

Jan. 24, 1956

A. POLIANSKY

2,732,124

GAS COMPRESSOR

Filed Jan. 16, 1952

6 Sheets-Sheet 1

Fig. 1

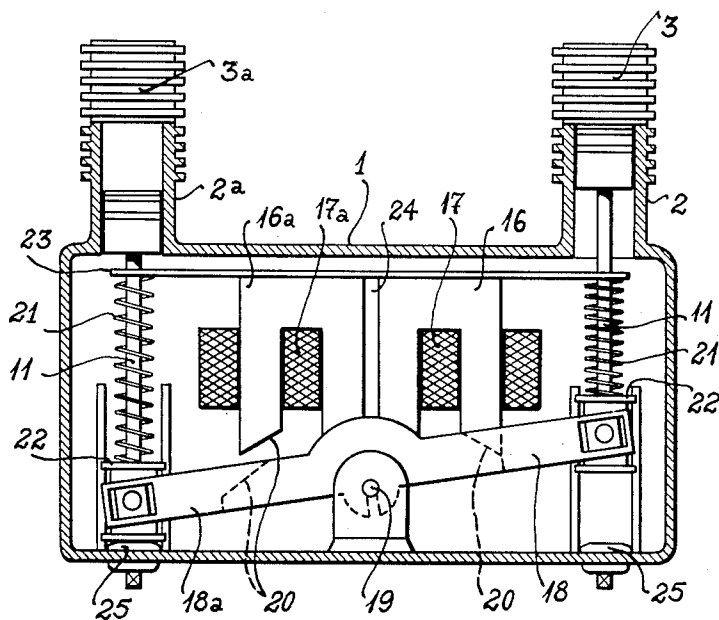
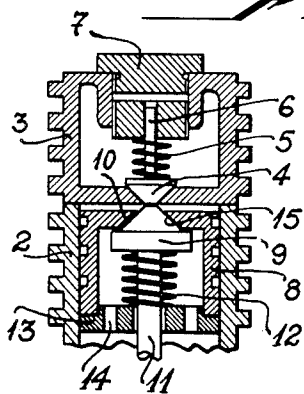


Fig. 2



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2,732,124

GAS COMPRESSOR

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Fig. 3

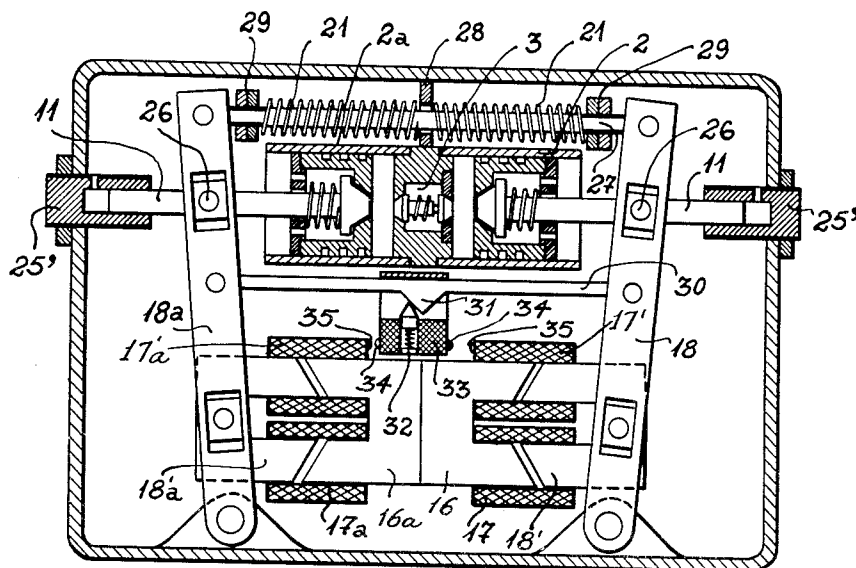
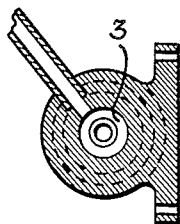


