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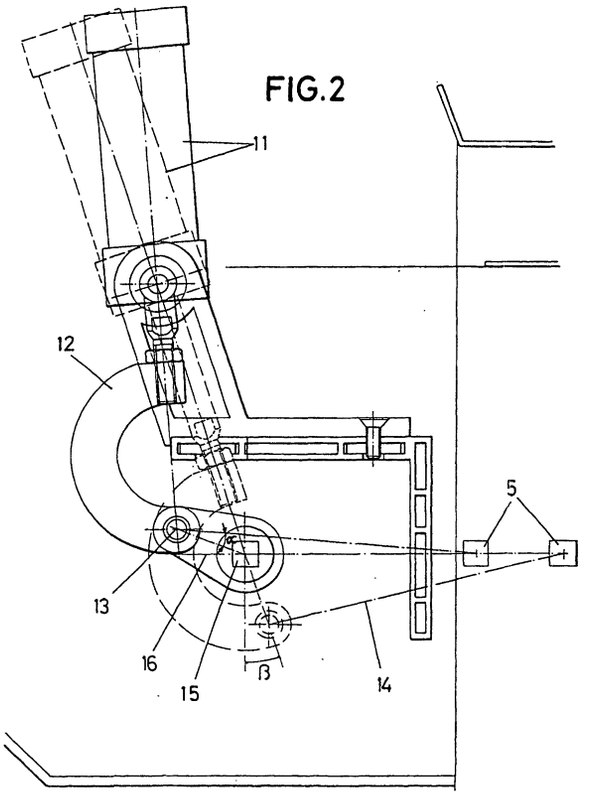
(54) **DEVICE FOR ACTUATING EMBEDDABLE SLIDING DOORS**

(57) The cylinder (11) that acts on the longitudinal guide (5) for sliding the doors (1) acts on said guide with the aid of a C-bar (12) connected to it and that is hinged to a second arm (14), which is in turn also hinged to the guide (5), so that the end of the aforementioned C-bar (12) is jointed to a crank (16) that makes it swivel about a shaft (15), to which it transmits a rotational motion when the cylinder (11) is actuated, which shaft is in turn meant to transmit the swiveling motion generated by said cylinder to the locking and safety mechanisms that keep the door in an inserted or locked position.

FIG.2



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Description

OBJECT OF THE INVENTION

[0001] The present invention relates to a device specifically designed to perform the initial opening maneuver and the final closing maneuver of sliding-locking doors such as those used in subway and train cars or the like, wherein their opening is initiated by a forward displacement of the door to release it from the body of the car or element in question, and continues with the sideways sliding motion.

BACKGROUND OF THE INVENTION

[0002] In closures such as those of the aforementioned examples, wherein usually two sliding and locking doors are involved that must move in a synchronized manner, one of the most commonly employed solutions due to its structural and functional simplicity is a pneumatic cylinder that acts directly on one of the doors, while the second door receives the motion of the first door through a transmission belt to achieve a synchronized motion.

[0003] More specifically, the door driven directly by the pneumatic cylinder is provided with a rack that in its longitudinal displacement turns a pinion on whose shaft is mounted a transmission belt that connects said pinion with another one coupled to the rack of the second door, so that by using identical racks and pinions the motion of one door is transmitted to the other with perfect symmetry.

[0004] In addition, due to their operational conditions vehicles of this type require a good aerodynamic penetration, a minimized noise in its displacement and a good closure of the doors as relates to tightness. To achieve these objectives the sliding-locking doors of this type have mechanisms that enable their combined motion, so that when the doors are closest to each other, that is, when they are closed, as well as in their guides for the sliding motion they can be inserted in the car body to establish a more or less tight closure and a surface continuity between the doors and the car body, thereby optimizing the aerodynamics of the latter and preventing noises made by the air upon contact with the edges of the doors.

[0005] Typically, this front or transverse motion of the guides associated to the doors is achieved by double-action pneumatic cylinders, which with the aid of suitable guides generate the required motion. However, the main problem of this solution is that the same cylinders wedge the door in its closed position, so that if there is a pressure loss in them for any reason the door will be released and free to move outwards with any interior force, such as a passenger leaning on it.

