May 13, 1941. W. H. EMERSON 2,241,772

ADJUSTABLE FLUID CONTROL

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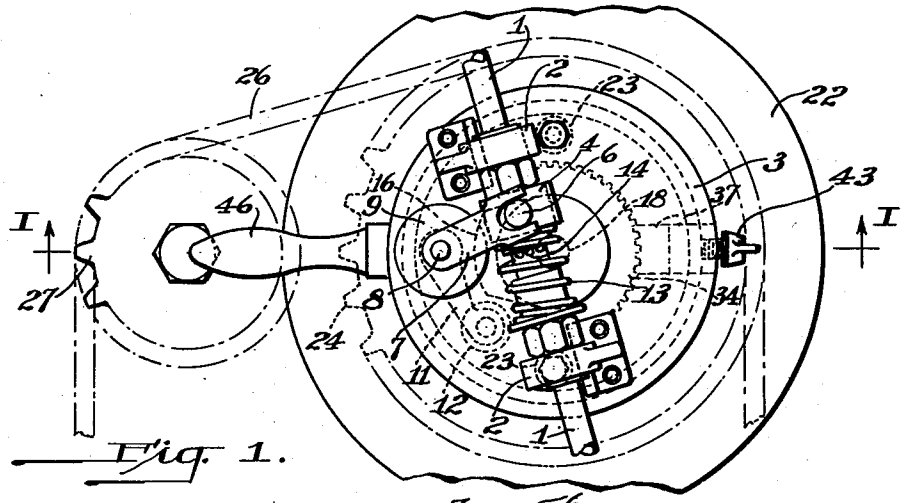


Fig. 1.

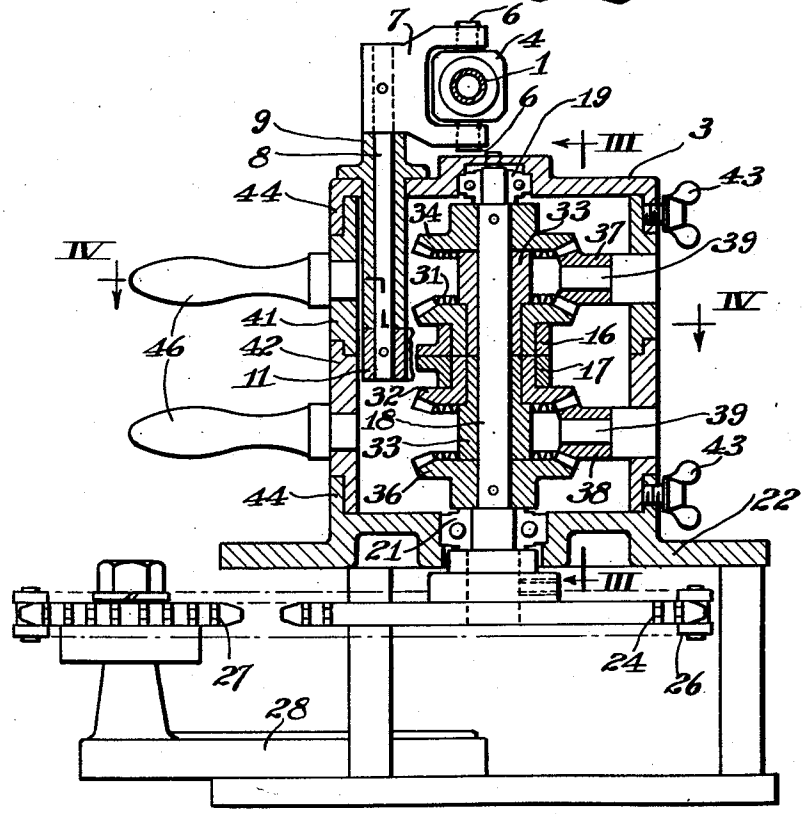


Fig. 2.

WITNESSES
A. B. Wallace.
V. A. Peckham

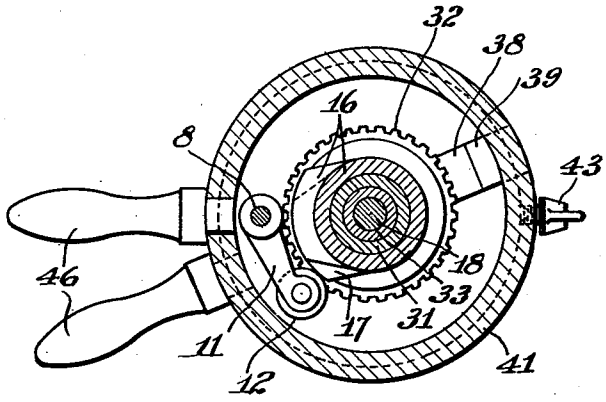
INVENTOR.
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Fig. 4.



