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Support mechanism for reciprocating tool and tool incorporating such mechanism

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(56) Related Art
DE 8702727 U
DE 8137904 U

ABSTRACT

A support roller 15 for supporting a blade of a jigsaw having a scroller mode and a pendulum mode is disclosed. A roller support frame 18 supports the roller 15 and is mounted via a collar 32 to a drive shaft 10 of the jigsaw such that the blade support roller 15 rotates with the jigsaw blade as the drive shaft 10 is rotated in the
5 scroller mode. The support frame 18 also pivots relative to the jigsaw housing to enable the blade support roller 15 to remain in contact with the jigsaw blade in the pendulum mode.

[Figure 2]

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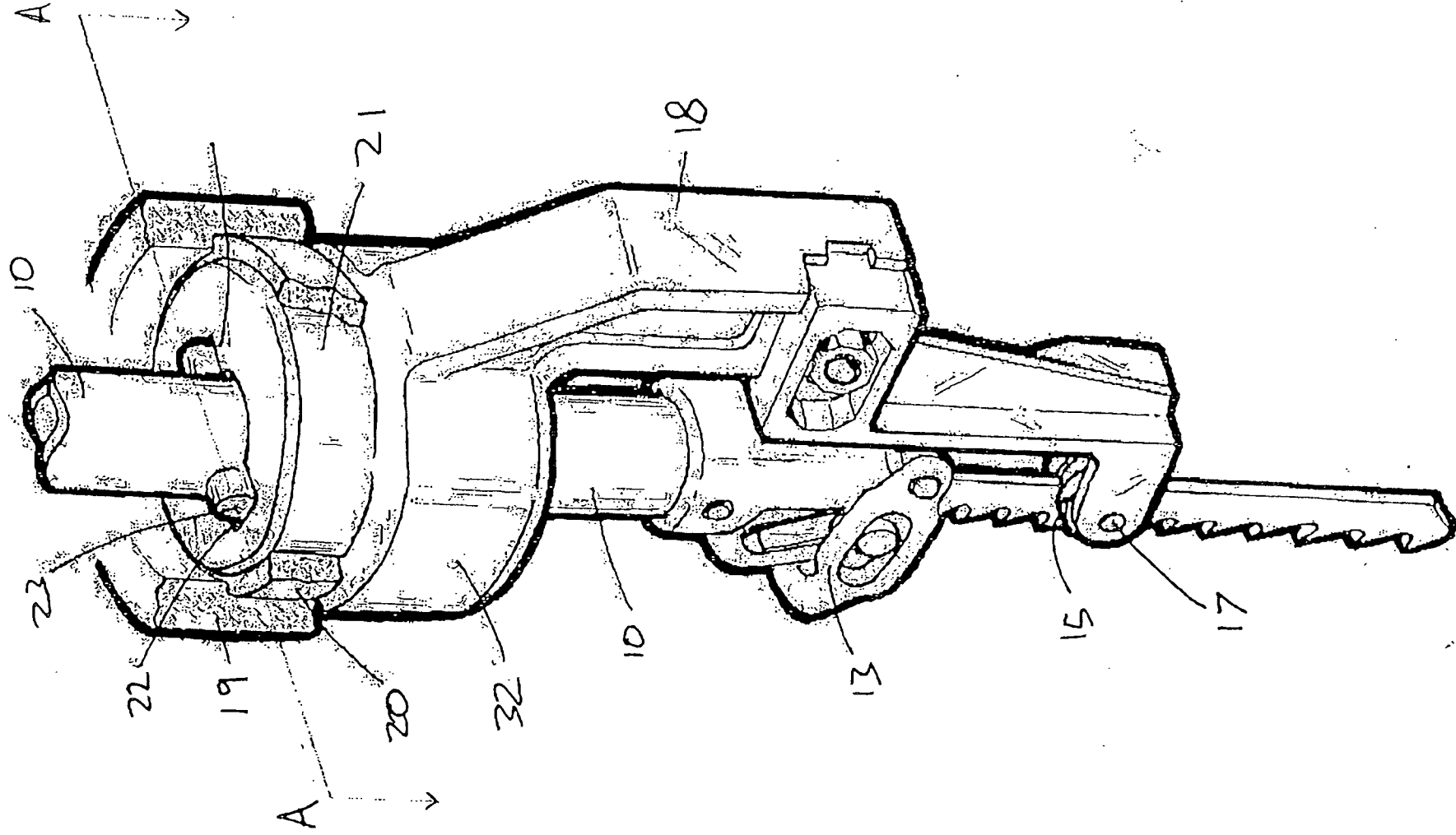


