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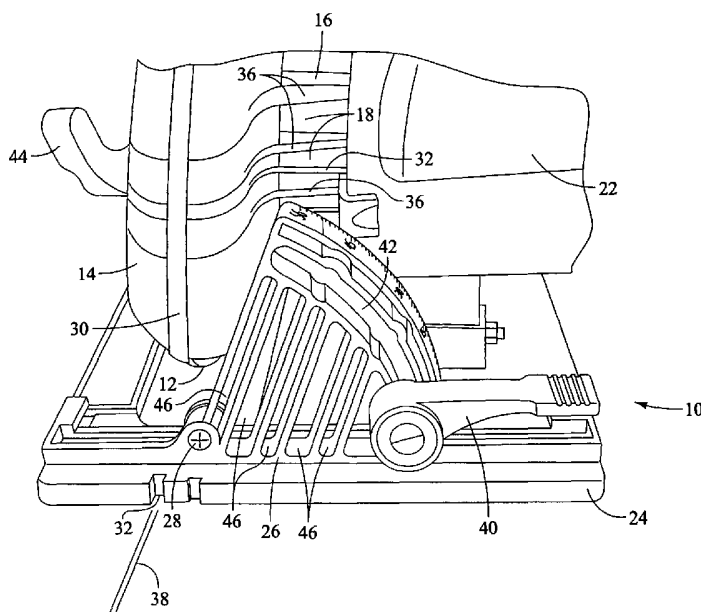
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(54) Title: BEVEL QUADRANT AND GEARBOX LOUVER BLOWER SYSTEM



(57) Abstract: A circular saw has one or more louvers (36) in the housing which direct air exiting the housing toward a work piece, together with openings (46) in other components of the saw located between the louvers and the work piece so that sawdust and other debris that is produced during operation of the saw will be blown out of the way and will not interfere with the line of sight of the user.



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BEVEL QUADRANT AND GEARBOX LOUVER BLOWER SYSTEM

BACKGROUND ART

The present invention generally relates to power hand tools and more particularly to circular saws.

5 Power hand tools such as circular saws have been commonly known for decades and generally have a foot plate that slides on a work piece that is being cut, a circular saw blade that may have a diameter as small as a few inches or as large as seven or more inches, with the saw blade extending through an opening generally perpendicular to the plane of the foot. The saw is typically
10 driven by an electric motor that is powered by either an AC or DC power source, the DC power source often being a battery pack or the like.

Circular saws are commonly used on construction sites to saw boards that are used in framing a building or for cutting large plywood or other material sheets into smaller pieces, all of which are known to those skilled in
15 the power hand tool art. Such circular saws have been the subject of much research and development and significant improvements have been made in their design and construction over the many decades that they have been used.

Significant developments have included improved blade guards, both above and below the blade for protecting a user from injury, with the lower
20 blade guards being designed to be moved out of the way when a board or the like is to be cut. Ergonomic developments have been made so that user handles, including main handles or auxiliary handles, facilitate the easy cutting of a sheet or board along a desired path.. The early circular saws were designed to only make perpendicular cuts relative to the work piece, but later
25 developments included an adjustable bevel angle capability.

Even with the many improvements that have been made in the design of circular saws, a common problem that continues to exist is the accumulation of sawdust and/or other debris on the line of cut which hinders the user from

following the desired cut line to produce a straight and accurate cut. Improvements in motors that are used in circular saws and other hand tools have resulted in the motors being smaller in size relative to the power that they develop. Because cutting of some materials, particularly those which are
5 relatively thick, put a significant load on the motor, it is necessary to have an adequate flow of air near the motor to dissipate heat during operation. Because of this requirement, many motors have an internal fan blade driven by the motor to expel air from the motor enclosure or housing for the purpose of cooling the motor. The air has been expelled through openings that have been
10 positioned at many different locations in circular saws of the prior art.

