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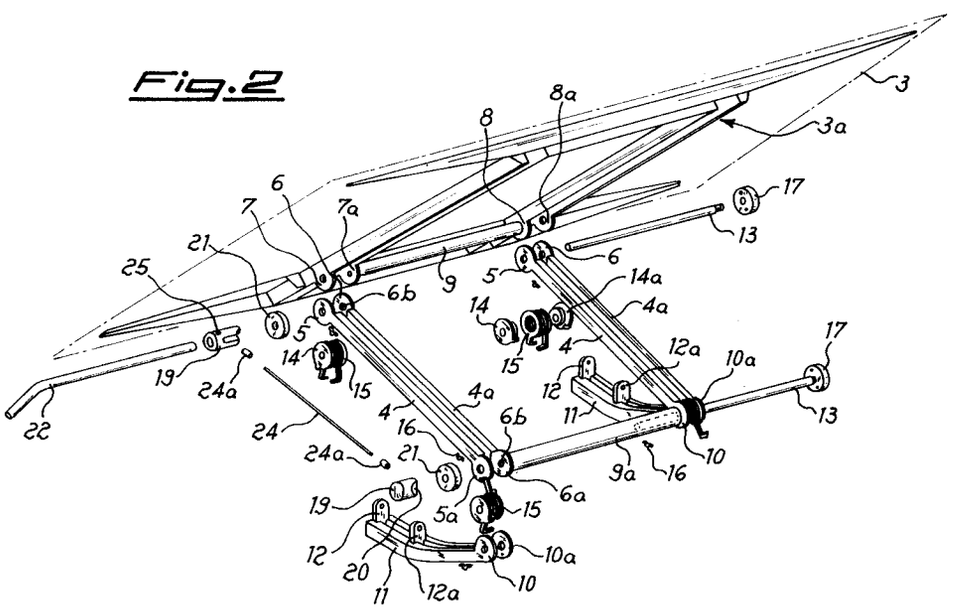
(54) Device for adjusting and blocking the slope of the work-plane of drawing boards and the like.

(57) Device for adjusting and blocking the slope of the work-plane of boards or tables, especially of drawing boards, of the type comprising a horizontal fixed bar supported by splayed legs or the like, and a work-plane pivotal relative to said bar, comprising at least one pair of connecting rods between the work-plane and said fixed support bar, each of said connecting rods having one end articulated to said fixed bar and the opposite end articulated to a support frame for the work-plane, elastic counterbalancing means being moreover associated with each of said hinges, these counterbalancing means being of the radial action type helically wound around the axis of rotation of said hinges, and also axially acting pressure means for the frictional blocking of each of said hinges.

Fig.2



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This invention relates to a manually operated device for adjusting and blocking, at various heights from the ground and at various inclinations, the work-plane of drawing boards and the like.

As is known, said drawing boards require that the work-plane can be raised and lowered relative to the floor and can be inclined relative to the horizontal plane, to enable it to be adapted to the requirements of the user and to his or her height, whether the work is performed by the user sitting or standing.

Generally speaking, drawing boards are constituted of a four-sided, solid board connected to a horizontal beam or bar, supported by four legs, by means of various types of articulated mechanisms which allow the work-plane to be raised relative to the fixed support beam and to be tilted relative to the horizontal plane.

These articulated mechanisms are constituted, in some cases, of two articulated parallelograms, parallel to each other and arranged vertically with respect to the support beam; one side or one corner of the parallelograms is anchored to the beam and the diagonally opposite corner is hinged to the frame which supports the work-plane.

By opening or closing the parallelograms, acting on the work-plane, raising and lowering respectively of the work-plane are obtained as well as, simultaneously, variations in the slope of said plane.

In other cases, the work-plane is supported by two rod-shaped elements, parallel and inclined to the vertical, which have one end articulated to the support beam and the opposite end articulated to the frame which supports the work-plane; in this case the frame (which carries the plane) and the support rods can be straddled apart or brought together like a pair of compasses, thus making possible the necessary variations in slope and in height position of the work-plane.

In all the forms of construction, the articulated systems referred to above are associated, for keeping the work-plane stable, with blocking means which can be operated by hand, and which are generally constituted of a lever which acts on a tightening nut acting on an analogous element which blocks one or more of the hinges of the articulated system.

Said articulated systems, moreover, are associated with counterweights for counterbalancing the weight of the work-plane, when the articulated system is unblocked, so as to facilitate the operations of tilting and/or raising, in this way preventing the plane from returning under its own weight to its lowest position.

Present-day counterbalancing systems provide for the use of a mass situated at the end of support rods, connected at their other end to the rods of the articulated system; in this way the weight of the work-plane is counterbalanced and therefore it remains in position, even after loosening of the blocking means.

In practice, nevertheless, the counterbalancing means composed of masses cantilevered by the rods of the articulated systems result in considerable bulk and undesirable increase in weight; furthermore, said masses result in a not very pleasing appearance of the drawing board complex.

The principal objective of the present invention is, therefore, that of creating a device for adjusting and blocking the slope and position in height of the work-plane of drawing boards and similar structures, in such a manner as to simplify and improve both the known articulated systems which support the plane and also the counterbalancing and blocking means for the plane at the various inclinations, with the advantage of imparting to the whole high practicality in use, reduced overall bulk and also a pleasing aesthetic effect.

