MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A
REGULATION 11 (1)

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952-1973

CONVENTION APPLICATION FOR A PATENT

We, WESTINGHOUSE BRAKE AND SIGNAL COMPANY LIMITED, a Company incorporated under the Laws of Great Britain, of 3 John Street, London, WC1N 2ES, England, hereby apply for the grant of a Patent for an invention entitled:

"SLIDING PLUG DOOR MECHANISMS"

which is described in the accompanying Complete Specification.

This application is a Convention Application and is based on the Application No. 52280/75 for a Patent or similar protection made in the United Kingdom on 20th December, 1975.

Our address for service is:-

APPLICATION ACCEPTED AND AMENDMENTS ALLOWED 19/10/79

SHEILSTON WATERS
55 Clarence Street,
SYDNEY. N.S.W. 2000

DATED this 8th day of December, 1976.

WESTINGHOUSE BRAKE AND SIGNAL COMPANY LIMITED

By

[Signature]

[Stamp]

Allow Institute of Patent Attorneys of Australia
of SHEILSTON WATERS

To: The Commissioner of Patents,
WODEN, A.C.T.

D.B. 51G — MS
Fee: $30.00
-9 DEC 1976
FORM 8—REGULATION 12 (2)
COMMONWEALTH OF AUSTRALIA
PATENTS ACT, 1952-1973
DECLARATION IN SUPPORT OF A CONVENTION APPLICATION FOR A PATENT

In support of the Convention Application No. 20418/76 made by

WESTINGHOUSE BRAKE AND SIGNAL COMPANY LIMITED

(hereinafter referred to as “Applicant”) for a patent for an invention entitled:

SLIDING PLUG DOOR MECHANISMS

1. (a) ALAN REGINALD TURNER, of

WESTINGHOUSE BRAKE AND SIGNAL COMPANY LIMITED

of (c) 3 John Street, London WC1N 2ES, England.

I do solemnly and sincerely declare as follows:

1. I am authorised by Applicant to make this declaration on its behalf:

2. The basic Application(s) as defined by section 141 of the Act was/were made in (a) GREAT BRITAIN on the 20th day of December 1975

by (b) WESTINGHOUSE BRAKE AND SIGNAL COMPANY LIMITED

of (c) 3 John Street, London WC1N 2ES, England.

the actual Inventor(s) of the invention and the facts upon which Applicant is entitled to make the Application are as follows:

Applicant is the Assignee of the said Inventor(s).

4. The basic Application(s) referred to in paragraph 2 of this Declaration was/were the first Application(s) made in a Convention country in respect of the invention, the subject of the Application.

DECLARED at Chippingham, England

17th day of November 1976

(Signature of Declarant)

To THE COMMISSIONER OF PATENTS.
Claim 1. A swinging arm door constraining device including an arm pivoted at one end in a housing and having spaced from the pivot point a part projectable from the housing for connection to a door, said arm carrying a first track and said housing carrying a second track, said tracks mutually crossing at respective different points for different positions of the arm and a drivable member engaging both said tracks and thereby positively determining the position of said arm.
Name of Applicant: WESTINGHOUSE BRAKE AND SIGNAL COMPANY LIMITED

Address of Applicant: 3 John Street, London WC1N 2ES, England

Actual Inventor: GEOFFREY ROBINSON TREGONING

Address for Service: Shelston Waters, 162 Clarence Street, Sydney

Complete Specification for the Invention entitled: "SLIDING PLUG DOOR MECHANISMS"

The following statement is a full description of this invention, including the best method of performing it known to me/us:
This invention relates to sliding plug door mechanisms and relates especially to a swinging arm door control linkage for use in such mechanisms.

In sliding plug door mechanisms for railway vehicles, it has been proposed to provide means whereby a vehicle door is arranged to, when opening or closing, travel along the outside of the vehicle and in the proximity of the closed position of the door, the mechanism providing for lateral movement of the door towards and away from the car so that the door in the closed position plugs into or at least against the door opening.

In such mechanisms, it has already been proposed to provide most of the controlling parts in a recess at the head of the vehicle door and to provide a swinging arm link at a lower point, preferably beneath the threshold, which provides a lateral steadying and/or locking effect for the door whilst sliding away from and towards the plugging position.

According to the invention it is proposed to provide a swinging arm door constraining device including an arm pivoted at one end in a housing and having spaced from the pivot point a part projectable from the housing for connection to a door, said arm carrying a first track and said housing carrying a second track, said tracks mutually crossing at respective different points for different positions of the arm and a drivable member engaging both said tracks and thereby positively determining the position of said arm.

Preferably, in the or each of two extreme positions of the pivotted arm, a force exerted on the arm
tending to rotate it is countered by a reaction between the first track, the drivable member and the second substantially normal to provide a locking action.

In order that the invention may be more clearly understood and readily carried into effect, the same will be further described by way of example with reference to the accompanying drawing which illustrates in cut-away diagrammatical form, a swinging arm control mechanism in accordance with one embodiment of the invention.

