An endbell cylinder frame is formed as an integral one-piece system having a motor end frame, a cylinder barrel, and a cylinder head mating face therein. The motor end frame includes plurality of concentric passages. The cylinder head mating face laterally extends from the motor end frame and connects to an end portion of the cylinder barrel such that a remainder of the cylinder barrel is designed to extend into an area within a compressor housing. Another portion of the cylinder barrel is circumferentially enlarged and is supportively connected to the motor end frame. Further, the cylinder head mating face includes a plurality of open passages to permit air through.
BACKGROUND OF THE INVENTION

[0001] 1. Field of Invention

[0002] The present invention relates to air compressors. More particularly, the invention relates to a particular endbell frame for use within an oil-free air compressor assembly.

[0003] 2. Related Art

[0004] An oil-free air compressor typically includes an electric motor, which rotates an eccentric, which in turn causes a piston to reciprocate in a cylinder. A valve plate closes an end of the cylinder and includes an inlet valve, which allows air to be drawn into the cylinder from an inlet port during an intake stroke of the piston and an exhaust valve, which allows compressed air to flow from the cylinder during a compression stroke of the piston. As the air is compressed, heat is released. The heat produced during compression is known to adversely affect the efficiency and operating life of the compressor.

[0005] More particularly, the piston/cylinder sleeve seal is a primary factor in the compressor’s longevity. Overheating of the piston and the cylinder sleeve detracts from the life of the same and compressor. It is thus a primary concern to maintain as low as temperature as possible of the cylinder sleeve to maximize the life of the compressor.

[0006] With the potential wearing of the piston and cylinder sleeve in mind, the prior art addressed the problem by making the cylinder and/or piston readily replaceable, with the cylinder sleeve becoming more readily acceptable as the interchangeable part. One attempted solution included a sleeve which when worn out could be removed from the motor and exchanged with a new cylinder sleeve. This solution is time consuming and relatively costly. Another solution further provided the interior wall of a conventional cylinder sleeve with a low friction coating. This again provides a temporary solution.

[0007] There remains a need to improve oil-free compressors and the cost of making the same. The present invention overcomes the above-recited deficiencies.

BRIEF SUMMARY OF THE INVENTION

[0008] It is an object to improve oil-free compressors.

[0009] It is another object to increase the life of oil-free compressors.

[0010] It is yet another object to increase the operating efficiency of an oil-free compressor.

[0011] It is still another object to reduce the cost of oil-free compressors.

[0012] Accordingly, the present invention is directed to an improved compressor design, which provides for enhanced life of the piston/cylinder seal. The improvement includes and endbell cylinder frame which is formed as an integral one-piece system having a motor end frame, a cylinder barrel, and cylinder head mating face. The motor end frame includes a rabbet configured to connect to one end of a motor housing of the compressor assembly and includes plurality of concentric spatially positioned air passages. The cylinder head mating face laterally extends from the motor end frame via structural ribs and connects to the cylinder head assembly. The cylinder head mating face connects to an end portion of the cylinder barrel such that a remainder of the cylinder barrel extends into an area between the structural ribs, motor end frame, and cylinder head mating face. A portion of the remainder of the cylinder barrel is circumferentially enlarged and is supportively connected to the motor end frame.

[0013] When the endbell cylinder frame is assembled into the compressor housing assembly, the cylinder barrel receives a piston, which is reciprocated by an eccentric on a motor shaft within the assembly. The cylinder head mating face includes a plurality of open passages to permit air therethrough. A fan on the motor shaft causes air to flow through the compressor assembly and around the cylinder barrel and out the passages to thus provide enhanced cooling of the cylinder barrel as well as the cylinder head assembly.

[0014] The invention provides an improved construction for an oil-free air compressor. Other objects and advantages of the invention will become apparent from the following detailed description of the invention and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] FIG. 1 is a general side view of the compressor assembly with a partial side sectional view showing an endbell cylinder frame of the present invention;

[0016] FIG. 2 is a part sectional view of a part of an air compressor having an endbell cylinder frame in accordance with a preferred embodiment of the invention;

[0017] FIG. 3 is an end view of the endbell cylinder frame of the invention;

[0018] FIG. 4 is a side sectional view of the endbell cylinder frame of FIG. 2 through line 4-4;

[0019] FIG. 5 is a top view of the endbell cylinder frame of FIG. 2;

[0020] FIG. 6 is a perspective view of the endbell cylinder frame of FIG. 2;

[0021] FIG. 7 is another perspective view of the endbell cylinder frame of FIG. 2, and

[0022] FIG. 8 is an end view with a partial cutaway of a part of the invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

[0023] Referring to FIG. 1 of the drawings, an oil-free air compressor assembly is generally designated by the numeral 10 which is disposed on a base 9 connected to a holding tank 11. The air compressor 10 and parts described therein when taken together with a connectable endbell cylinder frame 12 and housing shroud 14 are believed novel and unobvious to one skilled in the art. It will be apparent to those skilled in the art that the invention described herein can be modified without departing from the spirit of the invention and such modifications should be included within the claims appended hereto. Accordingly, components relating to the oil-free air compressor 10 are set forth herein to better
understand the full scope and usefulness of the improved endbell cylinder frame 12, but are not intended to be comprehensive in nature. Rather, these parts are illustrative and intended to lend understanding to the operation of the invention.

