Jan. 30, 1962 H. J. HOFFMAN 3,018,666

ROTATIONAL SPEED CONTROL FOR A DRIVEN SHAFT

Filed Nov. 21, 1960 3 Sheets-Sheet 1

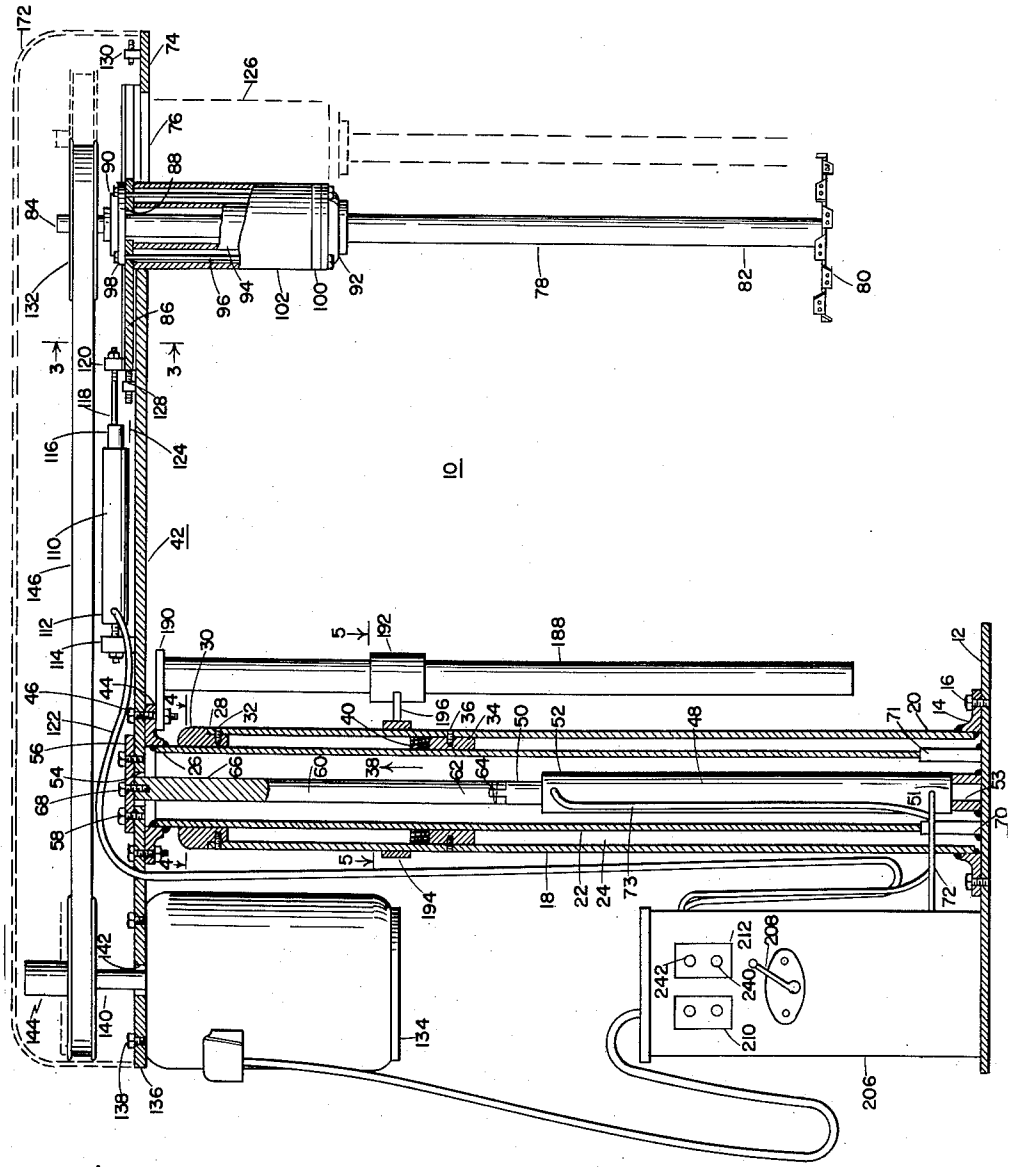


FIG. 1

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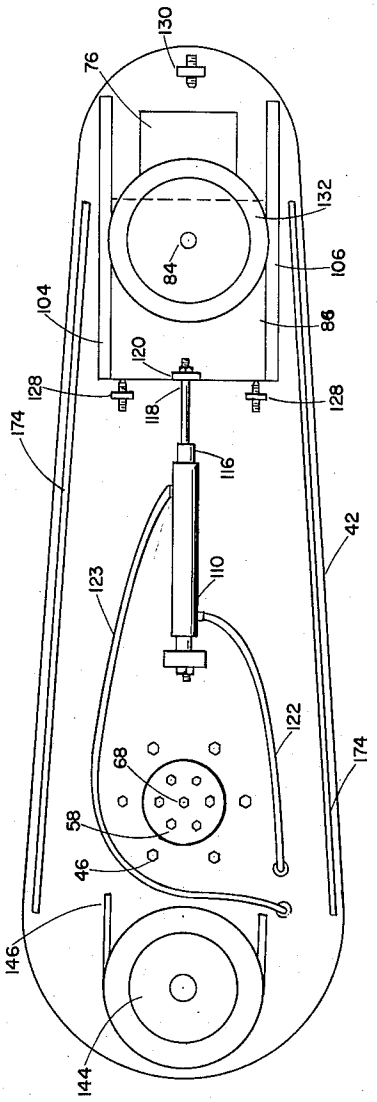


