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(54) ELASTIC ELEMENT FOR BRAKES OF GUIDED SYSTEMS

ELASTISCHES ELEMENT FÜR BREMSE VON GEFÜHRTEN SYSTEMEN

ELEMENT ELASTIQUE POUR FREINS DE SYSTEMES GUIDES

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US-A- 5 224 570

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Description

OBJECT OF THE INVENTION

[0001] The following invention, as stated in the title of this descriptive report, refers to a device of an elastic element for braking systems, which has been conceived and developed in order to obtain numerous and noteworthy advantages over other existing systems for similar purposes.

[0002] The invention is applicable to progressive brakes for transport systems using guide rails such as linear travelling systems, mining machinery, and especially in elevating or vertical transport systems.

[0003] The device is prepared to achieve a two-way braking system by means of a single elastic element, without the necessity of intermediate elements between it and the wedging element.

[0004] The device is based on a component, that gives the system the necessary rigidity in this type of devices, and at the same time serves as a guide to the wedging element.

BACKGROUND HISTORY OF THE INVENTION

[0005] Numerous devices are known which serve as elastic elements for guided system brakes, in particular, the ones used in brakes for elevation systems (lifts), designated according to European directives as progressive safety gear. The purpose of these devices is to stop the car and/or counterweight of a lift installation, in case that a certain speed is surpassed, maintaining acceleration in the brake process within certain margins.

[0006] Safety braking devices are already known for example from WO-A-9 731 852 or US-A-4 538 706.

[0007] The traditional lift brake systems basically consist of: a base or structure (2), that is fixed to the element to stop (car) and onto which the rest of the elements that make the brake are located; a brake shoe (3) that causes the braking force by friction with the guide rail (1) of the installation; a wedging element (5) which can be a roller or brake shoe that self-wedges against the guide rail after coming into contact with it as a consequence that the whole system moves together with the car, and the guide rail remains fixed; an elastic element (4) or spring intended to cause a normal force between the guide rail and the shoe brake as well as a certain deflection of the elastic element itself.

[0008] To guarantee that the braking force is kept within certain margins, once the nominal braking position is reached, the travel of the wedging element is limited by means of a stop (6) that is part of the structure of the brake, thereby guaranteeing, that the deflection and pressure of the elastic element are within the correct default or nominal values.

[0009] In this regard, we can cite devices in which the elastic element is based on superimposed flat plates or on single pieces with a determined shape. In both cases the elastic element is placed in a hole or cavity in the structure of the brake. The pressure that the elastic element withstands is transmitted to the structure of the brake, by means of two fixed supports in the structure of the brake, the elastic element behaving as a structure with two supports at both ends and supporting the pressure of the wedging element, which moves along the central part of the elastic element.

[0010] The drawback that these systems have is that they are only capable of braking in one direction.

[0011] Other types of elastic elements are obtained based on "beneville" type spring washers assembled in series, achieving the necessary rigidity. These washers act as traditional springs but they are much shorter, in the order of millimetres.

[0012] Regarding other systems capable of stopping in both directions, systems are known that use two elastic elements similar to the ones used in the one-way braking system but placed reversed, or one single elastic element with supplementary stress transmitting parts (7) between the wedging element and the elastic element. Another type of devices use a cam as a wedging element, permitting its utilisation in both directions with a single elastic element, albeit requiring a configuration different to the one considered, for the elastic element is placed on the side of the guide rail opposite the wedging element. There are also known systems that use two wedging systems together, in such way that each one of them acts in one direction. This type of system also needs intermediate parts between the wedging system and the elastic element.

[0013] The regulation of the braking capacity implies a change of the rigidity of the elastic element and is carried out in traditional systems in different ways, among them: changing the length between the supports by means of auxiliary parts (8) of interchangeable position, varying the thickness of the elastic element, substitution of the elastic element for another with similar shape, and varying any of it's dimensions as derived from a parametric formula. The biggest drawback of all of these systems is the need for interchangeable intermediate parts that serve as a union of the elastic element and the brake structure, or the use of different structures for each braking capacity.

[0014] The stop that limits the travel of the wedging element is a part of the base or brake structure in know systems.

DESCRIPTION OF THE INVETION

[0015] The invention device presents a new design, based on which it allows the brake to be applied in both directions with one single elastic element and without the need for intermediate parts between it and the wedging element, be it a roller, a shoe brake, or other. All of this is accomplished with the utmost simplicity with an easy to build system. For this, the elastic element is based on a long part with two opposite inclined ramps

that are used to guide the wedging element in both directions of operation. This elastic element can be made up of a single part or, to simplify production, by superimposing different parts of lesser thickness.

[0016] The elastic element is characterised for having a joint in the centre that allows it to pivot and serves as a fixing for the elastic element onto the brake structure, and for the different behaviour of its ends depending on the direction of operation: in a given direction, one of them behaves as a support while upon the other the wedging element exerts the corresponding pressure. When the wedging is produced in the opposite direction, the end that before acted as a support, in this case, would receive the pressure from the wedging element, while the end that was receiving the pressure before, in this case would behave as a support.

[0017] The joint can be accomplished in different ways, either by an axle, or any other type of support that permits the elastic element to pivot.

[0018] The fixing onto the brake structure can be equally accomplished in different ways, either directly upon the brake structure or base, or by means of intermediate parts that act as bolts or a stop. The support can be made on both sides of the support line of the wedging system upon the elastic element.

[0019] The braking force is produced as a consequence of the friction between the guide rail of the system and the brake shoes being part of the braking structure.

[0020] This system permits the possibility of having a larger braking force by being able to use a second friction zone different to the one obtained from the wedging element and its corresponding brake shoe. This is accomplished as a consequence of the pivot of the elastic element around its joint and the nearing of the end of the elastic element that acts as a support to the guide rail, the end behaving as a support and braking zone simultaneously. The support of the elastic element can rest on the guide rail directly, or through intermediate parts that transmit its effort to the guide rail. The other side of the guide rail rubs against a brake shoe. This fact allows having up to two friction zones more than conventional systems used up to now.

[0021] Regarding the regulation in the braking capacity, although other well known systems are applicable, the elastic element described in the present report enables it without the need for additional parts and without varying the general structure of the brake support, as it can be carried out by making slots or orifices of different dimensions upon one single elastic element with fixed exterior dimensions.

[0022] A stop for the travel limits of the wedging system may be implemented the same way as in any of the other known systems, however an innovative system can be applied in which the elastic element itself can act as a stop to limit the travel of the wedging element. This is accomplished by giving the ends of the elastic element a shape that can house the wedging element, this is especially applicable in case that the wedging system uses a roller.

[0023] Although the device of the present invention is designed for allowing two-way actuation, of course, it may also be used by systems in which operation in only one direction is necessary. For these systems, and in order to reduce dimensions and to have a more compact disposition, it is possible to obtain a configuration that has these features applying the essence of the invention. The disposition of the elastic element for these systems relies on giving the elastic element a "V" shape, being one of its sides the ramp on which the wedging element travels, as the second ramp is not necessary. The joint is placed in its central part as well, and one end acts as support while the other end works as a stop for the system and is acted upon by the wedging element.

[0024] To complete the description that follows and in order to have a better understanding of the invention's features, attached to this descriptive report are sketches with drawings that will help understand more easily the innovations and advantages of the object device of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025]

Figure 1.- Shows a general diagram of a simple actuation safety gear in the normal position.

Figure 2.- Shows a general diagram of a simple actuation safety gear in stopped position.

Figure 3.- Shows a general diagram of a two-way actuation safety gear with intermediate parts.

Figure 4.- Shows a system for regulating the braking capacity by placing auxiliary parts in the supports, between the elastic element and the brake structure.

Figure 5.- Shows a first preferred disposition of the elastic element object of the invention.

Figure 6.- Shows a second preferred disposition of the elastic element object of the invention.

Figure 7.- Shows a third preferred disposition of the elastic element object of the invention.

Figure 8.- Shows a fourth preferred disposition of the elastic element object of the invention.

