April 3, 1928. 1,664,733

J. BRAUN

COMPRESSOR

Filed Dec. 7, 1922 2 Sheets-Sheet 1

Fig.2.

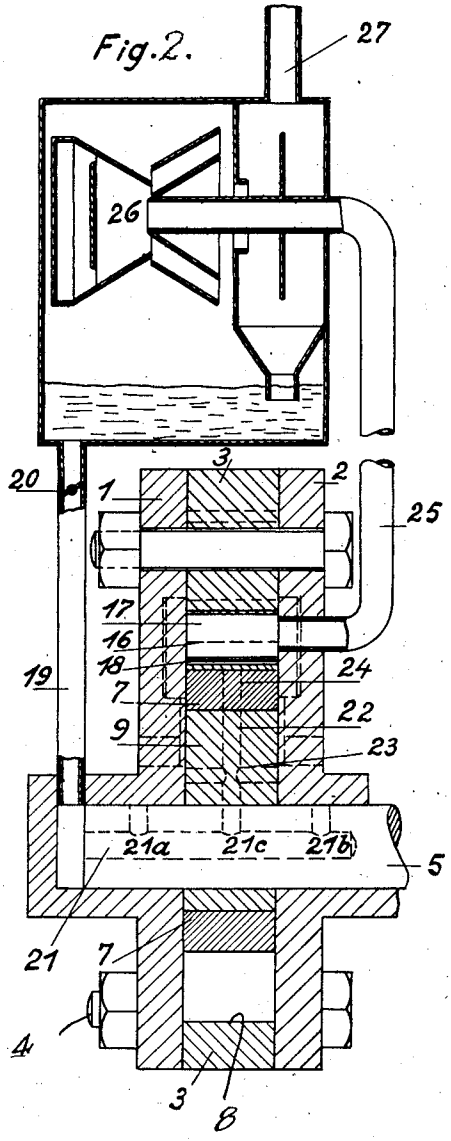
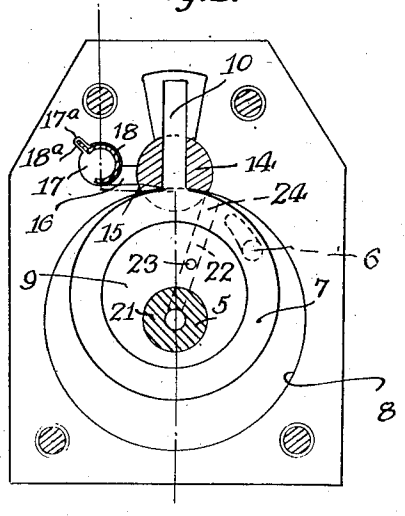


Fig.1.



