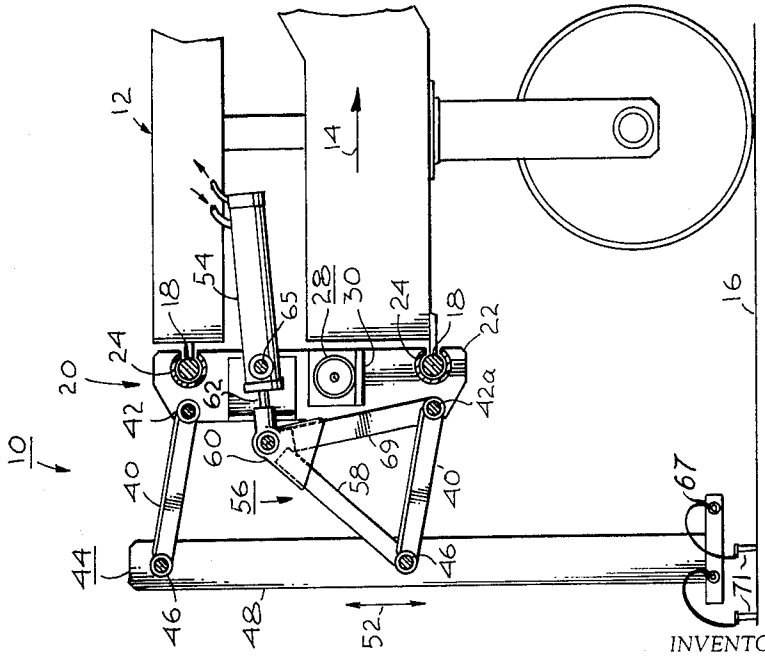


Fig. 1

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SCARIFIER ARRANGEMENT

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Fig. 5

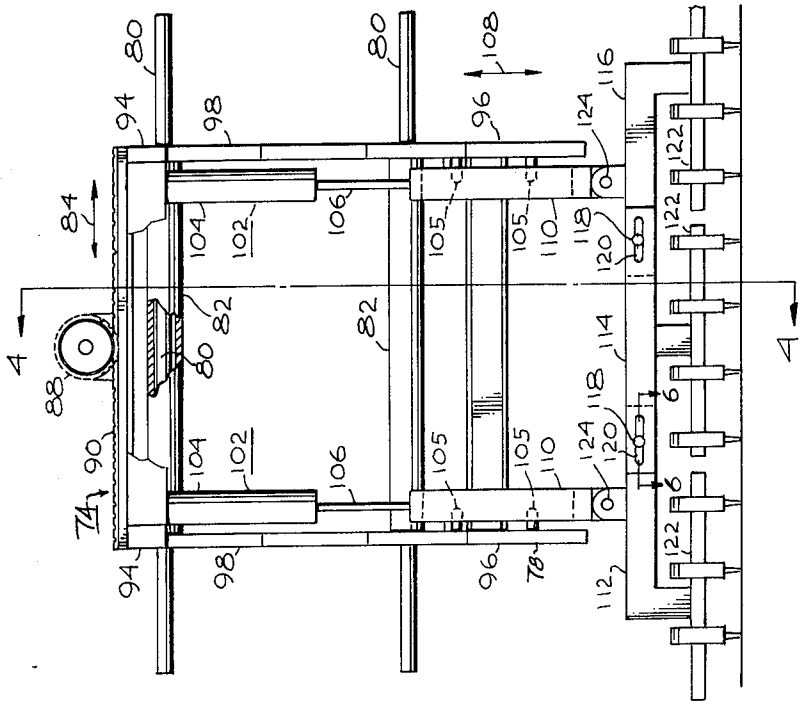


Fig. 4

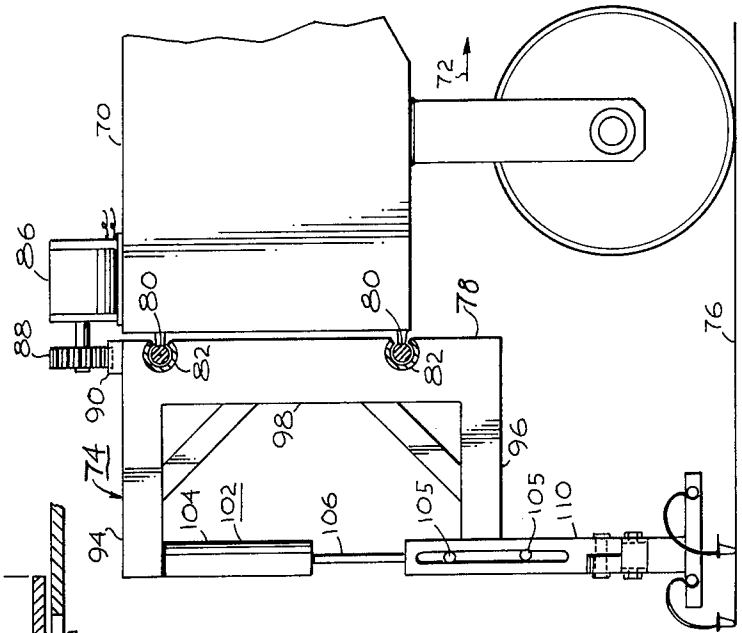
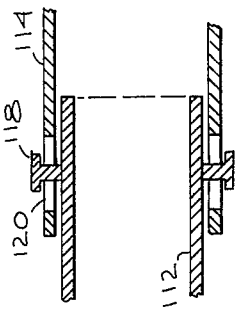


Fig. 6



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SCARIFIER ARRANGEMENT

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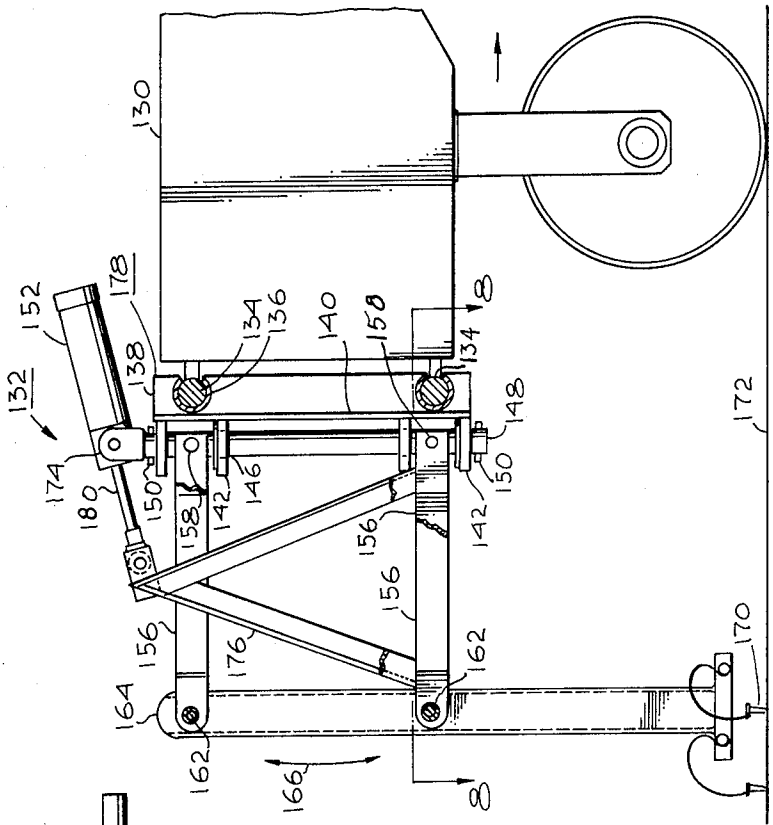


Fig. 7

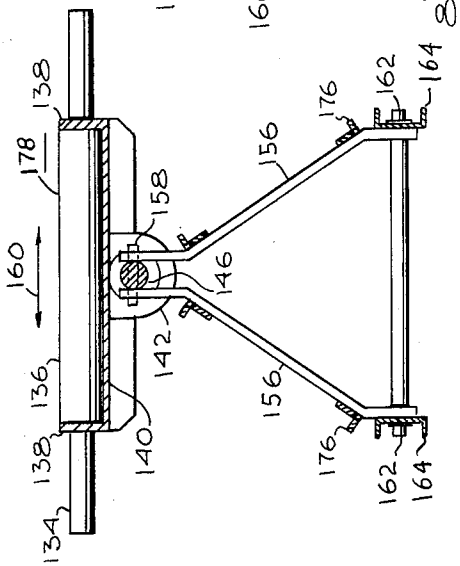


Fig. 8

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3,242,995

SCARIFIER ARRANGEMENT

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Filed June 27, 1963, Ser. No. 291,111
7 Claims. (Cl. 172—462)

This invention relates to grooving and mixing machines, and more particularly, to an improved scarifier forming part of or for use with mobile road working vehicles to provide scarification of, for example, an asphalt pavement roadway.

