

April 29, 1941.

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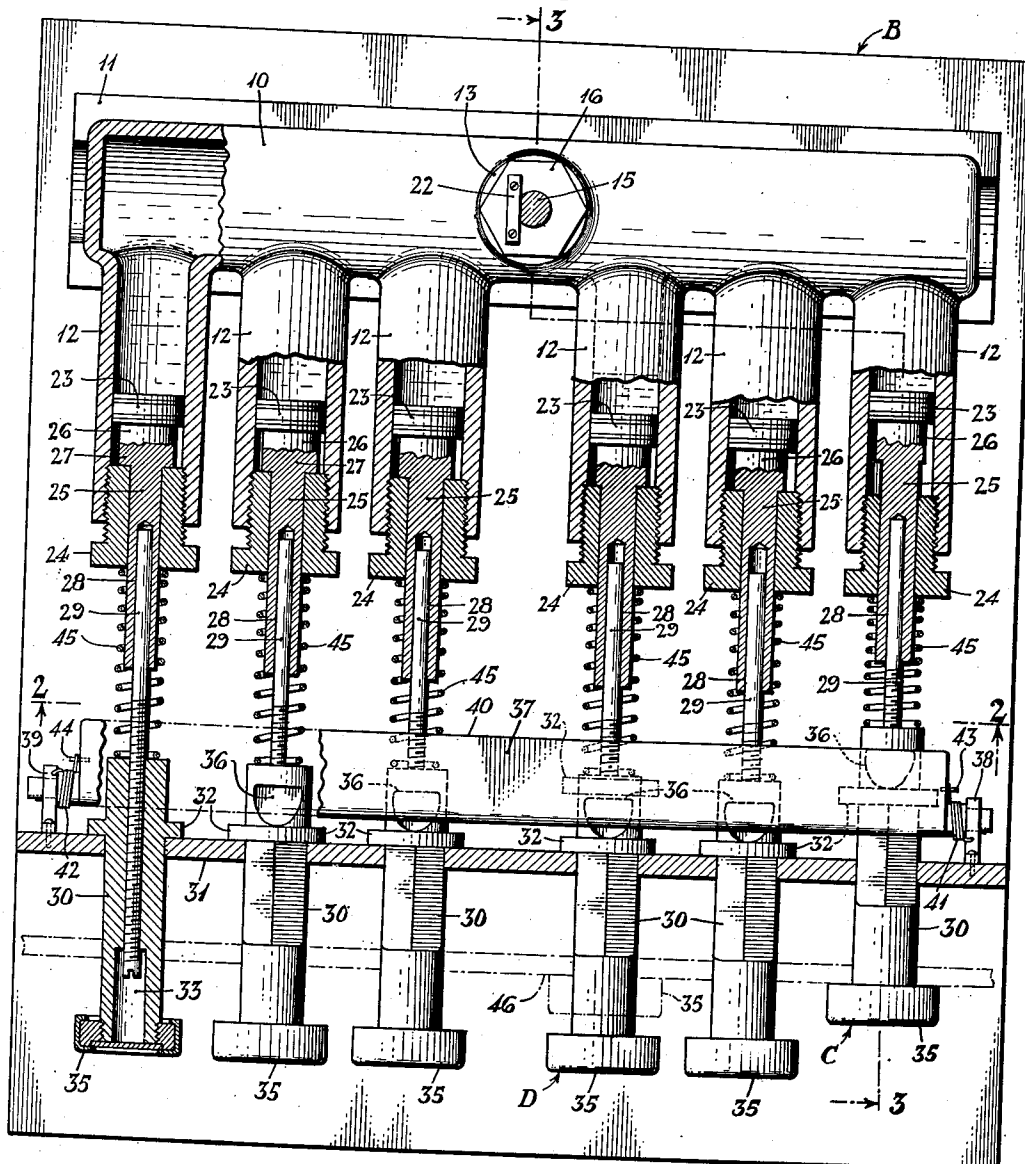
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RADIO APPARATUS TUNING DEVICE

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2 Sheets-Sheet 1

Fig. 1.



