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C. T. DOMAN

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FAN CONSTRUCTION

Filed Sept. 29, 1930

FIG. 1.

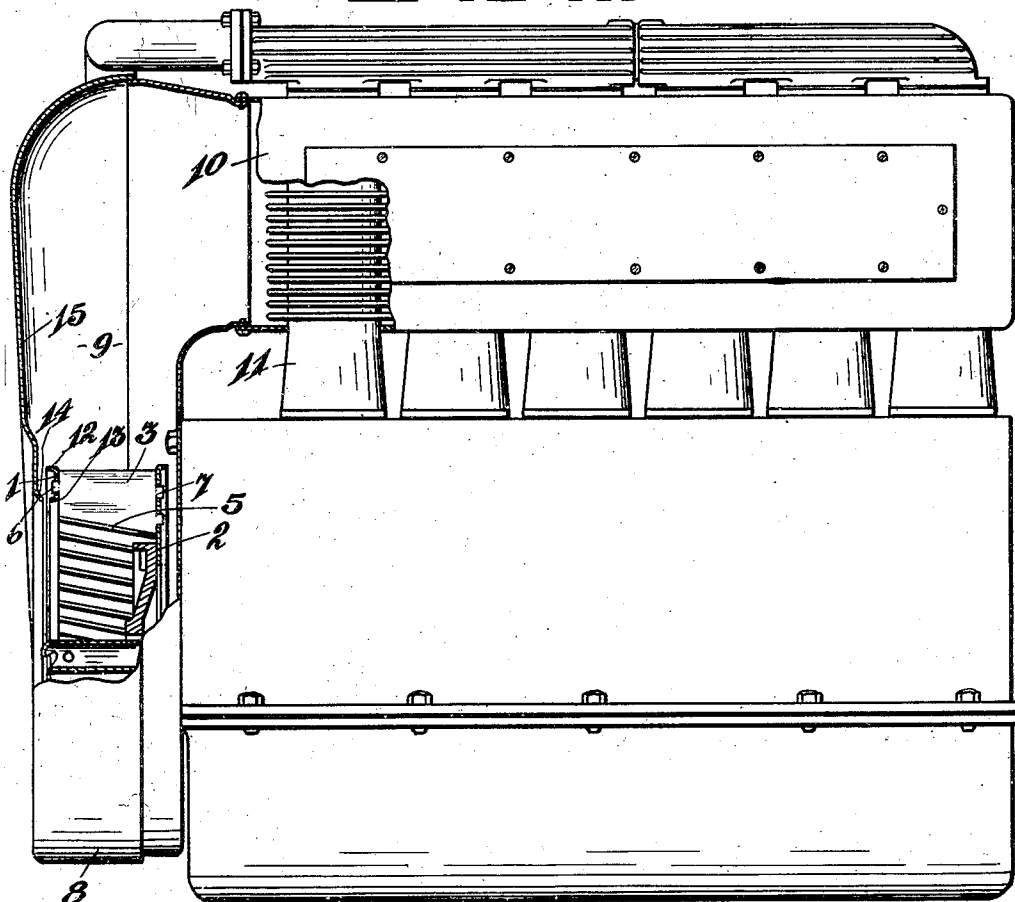
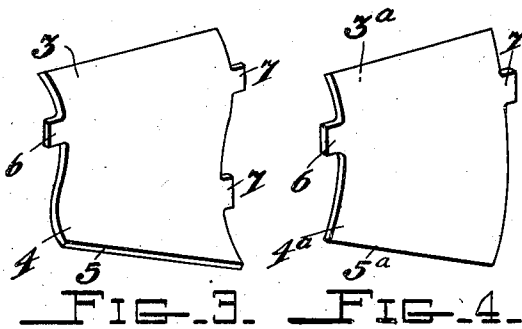
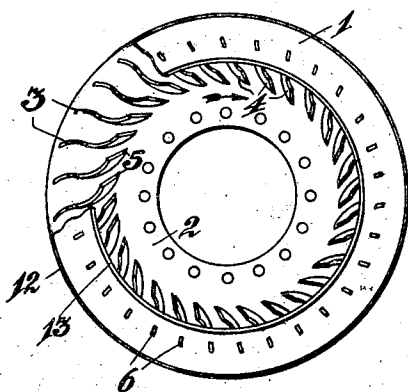


FIG. 2.



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UNITED STATES PATENT OFFICE

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FAN CONSTRUCTION

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This invention relates to centrifugal fans and has for its object a particularly simple fan or fan construction whereby the air is distributed the full width of the vanes and a maximum amount of air is pumped or moved with minimum power to drive the fan. The fan is particularly designed for supplying the air cooling current of air-cooled engines and particularly automobile air-cooled engines.

The invention consists in the novel features and in the combinations and constructions hereinafter set forth and claimed.

In describing this invention, reference is had to the accompanying drawing in which like characters designate corresponding parts in all the views.

Figure 1 is a fragmentary sectional view of the fan, the contiguous portion of an air-cooled engine and the air conduit leading from the fan housing being also shown.

Figure 2 is a front elevation of the fan, partly broken away.

Figure 3 is an isometric view of one of the fan vanes.

Figure 4 is a view similar to Figure 3 of a slightly different form of vane.

