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(54) Title: HANDLES FOR DIGGING TOOLS

(57) Abstract

A handle for a digging tool has a handgrip and a support member for supporting the handgrip. At least part of the handgrip is pivotable with respect to the support member. This reduces blistering of the user's hands, fatigue, and injury to the user's muscles, ligaments or tendons, particularly those associated with the wrist.

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HANDLES FOR DIGGING TOOLS

This invention relates to novel tool handles, particularly handles for digging tools such as spades, forks or shovels. The invention also encompasses a digging tool fitted with an improved handle.

Digging tools take many forms but generally comprise an elongate shaft having a head at one end and a handle at the other end. Such tools are widely used in horticulture, agriculture, construction and mining.

The shaft is commonly of wood, steel, plastics or fibre-reinforced composites and, depending upon the material, may be tubular or solid. The head is adapted to suit the purpose of the tool, and so, in a fork, includes a plurality of tines or prongs or, in a spade, includes a blade.

The handle may be simply an extension of the shaft but, for ease of use, usually includes a generally cylindrical hand grip which is oriented transversely with respect to the shaft. This orientation facilitates driving the head of the tool into the material being dug, such as soil, sand or gravel. To orient the hand grip transversely, the handle may be T-shaped, with the hand grip forming the cross-bar of the T. However, the handle is more commonly D-shaped, with the hand grip supported by a Y-shank i.e. supported between two support members which splay apart from the handle end of the shaft.

Digging with a hand tool for long periods is physically gruelling and involves numerous repetitive movements. With each movement, the user's hand may slip slightly on the hand grip, often resulting in painful blisters which hinder use of the tool and so reduce working efficiency. Worse, if blistering is serious, the user may have to stop using the tool until the blisters heal.

In an effort to reduce the problem of blistering, at least one tool manufacturer has adopted a cushioned hand grip in which a sleeve of soft and resilient foam rubber or

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plastics is bonded to a hard core. The core provides structural strength whilst the foam layer surrounds the core to improve the security of the user's grip on the handle. To this end, the foam layer has a rough surface texture which increases friction with the user's skin, and is soft enough to conform to the shape of the user's hand as the user grasps the hand grip.

Though an improvement over previous non-cushioned hand grips in that blistering is much reduced, the cushioned hand grip introduces problems of its own. Specifically, a digging operation involves considerable movement of the user's arms and, clearly, freedom of arm movement is extremely important. It is unfortunate, therefore, that the cushioned hand grip places extra load on the user's arm and particularly on his or her wrist. As the cushion substantially prevents movement of the user's hand with respect to the hand grip, the user's wrist has to flex repeatedly through a wide range of movement while digging and may assume unnatural and stressful positions in so doing. This promotes fatigue and, at worst, may damage the user's muscles, ligaments or tendons.

A solution to the problem of fatigue or injury is to make the hand grip pivotable with respect to the remainder of the handle. However, it is believed that no-one has marketed a digging tool having a cushioned, pivotable hand grip: this invention results from our efforts to solve the problems outlined above and provides, for the first time, a digging tool having a cushioned, pivotable hand grip.

The facility for pivotal movement of the hand grip allows the user's arm, and particularly the user's wrist, to adopt whatever positions may be most natural and comfortable during a digging operation. This reduces the risk of fatigue or injury. However, unlike previous handle designs, freedom of movement does not depend upon slippage of the user's hand with respect to the hand grip; the user's hand remains fixed in relation to the hand grip and so blisters are minimised. The resilience of the layer defining the gripping surface also provides a shock-absorbing effect and further improves the non-slip characteristics of the hand grip.

In one sense, therefore, this invention resides in a handle for a digging tool, the handle comprising at least one support member, a core supported by the support member, a rigid sleeve pivotable about the core, and a resilient gripping surface on the sleeve.

In preferred embodiments, the sleeve is tubular along its length and is axially located with respect to the core. To achieve this axial location, the sleeve may have an interlocking formation adapted to interlock with a complementary interlocking formation on the core. Advantageously, the interlocking formations are adapted to allow snap-fit interconnection of the sleeve and the core. One set of interlocking formations may be provided by a collet associated with the sleeve, the collet preferably being a separate component received by or otherwise attached to the sleeve.

There may be first and second cores, each core being a spigot associated with a respective one of first and second support members, with the sleeve being axially located with respect to each core.

