Dec. 3, 1968 A. D. DE SHANO 3,414,241

TENDER FOR HIGHWAY RESURFACING EQUIPMENT

Filed June 12, 1967 3 Sheets-Sheet 1

FIG-1

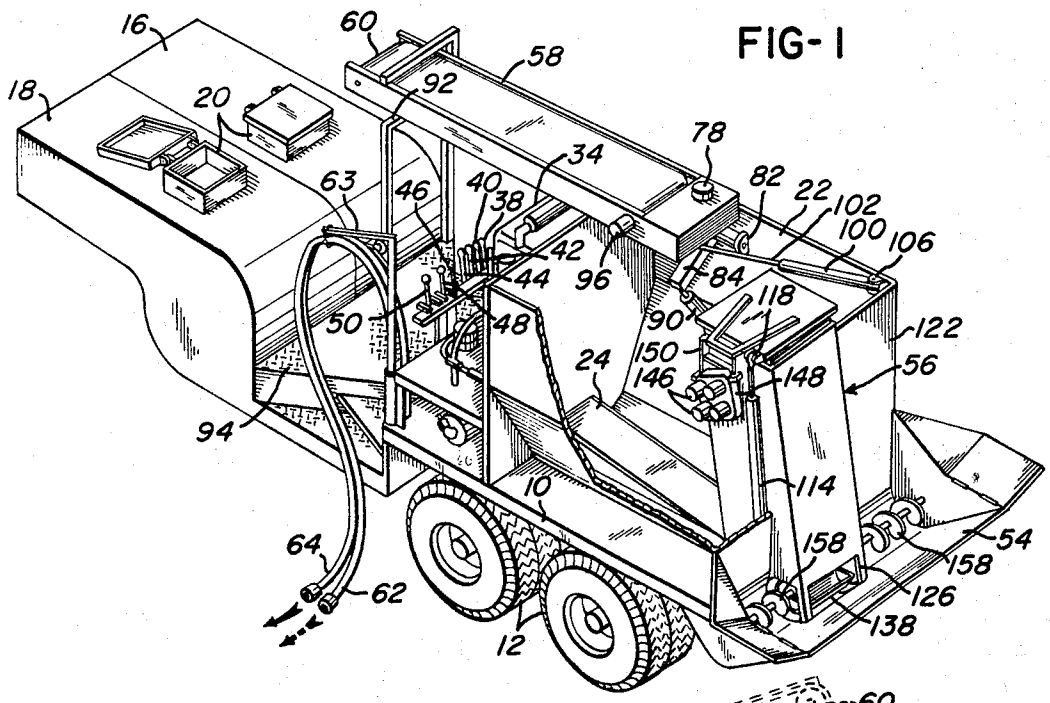
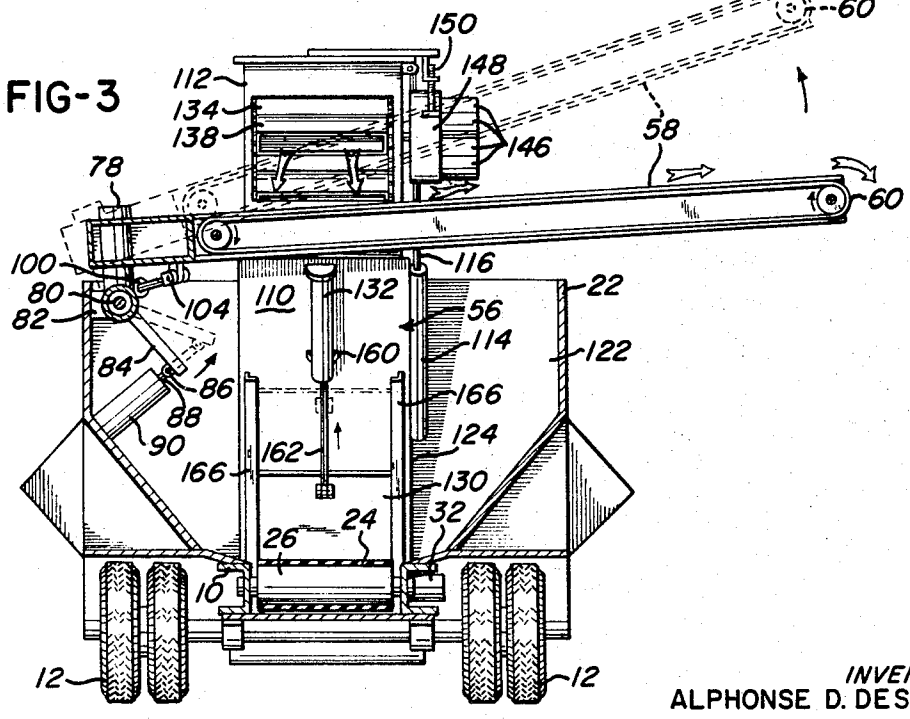


