United States Patent

[11] 3,569,658

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[21] Appl. No. **719,879**
[22] Filed **Apr. 9, 1968**
[45] Patented **Mar. 9, 1971**
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[54] **APPARATUS FOR APPLYING WELD METAL TO THE INTERIOR SURFACE OF A HOUSING FOR A DREDGE PUMP OR THE LIKE**
6 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **219/76,** 219/125; 228/45
[51] **Int. Cl.** **B23k 9/04**
[50] **Field of Search** ..... 219/76, 125, 124, 124 (S)(PL), 60, 60.1; 228/7, 45; 118/207, 214, 624

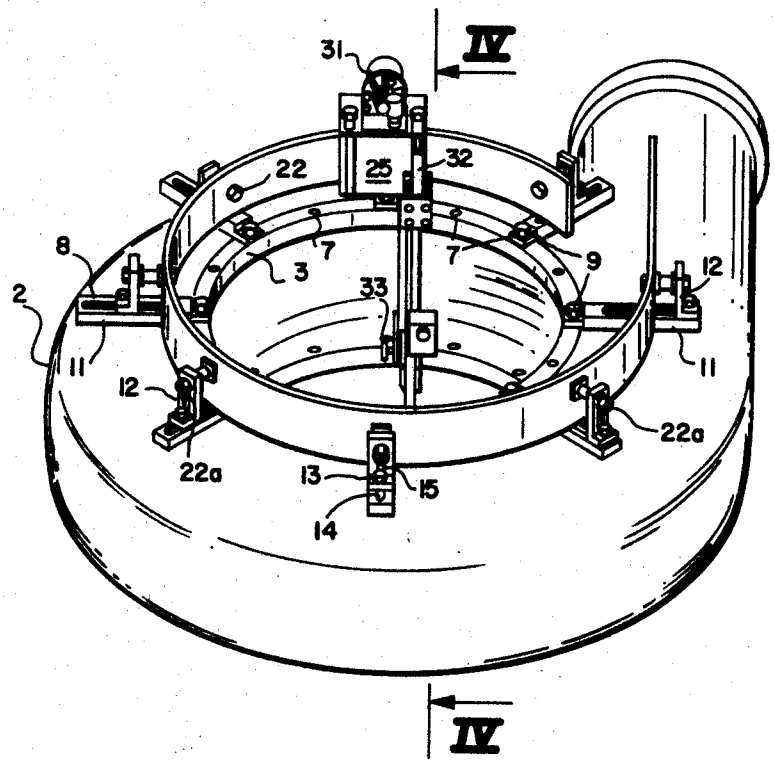
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ABSTRACT: Apparatus for applying weld metal to the interior surface of a housing for a dredge pump or the like at least a portion of which is noncircularly curved comprising a guideway extending substantially parallel to the surface and welding means movable along the guideway and adapted during such movement to apply weld metal to the surface. Adjustable brackets are preferably provided for mounting the guideway whereby all increments of the length of the guideway may be disposed substantially equidistant from the respective corresponding increments of the length of the surface. The guideway is preferably flexible enabling it to be bent or sprung into position substantially parallel to the surface. The guideway preferably has spaced apart means such as openings therein for attachment of the brackets thereto. The brackets may be adjustable in a direction toward and away from the surface and also transversely of that direction. The housing has a side opening and the brackets are preferably mounted on the housing at the edge of the side opening. The housing has bolt holes at the edge of the side opening and the brackets are preferably bolted to the housing through the bolt holes. When weld metal is being applied to the interior surface of the housing the housing is preferably disposed in position lying on its side with the side facing upwardly open and with the welder stationed within the housing. The structure is such that the space over the welder's station is unobstructed affording the welder rapid and easy egress in the event of an emergency.



