

April 25, 1939.

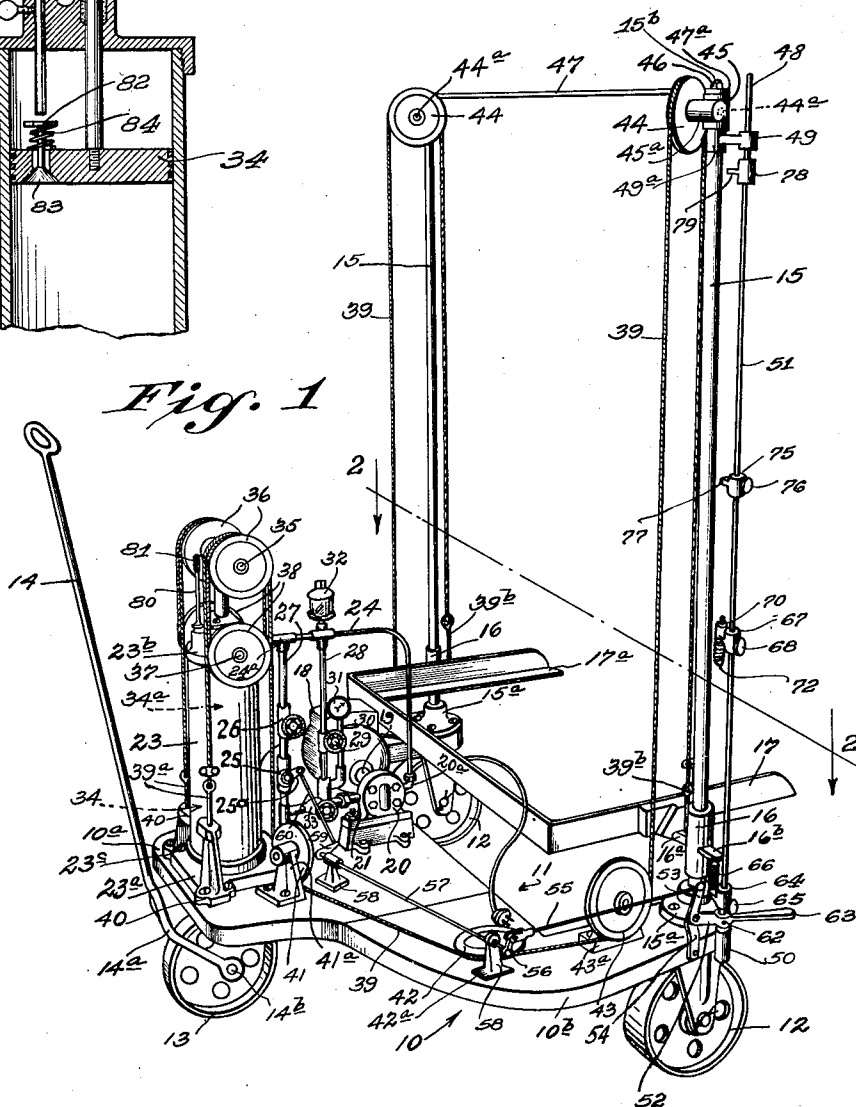
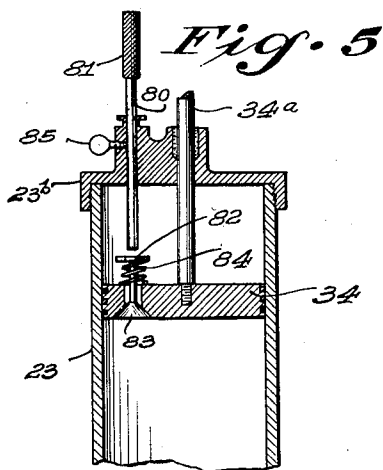
G. STOLZE

