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⑤④ **A striking tool with flexible handle.**

⑤⑦ This invention relates to a striking tool in the form of a hammer or axe having a resilient handle. Briefly, the striking tool of the invention comprises a handle and a tool head, the handle including a handle grip and two legs each made from a resilient material, means for securing each leg in the tool head and at least one leg including restraining means disposed adjacent the head for restraining displacement of the head towards the handle grip.

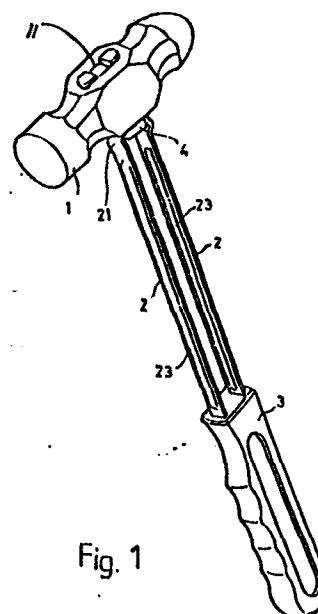


Fig. 1

TITLE:

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A STRIKING TOOL WITH FLEXIBLE HANDLE.

This invention relates to a striking tool such as a hammer or an axe having a flexible handle.

BACKGROUND OF THE INVENTION:

The inventor has collected and analyzed himself the following overseas patented information concerning the hammering tool:

A. U.S. Patent No. 2,809,684:

As shown in the Enclosure 1, this is made of a plate spring, one end of which is connected with a hammering block and its other end, a grip handle, however said plate spring is a rectangular flat board, so under the shocks resulted from the impacts, the hammering block will slide back toward the grip handle; further after used a certain time, said plate spring will, due to its insufficient stiffness, be deformed, thus making its practical functions become poor.

B. U.S. Patent No. 1,177,472:

As shown in the Enclosure 2, this is if an ax-structural design with a main feature lying in that its grip handle and ax blade are flexibly joined. However, the flexible connection plates 7, 8 for said flexible connection are of flat boards. Therefore, this is mostly similar to that disclosed in the above case A and its inadequate rigidity is worrisome.

C. U.S. Patent No. 4,331,193:

As shown in the Enclosure 3, its feature lies that its frame-shaped plate spring is implanted in the grip handle of the hammering tool and one end of said spring is joined a hammering block. This design may provide said hammering tool with same flexibility, however its structure tends to more complicate, so its utilization is more difficult and also uneconomic.

According to the present invention, a striking tool comprises a handle and a tool head, the handle including a handle grip and two legs each made from a resilient material, means for securing each leg in the tool head and at least one leg including restraining means disposed adjacent the head for restraining displacement of the head towards the handle grip.

It is therefore a feature of a striking tool according to the present invention that the end of at least one leg of the handle includes a restraining means for example an arc-shaped part protruding externally of the leg or legs to restrain the hammering block from sliding towards the grip handle during use. Conveniently, each leg is a plate spring having the same or different cross-sectional shape which, when of non-planar form, are disposed mutually opposite or facing each other according to the flexibility of handle required.

BRIEF DESCRIPTION OF THE DRAWINGS:

Fig. 1 is the three-dimensional view of the structure in relation to the present invention.

Fig. 2 is the side view in relation to the present invention.

Fig. 3 is the front view in relation to the present invention.

Fig. 4 is the top view in relation to the present invention.

Fig. 5 A-F is the view of an example of the utilization of the cross section of the plate spring in relation to the present invention.

Fig. 6 is the three-dimensional parts exploded view of the first example of the utilization according to the present invention.

5 Fig. 7 is the cross sectional view of the assembly of the first example of the utilization according to the present invention.

10 Fig. 8 is the structural view of another complying and match of said hammer block and U-shaped flexible handle of the first example of the utilization according to the present.

Fig. 9 is the three-dimensional parts exploded view of the second example of the utilization according to the present invention.

15 Fig. 10 is the cross sectional view of the assembly of the second example of the utilization according to the present invention.

Fig. 11 is the three-dimensional view of the third example of the utilization according to the present invention.

20 Fig. 12 is the cross sectional view of the assembly of the third example of the utilization according to the present invention.

25 Fig. 13 is the three-dimensional view of the flexible deformation of the example of the utilization of said hammer during operations according to the present invention.

Fig. 14 is a cross section taken through the hammer head of Figure 1.

The present invention is to provide the structure of a hammering tool with a flexible handle, its main feature lies in that a means to avoid the hammering block sliding back is provided on the end of the plate spring that joins the hammering block, and the cross section of said plate spring has different designs to select its flexible extent.

Most of the conventional hammering tools have a wooden grip handle, but because said handle does not have a good flexibility, and when the impulse of said impact collides the work piece during the hammering work, a counter-sheek thus produced directly reacts to the user's hand and easily leads the user's hand numb or painful or hurt or injured. In view of this, the inventor has conducted researches and provided a hammering tool with flexible handle in an improved design with a main feature lying in that the part between the hammering block of said hammering tool and its grip handle has a flexible not a stiff material in order to improve the defect of the conventional hammering tool. The applicant has also further strenuously improved the said newer practical hammering tool with flexible handle.

The structure of the hammering tool with flexible handle according to the present invention differs with the above-said ones in a way that its practical functions are much superior. The structural design of this invention is described in detail as follows in connection with the example in the utilization of the

As shown in Figs. 1 - 4, this invention mainly comprises a hammering block(1), its support handle is in a U-shaped plate form, two plate springs(2) are installed parallel or approximately parallel with a wider distance between them and at a place close to the end of said handle, the end of said two springs(2) has a small outwardly bent section respectively to lock up and prevent the hammering block from slip off thereon, and a grip handle(3), of which, said hammering block(1) has a gaint hole(11) the end of which close to said handle is larger and has a slight slope to accommodate the end of said two plate springs (2), a wedge block(4) to be closely wedged between said two plate springs(2) to make them stretch toward the respective two sides, thus firmly joint said hammering block(1). The other end of said two plate springs(2) is implanted in said grip handle(3), at a proper place on the its end joined to said hammering block(1), i.e. at its bottom after said hammering block(1), an outwardly protruding arc part(21) appears respectively, when and after said hammering block(1) is joined and fixed therein, its bottom is just seized and stopped on said protruding arc part(21), the action of this is that this invention is used, or after this invention is used for a period of time, said hammering block(1) would not slide back toward said grip handle(3) due to the hammering impulses or shocks, thus ensuring the safety of use.

