



(12) **EUROPEAN PATENT APPLICATION**

(21) Application number : **91500145.7**

(51) Int. Cl.⁵ : **B28D 1/22**

(22) Date of filing : **18.12.91**

(30) Priority : **04.01.91 ES 9100016**

(43) Date of publication of application :
15.07.92 Bulletin 92/29

(84) Designated Contracting States :
AT BE CH DE DK FR GB GR IT LI LU NL SE

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(54) **Machine for cutting and separating flat ceramic pieces and the like.**

(57) It comprises a housing (6) at one of its ends, which is placed between the sliding guides of the support (1) for the tool (2). In this housing (6) are articulated two opposite levers (7,8), superimposed on the same plane, the upper one terminating in points (14) in contact with the piece, and the lower one in a tip (16) which coincides with the breakage line. Both levers (7,8) are joined together by a rear spring (9), and are driven by a common cam and a lever (11), the axis of the lever (7), which is in contact with a rocker arm (30), passing through toothed openings (27) of components (28) in the form of circular sectors, whose rotation axis (29) is provided with an operating handle (29a).

The breakage is independent from the cutting. It allows the cutting of pieces of greater surface area and thickness.

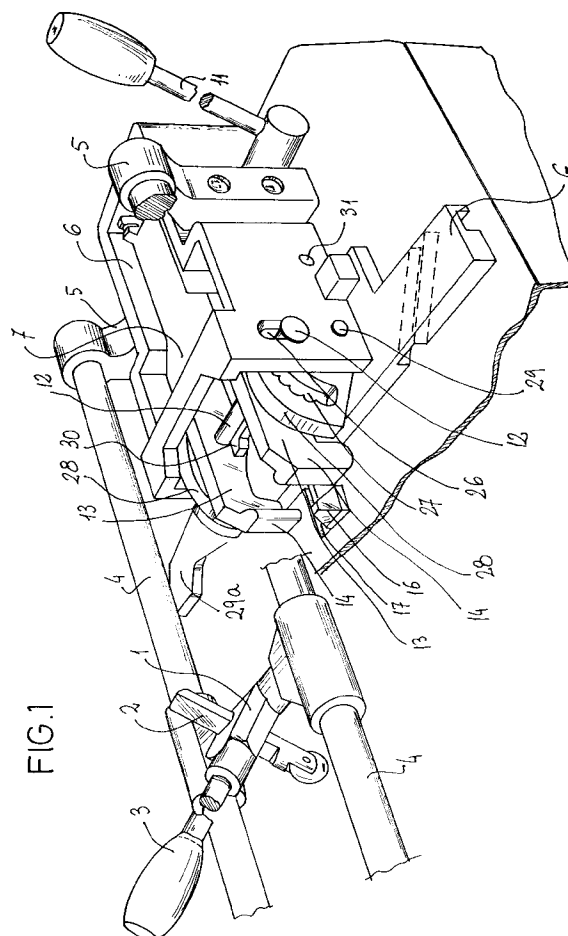


FIG.1

The present invention refers to a machine intended to facilitate the cutting and subsequent breaking of flat ceramic pieces and the like, such as paving tiles, terrazzo and other items intended for use in construction as flooring, lining and revetment in general, a machine which simplifies extraordinarily many operations which normally require either skill on the part of an operative or the use of specially designed breaking devices when it is necessary to separate pieces previously marked by a cutting line.

Until some years ago, the cutting into segments of pieces of revetment (for floors, walls, roofs, etc.) was done by hand with impact tools with which it was first necessary to mark with several blows the area to be cut, in order to then break the piece along the marked line. It is not necessary to stress that this system had enormous disadvantages, some stemming from the impossibility of marking out a straight and continuous line for breaking, and others from the difficulty of achieving the correct breakage along a discontinuous and irregular line. The pieces or serpents obtained, once separated along said cutting lines (something which frequently was not accomplished, leaving pieces not properly separated and therefore not usable), had highly irregular borders, and obtaining a precise fit in forming, for example, corners, recesses and other areas where it is impossible to use whole pieces, proved to be virtually impossible.

Subsequently there were developed machines intended to effect this operation, which basically used a form of cutting tool, with either a hard point or a disk, fixed to a support sliding over appropriate guides and hand operated, with which it was possible to mark a straight and uniform cutting line which slit the piece to be cut and would later allow, either by a sharp blow or by the use of another suitable tool, the clean separation of the segments, preventing the risk of breakage over an area different from the one marked.

On the other hand, there also exist a variety of devices for facilitating the breakage, these being either manual tools in the form of pincers, or static tools with oscillating levers, all of them working through the pressure exercised between two points situated on either side of the breakage line, on the upper side of the piece, and another point or area situated on the opposite side of the piece positioned on the plane of said breakage line.

In any event, the use of two independent elements (cutter and breaker) involves the removal of the piece from the former in order to subject it to the action of the latter. Further, the known devices, and in particular the manual ones, are difficult to use with thick ceramic pieces and cannot be used with hard materials, such as might be the case with terrazzos or similar items. On the other hand the static devices have the disadvantage that they are, in practice, only intended for use with pieces of a predetermined thickness and not for use with hard materials (terrazzos and

similar items) which still require cutting either manually or using disk cutters, or other more complex devices whose cost is not always within reach.

