Nov. 27, 1951 H. R. GAMBLE 2,576,876

COMPRESSOR

Filed Nov. 17, 1947 2 SHEETS--SHEET 1

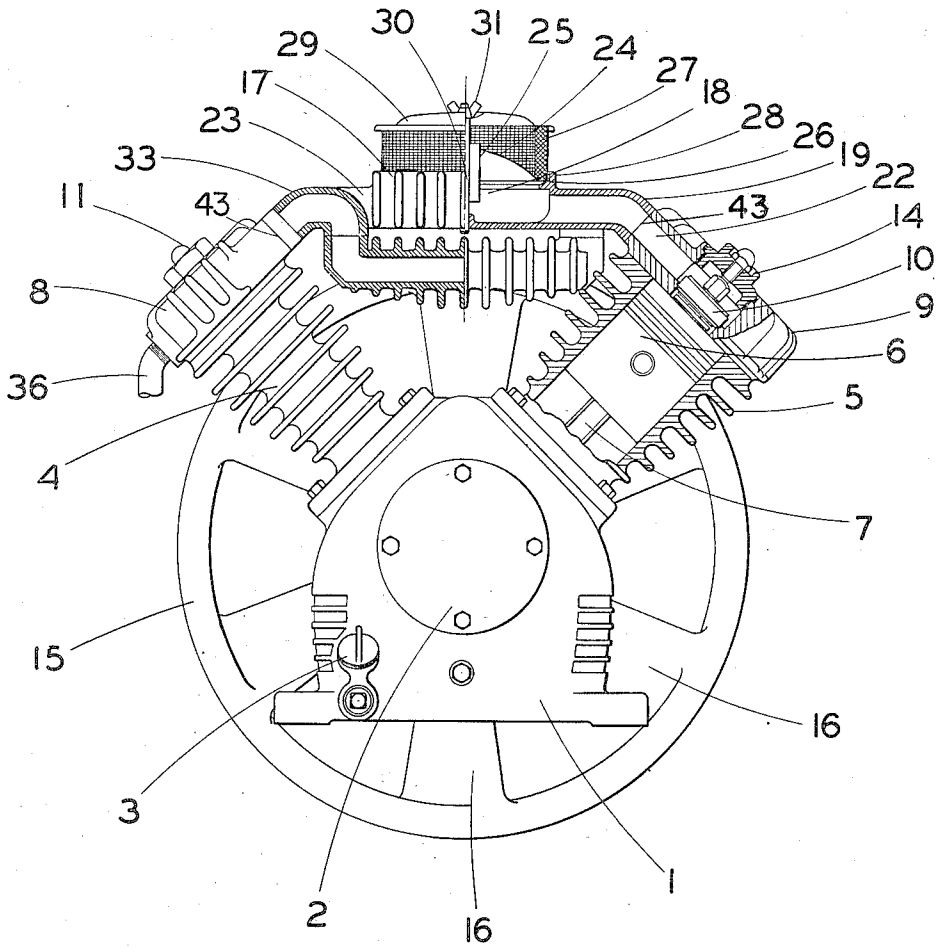



Fig. 1.

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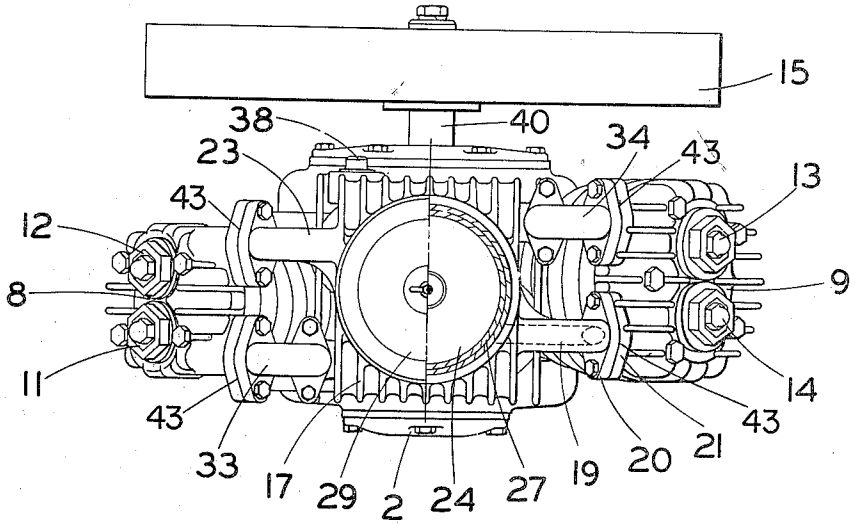



Fig. 2.

