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(54) **Levelling system for furniture**

(57) A system with adjustable levelling feet for pieces of furniture (30,130,230) with a bottom (32,132,232) and shoulders (31,131,231) terminating in correspondence with said bottom (32,132,232), of the type comprising, in combination: at least a pair of rear feet (35',135',235', 335'), wherein each foot (35',135',235', 335') comprises a mechanism (54,154,254,354) for regulating the height, accessible from outside the foot (35',135',235',335') and which can be manoeuvred by means of a tool (U), the foot (35',135',235',335') being assembled on a plaque (34',134',234',334') fixed externally with respect to the bottom (32,132,232) of said piece of furniture (30,130,230), at least one opening (42,142,242,342) for said tool (U) being inserted in said plaque (34',134',234', 334'). According to the invention, said at least one opening (42,142,242,342) is connected to the front area of the piece of furniture (30,130,230) by means of a containment and guiding element (E) of said tool (U).

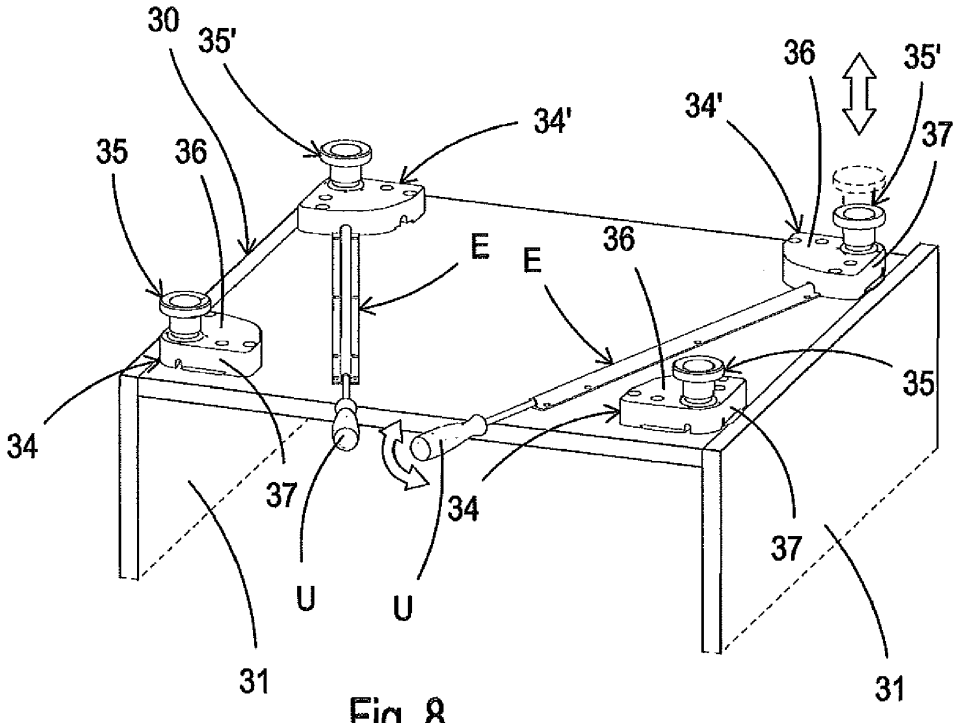

Fig. 8

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Description

[0001] The present invention relates to a perfected system with adjustable front and rear feet for the levelling of furniture.

[0002] The invention is particularly suitable for being applied to furniture in which the space beneath the bottom of the piece of furniture must be completely free, such as, for example, in kitchen bases, and where the distance between said bottom and the floor is minimum, making front access to the rear feet of the system impossible.

[0003] A levelling system of this type is described for example in EP1748710, in which the adjustable feet are assembled laterally with respect to the shoulder of the piece of furniture, by means of a specific support.

[0004] For a better understanding of the invention in question, when necessary, EP1748710 should be considered as being an integrant part of the present description.

[0005] The levelling system according to EP1748710, however, is only suitable for furniture, such as wardrobes, in which the shoulders extend to the floor: i.e. where the shoulders extend downwards beyond the bottom of the piece of furniture. In this type of furniture, in fact, it is not necessary to have free space beneath the bottom.

[0006] A levelling system according to EP1748710, on the contrary, is not adequate for furniture, such as for example kitchen bases, in which the shoulders do not reach the floor, but end in correspondence with the edge of the bottom. In this type of furniture, in fact, the necessity is strongly felt for having the space beneath the bottom completely free, for example for the passage of hydraulic and/or electrical systems.

[0007] The drawbacks of the known art described above are solved by a levelling system produced according to the disclosures of European patent application Nr. 13162252.4 filed on April 4, 2013 in the name of the same Applicant.

[0008] For a better understanding of the invention in question, when necessary, EP-A-13162252.4 should be considered as being an integrant part of the present description.

[0009] A levelling system produced according to EP-A-13162252.4 allows the following objectives to be achieved:

- to provide a levelling system for furniture with front and rear adjustable feet, which is particularly suitable for furniture in which the shoulders end in correspondence with the edge of the bottom of the same piece of furniture. This objective is achieved by means of a levelling system having a particular structure, suitable for being fixed beneath the bottom of the piece of furniture, rather than to the shoulder, as in the known art;
- to provide a levelling system for furniture of the type described above, wherein the rear feet can be regulated in the front, also in the presence of a minimum distance between the floor and the bottom of the piece of furniture;
- to provide a levelling system comprising a plurality of front and rear feet, and relative supports, wherein feet and supports can be all the same, regardless of their positioning, right or left, front or rear;
- to provide a system comprising front and rear feet which are all the same, wherein a base is applied to said feet not only in the front, but also laterally (on three sides), in so-called "peninsula" furniture.

[0010] Although the functioning of the levelling system produced according to EP-A-13162252.4 is completely satisfactory, its production and assembly are relatively costly.

[0011] The general objective of the present invention is to provide a levelling system which achieves all of the objectives listed above, but which is much less costly to produce and assemble with respect to the system of EP-A-13162252.4.

[0012] Another objective of the invention is to provide a levelling system of the type previously described, comprising at least two rear feet which can be easily accessed and regulated in the front and front feet that can also be of any traditional type.

[0013] These objectives are achieved by a system having the characteristics specified in the enclosed claim 1 and subclaims.

[0014] The structural and functional characteristics of the invention and its advantages with respect to the known art will appear more evident from the following description, referring to the enclosed drawings, which illustrate an embodiment of the same invention.

[0015] In the drawings:

- figures 1 to 8 are perspective views illustrating the assembly sequence and functioning modes of a levelling system for furniture produced according to the present invention;
- figure 9 is a vertical sectional detail illustrating the regulation mode of a rear foot according to the invention;
- figures 10 and 11 are two perspective views, from below and above respectively, illustrating the assembly plaque of the adjustable feet of the levelling system illustrated in figures 1-9;
- figures 12 and 13 are two plan views, from below and above respectively, illustrating the plaque of figures 10, 11;
- figure 14 is a raised view of the plaque of figures 12, 13;
- figure 15 is an exploded perspective view of the plaque of figure 11;
- figure 16 is an exploded perspective view illustrating the adjustable foot forming part of the levelling system according to the invention;
- figure 17 is a cross-section and sectional view similar to figure 16;

- figure 18 is a partial cross-section and sectional view of the foot of figures 16 and 17 in an assembled condition;
- figure 19 is a perspective view of the foot of figures 16-18 in an assembled condition;
- figures 20-26 are details illustrating a second embodiment of the invention wherein the attachment plaques of the foot illustrated in figures 1-19 are all substituted by a substantially cylindrical plaque;
- figures 27 to 35 are views illustrating different possible applications of the levelling system according to the invention;
- figures 36 to 39 illustrate different embodiments of the containment and guiding elements of the front regulation tool of a rear foot; and
- figures 40 to 43 are views similar to figures 16-19 illustrating a third possible embodiment of the invention wherein a plaque and foot, instead of being produced in two separate intercoupled pieces, are produced in a single piece.

[0016] With reference to the drawings, figure 1 partially illustrates a piece of furniture 30, overturned, for example a piece of kitchen furniture (base), in which the shoulders 31 (sides) end in correspondence with a bottom 32, i.e. they do not reach the floor.

[0017] As already specified, in this type of furniture, the space beneath the bottom must be completely free and front access to the rear adjustable feet may be impossible due to the limited distance between the floor and bottom of the piece of furniture which, in some cases, is not higher than 5 cm.

[0018] The bottom 32 is arranged, in correspondence with the angles, and according to an example of the invention, with four groups of holes 33, facing downwards, for fixing characteristic front and rear plaques 34, 34' respectively (figures 2 and 3).

[0019] The holes 33 of each group are situated at the vertexes of a triangle and the groups are symmetrical with respect to each other.

[0020] As can be clearly seen in the drawings, the plaques 34, 34' produced according to this embodiment of the present invention are identical to each other, only the orientation changes (right, left - front, rear).

[0021] Said plaques 34, 34' are destined for receiving in a stable and oriented manner - as explained hereunder - respective adjustable feet 35, 35' also identical to each other (figures 3-5).

[0022] With reference to figures 10-15, said plaques 34, 34' are made of a plastic material and generally have a square configuration, and a substantially box-shaped structure, with a lower surface 36 and a perimetric edge 37. This square configuration defines sides L substantially positioned at 90° with respect to each other. Said feet 35, 35' are assembled in the vertex defined by said sides L.

[0023] A central pin 38, and two end pins 39 extend from each plaque 34, 34', from the side opposite the surface 36, said pins 38, 39 are positioned according to the vertexes of the triangle defined by the holes 33. Said pins 38, 39 are destined for being inserted with pressure interference in the holes 33 for the stable fixing of the plaques 34, 34' to the bottom 32 of the piece of furniture 30.

[0024] The central pin 38 is hollow and defines, on the surface 36, a cylindrical seat 40 for the oriented assembly of the adjustable feet 35, 35'. For this purpose, said cylindrical seat 40 has four grooves 41 along generatrices and positioned at 90°.

[0025] In correspondence with the upper ends of the grooves 41, the seat 40 is characteristically provided with four access openings 42.

[0026] As can be clearly seen in figures 10-15 of the drawings, said openings 42 are accessible from the edge 37 of the plaque 34, 34' through two pairs of radial passages 43, 43' and 44, 44'.

[0027] As explained in greater detail hereunder, the pair of passages 43, 43' serves for regulating the front right and left feet 35, whereas the pair 44, 44' regulates the rear feet 35'.

[0028] With reference to figures 9, 16-19, the adjustable feet 35, 35' are structurally composed of three components: a central regulation mechanism 54 contained between a circular base 55 and a substantially cylindrical body 56.

[0029] The adjustable feet 35, 35' are those described in EP-A-13162252.4.

[0030] The mechanism 54 serves for regulating the height of the adjustable feet 35,35' by acting between the base 55 and the body 56 which is inserted on the plaque 34, 34'.

[0031] The mechanism 54, shown for purely illustrative and non-limiting purposes, is that described and illustrated in patents EP733322 and EP2203089, which should be considered as being an integral part of the present description, and to which reference should be made for any necessary clarifications.

[0032] Said regulation mechanism 54 is housed in a complementary seat 57 of the body 56. The mechanism 54 has a shaped hole 58 for the access of an operating tool U, which is aligned with an opening 59 of the body 56.

[0033] The body 56 containing the mechanism 54 thus oriented, is in turn, inserted in a complementary cylindrical seat 60 which extends from the base 55. The mechanism 54 with its perforated base 61 is engaged on a protruding shank 62 inside said base 55.

[0034] The adjustable feet 35,35' produced as described above, are coupled with the plaque 34,34' by the insertion of the external section 63 of the body 56 inside the complementary seat 40 of the respective plaque (figures 9 and 10).

[0035] The correct orientation of the feet 35,35', with the opening 59 aligned with the passage 43, 43'-44, 44', is determined by the selective insertion of a reference ribbing 64 inside the correct groove 41 among the four grooves, at 90°, present in the seat 40.

[0036] The correct insertion height of the feet 35,35', on the other hand, is determined by a collar 65 of the body 56 which is abutted against the surface 36 of the plaque 34,34'.

[0037] According to the invention, the rear feet 35' are connected to the front area of the piece of furniture 30 by means of a containment and guiding element E, for example in the form of a tube T fixed onto the outer surface of the bottom 32 of the piece of furniture 30 (figures 4-8), by fixing means 66, 66a, 66b which can be of any type, as clearly illustrated in figures 36-39 in the drawings. The tube T can also have a different section other than circular, for example rectangular, as shown in figure 38.

[0038] As can be clearly seen in the figures, said tube T has a free inlet end in correspondence with the front edge (front) of the piece of furniture 30, whereas the opposite end is connected to the passage 44 or 44' of the rear plaque 34.

[0039] The functioning of the levelling system for furniture according to this first embodiment of the invention is evident from what is described above with reference to the drawings and is briefly the following.

[0040] The correct assembly sequence of the various components of the system is illustrated - with the help of the arrows - in figures 1 to 6.

[0041] It is evident from the figures how the system shown for purely illustrative and non-limiting purposes, is composed of two pairs of feet 35, 35', wherein each pair comprises a front foot 35 and a rear foot 35'.

[0042] It is also evident how the plaques 34, 34' of each pair are rotated by 90° with respect to each other (right plaque and left plaque).

[0043] Once the plaques 34, 34' and relative feet 35, 35' have been assembled, the front regulation of the rear feet 35' can be effected by introducing a tool U into the tube T until it reaches the regulation mechanism 54 (figure 9).

