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(54) **A braking device for self closing doors.**

(57) In a braking device for self-closing doors of the type in which the closing movement is activated by means of a drop plumb (1) which via an elongated flexible transmission element (7) such as a pull wire can engage an element connected to the upper edge of the door, the transmission element (7) is routed mainly slip free over a transmission wheel (6), connected directly to the drop plumb and connected to an automatic revolving braking device, such as an eddy-current brake.

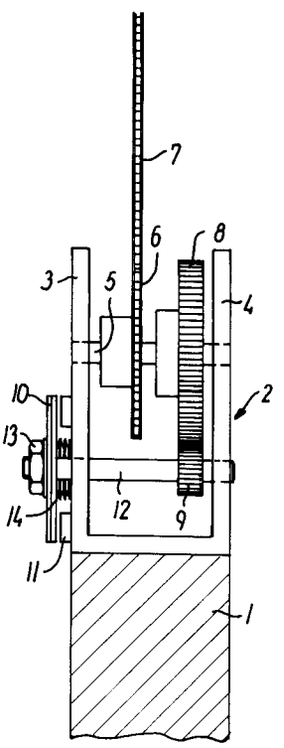

FIG. 1

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The invention relates to a braking device for self-closing doors of the type in which the closing movement is activated by means of a drop plumb which via an elongated flexible transmission element such as a pull wire can engage an element connected to the upper edge of the door.

In self-closing doors such as, e.g. fire doors, the closing speed is often regulated by means of an automatic braking device, usually in the form of an eddy-current brake, the turnplate of which functions as a short-circuiting rotor and is connected to the transmission element, usually designed as a pull wire, and thereby is brought to revolve by the closing movement at a speed of rotation corresponding to the closing speed. At increasing speed of rotation the braking effect is increased.

The known eddy-current brakes used for this purpose are most often designed as a bracket which, e.g. at sliding doors are firmly mounted in relation to the door opening at the upper edge thereof for connection with an element which corevolves with the closing movement of the pull wire. For use at sliding doors, the carrying wheels of which run in a rail that is open at the top, DK patent application No.5190/89 discloses an arrangement where the eddy-current brake is connected to one of the carrying wheels of the door running in said rail.

Mounting the known braking devices at installation of new doors as well as on existing doors requires a rather comprehensive assembling work, and the braking device which, with a view to unimpeded movement in the opening direction, must be provided with an overrunning clutch between the turnplate functioning as short circuit rotor and said corevolving element, must be of a varying design depending on whether the door opens to the right or the left. In addition, installation of the known braking devices will often be unsightly, as it cannot be established as an embedded installation.

The object of the invention is to provide a braking device, which can be used at all known types of self-closing doors, the closing movement of which is controlled by a drop plumb which normally moves in a closed plumb box, firmly mounted at one side of the door opening, and for which the mounting work is considerably reduced and the installation can be performed embedded.

These and other objects of the invention can be met by a design of the braking device which is characterized in that the transmission element is routed mainly slip-free over a transmission wheel connected directly to the drop plumb and connected to a revolving braking device, such as an eddy-current brake.

With the characteristic mounting of the braking device in connection with the drop plumb according to the invention the more laborious and often unsightly arrangement of the braking device as a separate bracket on the wall outside the door opening can be avoided. The braking device can also be used irrespective of whether the door is hinged in an open or a closed rail, and can be used on doors opening both to the left and to the right without altering its structure, and on standard types of self-opening doors which are normally kept open, as well as freely movable doors which allow manual opening and closing independently of the self-closing function.

In addition, the braking device according to the invention can be used on sliding doors as well as rise-and-fall doors.

The drop plumb and the braking device being in one unit, and the slip free connection to the elongated transmission element further entails an improved control of the closing movement, as the braking effect is exerted directly on the drop plumb.

In a preferred embodiment, the drop plumb is connected with a U-profile which is open at the top, with said transmission wheel and a gear arranged between the transmission wheel and a shaft journal of the eddy-current brake mounted inside the U-profile, the turnplate of the eddy-current brake being placed outside one side wall of the U-profile opposite a ring of permanent magnets mounted on this side wall.

