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G. G. TUTTLE

PLATE VALVE

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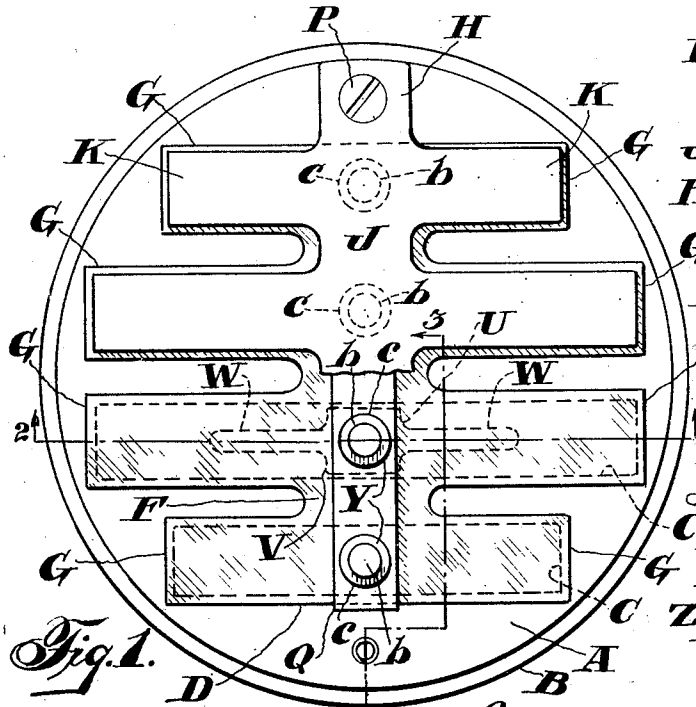


Fig. 1.

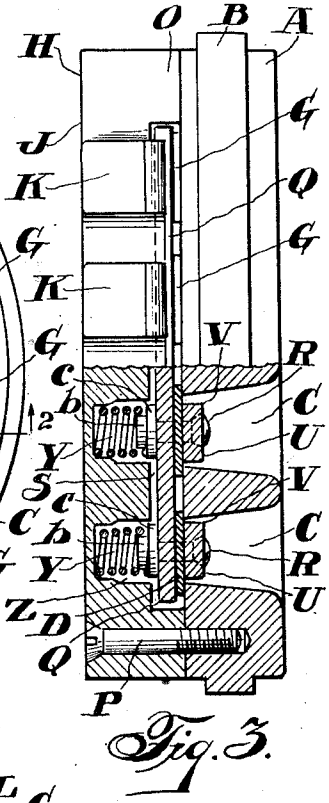


Fig. 3.

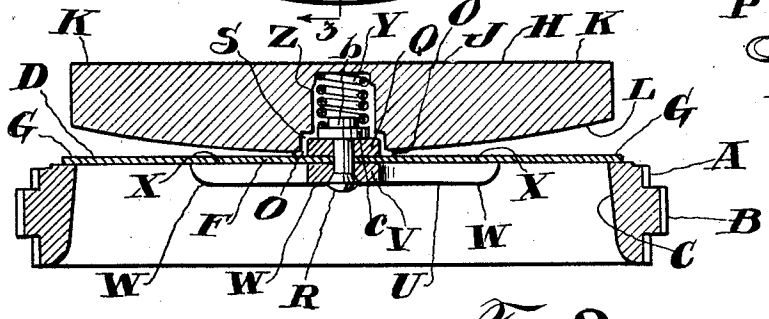


Fig. 2.

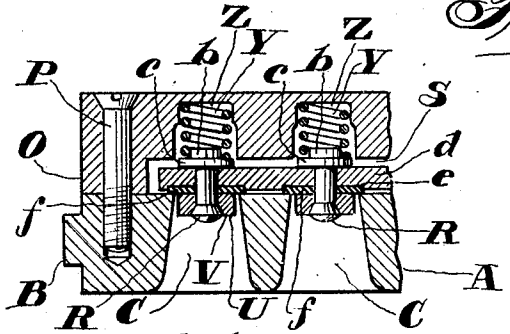


Fig. 4.

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UNITED STATES PATENT OFFICE.

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PLATE VALVE.

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This invention relates to valves of the type used in compressors, pumps and the like for controlling the admission of air into and from a compressor. More particularly, it relates to a flexible type of valve in which the valve is opened and closed by the fluid which it is is adapted to control either when used as an inlet or a discharge valve.

