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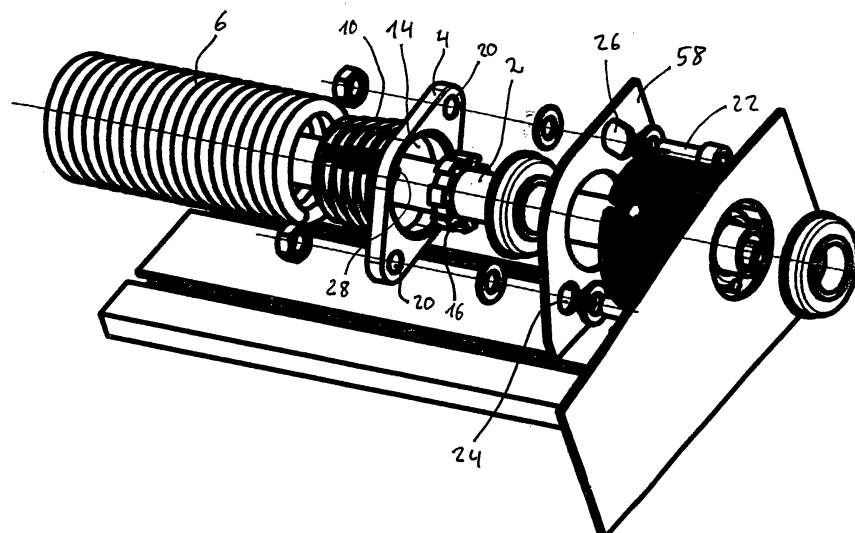
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(54) **Door locking mechanism**

(57) Door locking mechanism, in particular for sectional doors, comprising at least one member (4) being displaceable or movable between a first position (1P) allowing operation of the door and a second position (2P) preventing operation of the door by means of engagement with a door drive shaft (2), a door drive biasing member (6) for at least supporting opening operation of

said door, the locking member (4) is biased by said door drive biasing member (6) in the direction towards the first position, said locking member (4) is arranged only in the first position (1P) when biased by said door drive biasing member (6), and said locking member (4) comprises an aperture (14) adapted to receive said drive shaft (2), in particular an engagement portion (16) thereof, extending therethrough.

FIG. 3b



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Description

[0001] The present invention relates to a door locking mechanism, in particular for sectional doors, as well as to a door, in particular a sectional door, having a locking mechanism for preventing movement of the door in the closing direction in case of malfunction of the door driving mechanism.

[0002] Doors, in particular sectional doors, having a driving mechanism are known from the state of the art. For example, US 3,198,242 relates to an upwardly acting door assembly comprising hinged segments. These hinged segments are driven by a driving mechanism, which consists of a drive shaft mounted on top of the door in the door opening plane and being provided with a winding drum for winding up a cable connected to the outermost panel of the door. When winding up the cable on the door drive shaft, the door is opened as the cable raises the door panels. In general, such drive mechanisms are supported by means of biased supporting springs, so that the size or capacity of the drive mechanism can be reduced. However, there is a risk of injury of an operator of the door in case the driving mechanism malfunctions or the supporting spring breaks or collapses, which would result in an unintentional closing of the door.

[0003] Accordingly, it is an object of the present invention to provide a door locking mechanism as well as a door, in particular a sectional door, which provide protection for the operator even in case of malfunction of the door, in particular its door driving mechanism.

[0004] This object is achieved by a door locking mechanism, in particular for sectional doors, having the features disclosed in claim 1 and by a door, in particular a sectional door, having the features disclosed in claim 11. Preferred embodiments are subject of the dependent subclaims.

[0005] According to the invention, a door locking mechanism, in particular for sectional doors, is provided, comprising at least one locking member being displaceable or movable between a first position allowing operation of the door and a second position preventing operation of the door by means of engagement with a door drive shaft, a door drive biasing member for at least supporting opening operation of said door, the locking member is biased by said door drive biasing member in the direction towards the first position, said locking member is arranged only in the first position when biased by said door drive biasing member, and said locking member comprises an aperture adapted to receive said door drive shaft, in particular an engagement portion thereof, extending therethrough, so as to at least partially surround said drive shaft. In the first position, the locking member allows operation of the door. Consequently, when the locking member is arranged or positioned in the first position, the door can be brought from the opened-position to the closed-position, vice-versa and to positions therebetween. In case the locking member is arranged or posi-

tioned in the second position, the operation of the door is substantially prevented or restricted due to an engagement of the locking member with a door drive shaft. The engagement can be provided directly or indirectly, e.g. by means of provision of intermediate elements. Further, in the second position of the locking member, at least the operation of the door in the closing direction, i.e. towards the closed-position of the door, is prevented or restricted. However, a motion or operation of the door towards the opened state thereof, could be still allowed or permitted. In other words, preferably, when the locking member is in the second position, closing of the door is no longer possible, whereas opening of the door may still be possible. The drive shaft is in particular provided for driving the door, i.e. for displacing the door between the closed-position and the opened-position. Consequently, by locking the door drive shaft, the door itself is also locked. The door drive biasing member is provided for supporting opening operation of the door. That is, the door driving mechanism is supported by the door drive biasing member, as the door drive biasing member is biased in the opening direction of the door, i.e. supports the opening operation of the door. Thus, the door drive biasing member is adapted to compensate or take over a predetermined amount of force required to open the door. The door drive biasing member is supported at the locking member. In other words, the first operative end of the door drive biasing member is in operative connection with the locking member, whereas the second operative end of the door drive biasing member is in operative engagement with the door drive shaft. The locking member and the door drive biasing member are connected in such a configuration, that the door drive biasing member biases the locking member in the direction towards its first position. In case the door drive biasing member collapses, the locking member is brought in the second position (e.g. by its dead weight and/or by means of supplemental biasing means), in which the operation of the door is prevented by means of engagement with the door drive shaft. The locking member comprises an aperture adapted to receive the door drive shaft extending therethrough. The aperture can be provided in any suitable cross-sectional shape, in particular circular or polygonal. However, advantageously, the aperture has a circular cross-sectional shape, so as to correspond substantially to the door drive shaft extending therethrough. In other words, the locking member comprises an aperture or throughhole or recess or opening or cavity, which is in particular oriented in parallel to the extension of the door drive shaft.

