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Hutchins et al.

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[45] **Aug. 22, 1972**

[54] **AUTOMOTIVE AIR CONDITIONING COMPRESSOR**

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[73] Assignee: **General Motors Corporation,** Detroit, Mich.

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[52] **U.S. Cl.**.....**417/273,** 417/523

[51] **Int. Cl.**.....**F04b 1/04,** F04b 27/04, F04b 21/04

[58] **Field of Search**.....417/273, 523, 534–537; 92/138

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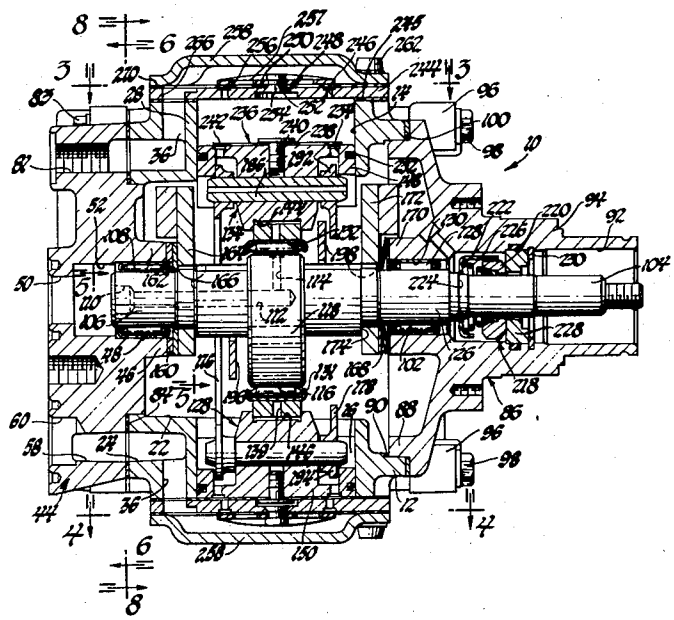
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[57] **ABSTRACT**

In preferred form, a four cylinder radial compressor which is operated by an eccentric slider drive mechanism. Two pairs of cylinder bores are radially spaced 90° apart with the center lines of the cylinders lying in a common plane. Opposed pairs of pistons in the bores are linked together with sheet metal links that apply piston preload to an eccentric slider block for high speed continuous operation. The compressor is lubricated by oil that is carried by the refrigerant to the compressor. The refrigerant gas enters the compressor at the rear of the drive shaft and the suction return is diverted into the cylinder housing while the heavier oil enters an aligned hole in the shaft for distribution to the eccentric bearing and eccentric slider of the drive mechanism.

4 Claims, 9 Drawing Figures



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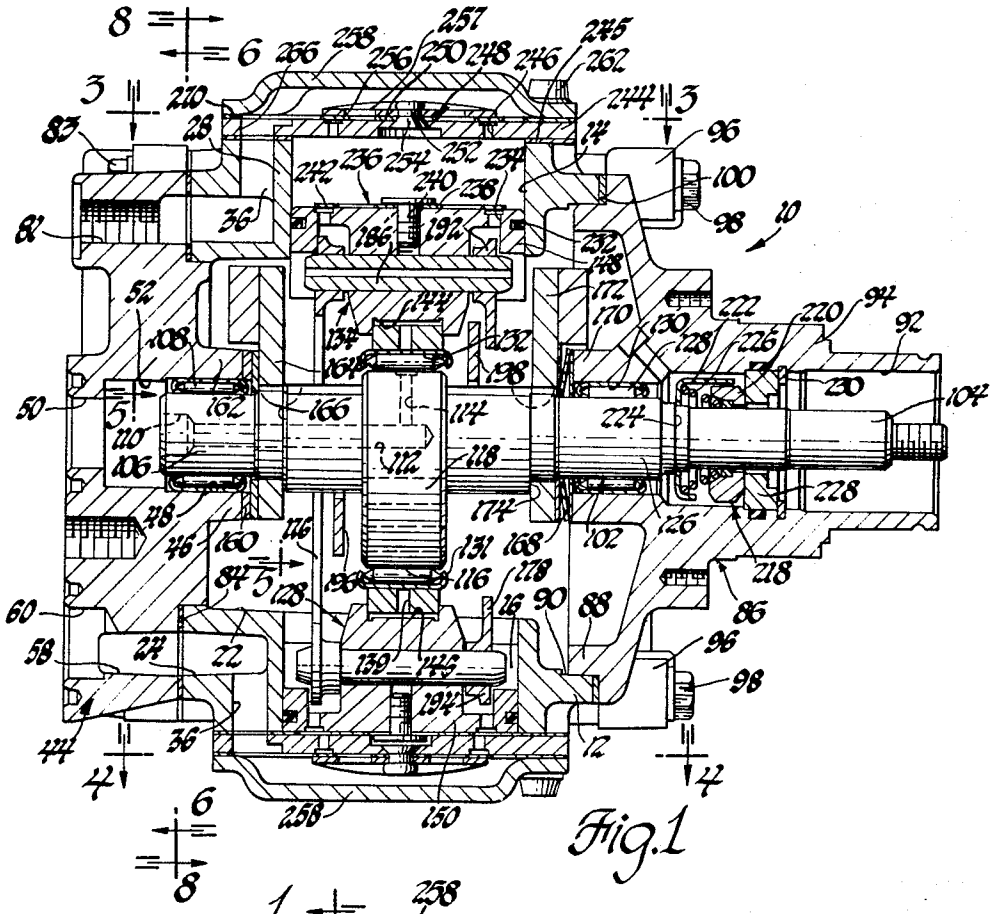


