Oct. 17, 1961 F. HUMERY 3,004,556

HYDRAULIC DISTRIBUTION DEVICE

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Fig. 1

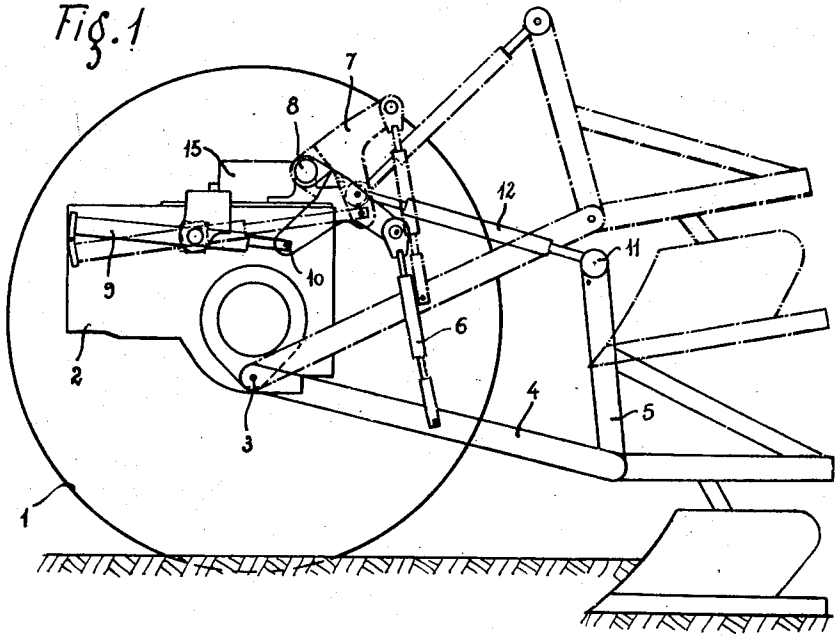


Fig. 2

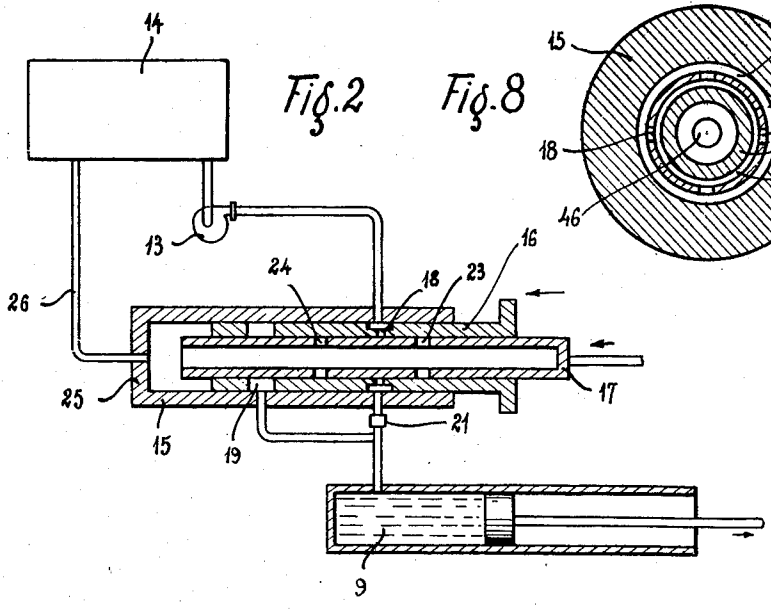


Fig. 8

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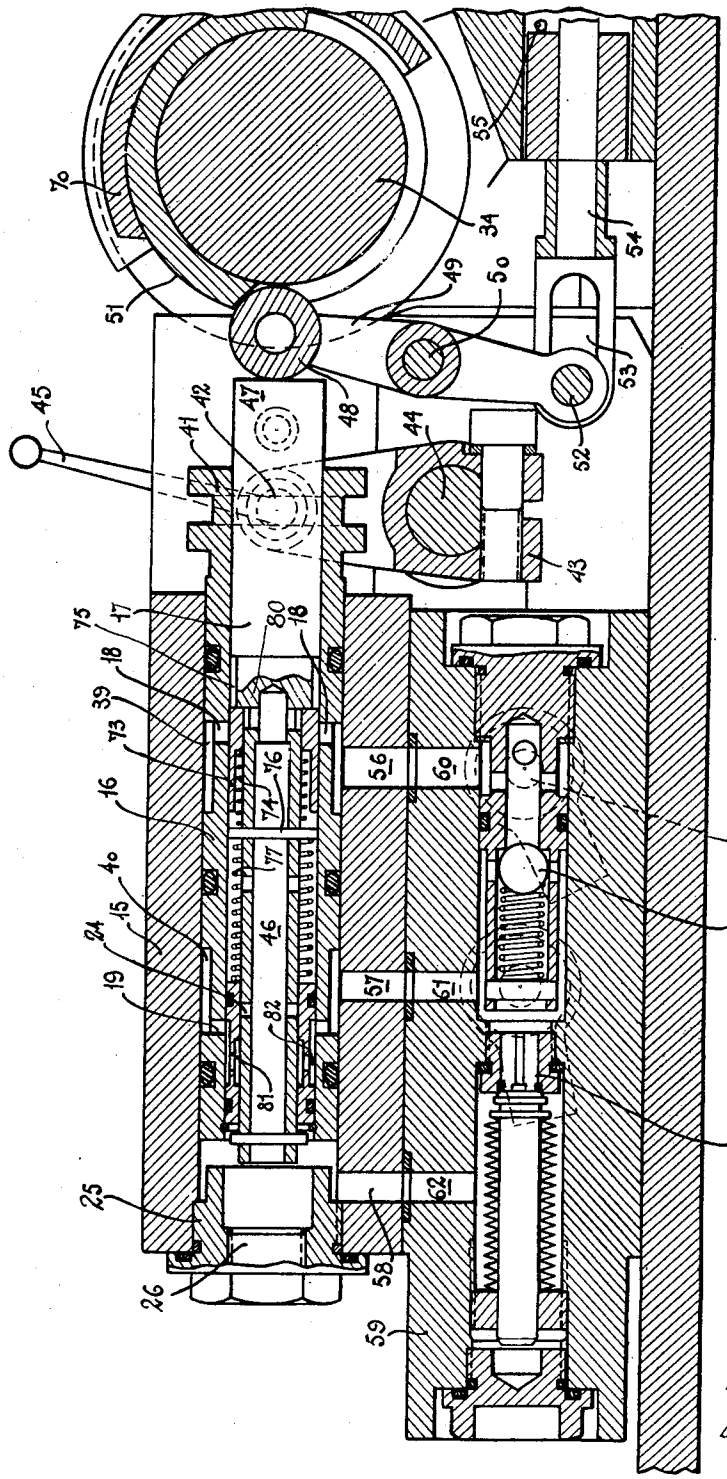


Fig. 3

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Fig. 4

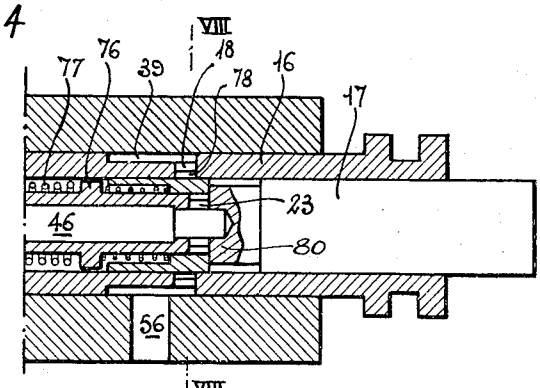


Fig. 5

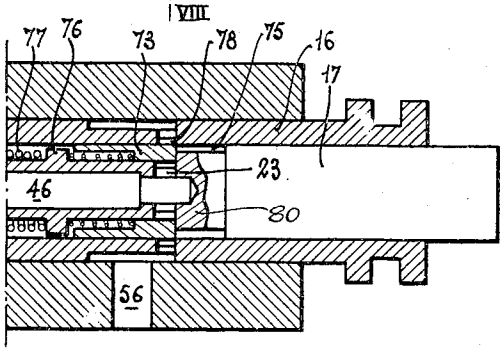


