

(19)



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(11)

EP 0 923 096 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
16.06.1999 Bulletin 1999/24

(51) Int Cl.⁶: **H01H 9/06**

(21) Application number: **98123657.3**

(22) Date of filing: **11.12.1998**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**
Designated Extension States:
AL LT LV MK RO SI

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(30) Priority: **11.12.1997 DE 19756290**

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(54) **Electric power tool, in particular a router**

(57) The invention relates to an electric power tool comprising a housing in which is housed an electric motor and an on/off switch (22) for the motor, a trigger element (20) which is displaceable out of an off-position, in which an actuation surface of the trigger element projects from the housing, and into an on-position in which the on/off switch (22) is activated, and a locking element (25) which is mounted at the trigger element (20), which is displaceable and which in a non-displaced position prevents movement of the trigger element into the on-position and in a displaced position allows movement of the trigger element into its on-position. The locking element (25), has an actuation surface which at least in its non-displaced position, is recessed relative to the actuation surface of the trigger element (20) in order to prevent inadvertent actuation of the power tool.

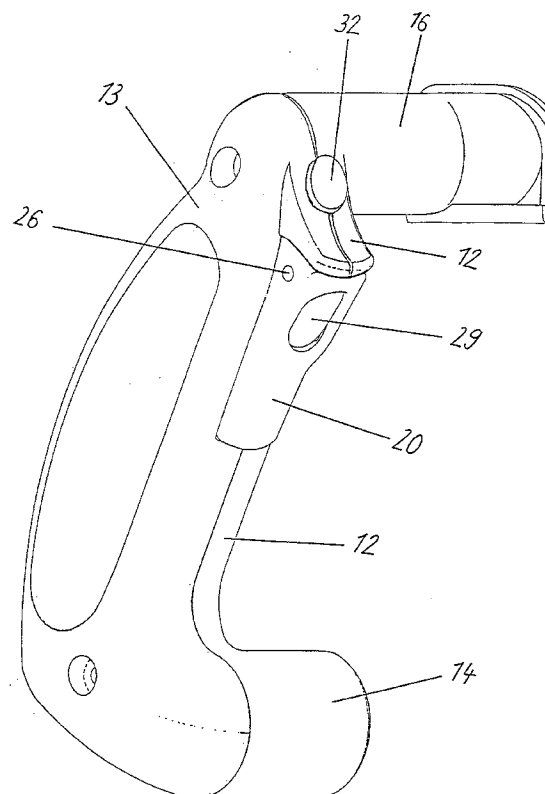


Fig. 2

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Description

[0001] The invention relates to an electric power tool comprising a housing in which is housed an electric motor and an on/off switch for the motor, a trigger element which is displaceable out of an off-position, in which an actuation surface of the trigger element projects from the housing, and into an on-position in which the on/off switch is activated, and a locking element which is mounted at the trigger element, which is displaceable and which in a non-displaced position prevents movement of the trigger element into the on-position and in its displaced position allows movement of the trigger element into its on-position.

[0002] In a known electric power tool of this type in the form of an angle grinder (U.S. Patent No. 3 881 081), an elongated trigger element is present which at its one end is mounted pivotable in the housing of the angle grinder and at the other end of which a locking element is mounted which can be displaced against the force of a compression spring in the direction of the longitudinal extension of the trigger element. In its rest position, the locking element lies with a projecting surface opposite a hook-shaped stop element in the tool housing, so that, when an attempt is made to displace the trigger element in the direction of the on-position, the stop surface of the locking element comes to rest, against the stop element blocking the displacement movement. Only when the locking element is displaced against the force of the compression spring somewhat towards the free end of the trigger element the stop element can dip, upon a pivot movement of the trigger element in the direction of its on-position, into a recess in the locking element, so that the displacement movement of the trigger element is no longer blocked, but the latter can reach the on-position.

[0003] While, with this known angle grinder, the user can carry out the displacement of the locking element and pivot of the trigger element with the same hand, there is the danger that, through an unintentional shifting of the locking element, say if the angle grinder falls while it is connected to a power source and in this process strikes an edge or the like with the locking element and the trigger element, it may happen that there is both a displacement of the locking element against the force of the compression spring in the direction of the free end of the trigger element and a pivot of the trigger element towards its on-position, with the result that the electric motor is unintentionally switched on.