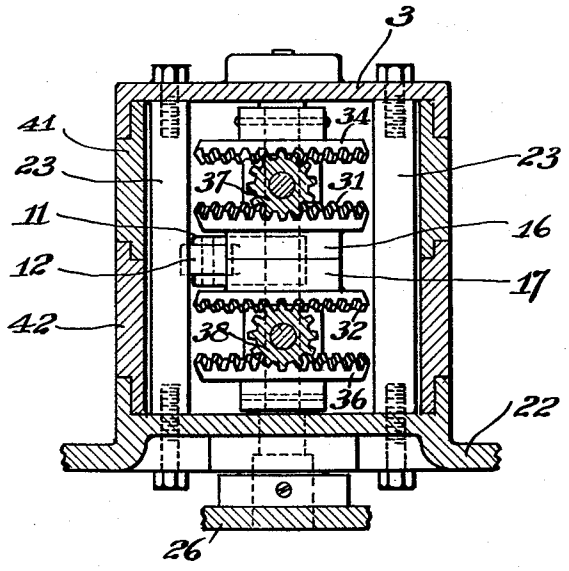


Fig. 3.

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UNITED STATES PATENT OFFICE

2,241,772

ADJUSTABLE FLUID CONTROL

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Application December 6, 1939, Serial No. 307,787

2 Claims. (Cl. 74—53)

This invention relates to fluid controls, and more particularly to apparatus for periodically opening and closing a valve in a fluid line.

In some cases in which such a valve is periodically opened and closed it is desirable to occasionally change the timing of the opening and closing. For example, in the making of dinnerware by automatic machinery the clay from which the ware is made is shaped on a mold by a mechanical jiggering tool. During the jiggering it is necessary to spray the blank with water. The amount of water applied and the time at which it is turned on and off relative to the start and stop of the jiggering are factors that have a very definite bearing on the quality of the ware produced. The opening and closing of the valve that controls the application of water to the blank can be set properly for a given set of conditions, but when these conditions vary the valve timing may no longer be correct. In such cases the ware may be inferior to what it should be.

It is among the objects of this invention to provide a fluid control of simple and inexpensive construction that can be quickly and easily adjusted to vary both the length of time during which a valve is open and the time relative to an associated operation at which the valve opens and closes. Another object is to provide such a control that can be adjusted while the valve-actuating apparatus is in motion.

In accordance with this invention, means for operating a valve in a fluid conduit is actuated by a plurality of control members that are moved in unison for this purpose. The control members are also adjustable relative to each other so that their relative operative positions may be changed at will. Preferably, the control members are cams that are mounted on a driven shaft by which they are normally rotated as a unit, but around which they may be turned independently of each other to vary the length of the effective valve-opening surfaces of the cams and vary the moment of opening or closing of the valve relative to the operations of the rest of the machine. The adjusting of the cams is most suitably effected through the medium of a differential-like gear mechanism.

The preferred embodiment of the invention is illustrated in the accompanying drawings in which Fig. 1 is a plan view of my apparatus connected to a valve-operating member; Fig. 2 is a vertical section taken on line II—II of Fig. 1; Fig. 3 is a vertical section taken on the line III—III of Fig. 2; and Fig. 4 is a horizontal section taken on the line IV—IV of Fig. 2 and showing the cams in one of their adjusted or modified positions.

Referring to the drawings, a pair of axially aligned pipes 1 are clamped in a pair of spaced clamping members 2 secured to the top of a gear housing plate 3. Connecting the adjacent ends of these pipes is a valve of the type shown in Patents Nos. 1,850,879 and 1,944,739 to Nathan C. Hunt, and which is opened and closed by moving a collar-like valve member 4 axially. For this purpose the collar is provided with upwardly and downwardly extending pins 6 that extend into the bifurcated ends of a yoke 7. The outer end of this yoke is rigidly mounted on the upper end of a shaft 8 rotatably disposed in a vertical sleeve 9 extending down through top plate 3. Rigidly mounted on the lower end of the shaft is one end of an arm 11 in the free end of which a roller 12 is journaled. Encircling the valve between collar 4 and one of the clamps 2 is a coil spring 13 that biases the collar toward valve-closing position in which exhaust ports 14 are uncovered as shown in Fig. 1.

For actuating arm 11 in order to turn shaft 8 and thereby cause the yoke to move the collar axially to valve-opening position, cam means is provided. This means preferably takes the form of a pair of adjoining cams 16 and 17 mounted on a vertical shaft 18 journaled at its upper end in a bearing 19 in top plate 3, and at its lower end in a bearing 21 in a bottom supporting plate 22. These two plates are spaced apart by vertical tie and spacing members 23 extending between them. Roller 12 is wide enough to engage both cams at once. The lower end of the center shaft projects from the bottom plate and carries a sprocket 24 which is driven by a chain 26 that also passes around an adjustable idler sprocket 27 mounted on a bracket 28 at one side.

