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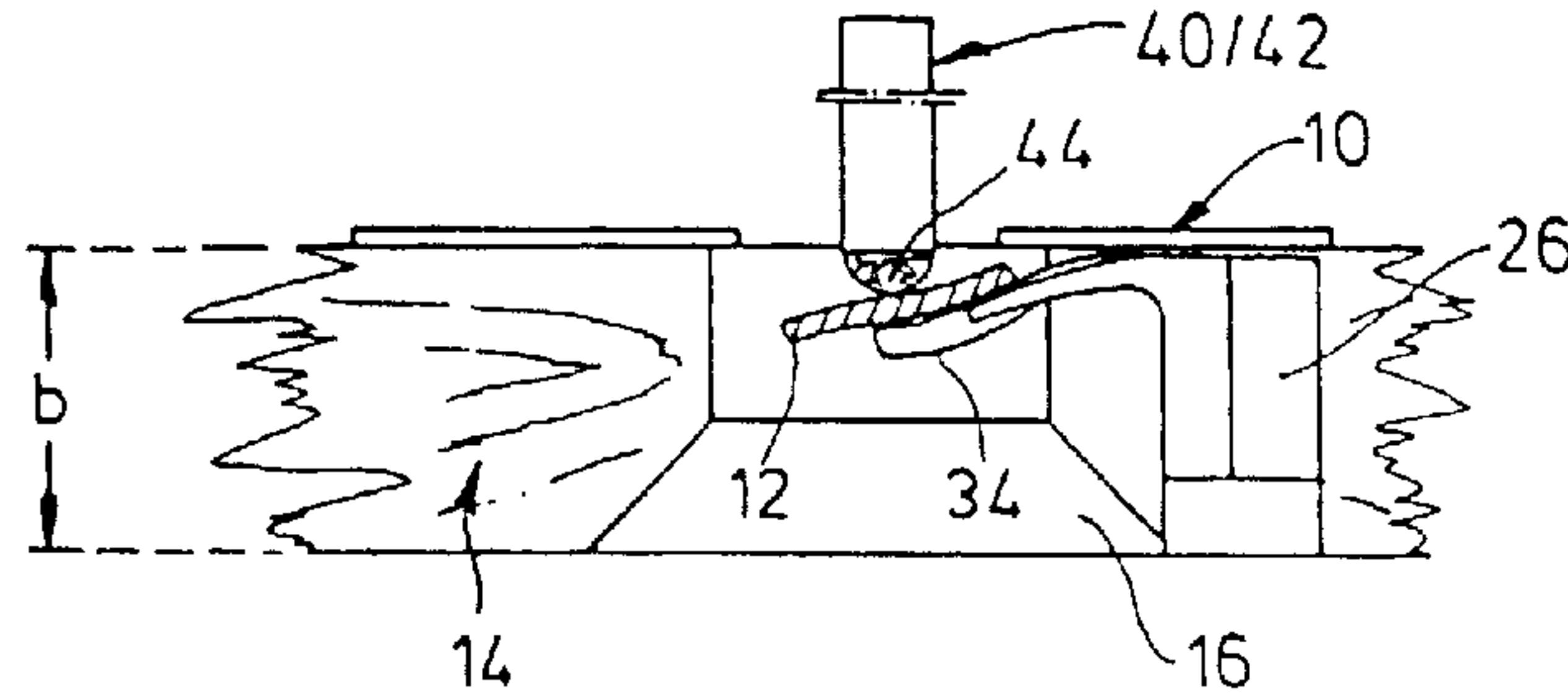
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**(54) DISPOSITIF PERMETTANT D'ENLEVER LES PARTIES A  
DECORTIQUER D'UNE FEUILLE DE MATERIAU OU  
EQUIVALENT**

**(54) DEVICE FOR REMOVING BREAK-OFF COMPONENTS FROM  
A SHEET OF MATERIAL OR EQUIVALENT**



(57) L'invention concerne un dispositif permettant d'enlever les parties à décortiquer (12), principalement les rebuts, d'une feuille de matériau contenant des découpes ou des morceaux plats similaires. Un dispositif de butée (20), mobile dans son sens longitudinal, est associé à un outil de décorticage (40, 42). Ce dispositif de butée pénètre dans une ouverture (16). En position de repos, il supporte sensiblement parallèlement la partie à décortiquer (12) ou le rebut intégré à la feuille de matériau (10) et, lors du déplacement du rebut, sa position est modifiée par l'outil de décorticage (40, 42) - il peut notamment être amené dans certain un angle d'inclinaison par rapport à la feuille de matériau lors de l'abaissement du rebut.

(57) The invention relates to a device for removing break-off pieces (12), especially waste parts, from a sheet of material containing blanks or similar flat pieces. An abutment device (20) which can move in a longitudinal direction is associated with a break-off tool (40, 42). The abutment device protrudes into a through opening (16). Even when said device is in a rest position it supports the break-off component or waste part of the sheet of material (10) in an approximately parallel position. When the waste part moves, its position can be modified by the break-off tool and brought into a specific angle of inclination in relation to the sheet of material, especially when the waste part is lowered.

### Abstract

The invention relates to a device for removing break-off pieces, especially waste parts, from a sheet of material containing blanks or similar flat pieces. An abutment device which can move in a longitudinal direction is associated with a break-off tool. The abutment device protrudes into a through opening. Even when said device is in a rest position it supports the break-off component or waste part of the sheet of material in an approximately parallel position. When the waste part moves, its position can be modified by the break-off tool and brought into a specific angle of inclination in relation to the sheet of material, especially when the waste part is lowered.

WO 99/51405

PCT/EP99/02266

Apparatus for removing broken-out pieces from a sheet of  
material or the like

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The invention concerns an apparatus for removing broken-out pieces, in particular waste portions, from a sheet of material containing blanks or the like flat portions, as set forth in the classifying portion of the independent claims.

10 EP 0 446 702 B1 to the present applicant discloses that automatic stamping machines for the production of blanks from sheets of card in the folding box industry have been provided for more than 30 years with breaking-out devices which are preferably arranged in a setting-up table outside the stamping machine. Such a breaking-out station is of particular  
15 importance in terms of manufacture as in the event of incorrect use it involves the highest proportion of the total setting-up time and a poorly set breaking-out station results in continual disturbances in the production procedure.

20 In the breaking-out station the stamped cardboard sheet, after reaching a predetermined detent position, on the breaking-out surface which is usually provided by a breaking-out board or a female die, is freed of the waste by means of breaking-out pins or cutting edges which press from above.

25 Development in the breaking-out procedures involved firstly entailed the top tool pin which presses downwardly from above and which passes the waste portion through the opening in the breaking-out board. There was then added an additional bottom tool with bottom pins, which are aligned with the top tool pins and which clampingly hold the waste portion. As a breaking-out tool can reliably break out a waste portion only  
30 when there is a certain force-locking engagement between the tool and the waste portion, the above-mentioned bottom pins have proven to be an

advantageous resistance at the moment when the breaking-out tool or breaking-out member comes to bear against the waste portion.

If there is a wish to avoid using a clamping tool, the breaking-out opening in the breaking-out surface must be smaller at various locations, 5 than the waste portion which is associated therewith, so that the waste portion rests with a relatively high friction, in small surface areas, on the breaking-out surface or female die. When the breaking-out pin comes into contact with the waste portion, the above-mentioned resistance occurs by virtue of the friction which is then produced. When the breaking-out pin 10 and the waste portion pass through the opening, friction occurs at the relatively close walls of the hole, whereby a certain force-locking action is achieved.

DE-A-25 35 452 discloses the so-called DYN-pin, namely a breaking-out pin having a tip or point whose substantially conical side 15 walls are of contours which are concave in cross-section, with a smooth surface. In the breaking-out procedure, that tip bears against the waste portion which, by virtue of being supported on the edges of the opening, opposes the tip with such a level of resistance that the tip can penetrate slightly into the material of the waste portion. That prevents unwanted 20 lateral deflection movement of the waste portion. As it passes through the opening, the waste portion bends, and the stressing force between it and the wall of the opening is intended to afford the DYN-pin sufficient friction for the desired force-locking engagement with the waste portion; that could then possibly make a bottom tool in itself unnecessary, when using 25 the DYN-pin.

As a simplification for breaking-out tools, above-mentioned EP 0 446 702 B1 proposes a support means which is a surface which is movable and/or resilient within the opening - at least in part in an inclined position - at a spacing relative to the breaking-out surface and which, in its rest 30 position, engages substantially parallel beneath the waste portion in the sheet of material and which, upon movement - that is to say primarily

upon downward movement - of the waste portion, is transferred, by the breaking-out member, into an angle of inclination with respect to the sheet of material. The resilient surface can be in the form of a tongue-like spring which is fixed at one end to the breaking-out surface - substantially 5 aligned therewith in the rest position - while the free end of the tongue-like spring is arranged in the opening. Also described are angle portions having one limb aligned with the breaking-out surface while the other limb thereof is pivotably mounted beneath the breaking-out surface and is subjected to a spring loading. The resilient surface can also be afforded by 10 rubber profile members or by bristles.

- An apparatus as set forth in the opening part of this specification is described in WO-A-97/30829. Extending from the edge of an opening in a female die at a right angle are straight slots or grooves which are adjoined at a large spacing relative to the opening by a respective enlargement 15 portion of rectangular configuration in plan view, as a receiving space for a block-like portion which forms the rear plug-in portion of an otherwise strip-like support means which projects with an end portion into the opening. The block portion which is wider in relation to the support web portion formed on the component tapers conically in the plug-in direction. 20 The end portions of the support web portions, which are disposed in the opening, engage under a waste portion and are urged downwardly at the end by the pressure of a breaking-out tool resting thereon, along a bend line which is at the transition to the block portion, until they release the waste portion in a downward direction.
- 25 Finally, DE-C-41 24 089 provides a cuboidal breaking-out tool of rectangular cross-section, from the pressing end of which two pressing tips or points project, in line with the two narrow sides thereof.
- In consideration of that state of the art relating to the breaking-out procedure, the inventor set himself the aim of substantially improving the 30 removal of waste portions from sheets of material and simplifying the tools required for that purpose. In particular the invention seeks to

provide that those tools can be used for the treatment of very small waste pieces.

That object is attained by the teaching of the independent claim; the appendant claims set forth advantageous developments. In addition 5 the scope of the invention embraces all combinations of at least two of the features disclosed in the description, the drawings and/or the claims.

In accordance with the invention the connection pairing comprises an undercut receiving groove on the one hand and on the other hand a coupling bar which can fit thereinto and which is preferably disposed on 10 the support tool; the receiving groove is disposed at the edge of the opening in the female die, but the association can also be reversed. The support tool is preferably an angle portion with one of said connection component parts on its one limb and with another flexible limb which forms the support surface.

15 In another embodiment which is in accordance with the invention the connection pairing comprises at least one receiving groove in the female die at the edge of the opening thereof on the one hand and a portion, which can be fitted thereinto, of a vertical limb of the support tool on the other hand, which is vertically fitted on to or into same.

20 In a particular embodiment that vertical limb can comprise a hollow profile portion which can be fitted on to a plug-in profile portion of the female die.

25 The angle portion with the limb which is vertical in the position of installation, and the other flexible limb which forms the support surface and which is horizontal in the position of installation can be formed overall from a material of limited flexibility, which ensures a long service life.

30 In a preferred embodiment the connection pairing comprises at least one vertical receiving groove - extending in the breaking-out direction - in the female die at the edge of the opening thereof on the one hand, and a portion - which can be fitted thereinto - of a vertical limb of the support tool on the other hand. The respective cross-sections of the

coupling bar and the opening are advantageously to be of a rectangular configuration and thus define an operative position which is easy to bring about. A plurality of such connection pairings can possibly be provided.

It has proven to be desirable if the flexible limb forming the support 5 surface has an edge opening which is delimited at both sides by cantilever portions, and, at a spacing relative to the edge opening, at least one inner opening. That configuration affords a particularly desirable support surface which is stable in respect of shape and nonetheless flexible.

In accordance with the invention the above-mentioned pin-like 10 plug-in element is on the vertical limb and extends at a spacing relative thereto and is respectively adapted to be inserted into an opening provided in the female die at a spacing relative to the receiving groove. Like also the opening which receives the plug-in element, the plug-in element is to be of a rectangular cross-section, while the plug-in element 15 projects either at a spacing relative to the back surface of the vertical limb or at a spacing relative to the flank surface of the vertical limb, from a respective transverse web portion. In the structure involving association with the flank surfaces, a pair of plug-in elements is preferred.

In a particular embodiment the flank surfaces of the vertical groove 20 are stepped, wherein the vertical limb is supported in the back region, which is narrower in cross-section, of that stepped vertical groove, and therefore the horizontal limb projects beyond the wider front region of the vertical groove.

In another embodiment the vertical limb is to be connected with a 25 coupling pairing to a limb, which extends in the vertical groove, of an angle bracket whose other limb is connected to the female die, preferably by means of force-locking engagement. It is however also possible to provide a pocket at the underside of the female die, for the limb of the angle bracket, whereby that limb projects in positively locking 30 engagement into same.

So that the broken-out piece is possibly held after the releasing procedure, at least one catch finger can be arranged downstream, in the breaking-out direction, of the limb forming the support surface; a pair of catch fingers which are in flanking relationship on both sides is however preferred. The catch fingers increase in width from their free end towards the limb formed thereon, in terms of longitudinal section, for the purposes of increasing the degree of flexibility thereof. In another embodiment the horizontal limb is flanked by side portions which are formed on the other limb, and therefore extend vertically.

Another embodiment provides a support tool with a partial frame which is approximately U-shaped in cross-section and which comprises a back portion having the coupling rib and having two parallel side walls; a

support plate for the broken-out portion is arranged between said side walls, pivotably about an axis which is generally horizontal in the position of use.

The feature whereby the breaking-out tools extend between  
5 surfaces of the support means, said surfaces being movable in the  
breaking-out direction, results in a higher level of operational reliability as  
the arrangement affords a kind of tongs or pincer engagement; that  
cannot be achieved in the state of the art as the breaking-out tools are  
usually within the contour which is defined by the free edges of the  
10 surfaces.

Engagement of the breaking-out tools can also become more  
efficient when an edge opening is disposed in opposite relationship to the  
free end of the tools, the edge opening extending from the free edge of  
the support surface.

15 It has proven to be desirable to associate with the support surface,  
as a breaking-out tool, a pressure pin having a rounded free end or a fork  
member with one or more finger-like fork prongs, preferably of flat cross-  
section.

In particular small waste pieces also take part in the bending  
20 movement of the breaking-out tool, in such a way that they assume a  
perpendicular position. When dealing with smooth cardboard surfaces,  
that results in slipping movement of the pressure pins on the surface of  
the cardboard and thus results in the waste portions being unsatisfactorily  
broken away. Therefore, for the sake of better engagement, the free end  
25 of the pressure pin or the fork prongs is in the form of a rough surface.  
That rough surface can be formed by a coating which for example is  
formed with oxides, carbides, corundum or the like and is possibly applied  
by means of thermal spraying. Another embodiment according to the  
invention provides a rough surface with irregularities such as teeth or  
30 steps in the surface of the pressure pin or the fork prong or prongs. The

irregularities can be produced by a mechanical, chemical or electrical treatment.

- By virtue of the rough surface described - for which protection is claimed separately - the arrangement affords the desired firm engagement and the piece which is to be broken away is effectively prevented from sliding away. For that purpose, it has been found sufficient for the axial height of the rough surface to correspond at most to the diameter of the pressure pin or the width of the fork prong, preferably making it less than 5 mm.
- 10        Each fork member is to project from a plate-shaped male die and in accordance with the invention it is connected thereto by a portion of the fork member which has clamping noses and which can also have abutments which are guided against the underneath surface of the male die.
- 15        Other insert portions for the female die are shaped support portions which are arranged in the opening of the female die at the edge thereof and which are fitted to plug-in profile members and which are disposed in mutually opposite relationship and which are provided with mutually directed radial support lips of elastic material. Preferably that shaped support portion is an angle portion of which one limb is the support lip, while the other limb formed thereon is formed by a hollow profile member; the latter preferably corresponds to a cylindrical cup and is pressed on to a plug-in profile member by a simple assembly procedure in the breaking-out direction.
- 20        The scope of the invention also embraces clip-like tools which are fixed at the opening in the female die and which each include a respective frame portion from which resilient support tongues project inwardly or on which are arranged inwardly disposed support plates which can be guided about a pivot axis; that arrangement therefore affords simple additional tools in the form of spring clips or mechanically moved clips which would even permit standardisation of the tools.

Further advantages, features and details of the invention will be apparent from the description hereinafter of preferred embodiments and with reference to the drawing in which:

5 Figure 1 is a plan view of a support tool for a waste portion for the removal thereof from cardboard sheets in the corrugated cardboard and folding box industry,

Figure 2 is a side view of Figure 1,

Figure 3 is a side view corresponding to Figure 2 of another embodiment,

10 Figures 4 through 7 are diagrammatically illustrated successive method steps with a breaking-out board which is shown in section and which includes a support tool as shown in Figures 1 and 3 and with which a breaking-out tool is associated,

15 Figure 8 is a view on an enlarged scale approximately corresponding to Figure 6, with a support tool which is modified in relation to Figure 6, and another breaking-out tool,

Figure 9 is a plan view of a part of a further breaking-out board with support tool and breaking-out tool as shown in Figure 8,

20 Figure 10 is a view corresponding to Figure 9 of a further embodiment,

Figure 11 is a perspective view of a further support tool with breaking-out tool and the indicated end positions of a movable support plate,

25 Figure 12 is a view corresponding to Figure 11 of an arrangement with a breaking-out tool,

Figure 13 is a diagrammatic view in section relating to Figures 11 and 12,

Figures 14 and 15 respectively show a support tool in plan and a breaking-out tool illustrated in section,

30 Figure 16 is a front view in section of the arrangement shown in Figure 9,

Figure 17 shows the mounting arrangement for the breaking-out tool of Figure 16 taken along line XVII-XVII therein,

Figure 18 is a front view of a plate-like breaking-out tool in two embodiments,

5 Figure 19 shows two side views in relation to Figure 18,

Figure 20 is a view in section on an enlarged scale through a further embodiment of the breaking-out tool of Figure 18,

Figure 21 is a view corresponding to Figure 18 of a further breaking-out tool,

10 Figure 22 is a side view relating to Figure 21,

Figure 23 is a front view of another breaking-out tool,

Figures 24 through 26 show side views of three other embodiments of the breaking-out tool,

15 Figures 27 and 28 show the breaking-out tool of Figure 24 in two stages of a breaking-out operation,

Figures 29 and 30 respectively show a perspective view of a unit comprising a support tool and a breaking-out tool,

Figure 31 shows a perspective view of another breaking-out tool,

20 Figure 32 shows a perspective view of another embodiment of a support tool,

Figures 33 and 34 show two views corresponding to Figures 4 and 5 respectively of a working operation with support tools as shown in Figure 32,

25 Figures 35 through 38 show plan views of special tools having a spring action,

Figures 39 and 40 show plan views of special tools having a mechanical action,

Figures 41, 43 and 46 show sectional views of breaking-out boards with respectively inserted support tools,

30 Figures 42, 44 and 45 show plan views of the structures shown in Figures 41, 43 and 46,

Figure 47 is a front view of the support tool of Figures 43 and 44, and

Figure 48 is a perspective view of the support tool of Figures 46 and 47.

5       Cardboard sheets 10 which are used in the folding box industry have stamped blanks for folding boxes or the like, with waste portions 12 being produced in or on the blanks. Downstream of a stamping station which is not shown in the drawing for reasons of enhanced clarity thereof, the stamped cardboard sheet 10 passes on to a breaking-out board or a  
10      female die 14 of a thickness b for example of 12 mm, on which the sheet 10 is freed of its waste portions 12; the waste portions 12 are disposed over openings 16 which are of a configuration designed in dependence on the contour of the waste portions 12 and at which, in the cross-sectional view in Figures 4 through 7, an upper frame portion 17 with a vertical wall  
15      is followed by a downwardly opening conical portion 18.

Fixed in the opening 16 is a support tool 20 for the waste portion 12, which as shown in Figures 1 and 2 is a kind of angle portion having two limbs 22 and 24 of flexible plastic material with a high level of endurance in relation to fluctuating loadings thereon. Projecting from the  
20      limb 22 which extends vertically in the position of installation is a coupling rib 27 which has flanks 26 of an undercut configuration and which is inserted into a vertical groove 28 of dovetail-shaped cross-section in the female die 14. As Figure 9 clearly shows the vertical groove 28 extends from a wall surface 15 defining the opening 16.

