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(54) **A catch apparatus for a rack lift.**

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Description

The present invention relates to a catch apparatus for a rack lift, with a tooth wheel engaging the rack and unrotatably mounted on a shaft, which also carries two friction members, which are spring tensioned towards each other for mutual frictional engagement, and of which one is unrotatably carried by the shaft, and the other one is glidingly supported on the shaft but normally co-rotating through the frictional engagement, an inertia blocking mechanism, being arranged to stop the other friction member at exceeding of a limit velocity of the shaft, for thereby braking the shaft through the frictional engagement.

Through EP-A 279 144 (an Article 54 (3) document) a catch apparatus for a driven shaft is known. The apparatus comprises a brake disc and a cam disc for a runner roll which is pressable against the cam disc by means of a release spring and has a catch lever associated therewith, which engages the cam disc in response to an overspeed. In order to make this catch apparatus to respond to both directions of rotation two tooth rings with opposite catch action of the teeth as well as a basic body with a catch bolt for oppositely directed catch levers are arranged on the shaft. For simultaneous engagement and disengagement of the catch levers a disengagement pin and an engagement bolt are supported in the basic body.

The object of the present invention is to effect a safer and more reliable braking of the lift than has hithertoo been possible with an apparatus of the kind defined by way introduction above.

This object has been attained in that the blocking mechanism includes a blocking member which is suspended for pendulum movement in a plane extending transversely to the shaft in order to be clamped, when the limit velocity is exceeded, between a fixed abutment and an abutment carried by the other friction member.

By the above features, which result in an improved locking mechanism, the apparatus according to the invention also differs from the subject matter of EP-A 279 144.

On the drawings Fig. 1 partly in section shows a catch apparatus according to the invention in the direction of arrows I-I in Fig. 2, and Fig. 2 illustrates the catch apparatus in the direction of arrows II-II in Fig. 1.

The catch apparatus has a tooth wheel 4 in engagement with the rack, not shown, and non-rotatably connected to a shaft 4. The shaft 4 is journalled at 6 in a base plate 8 which is fixedly connected to the lift cage and intended to be vertically mounted. On the base plate 8 a yoke 10 is mounted in the same horizontal plane as the shaft 4. The yoke 10 has a central opening for the shaft 4 and elements connected thereto, which will be described more closely below. Furthermore, the yoke 8 carries a casing 12 for the catch apparatus. More particularly the casing 12 is attached to the yoke 8 by means of screwed joints 14.

Behind the plate 8 the shaft 4 non-rotatably carries a wheel 16 with a conically extending peripheral surface. The wheel 16 is recessed in a bowl 18 normally rotating with the shaft 4. The bowl 18 has a conical inner wall mating with the conical periphery of the wheel 16. Between the conical surfaces of the wheel 16 and the bowl 18 a friction lining is arranged. The bowl 18 is seated on the shaft 4 via a slide bearing 20. Above the bowl 18 the shaft 4 carries a sleeve 22 which is journalled in the opening of the yoke 8 by means of bearings 24. Below the yoke 10 the sleeve 22 is widening into a cup shaped housing 26 for a disc spring package 28. The sleeve 22 is kept in place on the end of the shaft 4 by means of an end plate 30, which is attached to the shaft 4 by means of four screws 32. More particularly, a shoulder 34 of the plate 30 presses against the end of the sleeve 22 via a washer 36.

By means of the disc spring package 28 a pressure is exercized against the bowl 18 so that the later thus presses against the wheel 16 and thereby also the conical surfaces press against each other via the friction lining.

The bowl 18 has two externally profiled shoulders 38 and 40. The shoulder 38 has a hexagonal shape, as appears from the plane view in Fig. 2. The shoulder 40 has a saw tooth shaped profile with six teeth, as likewise appears from the plane view of Fig. 2. In the manner shown each of the teeth are arranged in front of its respective one of the plane sides of the hexagonal shoulder 38. Each tooth has furthermore a tooth shoulder 42 facing in the rotational direction.