Fig. 1

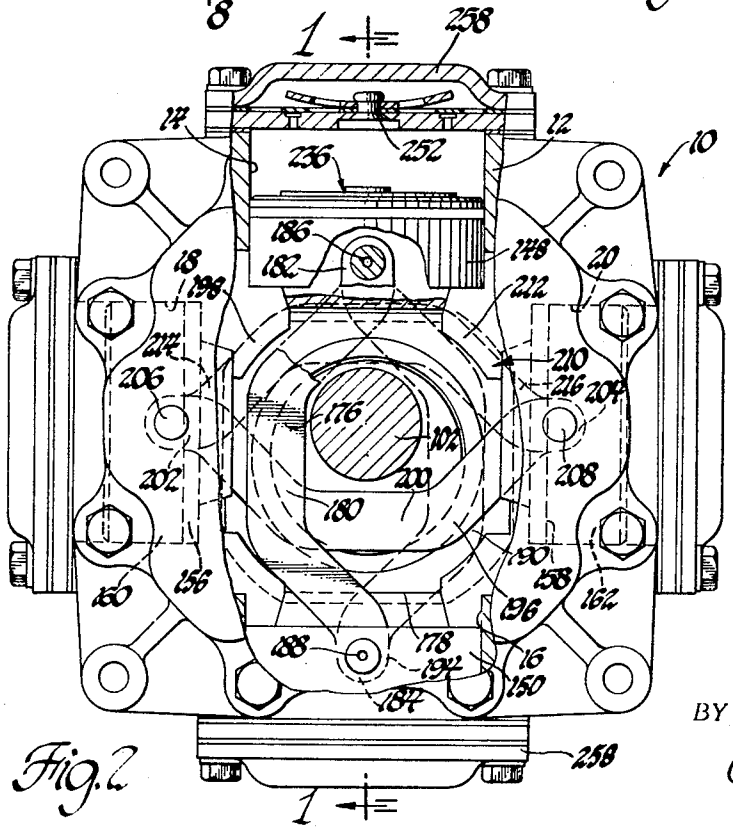


Fig. 2

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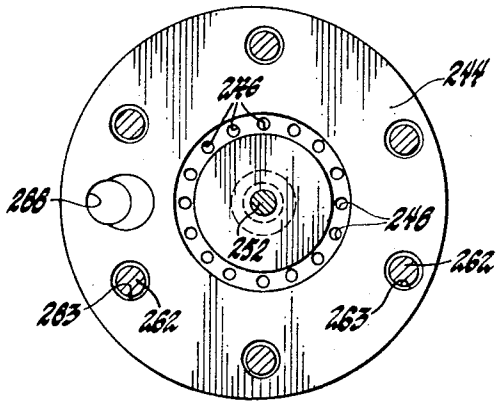


