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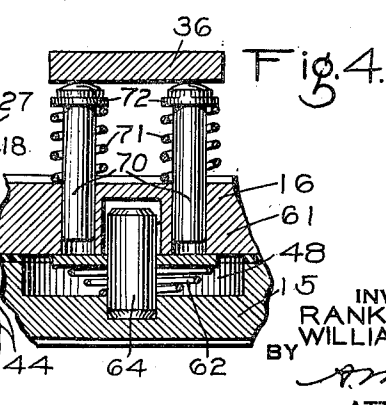
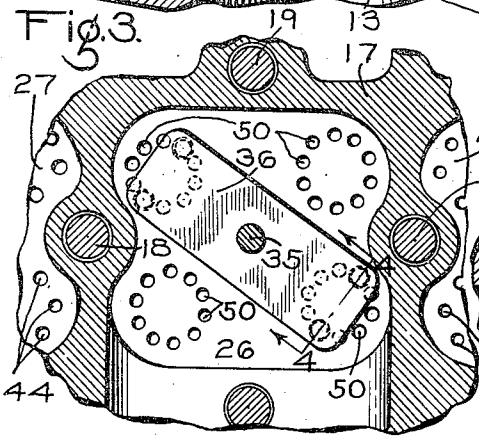
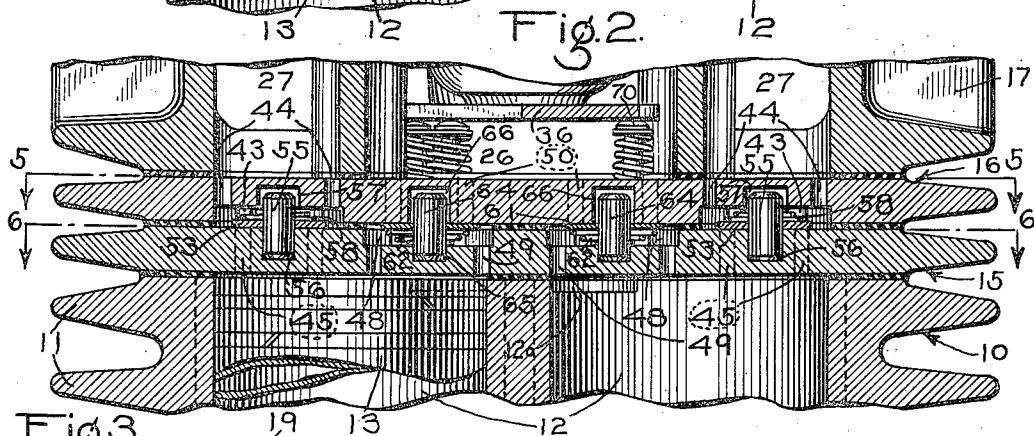
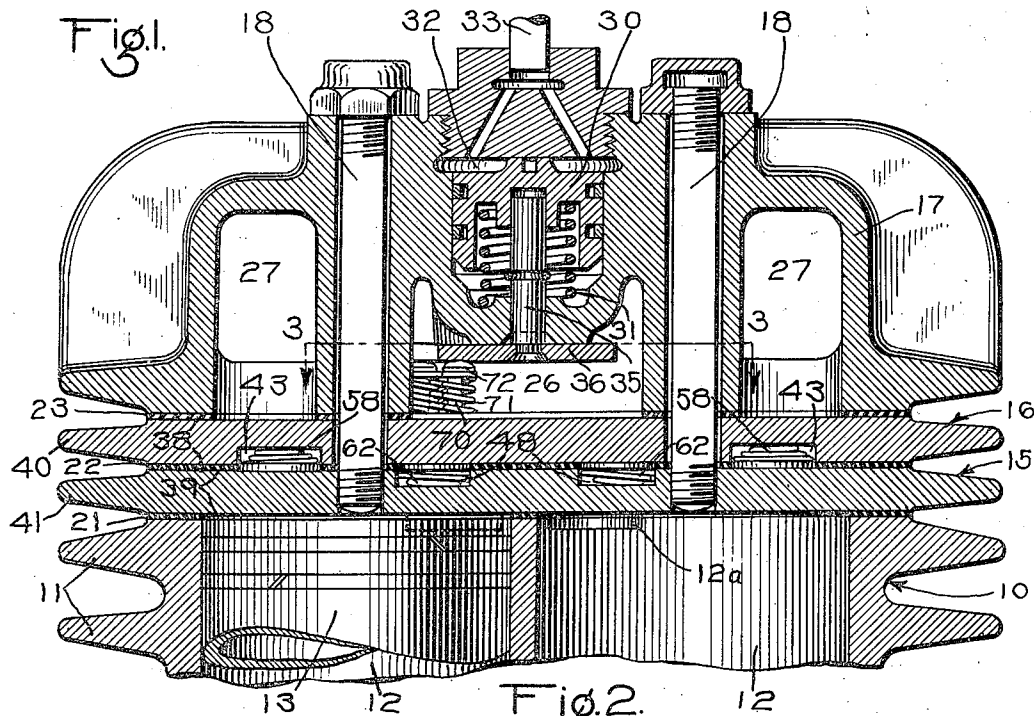
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2,187,931