FIG-3



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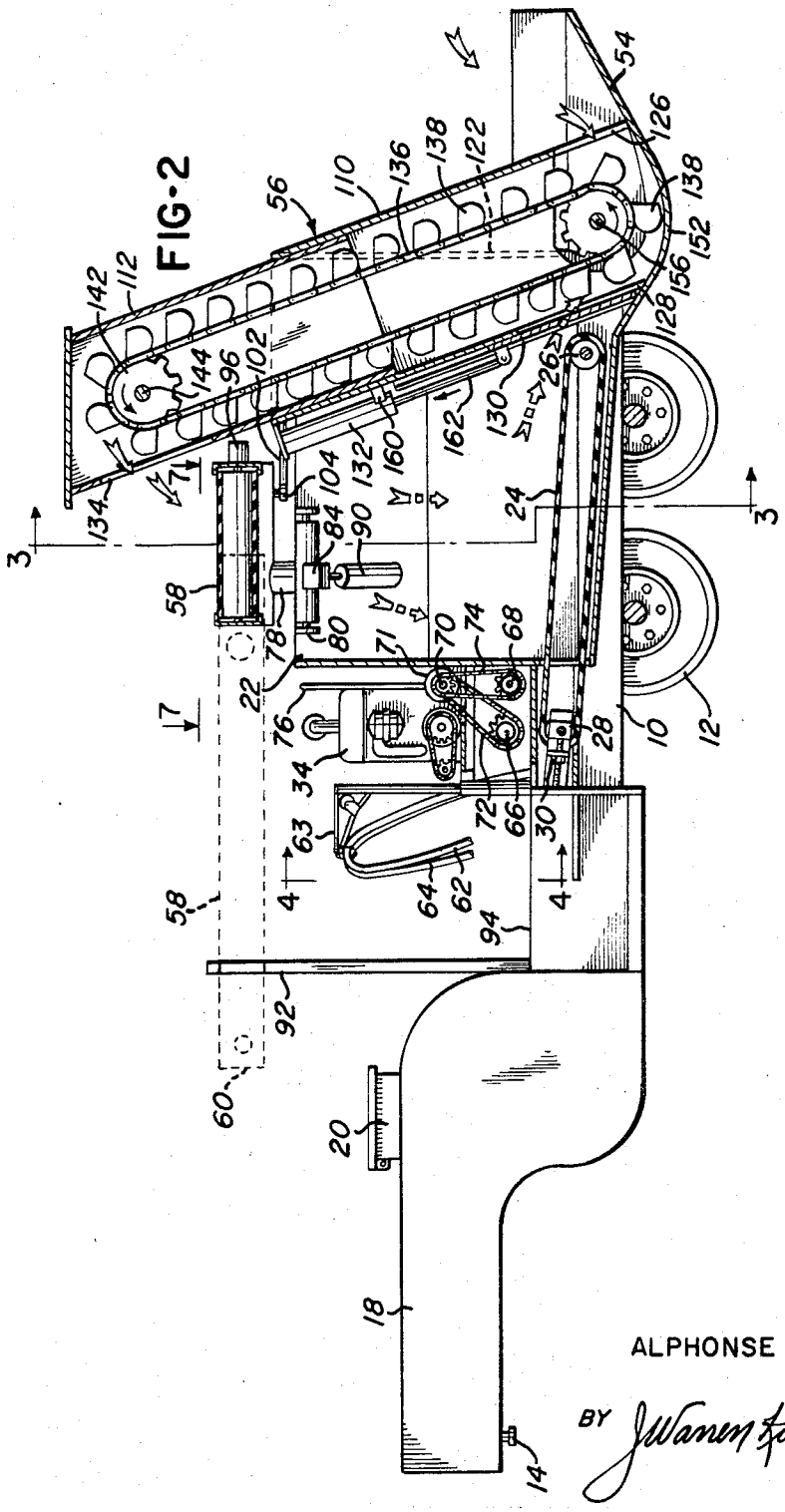
TENDER FOR HIGHWAY RESURFACING EQUIPMENT

Filed June 12, 1967 3 Sheets-Sheet 2

FIG-2



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Filed June 12, 1967 3 Sheets-Sheet 3

