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(54) HAIR DRYER

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(57) **ABSTRACT**

A hair dryer provides a multi-stage air current feed device to accelerate the flow velocity of the air current in the hair dryer such that the motor and the fans may generate least noise while the hair dryer is in operation. In addition to multiple stages of the air current feed device, a further added acceleration can be performed by way of applying the Bernoulli's law and the Venturi. Furthermore, a conventional hair dryer also can reduce the noise thereof without lower down the original high flow velocity and the flow rate thereof by way of applying the Bernoulli's law and the Venturi.

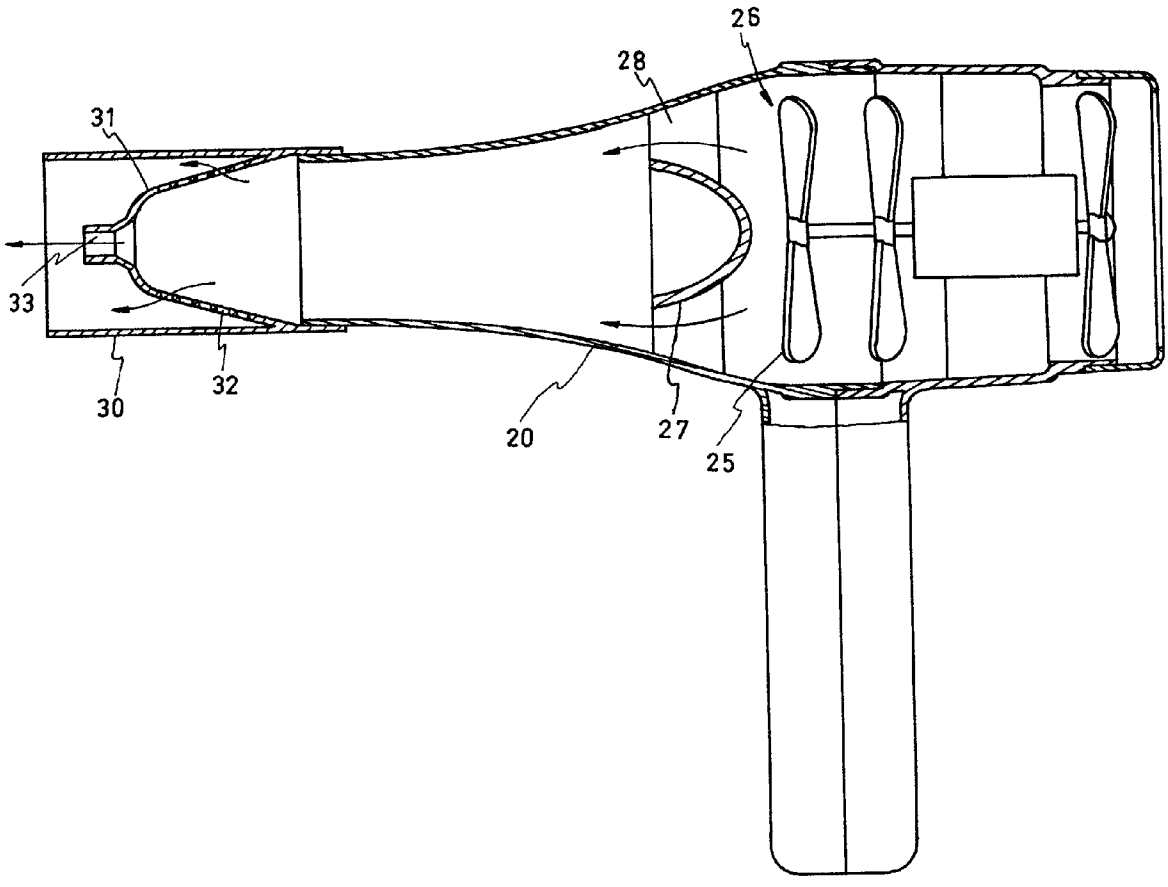


FIG. 1
(PRIOR ART)

