

Jan. 20, 1942.

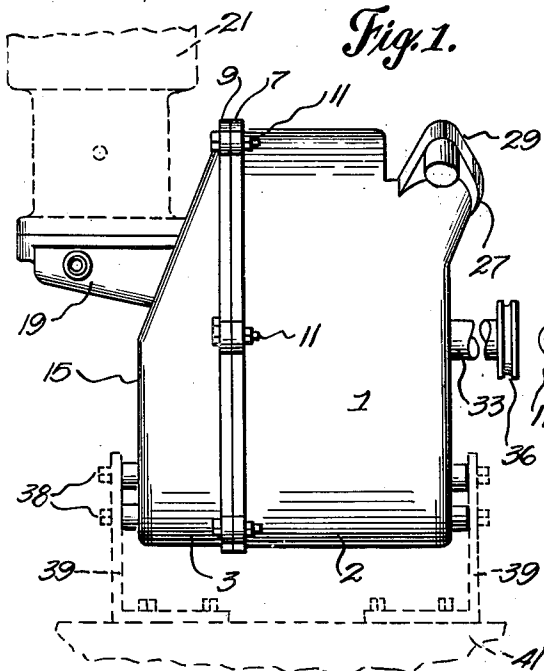
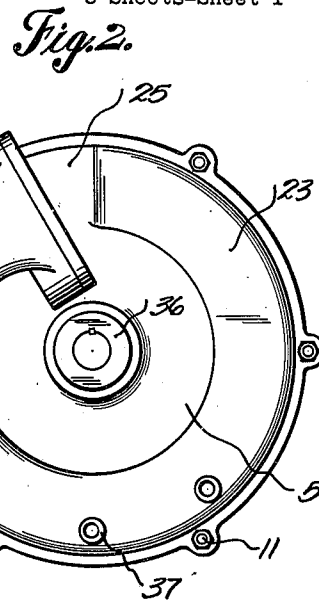
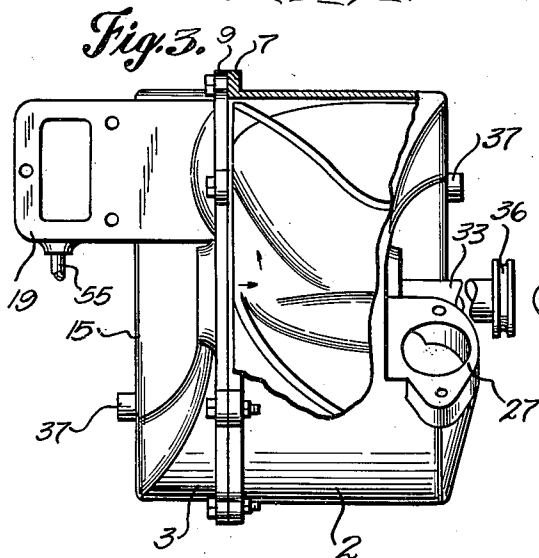
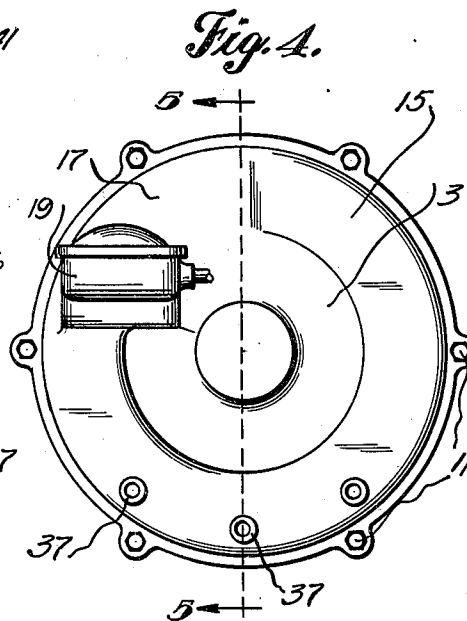
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2,270,489