The machine which is the object of this invention tends to overcome all the detailed disadvantages, since it is designed in such a way that the pieces to be cut do not need to be moved from the site of marking of the breakage line in order to accomplish the separation of the resulting serpents. On the contrary, with the simple action of an appropriate lever, independent of the operating lever of the cutting tool, it is possible to obtain said breakage and separation without undue difficulty and with the inherent advantage that the invention allows the cutting of pieces of greater surface area, thickness and hardness, for which purpose it is provided with additional means for supporting the piece and for regulating the gap provided for the introduction of the piece between the two active elements of the breaking device.

According to the invention, said machine, which is of the type which is provided with a sliding support for the cutting or marking tool, its movements being controlled manually using the appropriate lever, and comprises the breaking mechanism located in the centre of said lever, coinciding in position with the theoretical longitudinal displacement axis of said tool, the breaking mechanism being constituted by two oscillating levers, the first of which is positioned over the support base for the piece to be cut on the machine, and the second is positioned under the cutting plane and centered with respect to the first, coinciding with the plane of action of the tool for cutting or marking the piece.

Said levers, which are joined together at their rear end by a spring, are activated by a common cam which acts on their respective rear ends and which is operated by a manual lever. The fulcrum of said lever is positioned towards the front half of the lever, so that it produces an action arm which is greater than the resistance arm which is applied against the piece to be broken.

The front, or resistance, arm of the first of the aforementioned levers is formed by two parallel branches, situated on either side of the theoretical central axis, which coincides with the plane of action of the cutting tool, and said branches form elbow bends which point towards the surface of the piece to be cut, and determine the contact points with the same at the time of breakage.

The second lever is also provided with an elbow bend at its front end, finishing in a tip which determines the bearing point for the piece to be broken. This bearing point is located facing an opening in the support base of the machine, through which it is allowed to emerge in the breakage position.

Both levers are supplied with loose rollers at their rear end, by means of which they are in contact with their action cam, against which they are pressed by

one or more common springs, attached to the rear ends of said levers.

Said cam has three different working areas, one of which forms a projection with a small recess in which there fits, in the rest position, the roller of the upper lever. This projection is formed with lateral walls which terminate, on one side, in a curved eccentric region, and, on the other side, in an opposite concentric region, linked together by a depressed serpent into which fits, in like manner in the rest position, the roller attached to the lower lever. The eccentric region of the cam controls the progressive approach, with growing force, of the elbowed ends of the upper lever towards the piece to be broken, whilst the concentric region raises slightly the tip of the elbowed end of the lever which supports the piece, and keeps it in a permanently fixed position during the breaking operation.

The axis of the upper lever is able to slide in a radial and substantially vertical plane, through long slots or slides in the support housing of the mechanism, and passes through an eccentric toothed opening of a component formed in the shape of a circular sector. This latter component is also articulated, centered on a shaft which is in its turn articulated on the previously mentioned support housing and situated in a plane which substantially coincides with that of the axis of the lever.

The oscillation axis of the upper lever is supported on the end of a rocker arm articulated on a shaft mounted on the housing of the mechanism and subjected to the action of a rear spring which tends to maintain the arm in permanent contact with the axis of the upper lever.

Lateral arms are hingedly mounted on the support base of the piece to be cut on the machine, whose role is to serve as a support of said piece when its surface is wider than said base. The support base, which is provided with a conventional graduated rear support guide of the piece to be cut, is additionally equipped with a rule-like component, with one end bent in a U shape towards one side and with a short serpent at right angles on the opposite side. This rule is so positioned that it may be introduced as required through openings or channels in the graduated guide.

To assist understanding of this explanation, attached to the present description there are some drawings which represent, without constituting any limitation whatsoever, an example of an embodiment of a machine with the mentioned characteristics and a work scheme for its breaking mechanism.

In said drawings, figure 1 is a perspective view, partially sectioned, of a machine; figure 2 corresponds to a detail, similarly in sectioned perspective, of the active organs of the breaking mechanism; figure 3 is a view in elevation of the area of operation of the actuator cam of the breaking device lever; figure 4 is a partial perspective view in section of the device for adjustment of the breaking mechanism; figure 5 is

a top view which shows a part of the machine with the complementary, support elements for the pieces to be cut; and figures 6 to 8 offer schematic outlines of the the principal work phases of the breaking device.

The machine represented in the aforementioned drawings comprises, in conventional form, a sliding support -1- in which is fixed the tool -2- for cutting or marking the piece P, which is to be broken up, subjected to said support -1- by means of the lever fitted with the handle -3- operated by hand. The support -1- slides along the guide bars -4- which are sustained by two sets of end supports -5-, between which is located the housing -6-, which is centrally situated and coincides in its position with the theoretical longitudinal displacement axis of said tool -2-. The housing -6- contains the breaking mechanism, which is constituted by two opposing oscillating levers -7- and -8-, the first of which is situated over the support base B for the piece P which is to be cut on the machine, and the second below the plane of that piece, and centered with respect to the first lever, coinciding with the plane of operation of the tool -2- for cutting or marking the piece.

Said levers -7- and -8- are joined at their rear end by springs -9- and are operated by a common cam -10- (figure 3) which acts on said rear ends and which is driven by a manually operated lever -11-. The axis -12- of the lever -7- is positioned towards the front half, in a way which determines an action arm greater than the resistance arm which is applied to the piece to be broken.

The forward, or resistance, arm of the first mentioned lever -7- forms two parallel branches -13-, situated on either side of the central theoretical axis, and said branches -13- form elbow bends -14- directed towards the surface of the piece to be cut P, which determine the points of contact with the piece at the time of breaking.