Fig. 2

The present invention relates to a support apparatus for supporting a reciprocating blade of a jig saw according to the preamble of claim 1. The invention also relates to a reciprocating jig saw incorporating such a support apparatus. Such an apparatus and such a jig saw are known from DE8702727U.

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Jig saws are power tools which comprise a linearly reciprocating saw blade for cutting a workpiece of wood or other material. Various types of jig saw mechanism are known, including so-called "scroller" jigsaws, which allow the saw blade to rotate relative to the body of the jig saw, and "pendulum" jigsaws, which allow oscillation of the saw blade relative to the saw body in a direction generally perpendicular to the direction of sawing motion. Scroller jigsawing is particularly useful when working in restricted spaces, in which the body of the jigsaw may come into contact with obstructions and limit the range of cutting angles available to the blade. Pendulum jigsawing increases the cutting force on the workpiece, and increases the cutting speed of the jigsaw. For example, US Patent Number 4545123 describes a jigsaw which can operate in either a scroller mode or a pendulum mode.

It is known to provide blade support rollers in prior art jigsaws, which contact the saw blade to provide lateral support thereto. However, known jigsaws suffer from the drawback that blade support rollers only contact the saw blade at limited scrolling and pendulum blade positions, as a result of which the support offered by the blade support roller is limited.

DE8702727U discloses a jigsaw having a reciprocating blade mounted in a mounting portion. The jigsaw further includes a support portion, which abuts against the mounting portion during reciprocating movement of the blade.

DE8137904U discloses a jigsaw having a reciprocating blade which is capable of pendulum movement, mounted in a support apparatus. The support apparatus includes a support portion which abuts against the reciprocating blade during reciprocating movement of the blade and also during pendulum movement of the blade.

According to an aspect of the present invention, there is provided a support apparatus for supporting a reciprocating blade of a jigsaw, wherein the blade is adapted to execute reciprocating motion relative to a body of the jigsaw, and the jigsaw has a first mode in which the reciprocating blade is adapted to pivot relative to said body about a first axis substantially parallel to the direction of reciprocating motion of the blade, the apparatus comprising:-

a support portion for engaging the reciprocating blade to provide a reaction force to said blade along a line of action of the jigsaw; and

a mounting portion rigidly connected to said supporting portion for mounting the apparatus relative to the blade to enable said support portion to remain in engagement with the blade during rotation thereof relative to the body about said first axis in the first mode.

By providing a support apparatus having a support portion adapted to remain in engagement with the working member during rotation thereof relative to the body in the first mode, this provides the advantage of additional support for the working member at each position thereof relative to the tool body. In the case of jig saws, this provides the advantage of increasing the extent to which square cuts can be achieved at any scrolling angle.

Preferably, the jigsaw has a second mode in which the reciprocating blade is adapted to execute pivoting reciprocating motion relative to said body about a second axis transverse to the direction of reciprocating motion of the blade,

and the mounting portion further enables said support portion to remain in engagement with the blade during pivoting reciprocating motion thereof relative to the body about said second axis in the second mode.

By providing a support apparatus having a support portion adapted to remain in engagement with the working member during pivoting reciprocating motion thereof relative to the body about said second axis in the second mode, this provides the advantage of additional support for the working member at each position thereof relative to the tool body. In the case of jigsaws, this provides the advantage of increasing the speed of cutting of the saw.

The support portion may be adapted to prevent movement of said blade in a direction transverse to a line of action of the jigsaw.

