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(54) Chop saw linkage system.

(57) A chop saw (90) pivotably mounted for movement between a raised rest position and a lowered operational position, having a motor driven saw-blade (32) rotatably supported about a shaft (28), with a saw housing (106) partially encasing the saw-blade (32) and a swinging blade guard (108) which covers the exposed segment of the saw-blade (32) when the saw (90) is in the rest position. When the saw (90) is lowered to its operational position, a linkage system comprising four effective levers and four hinges clears the blade guard (108), thereby exposing the saw blade (32) to the work piece. To accommodate changing the saw blade (32) while the saw-unit (90) is in its rest position, the effective length of one of the levers can be temporarily reduced, thereby clearing the blade guard (108) from the exposed section of the saw blade (32). This provides easy access to the saw-blade (32) to be changed.

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CHOP SAW LINKAGE SYSTEM

This invention relates to table mounted, power circular saws which are primarily intended to perform a chopping function.

Traditionally chop saws are pivotably mounted on a saw table, between a raised rest position and a lowered operational position. For safety reasons, it is desirable to provide a hood to cover the saw blade when the saw is in the rest position. Convenience dictates that any such blade guard should be mounted in a manner such that it will be swung clear of the saw blade when the saw is pivoted from its rest position to its operational position. Prior art devices, such as German Offenlegungsschrift 28 29 297, have attempted to solve this problem by coupling the swinging hood to a saw table with a cable in order to pivot the hood to clear the blade when the saw unit is lowered to its operational position.

An inherent problem with such prior art devices is that when the saw unit is in the raised rest position, the blade guard hampers attempts to change the saw blade. Likewise, it is difficult to change a saw blade in the operational position because the saw table gets in the way.

When the chop saw is not in use, it is also desirable for safety reasons to lock the saw-unit in its rest position with the blade covered. Prior art locking systems, such as the one disclosed in German Gebrauchsmuster 74 20 476, keep the raised saw unit in the rest position by means of a locking element that engages a stationary locking surface. To be released, the locking element must displace a spring. In such an arrangement, the entire weight of the saw unit rests upon the locking element, which accordingly must be very rugged in order to prevent damage when the user inadvertently attempts to force the saw-unit down while the locking element remains engaged to the locking surface.

An object of the present invention is to overcome many of the disadvantages of prior art devices by providing a linkage system which effectively clears the blade guard from the saw blade when the chop saw is lowered to the operational position while being

partially collapsible in order to facilitate changing of the saw blade by allowing the protective blade guard to be swung out of position while the saw is maintained in the rest position.

According to the present invention a chop saw pivotally mounted on a bearing bracket for movement between a lowered, operational position and a raised, rest position, having a motor-driven saw blade rotatably supported on a shaft, a housing partially encasing the saw blade and a swinging blade guard disposed to cover an exposed segment of the saw blade when the chop saw is in the raised position, is characterized in that a linkage system is provided for moving the blade guard in response to movement of the chop saw between the lowered and raised positions, such that the blade guard immovably covers the exposed segment when the chop saw is in the raised position and is moved to uncover the exposed segment when the chop saw is moved to the lowered position, linkage system comprising aframe fixed to and extending upwardly from the bearing bracket, a first hinge for pivotally mounting the housing near the base of the frame member, a second hinge pivotally attaching one end of an actuation lever to the frame member upwardly from the first hinge, a third hinge pivotally attaching the other end of the actuating lever to the swinging blade guard and a fourth hinge pivotably connecting the swinging blade guard to the housing, the third hinge being eccentrically positioned on the blade guard with respect to the fourth hinge and the distance between the third and fourth hinges being substantially less than the distance between the first and second hinges.

Preferably the linkage system includes means for selectively disengaging the second hinging means to permit temporary shortening of the effective length of the actuation lever and moving of the blade guard to uncover the exposed segment when the chop saw is in the raised position for facilitating changing the saw blade.

The linkage system may include a locking device for detachably engaging the actuation lever when the saw is in the raised position.

