

May 30, 1961

P. ALLEMANN

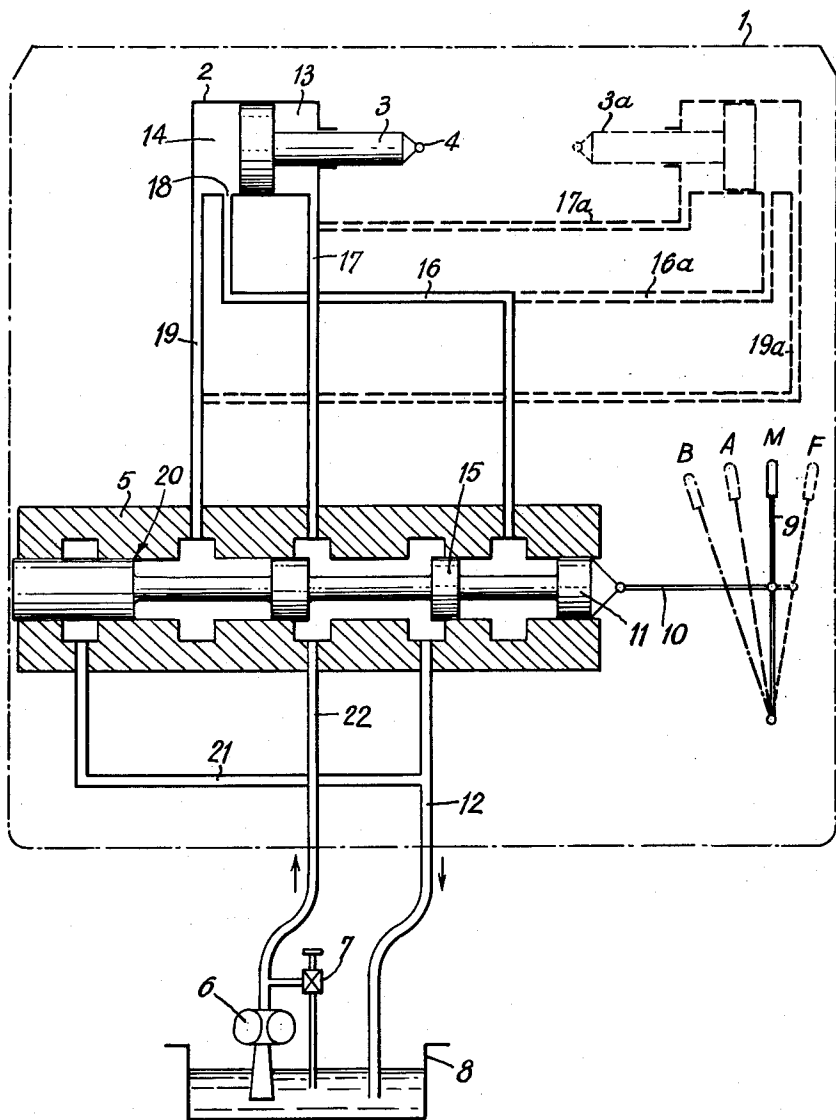
2,986,124

DEVICE FOR LIMITING THE OPENING STROKE OF A TOOL-CARRIER

Filed Jan. 16, 1958

3 Sheets-Sheet 1

FIG. 1.



