

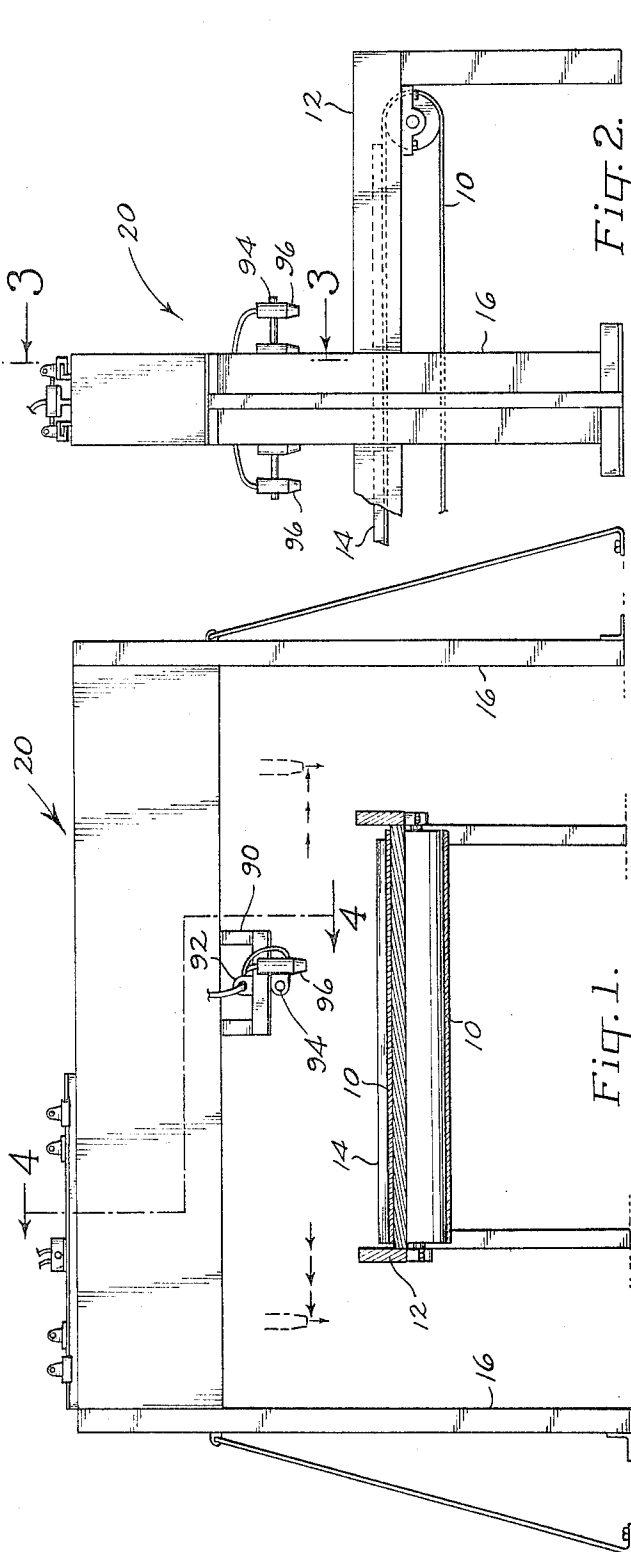
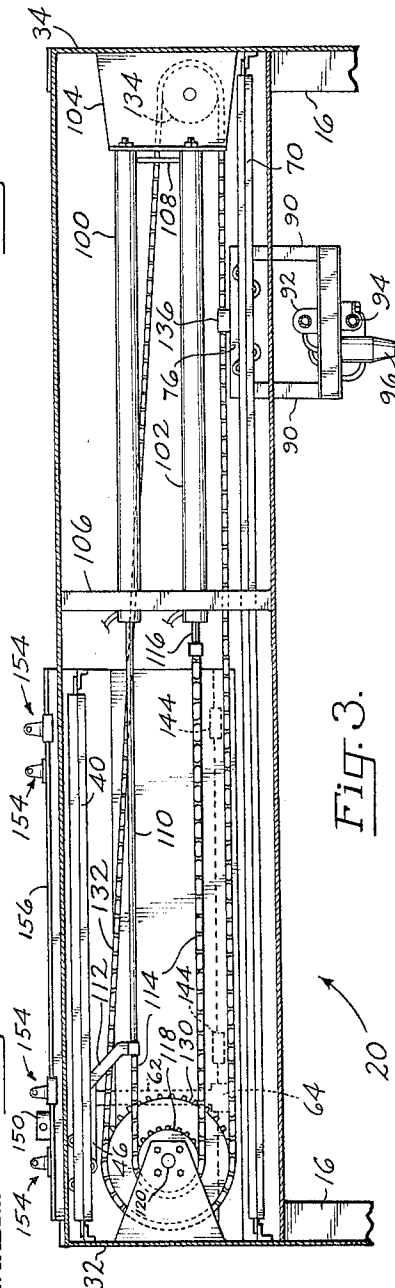
Aug. 16, 1966