The lower lever -8- is hingedly mounted on the shaft -12a- and is also provided with an elbowed forward terminal end -15-, culminating in a tip -16- which constitutes the bearing point of the piece P when breaking takes place. This bearing point -16- is situated facing an opening -17- in the support base B of the machine, through which it is allowed to emerge in the breaking position.

Both levers -7- and -8- are provided, at their rear ends, with loose rollers -18,19- by means of which they are in contact with their driving cam -10-, being pressured against said cam by common springs -9- joined to the rear ends of the said levers -7- and -8-.

The cam -10- offers three different working areas -20-, -21- and -22- (figure 3), the first of which forms a projection with a small recess -20a- into which fits, in the rest position, the roller -18- of the upper lever -7-. The projection -20- is formed with lateral sides -23- and -24- which terminate, on one side, in a curved eccentric region -21- and on the other in the opposite

concentric region -22-, linked together via a depressed segment -25- into which fits, similarly in the rest position, the roller -19- joined to the lower lever -8-. The eccentric region -21- of the cam -10- controls the progressive approach, with increasing force, of the elbowed ends -14- of the upper lever -7- towards the piece to be broken P, while the concentric region -22- initially raises slightly the tip -16- of the elbowed end -15- of the lever -8- which supports said piece and maintains it in a permanently fixed position throughout the breaking operation.

The -12- of the upper lever -7- is mounted in a way that enables it to slide in a radial and substantially vertical plane, through long slots or slides -26- in the support housing -6- of the mechanism, traversing at the same time the eccentric toothed opening -27- of oscillating end components -28- in the form of circular sectors, fixed to a shaft -29- mounted on the previously mentioned support housing and situated in a plane which again coincides substantially with that of the axis -12- of the lever -7-, the shaft -29- being fitted with an operating lever -29a-.

The axis -12- of the lever -7-, which passes through the eccentric toothed opening -27- of the components -28-, is supported on the end of a rocker arm -30- articulated on the shaft -31- mounted on the housing -6- and subject to the action of the rear spring -32-, which tends to maintain the rocker arm in permanent contact with the shaft -12-.

In the sides of the base B, which supports the piece P to be cut on the machine, are articulated folding arms -33- whose purpose is to provide support for said piece P when its surface area is larger than that allowed for by the base B (figure 5). Equally, the machine is equipped, in combination with the graduated conventional guide G for rear support for the piece to be cut, placed on the base B of the machine, with a rule-like component -34-, with one end bent in a U shape -35- towards one side and with a short segment -36- at right angles on the opposite side. Said rule can be introduced, in the required position, in the openings or passageways of said graduated guide which supports the piece, whether this be outside the area of the base B (position P' in dashed lines) or in the interior of the base (position P'').

In broad outline, the functioning and utilization of the machine are as follows.

In order to scratch or mark the piece to be cut the procedure takes the conventional form of placing the piece P over the base B, by which it is supported, and sliding the tool -2-, which will mark the cutting line.

However, once the piece P has been marked, the procedure for breaking is in accordance with the phases schematically represented in figures 6 to 8, according to which the piece P is placed flat on the base B (figure 6) with the elbowed end -14- of the branch -13- of the lever -7- being slightly separated

from the piece (in the rest position), while the rollers -18- and -19- remain engaged in the recesses -22- and -25- of the cam.

On activating the lever -11- and turning the cam -10-, the roller -18- emerges from the projection -20- and moves to the base of wall -23- (figure 7); this action will give rise to a small oscillation of the lever -7-, raising slightly its elbowed end -14-. At the same time the tip -16- in which the elbowed end -15- of the lever -8- terminates will also be raised slightly, due to the emergence from the recess -25- of the roller -19- and the oscillation of the lever -8-, said tip rising from the plane of the base B and thus raising the piece P (figure 7). As the cam -10- continues to turn, the rollers -18- and -19-, under pressure from the springs -9-, are driven by the regions -21- and -22- respectively. The first provokes an ever increasing oscillation of the lever -7-, whose elbowed ends -14- consequently are pushed with ever greater pressure against the piece P, whilst the second maintains the previously obtained position of the tip -16- (figure 8) while said pressure is applied, up to the point where the break is achieved. When the cam returns to its initial position, all the components return to the rest position (figure 6).

The piece P will be positioned on the base B and laterally supported, either on the elbowed end -36- of the rule -34- (position P' in figure 5) or against the elbowed U shaped end -35- (position P''), and respectively supported between the base and the auxiliary support -33-, when the dimensions of the piece P exceed those of the base B itself, or exclusively by the base B, in the case of normal dimensions.

Previous to placing the pieces P over the base B the initial position of the lever -7- is adjusted according to the thickness of the piece in question, in order that its elbowed ends -14- are sufficiently separated from the base B to allow the introduction of pieces of variable thicknesses. To accomplish this adjustment it is sufficient to operate the lever -29a-, connected to the shaft -29- which turns the component -28-, until the shaft -12- is positioned in the most appropriate setting within one of the teeth of the eccentric toothed opening -27-.

As can be understood, the use of a machine with the specified characteristics, in addition to facilitating the cutting of such pieces, also offers the inherent advantage of allowing the pieces to be broken along the marked cutting lines, being adaptable to the thicknesses and dimensions that may be presented. On the other hand the special arrangement of the lever -7- allows for the exercise of an extraordinarily large pressure over the piece P, with the consequence that it is possible to break pieces of a thickness and hardness greater than those of normal ceramics (terrazzos or similar items), thus broadening the range of application of this type of machines.

