

BLADE OF INTEGRATED STOVE FAN AND INTEGRATED STOVE FAN

TECHNICAL FIELD

The disclosure belongs to a technical field of kitchen utensils, and relates to an integrated stove, in particular to a blade of an integrated stove fan, and also relates to an integrated stove fan.

BACKGROUND ART

A range hood or integrated stove has been used as a common kitchen appliance in modern families. With continuous improvement of quality of life, noise requirements for the range hood or integrated stove are gradually increasing. The fan can be divided into three parts, an impeller, a drive motor, and a volute, in its internal structure. The impeller includes a plurality of blades. An existing blade is a circular arc plate-shaped straight blade with a straight leading edge and a straight trailing edge, which leads to large aerodynamic noise.

SUMMARY

In view of above problems in the prior art, a blade of an integrated stove fan and an integrated stove fan are proposed in this disclosure. A technical problem solved in the present disclosure is to reduce aerodynamic noise during operations by improving the blade.

An object of the disclosure can be achieved by following technical schemes.

A blade of an integrated stove fan includes an elongate sheet-shaped main body and fixed sheet parts at both ends of the main body. The main body is bent into a circular arc along a width direction, one side of the main body in the width direction is a leading edge, and the other side of the main body is a trailing edge. The blade is characterized in that a plurality of serrations are defined on the trailing edge of the main body along a length direction of the main body, and

heights of the plurality of serrations gradually increase from serrations in a middle to serrations at both ends.

The leading edge of the blade is a side where cooking fumes are sucked in, and the trailing edge of the blade is a side where the cooking fumes are blown out.

In the blade of the integrated stove fan, both side surfaces of each of the serrations are planar, a top of the serration is of an arc surface, and both side surfaces of the serration are tangent to the top of the serration.

In the blade of the integrated stove fan, two adjacent serrations are smoothly transitioned with an arc surface therebetween.

In the blade of the integrated stove fan, a position of the serration is calculated from a serration proximate to an end of the main body, which is expressed as n . A height corresponding to a n -th serration is H_n , H_n satisfies a following relational expression: $H_n = S - 0.2n$ ($n \in N$), where S is a height of the serration proximate to the end of the main body, S satisfies a following relational expression: $S = 0.6B \sim 1.5B$, where B is a distance between two adjacent serrations, B satisfies a following relational expression: $B = 0.1R \sim 0.3R$, where R is a curvature radius of the main body.

In the blade of the integrated stove fan, the curvature radius R of the main body satisfies a following relational expression: $R = 0.035D \sim 0.125D$.

In the blade of the integrated stove fan, both ends of the trailing edge of the main body are provided with a reserved section, and the plurality of serrations are located between the two reserved sections, and a length of the reserved section is F , F satisfies a following relation: $F \geq 3.5\text{mm}$.

A specific principle is as follows: the trailing edge of the blade adopts a serration structure, in which an original position where airflows at the trailing edge of the blade fall off a vortex is modified, and its interference with an active airflow is reduced, thus reducing the aerodynamic noise when the fan operates. The heights of the plurality of serrations are distributed in a stepwise decreasing

manner from both ends to the middle, and on one hand, the blade provides a crescent-shaped airflow channel based on an overall distribution of the serrations, which changes travels of the airflow at different positions on the blade, and reduces pressure impact on the leading edge of the blade; and on the other hand, the serrations with larger heights at both side ends of the blade provide a stable effect on bending and pressing of the blade; a spreading area of the blade is small, and an overall weight of the blade with the serrations defined is small.

An integrated stove fan includes an air guide casing and an impeller fixed inside the air guide casing. The impeller includes a volute and a motor. The integrated stove fan is characterized in that the impeller further includes a plurality of the blades according to any one of the above-mentioned fixed on the volute. The plurality of the blades are fixed in the volute through a circumferential array of the fixed sheet parts, the leading edge of the main body of the blade faces an inner side of the volute, and the trailing edge of the main body of the blade faces an outer side of the volute.

The leading edge of the blade is a side where cooking fumes are sucked in, and the cooking fumes are sucked in from a middle of the volute when in operation, and thus the leading edge of the blade faces the inner side of the volute and the trailing edge adopts a serration structure, in which an original position where airflows at the trailing edge of the blade fall off the vortex is modified and its interference with an active airflow is reduced, thus reducing the aerodynamic noise when the impeller operates. The heights of the plurality of serrations are distributed in the stepwise decreasing manner from both ends to the middle, and on one hand, the blade provides a crescent-shaped airflow channel based on an overall distribution of the serrations, which changes travels of the airflow at different positions on the blade, reduces pressure impact on the leading edge of the blade, and reduces resistance during operations of the blade; and on the other hand, the serrations with larger heights at both side ends of the blade provide a stable effect on the bending and pressing of the blade, ensuring

an overall stability of the impeller and enhancing stability of the impeller performance; a spreading area of the blade is small, and an overall weight of the blade with the serrations defined is also small, thus reducing quality of the volute after the blade is installed and reducing motor load, which is beneficial to improving overall efficiency of the fan.

