

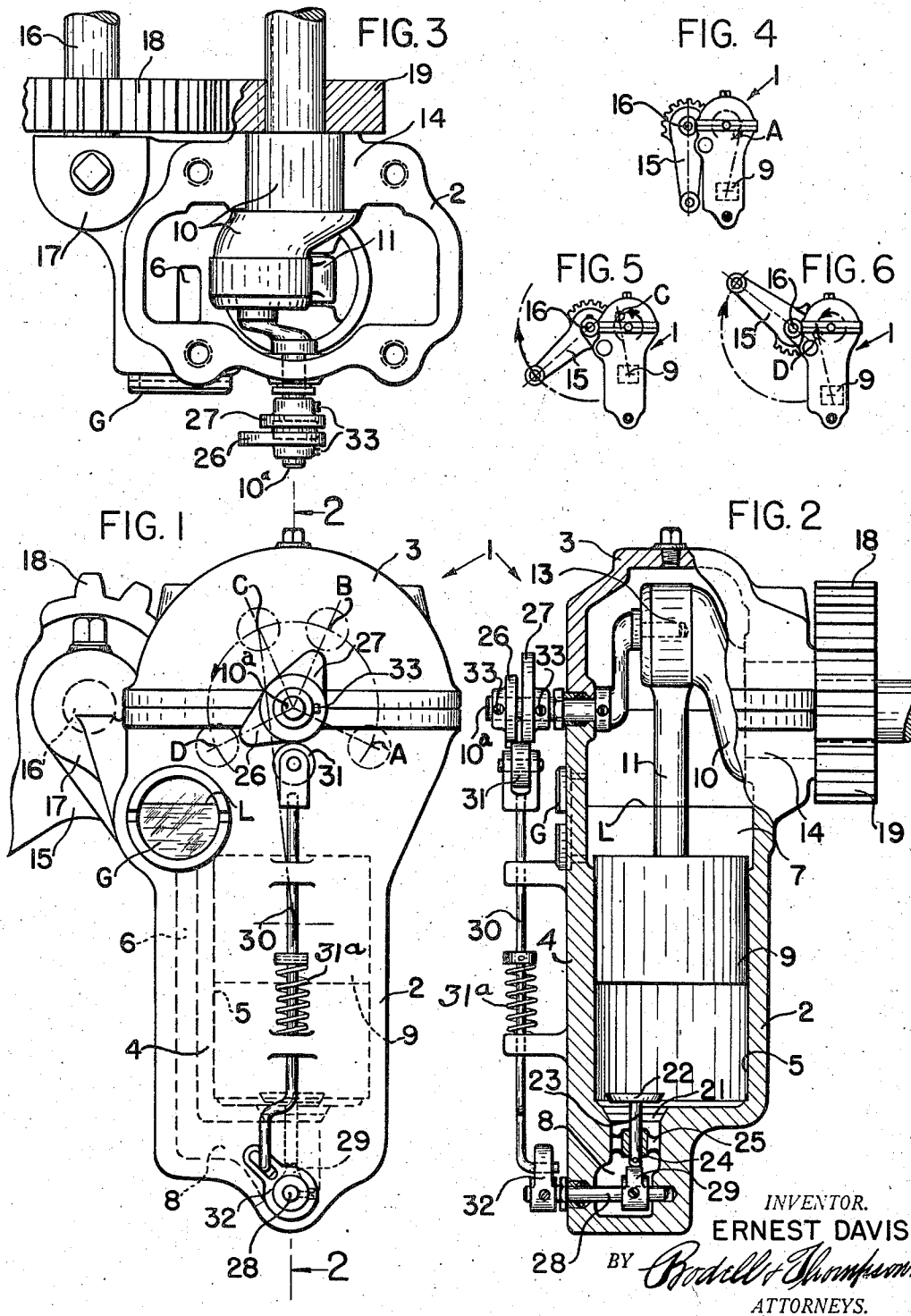
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CHECK MECHANISM

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CHECK MECHANISM

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This invention relates to checks or check mechanisms, particularly for checking movements in opposite directions or back and forth movements, as for instance, for checking machines having an operating movement in reverse directions during each cycle of operation, as an opening and closing movement, for checking or absorbing the shocks, as the machine approaches the end of its closing movement and as it approaches the end of its opening movement, and has for its object means operable to vary the checking effect during different periods of the cycle of movement of the check mechanism.

