United States Patent [19]

Kocher et al.

[11] **3,869,227**

[45] **Mar. 4, 1975**

[54] **VARIABLE CAPACITY ROTARY SCREW COMPRESSOR HAVING VARIABLE HIGH PRESSURE SUCTION FLUID INLETS**

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[73] Assignee: **Vilter Manufacturing Corporation**, Milwaukee, Wis.

[22] Filed: **Mar. 8, 1974**

[21] Appl. No.: **449,263**

[52] **U.S. Cl.** **418/15,** 418/159, 418/201

[51] **Int. Cl.** **F01c 1/16**

[58] **Field of Search** 418/15, 159, 201, 202, 418/203

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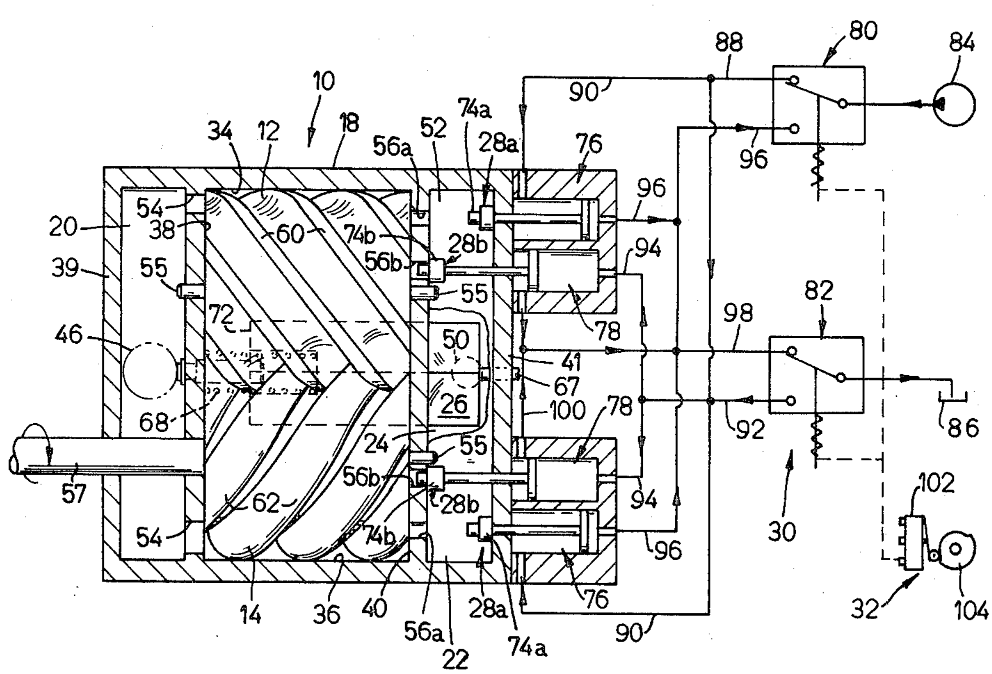
Primary Examiner—C. J. Husar
Assistant Examiner—Leonard Smith
Attorney, Agent, or Firm—James E. Nilles

[57] **ABSTRACT**

A variable capacity multiple inlet rotary screw compressor having a pair of helical rotors mounted within a housing for compressing fluid drawn from a low pressure suction fluid chamber and a high pressure suction fluid chamber and discharging to a discharge chamber. A slide valve is provided in the housing to control the capacity of the compressor by changing the point of low pressure suction fluid cut off to the rotors. The point of high pressure suction fluid admission being changed in synchronism with the movement of the slide valve to connect the working chambers of the rotors to the high pressure fluid suction fluid chamber simultaneously with or just after low pressure suction fluid cut off.

