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(54) **Handle assembly for tool**

Griffanordnung für Werkzeug

Ensemble poignée pour outil

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Description

[0001] The present invention relates to a drill according to the preamble of claim 1. Such a drill is known from US 2004/0078936.

[0002] Known power tools, such as power drills in which a drill bit is rotated by an output shaft which is in turn rotated by means of an electric motor, generate significant amounts of vibration, which can under certain circumstances limit the length of time during which the tool can be used continuously. In addition, the housing of such tools is generally made from a durable plastics material on which it can be difficult for a user of the tool to maintain a grip when the tool is in use for a sustained period.

[0003] US 6308378 discloses a gripping arrangement for a handle of a power tool in which the sides of the handle are provided with frictional gripping zones, each side of the handle including a plurality of alternating gripping zones of a softer material and a harder material. The softer material used is generally a thermoplastic elastomer or rubber material, and the harder material is generally the same material as that from which the tool housing is formed.

[0004] This known arrangement suffers from the drawback that because the softer material performs the dual functions of providing a friction grip and vibration damping, the choice of material constitutes a compromise in that although it will have acceptable friction reducing and vibration damping properties, the performance of the handle is limited because a material having optimum frictional properties will generally have unacceptable vibration damping properties, and vice versa.

[0005] WO02/38341 discloses a grip handle for a hand-held machine tool in which a hand grip is separated from the remainder of the housing by a vibration damping element consisting of an inflatable annular air filled cushion. An additional handle is provided which has a tubular grip element surrounding a further annular air cushion.

[0006] This known arrangement suffers from the drawback that the vibration damping properties of air can only be varied by adjusting the air pressure within a chamber containing the air, and even then, the range of vibration damping properties achievable is limited. Furthermore, it is difficult, and therefore expensive, to manufacture a sealed chamber containing air having a predetermined pressure.

[0007] This problem is solved by a drill according to claim 1.

[0008] Preferred embodiments of the present invention seek to overcome the above disadvantages of the prior art.

[0009] By providing at least one flexible member and at least one chamber containing at least one vibration damping gel material between the engaging portion and the surface of the handle in use, this provides the advantage of enabling the material of the flexible member to be chosen to have the optimum frictional properties to enable a user to maintain a grip on the tool, and the vibration damping gel material at the same time to have the optimum vibration damping properties. In particular, it is possible to provide gel materials having a wide range of vibration damping properties compared with air. This also provides the advantage of simplifying construction of the assembly, which in turn reduces the cost of manufacture of the assembly, as well as providing the advantage of further reducing the cost of manufacture of the assembly by providing one or more components which perform more than one function.

[0010] At least one said blister pack may be foldable.

[0011] This provides the advantage of enabling the blister pack to conform to the shape of the tool handle.

[0012] At least one said blister pack may be perforated between at least one pair of adjacent chambers.

[0013] This provides the advantage of facilitating folding of the blister pack.

[0014] At least one said blister pack may further comprise locating means for enabling the blister pack to be mounted to a support.

[0015] Said locating means may comprise at least one aperture through said blister pack at a respective location remote from the or each said chamber.

[0016] The assembly may further comprise support means adapted to be located on a side of at least one said blister pack remote from the corresponding said engaging portion.

[0017] At least one said chamber containing the or each said gel material may be at least partially transparent in use.

[0018] This provides the advantage of enabling visible indicia, such as decorative features or trade marks, or electrical indicators, for example indicating that the tool of which the assembly forms part is actuated, to be seen while the tool is in use.

[0019] The assembly may further comprise at least one visible indicium located in at least one said chamber.

[0020] At least one said visible indicium may be electrically operated in use.

[0021] This provides the advantage of enabling said indicium to provide an indication of an operating condition of a power tool, such as whether the tool is actuated.

[0022] At least one said indicium may be at least one light emitting diode.

[0023] The assembly may further comprise at least one electrical switch for actuating the tool.

[0024] This provides the advantage of simplifying assembly of the tool, which in turn further reduces the cost of manufacture of the tool.

[0025] Preferred embodiments of the invention will now be described, by way of example only and not in any limitative sense, with reference to the accompanying drawings, in which:-

Figure 1 is a perspective view of part of a housing of a power tool;

Figure 2 is an exploded perspective view of the hous-

ing of the embodiment of Figure 1;

Figures 3A to 3C show side cross-sectional views of three alternative forms of gel blister pack for use in the embodiment of Figures 1 and 2;

Figure 4A is a side view of a handle assembly of a power tool of an embodiment of the present invention;

Figure 4B is a rear view of the handle assembly of Figure 4A;

Figure 4C is a perspective view of the handle assembly of Figure 4A

Figure 4D is a partial cross-sectional view showing the relation between the gel piece and the handle for the power tool shown in Figures 4A-C.

Figure 4E is a side view showing an alternative embodiment of the power tool shown in Figure 4A.

[0026] Referring to Figures 1 and 2, a power tool 1 such as a drill or jigsaw comprises a housing 2 defining an aperture 3 bounded on one side thereof by a handle 4, the housing 2 containing a motor (not shown) for actuating an output member such as a drill bit or jigsaw blade (not shown).

[0027] The housing 2 is formed from a generally durable plastics material, as will be familiar to persons skilled in the art, and has a recessed portion 5 on a generally smooth upper surface of the handle 4, the recessed portion 5 being provided with a recess 6 containing an actuating switch (not shown) for turning the tool 1 on and off. The housing 2 is provided with ventilation apertures 7 at one end of the recessed portion 5 to allow cooling of the interior of the housing 2.