Fig. 3

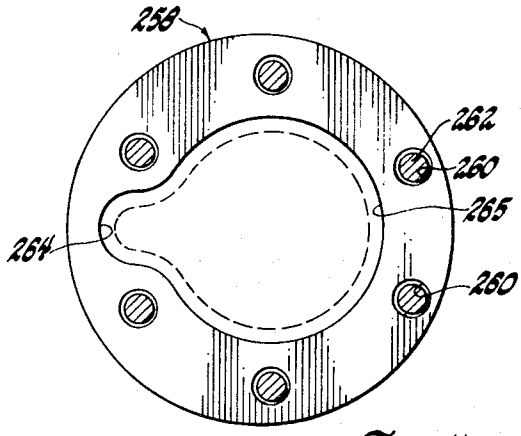


Fig. 4

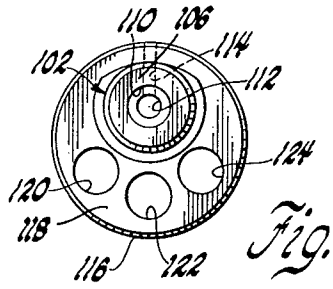


Fig. 5

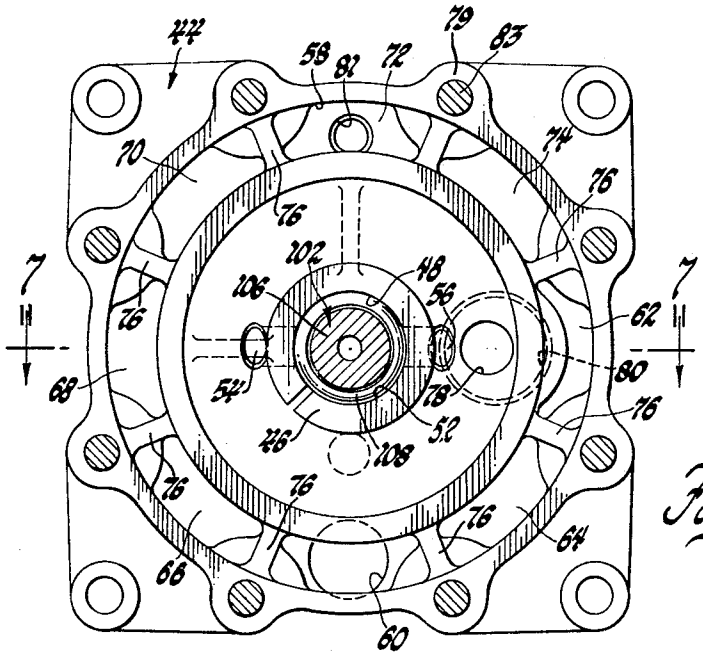


Fig. 6

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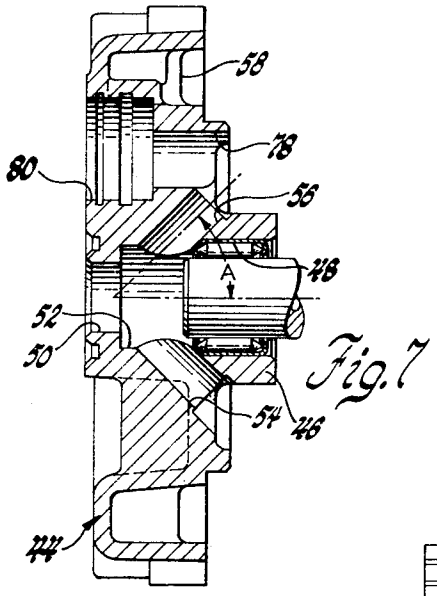


Fig. 7

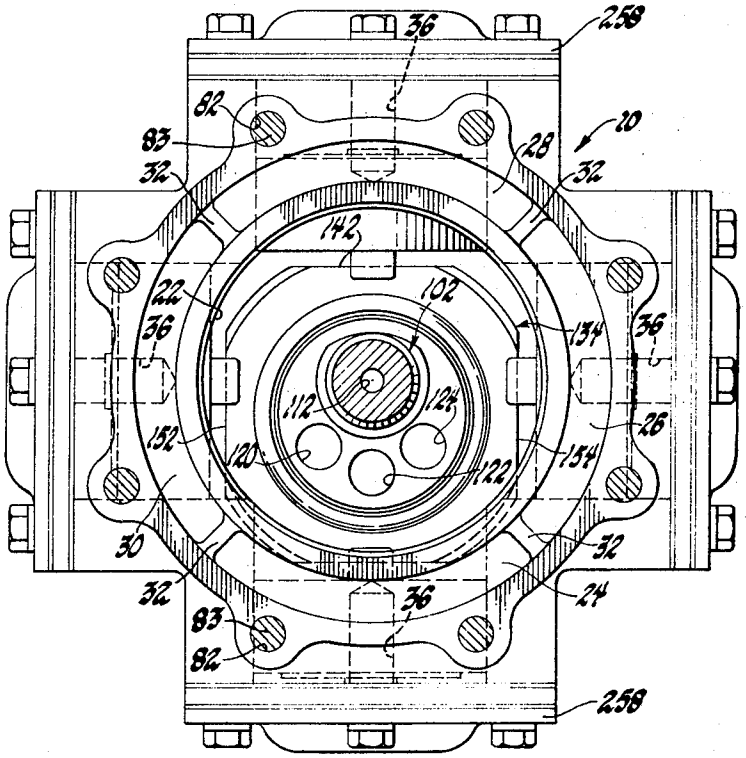


Fig. 8

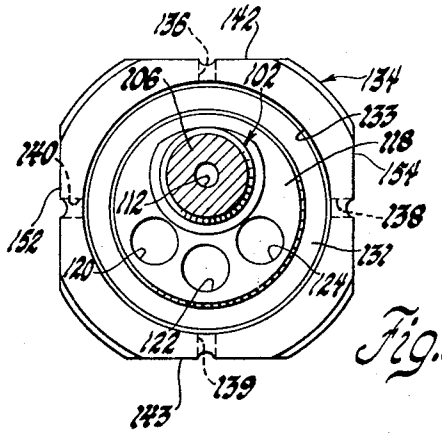


Fig. 9

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AUTOMOTIVE AIR CONDITIONING COMPRESSOR

This invention relates to rotary machines and more particularly to compressors having radial bores and radially reciprocated pistons therein driven by a common drive mechanism.

In automotive air conditioning systems it is desirable to have a light weight compressor that can be connected to the engine block of the automobile and driven at a continuous high speed of operation by the belt that drives the engine cooling fan.

At such high speed operation it is desirable to have a built-in lubricant supply system in the compressor and additionally it is desirable that the radial piston units be operated by a drive mechanism that will prevent wear producing tipping movement of the reciprocating pistons in the cylinder bores.

Accordingly, an object of the present invention is to provide a high speed rotary machine which includes a plurality of radially located piston cylinder units driven by a common drive mechanism wherein means are provided to prevent each of a plurality of the pistons from being tipped with respect to the cylinder bores during compressor operation.

Yet another object of the present invention is to provide a compact high speed compressor by locating a plurality of radial piston and cylinder units in a common plane and driving them by a common slider drive mechanism that prevents the pistons from tipping with respect to the cylinder units during high speed operation and wherein the pistons are separate components in the assembly and tied together by means of separate preloading links that maintain a tight fitting, no tip, close tolerance relationship between the common drive mechanism and the pistons during high speed operation.

Yet another object of the present invention is to provide a compact compressor configuration for use in automotive air conditioning systems wherein a shaft bearing housing has a suction port therein in axial alignment with a large diameter opening in the end of the shaft to direct suction gas entrained oil between sliding surfaces in component parts of the drive mechanism and wherein the bearing housing includes means for diverting the refrigerant into a low pressure region in the center of the compressor and wherein the bearing housing includes discharge port means for communicating each of a plurality of radially located circumferentially spaced cylinder bores for directing compressed refrigerant from the compact compressor arrangement.

