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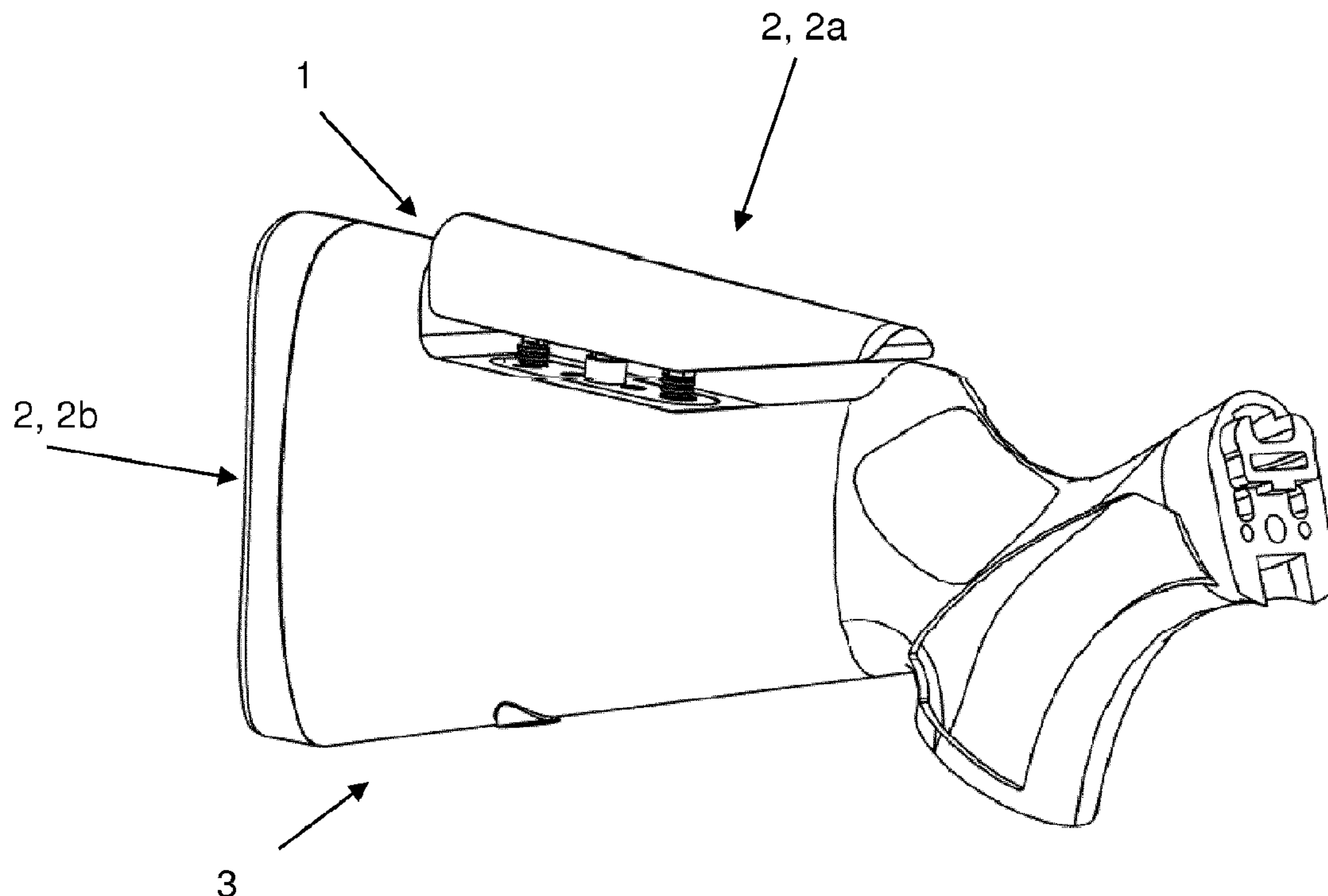


Fig. 1

(57) Abrégé/Abstract:

Adjusting device (1) for an adjustable rest (2, 2a, 2b) for a rifle stock (3), comprising: a first portion (4) adapted to be fixedly arranged to the rifle stock (3), an adjusting portion (5) adapted to be releasably engaged with the first portion (4) and movable between an engaged, locking position and a disengaged, release position upon actuation of the adjusting portion (5), wherein the adjusting portion (5) is adjustable in relation to the first portion (4) in a release position, and wherein the adjusting portion is locked in relation to the first portion (4) in the locking position, wherein the adjusting portion (5) is adapted to be fixedly arranged to the adjustable rest (2, 2a, 2b).

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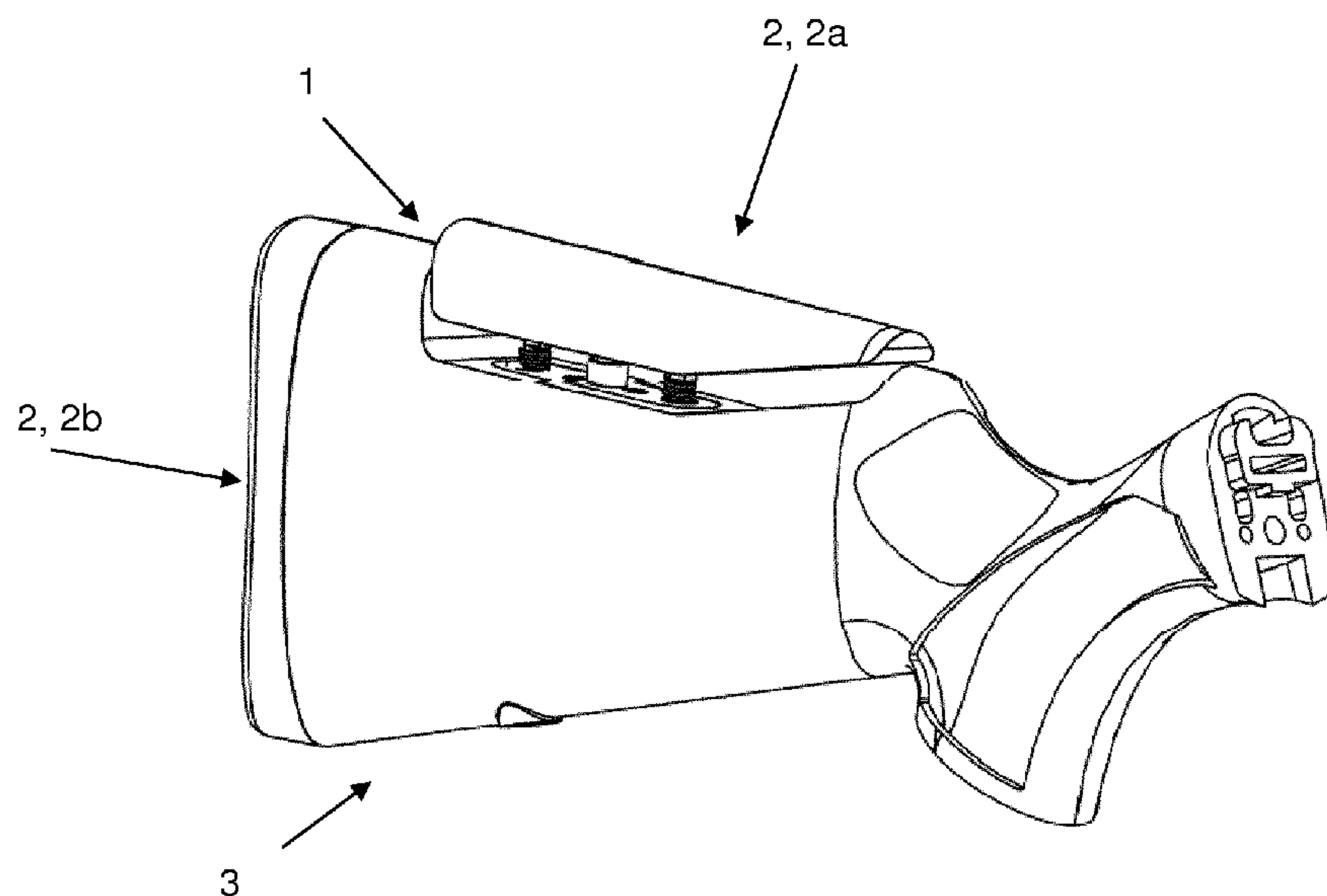


Fig. 1

(57) Abstract: Adjusting device (1) for an adjustable rest (2, 2a, 2b) for a rifle stock (3), comprising: a first portion (4) adapted to be fixedly arranged to the rifle stock (3), an adjusting portion (5) adapted to be releasably engaged with the first portion (4) and movable between an engaged, locking position and a disengaged, release position upon actuation of the adjusting portion (5), wherein the adjusting portion (5) is adjustable in relation to the first portion (4) in a release position, and wherein the adjusting portion is locked in relation to the first portion (4) in the locking position, wherein the adjusting portion (5) is adapted to be fixedly arranged to the adjustable rest (2, 2a, 2b).

WO 2017/144701 A1

ADJUSTING DEVICE FOR AN ADJUSTABLE REST FOR A RIFLE STOCK

Technical field

[0001] The present invention relates generally to an adjusting device for an adjustable rest for a rifle stock.

Background art

[0002] It is known to use adjusting mechanisms for cheek rests for rifle stocks that comprises a separate adjusting handle, button or knob for releasing and locking the cheek rest in relation to the rifle stock. Such adjusting knob is arranged on the side of the rifle stock and enters the interior and the locking portion of the cheek rest of the rifle stock via a hole in the side of the rifle stock.

[0003] A number of drawbacks exist with the known art. For instance, a separate adjusting knob is required which adds to the cost of the adjusting mechanism. Additionally, the work required to manufacture or retrofit an existing rifle including the preparation of a hole adds to the time and cost. Further a protruding adjusting knob is exposed to the elements and susceptible to wear and physical breakage. There is a risk that unwanted objects get entangled in the knob and that dirt enters via the hole in the rifle stock. The knob further reduces the visible appearance of the rifle stock, as well as it may impair the ergonomics of the rifle stock.

Summary of invention

[0004] It is an object of the invention to address at least some of the drawbacks, limitations, problems and issues outlined above. It is also an object to provide an adjusting device for an adjustable rest for a rifle stock which reduces time and cost for manufacturing and retrofitting. A further object is to provide an adjusting device for an adjustable rest for a rifle stock which is less susceptible to breakage and exposure to dirt. Another object is to provide an adjusting device for an adjustable rest for a rifle stock which is more ergonomic and visually attractive. A further object is to provide an adjusting device for an adjustable rest for a rifle stock which is more robust and provides reduced play in a release position and during

adjustment. A further object is to provide an adjusting device for an adjustable rest for a rifle stock which is more robust and secure and reduces the risk of unwanted release from the rifle stock during a recoil of a rifle.

[0005] According to one embodiment, an adjusting device for an adjustable rest for a rifle stock is provided, comprising: a first portion adapted to be fixedly arranged to the rifle stock, an adjusting portion adapted to be releasably engaged with the first portion and movable between an engaged, locking position and a disengaged, release position upon actuation of the adjusting portion, wherein the adjusting portion is adjustable in relation to the first portion in a release position, and wherein the adjusting portion is locked in relation to the first portion 4 in the locking position, wherein the adjusting portion is adapted to be fixedly arranged to the adjustable rest.

[0006] According to one embodiment, an adjusting device for an adjustable rest for a rifle stock is provided, comprising: a first portion adapted to be fixedly arranged to the rifle stock, an adjusting portion adapted to be releasably engaged with the first portion and rotationally movable around a pivot axis in relation to the first portion between an engaged, locking position and a disengaged, release position upon actuation of the adjusting portion, wherein the adjusting portion is adjustable in relation to the first portion in a direction parallel to the pivot axis in a release position, and wherein the adjusting portion is locked in the direction parallel to the pivot axis in relation to the first portion in the locking position, wherein the adjusting portion is adapted to be fixedly arranged to the adjustable rest.

[0007] According to one embodiment, a biasing device is adapted to force the adjusting portion towards the locking position.

[0008] According to one embodiment, the first portion comprises a first opening a second opening and a third opening, wherein the first opening and second opening comprises respective locking surfaces, wherein the adjusting portion comprises a first locking device comprising a locking surface, wherein the first locking device is adapted to be arranged in the first opening, and further adapted

to releasably engage with the locking surface of the first opening, a second locking device 5b comprising a locking surface wherein the second locking device is adapted to be arranged in the second opening, and further adapted to releasably engage with the locking surface of the second opening, a pivot shaft adapted to be slidably and pivotally arranged in the third opening of the first portion, wherein the centre axis of the pivot shaft forms a pivot axis, wherein the adjusting portion is biased in a locking position, wherein the adjusting portion is adapted to rotate around the pivot axis upon actuation of the adjusting portion, whereby the first locking device 5a disengages from the locking surface of the first opening and the second locking device disengages from the locking surface of the second opening, whereby the adjusting portion moves towards the release position for enabling adjusting of the adjusting portion in relation to the first portion in a direction parallel to the pivot axis.

[0009] According to one embodiment, the first portion comprises a first opening and a second opening, wherein the first opening and second opening comprises respective locking surfaces, wherein the adjusting portion comprises a first locking device comprising a locking surface, wherein the first locking device is adapted to be arranged in the first opening, and further adapted to releasably engage with the locking surface of the first opening, a second locking device comprising a locking surface wherein the second locking device is adapted to be arranged in the second opening, and further adapted to releasably engage with the locking surface of the second opening, wherein the adjusting portion is biased in a locking position, wherein the adjusting portion is adapted to rotate around a pivot axis upon actuation of the adjusting portion, whereby the first locking device disengages from the locking surface of the first opening and the second locking device disengages from the locking surface of the second opening, whereby the adjusting portion moves towards the release position for enabling adjusting of the adjusting portion in relation to the first portion in a direction parallel to the pivot axis.

[0010] According to one embodiment, the first portion comprises a first opening and a second opening, wherein the first opening comprises a locking surface,

wherein the adjusting portion comprises a first locking device comprising a locking surface, wherein the first locking device is adapted to be arranged in the first opening, and further adapted to releasably engage with the locking surface of the first opening, a second locking device comprising a locking surface wherein the second locking device is adapted to be arranged in the second opening, wherein the centre axis of the second locking device forms a pivot axis wherein the adjusting portion is biased in a locking position by a biasing device, wherein the biasing device comprises a biasing portion and a first spring device, wherein the biasing portion is pivotally arranged on the first portion, wherein the biasing portion comprises a locking surface, wherein the second locking device is further adapted to releasably engage with the locking surface, wherein the adjusting portion is adapted to rotate around the pivot axis upon actuation of the adjusting portion, whereby the first locking device disengages from the locking surface of the first opening and the second locking device disengages from the locking surface of the biasing portion, whereby the adjusting portion moves towards the release position for enabling adjusting of the adjusting portion in relation to the first portion in a direction parallel to the pivot axis.

[0011] According to one embodiment, the adjusting portion further comprises a retaining device, wherein the first locking device and second locking device and pivot shaft, is fixedly arranged in the retaining device.

[0012] According to one embodiment, the first opening and second opening are shaped to partially encompass the circumference of the first locking device and second locking device at a respective locking portion, wherein the locking portions comprises the locking surfaces of the first portion.

[0013] According to one embodiment, the first opening and second opening are shaped to enable the movement of the first locking device and second locking device in a release direction out of and away from the locking portions of the first and second openings, to a release position of the adjusting portion upon rotation of the adjusting portion around the pivot axis.

[0014] According to one embodiment, the first locking device and second locking device are elongatedly shaped to extend in a main extension direction, wherein the main direction is parallel to the pivot axis when the first and second locking devices and pivot shaft are arranged in the respective first opening, second opening and third opening.

[0015] According to one embodiment, the locking surfaces comprises locking teeth or grooves.

[0016] According to one embodiment, the locking teeth or grooves of the locking devices and the first and second openings are shaped as alternately increased and reduced radii portions adapted to matingly engage with each other, wherein the height of the radii portions in the main extension direction of the locking devices and holes parallel to the pivot axis, defines the adjusting steps of the adjusting device.

[0017] According to one embodiment, the radii of the locking teeth or grooves of the locking devices and/or the openings are shaped such that the adjusting portion requires a rotation of 1-10°, more preferably, 1-5°, most preferably 2,5° around the pivot point 5c', to move from a locking position to a release position.

[0018] According to one embodiment, the openings are through-holes.

[0019] According to one embodiment, the adjusting portion is biased towards a locking position by a biasing device, comprising at least a first spring device arranged to press the first locking device and second locking device towards the locking surface of the first and second opening respectively.

[0020] According to one embodiment, the first and second locking devices and pivot shaft are cylinder shaped.

[0021] According to one embodiment, a locking pin is arranged on the pivot shaft to protrude in a perpendicular direction in relation to the pivot axis to prevent removal of the adjusting portion from the first portion.

[0022] According to one embodiment, the retaining device is adapted to be fixedly arranged to the adjustable rest.

[0023] According to one embodiment, the adjusting portion is biased towards a locking position by at least a second spring device arranged to press the first locking device and second locking device towards the locking surface of the first and second opening respectively.

[0024] According to one embodiment, the first opening and second opening of the first portion are shaped to retain the spring devices and to pre bend the spring devices so that they press the first locking device and second locking device towards the locking surface of the first and second opening respectively.

[0025] According to one embodiment, a rifle stock is provided comprising an adjusting device according to any of the embodiments described above, e.g. in [0005]-[0022], wherein the first portion is fixedly arranged in the rifle stock and the adjusting portion is fixedly arranged in an adjustable cheek rest.