It also has for its object a check mechanism involving a piston having a back and forth movement in a piston chamber and making a complete back and forth movement, usually a reciprocation, during each cycle of movement of the check mechanism, and a check valve through which a hydraulic liquid is forced during the checking operation, with means actuated automatically during the operation of the checking device for varying the opening of the check valve, and hence, varying the checking effect during different periods of the cycle of movement of the piston member, so that, in a machine having an opening and closing movement, the piston makes one back and forth movement or one complete reciprocation during the opening movement and during the closing movement of the machine. The check mechanism may be adjusted to give a different checking effect during the opening of the machine from that during the closing of the machine.

Other more specific objects will appear throughout the specification.

The invention consists in the novel features and in the combinations and constructions hereinafter set forth and claimed.

In describing this invention, reference is had to the accompanying drawing in which like characters designate corresponding parts in all the views.

Figure 1 is a side elevation, partly broken away, of a check mechanism embodying this invention.

Figure 2 is a sectional view on line 2—2, Figure 1.

Figure 3 is a plan view of parts seen in Figure 1, the cap of the casing being omitted and parts being shown in section.

Figures 4, 5 and 6 are diagrammatic views illustrating the positions of the parts of the check mechanism when respectively in starting position, in an intermediate position, and in completely operated position.

The invention is here shown as embodied in the same type of check mechanism as that shown in my application, Serial Number 147,993, filed June 12, 1937, now Patent No. 2,138,372 issued Nov. 29, 1938, and the piston chamber is a cylinder, and the piston reciprocates in the cylinder.

1 designates the casing, which includes a lower section 2 and an upper section or removable cap 3, the lower section 2 being provided with an oil reservoir 4, and in this reservoir is located or formed a piston chamber or cylinder 5, with a passage or by-pass 6 connecting the upper portion 7 of the reservoir and the lower portion 8 around one side of the cylinder 5. The casing has a gage or sight-glass G for indicating the oil level.

9 designates a reciprocating pump piston or plunger in the cylinder 5.

10 designates a crank shaft journaled in the casing outside the reservoir 4, here shown as above the level L of the oil therein. The motion transmitting means between the piston 9 and the crank shaft is preferably a connecting rod 11 pivoted at its lower end to the piston and mounted at 13 on the crank of the crank shaft. The connecting rod extends out of the reservoir 4 above the liquid therein. The crank shaft is mounted in bearings 14 located between the sections 2, 3 of the casing and entirely out of or above the oil in the reservoir, and hence out of the pressure area.

15 designates a reversely movable actuator, as a lever arm, having a back and forth movement, as an oscillating movement, the lever 15 being shown as mounted on a shaft 16 journaled in bearings provided on a suitable bracket 17 on the outside of the casing. The reduction leverage mechanism between the arm 15 and the crank shaft 10 preferably consists of gears 18 and 19 keyed respectively on the shaft 16 and the shaft 10 outside of the casing 1. The gear 18 is of larger diameter than the gear 19 and the gear reduction is such, or the gears of such sizes as to provide a leverage ratio of slightly greater than two to one. The ratio is such that the piston makes a complete reciprocation or an "out" and "in" stroke, upon movement of the arm 15 in one direction from starting position and one reciprocation or two strokes upon each movement of the actuating arm 15 from its shifted position back to starting position. When the piston is at the end of its "in" stroke or at the lower end of the cylinder 5, in the position shown in Figure 4, the crank is at a radial angle, illustrated by the line A (Figures 1 and 4), and is

hence at one side of the dead center line, intersecting the axis of the crank shaft 10 and the axis of the pivot connecting the rod 11 to the piston. As the arm 15 moves outwardly from its starting position, the piston moves on its "out" stroke, and when it reaches the end of its "out" or "up" stroke it is in the radial position illustrated by the line B (Figure 1), and during continued movement of the arm 15 in the same direction, the piston remains substantially practically stationary while moving from the radius B to radius C (Figure 1), and then during continued movement of the arm 15 in the same direction, as indicated by the arrow, Figure 1, the piston moves on its "in" stroke to the lower end of the cylinder 9 and the crank moves into an angular position, illustrated by the radius D (Figure 1). During this movement, the arm 15 has moved through an angle of approximately 130°, and the crank of the shaft is moved through an angle of approximately 232°. During the return movement of the arm 15 to starting position, the shaft 10 is shifted reversely in the same manner, and the piston 9 likewise makes a complete reciprocation, or an "out" or "up" stroke and an "in" or "down" stroke, and in the direction of the arrows in Figures 6 and 5 from the position shown in Figure 4.