These and other objects of the present invention are found in one working embodiment which includes a cylinder body having four cylinder bores radially spaced 90° apart. All of the cylinder bores have their center lines lying in a common plane. An iron plated die cast aluminum piston is located in each of the bores for sliding reciprocating movement therein during compressor operation. Each of the pistons are driven by a common eccentric slider block.

Opposing pairs of the pistons are linked together with sheet metal links that apply a piston preload to the eccentric slider block which is actuated by a common eccentric on a drive shaft. The drive shaft is supported by a rear bearing plate and a front bearing plate on the

cylinder block. Suction gas enters the compressor through the rear plate where it is diverted into the cylinder body. Heavier oil in the returning refrigerant enters a hole in the shaft which is aligned with the suction port. Oil collected in the hole is distributed to an eccentric bearing which supports the eccentric slider block on the shaft eccentric.

Suction gas enters the compression chamber through suction ports in the top of the pistons. Suction reeds are attached to the top of the pistons. Refrigerant gas is discharged through a valve plate in each of the cylinder heads and is delivered to a manifold in the rear plate through a plurality of circumferentially spaced holes in the cylinder body, all located radially outwardly of the suction opening.

The arrangement enables the compressor to be operated at a high speed of operation in a range of 5500 continuous rpms to 8500 rpm a maximum instantaneous speed.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

FIG. **1** is a vertical sectional view taken along line **1—1** of FIG. **2** looking in the direction of the arrows;

FIG. **2** is a view in rear elevation of the compressor partly broken away and partly in section;

FIG. **3** is a horizontal sectional view taken along the line **3—3** of FIG. **1**;

FIG. **4** is a horizontal sectional view taken along the line **4—4** of FIG. **1** looking in the direction of the arrows;

FIG. **5** is an enlarged fragmentary vertical sectional view taken along the line **5—5** of FIG. **1** looking in the direction of the arrows;

FIG. **6** is a vertical sectional view taken along the line **6—6** of FIG. **1** looking in the direction of the arrows;

FIG. **7** is a horizontal sectional view taken along the line **7—7** of FIG. **6** looking in the direction of the arrows;

FIG. **8** is a vertical sectional view along the line **8—8** of FIG. **1** looking in the direction of the arrows; and

FIG. **9** is an elevational view of an eccentric slider block in the present invention.

Referring not to the drawings, in FIGS. **1** and **2**, a compact compressor **10** is illustrated which includes a central block or cylinder body **12** having four radially spaced bores **14, 16, 18** and **20**.

The bores **14** and **16** are formed coaxially of one another in the body and along an axis which is perpendicular to the axis of coaxially aligned bores **18** and **20**.

In the illustrated arrangement the rear of the compressor body includes a central opening or suction space **22** therein which serves as the inlet to each of the cylinder bores **14** through **20**.

As is best seen in FIG. **8**, the rear of the body further includes a plurality of arcuate openings **24, 26, 28** and **30** therein which are separated by partition members **32**.

Each of the arcuate openings communicates with a discharge bore **36** in body **12** which is adapted to be communicated with an adjacent one of the cylinder bores at the discharge end thereof.

The arcuate discharge openings **24, 26, 28, 30** and the central suction opening or suction space **22** at the rear of the compressor body **10** are covered by a rear bearing housing **44** which is illustrated in FIGS. **6** and **7** as including central hub **46** located concentrically and axially inwardly of the central suction opening **22**. The bearing housing includes a central bearing bore **48** therein which is formed coaxially with a suction or inlet port **50** that is adapted to be connected to a return conduit or suction hose of a refrigerant system of the type found in automotive air conditioning systems.

Between the bore **48** and suction opening **50** is a transition bore **52** which communicates with two spaced holes **54, 56** each of which intersects the transition bore **52** at an acute angle A shown in FIG. **7**. They also communicate with the suction opening **22** in the compressor body **12** on either side of the sleeve bore **48** therein.

Additionally, the rear bearing housing **44** includes an annular recess **58** formed in the inside face thereof continuously therearound to communicate each of the arcuate discharge openings in the compressor body with a discharge port **60** which is adapted to be connected to a supply line from the compressor to a condenser unit in the refrigerant system.

In the illustrated arrangement, the arcuate recess **58** communicates with a plurality of discharge muffler cavities **62, 64, 66, 68, 70, 72** and **74**, each of which are separated by a reinforcing rib **76** formed as an integral part of the housing **44** as is best illustrated in FIG. **6**.

Additionally, the housing includes an opening **78** which is adapted to communicate the low pressure side of the compressor with a pressure switch cavity **80** in which a diaphragm switch operated component can be located to control the operation of the refrigerant system. A pressure gauge tap **81** is also shown in FIG. **6**.

The housing **44** includes a plurality of like circumferentially spaced connecting lugs **79** thereon which have connecting screws **83** directed therethrough into threaded engagement with tapped openings **82** in the housing at circumferential point at the outer periphery thereof as best seen in FIG. **8**.

A gasket seal **84** is fastened between the inside face of the bearing housing **44** at the outer periphery thereof around the lug **79** thereon and the peripheral surface of the body **12** to seal between the inlet and outlet passageways in the housing **44** and the body **12**.

On the opposite end of the body a front bearing housing **86** has a peripheral shoulder **88** formed thereon which fits within an end opening **90** on the body **12**.

The front bearing housing **86** includes a seal cavity **92** therein which is formed by an axially outwardly directed tubular extension **94**. The outer periphery of the housing **86** includes a plurality of connecting lugs **96** thereon which have screws **98** directed therethrough into threaded engagement with the central body **12** to hold an annular gasket seal **100** in sealing engagement between the body **12** and the bearing housing **86** at the opening **90** therein.