[0006] Preferably, said locking member having at least one locking protrusion adapted to engage a preferably corresponding locking recess of said door drive shaft. Advantageously, the at least one locking protrusion being provided at an inner circumferential surface of said aperture. That is, the locking protrusion substantially protrudes in the direction towards the door drive shaft, in particular the axis of the door drive shaft. Thereby, the locking mechanism formed by the locking protrusion and

corresponding locking recesses of the door drive shaft is substantially encapsulated by the locking member. Thereby, introduction or seeping in of dirt, water etc. in the locking mechanism as well as injury of fingers of an operator are prevented. The locking protrusion may be formed of any suitable cross-sectional shape, however, is preferably teeth-like. The locking protrusion can be provided directly at the locking member. However, the locking protrusion can be also formed as part of an intermediate element associated to the locking member.

[0007] Further preferably, the door locking mechanism may comprise a supplemental biasing member, wherein said locking member is biased by said supplemental biasing member in the direction towards said second position. Additionally preferably, said locking member is arranged in said first position when biased by said door drive biasing member and said supplemental biasing member and in said second position when biased only by said supplemental biasing member. That is, a supplemental biasing member may be provided, which is in operative connection to the locking member. The supplemental biasing member therefore biases the locking member in the direction towards the second position. Consequently, by the door drive biasing member and the supplemental biasing member, forces are applied to the locking member, which act in substantially opposing directions. The configuration of the door drive biasing member and the supplemental biasing member as well as their geometric linkage connection to the locking member leads to the locking member being in the first position when being biased by both, the door drive biasing member and the supplemental biasing member. In case the door drive biasing member collapses, the force applied by the supplemental biasing member remains, so that the locking member is brought in the second position, in which the operation of the door is prevented by means of engagement with the door drive shaft.

[0008] In a preferred embodiment, said locking member comprises two locking protrusions, which are preferably arranged substantially opposing each other. In other words, preferably a locking mechanism is provided, wherein the locking member comprises an aperture adapted to receive the door drive shaft extending there-through, wherein the locking member comprises at least two locking protrusions, preferably an integer multiple number of two, which are preferably arranged substantially opposing each other. This leads to an advantageously versatile locking member, which can be mounted on both sides of a door, i.e. on a left-hand side and on a right-hand side, as each of the opposing locking protrusions is utilized for engagement at the respective left or right mounting position. Advantageously, said at least two locking protrusions are oriented substantially in opposing directions.

[0009] In a further preferred embodiment, said locking member is substantially plate-shaped. The locking member can be in particular shaped substantially rhombus- or diamond-like having the aperture substantially in the

middle thereof. However, the locking member can have any other suitable geometric configuration, such as disk-like (circular) or rectangular.

[0010] In a yet further preferred embodiment, said locking member is preferably pivotably supported on a substantially stationary mounted frame structure of said door or door locking mechanism. That is, the locking member is preferably pivotably supported by means of a bolt, pin or screw extending at one side through the locking member, whereas the locking member having preferably opposing to the first side on a second side a deep hole or oblong hole or longitudinal slot, through which a bolt, pin or screw mounted on the stationary mounted frame structure extends. Thereby, the amount of swinging or tilting or pivoting motion of said locking member is limited. However, correspondingly, on the second side of the locking member, there can be provided a bolt, pin or screw, which can be in engagement with a respective elongated hole in the stationary mounted frame structure leading to the same effect. The limitation of the swivelling or tilting motion of the locking member determines the displacement of the locking member between the first position and the second position.

[0011] In a still further preferred embodiment, said locking protrusion is formed by an engagement face and a back face, wherein said engagement face has a substantially undercut configuration and said back face is inclined, so as to prevent a closing operation and permit an opening operation of said door, when said locking member is in said second position. In other words, the locking protrusion is substantially formed as a teeth having said engagement face and back face inclined in the substantially same direction, but, however, with different angles of inclination. Consequently, the locking protrusion acts like a ratchet allowing turning of the door drive shaft in an opening direction of the door but preventing rotation of the door drive shaft in a closing direction.

[0012] Advantageously, in the first position of said locking member, the center of said aperture substantially aligns with the axis of said door drive shaft. That is, in case the locking member is substantially symmetrical, the axis of said door drive shaft substantially lies on the axis of symmetry of the locking member.

[0013] Still further preferably, said door drive biasing member is formed as a coil spring adapted to at least partially enclose said door drive shaft. However, the door drive biasing member can be also formed as a spring element with a different geometric configuration, such as a helical spring, plate spring, elastomeric block etc.

[0014] Further according to the invention, a door, in particular a sectional door, is provided, comprising a door drive shaft for driving said door between an opened position and a closed position, at least one locking member being movable between a first position allowing operation of said door and a second position preventing operation of said door by means of engagement with said door drive shaft, a door drive biasing member for at least supporting opening operation of said door, said locking mem-

ber is biased by said door drive biasing member in the direction towards said first position, said locking member is arranged only in said first position when biased by said door drive biasing member, and said locking member comprises an aperture receiving said door drive shaft, in particular an engagement portion thereof, extending therethrough. The door is preferably a sectional door, which can be formed of a plurality of generally horizontally extending sections or panels, each of which typically extends from one side of the door opening to the other side. The top section of each panel is attached to a lower section of an adjacent panel, wherein this attachment is provided preferably by means of hinges or the like. Additional sections can be mounted thereto in the same manner. The panel is arranged preferably at guide means, which may be formed as at least one rail, shaft or the like, which extend substantially parallel to the opening and closing direction of the door, i.e. substantially parallel to the displacement path of the door panels. That is, for sectional doors of the over-head type, the guide means preferably comprise vertical sections blending into curved sections and terminating in a horizontal section. In the inventive door, a plurality of panels could be used, however, also solely one panel may be provided, which is adapted to close or cover the door opening. By the inventive door having a locking member engageable with the door drive shaft, injury of an operator due to malfunction of the door drive mechanism or collapse of the door drive biasing member is advantageously prevented.