Another objective of the invention is that of creating a device of the above-specified type which shall be highly reliable, structurally simple and of reduced weight.

These and yet other objectives, which will become more apparent from the following description, are achieved by a device for adjusting and blocking the slope of the work-plane of drawing boards and the like, of the type comprising a horizontal bar supported by splayed legs and a work-plane connected, in a manner permitting orientation, to said support bar by means of pivoting rods, which device is constituted, according to the present invention, of at least one pair of rods for connecting the work-plane to said fixed support bar, each of said connecting rods having one end hinged to said fixed bar and the opposite end hinged to a support frame for the work-plane, there being also associated, with each of said hinges, elastic counterbalancing means of the radial action type wound in a cylindrical spiral on the axis of rotation of said hinges, and also axially acting pressure means for frictional blocking of each of said hinges.

More especially, said elastic counterbalancing means are constituted, according to a first form of embodiment, of at least one spiral spring acting in bending, wound on a cylindrical support coaxial with the axis of each hinge and having its ends attached, respectively, to a rod and to an arm converging on said hinge; according to another form of actuation, said elastic counterbalancing means are constituted of at least one spiral spring acting in torsion, connected to each of the arms converging on each hinge.

Furthermore, said axial pressure means for blocking each hinge are constituted of at least one cam-shaped element or the like, capable of being

actuated by a manually operated lever, and associated in a manner permitting orientation with the end of a rotary shaft common to each pair of hinges in mutual axial alignment, said shaft being provided, at the opposite end, with a contrast element in bearing against the outer face of the hinge axially opposite to that in engagement with said cam element, in such a way as to make possible, by displacement in one direction of said cam element against one hinge, simultaneous frictional blocking of both said hinges, and the simultaneous unblocking of said hinges by displacement of said cam element in the opposite direction to the former.

Other characteristics and advantages of the present invention will become more clearly apparent from the following detailed description of a preferred, but not exclusive, practical form of embodiment thereof, which description is prepared with reference to the attached drawings, given solely by way of indication, in which:

Fig. 1 shows, in perspective view, a board having a plane which can be inclined and raised, incorporating an adjustment and blocking device for the work-plane constructed according to this invention;

Fig. 2 shows, in exploded view, all the constructional elements which make up the device forming the subject of this invention;

Fig. 3 shows, to a larger scale and in axial section, the blocking-unblocking constructional elements of the hinges for adjusting the height of the work-plane, assembled together;

Fig. 3a shows an analogous section to that of Fig. 3, but relating to the blocking-unblocking of the adjustment of slope of the work-plane;

Fig. 4 shows, in exploded view, a first constructional variant of the device of Fig. 2, while

Fig. 5 shows, also in exploded view, a further variant of the same device as the preceding figures, with pedal operation of the blocking device.

With reference to said figures, and especially to Figures 1 to 3, the device forming the subject of the invention is so constructed that it may fitted to a board or table, for example drawing board, of the type comprising a horizontal tubular bar 1, supported in known manner by four diverging legs 2, and a work-plane 3 associated with a supporting frame 3a; the plane 3 is anchored in a manner permitting tilting and raising/lowering to the fixed bar 1 by means of a pair of rod-shaped elements 4, parallel to each other and hinged in various ways both to the frame 3 and to the fixed bar 1.

A device for adjusting and blocking the slope of the work-plane 3 of a drawing board of the above-specified type is constituted, according to this invention, of two rods, shaped in such a way as to constitute two pairs of connecting rods 4 - 4a (Fig. 2) parallel to each other, each of which has, at its opposite ends, a disc-shaped widening or flange; said flanges are referenced 5 - 5a for the rod 4, and 6 - 6a for the contiguous rod 4a. Each pair of rods 4 - 4a, shaped in this manner, constitutes a connecting arm between the work-plane 3 and the fixed bar 1 (the bar is not shown in Figures 2 to 5), while the pairs of facing disc-shaped flanges or widenings 5 - 6 and 5a - 6a, respectively, provided with a central hole 6b, constitute the hinge elements, as will become more apparent below.

The disc-shaped flanges 5 and 6 are intended to be connected coaxially in rotation with analogous widenings or flanges 7 - 7a and 8 - 8a, also having axial holes, projecting integrally from the base of the frame 4 which carries the work-plane 3.

The two internal flanges 7a - 8 are, furthermore, rigidly connected together by a tubular spacer piece 9, rigid with them and with the frame 4, the bore of this tubular spacer piece being coaxial with the holes of the widenings or flanges.

The coupling between the flanges 6 - 6b and 5 - 6 integral with the rods 4 - 4a, on the one hand, and the flanges 7 - 7a and 8 - 8a integral with the frame 4, on the other hand, is realized as shown in Figure 3a in such a manner that the flanges 7 - 7a and 8a are outside the flanges 6b - 6 and 5 - 6, in this way making possible the adjustment of the tubular spacer piece 9 in a position coaxial with the holes 6b of the flanges.

As Figures 2 and 3 show, the disc-shaped widenings or flanges 5a and 6a, present at the other end of the rods 4 - 4a, are instead arranged to be coupled in rotation and coaxially in offset manner with analogous flanges or widenings 10-10a, situated at the end of the two support elements 11, which are intended to be rigidly attached to the fixed bar 1 by screw connections of two small plates 12 -12a, projecting from each support element 11 (Figure 1).