An oval pendulum member 42 is pivotally suspended at one of its ends on a bolt 46 fixedly connected to the plate 8. The bolt 46 is not visible in Fig. 1. The oval pendulum member 44 in front of each leg of the yoke 8 has a projecting abutment 48 and 50, respectively. The abutment 48 has such a length that the longitudinal axis of the pendulum member 44 extends essentially perpendicularly to the plane of the yoke 8 when the abutment 48 engages the adjacent leg of the yoke 8. The abutment 50 is shorter than the abutment 48 and carries a pressure spring 52 which is tensioned between the side of the pendulum member 44 and the adjacent leg of the yoke 8. By this resilient clamping of the pendulum 44 between the legs of the yoke 8 not desirable shaking movements of the pendulum are restricted when the lift is operated.

At its lower end the pendulum 44 pivotally carries a crescent shaped blocking member 54.

The blocking member 54 is not visible in Fig. 1, but is carried behind the pendulum 44 so that it is located in the plane of the tooth profile 40. The blocking member 54 has a hook end 56 shaped for engagement with the tooth shoulder 42 and an opposite end 58. On its inside facing away from the pendulum 44, in the vicinity of the end 58, the blocking member 54 carries a roller 60 in the same plane as the hexagonal profile 38. The roller 60 is resiliently pressed into light engagement with the circumference of the hexagonal profile 38 by means of a draw spring 62 acting between the pendelum 44 and the blocking member 54. The tension of the draw spring 62 is settable by means of a screw- and nut arrangement 64.

The plate 8 carries a switch 66 connected in the drive circuit of the lift and having an operating element 68 which breaks the drive circuit at actuation by a shoulder 70 located on the blocking member 54, in a way to be described more closely below.

In the same plane as the blocking member 54, in association with the switch 66, a plate 72 with a V-shaped cut 74 is located in front of the adjacent end 58 of the blocking member 54, said end 58 having a pointed shape complementary to the cut 74.

The described catch apparatus operates as follows.

In normal operation all the elements carried by the shaft 4 and described above rotate together with the tooth wheel 2 and the shaft 4 in clockwise direction in Fig. 2. The roller 60 on the blocking member 54 follows the hexagonal contour 38. When the roller 60 passes the corners of the hexagonal, the hook end 56 of the blocking member 54 is pressed against the action of the spring 62 into the path of movement of the saw tooth contour 40, but when the roller leaves the corner and runs out on the plane side of the hexagonal profile 38 the hook end 56 of the blocking member 54 is lifted by the spring 62 just enough out of the path of movement of the saw tooth profile 40 before the hook end 56 of the blocking member 54 has time to be hit by the abutment 42 of an adjacent tooth of the saw tooth profile 40.

At increasing rotational velocity of the shaft 4 the inertia of the blocking member 54 results in the roller 60 getting a tendency of not having time to follow the flat side of the hexagonal profile 38. At a determined limit velocity this finally brings about that the hook end 56 of the blocking member 54 does not have time to be lifted out of the path of movement of the saw tooth profile 40 but is hit by the abutment 42 of an adjacent tooth. This immediately brings about that the pendulum 44 by the engagement of the saw tooth profile 40 is swung to the left in Fig. 2 so that the end 58 of the blocking member 54 enters the cut 74. A distinct locking of the blocking member 54 between the cut 74 and the tooth abutment 42 is thereby attained and the bowl 18 is brought to immediate stop on the shaft 4. This brings about braking of the shaft 4 through the friction engagement between the conical surfaces of the bowl 18 and the wheel 16 so that a soft braking of the shaft 4 is attained.

At the movement of the blocking member 54 into the cut 74 also the operating element 68 of the switch 66 is operated by means of the abutment 70 located on the blocking member 54, so that the drive circuit of the lift is broken.

The above-mentioned limit velocity at which the catch device shall start work is determined by the tension of the spring 62.

The braking time at first hand is decided by the spring force of the spring package 28 by means of which the bowl 18 is pressed against the wheel 16.

The invention at first hand consists in the rocking suspension of the blocking member 54 by means of the pendelum 44, which at catching makes possible controlled introduction into the cut 74 and thereby an always fixed locking position for the blocking member 54. As a result also a safe operation of the switch is always obtained. The mentioned advantages have not been obtained in prior apparatus of similar kind where the catch element is fixedly mounted.

