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(54) **VENTURI FAN**

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(57) **ABSTRACT**

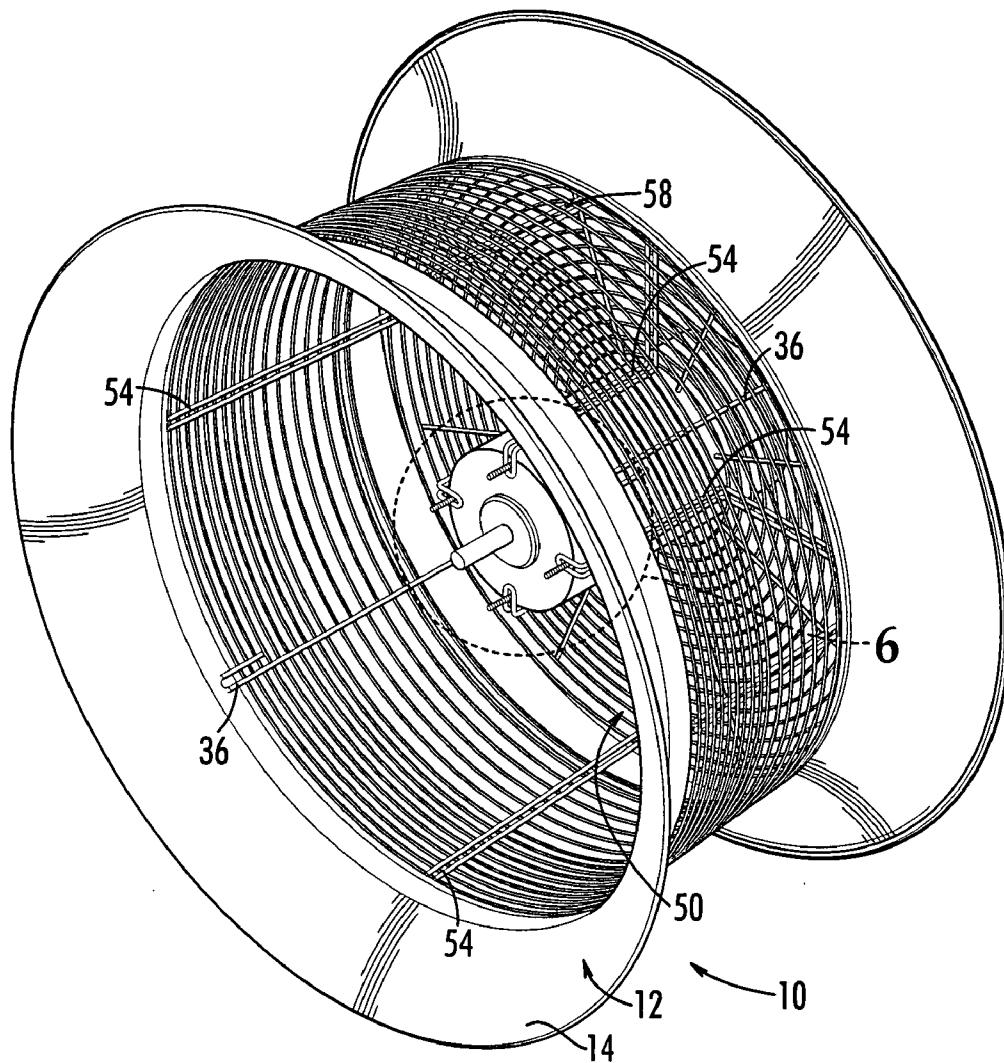
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Related U.S. Application Data

(60) Provisional application No. 60/630,113, filed on Nov.
22, 2004.

A venturi-type fan is composed of a wire basket between front and rear flares. The wire basket has a rear portion to which the motor and fan blade assembly is mounted. The rear flare controls the admission of air into the fan to reduce turbulence and allows the flow of air to be accelerated and directed forward in a slowly diffusing column. The openness of the sides of the present fan reduces the noise generally associated with close-sided venturi fans without degrading air movement characteristics



