

[54] LOBED ROTARY CUTTING BLADE

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848, 854, 855, 663, 676

[56] References Cited

UNITED STATES PATENTS

2,239,317 4/1941 Gibb..... 143/133 M
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FOREIGN PATENTS OR APPLICATIONS

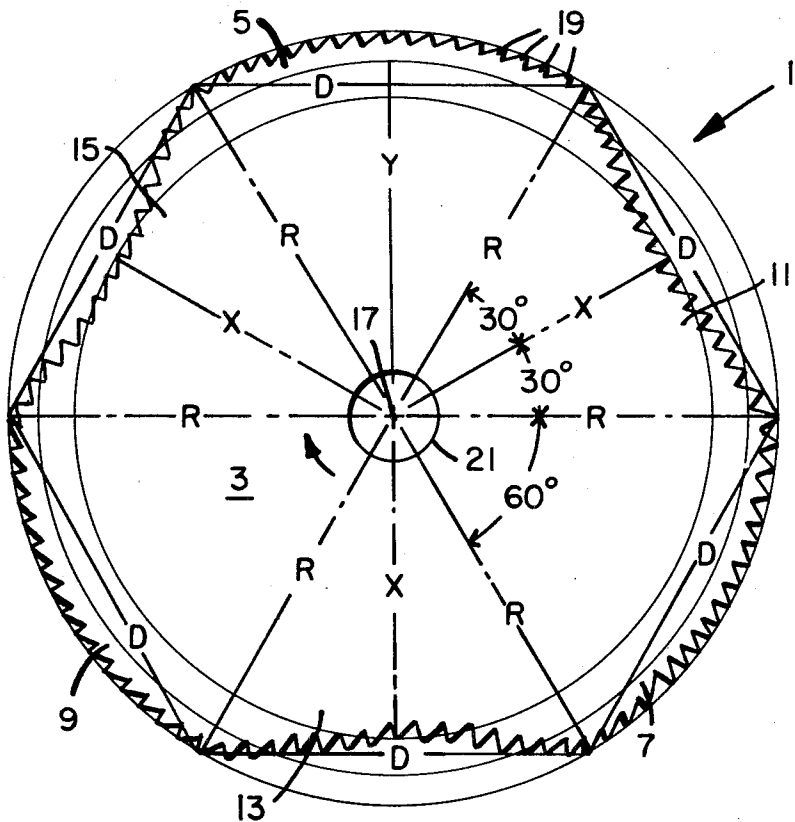
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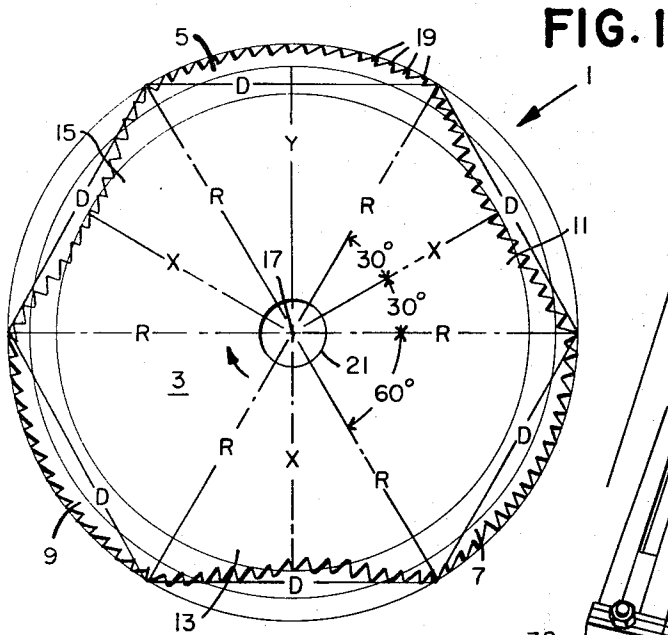
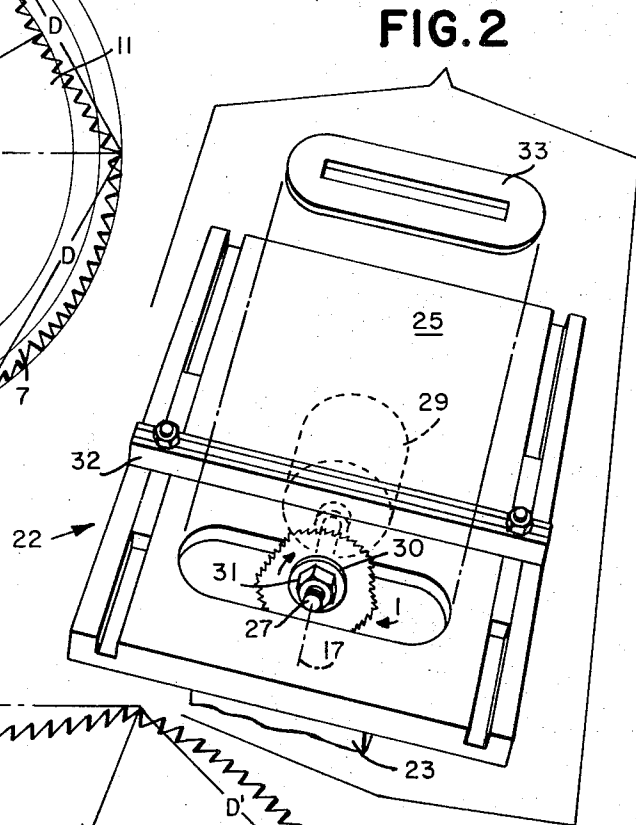
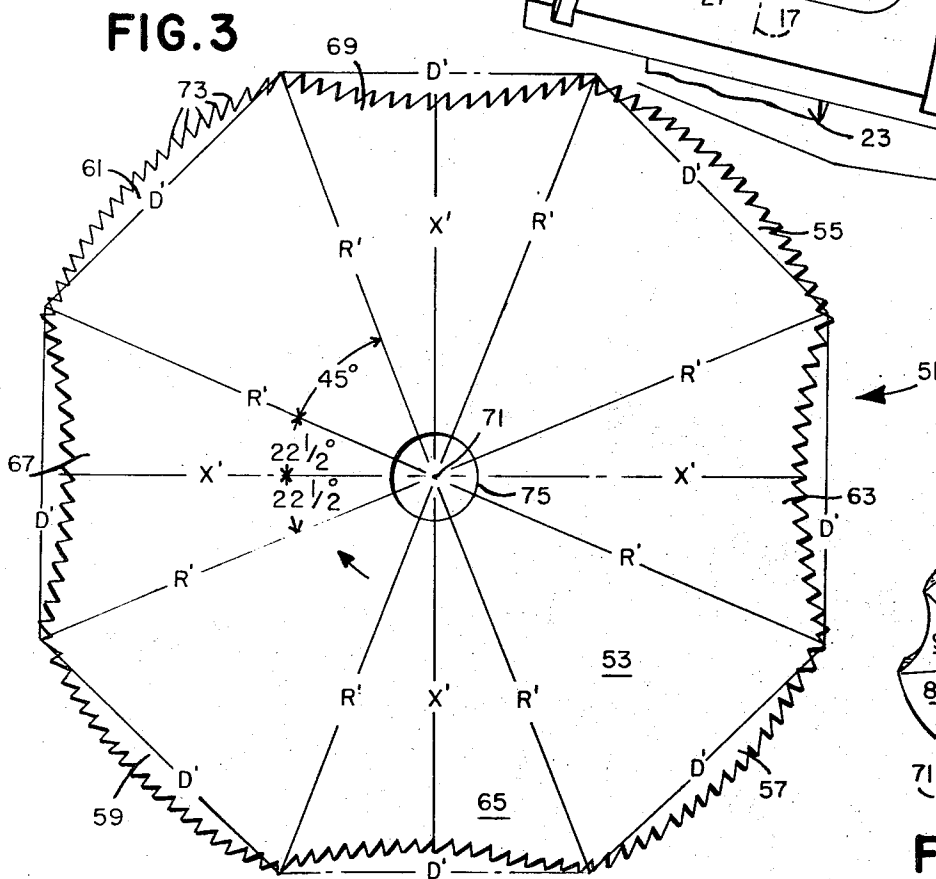
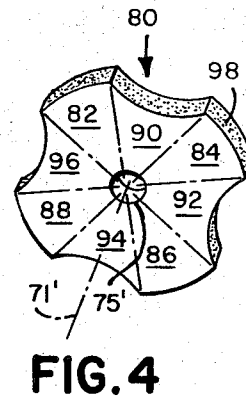
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[57] ABSTRACT

A multi-lobed cutting blade having a plane member adapted for mounting to a rotary drive shaft at right angles to the plane member. The plane member includes three or more lobes spaced apart relative to one another and a plurality of abbreviated sectors spaced apart relative to one another with an abbreviated sector intermediate two lobes such that the outer peripheral edge of each lobe extends to the outer peripheral edge of an abbreviated sector. Each of said lobes and abbreviated sectors carries a cutting edge surface about its' outer periphery.

