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TURBINE DRIVEN BLOWER.

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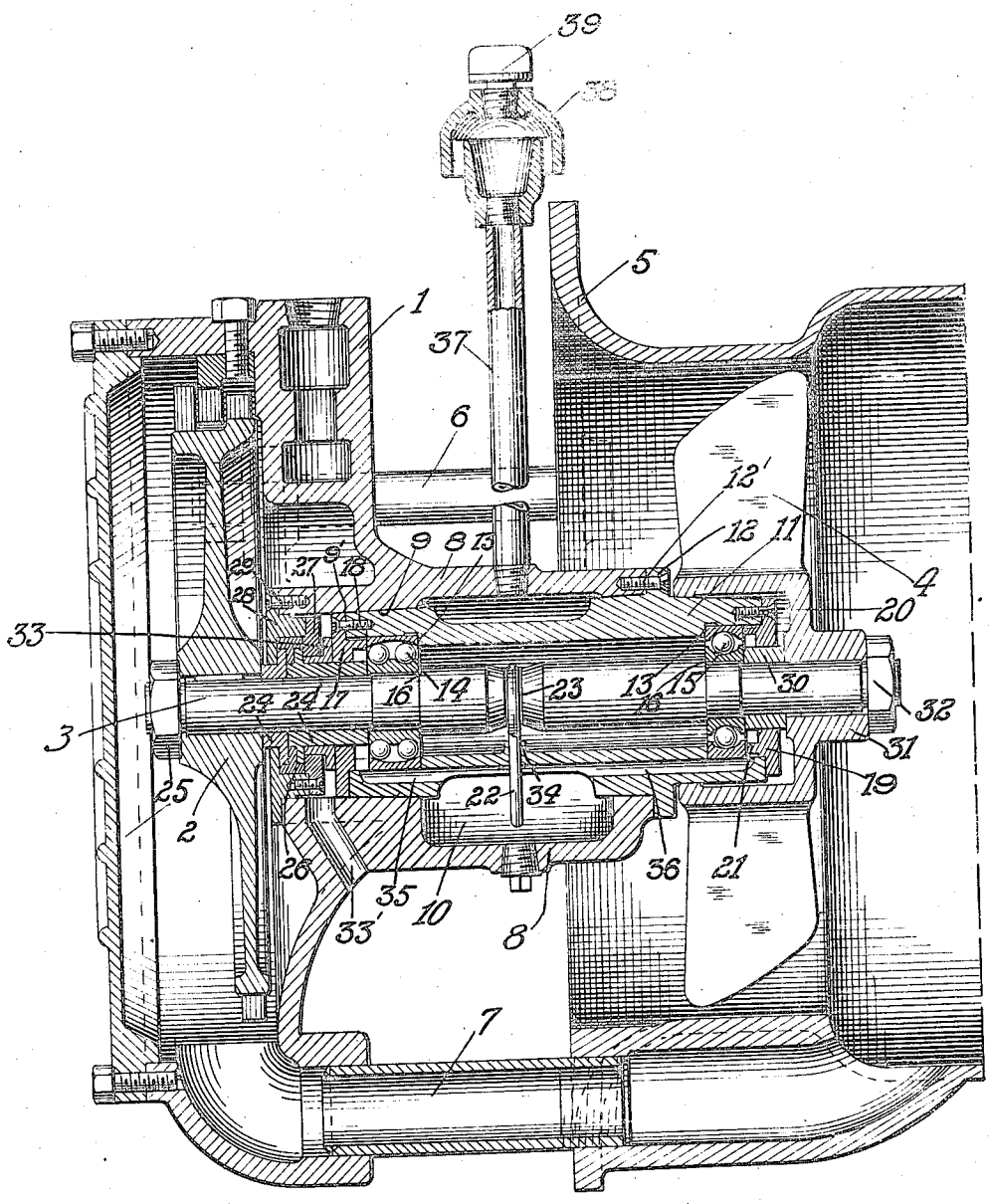

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UNITED STATES PATENT OFFICE.

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TURBINE-DRIVEN BLOWER.

1,427,150. Specification of Letters Patent. Patented Aug. 29, 1922.

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To all whom it may concern:

Be it known that I, FRANS H. C. COPPUS, a citizen of the United States, residing at Worcester, in the county of Worcester and Commonwealth of Massachusetts, have invented a new and useful Improvement in a Turbine-Driven Blower, of which the following, together with the accompanying drawings, is a specification.

The present invention relates to turbine driven blowers, sometimes known as turbo-blowers, in which a steam turbine has mounted on its shaft the fan or blades of a blower such as is used for creating a forced draft for boilers or for ventilating purposes.