Fig. 6

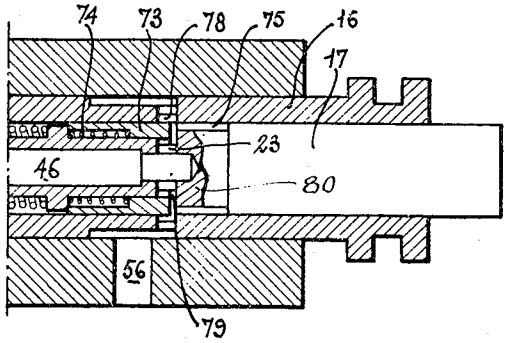
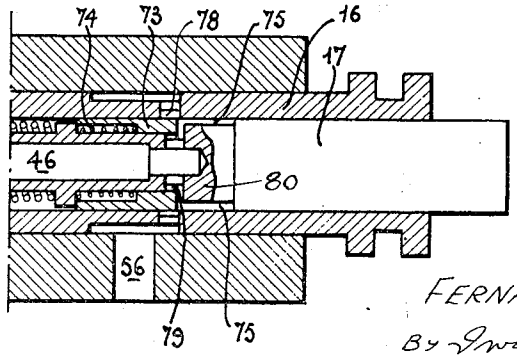


Fig. 7



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HYDRAULIC DISTRIBUTION DEVICE

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2 Claims. (Cl. 137—620)

The present invention relates to distribution devices employed for the control of members actuated by means of hydraulic jacks, such as dump-trucks, lifting devices, lifting mechanisms for agricultural machines, etc.