The cams are rotatable around the shaft, but are normally held against such rotation in the following way so that they will be driven by the shaft. The cams are rigidly mounted on the hubs of a pair of bevel gears 31 and 32 that are rotatably mounted on the reduced inner ends of a pair of bushings 33 on the drive shaft. Spaced from these bevel gears by the enlarged outer ends of the adjoining bushings are bevel gears 34 and 36 which are rigidly mounted on the shaft. Meshing with the upper pair of gears is a bevel pinion 37, and with the lower pair is a similar pinion 38, both of which are journaled on stub shafts 39 projecting radially inwardly from up-

per and lower cylindrical rings 41 and 42 that encircle the two pairs of gears. Each of these rings is rotatable independently of the other around the gears for a purpose about to be described, but is normally prevented from rotating by a set screw 43 that engages it and is threaded in a peripheral flange 44 of the adjoining housing plate. The rings and flanges 44 may be provided with scales to aid in adjusting the rings.

It will thus be understood that when drive shaft 18 is rotated by the sprocket at its lower end it rotates bevel gears 34 and 36 rigidly mounted thereon which in turn rotate the bevel pinions and cause them to drive the inner bevel gears 31 and 32 in the opposite direction. These inner gears rotate the cams mounted thereon which periodically swing cam follower arm 11 outwardly and thereby open the valve.

As the cams rotate together as a unit, the length of time that the valve is open depends on the amount of time required for the cam surfaces of both cams to pass the cam follower roller. To increase this time the effective length of the cam surfaces in engagement with the roller is increased by rotating the cams relative to each other the desired distance. This is done by loosening one or both of the set screws 43 and then turning the adjoining ring or rings by means of the handles 46 projecting therefrom. When a ring is turned, it carries its bevel pinion 37 in an arcuate path around the registering gear rigidly mounted on drive shaft 18 and thereby rotates the adjoining inner gear in the same direction around the shaft. When one of these inner gears is thus rotated relative to the other inner gear it changes the positions of the roller-actuating surfaces of the cams relative to each other, as shown in Fig. 4. This adjustment of the cams can be made while the drive shaft is rotating, so it is not necessary to shut down the machine for this purpose.

If both rings are turned the same amount in opposite directions from their center position in which they coincide with each other, the valve will be opened sooner and be closed later than before because one of the cams will strike roller 12 earlier in the cycle and the other cam will leave the roller later. If only one cam is turned around the drive shaft, the valve will either be opened sooner or later and be closed at the same time in the cycle as previously, or it will be opened at the usual time and be closed sooner or later, depending on whether the cam is moved ahead or backwardly. If both cams are turned together in the same direction, the valve will either be opened later and closed later, or be opened sooner and closed sooner, relative to the cycle in which the drive shaft is rotated. It will thus be seen that my invention makes it possible to quickly and easily produce an infinite number of variations in the timing of the opening and closing of a valve. Not only may the period during which the valve is opened be increased or decreased, but the moments of opening and closing relative to a given cycle of operation may be independently varied at will.

According to the provisions of the patent statutes, I have explained the principle and mode of operation of my invention, and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. A fluid control comprising means for operating a valve in a fluid conduit, a plurality of cams for engaging and actuating said means, a pair of spaced members, a rotatable shaft extending through said cams and journaled in said end members, a bevel gear rigidly connected to each cam and rotatable on said shaft, a cooperating bevel gear spaced from each of said first-mentioned gears and rigidly mounted on said shaft, a bevel pinion meshing with each pair of bevel gears, a pair of rings encircling said gears and rotatably supporting said pinions, said rings being disposed end to end between said end members and closing the space between them, means for rotating the rings relative to each other and said end members to adjust the position of the cams relative to each other, and means for detachably locking the rings against rotation.

2. A fluid control comprising a valve-operating member, a spring for biasing said member to valve-closing position, a pair of spaced end members, a rotatable shaft extending through one of said end members, an arm connecting the shaft to said member for moving it to valve-opening position, a lever connected to the shaft between said end members for turning it, a plurality of coaxial cams for engaging and oscillating said lever, means for rotating the cams in unison relative to the lever, means including a pair of adjacent coaxial rings for rotating the cams relative to each other, said end members and rings having cooperating overlapping flanges whereby the rings are retained between the end members and close the space between them, and means connected to said end members for detachably locking the rings against rotation.

WALTER H. EMERSON.