United States Patent

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[54] **APPARATUS FOR APPLYING A FLUID SUBSTANCE TO A SURFACE**
8 Claims, 13 Drawing Figs.

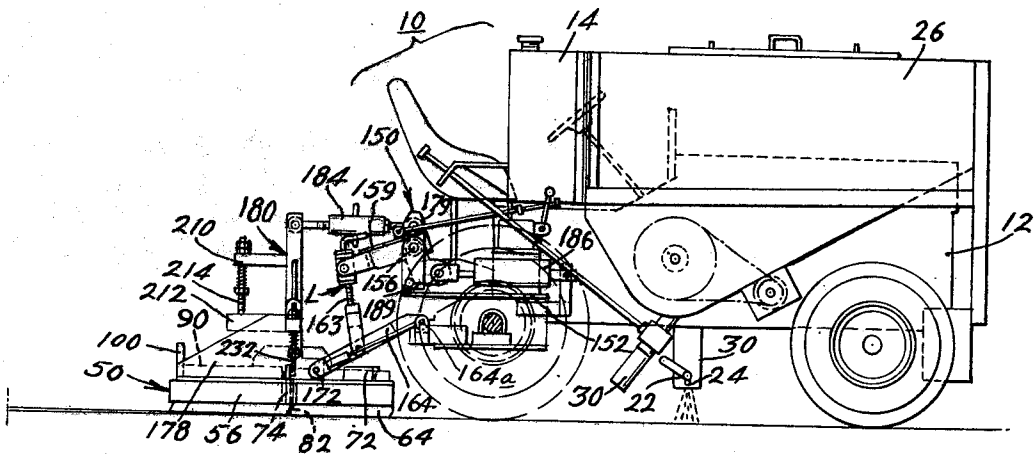
[52] **U.S. Cl.** 94/44
[51] **Int. Cl.** E01c 19/12
[50] **Field of Search** 94/39, 44

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Primary Examiner—Jacob L. Nackenoff
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ABSTRACT: A spreader assembly adapted to be attached to a prime actuator for movement over a surface to uniformly spread a viscous material comprising an outer frame member of generally U-shaped configuration consisting of a center section and left and right-hand wing sections pivotally connected to opposite terminal ends of the center section, said frame member including a first main support member and a first strip made of a flexible material depending from the first main support member to provide a flexible edge in contact with the surface, a wiping bar generally parallel to the center section and spaced therefrom consisting of a second main support member and a second strip made of a flexible material depending from the support member and a center divider extending generally perpendicular to the center section and mounted for angular adjusting movement relative thereto.



PATENTED FEB 2 1971

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FIG. 1.

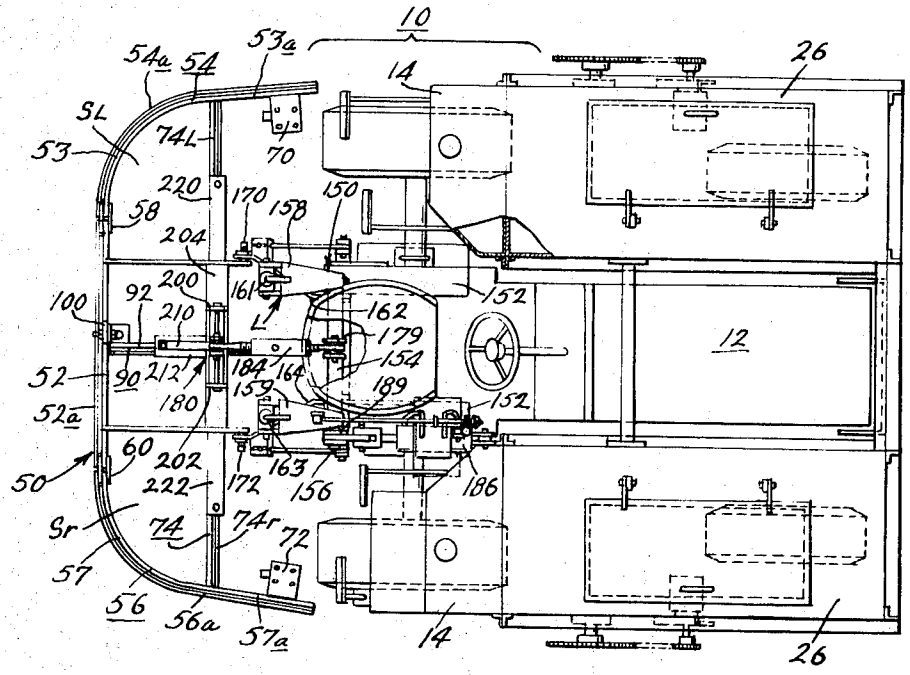
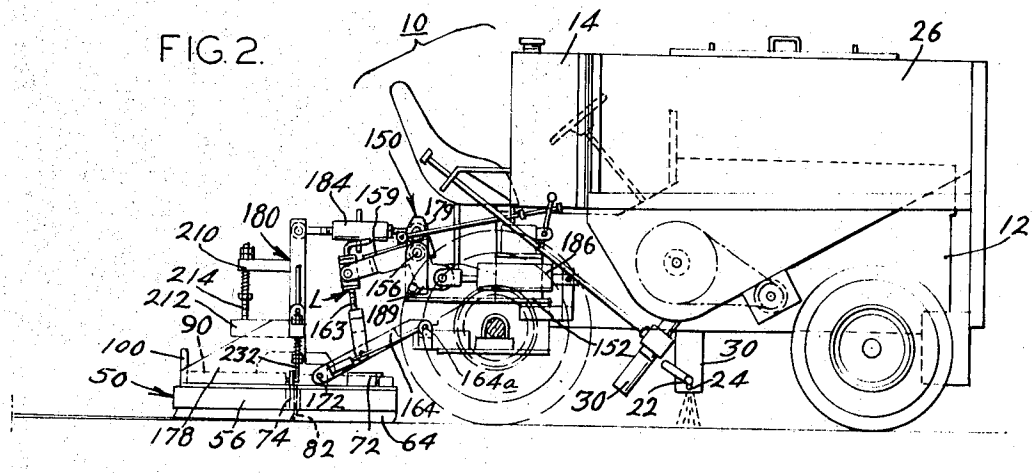


