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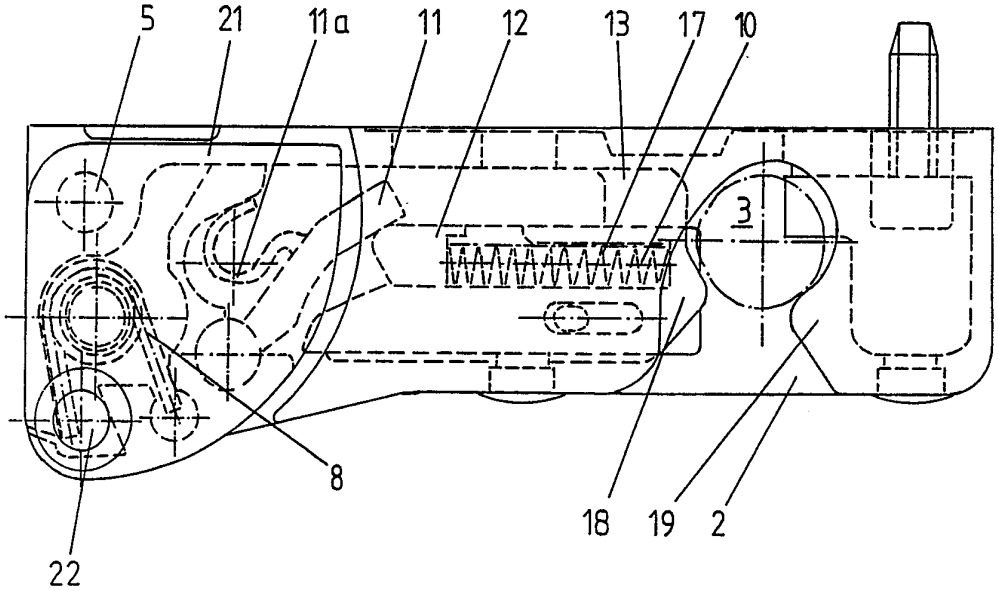
(54) Title: A HINGE FOR FRENCH DOORS IN A REFRIGERATOR



(57) Abstract

The invention relates to a hinge for French doors in a refrigerator. The problem involved in a hinge of this type is that the opposite doors without an intermediate support should open with a yielding movement so that the seals of the doors will not rub against each other. The hinge according to the invention makes such a movement possible and is at the same time strong and small-dimensioned, and it makes possible a rapid opening movement and a rapid enhanced closing movement. The hinge comprises a notch (2) and a roller (3) working in conjunction with each other in order to produce a guided lateral movement. The notch is located in the hinge frame (1) and the roller at the upper or lower edge of the door. The hinge additionally has a spring-loaded slide (9) which receives its reciprocating movement from the roller and a slide-guided locking member (11) for locking the hinge in the lateral direction while the door is being pivoted freely.

* See back of page

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A hinge for French doors in a refrigerator

The present invention relates to a hinge for French doors in a refrigerator. More precisely, the invention relates to a hinge according to the preamble of Claim 1.

In a refrigerator, as in a window structure, French doors are opposite doors covering the opening, without a post between them. In connection with a refrigerator this means that the inside vertical edges of the doors must seal effectively against each other. The seals of the doors must not rub against each other during the opening of both of the doors, or only one of the doors. Rubbing would cause wear of the seals and would make the opening of the doors more difficult.

For this reason, the doors must open with a yielding movement, i.e. with a movement taking place simultaneously both outward and laterally, and not with the conventional movement taking place along the arc of a circle. In this case the seal surfaces will not rub against each other.

In addition, the hinge should be of small dimensions and in particular such that the hinge will not protrude beyond the side-wall plane. The hinge should be easy to use and reliable in such a manner that the door will open and close easily and, beyond a certain angle of opening, it will remain open by itself and, respectively, will close rapidly when the opening angle has reached a sufficiently small angle. In addition, the hinge should be durable, allowing the door to be opened completely, i.e. through almost 270°.

There is available in the market today a hinge used in French doors in a refrigerator. This hinge is a relatively large-sized structure and therefore esthetically poor. It extends in the lateral direction of the refrigerator beyond the plane of

the side wall and also protrudes from the frontal plane of the refrigerator. The yielding movement, i.e. the lateral component of the movement, is effected with the aid of a notch in the swiveling part of the hinge so that the notch will guide the path of movement of the door, a guide roller in the hinge frame sliding in this notch. The swiveling part turns about a pin which is at the end of an arm attached to a spring.

In addition to the prior-art hinge being large-sized and protruding beyond the dimensions of the refrigerator, its path of movement is limited. The door opens at maximum through only approx. 110°. Also, the hinge structure is weak, since the weight of the door strains the said spring and for this reason clunks during opening when the doors are loaded. If the spring breaks, the hinge will be unserviceable.

