This invention relates generally to reciprocating pumps and more particularly to new and useful improvements in a case or housing therefor which is constructed of sheet metal stampings.

Hereinafore pumps and compressors have been made of a casting bored out to constitute a cylinder portion adapted to receive a piston. Frequently two or more cylinders are cast in a block and the shape of the casting then requires expensive grinding and boring operations and to a greater extent than in the case of a single cylinder. In such castings, great care must be taken to properly align the cylinder boring with respect to the crankshaft bearings.

It is an important object of the present invention to provide a pump case or housing having any desired number of cylinders, the integral parts of which may be fabricated from sheet metal and then assembled into an operating structure.

Another object of the invention is to provide a case or housing of this kind with a multiple of cylinders having valve seats intermediate the ends thereof in which valve members for the valve seats are assembled therewith leading to an outlet for a chamber common to the cylinders.

A further object of the invention is to provide a case or housing for a pump which is simple and rugged in construction, economical to manufacture and having the valve members therein readily accessible for replacement and servicing purposes.

For further comprehension of the invention, and of the objects and advantages thereof, reference will be had to the following description and accompanying drawings and to the appended claims in which the various novel features of the invention are more particularly set forth.

In the accompanying drawings forming a material part of this disclosure:

FIG. 1 is a top perspective view of a pump case or housing embodying the invention.

FIG. 2 is a horizontal sectional view taken on the plane of the line 2-2 of FIG. 1.

FIG. 3 is a longitudinal sectional view taken on the plane of the line 3-3 of FIG. 2, with the top closure plate in place.

FIG. 4 is a longitudinal sectional view taken on the plane of the line 4-4 of FIG. 2.

FIG. 5 is a cross sectional view taken on the plane of the line 5-5 of FIG. 2.

FIG. 6 is a top plan view of one end of the case or housing with parts being shown broken away.

FIG. 7 is a bottom plan view with the bottom closure plate removed.

FIG. 8 is a detail perspective view of a valve unit.

FIG. 9 is an exploded perspective view of the case or housing, parts being shown broken away.

FIG. 10 is a top plan view showing the case or housing operatively connected to the drive means of the pump, parts being shown broken away.

FIG. 11 is a side view of a water tank display assembly employing a modification of the invention.

FIG. 12 is a horizontal plan view taken on line 12-12 of FIG. 11.

The reciprocating pump 10 shown in FIG. 10 comprises generally a case or housing 12, upper and lower cylinders 14 and 15, respectively, formed in the case or housing 12, pistons 16 slidably mounted in the cylinders, driven shafts 18 connected to the pistons, pintails 20 connected at one end to the shafts 18 and pivotally connected at the other end to a disc 22 driven by a belt 24 from an electric motor 26.

The present invention is concerned with the case or housing 12 and associated parts. The case 12 comprises a rigid unitary block 30 fabricated from sheet metal. The block 30 is substantially rectangular in plan and configuration and cross section. It is provided with a central plate-like body 32 straight across at its inner end as indicated at 34 and formed with a V-shaped notch 36 at its outer end and slanting end edges 38 on both sides of the notch. An elongated rectangular plate-like extension 40 is formed integrally with the inner end. The slanting end edges 38 are formed with perforations 42 at the ends thereof and the extension 40 is similarly formed with perforations 44 along its long edges, with a series of perforations 45 in line with one long edge of the extension 40 and with a series of perforations 47 in line with the other long edge of the extension.

On the top surface of the plate-like body 32 there is an upright vertically disposed side wall 46 extending along one side of the body and then curving inwardly as indicated at 49 to the inner end of notch 36 and then continuing along one edge of said notch to the adjacent end edge 38. At its other free end the wall 46 extends to a point in line with the free end of extension 40. The wall 46 is formed with outwardly extending flanges 48 and 50 on its top and bottom edges, respectively. The bottom flange 50 is secured to the top surface of the plate body 32 by means of screw and nut units 52 passing through the perforations 47 in the plate body 32 and aligned perforations in the bottom flange 50.

