



(11)

EP 1 162 009 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
12.12.2001 Bulletin 2001/50

(51) Int Cl.7: **B21D 37/14**

(21) Application number: **01202014.5**

(22) Date of filing: **28.05.2001**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR**
Designated Extension States:
AL LT LV MK RO SI

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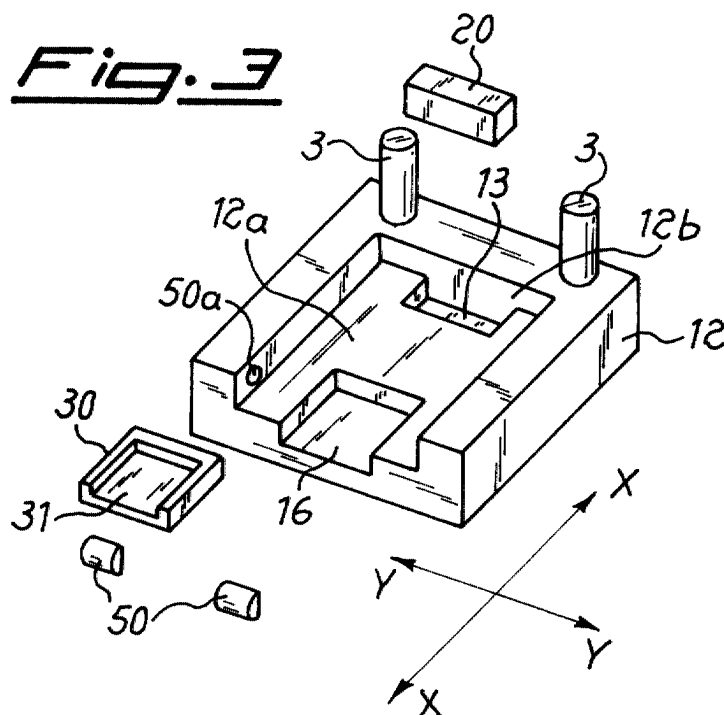
(30) Priority: **09.06.2000 IT MI001305**

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(54) **Die-holder/tray assembly with anti-rotation means for die-forming machines**

(57) Die-holder (10,11,12)/tray (40) assembly for the die-forming of materials such as steel and the like, comprising first means (20,43;220,43;320,43;420,43) for relative positioning and locking of the tray (40) with

respect to the die-holder (10,11,12) and second means (30,42;230,42;330,42;430,42) for constraining the relative rotation/rotary translation of the tray (40) with respect to the die-holder.



Description

[0001] The present invention relates to a die-holder/tray assembly for machines used for the die-forming of materials such as steel and the like, comprising means for constraining the relative rotation/rotary translation of the tray with respect to the said die-holder.

[0002] It is known in the technical sector relating to the hot pressing of steel or other materials of the need to equip die-forming presses with corresponding dies suitably shaped so as to obtain the desired form of the final part.

[0003] Said dies are normally housed inside support trays which are in turn inserted in the die-holders which consist of an apparatus formed by two parts - i.e. an upper part, integral with the press ram and movable therewith and a lower part fixed to the bottom of the press - which are joined together by suitable guiding and centring devices.

[0004] It is also known that this configuration has proved to be particularly advantageous during use since it allows the trays with the dies to be arranged outside the machine, allowing the press to continue production during composition of the die and limiting the machine idle time for re-fitting of the machine to the tray change-over time.

[0005] For this purpose numerous variations of the means for positioning and locking each tray with the associated die-holder have been envisaged, which means are essentially based on locking wedges which are designed to push the tray against two mutually perpendicular reference surfaces of the said die-holder.

[0006] Alternatively, fixing of the tray is envisaged by means of keys projecting from the die-holders and designed to be inserted in corresponding seats of the tray so as to prevent the movements thereof on the bottom surface.

[0007] Locking in a perpendicular (vertical) direction with respect to the said bottom surface is performed by means of wedges or similar inclined surfaces.

[0008] A further known configuration envisages that the tray is brought into contact against a rear surface of the associated die-holder and that the movements in the lateral direction on the die-holder surface are prevented by an insert which projects from the base, or from the end wall thereof, opposite said rear contact surface and is designed to engage with a seat in the tray, locking in the vertical direction nevertheless being obtained by means of wedges and/or equivalent inclined contact surfaces.