For structural strength, an end of the sleeve preferably bears against a support member: indeed, it is preferred that respective ends of the sleeve bear against the first and second support members, with the sleeve acting in compression to separate the support members.

The core can be integral with the support member or may be attached to the support member, for example with the core being received in an opening in the support member. In another arrangement, the core is tubular and receives a male portion of the support member.

The core can be attached to the support member by plastic deformation of the core, with the core being crimped, upset or peened.

The gripping surface preferably has a high friction characteristic which minimises side-to-side slippage of the user's hand on the hand grip; it will be noted that such slippage could occur despite the pivoting facility. Further, the gripping surface ensures that the

frictional force between the user's hand and the gripping surface always exceeds the frictional force resisting pivoting of the hand grip. This ensures that, if movement is called for during a digging operation, the hand grip will pivot rather than allow slippage of the user's hand.

The gripping surface may be integral with the sleeve, the sleeve having non-uniform rigidity being relatively rigid inwardly towards the core and being relatively flexible outwardly to define the resilient gripping surface.

The resilient layer is suitably a layer of foam rubber or plastics material such as neoprene, bonded or otherwise fitted to the sleeve. The foam material constituting the resilient layer may be of non-uniform density, having a relatively large-celled internal structure and a relatively small-celled outer surface region.

To resist the ingress of water into the resilient layer, the gripping surface defined by the cushioned layer can be substantially impervious or, if it is preferred to absorb sweat, the gripping surface can be porous.

For optimum structural strength, it is preferred that the core is supported by first and second support spaced members, one at each end of the core. In an advantageous arrangement, the first and second support members are connected by the core, the core being axially located with respect to each of the support members and acting in tension to prevent the support members from separating from one another.

In certain embodiments of the invention, there may be first and second cores, one core being associated with a respective one of first and second support members, wherein the cores are connected by a tensile member acting in tension to prevent the support members from separating from one another.

The handle of the invention suitably includes connecting means for connecting the handle to a shaft of the digging tool. Usually, the connecting means will be a socket for receiving an end of the shaft. Further, the hand grip is typically oriented transversely

with respect to the shaft when the shaft is connected to the handle.

The invention also resides in a digging tool fitted with or integral with the handle of the invention.

In order that this invention may be clearly understood, reference is made to the following detailed description of preferred embodiments, and to the accompanying drawings. Whilst these embodiments are presently preferred and are described for the purposes of illustrating this invention, it will be understood that the invention is not limited to the specific arrangements disclosed.

In the drawings:

Figure 1 is a part-sectioned front view of the upper end of a digging tool, showing a handle constructed in accordance with this invention;

Figure 2 is a side view corresponding to Figure 1;

Figure 3 is an enlarged cross-sectional detail view illustrating a part of the handle shown in Figures 1 and 2;

Figure 4 is an enlarged cross-sectional detail view illustrating a further embodiment of the invention in which a collet forming part of the sleeve engages with a spigot associated with a support member;

Figure 5 is an enlarged cross-sectional detail view illustrating another handle arrangement, the handle having a spigot associated with a support member constituting a core, with a tubular sleeve pivoting around the core; and

Figure 6 is an enlarged cross-sectional detail view illustrating a further handle arrangement, this arrangement having a tubular sleeve pivoting about two cores and a screw extending between the cores within the sleeve acting as a tensile member.

Referring firstly to Figures 1 and 2, a digging tool 10 comprises an elongate cylindrical shaft 12 having a handle 14 situated at its upper end.

A connecting means in the form of a sleeve 16 is integral with the handle 14. The sleeve 16 is generally tubular to define a cylindrical socket within which the uppermost portion of the shaft 12 is received. The shaft 12 may be retained in the socket by adhesive bonding, mechanical fixings such as rivets or screws, friction, or by a combination of any of these means. However, to reduce complexity, it is preferred that the shaft is simply force-fitted into the socket; for this purpose, the socket may have inwardly-facing projections creating an interference fit with the shaft 12.

Above the sleeve 16, the handle 14 divides into two support members 18 which splay apart in a Y-shank formation. A hand grip 20 spans the gap between the support members 18 at their upper ends, with its axis *A* oriented perpendicularly with respect to the common axis *B* of the shaft 12 and sleeve 16. Thus, the hand grip 20 completes a generally D-shaped handle of familiar appearance.