Claims

1. Machine for cutting and separating flat ceramic pieces (P) and the like, of the type which is provided with a sliding support (1) for the cutting or marking tool (2), its movements being controlled manually using the appropriate lever (3), characterised in that it comprises a breaking mechanism located in the centre of said lever, coinciding in position with the theoretical longitudinal displacement axis of said tool (2), the breaking mechanism being constituted by two oscillating levers (7,8), the first of which is positioned over the support base (B) for the piece (P) to be cut on the machine, and the second is positioned under the cutting plane and centered with respect to the first, coinciding with the plane of action of the tool (2) for cutting or marking the piece; said levers, joined together at their rear end by one or more springs (9), being activated by a common cam (10) which acts on their respective rear ends and which is operated by a manual lever (11), the fulcrum of said lever (11) being positioned towards the front half of the lever, so that it produces an action arm which is greater than the resistance arm which is applied against the piece (P) to be broken; the front, or resistance, arm of the first of the aforementioned levers being formed by two parallel branches (13), situated on either side of the theoretical central axis, which coincides with the plane of action of the cutting tool (2), and ending in elbow bends (14) which point towards the surface of the piece (P) to be cut, and determine the contact points with the same at the time of breakage, while the opposite lever (8) is also provided with an elbow bend at its front end (15), finishing in a tip (16) which determines the bearing point for the piece (P) to be broken, this bearing point being located facing an opening (17) in the support base (B) of the machine, through which it is allowed to emerge in the breakage position.

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2. Machine for cutting and separating flat ceramic pieces and the like, according to the preceding claim, characterised in that both levers (7,8) are supplied with loose rollers (18,19) at their rear end, by means of which they are in contact with their driving cam (10), against which they are pressed by said common springs (9), attached to the rear ends of said levers (7,8).

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3. Machine for cutting and separating flat ceramic pieces and the like, according to claims 1 and 2, characterised in that said cam (10) has three different working areas (20,21,22), one of which (20) forms a projection with a small recess (20a) in which there fits, in the rest position, the roller (18) of the upper lever (7), this projection being formed with lateral walls (23,24) which terminate, on one side, in a curved eccentric region (21), and, on the other side, in another opposite concentric region (22), linked together by a depressed segment (25) into which fits, in like manner in the rest position, the roller (19) attached to the lower lever (8).

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4. Machine for cutting and separating flat ceramic pieces and the like, according to claims 1 to 3, characterised in that the rotation axis (12) of the upper lever (7) is mounted able to slide in a radial and substantially vertical plane, through long slots or slides (26) of the support housing (6) of the mechanism, and at the same time passes through an eccentric toothed opening (27) of one or more components (28), formed in the shape of a circular sector, which are also able to oscillate around a shaft (29) which is in its turn mounted on the previously mentioned support housing (6) and situated in a plane which substantially coincides with that of the axis (12) of the lever (7).

20
5. Machine for cutting and separating flat ceramic pieces and the like, according to claims 1 to 4, characterised in that the oscillation axis (12) of the upper lever (7), which passes through the eccentric toothed openings (27) of the components (28), is supported on the end of a rocker arm (30) articulated on a shaft (31) mounted on the housing (6) itself and subjected to the action of a rear spring (32) which tends to maintain the rocker arm (30) in permanent contact with the axis (12).

25
6. Machine for cutting and separating flat ceramic pieces and the like, according to claims 1 to 5, characterised in that arms (33) are hinged mounted on both sides of the support base (B) of the piece (P) to be cut on the machine, said arms (33) being intended to serve as a support of said piece when its dimensions are larger than the width of said base (B), and being also foreseen, in combination with the conventional graduated rear support guide (G) of said piece to be cut with which the machine is provided, a rule-like component (34), with one end (35) bent in a U shape towards one side and with a short segment (36) at right angles on the opposite side.

