

[54] **SAW BLADE GUARD**
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83/478; 144/252 R

[56] **References Cited**

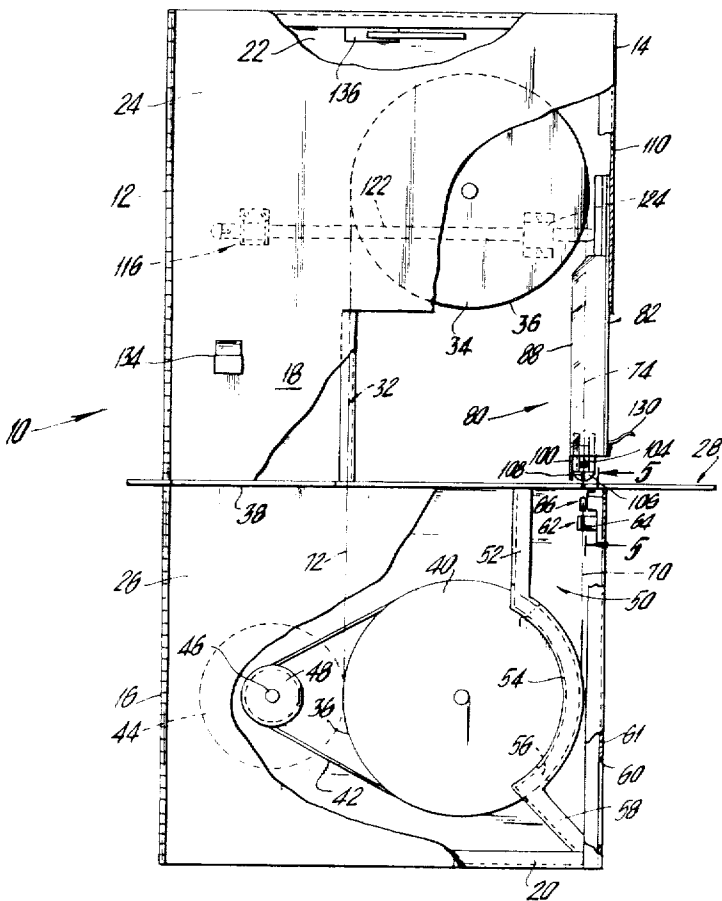
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[57] **ABSTRACT**
A saw blade guard is movable between an upper hous-

ing and a generally horizontal work support table disposed below and spaced from the housing. An unconfined portion of a blade is disposed between the housing and work table, the blade guard forming a barrier between the unconfined blade portion and an operator. The guard is in the form of a channel-shaped member disposed in confronting relation and spaced from the blade to present a barrier between the blade and the operator. The upper portion of the channel member is slidably mounted for vertical movement. The guard member is fully extended in full guard position when the member extends from the housing to a position adjacent the work table and may be manually raised to any desired degree of elevation along the otherwise exposed edge of the blade to thereby provide access to a selected portion thereof for operation on a work piece. A solenoid, mounted on the housing is connected to an engaging slide member which controllably engages a toothed rack mounted lengthwise on the guard member. The engaging slide member, controlled by the solenoid, engages the toothed rack to maintain the guard member at a selected vertical position above the work table when the saw is in operation and releases the guard member and permits the same to drop to the level of the work table under the action of gravity to substantially enclose the blade when the saw is not in operation.

