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3,239,191

ART OF MANUFACTURING BALL VALVES

Original Filed Aug. 3, 1962

FIG. 1

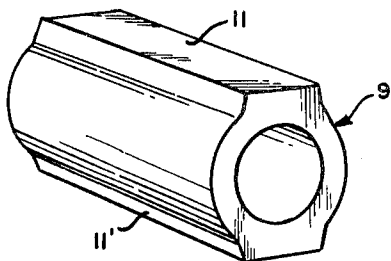


FIG. 2

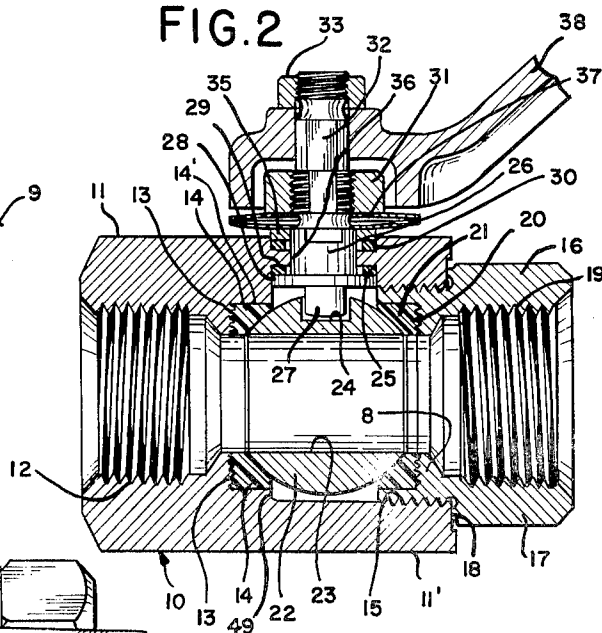


FIG. 3

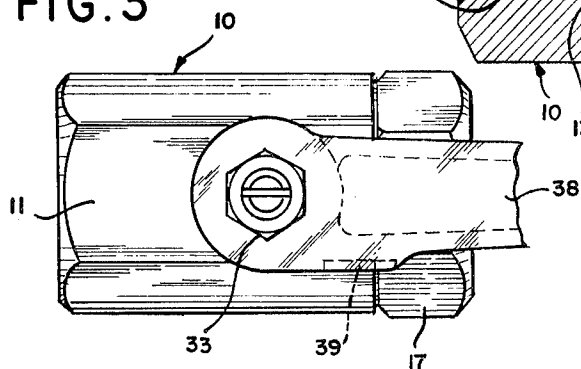


FIG. 4

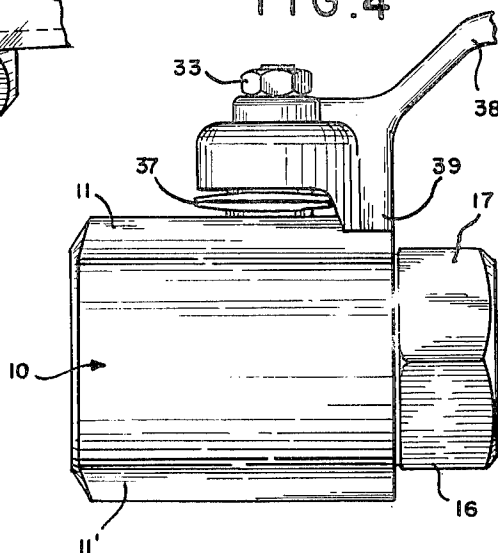
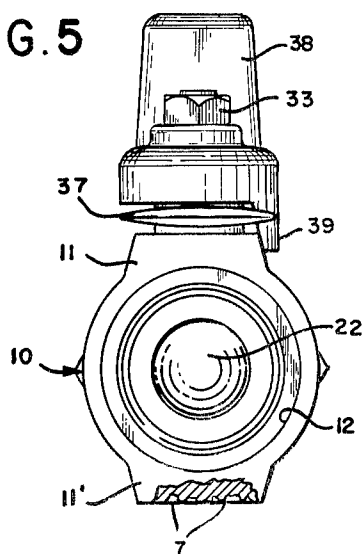


FIG. 5



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ART OF MANUFACTURING BALL VALVES

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Original application Aug. 3, 1962, Ser. No. 214,651.
Divided and this application June 20, 1963, Ser. No.
289,276

1 Claim. (Cl. 251—288)

This invention relates to improvements in the art of manufacturing ball valves, and is a division of my application, Serial No. 214,651, filed August 3, 1962.

