United States Patent [19]

Coles

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[54] **CONCRETE PUMP**

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[73] Assignee: **Mancole Company Limited,** Winnipeg, Manitoba, Canada

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[52] **U.S. Cl.** **415/72,** 198/64, 417/900

[51] **Int. Cl.**.....**F10b 3/00**

[58] **Field of Search** 415/72; 417/900; 198/64, 213

[56] **References Cited**

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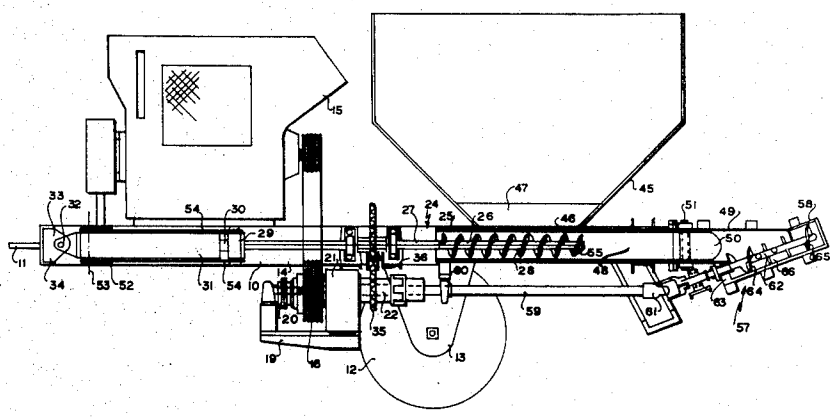
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Primary Examiner—C. J. Husar
Attorney—Kent & Ade

[57] **ABSTRACT**

A pair of alternately reciprocal auger pumps fed by a common hopper and discharging concrete or the like into a common manifold. A clearance auger rotates considerably faster than the pump unit auger assemblies and clears the concrete from the manifold into the discharge conduit. Sections of the pump auger flights at the front ends thereof hinge to close off the ends when on the pumping stroke thus forming the auger flights into pistons.