5 This provides the advantage of minimising warping or buckling of the working member in the case of a flexible working member. In the case of a jigsaw, this maximises the extent to which square cuts can be achieved.

10 The support portion may be adapted to engage the blade on both sides thereof in a direction transverse to a line of action of the jigsaw.

The support portion may comprise at least one roller.

15 This provides the advantage that friction is reduced between the working member and the support portion.

The mounting portion may comprise a first part rigidly connected to said support portion, and a second part adapted to be connected to said blade and to undergo reciprocating movement relative to said first part.

20 In a preferred embodiment, said first part may further comprises an elongate aperture, and said second part further comprises an elongate bearing such that said elongate aperture slidably receives said bearing therein.

25 According to a further aspect of the present invention, there is provided a reciprocating jigsaw comprising:-

a body;

a motor having a rotary output shaft;

first drive means for converting rotary movement of said output shaft to reciprocating movement of a blade; and

30 a support apparatus as defined above.

The jigsaw may further comprise second drive means for converting rotary movement of said output shaft to pivoting reciprocating movement of said support apparatus about said second axis in said second mode.

This provides the advantage of enabling a single drive means such as a motor to synchronise pivotal reciprocating movement of the apparatus about the second axis with reciprocating movement of the blade relative to the jigsaw body.

5 The second drive means may comprise cam means for pivotally displacing said support apparatus from a first position relative to said jigsaw body.

10 The second drive means may further comprise biasing means for pivotally urging said support apparatus into said first position relative to said jigsaw body.

A preferred embodiment of the present invention will now be described, by way of example only and not in any limitative sense, with reference to the accompanying drawings in which:-

15 Figure 1 is a cross-sectional side view of a hand-held jigsaw embodying the present invention;

Figure 2 is a perspective view of a saw blade and blade support mechanism of the jigsaw of Figure 1;

Figure 3a is a view along the line A - A in Figure 2;

20 Figure 3b is a view of the bush member of Figure 3a with the shaft and steering pin removed; and

Figure 3c is a view of the drive shaft and steering pin of Figure 3a removed from the bush member.

25 Referring to Figure 1, a hand-held jigsaw 1 has a housing 2 having a motor 3 disposed axially therein. The motor 3 has a rotary output shaft 4 having teeth 5 at its surface, the teeth 5 meshing with teeth on the circumference of an output gear 6. The output gear 6 carries an eccentrically mounted drive pin 7. Rotation of the output shaft 4 therefore causes rotation of output gear 6, which in turn causes circular
30 motion of the drive pin 7 about an axis 8.

The eccentric drive pin 7 drives a conventional scotch yoke mechanism 9, the operation of which will be familiar to persons skilled in the art. The scotch yoke mechanism 9 converts circular motion of the drive pin 7 into linear reciprocating

motion of a saw blade drive shaft 10 to cause linear reciprocating motion of a saw blade 11. The saw blade 11 is attached to the drive shaft 10 by a blade clamp 13.

5 A shoe 14 provides a reaction surface to rest on a workpiece to be cut (not shown). The saw blade 11 has teeth which are angled in such a way that the teeth cut the workpiece on an upward stroke of the blade 11 (against the reaction force provided by shoe 14), and loose material is cleared from the cut on the downward stroke, in a manner which will be familiar to persons skilled in the art. A blade support roller 15 having a circumferential groove therein contacts the saw blade 11 at 16 and provides support against rearward and lateral forces acting on the blade 11. The support roller 15 is rotably connected by a pin 17 to a roller support frame 18.

10 Referring now to Figure 2, the upper part of the roller support frame 18 mechanism comprises a bearing carriage 19 formed separately from the housing 2 of the saw 1. The bearing carriage 19 has an outer bush 20 rigidly mounted thereto which rotatably receives an inner bush 21. The inner bush 21 is rigidly connected to the roller support frame 18 by means of a circular collar 32.

