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(71) Applicant: **Pitney Bowes Technologies GmbH**
61169 Friedberg (DE)

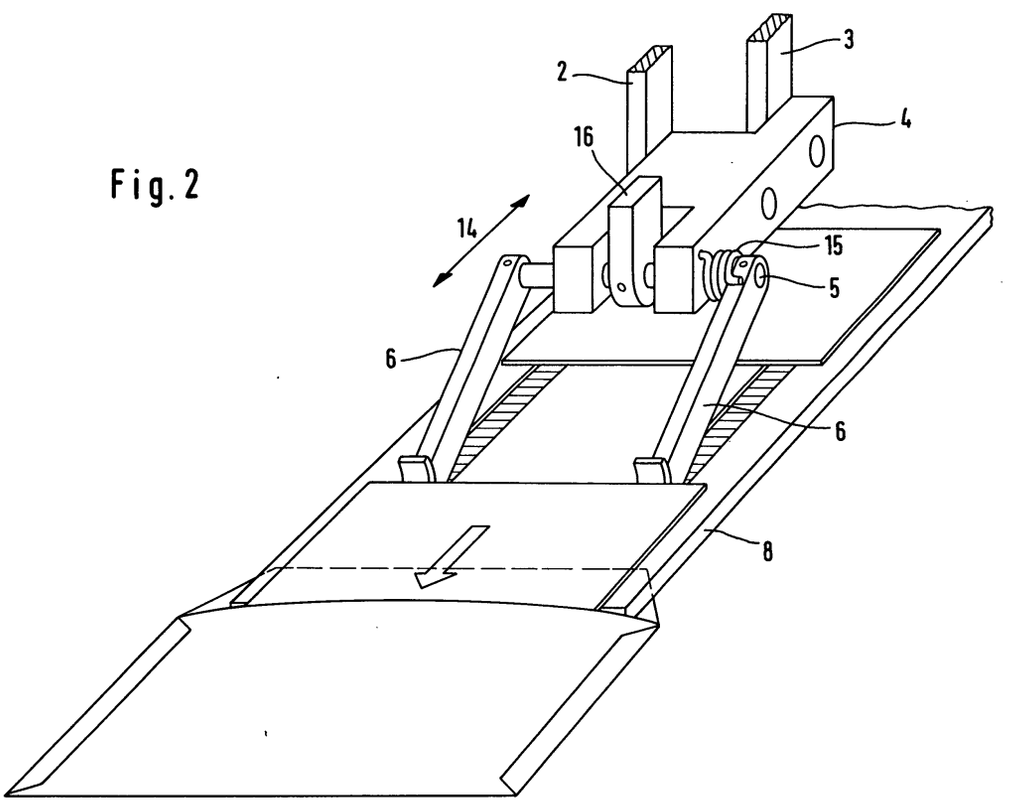
(72) Inventor: **Sting, Martin, Dr.**
61118 Bad Vilbel (DE)

(74) Representative: **Kuhnen & Wacker**
Patentanwaltsgesellschaft mbH,
Prinz-Ludwig-Strasse 40A
85354 Freising (DE)

(54) Envelope-filling machine

(57) In an envelope-filling machine having a push-in-finger carrier (4) being provided in a push-in arrangement (1 to 6) and carrying out reciprocating strokes, jumping of the push-in-fingers (6) at high operating speeds is avoided by coupling an addition-mass body (16) coupled to the push-in-finger or to each one of the push-in-fingers, said addition-mass body being effecitve in relation to the pivot axis (5) of said push-in fingers and has the effect that the common gravity center of the push-in fingers and of the addition-mass body or the addition-mass bodies is located at least near said pivot axis (5).

Fig. 2



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Description

[0001] The invention relates to an envelope-filling machine with an envelope-filling table according to the preamble of Claim 1.

[0002] The push-in-finger carrier may be the bottom end of a pivoting lever which is mounted at its top end such that it can be pivoted at a certain height above the level of the envelope-filling table and which is made to move back and forth by means of a crank drive. It is also possible for the push-in-finger carrier, in another design of the push-in arrangement, to be provided on an arrangement of circulating chains with horizontal chain sections. Finally, it is possible for the push-in-finger carrier, in a very expedient design of the push-in arrangement, to form a link of a three-link mechanism in the case of which the spacings between the articulation connections and the position of the pivot bearings of the top ends of two links are selected such that the free end of the link which forms the push-in-finger carrier, said end projecting in the push-in direction, is moved over the envelope-filling table approximately horizontally at a distance therefrom (DE 199 13 638 C1).

