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Merton et al.

[11] **3,929,400**

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[54] **SLURRY PUMPS**

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[52] **U.S. Cl.** **417/516;** 417/900

[51] **Int. Cl.** **F04b 15/02**

[58] **Field of Search** 417/516, 517, 519, 531, 417/532, 900

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Attorney, Agent, or Firm—Kemon, Palmer & Estabrook

[57] **ABSTRACT**

Slurry pump, particularly for wet concrete, in which a discharge pipe extends upwardly from the base of a supply hopper and is rotatable through a restricted arc about the vertical axis. The discharge pipe is provided, at the bottom of the hopper, with a horizontal elbow registering alternatively with two pump cylinders extending horizontally from the hopper. During induction a pump cylinder ingests slurry from the hopper and during discharge, discharges slurry to the discharge pipe through the elbow, the discharge pipe being oscillated to connect with the appropriate cylinder.

5 Claims, 2 Drawing Figures

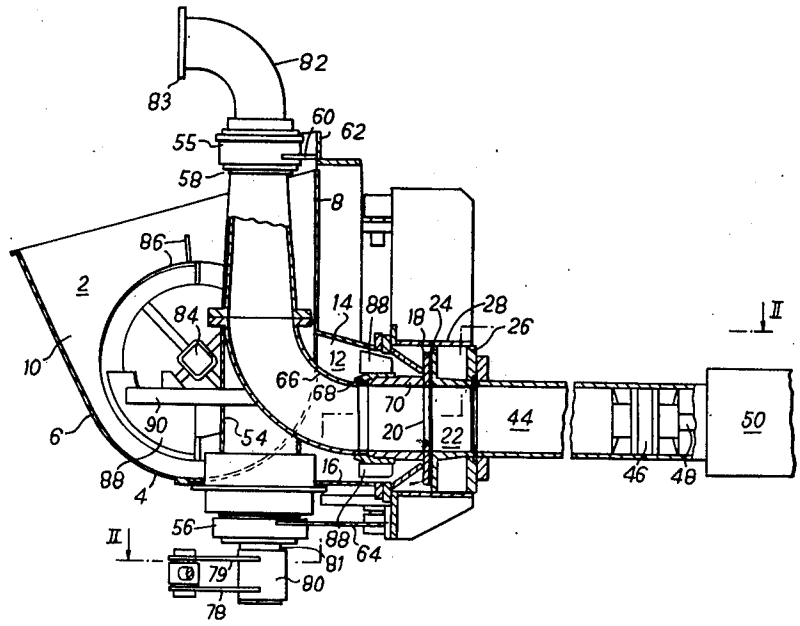

FIG. 1

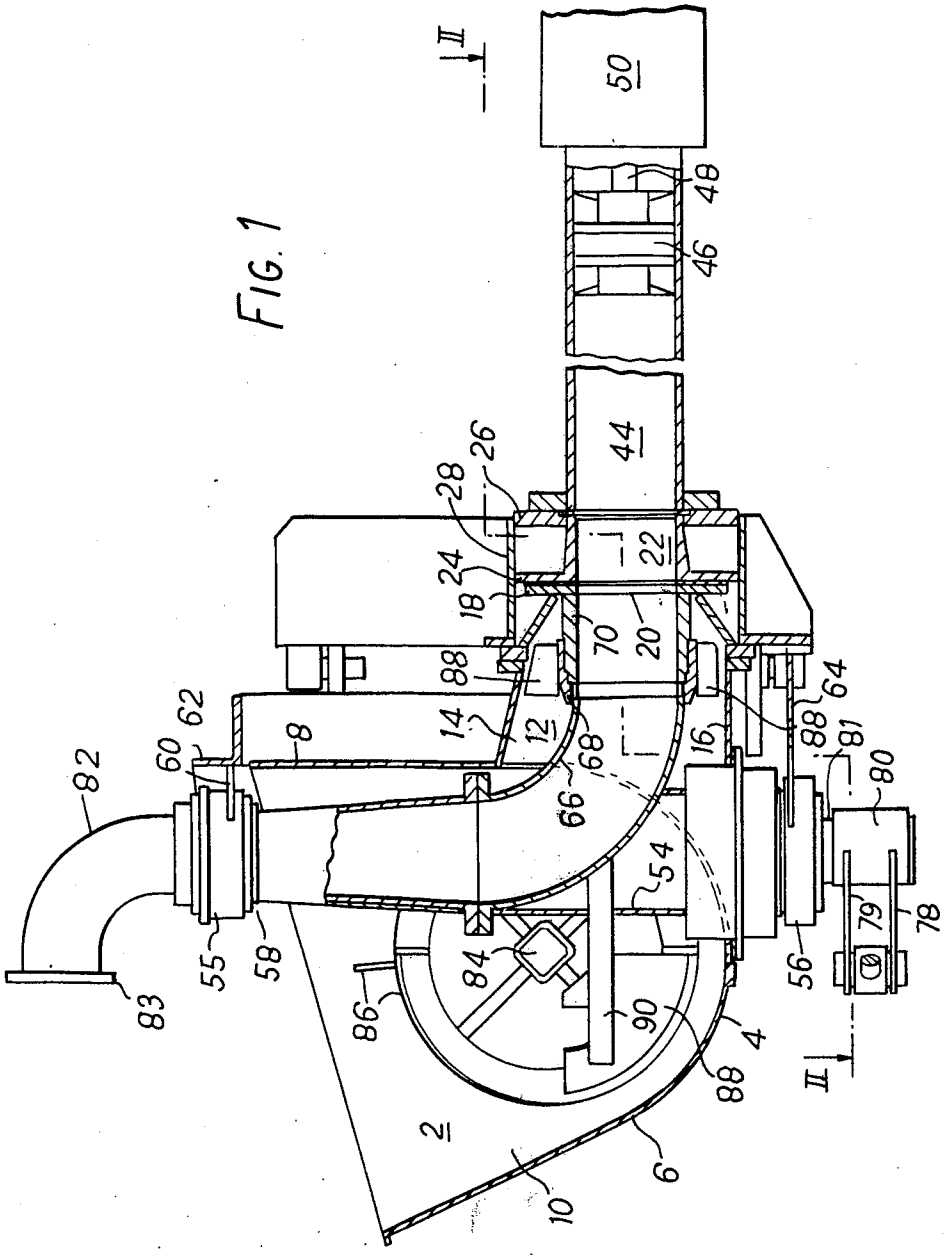
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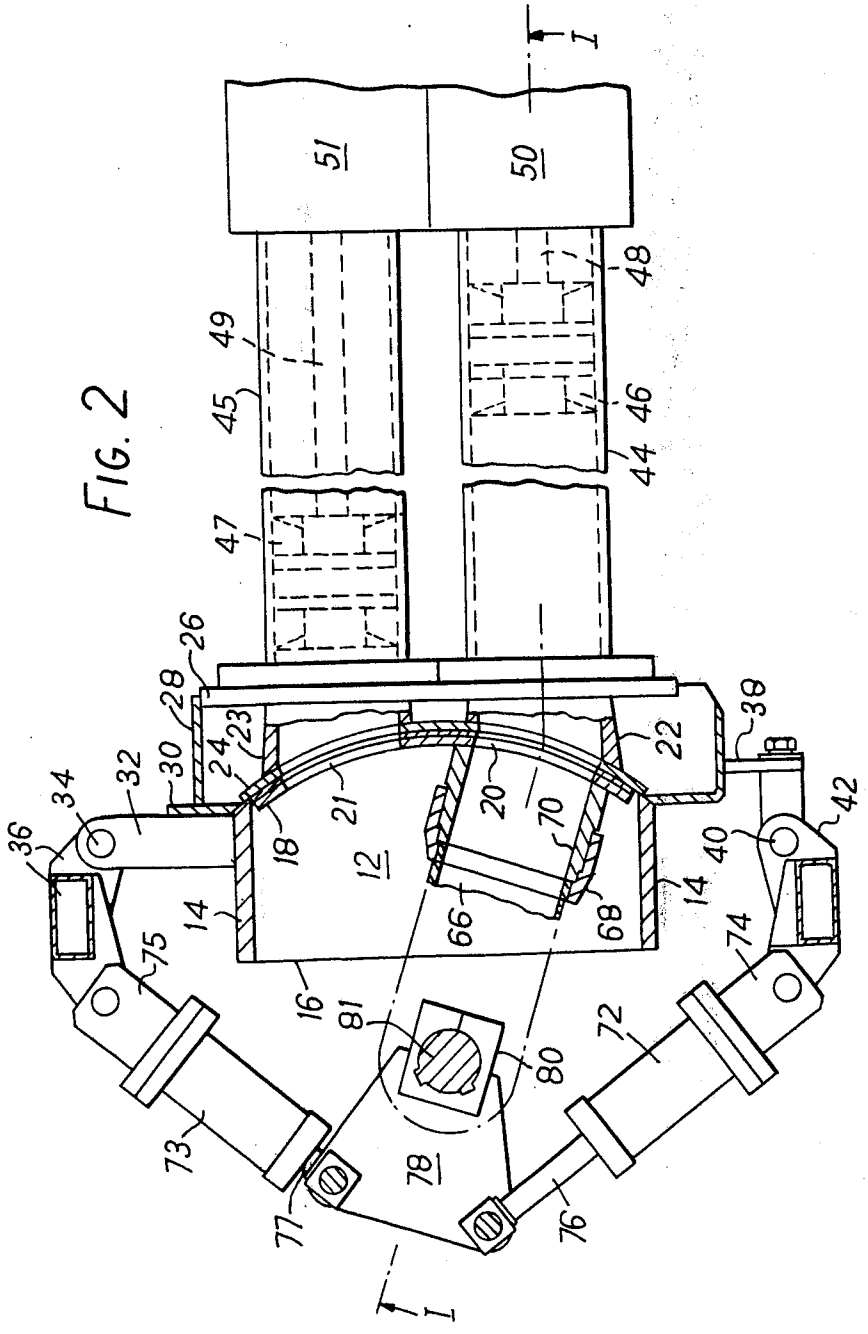
FIG. 2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SLURRY PUMPS