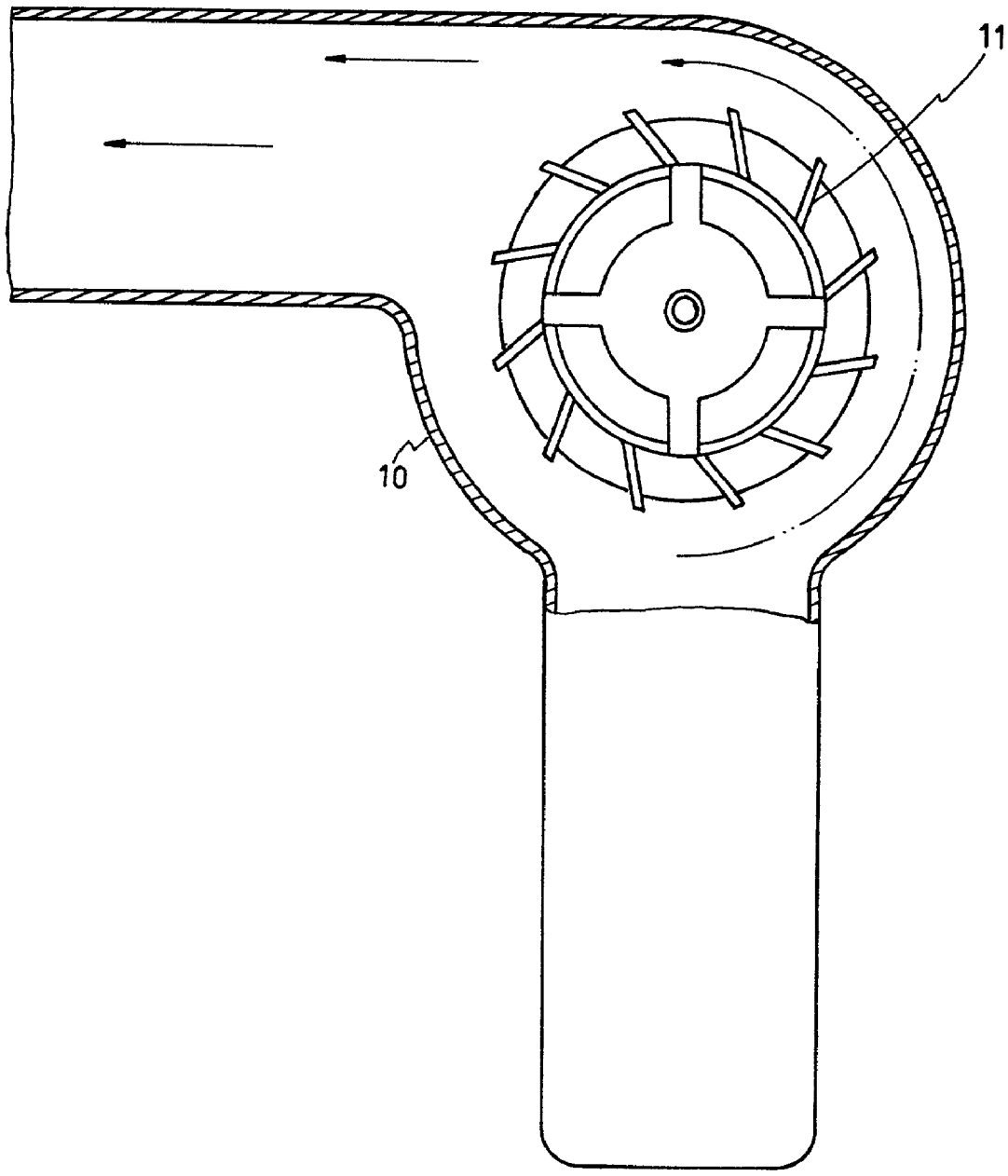
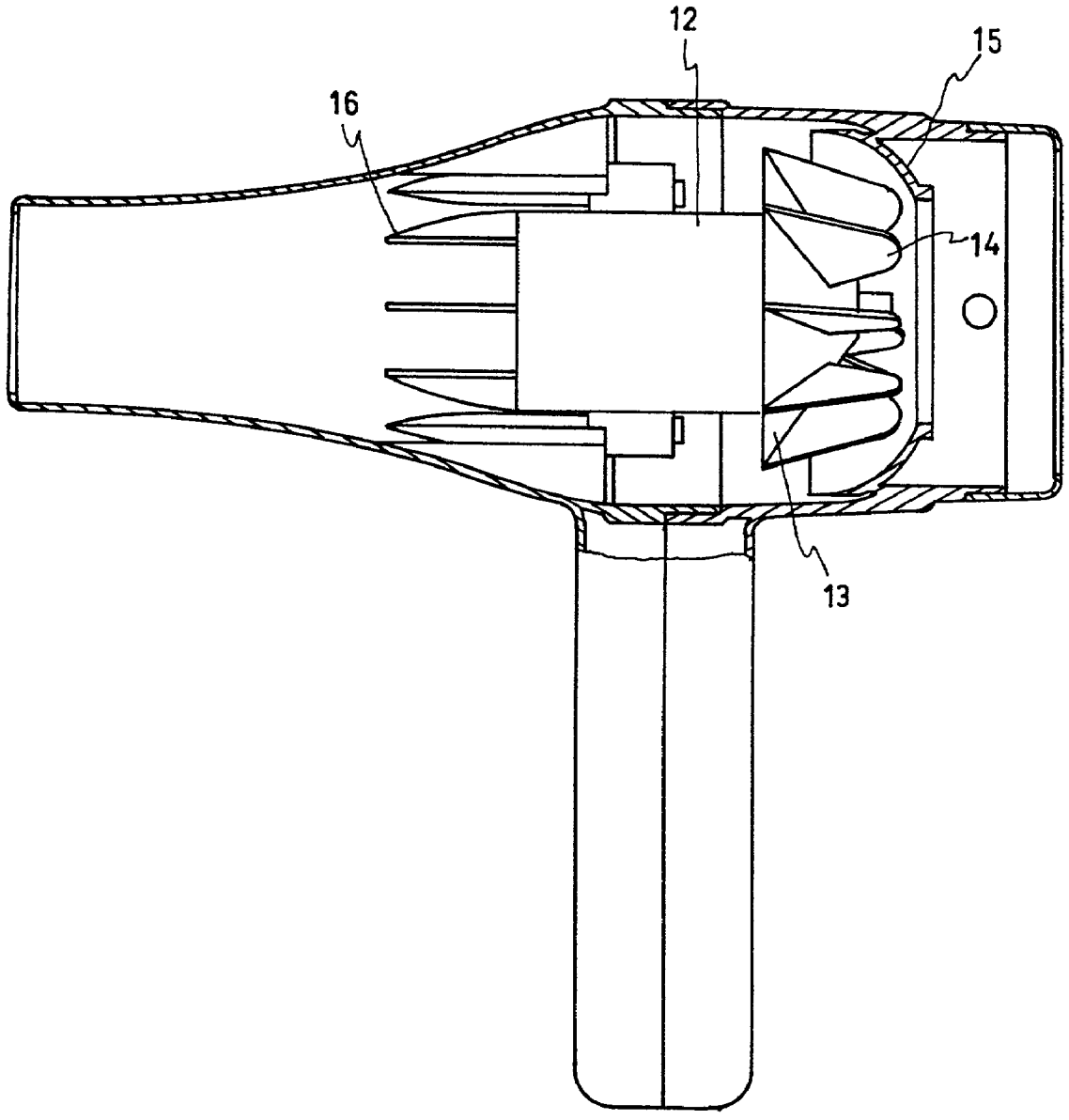


FIG. 2

(PRIOR ART)