FLUID COMPRESSOR CONSTRUCTION

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2 Sheets-Sheet 1.



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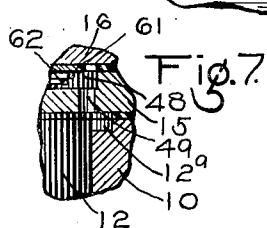
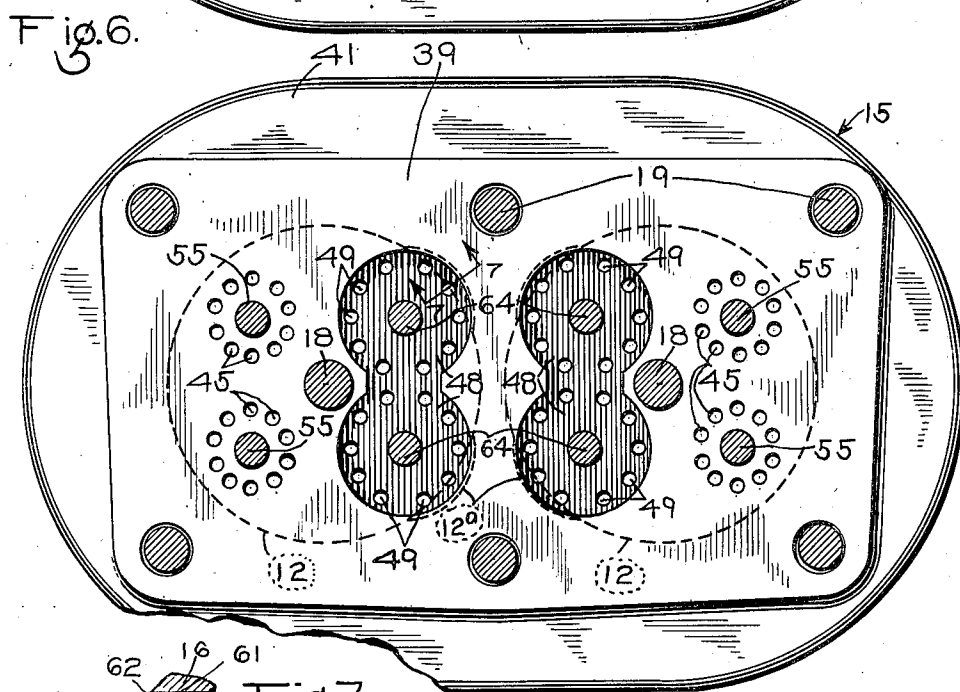
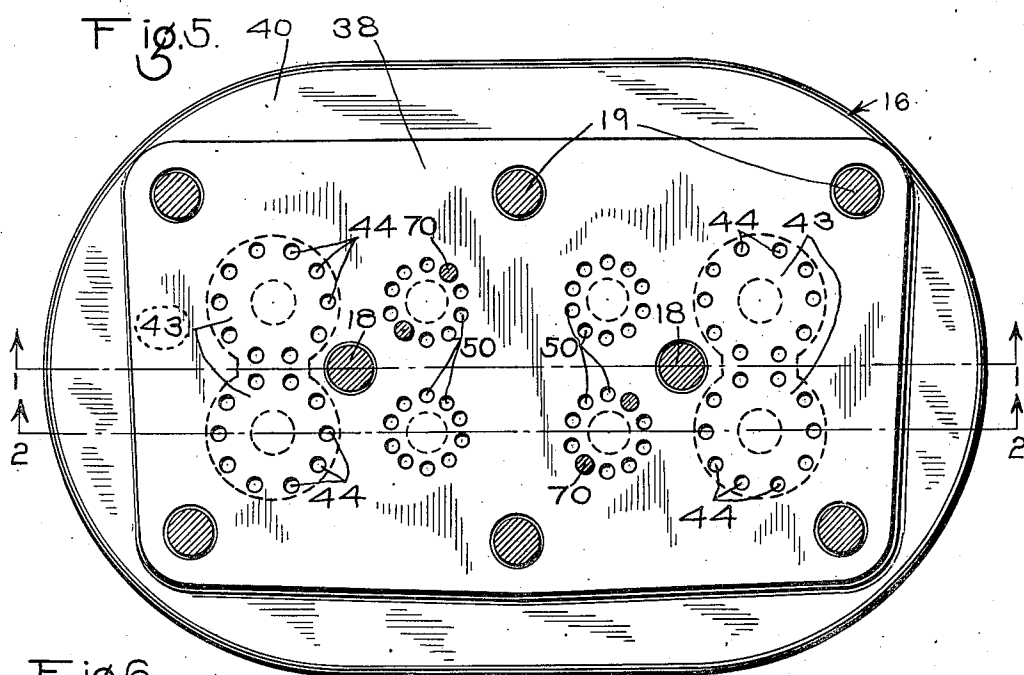
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FLUID COMPRESSOR CONSTRUCTION

