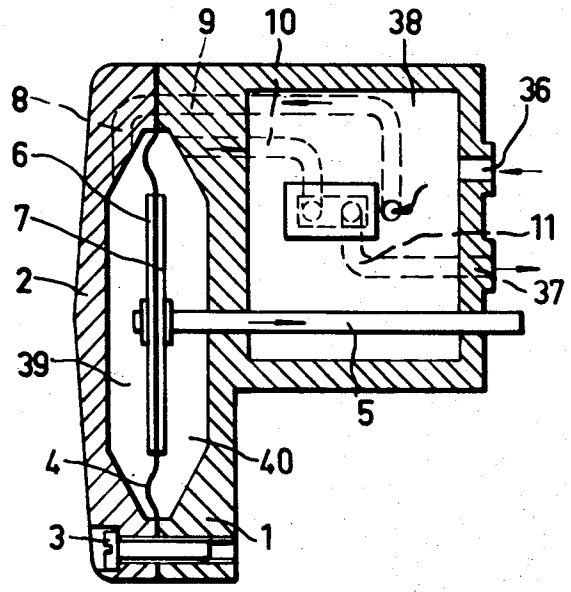
Sept. 6, 1960 H. E. EKLUND 2,951,382

SNAP ACTION DEVICE

Filed Sept. 13, 1957 4 Sheets-Sheet 1

Fig.1



HANS E. EKLUND
INVENTOR

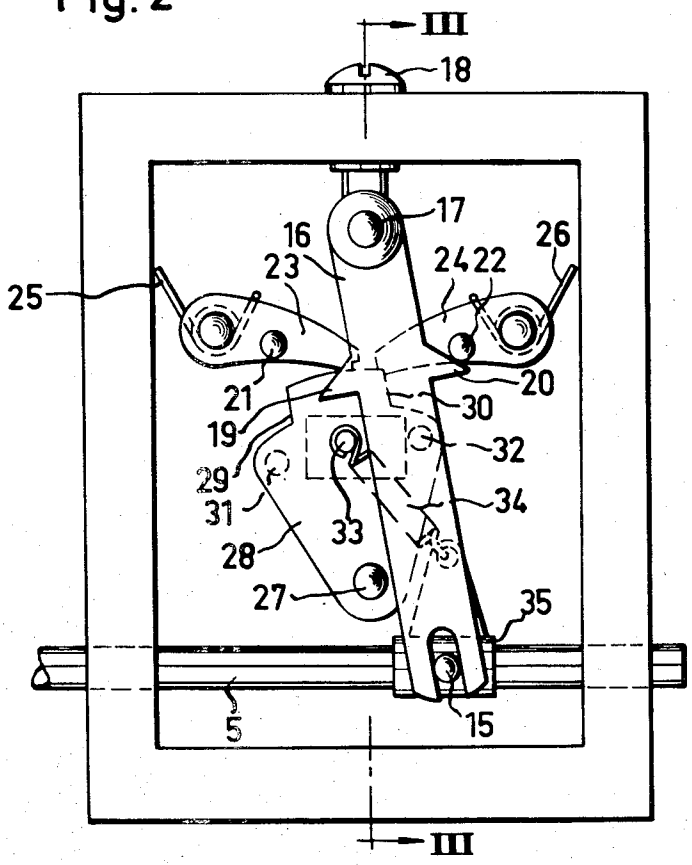
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Fig. 2



HANS E. EKLUND
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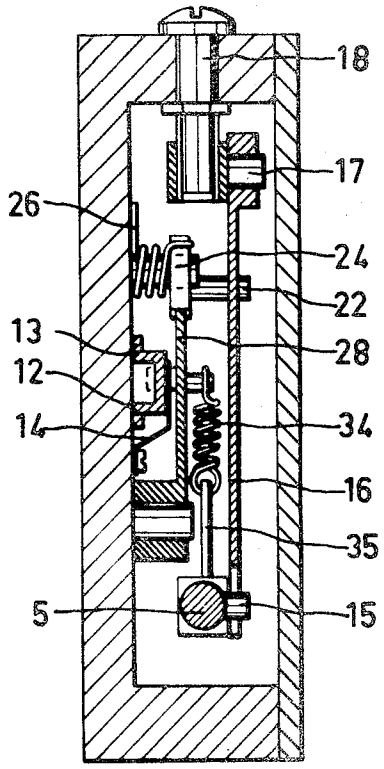
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Fig. 3



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Sept. 6, 1960 H. E. EKLUND 2,951,382