20 In order to allow reciprocating motion of the drive shaft 10 in an up and down direction as shown in Figure 2, a slot 22 extends axially through at least the inner bush 21 (Figures 3a, 3b and 3c), and is shaped to slidably receive the drive shaft 10. A steering pin 23 extends transversely through the drive shaft 10, such that when the drive shaft 10 is rotated, the steering pin 23 will engage slot 22 and rotate the inner bush 21 with the drive shaft 10. As bush member 21 is formed integrally with the roller support frame 18 and collar 32, rotation of the drive shaft 10 will cause corresponding rotation of the blade support roller 15 so that the roller 15 rotates with the blade 11 as the blade is rotated relative to the saw housing 2.

30 Referring again to Figure 1, when the jigsaw 1 is operating in scroller mode as described above, the user can change the orientation of the blade 11, together with the blade support roller 15, by rotating knob 24 provided on the housing 2. The upper portion of the drive shaft 10 is slidably received in an aperture 25 in the inner portion of knob 24, and a further drive pin 26 (similar to drive pin 23) is transversely disposed in the upper portion of drive shaft 10. This drive pin 26 engages aperture 25 in the

same manner as drive pin 23 engages slot 22 (Figure 3a), such that the drive shaft 10 rotates with knob 24.

5 In order to enable operation of the jigsaw 1 pendulum mode, the whole of the blade support mechanism shown in Figure 2 (i.e. including the drive shaft 10 and roller support frame 18) pivot as a single unit about point 28 relative to the housing. This enables the blade 11 and blade support roller 15 to pivot together in the direction of arrow B shown in Figure 1. It is to be noted that for this to occur, the scroller mode must be disengaged and the blade must be facing forward in the "in-
10 line" direction. A spring 29 (the purpose of which will be explained in greater detail below) urges the bearing carriage 19 towards the position shown in Figure 1.

A cam surface 30 is formed on a front face of output gear 6 such that as the output gear 6 rotates, the cam surface 30 will come into contact with a roller 33 rigidly
15 connected to a bracket 34 such that once per revolution of the output gear 6, the cam surface 30 will push the roller 33 and bracket 34 forwardly against the force of spring 29. The roller 33 is rigidly connected to bracket 34, which is in turn coupled to the bearing carriage 19. As a result, the whole of bearing carriage 19, drive shaft 10 and blade 11 are pivoted forwardly about point 28 in the direction of arrow B.

20

As the output gear 6 continues to rotate, the cam surface 30 is moved away from roller 33 and spring 29 is therefore able to push the bearing carriage 19, bracket 34 and roller 33 back to the position shown in Figure 1. As a result, once per revolution of output gear 6, both the blade 11 and blade support roller 15 are
25 reciprocated backwards and forwards in the plane of the blade 11, the blade support roller 15 remaining in contact with the blade 11 at all time during pendulum operation.

In order to disengage the pendulum action, a selector knob 36 can be rotated by the user. On rotation of the selector knob 36, bracket 34 is pushed forwardly
30 thereby moving roller 33 out of contact with cam surface 30 and pushing the bearing carriage 19 forward against the action of spring 29. As the roller no longer abuts cam surface 30, the pendulum action is disabled.

It can be seen that the blade support roller 15 remains in contact with the blade at any scrolling angle, and during "in-line" pendulum operation, and that the scroller and pendulum modes are essentially independent of one another. This provides significant advantages over the prior art, in particular with regard to the squareness of cuts which can be achieved by the saw 1 in both scroller and pendulum modes.

The blade support roller 15 is mounted in roller support frame 18 which is slidably mounted and selectively fixed relative to collar 32 and blade 11 to accommodate a plurality of blade shapes and ensure the blade support roller 15 is in contact with said blade before operation of the tool.

It will be appreciated by persons skilled in the art that the above embodiment has been described by way of example only and not in any limitative sense, and that various alterations and modifications are possible without departure from the scope of the invention as defined by the appended claims.

The reference in this specification to any prior publication (or information derived from it), or to any matter which is known, is not, and should not be taken as an acknowledgment or admission or any form of suggestion that that prior publication (or information derived from it) or known matter forms part of the common general knowledge in the field of endeavour to which this specification relates.

Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A support apparatus for supporting a reciprocating blade of a jigsaw, wherein the blade is adapted to execute reciprocating motion relative to a body of the jigsaw, and the jigsaw has a first mode in which the reciprocating blade is adapted to pivot relative to said body about a first axis substantially parallel to the direction of reciprocating motion of the blade, the apparatus comprising:-

a support portion for engaging the reciprocating blade to provide a reaction force to said blade along a line of action of the jigsaw; and

a mounting portion rigidly connected to said support portion for mounting the support apparatus relative to the blade to enable said support portion to remain in engagement with the blade during rotation thereof relative to the body about said first axis in the first mode.

2. An apparatus as claimed in claim 1, wherein the jigsaw has a second mode in which the reciprocating blade is adapted to execute pivoting reciprocating motion relative to said body about a second axis transverse to the direction of reciprocating motion of the blade,

and the mounting portion further enables said support portion to remain in engagement with the blade during pivoting reciprocating motion thereof relative to the body about said second axis in the second mode.

3. An apparatus according to claim 1 or 2, wherein said support portion is adapted to prevent movement of said blade in a direction transverse to a line of action of the jigsaw.

4. An apparatus according to claim 3, wherein said support portion is adapted to engage the blade on both sides thereof in a direction transverse to a line of action of the jigsaw.

5. An apparatus according to any one of the preceding claims, wherein said support portion comprises at least one roller.

6. An apparatus according to any one of the preceding claims, wherein said mounting portion comprises a first part rigidly connected to said support portion, and a second part adapted to be connected to said blade and to undergo reciprocating movement relative to said first part.

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7. An apparatus according to claim 6, wherein said first part further comprises an elongate aperture, and said second part further comprises an elongate bearing such that said elongate aperture slidably receives said bearing therein.

10

8. A jigsaw comprising:-

a body;

a motor having a rotary output shaft;

first drive means for converting rotary movement of said output shaft to reciprocating movement of a blade; and

15

a support apparatus according to any one of the preceding claims.

9. A jigsaw according to claim 8, further comprising second drive means for converting rotary movement of said output shaft to pivoting reciprocating movement of said support apparatus about said second axis in said second mode.

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10. A jigsaw according to claim 9, wherein said second drive means comprises cam means for pivotally displacing said support apparatus from a first position relative to said jigsaw body.