14 Claims, 14 Drawing Figures



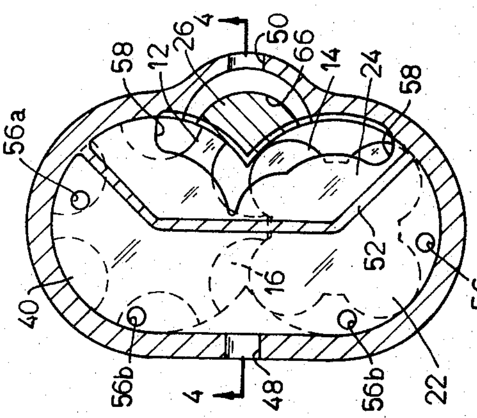


FIG.3

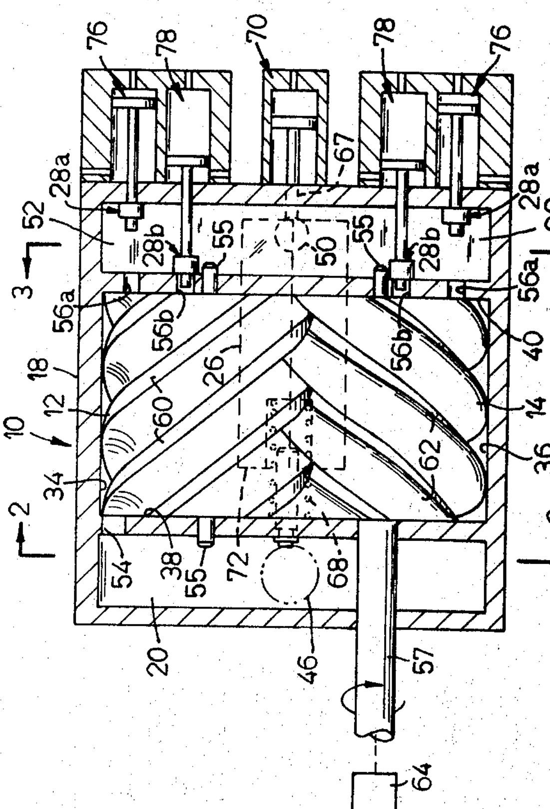


FIG.1

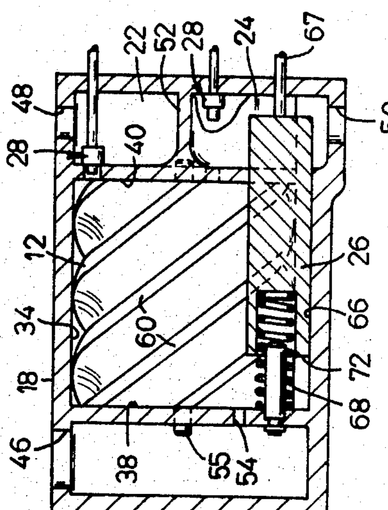


FIG.4

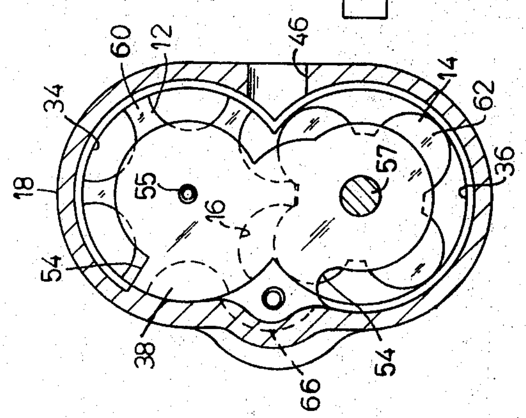


FIG.2

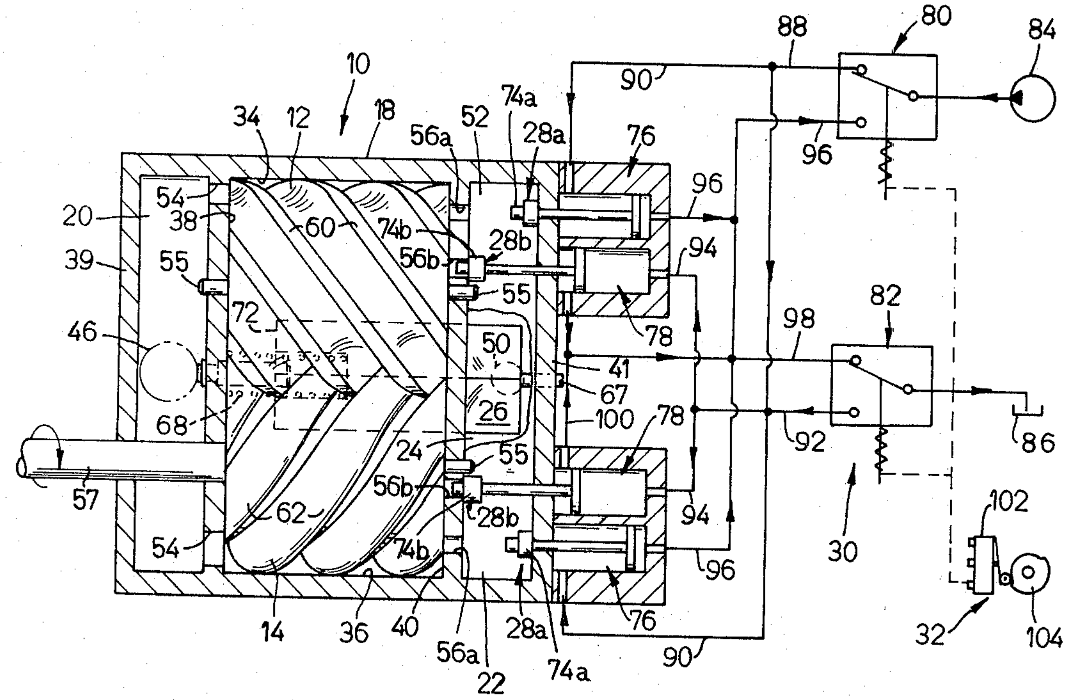

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FIG. 5

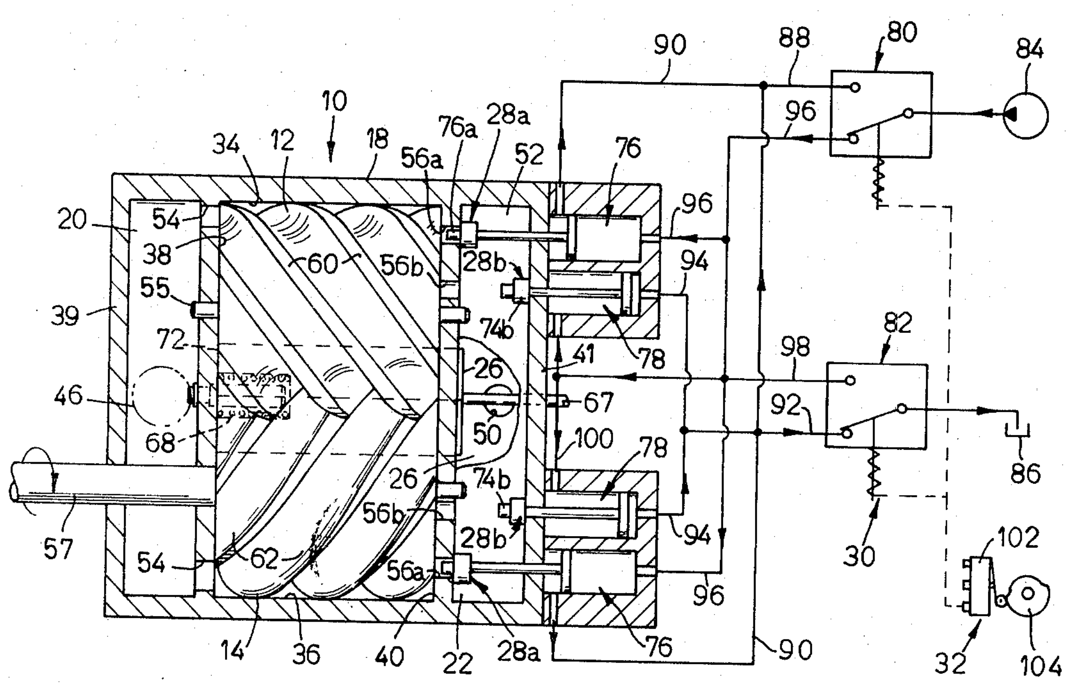
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FIG. 6