[0004] In a known router (German Patent Application P 44 07 418), the trigger element for the on/off switch is integrated into one of the side-handles of the router, and a locking element which is articulated to the trigger element, projects with a gripping portion over the outer periphery of that part-portion of the trigger element which lies outside the handle housing when the trigger element is in the off-position. It is therefore also possible with this arrangement through an unfortunate concatenation of loading of locking element and trigger element, to firstly

pivot the locking element out of its position blocking the trigger element against displacement into the on-position, with the result that the trigger element is possibly then unintentionally pivoted into the on-position, as a result of which, if the router is connected to the power supply, its electric motor starts up, i.e. the unsupervised operating state already mentioned above comes about.

[0005] The object of the invention is to improve an electric power tool in such a way that the danger of an unexpected displacement of the trigger element into its on-position, say as a result of the electric power tool being dropped, is at least considerably reduced.

[0006] To achieve this object, an electric power tool of the type mentioned at the beginning of this document is designed in such a way that the locking element, has an actuation surface which at least in its non-displaced position, is recessed relative to the actuation surface of the trigger element.

[0007] Due to the fact that, with the electric power tool according to the invention, the locking element does not project beyond the actuation surface of the trigger element, it cannot be accidentally touched or displaced, say if the electric power tool is dropped, from its undisplaced position against an acting spring force, as a result of which it would be possible to move the trigger element into its on-position. Rather, the user must grasp, or exert pressure on, the actuation surface of the locking element which is recessed relative to the actuation surface of the trigger element, in order to bring about the displacement of the locking element, and only then can the trigger element be manually moved into its on-position.

[0008] Preferably, the locking element is mounted on the trigger element. Further, in a preferred version, the actuation surface of the locking element is located for this purpose in a recess provided in the actuation surface of the trigger element. The user must therefore exert pressure on the locking element through this recess in order to move it out of its undisplaced position. An accidental displacement of the locking element, in particular if the electric tool is dropped, is thereby practically impossible.

[0009] The trigger element is preferably mounted pivotable about an axis, and in the case of such a structure the locking element may be mounted, preferably pivotably mounted, in the trigger element towards the end of the remote from the axis.

[0010] If the pivotably mounted locking element is L-shaped, its first arm may form the actuation surface on which the user must exert pressure in order to displace the locking element against a spring force, while its second arm may lie opposite a lock surface provided in the housing when the locking element is in the non-displaced position, with the result that, when an attempt is made to shift the trigger element without prior pivoting of the locking element, the second arm engages with the lock surface, and prevents the movement of the trigger element into its on-position.

[0011] When an L-shaped locking element is used, it is possible in an easy way to also provide a locked on-position for the trigger element by forming, on the second arm of the L-shaped locking element, a hooked portion which, when the trigger element is in the on-position, can be made to engage with an engagement portion of a lock part in order to keep the trigger element in the on-position. The lock part can be manually displaced against spring force to engage the hooked portion. If, as is customary with such arrangements, the lock part holding the locking element is then manually displaced further against the action spring force, it ceases to engage with the hooked portion of the locking element, which is thereby pivoted back into its starting position as a result of an acting spring force. Upon release, the trigger element now returns to its off-position, while the lock part is likewise returned to its starting position after release as a result of an acting spring force.

[0012] The invention is described in more detail below with reference to the figures showing an embodiment.

Figure 1 shows an electrically powered router in perspective representation.

Figure 2 shows the one handle, containing the switch, of the router of Figure 1, in perspective representation.

Figure 3 shows a half-shell of the handle of Figure 2 with the on/off switch, the trigger element, the locking element and the lock part, the trigger element being in its off-position.

Figure 4 shows, in a representation corresponding to Figure 3, the trigger element displaced into the on-position.

Figure 5 shows, in a representation corresponding to Figures 3 and 4, the trigger element displaced into the on-position and the locking element in its locked position.

[0013] The router represented in Figure 1 has a motor housing 1 which is arranged in the customary way displaceable against spring force on guide columns 2, 3 which are secured to a shoe or baseplate 4. The baseplate 4 has a central opening which lies underneath the tool holder 6, which is formed at the lower end of the armature of the electric motor located in the motor housing 1 and in which a router bit can be held in clamping manner. By lowering the motor housing, the router bit is guided through the central opening 5 in the baseplate 4 and made to engage with the workpiece to be machined. The depth of penetration of the router bit can be limited to the desired depth in the usual way by means of a stop pin 7 mounted in clamping manner on the motor housing 1 and stops provided at a stop support 8 rotatably attached to the baseplate 4.