In this invention, two plate springs(2) of said

U-shaped support handle are used to join said hammer-
ing block(1) and grip handle(3), said two plate spring
(2) have the expected proper flexibility and supposed
stiffness to avoid deformations produced under the
5 applied forces during uses, so they are not in con-
ventional simple flat plate form, but their cross sec-
tional area in their middle section are in a variety
of different designs as shown in Fig. 5A - Fig. 5F, of
which Fig. A the cross section of said two parallel
10 plate springs(2) are in a mutually opposite U-shaped
design; of as shown in Fig. B arc in a mutually facing
U-shaped design; or as shown in Fig. C, are in a mutua-
lly opposite are design; or as shown in Fig. D, are in
a mutually facing arc design; or as shown in Fig. E,
15 at the central part of said two parallel plate springs
(2), a bent arc part(22) design is axially provided
on their mutually facing inner sides respectively; or
as shown in Fig. F, at the central part of said two
parallel plate springs(2), a bent arc part(23) design
20 is axially provided on their mutually opposite outer
sides respectively. The above said cross sectional
structural design on the middle section of said two
parallel plate spring(2) has the expected flexibility
and also provides the supposed stiffness, hereby incre-
25 asing its novel and practical functions.

About the second example of the utilization
according the present invention as shown in Fig. 6, its
constituent structure comprises said hammer block(101),
U shaped flexible handle(102), fixing plug(103) and ahnd
30 (104), of which:

said hammer block(101) can be in a conventional shape and made of a conventional material, however its structure to join said U-shaped handle(102) has a T-shaped join hole(111), and the middle post hole of said T-shaped join hole(111) is an oblique hole that slightly expands backward; said U-shaped flexible handle(102) is formed by bending a post-shaped or plate-shaped high flexural or excellent flexible material, after said material is bent, the opposite distance between its open ends is larger than or equal to the maximum outer diameter of the middle post hole of said T-shaped join hole(111), further a small section of each of two terminals of said open ends bends outward 90° or more than 90° or bends in a two-stage type, the function of this lies in that after U-shaped handle (102) is retracted back and extends from the rear side of said hammer block(101) via said T-shaped join hole (111), the bent parts of its two said terminals of said open ends are matched and seized in the place in a larger hole diameter in the front end of said T-shaped join hole(111) as shown in Figs. 7,8, the part in a large hole diameter of said T-shaped join hole(111) will, according to the bend structure of the open ends of said U-shaped flexible handle(102), be in a flat bottom shape, or bottom ring end face provided with circular, square or conic ring-shaped slots.

Said fixing plug(103) is a high elastic, flexural oblique column in a slope same as of said middle post hole of said T-shaped join hole(111), its ring-shaped post face is provided with a rough convex and concave

structure or ring-shaped tooth-shaped or ratchet-shaped carved patterns, when said open ends of said U-shaped flexible handle(102) are pressed to a closed state and also inserted in from the rear end of said T-shaped join hole(111). and then open again to seize and join said hammer block(101), then said fixing plug(103) is filled and pressed in to said T-shaped join hole(111) between said U-shaped flexible handle(102), the two inner sides of said open ends of said post-shaped or plate-shaped flexible handle(102) can also be provided with a rough face respectively different from or same as of that on said fixing plug(103), so said fixing plug (103) maybe fixed in said T-shaped join hole(111), during the strike operations of said hammer block(101), the deformation and position vibrations of said U-shaped flexible handle(102) can be absorbed by said fixing plug(103), thus maintaining a stable coupling state as shown in Fig. 7, 13.

Further, said hand grip(104) of the example of the utilization in this item is made of a common plastic material, the state that it covers said U-shaped flexible handle(102) is in a manner that during extrusion forming, it may directly fill and cover said closing and bent ends of U-shaped flexible handle(102) to a proper length.

A further design of this invention is such as the third example of the utilization as shown Fig. 9 comprising hammer block(101), U-shaped flexible handle(102), and post(105) and hand grip(106), of which said hammer block(101) has two through holes(112) which are provided

transversely, the open ends of said U-shaped handle (102) are in an upright state, and the front end of said hammer block(101) passes through said two through holes (112) and then extends from the rear side of said holes to the bent part of said U-shaped flexible handle(102) and overlaps over the front end of said two through holes(112), then is fixed by a strong thrust ring or nut (122) and washer(121) on the part of said U-shaped flexible handle(102) that stretches out of the rear end of said hammer block(101), thus achieving the fixation and join of said hammer block(101) and U-shaped flexible handle as shown in Fig. 10.

As shown in Figs. 9, 10, two lengthway round slots (151) in opposite 180° are provided on the rim of the clamp post(105) of the example of the utilization in this item, the diameter of the cross section of said round slots(151) is same as of that of the cross section of said U-shaped flexible handle(102), and after said U-shaped flexible hand(102) penetrates through and stays in said round slots(151), it forms a complete circle together with said clamp post(105), further threads are provided in a proper length on the post face of said clamp post(105) and the outer post face of said open ends of said U-shaped flexible handle(102) for the inner threads of the precast formed hand grip (106) to directly screw on, match and fix said clamp post(105) and said open ends of said U-shaped flexible handle(102).

As shown in Figs. 11, 12, a further 4th example of the utilization according to this invention can be

composed of said hammer block(101), U-shaped flexible handle(102), sleeve post(107) and rear cover(108), of which, said hammer block(101) and U-shaped flexible handle(102) is joined and locked in a same manner

5 as of the third example of utilization, the open ends of said U-shaped flexible handle(102) penetrates through said column-shaped sleeve post(107), and their protruding ends is coupled and fixed by a nut(122), the outer diameter of a proper length of the tail

10 end of said sleeve post(107) is smaller, and outer threads are provided on said length of the tail end of said sleeve post to screw and match the rear cover (108), thus tightly packing and covering the nut(122) on the tail end of the sleeve post to avoid any free

15 slide phenomenon taken place between said sleeve post (107) and U-shaped flexible handle(102).

The hammer tool structures of the above four examples of utilization all use said U-shaped flexible handle as the part of the arm of force for operating said hammer block, since the flexibility and

20 proper rigid strength of said U-shaped flexible handle makes the hammer tool of this invention can make timely flexible deformations during operations to eliminate the counter-vibrations as shown in Fig. 13, this

25 exemplifies its unique functions.

Summing all the above up, the hammering tool with flexible handle according to this invention is simple in structure and low in manufacture costs and also has the function to prevent its hammering block from

30 sliding back while further its variety of different

cross sectional structural designs on the middle section of said plate spring achieve the object to increase the stiffness.

