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IMPELLER BLOWER OF THE ROTARY PISTON TYPE

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BY A. P. C.

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2 Sheets—Sheet 1

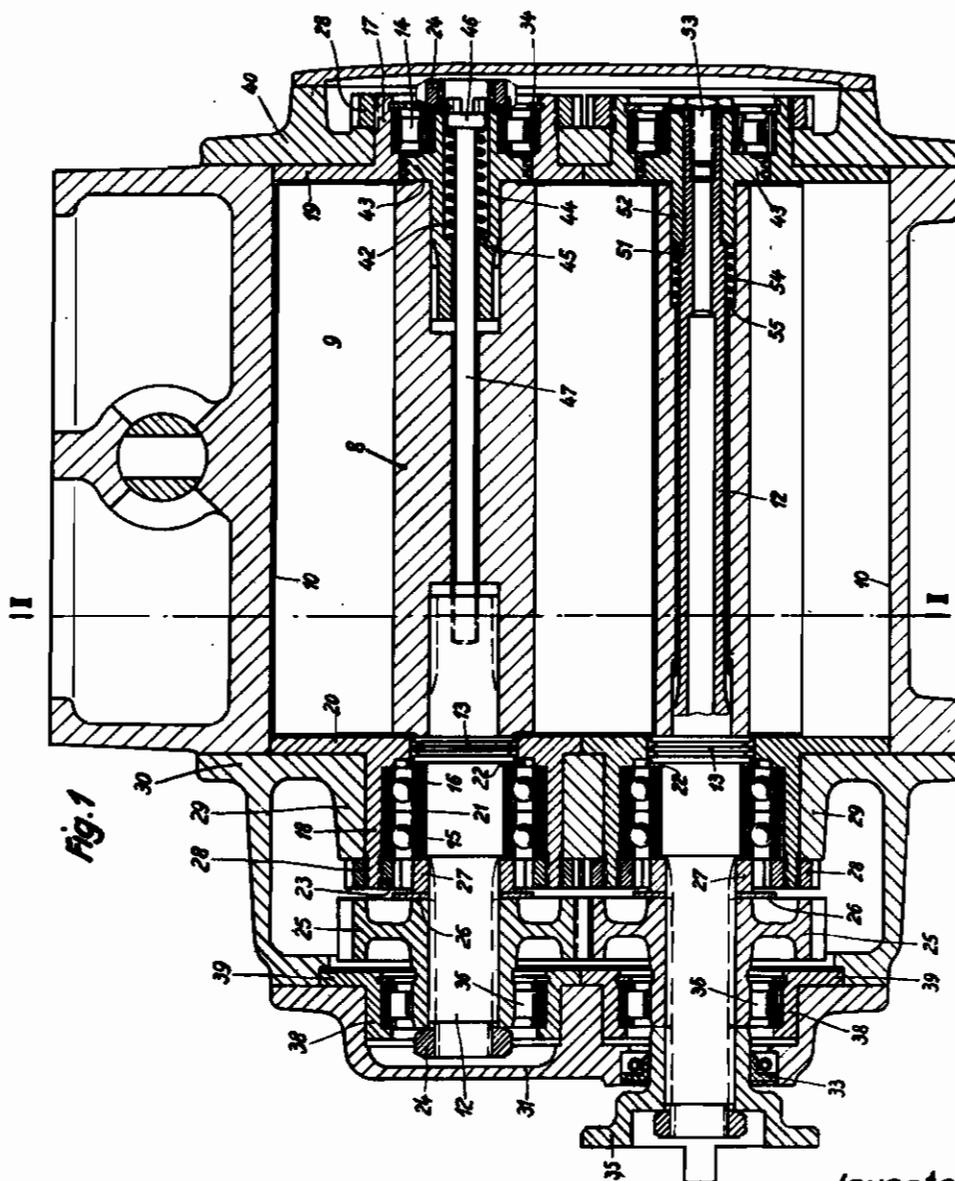


Fig. 1

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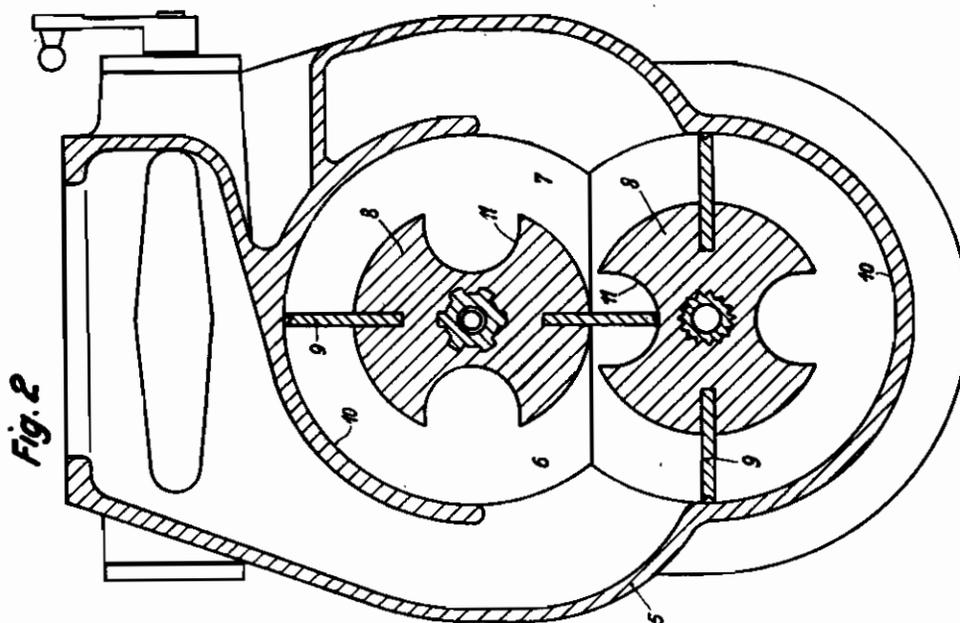
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IMPELLER BLOWER OF THE ROTARY PISTON TYPE

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the Alien Property Custodian

Application filed March 2, 1940

The invention relates to an impeller blower of the rotary piston type, containing impellers running in counter motion, and being sealed against each other and against the inner wall of the blower casing. In order to guarantee a good working order the faces as well as the circumference of the impellers must have as little play as possible, on the other hand, with respect to the high revolving speeds a metallic contact of the revolving parts with the casing walls must be avoided as far as possible. In order to fulfill the contradicting conditions, in the first place the impellers and the walls of the working space must be machined very exactly. Secondly the impellers must be centered very exactly within the casing and mounted in such manner, that in running none of the impeller faces can be pressed against the proximate face of the working space.

While the former of these two conditions may be comparatively easily reached by good workmanship, the fulfillment of the requirements named in the second place meets with considerable difficulties which may be obviated by the present invention. This is reached firstly by the fact, that the bushings of the bearings enclosing the impeller shafts form with the faces limiting the working space construction parts exactly fitted into the cylindric walls of the working space. As these walls must be most accurately machined, as stated above, an unobjectionable centering of the impellers is reached by the object of the invention, without additional fitting faces. The front walls provided with bushings may be fastened to the blower by means of two casing parts confining its walls towards the front, to which walls they are flanged showing each two bores enclosing tightly the bushings to which the front walls may be secured by the aid of ring nuts screwed onto the bearing bushings. One of these lids may here form the one front wall of a casing part enclosing the coupling gear. In this part some more of these bushings may be centered, containing the thrust bearings of the impeller shafts on the driving side, if the coupling gear should not be overhung on one side.