[0028] A flexible sheet 8, of thermoplastic elastomeric material, such as a thin layer of polyurethane, having a coefficient of friction higher than that of the material from which the housing 2 is made, is formed by means of a suitable method such as moulding. The sheet 8 has a periphery shaped to fit inside the periphery of recessed portion 5 to cover all of the recessed portion 5 except that part in which the ventilation apertures 7 are provided, and the flexible sheet 8 is provided with a through-aperture 9 to allow access to the actuating switch in recess 6. The flexible sheet 8 is also provided with a series of protrusions 10, each of which defines a chamber between the sheet 8 and the upper surface of the handle 4 of the housing 2 when the sheet 8 is placed in position on the upper surface of the recessed portion 5. Each of the chambers underneath the protrusions 10 accommodates a vibration damping gel contained in a blister pack 20 (Figures 3A to 3C). Alternatively, the flexible sheet 8 may be bonded to a backing sheet (not shown) to define the chambers containing the vibration damping gel.

[0029] A cover plate 11 of durable plastics material, such as the material from which the housing 2 is constructed, has an internal surface 12 corresponding generally to the external (i.e. upper) surface of the flexible sheet 8. The cover plate 11 is provided with a series of first apertures 13 for allowing the protrusions 10 of the sheet 8 to protrude therethrough when the plate 11 is mounted to the handle 4 to secure the flexible sheet 8 in place, a second aperture 14 co-operating with the aperture 9 to allow access to the actuating switch in recess 6, and a series of third apertures 15 cooperating with the ventilation apertures 7 in the housing 2.

[0030] Referring now to Figure 3A, a gel blister pack 20 for use in the embodiment of Figures 1 and 2 is formed from a thin, flexible backing piece 21 of thermoplastic polyurethane film on which one or more pieces 22 of a vibration damping gel formed from a semi-solid silicone rubber or polyurethane material are provided. The pieces 22 of gel may be translucent and/or semi transparent and/or coloured, for reasons which will be explained in greater detail below. The backing layer 21 with the pieces 22 of gel are then covered by a generally transparent layer 23 of thin, thermoplastic polyurethane film, which is pulled down tightly over the gel pieces 22 by means of a combination of heat and pressure, and then secured to the backing piece 21 at the periphery 24 of each gel piece 22 to form discrete chambers encapsulating each gel piece by suitable welding techniques, such as heat staking and/or ultrasonic vibration, which will be familiar to persons skilled in the art. Alternatively, the gel material 22 can be poured or injected into a pre-formed transparent sheet 23 and then covered by backing piece 21 and welded. The upper surface of the backing piece 21 may be printed with decorative or trade mark information which is visible through the transparent layer 23 and gel 22.

[0031] Referring to Figure 3B, in which parts common to the embodiment of Figure 3A are denoted by like reference numerals but increased by 100 and will therefore not be described in greater detail herein, the backing piece 121 of the blister pack 120 is provided with a series of raised portions 125 which may be decorative matter and/or trade marks or raised lettering. The raised portions 125 define recesses 126, which may accommodate light emitting diodes which can be illuminated to provide a visual indication of an operating parameter of the tool incorporating the blister pack 120, for example to indicate whether the tool is switched on.

[0032] In the arrangement of Figure 3C, in which parts common to the embodiment of Figure 3B are denoted by like reference numerals but increased by 100, the raised portions 225 defining recesses 226 may be formed by a separate layer 227, which is encapsulated along with gel material 222 by transparent sheet 223 and backing piece 221.

[0033] The operation of the handle 4 of the tool 1 of Figures 1 to 3 will now be described.

[0034] When a user's hand (not shown) grips the tool 1 when in use, the user's hand comes into contact with the cover plate 11 and the protrusions 10 beneath which one or more blister packs 20, 120, 220 containing vibration damping gel are located. As a result, vibrations generated by the motor in the tool housing 2 are damped by the vibration damping gel underneath protrusions 10, and

the user's grip on the tool is maintained by contact between the user's hand and the high friction material of the flexible sheet 8. It can therefore be seen that by suitable choice of material of the flexible sheet 8, the frictional properties of the sheet 8 can be optimized, while the vibration damping properties of the gel-filled blister packs 20, 120, 220 are generally superior to the vibration damping properties of known high friction materials or air filled cushions used in conventional handle assemblies.

[0035] Referring to Figures 4A to 4D, handle 404 of power tool 401 of an embodiment of the invention, for example, a drill, is defined by two halves 402A, 402B of housing 402. Drill 401 includes an upper motor housing 430 disposed above handle 404. Housing 430 may extend along or at a small angle to the horizontal direction, while handle 404 may extend along or at a small angle to the vertical direction. As shown, both housing 430 and handle 404 are slightly angled to the horizontal and vertical directions when the drill rests on a horizontal surface. The lower surface of motor housing 430 transitions into handle 404 at fillet 404a. At its lower end handle 404 transitions into battery receiving portion 435 at a second fillet 404b. Battery 440 is slidably received in the receiving portion. Although the drill shown is a cordless drill receiving a removable battery which when inserted in the receiving portion forms the lower end of the drill, the invention could also be directed to a corded drill as well in which there is not a substantial part of the drill housing which is removable.

[0036] Three gel pieces 422a-c protrude from the rear of handle 404 and extend through cover plate 411, which may be formed in one or two pieces. Both gel pieces 422a-c and cover plate 411 may have the same structure as the cover plate and gel pieces described with respect to the embodiment of Figures 1-3. Gel pieces 422a-c encompass the rear of handle 404 and extend partially around both sides of handle 404 and preferably terminate rearwardly of the center axis Y-Y of handle 404, which extends at a slight angle to the vertical. Preferably, upper gel piece 422a is positioned relatively high on handle 404, encompassing upper fillet 404a, opposite depressible trigger 429 which is disposed through the front of handle 404. Upper gel piece 422a extends downwardly for substantially the same distance as trigger 429 to provide the maximum cushioning benefit when the user actuates trigger 429.