Claims

1. A catch apparatus for a rack lift, with a tooth wheel (2) engaging the rack and unrotatably mounted on a shaft (4), which also carries first and second friction members (16,18), which are spring tensioned (28) towards each other for mutual frictional engagement, and of which the first friction member (16) is unrotatably carried by the shaft (4), and the second friction member (18) is glidingly supported (20) on the shaft but normally co-rotating through the frictional engagement, an inertia blocking mechanism (38,74) being arranged to stop the second friction member (18) at exceeding of a limit velocity of the shaft (4), for thereby braking the shaft through the frictional engagement, said blocking mechanism including a blocking member (54) which is suspended (44,46) for pendulum movement in a plane extending transversely to the shaft (4) in order to be clamped, when the limit velocity is exceeded, between a fixed abutment (74) and an abutment (42) carried by the second friction member (18).

2. A catch apparatus according to claim 1, **characterized in** that the fixed abutment has a cut, into which a nose (58) of the pivotally suspended blocking member (54) is arranged to be guided at the clamping between the two abutments (42,74).

3. A catch apparatus according to claim 2, **characterized in** that a switch (66) in the drive circuit of the lift is arranged in the cut (74) and is operable by the pivotally suspended blocking member (54), at the guiding thereof into the cut (74).

4. A catch apparatus according to any of the preceding claims, **characterized in** that a portion (56) of the pivotally suspended blocking member (54), which is intended for engagement with the abutment (42) on the second friction member (18) is brought, by a cam mechanism (38,60) acting between the blocking member (54) and the second friction member (18), resiliently outside the path of movement of the last-mentioned abutment (42) at velocities of the shaft (4), which are below the limit velocity, said cam mechanism (38,60) at attainment of the limit velocity being brought out of operation through the influence of inertia.

5. A catch apparatus according to any of the preceding claims, **characterized in** that the pivotally suspended blocking member (54) also is suspended for a pivoting movement, superposed on the pivoting movement, about an axis (53) located between the portions of the blocking element (54) intended for engagement with the abutments (42,74).

6. A catch apparatus according to any of the preceding claims, **characterized in** that the second friction member (18) has a saw tooth shaped profile on which each tooth (42) forms an abutment intended for engagement with the pivotally suspended blocking member (54).

7. A catch apparatus according to claims 4, 5 and 6, **characterized in** that the cam mechanism (38,60) includes a cam follower roller (60) carried by the pivotally suspended blocking member and, on the side of the pivot axis (53) of the blocking member (54) facing away from the side of the blocking member (54) intended for engagement with the abutment (42) of the second friction member (18), being forced by a spring (62) towards a multicorner peripheral cam surface (38) on the second friction member (18), said cam surface (38) having as many corners as the number of teeth of the saw tooth profile, each tooth (42) being located between two corners of the cam surface (38), and the spring (62) being dimensioned so as to, at velocities exceeding the limit velocity, not being able to keep the cam follower roller (60) in engagement with portions of the cam surface extending between the corners of the cam surface (38), whereby the blocking member (54) for engagement with the teeth (42) of the second friction member (18) is brought into the path of movement of said teeth.

8. A catch apparatus according to any of the preceding claims, **characterized in** that the pendulum movement is damped (52).

Patentansprüche

1. Fangvorrichtung für eine Zahnantrieb-Hubvorrichtung, mit einem Zahnrad (2), das in den Zahnantrieb eingreift und drehfest auf einer Welle (4) montiert ist, welche auch ein erstes und zweites Reibungsglied (16, 18) trägt, die zum gegenseitigen Reibungseingriff durch Federkraft (28) aufeinander zu vorgespannt sind und von denen das erste Reibungsglied (16) drehfest durch die Welle (4) gehalten und das zweite Reibungsglied (18) auf der Welle gleitend gelagert (20) ist, sich jedoch normalerweise durch den Reibungseingriff mit dieser dreht, mit einer Trägheitsblockiervorrichtung (38, 74), die vorgesehen ist, das zweite Reibungsglied (18) beim Überschreiten einer Grenzgeschwindigkeit der Welle (4) anzuhalten, um dadurch die Welle durch den Reibungseingriff abzubremsen, wobei die Blockiervorrichtung ein Blockierelement (54) enthält, das zur Pendelbewegung in einer quer zur Welle (4) verlaufenden Ebene aufgehängt (44, 46) ist, um zwischen einem ortsfesten Lager (74) und einem vom zweiten Reibungsglied (18) getragenen Lager (42) eingeklemmt zu werden, wenn die Grenzgeschwindigkeit überschritten wird.