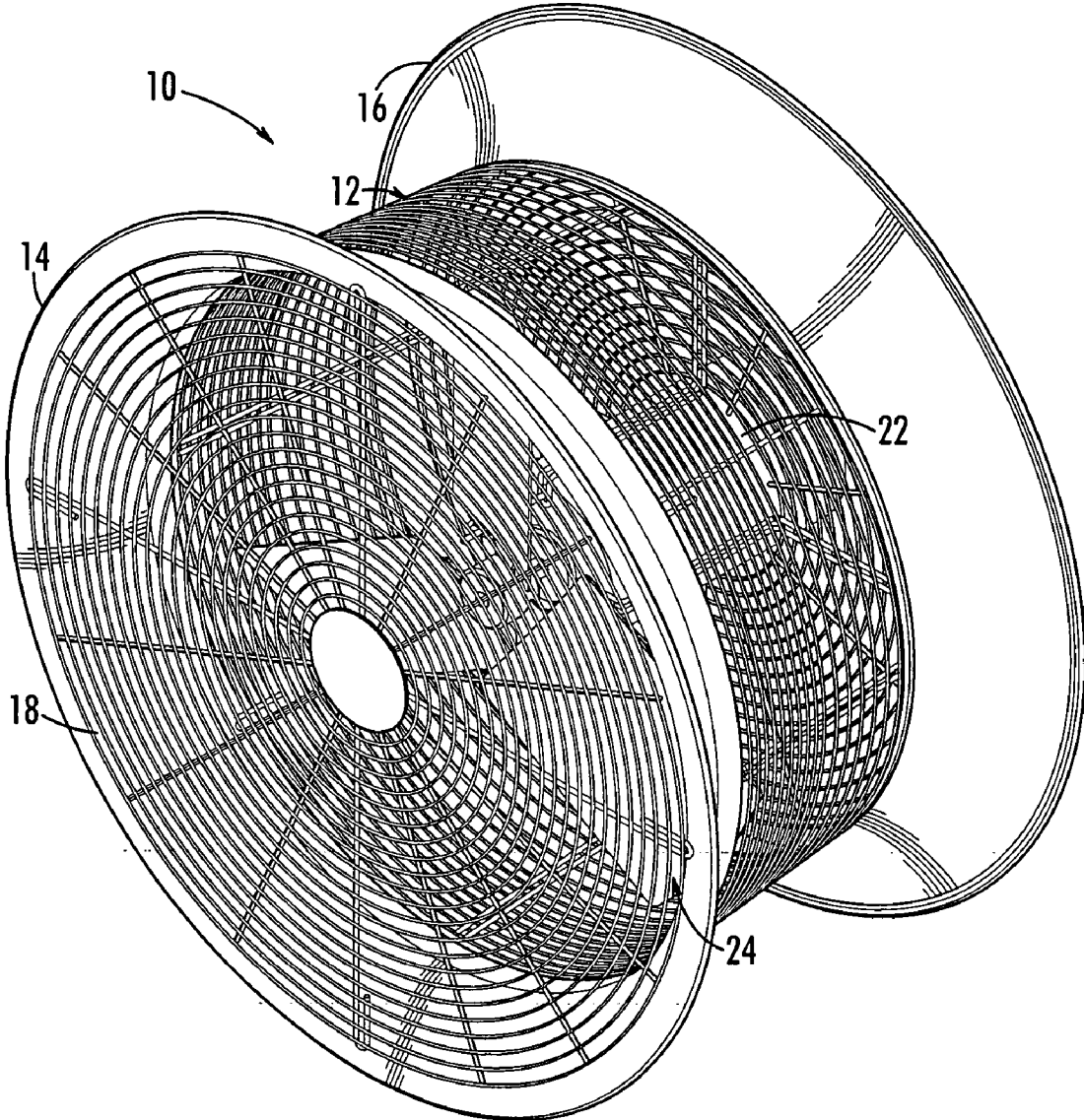
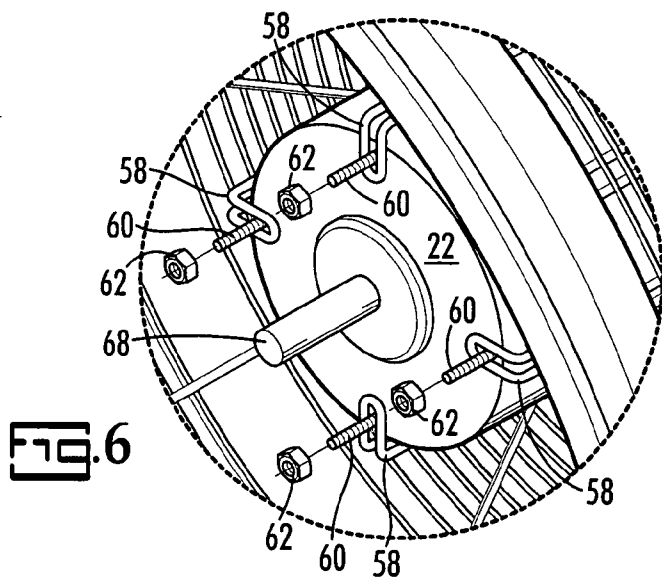
