DISCHARGE NOZZLE ARRANGEMENT FOR CENTRIFUGAL GAS COMPRESSOR


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ABSTRACT
A centrifugal gas compressor impeller with a surrounding gas-collecting scroll is enclosed within an outer casing or housing to provide good appearance and reduced noise transmission. A discharge nozzle is detachably secured to pass through an opening of the housing with its inner end received in the discharge outlet of the gas-collecting scroll.

4 Claims, 3 Drawing Figures
DISCHARGE NOZZLE ARRANGEMENT FOR CENTRIFUGAL GAS COMPRESSOR

CROSS REFERENCES TO RELATED APPLICATIONS

A centrifugal refrigerant gas compressor assembly for which the discharge nozzle arrangement of this invention may be particularly suitable is disclosed by the copending patent application Ser. No. 14,469.

BACKGROUND OF THE INVENTION

Recent developments are making practical the use of a centrifugal refrigerant gas compressor in relatively small air-conditioning systems where the reciprocating compressors were previously considered more economical. One of the many advantages of the centrifugal compressor is its small size for a comparable capacity relative to a reciprocating compressor. Since the centrifugal impeller runs at a very high speed, an objectionable whine may be noticeable at times during operation. It is therefore desirable to provide an assembly for containing the centrifugal compressor including its compressed gas collecting scroll within an outer housing that will serve to reduce the transmission of sound from the gas-collecting scroll and enhance the overall appearance of the compressor.

PRIOR ART

Applicant is not aware of any prior disclosures of the centrifugal gas compressor assembly embodying his invention.

SUMMARY OF THE INVENTION

In accordance with the invention, a centrifugal gas compressor impeller is mounted on a bearing assembly projecting from a bearing support wall. An outer housing is detachably secured to the bearing support wall in a manner to enclose the impeller with a gas-collecting scroll surrounding the impeller but in generally spaced relation to the inside walls of the housing. The scroll may be detachably secured to the inside of the housing in a manner to surround the impeller when the housing is assembled to the bearing support. Thus the impeller and the scroll are fully enclosed within the outer housing. A discharge nozzle is inserted through an opening of the housing wall with its inner end received in the discharge outlet of the gas-collecting scroll in the assembled relation and in the preferred form of the invention the discharge nozzle is detachably secured to the housing by one or more bolts passing through a collar of the nozzle into threaded apertures on the outside wall of the housing. In the preferred form of the invention, the passage in the discharge nozzle is tapered to increase in cross-sectional diameter from the outlet of the scroll through the opening of the casing, and the taper is preferably matched to a similar tapered increase for the compressed gas-collecting scroll towards the outlet of the scroll.

Further advantages and features of the invention will be apparent with reference to the following specification and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross-sectional side elevational view of a self-contained electric motor and centrifugal gas compressor assembly embodying the invention;

FIG. 2 is an enlarged cross-sectional view of the compressor portion of the assembly showing the manner of securing the compressed gas-collecting scroll on the inside of the outer housing wall, and

FIG. 3 is a section on the line III—III of FIG. 2 to show the details of the discharge nozzle and its manner of assembly on the outer casing.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A bearing support member is shown at 10 and projecting on the back side of bearing support member 10 is a bearing assembly 11 within which is journaled an electric motor armature shaft 12. An outer housing 13 containing an electric motor field 14 is detachably secured by means of bolts such as the bolts shown at 15 to the back side of the bearing support member 10 to enclose electric motor armature therein. The armature motor shaft 12 extends through an opening of the bearing support 10 to the front side thereof and a bull gear 16 meshes with a pinion 17 for an impeller shaft 18 which is journaled within the bearing assembly 19 projecting from the front side of the bearing support member 10. A rotatable centrifugal gas impeller 20 is secured to an end of the impeller shaft 18 as shown.

