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00101 Helsinki (FI)(54) **Clamp device for fastening accessories**

(57) The invention relates to a clamp device for detachably fastening an accessory to hospital furniture, such as an operating table or the like. The clamp device comprises first and second clamping elements (1,2) that are interconnected. The first clamping elements (1) comprise a fastening frame (10) provided with a channel (11) that is C-shaped in cross-section, in which channel there is installed the accessory rail (20), and locking means (22) provided in connection with the fastening frame (10)

and the channel (11) for fastening and locking the frame and at the same time the clamp device detachably to the accessory rail. The second clamping elements (2) comprise jaws (3), and in between the jaw elements (31,32) of said jaws, there is left a gap (4); a space (5) for the accessory support element (T) provided in the gap (4) left between the jaws (3;31,32); and a compression element (6) for pressing the jaws (3;31,32) together and respectively for opening them for fastening and respectively detaching the accessory support bar (T).

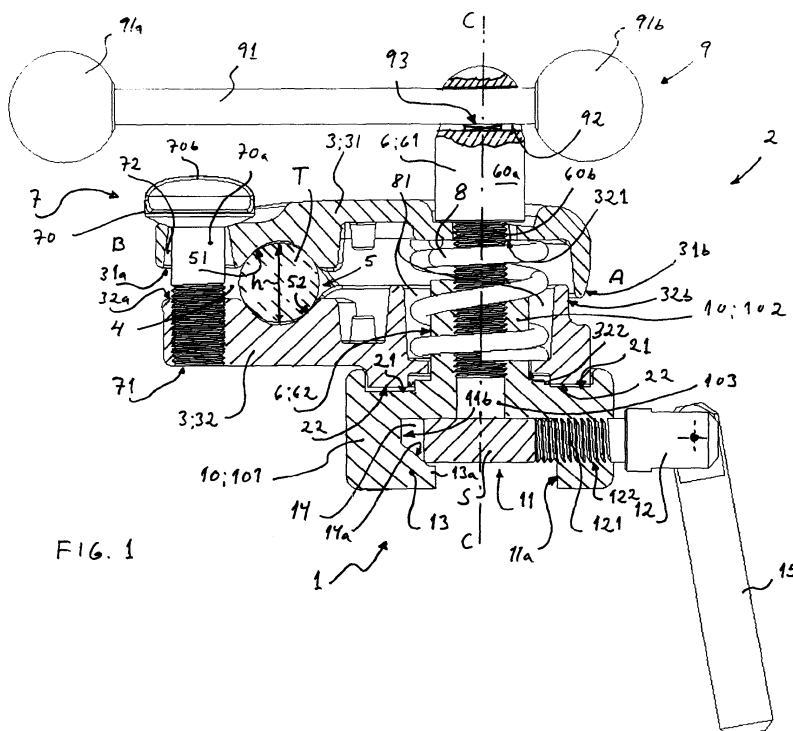


FIG. 1

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Description

[0001] The invention relates to a clamp device according to the preamble of claim 1.

[0002] In the prior art, there are known clamp devices, the purpose of which is the fastening of accessories particularly to operating tables, among others from the British patent publications GB-879 878 and GB-1 065 661.

[0003] Operating tables are provided with rails or bars arranged at the sides in the lengthwise direction, said rails or bars being rectangular in cross-section. Various auxiliary devices, i.e. accessories, are designed to be attached to said rails, i.e. accessory rails, when performing operations. Said accessories can be for example various supports by which the limbs of the patient are supported in a desired position, or supports by which various auxiliary devices or their parts needed in the operation can be attached to the operating table. The accessory rails of operating tables are standardized in measures. Similar accessory rails used in operating tables can also be arranged in other pieces of hospital furniture, such as beds, tables or chairs, for fastening various accessories by which the patient can be helped for example in connection with clinical treatment and/or eating or washing.

[0004] The problem with current clamp devices that are used for fastening accessories to hospital furniture, particularly to operating tables, is how to achieve sufficient holding power. There are several reasons for this, for instance that a sufficient holding power should be achieved by a moderate manual power, by which the clamping elements of the clamp device are pressed to an accessory rail or the like. It is also pointed out that in cross-section, an accessory clamping part is generally circular, which also requires a high friction between the clamping surfaces of the clamping element and the clamping part of the accessory, in order to realize a good and solid grip. In addition, the diameters of various clamping parts of accessories vary, in which case the contact points between the clamping surfaces of a clamping element and the clamping parts of an accessory as well as their areas may change as the diameters vary, in which case the grip of the clamp device of the accessory clamping part also varies.

[0005] The object of the invention is to eliminate the drawbacks connected to the currently used prior art clamp devices. Another object of the invention is to realize a new clamp device that is suited for fastening various different accessories to hospital furniture, particularly to operating tables, which clamp device is simple and functions reliably, holding the accessory in place, fastened in a desired position and locked in place.

[0006] The clamp device according to the invention is characterized by what is set forth in claim 1. The dependent claims represent various preferred embodiments of the clamp device according to the invention.

[0007] The invention relates to a clamp device for detachably fastening an accessory to hospital furniture, such as an operating table or the like, said clamp device

comprising first and second clamping elements that are interconnected; in which clamp device, by means of the first clamping elements, the clamp device is detachably fastened to an accessory rail or the like of hospital furniture, such as an operating table, and by means of the second clamping elements, the accessory is detachably fastened to the clamp device, said first clamping elements comprising a fastening frame provided with a channel that is C-shaped in cross-section, in which channel the accessory rail or the like of hospital furniture, such as an operating table, should be fitted; and locking means provided in connection with the fastening frame and the channel, for fastening and locking the frame and at the same time the clamp device detachably to the accessory rail, said second clamping elements comprising jaws, with a gap in between the jaw elements of the jaws; a space for a support element of the accessory in the gap in between the jaws; and a compression element for pressing the jaws together and respectively for opening the jaws for fastening and respectively detaching the support element of the accessory.