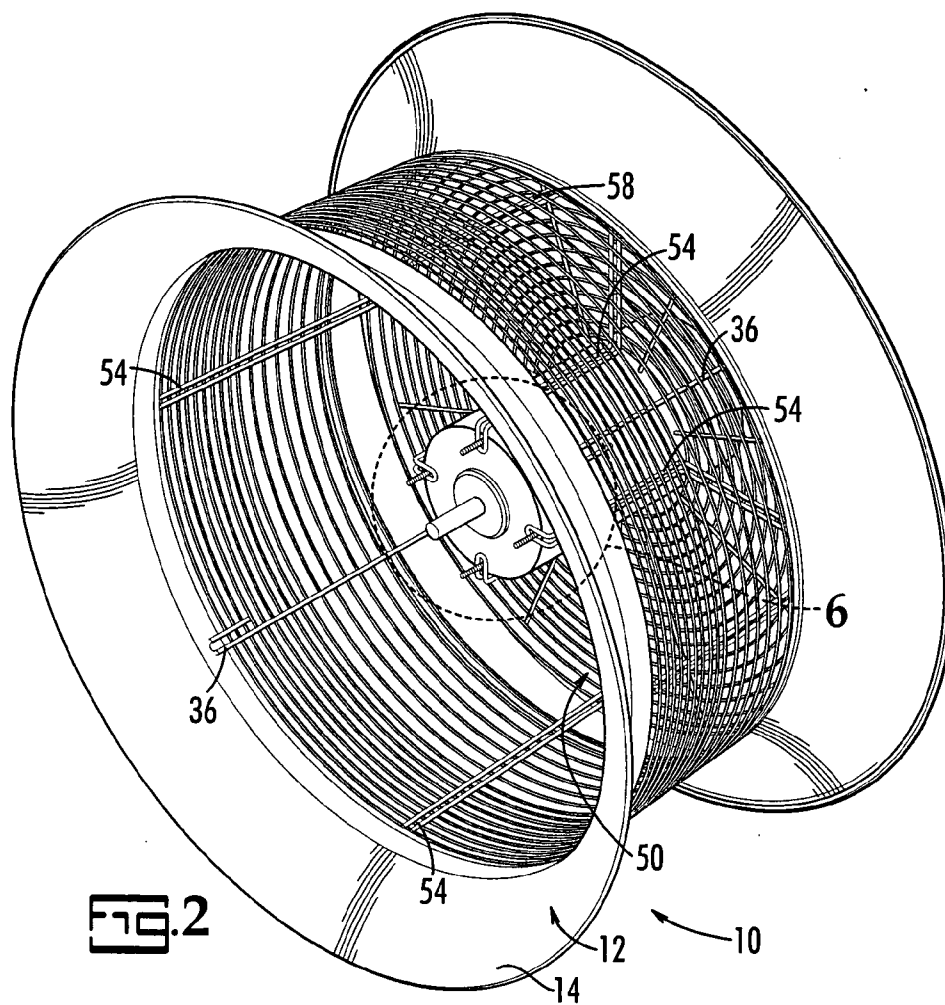


