

March 14, 1944.

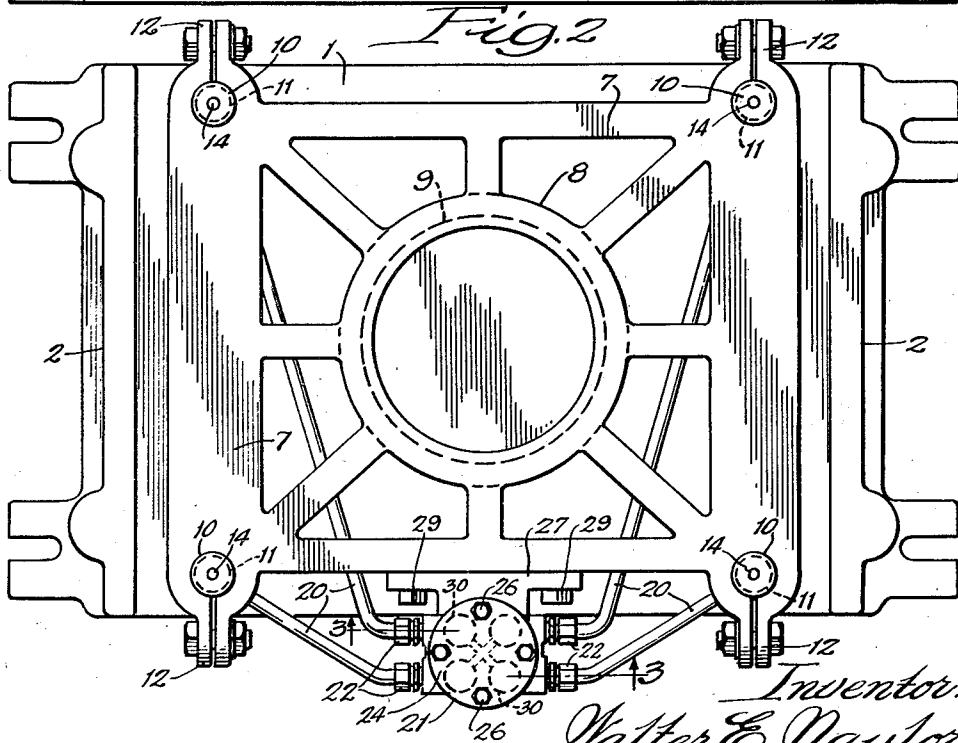
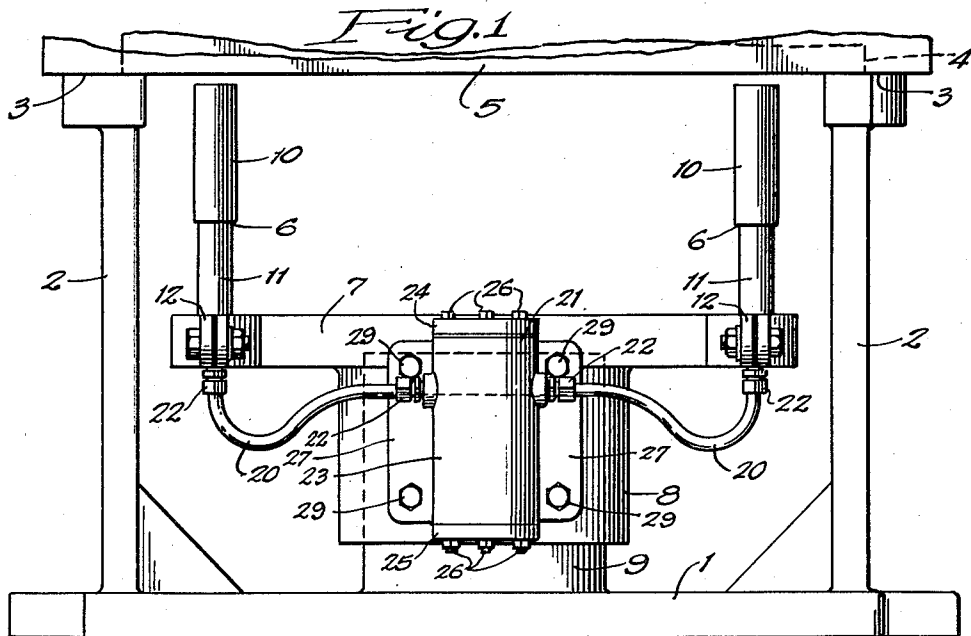
W. E. NAYLOR

