United States Patent [19]

Weeks et al.

[11] **3,746,313**

[45] **July 17, 1973**

[54] **CONCRETE MEASURING AND MIXING APPARATUS**

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[21] Appl. No.: **197,292**

[52] **U.S. Cl.** **259/154**, 259/168

[51] **Int. Cl.** **B28c 7/04**

[58] **Field of Search** 259/154, 149, 165, 259/175, 176, 168, 164, 166, 169, 178, 153, 161, 162

[56] **References Cited**

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Primary Examiner—Robert W. Jenkins
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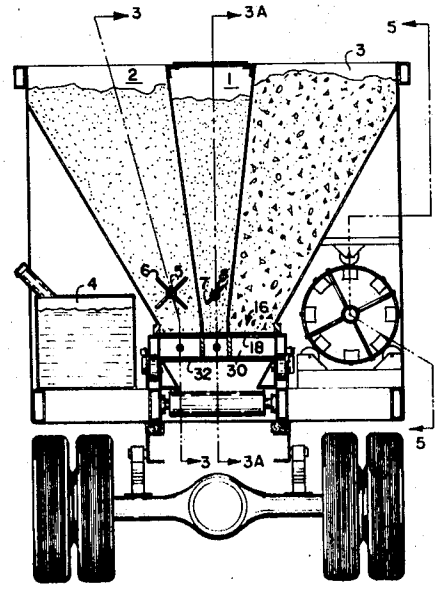
[57] **ABSTRACT**

A concrete-mixing machine, detachably mounted on a standard truck frame, comprising: a water tank and chambers for storing and hauling dry-mix materials; a metering slide (FIGS. **1**, **3** to **4B**, **8**, **12** and **12A**), measuring desired amounts of cement, sand and gravel at the site of concrete use; a tumbling cylinder in which measured amounts of water are added; and a conveyor system for moving the dry-mix materials to the tumbler and the wet concrete out of the machine. One of the walls of each of the cement and sand compartments of the slide is movable for variation of the volume of the compartment, thus controlling the proportions of the dry-mix materials for concrete of varying strengths. The slide is power-reciprocated between compartment-inlet ports at the bottoms of the storage chambers and compartment-outlet openings in a relatively stationary plate below the slide, the inlets to the slide compartments being open and the compartment outlets closed in one extreme reciprocated position, and the inlets being closed while the outlets are open in the other extreme position. The amount of water used is controlled by varying the stroke of a pump. The conveyor system comprises a conveyor by which concrete materials are elevated to a point well above the truck frame — preferably, as indicated in FIG. 9, to a point above seven feet in height — for example, in pouring an 8-foot-high concrete wall. The belt which moves dry-mix materials from beneath the slide and chambers is protected from excessive wear by the apertured plate between it and the heavy load of dry-mix materials. Preferably all the moving parts of the apparatus are driven from the truck's auxiliary transmission.

27 Claims, 20 Drawing Figures



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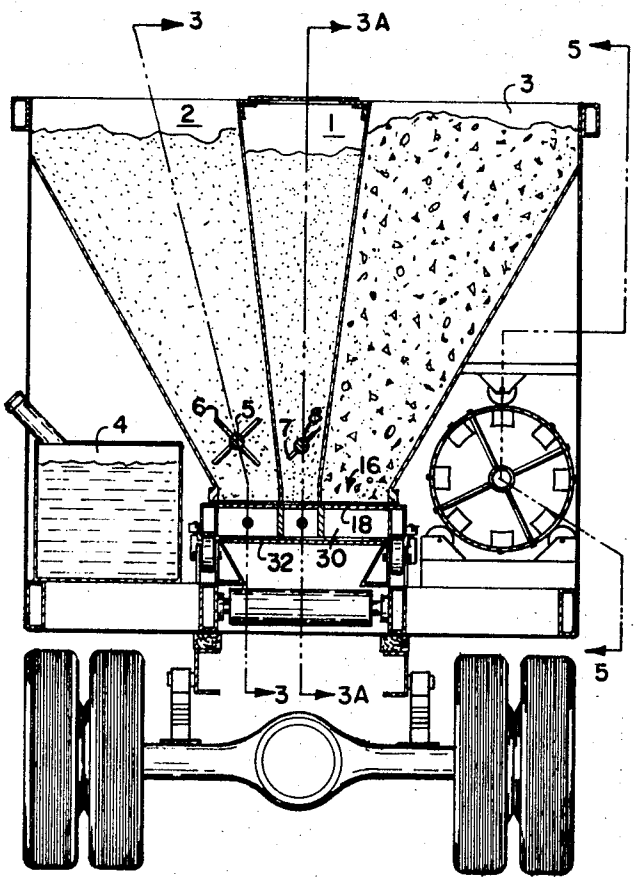

FIG. 1

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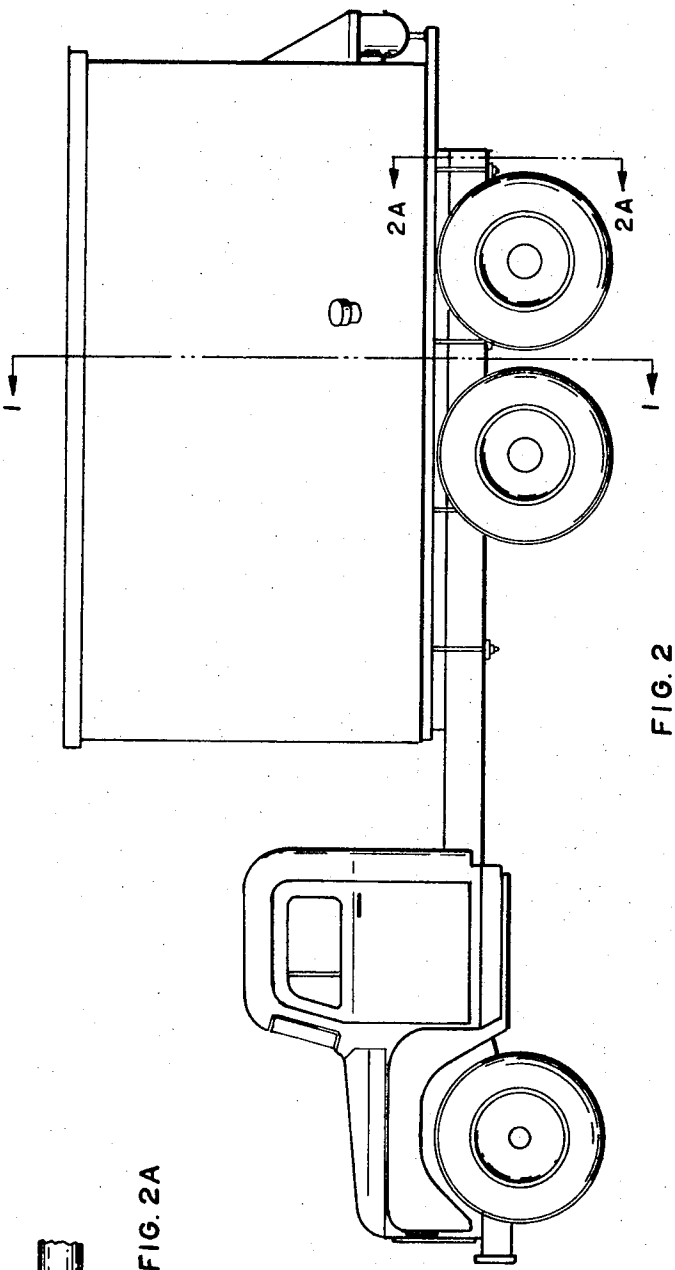