T. N. BASKETT
RECIPROCATING SPRAY GUN CARRIAGE ASSEMBLY FOR SPRAY COATING
OR LIKE APPARATUS

3,266,729

Filed June 29, 1964

3 Sheets-Sheet 1



Theodore N. Baskett

INVENTOR.

BY *Engene D. Farley*
Att'y.

Aug. 16, 1966

T. N. BASKETT
RECIPROCATING SPRAY GUN CARRIAGE ASSEMBLY FOR SPRAY COATING
OR LIKE APPARATUS

3,266,729

Filed June 29, 1964

3 Sheets-Sheet 2

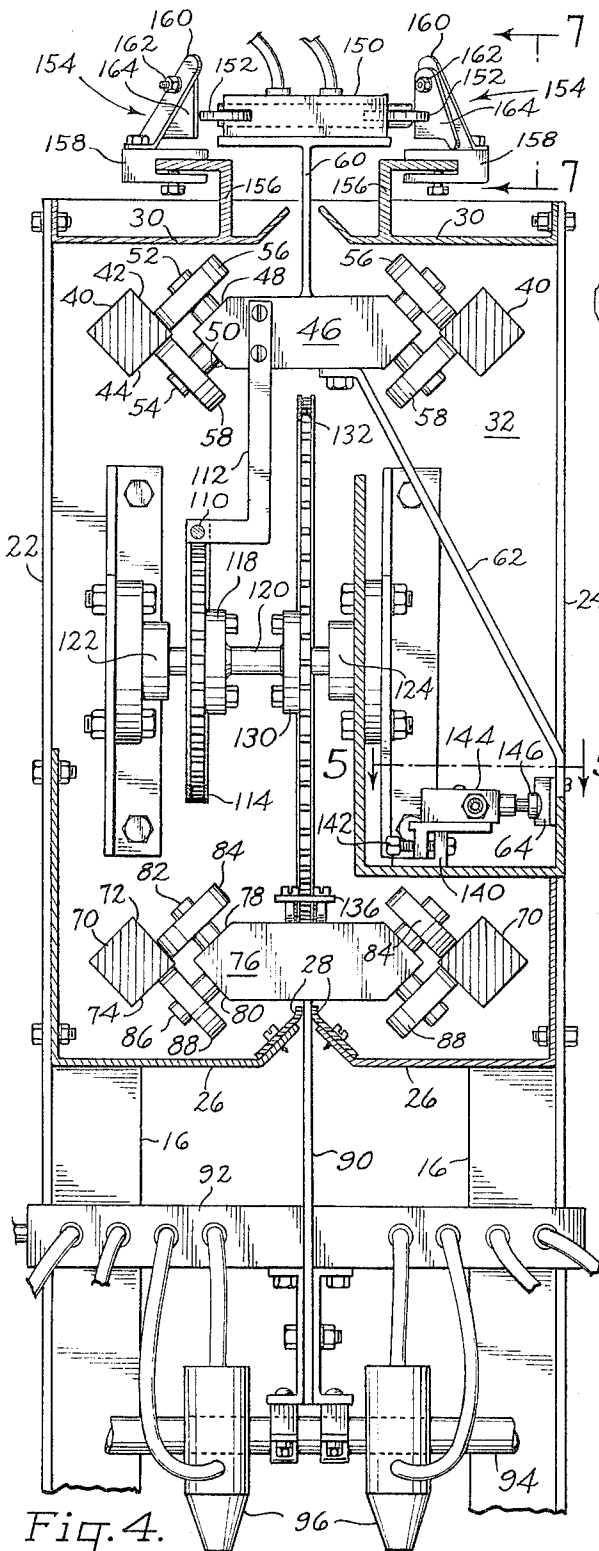


Fig. 4.