SUPERCHARGER

Filed Nov. 22, 1939

3 Sheets-Sheet 1



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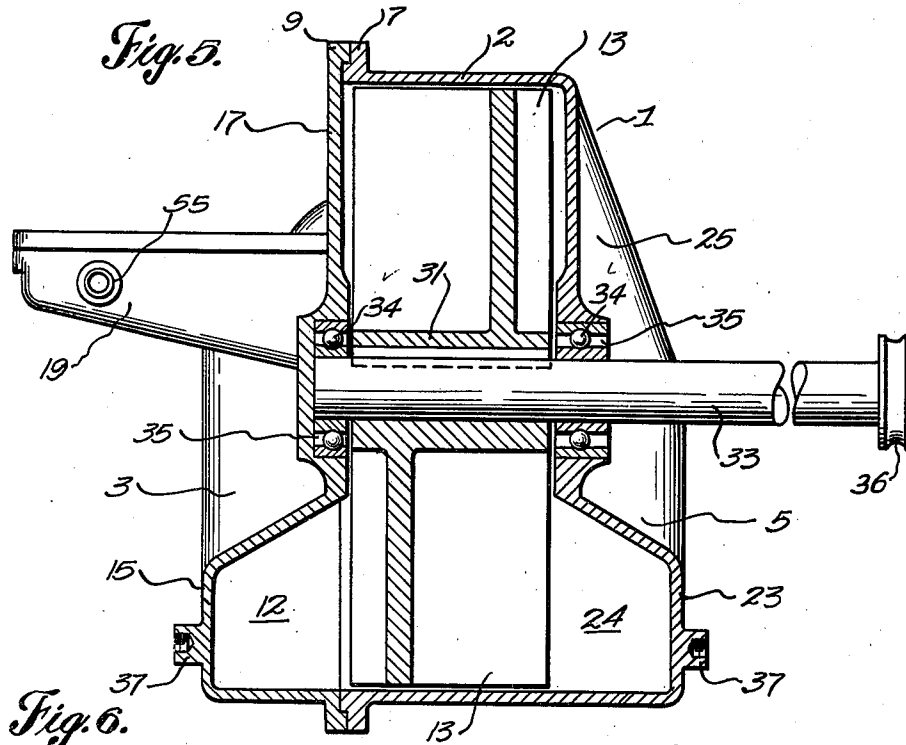


Fig. 6.

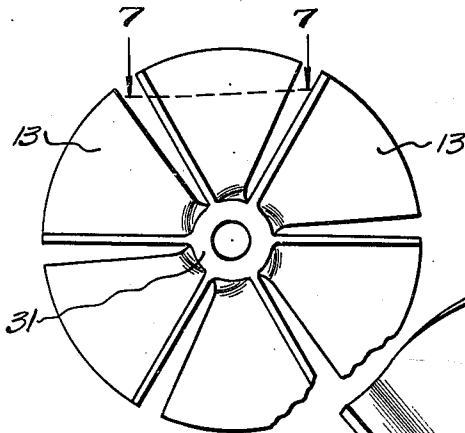


Fig. 7.

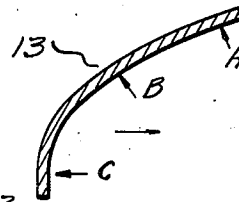
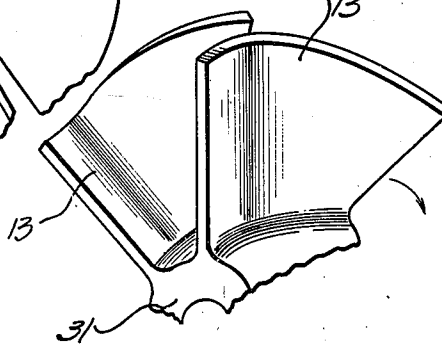


Fig. 8.



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Fig. 9.

