H. F. SCHMIDT.

BLOWER.

APPLICATION FILED APR 15, 1920.

1,407,889.

Patented Feb. 28, 1922.

2 SHEETS—SHEET 1.

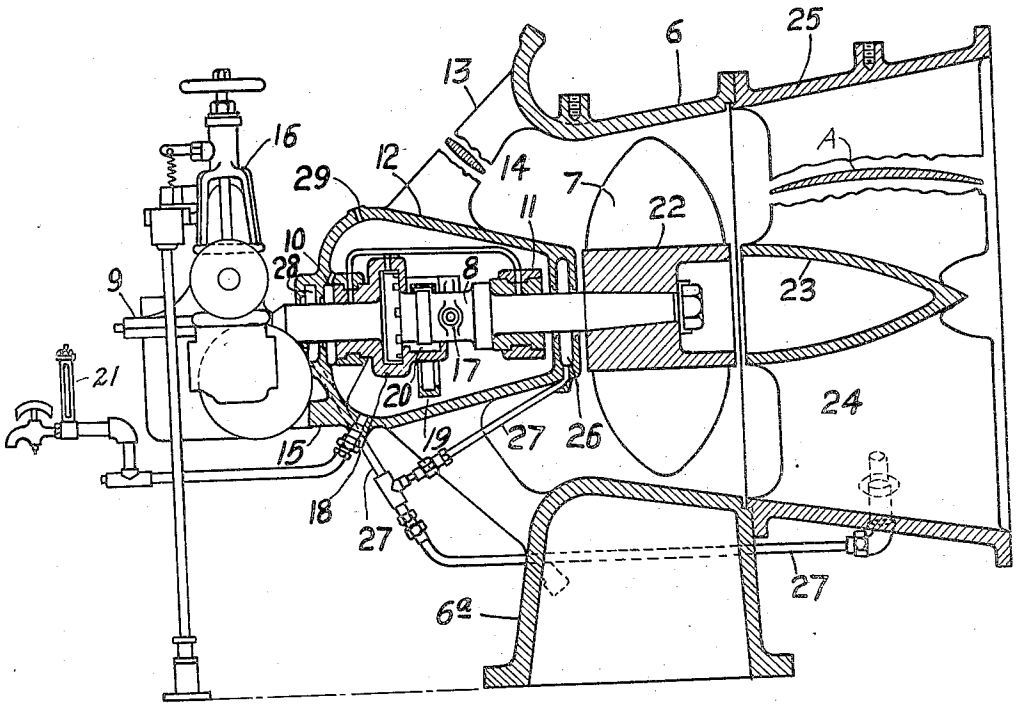


Fig. 1

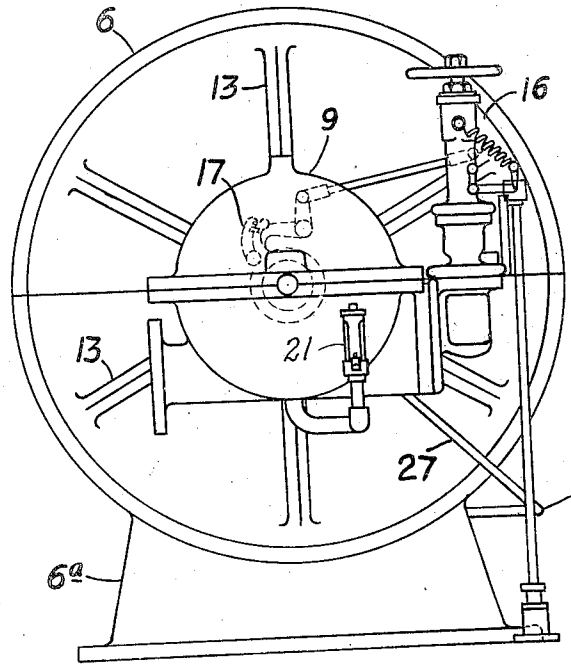


Fig. 2

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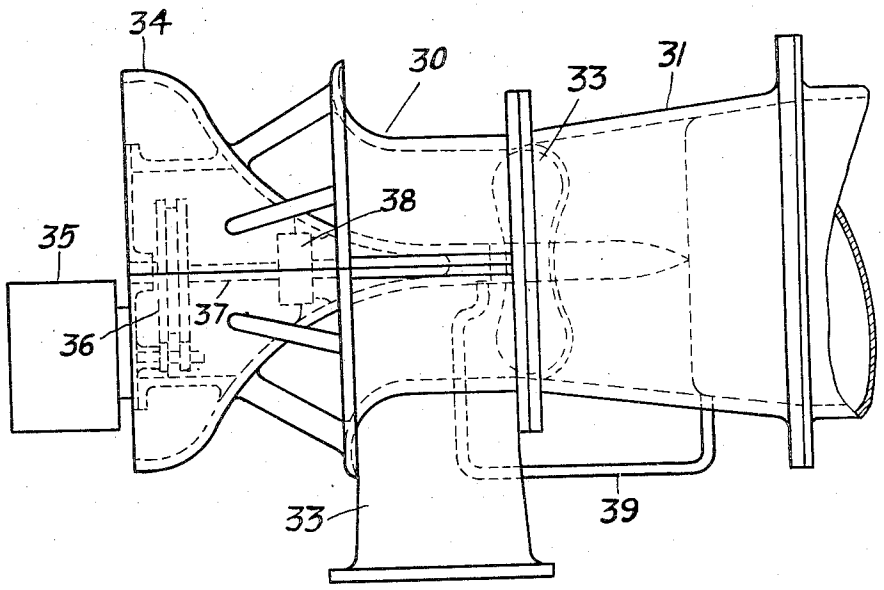


Fig. 3

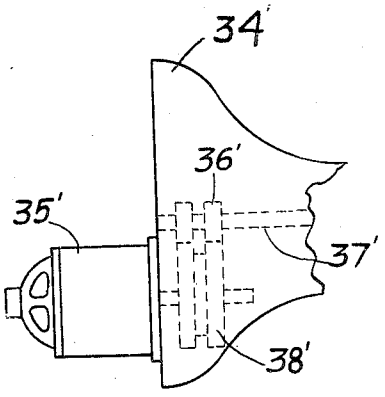


Fig. 4

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BLOWER.

1,407,889. Specification of Letters Patent. Patented Feb. 28, 1922.

Application filed April 16, 1920. Serial No. 374,372.

To all whom it may concern:

Be it known that I, HENRY F. SCHMIDT, a citizen of the United States, and a resident of Swarthmore, in the county of Delaware and State of Pennsylvania, have invented a new and useful Improvement in Blowers, of which the following is a specification.

This invention relates to blowers and has for an object to produce a new and improved blower of the propeller type which is more efficient than other blowers now in use and known to me.

A further object is to produce a blower in which the casing and other elements are so constructed that the loss of energy, due to eddy and cross currents in the fluid being translated is reduced to a minimum.

A further object is to produce a new and improved blower which is more efficient and may be more easily manufactured than other blowers now in use and known to me and which is so constructed that the working parts may be examined and repaired without disturbing the setting of the blower or the main piping connected therewith.

A further object is to produce new and improved means for conserving the oil or other lubricants employed in the bearings of a fan or blower.

