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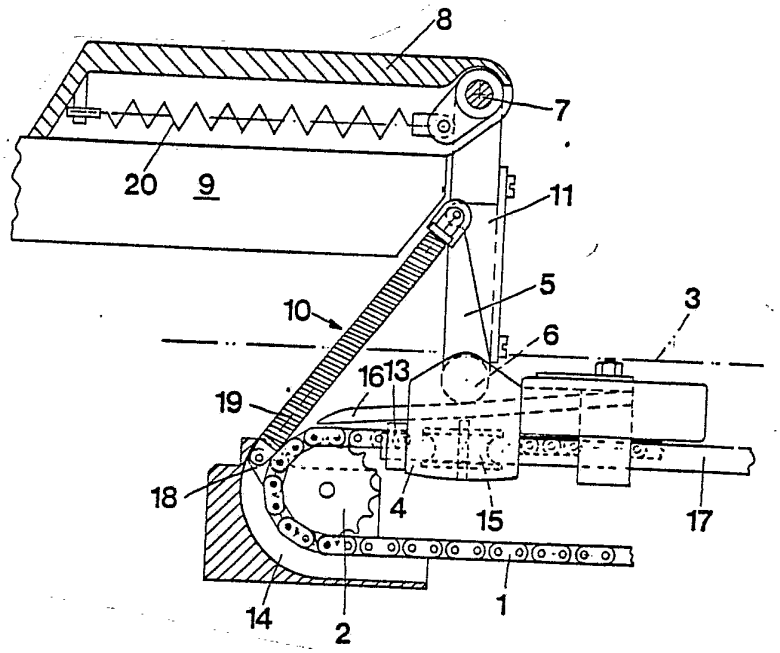
(54) Title: A REMOTELY CONTROLLED DRIVING DEVICE FOR SLIDING DOORS

(57) Abstract

The remotely controlled driving device for sliding doors (9), particularly for motor vehicles, is displaceable in guides (17) between an open position in which the door is situated adjacent the vehicle side (3) and a closed position in which the door is located in an opening in the side of the vehicle and where the swinging motion of the door is guided by a pivotable swinging lever (5) one end of which is supported by a displaceable trolley (4) and opposite end of which is hingedly connected to the sliding door (9). The device incorporates a pliable member (1) which is driven along a track along the movement distance of the sliding door by means of the remotely controlled motor and a pliable actuation member (10) which with one of its ends is connected to the pliable member (1) and with its other end to the door (9) or alternatively to the swinging lever (5) for bringing about at least its swinging in at the end of the closing function of the sliding door and preferably also its swinging out at the beginning of the opening function of the sliding door.



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A remotely controlled driving device for sliding doors

The present invention refers to a remotely controlled driving device for sliding doors, particulary for motor vehicles and of the type which is slidable in guides between and open position in which the door is located adjacent the side of the vehicle and a closed position in which the door is located in an opening in the side of the vehicle and flush with said side and where the swinging motion between said position is guided by a swinging lever one end of which is supported by a displaceable trolley and the opposite end of which is pivotally connected to the sliding door.

Background of the invention

Sliding doors of the type which are displaceable between an open position in which the door hangs in parallel with and adjacent the side of the vehicle and a closed position in which the door is located in an opening in the vehicle side and lays flush with this are earlier known in several different embodiments. Such doors are usually arranged to slide in guides along the vehicle side and at one such expedient arrangement the swinging motion of the door is guided by a foldable shackle.

These earlier known sliding doors operate saticfactorily when it concerns manual operation, but there are no available remotely controlled driving devices by means of which it is possible to open and close the sliding door, e.g. from the driver's seat . Such a remotely controlled driving device is a desire e.g. in small buses for passenger transport but also for such vehicles which are used for cargo transport particulary for mail delivery.

Attempts which have been made to produce motor driven, remotely controlled doors of this type have failed due to difficulties is to bring about the complex movement which is

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required at the opening of the door, which includes an accurately guided swinging motion and a subsequent linear displacement to fully open door and vice versa. Another problem has been that the driving device may not encroach upon the free space in the vehicle which has not been possible to fulfill with conventional devices.

Purpose and most essential features of the invention

The purpose of the present invention is to provide a well operating, simple and reliable remotely controlled driving device for sliding doors of motor vehicles, which device shall be space saving and which should be attachable inside existing cavities in the vehicle body. It shall also be designed thus that it can be operated manually. These tasks have been solved with the invention by the features defined in the accompanying claim 1.

