

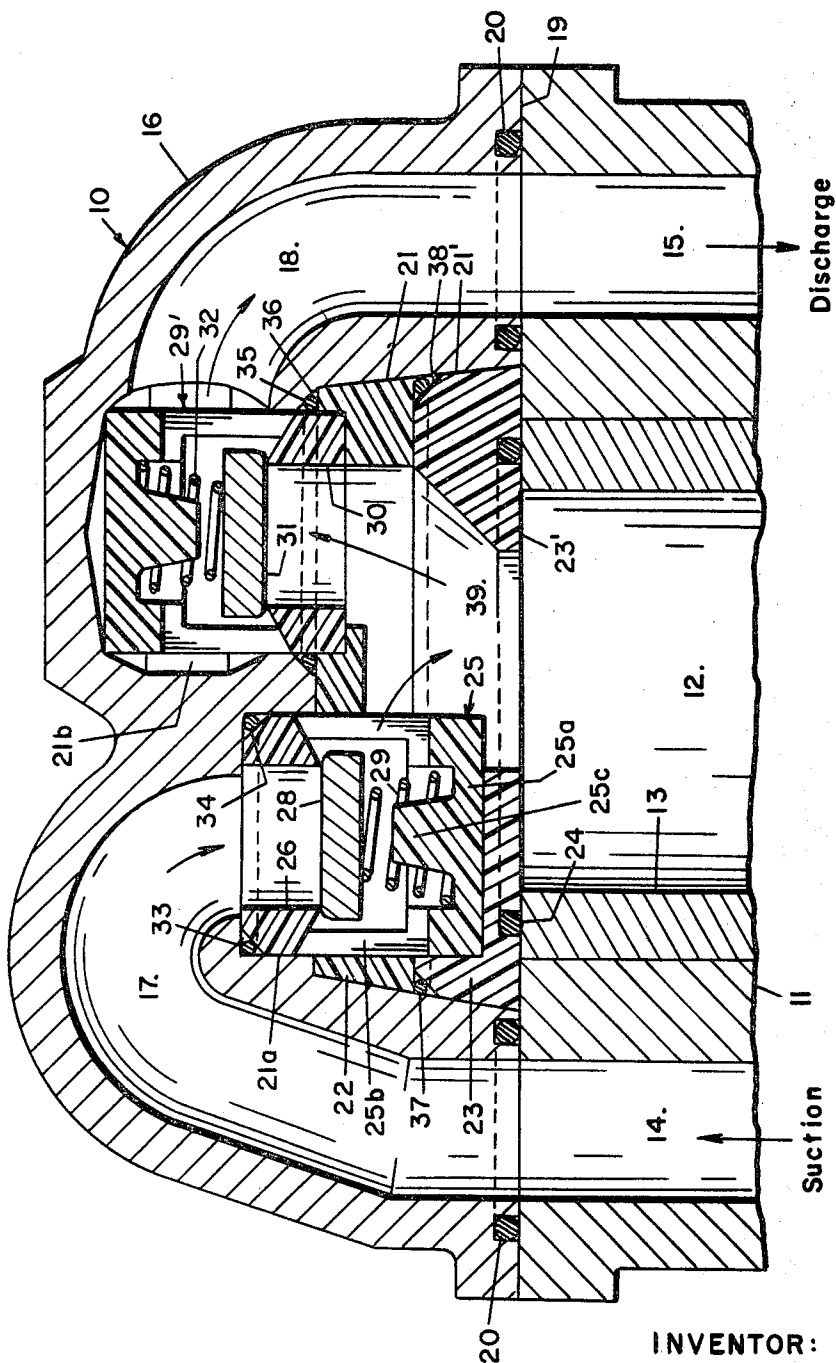
Nov. 26, 1968

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3,412,931

VALVED CYLINDER HEADS

Filed Oct. 18, 1966



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1

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VALVED CYLINDER HEADS

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Filed Oct. 18, 1966, Ser. No. 587,600

6 Claims. (Cl. 230—231)

ABSTRACT OF THE DISCLOSURE

A metallic cylinder head having suction and discharge ports and a chamber communicating the ports with a cylinder. A plastic insert removably positioned in the chamber contains removable suction and discharge valve cages and removable suction and discharge valve seats, all of plastic material. Suction and discharge valve members of metal or ceramic are removably positioned in the respective cages and spring-biased against the respective seats.

This invention relates to new and useful improvements in reciprocating pumps, and in particular the invention concerns itself with an improved cylinder head construction of such pumps, wherein the head is equipped with suction and discharge valves.