A compact embodiment is hereby obtained, in which the braking device does not exceed the transverse dimensions of know drop plumbs.

The invention is further explained in the following with reference to the drawing in which

figs 1 and 2 are two side views of a preferred embodiment of the braking device according to the invention, and

figs 3 and 4 show the use of the braking device on a standard type of a sliding door and a self-closing door, respectively, which also moves freely when operated manually.

In the embodiment shown in figs 1 and 2, the drop plumb 1, having a square or rectangular cross section for running in a vertical plumb box at the closing side of a door opening, is connected to a U-profile 2 which is open at the top, between the vertical walls of which a chain wheel 6 is arranged on a shaft with overrunning clutch 5 for engagement with a draw chain 7 comprising two chain sections 7a and 7b, of which the first one is firmly anchored in relation to the door opening at or above the upper position of the plumb when the door is in its open position, whereas the second one is connected to the upper edge of the door or to an element engaging therewith. The chain wheel 6 can thus turn freely when the door moves towards its open position, but is locked in relation to the axle 5, when the door moves towards its closed

position.

The chain wheel 6 is via a gear with gear wheels 8 and 9 connected to a turnplate 10, placed outside one wall of the U-profile and functioning as short circuit rotor in an eddy-current braking device. Opposite the turnplate 10 a ring of permanent magnets 11 are mounted on the wall. For adjustment of the braking effect the turnplate 10 can be displaced on its shaft 12, whereby the air gap between the turnplate 10 and the magnets 11 is adjusted. Adjustment can in the shown embodiment be done by more or less tightening of a nut 13, against which the turnplate 10 abuts by means of saucer springs 14.

Fig 3 shows the braking device 16 built together with the drop plumb 15 arranged on a self-closing standard type fire door 17, i.e. of the type which is normally kept open. The door 17 is retained in its open position by means of an anchor plate 18 connected to the door which is attracted by a firmly mounted electromagnet 19.

When the current is cut from the electromagnet 19, which may be effected by a safety fuse not shown, the door 17 will be closed by means of the drop plumb 15, which via the transmission chain 20 is connected to the suspension elements 21, connected to the upper edge of the door, the chain 20 for instance being routed inside the guide rail 20 of the door.

The transmission chain 20 is routed through the plumb box 24 via a guide wheel 23.

Fig 4 shows the braking device on a freely movable, self-closing door 25. The anchor plate 27 is retained in the open position by the electromagnet 26 and is here connected to the transmission chain 28, which is routed through a hole 29 in a carrier element 30 connected to the door. This can move freely to and fro along the chain 28 as long as the retaining device consisting of the anchor plate 27 and the magnet 26 is activated. When the retaining device is released, the carrier element 30 is caught by the anchor plate 27, whereby the door moves towards its closed position.

Albeit preferable, the connection between the drop plumb and the door does not necessarily have to be a draw chain. A pull wire may be used, as long as a mainly slip free transmission between the wire and the transmission wheel of the braking device is ensured, e.g. by winding the wire twice around the transmission wheel, the latter having a substantially larger diameter than the wire, e.g. twenty times the diameter of the wire.

Claims

1. A braking device for self-closing doors of the type in which the closing movement is activated by means of a drop plumb (1) which via an elongated flexible transmission element (6), such as a pull wire can engage an element connected to the upper edge of the door, **characterized** in that the transmission element (7) is routed mainly slip-free over a transmission wheel (6) directly connected to the the drop plumb and to an automatic revolving braking device, such as an eddy-current brake.

2. A braking device as claimed in claim 1, **characterized** in that the transmission element is a draw chain (7) and that said transmission wheel (6) engages the chain.

3. A braking device as claimed in claim 1 or 2, **characterized** in that the drop plumb (1) is connected with a U-profile (2) open at the top, with the transmission wheel (6) and a gear (8, 9) between the wheel and a shaft journal of the eddy-current brake mounted inside the U-profile, the turnplate (10) of the eddy-current brake being placed outside one side wall (3) of the U-profile opposite a ring of permanent magnets (11) mounted on this side wall.