Description of the drawings

The invention will hereinafter be further described with reference to embodiments shown in the accompanying drawings.
Figure 1 shows a section through the rearmost part of a sliding door and an adjacent vehicle side wall, provided with the driving device according to the invention and with the sliding door in a swinged out position,
Figure 2 is a corresponding view with the sliding door in closed position,
Figures 3-5 show schematically use of the driving device according to the invention during different stages of the opening movement, and
Figure 6 shows a longitudial section through a pliable member forming part of the device according to the invention.
Figure 7 is a view corresponding to figure 1 and showing a modified embodiment of the device according to the invention.

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Description of the embodiments

The driving device according to the invention incorporates an endless chain 1, which runs over two chain wheels 2 and 12 located at a distance from each other and recessed in the vehicle side 3 with the axes of the chain wheels arranged vertically. The chain drives a trolley 4 which rolls on a guide 17 and attached to the trolley is one end of a swinging lever 5 which is limited pivotable about a pivot shaft 6 fitted to the trolley 4 and which swinging lever 5 with its opposite end is hingedly connected to a bracket 8 about a shaft journal 7, which bracket projects from one end of the sliding door 9 and runs mainly in the longitudinal direction of the door. A link 18 of the endless chain 1 supports the end of a pliable actuation member 10, which in the embodiment shown is a helically wound spring 19, which at its opposite end is attached to an attachment 11 fitted to the swinging lever 5. The movement of the trolley 4 is limited in the left hand direction in figures 1 and 2 by means of a stop 13. The trolley is further provided with a carriage wheel 15, indented to run on said guide 17. This type of door suspension and operation is earlier known and further described in Swedish patent specification 201 831. In connection to the chain wheel 2 situated nearest to the door opening there is arranged a guiding track 14, which is concentric with and has a curvature which adapts itself mainly to the curvature of the chain part which is arranged around the chain wheel 2. The track 14 has an arc formed cross section and is slightly larger than the spring 19 which has a corresponding cross section. In this manner spring 19 will be safely guided during its entire movement whereby the guiding track 14 and the chain arranged around the wheel 2 will support the spring 19 in its curved position thus that it thereby has ability of transferring push forces without thereby being bent out laterally.

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The trolley 4 is provided with an elongated stop portion 16 which is adapted to cooperate with the driving chain 1 at a position between the actuation member 10 and the driving chain 1 preferably at an attachment link 18. Hereby it is avoided that the entire force is transferred via the swinging lever 5 which eliminates the risk for tilting of the trolley.

Figure 1 shows the sliding door 9 during beginning of its opening whereby the chain 1 moves toward the right hand side according figure 1. In this position the spring 19, due to the fact that it for axial thrust acts as a rigid pushing member, urges the swinging lever 5 to the position shown in figure 1, whereby the door leaf of the sliding door 9 by influence of a spring 20 which acts between the door leaf 9 and the pivot point 7 of the swinging lever, has reached a positon outside the plane of the vehicle body wall 3 from which position the sliding door is displaceable along the guide 17. During the driving of chain 1 in the opposite direction the actuation member 10 will pull the trolley 4 along the guide 17 until it pushes against the stop 13. At continued driving of the chain 1 in the left hand direction according to figure 1 the actuation member 10 will be urged by the guiding track 14 to a curved position and to follow the curvature of the chain about the chain wheel 2 whereby the actuation member 10 provides a secure swinging in of the swinging lever and thereby a pulling in of the door leaf 9 to the position shown in figure 2, where the sliding door fills the door opening and lays flush with the vehicle body wall.

Figures 3-5 show the operating mode for the device according to the invention whereby figure 3 shows a portion of the sliding door 9 and the entire extension of the endless chain 1 with its two chain wheels 2 and 12 in a position corresponding to figure 2, whereas figure 4 corresponds to the position of figure 1 and figure 5 shows the device in a maximum open position and just at the beginning of the

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closing process.