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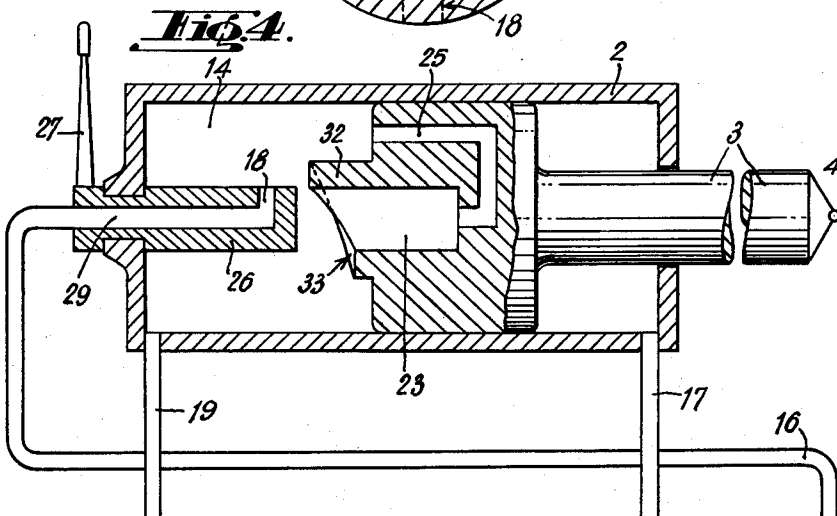
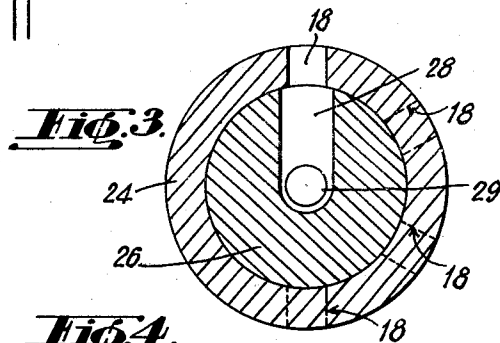
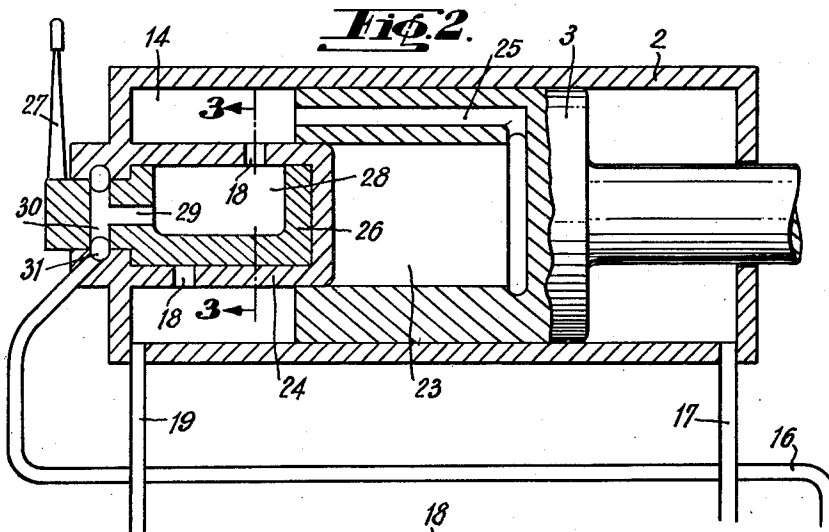
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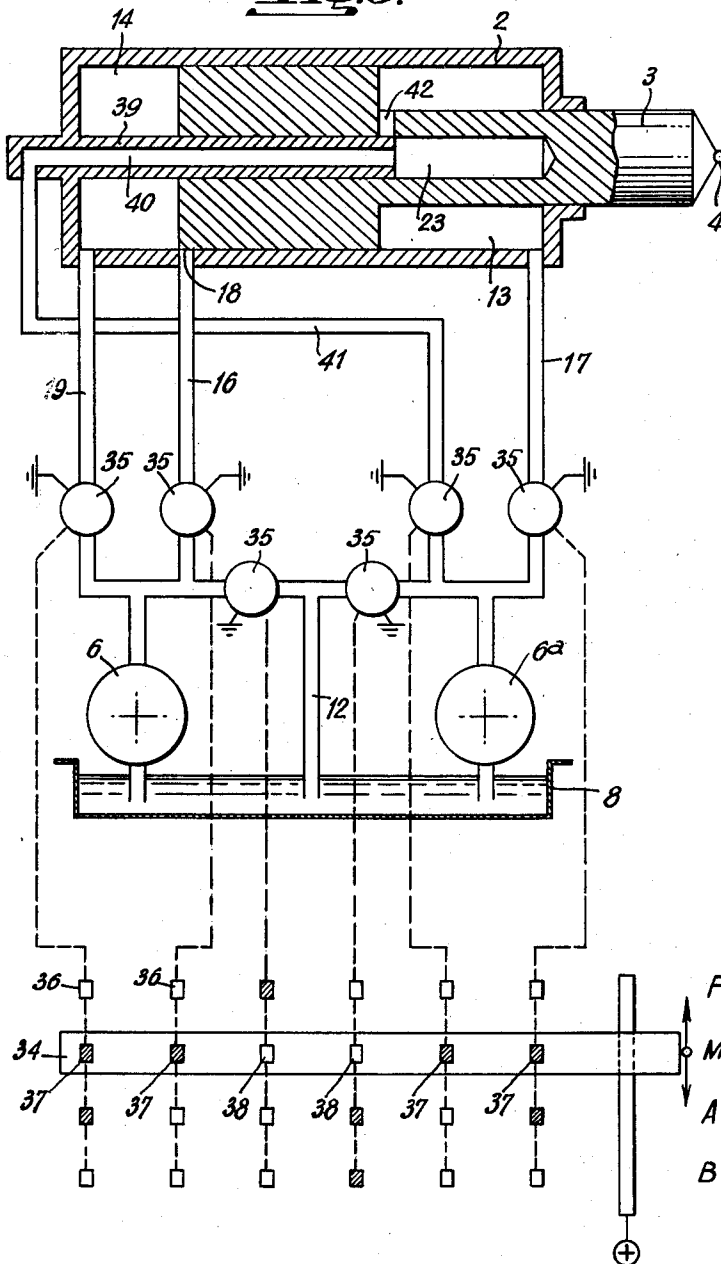
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DEVICE FOR LIMITING THE OPENING STROKE OF A TOOL-CARRIER