Various embodiments of tool according to the present invention are summarised in the following features:

FEATURES

1. A hammering tool with main improvements comprising a hammering block(1), its support handle is in a U-shaped plate form, two plate springs(2) are provided parallel, or approximately parallel with a wider distance away from the handle end, the end of said two plate springs(2) has a small outwardly bent section respectively to seize and step the hammering block, thus preventing said hammering block from slipping off therein, and a grip handle(3), of which, said hammering block(1) has a joint hole(11) with a slight slope and a larger end close to the handle respectively to accommodate the end of said two plate springs(2), a wedge block(4) to be closely wedged between the ends of said two plate springs, thus making them stretched toward both sides and hereby firmly joined to said hammering block(1). This other U-shaped end of said two plate springs(2) are implanted in said grip handle (3), at a proper position on its end joined to said hammering block(1), i.e. at the bottom after said hammering block(1) is positioned, an outwardly protruding arc part(21) is provided respectively, when and after said hammering block(1) is joined, its bottom is just seized and stepped on top of said protruding arc part (21).

2. A further structural design of the hammer tool with a flexible handle comprising.

a hammer block - possibly having a T-shaped join hole, the middle post hole of which is an oblique hole that slightly expands backward in which the open ends of said U-shaped flexible handle are pressed to close together and then jammed therein, so the outwardly bent parts of its open ends is seized and rabbeted in the front end of the join hole.

a U-shaped flexible handle - made of a round post and steel plate having a proper flexure and flexibility which are bent into a U shape, its open ends are bent outwardly at least 90° or bent outward in a two-stage type, further the opposite sides of the two terminals of its open ends maybe provided with a rough face or tooth form or ratchet form in a proper length for firmly locking up the fixing plug that is pressed, rammed and inserted therein.

a fixing plug - an oblique column with a high elasticity and flexure, its slope is the same as of the middle post hole of the said hammer block T-shaped join hole, the ring-shaped post face of said fixing plug is provided with a rough convex and concave structure or ring-shaped teeth or ratchets to be pressed, rammed and inserted into the middle post hole of said T-shaped join hole from the inner side of the open ends of said U-shaped flexible handle and from the rear side of said hammer block to press and tighten the open ends of said U-shaped flexible handle into said hammer block.

a hand grip - possibly a finished product made of a

a common plastic material which during its extrusion forming directly covers a proper length of the end of said U-shaped flexible handle.

3. The T-shaped join hole as defined in feature 2, wherein the ring-shaped end face joined by the part of its front end in a larger hole diameter and said middle post hole is provided with round, square or conic ring-shaped slots in a proper depth and a width equal to or larger than that of the cross section of the physical body of said U-shaped flexible handle.

4. The hammer tool having a flexible handle as defined in feature 2, wherein its constituent structure comprising:

a hammer block - having two through holes to accommodate said hammer block.

a U-shaped flexible handle - formed by a bent round post body with a high flexibility and flexure, the open ends of which can penetrate through the front end of said hammer block and then protrude out of the rear side of said hammer block, a strong thrust ring passes through and U-shaped flexible handle mutually tightened and fixed.

a clamp post - having a round slot on each of its two sides respectively, said two round slots are in opposite positions on its both sides to accommodate the post bodies on the open ends of said U-shaped flexible handle, and threads are provided on the ring-shaped face of said clamp post.

a hand grip - possibly having an inner thread hole in a diameter same as of the outer diameter of said clamp post screw and match said clamp post during assembly.

thus making said clamp post firmly tighten the open ends of said U-shaped handle.

5 5. The U-shaped flexible handle as defined in feature 4, wherein at the position that it passes through said hammer block, threads maybe provided to couple and tightly clamp said hammer block by a nut.

6. The U-shaped flexible handle as defined in feature 4, wherein the outer side of the post body that penetrates through and stays between said clamp post and grip handle maybe provided with threads to screw and firmly tighten the inner threads on said hand grip.

7. The hammer tool having a flexible handle as defined in the above feature 2, wherein its constituent structure comprises:

 a hammer block - having two through holes to accommodate said hammer block.

 a U-shaped flexible handle -formed by a bent round post body with a high flexibility and flexure, the open ends of which can penetrate through the front end said hammer block and then protrude out of the rear side of said hammer block, a strong thrust bolt penetrates through and stays in its protruding part to make said hammer block and U-shaped flexible handle mutually and firmly tightened, and the terminals of its open ends are provided with threads to couple a nut, thus positioning the sleeve post.

 a sleeve post - having two through holes to accommodate the open ends of said U-shaped flexible handle, and the ring-shaped post face of the tail end of said

sleeve post is provided with threads.

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a rear cover - having inner threads same as of
the outer threads of said sleeve post to be screwed
and sleeve on the rear end of said sleeve post, thus
5 achieving the object to cover and firmly tighten the
nut of said U-shaped flexible handle.

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1.

CLAIMS

1. A striking tool comprising a handle and tool head, the handle including a handle grip and two legs each made from a resilient material, means for securing each leg in the tool head and at least one leg including restraining means disposed adjacent the head for restraining displacement of the head towards the handle grip.
2. A tool according to Claim 1 wherein the two legs are inter-connected in the region of the handle grip to form a "U" and diverge relative to each other when considered in the direction of the handle grip.
3. A tool according to Claim 1 or Claim 2 wherein the means for securing each leg in the tool head includes a hole having a maximum dimension remote from the handle grip which is less than the maximum dimension nearest the handle grip, and a wedge block shaped to cooperate with the hole to securely wedge the legs of the handle in the hole.
4. A tool according to Claim 3 wherein the hole is a through hole and each leg includes an outwardly extending projection, each projection forming a stop against which the head is positioned at a location remote from the handle grip.
5. A tool according to Claim 4 wherein the hole includes a notch or rebate for receiving the said projections.
6. A tool according to any one of Claims 3 to 5 wherein the wedge includes cut-away portions shaped to receive the legs of the handle.
7. A tool according to any preceding claim wherein the restraining means comprises a portion of the leg displaced outwardly from the leg to engage that face of the tool head facing the handle grip.

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8. A tool according to any preceding claim wherein each leg of the handle has a cross-section shape which is, rectangular, circular, acruate, tubular or channel shaped and wherein the cross-sectional shape of the two legs may be the same or different.
9. A tool according to any preceding claim wherein the handle grip comprises an inner core shaped to receive portions of the legs and an outer sheath attachable to the inner core to lock the legs therebetween.
10. A tool according to Claim 10 wherein the legs of the handle are interconnected to form a "U" with the bridge of the "U" constituting a stop for the tool head in a position remote from the handle grip and the means for restraining displacement of the head towards the handle grip includes a thrust ring on each leg for securing the head against the bridge of the "U".
11. A tool according to Claim 10 wherein the free ends of the "U" are secured in a handle grip.
12. A tool according to any preceding claim wherein the tool head is a hammer head or an axe head.