[0003] In the case of known envelope-filling machines of this type, a guide contact lever is fastened on the common pivoting spindle of the push-in fingers, said guide contact lever bearing a guide contact roller at its outer end. As the push-in-finger carrier moves back and forth, the contact roller follows a guide, in contact therewith, such that, in the operating stroke of the push-in-finger carrier, the push-in fingers slide over the surface of the envelope-filling table under spring prestressing and the push-in-finger ends position themselves against the trailing edges of enclosures or sets of enclosures which are to be pushed in, whereas, in the return stroke of the push-in-finger carrier, the push-in fingers are raised off from the envelope-filling table and are thus guided over the next-following enclosure or the next-following set of enclosures at a vertical distance therefrom.

[0004] In particular when an envelope-filling-machine design which has the enclosures or sets of enclosures which are to be introduced into envelopes conveyed up by the conveying arrangement in a direction which coincides with the push-in direction is selected, it would be quite possible, rather than the pivoting movements of the push-in fingers about their pivoting spindle being controlled by guides or produced by means of drives, for the push-in fingers merely to be provided with slight spring prestressing in the direction of the surface of the envelope-filling table such that, in the push-in operating cycle, the bottom ends of the push-in fingers are retained on the surface of the envelope-filling table, whereas, in the return cycle, the bottom ends of the push-in fingers, counter to the spring prestressing, run up the leading edges of the next following enclosures or sets of enclosures and then slide over the surface of these enclosures or sets of enclosures until they drop back onto the envelope-filling table behind the trailing edge of the enclosures or sets of enclosures, whereupon the next push-in operating cycle can be carried out.

[0005] It has been found, however, that, in the case of high cycle speeds, the push-in fingers are subjected to high negative or positive accelerations predominantly at the end of the push-in operating cycle and at the beginning of the return cycle, respectively, these accelerations resulting in undesirable pivoting movements of the push-in fingers and thus in the push-in fingers, as it were, jumping. If it is intended to counteract these undesirable pivoting movements of the push-in fingers by increasing the spring prestressing of the bottom ends of the push-in fingers against the surface of the envelope-filling table, then it is no longer possible for the bottom ends of the push-fingers to be guided over the respectively next-following enclosures or sets of enclosures without disruption. Rather, there is then a risk of the enclosures or sets of enclosures being thrown up or of marks being formed.

[0006] DE 197 34 205 A1 describes an arrangement for directing and holding down sheets on sheet stacks, the mass moment of inertia of a double-armed holding-down lever being kept as small as possible for the purpose of achieving a certain independence between the operation of the holding-down lever and the cycle speed by a weight being fastened on a leg of the lever which is located at a angle to an operating leg of the lever, said weight making it possible to adjust a certain position of the resulting centre of gravity of the lever as a whole.

[0007] The invention is intended to achieve the object of designing an envelope-filling machine of the general type described in the introduction such that the design of the push-in arrangement can be simplified and high operating speeds are made possible.

[0008] This object is achieved according to the invention by an envelope-filling machine having the features according to Patent Claim 1.

[0009] The common centre of gravity of the push-in fingers, which are coupled to one another in a fixed manner, and of the additional-mass element or of the associated additional-mass elements is preferably positioned on the pivoting spindle or at least in the vicinity of the pivoting spindle.

[0010] Advantageous configurations and developments are also characterized in the patent claims subordinate to the attached Claim 1.

[0011] Preferred embodiments will now be explained in more detail with reference to the drawings, in which:

Figure 1 shows a schematic drawing of a push-in arrangement of a known envelope-filling machine with a speed/distance diagram and/or force-distance diagram for explaining in qualitative terms the processes in the push-in operating cycle and in the return cycle;

Figure 2 shows a schematic perspective view of part of the push-in arrangement of an envelope-

filling machine of the type specified here; and

Figure 3 shows a side view, depicted partially in section, of a detail of the pushin arrangement according to a modified embodiment.