FIG. 2

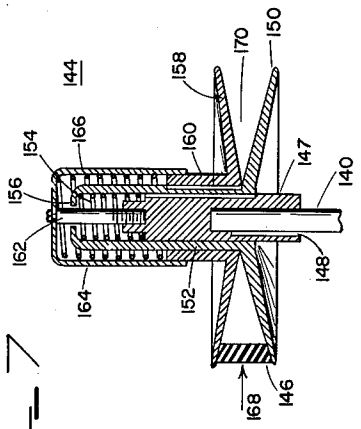


FIG. 7

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FIG. 3

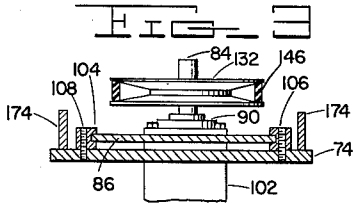


FIG. 4

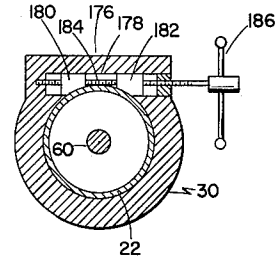


FIG. 5

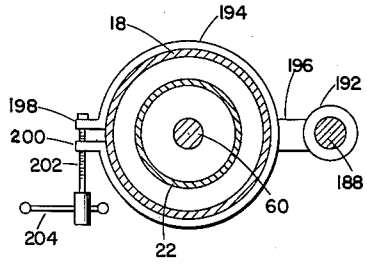
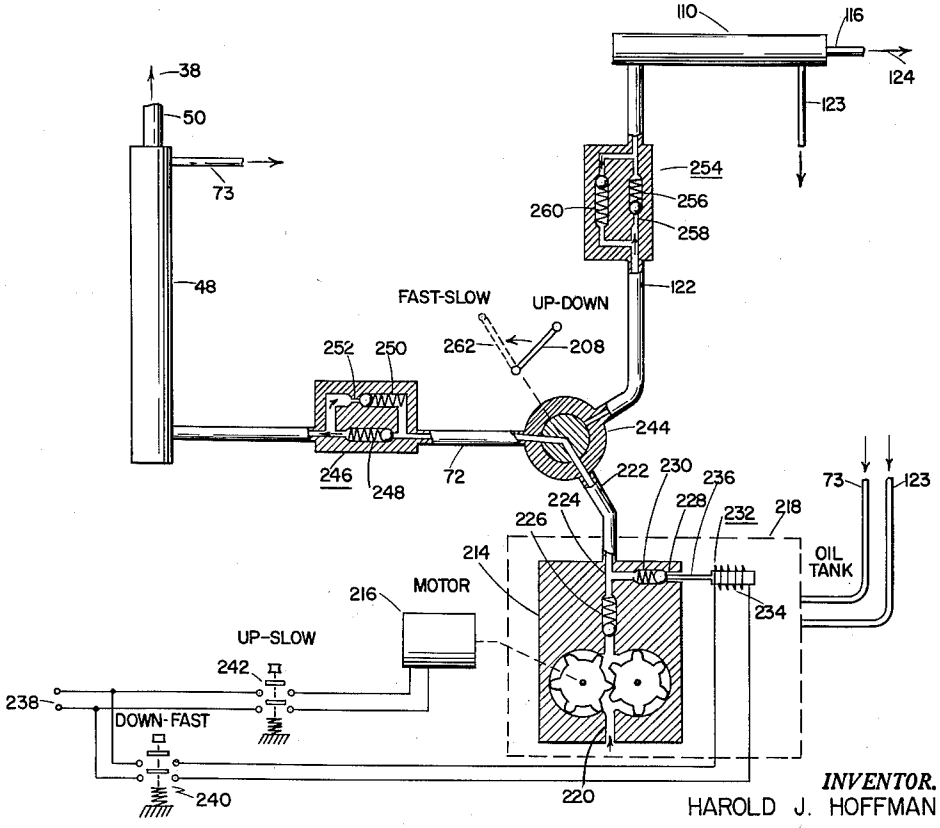


FIG. 6



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3,018,666
ROTATIONAL SPEED CONTROL FOR A DRIVEN SHAFT

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Filed Nov. 21, 1960, Ser. No. 70,791
8 Claims. (Cl. 74—217)

This invention relates generally to apparatus for dispersing and/or blending liquid materials, such as paint.