[0009] Although fulfilling their function, all the positioning and locking devices described above nevertheless have the drawback that they are not very suitable for preventing the relative movements of the upper die with respect to the lower die due to the play of the machine, and in particular in the second die-holder configuration described above, the relative rotation/rotary translation of a tray with respect to its die-holder, due to

the forces acting on the die itself during die-forming.

[0010] Since these rotations/rotary translatory movements result in die-forming errors which give rise to rejects of the finished part, the technical problem which is posed is that of providing die-holder/tray assemblies for the hot-pressing of steel or other material which are designed to prevent both the relative movements of the die-holders and the relative rotational/rotary translatory movement of the tray with respect to its die-holder.

[0011] Within the scope of this problem a further requirement is that the tray should also be able to be inserted into the associated die-holder by means of a translational movement while resting on the surface of the lower die-holder or on corresponding guides in the case of the upper die-holder.

[0012] These technical problems are solved according to the present invention by a die-holder/tray assembly for machines used for the die-forming of materials such as steel and the like, comprising first means for the relative positioning and locking of the tray with respect to the die-holder and second means for constraining the rotation/rotary translation of the tray with respect to the said die-holder.

[0013] Further details may be obtained from the following description of a non-limiting example of embodiment of the invention, provided with reference to the accompanying plates of drawings in which:

- Figure 1 shows an exploded view of the die-holder;
- Figure 2 shows a perspective view of the die-holder/tray assembly in the assembled condition;
- Figure 3 shows an exploded view of the die-holder with associated tray positioning devices;
- Figure 4 shows a perspective view of the die-holder according to Fig. 3 in the assembled condition;
- Figure 5 shows a cross-section along the plane indicated by V-V in Figure 4;
- Figure 6 shows an exploded view of an alternative example of embodiment of the anti-rotation means of the die-holder/tray assembly;
- Figure 7 shows a perspective view of the assembly according to Fig. 6 with adjustment means assembled and arranged in different locked positions of the tray;
- Figure 8 shows a plan view of a third embodiment of the assembly according to the invention;
- Figure 9 shows a plan view of a further embodiment of the adjustment means of the assembly according to the invention; and
- Figure 10 shows a cross-section along the plane indicated by X-X in Fig. 9.

[0014] As illustrated in Figures 1 and 2 the die-holder device 10 consists of an upper die-holder 11 and a lower die-holder 12 which are connected together by columns 3 for guiding the relative translatory movement in the vertical direction.

[0015] For the sake of convenience of the description,

a longitudinal direction X-X, a transverse direction Y-Y and a vertical direction Z-Z are indicated.

[0016] In the description below only the lower unit will be described in that the upper unit is identical.

[0017] In greater detail (Fig. 3), each bottom surface 12a of the associated die-holder element 12 has a first seat 13 arranged in the vicinity of the closed rear side 12b of the said die-holder 12.

[0018] Said seat 13 is designed to contain partially an insert 20 - in the example with a parallelepiped shape - which once inserted in the seat 13 will project partially in the vertical direction from the surface 12a (Fig. 4).

[0019] In a different embodiment (not illustrated) said insert is formed by a parallelepiped which is totally contained in the seat 13 and by a projection protruding vertically from said parallelepiped and therefore from the base of the die-holder.

[0020] Each bottom surface 12a is also provided with a second seat 16 arranged on the open front side of the die-holder and in turn open towards said front side.

[0021] Said seat is designed to house a second insert 30 (Fig. 3) which is in turn provided with a cavity 31 open towards the said front side of the die.

[0022] According to the invention (Fig. 5) it is envisaged that the tray 40 to which the die (known per se and therefore not shown) is applied has, in the bottom surface 41a of the base 41, a first seat 43 which is open towards the rear side 12b of the die-holder and has dimensions corresponding to those of the projection 13 emerging from the bottom surface 12a of the die-holder 12.

[0023] The front side of the bottom surface 41a of the said base 41 of the tray 40 is also provided with a projection 42 extending towards the outside in the vertical direction and having a shape and dimensions such as to mate precisely with the second front seat 31 of the bottom surface of the die-holder.

[0024] The engagement between said front projection 42 of the tray 40 and second seat 31 of the base 12a is designed to prevent rotation of the tray 40 and consequently the die with respect to the associated die-holder 12.