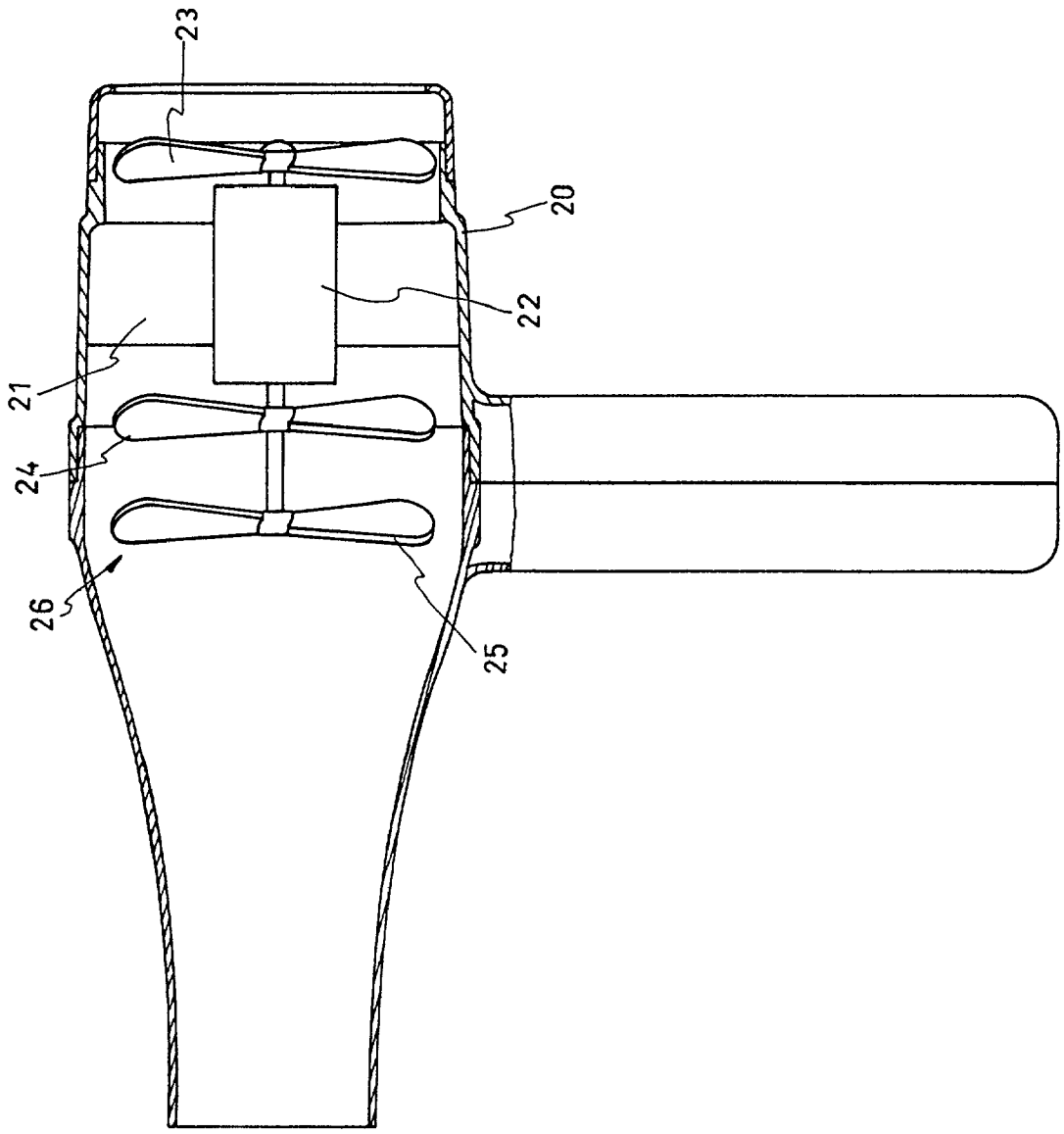


FIG. 3

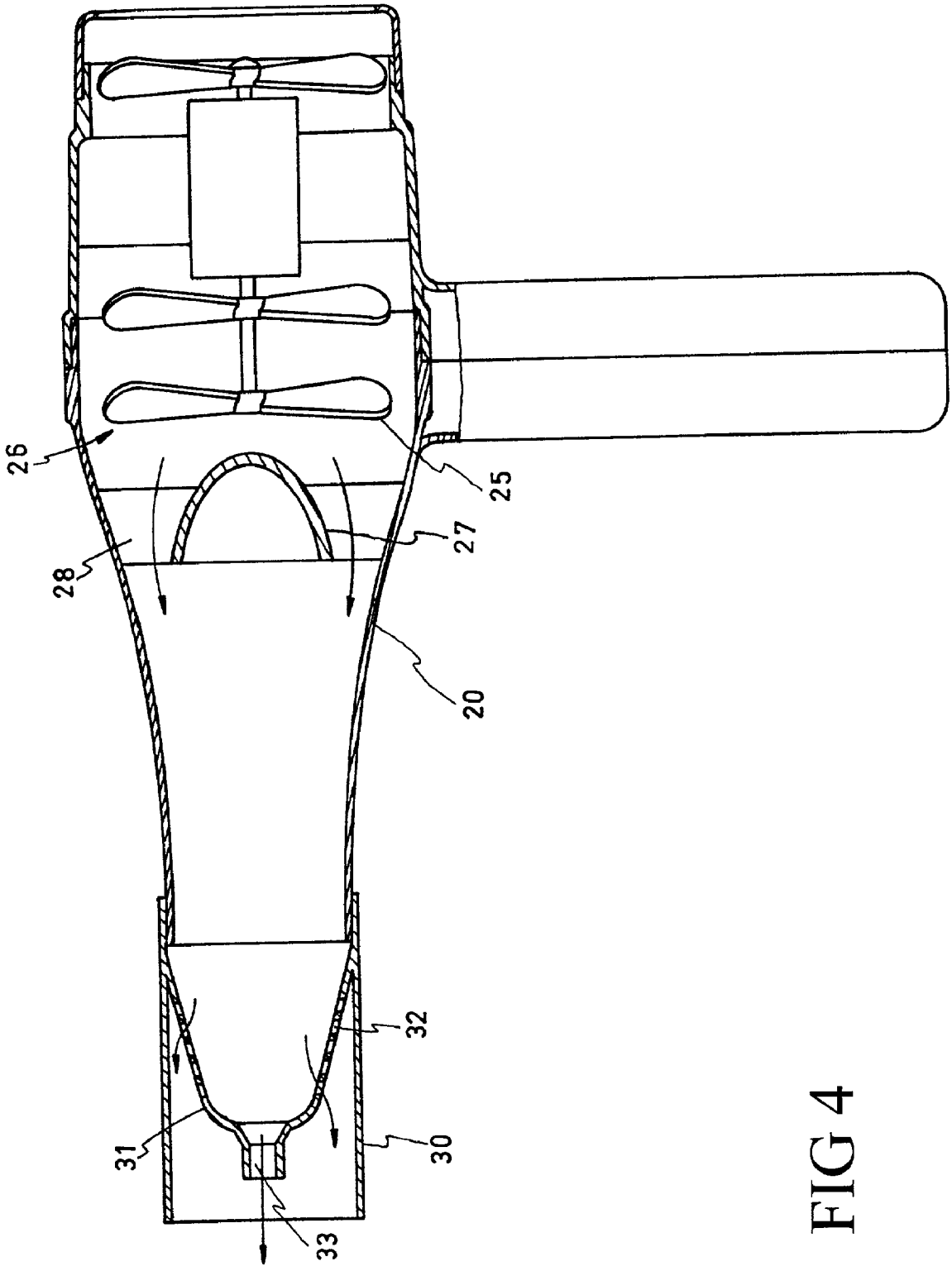