3 Claims, 4 Drawing Figures





LOBED ROTARY CUTTING BLADE

BACKGROUND OF THE INVENTION

The present invention relates to improvements in rotary cutting blades and more specifically to blades capable of cutting longitudinally and/or laterally.

The building industry is continuously in search of improved methods and tools to aid in the construction of building structures. Power saws, such as table saws, band saws, radial arm saws, jig saws and portable circular saws, are commonly used tools. The utility of such saws is dependent in large measure upon the design and structure of the saw blades. Various blade structures have been proposed for performing various tasks. Various uses include making circular cuts in materials of wood, plastics, etc.; cutting bee-box boards; cutting hand holds in bee boxes; making starts for rotary or jig-saw blades for window cut-outs in walls, etc.; and abrasive blades, e.g. fibre blades, for cutting and grinding off high spots of brick, stone, concrete, etc. Heretofore there have been proposed rotary saw blades of the "wobble" type with teeth spaced at varying distances from the axis of rotation, which are adapted for the formation of tongues and grooves in boards and other materials. Wobble saws, however, are primarily adapted only for making cuts of limited sizes and shapes for which they are specifically designed and are limited as to their use for making ordinary saw cuts. Wobble blades of such design are depicted in U.S. Pat. No. 2,756,787 granted to Henry Sies and Austrian Patent No. 197,069. The prior art includes other non-circular shaped blades.

The present inventor, as disclosed in U.S. Pat. No. 2,239,317, has heretofore disclosed and described an ellipsoidal planar blade adapted for cutting laterally and longitudinally. The present invention has proven to provide substantially improved operation over the ellipsoidal blade in making lateral and/or longitudinal cuts and in structural durability.

SUMMARY OF THE PRESENT INVENTION

The present invention provides an improved saw blade for rotary saws. The blades are adapted to cut materials longitudinally and/or laterally to establish a plurality of different designs upon the demand of the operator. The capability of the present invention represents an advance over ordinary circular saw blades, ellipsoidal and other proposed non-circular blades. Relative to other non-circular blades, blades of the present invention provide for smoother rotation of the blade and faster, smoother cutting of the material; allows for better cleaning of the blade teeth; and for a more stable, stronger blade structure, which enhances safety to the operator. The required power to drive blades of the present structure for performing a given task is less than that of ellipsoidal blades.

The present invention provides for multi-lobed blades. As hereinafter utilized, the term "sector" shall be defined to include an angular segment of the blade; the term "lobe" will be defined to include a sector having a convex rounded projection of uniform radius relative to the axis of rotation of the blade; and the term an "abbreviated sector" shall be defined to include a sector of substantially triangular phase or a sector with a concave rounded edge such that any two points along the peripheral edge contour of a given sector are equal

distance from said axis of rotation where one of said points is spaced a given distance along the periphery from the leading edge and the other point is placed an equal given distance along the peripheral edge from the trailing edge of each of said lobes.

Exemplary embodiments of blades of the present invention include a unitary plane member having an axis of rotation and structured to include three or more lobes with a like number of abbreviated sectors extending radially from said axis of rotation. The lobes and abbreviated sectors are positioned intermediate to one another such that each lobe is intermediate a pair of abbreviated sectors and each abbreviated sector is intermediate a pair of lobes. Each of said lobes and abbreviated sectors carries a cutting peripheral edge, e.g. a plurality of teeth.