The invention will now be described further, by way of example, with reference to the accompanying drawings, in which:-

Fig 1 is a schematic diagram of the linkage system in both the operational and rest positions;

Fig 2 is a side elevation of the chop saw with a fragmentary sectional view of the locking mechanism and a portion of the linkage system;

Fig 3 is a cross-section of the chop saw on the line III-III of Fig 2, emphasizing the relationship of the pivot bolt that attaches the frame member to the actuation lever; and

Fig 4 is an elevation of the actuation lever.

The chop saw shown in the drawings includes a power circular saw-unit 90 pivotably mounted on a saw table 20 for movement between a raised rest position and a lowered operational position. The saw-unit includes a prime mover preferably an electric motor (not shown), which rotatably drives a saw blade 32 about its supporting shaft 104; a housing 106 which partially encases the blade 32 and a pivotably mounted blade guard 108 that immovably encases the exposed portion of the saw blade 32 when the saw-unit is in the rest position.

A linkage system is provided which clears the blade guard 108 when the saw unit 90 is lowered into the operational position, thereby exposing the blade 32 to a workpiece.

The linkage system schematically shown in Fig 1, includes four hinges 1, 2, 3 and 4 as well as four effective levers 5, 6, 7 and 8. The first hinge 1 is stationary and is located at the base of the lever 5 which is also stationary. The lever 6 is pivotably mounted to the lower end of the lever 5 by the first hinge 1. The lever 6 corresponds to the saw housing 106 of Fig 2, and the pivotal motion of the first hinge 1 corresponds to the movement of the saw-unit 90 between its rest position and its operational position. The lever 8 is pivotably connected to the lever 6 by the hinge 4. The lever 8 corresponds to the swinging blade guard 108 of Fig 2. The lever 7 is pivotally connected to the lever 5 at hinge 2 and to the lever 8 at hinge 3.

The lever positions depicted by solid lines in Fig 1 represent the saw in the operational position. The dashed lines represent the rest position. Since the effective length of the lever 8 is substantially less than the effective length of the lever 5, the lever 8, which corresponds to the swinging blade guard 108, has a much greater arc of rotation than does the lever 6, which corresponds to movement of the housing 106 between the rest position and the operational position. In order to reach the operational position, the lever 6' is pivoted clockwise about hinge 1. This causes a counterclockwise rotation of the lever 8 about the hinge 4. This corresponds to the movement of the swinging blade guard 108 as the saw is lowered. Since initially the distance between the hinge 3' and the hinge 1 must increase, the lever 7' is initially required to swing upwardly about the hinge 2.

An engaging member 10 is mounted on the lever 7. When the saw is in its rest position, engaging member 10' attaches to a locking device 12 to secure the saw in that position. In the rest position, as shown by the dashed line in Fig 1, the hinge 3' is further from the lever 5 connecting the first and second hinges than is the hinge 4' and the two essentially form a straight line with hinge 2. Thus, when the saw is in the rest position, the alignment of the levers is such that the majority of the load acting on the saw unit is transmitted by the levers 7' and 8', thereby alleviating the bulk of the load on the locking device 12.

The safety saw shown in Figs 2 and 3 comprises a conventional saw table 20 with a workpiece stop 22 against which the workpiece is adapted to rest. A revolving seat 24 is rotatably supported on the saw table 20 and holds a bearing bracket 26 through which passes a horizontal shaft 28. A frame 105 is attached to revolving the seat 24. When a clamping knob 30 is loosened, the frame 105 may be rotated about the axis of the shaft 28. This makes possible the miter-setting of the saw-unit.

A shaft 101 is mounted in the frame 105 and pivotably supports the saw housing 106. This pivot-junction corresponds to the hinge 1 of Fig 1 and the housing 106 corresponds in function to the effective lever 6 of the linkage system shown in Fig 1.

The frame 105 extends upwardly from the shaft 101 and terminates at a pivot junction with an actuation lever 107. The pivot junction is formed by a pivot bolt 102 which corresponds to the hinge 2 of Fig 1. The frame 105 corresponds to the effective lever 5 of Fig 1 and the actuation lever 107 corresponds to the effective lever 7 of the linkage system shown in Fig 1. The actuation lever 107 is pivotably connected to the swinging blade guard 108 by a pivot joint 103. The pivot joint 103 corresponds to the hinge 3 shown in Fig 1, is eccentrically positioned on the blade guard 108 about the saw blade support shaft 104. The swinging blade guard 108 corresponds to the lever 8 in Fig 1.