The invention resides in improvements in construction of devices of this class by which the assemblage of the same as a unit is facilitated, and by which proper and adequate lubrication of the rapidly rotating parts is insured; to this end the invention consists in the provision of means for overcoming the effect of suction on the lubricating devices, at the same time insuring against the leakage of steam or water from the turbine into the bearings whose lubrication is essential. Other and further objects will be apparent as the description proceeds, reference being had in this connection to the accompanying drawing, the single figure of which is a vertical sectional view of a blowing unit, consisting of the turbine and the blower driven thereby.

Referring to said drawing, the usual arrangement of parts in a device of this class is shown, the same consisting of a turbine casing 1 containing a steam turbine 2 of any well known construction; the shaft 3 of the latter carries a fan 4 whose blades rotate in the mouth of a surrounding casing 5. The casing 5 is ordinarily connected by struts 6 to the turbine casing 1, in a unit construction, and if desired, the exhaust steam from the turbine casing 1 may be discharged through a connection 7 longitudinally into the blower casing 5, in which it commingles with the air which is forced lengthwise of said casing by the fan 4.

For the support of the shaft 3 and its bearings, the turbine casing 1 has an integral hub extension 8, the latter having a bore 9 of larger diameter than shaft 3, said bore 9 being recessed midway of its length, as shown at 10, to provide an oil reservoir, as hereinafter described. The bore 9 of hub extension 8 has a continuous taper from its outer end to the point 9′, this internal taper corresponding to the external taper of a bearing housing or sleeve 11, which is snugly received within the bore 9. The sleeve 11, at the outer termination of its tapered surface, provides a flange 12, which latter, when the sleeve is in place, abuts the outer end of the hub 8, to form a tight joint for the oil chamber or reservoir in said hub; a series of bolts or screws 12′, passing through the flange 12, enter the end of the hub, and hold the sleeve firmly in place.

The bearing housing or sleeve 11 serves for the assemblage of the bearings and packings of the shaft 3, this assemblage preferably taking place before the housing is inserted in the hub 8. At each end, the housing 11 is counterbored to provide shoulders 13, 13 for the outer raceways of annular ball bearings 14 and 15. The inner raceways of said ball bearings are held against similarly spaced shoulders 16, 16 on shaft 3. After the assemblage of the shaft and ball bearings within the housing 11, an annular ring or inclosure 17 is secured by screws 18 to the inner end of the housing, and a similar ring 19 is secured by screws 20 to the outer end of the housing, said rings 17 and 19 serving to retain the outer raceways of the ball bearings 14 and 15 respectively in proper position, by means of their projecting flanges 21. The lubrication of the shaft 3 and bearings 14 and 15 is secured by means of a suitable oil ring 22, the latter passing through slots, not shown, in the housing 11 and dipping down into a supply of liquid lubricant maintained in the reservoir 10 of hub 8. This ring 22 is assembled on the shaft, preferably in operative relation to a wide V-shaped groove 23 therein, before the housing is put in place in the hub 8. When the assembled housing is inserted in the bore 9, a spacing sleeve 24′ is slipped over the rear end of shaft 3 and a packing ring 24 is inserted between sleeve 24′ and the hub of turbine 2, which latter is held in place by a nut 25 on the extreme inner end of shaft 3. Co-operating with the spaced flanges of sleeve 24′ and ring 24 is a flanged packing ring 26, the latter being held in place by a ring 27

that is secured to the outer edge of a closure plate 28 having screws 29 which secure it to the inner open end of hub 8.

At the outer end of shaft 3, a spacing sleeve 30 is put in place, to space the inner raceway of ball bearing 15 from the hub 31 of fan 4, the latter being secured in position by means of a nut 32. With the structure assembled as shown and described, it will be noted that the cooperating packing devices 24, 24', 26, 27 and 28 form an exceedingly tortuous passage for any steam or water that passes in the direction of the shaft bearings, with the result that the escape of steam and water in any quantity is effectually retarded; a flanged ring 33 surrounding the spacing sleeve 24', and interposed between rings 17 and 27, prevents further passage of steam and water along the sleeve 24, and directs the same into a passage 33' of the turbine casing.

In the operation of the mechanism, the oil ring 22 is rotated frictionally by the shaft 3, and continuously carries up lubricant from the reservoir 10 into the interior of housing 11. This oil is transferred to the shaft 3, and travels outwardly on both sides of the V-shaped groove 23, being thrown off therefrom in opposite directions, whence it runs down and collects in the bottom of housing 11. A dam 34 on the bottom of said housing insures the access of this collected oil to both ball bearings 14 and 15, preventing its all running to one bearing, as might occur if the mechanism were not set perfectly level. The oil thus continuously supplied to the interior of housing 11 runs freely to the ball bearings 14 and 15 and, after passing therethrough, is returned by passages 35 and 36 to the reservoir 10.