Fig. 4



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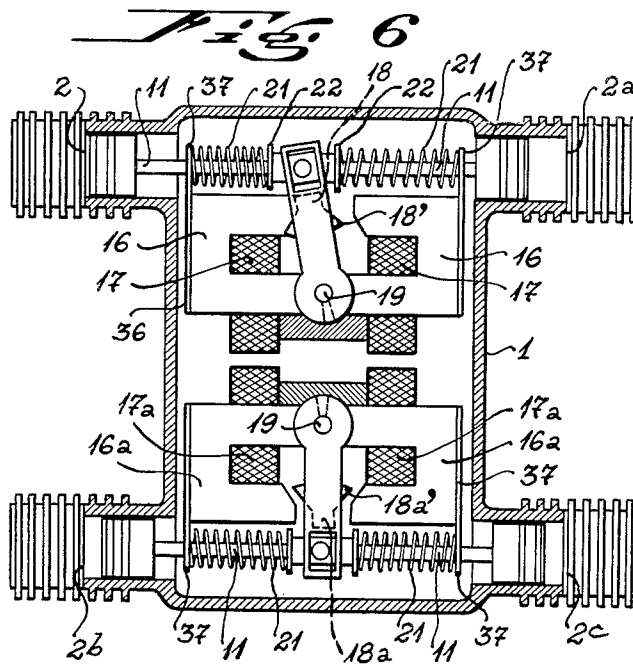
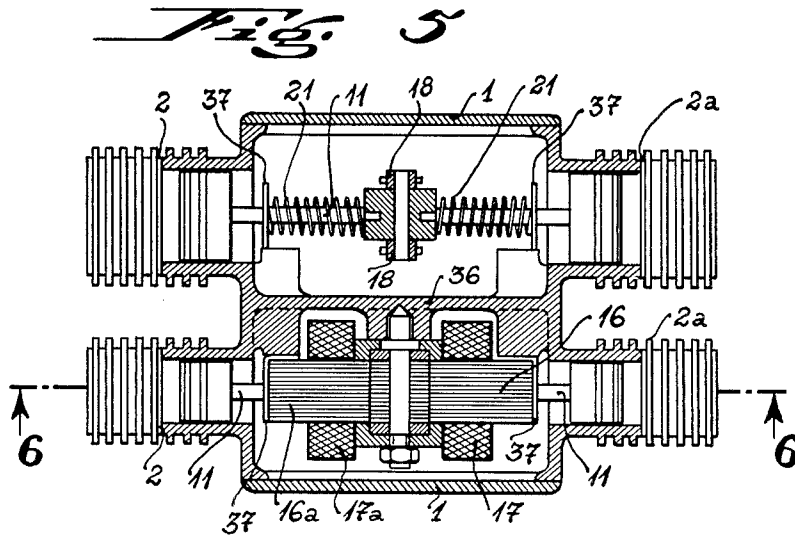
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GAS COMPRESSOR

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2,732,124

GAS COMPRESSOR

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Fig. 7

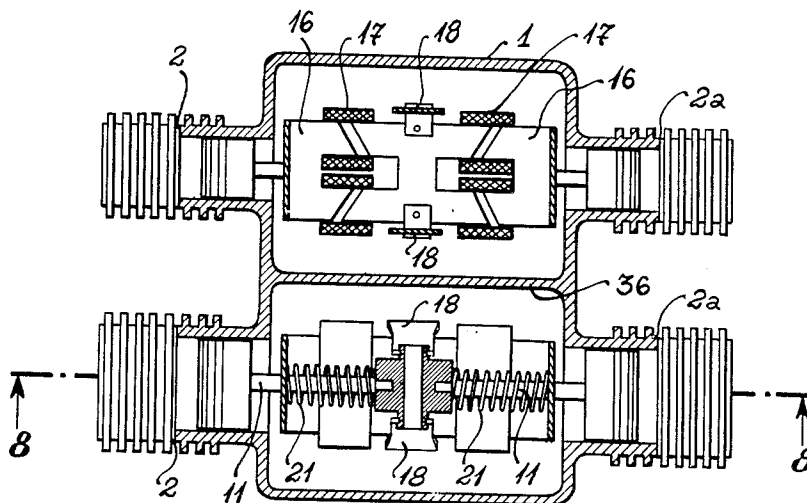
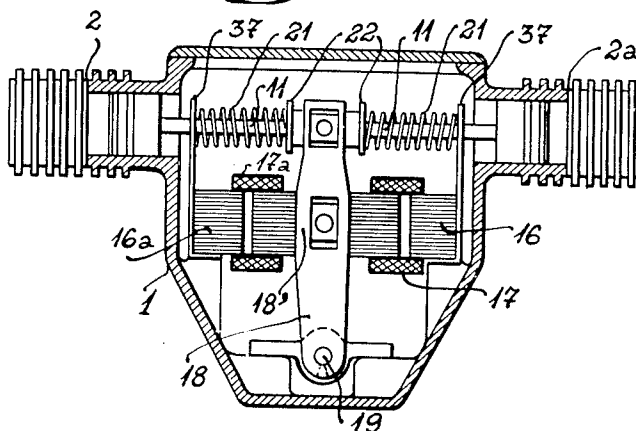