The saw blade 32 is rotatably supported by the saw blade support shaft 104 in the housing 106 and is driven by an electric motor (not shown), located on the back of the saw as seen in Fig 2. The saw blade support shaft 104 shares the same axis of rotation as the swinging blade guard 108. The saw blade support shaft 104 corresponds, in location, to the hinge 4 of Fig 1.

When the saw unit is lowered from its rest position, the saw housing 106 is rotated about the first hinge i.e. shaft 101. The actuation lever 107 is similarly rotated in a clockwise manner about the pivot bolt 102. As is apparent from the schematic diagram of Fig 1, this combination of motion causes a relatively large rotation of the swinging blade guard 108 about the saw blade support shaft 104 corresponding to a relatively small rotation of the saw housing 106 about the shaft 101. This combination of motions allows the swinging blade guard 108 to rotate clear of the saw blade 32 when the saw unit is lowered to its operational position.

In a preferred embodiment, the actuation lever 107 is L-shaped. Such a structure assures that the actuation lever will always be outside the range of displacement of the saw blade support shaft 104. This permits the entire linkage system to be mounted essentially in a single plane. The L-shaped actuation lever 107 has a pivot point aperture 40 at the outer end of its longer leg

(Fig). Adjoining the pivot point aperture 40 is a slot 41 which runs longitudinally along the center of the longer leg of the L-shaped actuation lever 107. The width of the slot 41 is less than the diameter of the pivot point aperture 40.

As shown in Fig 3, it is preferred that pivot bolt 102 has a threaded end section of lesser diameter than its shank. When the saw unit is operational, the pivot bolt 102 is threadably secured to the frame 105. The pivot point aperture 40 of the actuation lever 107 receives the shaft of the pivot bolt 102. It is preferred that the width of the slot 41 be less than the diameter of the shaft of the pivot bolt 102 but greater than the diameter of the threaded portion of the pivot bolt.

It is further preferred that an opening 45 be cut into the housing 106 in a location such that it will be aligned with the pivot bolt 102 when the saw unit is in its rest position. The opening 45 preferably consists of a bore 47 expanded by an inner cavity 49 internal to the housing 106.

To accommodate changing of the saw blade 32, the saw unit is placed in the rest position. A screw driver, inserted through the opening 45 in the saw housing 106 can be used to partially withdraw the pivot bolt 102 from the frame 105. It is preferred that the face of inner cavity 49 be located in a manner such that while it prevents the pivot bolt 102 from being totally withdrawn from the frame 105, it allows sufficient space for the shank of the pivot bolt 102 to be cleared from the L-shaped actuation lever 107. This allows the actuation lever to slide freely along the threaded portions of the pivot bolt 102. The swinging blade guard 108 can then be raised without moving the saw unit from its rest position. The saw blade 32 may then be freely changed without any obstruction from the blade guard 108. The head of the pivot bolt 102 which is within the inner cavity 49 prevents the saw-unit from being lowered to its operational position until the actuation lever 107 has been returned to its normal position and the pivot bolt 102 is turned back into place.

A locking element 50 engages the actuation lever 107 when the chop saw is in its rest position. The locking element 50, which is pivotably mounted about a pivot axis 52, is connected to a lock release button 54 by a release lever 55. The release lever itself is mounted pivotably about a pivot axis 56.

In order to lower the saw blade so it may engage a work-piece, the locking element 50 must be disengaged. To accomplish this, the lock release button 54 is depressed. As a result, the release lever 55, which is attached at one end to lock release button 54, is rotated about the pivot axis 56. This rotation causes an upward displacement of a pin 60 which is mounted at the opposite end of the release lever 55. The locking element 50 is provided with a curved slit 62 that has an enlarged clearance 64 at the lower end thereof. When the pin 60 is forced upwards by the actuation of the lock release button 54, it forces the locking element 50 to rotate in a clockwise direction as seen in Fig 2. This rotation of the locking element 50 causes the actuation lever 107 to rotate about the pivot bolt 102 in a counterclockwise direction. Simultaneously, the third hinge 103, which corresponds to hinge 3 in Fig 1, is raised above the line connecting hinges 2 and 4 (which correspond to the pivot bolt 102 and the sawblade support shaft 104 respectively), thereby eliminating the dead position. Thereupon, the locking element 50 is disengaged and the saw unit can be easily lowered.

