(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 431 705 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **90203194.7**

(51) Int. Cl.5: **E05F 15/00**

(22) Date of filing: **03.12.90**

The title of the invention has been amended (Guidelines for Examination in the EPO, A-III, 7.3).

(30) Priority: **01.12.89 NL 8902976**

(43) Date of publication of application: **12.06.91 Bulletin 91/24**

(84) Designated Contracting States: **AT BE CH DE DK ES FR GB GR IT LI LU NL SE**

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(54) Protected closing device.

(57) A device for closing a passageway, which device comprises a closing body that can be moved by means of a motor along a guiding from a closed position to an open position and vice versa, wherein the body is provided with a safety sensor interrupting the motor feed, is incorporated in a circuit with separate feed connected fixedly to the movable body and the circuit is provided with a conductor which extends in the direction of movement and which is guided slidably along at least one fixed coil disposed close to the guiding, which coil is a part of the control circuit for the motor, wherein the safety sensor comprises one or more break contacts connected in series, and further connected in series with a capacitor in the circuit so being able to measure the frequency change in the circuit, instead of operating on the usual measuring of a resistance or power change when the sensor is activated.

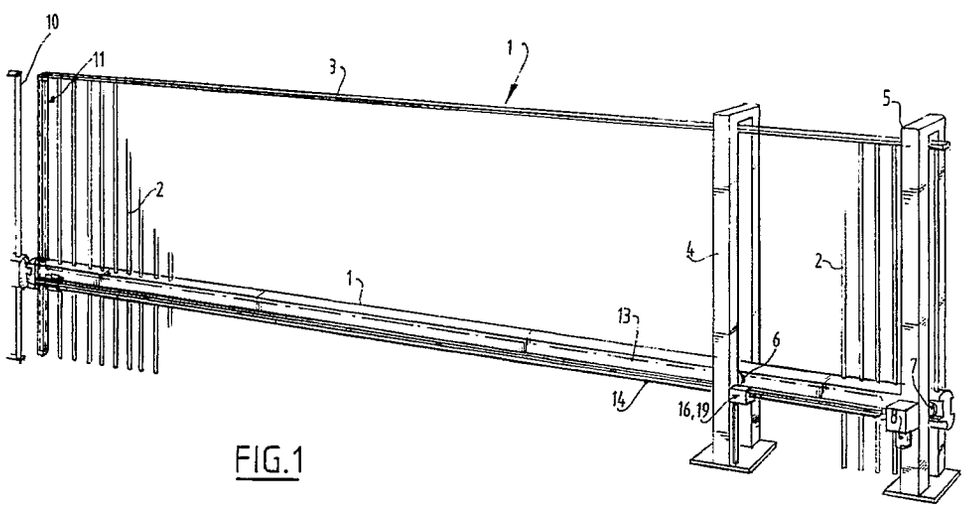

FIG.1

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PROTECTED CLOSING DEVICE

The invention relates to a device for closing a passageway, which device comprises a closing body that can be moved by means of a motor along a guiding from a closed position to an open position and vice versa, wherein the body is provided with a safety sensor interrupting the motor feed, is incorporated in a circuit with separate feed connected fixedly to the movable body and the circuit is provided with a conductor which extends in the direction of movement and which is guided slidably along at least one fixed coil disposed close to the guiding, which coil is a part of the control circuit for the motor.

Such a circuit is frequently used in electrically driven doors such as elevator doors, fences for closing entrances, which doors or fences are provided on the end post with an end post sensor. Pressing in this end post sensor causes stopping of the drive motor, whereby people and objects cannot be pinned by the closing door or closing fence. The known systems operate on the measuring of a resistance or power change when the sensor is activated. These systems are very sensitive to the dimensions of the circuit and are therefore not universal for different applications.

The invention has for its object to improve the safety system such that the above mentioned drawbacks do not occur.

The device according to the invention is distinguished in that the safety sensor comprises one or more break contacts connected in series which are connected in series with acapacitor in the circuit.

The invention is based on the idea that the frequency change has to be measured.

The circuit feed is preferably brought about by a second induction coil which is likewise disposed stationary close to the guiding. Herewith a voltage source arranged on the moving body becomes superfluous, which further simplifies the whole device.