Fig. 8



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2,732,124

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Fig. 9

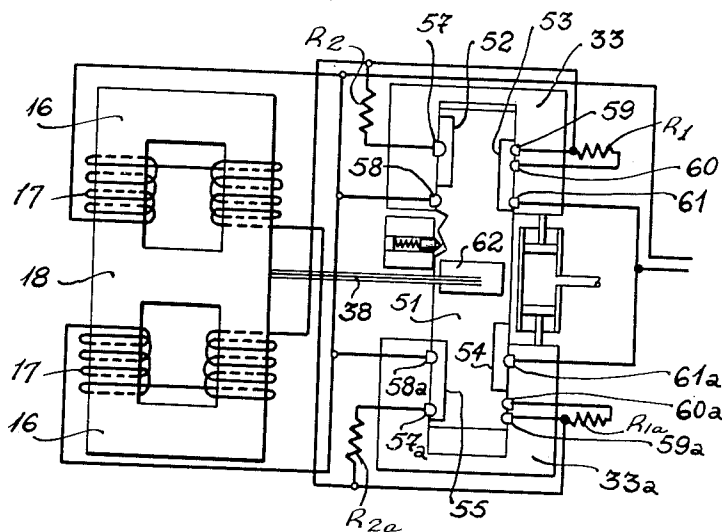
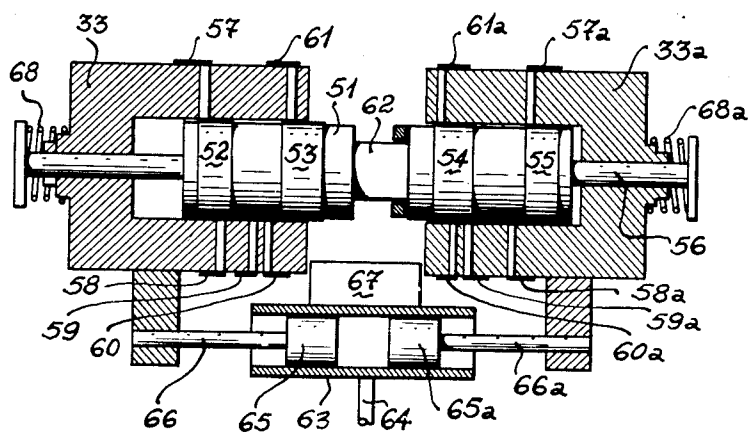


Fig. 10



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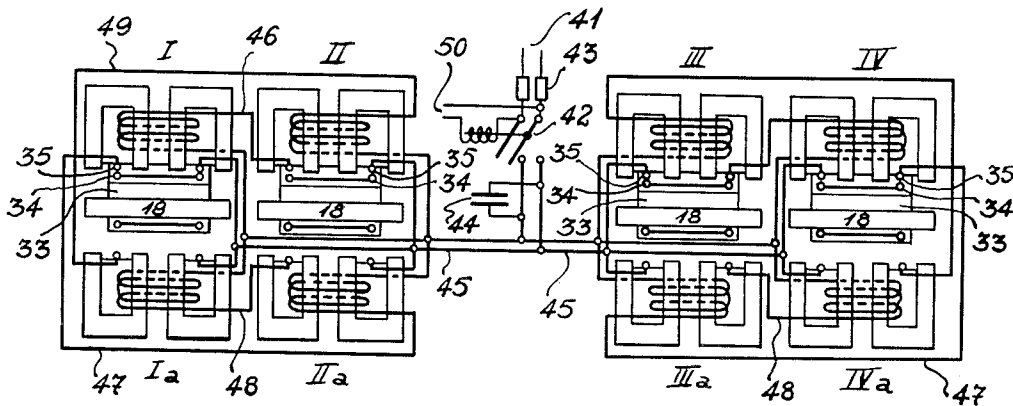
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Fig. 11



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2,732,124

GAS COMPRESSOR

Alejandro Poliansky, Buenos Aires, Argentina

Application January 16, 1952, Serial No. 266,615

15 Claims. (Cl. 230—55)

My present invention relates to certain new and useful improvements in air or gas compressors and more particularly refers to an improved gas compressor of the type having at least one pair of compressor heads combined, within one and the same casing, with electric means for driving the pistons of the compressor heads.

The main object of the invention is to provide an improved gas compressor, wherein the linear movements of at least one armature attracted alternately by two electro-magnets are used for operating the pistons of at least one pair of compressor heads, with the advantageous result that the usually employed electric motor and crank may be dispensed with and that the compressor structure is considerably simplified.

One object of the invention is to provide an improved gas compressor, wherein spring means are provided in connection with the pistons of the compressor heads and are so arranged that they at least in part mitigate the rough movements of the armatures attracted by the electro-magnets, with the advantageous result that said spring means at the same time recover energy and assist in returning the armatures to their neutral position and in reducing the gap between the armature and the core of each electro-magnet, thereby rendering the driving mechanism more efficient.

Another important object of the invention consists in providing an improved gas compressor, wherein each compressor head comprises a composite piston so constructed and arranged that the same in its gas-compressing stroke provides for the formation on the bottom of the compressor cylinder of a gas cushion capable of acting as an efficient shock absorber for the piston and the whole compressor structure, with the advantageous result that at the same time an efficient and simple operator of the usual non return valve of the pressure chamber is obtained.

Still another not less important object of the invention is to provide an improved gas compressor, wherein automatic switch means are provided in connection with the electro-magnets for alternately energizing the same in dependence upon the movements of their armatures, with the advantageous result that the operation of the electro-magnetically driven compressor is absolutely reliable.

A further important object of the invention is to provide an improved gas compressor, wherein the automatic switch means for controlling the electro-magnets include electric resistance means so arranged as to reduce the energizing current of the electro-magnets as well as to avoid the necessity of interrupting the electric circuit for said electro-magnets, but to keep it closed by way of an electric resistance and to thereby eliminate the disadvantageous formation of sparks, with the additional advantageous result that the reduction of the energizing current at the same time assists in mitigating the rough attraction produced by the electro-magnetic force.

According to another feature of the invention, the improved gas compressor may include, in connection

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with the switch means, a synchronous motor for controlling the switch means associated with pairs of electro-magnets of the compressor, with the advantageous result that the electro-magnets are energized and de-energized in due course for ensuring a correct and efficient operation of the compressor-driving mechanism.