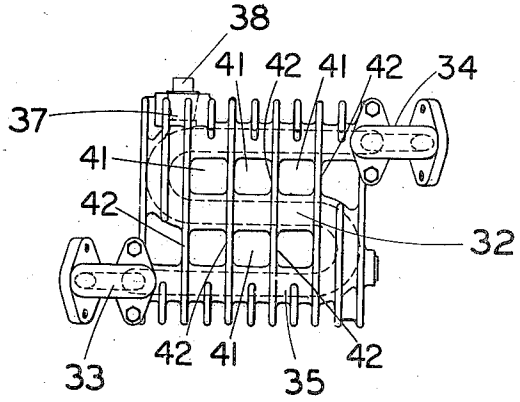



Fig. 3.

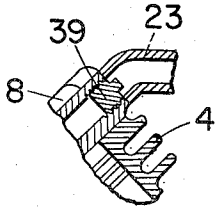



Fig. 4.

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## COMPRESSOR

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5 Claims. (Cl. 230—182)

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This invention relates to a V-type compressor and particularly to air inlet and outlet manifolds therefor.

The primary object of the invention is to provide a well balanced structure that is compact in design.

Another object is the provision of manifolds which are adaptable for use with either single or double stage compression.

A further object is the provision of a fastening arrangement that compensates for machining variations.

Another object is the provision of effective cooling means.

A still further object is the provision of an air inlet midway between the air cylinders, and an inlet structure that reduces the compressor operating noise.

These and other objects, which will become apparent upon reading the following description, are attained through the use of an air inlet manifold connected at each end with a cylinder head and with an air inlet opening on its top center portion. This manifold has cooling fins extending laterally therefrom. Its fastening means have flanged cylinder head-joining surfaces lying in a plane at each end parallel to the axis of the compressor cylinder and the fastening means are tubular for the transmission of air to the cylinder heads.

Below the intake manifold is a horizontally disposed air manifold for cooling the air under first stage compression. This has upwardly bent and subsequently downwardly turned connecting tubular portions for joining the manifold to the cylinder heads at locations alongside of those to which the inlet manifold is fastened.

These and additional features will be more fully explained hereafter.

In the drawings:

Figure 1 is a side elevation of a compressor embodying my design with portions thereof shown in vertical section;

Figure 2 is a plan view of the compressor shown in Figure 1 with a portion of the air inlet shown in horizontal section; and

Figure 3 is a plan view of the secondary air outlet manifold;

Figure 4 is a fragmentary vertical section of the connection between the inlet manifold and the cylinder head of the cylinder on the left side of the compressor shown in Figures 1 and 2.

The embodiment of this invention illustrated in the drawings includes an air compressor crankcase 1 with end plate 2 and oil filling attachment 3.

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Upon this crankcase as a supporting base are mounted cylinders 4 and 5.

When used as a two-stage unit the larger cylinder 5 provides the initial compression of the air. Both cylinders include a conventional piston 6 with a connecting rod 7. Upon the cylinders are mounted cylinder heads 8 and 9. Within the heads are inlet and exhaust valves. One of the former is shown at 10 in Figure 1. Upon the heads are caps 11, 12, 13 and 14 for holding the inlet and exhaust valve assemblies in place.

The compressor has, on the end of the crankshaft 40, a standard fly wheel or pulley 15 with vane-type spokes 16 to direct air against the cylinders, cylinder heads and air manifolds, all of which have cooling fins.

