Sept. 26, 1939. C. K. BASSETT 2,174,306

LIQUID METER

Filed March 24, 1938

Fig. 1.

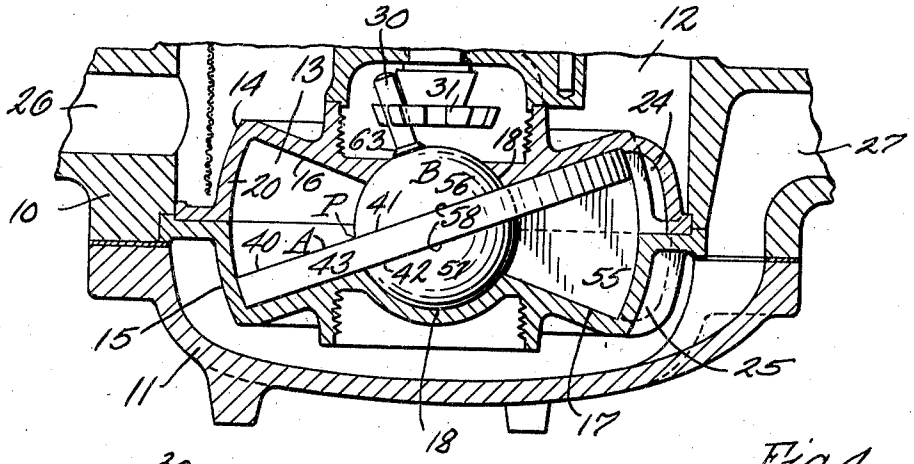


Fig. 2.

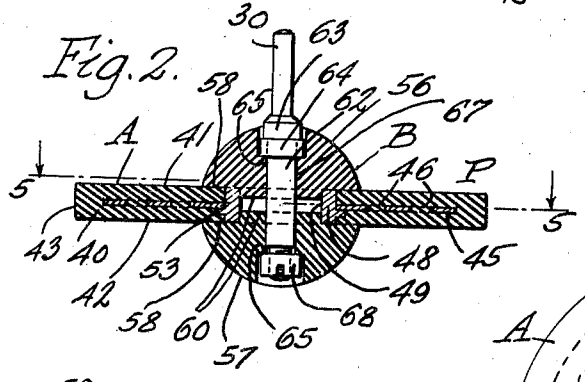
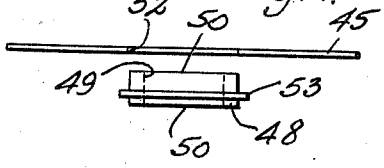


Fig. 4.



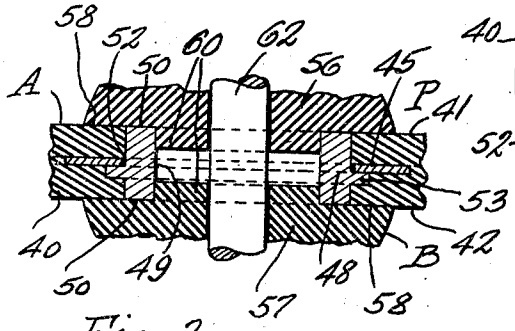


Fig. 3.

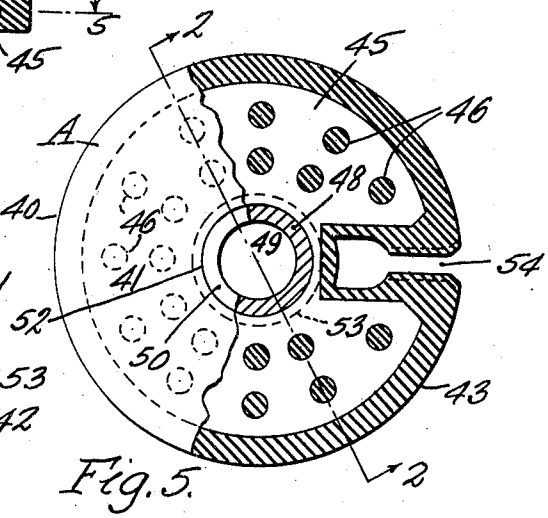


Fig. 5.

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LIQUID METER

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Application March 24, 1938, Serial No. 197,899

3 Claims. (Cl. 121—69.5)

This invention relates to liquid meters or measuring devices, and particularly to improvements in the construction of the disk pistons used in one type of such meter.