FIG. 1



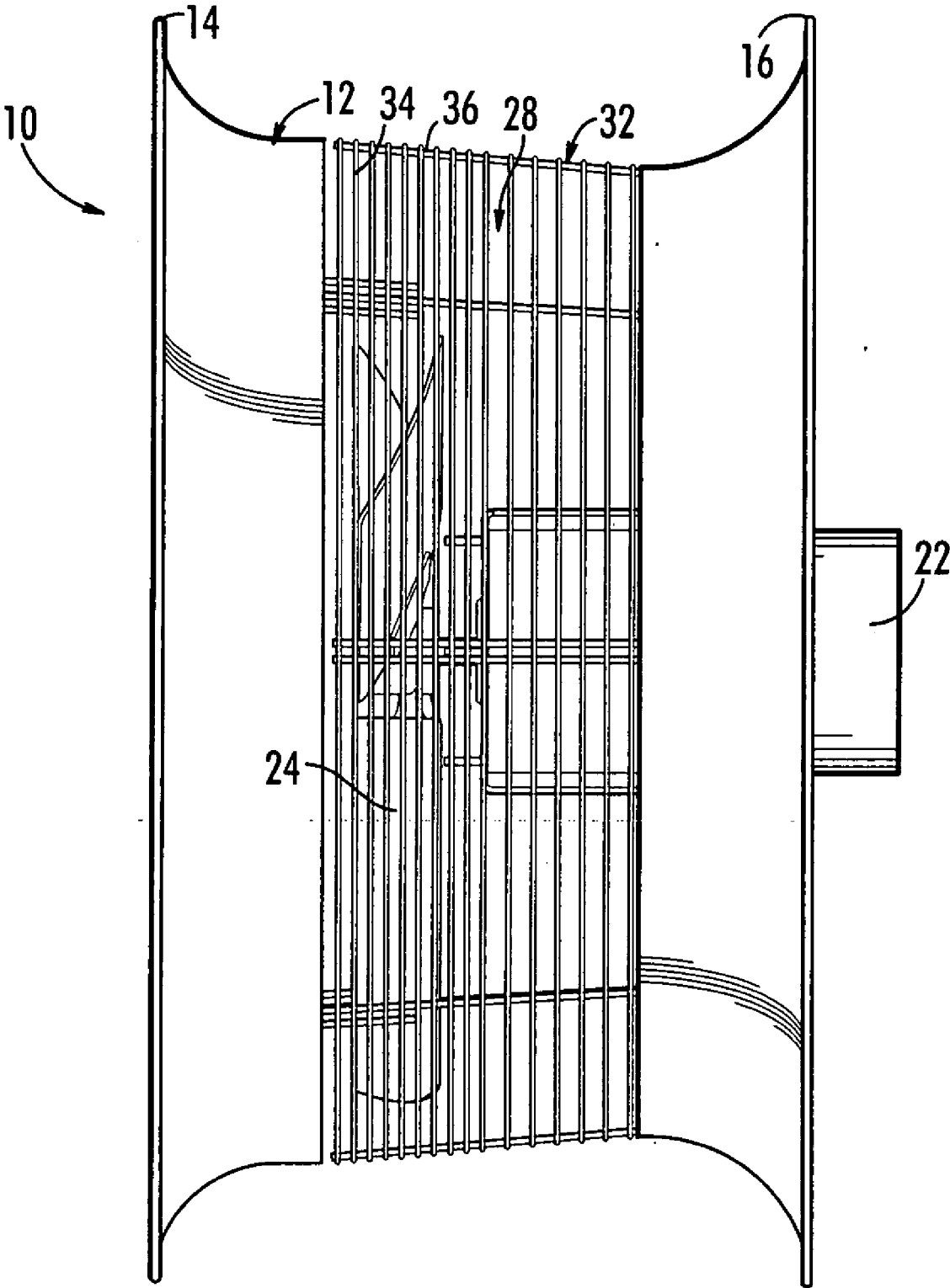


FIG. 3

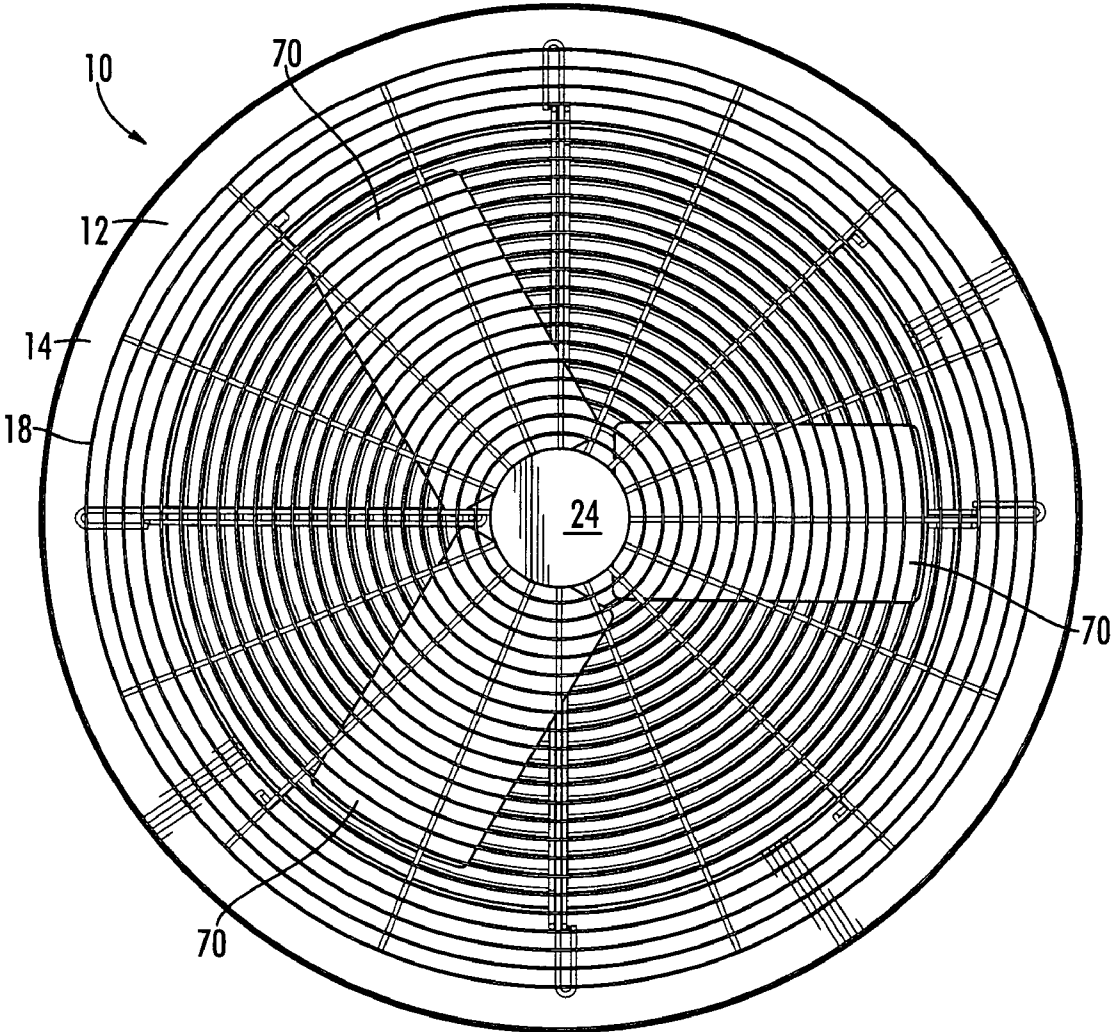


FIG. 4

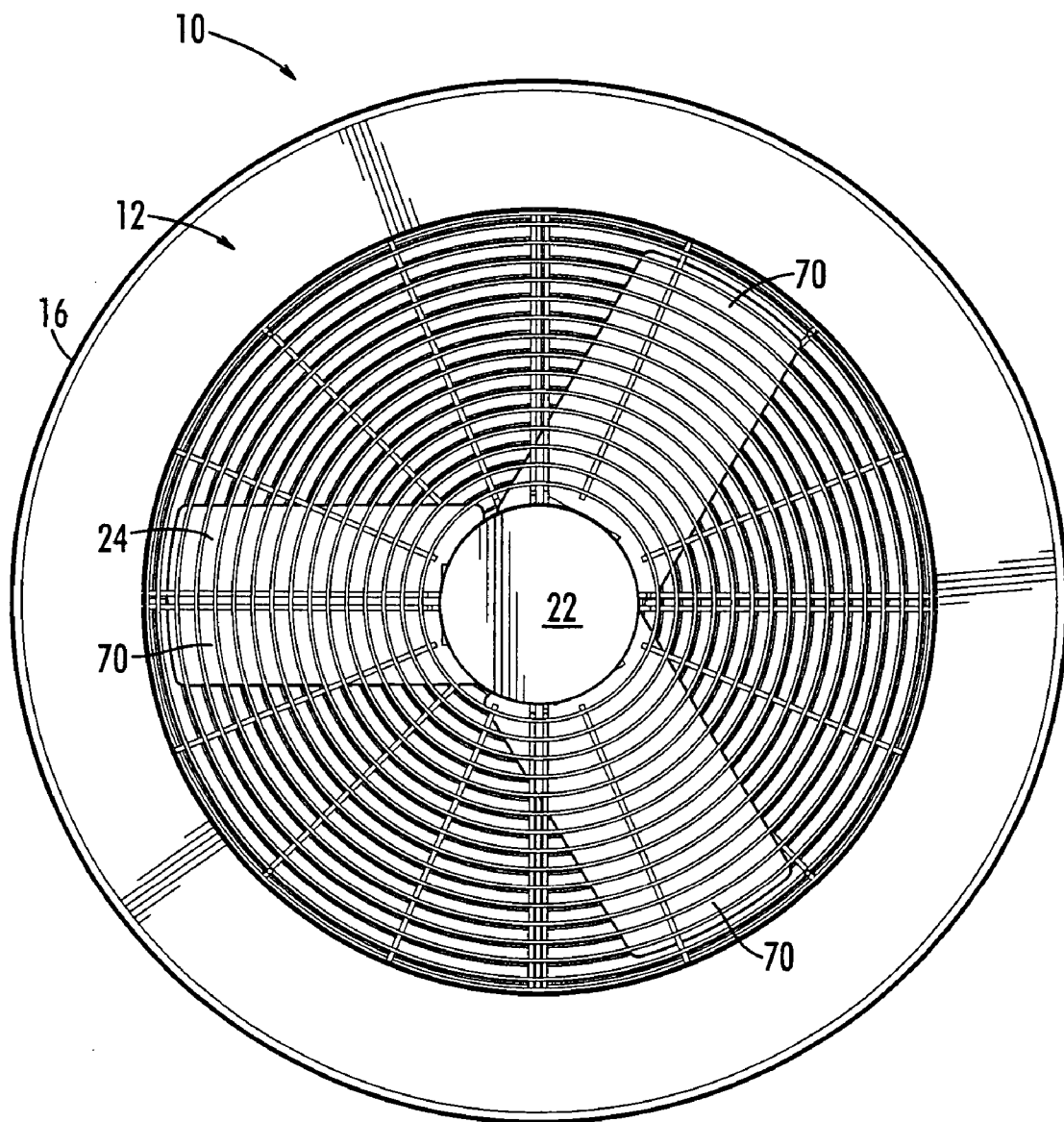


FIG. 5

VENTURI FAN

CROSS REFERENCE TO RELATED PATENTS

[0001] The present application claims priority to U.S. Provisional Application Ser. No. 60/630,113, filed Nov. 22, 2004, incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] The present invention relates to fans generally, and to fans used in industrial and commercial settings in particular.

[0003] The purpose of a fan is move air in order to ventilate and cool an area. In industrial and commercial environments, where air conditioning may be impractical, fans are vital to employees' health and comfort.

[0004] There are several types of fans used in commercial and industrial environments. One type includes a fan blade enclosed within a wire frame housing or "cage", sometimes mounted on a pedestal. The shaft of a motor