[0044] The regulation of the front feet 35, on the other hand, is effected directly, by introducing the tool U through the passages 43, 43' of the front plaques 34, 34', through which access is gained to the control head 58' of the mechanism 54.

[0045] According to this first embodiment of the invention, the plaques 34,34' and the respective feet 35,35' are the same as each other.

[0046] Figures 20-26 and 28 illustrate a second embodiment of the invention wherein the containment and guiding element E of the tool U is associated with a plaque having a different configuration with respect to that of the plaque illustrated in figures 1-19.

[0047] In this second embodiment of the invention, the same and/or equivalent components, or components having an identical function, with respect to those illustrated in figures 1-19, and 28 are indicated with the same reference numbers increased by 100.

[0048] The levelling system according to this second embodiment of the invention comprises a plaque 134, 134' having a generally cylindrical configuration, with a single axial pin 138 for fixing the plaque itself 134, 134' to the bottom 132 of the piece of furniture 130, which therefore only has one corresponding insertion hole instead of three holes according to the embodiment illustrated in figures 1-19.

[0049] As can be clearly seen from the drawings, said plaque 134,134' has a single radial opening 142 on the mantle M, for connection with the tube T (figures 24-26) and passage of the tool U, which can consequently manoeuvre the height regulation mechanism 154 of the respective foot 135,135' (figure 28).

[0050] This particular configuration of the plaques 34,34' and 134, 134', combined with the containment and guiding element E of the tool U, allows the following advantageous possibilities to be implemented, depending on the requirements.

[0051] Figures 2-6 illustrate a first possibility in which square plaques 34, 34' are used, all the same as each other, and respective feet 35,35' complementary thereto.

[0052] Figure 27 illustrates a second possibility in which only plaques 134, 134', front and rear respectively, are used, and feet 135, 135' all the same, complementary thereto.

[0053] The regulation of the respective feet 135,135', all produced as shown in figures 16-19, can therefore be effected with the same tool U.

[0054] Figures 29-33 (where the reference numbers of the first embodiment are increased by 200) illustrate a further possibility in which the rear plaques 234' are those illustrated and described with reference to figures 13-15, whereas the front plaques 234 can be of any other of the known types.

[0055] The rear feet 235' are therefore like those described with reference to figures 16-19, whereas the front feet 235 can be of any other type, obviously complementary to the respective plaque 234.

[0056] In this situation, the regulation of the rear feet 235' is effected with the tool U (figure 35), whereas the regulation of the front feet 235 can be effected with another short tool C (figure 33), or even manually.

[0057] According to a third possible embodiment of the invention, illustrated in figures 40-43, a plaque 334,334' - which can have any configuration, preferably but not necessarily the cylindrical configuration illustrated in figures 20-26 -, is produced in a single piece with the body 356 of the foot 335,335'.

[0058] The objective mentioned in the preamble of the description has therefore been achieved.

[0059] The protection scope of the present invention is defined by the enclosed claims.

Claims

1. A system with adjustable levelling feet for pieces of furniture (30,130,230) with a bottom (32,132,232) and shoulders (31,131,231) terminating in correspondence with said bottom (32,132,232), of the

type comprising, in combination: at least one pair of rear feet (35',135',235',335'), wherein each foot (35',135',235',335') comprises a mechanism (54,154,254,354) for regulating the height, accessible from outside the foot (35',135',235') and which can be manoeuvred by means of a tool (U), the foot (35',135',235',335') being assembled on a plaque (34',134',234',335') fixed externally with respect to the bottom (32,132,232) of said piece of furniture (30,130,230), at least one opening (42,142,242,342) for said tool (U) being inserted in said plaque (34',134',234',334'), **characterized in that** said at least one opening (42,142,242,342) is connected to the front area of the piece of furniture (30,130,230) by means of a containment and guiding element (E) of said tool (U).

2. The system according to claim 1, **characterized in that** said element (E) is in the form of a tube (T).

3. The system according to any of the claims 1 and 2, **characterized in that** said element (E) is fixed to the outer surface of the bottom (32,132,232) of the piece of furniture (30,130,230) by fixing means (66, 66a, 66b).

4. The system according to claim 1, **characterized in that** said plaque (34') has a set-square configuration which forms sides (L) substantially positioned at 90°, said foot (35') being positioned in the vertex between said sides (L), whose regulation mechanism (54) is accessible through passages (43,43';44,44') situated radially in said sides (L) with respect to said foot (35').

5. The system according to any of the previous claims, **characterized in that** a centre pin (38) and two end pins (39) extend from each plaque (34'), said pins (38,39) being positioned at the vertexes of a triangle defined by holes (33) situated on the bottom (32) of the piece of furniture, in correspondence with the angles, for fixing said plaque (34') to the same.

6. The system according to claim 5, **characterized in that** said centre pin (38) is hollow and defines a cylindrical seat (40) for the oriented assembly of the adjustable foot (35'), said cylindrical seat (40) having four grooves (41) positioned at 90°, along generatrices, in correspondence with the upper end of the grooves (41), said seat (40) having four access openings (42) which are accessible through said sides (L) of the plaque (34') through two pairs of radial passages (43, 43' and 44,44'), said pairs of passages being respectively destined for the regulation of the front right and left feet (35) and for the regulation of the rear feet (35').

7. The system according to claim 1 or 6, **characterized in that** said adjustable feet (35,35') are structurally composed of three components: a centre regulation mechanism (54) contained between a circular base (55) and a substantially cylindrical body (56).

8. The system according to claim 7, **characterized in that** said mechanism (54) serves for regulating the height of the foot (35,35'), acting between the base (55) and the body (56) which is inserted on the plaque (34,34').

9. The system according to claims 7 or 8, **characterized in that** said mechanism (54) is housed in a complementary seat (57) of the body (56), said mechanism (54) being provided with a shaped hole (58) for the access of a manoeuvring tool U, said hole (58) being aligned with an opening (59) of the body (56), said body (56), with the mechanism (54) thus oriented in its interior, being inserted, in turn, in a cylindrical complementary seat (60) which extends from said base (55).

10. The system according to claim 9, **characterized in that** said mechanism (54) has a perforated base (61) which is engaged with a shank (62) protruding internally from said base (55).

11. The system according to any of the previous claims, **characterized in that** said adjustable foot (35,35') is coupled with the plaque (34,34') by the insertion of an external section (63) of the body (56) inside the complementary seat (40).

12. The system according to any of the previous claims, **characterized in that** the correct orientation of the foot (35,35') with the opening (59) aligned with the passage (43,43' - 44, 44') is determined by the selective insertion of a reference rib (64) inside the correct groove (41) among the four of these, at 90°, present in the seat (40).

13. The system according to any of the previous claims, **characterized in that** the correct insertion height of the foot (35,35') is determined by a collar (65) of the body (56) which is abutted against a surface (36) of the plaque (34,34').

14. The system according to any of the previous claims, **characterized in that** said plaque (34') has a substantially box-shaped structure with a lower surface (36) and a perimetric edge (37).

15. The system according to claim 1, **characterized in that** said plaque (134') has a generally cylindrical shape.

16. The system according to claim 15, **characterized in that** said plaque (134') has a generally cylindrical

form with a mantle (M) with a single radial opening (142) for connection with the tube (T) and passage of the tool (U).

17. The system according to claim 1, **characterized in that** said plaque (134') has a generally cylindrical configuration with a single axial pin (138) for fixing the plaque (134') to the bottom (132) of the piece of furniture (130).

18. The system according to claim 1, **characterized in that** said feet (35',135',235',335') are produced in a single piece with said plaque (34',134'234',334').