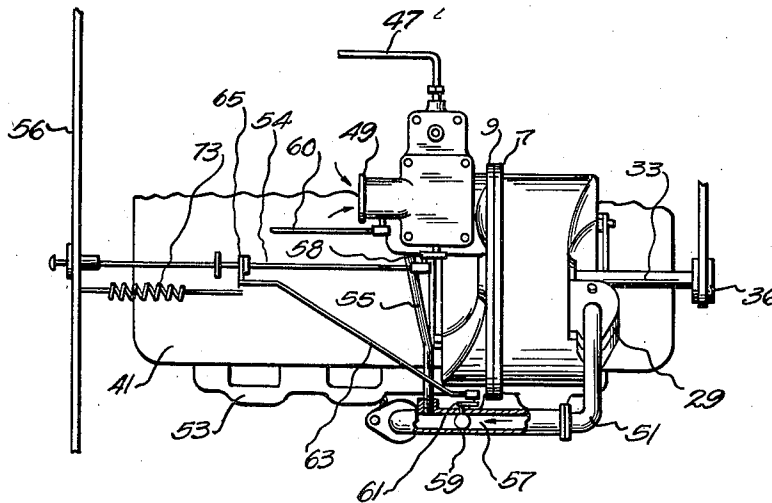
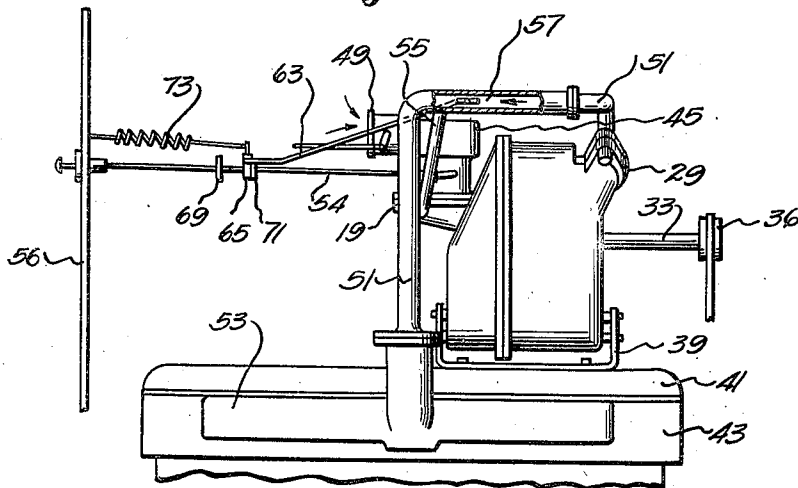


Fig. 10.



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UNITED STATES PATENT OFFICE

2,270,489

SUPERCHARGER

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Application November 22, 1939, Serial No. 305,709

4 Claims. (Cl. 230—120)

My invention pertains to air impelling devices and more particularly to super-chargers for internal combustion engines.

It is an object of my invention to provide an improved super-charger for internal combustion engines which will be of a simple rugged construction adapted to operate quietly and efficiently.

It is also an object of my invention to provide a super-charger comprising, a rotatively supported propeller type fan for moving a stream of air axially and having casing means coupling closely around the outer extremities of the blades of said fan for separating the intake area of said fan from the discharge area thereof, an intake manifold disposed adjacent the intake area of the fan and defining an air intake passage of a broken annular conformation parallel to the plane of rotation of the fan and adjacent the high velocity portions thereof, an air inlet port admitting air into one end of said broken annular air passage, casing means defining a plenum chamber of a broken annular conformation disposed parallel to the plane of rotation of said fan on the discharge side and adjacent the high velocity portions of the fan blades, and an air outlet port opening from one end of the broken annular plenum chamber for discharging air therefrom.

It is also a further object of my invention to provide a high velocity high pressure fan especially useful for superchargers and similar applications comprising a plurality of air impelling blades extending outwardly from the hub, and each of said blades being so conformed as to provide the leading edge with a surface inclined sharply with reference to a plane passing through the main axis of the blade and the axis of rotation for impinging the entering air thereon with a small angle of incidence, the lagging edge of each blade being disposed substantially axially for impelling air from the fan with high velocity and the portions of each fan blade between the aforesaid leading and lagging portions being suitably curved to gradually increase the velocity of the air charged onto the blade to be thrown from the lagging axially disposed portion of the blade with high velocity.