outside the housing may project into the housing to turn the blades. These fans work fine in smaller quarters. Increasing the speed of the motor and the pitch of the blade allows this type of fan to throw more air, but increases noise. Another type of fan is a venturi fan that has a metal, venturi-shaped housing with a motor and a set of blades mounted therein. The set of blades is rotated by the motor and thus accelerates air through the housing. These fans move a large volume of air and project it over large distances, which fact is especially important in large industrial buildings such as distribution centers, but they are relatively noisy.

[0005] Thus there remains a need for improvements in fans, particularly high volume industrial and commercial fans such as venturi fans.

SUMMARY OF THE INVENTION

[0006] According to its major aspects and briefly recited, the present invention is a venturi fan capable of producing a significant, directed flow of air but with significantly reduced noise compared to prior art venturi fans. The present fan has a body comprised of a generally cylindrical wire basket for carrying a motor and fan blade assembly, and a flared intake carried at the rear of the wire basket. Preferably, the front of the basket carries an exit channel, which may also have a flare but is otherwise preferably substantially cylindrical in shape. The rear-flared intake allows for a smooth feed of air into the basket and past the motor and the air-accelerating fan blade assembly. The wire basket, in a preferred embodiment, acts as a conduit for the flow-path air but also admits additional air into the flow path and channels the flow of air produced by the fan while allowing fan noise to dissipate through the sides. The basket also avoids generation of some fan noise and is a safety feature, preventing injury in its role as both the side and rear finger guard.