25      The resilient horizontal limb 24 of the support tool 20, of a thickness a, has an inner opening 30 and at its free edge 25 an edge opening or recess 32; two prong-like cantilever portions 34 of the horizontal limb 24, which flank the edge opening 32, are curved in longitudinal section and each form a kind of bowl or cup.

30      In the embodiment shown in Figure 3, formed on the vertical limb 22 is a catch finger 38 for the waste portion 12. The catch finger 38 is

curved downwardly in its longitudinal section and narrows towards its free end 36.

The waste portion 12 which rests on the surface 25 of the horizontal limb 24 is subjected to a pressure from above by a breaking-out member 5 or tool in the form of a pressure pin 40 with a roughened part-spherical pressure end which is similar to a fingertip, with the contact between the pressure end and the waste portion being in point form or - for example in Figures 8 and 12 - as a fork member 41, in substantially linear configuration; the flat fork prongs 42 of the fork member 41 are aligned 10 with each other. Both the part-spherical pressure end of the pressure pin 40 and also the flat ends of the above-mentioned fork prongs 42 are provided with a coating 44, affording the roughness thereof, of an axial height  $h$  of between about 4 and 10 mm. The coating was produced for example by thermal spraying from aluminum oxide, corundum, carbide grains or the like. 15

The preferred height  $h$  is at most equal to the diameter  $d$  of the pressure pin 40 and the roughness depth is less than 0.5 mm. That coating can also be replaced by roughening of the surface of the pressure pin or the flat prong 41, which is effected chemically, electrically or - for 20 example by means of sand blasting - mechanically.

In the downward movement of the breaking-out tool or tools 40, 41, the waste portion 12 is separated by pressure from the cardboard sheet 10 and carried away downwardly in the breaking-out direction  $x$ .

In the embodiment shown in Figure 9 the edge opening 32 is at its 25 end of a part-circular contour and the horizontal limb 24 is flanked by side portions which respectively form the above-described catch fingers 38 and which - like also the horizontal limb 24 itself - are formed on the vertical limb 22.

Figure 10 indicates a connection pairing between the support tool 30<sub>n</sub> and the female die 14, which is modified in relation to the embodiment shown in Figure 9; the female die 14 engages with a vertical bar 29 which

projects from the wall surface 15, into a vertical groove 31 in the support tool 20 or the vertical limb 22 thereof. The flank of the vertical groove 31 is identified by reference 26<sub>a</sub>.

In the support tool 20<sub>a</sub> shown in Figures 11 and 12, the support 5 surface 25 for the waste portion 12 is provided by a support plate 46 which hangs separately between side walls 23; the support plate 46 rests with lateral trunnions which are not visible - pivot axis A - in finite mounting grooves 48 in the side walls 23 and can be moved from the horizontal position into the inclined position indicated at 46<sub>a</sub>. In that 10 position the support plate 46 is disposed in approximately parallel relationship with the inclined front ribs 50 of the side walls 23, the front ribs 50 also forming catch fingers.

Figure 13 is intended to show the manner of suspending the support plate 46 forming a kind of mechanical finger, as well as forwardly 15 and downwardly inclined front surfaces 52 of the side walls 23, as deflector means for the waste portion 12.

The support plate 46<sub>a</sub> in Figure 14, which is intended for long waste portions 12, shows two edge openings or chambers 32, with which there are associated flat prongs 42 of a fork member 41 which is otherwise not 20 shown herein.

In Figure 15, strip-like cantilever portions 34<sub>a</sub> of flexible material project from oppositely disposed wall surfaces 15 which define the opening 16. The cantilever portions 34<sub>a</sub> form between them chamber spaces 33 of a width as indicated at n; the cantilever portions 34<sub>a</sub> flank 25 the pressure pins 40 which engage into the chamber spaces 33, or flat prongs 42 corresponding to the pressure pins.

Figures 16 and 17 show that the fork member 41 is firmly driven into a male die 51 of plywood of a thickness b<sub>1</sub> of for example 12 mm, as far as abutments 54 which are formed from the fork member 41 and 30 which are directed transversely with respect to the prong axis B. The firm fit is produced by means of abutment plates 59 (Figures 21 through 23)

which are near the upper edge and which are parallel to the prong axis B, or by means of clamping noses 60 or gripping ridges which project at both sides from the surfaces 58 of the fork member 41.

The ridge-like clamping nose 60 or the abutment 54 respectively 5 can also be seen in the fork member 41<sub>a</sub> shown in Figures 18 through 25. The free ends of the fork prongs or flat prongs 42 - the free ends being defined by straight or curved end edges 43 and 43<sub>a</sub> respectively - have in this case mechanically produced roughness in the form of teeth 61 which are inclined at about 30° in Figures 18 and 19 and which are shaped near 10 the edge at one or both sides, teeth 61<sub>a</sub> which project at about 90° in Figures 21 and 22, hooks 61<sub>b</sub> (Figure 20) or shoulders 61<sub>c</sub> which are formed on fork prongs 42<sub>a</sub>.

In addition Figure 23 shows a breaking-out tool 41<sub>b</sub> with only one flat prong 42<sub>b</sub> which is delimited downwardly by the above-mentioned end 15 edge 43<sub>a</sub> which is curved in cross-section.

In that respect, Figures 27 and 28 clearly show how a small waste portion 12 is engaged by the free end of the flat prongs 42<sub>a</sub> and laid into the shoulder 61<sub>c</sub>, for perpendicular positioning thereof. Reliable downward guidance of the waste portion 12 is ensured by virtue of the fact that it is 20 pressed in force-locking engagement against the breaking-out tool or fork member 41<sub>a</sub> by the cantilever portion 34 of the support tool 20. Because the waste portion 12 is caused to bear against the breaking-out tool 41<sub>a</sub> in force-locking engagement therewith in that way, the shoulders 61<sub>c</sub> produce their effect. In the breaking-out process the breaking-out tool 41<sub>a</sub> 25 presses the waste portion 12 against the support tool 20, clamps it in place and guides it positively downwardly. In that procedure the waste portion is disposed approximately perpendicularly. Upon further downward movement of the breaking-out tool, the waste portion 12 is pushed downwardly by the tooth 61, 61<sub>a</sub> - or the hook 61<sub>b</sub> or the shoulder 61<sub>c</sub>. 30 The support tool 20 or the cantilever portion 34 thereof moves rapidly back into its initial position.

The described system affords advantages not only in relation to internal waste portions 12, but also in relation to so-called edge waste; the procedure for breaking away edge waste is effected only with the above-described combination of the breaking-out tool 41<sub>a</sub> and the support tool 20; wooden die or support members are unnecessary. The risk which arises due to wooden die or support members which are necessarily disposed close to the breaking-out female die 14 no longer arises. A spacing of 4 mm between the breaking-out tool 41<sub>a</sub> and the outside contour of the breaking-out female die 14 affords sufficient tolerance and security. A movement in the severing operation, which corresponds to the pitching action, carries the edge waste positively away from the breaking-out female die 14. As in the case of internal waste, in this case also the edge waste is disposed perpendicularly and is reliably guided downwardly by the thrust teeth 61, 61<sub>a</sub>, 61<sub>b</sub>, 61<sub>c</sub>.

Figure 29 shows an illustrative perspective view of a female die 14 which is made from plywood, with an angle portion 20 which serves as a support tool being releasably secured to the opening 16 thereof; disposed above the angle portion 20 is a fork member 41<sub>a</sub> with shoulders 61<sub>c</sub> which are formed in its flat prongs 42<sub>a</sub>.

The fork member 41<sub>a</sub> in Figure 30 shows the teeth 61 which project inclinedly from the flat prongs 42 into the intermediate spaces between the prongs, and a region of a coating 44 on the finger or end portions 45 of the flat prongs, which are shaped downwardly as pointed tips.

The breaking-out tool 41<sub>b</sub> in Figure 31 - corresponding to that shown in Figure 23 - is provided with a flat prong 42<sub>a</sub> which is here disposed laterally and which has a shoulder 61<sub>c</sub> at its end.

Referring to Figures 33 and 34, in an opening 16<sub>a</sub> of the same cross-section throughout, the female die 14<sub>a</sub> shown therein receives on both sides a shaped support portion 62 which is clearly illustrated in Figure 32 and which comprises a cylindrical inversion-action neck 63 and a radial

support lip 64 which in turn has an edge opening 32. The inversion-action neck 63 is connected to a plug-in profile member 65.

The waste portion 12 which lies on the mutually facing support lips 64 is urged in the breaking-out direction against the support lips 64 by 5 pin-like breaking-out tools 40 which are provided above the support lips 64. In that case, the support lips 64 are elastically deformed and, when relieved of load, move quickly back into the initial position. In this case also, the breaking-out tools 40 are arranged in the region of the edge openings 32.

10 The drawing shows in plan hereinafter some diagrammatic views of special tools, more specifically Figures 35 and 36 showing spring clips 66, 66<sub>a</sub> for waste portions 12<sub>a</sub> and 12<sub>b</sub> respectively of round and half-round contour, while in addition Figures 37 and 38 show spring clips 70 and 68 for waste 12<sub>c</sub> of an extended so-called Euro-hole or for cigarette waste 15 12<sub>d</sub>. Figures 39 and 40 show mechanical clips 72 and 72<sub>a</sub> respectively for round waste portions 12<sub>a</sub> and for rectangular waste portions 12.

These special tools 66, 66<sub>a</sub>, 68, 70, 72, 72<sub>a</sub> - which are suitable as a basis for standardisation - each have a frame portion 76 from which project spring tongues 34<sub>a</sub> which are directed inwardly in Figures 35 20 through 37. The rectangular frame portions 76 of the clips 72, 74 in Figures 39, 40 include support plates 46<sub>b</sub> which are possibly of a resilient nature and which are limitedly rotatable about a respective pivot axis A and into whose edge opening or openings 32 projects a respective pressure profile member 78.

25 Figure 41 shows a support tool 20<sub>e</sub> whose vertical limb 22 which is of rectangular cross-section is provided with a strip 80 which is parallel thereto at a spacing y, forming a channel; the two are connected by a transverse web portion 82 which is formed thereon at both sides.

The parallel strip 80 engages from below into a stamped-out 30 opening 84, which is of a cross-section corresponding to the parallel strip 80, in the breaking-out board 14. The stamped-out opening 84 is

separated from the opening 16 of rectangular cross-section, by a board web portion 86 which is disposed in the above-mentioned channel. A vertical groove 28<sub>a</sub> - also of rectangular cross-section - extends from the opening 16, with stepped flank surfaces 88. The vertical limb 22 of the 5 support tool 20<sub>f</sub> in Figures 43 through 45 is also carried in the back region 90 of a vertical groove 28<sub>a</sub>. Plug-in strips 92 of L-shape in longitudinal section are formed at a spacing y, by virtue of the above-mentioned transverse web portions 82, on the flanks of the vertical limb 22. In the 10 rest position shown in Figures 43 and 44, the strips 92 are fitted into corresponding flank holes 94 in the breaking-away board 14 - the latter are therefore in alignment with the back region 90 of the vertical groove 28<sub>a</sub>.

A support arrangement 96 in the breaking-away board 14 in Figures 46 and 47 comprises an angular plastic body 21 which is provided for the 15 vertical groove 28<sub>b</sub>, the plastic body having a short vertical limb 97 which has a downwardly open plug-in passage 92 for a plug-in tongue 99, of rectangular cross-section, of the vertical limb 100 of an angle bracket 102. Its limb 101 which is horizontal in Figures 46 and 47 is fixed in force-locking engagement to the underneath surface 13 of the breaking-out 20 board 14.

CLAIMS

1. Apparatus for removing broken-out pieces, in particular waste portions (12), from a sheet of material (10) which contains blanks or the like flat portions and which rests on a female die (14) or the like breaking-out surface in such a way that the broken-out portion extends over an opening (16) in the breaking-out surface and is urged away through the opening under the pressure of at least one breaking-out tool (40, 41), wherein associated with the breaking-out tool is a support means (20, 20<sub>a</sub>, 20<sub>b</sub>, 20<sub>n</sub>) which is movable in the direction of movement of the breaking-out tool and which is rigidly connected in positively locking relationship to the breaking-out surface or female die in the edge region of the opening and which projects into the opening with a support or contact surface (24, 25, 34) which can be inclined with respect to said connection pairing and which in the rest position engages in substantially parallel relationship under the waste portion or broken-out piece disposed in the sheet of material and which is adapted to be variable in its position upon the movement of the waste portion by the breaking-out tool and in particular is adapted to be transferred into an angle of inclination relative to the sheet of material in the downward movement of the waste portion, wherein the connection pairing for the support means comprises at least one undercut receiving groove (28, 31) on the one hand and a portion (27, 29) which can be fitted thereinto and which extends in the breaking-out direction (x) on the other hand, characterised in that the cross-sections of the receiving groove (28, 31) and the portion forming a coupling rib or bar (27, 29) are of a dovetail-shaped configuration, wherein the support means (20, 20<sub>a</sub>, 20<sub>b</sub>, 20<sub>n</sub>) is in longitudinal section an angle portion with at least one coupling rib (27) which is formed out of one of its limbs (22) for a receiving groove (28) of the female die (14) or with a vertical groove (31) formed in a limb (22) for a coupling rib (29) of

the female die on the one hand and with another flexible limb (24, 34) forming the support surface (25) on the other hand.

2. Apparatus for removing broken-out pieces, in particular waste portions (12), from a sheet of material (10) which contains blanks or the like flat portions and which rests on a female die (14, 14<sub>a</sub>) or the like breaking-out surface in such a way that the broken-out portion extends over an opening (16, 16<sub>a</sub>) in the breaking-out surface and is urged away through the opening under the pressure of at least one breaking-out tool (40, 41), wherein associated with the breaking-out tool is a support means (20<sub>a</sub>, 62) which is movable in the direction of movement of the breaking-out tool and which is rigidly connected in positively locking relationship to the breaking-out surface or female die in the edge region of the opening and which projects into the opening with a support or contact surface (24, 25, 34) which can be inclined with respect to said connection pairing and which in the rest position engages in substantially parallel relationship under the waste portion or broken-out piece disposed in the sheet of material and which is adapted to be variable in its position upon the movement of the waste portion by the breaking-out tool and in particular is adapted to be transferred into an angle of inclination relative to the sheet of material in the downward movement of the waste portion, wherein the connection pairing is adapted to be brought together in the breaking-out direction (x), characterised in that the connection pairing comprises at least one receiving groove (28<sub>a</sub>, 28<sub>b</sub>) in the female die (14) at the edge of the opening (16) thereof on the one hand and a portion (80, 92, 97), which can be fitted thereinto, of a vertical limb (22) of the support tool (20<sub>e</sub>, 20<sub>f</sub>, 21) on the other hand, or that the connection pairing comprises a plug-in profile portion (65) of the female die and an associated hollow profile portion (63) which is formed by a limb of an angle portion as a shaped support portion (62) whose other limb is a

support lip (64), wherein the shape of the hollow profile portion corresponds to that of a cylindrical cup.

3. Apparatus as set forth in claim 2 characterised in that formed on the vertical limb (22) is at least one pin-like plug-in element (80, 92) which extends or extend at a spacing (y) relative to the vertical limb and which is respectively adapted to be inserted into an opening (84, 94) provided in the female die (14) at a spacing (y) relative to the receiving groove (28<sub>a</sub>) and is removable in the breaking-out direction (x).

4. Apparatus as set forth in claim 3 characterised in that the plug-in element (80, 92) and the opening (84) are of rectangular cross-section and/or that the plug-in element (80) projects from a transverse web portion (82) at a spacing (y) relative to the rear surface of the vertical limb (22).

5. Apparatus as set forth in claim 3 or claim 4 characterised in that the plug-in element (22) projects up from a transverse web portion (82) at a spacing (y) relative to the flank surface of the vertical limb (22).

6. Apparatus as set forth in one of claims 2 through 5 characterised in that the flank surfaces (88) of the vertical groove (28<sub>a</sub>, 28<sub>b</sub>) are stepped and the vertical limb (22) is supported in the rear region (90) of the vertical groove, which rear region is of narrower cross-section.

7. Apparatus as set forth in one of claims 2 through 6 characterised in that the vertical limb (97) is fitted with a plug-in slot (98) on to a limb (100) of an angle bracket (102), which extends in the vertical groove (28<sub>b</sub>), while the other limb (101) of the angle bracket is connected to the female die (14).

8. Apparatus as set forth in claim 2 characterised in that shaped support portions (62) which are arranged in the opening (16<sub>a</sub>) at the edge thereof and which are fitted on to plug-in profile members (65) are disposed in mutually opposite relationship, the support portions (62) being provided with radial support lips (64) of elastic material which are directed towards each other.

9. Apparatus as set forth in claim 1 characterised in that the flexible limb (24) forming the support surface (25) has an edge opening (32) which is delimited on both sides by cantilever portions (34), and at least one inner opening (30) at a spacing in relation to the edge opening (32).

10. Apparatus as set forth in one of claims 1 through 9 characterised in that arranged downstream, in the breaking-out direction (x), of the limb (24) forming the support surface (25) is at least one catch finger (38), in particular a pair of catch fingers.

11. Apparatus as set forth in claim 1 or claim 10 characterised in that the limb (24) forming the support surface (25) is flanked by side portions which are formed on the other limb (22) and form the catch fingers (38).

12. Apparatus as set forth in claim 10 or claim 11 characterised in that the catch finger (38) is enlarged in longitudinal section from its free end (36) towards the limb (22) formed thereon.

13. Apparatus as set forth in one of claims 1 through 12 characterised in that the support tool (20<sub>a</sub>) has a partial frame which is substantially U-shaped in cross-section and which comprises a back portion including the coupling rib or ribs (27), with two parallel side walls (23), wherein a support plate (46, 46<sub>a</sub>) is arranged pivotably about an axis (A) between the side walls.

14. Apparatus as set forth in one of claims 1 through 13 characterised in that the breaking-out tool or tools (40; 41, 42) extends or extend between surfaces (34, 34<sub>a</sub>) of the support means (20, 20<sub>a</sub>, 20<sub>b</sub>, 20<sub>n</sub>), said surfaces being movable in the breaking-out direction (x).

15. Apparatus as set forth in one of claims 1 through 14 characterised in that the portion (24; 46, 46<sub>a</sub>; 64) including the support surface (25) is provided at its free edge (35) with at least one edge opening (32), wherein possibly the edge opening or openings is or are disposed in opposite relationship to the free end or ends of the breaking-out tool (40, 41).

16. Apparatus as set forth in one of claims 1 through 15 characterised in that disposed opposite the support surface (25) as a breaking-out tool is a pressure pin (40) with a rounded free end which is in the form of a rough surface.

17. Apparatus as set forth in one of claims 1 through 15 characterised in that associated with the support surface (25) as a breaking-out tool is a fork member (41, 41<sub>a</sub>, 41<sub>b</sub>) with one or more finger-like fork prongs (42, 42<sub>a</sub>, 42<sub>b</sub>) of preferably flat cross-section, wherein preferably the free end of the pressure pin (40) or the fork prong (42, 42<sub>a</sub>, 42<sub>b</sub>) is in the form of a rough surface.