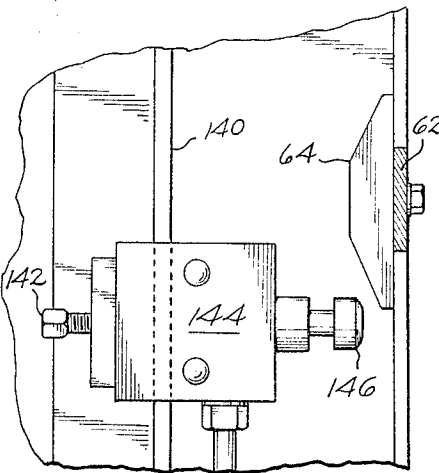


Fig. 5.

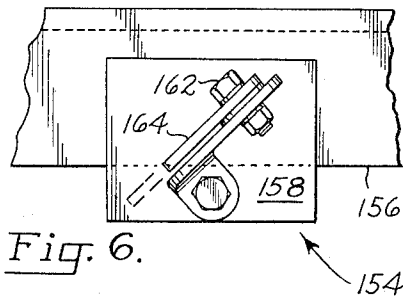


Fig. 6.

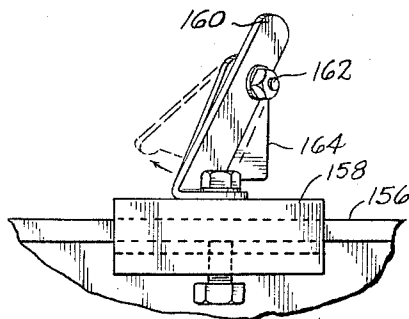


Fig. 7.

Theodore N. Baskett
INVENTOR.

BY Eugene D. Farley

Atty.

Aug. 16, 1966

T. N. BASKETT

3,266,729

RECIPROCATING SPRAY GUN CARRIAGE ASSEMBLY FOR SPRAY COATING
OR LIKE APPARATUS

Filed June 29, 1964

3 Sheets--Sheet 3

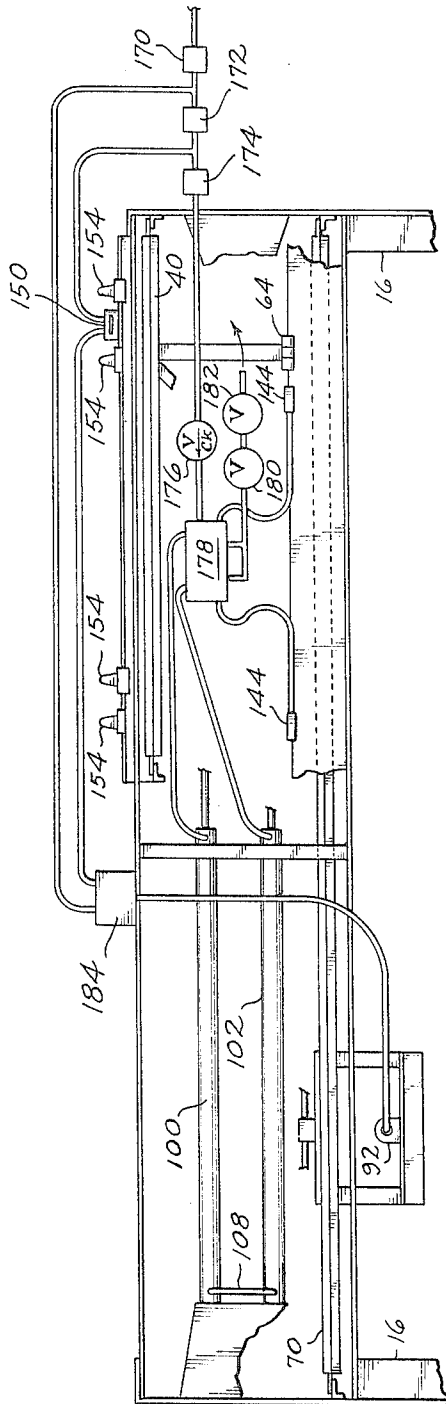


Fig. 8.