Figure 9.- Shows the first preferred disposition of the elastic element device in a brake for two-way guided systems in normal operation and wedging position.

Figure 10.- Shows the second preferred disposition of the elastic element device in a brake for two-way guided systems in normal operation and wedging position.

Figure 11.- Shows the third preferred disposition of the elastic element device in a brake for two-way guided systems in normal operation and wedging position.

Figure 12.- Shows the fourth preferred disposition of the elastic element device in a brake for two-way guided systems in normal operation and wedging position.

Figure 13.- Shows a preferred disposition of the regulating system for the braking capacity of the elastic element device.

Figure 14.- Shows a preferred disposition of the regulating system for the braking capacity of the elastic element device.

DESCRIPTION OF THE PREFERRED IMPLEMENTATIONS

[0026] As can be seen in the drawings, the elastic element device can be carried out in many ways, all of which respect the essence of the invention as defined by the appended claims. Following are descriptions of four preferred implementations, three of them for two-way actuation systems and one for one-way actuation systems.

[0027] The common aspects for the three implementations are the following:

a) The object of the invention is made up of one single part with two inclinations in one of its sides that serve as a guide to the wedging element for both directions, (in one-way systems, only one inclination serves as a guide for the wedging element.)

b) The part is symmetrical with respect to the centre for simplicity, but this isn't necessary for correct operation.

c) In the middle there is a joint that allows it to turn freely by means of an orifice for its fixing through an axle (10) to the brake structure.

d) Both ends have support zones, that can be devised in different ways, this is the main difference between the four preferred implementations that follow:

[0028] The first preferred implementation of the elastic element (9) uses a projection (11) of the brake structure as support. This support is used as a stop for the wedging element.

[0029] The second preferred implementation of the elastic element (12) uses as support of the elastic element bolts that are joined to the brake structure and are located on the side of the elastic element opposite the wedging element. This way the stop (14) of the wedging system is the elastic element itself.

[0030] The third preferred implementation of the elastic element (15) is conceived to use two additional braking zones (16) as described in the report. In this case the support zones (16) are against the guide rail, and the elastic element is used as a stop (17) of the wedging system. To facilitate the production of the system and increase the anti-wear behaviour of the elastic element two brake shoes (18) are added to rub against the guide rail.

[0031] The fourth preferred implementation of the elastic element (19) is destined to one-way actuation brakes and is characterised by the support on one end being accomplished with a bolt (20) in a similar way as the second preferred implementation, and by the other end onto which the wedging element exerts pressure being free because it is not needed as a support, as the device only acts in one direction. The stop (21) of the wedging system is the elastic element itself. To make the system shorter the elastic element is given the shape of a "V".

[0032] The preferred regulation system is based on the making of orifices, slits or slots (22) of different diameters and widths to make a precise adjustment by slightly varying it's rigidity, and varying the total width (23) to accomplish a great variation of rigidity in the elastic element.

[0033] Independent from the object of the invention will be the materials used in the manufacture of the elastic element components, their shapes and dimensions, and all the accessory details that may come up, as long as they don't affect its essence.

REFERENCES USED IN THE DRAWINGS

[0034]

1.- Guide rail.
2.- Brake structure or base.
3.- Brake shoe.
4.- Elastic element.
5.- Stop element.
6.- Stop of the stop element.
7.- Supplementary stress transmitting parts.
8.-Auxiliary parts for regulation.
9.- First preferred implementation of the elastic element.
10.- Pivot axle.
11.- Support in the first preferred implementation of the elastic element.
12.- Second preferred implementation of the elastic element.

13.- Support bolts in the second preferred implementation of the elastic element.
14.- Stop of the stop system in the second preferred implementation of the elastic element.
15.- Third preferred implementation of the elastic element.
16.- Additional braking and support zones in the third preferred implementation of the elastic element.
17.- Stop of the stop system in the third preferred implementation of the elastic element.
18.- Supplementary shoe brakes in the third preferred implementation of the elastic element.
19.- Fourth preferred implementation of the elastic element.
20.- Support bolt in the fourth preferred implementation of the elastic element.
21.- Stop of the stop system in the fourth preferred implementation of the elastic element.
22.- Fine regulation system by making orifices, slits or slots.
23.- Coarse regulation system by variation of the geometry.

Claims

1. A safety braking device for a transport system using a guide rail, said safety braking device being adapted to be actuated in both directions of travel along said guide rail, comprising a brake structure (2), **characterized in that** said device further comprises a resilient element (9,12,15) having a center part from which two opposite arms extend, each of said arms having at least one resilient portion, wherein said element (9,12,15) is pivotally connected in its center part (10) to said brake structure (2) and wherein said device being actuated in a given direction of travel, one of said arms urges a wedging element (5) against said guide rail while the other one of said arms acts as a retaining support against rotation of said element about said center part (10).

2. A safety braking device according to claim 1, wherein each of said arms has a brake shoe (18) at its end and wherein said device being actuated, the brake shoe of said other one of said arms is urged against said guide rail and acts as a retaining support against rotation of said element.

3. A safety braking device according to claim 1 wherein said resilient element (9,12,15) is provided with orifices or slits for adjusting its braking capacity.

4. A safety braking device according to claim 1 wherein the ends of said arms act as a resilient stop (14) for said wedging element.

5. A safety braking device for a transport system using a guide rail, said safety braking device being adapted to be actuated in one direction of travel along said guide rail, comprising a brake structure (2), **characterised in that** said device further comprises a resilient element (19) having a center part from which two arms extend in a V-shape, each of said arms having one end remote from said center part, wherein said element is pivotally connected in its center part (10) to said brake structure (2) and wherein said device being actuated in said one direction of travel, one of said arms urges a wedging element (5) against said guide rail, said end of said arm acting as a resilient stop (21) for said wedging element while the end of said other one of said arms acts as a retaining support against rotation of said element about said center part (10).

Patentansprüche

1. Sicherheitsbremsvorrichtung für Führungsschiene benutzende Transportmittel, dass in beiden Richtungen verwendet werden kann. Das System besteht aus einer Bremsstruktur (2), **gekennzeichnet durch** ein elastisches Element (9,12,15) aus dessen zentralen Teil zwei entgegenorientierte Arme, mit mindestens einem flexiblen Teil ausgehen. Das Element (9,12,15) ist seinem zentralen Teil auf rotierender Basis (10) mit der Bremsstruktur (2)verbunden. Wenn die Bremsstruktur in eine Richtung betrieben wird, wirkt einer der Arme auf die Klemmvorrichtung (5), die gegen die Schiene drückt. Der zweite Arm wirkt als Rückhaltsführung und bremst die Rotation des Elementhauptteiles (10).

2. Sicherheitsbremsvorrichtung nach Forderung Nr.1, wo jedes der erwähnten Armen einen Bolzen (18) an dessen Ende besitzt. Wenn die Vorrichtung betrieben wird, wirkt der Bolzen des Armes gegen die Schiene und übernimmt zur selben Zeit die Bremsung zur Justierung der Bremsfähigkeit.

3. Sicherheitsbremsvorrichtung nach Forderung Nr.1, wo das erwähnte flexible Element (9,12,15) Öffnungen oder Spalten zur Justierung der Bremsfähikeit besitzt.

4. Sicherheitsbremsvorrichtung nach Forderung Nr.1, wo die Enden der erwähnten Armen als elastische Anschläge (14) der Klemmvorrichtung wirken.

5. Sicherheitsbremsvorrichtung für Führungsschiene benutzende Transportmittel, dass in eine Richtung verwendet werden kann. Das System besteht aus einem Bremsgehäuse (2), **gekennzeichnet durch** ein elastisches Element (9) aus dessen zentralen Teil zwei Arme in V-Form ausgehen, mit mindestens

einem Teil, der sich von diesem zentralen Teil abwendet. Das Element ist seinem zentralen Teil auf rotierender Basis (10) mit der Bremsstruktur (2) verbunden. Beim Betrieb der Bremsvorrichtung wirkt einer der Arme auf die Klemmvorrichtung (5), die gegen die Schiene drückt. Das Ende dieses Armes wirkt wie ein flexibler Anschlag (21) der Klemme. Der zweite Arm bremst die Rotation des Elementhauptteiles (10).