The general efficiency of the present blade; the smoother rotation of the blade; the faster, smoother cutting and better cleaning realized by the present structure are believed to result from the structural improvements of the present blade. The present structure provides for a distribution of teeth which takes into account the inverse relationship of rotary speed and power of a lever such as a rotating saw blade, and the effect of this inverse relationship on the cutting action of a non-circular rotating blade. The present structure permits teeth to be positioned at different radii relative to the axis of rotation, thereby permitting lateral and/or longitudinal cutting of a material. It further provides for relative even and uniform spacing of the greatest number of the teeth at the greatest radius, in turn providing high efficiency. This result is believed to emanate from the fact that the coefficient of power is at its smallest value at the maximum radius point and the coefficient of speed the largest relative to all the radii of the blade. Relative to an ellipsoidal blade, the present structure permits the incorporation of a greater number of teeth positioned at shorter radii with the teeth being closer together about the periphery of the blade. At the same time, the present structure provides for a greater number of teeth at the maximum radii, whereas an ellipsoidal blade is limited to two teeth at the maximum radii and four teeth at each lesser radii.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view of a rotary saw blade incorporating the teachings of the present invention;

FIG. 2 is a perspective view of the blade of FIG. 1 mounted on a drive shaft of a table saw;

FIG. 3 is a view of an alternate embodiment of a blade of the invention; and

FIG. 4 is a perspective view of an alternative blade of the present invention with an abrasive cutting edge.

DESCRIPTION OF PREFERRED EMBODIMENT

Referring to the drawings, FIG. 1 depicts a saw blade, referred to by the general reference character 1 and incorporating the teachings of the present invention. The blade 1 comprises a multi-lobed planar member 3 shaped with three sectors 5, 7, and 9 having a convex or lobed outer peripheral contour and three sectors 11, 13, and 15, having a concave parabolic outer peripheral contour. The sectors 5, 7, and 9 are hereinafter referred to as lobes, and the sectors 11, 13, and 15 are hereinafter referred to as abbreviated sectors. The lobes 5, 7, and 9 and the abbreviated sectors 11, 13 and 15 are structured such that intermediate adjacent lobes

is an abbreviated sector and intermediate adjacent abbreviated sectors is a lobe such that the leading edge of a lobe coincides with the trailing edge of an abbreviated sector. The lobes 5, 7, 9 and sectors 11, 13, and 15 all extend radially from an axis 17. Each lobe and abbreviated sector carries a plurality of standard teeth 19 disposed along the outer peripheral edge to establish a cutting edge. The teeth 19 are shaped such that the blade cuts as it is rotationally driven in a clockwise direction. The member 3 carries an aperture 21 about the axis 17 so as to permit the blade 1 to be mounted to a rotating drive shaft as commonly existent on circular saw table saws, radial saws, and so forth. The lobes 5, 7, and 9 each comprise an arc of a radius R from the tip of the teeth 19 and a chord of distance D. Each lobe 5, 7, and 9 has an angle of 60° between the leading and trailing edge. Accordingly, about the maximum radius R there are a plurality of teeth at each lobe with the total number of teeth about the maximum radius multiplied by the number of lobes, which in the embodiment 1 is three.

The abbreviated sectors 11, 13, and 15 each have a chord of the distance D and an angle of 60° between the leading and trailing edge. The abbreviated sectors 11, 13, and 15 each have a maximum distance R from the axis 17 at the point at which their respective peripheral edges converge with the peripheral edge of the lobes 5, 7, and 9. Accordingly, the leading edge of the lobes 5, 7, and 9 coincide with the trailing edge of the abbreviated sectors 11, 13, and 15, respectively. The trailing edges of the convex-shaped lobes 5, 7, and 9 coincide with the leading edges of the sectors 15, 11, and 13, respectively. Each of the sectors 11, 13, and 15 has a minimum distal spacing X from the axis 17 coinciding with the center line 30° from the leading edge and trailing edge of the respective lobe. Thus, at the minimum radius X, the blade 1 has three teeth, e.g. one per sector 11, 13 and 15. At every radius greater than X and less than R, as illustrated by the circle of radius y, the blade has a maximum of six teeth, i.e. two per sector 11, 13, and 15.

FIG. 2 illustrates the blade 1 as mounted on a conventional table saw 22 having a base 23 and a planed smooth and flat top 25. The blade 1 is mounted on a drive shaft 27 driven by a drive motor 29. A stabilizer washer 30 and nut 31 secure the blade to the shaft 27. If desired, a fence member 32 may be positioned on the top 25 to aid in guiding the work as it is fed to the saw blade 1. As illustrated, a throat plate 33 is removed to illustrate the blade 1 mounted in place.