[0025] In addition to this, the arrangement of the said seats in the tray and the die-holder, which are open on the rear side and front side of the die-holder respectively, allows insertion of the tray into the said die-holder by means of a translatory movement of the former which remains resting on the latter, avoiding the need for complex equipment for gripping, transporting and releasing the tray into its die-holder.

[0026] Once it has been inserted into the seat of the die-holder, the tray is locked in the longitudinal direction X-X and vertical direction Z-Z by means of wedge elements 50 with a double inclination which project from corresponding seats 50a formed in the sides of the die-holder and upon operation of respective means such as oil-hydraulic cylinders or the like, not illustrated.

[0027] As shown in Figure 6, the means for locking

rotation/rotary translation of the tray 40 with respect to the die-holder 12 may also be provided with means for adjusting the position of the tray in the transverse direction Y-Y.

[0028] In greater detail the male rear block 220 and the female front block 230 have, passing through them in the longitudinal direction, respective holes 222,232 with a female thread; said holes 222,232, once the blocks have been inserted into their respective seat 113,116, are arranged coaxially with further through-holes 18 formed in the die-holder 12.

[0029] Since all the holes 18,222,232 are coaxial with each other it is possible to insert, into them, a threaded bar 150 which is arranged inclined with respect to the longitudinal axis X-X and can be manoeuvred on the front side of the die-holder and which is designed to engaged with the respective female threads of the two said inserts 220,230 so that operation of the screw in one direction or the other causes displacement, simultaneously and in the same manner, of the two said inserts either towards the rear or towards the front of the die-holder.

[0030] Since the said movement of the two inserts 220,230 must allow correct positioning of the tray 40, which is in contact with the rear side 12b of the die-holder, both the rear seat 113 and front seat 116 of the die-holder 12 and the associated blocks 220,230 have sides which are parallel, but inclined with respect to the longitudinal axis of symmetry of the die-holder; on the other hand the associated projection 220b and seat 231 of each block are parallel to said axis of symmetry, since they have to allow engagement with the corresponding seat and projection on the bottom side of the tray.

[0031] In this way the tray 40 may still be inserted into the die-holder by means of a translatory movement while resting on the base of the die-holder and subsequent operation of the threaded bar 150 causes a displacement, in the longitudinal direction, of the elements 220,230 and, consequently, a displacement of the tray 40 in the transverse direction in a sense (Fig. 7a,7b) depending on the sense of rotation of the bar 150, this movement in the transverse direction allowing precise adjustment of the position of the tray.

[0032] The configuration of the adjustment and locking devices described above is moreover particularly strong since it is achieved by inserting the anti-rotation means inside the tray 40, which allows all the resistive forces resulting from the precise insertion thereof into the die-holder to be used.

[0033] As illustrated in Fig. 8, the means for adjusting the position of the tray 40 may also consist of two elements, i.e. rear element 320 and front element 330, which are arranged coaxial with each other and the threaded bar 150 which in this case is arranged parallel to the longitudinal axis of the die-holder/tray assembly.

[0034] The rotation of the threaded bar 150 in one direction or the other causes the simultaneous displacement in one direction or the other of the two inserts and

therefore the displacement of the tray 40 in the transverse direction.

[0035] Fig. 9 shows a further embodiment of the front insert 420 and rear insert 430 which in this case are a mirror-image of each other; in this configuration the respective female threads have oppositely directed threading so that operation of the threaded bar 150 which is again arranged parallel to the longitudinal axis of the die-holder/tray assembly causes a symmetrical movement of the two inserts towards/away from each other and therefore the displacement in one sense or the other along the transverse direction Y-Y of the tray 40.

[0036] In both cases (Fig. 10) the threaded bar 150 must be associated with two sliders 151 mating with the respective front/rear insert so as to cause the desired movement of the said inserts.

[0037] Although, in the examples of embodiment described, the anti-rotation means have been illustrated positioned along the front edge of the die-holder/tray assembly, the position thereof in the longitudinal direction is not limiting and during practical implementation it will be taken into account that the greater the distance from the rear locking means the greater will be the resistance torque produced.