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Fig. 4

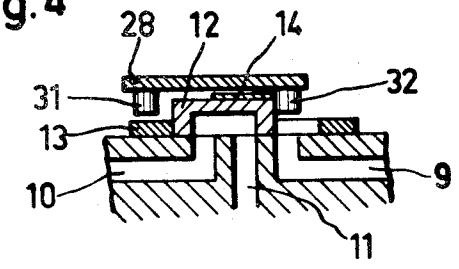
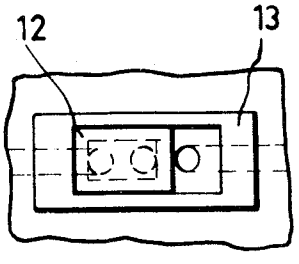


Fig. 5



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United States Patent Office 2,951,382 Patented Sept. 6, 1960

2,951,382

SNAP ACTION DEVICE

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Filed Sept. 13, 1957, Ser. No. 683,833

Claims priority, application Sweden Sept. 15, 1956

4 Claims. (Cl. 74—100)

This invention relates to an arrangement in a liquid meter of the type in which a piston or diaphragm member subjected to the liquid pressure and separating two measuring chambers is adapted to actuate a valve slide with the intermediary of rocking means connected to the piston or diaphragm member by power storing spring means and swingable between two extreme positions in which it is retained by pawls, said rocking means carrying the valve slide along in order alternatingly to open an inlet to one measuring chamber and an outlet from the other measuring chamber and vice versa for liquid to be metered, in that a pivotally mounted releasing member which can be carried along by said piston or diaphragm member is adapted to release one of said pawls at the stroke of the piston or diaphragm member in one and the other direction, respectively, to initiate operation of the rocking means and the valve slide to reverse the liquid supply and liquid discharge and to change the direction of movement of the piston or diaphragm member.

According to the invention, this arrangement in a liquid meter is characterized in that the position of the axis of pivotment of the releasing member is adjustable to permit changing the length of the stroke of the piston or diaphragm member.

With the described arrangement it is quite generally realized that the function of the type of liquid meters herein concerned in dependence on the amounts of liquid to be measured is ensured by a small number of moveable parts which can be designed in a simple and reliable manner. A special merit of the arrangement is that it permits simple and easy adjustment of the liquid meter for obtaining the correct stroke volume of the piston or diaphragm member.

The rocking means is preferably adapted to engage the valve slide to carry it along only after it has covered a given portion of its rocking movement from either of its extreme positions. This embodiment brings the advantage that before engaging the valve slide the rocking means will have time to store energy of motion so that it is capable of overcoming the frictional resistance and the like of said slide in a safer manner than merely by the action of the static force of the spring means.

For a better understanding the invention will be described more in detail in the following, reference being had to the accompanying drawings which diagrammatically illustrate the invention as applied to a liquid meter having diaphragm means. In the drawings:

Fig. 1 is a section through the liquid meter;

Fig. 2 is an elevation of the arrangement in the liquid meter, taken parallel to the section in Fig. 1;

Fig. 3 is a section on line III—III in Fig. 2;

Fig. 4 is a longitudinal section through the slide valve of the arrangement; and

Fig. 5 is a plan view of said slide valve.

As will be seen from Fig. 1, the liquid meter has a housing 1 which is designed at one end with an annular flange, and a cover 2 with a corresponding flange which

is clamped to the first-mentioned flange by means of screws 3. A diaphragm 4 is clamped between the meter housing 1 and the cover 2, and a rod 5 displaceable in the meter housing is secured to the center of said diaphragm 4. At its central portion the diaphragm 4 is reinforced with two washers 6 and 7. The diaphragm 4 divides the space between the housing 1 and the cover 2 into two uniform, equally large sections. A passage 8 extending from one section is provided in cover 2 and a passage 9 constituting an extension of passage 8 is provided in the meter housing 1. In addition, a passage 10 extending from the other section and a passage 11 leading to an outlet are provided in the meter housing 1. The passages 9, 10 and 11 open into a common slide plane at the wall of a closed chamber in the meter housing. Said slide plane forms the stationary portion of a slide valve, the movable portion of which is a plane valve slide 12 which is guided in a frame 13 and held pressed against the slide plane by a leaf spring 14. Provided in the valve slide 12 is a passage which in one extreme position of said slide connects passages 10 and 11 with each other (the position shown in the drawings), thus connecting the section on one side of the diaphragm 4 to the outlet, while said passage in the slide 12 in the other extreme position thereof connects passages 8 and 9 to passage 11, thus connecting the section on the other side of the diaphragm 4 to the outlet.