DESCRIPTION OF THE INVENTION

[0006] The actuation device for sliding-locking doors of the invention enables optimum displacement conditions both in the forward motion of the door and in its subsequent longitudinal motion. For this purpose and more specifically, according to one of the characteristics of the invention the guides for the longitudinal motion of the doors with its corresponding mechanisms, that are in turn aided by transverse guides that enable the forward motion, receive the action of a pneumatic cylinder that is hinged onto the fixed chassis with respect to which move the doors; connected to the shaft of said cylinder is a C-bar to which is in turn hinged a second bar that will act on the aforementioned longitudinal guide of the doors, so that the free end of said arched bar defines during the actuation of the pneumatic cylinder a motion that includes an approximation to the working plane of the doors, forcing the longitudinal guides of said doors to move outwards when the piston emerges from the cylinder and to move inwards when the piston retracts.

[0007] According to another characteristic of the invention the transverse guides that aid in the wedging/release of the door system, that is, in the outwards and inwards motion of the longitudinal guides on which the door sliding mechanisms are established, are mounted on four rollers which ensure a perfect guidance of said system both during the outwards motion of the longitudinal guides and during its inward motion.

DESCRIPTION OF THE DRAWINGS

[0008] As a complement of the description being made and in order to aid a better understanding of the characteristics of the invention, according to a preferred example of embodiment, the present description includes a set of drawings where for purposes of illustration only and in a non-limiting manner, the following is shown:

Figure 1 shows a profile and cross-sectional detailed view of a system of sliding doors for train cars and the like, provided with the actuation device that is the object of the present invention, the cross-section being made along one the plane of the transverse guides of the door system.

Figure 2 shows a cross-sectional detailed view similar to the previous figure, made along the plane of the cylinder that performs the wedging/releasing maneuver of the door system from the car body.

PREFERRED EMBODIMENT OF THE INVENTION

[0009] In view of these figures, and more specifically of figure 1, it can be appreciated that the device of the invention is applicable for example to doors (1) that can

fit in the car body (2), establishing an external surface continuity with said body, or capable of being released and sliding outwards with the aid of transverse guides (3) that, in accordance with one of the characteristics of the invention, travel each on four casters (4), thereby providing an optimum stability to the guides (3), which are connected to the longitudinal guides (5) on which takes place the longitudinal displacement of the doors (1), that will result in their opening when said longitudinal guides (5) have emerged sufficiently from the body (2) of the car; this longitudinal actuation is performed for example by a pneumatic cylinder (6) acting directly by means of a bar (7) on one of the doors (1), and acting indirectly on the other door through a belt (8) that is attached to the same arm (7) with the aid of a clip (9) and is attached on its other end to the other door (1) with the aid of a second clip (10), so that said transmission belt (8) determines a synchronized and opposite motion of one of the doors with respect to the other, specifically with respect to the one actuated on directly by the cylinder (6).

[0010] The wedging/releasing operation of the guides (5) is achieved by the corresponding pneumatic cylinder (11), as shown in figure 2, being connected on the free end of its shaft to a C-bar (12) with an approximately semi-circular shape, that on its free end (13) is hinged to a second bar (14) that will act on the guides (5) to retract them or push them outwards, according to the two positions shown in a solid and broken line in figure 2; the purpose of the C-shape of the bar (12) is that its motion does not affect a shaft (15) that is jointed to said bar (12) through a crank (16) so that the resulting motion of the arm (12) implies a rotation of the shaft (15) that is meant to transmit the motion to the door locking mechanisms, which is foreign to the invention and the description of which is beyond its scope.

[0011] Obviously, if a locking system is used for the door that does not require the use of the actuation device of the invention, said arm (12) may be straight.