[0024] As shown in FIG. 4, the compressor assembly 10 includes an electric motor 16 operably disposed therein and having a shaft 18, which extends therefrom through a bearing 22 seated within the endbell cylinder frame 12. An eccentric 20 of a type known in the art is operably disposed about the shaft 18 next to the bearing 22 and has a counter weight 24 for dynamically balancing the compressor assembly 10 as the shaft 18 rotates at high speeds.

[0025] As shown in FIG. 2, a piston assembly 26 is provided which includes a connecting rod 28, which is in turn operably connected at end 30 through bearing 32 to eccentric shaft 34 of the eccentric 20. A piston head 36 is operably connected to an opposite end 38 of connecting rod 28.

[0026] The compressor assembly 10 is of a type which is lubrication free and can be operable by way of Polytetrafluoroethylene (PTFE) technology which has a low coefficient of friction and allows substantially unrestricted movement without deposit build-up. A PTFE ring 40 is employed on the piston head 36 as a seal against an inner cylinder barrel wall 42.

[0027] As shown in FIG. 4, a fan 44 is mounted concentrically on eccentric shaft 34 of eccentric 20 allowing fan 44 to spin concentrically with shaft 18 of motor 14. The fan 44 is designed to cause air to flow through the housing shroud 14 as the shaft 18 rotates. The airflow moves upward and around the cylinder barrel 48 as will be apparent from herein.

[0028] The endbell cylinder frame 12 is preferably formed as an integral one-piece system having motor end frame 46, a cylinder barrel 48, and a cylinder head mating face 50 preferably being made of die cast aluminum. The motor end frame 46, as shown in FIG. 3, includes an open frame 52 having a plurality of concentric spatially positioned passages 54. As seen in FIG. 4, the housing shroud 14 is configured in a manner to attach to the cylinder head mating face 50 and the motor end frame 46 of the endbell cylinder frame 12 to partially enclose end of the shaft 18, piston assembly 26, fan 44, and cylinder barrel 48. It is contemplated that the particular orientation of the passages 54 can be varied without departing from the intended use thereof in the invention.

[0029] The cylinder head mating face 50 laterally extends from the motor end frame 46 at approximately 90 degrees. The cylinder head mating face 50 connects to an end portion 56 of the cylinder barrel 48. A remaining portion 58 of the cylinder barrel 48 extends downwardly and laterally disposed from the motor end frame 46 into an area 60 between the housing shroud 14 and motor end frame 46. An end portion 62 of the remainder 58 of the cylinder barrel 48 is circumferentially enlarged and is supportively connected to the motor end frame 46 by way of support ribs 64. Additionally, support ribs 66 interconnect the end portion 62, cylinder barrel 48, and cylinder head mating face 50 with side support frame 68.

[0030] A plurality of passages 70 are spatially positioned in the cylinder head mating face 50 to permit air to pass by cylinder barrel 48. Additional passages 72 are provided between the support ribs 66 and the motor end frame 46.

[0031] It is to be noted that by so providing, the configuration of the cylinder barrel 48 is significantly stabilized while material used in forming the cylinder barrel 48 can be minimized. The configuration also provides for maximizing strength and support of the cylinder barrel 48 with increased surface area exposure to air flow to maximize cooling of the same. Secondly an optional cast-in aluminum barrel sleeve 74 can be employed to further increase service life, i.e. going from noncommercial to commercial use, wherein the barrel sleeve 74 is formed in a manner to assure having an inner wall surface with minimal abrasive defects. In this case, grooves 75 can be formed in another side (i.e., outer surface) of sleeve 74 which when included in the die cast are filled to integrally retain the sleeve 74 in place by cylinder barrel 48.

[0032] When the endbell cylinder frame 12 is connected to the motor 16, the cylinder barrel 48 receives the piston rod assembly 26 and is attached to eccentric shaft 34 via bearing 32 of rod end portion 30. The cylinder barrel 48 and the cylinder head mating face 50 are configured to receive a valve plate 76 having an inlet side 78 and an outlet side 80 which flow into separate air chambers 82 and 84 of a cylinder head 86 which is mounted onto valve plate 76. An inlet port 88 within the cylinder head 86 is connected to draw in ambient air, which preferably passes through one or more filters (not shown) prior to entering cylinder chamber 90. An outlet port 92 delivers compressed air to the intended receiving source.