2,343,993

LEVELING DEVICE

Filed March 23, 1942

2 Sheets-Sheet 1



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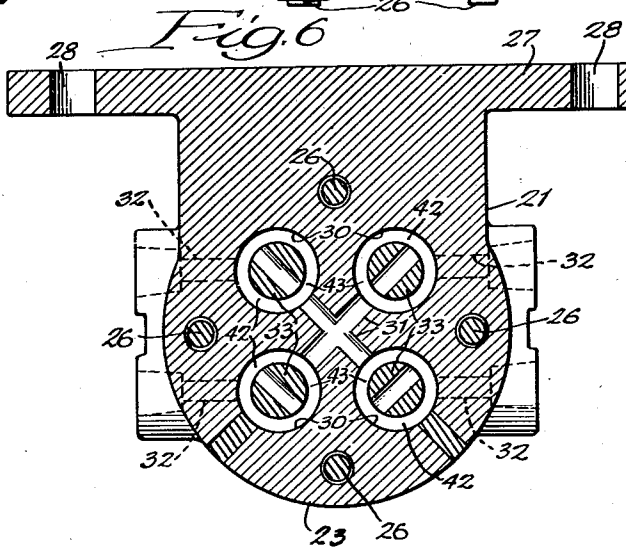
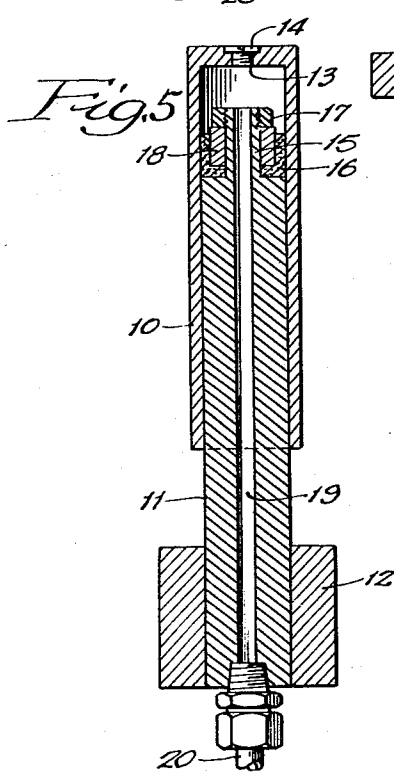
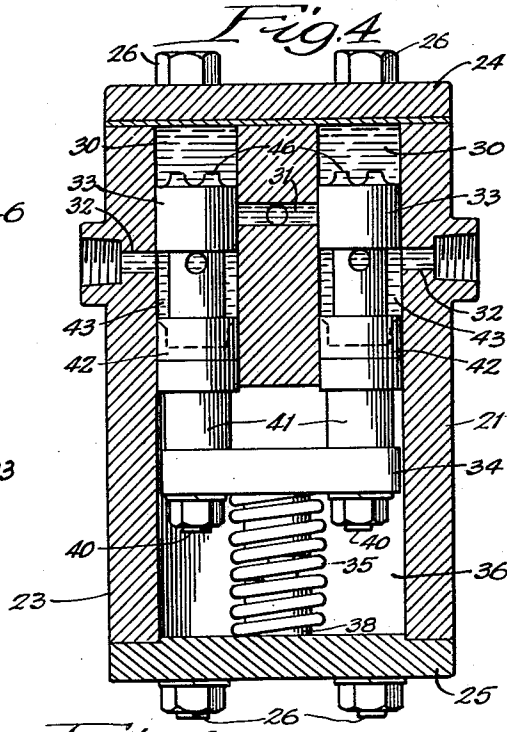
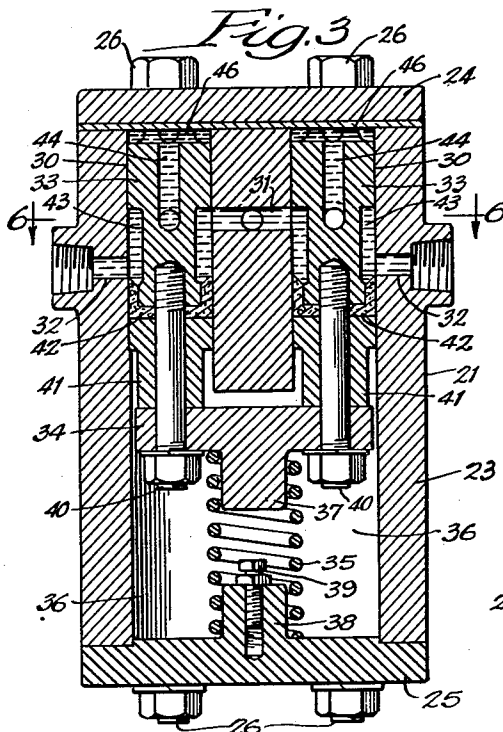
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UNITED STATES PATENT OFFICE