A drive shaft **102** is directed through the body **12**. It includes an outboard end extension **104** thereon which is adapted to be connected to a drive source for high speed operation. A rear end **106** of the shaft is supportingly received by a bearing assembly **108** seated within the sleeve bore **48** in the rear housing **44**.

As is best seen in FIG. **5**, the shaft includes a large diameter opening **110** on the front end thereof which is aligned coaxially of the suction port **50** and the transition bore **52**. The opening **110** in turn is in communication with an oil feed passageway **112** formed longitudinally through shaft **102** that is intersected by a bore **114** extending radially outwardly of the passageway **112** to intersect the outer surface **116** of an eccentric **118** integrally formed on the shaft **102**. In the illustrated arrangement the eccentric **118** has three holes **120, 122, 124** formed therethrough to balance the shaft **102**.

Additionally, the shaft **102** has a second bearing surface **126** thereon which is supportingly received in a bearing assembly **128** that is fitted within a sleeve bore **130** in housing **86**. Bore **130** is aligned coaxially with the bore **48** thereby to support the shaft **102** for rotation with respect to the central compressor body **12** so as to move the eccentric **118** therein with respect to each of the cylinder bores.

The eccentric **118** forms part of an improved high speed compressor slider drive mechanism **132**.

The eccentric slider drive mechanism **132** more particularly includes a needle bearing assembly **131** which has the inner race thereof fit on the outer periphery **116** of the eccentric **118** in the outer race thereof fit within a central opening **133** of an eccentric slider block **134** which is best illustrated in FIG. **9**.

The slider block **134** includes a plurality of circumferentially spaced radially outwardly directed oil ports **136, 138, 139, 140** therein to feed oil to a first and second pair of flat, spaced parallel surfaces **142, 143** which are slidably received in grooves **144, 146** formed in the ends of an opposed separate pair of pistons **148, 150**.

The opposed pistons **148, 150** are coaxially aligned with one another and slidably received within the cylinder bores **12, 14** for opposite reciprocation therein during operation of the compressor.

Additionally, the eccentric slider block **134** includes a second pair of flat spaced parallel surfaces **152, 154** thereon which are supportingly received in grooves **156, 158** located in opposed pistons **160, 162**, respectively.

The opposed pistons **160, 162** are slidably supportingly received for reciprocation in the coaxially aligned cylinders **18, 20** which are located on an axis perpendicular to that of the axis formed through the coaxially aligned cylinders **14, 16**.

In accordance with one principle of the present invention, all of the piston cylinder units are located in a common plane and driven by a common drive mechanism to produce a reduced outer dimensional compactness compared to the total volumetric output thereof.

One important aspect of the present invention is the manner in which the opposed pistons are tied together and balanced with respect to the eccentric compressor drive mechanism **132** to produce an improved high speed range of operation of the device.

To accomplish such operation, the shaft is maintained in its supported relationship with respect to the sleeve bearings **108, 128** by means of a first bearing thrust washer **160** at one end of the shaft which is located between a hub extension **162** and a shaft counterweight **164** which seats against a shaft shoulder **166**.

On the opposite end of the shaft a Belleville type thrust washer **168** is located between a hub extension **170** on the front bearing housing **86** and a counterweight **172** which seats against a shaft shoulder **174**.

The counterweights and drilled eccentric serve to carefully balance the high speed shaft **102** and the bearing arrangement define a stable platform.

Additionally, in order to further enhance the dynamic stability of the mechanism while operating at high speed operation, in accordance with certain principles of the invention the opposed parallel surfaces **142, 143** are maintained in a close tolerance relationship with the slider grooves **144, 146** on the pistons **148, 150** be a pair of spaced connector links **176, 178** of sheet metal material.

The link **176** includes a central portion **180** which is bent to one side of the drive shaft **126** is best illustrated in FIG. **2**. It is joined to offset ends **182, 184** that are fastened to the end of a cross pin **186** through piston **148** and a cross pin **188** through piston **150**, respectively.

The connecting link **178** includes a central portion **190** which is bulged to one side of the shaft **126** in the opposite direction to the central portion **180** of link **176**. It includes opposite ends **192, 194** thereon which are press fit over the opposite end of the cross pin **186** and the cross pin **188**.

Together the links **176, 178** are prestressed during the assembly of the compressor to cause the slider grooves **144, 146** on the pistons **148, 150** to be held in close sliding fit relationship with the parallel surfaces **142, 143** on the slider block.

One feature of the slider surfaces **142, 143** and the grooves **144, 146** is that they are formed flat with respect to one another and together define a moving, sliding flat surface that enables the supported piston thereon to reciprocate within its cylinder bore without being tipped with respect thereto on opposite reciprocation of the piston within the unit.

The provision of separate pistons and connecting links has a further advantage in that it enables four piston units to be driven by a common slider block eccentric at high speeds. This is in contrast to arrangements where a slider block mechanism is located within a double-ended unitary piston which is reciprocated within opposed cylinder units as for example of the type shown in U.S. Pat. No. 2,031,940 to Drysdale. In this arrangement, the inclusion of a double-ended piston prevents location of an additional pair of opposed piston cylinder units at 90° with respect to a first pair.

In this arrangement, the opposed pistons **160, 162** are interconnected by a second pair of connecting links **196, 198** which are located axially of the shaft between the outer connecting links **176, 178** and the axial end surfaces on the eccentric **118** as is best seen in FIG. **1**.