Further objects and advantages are within the scope of my invention such as relate to the arrangement and function of the related elements of the structure, to various details of construction and to combinations of parts, elements, per se, and to economies of manufacture and numerous other features as will be apparent from

a consideration of the specification in conjunction with the drawings disclosing a specific form of my invention, in which:

Fig. 1 is a side elevational view of my super-charger;

Fig. 2 is an elevational view showing the discharge side of the super-charger;

Fig. 3 is a plan view with top wall of the casing broken away to show the fan;

Fig. 4 is an elevational view showing the intake side of the unit;

Fig. 5 is a sectional view on line 5—5 of Fig. 4;

Fig. 6 is an elevational view of the discharge side of the special fan provided;

Fig. 7 is a sectional view on line 7—7 of Fig. 6;

Fig. 8 is an enlarged perspective view showing a fragment of the special fan from the discharge side;

Fig. 9 is a plan view of a portion of a motor and dashboard of an automobile showing my super-charger connected thereto and to a carburetor and the operating means, a portion of the conduit line being shown in cross section; and

Fig. 10 is a side elevational view of the parts shown in Fig. 9, also having a portion of the conduit line shown in cross section.

Referring more particularly to the drawings, my improved super-charger comprises an enclosing casing 1 having a mid-portion 2 of a generally cylindrical conformation closed on the intake side by an end wall 3 and closed on the discharge side by an end wall 5. Such a casing may be constructed either of sheet metal or cast, but I prefer to utilize a cast housing in which the cylindrical mid-portion 2 and the end wall 5 on the discharge are integral. The other open end of the housing casting is provided with a laterally projecting flange 7 for abutting a similar flange 9 from the intake wall 3 which is clamped thereon by bolts 11 passing through the flanges. A gasket of any suitable yielding material (not shown) may be interposed between the flanges 7 and 9 to facilitate providing an air tight seal if desired.

The end wall 3 is suitably formed to provide an intake manifold and enclosing a chamber 12, shown in Fig. 5, to deliver air efficiently to the intake area of a fan having blades 13. For this purpose I provide in the end wall 3 a raised or outwardly projecting portion 15 which extends around the outer portion in a circular or annular fashion except that at one side it is broken by a flat portion 17 which is substantially aligned

radially with the flange 9 and with the intake or leading edges of the fan blades 13 to form a cut-off where the air can no longer follow the rotation of the fan.

An air inlet port 19 projects from the end wall 3 and is suitably formed for connection with a down-draft carburetor 21 or an air filter or any other connection from whence air is to be drawn. The inlet port opens into the leading or forward end of the broken annular air intake passage 12 for admitting air therein to follow around the passage 12 and enter the intake face of the fan 13.

The other end wall 5 is also provided with a raised or outwardly projecting wall 23 which is of a similar broken annular conformation enclosing a chamber 24 and having a flat portion 25 which approaches the fan blades, breaks the annular conformation, and forms a cut-off serving to separate the air from the discharge edges of the fan blades. An air discharge outlet port 27 opens from the lagged end of the chamber 24 and projects from the end wall 5. Flanges 29 on the outlet port are of a suitable conformation for connection with the intake manifold of an internal combustion engine.

The fan 13 is a modified propeller type of fan having a hub 31 from which the blades 13 extend. The fan hub 31 is rotatively supported on and keyed to a shaft 33 which is journaled in bearings 34 centrally disposed in the end walls 3 and 5 of the casing in which suitable anti-friction or ball bearings 35 may be provided. The shaft 33 extends from the casing on one side for convenient connection with a suitable source of driving energy, as by means of a belt pulley 36 which may (for example) be mounted to engage the fan belt (not shown) of an automotive engine.