In many road working operations it is often necessary to scarify the roadway as part of the over-all construction and maintenance procedures required thereon. For example, hot scarification is often required when reconditioning an asphalt pavement roadway having a surface layer of asphalt concrete. In such an operation, the surface layer of asphalt concrete is first heated and then scarified to provide an in-place mixing of the constituents of the asphalt concrete surface layer. The scarification generally comprises making a plurality of grooves in the roadway by a toothed member that not only provides the above-mentioned grooves, but also mixes together the portions of the asphalt concrete surface layer to the depth of scarification. Such hot scarification may be followed by further treatment of the roadway such as application of the reconditioning additive, resurfacing with new asphalt concrete, and compacting.

Cold scarification of asphalt concrete surface layers of an asphalt pavement roadway is also utilized, primarily where a mobile pug mill is incorporated as part of the road-working machinery. This type of scarification breaks up the asphalt concrete surface layer into a plurality of comparatively small segments which are introduced into a mobile pug mill where they are ground and remixed before redepositing on the roadway surface.

In other applications, such as windrowing compost and combing surface areas of, for example, open mines, to accelerate surface drying, arrangements are often utilized to provide both a plurality of grooves to a preselected depth as well as mixing of the constituents.

Scarifiers utilized in the past in both hot and cold scarification as well as prior windrowing and combing arrangements have not always proven to be completely satisfactory. For example, in hot scarification, the scarifier is often coupled to the mobile vehicle containing the furnace hood that provides the heating of the surface to be scarified. Such hoods often may be laterally side shifted with respect to the direction of traverse of the vehicle, and, to provide proper scarification of the surface, the scarifier should also have the capability of being side shifted for alignment with the hood so that scarification takes place in the surface heated by the hood. Also, it is often desirable in scarification that the angle of incidence of the tooth members performing the scarification be substantially constant with respect to the plane of the surface being scarified regardless of the depth of scarifiication that is desired. It is generally preferred that the depth of scarification be constant across the width of the scarifier, regardless of vertical irregularities, such as a crowned roadway provides. Further, it is often necessary to raise and lower the scarifier with respect to the roadway surface so that the depth of scarification may be controlled and the scarifier lifted to avoid obstacles such as rocks, railway tracks, and the like.

The scarifiers utilized in the past have not always been able to achieve these desiderata. More particularly, the prior art scarifiers have been comparatively fixed with respect to lateral shifting. Also, they have generally been raised and lowered in a vertical plane in arcuate

paths that vary the angle of incidence of the tooth members with respect to the roadway, depending upon the depth of scarification. No scarifier utilized in the past has been, according to the best of applicant's knowledge, capable of providing substantially uniform depth of scarification on a crowned or other irregular or non-coplanar surfaced roadway.

Accordingly, it is an object of applicant's invention to provide an improved surface grooving and mixing arrangement.

It is another object of applicant's invention herein to provide a surface grooving and mixing arrangement that may be laterally shifted.

It is another object of applicant's invention to provide an improved scarifier wherein the tooth members thereof may be maintained at substantially a constant angle of incidence with respect to the surface to be scarified, independently of the depth of scarification desired.

It is yet another object of applicant's invention to provide a scarifier that will track the mobile vehicle pulling the scarifier along the surface.

It is another object of applicant's invention to provide a scarifier that scarifies to a preselected depth independently of surface irregularities or crowns in the surface to be scarified.

The above and other objects are achieved according to the broad aspects of applicant's invention by providing a scarifier that is slidingly coupled to the back end of a mobile vehicle, which vehicle pulls the scarifier over the surface to be scarified. The scarifier may be side shifted laterally of the direction of travel of the vehicle on the sliding mounting of the scarifier on the vehicle by means of, for example, a hydraulic actuator. This permits lateral shifting of the scarifier so that it may closely follow the preselected heated path of a hood that may be carried on the mobile vehicle for heating the surface to be scarified.

