Dec. 6, 1927. 1,651,820

S. M. HANSEN

ROTOR

Filed Aug. 11, 1927

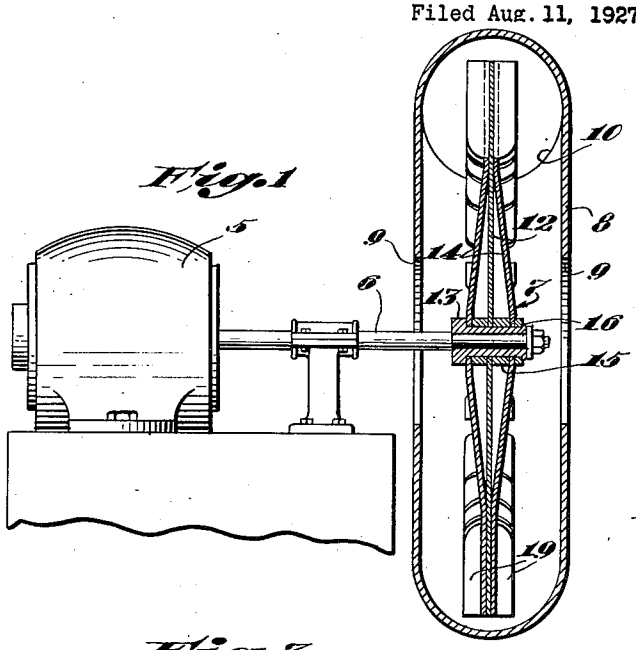


Fig. 1

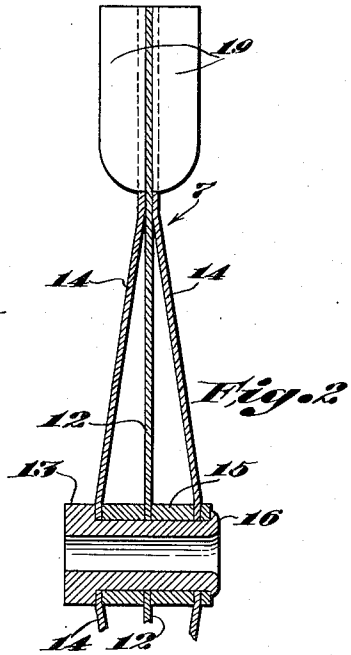


Fig. 2

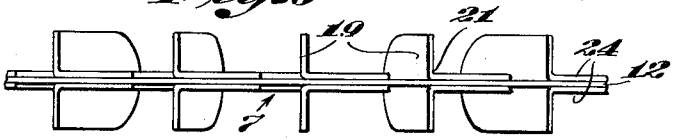


Fig. 3

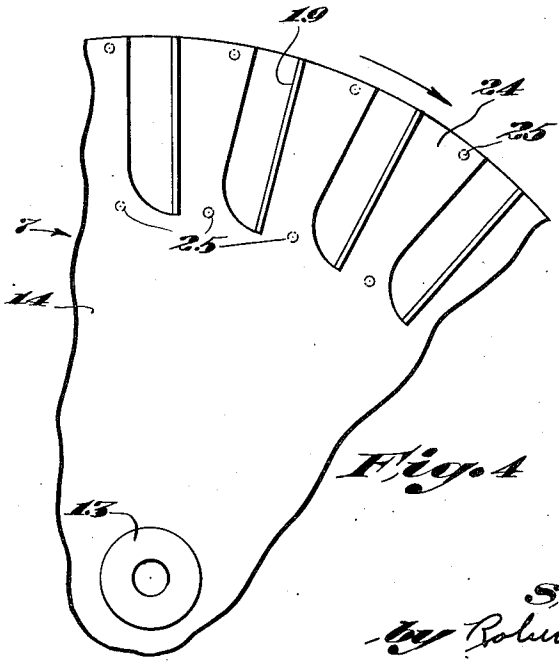


Fig. 4

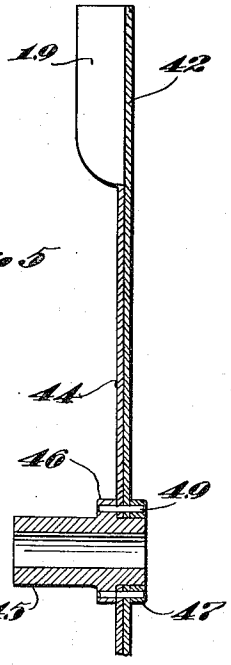


Fig. 5

Inventor
Sirius M. Hansen
by Roberts Cushman & Woodberry.
Attys.