FIG. 2

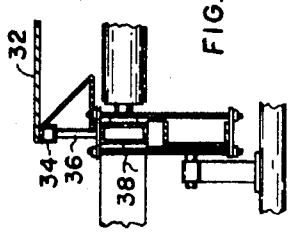

FIG. 2A

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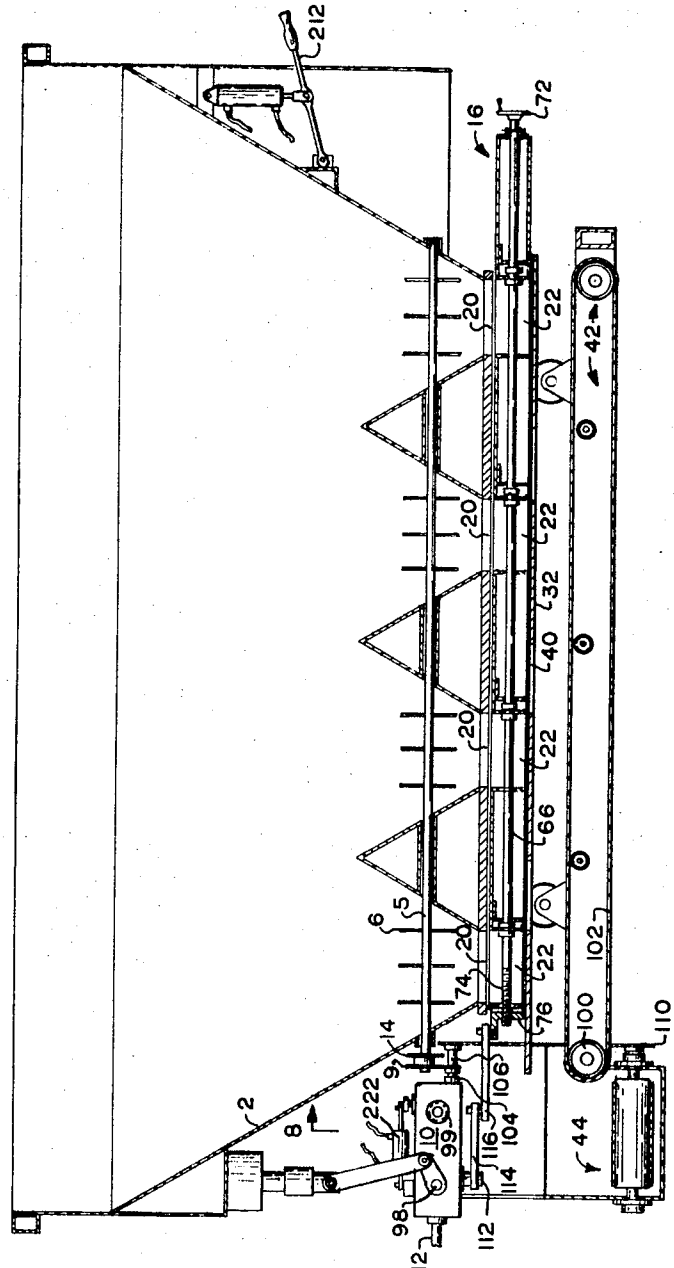

FIG. 3

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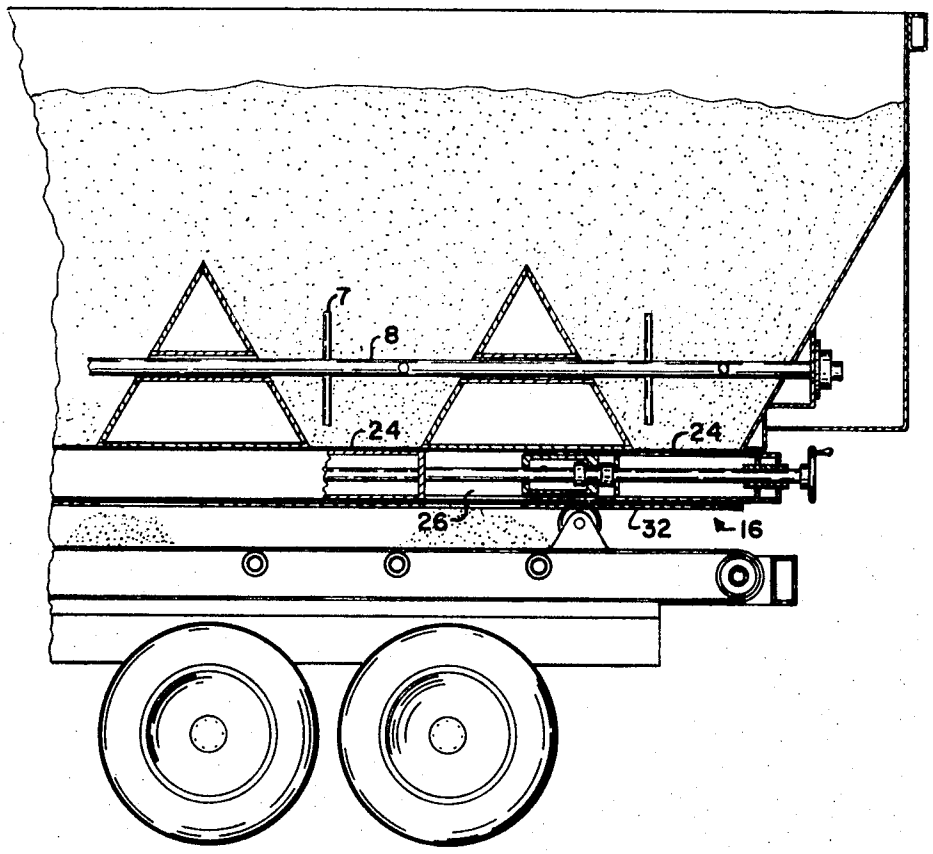

FIG. 3A

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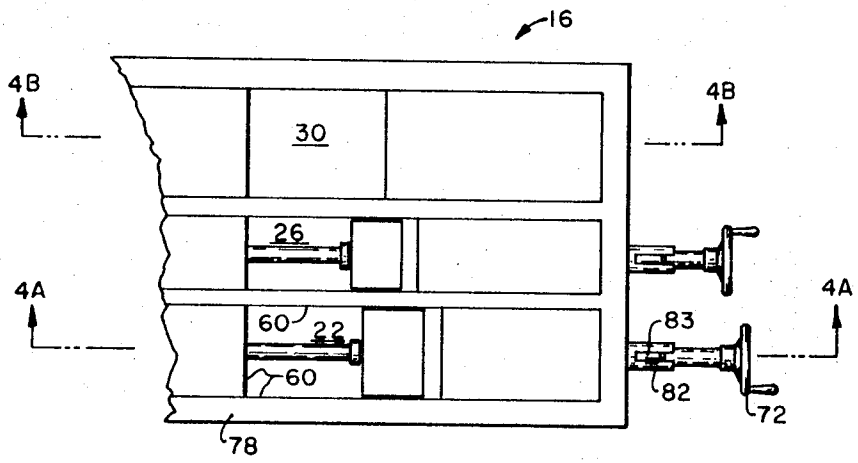