The front walls on the driving side being centered according to the invention in the cylindric inner walls of the working space, may be pulled out in order to exactly define the small air-gap required between the face of the impeller and the front walls of the working space. This is evident from the following description relating to the illustration of the object of the invention given by way of example in the drawing showing

a longitudinal cross section of it through line II—II.

Within a casing 5 provided with a suction space 6 and a pressure space 7 are two impellers 8 rotating in counter motion, carrying at their circumference two vanes 9. In running the blower these vanes are moved with very little play along the exactly cylindrical inner walls 10 of the casing 5, and after leaving them engage also with very little play the grooves 11 which are slotted into the impellers 8. In order to exactly define the position of the impeller shafts 12, the bearings 14 provided at the front side of each impeller, as well as the bearing 15 and 16 are arranged in bearing bushings 17 and 18. These bushes are connected with the front walls 19 and 28 the accurately machined rims of which touch the inner walls 10 of the working space. Between the inner races of the two ball bearings 15 and 16 in the bushing 16 a sheet steel ring 21 is inserted by which the inner races are displaced axially to such an extent relative to the outer races that any axial play is eliminated. Between the inner race of the bearing 16 and the proximate collar 13 of the shaft, being formed as labyrinth packing, a ring shaped insertion 22 is provided, the thickness of which may easily be so dimensioned, that the play between the faces of each impeller 8 relative to each of the two front walls 20 may assume an exactly determinable small dimension. By means of the insertion 22 the parts of the bearings 15 and 16 which are adjusted axially free of play, and revolve together with the impellers 8, i. e. the inner races may be adjusted in axial direction relative to the impellers. The outer races of the ball bearings are fixed in the bearing bushes 18 by means of a threaded ring 23 screwed into these bushes, while a nut 24 screwed onto the end of each impeller shaft 12 serves for securing the inner races, the nut 24 pressing the not revolvingly guided gear wheel 25 on the axle towards the inner race of the bearing 15 and 16, a washer 26 and a pressure ring 27 being interposed, and these races with the insertions 21 and 22 being pressed against the shaft collar 13, formed as a labyrinth packing. If the coupling gears 25 are cut slantingly, which would be preferable with respect to a most noiseless operation, the angular position of the two impeller shafts relative to each other may be accurately adjusted by changing the thickness of one of the two washers 26 relative to the other one.