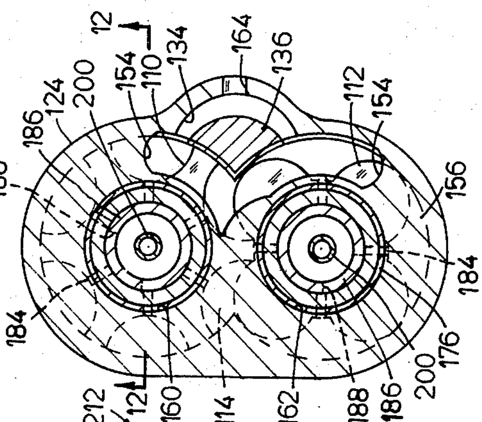

FIG.9

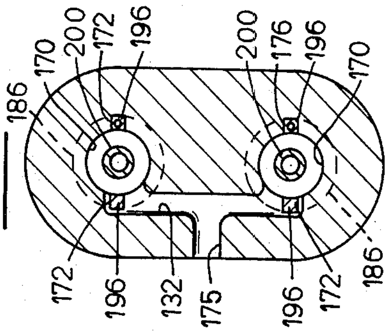

FIG.10

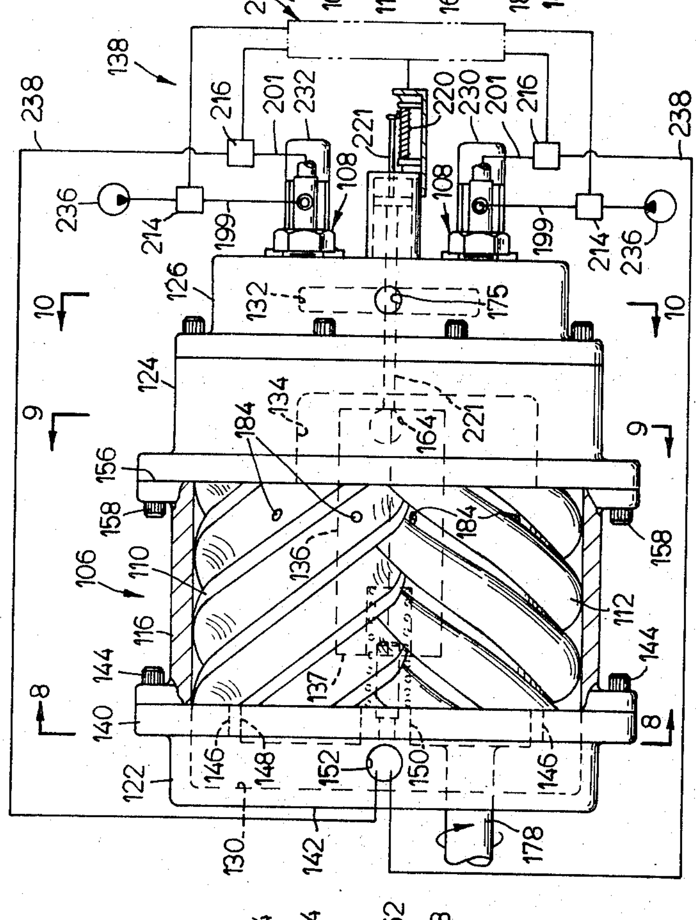

FIG. 7

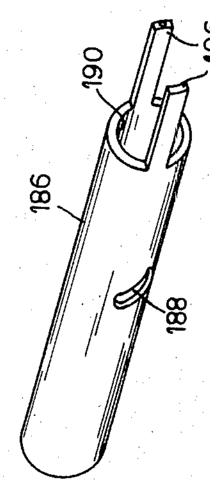

FIG.11

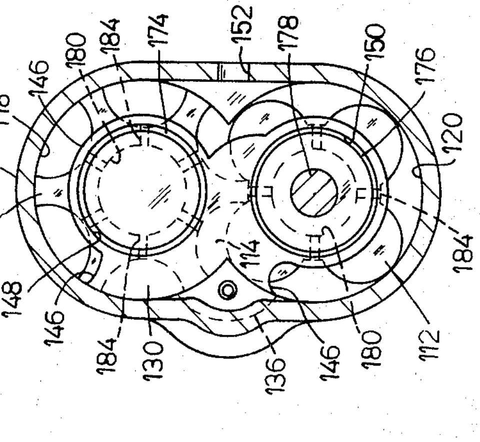

FIG.8

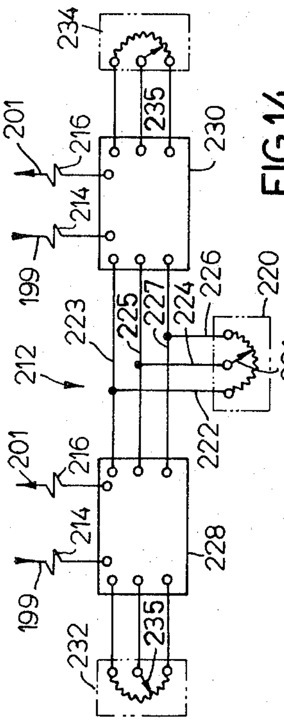
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FIG.14

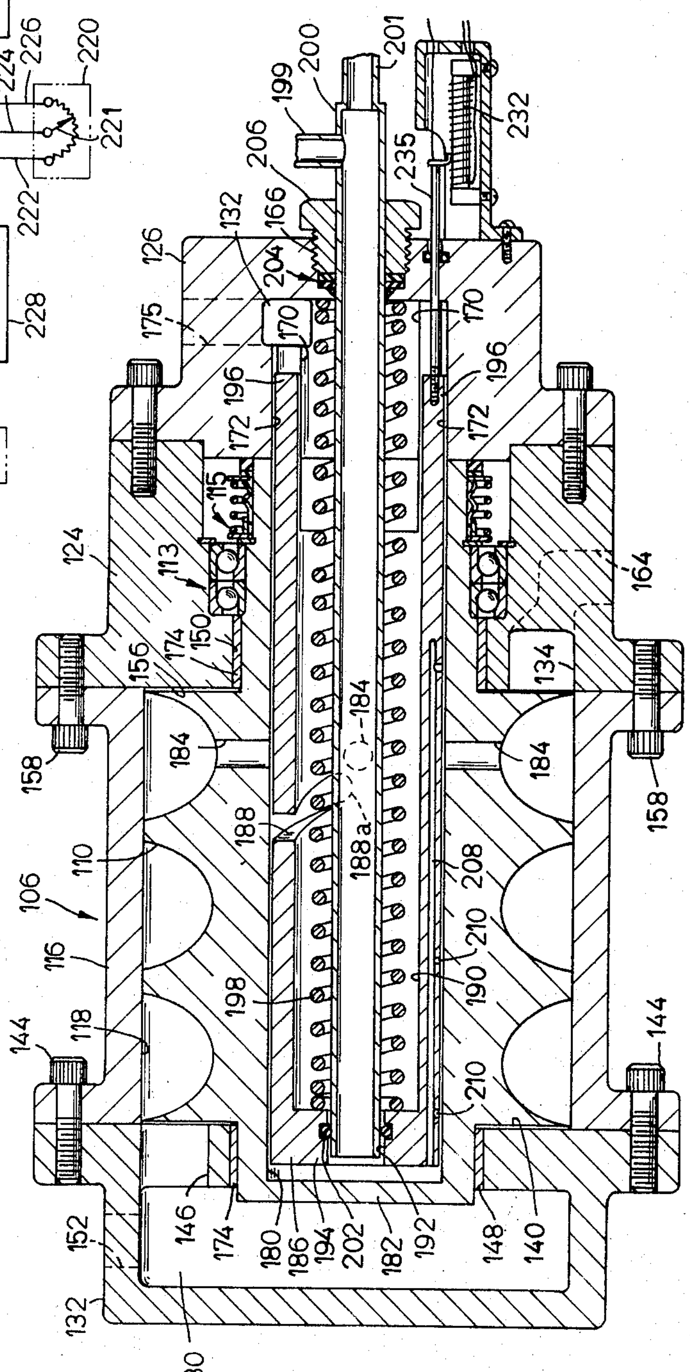
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FIG. 12