FIG-4

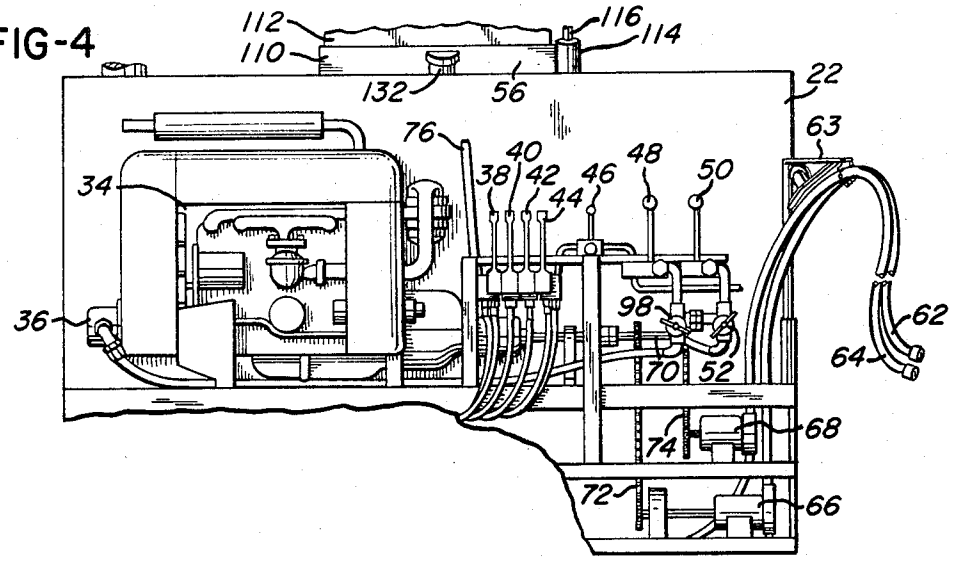


FIG-5

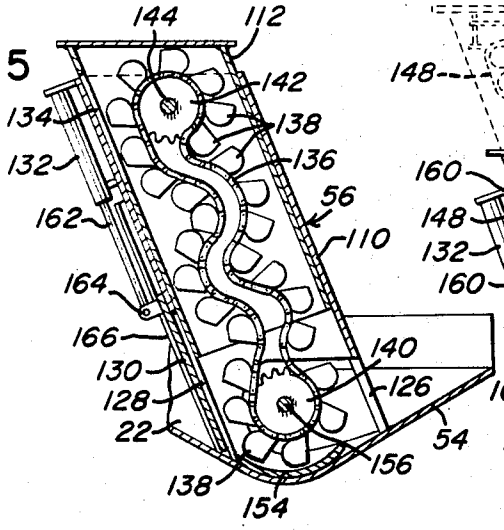


FIG-6

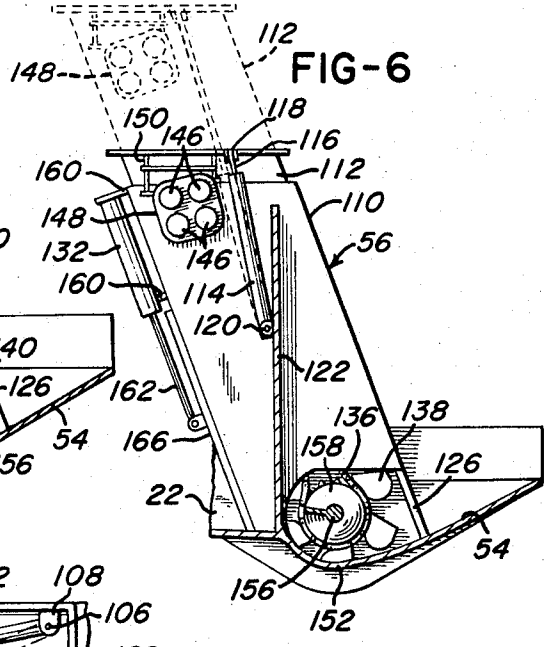
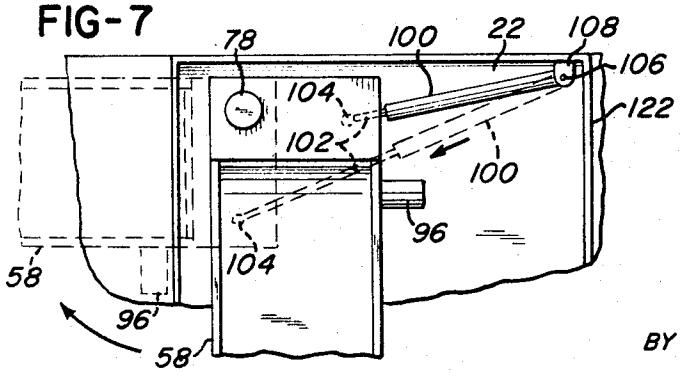


FIG-7



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3,414,241

TENDER FOR HIGHWAY RESURFACING EQUIPMENT

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ABSTRACT OF THE DISCLOSURE

Tender for highway resurfacing equipment loads, transports, and unloads slurry ingredients with substantial savings of time, labor, and transport equipment personnel. Tender incorporates high headroom components which may be collapsed or otherwise compacted to permit unrestricted highway travel beneath bridges, underpasses, and the like. Its use eliminates roadside stockpiling of slurry ingredients and attendant contamination thereof, and eliminates search for suitable stockpiling sites. Included in the apparatus is a novel collapsible materials elevator, and other conveyor elements hydraulically operated and controlled for efficient handling of slurry materials.

This invention relates to a tender for highway resurfacing equipment.

Roads and highways of certain types are known to require periodic sealing treatment or resurfacing with a coating usually consisting of crushed stone mixed with viscous asphalt in a water solution. The stone, asphalt, and water, generally are mixed in a pug mill to produce a slurry which may be flowed onto the road surface and uniformly distributed thereon to provide a smooth surface.

Common practice is to equip a motor truck with a mixer or pug mill into which predetermined proportions of stone, asphalt, and water, carried by the truck, are deposited and mixed to produce the desired slurry. By means of a distributor unit towed or otherwise advanced by the truck along the surface of the roadway, the slurry is progressively laid down upon the roadway surface as the mill continuously produces and feeds slurry to the distributor unit advanced by the truck. With the motor truck proceeding along the roadway at a substantially uniform rate of speed, the resurfacing operation is continuous except for interruptions resulting from frequent depletion of the supply of slurry ingredients carried by the truck.