[0014] Handles 10, 11 are arranged at the side of the motor housing 1, and an on/off switch 22 is located in the handle 10, via which the electric motor located in the motor housing 1 is activated, which can be connected to a power source via a cable, not shown, which is guided into the motor housing 1 through a guard 9.

[0015] The handle 10, just like handle 11, is formed from two half-shells 12, 13, half-shell 12 having an upper projection 16 and a lower projection 14 which are fixedly connected to the motor housing 1 by means of screws extending in these areas through both half-shells 12, 13. The two half-shells form an inner space in which the on/off switch 22 for the router is arranged in the customary manner by means of ribs provided in the half-shells. This switch has a switch-actuating pin 23, with a supporting flange 23' formed at the outer end, between which and a stationary part of the switch housing a compression spring 24 is arranged. If the switch-actuating pin 23 is shifted against the force of the spring 24 in the direction of the switch housing and into the latter, the on/off switch assumes its on-position and the electric motor of the router is activated if the latter is connected to a power source.

[0016] Present on the inside of the handle 10 is an opening through which, when the on/off switch 22 is in the off-position, a part-portion of a trigger element 20 projects outwards or is accessible from outside. The trigger element 20 is essentially designed in the form of a box. It is open at the inner side facing the on/off switch 22, and has there a cross-rib coming to rest against the supporting flange 23'. It is held pivotable about an axis 21 formed underneath the opening in the handle 10. The axis 21 may be designed as a pin in one piece with a half-shell of the handle 10.

[0017] An opening 20' is formed in the outwardly directed wall of the trigger element 20 at the end remote from the pivot axis 21, and in this area a locking element 25 is pivotably mounted in the trigger element 20. The locking element 25 is essentially L-shaped and lies with its one arm 28 in the area of the opening 20' of the trigger element 20 and there forms with its outer surface 29 an actuation surface 29 for the user. The other arm 30 extends roughly at right angles to the one arm 28 and forms a hooked section 31 at its outer upper end. The locking element 25 is biased by a compression spring 27 in the direction of an anti-clockwise rotation (Figures 3 to 5). The compression spring 27 encloses a housing-fixed pin 19 and rests with its end remote from the locking element 25 against a part of the half-shell 12. In the unloaded state, the locking element 25 is kept by the force of the spring 27 in the position according to Figure 3, in which it rests with its arm 30 against a stepped section 17 of the half-shell 12 and is thus impeded from a further anti-clockwise rotation. In this situation, the actuation surface 29 of the arm 28 of the locking element 25, is situated underneath or recessed relative to the actuation surface of the trigger element 20 that is not covered by the half-shells 10, 11. As Figure 3 in partic-

ular shows, the surface forming the actuation surface 29 lies completely within the inside space of the box-shaped trigger element 20. Therefore, in order to displace the locking element 25 against the force of the spring 27, the user must reach into the opening 20' formed in the trigger element 20. Therefore, an accidental displacement, even say through the striking of an edge or corner if the router is dropped, is clearly reduced.

[0018] If the locking element 25 is in the position according to Figure 3, then, as already mentioned, its arm 30 engages with a stepped portion 17 of the half-shell 12, and a displacement of the trigger element 20 about the axis 21 is prevented by resting of the arm 30 against the lock surface formed by the stepped portion 17. Only when the user has consciously, by acting on the actuation surface 29 of the locking element 25, caused the latter to pivot about the axis 26 into the position according to figure 4, can he also pivot the trigger element 20 about the axis 21 and bring the on/off switch 22 into the on-position, with the result that the motor of the router is activated.

[0019] Projecting from the upper end of the handle 10 is the actuation head of a lock part 32 which is biased by the force of a spring 34 in the direction of an outwardly displaced position according to Figures 3 and 4. At the inner end, the lock part 32 has a hook-shaped engagement portion 33 which, by shifting of the lock part 32 against the force of the spring 34, moves inwards into the region of the hooked portion 31 of the locking element 25 which has been pivoted out of its blocked position. In this way the positive engagement shown in Figure 5 between locking element 25 and lock part 32 is produced, and through this the trigger element 20 which has been displaced into the on-position is held in this on-position and thus the on/off switch 22 is also held in the on-position. As soon as the user carries out a slight, additional anti-clockwise displacement of the trigger element 20 about the axis 21 (Figures 3 to 5), i.e. further into the handle 10, the hooked portion 31 of the locking element 25 ceases to engage with the hook-shaped engagement portion 33 of the lock part 32, with the result that the latter moves, as a result of the force of the spring 34, back into the position according to Figures 3 and 4 and its engagement portion 33 is thus moved out of the region of the lock portion 31 of the locking element 25. A release of the trigger element 20 which now takes place leads, through the force of the spring 24, to its movement into the off-position according to Figure 3, with the result that the on/off switch 22 also returns to the off-position and the locking element 25 returns to the position according to Figure 3.