2,343,993

LEVELING DEVICE

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Application March 23, 1942, Serial No. 435,821

10 Claims. (Cl. 254—133)

This invention relates generally to leveling devices. It is particularly adapted for use in connection with lifting machines in which the article acted upon must be maintained level while it is being raised.

The invention has been found particularly useful in connection with the power-driven flask lifting machines extensively employed in foundries for lifting the flask and mold from the pattern after the mold is completed.

Such foundry machines heretofore in common use comprise a base having fixed supports on which the pattern and flask are supported while the mold is being made. The flask and mold are raised from the pattern by a power operated yoke or lift having a plurality of pins for engaging the lower edges of the flask. It is seldom that one finds a flask having a level bottom surface and, for this reason, it is necessary that one or more of these pins be adjustable vertically relative to the lift in order that all pins may properly engage the lower edges of the flask. Heretofore, to permit such adjustment, the pins had threaded engagement with the lift and could be rotated by hand to bring them into contact with the flask. The manual adjustment of the lifting pins has been found to be objectionable because of the time required for manually rotating each pin and also because manual adjustment of the pins requires considerable skill on the part of the workman.

The main objects of this invention are to provide an improved leveling device which is self adjusting so as to be adapted to accurately maintain the article acted upon in the desired position without the exercise of any high degree of care or skill; to provide a leveling device which is sturdy and dependable; and to provide a leveling device of this kind which is adapted for use in a foundry flask lifting machine for maintaining the flask and mold level while they are lifted from the pattern, thereby avoiding injury to the mold.

An illustrative embodiment of this invention is shown in the accompanying drawings, wherein:

Figure 1 is a side elevation of a foundry flask lifting machine to which an improved leveling device is applied; portions of a flask and pattern being also shown.

Fig. 2 is a top plan view of the machine without the flask and pattern.

Fig. 3 is an enlarged vertical section of the controlling valve, the view being taken on the line 3—3 of Fig. 2.

Fig. 4 is a view similar to Fig. 3 but showing

the movable parts in changed position to close the fluid passages.

Fig. 5 is an enlarged axial sectional view of one of the lifting pins.

Fig. 6 is a transverse sectional view of the valve, taken on the line 6—6 of Fig. 3.

In the specific form shown, the invention is applied to a power driven flask lifting machine comprising a base 1 having end members 2 provided with flat supporting surfaces 3, for supporting the usual pattern 4 and flask 5. The mold is formed within the flask and, after its completion, the flask and mold are lifted from the pattern by the improved leveling device.

The leveling device includes a plurality of self adjusting bearing members 6 which may be carried by the usual form of lift comprising a yoke 7 having a collar 8 embracing a piston 9 which is raised by the usual power driven means, not shown.

The self adjusting bearing members 6 are preferably cylinder-piston units adapted for intercommunication through a closed, self-contained fluid system which is controlled by an automatically operated valve mechanism, all of which is more fully hereinafter described. This system permits a relative adjustment of all the bearing members thereby enabling them to properly engage the lower edges of the flask before the lift becomes effective for raising the flask and mold from the pattern.

The bearing members 6 are preferably in the form of cylinder-piston units each of which comprises a sleeve 10 of inverted cup shape which is slidably mounted on a pin 11. The lower ends of the pins 11 are rigidly mounted in clamps 12 which are formed in the four corners of the lift, as shown in Fig. 2.