These and other objects which will be made apparent throughout the further description of my invention are attained by means of apparatus embodying the features herein described and illustrated in the drawings accompanying and forming a part hereof.

In the drawings, Fig. 1 is a diagrammatic sectional view of a blower embodying my invention.

Fig. 2 is an end view of the apparatus illustrated in Fig. 1.

Fig. 3 is a diagrammatic view of a modification of the blower illustrated in Fig. 1.

Fig. 4 is a fragmental view of a further modification of the apparatus illustrated in Fig. 1.

My invention contemplates a new and improved blower in which the casing and other members of the structure are formed to handle the air or other fluid to be translated in the most efficient manner and in which the casing and other members are so divided and assembled that the working parts may be easily reached for inspection and repairs. My invention also contemplates a new and improved lubrication arrangement and means for preventing the suction of the blower from drawing the oil or lubricant out of the bearings.

The blower illustrated in Fig. 1 is of a type well adapted to be employed, for example, in supplying air to mines, stokers or ventilating systems. It will, of course, be understood that my invention may equally well be applied to blowers and fans of other types and employed for other purposes.

As illustrated, the blower is provided with a converging-diverging casing 6 near the throat or narrowest part of which I have shown a propeller 7. The propeller is mounted on the end of a suitable shaft 8 and is adapted to be driven, as shown, by means of a turbine 9. As illustrated, the shaft 8 is supported in bearings 10 and 11 located near the opposite ends of the shaft and mounted in a centrally located conical casing member or bearing housing 12.

