That which is claimed:

1. An exhaust fan housing comprising a first cylindrical or conical element, a second cylindrical element interior of said first cylindrical or conical element, and a plurality of partial passageway walls operatively uniting said first cylindrical or conical element and said second cylindrical element, an interior space delimited by said second cylindrical element in fluid communication with ambient air exterior of said first cylindrical or conical element via partial passageway walls of said plurality of partial passageway walls, each partial passageway wall of said plurality of partial passageway walls characterized by spaced apart passageway wall segments which unitingly terminate so as to delimit a leading edge for each partial passageway wall of said partial passageway walls, each of said spaced apart passageway wall segments having a free end delimiting first and second trailing edges for each partial passageway wall of said partial passageway walls.

2. The exhaust fan housing of claim 1 wherein a first wall passageway wall segment of said spaced apart passageway wall segments is characterized by a first chord length, and a second wall passageway wall segment of said spaced apart passageway wall segments is characterized by a second chord length, said first chord length being greater than said second chord length.

3. The exhaust fan housing of claim 1 wherein a first wall passageway wall segment of said spaced apart passageway wall segments is characterized by a first chord length, and a second wall passageway wall segment of said spaced apart passageway wall segments is characterized by a second chord length, said first chord length being substantially equivalent to said second chord length.

4. The exhaust fan housing of claim 1 wherein a first wall passageway wall segment of said spaced apart passageway wall segments is a pressure surface characterized by a first chord length, and a second wall passageway wall segment of said spaced apart passageway wall segments is a suction surface characterized by a second chord length, said first chord length being greater than said second chord length.

5. The exhaust fan housing of claim 1 wherein a first wall passageway wall segment of said spaced apart passageway wall segments is a pressure surface characterized by a first chord length, and a second wall passageway wall segment of said spaced apart passageway wall segments is a suction surface characterized by a second chord length, said first chord length being substantially equivalent to said second chord length.

6. The exhaust fan housing of claim 1 wherein each trailing edge of

said first and second trailing edges is characterized by a skew angle of about zero degrees.

7. The exhaust fan housing of claim 1 wherein each trailing edge of said first and second trailing edges of each of said spaced apart passageway wall segments is characterized by a skew angle within a range of about -80 to +80 degrees.

8. The exhaust fan housing of claim 1 wherein said leading edge for each partial passageway wall of said partial passageway walls is characterized by a skew angle of about zero degrees.

9. The exhaust fan housing of claim 1 wherein said leading edge for each partial passageway wall of said partial passageway walls is characterized by a skew angle within a range of about -50 to +50 degrees.

10. The exhaust fan housing of claim 1 wherein said leading edge for each partial passageway wall of said partial passageway walls is characterized by a leading edge radius to maximum chord length ratio having a value within a range of about 0-0.25.

11. The exhaust fan housing of claim 1 wherein said each partial passageway wall of said plurality of partial passageway walls is characterized by a chord ratio having a value within a range of

about 0.1-1.0.

12. The exhaust fan housing of claim 1 wherein said each partial passageway wall of said plurality of partial passageway walls is characterized by a thickness to minimum chord ratio having a value within a range of about 0.01-0.5.

13. The exhaust fan housing of claim 1 wherein said each partial passageway wall of said plurality of partial passageway walls is characterized by a camber to minimum chord ratio having a value within a range of about 0-0.25.

14. The exhaust fan housing of claim 1 wherein one passageway wall segment of said spaced apart passageway wall segments is adapted to include a tab for mated union with a portion of a windband assembly in furtherance of supporting same.

15. The exhaust fan housing of claim 1 wherein one passageway wall segment of said spaced apart passageway wall segments is adapted to include an upwardly extending tab for mated union with a portion of a windband assembly in furtherance of supporting same.

16. The exhaust fan housing of claim 1 further comprising closed cell insulation, an interior surface of said first cylindrical element adapted to include said closed cell insulation.

17. The exhaust fan housing of claim 1 wherein a spacing for and between said first and second cylindrical elements is substantially constant along a shared axial centerline for each of said first and second cylindrical elements.

18. The exhaust fan housing of claim 1 further comprising a directly driven impeller, said impeller housed within said first cylindrical element and below said second cylindrical element.

19. The exhaust fan housing of claim 18 wherein said impeller is characterized by "x" number of vanes, a number of partial passageway walls "n" of said plurality of partial passageway equating to a prime number satisfying n = x +/- 1, or a next higher/lower value of the expression which is a prime number.

20. The exhaust fan housing of claim 1 wherein said leading edge for said partial passageway wall is symmetrical about a centerline thereof.

21. The exhaust fan housing of claim 20 further comprising closed cell insulation, an interior surface of said first cylindrical element adapted to include said closed cell insulation.

22. The exhaust fan housing of claim 1 wherein said leading edge for said partial passageway wall is asymmetric about a centerline

thereof.

23. The exhaust fan housing of claim 22 further comprising closed cell insulation, an interior surface of said first cylindrical element adapted to include said closed cell insulation.