In the integrated stove fan, a diameter of volute is D , and D ranges: $D=200\sim 300\text{mm}$; and a width of the volute is A , and A ranges: $A=60\sim 120\text{mm}$.

In the integrated stove fan, the middle of the volute has a bowl-shaped mounting part, the motor is located in the mounting part, and a plurality of cooling windows are defined on the mounting part. The cooling window can increase air circulation around the motor during operations, realizing cooling of the motor and providing a normal and stable operating environment for the motor.

Compared with the prior art, the integrated stove fan has advantages of less operating noise, enhanced stability of the impeller performance and improved overall efficiency of the impeller.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of an impeller according to the disclosure.

Fig. 2 is a schematic side view of a volute with a blade.

Fig. 3 is a schematic front view of a volute with a blade.

Fig. 4 is a perspective view of a blade.

Fig. 5 is a schematic side view of a blade.

Fig. 6 is a schematic view of an unfolded blade.

Reference Number: 1.Volute; 11. Mounting Part; 12. Cooling Window; 2. Motor; 3. Blade; 31. Main Body; 311. Serration; 312. Reserved Section; 313. Leading Edge, 314. Trailing Edge; 32. Fixed Sheet Parts.

DETAILED DESCRIPTION

The following presents specific embodiments of the present disclosure and technical solutions of the present disclosure will be further described with reference to the drawings, but the present disclosure is not limited thereto.

As shown in Figs. 1 to 6, the integrated stove fan includes an air guide casing and an impeller fixed inside the air guide casing. The impeller includes a volute 1 and a motor 2. A middle of the volute 1 has a bowl-shaped mounting part 11, the motor 2 is located in the mounting part 11, and a plurality of cooling windows 12 are defined on the mounting part 11. The impeller also includes a plurality of blades 3 fixed on the volute 1. The blades 3 includes an elongate sheet-shaped main body 31 and fixed sheet parts 32 at both ends of the main body 31. The main body 31 is bent into a circular arc along a width direction. The plurality of the blades 3 are fixed in the volute 1 through a circumferential array of the fixed sheet parts 32, the leading edge 313 of the main body 31 of the blade 3 faces an inner side of the volute 1, and the trailing edge 314 of the main body 31 of the blade 3 faces an outer side of the volute 1. The leading edge 313 of the main body 31 of the blade 3 is a side where cooking fumes are sucked in, and the trailing edge 314 of the main body 31 of the blade 3 is a side where the cooking fumes are blown out. Both ends of the trailing edge 314 of the main body 31 are provided with a reserved section 312, and the plurality of serrations 311 are located between the two reserved sections 312. The serrations 311 proximate to the end of the main body 31 are connected with the reserved sections 312.

As shown in Figs. 4 to 6, one side of the main body 31 in the width direction is the leading edge 313, and the other side of the main body is the trailing edge 314. The plurality of serrations 311 are defined on the trailing edge 314 of the main body 31 along a length direction of the main body 31, and heights of the plurality of serrations 311 gradually increase from serrations 311 in a middle to serrations 311 at both ends. Both side surfaces of each of the serrations 311 are planar, a top of the serration 311 is of an arc surface, and both side surfaces of the serration 311 are tangent to the top of the serration 311, and two adjacent

serrations 311 are smoothly transitioned with an arc surface therebetween.

Specifically, a position of the serrations 311 is calculated from a serration 311 proximate to the end of the main body 31, which is expressed as n . Since the calculation can be started from both ends of the main body 31, a maximum value of n is half of the total number of the serrations 311. A height corresponding to a n -th serration 311 is H_n , H_n satisfies a following relational expression: $H_n = S - 0.2n$ ($n \in N$) where N is a maximum number of the serration 311 at an edge to the serration 311 at the middle, S is a height of the serration 311 proximate to the end of the main body 31, S satisfies a following relational expression: $S = 0.6B \sim 1.5B$, where B is a distance between two adjacent serrations 311, B satisfies a following relational expression: $B = 0.1R \sim 0.3R$, where R is a curvature radius of the main body 31. The curvature radius R of the main body 31 satisfies a following relational expression: $R = 0.035D \sim 0.125D$. A length of the reserved section 312 is F , F satisfies a following relation: $F \geq 3.5\text{mm}$. A diameter of volute 1 is D , and D ranges: $D = 200 \sim 300\text{mm}$; and a width of the volute 1 is A , and A ranges: $A = 60 \sim 120\text{mm}$.