Between the cylinder heads is mounted an air intake finned manifold 17 having a circular cavity 18 at its center to which a lateral tubular extension 19 connects. This extension terminates with a flange 20 by which it is fastened to a complementary flange 21 on the cylinder head 9. From the flange connection 21 on the cylinder head a passage 22 leads to the air inlet valve 10. From the other side of the cavity a second tubular extension 23 joins the manifold with the other cylinder head. The connecting extensions 19 and 23 are on opposite sides of the lengthwise center line of the manifold 17.

When the compressor is operated as a two stage unit the larger cylinder 5 compresses all of the air initially and the cylinder head 8 does not receive air directly from the intake manifold 17 as the travel of air through the tubular extension 23 is prevented by plugging, with a threaded plug 39 as illustrated in Figure 4, the receiving passage in the cylinder head communicating with the extension.

Spanning the center cavity 18 is a conical partition 24 ported at its apex to receive the upper end of tube 25. The edge of partition 24 is supported upon an annular shoulder 26, an integral part of the inlet manifold casting. Over the partition is positioned a cylindrical filter screen 27. Its vertical wall section stands on the edge of the partition within an annular lip 28 on the manifold casting. A cover 29 lies over the upper end of the filter 27. A bolt 30 which passes from the under side of the manifold into the center of the cavity 18, through the tube 25, and through the cover 29 cooperates with a thumb nut 31 which is threaded to the bolt at its upper end to hold the cover, filter and partition in assembled relation.

The entering air is drawn inwardly through the filter screen 27 and passes downwardly

through the central tube 25 into cavity 18. The arrangement of the partition 24 cooperates with the tube and the cavity to absorb the compressor operating noise generally escaping through the air inlet. The tangential connections between the cavity and the tubular extensions 19 and 23 may also contribute to the sound deadening results obtained with this structure. The air filtering and sound deadening air inlet structure is not a part of this invention, being the subject of application Ser. No. 46,052 filed August 25, 1948, and which issued as U. S. Patent No. 2,564,814 to the assignee of this application.

Below the air intake manifold 17 is positioned a second finned air manifold 32 for compressed air. This is suspended between the cylinder heads by flanged elbows 33 and 34. The connections 33 and 34 are on opposite sides of the lengthwise center line of manifold 32.

The elbow 34 communicates with the exhaust outlet of cylinder head 9. When the compressor is operating for two stage compression the air from head 9 travels through the S passage 35 of the manifold through elbow 33 to the intake valve of cylinder head 8. From here it enters the compressing chamber of cylinder 4 where it is compressed to a higher pressure, before being discharged through the exhaust valve to outlet 36.

When it is desired to use both cylinders for compressing atmospheric air instead of in series for two stage operation, the intake air passes to both cylinder heads from the cavity 18 and after being compressed enters the manifold 32 from the exhaust valves. For this use the positions of the exhaust and inlet valve assemblies of cylinder head 8 must be interchanged and the opening into the head 8 from the intake manifold opened. Also the outlet 36 is closed with a pipe plug. The air after reaching the manifold 32, travels therefrom out opening 37 to reach the air tank or other receiving means. The plug 38 shown in Figure 3, which closes this opening during two stage operation may be used to close outlet 36 for single stage compression.

It may be noted therefore that when the compressor is used for two stage operation, the air inlet manifold 17 delivers air only to the first stage cylinder head 9 and the lower manifold delivers air from cylinder head 9 to the cylinder head 8 of the other cylinder.

Alternately when the compressor is operated for single stage compression, the air passing into the inlet manifold 17 travels to both cylinder heads and is delivered from both heads back into manifold 32 which then acts as an after cooler.

While the compressor shown in the drawings and discussed herein, is particularly adapted for two stage operation and would not ordinarily be used for single stage, it is here treated as serving in either manner in order to better point out the features of the invention.

The cooling air form the fly wheel travels through the horizontal space between the manifolds as well as through the vertical openings 41 between webs 42 which are exteriorly between the curves of the S-shaped passage in the lower manifold.