[0008] According to the invention, the second clamping elements of the clamp device also comprise an adjusting element for adjusting the space diameter, said adjusting element being arranged at the jaws, at the second end of the jaw elements, and on the second side of the space, whereas the compression element is arranged at the jaws, at the first end of the jaw elements and on the first side of the space.

[0009] The advantage of the invention is its simple and solid structure. In addition, the invention is rapid and easy to use.

[0010] The invention also is economical to manufacture owing to its simple structure.

[0011] A particular advantage of the invention is that it can be used for fastening various different accessories, particularly accessories with various diameters, to hospital furniture; particularly, however, to operating tables and the like.

[0012] The invention and its further advantages will be described in more detail below, with reference to the appended drawings, where

Figure 1 illustrates a clamp device according to the invention, in partial cross-section viewed from the side;

Figure 2 illustrates a clamp device as viewed at the front;

Figure 3 illustrates the second jaw element of the second clamping elements of a clamp device, as enlarged and viewed at an oblique angle from the side;

Figure 4 illustrates the fastening frame of the first clamping elements of a clamp device, as enlarged and viewed at an oblique angle from the side; and

Figure 5 illustrates how the fastening frame of the first clamping elements of a clamp device and the second jaw element of the second clamping elements are matched together, seen in an enlarged exploded view, at an oblique angle from the side.

[0013] An advantageous clamp device according to the invention is illustrated in the drawings. Like numbers for like parts of the clamp device are used in the drawings.

[0014] The clamp device is particularly meant for fastening an accessory detachably to hospital furniture, such as an operating table or the like.

[0015] The clamp device comprises first and second clamping elements 1, 2 that are interconnected. By means of the first clamping elements 1, the clamp device is detachably fastened to the accessory rail S of a piece of hospital furniture, such as an operating table. By means of the second clamping elements 2, an accessory, particularly the support element T of the accessory, is detachably fastened to the clamp device.

[0016] The first clamping elements 1 comprise a fastening frame 10, a channel 11 provided therein and locking means 12. The frame 10 is advantageously formed of two interconnected frame parts, a first and second frame part 101, 102.

[0017] In a preferred embodiment of the invention, the first frame part 101 is in cross-section a rectangular element provided with an elongate, straight, advantageously C-shaped recess, i.e. a channel 11. An accessory rail S or a corresponding element of a piece of hospital furniture, such as an operating table, should be fitted in this channel 11, when the accessory is installed in connection with said hospital furniture. In connection with the frame 10, particularly the first frame part 101, and the channel 11, there are arranged locking means 12 for fastening and locking the frame and at the same time the whole clamp device detachably to said accessory rail S.

[0018] In a preferred embodiment of the invention, the locking means 12 are realized by a fixing screw 121 arranged in connection with the channel 11. Now the fastening frame 10, particularly the first frame part 101, is at the first edge 11 a of the channel 11 provided with a threaded hole 122, in which the fixing screw 121 can be fitted. The hole 122 is arranged preferably at right angles to the channel 11. Respectively the second opposite edge 11 b of the channel 11 is provided with a bracket 13, belonging to the fastening frame 10, and in this case to its first frame part 101, by means of which bracket a wedge-shaped groove 14 is configured in the channel. The external free end of the fixing screw 121 is preferably connected to a shift lever 15 or a corresponding shift element, by means of which the fixing screw 121 can be turned in the hole 122 to inside the frame 10; 101, to the closed position, i.e. towards the opposite edge 11 b of the channel 11, or to the open position, i.e. out of the frame and channel. In this case the shift lever 15 is pivoted, turnably on one plane, to the protruding end of the fixing screw 121. When the accessory rail S is fitted in the chan-

nel 11, the fixing screw 22 is in the open position. When the clamp device is locked in the accessory rail S, the fixing screw 22 is turned to the closed position, and thus as far as possible inwards in the frame and the channel, in which case the fixing screw 22 presses the accessory rail S tightly in the wedge-shaped groove 24 and locks it in place.

[0019] In a preferred embodiment of the invention, the free end of the bracket 13 is provided with a threshold 13a. Now at the side of the free end of the bracket 13, particularly at the inclined side 14a of the groove 14, there is created an angle that prevents the accessory rail S fitted in the channel from slipping out of the channel 11, and it thus ensures a reliable locking between the accessory rail S and the clamp device.

[0020] In a preferred embodiment of the invention, the second frame part 102 constitutes a bracket that is arranged in the middle region of the first frame part 101, advantageously at right angles to the channel 11. In shape, the second frame part 102 is advantageously cylindrical or a truncated cone shaped bracket (or it may have some other corresponding suitable geometric shape). In this embodiment, the second frame part 102 is a hole 103 provided with threadings 104.

[0021] In a preferred embodiment of the invention, the second clamping elements 2 comprise jaws 3, between which there is left a gap 4; a space 5 in the gap for the accessory support element T, and a compression element 6 in connection with the jaws for closing and respectively opening said jaws. The jaws 3 comprise a first and second elongate jaw element 31, 32, and in between the facing surfaces 31 a, 32a of said jaw elements, there is left the gap 4. The space 5 for the accessory support element T, such as a round support bar, is located in the gap 4 left between the jaws 3 and thus the jaw elements 31, 32, particularly on their facing inner surfaces 31a, 32a. In this embodiment in particular, the gap 4 is formed between the surfaces 31 a, 32a of the jaw elements, relatively near the second end B of the jaw elements.