For replenishing the supply of slurry ingredients to be loaded into the motor truck, common practice has been to stockpile at intervals alongside the roadway, mounds of crushed stone and tanks of asphalt and water. One of the primary difficulties of this procedure has been to find convenient locations at which stockpiling might be achieved, due to the presence of ditches, hillsides, bridges, and various obstructions encountered alongside the roadway. It is sometimes very difficult, therefore, if not impossible, to stockpile the slurry ingredients at locations where the resurfacing equipment is expected to require replenishment. Under such conditions, reloading of the resurfacing equipment with slurry ingredients results in costly delays and the employment of large gangs of workmen and transport equipment for effecting the necessary rehandling of the slurry materials.

Another objection to the common practice above related, is the waste of time, labor, and materials resulting from removing crushed stone from the stockpiles, to the exclusion of earth, trash, and organic matter which must necessarily be excluded from the slurry as contaminants. This difficulty, and the inept roadside locating of stockpiles as above mentioned, impose costly burdens and delays in the resurfacing procedure, and require the employment of an excess of transport and loading equipment, and men to operate such equipment.

One of the objects of the present invention is to eliminate the need for excessive mechanical equipment and manpower in the process of resurfacing a roadway, thereby to expedite the procedure and effect very substantial savings of cost, labor, and equipment operation.

Another object of the invention is to eliminate roadway stockpiling of slurry ingredients, and the attendant risk of contaminating the slurry with earth, trash, organic matter and the like which produce an unsatisfactory resurfacing job.

Another object of the invention is to provide a resurfacing machine tender which includes means for rapidly replenishing the supply of slurry ingredients to resurfacing machinery, without costly delays and without the employment of large gangs of workmen and material-handling equipment.

A further object is to provide a tender for the purpose stated, which may replenish the supply of slurry ingredients to the resurfacing machine without interruption of the progress of the resurfacing machine over the roadway surface undergoing treatment with slurry.

Another object of the invention is to provide a resurfacing machine tender which is highly versatile in its operations of performing materials loading, unloading and transport functions.

Still another object of the invention is to provide a durable and reliably operative resurfacing machine tender of the character stated, including means whereby the tender is adapted for roadway use unrestricted by the presence of overhead obstructions such as low bridge superstructures, underpasses, transmission lines and the like commonly associated with roadways or highways, and such obstructions which may restrict the width of the roadway or highway.

The foregoing and other objects are attained by the means described herein and illustrated upon the accompanying drawings, in which:

FIG. 1 is a perspective view of the tender, parts broken away, and showing the constituent elements of the tender in condition for travel over a roadway, the view omitting the showing of a tractor or motor vehicle normally used for towing the tender by means of a hitch at the left end thereof.

FIG. 2 is a vertical longitudinal cross-section of the right-hand portion of FIG. 1, with a material elevator and a discharge conveyor shown in use position, and other elements shown in side elevation.

FIG. 3 is a cross-sectional view taken on line **3—3** of FIG. 2.

FIG. 4 is a side elevation showing a control station and power unit as seen from line **4—4** of FIG. 2.

FIG. 5 is a vertical cross-section through the bucket elevator of FIG. 2, showing the elevator casing telescopically collapsed to reduce the height of the elevator for road transport purposes.

FIG. 6 is a side elevation of the bucket elevator, with parts of a loading hopper and a storage bin shown in cross-section.

FIG. 7 is a fragmentary plan view taken on line **7—7** of FIG. 2, showing an open-top storage bin and one end portion of a horizontally swingable discharge conveyor.

With reference to the accompanying drawings, the numeral **10** denotes an ambulatory carriage or chassis mounted upon rubber-tired road wheels **12**, and in FIG. 2 is represented a hitch member **14** whereby the carriage may be drawn or towed by means of a motor tractor unit, not shown. Above the hitch member are shown storage tanks **16** and **18** for water and for a fluid or viscous binder material, respectively, the binder material being

for example a fluid asphalt to be mixed with water and crushed stone to produce a slurry. The binder material or fluid asphalt may be stored in tank **18**.

Each tank above mentioned may be provided with a covered charging opening denoted by the numerals **20**.

At the opposite or rear end of the carriage is mounted an open-top storage bin **22** for crushed stone or other comminuted material which forms the slurry base; and the bottom of the bin may incorporate an endless belt conveyor **24** trained about rollers **26** and **28**, one of said rollers being power drivable to move stone rearwardly within the bin, when necessary. Roller **28** may be adjustable with the use of any conventional means **30**, for adjusting the tension of belt **24**. Upon FIG. 3 is shown a rotary fluid motor **32** for driving the conveyor belt roller **26**.

It may here be noted that all major elements of the apparatus requiring driving power, are driven hydraulically, by preference. For the purpose, use is made of rotary fluid motors and reciprocating fluid motors, or hydraulic cylinders, of conventional design. Hydraulic fluid under pressure may be generated by means of one or more pumps driven by an internal combustion engine or equivalent power plant **34** mounted upon carriage **10**. A master hydraulic pump **36** driven by the engine, may supply hydraulic pressure through a series of conduits, to various control valves **38**, **40**, **42**, **44**, **46**, **48** and **50**, which control the various hydraulic motors. The motor **32** for driving the bin conveyor **24**, may be controlled by valve **50** having in the hydraulic circuit thereof a variable flow regulator valve **52** for varying the operating speed of said conveyor.

