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(54) **A guard lock arrangement for a saw.**

(57) A chop saw is described consisting of a stand, a pivoting saw unit including the blade (18) and the saw guard (66), a guard lock (34) to lock the guard (66) closed, a housing lock (76,78) to lock the saw unit in a raised inoperative position and a handle (52) attached to the saw unit. The handle (52) includes a push-button (50), depression of which releases the guard lock (34) and the housing lock (76,78) and opens the guard (66). The push-button (50) is biased into its elevated position. The guard lock (34) is biased towards its released position, but is coupled to the push-button (50) in such a way that this bias is overcome. Depressing the push button (50) first allows the guard lock (34) to relax to its released position and then, through a series of linkages, opens the guard (60) and releases the housing lock (76,78). So that the push-button (50) is easy to maintain in its depressed position, its biasing means (31) e.g. a leaf spring is arranged to exert substantially zero opening torque thereon when depressed.

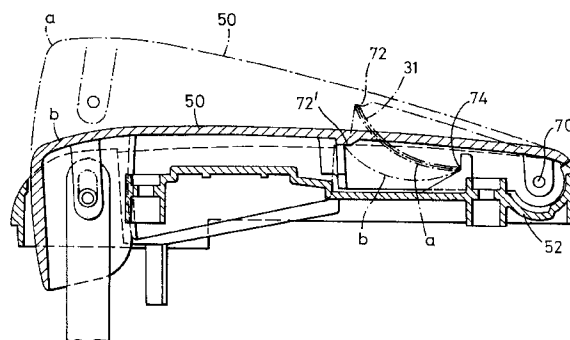


FIG. 4

This invention relates to saws, e.g. chop saws, mitre saws, etc., consisting of a stand, a pivotable saw unit including a saw blade and a pivotable saw guard and a guard lock which locks the saw guard in a closed position, in which it shields the saw blade.

Such a saw as above is known from DE-C-4010455. The saw includes a handle, to which a lever is pivotally attached. Movement of the lever first causes the guard lock to release the saw guard and then causes the saw guard to rotate to an open position, exposing the blade. The lever is attached to an arm, part of which obstructs the movement of the saw guard from its closed position. A cable is attached at one end to the arm and at the other end wraps around a spindle integral with the guard. Movement of the arm therefore removes the obstruction from the path of the saw guard and, by means of the cable, causes the saw guard to rotate to its open position.

Since some movement of the arm is required before the guard can rotate to its open position, this arrangement introduces a certain amount of undesirable slack when the saw guard is locked closed. This results in some movement of the saw guard being possible when locked in its closed position.

Although not shown in DE-C-4010455, various spring biasing means must be provided in order to ensure that the various locks and guards return to their effective positions when the saw is at rest. However, they each add to the force which must be maintained on the lever when the saw is operated and this force need not be much in order to be excessive from the user's point of view after several hours of use.

It is an object of the present invention to provide a saw which is substantially free from these disadvantages. It has been found that these disadvantages can be overcome through the use of a combination of a guard lock biased towards its released position, at which the saw guard is not locked closed, and a push-button coupled to the guard lock and biased into its elevated position with sufficient strength to overcome the biasing of the guard lock. Thus, at rest, the push-button lies in its elevated position and the guard lock lies in its locked position, locking the saw guard in its closed position. The push-button will also be coupled to the saw guard such that depression of the push-button causes the saw guard to move to its open position. The advantage of using this arrangement is that the push-button need not be coupled actively to the guard lock, since the guard lock will automatically move to its released position under the influence of its bias, once the push-button is depressed. Further depression of the push-button, once the guard lock has reached its released position therefore need not affect the guard lock in any way, due to the absence of an active coupling. In a practical embodiment, the push-button may be coupled to the guard lock by means of a flexible cable.

With this arrangement, once the guard lock has

reached its released position, all subsequent effort applied to the push-button can be transmitted through the coupling to the saw guard, so as to move the saw guard to its open position, and, in a preferred embodiment, transmitted through another coupling to release a housing lock, enabling the saw unit to pivot with respect to the stand. With an appropriate arrangement of couplings, the slack which is present in the existing saw described above can be eliminated.