FIG. 4

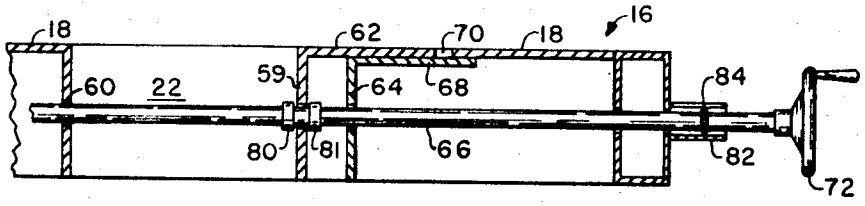

FIG. 4A

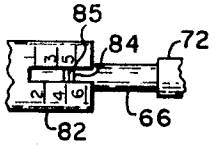

FIG. 4C

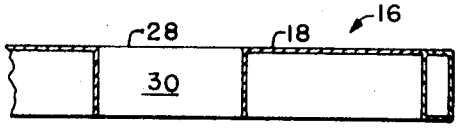

FIG. 4B

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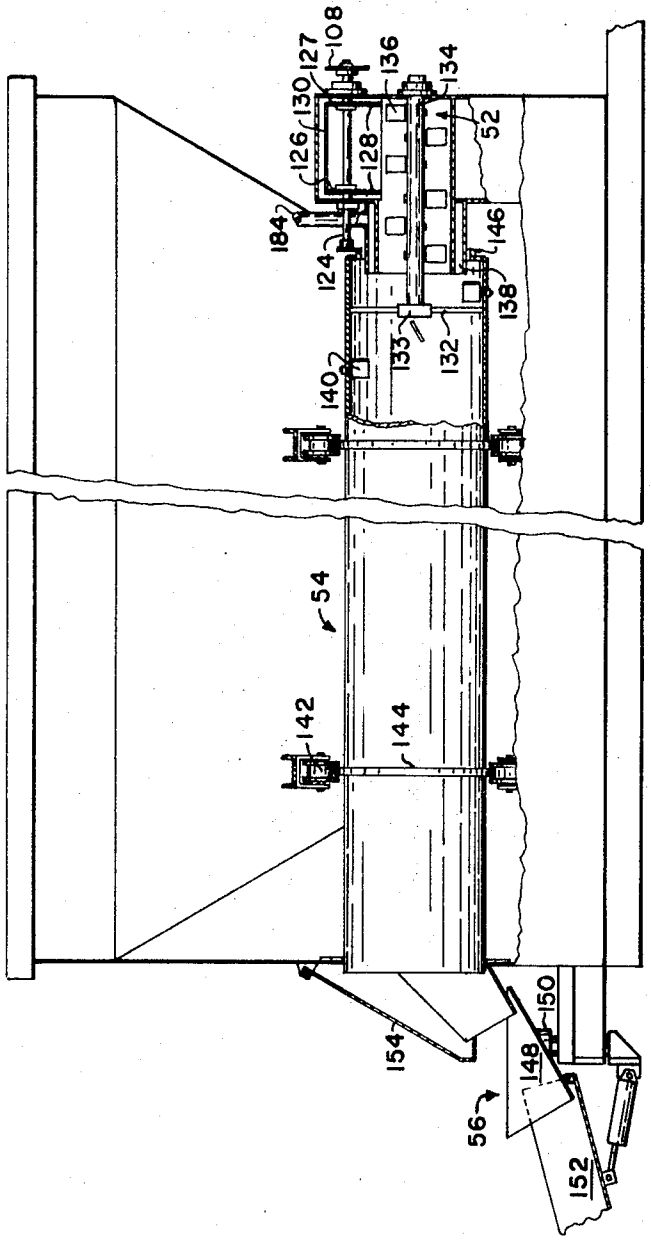

FIG. 5

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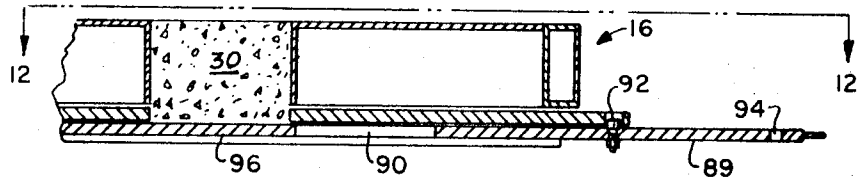