The scarifier head which comprises a plurality of tooth members adapted to engage the surface to be scarified and to provide scarification thereof is coupled to a bottom portion of a frame member that is pivotally coupled to the portion of the scarifier slidingly coupled to the mobile vehicle. The pivotal coupling of the frame member allows vertical positioning of the scarifier head with respect to the surface to be scarified and it may be accomplished, for example, by a hydraulic actuator. In the preferred embodiment of applicant's invention, a parallel four-bar linkage is provided for the vertical movement of the scarifier head so that the preselected angle of incidence of the tooth members with respect to the roadway is maintained regardless of the elevational differences between the tooth members and the roadway or the depth of scarification selected.

In another embodiment of applicant's invention the scarifier head comprising the tooth members for scarification of a surface to be scarified is pivotally coupled to the frame member and movably connected to adjacent scarifying heads to allow relative motion in a vertical plane thereof so that the tooth members in the scarifier head may conform, in segments, to a crowned or irregular surface road.

The above and other embodiments of applicant's invention are explained in more detail in the following description, taken together with the accompanying drawings, wherein similar reference characters refer to similar elements throughout, and in which:

FIGURES 1, 2 and 3 illustrate one embodiment of applicant's invention;

FIGURES 4, 5 and 6 illustrate another embodiment of applicant's invention; and

FIGURES 7 and 8 illustrate another embodiment of applicant's invention.

Referring now to FIGURES 1, 2 and 3, there is shown the structure associated with one embodiment of applicant's invention. In this embodiment, a scarifier, generally designated **10**, is coupled to a mobile vehicle **12** adapted to pull the scarifier in the direction of the arrow **14** over a surface **16** that is to be scarified.

The mobile vehicle **12** may be of any type desired. For example, in road-working equipment it may be similar to the mobile surface heater described in copending application Serial No. 291,110 filed on June 27, 1963, or may be of any type of machine. Where hot scarification is being performed, however, applicant prefers that the scarifier **10** be coupled directly to the mobile vehicle, that includes the furnace hood for heating the surface **16** so that cooling of the surface **16** does not occur prior to scarification. However, where cold scarification is desired, the mobile vehicle **12** may be of any variety. In addition, it will be appreciated that applicant's improved scarifier may be utilized not only in road-working applications, but in any other applications where it is desired to provide a plurality of scarifications in a surface **16**.

A pair of shafts **18** are coupled to the mobile vehicle **12** at the rear thereof and slidingly support the scarifier **10** thereon. The scarifier **10** has a first frame, generally designated **20**, comprising a pair of vertically-disposed support members **22** and transversely extending sleeve members **24** coupled to the vertically disposed support members **22** and engaging the transversely-disposed shaft members **18**. The sleeve members **24** provide not only lateral and vertical rigidity to the first frame **20** but also slidingly retain the scarifier **10** on the transversely-disposed shafts **18**.

Lateral shifting of the scarifier **10** in the direction indicated by the arrow **26** is achieved by utilization of the hydraulic actuator **28**. The hydraulic actuator **28** is illustrated in greater detail in FIGURE 2. As shown thereon, the hydraulic actuator **28** is coupled to the vertical support members **22** by angle supports **30**. The angle supports **30** are rigidly coupled to the cylinder **32** of hydraulic actuator **28**. Thus, the cylinder **32** is rigidly coupled to the first frame **20**. A piston **34** is contained within the cylinder **32** and a shaft member **36** is coupled to the piston **34** and extends from cylinder **32** from both ends thereof. The portions **36***a* and **36***b* of the shaft **36** are slidingly retained in brackets **33***a* and **33***b* of the mobile vehicle **12** by stops **35***a* and **35***b*, respectively.

Ports are provided on both sides of the piston **34**, as for example ports **38***a* and **38***b* for inlet and discharge of hydraulic fluid. When pressurized hydraulic oil, for example, is fed into the hydraulic actuator **28** through port **38***a*, the scarifier **10** is shifted laterally in the direction of the arrow **26***a* since the piston is coupled through the shaft portion **36***a* to the mobile vehicle **12** by engagement of stop **35***a* with bracket **33***a*. Similarly, when pressurized hydraulic oil is fed into the hydraulic actuator **28** through port **38***b*, the scarifier **10** is laterally shifted with respect to the mobile vehicle **12** in the direction of the arrow **26***b* since stop **35***b* engages bracket **33***b*. This double shafted hydraulic actuator arrangement is preferred by applicant since regardless of the directions of side shifting of the scarifier **10**, a portion of the shaft **36** is maintained in tension and neither portion **36***a* nor **36***b* is subjected to compressive forces which might tend to distort them. The hydraulic actuator **28** may be of conventional design such as Parker-Hannifin hydraulic cylinder, model No. KC 2L–L–19, manufactured by Parker-Hannifin Corporation.