FIG. 2.



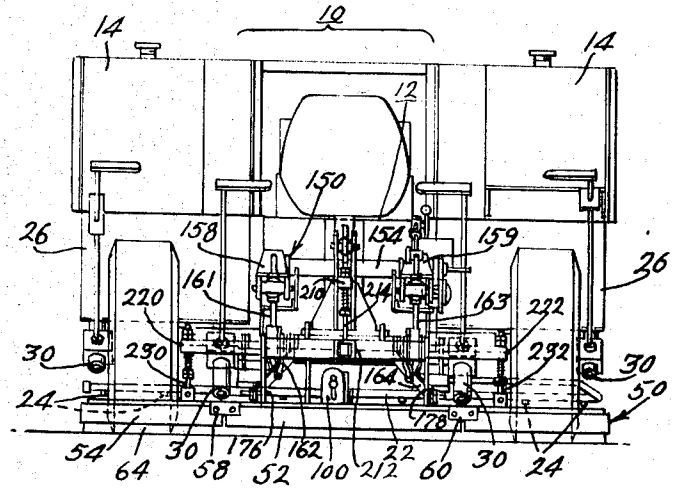


FIG. 3.

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PATENTED FEB 2 1971

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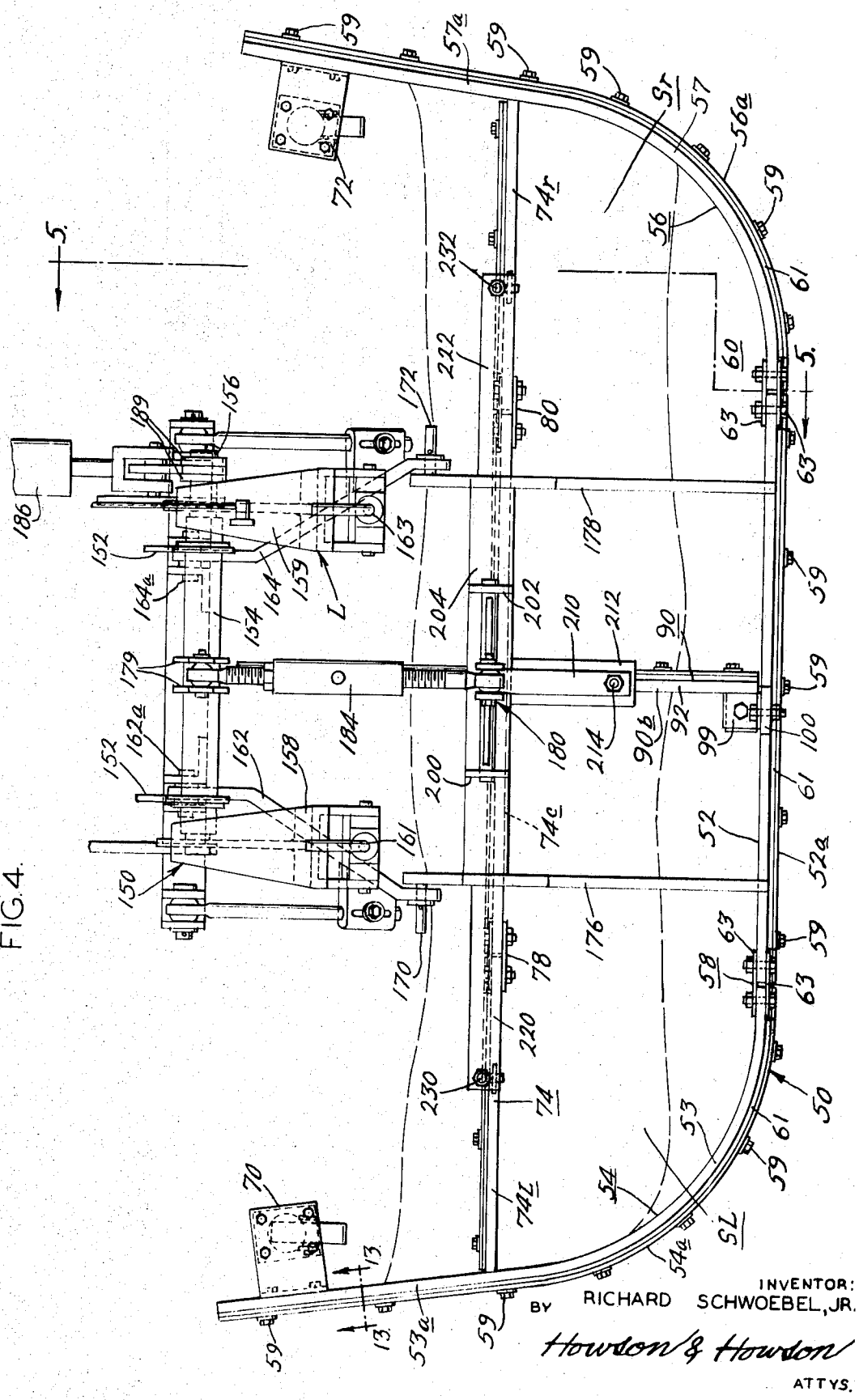