Claims

1. An electric power tool comprising;

a housing in which is housed an electric motor and an on/off switch (22) for the motor, a trigger element (20) which is displaceable out of an off-position, in which an actuation surface of the trigger element projects from the housing, and into an on-position in which the on/off switch (22) is activated, and a locking element (25) which is mounted at the trigger element (20), which is displaceable and which in a non-displaced position prevents movement of the trigger element into the on-position and in a displaced position allows movement of the trigger element into its on-position,

characterised in that the locking element (25), has an actuation surface which at least in its non-displaced position, is recessed relative to the actuation surface of the trigger element (20).

2. An electric power tool according to claim 1, characterised in that the locking element (25) is mounted on the trigger element (20).
3. An electric power tool according to claim 1 or claim 2, characterised in that the actuation surface (29) of the locking element (25) is located in a recess (20') provided in the actuation surface of the trigger element (20).
4. An electric power tool according to any one of claims 1 to 3, characterised in that the trigger element (20) is mounted pivotable about an axis (21).
5. An electric power tool according to claim 4, characterised in that the locking element (25) is mounted in the trigger element (20) towards the end of the trigger element remote from the axis (21).
6. An electric power tool according to any one of the preceding claims, characterised in that the locking element (25) is mounted pivotably in the trigger element (20).
7. An electric power tool according to claim 6, characterised in that the locking element (25) is L-shaped and has a first arm (28) which comprises the actuation surface (29) and a second arm (30) which is located opposite to a housing fixed lock surface (18) when the locking element (25) is in the non-displaced position.
8. An electric power tool according to claim 7, characterised in that, the second arm (30) has a hooked portion (31) which, when the trigger element is in the on position, is engageable with an engagement portion (33) of a lock part (32) in order to keep the trigger element in the on-position.

9. An electric power tool according to claim 8, characterised in that the lock part (32) is shiftable to engage the hooked portion (31).