Patented Dec. 6, 1927. 1,651,820

UNITED STATES PATENT OFFICE.

SINIUS M. HANSEN, OF LYNN, MASSACHUSETTS, ASSIGNOR TO HORACE M. EATON, TRUSTEE, OF NAHANT, MASSACHUSETTS.

ROTOR.

Application filed August 11, 1927. Serial No. 212,237.

This invention relates to an improved rotor adapted particularly for blowers and designed for high rotary and peirpheral speeds.

The present invention provides a rotor of this character which may be made of sheet metal and which therefore may be of inexpensive construction and may have a low moment of inertia and consequent low centrifugal stresses so that it is adapted to rotate at an extremely high speed in order to provide a fairly high air pressure and air velocity. Furthermore, although this rotor is formed of sheet metal, which is naturally a somewhat resonant material, the metal is so disposed and arranged that the rotor has little resonance so that no objectional noise emanates from the same even at very high speed. The outstanding blades of the improved rotor are so disposed and arranged that they are locked more firmly in engagement with the body portion of the rotor as the air pressure increases. An article of this character may be made at a low cost without the need of especially accurate workmanship or care to obtain a satisfactory rotational balance due to uniform centrifugal stresses.

The above and further advantageous features of the invention will be apparent to those skilled in the art upon a reading of the subjoined description and claims in conjunction with the accompanying drawings, in which

Fig. 1 is a view of a blower installation in which the improved type of fan is shown in cross section;

Fig. 2 is an enlarged cross section of a portion of the fan;

Fig. 3 is a top view of a portion of the rotor;

Fig. 4 is a side elevation of a portion of the rotor; and

Fig. 5 is a view corresponding to Fig. 2 but showing a fan having blades upon one side only.

A rotor of the character disclosed by the accompanying drawings is designed to be used in a blower for providing a forced current of air or for similar purposes. Such an installation of the improved rotor is disclosed in Fig. 1, wherein the electric motor 5 rotates shaft 6 upon which the rotor 7 is secured. Disposed about the rotor is a casing 8 having central openings 9 adjoining its axis into which air is adapted to be drawn by the rotor fans. The casing is provided with an outlet 10 into which the air is delivered.

The improved rotor preferably is formed of plates or laminæ of sheet metal and comprises an intermediate supporting plate or disk 12 having its central portion fitted upon the bushing 13 which in turn may be keyed to drive shaft 6 or secured thereto in any suitable manner. Disposed at either side of disk 12 are the fan plates 14 which preferably are dished so that their central portions are spaced from the adjoining portion of plate 12. Spacers or distance members 15 are disposed between the central portions of the adjoining disks, Fig. 2, while the bushing 13 may have an extremity flanged over as designated by numeral 16, to hold intermediate portions of the plates firmly in position upon the bushing.

The peripheral areas of disks 14 preferably are arranged with marginal portions in engagement with disk 12. In other words, these peripheral portions are disposed at an angle to the dished portions of the fan plates as shown. The blades 19 are formed upon these peripheral areas of disks 14. Preferably the blades may be outlined by making cuts in substantially radial directions inwardly from the circumference of the disk and continuing the cuts in curved extensions, each of which has a substantial component in a circumferential direction. Thus each fan blade is defined upon its outer end by the circumference of the disk and upon two of its sides by the cut with its curved extension. The remaining side of each blade is defined by the bend or fold 21, the metal of the blade being folded out substantially at right angles to the plane of disk 12 and the marginal portions of disks 14. Thus each of the blades preferably comprises a struck out sheet metal portion of substantially quadrilateral form having a straight edge adjoining the circumference of the rotor and a straight edge paralleling the main plate thereof, while its inner end is curved, being formed by the curved cut at the inner portion of the circumferential area.