The objects of the invention are to obtain a maximum port area and valve lift, to prevent friction between the various elements of the valve and to reduce the chances of breakage of the valve plate to a minimum.

Other objects will be in part obvious and in part pointed out hereinafter.

The invention is illustrated in one of its preferred forms in the accompanying drawings, in which

Figure 1 is a top plan view with a portion of the stop plate broken away,

Figure 2 is a sectional elevation taken through Figure 1 on the line 2—2 looking in the direction of the arrows,

Figure 3 is an elevation partly in section taken through Figure 1 on the line 3—3 looking in the direction of the arrows, and

Figure 4 is a sectional elevation of a portion of a valve plate showing a modified form of the invention.

Referring to the drawings, the invention comprises a circular valve seat A having a flange B on its perimeter to cooperate with a seat (not shown) of the compressor or similar machine to which the valve may be applied. The valve seat A in this instance is provided with a series of parallel ports C which extend across the valve seat and terminate with their ends at points near the edge of the valve seat.

The ports C are controlled by a valve plate designated generally by D and comprising in this instance a central body portion F and laterally extending fingers G disposed on opposite sides of the body portion F. The fingers G are somewhat wider than the ports C which they control to obtain a substantial contact between the fingers and the valve seat.

Suitable means is provided for limiting the degree of movement of the valve plate. To this end a stop plate H is disposed above the valve plate and, like the valve plate, has a body portion J and lateral arms K on opposite sides of the body portion J. The arms K of the valve stop H are preferably somewhat shorter and of less width than the fingers G of the valve plate so that a substantial area of the fingers G will be exposed to the fluid exhausted through the valve for closing said valve plate.

The inner surface L of the stop plate H is in this instance of convex form to enable the fingers G to contact gradually with the arms K upon opening, thus rendering the valve practically noiseless in operation.

In the present instance the stop plate is provided with lateral projections O at its ends which seat on the valve seat A. The stop plate H is preferably secured to the valve seat A by means of screws P. By thus forming the projections O on the stop plate, the central body portion J of said stop plates is removed somewhat from the body portion F of the stop plate, so that the valve plate as a whole may reciprocate somewhat between the stop plate and the valve seat.

Heretofore in valves of the type in which the flexible fingers have been employed for controlling the ports, considerable expense and delay has been occasioned by the breakage of the flexible fingers. To overcome this undesirable feature in the present invention, a strap Q is disposed on the outer surface of the body portion J to reinforce the valve plate at this point. The strap 2 may be rigidly secured to the valve plate by means of rivets R. The strap Q in the present instance is permitted to extend into a longitudinal recess S in the stop plate and is of sufficiently less width than the recess S to prevent contact between the said strap and the recess during the operation of the valve. For the same reason, the recess S is preferably of greater length than the strap Q and the body portion F of the valve plate D.

Suitable means are provided for supporting the fingers G of the valve plate along their longitudinal axes. Such means in the present instance consists of rigid bars U having hub portions V through which the rivets R extend for clamping the bars U to the body portion F of the valve plate D.

Extending from opposite sides of the hub portion V are arms W, the upper surfaces X of which are adapted to lie in the same transverse plane as the seating surface of the valve seat when the valve plate is closed. In this way the fingers G are adequately supported on their inner side to prevent the back pressure acting against the outer sur-

face of the fingers from pressing or bending the portions of the fingers G which are unsupported by the valve seat into the ports C. It will be noted however that the fingers G may move freely in an outwardly direction independently of the arms W.

In order to insure the prompt return of the valve plate D to its seat, coil springs Y are interposed between the valve plate and the stop plate. In the present instance the coil springs Y are disposed in sockets Z in the stop plate H whereby one end of the springs is held against transverse movement with respect to the stop plate. The opposite ends of the springs Y are held against similar movement by the heads *b* of the rivets R. Preferably, plates *c* are clamped between the heads *b* of the rivets and the strap Q to form spring seats for the inner ends of the springs Y.