The connecting link **196** includes a central portion **200** thereon bulged outwardly of the shaft **126** to the same extent as are central portions **180, 190**. Offset ends **202, 204** on the link **198** are press fit over cross pins **206, 208** directed through the ends of pistons **160, 162**, respectively.

The connecting link **198** is located between the eccentric **118** and the link **178**. It includes a central portion **212** and end portions **214, 216** which are connected to the opposite ends of the cross pins **206, 208**. As in the case of the pistons **148, 150**, the connecting links **198, 210** are preloaded to draw the axially aligned piston **161, 162** together so as to hold them in a close tolerance sliding fit relationship with the grooves **156, 158** therein and the opposed parallel surfaces **152, 154** on the slider block **134**. The respective sliding surfaces thus serve as a stable platform during compressor operation to prevent tipping of the pistons with respect to their cylinder bores.

In addition to the dynamic stability the compressor includes features to maintain a uniform suction and discharge action through the discharge port **60** and the suction port **50** of the rear bearing housing **44**. Such refrigerant flow is accomplished through a flow path which separates the lubricant from the circulating refrigerant gas. Furthermore, the high speed shaft **102** has the extension **104** thereon sealed by a rotary seal assembly **218** which is operative to prevent gas leakage through the shaft bore **92** during such operation. More particularly, the rotary seal assembly includes a rotary seal element **220** which is connected for rotation with the shaft **102** through a seal retainer **222** that is secured on a shoulder **224** of the shaft. The rotary spring is spring biased outwardly of the retainer **222** coaxially along the shaft **102** by coil spring **226**. The biased element **220** bears against a sealing surface **228** constituted by an annular ring that is held in place by a snap ring **230** within the housing **178**.

The refrigerant circuit for all of the piston cylinder units is identical. For purposes of this description, reference will be only had to that through the piston unit **148**.

The component parts of the refrigerant circuit are the same for each of the piston cylinder bore units. It includes an annular seal **232** in the periphery of each of the pistons which is biased radially outwardly to seal against the inside surface of the cylinder bore to prevent bypassing of the piston.

Additionally, each of the pistons includes a plurality of suction ports **234** formed in the head thereof at uniformly spaced circumferential points therealong.

A suction reed valve **236** includes a center segment **238** thereon secured to the top of the piston by a screw retainer **240**. It further includes an outwardly located continuously formed peripheral ring **242** which covers each of the suction ports **234**.

The upper open end of each of the bores is closed by a discharge valve plate **244**.

It is sealed with respect to the housing or compressor body **12** of the bore therein by a valve plate gasket **245**.

The valve plate includes a plurality of discharge ports **246** therein which are best illustrated in FIG. **3**, as being formed continuously around the plate **244** at equally spaced circumferential points thereon.

These discharge ports are covered by a discharge reed valve **248** that has a center portion **250** thereon secured to the center of the plate **244** by a rivet **252** having the head thereof **254** upset against the underside of the plate **244**.

The discharge reed valve **248** further includes an outer peripheral ring **256** thereon which covers the ports when the valve is closed. A back-up plate **257** is fastened by rivet **252** to plate **244**.

A cylinder head **258** is located on each of the plates **244** in covering relationship therewith. Each of the heads **258** includes a plurality of openings **260** therethrough which receive connecting screws **262** that are directed through like openings **263** in the discharge plate into tapped holes in the compressor body **12** around the bore therein.

Additionally, the cylinder head **258** includes a recess **265** thereon which includes a side segment **264** that overlies a crossover passageway **266** in the discharge plate which leads to a discharge bore **36** in the body **12**.

The cylinder head is sealed with respect to the upper surface of the discharge plate by a head gasket **270**.

Operation of the compressor includes a continuous suction intake and discharge of refrigerant gas to produce a relatively constant torque on the drive shaft during its high speed operation.

Thus, as the shaft is rotated for example in a clockwise direction as viewed in FIG. **2**, the eccentric **118** as shown in FIGS. **1** and **2** locates the opposed pistons **148** and **150** at the beginning of a discharge stroke and at the end of the discharge stroke, respectively. Simultaneously, the opposed pistons **160, 162** are located at intermediate positions within the bores through an intermediate point of a suction stroke and an intermediate point of a discharge stroke respectively. Further, clockwise movement will cause the following to occur:

The piston **148** will move upwardly within the bore **12** to discharge refrigerant between the top of the piston **148** and the discharge plate thence through the opening or recess of the cylinder head and out the discharge bore **36** into the arcuate recess **58** thence to the discharge port **60**. At the same time, refrigerant gas is drawn through the suction port **48** and the central opening **22** into the inside of the body **12** where it passes across the suction reed valve on the piston **150** into the increasing volume formed between the piston **150** and the bore **16**.

When the eccentric is moved **90°** from the position shown in FIG. **2** in a clockwise direction, the opposed parallel surfaces **142, 143** on the slider block **134** are positioned equidistantly with respect to the center line of the shaft thereby to position the piston unit **148, 146** at midpoint within their bores. At the same time the eccentric has moved the slider block **134** to cause the opposed parallel surfaces **152, 154** thereon to position the piston **160** at the end of its discharge stroke and the piston **162** at the end of its suction stroke. Further counterclockwise movement of 90° will move the piston **148** to the end of its discharge stroke and the piston **150** to the beginning of its suction stroke.