An outer casing 21 is detachably secured by bolts such as the bolts 22 to the front side of the bearing support member 10 to substantially enclose the gearing 16, 17 and the centrifugal gas impeller 20 therein. As more clearly shown by FIGS. 2 and 3 of the drawings, a compressed gas-collecting scroll 30 is detachably secured by bolts such as the bolt shown at 31 to an inwardly projecting collar 32 of the outer casing 21. Thus when the outer casing 21 is assembled to the bearing support 10 to enclose the impeller 18, the scroll 30 is positioned to surround the impeller 20 and to receive the compressed gas through the diffuser passage 33, into the scroll passage 34. It will be noted as most clearly shown by FIGS. 2 and 3 of the drawings that the cross-sectional diameter of the gas-collecting passage 34 of the scroll increases from a minimum cross-sectional diameter at 35 to a maximum cross-sectional diameter at 36 which is the discharge outlet of the gas-collecting scroll 30. Also, although this invention is not limited to such an arrangement, the change in shape and dimensions of the gas-collecting passage 34 is preferably toroidal with the center of the diameter of the cross section gradually moving away from the base wall of the scroll as shown at 37 and 38 in the direction towards the discharge outlet 36.

Now referring in more detail to FIG. 3, of the drawings, a discharge nozzle 40 is passed through an outlet opening 41 of the outer casing 21 and its inner end 42 is received within the counter bored opening 43 of the discharge outlet 36 for the scroll 30. Suitable gaskets such as shown at 44 and 45 may be provided to assure a gas tight seal. In the preferred form of the invention, the discharge nozzle 40 is provided with an exterior collar structure 46 which is attached by means of bolts 47 and 48 to the outside wall of the outer casing 21.

It should now be obvious that the gas compressor of the invention may be readily assembled by bolting the scroll 30 to the inside collar wall 32 of the outer housing 21. Thereafter the outer housing 21 may be secured to the bearing support 10 by means of bolts such as shown at 22 and the scroll 30 will be supported in a position surrounding the rotatable gas impeller 20. Thereafter the discharge nozzle 40 may be inserted through the discharge opening 41 of the housing 21 and bolted thereto with its inner end received in the discharge outlet 36 of the scroll 30. It is of course apparent that the discharge nozzle 40 may be secured to the housing 21 and the scroll 30 while the scroll 30 is assembled to the outer housing 21 and before the outer housing 21 is attached to the bearing support member 10 if desired.

It will be noted that the discharge nozzle 40 is provided with a discharge passage 50 that is tapered to increase in diameter from the inner end adjoining the discharge outlet 36 of the scroll 30 to its outer end on the exterior of the outer housing wall 21. It is believed preferable that the discharge passage through the nozzle 40 be tapered with a similar taper to the taper of the gas-collecting passage 34 of the scroll 30.

There has now been described a compact centrifugal gas compressor assembly in which the gas compressor impeller and the compressed gas-collecting scroll is fully enclosed within the walls of an outer housing, thus providing a neat and attractive external appearance and more importantly providing sound insulation against the transmission of sound from the gas-collecting scroll 30 to the compressor surroundings. Various modifications will occur to those skilled in the art. I claim as my invention:

1. A centrifugal gas compressor comprising, a bearing support member, a bearing assembly on said support member, a
rotatable gas impeller journaled in said bearing assembly, a housing member detachably secured to said bearing support member to enclose said bearing assembly and said impeller in the assembled relation, a compressed gas-collecting scroll, means detachably securing said scroll to an inside wall of said housing in a position to surround said impeller in the assembled relation of said housing to said support member, an opening in said housing, and a compressed gas nozzle extending through said opening within said housing and detachably secured to said housing in the assembled relation, said scroll having a compressed gas outlet, and the inner end of said nozzle being received in the gas outlet of said scroll in the assembled relation.

2. The invention of claim 1 in which the gas-collecting passage within said scroll increases from a minimum diameter cross section to the maximum diameter cross section of said compressed gas outlet, and the passage within said outlet nozzle is tapered to increase in diameter from its inner end to its outer end in the assembled relation with a similar rate increase to that of the scroll passage.

3. The invention of claim 2 in which the gas-collecting passage of said scroll increases toroidally.

4. The invention of claim 1 in which said gas nozzle is adapted to be inserted through said opening of the housing with its inner end received within the outlet of said scroll and to be detachably secured in the assembled relation to said housing by at least one bolt passing through a collar on said nozzle into threaded aperture on the outside wall of the housing.