Figure 6 shows in a longitudinal section the pliable actuation member 10, which incorporates said helically wound spring 19 arranged between two connection members 21 and 24, of which the first connection member 21 has an attachment hole 22 intended for flexible connection with the chain 1 via a chain link 18 and a second attachment hole 23 arranged inside the spring 19. The second attachment member 24 consists of two parts 25 and 26 which are inteconnected by means of a screw 27 and each of which has one attachment hole 28 and 29 respectively. The connecting member 24 is intended to be connected to the attachment 11 on the swinging lever 5. Between the two connection members 21 and 24 is arranged a pliable pulling member 31 which is fitted in the holes 23 and 28 and which has such a length that the spring 19 is not subjected to pulling forces. The pulling member 31 is preferably made from a number of threads from aramide fibre (KEVLAR), which are thread through the holes 23 and 28 and are fixed in suitable manner.

The driving chain 1 is driven in a manner known per se by a (not shown) suitable motor, which via a gear device drives one of the chain wheels, but which can also transfer movement to the driving chain in other known manners. The motor is preferably an electric motor, which is remotely controlled from the driver's seat and possible also from other locations in or outside the vehicle.

By the invention is provided a simple, but at the same time efficient and reliable, remotely controlled opening device for a sliding door at a vehicle or the like.

The invention is not limited to the embodiments shown in the drawings and described in connection thereto but variations and modifications are possible within the scope of the appended claims. The actuation member 10 thus needs not be a helically wound spring but it is a also possible to use

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other similar machine members with ability of being bent under influence of axial and/or lateral forces. Instead of a spring it is thus possible to design the actuation member as a pulling member only, e.g. in form of a short length of chain 32 and to bring about the swinging out of the swinging lever 5 by means of a spring 33, such as shown in figure 7. The endless driving member 1 needs not necessarily be a chain but can for instance also be a wire whereby the forward pulley wheel can be a wheel on any suitable type.

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CLAIMS

1. A remotely controlled driving device for sliding doors (9), particularly for motor vehicles and of the type which is slideable in guides (17) between an open position in which the door is located adjacent the side (3) of the vehicle and a closed position in which the door is located in an opening in the side of the vehicle and flush with said side and where the swinging motion between said positions is guided by a swinging lever (5) one end of which is supported by a displaceable trolley (4) and the opposite end of which is pivotally connected to the sliding door (9),
c h a r a c t e r i z e d t h e r e b y
that the device incorporates a pliable member (1) which is driven along a track extending along the distance of movement of the sliding door by means of a remotely controlled motor, that a pliable actuation member (10) is fitted with one of its ends to said pliable member (1) and with its opposite end to the door (9) or alternatively to the swinging lever (5) in order to bring about at least the swinging in of the sliding door at the end of the closing function of the sliding door and preferably also its swinging out at the beginning of the opening function for the sliding door.

2. A device according to claim 1,
c h a r a c t e r i z e d t h e r e b y
that the pliable member (1) is a chain, the movement track of which is adapted to extend along the guide (17) between a forward pulley wheel (2) in front of the guide, at the rear edge of the sliding door opening in the vehicle side (3), and a rear pulley wheel (12) located at the rear end of the guide (17).

3. A device according to claim 2,
c h a r a c t e r i z e d t h e r e b y
that the actuation member (10) is bendable about a portion of the forward pulley wheel (2) circumference, along the

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pliable member (1).

4. A device according to claim 3,
c h a r a c t e r i z e d t h e r e b y
that the actuation member (10) is composed of a chain (32), which brings about the swinging in motion of the swinging lever (5) and thereby the door (9), whereas a spring (33) is provided for the swinging out of the door, which spring is arranged to pivot the swinging lever (5) about its support in the trolley (4).

5. A device according to claim 3,
c h a r a c t e r i z e d t h e r e b y
that the actuation member (10) is a helically wound spring (19) provided with a pliable tension member (31), adapted to take up pulling power acting upon the actuation member (10).

6. A device according to claim 5,
c h a r a c t e r i z e d t h e r e b y
that a guiding track (14) is arranged about a portion of the circumference of the forward pulley wheel (2), which guiding track (14) guides the actuation member (10) laterally thus that this acts as a pushing member at the opening of the door.

7. A device according to one or more of the preceeding claims,
c h a r a c t e r i z e d t h e r e b y
that a stop portion (16) is arranged at the trolley (4) and designed to be driven by the pliable member (1) or an attachment (18) fitted thereto resp. at the movement of the pliable member during opening of the sliding door (9).