Such pistons usually comprise a flat, circular disk and a central bearing sphere, equal parts of which project from opposite faces of the disk. The bearing sphere engages in concave seats in the central portion of a measuring chamber in the meter. The disk piston oscillates on its bearings under the action of the liquid passing through the measuring chamber, during which movement the disk of the piston contacts successively with different portions of the measuring chamber walls.

The disk pistons are usually formed of some moldable material, such as hard rubber, phenolic resin or other plastic compounds, and in order to maintain the true form of the structure, metal reinforcements are embedded in the piston. For example, many of the disks of pistons of this type include a thin sheet metal plate preferably perforated, which is embedded in the material of which the disk is made, and is intended to lie parallel with the opposite faces of the disk, but in the manufacture of the disks, it is difficult to retain the metal plate in the exact position desired, since the material of which the body of the disk is formed becomes softened or liquefied by high temperature in the course of manufacture, and the metal plate shifts from its intended position, due to lack of substantial support or means for definitely retaining it in its intended position.

An important object of the present invention is to construct a disk for use with disk pistons of the type mentioned, in which the metal reinforcing plate is accurately retained in its intended position, and whereby shifting of the metal plate during manufacture of the piston disk is positively prevented; and also to provide improved means for reinforcing and strengthening the disks of such pistons.

Another object of the invention is to provide a disk piston for use in a liquid meter, by the novel construction of which piston corrosion of the meal parts of the disk is eliminated or reduced to a minimum.

In some of the disk pistons as now manufactured, the bearing sphere of the piston is formed of two separate members or segments which are secured upon opposite faces of the disk of the piston by suitable securing means passing through relatively small diameter, alined bores in the two segments and in the disk.

With such constructions it was difficult to retain the piston parts alined in the exact relation desired, since no provision was made to prevent slight lateral displacement of the segments of the bearing sphere relatively to the piston disk either in assembly or in subsequent use, with the result that inaccuracy of measurement of the liquid passing through the meter might result, as the bearing spheres and the disk have to be very accurately manufactured to close dimensions. Thus, any misalinement of the parts of the disk piston during assembly or in after use, might result in improper action of the piston and error in the reading recorded by the meter.

Another object of the invention is to construct a disk piston for the purpose described in which easy, quick and accurate assembly of the parts of the piston and the positive retention of these parts in such position during extended use is assured.

Various other improvements and advantages of this invention will be apparent from the following disclosure of an embodiment thereof, and the novel features of the invention will be pointed out in connection with the appended claims.

In the accompanying drawing:

Fig. 1 is a fragmentary, longitudinal, vertical section of a liquid meter having therein an improved disk piston constructed in accordance with this invention.

Fig. 2 is a vertical, central section of my improved disk piston.

Fig. 3 is a fragmentary, vertical, central section of a part of the piston on an enlarged scale.

Fig. 4 shows, in side elevation, the metal disk and the metal hub used in the formation of the disk portion of the piston.

Fig. 5 is a plan view, partly in section, of the disk of the piston with the bearing sphere and its securing means removed.

In Fig. 1, I have illustrated only sufficient portions of a liquid meter of standard form to show the relation of a disk piston of the type under consideration to the adjacent parts of the meter. The meter includes a main casing, part of which is indicated at 10 and which is open at its lower end, and a base 11 which extends across and closes the lower end of the main casing and is secured thereto at its margin by cooperating flanges. Within a chamber 12 formed by the assembling of the parts 10 and 11, there is disposed a measuring chamber 13 comprising two hollow shells or members 14 and 15, the marginal portions of which interfit and are secured between and held together by the engaging portions of

the main casing 10 and base 11. The upper and lower or end walls 16 and 17 respectively of the measuring chamber are of substantially truncated, conical form, having at their central portions concaved bearing seats 18, and the side walls 20 of the measuring chamber are of curved formation, as shown. The end walls 16 and 17 and the side walls 20 cooperate with the opposite flat faces and circular edge portion respectively of a disk piston P disposed in said chamber, the bearing sphere of which engages in the seats 18. Inlet and outlet ports 24 and 25 are formed respectively in the shells 14 and 15.

