VALVE HOUSING AND METHOD OF MAKING THE SAME

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ABSTRACT

A valve housing has an upper and a lower elongated shell each having opposite end portions and a wider intermediate portion with the intermediate portion of the upper shell also being provided with an opening. Lateral edge faces are provided on the respective shells extending longitudinally thereof and abutting and welded to one another in a plane of separation. A first transverse rib of the lower shell is accurately curved intermediate one of the end portions and the opening and has an upwardly directed surface located in the plane of separation. A second transverse rib interiorly of the upper shell is accurately curved from the first rib towards the opposite end portion and around the opening and has a downwardly directed face which merges with the respective lateral edge faces of the upper shell. A support ring is embraced by and welded to the ribs and has an other downwardly directed face partly overlying and welded to the upwardly directed surface with both of these faces having general planes inclined upwardly from the region of the upper surface and the plane of separation to a level above the latter. The transverse width of the edge faces is at least substantially uniform over the elongation of the shells and the respective inner margins of the edge faces are exposed and offset with reference to the support ring below the general planes of the faces so as to facilitate free access and passage of a welding beam to said edge faces and to the interface defined by the upwardly directed surface of the first rib and the other downwardly directed face of the support ring.

6 Claims, 6 Drawing Figures
VALVE HOUSING AND METHOD OF MAKING THE SAME

BACKGROUND OF THE INVENTION

The present invention relates generally to a valve housing, and more particularly to an improved valve housing construction. The invention also relates to a method of making such a valve housing.

From my prior U. S. Pat. No. 3,473,785 a valve body is known which is intended particularly for globe valves and which comprises two sections welded to each other in a first reference plane and being of substantially circular outline, meaning that their width approximates their length. The sections are provided with arcuate internal rib which are welded to a one-piece seat ring and the latter is located in or parallels the reference plane.

Each of these sections has a substantially conchoidal part which extends from end of the valve body toward the concave side of the respective rib and has a constant depth but flares in a direction toward the respective rib. One of the sections is provided with an annulus whose opening is coaxial with the passage of the seat ring and which is preferably integral with and extends from a flat external surface of the respective conchooidal part.

In that construction it is an important consideration that the particular configuration of the housing sections—which are forgings—be so chosen that the forging can be carried out in a simple manner and with the least possible amount of material. Furthermore, those portions of the respective housing sections which are to be welded to one another, and also of the seat ring, are to be so configured and arranged that the welding can be effected by means of a welding beam, in particular an electron beam. The welding operation itself is carried out under vacuum and requires that suitable welding apparatus be provided. On the other hand the construction is to be such that the valve seat in particular can be made of high-quality materials with a view towards a long life, and that the seat ring can be produced separately from the housing sections and be connected with a supporting ring which during the welding operation is then simply welded between and to the housing sections.

I have found, however, that while the invention disclosed in my aforesaid United States patent is highly advantageous, further improvements are desirable especially with a view to facilitating and simplifying the welding of the housing sections to one another and to the seat and supporting rings, especially by means of welding beams.

SUMMARY OF THE INVENTION

It is, accordingly, a general object of the present invention to provide such improvements.

More particularly it is an object of the invention to provide a valve housing which affords such improvements.

A concomitant object is to provide an improved method of connecting the shell sections of such a valve housing by welding.

In pursuance of the above objects, and of others which will become apparent hereafter, one feature of the invention resides in a valve housing which, briefly stated, comprises an upper and a lower elongated shell each having two opposite end portions and a wider intermediate portion with the intermediate portion of the upper shell being provided with an opening for a valve spindle. Lateral edge faces are provided on the respective shells extending between the respective end portions thereof and abutting and welded to one another in a plane of separation. A first transverse rib is located intermediate one of the end portions and the opening interiorly of the lower shell and is arcuately curved towards the opening; this first rib has an upwardly directed surface located in the plane of separation and merging with the respective edge faces of the lower shell. A second rib is located interiorly of the upper shell intermediate the opposite end portion and the opening and is arcuately curved from the region of the first rib towards the opposite end portion and around the opening, again extending transversely and having a downwardly directed face which merges with the respective lateral edge faces of the upper shell. Finally, a support ring is embraced by and welded to the ribs and has an other downwardly directed face partly overlapping and welded to the upwardly directed surface.