24. An exhaust fan assembly comprising:

a. a plenum for receipt of exhaust and bypass flow;

b. a fan assembly in fluid communication with said plenum and characterized by first and second fan assembly portions, said first portion comprising a fan inlet cone in combination with an inlet cone housing, said second portion comprising a fan housing characterized by spaced apart inner and outer walls, which alone or in combination delimit i) an annular fluid passage chamber between said inner wall and said outer wall, ii) a central drive chamber circumferentially bounded by said inner wall and adapted to retain a motor for an exhaust fan, and iii) an exhaust fan chamber within said outer wall and below said inner wall, and a plurality of hollow vanes extending between said inner wall and said outer wall of said fan housing of said second fan assembly portion so as to reside within said annular fluid passage chamber thereof, each hollow vane of said hollow vanes characterized by a leading edge and two trailing edges, each of said inner and outer walls adapted such that said each hollow vane delimits a

partially walled passageway for radial fluid flow from exterior of said outer wall to and through said inner wall and into said central drive chamber; and,

c. a windband assembly operatively linked to said fan assembly, said windband assembly characterized by a plurality of brackets adapted for mated securement to a portion of each hollow vane of said plurality of hollow vanes in furtherance of supporting said windband assembly in relation to said fan housing.

25. An exhaust fan assembly of claim 24 wherein an inner surface of a windband of said windband assembly is equipped with closed cell foam in furtherance of sound attenuation.

26. An exhaust fan assembly of claim 24 wherein said annular fluid passage chamber between said inner wall and said outer wall is characterized by sound attenuation material.

27. An exhaust fan assembly of claim 24 wherein an inner surface of said inner wall is equipped with closed cell foam in furtherance of sound attenuation.

28. An exhaust fan assembly of claim 27 wherein an inner surface of a windband of said windband assembly is equipped with closed cell foam in furtherance of sound attenuation.

Claims

1. An exhaust fan housing comprising a first cylindrical or conical element, a second cylindrical element interior of said first cylindrical or conical element, and an annular chamber having an outer wall formed by the first cylindrical or conical element and an inner wall formed by the second cylindrical element, a plurality of hollow vanes extending radially across the annular chamber and operatively uniting said first cylindrical or conical element and said second cylindrical element, an interior space delimited by said second cylindrical element in fluid communication with ambient air exterior of said first cylindrical or conical element via said hollow vanes, each hollow vane characterized by spaced apart wall segments which unitingly terminate so as to extend radially from the outer wall to the inner wall of the annular fluid passage chamber delimiting an airfoil-shaped leading edge for each hollow vane, each of said spaced apart wall segments having an open end extending radially across the annular chamber delimiting first and second trailing edges for each hollow vane, one trailing edge of said spaced apart wall segments include a tab extending radially outward beyond an exterior of the first cylindrical or conical element for mated union with a portion of a windband assembly to operatively link the windband assembly to said exhaust fan housing.

2. The exhaust fan housing of claim 1 in operative combination with a fan.

3. The exhaust fan housing of claim 1 in operative combination with a fan housing.

4. The exhaust fan housing of claim 1 in operative combination with a wind band.

5. The exhaust fan housing of claim 1 in operative combination with a wind band assembly.

6. An exhaust fan housing comprising a first cylindrical or conical element, a second cylindrical element interior of said first cylindrical or conical element, and an annular chamber having an outer wall formed by the first cylindrical or conical element and an inner wall formed by the second cylindrical element, a plurality of hollow vanes extending radially across the annular chamber and operatively uniting said first cylindrical or conical element and said second cylindrical element, an interior space delimited by said second cylindrical element in fluid communication with ambient air exterior of said first cylindrical or conical element via said hollow vanes, each hollow vane characterized by spaced apart wall segments which unitingly terminate so as to extend radially from the outer wall to the inner wall of the annular fluid passage chamber delimiting an airfoil-shaped leading edge for each hollow vane, each of said spaced apart wall segments having an open end extending radially across the annular chamber delimiting first and second trailing edges for each hollow vane, one trailing edge of said spaced apart wall segments include an upwardly extending tab extending radially outward beyond an exterior of the first cylindrical or conical element for mated union with a portion of a windband assembly to operatively link the windband assembly to said exhaust fan housing.

7. The exhaust fan housing of claim 6 in operative combination with a fan.

8. The exhaust fan housing of claim 6 in operative combination with a fan housing.

9. The exhaust fan housing of claim 6 in operative combination with a wind band.

10. The exhaust fan housing of claim 6 in operative combination with a wind band assembly.

11. An exhaust fan assembly comprising: a. a plenum for receipt of exhaust and bypass flow; b. a fan assembly in fluid communication with said plenum and characterized by first and second fan assembly portions, said first portion comprising a fan inlet cone in combination with an inlet cone housing, said second portion comprising a fan housing characterized by spaced apart inner and outer walls, which delimit i) an annular fluid passage chamber between said inner wall and said outer wall, ii) a central drive chamber circumferentially bounded by said inner wall and adapted to retain a motor for an exhaust fan, and iii) an exhaust fan chamber within said outer wall and below said inner wall, and a plurality of hollow vanes extending between said inner wall and said outer wall of said fan housing of said second fan assembly portion so as to reside within said annular fluid passage chamber thereof, each hollow vane characterized by an airfoil-shaped leading edge extending radially from the outer wall to the inner wall of the annular fluid passage chamber and two trailing edges, each of said inner and outer walls adapted such that said each hollow vane delimits a partially walled passageway having an open end extending radially across the annular fluid passage chamber for radial fluid flow from exterior of said outer wall through said inner wall and into said central drive chamber; and, c. a windband assembly operatively linked to said fan assembly, said windband assembly characterized by a plurality of brackets for mated securement to a portion of each hollow vane that extends exterior of said outer wall to operatively link said windband assembly to said fan housing.