The upper ends of the sleeves 10 are substantially flat and are provided with filler openings 13 with removable plugs 14 to permit filling of the fluid system with brake fluid, oil, water, or other suitable fluid.

The upper end of each pin 11 is reduced to form a stem 15 for the attachment of a flexible seal 16 which is secured to the pin by a nut 17 and an intermediate spacer 18.

The pins 11 are axially bored to provide fluid passages 19 adapted to communicate with one another through conduits 20 and a control valve 21. The conduits are attached to the pins 11 and valve 21 by means of the usual compression fittings 22.

The particular valve illustrated comprises a cylindrical casing 23 to which end caps 24 and

25 are secured by bolts 26. Formed on the casing, is an integral bracket 27 having apertures 28 for receiving bolts 29 by which the valve assembly is firmly secured to the lift.

Formed in the upper portion of the valve casing, are four fluid chambers 30 adapted to communicate with one another through radial passages 31, and communicating with the conduits 20 through passages 32. Located in the chambers 30 are valve pistons 33 which are carried by a plate 34 mounted on a helical spring 35 within a chamber 36 formed in the lower part of the valve casing. The spring is secured against displacement by bosses 37 and 38 formed on the plate 34 and bottom cap 25, respectively. Downward movement of the plate 34 and the connected valve pistons is limited by an adjustable screw 39 mounted in the boss 38.

The valve pistons are firmly secured to the plate 34 by bolts 40. Clamped between the plate 34 and the lower ends of the valve pistons, are spacers 41 and flexible seals 42.

As shown in Figs. 3 and 4, the lower ends of the valve pistons are reduced in diameter to provide annular fluid passages 43 so that, when the valve pistons occupy the normal position shown in Fig. 3, there is free communication between all of the cylinder-piston units 6 through the conduits 20 and passages 43, and 31.

The upper ends of the valve pistons 33 are axially bored to provide fluid passages 44, which communicate with the annular passages 43 through radial passages 45 so as to permit the fluid to enter the chambers 30 above the pistons. Lugs 46 are formed on the upper ends of the valve pistons to insure entry of the fluid above the pistons.

The cylinder-piston units, the conduits 20, and the valve mechanism 21 constitute a closed and completely self-contained oil system in that there is no outside connection to an oil reservoir or pump. Any flow of the oil through the conduits or the valve housing is caused by the movement of one or the other of the piston pins 11. Any pressure on the oil in the system is created only by the unison movement of the four piston pins. There are no valves to open or close and no pump is related to the system for exerting pressure or influence of any kind on the oil contained in the cylinder-units, the conduits, and the valve mechanism. It is for that reason that the system is appropriately described as a closed, self-contained fluid system.

In operation, when the improved leveling device is applied to a foundry molding machine, the parts are adjusted so that the upper ends of the bearing sleeves 10 will be spaced slightly from the lower edges of the pattern 4 and flask 5 as illustrated in Fig. 1. When the mold is completed and it is desired to lift the flask 5 and mold from the pattern, the power mechanism (not shown) is set in operation for elevating the lift 7 and bearing members 6. As the bearing sleeves 10 are pressed upwardly against the lower edges of the flask 5, the fluid above the pins 11 will be forced downwardly through the passages 19 and conduits 20 into the control valve. If for any reason the bearing sleeves 10 do not all simultaneously engage the flask, the fluid in the system will flow toward the bearing members 6 which are not yet in contact with the flask. This is permitted so long as the valve pistons 33 remain in the open position shown in Fig. 3. When all of the bearing sleeves 10 are in contact with the flask, further eleva-

tion of the lift 7 will cause an increase in the fluid pressure of the system and the fluid passing upwardly through the passages 44 will enter the chambers 30 above the pistons 33 thereby forcing the pistons downwardly against the action of the spring 35 until they close the radial passages 31, as shown in Fig. 4.

When the parts occupy the positions shown in Fig. 4, the bearing sleeves 10 are positively locked against any downward movement relative to one another or to the lift 7.

It will thus be seen that the lift is not effective for raising the flask from the pattern until all of the bearing sleeves 10 are in proper engagement with the lower edges of the flask and therefore the flask is maintained level while it is being raised from the pattern so that the mold suffers no injury.

Although but one specific embodiment of this invention has been herein shown and described, it will be understood that details of the construction shown may be altered without departing from the spirit of this invention as defined by the following claims.