[0007] An important feature of the present invention is the relatively open sides of the present fan, compared to prior art venturi fans. The relatively open sides contribute significantly and in a number of ways to noise reduction, chiefly by allowing noise to escape, while not significantly degrading the flow of air. Indeed, the openness of the sides increases the amount of air available to the fan.

[0008] Additionally, the combination of the rear flare intake and the wire basket is a significant feature of the present invention. This combination allows the flow of air generated by the fan blade assembly to be created and directed significant distances with little diffusion.

[0009] The use of the wire basket to support the motor and fan blade assembly is yet another important feature of the present invention. This arrangement reduces material, weight and obstructions to air flow while providing a sufficiently sturdy securement for the motor and fan blade assembly.

[0010] These and other features and their advantages will be apparent to those skilled in the art of fan design from a careful reading of the Detailed Description of Preferred Embodiments accompanied by the following drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0011] In the drawings,

[0012] **FIG. 1** is a perspective view of a fan, according to a preferred embodiment of the present invention;

[0013] **FIG. 2** is a side view of the fan of **FIG. 1**, according to a preferred embodiment of the present invention;

[0014] **FIG. 3** is a front view of the fan of **FIG. 1**;

[0015] **FIG. 4** is a rear view of the Fan of **FIG. 1**;

[0016] **FIG. 5** is a perspective view of the Fan of **FIG. 1** with the front finger guard and fan blade assembly removed to show the mounting of the motor; and

[0017] **FIG. 6** is a detailed view of the interior of the fan of **FIG. 2** showing the manner in which the motor is mounted, according to a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0018] The present invention is an improvement in venturi-style fans. Venturi fans direct a significant quantity of air in a forward direction and are suitable for large buildings such as warehouses. Unfortunately, prior art venturi fans are relatively noisy.

[0019] **FIG. 1** illustrates in perspective the present venturi fan **10**. Fan **10** has a housing **12** that is flared on both the front **14** and the rear **16**, and has a front finger guard **18**. Inside housing **12** is a motor **22** and a fan blade assembly **24**.

[0020] Referring now to **FIG. 2**, there is illustrated a side view of venturi fan **10** according to a preferred embodiment of the present invention. Fan **10** is rotationally symmetric so it appears the same from all sides. Unlike prior art venturi fans, venturi fan **10**, shown in **FIGS. 1-6** in its preferred embodiment, has an opening formed in the side wall **28**, preferably a multiplicity of openings such as perforations or an array of slots, but, most preferably, a multiplicity of openings formed by spacing wires **34**, either by constructing a cage or basket **32**, as shown. Basket **32** is illustrated as made from circular wires **34** secured at the desired intervals with cross supports **36**, also made of wire, or, alternatively, by forming a single helical wire secured with cross supports

to maintain the desired spacing of each turn of the helical wire. Spacing between adjacent wires is in part dictated by safety requirements imposed by authorities, by the requisite strength required for fan 10, by the function of fan 10 to serve as an airflow conduit but otherwise fan 10 is preferably open on side 26 to the greatest extent possible.

[0021] Safety requirements relate to the size of the openings between wires 34 that, when properly set, the likelihood that someone will inadvertently stick fingers into the interior of basket 32 in the vicinity of fan blade assembly 40 is minimized. Consequently, the spacing will take into account the age of those likely to come into contact with fan 10 and the proximity of fan blade assembly 24 to basket 32. Thus, the spacing will be wider if wires 34 are farther from fan blade assembly 24 and narrower closer to fan blade assembly 24, and can include both spacings in the same basket 32, as best seen in FIG. 2.

[0022] Basket 32 must also be rigid enough to support fan blade assembly 24, a motor 22 and a rear flare 16. Rear flare 16 is the solid portion of housing 12. The term “flare” simply means that the cross sectional area taken at right angles with respect to the direction of air flow increases toward the end of housing 12, as in the flare of a trumpet. Optionally, front flare 14 is added to fan 10 to give the present fan 10 a symmetric, finished look. Front flare 14 includes an optional front finger guard 18, best seen in FIG. 3. Basket 32 is made to be basket-shaped so that its rear portion 50 contiguous with side wall 28 and best seen in FIG. 5, acts as a finger guard for the rear of fan 10.