Revendications

1. Dispositif de freinage de sécurité pour des systèmes de transport où l'on utilise un rail conducteur, dispositif adapté de manière à pouvoir agir dans les deux sens de déplacement le long de ce rail conducteur, comprenant une structure de frein (2), caractérisé parce que ce dispositif dispose également d'un élément flexible (9, 12, 15) d'où s'étendent deux bras opposés de la partie centrale, chacun desquels avec au moins une portion flexible, cet élément (9, 12, 15) étant connecté en pivot dans sa partie centrale (10) à cette structure de frein (2) pour lequel ce dispositif restant activé dans un sens donné de déplacement, l'un de ces bras fait qu'un élément d'enclavement (5) agisse contre ce rail, tandis que l'autre bras agit comme support de rétention contre la rotation de cet élément autour de cette partie centrale (10).

2. Dispositif de freinage de sécurité selon la revendication 1, où chacun des bras mentionnés a un sabot (18) à son extrémité. En activant ce dispositif, le sabot de l'autre bras agit contre le rail mentionné et agit comme support de rétention contre la rotation de cet élément.

3. Dispositif de freinage de sécurité selon la revendication 1, où l'élément flexible mentionné (9, 12, 15) dispose d'orifices ou rainures pour régler la capacité de freinage de celui-ci.

4. Dispositif de freinage de sécurité selon la revendication 1, où les extrémités des bras mentionnés agissent comme butoir élastique (14) de l'élément d'enclavement mentionné.

5. Dispositif de freinage de sécurité pour des systèmes de transport pour lesquels on utilise un rail conducteur, dispositif adapté de manière qu'il peut agir dans l'un des deux sens de déplacement le long de ce rail conducteur, comprenant une structure de frein (2), caractérisé car ce dispositif dispose aussi d'un élément flexible (9) d'où s'étendent deux bras de la partie centrale en forme de « V », chacun desquels avec une extrémité écartée de cette partie centrale. Cet élément est connecté en pivot sur sa partie centrale (10) à cette structure de frein (2) et, ce dispositif étant activé dans un sens de déplacement, l'un de ces bras active un élément d'enclavement (5) contre le rail mentionné, l'extrémité de ce bras agit comme un butoir flexible (21) de cet élément d'enclavement, tandis que l'extrémité de l'autre bras agit comme support de rétention contre la rotation de cet élément autour de cette partie centrale (10).