Tension springs 70 and 71 are mounted on the frame at one end and on the housing at their other end, in a manner such that they exert an upward force on the pivotably mounted housing 106. The springs 70 and 71 automatically pivot the saw into the rest position shown in Fig 2 when the user releases the housing 106.

A threaded borehole 80 is present in the frame 105 between the points acted upon by the springs 70 and 71 on one side and the pivot bolt 102 on the other. The borehole 80 is configured to receive a locking screw 83 that is mounted on the housing unit 106 in a manner such that when the saw unit is lowered into its

operational position, the locking screw 83 and the borehole 80 are aligned. It is therefore possible to lock the saw unit in its lowered position, which is desirable, for example, when the saw unit is being transported.

CLAIMS

1. A chop saw (90) pivotally mounted on a bearing bracket (26) for movement between a lowered, operational position and a raised, rest position, having a motor driven saw blade (32) rotatably supported on a shaft (28), a housing (106) partially encasing the saw blade (32), and a swinging blade guard (108) disposed to cover an exposed segment of the saw blade (32) when the chop saw (90) is in the rest position, characterized in that a linkage system is provided for moving the blade guard (108) in response to movement of the chop saw (90) between the lowered and raised positions, such that the blade guard (108) immovably covers the exposed segment when the chop saw (90) is in the raised position and is moved to uncover the exposed segment when the chop saw (90) is moved to the lowered position, linkage system comprising a frame (105) fixed to and extending upwardly from the bearing bracket (26), a first hinge (101) for pivotally mounting the housing (106) near the base of the frame (105), a second hinge (102) pivotally attaching one end of an actuation lever (107) to the frame (105) upwardly from the first hinge (101), a third hinge (103) pivotally attaching the other end of the actuating lever (107) to the swinging blade guard (108)and a fourth hinge (104) pivotably connecting the swinging blade guard (108) to the housing (106), the third hinge (103), being eccentrically positioned on the blade guard (108) with respect to the fourth hinge (104) and the distance between the third (103) and fourth (104) hinges being substantially less than the distance between the first (101) and second (102) hinges.

2. A chop saw linkage system according to claim 1, characterized in that means are provided for selectively disengaging the second hinge (102) to permit temporary shortening of the effective length of the actuation lever (107) and moving of the blade guard (108) to uncover the exposed segment when the chop saw (90) is in the raised position for facilitating changing the saw blade (32).

3. A chop saw linkage system according to claim 2, characterized in that the second hinge (102) is a pivot bolt having a shank received through a pivot point aperture (40) in the actuation lever (107) and a threaded end section threadably secured to the frame member (105), the threaded end section having a diameter less than the shank, the means for disengaging the second hinge (102) comprises an axial slot (41) in the actuation lever (107) adjoining the pivot point aperture (40), the width of the slot (41) being less than the diameter of the shank of the pivot bolt (102) and less than the diameter of the pivot point aperture (40) and greater than the diameter of the threaded portion, means being provided for partially withdrawing the threaded end section of the pivot bolt (102) from the frame (105) to dispose part of the threaded end section for slidable movement in the axial slot (41).

4. A chop saw linkage system according to claim 3, characterized in that the withdrawing means includes an opening (45) in the housing (106) providing access to the head of the pivot bolt (102) when the chop saw (90) is in the raised position permitting manual partial withdrawal of the threaded end section from the frame (105).

5. A chop saw linkage system according to claim 4, characterized in that the opening (45) includes a central bore (47) of insufficient diameter to permit removal of the pivot bolt (102) therethrough and an expanded inner cavity (49) of sufficient diameter to receive the head of the pivot bolt (102) and wherein disposition of the head of the pivot bolt (102) in the inner cavity (49) prevents the chop saw (90) from being moved to the lowered position.