12 Claims, 5 Drawing Figures



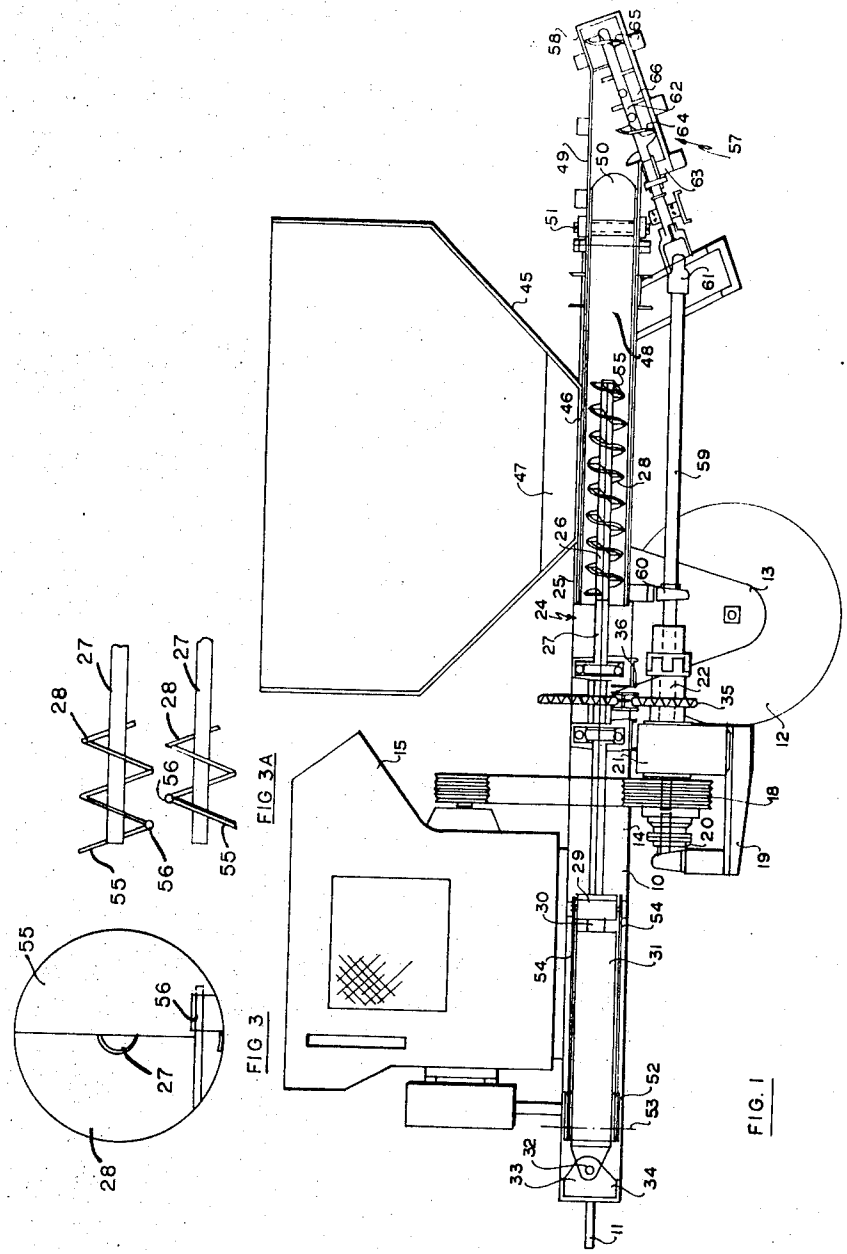


FIG. 1

FIG. 3A

FIG. 3

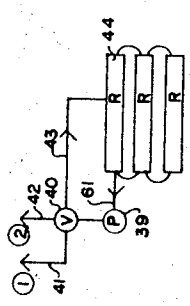

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FIG 4

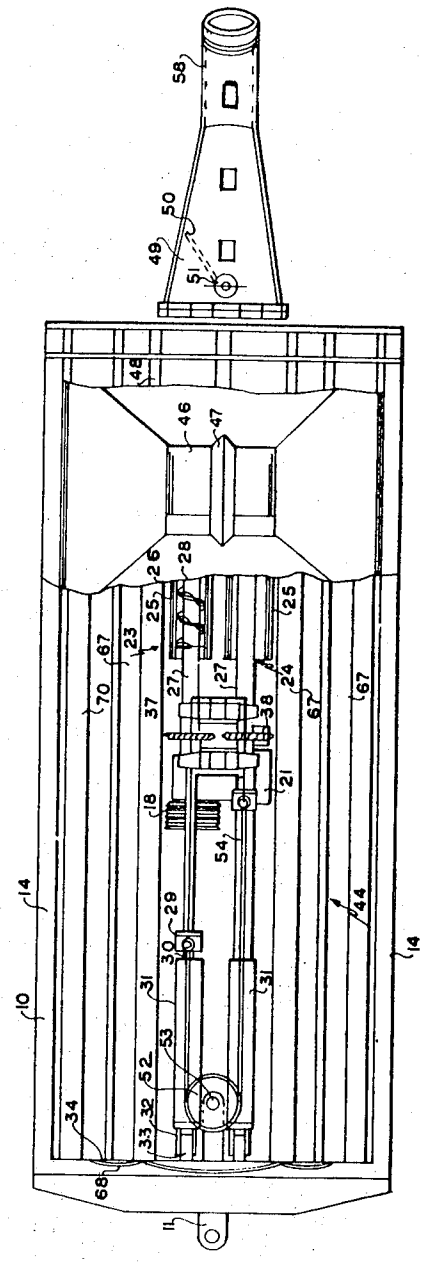

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FIG 2

CONCRETE PUMP

This invention relates to new and useful improvements in pumps for concrete or the like.

Such pumps usually consist of alternately reciprocating pump units operated hydraulically and lying side by side which draw concrete from a hopper and pump it forwardly into a manifold to be distributed conduits to the discharge location.

Due to the consistency of concrete and due to the fact that a large percentage of gravel is incorporated therein, the mixture is relatively stiff and therefore requires considerable power in order to be pumped. Furthermore considerable wear takes place due to the gravel content thereof.

The present invention overcomes disadvantages inherent in conventional constructions by having a pumping unit which consists of a rotating auger which at the same time reciprocates acting as a piston. The rotating auger assists in feeding the concrete forwardly of the front end thereof and as it moves forwardly on the pumping stroke, the concrete is urged into the discharge conduit. Furthermore a rapidly rotating clearance auger is situated within the manifold to assist in clearing the concrete from the manifold into the discharge conduit.