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Fig. 5.



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DEVICE FOR LIMITING THE OPENING STROKE OF A TOOL-CARRIER

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This invention relates to devices for controlling the movement of tool carriers.

Known machines for packing the ballast of railway lines very often comprise detachable tools, the number of which is variable, and which can be mounted on tool-carriers arranged in pairs opposite to one another on either side of a sleeper which is to be packed. These tool-carriers are arranged on one or more supporting members, currently designed as mobile or vibrating frames according to their function, which in their turn are mounted in appropriate manner on a vehicle or fixed frame.

It is known that the packing of ballast under a sleeper can be obtained by the successive motions towards one another and away from one another of the lower extremities of tools called spades. In packing machines with hydraulic or pneumatic control of the tools, these motions, respectively called closing and opening motions, are due to the action of a fluid acting by its pressure in variable volume chambers.

It is this type of packing machine having a fluid controlled actuating device for the tool-carriers and tools which vibrate, with which may or may not this present invention is concerned, the invention increasing the hourly working capacity of such machines, by substantially eliminating the loss of time resulting from too wide an opening of the tool-carriers by means of a hydraulic or pneumatic device which can be controlled with ease.

It is clear that the extreme positions of the spades (total closing and total opening) must be chosen according to the extreme conditions imposed by the various arrangements of the sleepers of railway lines, and in particular by the pitch or distance between two consecutive sleepers and by the width of the sleepers. From this it can be seen that the available total travel of a tool-carrier is in most cases considerably greater than the useful travel strictly necessary for any one packing operation, resulting in a dead loss which is not negligible. This is apt to be repeated in each packing cycle and it is advantageous to reduce this loss as much as possible.

In the closing direction it may be noted that:

(1) The working speed is necessarily limited by the resistance which has to be overcome and by the power which has to be furnished.