At the extreme rear end of the carriage may be located a stationary loading hopper **54** of considerable width and capacity, to receive crushed stone from a dump truck or motorized loader. By means of an elevator **56**, stone may be lifted from hopper **54** to a higher level for gravity deposit either into storage bin **22**, or onto a discharge conveyor **58**, depending upon the positioning of said conveyor by the machine operator. That is to say, when discharge conveyor **58** is in the inoperative position of FIG. 1, or in parallelism with the length of the machine, said conveyor is removed from proximity with elevator **56** and may not receive stone discharged from the upper portion of the elevator. The discharge of stone therefore enters storage bin **22**. On the other hand, when the discharge conveyor **58** is swung to the operative position of FIG. 3, or FIG. 2, at which the conveyor is transverse to the length of the machine, the upper reach of the conveyor belt assumes a position directly beneath the elevator discharge port, and may therefore convey stone from the elevator to a truck or receptacle placed alongside the machine or tender.

It will be noted from FIG. 3, that the endless belt of conveyor **58** is so driven as to discharge stone at the free end **60** thereof, usually into the stone storage compartment of a truck equipped for roadway resurfacing. If the truck is in motion, and in the act of performing a resurfacing operation, the tender of FIG. 3 may be advanced at the speed of the truck while conveyor **58** fills the stone storage compartment of the truck, thereby to avoid interruption of the resurfacing operation. At the same time, the truck compartments for water and asphalt may be supplied from the storage tanks **16** and **18**, by way of flexible hoses **62** and **64** (FIG. 1). Said hoses may be connected to pumps carried by the tender, for transferring the water and asphalt under pressure to the truck compartments. A rack for the hoses is denoted **63**.

In FIG. 4, the pump for water is denoted **66**, and the pump for asphalt is denoted **68**, and these are connected to the proper hoses **62** and **64**, respectively. The pumps **66** and **68** preferably are reversible, and may therefore be used to either fill or empty the tanks **16** and **18**. A reversible drive for the pumps is indicated upon FIG. 4, wherein a power take-off shaft **70** driven by engine **34** may drive the pumps **66** and **68** through chain and sprocket drives **72** and **74**. A reversing gear box **71** of conventional design (FIG. 2) coupled to shaft **70**, may be controlled by a shift lever **76**. The reversing gear box may be of any approved type, coupled to shaft **70** in accordance with common practice, and need not therefore be illustrated in detail for a proper understanding thereof.

The discharge conveyor **58** (FIG. 3) may be adjusted as to inclination, so as to feed stone into the highest of truck compartments. When lowered to a substantially horizontal position, conveyor **58** may be swung about a pivot member **78** to the inoperative position of FIG. 1 at which the conveyor extends lengthwise of the carriage at a low elevation, so as to clear overhead obstructions as the tender travels along a roadway.

Pivot member **78** may be rockable upon a shaft **80** attached to a fixed bracket **82** suitably supported, as by a wall of bin **22** properly reinforced. An arm **84** fixed to and movable with the pivot member, has connection at **86** with the free end of a reciprocable piston rod **88** operative within a hydraulic cylinder **90** which may be fixed to a stationary wall of bin **22** suitably reinforced. Operation of the hydraulic cylinder to extend its piston rod, results in increasing the inclination of conveyor **58**, as is evident. Extension and retraction of piston rod **88** may be hydraulically effected by manipulating a control valve **38**, FIG. 4, said valve being connected in a hydraulic circuit which includes cylinder **90**, pump **36**, and the necessary conduits as will be understood.

Pivot member **78** preferably is so located as to guide the upper reach of conveyor **58** to one position (FIG. 2) at which the conveyor intercepts material delivered by elevator **56**, or to an inoperative position (FIG. 1) at which the elevator may discharge to bin **22** without interference from said conveyor. When in the inoperative position of FIG. 1, the conveyor may rest upon a suitable stationary rest or support **92** upstanding upon the carriage or upon an operator's platform **96**. The engine **34** and all of the control valves are accessible from the operator's platform, or station, by preference.

The reference numeral **96**, FIG. 1, indicates a rotary fluid motor for driving the endless belt of discharge conveyor **58**, the operation of said motor being controlled by means of a control valve **48** (FIG. 4) connected in a hydraulic circuit including said motor, the pump **36**, and the necessary conduits as will be understood. A variable flow control valve **98** may be incorporated in said hydraulic circuit to regulate the speed of drive motor **96**.

The aforementioned swingability of conveyor **58** upon pivot member **78**, between the operative and the inoperative positions of said conveyor, may be effected by means of a hydraulic cylinder **100** actuated by a flow-reversing control valve **42**. Said cylinder **100** (FIG. 7) may include a piston rod **102** pivotally attached to the frame of conveyor **58** at **104** in offset relationship to pivot member **58**. The base end of the cylinder may be pivoted at **106** upon a bracket **108** fixed to the bin **22** or to any suitable stationary member of the carriage. As will readily be understood, the cylinder **100** and control valve **42** may be incorporated in a conventional hydraulic circuit which includes a pump such as **36** and the necessary conduits for conveying fluid under pressure to and from opposite ends of the cylinder or fluid motor **100**.