In operation, an operator guides the work piece, e.g., piece of wood, metal or masonry, over the table top 25 laterally and/or longitudinally relative to the plane of the blade 1 so as to cut the desired design. The work piece may be guided longitudinally and/or laterally relative to the plane of the blade.

FIG. 3 depicts an alternative embodiment of a saw blade, referred to by the general reference character 51, and incorporating the teachings of the present invention. The blade 51 comprises a planar member 53 shaped with four lobes 55, 57, 59 and 61 and four abbreviated sectors 63, 65, 67 and 69. The lobes 55, 57, 59, 61 and the sectors 63, 65, 67 and 69 all extend radially from an axis 71. Each lobe and sector carries a plurality of standard teeth 73 disposed along the outer peripheral edge. The member 53 carries an aperture 75 about the axis 71 so as to permit the blade 51 to be

mounted to a rotating drive shaft. The lobes 55, 57, 59 and 61 each comprise an arc of a radius R' from the tip of the teeth 73 and a chord of a distance D'. Each lobe 55, 57, 59 and 61 has an angle of 45° between its' leading and trailing edge.

The abbreviated sectors 63, 65, 67, and 69 each have a chord distance D' and an angle of 45° between its' leading and trailing edge. The sectors 63, 65, 67, and 69 each have a maximum distance R' from the axis 71 at the point at which their respective peripheral edges converge with the peripheral edge of the lobes 55, 57, 59, and 61 and a minimum distance X' from the axis 71 at the center line $22\frac{1}{2}^\circ$ from the leading edge and trailing edge of the respective sector. Accordingly, the leading edge of the lobes 55, 57, 59, and 61 coincide with the trailing edge of the sectors 63, 65, 67, and 69, respectively. The trailing edge of the lobes 55, 57, 59, and 61 coincide with the leading edges of the sectors 65, 67, 69, and 63, respectively. Thus, at the minimum radius X', the blade 51 has four teeth, i.e. one per sector 63, 65, 67, and 69. At every radius greater than X' and less than R', the blade has a maximum of eight teeth, i.e. two per sector 63, 65, 67 and 69.

FIG. 4 illustrates an embodiment of a blade of the present invention, referred to by the general reference character 80, adapted for cutting or grinding masonry products, e.g. stone, concrete, etc. The blade 80 may be comprised of a fibre material with an abrasive peripheral cutting edge. The blade 80 comprises four lobes 82, 84, 86 and 88, and four abbreviated sectors 90, 92, 94 and 96 similar to the blade 51 of FIG. 3. The blade 80 includes a central aperture 75' coaxial with an axis 71' for mounting to a power source. The cutting edge of the blade 80 is comprised of an abrasive material 98. In operation, the blade 80 may be mounted on a power source individually, or with a gang of similar multi-lobed blades with an abrasive cutting edge. In an exemplary application, in a gang the blades may be utilized to remove high spots of the masonry, e.g. a concrete surface.

I claim:

1. A rotary cutting blade, comprising a planar disc member adapted for mounting about its axis of rotation to a rotary drive shaft and at right angles to said drive shaft, the planar member including at least three lobe sectors of similar shape and dimensions and at least three abbreviated sectors of similar shape and dimensions, each of said lobe sectors having a leading edge and a trailing edge with the leading edge of each lobe common to the trailing edge of one of said abbreviated sectors and the trailing edge of each lobe common to the leading edge of one of said abbreviated sectors, the abbreviated sectors having a uniform outer peripheral edge contour relative to said axis of rotation in which any two points along the peripheral edge of a given sector are of equal distance from said axis of rotation where one of said points is spaced a given distance along the periphery from the leading edge and the other point is spaced an equal given distance along the peripheral edge from the trailing edge of the abbreviated sector, the outer peripheral edge contour of each of said lobe sectors and of each of said abbreviated sectors carrying a plurality of saw-teeth which teeth are substantially evenly spaced relative to one another intermediate the leading edge and trailing edge of each of said lobe sectors and each of said abbreviated sectors.

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2. The rotary cutting blade of claim 1 wherein each of the abbreviated sectors has a uniform concave outer peripheral edge contour relative to the axis of rotation of the blade.

3. The rotary cutting blade of claim 2 wherein each

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of the abbreviated sectors has a uniform concave parabolic peripheral edge contour relative to the axis of rotation of the blade.

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