(2) This motion is in addition, more or less slowed down owing to this fact.

(3) The operator must be able to interrupt it easily when there is a possibility that the packing is finished, or when the tools may come into contact with the sleeper being worked on or with another obstacle and may thus be broken. As, in addition, it is only the width of the sleeper which intervenes, the gain in time which can be obtained by limiting the closing travel is practically negligible.

In any case, in a hydraulic or pneumatic packing machine, the closing motion of the tools stops automatically as soon as the degree of packing is such that the ballast opposes a reaction which balances the pressure of the

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fluid. Stops for the closing motion are therefore not necessary.

In the direction of the opening motion, this dead return motion may be advantageously chosen to be even more rapid than in the actual designs, on condition that sufficient precautions against shocks are taken. On the other hand, this opening motion may continue unhindered to the end of the travel, so that its interruption in an intermediate position is less easily effected and thus depends on the skill of the operator and on the attention he devotes to the work. A motion extending beyond the desired limit position therefore results in a relatively considerable loss of time owing to the corresponding useless return travel which is effected at a lower speed. In addition, this limited opening depends essentially on the distance between two consecutive sleepers, which can vary considerably according to circumstances. This is due first of all to the presence of so-called double sleepers which are disposed periodically along the line, in particular at the joints between the rails. An opening adjusted to correspond to such sleepers would thus be ill adapted to single sleepers in most cases, whereas the closing motion, which must permit the packing of single sleepers would only be improper comparatively few times. In order that these inadmissible losses of time may be avoided it is necessary to have a temporary limiter of the opening motion, which is adjusted to correspond to the single sleepers and the action of which may be easily suppressed when double sleepers are to be packed.

It is to be noted that the distance between single sleepers itself also varies in a considerable measure according to the installations. It will therefore be preferred to have a device limiting the opening motion having several degrees of control, and even, according to requirements, a device limiting the opening motion in a continuous manner. It will thus be possible to adjust the extent of the opening in an exact manner to the greatest value permitted by the backs of the spades and by the neighboring sleepers, which will allow the maximum quantity of ballast to be gathered and in the case of a small spacing between the sleepers will enable avoiding the need for repetition of a complete packing cycle in order to obtain a sufficient packing of the ballast.

For large spacings, it will be possible according to the invention to regulate in an exact manner the amount of ballast which is strictly necessary, resulting in a greater regularity of the packing and in speedier work.

Finally, in certain cases, as when curved lines have to be packed for instance, it is preferred to be able to have two independent adjustments available, corresponding to each row of rails, in order to make the asymmetrical packing of sections of the line possible.

In the known hydraulic or pneumatic packing machines it has been considered sufficient up to now to make use of a rough solution, consisting in arresting the motion by means of mechanical stops, resulting on the one hand in shocks on the vibrating members and on the other hand in a limitation which is very approximative and more or less easily effected by means, for instance, of removable shims.

This gave rise to the novel idea of acting directly on the fluid controlling the tool-carrier, by interrupting the flow by means of an appropriate device, functioning as a hydraulic or pneumatic limiting device of the opening motion, the control of which can be effected with ease and lends itself easily to the various requirements mentioned above.

The object of the present invention is a hydraulic or pneumatic pressure fluid controlled device for actuating the tool-carriers of a machine for packing the ballast of railway lines, which is characterized in that it comprises means which limit the opening stroke of the tool-carriers

by acting on one at least of the inlet and outlet ducts of at least one cylinder in which moves the piston actuating at least one tool-carrier.

The accompanying drawing illustrates, by way of examples, several embodiments and variants of the device according to the invention, corresponding to the case of a hydraulic packing machine.

Fig. 1 is a diagrammatic illustration of a first embodiment of the invention.

Fig. 2 relates to a variant.

Fig. 3 is a partial cross-section along line 3—3 in Fig. 2.