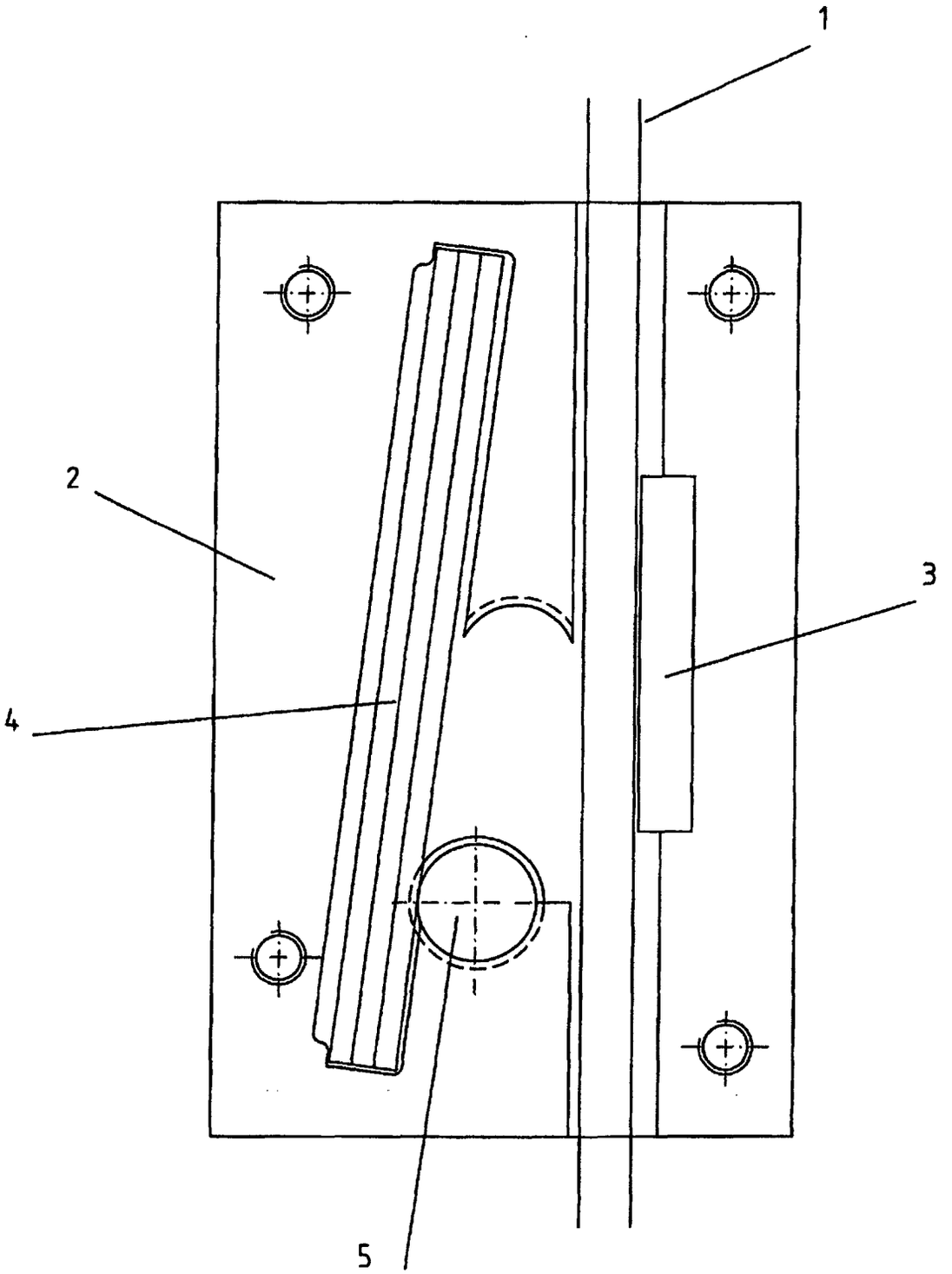

Figure 1

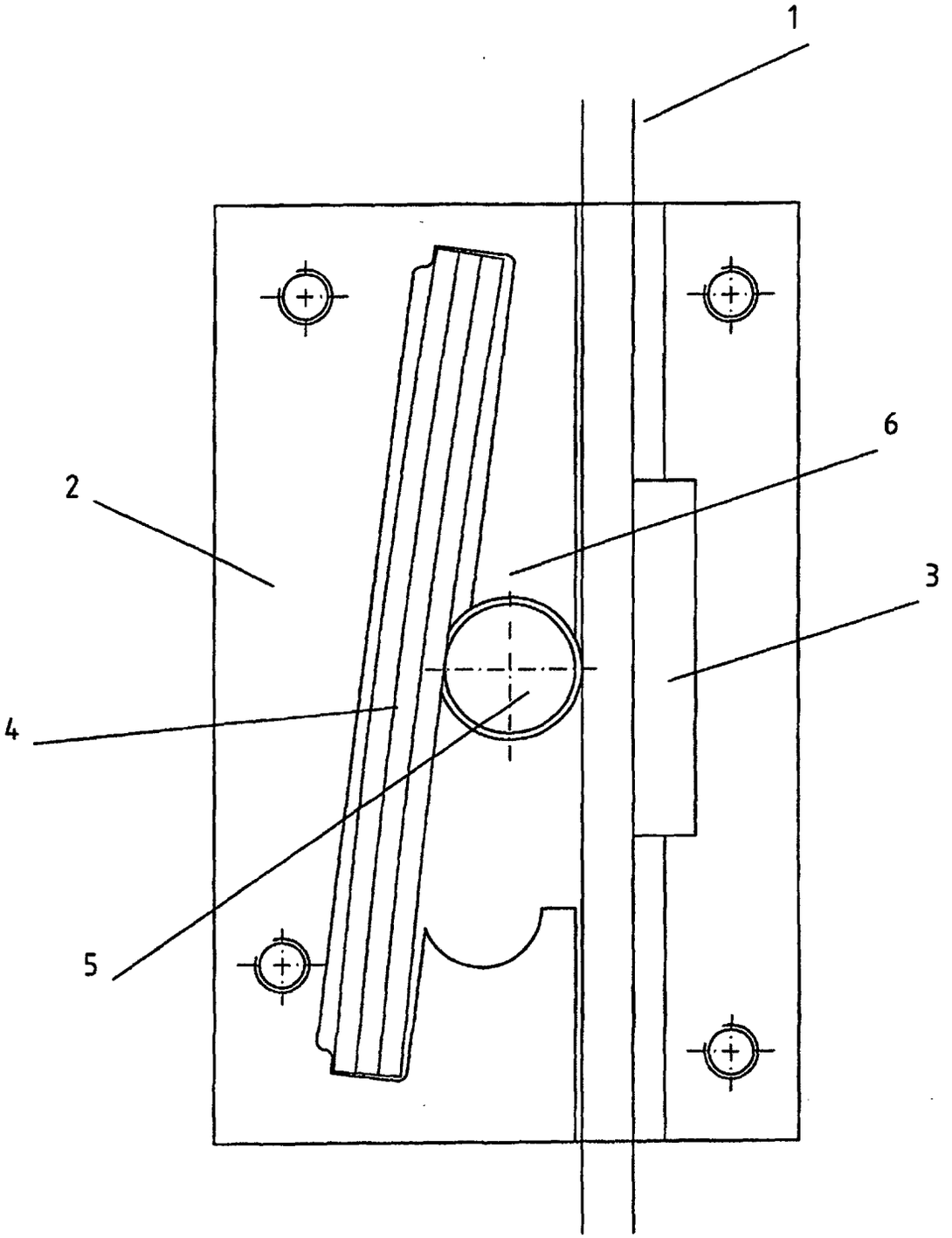

Figure 2

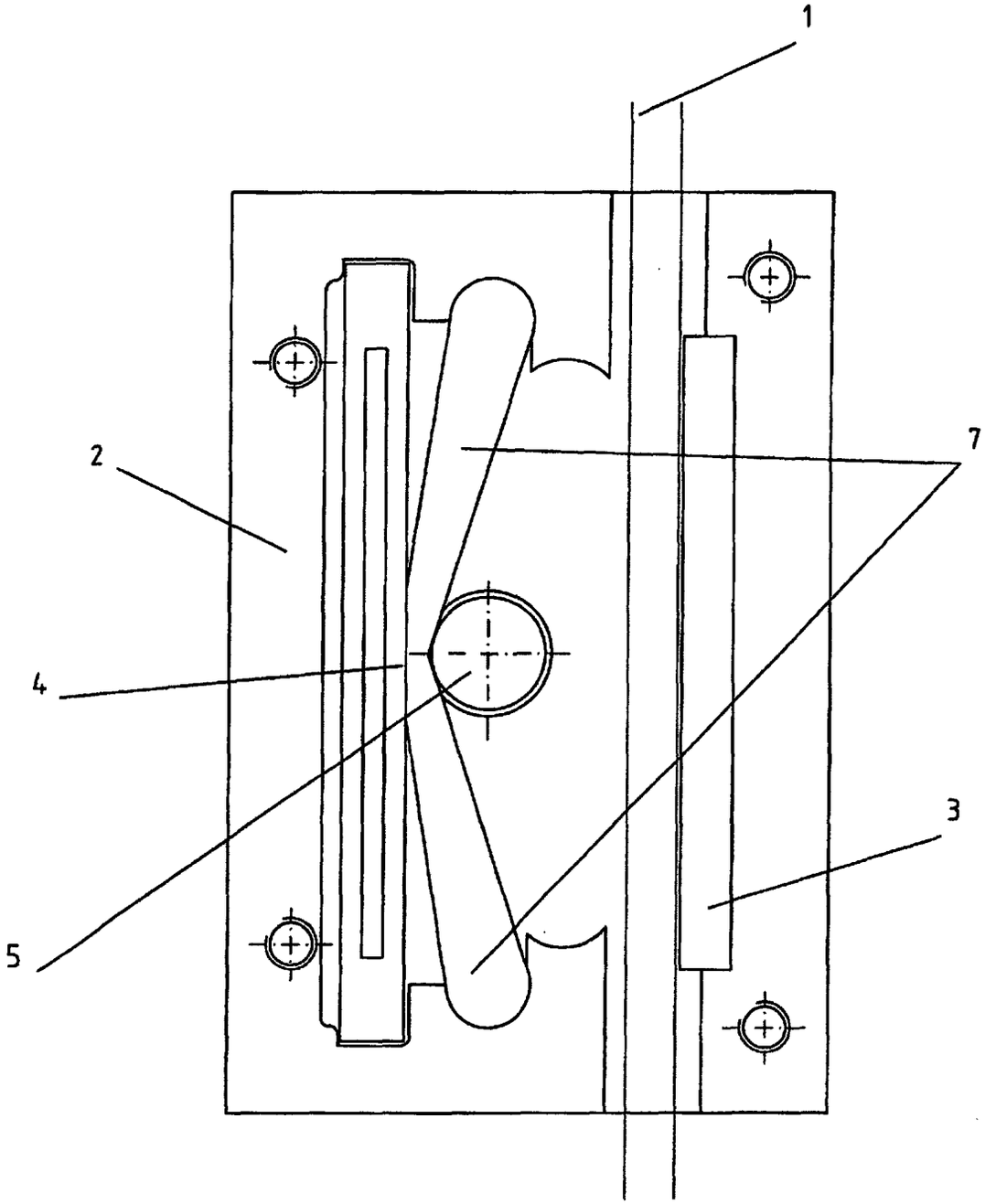