[0015] In a preferred embodiment, said engagement portion of said drive shaft is accommodated within said aperture and covered by a substantially plate-shaped stationary mounted frame structure at which said locking member is preferably pivotably supported. Thereby, the door locking mechanism is advantageously encapsulated by said plate-shaped stationary mounted frame structure and said locking member.

[0016] Further preferably, said door comprising a supplemental biasing member, wherein said locking member is biased by said supplemental biasing member in the direction towards said second position, and said locking member is arranged in said first position when biased by said door drive biasing member and said supplemental biasing member and in said second position when biased only by said supplemental biasing member.

[0017] Obviously, the further features and advantages of the inventive door locking mechanism can be also applied to the inventive door.

[0018] These and other objects, features and advantages of the present invention will become more apparent upon reading of the following detailed description of preferred embodiments and accompanying drawings. It should be understood that even though embodiments are separately described, single features thereof may be combined to additional embodiments.

Fig. 1 is a perspective view of an embodiment of the door according to the

present invention.

- Fig. 2 is a perspective view of an embodiment of the door locking mechanism according to the present invention.
- Figs. 3a and 3b are exploded perspective views of the door locking mechanism according to fig. 2.
- Fig. 4 is a cross-sectional view of the door locking mechanism according to fig. 2 in a first position.
- Fig. 5 is a cross-sectional view of the door locking mechanism according to fig. 2 in a second position.

[0019] Fig. 1 shows a perspective view of the door (D) according to an embodiment of the present invention. The door comprises preferably a plurality of door panels 50 and a guide means 52 for guiding the panels 50 during displacement thereof. For displacing the panels 50, a driving means is provided, which comprises a door drive shaft 2.

[0020] The door comprises of at least one panel 50 for at least partially closing a door opening of e.g. a building structure. By use of the door as a sectional door, a plurality of panels 50 are provided, which are arranged in an edge-to-edge relationship, hingedly connected by means of hinges 54 or the like. However, the door may also comprise solely one single panel 50, which preferably entirely covers or closes the door opening of a building structure. The sectional door may be used as a folding door, in which the door opening is opened and closed by substantially horizontal movement of the door, i.e. of the door panels 50. However, preferably, the sectional door may be employed in door systems of the overhead-type. In these doors, the panels 50 are displaced from a substantially vertical position (i.e. arranged in the door opening) to a substantially horizontal position (i.e. a plane substantially perpendicular to the door opening). However, the invention may be also employed in roll-up doors, in which a plurality of the panels is - in the opened state of the door - wound up on e.g. a shaft. This shaft could also function as the door drive shaft 2. These door systems are typically employed in garages, industrial building structures or the like.

[0021] The panels 50 may be formed of wood or the like. Preferably, the panels 50 may be formed of at least two sheet metal or plastic shells. Between these two sheet metal or plastic shells, an insulation material may be provided. This insulation can be either glued to the shells or it is introduced into the shells by foaming (e.g. PU-foam). This results in a panel 50 having a reduced weight while having an improved strength. Moreover, the panels 50 could be also reinforced, so that a high stability thereof can be ensured. The sheet metal or plastic shells

may be of identical design or shape, thereby simplifying their manufacture. Thus, a symmetrically panel 50 is preferably provided. The connection between the sheet metal or plastic shells or respective elements may be achieved alternatively by means of snap connection or other kinds of mechanical connection.

[0022] The door comprises the guide means 52 for guiding the panels 50 during displacement between a first position (such as an opened-position) and a second position (such as a closed-position) of the door. The guide means 52 are adapted to guide guiding elements provided at the door panels 50. The guiding elements can be formed as a sliding element or as a rotatable element, such as a roller. Consequently, the guiding element is adapted to translate or move in the guide means 52, which might be formed as a rail element. The guide means 52 is preferably adapted to at least partially encapsulate the guiding element in order to prevent displacement of the panels 50 in a plane substantially normal or perpendicular to the displacement path of the panels. This is achieved by an inner configuration of the guide means 52, which is substantially adapted to the outer configuration of the guiding elements. By use of the door as an overhead-type door, the guide means 52 extend from a vertical position over a bent portion to a horizontal position. On the distal end portions of a top portion of the door in the door opening plane, a door locking mechanism according to a preferred embodiment of the present invention is shown.

[0023] With reference to **fig. 2**, the door locking mechanism is described in more detail. As shown in the perspective view of **fig. 2**, the door locking mechanism comprises a locking member 4, a door drive biasing member 6 as well as a supplemental biasing member 8 (**figs. 4 and 5**). The locking member 4 is preferably in particular substantially plate-shaped. In the shown embodiment, the locking member 4 is plate-shaped having a rhombus-like or diamond-like form. As in particular shown in **figs. 3a and 3b**, the locking member 4 may further comprise a cylindrical tube-like element 10, which can be integrally or unitarily formed with the locking member 4. The cylindrical element 10 of the locking member 4 substantially receives or accommodates a distal end portion of a first side 12 of the door drive biasing member 6. Advantageously, the cylindrical element 10 is formed substantially conical with its larger diameter provided at the locking member 4 and its smaller diameter facing towards the center of the door or the door drive biasing member 6, respectively. The locking member 4 further comprises an aperture or space 14 extending substantially in the middle through the locking member 4. The aperture 14 is provided in order to at least house the door drive shaft 2. The aperture 14 is in its diameter larger than the diameter of the door drive shaft 2, as the door drive shaft 2 comprises an engagement portion 16, which is preferably housed in the locking member 4 and/or the cylindrical element 10. The engagement portion 16 of the door drive shaft 2 has recesses provided therein for engage-

ment with respective portions of the locking member 4, as will be described later with reference to **figs. 5 and 6**.