[0012] The push-in arrangement, which is outlined in Figure 1 by chain-dotted lines, contains a three-link mechanism 1 with two links 2 and 3, which are mounted at their top ends such that they can be pivoted on a housing, and with a third link 4, which is connected pivotably to the bottom ends of said links 2 and 3 and forms a push-in-finger carrier. Push-in fingers 6 are mounted at the free end of the link 4, via a pivoting spindle 5, only one of these push-in fingers 6 being visible in the viewing direction selected in Figure 1. Guide contact systems which interact with the push-in fingers 6 and are intended for actuating the push-in fingers 6, as are provided in conventional envelope-filling machines of this type, have been omitted from the push-in station indicated in Figure 1.

[0013] If, following completion of the push-in operating cycle, the push-in-finger carrier 4 is accelerated from left to right, in relation to the illustration of Figure 1, by a drive (not shown) in order to carry out its return cycle, then the speed profile over the return distance R may be given, for example, by the curve 7 (negative speed values during movement counter to the push-in direction). In the acceleration phase, the centre of gravity S of a push-in finger 6 is subjected to forces of inertia in horizontal direction, the relevant force being indicated by the arrow H. This force can be broken down into a component E, running in the longitudinal direction of the push-in finger 6, and a component D, perpendicular to E. The component D subjects the lever arm, corresponding to the distance between the pivoting spindle 5 and the centre of gravity S, to a torque which strives to pivot the push-in finger 6 upwards about the pivoting spindle 5 and to raise the bottom end of the push-in finger up from the envelope-filling table 8.

[0014] When the push-in-finger carrier 4 arrives in the left-hand position in Figure 1 at the end of a push-in operating cycle, which may be carried out with the speed profile corresponding to the curve 9, the deceleration of the push-in fingers 6 results in corresponding processes taking place, in which case a force-of-inertia component D again produces a torque which forces the push-in finger 6 about the pivoting spindle 5 in the clockwise direction and tries to raise the push-in finger 6 off from the envelope-filling table 8. The torque profile in dependence on the distance of the centre of gravity S over the envelope-filling table 8 is depicted in qualitative terms for the end of the push-in operating cycle and for the beginning of the return cycle by the dashed lines 10 and 11, which are of essentially the same profile. At the end of the return cycle and at the start of the push-in operating cycle, forces of inertia act on the centre of gravity S of the push-in fingers 6 in an analogous manner, although in this case the forces of inertia are oriented counter to the push-in direction in each case and the torque produced by the component D now strives to force the bottom ends of the push-in fingers to a pronounced extent against the surface of the envelope-filling table 8. The profile of this additional contact-pressure torque in qualitative terms is indicated on the right-hand side of Figure 1 by the curves 12 and 13.

[0015] Up to a certain level of deceleration and of acceleration at the end of the push-in operating cycle and at the beginning of the return cycle, respectively, it is only the dead weight of the push-in fingers 6 which is capable of counteracting the torque which is produced by the forces of inertia and tries to swing the push-in fingers 6 up. If, however, the decelerating values and/or the accelerating values increase, then it is necessary to provide guide means and, if appropriate, also spring means which retain the outer ends of the push-in fingers on the surface of the envelope-filling table at least at the end of the push-in operating cycle.

[0016] The invention, however, achieves the situation where, even in the case of very high cycle frequencies and correspondingly high deceleration values and/or acceleration values at the end of the push-in operating cycle and at the beginning of the return cycle, respectively, there are no undesirably high torques which strive to cause the push-in fingers 6 to pivot in an uncontrolled manner.

[0017] Figure 2, in turn, shows the push-in-finger carrier 4, which is guided pivotably on links 2 and 3 and of which the front end, which is forked and serves for mounting the pivoting spindle 5, is guided essentially rectilinearly over the surface of the envelope-filling table 8 in the direction of the double arrow 14 and is made to move back and forth by a drive (not depicted).

[0018] Two push-in fingers 6 are fastened on the pivoting spindle 5 and are prestressed in the direction of the envelope-filling table 8 by a helical spring 15, which wraps around the pivoting spindle 5 and is supported on the push-in-finger carrier 4, on the one hand, and one of the push-in fingers 6, on the other hand.