14 Claims, 6 Drawing Figures



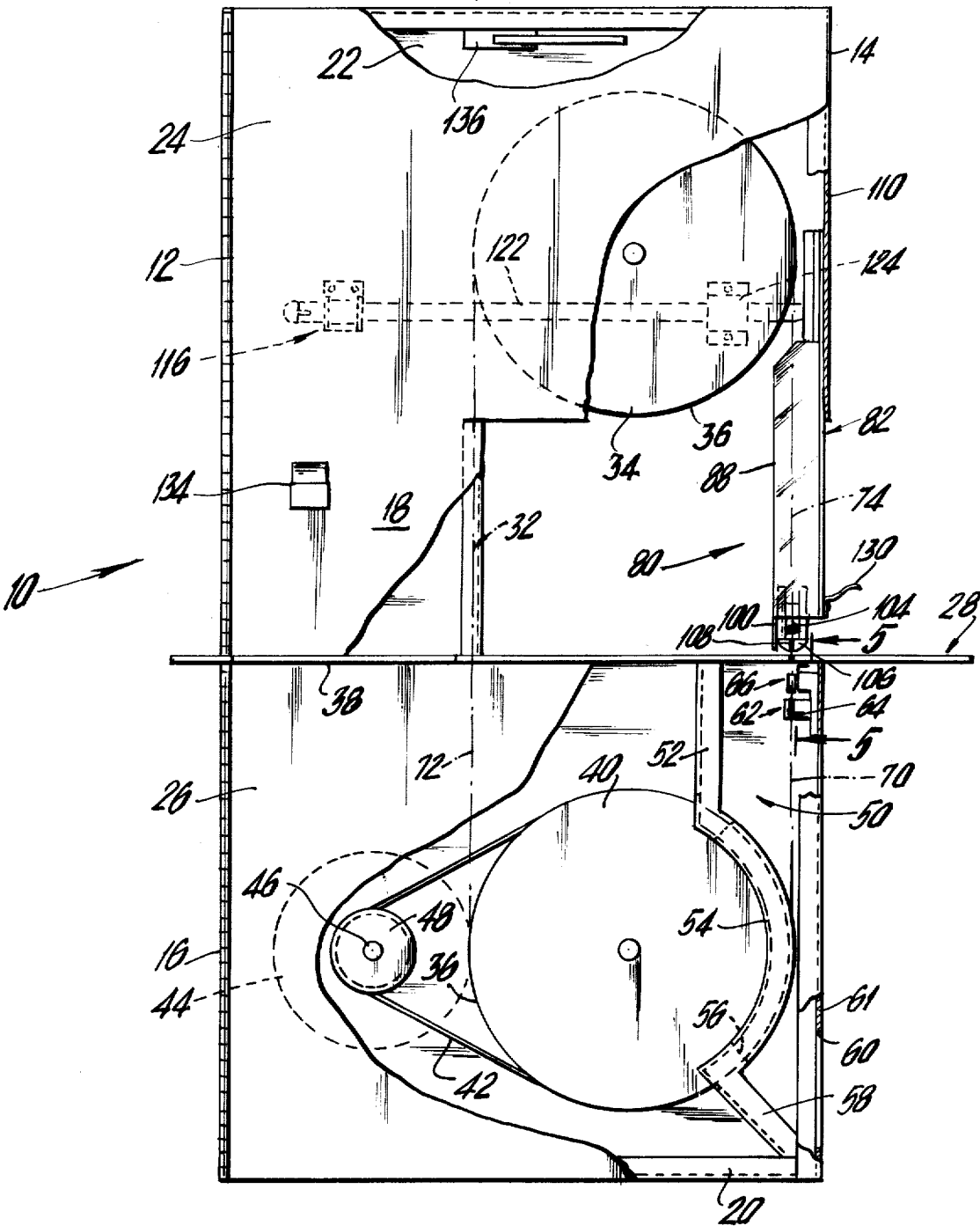
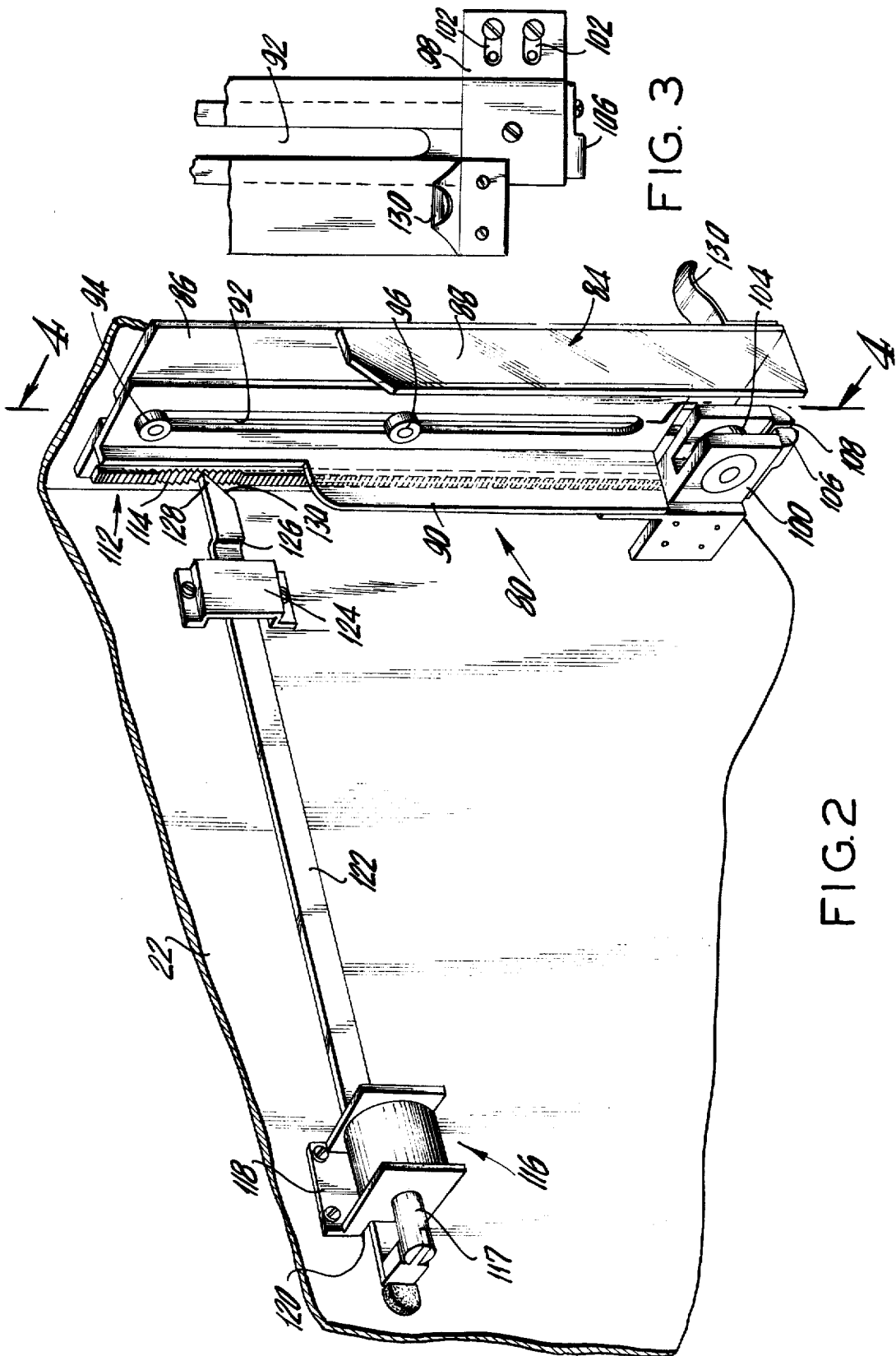