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SHEET 1 OF 2

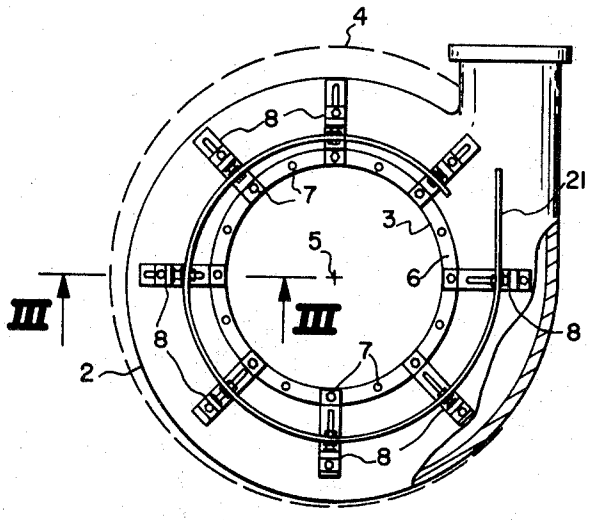


FIG. 2.

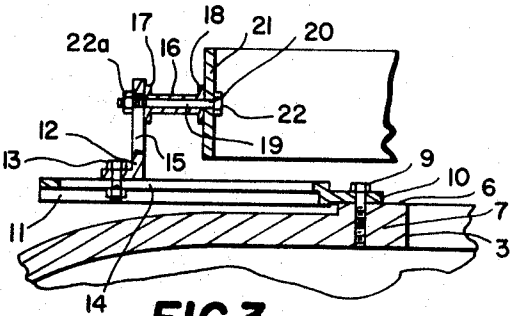


FIG. 3.

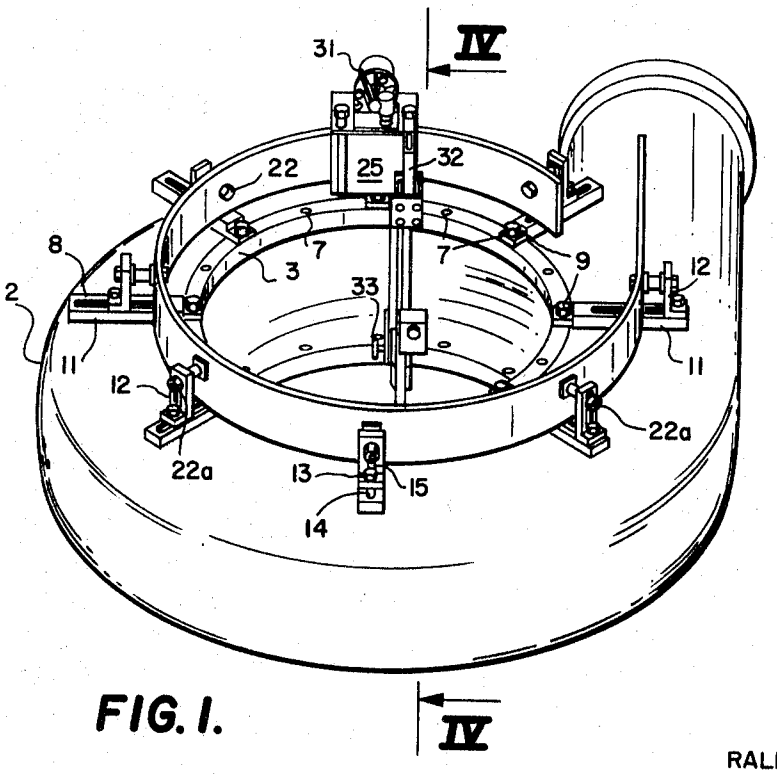


FIG. 1.