[0037] In a preferred embodiment, the overall gripping region of the tool extends generally from upper fillet 404a towards lower fillet 404b in a range of 80-100mm as measured in the vertical direction. Preferably lower gel piece 422c terminates above and adjacent lower fillet 404b. Upper gel piece 422a may extend in the vertical direction of handle 404 for 36 mm. At its maximum, upper gel piece 422a extends along each side of handle 404 in the direction which is transverse to the centerline Y-Y to a location which is 11 mm rearward of centerline Y-Y. The distance in the vertical direction between upper gel piece 422a and middle gel piece 422b may be 8 mm. The dimension of the middle and lower gel pieces 422b and 422c in the vertical direction may be 15mm, and each may extend along each side of handle 404 in the direction which is transverse to the centerline Y-Y to a location which is 13 mm rearward of the centerline Y-Y. The distance in the vertical direction between middle gel piece 422b and lower gel piece 422c may be 7 mm. The distance in the vertical direction between lower gel piece 422c and lower fillet 404b may be 15 mm. The thickness of gel pieces 422a-c may be between 5-10 mm.

[0038] Cover plate 411 may be formed as one saddle-shaped piece which extends about the rear and partially along each side of handle 404. Alternatively cover plate 411 may be formed as two pieces, with one piece disposed on each handle half. As measured in the vertical direction, cover plate 411 may extend from a location which is 6 mm above upper gel piece 422a to a location which is 8 mm below lower gel piece 422c. The openings in cover plate 411 have dimensions corresponding to those of gel pieces 422a-c. As shown, at an upper location cover plate 411 may extend forwardly of centerline Y-Y for 12 mm at its maximum. At a location which is about 32 mm below the upper edge of cover plate 411, cover plate 411 narrows such that it only extends to a location which is 4 mm to the rear of centerline Y-Y. As shown in Figure 4D, gel piece 422c may project outwardly from cover plate 411 by 3 mm. Gel pieces 422a and 422b also project outwardly from cover plate 411 by 3 mm.

[0039] Figure 4E shows an alternative to the embodiment shown in Figures 4A-4D. In Figure 4E, only a single gel piece 422' is disposed on handle 404'. Gel piece 422' may have a saddle shape and wrap around the rear of handle 404', and extend forwardly on both side of handle 404', terminating to the rear of centerline Y-Y. Alternatively, two gel pieces 422' which jointly form a saddle shape and wrap around the rear of handle 404' may be used. With respect to the portion of handle 404,404' covered by the gel piece(s), the overall dimensions of gel piece 422' are similar to those of the three gel pieces 422a-c of Figures 4A-C. However, in the present embodiment, gel piece 422' also occupies the regions of handle 404' between each of gel pieces 422a-c. Similarly, the overall dimensions of cover plate 411' is similar to the overall dimensions of cover plate 411.

[0040] It will be appreciated skilled in the art that the above embodiments have 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.

Claims

1. A drill (401) comprising:

a motor housing (430);
a handle (404) extending downwardly from said

motor housing, said handle (404) having a front surface, a rear surface and side surfaces;
a chamber enclosing a gel material (422a-c) disposed on said handle (404), said chamber disposed about the rear surface of said handle (404) **characterized in that** said chamber is extending forwardly along both said side surfaces; and the drill is further comprising
a cover plate (411) made of a material which is relatively hard as compared to said chamber (422a-c), said cover plate (411) disposed on said handle (404) and including an aperture through which said chamber (422a-c) protrudes.

2. The drill recited in claim 1 further comprising a trigger switch (429) extending through said front surface, said chamber (422a-c) disposed on said handle at a location opposite said trigger switch (429).

3. The drill recited in claim 1, an upper transition defined between said motor housing and said handle, said chamber (422a-c) disposed so as to encompass said transition.

4. The drill recited in claim 3, said drill comprising a lower housing structure disposed below said handle (404), a lower transition defined between said handle and said lower housing structure, said chamber (422a-c) terminating at a location adjacent said lower transition.

5. The drill recited in claim 4, said lower housing structure comprising a battery receiving housing (435).

6. The drill recited in claim 1, said handle (404) having a longitudinal center axis (y-y), said chamber extending along said side surfaces so as to terminate rearwardly of said center axis (y-y).

Patentansprüche

1. Bohrmaschine (401) umfassend:

ein Motorgehäuse (430),
einen sich nach unten von dem Motorgehäuse erstreckenden Griff (404), der eine vordere Fläche, eine hintere Fläche und Seitenflächen aufweist,
eine ein Gelmaterial (422a-c) einschließenden Kammer, die an dem Griff (404) angeordnet ist, wobei die Kammer um die hintere Fläche des Griffs (404) angeordnet ist, **dadurch gekennzeichnet, dass** die Kammer sich nach vorne entlang beider Seitenflächen erstreckt und die Bohrmaschine ferner eine Abdeckplatte (411), die aus einem Material hergestellt ist, das vergleichsweise hart im Vergleich zu der Kammer (422a-c) ist, aufweist, wobei die Abdeckplatte (411) an dem Griff (404) angeordnet ist und eine Öffnung umfasst, durch die die Kammer (422a-c) vorsteht.

