United States Patent [19]

Lokey

[11] **3,785,230**

[45] **Jan. 15, 1974**

[54] **AUTOMATIC SAFETY BRAKE FOR ROTARY BLADE EQUIPMENT**

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[73] Assignee: **Lokey Tool, Inc.**, San Leandro, Calif.

[22] Filed: **Nov. 8, 1972**

[21] Appl. No.: **304,726**

[52] **U.S. Cl.** ..... **83/58**, 30/390, 192/129 A, 192/130, 192/144, 317/DIG. 2

[51] **Int. Cl.** **B27h 19/02**, B27h 19/04

[58] **Field of Search** ..... 408/710; 82/34 R; 30/390, 388, 391; 83/72, 544, 571, 860, 58; 192/129 R, 129 A, 130, 131, 144; 317/DIG. 2

[56] **References Cited**

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Primary Examiner—Donald R. Schran

[57] **ABSTRACT**

An automatic safety brake for rotary blade equipment in which a capacitance proximity sensor utilizes the spinning blade as an antenna so that when any portion of the body of the user approaches the blade to closely a cam brake will be instantaneously actuated to stop the rotation of the blade before the body of the user comes in contact with the cutting edge of the blade. In one form of the invention cam members are applied to opposite side faces of the blade to serve as a brake for the instanteous stopping of the rotation of the blade. In another form of the invention a rubber wedge is driven into the cutting edge of the blade so as to instantaneously stop the rotation of the blade. In both forms of the invention the sensitivity of the sensor may be adjusted to suit the capacitance effect of the individual user of the equipment.

5 Claims, 9 Drawing Figures

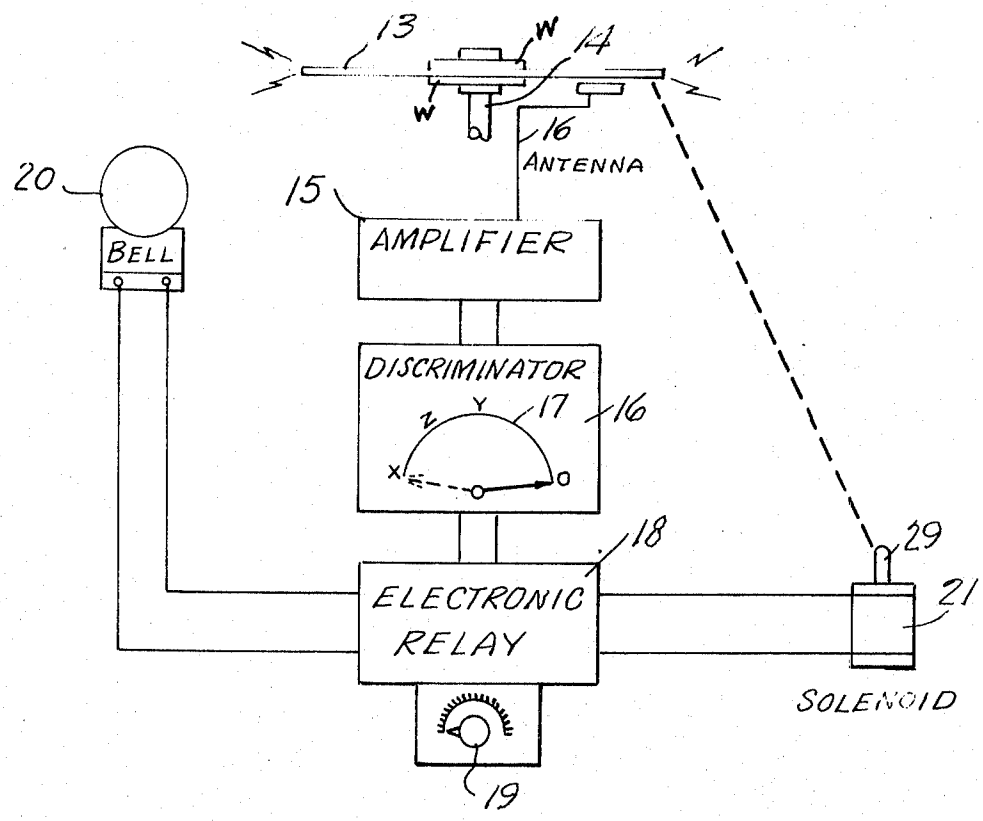
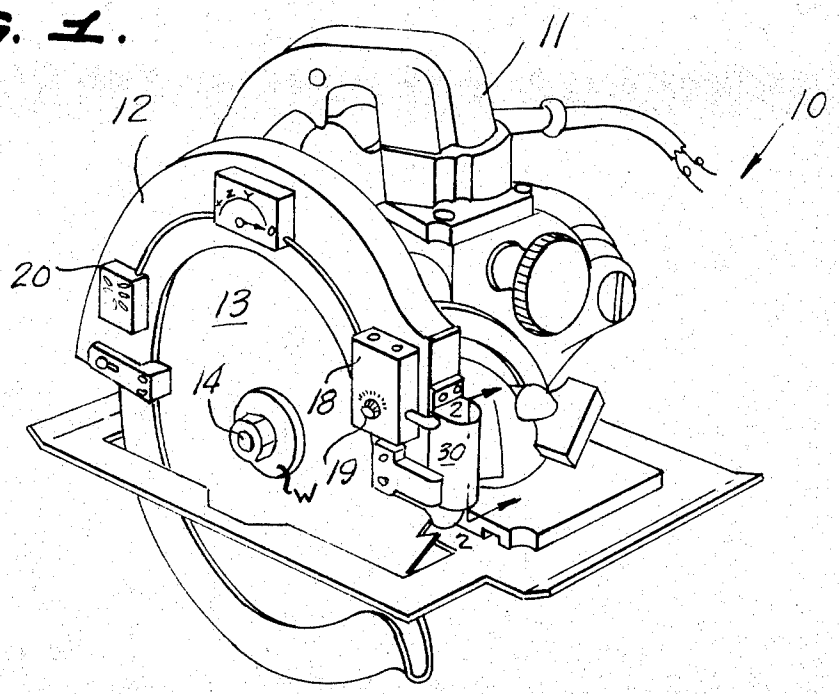