During the initial depression of the push-button, the action is assisted by the bias of the guard lock. Thus, the amount of force required on the push-button is that required to overcome the biasing means acting on the push-button, less the force provided by the bias of the guard lock. However, once the guard lock has reached its released position, it ceases to assist depression of the push-button and the force then required is the full amount of force necessary to overcome the biasing means acting on the push-button plus the force required to overcome any return spring of the guard or other locks. From a practical point of view, it has been found that with biasing means such as a compression spring acting against the movement of the push-button, this force would be unacceptably high and make the saw extremely difficult to use. According to the present invention, this problem is overcome by using a pivotally mounted push-button and arranging for the biasing means to exert substantially zero opening torque on the push-button when the push-button is in its depressed position.

Thus, according to the present invention, there is provided a saw comprising a stand, a pivotable saw unit including a saw blade and a pivotal saw guard movable between a closed position, in which it shields the saw blade, and an open position, a guard lock movable between a locked position locking the saw guard in its closed position and a released position and biased towards its released position, a push-button pivotally mounted on the saw unit about an axis and movable between an elevated rest position and a depressed position, and biasing means acting between an attachment point on the saw unit and an insertion point on the push button to bias the push-button into its elevated position, the push-button being coupled to the guard lock and the saw guard such that when the push-button is in its elevated position, the guard lock is in its locked position, and such that depression of the push-button causes the guard lock to move to its released position and the saw guard to its open position, wherein, when the push-button moves towards its depressed position, the plane containing the said axis and the attachment point and the plane containing the said axis and the insertion point approach one another.

Since the plane containing the axis of rotation of the push-button and the attachment point and the plane containing the axis and the insertion point are

substantially coincident, the line of action of the biasing means, apart from any axial component, passes through or close to the axis. As a result, the torque exerted by the biasing means about the axis is very small or zero. With this arrangement, the force required on the push-button is very little greater or no greater when the push-button is in its depressed position than it would be if the biasing means were absent.

As was briefly mentioned above, the push-button may be used to operate a housing lock. Indeed, this may be a requirement of relevant safety standards. Thus, it is preferred that the saw unit be pivotable between a raised position and a lowered operative position and include a housing lock movable between a locked position locking the saw unit in its raised position and a released position, the push-button being coupled to the housing lock such that when the push-button is in its elevated position, the housing lock is in its locked position, and such that depression of the push button causes the housing lock to move to its released position.

As was also mentioned above, in a preferred practical embodiment of the invention, the push-button is coupled to the guard lock by means of a flexible cable which maintains the guard lock in its closed position when the push-button is in its elevated position.

A practical way of ensuring that the guard lock has released before the saw guard begins to move is to arrange for the push-button to be coupled to the saw guard by means of one or more linkages which, on depression of the push-button, begin to move only after the push-button has been depressed by a predetermined distance. For example, the one or more linkages may include a linkage bar, to one end of which the push-button is connected, that end of the linkage bar including an elongate slot which receives a pin integrally attached to the push-button, wherein the push-button must be depressed by the said predetermined distance before the pin traverses the elongate slot and begins to move the linkage bar.

The present invention will now be described with reference to the accompanying drawings, wherein:

Figure 1 is a part-sectional side view of a saw;

Figure 2 is a part-sectional other side view of the handle of the saw;

Figure 3 is a part-sectional front view of the handle; and

Figure 4 is a similar side view to that of Figure 3, illustrating the operation of the biasing means.

Figure 1 illustrates in general the construction of a saw according to the invention. The guard lock and its associated mechanisms are not illustrated in this figure. The saw 10 has a base table 12 on which is pivoted a saw housing 14 about an axis 82. The saw housing 14 has a motor 16 driving a circular saw blade 18 about an axis 20. the housing 14 is actuated by a

handle 52 to pivot the housing about its axis 82 and plunge the blade 18 into a slot (not shown) in the table 12, through a workpiece positioned on the table.