[0022] The compression element 6 is arranged to connect the jaw elements 31, 32 and to provide a suitable compression force therebetween. The compression element 6 is in the described embodiment realized as a screw and nut combination, i.e. as a combination of a screw element 61 and a nut element 62, for pressing the jaws 3 and thus the jaw elements 31, 32 together, and respectively for opening them for fastening and respectively detaching an accessory, particularly said support bar T or the like.

[0023] The screw element 61 comprises a head part 60a and the screw proper 60b. The screw element 61 is arranged to pass through the first jaw element 31 and the aperture 321 provided therein, so that its head part 60a is supported against the first jaw element 31 around the aperture 321, when using the compression element 6; 61, 62, particularly when tightening it.

[0024] The nut element 62 comprises a fastening frame 10, particularly a second frame part 102, belonging

to the first clamping element 1, in connection with which there is arranged a hole 103 provided with corresponding threadings 104 of the screw element. The screw element 61 of the compression element 6, particularly a screw 60b, is arranged to pass through the jaws and the jaw elements 3; 31, 32, to the side of their first end A (or at least to the vicinity of the first end) and at the same time to the first side of the space 4. The screw 60b of the compression element 6 is arranged to turn in the hole 103 of the fastening frame 10 and of its second frame part 102, when using the compression element 6; 61, 62. Now the second frame part 102 is arranged in the aperture 322 provided in the second jaw element 3; 32, and so that the second frame part 102 extends to the interior of the second jaw element 32. Now the first frame part 101 of the fastening frame 10, particularly the first stop face 21 provided therein, is arranged to rest against the second jaw element 32, particularly against the second stop face 22 provided therein. Both stop faces 21, 22 are annular surfaces; the first stop face 21 is arranged in the first frame part 101, around the second frame part 102 forming a bracket, and the second stop face 22 is arranged around the aperture 322 of the second jaw element 32.

[0025] In a preferred embodiment of the invention, the first stop face 21 of the fastening frame 10, particularly of the first frame part 101, and the second stop face 22 of the second jaw element 32, are provided with mutually matching and gripping friction surfaces, gear surfaces or the like. Now it is preferable that the second (or alternatively first) stop face 22 includes a gear ring, provided with radially arranged straight grooves 221 and protrusions 222. Respectively the first (or alternatively second) stop face 21 includes preferably a number, such as three, of elongate radial pins 211 (or alternatively grooves) that match with the gear ring grooves 221 (or pins) of the first stop face. When the tightening of the compression element 6; 61, 62 is loosened, the stop faces 21, 22 are made to disengage, in which case the jaws 3; 31, 32 can be turned with respect to the fastening frame 10, and simultaneously with respect to the accessory bar S attached thereto, and at the same time the position of the accessory arranged in the gap 4 in between the jaws, particularly a support bar T, can be turned with respect to the axis C-C. When the jaws 3; 31, 32 are pressed together by the compression elements 6; 61, 62, i.e. when the compression elements 6; 61, 62 are tightened, the stop faces 21, 22 are clamped and locked together, and the jaws 3; 31, 32 cannot be turned with respect to the fastening frame 10.

[0026] In connection with the compression element 6; 61, 62, there is arranged a spring, advantageously a coil spring 8. This is advantageously arranged around a screw element 61, particularly a screw 60b, and a second frame part 102 in a spring recess 81, which is arranged to extend to both jaw elements 31, 32. The coil spring 8 is arranged to push the jaw elements 31, 32 apart at the same time when the compression element 6; 61, 62 binds

the jaw elements 31, 32 together.

[0027] The first jaw element 31 is provided with a recess 31 b, located particularly in connection with the first end A of the jaw elements and in connection with the compression elements 6; 61, 62. Respectively, the second jaw element 32 is provided with a bracket 32b, located particularly at the first end A of the jaw elements, and in connection with the compression elements 6; 61, 62. The bracket 32b of the second jaw element 32 is fitted in the recess 31 b of the first jaw element 31 so that the jaw elements 31, 32 can move with respect to each other, particularly when the compression element 6; 61, 62 is being used. The recess 31 b of the first jaw element and the bracket 32b of the second jaw element are preferably realized by molding the jaw element frames at the first end A of the jaw elements. Alternatively, the recess 31 b and the bracket 32b are located in the second 32 and respectively first jaw element 31. The jaw elements 31, 32 are supported against each other by intermediation of the recess 31 b and the bracket 32b, and maintain thereby their mutual positions, and consequently cannot be turned with respect to each other.

[0028] As an alternative, the compression element 6 can be realized by other means than the above described screw and nut combination 61, 62. The essential feature with the compression element 6 is that it comprises means by which the jaw elements 31, 32 are interconnected at their first end A, and means by which the jaw elements can be suitably pressed together and locked in a compressed position, and in reverse respectively released from the compressed position, so that the compression of the jaw elements is loosened. Now the compression element 6 can be realized for example as a structure with a pin proceeding through the jaw elements 31, 32 and a turnable compressor (shaft, eccentric etc.) attached at the jaw elements at the protruding end thereof, to which compressor there is connected a drive unit, such as an auxiliary shaft, by which the compressor is manipulated, so that the jaw elements are pressed together or released from compression.