For mounting the super-charger unit, the cast end walls 3 and 5 may be provided with bosses 37 internally threaded to receive bolts 38 for attachment to brackets 39, as shown in Fig. 1, by which the unit may be mounted in any desired position on or adjacent to the internal engine 41 to be super-charged.

For improved efficiency and quiet operation, I preferably utilize an especially formed propeller type of fan. As shown in Figs. 3, 5, 6, 7 and 8, the fan used has especially shaped blades 13. Each blade is so conformed as to provide the leading edge of the blade with a surface A which is inclined sharply with reference to a plane passing through the main axis of the blade and the axis of rotation of the fan. This portion A of the fan is so disposed that the entering air impinges thereon with a small angle of incidence. The following or lagging portion of the blade B then curves gradually toward an axial direction until finally near the trailing edge, a surface C is provided which is substantially axial or parallel to the axis of rotation of the fan. The air which is drawn in and charged upon the blades 13 by the leading edge A, is thus speeded up gradually until it is kicked off of the axially disposed lagging edge C with high velocity.

For satisfactory operation, I have found it desirable to install my improved super-charger with a special valve and by-pass arrangement to by-pass the super-charger at slow speeds when only a very little power is desired. In Figs. 9 and 10, I have shown such an installation of my improved super-charger 1, which as shown is

supported by the bracket 39 on the cylinder head 41 of an internal combustion engine 43. Any suitable carburetor 45 is mounted upon the air intake port 19 of the super-charger 1 to which it may be firmly attached with a resilient gasket therebetween in any suitable manner as by bolts (not shown) passing therethrough in a manner that will be readily understood. The carburetor 45 receives a suitable liquid hydro-carbon through a pipe line 47, from any suitable source which may be regulated to a proper level by a float actuated valve in the bowl of the carburetor in any usual manner, so that air (as shown by arrows) entering the inlet port 49 of the carburetor properly carburizes the fuel oil to provide a suitable combustible charge for the engine.

From the carburetor the carburized charge is drawn at high velocity into the intake port 19 of the super-charger being projected from the outlet port 29 and continuing through a suitable conduit line 51 into the intake manifold 53 of the engine. In this manner the air flow resistance of the carburetor, intake manifold and valve ports is eliminated, neutralized or over-compensated so that each cylinder of the engine is enabled to receive a much larger combustible charge for each intake stroke of the piston and the power of the engine is greatly increased. Throttle rod 54 passes through any instrument board or dash 56 and connects to the throttle valve 58 of the carburetor for controlling the engine in a usual manner. Also the usual choke rod 60 extends therefrom.

To provide for reduced power operation of the engine, as when idling or operating at slow speeds, I find it very desirable to provide a by-pass connection consisting of a conduit 55 which is connected from the carburetor outlet port or the super-charger inlet port 19 (which are together) into the line 51 on the discharge side of the super-charger, and thence into the intake manifold 53 to the engine. To control the extent to which the charge for the engine shall be drawn directly from the carburetor, or shall be received from the super-charger, I provide a butterfly valve 57 in the super-charger outlet line 51 between the connection of by-pass line 55 therewith and the super-charger outlet port 29, thereinto. The by-pass valve 57 is pivotally supported on a shaft 59 pivotally supported in the side walls of the conduit 51 from which one end of the shaft extends and carries a crank 61 which is pivotally connected to an actuating rod 63.

For controlling the position of the by-pass valve 57 in accordance with the power requirements of the engine, the actuating rod 63 thereof is connected to a slider 65 which slides freely upon the throttle rod 54 between two spaced stops 69 and 71 secured firmly on the throttle rod. Any suitable tension spring 73 may be provided for continuously biasing the by-pass valve 57 to move to a closed position so that in slow speed positions of the throttle the super-charger discharge line 51 is closed and the engine draws its charge directly from the carburetor. When the throttle rod 54 is moved toward the carburetor to open the throttle valve therein for larger power demands, the slack motion between slide 65 and stop 69 is first taken up and then the movement of the throttle rod 54 forcefully pushes the by-pass rod 63 to open the by-pass valve 57 to receive the charge under high velocity and pressure from the super-

charger in accordance with the increased power demand.