[0026] According to one embodiment, a rifle stock is provided comprising an adjusting device according to any of the embodiments described above, e.g. in [0005]-[0022], wherein the first portion is fixed in the rifle stock and the adjusting portion is fixedly arranged in an adjustable shoulder rest.

[0027] According to one embodiment, a rest for a rifle stock is provided, comprising an adjusting device according to any of the embodiments described above, e.g. in [0005]-[0022].

[0028] According to one embodiment, a rifle is provided, comprising a rifle stock as described above, e.g. in [0023]-[0024].

[0029] Further possible features and benefits of this solution will become apparent from the detailed description below.

Brief description of drawings

[0030] The invention is now described, by way of example, with reference to the accompanying drawings, in which:

[0031] Fig. 1 shows a perspective view of a rifle stock comprising an adjusting device according to one embodiment of the invention.

[0032] Fig. 2 is a perspective view of an adjusting device according Fig. 1.

[0033] Fig. 3a is a side view of an adjusting device as seen in Fig 2 in a locking position.

[0034] Fig. 3b is a cross-section view of an adjusting device as seen in Fig. 3a along line B-B.

[0035] Fig. 3c is a cross-section view of an adjusting device as seen in Fig. 3a along line C-C.

[0036] Fig. 4a is a side view of an adjusting device as seen in Fig 2 in a release position.

[0037] Fig. 4b is a cross-section view of an adjusting device as seen in Fig. 4a along line D-D.

[0038] Fig. 4c is a cross-section view of an adjusting device as seen in Fig. 4a along line E-E.

[0039] Fig. 5a is a perspective view of a first portion of an adjusting device of one embodiment of the invention.

[0040] Fig. 5b is a side view of the first portion according to Fig. 5a.

[0041] Fig. 6a is a side view of an adjusting device 1 according to one embodiment of the invention.

[0042] Fig. 6b is a cross-section view of an adjusting device 1 as seen in Fig. 6a along line A-A in a locking position.

[0043] Fig. 6c is a cross-section view of an adjusting device 1 as seen in Fig. 6a along line A-A in a release position.

[0044] Fig. 6d is a cross-section view of an adjusting device as seen in Fig. 6a along line B-B.

[0045] Fig. 7a is a side view of an adjusting device 1 according to one embodiment of the invention.

[0046] Fig. 7b is a cross-section view of an adjusting device 1 as seen in Fig. 7a along line C-C.

[0047] Fig. 7c is a cross-section view of an adjusting device as seen in Fig. 7a along line D-D.

[0048] Fig. 7d is a cross-section view of an adjusting device 1 as seen in Fig. 7a along line C-C, wherein the adjusting device 1 is in a locking position.

[0049] Fig. 7e is a cross-section view of an adjusting device 1 as seen in Fig. 7a along line E-E.

[0050] Fig. 8a is a cross-section of a rifle stock comprising an adjusting device according to the invention.

[0051] Fig. 8b is a cross-section of a rifle stock comprising an adjusting device according to the invention.

Description of embodiments

[0052] In the following, a detailed description of the invention will be given. In the drawing figures, like reference numerals designate identical or corresponding elements throughout the several figures. It will be appreciated that these figures are for illustration only and are not in any way restricting the scope of the invention.

[0053] Fig. 1 illustrates a perspective view of a rifle stock 3 comprising an adjusting device 1 for an adjustable rest 2, 2a, 2b. According to one embodiment,

as seen in Fig. 1 the adjusting device 1 is used for adjusting an adjustable cheek rest 2a also known as comb rest. The adjusting of the cheek rest 2a is suitable in order to arrange the cheek and thus head and eyes in a desired relation to a telescopic sight arranged on a rifle. According to one embodiment, the adjusting device 1 is used for adjusting an adjustable shoulder rest 2b which can be seen in Fig. 8b.

[0054] Fig. 2 is a perspective view of an adjusting device 1 according to one embodiment of the invention. The adjusting portion 5 is shown comprising a first locking device 5a, a second locking device 5b and a pivot shaft 5c fixedly arranged in the retaining device 5d forming part of the adjusting portion 5. According to one embodiment, the retaining device 5d is adapted to be fixedly arranged to the adjustable rest 2, 2a, 2b. A first portion 4 adapted to be fixedly arranged in the rifle stock 3 is shown. The adjusting portion 5 is adapted to be releasably engaged with the first portion 4.

[0055] Fig. 3a is a side view of an adjusting device 1 for an adjustable rest 2, 2a, 2b for a rifle stock 3 as seen in Fig 2, in a locking position. The adjusting device comprises a first portion 4 adapted to be fixedly arranged to the rifle stock 3, an adjusting portion 5 adapted to be releasably engaged with the first portion 4 and movable between an engaged, locking position and a disengaged, release position upon actuation of the adjusting portion 5, wherein the adjusting portion 5 is adjustable in relation to the first portion 4 in a release position, and wherein the adjusting portion is locked in relation to the first portion 4 in the locking position. According to one embodiment, the adjusting portion 5 is adjustably locked in relation to the first portion 4 in the locking position. According to one embodiment, the adjusting portion 5 is locked or adjustably locked in relation to the first portion 4 in a direction essentially perpendicular to the moving direction of the adjusting portion 5 between a release and locking position. According to one embodiment, the adjusting portion 5 is rotationally movable between an engaged, locking position and a disengaged, release position upon actuation of the actuation of the adjusting portion 5, wherein the adjusting direction is essentially parallel to the pivot axis defined by the rotation. The adjusting portion 5 is further adapted to be

fixedly arranged to the adjustable rest 2, 2a, 3b. Thus, the actuatable adjusting portion 5 is arranged on the actual rest 2, 2a, 3b and adapted to move together with the rest 2, 2a, 2b during adjusting of the adjustable rest 2, 2a, 2b.

[0056] As can be further seen in Fig. 3b, showing a cross-section view of an adjusting device as seen in Fig. 3a along line B-B, according to one embodiment, the first portion 4 comprises a first opening 4a a second opening 4b and a third opening 4c, wherein the first opening 4a and second opening 4b comprises respective locking surfaces 4a", 4b", further seen in Fig. 3c. According to one embodiment, the openings 4a, 4b, 4c are through-holes. According to one embodiment, the first portion 4 is fixedly arranged with the second opening 4b arranged closest to the gun barrel opening when used for an adjustable cheek rest 2a.

[0057] The adjusting portion 5 comprises a first locking device 5a comprising a locking surface 5a", wherein the first locking device 5a is adapted to be arranged in the first opening 4a, and further adapted to releasably engage with the locking surface 4a" of the first opening 4a. The adjusting portion 5 further comprises a second locking device 5b comprising a locking surface 5b" wherein the second locking device 5b is adapted to be arranged in the second opening 4b, and further adapted to releasably engage with the locking surface 4b" of the second opening 4b. Further, the adjusting portion 5 comprises a pivot shaft 5c adapted to be slidably and pivotally arranged in the third opening 4c of the first portion 4, wherein the centre axis of the pivot shaft 5c forms a pivot axis 5c'. The adjusting portion 5 is thus adapted to pivot around the pivot axis 5c'. According to one embodiment, the adjusting portion 5 is thus adapted to pivot around the pivot axis 5c' in relation to the first portion 4. According to one embodiment, the adjusting portion 5 is biased in a locking position, i.e. the locking position shown in Fig. 3a, 3b, 3c. According to one embodiment, being biased in a locking position is similar to being biased e.g. into, to or towards a locking position. Such biasing action may be generated by a biasing device 6. According to one embodiment, the adjusting device 1 comprises the biasing device 6. According to one embodiment, the biasing device comprises at least a first spring device 6a, 6b arranged to press the

first locking device 5a and second locking device 5b towards the locking surface 4a", 4b" of the first and second opening 4a, 4b respectively. According to one embodiment, the adjusting portion 5 is biased towards a locking position by at least a second spring device 6b arranged to press the first locking device 5a and second locking device 5b towards the locking surface 4a", 4b" of the first and second opening 4a, 4b respectively. According to one embodiment, the first opening 4a and second opening 4b of the first portion 4 are shaped to retain the spring devices 6a, 6b and to pre bend the spring devices 6a, 6b so that they press the first locking device 5a and second locking device 5b towards the locking surface 4a", 4b" of the first and second opening 4a, 4b respectively. According to one embodiment, the spring devices 6a, 6b are leaf springs or plate springs.

[0058] According to one embodiment, the first opening 4a and second opening 4b are shaped to partially encompass the circumference of the first locking device 5a and second locking device 5b at a respective locking portion 4a', 4b', wherein the locking portions 4a', 4b' comprises the locking surfaces 4a", 4b" of the first portion 4.

[0059] Fig. 3c is a cross-section view of an adjusting device as seen in Fig. 3a along line C-C. Fig. 3c further discloses an enlarged view of the locking surface 5b" of the locking device 5 and locking surface 4b" of the second opening 4b in an engaged, locking position, wherein the adjusting portion 5 is locked in relation to the first portion 4 in a direction parallel to the pivot axis 5c'. A corresponding structure is provided for the opposite side of the adjusting device 1, i.e. wherein the first locking device 5a comprises a locking surface 5a" and a locking surface 4a" of the second opening 4b.

[0060] Fig. 4a is a side view of an adjusting device as seen in Fig 2 in a release position, i.e. wherein the adjusting portion 5 is adjustable in relation to the first portion 4 in a direction parallel to the pivot axis 5c'. According to one embodiment, the first opening 4a and second opening 4b are shaped to enable the movement of the first locking device 5a and second locking device 5b in a release direction out of and away from the locking portions 4a', 4b' of the first and second openings 4a,

4b, to a release position of the adjusting portion 5 upon rotation of the adjusting portion 5 around the pivot axis 5c'.

[0061] According to one embodiment, the adjusting portion 5 is adapted to rotate around the pivot axis 5c' upon actuation of the adjusting portion 5, whereby the first locking device 5a disengages from the locking surface 4a'' of the first opening 4a and the second locking device 5b disengages from the locking surface 4b'' of the second opening 4b, whereby the adjusting portion 5 moves towards the release position for enabling adjusting of the adjusting portion 5 in relation to the first portion 4 in a direction parallel to the pivot axis 5c'.

[0062] Thus, according to one embodiment, the shape of the first and second opening 4a, 4b enabling such of the locking devices 5a, 5b is such that the encompassing portion 4a', 4b' is only partially encompassing the locking devices 5a, 5b, i.e. partially the openings 4a, 4b are not encompassing the locking devices 5a, 5b but opens up and enlarges so that the locking devices 5a, 5b faces a free space within the respective openings 4a, 4b. The enlarged allowance portions of the openings 4a, 4b are sufficiently large and extends sufficiently in a direction parallel to the movement direction of the locking devices 5a, 5b during a release movement/actuation of the adjusting device 5, to enable the movement of the first locking device 5a and second locking device 5b in a release direction out of and away from the locking portions 4a', 4b' of the first and second openings 4a, 4b, to a release position of the adjusting portion 5 upon rotation of the adjusting portion 5 around the pivot axis 5c'. According to one embodiment, such allowance is at least corresponding to the depth of locking teeth which may form the locking surface 4a'', 4b'', 5a'', 5b''.

[0063] According to one embodiment, the first locking device 5a and second locking device 5b are elongatedly shaped to extend in a main extension direction, wherein the main direction is parallel to the pivot axis 5c' when the first and second locking devices 5a, 5b and pivot shaft 5c are arranged in the respective first opening 4a, second opening 4b and third opening 4c.

[0064] According to one embodiment, the first and second locking devices 5a, 5b and pivot shaft 5c are cylinder shaped.

[0065] Fig. 4b is a cross-section view of an adjusting device as seen in Fig. 4a along line D-D. Fig. 4b thus shows the release position of the adjusting portion 5, wherein the adjusting portion 5 has moved against the biasing action of the biasing devices 6a, 6b, out of and away from the locking portions 4a', 4b' of the first and second openings 4a, 4b, to a release position of the adjusting portion 5 upon rotation of the adjusting portion 5 around the pivot axis 5c'.

[0066] Fig. 4c is a cross-section view of an adjusting device 1 as seen in Fig. 4a along line E-E. Fig. 4c further discloses an enlarged view of the locking surface 5b'' of the locking device 5 and locking surface 4b'' of the second opening 4b in an disengaged, release position, wherein the adjusting portion is adjustable in relation to the first portion 4 in relation to the first portion 4 in a direction parallel to the pivot axis 5c'.

[0067] According to Fig. 4a-4c, the actuation direction, i.e. the rotation movement, is anti-clockwise. However, by turning the first portion 4 comprising through-holes 4a, 4b, 4c, at 180°, wherein the other side of the first portion is revealed, i.e. flipping the first portion 4 around, an opposite actuation direction is required/achieved. In this case, a clock-wise actuation direction is established. This is an advantage since it enables the freedom of choice when mounting the adjusting device 1 based on if a right handed shooter or left handed shooter is using the adjusting device 1. Generally, irrespective of shooter type, the most weight is placed on the fore most portion of the adjusting device 1, i.e. closes to the gun barrel opening when mounted. To avoid unintended actuation, and subsequent release, of the adjusting device 1 during aiming and shooting for a right handed shooter, the adjusting device 1 is preferably mounted with the second opening 4b and second locking device 5b in a foremost position. Conversely, for a left hand shooter, the first portion 4 is flipped and again mounted with the second opening 4b and second locking device 5b in a foremost position to avoid

unintentional actuation, and subsequent release, of the adjusting device 1 during aiming and shooting.

[0068] Thus, when the shooter takes aim, higher load from the side in form of shooters face and cheekbone is put on the adjustable cheek rest 2a in front of the pivot shaft 5c, this results in that it automatically locks the locking devices 5a 5b with a higher force into the first and second openings 4a, 4b and therefore secures the height of the adjustable cheek rest 2a while firing the weapon.

[0069] Fig. 4c, as well as Fig. 3c discloses an embodiment wherein the locking surfaces 4a'', 4b'', 5a'', 5b'', comprises locking teeth or grooves. According to one embodiment, the locking teeth or grooves of the locking devices 5a, 5b and the first and second openings 4a, 4b are shaped as alternately increased and reduced radii portions adapted to matingly engage with each other, wherein the height of the radii portions in the main extension direction of the locking devices 5a, 5b and holes 4a, 4b, parallel to the pivot axis 5c', defines the adjusting steps of the adjusting device 1. According to one embodiment, the relevant radii are defined in a direction perpendicular to the main extension direction/extension direction of the pivot axis 5c'. As described above, the adjusting steps of the adjusting device are thus in a direction parallel to the pivot axis 5c'. According to one embodiment, the adjusting steps are in the range of 1-5 mm, more preferably 2-3 mm, most preferably 2 mm.

[0070] According to one embodiment, the radii of the locking teeth or grooves of the locking devices 5a, 5b and/or the openings 4a, 4b are shaped such that the adjusting portion 5 requires a rotation of 1-10°, more preferably, 1-5°, most preferably 2,5° around the pivot point 5c', to move from a locking position to a release position.

[0071] Fig. 5a is a perspective view of a first portion 4 of an adjusting device 1 according to one embodiment of the invention. According to this embodiment, the biasing devices comprises a first spring device 6a and a second spring device 6b. According to one embodiment, the spring devices 6a, 6b are coil springs. According to one embodiment, the spring devices 6a, 6b are arranged in the

respective openings 4a, 4b in an area adapted to fit the spring devices 6a, 6b such that a movement of the spring devices 6a, 6b perpendicular to the extension/compression direction of the spring devices 6a, 6b are limited. A respective biasing portion 6a' and 6b' are pivotally arranged on the first portion 4 and adapted to act against the movement of the locking devices 5a, 5b in a release direction out of and away from the locking portions 4a', 4b' of the first and second openings 4a, 4b. According to one embodiment, the inner surfaces of the biasing portions 6a', 6b', i.e. facing the first and second locking devices 5a, 5b respectively, are adapted for allowing the locking devices 5a, 5b to slide against said inner surfaces. According to one embodiment, the inner surfaces are essentially flat. Fig. 5b is a side view of the first portion 4 according to Fig. 5a. Notably, as shown in Fig. 5a, 5b, the first portion 4 is mirrored in relation to the first portions described in Fig. 3a-3c, 4a-4c, i.e. it has been turned over/flipped as described above.

[0072] Fig. 6a is a side view of an adjusting device 1 according to one embodiment, in a locking position, i.e. wherein the adjusting portion 5 is not adjustable in relation to the first portion 4 in a direction parallel to the pivot axis 5', i.e. locked in relation to the first portion 4 in a direction parallel to the pivot axis 5', wherein the pivot axis 5' is essentially at a center point between the axis of the first locking device 5a and second locking device 5b. According to one embodiment, as shown in Fig. 6a-6d, no specific pivot shaft 5c is used, but rotation is still generated by the actuation of the adjusting portion 5 around said thereby defined pivot axis 5'. According to this embodiment, the first portion comprises a first opening 4a and a second opening 4b, wherein the first opening 4a and second opening 4b comprises respective locking surfaces 4a'', 4b'', wherein the adjusting portion 5 comprises a first locking device 5a comprising a locking surface 5a'', wherein the first locking device 5a is adapted to be arranged in the first opening 4a, and further adapted to releasably engage with the locking surface 4a'' of the first opening 4a, a second locking device 5b comprising a locking surface 5b'' wherein the second locking device (5b) is adapted to be arranged in the second opening 4b, and further adapted to releasably engage with the locking surface 4b'' of the second opening 4b, wherein the adjusting portion 5 is biased in a locking

position. According to one embodiment, a corresponding biasing device 6 as described under Figs 5a-5b is used herein as well. According to one embodiment, the adjusting portion 5 is adapted to rotate around the pivot axis 5' upon actuation of the adjusting portion 5, whereby the first locking device 5a disengages from the locking surface 4a'' of the first opening 4a and the second locking device 5b disengages from the locking surface 4b'' of the second opening 4b, whereby the adjusting portion 5 moves towards the release position for enabling adjusting of the adjusting portion 5 in relation to the first portion 4 in a direction parallel to the pivot axis 5'.