FIG 4

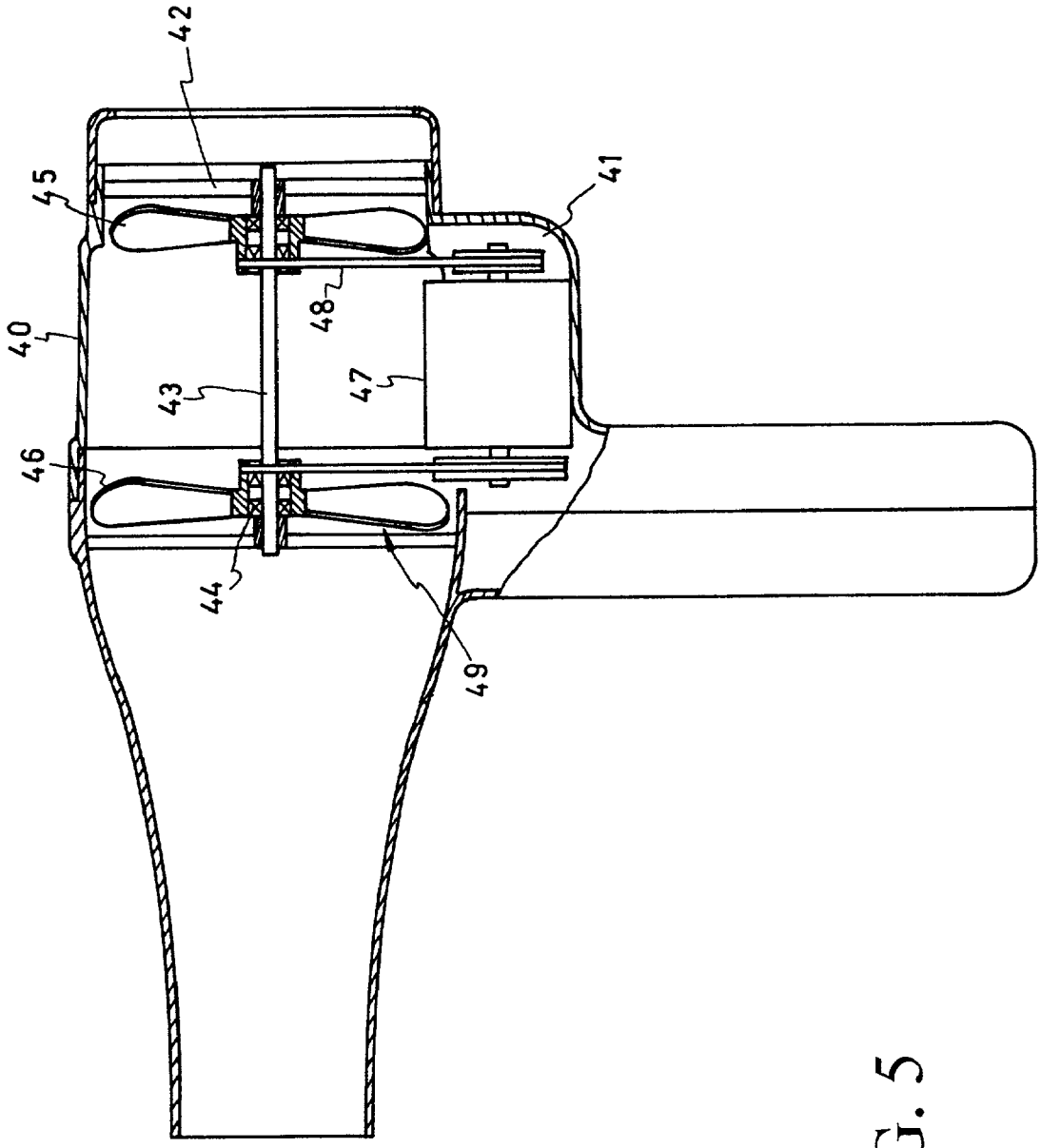


FIG. 5

