

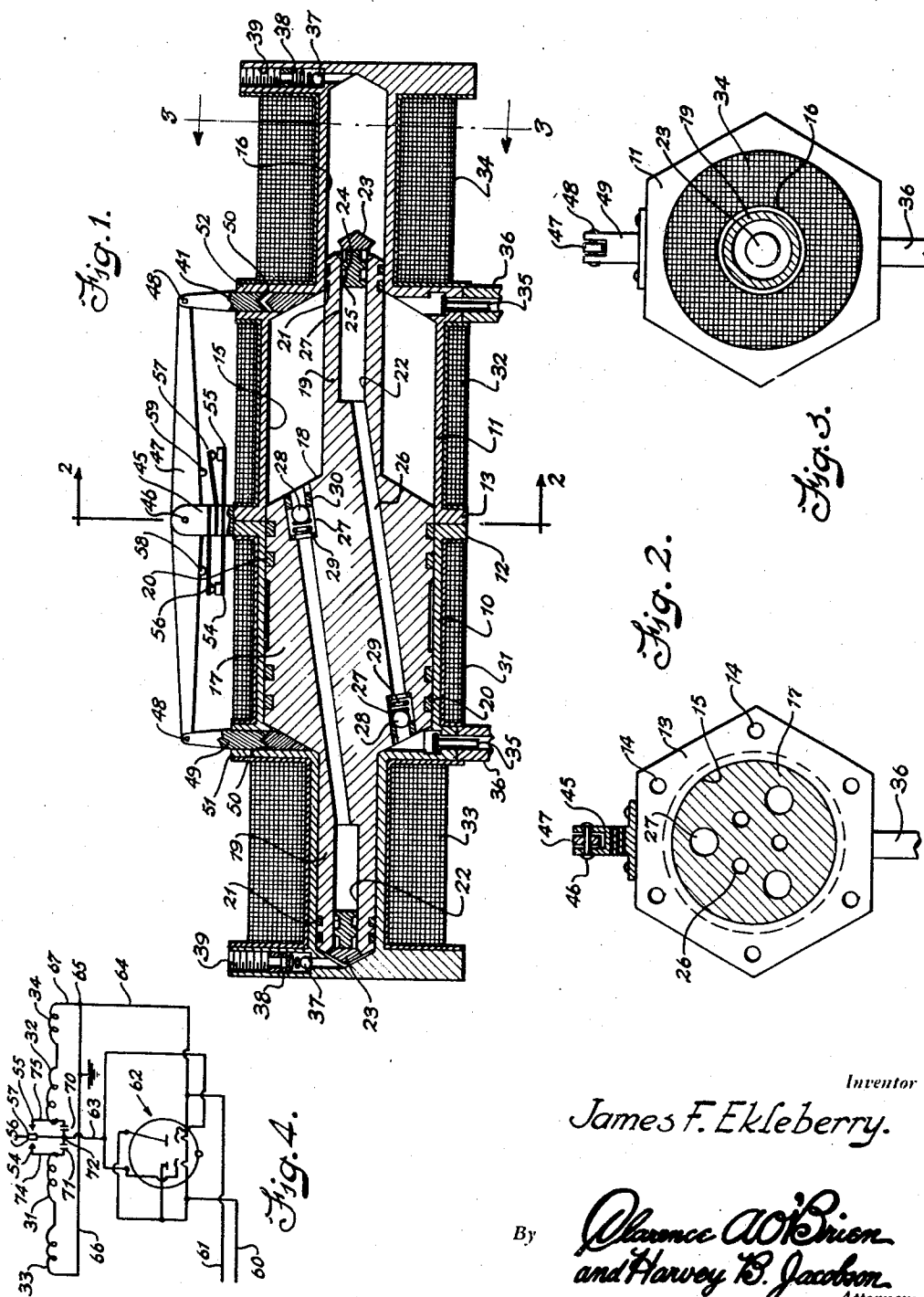
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RECIPROCATING COMPRESSOR

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RECIPROCATING COMPRESSOR

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8 Claims. (Cl. 230—55)

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This invention relates to a reciprocating compressor, and more particularly to such a compressor adapted to be operated by a solenoid.

A primary object of this invention is the provision of an improved reciprocating compressor, adapted to be contained within a sealed housing, wherein the reciprocation is affected by alternating the energization of solenoid coils.

An additional object of the invention is the provision of such a device having improved inlet and outlet means, whereby fluid may be compressed, or pumped thereby.

Still another object of the invention is the provision of such a device provided with magnetically actuated circuit opening and closing mechanism, whereby solenoid coils at opposite ends of the device may be alternately energized by a movement of the solenoid core.

Still another object of the invention is the provision of such a device embodying improved valve means for passing fluid therethrough.

Other objects reside in the provision of such a device which will be sturdy and durable in construction, reliable and efficient in operation, and relatively simple and inexpensive to manufacture and operate.