[0073] Fig. 6b is a cross-section view of an adjusting device 1 as seen in Fig. 6a along line A-A. Fig. 6b thus shows the locking position of the adjusting portion 5 in a similar way as shown under Fig. 5a-5b and described in connection to these Figs. 5a-5b.

[0074] Fig. 6c is a cross-section view of an adjusting device 1 as seen in Fig. 6a along line A-A, in a release position, i.e. wherein the adjusting portion 5 is adjustable in relation to the first portion 4 in a direction parallel to the pivot axis 5'.

[0075] Fig. 6d is a cross-section view of an adjusting device as seen in Fig. 6a along line B-B. A corresponding structure is provided for the opposite side of the adjusting device 1, i.e. comprising the first locking device 5a, the first opening 4a and biasing portion 6a'.

[0076] Fig. 7a is a side view of an adjusting device 1 according to one embodiment, in a release position, i.e. wherein the adjusting portion 5 is adjustable in relation to the first portion 4 in a direction parallel to the pivot axis 5b'. According to one embodiment, shown in Fig. 7a-7c, the first portion comprises a first opening 4a and a second opening 4b, wherein the first opening 4a comprises a locking surface 4a''. The adjusting portion 5 comprises a first locking device 5a comprising a locking surface 5a'', wherein the first locking device 5a is adapted to be arranged in the first opening 4a, and further adapted to releasably engage with the locking surface 4a'' of the first opening 4a. The adjusting portion further comprises a second locking device 5b comprising a locking surface 5b'' wherein the second

locking device 5b is adapted to be arranged in the second opening 4b, wherein the centre axis of the second locking device 5b forms a pivot axis 5b'.

[0077] Fig. 7b is a cross-section view of an adjusting device 1 as seen in Fig. 7a along line C-C, wherein the adjusting device 1 is in a release position.

[0078] Further, as can be seen in Fig. 7b, the adjusting portion 5 is biased in a locking position by a biasing device 6, wherein the biasing device 6 comprises a biasing portion 6c and a first spring device 6a, wherein the biasing portion 6c is pivotally arranged on the first portion 4, wherein the biasing portion 6c comprises a locking surface 6c'', wherein the second locking device 5b is further adapted to releasably engage with the locking surface 6c''. The adjusting portion 5 is adapted to rotate around the pivot axis 5b' upon actuation of the adjusting portion 5, whereby the first locking device 5a disengages from the locking surface 4a'' of the first opening 4a and the second locking device 5b disengages from the locking surface 6c''' of the biasing portion 6c, whereby the adjusting portion 5 moves towards the release position for enabling adjusting of the adjusting portion 5 in relation to the first portion 4 in a direction parallel to the pivot axis 5b'.

[0079] According to one embodiment, the locking surface 6c'' comprises locking teeth or grooves for matingly engaging with the locking surface 5b'' of the second locking device 5b comprising corresponding locking teeth or grooves.

[0080] According to one embodiment the inner surface of the second opening 4b is adapted for allowing the locking device 5b to slide against it. According to one embodiment, the inner surface of the second opening 4b is essentially flat.

[0081] According to one embodiment, the first opening 4a and the second opening 4b are part of the same opening. According to one embodiment, the first opening 4a and second opening 4b are the same opening.

[0082] Fig. 7c is a cross-section view of an adjusting device 1 as seen in Fig. 7a along line D-D.

[0083] Fig. 7d is a cross-section view of an adjusting device 1 as seen in Fig. 7a along line C-C, wherein the adjusting device 1 is in a locking position.

[0084] Fig. 7e is a cross-section view of an adjusting device 1 as seen in Fig. 7a along line E-E.

[0085] According to one embodiment, shown in e.g. Fig. 1-7e above, an adjusting device 1 for an adjustable rest 2, 2a, 2b for a rifle stock 3, is provided comprising: a first portion 4 adapted to be fixedly arranged to the rifle stock 3, an adjusting portion (5) adapted to be releasably engaged with the first portion 4 and rotationally movable around a pivot axis 5b', 5c', 5' in relation to the first portion 4 between an engaged, locking position and a disengaged, release position upon actuation of the adjusting portion 5, wherein the adjusting portion 5 is adjustable in relation to the first portion 4 in a direction parallel to the pivot axis 5b', 5c', 5' in a release position, and wherein the adjusting portion is locked in the direction parallel to the pivot axis 5b', 5c', 5' in relation to the first portion 4 in the locking position. According to one embodiment, a biasing device 6 is adapted to force or bias the adjusting portion 5 towards the locking position, i.e. the adjusting portion 5 is biased in, into, to or towards a locking position by a biasing device 6 as described herein. According to one embodiment, the biasing device 6 may comprise at least one of all the various described embodiments of the biasing device 6 described herein. According to one embodiment, the adjusting portion 5 is adapted to be fixedly arranged to the adjustable rest 2, 2a, 2b. According to one embodiment, as is realized by a skilled person a parallel direction to the pivot axis 5b', 5c', 5' comprises all directions that is an essentially parallel direction to the pivot axis 5b', 5c', 5'.

[0086] According to one embodiment, the first portion 4 comprises a first opening 4a and a second opening 4b, wherein at least the first opening 4a comprises a locking surface 4a'', wherein the adjusting portion 5 comprises a locking surface 5a'', wherein the first locking device 5a is adapted to be arranged in the first opening 4a, and further adapted to releasably engage with the locking surface 4a'' of the first opening 4, a second locking device 5b comprising a locking

surface 5b", wherein the second locking device 5b is adapted to be arranged in the second opening 4b. According to one embodiment, the second opening 4b comprises locking surface 4b", i.e. the first opening 4a and second opening 4b comprises respective locking surfaces 4a", 4b", wherein the second locking device 5b is adapted to releasably engage with the locking surface 4b" of the second opening 4b, a pivot shaft 5c adapted to be slidably and pivotally arranged in the third opening 4c of the first portion 4, wherein the centre axis of the pivot shaft 5c forms a pivot axis 5c', wherein the adjusting portion 5 is biased in a locking position, wherein the adjusting portion 5 is adapted to rotate around the pivot axis 5c' upon actuation of the adjusting portion 5, whereby the first locking device 5a disengages from the locking surface 4a" of the first opening 4a and the second locking device 5b disengages from the locking surface 4b" of the second opening 4b, whereby the adjusting portion 5 moves towards the release position for enabling adjusting of the adjusting portion 5 in relation to the first portion 4 in a direction parallel to the pivot axis 5c'.

[0087] According to one embodiment, the first opening 4a and second opening 4b comprises respective locking surfaces 4a", 4b", wherein the adjusting portion 5 comprises a first locking device 5a comprising a locking surface 5a", wherein the first locking device 5a is adapted to be arranged in the first opening 4a, and further adapted to releasably engage with the locking surface 4a" of the first opening 4a, a second locking device 5b comprising a locking surface 5b" wherein the second locking device 5b is adapted to be arranged in the second opening 4b, and further adapted to releasably engage with the locking surface 4b" of the second opening 4b, wherein the adjusting portion 5 is biased in a locking position, wherein the adjusting portion 5 is adapted to rotate around a pivot axis 5' upon actuation of the adjusting portion 5, whereby the first locking device 5a disengages from the locking surface 4a" of the first opening 4a and the second locking device 5b disengages from the locking surface 4b" of the second opening 4b, whereby the adjusting portion 5 moves towards the release position for enabling adjusting of the adjusting portion 5 in relation to the first portion 4 in a direction parallel to the pivot axis 5'.

[0088] According to one embodiment, the adjusting portion 5 comprises a first locking device 5a comprising a locking surface 5a", wherein the first locking device 5a is adapted to be arranged in the first opening 4a, and further adapted to releasably engage with the locking surface 4a" of the first opening 4a, a second locking device 5b comprising a locking surface 5b" wherein the second locking device 5b is adapted to be arranged in the second opening 4b, wherein the centre axis of the second locking device 5b forms a pivot axis 5b' wherein the adjusting portion 5 is biased in a locking position by a biasing device 6, wherein the biasing device 6 comprises a biasing portion 6c and a first spring device 6a, wherein the biasing portion 6c is pivotally arranged on the first portion 4, wherein the biasing portion 6c comprises a locking surface 6c", wherein the second locking device 5b is further adapted to releasably engage with the locking surface 6c", wherein the adjusting portion 5 is adapted to rotate around the pivot axis 5b' upon actuation of the adjusting portion 5, whereby the first locking device 5a disengages from the locking surface 4a" of the first opening 4a and the second locking device 5b disengages from the locking surface 6c" of the biasing portion 6c, whereby the adjusting portion 5 moves towards the release position for enabling adjusting of the adjusting portion 5 in relation to the first portion 4 in a direction parallel to the pivot axis 5b'.

[0089] Fig. 8a is a cross-section of a rifle stock 3 comprising an adjusting device 1 according to one embodiment of the invention. However, any embodiment described herein may correspondingly be comprised in the rifle stock 3. The adjusting device 1 is herein used for an adjustable cheek rest 2a. The rifle stock 3 may be prepared by using a separated portion of the rifle stock 3 as an adjustable rest 2b. Alternatively, a separate adjustable rest 2b may be arranged on an existing rifle stock 3. Further, the rifle stock 3 is prepared by forming or drilling holes for receiving the elongated locking devices 5a, 5b and pivot shaft 5c. The surface of the rifle stock 3 at the prepared holes is made essentially flat to receive the first portion 4 and to allow the first portion to be fixedly arranged to the rifle stock 3. The adjustable rest 2a is prepared to receive the adjusting portion 5. According to one embodiment, the adjusting portion 5 is fixedly arranged to the adjustable rest 2a directly connecting the locking devices 5a, 5b and pivot shaft by

suitable means. According to one embodiment, the adjusting portion 5 is fixedly arranged to the adjustable rest 2a by fixedly arranging the retaining device 5d to the adjustable rest 2a. Adjusting of the adjustable rest 2a is hereby carried out by actuating the adjustable rest 2a, and thus the adjusting portion 5, thus carrying out a movement of the first locking device 5a and second locking device 5b in a release direction out of and away from the locking portions 4a', 4b' of the first and second openings 4a, 4b, to a release position of the adjusting portion 5 upon rotation of the adjusting portion 5 around the pivot axis 5c' and moving the adjustable rest 2a and thus adjusting portion 5 in a direction along the pivot axis 5c' either away from the rifle stock 3 or towards the rifle stock 3. Thereafter, releasing the adjustable rest 2a and adjusting portion 5 at a selected position/height, whereby the biasing action of the biasing device forces the adjustable rest 2a and adjusting portion 5 to rotate around the pivot axis 5c' towards and to a locking position, wherein the locking surfaces 5a'', 5b'' of the locking devices 5a, 5b again matingly engages with the locking surfaces 4a'', 4b'' of the openings 4a, 4b, wherein the adjustable rest 2a and adjusting portion 5 is locked in relation to the first portion 4 in a direction parallel to the pivot axis 5c'.

[0090] According to one embodiment, as is shown in Fig. 8a, a locking pin 5c'' is arranged essentially at an end portion of the pivot shaft 5c, wherein the locking pin protrude in a perpendicular direction in relation to the pivot axis 5c' to prevent accidental removal of the adjusting portion 5 from the first portion 4.

[0091] Fig. 8b is a cross-section of a rifle stock 3 comprising an adjusting device 1 according to one embodiment of the invention. In addition to the adjusting device 1 herein used for an adjustable cheek rest 2a as disclosed in Fig. 6a, the adjusting device 1 is herein also used for an adjustable shoulder rest 2b. Any embodiment described herein may be used for an adjustable shoulder rest 2b. The first portion 4 of the latter adjusting device is fixedly arranged in the rifle stock 3, and the adjusting portion 5 is fixedly arranged in the adjustable shoulder rest 2b. What is described in relation the mounting of the adjusting device 1 for an adjustable cheek rest 2a, may also be applied for the mounting of the adjustable device 1 for an adjustable shoulder rest 2b. According to one embodiment, the retaining device

5d is shaped to have essentially the same shape, i.e. concerning the outer boundary of the mounting surface of the same, as the adjustable shoulder rest 2a or adjustable cheek rest 2b.

[0092] According to one embodiment, a rest 2, 2a, 2b for a rifle stock 3 is provided comprising an adjusting device 1 according to any embodiment described.

[0093] According to one embodiment, a rifle is provided, comprising a rifle stock 3.

[0094] According to one embodiment, the first portion 4 and adjustable portion 5 are fixedly arranged to the rifle stock 3 and adjustable rest 2a, 2b by means of screws.

[0095] A preferred embodiment of an adjusting device 1 for an adjustable rest 2, 2a, 2b for a rifle stock 3, according to the invention has been described. However, the person skilled in the art realizes that this can be varied within the scope of the appended claims without departing from the inventive idea.

[0096] All the described alternative embodiments above or parts of an embodiment, can be freely combined without departing from the inventive idea as long as the combination is not contradictory.

- - -

CLAIMS

1. Adjusting device (1) for an adjustable rest (2, 2a, 2b) for a rifle stock (3), comprising:

a first portion (4) adapted to be fixedly arranged to the rifle stock (3),

an adjusting portion (5) adapted to be releasably engaged with the first portion (4) and rotationally movable around a pivot axis (5b', 5c', 5') in relation to the first portion (4) between an engaged, locking position and a disengaged, release position upon actuation of the adjusting portion (5), wherein the adjusting portion (5) is adjustable in relation to the first portion (4) in a direction parallel to the pivot axis (5b', 5c', 5') in a release position, and wherein the adjusting portion is locked in the direction parallel to the pivot axis (5b', 5c', 5') in relation to the first portion (4) in the locking position,

wherein the adjusting portion (5) is adapted to be fixedly arranged to the adjustable rest (2, 2a, 2b).

2. The adjusting device (1) according to claim 1, wherein a biasing device (6) is adapted to force the adjusting portion (5) towards the locking position.

3. The adjusting device (1) according to claim 1 or 2, wherein

the first portion (4) comprises a first opening (4a) a second opening (4b) and a third opening (4c), wherein the first opening (4a) and second opening (4b) comprises respective locking surfaces (4a'', 4b''), wherein

the adjusting portion (5) comprises a first locking device (5a) comprising a locking surface (5a''), wherein the first locking device (5a) is adapted to be arranged in the first opening (4a), and further adapted to releasably engage with the locking surface (4a'') of the first opening (4a), a second locking device (5b) comprising a locking surface (5b'') wherein the second locking device (5b) is adapted to be arranged in the second opening (4b), and further adapted to releasably engage

with the locking surface (4b'') of the second opening (4b), a pivot shaft (5c) adapted to be slidingly and pivotally arranged in the third opening (4c) of the first portion (4), wherein the centre axis of the pivot shaft (5c) forms a pivot axis (5c'), wherein the adjusting portion (5) is biased in a locking position,

wherein the adjusting portion (5) is adapted to rotate around the pivot axis (5c') upon actuation of the adjusting portion (5), whereby the first locking device (5a) disengages from the locking surface (4a'') of the first opening (4a) and the second locking device (5b) disengages from the locking surface (4b'') of the second opening (4b), whereby the adjusting portion (5) moves towards the release position for enabling adjusting of the adjusting portion (5) in relation to the first portion (4) in a direction parallel to the pivot axis (5c').

4. The adjusting device (1) according to claim 1 or 2, wherein

the first portion comprises a first opening (4a) and a second opening (4b), wherein the first opening (4a) and second opening (4b) comprises respective locking surfaces (4a'', 4b''), wherein

the adjusting portion (5) comprises a first locking device (5a) comprising a locking surface (5a''), wherein the first locking device (5a) is adapted to be arranged in the first opening (4a), and further adapted to releasably engage with the locking surface (4a'') of the first opening (4a), a second locking device (5b) comprising a locking surface (5b'') wherein the second locking device (5b) is adapted to be arranged in the second opening (4b), and further adapted to releasably engage with the locking surface (4b'') of the second opening (4b),

wherein the adjusting portion (5) is biased in a locking position, wherein the adjusting portion (5) is adapted to rotate around a pivot axis (5') upon actuation of the adjusting portion (5), whereby the first locking device (5a) disengages from the locking surface (4a'') of the first opening (4a) and the second locking device (5b) disengages from the locking surface (4b'') of the second opening (4b), whereby the adjusting portion (5) moves towards the release position for enabling adjusting of

the adjusting portion (5) in relation to the first portion (4) in a direction parallel to the pivot axis (5').