In the embodiment illustrated in Figures 1 to 3, the hand grip 20 comprises a substantially tubular core 22 of aluminium although steel or other materials could also be used. The core 22 is surrounded by a close-fitting sleeve 24 of expanded plastics material, which in turn is surrounded by a tube 26 of foam rubber, preferably neoprene. The sleeve 24 is a sliding fit around the core 22 and so can pivot freely about the axis *A* of the hand grip.

The internal diameter of the foam rubber tube 26 matches the external diameter of the sleeve 24, so that the tube 26 defines a seamless cushioned layer around the sleeve 24. The foam rubber tube 26 may be bonded to the sleeve 24 using suitable adhesives, or may be held in place simply by friction with the outer surface of the sleeve 24. In either case, the tube 26 may be initially slightly under-size so that it stretches to accommodate the sleeve 24, thereby improving its grip on the sleeve 24.

As best shown in Figure 3, each support member 18 defines an opening 28 which

receives a respective end of the tubular core 22. Once inserted into the opening 28, the core 22 is anchored to the support member 18 by expansion of the outer end portion of the core 22 in a peening or upsetting operation. The core 22 is thereby anchored in an immovable manner to each support member 18 and, by acting in tension, prevents the support members 18 from moving apart under the loading of use.

It will be noted that the sleeve 24 has a shoulder 30 at each end, which shoulders 30 bear against the respective support members 18. The sleeve 24 therefore acts in compression to prevent the support members 18 from moving towards one another in use and possibly deforming the foam rubber tube 26.

This invention therefore provides a rigid structure in which deflection of the support members 18 is minimised by the core 22 which acts both in tension and in compression.

The foam rubber material of the tube 26 is of non-uniform density, having a relatively large-celled internal structure for effective cushioning but presenting a relatively small-celled outer surface which maximises wearing qualities. If desired, the outer surface can be substantially impermeable to resist the ingress of sweat or other moisture into the internal cellular structure, but alternatively can be designed with a degree of permeability to soak up such moisture and thus to reduce still further the possibility of slippage.

Referring now to Figure 4, this drawing illustrates a different arrangement in which the sleeve 24 is a gas injection moulding of plastics material and is attached to the support member 18 by engagement with a spigot 32 moulded integrally with the support member 18. For this purpose, the open end of the sleeve 24 accommodates a collet 34 which is a separate plastics moulding pushed into the sleeve 24. The collet 34 has a plurality of angularly-spaced inwardly-extending fingers 36 at its open end which engage with the spigot 32 in a snap-fit interlocking manner, the fingers 36 deforming around an expanded head portion 38 of the spigot 32 as the respective parts are pushed together. With reference to the terminology used above in relation to Figures 1 to 3, the spigot 32 thus acts as a core about which the sleeve 24 pivots.

Figure 4 also shows how the gas injection moulded sleeve 24 may be provided with a central transverse web 40 for additional structural strength.

In a broadly similar alternative arrangement as shown in Figure 5, the sleeve 24 again pivots about a spigot 32 formed integrally with the support member 18, the spigot 32 being received within an open end of the sleeve 24. Further, interlocking formations are employed for axial location of the sleeve 24 with respect to the support member 18. However, in this arrangement, the interlocking formations are an annular groove in the spigot 32 and a complementary annular ridge near the open end of the sleeve 24.

It will be noted that, in the embodiments shown in Figures 4 and 5, the sleeve 24 acts both in tension and in compression to minimise deflection of the support members 18.

Referring finally to Figure 6, the arrangement therein is akin to those illustrated in Figures 4 and 5 in that a tubular sleeve 24 is supported by spigots 32 formed integrally with the support members 18. However, the interlocking formations of the embodiments illustrated in Figures 4 and 5 are replaced by a long screw 42 which preferably extends along the pivot axis *A* of the hand grip as shown, although this central or axial positioning is not essential. The screw 42 connects the two support members 18 and so acts as a tensile member separate from the sleeve 24. Deflection of the support members 18 is resisted by compression of the sleeve 24 and by tension of the screw 42.