12. An exhaust fan assembly of claim 11 wherein an inner surface of a windband of said windband assembly is equipped with closed cell foam in furtherance of sound attenuation.

13. An exhaust fan assembly of claim 11 wherein said annular fluid passage chamber between said inner wall and said outer wall is characterized by sound attenuation material.

14. An exhaust fan assembly of claim 11 wherein an inner surface of said outer wall is equipped with closed cell foam in furtherance of sound attenuation.

15. An exhaust fan assembly of claim 14 wherein an inner surface of a windband of said windband assembly is equipped with closed cell foam in furtherance of sound attenuation.

16. The exhaust fan assembly of claim 11 wherein each hollow vane further comprises a first passageway wall segment of a delimited partially walled passageway characterized by a first chord length, and a second wall passageway wall segment of said delimited partially walled passageway characterized by a second chord length, said first chord length being greater than said second chord length.

17. The exhaust fan assembly of claim 11 wherein each hollow vane further comprises a first passageway wall segment of a delimited partially walled passageway characterized by a first chord length, and a second wall passageway wall segment of said delimited partially walled passageway characterized by a second chord length, said first chord length being substantially equivalent to said second chord length.

18. The exhaust fan assembly of claim 11 wherein each hollow vane further comprises a first passageway wall segment of a delimited partially walled passageway defining a pressure surface

characterized by a first chord length, and a second wall passageway wall segment of said delimited partially walled passageway defining a suction surface characterized by a second chord length, said first chord length being greater than said second chord length.

19. The exhaust fan assembly of claim 11 wherein each hollow vane further comprises a first passageway wall segment of a delimited partially walled passageway defining a pressure surface characterized by a first chord length, and a second wall passageway wall segment of said delimited partially walled passageway defining a suction surface characterized by a second chord length, said first chord length being substantially equivalent to said second chord length.

20. The exhaust fan assembly of claim 11 wherein each trailing edge of said two trailing edges is characterized by a skew angle of about zero degrees.

21. The exhaust fan assembly of claim 11 wherein each trailing edge of said two trailing edges of each of said spaced apart passageway wall segments is characterized by a skew angle within a range of about -80 to +80 degrees.

22. The exhaust fan assembly of claim 11 wherein said leading edge of each hollow vane of said hollow vanes is characterized by a skew angle of about zero degrees.

23. The exhaust fan assembly of claim 11 wherein said leading edge of each hollow vane of said hollow vanes is characterized by a skew angle within a range of about -50 to +50 degrees.

24. The exhaust fan assembly of claim 11 wherein said leading edge of each hollow vane of said hollow vanes is characterized by a leading edge radius to maximum chord length ratio having a value within a range of about 0-0.25.

25. The exhaust fan assembly of claim 11 wherein each passageway wall of a delimited partially walled passageway is characterized by a chord ratio having a value within a range of about 0.1-1.0.

26. The exhaust fan assembly of claim 11 wherein each passageway wall of a delimited partially walled passageway is characterized by a thickness to minimum chord ratio having a value within a range of about 0.01-0.5.

27. The exhaust fan assembly of claim 11 wherein each passageway wall of a delimited partially walled passageway is characterized by a camber to minimum chord ratio having a value within a range of about 0-0.25.

28. The exhaust fan assembly of claim 11 wherein a passageway wall of a delimited partially walled passageway is adapted to include a tab for mated union with a portion of a windband assembly to operatively link said windband to said fan housing.

29. The exhaust fan assembly of claim 11 wherein a passageway wall of a delimited partially walled passageway is adapted to include an upwardly extending tab for mated union with a portion of a windband assembly to operatively link said windband to said fan housing.

30. The exhaust fan assembly of claim 11 further comprising closed cell insulation, an interior surface of said outer wall adapted to include said closed cell insulation.

31. The exhaust fan assembly of claim 11 wherein a spacing for and between said inner and outer walls is substantially constant along a shared axial centerline for each of said inner and outer walls.

32. The exhaust fan assembly of claim 11 wherein said leading edge of each hollow vane of said hollow vanes is symmetrical about a centerline thereof.

33. The exhaust fan assembly of claim 32 further comprising closed cell insulation, an interior surface of said first outer wall adapted to include said closed cell insulation.

34. The exhaust fan assembly of claim 11 wherein said leading edge of each hollow vane of said hollow vanes is asymmetric about a centerline thereof.

35. The exhaust fan assembly of claim 34 further comprising closed cell insulation, an interior surface of said first outer wall adapted to include said closed cell insulation.