5. The adjusting device (1) according to claim 1 or 2, wherein the first portion comprises a first opening (4a) and a second opening (4b), wherein the first opening (4a) comprises a locking surface (4a''), wherein

the adjusting portion (5) comprises a first locking device (5a) comprising a locking surface (5a''), wherein the first locking device (5a) is adapted to be arranged in the first opening (4a), and further adapted to releasably engage with the locking surface (4a'') of the first opening (4a), a second locking device (5b) comprising a locking surface (5b'') wherein the second locking device (5b) is adapted to be arranged in the second opening (4b), wherein the centre axis of the second locking device (5b) forms a pivot axis (5b')

wherein the adjusting portion (5) is biased in a locking position by a biasing device (6), wherein the biasing device (6) comprises a biasing portion (6c) and a first spring device (6a), wherein the biasing portion (6c) is pivotally arranged on the first portion (4), wherein the biasing portion (6c) comprises a locking surface (6c''), wherein the second locking device (5b) is further adapted to releasably engage with the locking surface (6c''),

wherein the adjusting portion (5) is adapted to rotate around the pivot axis (5b') upon actuation of the adjusting portion (5), whereby the first locking device (5a) disengages from the locking surface (4a'') of the first opening (4a) and the second locking device (5b) disengages from the locking surface (6c'') of the biasing portion (6c), whereby the adjusting portion (5) moves towards the release position for enabling adjusting of the adjusting portion (5) in relation to the first portion (4) in a direction parallel to the pivot axis (5b').

6. The adjusting device according to any of the preceding claims, wherein the adjusting portion (5) further comprises a retaining device (5d), wherein the first locking device (5a) and second locking device (5b) and pivot shaft (5c), is fixedly arranged in the retaining device (5d).

7. The adjusting device (1) according to any of the preceding claims, wherein the first opening (4a) and second opening (4b) are shaped to partially encompass the circumference of the first locking device (5a) and second locking device (5b) at a respective locking portion (4a', 4b'), wherein the locking portions (4a', 4b') comprises the locking surfaces (4a'', 4b'') of the first portion (4).
8. The adjusting device (1) according to any of the preceding claims, wherein the first opening (4a) and second opening (4b) are shaped to enable the movement of the first locking device (5a) and second locking device (5b) in a release direction out of and away from the locking portions (4a', 4b') of the first and second openings (4a, 4b), to a release position of the adjusting portion (5) upon rotation of the adjusting portion (5) around the pivot axis (5a', 5b', 5c', 5').
9. The adjusting device (1) according to any of the preceding claims, wherein the first locking device (5a) and second locking device (5b) are elongatedly shaped to extend in a main extension direction, wherein the main direction is parallel to the pivot axis (5c') when the first and second locking devices (5a, 5b) and pivot shaft (5c) are arranged in the respective first opening (4a), second opening (4b) and third opening (4c).
10. The adjusting device according to any of the preceding claims, wherein the locking surfaces (4a'', 4b'', 5a'', 5b'', 6b'') comprises locking teeth or grooves.
11. The adjusting device (1) according to claim 10, wherein the locking teeth or grooves of the locking devices (5a, 5b) and the first and second openings (4a, 4b) are shaped as alternately increased and reduced radii portions adapted to matingly engage with each other, wherein the height of the radii portions in the main extension direction of the locking devices (5a, 5b) and holes (4a, 4b), parallel to the pivot axis (5c'), defines the adjusting steps of the adjusting device (1).
12. The adjusting device (1) according to claim 11, wherein the radii of the locking teeth or grooves of the locking devices (5a, 5b) and/or the openings (4a, 4b) are shaped such that the adjusting portion (5) requires a rotation of 1-10°,

more preferably, 1-5°, most preferably 2,5° around the pivot point (5c'), to move from a locking position to a release position.

13. The adjusting device (1) according to any of the preceding claims, wherein the openings (4a, 4b, 4c) are through-holes.

14. The adjusting device (1) according to any of the preceding claims, wherein the adjusting portion (5) is biased towards a locking position by a biasing device (6) comprising at least a first spring device (6a, 6b) arranged to press the first locking device (5a) and second locking device (5b) towards the locking surface (4a", 4b") of the first and second opening (4a, 4b) respectively.

15. A rifle stock (3) comprising an adjusting device (1) according to any of the preceding claims, wherein the first portion (4) is fixedly arranged in the rifle stock (3) and the adjusting portion (5) is fixedly arranged in an adjustable cheek rest (2, 2a).

16. A rifle stock (3) comprising an adjusting device (1) according to any of the preceding claims 1-14, wherein the first portion (4) is fixed in the rifle stock (3) and the adjusting portion (5) is fixedly arranged in an adjustable shoulder rest (2, 2b).

17. A rest (2, 2a, 2b) for a rifle stock (3) comprising an adjusting device (1) according to any of the preceding claims 1-14.