Fig. 4 is a view similar to the one shown in Fig. 2 but relating to a further variant.

Fig. 5 is a diagrammatic illustration of a further embodiment.

On the mobile frame 1 (Fig. 1) represented by a simple plate, of a hydraulic packing machine, which is not shown in its entirety, may be seen, sketched in full lines, the actuating device of a tool-carrier constituted by a cylinder 2 in which can move a differential piston 3 driving the tool-carrier, which is not shown, by means of the articulation 4, under the action of a liquid (for instance oil) provided through a distributor 5 controlled by a slide valve 11, fed by a source which in this example is represented by a pump 6 supposed mounted on the fixed frame with a regulating valve 7 and a settling tank 8 for the returning oil.

The operation is then as follows:

When the lever 9, which is here supposed mounted on the mobile frame and connected to the distributing slide valve 11 by a simple rod 10, is in the mean position M shown, the pump 6 which has already been mentioned, delivers fluid, through the inlet duct 22 and through the distributor, to the free outlet duct 12 which also relieves the chamber 13 (through the duct 17), while the oil contained in the chamber 14 is unable to escape through the distributor, owing to the fact that the ducts 16 and 19 are then cut off (by the slide valve 11) from the ducts 21 and 22. The piston is thus immobilized in any given position of its travel.

When the lever 9 is moved to an intermediate position A, the part 15, forming a piston, of the slide valve 11, interrupts the direct communication, through the distributor, between the inlet duct 22 and the outlet duct 12. At the same time, the distributor releases the escape from the chamber 14 through the two ducts 16 and 12 which it then causes to communicate with one another. The piston 3 subjected to the pressure of the pump 6 acting in the chamber 13 (through the ducts 22 and 17 and through the distributor), moves in the direction of the opening, i.e. towards the left in the drawing, until it obstructs the opening 18 of the outlet duct 16. As the oil remaining in the chamber 14 cannot be evacuated by the duct 19 which remains cut off from 21 and 22 by the slide valve 11, the piston 3 comes to rest in this limit position which is thus determined by the intermediate position of the opening 18. It will be noted that owing to the fact that the pressure in the chamber 13 continues to act, the point of articulation 4 remains blocked in the two directions of motion, this rigidity being particularly important in the case of vibrating tools, in order to avoid perturbations in the operation, especially in the hydraulic circuit.

The limitation of the opening motion is thus effected here by acting on the escape of the liquid from the chamber 14 (through 18, 16, and 12).

When the lever 9 is pushed home, to the full open position B, the edge 20 of the slide valve, by being uncovered, puts into communication the ducts 19 and 21 which then allow the remainder of the oil imprisoned in the chamber 14 to escape freely, so that the piston, which is still subjected to the pressure of the pump 6, will move to the end of its travel, where it will again remain blocked.

When, on the contrary, the lever 9 is moved to the closed position F, the pump 6 simultaneously delivers oil at the same pressure (through 22 and 17, respectively 19) to the two chambers 13 and 14, producing the displacement towards the right of the differential piston 3, i.e. the closing motion of the tool-carrier.

The essential advantages of this kind of hydraulic device for limiting the opening motion are that all stoppage shocks are avoided, that no connecting mechanism of complicated and delicate construction is required, that only one single control lever is used for the packing of single or double sleepers, that this control can be very gentle and corresponds to a natural reflex of the operator (sympathetic control), and finally that it allows a same degree of intermediate opening to be obtained for several tool-carriers in a very simple manner.

To this end it is sufficient to connect the corresponding ducts, leading to the homologous pressure chambers in parallel together, as indicated by way of an example by dotted lines in Fig. 1, by directly connecting together the homologous ducts 16 and 16a, 17 and 17a, and 19 and 19a. It will be seen clearly that the two pistons 3 and 3a, shown actuating a pair of tools will stop in the intermediate position independently of one another.