The cut-away portions of disk 14 left by the bent out blades 19 are spaced by substantial peripheral portions or blade supports 24, each of which preferably may have a surface area of somewhat the order of the area of the blades. These portions of the plates 14 preferably are secured to the sup-

porting plate 12 by any suitable means 25, such as spot welding. Preferably fastening means of this character is located adjoining the cut portion at the edge of each blade support area and spaced from the bend where the blade supporting portion joins the outstanding blade, Fig. 4. Thus the marginal area of each fan plate is broken up into a series of similar parts, each of which comprises a sheet metal blade supporting portion of substantial area held in abutting engagement with the central plate and an extension of this portion bent out substantially at right angles to compose a fan blade. Preferably the blades of the fan plates upon opposite sides of the rotor are aligned with each other in order to obtain substantial balancing of transverse stresses in a rotor of this character having two fan plates. Each bend 21 preferably is so disposed that a continuation thereof will fall somewhat to one side of the center of the rotor; for example, one satisfactory manner of laying out the blades is to arrange this line so that it will lie substantially parallel to the radius of the rotor. Thus the plane of the blades is at a slight angle to a radius which intersects the same.

Fig. 5 discloses a similar form of rotor for installation in blowers of smaller capacity which has blades upon one face only of the supporting plate. For example, this form of rotor comprises a supporting plate 42 and a single fan disk 44 disposed in abutting engagement with the supporting plate. The vanes 19 are formed upon disk 44 in a manner exactly analogous to that disclosed in the other form of the invention, and the plates 44 and 42 may be welded together in a similar manner. The central portions of the plates are mounted upon the sleeve 44, which is provided with an annular flange 46 and a retaining washer 47 between which disks 42 and 44 are held. Suitable pins or rivets 49 extend through washer 47, flange 46, and the portions of the plates therebetween in order firmly to lock the parts together.

A rotor of the type disclosed herein is adapted effectively to withstand extremely high peripheral speeds due to the advantageous and scientific distribution and disposition of the sheet metal and of the means of securing the parts together. Thus the rotor is movable in the direction indicated by the arrow of Fig. 4, the air is thrown centrifugally outward and passes out through outlet 10, this flow of air being aided by the disposition of blades at a slight angle to the radius of the rotor. The pressure of the air upon the vanes forces the portions of areas 24 which adjoin bends 21 more firmly into engagement with the supporting plate 12 so that the higher the rotational speed and the greater the fluid pressure, the more securely are the blades held in place and the parts of the rotor held together; the fastening means 25 may be comparatively light since little strain is thrown thereon. In fact, it is commercially practical to make rotors of this type in which the portions of the blade supports adjoining bends 21 normally are spaced slightly from the adjoining faces of plate 12, since the air pressure will force these members into firm engagement to avoid resonance of the parts.

Obviously since the rotor is formed of sheet metal which may be of comparatively thin section, its moment of inertia is low, the centrifugal forces are consequently low, and its speed may be very high. The arrangement of the body portions of the sheet metal plates in planes substantially at right angles to the axis of rotation provides the maximum of strength in a circumferential direction, so that a rotor of this type is adapted to receive very high torque and to rotate at very high speeds. Provision of the substantial metal areas 24 in operative engagement with the peripheral portion of the supporting plate provides an unusually firm construction, this type of laminated structure consequently permitting the provision of rotors having comparatively low resonance in spite of their high speed of operation.

I claim:

1. A rotor for fans, blowers or the like, comprising a circular supporting plate, a fan plate, peripheral portions of the fan plate comprising blade supports and being held in abutting engagement with the supporting plate, said blade supports each having a substantial area, integral extensions of said blade supports being bent out to form blades.

2. A rotor for fans, blowers or the like, comprising a circular supporting plate, a fan plate, peripheral portions of the fan plate comprising blade supports and being held in abutting engagement with the supporting plate, said blade supports each having a substantial area, integral extensions of said peripheral portions being bent out to form blades, the means securing each blade support to the supporting plate being disposed at a part of the blade support which is spaced from the blade that is integral therewith.