This fan comprises generally a rotor having a front annular wall 1, a rear discoidal closed wall 2 and vanes 3 between the annular wall 1 and the margin of the rear wall 2. Each vane has an inner portion 4 extending beyond the inner circle of the annular wall 1, this portion 4 having its inner edge 5 inclining from the front end of the vane toward the rear end and converging toward the axis of the fan. Also, this portion 4 is curved to have a lead in the direction of rotation of the fan. The outer end portion of each vane is curved or deflected more or less in a direction opposite to the direction of rotation, the amount of curvature of the outer portion depending upon conditions under which the fan is to work. By changing the curve of the outer end of the blades or tipping it more in one direction more power will be required in accordance with the portion of tipping of the outer end portion of the blade.

The portions 4 of the vanes are a preferred means for distributing the air the full width

of the vanes and hence causing the fan to deliver a maximum quantity of air or other medium with minimum power to drive the fan.

In Figure 4, the inner end portion 4^a of the vane 3^a is not curved to have a lead but is in the curve of the major part of the vane. The inner edge 5^a, however, inclines from the front end of the vane toward the rear end as in the vane shown in Figure 3.

The vanes are assembled between the front and rear walls in any suitable manner, they being here shown as formed with tongues 6 and 7 at the front and rear edges which enter corresponding holes or slots in the front and rear walls 1, 2 and the ends of the tongues are clinched or riveted.

The fan is mounted in a suitable housing 8 having an outlet pipe 9 which extends to an air conduit 10 extending along one side of the cylinders 11 of a multi-cylinder in line engine, the conduit blowing from one side of the line of cylinders to the other.

The front annular wall 1 is formed with upturned marginal flanges 12, 13, the inner flange 13 being approximately in line with an inwardly deflected margin 14 of the fan housing. The margins 13 and 14 form a Venturi inlet for the fan.

The outlet 9 of the fan is wider than the fan casing and the front wall 15 thereof diverges upwardly and outwardly. In developing this fan, it was found that the efficiency of the fan depended to a large extent upon the shape of the housing. A narrow housing gave lower efficiency than a wider housing with the radial dimensions of the fan the same. However, the wider housing requires more room under the hood. A narrow fan and housing with the wider air conduit with the tapered upwardly flaring front wall being as great in efficiency as a wider fan. One of the advantages of the narrow fan is that it can be mounted on the engine on the chassis of the automobile without increasing the overall length of the power plant or without lengthening the space under the hood and in the using of the wider air outlet the inclination of the engine in the chassis is taken advantage of, as the engine being slightly inclined, the fan with the housing surrounding

it is also slightly inclined out of the vertical while the air outlet is widened by having its front wall vertical, which in effect is an upward and forward inclination relatively to the housing around the fan. The result is

In operation, the fan rotates in the direction of the arrow, Figure 2, and the inward portions 4 distribute air the full width of the vanes and greatly increase the amount of air taken in and pumped by the fan without increasing the power required to drive the fan, for instance, I have found that a fan constructed as described will deliver seven per cent more air than a Sirocco fan of the same size and requires only fifty-two per cent of the power to drive it 3500 R. P. M., the increase in efficiency of the fan being due to the formation and location of the inner portions of the vanes in the air inlet of the fan.

What I claim is:

1. A centrifugal fan including an annular front wall, enclosing an air inlet, and a closed rear wall, said front and rear walls having substantially parallel opposing faces; vanes between said parallel faces and confined between the planes of the faces, said vanes having portions extending inwardly beyond the inner edge of the annular front wall, and having their inner portions inclined rearwardly and the edges of said inner portions inclined inwardly toward the axis of the fan.

2. A centrifugal fan including an annular front wall, enclosing an air inlet, and a closed rear wall; vanes between the annular front wall and the outer margin of the closed rear wall, said vanes having portions extending inwardly beyond the inner edge of the annular front wall and having their inner portions inclined rearwardly and of decreasing inclination toward the outer edge of the fan, and the edges of said inner portions inclined inwardly toward the axis of the fan, the portions of the vanes located within the circle of the annular front wall having a reverse curve contour by which the decreasing rearward inclination of the inner portion varies to an increasing rearward inclination toward the outer edge of the fan.

3. A centrifugal fan including an annular front wall, enclosing an air inlet, and a closed rear wall, said front and rear walls having substantially parallel opposing faces; vanes between said parallel faces and confined between the planes of the faces, said vanes having portions extending inwardly beyond the inner edge of the annular front wall, and having their inner portions inclined rearwardly and the edges of said inner portions inclined inwardly toward the axis of the fan, the outer end portions of the vanes being inclined in a direction opposite to the direction of rotation of the fan.

4. A centrifugal fan including an annular front wall, enclosing an air inlet, and a closed rear wall, said front and rear walls having substantially parallel opposing faces; vanes between said parallel faces and confined between the planes of the faces, said vanes having portions extending inwardly beyond the inner edge of the annular front wall, and having their inner portions inclined rearwardly and of decreasing inclination toward the outer edge of the fan, and the edges of said inner portions inclined inwardly toward the axis of the fan, the portions of the vanes located within the circle of the annular front wall having a reverse curve contour by which the decreasing rearward inclination of the inner portion varies to an increasing rearward inclination toward the outer edge of the fan.

In testimony whereof, I have hereunto signed my name, at Syracuse, in the county of Onondaga, and State of New York, this 22nd day of September, 1930.

CARL T. DOMAN.