Another upright vertically disposed wall 54 extends along the opposite side of the plate body 32, extending along said side edge with its front end following the tapering side edge of the plate body as indicated at 56. The wall 54 is formed with top and bottom perforated flanges 58 and 60, respectively secured to the adjacent edge of the plate body by means of screw and nut units 62 passing through perforations 56 in the body 32 and aligned perforations in the bottom flange 60. Wall 54 is of substantially the same length as wall 46.

A third vertically disposed elongated intermediate wall 66 is mounted on the top surface of the plate-like body 32 spaced inwardly of side wall 46 and extending along the top surface of one long edge of the extension 40 to the free end thereof. The other end of wall 66 is curved as indicated at 68 conforming generally to the curved portion 49 of side wall 46. The curved end 68 however terminates midway the ends of the plate body 32. Wall 66 is
formed with inwardly extending perforated flanges 70 and 72 along its top and bottom edges, respectively.

A single upright elongated vertically disposed intermediate wall 80 formed with top and bottom perforated flanges 82 and 84, respectively, extending toward the flanges 70 and 72 on intermediate wall 66 is secured longwise of plate body 32 and along the other long edge of extension 40 by means of screw and nut units 86 extending through aligned perforations in the bottom flange 84 and the perforations 45 in plate-like body 32 and the perforations 44 in said long edge of the extension 40. Wall 80 extends straight over the plate body 32, terminating with its inner end in abutting relation with the inner curved portion of the wall 66. The walls 66 and 80 extend to a point aligned with the free end of extension 40.

On the bottom surface of the plate-like body 32 on the side opposite to the wide mounting wall 46, there is a vertically disposed downwardly extending side wall 90 (see FIG. 7) extending part way along said side of the plate body 32 and then extending along the edge of notch 36 opposite to the edge mounting side wall 46. The wall 100 is formed with outwardly extending perforated flanges 92 and 94 along its top and bottom long edges, respectively. Flange 92 is in line with and abutting the perforated bottom flange 60 of the side wall 54, and the flanges and plate body are secured together by screws and the nut units 96 passing through the aligned perforations.

Another vertically disposed downwardly extending side wall 110 extends along the opposite side of the plate body 32 on its bottom surface and along the bottom flange 60 of said wall 54 and at one end curves across the body 32 and then extends along the edge of notch 36 opposite to the edge mounting side wall 46. The wall 100 is formed with outwardly extending top and bottom perforated flanges 106, 108 respectively.

Another vertically disposed downwardly extending elongated intermediate wall 110 formed with top and bottom flanges 112 and 114, respectively, is mounted on the bottom surface of the body 32 spaced inwardly of adjacent side wall 90 and along the adjacent long edge of the extension 40 to the end thereof. The other or front end of wall 110 terminates midway the ends of the body 30. The flanges on the wall 110 are in vertical alignment with the flanges on the intermediate wall 66 and the top flange 112 is secured to the body 32, extension 40, and to the wall 66 by means of screw and nut units 114 passing through the aligned perforations therein.

A vertically disposed downwardly extending elongated intermediate wall 120 formed with top and bottom flanges 122 and 124, respectively, is mounted on the bottom surface of the body 32 spaced inwardly of adjacent side wall 90. The flanges on the intermediate walls 110 and 120 extend toward each other. The other end of wall 120 is curved as indicated at 126 conforming generally to the curved portion of side wall 100. The curved end of wall 120 terminates in a butting relation to the adjacent end of wall 110.

A butterfly valve 130 is pivotally mounted on the top surface of the plate body 32 adapted to close and open the space between the intermediate walls 66 and 80 and the side walls 46 and 54, which spaces lead to a common chamber 132. The butterfly valve is formed with a pair of plate-like wings 134 and 136 and with upper and lower tubular bearings 138 and 140, respectively, at the juncture of the wings. A tubular bearing 142 formed on the juncture of the intermediate walls 66 and 80 fits between the tubular bearings 138 and 140 and a pivot pin 144 extending through the bearings completes the mounting for the valve. The valve is adapted to be swung back and forth with its free bent ends engaging the spaces between the walls 46 and 54 to thereby close and open communication between the spaces between the walls 46 and 54 and the common chamber 132.