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FIG 1

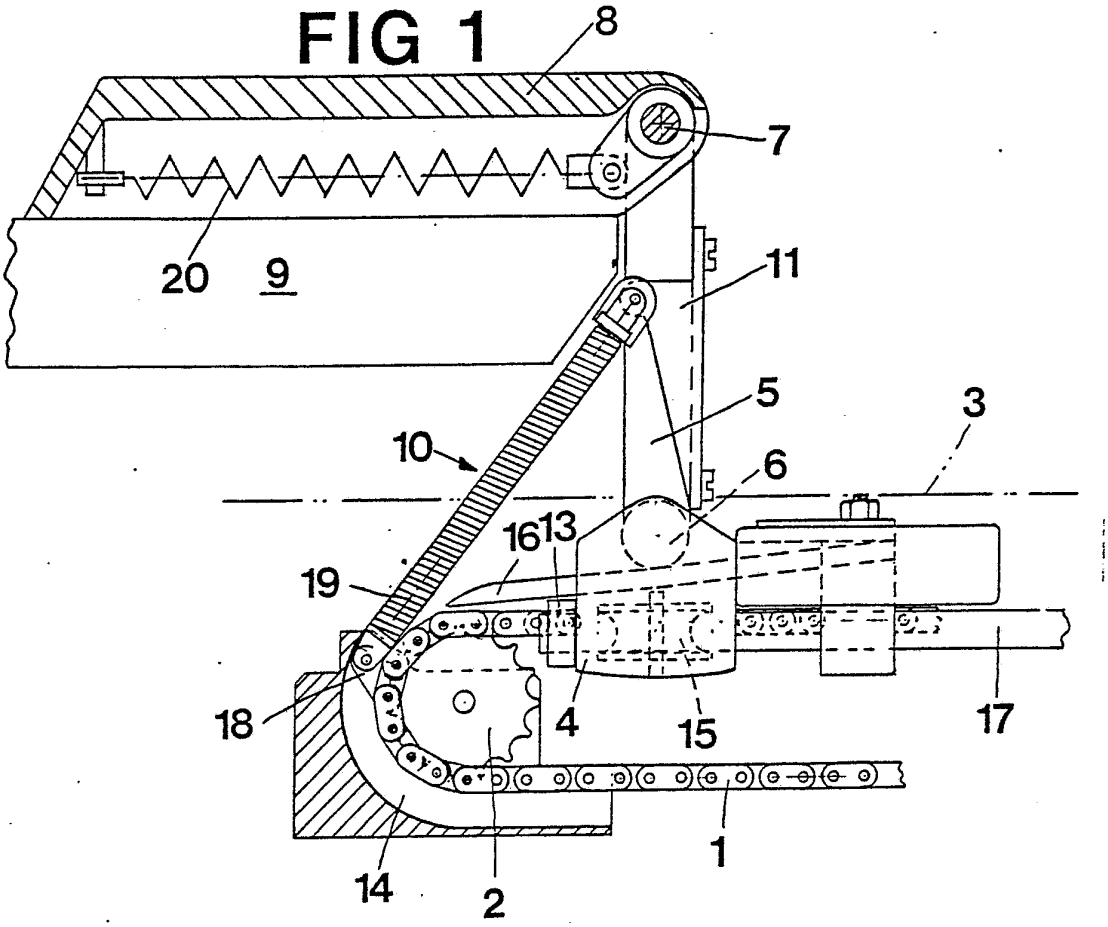

FIG 2

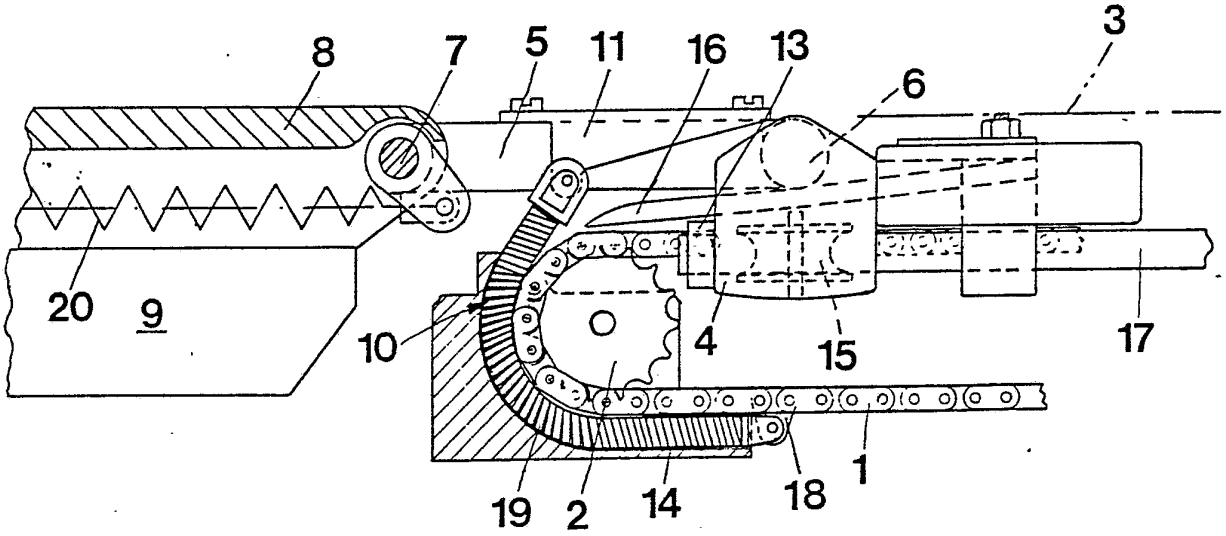

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FIG 3

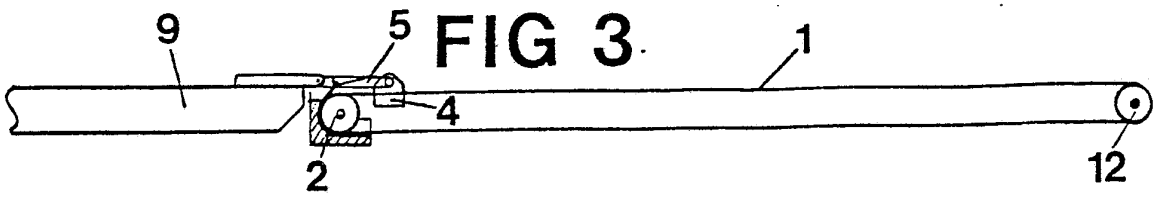

FIG 4

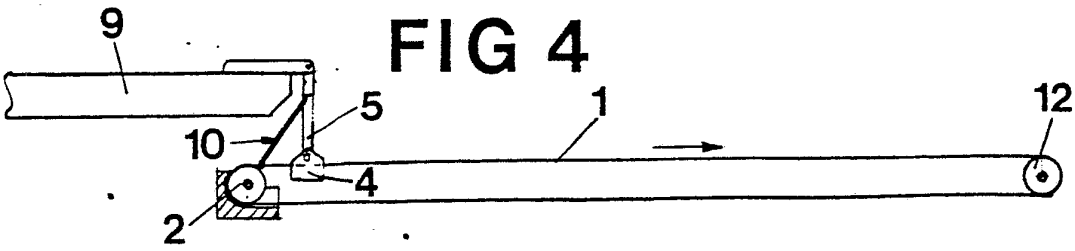

FIG 5

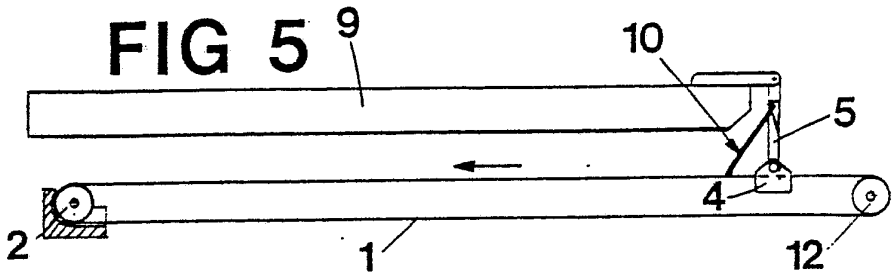

FIG 6