Claims

1. Die-holder (10,11,12)/tray (40) assembly for the die-forming of materials such as steel and the like, comprising first means (20,43;220,43;320,43;420,43) for relative positioning and locking of the tray (40) with respect to the die-holder (10,11,12), **characterized in that** it comprises second means (30,42;230,42;330,42;430,42) for constraining the relative rotation/rotary translation of the tray (40) with respect to the die-holder.
2. Assembly according to Claim 1, **characterized in that** said second anti-rotation means comprise a female element (30,31;230,231;330,331;430,431) integral with the die-holder (10) and a male element (42) integral with the tray (40).
3. Assembly according to Claim 2, **characterized in that** said female element consists of an interchangeable insert (30;230;330;430) provided with a seat (31;231;331;431) having at least one open side.
4. Assembly according to Claim 3, **characterized in that** the open side of said seat (31;231;331;431) is that corresponding to the front side of the die-holder.
5. Assembly according to Claim 2, **characterized in that** said male element consists of a projection (42)

integral with the tray (40) and extending towards the outside from the bottom surface (41a) of the base (41) of the said tray.

- 5 6. Assembly according to Claim 2 or 5, **characterized in that** said male projection has dimensions corresponding to the dimensions of the female element.
7. Assembly according to Claim 1, **characterized in that** said first locking means comprise a male element (20;220b) projecting in the vertical direction from the base of the die-holder (12).
- 10 8. Assembly according to Claim 1, **characterized in that** said first positioning and locking means (20,43; 120,43;220,43) and second positioning and locking means (30;42;230,42) have associated operating means (150) for adjusting their position with respect to the die-holder.
- 15 9. Assembly according to Claim 8, **characterized in that** said first and second locking means have respective holes (222,232) with a female thread coaxial with each other and inclined with respect to the longitudinal axis of symmetry of the assembly.
- 20 10. Assembly according to Claim 9, **characterized in that** said operating means consist of a threaded bar (150) designed to engage with the said female threads of the first and second positioning and locking means.
- 25 11. Assembly according to Claim 9, **characterized in that** said threaded bar (150) can be manoeuvred from the outside of the die-holder.
- 30 12. Assembly according to Claim 9, **characterized in that** said male locking elements (220a,230) have sides inclined with respect to the longitudinal axis of symmetry of the assembly.
- 35 13. Assembly according to Claim 9, **characterized in that** said male element (220a) of the first positioning and locking means has a projection (220b) extending towards the outside in the vertical direction and provided with sides parallel to the longitudinal axis of symmetry of the assembly.
- 40 14. Assembly according to Claim 9, **characterized in that** said male element of the second positioning and locking means is provided with a seat (231) which has sides parallel to the longitudinal axis of symmetry of the assembly.
- 45 15. Assembly according to Claim 9, **characterized in that** said inserts of the first locking means (320) and second locking means (330) are coaxial and parallel with each other.
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16. Assembly according to Claim 9, **characterized in that** said inserts of the first locking means (420) and second locking means (430) are coaxial and a mirror-image of each other.

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17. Assembly according to Claim 15 or 16, **characterized in that** the threaded bar (150) is arranged parallel to the longitudinal axis (X-X) of the assembly.

18. Assembly according to Claim 16, **characterized in that** the female thread of said holes in the inserts of said first and second locking and adjusting means is oppositely directed.