The manifolds 17 and 32 present substantial cooling surfaces as they are as wide as either cylinder head. The vertical height of each manifold is limted, being less than half the width of the manifold. This permits them to fit compactly one above the other between the opposing or mutually facing sides of the cylinder heads with the lower portion of the upper air intake manifold lying horizontally below the uppermost portions of the cylinder heads.

Because of machining discrepancies in the joining portions of the crankcase and the cylinders and between the cylinders and the heads, there may be some variation in the distance between the cylinder heads. In order to compensate for such variation the contacting surfaces between each cylinder head and the flanged elbow connections joining the manifolds to the heads are disposed in a plane parallel with the axis of the cylinder on which the cylinder head is mounted. This parallel relationship may be noted by referring to the joint lines 43 in Figures 1 and 2. This arrangement permits the manifolds to slide downwardly into a tight connection with the heads whether the distance between the heads is somewhat greater or less than that specified in production drawings. This, of course, would not be possible were the contacting surfaces in vertical planes. The bolt holes in the attaching flanges are oversize to permit entry of the bolts when the flanges are somewhat out of line.

The air inlet manifold in addition to its utility in distributing air and in sound deadening also contributes to the effective operation of the compressor by assisting in the dissipation of heat as the latter travels from the cylinder heads through the walls of connecting tubular portions of the manifold and is carried off the outer surface of the manifold by the air from the flywheel.

It may thus be seen that this invention provides a structure that is particularly effective in quieting the sound of operation and in dispersing the heat of compression.

While simple in design the arrangement is suitable with minor alterations for both single and two stage compression. And, as has been brought out, the construction is confined to a minimum of space while retaining a maximum of efficient cooperation in functions.

Various changes and modifications could be made without departing from the spirit and scope of the invention and it is intended to cover such variations within the field of the accompanying claims.

What I claim is:

1. In an air compressor, a crankcase providing a supporting base for the compressor, two upwardly diverging cylinders mounted on the crankcase, a cylinder head on the top of each cylinder, air inlet and exhaust valves in each cylinder head, a crankshaft extending horizontally from the crankcase on one side of the cylinders, a pulley on the exterior end of the crankshaft, vane type spokes on the pulley directing cooling air between and around the cylinders and cylinder heads, cooling fins on the cylinders and cylinder heads, a finned air intake manifold spanning the space between the cylinder heads, said manifold having at its center a large upwardly facing circular opening, an air filter between the atmosphere and the opening, a finned compressed air manifold below the air intake manifold extending between the cylinder heads, and connections joining said manifolds with the cylinder heads, the contacting surfaces between the connections and each cylinder head lying in a plane parallel to the axis of the cylinder upon which the cylinder head is mounted.

2. In an air compressor, a crankcase providing a supporting base for the compressor, two upwardly diverging cylinders mounted on the crankcase, a valved cylinder head on the top of each

cylinder, a crankshaft extending horizontally from the crankcase on one side of the cylinders, a pulley on the exterior end of the crankshaft, vane-type spokes on the pulley directing cooling air between and around the cylinders and cylinder heads, a finned air intake manifold extending directly and horizontally between the cylinder heads with its lower portion below the uppermost portions of the cylinder heads, said intake manifold being horizontally broadened to an extent whereby it is more than twice as broad as vertically thick, said manifold having a large upwardly facing air inlet opening, a similarly broadened finned compressed air manifold extending horizontally between the cylinder heads and positioned adjacently below the intake manifold and completely below the uppermost portions of the cylinder heads, and connections at the ends of the manifolds joining them to the mutually facing sides of the cylinder heads, said manifolds being thus compactly placed between the cylinder heads in the path of cooling air from the pulley.

3. An air compressor as set forth in claim 2 in which the manifolds are as wide as either cylinder head.

4. An air compressor as set forth in claim 2 in which the connection of each manifold to a cylinder head is on the opposite side of the lengthwise center line of the manifold from the connection of the manifold to the other cylinder head.



5. An air compressor as set forth in claim 2 in which the compressed air manifold is shaped to provide an interior S-shaped passage for the compressed air and there are spaced vertical webs extending exteriorly between the convolutions forming the S-shaped passage, the openings between the webs providing an upward path for the cooling air from the pulley.

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