

April 27, 1943.

W. BECHT

2,317,723

AIR BLOWER

Filed Jan. 26, 1940

Fig. 1

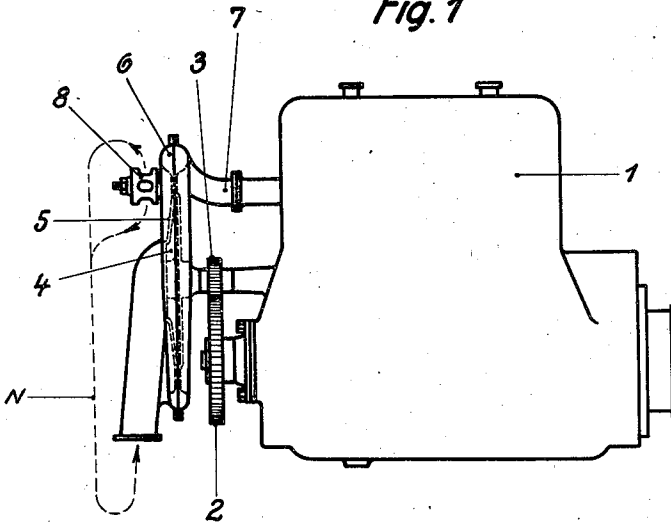
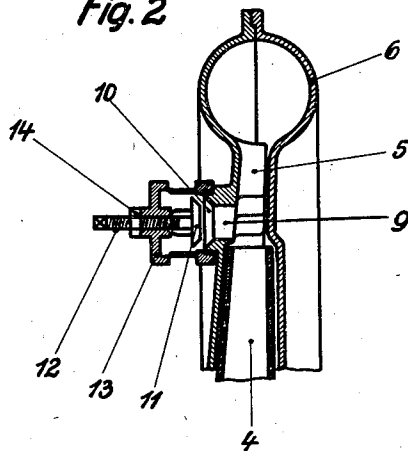


Fig. 2



Inventor
WALTER BECHT
By *A. A. Blaisie*
Donald K. Remy
Attorneys

UNITED STATES PATENT OFFICE

2,317,723

AIR BLOWER

Walter Becht, Stuttgart-Bad Cannstatt, Germany; vested in the Alien Property Custodian

Application January 26, 1940, Serial No. 315,665
In Germany February 4, 1939

5 Claims. (Cl. 230—22)

This invention relates to improvements in an air supply arrangement for internal combustion engines, and more particularly to the relationship between an internal combustion engine and the air-charging means therefor.

An object of this invention is to provide an air compressor which is adaptable to internal combustion engines of a large range in size.

Another object of this invention is to provide an improved turbo-blower having an adjustable short circuit between its suction and delivery sides.

An additional object of this invention lies in the provision of a turbo-blower for delivering charging air to an internal combustion engine, such blower having a larger capacity than needed by said engine and being provided with a continuous but variable by-pass between its suction and delivery sides, the amount of by-pass depending upon the relative capacities of the turbo-blower and the engine.

Other objects will be in part obvious from the annexed drawing, and in part indicated in connection therewith by the following analysis of this invention.

This invention accordingly consists in the features of construction, combination of parts, and in the unique relation of the members and in the relative proportioning and disposition thereof, all as more completely outlined herein.

To enable others skilled in the art so fully to comprehend the underlying features thereof that they may embody the same by the numerous modifications in structure and relations contemplated by this invention, a drawing depicting a preferred form has been annexed as a part of this disclosure, and in such drawing:

Fig. 1 illustrates a side view of an internal combustion engine in combination with a turbo-blower designed in accordance with the relationships of this invention; and

Fig. 2 is a partial longitudinal cross-sectional view, drawn to an enlarged scale, of the turbo-blower illustrated in Fig. 1.

As shown in Fig. 1, an internal combustion engine, which in this case may be a Diesel engine, is indicated by the reference numeral 1, and through suitable gears 2 and 3 is drivably connected with the turbo-blower wheel 4. The latter, upon being driven by the engine 1, sucks in air through a suitable centrally located inlet opening and discharges it preferably through guiding vanes such as illustrated at 5 in Fig. 2. into the hollow spiral housing 6, from whence it is guided back to the engine 1 through the con-

duit 7. Since, in accordance with the teachings of this invention, the turbo-blower is designed to have a capacity greater than is necessary for supplying the air to the internal combustion engine 1, the turbo-blower is accordingly also provided with an outlet 8 on its discharge side, which results in a short-circuit or by-pass between the suction and delivery, and indicated in Fig. 1 by the reference character N.