The cylinder 5 is formed with a port in the outer end portion thereof, and preferably in the head thereof, which head is spaced from the bottom of the reservoir, so that the port opens into the lower portion 8 of the reservoir.

21 designates a port, and 22 a check valve for controlling said port, the check valve being here shown as having a stem 23 guided in a suitable bushing 24 suitably supported by a spider 25 in the port 21, the stem extending through the port into the lower portion 8 of the reservoir. This valve 21 is adjusted to open different distances from its seat. It is operated in synchronism with the movement of the piston 9 from any suitable moving part of the check mechanism, as for instance, the crank shaft 10, and suitable connections operated by the crank shaft. These connections include cams 26, 27 actuated by the crank shaft, and here shown as mounted on an extension 10^a thereof, outside of the casing, a shaft 28 journaled in the lower portion of the casing and extending into the lower portion 8 of the reservoir and provided with a connection, as a cam 29, for coacting with the lower end of the stem 23 of the valve 22 and motion transmitting connections extending outside the casing, as a link 30 having a follower or roller 31 at one end coacting with the cams 26 and 27, and also being connected at its other end to an arm 32 on the shaft 28, it being connected to the arm 32 by a sliding or pin-and-slot connection. The cams 26, 27 are adjustable into different radial angles relatively to each other and the crank shaft, and are held in their adjusted position in any suitable manner, as by set screws 33, extending radially into the hubs of the cams against the extension 10^a of the crank shaft 10. The roller 31 is caused to follow the cams 26, 27 by a suitable spring 31^a acting on the rod 30. The cam 29 is of such contour as to not permit the valve head 22 to entirely seat, so that the flow of oil from the piston chamber 5 past the valve is not entirely obstructed, when the valve head 22 is in its lowermost position.

In operation, during each "out" or "up" stroke of the piston 9, the oil in the reservoir readily transfers through the by-pass 6 into the cylinder

below the piston and flows up through the port 21, past the valve 22, which opens freely and is not retarded in its opening movement by the cam 29, and during the "in" or "down" stroke, the valve 22 is held by the cam 29 off its seat an amount corresponding to the adjustment of the cam, so that the resistance offered to the flow of the oil past the valve, or the checking effect is determined by the position of the valve 22. During the period that the piston is reversing itself at the end of the "out" stroke and at the beginning of the "in" stroke, there is, in this embodiment of my invention, practically no checking effect, because the piston is practically stationary while the crank is traveling from the point B to the point C, or vice-versa. The piston 9 makes one reciprocation or one up and down movement during the movement of the actuator 15 from the position shown in Figure 4 to that shown in Figure 6, these being the positions occupied when the machine, having an opening and a closing movement, as a press, is in open position and in closed position, respectively, and during this movement, one of the cams 26 or 27 controls the movement of the valve 22. During the movement of the piston 9, when the actuator 15 is in the position occupied in Figure 6 and moved to that shown in Figure 4, the piston makes a complete up and down movement, while the machine or press, having an opening and a closing movement, is going from closed to open position, and the other of the cams then controls the movement of the valve 22, so that a different checking effect, if desired, may be had during the opening movement of the machine or press.

In Figure 5, the actuating element or arm 15 is shown in its position occupied when the piston is approaching the end of its "up" stroke or approaches the beginning of its reversing movement, when it is practically at a standstill. During movement of said arm from the position shown in Figure 4, to that shown in Figure 6, the connecting rod is passing through the dead center line or between radial lines B—C (Figure 1), that is, a line passing through the axis of the crank shaft and the point of connection of the connecting rod to the piston.

Owing to the adjustable cams 26, 27, the check valve 22 may be adjusted to open to a greater or less degree during the cycle of movement of the piston, and hence, vary the checking effect during different periods of the cycle of movement of the piston. One of the cams 26, 27 controls the cycle of movement while the machine to which the checking device is applied, is closing, and the other controls the checking effect during the cycle of movement of the piston, while the machine is opening.