Fig. 1

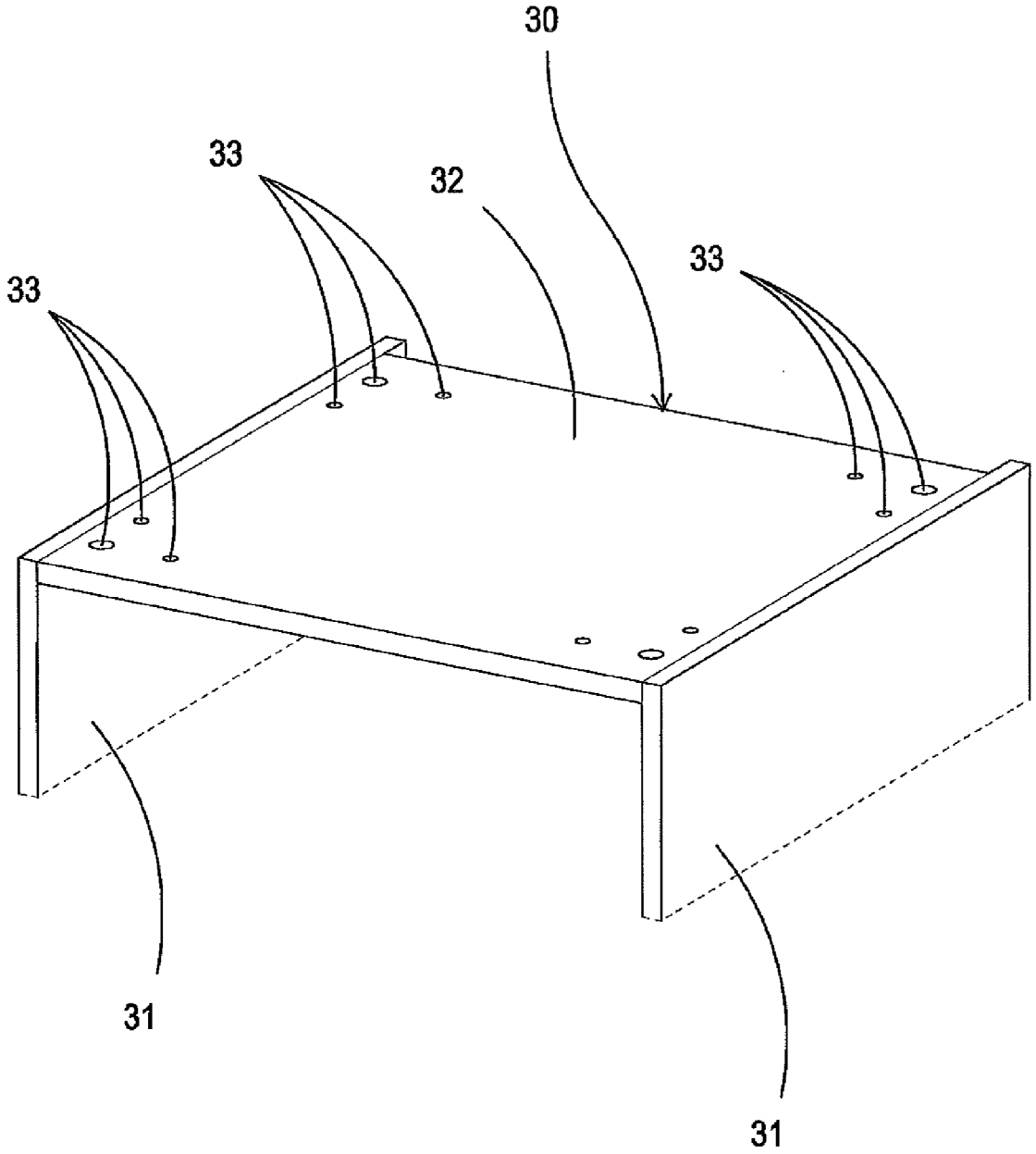


Fig. 2

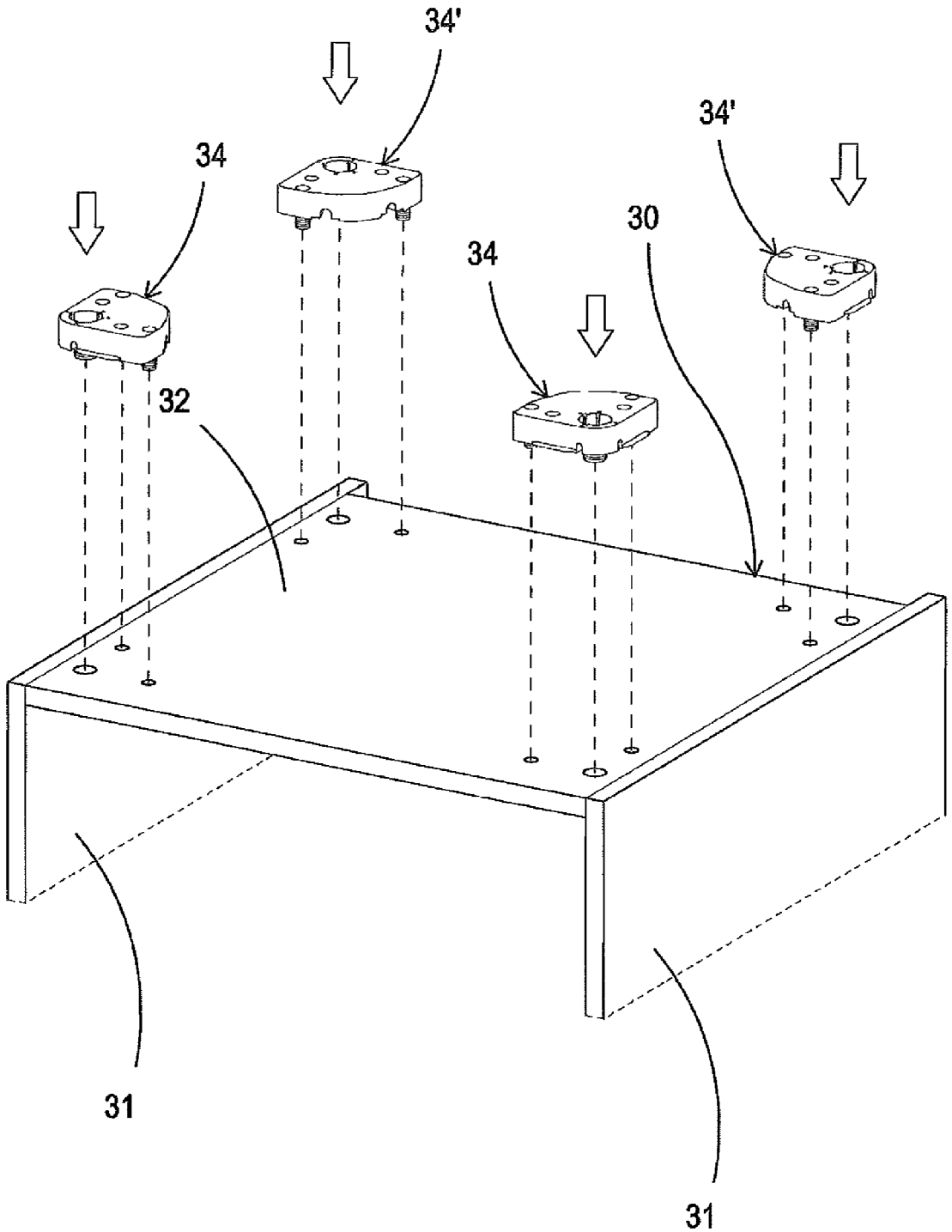


Fig. 3

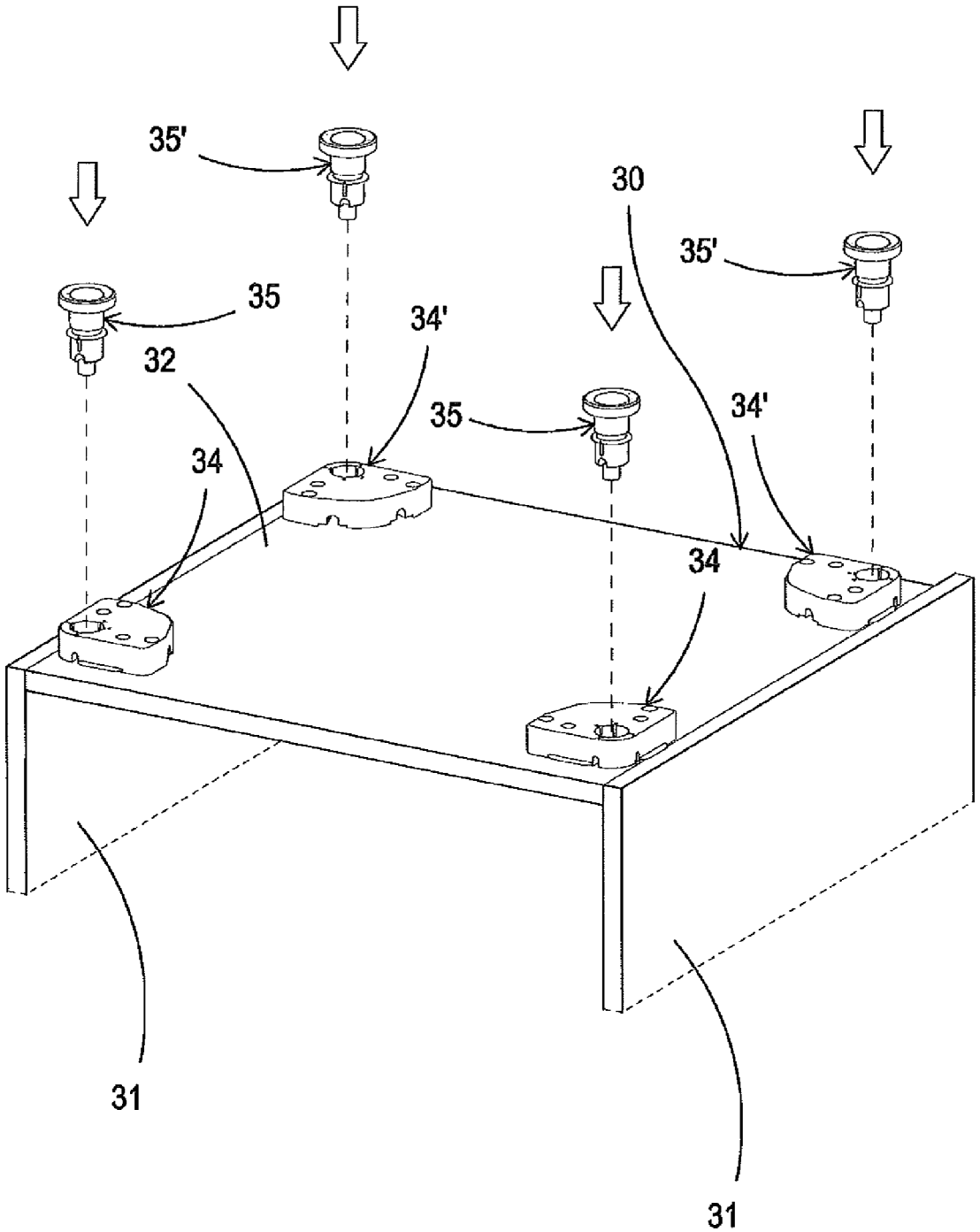
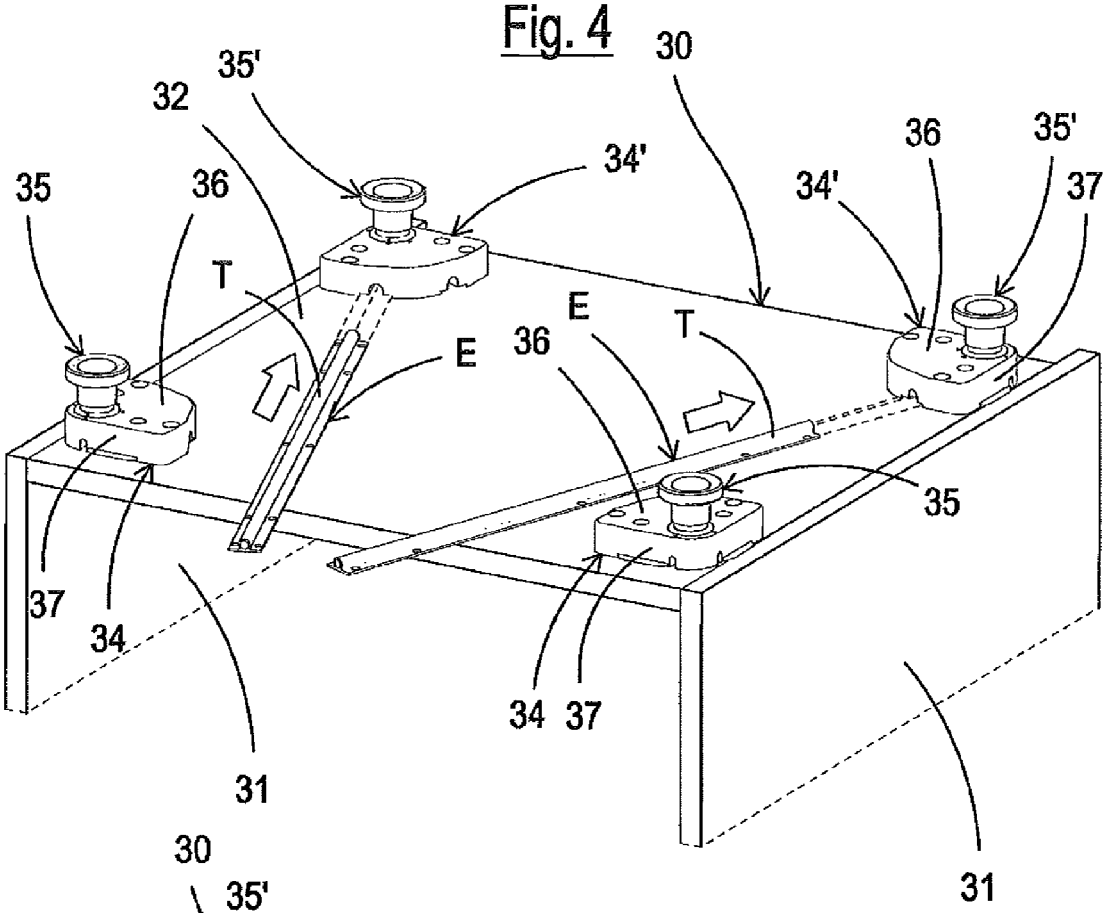


Fig. 4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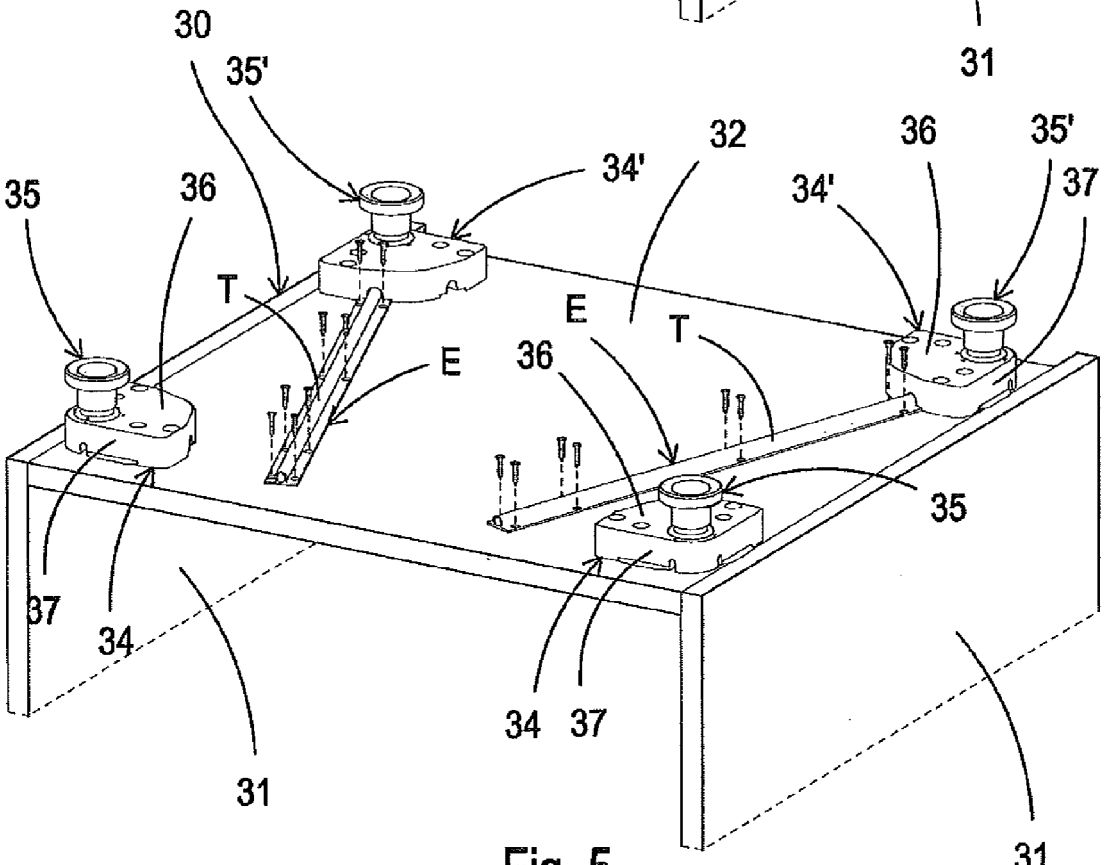
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Fig. 5