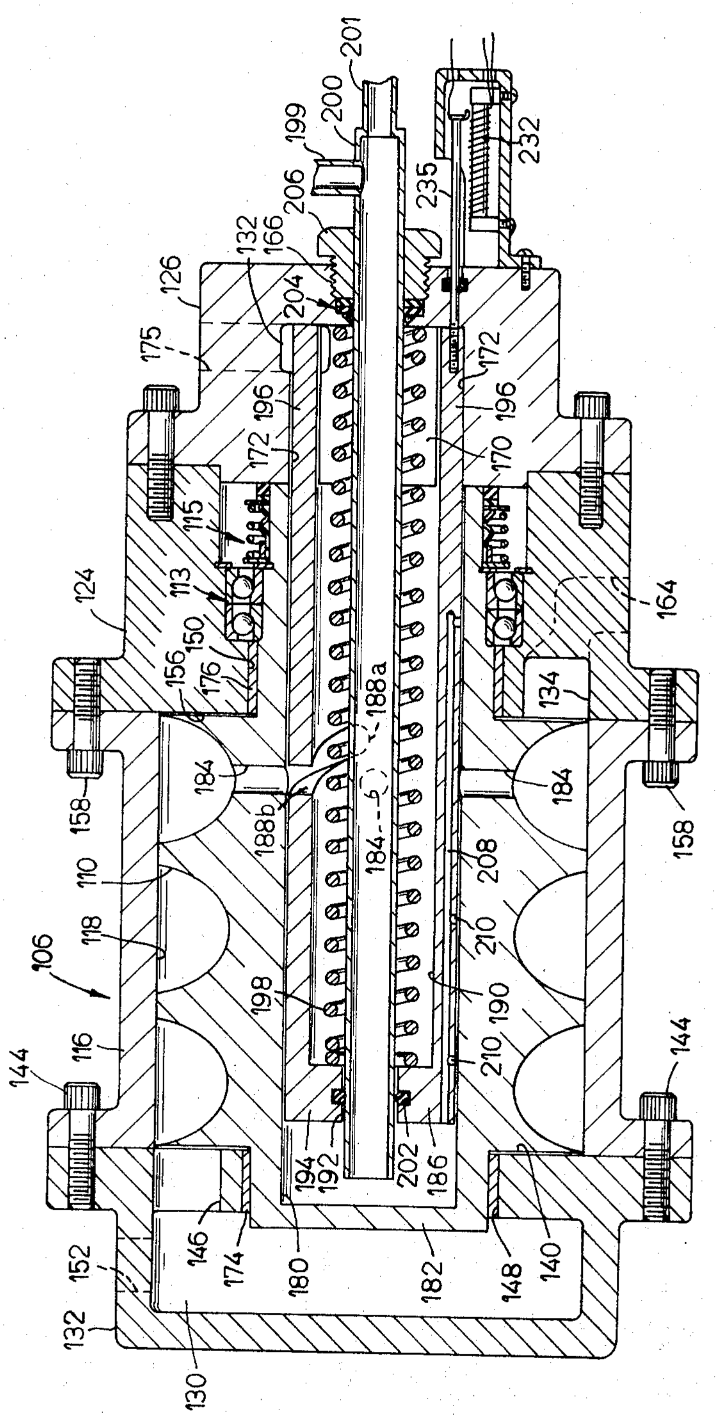

FIG.13

VARIABLE CAPACITY ROTARY SCREW COMPRESSOR HAVING VARIABLE HIGH PRESSURE SUCTION FLUID INLETS

BACKGROUND OF THE INVENTION

Multiple suction variable capacity screw compressors utilize a slide valve to vary the capacity of the compressor between minimum and maximum capacity positions. The slide valve is used to control the low pressure suction fluid inlet producing a change in the pressure at the point of admission of the high pressure suction fluid. In a copending application Ser. No. 403,195, filed Oct. 3, 1973 and entitled "Variable Capacity Rotory Screw Compressor", the point of injection of the secondary or high pressure suction fluid is maintained constant with respect to the low pressure suction fluid cut off in order to maintain the constant pressure at the point of admission of the high pressure suction fluid. This was accomplished by introducing the high pressure suction fluid at a fixed distance from the low pressure suction fluid cut off.

SUMMARY OF THE PRESENT INVENTION

The multiple inlet variable capacity screw compressor of the present invention provides a change in the point of admission of the high pressure suction fluid vapor with a change in the position of the slide valve in order to admit high pressure suction fluid at the point of low pressure suction fluid cut off. In one embodiment of the invention, this is achieved by advancing or retracting the point of injection of the high pressure suction fluid vapor with respect to the position of the working chamber between the rotors. An electro-hydraulic sensing system is used to sense the position of the slide valve and to open or close angularly offset plug valve assemblies. In the alternate embodiment of the invention, a continuing change in the point of admission of the high pressure suction fluid is provided with a continuing change in the position of the slide valve. Control valve assemblies are provided in each of the rotors of the compressor which are controlled by an electro-hydraulic circuit that maintains a synchronized relationship between the position of the slide valve and the control valve assemblies through an electrically balanced circuit.

DRAWINGS

FIG. **1** is a plan view partially in section of the variable capacity compressor according to the present invention;

FIG. **2** is a section view taken on line **2—2** of FIG. **1** showing the inlet passages from the low pressure suction fluid inlet chamber to the working chambers of the compressor;

FIG. **3** is a view taken on line **3—3** of FIG. **1** showing the connection of the high pressure suction fluid chamber and the discharge chamber to the working chambers of the compressor;

FIG. **4** is a section view taken on line **4—4** of FIG. **3** showing the position of the slide valve and the plug valve assemblies in the minimum capacity position;

FIG. **5** is a plan view similar to FIG. **1** showing the hydraulic circuit for controlling the plug valve assemblies;

FIG. **6** is a plan view similar to FIG. **5** showing the slide valve in the maximum capacity position and the hydraulic control circuit in the maximum capacity position;

FIG. **7** is a plan view partially in section showing another embodiment of the variable capacity compressor of this invention;

FIG. **8** is a view taken on line **8—8** of FIG. **7** showing the connection of the low pressure suction fluid chamber to the working chambers of the rotors;

FIG. **9** is a view taken on line **9—9** of FIG. **7** showing the connection of the discharge chamber to the working chambers of the rotors;

FIG. **10** is a view taken on line **10—10** of FIG. **7** showing the connection of the high pressure suction fluid chamber to the rotors;

FIG. **11** is a perspective view of the control cylinder which is used to control high pressure suction fluid admission to the rotors;

FIG. **12** is a section view taken on line **12—12** of FIG. **9** showing the control valve assembly for controlling the admission of high pressure suction fluid to the grooves in one of the rotors; and

FIG. **13** is a view similar to FIG. **12** showing the control valve assembly in the maximum capacity position; and

FIG. **14** is a schematic diagram of an electrohydraulic circuit for controlling the movements of the control assemblies.