Attention is now directed to the elevator **56**, which may comprise a lower tubular casing section **110** and an upper tubular casing section **112**, telescopically assembled. The casing sections may be rectangular in transverse cross-section as shown. Section **112** may be elevated and lowered relative to section **110**, by means of one or more hydraulic motors or cylinders **114** located outside the elevator casing. The reciprocatory piston rod **116** of the cylinder may be attached to the upper section **112** at **118**, and the base portion of the cylinder may be anchored at **120** upon the stationary rear wall **122** of bin **22**, or upon a side wall of the stationary lower section **110**. Reciprocation of

piston rod **116** serves to move upper section **112** between upper and lower limits of elevation as indicated upon FIG. 6, by broken lines and full lines, respectively. The broken lines indicate the elevated or operative position, and the full lines indicate the lowered or inoperative position of the elevator.

The movements of cylinder **114** may be controlled by a control valve **44** of FIG. 4 connected in a conventional hydraulic circuit which includes valve **44**, cylinder **114**, a pump such as **36**, and the necessary conduits for conveying fluid under pressure to and from the cylinder **114**.

The elevator casing **110, 112** may be rigidly supported in upstanding position, preferably between bin **22** and loading hopper **54**, as by forming a vertical opening **124** in bin wall **22** (FIG. 3), and fitting and welding the lower elevator section into the opening to establish the assembly depicted by FIG. 6.

The lower elevator section **110** has an intake port **126** exposed to loading hopper **54**, and a second intake port **128** exposed to the storage bin **22** near the bottom conveyor **24**. Port **128** may be provided with a sliding gate **130** to open and close this port, the gate being actuated by means of a hydraulic motor or cylinder **132**. When the gate is elevated, or opened, the elevator may remove crushed stone from bin **22**, and also from hopper **54** if the hopper contains any stone. With gate **130** closed, the elevator may remove stone from hopper **54** exclusively. The elevator discharges stone through an upper discharge port **134** provided in upper casing section **112**, which discharge port overlies the open top of storage bin **22**. Thus, the storage bin may be filled with stone taken from hopper **54** by the elevator, or alternatively, the stone so discharged may be deposited upon discharge conveyor **58** if said conveyor is disposed to the operative position of FIG. 3. Also as an alternative, the discharge conveyor in the operative position may be supplied with stone from storage bin **22**, by opening the gate **130** of the elevator casing, whether or not the hopper **54** contains any stone.

From the foregoing, it will be understood that discharge conveyor **58** in the operative position, and when driven by its motor **96**, may transfer to a truck alongside the tender, quantities of stone taken from either the hopper **54** or the storage bin **22**, while the elevator is in operation. If desired, this may be accomplished with the tender and the truck in motion, while the slurry-applying equipment carried by the truck continues to lay down a coating of slurry upon a roadway undergoing treatment. Of course, it is not necessary in all cases that the truck and the tender remain in motion.

Elevator **56** may include one or more endless chains **136**, FIG. 5, carrying a series of buckets or equivalent lifters **138** for conveying comminuted material or crushed stone to discharge port **134**. Chain **136** may be trained about sprockets **140** and **142** which are rotationally supported by the lower casing section **110** and the upper casing section **112**, respectively. The upper sprocket moves bodily with upper section **112** when said upper section is extended or retracted, and consequently, the chain **136** may collapse by gravity when the upper section **112** is lowered to the inoperative position of FIG. 5. By elevating the upper section **112** to the operative position shown by broken lines in FIG. 6, chain **136** will become substantially taut about sprockets **140** and **142**. When the chain is taut, the elevator may be driven to lift material for discharge through the upper port **134**.

In a preferred construction, the shaft **144** of the upper sprocket may be rotated by means of one or more fluid motors **146** mounted upon a gear box **148** which is fixed to a side wall of the movable casing section **112**. Four such motors **146** are shown by way of example, and all of them may simultaneously drive a planetary gear system within box **148**, which in turn rotates the shaft **144** upon which the upper sprocket may be fixed. By resorting to use of a cluster of motors **146** as shown, the size of the driving means for sprocket shaft **144** may be minimized, while at the same time providing adequate power to activate the elevator. The reference numeral **150** indicates a torque mechanism for stabilizing gear box **148** against rotation.

From the foregoing explanation, it will be understood that the elevator when extended for use, may be driven to lift material to a high level necessary for discharging onto conveyor **58**. It may be necessary, however, to lower the elevator when not in use, so as to clear overhead obstructions such as bridge superstructures, underpasses and the like, while the tender is traveling over a roadway in the work of tending one or more pieces of slurry-laying equipment treating the roadway.

In order to avoid displacement of chain **136** from the teeth of lower sprocket **140** as the chain collapses incident to lowering of upper elevator section **112** and the sprocket **142** supported thereon, means may be provided to retain the chain against such displacement. For this purpose, the lowermost buckets of the elevator chain may be adapted to move in close proximity to an arcuate bottom wall **152** of hopper **54**, so that upon collapse of the chain, its links may not disengage from the teeth of lower sprocket **140**. The construction avoids also possible lateral displacement of the chain from the common plane of the sprockets. In an alternative structure depicted by FIG. 5, an arcuate guide member **154** fixed within the lower elevator section beneath sprocket **140**, may serve to support the lowermost buckets when the elevator chain collapses, thereby to prevent disengagement of the chain links from the lower sprocket teeth.