Fig. 6

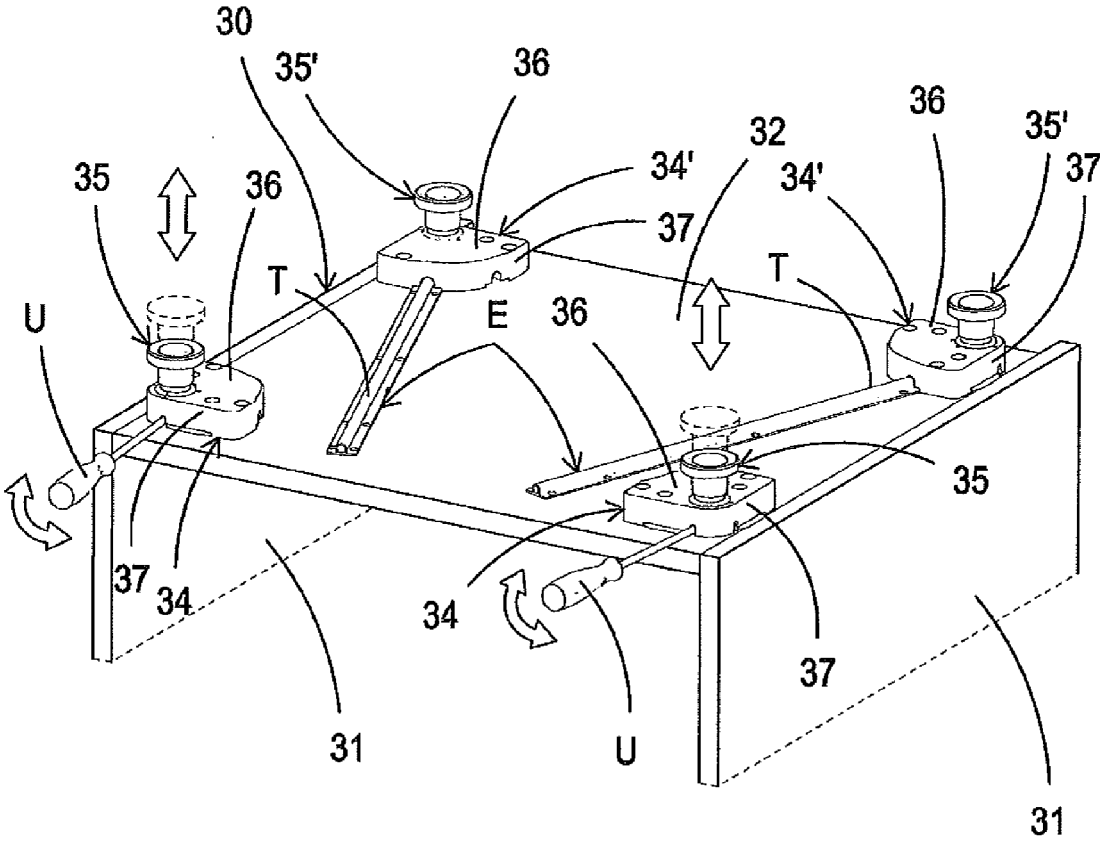
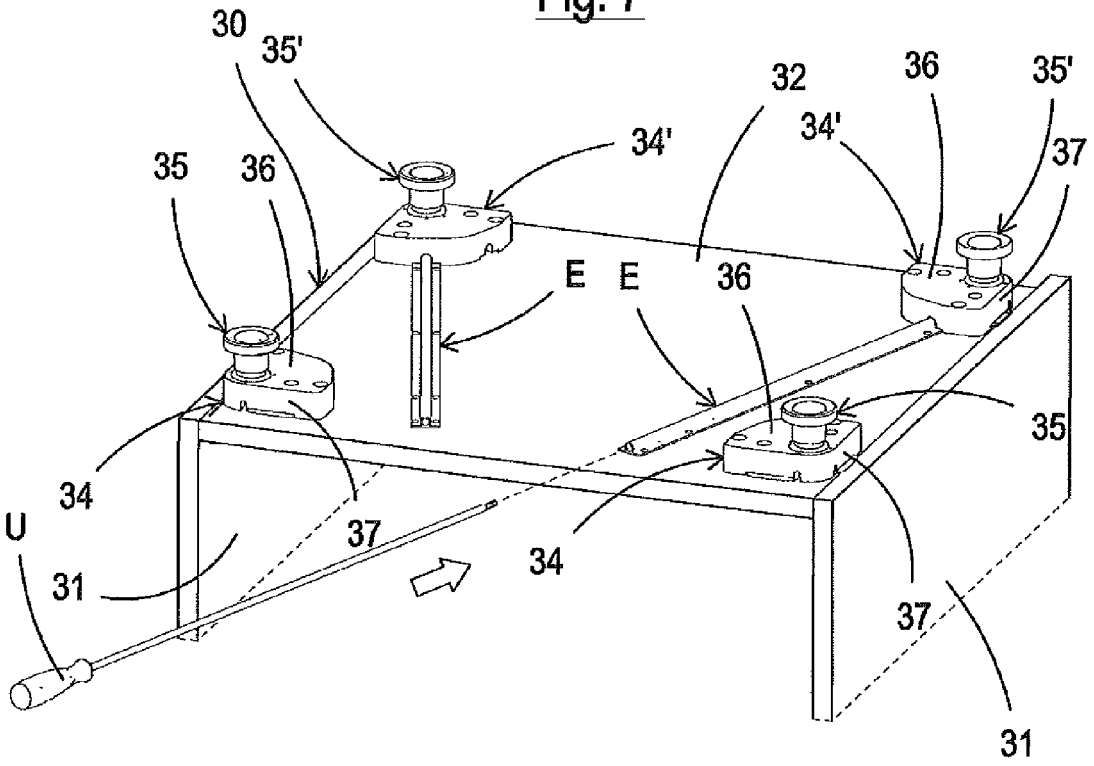


Fig. 7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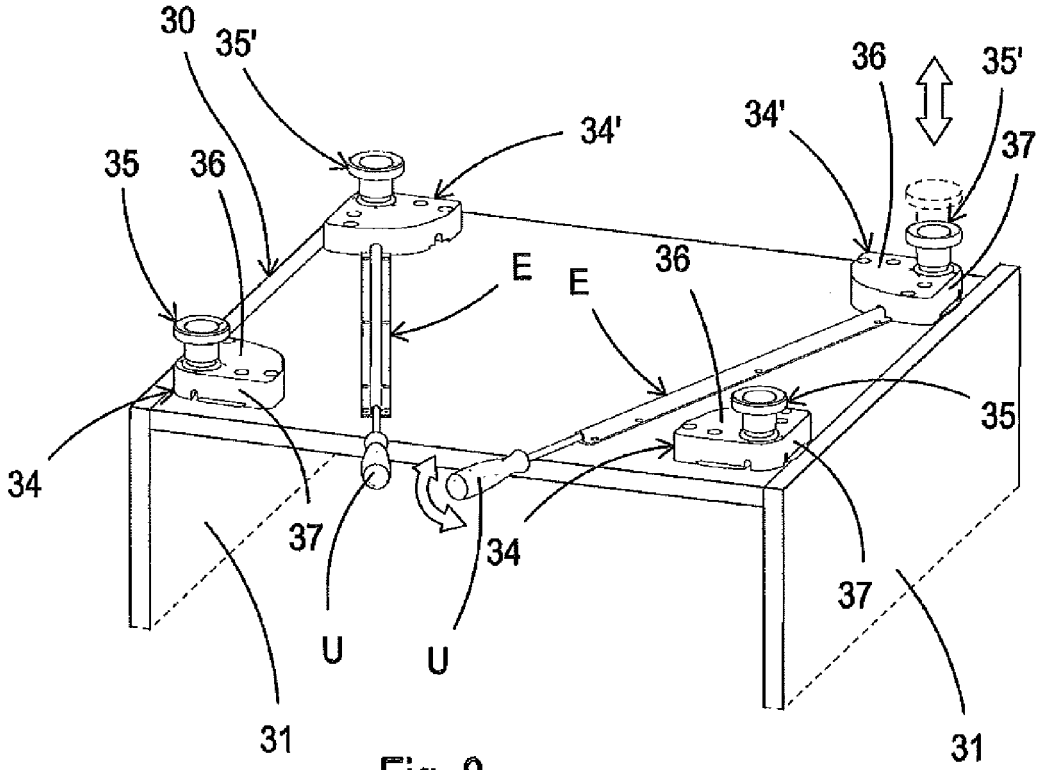
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Fig. 8