FIG. 12A

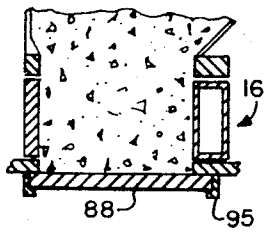

FIG. 11

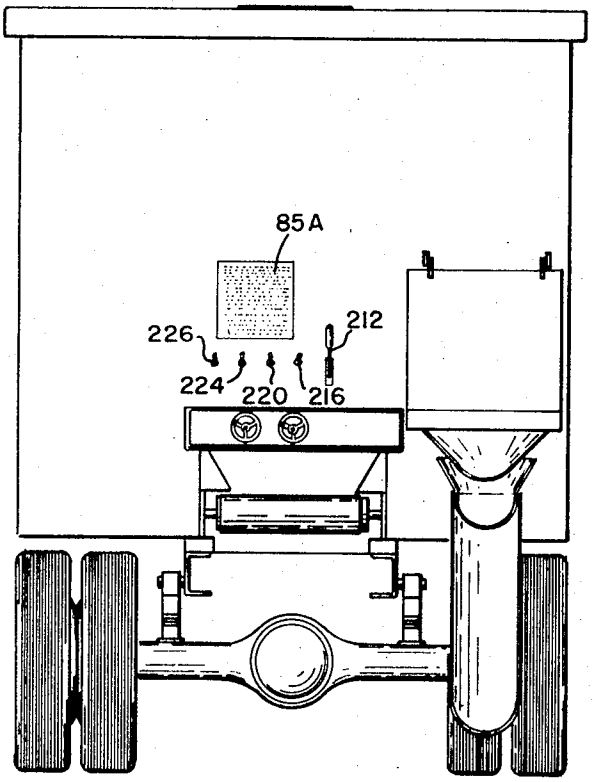

FIG. 6

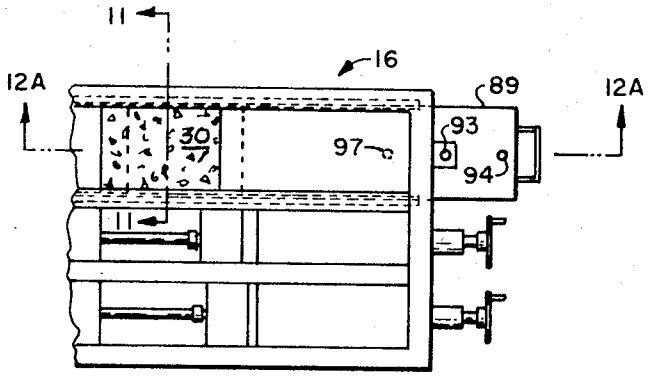

FIG. 12

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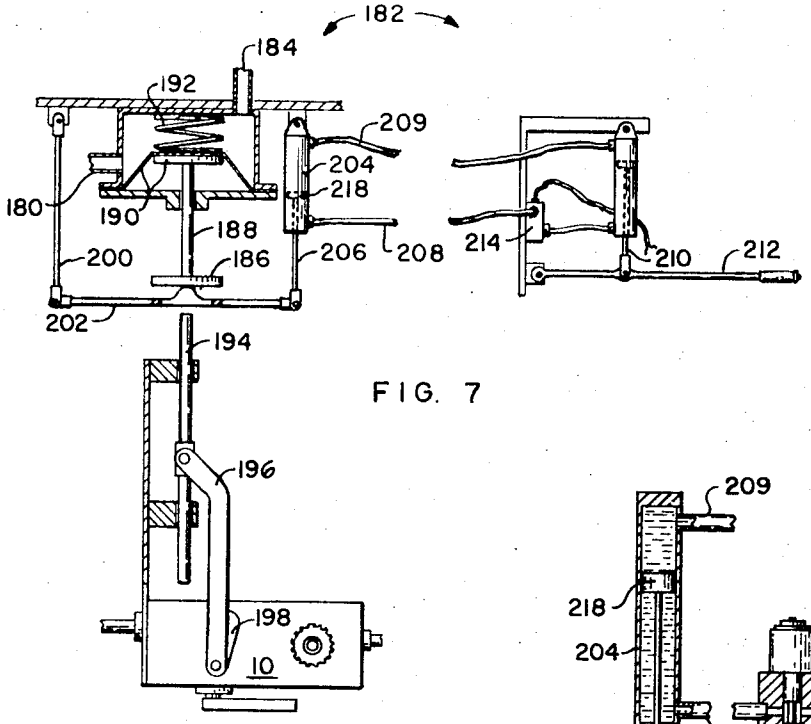

FIG. 7

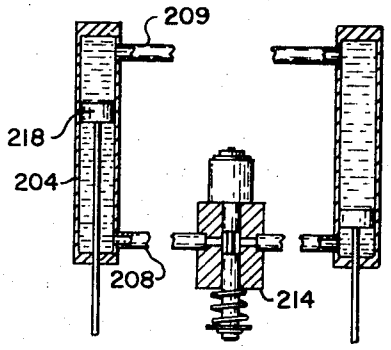

FIG. 7A

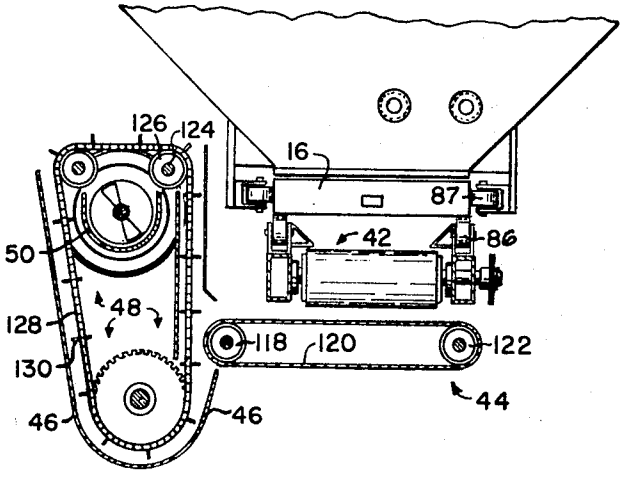

FIG. 8

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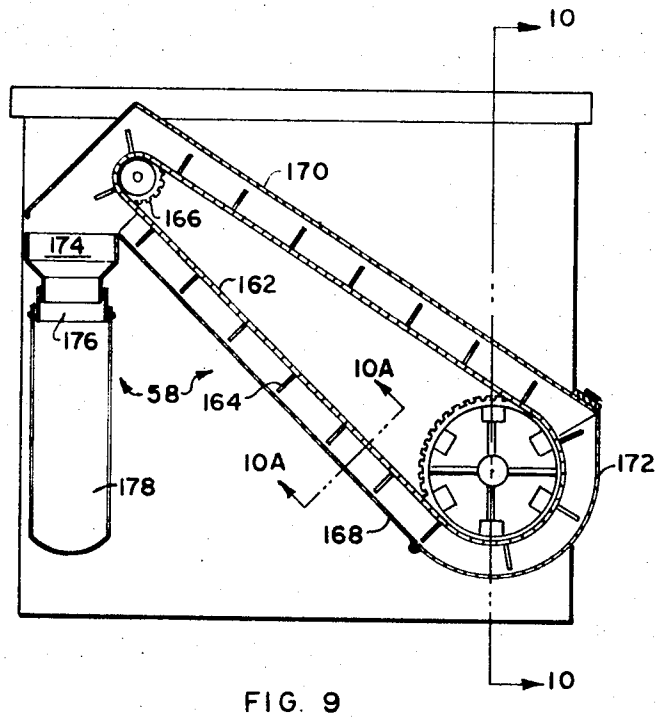

FIG. 9

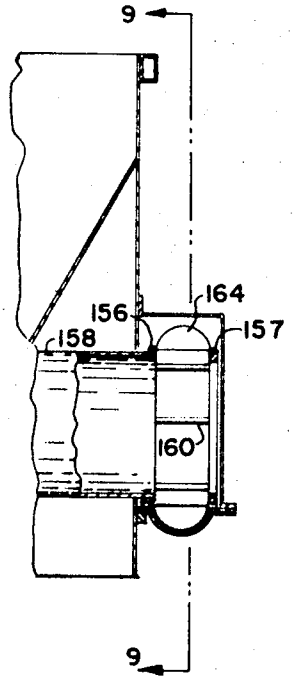

FIG. 10

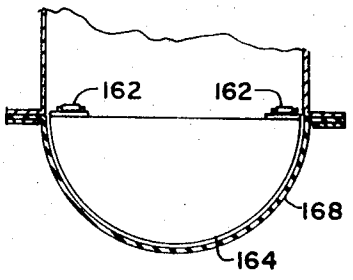

FIG. 10A

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CONCRETE MEASURING AND MIXING APPARATUS

The presently common, cumbersome type of concrete-mixing truck has numerous disadvantages. It can be efficiently used only in the simultaneous mixing and transport of a large amount of ready-mixed concrete. It does not provide metering various quantities of cement, aggregate and water in optionally variable proportions. If a loaded truck breaks down it is necessary to manually unload a large mass of concrete before it sets inside the tumbler; and when the contents of the tumbler are more than the amount of concrete needed at a given site the remainder must be poured relatively quickly, often in waste. It does not pour at sufficient height to form an eight-foot-high wall. It requires a very expensive stationary batch plant for metering all the concrete materials at a high elevation.