Conventional paint dispersing and blending apparatus comprises a vertically disposed hydraulic cylinder with a horizontally disposed bridging member secured to the upper end of the piston element thereof, the bridging member supporting the driving motor and the dispersing shaft with speed-varying apparatus interconnecting the motor and the dispersing shaft; the hydraulic cylinder is required in order to lower the dispersing shaft with the impeller on the lower end thereof into a container of material to be dispersed or blended, and to raise the shaft and impeller out of the container when the dispersing or blending operation is completed. Due to the turning movement involved, by virtue of the weight of the motor, it is required that the bridge be supported by a reasonably large-area bearing surface. To the best of the present applicant's knowledge, prior dispersing machines of this type have incorporated a hydraulic cylinder having a piston element of sufficiently large diameter to provide the requisite bearing surface for the bridge, and a hydraulic system requiring a supplemental supply of compressed air; such prior dispersing apparatus thus incorporated an unnecessarily large and expensive hydraulic cylinder and a hydraulic system having a capacity sufficient to lift many times the weight of the driving motor, bridge and shaft. However, if a hydraulic cylinder having a capacity only sufficiently large comfortably to lift the bridge assembly were provided in such a prior dispersing apparatus, the piston element would have such a small diameter that the turning moment exerted by the weight of the motor would most certainly result in bending the piston rod. In addition, such prior dispersing apparatus known to the present applicant has incorporated manually adjustable speed varying apparatus interconnecting the motor and the dispersing shaft in order to provide the requisite variation in dispersing speeds. Such prior apparatus thus requires an unduly large amount of time and physical effort to effect speed changes which is particularly disadvantageous for paint blending operations. It is accordingly desirable to provide self contained, compact dispersing apparatus which eliminates the unduly large and expensive hydraulic cylinder and system previously employed in apparatus of this type together with the need for a supply of compressed air, and which further eliminates the manually actuated speed variation apparatus previously employed.

It is accordingly an object of my invention to provide an improved dispersing apparatus.

Another object of my invention is to provide a self-contained dispersing apparatus employing a hydraulic cylinder and hydraulic system having a capacity only large enough comfortably to lift the bridge assembly with other means being provided for supporting the bridge assembly.

A further object of my invention is to provide improved dispersing apparatus incorporating simple, fast acting, remotely controlled speed variation means for varying the speed of the dispersing shaft.

Further objects and advantages of my invention will become apparent by reference to the following description and the accompanying drawing, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

My invention, in its broader aspects, provides a base member with a first elongated hollow column secured thereto and extending upwardly therefrom and with a second elongated hollow column telescopically arranged within the first column for longitudinal movement with respect thereto. First hydraulic cylinder means is provided supported on the base and extended upwardly within the second column, the first cylinder means having piston means movable longitudinally upwardly responsive to application of hydraulic pressure thereto. Means are provided connecting the piston means to the second column whereby the second column is moved upwardly in response to application of hydraulic pressure to the first cylinder. The horizontally disposed bridge member is secured to the upper end of the second column and raised and lowered thereby. A dispersing shaft is provided having first pulley means thereon and extending downwardly from the bridge member. Bearing means is provided for rotatably supporting the dispersing shaft and means are provided for supporting the bearing means on the bridge member for longitudinal movement with respect thereto. A second hydraulic cylinder means is provided supported on the bridge member and having piston means movable longitudinally outwardly parallel with the bridge member in response to application of hydraulic pressure thereto, the piston means of the second cylinder means acting upon the bearing means thereby to move the same and the dispersing shaft outwardly away from the column means in response to the application of hydraulic pressure. Power means is provided secured to the bridge member and having a rotatable shaft with variable speed pulley means secured thereto and with endless drive means trained around the first and variable speed pulley means. With this arrangement, outward movement of the bearing means under the influence of the second hydraulic means causes the drive means to actuate the variable speed pulley means thereby to reduce the speed of the dispersing shaft. A source of the hydraulic fluid under pressure is provided and means are provided for selectively connecting the source to the first and second hydraulic cylinder means for actuating the same.

In the drawings:

FIG. 1 is a side view, partly in cross-section, illustrating the improved dispersing apparatus of my invention;

FIG. 2 is a top view of the apparatus of FIG. 1;

FIG. 3 is a fragmentary cross-sectional view taken along the lines 3—3 of FIG. 1;

FIG. 4 is a fragmentary cross-sectional view taken along the line 4—4 of FIG. 1;

FIG. 5 is a fragmentary cross-sectional view taken along the line 5—5 of FIG. 1;

FIG. 6 is a schematic illustration of the hydraulic system of the apparatus of FIG. 1; and

FIG. 7 is a cross-sectional view of the variable speed pulley incorporated in the embodiment of FIG. 1.

Referring now to the figures of the drawing, my improved high speed dispersing and blending apparatus, generally indicated at 10 in FIG. 1, comprises a flat base plate member 12 for mounting the apparatus 10 on a floor and having a flange member 14 secured thereto as by bolts 16 threadingly engaged with tapped holes in the base plate member 12. An outer hollow cylindrical column 18 is provided having its lower end 20 inserted within flange member 14 and welded thereto as shown, column 18 extending vertically upwardly from base plate 12. An inner column 22 is provided telescopically disposed within the outer column 18 and spaced therefrom to define annular space 24 therewith. Inner column 22 has its upper end 26

projecting above the upper end 28 of the outer column 18, as shown. A first sleeve bearing 30 is provided disposed at the upper end 28 of outer column 18 and secured thereto, as by bolts 32, and a second sleeve bearing 34 is provided spaced vertically downwardly from the sleeve bearing 30 and secured to the outer column 18 by bolts 36. Sleeve bearings 30 and 34 support the inner column 22 for vertical movement in the direction shown by the arrow 38. A pair of washer-shaped wick elements 40 are provided disposed in the annular space 24 between the bearings 30 and 34, elements 40 being formed of suitable lubricant-absorbent material such as felt impregnated with lubricant and serving to lubricate the outer or journal surface of the inner column 22.