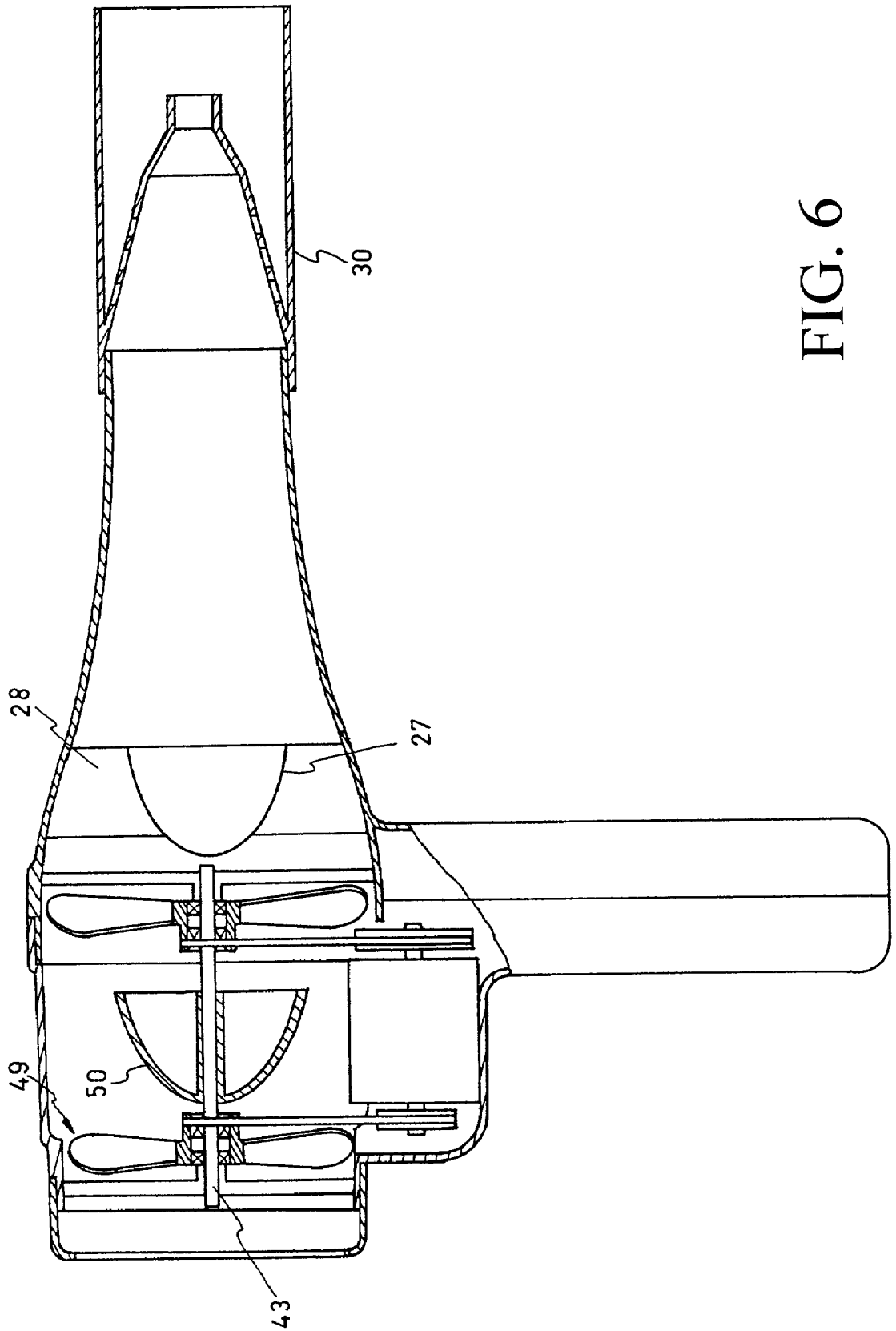
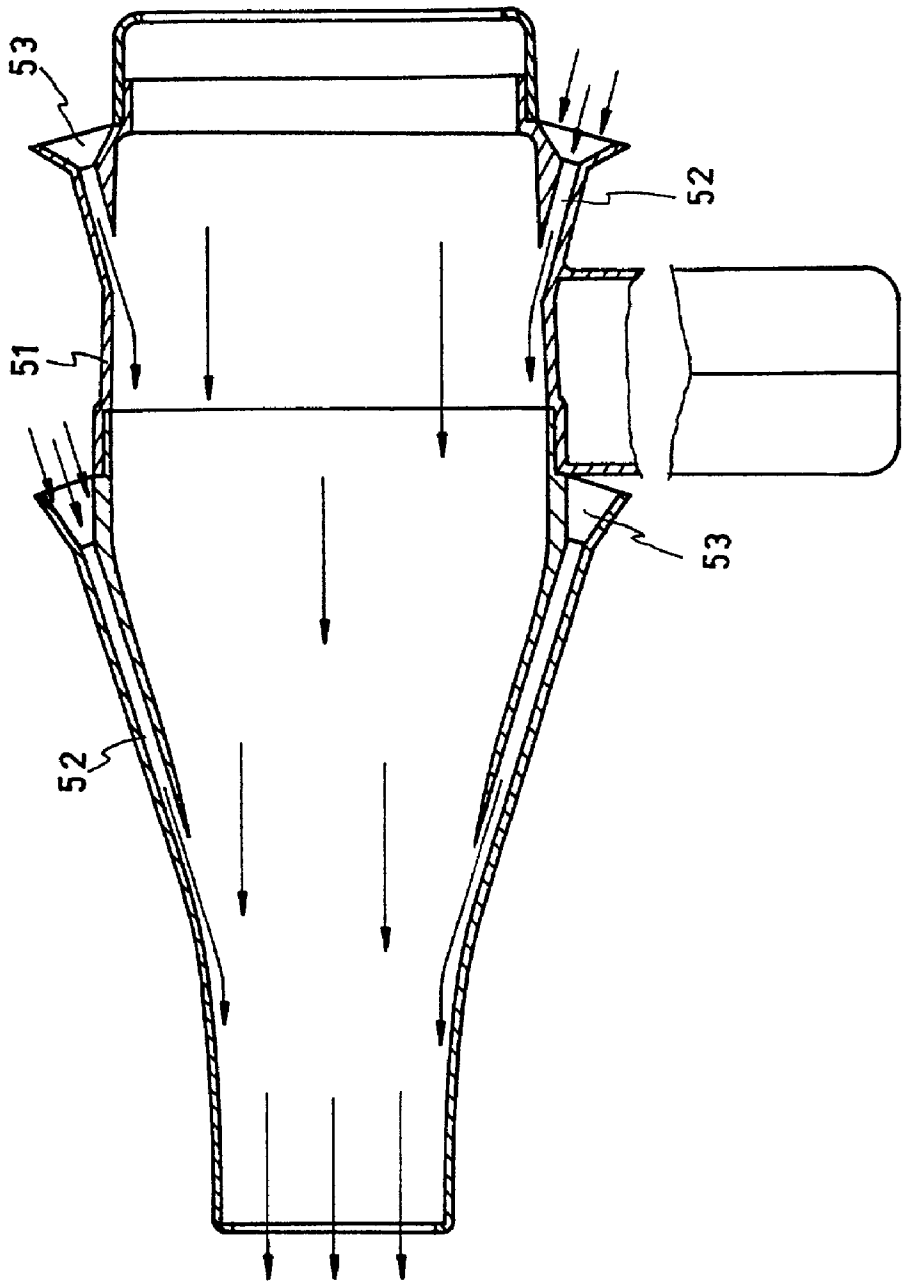