Another known type involves a highly expensive neoprene conveyor belt, carrying the entire load of materials, that rather quickly wears out because of the friction between the rubber and the very heavy load of abrasive aggregate on top of it.

In view of these facts, some objects of the present invention are to provide a truck-transportable concrete-mixing apparatus in which: (1) the cement, aggregate and water are separately stored while being transported and are mixed at the site of pouring to supply a controllable amount of concrete; (2) the water, cement, sand and gravel or other coarse aggregate are separately metered in controllable amounts to supply a desired amount of concrete of a desired strength; (3) the apparatus is preferably detachably mounted on a standard truck chassis, thus permitting repair of the concrete mixer while off the truck, or replacement of worn apparatus on the truck, or its movement from a defective truck to another.

Other objects of the invention will be apparent from the following specification and attached drawings. In these drawings:

FIG. 1 is an elevational, sectional view of the apparatus on a truck, from the plane 1—1 of FIG. 2;

FIG. 2 is a side elevation of the assembled truck and apparatus;

FIG. 2A is a detail, sectional view from the plane 2A—2A of FIG. 2, illustrating a detachable mounting of the apparatus on the truck frame;

FIG. 3 is an elevational, sectional view from the plane 3—3 of FIG. 1;

FIG. 3A is a sectional view from the plane 3A—3A of FIG. 1;

FIG. 4 is a fragmentary top plan view illustrating one of the four sets of cement and aggregate metering units;

FIG. 4A is an elevational, sectional view from the plane 4A—4A of FIG. 4;

FIG. 4B is an elevational, sectional view from the plane 4B—4B of FIG. 4;

FIG. 4C is a fragmentary, plan, detail view showing the volume-indicating means on a scale enlarged from that of FIG. 4;

FIG. 5 is a side elevational view, partly in section and partly broken away, from the planes 5—5 of FIG. 1;

FIG. 6 is a rear elevational view of the assembled apparatus and truck;

FIG. 7 is a detail, sectional view of the water metering device, for clarity being shown in different proportions from those of the device's parts in FIG. 3;

FIG. 7A is a detail sectional view illustrating the pump-stroke-adjusting mechanism of the water-metering device;

FIG. 8 is a detail, elevational, sectional view from the plane 8—8 of FIG. 3;

FIG. 9 is a rear-end, elevational view, partly in section from the plane 9—9 of FIG. 10, showing the optional means for high-elevation discharge of the mixed concrete;

FIG. 10 is an elevational, sectional, fragmentary view from the plane 10—10 of FIG. 9;

FIG. 10A is a detail sectional view from the plane 10A—10A of FIG. 9;

FIG. 11 is a fragmentary top plan view illustrating one of the four sets of cement, sand and coarse-aggregate metering units, this figure being similar to FIG. 4, but showing addition of an optional and preferred slide which at the will of the operator may be adjusted to block off the coarse aggregate from entering into the mix;

FIG. 12 is a top plan view of the metering-slide assembly, showing the coarse-aggregate-blocking slide as in the process of closing off the discharge openings of compartments 30; and

FIG. 12A is a detail view in section from the plane 12A—12A of FIG. 12, having the blocking slide in coarse-aggregate-blocking position.

With particular reference to FIGS. 1 to 5, 8 and 9, the invented apparatus comprises: a cement storage chamber 1; a sand storage chamber 2, a chamber 3 for storage of gravel, crushed stone or other coarse aggregate; a water tank 4 (which optionally may also contain an antifreeze material, for instance calcium chloride, when the machine is operated under cold conditions); an agitator in the sand compartment comprising a rotating shaft 5 and tines 6 which are staggered on the shaft and spaced along its length; an agitator in the cement that is similar to the sand agitator but has shorter tines, 7, fixed to rotary shaft 8; a chain-and-sprocket drive 9 for rotating the shaft 5; reduction gearing 10, which drives five secondary power-transmitting units; a power-input shaft 12, connectible at will to any power source, preferably to the truck's auxiliary transmission or power-take-off unit; a chain-and-sprocket drive for the cement-agitator shaft 8, of which only the sprocket 14, fixed to shaft 5, is illustrated in FIG. 3; a metering-slide assembly 16, comprising a planar cover or top 18 having four spaced holes, 20, for free passage of sand into the four variable-volume sand-measuring compartments 22, four spaced holes 24, smaller than 20, for passage of cement into the four variable-volume cement-metering compartments 26 (only one of which is shown in FIG. 3A), and four spaced openings 28 for passage of coarse aggregate into four fixed-volume coarse-aggregate compartments 30; a dry-mix-material retaining plate 32, which is fixed to and supported by the tubular beam 34, the attached upright tubular column 36 and the attached apparatus frame 38, and has 12 dry-materials-discharge ports 40, one of which is beneath each of the above-described metering compartments when the metering slide is in its discharge position; a main conveyor assembly 42, conveying the dry-mix materials forward of the compartments; a cross-feed conveyor, 44, for reception of materials from conveyor 42 and transferring them to a side of the apparatus; a trough 46; an elevator 48; a hopper 50, into which the dry-mix materials fall from the elevator; a he-

lical conveyor **52**, moving the materials out of the hopper; a rotatable mixing cylinder **54**, which acts as a second helical conveyor, receiving the dry materials from the helical conveyor **52** and mixing them with water from a water-metering device (described below); and a device for supplying the wet concrete to the point of its use, which optionally may comprise the gravity chute **56** of FIG. 5 or the elevator-and-chute assembly **58** of FIG. 9.

DEVICE FOR METERING THE DRY-MIX MATERIALS

The device **16** provided for varying the ratio of the cement and aggregates for concrete of a desired stregnth comprises separately controllable means in each of the sand and cement compartments **22** and **26** for varying the volume in these compartments, thus controlling at will the proportions of the amounts of sand and cement to the total amount of dry mix utilized. Only the volumes of sand and cement are thus variable with respect to a constant amount of the gravel, crushed stone or other coarse aggregate in the fixed-volume compartment **30**. The volume of sand used (exampling also the volume of the cement compartment **26**) is controlled by means of the adjustable rear wall **59** which together with the fixed side walls **60** and an adjacent portion of the retaining plate **32** forms a compartment for retaining the sand during its measurement. The flange **62**, fixed to the movable wall **59**, prevents sand (or cement) from falling into the space between **59** and the support wall **64**, which provides a bearing for the shaft **66** and also a support for the fixed flange **68** which is fixed to it. This fixed flange provides a bearing and support for the movable elements **62, 59** and **66**. Unless the compartment (for the sand or cement) is expanded into its maximum volume there is a gap **70** between the movable flange and an edge of the top plate **18**. Sand (or cement) is prevented from falling into this gap by the flange **68**, which is of sufficient fore-and-aft length to block off the gap **70** in all positions of **59** and **62**.