18. A rifle comprising a rifle stock (3) according to any of the preceding claims 15-16.

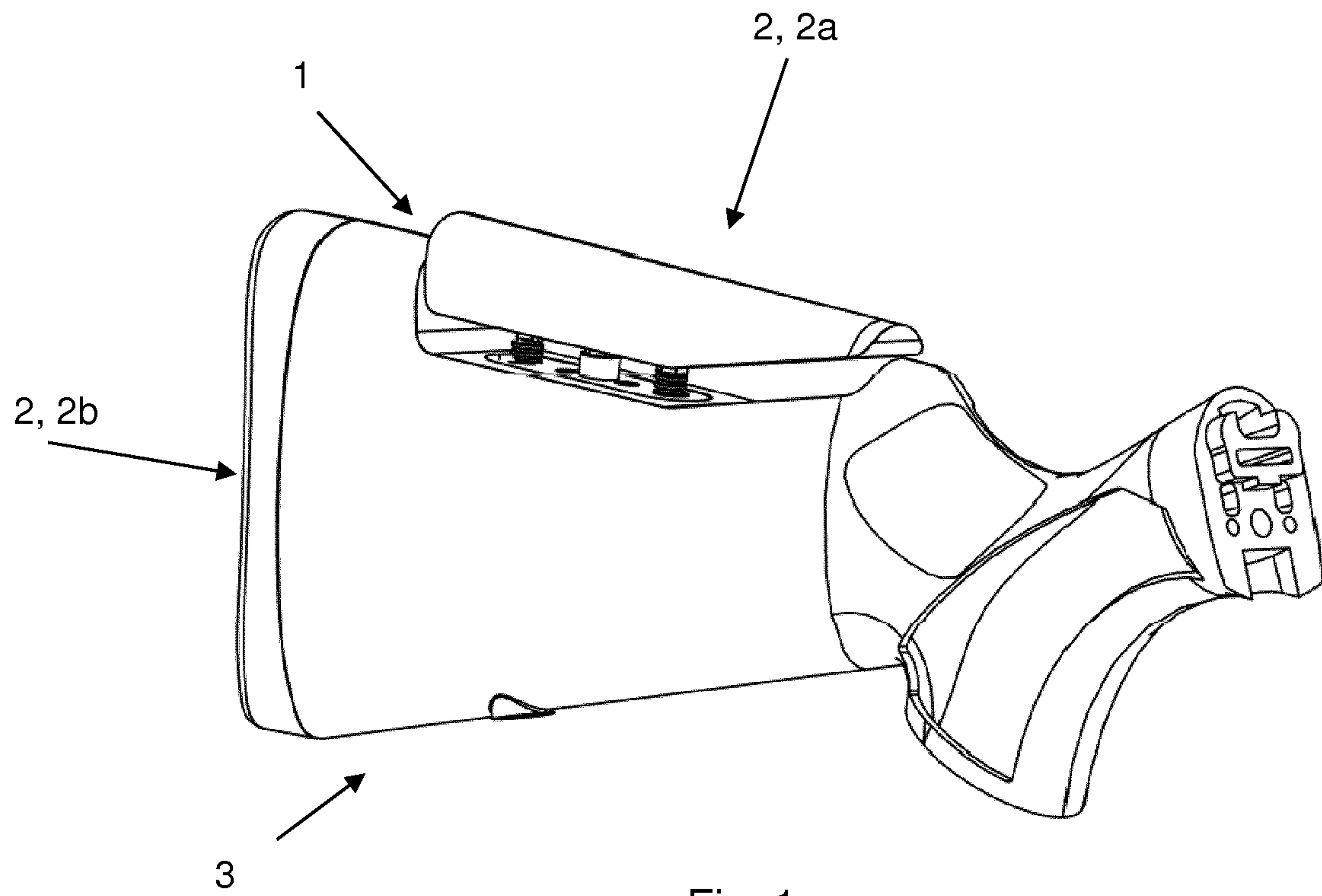


Fig. 1

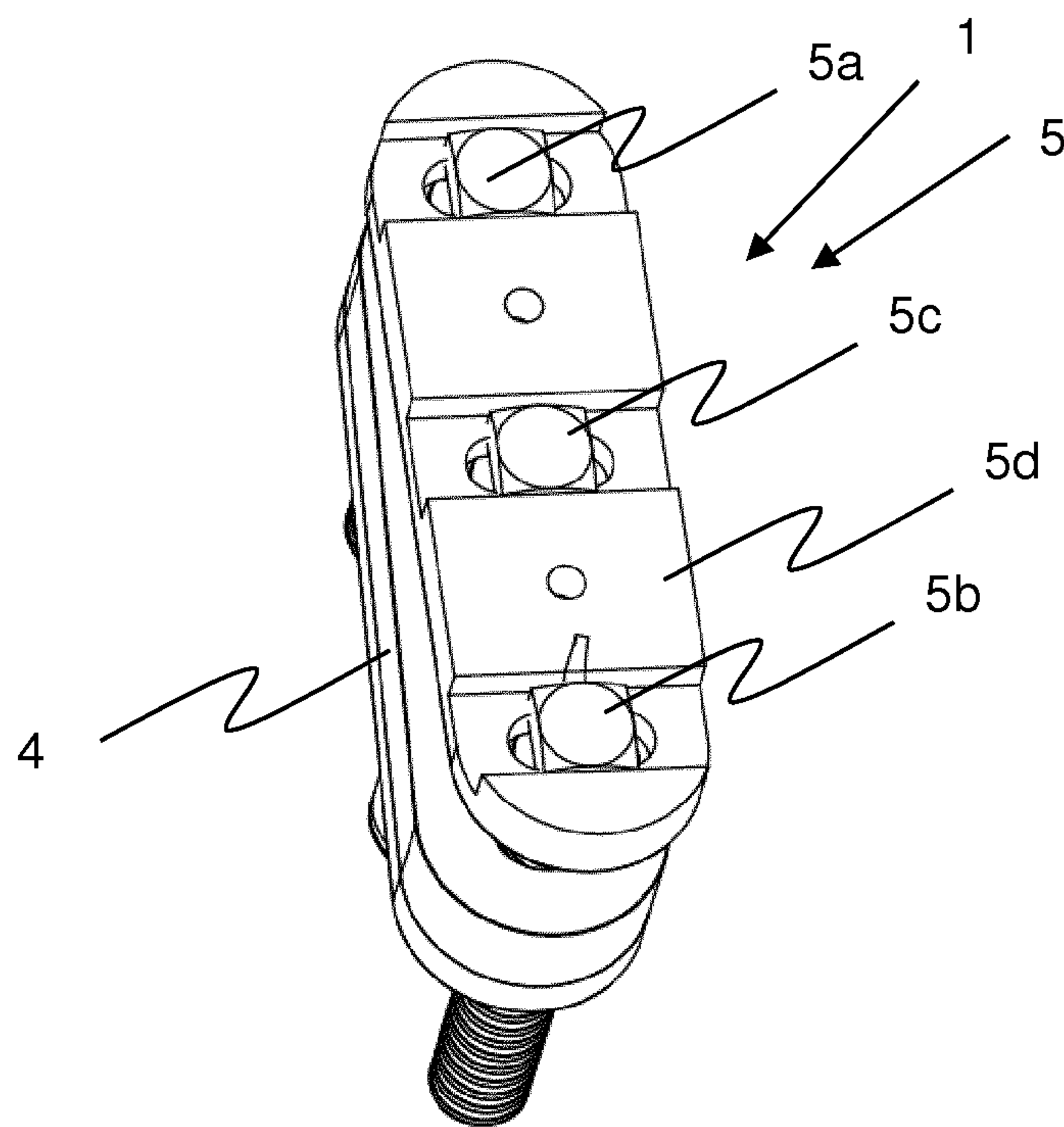


Fig. 2

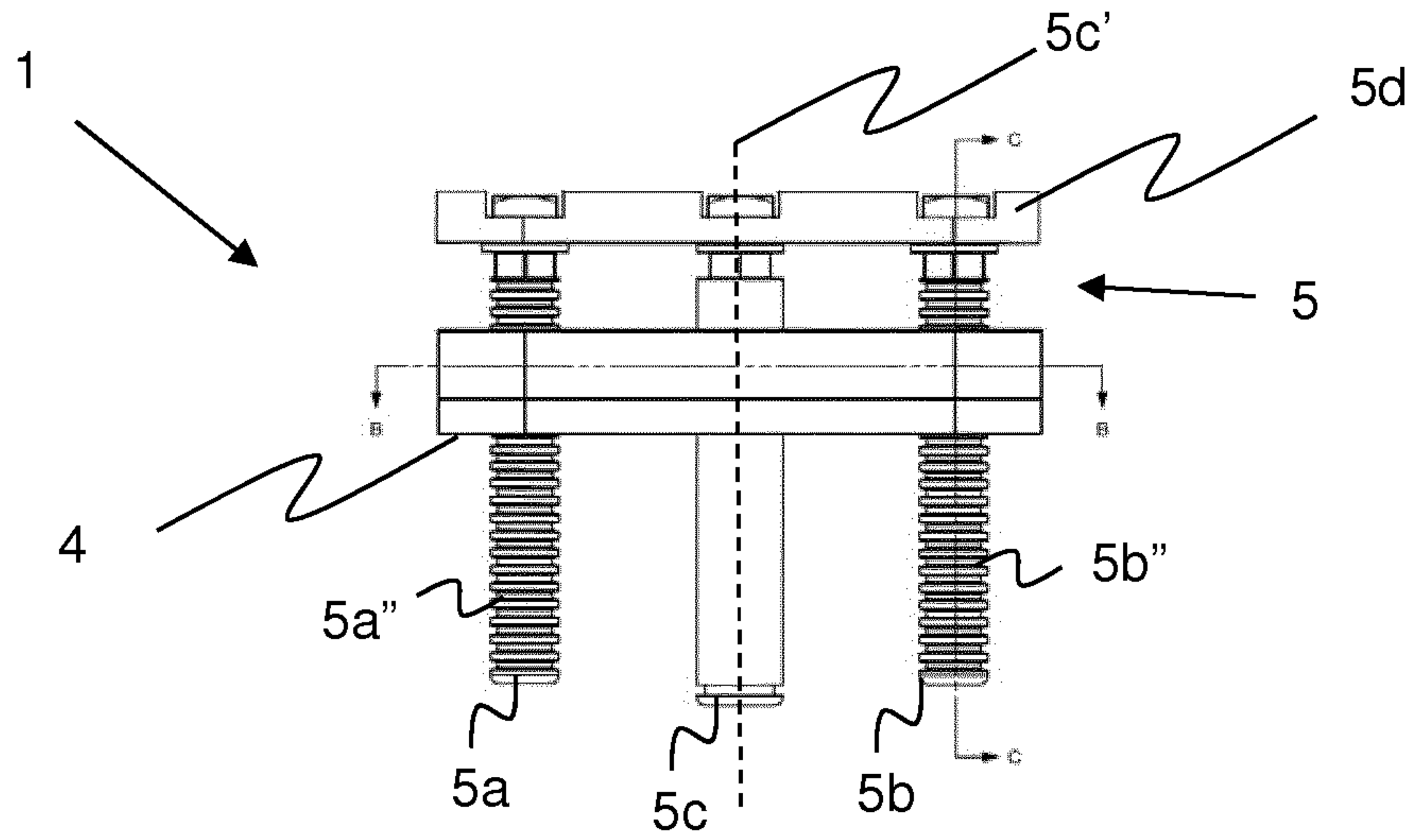


Fig. 3a

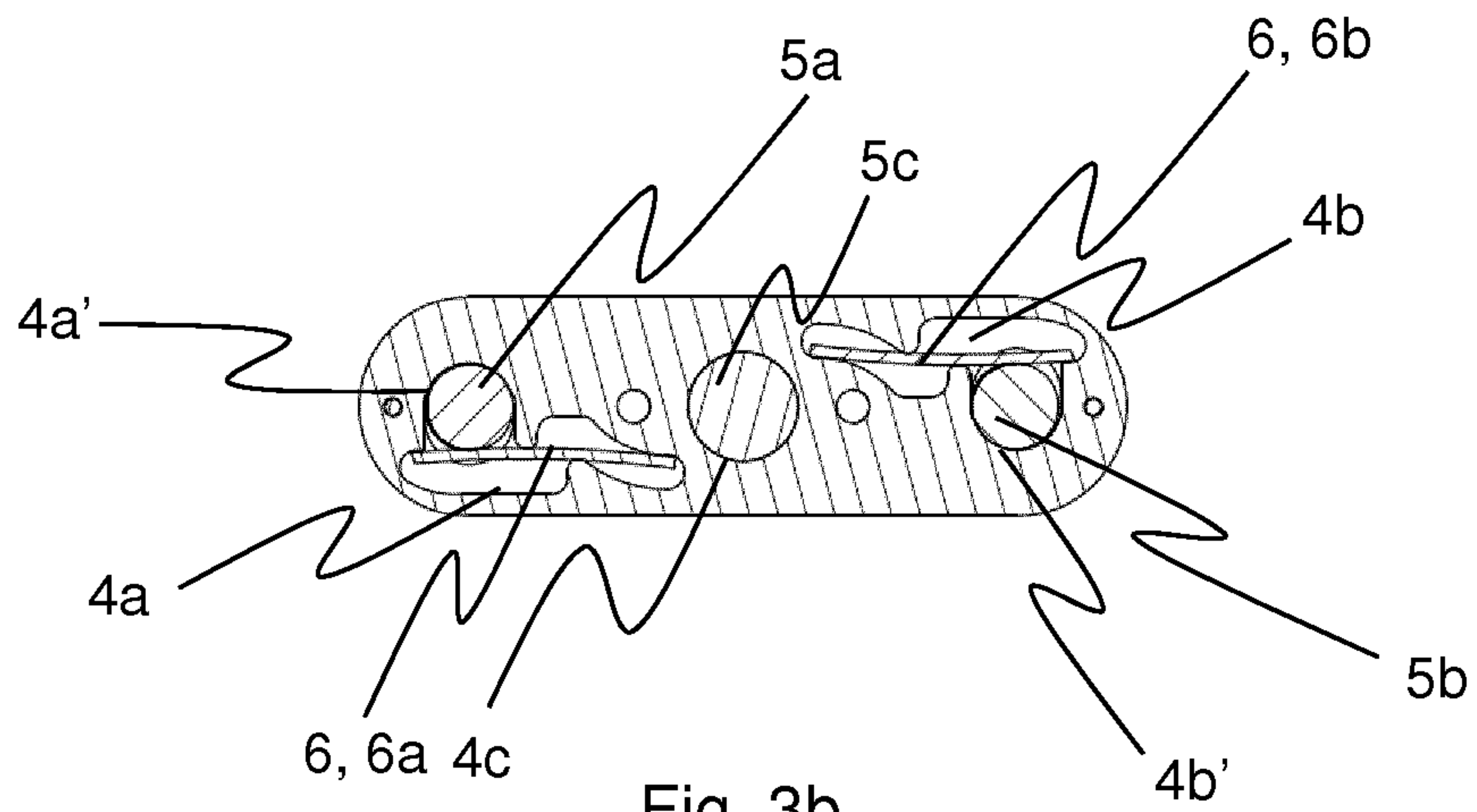


Fig. 3b

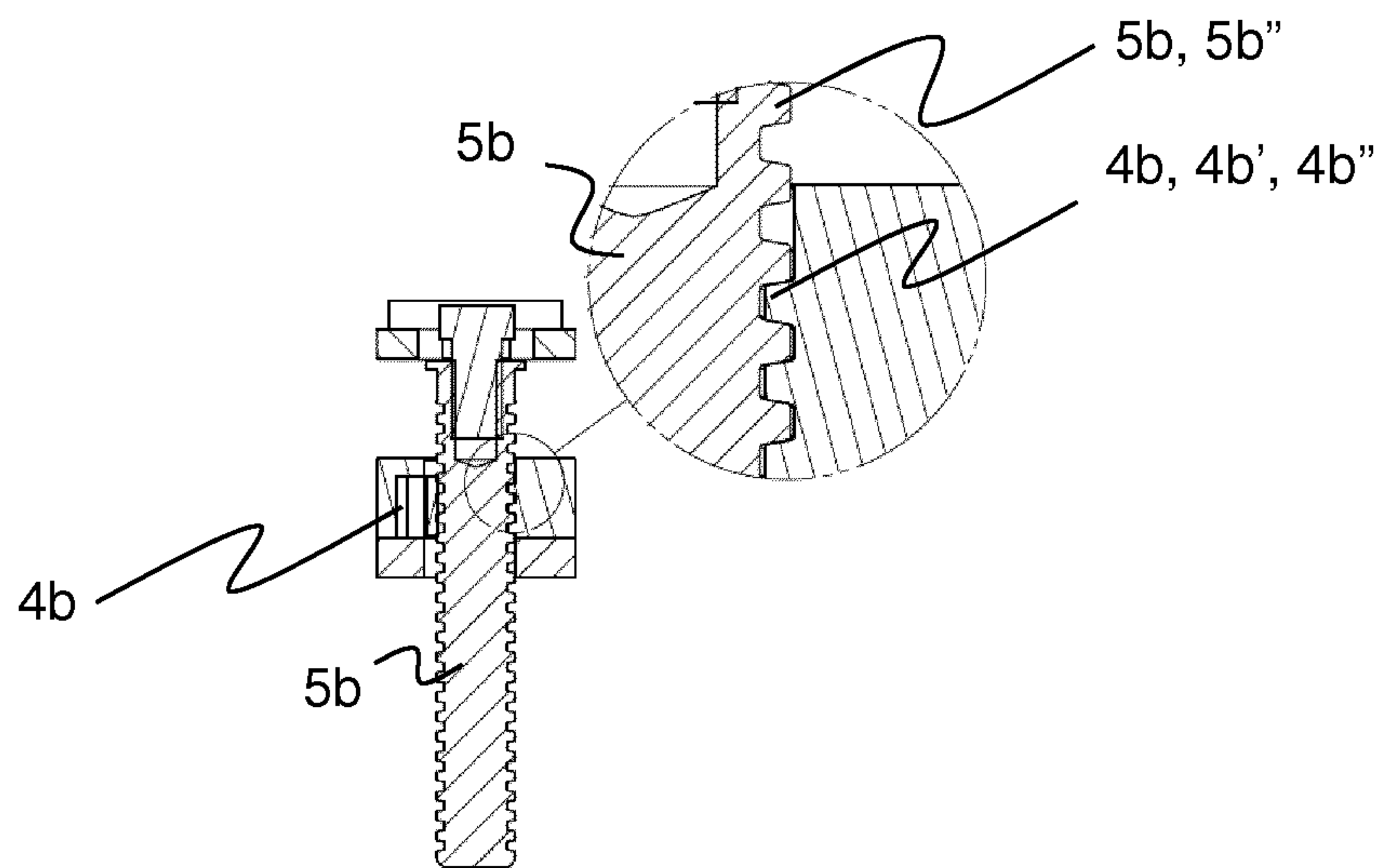


Fig. 3c