2,156,204

DIPPING MACHINE

Filed Nov. 17, 1937

2 Sheets-Sheet 1



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Fig. 2

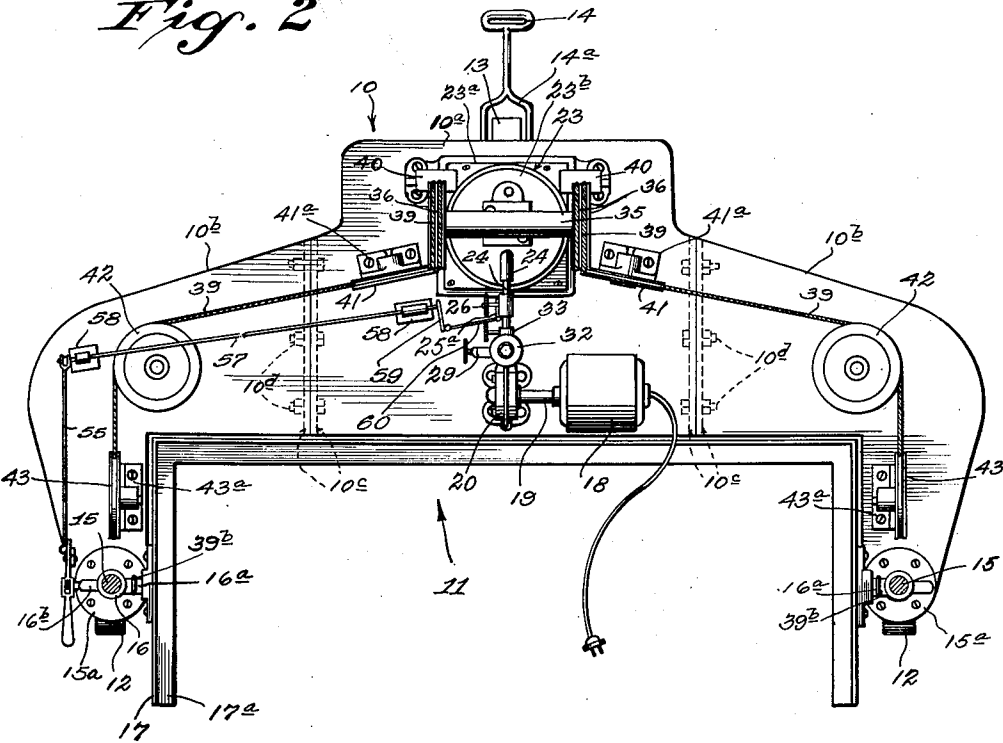


Fig. 3

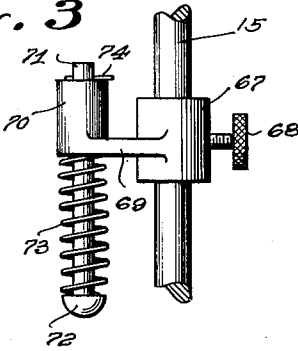
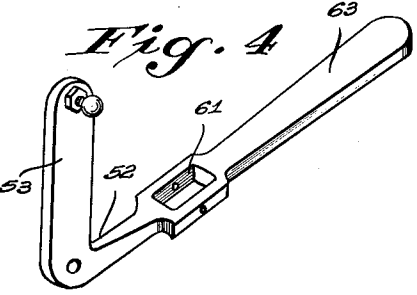


Fig. 4



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2,156,204

DIPPING MACHINE

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7 Claims. (Cl. 91-46)

My invention relates to improvements in that type of liquid coating machine in which the articles to be treated to a liquid coating are held in an article holder which is lowered into a vat or fluid-containing receptacle to coat the articles and is then subsequently raised. While such a machine finds, perhaps, its chief field of utility in the art of dip-painting yet it is employed for other purposes.

Briefly and generally the invention has among its primary objects to provide a dipping machine which is relatively simple in construction, inexpensive to manufacture, highly efficient in practical use, and which lends itself to ready manufacture in different sizes while maintaining a standardization of size and construction of many of the parts.

Furthermore, the invention contemplates a dipping machine which will be entirely automatic in operation in that the carriage or member which carries the articles to be dipped will be operated up and down at predetermined speeds to successively immerse the articles in the fluid and raise them therefrom without necessitating manual attention.

An additional object of the invention is to provide an automatically operable dipping apparatus as hereinabove characterized which embodies means operated by the vertically movable article carrier for effecting reversal of movement of the same; and additionally the invention is characterized by means which is operable for bringing the article carriage or holder to a stop at a selected position with respect to the vat or receptacle containing the fluid in which the articles are to be dipped.

