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[54] **HYDRAULIC-POWERED SCREW-DRIVEN PAINT
SPRAYER**
6 Claims, 4 Drawing Figs.

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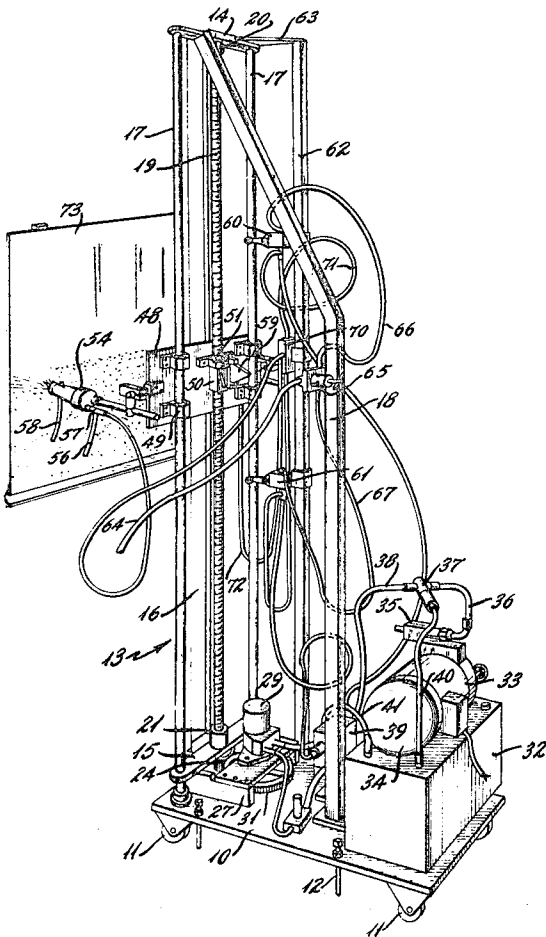
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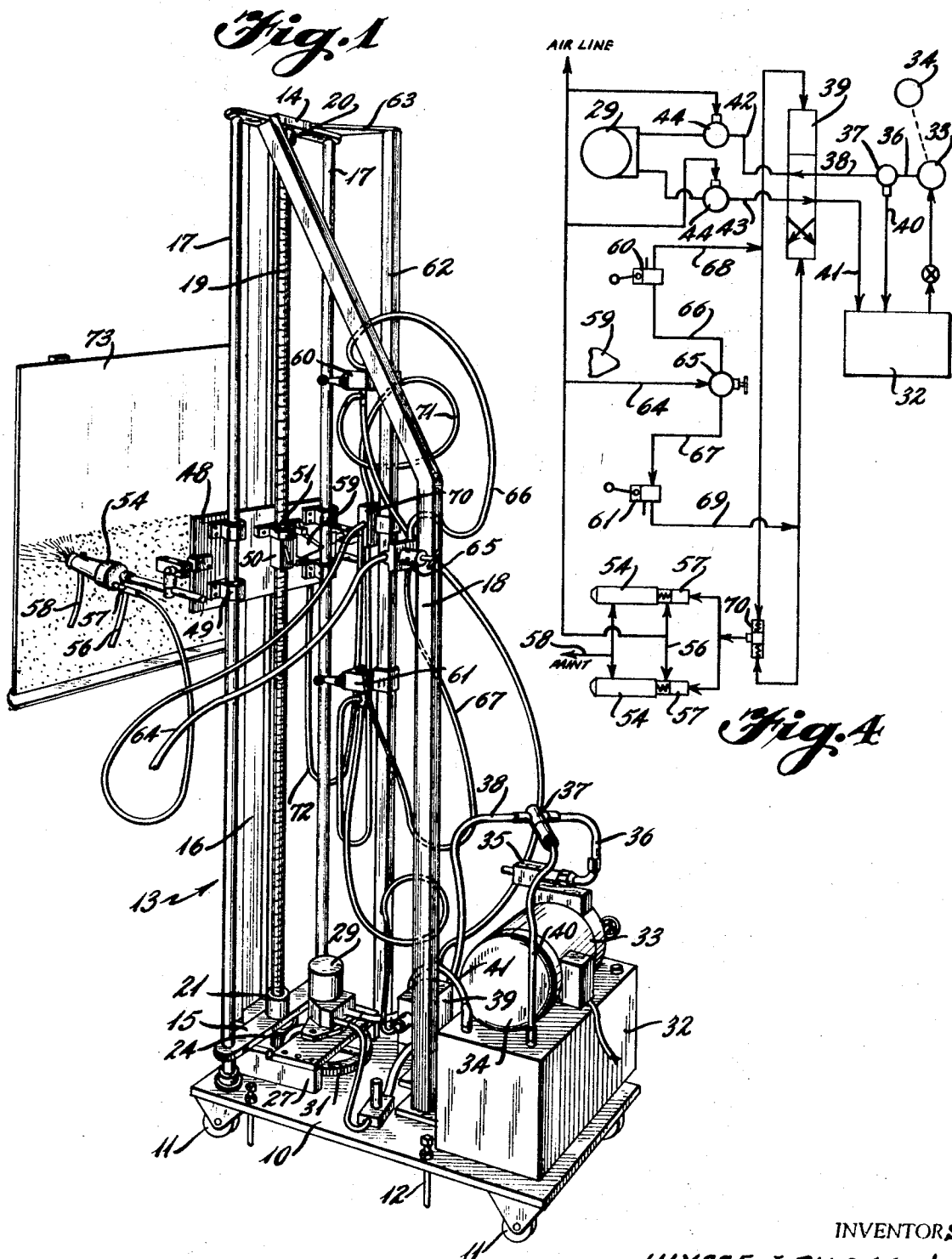
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186, 587, 97, 146, 160, 169, 187, 207, 210;
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ABSTRACT: Apparatus including a carriage adapted to be moved rectilinearly along a desired plane by a rotatable screw-threaded shaft. The shaft is reversibly driven by fluid motor means supplied with fluid under pressure and adapted to be automatically reversed when a portion of the carriage engages limit switch means.