[0024] The door drive shaft 2 extends through a frame structure 56 of the door. The frame structure 56 can act in particular as a guide or support for the door drive shaft 2, which is rotatably supported in the frame structure 56. The frame structure 56 comprises a substantially plate-shaped element 58, which is preferably arranged between the locking member 4 and a drum 60, which forms part of the door drive mechanism.

[0025] The locking member 4 is connected or in engagement with the first side 12 of the door drive biasing member 6. The door drive biasing member 6 is on its second side 18 connected or in engagement with the door drive shaft 2. The locking member 4 has on its outer end portions mounting holes 20 through which mounting elements, such as bolts, pins or screws 22 can engage. One of the bolts 22 extends through a respective hole 24 of the plate-shaped element 58. The other of the bolts 22 extends through an elongated hole 26 of the plate-shaped element 58. The elongated hole 26 may have a linear configuration, however, preferably, it follows a curved line, of which center of radius the hole 24 defines. Thereby, the locking member 4 is pivotable or swivable or displaceable between a first position and a second position by rotating the locking member 4 around the axis defined by the hole 24 within the limitations defined by the elongated hole 26.

[0026] As the door drive biasing member 6 is engaged on its second side 18 with the door drive shaft 2 and on its first side 12 with the locking member 4, the door drive biasing member 6 biases or urges the locking member 4 in the directional towards the first position of the locking member 4 (shown in **fig. 4**). On the other hand side, by means of the supplemental biasing member 8, the locking member 4 is biased or urged in the direction towards the second position (shown in **fig. 5**). The door drive biasing member 6 and supplemental biasing member 8 are configured such that the locking member 4 is arranged in the first position when biased by both, the door drive biasing member 6 as well as the supplemental biasing member 8, and in the second position when biased only by the supplemental biasing member 8.

[0027] The locking member 4 has in the shown embodiment of the present invention two locking protrusions 28 provided at the inner circumferential surface of the aperture 14. The locking protrusions 28 are adapted to engage a preferably corresponding locking recess of the engagement portion 16 of the door drive shaft 2. In case the locking member 4 is arranged in its first position, the axis of the door drive shaft 2 substantially is aligned with the symmetrical line of the locking member 4, i.e. the axis of the circular aperture 14. In this position, the door drive shaft 2, i.e. the engagement portion 16 respectively, is out of engagement with the locking protrusion 28 of the locking member 4. In case the door drive biasing member 6 collapses, i.e. the opposing force applied by the supplemental biasing member 8 exceeds the force applied

by the door drive biasing member 6 on the locking member 4, the locking member 4 is displaced towards its second position. In the second position, the locking protrusion 28 engages a respective recess in the engagement portion 16 of the door drive shaft 2. Thereby, operation of the door is prevented. This means, the operation of the door at least towards its closing direction is prevented. However, in case the locking protrusion 28 is formed teeth-like having an engagement face for engagement with the recess of the engagement portion 16 and a back face, wherein said engagement face has an undercut configuration and the back face has an inclination directed towards the same direction as the inclination of the engagement face, but with a different inclination angle, the rotation of the door drive shaft 2 into the closing direction is prevented, whereas the rotation of the door drive shaft 2 in the opening direction of the door is permitted.

[0028] As shown in **figs. 2 and 3b**, the engagement portion 16 of the door drive shaft 2 is accommodated within the aperture 14 of the locking member 4. Further, the engagement portion 16 is covered by the cylindrical element 10 and by the plate-shaped element 58, at which the locking member 4 is preferably pivotably supported. Consequently, the essential or moving parts of the locking mechanism are substantially housed within the locking member 4 and the plate-shaped element 58, so that injuries of an operator's fingers or intrusion of dirt, water etc. is avoided.

List of Reference Numerals

[0029]

2	door drive shaft
4	locking member
6	door drive biasing member
8	supplemental biasing member
10	cylindrical element
12	first site
14	aperture
16	engagement portion
18	second site
20	mounting hole
22	bolt
24	hole
26	elongated hole
28	locking protrusion
50	panel
52	guidemeans
54	hinge
56	frame structure
58	plate-shaped elements
60	drum
D	door
1 P	first position
2P	second position

Claims

1. Door locking mechanism, in particular for sectional doors (D), comprising
 at least one locking member (4) being displaceable between a first position (1 P) allowing operation of the door and a second position (2P) preventing operation of said door (D) by means of engagement with a door drive shaft (2),
 a door drive biasing member (6) for at least supporting an opening operation of said door (D), wherein said locking member (4) is biased by said door drive biasing member (6) in the direction towards said first position (1 P),
 said locking member (4) is arranged only in said first position (1 P) when biased by said door drive biasing member (6), and
 said locking member (4) comprises an aperture (14) adapted to receive said door drive shaft (2), in particular an engagement portion (16) thereof, extending therethrough, so as to at least partially surround said drive shaft (2).
2. Door locking mechanism according to claim 1, wherein said locking member (4) having at least one locking protrusion (28) being provided at the inner circumferential surface of said aperture (14), so as to be coupleable to said door drive shaft (2), in particular to a preferably corresponding locking recess of said engagement portion (16), when said locking member (4) is in said second position (2P).
3. Door locking mechanism according to one of the preceding claims, further comprising a supplemental biasing member (8), wherein
 said locking member (4) is biased by said supplemental biasing member (8) in the direction towards said second position (2P).
4. Door locking mechanism according to claim 3, wherein said locking member (4) is arranged in said first position (1 P) when biased by said door drive biasing member (6) and said supplemental biasing member (8) and in said second position (2P) when biased only by said supplemental biasing member (8).
5. Door locking mechanism according to claim 2, wherein said locking member (4) comprises two locking protrusions (28), which are preferably arranged substantially opposing each other.
6. Door locking mechanism according to one of the preceding claims, wherein said locking member (4) is substantially plate shaped.
7. Door locking mechanism according to one of the preceding claims, wherein said locking member (4) is

preferably pivotably supported on a substantially stationary mounted frame structure (58) of said door or door locking mechanism.

member (6) and said supplemental biasing member (8) and in said second position (2P) when biased only by said supplemental biasing member (8).