[0019] Fastened on the pivoting spindle 5 in the region between the fork legs of the push-in-finger carrier 4 is an additional-mass element 16 which, essentially in all the operating phases, is positioned in the upward direction in the manner illustrated. The centre of gravity of the additional-mass element 16 is located approximately vertically above the pivoting spindle 5. The mass of the additional-mass element 16 is selected such that the common centre of gravity of the two push-in fingers 6, which are fastened on the pivoting spindle 5, and of the additional-mass element 16 is essentially positioned on the pivoting spindle 5 of the push-in fingers, which means that pronounced accelerations and decelerations of the push-in finger carrier 4 do not result in torques which try to rotate the entire system comprising the push-in fingers 6, the pivoting spindle 5 and the ad-

ditional-mass element 16. The helical prestressing spring 15 may thus be of comparatively soft configuration such that the bottom ends of the push-in fingers 6, as they run up the leading edge of a set of enclosures which is to be pushed in, do not throw up or damage the latter.

[0020] Figure 3 shows an embodiment of an envelope-filling machine with a push-in arrangement in the case of which push-in fingers 6, which are mounted on the push-in-finger carrier 4 such that they can be pivoted via the pivoting spindle 5, are each formed integrally with an associated additional-mass element 16a. The common centre of gravity of each push-in finger 6 and the associated additional-mass element 16a is located approximately on the geometrical axis of the pivoting spindle 5. Since that part of each push-in finger 6 which extends from the pivoting spindle 5 to the bottom end of the push-in finger is designed with a very low mass and is provided with corresponding recesses or through-passes (indicated at 17 in Figure 3), it is possible for the additional-mass element 16a, which projects upwards from the pivoting spindle 5, to be of comparatively small and/or short design. Of course, the same also applies to the configuration of the push-in fingers 6 and of the common additional-mass element 16 in the embodiment according to Figure 2.

[0021] It should also be mentioned that, when an operating cycle of the conveying arrangement for feeding the enclosures or sets of enclosures is coordinated in a particular way with the operating cycle of the push-in arrangement, it is also possible for the envelope-filling machine proposed here to be designed such that the direction in which the enclosures or sets of enclosures are fed onto the envelope-filling table 8 is oriented perpendicularly to the push-in direction. For this purpose, it is necessary for the feeding operation to be carried out, for example, when the push-in fingers 6 are nearing the end of the push-in operating cycle and the bottom ends of the push-in fingers have thus freed the feeding path for the next-following enclosure or the next-following set of enclosures on the envelope-filling table 8.

Claims

1. Envelope-filling machine with an envelope-filling table (8) on which enclosures or sets of enclosures are transported by means of a conveying arrangement and from which the enclosures or sets of enclosures are pushed, by means of a push-in arrangement (1 to 6), into envelopes which are held ready in an open state, it being the case that the push-in arrangement has a push-in-finger carrier (4) which can be moved by means of a reciprocating drive and on which push-in fingers (6) are mounted such that they can be pivoted about a pivoting spindle (5), the free ends of said push-in fingers, in the push-in operating cycle, sliding over the surface of the envelope-filling table and positioning themselves against the trailing border of the enclosures or sets of enclosures which are to be pushed in and, at least in one section of the return cycle, moving over the surface of the respectively next-following enclosure or of the respectively next-following set of enclosures, **characterized in that** the pivoting movements of the push-in fingers (6) about their pivoting spindle (5) are neither guide-controlled nor drive-controlled, and **in that** there is coupled to the push-in fingers (6) an additional-mass element (16; 16a), or a respective additional-mass element (16; 16a), which acts in relation to the pivoting spindle (5) and of which the centre of gravity is positioned in relation to the pivoting spindle (5) such that positive or negative accelerations of the pivoting spindle (5) in a direction parallel to the push-in direction cause an additional torque, about the pivoting spindle (5), which acts on the push-in fingers (6), the centre of gravity of the additional-mass element (16, 16a) and the centre of gravity of the push-in fingers (6) being located opposite one another in relation to the pivoting spindle (5), as seen in the direction perpendicular to the surface of the envelope-filling table.

2. Envelope-filling machine according to Claim 1, **characterized in that** the common centre of gravity of the push-in fingers (6), which are coupled to one another in a fixed manner, and of the additional-mass element (16, 16a) is positioned on the pivoting spindle (5) or at least in the vicinity of the pivoting spindle (5).