Theodore N. Baskett
INVENTOR.

BY *Ernest O. Jolley*
Atty.

1

3,266,729

**RECIPROCATING SPRAY GUN CARRIAGE
ASSEMBLY FOR SPRAY COATING OR LIKE
APPARATUS**Theodore N. Baskett, 9514 Portland Ave.,
Tacoma 44, Wash.Filed June 29, 1964, Ser. No. 378,867
8 Claims. (Cl. 239-186)

This invention relates to a reciprocating spray gun carriage assembly of the class employed in spray coating and like apparatus. It particularly pertains to a reciprocating spray gun carriage assembly for use in spray coating paints or adhesives on plywood, wood composition board or other sheet material continuously passing a spray coating station on a conveyor.

It is the general object of the present invention to provide a reciprocating spray gun carriage assembly for use in spray coating or like apparatus and characterized by the following advantages:

(1) Widely applicable to the spray coating of a diversity of work pieces with diverse types of paint, glue and other coating materials.

(2) Highly efficient and operable at a high production rate.

(3) Adjustable to accommodate coating materials of varying viscosity.

(4) Free from vibration.

(5) Stroke easily adjustable to suit different widths of work pieces.

(6) Smooth acceleration and deceleration at any speed.

(7) Free from fouling of the carriage assembly mechanism by the sprayed material.

(8) Free from explosion hazard even though the coating materials employed are highly flammable.

(9) Characterized by greatly reduced wear on moving parts.

(10) Light in weight, truly portable and requires little or no anchoring at its operating station.

(11) Stroke adjustable to any length or any position, i.e. left side, right side, or center, of work pieces passing the coating station.

(12) Spray gun instantly inactivatable when shutting down for any reason, thereby preventing excessive damage to work pieces being coated.

(13) Amount of overspray can be adjusted to suit the viscosity of the coating material.

(14) Can accommodate one or a plurality of guns working in overlapping paths and adjustable, if desired, to spray in one direction of travel only.

(15) Areas on which overspray can build up are kept at a minimum, preventing accumulated overspray from loosening and falling on the coated work.

(16) Running adjustments of stroke and spray gun operating periods can be made.

(17) Eliminates inefficient, scotch-yoke type of reciprocating carriage assembly conventionally used in spray coating apparatus.

Generally stated, the reciprocating spray gun carriage assembly which accomplishes the foregoing and other objects of the invention comprises a carriage track arranged suitably with reference to the work to be coated, as the work moves continuously past the coating station on an endless conveyor. A carriage is supported on the track. It, in turn, is provided with means for mounting one or more spray guns.

Flexible, elongated, drive means, such as a length of chain reversely bent about a sprocket, is connected to the carriage substantially parallel to the track. Reversible motor means, preferably a pair of single-acting, alternating, fluid-operated cylinders, are connected to the drive means.

2

Of the foregoing elements, the track, carriage, flexible drive, and motor means are assembled within a cabinet to protect them from overspray. Where a pneumatic drive is employed, it is exhausted within the cabinet, providing a pressurized environment. The spray gun mounting means extends outside the cabinet so that the guns only are exposed to the spray coating environment.

Suitable control means for the motor means are so positioned that they are contacted by the carriage after a predetermined travel, thereupon reversing the motors and securing a reciprocating motion of the carriage across the work. The control means are adjustable as required to adjust the carriage travel to the width of various work pieces and also to change the location of spraying selectively to coat the right, left, or central portions of the work.

Also actuatable by the carriage is spray gun control means. This is synchronized with the control means for the motor so that the spray guns are turned on and off as they pass across and beyond the work. This occurs each time the direction of motion of the carriage is changed. Depending upon the viscosity of the coating material, greater or lesser overspray time periods are required, and these periods may be adjusted.

Preferably all of the operating units of the assembly, i.e. the spray guns, the drive motor for the carriage, the controls for the drive motor and the controls for the spray gun, are fluid operated so that they may be incorporated in a single fluid drive system. This simplifies the construction and eliminates the necessity for providing electric circuits, which would increase the danger of exploding the highly flammable solvents often present in coating materials.