3. A rotor for fans, blowers or the like, comprising a circular supporting plate, a fan plate, peripheral portions of the fan plate comprising blade supports and being held in abutting engagement with the supporting plate, said blade supports each having a substantial area, integral extensions of said blade supports being bent out to form blades, the line of the bend between each blade and blade support falling to one side of the radius of the plate which intersects

the blade, whereby the blade lies at an angle to the radius.

4. A rotor for fans, blowers or the like, comprising a circular supporting plate, a fan plate, peripheral portions of the fan plate comprising blade supports and being held in abutting engagement with the supporting plate, said blades supports each having a substantial area, integral extensions of said blade supports being bent out to form blades, the width of each blade support being substantially as great as the distance between the bend and the opposite outer edge of the blade.

5. A rotor for fans, blowers or the like, comprising a circular supporting plate, a fan plate, peripheral portions of the fan plate comprising blade supports and being held in abutting engagement with the supporting plate, said blade supports each having a substantial area, integral extensions of said blade supports being bent out to form blades, the width of each blade support being substantially as great as the distance between the bend where it joins the blade and the opposite edge of the blade, and means securing each blade support to the supporting plate being disposed at a part of the blade support which is spaced from the blade that is integral therewith.

6. A rotor for fans, blowers or the like, comprising a circular supporting plate. a fan plate, peripheral portions of the fan plate comprising blade supports and being held in abutting engagement with the supporting plate, said blade supports each having a substantial area, integral extensions of said blade supports being bent out to form blades, said blades being of substantially quadrilateral form, and being bent out substantially at right angles to the blade supports.

7. A rotor for fans, blowers or the like, comprising a sheet metal supporting plate, a pair of sheet metal fan plates, peripheral portions of the fan plates comprising blade supports and being held in abutting engagement with the supporting plate, said blade supports each having a substantial area, integral extensions of said blade supports being bent out to form blades, said blades being of substantially quadrilateral form, and being bent out substantially at right angles to the blade supports.

8. A rotor for fans, blowers or the like, comprising a circular supporting plate, a pair of fan plates, peripheral portions of the fan plates comprising blade supports and being held in abutting engagement with the supporting plate, said blade supports each having a substantial area, integral extensions of said blade supports being bent out to form blades, said blades being of substantially quadrilateral form. and being bent out substantially at right angles to the blade supports, the blades at opposite sides of the fan plates being mutually aligned.

9. A rotor for fans, blowers or the like, comprising a circular supporting plate, a pair of fan plates, peripheral portions of the fan plates comprising blade supports and being held in abutting engagement with the supporting plate, said blade supports each having a substantial area, integral extensions of said blade supports being bent out to form blades, said blades being of substantially quadrilateral form and being bent out substantially at right angles to the blade supports, the central portions of the fan plates being dished away from the supporting plate to provide the rotor with additional transverse rigidity.

10. A rotor for fans, blowers or the like, comprising a circular supporting plate, a pair of fan plates, peripheral portions of the fan plates comprising blade supports and being held in abutting engagement with the supporting plate, said blade supports each having a substantial area, integral extensions of said peripheral portions being bent out to form blades, said blades being of substantially quadrilateral form and being bent out substantially at right angles to the blade supports, the blades at opposite sides of the fan plates being mutually aligned, the central portions of the fan plates being dished away from the supporting plate to provide the rotor with additional transverse rigidity.

11. A rotor for fans, blowers or the like, comprising a circular supporting plate. a fan plate, peripheral portions of the fan plate comprising blade supports and being held in abutting engagement with the supporting plate, said blade supports each having a substantial area, integral extensions of said peripheral portions being bent out to form blades, said fan plate having its central portion dished away from the supporting plate and its peripheral portion in close parallelism therewith to provide the rotor with additional transverse rigidity.

12. A rotor for fans, blowers or the like, comprising a circular supporting plate, a sheet metal fan plate, peripheral portions of the fan plate comprising blade supports and being held in abutting engagement with the supporting plate, said blade supports having a substantial area, integral extensions of said supports being bent out to form blades, and welds securing the peripheral portions to the supporting plate, said welds being disposed at a part of each blade support, which is spaced from the blade that is integral therewith.

Signed by me at Lynn, Massachusetts this 9th day of August, 1927.

SINIUS M. HANSEN.