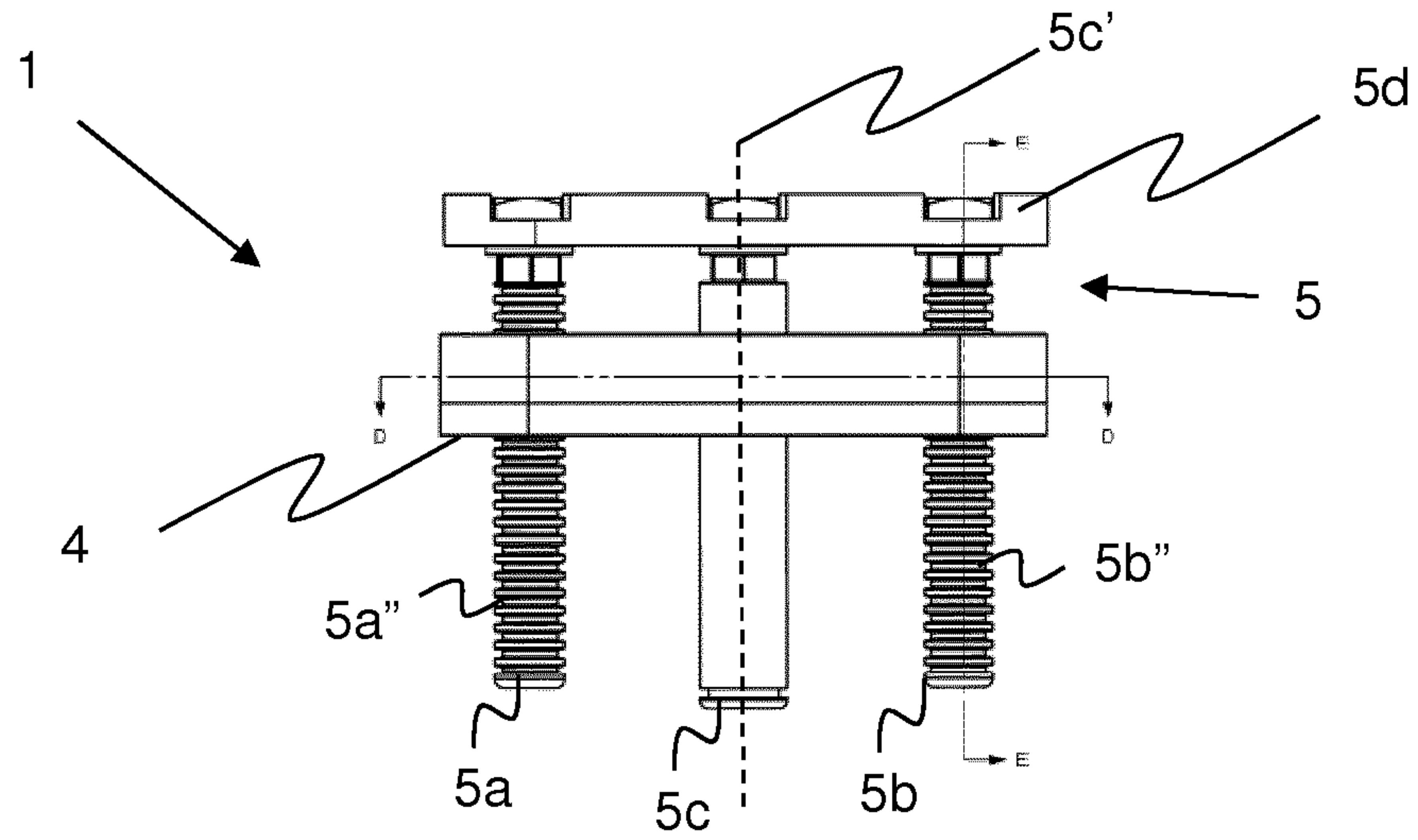


Fig. 4a

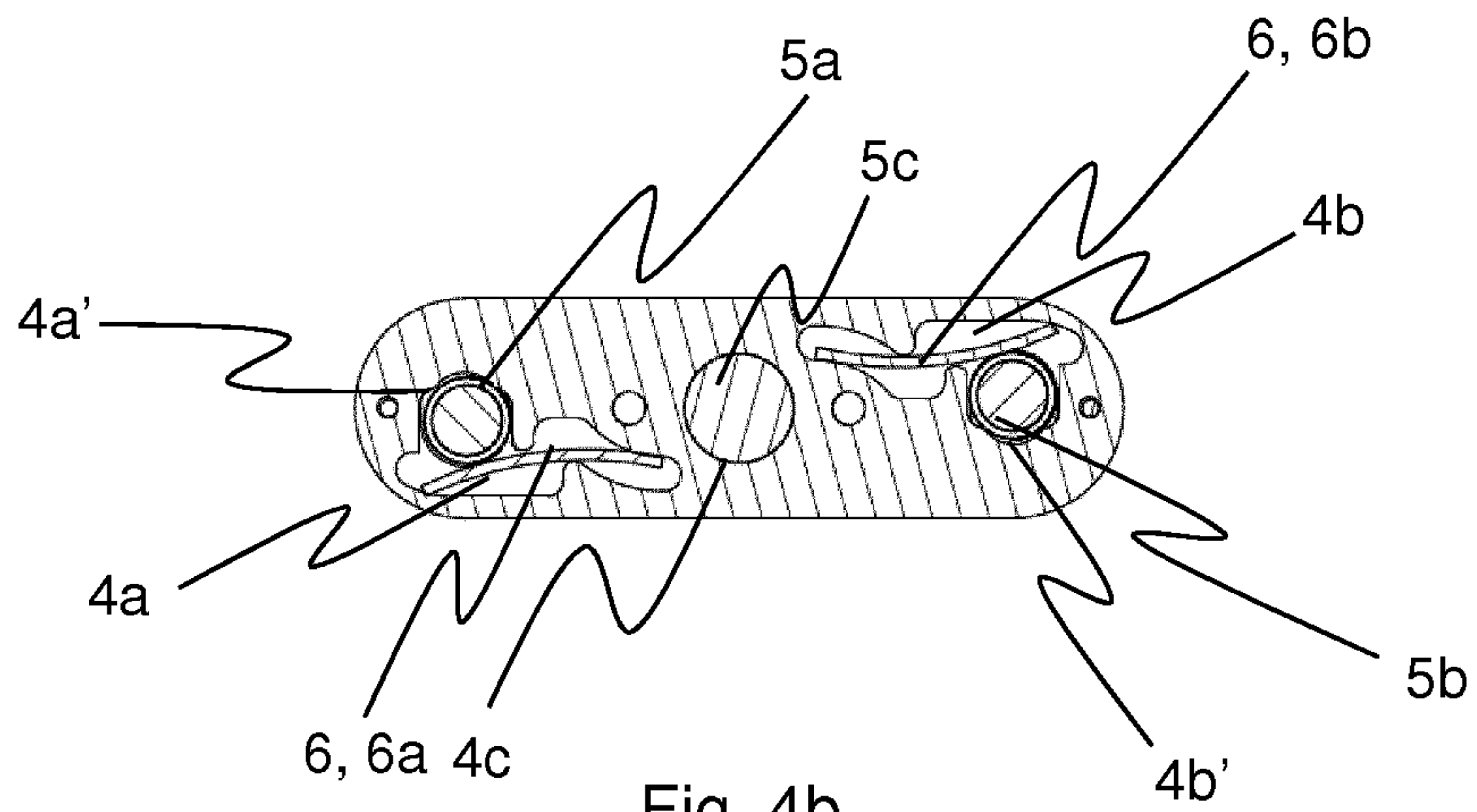


Fig. 4b

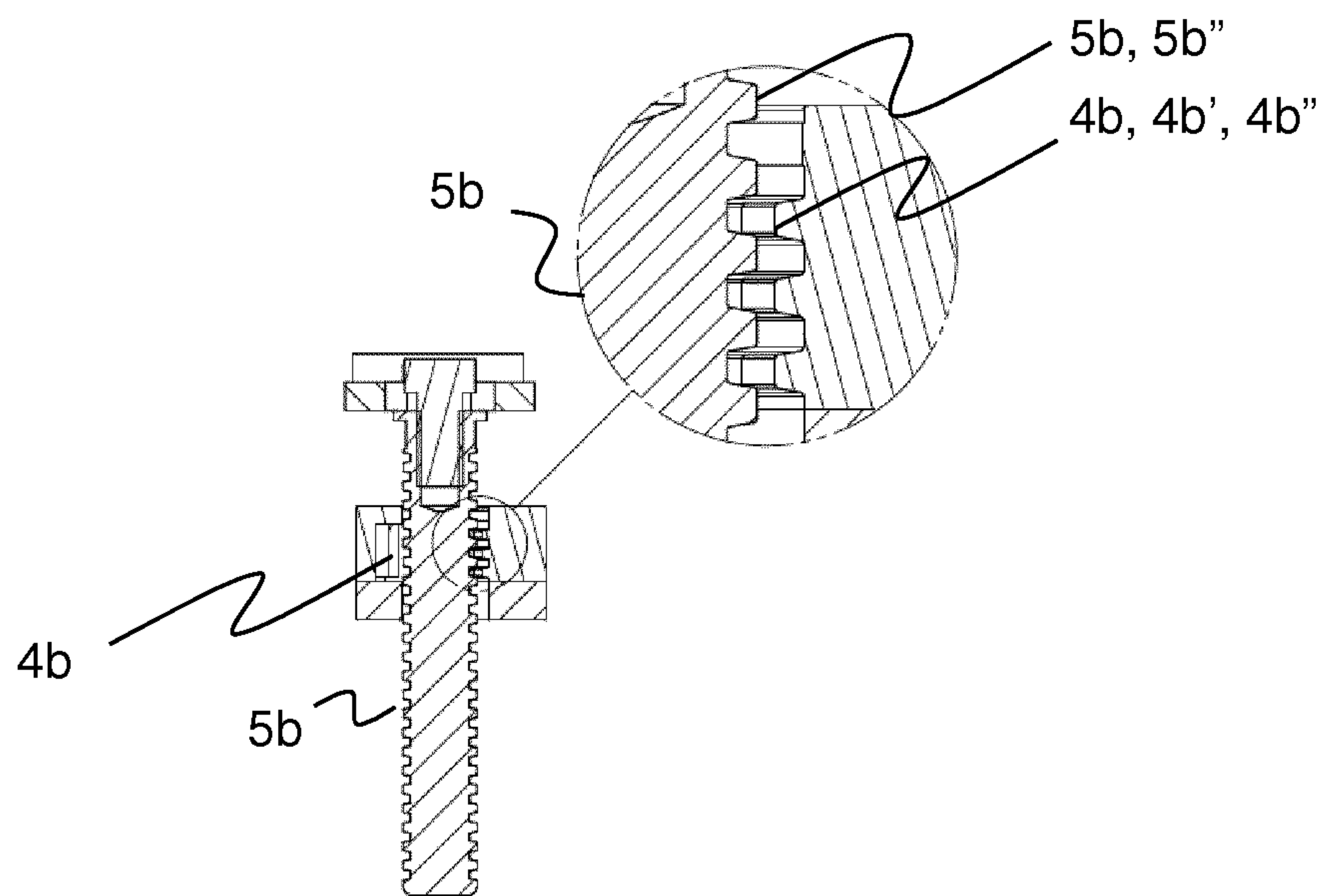


Fig. 4c

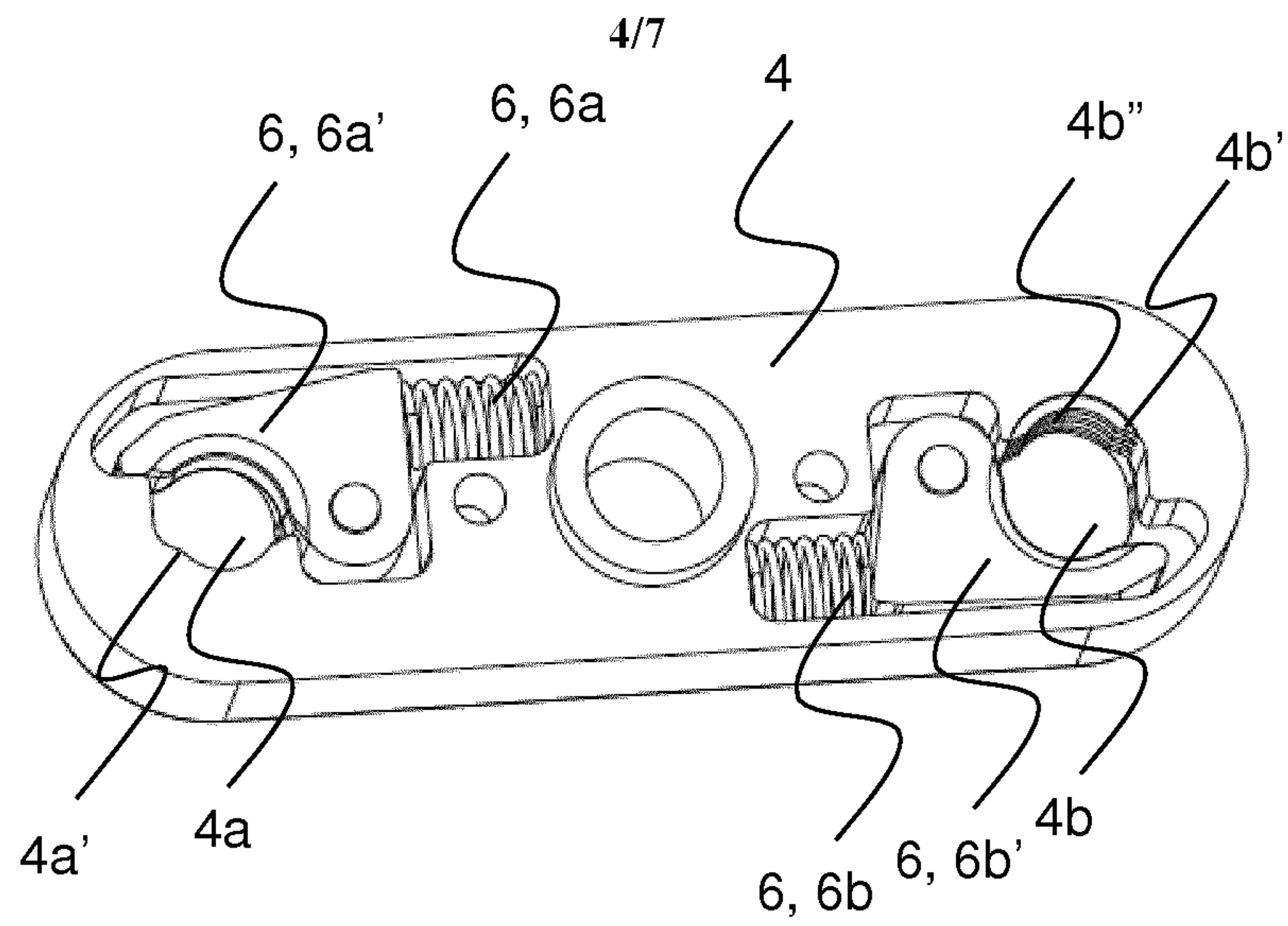


Fig. 5a

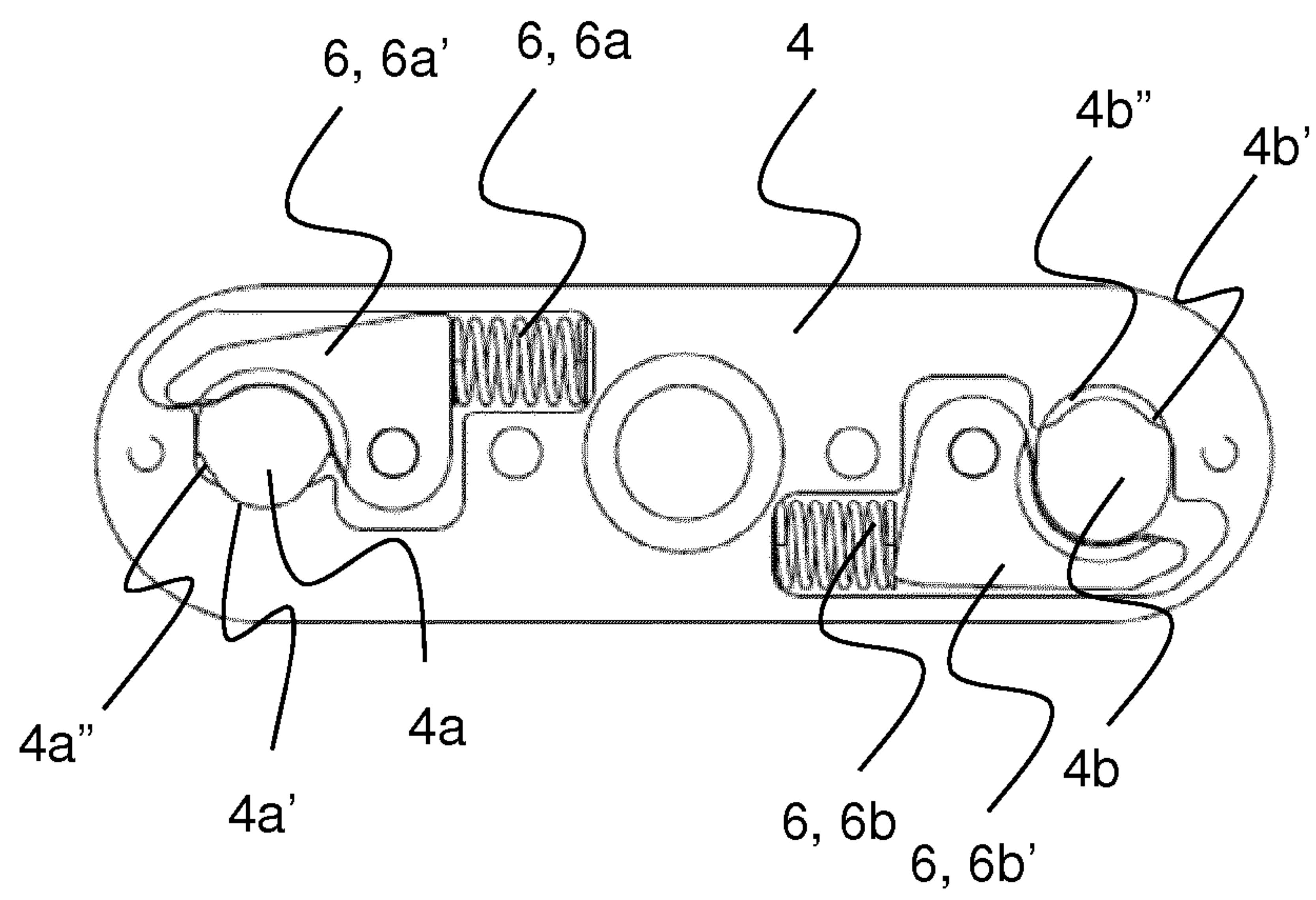


Fig. 5b

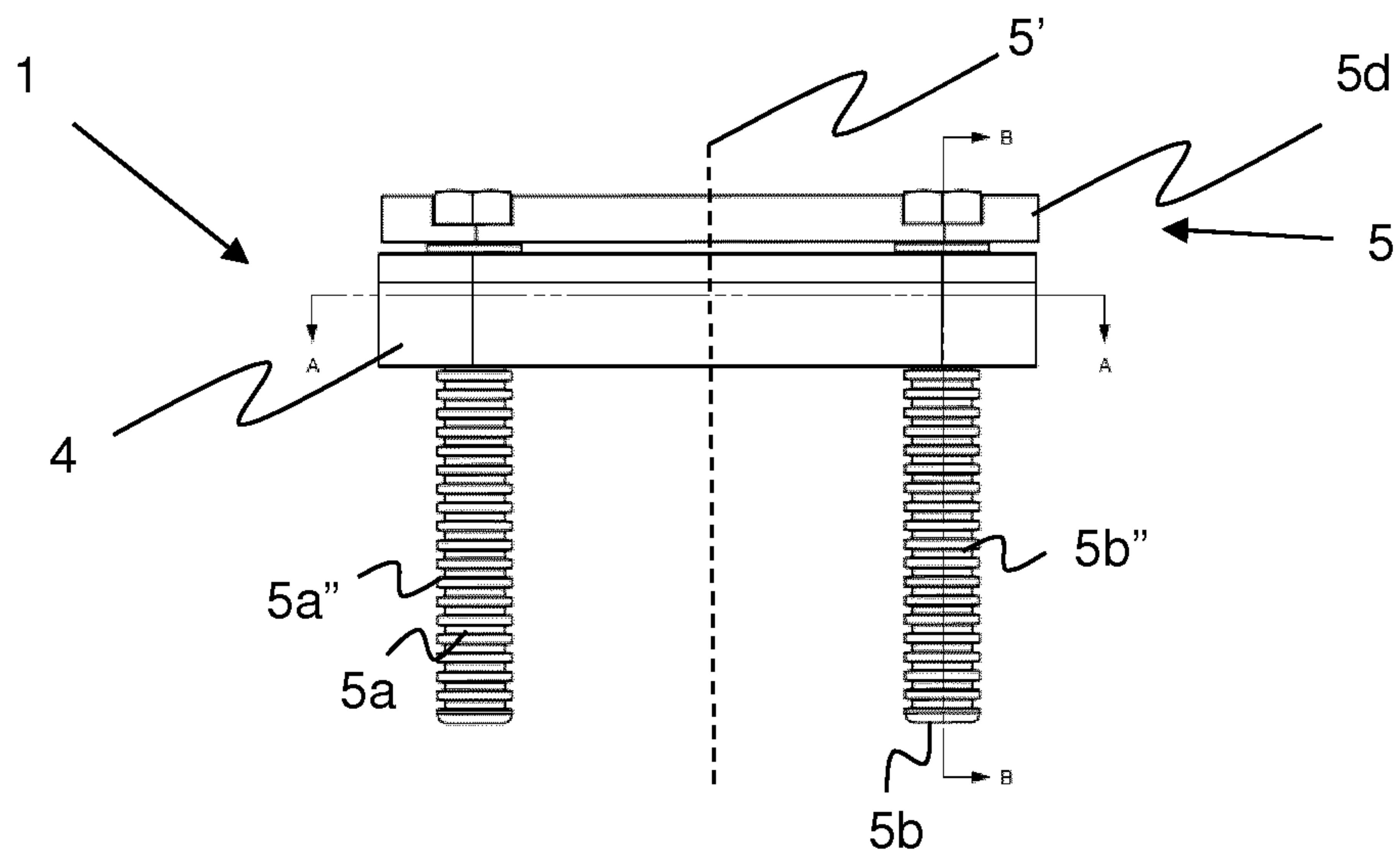


Fig. 6a

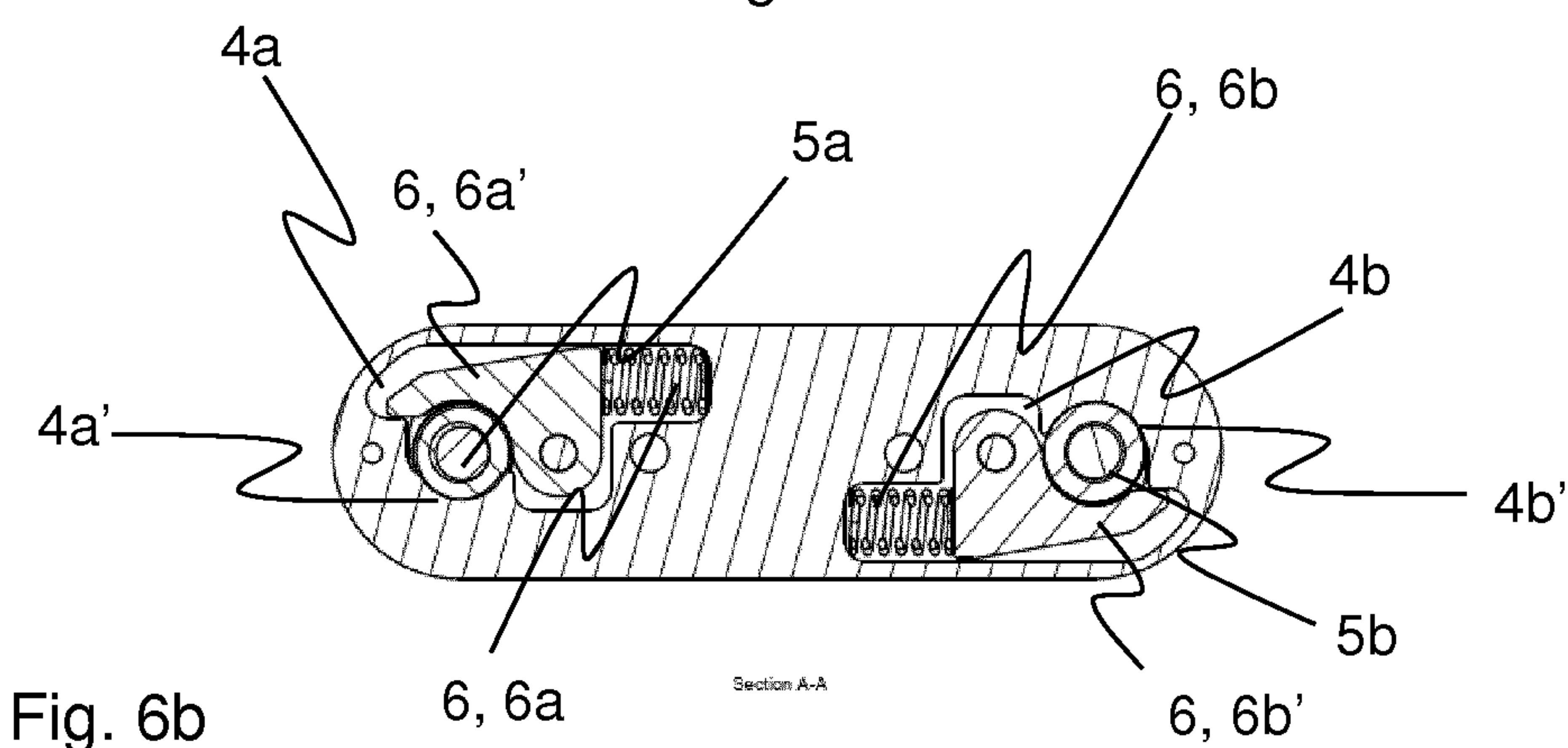


Fig. 6b