The reciprocation of the valve slide 12 between its extreme positions is effected by the force of the liquid to be measured exerts on the diaphragm 4, the liquid being alternatingly admitted through said passages to the sections on both sides of the diaphragm under the control of the slide valve proper. For transmitting the driving force from the diaphragm 4 and its rod 5, respectively, to the valve slide 12 the following arrangement has been provided, which is the subject matter of the invention. The rod 5 has a lateral pivot 15 which is grasped by the lower slit end of an arm 16. Said arm is pivotally mounted in the upper part of the meter housing 1 on a pivot 17 which is disposed on a vertical setscrew 18 which is screwed from above into the meter housing and which in case of need, can be adjusted from outside said housing to raise or lower arm 16 for a purpose to be described later on. The arm 16 is formed with two shoulders 19 and 20 on opposite sides thereof. These shoulders cooperate with lateral pins 21 and 22, respectively, on two pawls 23 and 24 which are mounted in the meter housing at a horizontal distance from each other, turning their hook ends towards each other. Said pawls are under the action of torsion springs 25 and 26, respectively. Pivotally mounted on a shaft 27 in the meter housing 1 is a sector-shaped plate 28, which is symmetrically designed with two abutment notches 29 and 30 in which the pawls 23 and 24 engage. The plate 28 is also provided with two pins 31 and 32 cooperating with the valve slide 12 to move it in one or the other direction. Attached to a pin 33 disposed on the plate 28 at a point on its line of symmetry is a pull spring 34 which has its other end connected to a yoke 35 secured to the rod 5. During each stroke of the latter in one or the other direction the spring 34 will first be tensioned and store force while the plate 28 is retained in its one position by one pawl 23 or 24. At the end of the stroke the plate 28 is released by one shoulder 19 or 20 on the arm 16 carried along by rod 5 releasing the pawl in question. As a result, the spring 34 will rock the plate 28 into its other extreme position. The two abutment pins 21 and 22 on the plate 28 are so arranged that each of them will engage the valve slide 12 to carry it along only after the plate 28 has covered a given portion of its rocking stroke from either of its extreme positions. By this arrangement the plate will have time to acquire a cer-

tain amount of energy of motion before it becomes active to carry the valve slide along, and it is thus easier for the plate to overcome, by stroke action, the friction of rest of the valve slide, which may be considerable as the slide is held pressed against the slide plane not only by the pressure of spring 14 but also by the difference in liquid pressure between the inlet and outlet sides of the meter.

The meter housing 1 has an inlet 36 opening into the slide valve chamber, and an opening 37 forming the outlet from passage 11.

The liquid meter shall be provided with a register (not shown) actuated by rod 5 or arm 16 and registering the number of strokes of the diaphragm 4. The meter is preferably so dimensioned that a whole multiple of the stroke volume of the diaphragm gives a whole litre number whereby the registered number of strokes will correspond to a number of litres of liquid which is directly readable on the register. The registration may also be effected by rod 5 or arm 16 actuating a switch for giving an impulse to a register, possibly a remote register.

The function of the liquid meter described is as follows. Liquid is supplied to the slide chamber 38 under pressure through inlet 36. When the slide 12 occupies the position shown in the figures, the liquid is pressed through passages 9 and 8 into the section or measuring chamber 39 on one side of diaphragm 4. The latter will now be moved to the right as seen in Fig. 1, as is indicated by the arrow on rod 5. Measuring chamber 39 will consequently be enlarged simultaneously as the section or measuring chamber 40 on the other side of the diaphragm 4 is reduced and the liquid contained in the last-mentioned chamber is pressed out via passage 10, slide 12 and passage 11 through outlet 37. At the same time arm 16 is moved by the action of pin 15 to an extreme position, shoulder 20 moving pawl 24 via pin 22 out of engagement with notch 30 in the rockable plate 28 which is thereby released. By the movement of the diaphragm 4 the yoke 35 has also been moved to the right, tensioning the pull spring 34, and when plate 28 is released it is rocked by the spring force into its other extreme position in which the other pawl 23 engages in the other notch 29 by the action of its torsion spring. Having covered a given portion of its rocking movement, the plate 28 begins to carry valve slide 12 along with the aid of pin 31 so that the slide is moved over into its other extreme position. The liquid in chamber 38 will now instead flow through passage 10 into measuring chamber 40, driving the diaphragm 4 in the other direction, and the liquid contained in measuring chamber 39 will be discharged via passages 8 and 9, slide 12 and passage 11. The entire procedure will then take place in the manner already described in connection with the stroke of the diaphragm to the right.