According to a further feature of the invention it is recommended to have the number of windings on the first induction coil differ from that of the windings on the second induction coil. In this way the frequency change of the first induction coil to be detected is changed proportionally and made insensitive to possible radio disturbances.

In order to be able to easily detect short-circuit in the circuit, which short-circuiting may cause the safety system to be rendered inoperative, a resistance increasing member, for instance a capacitor, diode or resistor, is incorporated in the circuit such that when short-circuiting occurs a clearly detectable difference in frequency can be detected, whereby the feed of the drive motor can likewise be rendered inoperative.

Above mentioned and other features of the invention will be further elucidated in the figure description hereinafter of a number of embodiments. In the drawing:

Fig. 1 shows a perspective view of a sliding gate which serves to close off a roadway,

fig. 2 is a schematic survey of the circuit in the movable body and the control circuit for the drive motor,

fig. 3 is a diagram corresponding with fig. 2 of an embodiment variant,

fig. 4 is a perspective view of a movable body in the form of a drop door for closing an access opening.

Shown in fig. 1 is a slide fence consisting of a main beam 1 through which are arranged bars 2 which are mutually coupled at the top by an upper beam 3. This whole rectangular construction is considered as a movable body which is reciprocally slidable in the direction of the arrow P1 relative to fixedly arranged posts 4 and 5. For this purpose guide wheels 6, 7 are arranged in the posts 4 and 5, wherein wheel 7 is driven by an electric motor with transmission. Motor 8 is reversible so that the fence moves to the left in the one rotational direction of motor 8 and to the right in the other rotational direction in order respectively to close and open the passageway defined by post 4 and a fixed post 10. There is a danger here that people or objects can get caught between the end post 11 of the fence and the fixed post 10. As is known, the end post 11 is embodied with a number of break contacts connected in series or otherwise in order to break an electric circuit. The known electric circuit is a component of a control circuit connected to the motor 8 so that a signal transfer has to be effected between the electric circuit part moving along with the fence 1 and the electric circuit part present on the post 5.

The electric circuit according to the invention is elucidated in schematic form with reference to fig. 2. As stated above, the end post 11 is embodied with a number of break contacts 12 connected in series which together with a conductor 13 form a closed circuit. The conductor 13 is shown schematically in fig. 1 with the broken line. This extends in the direction of movement P1 parallel to the beam 1. Along at least one portion of the electric circuit in fig. 2 the lower conductor 14 is spanned such that it can be passed along two induction coils. In addition a capacitor 15 is arranged at the connection to the end post safety conductor and the lower conductor 14. The induction coil 16 is connected to a detection unit 17 via a coupling

block 18. The induction coil 16 has a core which extends in annular manner about conductor 14 and is provided with a number of windings.

In the embodiment according to fig. 2 a second induction coil 19 is arranged which is fed by a voltage via coupling block 18. This induction coil also consists of a core provided with a number of windings, this such that when an alternating voltage or a pulsating direct voltage is applied a magnetic field is generated in induction coil 18 which excites a voltage in the electric circuit 13. As a result of this voltage a current will flow in the circuit formed by the lower conductor 14, the capacitor 15, the non-broken contacts 12 and subsequently to the conductor 13. This current is detected in the induction coil 16 which generates a determined frequency via the coupling block 18 to the detection unit.

It will be apparent that when the gate is moved in the direction of the arrow P1 the lower conductor 14 can move freely along the induction coils 16, 19 without this necessitating any mechanical contact between the two electric circuits. The detection block 17 is connected to the control circuit for the drive motor 8.

The above stated device operates as follows. In normal operation the electric circuit 13, 14 is closed because the break contacts 12 are all closed. When the motor 8 is energized the gate can therefore be closed and the conductor 14 will move freely along the induction coils 16, 19. As soon as an object or person is touched at the end post one of the break contacts 12 is opened and the electric circuit 13, 14 is broken. Current will no longer flow and the induction coil 16 no longer detects any frequency in the circuit, whereby a frequency change is transferred to the detection unit 17. This immediately renders the motor 8 inoperative via the associated control circuit.