The advantages of the present invention reside chiefly in the fact that a wide port area may be obtained and that friction between the movable valve plate and the stationary associated elements has been practically eliminated. The only point of contact between the movable and stationary elements of the valve being that of the seating surface of the valve plate and the cooperating surface of the valve seat. As will be observed, there are no pins or other equivalent means for guiding the valve and the valve plate merely floats between its seat and the stop plate. Owing to the fact that the valve fingers G are suitably supported along their longitudinal axes, bending or buckling of the fingers G has been entirely eliminated, thus enabling the valve plate to seat squarely on the seat A and form a fluid tight contact therewith.

In the modification illustrated in Figure 4, a strap *d*, similar in some respects to the strap Q in the preferred modification, is provided on its inner surface with a series of transverse grooves *e* to accommodate individual valve fingers *f* for controlling the ports C. The valve fingers *f* in this instance are held against oscillation about the rivets R by the grooves *e* and are secured to the strap *d* in the manner described in connection with the preferred modification.

I claim:

1. A plate valve comprising a valve seat having ports, each of said ports extending across the valve seat and terminating at opposite ends near the edge of the valve seat, a valve plate controlling the ports, said valve plate comprising a body portion and oppositely extending fingers, a stop plate for the valve plate, and springs for closing and guiding the valve plate.

2. A plate valve comprising a valve seat having a series of ports extending across the valve seat and with opposite ends to points near the edge of the valve seat, a valve plate controlling the ports, said valve plate comprising a body portion and oppositely extending fingers, a stop plate for the valve plate seated on the valve seat and contacting therewith only at its ends, springs for closing and guiding the valve plate, and reciprocable means for supporting the valve plate intermediate the ends of the fingers.

3. A plate valve comprising a circular valve seat having a series of parallel ports, the opposite ends of each port extending to points near the edge of the valve seat, a valve plate controlling the ports, said valve plate comprising a body portion and oppositely extending fingers, a stop plate for the valve plates, said stop plate having a recess to permit limited reciprocation of the body portion of the valve plate for opening the ports along their entire length, said recess being of greater length than the body portion to prevent contact therebetween, laterally extending arms on the stop plate to act as abutments for the fingers of the valve plate, the inner surfaces of the stop plate being convex, lateral projections at the ends of the body portion to seat on the valve seat, springs between the stop plate and the valve plate for closing the valve plate, and means carried by the valve plate for reinforcing said valve plate intermediate the ends of the fingers.

4. A plate valve comprising a valve seat having ports, a valve plate controlling the ports, said valve plate comprising a body portion and oppositely extending fingers, a stop plate for the valve plate secured to the valve seat, springs for closing the valve plate, and means secured to the body portion for preventing flexion of the fingers in one direction.

5. A plate valve comprising a valve seat having ports, a valve plate controlling the ports, said valve plate comprising a body portion and oppositely extending fingers, a stop plate for the valve plate secured to the valve seat, springs for closing the valve plate, and rigid means secured to the body portion of the valve plate and reciprocable therewith for preventing flexion of the fingers in one direction when the valve plate is in its closed position.

6. A plate valve comprising a valve seat having a series of parallel ports extending across the valve seat and terminating with their opposite ends at points near the edge of the valve seat, a valve plate controlling the ports, said valve plate comprising a body portion and oppositely disposed lateral fingers, a stop plate for the valve plate having a recess to permit the valve plate to reciprocate between the valve seat and the stop plate, arms on the stop plate lying in the same longitudinal plane as the fingers, the inner surface of the stop plate being convex, means secured to the body portion support-

ing the fingers along their longitudinal axes to maintain all portions of the fingers in the same transverse plane when the valve plate is in its closed position, said means being out of contact with the fingers during the open position of the valve, and springs between the valve plate and the stop plate for closing and guiding the valve plate.

7. A valve plate comprising a valve seat having a series of parallel ports, a valve plate controlling the ports, said valve plate comprising a body portion and a plurality of oppositely disposed fingers, a stop plate for the valve plate secured to the valve seat and contacting therewith only at its ends, said stop plate having a recess to permit reciprocation of the entire valve plate, arms on the stop plate lying in the same longitudinal plane as the fingers, the inner surface of the stop plate being convex to permit the fingers to open to wider limits than the body portion of the valve plate, a strap on one side of the valve plate to reinforce the body portion, bars on the opposite side of the valve plate to support the fingers along their longitudinal axes, means for securing the strap and the bars to the body portion, and springs for closing and guiding the valve plate.

In testimony whereof I have signed this specification.

GROVER G. TUTTLE.