While the circular saw designs are sufficient to expel the air and dissipate heat during operation, little regard has heretofore been made in directing the air in any particular direction or for any apparent purpose other than to expel the air from inside the motor housing.

15 DISCLOSURE OF INVENTION

The preferred embodiment of the present invention comprises one or more louvers in the housing of a hand tool such as a circular saw, which direct the air toward a specific location that includes the work piece, together with providing openings in other components of the tool located between the louvers
20 and the portion of the work piece that the saw is approaching so that sawdust and other debris that is produced during operation of the tool will be blown out of the way and will not interfere with the line of sight of the user.

The preferred embodiment is a circular saw having a gearbox located adjacent the output of the motor between the motor and the saw blade, with the
25 gearbox having directional louvers that direct air produced by an internal fan blade used to cool the motor toward the portion of the work piece that is to be cut. The preferred embodiment also comprises a bevel quadrant structure located on the front of the foot of the circular saw, with the quadrant having one or more airflow vents within it so that the air expelled through the
30 directional louvers can also flow through the foot quadrant toward the portion

of the work piece that the saw blade is approaching and thereby remove the sawdust and/or other debris from the line of cut.

DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a generally front perspective of a circular saw illustrating the preferred embodiment of the present invention, and particularly illustrating the directional louvers in a gearbox of the saw as well as a bevel quadrant having a plurality of airflow vents through which air generated by the internal fan of the circular saw can pass to clear the line of cut of the saw of sawdust and other debris;

FIG. 2 is another front perspective view similar to FIG. 1, but taken from a higher elevation;

FIG. 3 is a plan view of the inside of a portion of the gearbox end casting illustrating the configuration of the louvers therein and the direction of flow produced by the internal fan blade of the circular saw illustrated in FIG. 1; and

FIG. 4 is a perspective view illustrating a portion of the saw motor and the internal fan blade which creates the airflow that is expelled through the louvers of the gearbox.

BEST MODE OF CARRYING OUT THE INVENTION

The preferred embodiment of the present invention is shown in FIGS. 1-4 and is directed to a circular saw of the type which has a motor housing 10 in which a motor 11 is located, a saw blade 12 that is protected by a blade housing 14, the blade housing 14 being attached to a gearbox end casting 16 that is in turn connected to the housing 10 and which has a number of vent openings 18 through which air from a fan 20 is expelled during operation of the circular saw. The circular saw also has a forward auxiliary handle 22 as well as a main handle (not shown) that is typical with such circular saws.

The circular saw also has a generally flat foot assembly 24 which preferably has an integrally formed quadrant structure 26 that is part of a bevel

adjusting mechanism that is configured to enable the saw to cut a work piece at an adjustable bevel angle. Preferably, the bevel angle can be adjusted from perpendicular to approximately 55° from perpendicular by pivoting the motor housing 10 as well as the blade 12 and 14 around a pivot axis defined by a bolt 28.

In the embodiment illustrated in FIG. 1, the blade housing 14 has a raised center portion 30 that is generally aligned with the plane of the blade 12. A notch 32 in the front edge of the foot 24 is also provided to indicate a more accurate line of the cut when set at a zero degree bevel that results from cutting by the blade 12. As shown in FIG. 3, the air that is generated by the fan blade 20 flows in a generally counterclockwise direction in the housing 10 as shown by the arrows 34 and exits out of vent openings 18 defined by louvers 36. There are four louvers 36 which have slightly different lengths and angular orientations, but all are oriented to direct the air flow produced by the fan blade 20 forwardly of the circular saw toward the portion of the work piece that is to be cut generally along the line 38.

The quadrant 26 is preferably integrally formed with the foot 24 in the embodiment illustrated in the drawings, but it should be understood that the quadrant can also be separately made and attached to the foot 24. As illustrated in the drawings, the foot 24 is configured to provide an adjustable bevel angle when it is rotated relative to the saw housing 10, blade 12 and blade housing 14 about the axis of the bolt 28 and a separate bolt (not shown) located at the rear of the foot 24.