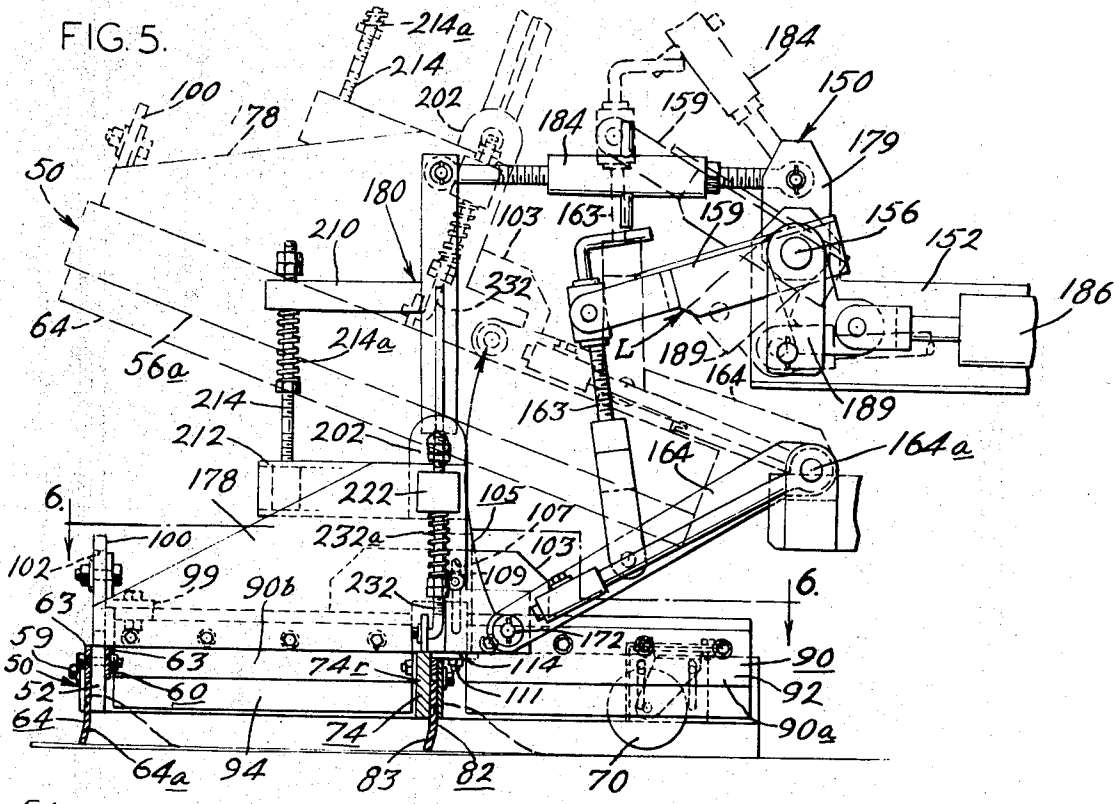


FIG. 4.

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FIG. 5.



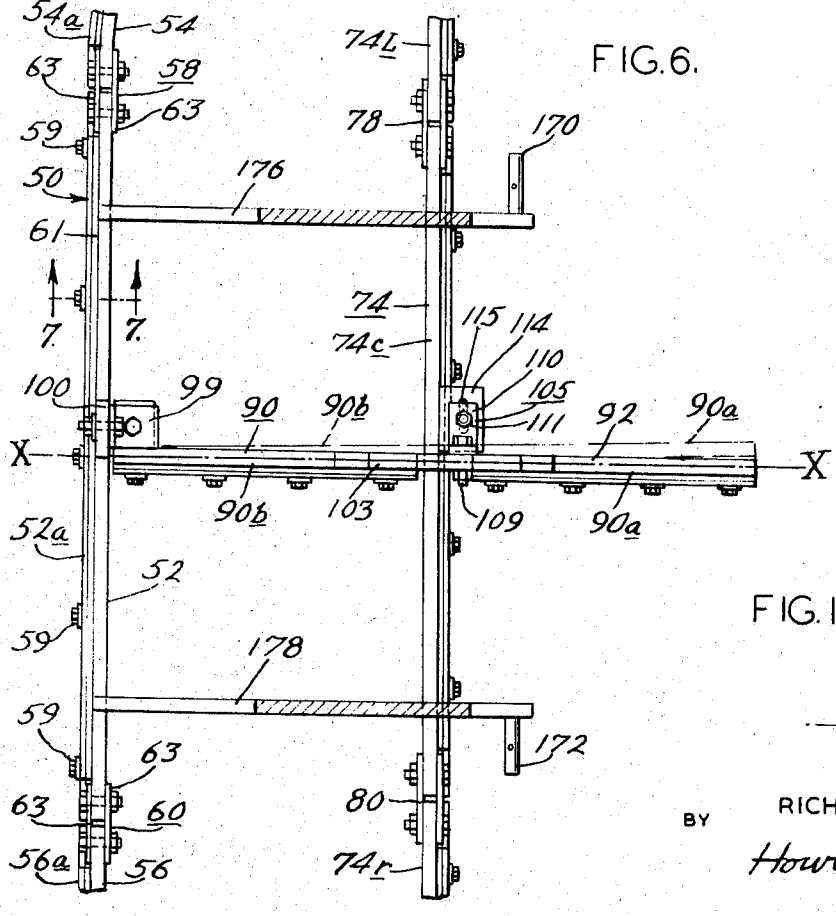
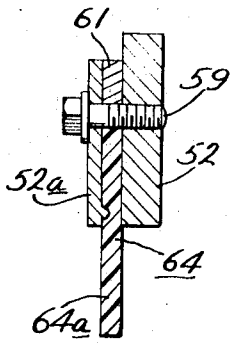