[0029] The space 5 arranged in the gap 4 is preferably realized by recesses 51, 52 arranged at matching points in both jaw elements 31, 32, particularly in their facing surfaces 31a, 32a. In shape, these recesses are advantageously identical, and mirror images with respect to the surfaces 31 a, 32a of the jaw elements.

[0030] In a preferred embodiment of the invention, the support surfaces and borderlines of the recesses 51, 52 of the space 5 are advantageously V-shaped or resembling the shape of the letter V. Thus both recess 51, 52 are formed as V-shaped grooves, the sides, i.e. support surfaces, of which are essentially straight and positioned at an angle with respect to each other. In addition, the bottom of both recesses 51, 52 is preferably rounded. Now the accessory and particularly its support element T is clamped and locked in place in the space 5 by finding two fastening points in the support surfaces of both recess 51, 52, particularly on the sides of the V-shaped

groove, i.e. four fastening points altogether, in which case the fastening and locking between the support element T and the space 5 is carried out reliably and effectively. It is pointed out that the mutual fastening of the jaw elements 31, 32 is loose in purpose, in order to realize the support of said four fastening points. Thus the accessory to be fastened, particularly its auxiliary part T, finally determines the exact mutual positions of the jaw elements 31, 32.

[0031] In a preferred embodiment of the invention, the second clamping elements 2 of the clamp device also comprise an adjusting element 7 for adjusting the diameter h of the space 5, and at the same time for adjusting the maximum diameter describing the opening of the gap 4. The adjusting element 7 is arranged in between the jaws 3; 31, 32, particularly at the second end B of the jaw elements (or at least in the vicinity of the second end of the jaw elements) and at the same time on the second side of the space 5. The compression element 6 is arranged in between the jaws 3; 31, 32, at the first end A of the jaw elements, in the vicinity of the first ends thereof, and at the same time on the first side of the space 5. The diameter h of the space 5 is adjusted to be suitable according to the diameter of the support element T of the accessory to be installed, or according to a corresponding diameter, so that the support element T can be fitted in the space 5 with a small clearing. Thereafter the jaws 3, particularly the jaw elements 31, 32, are pressed together by the compression element 6, in which case the accessory and particularly its support element T is clamped and locked in place in the space 5 even by a slight compression force.

[0032] As was already stated above, the compression element 6, such as a screw element 61, is arranged in connection with both jaw elements 3; 31, 32, at the first end A thereof (or at least near the first end of the jaw elements), and at the same time on the first side of the space 4. Respectively, the adjusting element 7, such as an adjusting screw 70, is arranged in connection with both jaw elements 3; 31, 32, at the second end B thereof (or at least near the second end of the jaw elements), and at the same time on the second side of the space 4. The distance between the compression element 6 (particularly its imaginary center axis) and the space 4 (particularly the vertical axis passing through its imaginary center point), i.e. the first distance a, is longer than the distance between the adjusting element 7 (particularly its imaginary center axis) and the space 4 (particularly the vertical axis passing through its imaginary center point), i.e. the second distance b. The ratio a/b of the first and second distances is advantageously within the range 1.5-3.0, preferably of the order 2.5, but it may be even larger than this given maximum value.

[0033] In the above described arrangement, the adjusting element 7 is placed a great deal nearer to the space 4 and to the object that is supposed to be fastened thereto, such as accessory support element T, than the compression element 6, by which the clamping strength

proper of the jaws is generated. The force directed to the object to be fastened is the sum of the vertical forces generated by the adjusting element 7 and the compression element 6 against the jaw elements. Because the compression element 6 is located further away from the space 4, and from the object T to be fastened in the space, there is created a larger tightening torque than with a structure where for example the compression element 6 and the adjusting element 7 are placed at the same distance from the space 4 and from the object T to be fastened in the space.

[0034] In a preferred embodiment of the invention, the adjusting element 7 is an adjusting screw 70 which is arranged in connection with both jaw elements, at the second end B of the jaw elements 31, 32, or at least near the second end B of the jaw elements 3; 31, 32. Both jaw elements 31, 32 are provided with a hole 71, 72 for the adjusting screw 70. The first 71 of the holes is provided with threadings, in which the threaded part 70a of the adjusting screw 70 fits. In diameter, the second of the holes 72 is larger than the adjusting screw 70, so that the adjusting screw has free access to move in the hole. In diameter, the head part 70b of the adjusting screw 70 is larger than the second hole 72. Now the adjusting screw 70 is supported, at the head part 70b, against the area surrounding the second hole 72, when the adjusting screw is used for adjusting the diameter of the gap 4 and at the same time of the space 5, either for reducing or expanding said diameter.

[0035] The adjusting screw 70 is advantageously manually adjusted, in which case there is not needed any tool for adjusting the space 5; 51, 52. It is preferable that the diameter of the head part 70b of the adjusting screw is relatively large, for instance 10-15 mm, and provided with a coarsened surface at least on its outer circumference. Now there is achieved a good and solid grip for fingers at the head part 70b of the adjusting screw, and the adjusting operation itself is made easy.

[0036] As an alternative, the adjusting element 7 can be realized by some other types of means than the above described adjusting screw 70. The essential thing about the adjusting element 7 is that it comprises means by which the jaw elements 31, 32 can be interconnected at their second ends B, and means by which the distance between the jaw elements 31, 32, and at the same time the diameters of the gap 4 and the space 5 can be set as desired (i.e. adjusted) and locked at this selected distance, and also at the selected diameter of the space, and conversely, respectively released from the locking at the selected distance/diameter and readjusted.