The object of the present invention is to provide for French doors in a refrigerator a hinge from which the above disadvantages have been eliminated.

This is achieved with the hinge structure according to the invention, the principal characteristics of which are given in the characterizing clause of the accompanying patent claim.

The hinge structure according to the invention is small-dimensioned and esthetically pleasing. When installed in place it does not protrude beyond the side plane or the frontal plane of the refrigerator. It is strong and enables the doors to be opened through an angle ranging from 0 to 270° without the hinge giving in, or yielding, and thereby straining the structure. The hinge is easy to open and close. The first, primarily lateral opening phase is rapid. After the first opening phase the hinge is stationary and the door pivots only about the hinge pin. The last, primarily lateral closing phase occurs rapidly with the additional effect produced by the spring. The opposite door remains closed, if so desired, while

one door is being opened.

The hinge according to the invention is described below in the form of a preferred embodiment, with reference to the accompanying drawings, in which:

Figure 1 depicts a top plan view of the hinge frame for the lower edge of the door,
Figure 2 depicts, from the side turning to face the hinge frame, the swiveling part which attaches the door and constitutes part of the hinge frame depicted in Figure 1,
Figure 3 depicts the hinge parts depicted in Figure 1 and Figure 2, interconnected in the operating position,
Figure 4 depicts a front view of the combination according to Figure 3,
Figure 5 depicts the frame and swiveling part of a hinge for the upper edge of the door, interconnected in the operating position,
Figures 6a, 6b and 6c depict a hinge according to Figure 3, attached to the lower edge of a door, in operation, i.e. a) in the closed position, b) slightly before the extreme position of the phase of lateral movement, and c) with the lateral movement locked, the door opening freely,
Figure 7 depicts a separate latch part made of thermosetting plastic, and
Figure 8 depicts a separate slide made of thermosetting plastic.

In all the figures the corresponding parts are indicated by the same reference numerals. The frame and swiveling part of the hinge are preferably made of a pressure-casting mix and the separate parts, such as the latch, the slide and the roller, of thermosetting plastic.

The frame of the lower-edge hinge, depicted in Figure 1, is indicated by reference numeral 1. The notch which renders to

the roller in the door a lateral component of movement is indicated by numeral 2. The said roller is indicated by 3. The pin 6 of the swiveling part 21 is fitted in a hole 5 in the hinge frame and serves as the pivot axis for the swiveling part. The P-shaped groove 7 in the frame is intended for receiving the load-lightening spring 8 of the hinge. The frame has a lower surface and an upper surface, between which the notch 2 is formed. In the end receiving the swiveling part there is only the lower surface, the swiveling part forming a surface in the same plane as the upper surface. The swiveling part is attached to the frame by means of the pin 6 and to the door by means of a pin 22. The maximum dimensions of the assembled hinge are: approx. 35 mm deep, approx. 105 mm wide, and approx. 17.5 mm high. In the height dimension, the attaching height of the attaching wall makes up approx. 4.5 mm.

The hinge structure has as its essential parts a separate slide 9 and a spring 10 acting on it, as well as a latch 11 with its spring 11a. The slide 9 is in a location fitted in the lower surface of the frame, between one of the vertical walls and the guides 12 and 13 opposite that wall, and is capable of reciprocating in its own longitudinal direction, guided by the guides. The lower surface of the frame also has a pin 14, which serves as a limiter and mates with an opening 15 in the slide. The latch 11 with its spring is located in the swiveling part 21, in the vertical partition wall 16 of which there is a notch corresponding to the latch end and a concave arch corresponding to the spring 11a of the latch. The slide has a bore 17, parallel to the direction of movement of the slide, into which bore one end of the spring 10 loading the slide is fitted. The length and rigidity of the spring have been adjusted so that the spring will be compress between the slide bore 17 and the stop 12 meeting the other end of the spring. The other end of the latch has been fitted to extend, in the closed position of the door, somewhat beyond the said stop 12; see Figures 3 and 6a. In the closed position of the

door the roller 3 at the lower edge of the door is in the notch 2. That end 18 of the slide which faces the notch is cam-shaped and protrudes in the closed position of the door so much into the notch area that the roller 3 will touch the oblique surface inside the cam. Simultaneously the roller 3 will touch the opposite wall of the notch 2, which wall forms another cam 19, but in the opposite direction.