The two innermost widenings or flanges 10a and 10 are, furthermore, rigidly connected to each other by a further tubular element 9a, equivalent to that which connects together the flanges 7a - 8; in this manner, the rods 4a and 4 (facing each other) and the two tubular elements 9 and 9a constitute, once they have been joined together, a rigid quadrilateral, in which the holes of the end disc-shaped widenings or flanges are axially aligned with one another, in this way making possible the introduction of a single rotation shaft 13; this, passing through the holes in the various flanges of the two rods 4 and 4a, and the holes in the other flanges integral with the frame 4, create two pairs of coaxial hinges, about which the plane 3 can rotate; at the opposite end of the rods 4 - 4a, an analogous shaft

13 constitutes, together with the disc-shaped flanges of the supports 11 and those at the ends of said rods 4 - 4a, a further pair of coaxial hinges, about which the rods 4 - 4a can rotate relative to the fixed bar 1.

As shown in Figures 3 and 3a, which illustrate the pairs of axially aligned hinges used for the rotation of the work-plane and for the connecting rods which pivot relative to the fixed bar 1, between the facing disc-shaped flanges of each pair of rods there is inserted a spacer cylinder, constructed in two coaxial parts 14 and 14a, shaped substantially as two opposed half-spools, the function of which is to keep spaced apart the disc-shaped flanges and to constitute a cylindrical support for a cylindrical helical spring 15.

Each helical spring 15 has one end attached to the frame and the other end attached to a rod, for example the rod 4, in the case of the two springs inserted into the hinges connected to the work-plane, whereas in the case of the hinges attached to the fixed bar by means of the support 11, the two ends of each spring are connected, respectively, to the pivoting rod and to the support 11.

Said ends of the springs are anchored by means of conventional plates 16 and associated fixing screws. The individual springs are fitted preloaded in such a way as to keep the work-plane and the slope of the connecting rods in a stable, non-blocked position, that is to say with the hinges free to rotate, the angular position of the rods, whatever may be the slope of the work-plane; in other words, the springs fulfil the function of counterbalances for the work-plane and associated connecting rods and at the same time make it possible to perform the necessary variations in the angle of inclination of the work-plane and in that of the rods, simply by acting upon the work-plane itself.

For the stable blocking of the work-plane at the various angles of inclination and heights from the floor, the present invention provides a blocking device for the hinges by means of a compressive action exerted axially on all the hinges.

Said device acts on the ends of each of the shafts 13 forming the axes of rotation of the flanges and for this purpose provides, at one end of each shaft 13, a contrast means, basically a disc 17 equipped with a female screw 17a adapted for engaging on a corresponding outer thread 13a of the shaft 13, a contrast means, substantially a shaft 13 continuing into contact with the outermost flange 6 (Figure 3), and blocked in this position by two headless screws 17b, which prevent undesired rotation thereof by friction.

At the opposite end of each shaft 13 there is coaxially anchored, rotatable about a pin 18 or analogous element, a hollow cylinder 19, the end of which facing towards the adjacent hinge is provided with a flat chamfer 20 (clearly shown in Figures 2, 4 and 5), oblique with respect of the axis of the cylinder 19. Said chamfer constitutes in practice a cam element acting axially on a washer 21, coaxially bearing against the outermost flange 5 of the connecting rod 5.

The distance between the axis of rotation of the pin 18 and the washer 21 is of such a value that when the cylinder 19 has its own axis aligned with the axis of the shafts 13, the end of the cylinder shall be pressed against the washer 21 and, in this position, the shafts shall be slightly displaced towards the left in Figure 3; this displacement causes, through the contrast disc 17, blocking by friction of the various pairs of disc-shaped widenings or flanges of both the axially aligned hinges, which blocking is made possible by the presence of the elements opposing the tension of the shafts, that is to say of the spacer tubes 9 and of the spacer cylinders 14, 14a.

For bringing the pairs of aligned hinges from the blocking position to the unblocked position (for the purpose of allowing variations in the slope of the plane 3 and of the connecting rods), the cylinder 19 of each shaft 13 is pivoted laterally through approximately 45° from its initial position, causing it to rotate about its hinge axis 18. This movement brings the plane of the chamfer 20 into contact with the outer face of the washer 21, with the result that the axial compressive action of the various flanges of the hinges is cancelled out; the hinges, therefore, become unblocked to allow the desired changes in inclination.

The operation for performing blocking and unblocking of the hinges is performed by means of a manually operated lever 22, inserted into the free end of each hollow cylinder 19. To make the blocking operation (and therefore the unblocking operation also) simultaneous for all the hinges, there is provided, according to the present invention, a transmission device, which eliminates the need for providing a manual operating lever for each hinge. Said device is basically composed of a transmission rod 24, provided at the opposite ends with a cylinder 24a (Figure 2), rotationally seated in a cylinder 19 by means of a pin 25, parallel to the pin 18 about which the cylinder is rotatable. In this case, a single lever 23, inserted in one of the cylinders having a chamfered head 19, for example that which commands blocking of the pair of hinges integral with the work-plane, causes the simultaneous lateral deflection also of the cylinder of the pair of hinges integral with the supports 11, associated with the bar 1.