The suction produced by the rotation of the fan 4 may have a tendency to create a partial vacuum in the reservoir 10, in spite of the extremely tight joints obtained by the tapering fit of the sleeve 11 in bearing 9 and the contact of flange 12 with the outer end of hub 8. Such a partial vacuum, unless means be taken to prevent it, is extremely dangerous in a mechanism of this class, for the reason that it would draw the oil toward the outer bearing 15 and away from the inner bearing 14; the latter would soon be ruined by the ingress of steam and water drawn in past the packing devices by said partial vacuum. It is therefore necessary to vent the oil reservoir to the atmosphere, and this is done by the provision of a suitable pipe 37 leading from the interior of the space between hub 8 and sleeve 11. The pipe 37 terminates, as shown in the drawing, beyond the zone of suction, being surmounted by a suitable cap 38 which prevents the ingress of dust and dirt and which provides a removable plug 39 in order that said pipe may serve as a means for replenishing the supply of oil in reservoir 10.

I claim,

1. In mechanism of the class described, the combination with a casing and shaft, of a sleeve providing spaced bearings at opposite ends of said shaft for the support thereof, said sleeve being insertible, with said shaft, in said casing, and having a tapered fit within said casing.

2. In mechanism of the class described, the combination with a casing having a tapered bore and a shaft, of a sleeve providing spaced bearings at opposite ends of said shaft for the support thereof, said sleeve being insertible, with said shaft, in said casing, and having an external taper corresponding to the tapered bore of said casing.

3. In mechanism of the class described, the combination with a casing having a tapered bore and a shaft, of a tapered sleeve providing spaced bearings at opposite ends of said shaft for the support thereof, said sleeve being insertible, with said shaft, in the bore of said casing, and being provided at one end with a flange abutting the end of the casing for attachment thereto.

4. In mechanism of the class described, the combination with a casing having a tapered bore and a shaft, of a tapered sleeve providing spaced bearings at opposite ends of said shaft for the support thereof, said sleeve being insertible, with said shaft, in the bore of said casing, and being provided at one end with means for drawing it into the bore of said casing.

5. In mechanism of the class described, the combination with a shaft and a casing provided with a reservoir for lubricant, of a sleeve providing bearings for said shaft and insertible, with said shaft, into said reservoir, and means for maintaining said reservoir at atmospheric pressure.

6. In mechanism of the class described, the combination with a shaft and a casing provided with a reservoir for lubricant, of a sleeve providing bearings for said shaft and insertible, with said shaft, into said reservoir, and means for preventing the creation of a vacuum within said reservoir.

7. In mechanism of the class described, the combination with a shaft provided with means for creating a suction and a casing provided with a reservoir for lubricant, of a sleeve providing bearings for said shaft and insertible, with said shaft, into said reservoir, and means for preventing the creation of a vacuum within said reservoir by the suction produced by rotation of said shaft.

8. In mechanism of the class described, the combination with a shaft provided with a fan and a casing provided with a reservoir for lubricant, of a sleeve providing

bearings for said shaft and insertible, with said shaft, into said reservoir, and means for admitting air to said reservoir from beyond the zone of suction of said fan.

9. In mechanism of the class described, the combination with a shaft provided with a fan and a casing provided with a reservoir for lubricant, of a sleeve providing bearings for said shaft and insertible, with said shaft, into said reservoir, and a pipe open to atmospheric pressure extending from the interior of said reservoir to a point beyond the zone of suction of said fan.

10. In mechanism of the class described, the combination with a shaft provided with a fan and a casing provided with a reservoir for lubricant, of a sleeve providing bearings for said shaft and insertible, with said shaft, into said reservoir, and a pipe extending from the interior of said reservoir to a point beyond the zone of suction of said fan for the admission of air and lubricant to said reservoir.

11. In mechanism of the class described, the combination with a shaft provided with a fluid pressure turbine element and a casing, of a sleeve providing bearings for said shaft and insertible, with said shaft, into said casing, and means for providing a tortuous passage between the turbine element and the said sleeve for preventing the access of the fluid pressure medium to said bearings.

12. In mechanism of the class described, the combination with a shaft provided with a fluid pressure turbine element and a casing, of a sleeve providing bearings for said shaft and insertible, with said shaft, into said casing, and a plurality of interlocking packing devices disposed between said turbine element and the sleeve for preventing the access of the fluid pressure medium to said bearings.

Dated this 19th day of July, 1920.

FRANS H. C. COPPUS.