What I claim is:

1. In a check for checking movements in opposite directions, a casing formed with a reservoir for a liquid, a piston chamber communicating with the reservoir to receive liquid therefrom and discharge the same thereinto, the chamber having a port opening into the reservoir, a piston having a back and forth movement in the piston chamber, a check valve in the port, a rock shaft, means connecting it to the piston for transferring the motion thereof to the piston and effecting a complete back and forth movement upon rocking of the rock shaft in one direction and a complete back and forth movement upon rocking of the rock shaft in the other direction, an actuating element connected

to the rock shaft, and mechanical motion transmitting means controlled by the rock shaft and adapted to differentially control the closing movements of the check valve during the movement of the rock shaft in one direction as regards the movement of the rock shaft in the other direction.

2. A check for checking movements in opposite directions, a casing formed with a reservoir for a liquid, a cylinder communicating with the reservoir to receive liquid therefrom and discharge the same thereinto, the cylinder having a port opening into the reservoir, a reciprocating piston movable in the cylinder, a check valve in the port, a crank shaft mounted in the casing, a connecting rod between the crank thereof and the piston, a rocking actuator for the crank shaft and connected thereto to rock the same and effect a complete back and forth reciprocation of the piston during rocking movement of the actuator in one direction, and a complete back and forth reciprocation during rocking movement of the actuator in the opposite direction, and means for controlling the operation of the check valve including a plurality of cams on the crank shaft arranged in different angular relations to the crank shaft, an actuator for the check valve, and motion transmitting connections between the cams and the check valve actuator, one cam being located to control the check valve actuator during the reciprocation of the piston during rocking movement of the crank shaft in one direction, and the other cam to control the check valve actuator during reciprocation of the piston during rocking movement of the crank shaft in the opposite direction.

3. In a check for checking movements in opposite directions, a casing formed with a reservoir for a checking liquid, and a piston chamber located in the reservoir below the level of the liquid therein and having a port opening into the lower section of the reservoir, the chamber also having communication with the upper portion of the reservoir, a check valve in the port, a piston having a back and forth movement in the chamber, a rock shaft supported in the casing out of the reservoir, connections between the shaft and the piston member to actuate the piston member, a reversely movable actuating element for connection to a moving part to be checked, motion transmitting means between the actuating member and the shaft, and motion transmitting means between the shaft and the check valve, the latter motion transmitting means including adjustable parts for varying the operation of the check valve to vary the checking effect during different portions of the cycle of movement of the piston.

4. In a check for checking movements in opposite directions, a casing formed with a reservoir for a checking liquid, and a piston chamber located in the reservoir below the level of the liquid therein and having a port opening into the lower section of the reservoir, the chamber

also having communication with the upper portion of the reservoir, a check valve in the port, a piston having a back and forth movement in the chamber, a rock shaft supported in the casing out of the reservoir, connections between the shaft and the piston member to actuate the piston member, a reversely movable actuating element for connection to a moving part to be checked, motion transmitting means between the actuating member and the shaft, motion transmitting means between the shaft and the check valve, the latter motion transmitting means including adjustable cams for varying the operation of the check valve to vary the checking effect during different portions of the cycle of movement of the piston.

5. In a check for checking movements in opposite directions, a casing formed with a reservoir for a checking liquid and with a cylinder in the reservoir arranged to be immersed in the liquid, the cylinder having a port in its outer end portion opening into the lower portion of the reservoir, a piston working in the cylinder, a crank shaft journaled in the casing outside of the reservoir, a connecting rod between the piston and the crank shaft and extending out of the reservoir, an actuating member having a back and forth movement for connection to a part to be checked, and a reduction leverage mechanism between the actuating member and the crank shaft to cause the piston to make a complete reciprocation during the movement of the actuating member in one direction, and a complete reciprocation during the actuation of said member in the opposite direction, a check valve in said port, connections between the rock shaft and the check valve for operating the same.

6. In a check for checking movements in opposite directions, a casing formed with a reservoir for a checking liquid and with a cylinder in the reservoir arranged to be immersed in the liquid, the cylinder having a port in its outer end portion opening into the lower portion of the reservoir, a piston working in the cylinder, a crank shaft journaled in the casing outside of the reservoir, a connecting rod between the piston and the crank shaft and extending out of the reservoir, an actuating member having a back and forth movement for connection to a part to be checked, and a reduction leverage mechanism between the actuating member and the crank shaft to cause the piston to make a complete reciprocation during the movement of the actuating member in one direction, and a complete reciprocation during the actuation of said member in the opposite direction, a check valve in said port, connections between the rock shaft and the check valve for operating the same, said connections including cams on the shaft adjustable into different radial angles to vary the checking effect during different periods of the cycle of movement of the piston.

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