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2 Sheets-Sheet 2



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FLUID COMPRESSOR CONSTRUCTION

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2 Claims. (Cl. 230—228)

This invention relates to fluid compressors, and more particularly to improved inlet and discharge valve means for a fluid compressor.

Fluid compressors of the high speed type designed for use with the fluid pressure brake apparatus on automobiles and the like must be provided with inlet and discharge valve means of sturdy but inexpensive construction, which will be capable of operating at high speeds over long periods of time without requiring attention. Such valves should be light enough to operate silently and with minimum resistance to movement, and yet must have adequate flow capacity to permit rapid supply of fluid under pressure. The construction and arrangement of the inlet and discharge valve means of the compressor should, furthermore, be such as will permit inspection and removal of the parts to be performed without difficulty.

The principal object of the invention is to provide an improved fluid compressor comprising inlet and discharge valve means having the above advantages.

Another object of our invention is to provide improved inlet and discharge valve means of simple and inexpensive construction for a fluid compressor, comprising one or more inlet valve mechanisms and one or more discharge valve mechanisms for each compressor cylinder, all of said valve mechanisms being operably mounted in suitable valve chambers formed within a pair of associated plate members adapted to be interposed between the usual cylinder block and the compressor head, so that the valve means will occupy a relatively small space while providing adequate flow capacity, and yet be readily removable as a unit for inspection or repairs.

A further object of our invention is to provide compressor inlet and discharge valve means as above described, the individual valve elements of which comprise centrally apertured discs slidably mounted on stationary guide members and provided with spiral or cone-shaped biasing springs, which act to cushion movement of the valve elements away from the valve seats.

Other objects and advantages of our invention will appear in the following description thereof, taken with reference to the accompanying drawings, wherein:

Fig. 1 is a vertical sectional view of a portion of a fluid compressor embodying the invention; Fig. 2 is a fragmentary sectional view similar to that in Fig. 1 but taken on a different plane; Fig. 3 is a sectional view taken on the line 3—3 of Fig. 1; Fig. 4 is a fragmentary enlarged detail sectional

view taken on the line 4—4 of Fig. 3; Fig. 5 is a sectional plan view taken on the line 5—5 of Fig. 2, and showing at the lines 1—1 and 2—2 the planes of sections for the Figures 1 and 2, respectively; Fig. 6 is a sectional plan view taken on the line 6—6 of Fig. 2; and Fig. 7 is a fragmentary sectional view taken on the line 7—7 of Fig. 6.