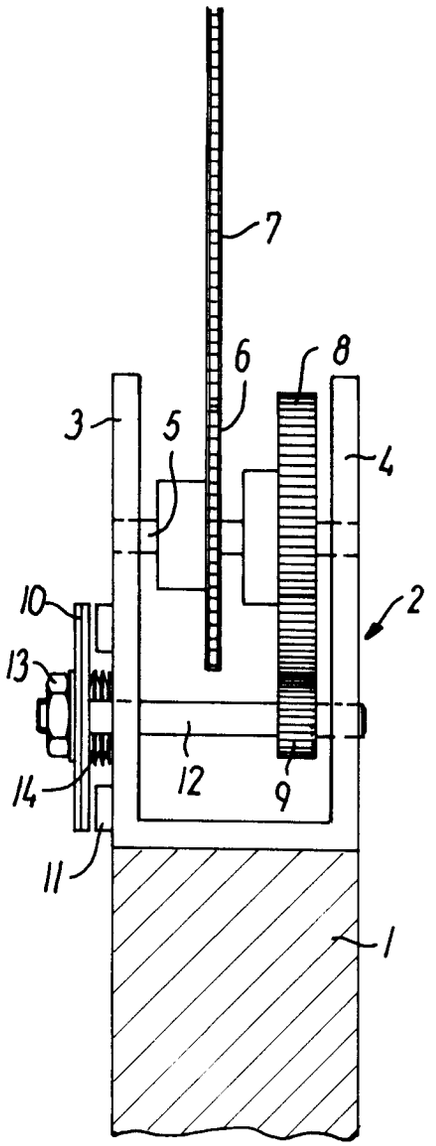

FIG. 1

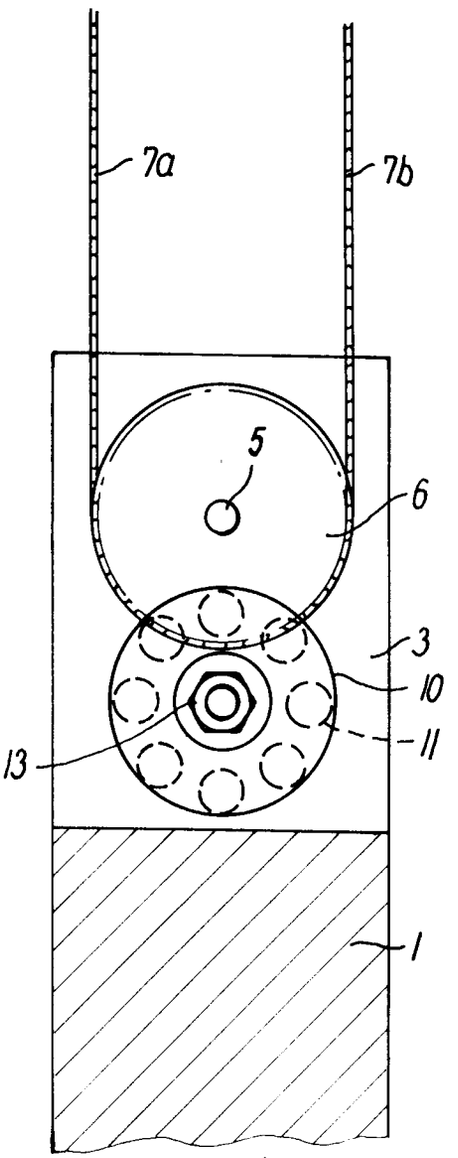

FIG. 2

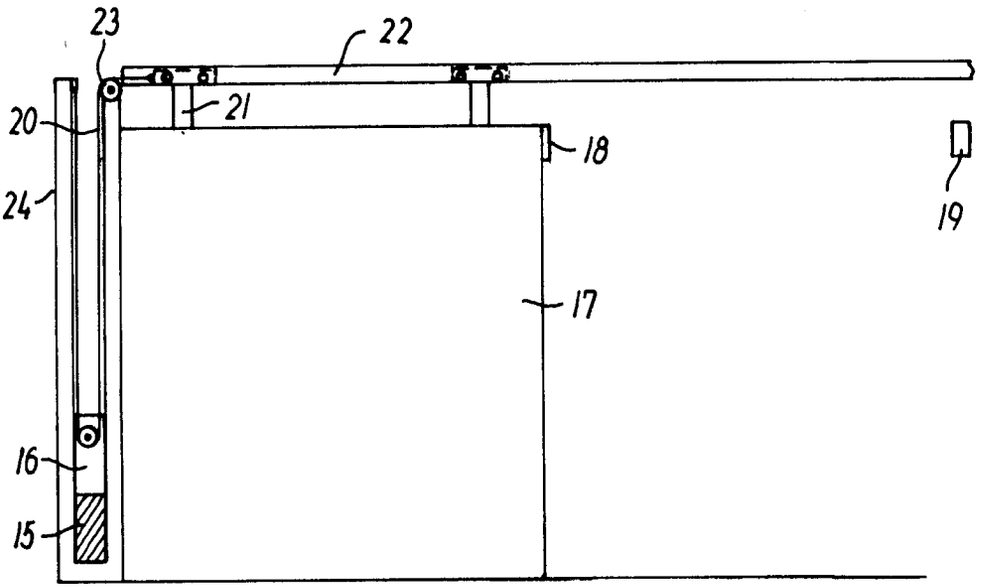

FIG. 3

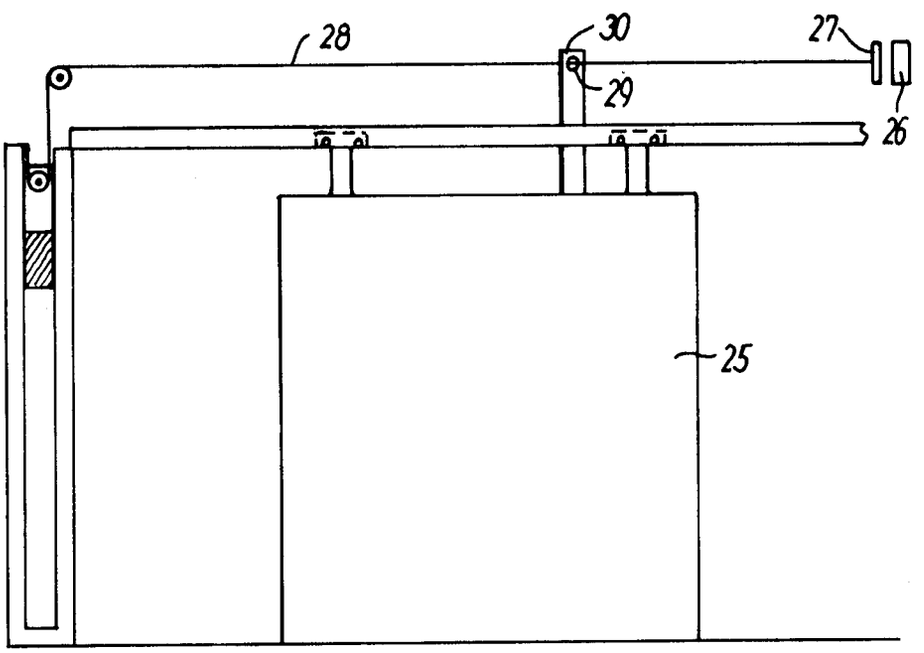

FIG. 4

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EUROPEAN SEARCH REPORT

Application Number

EP 91 61 0074

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)
Y	DE-C-668 313 (A. SIEWERT) * page 2, line 6 - line 35; figures 1,2 *	1,2	E05F1/00 E05D13/00
Y	FR-A-972 425 (SOCIETE FRANCAIS DE CONSTRUCTION DE BENNES AUTOMATIQUES) * page 1, column 1, line 7 - line 27; figure 1 *	1,2	
A	EP-A-0 081 189 (KARL-HEINZ LINNIG) * abstract * * page 10, line 10 - page 13, line 1; figures 1,2 *	1-3	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)
E05F
E05D
A62C
B66C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	16 APRIL 1992	GUILLAUME G.E.P.

CATEGORY OF CITED DOCUMENTS

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