8. Door locking mechanism according to claim 2, wherein said locking protrusion (28) is formed by an engagement face and a back face, wherein said engagement face has an undercut configuration and said back face is inclined, so as to prevent a closing operation and permit an opening operation of said door, when said locking member (4) is in said second position. 5
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9. Door locking mechanism according to claim 3, wherein in the first position of said locking member (4), the center of said aperture (14) substantially aligns with the axis of said door drive shaft (2). 15
10. Door locking mechanism according to one of the preceding claims, wherein said door drive biasing member (6) is formed as a coil spring, adapted to at least partially enclose said door drive shaft (2). 20
11. Door (D), in particular a sectional door, comprising a door drive shaft (2) for driving said door (D) between an opened position and a closed position, at least one locking member (4) being movable between a first position (1 P) allowing operation of said door (D) and a second position (2P) preventing operation of said door (D) by means of engagement with said door drive shaft (2), a door drive biasing member (6) for supporting opening operation of said door (D), said locking member (4) is biased by said door drive biasing member (6) in the direction towards said first position (1 P), said locking member (4) is arranged only in said first position (1 P) when biased by said door drive biasing member (6), and said locking member (4) comprises an aperture (14) receiving said door drive shaft (2), in particular an engagement portion (16) thereof, extending there-through. 25
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35
40
12. Door according to claim 11, wherein said engagement portion (16) of said drive shaft (2) is accommodated within said aperture (14) and covered by a substantially plate-shaped stationary mounted frame structure (58) at which said locking member (4) is preferably pivotably supported. 45
50
13. Door according to claim 11 or 12, further comprising a supplemental biasing member (8), wherein said locking member (4) is biased by said supplemental biasing member (8) in the direction towards said second position (2P), and said locking member (4) is arranged in said first position (1 P) when biased by said door drive biasing 55