When the door is being opened and the roller 3 draws outward in the notch 2, the cam 19 will force the roller to move in the lateral direction; in Figures 3 and 4 to the left. Thereupon the roller 3 for its part will force the slide end 18 to move likewise to the left, thereby compressing the spring 10. The opposite slide end 20, which is a cam delimited by a straight line and an arc, will gradually meet the arm of the latch 11 and detach the latch from its contact with the stop 12 against the spring force of the spring 11a. Simultaneously the swiveling part 21 will swivel somewhat outward in the lateral direction along with the door movement; see Figures 6a-6c. When the roller 3 is at the peak 19 of the cam of the frame and simultaneously presses the slide at the peak 18 of its cam, the front end 20 of the slide has detached the latch end from the stop 12; Figure 6b. When the door moves still more, the roller 3 will move along the surface subsequent to the cam 19 and will pass the slide peak 18, whereupon the slide is pushed to the right by the action of the spring 10. At the same time the end of the latch will move to the stop 12, the slide having been pushed out of the way, i.e. to the right in Figure 6c, under the action of the spring force of the spring 11a. In this position the latch locks the lateral movement of the hinge, and the door will open freely about the pin 22. From phase 6a to phase 6b the door has opened through only a few degrees, but has at the same time moved laterally approx. 3-4 mm. Thus the most important objective of the invention has been achieved, i.e. the opening of the door in a yielding fashion so that the seals of the door will not rub

against each other. By the time of phase 6c, the door has opened slightly more, primarily with respect to the opening angle, and the slide 9 has moved to behind the roller 3 in the notch 2, and the latch 11 is locked against the stop 12. Thereafter the door will pivot about the pin 22 and the swiveling part 21 is propped in a stationary state through the action of the latch 11 bearing on the stop 12. Thus the hinge structure will not yield when the door moves. For this reason the hinge is very durable. Thus another important objective of the invention has been achieved.

The door is free to open through up to 270°, and owing to the said latch solution, moving even a heavily loaded door within the opening range 0 - 270° will not strain the hinge detrimentally. When the door is being closed after having been opened, the following will occur when the roller 3 arrives in the notch 2. The slide 9 will be pushed to the left (from the situation of Figure 6c), the front end 20 of the slide sliding along the shaped arm of the latch. When the roller is at the cam peaks 18 and 19, the slide has detached the latch end from the stop 12 by pushing, whereupon the swiveling part is free to pivot counterclockwise under the effect of the closing movement. The closing movement is enhanced and sped up by the slide 9, which pushes out to behind the roller and closes the door in a moment, thereby increasing the closing force. The rapid closing is also promoted by the magnet generally used in the seals. The closing, of course, takes place primarily from the side, as does the opening, and so no rubbing of the seals will occur in connection with the closing.

The spring 8 depicted in Figure 3 is used only in the lower hinge of the door, where the weight of the door loads the hinge. It is intended for lightening the load, but is not indispensable. It is not used in the upper hinge of the door, as is evident from Figure 5.

The lower and upper hinges function in principle in exactly the same manner. However, there are nonessential additional differences between their structures, mainly owing to their different locations. The openings in the upper and lower surfaces of the hinge are covered with cover plates. Figure 5 depicts a limiter plate 23, which is fastened to the swiveling part by means of a screw. The cover plate 24, covering the latch, the slide and the spring, is attached to the frame by means of a screw.

Blameless functioning of the hinge requires high precision in the design of not only the notch but also of the latch, the latch spring and both ends of the slide. This can be defined in the main geometrically. Figures 3 and 5 show that the guiding edge of the notch 2 may be of a different shape at the mouth opening; in one hinge the angle is sharper, in the other more gentle. The figures depicting the notch 2 also show that its outlines are made up of circle arcs of various sizes. In addition, the resilience of the latch and the rigidity of the spring 10 affect the functioning.

It is clear that the details of the hinge structure can be varied within the art. What is essential is the forced lateral movement caused by the roller, the bearing of the swiveling part of the hinge against the stop in order to receive loads, and the enhancing of the closing movement by means of a rapid slide movement. The embodiment depicted above provides an advantageous example of how this can be accomplished.

Claims

1. A hinge for French doors in a refrigerator, the hinge comprising a frame (1) which is attached to the cabinet part of the refrigerator and a swiveling part (21) which is pivotally attached to the hinge frame and serves as the hinge pin of the door, and furthermore a notch (2) and a roller (3) working in conjunction with each other in order to cause a force-guided lateral movement, **characterized** in that the notch (2) is located in the hinge frame (1) and the roller (3) is located at the upper or respectively lower edge of the door; that the hinge also has a spring-loaded slide (9) which receives its reciprocating movement from the said roller, and a locking member (11) guided by the slide.

2. A hinge according to Claim 1, **characterized** in that at one end of the slide (9) there is a cam (18) which extends into the notch (2), to the area of influence of the roller (3).

3. A hinge according to Claim 1 or 2, **characterized** in that that end (20) of the slide (9) which is farther away from the notch (2) is fitted to act on the locking member (11) in the in-pushed state of the slide, thereby promoting the closing of the door and increasing the closing force.