If no voltage is carried to the induction coil 19 as a consequence of a disturbance, no current is excited in the circuit 13, 14 either, whereby the motor 8 is likewise rendered inoperative so that the gate ceases to move.

If a short-circuit occurs outside the end strip 11, for instance between the conductors 13, 14, the capacitor 15 will then change the RC-value of the electric circuit due to the end strip break contacts 12 being rendered inoperative. The induction coil 16 detects a frequency change, which is compared at the detection unit 17 to a window value, whereby at a higher maximum limit value or a lower minimum limit value the motor 8 is rendered inoperative. Because the coil 16 preferably has more windings than coil 19, the frequency will be taken to a higher level so that the window values can be increased. Accuracy in detecting disturbances is herewith improved. Radio disturbances resulting from signals emitted by the electric circuit and signals received thereby are also eliminated. In this way the system is also protected within itself.

Fig. 3 shows a variant of the embodiment in fig. 2, with the difference that the second induction coil 19 is replaced by a voltage source 20 which is arranged on the movable body or fence. This voltage source is arranged such that an alternating voltage of determined frequency is applied in the electric circuit 12, 13 and 14, which can be detected by the induction coil 16.

This variant otherwise operates in the same way as the embodiment of fig. 2.

Fig. 4 shows another embodiment, wherein the moving body is formed by a roll-down door consisting of a number of mutually pivotable slats 21 whereof the head ends are received in a guiding 22. Arranged at the top of the passage opening 23 are guide rollers or drive rollers 24, wherein the guiding 22 continues further in horizontal direction. The slats 21 can therefore run through a curved path and, depending on the drive direction of the rollers 24, can be moved in upward or downward direction according to arrow P2. The moving body can also be provided here with a bottom strip 11' provided with break contacts 12' forming part of an electric circuit 13, 14. The conductor 13 can herein be adhered fixedly to the slats 21 so that it can move along hingeably with these slats 21, while the other conductor 14 extends freely along the head end of slats 21. This conductor has to be provided with a guide wheel similar to wheel 24. The conductor 14 is here also carried along two induction coils 16, 19 which are connected to a detection unit 17 via a coupling block 18.

Detection unit 17 controls the drive motor 8' in the extension of the rotational shaft for the guide drive wheels 24.

The operation of this embodiment is otherwise the same as that of the above described embodiments.

The invention is not limited to the above described embodiments. The annular coil(s) can for instance be replaced by any other suitable form at the conductor 14. The capacitor 15 can be replaced by any other suitable resistance increasing member, such as resistor, diode or coil suitable for altering the frequency in the electric circuit.

Claims

1. Device for closing a passageway, which device comprises a closing body that can be moved by means of a motor along a guiding from a closed position to an open position and vice versa, wherein the body is provided with a safety sensor interrupting the motor feed, is

incorporated in a circuit with separate feed connected fixedly to the movable body and the circuit is provided with a conductor which extends in the direction of movement and which is guided slidably along at least one fixed coil disposed close to the guiding, which coil is a part of the control circuit for the motor, **characterized in that** the safety sensor comprises one or more break contacts connected in series which are connected in series with a capacitor in the circuit.

2. Device as claimed in claim 1, **characterized in that** a second induction coil is arranged as feed for the circuit.

3. Device as claimed in claims 1 and 2, **characterized in that** the number of windings on the first induction coil differs from that of the windings on the second induction coil.

4. Device as claimed in any of the foregoing claims, **characterized in that** the circuit is provided with a resistance increasing member, such as a capacitor, diode or resistor, which is arranged close to the safety sensor.