A plurality of link members **40** are pivotally coupled to the first frame **20** by pivot rods **42** and **42***a* arranged in a spaced relationship. A second frame member **44** is pivotally coupled to the link members **40** by pivot rods **46** and **46***a* and comprises a pair of vertically disposed support members **48** rotatably coupled to tube members **50** and **50***a* through which the pivot rods **46** are carried. The first frame **20**, the link members **40** and the second frame **44** comprise a parallel four-bar linkage assembly such that vertical movement of the second frame **44** with respect to the first frame **20** maintains the second frame **44** substantially parallel to the first frame **20**.

The second frame **44** is moved vertically toward and away from the surface to be scarified **16**, in a direction of the arrow **52** by the hydraulic actuator **54** pivotally coupled to an A-frame **56**. The A-frame **56** comprises side bars **58** coupled, at their apex **60**, to a fork **64** engaging the shaft **62** of hydraulic actuator **54**.

The forward side bars **58** of the A-frame **56** are coupled to the lower tube member **50***a* of the second frame **44**. A pair of rear support arms **69** of the A-frame **56** are rotatably mounted on the lower pivot rod **42***a* of the first frame **20** and are coupled to side bars **58** at the apex **60**.

Extension of the shaft **62** from the hydraulic actuator **54** lowers the second frame **44** toward the surface **16**. Similarly, retraction of the shaft **62** into the hydraulic actuator **54** raises the second frame **44** away from the surface **16**. The hydraulic actuator **54** is pivotally coupled for vertical rotational movement to the first frame **20** by trunnion mount **65** so that raising and lowering of the second frame **44** may be achieved regardless of the position of lateral shifting of the scarifier **10** with respect to the mobile vehicle **12**.

It will be appreciated that since the first frame **20**, the link members **40** and the second frame **44** comprise a four-bar linkage, the second frame **44** moves substantially parallel to the first frame **20** during vertical movement of the second frame **44** by the hydraulic actuator **54**. Thus, while the second frame **44** may be moved inwardly and outwardly with respect to the first frame **20**, regardless of the spatial separation of the second frame **44** from the first frame **20**, it is retained in substantially parallel relationship thereto.

A scarifier head **67** is coupled to the second frame **44** and moves therewith in both vertical and lateral directions. The scarifier head **67** has a plurality of teeth **71** that engage the surface **16** to provide scarification thereof.

FIGURES 4, 5, and 6 illustrate the structure associated with another embodiment of applicant's improved scarifier. As shown thereon, there is a mobile vehicle **70** adapted to move in the direction of arrow **72** to pull the scarifier, generally designated **74**, across a surface to be scarified **76**. The mobile vehicle **70** may be similar to the mobile vehicle **10** described in the above embodiment of applicant's invention. A first frame **78** of the scarifier **74** is slidingly mounted on shafts **80** of the mobile vehicle **70** by the sleeve members **82** in sliding engagement therewith, and the sleeve members **82** are coupled to vertical supports **98**. The first frame **78** is adapted to move laterally of the mobile vehicle **70** in the directions indicated by the arrow **84**.

In this embodiment lateral movement of the scarifier **74** is achieved by utilization of an electric motor **86** driving a pinion **88** engaging a track **90** coupled to the first frame **78**.

The first frame **78** has upper arms **94** and lower arms **96** coupled to vertical supports **98** and extending away from the vehicle **70**.

A pair of hydraulic actuators **102**, each comprising a cylinder **104** and a shaft **106** have the cylinders **104** thereof secured to the upper arms **94** of first frame **78** in spaced-apart relationship.

The shafts **106** of the hydraulic actuators **102** are coupled to a second frame **110** and the second frame **110** is raised and lowered with respect to the surface **76** to be scarified by the hydraulic actuators **102** in the direction of the arrow **108** and is stabilized for vertical movement by pins **105** of arms **96** engaging slots **107** in second frame **110**.

In this embodiment, applicant provides a segmented scarifier head. It will be appreciated that the segmented scarifier head illustrated in this embodiment could equally

well be used in the other embodiments of applicant's invention described herein. Similarly, the electric motor **86** utilized to laterally move the scarifier **74** could also be utilized in the other embodiments of applicant's invention described herein.