FIG. 6.

FIG. 7.



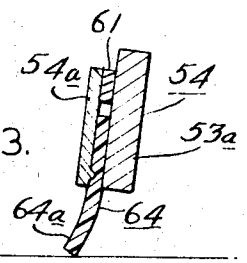


FIG. 13.

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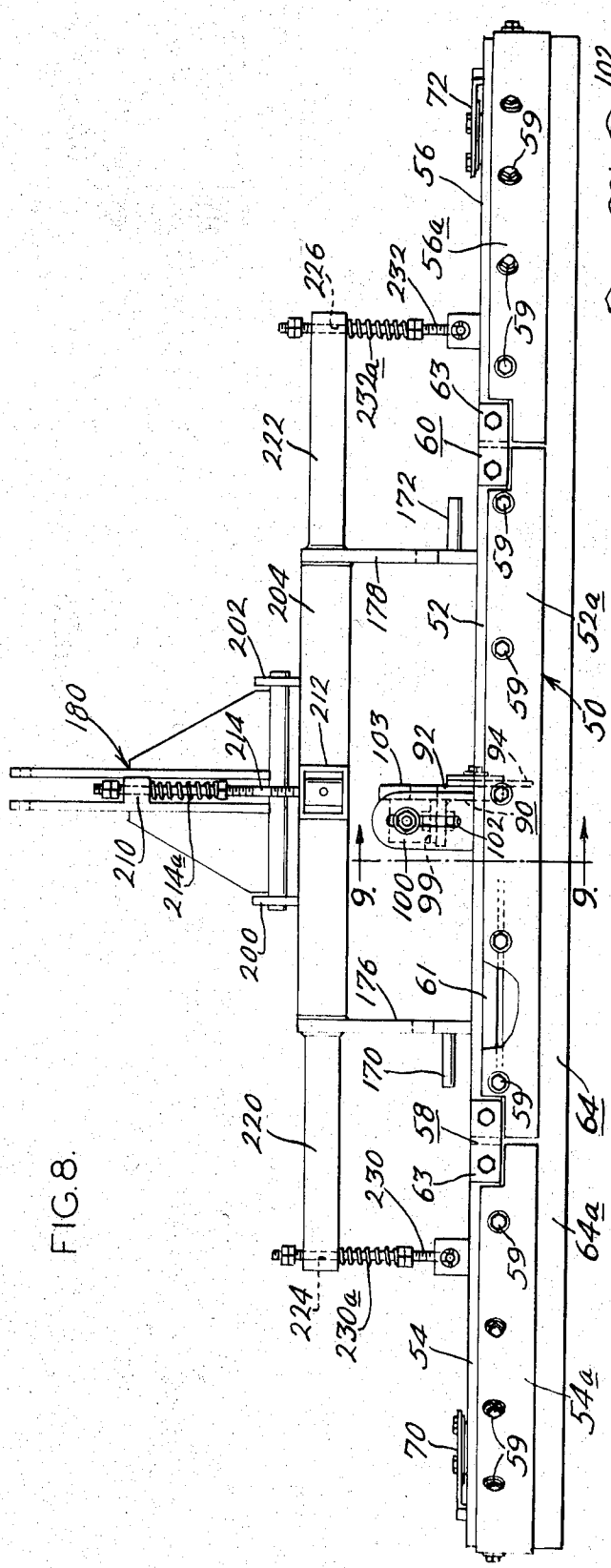


FIG. 8.

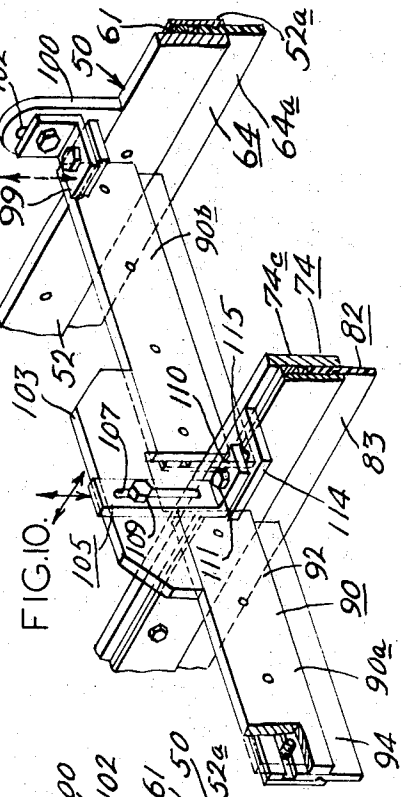


FIG. 10.