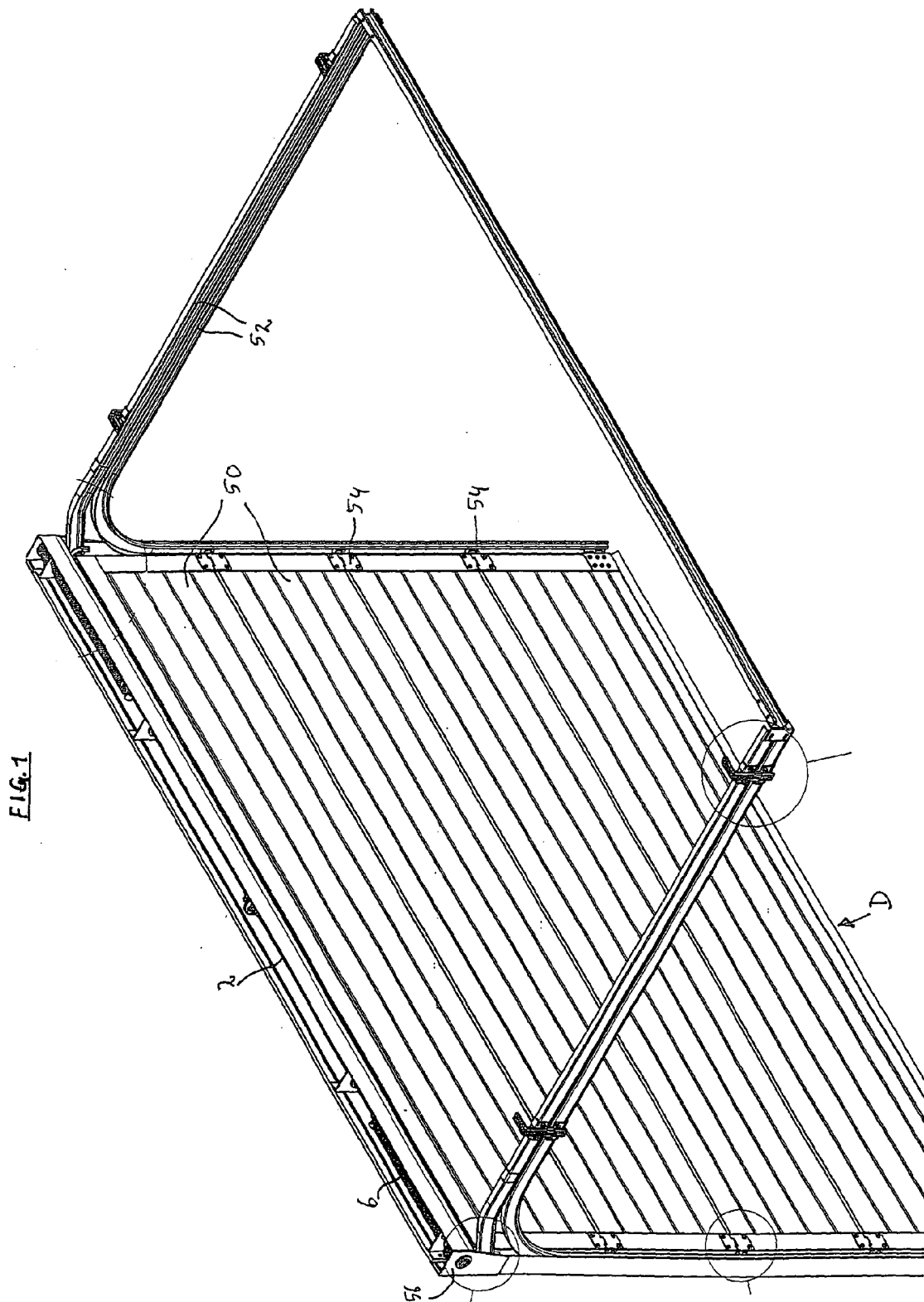


FIG. 2

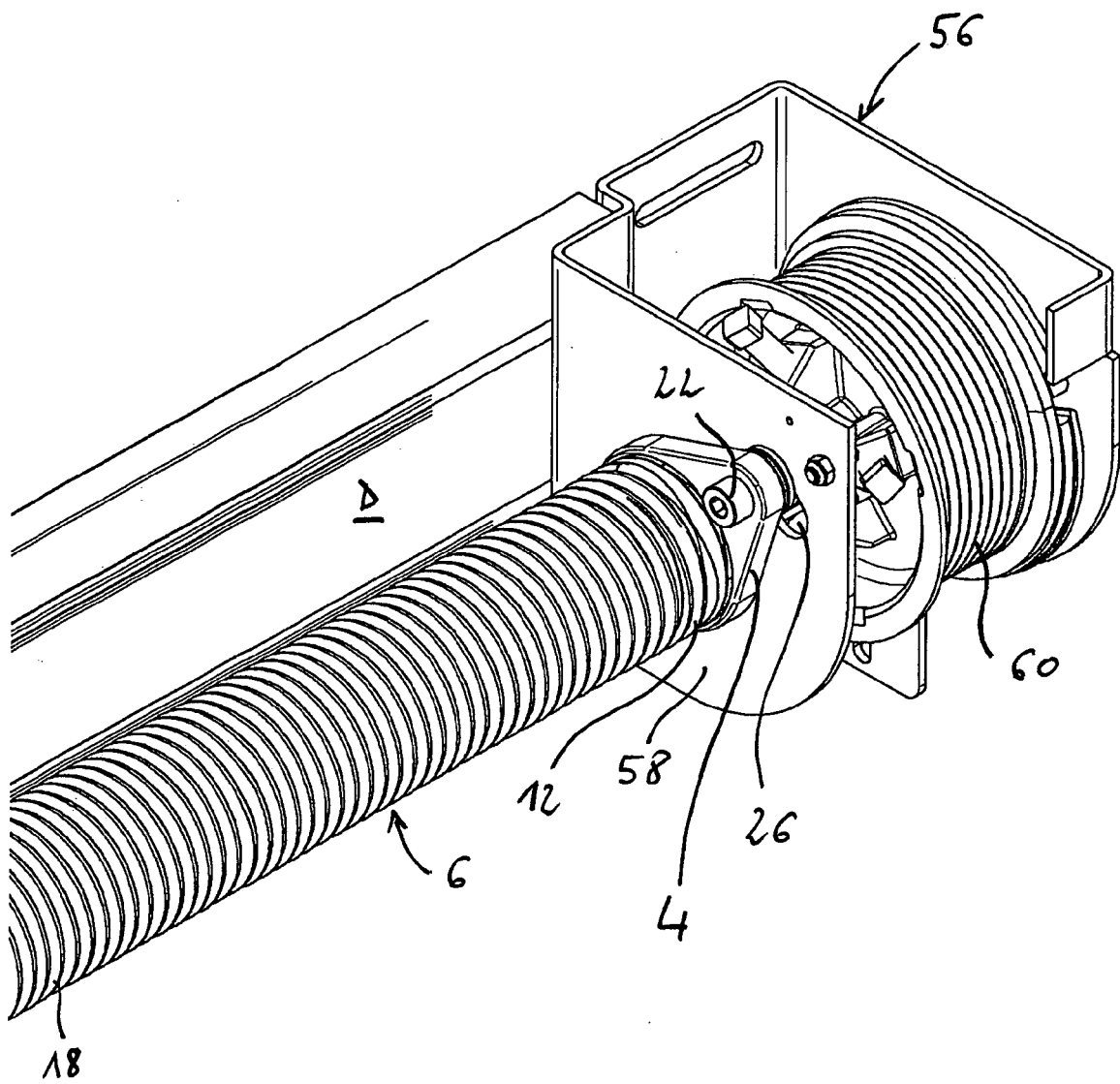


FIG. 3a

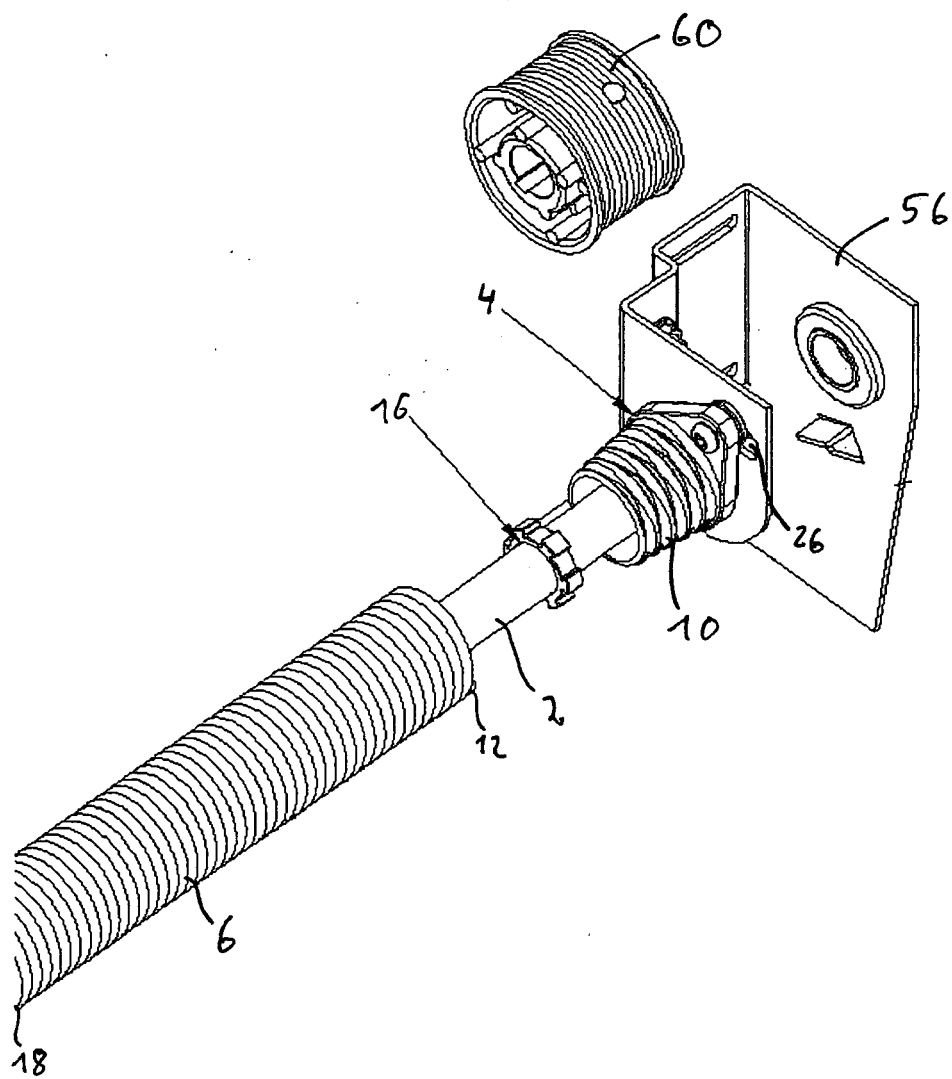


FIG. 3b

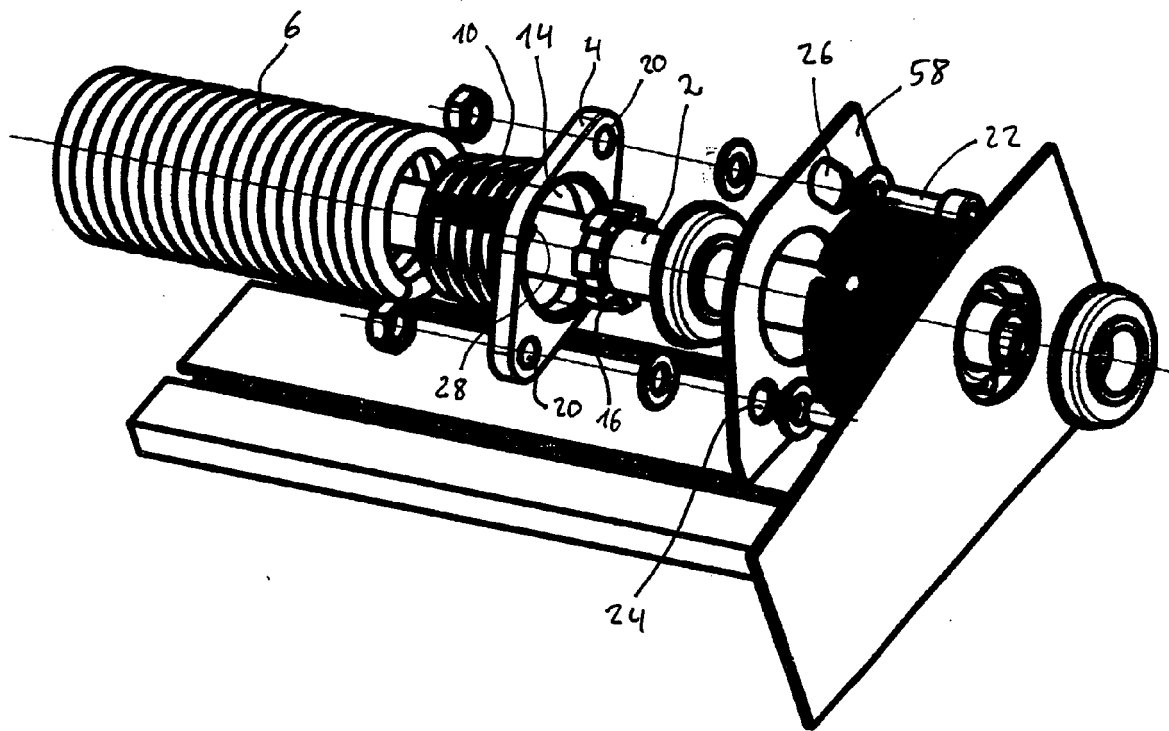


FIG. 4