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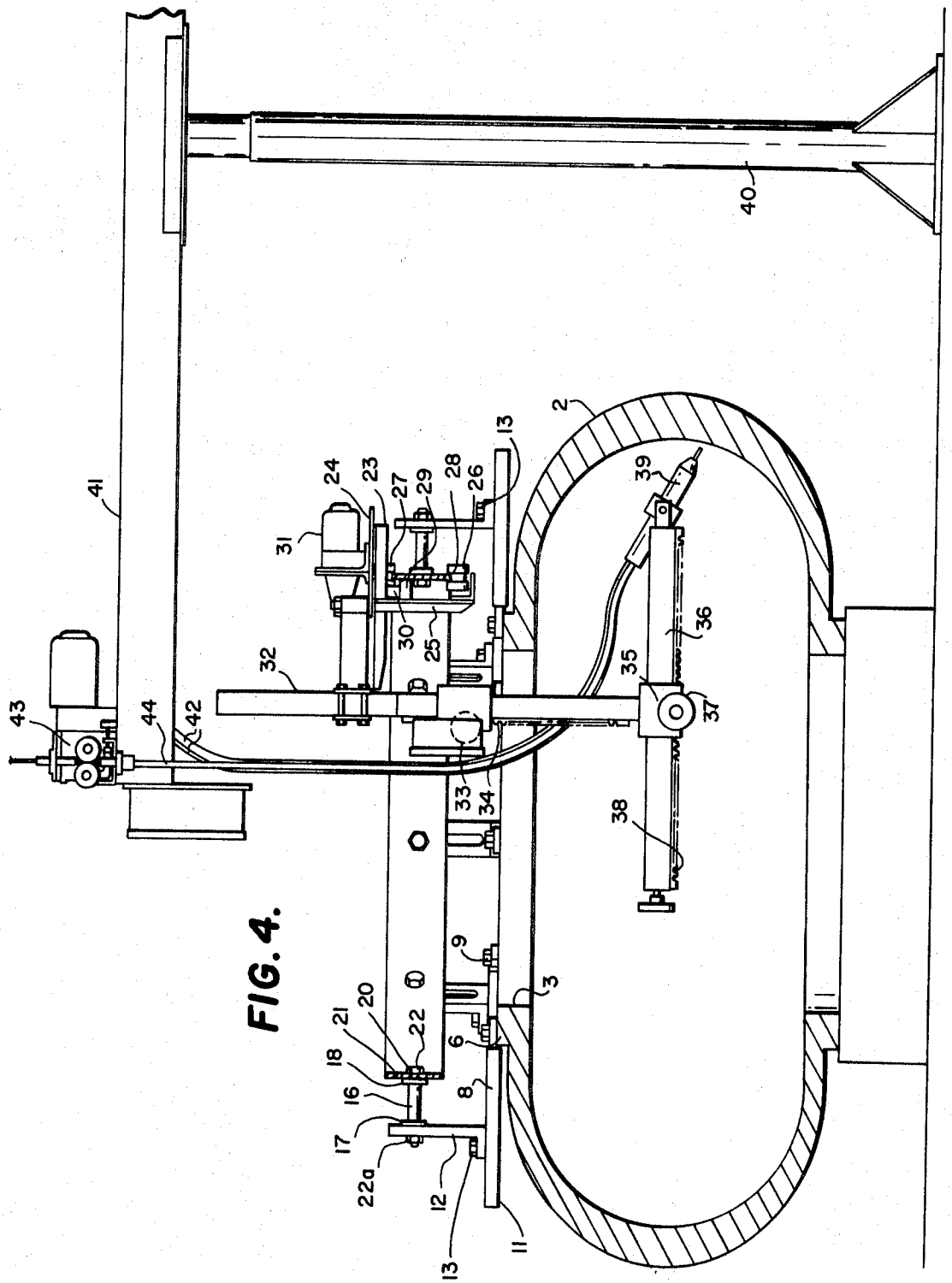


FIG. 4.

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APPARATUS FOR APPLYING WELD METAL TO THE INTERIOR SURFACE OF A HOUSING FOR A DREDGE PUMP OR THE LIKE

This invention relates to apparatus for applying weld metal to the interior surface of a housing for a dredge pump or the like. Dredge pumps are used in the worn of rivers and other waterways to pump sand and gravel-laden water. The pump housings are of great size and mass and are subject to rapid wear due to abrasion or cavitation or a combination of the two. As the interior surface of a pump housing wears a continuously increasing clearance develops between the rotating pump element and the housing resulting in great loss of efficiency. Such loss of efficiency can be tolerated only to a certain point after which the housing must either be replaced or restored to its original internal dimensions by application of weld metal to the work interior surface. Since the housings are costly structures the customary procedure is to build up the worn inner surface by welding. With care such an operation may be repeated as many as thirty or forty times on a single housing.