FIG. 1.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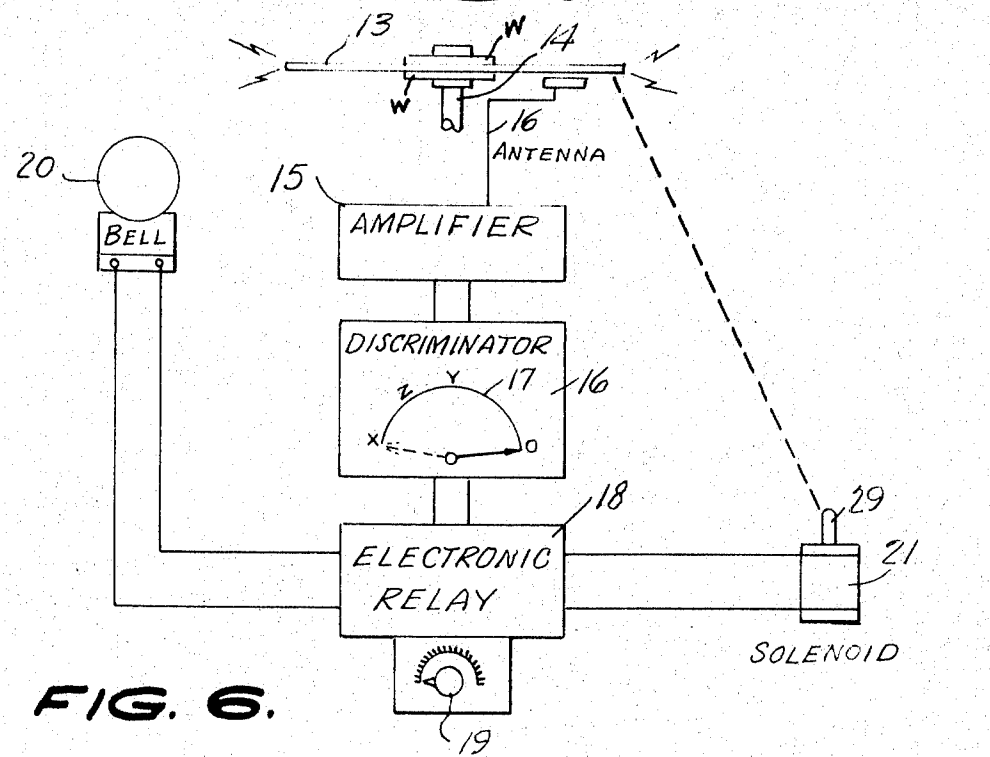
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AMPLIFIER
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ELECTRONIC
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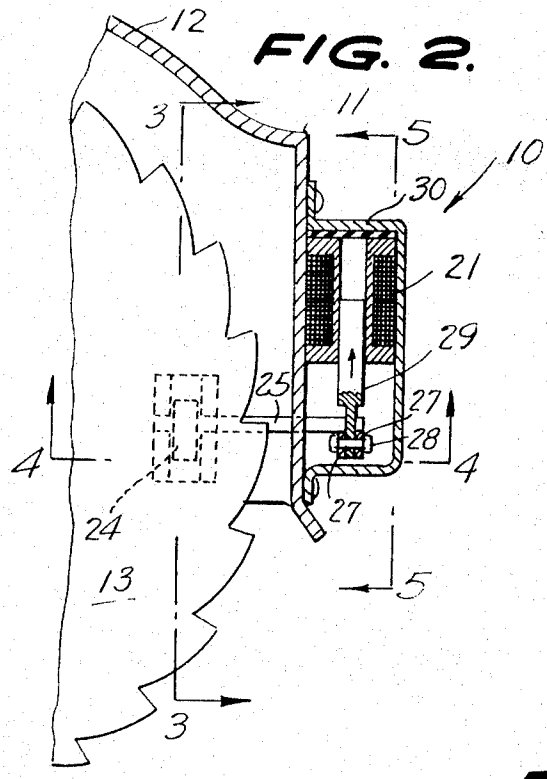
FIG. 6.