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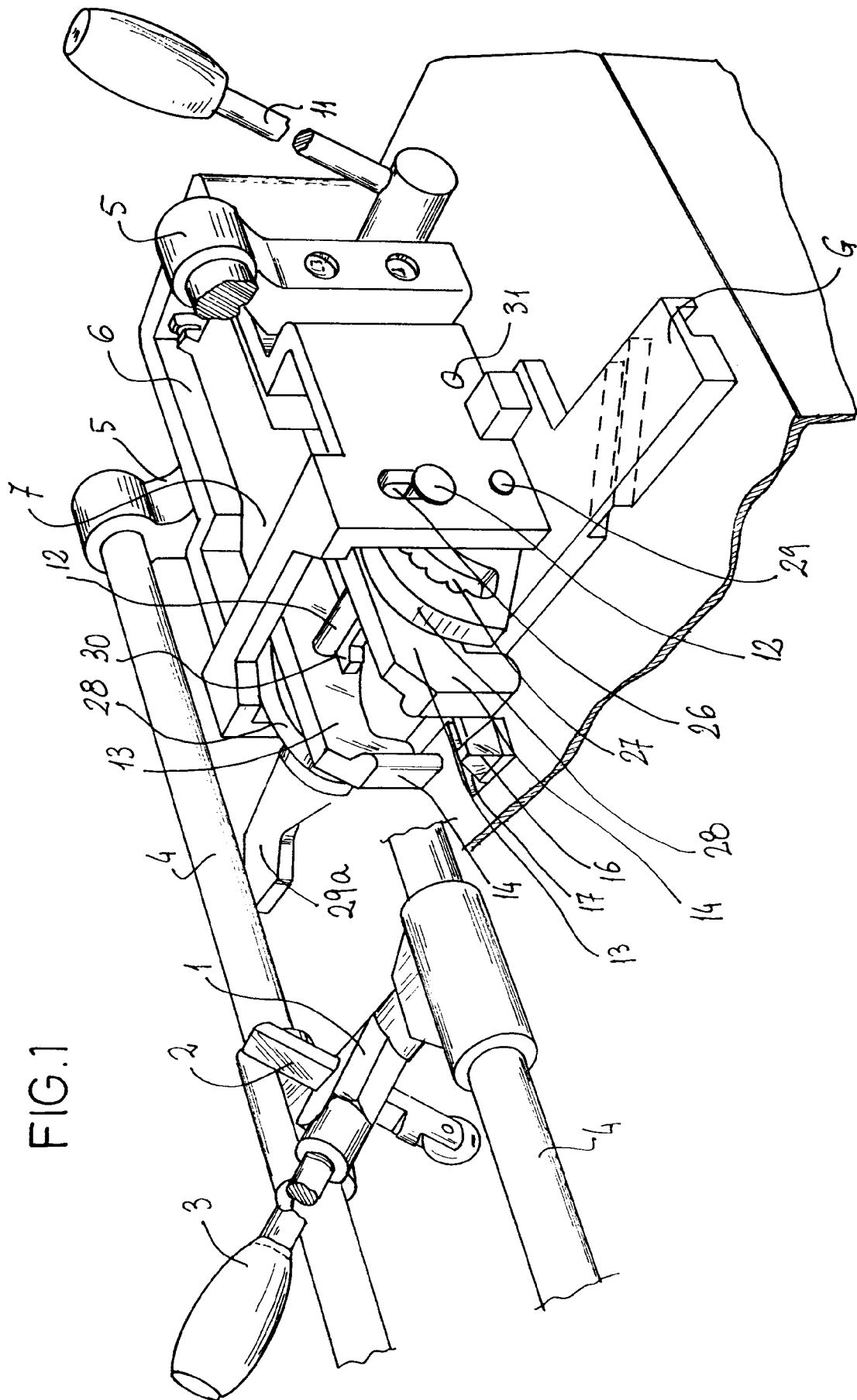