2. Bohrmaschine nach Anspruch 1, ferner mit einem Betätigungsschalter (429), der sich durch die vordere Fläche erstreckt, wobei die Kammer (422a-c) an dem Griff an einer Position gegenüber den Betätigungsschalter (429) angeordnet ist.

3. Bohrmaschine nach Anspruch 1, wobei ein oberer Übergang zwischen dem Motorgehäuse und dem Griff vorgesehen ist, wobei die Kammer (422a-c) so angeordnet ist, um den Übergang zu umgeben.

4. Bohrmaschine nach Anspruch 3, wobei die Bohrmaschine einen unteren Gehäuseaufbau, der unter dem Griff (404) angeordnet ist, und einen unteren Übergang aufweist, der zwischen dem Griff und dem unteren Gehäuseaufbau angeordnet ist, wobei die Kammer (422a-c) an einer Position benachbart zu dem unteren Übergang endet.

5. Bohrmaschine nach Anspruch 4, wobei der untere Gehäuseaufbau ein Batterieaufnahmegehäuse (435) umfasst.

6. Bohrmaschine nach Anspruch 2, wobei der Griff (404) eine in Längsrichtung verlaufende Mittelachse (y-y) aufweist, wobei sich die Kammer entlang der Seitenflächen erstreckt, so dass sie hinter der Mittelachse (y-y) endet.

Revendications

1. Perceuse (401) comprenant :

un carter de moteur (430) ;
une poignée (404) s'étendant vers le bas depuis ledit carter de moteur, ladite poignée (404) ayant une surface avant, une surface arrière et des surfaces latérales ;
une chambre enfermant un matériau en gel (422a-c) disposée sur ladite poignée (404), ladite chambre étant disposée autour de la surface arrière de ladite poignée (404), **caractérisé en ce que** ladite chambre s'étend vers l'avant le long des deux dites surfaces latérales ; et la perceuse comprend en outre :

une plaque de recouvrement (411) composée d'un matériau qui est relativement dur en comparaison avec ladite chambre (422a-c), ladite plaque de recouvrement (411) étant disposée sur ladite poignée (404) et comprenant une ouverture à tra-

vers laquelle ladite chambre (422a-c) fait saillie.

2. Perceuse selon la revendication 1 comprenant en outre un commutateur de déclenchement (429) s'étendant à travers ladite surface avant, ladite chambre (422a-c) étant disposée sur ladite poignée au niveau d'un emplacement opposé audit commutateur de déclenchement (429).

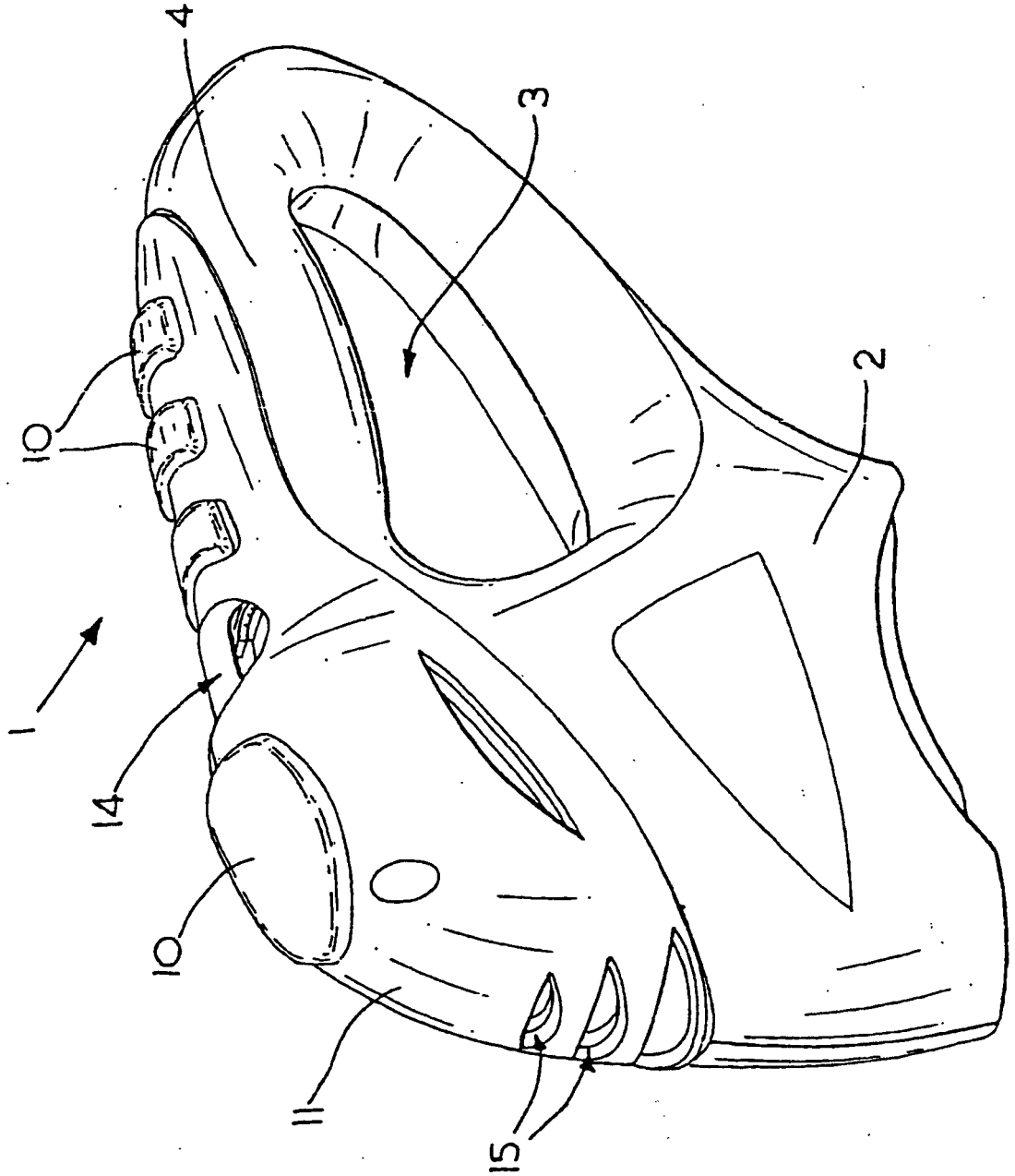
3. Perceuse selon la revendication 1, une transition supérieure étant définie entre ledit carter de moteur et ladite poignée, ladite chambre (422a-c) étant disposée de telle manière à enfermer ladite transition.