A further clockwise movement of 90° will cause the eccentric to be aligned with the piston **162** moving it to the end of its discharge stroke and the piston **160** to the end of its suction stroke leaving the pistons **148, 150** at their intermediate position. Then the eccentric will be located in alignment with the piston **150** through a further clockwise movement of 90° to return the pistons to their positions shown in FIGS. **1** and **2**.

Thus, the location of the eccentric will produce a continuous and progressive shifting movement of the pairs of parallel surfaces to cause each of the pistons to move completely upwardly within its bore and then reciprocate back to a suction position wherein the low point on the eccentric is in alignment with that piston. The motion is harmonic in nature and continuous to maintain a uniform torque on the shaft.

Furthermore, the improved link arrangement and the arrangement of separate pistons produces four compression strokes and discharge strokes each rotation of the shaft.

During this movement the respective sliding surfaces between the slider block and the pistons are moved through a sliding transverse movement with respect to each other thereby to define a continuous flat surface for supporting the pistons during this reciprocating motion. This stable platform prevents tipping of the piston with respect to its bore to improve the wear characteristics of the compressor.

Still another feature of the invention is the manner in which the refrigerant flow passes into the compressor during the suction return. Refrigerant gases passing through the suction port **50** enters the transition bore **52** and then pass through the angularly formed holes **54, 56** and are thence directed into the interior of the compressor body **12** through the central end opening **22** therein. The light gas freely flows through the angular openings **54, 56**.

Heavier oil particles, however, continue to flow in the same direction through the suction port **50** and the transition bore **52** thereby to be collected by the large diameter opening **110** for flow through the previously described oil distribution system thereby to completely lubricate the friction surfaces between the outer surface **116** of the eccentric; the component parts of the eccentric bearing **131** and the grooves in each of the pistons.

In one working embodiment of the present invention the compressor has a capacity of 8.5 cubic inches of displacement. This is produced by four cylinder bores each having a diameter of 2.125 inches. The pistons have strokes of .600 inches.

The speed range is from a 5500 rpm maximum continuous running speed to an instantaneous maximum speed of 8500 rpms.

The 8.5 cubic inch compressor has an oil charge of 6 ounces of oil for 1½ pounds of dichlorodifluoromethane refrigerant charge.

The major parts of the radial compressor are made of the following materials:

Part	Material
cylinder body **12**	die cast aluminum
rear bearing housing **44**	die cast aluminum
front bearing housing **86**	die cast aluminum
pistons **148, 150, 160, 162**	iron plated die cast aluminum
eccentric slider block **134**	hardened steel
shaft **102**	localized induction hardened
cylinder head	forged steel

Also in addition to having extreme compactness the overall weight of the compressor is low which makes it especially suitable for connection to small displacement internal combustion engines.

While the embodiments of the present invention as herein disclosed constitute a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. A rotary machine comprising a cylinder block having four cylinder bores formed therein, each of said cylinder bores having their centerline located in a common plane, a first pair of said cylinder bores being located coaxially with one another and at a perpendicular relationship with a second pair of said bores, a rear bearing housing on said cylinder block, a front bearing housing on said block, a rotary shaft directed through said block having the opposite ends thereon supported by said front and rear bearing housings, said shaft having an extension thereon adapted to extend outwardly of said front bearing housing for connection to a drive source, an eccentric throw on said shaft, said eccentric throw having an outer peripheral surface thereon located in said common plane of the centerlines of said cylinder bores, an annular needle bearing on said eccentric, a slider block slidably supported by said annular needle bearing, said slider block having a first pair of parallel sides thereon located coaxially of said first pair of bores and a second set of parallel sides thereon located in coaxial alignment with said second pair of bores, a piston in each of said bores, each of said pistons having a base portion thereon with a groove therein in which is supportingly received one of said parallel surfaces on said slider block, said eccentric throw being rotated by said shaft within said needle bearing to cause axial movement of said slider block with respect to each of said cylinder bores to cause each of said pistons to reciprocate within one of said cylinder bores, said slider block being moved by rotation of said eccentric laterally with respect to the groove in each of said pistons to provide a full-bearing support for said piston during reciprocation thereof within said bore thereby to prevent tilting movement of said pistons during reciprocable movement thereof within said bores, and means to preload each of said piston base portions against one of said parallel sides of said slider block including a first pair of spaced apart flat sheet metal links located on opposite sides of said slider block, each of said links having a central portion offset from said shaft and opposite ends colinear with each other and with the axis of said shaft, means joining said opposite ends to said first pair of pistons together, each of said links being pre-stressed to a predetermined length between its opposite ends to locate said pistons to hold the grooved base portions of said first pistons in close sliding fit engagement with said first pair of parallel sides of said slider block, said preloading means including a second pair of flat sheet metal links located on opposite sides of said slider block, each of said links having a central portion offset from said shaft and opposite ends colinear with each other and with the axis of said shaft, means joining said opposite ends of said second pair of links to said second pair of pistons, each of said links being pre-stressed to a predetermined length between its opposite ends to locate said pistons to hold the grooved base portions of said second pair of pistons in close sliding fit engagement with said second pair of parallel sides on said slider block there to maintain said slider block and the grooves in said piston continuously in close sliding engagement upon opposite reciprocation of said pistons within said cylinder bores.