FIG. I



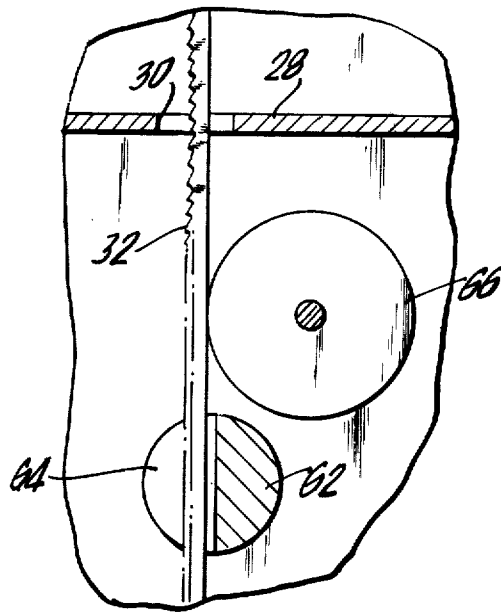
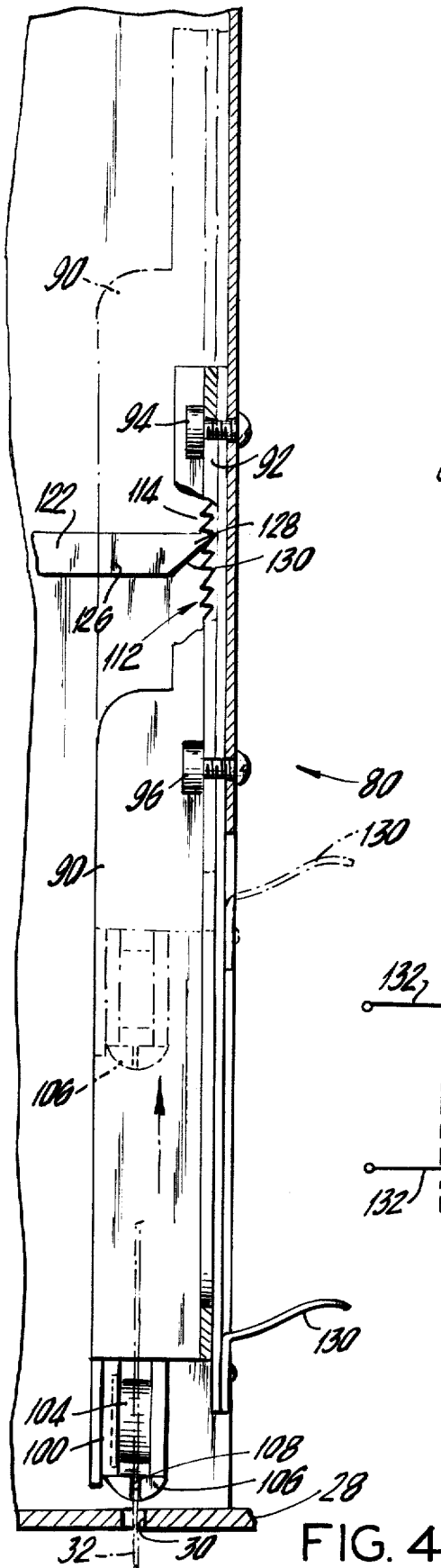