A clamping lever 40 attached to the motor housing 10 is slidable in an arcuate slot 42 having a radius that is constant around the bolt 28. When the lever 40 is rotated in the counterclockwise direction as shown in FIG. 1, it loosens the mechanism so that the foot can be rotated relative to the motor housing 10 to cause the blade 12 to be moved to a different bevel angle. When the angle is at the desired location, the lever 40 can be rotated in the clockwise direction to tighten the same and hold the saw at the desired bevel angle. A lower blade guard lift lever 44 is shown to the left of the blade housing 14 and

this lever enables the user to manually move the lower guard as is sometimes necessary during operation of a circular saw.

While the air that is expelled from the motor housing 10 through the openings 18 is directed forwardly, the quadrant 26 has openings 46 as well as the slot 42 which function as vents and permit the air to pass relatively unimpeded through the quadrant 26 onto the work piece along the line of cut. This enables the flow to blow away sawdust that would likely otherwise accumulate were it not for the quadrant permitting passing of the air flow through it.

10 As a result of this airflow, the user seldom experiences the deposit of sawdust or debris produced by the cutting of whatever material is being cut on the line of cut which often necessitates interruption of the cutting operation.

While various embodiments of the present invention have been shown and described, it should be understood that other modifications, substitutions and alternatives are apparent to one of ordinary skill in the art. Such modifications, substitutions and alternatives can be made without departing from the spirit and scope of the invention, which should be determined from the appended claims.

Various features of the invention are set forth in the following claims.

CLAIMED:

1. A power circular saw comprising:
a motor housing (10);
a motor (11) having an output shaft located in the motor housing,
a circular saw blade (12) operatively driven by said output shaft, said
5 blade being positioned to cut a work piece as said saw is moved in a forward
direction,
a foot structure (24) connected to said motor housing and having a
bottom surface for contacting a work piece;
a protective blade housing (14) surrounding approximately the portion
10 of the saw blade that is located above said foot structure bottom surface;
a fan blade (20) operatively driven by said output shaft and positioned in
said housing to draw air past said motor for cooling the same;
said housing having at least one opening (18) defining an air flow exit
through which air generated by the fan passes, said opening being on the front
15 of said motor housing so that air is expelled forwardly for the purpose of
removing debris from the line of cut during operation of said circular saw.
2. A circular saw as defined in claim 1 wherein said blade housing
is connected to said motor housing and said opening is located adjacent said
blade housing.
- 20 3. A circular saw as defined in claim 1 wherein said motor housing
includes a gearbox mounted thereto, said gearbox including said at least one
opening.
4. A circular saw as defined in claim 3 wherein said gearbox has a
plurality of vents separated by air directing vanes.
- 25 5. A circular saw as defined in claim 1 further comprising a bevel
adjustment mechanism including a bevel quadrant connected to said foot
structure, said bevel quadrant being located near the front of said foot structure
and including a bevel pivot connection that permits said motor housing, blade
and blade housing to be pivoted along a lengthwise axis substantially parallel to
30 the plane of said saw blade, said quadrant having at least one opening therein to

enable air expelled from said motor housing to pass through said bevel quadrant onto the work piece that is being cut, for the purpose of removing debris from the line of cut of said circular saw.

6. A circular saw as defined in claim 5 wherein said bevel quadrant
5 has a generally triangular configuration with an arcuate slot in which a locking mechanism is located, said locking mechanism sliding along said slot when said bevel adjustment mechanism is adjusted to vary the angle of said bottom surface of said foot structure relative to the plane of said saw blade, said quadrant having a plurality of additional openings through which air can pass
10 toward the work piece.