4. Perceuse selon la revendication 3, ladite perceuse comprenant une structure de carter inférieure disposée en dessous de ladite poignée (404), une transition inférieure étant définie entre ladite poignée et ladite structure de carter inférieure, ladite chambre (422a-c) se terminant au niveau d'un emplacement adjacent à ladite transition inférieure.

5. Perceuse selon la revendication 4, ladite structure de carter inférieure comprenant un logement de réception de batterie (435).

6. Perceuse selon la revendication 1, ladite poignée (404) ayant un axe central longitudinal (Y-Y), ladite chambre s'étendant le long desdites surfaces latérales de manière à se terminer vers l'arrière dudit axe central (Y-Y).

FIG. 1



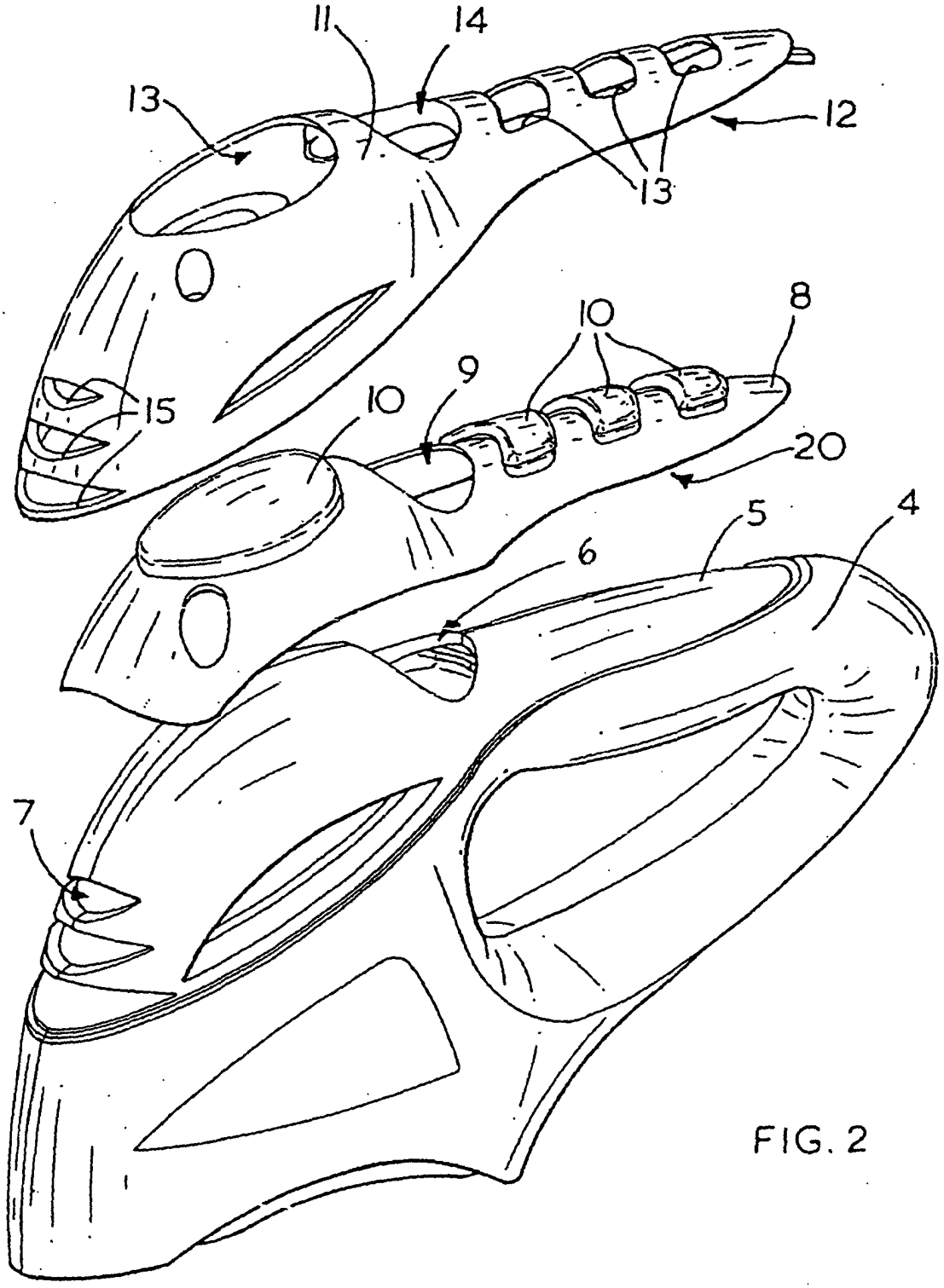


FIG. 2

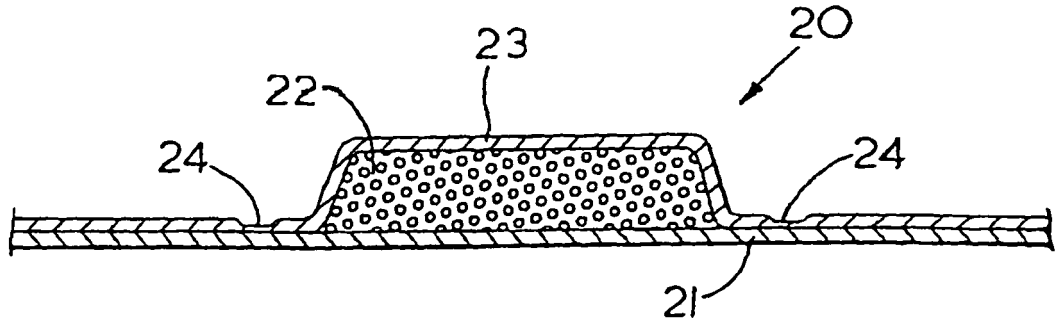


FIG. 3A

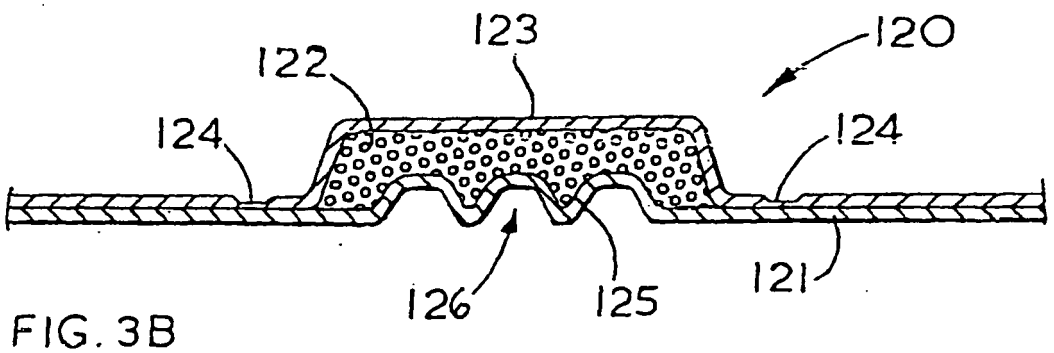


FIG. 3B

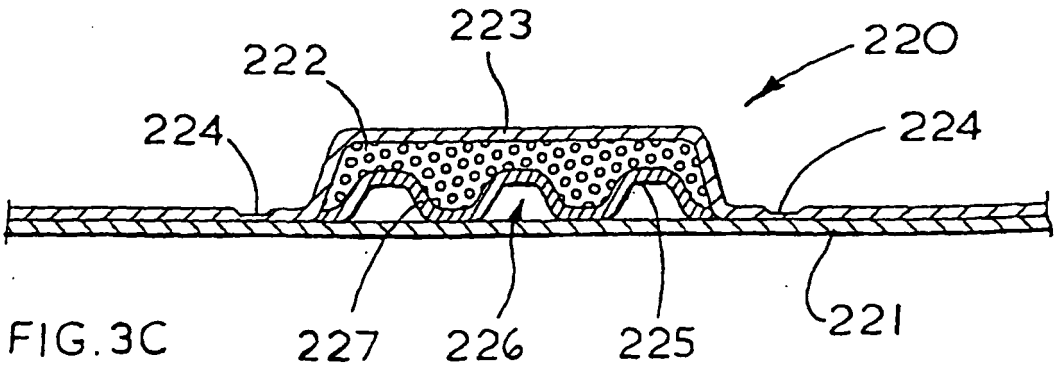


FIG. 3C

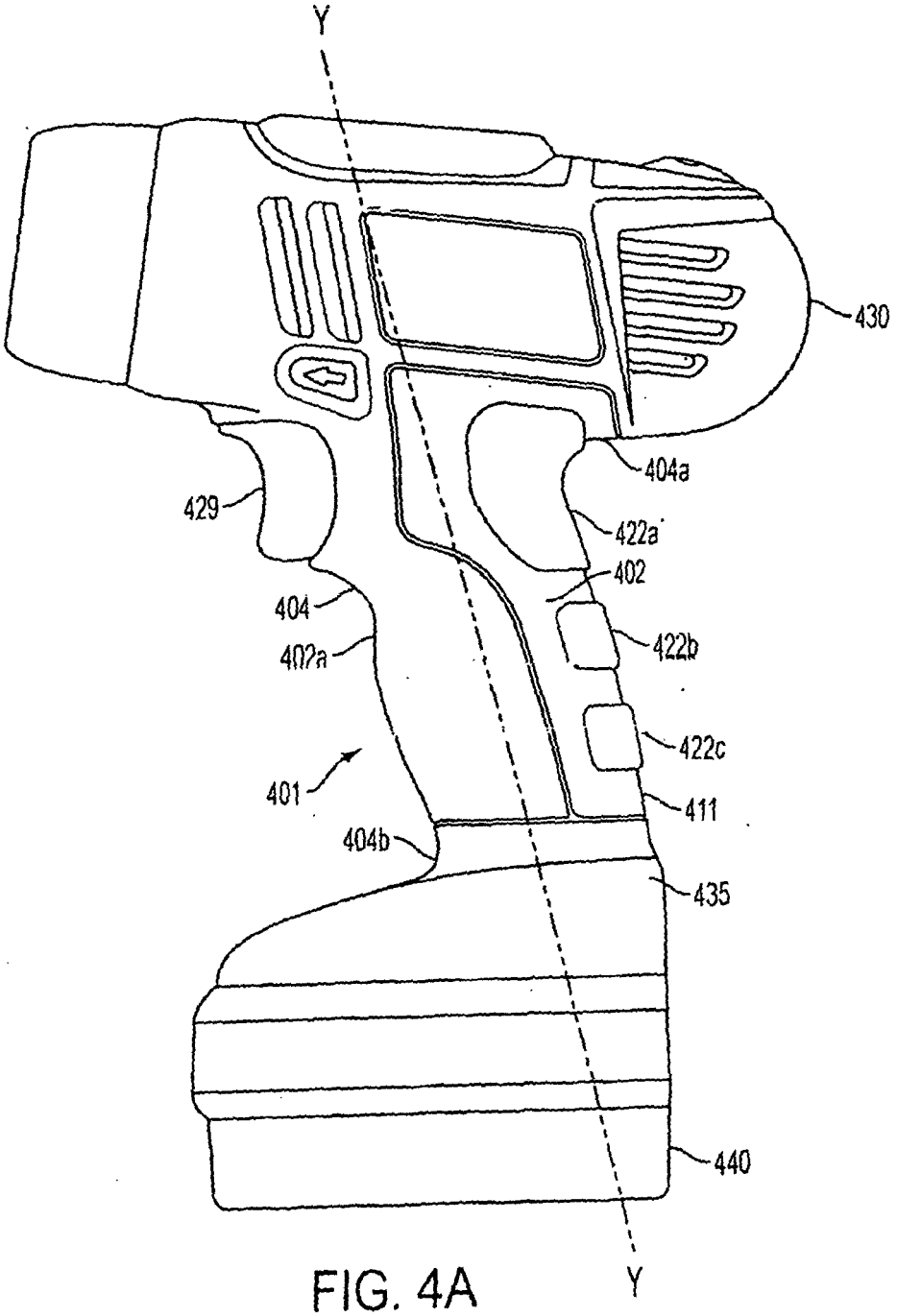

Y
430
404a
429
422a
402
404
422b
402a
422c
401
411
404b