FIG. 5

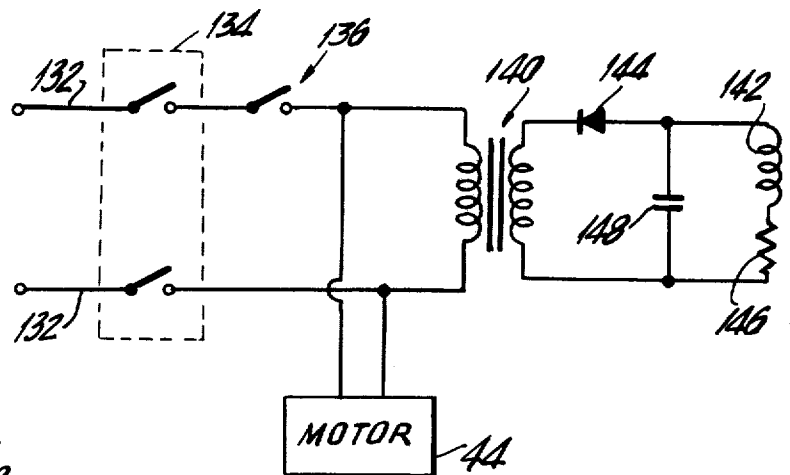


FIG.6

SAW BLADE GUARD

BACKGROUND OF THE INVENTION

The present invention generally relates to protective devices, and more particularly, to a guard member for power saws.

Various protective measures have been proposed for preventing injury in the use of power tools. However, many of these proposed measures are not always full-proof and depend for their effectiveness to a certain degree upon the steps taken by the operators of the machine. Covers and hoods of various types are known which must be positioned manually to prevent exposure of dangerous elements, such as saw blade teeth. For this reason, the known protective devices are not always successful. An operator must take the necessary steps, for example when he has completed using a power tool, to prevent a hazardous condition to himself or another user upon a subsequent use of the machine. However, inadvertence or forgetfulness sometimes results in the preventive measures or steps not being taken and a hazardous condition may be established.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a saw blade guard which is not possessed of the above described disadvantages heretofore known in the prior art comparable safety devices.

It is another object of the present invention to provide a saw blade guard which operates automatically and does not depend on the steps taken by the operator of the machine to prevent a hazardous condition.

It is still another object of the present invention to provide a saw blade guard which requires, as an additional safety measure, an operator to utilize both hands to operate the machine from its guarded or safe condition.

It is yet another object of the present invention to provide a saw blade guard which includes an override feature which permits a portion of the blade to be exposed in the protective mode of the guard.

It is a further object of the present invention to provide a saw blade guard which is simple in construction and economical to manufacture.

It is still a further object of the present invention to provide a saw blade guard which is electrically and automatically operated and which is adapted for integration with a safety circuit wherein the saw blade guard is placed into operation whenever the power saw housing is opened, as for maintenance or repair purposes.

In order to achieve the above objects, as well as others which become apparent hereafter, a saw blade guard in accordance with the present invention will be described herein which is utilized in a power-operated saw having a vertically disposed saw blade wherein an upper portion of the blade is enclosed in a housing and the blade extends through an aperture provided in a generally horizontal work support table disposed below and spaced from said housing and whereby an unconfined portion of the table is disposed between said housing and work table. The saw blade guard of the present invention for forming a barrier between said unconfined portion and an operator comprises an elongated barrier member disposed in confronting relation and spaced from the blade to present a barrier between the blade and the operator. The upper portion of the barrier member is mounted in said housing for vertical

movement and is fully extended in full guard position when said member extends from said housing to a position adjacent said work table and may be manually raised to any desired degree of elevation along the otherwise disposed edge of the blade to thereby provide access to a selected portion thereof for operation on the work piece. Locking means are provided for engaging said guard to maintain said enclosure at a selected vertical position above the work table when the saw is in operation and to release said guard and permit the same to drop to the level of the work table under the action of gravity to substantially cover the blade when the saw is not in operation.