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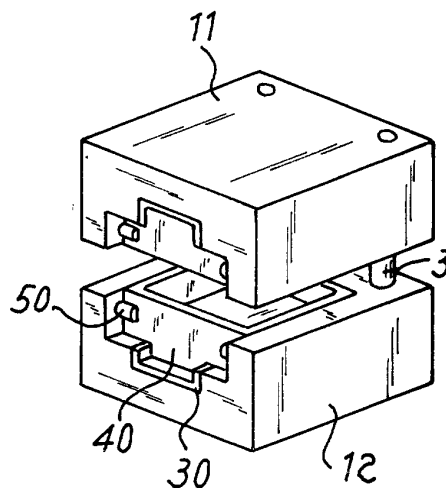
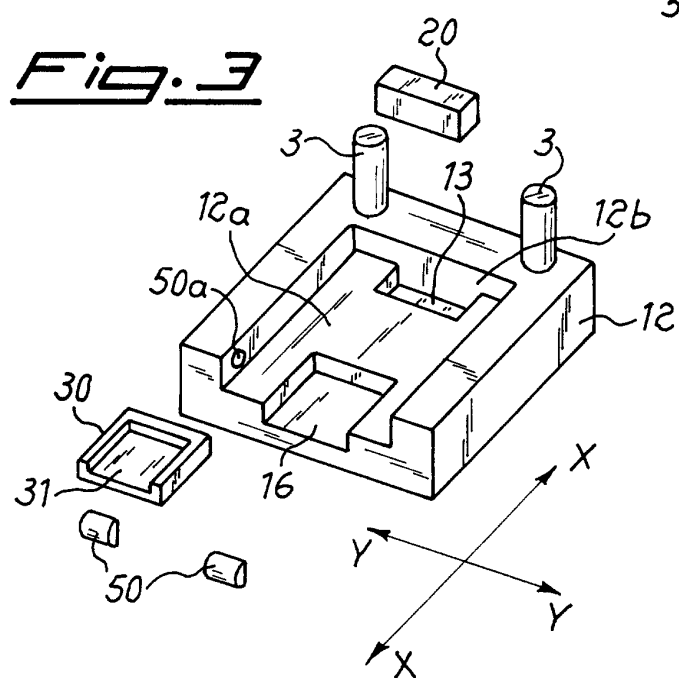
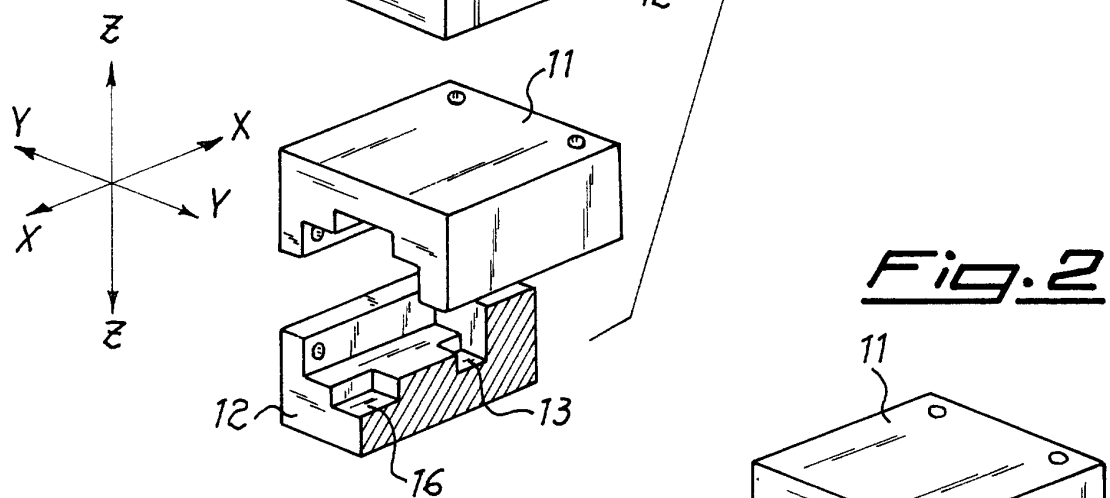
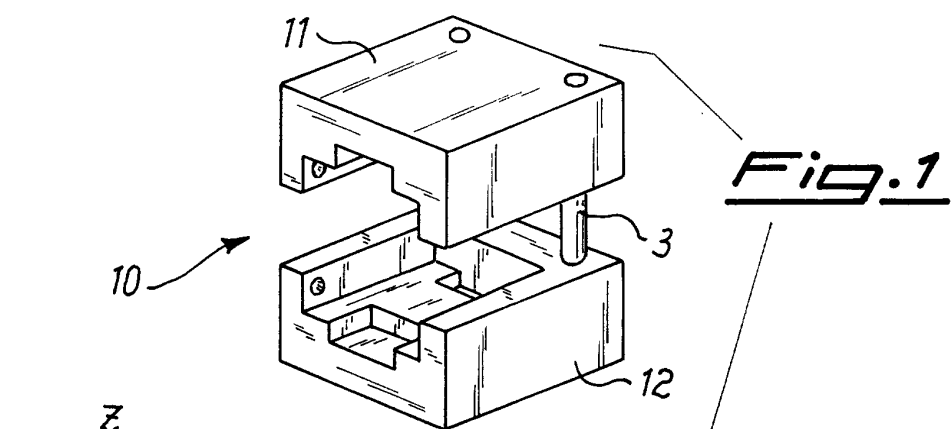