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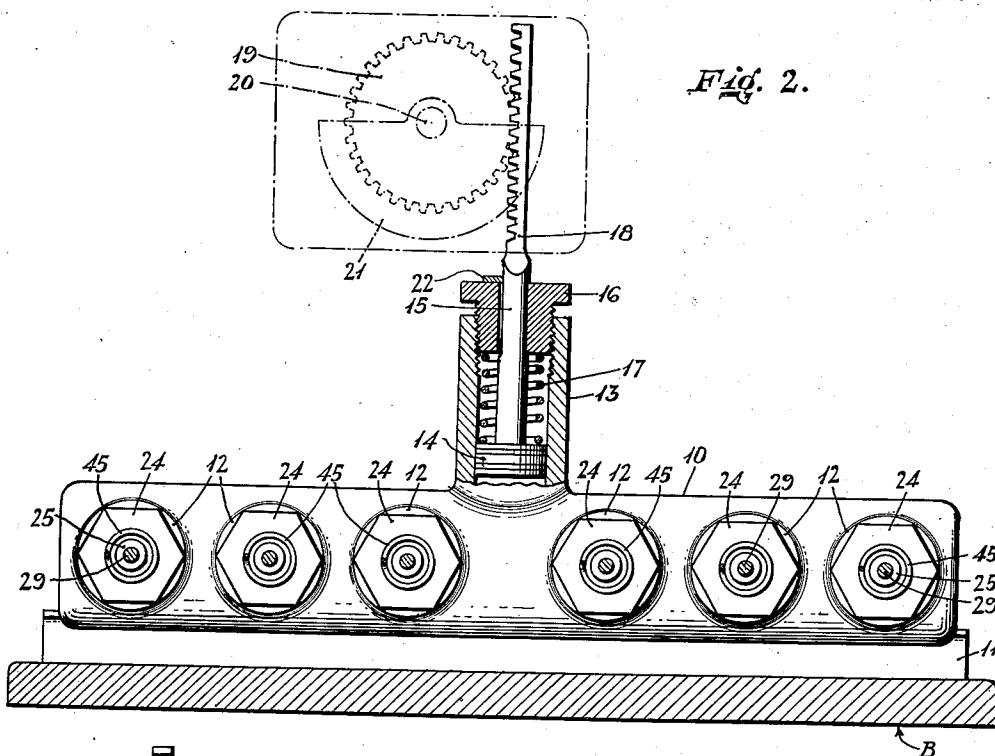
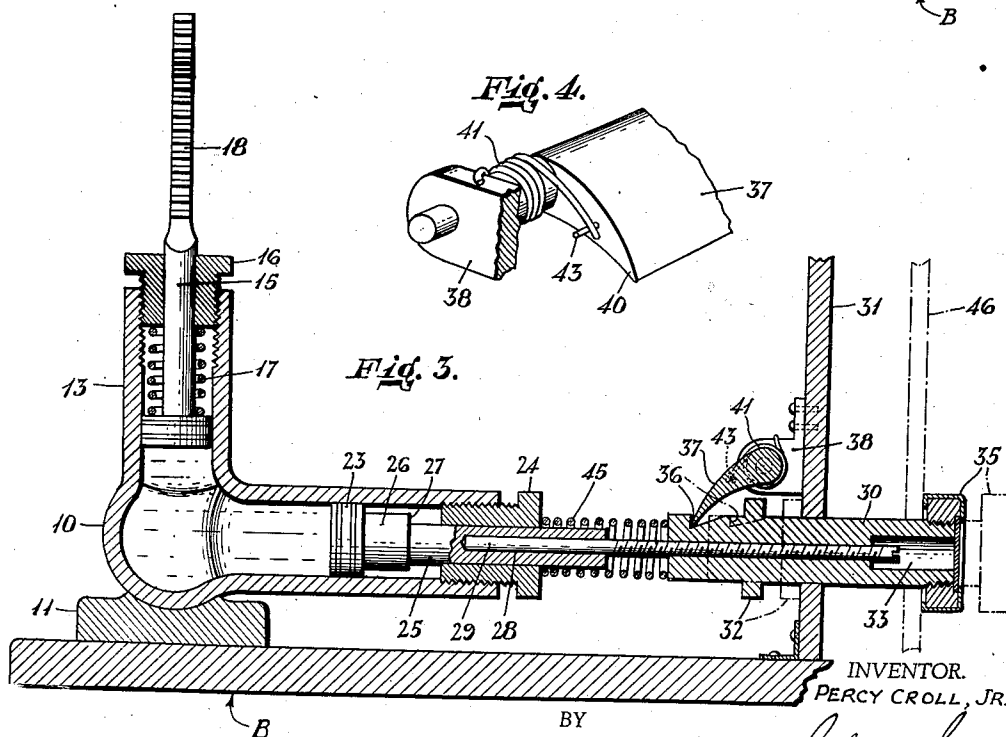
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RADIO APPARATUS TUNING DEVICE