Claims

1. Actuation device for sliding-locking doors, particularly for sliding doors of the type used in train cars and the like, in which two combined and consecutive movements are established, one of longitudinal displacement on the outer face of the car body, and another of transverse displacement for locking-releasing the door from said body, wherein the longitudinal guide for the displacement of the doors can move forward, that is, in a locking-releasing sense, by the action of a pneumatic cylinder, **characterized in that** said pneumatic cylinder (11) incorporates, rigidly connected to a free end of its shaft, an arm (12) that is jointed to a second arm (14) which transmits the motion to the longitudinal guides (5) of the doors, with the first arm (12) having a C-shaped configuration and jointed on its free end to a crank (16) that during the displacement of the arm (12) undergoes a swiveling motion about a shaft (15) to which it is suitably keyed, such that said shaft (15) transmits its motion to the door locking mechanism.

2. Actuation device for sliding-locking doors, as claimed in claim 1, **characterized in that** the transverse guides (3), with which the locking and releasing maneuvers of the longitudinal guide (5) are effected, are mounted on corresponding groups of four casters (4) that stabilize its trajectory. stabilize its trajectory.

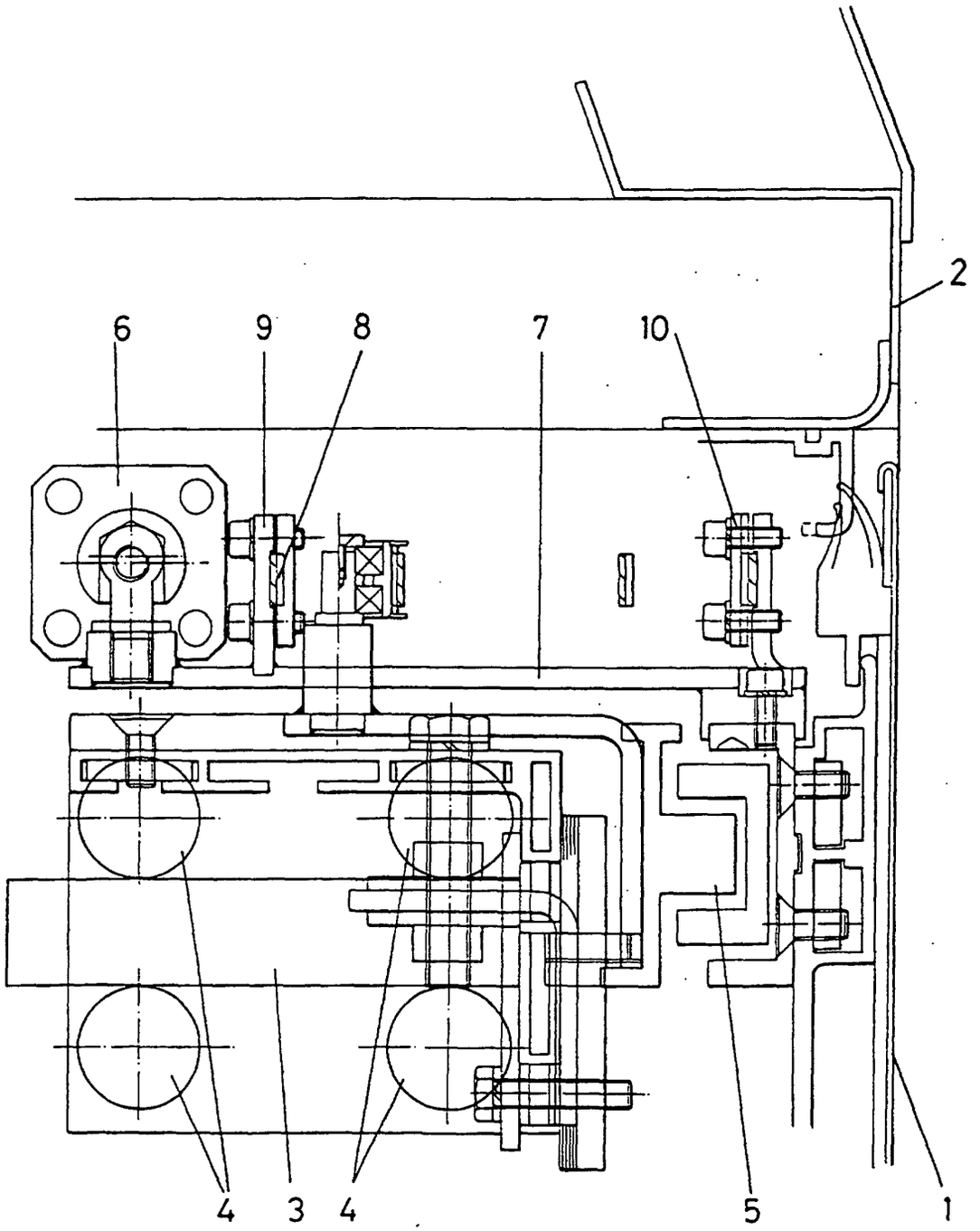
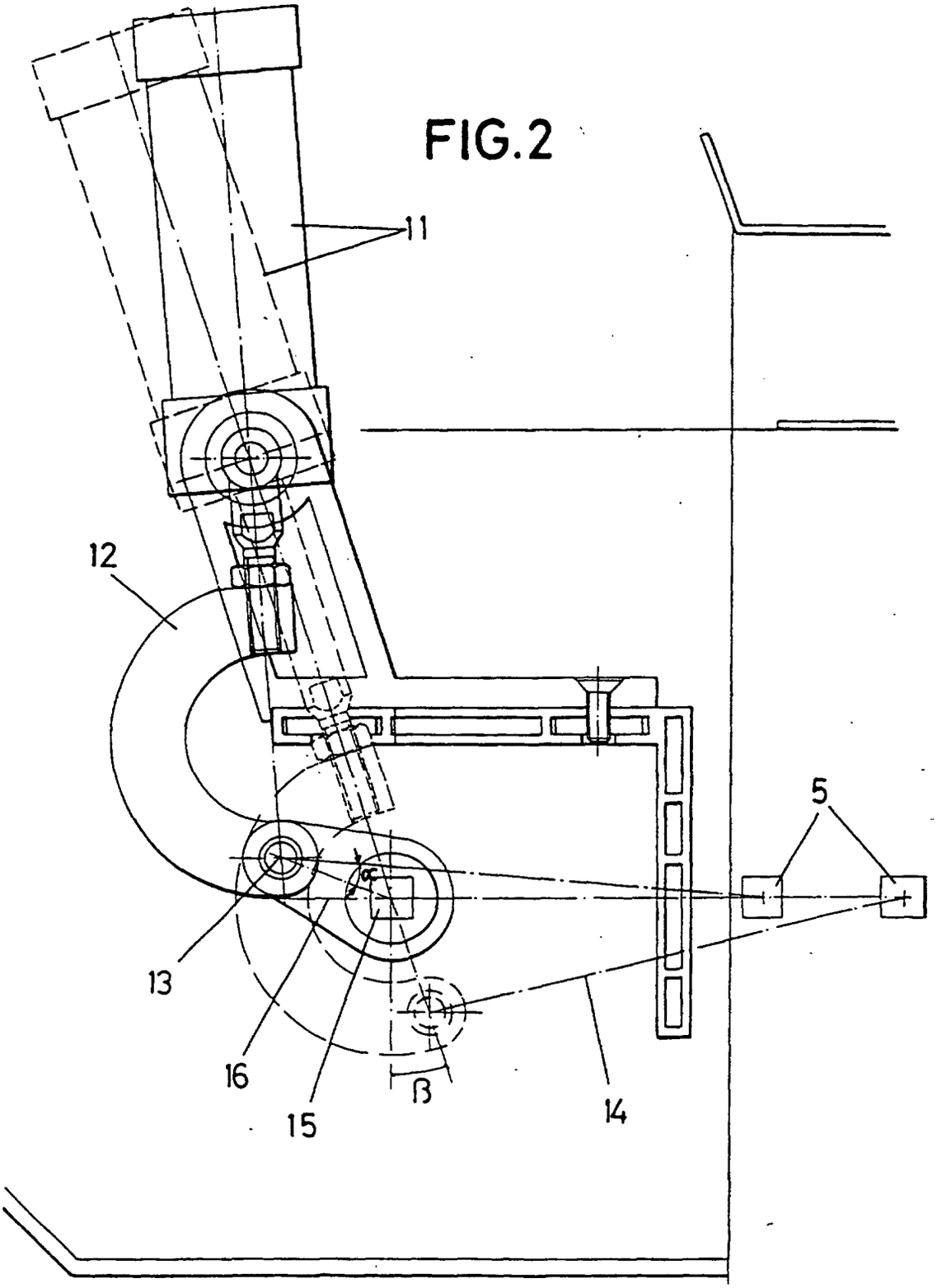