FIG. 2.



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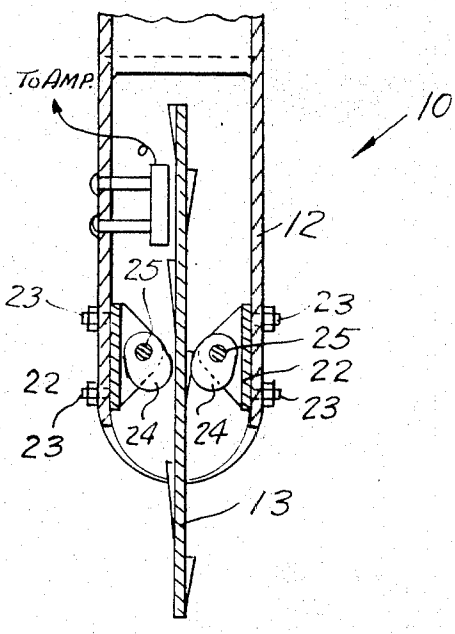


FIG. 5.

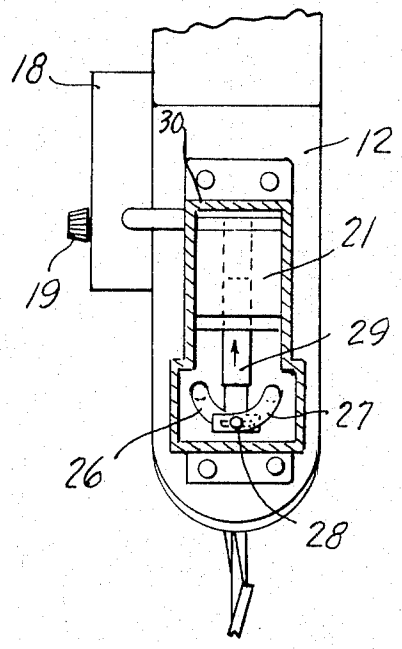


FIG. 4.