Both of the faces have general planes which are inclined upwardly from the region of the upper surface and the plane of separation to a level above the latter. The transverse width of the edge faces is, as a result of this construction, at least substantially uniform over the elongation of the shells and respective inner margins of the edge faces are exposed and offset with reference to the support ring below the general planes whereby to facilitate free access and passage of a welding beam to the edge faces and to the interface defined by the upwardly directed surface of the first rib and the other downwardly directed face of the support ring.

It will be appreciated that the resulting flattened and relatively wide valve housing with the support ring—which may carry or be of one piece with the seat ring—permits welding of the sections to one another by playing a welding beam (such an electron beam) through one open end of the valve housing, and in particular the inlet end which is defined by the cooperating opposite end portions of the shells which together make up the valve housing. The support ring is to all intents and purposes located closely adjacent the plane of separation of the shells and the plane in which they are welded together, and despite this the configuration of the support ring and that of the transverse rib of the upper shell assures that free access is provided for the welding beam over substantially the entire length of the housing. Thus, the beam does not terminate in the material of the shell and a non-porous weld is obtained at the contacting surfaces which extends over the entire area of the respective contacting surfaces, that is over the entire interfaces between the contacting surfaces. Such a weld is of course highly desirable because of its great strength and lack of porosity. This can be obtained, however, only by the upward inclination of the faces on the support ring and on the rib in the upper shell, which makes it possible to play the beam through the open inlet end of the housing into the interior and against all locations which require welding. Also, with this construction the narrow strip-shaped interfaces between the upper and lower sections have a width which can be well connected over their entire surface area by the welding beam.

According to a further concept of the invention the downwardly directed surface of the rib in the upper shell may be located over the entire length of the arcuate portion of the rib in the upper shell—which faces
the opposite end portion mentioned earlier—with a gap-shaped spacing above the plane of separation, and the underside or downwardly directed surface of the support ring will be similarly upwardly spaced from the plane of separation everywhere except at its portion which overlies the upper surface of the transverse rib in the lower shell.

The construction may be such that the cross-section of the support ring in a plane transverse to the longitudinal axis of the latter is upwardly wedge-shaped in the direction towards the inlet of the housing, that is upwardly from the plane of separation of the upper and lower shells.

For the purposes of the present invention it is important that the support ring is now welded into a cylindrical surround in the upper shell which begins with spacing above the plane of separation of the shells, and that in its region which is located above the rib in the lower shell it is welded with a relatively wide portion of its downwardly directed surface against the upper side or upper surface of the rib in the lower shell.

A particularly advantageous method of connecting the shells of the housing according to the present invention by welding is afforded in that the welding beam is played from the exterior through the inlet opening into the interior of the valve housing defined by the superimposed shells, and is played underneath the support ring with spacing from the lower edge of the latter which is closest towards the inlet, over the interface between the upwardly directed surface of the rib in the lower shell and that portion of the downwardly directed face of the support ring which overlies this upwardly directed surface, with the beam and/or the housing being moved relative to one another substantially in the plane of separation to also effect welding along the interface between the upper and lower shells. This makes it possible for the beam to follow exactly the arcuate curvature of the rib in the lower shell and also to follow the margins of the edge faces which abut one another. It is assured thereby that the weld obtained is uniform throughout as to quality and characteristics.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing.

**BRIEF DESCRIPTION OF THE DRAWING**

FIG. 1 is a somewhat diagrammatic top-plan view illustrating a valve housing according to the present invention;

FIG. 2 is a vertical longitudinal section through the valve housing of FIG. 1;

FIG. 3 is a vertical transverse section of the valve housing in FIG. 1;

FIG. 4 is a top-plan view of the lower shell;

FIG. 5 is a bottom plan view of the upper shell; and

FIG. 6 is a bottom view of the support ring.

**DESCRIPTION OF THE PREFERRED EMBODIMENTS**

Discussing now the drawing in detail with respect to FIGS. 1–6, it will be seen that the novel valve housing according to the present invention has two longitudinally spaced flanges 1 by means of which it can be connected with suitable conduits, for instance by welding. Intermediate these flanges 1 the housing is provided with an upper shell 3 and a lower shell 4, with the upper shell 3 carrying a cover mounting ring 2. The upper shell is formed (see FIG. 5) with an internal arcuately curved transverse rib 5, and the lower shell 4 is similarly formed with an arcuately curved internal transverse rib 6. A supporting ring 7, whose outline is most clearly evident from FIG. 6, is welded to the ribs 5 and 6 along circumferentially adjacent arcuate sections 32 and 33 (see FIG. 6). A seating ring 8, secured to or of one piece with the supporting ring 7, surrounds the circular valve seat opening 9.