Fig. 9

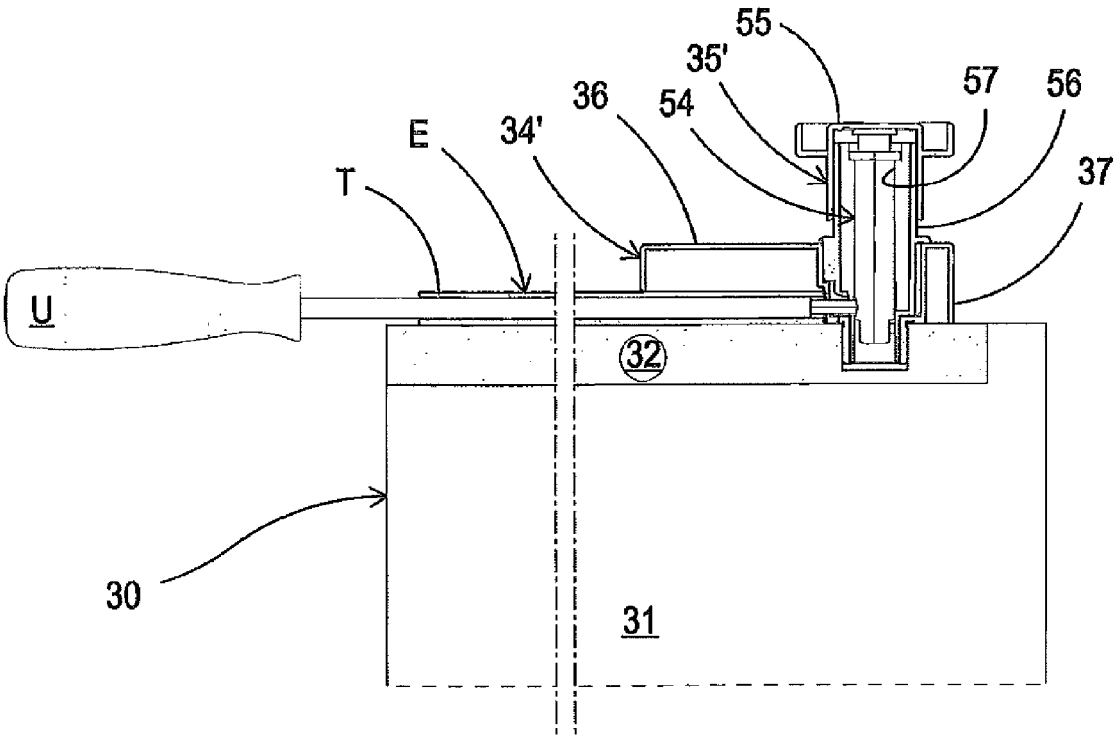


Fig. 12

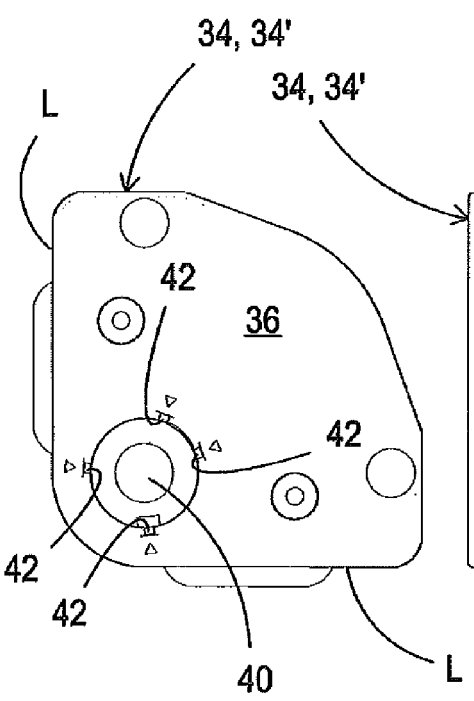


Fig. 14

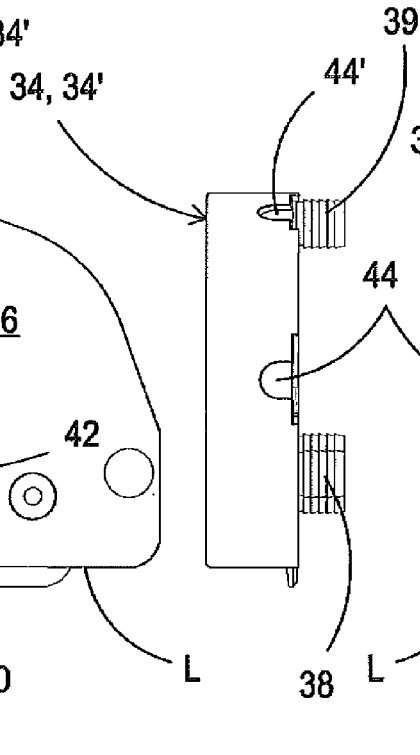


Fig. 13

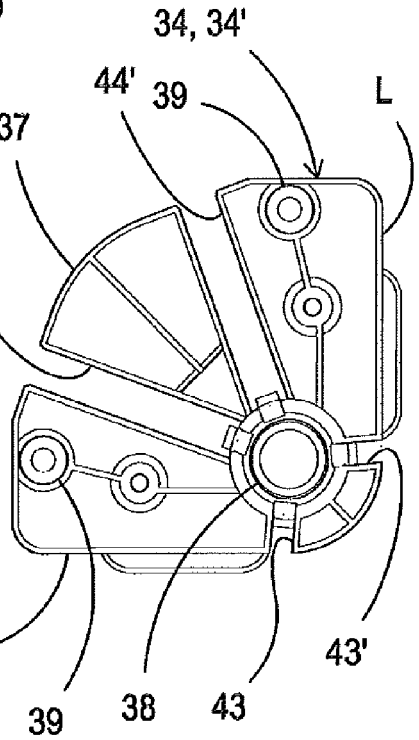


Fig. 10

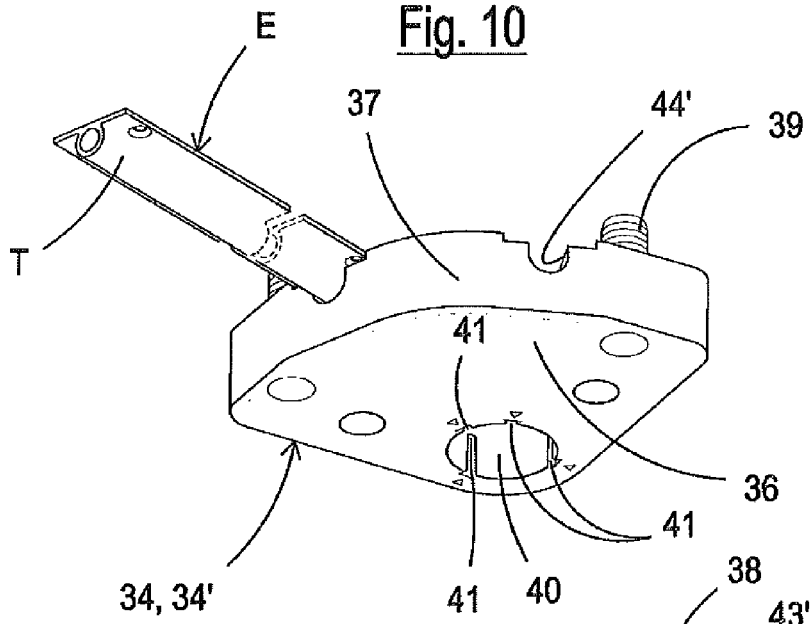
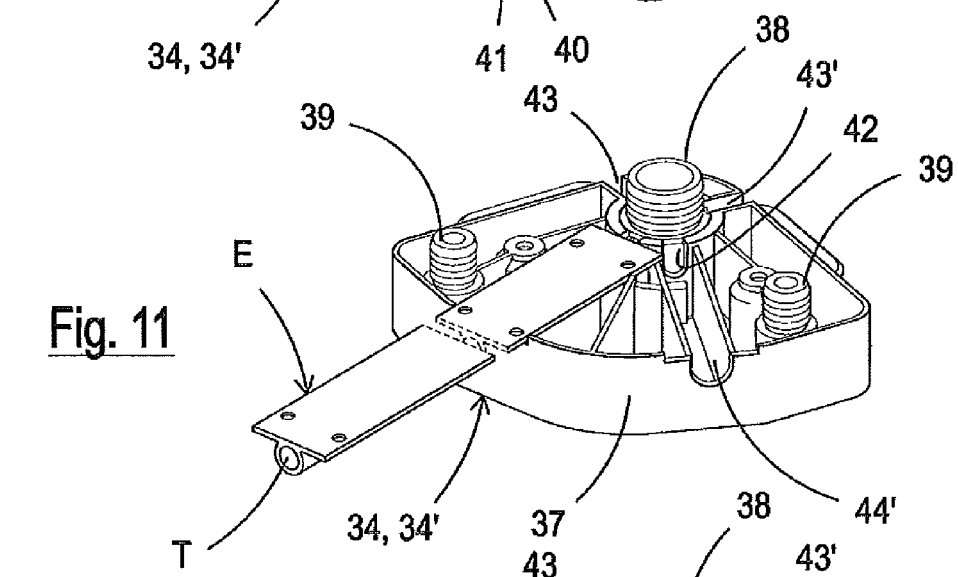


Fig. 11



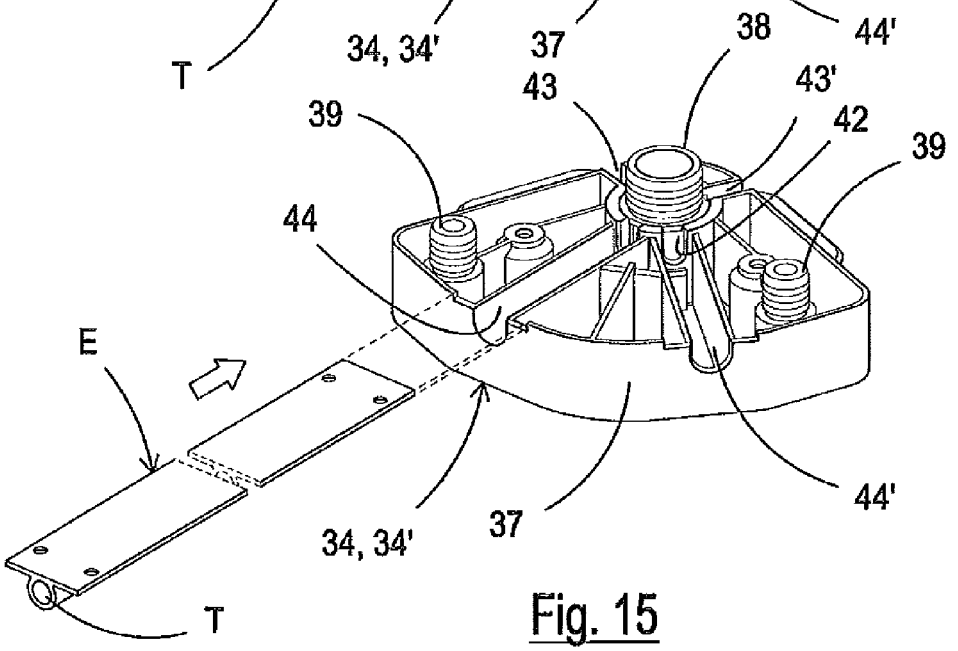


Fig. 15

Fig. 16

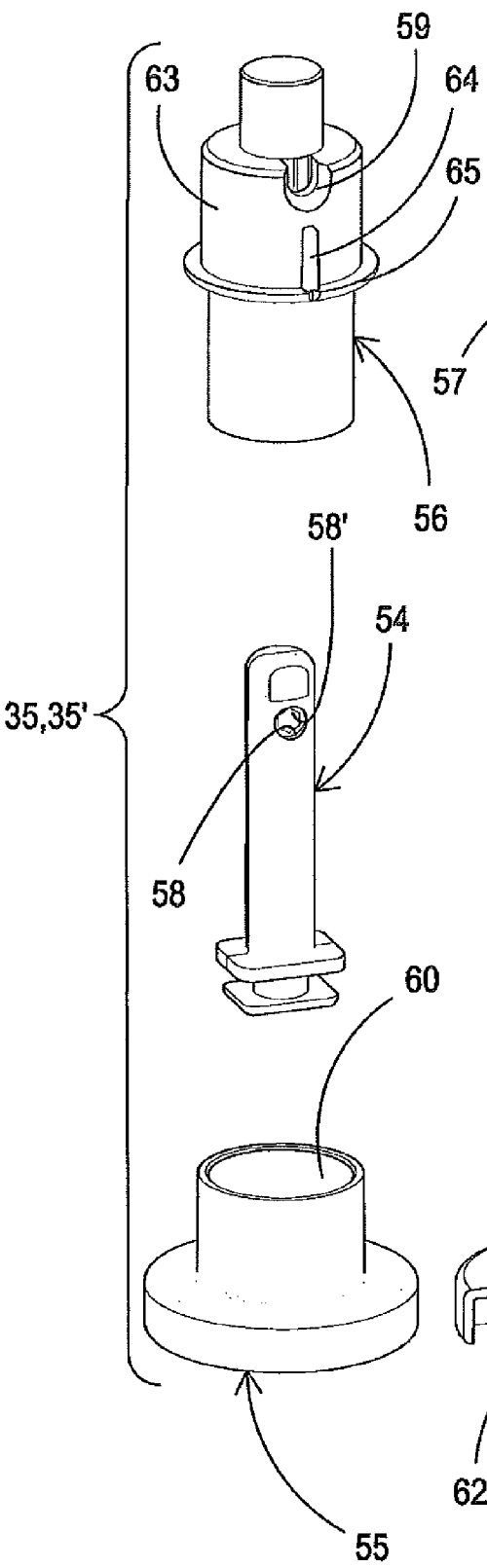
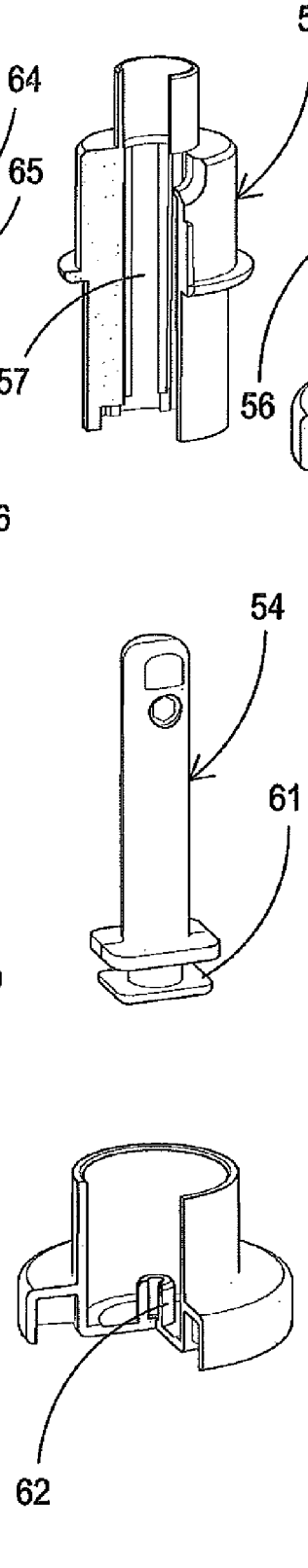


Fig. 17



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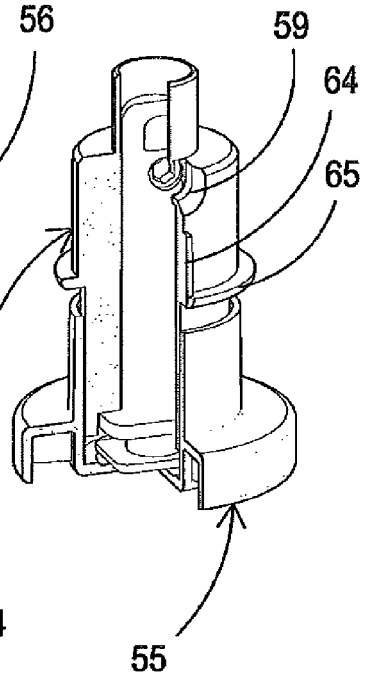

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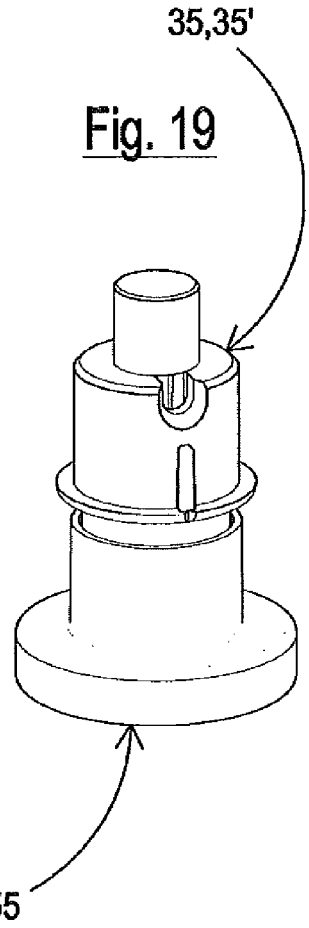

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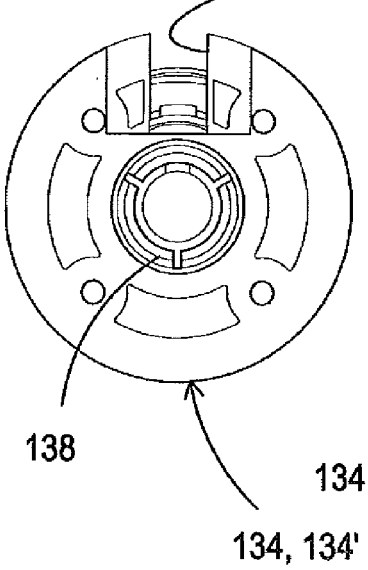

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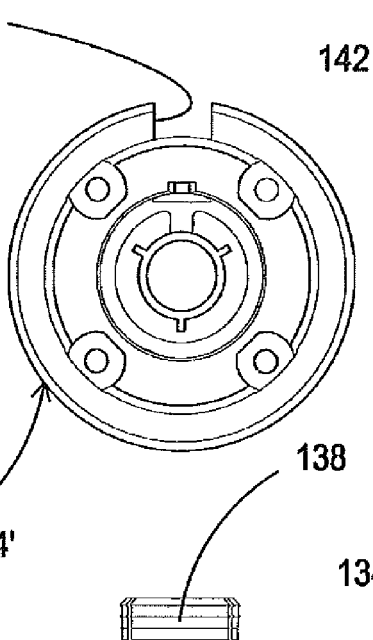

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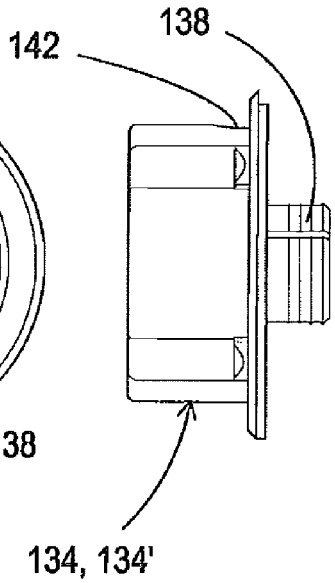

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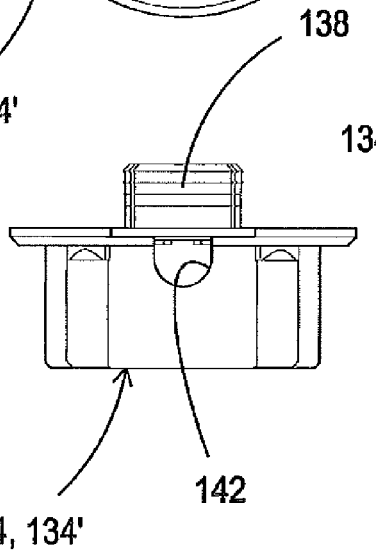