Figure 3

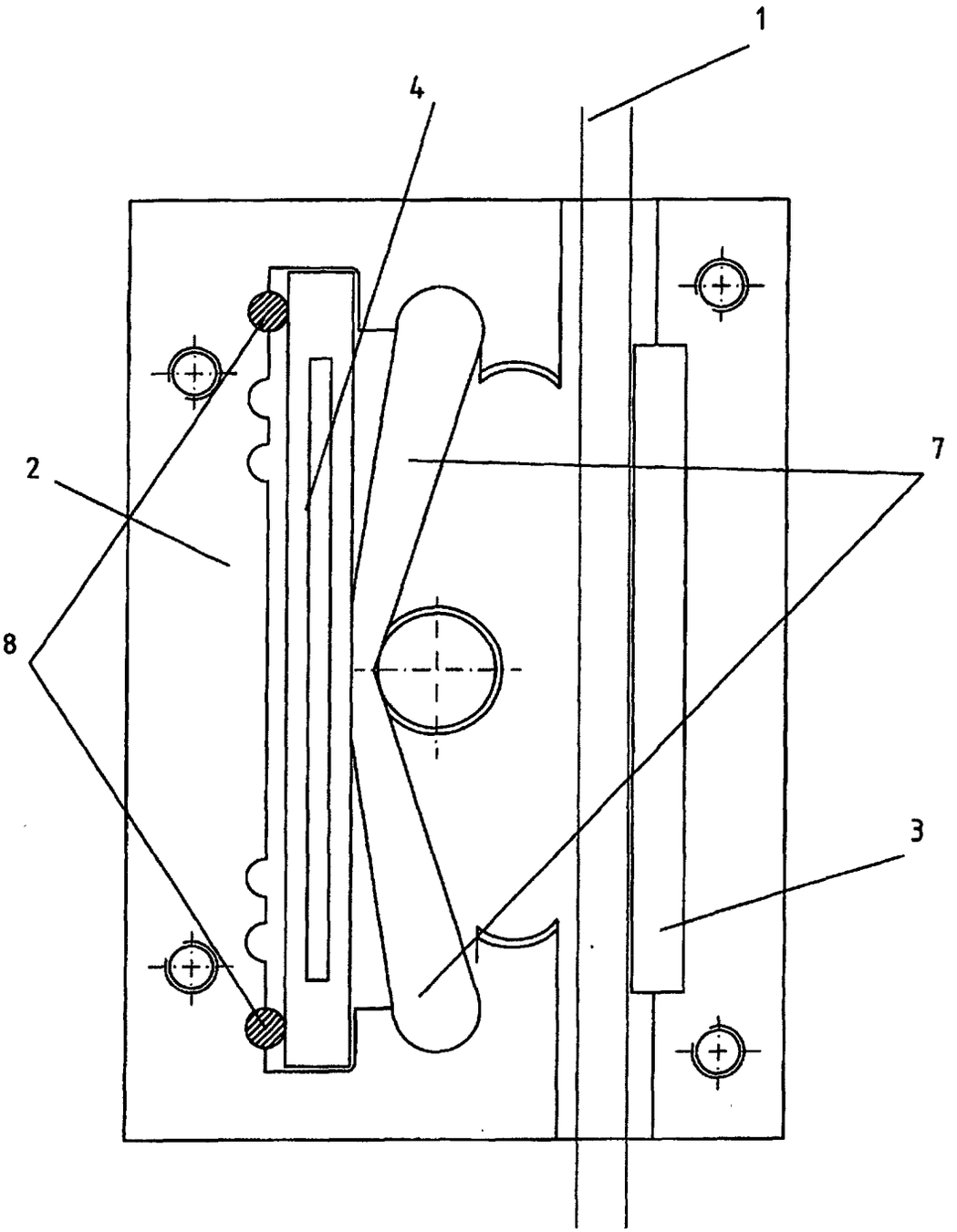

Figure 4

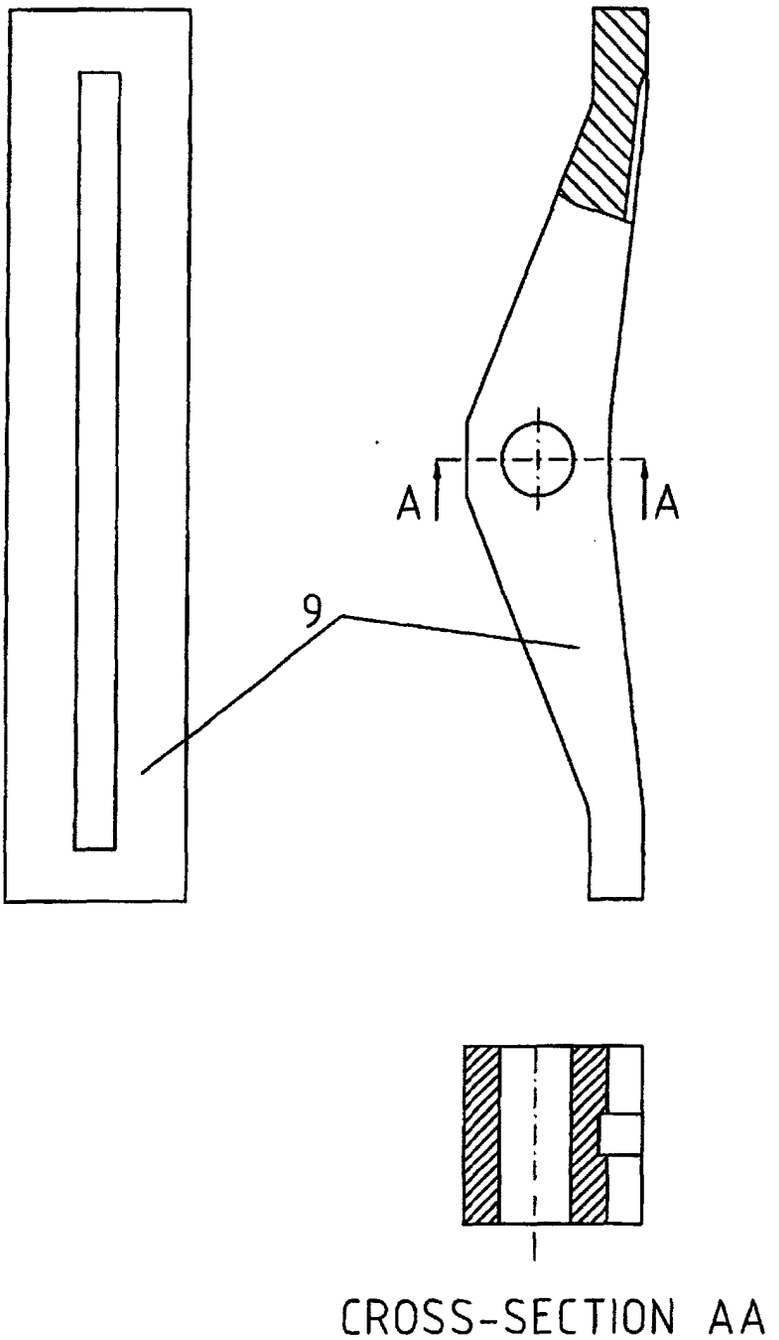

Figure 5

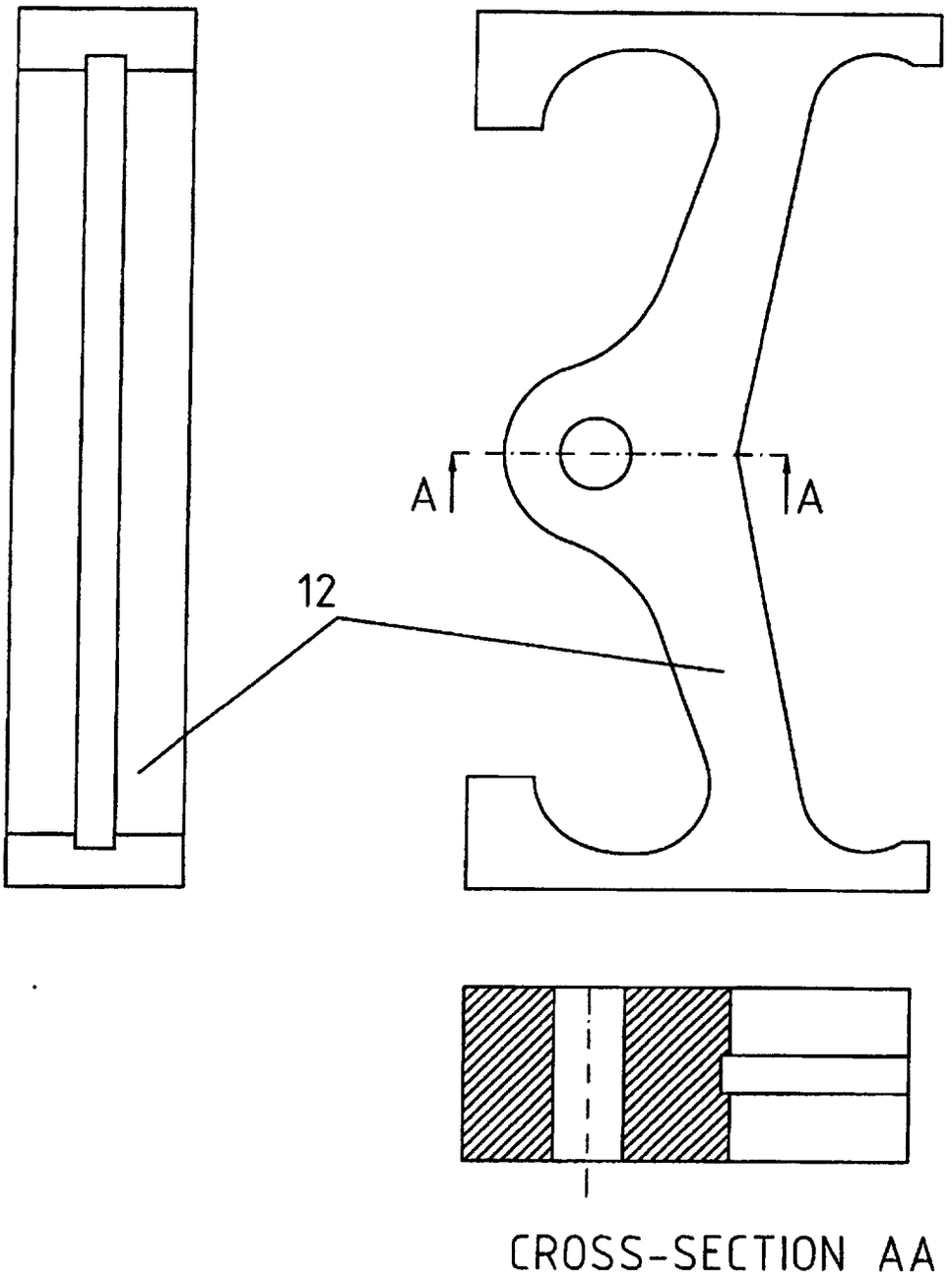