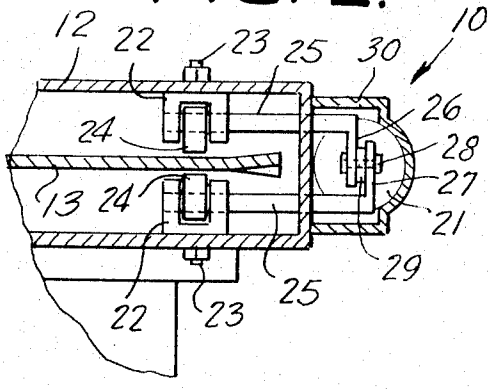


FIG. 7.

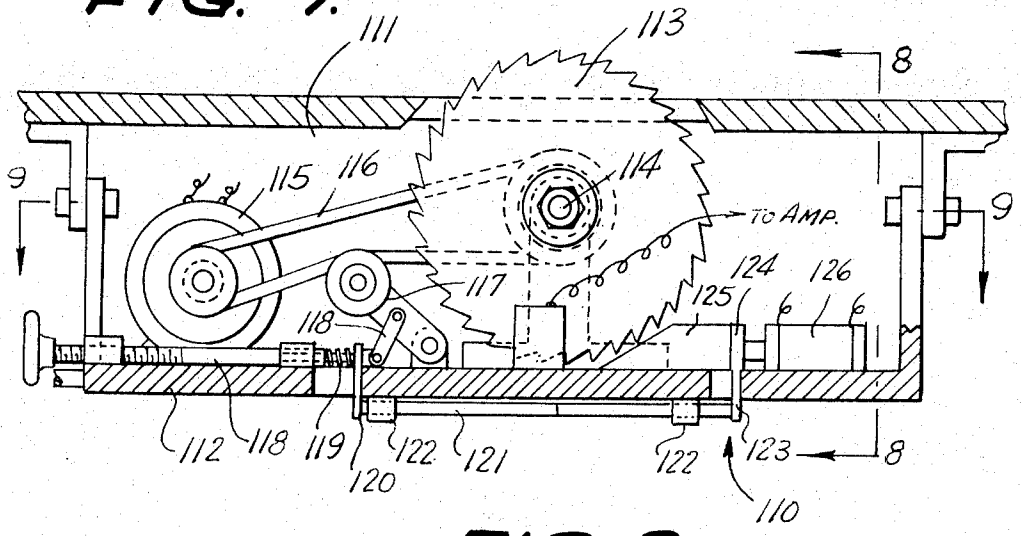


FIG. 8.