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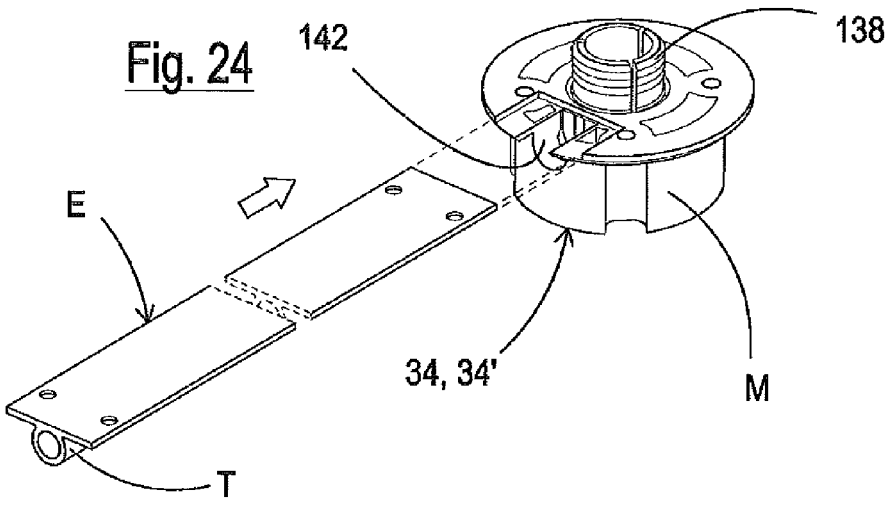

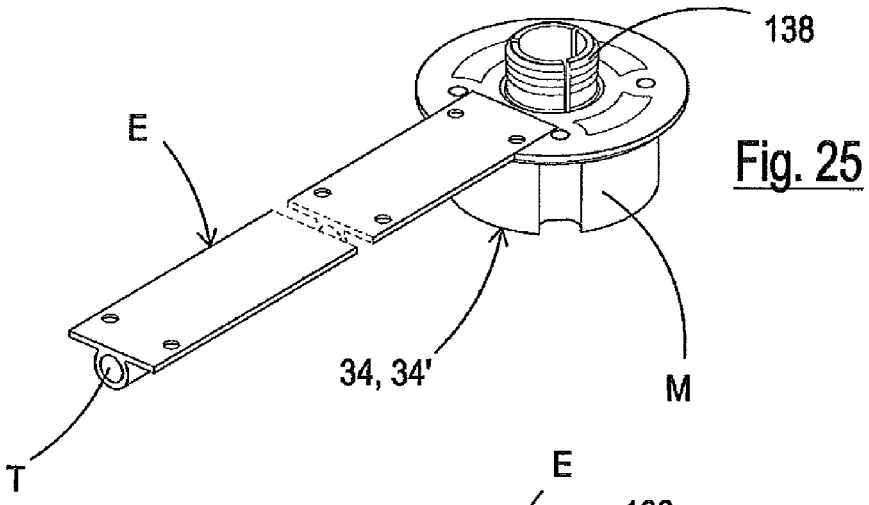

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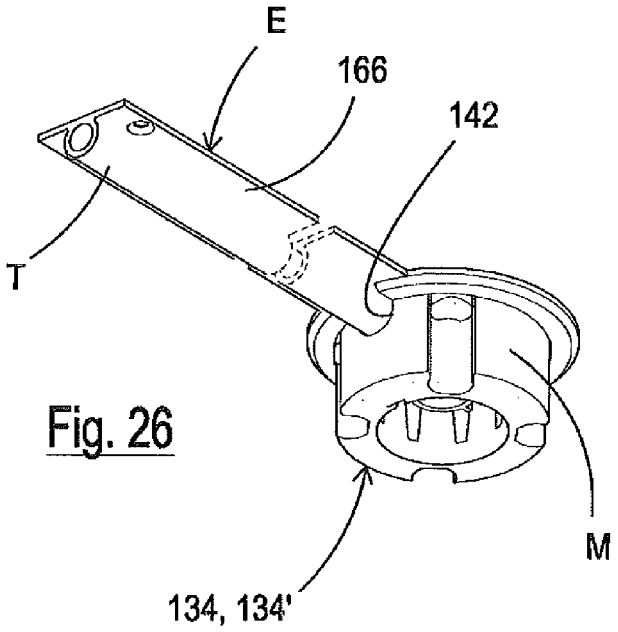
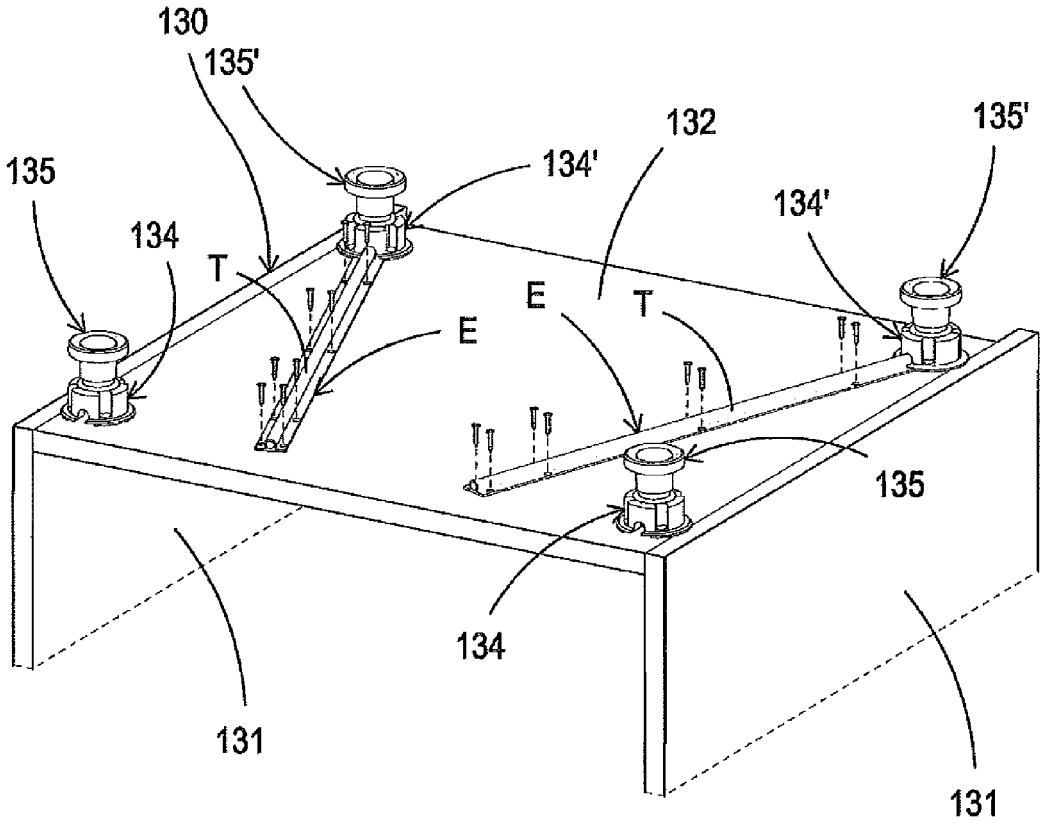


Fig. 26

Fig. 27



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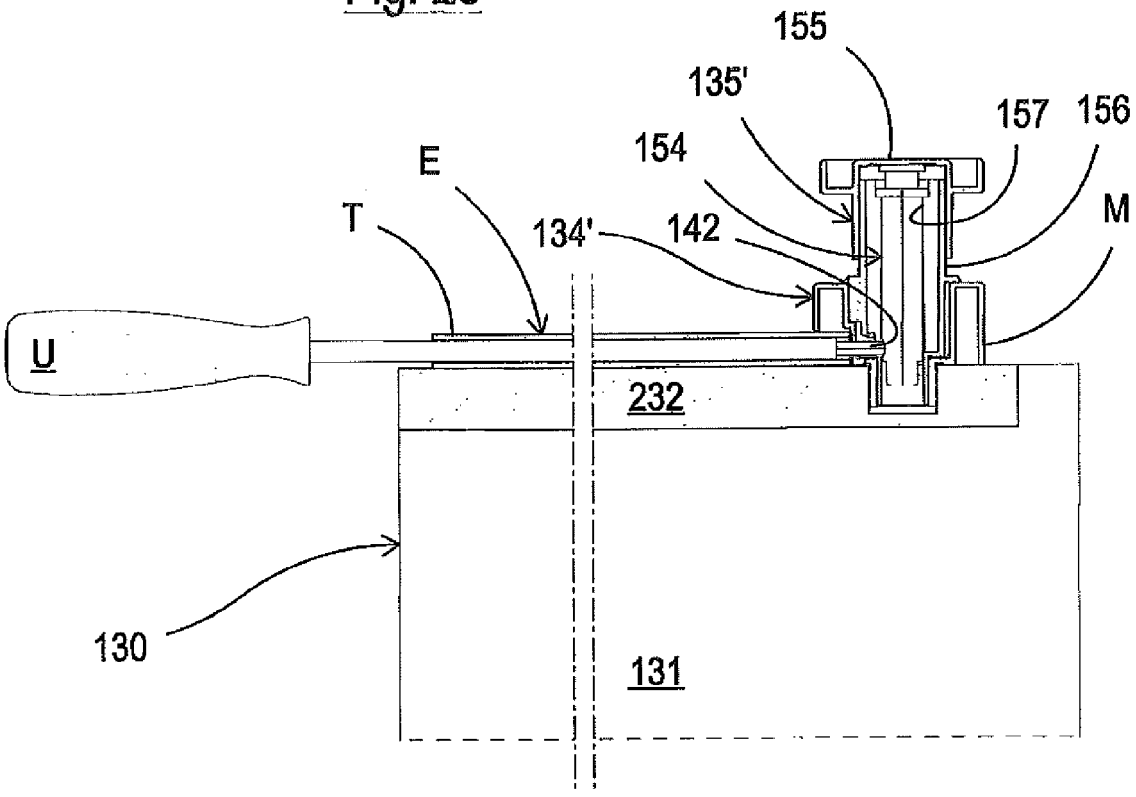

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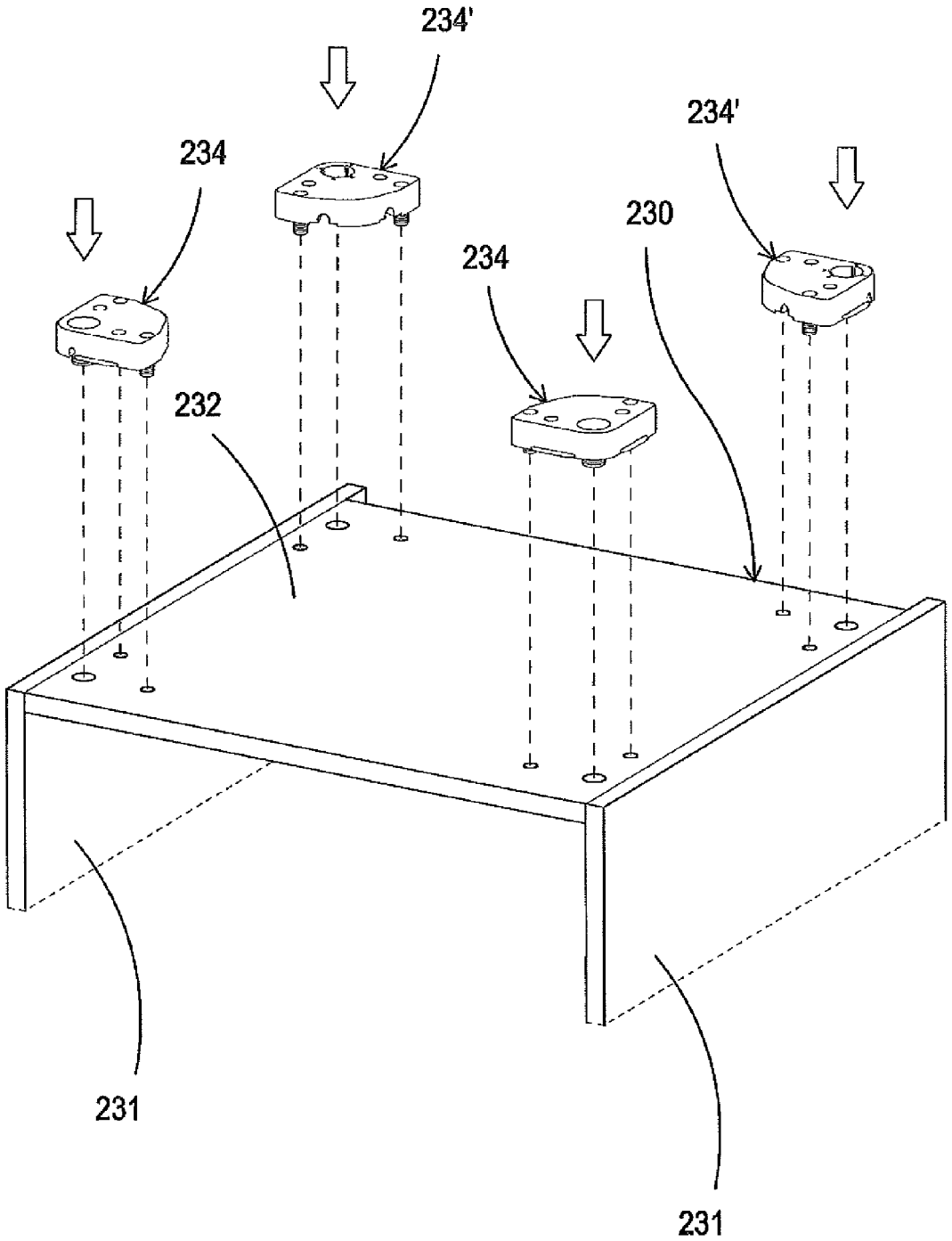