A saw guard 66 surrounds the lower portion of the blade 18 and is pivoted about the axis of rotation 20 of the saw blade 18 inside the housing 14. The guard 66 is opened by a series of linkages connected to the handle 52 prior to the blade 18 being plunged into the workpiece. The linkages are actuated by a push-button 50 which is depressed into the handle 52 when the handle is grasped by a user. The push-button 50 is connected to a linkage bar 54 at one end, the other end of which is pivotally attached to an intermediate lever 56, pivotable about an axis 60 in the housing 14. The intermediate lever 56 serves two related purposes. Firstly, it is pivotally attached about an axis 64 to one end of a guard opening lever 62. The other end of the guard opening lever 62 is pivotally connected about an axis 68 to a flange 69 of the guard 66. When the intermediate lever 56 is actuated by the push-button 50 and the linkage bar 54, the guard opening lever 62 is moved rightwardly to the position shown in phantom, thereby opening the guard 66 by rotating it through an angle approaching 90 degrees. The guard is biased by a return spring (not shown) towards its closed position and the force of this spring must always be overcome when the push-button so is depressed during use. Thus the user requires a relatively strong grip on the handle 52 and its push-button 50 in order to keep the guard 66 open.

The second function of the intermediate lever 56 is to pivot a housing lock lever 72 about an axis 74. A pin 71 attached to the intermediate lever 56 on the pivot axis 64 engages a slot 70 in the end of the housing lock lever 72. The other end 76 of the housing lock lever 72 normally abuts a stop 78 formed on the pivot block 80 of the pivot axis 82. This pivot block 80 is fixed to the table 12. However, when the intermediate lever 56 is pivoted to the position shown in phantom, the housing lock lever 72 is likewise pivoted so as to release its said other end 76 from the stop 78, thereby allowing the housing 14 to pivot about its axis 82. Thus, it can be seen that depression of the push-button 50 not only rotates the saw guard 66 to its open position, but also moves the housing lock 76, 78 to its released position.

Figures 2, 3 and 4 illustrate the handle 52 in more detail. The linkage bar 54 is provided with an elongate slot 53, through which passes a pin 51, integral with the push-button 50. The existence of the slot 53 provides a small dead movement of the push-button 50 before the linkage bar 54 is actuated.

A guard lock 34 is pivotally attached to the housing 14 about an axis 36. The guard lock 34 is free to move between two limiting positions, a locked position as illustrated and a released position. In the locked position, a toe 40 of the guard lock 34 obstructs the guard 66 and prevents it from opening

whilst a heel 38 thereof abuts the housing 14. The guard lock 34 is biased towards its released position by a coiled spring 33. However, the guard lock 34 is prevented from adopting its released position under the bias of this spring 33 by means of a flexible cable 30, one end of which is attached to an axis 32 of the guard lock 34, the other end of which is attached to the pin 51 of the push-button 50. A leaf-spring 31 biases the push-button into its elevated position, labelled "a" in Figure 4. Since the leaf-spring 31 is sufficiently strong to overcome the bias of the guard lock spring 33, the guard lock 34 will, at rest, lie in its locked position.

When the push-button 50 is depressed slightly, the pin 51 will traverse the elongate slot 53, but without effecting any movement of the linkage bar 54. Nevertheless, this degree of movement of the push-button 50 is sufficient to allow the guard lock 34 to pivot about its axis 36 from a locked to a released position. This moves the toe 40 of the guard lock 34 from its obstructing position in front of the leading edge 42 of the guard 66; instead the toe 40 now abuts the housing 14 in the same manner as does the heel 38 when the guard lock 34 is in its locked position.

Owing to the flexibility of the cable 30, further depression of the push-button 50 has no further effect on the guard lock 34. However, through the push-button pin 51 and the linkage bar 54, further movement of the push button 50 is transmitted into the linkage system described above with reference to Figure 1, thereby opening the guard 66 and releasing the housing lock 76, 78. It can therefore be seen that depression of the push-button 50 firstly unlocks the guard lock 34 and then opens the guard 66 while unlocking the housing lock 76, 78.