The invention is still further characterized, at least in its more specific aspects, by a novel actuating unit which incorporates an improved fluid cylinder and piston construction, including connections therefrom for control of the article dipping carriage, the nature of the arrangement being such that the article carrying carriage can be operated vertically any required distance that it is necessary for it to be moved.

The invention also resides in certain novel features of construction, combination and arrangement of the various parts, and in modes of operation, all of which will be readily understood and appreciated by those skilled in the art upon reference to the accompanying drawings in connection with the detailed description to follow.

While the drawings and description deal with what now appears to be a preferred example of the invention yet it will be obvious to those skilled

in the art that same is susceptible of other mechanical expression within the spirit and scope of the subject matter claimed hereinafter.

In the drawings, wherein the same reference characters have been used to designate the same parts in all views,

Figure 1 is a perspective view of a dipping machine embodying my invention;

Figure 2 is a cross sectional view taken on the line 2-2 of Figure 1 and illustrating the base and operating mechanism of the machine in plan;

Figure 3 is a fragmentary side elevational view of a portion of the valve operating rod and one of the carriage actuated members on said rod;

Figure 4 is a perspective view of a lever member which is swingably carried by the valve operating rod of Figures 1, 2 and 3;

Figure 5 is a detail vertical section taken through the upper portion of the cylinder illustrating an adjustable safety control means for effecting stoppage of the lifting movement of the mechanism at a desired point.

Referring to the drawings by reference characters numeral 10 denotes generally the base comprising the central section 10a and the end sections 10b at each side. The sections 10a, 10b have flanges 10c whereby they can be connected by bolts, rivets or the like as indicated at 10d in Figure 2. This particular construction is of considerable advantage in that the central base section 10a can be made the same size for all machines leaving the composite width of the base 10 to be determined by the size of the sections 10b. As will be observed from Figure 2, the various elements of the operating mechanism are mounted on the intermediate section 10a of the base.

The base sections 10b provide the forwardly extending arms which define the ends of the space 11 which is adapted to receive the fluid container (not shown).

The base 10 as shown in Figures 1 and 2 is supported by the casters 12, 13 which are carried in suitable bearings. There are two casters 12, one adjacent the forward end of each of the arms of the end sections 10b of the base; and one caster 13 which is preferably swivelly mounted at the underside of the intermediate section 10a of the base and has its axle 14b received in the eyes of the opposed arms 14a of the handle 14 which serves as the means for pulling or pushing the machine from one part of a plant to another.

Upon the upper surfaces of the arms of the

end members 10b of the base, are secured the mounting seats 15a which carry the upstanding guide standards 15 upon which slide the bearing sleeves 16 which are carried by the lateral arms 16a of the article support or carriage 17 which is aligned with the space 11, previously mentioned, as being arranged to receive the liquid receptacle. The carriage or article carrier 17 has the inwardly extending flange 17a for supporting cross members, such as rods or the like, (not shown) which carry the articles to be dipped. The carriage 17 is operated up and down by means which will be presently described.

Figures 1 and 2 illustrate the central base section 10a as supporting the article carriage actuating means comprising the electric motor 18 having the coupling connection 19 with the rotary pump 20 having the output pipe connection 21 leading into the base 23a of the piston cylinder 23, there being the pipe connection 24 leading from the head 23b of cylinder 23 to the intake 20a of the pump 20. A by-pass pipe 27 having therein the valves 25 and 26 connects the pipes 21 and 24 adjacent the cylinder 23 and there is also provided a second by-pass or pressure relief pipe 28 connecting the pump output and intake pipe 21, 24 at points between the pipe 27 and the pump 20. The last mentioned by-pass or pressure relief pipe 28 includes an adjustable setting relief valve 29 and likewise the branch 30 providing the pressure gauge 31. The coupling which establishes connection between the upper end of the pipe 28 and the return line 24 to the pump carries the closed glass cup 32 which serves merely as an indicator to show if there is enough fluid in the pump circuit and cylinder 23.

The vase 23a of the cylinder is secured to the base section 10a of the machine base as indicated at 23c and working within the cylinder 23 is the piston 34 having the piston rod 34a extending through a packing gland in the cylinder head 23b.