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Fig. 4

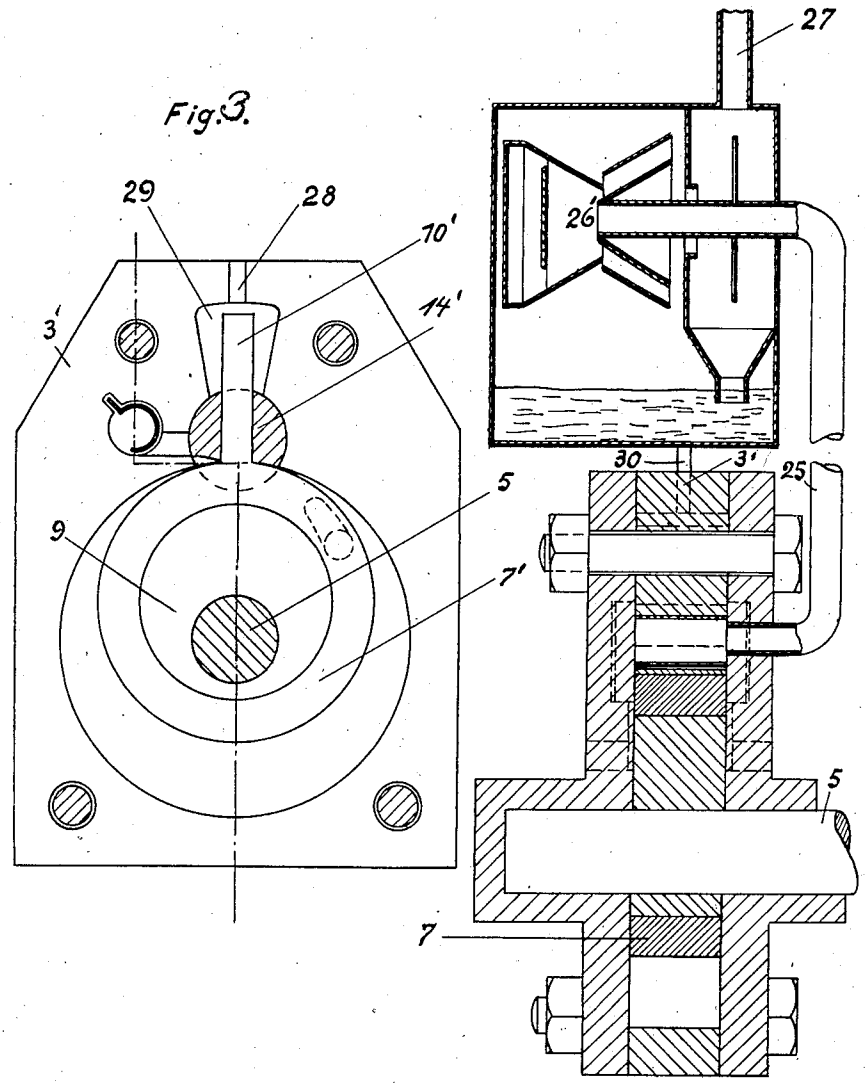


Fig. 3.

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1,664,733

UNITED STATES PATENT OFFICE.

JUSTUS BRAUN, OF NUREMBERG, GERMANY.

COMPRESSOR.

Application filed December 7, 1922, Serial No. 605,483, and in Germany March 8, 1922.

This invention relates to rotary compressors of the eccentric displacement type having an annular piston provided with a slide which engages in a swivel block rotatably mounted in the compressor casing, the piston rolling over the inside wall of the casing.

The present invention has for its object to provide an improved compressor of the type referred to in which the clearance space is reduced to a minimum, which is of simple and reliable construction and in which the compressed fluid sweeps over the smallest possible area of the swivel block on its way to the outlet port in the casing of the compressor.

In order that the invention may be clearly understood, I shall proceed to describe the same with reference to the two forms of construction shown by way of example in the accompanying drawings, wherein:—

Figures 1 and 2 show one constructional form of the improved compressor in side elevation with one end cover removed and in a vertical axial section respectively.

Figures 3 and 4 show, respectively, in side elevation with one end cover removed and in vertical axial section a modified form of the compressor.

Referring to Figures 1 and 2, the casing of the compressor comprises a central portion 3 having a cylindrical bore 8 to which two covers 1 and 2 are fixed by means of connecting bolts 4 passed through holes in the covers and central portion. The two covers are provided with bearings for the driving shaft 5 and the inner surfaces of said covers are well machined for the purpose of forming tight joints with the stationary middle part 3 and with the annular piston 7. The bore 8, which is concentric with the shaft 5 is well machined also and forms the piston chamber in which the annular piston 7 is displaced by means of an eccentric 9 keyed on the shaft 5. The annular piston 7 is provided with an upwardly extending slide 10, rigidly connected to it, said slide engaging in a guide slot formed in the swivel block 14 which is rotatably mounted in the compressor casing, so that the piston is prevented from turning with the eccentric and can only gyrate, the periphery of the piston rolling and sliding over the inner surface of the piston chamber 8. During the displacement of the piston by the eccentric the slide 10 oscillates the swivel block 14 in the guide slot of which the slide reciprocates. The swivel block 14 is constructed so as to serve at the same time as an oscillating valve for controlling the outflow of fluid from the piston chamber, and has a portion of its periphery adjacent the piston cut away so as to form on the suction side of the compressor, that is on the right hand side of the slide 10 in Figure 1, a continuation of the wall of the cylindrical bore 8 when the piston is in the dead centre position. On the delivery side of the compressor, that is to the left of the slide 10 in Figure 1, the periphery of the swivel block 14 adjacent the piston is cut away so as to form a flat, the edge 15 between this flat and the cylindrical part of the swivel block constituting a cut-off shoulder for the outlet port 16 which is in open communication with the transverse bore 17 which serves as delivery conduit.