FIGS. 2 and 3 indicate the plane of separation X—X which approximately parallels the plane of the valve seat and along which the upper and lower shells 3, 4 are welded together in the region of their longitudinal edge faces 18. It should be noted that the plane X—X is located somewhat below a central axis A passing through the inlet and the outlet of the valve housing, this axis A is indicated in broken lines in FIG. 2 with the inlet being at the left-hand and the outlet being at the right-hand side of the Figure. The inlets and outlets are each defined by the respective cooperating end portions of the upper and lower shells 3 and 4 and in the illustrated embodiment are of circular outline. The internal diameter of the inlets and outlets and the cross-section of the valve seat opening 9 are approximately equal. The internally projecting beads at the inlets and outlets may be partially or completely removed during the final processing of the valve housing by means of material-removing techniques.

FIGS. 4 and 5 show most clearly that the shells 3 and 4 are of approximately unchanging depth over their respective lengths but that they widen substantially in their intermediate portions as opposed to their opposite end portions. The cover mounting ring 2 is located on the upper shell 3—and which may be of one piece with the same has a height which is approximately uniform over its entire circumference and may be configured as a ring having lugs 22 each of which may be provided with a bore—tapped or otherwise—for a screw or bolt.

The transverse rib 5 provided in the upper shell 3 corresponds to a portion of arc 23 whose center is offset with reference to the middle of the valve seat opening 9 by a greater distance in direction towards the outlet opening (right-hand side of FIG. 5). The end portions of the rib 5 merge into the edge faces 18 of the shell 3. The shell 4 has the transverse rib 6 which, as shown in FIG. 4, is slightly arcuately curved in the direction opposite to the curvature of the rib 5 along an arc of curvature 27 whose diameter is greater than the inner width of the intermediate portion of the shell 4 and whose center is offset towards the inlet opening (left-hand side of FIG. 4) from the center of the valve seat opening 9. The relationship of the arcs of curvature 23 and 27 is such that their regions of overlap—identified with reference numeral 28—are located in the edge faces 18 where the latter tangentially contact the arc 23 of the rib 5.

FIG. 5 shows, and FIG. 2 shows still more clearly, that the rib 5 of the shell 3 is provided with a centering recess or channel 38 into which that portion of the circumference of the support ring 7 which corresponds to the portion of arc 32 is inserted. The abutting surfaces
of the groove 38 and the portion of arc 32 are welded together with an electron beam or another welding beam, as indicated by the legend in FIG. 2. The depth of the groove 38 is greater than the height of the portion of the ring 7 which it surrounds so that a proper welding by means of a welding beam can be achieved.

As the drawing shows, particularly in FIGS. 2, 3 and 5, the downwardly directed surface of the rib 5 of the shell 3 is arranged in a gap-shaped spacing above the plane of separation and welding X--X of the shells 3 and 4, preferably over the entire arcuate portion 23. Similarly, the downwardly directed face of the ring 7 is appropriately configured so as to be located at a level above the plane X--X in the region in which the ring 7 is surrounded by the groove 38. In other words, the general plane of the downwardly directed faces of the ring 7 and of the rib 5 in the aforementioned portions thereof are upwardly inclined axially of the valve body away from the rib 6 and above the plane X--X, as is very clearly evident in FIG. 2. As a result of this the welding surfaces at the edge faces 18 are of almost uniformly narrow configuration over the entire length of the housing and can be contacted over their entire width by a welding beam which passes through the open inlets F in the direction of the plane X--X, as shown in FIG. 2, whereby appropriate surface-to-surface welding can be effected.

In the region of the arcuate portion 33, which faces towards the outlet of the valve housing (see FIG. 2) and is provided on the rib 6, the downwardly directed face of the ring 7 extends into the plane X--X and contacts the upwardly directed surface of the ring 6. In other words, it is located together with the upwardly directed surface of the rib 6 in the plane X--X to thereby facilitate welding of the ring 7 in the region 33 to the rib 6. The upper surface of the ring 6 is, of course, located in the plane X--X as is also most clearly evident from FIGS. 2 and 3. In this manner the shaping of the surfaces which are subsequently to contact one another and be welded together is very simple but can in a very ready manner be carried out accurately, and similarly the same comments are applicable to the welding operation itself.

