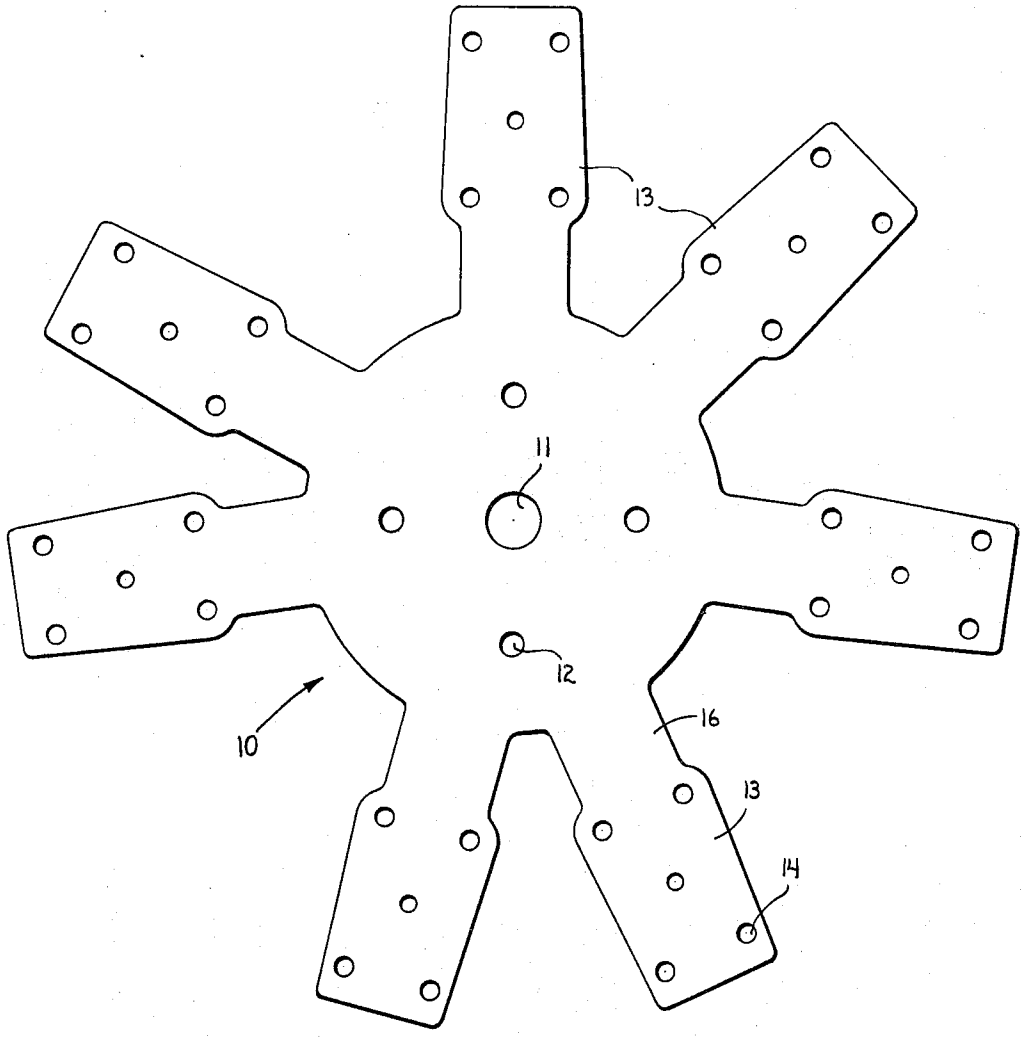
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BALANCED FAN CONSTRUCTION

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INVENTOR.
JOHN A. WOODEN

BY Lockwood, Woodard, Smith & Weikart
Attorneys

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BALANCED FAN CONSTRUCTION

John A. Wooden, Indianapolis, Ind., assignor to Brookside Corporation, McCordsville, Ind., a corporation of Indiana

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This invention relates generally to air moving fans and particularly to a fan construction which minimizes pulse rate frequency noise and energy loss.

It has, in the past, been recognized that a member, such as a fan, rotating about a central axis and with equal spacing of its blades, will emit a definite tone or "siren" effect when obstructions are present in the air stream induced by the fan. Analysis of this noise tone indicates that it has a frequency equal to the product of the r.p.m. of the rotating member and the number of legs extending radially from the rotating member. In the trade the noise produced as referred to above is often identified as "pulse rate" frequency noise. It is, of couse, highly desirable that this noise, and consequent energy loss be minimized.

The primary object of the present invention is to provide a rotatable member such as a fan having a plurality of radially extending legs with the angle between the longitudinal axes of any two of said legs differing in magnitude from the angle between any other two of said legs, the angular spacing of the legs being such as to dynamically balance the member about its axis of rotation, whereby pulse rate frequency noise is minimized.

This and other objects will become apparent as the description proceeds with reference to the accompanying drawing showing a front view of a fan spider, the fan blades being omitted, which embodies the present invention.

Referring to the drawing, the present invention is embodied in a rotatable member such as the fan spider **10**. The spider is provided with a central aperture **11** and a series of bolt holes **12** which permit the spider to be assembled with a pulley or other mounting structure. Extending radially from the central portion of the spider are legs **13**.

At their outer ends the legs **13** are enlarged somewhat and provided with rivet holes **14** to permit fan blades (not shown) to be attached to the enlarged portions of the legs. The legs may be twisted or skewed in the intermediate area **16** to provide the proper pitch for the fan blades when mounted on the legs. It will be noted that the legs are uniformly shaped so that their centers of gravity are uniformly spaced from the center of the spider. The fan blades to be attached to the legs are, of course, also of uniform configuration and weight so that in the completed assembly the effective centers of gravity of the radially extending legs and the fan blades mounted thereon will be uniformly spaced about the center of the spider.

It will be noted that each of the legs is disposed so that the angle between the longitudinal axes of any two

of the legs differs in magnitude from the angle between the longitudinal axes of any other two of the legs. The angular spacing of the legs is nonuniform, however, the spacing of the legs being such that the structure is dynamically balanced about the center of the spider. The spacing is such that this balance occurs automatically without the addition of weights to one or more of the legs, or the subtraction of weight from one or more of the legs. The spider embodied in the present invention lends itself to mass production since it can be stamped or otherwise formed completely balanced and subtraction or addition of supplementary weights is not required for balancing the structure. Because of the staggered and unequally spaced legs on the spider objectionable and energy loss due to pulse rate frequency noise is minimized.

While the invention has been disclosed and described in some detail in the drawings and foregoing description, they are to be considered as illustrative and not restrictive in character, as other modifications may readily suggest themselves to persons skilled in this are and within the broad scope of the invention, reference being had to the appended claims.

The invention claimed is:

1. A fan spider having a plurality of radially extending legs, said legs each being adapted to have identical fan blades secured thereto, the angle between the longitudinal axes of any two of said legs differing in magnitude from the angle between the longitudinal axes of any other two of said legs, the center of gravity of each of said legs being equidistant from the center of said spider, the angular spacing of said legs being such as to dynamically balance said spider about its center without the addition or subtraction of mass to or from said legs.

2. A rotatable member having a plurality of radially extending elements, the angle between the longitudinal axes of any two of said elements differing in magnitude from the angle between the longitudinal axes of any other two of said elements, the center of gravity of each of said elements being equidistant from the axis of rotation of said member, the angular spacing of said elements being such as to dynamically balance said member about its axis of rotation without the addition or subtraction of mass to or from said elements.

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MARTIN P. SCHWADRON, *Primary Examiner.*

HENRY F. RADUAZO, *Examiner.*