It is apparent that within the scope of the invention, modifications and different arrangements may be made other than herein disclosed, and the present disclosure is illustrative merely, the invention comprehending variation thereof.

I claim:

1. A super-charger comprising, a propeller type fan for moving a stream of air axially, means for rotatively supporting said fan, casing means coupling closely around the outer extremities of the blades of said fan for separating the intake area of said fan from the discharge area thereof, an intake manifold disposed adjacent the intake area of the fan and defining an air intake passage of a broken annular conformation parallel to the plane of rotation of the fan and adjacent the high velocity portions thereof, an air inlet port admitting air into one end of said broken annular air passage, casing means defining a plenum chamber of a broken annular conformation disposed parallel to the plane of rotation of said fan on the discharge side and adjacent the high velocity portions of the fan blades, and an air outlet port opening from one end of the broken annular plenum chamber for discharging air therefrom.

2. A supercharger comprising, a shaft, a propeller type fan rotatively mounted on said shaft for moving air axially, a casing forming a shroud ring coupling closely around the outer extremities of the blades of said fan for separating the intake area of the fan from the discharge area thereof, said casing having end wall portions extending across the intake area and the discharge area of said fan, bearings centrally disposed in said end walls for journalling said shaft, the end wall portions being conformed to enclose air flow passages of a broken annular shape adjacent the high velocity portions of the fan blades, an air inlet port opening into one end of the broken annular air passage adjacent the intake side of the fan for admitting air to flow around the annular passage into the adjacent portions of the fan blades, and an air discharge port opening from one end of the broken annular passage on the discharge side of the fan for discharging air therefrom.

3. A super-charger comprising, a shaft, a propeller type fan rotatively mounted on said shaft for moving air axially, said fan having a hub rotatively supported on and driven by the shaft, a plurality of air impelling blades extending outwardly from the hub, and each of said blades being so conformed as to provide the leading edge with a surface inclined sharply with reference

to a plane passing through the main axis of the blade and the axis of rotation for impinging the entering air thereon with a small angle of incidence, the lagging edge of each blade being disposed substantially axially for impelling air from the fan with high velocity, and the portions of each fan blade between the aforesaid leading and lagging portions being suitably curved to gradually increase the velocity of the air charged onto the blade to be thrown from the lagging axially disposed portion of the blade with high velocity, a casing forming a shroud ring coupling closely around the outer extremities of the blades of said fan for separating the intake area of the fan from the discharge area thereof, said casing having an integral end wall extending across the discharge area of said fan, an end wall attached to said casing adjacent the intake area of said fan, bearings centrally disposed in said end walls for journalling said shaft, said end walls being conformed to enclose air flow passages of a broken annular shape adjacent the high velocity portions of the fan blades, an air inlet port opening into one end of the broken annular air passage adjacent the intake side of the fan for admitting air to flow around the annular passage into the adjacent portions of the fan blades, and an air discharge port opening from one end of the broken annular passage on the discharge side of the fan for discharging air therefrom.

4. A super-charger comprising, a shaft, a propeller type fan rotatively mounted on said shaft for moving air axially, the outer edges of the blades of the fan extending axially a substantial distance, a casing forming a cylindrical shroud ring coupling closely around the outer axially extending extremities of the blades of said fan for separating the intake area of the fan from the discharge area thereof, said casing having an integral end wall extending across the discharge area of said fan, an end wall attached to said casing adjacent the intake area of said fan, bearings centrally disposed in said end walls for journalling said shaft, said end walls being conformed to enclose air flow passages of a broken annular shape adjacent the high velocity portions of the fan blades with a circular control wall portion adjacent the fan, an air inlet port opening into one end of the broken annular air passage adjacent the intake side of the fan for admitting air to flow around the annular passage into the adjacent portions of the fan blades, and an air discharge port opening from one end of the broken annular passage on the discharge side of the fan for discharging air therefrom.

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