

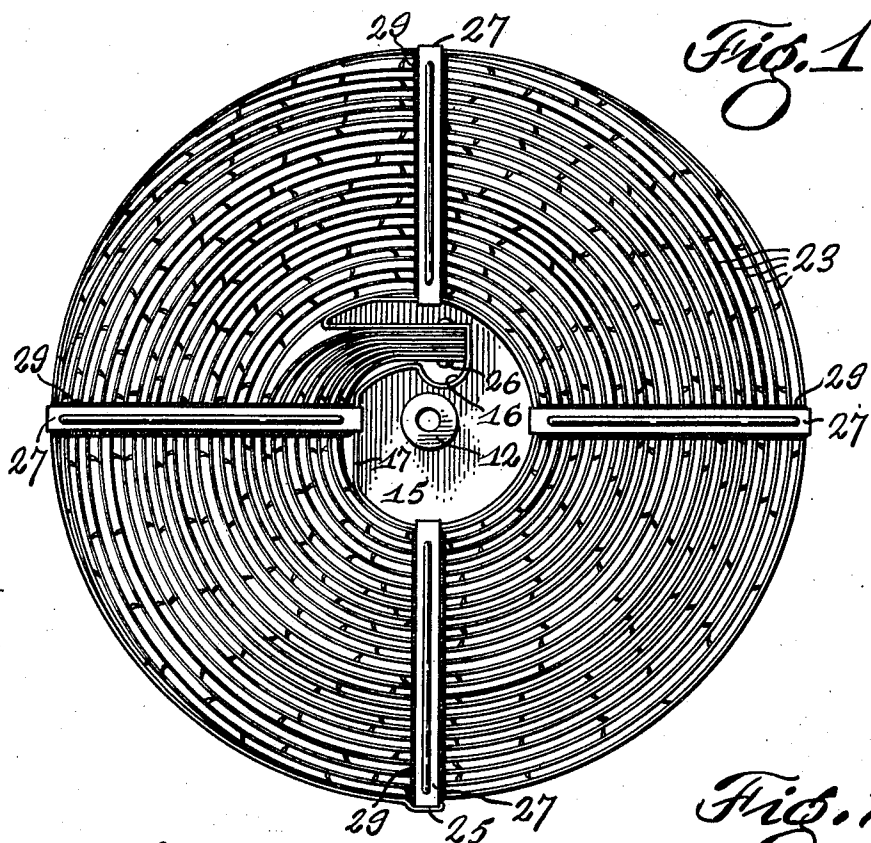
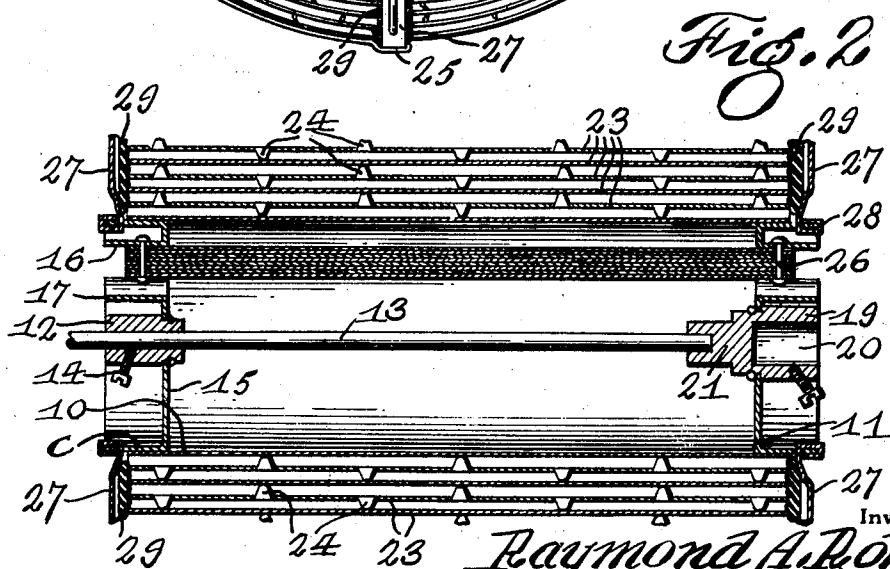
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AIR TREATING WHEEL

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AIR TREATING WHEEL

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4 Claims. (Cl. 261—92)

The present invention relates to improvements in air treating wheels particularly adapted for air conditioning apparatus.