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Fig. 2

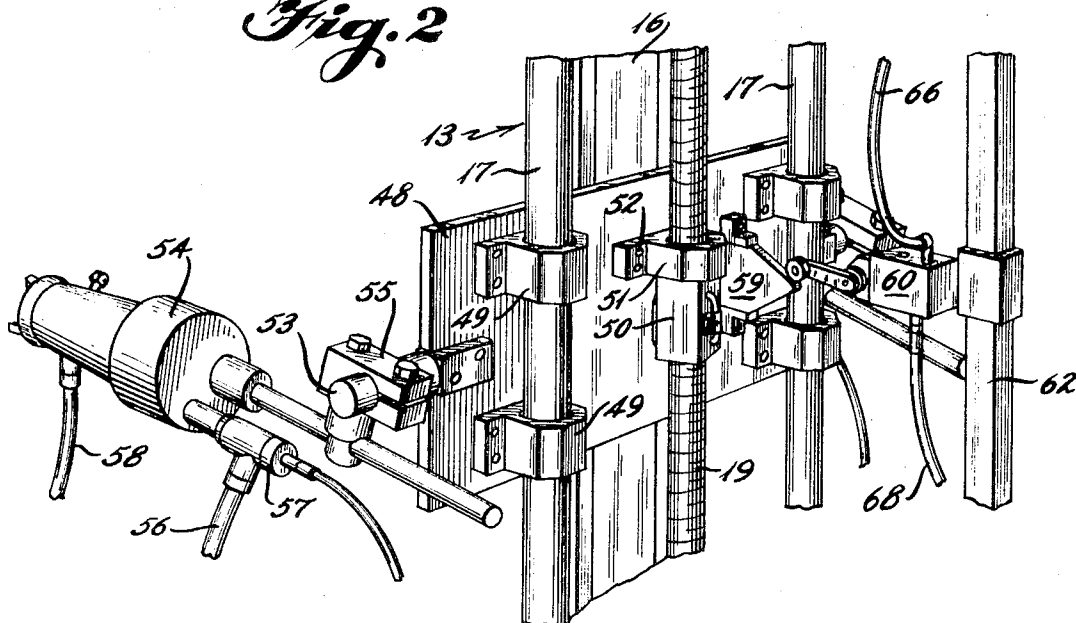
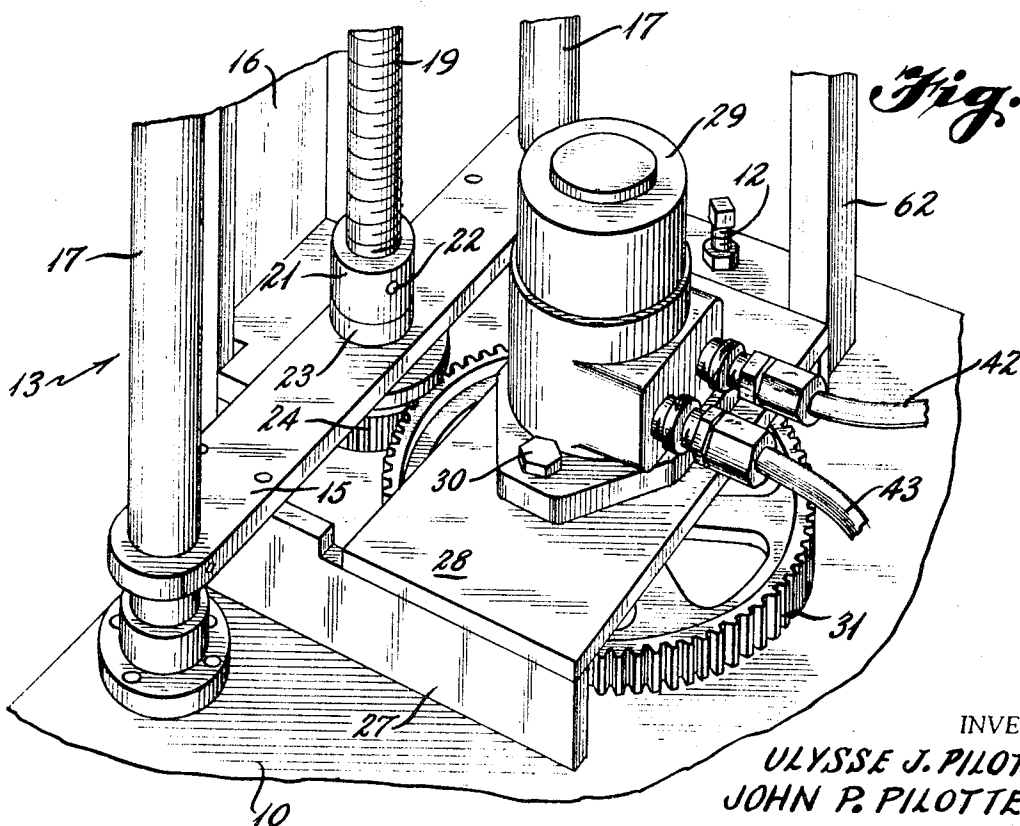