The principal objects of the present invention are to provide a novel valve assembly which is substantially less expensive to manufacture than comparable valves in present use; which novel valve is efficient and reliable in operation, easy to disassemble for cleaning or replacement of parts, and which is otherwise particularly well adapted for its intended purposes.

A more specific object of the invention is to provide a ball valve wherein the main portion of the valve body is formed of a cutoff length of either an extrusion or of automatically-machined bar stock which has been specially shaped so that the valve body may be of two-piece construction instead of three, said special shape also providing extra stock which is so located on the valve body that the need for a branch stem or neck is eliminated.

A further object of the invention is to provide a valve as above described which may be advantageously formed of a balanced extrusion having oppositely-disposed, longitudinally-extending ribs, in one of which the valve rating and trademarks may be stamped without danger of knocking the body out of round and without taking away from effective wall thickness.

A further object of the invention is to provide a valve as above described wherein the side of one of the before mentioned ribs of the valve body forms a stop for co-action with a handle lug.

Further objects of the invention are to provide a ball valve assembly which is compact and light in weight, wherein there is little metal wastage, and wherein there is a minimum of machining required.

Still further objects of the invention are to provide a novel ball valve including an improved valve seat assembly, and including novel means for receiving and yieldingly holding the valve stem seals in assembled position.

With the above and other objects in view, which other objects and advantages of the present structure will be seen hereinafter, the invention consists of the improved ball valve and all of its parts and combinations, as set forth in the claim, and all equivalents thereof.

In the accompanying drawing, illustrating one complete embodiment of the preferred form of the invention, and wherein the same reference numerals designate the same parts in all of the views:

FIG. 1 is a perspective view of a length of metal stock from which the main valve body featured in the present invention is formed;

FIG. 2 is a longitudinal sectional view through the improved valve;

FIG. 3 is a top view of the valve;

FIG. 4 is a side elevational view; and

FIG. 5 is an end view of the improved valve.

Referring now more particularly to FIG. 1 of the drawing, it will be seen that the special length of metal tubing 9 from which the main valve body is formed is generally of cylindrical shape but provided with oppositely-disposed longitudinal ribs 11 and 11' which extend the entire length of the material, and which ribs have relatively wide, flat outer surfaces as shown. This form of metal stock may be a "balanced extrusion," readily

produced through relatively inexpensive extrusion methods which are well known in the art, or by machining on an automatic machine from bar stock. As will be hereinafter described in greater detail, the said rib protrusions 11 and 11' provide increased wall thickness, the rib on one side being utilized to provide a bearing for the valve stem, and to eliminate the necessity of using a special, expensive body having a projecting neck for this purpose, which neck must either be a separate part or must be forged or otherwise specially formed from the main body.

As appears in FIG. 2, the main valve body 10 comprises a short length of said ribbed cylindrical bar. Extending longitudinally inwardly from one end thereof is a threaded bore 12. The inner end of said bore 12 merges with a bore portion of lesser diameter having an inwardly facing annular shoulder 49, which is recessed as at 14' to receive an annular sealing ring 14 formed of "Teflon" or the like. Said ring has a concave exposed face to conform to the spherical shape of the ball 22. The abutting end faces of said ring and shoulder recess are serrated, as at 13. "Teflon" sealing rings of the type herein employed are effective for their intended purpose, but they tend to shift or creep in use, and the interfitting serrated faces of the ring and shoulder prevent such shifting.

Extending longitudinally-inwardly from the opposite end of the main valve body 10 is a bore 15 which terminates at the shoulder 49 and communicates with said first bore 12, said bore 15 being of a larger diameter and providing a relatively large cavity within said valve body. An end fitting 16 is threaded into said bore 15 and includes an enlarged head 17 having an annular metal sealing lip 18 adapted to abut the end of said valve body to provide a fluid-tight, metal-to-metal seal.

Said end fitting 16 has a longitudinal threaded bore 19, and formed at the inner end thereof is a radially-inwardly projecting annular shoulder 8 recessed to receive a "Teflon" sealing ring 21 having a concave exposed face to conform to the spherical shape of the ball 22. The abutting faces of said ring and shoulder members are serrated as at 20 to prevent shifting, as hereinabove described.

Mounted within the valve body cavity is a metal ball valve member 22 which is rotatably supported between the concave faces of the aforementioned "Teflon" rings 14 and 21, which form oppositely-disposed annular valve seats. Said ball has a bore 23 extending therethrough which is registrable with the valve bores 12 and 19 when the valve is in open condition, and which bore can be rotated out of registration with said bores 12 and 19 to closed position, as will presently appear.