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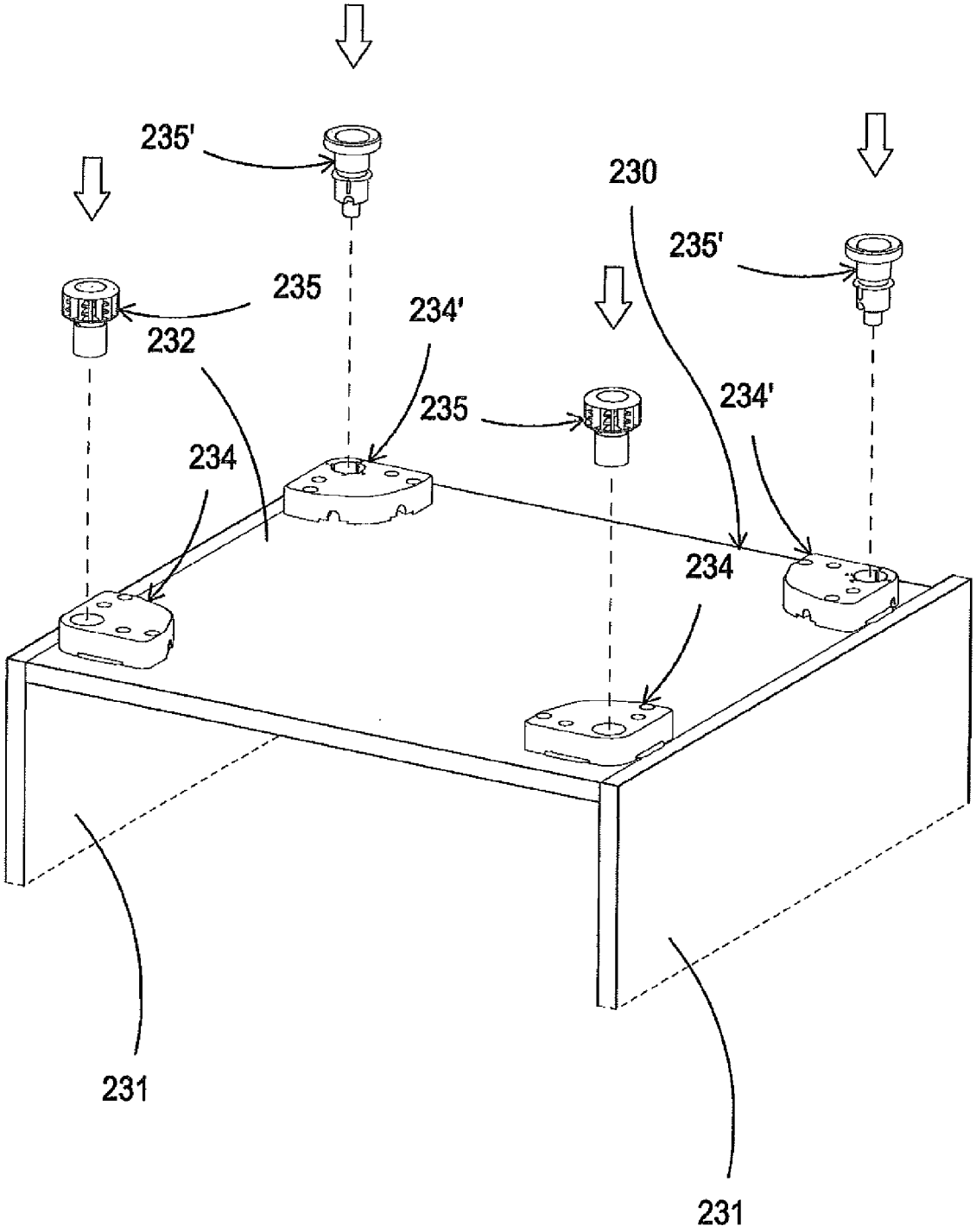

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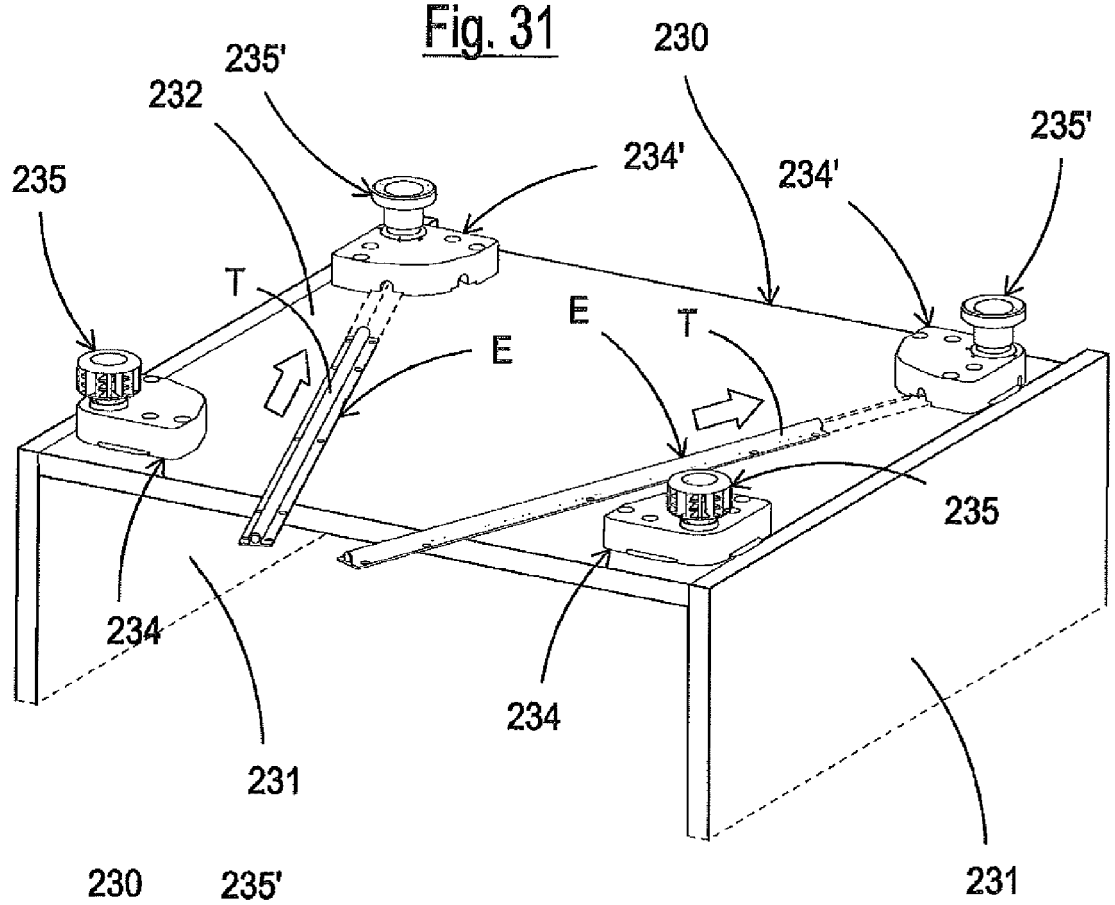
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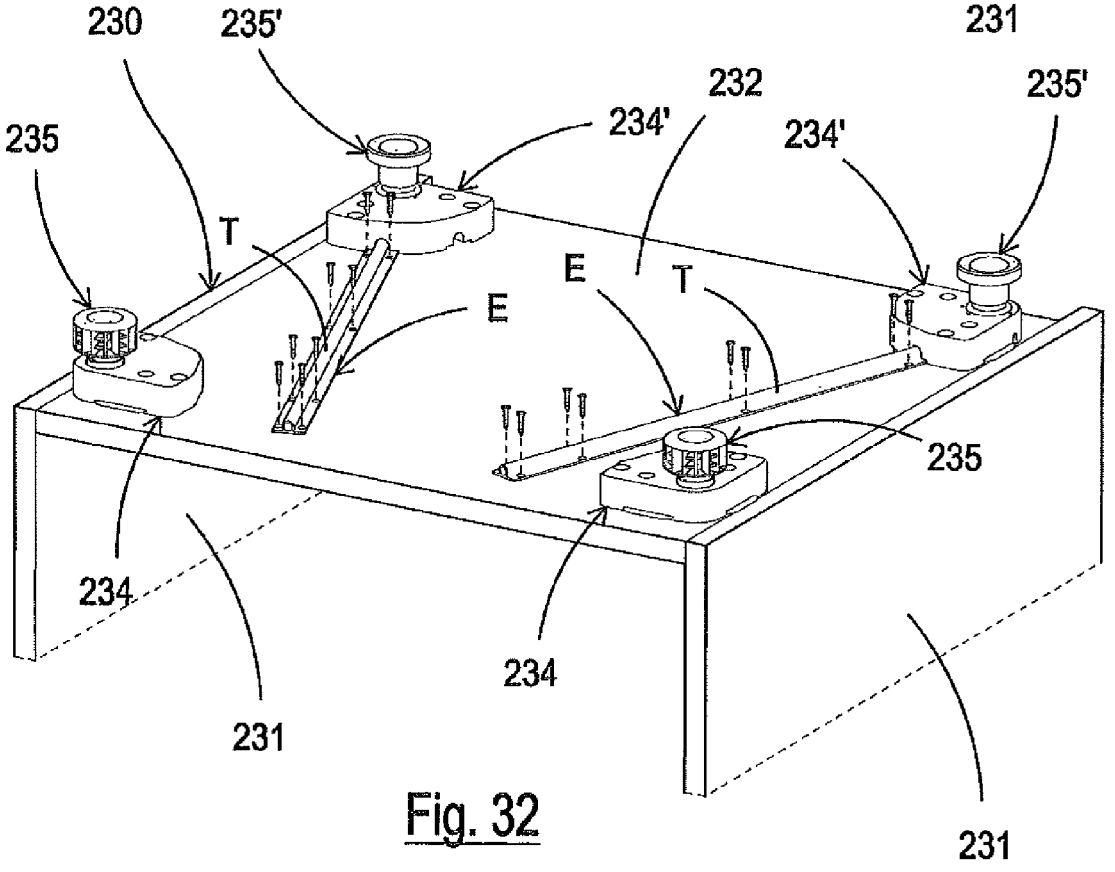
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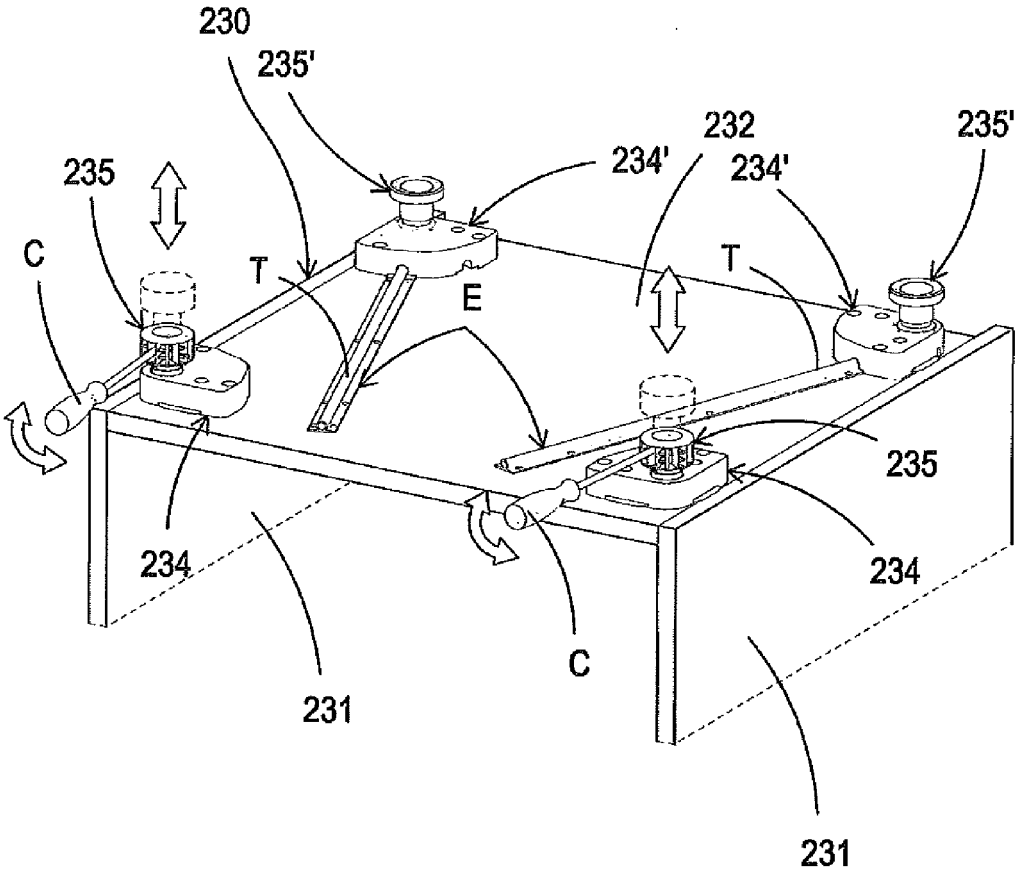
Fig. 32