A flat elongated bridge plate member 42 is provided having a flange 44 secured thereto by bolts 46 with the upper end 26 of inner column 22 being fitted within flange 44 and secured thereto by welding, as shown. An elongated hydraulic cylinder 48 is provided having its lower end 51 supported on base plate member 12 by means of a suitable collar 53, cylinder 48 extending upwardly coaxially within the inner column 22, as shown. Hydraulic cylinder 48 is substantially shorter than columns 18 and 22 and has piston rod 50 projecting from its upper end 52. Bridge plate member 42 has an opening 54 formed therein in vertical alignment with piston rod 50 of hydraulic cylinder 48, opening 54 being closed by a plate member 56 secured to the upper surface of bridge member 42 and bolts 58. A piston rod extender 60 is provided having its lower end 62 attached to piston rod 50 in any suitable manner, as by pin 64, and having its upper end 66 extending upwardly through opening 54 in bridge member 42 and abutting plate member 56, being secured thereto by stud 68, as shown. A pair of stops 70 are provided welded to base plate 12 intermediate outer column 18 and collar 52 for supporting the lower end 71 of inner column 22 in its lower-most position, as shown in FIG. 1. A hydraulic fluid pressure line 72 extends through the outer column 18 adjacent base plate 12 and under inner column 22 in its lowermost position and is connected to hydraulic cylinder 48 for applying hydraulic pressure thereto, thereby to cause piston rod 50 and extender 60 to move upwardly in the direction shown by arrow 38; it will be seen that the upward movement of piston rod 50 and extender 60 as applied to bridge member 42 and inner column 22 causing the same to move upwardly in the direction shown by the arrow 38, the inner column 22 supported by bearings 30 and 34 providing the requisite support for bridge member 42. A hydraulic fluid overflow line 73 is also connected to cylinder 48 and also extends under column 22 and out of column 18.

Bridge member 42 has an end portion 74 extending outwardly in cantilever fashion, as shown, and having elongated rectangular opening or slot 76 formed therein, as shown. A vertically extending dispersing shaft 78 is provided having a suitable impeller 80 secured to its lower end 82, the upper end 84 of shaft 78 extending upwardly through the opening 76, as shown. A horizontally disposed supporting plate member 86 is provided having an opening 88 formed therein through which shaft 78 extends. A first pillow block 90 is provided secured to the upper surface of plate member 86 and rotatably supporting shaft 78, and a second pillow block 92 is provided spaced downwardly from the first pillow block 90 and likewise rotatably supporting shaft 78. Pillow block 92 is held in assembled relation with the plate 86 and the upper pillow block 90 by a sleeve member 94 surrounding shaft 78 and through-bolts 96 extending through flange 98 of upper pillow block 90, plate member 86, and flange 100 of lower pillow block 92, as shown. An outer enclosing housing 102 may be provided surrounding sleeve 94 and through-bolts 96, as shown. It will be observed that shaft 78, sleeves 94, through-bolts 96 and housing 102 extend downwardly through the elongated slot 76 in end portion 74 of bridge member 42.

Plate member 86 which is rectangular in form, is supported for longitudinal movement by spaced guide rails 104 and 106 secured to the upper surface of end portion 74 of bridge member 72 on opposite sides of elongated opening 76 by bolts 108, as shown. A second hydraulic cylinder 110 is provided disposed above the upper surface of end portion 74 of bridge member 42 and parallel therewith its end 112 being secured to the upper surface of bridge member 42 by bracket 114 and with its piston rod 116 extending toward dispersing shaft 78. Piston rod 116 of hydraulic cylinder 10 has its outer end 118 connected to bracket 120 which in turn is secured to the upper surface of plate member 86. It will now be seen that prior to the application of hydraulic pressure to the hydraulic cylinder 10, plate member 86 and dispersing shaft 78 have a first or inner high speed position as shown in solid lines in FIG. 1. When hydraulic pressure is applied to hydraulic cylinder 110 through high pressure hydraulic fluid line 122, piston rod 116 is caused to move outwardly in the direction of the arrow 124, thus causing plate 86 to slide in the guide rails 104, 106 and moving shaft 78 outwardly toward its second or low speed position as shown in the dashed lines 126 in FIG. 1. Adjustable stops 128 and 130 are provided on the upper surface of the bridge member 42 at the opposite ends of guide rails 104, 106 in order to limit the longitudinal movement of plate member 86. A hydraulic fluid discharge line 122 is also connected to cylinder 110.

A first pulley 132 is secured to the upper end 84 of the dispersing shaft 78. A drawing motor 134 is provided secured to the lower surface of the other end portion 136 of bridge member 42 by suitable bolts 138, and depends therefrom, motor 134 having a shaft 140 extending vertically upwardly through opening 142 in end portion 136 of bridge member 42. An adjustable speed pulley 144 is secured to motor shaft 140 and a suitable endless belt 146 is trained around the pulleys 132 and 144, as shown.