Fig. 4

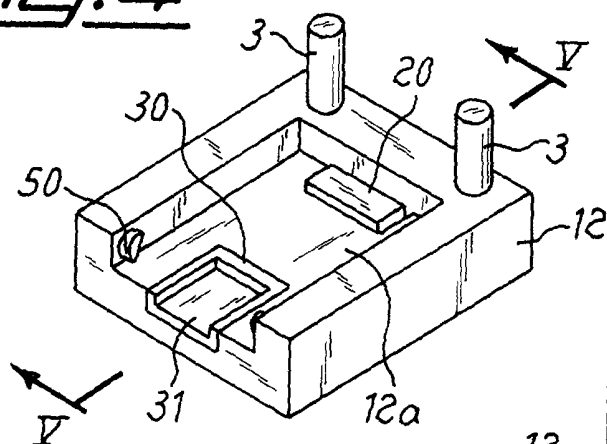


Fig. 5

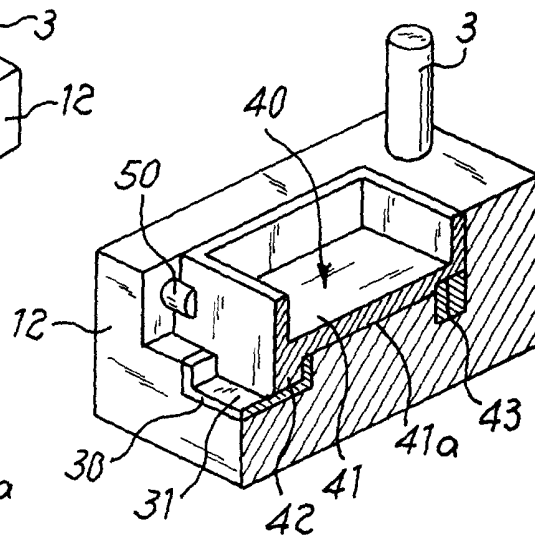


Fig. 6

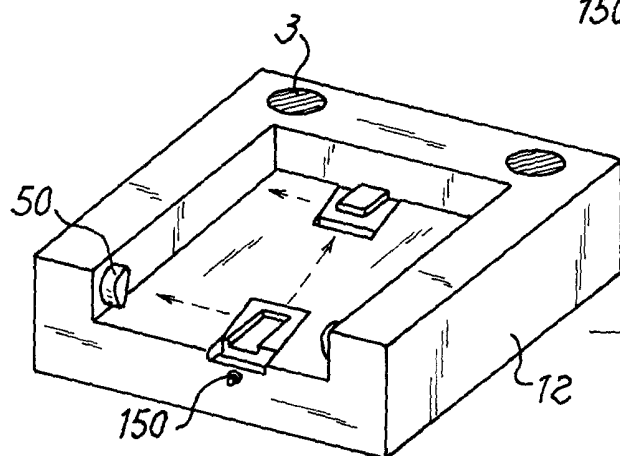
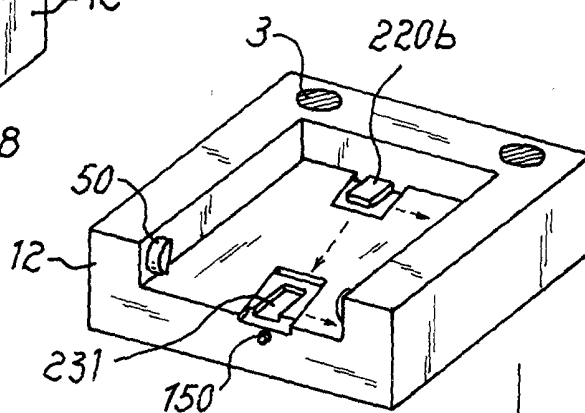
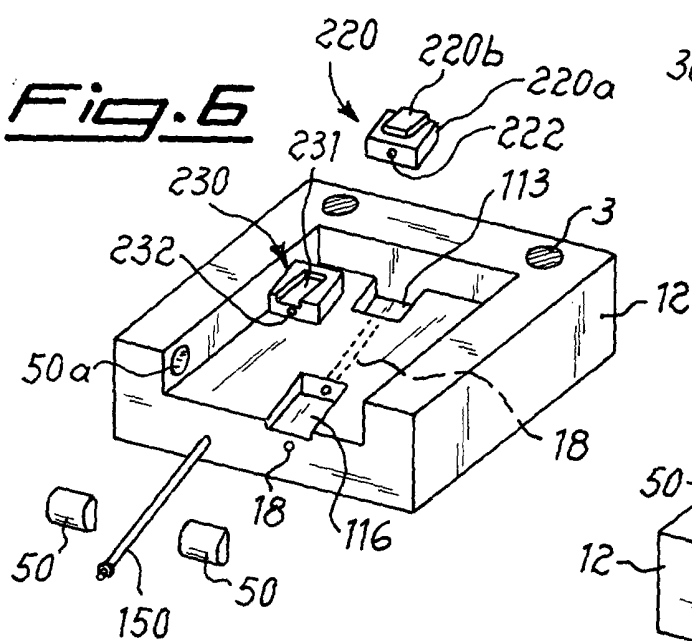


