SINGLE STAGE COMPRESSOR

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My invention relates to compressors, particularly to single stage compressors for compressing fluids such as air.

One important object of the invention is to provide a self-contained compressor unit for furnishing large volumes of air at high pressure.

Another important object is to arrange a plurality of cylinders in compact sets around a common crank shaft so that a very compact structure will result, and to arrange the connections of the cylinders with the crank shaft so that there will be uniform distribution of impulse and flow and reduction of vibration to a minimum.

A further object is to offset the cylinder sets on the crank case so as to permit the use of straight connecting rods with each rod having its own bearing on the crank shaft.

Another important object is to provide domed cylinder heads with correspondingly domed pistons, and to discharge the fluid from the center of the domed cylinder heads to thereby balance the operation of the pistons and to prevent pounding, and also to keep down the temperature.

A further object is to arrange the cylinders in the path of cooling air propelled by vanes provided on the flywheel pulley for the compressor.

The above enumerated and other features of my invention are exemplified in the structure shown on the drawings, on which

Figure 1 is a side elevation of my improved compressor unit;
Figure 2 is a plan view of the unit;
Figure 3 is an enlarged section on plane III—III of Figure 2, and
Figure 4 is an enlarged section on plane IV—IV of Figure 3.

As shown, the unit comprises a supporting base 1, a compressor structure C and a motor M. The driving motor may be a gasoline engine or, as shown, may be an electric motor.

The reservoir 2 is supported on suitable standards 3 and the base 1 of the unit may be in the form of a channel bar and is secured on the top of the reservoir, the entire outfit thus forming a very compact structure.

The compressor structure comprises a base 4 which may be in the form of a casing and which is mounted on the supporting base 1. The crank case 5 of the compressor is mounted on the base 4, and on the crank case are mounted and detachably secured two pairs of cylinder structures A and B, each set being shown as comprising two cylinders 6 of like bore. The cylinders of each set preferably form part of an integral casting and the sets are preferably offset 45 degrees from the vertical axis of the compressor, or in other words, they are spaced 90 degrees apart on the upper part of the crank case. The bores 7 of the cylinders 6 of each set communicate at their lower ends with the interior of the crank case through openings 8.

The crank shaft 9 is journaled in the ends of the crank case and in the arrangement shown the shaft has two crank sections 10 and 11 offset 180 degrees. Each piston 12 has a wrist pin 13 from which extends a connecting rod for connection with the crank shaft. Referring to Figures 3 and 4, one piston of the set A is connected by a connecting rod 14 with the crank section 10 and the other piston of this set is connected by a rod 14 with the crank section 11. Likewise, one piston of the cylinder set B is connected by a connecting rod 14 with the crank section 10 and the other piston of said set is connected with the crank section 11 by a rod 14. As best shown in Figure 2, the cylinder sets are offset sufficiently in the direction of the axis of the compressor so as to permit the use of straight connecting rods, the rods being preferably of the I-beam type. The described arrangement of the cylinders and their connections with the crank shaft results in smooth and balanced operation and reduces vibration to a minimum.

The upper end 15 of each piston is frustoconical or dome-shaped and the cylinder terminates in a recess 16 which is correspondingly shaped to receive such piston end. The recess 16 of each cylinder has communication at its upper or apex end with an outlet passage 17 which is concentric with the cylinder. The passages shown are cylindrical and of comparatively large diameter and at their inner ends present annular shoulders 18 for re-
ceiving cylindrical check valve structures 19. Each cylinder has also an inlet passage 20 extending laterally from its frusto-conical recess and having a check valve 21 therein.

For each set of cylinders an intake manifold fitting 22 is provided and secured by its flange 23 to the cylinder structure to communicate with the cylinder inlet passages. These manifold fittings lead from an air filter structure 24 which cleans the air before it is taken into the cylinders.

For each set of cylinders there is also a manifold fitting 25 secured by its flange 26 to the cylinder structure to communicate with the outlet or discharge passages of the cylinders. Each manifold 25 is connected by a pipe 27 with a chamber 28 provided in the base of the compressor. The cylinders take in air through the filter 24, and then compress it and discharge it into the chamber 28. With the arrangement shown, each quarter turn of the crank shaft starts a compression stroke, the distribution of impulse and load being uniform so that smooth and balanced operation results and vibration is reduced to a minimum.

The air discharged into the chamber 28 is conducted therefrom into the reservoir 2 through a pipe 29 and this pipe preferably includes a check valve 30 for preventing back flow of compressed air from the reservoir to the compressor when the compressor is not running.

Compressed air is fed from the reservoir to a pipe 31 into a housing 32 containing automatic switch mechanism (not shown) controlled by pressure to regulate the current flow to and speed of the motor. A pressure gauge 34 and a safety valve 35 may be connected with the housing 32.

On the outer end of the crank shaft is supported a drive pulley 36 connected by belt 37 with the driving motor M. The pulley is of comparatively large diameter so as to be opposite the cylinders of the compressor, and the spokes of the pulley are extended to form fan wings or blades 38 of substantial area and capacity to throw large volumes of air against the cylinders when the compressor is operated. The cylinders preferably have radiator fins or flanges 39 so that the heat of compression is rapidly conducted away from the cylinder walls and dispersed by the air propelled by the vanes. The vanes are preferably at the outer ends of the spokes of the drive pulley so that practically all of the air impelled thereby is applied to the cylinder walls to effect cooling. The vanes also add weight to the pulley so that it will act as a fly wheel for the compressor.

The arrangement involving the frusto-conical piston and the correspondingly shaped cylinder recess, together with the central discharge of the compressed air through the outlet port of large diameter, prevents wire drawing and the formation of eddy currents. The frusto-conical recess with the large outlet port forms a sort of Venturi passage through which the compressed air may flow smoothly and uniformly, and so-called bouncing is entirely eliminated. The smooth and uniform flow of the air also keeps the temperature down and carbonization is reduced to a minimum. Any lubricant which may travel upwardly along the cylindrical wall of the cylinder will not be drawn into the main air flow and consequently will not escape into the pressure system, and as the arrangement described prevents the cylinder head from becoming unduly heated, any stray oil or lubricant will not be burned or carbonized. The result is a well balanced, smooth running and quiet compressor structure of large capacity and exceptional efficiency.

Changes and modifications can undoubtedly be made without departing from the spirit and scope of the invention and I do not therefore desire to be limited except as necessitated by the prior art.

I claim as my invention:

In a compressor structure, the combination of a crank case, a crank shaft, sets of compression cylinders circumferentially spaced on said crank case, pistons within said cylinders connected with said crank shaft, the inner ends of said pistons being domed and the inner ends of said cylinders being correspondingly domed, a fluid outlet for each cylinder concentric therewith and extending from the center of its domed end, a manifold conduct connecting with the fluid outlets of the cylinders of each set and communicating with a fluid reservoir, a fluid inlet for each cylinder, and check valves in said fluid outlets and fluid inlets.

In testimony whereof I have hereunto subscribed my name at Chicago, Cook County, Illinois.

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