The described device may be easily transformed into a device for limiting the opening having several degrees, as shown by the variant according to Figs. 2 and 3, illustrating the arrangement to this effect of the cylinder 2 and of the piston 3 connected to the ducts 16, 17, and 18 of the preceding embodiment.

In this variant, the cylinder 2-differential piston 3 assembly is replaced by the one illustrated in the Figs. 2 and 3, the other components of the device remaining identical.

In this variant the differential piston 3 is provided with an inner coaxial chamber 23 which is open on the side of the chamber 14 and into which penetrates (when the piston 3 has moved sufficiently to the left) a hollow piston 24 which is secured to the cylinder 2 and is therefore fixed. The chamber 23 thus forms a mobile cylinder sliding on the fixed piston 24.

The chamber 23 is constantly connected to the chamber 14 by a duct 25 provided in the piston 3. The lateral wall of the fixed piston is provided with a series of openings 18 arranged along a helix.

Inside the fixed piston 24 is mounted a rotary valve 26 fitted with an actuating handle 27. This valve is provided with a longitudinal groove 28, which by a rotation of the handle 27 and of this valve, can be brought to coincide at will with one or the other of the openings 18. This groove is in constant communication with the duct 16 thanks to an axial hole 30 in the valve, as well as to an annular passage 31 provided in 24 and into which the duct 16 opens.

When the piston 3 moves in the direction of the opening motion of the tool-carriers (towards the left in Fig. 2), the oil contained in the chamber 14 escapes into the duct 16 (and from there to 12 through the distributor 5, 11) through the opening 18 which is situated opposite to the groove 28. The piston will thus be stopped when it obstructs this opening 18 serving to evacuate the chamber 14. For a given angular position of the handle 27, the operation is therefore identical to the preceding case, but now there are as many intermediate stop positions available as there are openings 18 provided.

This step-by-step adjustment can be transformed into a continuous adjustment by replacing the arrangement according to Figs. 2 and 3 by the one according to Fig. 4.

In this third variant, the differential piston 3 is similar to the one of Fig. 2. It differs from it, however, by the fact that it is fitted on its left-hand face with a cylindrical axial prolongation 32 terminating at its free extremity by a surface 33 forming a helicoidal ramp.

The fixed piston 24 of Fig. 2 is suppressed and the

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rotary valve 26 penetrates into the chamber 23 after the fashion of a fixed piston, when the differential piston 3 moves sufficiently towards the left. An axial duct 29, permanently connected to the duct 16, passes through the valve 26 for nearly the whole of the latter's length. This duct 29 is continued by a radial duct 18. It will be understood immediately that, when the piston 3 moves towards the left, a moment will come when the ramp 33 will mask the duct 18 and cut off the communication between the chamber 14 and the duct 16. This will occur at a point along the travel of the piston 3 depending on the angular position of the valve 26 (and of the handle 27) and which, like this angular position, is adjustable in a continuous manner. It is thus possible here, by acting on 27, to adjust in the most precise fashion, the intermediate stopping position of the piston 3 and of the tool-carrier to which it is connected in 4. In principle, the shape of the outlet opening of the duct 18 has no influence; it could be, instead of a simple hole, for instance a circular groove, or an opening having a special profile, allowing for instance the opening motion effected at high speed to be slowed down in the most efficient way.

The devices illustrated imply a preliminary adjustment of the intermediate limit positions. The control of this adjustment, indicated by the lever 27, can be effected from a remote point, for instance from the packing station, by means of auxiliary levers for instance.

The devices described up to now have this in common that they effect the stoppage of the opening motion of the tool-carriers by interrupting the fluid outlet (between 14 and 12) in 18.

In the embodiment according to Fig. 5, this stoppage is produced by a simultaneous action on the inlet and on the outlet.

