Nov. 1, 1938. J. A. ROCKWELL 2,135,053

CENTRIFUGAL FAN

Filed Aug. 24, 1937

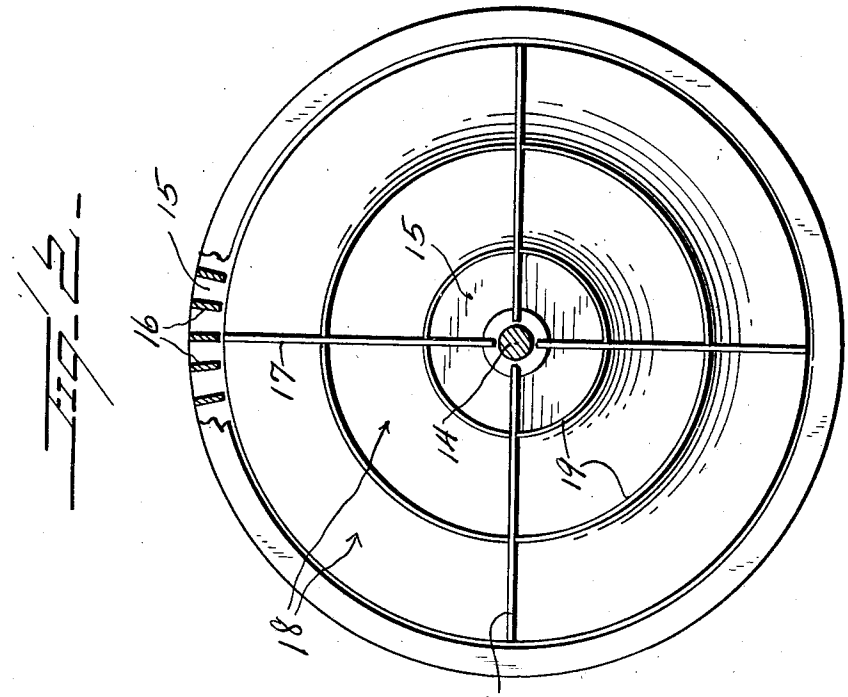


Fig. 2.

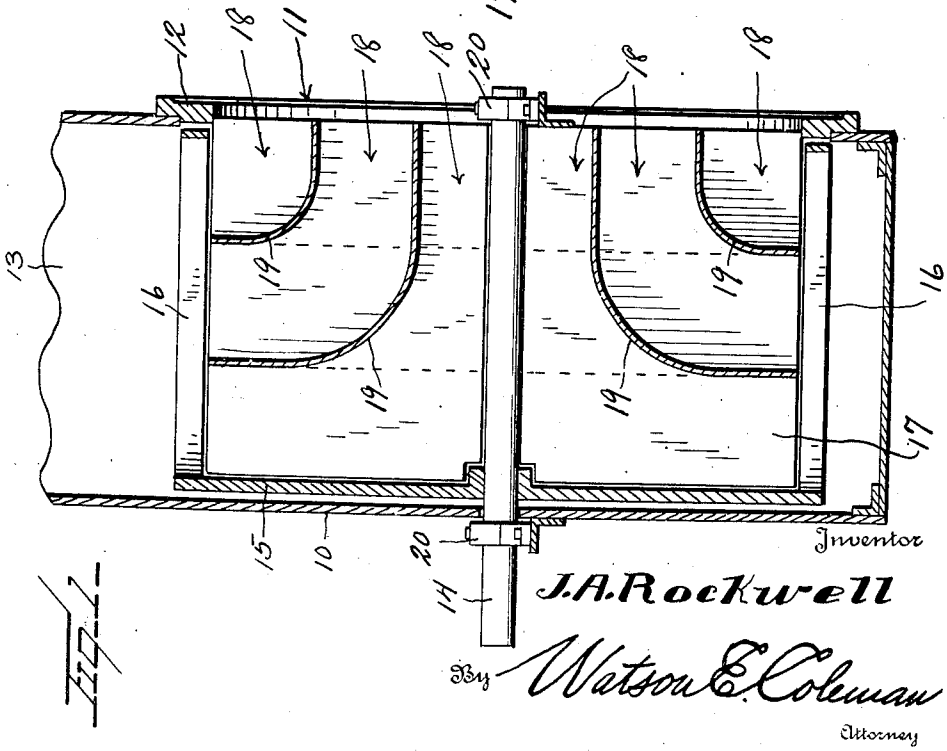


Fig. 1.

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CENTRIFUGAL FAN

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1 Claim. (Cl. 230—127)

This invention relates to centrifugal fans or pumps of the "squirrel cage" type and particularly to those fans or pumps having blades extending approximately parallel to the axis of rotation of the fan or pump. This class of fan is open to the objection that the air pumped through the blades by centrifugal force tends to hug the air inlet flange ring at the margin of the air inlet opening, creating high air pressure relatively adjacent the annular wall of the air inlet opening. This increases resistance and the air is not distributed evenly over the length of the blades, thus decreasing the efficiency of the fan and requiring a larger fan operating at slower speed. Furthermore, the air is given a rotary motion causing a variation in velocity of the air entering the inlet of the fan.

