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(54) SMOKE EXHAUSTER HAVING AN IMPROVED FAN DEVICE

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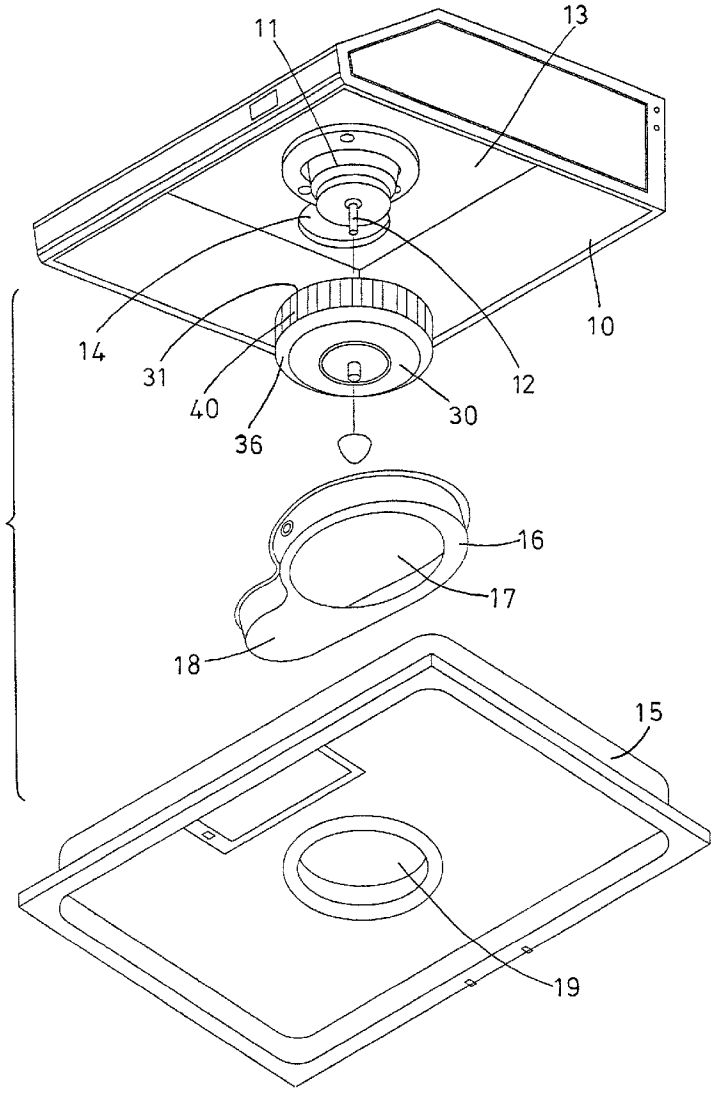
(57) **ABSTRACT**

A smoke exhauster includes a motor and a fan device attached to a housing. The fan device includes an upper and a lower plates each having an outer peripheral portion, and a number of fan blades secured between the outer peripheral portions of the upper and the lower plates for forming a chamber in the fan device. The lower plate has a bore for air to flow or to be drawn into the chamber of the fan device. The fan blades each has an inner section partially extended inward of the bore of the lower plate and has a curvature smaller than the other portion of the blade.