7. A power circular saw comprising:
a motor housing (10);
a motor (11) having an output shaft located in the motor housing,
a fan blade (20) operatively driven by said output shaft,
15 a circular saw blade (12) operatively driven by said output shaft,
a foot structure (24) connected to said motor housing and having a bottom surface for contacting a work piece;

a protective blade housing (14) surrounding approximately the portion of the saw blade that is located above said foot structure bottom surface;
20 a bevel adjustment mechanism (40) including a bevel quadrant (26) connected to said foot structure, said bevel quadrant being located near the front of said foot structure and including a bevel pivot connection (28) that permits said motor housing, blade and blade housing to be pivoted along a lengthwise axis substantially parallel to the plane of said saw blade, said motor
25 housing having at least one opening (18) defining an air flow exit through which air generated by the fan passes, said opening being on the front of said motor housing so that air is expelled forwardly;

said quadrant having at least one opening (42, 46) therein to enable air expelled from said motor housing to pass through said bevel quadrant onto the
30 work piece that is being cut, for the purpose of removing debris from the line of cut of said circular saw.

8. A circular saw as defined in claim 7 wherein said blade housing is connected to said motor housing and said opening is located adjacent said blade housing.

9. A circular saw as defined in claim 7 wherein said motor housing
5 includes a gearbox mounted thereto, said gearbox including said at least one opening.

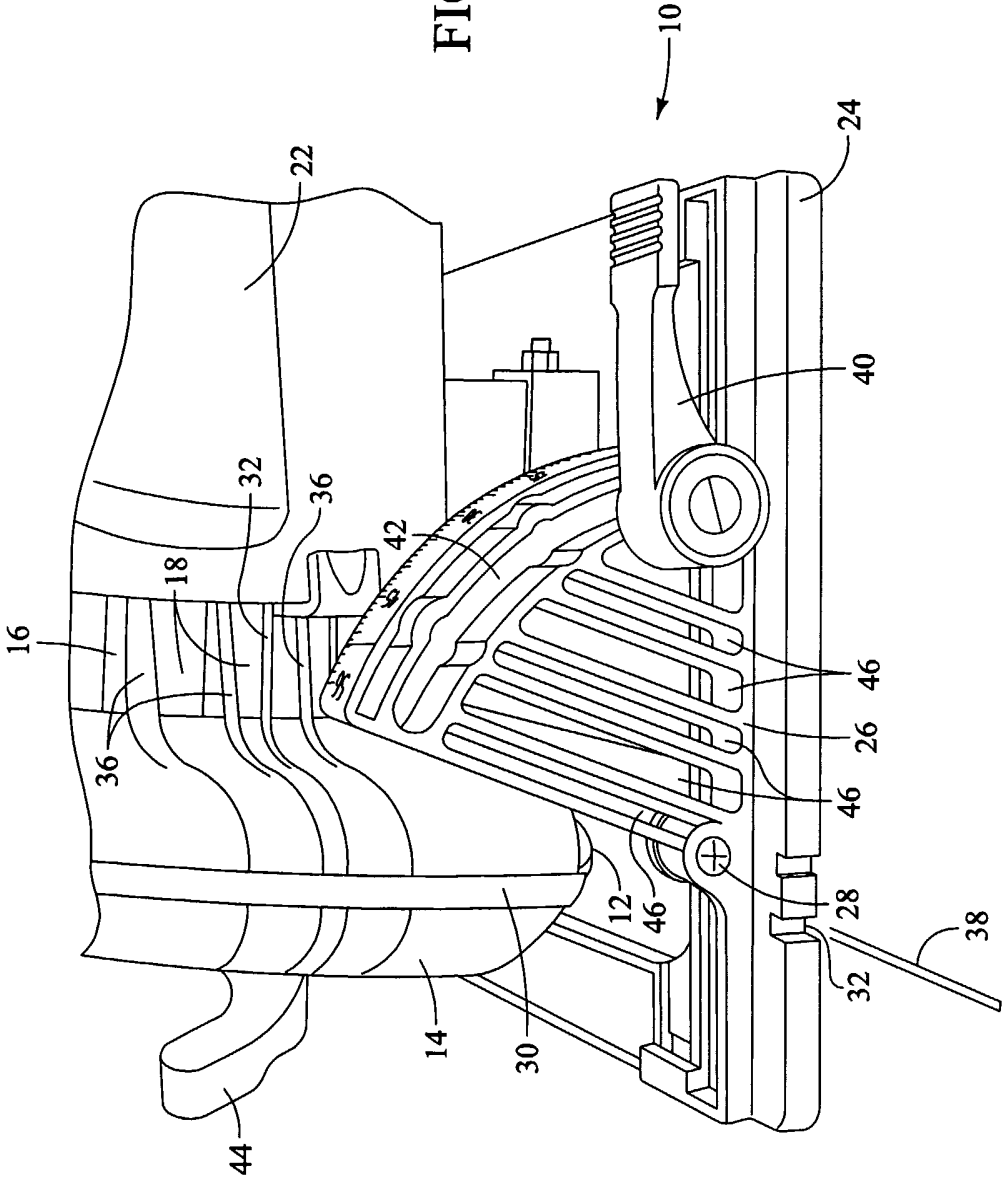
10. A circular saw as defined in claim 9 wherein said gearbox has a plurality of vents separated by air directing vanes.