[0023] Rear flare 16 helps to control the flow of air into fan 10 is because it minimizes turbulence and increases laminar flow. Rear flare 16 is significant from an airflow standpoint; front flare 14 is much less so and is essentially an optional feature of the invention, provided essentially for appearances.

[0024] In addition to acting as a rear finger guard, rear portion 50 provides a surface on which motor 22 can be mounted. Rear portion 50 has a central opening through which motor 22 is partially inserted. Brackets 54, that run along the side of basket 32 across rear portion 50 and thence into the interior of basket 32 where they form loops 58 and then return, are used to support motor 22. Threaded posts 60 on the front of motor 22 extend through loops 58. Nuts 62 are then threaded to posts 60 to secure motor 22 to brackets 54.

[0025] Motor 42 has a central shaft 68 to which fan blade assembly 40 is attached. Blade assembly may have three or more paddle blades 70.

[0026] The present fan 10 is much quieter than prior art venturi fans. While not wishing to be bound by theory, it is believed that this result has been achieved by a number of different factors working in combination. First, although fan 10 controls and directs airflow in much the same way as a prior art venturi fan, sound now can disperse over a greater angle because side wall 28 of fan 10 is open and is not channeled with the airflow. Second, in the prior art venturi fan, the tips of its blade assembly normally pass closer to the housing than in the present fan 10 and the turbulence that arises sets up vibrations in the solid housing. Those vibrations are reflected throughout the housing and may resonate. Turbulence is reduced in the present fan 10. Indeed, the tips

of fan blade assembly 24 are farther from wires 34 at least for safety reasons alone, and are no longer as starved for air, as air is admitted freely through side wall 28 between wires 34. Furthermore, vibrations created by the movement of fan blade assembly 24 in the vicinity of wires 34 are weaker and less easily reflected by wires 34. The prior art side wall mounted bracket has been removed in favor of mounting motor 22 directly onto rear portion 50, thus eliminating a structure on the interior of the fan that causes additional turbulence and noise. It is believed that these changes result in less noise and “whiter” noise, that is, noise spread more evenly over the audible frequency spectrum.

[0027] The shapes of the front and rear flares 14, 16 may be the same and may be symmetrical with respect to each other, but may alternatively be different if desired for packaging efficiency. For example, rear flare 16 may have a smaller diameter where it fits onto basket 32 than front flare 14 in order that basket 32 may have a slightly frustoconical shape, as shown best in FIG. 2, so that it nests better with other baskets 32 in shipping or storing.

[0028] Many modifications and substitutions will be apparent to those skilled in the art of fan manufacture from the foregoing description of the preferred embodiments without departing from the spirit or scope of the present invention. It is intended that the scope of the present invention include all modifications that incorporate its principal design features, and that the scope and limitations of the present invention are to be determined by the appended claims.

What is claimed is:

1. A fan, comprising:
 - a motor having a shaft;
 - a fan blade assembly carried by said shaft and rotatable therewith when said motor is operating, said fan blade assembly forming a flow of air when rotating; and
 - a housing having
 - a rear flare,
 - a side wall having at least one hole formed therein to admit air through said side wall to join said flow of air when said fan blade assembly rotates, and
 - a rear portion for carrying said motor.
2. The fan as recited in claim 1, wherein said at least one hole is a multiplicity of holes.
3. The fan as recited in claim 1, wherein said side wall is formed of spaced apart wires.
4. The fan as recited in claim 1, wherein said side wall and said rear portion are formed of a wire basket.
5. The fan as recited in claim 1, wherein said side wall is formed of a helical wire having plural turns, each turn of said plural turns being spaced apart from adjacent turns of said helical wire
6. The fan as recited in claim 1, wherein said side wall is frustoconically shaped.
7. The fan as recited in claim 4, wherein said wire basket is frustoconically shaped.
8. The fan as recited in claim 1, wherein said housing carries a front finger guard.

9. The fan as recited in claim 1, wherein said rear portion surrounds said motor.

10. The fan as recited in claim 1, further comprising means carried by said rear portion for mounting said motor.

11. The fan as recited in claim 10, wherein said mounting means is a set of brackets.

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