Fig. 3



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HYDRAULIC-POWERED SCREW-DRIVEN PAINT SPRAYER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to the moving of an applicator relative to a workpiece and relates particularly to a paint spray applicator having a carriage on which a plurality of spray heads are mounted and which are moved relative to an object to be painted.

2. Description of the Prior Art

Heretofore apparatus for applying paint and other coating materials have been provided; however, these prior art devices normally have been operated by an electric motor or the like using drive chains and pulleys which in turn are adapted to move a carriage on which the applicator heads are mounted. In some instances fluid cylinders have been provided for moving the heads along a track. These prior art devices have not been satisfactory since they have been complicated, expensive to produce and maintain, have not provided a substantially instantaneous reversal of the carriage, have continued to spray material while the direction of travel was being reversed which has resulted in excess material being deposited in certain areas, and for other reasons have not been satisfactory.

SUMMARY OF THE INVENTION

The present invention is a fluid-powered screw-driven paint applicator having a fluid motor supplied with fluid under pressure from a pump or the like, and such fluid motor is adapted to drive a screw-threaded shaft on which a carriage is mounted. The carriage is supported by parallel rails and is adapted to carry one or more applicator heads which can be moved relative to a workpiece. A pair of limit switches are mounted on a frame in the path of travel of a cam mounted on the carriage and such limit switches are connected to a reversing or distributing valve member which will change the direction of rotation of the screw-threaded shaft to move the carriage in a reverse direction. When the carriage reaches the end of travel in one direction, the supply of material to the applicator heads will be automatically stopped until the carriage begins to move in the opposite direction.

It is an object of the invention to provide a coating applicator in which rotary motion of a screw shaft is translated to a rectilinear motion of the applicator heads and the direction of travel of the screw-threaded shaft is automatically reversible in a minimum of time, and in which the supply of material to the applicator heads is interrupted during the reversing of the motion.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective illustrating one application of the invention.

FIG. 2 is an enlarged perspective of the applicator head carriage.

FIG. 3 is an enlarged perspective of the fluid motor drive mechanism.

FIG. 4 is a schematic of the fluid system of the apparatus.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With continued reference to the drawings, a base 10 is provided supported by wheels 11 for movement from place to place. If desired a plurality of adjustable locking bolts 12 can be provided which can be moved downwardly into engagement with the floor of a building and relieve the weight on the wheels 11 so that the base will remain in fixed position.