FIG. 2

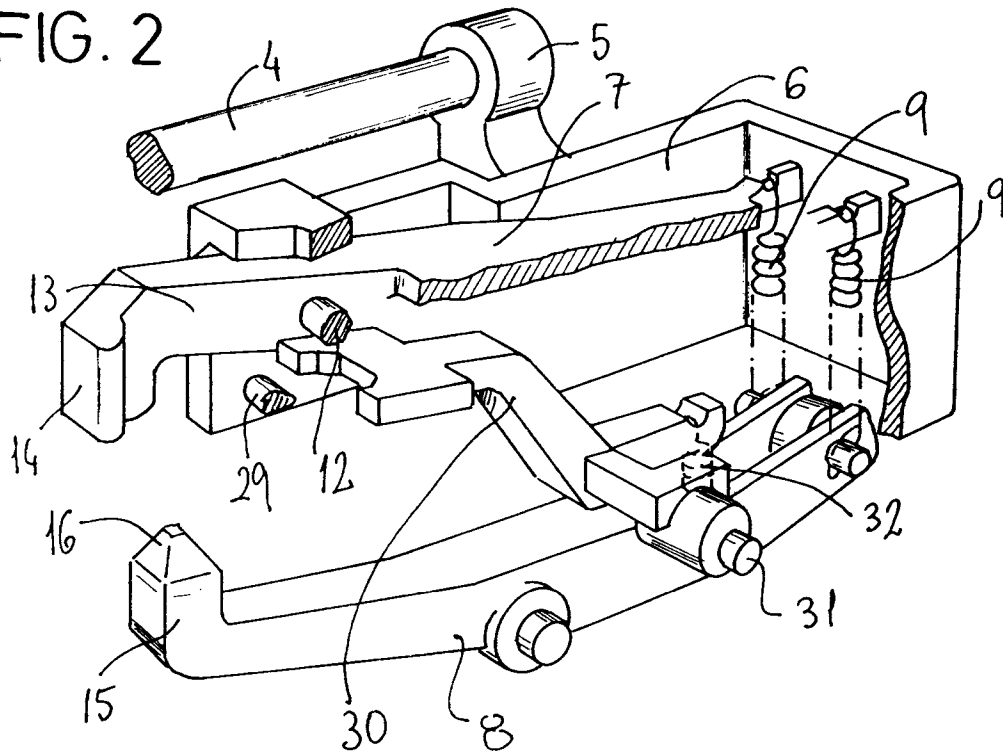


FIG. 3

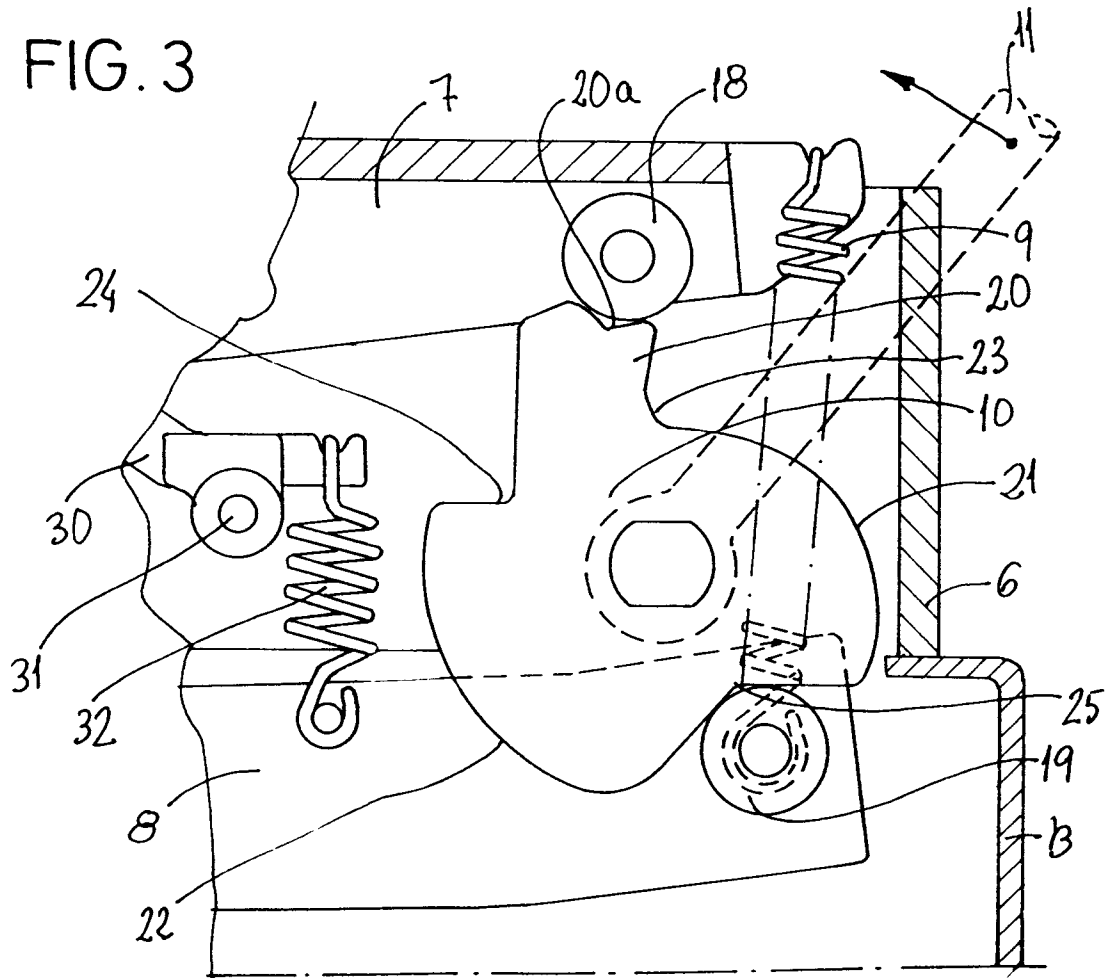


FIG. 4

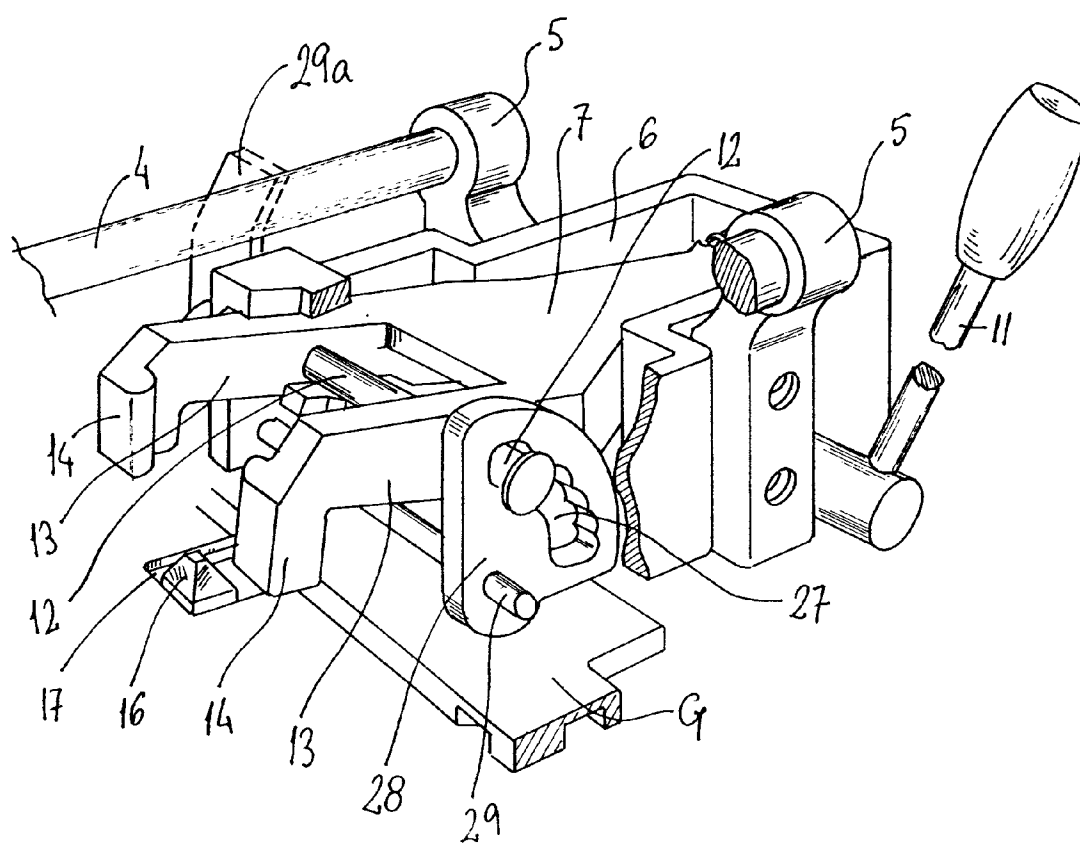


FIG. 5

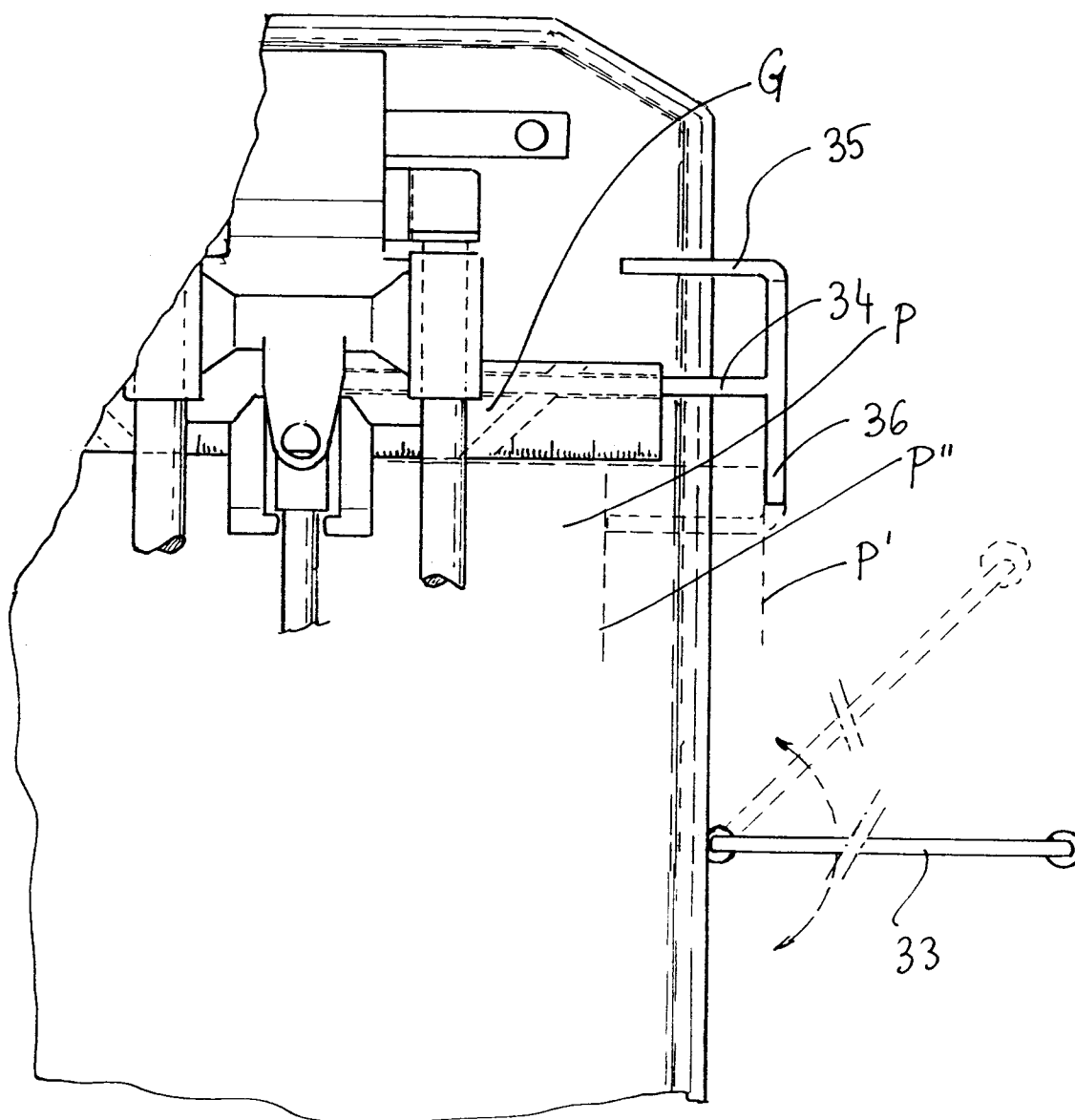


FIG. 6

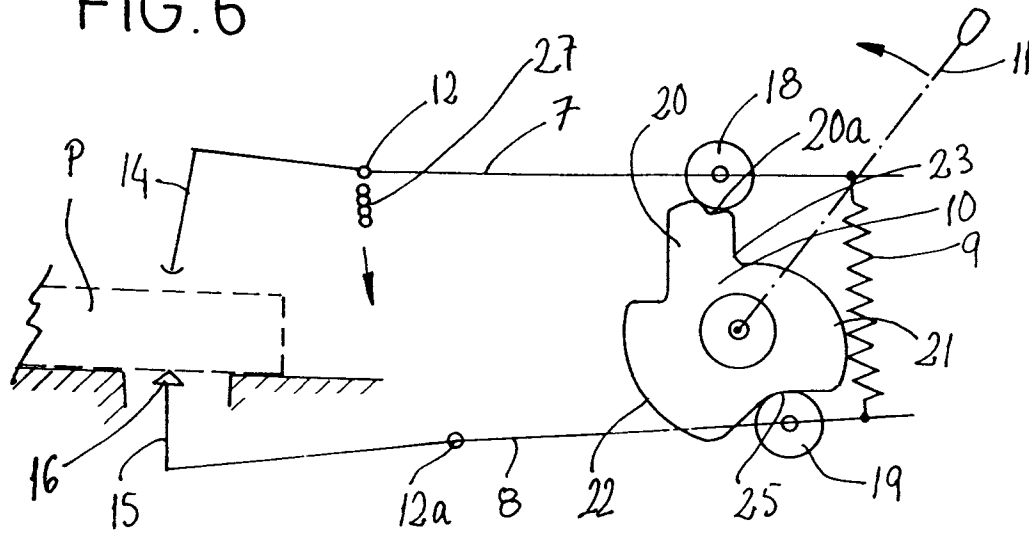


FIG. 7

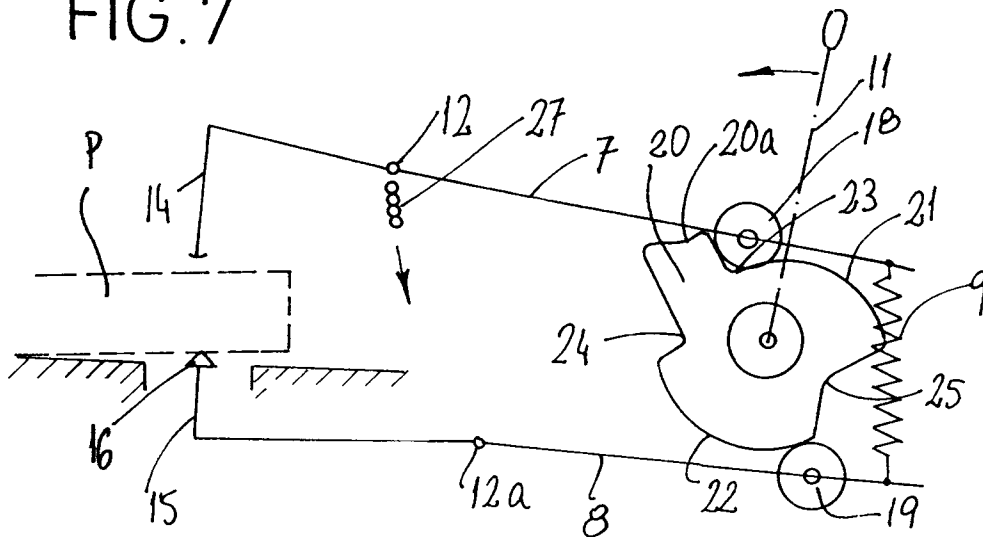
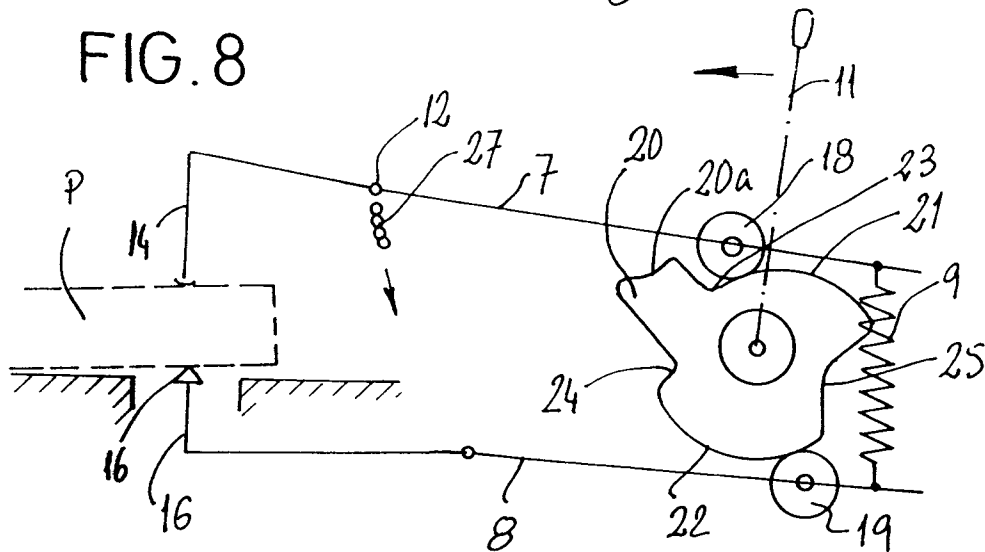


FIG. 8





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 50 0145

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	JP-A-57 170 706 (...) * figures 1-3 *	1,2	B28D1/22
A	---	3	
A	FR-A-2 169 681 (HERMANOS BOADA S.A.) * page 2, line 6 - line 24; figures 1-5 *	1-3	
A	FR-A-1 405 604 (P. DESVOIGNES) * page 1, left column, line 32 - right column, line 30; figures 1-3 *	2-5	
A	GB-A-861 670 (E. KREBS) * page 2, left column, line 7 - line 26 * * figures 1-3 *	1,4,5	
A	EP-A-0 283 597 (B.J. WALLIS) * column 4, line 31 - column 5, line 4 * * figures 9,10 *	3,5	
A	DE-C-892 125 (W. HARRER) * page 2, right column, line 65 - line 82 * * figure 2 *	6	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B28D B26F C03B B25B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 23 MARCH 1992	Examiner LILIMPAKIS E.
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