Fig. 33



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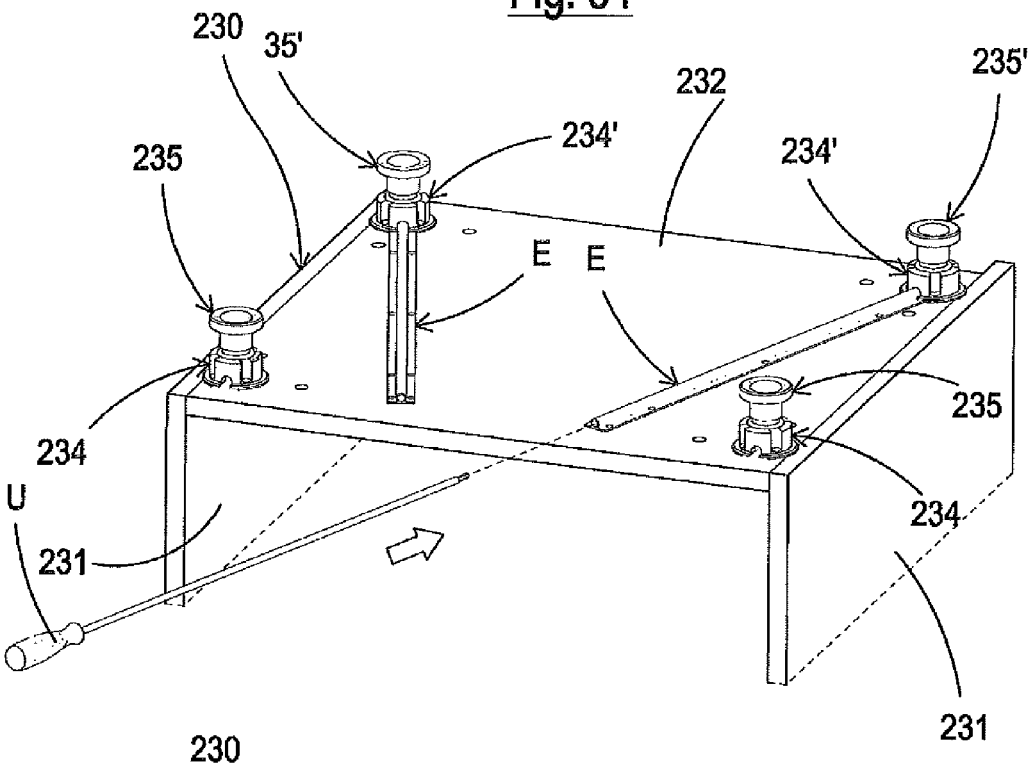
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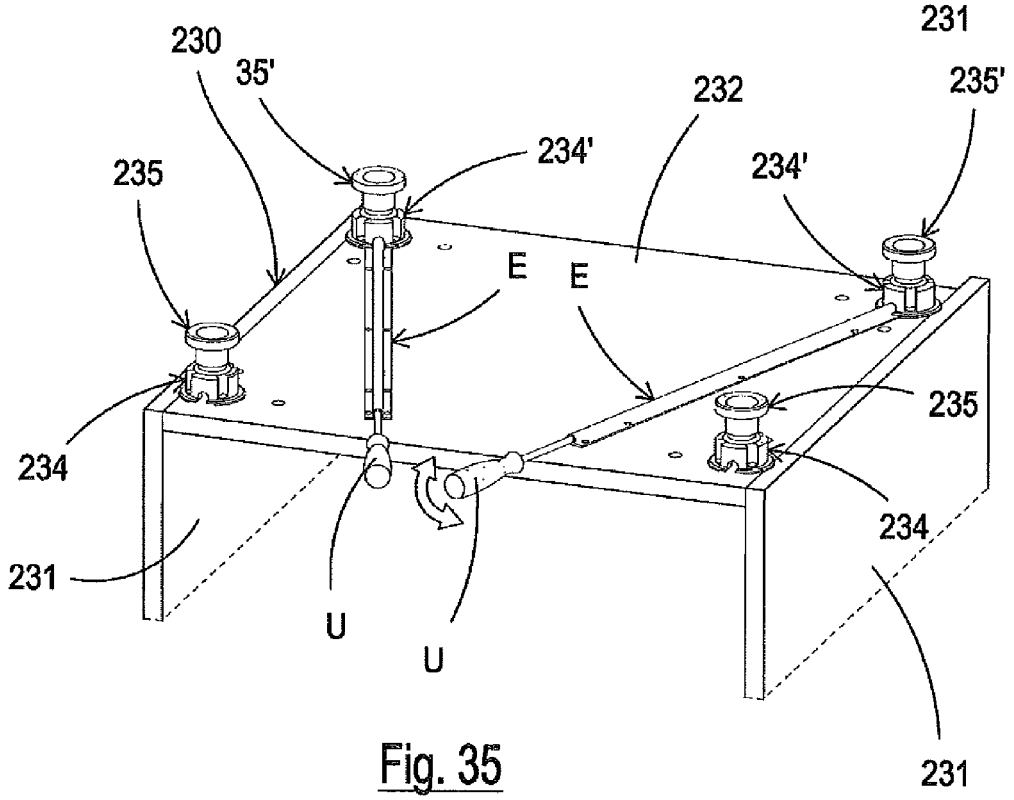
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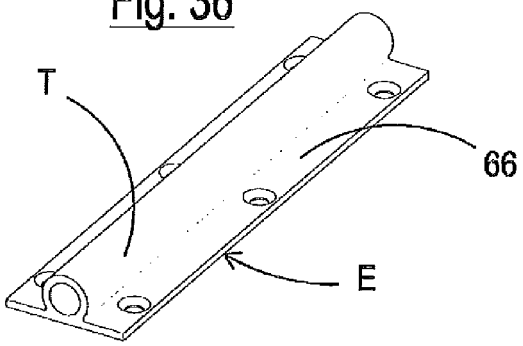
Fig. 35

Fig. 36



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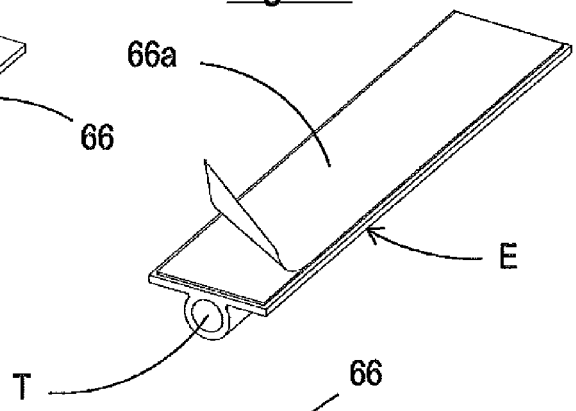

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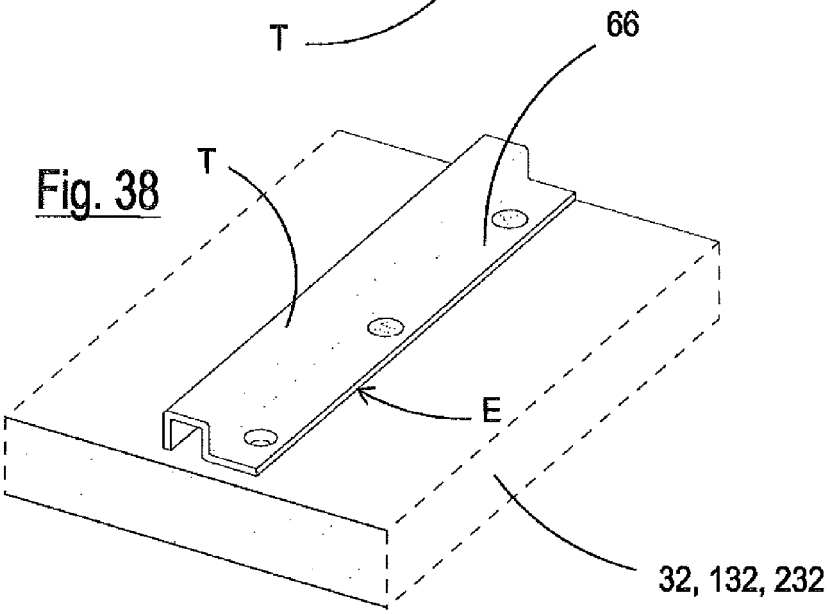

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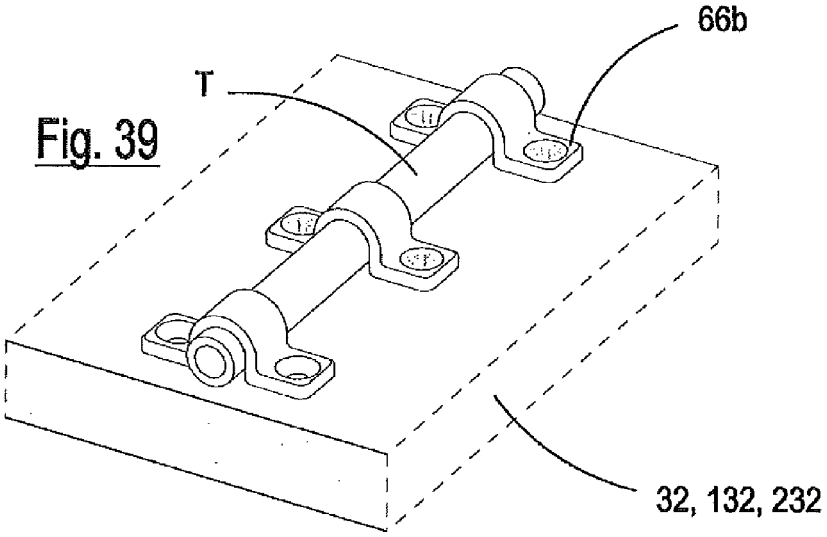

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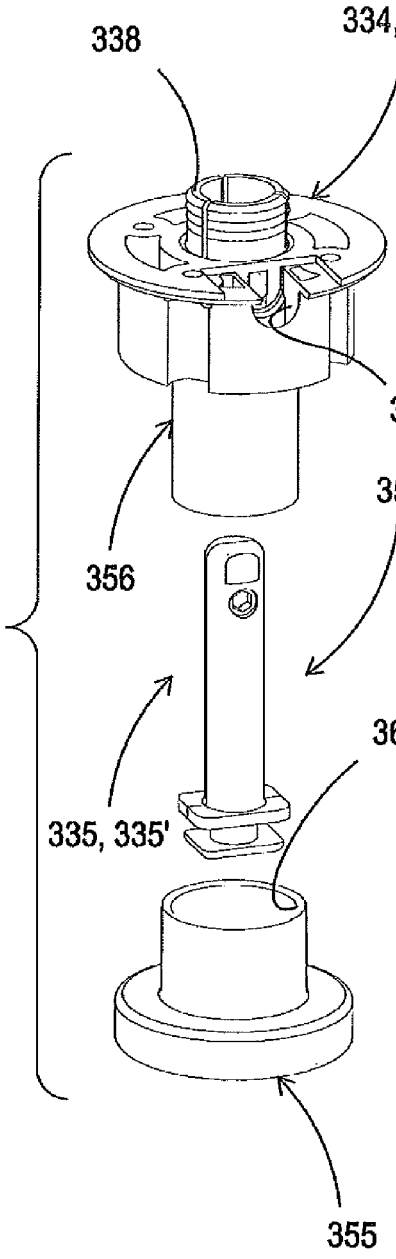

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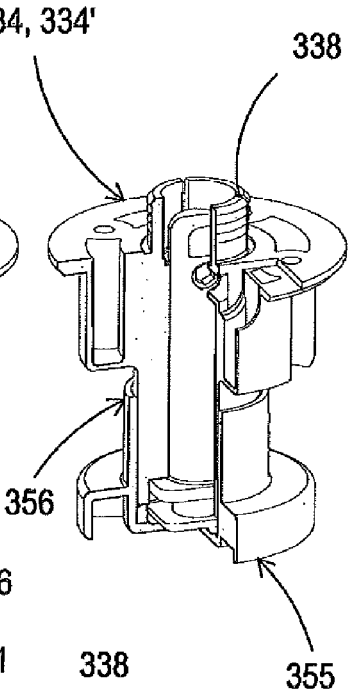

Fig. 42

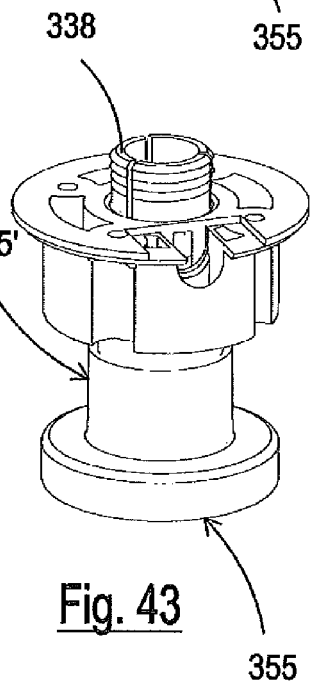

Fig. 43

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EUROPEAN SEARCH REPORT

Application Number
EP 14 17 2508

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	NZ 580 498 A (MARK ROMANY) 29 April 2011 (2011-04-29)	1-5, 7-11, 13-18	INV. A47B91/02
A	* page 14, line 20 - page 26, line 2; figures 1-17 *	6,12	
A	DE 74 35 483 U (BOSCH SIEMENS HAUSGERÄTE GMBH) 10 June 1976 (1976-06-10) * page 3, line 9 - page 4, line 31; figures 1-3 *	1-18	
A	EP 1 103 206 A1 (ESSWEIN SA [FR]) 30 May 2001 (2001-05-30) * paragraph [0012] - paragraph [0020]; figures 1-7 *	1-18	

TECHNICAL FIELDS SEARCHED (IPC)
A47B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	15 January 2015	Klintebäck, Daniel

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15-01-2015

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- EP 13162252 A **[0007] [0008] [0009] [0010] [0011] [0029]**
- EP 733322 A **[0031]**
- EP 2203089 A **[0031]**