The volume of each of the four sand-measuring compartments **22** is adjusted by reciprocation of the shaft **66**. This shaft is rotated by the handwheel **72**, thus turning the screwthreaded shaft portion **74** in the threaded hole in the plate **76**, this plate being welded to an end part of the frame **78** of the metering-slide assembly. This rotation simultaneously reciprocates the shaft **66** and all four of the movable sand-compartment walls **59**, which are rotatably associated with and prevented from axial movement on the shaft by the bearing collars **80** and **81**. A similar handwheel **72** and reciprocable device adjustably controls the volume of cement in the cement compartments **26**.

A position or volume indicating means is utilized that is calibrated, in variation for the type of coarse aggregate that is used in each geographic locality where the apparatus is to be operated. This indicating means, shown in FIGS. **4**, **4A** and **4C**, comprises a sleeve **82**, having a slot **83**. This sleeve is welded to an end part of the frame **16**; and thru its slot the operator may view the top of the shaft-fixed collar **84**, and the annular V-groove **85** that is formed on a lathe around the collar. The calibration on the top of the sleeve **82**, shown in FIG. 4C, may indicate the actual volume of the four associated compartments; but preferably the numbers (exampled as **1** to **6**) are so positioned that by reading the number indicated on each of the indicators connected with the sand and cement compartments and comparing these with the indicia on a placard **85A** (FIG. **6**) the opeator may determine when the proportions of the volumes of sand, cement and coarse aggregate are properly adjusted for dispensing and forming concrete of a desired strength in pounds per square inch.

In operation the entire metering-slide assembly **16** is automatically reciprocated back and forth on the four horizontal-axis rollers **86**, which are in contact with the bottoms of the frame **78**, and between the two pairs of vertical-axis rollers **87**.

An important advantage of the invention is the fact that it optionally may be used either for mixing and pouring coarse-aggregate concrete of a desired strength or for ready-mixing and supplying mortar to masons, plasterers and stuccoers, who usually need it in relatively small amounts. With this machine the operator optionally may supply ready-mixed concrete, then ready-mixed mortar, and, if desired, then another immediate batch of concrete — all from one delivered load. These changes may be quickly effected by means of variations in the above-described settings of the sand and cement proportions and by operating the aggregate-blocking slide (**88** or **89**) to block off supply of the coarse aggregate from the concrete mix. As indicated in FIG. **11**, this blocking slide may be an elongated solid plate that the operator may take from the truck and slide beneath the coarse-aggregate compartments until all their lower discharge openings are blocked. But preferably the blocking slide, as indicated in FIGS. **12** and **12A**, comprises an elongated planar plate **89** that has ports **90**. When the slide is in position for allowing discharge of the coarse aggregate each of these ports is in registry with one of the four bottom discharge openings of the compartments **30**, allowing discharge of the measured amounts of the coarse aggregate. The slide is detachably locked in this position by means of a cap screw or bolt **92** (or an equivalent pin), fitted in registered holes. When mortar is desired the operator removes the screw from the registered holes **93** and **94**, pulls the slide on its bearing channel **95** outward thru its partially reciprocated positions one of which is illustrated in FIG. **12**, until it is in the position of FIG. **12A**, in which the discharge opening of each coarse-aggregate compartment **30** is blocked off by a solid portion **96** of the slide. Then it is temporarily locked in this position by inserting the screw (or pin) in the registered holes **93** and **97**.

MEANS FOR DRIVING THE APPARATUS

The power transmission of the machine comprises the input shaft **12**, the reduction gearing **10**, and five secondary power-transmitting units that are driven by the reduction gearing. In operation, the following four of these five units are continually and simultaneously driven: (1) the water-pump shaft **98**; (2) the conveyor shaft **99** which, via the roller **100**, rotates the conveyor belt **102**; (3) the shaft **104**, driving the two agitator shafts **5** via sprocket chains and the sprockets **9** and **14**; and (4) the shaft **106** (FIGS. **3** and **5**) which drives the sprocket **108** and the mixing assembly and (with reference to FIG. **3**) drives the sprocket **110** and the connected cross-feed conveyor **44**. The fifth unit, in supplying concrete or mortar continually driven by the reduction gearing **10**, comprises the shaft **112** which re-

ciprocates the metering-slide assembly **16** via the crank **114** and the connecting link **116.**

The cross-feed conveyor **44** comprises the roller **118,** driven by the sprocket **110,** and the neoprene belt **120** which rolls on the roller **122.**

With reference to FIGS. **8** and **5,** the elevator **48** comprises: the shaft **124,** driven by the sprocket **108;** the sprockets **126** and **127** that are interconnected by the shaft **124** and simultaneously drive the pair of roller chains **128;** and the mix-lifting bars or paddles **130** that are fixed at regular intervals to the chains **128.**

The mixing cylinder **54** and the helical conveyor **52** are driven from the shaft **124.** The helical conveyor **52** is driven from the mixing cylinder by means of the rigidly connected spokes **132,** hub **133** and shaft **134.** The conveyor **52** transfers the dry-mix materials into the mixing cylinder **54** from the hopper **50** by means of the helically positioned blades **136** that are fixed to the shaft **134.**

The mixing cylinder **54** receives water via the relatively fixed water-inlet annulus **138** in the area where the dry-mix materials enter the mixing cylinder. Helically arranged paddles **140** are fixed to the interior surface of the cylinder, which is rotated on rollers **142** and is axially restrained by the cylinder's flanges **144** that fit in grooves in the rollers. The cylinder is rotated by the rigidly attached sprocket **146** which is driven from the shaft **124** by a sprocket and chain. The cylinder and its paddles **140** tumble and agitate the wet materials and axially move them into the device for supplying the wet concrete to the point of its use. In FIG. **5** this device is exampled as comprising: the trough-like receiver **148,** pivotal on the vertical-axis bearing **150;** the final discharge chute **152,** which is hingedly or otherwise pivotally mounted on **148** for varying the elevation of the discharge of the concrete; and the shield **154** which prevents splashing of the concrete.

When the concrete is to be lifted to a substantial elevation — for example, 6 to 10 feet — the concrete is elevated by the assembly of FIGS. **9, 10** and **10A.** This assembly comprises: the pair of sprockets **156** and **157** (FIG. **10**), one of which (**156**) surrounds the cylinder **158** and is rigidly connected to the other sprocket **157** by the bars **160;** the pair of chains **162;** the planar, segmental lifting paddles **164;** the pair of idler sprockets **166;** the neoprene chute **168;** the metallic upper shield **170;** the curved cover **172,** hinged to permit cleaning the inside of the elevator; and the final gravity chute assembly which comprises the receiving hopper **174,** and the apertured universal coupling having the vertical-axis swiveling base **176** and the horizontal-axis pivotal trough or channel **178.** The final gravity chute assembly is shown in FIG. **9** in its hauled position. In use it is universally pivoted into position for pouring the concrete into its location of use, for example, into a form which may be open either at a high elevation or in a low position which for instance may be a pavement form. In FIG. **9** only one segment of the final concrete-conveying channel is shown, but other segments of known type preferably are transported on the truck, and these may be fixed to the illustrated segment by means of the known type of attachments for such segments.