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5 Claims. (Cl. 60—54.5)

This invention relates to a hydraulic push button control device and, more particularly, to such a device wherein an actuating member may be hydraulically actuated a pre-determined amount by operation of various push buttons.

One of the objects of the present invention is to provide an improved tuning device for radio apparatus by means of which the apparatus is accurately tuned to a selected station by means of a push button.

A further object of this invention is to provide a push button tuning device for a radio apparatus by means of which the apparatus is tuned to a selected station through the displacement of a hydraulic medium to a pre-determined extent by said push button which operates the tuning mechanism of said radio apparatus, which is responsive to the displacement of the hydraulic medium.

A still further object of this invention is to provide a hydraulic push button control for a radio receiving apparatus for automatically tuning said apparatus to a selected station, which control may be easily adjusted to accurately tune a selected station.

Another object of the present invention is to provide a hydraulic push-button control for a radio receiving apparatus which is simple and inexpensive to construct.

These and other objects will be obvious or will appear during the course of the following specification.

In accomplishing the objects of this invention, it has been found most satisfactory to provide a chamber adapted to be filled with a fluid having a plurality of cylinders, in each of which is mounted a piston having a piston rod thereon. Each cylinder is in communication with the fluid chamber, the fluid therein also filling said cylinders. Each of the pistons is adapted to be moved into said cylinders by means of a push button, the inward movement of each piston being governed by an adjusting means between the piston rods on said pistons and said push button. A locking means is also provided to hold the push button in its operative position.

Also in communication with the fluid chamber is a tuning rack cylinder having a plunger operative therein, said plunger having a stem with a gear rack formed thereon. The gear rack is adapted to be enmeshed with a gear on the tuning shaft of the radio apparatus. The movement of the gear rack is secured by displacement of the fluid from the push button cylinder caused through the movement of a push button-piston

inwardly in its respective cylinder, the movement of said rack being governed by the extent of the displacement of said fluid. The amount of displacement of the fluid depends upon the extent of the movement of the push button piston inwardly.

The invention will appear more clearly from the following detailed description when taken in conjunction with the accompanying drawings which show by way of example a preferred embodiment of the invention.

In the drawings:

Figure 1 is a plan view of the device of this invention, parts of which have been broken away to better illustrate the device;

Figure 2 is a sectional view of the invention taken on the line 2—2 of Figure 1;

Figure 3 is a sectional view taken on the line 3—3 of Figure 1, and

Figure 4 is a perspective view of a portion of the push button locking means.

Like numerals refer to like parts throughout the several views.

In the embodiment of the invention shown in the drawings, the reference numeral 10 designates an elongated cylindrically shaped fluid chamber having a base 11 mounted on base B. The fluid chamber has formed integrally therewith a plurality of cylinders 12. Each cylinder extends from said fluid chamber and is in communication therewith. The cylinders 12 are preferably in alignment with one another along the axis of said fluid chamber, and in the embodiment of the invention shown in the drawings are of slightly less diameter than the fluid chamber 10. The number of cylinders formed by said fluid chamber may be varied in accordance with the number of stations to which the radio apparatus is desired to be tuned by the use of the device of this invention, as will hereafter be more fully set forth. Each cylinder and its cooperative parts are similar in construction to each of the other cylinders and their cooperating parts.