2. Fangvorrichtung nach Anspruch 1, dadurch **gekennzeichnet**, daß das ortsfeste Lager einen Ausschnitt hat, in welchem eine Nase (58) des schwenkbar aufgehängten Blockierelements (54) vorgesehen ist, um beim Einklemmen zwischen den zwei Lagern (42, 74) geführt zu werden.

3. Fangvorrichtung nach Anspruch 2, dadurch **gekennzeichnet**, daß im Ausschnitt (74) ein Schalter (66) innerhalb des Antriebsschaltkreises der Hubvorrichtung vorgesehen ist, der durch das schwenkbar aufgehängte Blockier-

element (54) beim Einführen desselben in den Ausschnitt (74) betätigbar ist.

4. Fangvorrichtung nach einem der vorhergehenden Ansprüche, dadurch **gekennzeichnet**, daß ein Teil (56) des schwenkbar aufgehängten Blockierelements (54), der für den Eingriff mit dem Lager (42) auf dem zweiten Reibungsglied (18) vorgesehen ist, durch einen zwischen dem Blockierelement (54) und dem zweiten Reibungsglied (18) wirkenden Steuerkurvenmechanismus (38, 60) bei unterhalb der Grenzgeschwindigkeit liegenden Geschwindigkeiten der Welle (4) nachgiebig aus der Bewegungsbahn des Lagers (42) herausgebracht wird, wobei der Steuerkurvenmechanismus (38, 60) beim Erreichen der Grenzgeschwindigkeit durch den Einfluß der Trägheit außer Betrieb gebracht wird.

5. Fangvorrichtung nach einem der vorhergehenden Ansprüche, dadurch **gekennzeichnet**, daß das schwenkbar aufgehängte Blockierelement (54) auch zum Ausführen einer der Schwenkbewegung überlagerten Drehbewegung um eine Achse (53) aufgehängt ist, die zwischen den Teilen des Blockierelements (54) angeordnet ist, die zum Eingriff mit den Lagern (42, 74) vorgesehen sind.

6. Fangvorrichtung nach einem der vorhergehenden Ansprüche, dadurch **gekennzeichnet**, daß das zweite Reibungsglied (18) ein sägezahnförmiges Profil hat, auf dem jeder Zahn (42) ein Lager bildet, das zum Eingriff mit dem schwenkbar aufgehängten Blockierelement (54) vorgesehen ist.

7. Fangvorrichtung nach einem der Ansprüche 4, 5 und 6, dadurch **gekennzeichnet**, daß der Steuerkurvenmechanismus (38, 60) eine einer Steuerkurve folgende Rolle (60) hat, die von dem schwenkbar aufgehängten Blockierelement (54) gehalten ist und die auf der Seite der Drehachse (53) des Blockierelements (54), die von der Seite des Blockierelements (54) abgewandt ist, welche zum Eingriff mit dem Lager (42) des zweiten Reibungsglieds (18) vorgesehen ist, durch eine Feder (62) in Richtung einer vieleckigen Umfangssteuerfläche (38) auf dem zweiten Reibungsglied (18) vorgespannt ist, daß die Steuerfläche (38) so viele Ekken wie die Anzahl von Zähnen des Sägezahnprofils hat, daß jeder Zahn (42) zwischen zwei Ecken der Steuerfläche (38) angeordnet ist, und daß die Feder (62) so dimensioniert ist, daß sie bei die Grenzgeschwindigkeit überschreitenden Geschwindigkeiten nicht in der Lage ist, die der Steuerkurve folgende Rolle (60) mit Abschnitten der Steuerfläche, die sich zwischen den Ecken der Steuerfläche (38) erstrecken, in Eingriff zu halten, wodurch das Blockierelement (54) zum Eingriff mit den Zähnen (42) des zweiten Reibungsgliedes (18) in die Bewegungsbahn der Zähne gebracht wird.