The two bearing bushes 16 are inserted into two sleeves 29 of the casing part 30 surrounding the coupling gears 25 with the aid of two ring nuts

28. The casing part 30 is closed by a lid 31 through which the hub of a driving flange 35 is led, being packed by means of the packing 33. In the same manner this driving flange is journaled stationarily upon the longer one of the two impeller shafts 12, as the gear wheel 25 on this shaft, and is kept in position as described above by the nut 24 together with the other parts 26 and 27 between the flange and the shaft collar 13 which is formed in the shape of a labyrinth packing. The hubs of the gear wheels 25 are journaled upon rollers 36, the outer races of which are inserted in bushings 38. These two bearing bushes are connected by flanges 39 each fitted into a recess bore on the face of the casing part 30 which are exactly coaxial with the sleeves 29. This arrangement also guarantees that the thrust bearings 36 can be adjusted exactly coaxial with the other bearings carrying the impeller shafts 12.

The bearing bushes 17 of the thrust bearings 14 are inserted into accurately fitting bores of a lid 40 to which they are screwed by means of ring nuts 28. The outer races of the bearings 14 are fixed within the bushings 17 by means of spring rings 34, while the inner races are pressed by means of nuts 24 against the shaft collars 43 formed in the shape of labyrinth packings. The diameter of these collars is somewhat larger than the inner diameter of the outer races, so that when using the customary roller bearings, the rollers of which are arranged in a cage provided on the inner race, the impellers may be mounted and dismounted together with the casing part 30 without taking off the lid 40. Furthermore this arrangement allows to put the lid 40 in the place of the casing part 30 and thereby to change the driving flange 35 from the left to the right hand front side of the casing 5. If the securing means of the parts 30 and 40 to the casing are coaxial and symmetric, the casing part 30 may, if required, be turned by 180° and in this way the impeller shaft provided with driving flange 35 may be arranged above the other impeller shaft. Thus the blower may be adapted to several different means of driving which specially come into consideration, if the device is to be used as a charging blower for internal combustion engines. This adaptability is accomplished by the fact that in leaving out the usual ways of machining, re-

quiring the use of fitting pins, and of similar means, the accurately cylindrical machined inner walls 18 of the working space serve for centering the bearing bushes 17 and 18 connected with the frontwalls 19 and 20 which are held in proper distance from each other by the casing part 30 and the lid 40. On the other hand the distance between the front walls 20 and the adjoining faces of the impellers 8 and their vanes 9 may be dimensioned so small that though a direct metallic touch is avoided, only small gap-losses will occur. The length of the impellers 8 is preferably so dimensioned that the gaps between these and the front walls 19 also suit the above mentioned conditions, after the blower has warmed up to its normal temperature.

As the impeller shafts must be manufactured of a material of high strength like steel, while the impellers 8 proper and their vanes 9 preferably consist of light metal expanding strongly when heated, care should be taken that the impellers can expand relative to the impeller shafts 12 and preferably in such a way that an unobjectionable journaling of the impeller front sides which are opposite to the shaft collars 13 will be guaranteed. As shown in Fig. 1, this may be done by the fact that into the above mentioned front side of the impeller 8 a hollow shaft end 42 with a collar 43 is inserted. In the hollow space of same a strongly tightened spring 44 is placed, supported with one end by a shoulder 45 limiting the hollow space, and with the other end by the head 46 of a tension bolt 47 screwed into the shaft 12. In the second instance, shown in connection with the lower impeller, the shaft 12 is led through the impeller and is provided with a ring shaped shoulder 51 onto which thrusts an axle bushing placed over the shaft end and fastened to same with the screw 53. This screw is like the part 42 provided with a shaft collar 43 working as a labyrinth packing. On the face of the axle bushing 52, protruding into the impeller, one end of a strongly tightened spiral spring 54 is supported, the other end of which thrusts against a ring shaped face 55 provided within the hollow impeller. By means of this spiral spring the impeller, which is longitudinally moveable relative to the part 52, is pressed strongly against the shaft collar 13.

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