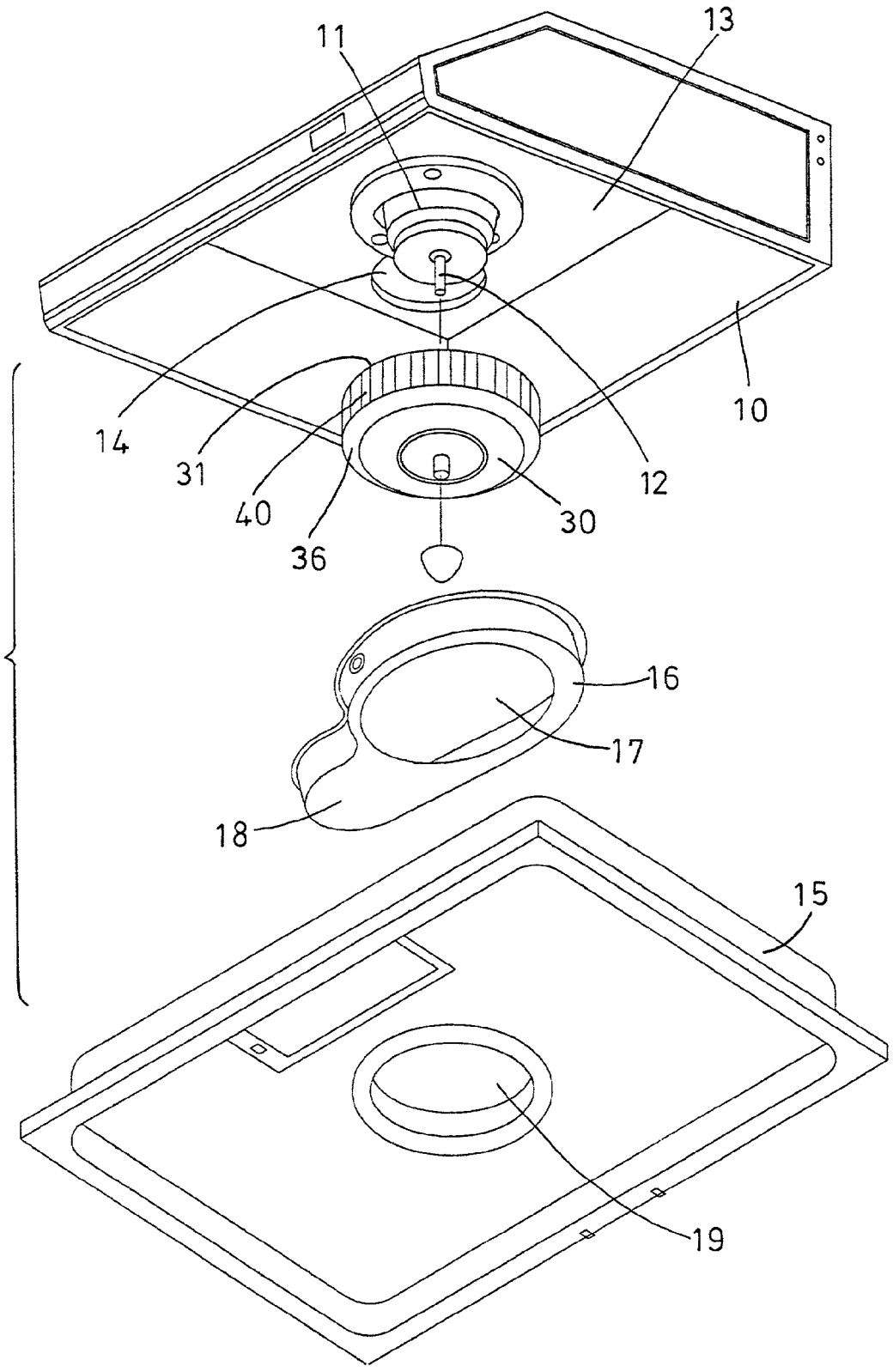


FIG. 1

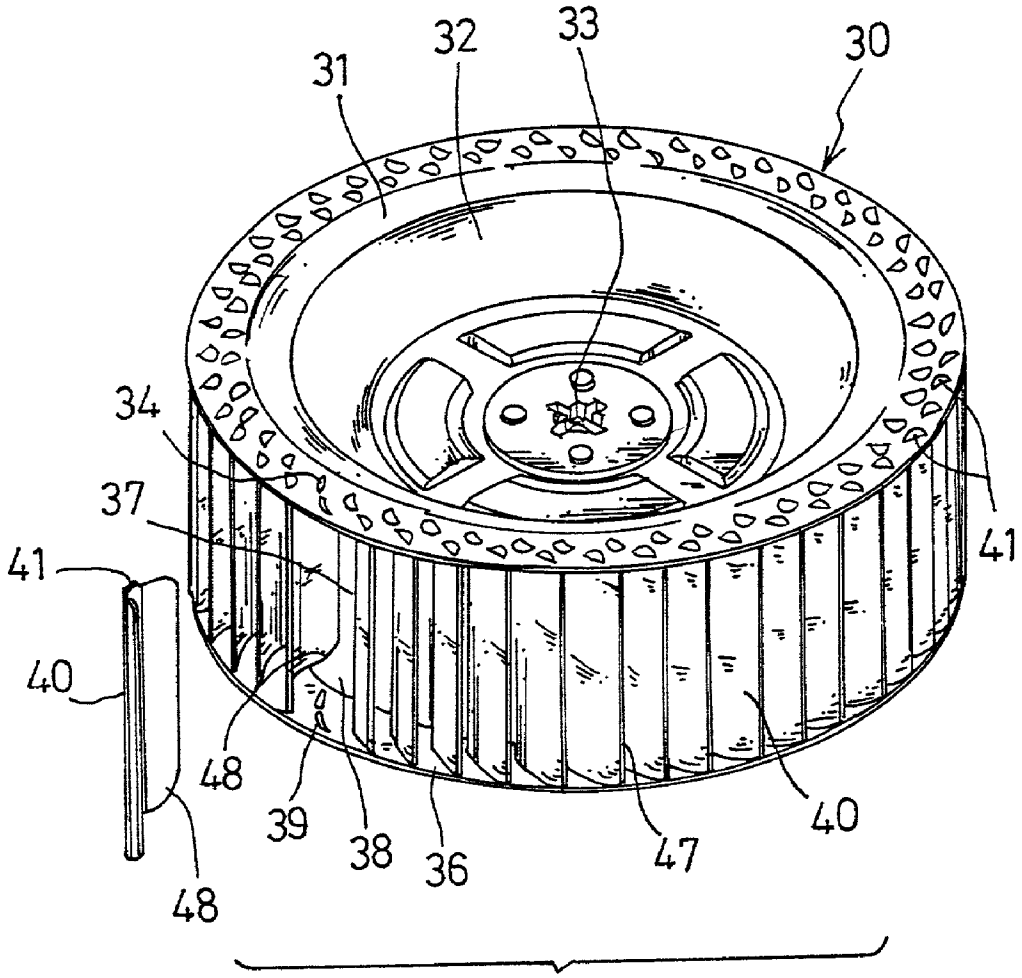


FIG. 2

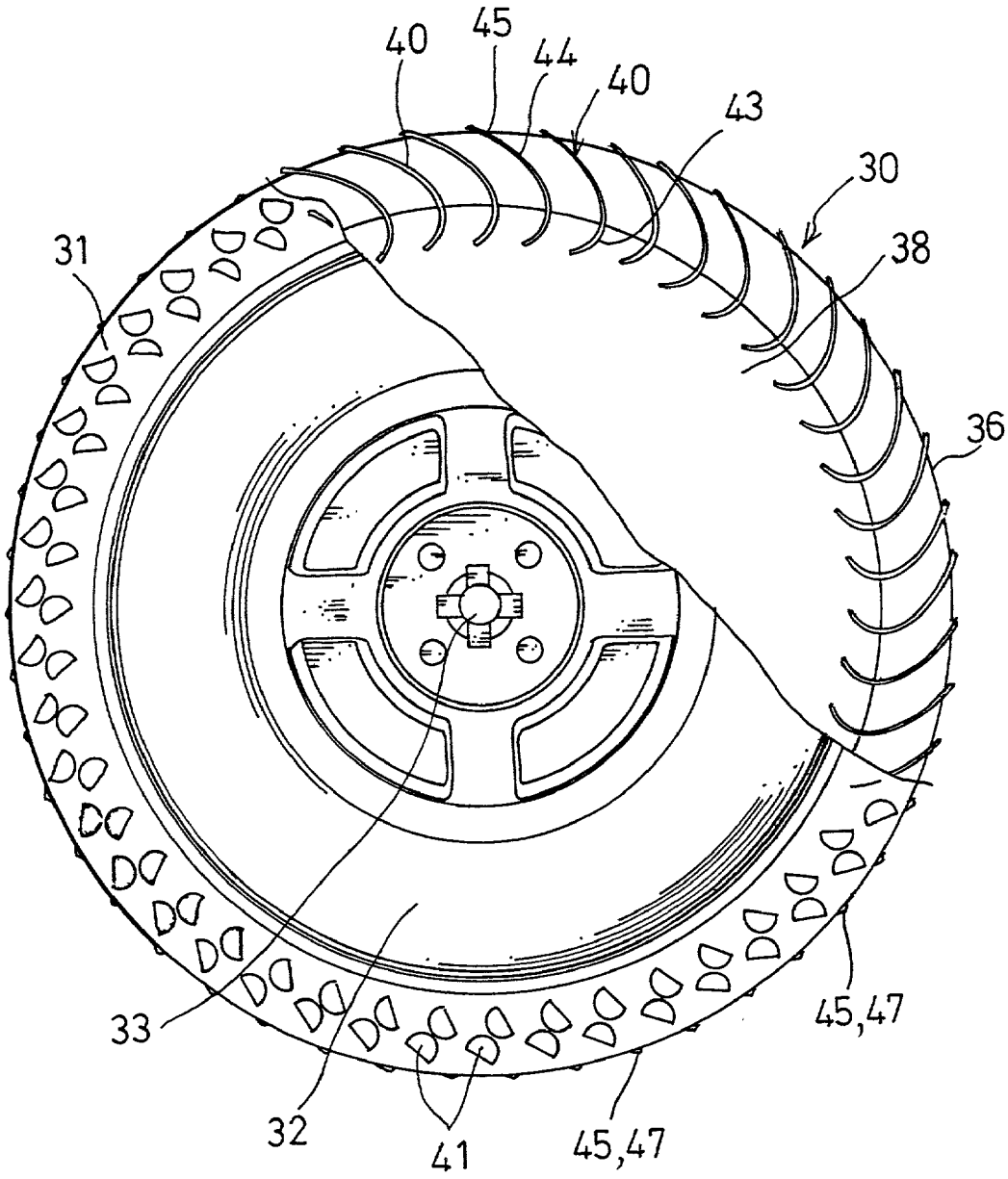


FIG. 3

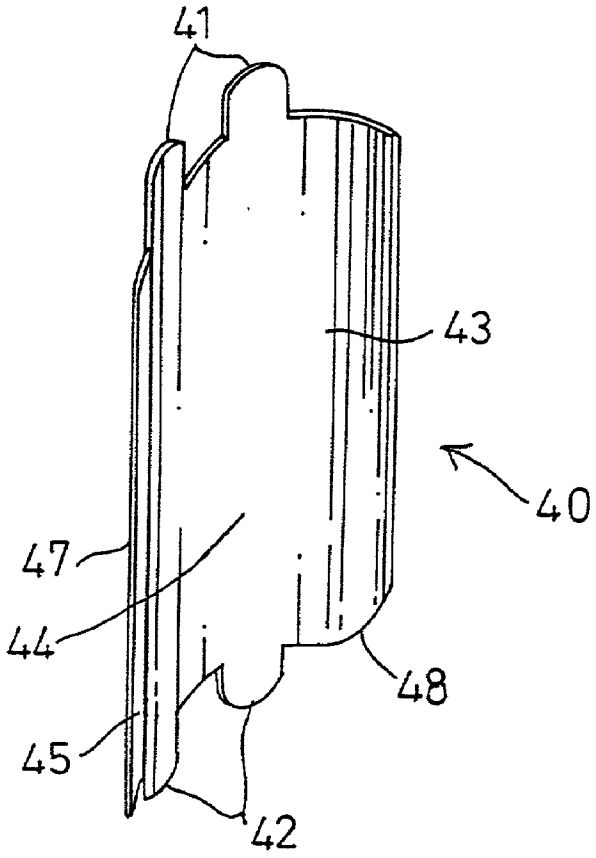


FIG. 4

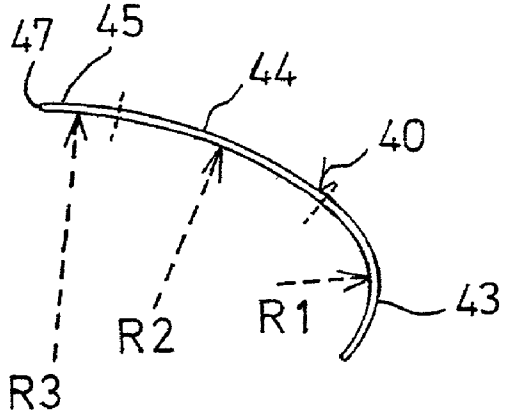


FIG. 5

SMOKE EXHAUSTER HAVING AN IMPROVED FAN DEVICE

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a smoke exhauster, and more particularly to a smoke exhauster having an improved fan device for drawing much air or for increasing the air drawing effect.

[0003] 2. Description of the Prior Art

[0004] The applicant has developed various kinds of smoke exhausters which comprise one or more centrifugal fan devices each having a fan casing and a number of radially extended fan blades directly punched or forged or extended from the fan casing. U.S. Pat. No. 5,979,436 to Chiang et al. discloses one of the typical smoke exhausters. Due to the directly punching or forming of the fan blades from the fan casing, the fan blades may only be formed with a single curvature therein and include a limited or a small area for actuating the air.

[0005] The present invention has arisen to mitigate and/or obviate the afore-described disadvantages of the conventional smoke exhausters.