As one of the principal objects of the present invention is to provide an arrangement whereby a turbo-blower of one design and one nominal capacity may be used in connection with internal combustion engines of varied requirements, it is desirable that the amount of short-circuit between the suction and delivery ends of the blower be made variable. For this reason, I have provided an arrangement which is more fully illustrated in Fig. 2. As can be there seen, an opening 9 is provided in the casing 6 immediately adjacent the outlet from the turbine wheel 4, and intermediate the periphery of the turbine wheel and the air-guide vanes 5. At the outside of the opening 9, is formed a conical seat 10 with which a conically shaped valve 11 is adapted to cooperate for controlling the size of the outlet. The position of the valve 11 is preferably adjusted as desired by means of a threaded valve rod 12 which can be screwed in and out of the attached housing 13. A nut 14 will hold the valve 11 in place in the desired position.

From the above-described arrangement, it will be seen that I have provided a turbo-blower which is obviously adaptable to internal combustion engines of varied requirements. If the turbo-blower has a much greater capacity than necessary for the engine, the valve 11 will be open to a comparably large extent. If, however, the turbo-blower has a capacity only slightly in excess of that needed by the engine, the valve 11 will be almost closed. It has long been known that the capacity of a centrifugal blower must closely approximate the requirements of the engine supercharge, for otherwise deleterious and unsafe conditions in the air-charging system, such as hammering will arise. By means of the present invention, however, a single turbo-blower can be used with internal combustion engines of a wide capacity range. For example, a turbo-blower which has been designed for an engine having a compression space of 1.5 liters can, by proper adjustment of the short circuit, be made usable for an engine of only 1 liter compression space.

It is also to be noted, that the use of a rela-

tively large turbo-compressor does not result in any loss in over-all efficiency of the resulting blower-engine combination. While the larger blower will use more engine power, the provision of a superfluous amount of air shifts the operation of the blower into a region of higher efficiency, so that the over-all efficiency of the combination remains substantially the same. A proper designing of the outlet of the blower also makes up for any loss in efficiency.

While the invention has been described in connection with an internal combustion engine of the Diesel type, it is also equally applicable to engines using a carbureter. If the carbureter is to be positioned on the pressure side of the blower, this can be done in the usual manner. If the carbureter is to be positioned on the suction side of the blower, the mouth upon the suction side of the short circuit will be displaced along the entrance to the turbine wheel in such a manner as to exclude losses in fuel.

It will also be obvious to those skilled in this art that the principles of the present invention may be applied in the case of a two-stage centrifugal blowers, and, furthermore, that the supplied air may be used for scavenging purposes as well as charging purposes.

While a particular type of control means for varying the amount of short circuit between the suction and delivery sides of the blower has been disclosed, it will also be clear to those skilled in this art that the other type of throttling means such as butterfly valves, slide valves and the like are contemplated.

Having now thus described the invention, in a specific embodiment thereof, as well as the function and mode of operation of the same, what I claim as new and desire to secure Letters Patent of the United States is:

1. A turbo-blower comprising, in combination, a turbine wheel, a casing surrounding said wheel having a centrally located inlet opening, a substantially tangential discharge opening, and a by-pass opening positioned immediately outside the periphery of said turbine wheel, and means for adjustably throttling said by-pass opening.

2. The combination according to claim 1, in which the outside of said by-pass opening is provided with a conical seating face, and said last means includes a conically faced valve adapted to cooperate with said face to control said by-pass.

3. A turbo-blower comprising, in combination, a casing having a centrally located inlet opening, a substantially tangential discharge opening and a by-pass opening, a turbine wheel centrally mounted for rotation within said casing, and air-guide vanes for leading the air from said turbine wheel to said discharge opening, said by-pass opening being positioned in said casing intermediate the periphery of said turbine wheel and said air-guide vanes, and means for throttling said by-pass opening.

4. The combination according to claim 3, in which the outside of said by-pass opening is provided with a conical seating face, and said last means includes a conically faced valve adapted to cooperate with said face to control said by-pass.

5. The combination according to claim 3, in which the outside of said by-pass opening is provided with a conical seating face, and said last means includes a conically faced valve adapted to cooperate with said face to control said by-pass, a threaded extension on said valve, and means for holding said extension in the desired position of said valve.

WALTER BECHT.