The segmented scarifier head comprises a plurality of load bars **112**, **114**, and **116**. Each of the load bars is movably coupled to the adjacent load bar. That is, outermost load bars **112** and **116** are movably coupled to the inner load bar **114**. This arrangement applicant has found particularly useful in providing scarification on crowned roads and similar vertically irregular surfaces.

The inner load bar **114** is thus seen to be "free-floating" with respect to the second frame **110** through its movable coupling to the outer load bars **112** and **116**. The coupling of the outer load bars **112** and **116** to the inner load bar **114** is accomplished by means of pins **118** coupled to each of the load bars **112** and **116** and engaging slots **120** in the inner load bar **114** as illustrated in more retail in FIGURE 6. The length and shape of the slots **120** determine the amount of relative movement between the outer load bars **112** and **116** and the inner load bar **114**, there will be, and the amount of vertical deviation between the scarifier tooth supports **122** coupled to each of the load bars **112**, **114**, and **116**.

Thus the inner load bar **114** may be vertically raised with respect to the outer load bars **112** and **116** and through action of the pin and slot arrangement defined above, the outer load bars **112** and **116** rotate on their pivotal mountings **124** by which they are coupled to the second frame member **110** to achieve the desired crown correction. It will be appreciated that any number of load bars may be utilized in the practice of applicant's invention to provide even finer crown correction that is achieved, for example, with the three load bars illustrated in FIGURE 5.

Applicant has also found that in many scarifying operations, it is desirable to have a scarifier that will track the vehicle that is pulling the scarifier. This embodiment of applicant's invention is illustrated in FIGURES 7 and 8. As shown thereon, a mobile vehicle **130** which may be similar to the mobile vehicles **10** and **70**, described above, has a first frame **178** of a tracking scarifier, generally designated **132**, slidingly coupled thereto on shafts **134** of the mobile vehicle by sleeves **136**. This mounting of the tracking scarifier **132** on the mobile vehicle **130** is similar to the mounting of the scarifier **74** on the mobile vehicle **70** and the scarifier **10** on the mobile vehicle **12** described above.

The sleeves **136** are coupled to a pair of vertically disposed support brackets **138** which are maintained in spaced relationship thereby. A plate **140** is also coupled to the brackets **138** and a pair of shaft supports **142** are coupled to the plate **140** and extend therefrom. The shaft supports **142** have aligned shaft receiving apertures **146** therein for receiving a shaft **148** which is retained therein by stops **150** secured to the shaft **148**. The stops **150** prevent the shaft **148** from separating from the shaft supports **142** during actuation of the hydraulic actuator **152** as described below.

A plurality of links **156** are pivotally coupled for vertical pivotal movement in the shaft **148** by pivot pins **158**. Thus the links **156** are free to rotate on the pivot pins **158** in a vertical plane but rotate with the shaft **148** in horizontal planes and also move translationally in lateral directions as indicated by the arrow **160** with movement of the shaft **148** in lateral directions.

The links **156** are also pivotally coupled to a second frame **164** by pivot pins **162**. The second frame **164**, the shaft **148** and the plurality of links **156** define a parallel four-bar linkage so that vertical movement of the second frame **164** as indicated by the arrow **166** maintains the second frame **164** substantially parallel to the shaft **148**. Thus, the angle of incidence of the tooth members **170** with respect to the surface to be scarified **172** is maintained substantially constant regardless of the vertical positioning of the second frame **164**.

The second frame **164** is raised and lowered with respect to the surface **172** by means of the hydraulic actuator **152** pivotally coupled to a clevis **174** secured to the shaft **148** and rotating therewith. Therefore, the hydraulic actuator **152** rotates in a horizontal plane with rotation of the shaft **148**. The shaft **180** of the hydraulic actuator **152** is pivotally coupled to an A-frame **176** which may be similar to the A-frame **56** described above in connection with the embodiment of applicant's invention shown in FIGURES 1, 2, and 3. The A-frame **176** is in this embodiment, coupled to the lowermost pair of links **156** which are pivotally coupled to both the frame **164** and the shaft **148** by the lowermost pivot pins **162** and **158**, respectively, so that rotation of the A-frame **176** with respect to the frame **164** and the shaft **148** is allowed to provide the vertical positioning of the frame **164** by actuation of hydraulic actuator **152**.