Furthermore, the simultaneous operating of the cam cylinders 19 can be actuated, still according to this invention, by a lever 23 (Figure 5), shaped as a pedal, which is rotatably guided in a plate or the

like 26, fixed to the fixed bar 1 and having its upper end firmly inserted axially into the cylinder 19, which controls blocking of the pair of hinges fixed to the fixed bar, while its other end is bent to a "L" (or an eye), in such a way that it can be displaced in both directions, indicated by arrow A in Figure 5, by means of a foot.

Finally, the counterbalancing springs 15, wound on a cylinder in two coaxially facing parts, which act in bending, can be constructed instead as a helical spiral, as indicated at 15a in Figure 4, wound on a single-piece spool 14b and connected at their other ends to the connecting rods and to the fixed supports 11, as in the case of the springs 15. In this case, the springs 15a act in torsion.

From what has been explained above and that which is illustrated in the figures, the constructional simplicity and reduced overall size of the device for adjusting and blocking the slope of the working table will be apparent, as compared with the counterweight devices in the presently known drawing boards.

Evidently, the invention as described in accordance with some of its preferred forms of embodiment, can be the subject in practice of further constructional and operating variants of equivalent nature, without thereby departing from the scope of protection of this invention.

Claims

1. Device for adjusting and blocking the slope of the work-plane of drawing boards and the like, of the type comprising a horizontal bar supported by diverging legs and a work-plane which can be orientated and is connected to said fixed bar by pivoting rods, characterized by the fact that it is composed of at least one pair of connecting rods (4 - 4a) for connecting the work-plane (3) to said fixed support bar (1), each of said connecting rods (4 - 4a) having one end hinged to said fixed bar and the other end hinged to a support frame (3a) for the work-plane (3), there being, furthermore, associated with each of said hinges, elastic counterbalancing means (15 - 15a) for the frame and for the work-plane, as well as axially acting pressure means (19, 17) for the frictional blocking of each of said hinges.

2. Device according to Claim 1, characterized by the fact that said elastic counterbalancing means are constituted of at least one cylindrical spiral spring (15) acting in bending, wound coaxially on a cylindrical support (14, 14a) coaxial with the rotation shaft (9, 9a) of each hinge and having its ends connected to one connecting rod and to an arm converging on said hinge.

3. Device according to Claim 1, characterized by the fact that said elastic counterbalancing means are constituted of at least one helical spring (15a), acting in torsion, with its opposite ends connected to a rod and to an arm converging on said hinge.

4. Device according to Claim 1, characterized by the fact that each connecting rod is basically constructed to form two rod-shaped elements (4, 4a) having, at their opposite ends, disc-shaped widenings or flanges (5, 6, 8a, 6a), having central holes (6b), capable of being coupled, on the same rotation shaft, with analogous flanges (7a, 8, 10, 10a) having holes, and projecting respectively from the frame (3a) of the work-plane (3) and from said fixed support bar (1), in such a manner as to form pairs of hinges axially aligned on the same shaft, there being interposed between the flanges forming each hinge, when the various components have been assembled, a hollow cylindrical element (9) having the function of a spacer and stiffening piece.

5. Device according to Claims 1 to 4, characterized by the fact that, between the disc-shaped widenings or flanges (7a, 8, 10, 10a), especially facing one another, of two axially aligned hinges, there is incorporated a tubular element (13), coaxial with the common rotation shaft (13), having the function of stiffening and opposing said axial pressure means provided for the blocking of each hinge aligned on the same axis.

6. Device according to Claims 1 to 5, characterized by the fact that said axial pressure means are constituted of a cylindrical element (19), having one end chamfered at approximately 45°, or shaped as a cam, associated in a manner permitting orientation with the end of each rotation shaft (13) of the mutually aligned hinges, said shafts (13) being provided, at the opposite end, with a contrast element (17) in contact with the outer face of the outermost flange of the hinge remote from that which is in engagement with said chamfered cylinder, in such a way as to make possible, by displacement of said chamfered element, the simultaneous blocking and, respectively, unblocking, of each hinge aligned on the same shaft.

7. Device according to the preceding Claims, characterized by the fact that said connecting rods (4, 4a) are hinged to the fixed support bar by arms firmly attached to the bar and carrying, at the free end, said disc-shaped widenings or flanges capable of being coupled with the corresponding flanges of the individual rods.

8. Device according to one or more of the preceding Claims, characterized by the fact that the cylinders (19) having a chamfered end, provided at the end of the two rotation shafts (13), are connected together by a tie-bar or transmission rod (24) in such a way that they can be actuated simultaneously, and therefore perform the blocking and unblocking of the mutually aligned hinges simultaneously, by means of a single operating lever.

9. Device according to the preceding Claims, characterized by the fact that said actuating element for the cylinders (19) having a chamfer is a lever (28), which can be operated by hand.

10. Device according to the preceding Claims, characterized by the fact that said element is a shaped lever (23), capable of being operated by foot, which transmits the movement by means of transmission devices (26).