The upper end of the piston rod 34a carries a cross head 35 providing the bearing shaft for a pair of sheaves 36, one pair at each side of the piston rod 34a. The cylinder head 23b is likewise provided with a cross shaft 37 having journaled at each of its opposite sides a pair of sheaves 38.

Operation of the vertically slidable article carriage 17 is effected by two cables 39 having anchoring elements 39b secured to the aforementioned lateral bearing carrying arms 16a at opposite sides of the carriage 17 as shown in Figures 1 and 2. The other end of each cable 39 has an anchor element 39a secured to upstanding base-carried members 40 at opposite sides of cylinder 23. From its base carried anchor-engaging member 40 each cable 39 leads upwardly over the upper sheave 36 of the pair at its side of the piston rod crosshead 35, thence downwardly and about the subjacent cylinder head carried sheave 38, thence upwardly and over the outer other piston rod sheave 36, and then downwardly and under the sheave 41 whose mount 41a is carried by base section 10a. From its sheave 41 each cable passes laterally outward about a vertically journaled sheave 42, thence under the horizontally journaled sheave 43 and upwardly over the sheave 44 whose shaft 44a is carried by the bearing 45a of a sleeve 45 carried at the upper end of the adjacent standard 15, and from which sheave 44 the cable 39 leads

downwardly to its point of attachment to the adjacent arm 16a.

From the foregoing it will be apparent that since each cable 39 provides a single loop about the sheaves 36, 38 of the piston rod crosshead 35 and cylinder head 23b, respectively upward movement of the piston 34a will effect elevation of the carriage 17 thrice the distance the piston 34 is moved. Also it will be evident that additional sheaves 36, 38 may be added for each cable 39 so that additional cable loops may be provided in the event that it is desired to increase the ratio of movement of the carriage 17 with respect to piston 34. Obviously, if one additional loop is so provided for each cable 39 the carriage will be moved thrice the distance the piston 34 is moved.

Figure 1 illustrates a tie rod 47 connecting the upper ends of the guide standards 15. As shown, said tie rod 47 has eyes 47a at its ends which receive the threaded standard ends 15b and overlie the bearing-carrying sleeves 45, which latter rest upon the collars 49a of guide brackets 49—to be referred to presently. Nuts 46 on standard ends 15b hold the tie rod 47 in place.

The base 10 carries on one of the sections 10b a bearing bracket 50 vertically aligned with the bearing bracket 49 supported at the upper end of the standard 15, as shown in Figure 1. A rod 51 is mounted for vertical slidable movement in said bearing bracket and adjacent its lower end is in pivotal connection with the long arm 52 of a bell-crank lever that is fulcrumed on a bracket 54 carried by the base and which has its short arm 53 in pivotal connection with a link rod 55 pivotally connected at its opposite ends to a crank 56 rigidly fixed to one end of a rocker rod 57 journaled in a pair of base-carried uprights 58, its opposite end having rigidly secured thereto a crank 59 in pivotal connection with one end of an actuator rod 60 which at its other end has pivotal connection with the operating handle of the valve 25 in the line 27.

The long arm 52 of the bell crank lever has a flattened shank portion somewhat laterally enlarged and apertured with a longitudinal slot 61, the side walls of which are suitably bored in transverse alignment to receive therethrough a pivot pin 62 passed through the shank of the rod 51 and providing a pivotal connection between these elements, the length of the slot 61 providing sufficient clearance to accommodate the relative pivotal play between the lever arm 52 and the rod 51 as the rod is shifted vertically to rock the bell-crank lever on its fulcrum. The outer end of the long arm 52 is formed as a pedal 63.

Slightly above its point of pivotal connection with the bell crank lever the rod 51 carries a collar 64 vertically and rotatably adjustable thereon by means of a set screw 65 and which collar is formed with a laterally extending lug adapted to underlie the lug 16b of the carriage carried standard engaging collar 16. The lug 65 of the collar 64 mounts an upstanding tension member 66, such as an expansion spring coiled about the shank of a headed stud that is mounted for vertical sliding movement through the lug of the collar. In normal operation of the apparatus the upper extremity of this tension member is adapted to be contacted by the lateral arm or lug 16b as the carriage 17 descends.