In the illustrated embodiment the cross-sectional configuration of the ring 7 in direction transversely to its longitudinal axis is wedge-shaped towards the inlet of the valve housing (left-hand side of FIG. 2). In other words, a wedge-shaped gap is defined between the downwardly directed face of the ring 7 and the plane X--X as is also shown in FIG. 2.

The raising of the downwardly directed surface of the rib 5 with respect to the plane X--X and the similar raising of the downwardly directed surface of the ring 7 assures that a welding beam can be played through the inlet of the housing from the exterior of the latter, and can freely contact all requisite portions of the shells 3 and 4, the ring 7 and the rib 6 without being in any way hindered or interfered with. Moreover, the beam passes through the welding region and can freely exit, so that a proper surface-to-surface welding is assured, with the width of the weld being uniform.

It is particularly advantageous when the welding beam, especially an electron beam, is played into the interior through the inlet of the valve housing, but it is conceivable that an appropriate instrumentation might be introduced through the inlet. Because of the configuration of the valve housing as discussed above, the welding beam can contact the interface between the downwardly directed surface of the ring 7 and the upwardly directed surface of the rib 6 without being deflected or broken, and because the distance between this interface and the device S from which the beam originates (see FIGS. 4 and 5) remains unchanged, and the width of the welded seam does not have any variations, an excellent surface-to-surface weld is obtained.

It is advantageous, although not absolutely necessary, that the valve housing be appropriately clamped or otherwise mounted and be tilted or deflected with reference to the welding beam, with the tilting axis being the point of origin of the beam, that is the location of the device S, and such tilting taking place as indicated by the double-headed arrows in FIGS. 4 and 5 and in the plane X--X. However, it is also possible to mount the housing fixedly and to appropriately tilt the beam with reference to it, or to effect movement of the beam and of the housing both.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of constructions differing from the types described above.

While the invention has been illustrated and described as embodied in a valve housing, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is set forth in the appended claims:

1. A valve housing, comprising an upper and a lower elongated shell each having two opposite end portions and a wider intermediate portion, said intermediate portion of said upper shell being provided with an opening; lateral edge faces provided on the respective shells extending between the respective end portions thereof and abutting and welded to one another in a plane of separation; a first transverse rib interiorly of said lower shell intermediate said opening and one of said end portions and being arcuately curved towards the former, said first rib having an upwardly directed surface located in said plane of separation and merging with the respective edge faces of said lower shell; a second transverse rib interiorly of said upper shell intermediate said opening and the opposite end portion and being arcuately curved from the region of said first rib towards said opposite end portion and around said opening, said second rib having a downwardly directed face which merges with the respective lateral edge faces of said upper shell; and a support ring embraced by and welded to said ribs and having an other downwardly directed face partly overlying and welded to said upper directed surface, both of said faces having general planes which are inclined upwardly from the region of said upper surface and said plane of separation to a level above the latter, the transverse width of said edge faces being at least substantially uniform.
over the elongation of said shells and respective inner margins of said edge faces being exposed and offset with reference to said support ring below said general planes so as to facilitate free access and passage of a welding beam to said edge faces and to the interface defined by said upwardly directed surface of said first rib and said other downwardly directed face of said support ring.

3. A valve housing as defined in claim 1, wherein said shells are castings.

4. A valve housing as defined in claim 1, wherein the cooperating opposite ends of said shells define an inlet, and the cooperating one ends of said shells define an outlet of said valve housing.

5. A valve housing as defined in claim 4, wherein said support ring has a longitudinal axis and is of wedge-shaped cross-section in direction transversely to said axis.

6. A valve housing as defined in claim 4, wherein said general planes are upwardly inclined in direction towards said inlet of said valve housing.
UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,756,560 Dated September 4, 1973

Inventor(s) Walter Siepmann

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the cover sheet, in the heading, item [75] should read as follows: -- Inventor: Walter Siepmann, Belecke/Mohne, Haus Mohnetal, Germany --.

On the cover sheet, in the heading, item [73] should read as follows: -- Assignee: Eugen Vogt, Belecke/Mohne, Germany --.

Signed and sealed this 30th day of April 1974.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR. G. MARSHALL DAHN
Attesting Officer Commissioner of Patents