It should be clearly understood that the elevator, if desired, may employ two chains supporting opposite ends of the buckets or lifters **138**, in which case each sprocket shaft will be furnished with two sprockets spaced apart upon the shaft and fixed thereon.

The shaft **156** of lower sprocket **140** may be extended, as in FIG. 1, to drive a pair of screws or augers **158** within hopper **54**, for moving the hopper contents toward the elevator intake port **126** during operation of the elevator. The screws or augers may be separate elements axially coupled to opposite ends of the sprocket shaft, if desired.

With further reference to the elevator drive means, which includes the rotary fluid motors **146**, it should be understood that said motors may be incorporated in a conventional hydraulic circuit which includes also a control valve **46**, pump **36**, and flexible conduits such as may be necessary for supplying fluid under pressure to said motors **146**. A single motor **146** may be employed, if desired.

The gate-operating fluid motor or cylinder **132**, FIGS. 5 and 6, may be fixedly mounted at **160** upon a wall of elevator casing section **110**, with the piston rod **162** thereof connected at **164** to a lug on gate **130**, whereby projection and retraction of the piston rod effects closing and opening of the gate. The gate may move in spaced guides **166** fixed to a wall of elevator section **110**. Cylinder **132** may be incorporated in a conventional hydraulic circuit which includes pump **36** and a control valve **40**, along with the necessary conduits for supplying fluid under pressure to said cylinder **132**. All of the hydraulic cylinders employed may be of the double-acting type.

The slurry equipment tender herein disclosed achieves many advantages in the process of resurfacing or treating roadways. It performs to substantially reduce the number of pieces of equipment heretofore believed necessary to supply slurry ingredients to roadway resurfacing machinery, and eliminates costly waste of time, materials, and labor. Various other advantages attained are stated in the objects of the invention preceding the detailed description of the apparatus herein disclosed.

It is to be understood that various modifications and changes may be made in the structural details of the device, within the scope of the appended claims, without departing from the spirit of the invention.

What is claimed is:

1. A tender for supplying slurry ingredients to ambulatory roadway resurfacing equipment which comprises a slurry distributor, a mill for mixing and feeding to said distributor a slurry comprising crushed stone, a viscous binder material, and water carried in separate compartments of a motor truck body, said tender comprising in combination: an elongate ambulatory wheeled carriage including an open-top storage bin for crushed stone located near the rear end of the carriage, and storage tanks for water and viscous binder material supported upon the carriage; said bin having a rear wall, and a stone loading hopper located outside said rear wall for receiving crushed stone from a source of supply; a loading elevataor adjacent to said bin wall, including an upstanding casing having an upper discharge port overlying the open top of the bin, and two lower intake ports one of which is in communication with the loading hopper, and the other of which is communicable with the interior of the stone storage bin; said elevator including a series of buckets exposable successively at each of said ports, an upper sprocket and a lower sprocket within the casing, and an endless chain trained about the upper and the lower sprocket; means mounting the buckets upon the chain in spaced succession; a gate for selectively opening or closing that elevator intake port which communicates with the storage bin; means selectively operable to rotate the sprockets and thereby advance the buckets to remove stone from the loading hopper through the intake port which communicates with the hopper, and to discharge the removed stone through the upper discharge port of the elevator casing, said buckets being receptive of stone from the storage bin when the aforesaid gate is open, to convey stone from the bin and discharge same through said upper discharge port; an elongate endless belt discharge conveyor having one end overlying the open top of the storage bin; means pivoting said one end of the conveyor relative to the bin for bodily swinging movement of said conveyor in a substantially horizontal plane between an inoperative position lengthwise of the carriage, and an operative position of extension transversely of the carriage, said conveyor being longer than the width of the carriage so as to dispose the swinging end of the conveyor beyond one side of the carriage when the conveyor is swung to the operative position, the pivot means for the conveyor being so spaced from the elevator casing as to dispose the pivoted end of said conveyor in position to receive stone from the upper discharge port of the elevator casing when the conveyor is in the operative position aforesaid; means for driving the endless belt discharge conveyor to move stone toward the swinging end thereof; and means for swinging said discharge conveyor between the operative and inoperative positions aforesaid.

2. The tender as specified by claim 1, wherein the loading elevator casing comprises a lower section fixed relative to the storage bin, and an upper section telescopically slidable relative to said lower section, for varying the effective height of the upper section above the carriage; means rotationally supporting the lower elevator sprocket upon the lower fixed section of the casing; means rotationally supporting the upper elevator sprocket upon the upper slidable section of said casing, with the sprockets disposed in a common upright plane; means selectively operative to move the upper section of the casing between an upper limit at which the bucket chain is substantially taut upon the sprockets, and a lower limit at which said chain collapses within the lower section of the casing; and means for precluding lateral displacement of the chain in the region of the lower sprocket, upon collapse of the chain incident to lowering of the slidable casing section of the elevator.