[0037] The drive unit 9 of the compression element 6, particularly the screw and nut element 61, 62, is realized as a straight bar, a torsion bar 91. This bar 91 is arranged movably in the longitudinal direction in the hole 92, which is arranged to pass transversally with respect to the longitudinal and rotation axis C-C of the screw element 61, advantageously at right angles thereto, through the head part 60a of the screw element 61. The ends of the bar

91 are advantageously provided with balls 91 a, 91 b or with corresponding stop elements that allow the bar to slide in the hole between the stop elements, but prevent the bar 91 from sliding out of the hole 92.

[0038] In a preferred embodiment of the invention, the diameter of the hole 92 of the screw element is larger than the diameter of the bar 91. In addition, the hole 92 of the screw element is provided with a spring 93, so that the spring force affects transversally in the bar passing through the hole 92. The bar 91 is free to move lengthwise in the hole 92, but so that the spring 93 allows a slight transverse movement within a suitable trajectory.

[0039] The invention is not restricted to the above described embodiment only, but many modifications are possibly within the scope of the inventive idea defined in the claims.

Claims

1. A clamp device for fastening an accessory detachably to hospital furniture, for instance to an operating table or the like, said clamp device comprising first and second clamping elements (1, 2) that are interconnected, and in which clamp device, said clamp device is detachably fastened to an accessory rail (20) or the like of hospital furniture, such as an operating table, by means of first clamping elements (1), and the accessory is detachably fastened to the clamp device by means of second clamping elements (2), wherein

- the first clamping elements (1) comprise a fastening frame (10) provided with a channel (11) that is C-shaped in cross-section, in which channel there is due to be installed the accessory rail (20) or the like of hospital furniture, such as an operating table; and locking means (22) provided in connection with the fastening frame (10) and the channel (11) for fastening and locking the frame and at the same time the clamp device detachably to the accessory rail,

- the second clamping elements (2) comprise jaws (3), and in between the jaw elements (31, 32) of said jaws, there is left a gap (4); a space (5) for the accessory support element (T) provided in the gap (4) left between the jaws (3; 31, 32); and a compression element (6) for pressing the jaws (3; 31, 32) together and respectively for opening them for fastening and respectively detaching the accessory support bar (T),

characterized in that the second clamping elements (2) of the clamp device also comprise an adjusting element (7) for adjusting the diameter (h) of the space (5), which adjusting element (7) is arranged in the jaws (3; 31, 32) at the second end (B) of the jaw elements, and on the second side of the

space (5), whereas the compression element (6) is arranged in the jaws (3; 31, 32) at the first end (A) of the jaw elements and on the first side of the space (5).

2. A clamp device according to claim 1, **characterized in that** the distance between the compression element (6) and the space (4), i.e. the first distance (a) is longer than the distance between the adjusting element (7) and the space (4), i.e. the second distance (b), and that the ratio (a/b) of the first and second distances is advantageously within the range 1.5-3.0, preferably of the order 2.5.
3. A clamp device according to claim 1 or 2, **characterized in that** the space (5) is realized by recesses (51, 52) arranged at respective points in both jaw elements (31, 32) and that both recesses (51, 52) are advantageously formed of V-shaped grooves with a bottom that is preferably rounded.
4. A clamp device according to any of the preceding claims, **characterized in that** the compression element (6) is realized as a screw and nut element, which comprises a screw element (61) and a nut element (62), said screw element being arranged to pass through both jaw elements (3; 31, 32) at the first end (A) of the jaw elements.
5. A clamp device according to claim 4, **characterized in that** in connection with the compression element (6), there is arranged a spring, advantageously a coil spring (8), which is fitted in a spring recess (81) arranged to extend to both jaw elements (31, 32).
6. A clamp device according to claim 4 or 5, **characterized in that** the drive unit (9) of the compression element is realized as a straight bar (91) that is fitted in the hole (92), movably in the longitudinal direction, and arranged to pass through the head part (60a) of the screw element (6; 60), transversally with respect to the rotation axis (C-C).
7. A clamp device according to claim 6, **characterized in that** the diameter of the hole (92) of the screw element (6; 60) is larger than the diameter of the torsion bar (91), and that the hole (92) is provided with a spring (93), so that the torsion bar is free to move elastically in the hole, also in the transverse trajectory.
8. A clamp device according to any of the preceding claims, **characterized in that** the adjusting element (7) is an adjusting screw (70), which is arranged in connection with both jaw elements (3; 31, 32) at the second end (B) of the jaw.
9. A clamp device according to claim 8, **characterized**

in that both jaw elements (31, 32) are provided with a hole (71, 72) for the adjusting screw (70), the first (71) of said holes having threadings, with which the threading of the adjusting screw matches; and that the diameter of the second hole (72) is larger than the diameter of the adjusting screw (70). 5

10. A clamp device according to any of the preceding claims, **characterized in that** the first clamping elements (1) comprise a first and second frame part (10; 101, 102), said second frame part (102) being arranged as the nut element (62) of the compression element (6) realized as a screw and nut element. 10

11. A clamp device according to claim 10, **characterized in that** the locking means (12) included in the first clamping elements (1) are realized by means of a fixing screw (121) arranged in connection with the channel (11), so that the fastening frame (10), particularly the first frame part (101), is provided, at the first edge (11 a) of the channel (11), with a threaded hole (122), in which the fixing screw (121) can be fitted, and respectively the second opposite edge (11 b) of the channel (11) is provided with a bracket (13), by means of which a wedge-shaped groove (14) is configured in the channel. 15 20 25