Referring to Fig. 1 of the drawings, the fluid compressor comprises a cylinder block 10, which is provided with a plurality of heat radiating fins 11 and is adapted to be mounted on the usual crankcase, not shown, or other suitable base for the compressor. Two cylinders 12 are formed in the cylinder block 10, in each of which cylinders is operably mounted a piston such as that indicated at 13. The fluid compressor further comprises a lower plate member 15, an upper plate member 16 and a compressor head 17, which elements are secured together by suitable means such as bolts 18 and are adapted to be mounted by means of similar bolts 19 to the cylinder block 10 as shown in Figs. 1 and 5 of the drawings, the upper ends of the cylinders 12 being closed by the plate member 15. Suitable gaskets 21, 22 and 23 may be interposed between the adjacent surfaces of the cylinder block 10 and the lower plate member 15, between the plate members 15 and 16, and between the plate member 16 and the cylinder head 17, respectively, for insuring tight joints between these members.

As shown in Fig. 1 of the drawings, the compressor head 17 has formed therein a centrally disposed inlet passage 26 which communicates with the atmosphere, and a discharge passage 27 which partially surrounds the inlet passage and may be connected with the usual receiving reservoir, not shown. An unloading mechanism is mounted in the head 17, comprising a piston 30 disposed in a vertical bore and movable downwardly against the force of a spring 31 upon a predetermined increase in pressure of fluid in a chamber 32, which communicates through a pipe 33 with the receiving reservoir. The piston 30 operatively engages a plunger 35 carrying at the lower end thereof a yoke member 36, which is disposed diagonally in the inlet passage 26 and is adapted to be operated to effect unseating of two of the compressor inlet valves in a manner hereinafter explained.

According to our invention, the upper and lower plate members 16 and 15 are similar in form, as is best shown in Figs. 5 and 6, these plate members being adapted to be assembled into a unit within which the inlet and discharge valve

mechanisms of the compressor are entirely contained.

Each of the plate members 16 and 15 is provided on opposite sides with flat rectangular sealing faces such as indicated at 38 and 39 in Figs. 5 and 6, the portions of the plate members surrounding the sealing faces constituting heat radiating fins 40 and 41, respectively. Formed in the upper plate member 16 are two separate pairs of connected valve chambers 43, which pairs of chambers are adapted to be disposed above the two cylinders 12, respectively, when the compressor is assembled as shown in Fig. 2. Each of the valve chambers 43 is connected through a plurality of circularly arranged passages 44 formed in the plate member 16 with the discharge passage 27 of the compressor head 17, and is concentrically aligned with a plurality of similarly arranged valve passages 45, which are formed in the adjoining plate member 15 and communicate with one or the other of the cylinders 12, as shown in Fig. 2 of the drawings.

Referring to Fig. 6, the lower plate member 15 is similarly provided with two pairs of connected inlet valve chambers 48, each pair being associated with one of the compressor cylinders. Each of the valve chambers 48 communicates through a plurality of circularly disposed passages 49 with the corresponding compressor cylinder 12, as is shown in Fig. 2 of the drawings, and also by way of similarly arranged passages 50 in the upper plate member 16 with the inlet passage 26.

For controlling the flow of fluid compressed in the respective cylinders 12 to the discharge passage 27, there are provided four annular valve elements 53, one of which is disposed in each of the outlet valve chambers 43 and is adapted to engage the sealing face 39 of the lower plate member 15 for closing communication between the passages 45 and the chamber 43. Each of the valve elements 53 has a central aperture and is slidably mounted on a vertically disposed pin 55 contained in the valve chamber, each of which pins is securely fitted into a suitable bore 56 formed in the plate member 15 and extends concentrically through the aperture in the valve element 53 and into a recess 57 formed in the upper plate member 16. The discharge valve elements 53 are biased toward seated position by spirally coiled springs 58, each of which is interposed between the corresponding valve element 53 and the upper surface of the valve chamber 43, and being of conical form is adapted to permit maximum upward movement of the valve element. It will be noted that each of the discharge valve elements 53 is thus adapted to move upwardly on its guide pin 55 without striking the usual rigid stop shoulder, such upward movement being effectively cushioned by the associated spring 58.

Similarly, one of four inlet valve elements 61 is disposed in each of the inlet valve chambers 48 for controlling communication between each chamber and the passages 50. The inlet valve elements 61 are biased toward seated position by spirally coiled springs 62 similar to the springs 58, and are slidably guided on pins 64, which are secured in suitable bores 65 formed in the plate member 15 and extend through central apertures in the valve elements 61 into recesses 66 formed in the upper plate member 16. As in the case of the discharge valve elements 53 already described, the inlet valve elements 61 in moving downwardly from seated position are adapted to be cushioned against the springs 62, which thus con-

stitute yielding stop means for insuring quiet operation.