Considering the foregoing in greater detail and with particular reference to the drawings, wherein:

FIG. 1 is an end elevation, partly in section, of the herein described reciprocating spray gun carriage assembly, illustrated in conjunction with an endless conveyor moving work pieces past the spray coating station;

FIG. 2 is a view in side elevation of the assembly of FIG. 1;

FIG. 3 is a longitudinal, sectional view, taken along line 3-3 of FIG. 2;

FIG. 4 is a transverse sectional view taken along line 4-4 of FIG. 1;

FIG. 5 is an enlarged detail plan view illustrating particularly the drive motor control means, looking in the direction of the arrows of line 5-5 of FIG. 4;

FIG. 6 is an enlarged detail plan view and FIG. 7 is an enlarged detail view in side elevation, looking in the direction of the arrows of line 7-7 of FIG. 4, of the control means for controlling the operation of the spray guns mounted on the herein described reciprocating spray gun carriage assembly; and

FIG. 8 is a schematic view illustrating an integrated fluid circuit, specifically a pneumatic circuit, which may be employed to actuate the components of the herein described apparatus.

Referring to the drawings:

FIGS. 1 and 2 illustrate a typical environment in which the reciprocating spray gun carriage assembly of the invention is to be employed. An endless conveyor 10 moving in a guideway 12 carries plywood panels, sheets of wood composition board, or other work pieces 14, past the spray coating station.

At this station, is located the spray coating apparatus, supported above the conveyor on standards 16.

The apparatus is housed in an elongated housing, indicated generally at 20, and substantially wider than the work pieces to be sprayed. As shown in FIGS. 3 and 4, housing 20 is fabricated from a pair of side plates 22,

24, a composite bottom plate formed of two slightly spaced-apart, angularly-bent pieces 26 bolted to the side plates and provided with flexible curtain strips 28; a composite top plate composed of a pair of spaced, angularly-bent plates 30 bolted to the top of side plates 22, 24, and a pair of end plates 32, 34. The central, longitudinally-extending slot present between bottom plates 26 provides a guideway in which works the spray gun support, while the corresponding central, longitudinally-extending slot between top plates 30 provides a guideway in which works the support arm for the spray gun control mechanism, as will appear hereinafter.

Housed within housing 20 is a reciprocating spray gun carriage drive assembly which, in the illustrated form of the invention, is geared to provide a relatively high rate of carriage travel at a relatively low drive motor speed.

To this end there are provided two cooperating carriage assemblies, the first of which is driven relatively slowly and which carries both the control means for the drive motor and the control means for the spray guns, and the second of which moves at a relatively high speed and carries the spray guns themselves.

The first, or control-mounting carriage assembly, is supported on a pair of spaced track bars 40, FIGS. 3 and 4. These are rectangular in cross section and extend substantially parallel to each other and to the longitudinal direction of housing 20, but at right angles to the work traveling on conveyor 10. The track bars preferably are arranged to provide two pairs of angled side faces, 42, 44, each of which provides a tracking surface. The bars thus are reversible to provide fresh tracking surfaces after a period of use.

The first control carriage assembly comprises a flat body 46 having angled side faces 48, 50 on both sides. Extending normal to side face 48 is a shaft 52 which mounts a wheel 56. Extending normal to face 50 is a shaft 54 on which is journaled a wheel 58. Similar shafts and wheels are provided on the opposite side of the bar.

The horizontal axis of carriage body 46 is aligned with the horizontal axes of track bars 40. The angular relationship between side faces 42, 44 of the track bars and side faces 48, 50 of the carriage body is such that wheels 56, 58 of the carriage track on side surfaces 42, 44 of the track bars, thus providing a sturdy, vibration-proof mounting in which wear is kept at a minimum.

Carriage body 46 mounts a support arm 60, which extends upwardly through the guideway between top plates 30 of the cabinet. The arm supports the valve which controls the spray guns, as will be described hereinafter.

The underside of carriage body 46 mounts a downwardly and angularly extending cam arm 62 which supports a cam 64 having oppositely beveled cam surfaces, also to be described hereinafter.

The second, or spray gun mounting carriage assembly, moves on track bars 70. These extend the entire length of housing 20. They are spaced apart, parallel to each other, and directly below track bars 40. Like the latter, track bars 70 are arranged at an angle to present side faces 72, 74.