A single winged valve 148 is similarly mounted on the abutting ends of the intermediate walls 110 and 120 on the bottom surface of the plate body 32. The mounting comprises upper and lower tubular bearings 150 and 152, respectively, formed on the abutting ends or juncture of the walls 110 and 120. A pivot pin 154 extends through the bearings 150 and 152. The body of the valve 148 is formed at one end with a tubular bearing 156 which fits between the bearings 150 and 152 and encircles the pivot pin 154. Upper and lower flanges 158 and 160, respectively, are formed on the body of the valve 148 to reinforce the same. Valve 148 is so dimensioned that the free end is adapted to be swung into engagement with the inner surfaces of the side walls 90 and 100 to thereby close and open the spaces between the intermediate walls 110 and 120 and the side walls 90 and 100 which spaces lead to a common chamber 162.

Flap valves 164, 166, 170 are pivotally mounted on the inner straight edge 34 of plate body 32 at the sides thereof. The mounting for each flap valve comprises tubular bearings 166, 166 formed on the edge of the body supporting a pivot pin 168. A tubular bearing 170 is formed on one edge of the body of the flap valve which loosely encircles the pin 164. The flap valves 164 hang loosely downwardly between the bottom side and intermediate walls.

A top closure plate 174 closes the top open of the case or housing 12. The plate 174 is similar in shape to the space defined by the side walls 46 and 54 and is secured in place by screw and nut units 176 extending through perforations in the top flanges 48 and 58 of the side walls 46 and 54, respectively. Spaced flap valves 180, 182 are pivotally mounted on the bottom surface of the top plate 174 and hang loosely downwardly between the top side and intermediate walls.

A bottom closure plate 184 closes the bottom of the case or housing 12. The plate 184 is similar in shape to the plate 174 conforming to the shape of the space defined by the bottom side walls 90 and 100 and is secured in place by screw and nut units 186 extending through perforations 188 in the long edge of the plate 184 and through aligned perforations in the bottom flanges 94 and 108 of the bottom side walls 90 and 100. Legs 190 are provided on the sides of the bottom plate adjacent the ends thereof. Bent plates 192 fixed on the top surface of the bottom plate midway its ends serve as stops to limit swinging movement of the flap valves 164, 166.

The top and bottom plates 174 and 184, respectively, the plate body 32, top side walls 46, 54, bottom side walls, 90 and 100, intermediate top wall 66 and 80, intermediate bottom walls 110 and 120, define the cylinders 14 and 15. The cylinders communicate at one end with the common chambers 132 at the top of the case or housing and with the common chambers 162 at the bottom of the case or housing.

In the operation of the pump 10, rotation of the disc 22 reciprocates the connecting pitmans 20 and shafts 18 and in turn the pistons 16. The connections of the pitmans are set 180° apart on the disc 22 so that the pistons move in opposed directions. Control of the fluid through the pump is accomplished by the valve units 130 and 148, 164 and 180 which are operated in response to the fluid pressure in the cylinders 14 and 15 and in the chambers 132 and 162.

The invention exemplifies a pump which includes an enclosure case or housing which is adapted for production, as much as is practical, from stampings or plate metal.

The display apparatus 200 shown in FIGS. 11 and 12 employs a pump constructed according to the principles already described in connection with pump 10. The apparatus includes a generally rectangular tank provided with both inner and outer spaced walls 204, 206 defining a channel 208. Wall 206 is provided with flanges 212 joined to edges of bottom plate 214 by rivets 215. The tank is
closed at the top by a flat transparent plate 216 held by screws 217, so that channel 208 is completely closed. Inside the tank is pump 10A including two parallel horizontal cylinders 218, 220 in which reciprocate pistons 222 and 224 oppositely phased. Piston shafts 226 are connected at their outer ends to pins 28 pivotally joined to disks 230 and 232 carried by a shaft 234 journaled in bearing 236. Shaft 234 carries a pulley 238 on which is entrained a blet 240 engaged on drive pulley 242 of motor 244.