SUMMARY OF THE INVENTION

[0006] The primary objective of the present invention is to provide a smoke exhauster including an improved fan device for drawing much air or for increasing the air drawing effect to the fan device.

[0007] In accordance with one aspect of the invention, there is provided a smoke exhauster comprising a housing, a motor attached to the housing, and a fan device attached to the motor and driven by the motor, the fan device including an upper plate including an outer peripheral portion, a lower plate including an outer peripheral portion and including a bore formed therein, and a plurality of fan blades secured between the outer peripheral portions of the upper and the lower plates for defining a chamber between the upper and the lower plates and the fan blades, the chamber of the fan device being communicating with the bore of the lower plate for allowing air to flow and to be drawn into the chamber of the fan device.

[0008] The upper and the lower plates each includes a plurality of slits formed in the outer peripheral portion thereof, the fan blades each includes an upper and a lower portions each having at least one ear extended therefrom and engaged through the slits of the upper and the lower plates, for securing the fan blades between the outer peripheral portions of the upper and the lower plates.

[0009] The motor includes a lower portion, the upper plate includes a recess formed therein for receiving the lower portion of the motor. The motor includes a spindle, the upper plate includes a hub secured thereto and attached to the spindle of the motor, for securing the fan device to the spindle of the motor.

[0010] The fan blades each includes a first section partially extended inward of the bore of the lower plate. The fan blades each includes a second section extended from the first section and disposed between the outer peripheral portions of the upper and the lower plates, the second section includes a curvature greater than that of the first section of the fan blade.

[0011] The fan blades each includes a third section extended from the second section and disposed between the outer peripheral portions of the upper and the lower plates, the second section includes a curvature less than that of the third section of the fan blade.

[0012] Further objectives and advantages of the present invention will become apparent from a careful reading of a detailed description provided hereinbelow, with appropriate reference to accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] **FIG. 1** is a partial exploded view of a smoke exhauster in accordance with the present invention;

[0014] **FIG. 2** is a partial exploded view of the fan device;

[0015] **FIG. 3** is a top plan view of the fan device, in which a portion of the upper plate has been cut off for showing the inner structure of the fan device;

[0016] **FIG. 4** is a perspective view of one of the fan blades; and

[0017] **FIG. 5** is a top plan view of the fan blade.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0018] Referring to the drawings, and initially to **FIG. 1**, a smoke exhauster in accordance with the present invention comprises a housing **10**, a motor **11** secured to the ceiling or the top panel **13** of the housing **10**, and a fan device **30** attached or secured to the spindle **12** of the motor **11** for being actuated or driven by the motor **11**. The top panel **13** of the housing **10** includes an orifice **14** formed therein for air circulation purposes. A casing **16** is engaged onto the fan device **30** and secured to the top panel **13** of the housing **10**, for covering or shielding the peripheral portion of the fan device **30**, and includes an opening **17** formed therein and aligned with the fan device **30** for allowing the air to be drawn into the casing **16** by the fan device **30**. The casing **16** includes a conduit **18** formed or provided therein and directed toward the orifice **14** of the housing **10** for directing the air out through the orifice **14** of the housing **10**. A board **15** is attached or secured to the bottom of the housing **10** for covering or shielding the housing **10**, and includes an aperture **19** formed therein and aligned with the opening **17** of the casing **16** for allowing the air to be drawn through the aperture **19** of the board **15** and drawing into the casing **16** by the fan device **30**.

[0019] Referring next to FIGS. **2-4**, the fan device **30** includes an upper plate **31** having a recess or a depression **32** formed in the upper portion thereof for receiving the lower portion of the motor **11**, and having a hub **33** attached thereto for receiving or for securing to the spindle **12** of the motor **11**. The upper plate **31** includes an outer peripheral portion having a number of slits **34** formed therein, particularly having a number pairs of slits **34** formed therein. A lower plate **36** is disposed below the upper plate **31** and to be secured to the upper plate **31** with a number of fan blades **40**, and for forming a chamber **37** between the upper and the lower plates **31**, **36** and the fan blades **40**. The lower plate

36 includes a bore **38** formed therein for forming or defining a circular shape to the lower plate **36**, and communicating with the chamber **37** of the fan device **30**, for allowing the air to flow and to be drawn into the chamber **37** of the fan device **30**. The lower plate **36** includes a number of slits **39** formed therein, particularly having a number pairs of slits **39** formed therein.