WATER METERING AND SUPPLY DEVICE

The amount of water used in making concrete, mortar or plaster needs to be varied because of varying wetness or dampness of the aggregate and varying volumes and proportions of the cement and aggregate. Therefore, the invention comprises means for controlling the quantity of water at the will of the operator. This means comprises: the water storage tank **4;** the pump-inlet pipe **180;** a variable-stroke pump assembly, **182;** the pipe **184** that connects the pump and the water-inlet annulus **138,** and thus supplies water to the mixing cylinder **54** of FIG. **5.**

The pump is illustrated as of the diaphragm type. It comprises: a disk **186** that is power-reciprocated; a rod **188,** connected to the disk; a diaphragm assembly **190,** connected to the rod **188;** a spring **192** for returning the diaphragm after each upward stroke of the rod and disk; and reciprocating means for actuating said disk and rod comprising the push rod **194,** the connecting rod **196,** and the crank **198** that is driven from a gear in the reduction gearing **10.**

The means for varying the stroke of the pump determines the volume of water supplied during each cycle of the pump's operation and is controlled by the operator to determine the desired wetness of the concrete. The operator thus may observe this wetness as the concrete is dispensed from the machine and gradually either increase or decrease the pump's stroke until the concrete is of the desired viscosity. Such change may be made at any time during the formation of concrete from the dry materials in the main storage chambers.

Thus from one load of said materials very wet concrete can be poured at one location, and drier concrete at another.

This stroke-varying means comprises: a fixed-length support rod **200;** a spring-restraining link **202** that limits and controls the return stroke of the spring **192;** a hydraulic slave cylinder, **204,** and the piston rod **206;** hydraulic lines **208** and **209,** one leading to each end of the cylinder **204;** a master-cylinder hydraulic assembly comprising piston rod **210;** a hand lever **212** by which the rod **210** and its associated piston may be adjusted to any desired position; and means for locking these pistons and piston rods in their desired positions. With reference to FIGS. **7A** and **6,** this locking means comprises a normally spring closed solenoid-controlled valve **214,** which the operator opens by closing the switch **216** (FIG. **6**) before altering the pump stroke; and after adjusting the position of the slave-cylinder piston **218** by the hydraulic linkage this valve is closed by the spring, in locking position, after the operator opens the switch **216.**

OPERATION

The operation of the invented machine takes place in the following sequence of steps: (1) The storage chambers **1, 2, 3** and **4** are filled with the concrete materials. (2) At the place for supplying concrete a clutch is released, beginning supply of power to the rotary shaft **12** (FIG. **3**). (3) This rotary shaft sets into motion all the gears of the reduction gearing **10** except the one that drives the rotary shaft **112.** (4) Four of the above-described five secondary power-transmitting units are simultaneously driven from **10,** thus operating the agitator shafts, the main conveyor assembly, the cross-feed conveyor, the elevating conveyor assembly **48,** the helical conveyor **52** and mixing cylinder **54,** and the water pump assembly (and the elevating conveyor assembly **58** when the concrete is to be applied at a high location). (5) The switch **220** (FIG. **6**) is closed, thus

opening a solenoid-controlled pneumatic valve that controls the pneumatic cylinder **222** to engage a clutch in the reduction-gearing box, thus beginning rotation of the shaft **112**. (If desired, steps (4) and (5) may be simultaneous.) (6) The crank **114** and link **116** reciprocate the metering-slide assembly. (In its extreme rearward position in each cycle the three sets of four measuring compartments each are under and open to the discharge ports **20** of the three storage chambers, while the discharge ports **40** in the dry-mix-material retaining plate are closed, thus closing the outlets of the measuring compartments; and in the opposite, extreme forward position of the slide, the measuring compartments have moved from under the ports **20** and into positions over the discharge ports **40**.) (7) The materials are discharged onto the main conveyor assembly **42**, which moves them forward and discharges onto the cross-feed conveyor **44**. (8) The conveyor **44** moves the materials into the trough **46** (FIG. **8**). (9) The materials are lifted by the conveyor **48** and discharged into the hopper **50**. (10) The conveyor **52** (FIG. **5**) moves the materials into the mixing cylinder **158** (FIGS. **5** and **10**). (11) The cylinder assembly **54** mixes the dry materials with water, tumbles them and moves them rearward and onto the device for supplying the concrete to the point of its use (the chute **56** or the elevator **58**).

The operator may disengage the clutch from the power source by actuating a solenoid-controlled pneumatic valve via the switch **224**; or, in emergency, he may shut off the engine's ignition by actuating the switch **226**.

In the claims, unless otherwise qualified, the word "concrete" means material that has coalesced or is capable of coalescing into a mass, comprising aggregate and cement of any kind, for example, wet concrete of Portland cement and sand and gravel, or mortar, or plaster; the word "aggregate" signifies particles or roundish or fragmented portions of solid matter; and "cement" means Portland cement, or lime, or a mixture of Portland cement and lime, or plastic cement.

I claim:

1. A device for mixing measured amounts of concrete, comprising:

a plurality of chambers in fixed relation to each other, for storage of cement and aggregate materials, each chamber having a discharge port at its bottom;

a metering-slide assembly below said chambers, having a materials-measuring slide, comprising: at least one materials-measuring compartment associated with each of the said chambers; means for supporting said slide for reciprocating movement; and means for reciprocating the slide;

a relatively stationary, apertured plate beneath said slide, having solid portions that close the bottom of each of said compartments in one extreme position of the reciprocable slide, and having openings, one of which is beneath each of said compartments in the opposite extreme position of the slide; each of the said compartments of the slide in said first-named extreme position being below one of said discharge ports;

means for mixing the measured materials from said compartments and adding water to them; and

means for moving the wet concrete out of said mixing means.

2. A device as set forth in claim **1**, comprising means for varying the volume of at least one of said measuring compartments.

3. A device as set forth in claim **1**, in which said compartments comprise side walls, at least one of which is movable to adjust the volume of its compartment.

4. A device as set forth in claim **1**, in which said cement is calcareous, and the device comprises means for supplying measured amounts of water to the said means for mixing the materials.

5. A device as set forth in claim **4** in which: said water-supplying means comprises a variable-stroke pump; and the device comprises means for simultaneous actuation of the said pump and said means for reciprocating the slide in predetermined relation of their speeds.

6. A device as set forth in claim **5**, in which said simultaneous-actuation means comprises reduction gearing.

7. A device for mixing concrete, comprising:

a plurality of chambers, in fixed relation to each other, for storage of cement and aggregate materials, each chamber having a discharge port at its bottom;

a device for tumbling and mixing said materials;

reciprocable means for alternately opening and closing said ports, allowing gravity discharge of the cement and aggregate materials;

means comprising a conveyor belt, positioned below said chambers, for transferring said gravity-discharged materials to said tumbling device;

means, between the said conveyor belt and the said discharge ports and bottoms of said chambers, comprising an apertured plate, for preventing a heavy load in said chambers from bearing on and causing excessive wear of said belt; and

power means for driving said reciprocable means, tumbling means and conveyor belt.

8. A device as set forth in claim **7**, in which said means berween the conveyor belt and said discharge ports comprises a reciprocating slide, adapted to open said discharge ports in one extreme position of its reciprocation and to open said ports in the other extreme position of its reciprocation.