Also formed, preferably integrally, with said fluid chamber 10 is a cylinder 13, the plane of the axis of which is substantially vertical to the plane of the axes of the cylinders 12. A plunger 14, having a stem 15, is slidably mounted in the cylinder 13. The cylinder 13 is closed by a cap 16, having a hole therein, through which the stem 15 projects. A spring 17 is positioned between the cap 16 and the plunger 14, so that movement of said plunger away from the fluid chamber will be against the tension of said spring. The

upper portion of the plunger stem 15 has formed thereon a gear rack 18 which meshes with a gear 19. On the tuning shaft 20 of the radio apparatus, the shaft 20, as shown in the embodiment of the invention illustrated in the drawings (Figure 2), is the rotor shaft of a condenser 21.

A portion of the stem 15 is flat and bears against a plate 22 mounted on the top of the cap 16, which prevents the stem 15 and gear rack 18 thereon from turning.

It will be understood that the piston 14 is very closely fitted to the cylinder 13, so that fluid will not pass said plunger. Piston rings or any well known means of packing may be used about said plunger for this purpose.

In each of the cylinders 12, a piston 23 is slidably mounted. The fit between the piston and the inside wall of the cylinder 12 is a close one, so that fluid in the cylinders will not escape past the inner face of the pistons 23. Piston rings or packing not shown in the drawings may be used to prevent any leakage of fluid. The outer end of each cylinder is closed by a cap 24, having a hole through the center thereof, through which extends a piston rod 25 carried by each piston 23. The piston rods 25 have a portion 26 adjacent the piston 23 of slightly greater diameter than the remainder of said piston rods, so that the outward movement of the piston 23 is limited by the engagement of the shoulder 27 between the enlarged portion 26 and the remainder of the piston rod 25 against the inner face of the cap 24.

Each piston rod 25 has a recess 28 in the outer end thereof, which is adapted to receive one end of an adjusting pin 29. The opposite end of each adjusting pin 29 is screw-threaded and is adapted to extend into a screw-threaded hole through the center of a push button shaft 30. A slot 34 is formed on the outer end of each pin 29.

The push-button shafts 30 are each slidably mounted in a hole in the panel 31 mounted on the base B. It is preferable that the portion of each push-button shaft 30, which slidably engages the holes in panel 31 be square or rectangular in shape, so that said shafts will not turn. It is preferable that each of the push-button shafts be of equal length.

Each push-button shaft 30 has a collar 32 thereon, the purpose of which is to limit the outward movement of the push-button shaft through the engagement of the collar with the inner surface of the panel 31 when the shaft 30 is in its inoperative position.

Since it is desirable, for appearance sake, that each push-button shaft 30, in its inoperative position, extend the same distance outwardly from the panel 31, so that the outer ends thereof, with the exception of the one in its operative position, are all in longitudinal alignment, each collar is positioned the same distance from the outer end of the shaft 30.

The outer end of each push-button shaft has a recess 33 therein, so that the pin 29 may be turned for adjustment and the head thereof will not extend beyond the outer end of the push-button shaft 30. The end of each push-button shaft has a cap 35 adapted to be screwed, which covers the recess 33. Each cap has an indicator on which is designated the radio station tuned when the particular button is pressed.

A detent 36 is formed in the inner end of each shaft 30, each detent 36 being positioned in said shafts an equal distance from the outer end

thereof, so that, when the shafts are in their inoperative position, the detents are each in longitudinal alignment with the other.