In accordance with conventional practice, the cylinder head is a metallic casting which requires expensive machining to close tolerances in order to properly seat on the cylinder block and also to accommodate the valve components which, in themselves, must be accurately machined. Moreover, assembly of the valve components in a conventional head requires special tools and highly skilled labor, so as a result, a conventional valved head is expensive and difficult to service. When the head is associated with a pump used for pumping abrasive and/or corrosive liquids, as for example, chemical sprays in the agricultural industry, the problems become compounded by frequent necessities for service and replacement of parts.

It is, therefore, the principal object of this invention to minimize, if not completely eliminate, the disadvantages of conventional valved heads as above outlined. This object is attained by the provision of valve components which, for most part, are made of plastic material and are assembled in a metallic head casting which does not require any machining at all. Elastomeric rings are employed for sealing the plastic valve components against unmachined surfaces of the head casting to prevent leakage, and also for sealing the head itself against the cylinder block. Moreover, the arrangement is such that the valve components may be assembled in or removed from the head casting without the use of any tools or skilled labor, once the head is removed from the cylinder block.

With the foregoing more important object and features in view and such other objects and features as may become apparent as this specification proceeds, the invention will be understood from the following description taken in conjunction with the accompanying drawing, wherein the single drawing figure shows a vertical sectional view of the valved cylinder head of the invention in position on a cylinder block.

Referring now to the accompanying drawing in detail, the valved cylinder head of the invention is designated generally by the numeral 10 and is shown in position on a cylinder block 11 of any suitable construction. The cylinder itself is shown at 12 and may have a metal or ceramic liner 13, if so desired. The block 11 may also be provided with suction and discharge passages 14, 15, respectively, at opposite sides of the cylinder 12, as will

2

be readily apparent. It will be understood that this particular block construction is shown for illustrative purposes only, and forms no part of the invention which concerns itself only with the valved cylinder head 10.

The valved cylinder head 10 comprises a metallic head casting 16 which is completely unmachined, but is cast with a very fine sand so that its surfaces are sufficiently smooth for effective engagement by elastomeric sealing rings as hereinafter described, thus preventing leakage wherever the sealing rings are in contact with the head casting.

The head 10 is removably attached to the cylinder block 11 by a plurality of conventional cylinder head bolts (not shown), and suction and discharge ports 17, 18, respectively, are provided in the head casting, to register with the respective suction and discharge passages 14, 15 in the cylinder block. The lower face 19 of the head casting which abuts the cylinder block is formed with annular grooves concentric with the suction and discharge ports 17, 18, these grooves accommodating O-rings 20 of elastomeric material for sealing the head against the block and preventing leakage at the junction of the passages 14, 15 with the respective ports 17, 18. The grooves in which the rings 20 are disposed are cast into the metallic head casting, as will be understood.

The head casting 16 is also formed with a central chamber 21 disposed between the ports 17, 18, the chamber 21 having an open bottom, an upwardly tapered annular side wall 21', and upward chamber extensions 21a, 21b which communicate with the suction and discharge ports 17, 18, respectively. Thus, the suction and discharge ports are in communication through the chamber 21 with the cylinder 12.

The valve mechanism involves the provision of insert means of plastic material in the chamber 21, which insert means provide support for valve cages and valve seats to be hereinafter described. To facilitate convenient fabrication and assembly, the insert means are preferably in the form of two superposed, complementary, disc-like insert members 22, 23 of plastic, the side walls of these members being upwardly tapered to fit the tapered side wall 21' of the chamber 21 and the lower face 23' of the lower member 23 being coplanar with the lower face 19 of the head casting 16. The lower face 23' of the member 23 is formed with an annular groove to accommodate an elastomeric O-ring 24 for sealing engagement with the upper end of the cylinder liner 13, or with the upper surface of the cylinder block when the liner 13 is not provided. It will be understood that the groove for the sealing ring 24 is formed in the lower insert member 23 when the latter is molded, so that machining is not necessary.

The insert means 22, 23 provide support for a plastic suction valve cage 25 cooperating with a plastic suction valve seat 26, the cage 25 having a circular end portion 25a formed integrally with circumferentially spaced side pieces 25b which project toward and engage the seat 26 so as to retain the seat in position in the chamber extension 21a, it being noted that the seat 26 is thus in register with the suction port 17. A disc-like valve member 28 is movably positioned in the cage 25 and is resiliently biased against the seat 26 by a compression spring 29 which is interposed between the valve member 28 and the end portion 25a of the cage 25. The case end portion 25a serves to hold the spring 29 centered, and is provided integrally with a boss 25c which functions as a stop to limit movement of the valve member 28 away from the seat 26.

While the entire valve cage 25 and the seat 26 are made of molded plastic, the valve member 28 is formed from material harder than plastic, preferably metal or ceramic. It will be understood that during the suction stroke of

the pump, the valve member 28 will be drawn away from the seat 26 toward the boss 25c against the resiliency of the spring 29, so that passage of fluid from the suction port 17 through the suction valve into the cylinder 12 will be facilitated.