Above the carriage sleeve 16 the rod 51 also mounts a collar 67 vertically and rotatably ad-

justable on the rod by means of a set screw 68 and formed with a lateral lug 69 having its outer end formed as a bearing 70 for a vertically slidable stem 71. The stem 71 is provided at its lower end with a head 72 forming an abutment for one end of the expansion spring 73 coiled about the shank 71 between its head and the lower face of the lateral lug 69, the normal expansion of the spring tending to hold the shank head 72 at its lowermost point, the upper end of the shank being retained in association with the bearing by means of a cotter key 74.

Above the collar 67 the rod 51 is further provided with an additional collar 75 vertically and rotatably adjustable thereon by means of a set screw 76 and having a laterally projecting lug 77. Adjacent the upper extremity of the rod 51 and beneath the bearing 49 there is provided a stop member comprising a collar 78 appropriately fixed to the rod 51 and carrying a laterally projecting lug 79.

The various collars and their lug portions as just described constitute means cooperative with the arm 16b of the traveling carriage carried sleeve 16 for enabling the automatic operation of the apparatus as well as for adjustably regulating the limit of travel for the vertically movable carriage 17.

In service, the motor 18 is continuously operated to drive the pump 20 which establishes a pressure circulation of the fluid within the pipe and cylinder system, generally water or oil. The valve 33 is open to permit passage of the liquid from the pump to the cylinder 23 beneath the piston 34, it being understood that the valve 25 is closed, the valve 26 is open and the valve 29 is set to partly open position.

With the pump in operation the pressure within the cylinder 23 will elevate the piston 34 and correspondingly the sheaves 36 drawing up the cable and consequently lifting the carriage 17 until the arm 16b projecting from the carriage sleeve 16 rises sufficiently far on the standard 15 to engage the head 72 forming a part of the assembly of the stop collar 67. As the carriage continues to rise the head 72 will be moved upwardly against the tension of the spring 73 until the spring tension has been overcome whereupon under the further continued rising movement of the carriage the collar 67 will be snapped upwardly and will in turn lift the rod 51 sharply. As the rod 51 is connected to the bell crank lever arm 52 the rising movement of the rod will rock the bell crank lever on its pivot, lifting the long arm 52 and through the positive connection of the linkage and rocker rod mechanism as described will open the valve 25 in the by-pass line 27. Immediately upon opening movement of this valve the pressure beneath the piston is relieved and the piston will descend, the carriage 17 dropping at a corresponding ratio until the arm 16b engages the tension member 66 carried by the lower end portion of the rod 51. As the carriage continues to move down the tension member 66 will effect a snap action transmitted through the collar 64 which acts sharply to pull the rod 51 down thus effecting a corresponding movement of the long arm 52 of the bell crank lever which rocks on its fulcrum to bring the valve 25 back to closed position whereupon the operating cycle is automatically repeated and operation will continue automatically in this cycle so long as the stop collar 67 is adjusted on the rod to dispose its

lug 69 in the path of travel of the arm 16b. The height at which the collar 67 is located on the rod 51 determines the extent of upward vertical movement of the carriage during the automatic operation of the mechanism.

If automatic operation is not desired and if it is intended that the carriage shall be stopped in its upward movement and held arrested at the point of stoppage, the stop collar 75 is brought into play, the collar 67 being adjusted on the rod 51 through rotative movement to remove it from the path of travel of the arm 16b which travels with the carriage.

With the collar 67 clear of the path of travel of the carriage carried arm 16b and with the stop lug 77 of the collar 75 projected into its path of travel, as the carriage rises the arm 16b contacts the lug 77 and thus the rod 51 is lifted at the rate of upward movement of the carriage 17. There is no snap action and the rod 51 is therefore gradually lifted so that the bell-crank lever is operated in like manner to cause a gradual opening movement of the valve 25 which brings about a gradual balance of pressures at opposite sides of the piston so that when a pressure balance is reached the lifting operation ceases and the carriage is held at the point of stoppage. In order to allow the carriage to descend after an operation of this character the valve 25 is brought to fully opened position by a manipulation of the lever 63.