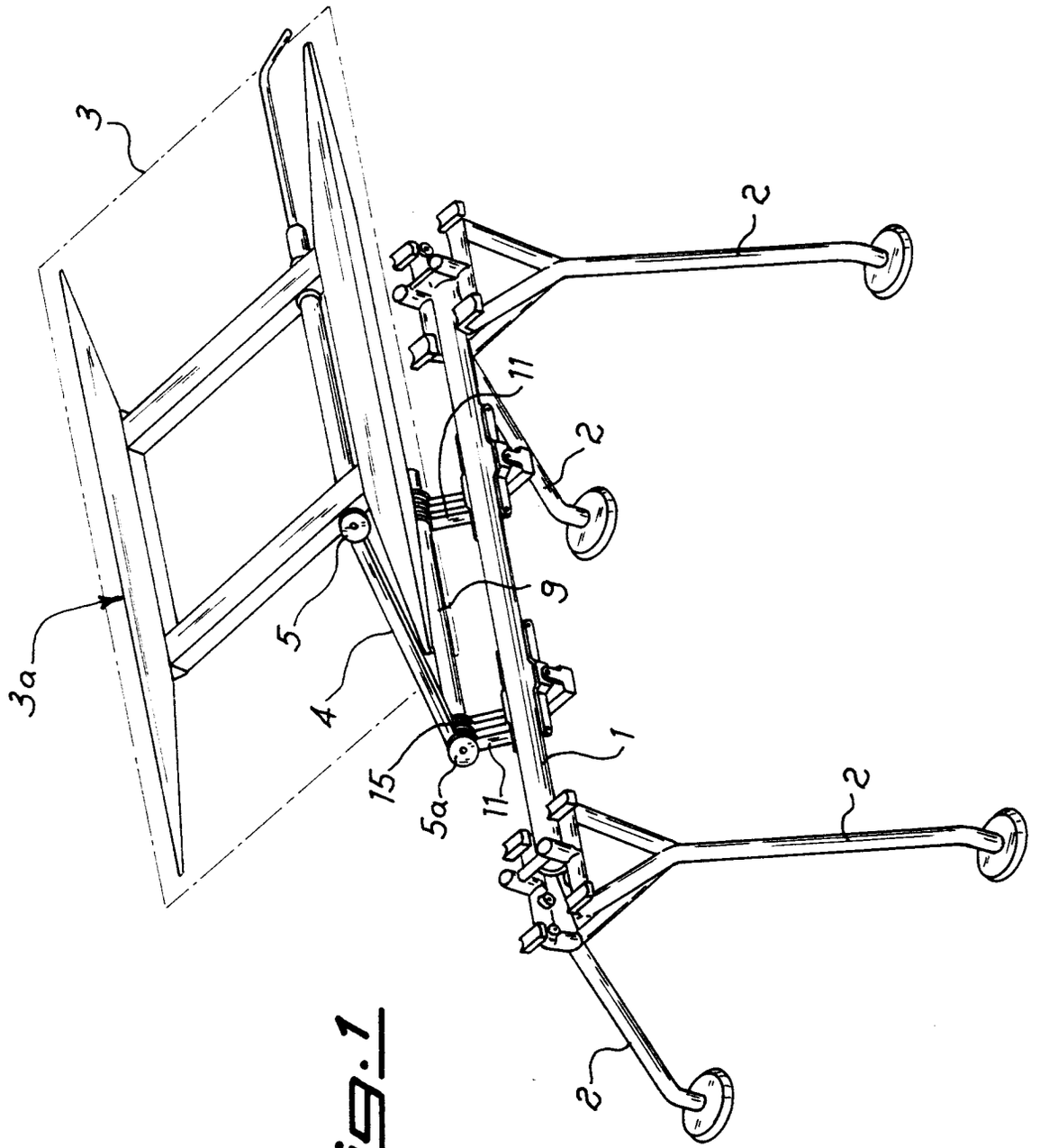
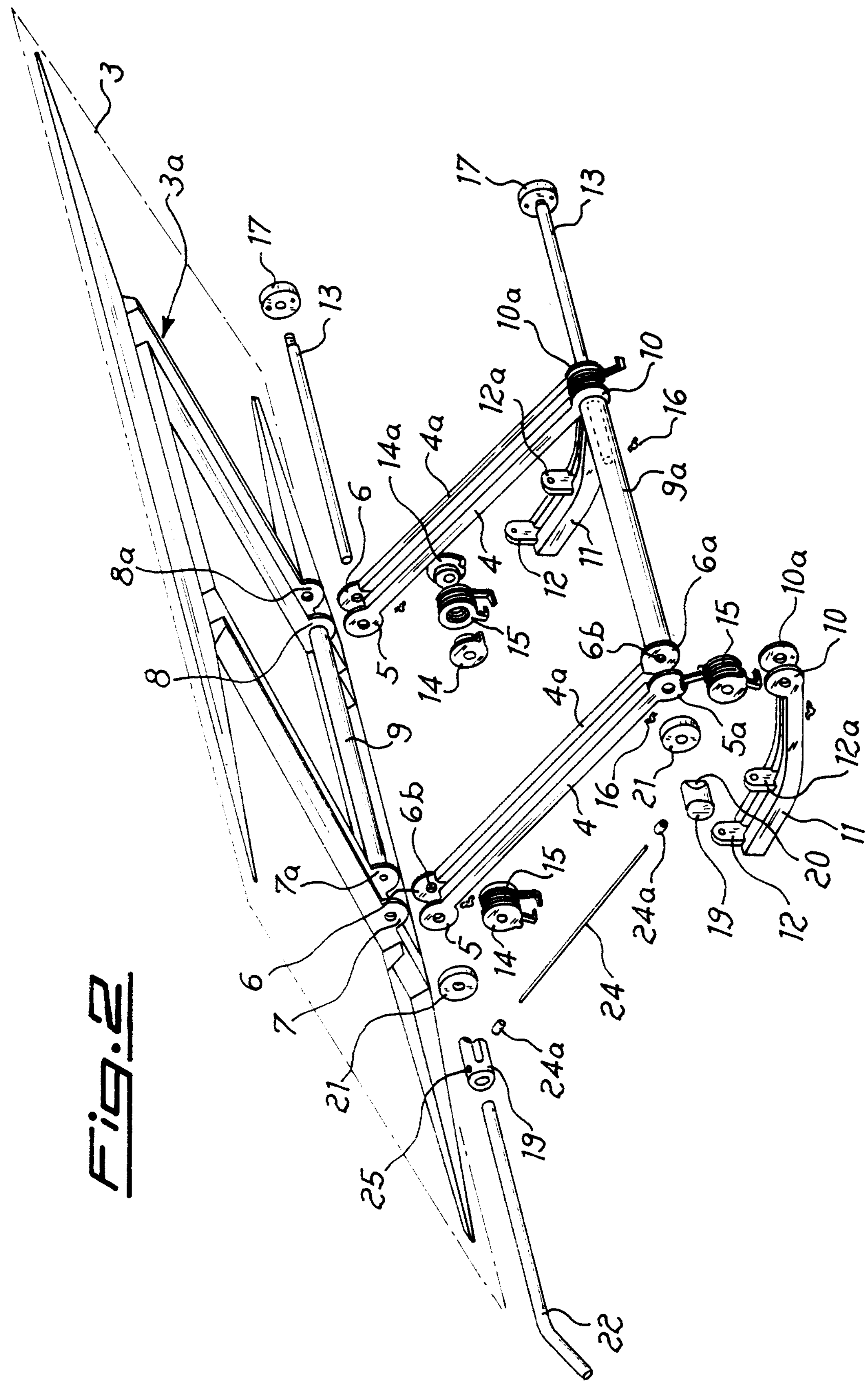