[**0020**] The fan blades **40** each includes an upper portion having one or more ears **41** extended upward therefrom and engaged through the slits **34** of the upper plate **31** and bent or secured to the upper plate **31**, for securing the fan blades **40** to the upper plate **31**. The fan blades **40** each includes a lower portion having one or more ears **42** extended downward therefrom and engaged through the slits **39** of the lower plate **36** and bent or secured to the lower plate **36**, for securing the fan blades **40** to the lower plate **36**. The fan blades **40** may thus be solidly secured between the outer peripheral portions of the upper and the lower plates **31**, **36**.

[**0021**] As best shown in **FIGS. 3 and 5**, the fan blades **40** each includes a first or an inner section **43** having a portion extended inward of the bore **38** of the lower plate **36**; a second or an intermediate section **44** extended from the inner section **43** and disposed between the upper and the lower plates **31**, **36**; and a third or an outer section **45** disposed between the upper and the lower plates **31**, **36**, or having the tip portion of the outer edge **47** slightly extended radially outward of the upper and the lower plates **31**, **36**, best shown in **FIG. 3**. The portion of the inner section **43** of the fan blade **40** that extends inward of the bore **38** of the lower plate **36** may be used for scooping the air in the chamber **37** of the fan device **30**.

[**0022**] As best shown in **FIG. 5**, the inner section **43** of the fan blade **40** includes a curvature or a semidiameter R1 preferably less than the curvature or the semidiameter R2 of the intermediate section **44**, for increasing the air scooping effect of the fan blades **40** and the air drawing effect of the fan device **30**. The curvature or the semidiameter R2 of the intermediate section **44** is preferably less than the curvature or the semidiameter R3 of the outer section **45**. As shown in **FIGS. 2 and 4**, the inner sections **43** of the fan blades **40** each includes a rounded lower corner **48** for reducing the eddy current and for reducing the noise while the fan device **30** is actuated or energized.

[**0023**] As shown in **FIG. 1**, the smoke exhauster is shown and illustrated to include a single fan device **30** attached to the housing **10** and driven by one motor **11**. Certainly, the smoke exhauster may also include two or more fan devices **30** attached to the housing **10** and each driven by one motor **11**.

[**0024**] Accordingly, the smoke exhauster in accordance with the present invention includes an improved fan device for drawing much air or for increasing the air drawing effect to the fan device.

[**0025**] Although this invention has been described with a certain degree of particularity, it is to be understood that the present disclosure has been made by way of example only and that numerous changes in the detailed construction and the combination and arrangement of parts may be resorted to without departing from the spirit and scope of the invention as hereinafter claimed.

I claim:

1. A smoke exhauster comprising:

a) a housing,

b) a motor attached to said housing, and

c) a fan device attached to said motor and driven by said motor, said fan device including:

i) an upper plate including an outer peripheral portion,

ii) a lower plate including an outer peripheral portion and including a bore formed therein, and

iii) a plurality of fan blades secured between said outer peripheral portions of said upper and said lower plates for defining a chamber between said upper and said lower plates and said fan blades, said chamber of said fan device being communicating with said bore of said lower plate for allowing air to flow and to be drawn into said chamber of said fan device.

2. The smoke exhauster according to claim 1, wherein said upper and said lower plates each includes a plurality of slits formed in said outer peripheral portion thereof, said fan blades each includes an upper and a lower portions each having at least one ear extended therefrom and engaged through said slits of said upper and said lower plates, for securing said fan blades between said outer peripheral portions of said upper and said lower plates.

3. The smoke exhauster according to claim 1, wherein said motor includes a lower portion, said upper plate includes a recess formed therein for receiving said lower portion of said motor.

4. The smoke exhauster according to claim 1, wherein said motor includes a spindle, said upper plate includes a hub secured thereto and attached to said spindle of said motor, for securing said fan device to said spindle of said motor.

5. The smoke exhauster according to claim 1, wherein said fan blades each includes a first section partially extended inward of said bore of said lower plate.

6. The smoke exhauster according to claim 5, wherein said fan blades each includes a second section extended from said first section and disposed between said outer peripheral portions of said upper and said lower plates, said second section includes a curvature greater than that of said first section of said fan blade.

7. The smoke exhauster according to claim 6, wherein said fan blades each includes a third section extended from said second section and disposed between said outer peripheral portions of said upper and said lower plates, said second section includes a curvature less than that of said third section of said fan blade.

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