435
440
Y

FIG. 4A

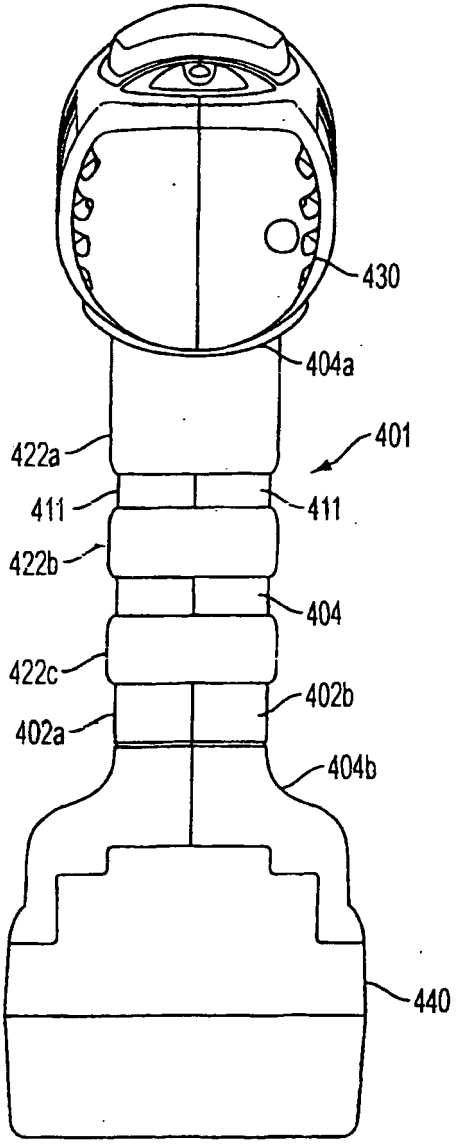


FIG. 4B

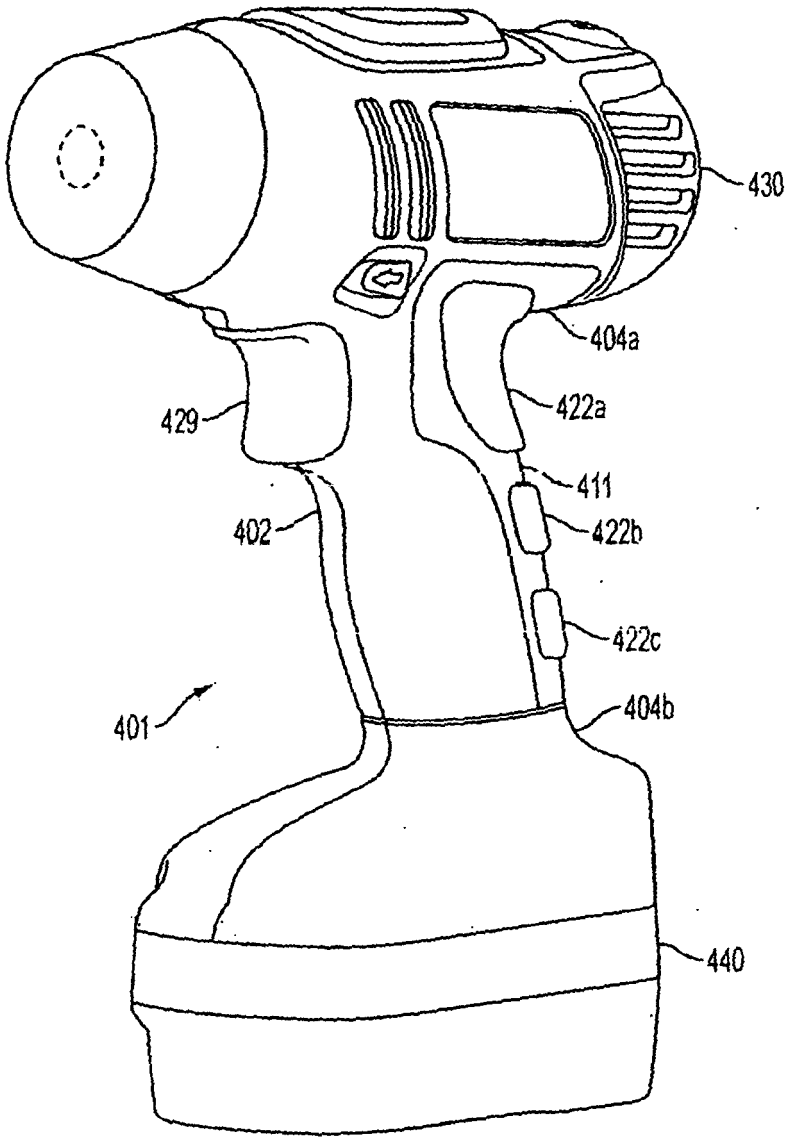


FIG. 4C

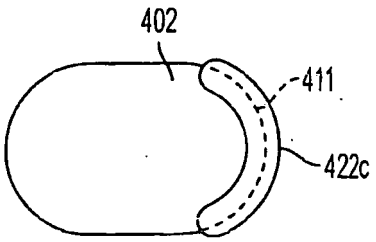


FIG. 4D

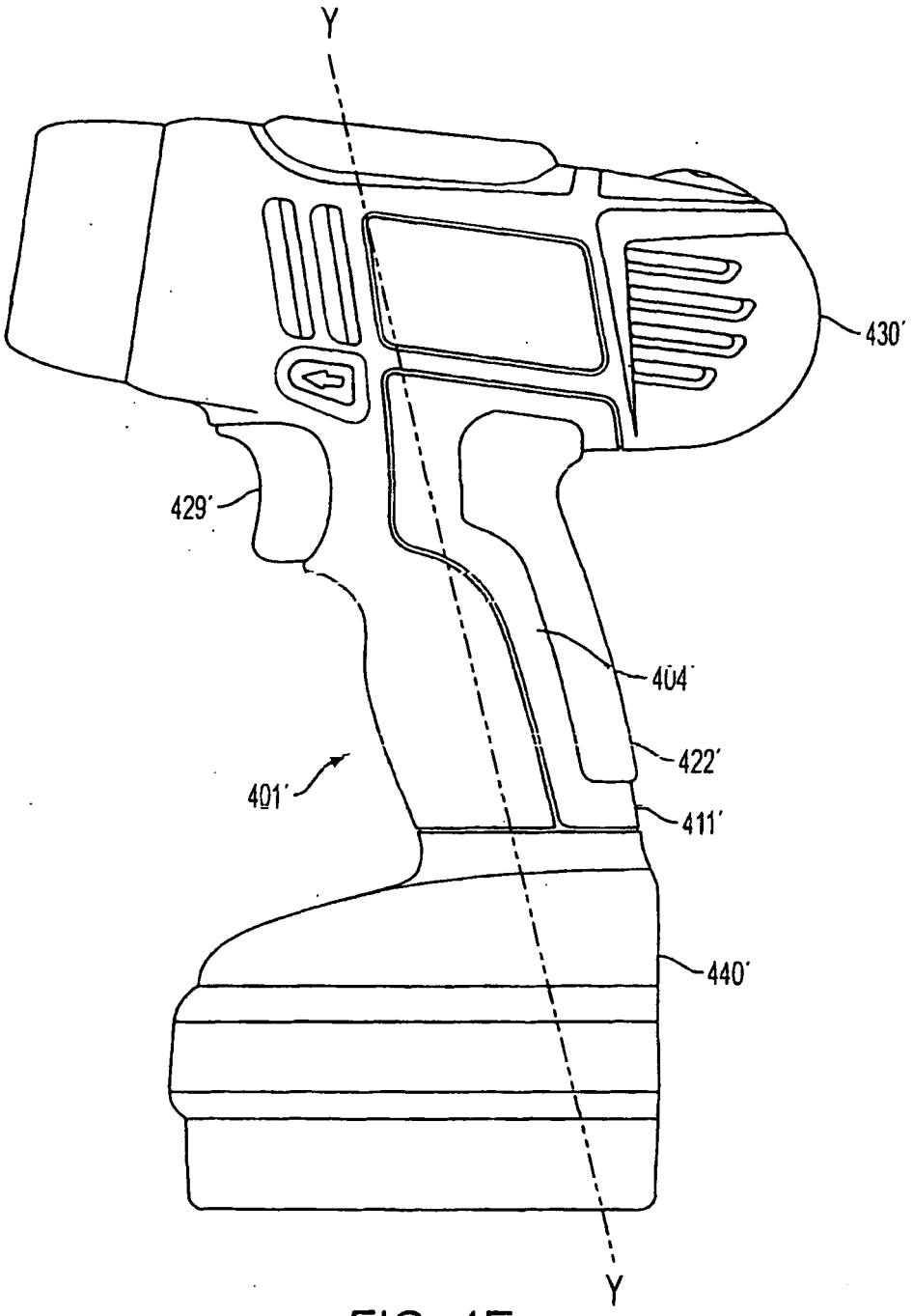


FIG. 4E

REFERENCES CITED IN THE DESCRIPTION

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- WO 0238341 A **[0005]**