The spring 31 acts in the same sense on the push-button 50 as does the return spring (not shown) for the guard 66. In order to prevent the force which must be maintained on the push-button to keep it closed from becoming excessive, the biasing spring 31 is arranged as illustrated in Figure 4. As can be seen, the spring 31 is a leaf-spring, which acts between a shoulder 72 in the push-button 50 and a shoulder 74 in the handle 52. When the push-button 50 is in its elevated position, labelled "a", the line of action of the leaf-spring 31, that is the line joining the two shoulders 72, 74, passes some distance away from the axis 70 about which the push-button 50 is pivoted. In contrast, when the push-button 50 is in its depressed position, labelled "b", the line of action of the leaf-spring 31, namely the line joining the depressed shoulder 72' of the push-button 50 and the shoulder 74 of the handle 52, passes through the axis 70. Thus, in this position, the opening torque exerted on the push-button 50 by the spring 31 about the axis 70 is zero. Accordingly, as the push-button 50 is depressed from its elevated to its depressed position, the bias of the leaf-spring 31 becomes progressively

easier to overcome. When the push-button 50 is in its fully depressed position, it is as though the leaf-spring 31 were not present.

In the manner described above, a relatively large movement of the push-button 50 is securely and simply translated into a relatively small movement of the guard lock 34 followed by a relatively large movement of the guard 66 and its associated linkages.

It will of course be appreciated that the present invention has been described above purely by way of example and that modifications of detail may be made without departing from its scope. For instance, this description and the claims refer to a "push-button", but it is evident that this component might equally be a lever which is pulled or has some other mode of operation.

Claims

1. A saw comprising a stand, a pivotable saw unit including a saw blade and a pivotable saw guard movable between a closed position, in which it shields the saw blade, and an open position, a guard lock movable between a locked position locking the saw guard in its closed position and a released position and biased towards its released position, a push-button pivotally mounted on the saw unit about an axis and movable between an elevated rest position and a depressed position, and biasing means acting between an attachment point on the saw unit and an insertion point on the push-button to bias the push-button into its elevated position, the push-button being coupled to the guard lock and the saw guard such that when the push-button is in its elevated position, the guard lock is in its locked position, and such that depression of the push-button causes the guard lock to move to its released position and the saw guard to its open position, wherein, when the push-button moves towards its depressed position, the plane containing the said axis and the attachment point and the plane containing the said axis and the insertion point approach one another.
2. A saw according to claim 1 in which the saw unit is pivotable between a raised position and a lowered operative position and including a housing lock movable between a locked position locking the saw unit in its raised position and a released position, the push-button being coupled to the housing lock such that when the push-button is in its elevated position, the housing lock is in its locked position, and such that depression of the push-button causes the housing lock to move to its released position.

3. A saw according to claim 1 or claim 2 wherein the push-button is coupled to the guard lock by means of a flexible cable which maintains the guard lock in its closed position when the push-button is in its elevated position. 5
4. A saw according to any preceding claim wherein the push-button is coupled to the saw guard by means of one or more linkages which, on depression of the push-button, begin to move only after the push-button has been depressed by a predetermined distance. 10
5. A saw according to claim 4 wherein the one or more linkages include a linkage bar, to one end of which the push-button is connected, that end of the linkage bar including an elongate slot which receives a pin integrally attached to the push-button, wherein the push-button must be depressed by the said predetermined distance before the pin traverses the elongate slot and begins to move the linkage bar. 15 20
6. A saw according to any preceding claim wherein the biasing means is a leaf spring. 25
7. A saw according to claim 6 wherein the leaf spring acts between a shoulder on the saw unit and a shoulder on the push-button, the shoulders being spaced from the said axis by unequal distances. 30
8. A saw substantially as described herein with reference to the accompanying drawings. 35