A specific principle is as follows: the leading edge 313 of the blade 3 is a side where cooking fumes are sucked in, and the cooking fumes are sucked in from a middle of the volute 1 when in operation, and thus the leading edge 313 of the blade 3 faces the inner side of the volute 1 and the trailing edge 314 adopts a serration 311 structure, in which an original position where airflows at the trailing edge 314 of the blade 3 fall off the vortex is modified and its interference with an active airflow is reduced, thus reducing the aerodynamic noise when the impeller operates. The heights of the plurality of serrations 311 are distributed in the stepwise decreasing manner from both ends to the middle, and on one hand, the blade 3 provides a crescent-shaped airflow channel based on an overall distribution of the serrations 311, which changes travels of the airflow at different positions on the blade 3, reduces pressure impact on the leading edge

313 of the blade 3, and reduces resistance during operations of the blade 3; and on the other hand, the serrations 311 with larger heights at both side ends of the blade 3 provide a stable effect on the bending and pressing of the blade 3, ensuring an overall stability of the impeller and enhancing stability of the impeller performance; a spreading area of the blade 3 is small, and an overall weight of the blade 3 with the serrations 311 defined is also small, thus reducing quality of the volute 1 after the blade 3 is installed and reducing motor 2 load, which is beneficial to improving overall efficiency of the fan.

Now, a set of optimized specific examples and test results are given.

Specific parameters are as follows: $D = 280\text{mm}$; $A = 100\text{mm}$; $F = 4.2\text{mm}$; $B = 6$; $R = 28$; $H_n = S - 0.2n$ ($n \in 8$); $S = 4$.

Comparative experimental data				
Five integrated stoves of the same type were randomly selected, and the data is averaged.				
Impeller Conditio n	Front Noise of Integrated Stove /dB	Maximum Air Volume m3/min	Maximum Static Pressure /Pa	Testing Environmen t
unimprov ed fan	57.7	16.7	485	28.5℃/68% of humidity
improved fan	56.7	16.6	465	

The unimproved fan and the improved fan in this application use a same type of motor, and their parameters D and parameters A are the same. From the above test results, it can be seen that the noise of the integrated stove with the improved fan is reduced.

The specific embodiments described herein are only illustrative of spirits of the present disclosure. Various modifications, supplements or similar

replacements can be made to the described specific embodiments by those skilled in the art to which the present disclosure pertains, without departing from the spirit of the present disclosure or beyond the scope defined in the claims.

CLAIMS

What is claimed is:

1. A blade of an integrated stove fan, comprising an elongate sheet-shaped main body and fixed sheet parts at both ends of the main body, the main body being bent into a circular arc along a width direction, one side of the main body in the width direction being a leading edge and the other side of the main body being a trailing edge, wherein a plurality of serrations are defined on the trailing edge of the main body along a length direction of the main body, and heights of the plurality of serrations gradually increase from serrations in a middle to serrations at both ends.
2. The blade of the integrated stove fan according to claim 1, wherein both side surfaces of each of the serrations are planar, a top of the serration is of an arc surface, and both side surfaces of the serration are tangent to the top of the serration.
3. The blade of the integrated stove fan according to claim 1, wherein two adjacent serrations are smoothly transitioned with an arc surface therebetween.
4. The blade of the integrated stove fan according to claim 1 or 2 or 3, wherein a position of the serration is calculated from a serration proximate to an end of the main body, which is expressed as n , a height corresponding to a n -th serration is H_n , H_n satisfies a following relational expression: $H_n = S - 0.2n$, where a value of n is $n \in N$, N is a maximum number of at an edge to the serration at the middle, and S is a height of the serration proximate to the end of the main body, S satisfies a following relational expression: $S = 0.6B \sim 1.5B$, where B is a distance between two adjacent serrations, B satisfies a following relational expression: $B = 0.1R \sim 0.3R$, where R is a curvature radius of the main body.
5. The blade of the integrated stove fan according to claim 4, wherein the integrated stove further comprises a volute, the blades fixed on the volute, and the curvature radius R of the main body satisfies a following relational

expression: $R = 0.035D \sim 0.125D$, where D is a diameter of the volute.

6. The blade of the integrated stove fan according to claim 1, 2 or 3, wherein both ends of the trailing edge of the main body are provided with a reserved section, and the plurality of serrations are located between the two reserved sections, and a length of the reserved section is F , F satisfies a following relation: $F \geq 3.5\text{mm}$.

7. An integrated stove fan comprising an air guide casing and an impeller fixed inside the air guide casing, the impeller comprising a volute and a motor, wherein the impeller further comprises a plurality of the blades according to any one of the above claims 1 to 6 fixed on the volute, the plurality of the blades are fixed in the volute through a circumferential array of the fixed sheet parts, the leading edge of the main body of the blade faces an inner side of the volute and the trailing edge of the main body of the blade faces an outer side of the volute.

8. The integrated stove fan according to claim 7, wherein a diameter of the volute is D , and D ranges: $D = 200 \sim 300\text{mm}$.

9. The integrated stove fan according to claim 7, wherein a width of the volute is A , and A ranges: $A = 60 \sim 120\text{mm}$.

10. The integrated stove fan according to claim 7, wherein a middle of the volute has a bowl-shaped mounting part, the motor is located in the mounting part, and a plurality of cooling windows are defined on the mounting part.