The discharge valve arrangement is the same as the suction valve arrangement, except that it is relatively inverted. As such, the discharge valve includes a discharge valve cage 29' of plastic cooperating with a discharge valve seat 30 also of plastic, the valve seat 30 being supported by the upper insert member 22 so that the valve cage 29' is also supported in the aforementioned extension 21b of the chamber 21, in communication with the discharge port 18. The cage 29' contains a metallic or ceramic valve member 31 which is biased against the seat 30 by a compression spring 32. Manifestly, during the discharge stroke of the pump, the valve member 31 will be forced away from the seat 30 against the action of the spring 32 to facilitate flow of fluid from the cylinder 12 through the discharge valve into the discharge port 18.

To eliminate possible leakage in the valve mechanism, an elastomeric O-ring 33 is provided between the suction valve seat 26 and the wall portion of the chamber extension 21a around the suction port 17, the seat 26 being molded with a bevel 34 to accommodate the ring 33. Similarly, a sealing ring 35 is provided around the discharge valve seat 30 on top of the insert member 22 to engage a bevel 36 which is cast into the head casting at the junction of the side wall 21' of the chamber 21 with the chamber extension 21b. In addition, an elastomeric sealing ring 37 is provided between the insert members 22, 23 to engage the side wall 21' of the chamber 21 as shown, the ring 37 being accommodated by a bevel 38 molded with the insert member 23.

The insert members 22, 23 serve to hold the valve cages and seats in proper position in the head casting, and conceivably, these two members may be formed as an integral unit. However, from the practical standpoint such integral formation may be difficult and thus it is preferred to make the members 22, 23 as two separate, complementary entities.

As already brought out in the opening paragraphs of this specification, the use of plastic valve cages and valve seats in conjunction with elastomeric sealing rings facilitates embodiment of the valve mechanism in a head casting which is completely unmachined, thus effecting a substantial saving in cost through elimination of machining operations. Also, equally important is the fact that the valve mechanism, that is, the cages 25, 29', the seats 26, 30, the valve members 31, 28, the springs 29, 32, and the supporting inserts 22, 23 may be quickly and easily assembled in the head casting 16 by hand, without the use of any tools whatever, and may be removed therefrom with equal expediency for purposes of inspection or replacement, once the head is separated from the cylinder block. In this respect it will be noted that the tapered formation of the side wall 21' of the chamber 21 facilitates convenient insertion of the tapered insert members 22, 23 into the chamber, and that the various components of the valve mechanism are firmly held in place when the head is tightened against the block.

The insert members 22, 23, being annular in form, define a cavity 39 for communication of the valve cages 25,

29' with the cylinder 12 through the open bottom of the chamber 21, this cavity being of a generous size for passage of wettable powders commonly used in spraying operations, so that effects of abrasion are reduced and long life of the valve mechanism is assured.

While in the foregoing there has been described and shown the preferred embodiment of the invention, various modifications may become apparent to those skilled in the art to which the invention relates. Accordingly, it is not desired to limit the invention to this disclosure, and various modifications and equivalents may be restored to, falling within the spirit and scope of the invention as claimed.

What is claimed as new is:

1. A valved cylinder head for reciprocating pumps, comprising in combination, a metallic head casting provided with suction and discharge ports and with a chamber communicating said ports with a cylinder, a hollow insert of plastic material removably positioned in said chamber, a plastic suction valve cage removably held in said insert, a cooperating plastic suction valve seat removably supported in said chamber by said suction valve cage against the head casting and in register with the suction port, a suction valve member of material harder than plastic movably and removably positioned in said suction valve cage and resiliently biased against said suction valve seat, a plastic discharge valve seat removably held in said insert, a cooperating plastic discharge valve cage removably supported by said discharge valve seat against the head casting and in register with the discharge port, and a discharge valve member of material harder than plastic movably and removably positioned in said discharge valve cage and resiliently biased against said discharge valve seat.

2. The device as defined in claim 1 wherein said suction and discharge valve members are formed from metal.

3. The device as defined in claim 1 wherein said suction and discharge valve members are formed from ceramic material.

4. The device as defined in claim 1 wherein said metallic head casting is unmachined, together with elastomeric rings sealing said insert means and said suction and discharge valve seats against walls of said chamber in said casting.

5. The device as defined in claim 1 wherein said metallic head casting is unmachined and has a bottom face engageable with a cylinder block, together with elastomeric sealing rings provided in the bottom face of said casting around said suction and discharge ports.

6. The device as defined in claim 1 wherein said insert comprises two complementary insert members separably and removably assembled in said chamber.

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