18. Apparatus as set forth in claim 17 characterised in that the free end of the fork prongs (42, 42<sub>a</sub>, 42<sub>b</sub>) is formed by a part-circular curve (43<sub>a</sub> in Figures 18, 23) formed therein or a tip (Figures 30, 31) formed out thereon.
19. Apparatus as set forth in claim 16 or claim 17 characterised in that the rough surface is formed by a coating (44), in particular a coating with oxides, carbides, corundum or the like.
20. Apparatus as set forth in one of claims 16 through 19 characterised in that the coating (44) is applied by means of thermal spraying.
21. Apparatus as set forth in claim 16 or claim 17 characterised in that the rough surface is formed by a coating of plastic material or rubber.
22. Apparatus as set forth in claim 16 or claim 17 characterised in that the rough surface is formed by irregularities provided in the surface of the pressure pin (40) or the fork prongs (42, 42<sub>a</sub>, 42<sub>b</sub>), wherein the surface of the pressure pin or the fork prongs (42) is roughened mechanically, chemically or electrically.
23. Apparatus as set forth in one of claims 17 through 22 characterised in that the axial height (h) of the rough surface (44) corresponds at most to the diameter (d) of the pressure pin (40) or the width of the fork prong (42).
24. Apparatus as set forth in claim 16 or claim 17 characterised in that projecting teeth (61, 61<sub>a</sub>), hooks (61<sub>b</sub>) or at least one shoulder (61<sub>c</sub>)

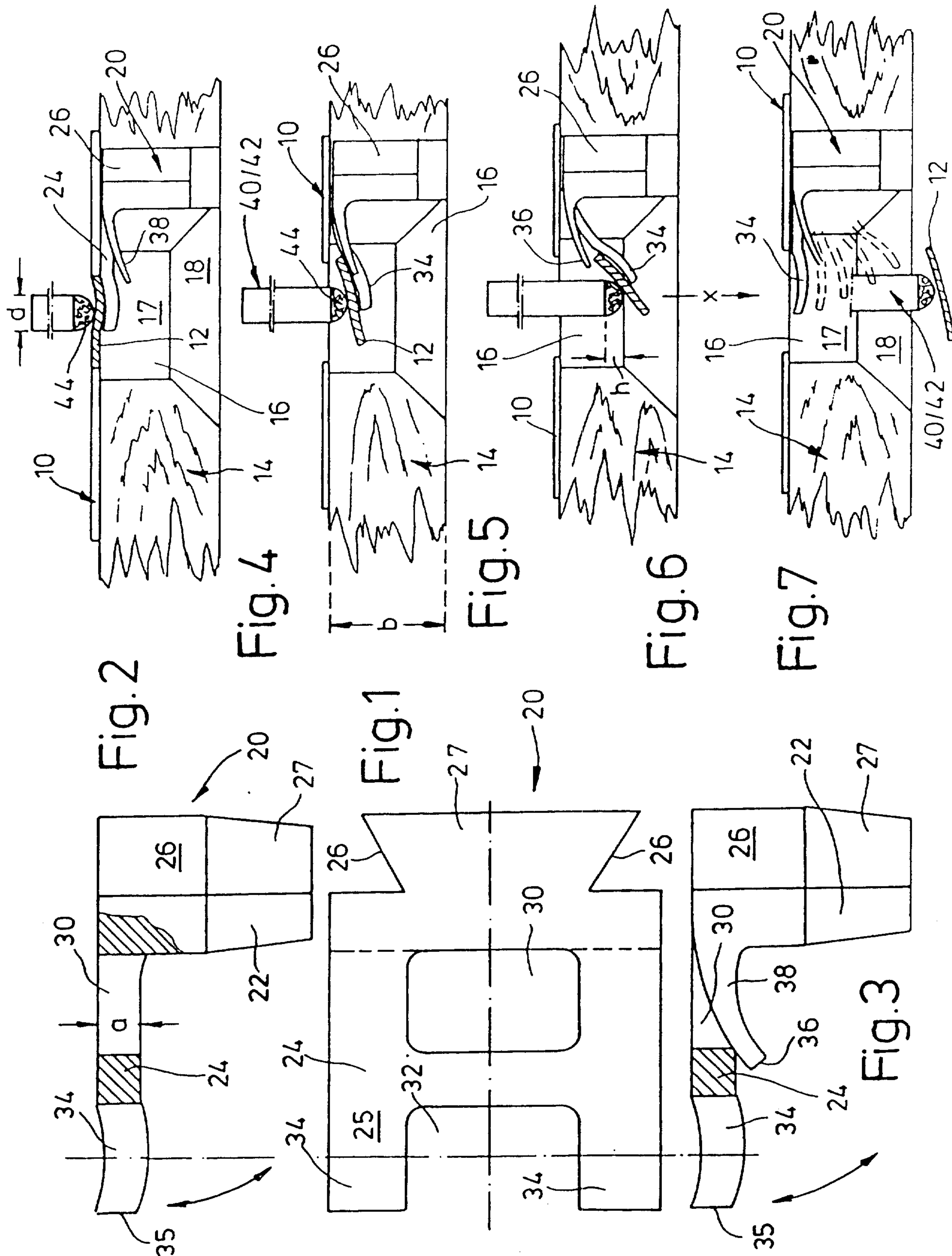
in inclined relationship are formed out at the pressure pin (40) or fork prongs (42, 42<sub>a</sub>, 42<sub>b</sub>) near the end edge at a spacing in relation thereto.

25. Apparatus as set forth in one of claims 17 through 24 characterised in that the fork member (41) projects from a plate-shaped male die (56), wherein possibly the portion of the fork member (41), which is connected to the male die (56), has clamping noses (60) and/or abutments (54) (Figure 14).

26. Apparatus as set forth in one of claims 1 through 25 characterised by a clip-like tool (68 through 74) which is fixed to the opening (16, 16<sub>a</sub>) and which respectively includes a frame portion (76) from which resilient support tongues (34<sub>b</sub>) project inwardly or on which at least one inwardly disposed support plate (46<sub>b</sub>) is arranged movably about a pivot axis (A).

27. Apparatus as set forth in claim 26 characterised by a frame portion (76) which is at least partially curved in plan view or by a substantially rectangular frame portion (76).

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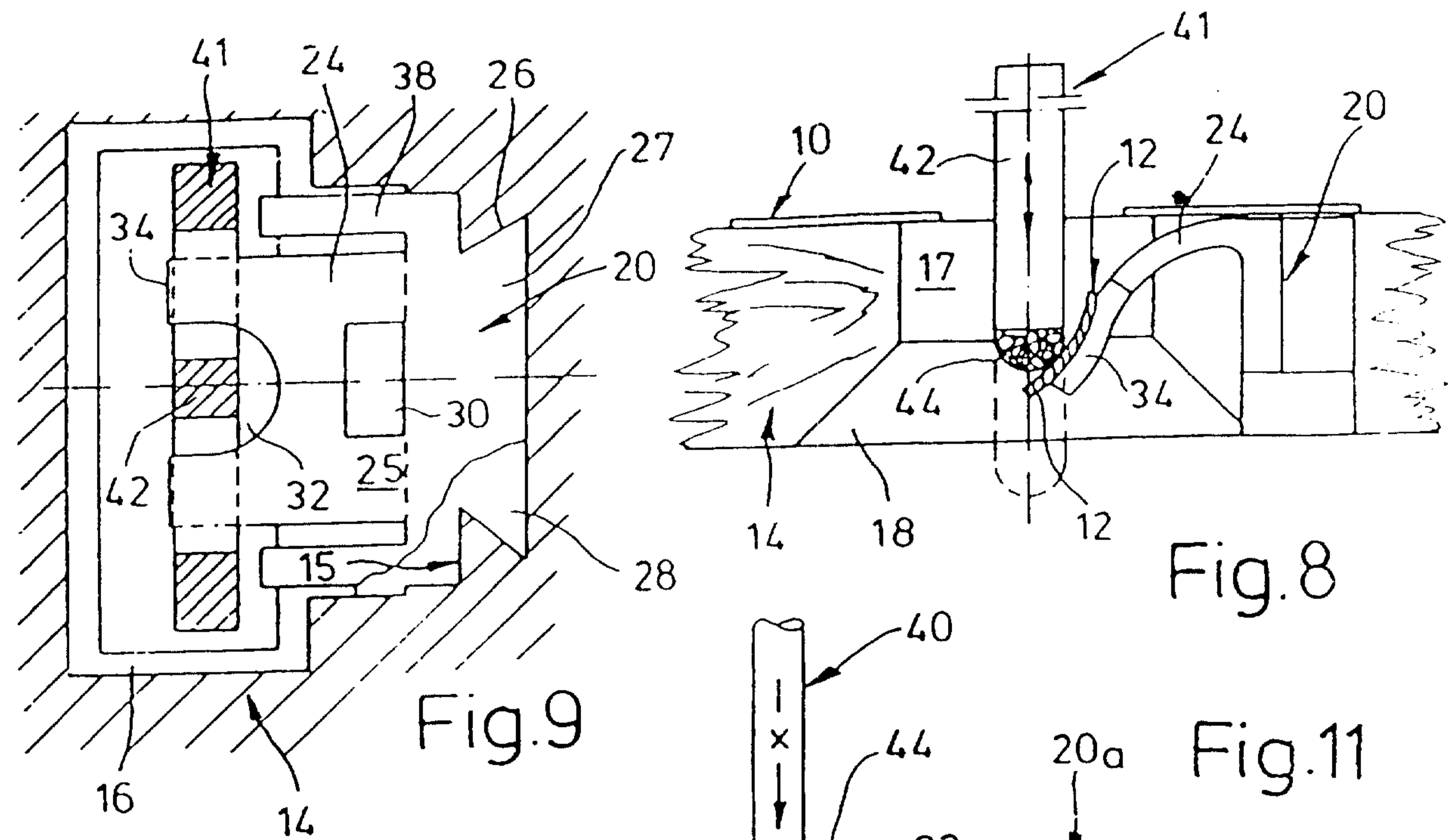
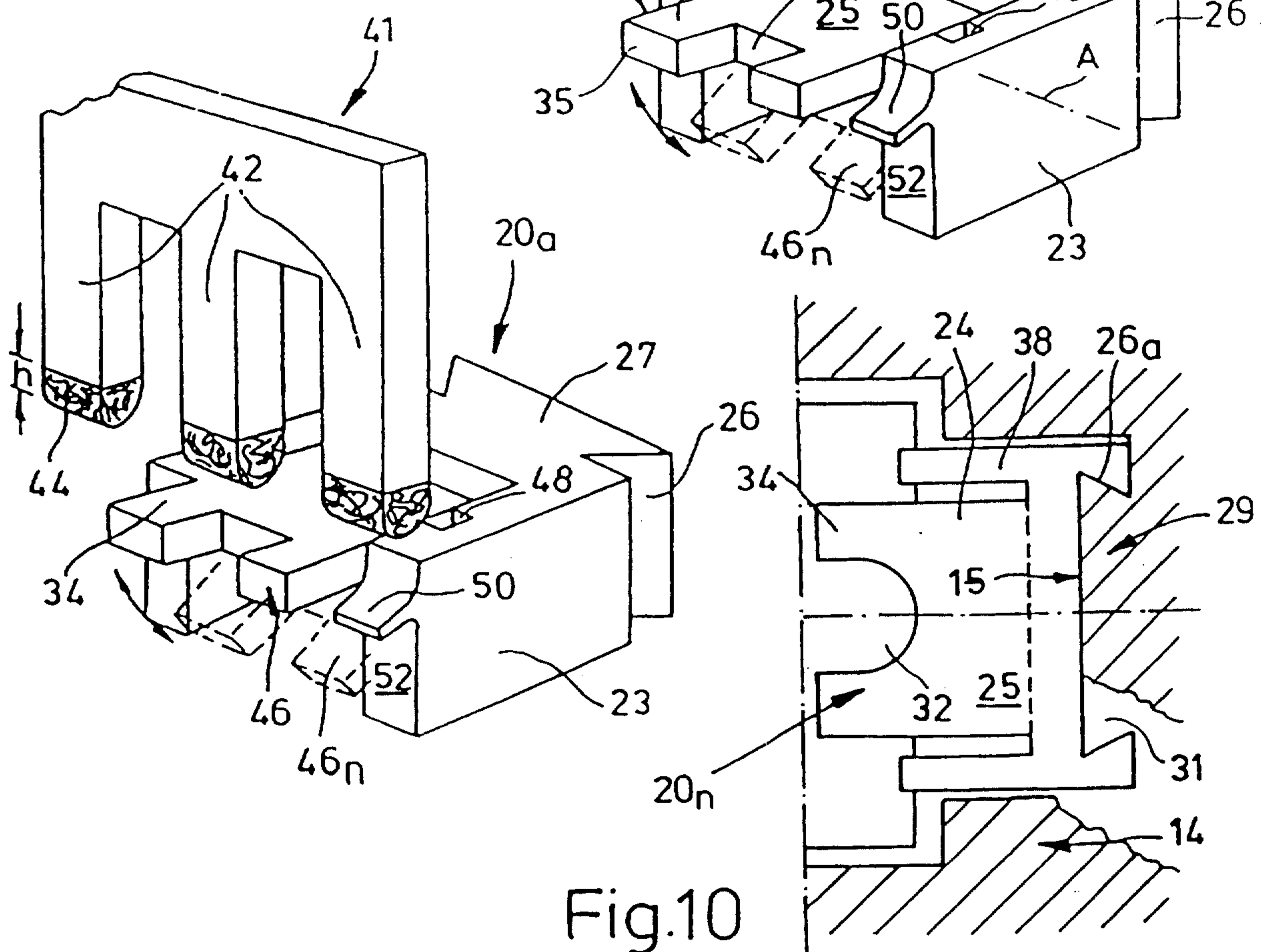