This invention relates to slurry pumps and, more particularly, to pumps for effecting movement of wet concrete mixtures from a hopper through a discharge pipe to a discharge location for direct deposition of the concrete mixture.

According to the present invention there is provided a slurry pump including a hopper arranged to receive slurry, a hollow discharge column extending into the hopper axially rotatable through a restricted arc, a duct extending radially from the column to an aperture in the hopper wall movable, upon rotation of the column, between a position in register with the aperture and a position displaced from the aperture, and a cylinder extending externally of the hopper in register with the aperture provided with a piston connected to be urged toward the column to urge slurry from the column when the duct is in register with the aperture and away from the column to induct slurry into the cylinder when the duct is displaced from the aperture.

The invention will now be described, by way of example, with reference to the accompanying, partly diagrammatic drawings, in which:

FIG. 1 is a fragmented sectioned side elevation of a hopper and pump for wet concrete mixtures, taken on the line I—I of FIG. 2; and

FIG. 2 is a sectioned plan view of the pump, taken on the line II—II of FIG. 1.

Referring to the drawings, the pump includes a hopper **2** of substantially rectangular cross-section in plan with a base portion **4** in the form of a half-cylinder merging respectively tangentially with an inclined front wall portion **6** and an upright rear wall portion **8**, the sides being formed with upright plates **10**. A rearwardly tapering chamber or pocket **12** is formed centrally of the rear wall and includes upright walls **14** extending upwardly from base **16** to an inclined plate **17**. An arcuate plate **18** of abrasion resistant material is removably positioned at the rear of the chamber and is formed with apertures **20, 21** in register with a pair of cylindrical ducts **22, 23** welded to an outwardly flanged arcuate support plate **24** backing the abrasion resistant arcuate plate. Rear ends of the cylindrical ducts are mounted in an apertured rear plate **26** carried on a box frame **28** welded to the outwardly flanged arcuate support plate **24** adjacent the transition between the arcuate portion and the flanged portion. A further box framework **30** is welded to the periphery of the flange of the arcuate support plate and carries, to one side, hinge brackets **32** connected with hinge pins **34** with hinge brackets **36** connected to the hopper and, on the other side, with retaining lugs **38** connected with pins **40** to retaining brackets **42** connected to the hopper. By removing the pins **40** from the retaining lugs and brackets, the hopper is rotatable about the hinge pins **34** to separate the hopper **2** from the cylindrical ducts **22, 23** and associated framework at the abrasion resistant plate **18** to permit replacement thereof.

Positioned in register with the rear of the cylindrical ducts **22, 23** are two pump cylinders **44, 45** provided with pistons **46, 47** connected through rods **48, 49** to double acting hydraulic rams **50, 51** all carried on a frame (not shown) connected to the box framework **28** around the arcuate support plate.

A hollow column **54** mounted in top and bottom bearings **55, 56** extends upwardly through an aperture

in the base of the hopper in register with the pocket **12**, the top bearing **55** being a simple bearing acting on a collar **58** on the column and carried on a bracket **60** above the hopper mounted on brackets **62** on the rear wall and the bottom bearing **56** being a thrust bearing including a spherical roller bearing carried on a bracket **64** below the hopper and mounted on the base of the hopper. A flexible seal (not shown) is provided between the base of the hopper and the column at the aperture in the base and is held in place by a retaining ring bolted to the base of the hopper. A tubular elbow **66** extends from the column at the base region of the hopper into the chamber **16** and terminates in a short, straight, internally stepped collar **68** locating a sleeve **70** of abrasion resistant material registering with the apertures **20, 21** in the abrasion resistant arcuate plate **18**. Rotation of the column through approximately 36° of arc serves to move the sleeve **70** from registration with one of the apertures to registration with the other of the apertures. Rotation of the column **54** is effected by means of two hydraulic actuators **72, 73** positioned below the hopper, the cylinder **74, 75** of each actuator being pivotted on the base of the hopper and the rams **76, 77** of each actuator being pinned to plates **78, 79** on a collar **80** keyed onto a solid base **81** of the column. Upon alternate actuation of the actuators the rams are advanced and retracted to effect reciprocation of the arms and thus the column, the actuators being supplied with hydraulic actuating fluid through flexible pipes (not shown) to permit pivotting thereof, the supply being such that advancing of one ram effects retraction of the other ram.

A discharge elbow **82** is bolted to the collar **58** at the upper end of the column and is provided with a coupling **83** for a flexible discharge pipe accommodating the 36° oscillation of the column.

A square shaft **84** extends across the width of the hopper, through bearings in the side walls and is connected to a drive motor (not shown). Blades **86** are mounted on the shaft to effect agitation, or remixing, of the concrete in the hopper and are directed to urge the concrete toward the chamber **16** at the rear wall.

Vanes **88** are welded to the collar **68** and to a spigot **90** on the elbow **66** to agitate the concrete upon reciprocation of the elbow to assist retaining of the cementious material in suspension.