8. Fangvorrichtung nach einem der vorhergehenden Ansprüche, dadurch **gekennzeichnet**, daß die Pendelbewegung gedämpft (52) wird.

Revendications

1. Appareil d'arrêt pour un ascenseur à crémaillère avec une roue dentée (2) coopérant avec la crémaillère et montée sans possibilité de rotation sur un arbre (4), lequel porte également des premier et second éléments de friction (16, 18), qui sont sollicités élastiquement (28) l'un vers l'autre pour coopération à friction, et parmi lesquels le premier élément de friction (16) est porté sans possibilité de rotation par l'arbre (4), et le second élément de friction (18) est monté en coulissement (20) sur l'arbre mais normalement en rotation avec dudit premier élément par l'intermédiaire de la coopération à friction, un mécanisme de blocage à inertie (38, 74) étant disposé pour immobiliser le second élément de friction (18) lors du dépassement d'une limite de vitesse de l'arbre (4) afin de freiner l'arbre par coopération de friction, ledit mécanisme de blocage comportant un élément de blocage (54), qui est suspendu (44, 46) pour un mouvement pendulaire dans un plan qui s'étend transversalement par rapport à l'arbre (4), de façon à être serré, lorsque la limite de vitesse est dépassée, entre une butée fixe (74) et une butée (42) portée par le second élément de friction (18).

2. Appareil d'arrêt selon la revendication 1, caractérisé en ce que la butée fixe comporte une découpe dans laquelle un prolongement (58) de l'élément de blocage suspendu en pivotement (54) est disposé pour être guidé lors du serrage entre les deux butées (42, 74).

3. Appareil d'arrêt selon la revendication 2, caractérisé en ce qu'un commutateur (66) situé dans le circuit d'entraînement de l'ascenseur est disposé dans la découpe (74) et est susceptible d'être actionné par l'élément de blocage suspendu pivotant (54) lors du guidage de celui-ci à l'intérieur de la découpe (74).