Fig.12



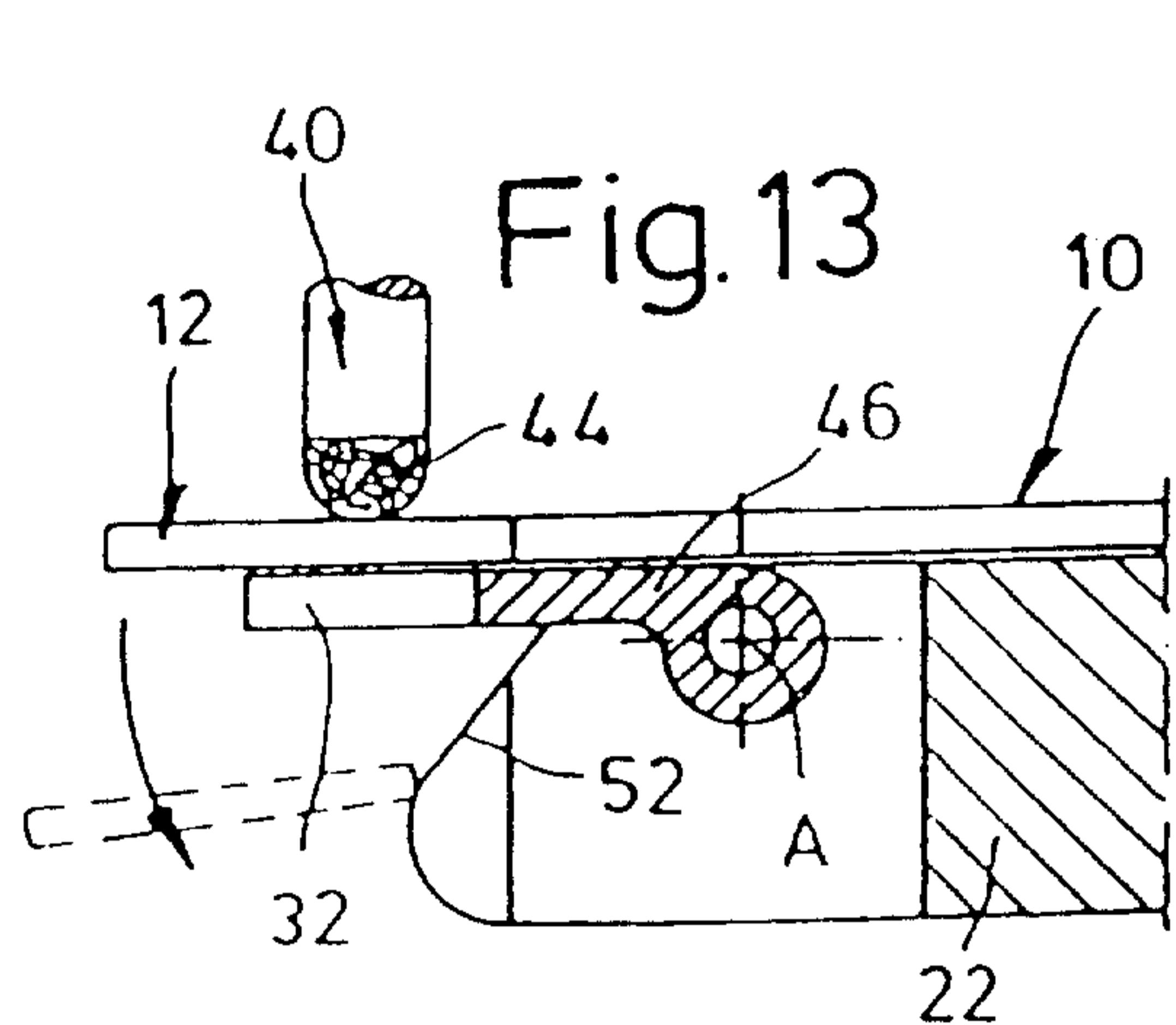


Fig. 13

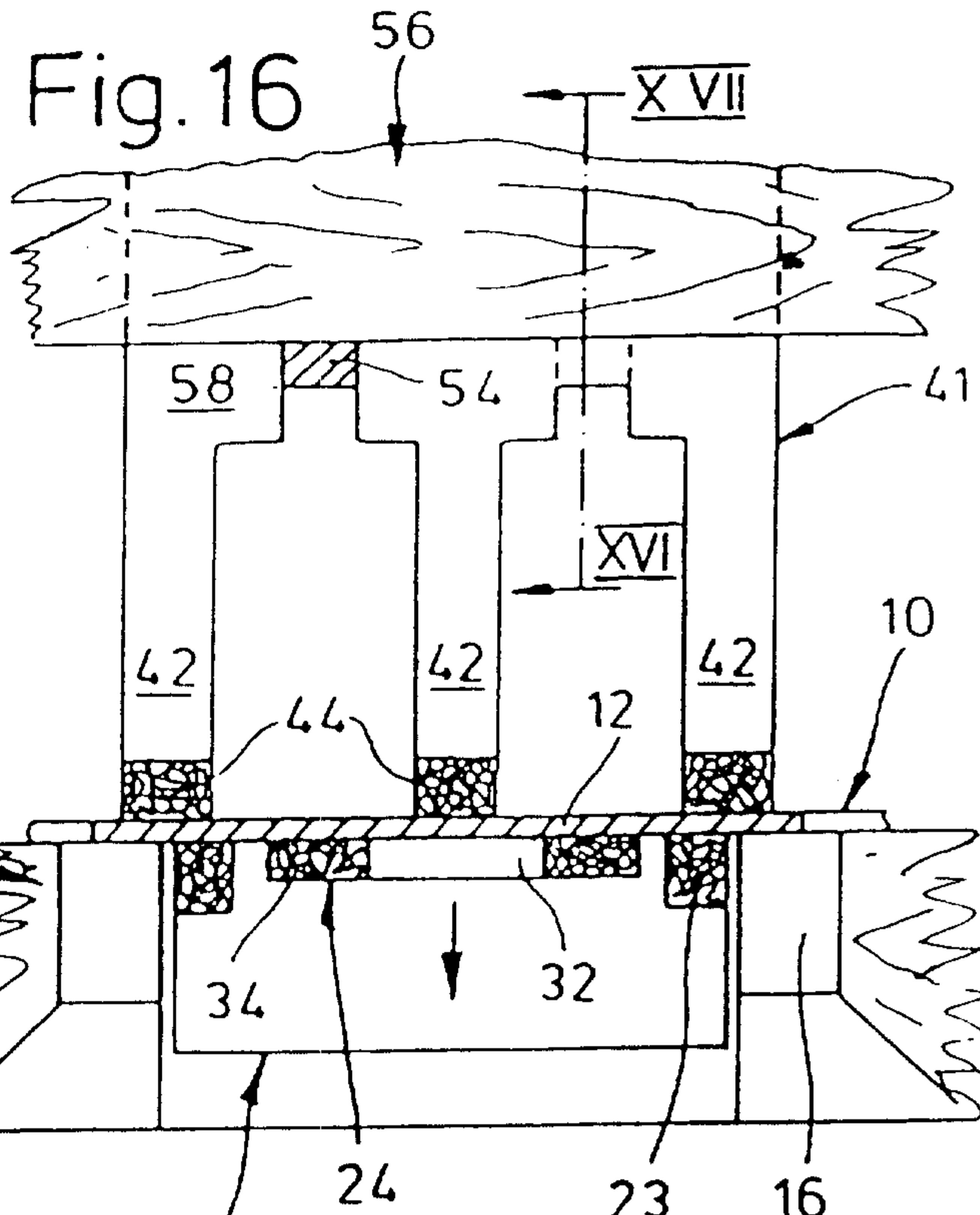


Fig. 16

Fig. 14

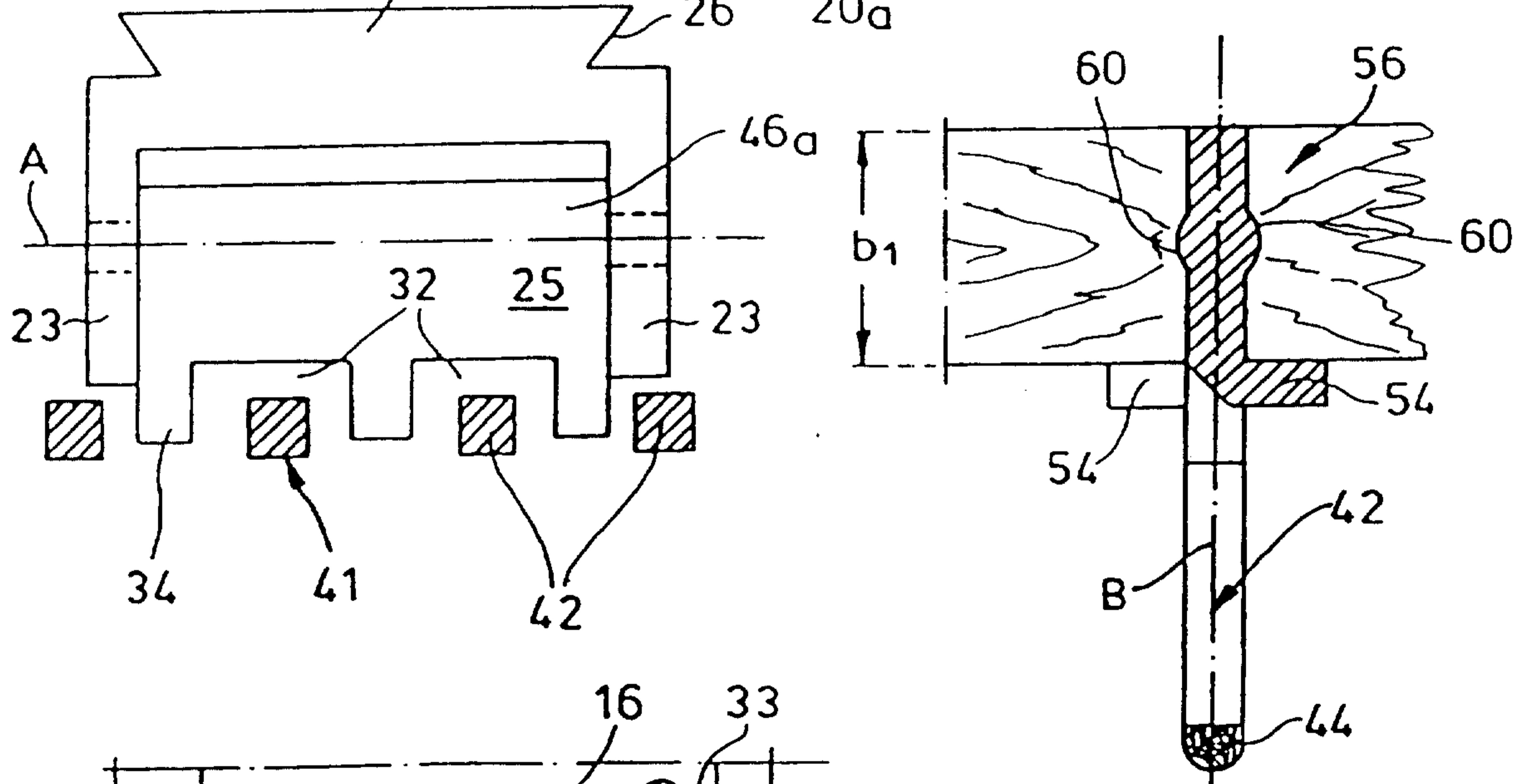


Fig. 17

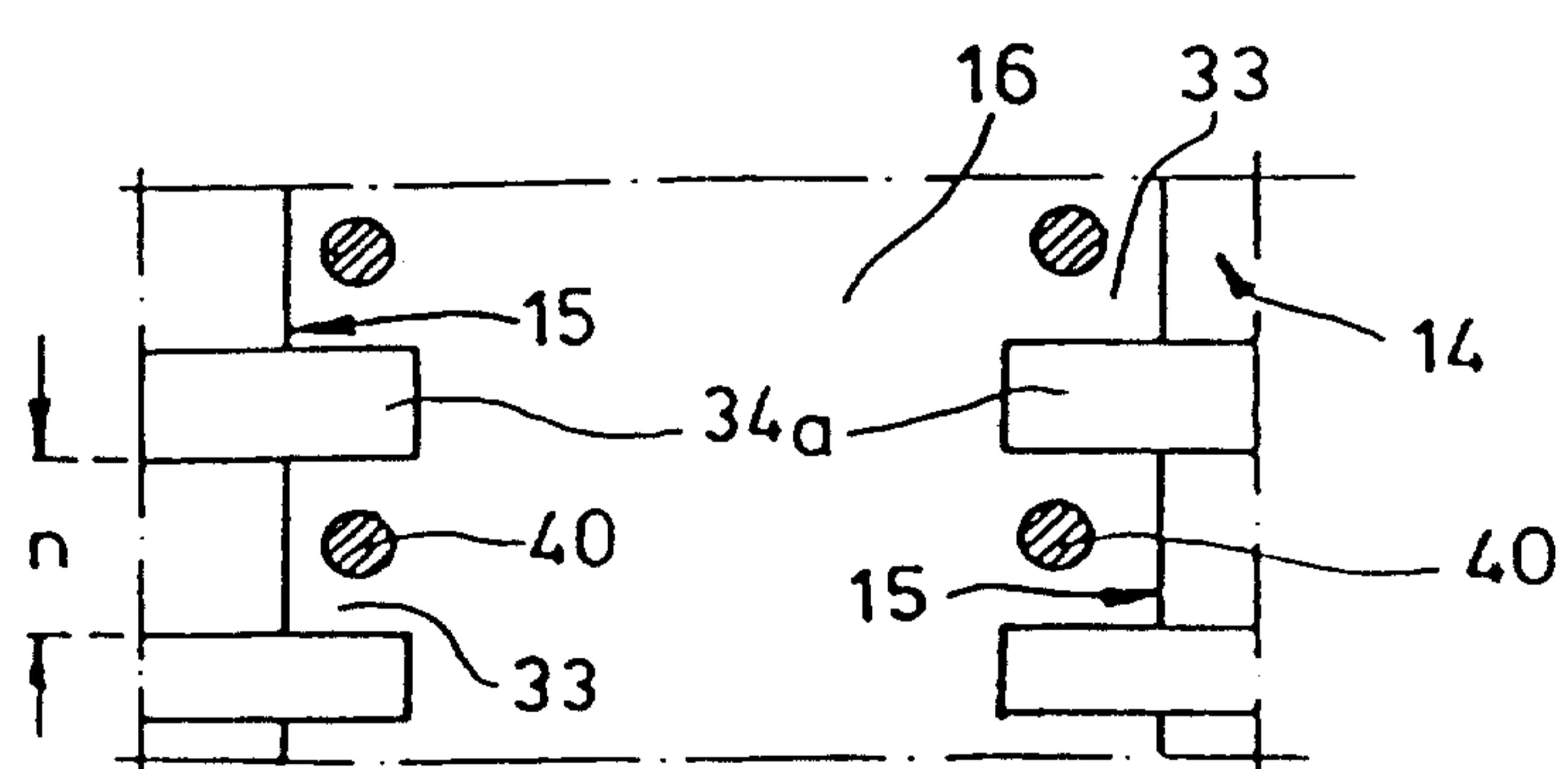


Fig. 15

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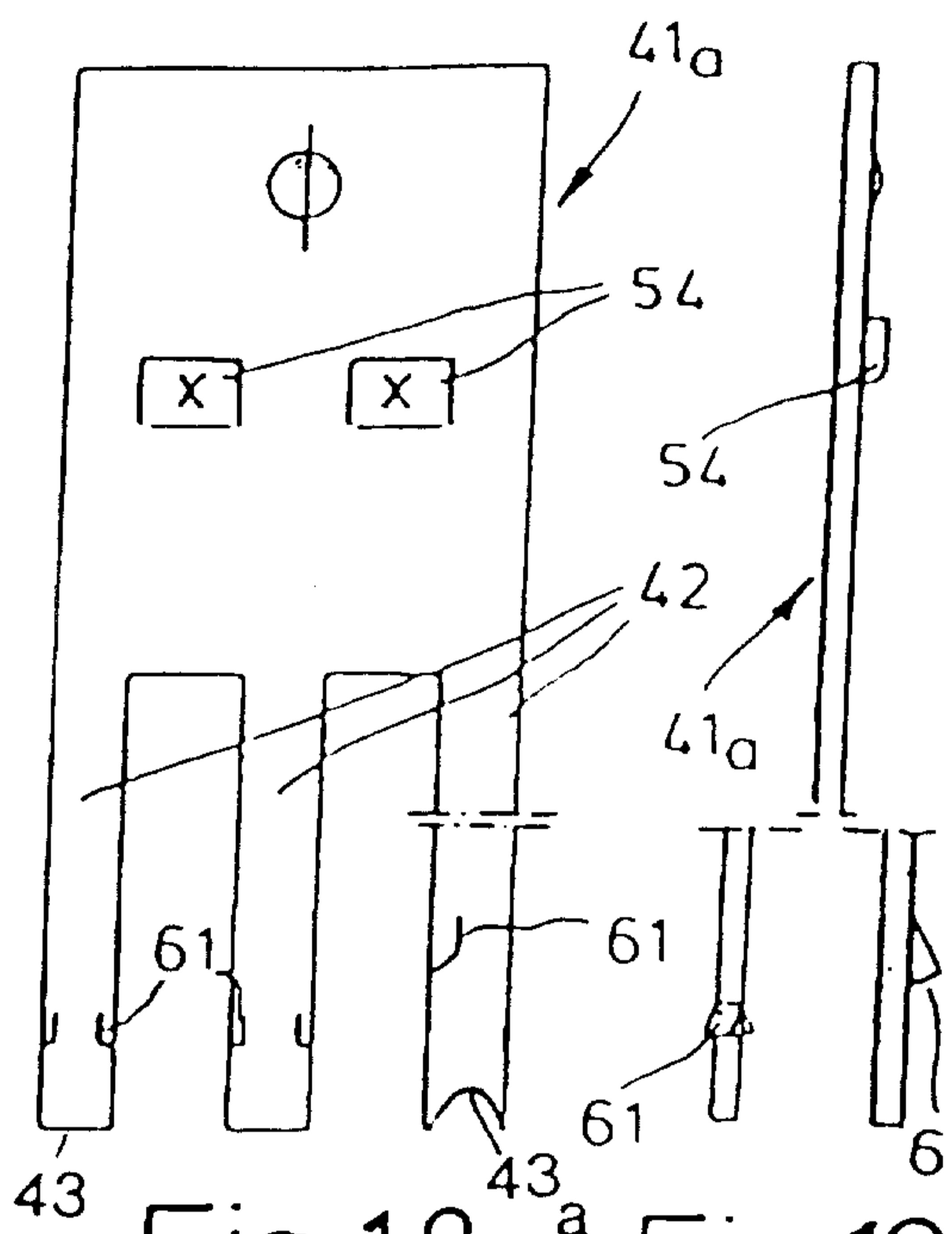