BRIEF DESCRIPTION OF THE DRAWINGS

With the above and additional objects and advantages in view, as will hereinafter appear, this invention comprises the devices, combinations and arrangements of parts hereinafter described and illustrated in the accompanying drawings of a preferred embodiment in which:

FIG. 1 is a front elevational view of a band saw incorporating the saw blade guard in accordance with the present invention, showing portions of the housing broken away to expose important features of the band saw;

FIG. 2 is a perspective view of the saw blade guard of the present invention shown in FIG. 1, showing a control solenoid and slide member forming part of the locking device of the present invention with the upper saw wheel removed;

FIG. 3 is a fragmented rear elevational view of the lower portion of the saw blade guard shown in FIGS. 1 and 2;

FIG. 4 is a cross-sectional view of the saw blade guard of the present invention taken along line 4—4 of FIG. 2, showing the two extreme positions of the guard for exposing and for covering the saw blade portion which acts upon a work piece;

FIG. 5 is a fragmented cross sectional view of a guide and bearing provided for the saw blade, taken along 5—5 in FIG. 1; and

FIG. 6 is an electrical schematic for the circuit which controls the operation of the band saw including the blade guard of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now specifically to the drawings, wherein similar or identical parts have been designated by the same reference numerals throughout, the present invention will be described in connection with a band saw 10. It should be clear, from the description that follows, however, that the blade guard of the present invention can be utilized with any power tool wherein hazardous components thereof must not be left exposed when the machine is not in use. The present invention is particularly useful to protect operators of saws of various types, including band saws and jig saws.

The band saw includes a U-shaped enclosure 12 which includes upper and lower housings 14, 16 and a lateral connecting housing 18. The general outline of the enclosure is formed by U-shaped channels 20. Mounted on one side of the U-shaped channels is a back or rear wall 22. Hingedly connected to the other side of the U-shaped channels are upper and lower housing doors 24, 26 which can individually be opened

to provide access to the upper housing 14 or the lower housing 16 respectively.

A work support table 28, generally horizontally disposed, is provided below and spaced from the upper housing 14. The work support table 28 is provided with an aperture or slot 30 through which a circular saw blade band 32 can extend, as to be more fully described hereafter.

Provided in the upper housing is a saw wheel 34 which is rotatably mounted on the rear wall 22. The saw wheel 34 can, for example, be made of an elastomeric material such as nylon. Advantageously, a rubber strip of material 36 is provided about the peripheral or circumferential surface of the saw wheel 34 to provide better gripping action for the saw blade 32. Conventional means (not shown) may be provided for raising and lowering the upper saw wheel 34 within predetermined limits to facilitate the mounting of the circular saw blade 32 and fixing the same.

The work support table 28 is provided with an extension 38 disposed in front of the connecting housing 18. The extension 38 is removably mounted on the connecting housing 18 in any suitable or conventional manner whereby the platform or work table extension 38 may be removed for mounting the circular blade band 32.

In the lower housing 16, there is provided a lower saw wheel 40 which is in the nature of a belt pulley wheel. The pulley wheel 40 can similarly be made of elastomeric material and is similarly provided with a strip of rubber material 36 about its circumferential surface. The two saw wheels 34, 40 are vertically aligned and spaced substantially equal distances from the back or rear wall 22 to permit mounting and carrying of the circular saw blade 32 thereon.

The lower belt pulley wheel 40 is provided with a groove (not shown) suitable for receiving a pulley belt 42. Mounted in back of the rear wall 22 is a motor 44 for driving the band saw 10, the shaft 46 thereof extending through the rear wall 22 and being provided at the end thereof with a belt pulley wheel 48 provided with spaced ridges (not shown) configured to meshingly engage the ridges (not shown) on the interior of the pulley belt 42. A slot (not shown) may be provided in the rear wall, through which one of the mounting screws to the motor passes to permit slight movements of the motor shaft 46 relative to a fixed axis on which the bottom saw wheel 40 rotates for tightening the pulley belt 42.

Provided on one side of the bottom saw wheel 40 in the lower housing 16 is a collecting chamber 50 disposed beneath the slot 30 in the work support table 28. The chamber or compartment 50 is formed by a straight wall portion 52 extending from the work table 28 to the periphery of the wheel 40. A curved wall portion 54 follows the contour of the periphery of the bottom wheel 40, the curved wall portion 54 being provided with an opening 56 which communicates the interiors of the collecting chamber 50 and the lower housing 16 along a circumferential portion of the lower saw wheel 40. A further flat inclined wall portion 58 is provided, which together with the other above described wall portions 52, 54, define the collecting chamber 50.

An opening 60 is provided at the lower end of a channel member wall 61 which is suitably connected to a vacuum system, such as a vacuum cleaner, for collect-

ing the dust, shavings and the like which are transmitted into the collecting chamber 50 by the saw blade 32.