The bearing housing 12 is spaced away from the convergent end of the casing 6 and is supported by struts 13 in such a manner that the space between the housing and the converging walls of the casing forms an annular smoothly curved converging inlet passage 14 for the air to be translated. As illustrated, a turbine 9 is mounted on the bearing housing 12 by means of a suitable bracket 15.

The turbine 9, as shown, is provided with a throttle valve 16 which may be manually opened and closed. This valve is also adapted to be closed in response to being tripped by an automatic stop governor 17 located, as shown, at an intermediate point in the shaft 8. Both of these are familiar to those skilled in the art, and require no further description.

The thrust of the propeller 7 is adapted to be taken up by means of a thrust bearing 18 located, as shown, adjacent to the shaft bearing 10. This thrust bearing also serves as a pump for delivering lubricant to the bearings 10 and 11. The lower portion of the conical casing 12 is adapted to form a lubricant reservoir. Lubricant, hereinafter referred to as oil, is delivered from this reservoir to the thrust bearing and pump 18 by means of a ring oiler 19 and pocket 20. This construction is described in greater detail in my co-pending application, serially numbered 230,449 and filed April

24, 1918. An indicator 21 is provided for showing the level of the oil in the casing 12.

As illustrated, the casing 6 is provided with a pedestal 6a which serves as a support for the whole machine. If desired, a separate support may be provided for the turbine 9, although the arrangement illustrated reduces the possibility of alignment difficulties to a minimum. In some installations, such as those on board ship, the pedestal may be eliminated and the casing of the blower bolted directly to a bulk-head.

The smoothly curved surfaces forming the inlet passage 14 deliver the air or other fluid to be translated to the propeller 7 with a minimum loss of energy, due to eddy and cross currents. The air is accelerated as it approaches the propeller because of the convergence of the inlet passage and is, therefore, picked up by the propeller with a minimum amount of shock loss. After leaving the propeller 7 a part of the velocity energy of the rapidly moving air is transformed into pressure energy in the diverging portion of the casing 6. As shown, the propeller 7 is provided with a hub 22 of substantially the same diameter as the inner or small end of the conical casing member 12. On the other side of the propeller hub 22 I have shown a stationary cone 23 for preventing the formation of eddy currents in the neighborhood of the hub, that is the cone is provided for the purpose of stream lining the hub. As illustrated, the cone 23 is supported by vanes 24 formed within a converging casing member 25 which, as illustrated, is bolted directly to the casing 6. The vanes 24 are curved somewhat as indicated by section A so as to gradually overcome the rotation of the stream of air delivered by the propeller. It will, of course, be understood that the propeller, in translating the air, also imparts a rotary motion to it which results in eddy and cross currents and some loss of energy, if not corrected. The vanes 24 gradually remove the rotation of the air so that it is finally delivered from the blower in substantially parallel streams and with a minimum loss of energy.

The vanes 24 and the struts 13 are preferably spaced from the propeller sufficiently to avoid objectionable sound vibrations set up after the manner of a siren. The inner bearing 11 for the shaft 8 is, of course, located near the propeller 7. The suction created by the propeller on one side of this bearing tends to draw the oil out of the bearing along the shaft 8 and into the blower. This tendency is overcome, in the construction illustrated, by supplying air under pressure to a small annular chamber 26 surrounding the shaft 8 and located between the bearing 11 and the propeller. As illustrated, the air is delivered to the annular chamber from the diverging casing 25 by means of a conduit 27. I have also shown an annular chamber 28, communicating with the conduit 27, at the outer end of the bearing housing 12. A vent 29 is shown in the upper portion of the housing so that the pressure within the housing is maintained at substantially atmospheric pressure. The pressure in the diverging casing 25 is, of course, somewhat greater than atmospheric pressure and is communicated to the annular chambers 26 and 28 by means of the pipe 27. The pressure of the air in the annular chambers 26 and 28 is therefore somewhat greater than atmospheric pressure, consequently the flow of air will be from the annular chambers into the housing 12. This effectively prevents the suction of the propeller from withdrawing oil from the bearings or the housing. It will, of course, be understood that the air entering the housing 12 escapes through the vent hole 29.

As shown in Fig. 2 the casing 6 is horizontally divided so that the upper half may be lifted off for the inspection of the bearings 10, 11 and 18 and the propeller 7. It will be noted that the turbine supporting bracket 15 is formed on the lower half of the casing 12, consequently the turbine and its piping connections are not effected by the removal of the upper half of the casing 6. This also applies to the conduit 27. It is evident that with this construction all the working parts of the blower may be easily reached for either inspection or repair by the single operation of removing of the upper half of the casing 6, and that this does not involve any disturbance of piping connections or the setting of the blower.