FIG. 6

FIG. 7



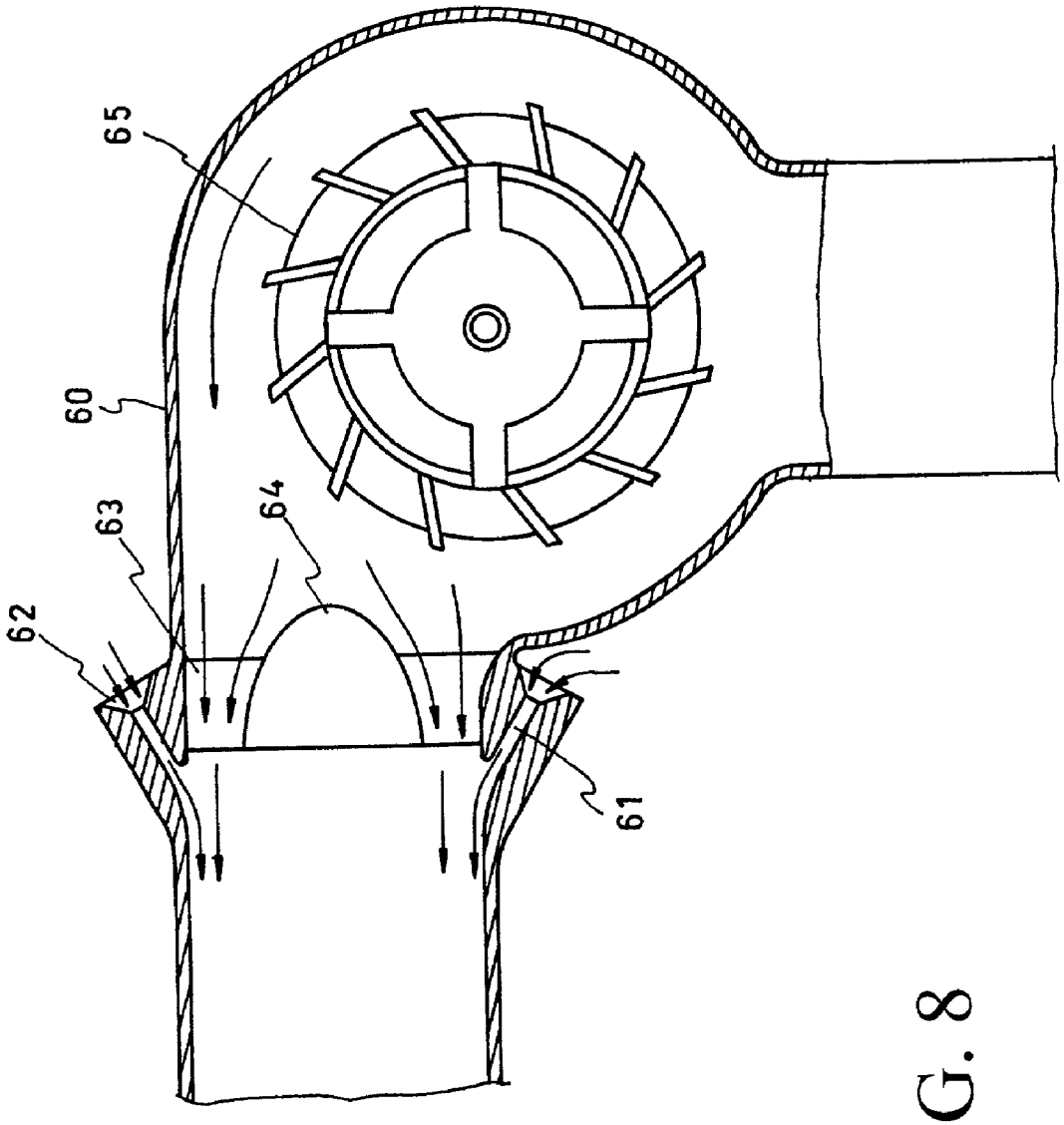
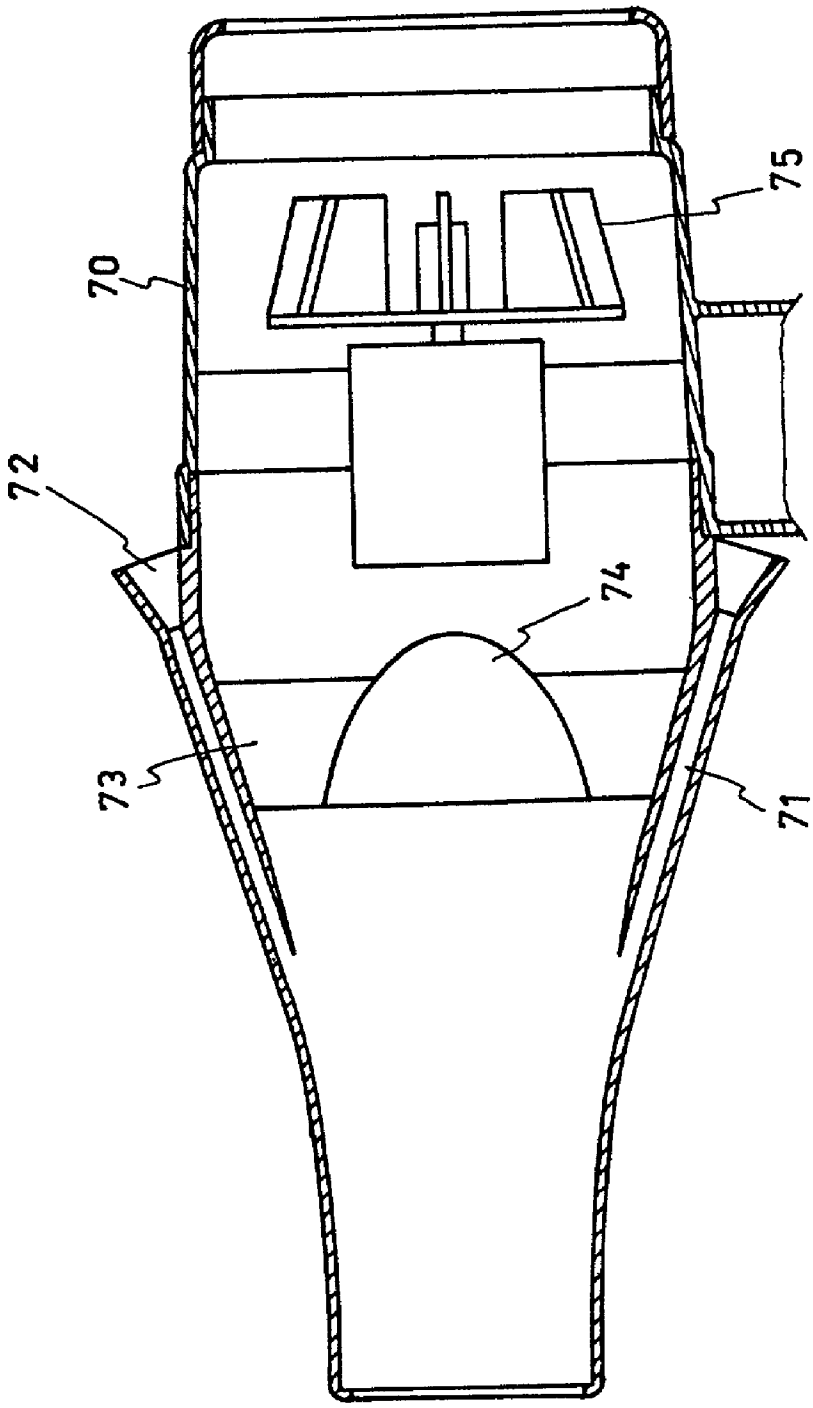


FIG. 8

FIG. 9



HAIR DRYER

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a hair dryer, and, particularly, to an improved hair dryer, which provides a plurality of fan blade assemblies to accelerate the air current therein and provides additional acceleration parts attached to the casing thereof so as to offer a strong output of air current as well as a low sound generation.

[0003] 2. Description of Related Art

[0004] Usually, the conventional hair dryer provides a motor associated with a blade wheel, and in order to maintain a powerful output of air current, the motor has a rotational speed around 1,000 revolutions per minute. Unfortunately, the sound lever produced by the conventional hair dryer is always higher than 60 decibels so that the user is often bothered by the noise from the conventional hair dryer. Mostly, the conventional hair dryer can be classified into two categories, the centrifugal type and the axial flow type.

[0005] Referring to **FIG. 1, a** centrifugal type hair dryer provides a blade wheel **11** joined to the motor in the casing **10** and the motor turns with a high rotational speed to drive the blade wheel **11** so that the air current can be sent out from the casing **10** with a high velocity and a high flow rate.

[0006] Referring to **FIG. 2**, an axial flow type hair dryer provides a conical blade wheel **13** in the casing joined to a motor **12** and the blade wheel **13** is attached with blades **14**. The outer rim of each of the blades **14** has the same taper as the blade wheel **13**, and the blades **14** are covered with a conical shield **15**, which provides a bowl space at the inner side thereof so as to be passed through by the air current. The motor **12** at the other side thereof has turbulent wings **16** next to the casing to correspond to both of the blade wheel **13** and the conical shield **15** so that the random air current may not generate at the central area in the casing to avoid the noise and the vibration as soon as the air is sucked into the casing.

[0007] A U.S. patent application Ser. No. 08/779,323 has disclosed a hair dryer assembly to lower down the high temperature in the motor. Because a high rotational speed of the motor is the essential factor to create the high temperature, the U.S. patent application provides a structure to bring the outside air current into the motor and remove the heat therein so that the purpose of heat dissipation can be attained and the temperature can be reduced effectively.

[0008] It is obvious from the foregoing that the preceding prior art tries to solve the problem with regard to the noise, the vibration and the high temperature under a condition of maintaining a high rotational speed of the motor. However, it is not a fundamental solution to the problem, and, actually, key points for solving the problem can be listed in the following:

[0009] 1. A high flow velocity may generate sound, and, especially, a loud sound can form easily during the air current turning a direction. Hence, the arrangement in the prior art can reduce very limited decibels for the noise.

[0010] 2. A large noise can be emitted in case of the air current moving a longer distance under a high flow velocity.

[0011] 3. The blade wheel in the hair dryer usually propels the air in a way of the blades thereof flapping the air along a vertical direction or an approximate vertical direction and this is a factor to produce the noise and the vibration too.

[0012] 4. It merely can solve the problem with regard to the noise, the vibration, and the high temperature resulting from the high rotational speed of the motor partially because the high rotational speed is kept unchanged.

[0013] 5. The higher the rotational speed of the motor, the more electricity is consumed and the stronger electromagnetic wave creates. It is known that a stronger electromagnetic wave is harmful to the human body intangibly.