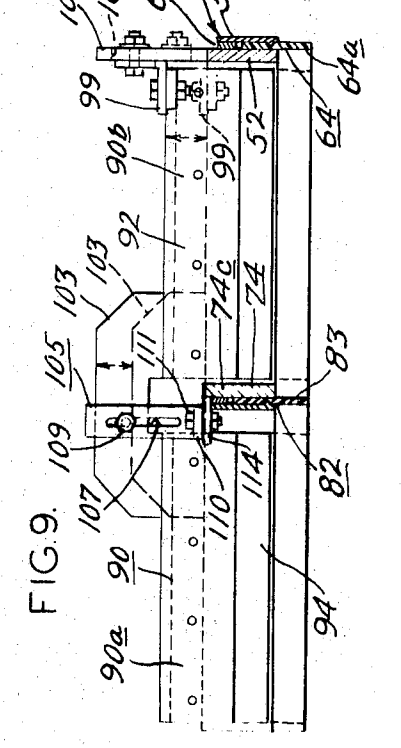


FIG. 9.

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FIG. 11.

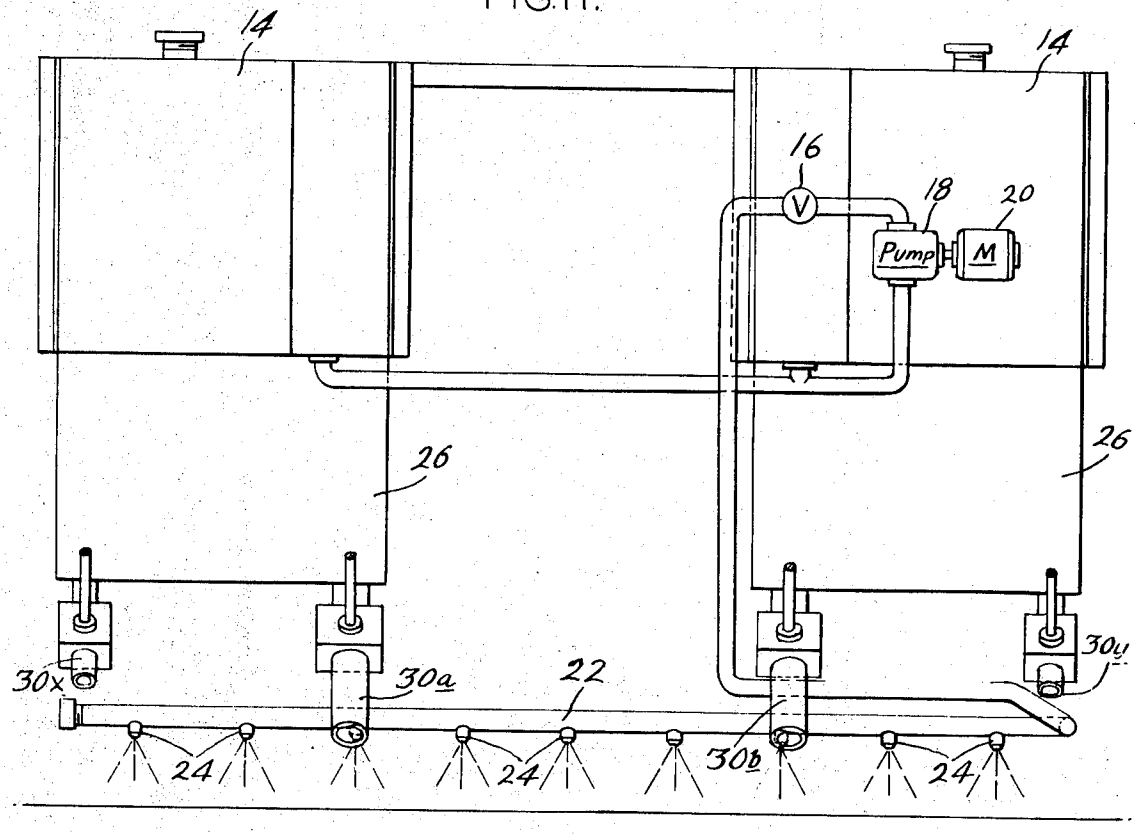
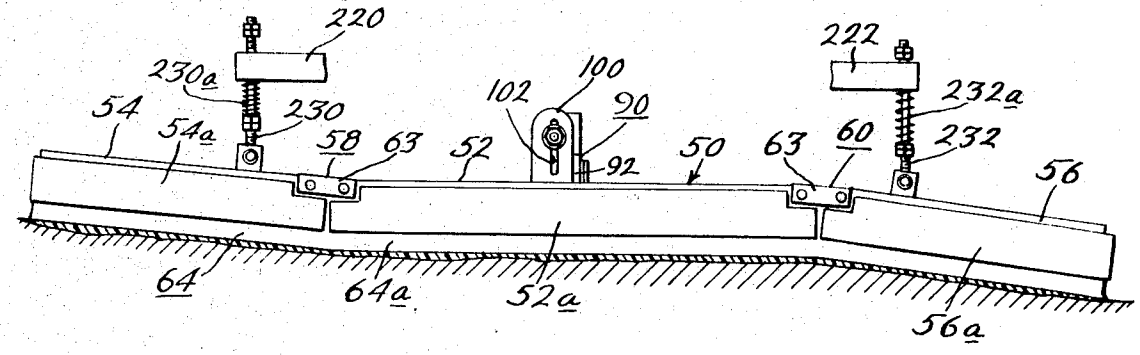


FIG. 12.