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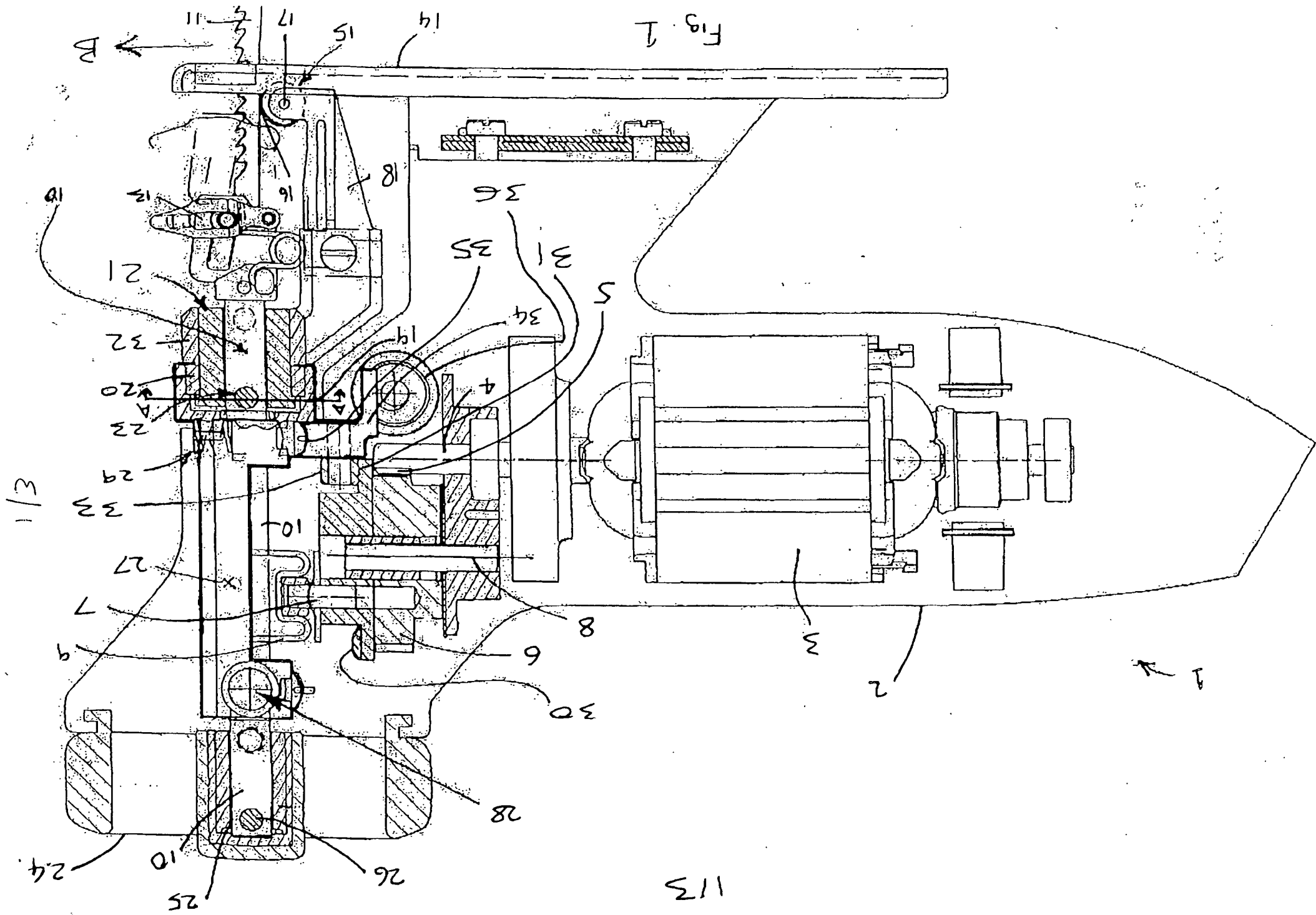
11. A jigsaw according to claim 9 or 10, wherein said second drive means further comprises biasing means for pivotally urging said support apparatus into said first position relative to said jigsaw body.

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12. A support apparatus, substantially as described with reference to the drawings and/or examples.