11. A circular saw as defined in claim 7 wherein said bevel quadrant
1) has a generally triangular configuration with an arcuate slot in which a locking mechanism is located, said locking mechanism sliding along said slot when said bevel adjustment mechanism is adjusted to vary the angle of said bottom surface of said foot structure relative to the plane of said saw blade, said quadrant having a plurality of additional openings through which air can pass
5 toward the work piece.

12. A circular saw as defined in claim 11 wherein said bevel adjustment mechanism pivot axis is located generally in the same plane as said saw blade.

13. A power circular saw comprising:
1) a motor housing with a motor therein;
a foot structure with a bevel adjustment mechanism, said motor having an output shaft that is operatively connected to drive a circular saw blade;
a blade housing connected to said motor housing and surrounding the portion of the blade that extends above the foot structure;
5 a fan blade in said housing operatively driven by said output shaft and being configured to move air through said housing to cool said motor;
said motor housing having at least one vent in the front thereof adjacent said blade housing configured to direct air exiting said motor housing downwardly toward the front of said foot structure for the purpose of removing
1) saw dust and other debris from the front of said circular saw.

FIG. 1



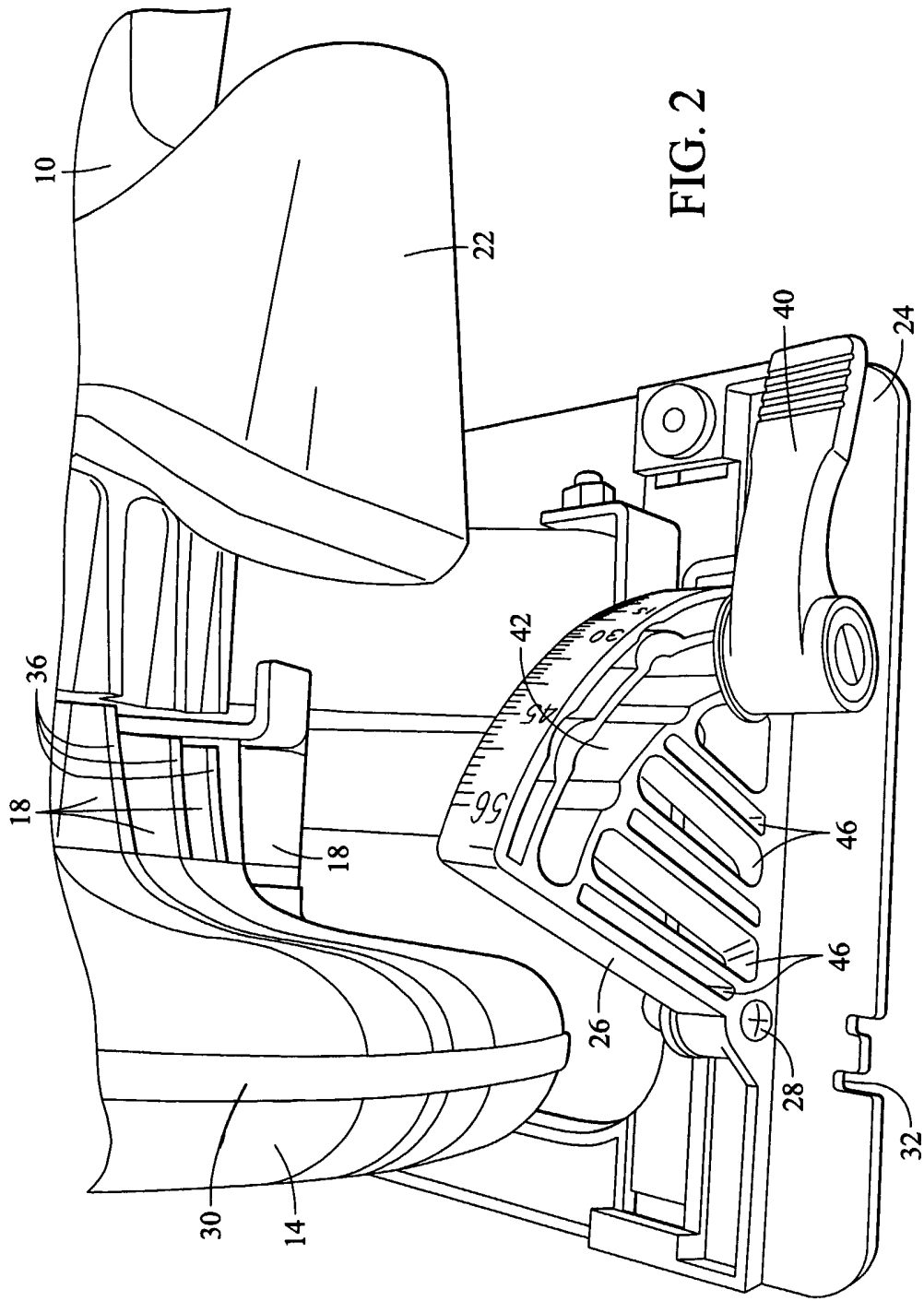
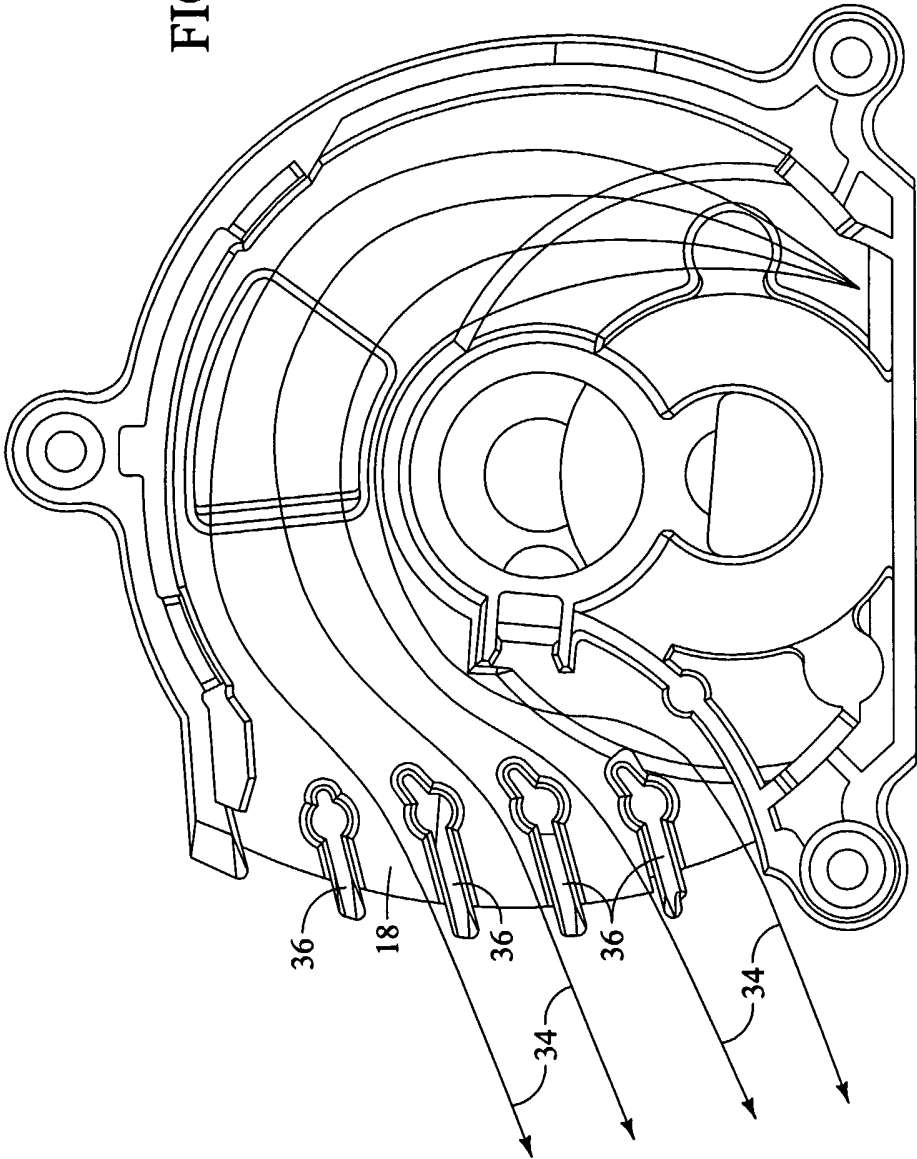