The liquid volume as measured per stroke of the diaphragm 4 and rod 5 is directly related to the length of stroke of rod 5 and thus to the angular deflection of arm 16. To adjust the meter to the correct volume the length of stroke is changed, which is effected by raising or lowering pin 17, i.e. moving it at right angles to the longitudinal direction of the rod. Said raising or lowering takes place by turning setscrew 18. The more pin 17 is raised, at the less angular deflection of arm 16 will the shoulders 19 and 20 thereof release the pawls by reason of the oblique abutment surfaces of said shoulders and the smaller will therefore be the stroke and volume of stroke of the diaphragm.

While the invention has been described with reference to an embodiment chosen by way of example, it is understood that the invention is not limited to this very embodiment. It is thus within the scope of the invention to employ a piston together with a measuring cylinder instead of diaphragm 4.

What I claim and desire to secure by Letters Patent is:

1. A snap action valve actuating mechanism comprising a rocking member for operating a valve means, pawl members cooperating with said rocking member to retain said rocking member in either of two extreme positions, power storing spring means connected to said rocking member for exerting a force thereon alternately in directions on opposite sides of the pivot axis of said rocking member, means for releasing said pawl members alternately, said means including a pivot member, a releasing member pivotally mounted on said pivot member, and means on said releasing member for engaging said pawl members, and means connected to said pivot member for adjusting the position of said pivot member to permit changing the interval between the positions of engagement of said releasing member with said pawl members.

2. A snap action valve actuating mechanism comprising a housing, a rocking member mounted on a wall of said housing for operating a valve means, pawl members mounted on said wall and cooperating with said rocking member to retain the rocking member in either of two extreme positions, power storing spring means connected to said rocking member for exerting a force thereon alternately in directions on opposite sides of the pivot axis of said rocking member, means for releasing said pawl members alternately, said means including an adjustable screw passing through a wall of said housing, a pivot member supported by said screw, a releasing member pivotally mounted on said pivot member and operable to perform a reciprocating movement, and means on said releasing member for engaging said pawl members at the ends of the angular stroke of said releasing member, said stroke being adjustable by a change in position of said pivot member produced by turning said screw.

3. A snap action valve actuating mechanism comprising a rocking member for operating a valve means back and forth, pawl members cooperating with said rocking member to retain said rocking member in either of two extreme positions, an actuating slide member, power storing spring means connected between said rocking member and said actuating slide member for exerting a force on said rocking member alternately in directions on opposite sides of the pivot axis of said rocking member as determined by the instantaneous condition of said actuating slide member, means for releasing said pawl members alternately, said releasing means including a pivot member, a releasing member pivotally mounted on said pivot member and engaged by said actuating slide member so as to be moved thereby in either direction, and means on said releasing member for engaging said pawl members, and means connected to said pivot member for adjusting the position of said pivot member to permit changing the interval between the positions of engagement of said releasing member with said pawl members.

4. A snap action valve actuating mechanism, comprising a rocking member for operating a valve means back and forth, pawl members cooperating with said rocking member to retain said rocking member in either of two extreme positions, an actuating slide member, power storing spring means connected between said rocking member and said actuating slide member for exerting a force on said rocking member alternately in directions on opposite sides of the pivot axis of said rocking member as determined by the instantaneous condition of said actuating slide member, means for releasing said pawl members alternately, said releasing means including a pivot member, a releasing lever member pivotally mounted at one end on said pivot member and engaged by said actuating slide member adjacent the other end so as to be moved thereby in either direction, and means on said lever member between the ends thereof for engaging said pawl members, and means connected to said pivot member for adjusting the position of said pivot

member to permit changing the interval between the positions of engagement of said releasing lever member with said pawl members.

References Cited in the file of this patent

UNITED STATES PATENTS

2,022,442 Stollberg ---------- Nov. 26, 1935
2,069,016 Newton ---------- Jan. 26, 1937
2,090,575 DeMotte ---------- Aug. 17, 1937
2,238,043 Kleen ---------- Apr. 15, 1941
2,292,703 Lawler ---------- Aug. 11, 1942
2,488,125 Hungate ---------- Nov. 15, 1949
2,771,784 Deibel ---------- Nov. 27, 1956