The device schematically illustrated in Fig. 5 comprises two feed pumps 6, 6a and six electro-magnetic valves 35 controlled by a multipolar switch 34 having four positions F, M, A, and B, which are homologous to the positions shown for the lever 9 (Fig. 1). This switch thus plays the part of a control member in a fashion which is exactly similar to that of the lever 9 in the first embodiment. For simplicity's sake the six valves 35 are supposed here to be of the same type and to interrupt the passage of the liquid in the duct on which they are placed, when they are excited. The contacts which are open when the mobile member of the switch 34 is opposite to them have been represented by an unhatched rectangle 38, while the contacts which are closed under the same conditions are shown by hatched rectangles 37. It may thus be seen immediately which of the valves 35 are open and which are closed for each of the four positions F, M, A, B, of the multiple switch.

The differential piston 3 is provided with an axial boring in which penetrates in the fashion of a piston, a hollow rod 39 secured to the bottom of the cylinder 2. The axial duct 40 is permanently connected to a duct 41 and temporarily to the chamber 13. For a certain position of the piston 3, shown in Fig. 5, the extremity of the rod 40 coincides with an opening 42 of this piston. On this side of this position (towards the right), a communication exists, through the opening 42 and the duct 40, between the chamber 13 and the duct 41, which is an inlet duct. Beyond this position (towards the left of the drawing) the communication between 13 and 41 is cut off by the rod 39 which then masks the opening 42.

This construction is distinguished from the preceding ones by the fact that the limitation of the opening motion of the tools is effected by the simultaneous cutting off of the outlet (out of the chamber 14, through the duct 16) in 18 by the piston 3, and of the inlet (into the chamber 13, through the duct 41) in 42, by means of the six valves 35 and of the switch 34.

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The invention is not limited to the case where the opening motion of the tool-carriers is effected by acting on the escape (eventually simultaneously on the inlet) of the liquid from the cylinder 3. This limitation could also be effected by acting solely on the inlet.

In the embodiments according to the Figs. 2 to 4 a manual adjustment of the degree of opening of the tool-carriers has been shown for simplicity's sake. The man of the art will easily be able to imagine the case of a control of this adjustment by means of a mechanical or hydraulic connection.

Finally, although in the embodiments illustrated it has been supposed that the control fluid is a liquid, the invention is not limited to this case. In fact, the duct 22 might as well be fed with a gas (air) under pressure; the device would then be pneumatic and would operate practically in the same way as that described for the various examples given.

The device can be adapted to an automatic or semi-automatic control.

What I claim is:

1. Apparatus for controlling the movement of a tool carrier comprising a differential piston and cylinder arrangement including a piston and a cylinder movable relative to each other and one of which is adapted to be coupled to said tool carrier, said piston dividing the cylinder into two chambers, a hydraulic system for supplying and receiving a pressure fluid to and from said chambers to control movement of said piston, and distributor means connecting said hydraulic system to said chambers and being adapted for coupling the hydraulic system to one of the chambers while isolating the other chamber, said piston and cylinder arrangement having a discharge opening arrangement enabling a movement of said piston towards said other chamber, said opening arrangement being closable by said piston whereby movement of the latter is terminated, said apparatus further comprising control means in said piston and cylinder arrangement for varying the position at which said piston closes the opening arrangement, said control means and discharge opening arrangement being adapted for operative engagement along a helix concentric with said cylinder whereby a relative rotation between the control means and opening arrangement controls the position at which the opening arrangement is closed.

2. Apparatus as claimed in claim 1, wherein the piston comprises a helical edge for selectively engaging said opening arrangement.

3. Apparatus as claimed in claim 1, wherein said piston and cylinder arrangement comprises a hollow member aligned axially in said other chamber and defining said discharge opening arrangement in the form of at least one radial opening, said piston including a portion for slidably engaging said member and obturating said radial opening, said portion being a helicoidal ramp, said piston and cylinder arrangement including means for rotating said member for aligning the radial opening with a selected portion of said ramp.

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