DESCRIPTION OF THE INVENTION

The variable capacity multiple inlet rotary screw compressor **10** of this invention generally includes a pair of oppositely rotating constant mesh rotors **12, 14** which define working chambers **16** within a housing **18.** The working chambers **16** are in fluid communication with a low pressure suction fluid inlet chamber **20** at one end of the housing **18** and to a high pressure suction inlet chamber **22** at the other end of the housing **18.** Fluid drawn from the chambers **20** and **22** is compressed in the working chambers **16** is discharged to a discharge chamber **24.**

The capacity of the compressor **10** is adjusted by means of a slide valve **26** which controls the low pressure suction fluid cut off. The admission of the high pressure suction fluid is varied so that communication with the working chambers **16** occurs simultaneously with or just after low pressure cut off. In FIGS. **1** through **6,** this is achieved by means of a number of plug valve assemblies **28.** The timing of the operation of the plug valve assemblies **28** in relation to the position of the slide valve **26** is controlled by means of an electro-hydraulic circuit **30** which includes a cam operated switch assembly **32** that is connected to the slide valve **26.**

In a variable capacity compressor of the type contemplated herein, as the slide valve **26** is moved between maximum and minimum capacity positions, the plug valve assembly **30** must be opened or closed so that high pressure suction fluid cannot bypass through the working chambers **16** between the rotors **12** and **14** back to the low pressure suction chamber **20.** More particularly and referring to FIGS. **5** and **6,** it should be noted that as the rotors **12** and **14** intermesh to form the working chambers **16,** the working chambers will initially register with the low pressure suction chamber **20,** then the high pressure suction chamber **22** and finally discharge through the discharge chamber **24.** In order to obtain maximum efficiency, the high pressure suction fluid chamber **22** should be in communication with the working chambers **16** simultaneously with or just after low pressure cut off but prior to pressure build up in the working chambers **16**. As the point of low pressure cut off is changed by moving slide valve **26** to reduce capacity, the point of admission of high pressure suction fluid to the working chambers **16** must be varied so that the high pressure suction fluid enters the working chambers **16** in accordance with the new low pressure suction cut-off.

THE VARIABLE CAPACITY COMPRESSOR OF FIGS. 1–6

More specifically, the housing **18** includes two intersecting bores **34** and **36** closed at each end by end walls **38** and **40**. The low pressure suction chamber **20** is provided between the end wall **38** and outside wall **39**. The high pressure suction chamber **22** is provided between the end wall **40** and outside wall **41**. A low pressure suction inlet port **46** is connected to the chamber **20**. A high pressure suction inlet port **48** and a discharge port **50** are connected to the high pressure suction chamber **22** and discharge chamber **24**, respectively. Chamber **22** is separated from discharge chamber **24** by means of a partition **52**.

The low pressure suction inlet chamber **20** is connected to the working chambers **16** within the housing **18** by means of a pair of arcuate slots **54** provided in the end wall **38**. The high pressure suction inlet chamber **22** is connected to the working chambers **16** by ports **56*a*** and **56*b*** in end wall **40**. The discharge chamber **24** is connected to the working chambers **16** through arcuate slots **58** in end wall **40**.

The rotors **12** and **14** are mounted for rotation on shafts **55** which are supported in a parallel spaced relation by end walls **38** and **40**. Each rotor includes a number of helical lands **60** and grooves **62**. The wrap angle of the land **60** on the male rotor **12** is approximately 270° and the wrap angle of the land **60** on its female rotor **14** is approximately 180°. The rotors **12** and **14** are positioned within the working cylinders defined by the end walls **38** and **40** and the parallel bores **34** and **36**. The compressor **10** can be driven in a conventional manner by an electric motor **64** connected to a shaft **57** on rotor **14**.

COMPRESSOR CAPACITY CONTROL

The capacity of the compressor **10** is varied by means of the slide valve **26** which is positioned in a bore **66** provided in the housing **18** in a parallel relation to the bores **34** and **36**. The slide valve **26** forms a movable wall for portions of the wall of the bores **34** and **36** in the housing **18** and is axially movable in the bore **66** from the minimum capacity position shown in FIG. **5** to a maximum capacity position shown in FIG. **6**. The slide valve **26** can be moved to the maximum capacity position by means of a hydraulic piston and cylinder assembly **70** connected to one end of the slide valve **26** by a shaft **67** and is normally biased to the minimum capacity position by means of a spring **68**.

The point or timing of admission of low pressure suction fluid or vapor into the working chambers of the rotors **12** and **14** is determined by the position of the face or end **72** of the slide valve **26**. In the minimum capacity position of the slide valve **26**, the end **72** of the slide valve is spaced from end wall **38** connecting a portion of the bores **34** and **36** for the rotors **12** and **14** to the bore **66** for slide valve **26**. The working chambers **16** of the rotors will not close until the point of contact of the helical land **60** of the rotor **12** seats in groove **62** of rotor **14** and passes the end **72** of the slide valve **26**. The stroke of the compressor at the minimum capacity position will be equal to the distance of the end **72** of the slide valve **26** to the end wall **40** at the discharge end of the rotors **12** and **14**.

HIGH PRESSURE SUCTION FLUID ADMISSION

The location of the point of admission or introduction of the high pressure suction fluid or vapor into the working chambers **16** between the rotors **12** and **14** is determined by opening or closing the plug valve assemblies **28*a*** and **28*b*** provided in the high pressure suction chamber **22**. In this regard, each of the plug valve assemblies **28** includes a valve member **74** which is positioned for movement into a closing position with respect to the ports **56** in end wall **40**. The valve members **74** are actuated by means of double acting piston and cylinder assemblies **76** and **78** provided on the end of the housing **18**. In the minimum capacity position of the slide valve **26**, (FIG. **5**) the high pressure suction fluid must be admitted into the chambers **16** as they are closed by the end **72** of the slide valve **26**. Since only a portion of the working chambers **16** formed between the rotors **12** and **14** is used in the minimum capacity position of the slide valve **26**, the outer ports **56*a*** should be opened and the inner ports **56*b*** closed. As the slide valve **26** is moved toward the maximum capacity position the full length of the working chambers **16** defined by the rotors **12** and **14** will be used and the ports **56*a*** closed and the ports **56*b*** opened to allow the high pressure suction fluid to enter the working chambers **16** at an earlier point in the rotory motion of the rotors **12** and **14**.