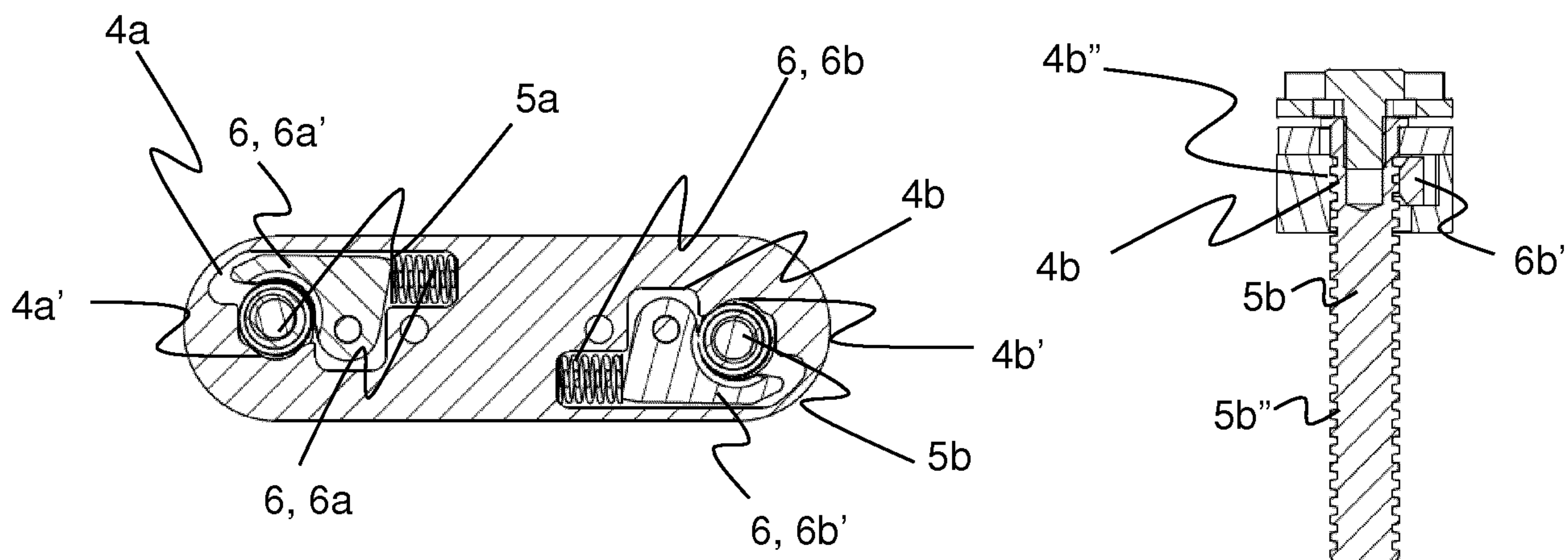


Fig. 6c

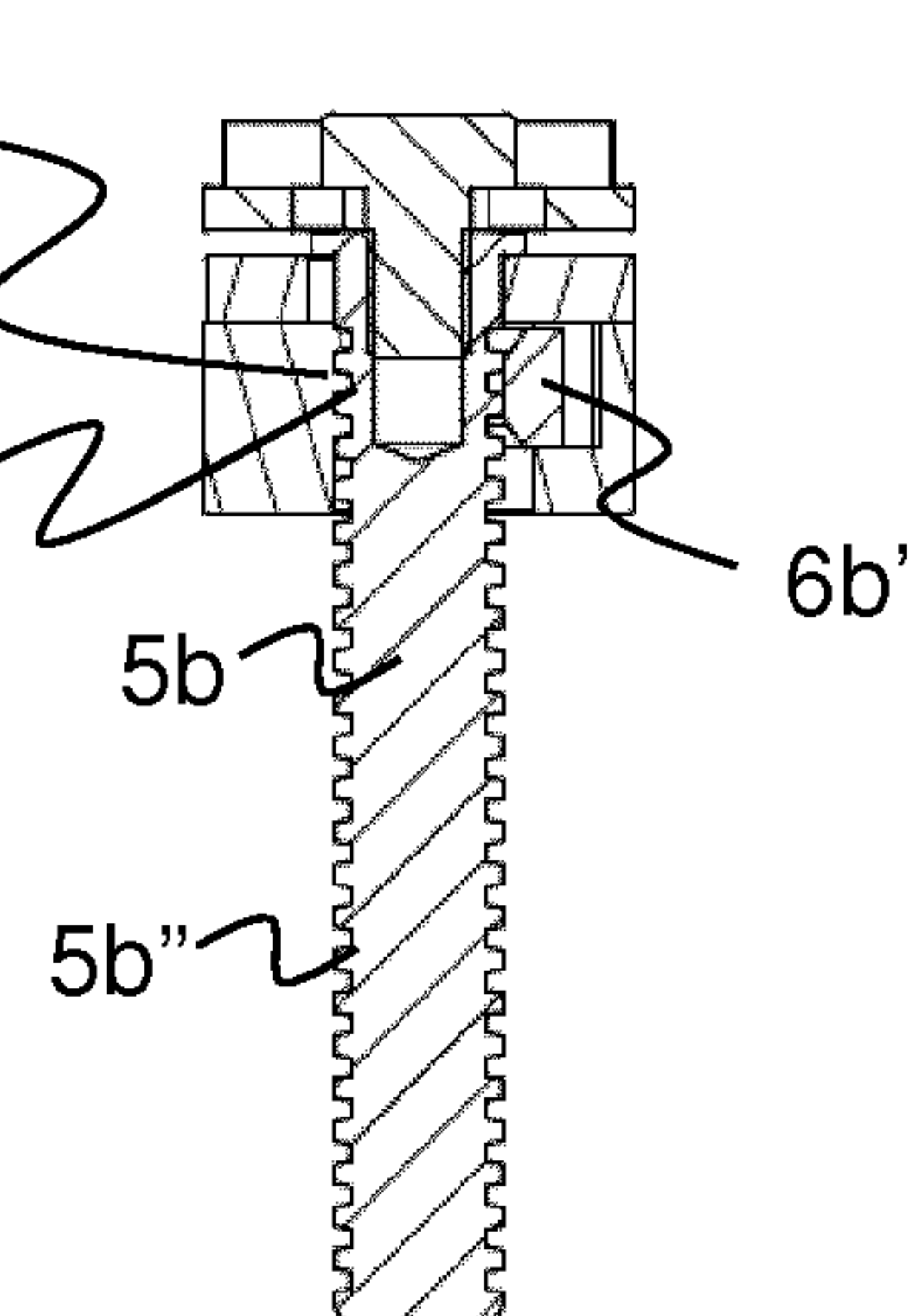
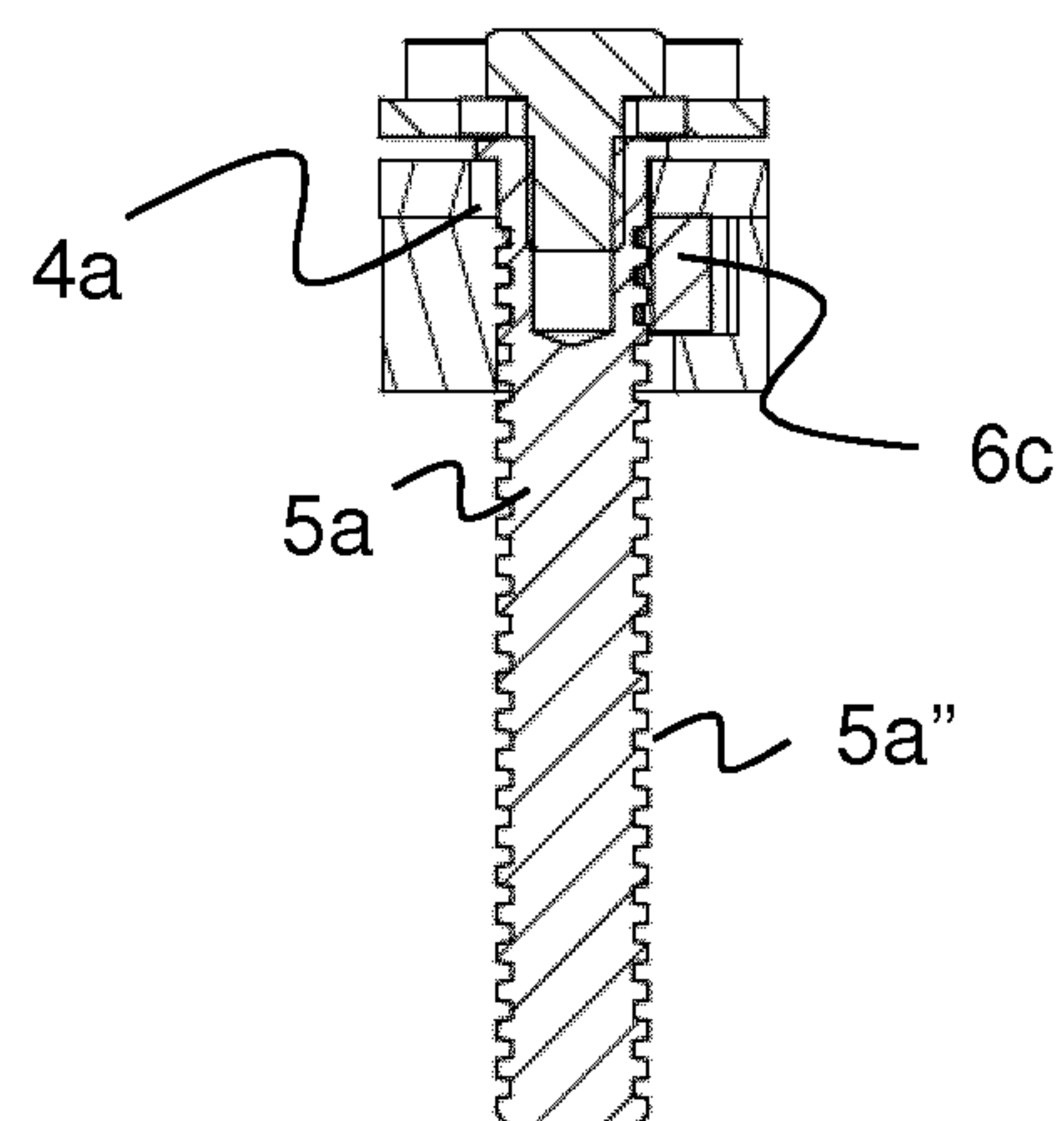
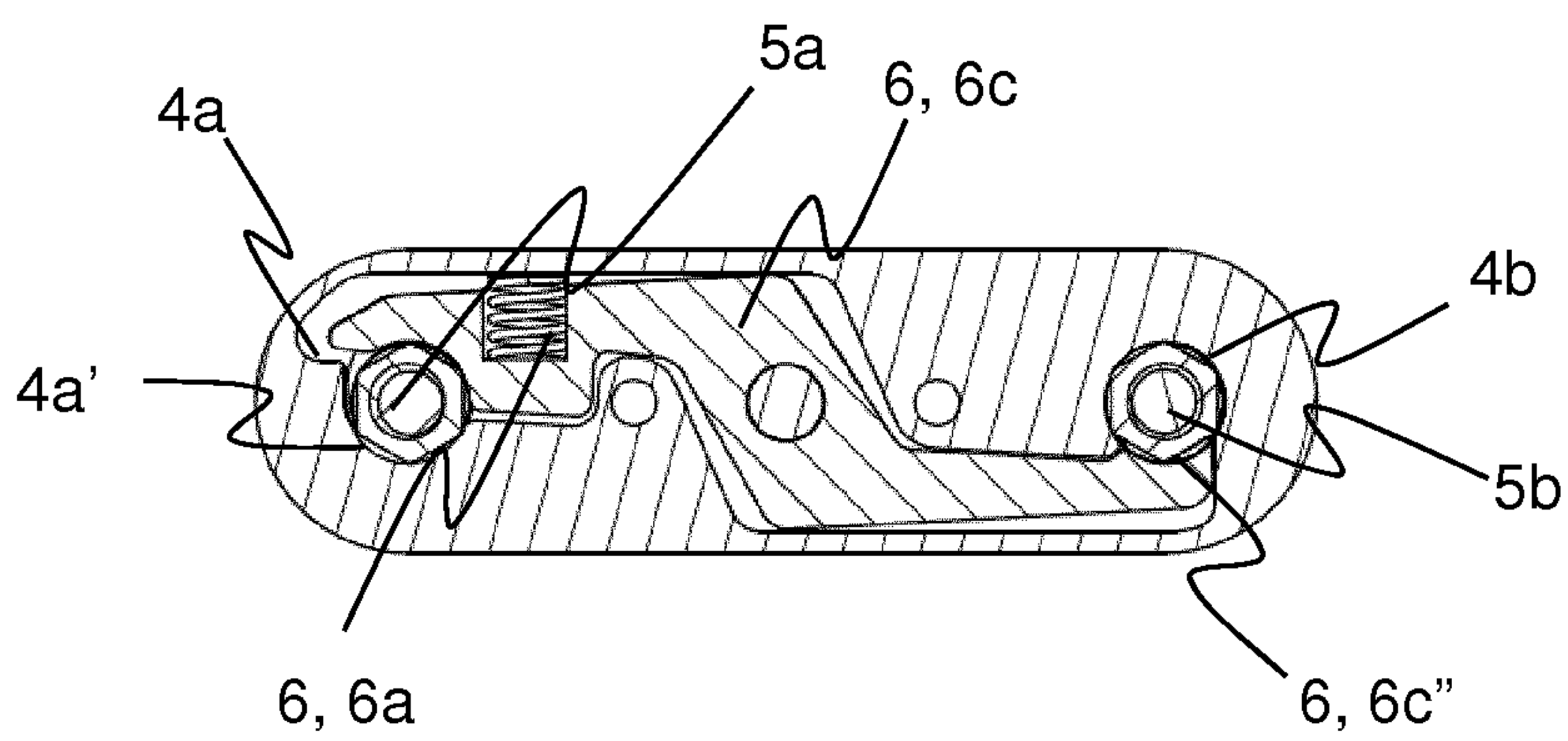
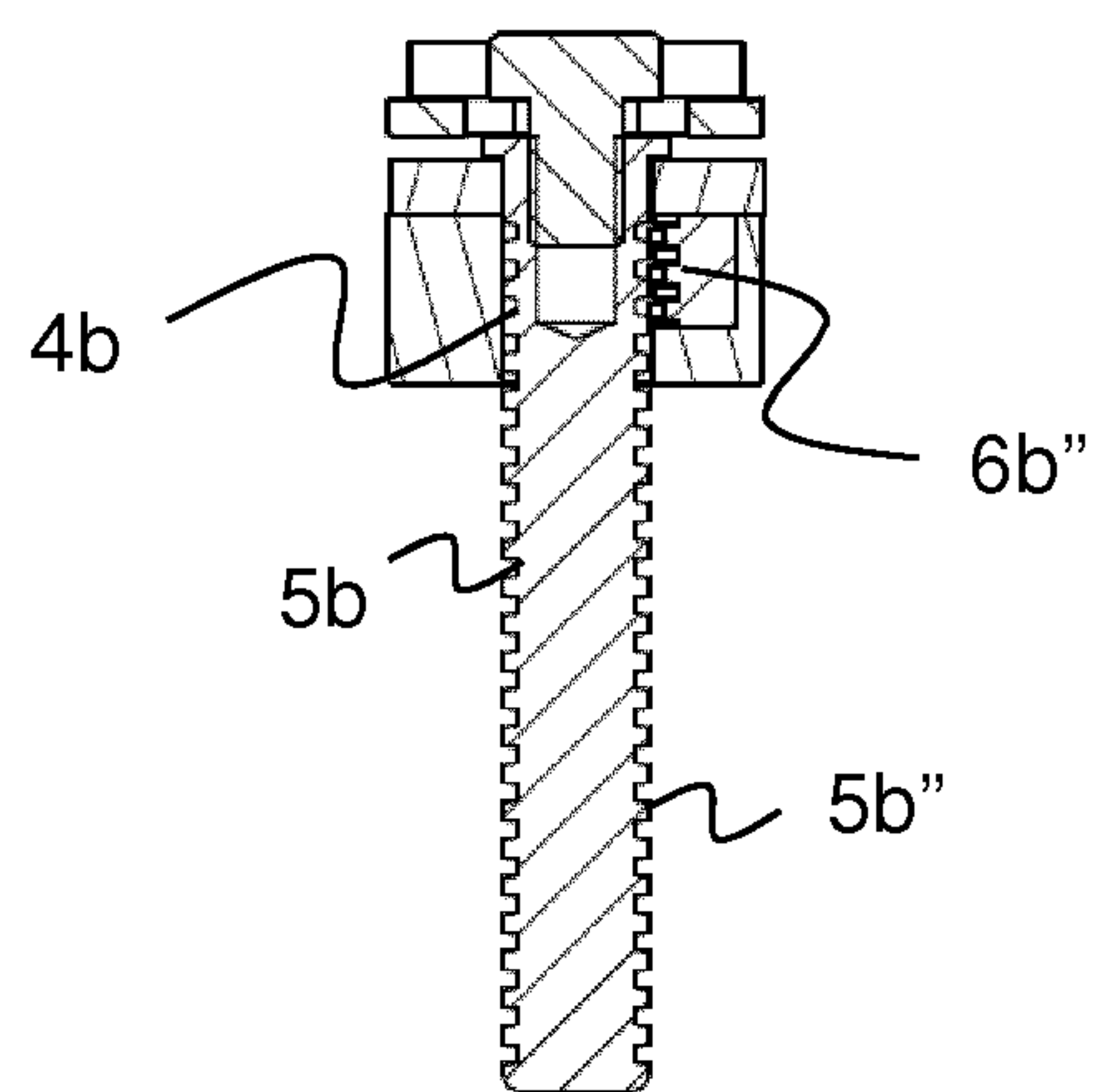
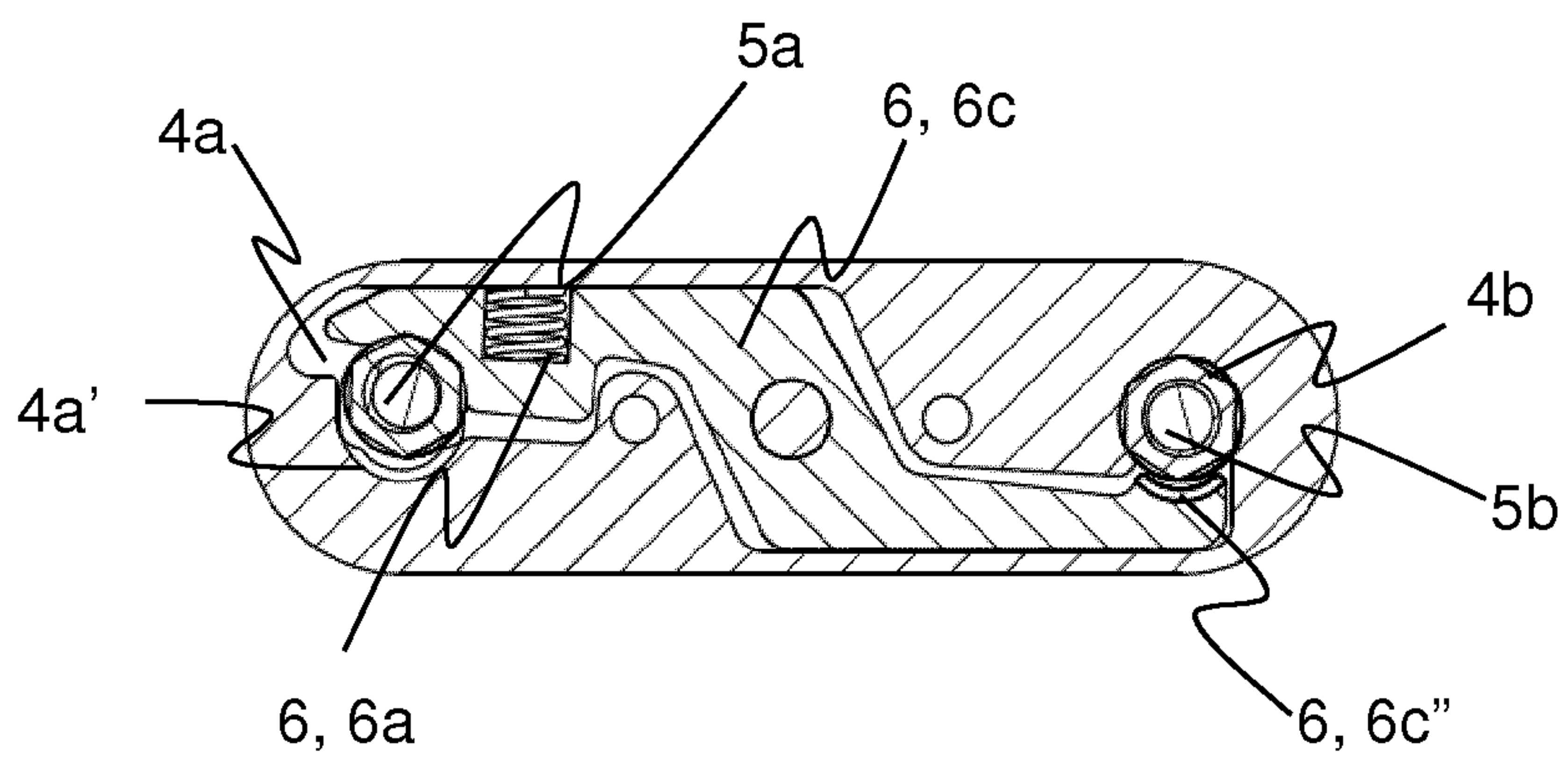
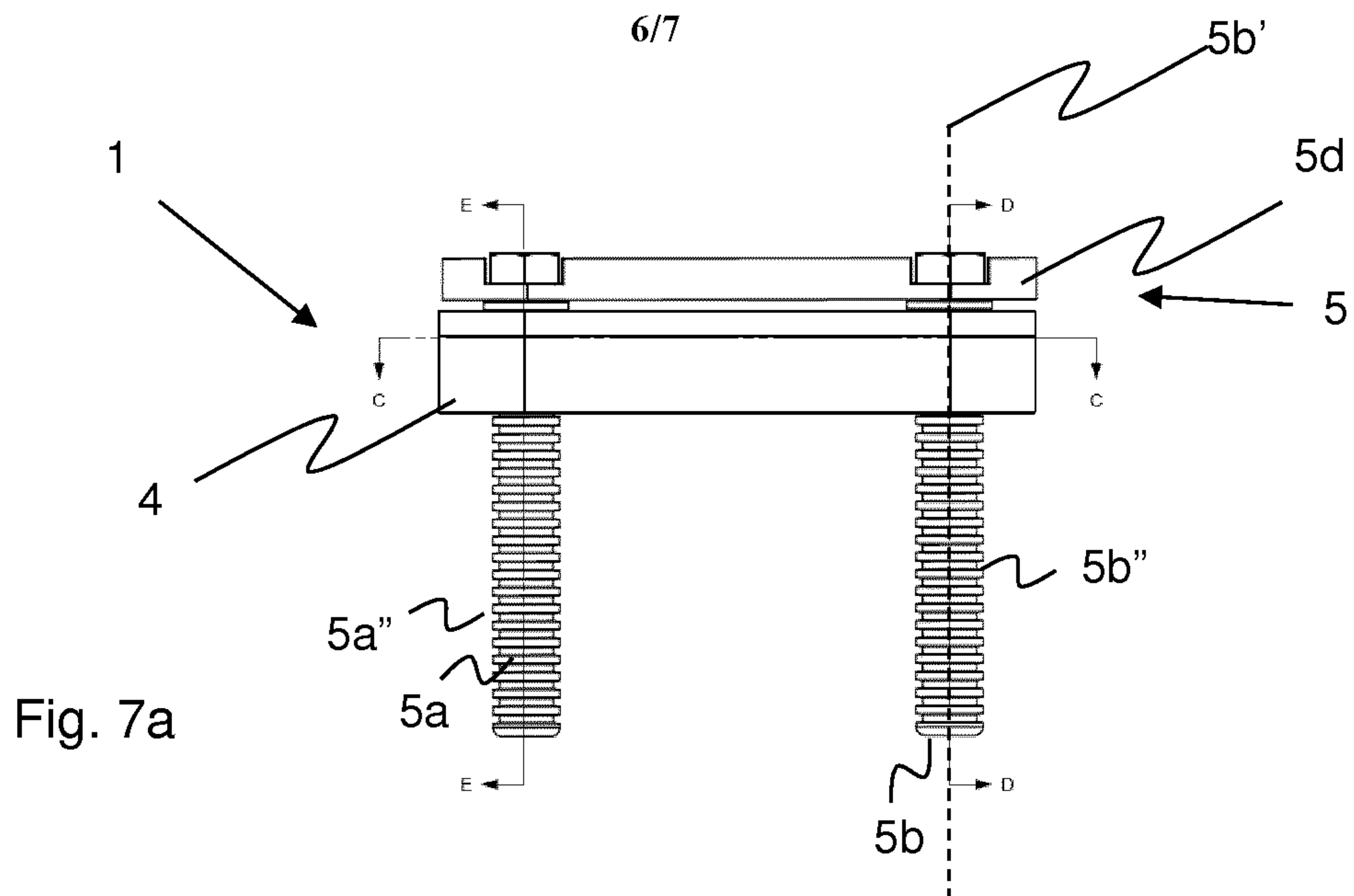
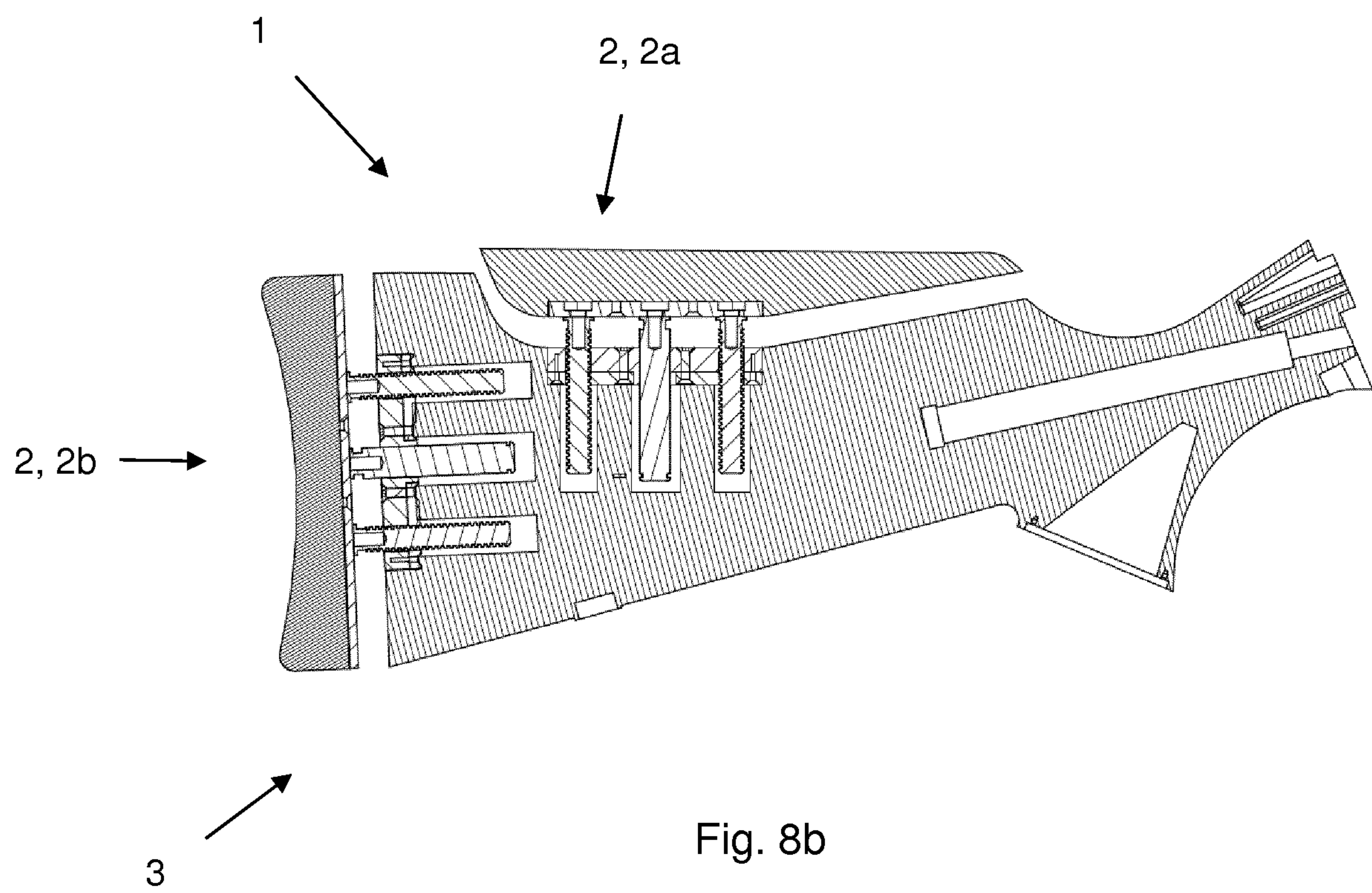
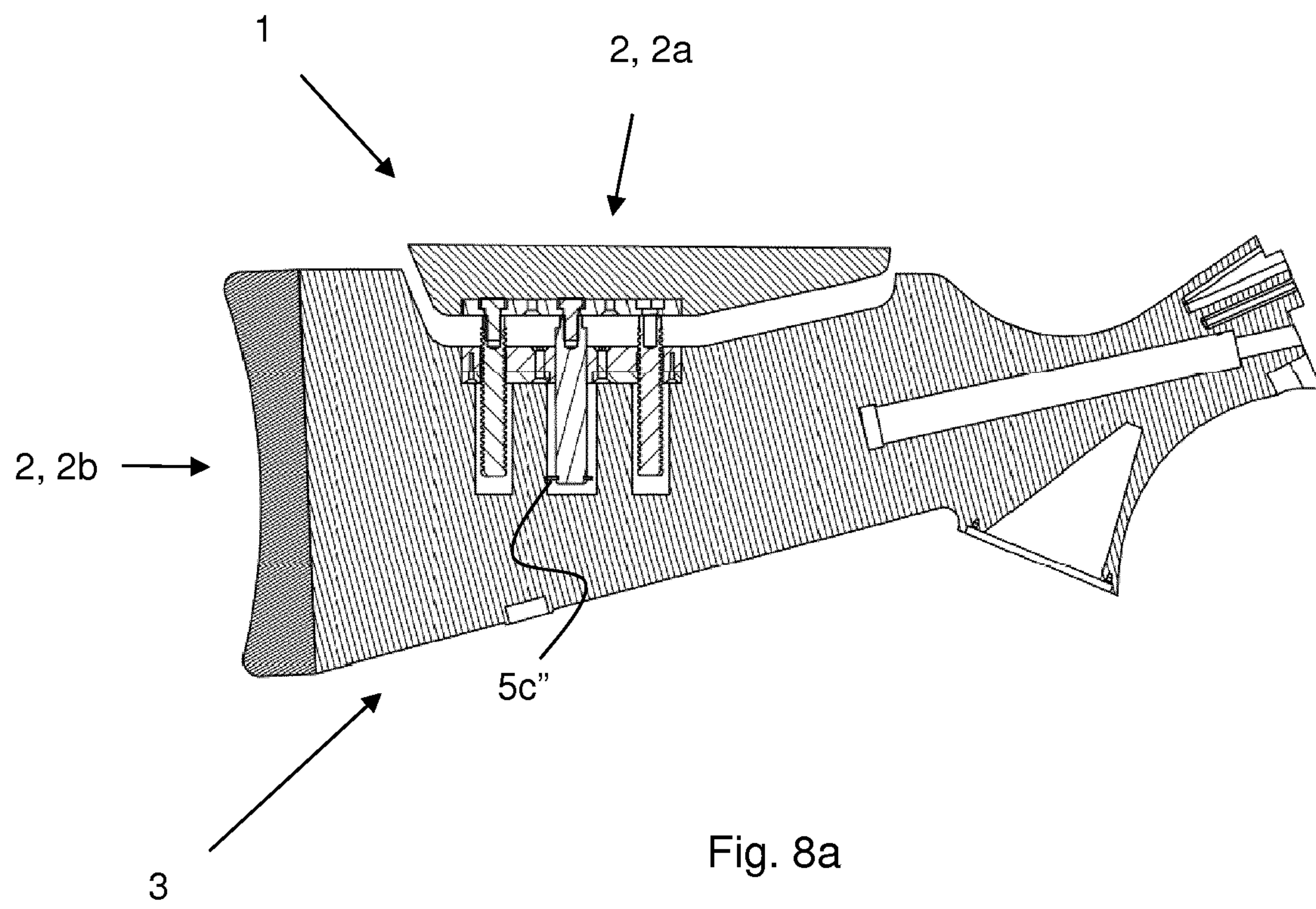