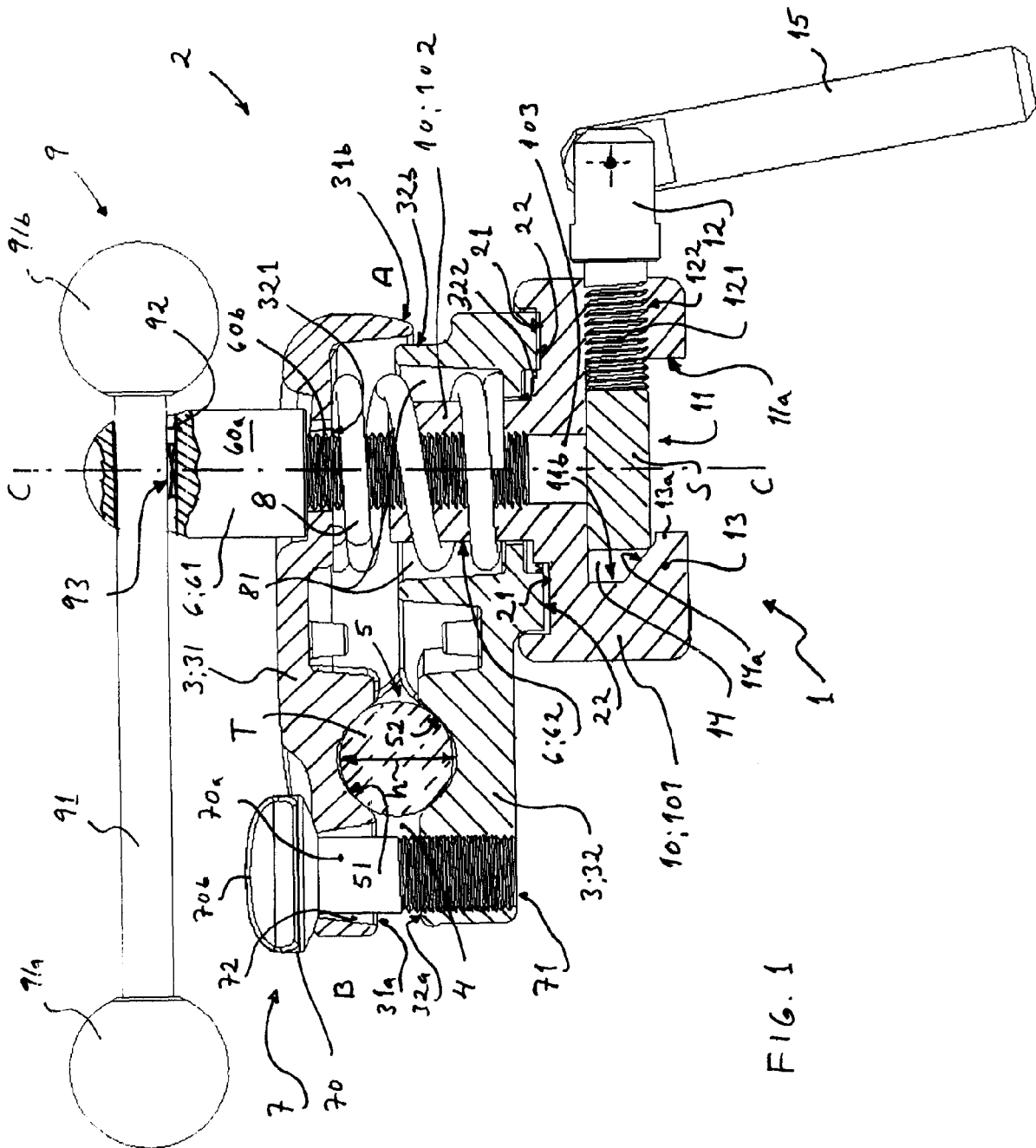
12. A clamp device according to claim 11, **characterized in that** the free end of the bracket (23) is provided with a threshold (23a), and that the side of said threshold that is located on the side of the groove (24) forms an angle with the side of the wedge-shaped groove that is located on the side of the bracket. 30 35