On one end of the base 10, a frame 13 is provided and such frame includes upper and lower spacers 14 and 15, respectively, connected by a generally upright support member 16. The outer ends of the spacers 14 and 15 are connected by rods or rails 17 disposed generally parallel to each other and arranged in a substantially vertical position. A brace 18 spaced rear-

wardly from the rail 17 connects the upper spacer 14 with the base 10 to support the frame.

A screw-threaded shaft 19 is located between and substantially parallel with the rails 17 and the upper end of such shaft is journaled in a bearing 20 carried by the spacer 14. A collar 21 is fixed to the shaft 19 adjacent to the lower end in any desired manner, as by a setscrew 22, and such collar is adapted to bear against a thrust washer 23 carried by the upper surface of the spacer 15. Below the spacer 15 a pinion gear 24 is keyed or otherwise attached to the lower end of the shaft 19.

In order to drive the shaft 19, a housing including side members 27 connected by a bridge 28 is mounted on the base 10. A fluid motor 29 is mounted on the bridge 28 in any desired manner, as by fasteners 30, and such fluid motor has a drive shaft (not shown) extending through the bridge. Such drive shaft is keyed or otherwise attached to a drive gear 31 meshing with the pinion gear 24 so that rotation of the drive gear 31 will rotate the pinion gear 24.

As illustrated, a fluid reservoir 32 is mounted on the base 10 and such reservoir is adapted to contain a supply of hydraulic fluid for operating the motor 29. In order to supply fluid under pressure to the motor 29, a pump 33 is mounted on the reservoir 32 and such pump is driven by an electric or other type motor 34. A bypass regulator 35 receives fluid under pressure from the pump 33 and is adapted to prevent the excess buildup of fluid pressure within the system by means of a pressure-controlled return line (not shown). A pressure line 36 connects the bypass regulator 35 with an adjustable relief valve 37 which functions as a speed control for the fluid motor 29. The adjustable relief valve 37 is connected by a line 38 to a distributor valve or reversing valve 39 and is connected to the reservoir 32 by a relief line 40. A return line 41 connects the distributor valve 39 with the reservoir 32. A pair of fluid pressure lines 42 and 43 connect the distributor valve 39 to the fluid motor 29 to drive the fluid motor in a selected direction. If desired each of the fluid pressure lines 42 and 43 may be provided with a pulsation damper 44 to provide smooth direction changes of the fluid motor 29 without overloading the mechanical or hydraulic units.

A carriage 48 having slide blocks 49 which slidably engage the rails 17 is mounted for movement along the shaft 19. In order to cause up and down movement of the carriage 48 when the shaft is rotated, a ball bearing type nut 50 is mounted on a pillow block 51 which in turn is secured to the carriage 48 in any desired manner, as by fasteners 52. The ball bearings on the nut 50 are arranged in a path complementary to the threads of the shaft 19 so that when the shaft is rotated the carriage 48 will be moved up or down depending upon the direction of rotation of the shaft. At each side of the carriage 48 is mounted an outwardly extending stub shaft 53 to which an applicator head 54 is mounted by means of a clamp 55. The applicator head is supplied with air under pressure from a suitable source through an air line 56 and control valve 57. Paint or other material being applied by the head 54 is provided through a supply line 58 from a suitable source (not shown).

In order to change the direction of movement of the carriage 48, a cam or projection 59 is fastened to the rear of the carriage 48 and projects outwardly therefrom. A pair of spaced adjustable limit switches 60 and 61 are slidably mounted on a carrier bar 62 connected at one end to the base 10 and supported at the other end by a flange 63 carried by the upper spacer 14. The carrier bar 62 preferably is generally polygonal in cross section so that the limit switches 60 and 61 can be moved lengthwise of the carrier bar while remaining in substantially the same vertical plane as the cam 59. The limit switches 60 and 61 may be operated in any desired manner to control the distributor valve 39; however, as illustrated, such limit switches are provided with air under pressure through a supply line 64 to an air regulator 65 and from the regulator through air lines 66 and 67 to the limit switches 60 and 61, respectively. The limit switch 60 is connected to one end of

the distributor valve 39 by an air line 68 and the limit switch 61 is connected to the opposite end of the distributor valve by an air line 69.

In order to interrupt the supply of material to the applicator head 54 at the end of travel of the carriage 48, a check valve 70 is mounted on the carrier bar 62 and is connected by flexible lines 71 and 72 to the limit switches 60 and 61, respectively, so that when either of the limit switches 60 or 61 is open to permit air to flow to the distributor valve 39, air under pressure will pass through the check valve 70 and close the control valve 57 of each applicator head and thereby shut off the supply of air under pressure to the applicator heads.