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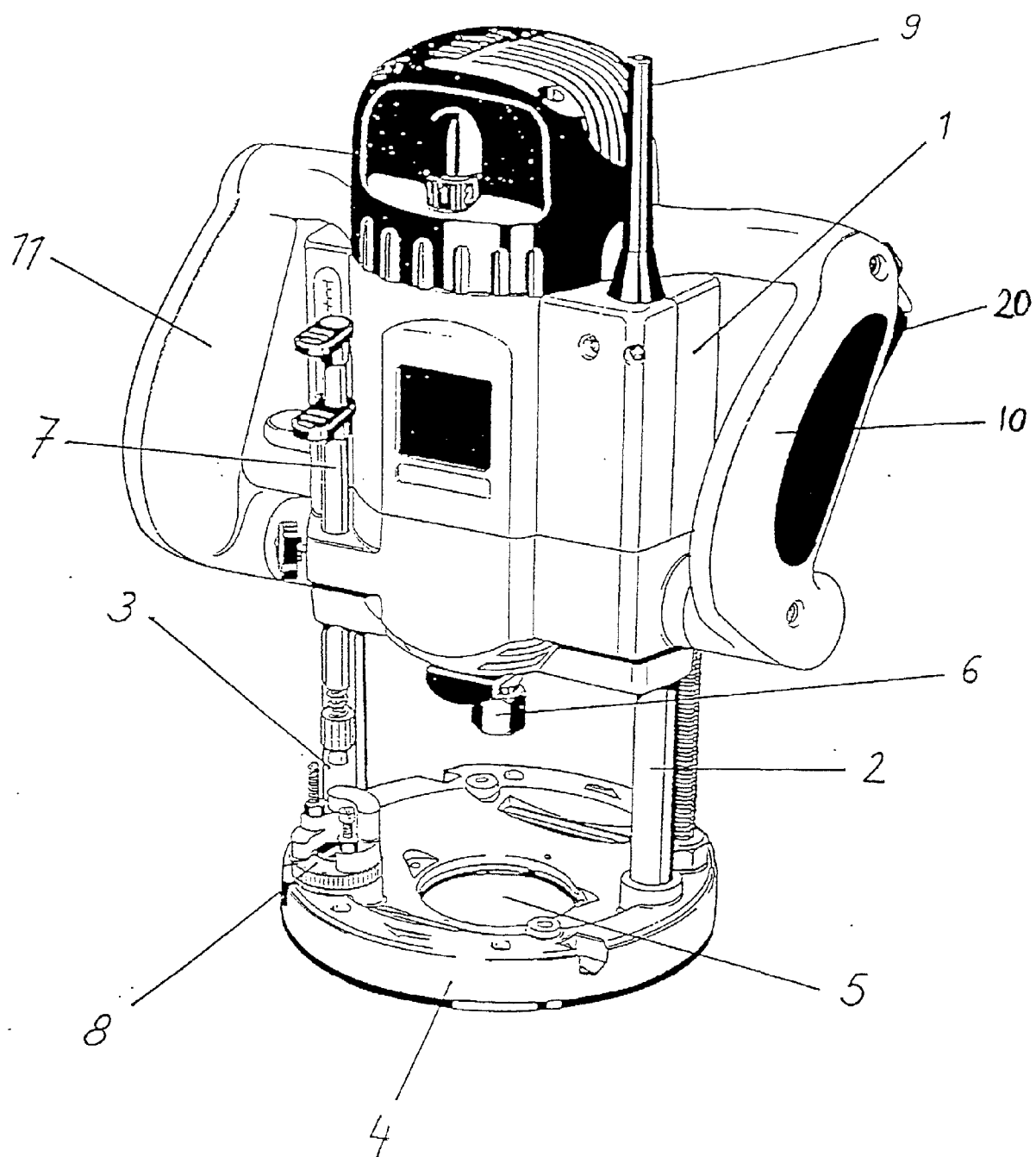