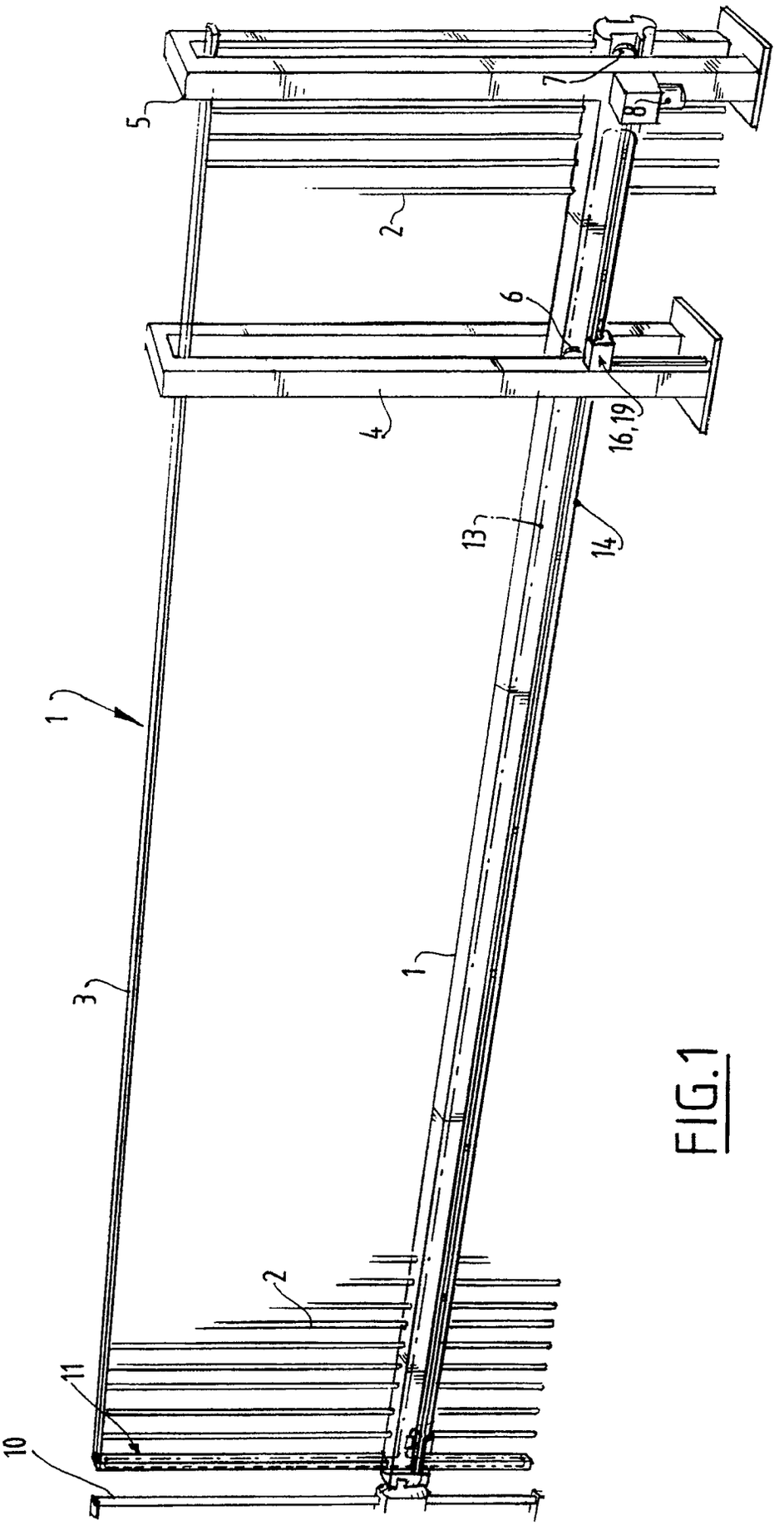


FIG.1

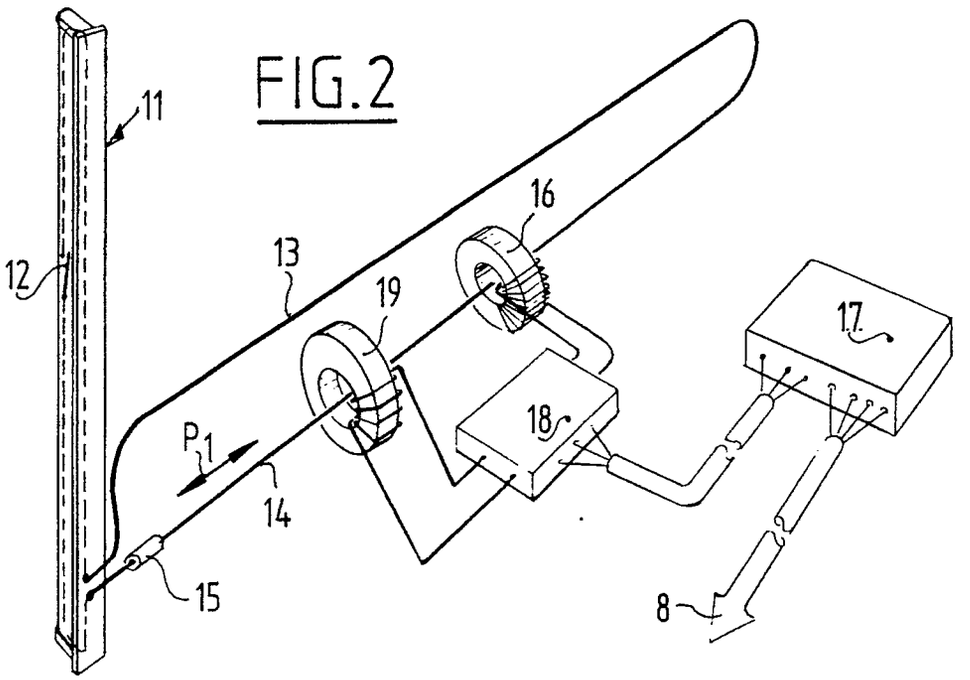


FIG.2

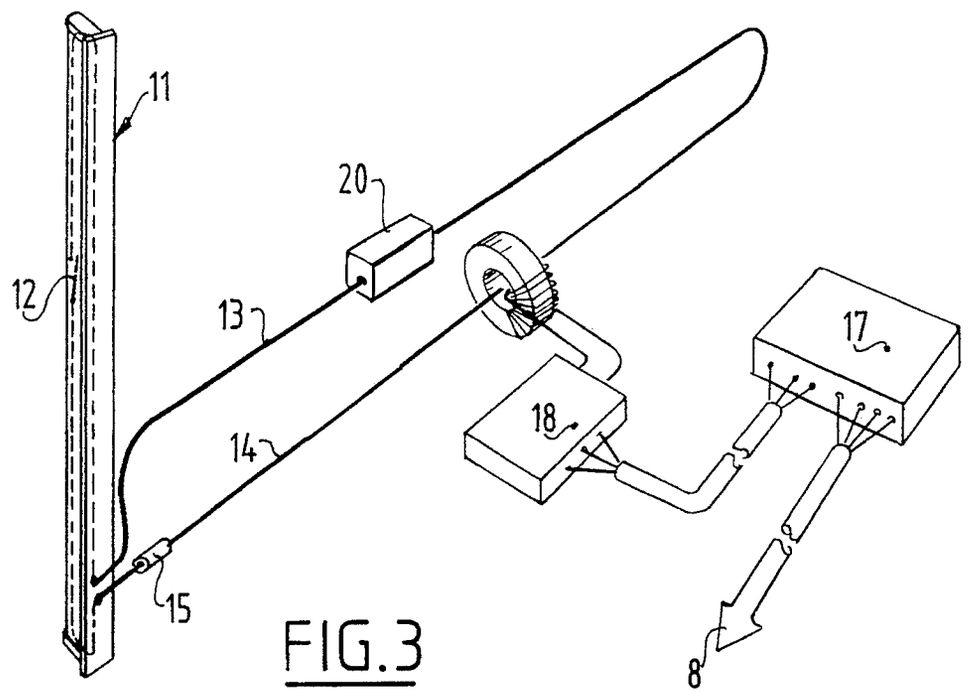
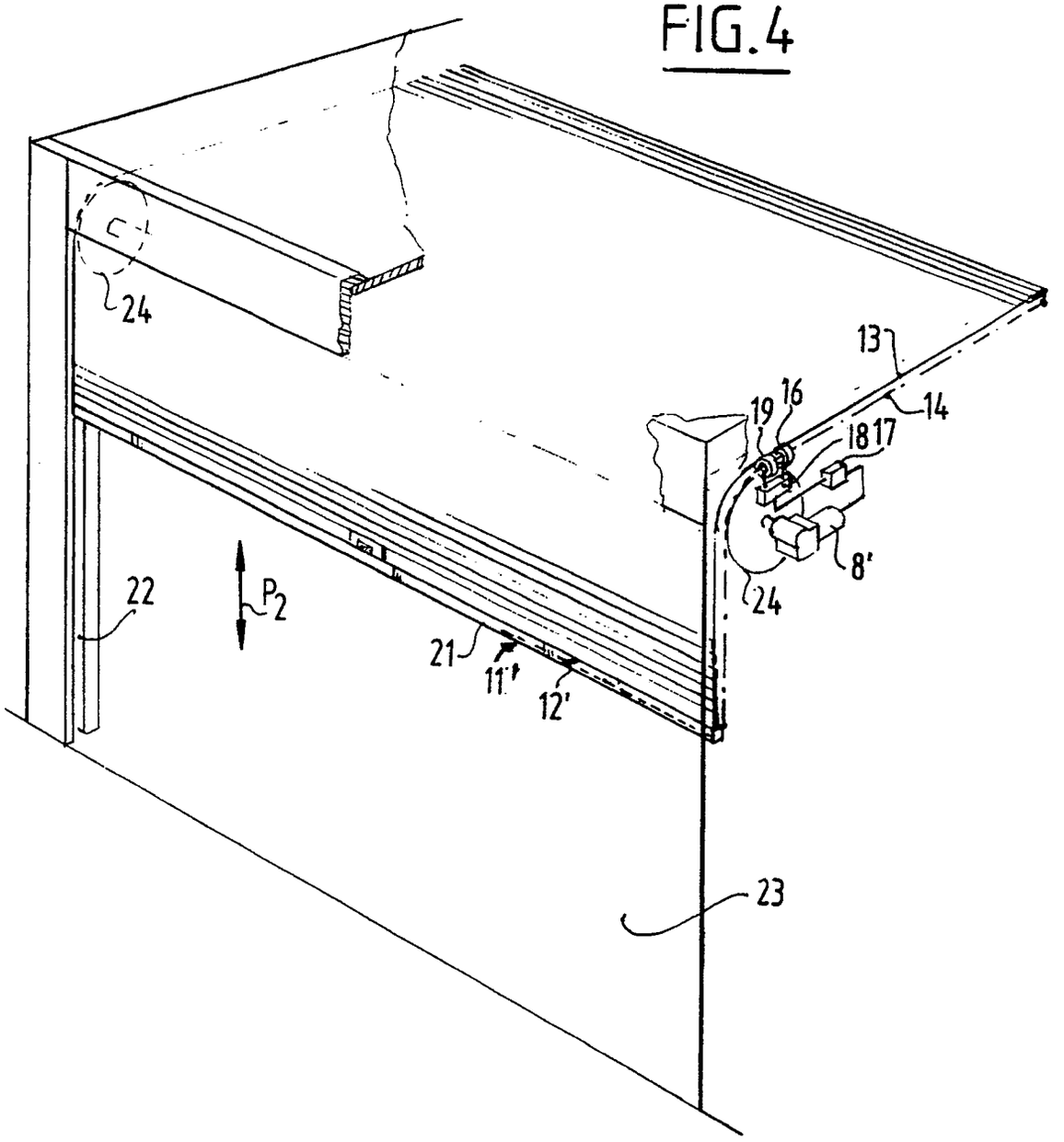


FIG.3

FIG.4



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EUROPEAN SEARCH REPORT

Application Number

EP 90 20 3194

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.5)
X	EP-A-0 316 691 (THYSSEN INDUSTRIE) * Column 3, line 45 - column 7, line 40 *	1,2,4	E 05 F 15/00
A		3	
A	WO-A-8 605 836 (JÖHNSON) * Page 2, lines 10-24; figure 1 *	1	
A	DE-A-3 008 597 (MESSERSCHMIDT) * Figure 2 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

E 05 F

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	08 March 91	NEYS B.G.

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
Y: particularly relevant if combined with another document of the same catagory
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