Figure 6

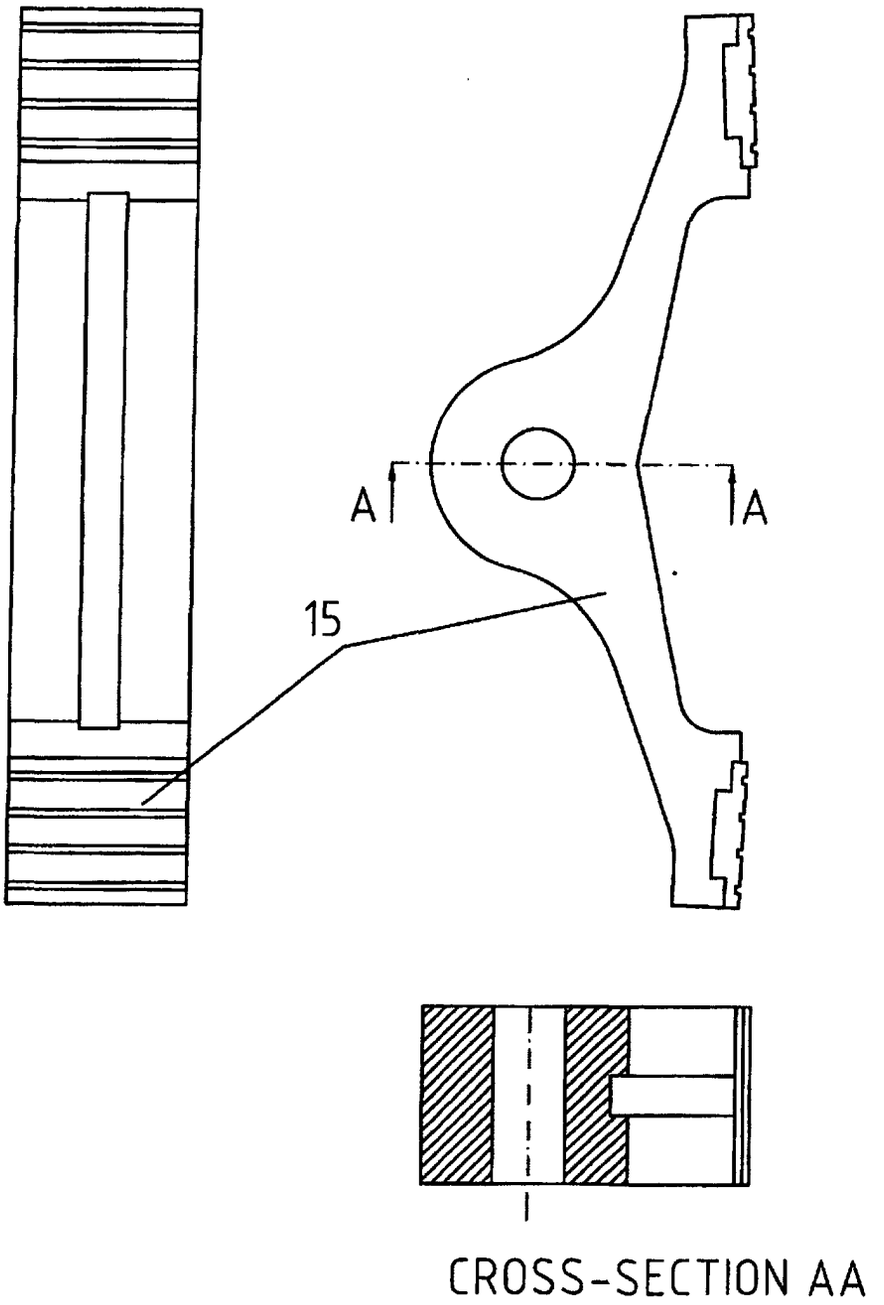

Figure 7

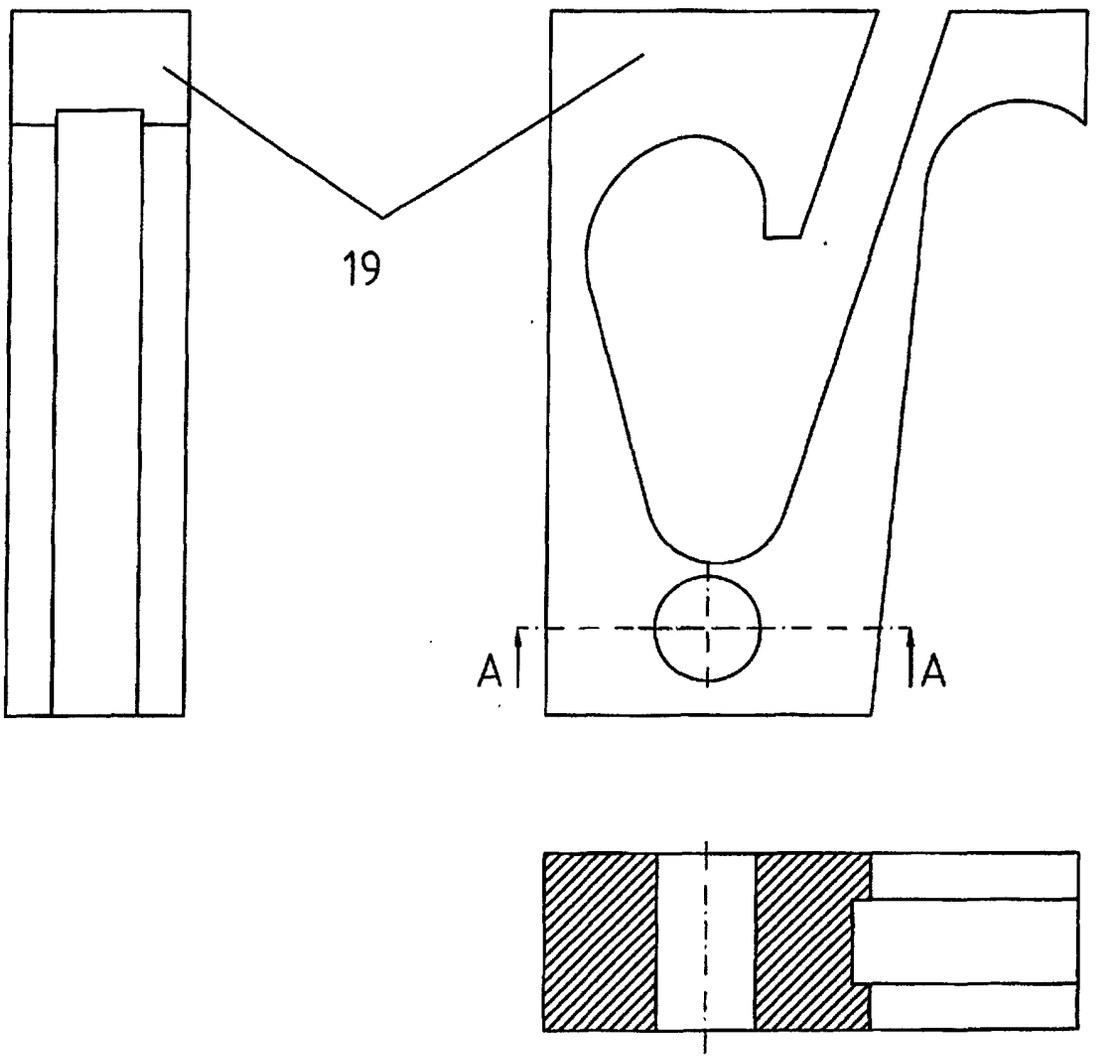

Figure 8

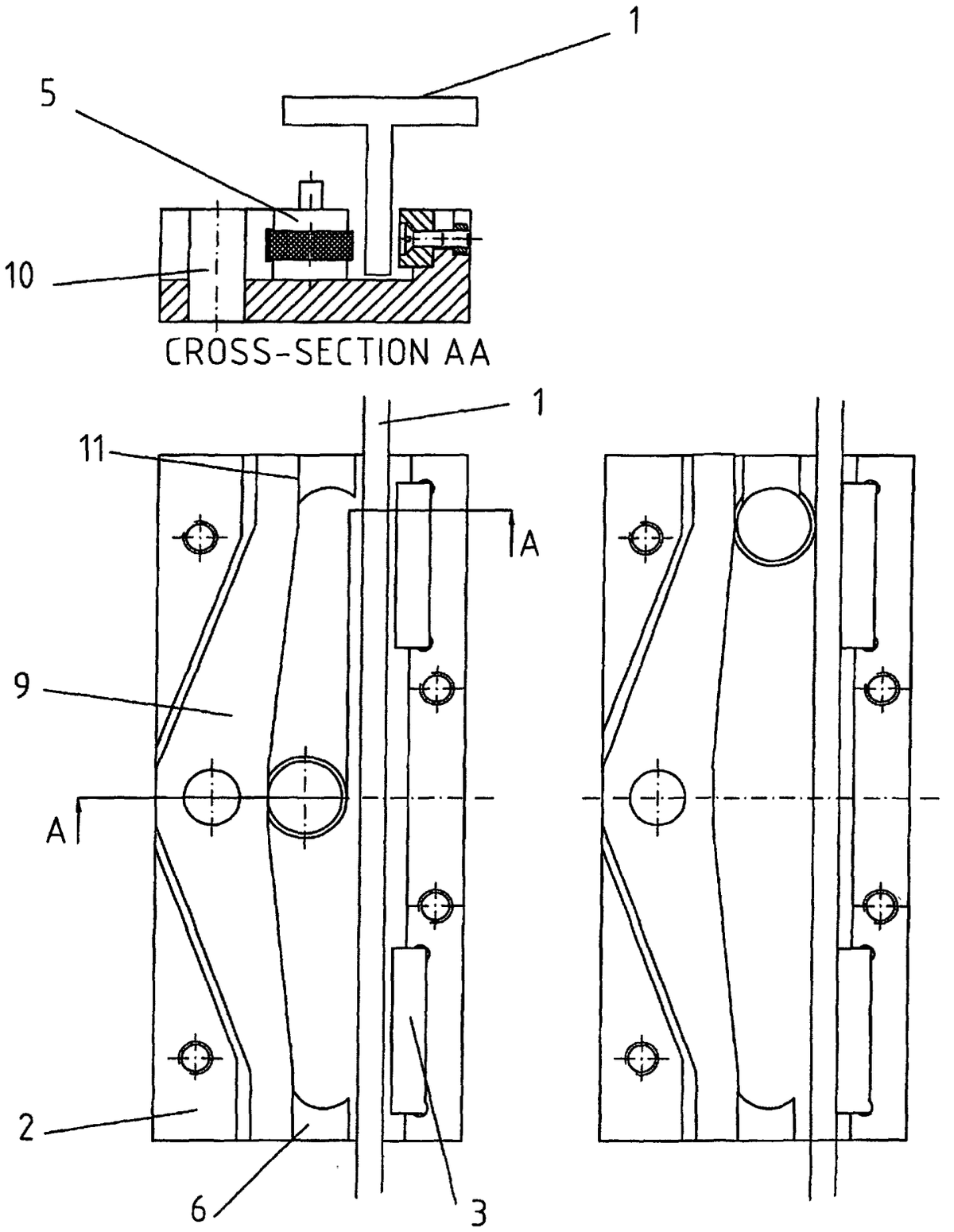