3. Envelope-filling machine according to Claim 1 or 2, **characterized in that** spring-prestressing means (15) are provided between the push-in-finger carrier (4) and the push-in fingers (6) in order to prestress the free ends of the push-in fingers against the envelope-filling table (8).

4. Envelope-filling machine according to one of Claims 1 to 3, **characterized in that** the push-in fingers (6) are fastened on a common spindle (5), on which the additional-mass element (16), which is provided jointly for the push-in fingers (6), is also fastened.

5. Envelope-filling machine according to one of Claims 1 to 3, **characterized in that** the push-in fingers (6) are each provided at the top end with an associated additional-mass element (16a) which is formed integrally with the respective push-in finger (6).

6. Envelope-filling machine according to one of Claims 1 to 5, **characterized in that** the enclosures or sets of enclosures are fed by the feeding arrange-

ment in the direction of the push-in movement of the push-in arrangement.

7. Envelope-filling machine according to one of Claims 1 to 5, **characterized in that** the enclosures or sets of enclosures are fed by the feeding arrangement perpendicularly to the push-in direction of the push-in arrangement.

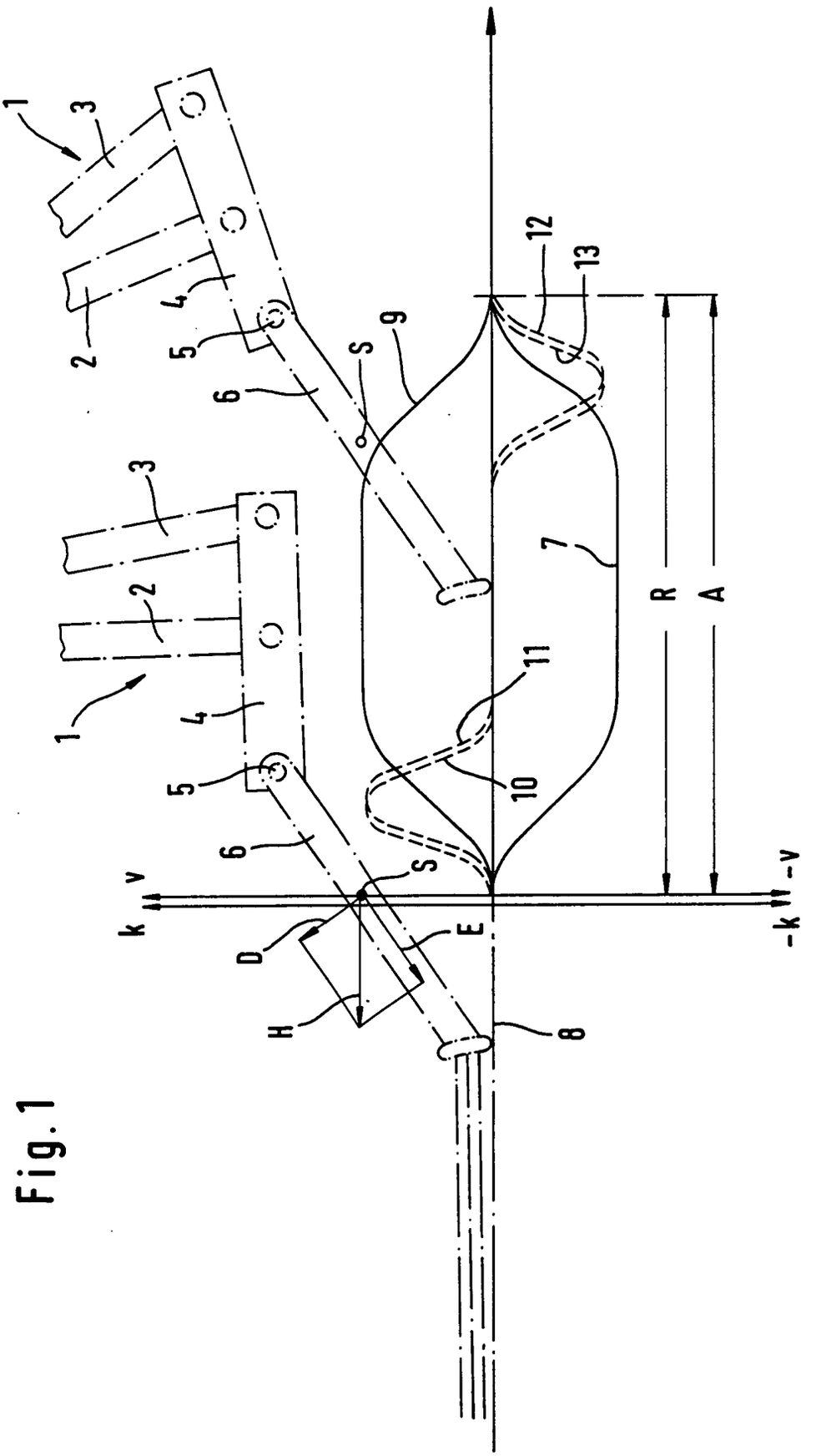