2. In a reciprocating compressor the combination of a body with a plurality of cylindrical bores therein, a suction space in said body, a plurality of discharge passageways formed in said body radially outwardly of said suction space in spaced circumferential relationship therearound, a rear bearing housing secured to said body for closing said suction space therein, a front bearing housing secured to said housing, a rotary drive shaft, bearing means in said front bearing housing and said rear bearing housing for supporting said shaft within said body for rotation with respect thereto, an eccentric throw secured to said shaft for rotation therewith, said throw being located within said suction space, a bearing supported on the outer surface of said throw rotatable therewith, a slider block having a central opening receiving said bearing, said bearing and throw driving said block through oscillating movement with respect to the longitudinal axis of said drive shaft, said block including a plurality of flat surfaces on the outer periphery thereof, a piston in each of said cylinder bores having a base portion thereon formed as a flat surface, each of said base portion surfaces engaging one of said slider surfaces on said slider block for sliding movement therebetween upon oscillatory movement of said slider block about the longitudinal axis of said drive shaft, a pin directed through each of said pistons, a link member having one end thereof connected to one end of a pin in one of said pistons and having the opposite end thereof connected to the end of a pin in another one of said pistons, a second link member having one end thereof connected to the opposite end of the pin in the one piston and the opposite end thereof connected to the opposite end of the pin in the another one of said pistons, said first and second links having a central portion thereon offset from the connected ends of each of said links on either side of said shaft, each of said links prestressed between its connected ends to a length to hold said first and second pistons against said slider block to maintain a close sliding fit therebetween upon rotation of the shaft, said slider block surfaces moving axially of and laterally of each of said bores during oscillation of said slider block about said drive shaft during rotation thereof to produce reciprocation of said first piston into and out of its cylinder bore in a direction opposite to the reciprocation of said second piston within its cylinder bore and serving to define a flat surface support for said pistons at the base thereof to prevent tipping movement of said pistons with respect to said cylinder bores during opposite reciprocation of said pistons within said bores.

3. In a reciprocating compressor the combination of, a central body, a plurality of radially outwardly directed cylinder bores in said body spaced 90° apart, the centerline of each of said cylinder bores lying in a common plane, a separate piston in each of said cylinder bores, a rotary drive shaft for said pistons, means for supporting said drive shaft for rotation with respect to said body, a common eccentric on said shaft for actuating each of said pistons, a slider block operated by said common eccentric, a flat surface on said slider block in alignment with each of said pistons, means forming a flat follower surface on each of said pistons supportingly engaged by said flat surface on said slider block, a first pair of said pistons located coaxially of one another, a first pair of flat sheet metal connecting links located on each side of said second pair of pistons, each of said links having a center por-

tion offset from said shaft and ends secured to said first pair of pistons, each of said links being prestressed to a predetermined length between its opposite ends to locate said pistons together against said slider block, a second pair of said pistons located coaxially of one another and at right angles to said first pair, a second pair of flat sheet metal connecting links located on each side of said second pair of pistons, each of said links having a center portion offset from said shaft and ends secured to said second pair of pistons, each of said links being prestressed to a predetermined length between its opposite ends to locate said second pair of pistons together against said slider block, said first and second pairs of sheet metal connecting links maintaining the follower surface on each of said pistons in close sliding fit relationship with the flat surfaces on said slider block to produce opposite reciprocation of each of said pistons within its cylinder bore upon rotation of said shaft, said slider block flat surface moving laterally and axially of said piston during reciprocation thereof to define a stable supporting surface for said piston to prevent tipping movements thereof with respect to the cylinder bore during opposite reciprocation of said first and second piston pairs.

4. A compressor having a central body with a plurality of radially outwardly directed cylinder bores therein, a piston in each of said bores slidably reciprocable with respect thereto, said body including a suction space located centrally thereof and radially inwardly of said bores, a plurality of discharge openings in said body located radially outwardly of said suction space in spaced circumferential relationship therearound, means for communicating said suction space and said discharge openings with said bores, a rear bearing housing secured to said body including means thereon closing said suction space in said body, a front bearing housing on said body, a rotary shaft having the opposite ends thereof supportingly received in said rear and front bearing housings, drive means for operatively connecting each of said pistons in said radial bores to said shafts for causing opposite reciprocation of each of said pistons within one of said radial bores during rotation of said shaft, said drive means including an eccentric throw on said shaft, a bearing on the outer periphery of said throw, a slider block supportingly received on the bearing having a portion thereon slidably engaging said pistons at an interface for causing the opposite reciprocation thereof, means for lubricating said bearing and a sliding interface between said slider block and each of said pistons, said lubricating means including a suction port in said rear bearing housing formed coaxially of the end of said shaft supported by said rear bearing housing, said rear bearing housing having a transition bore aligned with said suction port for reducing velocity of inlet gas from said suction port, a large diameter opening in the supported end of said rotary shaft coaxially aligned with said suction port and transition bore and facing in the direction of inlet gas flow through said suction port to separate and intercept lubricants suspended therein, a longitudinal passageway in said shaft for receiving separated lubricant from the large diameter opening, a transverse passageway in said shaft receiving oil from the longitudinal passageway to said bearing, and being rotated by said shaft to distribute oil in a radial direction, said slider block including a plurality of radially outwardly directed openings therein for directing oil from said bearing to the sliding interface between said slider block and each of said pistons and into said suction space for lubricating the surface during rotation of said shaft, said rear bearing housing including a pair of side ports intersected and communicated with said transition bore and said suction space, said side ports formed at an angle with respect to the longitudinal axis of said transition bore on either side thereof for receiving gas from the suction port and directing it to the suction space in said body, and suction valve means in each of said pistons for passage of gas and lubricant from the suction space of said body into each of said radial bores.

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