In Fig. 3, I have illustrated a modification of the blower illustrated in Figs. 1 and 2, the construction being especially suitable for large size blowers. As illustrated, the blower is provided with a converging inlet casing 30 and a diverging outlet casing 31, the latter being bolted or otherwise suitably secured to the former. The converging casing 30 is provided with a pedestal 33 serving, as shown, as a support for the whole machine.

At the junction of the two casing members 30 and 31, or in other words at the throat of the casing considered as a whole, I have shown a propeller 33. The propeller is mounted at the end of a stationary conical member or housing 34 which extends into the converging inlet casing 30 in the same manner as illustrated in connection with the blower illustrated in Fig. 1.

In the apparatus illustrated the propeller 33 is adapted to be driven by a turbine 35 which I have shown mounted on the housing 34 and which is operatively connected to the propeller 33 by means of reduction gearing 36 and a shaft 37. The shaft 37 is, of course,

mounted in suitable bearings in the housing 34 and a thrust bearing 38 is preferably provided. I have shown a conduit 39 extending from the outlet casing 31 to the inner end of the housing 34 for the purpose of preventing the oil from being drawn out of the bearings in the housing, as described in connection with the apparatus illustrated in Fig. 1.

It will be understood that in some large size blower installations the highest efficiency may be obtained in both turbine and blower if the turbine is operated at a higher speed than the blower. This is accomplished by providing the reduction gearing 36 and without the sacrifice of space, the gearing, as illustrated, being entirely enclosed within the housing 34.

In Fig. 4, I have shown an arrangement suitable for an electric drive. If an electric motor is employed for operating the propeller of the blower it is usually desirable to operate the propeller at a higher speed than the motor, consequently I have shown a construction in which gearing is provided for stepping up the speed in transmitting the power of the motor to the propeller. In the fragmental view I have shown a portion of a conical housing member 34′ on which is mounted a motor 35′. The propeller, not shown, is mounted on the inner end of a shaft 37′ which is provided with a pinion 36′ adapted to be driven by a gear 38′. The latter is, of course, driven by the motor 35′.

In both Figs. 3 and 4 it will be noticed that the apparatus is so divided that the working parts may be easily inspected by removing only a portion of the casing and without disturbing the setting of the blower or the pipe or wiring connected with it or its auxiliaries.

While I have described and illustrated but there embodiments of my invention, it will be apparent to those skilled in the art that various changes, modifications, additions and omissions may be made in the apparatus described and illustrated without departing from the spirit and scope of the invention as set forth by the appended claims.

What I claim is:

1. In combination in a blower, a converging-diverging casing, a conical casing member extending into the converging portion of the casing, a propeller having a hub located near the end of the conical casing member and within the converging-diverging casing, means for preventing eddy currents from being formed near said hub, and means for driving the propeller.

2. A blower having a converging inlet casing, a propeller operating near the narrowest part thereof, a conical member extending into the inlet casing and forming with said inlet casing a converging smoothly curved inlet passage, and a conical member associated with the propeller for preventing the formation of eddy currents near the central portion of said propeller.

3. In a blower, means for translating a fluid, a shaft for transmitting power to said means, a bearing for the shaft, and means including fluid under pressure for preventing the suction of the fluid translated from drawing lubricant out of said bearing.

4. In a blower, means for translating a fluid, a shaft for transmitting power to said means, a bearing for the shaft, a chamber surrounding said shaft between the bearing and the translating means, and means for delivering fluid under pressure to said chamber whereby the bearing is protected from the suction of the translating means.

5. In combination in a fluid translating device, a converging-diverging casing, a propeller operating at the throat thereof, a conical member extending into the casing and having the propeller operating at its small end, a shaft for driving the propeller, a bearing for said shaft in the conical member, and means for preventing the bearing from being subjected to the suction of the propeller.

6. In a blower, a converging inlet casing, a conical member extending into said casing and forming therewith a converging smoothly curved inlet passage, a shaft mounted in the conical member, a propeller mounted on said shaft within the casing, driving means for said shaft mounted on the conical member, and supporting means connecting the conical member and the casing.