Another object of the invention is to provide a device of the character herewithin described which therefore requires less power than normal and operates more efficiently with practically no chance of jamming taking place.

Another object of the invention is to provide a device of the character herewithin described which incorporates an automatically operating flap valve in the common manifold to prevent concrete from being pumped from one auger into the other which of course, is on its return stroke.

A further object of the invention is to provide a device of the character herewithin described which requires a relatively simple hydraulic system inasmuch as means are provided so that the auger assembly on the pumping stroke automatically withdraws the auger assembly on the non-pumping stroke and vice versa.

A yet further object of the invention is to provide a device of the character herewithin described which is self contained and can easily be transported from one place to the other.

With the foregoing in view, and such other or further purposes, advantages or novel features as may become apparent from consideration of this disclosure and specification, the present invention consists of, and is hereby claimed to reside in, the inventive concept which is comprised, embodied, embraced, or included in the method, process, construction, composition, arrangement or combination of parts, or new use of any of the foregoing, of which concept, one or more specific embodiments of same are herein exemplified as illustrative only of such concept, reference being had to the accompanying Figures in which:

FIG. 1 is a side elevation of the device sectioned in part to show the interior thereof.

FIG. 2 is a top plan view of FIG. 1 with the source of power removed.

FIG. 3 is an end elevation of one end of the auger flight showing the hinged section.

FIG. 4 is a schematic hydraulic diagram.

In the drawings like characters of reference indicate corresponding parts in the different figures.

Proceeding therefore to describe the invention in detail, reference character **10** illustrates a substantially rectangular frame having a hitch **11** at one end thereof which may be attached to a towing means such as a tractor, truck or the like. The frame is mounted upon a pair of ground engaging wheels **12** one upon each side thereof, which in turn are journalled within depending wheel supports **13** attached to the longitudinal frame members **14**.

Mounted upon the frame is a source of power **15** taking the form of a diesel engine which supplies drive via drive pulley **16** and belt **17**, to driven pulleys **18** supported within a sub-frame **19** below the main frame. These pulleys in turn operate a drive shaft **20** connected to a gear reduction unit **21** which in turn is connected to a driven shaft **22** on one side thereof.

A pair of pump units collectively designated **23** and **24** are supported within the frame and consist of cylinders **25** situated in side by side relationship with an auger flight assembly **26** rotatable within the cylinders **25**. Each auger flight assembly includes an auger shaft **27** having an auger flight **28** formed thereon in the usual way, and this shaft **27** extends towards the end of the frame carrying the hitch **11** and is connected via a thrust bearing **29** to the piston rod **30** of an hydraulic piston and cylinder assembly **31** supported at the rear end thereof by pivot pin **32** to lugs **33** extending from the transverse member **34**. forming part of the frame **10**.

A sprocket wheel **35** is driven by driven shaft **22** and a chain **36** extends around this sprocket wheel and around drive sprockets **37** and **38** splined to shafts **27** so that the shaft **27** although rotated by sprockets **37**, can nevertheless slide lengthwise through the sprockets as will hereinafter be described.

Also driven by the source of power **15** by means (not illustrated) is an hydraulic pump **39** which is connected to a control valve **40**. The control valve has conduits **41** and **42** extending to the rear ends of each of the cylinders **31**. A fourth conduit **43** extends from the valve to the fluid reservoir **44** which will hereinafter be described.

Summarizing the operation to date, the source of power **15** rotates the auger shaft **27** together with their flights **28** within cylinders **25**. The pump **39** via valve **40** supplies hydraulic pressure alternately to the rear end of the piston and cylinder assemblies **31** thus driving the shafts **27** together with the auger flights alternately forwardly and rearwardly within cylinders **25**.

A concrete hopper **45** is situated upon the frame and communicates with the two cylinders **25** towards the forward ends thereof as illustrated by reference character **46** in FIG. **1**. A divider **47** ensures that concrete flows evenly on either side thereof into the cylinders **25**.

When the auger flight of cylinder assembly **23** is in the rearward position shown in FIG. **1**, concrete is picked up by the rotating auger and fed forwardly of the auger into the pumping section **48** of the cylinder **25**. Concrete is also being picked up by the other auger which is in the forward position at this time.