FIG.1

FIG.2



INTERNATIONAL SEARCH REPORT

International application No.
PCT/ ES00 /00425

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 E05D15/10, E05F15/06, B61D19/02,B60J5/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 E05D15, E05F15, B60J5, B61D19

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CIBEPAT, EPODOC, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 0053875 A (FAIVELEY ESPAÑOLA, S.A.) **14 September 2000 (14.09.00) abstract, figures, page 4, line36-page 5, line 26**	1,2
Y	US 4669220 A (DILCHER, Dietmar) **2 June 1987 (02.06.87) the whole document**	1,2
Y	EP 0940278 A (IFE Industrie-Einrichtungen Fertigungs-Aktiengesellschaft) 08 de **8 September 1999 (08.09.99) abstract, figures 3-6**	2
A	US 3994094 A (MARZOCCO, Alessandro) **30 November 1976 (30.11.76) the whole document**	1,2
A	DE 2451735 A (KIEKERT SÖHNE, Am) **6 May 1976 (06.05.76) the whole document**	2

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Date of the actual completion of the international search	Date of mailing of the international search report
8 August 2001 (08.08.01)	**16 August 2001 (16.08.01)**
Name and mailing address of the ISA/ **S.P.T.O**	Authorized officer
Facsimile No.	Telephone No.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/ ES00 /00425

Patent document cited in search report	Publication date	Patent familiy member(s)	Publication date
WO 0053875	14-09-2000	AU 2807000	28-09-2000
		ES 2156540	16-06-2001
US 4669220	02-06-1987	NO 86096	02-10-1986
		FI 861058	02-10-1986
		DK 144086	02-10-1986
		EP 0196488	08-10-1986
		ES 8703114	16-04-1987
		AT 47985	15-12-1989
		DE 3666935	21-12-1989
EP 0940278	08-09-1999	AT 38998	15-05-1999
US 3994094	30-11-1976	BE 836853	16-04-1976
		DK 575375	21-06-1976
		SE 7514182	21-06-1976
		FI 753561	21-06-1976
		NO 754322	22-06-1976
		NL 7513906	22-06-1976
		DE 2522640	01-07-1976
		FR 2294871	16-07-1976
		JP 51085111	26-07-1976
		BR 7508464	24-08-1976
		DE 2545694	18-11-1976
		DE 2547336	18-11-1976
		ZA 7507324	24-11-1976
		FR 2310235	03-12-1976
		FR 2310236	03-12-1976
		DD 123512	05-01-1977
		AR 209132	31-03-1977
		AU 8702375	02-06-1977
		ES 443671	16-07-1977
		GB 1485921	14-09-1977
		AT 392275	15-01-1978
		GB 1498455	18-01-1978
		GB 1513686	07-06-1978
		CA 1033989	04-07-1978
		CH 603376	15-08-1978
		AT 345335	11-09-1978
		IT 1027933	20-12-1978
		YU 321475	31-05-1982
		HU 178955	28-07-1982
		IN 155529	16-02-1985
		BG 37073	15-03-1985
		YU 39509	20-03-1985
DE 2451735	06-05-1976	NONE	

Form PCT/ISA/210 (patent family annex) (July 1992)