4. Appareil d'arrêt selon l'une quelconque des revendications précédentes, caractérisé en ce

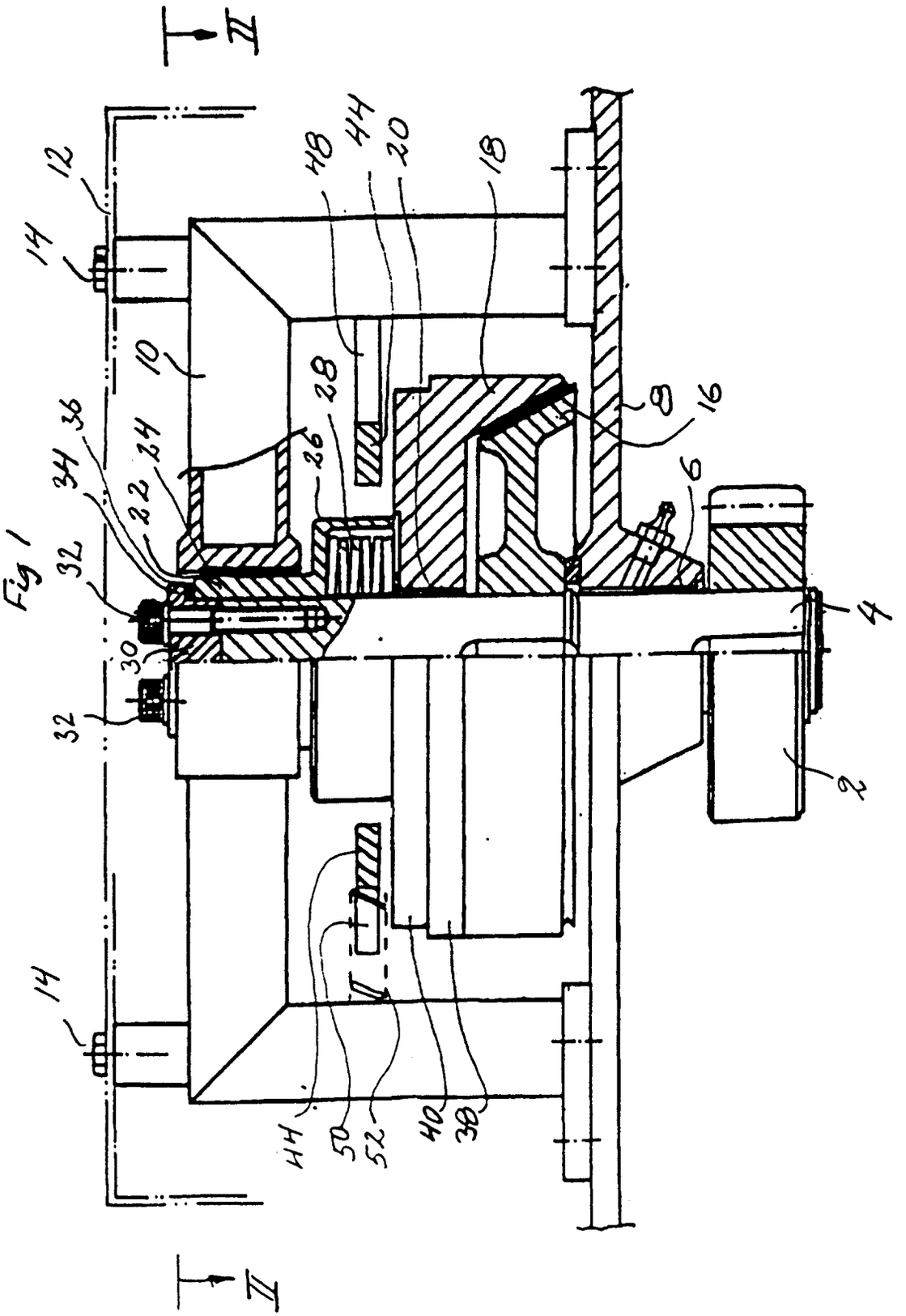
qu'une partie (56) de l'élément de blocage suspendu en pivotement (54), qui est prévue pour coopérer avec la butée (42) située sur le second élément de friction (18) est amenée, par un mécanisme de came (38, 60) agissant entre l'élément de blocage (54) et le second élément de friction (18), de façon élastique à l'extérieur du trajet de déplacement de la butée mentionnée en dernier (42) pour des vitesses de l'arbre (4) qui se trouvent en-dessous de la vitesse limite, ledit mécanisme à came (38, 60), lorsque la vitesse limite est atteinte, étant amené hors-service sous l'action de l'inertie.

5. Appareil d'arrêt selon l'une quelconque des revendications précédentes, caractérisé en ce que l'élément de blocage suspendu en pivotement (54) est également suspendu en vue d'un mouvement de pivotement en superposition avec le mouvement de pivotement, autour d'un axe (53) disposé entre les parties de l'élément de blocage (54) prévu en vue de la coopération avec les butées (42, 74).

6. Appareil d'arrêt selon l'une quelconque des revendications précédentes, caractérisé en ce que le second élément de friction (18) comporte un profil en forme de dents de scie, sur lequel chaque dent (42) constitue une butée destinée à coopérer avec l'élément de blocage suspendu en pivotement (54).

7. Appareil d'arrêt selon les revendications 4, 5 et 6, caractérisé en ce que le mécanisme de came (38, 60) comporte un galet suiveur de came (60) porté par l'élément de blocage suspendu en pivotement et, sur le côté de l'axe de pivotement (53) de l'élément de blocage (54), qui se trouve écarté par rapport au côté de l'élément de blocage (54) prévu pour coopérer avec la butée (42) du second élément de friction (18), étant sollicité par un ressort (62) vers une came périphérique comportant des coins multiples (38) sur le second élément de friction (18), ladite surface de came (38) comportant autant de coins qu'il y a de dents dans le profil en dents de scie, chaque dent (42) étant disposée entre deux coins de la surface de came (38) et le ressort (62) étant dimensionné de telle sorte que, pour des vitesses dépassant la vitesse limite, il ne soit pas susceptible de maintenir le galet suiveur de came (60) en coopération avec les parties de la surface de came s'étendant entre les coins de la surface de came (38) dont il résulte que l'élément de blocage (54) prévu pour coopérer avec les dents (42) du second élément de friction (18) est amené dans le trajet de déplacement desdites dents.