On the inner surface of the panel 31 is an elongated locking bar or pawl 37 of a slightly greater length than the longitudinal distance between the two shafts 30 in opposite ends of the panel 31. The opposite ends of the bar 37 are pivotally mounted in supports 38 and 39, respectively. The bar 37 is mounted above the shafts 30, the pointed end 40 thereof being adapted to extend over the inner ends of the shafts when the same are in their inoperative position and be engaged thereby when the shaft is pressed inwardly. The bar 37 has coil springs 41 and 42 mounted on the opposite ends thereof, one end of said springs engaging pins 43 and 44, respectively, and the other end engaging the mountings 38 and 39, respectively, so that upward movement of the bar 37 is against the tension of the springs 41 and 42. When a shaft 30 is in its operative position, the pointed end of the bar 37 engages the detent 36 therein, locking the shaft in its operative position. The inner end of the next shaft pressed inwardly engages the pointed end of the bar 37, raising the same and releasing the shaft 30 previously held in an operative position.

Mounted between the inner end of each shaft 30 and the cap 24 is a spring 45 which is under tension when the shaft is in its operative position, and which returns the shaft to its inoperative position when the bar 37 is released from the detent 36.

When it is desired to use the hydraulic tuning apparatus of this invention, the same is placed within a radio cabinet, so that the rack 18 meshes with the gear 19 on the tuning shaft 20 and the push-button shafts 30 extend through holes in the radio panel, the panel being indicated in Figures 1 and 3 of the drawings by dotted lines and designated by the reference numeral 46. The caps 35 are then screwed onto the ends of the shafts 30. The caps, when the shafts 30 are in their inoperative position, are all an equal distance from the radio panel 46.

The fluid chamber 10 is filled with any desirable fluid such as oil, the fluid extending into the cylinders 12 and filling the same inwardly of the pistons 23. The shoulders 27 of each portion 26 of the piston rods 25 bear against the inner surface of the caps 24. The adjusting pins 29 are turned in relation to their respective push-button shafts 30, so that each pin projects into the recess 28 in each piston rod 25 a different distance. For example, as shown in Figure 1 of the drawings, the adjusting pin in the push-button shaft on the left hand end of the panel 31 projects approximately all the way into the recess 28 in the piston rod. The adjusting pin 29 in the next push-button shaft to the right projects a lesser distance into the recess 28 in that piston rod, and the next adjusting pin 29 to the right extends into its respective piston rod recess a slightly lesser distance, and so on, to the adjusting pin in the furthestmost push-button shaft to the right, each adjusting pin extending a lesser distance into its piston rod recess. In this manner, the length of the stroke of the various pistons 23 in the cylinders 12 is governed; that is, each push button, when the same is operative, will be pressed until the inner surface of the cap 35 engages the outer face of the radio panel 46, the distance each push-button shaft travels being the same. The adjusting pin 29, however, will not act to move the piston 23 until the inner

end of the adjusting pin engages the inner end of the recess 28.

For the purpose of illustration, it will be assumed that it is desired to tune in on the radio apparatus the station designated in the push button 35 on the right hand end of the radio panel 46 (Fig. 1). The button is pressed inwardly until the inner surface thereon rests against the outer surface of the radio panel 46, as shown in full lines in Figures 1 and 3 of the drawings. The dotted lines in Figure 3 show the inoperative position of this push button and its related parts. The piston 23 is moved inwardly in the cylinder 12 when the inner end of the adjusting pin 29 engages the end of the recess 28 in the piston rod 25. When the push-button shaft 30 has reached its innermost position, as governed by the contacting of the cap 35 with the radio panel 46, the pointed end 40 of the locking bar 37 engages the detent 36 in the push-button shaft 30, being snapped into said detent by means of the tension of the springs 41 and 42.

As the piston 23 moves inwardly in the cylinder 12, the fluid in the cylinder 12 is displaced therefrom and flows into the fluid chamber 10 and chamber 13. The displacement of said fluid from the cylinder 12 to the chambers 10 and 13 causes the piston 14 on the piston rod 50, to move said piston rod and the gear rack 18 thereon upwardly against the tension of the spring 17. The upward movement of the gear rack 18 turns the gear 19 in a counter-clockwise direction, which turns the tuning shaft 20 of the radio apparatus in the same direction, tuning in the desired station.