The relative positions of the cut-off shoulder of the oscillating valve 14 and of the outlet port 16 are selected in such a manner that the port is uncovered at the end of half the stroke of the piston and closed at the dead centre. The economical pressure limit would thus be fixed at approximately 2 to 3 atmospheres. In order to produce still higher pressures in an economical manner a curved spring 18 is inserted in the transverse bore 17 to cover the port 16 and to act as check-valve. The spring 18 is fixed by inserting an offset portion 18^a in a groove 17^a in the wall of the bore 17 in which it is secured.

The fluid is admitted to the compressor through an inlet port 6 in the part 3 which is covered by the side of the piston when the latter is in the dead centre position.

The operation of the compressor is as follows: In the dead centre position shown in Figure 1, both the inlet and outlet ports are covered. As the eccentric 9 is turned in the clockwise direction the inlet port 6 is uncovered and remains uncovered until the piston again approaches the position shown in Figure 1. The outlet port 16, however, remains covered until the piston has travelled over half the circumference of the cylindrical bore 8 when the swivel block 14 uncovers the outlet port 16 and the compressed fluid is then forced into the delivery conduit 17, the spring valve 18 yielding under the pressure of the fluid being discharged from the piston chamber. The outlet port is

again covered as the piston reaches its dead centre position when the cycle commences afresh.

The lubrication of the compressor is effected by means of an oil circulating system. The oil flows into one bearing of the shaft 5 through the pipe 19 in which a throttling element 20 is arranged and the oil is conducted through the axial bore 21 of the shaft 5 to the several lubricating points. Through the radial bores 21^a and 21^b the oil flows to the bearings of the shaft and through the radial bore 21^c it flows into the radial bore 22 of the eccentric. With the radial bore 22 of the eccentric intersects an axial bore 23 designed to conduct the oil to the lateral sliding faces of the eccentric, the circumference of the same being lubricated from the bore 22.

The lubrication of the outer cylindrical surface of the annular piston 7 is effected through the bore 24 of the piston which terminates in the working space upon the suction side of the pump at a distance from the slide 10 which is approximately equal to the radius of the swivel block 14. By suitably arranging the direction of the bore 22 it is ensured that this bore 22 registers with the bore 24 when the piston stands at the dead centre position. Through bore 24 a determined quantity of oil, adapted to be regulated by a throttle valve, can flow into the working space of the pump whilst the piston is passing through the dead centre. This quantity of oil is pushed during the revolving of the piston in front of the contact line between the circumference of the piston and casing so as to form a gastight oil cushion but it flows partly also behind this contact line. This contact line is therefore permanently surrounded by a quantity of oil the surface tension of which, assisted by the capillary action, is greater than the gas pressure which normally exists in the compressor. The oil fills the cut out parts of the swivel block 14 and the outlet slit whereby the clearance space is reduced and it flows over together with the compressed gases through the outlet port into the delivery conduit 25 and from there into an oil separator 26. The inner circumference of the casing upon which the piston rolls is preferably roughened by etching in order to ensure a better adhesion of the oil.

The oil separator is constructed according to well known models and it serves at the same time as an oil reservoir for the reception of the lubricant which is continuously supplied to the compressor through the conduit 19, the compressed gases flowing to the point where they are to be used through the pipe 27.

The quantity of oil raised at each stroke of the compressor as oil cushion produces at the same time a cooling of the machine as the oil comes most intensively in contact just with the points which are most exposed to heat by the mutual sliding movement.

In the form of construction shown in Figs. 3 and 4 the lubricating is effected directly through a bore 28 in the centre portion 3′ of the casing which terminates in the space 29 of the compressor into which enters the part of the slide 10′ projecting over the swivel block 14′. The oil flows from the space 29 between the wall of the casing and the swivel block 14′ directly into the casing where it is pushed in front of the contact line between the circumference of the piston 7′ and the casing during the revolving of the piston as a gas-tight cushion in a similar manner to that described with reference to the form of construction shown in Figs. 1 and 2. The oil flows over with the compressed gases through the outlet element into the delivery conduit and from this into the oil separator 26′ from which it flows again through the conduit 30 into the bore 28 of the wall of the casing. The other parts of the compressor can be lubricated in a similar manner to that described in the form of construction shown in Fig. 1.

The compressor can evidently work also as a motor if the check-valve 18 is removed, the cut off shoulder 15 regulating the cut-off and expansion.