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APPARATUS FOR APPLYING A FLUID SUBSTANCE TO A SURFACE

This invention relates to a machine for applying a fluid substance to a surface and more particularly to improvements in apparatus for applying a sealer to a paved surface commonly referred to as "blacktop pavement."

There are currently apparatus for applying a sealer to a paved surface. However, these known apparatus have some disadvantages or drawbacks that the present invention is designed to overcome. For example, in some of these apparatus, the device is equipped with a series of straight flexible members mounted on a paddle wheel adapted to distribute the sealer on the paved surface. These arrangements are too intricate, are easily damaged, and the task of applying the slurry is extremely slow and wasteful. Furthermore, in these apparatus, the spreading mechanism is an integral part of the entire machine and thus cannot be removed for cleaning purposes. A further disadvantage of integral units is the danger of damage to parts thereof when transporting the machine from one location to another. Moreover, the task of disassembling the spreading device in the event of damage to parts thereof requiring replacement is time-consuming and tedious and thus there is a prolonged downtime required when parts of the machine are damaged.

In some apparatus, the spreader assembly is a rectangular or square box arrangement including flexible spreader elements projecting downwardly from a metal frame. In these arrangements the side portions of the box extend parallel to the direction of the movement of the spreader along the surface. The disadvantage of this type of spreader assembly is that the flexible spreading elements do not flex properly and tend to assume a serpentine configuration and ride on edge. Thus, the sealer is not spread evenly or uniformly on the surface. Furthermore, there is a tendency for the sealer to leak through the sharp corners of the assembly.

These and other objects of the present invention and the various features and details thereof are hereinafter more fully set forth with reference to the accompanying drawings, wherein:

FIG. **1** is a plan view of apparatus in accordance with the present invention for spreading a fluid material;

FIG. **2** is a side elevational view of the apparatus shown in FIG. **1**;

FIG. **3** is a view from the rear of the apparatus;

FIG. **4** is an enlarged plan view showing the construction and details of the spreader assembly;

FIG. **5** is a sectional view taken on line **5–5** of FIG. **4**, the broken line position showing the spreader assembly in an elevated or a raised position;

FIG. **6** is a sectional view taken on line **6–6** of FIG. **5**;

FIG. **7** is a sectional view taken on line **7–7** of FIG. **6**;

FIG. **8** is an end elevational view of the spreader assembly;

FIG. **9** is a sectional view taken on line **9–9** of FIG. **8**;

FIG. **10** is a fragmentary perspective view of the center divider member of the spreader assembly;

FIG. **11** is a schematic view showing the basic elements of the system for discharging the sealer;

FIG. **12** is a partial end view of the spreader assembly; and

FIG. **13** is an enlarged sectional view taken on line **13–13** of FIG. **4**.

Referring now to the drawings and particularly to FIGS. **1—3** inclusive thereof, there is illustrated apparatus designated by the numeral **10** for spreading a semiliquid or viscous sealer on a bituminous concrete surface. The machine broadly includes a prime actuator or mover such as a tractor or the like **12** which is suitably modified to include tank sections for the slurry mixture and control valves for controlling discharge of the fluid substances to be dispensed. In the present instance, a pair of water tanks **14** are mounted on opposite sides of the tractor having control means including a valve **16**, pump **18** and motor **20** for effecting discharge of a controlled water spray through nozzles **24** in a manifold pipe **22** which extends transversely of the path to be sealed. Outboard of each water tank is a reservoir chamber **26** for the fluid sealer substance. Two main discharge nozzles **30***a* and **30***b* having suitable valve controls are provided on opposite sides of the center line of the spreader assembly to discharge sealer to each of the compartments thereof. These sealer discharge nozzles are located rearwardly of the water spray manifold. Additionally, as illustrated in FIG. **11**, auxiliary nozzles **30***x* and **30***y* are provided. These nozzles are used when small quantities of sealer are needed to finish a given area by hand.

In accordance with the present invention, there is provided a spreader assembly also referred to herein as a "squeegee box" for uniformly spreading a sealer such as a slurry mix discharged from the nozzles **30** thereby to provide a coating of substantially uniform thickness on the surface to which it is applied. The spreader assembly as best illustrated in FIGS. **4** and **8—10** inclusive includes an outer frame member **50** of generally U-shaped configuration comprising a straight center section **52** and left and right hand wing sections **54** and **56** pivotally connected to opposite terminal ends of the center section as at **58** and **60**. The wing section **54** consists of an arcuate corner portion **53** and a straight outer terminal portion **53***a* which diverges outwardly relative to a plane perpendicular to the center section **52** for a purpose to be described in more detail hereafter. The wing section **56** also comprises an arcuate corner portion **57** and a straight-sided outwardly divergent terminal portion **59***a*. The outer terminal portions **53***a* and **57** are disposed at an angle of about 3 to 7° relative to a plane or line perpendicular to the center section **52**. The hinge connections simply consist of a pair of confronting straps **63** at each hinge point secured to the adjacent frame sections by conventional nut and bolt type fasteners. A continuous flexible strip **64** made for example of rubber is secured to the main frame along the entire length thereof. The strip **64** projects below the lower edge of the frame sections as illustrated in FIG. **8** to provide a flexible drag strip portion **64***a* facilitating a wiping action of the sealer on the surface to be coated as explained in more detail later. The sections **52**, **54** and **56** of the main frame are made of metal such as bar steel and are of rectangular cross section. The terminal portions **53***a* and **57***a* as best illustrated in FIG. **13** are outwardly directed at an angle to a perpendicular plane to further insure proper flexing of the drag strip **64**. The flexible strip **64** as best illustrated in FIG. **7** is secured to the inner face of the frame sections **52**, **54** and **56** by means of an inner seating plate **52***a*, **54***a* and **56***a* and conventional screw fasteners **59**. A spacer element **61** is disposed between the seating plate and frame section above the upper edge of the strip **64**. As illustrated in FIG. **4**, roller supports **70** and **72** are carried by the outer sections **54** and **56** of the main frame adjacent the inner terminal ends thereof. The rollers prevent the lead terminal ends of the spreader assembly from digging into the surface being paved when transversing an uneven area. If desired, a contoured skid plate could be used in lieu of the rollers.