Fig.18

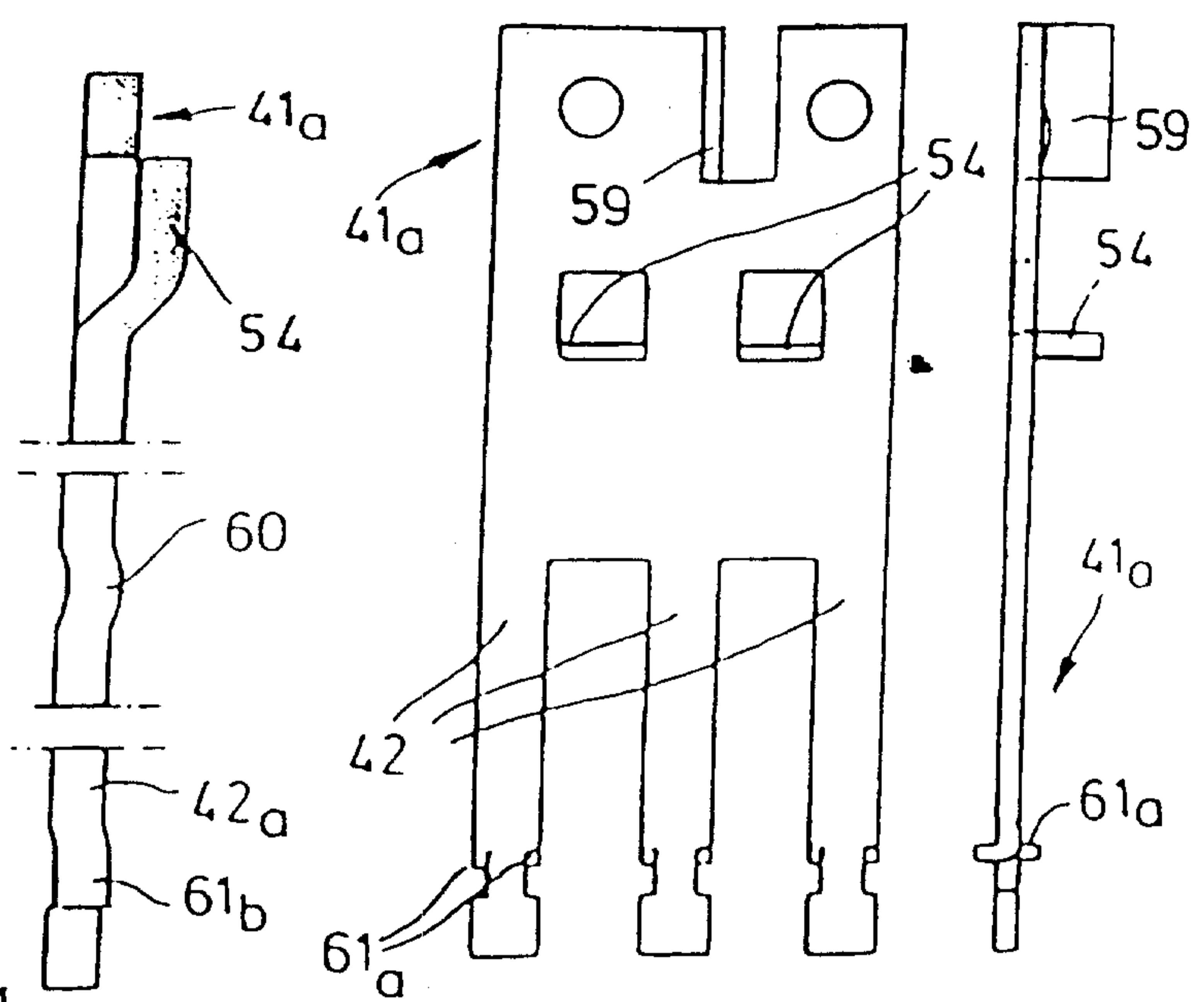


Fig.19

Fig.20

Fig.21

Fig.22

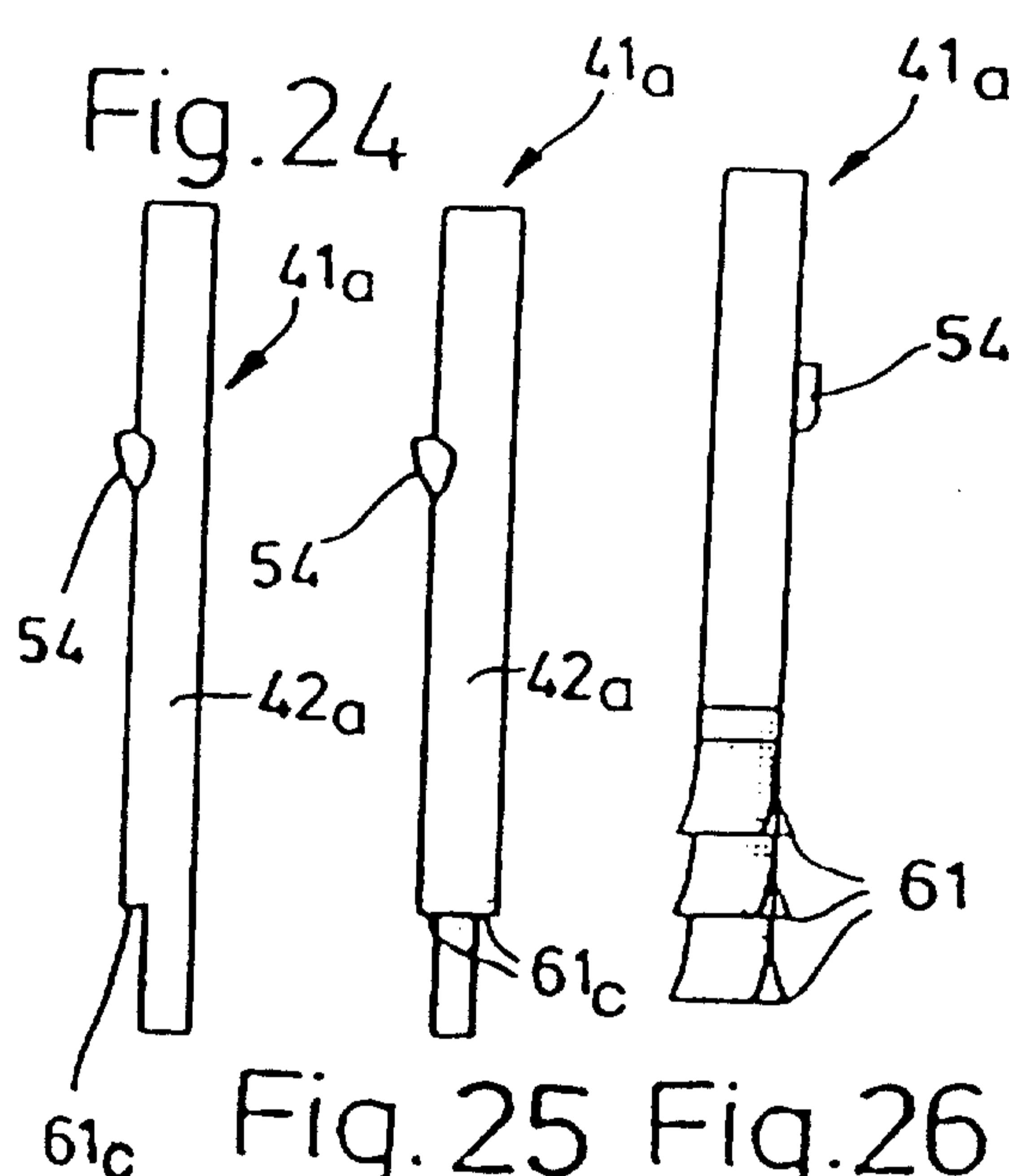


Fig.24

Fig.25 Fig.26

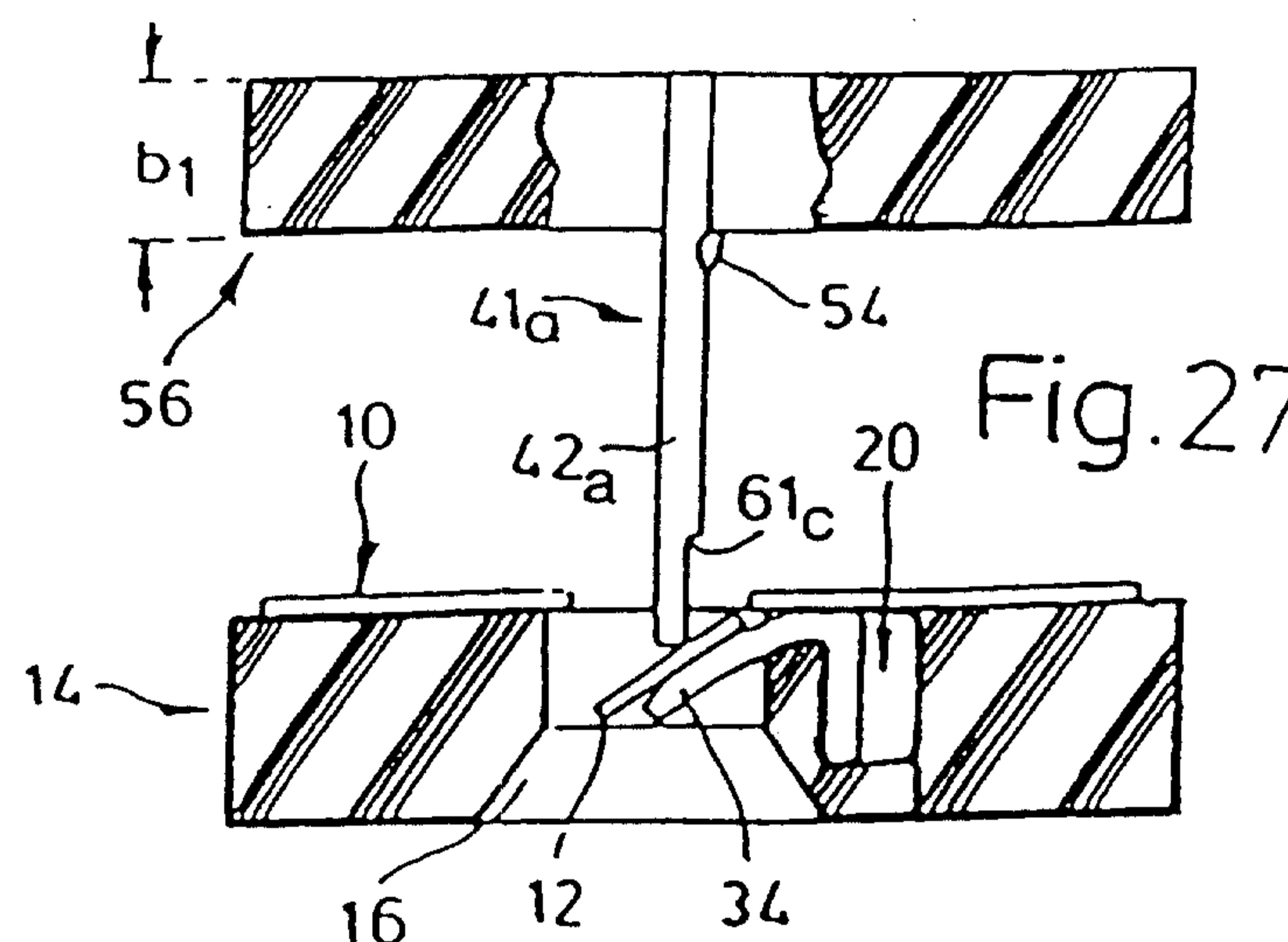


Fig.27

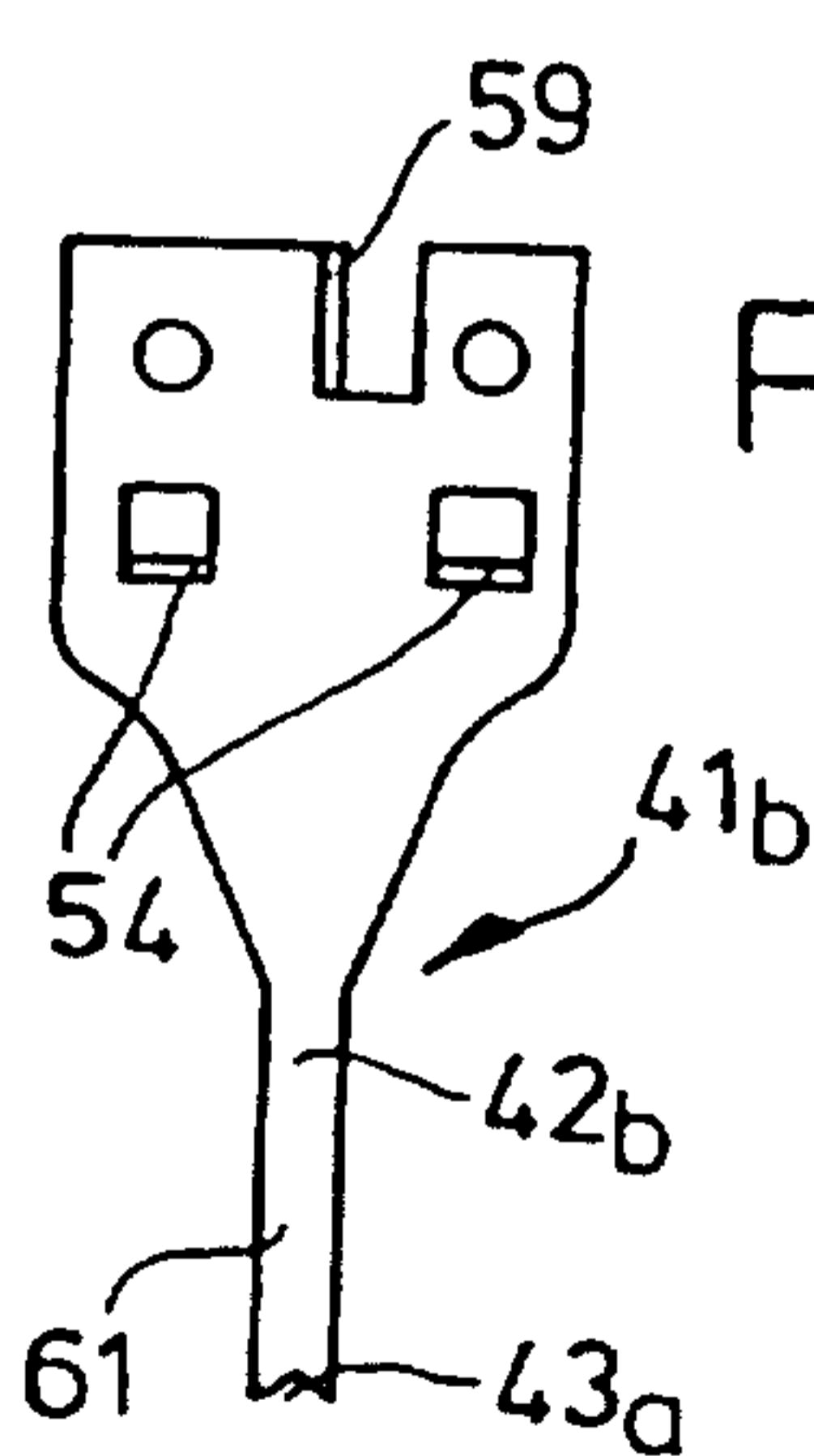


Fig.23

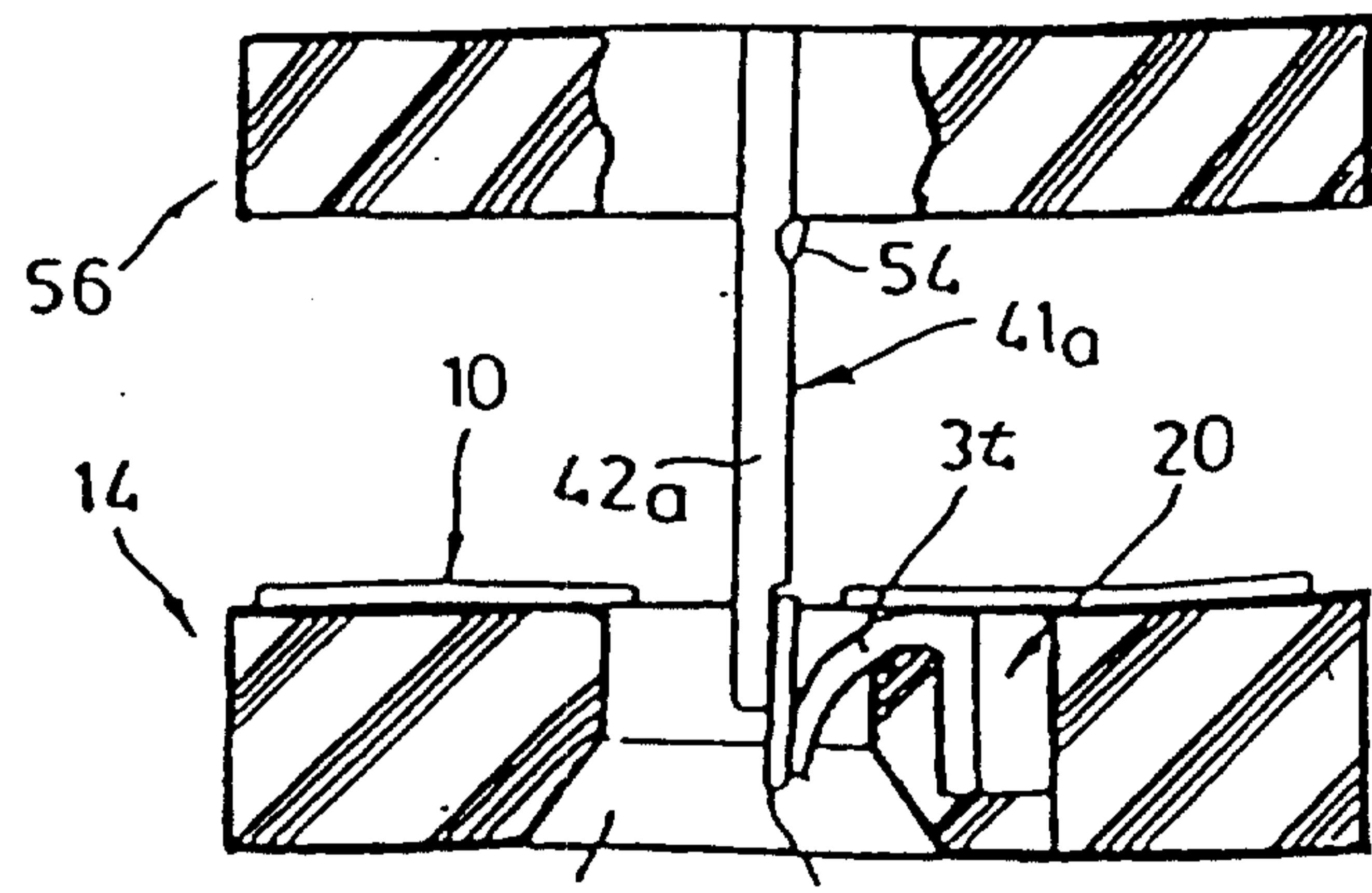


Fig.28

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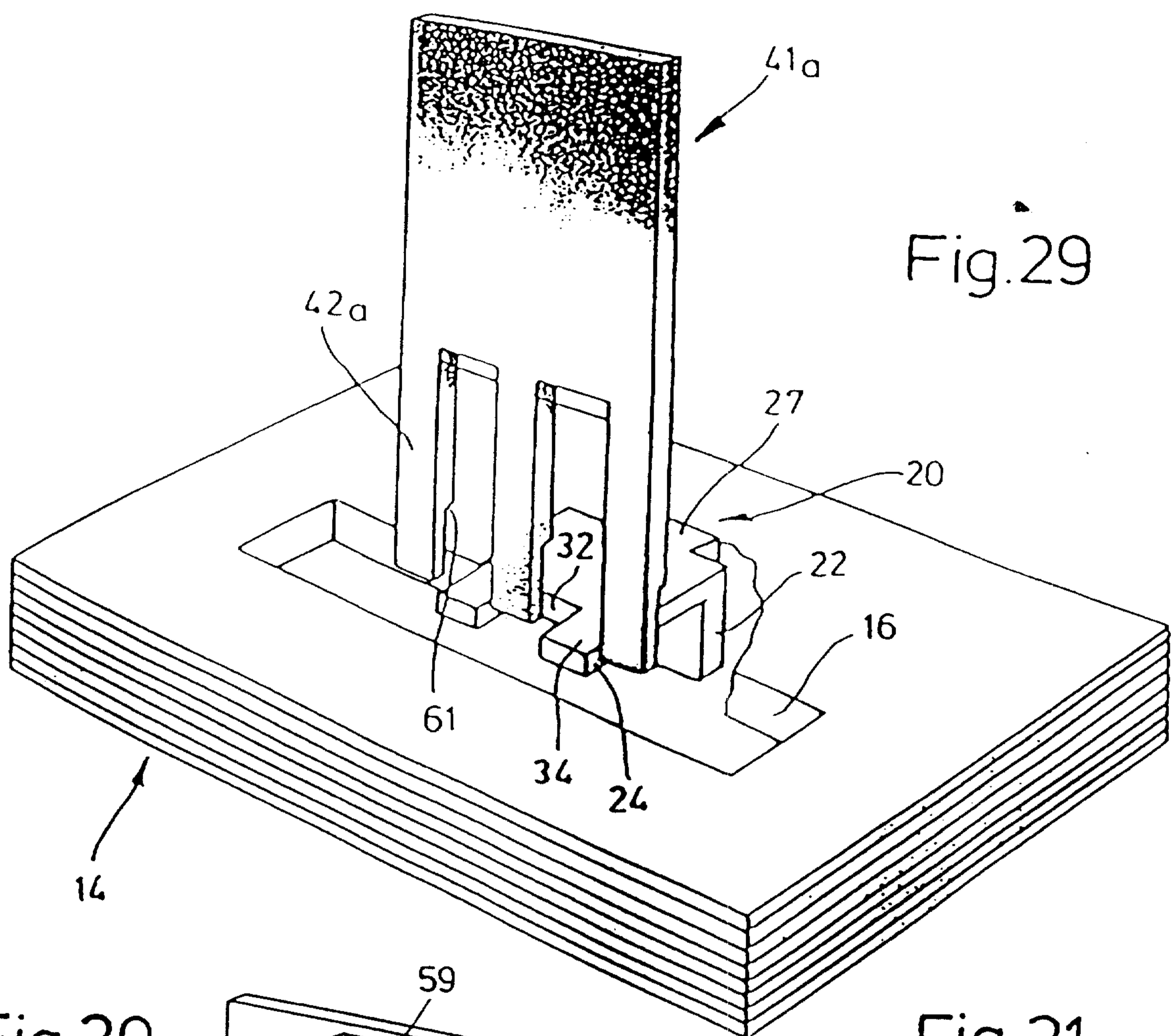


Fig.29

Fig.30

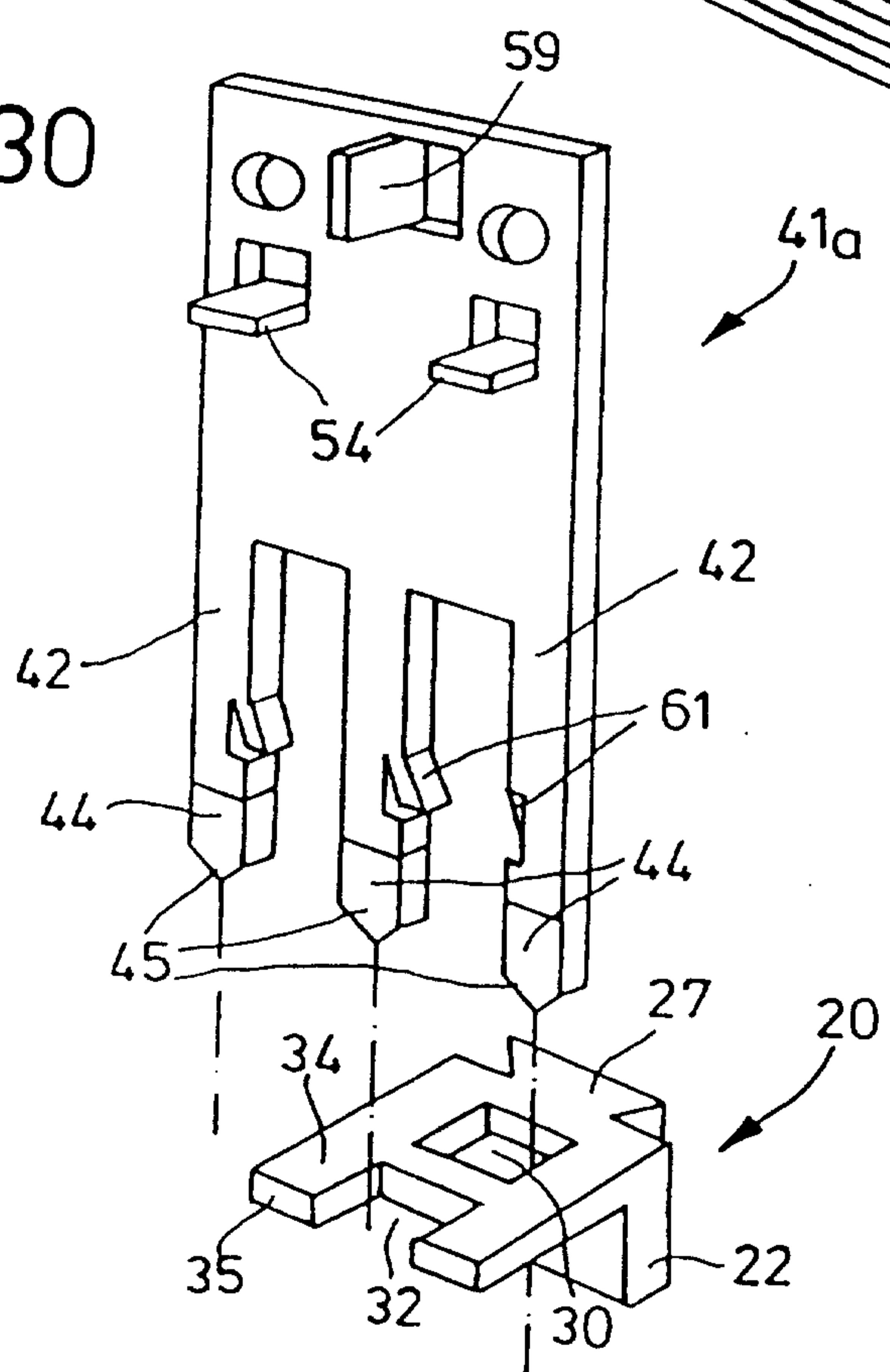
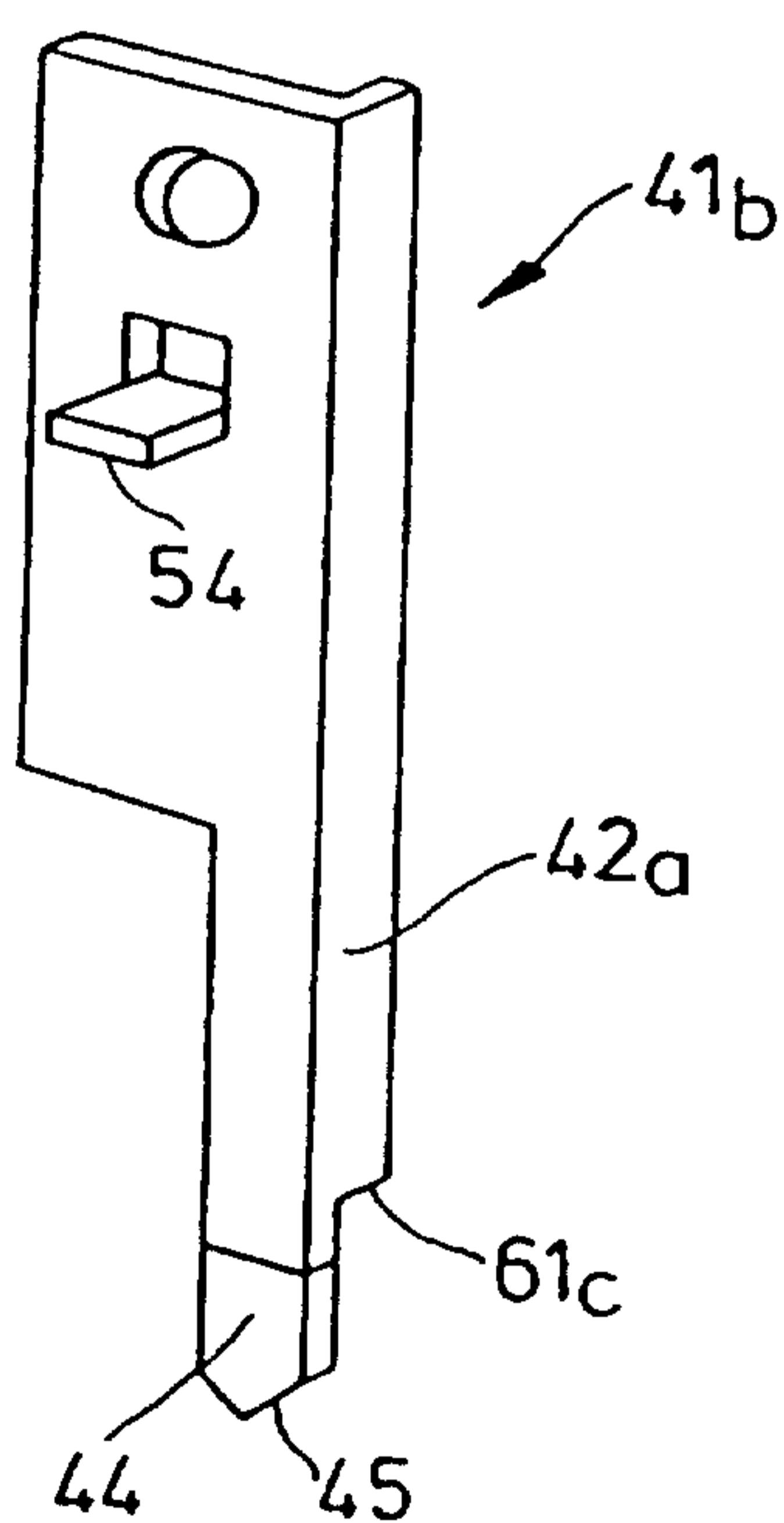