Supported on track bars 70 is a carriage assembly comprising a body 76 having angled side faces 78, 80. Extending substantial normal to the respective side faces are a first axle 82 on which is journaled wheel 84, and a second axle 86 on which is journaled wheel 88.

Carriage body 76 is aligned with track bars 70 and the angular relationship between the side faces is such that wheels 84, 88 of the carriage track on side faces 72, 74 of the track bars. As pointed out in connection with track bars 40, track bars 70 may be reversed 180° after a period of use, thus providing fresh tracking surfaces.

Affixed to, and extending downwardly from, the under-surface of carriage body 76 is a support arm 90. This arm works in the sealed slot present between bottom plates 26 of cabinet 20. It supports the spray gun assembly.

The latter includes a manifold 92 and, spaced below the manifold, a crossarm 94 on which are mounted one or more spray guns 96 supplied with coating material and compressed air through flexible conduits in the usual manner.

The drive by which control-mounting carriage 46 and spray gun-mounting carriage 76 are reciprocated at differential rates is illustrated particularly in FIGS. 3, 4 and 8. This drive, as well as its control system and the spray guns mounted on the apparatus preferably all are pneumatically operated and are described as such. However, it is to be understood that other types of drives, for example, hydraulic drives, may be substituted.

As seen in FIG. 3, the motive power is supplied by a pair of alternating, single acting, long stroke, pneumatic cylinders 100, 102. The rearward ends of the cylinders are supported on a bracket 104; the forward ends, by a support plate 106. The cylinders are connected in series through a conduit 108, so that the air exhausted from the working cylinder must pass through the idle cylinder before being vented. This slows down the action of the cylinder and produces a stroke of more uniform speed.

The piston rod 110 of cylinder 100 is coupled to a connecting arm 112 which connects it to control carriage 46. It also is coupled to one end of a flexible drive member, e.g. a length of chain 114. The piston rod 116 of cylinder 102 is connected to the other end of chain 114.

The chain, in turn, engages a sprocket 118 fixed to a shaft 120 journaled in bearings 122, 124. As cylinders 100, 102 alternately are extended and retracted, drive chain 114 is reciprocated endwise at a speed and stroke commensurate with the speed and stroke of the cylinders. This drives correspondingly control carriage 46 connected to the piston rod of cylinder 100 through connecting link 112.

Spray gun carriage 76 also is driven by cylinders 100, 102, but at an accelerated rate.

Keyed to the same shaft 120 as is sprocket 118 is a second sprocket 130 which may be, for example, twice the diameter of sprocket 118. Sprocket 130 mounts one end of an endless chain 132, the other end of which is mounted on idler sprocket 134 at the far end of the apparatus. Carriage 76 is fastened to chain 132 by means of a coupling 136. Accordingly, chain 134 reciprocates with chain 114, but at twice the rate and with twice the stroke. This moves spray gun carriage 76 and the spray guns carried thereby between the extreme dotted line positions of FIG. 1.

The control means for regulating the stroke of spray gun carriage 76 is illustrated in FIGS. 4 and 5.

A horizontal bracket 140 extends lengthwise of the housing. Adjustably mounted on the bracket by means of bolts 142 are a pair of spaced valve actuators. These may be pneumatic bleeder valves 144, which control the action of a master valve connected directly to the cylinder. Contact buttons 146 of the valves are positioned for actuation by cam 64 on the end of arm 62 and serve to control the alternate reciprocation of cylinders 100, 102, both as to length and location of stroke.

Thus, by setting valve actuators 144 at any spaced interval along bracket 140, the stroke of the cylinders will match accordingly and any desired area of the work may be sprayed with guns 96.

Spray gun control means also are provided. These energize and de-energize the spray gun synchronously with the reciprocation of spray gun carriage 76. This presents a considerable problem, since it is desirable to overspray sufficiently to cover the work completely, but insufficiently to waste the coating material and create offensive deposits.

The extent of overspraying in turn is dependent upon the viscosity of the coating material. More viscous materials cause the spray gun to be less responsive to the control which shuts it on and off. For this reason it is necessary to provide spray gun control means which are

adjustable to suit coating materials of varying viscosity.

The control mechanism which I have devised to meet this need is illustrated particularly in FIGS. 4, 6 and 7.