Stub tubes or pipes 246 and 248 connect the cylinders 218 and 220 with channel 208. These pipes are normally closed off by the pistons when pistons are advanced to the right as viewed in FIG. 12. Thus tube 246 is shown closed by piston 222 while tube 248 is shown open just to the right of piston 224.

Ducts 250, 252, join the right ends of the cylinders 218, 220 with the channel 205 through openings 255 in inner wall 204. One way check valves 256, 258 are disposed at opposite end loops of the channel. They normally operate effectively to close the channel since they are held in contact with outer wall 206 by leaf springs 260. Check valves 263 and 264 are provided at ends of ducts 250, 252.

Small boats or other floating objects 266 will circulate around the tank in channel 208 on water or any other liquid placed in the tank. The objects will be visible through the transparent top plate 216.

In operation of the pump 10A, the pistons reciprocate alternately in opposite direction. When piston 222 moves to the right it drives liquid out of cylinder 218 and into duct 250 into channel 208. Valve 258 prevents reverse movement of liquid while valve 256 opens to permit the flow of liquid in counterclockwise direction around the tank as viewed in FIG. 12. Valve 263 closes to prevent liquid from entering duct 252 while piston 224 is moving to the left. When the piston 224 reaches fully open position, then pipe 248 is cleared and water enters and fills the cylinder 220 and duct 252. On the next half of the cycle, piston 224 moves to the right driving liquid into channel 208. Valve 256 prevents the liquid from moving clockwise and valve 264 closes duct 250 while piston 222 moves to the left. By this arrangement the liquid circulates continuously in one direction.

While I have illustrated and described the preferred embodiments of my invention, it is to be understood that I do not limit myself to the precise construction herein disclosed and that various changes and modifications may be made.

What is claimed is:

1. A case for a pump including a drive shaft and pistons operated by elements on the drive shaft, said case comprising, a flat stamped rectangular plate body having an elongated rectangular-shaped central extension, and having V-shaped notch in its other end, side walls above and below the plate body, one of the bottom side walls extending along one long side edge of the body, the other bottom side walls extending part way along the other long edge of the body and continuing across the top surface of the body and along one edge of the notch; one top side wall being aligned with the second named bottom side wall and extending along the adjacent long side edge of the body, the other top side wall aligned with the other bottom side wall and extending part way along said other side of the body and continuing across the top surface of the body and along the other edge of the V-shaped notch, and aligned top and bottom intermediate walls spaced from the adjacent side walls, and flat plates secured to the outer edges of the bottom and top side and intermediate walls closing the bottom and top of the case, the body, side and intermediate walls, bottom and top walls defining cylinders for the pistons, and valve units disposed in the cylinders operable in response to the fluid pressure in the cylinders created by the pistons, wherein one of the valve units comprises a pair of plates loosely suspended from the top closure plate and depending into the cylinders, one of the valve units comprising a butterfly valve pivotally mounted on one end of the upper intermediate walls and adapted to abut against either upper side wall.

2. A case for a pump as defined in claim 1, wherein one of the valve units comprises a single wing body pivotally mounted on one end of the bottom intermediate walls and adapted to be moved into engagement with either bottom side wall.

3. A case for a pump as defined in claim 2, wherein the side and intermediate walls are formed with flanges on the top and bottom thereof, said flanges being perforated and screw and nut units extending through the perforations for securing the flanges to each other and to the plate body.

4. A case for a pump as defined in claim 2, wherein the intermediate walls are aligned with the long edges of the body extension, and wherein the intermediate walls have perforated flanges along the edges thereof, said body and body extension having perforations, and the perforations in the body, extension and flanges being in register and screw and nut units extending through the registered perforations for holding the intermediate walls, body and extension together.

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