[0014] In order to overcome the preceding drawbacks, it is necessary for a hair dryer to have the following improvements:

[0015] 1. A revised structure of the blade wheel has to be performed.

[0016] 2. The moving distance of the air current with a high flow velocity in the hair dryer has to be shortened.

[0017] 3. The motor has to have a low rotational speed instead of a high rotational speed.

[0018] Thus, problems such as the noise, the vibration, the high temperature of the motor, and the electromagnetic wave can be solved effectively and the harm affected by the drawbacks can be lowered down to the least. But, the motor with a low rotational speed usually leads to a low flow velocity and a low flow rate so that no technique can breakthrough the bottleneck till now.

SUMMARY OF THE INVENTION

[0019] The present invention adopts a principle for accelerating the air gradually such that multiple stages of fan blade assemblies are utilized and driven by a low speed motor to accelerate the moving air current stage by stage gradually and the air current can be sent out from the hair dryer with a powerful velocity and the air current feed device does not generate the noise. In the meantime, the present invention has applied the Bernoulli's Law and the Venturi to increase the flow velocity of air and the flow rate. In addition, the conventional centrifugal type hair dryer and the conventional axial flow type hair dryer can be improved by way of the Bernoulli's Law and the Venturi to accelerate the air current in the hair dryer and lower down the noise, the vibration, the electromagnetic wave, and the temperature with a low speed of the motor. The present invention provides a most important feature that the air current has a highest flow velocity at the heat wire, which is located at the head end of the hair dryer, and the noise merely occurs at the same area instead of occurring from air inlet as the conventional one does.

[0020] Accordingly, a primary object of the present invention is to provide a hair dryer, which can eliminate the noise

generated from an air current feed device during the air current entering a casing thereof.

[0021] Another object of the present invention is to provide a hair dryer, which can lower down the temperature of a motor therein and reduce the electromagnetic wave thereof effectively.

[0022] A further object of the present invention is to provide a hair dryer, which can reduce the vibration derived from the motor and the blade wheel because of high rotational speed.

[0023] A further object of the present invention is to provide a hair dryer, in which the air current has a high velocity at an area of the heat wire to eliminate or greatly reduce the noise.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] The present invention can be more fully understood by reference to the following description and accompanying drawings, in which:

[0025] **FIG. 1** is a sectional view of a conventional centrifugal type hair dryer;

[0026] **FIG. 2** is a sectional view of a conventional axial flow type hair dryer;

[0027] **FIG. 3** is a sectional view of a hair dryer according to the present invention in a first preferred embodiment thereof;

[0028] **FIG. 4** is a sectional view illustrating an arrangement for accelerating the air current in the hair dryer shown in **FIG. 3**;

[0029] **FIG. 5** is a sectional view of a hair dryer according to the present invention in a second preferred embodiment thereof;

[0030] **FIG. 6** is a sectional view illustrating an arrangement for accelerating the air current in the hair dryer shown in **FIG. 5**;

[0031] **FIG. 7** is a fragmentary sectional view of the hair dryer of the first or the second embodiment at the casing thereof providing an auxiliary device for accelerating the air current additionally;

[0032] **FIG. 8** is a fragmentary sectional view of a centrifugal type hair dryer at the casing thereof providing an auxiliary arrangement for accelerating the air current additionally; and

[0033] **FIG. 9** is a fragmentary sectional view of an axial flow type hair dryer at the casing thereof providing an auxiliary arrangement for accelerating the air current additionally.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0034] Referring to **FIG. 3, a** hair dryer according to the present invention in the first preferred embodiment thereof provides a casing **20** with inner ribs **21** and a low speed motor **22** is mounted at a hollow central space surrounded by the inner ribs **21**. The motor **22** can be fixed in place firmly by way of the inner ribs **21** in addition to the original fixing parts thereof, which are not shown in **FIG. 3**, to reduce the vibration generated from the motor **22** during running. A central shaft of the motor **22** at an end thereof is attached with a first fan blade assembly **23** and the first fan blade assembly is disposed near the rear end of the casing **20**, and at the other end thereof is attached with a second and third fan blade assemblies **24, 25** such that it can form a multi-stage air feed device **26**. As soon as the motor **22** is powered on, the three fan blade assemblies **23, 24, 25** can rotate simultaneously, and because the respective fan blade assembly has been designed to propel the air without occurring turbulence so that the noise results from the fan blade assemblies thereof during beating the air. The first fan blade assembly **23** can suck the outside air into the casing **20** through the inlet at the rear end of the casing **20** and pushes the air toward the second and the third fan blade assemblies **24, 25**, and the second and the third fan assemblies further propel the moving air current forward to perform a function of further acceleration. Thus, the air current can flow in a state of high velocity through a heat wire (not shown) in the head part of the casing **20**. In order to obtain a high flow velocity of the air current, the second and the third fan blade assemblies **24, 25** can be provided with a capacity higher than that of the first fan assembly **23** respectively to produce a negative pressure between the first fan blade assembly and the second and the third fan blade assemblies **24, 25** so that a sate of vacuum can be formed in the hair dryer and the atmosphere can force the outside air into the casing **20** speedily. Hence, a strong air current with high flow velocity is possible to be sent out from the casing **20**. The advantages of the hair dryer illustrated in the first embodiment can be summarized in the following:

[0035] 1. The air current feed device will not leave out part of the air current at outside so as not to form a turbulence with noise as the blade wheel in the conventional hair dryer does.

[0036] 2. The air current feed device can speed up the air current gradually so that it is not possible for the air current to generate excessive noise during passing through the air current feed device.

[0037] 4. The motor provides a lower rotational speed so that the noise, the vibration, and the high magnetic wave can not be produced in the hair dryer.

[0038] Referring to **FIG. 4**, an additional arrangement for accelerating the velocity of the air current in the hair dryer shown in **FIG. 3** is illustrated. A turbulent part **27** is disposed in front of the third fan blade assembly **25** and the turbulent part **27** is supported with holding ribs **28** in the casing **20**. Due to the turbulent part **27**, the inner diameter of the casing **20** is reduced such that the discharged air current can be accelerated and reinforced. In addition, the holding ribs **28** can be provided with a shape of spiral or an inclined angle such that the air current can have a rotational movement so as to obtain a better effect of acceleration.

[0039] Besides, a muffle mask **30** can be adapted to an outlet at the head part of the casing **20** to eliminate the noise resulting from an excessive flow velocity. The muffle mask **30** has an inner mask **31** with a plurality of sound removing apertures **32**, and a ventilation opening **33** is disposed at a central position thereof to eliminate the noise generated by the hair dryer. It is clear that the hair dryer of the present invention in the first embodiment thereof can eliminate the noise by way of the low rotational speed of the air current

feed device and the muffle mask **30** can enhance the removal of noise resulting from the hair dryer. The muffle mask **30** can be mounted to a conventional hair dryer too to perform a function of noise reduction.