According to an important feature of the invention, the improved gas compressor comprises automatic switch means under the control of the gas compressed by the compressor in combination with a control by spring means, with the advantageous results that the pistons of the compressor heads are always stopped in their working strokes at a certain distance from the bottom of the compressor cylinders by controlling the respective electric circuits in relation to the counter-pressure, with the advantageous result that usual pistons may be successfully employed.

In accordance with still another feature of the invention, the improved gas compressor comprises at least one pair of compressor heads and at least one pair of electro-magnets for operating the pistons of said compressor heads through lever means connected to or forming parts of the armatures of said electro-magnets. In the case of providing at least two pairs of compressor heads, the arrangement of the compressor may be such as to produce both low and high pressure, in which case the compressor casing is subdivided by a partition wall into a low pressure section and a high pressure section.

With these objects and advantageous features in view, the present invention comprises the arrangement, combination and construction of parts as will be hereinafter fully described with particular reference to the accompanying drawings showing by way of examples only some preferred embodiments of the invention.

On the accompanying drawings:

Figure 1 is a cross-sectional view of a gas compressor according to the invention, with two compressor heads arranged in one and the same wall of the compressor casing;

Figure 2 is a longitudinal sectional view of a compressor head according to the invention;

Figure 3 shows in a cross-sectional view another embodiment of the compressor, wherein two compressor cylinders act upon a common pressure chamber;

Figure 4 is a sectional detail view of the pressure chamber of the embodiment of Figure 3;

Figure 5 is a horizontal sectional view of a compressor of two stages, low and high pressure; in the upper portion of this figure the electro-magnets have been omitted whereas in the lower portion thereof the springs on the piston rods are not shown for reasons of clearness;

Figure 6 is a vertical somewhat schematic sectional view along the line 6—6 of Figure 5;

Figures 7 and 8 are views similar to Figures 5 and 6, showing a simpler embodiment of a low and high pressure compressor;

Figure 9 is a schematic view showing a pair of opposite electro-magnets and the switch device controlling said electro-magnets, this switch device including electric resistance means for avoiding the formation of sparks;

Figure 10 is a sectional view showing an embodiment of switch device according to Figure 9;

Figure 11 is a circuit showing the electric connection for the electro-magnets of the compressor according to Figures 5 and 6, wherein the electro-magnets are connected in two groups one for low pressure and the second one for high pressure.

In these views, like reference numerals indicate like or corresponding parts and for reasons of clearness the means for fastening the component parts of the device, the supports of the electro-magnets, the fixing means for the cover of the casing, for the compressor heads, the

inlet and outlet ports of the gas, the electric connections of the electro-magnets, have been omitted, because these elements are quite known and may be arranged in accordance with the requirements of each case.

Referring to the accompanying drawings, and more particularly to Figures 1 and 2, the invention is shown as incorporated in a compressor having two alternately operating compressor heads.

The compressor according to this embodiment comprises a casing 1, of which form integral parts the cylinders 2 and 2a of the two compressor heads, the pressure chambers 3 and 3a of these compressor heads being firmly secured to the free open ends of the cylinders 2 and 2a, respectively. Both the cylinder 2, 2a and the pressure chambers 3, 3a of each compressor head are conveniently provided with cooling ribs as shown. The wall of the pressure chambers 3, 3a adjacent the open end of the compressor cylinders 2, 2a has a gas-inlet opening, which is controlled by a valve 4 under the pressure of a coil spring 5; the valve 4 being guided by means of its rod 6 in a corresponding cavity provided in a removable plug 7 (Figure 2).

The compressor cylinder 2 of each compressor head has a composite piston consisting of a hollow cylindrical compressing piston 8 (Figure 2) and a solid push member 9 movably arranged within the hollow piston 8. This hollow piston 8 is provided with usual piston rings for making a tight seal between the walls of the piston 8 and cylinder 2. The top wall of the hollow piston 8 has a central gas-outlet opening 10 in front of the gas-inlet opening of the pressure chamber 3, said opening 10 constituting a valve seat for co-operating with the solid push member 9 acting as a valve for closing said opening 10 under the pressure of a coil spring surrounding the piston rod 11 which extends through the central perforation of a disc 13 removably secured to the lower open end of the hollow piston 8 and provided with gas-inlet holes 14. For the purpose of efficiently acting as a valve, the push member 9 has a truncated conical top portion provided with a layer of rubber or like sealing material 15, the arrangement being such that in its closing position the top of the piston 9 projects slightly beyond the upper rim of the gas-outlet opening 10. In view of that this opening 10 has a diameter larger than that of the gas-inlet opening of the chamber 3, the push member 9 at the same time acts as a counter-valve for said gas-inlet opening.