Fig.31



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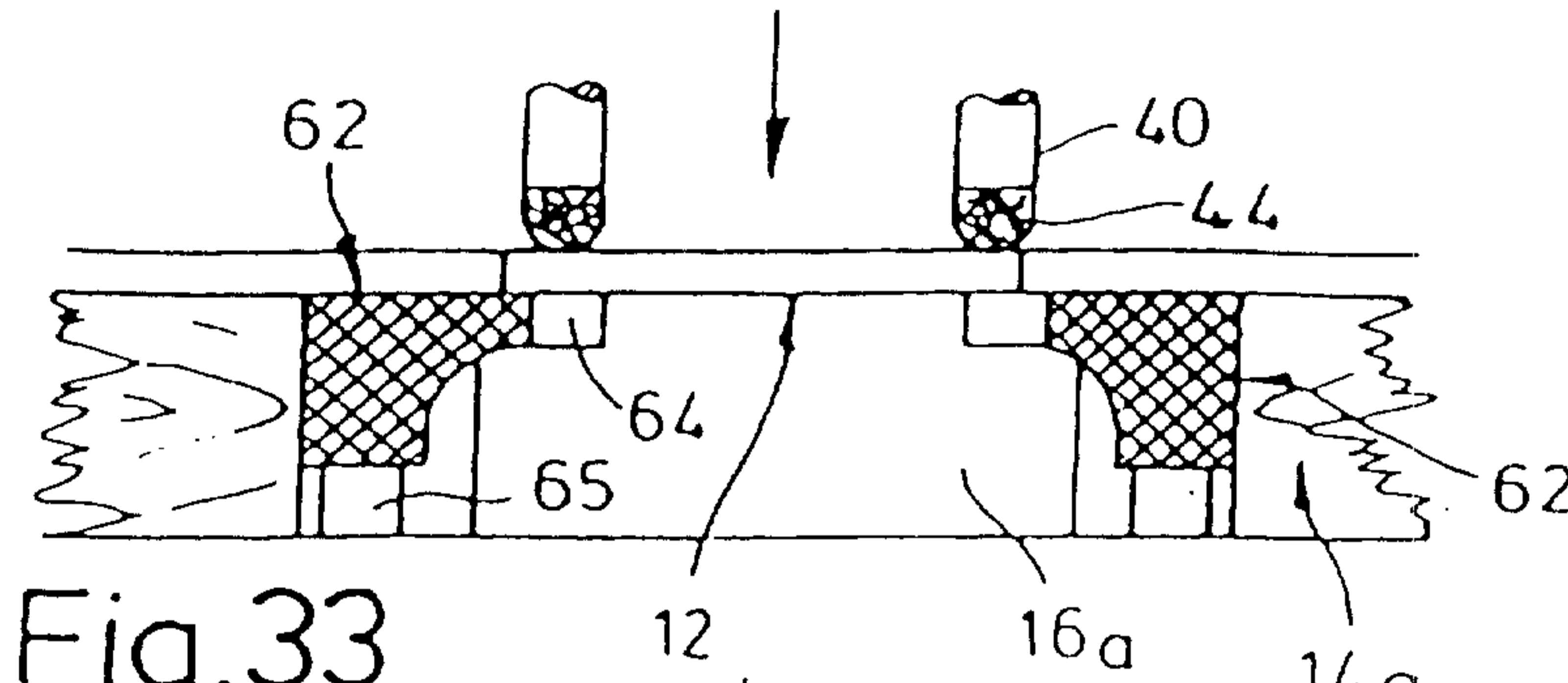