In preparation for the welding operation the pump is disassembled and the hollow housing or shell which has somewhat the shape of a volute or snail shell is disposed on its side so that the large side openings of the housing are disposed at the top and bottom when the housing is in position for welding. One or more welders standing in such openings or even crawling into the cavity of the larger sized housings apply the weld metal. Stick welding electrodes formerly used have been replaced by semiautomatic welding guns with important saving in application cost. Welders using semiautomatic guns customarily apply metal to the relatively flat portions of the inner surface of the housing first and then rebuild to the centerline or portion of greatest diameter by developing a shelf and then building upwardly upon the shelf layer by layer, each layer consisting of an appropriate number of beads.

As an alternative method to reduce operator fatigue the semiautomatic welding gun has been mechanized by mounting it on a motorized arm rotating about a central pivot and in this way supplying weld metal to the surface being built up. With the accurate vertical positioning of the weld beads which such apparatus makes possible it is customary to start on the horizontal portion of the housing and rebuild to the centerline normally using a minimum shelf technique in which each layer consists of a single bead. By repeating the operation as many times as required the worn inner surface of the housing is built up to the desired extent.

In the use of the prior welding apparatus as just described to apply weld metal to the inner surface of a dredge pump housing the operator must constantly adjust the location of the welding gun on the rotating arm because of the peculiar noncircular shape of the housing. As the welding gun moves around the inner surface of the housing the distance between the pivot about which the gun turns and the surface to which the weld metal is being applied is constantly changing so that the operator must be virtually continuously engaged in adjusting the welding gun at a uniform distance from the work. In the course of applying one complete bead on a large dredge pump housing it may be necessary to hand rack the welding gun outwardly as much as 16 inches and then hand rack the gun back an equal amount to start the next bead. This horizontal distance control occupies more of the welder's time and attention and contributes more to operator fatigue than all the other operations performed by the welder combined.

While previous apparatus for welding dredge pump housings has relieved the operator of the strain of holding the welding gun and manually moving it around the housing he must still attend to the welding with the same continuous intense concentration as is required, for example, in driving an automobile at high speed. After hours of work the welder becomes intensely fatigued and a momentary lapse of attention by the welder may result in running the gun into the work or complete loss of bead control due to undesired separation of the gun from the work. Also the provision of the central

pivot for mounting of the welding gun with the necessary accompanying apparatus acts somewhat as a cage confining the welder and impeding his egress in the event of an emergency.

I have solved the problem previously existing as above pointed out by the provision of apparatus for applying weld metal to the interior surface of a housing for a dredge pump or the like which automatically maintains the welding gun at approximately the desired spacing in relation to the surface to which the weld metal is being applied so that the continuous concentration of the operator in adjusting the welding gun is obviated and only occasional small horizontal adjustments are required. This very greatly reduces operator fatigue and increases efficiency. It also results in improved welding and a superior ultimate product. Also I provide for rapid and unobstructed egress of the welder from the welding station in the event of an emergency.

I provide apparatus for applying weld metal to the interior surface of a housing for a dredge pump or the like at least a portion of which is noncircularly curved comprising a guideway extending substantially parallel to the surface and welding means movable along the guideway and adapted during such movement to apply weld metal to the surface. Adjustable brackets are preferably provided for mounting the guideway whereby all increments of the length of the guideway may be disposed substantially equidistant from the respective corresponding increments of the length of the surface. The guideway is preferably flexible enabling it to be bent or sprung into position substantially parallel to the surface. The guideway preferably has spaced apart means such as openings therein for attachment of the brackets thereto. The brackets may be adjustable in a direction toward and away from the surface and also transversely of that direction. The housing has a side opening and the brackets are preferably mounted on the housing at the edge of the side opening. The housing has bolt holes at the edge of the side opening and the brackets are preferably bolted to the housing through the bolt holes. When weld metal is being applied to the interior surface of the housing the housing is preferably disposed in position lying on its side with the side facing upwardly open and with the welder stationed within the housing. The structure is such that the space over the welder's station is unobstructed affording the welder rapid and easy egress in the event of an emergency.

Other details, objects and advantages of the invention will become apparent as the following description of a present preferred embodiment thereof proceeds.