Fig. 6d

6/7





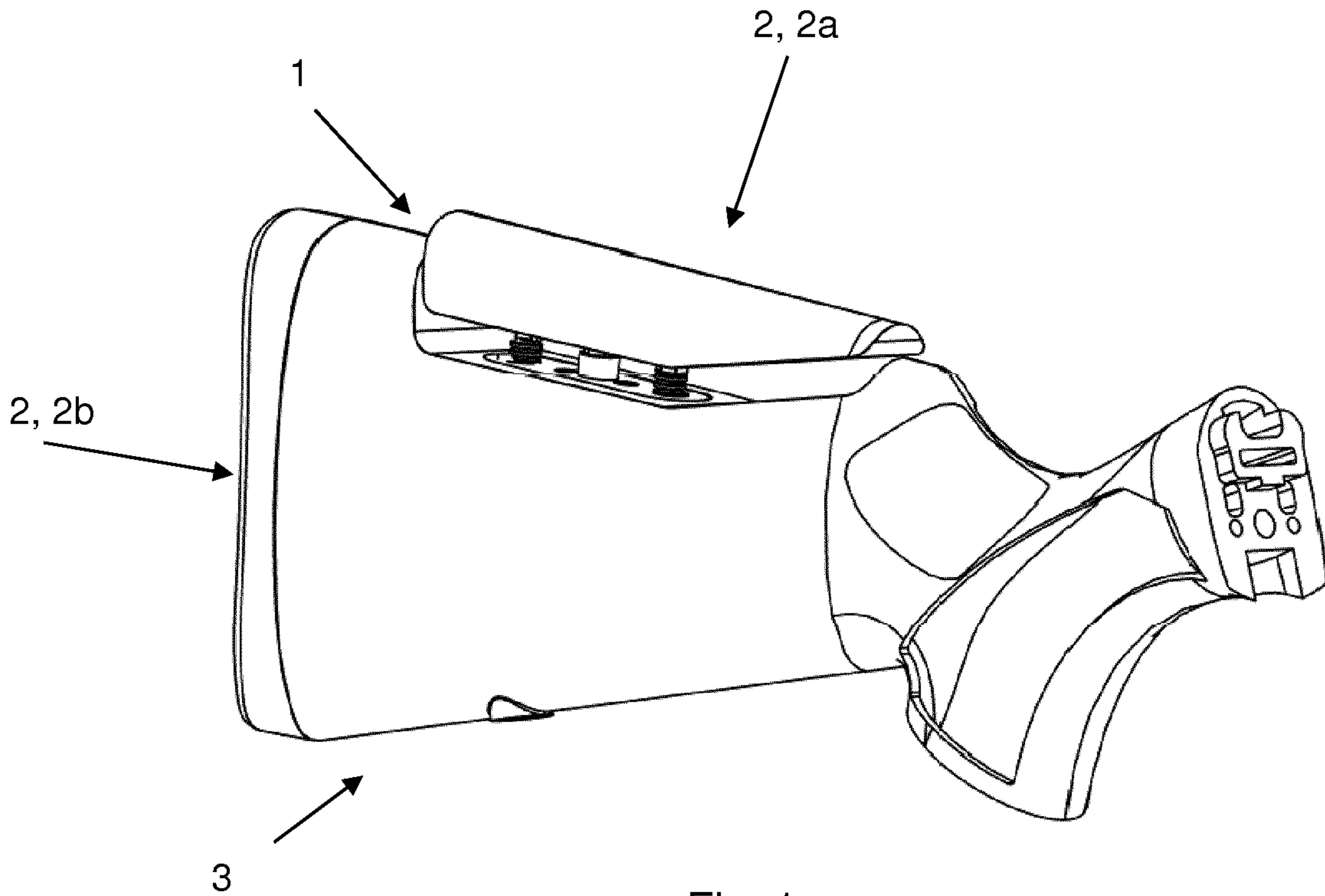


Fig. 1