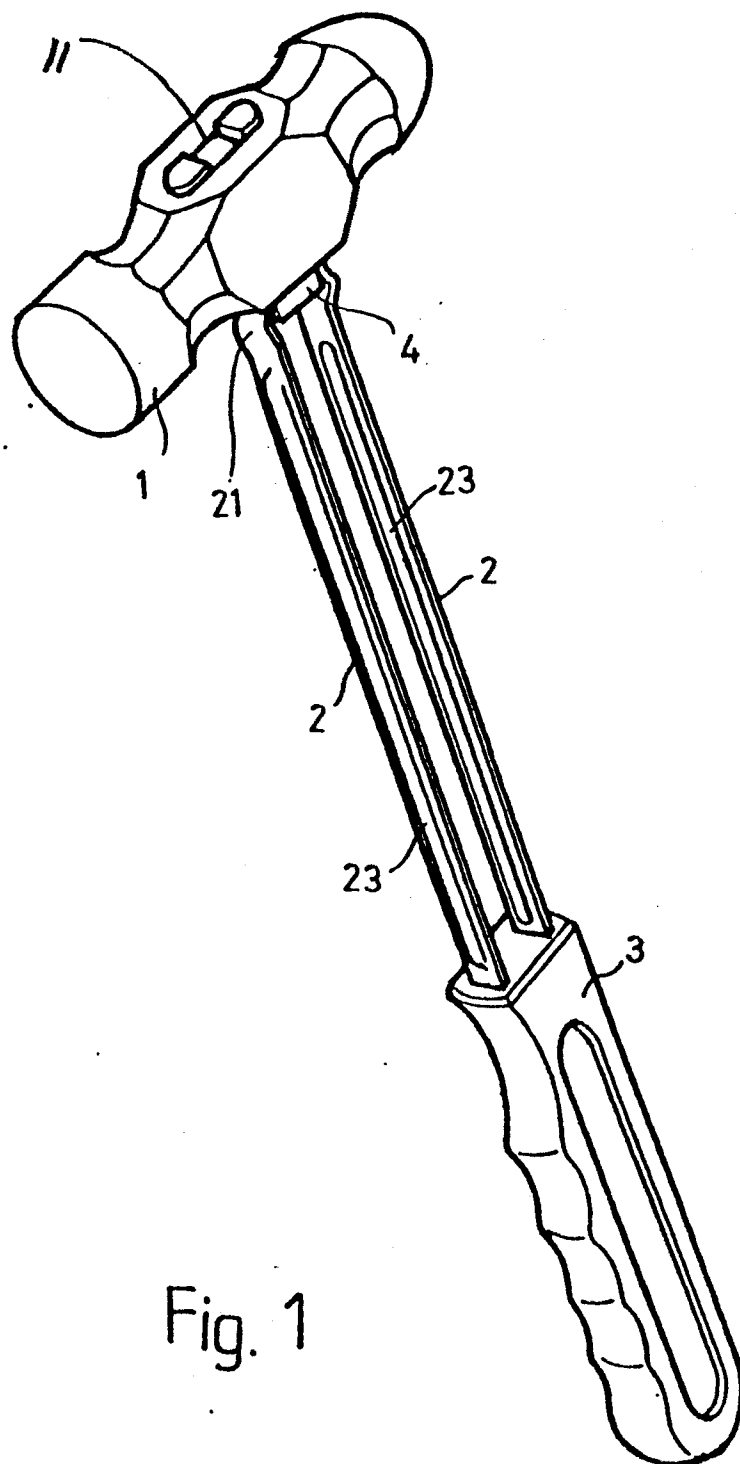


Fig. 1

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Fig. 4

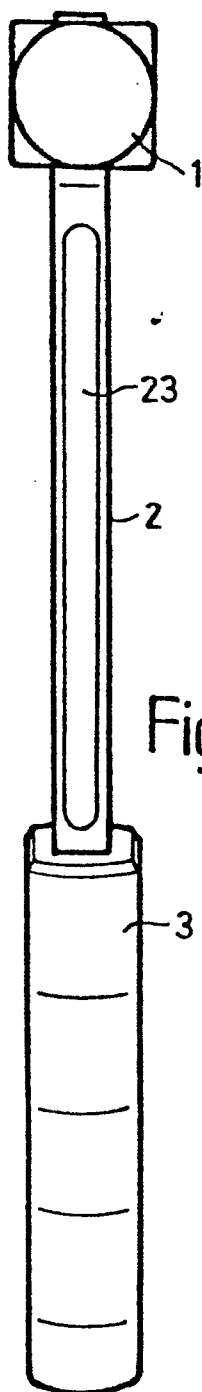
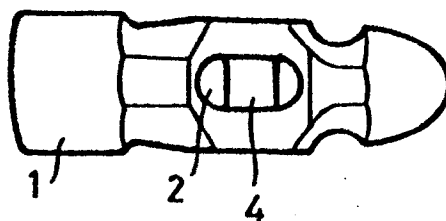