Fig.1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6b
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4a
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12a
7a
6b
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Fig.2

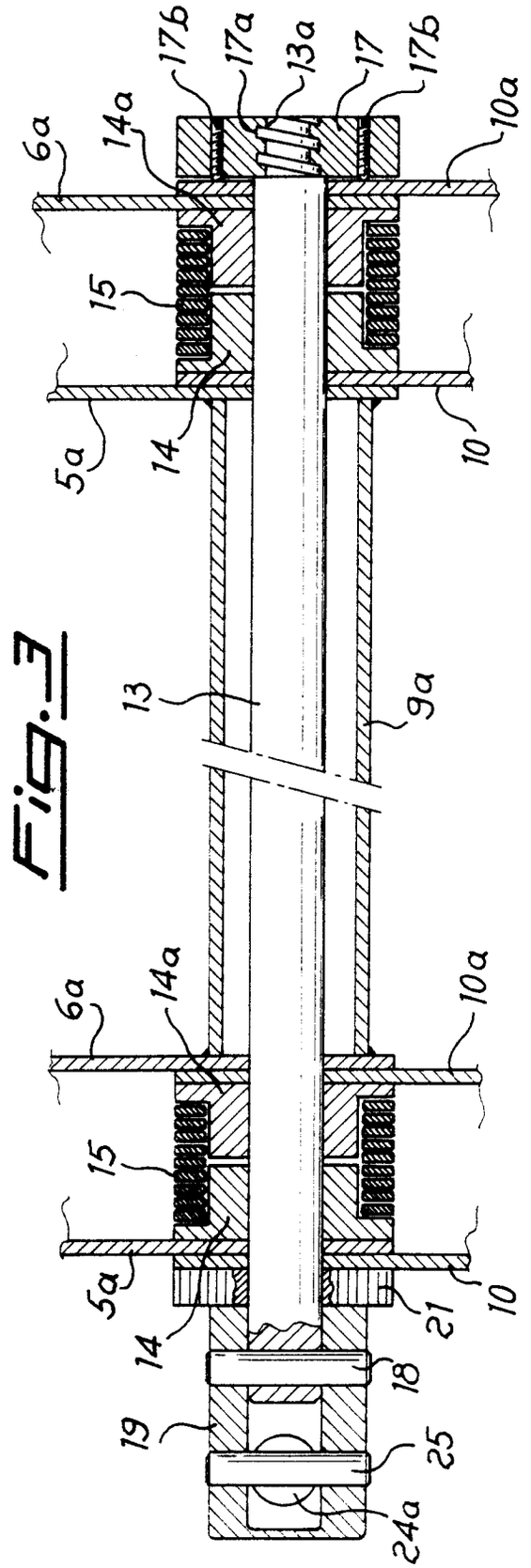
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Fig.3