7. In a blower, a converging inlet casing, a conical member extending into said casing and forming therewith a converging smoothly curved inlet passage, a shaft mounted in the conical member, a propeller mounted on said shaft within the casing, driving means for said shaft mounted on the conical member, and supporting means connecting the conical member and the casing, said casing and said conical member being divided so that the working parts may be examined and repaired without disturbing the setting of the blower.

8. A blower having a converging-diverging casing, a propeller operating at the throat of said casing, a conical member extending into said casing and forming therewith an annular converging smoothly curved inlet passage, and guide vanes in the diverging portion of the casing for overcoming the rotation of the column of fluid passing through the casing.

9. A blower having a converging-diverging casing, a propeller operating at the throat of said casing, a conical member extending into said casing and forming therewith an annular converging smoothly

curved inlet passage, guide vanes in the diverging portion of the casing for overcoming the rotation of the column of fluid passing through the casing, and a cone supported by said vanes for stream lining the hub of the propeller.

10. A blower having a converging-diverging casing laterally divided near the narrowest portion thereof, a propeller operating within the casing near said division, and a conical member extending into and rigidly secured to the converging portion of the casing, said converging portion and said conical member being longitudinally divided.

11. A blower having a converging-diverging casing laterally divided near the narrowest portion thereof, a propeller operating within the casing near said division, a conical member extending into and rigidly secured to the converging portion of the casing, said converging portion and said conical member being longitudinally divided, and driving means for the propeller mounted on the conical member.

12. A blower having a converging-diverging casing laterally divided near the narrowest portion thereof, a propeller operating within the casing near said division, a conical member extending into and rigidly secured to the converging portion of the casing, said converging portion and said conical member being longitudinally divided, driving means for the propeller mounted on the conical member, and gearing located within said conical member through which the power is transmitted.

13. In combination in a blower, a converging-diverging casing, a stream lined bearing housing extending into the converging portion of the casing and supported thereby, a pedestal for the casing, a propeller operating near the narrowest part of the casing, driving means therefor mounted on the lower portion of the bearing housing, said casing being transversely divided near the narrowest part thereof, and a horizontal division through the casing and the bearing housing extending to the transverse division whereby the upper portion of the housing and the converging portion of the casing may be removed.

14. In combination in a blower, a converging-diverging casing, a stream lined bearing housing extending into the converging portion of the casing and supported thereby, a pedestal for the casing, a propeller operating near the narrowest part of the casing, driving means therefor mounted on the lower portion of the bearing housing, said casing being transversely divided near the narrowest part thereof, and a horizontal division through the casing and the bearing housing extending to the transverse division whereby the upper portion of the housing and the converging portion of the casing may be removed without disturbing the driving means and the setting of the blower.

15. In a blower, a casing having a diverging portion, a propeller in the casing, and guide vanes in the casing to overcome the tendency of the fluid passing therethrough to rotate, said guide vanes being contiguous to the propeller but spaced sufficiently therefrom to avoid siren-like sound vibrations.

16. In a blower, a casing having a converging inlet, a conical member extending into the casing and forming therewith a smoothly curved inlet passage, struts supporting the conical members from the casing, a shaft mounted in the conical member, a propeller mounted on the shaft in the casing and guide vanes carried by the casing on the discharge side of the propeller for overcoming the rotation of the column of fluid passing through the casing, said struts and guide vanes being spaced from the propeller sufficiently to avoid siren-like sound vibrations.

17. A blower having a converging-diverging casing, a propeller operating at the throat of said casing, a conical member extending into said casing and forming therewith an annular converging smoothly curved inlet passage, and guide vanes in the diverging portion of the casing for overcoming the rotation of the column of fluid passing through the casing and being spaced from the propeller sufficiently to avoid siren-like sound vibrations.

18. A blower having a converging-diverging casing, a propeller operating at the throat of said casing, a conical member extending into said casing and forming therewith an annular converging smoothly curved inlet passage, struts for supporting the conical member from the casing, and guide vanes in the diverging portion of the casing for overcoming the rotation of the column of fluid passing through the casing, said struts and guide vanes being spaced from the propeller sufficiently to avoid siren-like sound vibrations.

19. In a blower, a converging inlet casing, a conical member extending into said casing and forming therewith a converging smoothly curved inlet passage, a shaft mounted in the conical member, a propeller mounted on said shaft within the casing, driving means for said shaft mounted on the conical member, and supporting means connecting the conical member and the casing and being spaced sufficiently to avoid siren-like sound vibrations.

In testimony whereof, I have hereunto subscribed my name this 13th day of April, 1920.

HENRY F. SCHMIDT.