When the valve **40** is actuated, the auger flight **28** together with shaft **27** is moved to the right with respect to FIG. **1** due to the action of the piston and cylinder assembly **31** and this forces the concrete in the section **28**, into a common manifold **49** connecting the ends of

cylinders 25 together as clearly shown, the rotation of auger flight 28 facilitating the pumping action.

When valve 40 is actuated once more, the other piston and cylinder assembly moves forwardly on the pumping stroke thus pumping concrete also into the manifold 49. A flap valve 40 is hinged vertically at 51 within the manifold and as the concrete is driven from one of the cylinders 25 into the common manifold, this flap valve moves across to close off the other cylinder and vice versa.

Means are provided to withdraw one auger flight assembly within the cylinder 25 as the other is being moved forwardly and vice versa, and takes the form of a sheave 52 journalled upon a shaft 53 between the two piston and cylinder assemblies 31.

A cable 54 extends around the sheave and is connected to the thrust bearings 29 at the ends of the piston rods 30 so that when one moves forwardly it automatically draws the other rearwardly and vice versa.

Fluid is discharged on the rear stroke through valve 40 to the reservoir 44.

Means are provided to assist in the pumping action of the auger flights 28 as they move forwardly and take the form of a section 55 on the front flight of the auger being hinged as at 56 so that it moves rearwardly and engages the portion therebehind thus forming the front of the auger flight into a piston head on the forward stroke. On the rearward stroke this portion of the auger flight 55 returns to its original position due to the fact that the auger flight is rotating and concrete is being drawn from the hopper 45.

A clearance auger assembly collectively designated 57 is situated adjacent the manifold and discharge conduit 58 into which the manifold leads. A drive shaft 59 extends forwardly from driven shaft 22 being supported in hanger bearing 60 below the auger flight assemblies 23 and 24. It connects via an universal joint 61 to the clearance auger shaft 62 which is supported within bearings 63 and extends upwardly and forwardly through the manifold 49 and into the discharge conduit 58.

A first auger flight section 64 is situated on the shaft 62 within the manifold just forwardly of the flap valve 50 and a second auger flight assembly 65 is secured to the shaft 62 spaced from the first auger flight assembly 64 and being situated within the discharge conduit 58. Spider bearings 66 along the length of the shaft assist in supporting the shaft within the manifold and the discharge conduit.

It will be observed that sprocket 35 is smaller in diameter than sprockets 37 and 38 so that the clearance auger assembly rotates considerably faster than the auger assemblies 23 and 24 thus assisting in clearing the concrete from the manifold and into the discharge conduit.

Situated within the frame and below the auger assemblies is three longitudinally extending hydraulic reservoir tubes 67 interconnected at both ends by means of cross linking conduits 68 and the pump is connected to one of these via conduit 69 as shown in FIG. 4. The aforementioned discharge conduit 43 is connected to one of these tubes, the three tubes together constituting the hydraulic fluid reservoir 44 and illustrated in FIG. 4.

A further tube 70 is also situated within the frame and may contain diesel fuel for the operation of the source of power 15.

Summarizing the operation, concrete mix is placed within the hopper 45 and the source of power 15 drives the shafts 27 together with the clearance auger shafts 59 and 62. Pump 39 operates through valve 40 to drive the piston and cylinder assemblies 31 forwardly and rearwardly alternately thus causing the rotating auger flights 28 to act as pumps to force concrete picked up thereby, into the front ends 48 of the cylinders 25 and thence into the discharge conduit 49 whereupon it is cleared by the clearance auger assembly 57 into the discharge conduit 58.

Various modifications can be made within the scope of the inventive concept which is herein disclosed and/or claimed.

What I claim as my invention is:

1. A concrete pump comprising in combination a supporting frame, a source of power on said frame, at least one pump unit mounted on said frame, a manifold connecting one end of said pump unit to a discharge conduit, an hydraulic piston and cylinder assembly for said pump unit operatively connected to said source of power and adapted to reciprocate said pump unit on a pumping stroke and a non-pumping stroke, a hopper communicating with said pump unit, a clearance assembly within said manifold and said discharge conduit, said pump unit including a cylindrical casing and an auger flight assembly rotatable and reciprocal in said casing and valve means on the end of said auger flight assembly adjacent said manffold, said valve means closing when said auger flight assembly is on the pumping stroke and opening when said auger flight assembly is on the non-pumping stroke.