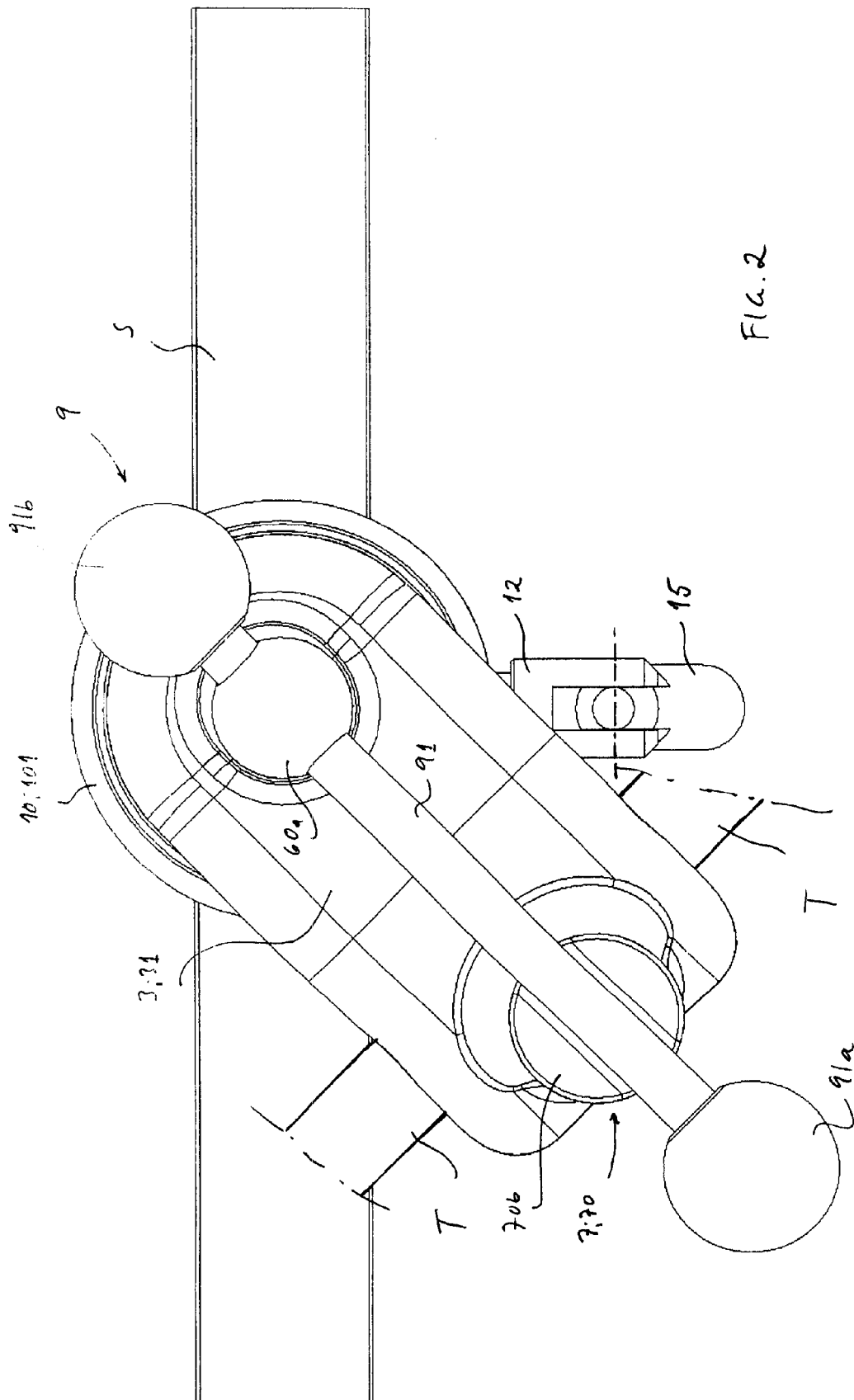
13. A clamp device according to any of the preceding claims 10-12, **characterized in that** the first frame part (101) of the fastening frame (10), particularly the first stop face (21) provided therein, is arranged to rest against the second jaw element (32), particularly against the second stop face (22) provided therein, and that the first stop face (21) and respectively the second stop face (22) are provided with mutually matching friction surfaces or the like. 40 45

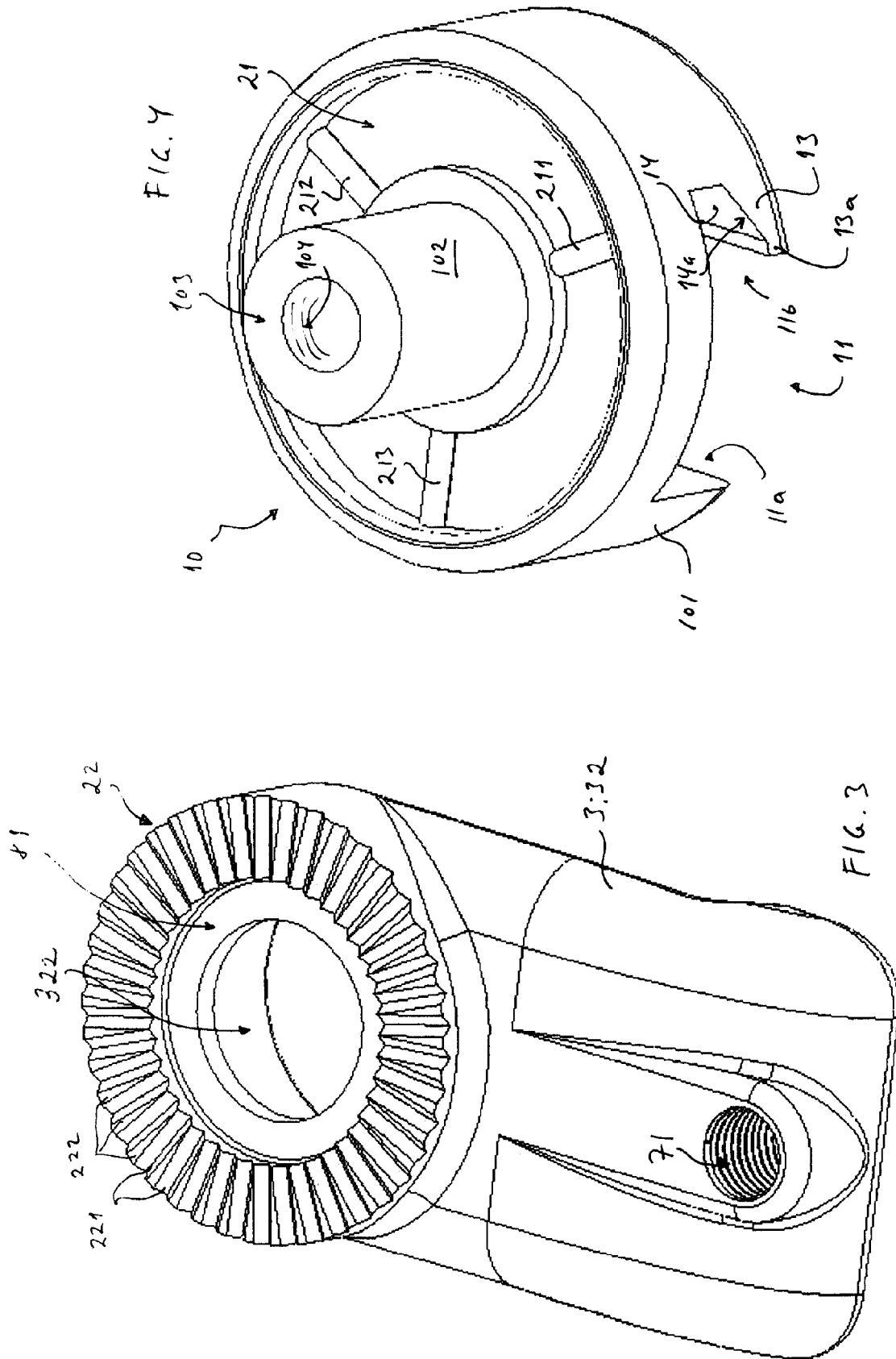
14. A clamp device according to claim 13, **characterized in that** both stop faces (21, 22) are annular surfaces, of which the first stop face (21) is arranged around the second frame part (102) forming a bracket in the first frame part (101), and the second stop face (22) is arranged around the aperture (322) provided in the second jaw element (32). 50