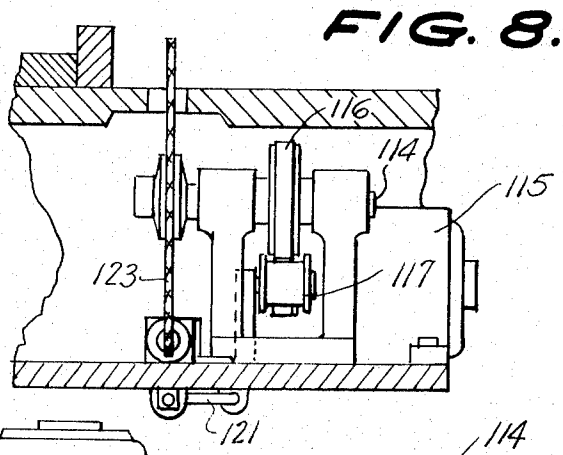
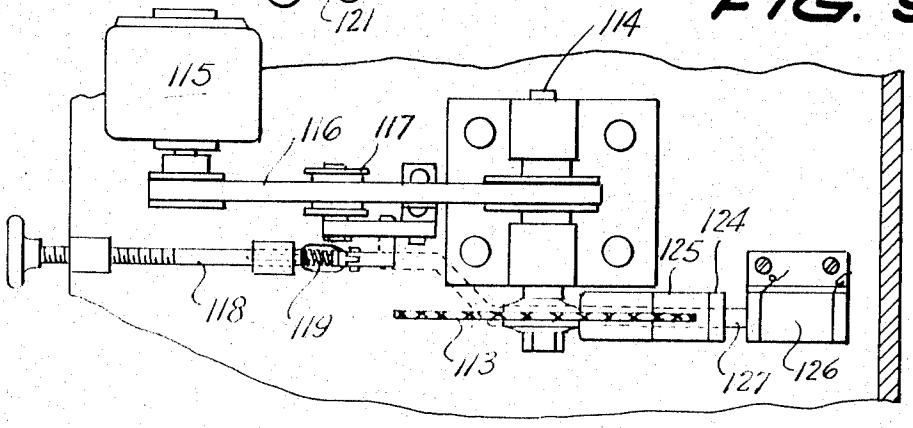


FIG. 9.



AUTOMATIC SAFETY BRAKE FOR ROTARY BLADE EQUIPMENT

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to an automatic electrically actuated brake for the spinning blade of rotary blade equipment.

Summary of the Invention

The brake of the present invention is instanteously actuated by the capacitance effect of a human body approaching the blade in such a way that cutting of the body would otherwise take place. Adjustability of the equipment permits the equipment to be tuned to the capacitance effect of each individual user.

The primary object of the invention is to provide an automatic brake for the rotary blade of rotary blade equipment actuated by approach of the human body to the blade.

Other objects and advantages will become apparent in the following specification when considered in the light of the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the invention;

FIG. 2 is an enlarged fragmentary vertical sectional view, taken along the line 2—2 of FIG. 1, looking in the direction of the arrows;

FIG. 3 is a transverse vertical cross section, taken along the line 3—3 of FIG. 2, looking in the direction of the arrows;

FIG. 4 is a transverse horizontal sectional view, taken along the line 4—4 of FIG. 2, looking in the direction of the arrows;

FIG. 5 is a vertical sectional view, taken along the line of 5—5 of FIG. 2, looking in the direction of the arrows;

FIG. 6 is a semi-diagrammatic view of the electric circuity involved in the invention;

FIG. 7 is a transverse sectional view of a table saw incorporating the invention;

FIG. 8 is a vertical sectional view, taken along the line 8—8 of FIG. 7, looking in the direction of the arrows; and

FIG. 9 is a horizontal sectional view, taken along the line 9—9 of FIG. 7, looking in the direction of the arrows.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings in detail, wherein like reference characters indicate like parts throughout the several figures, the reference numeral 10 indicates generally an automatic safety brake for rotary saws constructed in accordance with the invention.

The brake 10 is illustrated in FIG. 1 attached to an electric hand saw 11 of the type having a blade guide 12 secured thereto and covering the upper portion of the blade 13 mounted on the shaft 14. The blade 13 is electrically insulated from the shaft 14 by insulating washers W.

An amplifier 15 is connected to an antenna 16 positioned close to the blade 13 so that the blade 13 becomes a part of the electronic circuit. The amplifier is electrically connected to a discriminator 16 pulling an indicator 17 thereon and is in turn electrically connected to an electronic relay 18 having an adjustment knob 19 forming a part thereof. The amplifier 15, discriminator 16 and electronic relay 18 with its adjustment knob 19 together serve as a capacitance proximity sensor for actuating a bell 20 and a brake solenoid 21.