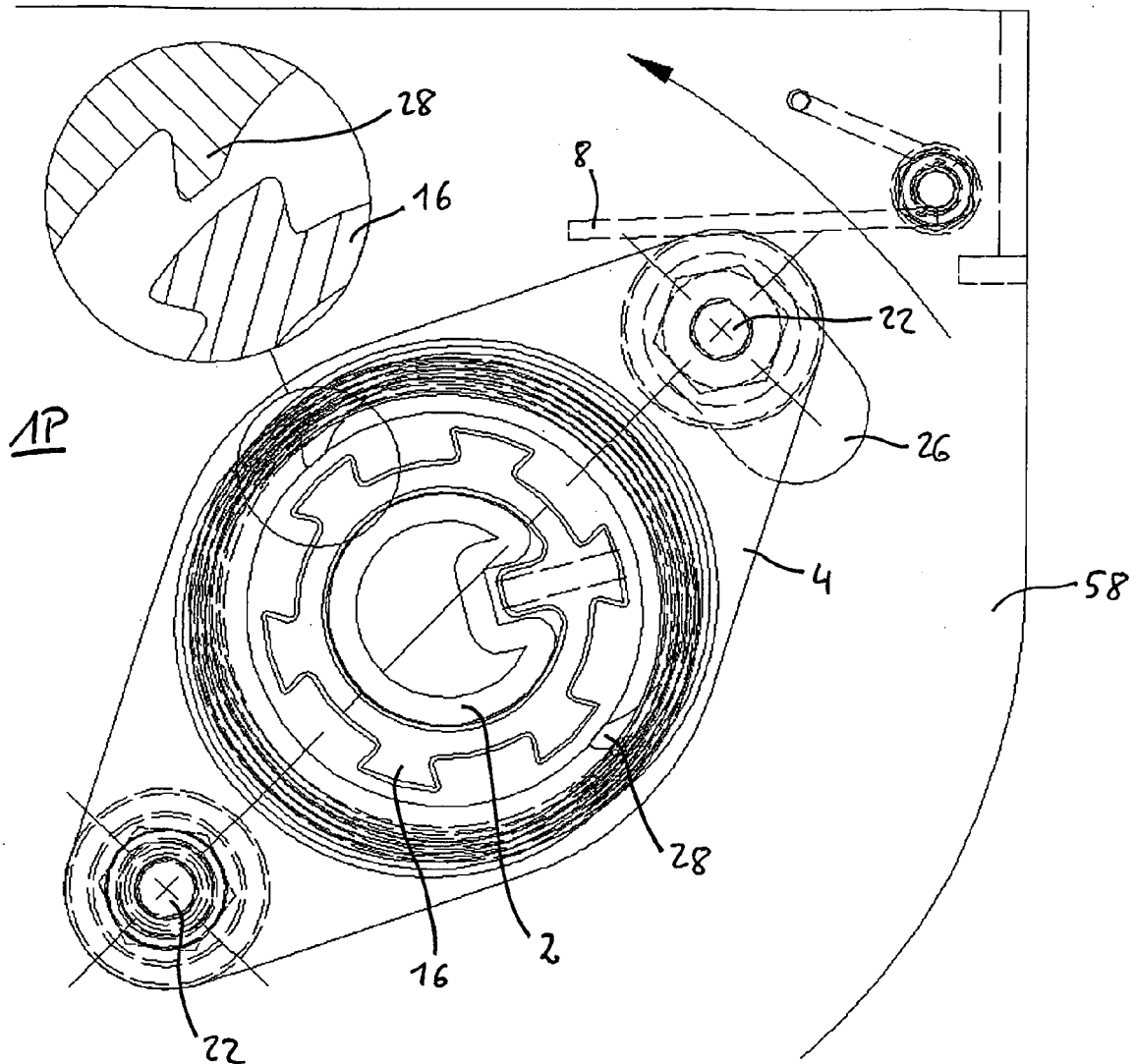
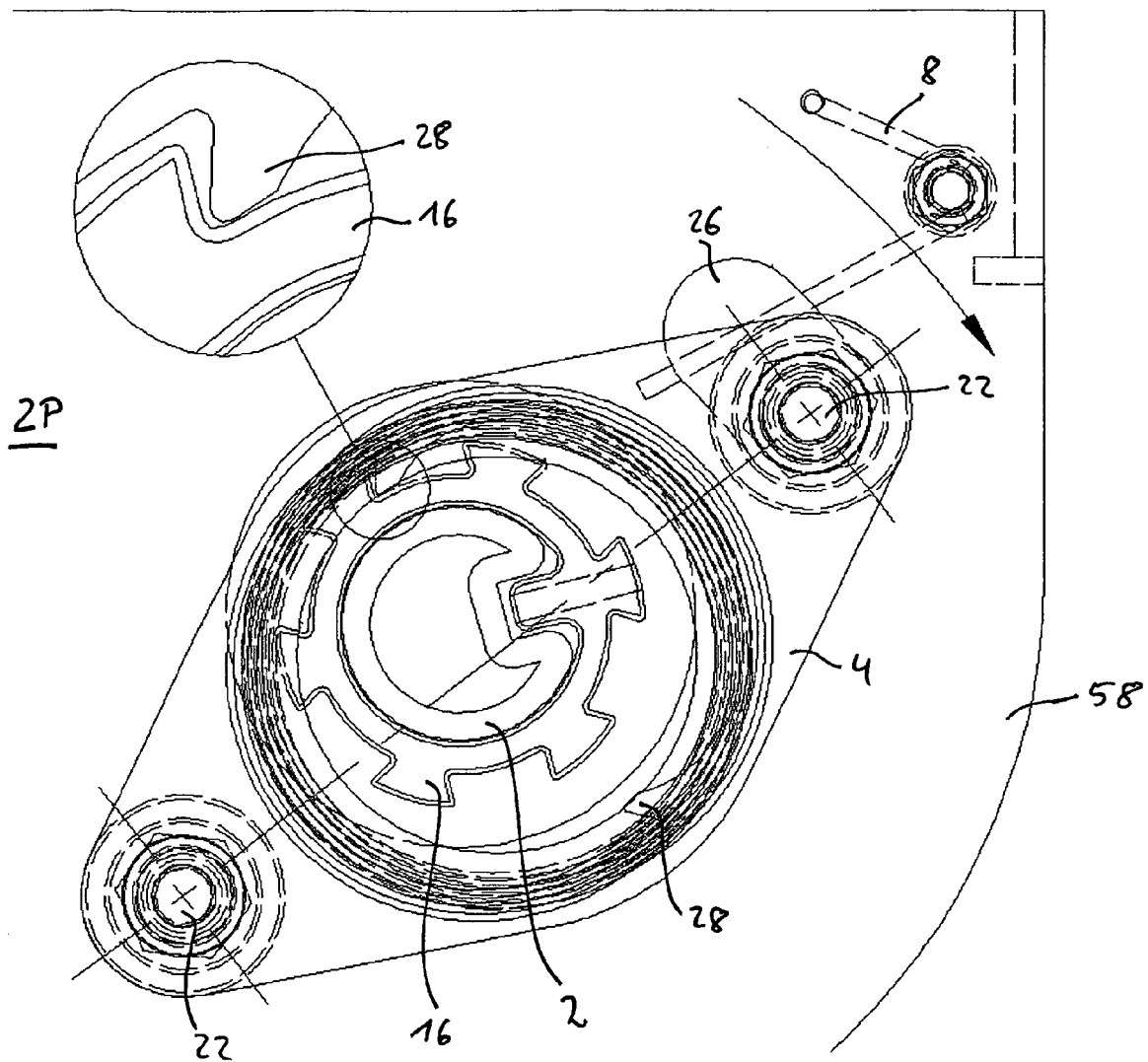


FIG. 5





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 00 4967

DOCUMENTS CONSIDERED TO BE RELEVANT			
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 2 October 2006	Examiner Di Renzo, Raffaele
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 06 00 4967

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