In operation, a wet concrete mixture is fed into the hopper and the drive to the square shaft **84** energized to effect re-mixing and urge the concrete into the chamber **16**. A hydraulic pump (not shown) is then energized and hydraulic fluid, at pressure, supplied to a valve block which delivers the hydraulic fluid alternately to the two hydraulic rams **50, 51** connected to the pistons **46, 47** in the cylinders **44, 45** and alternately to the two hydraulic actuators **72, 73** in sequence. The cycle is such that the actuators **72, 73** position the elbow **66** of the column in register with one of the cylinders, say **44**, the piston **46** in that cylinder is urged forwards to discharge the contents of the cylinder whilst, simultaneously, the piston **47** in the other cylinder **45** is urged rearwards to permit induction of concrete from the hopper through the chamber **16** into the cylinder. On completion of the piston strokes the actuators **72, 73** effect 36° rotation of the column to bring the elbow **66** into register with the cylinder **45** into which concrete has just been inducted. The piston **47** in that cylinder is then urged forwards to discharge the contents of the cylinder whilst the piston **46** in the

cylinder **44** that has just been discharged is moved rearwards to induct concrete into the cylinder. Upon completion of the strokes the actuators **72, 73** rotate the column back through 36° to place the elbow **66** in register with the original cylinder **44** and the cycle repeated.

Inspection and, if necessary, replacement of the arcuate plate **18** and the sleeve **70,** both of abrasion resistant material which are subject to heavy wear, is effected by removing the retaining pins **40** and rotating the hopper on the hinge pins **34,** thereby giving immediate access to the plate and sleeve, which may thus readily be lifted out of position.

We claim:

1. A slurry pump having a framework, fixedly mounted on the framework first and second pump cylinders, hingedly mounted on the framework a slurry hopper readily separable from the pump cylinders by rotation about an upright hinge mounting from a normal position in which the pump cylinders communicate with the interior of the slurry hopper, pistons in the respective first and second pump cylinder, each piston provided with drive means adapted to move the piston between a position adjacent the slurry hopper to a position remote from the slurry hopper by way of an induction stroke and from a position remote from the slurry hopper to a position adjacent the slurry hopper by way of a discharge stroke, extending into the slurry hopper an upright, hollow, slurry discharge column, extending horizontally from the upright, hollow, slurry discharge column and in communication therewith a radial duct formed at an end portion remote from the upright, hollow, slurry discharge column with a cylindrical end wall face co-axial with the upright, hollow, slurry discharge column axis, means adapted to rotate the upright, hollow slurry discharge column and the radial duct through a restricted arc about the upright, hollow, slurry discharge column axis between a first position and a second position, a cylindrical wall portion of the slurry hopper co-axial with the upright,

hollow, slurry discharge column penetrated by the first and second passages respectively in register with the radial duct in the first position connecting with the first pump cylinder and with the radial duct in the second position connecting with the second pump cylinder, the cylindrical wall portion being formed of abrasion resistant material and being readily removable upon rotating the slurry hopper about the upright hinge to separate the slurry hopper from the cylinders, and means interconnecting the drive means for each piston and the means adapted to rotate the hollow column such that the induction stroke is made with the respective pump cylinder in communication with the slurry hopper interior and the discharge stroke is made with the respective pump cylinder in communication with the radial duct.

2. A slurry pump as claimed in claim **1,** wherein the radial duct is provided with an end sleeve of abrasion resistant material readily removably mounted on the radial duct upon rotating the slurry hopper about the upright hinge to separate the slurry hopper from the cylinders.

3. A slurry pump as claimed in claim **2,** wherein the upright, hollow, slurry discharge column is supported in an upper bearing mounted adjacent the top of the slurry hopper and a lower extension of the hollow column extends through the slurry hopper base and is suppported in a bearing subjacent the base.

4. A slurry pump as claimed in claim **3,** wherein a drive shaft extending across the slurry hopper is provided with blades adapted to effect agitation of the slurry and urge the slurry tangentially from the blades horizontally toward the passages in the cylindrical wall portion.

5. A slurry pump as claimed in claim **4,** wherein vanes are provided on the radial duct and on the upright, hollow, slurry discharge column to effect agitation of the slurry upon reciprocation of the column.

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