When it is desired to tune in another radio station on the apparatus, the push button on which the desired station is designated is pressed inwardly until the cap 35 engages the outer surface of the radio panel 46. In pressing the selected button inwardly, the inner end of the push button shaft 30 engages the locking bar 37 and, as the push-button shaft travels inwardly, the engagement of the same with the shaft 30 raises the bar 37, releasing the pointed end 40 from the detent 36, which allows the push button previously held in a locked position to return to its normal inoperative position, the fluid flowing back into the cylinder 12 returning the same until the shoulder 27 rests against the inner surface of the cap 24 and the spring 45, returning it the remainder of the distance until the collar 32 engages the inner surface of the panel 31.

The button D is pressed until the detent 36 therein engages the locking bar 27, which holds the push-button shaft in its innermost position. Since the pin 29 of the push button D extends further into the recess 28 of the piston rod 25 than does the pin 29 of the push button C extend into the recess 28 of the piston rod 25 co-operating with the push button C, the end of the pin 29, operated by pressing the button D, engages the end of the recess after traveling a lesser distance inwardly, thereby moving the piston 23 operated by the push button D a greater distance inwardly than the piston 23 operated by the push button C. A greater amount of fluid is displaced from the cylinder 12 and flows into the chamber 10. A greater amount of fluid is thereby forced into the chamber 13, the greater amount of fluid moving the piston 14 a greater distance upwardly which, through the gear rack 18, will turn the gear 19 further in a

counterclockwise direction, tuning in a different radio station.

Should it be desired to tune in a station in the radio apparatus by moving the gear 19 in a clockwise direction, a button controlling a piston which is not adjusted to move inwardly as far as the previously operated piston, is pressed. Since the displacement of the fluid from the cylinders 12 to the chamber 10 is less, the piston rod 15, on which the gear rack 18 is formed, is moved downwardly by the action of the spring 17 until the piston 14 engages the fluid in the cylinder 13.

Should the apparatus become out of adjustment through the expansion or the contraction of the liquid through leakage or through other causes, and a station is not accurately tuned in when a push button is pressed inwardly, the apparatus may be very easily adjusted. It is merely necessary to push the selected push button inwardly to its full extent, where it is locked by the locking bar 37. The cap 35 is then unscrewed from the end of the push-button shaft, a screw driver is then inserted in a slot 34 of the adjustment pin 29 and turned. Should a greater amount of displacement of fluid from the chamber 12 to the chamber 10 and chamber 13 be needed to tune in the station accurately, the rod 29 is turned so that the piston 23 is forced inwardly in the cylinder 12. Should less fluid displacement be needed, the pin is turned in the opposite direction, allowing of the fluid to force the piston 23 outwardly until the end of the recess 28 engages the pin 29. Flow of the fluid into the cylinder 12 from the chambers 10 and 13 causes the spring 17 to force the piston 14 downwardly, as the fluid flows into the chamber 12.

It is apparent that the specific illustrations shown have been given by way of illustration and not by way of limitation and that the structure above described is subject to a wide variation and modification without departing from the scope or intent of the invention, all of which variations and modifications are to be included within the scope of the present invention.

What is claimed is:

1. A hydraulic device for actuating a shaft to a pre-determined position comprising a body portion having a main liquid chamber therein, an auxiliary chamber in communication with said main liquid chamber, actuating means mounted in said auxiliary chamber and responsive to liquid displacement from said main liquid chamber, a plurality of liquid displacing means in communication with said main liquid chamber each when actuated being adapted to displace a pre-determined amount of liquid from the main chamber into the auxiliary chamber, and locking means adapted to lock said liquid displacing means in their operative position.