In the operation of the device, a workpiece 73 is positioned adjacent to the carriage 48 and the limit switches 60 and 61 are adjusted along the carrier bar 62 so that the applicator head 54 will spray material onto the workpiece. When the pump 33 is operated, fluid under pressure will pass through the distributor valve 39 to the fluid motor 29 to drive such fluid motor in one direction. The fluid motor will drive the drive gear 31 which in turn will drive the pinion gear 24 to cause the shaft 19 to be rotated and move the carriage 48 in one direction. The carriage 48 will move until the cam 59 engages one of the limit switches 60 or 61 and opens such valve to permit air under pressure to flow to the distributor valve 39 and reverse the direction of flow of fluid to the fluid motor 29. Simultaneously air under pressure will close the control valves 57 to interrupt the operation of the applicator head 54. As soon as the distributor valve 39 is shifted, fluid under pressure will be introduced into the opposite side of the fluid motor 29 which will then drive the shaft 19 in a reverse direction and move the carriage in a direction opposite to which it had been travelling. As soon as the carriage moves away from the limit switch which the cam 59 had been engaging, such limit switch will close and interrupt the flow of air under pressure therethrough which will permit the check valve 70 to return to normal position which in turn will open the control valve 57 and permit the applicator head to again begin the spraying operation.

As illustrated, the speed of rotation of the shaft 19 and consequently the speed of movement of the carriage 48 is controlled by the adjustable relief valve 37 although it is contemplated that the speed could be regulated by changing the shaft 19 for a shaft with a different pitch. Also the speed could be regulated by providing a gearing between the drive gear 31 and the pinion gear 24.

Also as illustrated, the fluid motor 29 is operated by hydraulic fluid under pressure. However, it is contemplated that other fluids including air could be used to drive such motor.

We claim:

1. A screw-driven coating applicator for applying a coating to a workpiece and comprising a base, a frame mounted on said base, said frame including a pair of spaced generally parallel rails, a threaded shaft carried by said frame and located between and generally parallel with said rails, a reversible fluid motor drivingly connected to said shaft, distributor

valve means connected to said fluid motor and adapted to direct fluid under pressure to said motor for causing rotation of the same in a desired direction, means supplying fluid under pressure to said distributor valve means and said fluid motor, a carriage slidably mounted on said rails, means on said carriage engageable with said shaft for causing said carriage to move along the same, cam means extending outwardly from said carriage, spaced limit switch means adapted to be alternately engaged by said cam means, said limit switch means being connected to said distributor valve means for moving said distributor valve means alternately and reversing the flow of fluid to said fluid motor means, at least one applicator head carried by said carriage, means for supplying coating material to said applicator head, control valve means carried by said applicator head for controlling the flow of coating material, and means carried by said limit switch means for operating said control valve means and interrupting the flow of material to said applicator head when said limit switch means is operated.

2. The structure of claim 1 including an adjustable relief valve for controlling the speed of rotation of said fluid motor.

3. The structure of claim 1 in which said frame is disposed in generally vertical position and said limit switch means are adjustably mounted on a generally vertical carrier bar.

4. The structure of claim 1 including a bypass regulator for controlling the fluid pressure within the system.

5. The structure of claim 1 including damper means located between said distributor valve and said fluid motor for absorbing shock when the motor is reversed.

6. A fluid-powered screw-driven paint sprayer for applying paint to a workpiece and comprising a base, a frame mounted on said base and disposed in a generally vertical plane, said frame including a pair of spaced generally parallel rails, a screw-threaded shaft rotatably mounted on said frame, pinion gear means fixed to one end of said shaft, a drive gear meshing with said pinion gear, hydraulic motor means for driving said drive gear, a fluid pump carried by said base and adapted to supply fluid under pressure to said hydraulic motor means, distributor valve means located between said pump and said motor means and adapted to direct fluid under pressure alternately to opposite sides of said hydraulic motor to operate said motor means in reverse directions, a carriage mounted on said rails and threadedly engaging said shaft so that rotation of said shaft in one direction will move the carriage up the rails and rotation of the shaft in the other direction will move the carriage down the rails, a pair of spaced limit switches mounted on said frame, cam means mounted on said carriage and adapted to engage said limit switches at the end of travel of said carriage, said limit switches being connected to operate said distributor valve means and reverse the direction of rotation of said shaft when a limit switch is engaged, at least one applicator head mounted on said carriage, means for supplying coating material under pressure to said applicator heads, and means for controlling the supply of material to said head subject to the operation of said limit switches.

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