By an arrangement so that the two parts of the swivel block may be axially displaced and by giving to the cut out parts of the swivel block and to the cut-off shoulder 15 a helical shape the cut-off and expansion can be regulated by hand or automatically during the operation.

I claim:—

1. A rotary compressor, comprising in combination a casing, a driving shaft, an annular piston in said casing, an eccentric on said driving shaft for displacing said piston, a swivel block rotatably mounted in said casing, said swivel block having a guide slot, an upwardly extending slide on said annular piston, said slide engaging in said guide slot so as to oscillate the swivel block during the displacement of the piston, an inlet port in the casing capable of being covered by the side of the piston when the latter is in the dead-centre position and an outlet port in the casing capable of being obstructed by the swivel block as and for the purposes set forth.

2. A rotary compressor, comprising in combination a casing comprising a central portion having a cylindrical bore and a cover on either side of said central portion, an outlet port in said casing, a driving shaft, an annular piston in said casing, an eccentric on said driving shaft for displacing said annular piston, a swivel block rotatably mounted in said casing, said swivel block having a portion of its periphery cut away,

to form on the suction side of the compressor a continuation of the wall of the cylindrical bore, and on the delivery side so as to form a cut-off shoulder for the outlet port when the annular piston is in the dead centre position, a guide slot in said swivel block, an upwardly extending slide on said annular piston, said slide engaging in said guide slot so as to oscillate the swivel block during the displacement of the piston and an inlet port in one of said covers capable of being covered by the side of the piston when the latter is in the dead centre position, as and for the purposes set forth.

3. A rotary compressor as set forth in claim 1, and having a transverse delivery port in the casing in open communication with the outlet port and a curved spring fixed in said delivery port and adapted to isolate said delivery port from said outlet port, as and for the purposes set forth.

4. A rotary compressor comprising in combination a casing, bearings in said casing, means for supplying lubricant to one of said bearings, a driving shaft journalled in said bearings, said shaft having an axial hole adapted to receive lubricant from said bearing, an eccentric on said driving shaft, an annular piston on said eccentric, radial bores in said shaft in open communication with said axial hole for conducting lubricant to the shaft bearing, a bore in said shaft in open communication with said axial hole, a radial bore in said eccentric for conducting lubricant from said axial hole to the periphery of the eccentric, axial bores in said eccentric in open communication with the axial hole in the driving shaft for conducting lubricant to the sides of said casing, a radial hole in said annular piston for conducting lubricant to the periphery of the piston, said hole being adapted to register with the radial bore in the eccentric when the piston is in the dead centre position, a swivel block rotatably mounted in said casing said swivel block having a guide slot, an upwardly extending slide on said annular piston, said slide engaging in said guide slot so as to oscillate the swivel block during the displacement of the piston, an inlet port in the casing capable of being covered by the side of the piston when the latter is in the dead centre position, an outlet port in the casing capable of being obstructed by the swivel block and means for conducting surplus lubricant from the said outlet port to said reservoir, as and for the purposes set forth.

5. A rotary compressor comprising in combination a casing, bearings in said casing, means for supplying lubricant to one of said bearings, a driving shaft journalled in said bearings, said shaft having an axial hole adapted to receive lubricant from said bearing, an eccentric on said driving shaft, an annular piston on said eccentric, radial bores in said shaft in open communication with said axial hole for conducting lubricant to the shaft bearings, a bore in said shaft in open communication with said axial hole, a radial bore in said eccentric for conducting lubricant from said axial hole to the periphery of the eccentric, axial bores in said eccentric in open communication with the axial hole in the driving shaft for conducting lubricant to the sides of said casing, a swivel block rotatably mounted in said casing, said swivel block having a guide slot, an upwardly extending slide on said annular piston, said slide engaging in said guide slot so as to oscillate the swivel block during the displacement of the piston, an inlet port in the casing capable of being covered by the side of the piston when the latter is in the dead centre position, an outlet port in the casing capable of being obstructed by the swivel block, a radial hole in said annular piston terminating at the periphery of the piston at a distance from the slide on the suction side thereof equal to the radius of the swivel block for conducting lubricant to the periphery of the piston, said hole being adapted to register with the radial bore in the eccentric when the piston is in the dead centre position, and means for conducting surplus lubricant from the said outlet port to said reservoir, as and for the purposes set forth.

In testimony whereof I affix my signature.

DIPL. ING. JUSTUS BRÄUN.