Fluid treating wheels are known which embody a spirally wound sheet forming a drum or rotor used for contacting a liquid with a gas or other fluid. Obviously, the more compactly wound the rotor the greater is the operating surface; in fact, various suggestions have been made to indent, corrugate or otherwise treat the wound sheet for the purpose of enlarging the practical area thereof.

But, in air conditioning, or gas treating, the fluids subjected to treatment usually contain solid particles, either entrained or produced as a result of some physical or chemical reaction. The net result is a rapid coating of the rotor with a crust which clogs the passages and rapidly renders the wheels useless.

Another serious problem concerns the expansion or contraction of the metal of which the rotor is formed. It is evident that in a domestic or semi-industrial device, where a metal sheet one hundred feet long is wound compactly, the effects of expansion, for instance, are very great and may mean an unbalanced or noisy rotor, besides the tremendous stresses to which it is subjected. The above noted defects are probably responsible for the failure of such wheels in practice, although they have been known for some time.

The present invention is an improvement in a spirally wound rotor and contemplates an arrangement whereby the disadvantages enumerated above are eliminated. Briefly stated, the rotor of the invention embodies means for reducing expansion to a negligible value, while means are also provided to render ineffective the contraction effects. Furthermore, particle-collecting pockets are eliminated and means presented which are intended to produce a turbulence, in order to render said rotor self-cleaning.

Consequently, the objects of the invention can be stated as follows:

An object of the invention is the provision of an air treating wheel of generally improved construction.

Another object of the invention is the provision of an air treating wheel which may be assembled rapidly and efficiently.

A further object of the invention is the provision of an air treating wheel having convolutions formed by the assembly of a plurality of spirally wound flexible members.

Still another object of the invention is the provision of an air washing and humidifying wheel which will provide a maximum area of surface and will present a tight structure in assembly.

Other objects and advantages of the invention will become apparent as the description progresses.

In the accompanying drawing, forming a part of this specification and in which like reference characters are employed to designate corresponding parts throughout the same:

Figure 1 is an end view of one form of the wheel,

Figure 2 is a fragmentary axial section there-through.

Referring to Figures 1 and 2, wherein is illustrated a preferred embodiment of the invention, C generally designates the core of an air treating wheel embodying a pair of end head sections 10 and 11. The section 10 embodies a tubular hub member 12 adapted to slidably receive in the bore thereof a shaft 13 removably fixed in the hub by a set screw 14. In a groove adjacent the inner end of the hub 12 is secured the inner annular edge portion of a web 15 formed of flat, rigid, relatively thin plate or sheet material, such as sheet metal, having the exterior edge portion shaped approximately in the form of a spiral, as shown to advantage at Figure 1. The web 15 is also formed with an indentation 16 in the form of an elongated recess directed inwardly from the outer edge portion in a position substantially tangential to the hub 12. The exterior or peripheral edge of the web is formed with a lateral outwardly projecting flange 17 in the form of a continuous, comparatively wide ridge member extending also from the edge of the indentation 16.

The opposite end head 11 is similar to the head 10 with the exception that the hub thereof, indicated at 19, is somewhat longer than the hub 12 and is formed with a comparatively large socket or bore 20 for rotatably engaging a support member and has a reduced inward extension 21 having a smaller socket designed to receive therein the inner end portion of the shaft 13.

Upon the core C are mounted or wound a plurality of convolution forming members 23 preferably embodying flexible sheets or strips of relatively thin material, such as sheet metal. Certain of the flexible strip members 23 are treated to provide lateral spacing projections which may be formed by stamping the sheets to partially cut therefrom approximately triangular shaped spacing lugs 24 arranged in transversely spaced rows. As shown to advantage at Figure 2, several of the rows or projections are bent to project laterally from one side or base of the strip, while those of the next adjacent row are bent to project in the opposite direction.

In the assembly of the coil-forming members a plurality of imperforate and perforated or stamped strips 23, in the present example four of each, are disposed in alternate arrangement with the inner end margins in parallel contacting positions. These marginal portions are inserted into the indentations 16 of the head sections and are firmly secured therein by rivets 25 passed through

aligned apertures in the strip margins and the flange 17. The series of strip members are then simultaneously wound about the core heads in parallel spiral form to provide a predetermined number of convolutions which, exteriorly of the recess 16, are maintained in approximately uniformly spaced relation by the projections 24. The outermost strip 23 extends beyond the other strips, as shown at Figure 1, and terminates in a looped margin 25, for a purpose which will be hereinafter described.