The liquid to be measured is introduced into the meter through an inlet passage 26 of casing 10 and is discharged through a passage 27. The liquid, after leaving the passage 26, enters the chamber 12 and thence passes into the measuring chamber 13 through the port 24. The action of the moving liquid causes the disk piston P to oscillate upon its bearing sphere in the seats 18, and as the measuring chamber is filled, the disk of the piston alternately closes the port 24 and opens the port 25 to effect measurement of the liquid by its entrance into, filling up of and exit from the measuring chamber. The piston P, as usual, is provided with a projecting axial stem 30 which engages a wheel 31 forming part of the indicating or recording mechanism, not shown. In each oscillation of the piston, the stem 30 makes a complete revolution with a corresponding movement of the wheel 31.

The meter, as thus far described, is of usual commercial construction and of itself forms no part of the invention.

The disk piston P in the embodiment illustrated in the drawing includes a substantially flat, circular disk A and a bearing sphere B. The disk A of the piston is preferably constructed as follows:

As shown, the disk A includes a substantially flat body portion 40, having opposite upper and lower parallel faces 41 and 42, and a peripheral or marginal wall 43. This body portion may be formed of any usual or suitable moldable material, such as hard rubber, phenolic resin compound or any other suitable plastic compound, and embedded within the body portion 40 is a thin, metal plate 45 which is of smaller diameter than the body 40 and to which the moldable material of the body is bonded. To ensure thorough bonding between these parts, the metal plate 45 in accordance with usual practice, is provided with perforations or holes 46 passing therethrough and into which the material of which the body is formed may enter to form a bond between those portions of the material which are disposed at opposite faces of the metal plate. It is desirable that the metal plate 45 be retained exactly in the position shown, since during the process of manufacture the moldable material of which the body 40 of the disk A is made, often becomes softened or liquefied so that, unless properly supported or retained in its intended position, the plate 45 may become displaced and defeat the purpose for which it is intended, interfere with subsequent steps in the manufacture of the disk, or result in the production of imperfect or rejected disks.

Accordingly I provide novel means for this purpose, a desirable construction being illustrated in the drawing. At the central portion of the disk A, a metal hub or member 48 which is substantially in the form of an annular ring or part having a central bore 49 of relatively large diameter and having opposite end faces 50 which, when the disk is completed, are disposed substantially in the plane of or are coextensive with the opposite, flat faces 41 and 42 of the finished disk 40.

As shown in the drawing, the sheet metal plate 45 is provided with a central hole 52 which is substantially the same diameter or very slightly larger than the outside diameter of the cylindrical wall of the hub 48, so that in assembling the parts to form the disk A, the hub 48 can be inserted in the hole 52 in the disk 45, and in order to retain the disk 45 in the desired position, substantially intermediate of the opposite faces 41—42 of the disk and parallel therewith, I provide suitable means for retaining the disk in fixed relation to the hub so that upon subsequently applying the bonding material to form the disk A, the metal plate 45 will be positively prevented from shifting out of position. In the construction illustrated, I provide the hub 48 with a suitable lateral projetcion upon which the plate 45 may rest when the parts are assembled, the lateral projection shown being in the form of an annular projecting flange or shoulder 53 extending about the hub 48 and upon which the disk 45 may rest.

In order to complete the disk A, the assembled hub and plate may be placed in a mold and the material of which the body 40 is to be made suitably distributed around and bonded to the hub and plate to form the completed disk A, as shown in Fig. 5.

It will be noted that in Fig. 5, the disk is provided with the usual radial slot 54 adapted to straddle an upright, radial partition 55 in the measuring chamber of the meter so that the disk piston may oscillate without rotating about its axis.

While various metals may be found suitable for making the plate 45 and bushing 48, I prefer to make the plate 45 of aluminum on account of its lightness, while bronze or bronze alloy may be used for the bushing 48, since this metal is particularly resistant to corrosion from contact with liquids passing through the meters.

Thus while aluminum may be subject to corrosion from water and other liquids, the aluminum plate 45 of my piston, being entirely embedded in the body material, is never in contact with any liquid, and the bronze bushing 48, even if the liquid should reach it, which is improbable, will not corrode in the usual liquids passing through a meter.