6. A chop saw linkage system according to claim 3, characterized in that the actuation lever (107) is L-shaped and is connected to the pivot bolt (102) by its longer leg and is attached to the third hinge (103) by its shorter leg, permitting the linkage system to be essentially mounted in one plane.

7. A chop saw linkage system according to claim 6, characterized in that the axis of rotation of the fourth hinge (104) is the longitudinal axis of the shaft (104) supporting the saw-blade (32).

8. A chop saw linkage system according to claim 3, characterized in that a locking means (50, 52, 54, 55 and 56) detachably engages the actuation lever (107) when the saw (90) is in the raised position.

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FIG. 1.

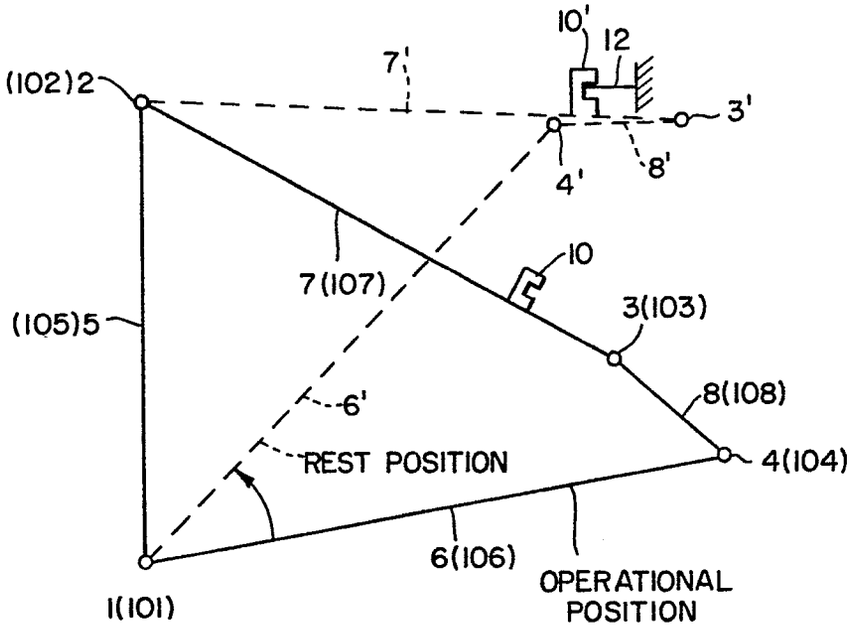

FIG. 4.

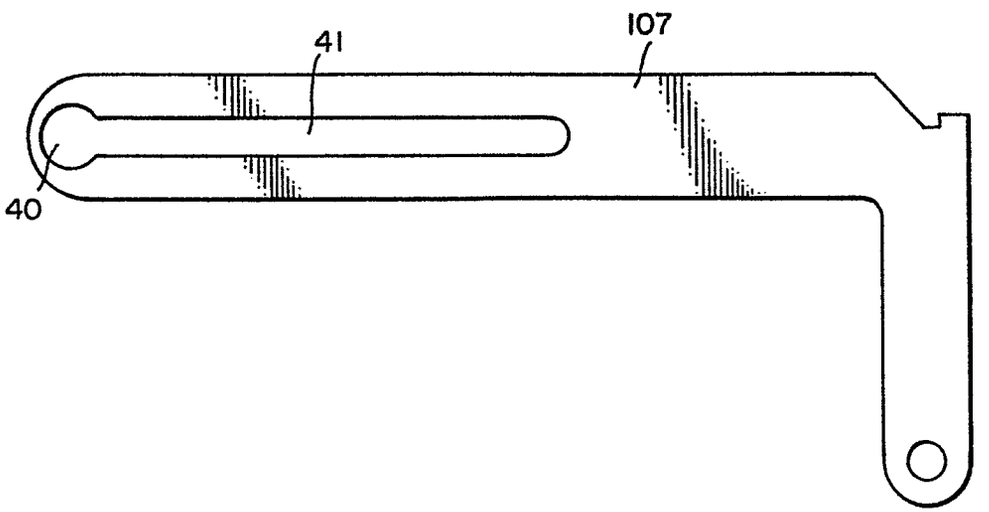

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FIG. 2.