Means are provided for synchronizing the opening and closing of the plug valve assemblies **28*a*** and **28*b*** with the position of the slide valve **26**. Such means is in the form of an electro-hydraulic circuit **30** shown in FIGS. **5** and **6**. In the minimum capacity position of the slide valve as seen in FIG. **5**, the plug valve assemblies **28*a*** should be in the open position and the plug valve assemblies **28*b*** should be in the closed position.

In the maximum capacity position (FIG. **6**) of the slide valve **26**, the plug valve assemblies **28*a*** should be closed and the plug valve assemblies **28*b*** should be opened. This is accomplished by means of the solenoid actuated valves **80** and **82**. The solenoid valve **80** is connected to a source of hydraulic fluid **84** under pressure. The solenoid valve **82** is connected to a reservoir **86**. In the minimum capacity position of the slide valve **26** shown in FIG. **5**, fluid under pressure will flow through the solenoid valve **80** and lines **88** and **90** to the cylinders **78** for the plug assemblies **28*a*** to move the pistons **76** to the open position. Fluid under pressure will also flow through line **92** and **94** to the cylinders **78** for the plug valve assemblies **28*b*** to move the valve members **74** to the closed position. Fluid discharging from the cylinder **76** in the plug assemblies **28*a*** will flow through the lines **96** and **98** to the solenoid valve **82** for discharge to the reservoir **86**. Fluid discharging from the cylinder **78** for the plug assemblies **28*b*** will discharge through lines **100** and **98** to the solenoid valve **82** for discharge to the reservoir **86**.

In the maximum capacity position of the slide valve **26** shown in FIG. **6**, the solenoid valves **80** and **82** are reversed to open plug valve assemblies **28*b*** and close plug valve assemblies **28*a***. In this position, fluid under pressure will flow through solenoid valve **80** and lines **96** to cylinder **76** and lines **98** and **100** to cylinders **78**. Fluid discharging from cylinders **78** will flow through lines **94** and **92** and from cylinders **76** through lines **90** and **88** through solenoid valve **82** to reservoir **86**.

The solenoid valves **80** and **82** are controlled by means of the cam actuated switch assembly **32** which is connected to respond to the movement of the slide valve to open or close the electrical circuit to the solenoid valves **80** and **82**. The assembly **32** includes a switch **102** and a cam **104**. In FIG. **5**, the cam **104** is shown in the minimum capacity position with the switch **102** open. Rotation of the cam **104** to the maximum capacity position of the slide valve as seen in FIG. **6** will close switch **102** and energize the solenoid valves **80** and **82**.

CONTINUOUS HIGH PRESSURE SUCTION FLUID CONTROL

In the alternate embodiment of the invention (FIGS. **7** through **14**), a variable capacity compressor **106** is shown having a continuous high pressure suction fluid control. This is accomplished by utilizing a pair of control valve assemblies **108** mounted within rotors **110** and **112** to control the admission of high pressure suction vapor or fluid to the working chambers **114** of the rotors **110** and **112**.

In this regard, the compressor **106** includes a compressor housing **116** having a pair of cylindrical bores **118** and **120** closed at one end by means of a low pressure suction fluid or vapor housing **122** and at the other end by means of a high pressure fluid or vapor discharge housing **124**. A high pressure suction fluid or vapor housing **126** is mounted on the discharge housing **124**.

Fluid or vapor is pumped from a low pressure suction chamber **130** in housing **122** and a high pressure suction fluid or vapor chamber **132** in housing **126** to a discharge chamber **134** in discharge housing **124** by the rotors **110** and **112**. The capacity of the compressor **106** is adjusted by means of a slide valve **136** which controls the low suction fluid pressure cut off as described above. High pressure suction fluid admission is controlled by means of the control valve assemblies **108**. The timing of the operation of the control valve assemblies **108** is controlled by means of an electrohydraulic circuit **138** which synchronizes the position of the control valve assemblies **108** with the slide valve **136**.

More particular, the low-pressure suction fluid housing **122** includes an inside wall **140** and an outside wall **142** spaced apart to define the chamber **130**. The housing **122** is connected to the compressor housing **116** by a number of bolts **144**. Fluid communication between the chamber **130** and the housing **116** is provided by means of a number of arcuate slots **146** provided in the end wall **140** as seen in FIG. **8**. A pair of rotor bearing openings **148** and **150** are provided in the inside end wall **140**. Low pressure suction fluid is admitted to the chamber **130** through an inlet port **152**.

The discharge housing **124** provides fluid communication between the discharge chamber **134** and the compressor housing **116** by means of a pair of arcuate recesses **154** provided in the end face **156** of the housing **124**. Fluid is discharged from chamber **134** through port **164** in housing **116**. The housing **124** is mounted on the compressor housing **116** by means of bolts **158**. A pair of rotor bearing openings **160** and **162** are provided in the discharge housing **124** in axial alignment with the rotor openings **148** and **150**, respectively, in housing **122**.

The high pressure suction fluid or vapor housing **126** includes a pair of threaded openings **166** which are axially aligned with openings **160** and **162**. An enlarged bore **170** is provided in each of the openings **160** on the inside surface of the housing **126**. A pair of diametrically opposite slots **172** are provided in each of the bores **170**. The bores **170** are intersected by the chamber **132**. High pressure suction fluid or vapor is admitted to chamber **132** through an inlet port **175**.

The rotors **110** and **112** are mounted for rotation within the housing **116** and cooperate to provide working chambers **114** for compressing fluid admitted from the low pressure suction chamber **130** and the high pressure suction chamber **132**. Rotor **110** is journalled for rotation in bearings **174** provided in the opening **148** in the end wall **140** and the opening **160** in the discharge housing **124**. The rotor **112** is journalled for rotation in bearings **176** provided in the opening **150** in the end wall **140** and the opening **162** in the discharge housing **124**. The rotors **110** and **112** can be driven by any suitable means such as a motor connected to a shaft **178** provided on the end of the rotor **112**. Rotor **110** includes an axially extending opening **180** which is closed at one end by end wall **182** and is connected to the grooves in the rotor by radially extending ports **184**. Rotor **112** is similar to rotor **110** and includes an axial bore **180** connected to the grooves of the rotor by ports **184**. Axial movement of the rotors **110** and **112** is prevented by twin ball thrust bearings **113**. The rotors **110** and **112** are sealed by spring biased seals **115**.