Fig. 33

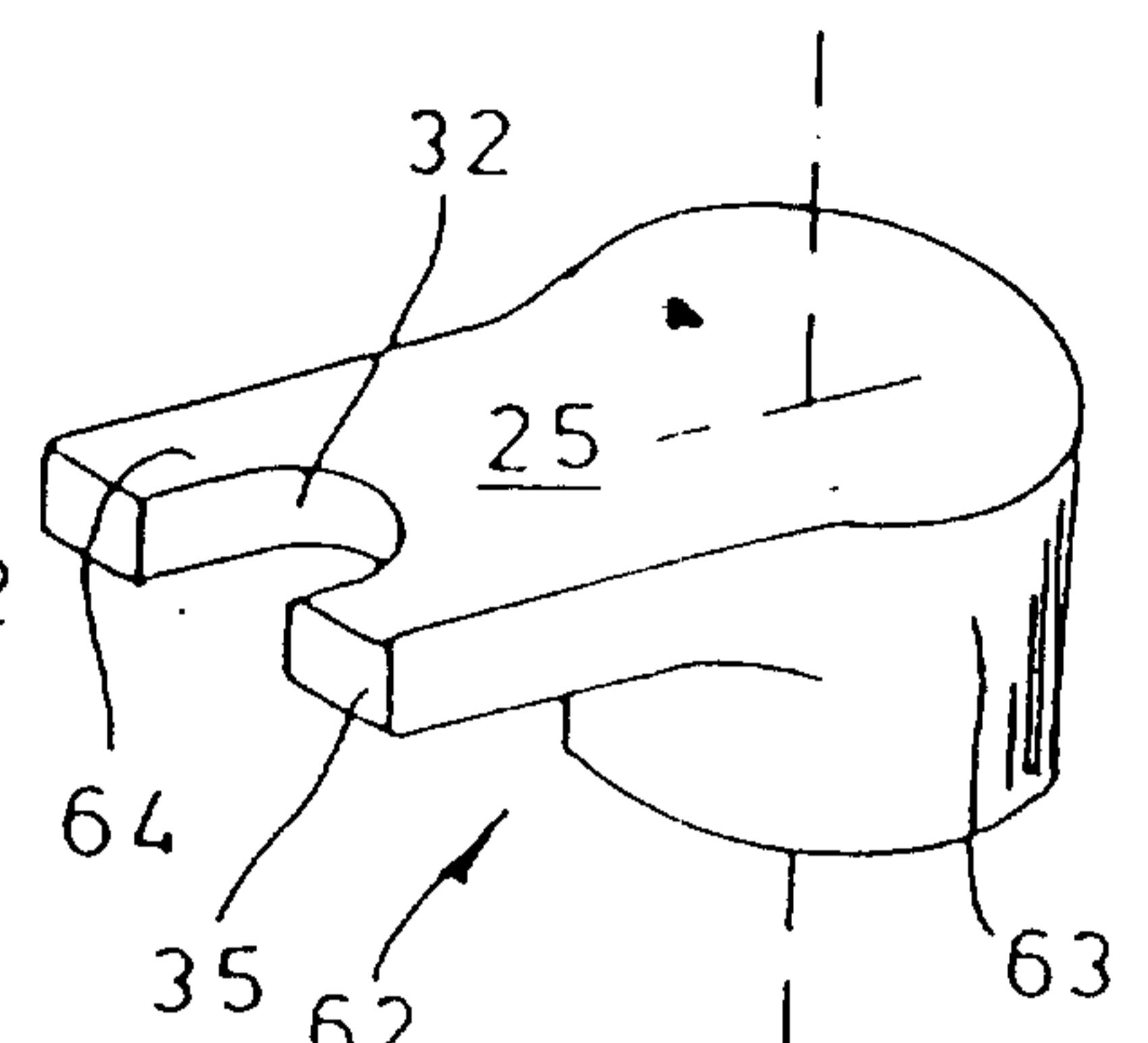


Fig. 32

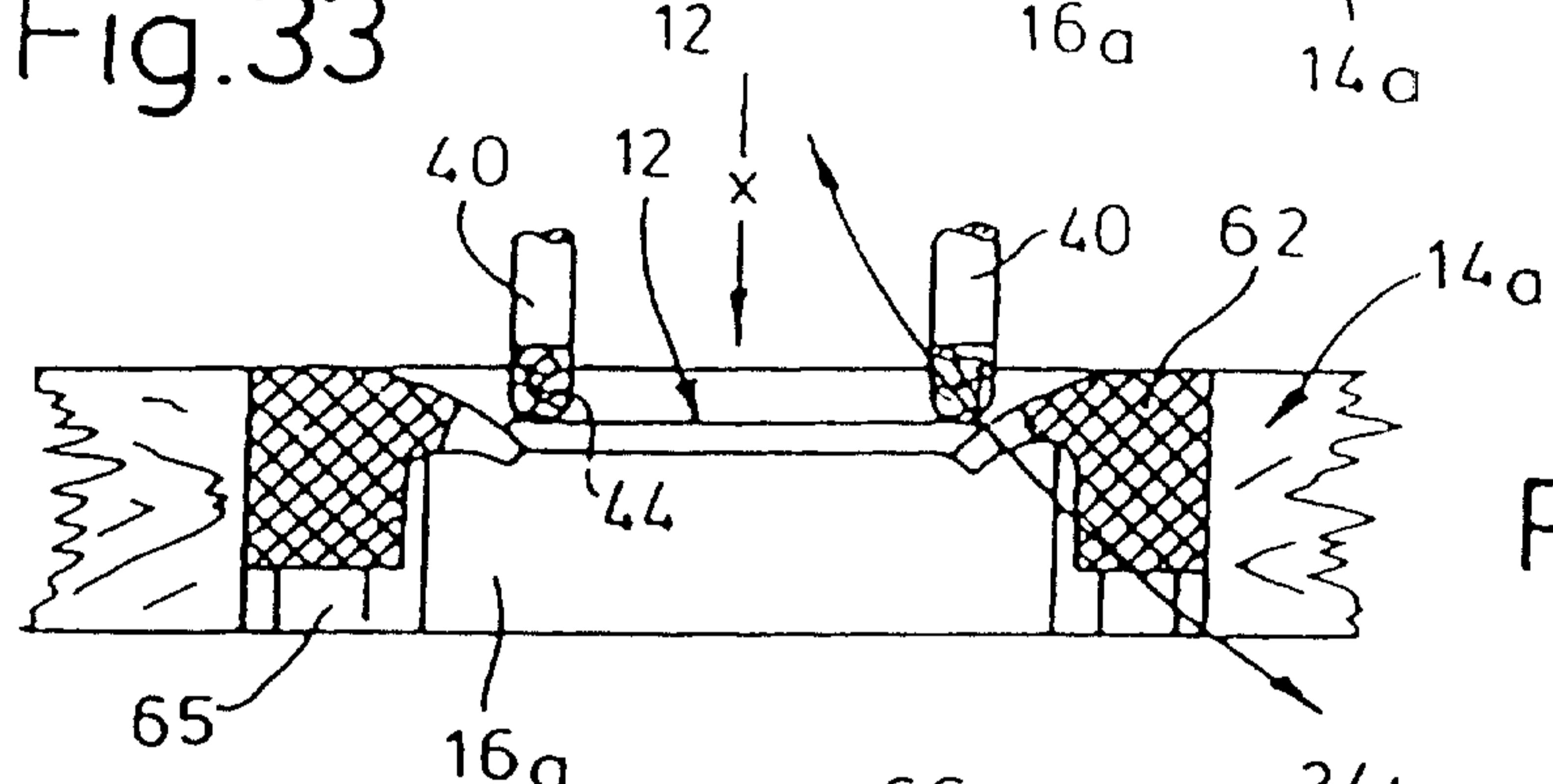


Fig. 34

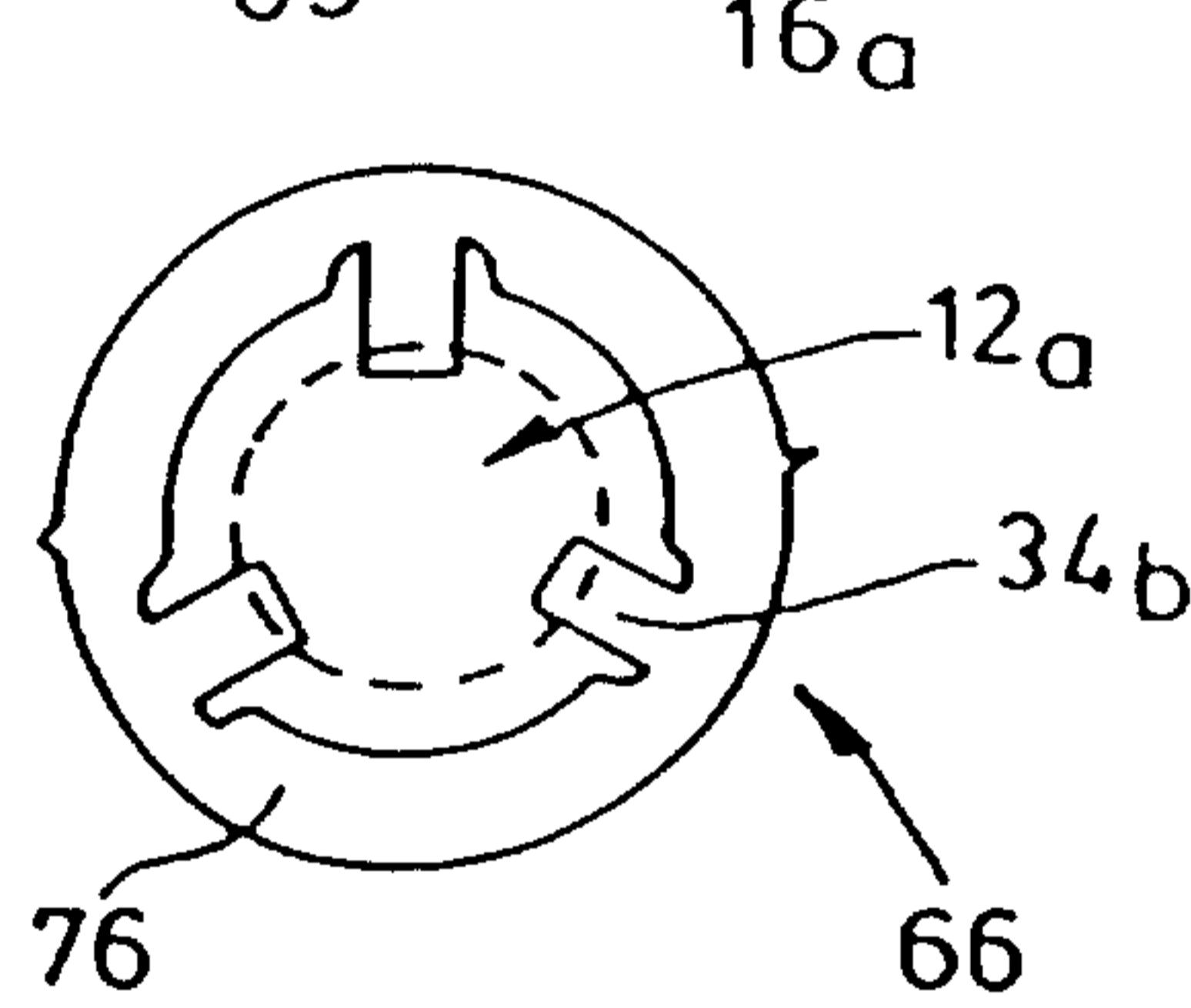


Fig. 35

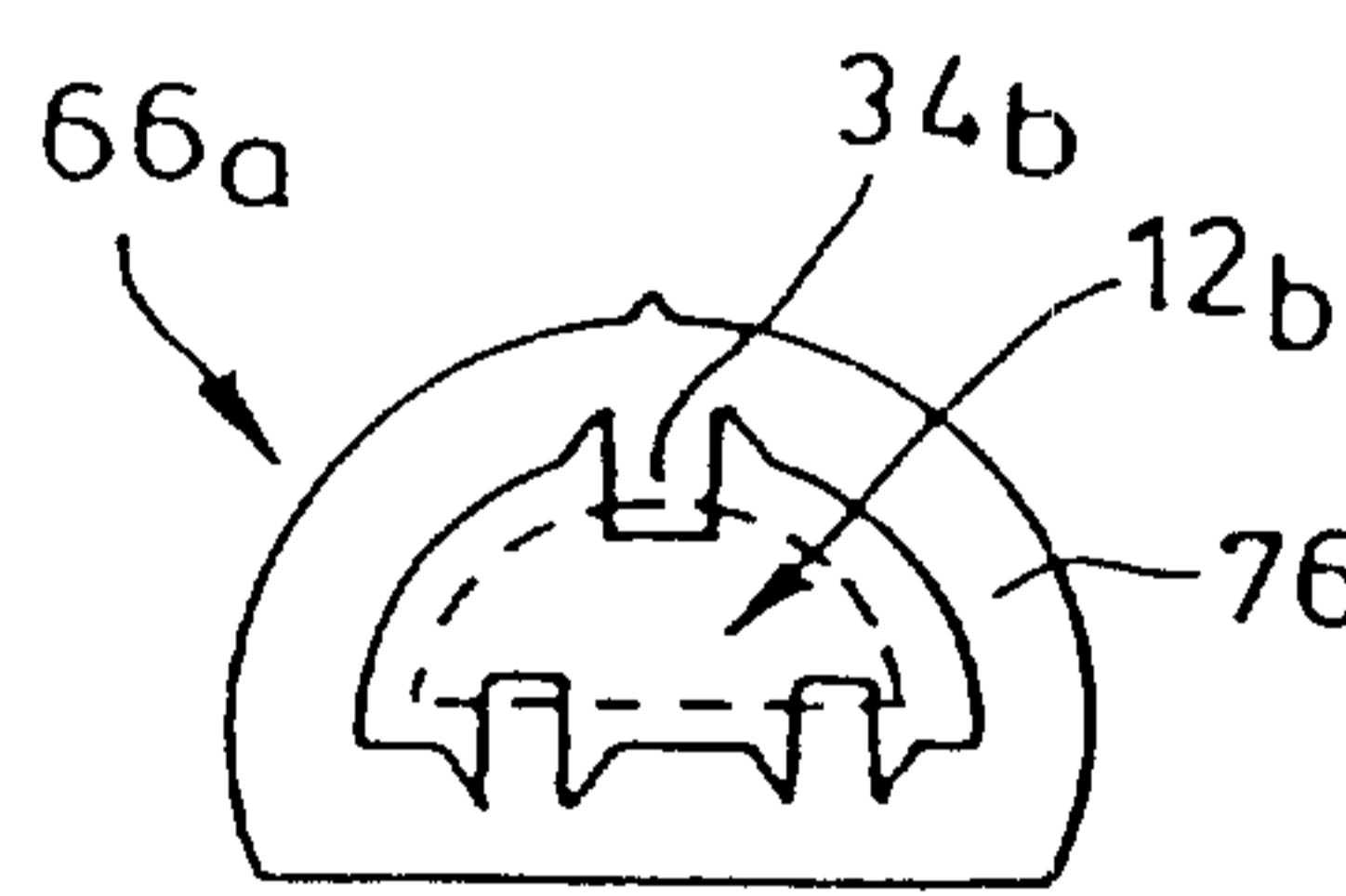


Fig. 36

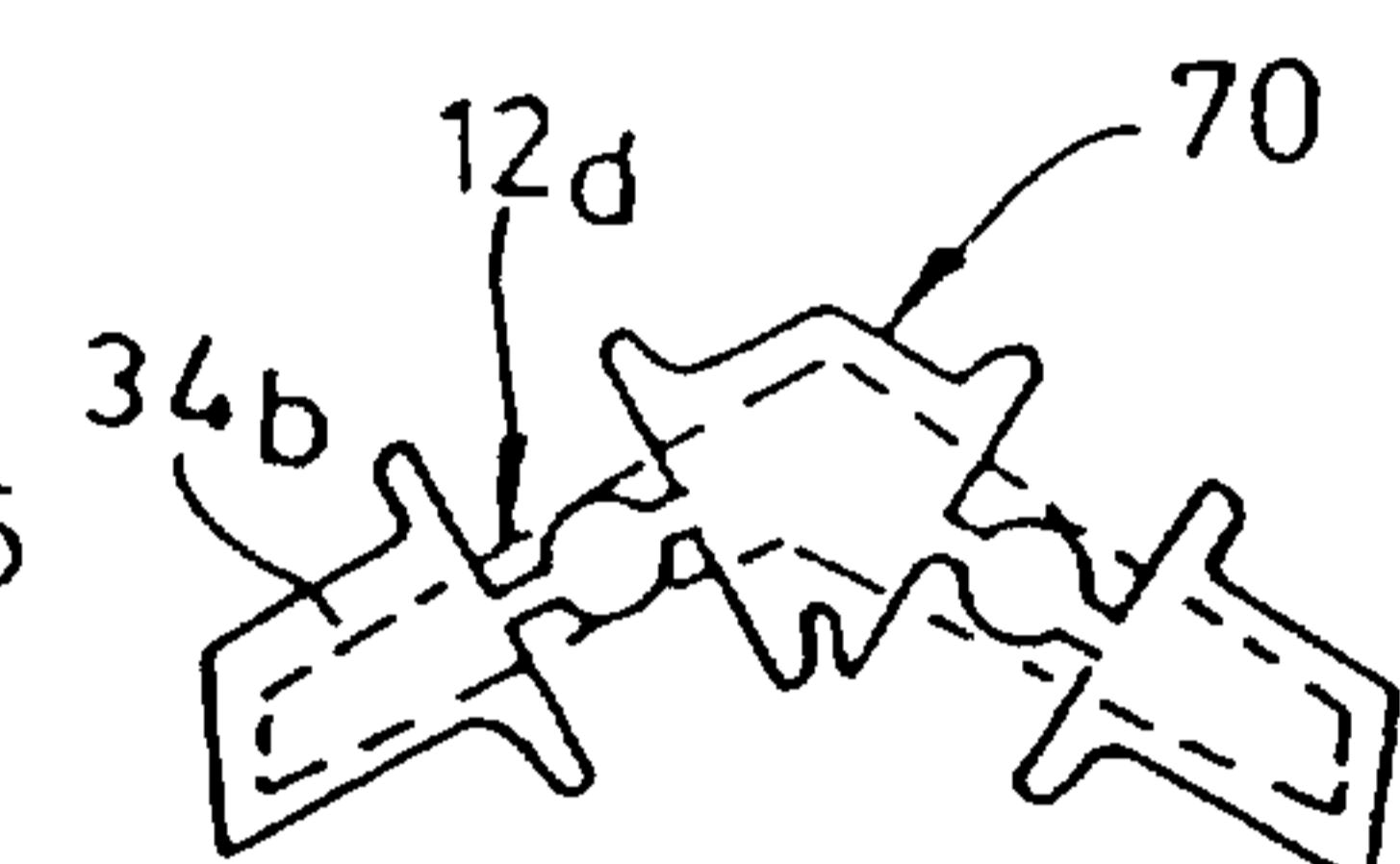


Fig. 37

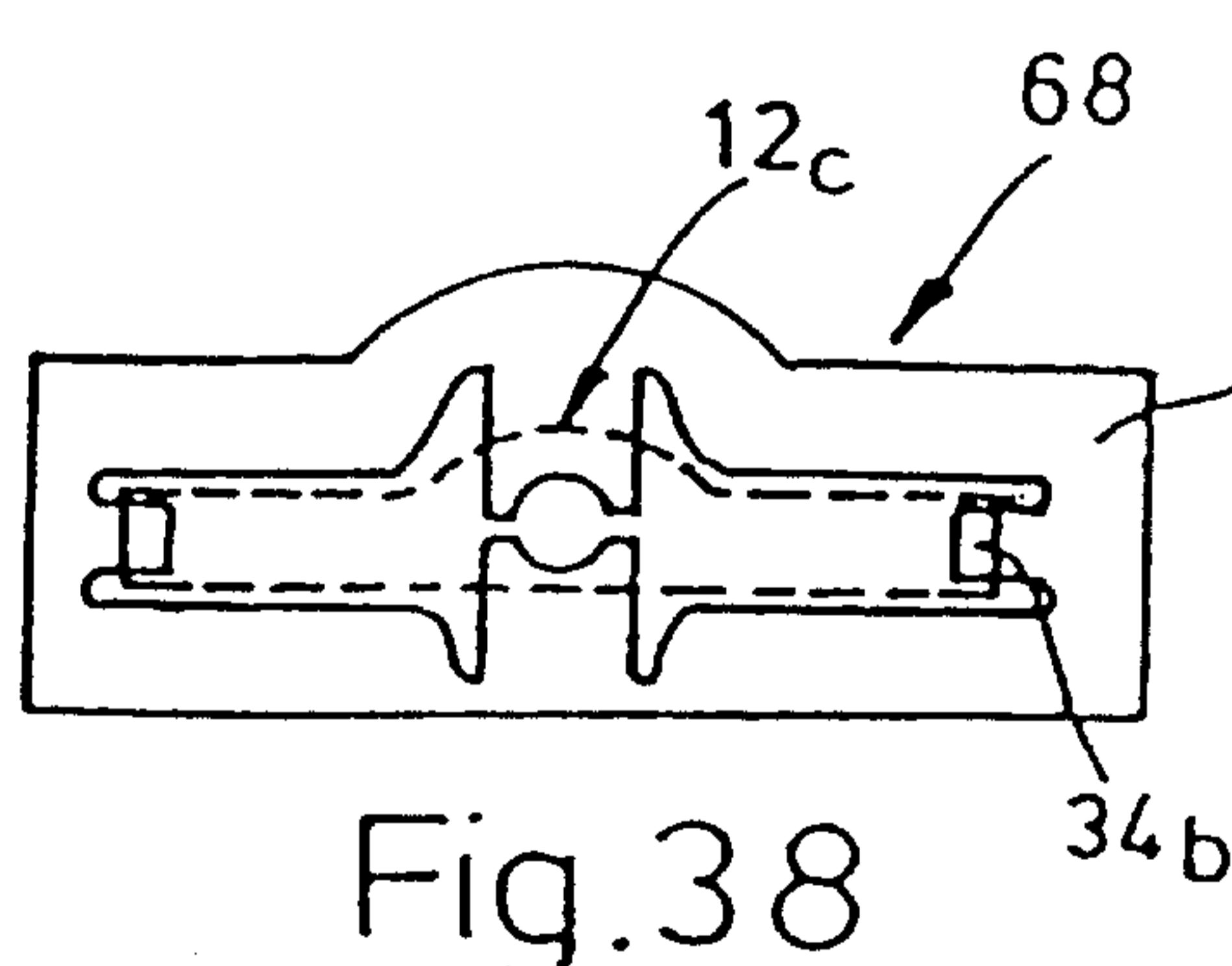


Fig. 38

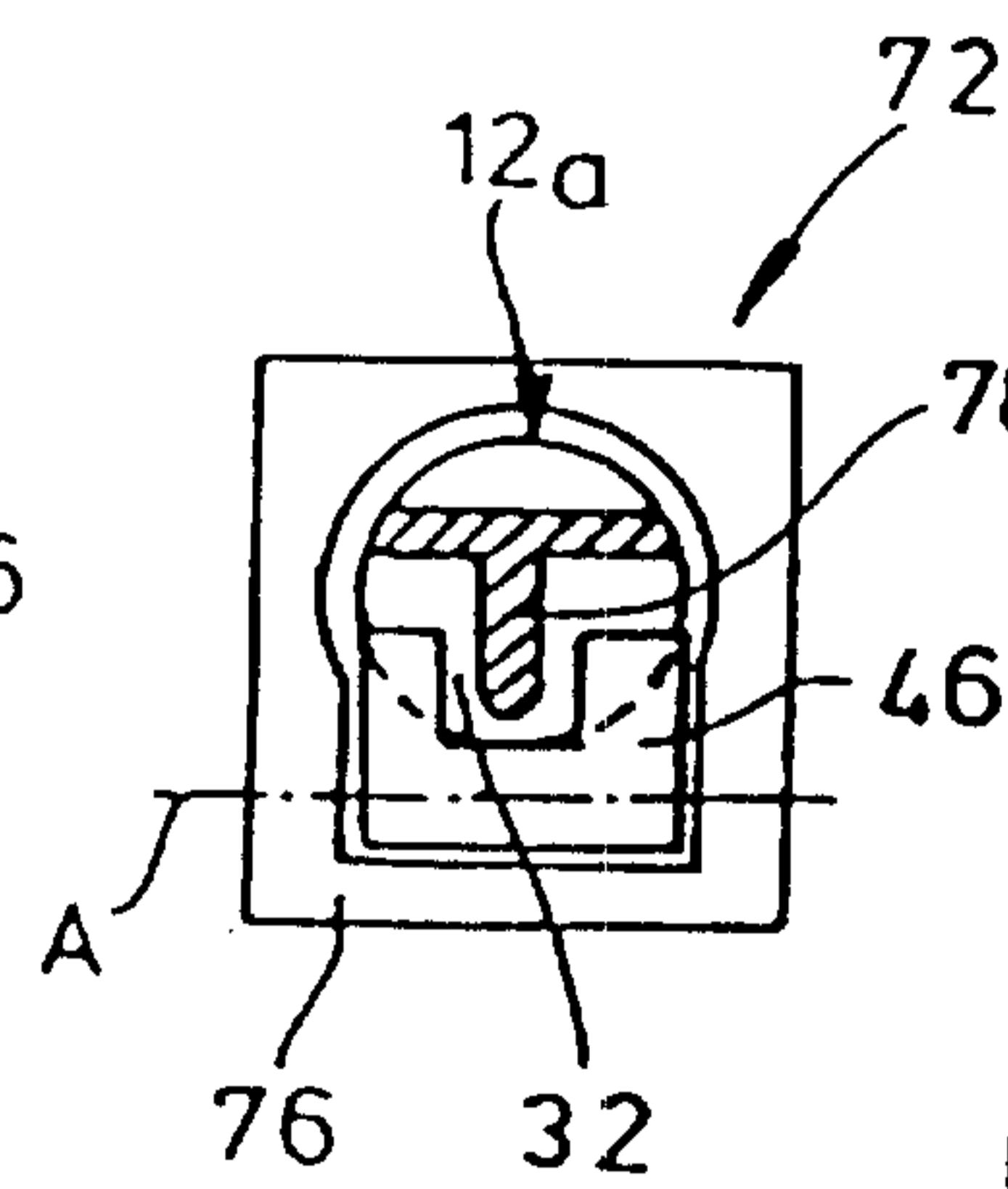
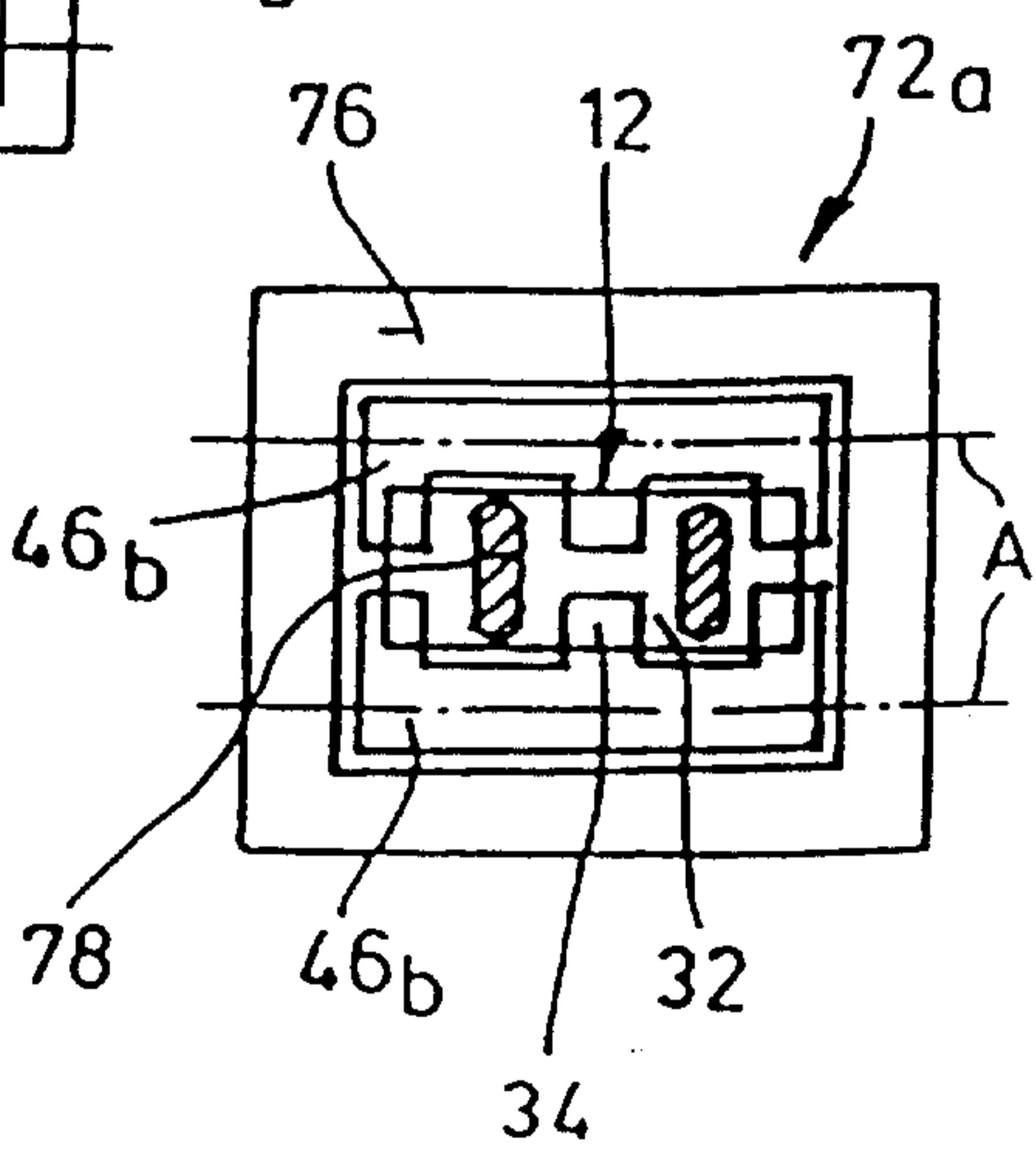