The object of my invention is to make it possible to operate fans of smaller diameter at higher speeds and yet secure the same results as would normally be secured by oversized fans which must be operated at slower speed to obtain the same capacity.

My invention is illustrated in the accompanying drawing wherein:

Figure 1 is a diametric section through a fan and casing therefor constructed in accordance with my invention.

Figure 2 is an end elevation partly in section of the fan and the partition plates therefor removed from the casing.

In the drawing, 10 designates a fan casing as commonly used with "squirrel cage" fans, the casing having the inlet 11 defined by the inlet flange ring 12. The outlet of the casing is designated 13. Extending longitudinally through the casing 10 is a shaft 14 having thereon the back plate 15 carrying the axially extending blades 16, as many as may be desired. So far, the parts described are such as is commonly found in "squirrel cage" fans.

My invention consists in disposing within the space defined by the blades, a plurality of radial partitions 17 shown as four in number, though I do not wish to be limited to this number of partitions, dividing the low pressure space of the fan into four compartments or ducts. The walls 17 prevent the air from rotating as it enters the inlet opening of the fan casing and when it is within the low pressure area of the fan. The air cannot start rotating until it reaches the fan blades because these radial partitions 17 extend radially outward to a point closely adjacent to the inner edges of the blades and extend from a point closely adjacent to the plate 15 out to the inlet ring 12.

In order to prevent the air from being urged by the centrifugal force toward the inlet ring, thus preventing proper distribution of the air along the fan blades, I divide each of the compartments formed by the partitions 17 into a plurality of ducts 18 by walls 19. Each partition or wall 19 extends axially inward from the inlet and then curves gently laterally or radially outward to points adjacent to the inner edges of the fan blade 16. The walls 19 may be supported in any suitable manner as by the radial partitions 17 and these radial partitions or walls 17 are supported in any suitable manner as by the inlet flange or ring 12. It is to be noted that the radial walls 17 and the funnel-like guide walls 19 extend to the front wall or flange 12 of the fan casing and that the inner ends of the walls 19 extend to the edges of the radial walls 17 closely adjacent to the inner edges of the fan blades. By the use of these guide walls 19, the space defined by the fan blades and the rear wall 15 is divided into a plurality of concentric inlet ducts which lead directly to the fan blades and these partitions or walls guide the entering air column in equal amounts and distribute it evenly to the fan blades and prevent the air from hugging the outside inlet wall or flange, and taking a short cut to and through those portions of the blades which are adjacent said ring 12, while the radial partitions 17 prevent any whirling motion being given to the air.

Of course, the shaft 14 is supported in suitable bearings and I have indicated these bearings by the numerals 20.

The walls 19 define ducts which distribute the air column equally over the inlet until it reaches fan blade 16. By dividing the air equally across the inlet flange 12, it is possible to prevent all the air from entering at a higher velocity at the space directly adjacent to the flange ring 12. The centrifugal pull created across the inner surface of blades 16 will be equally felt in all pockets or ducts formed by the walls 19 and 17. By carrying this centrifugal pull evenly across the face of the inlet, the air is evenly distributed and segregated at its source, namely, the inlet flange.

The result obtained by dividing the inlet into quadrants, as shown, creates four pockets. By the inserting of guide vanes 19, the result is a total of twelve pockets, such as is designated by 18. It can then be seen that the centrifugal pull

created by 16 will divide the inlet diameter into twelve separate sources of air supply.

To obtain a given capacity, for instance, and using a hypothetical case—on one hand we have a fan operating at 1000 R. P. M. to produce 1000 cubic feet of air current; on the other hand we have a smaller fan operating at 2000 R. P. M. to produce the same amount of air. The second fan would be half the size and half the weight and would still produce the same amount of air. Larger fans operating at slower speed are not usually troubled with the faults I am attempting to correct, but as larger fans have more weight and take up more space, this invention would permit a saving in both these items.

While I have illustrated certain details of construction and a certain specific arrangement of parts, I do not wish to be limited to these exact details or arrangement as obviously these might be varied in minor respects without departing from the spirit of the invention as defined in the appended claim.

What is claimed is:

A fan of the "squirrel cage" type, including a casing having an inlet opening in its front wall and an outlet opening in its side wall, a shaft extending centrally through the casing, a back plate mounted upon the shaft adjacent the inner wall of the casing, a plurality of axially extending blades carried by said back plate and extending to the front wall of the casing, a plurality of radially disposed partition walls within the space defined by the shaft and the parallel blades of the fan, the partition walls being held from rotation with the fan and extending from the front of the casing to the rear thereof and from the shaft to the inner edges of the blades, said radial walls dividing the space within the fan into a plurality of compartments, and a plurality of walls disposed between each pair of partition walls and extending inward from the inlet opening of the fan in concentric relation to each other and approximately parallel to the axis of rotation of the fan and then curving laterally outward and extending radially in planes radial to the axis of rotation but at right angles thereto and terminating at the outer edges of said radial walls, the said concentric walls forming ducts and being attached to the radial walls.

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