At spaced intervals about the coiled strip members are provided holding elements 27 in the form of U-shaped clips constructed of metal or like rigid material having side legs disposed radially at the edges of the convolutions and transverse portions extending axially across the exterior coil. At the inner end of the side legs of the clips are provided fastening portions which extend through slots in the flange 17 of each end head and are bent in approximately U-shaped form, as indicated at 28 and shown at Figure 2, to firmly secure the clips in position. Between the side legs of the clips 27 and the side edges of the coils are positioned filler strips 29, of yieldable cushioning material, such as soft rubber, which provides an efficient packing. As illustrated at Figure 1, the clips 27 may be spaced at intervals at approximately 90° and will thus tightly embrace the convolutions. The folded end marginal portion 25 of the outermost sheet member 23 is arranged to embrace the transverse portion of one of the clips 27 to firmly fasten the end structure of the coils.

Thus, my invention presents a wheel or rotor construction having the spaced convolutions thereof formed of a plurality of spirally wound simultaneously assembled members having the surface thereof treated to render the same somewhat porous. Such treatment is advantageous in that it produces a great increase in the capillary action by the liquid wetting the rotor, and also may be such as to form a corrosion resisting coating.

This coil structure and core and clip construction with which it is assembled provides a very efficient air conditioning rotor which may be built with a maximum of economic productivity. Furthermore, it furnishes a large treating area in a comparatively light, compact and tight wheel assembly.

This large area, for a given size of rotor, can be greatly increased by the addition of a relatively few outer layers.

This statement can be substantiated by an examination of the formula:

$$C=D \times 3.1416$$

where

C=circumference
D=diameter.

Consequently, the outer convolutions of the rotor are evidently much longer than the center ones, due to the diameter difference between the two.

Therefore, the advantage of a circular wound rotor is the facility of condensing a large surface in a relatively small space, and of increasing considerably the area of useful humidifying surface, without correspondingly enlarging the rotor size, by the simple expedient of winding a few additional outer layers.

As an explanation, a practical example is given wherein the hub of the rotor is 6 inches in diameter, the convolutions spaced $\frac{1}{8}$ inch and the width of the wound sheet 10 inches.

Now, calculating the available surface of each convolution, for an increase in diameter of one inch, and adding, we have:

At 6 inch diameter: $18.84 \times 10 = 188.4$

At $6\frac{1}{4}$ inch diameter: $19.62 \times 10 = 196.2$

At $6\frac{1}{2}$ inch diameter: $20.41 \times 10 = 204.1$

At $6\frac{3}{4}$ inch diameter: $21.19 \times 10 = 211.9$

At 7 inch diameter: $21.98 \times 10 = 219.8$

a total of 1020.4 square inches.

Assuming the rotor wound to a diameter of 24 inches, the addition of an extra $\frac{1}{2}$ inch, calculated as above, gives a grand total of 3847 inches or nearly four times the area for a further diameter increase of 1 inch at 24 inches.

Of course, both sides of the wound sheet are effective in evaporating water; since, however, the lower portion of the rotor dips in water, the actual area is therefore one-half only so that it is not necessary to figure both sides in our calculations.

It is to be understood that the forms of my invention herein shown and described are to be taken as preferred examples of the same, and that various changes as to the shape, size and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

Having thus described my invention, I claim:

1. In a wheel of the character described, a core embodying a plurality of sections of approximately spiral contour, each of the said sections having an elongated indentation formed therein, and a plurality of strips having their inner end marginal portions secured in the said indentations of the sections and wound in parallel arrangement to form spiral convolutions about the core.

2. In a wheel of the character described, a core embodying a plurality of sections of approximately spiral contour, each of the said sections having an elongated indentation formed therein, a plurality of strips having their inner end marginal portions secured in the said indentations of the sections and wound in parallel arrangement to form spiral convolutions about the core, and projections formed on the strips for maintaining the major portions thereof in spaced relation.

3. In a wheel of the character described, a core embodying a plurality of sections of approximately spiral contour, each of the said sections having an elongated indentation formed therein, a plurality of strips having their inner end marginal portions secured in the said indentations of the sections and wound in parallel arrangement to form spiral convolutions about the core, projections formed on the strips for maintaining the major portions thereof in spaced relation, and a plurality of U-shaped clips fitted over the convolutions and attached to the core.

4. In a wheel of the character described, a pair of complementary core sections, each of the said sections having a tangential recess, and a plurality of strips wound in spiral formation about the said core sections having their inner end portions secured in the recesses.

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