In Figure 2, the composite piston at the compressor head has been shown at the end of its compressing stroke. When the piston rod 11 is now withdrawn, the member 9 opens the gas-outlet opening 10, compresses the spring around the rod 11 and withdraws the hollow piston 8. During this movement, the gas to be compressed passes through the inlet openings 14 and the outlet opening 10 into the free space within the cylinder 2 above the top wall of the hollow piston 8. Now, for effecting the compression of gas, the push member 9 first closes the gas-outlet opening 10 and then pushes the hollow compressing piston 8 forwards, thereby compressing the gas and causing it to pass through the gas-inlet opening of the pressure chamber 3 as soon as the gas pressure surpasses the pressure of the spring-loaded valve 4. Before the top of the compressing piston can get in touch with the wall of the pressure chamber 3, the top of the member 9 closes the gas-inlet opening of the pressure chamber 3, thereby trapping certain quantity of gas within the cylinder 2 which constitutes an effective buffer preventing the hollow piston 8 from shocking with the adjacent wall of the pressure chamber 3. Thus a noiseless operation of compressing cylinder is ensured.

By virtue of this construction of the compressor heads and other features to be described later, the compressor according to the present invention, for its operation, may use the electro-magnetic force which as is well known acts in a rough manner rendering the same unsuitable for mechanical purposes.

The electro-magnetic mechanism for operating the compressor according to the invention, may be designed in different manner. A relatively simple embodiment has been shown in Figure 1. The same comprises two electro-magnets formed by the cores 16, 16a and the magnetic coils 17, 17a. As soon as one or another of these coils is energized, their cores attract their respective armatures constituted in this case by the arms 18, 18a of a lever pivoted at 19. If desired, the armatures may be formed by special bodies secured to said lever arms. The co-operating surfaces of the armatures and of the cores are conveniently chamfered as indicated at 20 for thus obtaining a smaller gap between said surfaces and a greater effect of electro-magnetic attraction.

The free ends of the lever arms 18, 18a are pivotally connected in any suitable known manner with the free ends of the piston rods 11 of the composite pistons 8, 9 (Figure 2). The piston rods 11 are surrounded by coil springs 21 which at one end abut against a disk or like stop 22 secured to the respective piston rod, and at the opposite end abut against a rod 23 secured to a support 24 provided in the casing 1. The springs 21 initiate the return stroke of the pistons in the moment the respective electro-magnets are deenergized thereby recovering energy and reducing the gap between the armature and the cores of the electromagnets, trying to keep these armatures in their neutral position.

For alternately energizing the two electro-magnets in the correct moments, the present invention provides automatic switch means which will be described later. For absorbing or damping the noise likely to be produced by the free ends of the lever arms 18, 18a, rubber pads 25 or the like may be provided.

A modified embodiment of the electro-magnetic compressor according to the invention has been shown in Figures 3 and 4, wherein two compressor cylinders 2, 2a act upon a common pressure chamber 3. The construction of the compressor cylinder with their composite pistons is identical with that as described with reference to Figure 2. The operation of the pistons differs from that shown in Figure 1 by that instead of a double arm lever, two one-arm levers 18, 18a are used, to which the piston rods 11 are pivotally connected at 26. The piston rods project beyond their pivots 26 for extending with their free ends into small cylinders 25' having gas-inlet orifices and acting as pneumatic shock absorbers.

In this embodiment, as shown in Figure 3, the electro-magnets are formed each by a U-shaped core 16, 16a and two coils 17, 17' and 17a, 17'a arranged on the legs of the cores in such a manner that they terminate within said coils with chamfered end surfaces. The armatures 18', 18'a pivotally connected with the respective levers 18, 18a are also U-shaped and have correspondingly chamfered leg ends which extend into the cavities left by the cores 16, 16a within the coils 17, 17', 17a, 17'a. This arrangement is advantageous insofar as by two coils in each electro-magnet with less quantity of copper one obtains the same number of windings, less ohmic losses and larger heat-dissipating surface, and by means of the gap between armature and core arranged within the coils, a more efficient attraction of the armature is ensured by adding the solenoid attraction, beside this there being less dispersion of the magnetic lines of forces and an increase of the armature mass.

The free ends of the levers 18 and 18a are interconnected by means of a rod 27 freely supported in a lug 28 or the like, at each side of which the rod 27 is surrounded by a coil spring 21. These springs abut at one end against the lug 28 and at the opposite end against a stop means 29, constituted for instance by a nut and counter-nut as shown. The springs 21 act in the same manner as described with reference to those 21 of Figure 1.

The levers 18, 18a are further interconnected by a rod 30 which comprises a triangular projection 31. This projection co-operates with a spring-loaded pin 32 movably

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disposed within a corresponding recess provided in a slidable contact-carrier 33, the contacts 34 of which co-operate with fixed contacts 35. This assembly 30—35 constitutes an automatic switch the operation of which will be described later.

Another embodiment of the compressor according to the invention has been shown in Figures 5 and 6. This embodiment represents a double compressor for producing low and high pressure. The casing 1 is subdivided by a partition wall 36 into a low pressure section and a high pressure section, each of these sections comprising four compressor heads 2, 2a, 2b, 2c, which are of the same construction as that described with reference to Figure 2. The piston rods 11 of the compressor heads are connected at their free ends with the levers 18, 18a carrying armature bodies 18' and 18'a for being acted upon by the electro-magnets 16, 17 and 16a, 17a, i. e. each lever is operated by two opposite electro-magnets. As has been clearly shown in Figure 6, the co-operating surfaces of the cores 16, 16a and armatures 18' and 18'a are at least partly chamfered. In this embodiment, the springs 21 on the piston rods 11 abut at one end against the connecting members of said rods with the levers 18, 18a and at the opposite end against rods 37 which at the same time constitute supporting members for the cores 16, 16a.