The assembly further includes a transverse wiping or spreader bar **74** extending generally parallel to the center section **52** of the main frame and spaced inwardly therefrom. The wiping bar **74** also includes a center section **74***c* and outer sections **74L** and **74***r* pivotally connected to the center section by hinge straps **78** and **80** generally in line with the hinge connections of the main frame. Each of the outer sections **74L** and **74***r* are suitably connected at their outer terminal ends to the wings **54** and **56** respectively. Similar to the main frame, the center spreader bar **74** is made of flat steel stock which mount a continuous flexible spreader strip **82** of rubber having a flexible depending lip **83** projecting below the lower edge of the spreader bar. The main frame is made of a sufficiently heavy bar stock to serve as a ballast and since it is an open construction, the operator can easily observe the accumulation of sealer in the compartments of the spreader assembly.

The spreader assembly is divided into left and right hand compartments broadly designated in FIG. **4** by the areas S_L and S_r by means of a center divider **90** which comprises a rigid bar member **92** mounting flexible strip **94** secured thereto in

the same manner described above in connection with the main frame strip. As best illustrated in FIGS. 8—10 inclusive, the center divider comprises two segments 90*a* and 90*b* so that it straddles the crosswise wiping or spreader bar and is mounted so that the height of the divider may be selectively adjusted relative to the main frame and surface to be coated for a purpose to be described. To this end, a bracket 100 having an elongated slotted opening 102 is mounted on the upper edge of the center section of the main frame and the center divider carries at its outer end an L-shaped lug, one leg of which confronts the bracket 100 and is adapted to receive a bolt fastener which engages in the slotted opening 102 and may be secured in a predetermined position by means of a nut. Further, the segments of the center divider 90 carry a bridging strap 103 which straddles wiper bar 74, and an L-shaped link 105 having a slot 107 in one arm is provided for adjusting the height of the divider relative to the surface through adjustment of nut and bolt fastener 109. Additionally, as best illustrated in FIG. 6, the angular position of the center divider may be adjusted from a center position, the axis X–X which is in line with the direction of movement of the spreader assembly to an angular position to either side of the center axis X–X for purpose to be described in more detail hereinafter. To facilitate this, the horizontal arm 110 of the link has an opening for a nut and bolt fastener 111 which engages in a plate 114 having a slotted opening 115 carried by the wiper bar. By this arrangement, the entire center divider may be pivoted to either side of the axis X–X simply by releasing the fastener 111.

The spreader assembly is pivotally mounted to the rear end of the tractor by means of a mounting assembly broadly designated by the numeral 150 which positions the spreader assembly between an operative lowered position in FIG. 5 and an inoperative raised position in FIG. 5.

The mounting assembly 150 includes a support bracket 152 projecting from the rear portion of the tractor and forming part of the main frame which in turn supports a tubular housing 154 for a pivot shaft 156 mounted in the housing having its opposite terminal end portions projecting from opposite ends of the housing. The spreader assembly is suitably connected to the pivot shaft by a linkage system including a toggle link 189 connected to one terminal end of the shaft engageable by an actuator to selectively permit positioning between raised and lowered positions illustrated in FIG. 5. The actuator means in the present instance is hydraulic piston-cylinder actuator 186. The cylinder is pivotally mounted on the main frame of the tractor and the piston rod mounts a bumper which confronts and engages the toggle link connected to the end of the pivot shaft 156. By this arrangement, when it is desired to raise the spreader assembly from its lowered operative position to a retracted or raised position, a control valve for the hydraulic actuator is simply actuated to effect outward movement of the piston rod whereby the toggle link is pivoted in a counterclockwise direction with respect to FIG. 5, thereby effecting rotation of the pivot shaft which through the linkage system lifts the spreader assembly to the raised position.

The linkage system includes a pair of pivot links 158 and 159 secured at their inner terminal ends to projecting terminal ends of the pivot shaft 156. The opposite ends of the pivot links pivotally mounting adjustable extensible connecting arms 161 and 163 which in turn are pivotally connected to bifurcated pivot arms 162 and 164 respectively. The inner terminal ends of the fingers of the bifurcated pivot arms are pivotally connected to the main frame of the tractor as at 162*a* and 164*a* and the opposite ends of the pivot arms 162 and 164 are pivotally supported on pins 170 and 172 carried by triangular support plates 176 and 178 connected to the main frame of the spreader assembly.

A fork assembly broadly designated by numeral 180 is mounted between the triangular plate members 176 and 178 and is connected to an upstanding bracket 179 forming part of the main frame by means of an adjustable connecting link 84.