Referring now particularly to FIG. 7, pulley 144 comprises a driving member 147 secured to shaft 140, as by key 148. Inner flange 150 has a sleeve portion 152 splined to member 147 and biased upwardly by means of spring 154 bearing against the end of member 147 and against end portion 156 of sleeve 152. Upper flange 158 is provided having sleeve portion 160 splined to sleeve portion 152 of lower flange 150. A stud 162 is secured to member 147 and has a cap 164 secured thereto. A spring 166 bears against the cap 164 on the one hand and the end of sleeve portion 160 of upper flange 158 on the other hand thus biasing flange 158 downwardly toward flange 150. It will now be seen that when force in the direction shown by the arrow 168 is applied inwardly on belt 146, there is a tendency for flanges 150 and 158 to separate against the forces respectively exerted by springs 154 and 166 thus permitting the belt 146 to ride more deeply in the groove 170 defined by flanges 150 and 158. It will now be seen that when hydraulic pressure is applied to cylinder 110 thus causing its piston rod 116 to move outwardly in the direction shown by the arrow 124 in turn causing plate member 86, shaft 78 and pulley 132 to move outwardly away from columns 18 and 22, the portion of belt 146 trained around adjustable speed pulley 144 will force the flanges 150 and 158 apart thus causing the belt to ride more deeply in groove 170 thus decreasing the speed of shaft 78. Conversely, when the hydraulic pressure is released from the cylinder 110, the force exerted by springs 154 and 166 tends to force flanges 150 and 158 together thus in turn tending to cause the portion of belt 146 trained around pulley 144 to be forced outwardly in the direction opposite from that shown by the arrow 168, thus in turn moving plate member 86, shaft 78 and pulley 132 to the left as shown toward its first position to increase the speed of shaft 78. The variable speed pulley 144 is not my invention per se, the specific pulley shown

in FIG. 6 being of the type manufactured by the Lovejoy Coupling Company of Chicago, Illinois.

A suitable cover member shown in dashed lines 172 in FIG. 1 is provided enclosing pulleys 132 and 144, belt 146 and the other apparatus disposed on the upper side of bridge member 42, cover member 172 engaging side rails 174 secured to the upper surface of bridge member 42 as seen in FIGS. 2 and 3.

It is desirable to lock the inner column 22 in a desired position and thus, as seen in FIG. 4, the upper sleeve bearing member 30 is provided with an enlarged portion 176 having an opening 178 formed therein. A pair of locking elements 180 and 182 are provided with a suitable lead screw 184 extending therethrough, as shown. Lead screw 184 extends out of sleeve bearing 30 and having a manually actuated handle 186 secured thereto. Locking elements 180 and 182 have portions which lockingly engage the outer surface of column 18 when the members are urged together by virtue of rotation of lead screw 184 in one direction by handle 186, rotation of handle 186 and lead screw 184 in the opposite direction causing locking elements 180 and 182 to separate thereby releasing the locking engagement with the outer surface of column 18.

It is further desirable to restrain bridge member 42 from rotation while the same is being raised or lowered. To this end, a vertically extending shaft 188 is provided having its upper end secured to flange 190 which in turn is rigidly secured to flange 44 by two of the bolts 46, as shown; shaft 188 extends vertically downwardly parallel with the outer column 18 and closely spaced therefrom, as shown. A bearing member 192 is provided slidingly supporting shaft 188 and being secured to a split ring 194 by means of a connecting member 196. Split ring 194 embraces the outer surface of the outer column 18 and has its ends 198 and 200 adjustably connected by means of screw element 202 having manually actuated handle 204 connected thereto, as shown. Thus, in order to raise or lower bridge 42, handle 186 is rotated thereby to release locking element 180 and 182 from inner column 22 thus permitting the inner column to be raised or lowered by hydraulic cylinder 48, ends 198 and 200 of split ring 194 being urged together by screw 202 so that ring 194 tightly engages outer column 18 thereby to prevent turning of shaft 188 and in turn bridge member 42; shaft 188 will however, slide vertically up and down with bearing 192. In order to turn bridge member 42 and with its dispersing shaft 78, it is necessary to release both handles 186 and 204.

The above described arrangement comprising sleeve bearing member 30 with its locking elements 180, 182 and split ring 194 with bearing member 192 and shaft 188, provides a double safety feature not found in prior dispersing apparatus kown to the present applicant. In such prior apparatus, it was not possible to lock the piston of the lifting cylinder since scoring of the piston could not be tolerated, whereas in my improved construction, inner column 22 can be locked since any resulting scoring thereof is of no consequence.

A control cabinet 206 is supported on base plate 12 and accommodates the remainder of the hydraulic system to be shortly described. Manually actuated hydraulic system selection lever 208 is provided on the control cabinet 206 together with start and stop control buttons 210 for the drive motor 134 and control buttons 212 for the drive motor 216 of the hydraulic system and the hydraulic pressure releasing solenoid 232 to be hereinafter described.

Referring now to FIG. 6, the hydraulic system of my improved dispersing apparatus comprises a suitable hydraulic fluid pump 214 shown as being of the positive displacement gear variety driven by motor 216. Pump 214 is disposed within an oil tank, shown by the dashed lines 218, with oil therefrom being drawn into the pump through inlet 220. A discharge line 222 is connected to

the discharge port 224 of pump 214, discharge port 224 having a check valve 226 therein arranged to pass fluid therethrough under a predetermined pressure to the discharge line 222, but to prevent the reverse flow of hydraulic fluid back through the pump. A pressure release port 228, communicates between the discharge port 224 and the oil tank 218 and has a check valve 230 therein arranged normally to prevent the return flow of hydraulic fluid from the discharge line 222 back to the tank 218. A suitable solenoid 232 is provided having an operating coil 234 and an element 236 arranged to engage the check valve 230 and to release the same responsive to energization of coil 234 thereby to permit the return of hydraulic fluid from the discharge line 222 to the tank 218. Operating coil 234 of solenoid 232 is connected to source 238 of suitable energizing potential by manually depressible switch contacts 240, and pump drive motor 216 is likewise connected to source 238 by manually depressible contacts 242.