Distribution devices of this kind generally comprise a slide-valve provided with suitable openings, sliding in a body provided with admission and exhaust orifices for the liquid. The movement of the slide-valve ensures the correspondence in position of the orifices which are suitable to bring into play the various phases of operation of the controlled members: action of the fluid under pressure, maintenance in position, evacuation.

In these devices, when the orifices on the slide-valve come into position opposite the orifices in the body of the distributor, the correspondence of position takes place progressively. The flow of fluid, which is at first very small, increases in accordance with the displacement of the slide-valve and finally the full sections of the orifices are brought into correspondence one with the other. The result is that at the beginning of the opening, an intense wire-drawing of the fluid takes place which has the effect of retarding the action of the fluid with the whole of its pressure effect, and to produce appreciable local heating. When the distributor is called upon to effect repeated alternations of the action of the fluid and the evacuation of this latter, such as is especially the case with the lifting mechanisms of agricultural machines, the resuling operation is not very satisfactory and a substantial loss of energy is caused.

The present invention has for its object to provide a remedy for this drawback.

The invention is characterised in that at least one of the orifices or ports of the slide-valve is associated with a valve having an elastic return and ensuring spontaneously the opening of the said orifice, more rapidly than would be the case with the movement of the slide-valve alone.

With this device, when the port of the slide-valve begins to move in front of the corresponding opening in the body, the liquid under pressure causes the immediate displacement of the valve, thus ensuring almost immediately a wide passage for the liquid with full and immediate effectiveness, this taking place even before the slide-valve has moved into a position corresponding to this enlarged passage. The wire-drawing at admission and the resulting heating are thus eliminated.

The accompanying drawings show by way of example a form of embodiment of the invention applied in particular to a distributor for the hydraulic lifting device of an agricultural machine coupled to a tractor.

FIG. 1 shows the assembly of the tractor of the agricultural machine.

FIG. 2 shows diagrammatically the hydraulic distributor of the tractor.

FIG. 3 is a view in longitudinal cross-section of the distribution device equipped with a valve in accordance with the invention.

FIGS. 4 to 7 show the various phases of operation of the valve.

FIG. 8 is a cross-section taken along the line VIII—VIII of FIG. 4.

In FIG. 1 is shown the rear portion of the tractor, to which a plough is coupled: the rear wheels are shown at 1 and the engine at 2. The coupling rods 4 are attached at

3 to the chassis 5 of the plough. The rods 4 are supported by the bars 6 which are fixed to the lifting arm 7, pivotally mounted at 8. The arm 7 is actuated by a hydraulic jack 9 pivoted at 10. The plough is further attached at a third point 11 by a bar 12 connected to the lifting device 7. The fluid put into action by the pump 13 is derived from the tank 14 and supplies the jack 9 through the intermediary of the distribution device 15. As shown in FIG. 2, this device is composed of two circular concentric slide-valves 16 and 17, sliding in the body 15.

One of the slide-valves, 16 for example, is directly operated by the control member of the jack 9. It is provided at 18—19 with suitable orifices so as to ensure the supply or the evacuation of the oil which actuates the jack 9.

The other slide-valve 17 is put into action as a function of the movements of the jack 9, or better, of the member driven by the jack 9, the lifting arm 7 for example.

At 23 and 24, the slide-valve 17 is provided with the orfices for putting the oil of the jack 10 into communication with the admission and the exhaust, the relative displacement of the said orifices with respect to the oriffices 18—19 ensuring the various operations desired. The lower slide-valve 17 is hollow and is in communication with the casing 15, the bottom 25 of which is provided with the return conduit 26 to the tank 14. A non-return valve is provided at 21.

The device shown diagrammatically in FIG. 2 is shown in detail in the constructional drawing of FIG. 3. The slide-valve 16 has its orifices 18 and 19 opening into the chambers 39 and 40, formed along its entire periphery. At its extremity is formed a groove 41, in which is inserted the handle 42 of a lever 43, mounted on the shaft 44 and actuated by an extension of the operating lever 45. The slide-valve 17 is hollow at 46 over a part of its length, and is solid at its other extremity at 47.

The extremity 47 may be suported on a roller 48 carried by a lever 49 pivotally mounted at 50. The roller 48 bears on a cam 51 which is rigidly fixed to the shaft 34 of the lifting arm 7. This cam 51 is adjustable; it can therefore be fixed in any position, which gives, within the possible limits of travel of the jack, an infinite number of positions of the arms 7 in height, and therefore of the load to be lifted.