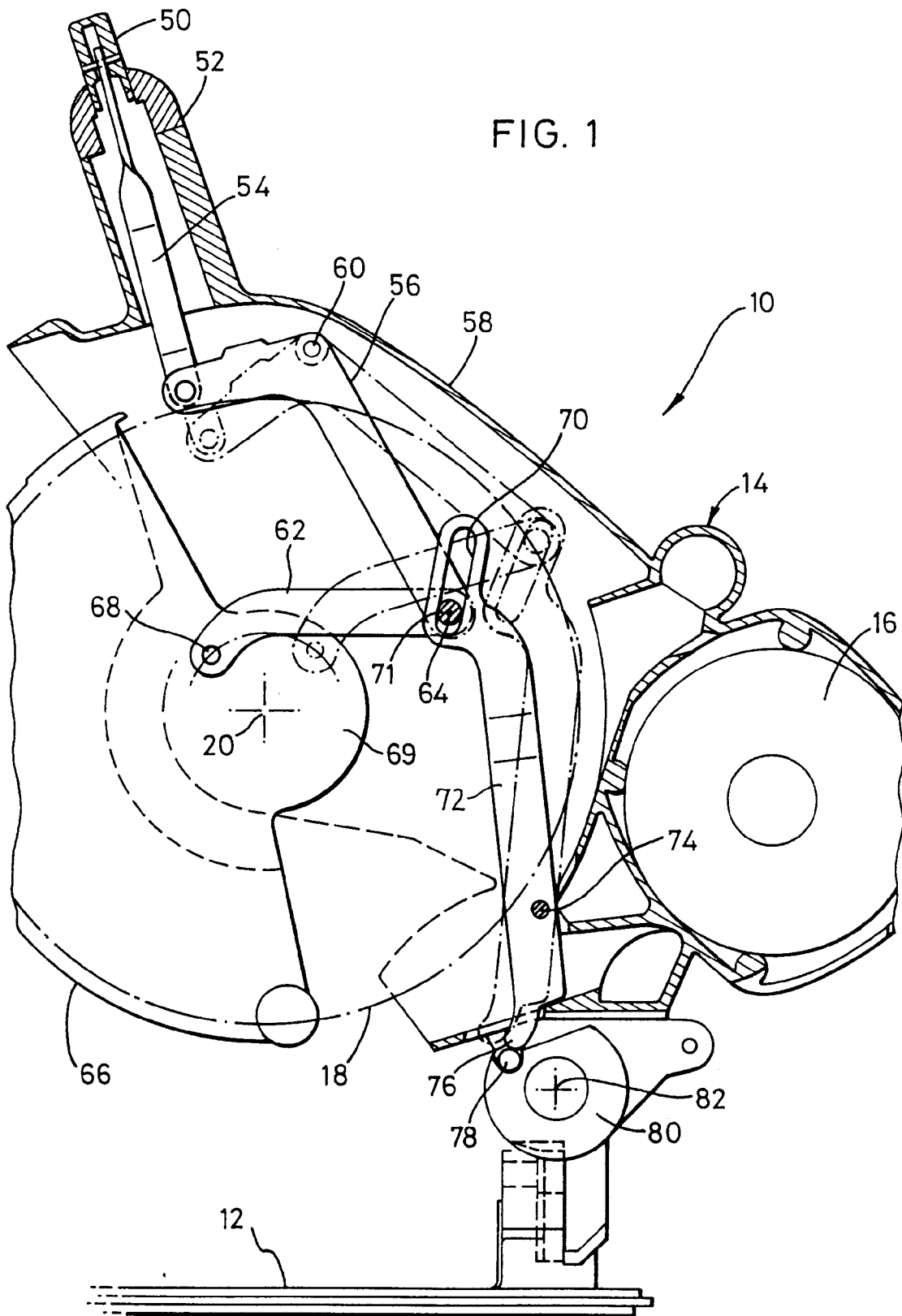
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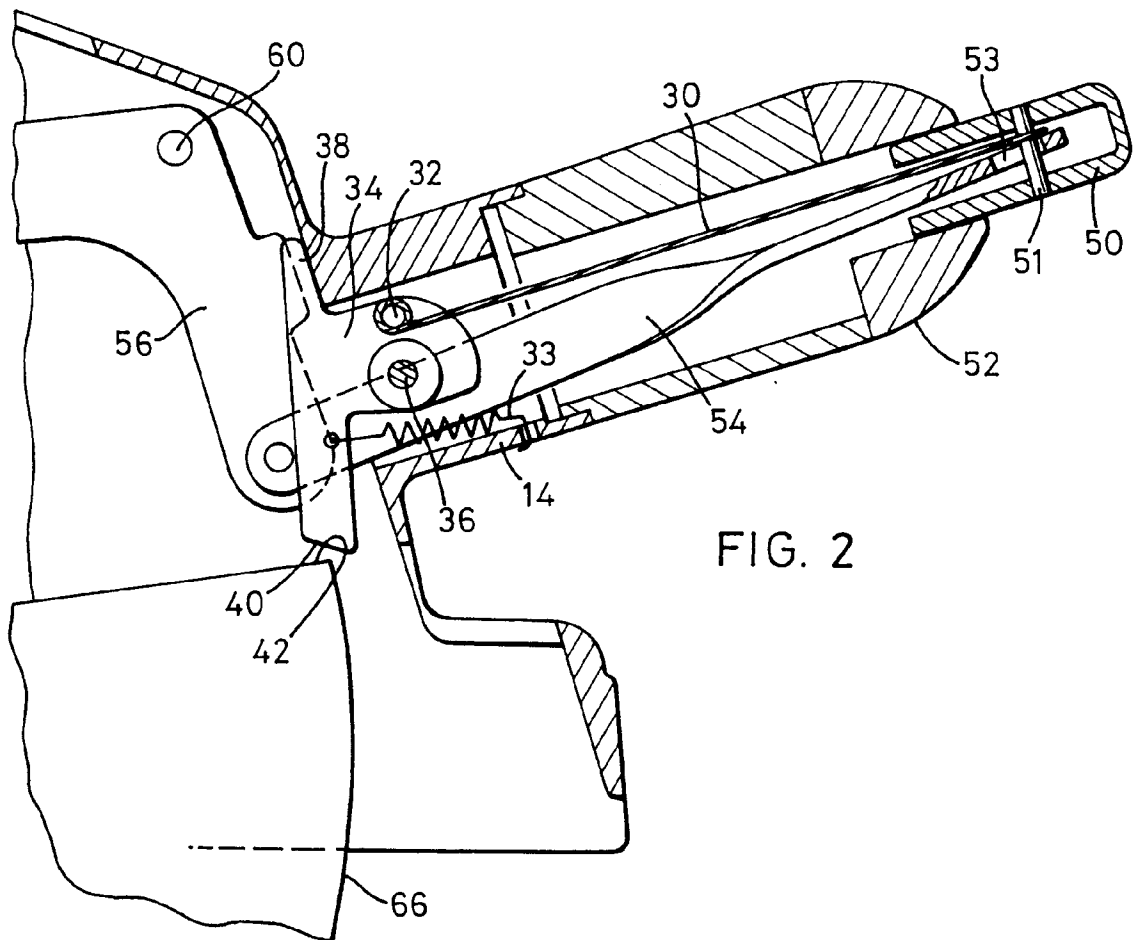