Discharge line 222 communicates with two-way valve 244 having pressure lines 72 and 122 respectively connected to hydraulic cylinders 48 and 110. Lever 208 is connected to actuate valve 244 selectively to connect pump discharge line 222 either to line 72 or line 122. A flow control valve 246 is located in line 72, valve 246 having a check valve 248 therein arranged to permit unrestricted flow of hydraulic fluid from pump 214 to the cylinder 48 but to prevent the return flow of fluid from cylinder 48 to pump 214. Control valve 246 is provided with a second check valve 250 and restriction 252, check valve 250 being arranged to prevent flow of hydraulic fluid from pump 214 to the cylinder 48, but to permit the return flow of fluid from cylinder 48 through restriction 252.

It will now be seen that with the actuating lever 208 of valve 244 in the position shown in the solid lines of FIG. 5 and with valve 244 thus connecting pump discharge line 222 to pressure line 72, depression of manual switch 242 will energize motor 216 thus causing pump 214 to force hydraulic fluid through check valve 226, discharge port 224, discharge line 222, valve 244, line 72 and check valve 248 to hydraulic cylinder 48 thus causing piston rod 50 to move upwardly in the direction shown by the arrow 38, thus in turn causing rod extender 60 to move bridge 42, inner column 22, and dispersing shaft 78 upwardly. As soon as manual pressure on switch 242 is released, drive motor 216 is deenergized thus stopping pump 214, however, the hydraulic pressure already established by hydraulic cylinder 48 is maintained by virtue of check valves 226 and 230 and thus piston 50, piston extender 60 and bridge 42 will be maintained in the position they have reached. However, when manual switch button 240 is depressed, coil 234 of solenoid 232 will be energized thus actuating member 236 to release check valve 230. Thus, under the influence of the combined weight of bridge 42, motor 134 and the other elements supported by bridge member 42, piston 50 and cylinder 48 will be forced downwardly thus forcing hydraulic fluid to return through restriction 252, check valve 250, line 72, valve 244, discharge line 222, and the now opened or released check valve 230 back to the tank 218 thus lowering the bridge 42, the rate of descent being controlled by restriction 252 of flow control valve 246. Again, when manually depressible switch 240 is released, coil 234 of solenoid 232 will be deenergized thus releasing the actuating member 236 so that check valve 230 will again be closed thus terminating the return flow of hydraulic fluid and terminating the descent of piston 50, piston rod extender 60, inner column 22 and bridge 42.

Another flow control valve 254 is provided in pressure line 122 connecting valve 244 to hydraulic cylinder 110. Flow control valve 254 has a check valve in 256 and restriction 258 in the direction of fluid flow from pump 214 to cylinder 110 thus restricting the rate of outward movement of piston rod 116 and dispersing shaft 78. Flow control valve 254 has another check valve 260 which

provides unrestricted return flow of fluid from cylinder 110 back to oil tank 218. Thus, with valve actuating lever 208 in the position shown in dashed lines 262 in FIG. 5, valve 244 connects pump discharge line 222 to line 122. Thus, when switch 242 is depressed to energize motor 216, pump 214 forces hydraulic fluid under pressure from tank 218 through check valve 226, discharge port 224, discharge line 222, valve 244, line 122, restriction 258 and check valve 256 to cylinder 110. When switch 242 is released motor 216 is deenergized thus stopping pump 214, however, return of piston rod 116 under the influence of adjustable pulley 144 is prevented by virtue of check valves 226 and 230 and thus piston rod 116 and dispersing shaft 78 are maintained in the positions they had assumed when operation of pump 214 was terminated. Again when switch 240 is depressed to energize coil 234 of solenoid 232, check valve 230 is released thereby permitting the return of fluid to tank 218 through check valve 260, release of switch 240 again causing check valve 230 to terminate further return flow of fluid. In this case, as indicated, flow control valve 254 is arranged to prevent fast outward or speed reducing motion of piston rod 116 and dispersing shaft 78 and to provide fast return or speed-increasing motion. Overflow lines 73 and 123 are returned to tank 218, as shown.

It will now be readily apparent that I have provided dispersing apparatus employing a hydraulic cylinder for raising and lowering the bridge having a capacity only sufficiently large comfortably to lift the bridge, the requisite bearing surface for supporting the bridge being provided by inner column 22. Thus, a substantially smaller capacity tank 218 and pump 214 and smaller pump motor 216 is required than in the case of prior machines of this type known to the present applicant. Further, I have provided a fast acting, remotely controlled dispersing shaft speed varying arrangement which is hydraulically actuated by the same hydraulic system which provides the raising and lowering motion. Transverse movement of the dispersing shaft 78 in order to provide the desired speed variation can be readily tolerated since the movement of a mere 6 inches provides a speed variation from 800 to 2200 r.p.m., such limited transverse motion of the dispersing shaft 78 and the impeller 80 being readily accommodated by the large size containers in which the paint is dispersed or blended. In an actual dispersing apparatus in accordance with my invention, bridge 42 in its lower-most position has a height of 6 feet 3 inches above base plate 12 and a height of 10 feet 6 inches above base plate 12 in its upper-most position. In this machine, bridge 42 has an overall length of 6 feet 4 inches and the total weight of apparatus supported thereon including motor 134 is approximately 850 pounds. In this machine, bridge 42 and the apparatus thereon, including motor 134 is supported by an outer column 18 having an inside diameter of 9 inches and an inner column 22 having an inside diameter of 7 inches, hydraulic cylinder 48 has an outside diameter of 2½ inches, a piston diameter of 2 inches, and overall length of 48 inches, a stroke of 41 inches and having a lifting capacity of 2,000 pounds in response to application of 750 p.s.i. hydraulic pressure. With this arrangement, oil tank 218 has a capacity of 1½ gallons, and a motor 216 of ½ H.P. is employed. This is in contrast to prior dispersing apparatus known to the present applicant which in order to provide the requisite bearing surface for the bridge member and the requisite lift, incorporated a hydraulic cylinder approximately 6 feet in height with a piston approximately 9 inches in diameter thus requiring an oil tank having approximately 20 gallons capacity, and a supplemental supply of compressed air for providing initial oil pressure in the oil tank. In addition, since the drive motor 134 of dispersing apparatus of this size will range from 10 to 20 H.P., prior machines known to the present applicant required heavy duty manually actuated speed variator devices which required appreciable operator time and effort to change speed.