The bearing sphere B of the piston P, before mentioned, is preferably constructed of two substantially segmental portions 56 and 57 which are alike and interchangeable, and each of which has a flat, transverse face 58 perpendicular to the axis of the sphere B and which, when the disk piston P is assembled, engages an adjacent face 41 or 42 of the disk A, their margins preferably extending outwardly beyond and covering the adjacent flat faces 59 of the hub 48.

As before mentioned, the hub 48 is of relatively large size so that a relatively large, central bore 49 may be formed therein. In order to properly center the segments 56 and 57 of the bearing sphere B and retain them in accurate position or relation to the disk A, I provide each segment with a circular shoulder or part 60 projecting from the flat face 58 of the section and which is disposed concentric with the axis of the piston P. The shouldered portion 60 of each disk is of such diameter as to closely fit within the bore

49 of the hub, as shown. Any suitable means may be provided for securing the segments 56 and 57 in assembled relation to the disk A, that shown comprising a shaft or stud 62 which has an extension at one end thereof forming the stud 30, before mentioned. At the inner end of the portion 30, the shaft 62 is provided with an enlargement 63 which engages a spacing member or sleeve 64 surrounding the shank of the shaft 62 and which is adapted to bear upon a shoulder 65 in one of the segments of the bearing sphere B. A nut 68 secured upon a reduced threaded portion at the opposite end of the shaft 62 bears upon the shoulder 65 of the other segment and which, upon being tightened, draws the shaft through the alined bores 67 of the two segments, causing the part 64 to be firmly clamped against the opposed shoulder 65 and the opposite, flat faces 58 of the sections 56 and 57 to bear firmly upon the opposite faces of the disk A.

By this construction, a large, sturdy, interfitting bearing is provided between the segments 56 and 57 and the disk A, permitting greater accuracy in manufacture than is possible in constructions which have no bored hub and shouldered parts of the segments interfitting therewith, as in the present construction.

In such former constructions the flat faces of the segments could slip laterally on the faces of the piston disk, since the only means depended on for retention of the segments in correct relation to the disk was the securing shaft or stud engaging in the relatively small holes in the segments and the disk.

While I prefer to use the shoulder 53 on the hub 48 for retaining the plate 45 in position, other means may obviously be provided for positioning the plate in fixed relation to the hub.

I claim as my invention:

1. A disk for use with a disk piston of the type employed in the measuring chamber of a liquid meter, comprising a cylindrical hub formed of a metal which is non-corrosive in selected liquids handled by the meter, an outwardly extending shoulder on said hub disposed in perpendicular relation to the axis of said hub, a thin plate of a different metal selected for lightness of weight and structural strength having a central hole through which said hub extends with the adjacent portions of said plate engaging said shoulder, and non-metallic bonding material surrounding and bonded to said hub and in which said thin metal plate is entirely embedded and by which it is retained upon said shoulder in operative relation to said hub, and entirely out of contact with the liquids in the meter so that corrosive action on said plate of liquids in said meter is avoided.

2. A disk piston, including a disk having a hub formed of bronze with a central bore and opposite end faces, a thin metal plate having a central hole for the reception of said hub, an exterior projection on said hub intermediate said end faces, relatively rigid bonding material surrounding said hub and in which said plate is entirely embedded, said bonding material being formed with opposite parallel faces which are substantially co-extensive with said end faces of said hub, thereby leaving the latter exposed, a pair of convex non-metallic bearing segments arranged one at each side and centrally of said disk and each having a face contacting the adjacent face of said disk to an extent to at least cover the adjacent face of said hub, and securing means passing through said members, through the bore of said hub and out of contact therewith to retain said members in contact with said disk.

3. A disk piston, including a disk formed of moldable material having opposite parallel faces and reinforcing means therefor including a thin metal plate disposed between and parallel with said faces and entirely covered by said material, and a central cylindrical metal hub having opposite end faces exposed at and co-extensive with said disk faces, said hub having a relatively large cylindrical bore extending from one end face to the other, said piston further including a pair of non-metallic bearing segments each having a convex face and a flat face, the latter being disposed to overlie and extend beyond an end face of said hub, each bearing member also having an annular shouldered part projecting centrally from its flat face and fitting within the adjacent end of said metal hub bore, and securing means fitting in relatively small axial holes in said bearing segments, through the bore of said hub and out of contact therewith for securing said segments to said disk, whereby the plate and hub of said piston are covered by non-metallic material and are out of contact with liquids in the use of said meter.

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