As illustrated, the fork assembly is pivotally mounted on spaced tabs 200 and 202 carried by a spacer box consisting of a T-bar 204 spanning the triangular plates, the upright portion of the fork assembly also having a boom arm 210 overlying and spaced from the leg 212 of the T-bar within which is mounted an adjustable tie rod 214. The triangular plates also mount spacer box ear member 220 and 222 which have clearance holes 224 and 226 within which are mounted tie rods 230 and 232 secured to the cross wiper bar. Compression springs 214*a*, 230*a* and 232*a* circumscribe the tie rods which serve to exert a downward leveling force on the spreader assembly which is adjustable through adjusting nuts on the threaded tie rods.

Considering now the operation of the spreader assembly, before actual use of the apparatus to apply a sealer substance to a surface, the operator positions the spreader assembly to the lower operative position through operation of the control valve for the hydraulic actuator 186. In this position the operator first makes rough level adjustment through the adjustable connecting link 184 and the extensible connecting arms 161 and 163. Thereafter fine level adjustment may be made by selectively varying the compression of the biasing springs 214*a*, 230*a*, and 232*a*. Also, before actual use of the apparatus to discharge sealer the center divider 90 is either fixed in a raised position providing communication between the compartments S_1 and S_r or in a lowered position dividing the compartments S_1 and S_r. If the center divider is in a lower position, its angular orientation relative to the axis X–X is also adjusted. For example, in the normal operation of the spreader assembly, the center divider 90 is fixed in a raised position and sealer is discharged through one or both of the main discharge nozzles 30*a* and 30*b*. Now when applying the sealer to a given area if the last segment to be covered is one-half or less the full width of the spreader assembly, the center divider 90 is maintained in a lowered position and one of the sealer discharge valves is shut off, depending on which compartment is used.

In the normal operation of the apparatus the operator through the control valve 16, pump 18, and motor 20, starts discharge of water through the spray nozzles 24 and also sets the valve control for discharge of sealer through one or a plurality of the discharge nozzles 30. It is noted that during operation, the various sections of spreader assembly may pivot relative to one another to provide conformity of the flexible drag strip to the surface being finished as shown in FIG. 12. Also, the biasing arrangement insures conformity to irregular surfaces and passage over smaller bumps without leaving any excess material. The arrangement also insures that there are no deposits of excess material causing an unevenness in the finished surface even when sharp turns are made. It is noted that the particular configuration of the spreader assembly, particularly the outer frame member 50 having the outwardly divergent wing sections with the angled support members, insures proper flexing of the flexible drag strip 64 around the entire periphery thereby insuring smooth application of the sealer without leakage. This contrasts with some prior arrangements wherein the flexible strip tended to ride on edge and assume a serpentine configuration and whereby it was virtually impossible to apply a smooth uniform coating without leakage.

Other features and advantages of the spreader assembly of the present invention include the fact that it is of comparatively simplified design permitting it to be easily and quickly disassembled from the prime mover and thereby facilitate transportation from one location to another. Its ready disassembly also permits cleaning and replacement of the rubber drag strip, for example, due to wear. Additionally, the double squeegee action provided by the main frame assembly and the cross wiper bar insures filling of all cracks, crevices low and high spots.

I claim:

1. A spreader assembly adapted to be attached to a prime actuator for movement over a surface to uniformly spread a viscous material comprising an outer frame member of generally U-shaped configuration consisting of a center section and left and right-hand wing sections pivotally connected

to opposite terminal ends of the center section, said frame member including a first main support member and a first strip made of a flexible material depending from the first main support member to provide a flexible edge in contact with the surface, a wiping bar generally located forwardly of the center section of the outer frame member parallel to the center section and spaced therefrom consisting of a second main support member and a second strip made of a flexible material depending from the support member, a center divider pivoted to said section and extending forwardly and generally perpendicular to the center section and mounted for angular adjusting movement relative thereto, and means on said wiping bar supporting said divider for angular, vertical and horizontal adjustment.

2. A spreader assembly as claimed in claim 1 where each of said wing sections comprises an arcuate corner portion and a straight sided outwardly divergent terminal portion disposed at an angle of about 3 to 7° relative to a plane perpendicular to the center section.

3. A spreader as claimed in claim 1 wherein the center divider comprises two segments arranged so that it straddles the wiping bar and including means for selectively adjusting the height of the center divider relative to the spreader bar and main frame.

4. A spreader assembly as claimed in claim 1 including con-

necting means for pivotally connecting the spreader assembly to the prime actuator so that it may be selectively pivoted between a raised inoperative position and lowered operative position.

5. A spreader assembly as claimed in claim 4 wherein said connecting means includes a pair of spaced apart plate members connected to the main frame and the spreader bar assembly and an elongated bar carried by the plate members slidably mounting at opposite terminal ends adjustable tie rods secured at their outer ends to the cross wiper bar and compression spring circumscribing the tie rods to exert a downward leveling force on the spreader assembly.

6. A spreader assembly as claimed in claim 1 including roller support members mounted adjacent the outer terminal ends of the wing sections thereby to prevent the terminal ends from digging into the surface.

7. A spreader assembly as claimed in claim 4 wherein said connecting means includes level adjustment means for the spreader assembly.

8. A spreader assembly as claimed in claim 1 wherein the outer terminal ends of the wing sections are outwardly directed at an angle to a perpendicular plane to ensure proper flexing of the edge in contact with the surface.