Figure 9

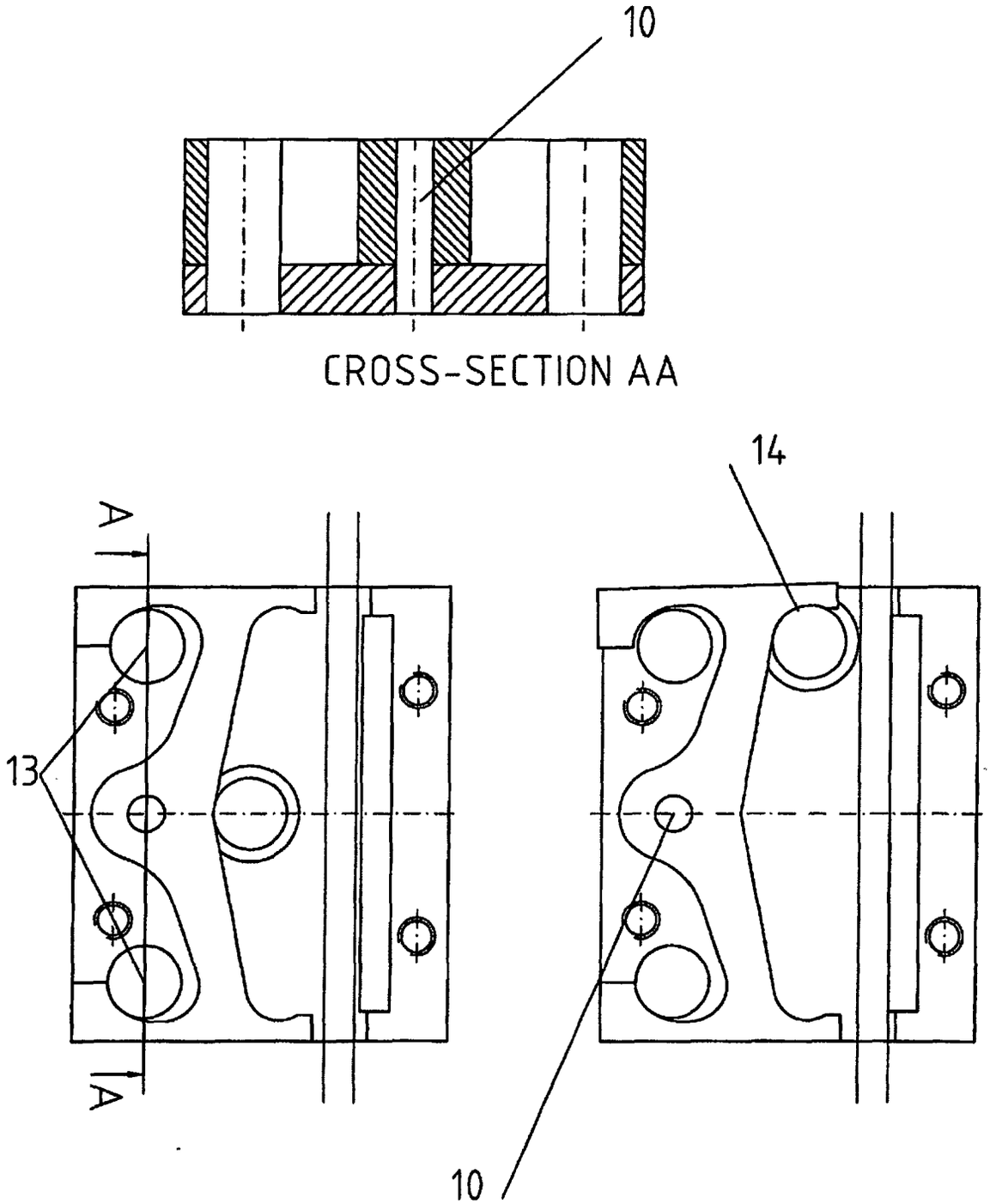

Figure 10

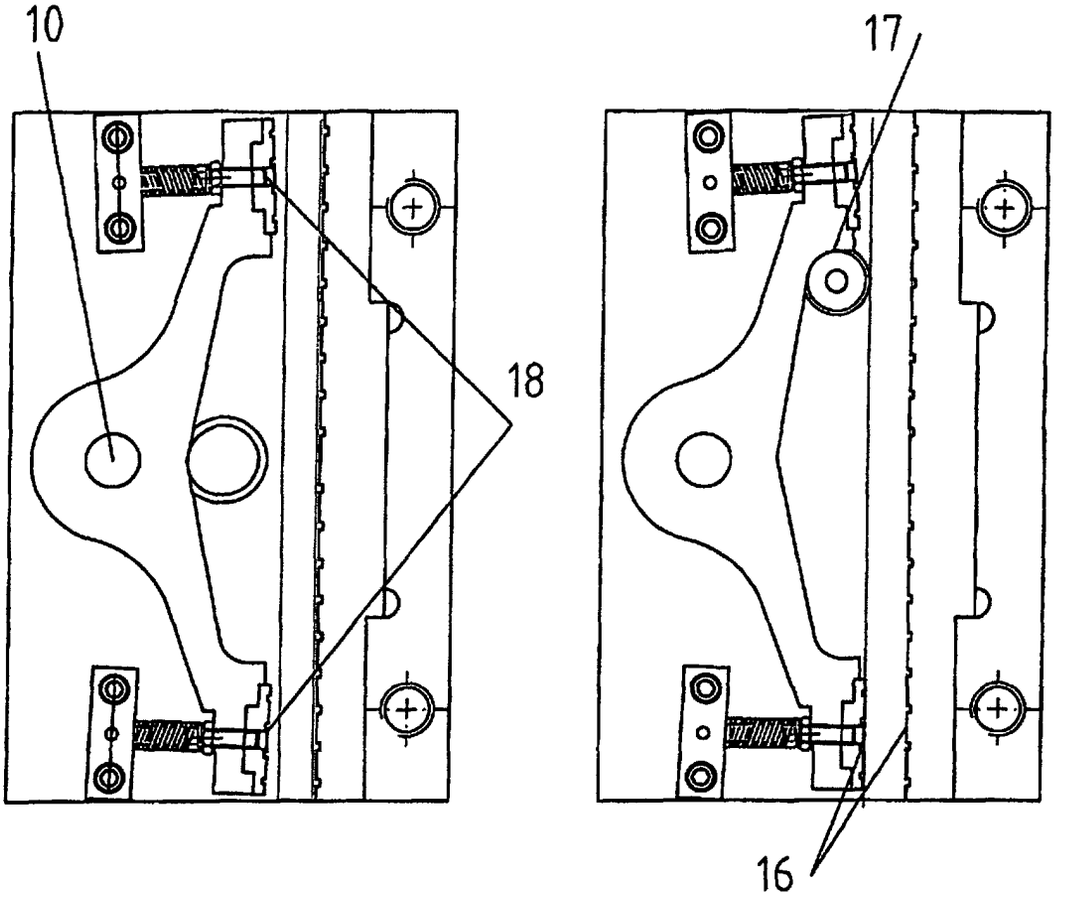

Figure 11