In the embodiment illustrated in Figure 6, the spigots 32 are hollow, each having an inwardly-extending recess 44 communicating with a hole 46 at the base of the recess 44. The recesses 44 and the holes 46 extend along the pivot axis *A* and are symmetrical about that axis. The screw 42 passes through the holes 46, its head 48 engaging with the bottom of one recess 44 and its threaded end 50 engaging within the hole 46 associated with the other recess 44. The recesses 46 help to conceal the screw 42 and may be provided with plugs or caps if desired.

For simplicity of manufacture, it is preferred that the holes 46 are unthreaded and that the screw 42 has a self-tapping thread which cuts a female thread in an appropriate one

of the holes 46. However, if desired, one of the holes 46 could be formed with a female thread, ready to accept a standard screw.

Many variations are possible without departing from the inventive concept. For example, any suitable materials may be used for the various components of the handle, as bound by cost and performance requirements. Structural modifications are also entirely possible; for instance, the interlocking formations may comprise a groove in a female pivot member and a complementary ridge in a male pivot member, the arrangement being dictated by manufacturing considerations. A further modification contemplates crimping of a metal sleeve around a spigot serving as a core, the crimping serving as axial location of the sleeve with respect to the core.

Indeed, the present invention may be embodied in a wide variety of specific forms without departing from the essential attributes thereof and, accordingly, reference should be made to the appended claims rather than to the foregoing specification as indicating the scope of the invention.

CLAIMS

1. A handle for a digging tool, the handle comprising at least one support member, a core supported by the support member, a rigid sleeve pivotable about the core, and a resilient gripping surface on the sleeve.

2. A handle according to claim 1, wherein the sleeve is tubular along its length.

3. A handle according to claim 1 or claim 2, wherein the sleeve is axially located with respect to the core.

4. A handle according to claim 3, wherein the sleeve has an interlocking formation adapted to interlock with a complementary interlocking formation on the core.

5. A handle according to claim 4, wherein the interlocking formations are adapted to allow snap-fit interconnection of the sleeve and the core.

6. A handle according to any of claims 3 to 5, and having first and second cores, each core being a spigot associated with a respective one of first and second support members, wherein the sleeve is axially located with respect to each core.

7. A handle according to any preceding claim, wherein an end of the sleeve bears against a support member.

8. A handle according to claim 7, wherein respective ends of the sleeve bear against first and second support members, the sleeve acting in compression to separate the support members.

9. A handle according to any preceding claim, wherein the core is integral with the support member.

10. A handle according to any of claims 1 to 8, wherein the core is attached to the support member.

11. A handle according to claim 10, wherein the core is received in an opening in the support member.

12. A handle according to claim 10, wherein the core is tubular and receives a male portion of the support member.

13. A handle according to any of claims 10 to 12, wherein the core is attached to the support member by plastic deformation of the core.

14. A handle according to claim 13, wherein the core is crimped, upset or peened.

15. A handle according to any of claims 10 to 14, wherein the core is in fixed relation to the support member.

16. A handle according to any preceding claim, wherein first and second spaced support members are connected by the core, the core being axially located with respect to each of the support members and acting in tension to prevent the support members from separating from one another.

17. A handle according to any preceding claim and having first and second cores, one core being associated with a respective one of first and second support members, wherein the cores are connected by a tensile member acting in tension to prevent the support members from separating from one another.

18. A handle according to any preceding claim, wherein the gripping surface is integral with the sleeve, the sleeve having non-uniform rigidity being relatively rigid inwardly towards the core and being relatively flexible outwardly to define the resilient gripping surface.

19. A handle according to any of claims 1 to 17, wherein the gripping surface is defined by a resilient layer bonded to or otherwise fitted to the sleeve.

20. A handle according to claim 19, wherein the resilient layer is a layer of foam rubber or plastics material.

21. A handle according to claim 20, wherein the foam material constituting the resilient layer is of non-uniform density, having a relatively large-celled internal structure and a relatively small-celled outer surface region.

22. A digging tool fitted with or integral with a handle as defined in any preceding claim.

23. A tool handle, or a tool fitted with or integral with a tool handle, substantially as hereinbefore described with reference to, or as illustrated in, any of the accompanying drawings.