Lateral positioning of the scarifier **132** with respect to the mobile vehicle **130** in the direction of the arrow **160** is achieved, in this embodiment of applicant's invention, by forces acting on the scarifier tooth members **170** in lateral directions as indicated by arrow **160** when the tooth members **170** are engaged in the surface to be scarified **172**. Thus, for example, when the vehicle **130** turns, forces will be acting laterally on the scarifier tooth members **170** as it is dragged through the surface **172** by the vehicle **130**. This initially causes a rotation of the shaft **148** in the shaft supports **142** and the lateral force is then transmitted through the shaft **148** to the shaft supports **142** which moves the frame **178** in lateral directions, as indicated by the arrow **160**. Lateral movement of the first frame **178** will continue until alignment of the first frame **178** and the second frame **164** is achieved so that lateral forces are no longer transmitted therebetween.

The three embodiments of applicant's invention shown herein illustrate some of the many variations and adaptions of applicant's invention. Various features illustrated on one of the three embodiments may, of course, be utilized interchangeably in the others. As noted above, the segmented scarifier head shown on FIGS. 4, 5 and 6 could equally well be utilized in the embodiment shown on FIGS. 1, 2 and 3 and in the embodiment shown on FIGS. 7 and 8.

This concludes the description of applicant's invention herein. It will be appreciated that many modifications and variations of applicant's invention may be achieved by those skilled in the art. Therefore, the following claims are intended to cover all such variations and adaptations falling within the true scope and spirit of applicant's invention.

I claim:

1. An improved scarifier of the type adapted to be moved along a surface to be scarified by a mobile vehicle comprising, in combination:

a first frame member slidingly mounted on said mobile vehicle and adapted to be moved laterally of said vehicle;

means for moving said first frame member laterally of said mobile vehicle;

a second frame member;

a plurality of link members having first ends mounted for pivotal motion with respect to said first frame member and second ends pivotally coupled to said second frame member to permit relative raising and lowering of said second frame member with respect to said first frame member, and said second frame member moving laterally with said lateral movement of said first frame member;

a scarifier head coupled to said second frame member and having tooth members adapted to engage the surface to be scarified;

means coupled to said second frame member for raising and lowering said second frame member relative to first frame member to selectively move said tooth members in engagement with and disengagement from the surface to be scarified; and

means for maintaining said scarifier tooth members in engagement with the surface to be scarified at a preselected force.

2. An improved scarifier comprising, in combination:

a first frame member slidingly mounted on a mobile vehicle for lateral movement thereof relative to the direction of travel of said mobile vehicle;

a first hydraulic actuator for laterally moving said first frame member and comprising a cylinder, a piston in said cylinder and a shaft coupled to said piston and having a first portion extending from a first end of said cylinder and a second portion extending from a second end of said cylinder, said cylinder secured to said first frame member, and said first portion and said second portion of said shaft coupled to the mobile vehicle;

a second frame member;

a plurality of link members pivotally coupled to said first and said second frame members to define therewith a parallel four-bar linkage;

a second hydraulic actuator for raising and lowering said second frame member and comprising a cylinder and a shaft extending therefrom, said cylinder of said second hydraulic actuator pivotally coupled to said first frame member and said shaft of said second actuator pivotally coupled to said second frame member; and

a scarifier head having tooth members adapted to engage a surface to be scarified and coupled to said second frame member whereby raising and lowering said second frame member selectively disengages and engages said scarifier tooth members with said surface to be scarified.

3. An improved scarifier of the type adapted to be moved along a surface to be scarified by a mobile vehicle comprising, in combination:

a first frame member slidingly mounted on a mobile vehicle for horizontal movement relative thereto in directions substantially perpendicular to the direction of travel of the mobile vehicle over the surface to be scarified;

means coupled to said first frame member and to said mobile vehicle for horizontally moving said first frame member;

a second frame member spaced apart from said first frame member and adapted to be moved horizontally with said first frame member and towards and away from the surface to be scarified;

a plurality of link members pivotally coupled to said first frame member and said second frame member and defining a parallel four-bar linkage therewith;

an "A"-frame having the cross-bar thereof pivotally coupled to said second frame member;

a hydraulic actuator comprising a cylinder and a shaft, said cylinder pivotally coupled to said first frame member and said shaft pivotally coupled to the apex of said "A"-frame for raising and lowering said second frame member with respect to said first frame member and substantially parallel thereto;

a scarifier head having a plurality of tooth members for engaging the surface to be scarified; and

means for maintaining said tooth members in engagement with the surface to be scarified at a preselected force.