8. Appareil d'arrêt selon l'une quelconque des revendications précédentes, caractérisé en ce que le mouvement pendulaire est amorti (52).


II
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II

Fig 1
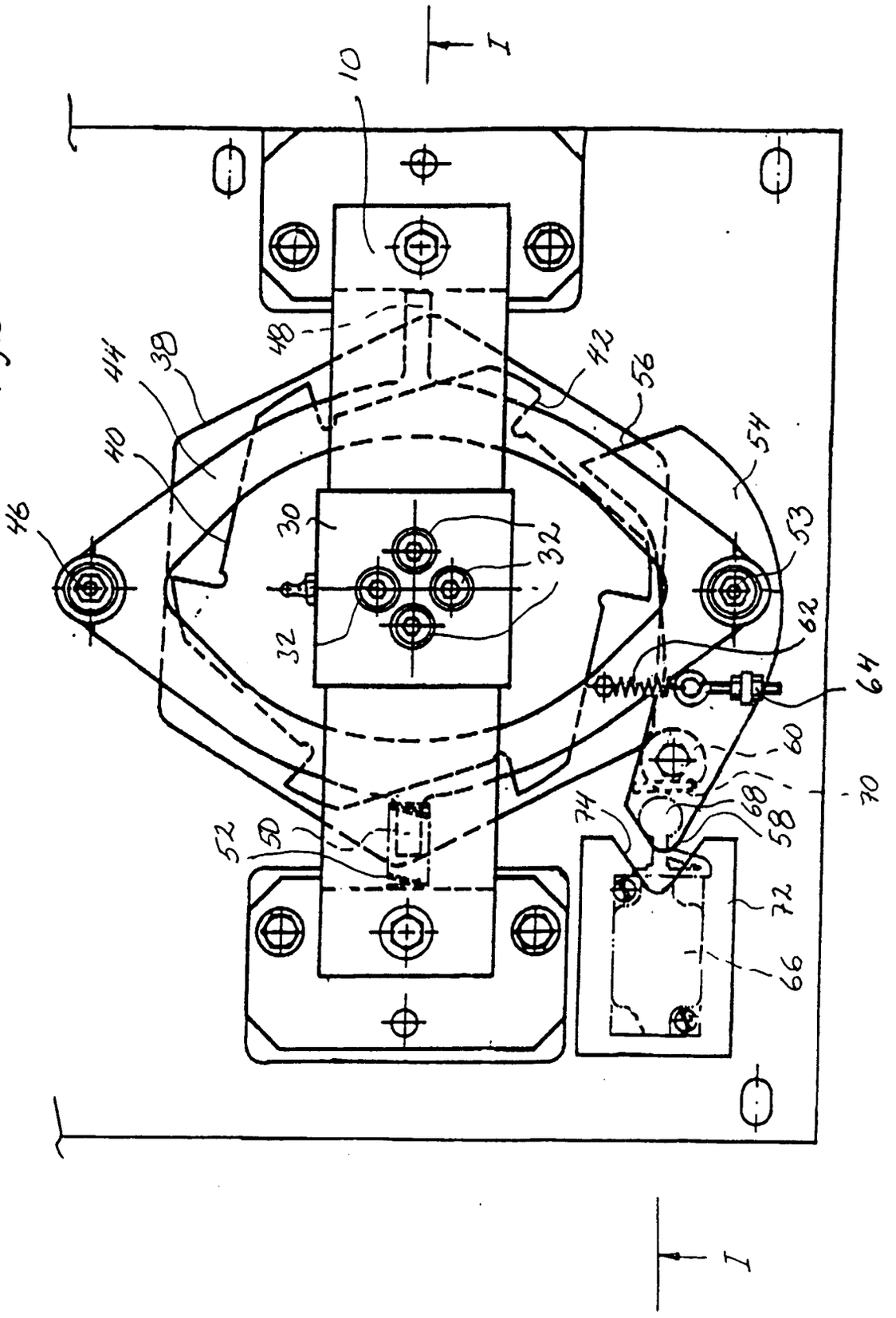
Fig 2