In this embodiment, the pressure chambers of the compressor heads of the low pressure section are conveniently communicated with the gas inlets of the high pressure section of the compressor (not shown).

The embodiment as shown in Figures 7 and 8 represents a simplified construction of the embodiment of Figures 5 and 6 and differs therefrom only in that the compressor sections of low and high pressure comprise each but one pair of compressor heads. Consequently, in view of that like parts are indicated by the same reference numerals a detailed description of this further embodiment is not required.

Before describing the operation of the switch devices, it may be pointed out that in any case the stationary contacts 35 are not connected with the coils of the electro-magnets to which they are secured, but are connected—in the case of Figure 3—to the opposite electromagnet, and—in the case of various pairs of electro-magnets—are connected to that electro-magnet which is the next one to work.

Referring back to Figure 3, in the position of the contact-carrier 33 as shown on the drawing, the electric circuit is closed for the electro-magnet 16, 17 which thus energized attracts the armature lever 18. This motion of the lever 18 is transmitted to the rod 30 and the projection 31 of the latter displaces the pin 32 against the pressure of its spring. In the moment the vertex of the triangular projection 31 has passed the pin 32 i. e. in the moment of the attraction of the armature lever 18 by the electro-magnet 16, 17 being completed, said pin under the pressure of its spring moves outwards and thereby displaces the contact-carrier 33 to the right until closing the circuit for the electro-magnet 16a, 17a which thus energized attracts the armature lever 18a. The rod 30 again moves to the right and the contact-carrier 33 to the left. Thus the automatic switch never remains in a neutral position, but always ensures the operation of the different electro-magnets in the correct moment.

The present invention, as been already pointed out, makes use of the electro-magnetic force-attraction of armatures by electro-magnets—for operating a gas compressor. It is well known that the attraction of armatures by electro-magnets is instantaneous and the motion of the armatures consequently is so rough and quick that it is mechanically difficult to transmit said motion and take profit thereof for directly operating a mechanical. In order to counteract this roughness of motion, it has hereinbefore proposed to provide the piston rods 11 with springs 21 and to employ a special piston capable of providing for the formation of a shock-absorbing gas cushion

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on the bottom of the compressor cylinder 2. In addition to these measures, the present invention provides another one consisting in a control of the electric current for energizing the electro-magnets in relation to the pressure produced by the compressor.

Another disadvantage of the electro-magnets consists in that, when interrupting the energizing current which produces a magnetic field, and electric spark will be formed when the magnetic field disappears. In order to avoid the formation of sparks, according to this invention, I reduce the energizing current by means of a first resistance and in addition hereto I do not interrupt the circuit of the energizing current, but deenergize the electro-magnets by means of a second resistance.

The two afore-mentioned features are incorporated in the switch arrangement as shown in Figures 9 and 10 of the accompanying drawings.

In Figure 9, the reference numerals 16 indicate a pair of U-shaped core members and 17 two pairs of electric coils in an arrangement similar to that shown in Figure 7. The electro-magnets 16, 17 act upon a common H-shaped armature 18 provided with a rigid arm 38 which constitutes the operating member for the switch device, in this case, for a movable contact bridge carrier 51, which carries four contact bridges 52, 53, 54, 55—two pairs for each electro-magnet—and which is slidably mounted on a rod 56 (Figure 10) between the two opposite portions 33, 33a of a composite contact carrier, each portion of which carries five contacts 57, 58, 59, 60, 61 and 57a, 58a, 59a, 60a, 61a, respectively.

The portion 33 (Figure 9) of the contact carrier has been shown in its end position for energizing the lower electro-magnet. The operation of the switch device is now as follows: The armature 18 attracted by said lower electro-magnet moves downwards and the arm 38 moves the contact bridge carrier 51 in the same direction. Thereby the contact 59 is opened and the electric current is caused to pass through the resistance R₁, whereby its voltage is reduced. While continuing its movement, the contact bridge carrier 51, instead of interrupting the current for the lower electro-magnet, interconnects the contacts 57 and 58 and thereby establishes the connection with the resistance R₂, so that the latter, with the same voltage as reduced by the resistance R₁, is connected in parallel with the coils 17 of the lower electro-magnet. Hereupon, while the contact bridge carrier 51 still continues moving downwards, the circuit is interrupted between the contact 52 and the contact bridge 60, whereby the coil 17 of the lower electro-magnet is deenergized by that the resistance R₂ absorbs the whole voltage and the current of the self induction of the coil thus avoiding the formation of a spark. At this moment, the lower electro-magnet is inoperative; the compressing piston connected to the armature 18 has completed its gas-compressing stroke. The contact bridge carrier 51, however, continues its movement due, on the one hand, to the elasticity of the arm 38 and, on the other hand; to the co-operation of the spring-loaded pin 32 with the tapered projection 31 of said contact bridge carrier 51, as has been described in detail with reference to Figure 3, and by virtue of this further movement the contact bridge carrier 51 completes the circuits corresponding to the upper electro-magnet by means of the contacts of the contact carrier portion 33a, attracting the armature 18 in upward direction and moving the arm 38 in the same direction. The contact bridge carrier 51, however, remains stationary until the arm 38 has moved over the free space 62 which is substantially wider than the thickness of the arm 38, and starts moving as soon as the somewhat elastic arm 38 subdues the inertia of the mass of the contact bridge carrier 51 and the resistance offered by the spring-loaded pin 32. The elasticity of the arm 38 assists in accelerating the contact closures between the contact bridge carrier 51 and the contact carrier portion 33a. The succession of contact closures is identical to that as hereinbefore described; at

first the resistance R_{1a} is connected, then the coil 17 of the upper electro-magnet is connected in parallel with the resistance R_{2a} , and finally the said coil is deenergized by the resistance R_{2a} as aforesaid.