It will be readily seen that my apparatus is compact and self-contained since all electrical and hydraulic controls are housed in control cabinet 206, no air compressor being needed to supply compressed air for the hydraulic system. It will also be seen that the electrical and hydraulic system of my apparatus can readily be rendered explosion-proof, a feature not provided in prior dispersing apparatus known to the present applicant.

While I have illustrated and described a specific embodiment of my invention, further modifications and improvements will become apparent to those skilled in the art, and I desire therefore in the appended claims to cover all modifications which do not depart from the spirit and scope of my invention.

What is claimed is:

1. Dispersing apparatus comprising: a base; first elongated hollow column means secured to said base and extending upwardly therefrom; second elongated hollow column means telescopically arranged within said first column means for longitudinal movement with respect thereto; first hydraulic cylinder means supported on said base and extending upwardly within said second column means, said first cylinder means having piston means movable longitudinally upwardly in response to application of hydraulic pressure thereto; means connecting said piston means to said second column means whereby said second column is moved upwardly in response to application of hydraulic pressure to said first cylinder means; a horizontally disposed bridge member secured to the upper end of said second column means and raised and lowered thereby; a dispersing shaft having first pulley means thereon and extending downwardly from said bridge member; bearing means for rotatably supporting said shaft; means supporting said bearing means on said bridge member for longitudinal movement with respect thereto; second hydraulic cylinder means supported on said bridge member and having piston means movable longitudinally outwardly parallel with said bridge member in response to application of hydraulic pressure thereto, said piston means of said second cylinder means acting upon said bearing means thereof to move the same outwardly away from said column means in response to application of hydraulic pressure; power means secured to said bridge member and having a rotatable shaft; variable speed pulley means secured to said last-named shaft; endless drive means trained around said first and variable speed pulley means whereby said power means drives said dispersing shaft, said outward movement of said bearing means causing said drive means to actuate said variable speed pulley means thereof to reduce the speed of said dispersing shaft; a source of hydraulic fluid under pressure; and means for selectively connecting said source to said first and second hydraulic cylinders for respectively actuating the same.

2. Dispersing apparatus comprising: a base member; a first elongated cylindrical hollow column having one end secured to said base member and extending vertically upwardly therefrom; a second elongated cylindrical hollow column telescopically arranged within said first column for vertical movement with respect thereto and having one end projecting beyond the other end of said first column; a first elongated hydraulic cylinder having one end supported on said base member and extending vertically upwardly within said second column, said first cylinder having piston means movable longitudinally upwardly in response to application of hydraulic pressure thereto; an elongated horizontally disposed flat bridge member secured to said one end of said second column and having end portions extending outwardly on both sides thereof, said piston means being connected to said bridge member whereby said second column and bridge member are moved upwardly in response to application of hydraulic pressure to said first cylinder; said bridge

member having a longitudinally elongated opening formed in one end portion; a dispersing shaft extending vertically through said opening; bearing means for rotatably supporting said shaft; a plate member having said bearing means secured thereto; guide means on said bridge member for supporting and guiding said plate member for longitudinal movement whereby said shaft is moved toward and away from said columns; a first pulley secured to one end of said shaft; a second elongated hydraulic cylinder secured to said bridge member and extending longitudinally toward said opening, said second cylinder having piston means acting upon said plate member and movable longitudinally outwardly thereby to move said shaft and first pulley outwardly away from said columns in response to application of hydraulic pressure thereto; a driving motor secured to the other end of said bridge member and having a vertically extending shaft; a variable speed pulley secured to said motor shaft; an endless belt trained around said pulleys; said outward movement of said dispersing shaft and first pulley causing said belt to actuate said variable speed pulley thereby to reduce the speed of said dispersing shaft, said variable speed pulley having means acting upon said belt to move said dispersing shaft and pulley inwardly thereby to increase the speed of said dispersing shaft responsive to release of said hydraulic pressure on said second cylinder; a source of hydraulic fluid under pressure; valve means for selectively connecting said source to said first and second cylinder thereby respectively to raise said bridge member and to decrease the speed of said dispersing shaft, and means for releasing the hydraulic pressure thereby respectively to lower said bridge member and to increase the speed of said dispersing shaft.

3. A combination of claim 2 wherein an annular space is defined between said first and second columns, and further comprising a pair of vertically spaced sleeve bearings in said space respectively secured to said first column and supporting said second column for said vertical movement thereof, and annular lubricant-absorbent means disposed in said space between said sleeve bearings for lubricating said second column.

4. A combination of claim 2 wherein said first cylinder is substantially shorter than said first and second columns, and wherein said piston means of said first cylinder includes a piston having an end projecting beyond the other end of said first cylinder, and a piston extender member having one end secured to said piston end and its other end attached to said bridge member.