Also provided in the collecting chamber 50, beneath the work support table 28, is a guide 62 which is provided with a slot 64 suitable to confine the saw blade 32 and prevent excessive transverse movement of the blade in lateral directions, as shown in FIGS. 1, 4 and 5. To prevent excessive transverse movement in a rearward direction, upon the application of a work piece the blade 32, a bearing 66 is mounted on the channel member wall 61, the bearing 66 being rotatable to minimize the frictional forces exerted on the saw blade 32 when the latter abuts against the bearing. The bearing 66 is movable to a limited degree in frontward and rearward directions by the provision of a slot (not shown) within the channel member wall 61 through which a supporting screw for the bearing passes.

In a band saw structure as above described, a circular saw blade 32 has an operative portion 70 and a return portion 72. The operative portion 70 extends from and is partially enclosed in the upper housing 14 while the lower end of the operative portion extends through the aperture or slot 30 provided in the generally horizontal work support table 28. Accordingly, there remains an unconfined portion 74 of the blade which is disposed between the housing 14 and the work table 28. An important feature of the present invention is a saw blade guard 80, as to be described, for forming a barrier between the unconfined portion 74 and an operator. In broad terms, the guard 80 comprises an elongate barrier member 82 disposed in confronting relation and spaced from the blade 74 to present a barrier between the blade and the operator. The operative portion of the barrier member is mounted in the upper housing 14 for vertical movement and is fully extended in full guard position when the member 82 extends from the housing to a position adjacent the work table 28. In the presently preferred embodiment, the guard 80 may be manually raised to any desired degree of elevation along the otherwise exposed edge of the blade 74 to thereby provide access to a selected portion thereof for operation on a work piece.

Examining the presently preferred embodiment of the blade guard in FIGS. 2-4, this is shown to comprise a generally U-shaped channel or member 84 which includes a slide or face plate 86 and front and rear side guard members 88, 90. The front side guard member 88 is advantageously transparent and made from a material such as Lucite or Plexiglas. The slide or face plate 86 is provided with an elongate slot 92 which runs substantially the entire length thereof. Mounted on the U-shaped channel 84 and forming part of the upper housing are two stops or bushings 94, 96 which are received within the slot 92. The upper stop 94 is positioned on the U-shaped channel to abut against the upper end of the slot when the lower portions of the guard 80 are just above the work support table 28 and substantially enclose and cover the otherwise unconfined blade portion 74. The lower stop 96 is mounted on the U-shaped channel 84 to engage the lower end of the slot to limit upward movement of the guard 80 when the unconfined portion 74 has been substantially exposed.

Provided at the lower end of the rear side guard member 90 there is provided a support bracket 98 on which a bearing support member 100 is mounted. The bearing support member 100 is provided with horizontal slots 102 which permit slidable movement of the

bearing support member 100 relative to the support bracket 98 for permitting limited frontward and rearward movement of a bearing 104 (FIG. 4) mounted on the bearing support member. A blade guide 106 is provided at the lower extremities of the bearing support member 100 having a slot 108 for limiting transverse movements of the blade. The bearing 104 and the blade guide 106 are similar to the bearing 66 and guide 62 described in connection with the collecting department or chamber 50 and serve the same functions as the latter.

From the above description, it should be clear that the guard member 80, in its lower position wherein the stop 94 engages the upper end of the slot, substantially encloses the unconfined portion of the blade 74 and effectively forms a barrier between the unconfined portion and an operator. When using the machine, the guard member 80 can be raised by slidable movement thereof along the slot 92 to expose as much or as little of the unconfined blade portion 74 as desired.

It should be noted that the face plate 86, when slidably mounted as above described, forms a continuation of the U-shaped channel or side wall 110 of the upper housing 14. This results in an additional safety feature whereby an operator cannot inadvertently position a finger, for example, into a space which may otherwise result. Also, this continuation provides a finished effect which is aesthetically pleasing.

An important feature of the present invention is the provision of locking means for the blade guard 80. Broadly, the locking means is provided for engaging the guard 80 to maintain the same at a selected vertical position above the work table 28 when the saw is in operation and for releasing the guard and permitting the same to drop to the level of the work table under the action of gravity to substantially cover the blade 74 when the saw is not in operation.

A presently preferred locking means is shown in FIGS. 1, 2, 4 and 6 wherein an elongate toothed rack 112 is mounted lengthwise of the slot on the face plate 86 in back of the rear side guard member 90. The toothed rack 112 is provided with teeth 114 each having an upper inclined surface and a lower substantially horizontal surface to form a ratchet tooth rack. Advantageously, the toothed rack 112 extends substantially along the entire length of the guard member 80.