Fig. 39

Fig. 40



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Fig. 41

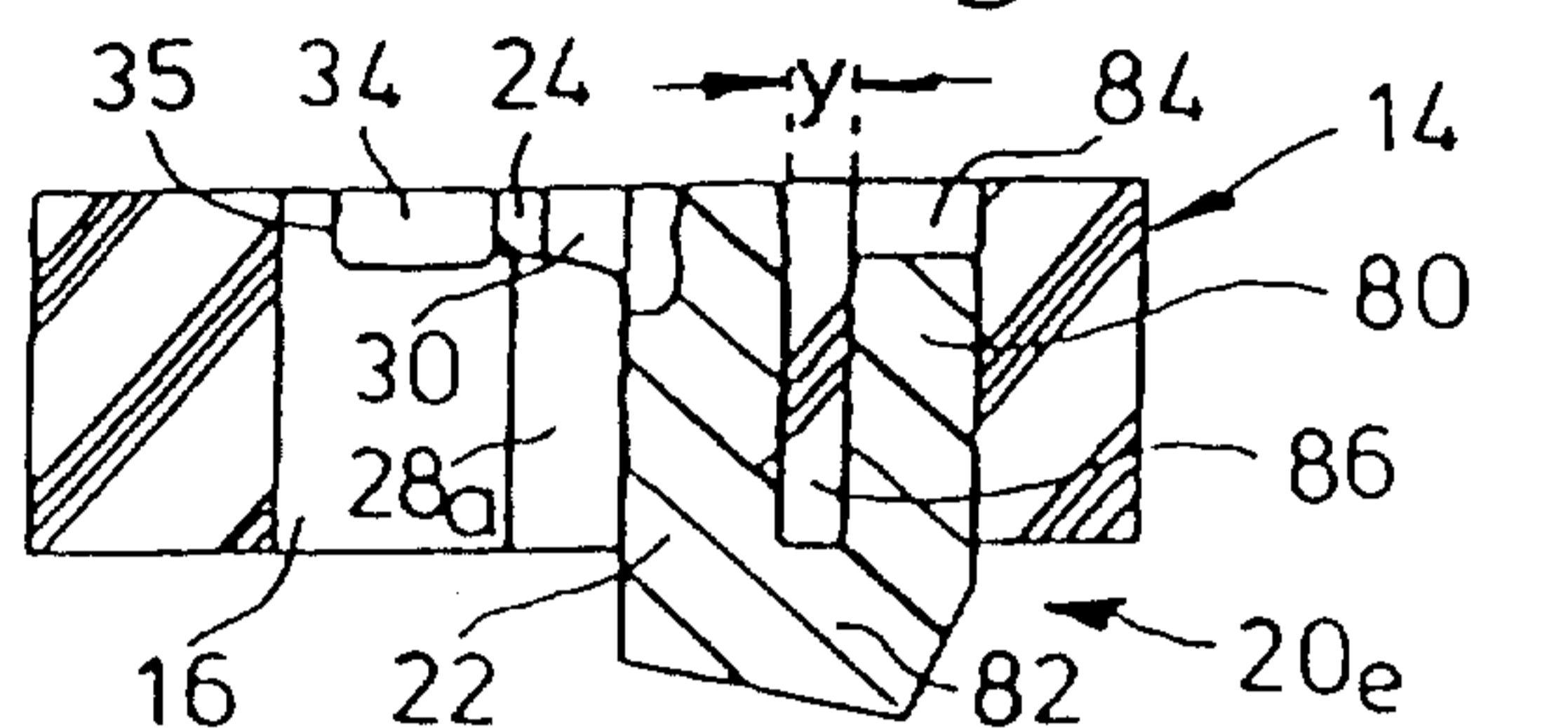


Fig. 43

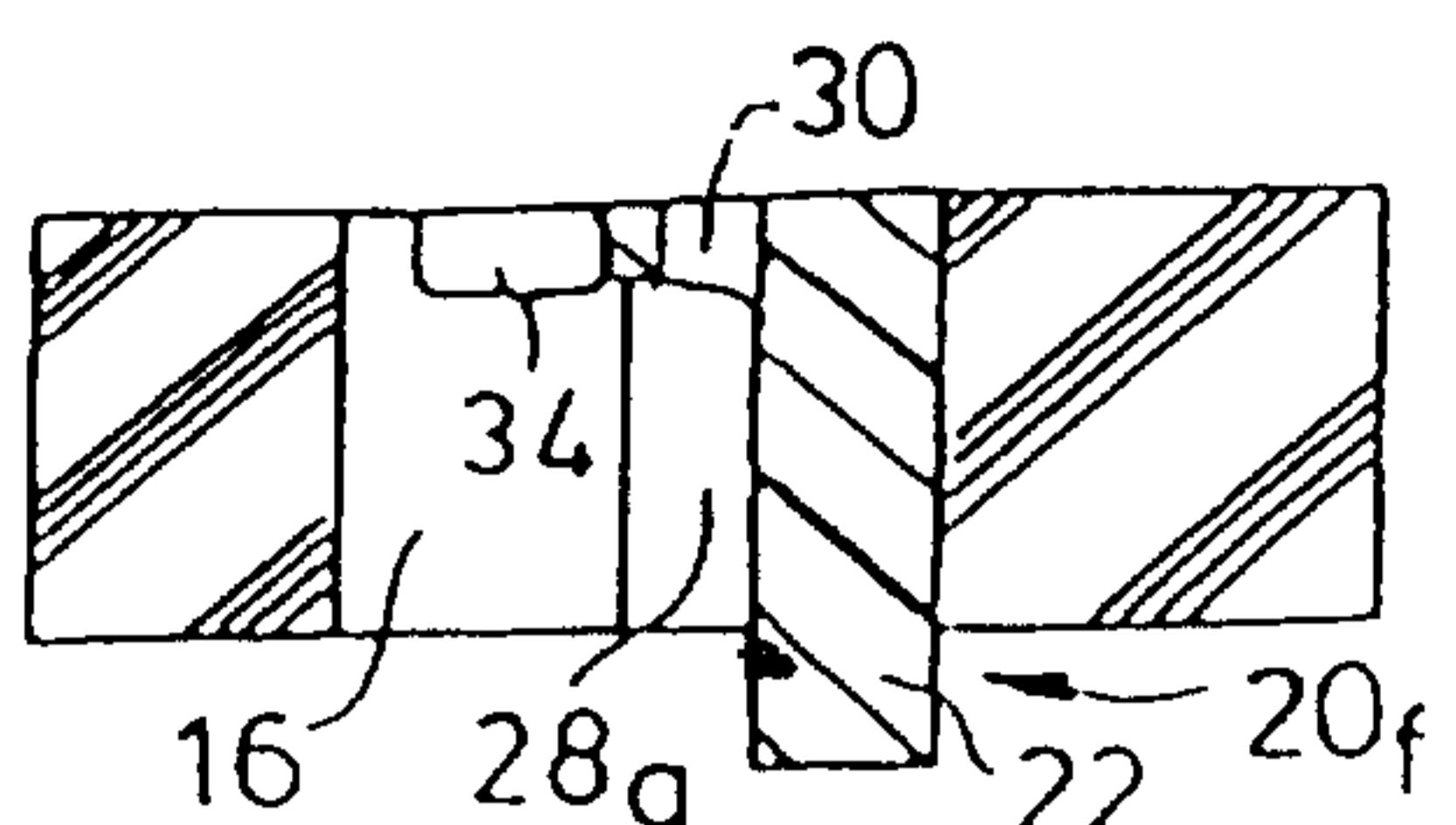


Fig. 44

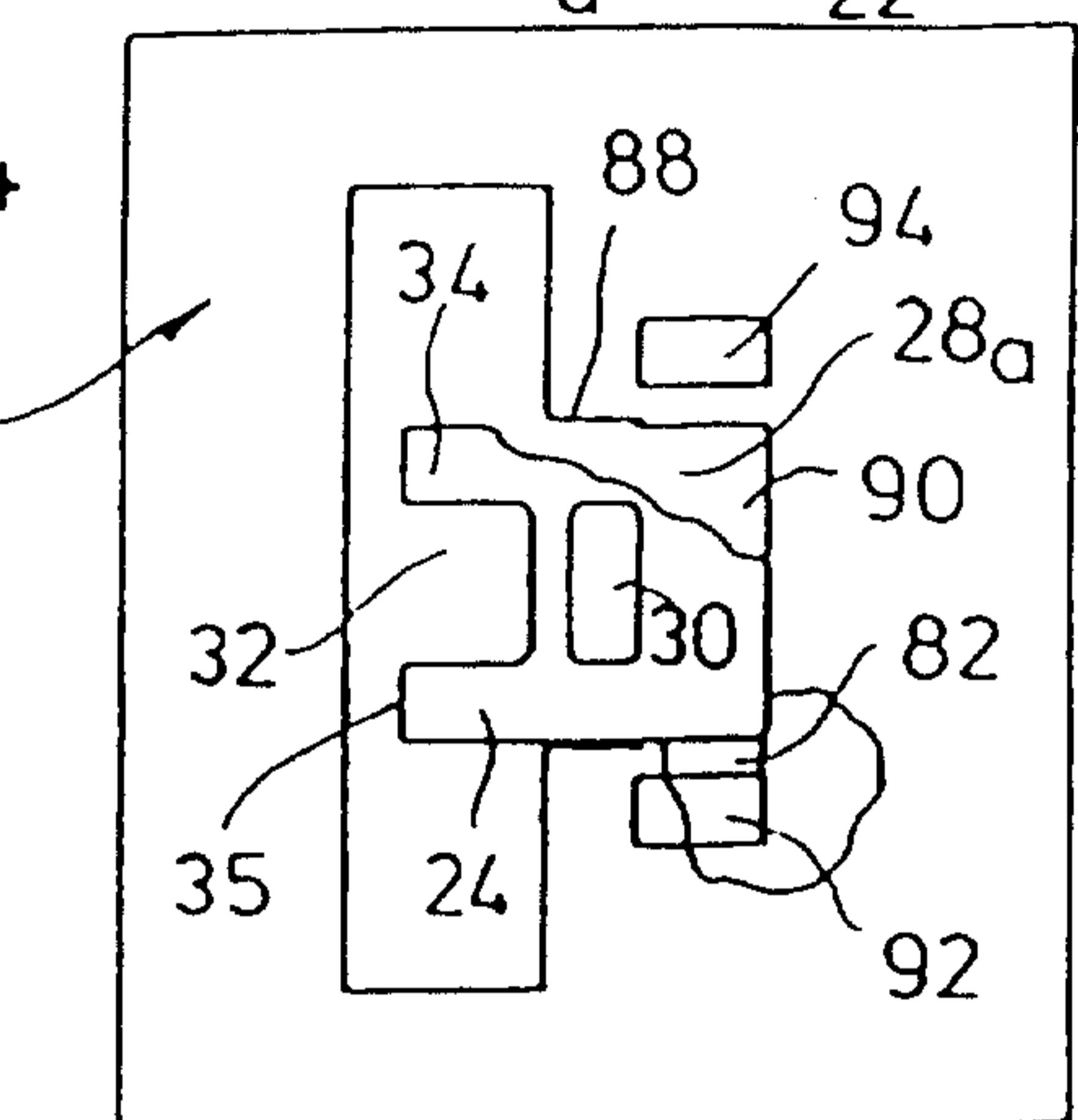


Fig. 42

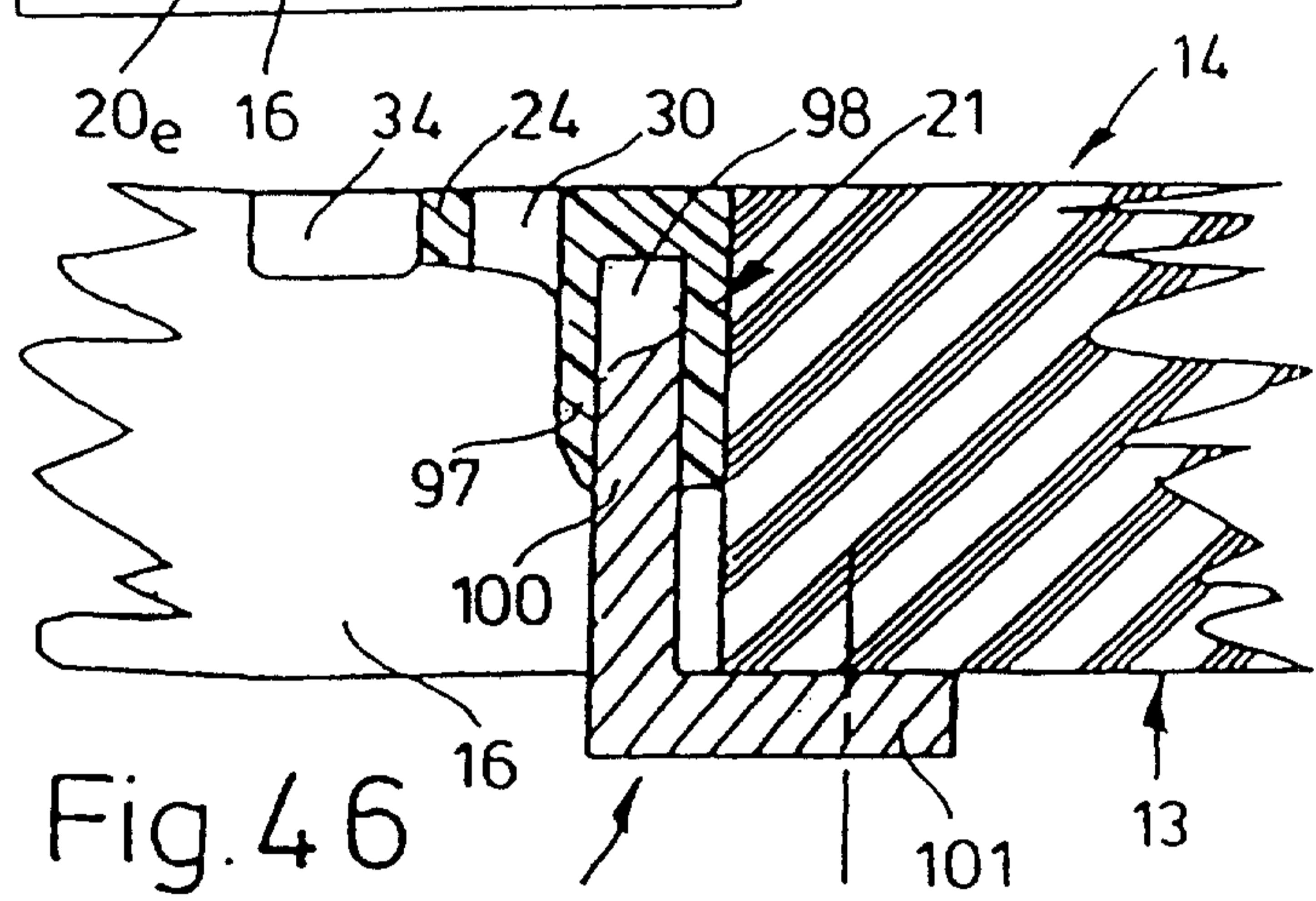
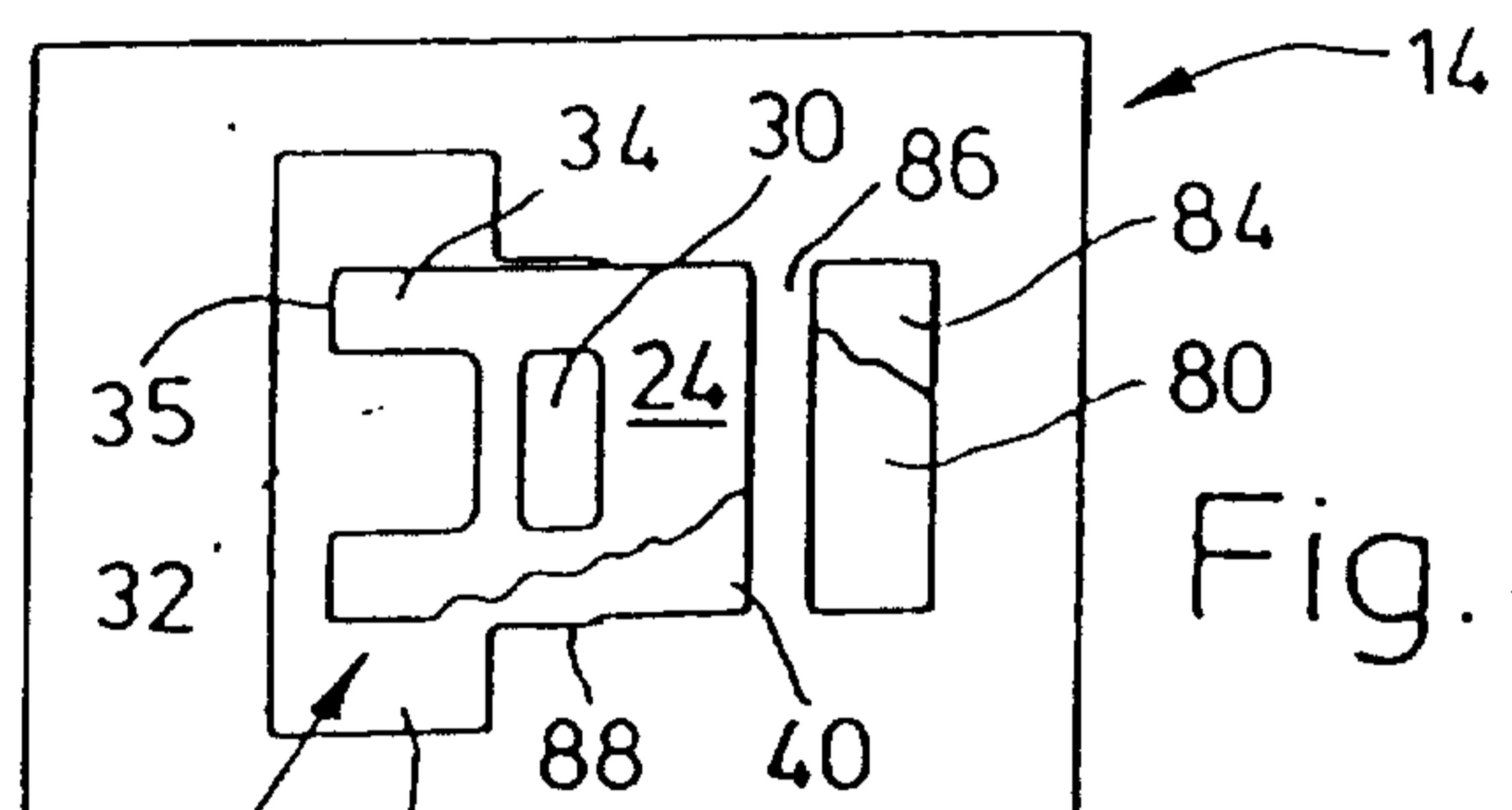


Fig. 46

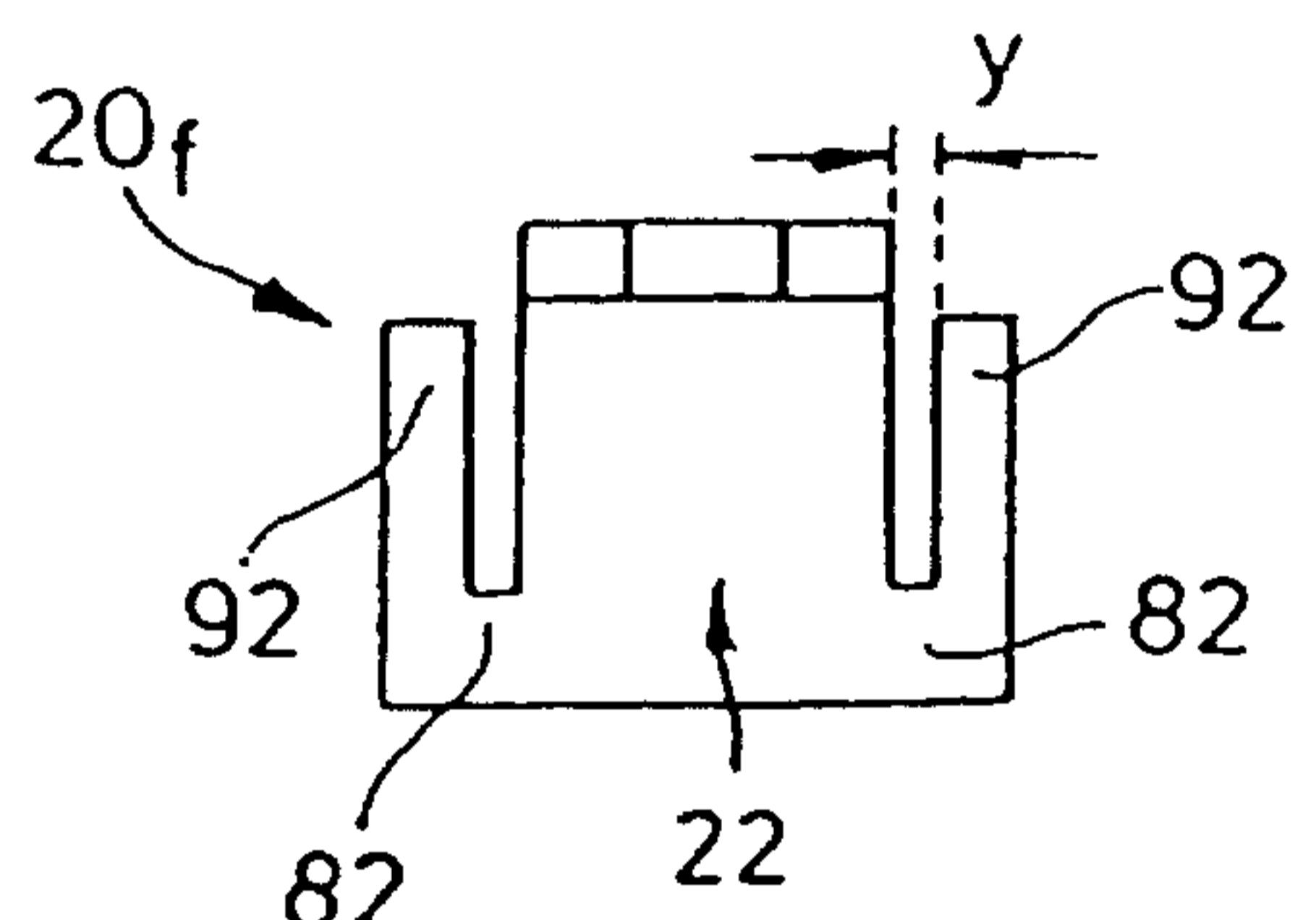


Fig. 45

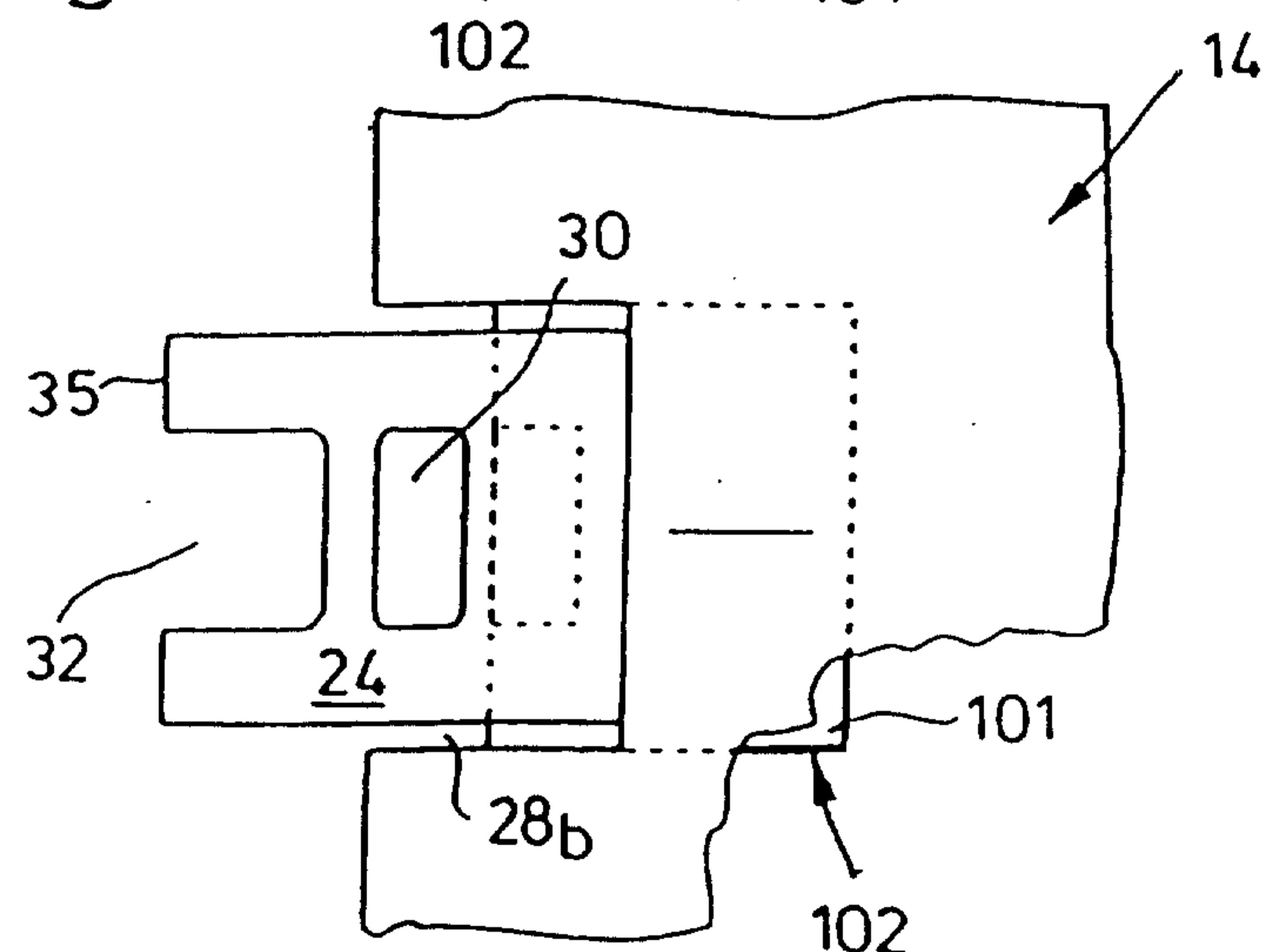


Fig. 47

Fig. 48