5. The combination of claim 2 wherein said motor is attached to the lower side of said bridge member with its shaft extending vertically upwardly through an opening therein, wherein said elongated opening and plate member are each rectangular, wherein said guide means comprises a pair of elongated spaced parallel guide rails secured to the upper side of said bridge member on opposite sides of said elongated opening; and wherein said bearing means comprises a first pillow block secured to the upper side of said plate member with said dispersing shaft rotatably seated therein and extending downwardly through an opening in said plate member, a second pillow block spaced downwardly from said first pillow block on the lower side of said plate member with said dispersing shaft rotatably seated therein and spacing members connecting said pillow blocks and plate member and extending through said elongated opening.

6. The combination of claim 2 wherein said source comprises a reservoir for hydraulic fluid and a pump for drawing fluid from said reservoir and having a discharge line for forcing the fluid under pressure to said cylinders wherein said releasing means includes a check valve connected to said pump discharge line for normally preventing return of fluid to said reservoir and solenoid means for releasing said check valve responsive to energization thereof to permit return of fluid to said reservoir thereby to release said hydraulic pressure; and wherein said valve means comprises a manually actuated two-way valve connected to said pump discharge line, first and second hydraulic lines respectively connecting said two-way valve to said first and second cylinder, a first flow control valve in said first line arranged to provide free flow of fluid under pressure from said pump to said first cylinders and to restrict the return flow of fluid from said first cylinder to said reservoir when said check valve is released thereby to control the rate of lowering said bridge member, and a second flow control valve in said second line arranged to restrict the flow of fluid under pressure from said pump to said second cylinder and to provide free return flow of fluid from said second cylinder to said reservoir thereby providing fast return of said dispersing shaft to its high speed position when said check valve is released.

7. Dispersing apparatus comprising: a flat base plate member; a first elongated cylindrical hollow column having one end secured to said base member and extending vertically upwardly therefrom; a second elongated cylindrical hollow column disposed within said first column defining an annular space therewith and having one end projecting beyond the other end of said first column; first and second vertically spaced sleeve bearings in said space attached to said first column and supporting said second column for vertical movement with respect to said first column; annular lubricant-absorbent means in the space between said sleeve bearings for lubricating said second column, the second sleeve bearing being at the other end of said first column and having means for selectively locking said second column against vertical movement; a first elongated hydraulic cylinder having one end supported on said base member and extending vertically upwardly within said second column, said first cylinder being substantially shorter than said columns and having a piston with an end projecting from its other end and movable vertically upwardly in response to application of hydraulic pressure thereto; an elongated horizontally disposed flat bridge plate member secured intermediate its ends to said one end of said second column, said bridge member having an opening therein in alignment with said first cylinder piston; a plate member secured to the upper side of said bridge member and covering said opening; a piston extender member having one end attached to said piston end and its other end extending through said bridge member opening and attached to said plate member whereby said second column and bridge member are moved upwardly in response to application of hydraulic pressure to said first cylinder and downwardly in response to release of said pressure; said bridge member having a longitudinally elongated rectangular opening formed therein adjacent one end thereof; a rotatable dispersing shaft extending vertically downwardly through said elongated opening; first and second vertically spaced pillow blocks for rotatably supporting said shaft respectively above and below said bridge member, a flat rectangular plate member horizontally disposed above said bridge member and having an opening therein with said dispersing shaft extending therethrough, said first pillow block being secured to the upper side of said rectangular plate member; spacing members connecting said second pillow block to said rectangular plate member and extending through said elongated slot; a pair of elongated spaced parallel longitudinally extending guide rails secured to said bridge member on opposite sides of said elongated opening for supporting and guiding said rectangular plate member for longitudinal movement whereby said shaft is moved toward and away from said column; a second elongated hydraulic cylinder having one end secured to the upper side of said bridge member and its other end extending toward said shaft, said second cylinder having a piston extending from said other end and attached to said rectangular plate member for moving the same and

said shaft from a first position toward a second position away from said column responsive to application of hydraulic pressure thereto; a first pulley secured to the end of said shaft above said first pillow block; a motor secured to the lower side of the other end of said bridge member and depending therefrom and having a shaft extending vertically upwardly through an opening in said bridge member; an adjustable speed pulley secured to the end of said motor shaft above said bridge member and having flanges normally spring biased toward each other, an endless belt trained around said pulleys; said movement of said dispersing shaft and first pulley toward said second position thereof causing said belt to separate said adjustable speed pulley flanges and to move inwardly therebetween thereby to reduce the speed of said dispersing shaft, said adjustable speed pulley flanges acting upon said belt to move the same outwardly therebetween and to move said dispersing shaft and first pulley toward the first position thereof thereby to increase the

speed of said shaft responsive to release of hydraulic pressure on said second cylinder; a source of hydraulic fluid under pressure; valve means for selectively connecting said source to said first and second cylinders thereby respectively to raise said bridge member and to decrease the speed of said dispersing shaft; and means for releasing the hydraulic pressure thereby respectively to lower said bridge member and to increase the speed of said dispersing shaft.

8. The combination of claim 2 wherein an annular space is defined between said first and second columns, and further comprising a sleeve bearing in said space secured to said first column and supporting said second column for said vertical movement thereof, said sleeve bearing having means for selectively locking said second column against vertical movement.

No references cited.