Fig. 7

Fig. 8

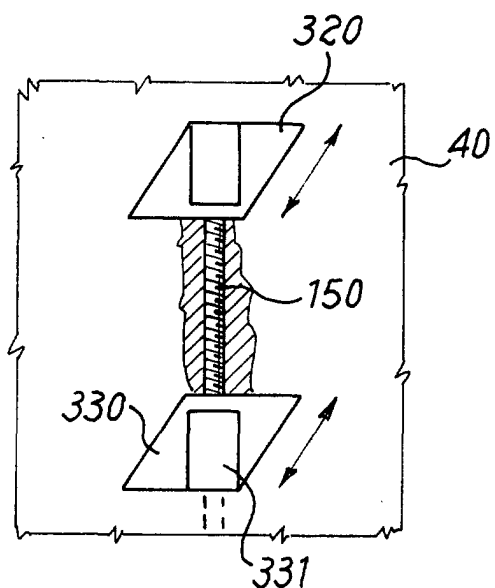


Fig. 9

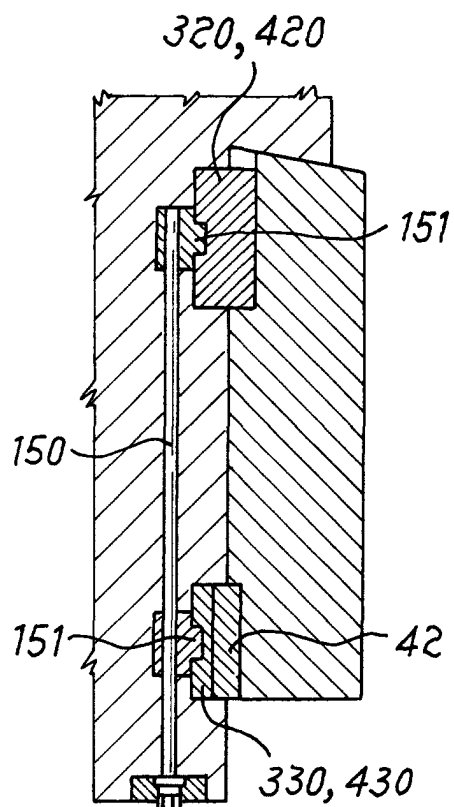
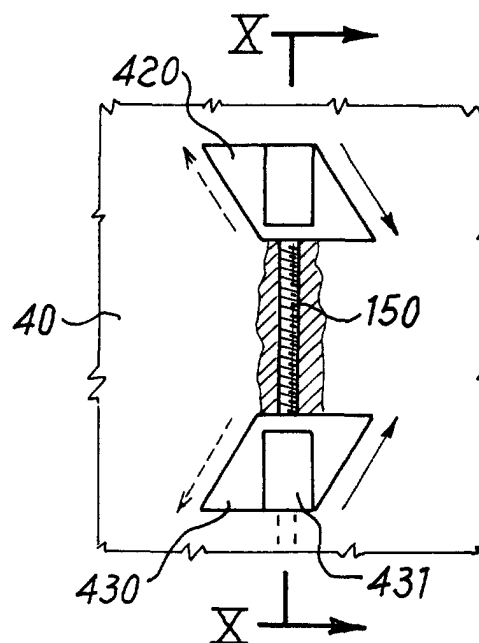


Fig. 10