13. A jigsaw, substantially as described with reference to the drawings and/or examples.

Fig. 1



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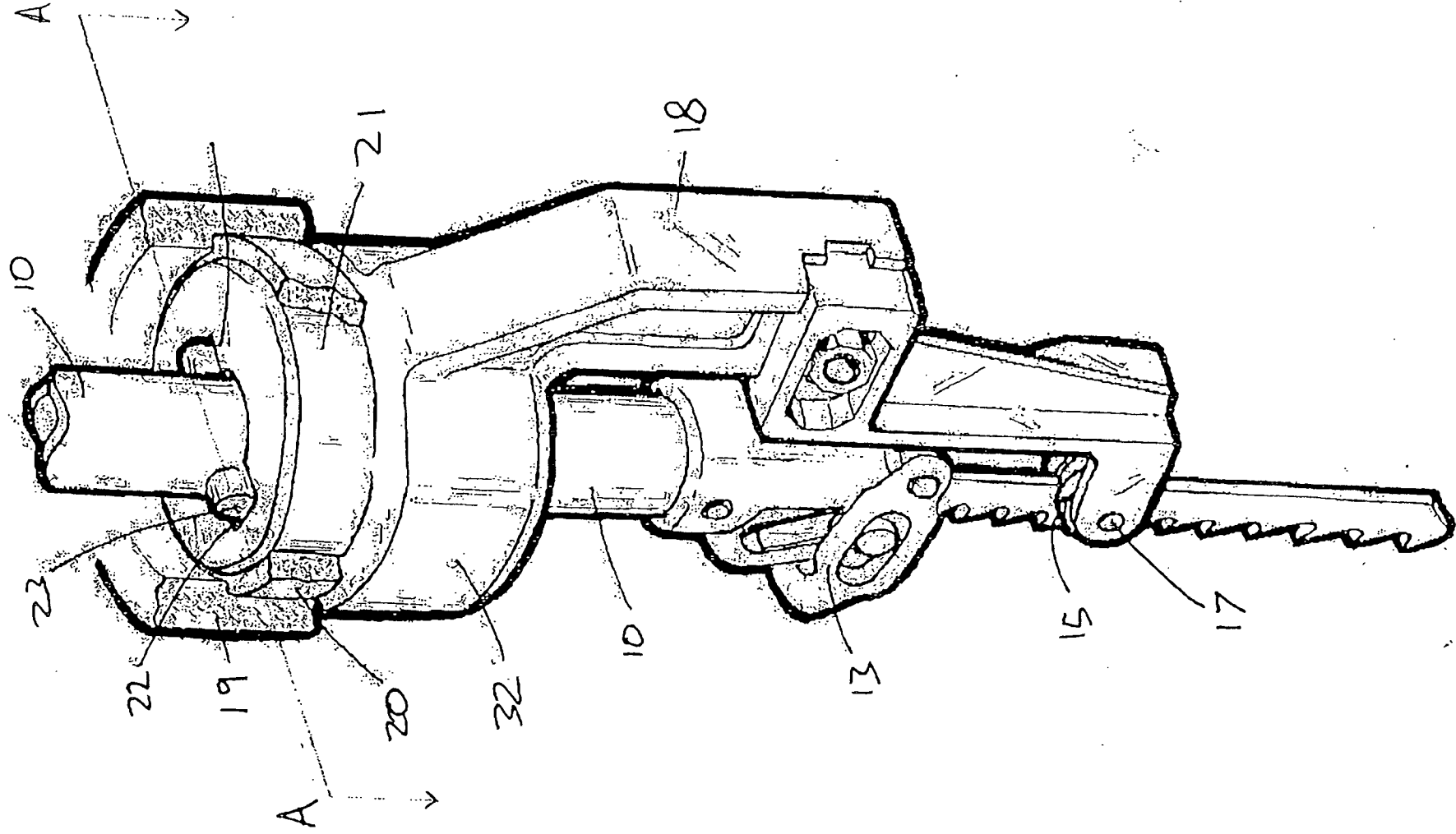


Fig. 2

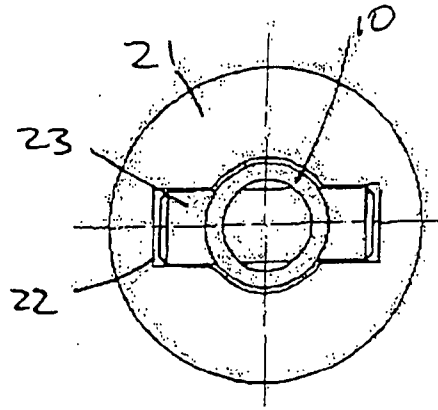


Fig. 3a

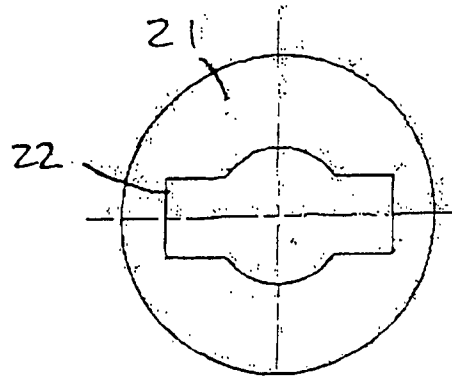


Fig. 3b

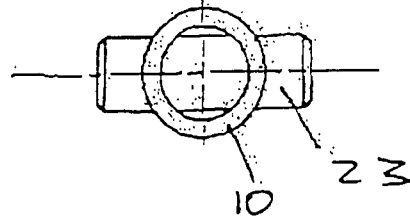


Fig. 3c