[**0040**] Referring to **FIG. 5, a** second preferred embodiment of the hair dryer according to the present invention is illustrated. An air current feed device **49** provides a drive transmission different from the first embodiment of the present invention. A chamber **41** is provided in the casing **40** and a motor **47** is fixedly attached to the casing in the chamber **41**. The chamber **41** at two opposite lateral sides thereof has a support frame **42** respectively with two ends thereof being fixed to the casing **40**, and an axial shaft **43** is fixedly arranged between the two support frames **42** with a bearing **44** being attached to both ends of the shaft **43** respectively. Further, a first fan blade assembly **45** and a second fan blade assembly **46** are arranged to fit with one of the bearings **44** respectively, and the first and the second fan assemblies **45**, **46** are driven by the motor **47** via transmission parts **48** such as pulleys with a belt, or a gear train. Hence, an air current feed device **49**, which comprises the shaft **43**, the bearings **44**, the fan assemblies **45**, **45**, the motor **47**, and the transmission parts **48**, can be formed in the chamber **41**. As shown in **FIG. 5**, pulleys with a belt are utilized as the transmission parts **48**, and it can be seen that the pulley attached to the right end of the motor shaft provides a diameter thereof greater than that of the pulley attached to the left end of the motor shaft. Thus, the second fan blade assembly **46** has a higher rotational speed than the first fan blade assembly **45** such that a speed difference resulting from different pulley sizes leads to the air sucked into the casing **40** by the fan blade assemblies **45**, **46** can be accelerated gradually so as to obtain an effect of reinforcing the air current during the hair dryer in a state of running. In the meantime, a negative pressure may be formed because of the faster speed of the second fan blade assembly **46** so that the air outside the casing **40** can flow into the casing **40** with a faster speed and a high flow rate of the discharged air current can be obtained substantially. Moreover, the second fan blade assembly **46** can be made with a size thereof greater the first fan blade assembly **45** to increase the negative pressure between the fan assemblies **45**, **46** such that a much greater flow rate of the discharged air current can be obtained.

[**0041**] Referring to **FIG. 6, a** further arrangement for accelerating the velocity of the air current additionally in the hair dryer shown in **FIG. 5** is illustrated. A turbulent part **50** is fixedly attached to the shaft **43** or a turbulent part **27** is disposed in front of the air current feed device **49**. Similar to the arrangement sown in **FIG. 4**, the turbulent part **27** is fixedly attached to the casing by way of a holding rib **28**. As soon as the air current passes through the turbulent part **50** or the turbulent part **27**, a further acceleration can be effected to the air current. Furthermore, a muffle mask **30** can be adapted to the head end of the hair dryer to lower down the decibel value of the noise.

[**0042**] Referring to **FIG. 7, a** further embodiment illustrates a casing **50** of the hair dryer can be arranged to provide at least a throat tube part **52** corresponding to the number of the fan blade assemblies and an entrance **53** is disposed at the end of the throat tube part **52**. When the air current flows speedily in the casing toward the outlet of the casing **50**, the pressure in the casing is less than the atmosphere so that it is in a state of partly vacuum and the air in the throat tube part **52** is sucked to move toward the outlet of casing **50** simultaneously. According to the theory of fluid mechanics, (the cross section area of the air current)×(the flow velocity of the air current)=a constant value, the air current in the throat tube part **52** has a much smaller cross section with a much higher flow velocity so that a greater amount of air can enter the casing through the throat tube part **52** and a greater amount of discharged air current with a higher discharged velocity.

[**0043**] Referring to **FIGS. 8 and 9**, the turbulent part and the throat tube part in the preceding description also can be applied to the prior art shown in **FIGS. 1 and 2**. As shown in **FIGS. 8 and 9**, a casing **60** of a centrifugal type hair dryer and a casing **70** of an axial flow type hair dryer provide throat tube parts **61**, **71** with entrances **62**, **72** respectively, and a turbulent part **64**, **74** is disposed between the blade wheel **65**, **75** and the throat tube parts **61**, **71** respectively. The turbulent part **64**,**74** is fixedly attached to the casing **60**, **70** by way of the support rib **63**, **73**. When the blade wheel **65**, **75** is driven to rotate, the air current can pass over the turbulent part **64**, **74**, at which a smaller passage for the air current is offered, so that an accelerated speed can be attained. Meanwhile, the air current in the throat tube part **61**, **71** is sucked into the casing in a state of vacuum and the outside air with atmosphere can move into the casing **60**, **70** through the throat tube part **61**, **71** fast because of the acceleration caused by the negative pressure. Thus, a supposed flow velocity with a required flow rate can be maintained and the noise also can be lower down effectively.

[**0044**] It is appreciated from the foregoing, the present invention can offer a motor with low rotational speed to reduce the noise source resulting from the motor and the fan, and the flow velocity of the air current can be accelerated by way of a reduced cross section, a negative pressure, and an arrangement of multiple fan blade assemblies respectively. Hence, the noise can merely occur at positions around the heat wire and the head part of the casing. In addition, the muffle mask can be adapted to the head part of the casing to eliminate the noise generating from the high air current at the outlet. Therefore, the present invention secures the effect of noise cancellation substantially. Besides, the low rotational speed of the motor also can reduce the electromagnetic wave and the temperature, which may be produced by the motor during running.

[**0045**] While the invention has been described with reference to the preferred embodiments, it is to be understood that modifications or variations may be easily made without departing from the spirit of the invention, which is defined by the appended claims.

What is claimed is:

1. A hair dryer, comprising:

a casing with a front end a rear end; and

an air current feed device, being disposed in the casing next to the rear end thereof, and further comprising

a motor, being fixedly attached to the casing;

a plurality of fan blade assemblies, being arranged coaxially, and being driven by the motor.

2. The hair dryer according to claim 1, wherein the motor has a central shaft extending axially toward the front end and rear end of the motor respectively and the fan blade assemblies are fixed the rotational shaft respectively.

3. The hair dryer according to claim 1, wherein first one of the fan blade assemblies is nearest the front end of the casing and a turbulent part is located between the first fan blade assembly and the front end of the casing.

4. The hair dryer according to claim 1, wherein the air current feed device further comprises an axial shaft for being attached with the fan blade assemblies and the axial shaft is driven by the motor via a plurality of transmission parts.

5. The hair dryer according to claim 4, wherein a further turbulent part is fixed to the axial shaft between a second and a third ones of the fan blade assemblies.

6. The hair dryer according to claim 1, wherein the casing is provided with at least a throat tube part corresponding to the fan blade assemblies.

7. A hair dryer, comprising:

a casing with a front end; and

a blade wheel, being disposed in the casing;

characterized in that a lateral side of the blade wheel provides a turbulent part fixedly attached to the casing.

8. The hair dryer according to claim 7, wherein the casing is provided with at least a throat tube part behind the turbulent part.

9. The hair dryer according to according to claim 1, wherein the head end of the casing fits with a muffle mask.

10. The hair dryer according to according to claim 7, wherein the front end of the casing fits with a muffle mask.

* * * * *