The other extremity 52 of the lever 49 is mounted in an elongated slot 53 carried by the rod 54 coupled to the bar 12 which is linked with the "third point" 11

The casing 15 of the slide-valves 16 and 17 is provided with three passages 56, 57 and 58 for the fluid admitted to the jack 9 or evacuated from this latter.

The distribution device proper 15, 16 and 17 constitutes a unit which can be placed on another unit 59 containing the fluid-passage conduits 60, 61 and 62 with their valves: the non-return valve 63 and the safety-valve 64.

The assembly is carred out so as to ensure the correspondence in position of the ports, respectively 56—60, 57—61, 58—62. Fluid-tightness is ensured by means of suitable joints.

In accordance with the invention, in order to avoid internal wire-drawing of the oil, which could take place at the moment of opening of the ports, and especially of the ports 18—23, the port 23 is made spontaneously extensible, as soon as it comes into action. In a preferred form of construction, the part of the valve 17 which forms the port 23 is constituted by a valve 73 sliding on the slide valve 17. This valve is housed in a cavity of the slide valve 17 limited on one side by the stop 76 and on the other by the stop 80, and it slides in this cavity, being lightly urged towards the stop 80 by a light spring 74. In the outer portion of the slide valve 17, after the stop 80, is provided an annular chamber 75.

The spring 74 is not a compression spring calibrated

to compensate a fluid pressure. It is a very light spring, the purpose of which is to ensure that the valve **73** has an initial tendency to be applied against the stop **80**. However, as soon as the fluid acts on the valve **73**, this spring is practically ineffective with respect to the pressure of the fluid.

With this moving part **73** completing the port **23**, it is an advantage to form the port **18** of the slide-valve **16** with an internal chamber **78**. This groove **78** ensures that the pressures are balanced.

At the start (FIG. 4), when the slide-valve **17** is at its end position (furthest to the right in the figure), the fluid under pressure which arrives at **56** passes into the chamber **39** and fills the chamber **78** through the ports **18**. As it finds no outlet, the fluid passes to the jack.

As a result of the action of the roller **48**, when the slide-valve is pushed towards the left of the drawing, it carries with it the member **73**. As long as the edge of this member does not coincide with that of the chamber **78**, the fluid is not able to pass.

At the moment when the opening takes place (FIG. 5) which permits the fluid **78** to pass into the chamber **75**, the pressure abruptly pushes back the member **73** and instantaneously causes a large opening to be formed (FIG. 6). The fluid then passes freely and without resistance into the chamber **79** of the orifice **23** so as to pass through the central hole **46** to the collector tank **14**. The fluid thus obtains an instantaneous and free passage **75—78—79** and is only required to withstand the practically negligible pressures of the spring **74**.

The passage **75—78** of the same width but having a larger diameter than the passage **75—79** has a wider section for the fluid, which prevents all undesirable parasitic effects.

The return is effected in the reverse manner, ensuring a firm closure of the ports **18—23** (FIG. 7) at the desired moment.

This moving member **73** acting in the same way as a flap-valve, frees the circuit-pressure pump in an almost instantaneous manner as soon as the pressure is no longer required.

In order to balance the pressures, it is an advantage to associated chambers or continuous grooves with the various ports (FIG. 8). Chambers of this kind have already been shown at **39**, **78** and **79**. These may also be provided at **81** and **82** (FIG. 3) at the outlets of the ports **19** and **24**.

The same rapid-armature valve device may be provided on the other ports of the distributor.

What I claim is:

1. In a hydraulic distributor for controlling a jack, comprising a circular slide valve with admission of fluid under external pressure to said slide valve, a conduit axially disposed in said slide valve for evacuation of said fluid therethrough, the improvement which consists in disposing on said slide valve, oppositely facing an admission orifice, a cylindrical valve freely sliding on the outer surface of said slide valve, two stops provided on said slide valve between which said cylindrical valve is freely movable, an annular chamber formed in one of said stops for admission of fluid from said admission orifice to abruptly move said cylindrical valve away from one of said stops, and biasing means to barely maintain said cylindrical valve against one of said stops while said cylindrical valve is in an inoperative position.

2. In the jack distributor controlling the hydraulic actuation of a mechanical apparatus, said distributor comprising at least one circular slide valve with admission of fluid under external pressure to said slide valve, an axial conduit in said slide valve for evacuation of fluid therethrough, means for eliminating friction due to wire drawing of the fluid under prtssure in the distribution orifices, said means consisting of disposing on said slide valve, facing an admission orifice, a valve sliding freely externally of said slide valve, two stops provided on said slide valve between which said valve is freely movable, a chamber formed in one of said stops for admission of fluid from said admission orifice to abruptly move said valve away from one stop toward the other, and means to maintain said valve against one of said stops while said valve is inoperative.

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