4. A hinge according to any of the above claims, **characterized** in that the locking member is made up of a latch (11) fitted pivotally to the swiveling part (21) of the hinge, the latch having a spring (11a) which bears on the swiveling part, and that the latch can be moved against a fixed stop (12) in order to lock the lateral movement of the hinge while the door is turned freely.

5. A hinge according to Claim 4, **characterized** in that the spring (11a) is a hook-shaped member which is integral with the latch (11).

6. Means according to any of the above claims, **characterized** in that there is a load-lightening spring (8) fitted between the swiveling part (21) and the frame (1).

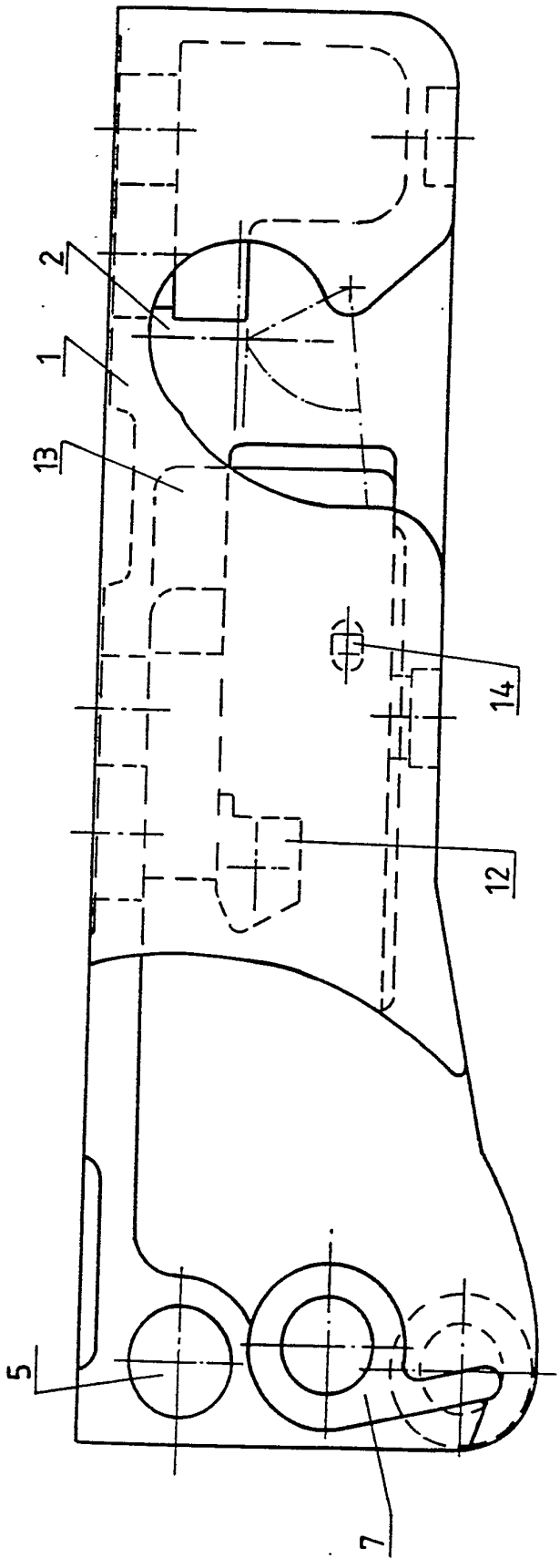

FIG. 1

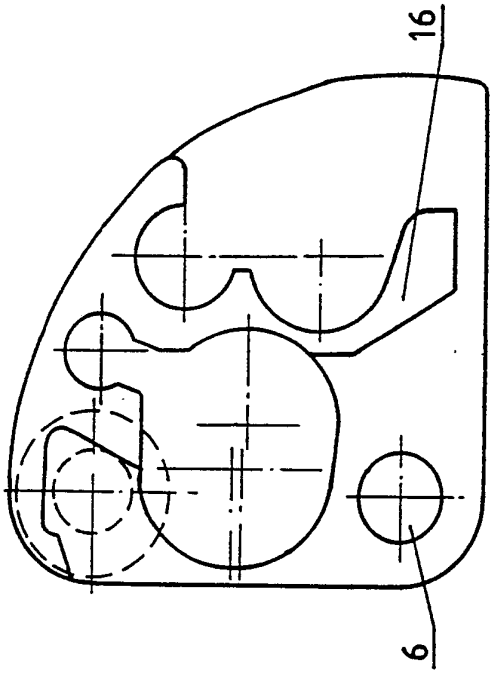

FIG. 2

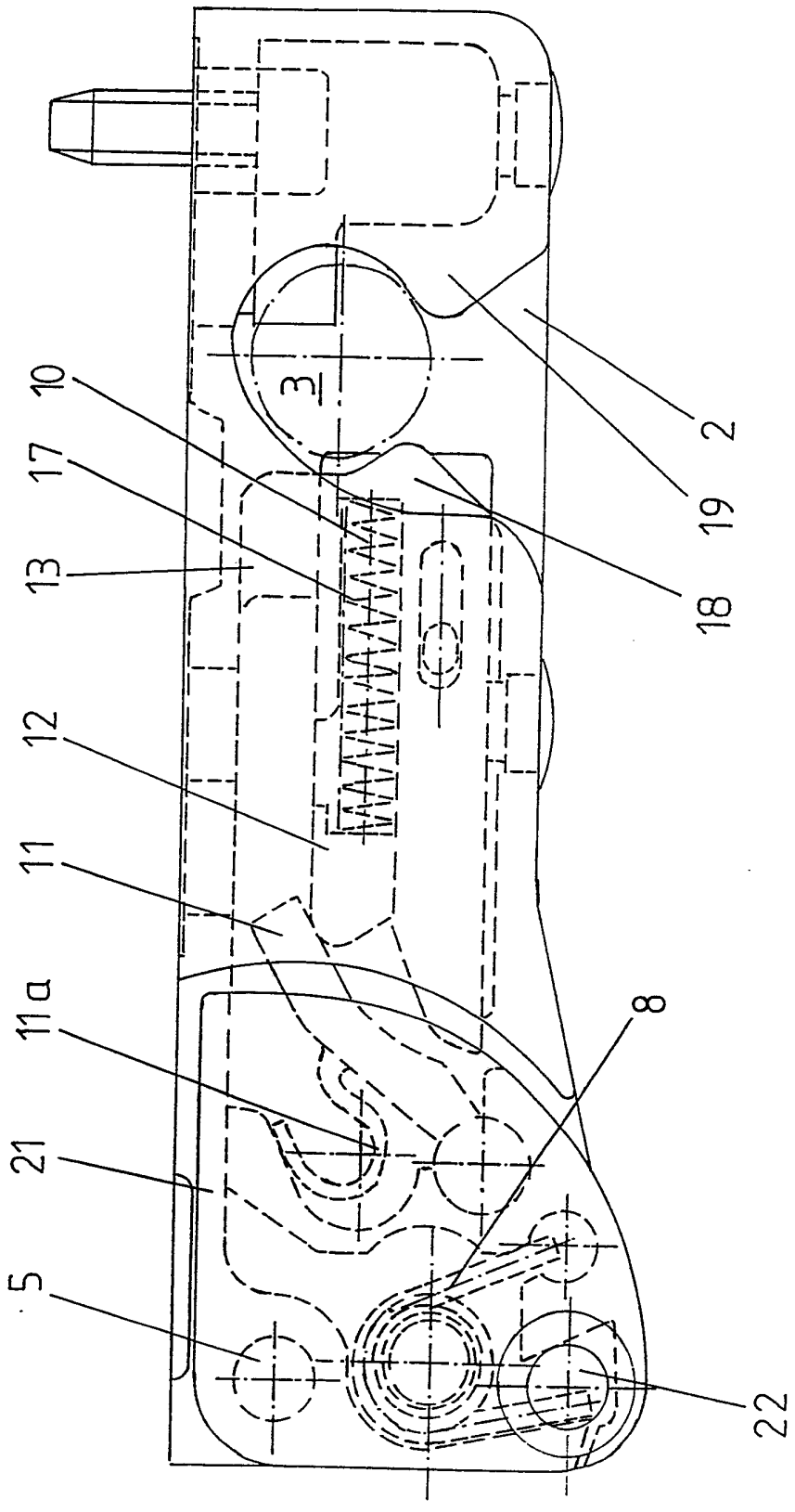

FIG. 3

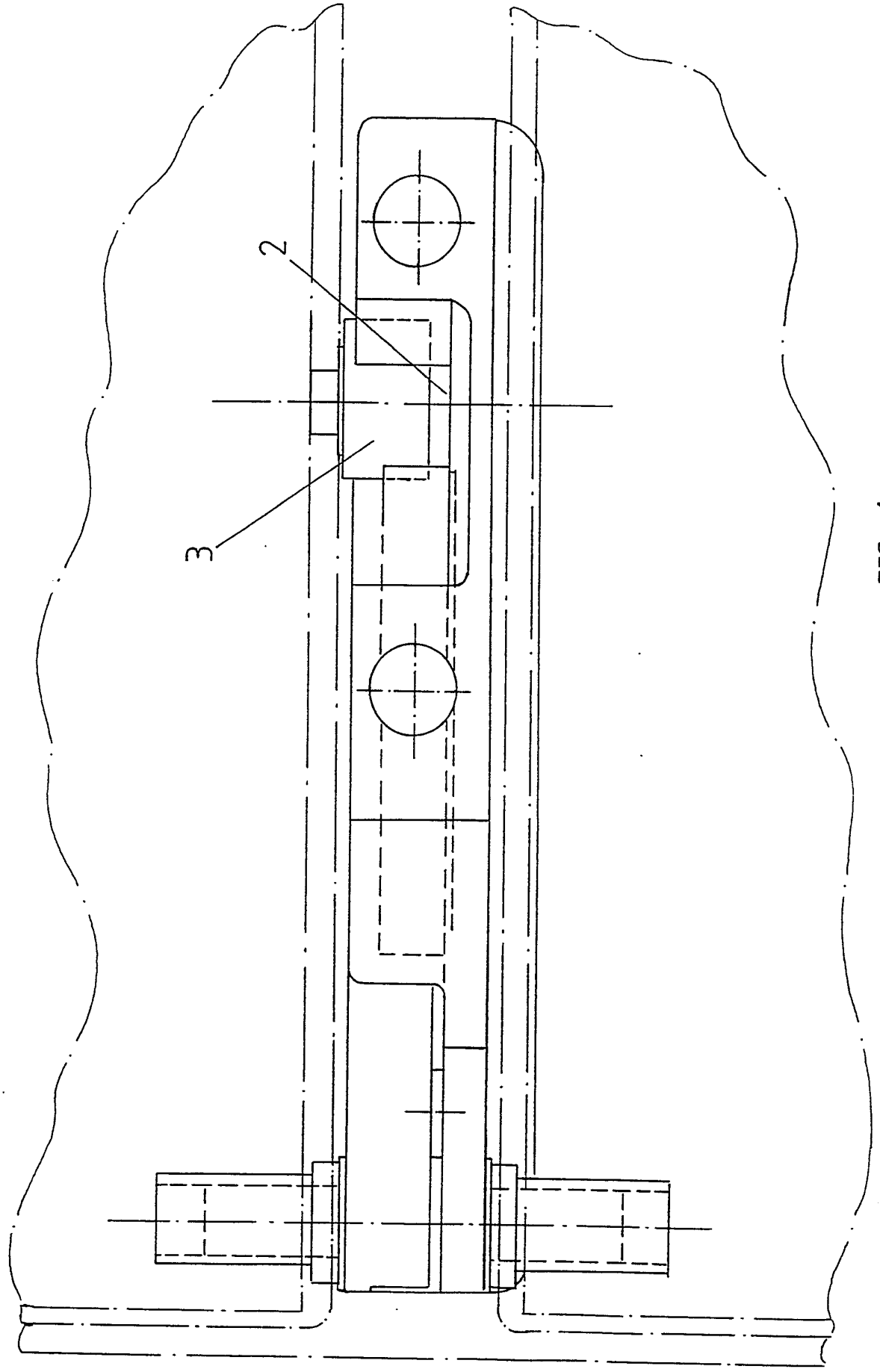

FIG. 4

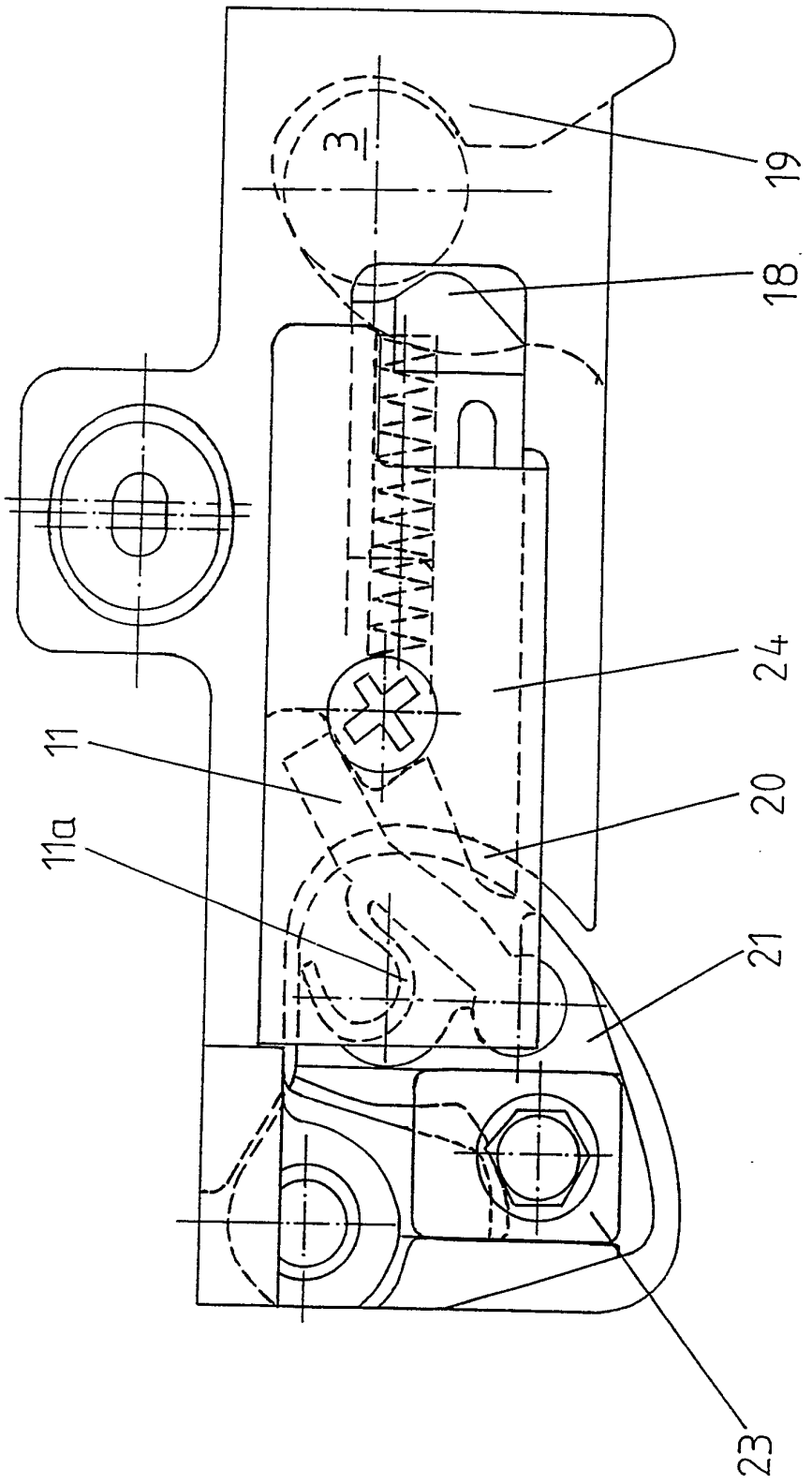

FIG. 5

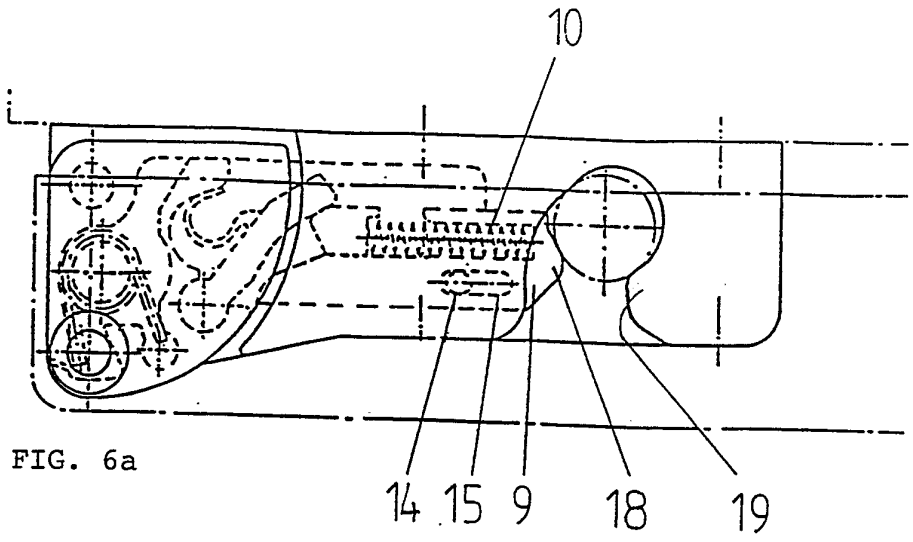