I claim:

1. A self adjusting pressure applying device comprising a support, a plurality of piston-cylinder units mounted on said support and serving as bearing members for engaging the article acted upon, a closed, self-contained fluid system providing normally open communication between all of said units but void of communication with any outside fluid supply, and means arranged in said system and automatically actuated by the pressure therein to block the passage of fluid from one unit to another when the pressure in said system exceeds a predetermined amount.

2. A self adjusting pressure applying device comprising a support, a plurality of piston-cylinder units mounted on said support and serving as bearing members for engaging the article acted upon, a closed, self-contained fluid system providing normally open communication between all of said units but void of communication with any outside fluid supply, and valve mechanism arranged in said system and automatically actuated by the pressure therein to block said system to prevent the passage of fluid from one unit to another when the pressure in said system exceeds a predetermined amount.

3. A self adjusting pressure applying device comprising a vertically movable support, a plurality of piston-cylinder units mounted on said support and serving as bearing members for engaging the article acted upon, a closed, self-contained fluid system providing normally open communication between all of said units but void of communication with any outside fluid supply, and means arranged in said system and automatically actuated by the pressure therein to block the passage of fluid from one unit to another when the pressure in said system exceeds a predetermined amount.

4. A self adjusting pressure applying device comprising a vertically movable support, a plurality of piston-cylinder units mounted on said support and serving as bearing members for engaging the article acted upon, a closed, self-contained fluid system providing normally open communication between all of said units but void of communication with any outside fluid supply, and valve mechanism arranged in said system and automatically actuated by the pressure therein to block the passage of fluid from one unit to an-

other when the pressure in said system exceeds a predetermined amount.

5. A self adjusting pressure applying device comprising a support, a plurality of piston-cylinder units mounted on said support and serving as bearing members for engaging the article acted upon, a closed, self-contained fluid system providing normally open communication between all of said units but void of communication with any outside fluid supply, and a normally open valve mechanism arranged in said system for controlling the passage of fluid through said system, said valve mechanism being automatically closed by said fluid when the pressure in said system exceeds a predetermined amount.

6. A self adjusting pressure applying device comprising a support, a plurality of piston-cylinder units mounted on said support and serving as bearing members for engaging the article acted upon, a closed, self-contained fluid system providing normally open communication between all of said units but void of communication with any outside fluid supply, a valve mechanism in said system for controlling the passage of fluid through said system, and a spring normally holding said valve mechanism open, said valve mechanism being automatically closed against the action of said spring when the pressure in said system exceeds a predetermined amount.

7. A self adjusting leveling device comprising a lift, a power unit for said lift, a plurality of piston-cylinder units carried by said lift and serving as bearing members for supporting the article acted upon, a closed, self-contained fluid system separate from said power unit and providing normally open communication between all of said units, and means arranged in said system and automatically actuated by the pressure therein to block the passage of fluid from one unit to another when the pressure in said system exceeds a predetermined amount.

8. A self adjusting leveling device comprising a lift, a power unit for said lift, a plurality of piston-cylinder units carried by said lift and serving as bearing members for supporting the article acted upon, a closed, self-contained fluid system separate from said power unit and providing normally open communication between all of said units, and valve mechanism arranged in said system and automatically actuated by the pressure therein to block the passage of fluid from one unit to another when the pressure in said system exceeds a predetermined amount.

9. A self adjusting leveling device comprising a vertical lift, a power unit for said lift, a plurality of piston-cylinder units carried by said lift and serving as bearing members for supporting the article acted upon, a closed, self-contained fluid system separate from said power unit and providing normally open communication between all of said units, and a normally open valve mechanism arranged in said system for controlling the passage of fluid through said system, said valve mechanism being automatically closed by the fluid when the pressure in said system exceeds a predetermined amount.

10. A self adjusting leveling device comprising a vertical lift, a power unit for said lift, a plurality of piston-cylinder units carried by said lift and serving as bearing members for supporting the article acted upon, a closed, self-contained fluid system separate from said power unit and providing normally open communication between all of said units, a valve mechanism for controlling the passage of fluid through said system, and a spring normally holding said valve mechanism open, said valve mechanism being automatically closed by the fluid when the pressure in said system exceeds a predetermined amount.

WALTER E. NAYLOR.