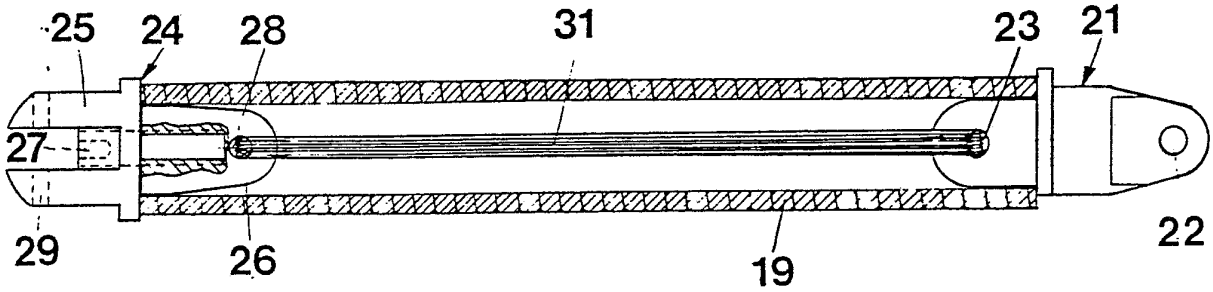

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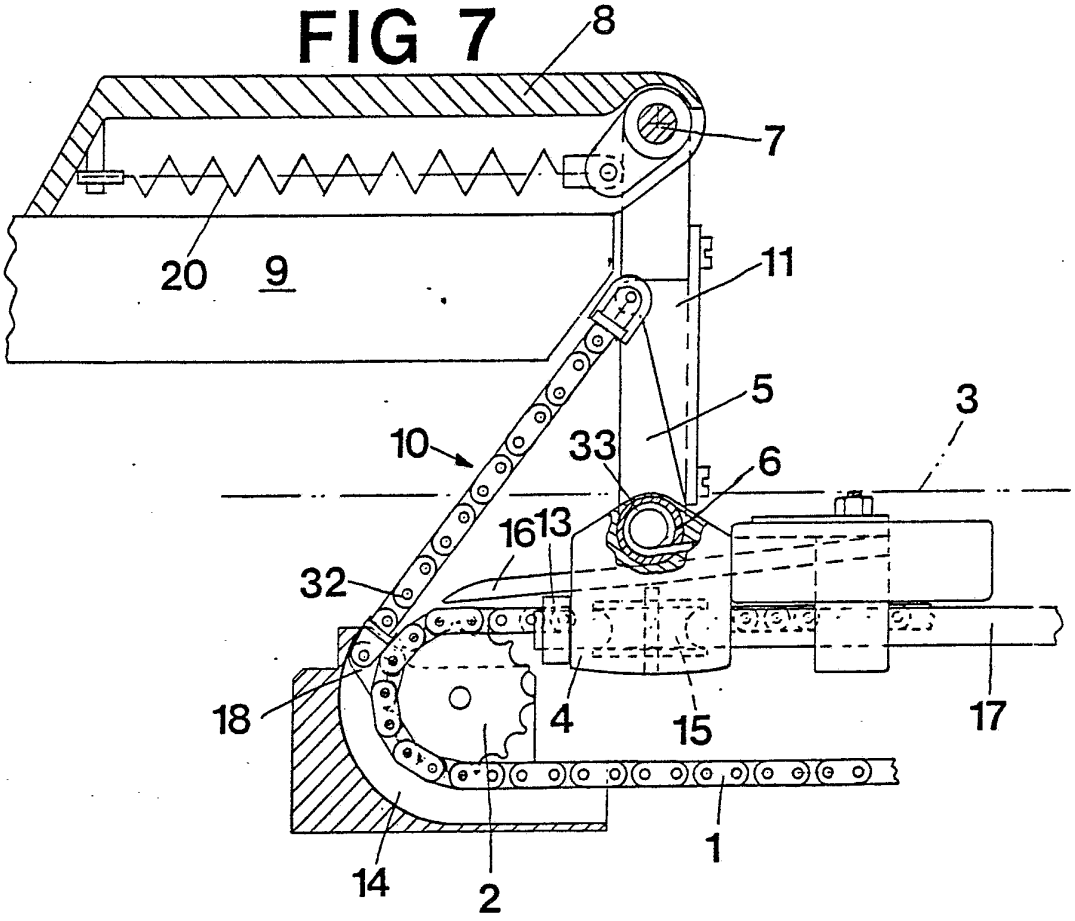
FIG 7



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INTERNATIONAL SEARCH REPORT

International Application No PCT/SE83/00142

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC 3

B 60 J 5/06

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
IPC 3	B 60 J 5/00-14, E 05 D 15/10, E 05 F 15/14
US C1	49:211-225; 296:155

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [5]

SE, NO, DK, FI classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
A	US, A, 3 197 817 (VORIS D.R.) 3 August 1965	1
A	DE, B2, 1 655 788 (WEGMANN & CO) 16 June 1976	1

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