Fig. 1

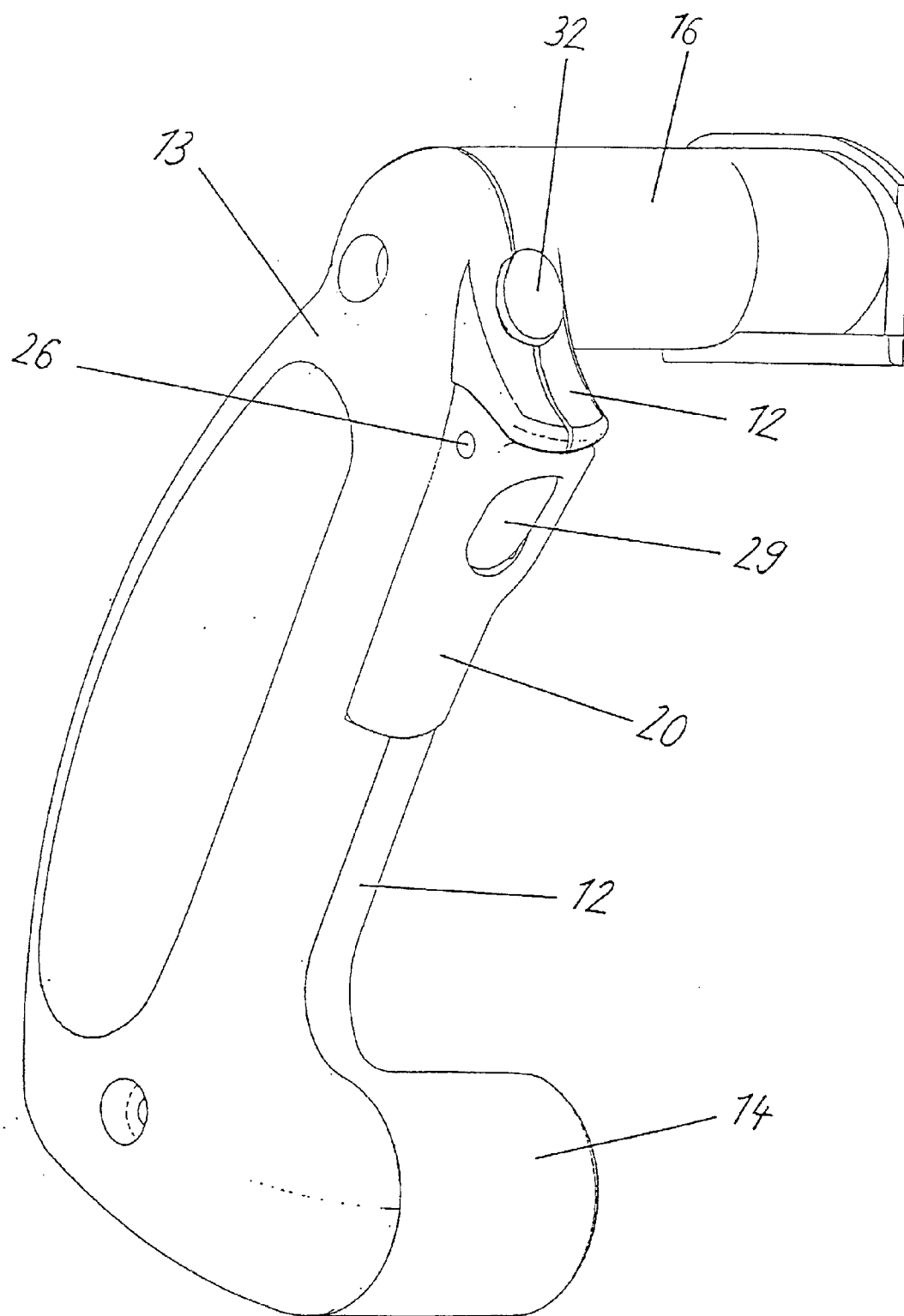


Fig. 2