[0033] During operation of the compressor 10, the fan 44 drives air pressure between housing shroud 14 and end bell frame 46 and out the passages 70 and 72. Airflow also is drawn through passages 54. The air movement cools the barrel cylinder 48, piston assembly 26, and valve plate 76. With this new design, airflow surface contact is maximized and the cooling air reduces the operating temperature of the cylinder barrel 48, piston assembly 26, and valve plate 76, which in turn prolongs the integrity of the seal between the same to extend the operating life. Secondly with the lower operating temperatures of the cylinder barrel 48, piston assembly 26, and valve plate 76 which in turn provides a lower inlet air temperature into the cylinder chamber 90 resulting in increased compressed air output.

[0034] The above-described embodiment is set forth by way of example and is not for the purpose of limiting the present invention. It will be readily apparent to those skilled in the art that obvious modifications, derivations and variations can be made to the embodiment without departing from the scope of the invention. Accordingly, the claims appended hereto should be read in their full scope including any such modifications, derivations and variations.

What is claimed is:
1. An improved endbell/housing assembly for an oil-free type air compressor which provides for enhanced life of a piston/cylinder seal, the improvement comprising:
   a housing shroud;
   an endbell cylinder frame having a cylinder barrel, a motor end frame connected to one end of said housing shroud and includes a plurality of spatially disposed passages therein to permit air flow therethrough, and
cylinder head mating face, said cylinder head mating face laterally extending from said motor end frame and connected to another end of said housing shroud and connects to a portion of said cylinder barrel with a remainder of said cylinder barrel extending into an area between said housing shroud and said motor end frame.

2. The improved endbell/housing assembly for an oil-free air compressor of claim 1, wherein said passages are generally concentrically spatially positioned.

3. The improved endbell/housing assembly for an oil-free air compressor of claim 1, wherein an end portion of said remainder of cylinder barrel is circumferentially enlarged and is supportively connected to said motor end frame.

4. The improved endbell/housing assembly for an oil-free air compressor of claim 1, wherein said cylinder head mating face includes a plurality of passages disposed therein about said portion of cylinder barrel to permit air flow therethrough.

5. The improved endbell/housing assembly for an oil-free air compressor of claim 1, wherein said endbell cylinder frame is die cast.

6. The improved endbell/housing assembly for an oil-free air compressor of claim 4, which includes a barrel sleeve formed in a manner to assure having an inner wall surface with minimal abrasive defects and wherein said cylinder barrel is die cast about said sleeve in a manner to integrally retain said sleeve.

7. The improved endbell/housing assembly for an oil-free air compressor of claim 6, wherein said barrel sleeve includes grooves formed in an outer surface and said grooves are filled by said die cast such that said cylinder barrel integrally retains said sleeve.

8. An endbell cylinder frame for an oil free type air compressor having a housing shroud which provides for an enhanced life of a piston/cylinder seal, said endbell cylinder frame comprising:

an endbell cylinder frame having a cylinder barrel, a motor end frame configured to connect to the housing shroud and includes a plurality of spatially disposed passages therein to permit air flow therethrough, and cylinder head mating face laterally extending from said motor end frame and configured to connect to the housing shroud and which connects to a portion of said cylinder barrel such that a remainder of said cylinder barrel extends laterally disposed from said motor end frame.

9. The endbell cylinder frame of claim 8, wherein said passages are generally concentrically spatially positioned.

10. The endbell cylinder frame of claim 8, wherein an end portion of said remainder of the cylinder barrel is circumferentially enlarged and is supportively connected to said motor end frame.

11. The endbell cylinder frame of claim 8, wherein said cylinder head mating face includes a plurality of passages disposed therein about said portion of said cylinder barrel to permit air flow therethrough.

12. The endbell cylinder frame of claim 8, wherein said endbell cylinder frame is die cast.

13. The endbell cylinder frame of claim 12, which includes a barrel sleeve formed in a manner to assure having an inner wall surface with minimal abrasive defects and wherein said cylinder barrel is die cast about said sleeve in a manner to integrally retain said sleeve.

14. The endbell cylinder frame of claim 13, wherein said barrel sleeve includes grooves formed in an outer surface and said grooves are filled by said die cast such that said cylinder barrel integrally retains said sleeve.

15. The endbell cylinder frame of claim 12, wherein said endbell cylinder frame is an integral one-piece die-casting.