FIG. 6a

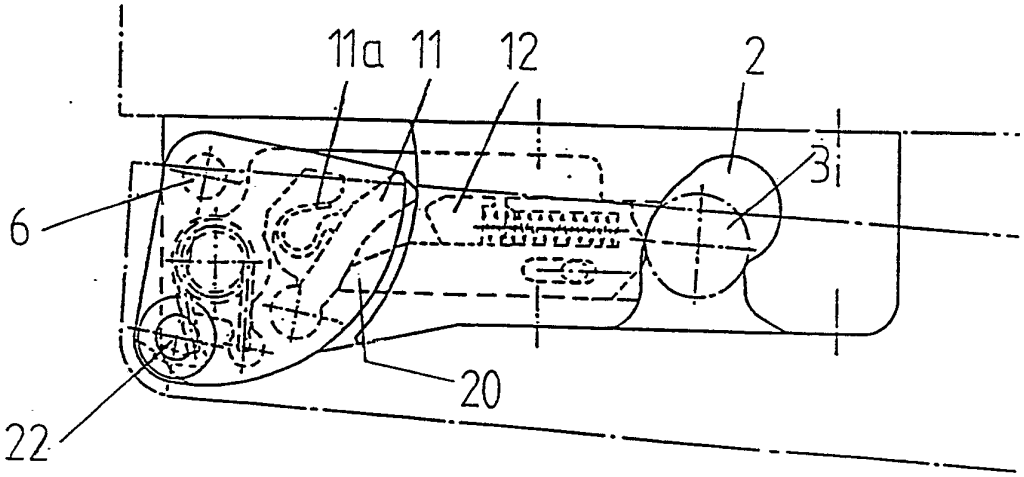

FIG. 6b

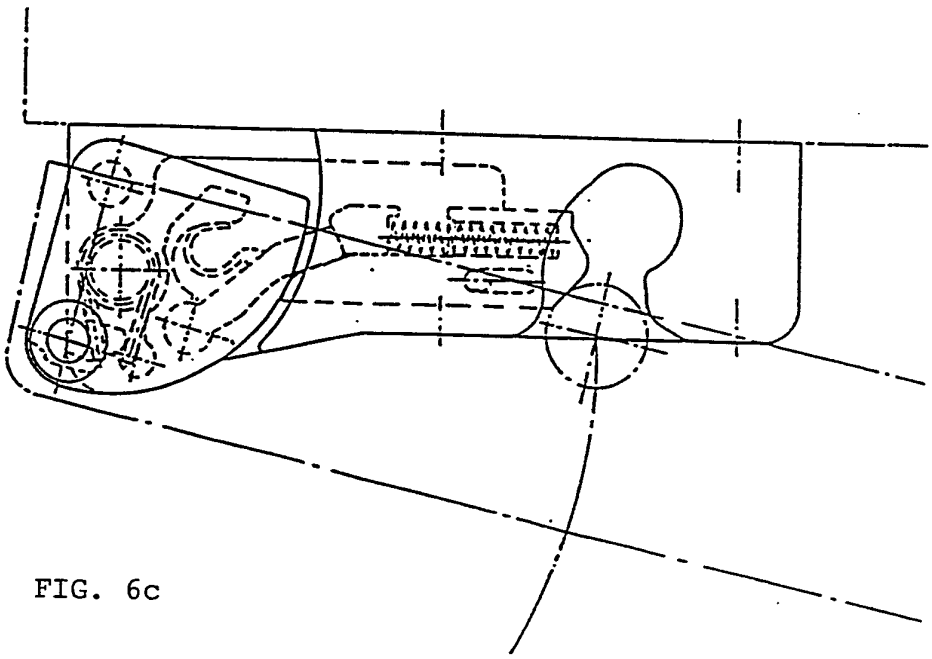

FIG. 6c

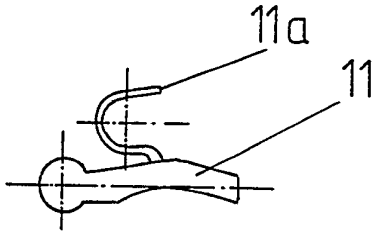

FIG. 7

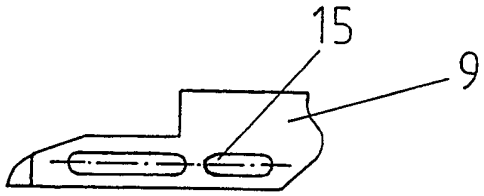

FIG. 8

INTERNATIONAL SEARCH REPORT

International Application No PCT/FI 90/00208

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC5: E 05 D 3/06, 7/00, 15/56, F 25 D 23/02

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
IPC5	E 05 D; F 25 D

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched[8]

SE,DK,FI,NO classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category *	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
A	GB, A, 2128244 (TOKYO SHIBAURA DENKI KABUSHIKI KAISHA) 26 April 1984, see the whole document --	1-6
A	DE, C2, 3218838 (LICENTIA PATENT-VERWALTUNGS-GMBH) 31 July 1986, see the whole document --	1-6

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"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
4th December 1990	1990 -12- 07
International Searching Authority	**Signature of Authorized Officer**
SWEDISH PATENT OFFICE	Christer Wendenius

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.PCT/FI 90/00208

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The members are as contained in the Swedish Patent Office EDP file on 90-11-01
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB-A- 2128244	84-04-26	DE-A-C- 3319757	84-03-15
		JP-A- 59048578	84-03-19
		US-A- 4609234	86-09-02
DE-C2- 3218838	86-07-31	NONE	