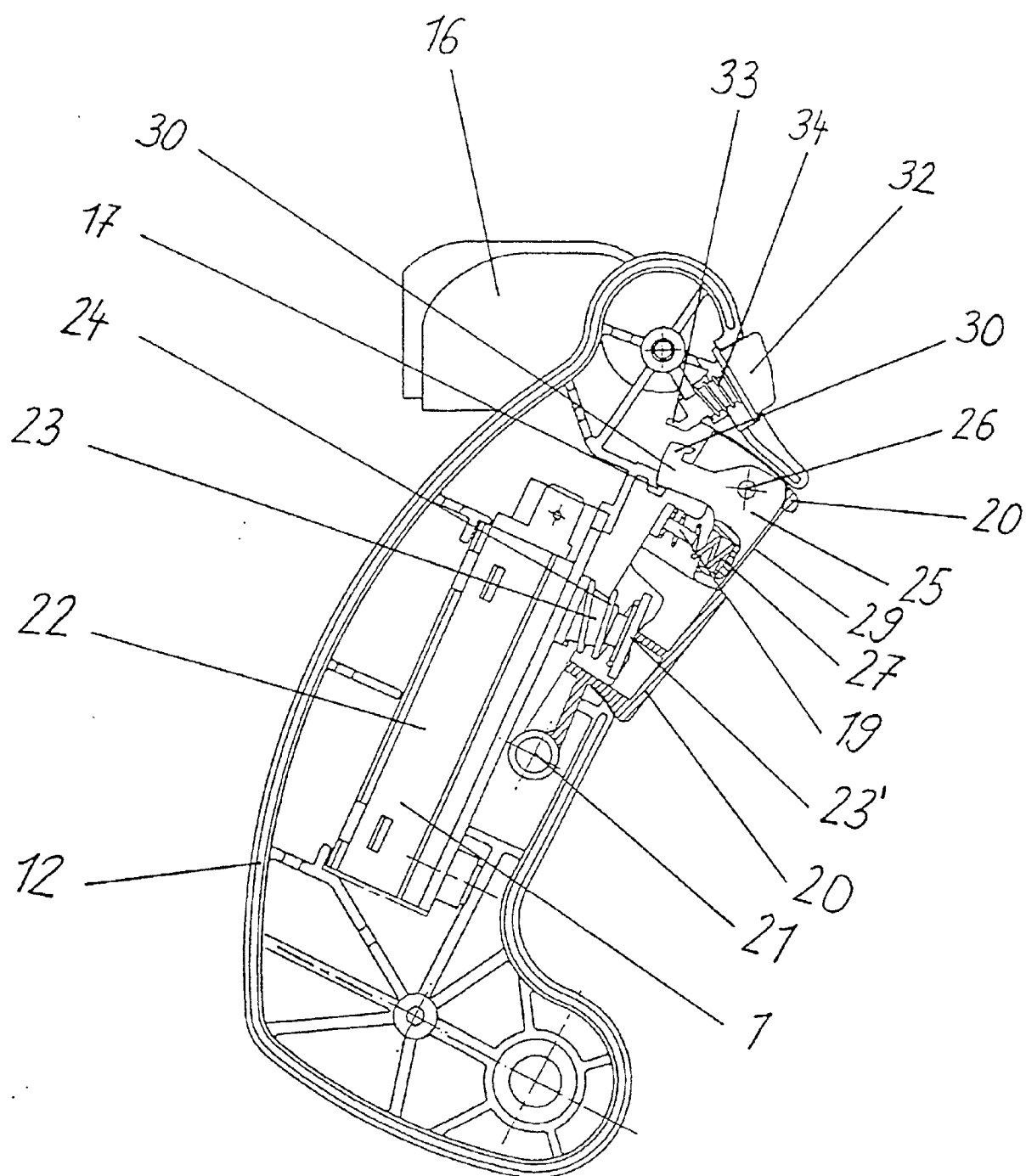


Fig. 3

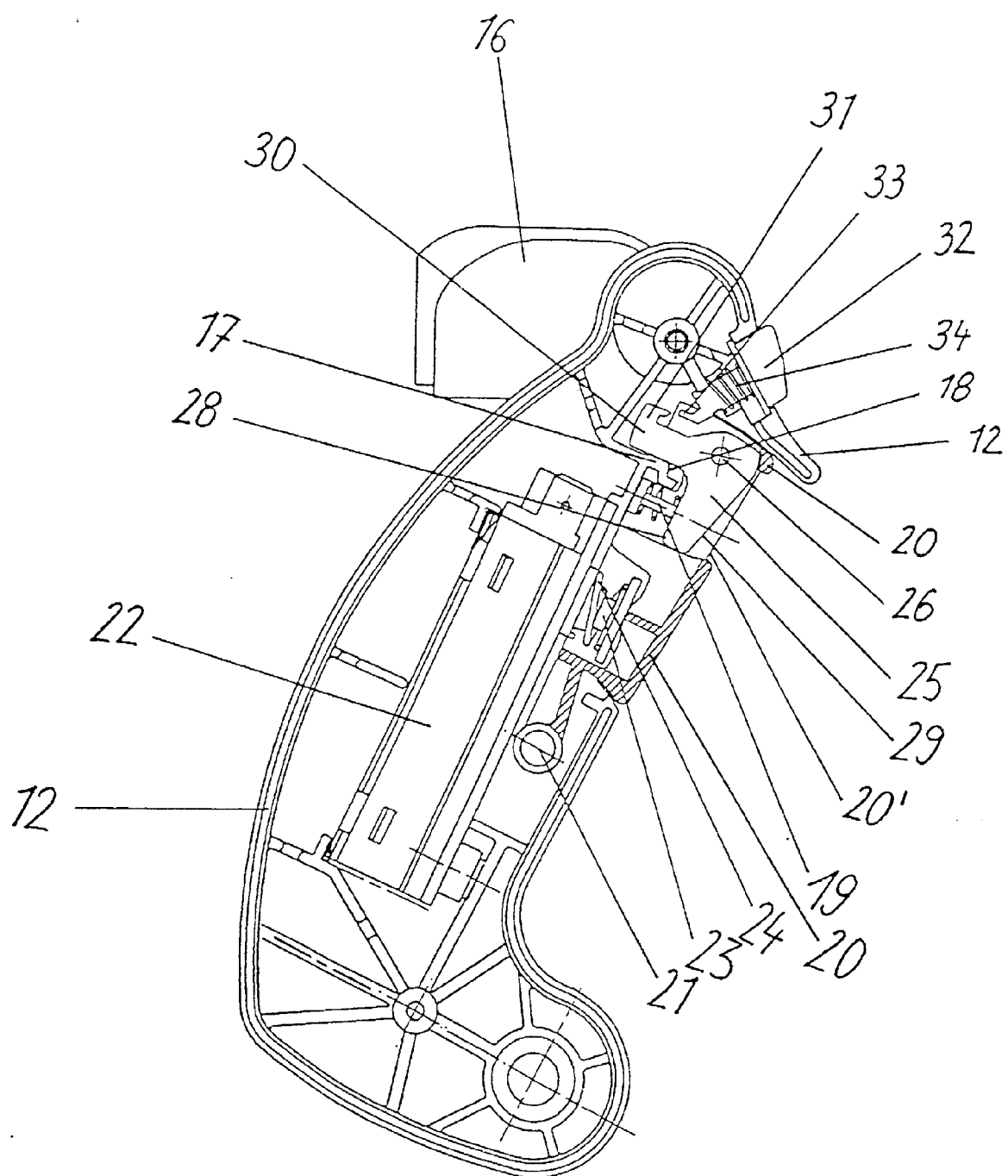