Fig. 3

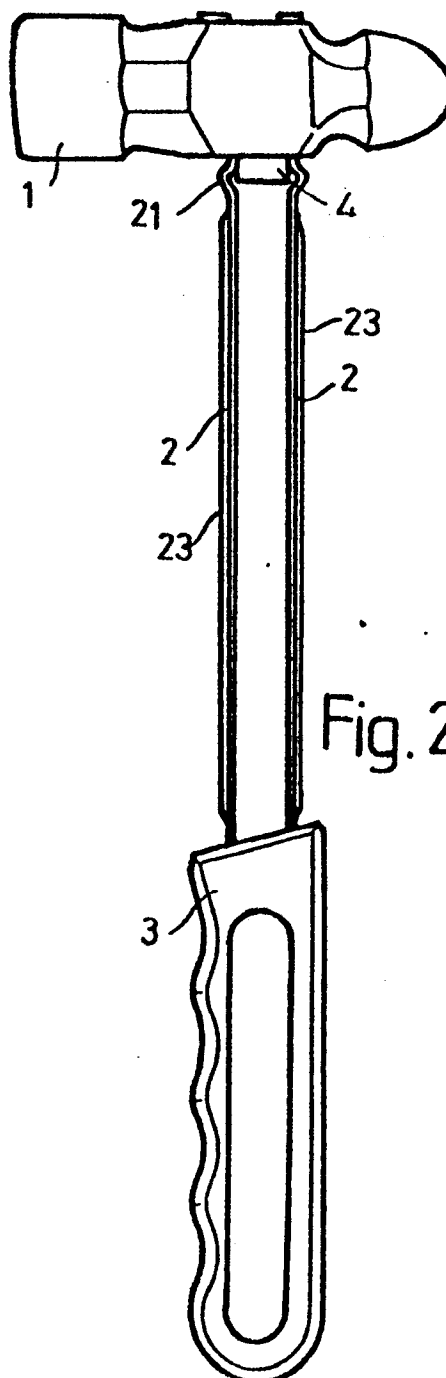


Fig. 2

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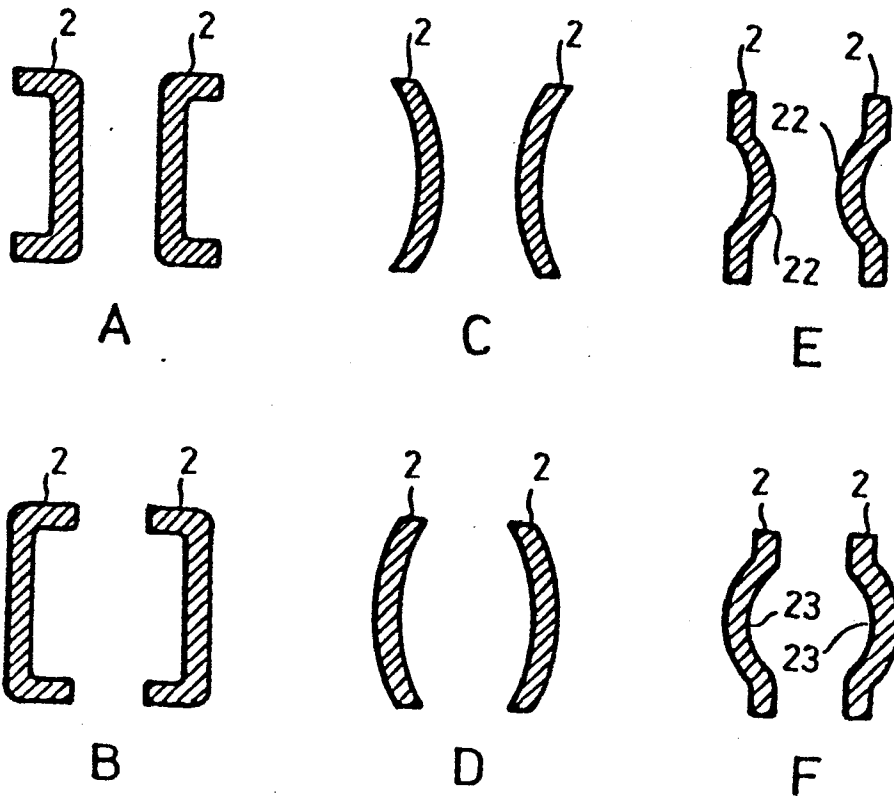


Fig. 5

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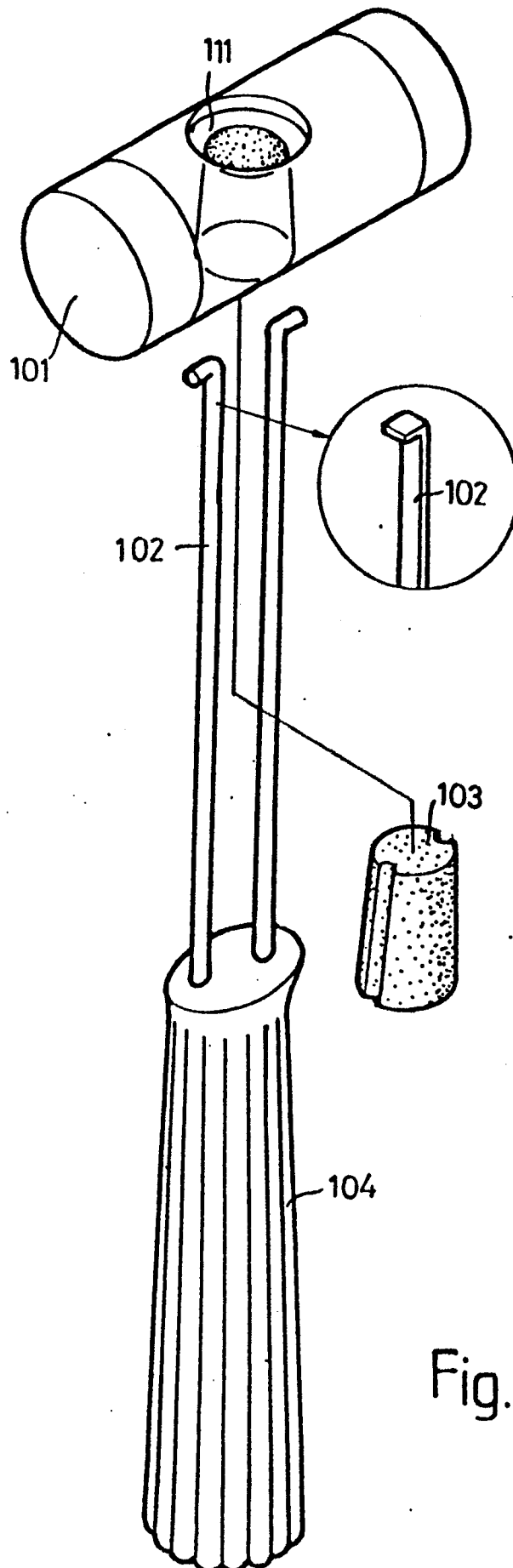


Fig. 6

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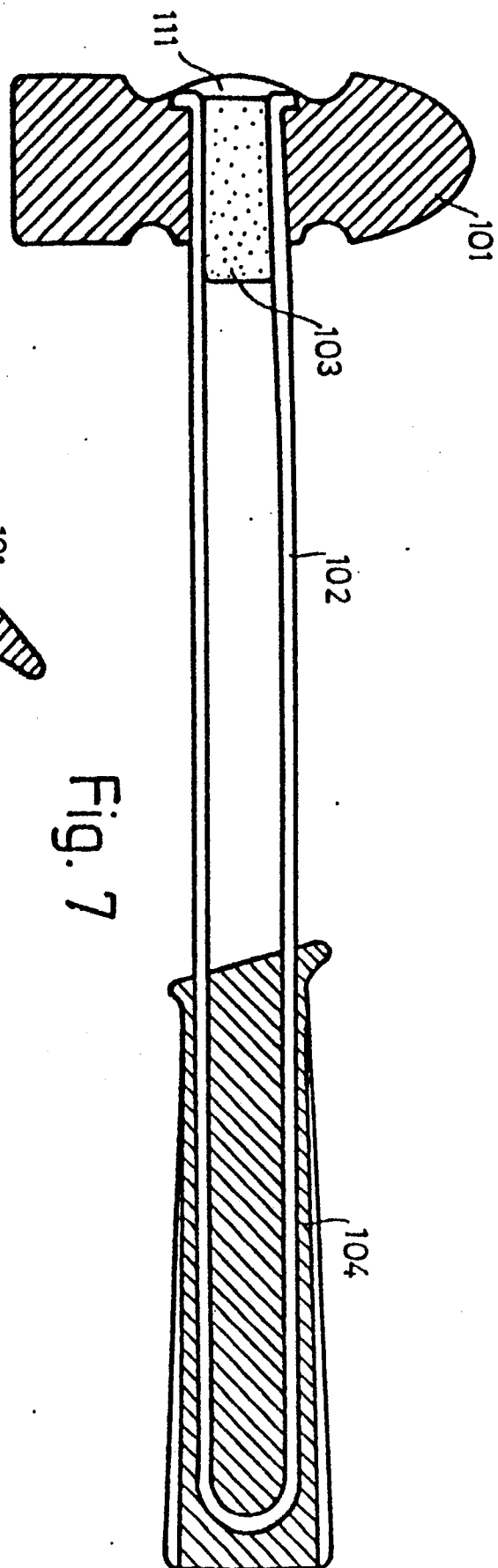