LOW PRESSURE SUCTION FLUID CONTROL

The point of admission of low pressure suction fluid or vapor into the working chambers **114** between the rotors **110** and **112** is controlled by means of the slide valve **136** in the same manner as described in the embodiment shown in FIGS. **1** through **6**. In this regard, the point of low pressure suction fluid cut off is determined by the position of the end **137** of the slide valve **136**. In the minimum capacity position of the slide valve **136**, the end **137** will be spaced from the end wall **140** connecting a portion of the bores **118** and **120** to the bore **134** for the slide valve **136**. The working chambers **114** will not close until the point of contact of the lands and grooves of the rotors **110** and **112** pass the end **137** of the slide valve **136**. The stroke of the compressor at the minimum capacity position will be equal to the distance of the end **137** of the slide valve **136** to the face **156** of the discharge housing **124**. The slide valve **136** is moved in substantially the same manner as shown in FIGS. **1** and **2**.

HIGH PRESSURE SUCTION FLUID CONTROL ASSEMBLIES

High pressure suction fluid is admitted to the working chambers **114** through the blind bore **180** and ports **184** provided in the rotors **110** and **112**. The timing of admission of the high pressure suction fluid or vapor from the high pressure chamber **132** is controlled by means of the control assemblies **108** provided in the bores **180** in rotors **110** and **112**. In this regard, each of the control assemblies **108** includes a hollow cylinder **186** as seen in FIG. **11**. The cylinder **186** is provided with a central bore 190, an axially extending arcuate alot 188 and an opening 192 in end wall 194. A pair of axially extending guide bars or rods 196 are provided at one end of the cylinder 186. Fluid communication is provided from the bore 190 through the wall of the cylinder 186 by means of the arcuate slot 188. The cylinder 186 is positioned for axial movement within the bore 180 of the rotor 110 with the slot 188 aligned with the radial ports 184 in the rotor 110. The cylinder 186 is prevented from rotating in the bore 180 by means of the rods 196 which are aligned with the slots 172 in bore 170.

The cylinder 186 is biased to a minimum capacity position by means of a spring 198 provided within the bore 190 of the cylinder 186 and bearing against the housing 126. In the maximum capacity position shown in FIG. 13, the end 188*b* of the slot 188 will be aligned in the radial plane of ports 184. In the minimum capacity position shown in FIG. 12, the end 188*a* will be moved beyond the radial plane of the ports 184 to cut off the high pressure suction fluid.

Means are provided for moving the cylinder 186 axially in the bore 180 of the rotor 110. Such means is in the form of a hollow tube 200 which extends through the bore 190 and the opening 192 in the end wall 194 of the cylinder 186. The tube 200 is sealed in the opening 192 by means of an O-ring seal 202. The tube 200 is retained in a fixed position in the cylinder 186 by means of a pressure seal 204 provided in the opening 166 in the housing 126 and a lock nut or cap 206 which is threadedly received in the threaded opening 166. Hydraulic fluid is admitted to the tube 200 through an inlet port 199 and discharged through a port 201. Hydraulic fluid under pressure is admitted to the bore 180 through tube 200 into the space between end wall 194 and the bore 180. When the pressure of the fluid builds up sufficiently to overcome the force of the spring 198, the cylinder will move axially in the bore 180.

The cylinder 186 is lubricated for free movement in the bore 180 by means of a passage 208 provided in the side wall of the cylinder 186 and a number of ports 210. As hydraulic fluid is admitted into the bore 180 it will flow through the passage 208 and the ports 210 into the space between the cylinder 186 and the walls of the bore 180.

ELECTRO-HYDRAULIC CONTROL

Means are provided for synchronizing the position of the cylinder 186 with the position of the slide valve 136. Referring to FIG. 14, a schematic electrohydraulic diagram is shown for synchronizing the movements of the cylinders 186 with the position of the slide valve 136. The electrohydraulic circuit includes an electrical circuit 212 which is used to control solenoid valves 214 and 216 in the hydraulic circuit 138.

More particularly, the electric circuit 212 includes a first potentiometer 220 which is connected to the slide valve 136 by means of a rod 221 and is used to convert the mechanical movement of the slide valve 136 to an electrical signal. The electric signal is transferred through electric lines 222, 224 and 226 to a pair of bridge balancing relays 228 and 230 through lines 223, 225 and 227. The bridge balancing relays 228 and 230 are connected to a pair of potentiometers 232 and 234, respectively. The potentiometers 232 and 234 are connected to the cylinders 186 by rods 235 and convert the mechanical position of the cylinders 186 to an electrical signal which is transmitted to the respective bridge balancing relays 228 and 230.

Each of the bridge balancing relays 232 and 234 is connected to an oil supply solenoid valve 214 and to an oil drain solenoid valve 216. Each of the oil supply solenoid valves 214 is connected to the inlet line 199 to the tubes 200. Each of the oil drain solenoid valves 216 is connected to the outlet port 201 to the tubes 200. The oil supply valves 214 are used to control the flow of hydraulic fluid from a source 236 of hydraulic fluid under pressure such as a lube oil pump. Each of the oil drain solenoid valves 216 is used to control the discharge of hydraulic fluid from the tube 200 to the suction chamber 130.

In operation, both of the valves 214 and 216 are normally closed when the slide valve 136 is in the minimum capacity position. When the slide valve 136 is moved from the minimum capacity postion to an intermediate position or to the maximum capacity position, the potentiometer 220 will move a corresponding amount indicating the mechanical movement of the slide valve and providing an electrical signal to each of the bridge balancing relays 228 and 230. The initial change in the electrical signal will unbalance the relays 228 and 230 opening the oil supply solenoid valves 214 and allowing hydraulic fluid to flow into the tubes 200 to move the cylinders 186 toward the maximum capacity position. The movement of the cylinders 186 will be sensed by the potentiometers 232 and 234 providing a signal of the postion of the cylinder 186 to the bridge balancing relays 228 and 230. When the potentiometer 220 for the slide valve comes to a stop, the potentiometers 232 and 234 will continue to move until the signal from the potentiometers 232 and 234 is balanced with the signal from the potentiometer 220 in the relays 228 and 230. When the signals are balanced, the solenoid valve 214 will close.

When the slide valve 136 is moved in the opposite direction, the movement of the potentiometer 220 will again produce a signal to the bridge balancing relays 232 and 234 which will cause the valves 216 to open allowing fluid to flow from the tube 200 to the low pressure chamber 130 through lines 238 or to a reservoir. The cylinders 186 will move toward the minimum capacity position due to the bias of the spring 198 moving the potentiometers 232 and 234 until the signal is balanced with the signal of the potentiometer 220.