Fig. 4

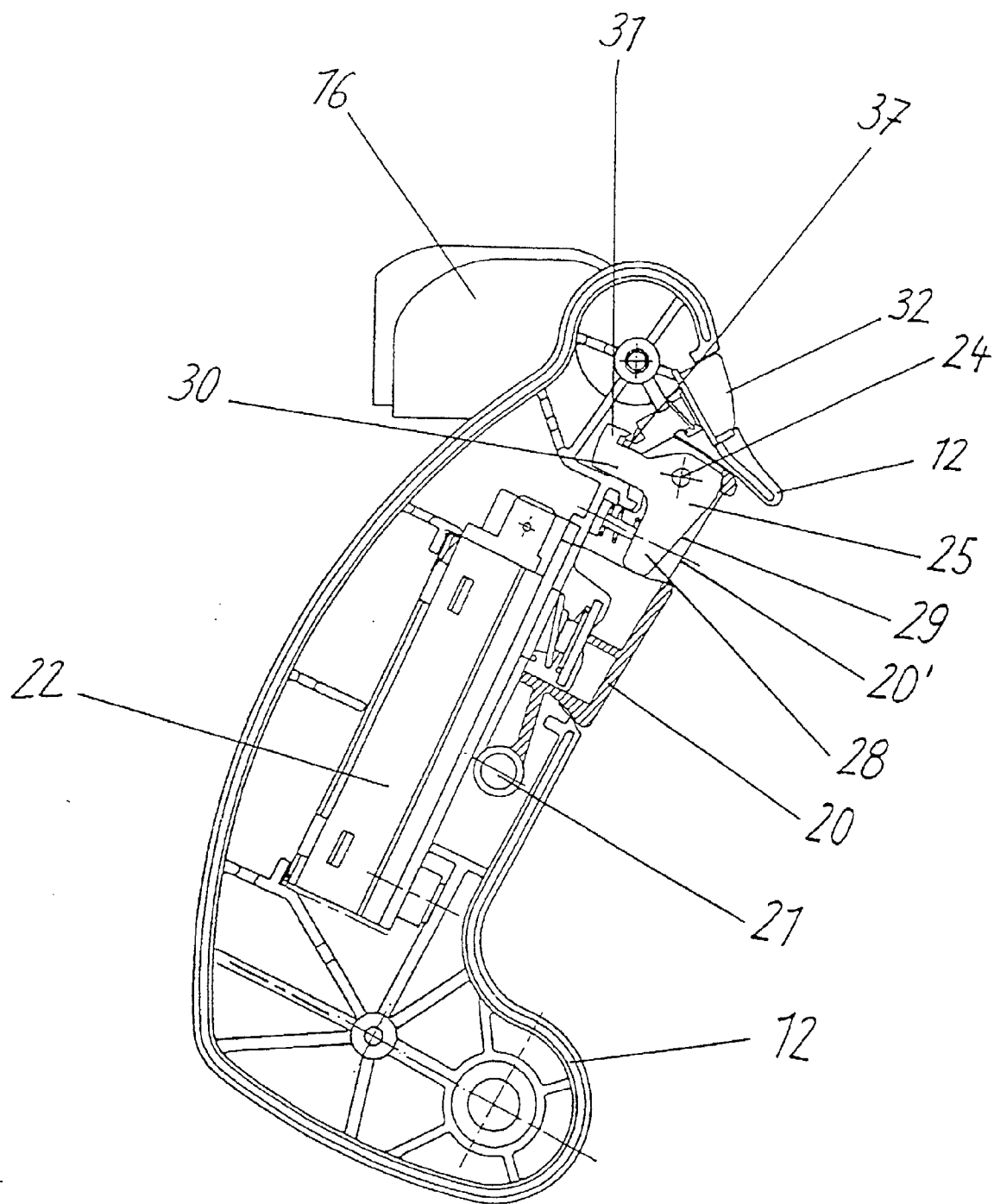


Fig. 5