Fig. 7

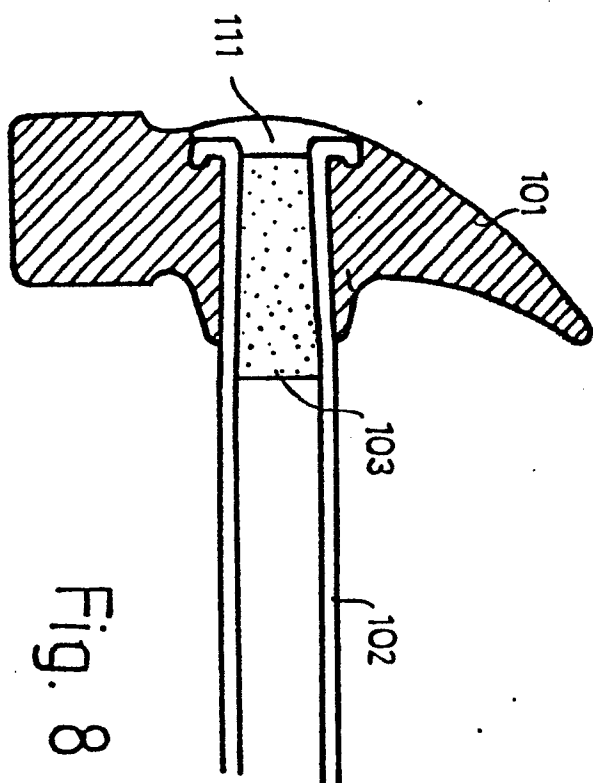
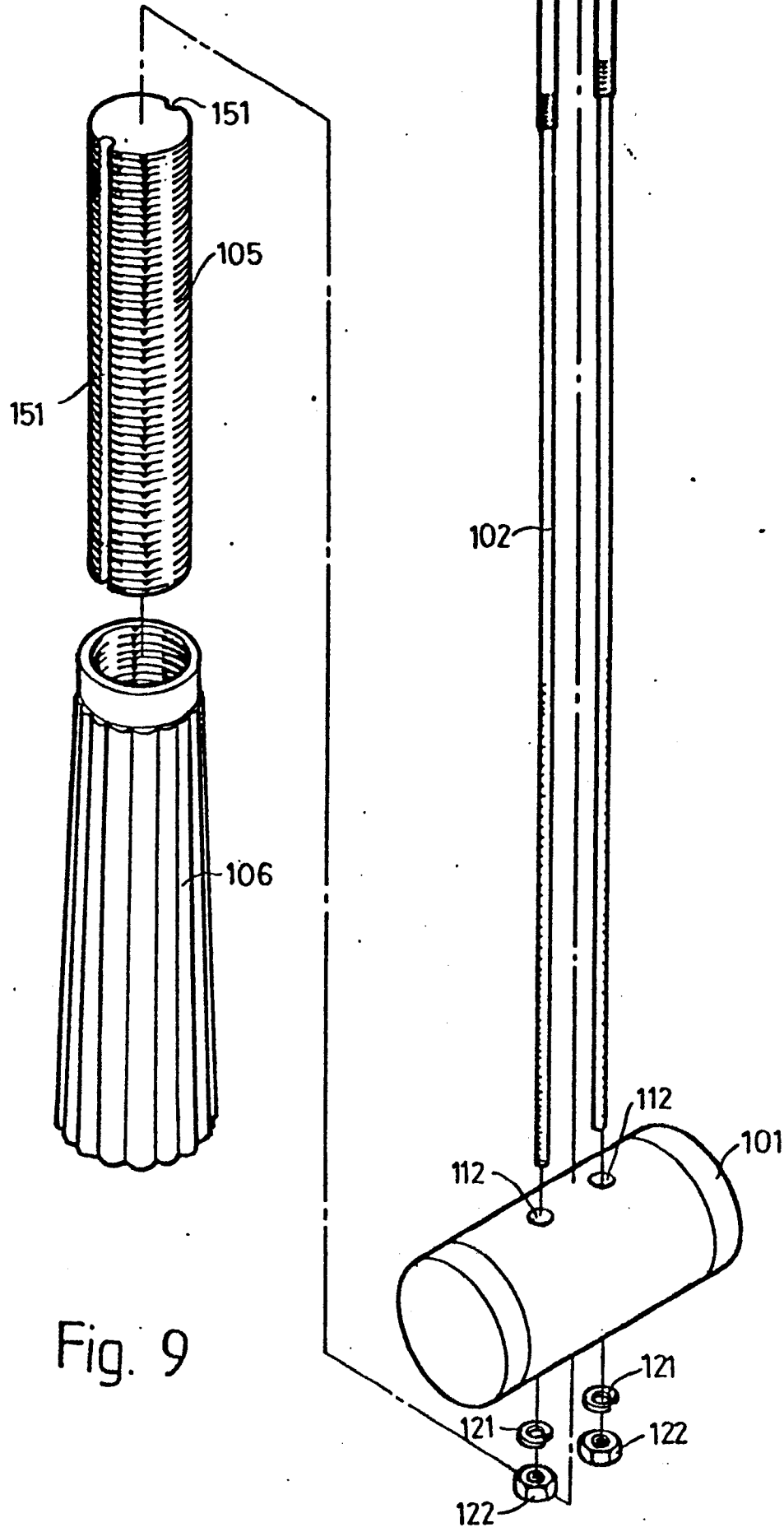