In the accompanying drawings I have shown a present preferred embodiment of the invention in which:

FIG. 1 is an isometric view of a dredge pump housing disposed on its side for application of weld metal to the interior surface thereof with a guideway for the weld metal applying means atop the housing and disposed substantially parallel to the inner surface of the housing with brackets for mounting the guideway and also showing the weld metal applying means carried by the guideway;

FIG. 2 is a somewhat diagrammatic view to reduced scale showing the housing, the guideway and the mounting brackets for the guideway but omitting the weld metal applying means, the diagram including a circle in broken lines drawn about the axis of the housing to illustrate the noncircular shape of the housing;

FIG. 3 is a fragmentary vertical cross-sectional view to enlarged scale taken on the line III–III of FIG. 2; and

FIG. 4 is a vertical cross-sectional view to enlarged scale taken on the line IV–IV of FIG. 1 and also showing the means for supplying current and feeding the electrode to the welding means.

Referring now more particularly to the drawings, there is shown a dredge pump housing designated generally by reference numeral 2. The housing is shown disposed on its side ready for application of weld metal to its interior surface. Its upper side opening is shown at 3 and is circular, but the housing itself is noncircular, being more in the nature of a volute or

the shape of a snail shell. To illustrate the noncircular shape of the housing there is shown in FIG. 2 in broken lines a circle 4 drawn about the axis 5 of the housing, which axis is also the center of the circular opening 3. Thus FIG. 1 illustrates that the inner surface of the housing to which the weld metal is to be applied is disposed at a constantly changing distance from the axis of the housing as the means for applying weld metal advance along such surface.

A circular flange or rim 6 defines the opening 3. Spaced apart holes 7 are provided in the flange 6 for attachment of a side plate carrying the pump rotor. The holes 7 are utilized for the attachment of adjustable brackets of which any number may be employed, eight being shown. Each of the brackets is designated generally by reference numeral 8 and is bolted to the housing 2 by a bolt 9 extending through a hole 10 in the bracket and through one of the holes 7 in the flange 6 of the housing 2. Each bracket 8 has a generally horizontal element 11 and a generally vertical element 12. The element 12 is adjustably positionable along the element 11 and fastenable in desired adjusted positions therealong by bolts 13 passing through a longitudinal slot 14 in the element 11. Each element 12 has a vertical slot 15. A sleeve 16 having flanges 17 and 18 at its opposite ends is disposed between the element 12 of the bracket and the guideway which is designated by reference numeral 21 with the flange 17 against the element 12 and the flange 18 against the guideway 21. The sleeve 16 is aligned with one of a plurality of spaced apart holes 20 in the guideway 21 and a bolt 19 is inserted through the hole 20 in the guideway, the sleeve 16 and the vertical slot 15 in the element 12 with the bolt head 22 against the inner surface of the guideway. A nut 22*a* is applied to the outer end of the bolt 19 and turned up against the element 12. Thus by means of the plurality of adjustable brackets 8 the guideway 21 is mounted and held in place on the housing 2.

The guideway 21 is flexible enabling it to be bent or sprung into a desired adjusted position. In the form shown the guideway 21 is a steel strip. It is provided with spaced apart means for attachment of the brackets thereto, such means in the form shown being the holes 20. The holes 20 are spaced at fairly close intervals so that selected holes may be used for attachment to the brackets. If in any case a hole 20 originally provided should not be disposed in the proper position for attachment to a bracket a properly positioned hole may be drilled in the guideway 21.

As shown in FIG. 2 the guideway 21 is mounted on the housing 2 by means of the adjustable brackets 8 to extend substantially parallel to the interior surface of the housing. It is this parallel mounting of the guideway relatively to the interior surface of the housing which brings about the unprecedented advantages of the invention above referred to.

The guideway 21 is used for mounting thereon of the welding means, i.e., the means for applying weld metal to the interior surface of the housing, so that the welding means may be advanced along the guideway to deposit weld material on the interior surface of the housing with a minimum of adjustment of the welding means relatively to the housing.

The supporting structure for the welding means is designated generally by reference numeral 23. The supporting structure 23 includes a shelflike portion 24 having a downward projection 25 with rollers 26 and 27 coacting respectively with the bottom and top edges of the guideway 21. Each of the rollers 26 and 27 has flanges 28 embracing an edge of the guideway so that the supporting structure is mounted upon and guided by the guideway. The supporting structure also carries a friction roller 29 mounted on a vertical shaft 30 and engaging the inner face of the guideway 21 as shown in FIG. 4. The friction roller 29 is driven by an electric motor 31 through suitable reduction gearing so that as the friction roller 29 is rotated in engagement with the guideway 21 the supporting structure 23 is caused to move along the guideway.