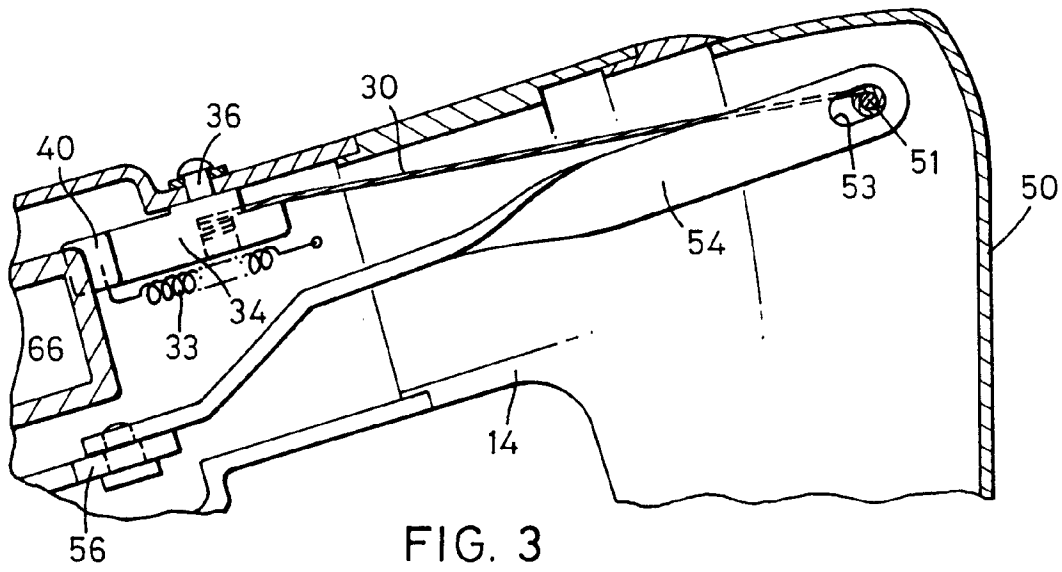
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FIG. 1