A pair of U-shaped brackets 22 are secured by bolts 23 internally of the blade guide 12 with each having a cam brake member 24 mounted for rotary motion therein on a shaft 25. The shafts 25 are provided respectively with crank arms 26, 27 having a slotted connection to a pivot pin 28. The pivot pin 28 connects the crank arms 26, 27 to the lower end of an armature 29 of a solenoid 21. The solenoid 21 is mounted in a housing 30 connected to the blade guide 12.

In the use an operation of the invention the operator sets the knob 19 to a position such that as his finger first approaches the blade 13 the bell 20 will ring as the indicator 17 reaches the Z and at the brake actuating solenoid will be energized as the indicator reaches X. The threading of the knob 19 should be such that the solenoid 21 will operate just prior to the finger touching the blade 13 so that the cam brake members 24 will be rotated by their shafts 25 when rotated by movement of the armature 29 in the solenoid 21. The movement of the brakes 24 into engagement with the blade 13 is virtually instantaneous and the blade 13 stops prior to even the slightest contact with the body of the user regardless of the speed of movement of the users finger toward a contacting position with respect to the blade 13.

In FIGS. 7 through 10 a modified form of the invention is illustrated wherein an electronic brake for a rotary blade is indicated generally at 110. The brake 110 is used with a table saw indicated generally at 111 having a frame 112 carrying a saw blade 113 mounted on a shaft 114 supported on the frame 112. The blade 113 is driven from an electric motor 115 by a belt 116 controlled by a belt tightener pulley 117. A control shaft 118 normally urges the belt tightener pulley 117 into belt tightening position by means of a connecting link 118 and spring 119. A link 120 is connected to the spring 119 and is carried by a slide shaft 121 mounted in bearings 122 depending from the frame 112. An arm 123 extends upwardly through the frame 112 and is connected to a block 124 slidably mounted on the frame 112 in aligned relation to the saw blade 113. A rubber wedge block 125 is connected to the slide block 124 and arranged for engaging with the saw blade 113 when moved toward the saw 113. A solenoid 126 is mounted on the frame 112 and is connected by an armature 127 to the block 124 so that actuation of the solenoid 126 forces the block 124 toward the blade 113 and engages the rubber brake block 125 with the teeth of the saw 113. Simultaneously the shaft 121 is moved in the direction to compass the spring 119 and pull the belt tightener 117 out of contact with the belt 116 to release the driving connection between the motor 115 and the shaft 114. The solenoid 126 is actuated by an identical amplifier, discriminator, and electronic relay as that used with the preferred form of the invention as illustrated in FIG. 6.

The use and operation of the apparatus illustrated in FIGS. 7, 8 and 9 is identical to that of the preferred form of the invention illustrated in FIGS. 1 through 6. It should be understood that the rubber block 125 is of sufficient strength to prevent the teeth of the blade 113

from cutting therethrough as the blade **113** is brought to a stop.

Having thus described the preferred embodiments of the invention it should be understood that numerous structural modifications and adaptations may be resorted to without departing from the spirit of the invention.

What is claimed is:

1. A power tool comprising a frame, a rotating cutting blade mounted in said frame, a brake mounted in said frame for movement into blade contacting position, a solenoid mounted in said frame and connected to said brake for moving said brake into contact with said blade, a capacitance proximity sensor mounted on said frame for detecting the approach of a portion of a human body to said blade, and means actuated by said sensor for energizing said solenoid to instanteously stop said blade when a portion of the human body closely approaches said blade.

2. A device as claimed in claim **1** including means for adjusting the relative senitivity of said sensor to tune said sensor to the capacitances of the body of the user.

3. A device as claimed in claim **1** wherein an audible signal is actuated by the means for actuating said solenoid prior to the actuation of said solenoid.

4. A device as claimed in claim **1** wherein said brake is mounted for rotation and includes a cam surface for binding engagment with the side face of said saw blade.

5. A device as claimed in claim **1** wherein said brake is mounted for sliding movement with respect to said blade and engages the cutting edge of said blade.

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