3. The tender as specified by claim 2, wherein the combination includes means for selectively varying the inclination of the discharge conveyor when disposed in the operative position transversely of the carriage.

4. The tender as specified by claim 3, wherein the combination includes reversible pump means and flexible hoses for transfer of water between the tender tanks for water and viscous binder material, and the corresponding compartments of the roadway resurfacing equipment; and a bottom conveyor within the stone storage bin of the tender, for moving stone toward the gate which controls access to one of the lower intake ports of the elevator casing.

5. The tender as specified by claim 2, wherein the stone storage bin includes a bottom conveyor operative to move stone toward the gate which controls access to one of the lower intake ports of the elevator casing.

6. The tender as specified by claim 2, wherein the means selectively operable to rotate the elevator sprockets includes a rotary fluid motor secured to the slidable upper section of the elevator casing exteriorly thereof, said fluid motor having a drive shaft; shaft means projected through a wall of said upper section and coupled in driving relation with the motor shaft and said upper sprocket; means including a pump for delivering pressured fluid to the fluid motor for rotating the drive shaft thereof; and wherein the means for elevating and lowering the slidable upper section of the elevator casing includes a reciprocating fluid motor operatively connected to said upper casing section.

7. The tender as specified by claim 2, wherein the means selectively operable to rotate the elevator sprockets comprises a rotary fluid motor secured to said slidable upper section, including means effecting a driving connection between the fluid motor and that sprocket which is supported upon the upper casing section; a stationary pump located upon the carriage remote from said fluid motor, and flexible conduit means for delivering pressured fluid from the pump to said fluid motor.

8. The tender as specified by claim 2, wherein the support for the lower sprocket includes a shaft upon which said lower sprocket is fixed, said sprocket shaft having an end extended exteriorly beyond the lower casing section, and an auger driven by said shaft end for moving stone from the loading hopper toward that intake port of the elevator casing which is in communication with said loading hopper.

9. The tender as specified by claim 1, wherein the pivot means for the discharge conveyor is tiltable to various angles of inclination, and the combination includes means for varying the inclination of the discharge conveyor when disposed in the operative position transversely of the carriage.

10. The tender as specified by claim 1, wherein the combination includes reversible pump means for selective charging or discharging of the contents of the tanks for water and viscous binder material.

11. Apparatus for handling bulk comminuted particles, comprising in combination: an upstanding casing including telescopic tubular sections movable linearly relative to one another for varying the effective length of the casing; a sprocket supported for rotation within one of said sections, and a sprocket supported for rotation within the other of said sections, the sprockets being disposed in a common plane; means for rotating one of said sprockets; an endless conveyor chain trained about said sprockets, and means on said chain for lifting comminuted particles within the confines of the telescopic sections; means selectively operative to move one of the sections between a position at which the chain is substantially taut upon the sprockets, and a second position at which said chain collapses by gravity toward one of the sprockets; and means for precluding disengagement of the chain from said one sprocket upon collapse of the chain incident to movement of said one section to the second position aforesaid.

12. The apparatus as specified by claim 11, wherein the lowermost of the casing sections is stationary with respect to the other section, and said other section is uppermost and movable between upper and lower limits

of travel; said lowermost section having a lower port for intake of material, and said uppermost section having an upper port for discharge of material elevated from the region of the lower port by said lifting means.

13. Variable headroom apparatus for lifting bulk comminuted material from a bin, said apparatus comprising: an upstanding elevator casing constituted of a normally stationary lower tubular section including an intake port exposed to the bin material, and an upper movable tubular section telescopically related to the lower section for linear extension and retraction relative thereto, said upper movable section having a material discharge port therein; an upper sprocket rotatably supported within the upper casing section adjacent to the discharge port; a lower sprocket rotatably supported within the lower casing section adjacent to the intake port, with the sprockets disposed in a common substantially upright plane; an endless conveyor chain trained about said sprockets, and material lifting means on the chain for elevating material from the intake port to the discharge port as the sprockets rotate; means selectively operative to move the upper casing section between an upper limit at which the conveyor chain is substantially taut upon the sprockets, and a lower limit at which said chain collapses by gravity within the lower casing section; means for maintaining in engagement with the teeth of the lower sprocket that portion of the conveyor chain which collapses at said lower sprocket; and drive means for rotating at least one of said sprockets when the upper casing section is disposed to its upper limit of extension.

14. Apparatus as specified by claim 13, wherein said engagement maintaining means comprises an inner surface of the lower casing section supporting against gravitation the lowermost lifting means disposed beneath the lower sprocket.

15. Apparatus as specified by claim 13, wherein the last mentioned drive means includes a motor mounted upon the upper movable casing section.

16. Apparatus as specified by claim 15, wherein the said means for selectively moving the upper casing section includes a hydraulic cylinder and associated movable piston rod; means securing the piston rod to one casing section, and means securing the cylinder to the other casing section, with the rod and the cylinder in substantial parallelism with the line of movement of the upper casing section.

17. Apparatus as specified by claim 13, wherein the support for the lower sprocket includes a shaft upon which said lower sprocket is fixed, said sprocket shaft having an end extended exteriorly beyond the lower casing section, and an auger driven by said shaft end for moving comminuted material toward the intake port of the lower casing section.

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