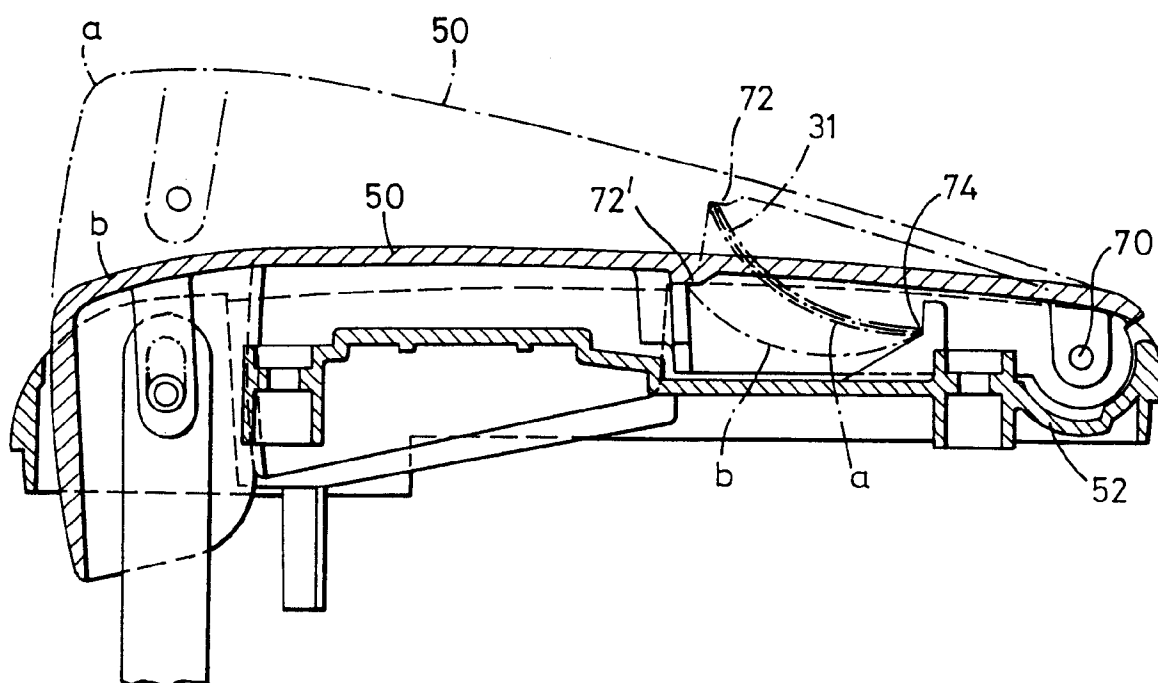


FIG. 4



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 94 30 4878

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
D,A	DE-C-40 10 455 (ELEKTRA-BECKUM LUBITZ & CO) * claims 1,3; figure 1 *	1,8	B27G19/02 G05G5/05
A	US-A-4 267 747 (W.K. WALLACE ET AL) * column 2, line 51 - column 3, line 2 * * figures 7,8 *	1,8	
A	DE-A-32 36 328 (STEYR-DAIMLER-PUCH AG) * page 4, line 19 - page 5, line 9 * * figure 1 *	1,8	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B27G B23D B27B G05G
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 17 October 1994	Examiner Moet, H
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