Referring to the drawing, this shows in part a rail vehicle sliding plug door the other panel of which is denoted by reference 1 and the inner panel of which is denoted by reference 2, the door being typically of aluminium with a suitable core filling. Between the panels there is a slipper block denoted by reference 3 which runs in a longitudinal track (not shown) in the door panel which is carried on a pivot pin 4 at the outward end of a projecting part of swinging arm 5 which in its turn is rotatably pivoted to a fixed pivot point 7 in a housing formed beneath the threshold 8 of the car door opening, one pillar 9 of which is shown. The upper surface of part of the threshold is shown cut-away to reveal the parts beneath and it will be seen that positively located beneath the cut-away part is a plate 10 having fixed in the housing therein a cam slot 11 which forms a track, within which a drivable member 12 is slideable and is carried on the end of a curved linkage 13 connected at a pivot 14 to a drive member 15 in the form of a crank mounted at the lower end of a stub shaft 16 journalled in the door opening threshold at the forward corner thereof. The linkage 13 is curved to clear in operation the further fixing
stud 17 which positively locates the cam plate 10 against rotation about the pivot point 7 which carries the swinging arm. The swinging arm itself is also provided with a cam slot 18 which also forms a track and has the configuration shown. The relationship between the cam form of the slot 18 and the cam form of the cam slot 11 in the plate 10, positively determines the motion characteristic of the swinging arm 5.

Whilst not shown in the drawing, the plate 10 which is uppermost in the mechanism, is duplicated by a further identical cam plate, lowermost in the apparatus and the drivable member 12 is also similarly duplicated to provide a positive effort against the swinging arm between the two cam plates. Additionally, the linkage 13 is duplicated to provide one such linkage on either side of the drive member 15 to again provide a true lateral thrust to the pivot 14. Furthermore, the pin forming the pivot 14 is provided with end pads of nylon or other suitable material for the purposes of locating it between projections throughout the range of its operational motion.

In operation of the swinging arm the member 15 is angularly movable by a slide shaft device 16, the stub shaft 16 is connected by a torque rod extending from drive means at the head of the vehicle door opening, through a suitable universal joint. Such a torque rod is shown as reference 42 in Figure 2 of the specification of copending patent application no. 20415/76. The stub 16 is thereby rotated clockwise during unplugging of the door and anti-clockwise during plugging by the door operating mechanism.
not shown. At commencement of unplugging of the vehicle door by the sliding door mechanism which is provided at the head of the door opening, the plugging edge 21 of the door moves outwards at least at its upper edge as a result of the unplugging effect of the mechanism provided at the head of the door and the drive mechanism drives through the torque rod to rotate the stub shaft 16 in the clockwise direction as shown by the arrow, thereby driving the cam drivable member 12 through the drive arm 15 and the linkage 13 in the direction shown by the arrows. Since the cam plate 10 is positively located, the member 12 can travel only along the cam slot 11 and a resultant of the motion is therefore imparted to arm 5 because of the relationship between the cam slots 11 and 18. This motion initially is negligible whilst the cam 12 moves away from its end positions in both the cam slots and thereafter motion takes place in the direction of the arrow to unplug and laterally position lower edge of the door. When the cam follower 12 reaches the end of the two cam slots, any reaction through the swinging arm 5 is generally normal to the reaching surfaces of the slots 11 and 18 and therefore in that position, the arm 5 is therefore positively positioned. Subsequent longitudinal sliding of the door is permitted by the block 3 being able to travel along the aforementioned track in the panel door and the door is thereby positively supported against lateral movement relative to the side of the car. The reverse operation takes place during closing motion when the swinging arm linkage returns to the position illustrated. Again, it will be seen that by virtue of the relationship between slots 11 and 18 the arm is again
positively positioned in the closed position of the door.

For the purposes of facilitating the setting up of doors mounted in a doorway on a sliding and plugging door mechanism according to the above description, the fixing stud 17 may incorporate an eccentric bearing or other adjustable locking means such that, by means of a suitable tool, rotational or sliding adjustment of 17 can set the mechanism a small distance inward or outward of the doorway in precise fashion.
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A swinging arm door constraining device including an arm pivoted at one end in a housing and having spaced from the pivot point a part projectable from the housing for connection to a door, said arm carrying a first track and said housing carrying a second track, said tracks mutually crossing at respective different points for different positions of the arm and a drivable member engaging both said tracks and thereby positively determining the position of said arm.

2. A swinging arm door constraining mechanism as claimed in Claim 1, wherein the or each of two extreme positions of the pivoted arm a force exerted on the arm tending to rotate it is countered by a reaction between the first track the drivable member and the second track is substantially normal to the tracks to provide a locking action.

3. A swinging arm door constraining mechanism substantially as described herein, with reference to the accompanying drawing.

4. A sliding plug door, the lower edge of which is controlled by a mechanism substantially as claimed in Claim 1, 2 or 3.

DATED this 10th day of October, 1979.

WESTINGHOUSE BRAKE AND SIGNAL COMPANY LIMITED.

Attorney: ROBERT C. SHELSTON
Fellow Institute of Patent Attorneys of Australia
of SHELSTON WATERS