Referring to Fig. 7 of the drawings, it will be noted that arcuate depressions 12a are provided in the cylinder blocks 10 at the upper portions of each of the cylinder bores 12, so that the outermost passages 49 are entirely open to the cylinder bores.

Means is carried on the upper plate member 16 for transmitting movement of the unloading mechanism to the inlet valves, comprising two pairs of plunger elements 70, each pair being slidably mounted in suitable bores formed in the upper plate member 16 and in operative alignment with one of the inlet valve elements 61 of the compressor cylinders, as shown in Figs. 2 and 4 of the drawings. The upper ends of the plunger members 70 extend into the inlet passage 26 and are urged upwardly into engagement with the lower face of the yoke member 36 by coil springs 71, which are interposed between the plate member 16 and collars 72 formed on the plunger members.

Operation

In operation, on the compression stroke of the compressor piston 13, fluid compressed thereby is forced from the cylinder through the passages 45 so as to unseat the associated discharge valve elements 53 against the forces of the springs 58, and thence flows through the valve chambers 43 and passages 44 to the discharge passage 27. Since a pair of discharge valve elements 53 is provided for each of the compressor cylinders, adequate flow capacity is insured so that each valve element 53 is required to move away from its seat for only a portion of the travel permitted by the associated spring 58, which thus acts as a yielding stop for the valve. Upon the downward or suction stroke of the compressor piston 13, the discharge valves 53 are seated while the inlet valve elements 61 associated with that piston are moved downwardly and away from their seats by air or other fluid flowing from the inlet passage 26 through the passages 50, valve chambers 48 and passage 49 to the compressor cylinder. In thus moving downwardly the valve elements 61 are cushioned against the spirally coiled springs 62, so that quiet operation is insured.

When fluid under pressure is supplied to the pipe 33, shown in Fig. 1 of the drawings, for unloading the compressor, the fluid pressure in the chamber 32 effects downward movement of the piston 30 and the associated members 35 and 36, the member 36 thereby operating the plunger members 70 to unseat one of the inlet valve elements 61 for each of the compressor cylinders, (see Fig. 4), the compressor being then unloaded.

It will thus be apparent that our invention provides improved inlet and discharge valve means for a fluid compressor, in which the individual valve elements are designed to offer minimum resistance to movement and to operate quietly, while providing the desired flow capacity. Since the valve elements are operatively mounted on pins secured in associated plate members which may be handled as a unit of the compressor, the parts of the compressor are rendered readily accessible for inspection or repairs.

Although we have described a preferred embodiment of our invention in detail, it is not our intention to limit its scope to that embodiment or otherwise than by the terms of the appended claims.

Having now described our invention, what we

claim as new and desire to secure by Letters Patent, is:

1. In a fluid compressor, in combination, a cylinder portion, a head portion, a pair of adjoining plate members interposed between said two portions and having inlet and discharge valve chambers formed in the adjacent faces thereof, one of said plate members having bores disposed concentrically of said valve chambers and the other plate member having recesses respectively aligned with said bores, guide pins removably inserted in said bores and extending through said chambers into locking relation with said recesses, centrally apertured inlet and discharge valve discs disposed in said chambers, respectively, each disc being slidably mounted on the corresponding guide pin, and spiral coil springs surrounding said guide pins and urging the respective valve discs toward seated position, said valve elements being associated with said plate members as a separably removable unit in the compressor.

2. In a fluid compressor comprising a cylinder portion and a head, the combination therewith of complementary plate members adapted

to be interposed between said cylinder and said head and having adjoining apertured seat faces, each of said plate members having formed therein a pair of connected circular valve chambers registering with the portion of the seat face of the other plate member surrounding the apertures therein, said pairs of valve chambers being relatively shallow and spaced apart but substantially within the area of the bore of the compressor cylinder, inlet valve discs separately mounted in one pair of valve chambers and seating on the face of the adjacent plate member to control inlet flow of fluid through the apertures therein to the cylinder, and outlet valve discs similarly disposed in the other pair of valve chambers for controlling discharge of fluid under pressure from said cylinder, the valve discs in each pair of associated chambers being operative simultaneously for thereby affording the required flow capacity with minimum valve lift to insure quiet operation of the compressor.

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