The stop collar 78 carrying the stop lug 79 functions at the upper end portion of the standard 15 as a safety measure in the event that neither of the abutments 67 or 75 should be functioning when the machine is operated. With the abutments 67 and 75 clear of path of travel of the arm 16b it will be apparent that when the carriage reaches a point at which the carriage arm 16b engages the stop lug 79 the rod 51 will be elevated to cause a stoppage of the machine in a manner corresponding to the stoppage effected through a balance of pressures as in the case of the stop collar 75.

The valve 29 in the by-pass line 28 is of a known type capable of being set to open at any desired pressure. Under the continuous operation of the motor and pump there is, of course, a continual pressure in the system and when this pressure rises beyond the setting of the valve 29 it opens to permit circulation without damage to the system.

The extent of opening of the valve 33 determines the speed of circulation through the pipe 21 and in like manner the extent of opening of the valve 26 determines the speed of circulation through the by-pass line 27. It should here be noted that the pump outlet pipe 21 communicating to the bottom of the cylinder 23 and also the by-pass pipe 27 are of larger diameter than is the return pipe 24.

The control of the carriage 17 with respect to its uppermost authorized limit of travel may also be effected by adjustable means carried by the cylinder 23. This means is illustrated in detail in Figure 5 and consists of a rod 80 having a sliding engagement through a vertical boss carried by the cylinder head 23b, the upper end of the rod externally of the cylinder being provided with a knurled operating portion 81 by which the rod may be moved to adjust the same vertically relative to the cylinder. Within the cylinder the rod 80 has its lower end disposed for contact against the stem 82 of a pressure relief valve 83 mounted in the piston 34 and seating 75

against its under face in normally closed position by means of an expansion spring 84 disposed between the upper face of the piston and a lateral abutment carried by the valve stem 82. The tension of the spring acts in addition to the pressure set up beneath the piston and serves to maintain the valve 83 tightly closed against its seat until contact with the lower end of the adjustable rod 80 whereupon as the piston continues to rise the valve 83 is opened to allow circulation of liquid through the piston and establish a balance of pressures to arrest further movement of the carriage 17. A set screw 85 in the cylinder head boss determines the adjustment of the rod 80.

It is obvious that the lever 63 may be manipulated to control the valve 25, this valve constituting, in effect, the throttle means by which the apparatus is operated and controlled.

I claim:

1. In a vat dipping machine, a base, parallel arms extending from said base in spaced relation to lie along the sides of a dipping vat, upright standards carried by said arms at their outer end portions, a load supporting carriage mounted for movement between said standards and having lateral bearings slidably engaging said standards, a cylinder on said base, a piston reciprocable therein and having a rod projecting slidably through one end of the cylinder, a circulatory fluid system in operative connection with opposite ends of said cylinder, base carried means for maintaining a fluid pressure in said system for operating said piston, a valve control for said piston, sheaves carried by said cylinder, said piston rod, said base, and the upper end portions of said standards, flexible cable means trained over all of said sheaves and anchored at one end to said base and at the other end to said carriage whereby said carriage is vertically reciprocated on said standards in accordance with movement of said piston rod, actuator means carried by one arm of said base and operatively connected with the fluid pressure system control valve, and means mounted on a portion of said carriage for operating said actuator at predetermined points in the path of travel of said carriage.

2. A vat dipping apparatus comprising a base including a central section and two end sections occupying substantially a common horizontal plane, said end sections each being provided with a laterally extending arm adapted to lie along the side of a dipping vat, an upright standard rigidly secured to each of said base section arms at its outer end, sheaves carried by said base end sections, a load supporting carriage mounted on said standards for vertical reciprocation therebetween, a cable connected to said carriage and trained over said sheaves, and power transmitting mechanism mounted entirely on the central section of said base and in operative connection with said cable means for effecting vertical reciprocation of said carriage on said standards.

3. A vat dipping apparatus comprising a portable base including a central section and a pair of end sections detachably secured thereto, arms extending from said end sections in parallel spaced relation, vertical uprights carried by each of said arms adjacent the outer ends thereof, sheaves carried by the upper end portions of said standards, sheaves carried by said base end sections, a load supporting carriage, slidably mounted on said standards for vertical reciprocation therebetween, a lift cable connected with said carriage and trained over said sheaves, power applying means mounted entirely on the central section of said base and in operative connection with said cable for effecting vertical reciprocation of said carriage, control means for said power applying means and carried by one of said end sections, operating connection between said control means and said power applying means, an actuator operatively connected to said control means and mounted for vertical shifting movement relative to said base, and cooperative contact means on said carriage and said actuator for vertically shifting said actuator at predetermined points in the travel of said carriage whereby to operate said control means in accordance with positions of the carriage.