Fig. 8



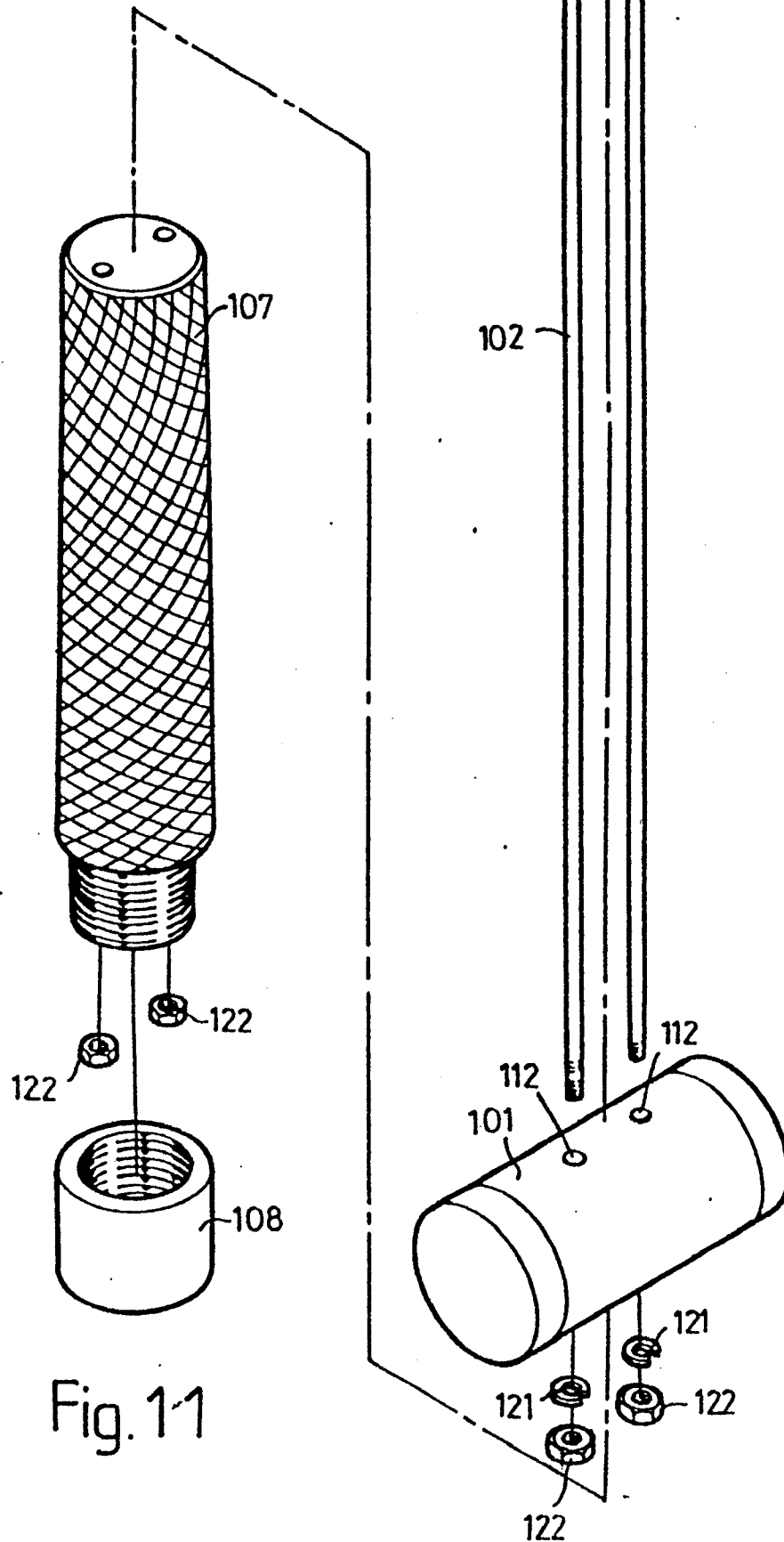


Fig. 11

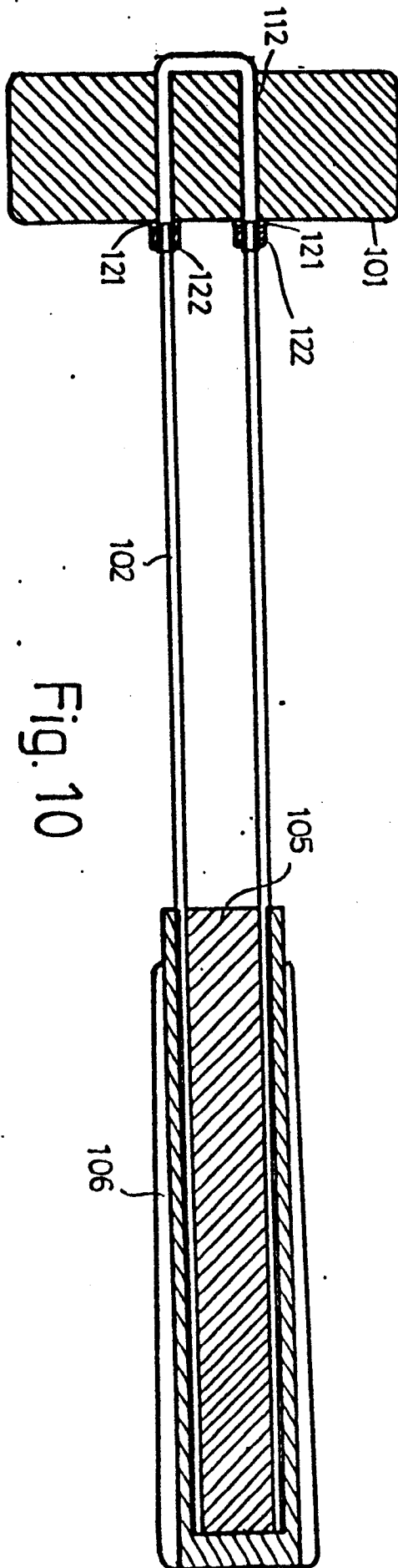


Fig. 10

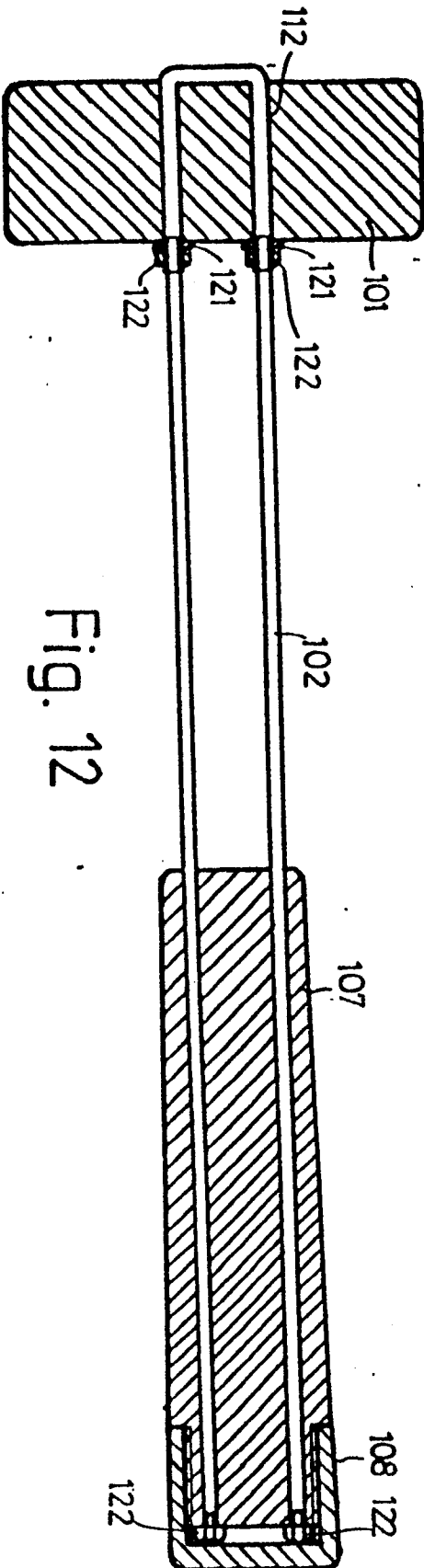


Fig. 12