Referring still to FIG. 2 of the drawing, it will be seen that a transverse bore 36 is formed in the valve body 10 and extends radially outwardly from the central cavity, opening in the flat, top surface of one of the longitudinal ribs 11. Rotatably and removably mounted within said transverse bore 36 is a stem 26 which projects radially outwardly beyond the valve body as shown. The lower, inner end of said stem is provided with a depending key 27 which engages within a groove 24 in the surface of the ball 22 to provide means for rotating said ball, as will be seen. The intermediate portion of said stem is provided with an enlarged collar 28 which rotates in an enlarged bore portion and abuts a composition seal 25 between it and a shoulder 29.

Said transverse bore 36 is provided with an annular enlargement at its upper end communicating with the top surface of the flat rib member 11, and mounted therein and closely surrounding the stem 26 is another composition sealing ring 30 and a metal ring 35. On

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the stem portion immediately thereabove is a spring assembly 37 formed of a pair of oppositely-dished metal washers. Immediately above the spring 37 is a nut 31 which is tightened against said spring and causes the latter to exert constant pressure on the resilient sealing rings 25 and 30. Said nut 31 also functions to prevent downward movement of the stem, and cooperates with the aforementioned collar 28 to removably retain said stem in its bearing.

The stem portion 32 above the nut 31 is flat-sided to coact with a squared opening in a handle 38, and the upper end of said stem has a retaining nut 33 threaded thereon.

Said handle 38 has its underside cupped to fit over the aforementioned retaining nut 31. In order to turn the rotatable ball 22 in the valve body, it is merely necessary to swing the handle 38 laterally, causing the stem 26 to rotate and to consequently rotate said ball through the engagement of the stem key 27 within the ball groove 24. Thus, the ball 22 may be rotated from the open position illustrated, wherein the bore 23 there-through is in alinement with the bores 12 and 19, to a closed position where said ball bore is at right angles to the position shown.

As is shown in FIGS. 4 and 5 and in broken lines in FIG. 3, said handle 38 has an integral lug 39 depending from one side thereof. Said lug is so positioned that a side will abut a side of the longitudinal rib 11 on the valve body when the ball 22 is in a fully-opened position, with an edge of the lug abutting said rib when the valve is closed.

As hereinabove mentioned, an important feature of the improved method of manufacture and valve assembly is that the main valve body 10 has the elongated ribs 11 and 11' on opposite sides which are provided by cutting off lengths of special stock, as shown in FIG. 1. Heretofore, special bodies have been used in order to obtain a projecting neck or branch in which the valve stem could be mounted. With the relatively inexpensive extrusion bar of FIG. 1, the increased wall thickness provided by the rib 11 is utilized for the stem bearing and the necessity for a special body or separable neck is eliminated. The result is a novel ball valve which is substantially less expensive to manufacture than the valves currently in use. In addition, the flat underside of the lower rib 11' may be used to advantage for stamping trademarks, capacity ratings, or other indicia 7 on the valve, as shown in FIG. 5. Due to the rib there is no danger of getting the body out of round during such stamping or of decreasing effective wall thickness because of the marking.

Further important features and advantages of the present structure, as hereinabove described, are that the serrated, interfitting design of the valve seats and shoulders prevents creeping or shifting of said valve seats during use. In addition, the novel spring device 37 on the valve stem is adapted to maintain constant pressure against the stem packing members. Also, in the present structure there is little metal wastage and a minimum of machining.

Another important feature of the present invention

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is that the valve body includes only two principal parts, the main body member 10 and the end fitting 16 which is removably mounted therein. In conventional ball valves, the structure ordinarily includes three interfitting members, which is a more expensive construction, and the entire structure must be unscrewed and separated in order to repair or clean the valve. With the present invention, on the other hand, it is necessary merely to remove the single end member 16, thus providing access to the body cavity, and the cleaning or removal and replacement of the stem and other parts is quick and simple.

It is contemplated that various changes and modifications may occur to those skilled in this art, and it is intended that the invention include not only the illustrated structure but also any and all modified forms thereof as may come within the spirit of said invention, and within the scope of the following claim.

What I claim is:

In a ball valve a generally cylindrical main body having a longitudinally extending external rib throughout its length, said rib having substantial width and having opposite side edges and said body having a longitudinal bore with a valve chamber, a valve movably mounted in said valve chamber for movement between open and closed position, a transverse bore extending radially outwardly from said valve chamber through the thickness of said rib, a valve stem mounted in said transverse bore and having an inner end coacting with said ball to rotate the latter and having an externally projecting outer end, and a handle on said outer end having a stop lug positioned to coact at a first location with one of the side edges of said body rib when the handle is in such a position of rotation that the valve is open, and to coact at a second longitudinally spaced location with the same side edge of the body rib when the handle is in such a position of rotation that the valve is closed.

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