2. A hydraulic device for actuating a shaft to a pre-determined position comprising a body portion having a main liquid chamber therein, an auxiliary chamber in communication with said main liquid chamber, actuating means mounted in said auxiliary chamber and responsive to liquid displacement from said main liquid chamber, a plurality of liquid displacing means in communication with said main liquid chamber each when actuated being adapted to displace a pre-determined amount of liquid from the main chamber into the auxiliary chamber, operating means for operating said liquid displacing means, and adjusting means on said operating means whereby the distance of travel of said operating

means before engaging said liquid displacing means may be varied, and locking means adapted to lock one of said liquid displacing means in its operative position to be released by subsequent actuation of another liquid displacing means.

3. A hydraulic device for actuating a shaft to a pre-determined position comprising a body portion having a main liquid chamber therein, an auxiliary chamber in communication with said main liquid chamber, a plunger in said auxiliary chamber responsive to liquid displacement from said main chamber, means operatively connecting said plunger to shaft actuating means, a plurality of control cylinders in communication with said main chamber, a piston in each of said control cylinders, a piston actuating means for each piston, adjusting means between each piston and piston actuating means, each adjusting means being adapted for adjustment to a different length, so that each piston actuating means will move its respective piston an unequal pre-determined distance into its respective cylinder displacing a pre-determined amount of liquid from the control cylinder into the main cylinder thereby moving said plunger in proportion to the amount of liquid displaced from the control cylinder by the piston actuated, each adjusting means being so adjusted that actuation of a selected piston operating means will actuate the shaft to a pre-determined position, and locking means adapted to lock one of said pistons in its operative position to be released by subsequent actuation of another selected piston.

4. A hydraulic device for actuating a shaft to a pre-determined position comprising a body portion having a main liquid chamber therein, an auxiliary chamber in communication with said main liquid chamber, a plunger in said auxiliary chamber responsive to liquid displacement from said main chamber, a gear rack connected to said plunger for movement therewith, adapted to be enmeshed with a gear on a shaft to be actuated, a plurality of control cylinders in communication with said main chamber, a piston in each of said control cylinders, said cylinders each having a piston rod projecting outwardly therefrom, each piston rod being of substantially equal length, a plurality of push rods of substantially equal length each adapted to be pressed the same distance inwardly, said push rods being slidably mounted in an apertured panel, means for limiting the inward and outward movement of each of said push rod adjust-

ing means between each piston rod and its respective push rod each adjusting means being adapted for adjustment to a different length, so that each push rod will move its respective piston an unequal pre-determined distance into its respective cylinder displacing varying amounts of liquid from said control cylinders into the main chamber thereby moving said plunger in proportion to the amount of liquid displaced by the piston actuated, each adjusting means being so adjusted that actuation of a selected push rod will actuate the shaft to a pre-determined position, and locking means adapted to engage said push rods and lock the push rod actuated in its innermost position to be released by subsequent actuation of another selected push rod.

5. A hydraulic device for actuating a shaft to a pre-determined position said device comprising a base, a liquid chamber mounted on said base, an auxiliary cylinder in communication with said chamber having a plunger operative therein, said plunger being responsive to liquid displacement from said main chamber, means operatively connecting said plunger to shaft actuating means, a plurality of control cylinders in communication with said main chamber, the plane of the axes of which are at substantially right angles to the plane of the axis of the auxiliary chamber, a piston in each of said control cylinders each having a piston rod projecting outwardly therefrom, each piston rod being of substantially equal length, a plurality of push rods of substantially equal length each adapted to be pressed the same distance inwardly, said push rods being slidably mounted in an apertured panel mounted on said base, means for limiting the inward and outward movement of each push rod, adjusting means between each piston rod and its respective push rod, each adjusting means being adapted for adjustment to a different length, so that each push rod will move its respective piston an unequal pre-determined distance into its respective cylinder displacing varying amounts of liquid from said control cylinders into the main liquid chamber thereby moving said plunger in proportion to the amount of liquid displaced by the piston actuated, each adjusting means being so adjusted that actuation of a selected push rod will actuate the shaft to a pre-determined position, and locking means adapted to engage said push rods and lock the push rod actuated in its innermost position to be released by subsequent actuation of another selected push rod.

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