4. An improved scarifier of the type adapted to be moved along a surface to be scarified by a mobile vehicle comprising, in combination:

a first frame member slidingly mounted on a mobile vehicle for horizontal movement relative thereto in directions substantially perpendicular to the direction of travel of the mobile vehicle over the surface to be scarified;

first motion producing means coupled to said first frame member and said mobile vehicle for horizontally moving said first frame member;

a second frame member having a plurality of transversely-extending load bars pivotally coupled thereto and each of said plurality of load bars movably coupled to the adjacent load bar for relative motion in a vertical plane;

a plurality of scarifier heads, each of said plurality of scarifier heads coupled to one of said load bars for motion in a vertical plane therewith and each of said plurality of scarifier heads having a plurality of tooth members adapted to engage a surface to be scarified; and

second motion producing means coupled to said first frame member and said second frame member for moving said second frame member towards and away from the surface to be scarified to move said tooth members in engagement with and disengagement from the surface to be scarified.

5. An improved scarifier of the type adapted to be moved along a surface to be scarified by a mobile vehicle comprising, in combination:

a first frame member slidingly mounted the back end on a mobile vehicle for horizontal movement relative thereto in directions substantially perpendicular to the direction of travel of the mobile vehicle over the surface to be scarified;

a second frame member having a plurality of transversely-extending load bars pivotally coupled thereto and each of said plurality of load bars movably coupled to the adjacent load bar for relative motion in a vertical plane;

a plurality of scarifier heads, each of said plurality of scarifier heads coupled to one of said load bars for motion in a vertical plane therewith and each of said plurality of scarifier heads having a plurality of tooth members adapted to engage a surface to be scarified; and

motion producing means coupled to said first frame member and said second frame member for moving said second frame member substantially parallel to said first frame member and towards and away from the surface to be scarified to move said tooth members in engagement with and disengagement from the surface to be scarified.

6. An improved scarifier comprising, in combination:

a first frame member slidingly mounted on a mobile vehicle for lateral movement thereof relative to the direction of travel of said mobile vehicle;

a first hydraulic actuator for laterally moving said first frame member and comprising a cylinder, a piston in said cylinder and a shaft coupled to said piston and having a first portion extending from a first end of said cylinder and a second portion extending from a second end of said cylinder, said cylinder secured to said first frame member, and said first portion and said second portion of said shaft secured to the mobile vehicle;

a second frame member having a plurality of transversely-extending load bars pivotally coupled thereto and each of said plurality of load bars movably coupled to the adjacent load bar for motion in a vertical plane;

a plurality of scarifier heads, each of said plurality of scarifier heads coupled to one of said load bars for motion in a vertical plane therewith, each of said plurality of scarifier heads having a plurality of tooth members adapted to engage a surface to be scarified;

a plurality of link members pivotally coupled to said first and said second frame members to define therewith a parallel four-bar linkage; and

a second hydraulic actuator for raising and lowering said second frame member and comprising a cylinder and shaft extending therefrom, said cylinder of said second hydraulic actuator pivotally coupled to said first frame member and said shaft of said second actuator pivotally coupled to said second frame member.

7. An improved scarifier comprising, in combination:

a first frame member slidingly mounted on a mobile vehicle for lateral movement thereof relative to the direction of travel of said mobile vehicle;

a first hydraulic actuator for laterally moving said first frame member and comprising a cylinder, a piston in said cylinder and a shaft coupled to said piston and having a first portion extending from a first end of said cylinder and a second portion extending from a second end of said cylinder, said cylinder secured to said first frame member, and said first portion and said second portion of said shaft secured to the mobile vehicle;

a second frame member;

a plurality of link members pivotally coupled to said first frame member and said second frame member and defining a parallel four-bar linkage therewith;

an "A"-frame having the cross-bar thereof pivotally coupled to said second frame member;

a second hydraulic actuator for raising and lowering said second frame member comprising a cylinder and a shaft, said cylinder pivotally coupled to said first frame member and said shaft pivotally coupled to the apex of said A-frame;

a scarifier head having tooth members adapted to engage a surface to be scarified and coupled to said second frame member whereby raising and lowering said second frame member selectively disengages and engages said scarifier tooth members with said surface to be scarified; and

means for maintaining said tooth members in engagement with the surface to be scarified at a preselected force.

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