In some cases, particularly in connection with relatively small compressors, the resistances R_2 and R_{2a} may be omitted if desired.

For the purpose of counteracting the rough movements caused by the attraction of the armature and of avoiding the noise likely to be caused by the pistons of the compressor cylinders, the switch device as hereinbefore described is advantageously combined with a pneumatic control device.

This device comprises a small cylinder 63 communicated by way of a pipe 64 with the pressure chamber of one of the compressor heads of the compressor, according to the invention, and a pair of opposite pistons 65, 65a, the rods of which 66, 66a are rigidly connected to the contact carrier portions 33, 33a. The cylinder 63 is provided with an attachment 67 which extends between the opposite contact carrier portions 33, 33a for limiting their relative movement towards each other caused by the pressure of the springs 68, 68a.

With regard to this pneumatic control device, it will be readily understood that when starting the operation of the compressor, there will be no pressure at all supplied to the cylinder 63 and the contact carrier portions 33, 33a will be under the pressure of the springs 68, 68a and will be pressed against the attachment 67. The switch device will normally operate as above described.

As the pressure produced by the compressor increases, the pressure also increases in the cylinder 63 and causes the pistons 65, 65a to move outwards and to move the contact carrier portions 33, 33a in the same direction against the pressure of the springs 68, 68a. Thereby the periods during which the contact bridges 52—54 maintain the contacts 57—61, 57a—61a closed, will be shortened.

As has been previously pointed out, in any case the switch device always closes the electric circuit of the electro-magnet which is the next one to work, and for the purpose of clearly explaining this detail, the Figure 11 shows a circuit diagram, wherein the four pairs of opposite electro-magnets are indicated at I—Ia, II—Ila, III—IIla, IV—IVa. Figure 11 shows the arrangement of the electro-magnets in two groups, for instance, one group for low pressure and the second one for high pressure.

Having reference to Figure 11, the conductors 41 of a source of electric current are connected to a bipolar switch 42, indicating the reference numeral 43 a pair of fuses for the protection of the compressor and 44 a condenser in parallel connection with the compressor for preventing the reaction load of the electro-magnets from excessively charging the device, whereas the numeral 50 indicates a connection to a distance control, for the use of which the switch 42 must be an automatic switch.

The armature body 18 is shown between the co-operating electro-magnets and for each pair of electro-magnets there is shown a contact-carrier 33, the contacts 34 of which co-operate with the contacts 35 secured to each electro-magnet, this automatic switch acting in the same manner as hereinbefore explained.

The electro-magnets I, Ia and II, IIa of one group may act simultaneously with those IV, IVa and III—IIla of the other group. In each group, the switches shown adjacent the electro-magnets I, II and III, IV are in their circuit-closing position. For the purpose of explaining the operation of the electro-magnets, it is supposed that only the switches shown adjacent the electro-magnets II and III, are in their circuit-closing position. Thus, the electric current entering by way of the conductor 45 reaches the first contact 35 on the electro-magnets II and III and as the contact-carrier 33 establishes connections with the second contact 35 of said electro-magnets, the

electric circuit is closed by way of the conductors 46 for the electro-magnets I and IV which thus energized attract their armatures 18.

The movements of these attracted armatures 18 move the switches adjacent the electro-magnets I and IV to their circuit-closing position, so that by way of the conductor 47 the electro-magnets IIa and IIIa are energized and produce the attraction of the armature 18 provided between the electro-magnets II and IIa and those III and IIIa. The movement of these armatures causes a circuit closure by the respective switches at the contacts 35 on the electro-magnets IIa and IIIa so that now by way of the conductors 48 the electro-magnets Ia and IVa are energized which in turn attract again the armature 18 between the electro-magnets I and Ia and those IV and IVa, with the result that then at the contacts 35 on the electro-magnets Ia and IVa the circuit is closed by way of the conductors 49 for the electro-magnets II and III and that the latter attract the armatures 18 situated between the electro-magnets II and IIa and those III and IIIa. Thereby a complete cycle of operations has finished and the same is repeated again and again as long as electric current is supplied to the device.

It will be understood that the arrangement of the stationary contacts 35 on the electro-magnets is by way of example only and merely for not complicating the drawing, and that any other place may be selected for the arrangement of said contacts. The construction and arrangement of the automatic switches may also change and are by no means restricted to the embodiment shown in Figure 3. In as far as the arrangement of the electro-magnets and their connection with the piston rods are concerned, the invention is not limited to the embodiments as shown in Figures 1, 3—4, 5—6, 7—8, but that alterations and amendments may be introduced therein and that finally in addition to the illustrated embodiments of the invention, the basic idea of the same may be carried into practice in other embodiments which, of course, have to be considered as falling within the scope of the appended claims.