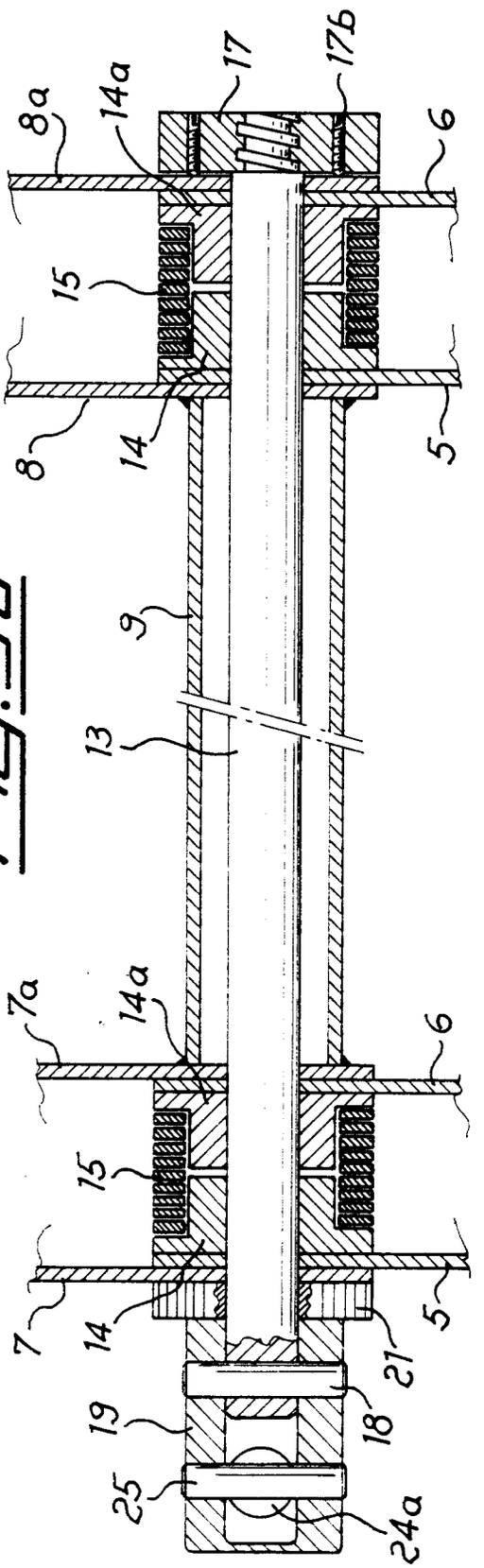
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Fig.3a