Mounted on the rear wall 22 is an electromechanical device in the form of a solenoid 116. The solenoid 116 is provided with a plunger 117 which, in the embodiment being described, moves towards the right, as viewed in FIGS. 1, 2 and 4, when energized. The solenoid 116 is mounted on a bracket 118, provided with a recess 120 through which an elongate engaging slide member 122 passes. One end of the engaging member is connected to the plunger and the other end of the engaging member extends through a retaining bracket 124 mounted on the rear wall 22 whereby the engaging member 122 is slidably mounted in a direction along its length in response to movements of the plunger 117.

The free end of the slide 122 which extends through the retaining bracket 124 is provided with a bent portion 126 and a tip 128 formed by cutting the end of the engaging member 122 at a slant to provide a lower inclined edge 130. The pointed tip 128 of the engagement member 122 is spaced from the rear wall 22 to assure engagement thereof with the teeth 114 of the rack 112.

The angle at which the end of the engaging member is cut advantageously corresponds to the angle of the inclined surfaces of the teeth 114 on the ratchet-type rack 112. The horizontal edge of the slide or engaging member is adapted to engage a respective one of the horizontal teeth surfaces of the rack when the engaging member is fully advanced towards the latter. Thus, the point 128 of the engaging member is complementary in configuration to the space formed between a horizontal surface of one tooth and an adjacent inclined surface of another tooth.

The stroke of the solenoid 116 is selected to cause the pointed end 128 of the engagement member 122 to engage the rack 112 when energized while disengaging the slide engagement member from the rack when de-energized.

As should now be clear, when the solenoid 116 is de-energized the guard 80 can be slidably moved between its upper and lowermost limits. For this purpose, a finger grip 130 is advantageously provided which facilitates the movement of the guard 80.

Referring now to the electrical schematic diagram of the circuit which controls the operation of the band saw 10, the leads or wires 132 are connectable to the power lines in a conventional manner. Each of the leads is connected to one pole of a double pole switch 134. One of the leads is further connected to a single pole, normally opened switch 136 which serves as a tripping switch for the upper door 24 of the housing 14, as will be more fully described hereafter. The motor 44 is connected to the power lines via the aforementioned switches 134, 136.

Connected in parallel to the motor 44 is the primary winding of a transformer 140, the secondary winding of which is connected to the solenoid 116 coil 142. A diode 144 is connected between the secondary winding and one end of the solenoid coil while a series resistance 146 is connected between the other end of the solenoid coil 142 and the secondary winding. A capacitance 148 is connected across the series connection of the solenoid coil 142 and the resistance 146.

The diode 144 and the capacitance 148 to form a rectification circuit for rectifying the alternating current presented at the secondary winding to convert the same to a d.c. current at the solenoid coil 142. The purpose for the series resistance 146 will be described hereafter.

The normally open switch 136 is closed when the upper housing door 24 is closed. In this condition, when the main power switch 134 is closed, the motor 44 is energized and the band saw is placed into operation. Simultaneously, the solenoid 116 is energized and the slide engaging member 122 is urged towards the right into engagement with the rack 112.

The operation of the guard member 80 will now be described. With the upper housing door 24 closed, and with the main power switch 134 in the off position, the solenoid 116 remains deenergized and the sliding engaging member 122 is maintained disengaged from the rack 112. Accordingly, an operator may manually slidably move the guard 80 to any desired elevation above the work table 28. As soon as the main power on/off switch 134 is closed and the motor 44 is energized, the solenoid 116 is similarly energized and the sliding engaging member 122 is urged towards the right into engagement with the rack 112. Release of the guard member 80 by the operator does not result in the latter

dropping to its lowermost position because of the rack engagement. Therefore, once an operator has selected a desirable elevation for the guide member 80, the desired position thereof is maintained throughout the cutting operation by the locking means or the slide engagement member 122. When the upper housing door 24 is opened or when the main power on/off switch 134 is closed, the solenoid 116 becomes deenergized and the sliding engagement member 122 is urged towards the left due to the spring loaded action on the plunger 117. The resulting disengagement between the pointed end 128 of the slide member 122 and the rack 112 causes the blade guard 80 to drop to the level of the work table 28 under the action of gravity to substantially cover the blade 74 when the saw is not in operation. This forms an important feature of the present invention as it is not dependent on any conduct on behalf of the operator of the machine but rather takes place automatically without any effort on his part. In this manner, both the operator as well as others are not exposed to a dangerous or hazardous condition on a subsequent use of the machine.