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

1. Gas compressor having a sealed casing with an entrance opening for the gas to be compressed and at least one pressure chamber for receiving the compressed gas, and comprising at least one pair of compressor heads secured to the walls of the compressor casing and communicated on the one hand with the interior of said casing and on the other hand with said pressure chamber, a non-return valve provided in the latter for controlling the communications between the compressor heads and the pressure chamber, a spring-loaded piston movably arranged in each compressor head and comprising an axially projecting front portion for prematurely closing the communication between the compressor head and the pressure chamber to provide for the formation of a shock-absorbing gas cushion in said compressor head for said compressing piston, each compressing piston having a piston rod extending into the interior of the compressor casing, at least one pair of electromagnets fixedly arranged within said compressor casing and formed by stationary cores and coils carried by leg portions of said cores and by armature bodies movably arranged in front of said cores for being attracted thereby in a direction substantially coaxial to said coils, lever means carrying said armature bodies and pivotally connected with said piston rods for transmitting and increasing the oscillating movements of said armature bodies to said compressing pistons, spring means secured to said piston rods for mitigating the movements of said pistons at the end of their working strokes and for assisting the same in initiating their working strokes, and electric switch means including at least one contact carrier movably arranged within the compressor casing for alternately supplying electric current to the coils of said electromagnets.

2. Gas compressor, according to claim 1, wherein each compressor head is provided with a pressure chamber.

3. Gas compressor, according to claim 1, wherein each compressor head comprises a composite piston formed by a hollow cylindrical piston body and a solid push member movably arranged within said hollow piston body and provided with a rod for operating the composite piston.

4. Gas compressor, according to claim 1, wherein the armature body of each electromagnet is carried by an individual lever.

5. Gas compressor, according to claim 1, wherein the armature bodies of a pair of oppositely arranged electromagnets are carried by a common lever.

6. Gas compressor, according to claim 1, wherein each compressor head comprises a composite piston formed by a hollow cylindrical piston body and a spring-loaded push member within said hollow piston body for operating the latter, said hollow piston body having end walls, one of which is provided with a perforation for the passage of the rod of said push member and with a number of gas inlet openings, whereas its opposite end wall is provided with a gas outlet opening in alignment with said perforation for the passage of the rod of said push member, which in turn is provided with a projecting portion for temporarily closing said gas outlet opening, and this gas outlet opening being of such a diameter to permit said projecting portion to extend therethrough and to temporarily close the usual gas passage opening between the compressor head and the pressure chamber.

7. Gas compressor, according to claim 1, wherein the cores of the electromagnets and the armature bodies have chamfered cooperating surfaces.

8. Gas compressor according to claim 1, wherein the cores of the electromagnets terminate within the coils of the latter and the armature bodies comprise a projecting portion extending into the cavity formed within said coils.

9. Gas compressor according to claim 1, wherein the cores of the electromagnets terminate within the coils of the latter and the armature bodies comprise a projecting portion extending into the cavity formed within said coils.

10. Gas compressor according to claim 1, wherein the cores of pairs of cooperating electromagnets are U-shaped and their legs terminate within the coils of said electromagnets, and the armature associated with said pairs of electromagnets are also U-shaped and extend into the cavities formed within the coils of the pairs of cooperating electromagnets.

11. Gas compressor according to claim 1, wherein the cores of pairs of cooperating electromagnets are U-shaped and their legs terminate within the coils of said electromagnets, and the armatures associated with said pairs of electromagnets are also U-shaped and extend into the

cavities formed within the coils of the pairs of cooperating electromagnets.

12. Gas compressor according to claim 1, wherein the said electric switch means comprise a movable contact carrier including a movable, spring-loaded tapered member and a rod provided with a tapered projection arranged in the path of said tapered member of the contact carrier; conductor means for connecting the contacts of said contact carrier with the terminals of the coils of electromagnets.

13. Gas compressor according to claim 1, wherein the said electric switch means comprise a movable contact carrier including a movable, spring-loaded tapered member and a rod connected to the said armature-carrying lever means and provided with a tapered projection arranged in the path of said tapered member of the contact carrier to make the movements of the latter dependent upon the attraction by electromagnets of said armature-carrying lever means and conductor means for connecting the contacts of said contact carrier with the terminals of the coils of said electromagnets.

14. Gas compressor according to claim 1, wherein the said electric switch means comprise a movable contact carrier including a movable spring-loaded tapered member, a fixed rod provided with a tapered projection arranged in the path of said tapered member of said contact carrier; this contact carrier being provided with a pair of arms for being engaged by a projection of the armature means of the electromagnets controlled by said contact carrier, and conductor means for connecting the contacts of said carrier with the terminals of the coils of said electromagnets.

15. Gas compressor according to claim 1, wherein the said electric switch means include a first resistance for reducing the energizing current of an electromagnet and a second resistance for deenergizing said electromagnet without interrupting its feeding circuit and for thereby avoiding the formation of sparks in said electromagnet, and contact means for successively connecting said resistances.

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