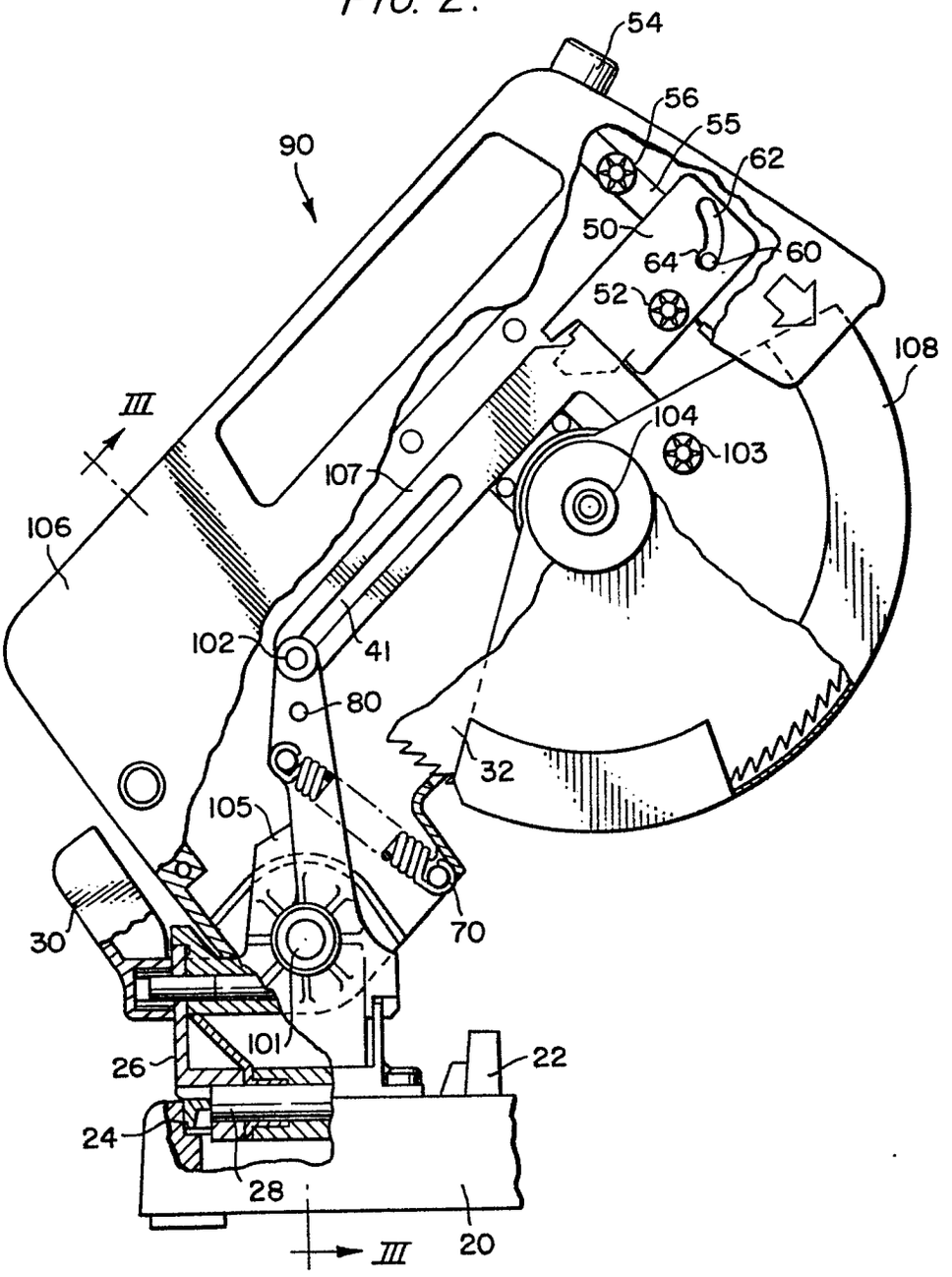

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FIG. 3.