The holding strength or power of the solenoid 116 when energized, or the force with which the slide engaging member 122 is urged against the rack 112, is a function of the current which flows through the solenoid coil 142. By placing a series current limiting resistor 146 with the coil 142, the holding strength can be adjusted. In the presently preferred embodiment, the holding strength of the solenoid 116 is adjusted to permit raising of the guard member 80 against the action of the pointed end 128 of the engagement member 122 wherein the latter successively slidably abuts against the inclined surfaces of the rack teeth 114. However, it should be noted, that only raising of the guard member 80 is possible, lowering the same not being permitted due to the engagement of the horizontal upper edge of the pointed end 128 and the horizontal surfaces of the rack teeth 114. Thus, while raising of the guard member 80 is possible, this is more difficult than when the machine is turned off because of the engagement of the slide member with the rack. In the selection of the resistor 146, care must be taken to select a low enough resistance value which will assure sufficient current through the solenoid coil 142 to assure the above described engagement of the slide member 122 with the rack 112 when the solenoid is energized.

Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However, it is to be understood that the present disclosure relates to a preferred embodiment of the invention which is for purposes of illustration only and is not to be construed as a limitation of the invention.

I claim:

1. In a power-operated saw having a vertically disposed saw blade wherein an upper portion of the blade is enclosed in a housing and the blade extends through an aperture provided in a generally horizontal work support table disposed below and spaced from said housing whereby an unconfined portion of the blade is disposed between said housing and work table, a saw blade guard for forming a barrier between said unconfined portion and an operator, said guard comprising an elongated barrier member disposed in confronting relation and spaced from the blade to present a barrier between the blade and the operator, the upper portion of said barrier member being mounted on said housing

for vertical movement and is fully extended in full guard position when said member extends from said housing to a position adjacent said work table and may be manually raised to any desired degree of elevation along the otherwise exposed edge of the blade to thereby provide access to a selected portion thereof for operation on a work piece; and locking means for engaging said guard to maintain said enclosure at any one of a plurality of discreet selected vertical positions above the work table upon actuation of the saw and to release said guard and permit the same to drop to the level of the work table under the action of gravity to substantially cover the blade when the operation of the saw is terminated.

2. A guard as defined in claim 1, wherein said barrier member is in the form of an elongate U-shaped channel.

3. A guard as defined in claim 2, wherein said U-shaped channel has a side facing the front of the saw made of a transparent material, whereby the unconfined blade portion is visible when enclosing the latter in a guarding condition.

4. A guard as defined in claim 2, wherein a slot is formed in a side of said barrier member, and stop means fixed on said housing and extending through said slot, wherein vertical movement of said guard is limited by engagement of one of stop means and an end of said slot.

5. A guard as defined in claim 1, further comprising blade guide means provided at the lower extremity of said guard for containing the blade and preventing excessive transverse movements thereof.

6. A guard as defined in claim 5, further comprising adjusting means for permitting limited movement of said guide means in a transverse direction.

7. A guard as defined in claim 1, wherein said housing has an end wall, and wherein said guard has a face slide surface substantially flush with said end wall in all vertical positions of said guard.

8. A guard as defined in claim 1, wherein said locking means comprises a toothed rack mounted lengthwise on said guard; slidable engagement means mounted on said housing for engaging said rack in a predetermined position thereof; and circuit means for moving said engagement means to said predetermined position only when the saw is in operation.

9. A guard as defined in claim 8, wherein said circuit means comprises a solenoid having a plunger fixed to said engagement means; and switch means for energizing said solenoid, said switch means also simultaneously energizing a motor which operates the saw.

10. A guard as defined in claim 9, wherein said solenoid is operated by d.c. and wherein said circuit means is connected to a source of a.c. power, and further comprising rectifier means for converting said a.c. power to d.c. power.

11. A guard as defined in claim 9, further comprising a resistance connected in series to the winding of said solenoid, wherein the holding strength thereof when energized can be adjusted to permit manual movement of said plunger to move said guard against the action of said engagement means.

12. A guard as defined in claim 11, wherein said rack is in the form of a ratchet and has teeth with upper inclined surfaces, said engagement member having a lower inclined edge substantially parallel to said upper inclined surfaces, whereby said guard may be forced in

an upward direction with said inclined edge slidably abutting said inclined surfaces.

13. A guard as defined in claim 1, wherein the saw is provided with a lower housing, further comprising a substantially closed collecting chamber below said aperture in said work support table, said blade passing into said chamber subsequent to cutting operations, whereby shavings and dust are drawn in to said collect-

ing chamber during operation of the saw.

14. A guard as defined in claim 13, further comprising an opening in a wall of said collecting chamber suitable to permit coupling thereto of a vacuum hose for drawing away of said shavings and dust and preventing accumulation thereof within said collecting chamber.

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