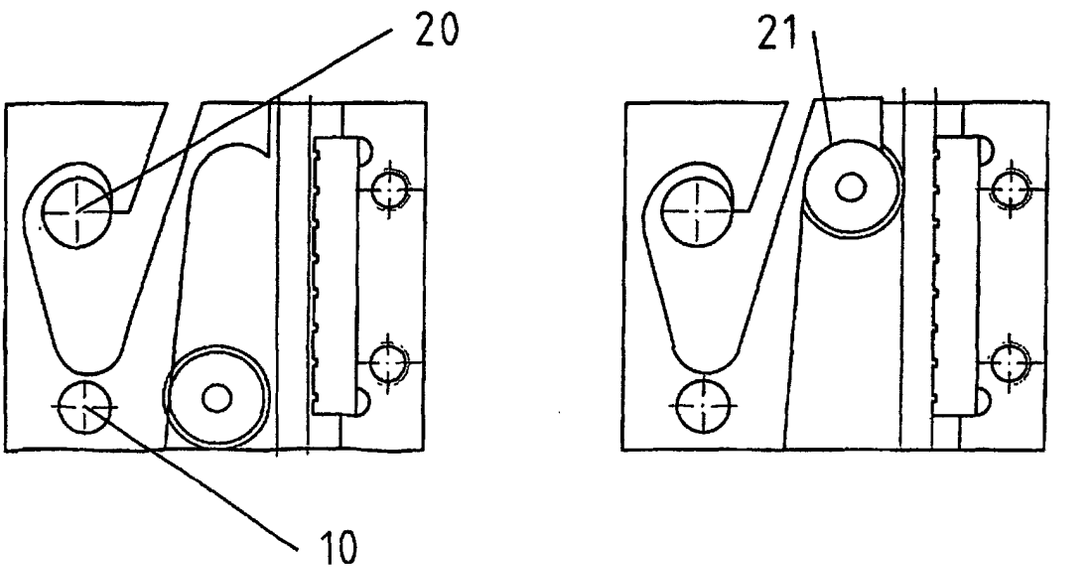

Figure 12

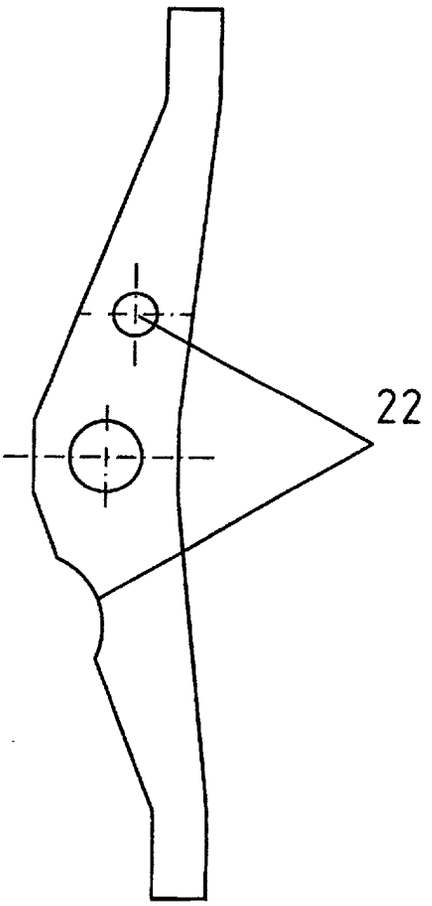

Figure 13

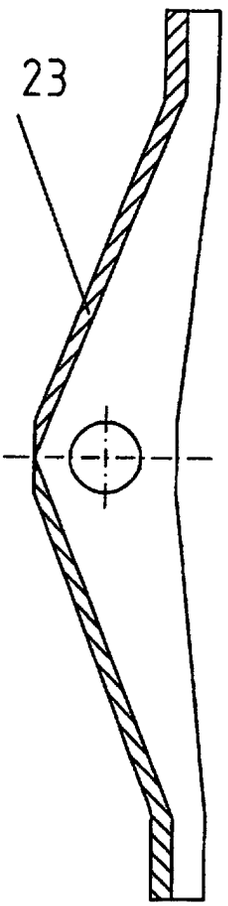

Figure 14