Fig. 1

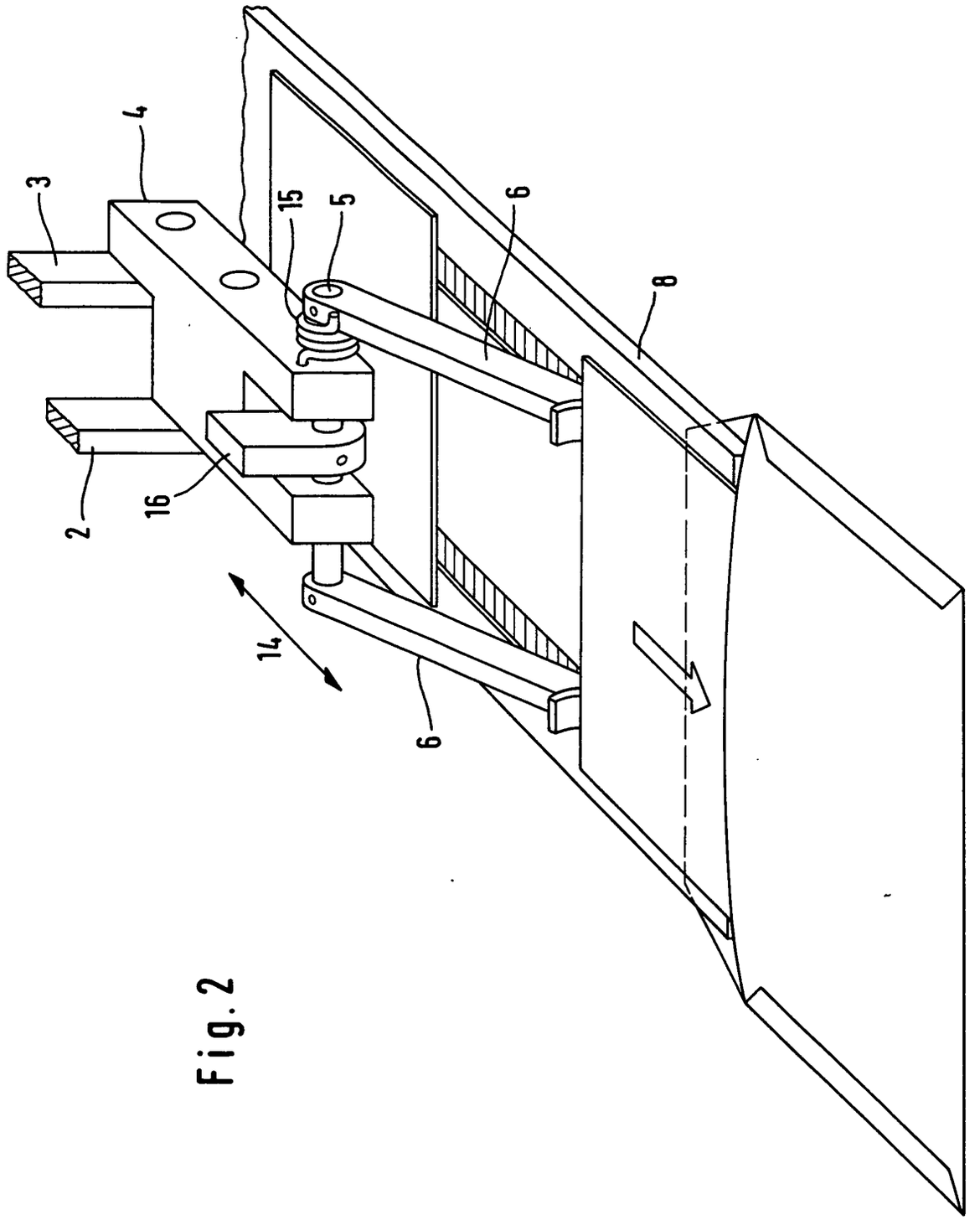

Fig. 2

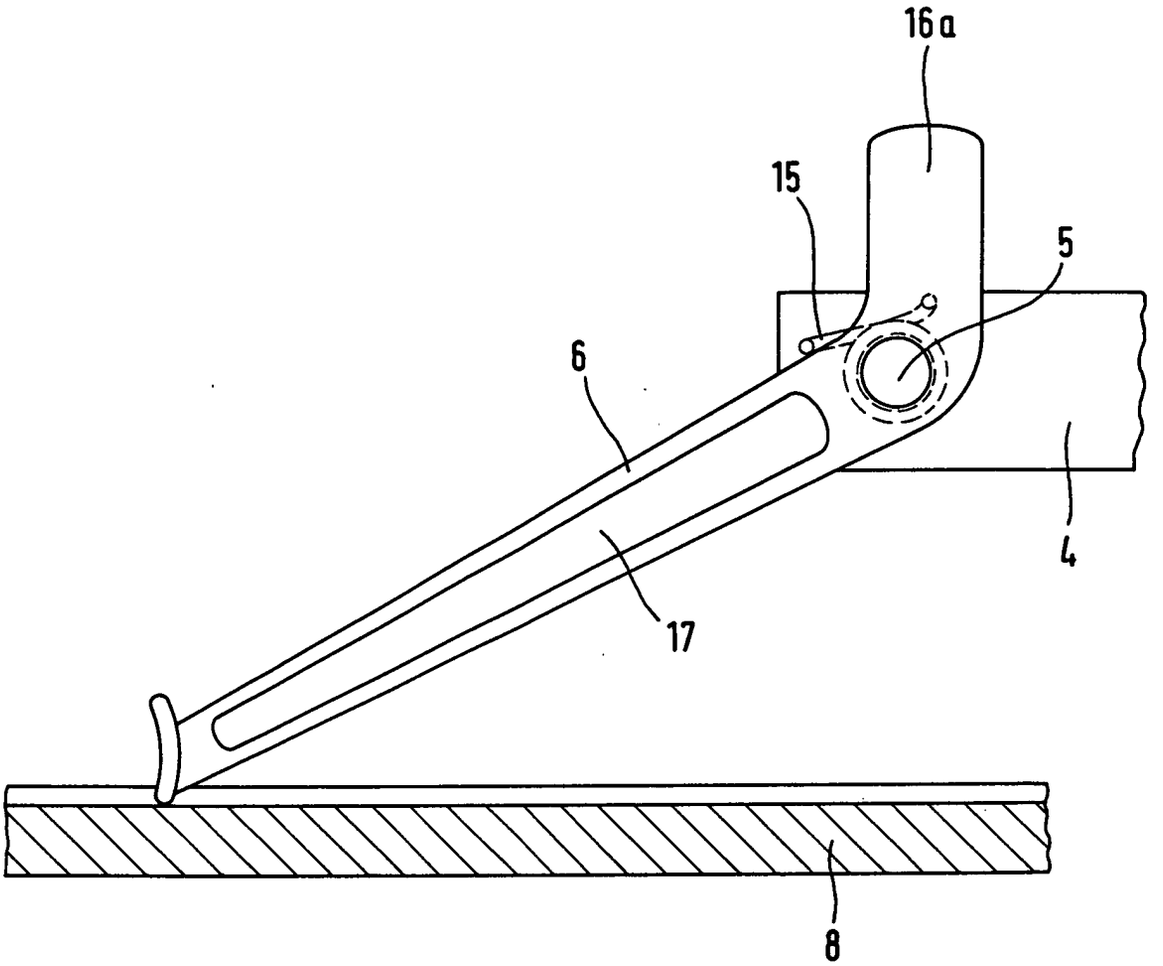

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 02 00 9808

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.7)
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A	WO 99 65707 A (BEEL & HOWELL) 23 December 1999 (1999-12-23) * abstract; figures *	1	
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TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B43M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	6 August 2002	Perney, Y

CATEGORY OF CITED DOCUMENTS

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