Other objects reside in the combinations of elements, arrangements of parts, and features of construction, all as will be more fully pointed out hereinafter and disclosed in the accompanying drawings wherein there is shown a preferred embodiment of this inventive concept.

In the drawings:

Figure 1 is a longitudinal sectional view taken along the center line of one form of the device embodying the inventive concept.

Figure 2 is a sectional view taken substantially along the line 2—2 of Figure 1 as viewed in the direction as indicated by the arrows.

Figure 3 is a sectional view taken substantially along the line 3—3 of Figure 1 and viewed in the direction indicated by the arrows, and

Figure 4 is a schematic wiring diagram disclosing the method of energizing the device.

Similar reference characters refer to similar parts throughout the several views of the drawings.

Having reference now to the drawings, the device of the instant invention is comprised of a housing, including two separable halves 10 and 11, provided respectively with abutting flanges 12 and 13, and secured in related assembly as by means of bolts or the like 14. The housing includes a central cylindrical chamber 15 having tapered frusto-conical end portions, from

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which extend bores 16, the outer diameter of which is substantially less than that of the central chamber 15.

Positioned within the chamber 15 for reciprocation is a solenoid core 17, the ends of which are tapered as at 18, to conform to the tapered extremities of the chamber 15, and from which extend two projections 19, of a diameter to fit snugly within the extending bores 16. Sealing rings 20 are provided about the body of the core 17, and additional sealing rings 21 are correspondingly positioned adjacent the extremities of the extensions 19.

Each of the extending portions 19 is provided with a centrally disposed bore 22, in which is positioned a valve member 23, adapted to open and close under conditions to be more fully described hereinafter. The valves 23 are provided with internal flanges 24 adapted, by abutment with pins 25, to retain the valve in related assembly within the bores 22.

Extending radially from the inner ends of the bores 22 are a plurality of passages 26, which terminate in chambers 27 opening outwardly on the surfaces 18 of the solenoid 17. Positioned within each of the chambers 27 is a ball valve 28 normally biased to closed position as by a spring 29. Retaining rings 30 serve as valve seats, and correspondingly to retain the ball valves 28 in position within the recesses 27.

Surrounding each of the body portions 10 and 11 is a solenoid coil 31 and 32, respectively, and correspondingly surrounding each of the extending portions defining the bores 16 are solenoid coils 33 and 34.

Inlet valves 35 are positioned in inlet passageways 36 adjacent the ends of each of members 10 and 11, and permit the access of fluid to the chamber 15. Correspondingly, outlet valves comprised of balls 37 biased by springs 38 are positioned in outlet passages 39 at the outer extremities of each of bores 16.

From the foregoing, it will now be seen that when the solenoid core 17 is reciprocated in a manner to be more fully described hereinafter by means of the solenoid coils 31, 32, 33, and 34, that fluid enters through one of the inlet valves 35, and as the solenoid moves toward the open inlet the associated ball valves 28 are forced inwardly by fluid pressure, thus forcing the fluid through the bores 26 into the appropriate chamber 22, which pressure causes the opening of the valve 23 and correspondingly forces the valve 37 open to pump the fluid outwardly through the appropriate outlet 39. Thus, a constant flow of

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fluid through one or the other of the openings 39 is maintained depending upon the relative position of the solenoid core 17 within the housing 15.

Positioned at the juncture of the flanges 12 and 13 is a projection 45 bifurcated at its upper extremity and carrying on a pivot 46 an arm 47, to the opposite extremities of which are pivoted as by means of pivots 48, magnetic transfer members 49, operating in bores 50 in the end plates 51 and 52, respectively, of the housing sections 10 and 11.

Contact arms 54 and 55 extend outwardly from member 45 and are adapted to be alternately engaged by associated contact arms 56 and 57 alternately abutted by projections 58 and 59, respectively, carried by the arm 47 dependent on the position thereof, in accordance with the actuation of the magnetic transfers 49.

Referring now particularly to Figure 4 wherein there is disclosed a wiring diagram of a circuit for use in conjunction with the device of the instant invention alternating current enters, through wires 60 and 61, a conventional full wave rectifier generally indicated as 62, from which rectifier a wire 63 leads to contacts 56 and 57. A wire 64 leads to a terminal 65, from rectifier 62, from which terminal wires 66 and 67 lead to the extremities of coils 33 and 34, respectively, it being noted that coil 34 is electrically connected with coil 32 and coil 33 is electrically connected with coil 31. The opposite extremities of coils 31 and 32 are connected through condensers 70 and 71 to a juncture 72 with wires 63, and correspondingly associated through leads 74 and 75 with contacts 54 and 55, respectively.

It will now be seen that when the system is energized in any desired manner, in accordance with the position of the core 17 within the chamber 15, either contacts 54 and 56, or contacts 55 and 57 will be closed, to energize their associated coils, thus moving the solenoid to the associated end of the chamber and effecting a pressure of fluid from the inlet 36 to an outlet 39 in the manner previously described. Simultaneously the associated magnetic transfer 49 will be energized by the proximity of the solenoid core, to break the circuit and simultaneously close the opposite circuit, thus effecting a continuous and rapid reciprocatory movement of the core 17, and a corresponding continuous passage of fluid through one or the other of the outlets 39.