15. A clamp device according to claim 13 or 14, **characterized in that** the second stop face (22) includes a gear ring, provided with radially arranged straight grooves (221) and protrusions (222), and respectively the first stop face (21) includes preferably a 55

number, such as three, of elongate radial pins (211, 212, 213) or grooves that match with the gear ring.







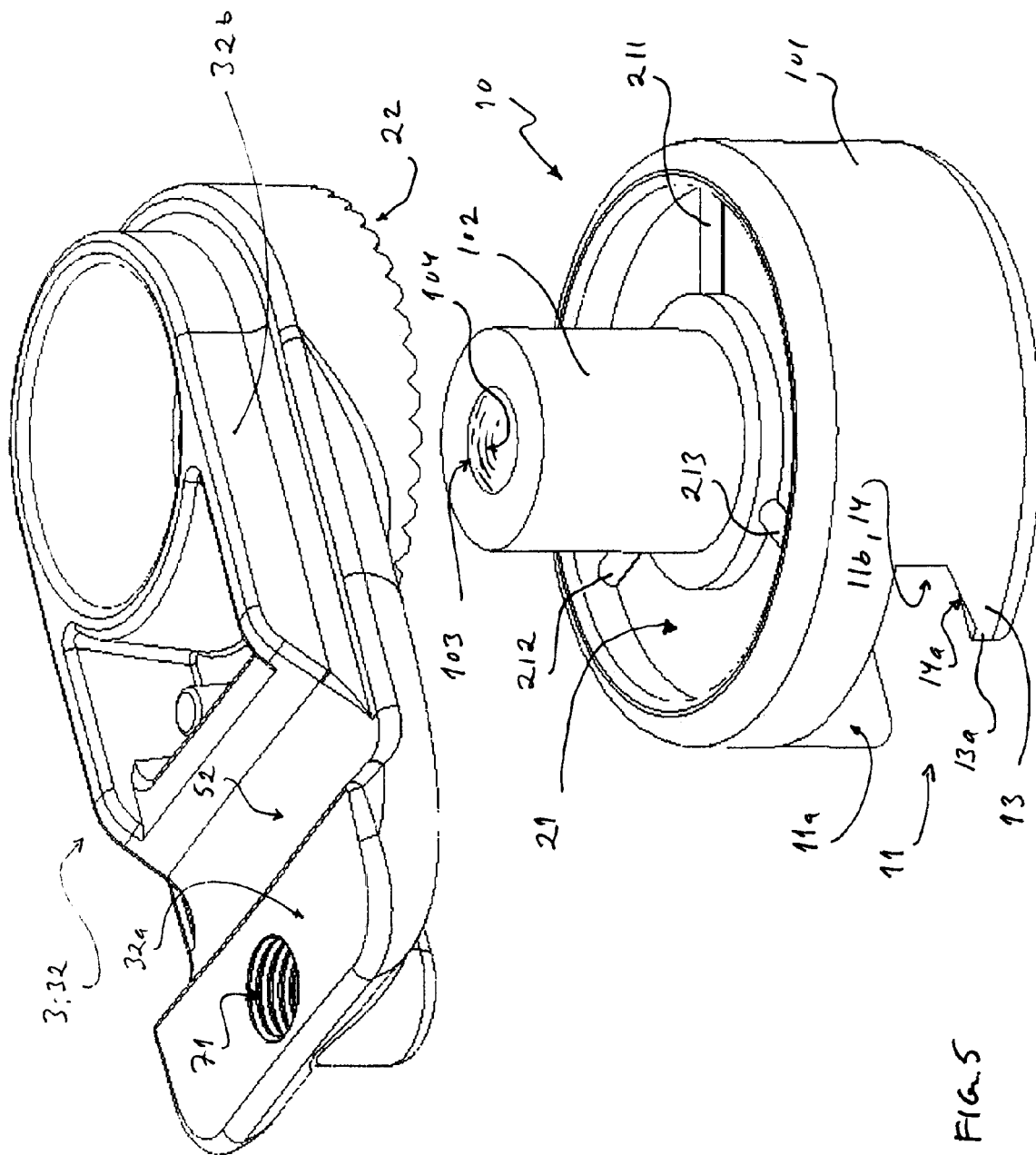


FIG. 5

REFERENCES CITED IN THE DESCRIPTION

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