Mounted on arm 60 supported on control carriage 46 is a spool-type pilot air valve 150. The ends of the spool extend outwardly from the body thereof and terminate in cam rollers 152.

Cooperating with cam rollers 152 are cam elements indicated generally at 154. There are two pairs of these elements, one pair being located adjacent each terminus of control carriage 46.

The cam elements are mounted on elongated brackets 156 extending the entire length of travel of carriage 46. The cam elements each comprise a base 158, a support arm 160 and, pivoted to the support arm by bolt 162, a triangular cam plate 164.

The cam plates of each pair are arranged opposite to each other. As a consequence, as valve 150 passes by the members of one pair it will be actuated by one of the cam plates, altering the operation of the spray gun. However, as it passes the oppositely arranged cam plate of the pair, the cam plate will swing to the dotted line position of FIGS. 6 and 7 in which it is inoperative. Then when the direction of motion of the carriage is reversed, the reverse action takes place. The cam plate previously inoperative becomes operative, and that previously operative becomes inoperative.

Accordingly, when a very viscous coating material is being sprayed, the cam members of each pair may be separated by an appreciable distance. The cam member which is innermost with respect to the work is so placed that the spray gun is de-energized substantially before it reaches the end of its stroke. However, because of the viscous character of the material, the spraying will continue until the end of the stroke. The cam plate furthest removed from the work is passed by and without function.

Upon reversal of the carriage, the latter cam plate is energized, actuating the spray gun. Again because of the viscosity of the coating material, actuation of the spray gun does not result immediately in emanation of coating material. Rather, there is a lag until the edge of the work is reached, whereupon the spray is initiated. In this motion the innermost cam plate tilts upwardly and is idle.

On the other hand, when thin, non-viscous coating materials are employed, cam plates 164 may be substantially opposite each other, the starting and stopping of the spray being substantially instantaneous.

FIG. 8 illustrates an integrated, pneumatic system by which all of the units of the herein described apparatus may be controlled and operated.

Air from a source of compressed air passes through a filter 170, an oiler 172, a pressure gauge 174 and a check valve 176.

Valves 144 which control the spray guns may be bleeder valves, cooperating with a pressurized, balanced-spool, four-way pneumatic valve 178. When bleeder valves 144 are actuated by cam 64, a pressure differential is established in four-way valve 178. This causes it to move and energize one or the other of cylinders 100, 102. The inactive cylinder exhausts its air through valve 178, as well as through a throttle valve 180 and a shut-off valve 182. There thus is provided an effective way of starting and stopping the spray gun carriage, as well as for controlling its speed.

Similarly, when pilot valve 150 is energized by contact with cams 154, it energizes a "quick-dump" pneumatic valve 184 which instantaneously loads and unloads manifold 92, controlling the spray guns.

OPERATION

Briefly summarized, the operation of the herein described reciprocating spray gun carriage is as follows:

First, the entire unit is stationed over the plywood

panel 14 or other work passing the coating station on conveyor 10. Bleeder valves 144 are positioned to regulate the stroke of cylinders 100, 102 to the desired lateral location and length. Pilot valve actuators 154 are set to determine the on-off positions of the spray guns with reversal of motion, their position being determined by the length of stroke of cylinders 100, 102 and the viscosity of the coating material.

Valve 182 is opened. This starts the apparatus. Valve 180 is regulated to control the speed by controlling the flow of air exhausted from alternately reciprocating cylinders 100, 102.

As the cylinders reciprocate they reciprocate endwise drive chain 114, rotating small sprocket 118 and hence large sprocket 130 on common shaft 120. Large sprocket 130 drives endless chain 132 at an accelerated rate determined by the differential diameters of the two sprockets.

Spray gun carriage 76 connected to chain 132 moves rapidly back and forth across the work. However, to insure better control, less wear and smoother operation, control carriage 46, driven directly by piston rod 110 of cylinder 100, moves at a greatly reduced rate. Arm 62 and cam 64 carried thereby strike first one and then the other of bleeder valves 144, reversing the motion of the apparatus in accordance with their setting.

Pilot valve 150 also carried by carriage 46 progressively strikes spaced cams 154, alternately turning on and shutting off the air supplied through dump valve 184 and manifold 92 to spray guns 96. The spacing between the members of each valve pair determines an overrun commensurate with the viscosity of the coating material, for most efficient use of the latter.