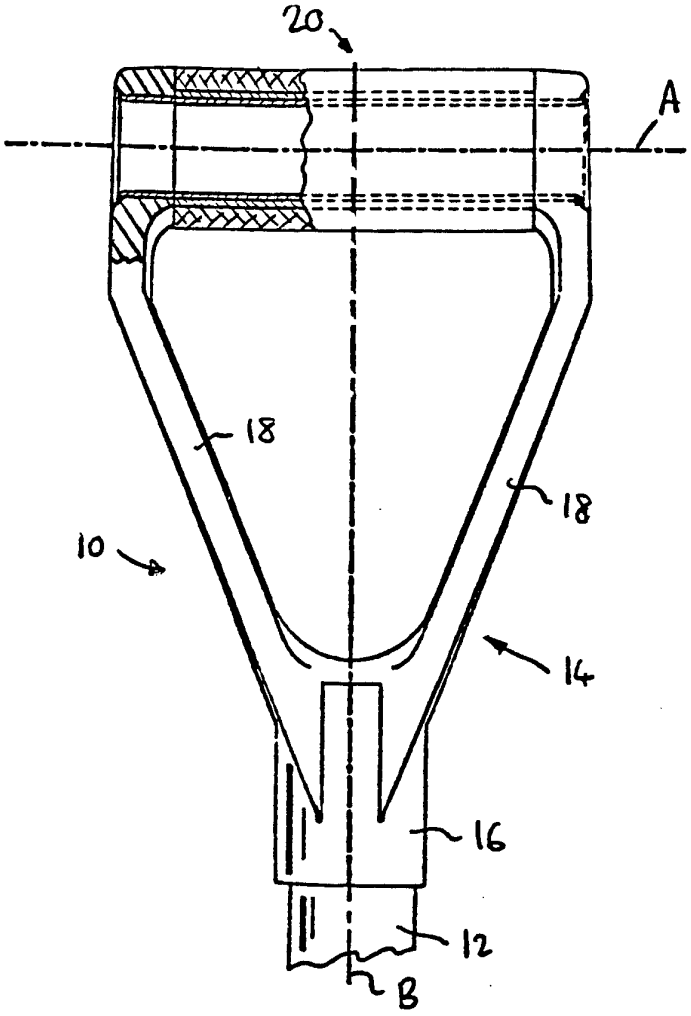


FIG. 1

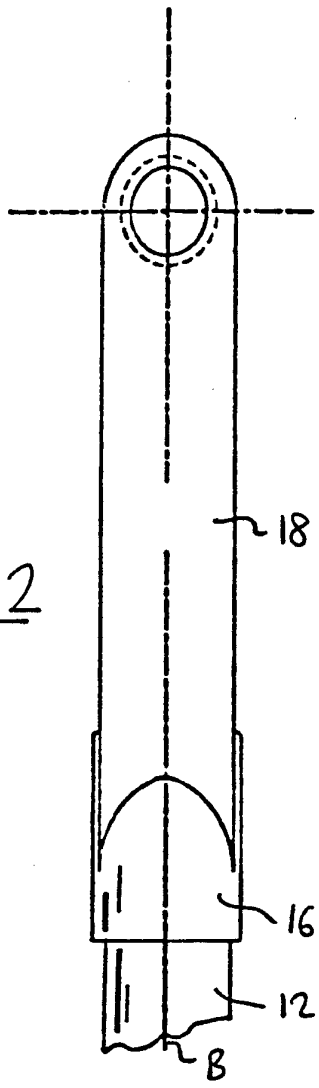


FIG. 2

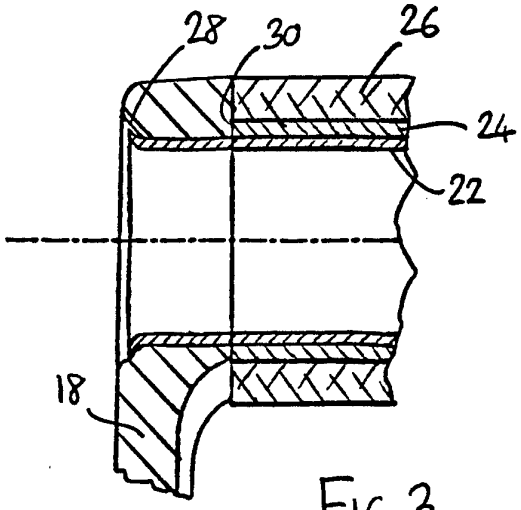


FIG. 3

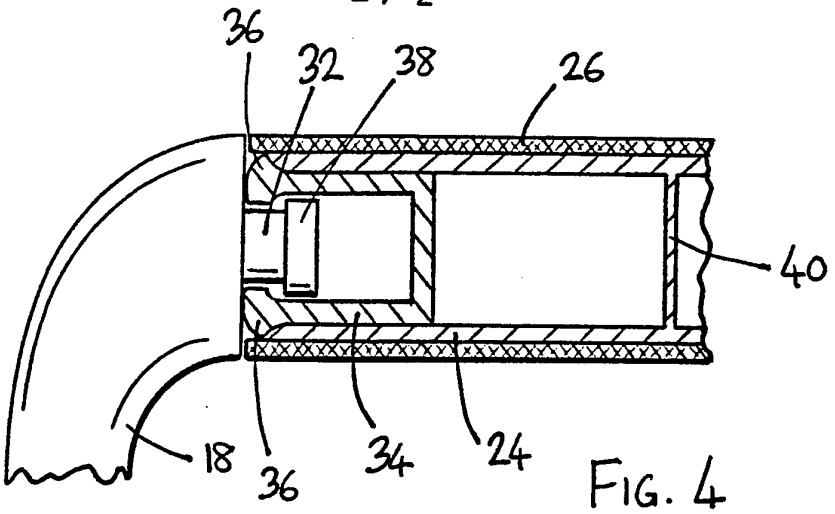


FIG. 4

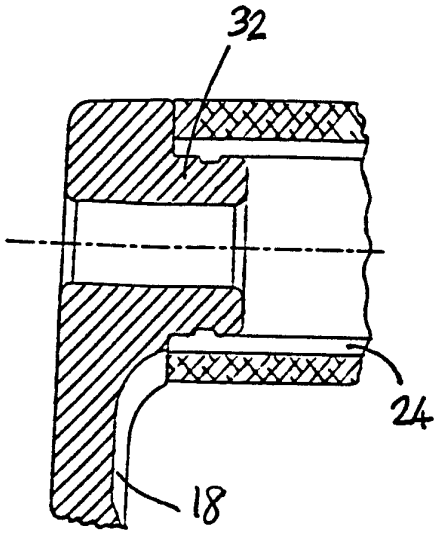
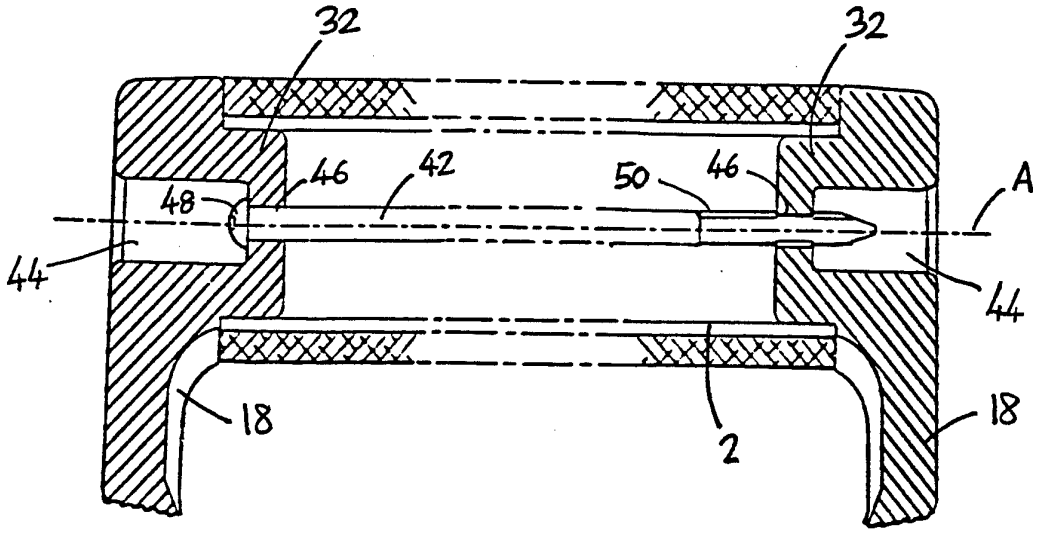


FIG. 5

FIG. 6



INTERNATIONAL SEARCH REPORT

Interna .l Application No
PCT/EP 94/03199

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B25G1/01 B25G1/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B25G A01B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	see page 2, line 17-23; figure 1	6-8,12, 19,20

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
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