From the foregoing it will now be seen that there is herein provided an improved reciprocating compressor, accomplishing all the objects of this invention and others including many advantages of great practical utility and commercial importance.

As many embodiments may be made of this inventive concept, and as many modifications may be made in the embodiment hereinbefore shown and described, it is to be understood that all matter herein is to be interpreted merely as illustrative and not in a limiting sense.

I claim:

1. An electro-magnetic pump comprising a central cylindrical chamber forming pre-compression chambers with a double acting piston reciprocable therein, a concentric piston carried by said double-acting piston at each side thereof, compression chambers receiving said concentric pistons, fluid inlet means at each end of said central chamber and a compressed fluid outlet from each compression chamber and by-pass means from said central chamber to said com-

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pression chambers, and electro-magnetic means for reciprocating said pistons in automatic, timed relation.

2. An electro-magnetic pump comprising a central cylindrical chamber forming pre-compression chambers with a double acting piston reciprocable therein, a concentric piston carried by said double-acting piston at each side thereof, compression chambers receiving said concentric pistons, fluid inlet means at each end of said central chamber and a compressed fluid outlet from each compression chamber and by-pass means from said central chamber to said compression chamber, and electro-magnetic means for reciprocating said pistons in automatic, timed relation, said concentric piston being disposed in tandem to said double-acting piston.

3. An electro-magnetic pump comprising a central cylindrical chamber forming pre-compression chambers with a double acting piston reciprocable therein, a concentric piston carried by said double-acting piston at each side thereof, compression chambers receiving said concentric pistons, fluid inlet means at each end of said central chamber and a compressed fluid outlet from each compression chamber and by-pass means from said central chamber to said compression chambers, and solenoid means for reciprocating said pistons in automatic, timed relation, said concentric piston being of reduced diameter and carried by said double-acting piston.

4. An electro-magnetic pump comprising a central cylindrical chamber forming pre-compression chambers with a double acting piston reciprocable therein, a concentric piston carried by said double-acting piston at each side thereof, compression chambers receiving said concentric pistons, fluid inlet means at each end of said central chamber and a compressed fluid outlet from each compression chamber and by-pass means from said central chamber to said compression chambers, and solenoid means for reciprocating said pistons in automatic, timed relation, and control means, engageable by said double-acting piston for energizing said solenoid in time relation.

5. An electro-magnetic pump comprising a central cylindrical chamber forming pre-compression chambers with a double acting piston reciprocable therein, a concentric piston carried by said double-acting piston at each side thereof, compression chambers receiving said concentric pistons, fluid inlet means at each end of said central chamber and a compressed fluid outlet from each compression chamber and by-pass means from said central chamber to said compression chambers, and solenoid means for reciprocating said pistons in automatic, timed relation, said by-pass means connecting one face of said double-acting piston with a compression chamber on the opposite side thereof.

6. An electro-magnetic pump comprising a central cylindrical chamber forming pre-compression chambers with a double acting piston reciprocable therein, a concentric piston carried by said double-acting piston at each side thereof, compression chambers receiving said concentric pistons, fluid inlet means at each end of said central chamber and a compressed fluid outlet from each compression chamber and by-pass means from said central chamber to said compression chambers, and solenoid means for reciprocating said pistons in automatic, timed relation, said by-pass means connecting one face

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of said double-acting piston with a compression chamber on the opposite side thereof, said by-pass means extending through said double acting piston and through the opposite compression piston carried thereby.

7. An electro-magnetic pump comprising a central cylindrical chamber forming pre-compression chambers with a double acting piston reciprocable therein, a concentric piston carried by said double-acting piston at each side thereof, compression chambers receiving said concentric pistons, fluid inlet means at each end of said central chamber and a compressed fluid outlet from each compression chamber and by-pass means from said central chamber to said compression chambers, and solenoid means for reciprocating said pistons in automatic, timed relation, said by-pass means connecting one face of said double-acting piston with a compression chamber on the opposite side thereof, and one-way check valves in said by-pass at each end thereof.

8. An electro-magnetic pump comprising a central cylindrical chamber forming pre-compression chambers with a double acting piston reciprocable therein, a concentric piston carried by said double-acting piston at each side thereof, compression chambers receiving said con-

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centric pistons, fluid inlet means at each end of said central chamber and a compressed fluid outlet from each compression chamber and by-pass means from said central chamber to said compression chambers, and solenoid means for reciprocating said pistons in automatic, timed relation, and control means, engageable by said double-acting piston for energizing said solenoid in time relation, and a solenoid surrounding each pre-compression chamber and another solenoid surrounding each compression chamber, said solenoids being connected in series for actuation by said control means.

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