2. The device according to claim 1 in which said auger flight assembly is operatively connected to said source of power and to said hopper, said auger flight assembly communicating with said manifold.

3. The device according to claim 1 in which said clearance assembly includes a shaft journalled for rotation and extending upwardly and forwardly through said manifold and into said discharge conduit, a first auger flight section on said shaft within said manifold and a second auger flight section on said shaft spaced from said first auger flight section and situated within the discharge conduit, said clearance assembly rotating faster than said pump unit auger flight assembly.

4. The device according to claim 2 in which said clearance assembly includes a shaft journalled for rotation and extending upwardly and forwardly through said manifold and into said discharge conduit, a first auger flight section on said shaft within said manifold and a second auger flight section on said shaft spaced from said first auger flight section and situated within the discharge conduit, said clearance assembly rotating faster than said pump unit auger flight assembly.

5. A concrete pump comprising in combination a supporting frame, a source of power on said frame, a pair of side by side pump units mounted on said frame, a common manifold connecting one end of each of said pump units to a discharge conduit, an hydraulic piston and cylinder assembly for each of said pump units operatively connected to said source of power and adapted to reciprocate said pump units alternately on a

pumping stroke and a non-pumping stroke, a hopper communicating with both of said pump units, and a clearance assembly within said manifold and said discharge conduit, each of said pump units including a cylindrical casing and an auger flight assembly rotatable and reciprocal in said casing and valve means on the end of each of said auger flight assemblies adjacent said manifold, said valve means closing when said auger flight assemblies are on the pumping stroke and opening when said auger flight assemblies are on the non-pumping stroke.

6. The device according to claim 5 in which said auger flight assemblies are operatively connected to said source of power and to said hopper, said auger flight assemblies communicating with said manifold.

7. The device according to claim 5 which includes flap valve means in said manifold closing off said pumping units alternately on the non-pumping strokes and opening said pumping units to said manifold on the pumping strokes, and means operatively connected between said pump units whereby the pumping stroke of one unit withdraws the auger flight assembly of the other unit and vice versa, and means including a sheave journalled for rotation near the rear end of said pumping units, a cable extending around said sheave and being connected by the ends thereof to each of the rods of said piston and cylinder assemblies.

8. The device according to claim 6 which includes flap valve means in said manifold closing off said pumping units alternately on the non-pumping strokes and opening said pumping units to said manifold on the pumping strokes, and means operatively connected between said pump units whereby the pumping stroke of one unit withdraws the auger flight assembly of the other unit and vice versa, said means including a sheave journalled for rotation near the rear end of said pumping units, a cable extending around said sheave and being connected by the ends thereof to each of the rods of said piston and cylinder assemblies.

9. The device according to claim 5 in which said clearance assembly includes a shaft journalled for rotation and extending upwardly and forwardly through said manifold and into said discharge conduit, centrally between said pumping units, a first auger flight section on said shaft within said manifold and a second auger flight section on said shaft spaced from said first auger flight section and situated within the discharge conduit, said clearance assembly rotating faster than said pump unit auger flight assemblies.

10. The device according to claim 6 in which said clearance assembly includes a shaft journalled for rotation and extending upwardly and forwardly through said manifold and into said discharge conduit, centrally between said pumping units, a first auger flight section on said shaft within said manifold and a second auger flight section on said shaft spaced from said first auger flight section and situated within the discharge conduit, said clearance assembly rotating faster than said pump unit auger flight assemblies.

11. The device according to claim 7 in which said clearance assembly includes a shaft journalled for rotation and extending upwardly and forwardly through said manifold and into said discharge conduit, centrally between said pumping units, a first auger flight section on said shaft spaced from said first auger flight section and situated within the discharge conduit, said clearance assembly rotating faster than said pump unit auger flight assemblies, said first auger flight section being forwardly of said flap valve.

12. The device according to claim 8 in which said clearance assembly includes a shaft journalled for rotation and extending upwardly and forwardly through said manifold and into said discharge conduit, centrally between said pumping units, a first auger flight section on said shaft within said manifold and a second auger flight section on said shaft spaced from said first auger flight section and situated within the discharge conduit, said clearance assembly rotating faster than said pump unit auger flight assemblies, said first auger flight section being forwardly of said flap valve.

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