The supporting structure 23 carries a vertical mounting element 32 which is mounted in the supporting structure for vertical adjustment, such adjustment being effected by a pinion 33 meshing with a rack 34 forming part of the mounting element 32. At its lower end the mounting element 32 carries a bracket 35 in which is mounted a horizontal member 36 horizontally adjustable in the bracket 35 by a pinion 37 meshing with a rack 38 forming part of the horizontal member 36. The welding nozzle or gun is designated 39 and is carried by an end of the horizontal member 36 as shown in FIG. 2. The mounting of the gun 39 is such that its angularity relatively to the horizontal member 36 may be adjusted as desired. Thus the gun 39 may be adjusted vertically, horizontally and angularly.

Mounted beside the housing is a standard having an arm 41 extending over the housing carrying electrical connections 42 leading to the gun 39 and also carrying an electrode drive unit feeding an electrode 44 to the gun 39.

The invention as heretofore explained resides in the flexible guideway 21 and the provision for mounting that guideway so as to extend substantially parallel to the interior surface of the housing for supporting and guiding the welding means therealong. The welding means per se may be conventional and no invention therein is claimed. Because the welding means are conventional such means are shown only diagrammatically as the construction and operation thereof will be understood by those skilled in the art.

In addition to the advantages derived by mounting the welding means for movement parallel to the interior surface of the housing my invention has the further advantage that the space over the welder's station in the housing is unobstructed affording the welder rapid and easy egress in the event of an emergency. This is in contradistinction to prior apparatus in which the welding means are mounted on a central pivot requiring support above and below with cooperating structure forming to a substantial extent a cage over the welder's station making it impossible or extremely difficult for the welder to escape quickly in the event of an emergency.

While I have shown and described a present preferred embodiment of the invention it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied within the scope of the following claims.

I claim:

1. Apparatus for applying weld metal to the interior surface of a housing for a dredge pump or the like while the housing is lying on its side with an upwardly facing side opening, at least a portion of which interior surface is noncircularly curved in the horizontal direction, and which housing affords no homologous surface or edge suitable for guidance and control of welding means, the apparatus comprising a welding means support shaped homologously in the horizontal direction to said interior surface of the housing mounted over the exterior of the housing and welding means supported and located entirely by said support, the welding means having a supporting portion exterior of the housing and horizontally propellable along said support and having another portion extending through the upwardly facing side opening the housing to the interior thereof and adapted during movement of the welding means along said support to closely traverse said interior surface of the housing and apply weld metal thereto without the necessity of a welder working inside the housing continuously adjusting the welding means.

2. Apparatus as claimed in claim 1 in which adjustable brackets are provided for mounting the welding means support whereby all increments of the length of the welding means support may be disposed substantially equidistant from the respective corresponding increments of the length of said interior surface of the housing.

3. Apparatus as claimed in claim 2 in which the brackets have separate elements which are relatively adjustable in a direction toward and away from said interior surface of the housing and also transversely of that direction.

4. Apparatus as claimed in claim 1 in which the welding means support is flexible enabling it to be bent or sprung into position substantially parallel to said interior surface of the

housing and has spaced apart means for attachment of the brackets thereto.

5. Apparatus as claimed in claim 3 in which the brackets are attached to the housing through bolt holes at the edge of the upwardly facing side opening of the housing and the welding means support has spaced apart openings for attachment of the brackets thereto.

6. Apparatus as claimed in claim 1 in which the space over the upwardly facing side opening of the housing is unobstructed affording a welder working in the housing rapid and easy egress in the event of an emergency.

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,569,658 Dated March 9, 1971

Inventor(s) RALPH E. MOORE

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

Column 1, line 7, "worn" should be --dredging--; line "work" should be --worn--. Column 4, line 57 (claim 1, line 14), after "opening" insert --in--.

Signed and sealed this 15th day of June 1971.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

WILLIAM E. SCHUYLER, JR
Commissioner of Patents