Fig.4

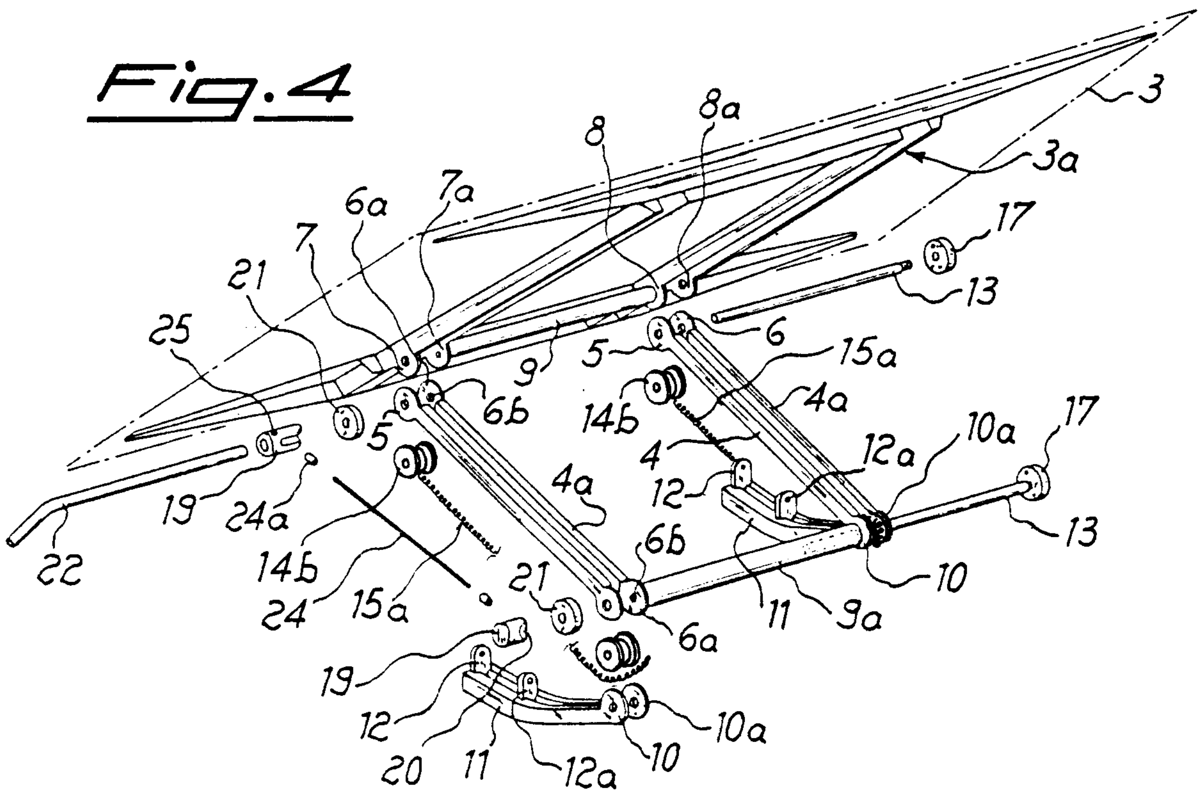
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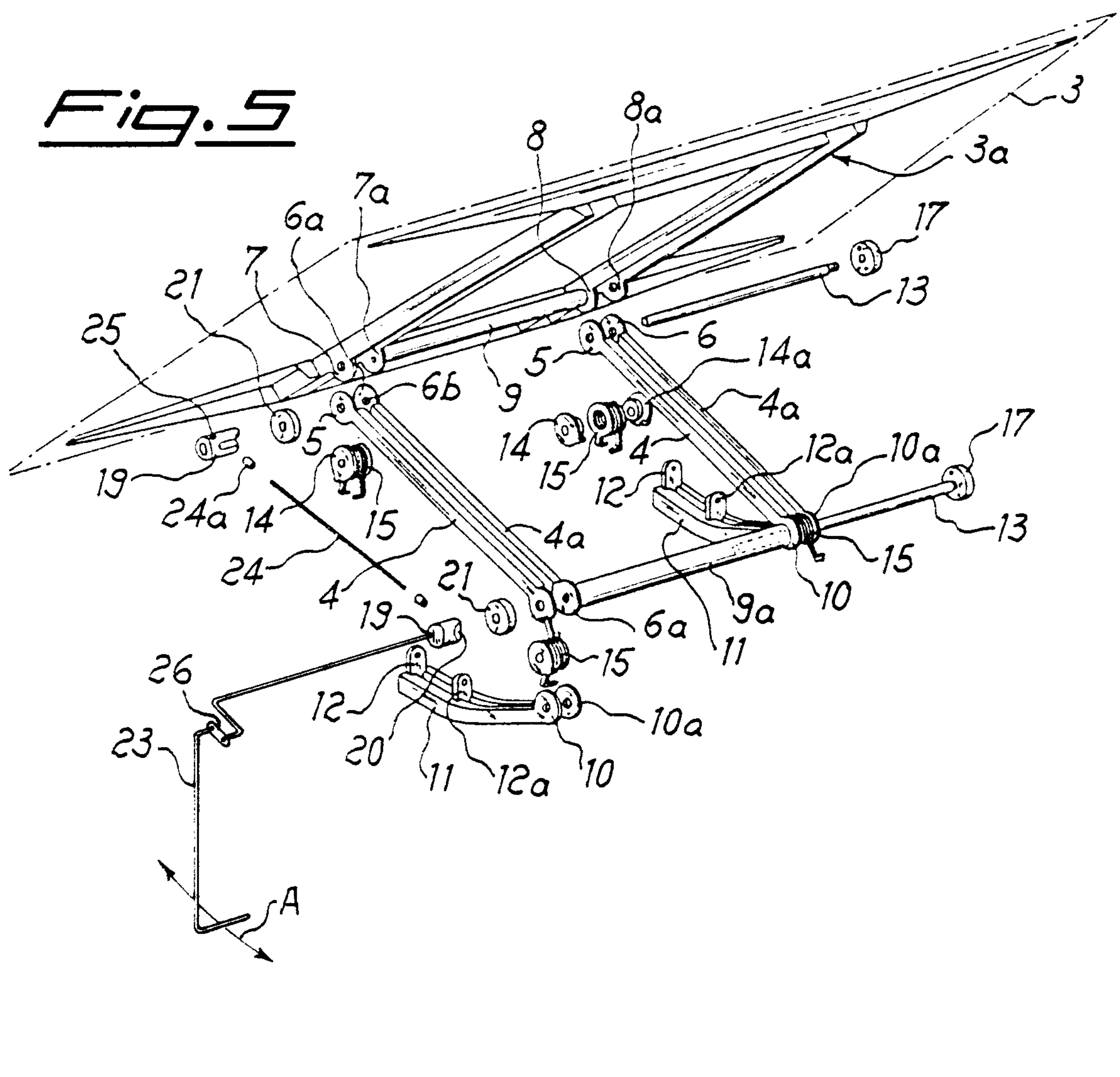
Fig.5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EUROPEAN SEARCH REPORT

Application Number

EP 91 20 2407

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	FR-A-2 524 278 (MARABUWERKE ERWIN MARTZ GMBH & CO.)	1,2	A 47 B 27/06 A 47 B 27/18
Y	(* page 5, line 12 - page 6, line 15; figures 1,2,5 *)	3	
A		4,5,6	
Y	GB-A-1 416 968 (COWLEY) * page 2, line 71 - line 85; figures 1,2,6 * *	3	
A	GB-A-609 230 (CLARKE) * claims 1,2; figure 3 * *	4,6,7	
A	FR-A-2 409 666 (ROSSETTI) * page 4; figures 4,5,6 * *	5,6,8,9	
A	US-A-4 726 556		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A 47 B

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	15 January 92	JONES C.T.

CATEGORY OF CITED DOCUMENTS

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