Running adjustments of bleeder valves 144 and cam units 154 can be made at any time. Also, the air from the system is exhausted within the enclosing housing, pressurizing the latter and preventing entrance of coating materials. Still further since electrical circuits are eliminated completely, the hazard of explosion when using coating materials containing volatile solvents also is eliminated.

It accordingly will be seen that there is provided an apparatus in which the several objects of this invention are achieved and which is well adapted to meet the conditions of practical use.

It is to be understood that the form of my invention herein shown and described is to be taken as a preferred example of the same and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of my invention or the scope of the subjoined claims.

Having thus described my invention, I claim:

1. In spray coating or like apparatus a reciprocating spray gun assembly comprising:

- (a) carriage track means arranged operatively with reference to work being coated,
- (b) a carriage supported on the track means,
- (c) spray gun mounting means on the carriage,
- (d) flexible, elongated drive means connected to the carriage and having spaced ends,
- (e) reversible fluid operated motor means having a pair of piston rods movable simultaneously in opposite directions and each connected to a different one of the spaced ends of the drive means,
- (f) motor control means actuatable periodically by the carriage to reverse the motor means after a predetermined travel of the carriage, and
- (g) spray gun control means actuatable by the carriage and synchronized with the motor means for altering the operation of the spray gun at a predetermined time with reference to the reversal of the motor means.

2. The apparatus of claim 1 wherein the carriage includes a horizontal body having angled side edges with wheels mounted thereon parallel thereto, and wherein the

track means comprises elongated bars having angled side edges, the bars being aligned horizontally with the body of the carriage and the upper and lower wheels of the carriage tracking respectively on the upper and lower angled side edges of the tracks.

3. The assembly of claim 1 including housing means enclosing the track means carriage, motor means and drive means, the housing means having a longitudinal slot along its bottom wall, and a support arm extending through the slot and connected at its inner end to the carriage and at its outer end to the spray gun mounting means, and wherein the motor means comprise a reversible pneumatic motor exhausting inside the housing means, thereby maintaining positive air pressure within the same for preventing ingress of sprayed material to the interior of the housing means.

4. The assembly of claim 1 wherein the drive means comprises a reversely arranged length of chain engaging a sprocket and wherein the reversible motor means comprises a pair of fluid operated cylinders connected one to each end of the chain.

5. The assembly of claim 1 wherein the drive means comprises a length of chain reversely arranged on a sprocket and wherein the reversible motor means comprises a pair of pneumatic cylinders connected one to each end of the chain.

6. The assembly of claim 1 wherein the drive means comprises a length of chain reversely arranged on a sprocket and wherein the reversible motor means comprises a pair of single-acting, alternating pneumatic cylinders interconnected to exhaust the air from the working cylinder through the non-working cylinder.

7. The assembly of claim 1 wherein the drive means comprises a rotatably mounted shaft, sprockets of different diameters keyed to the shaft, a length of chain reversely engaging the smaller of the sprockets, a pair of alternating single-acting, fluid operated cylinders connected one to each end of the chain, an endless chain engaging the larger of the sprockets, and connecting means on the endless chain for connecting the chain to the carriage.

8. The assembly of claim 1 wherein the spray gun is a pneumatically operated spray gun and the spray gun control means comprises cam-operated valve means mounted on the carriage and in a pneumatic circuit with the spray gun the valve means comprises a sliding spool air valve having on each end an external cam roller, and wherein two pairs of cams are adjustably mounted spaced from each other in the path of travel of the carriage; each cam including a cam plate arranged at working angle with reference to the cam roller, a support arm, and means for pivotally supporting the cam plate on the support arm; the cam plates being oppositely arranged with respect to each other, whereby to inactivate one cam plate of each pair upon traversal of the carriage in its first direction and to inactivate the other cam plate of each pair upon traversal of the carriage in its reverse direction.

References Cited by the Examiner

UNITED STATES PATENTS

3,027,095	3/1962	Paasche	239—187
3,041,999	7/1962	Bogshan	239—186
3,172,606	3/1965	Reynolds et al.	239—186

FOREIGN PATENTS

601,617 7/1960 Canada.

EVERETT W. KIRBY, *Primary Examiner.*