9. A device as set forth in claim **7**, in which: said slide comprises compartments for measuring volumes of said materials; the said apertured plate is fixed relative to said slide; and the said materials, after measurement, being discharged thru openings in said apertured plate onto said belt.

10. A device as set forth in claim **9**, comprising means for varying the proportions of the volumes of said materials that exit from said slide during each of its reciprocations.

11. A device as set forth in claim **10**, in which said proportions-varying means comprises at least one movable wall in one of said compartments.

12. A device as set forth in claim **7**, in which said cement is calcareous, comprising means for supplying measured amounts of water to the said means for mixing the materials.

13. A device as set forth in claim **12**, in which said water-supplying means comprises a variable-stroke pump.

14. A device for mixing and dispensing concrete, comprising:

a plurality of chambers for storage of cement and aggregate materials;

at least one measuring compartment associated with each of said chambers, for receiving and temporarily holding a measured quantity of one of said materials, having a volume that is substantially less than that of its larger associated chamber, having a closable inlet connected with its said associated chamber, and having a closable outlet for gravity-influenced discharge of said measured quantity of one of said materials; at least one of said compartments comprising means for varying its volume;

means for closing each of said inlets after entry of said measurable quantity of materials and for opening each of said outlets for gravity discharge of one of the measured amounts of materials;

means for mixing said measured amounts of materials; and

means for moving the mixed amounts of said materials out of said device.

15. A device as set forth in claim **14,** comprising means for controllably varying the volume of each of two said compartments.

16. A device as set forth in claim **14,** in which said volume-varying means comprises a compartment side wall, movable from a position providing larger compartment volume to a position providing a smaller compartment volume.

17. A device for mixing and dispensing concrete, comprising:

a plurality of chambers for storage of cement and aggregate materials;

a reciprocable slide having side walls and openings in its bottom, comprising at least one measuring compartment associated with each of said chambers, for receiving and temporarily holding a measured quantity of one of said materials, having a volume that is substantially less than that of its larger associated chamber, having a closable inlet connected with its said associated chamber, and having a closable outlet for gravity-influenced discharge of said measured quantity of one of said materials;

a materials-retaining plate, below said side walls;

means for closing one of said inlets after entry of said measurable quantity of materials and for opening each of said outlets for gravity discharge of one of the measured amounts of materials; the said inlets being ports between said chambers and said compartments in one of the extreme reciprocated positions of said slide, and the said closable outlets comprising openings in the said materials-retaining plate;

means for mixing said measured amounts of materials; and

means for moving the mixed amounts of said materials out of said device.

18. A device as set forth in claim **17** in which said slide is rack-like and each of the said openings at its bottom has a cross-sectional area at least as large as that of the space between bottom edges of the said side walls.

19. A device as set forth in claim **17,** in which the said cement comprises Portland cement, and the said slide comprises a plurality of said compartments for measuring aggregate; all the compartments being in fixed relation to each other; and each having said side walls, inlet and outlet.

20. A device as set forth in claim **19,** in which said compartments for measuring aggregate comprise at least one for measuring fine aggregate and at least one for measuring coarse aggregate; and the said device comprises means for blocking the outlet of said coarse-aggregate-measuring compartment, thus blocking entry of coarse aggregate into the mixture of materials.

21. A device for mixing and dispensing concrete, comprising:

a plurality of chambers for storage of Portland cement and aggregate materials;

a reciprocating slide, comprising measuring compartments having side walls and bottom edges that are free of fixed attachment to any other materials-retaining member, providing spaces for outlet of materials from the compartments, the said slide including at least one measuring compartment associated with each of said chambers, for receiving and temporarily holding a measured quantity of one of said materials, having a volume that is substantially less than that of its associated chamber, having a closable inlet connected with its said associated chamber, and having a closable outlet for gravity-influenced discharge of said measured quantity of one of said materials;

a relatively stationary materials-retaining member, below said reciprocating slide, having ports that come below said spaces during reciprocation of the slide;

means, connected to said slide, for closing each of said inlets after entry of said measurable quantity of materials and for opening each of said outlets for gravity discharge of one of the measured amounts of materials;

means for mixing said measured amounts of materials; and means for moving the mixed amounts of said materials out of said device.

22. A device for mixing and dispensing concrete, comprising:

a plurality of chambers for storage of calcareous cement and aggregate materials;

a slide, comprising a plurality of measuring compartments having fixed relation to each other, at least one compartment being for measurement of a volume of fine aggregate and at least one compartment for volume measurement of coarse aggregate; at least one of said compartments being associated with each of said chambers, for receiving and temporarily holding a measured quantity of one of said materials, having a volume that is substantially less than that of its associated larger chamber, having a closable inlet connected with its said associated chamber, and having a closable outlet for gravity-influenced discharge of said measured quantity of one of said materials;

means for closing each of said inlets after entry of said measurable quantity of materials and for opening each of said outlets for gravity discharge of one of the measured amounts of materials;

means for blocking the outlet of said coarse-aggregate-measuring compartment, thus barring entry of coarse aggregate into the mixture of materials;

means for mixing said measured amounts of materials; and

means for moving the mixed amounts of said materials out of said device.

23. Apparatus for mixing cement and aggregate, adapted to be carried by a vehicle, comprising:

a plurality of juxtaposed chambers having side walls, and means for fastening said chambers to a vehicle with the said side walls intersecting a transverse plane of the vehicle; one of the said chambers being adapted to store cement, another to store fine aggregate, and each of the chambers having at least one hole in its bottom for flow of material from the chamber;

means comprising a slide below said chambers for measuring and moving meterials, adapted for reciprocative movement relatively to the chambers, including a plurality of compartments having upper openings that come below said holes in one reciprocated position of the slide, receiving materials thru and from said holes; and means providing for discharge of the materials downward from said compartments in another reciprocated position of the slide;

a conveyor below said slide, mounted for movement of materials at an angle to said transverse plane, receiving measured amounts of said materials from said compartments and transferring them to a forward location;

means for transporting and mixing said measured materials, moving them from said forward location to rearward location at a rear-end portion of said apparatus, comprising a conveyor, adjacent to side-wall portions of said chambers and slide;

liquid-supplying means, flow-connected to said transporting and mixing means, for supplying liquid to said measured materials; and

mixture-supplying means at said rear-end portion for receiving wet-mix materials from said transporting and mixing means and supplying the materials to points of use.

24. Apparatus as set forth in claim **23,** in which said liquid is water, and said mixture-supplying means comprises: a conveyor for moving said wet-mix materials to a selected elevation having a maximum height of at least eight feet above ground level; and a pivotal dispensing channel.

25. Apparatus as set forth in claim **23,** comprising three of said juxtaposed chambers, one of which is adapted to store coarse aggregate.

26. Apparatus as set forth in claim **23,** in which said liquid-supplying means comprises a variable-stroke pump.

27. Apparatus as set forth in claim **23,** in which said transporting and mixing means comprises a cross-feed conveyor, for receiving materials at said forward location and moving them transversely of the vehicle to said last-named conveyor.

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