FIG. 3



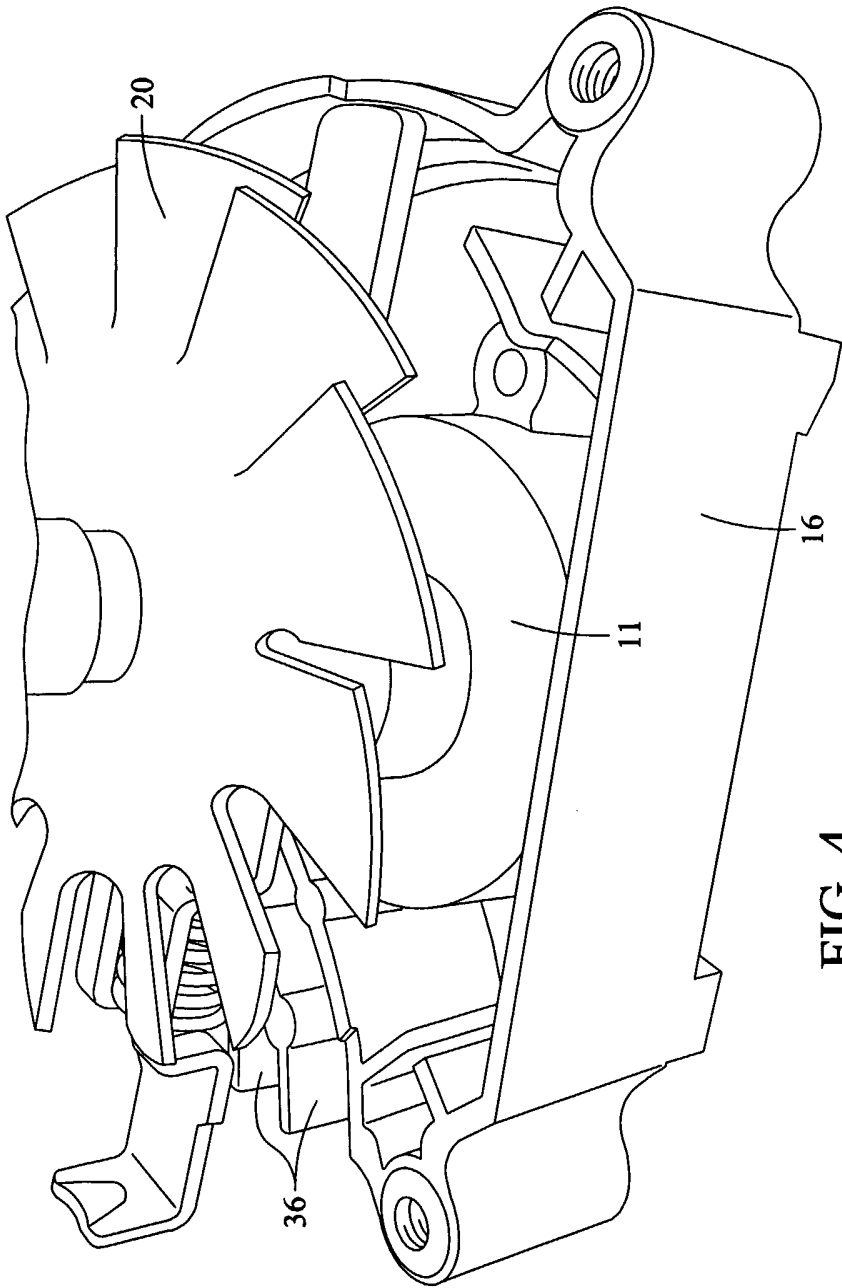


FIG. 4

INTERNATIONAL SEARCH REPORT

Application No

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A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 B27B9/02 B23D59/00 B23Q11/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 IPC 7 B27B B23D B23Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2003/226264 A1 (ZEMLOK MICHAEL A ET AL) 11 December 2003 (2003-12-11) paragraphs '0015!', '0018!'; figures 4-6 -----	1-13
X	US 3 873 862 A (BUTLER THOMAS C) 25 March 1975 (1975-03-25) column 5, lines 27-41; figures 1-3 -----	1-3, 5-9, 11-13
X	US 3 267 974 A (ELSON DONALD E) 23 August 1966 (1966-08-23) column 3, line 58 - column 5, line 2; figures 1-10 -----	1-3, 13
A	EP 0 445 972 A (BLACK & DECKER INC) 11 September 1991 (1991-09-11) column 6, lines 28-34; figures 3, 4 ----- -/--	5-7, 11, 12



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

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X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 1 245 357 A (MAKITA CORPORATION) 2 October 2002 (2002-10-02) paragraph '0021!; figure 3 -----	5-7, 11, 12

INTERNATIONAL SEARCH REPORT

 Application No
 PCT/US2005/001136

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 2003226264	A1	11-12-2003	AU 2003243401 A1 BR 0311621 A CA 2487383 A1 EP 1511591 A1 WO 03103881 A1	22-12-2003 08-03-2005 18-12-2003 09-03-2005 18-12-2003
US 3873862	A	25-03-1975	NONE	
US 3267974	A	23-08-1966	NONE	
EP 0445972	A	11-09-1991	US 4982501 A AU 630846 B2 AU 7262391 A CA 2036910 A1 DE 69102087 D1 DE 69102087 T2 EP 0445972 A1 JP 3207865 B2 JP 5077202 A	08-01-1991 05-11-1992 05-09-1991 06-09-1991 30-06-1994 01-09-1994 11-09-1991 10-09-2001 30-03-1993
EP 1245357	A	02-10-2002	JP 2002283301 A EP 1245357 A2 US 2002133955 A1	03-10-2002 02-10-2002 26-09-2002