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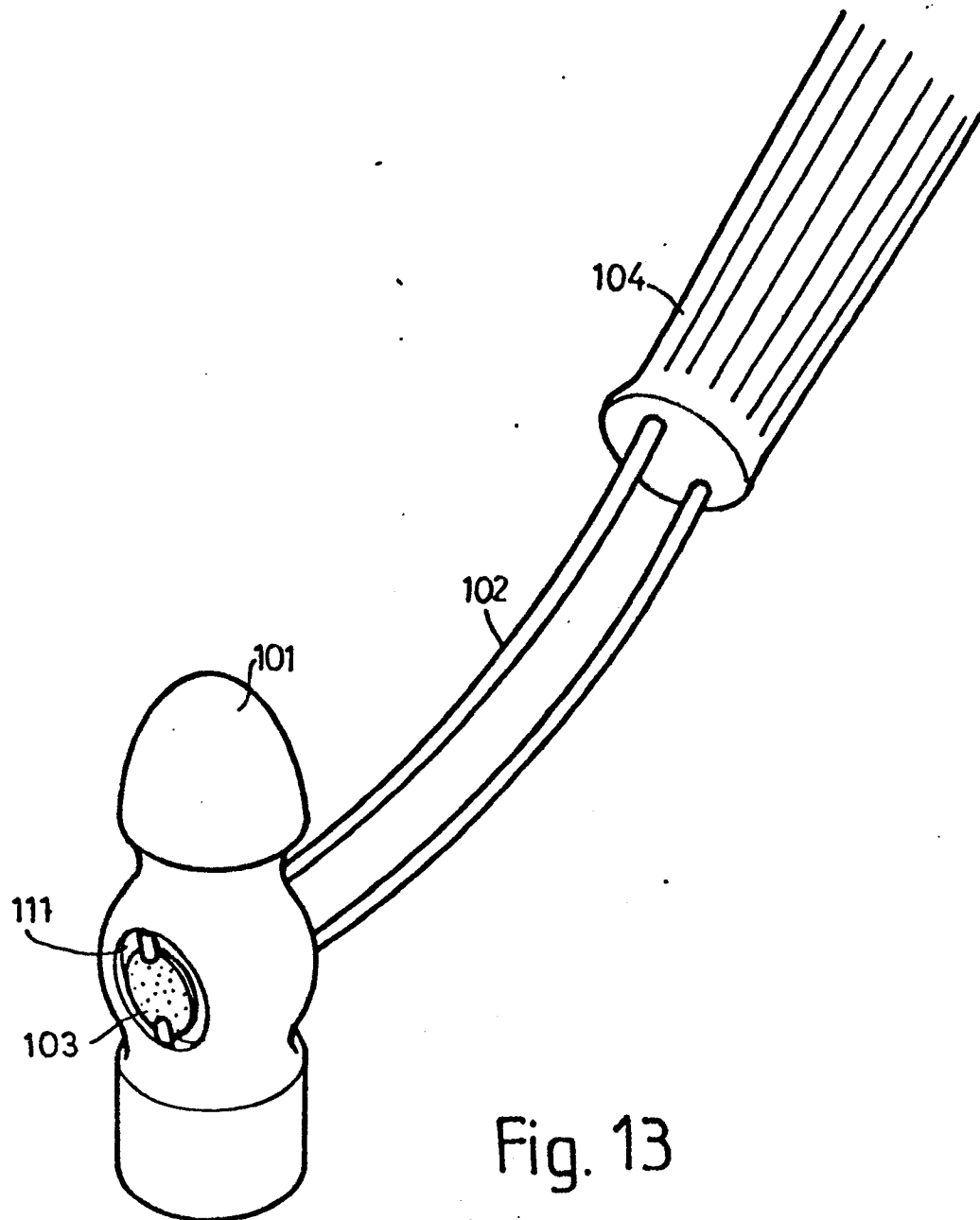


Fig. 13

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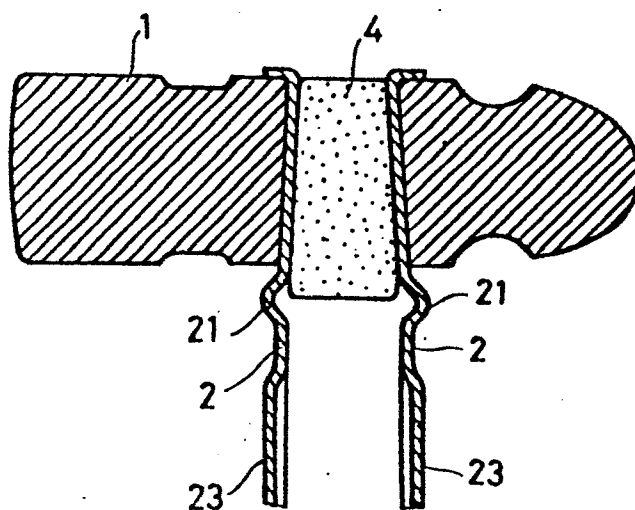


FIG 14