4. In a vat dipping apparatus, a base, a pair of arms projecting laterally from said base in spaced relation to lie along the sides of a vat, uprights carried by said arms, a load supporting carriage mounted on said uprights for vertical reciprocation therebetween, a cylinder carried by said base, a piston in said cylinder and having a piston rod extending through one end thereof, a flexible cable connection between the piston rod and said carriage for reciprocating said carriage in accordance with reciprocation of said piston rod, a closed fluid pressure system in operative connection with the opposite ends of said cylinder, means carried by said base for maintaining a pressure in said system for reciprocating said piston within said cylinder, a cylinder by-pass in said system, valve means in said by-pass, and carriage controlled means for operating said valve means in accordance with the travel of said carriage whereby to effect reciprocation of said piston within said cylinder in accordance with the opening and closing of said by-pass by the operation of said valve means.

5. In a vat dipping mechanism, a base, upright standards carried by said base in a position to occupy opposite sides of a dipping vat, a load supporting carriage mounted on said standards for vertical reciprocation therebetween, a cylinder carried by said base, a piston reciprocable therein and having a rod slidably through one end of the cylinder, an operative connection between the end of said piston rod and said carriage for moving said carriage on said standards in accordance with movement of said piston rod, a closed circulatory fluid system on said base and including a fluid pressure pump, means for operating said pump, a conduit from the outlet of said pump to one end of said cylinder, a conduit from the opposite end of said cylinder to the inlet of said pump, a by-pass conduit between said inlet and outlet conduits and by-passing said cylinder, a control valve in said by-pass conduit, a lever fulcrumed intermediate its ends on said base, an operating linkage connecting one end of said lever and said control valve for opening and closing said valve in accordance with the rocking movement of said lever, vertically aligned lateral brackets carried respectively by said base and the upper portion of one of said standards, a rod slidably engaging said brackets for vertical reciprocation therein, an operative connection between the lower end of said rod and said lever for rocking said lever in accordance with the shifting movement of said rod, rod carried detent means adapted to be engaged by a portion of said carriage at the lowermost point of its travel for shifting said rod downwardly to rock said lever and thereby close said by-pass

valve, and detent means vertically and rotatably adjustable on said rod for disposition in the path of movement of a portion of said carriage whereby to cause lifting movement of said rod on lifting movement of said carriage to rock said lever and thereby open said by-pass valve to relieve pressure from said cylinder and allow said carriage to descend.

6. In a vat dipping apparatus, a base, a pair of upright standards carried by said base in a position to occupy opposite sides of a dipping vat, a load supporting carriage mounted on said standards for vertical reciprocation therebetween, a fluid pressure cylinder carried by said base, a piston reciprocable therein and having a piston rod extending through one end thereof, flexible cable connection between the outer end of said piston rod and said carriage for moving said carriage in accordance with reciprocation of said piston within the cylinder, means for applying fluid pressure to one side of said piston for projecting said piston rod to elevate said carriage on the standards, a valve in said piston, and a manually adjustable rod positioned through one end of said cylinder for opening said valve by

contact with said rod whereby to relieve the fluid pressure on the piston and arrest the upward movement of the carriage.

7. A vat dipping machine comprising a base adapted for operative association with a dipping vat, spaced upright standards carried by said base, a load supporting carriage mounted on and for movement between said standards, a cylinder on said base, a piston reciprocable therein and having a rod projecting slidably through one end of the cylinder, a circulatory fluid system in operative connection with opposite ends of said cylinder, base carried means for maintaining a fluid pressure in said system for operating said piston, a valve control for said piston, a positive operating connection between the projecting portion of said piston rod and said carriage for vertically reciprocating said carriage in accordance with the movement of said piston, actuator means supported by said base and operatively connected with the fluid pressure system control valve, and means on said carriage for operating said actuator at predetermined points in the path of travel of the carriage.

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