We claim:

1. A variable capacity rotary screw compressor comprising: a housing having a pair of parallel cylindrical bores, a pair of oppositely rotating constant mesh rotors positioned in said bores and defining working chambers, a low pressure fluid chamber in fluid communication with said working chambers at one end of said rotors, a discharge chamber in fluid communication with said working chambers at the other end of said rotors, a blind bore in each of said rotors, a plurality of radial ports in said rotors, said ports lying in a common plane, a high pressure fluid chamber connected to each of said blind bores, cylinder means in each of said bores for selectively advancing or retracting the point of admission of high pressure fluid to said ports in said rotors, a slide valve mounted in said housing for controlling the low pressure fluid cut off between minimum and maximum capacity positions with respect to said rotors, and electrohydraulic means con-

nected to respond to the position of the slide valve for controlling said high pressure fluid control means.

2. A variable capacity rotary screw compressor comprising:

a housing having a low pressure chamber and a high pressure chamber,

means for separating said high pressure chamber into a high pressure fluid inlet chamber and a high pressure discharge chamber,

a low pressure fluid inlet port connected to said low pressure chamber,

a high pressure fluid inlet port connected to said high pressure chamber and a fluid discharge port connected to said high pressure discharge chamber,

a pair of oppositely rotating constant mesh rotors having helical lands and intervening grooves defining working chambers, said rotors being mounted within said housing to provide pumping and compressing action and being connected at the inlet end to said low pressure chamber and at the outlet end to said discharge chamber,

means at the outlet end for connecting the high pressure chamber to the working chambers defined by said rotors,

a slide valve mounted within said housing for movement between minimum and maximum capacity positions with respect to said rotors,

and electrohydraulic means connected to respond to the position of said slide valve and being operatively connected to said high pressure fluid connecting means to change the angular point of admission of high pressure fluid to the working chambers in relation to the minimum and maximum capacity positions of said slide valve.

3. The compressor according to claim 2 wherein said connecting means includes a pair of angularly offset ports for each of said rotors connecting the high pressure chamber to said rotors and a valve member corresponding to each of said ports mounted for movement between open and closed positions with respect to the corresponding port and including means for connecting said valve members to said electrohydraulic means whereby one of said ports in each of said pairs of ports is opened when the slide valve is in the minimum capacity position and the other of each of said pairs of bores is open when the slide valve is in the maximum capacity position.

4. A variable capacity multiple inlet rotary screw compressor comprising:

a housing having a low pressure suction inlet port, a high pressure suction inlet port and a discharge port,

a pair of oppositely rotating constant mesh rotors defining working chambers within said housing, said rotors being positioned in said housing to provide pumping and compressing action and being connected to draw fluid from the low pressure inlet port and said high pressure inlet port and to discharge the compressed fluid to the discharge port,

means mounted within said housing for controlling the low pressure suction inlet fluid cut off for said rotors,

means for varying the point of admission of the high pressure inlet fluid from said high pressure inlet port,

and electro-hydraulic means connected to respond to the position of the cut off means for controlling the high pressure varying means whereby said high pressure suction fluid is admitted to the working chambers simultaneously with or just after low pressure suction fluid cut off.

5. The compressor according to claim 4 wherein said rotors have helical lands and intervening grooves having wrap angles of less than 360°.

6. The compressor according to claim 4 wherein said high pressure varying means comprises a number of plug valve assemblies operatively connected to said electro-hydraulic means for connecting the high pressure suction inlet port to said working chambers.

7. The compressor according to claim 6 wherein said plug valve assemblies include a number of ports angularly displaced in a plane radially outwardly from the axis of rotation of said rotors and a corresponding number of valve members positioned for movement into engagement with said ports for selectively connecting said ports to the working chambers defined by said rotors.

8. The compressor according to claim 4 wherein each of said rotors includes a bore and a number of radially extending ports connecting said bore to said working chambers, and said varying means comprises a control valve assembly mounted in said bore in each of said rotors to control the point of communication of said bore with the working chambers.

9. The compressor according to claim 8 wherein each of said control valve assemblies includes a hollow cylinder positioned in said bore in each of said rotors, said cylinder including an arcuate slot positioned to intersect the radial plane of said ports and including means for moving said cylinder axially in the bore of said rotors to angularly displace the point of intersection of said ports with said arcuate slot.

10. A variable capacity rotary screw compressor comprising: a housing having a low pressure suction fluid chamber, a high pressure suction fluid chamber and a fluid discharge chamber, a low pressure fluid inlet port connected to said low pressure chamber, a high pressure fluid inlet port connected to said high pressure chamber and a discharge port connected to said discharge chamber, a pair of oppositely rotating constant mesh rotors having helical lands and intervening grooves defining working chambers, said rotors being mounted within said housing to provide pumping and compressing action, said working chambers being connected at one end to draw fluid from the low pressure chamber and at the other end to discharge compressed fluid to the discharge chamber, means for selectively providing fluid communication between said high pressure fluid chamber and said working chambers, a slide valve movably mounted within said housing and including cut off means for controlling the capacity of said compressor, and means connected to said slide valve and to the high pressure fluid communicating means for controlling the point of admission of high pressure fluid from said high pressure chamber to said working chamber in relation to the position of said slide valve.

11. The compressor according to claim 10 wherein said controlling means comprises a control valve assembly mounted in each of said rotors.

12. The compressor according to claim 11 wherein said rotors each includes a bore and a number of radially extending ports connecting said bores to said intervening grooves and said control valve assembly includes a hollow cylinder positioned in said bore in each

of said rotors, said cylinder including an arcuate slot positioned to intersect the radial plane of said radial ports in each of said rotors and further including means for moving said cylinder axially in said bore of said rotors to angularly displace the point of intersection of said ports with said arcuate slot.

13. The compressor according to claim **10** wherein said high pressure fluid communication means comprises a number of ports in said rotor connecting said high pressure chamber to one end of said working chambers and said controlling means includes a number of valve members corresponding to said ports and being mounted for movement between open and closed positions with respect to said ports.

14. The compressor according to claim **13** wherein said controlling means includes a first variable resistor connected to respond to the movements of the slide valve, a pair of bridge balancing relays connected to said first variable resistor to sense the change in the position of said first variable resistor, a second and a third variable resistor connected to each of said bridge balancing ralays, means for connecting said second and third variable resistors to respond to movements of said selectively providing means and hydraulic circuit means connected to said bridge balancing relays to control said selectively providing means to vary the point of fluid communication between said high pressure fluid chamber and said working chambers.

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