AUSTRALIA

PATENTS ACT 1990

PATENT REQUEST: STANDARD PATENT

I/We, the Applicant(s)/Nominated Person(s) specified below, request I/We be granted a patent for the invention disclosed in the accompanying standard complete specification.

[70,71] Applicant(s)/Nominated Person(s):

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[54] Invention Title:

Linear Induction Motor Actuated Stop

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Details of Basic Application(s):

[31] Appl'n No(s):

348,338

[33] Country:

US

[32] Application Date:

2 December 1994

DATED this FIRST day of DECEMBER 1995

Jervis B. Webb International Company

By:

[Signature]

Registered Patent Attorney

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INSTR CODE: 53409

S 061661 011295
NOTICE OF ENTITLEMENT

I, John Gordon Hinde, of Spruson & Ferguson, St Martins Tower, 31 Market Street, Sydney, New South Wales 2000, Australia, being the patent attorney for the Applicant(s)/Nominated Person(s) in respect of an application entitled:

Linear Induction Motor Actuated Stop

state the following:-

The Applicant(s)/Nominated Person(s) has/have entitlement from the actual inventor(s) as follows:-

The Applicant(s)/Nominated Person(s) is/are the assignee(s) of the actual inventor(s).

The Applicant(s)/Nominated Person(s) is/are entitled to rely on the basic application(s) listed on the Patent Request as follows:

The Applicant(s)/Nominated Person(s) is/are the assignee(s) of the basic applicant(s).

The basic application(s) listed on the Patent Request is/are the first application(s) made in a Convention country in respect of the invention.

DATED this FIRST day of DECEMBER 1995

John Gordon Hinde

IRN: 320332

INSTR CODE: 53490
Claim

1. A stopping device for a conveyor system having a carrier selectively engageable with a propelling member, said stopping device comprising:

   a housing;

   a stop plate slidably mounted to said housing for disengaging the propelling member from the carrier, said stop plate reciprocally movable between an extended position and a retracted position;

   magnetic means for moving said stop plate between said extended position and said retracted position; and

   locking means for selectively locking said stop plate in said extended position and said retracted position, wherein said locking means comprises said magnetic means and a pin slidably mounted in a pin bore having at least one opening, for movement between a first position and a second position with respect to said opening.

7. A carrier stopping device for a conveyor having a carrier and a propelling member, said stopping device comprising:

   a housing;

   a stop member mounted within the housing for disengaging said propelling member from said carrier;
said stop member reciprocally moving between an extended position where
said stop member is in contact with said carrier and a retracted position; and

a linear induction motor comprising a stator and a reactor element for
activating and deactivating said stop member.
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Invention Title: Linear Induction Motor Actuated Stop

The following statement is a full description of this invention, including the best method of performing it known to me/us:-
LINEAR INDUCTION MOTOR ACTUATED STOP

Background of the Invention

I. Field of the Invention

The present invention relates to conveyor systems having disengageable load carriers and more particularly to a device for stopping and disengaging a carrier in such a system.

II. Description of the Prior Art

Conveyor systems, such as "power and free conveyors" have load carriers which may be selectively released from a propelling mechanism. A power and free conveyor includes a "power line" and a number of load carriers suspended on a carrier track. The "power line" includes a propelling mechanism for the carriers and is supported for continuous movement on a power track.

The "power line" is mounted adjacent to the carrier track. Load carriers are suspended from the carrier track on trolleys. Each trolley has a driving mechanism which engages a pusher of the propelling mechanism. The driving mechanism includes a retractable driving dog and a hold-back dog. The pusher is held between the dogs to propel the carrier.

Wayside stopping stations are provided to selectively disengage the pusher from the carrier and hold the carrier in position while an operation, such as loading or unloading, is performed. The carriers are disengaged from the pusher by extending a stop plate into the path of travel of the driving mechanism to retract or depress the driving dog. The stop plate, thus, releases the pusher and then abuts against a stop engagement surface to hold the carrier.

Previously known stopping devices utilized mechanical assemblies or pneumatic systems to extend and retract the stop plate. These assemblies operate at a relatively slow speed in extending and retracting the stop plate. In environments having dust, dirt, or other contaminants, it is necessary to carefully
protect the mechanical assembly from clogging and jamming. Pneumatic systems are noisy and require extensive and expensive air supply systems and large compressors.

Accordingly, it would be advantageous to provide a simple and inexpensive stop assembly which is not sensitive to environmental conditions and which is rapidly extended and retracted.

**Summary of the Present Invention**

In accordance with one aspect of the present invention there is provided a stopping device for a conveyor system having a carrier selectively engageable with a propelling member, said stopping device comprising:

a housing;

a stop plate slidably mounted to said housing for disengaging the propelling member from the carrier, said stop plate reciprocally movable between an extended position and a retracted position;

magnetic means for moving said stop plate between said extended position and said retracted position; and

locking means for selectively locking said stop plate in said extended position and said retracted position, wherein said locking means comprises said magnetic means and a pin slidably mounted in a pin bore having at least one opening, for movement between a first position and a second position with respect to said opening.

In accordance with another aspect of the present invention there is provided a carrier stopping device for a conveyor having a carrier and a propelling member, said stopping device comprising:

a housing;

a stop member mounted within the housing for disengaging said propelling member from said carrier;

said stop member reciprocally moving between an extended
position where said stop member is in contact with said carrier and a retracted position; and

a linear induction motor comprising a stator and a reactor element for activating and deactivating said stop member.

Accordingly, the stopping device may be precisely extended and retracted at a high velocity. The stopping device may be reliably used in situations which require quick release of the
carrier from the propelling member. The stopping device has few movable parts and is subject to lower maintenance than other known devices. The stopping device may also be used effectively in environments having particulate contamination.

Other advantages and features of the present invention will become more apparent from the following detailed description when read in conjunction with the accompanying drawing.

Brief Description of the Drawing

The present invention will be more fully understood by reference to the following detailed description of the preferred embodiments of the present invention when read in conjunction with the accompanying drawing, in which like reference characters refer to like parts throughout the views, and in which:

FIG. 1 is a perspective view illustrating a stopping device for a conveyor system in accordance with the present invention;

FIG. 2 is a longitudinal cross-section of the stopping device with a stop plate in a retracted position in accordance with the invention taken along line 2-2 of Fig. 1;

FIG. 3 is a fragmentary view of a locking device shown in an unlocked position in accordance with the invention;

FIG. 4 is a longitudinal cross-sectional view of the stopping device with the stop plate in an extended position in accordance with the invention;

FIG. 5 is a cross-section of the stopping device in accordance with the invention taken along line 5-5 of FIG. 2; and

FIG. 6 is a side view of the stopping device and carrier in accordance with the invention.
Description of the Preferred Embodiments

With reference to FIG. 6, there shown is a stopping device 10 for use with a conveyor system of the type having a load carrier 12 disengageable from a continuously moving propelling device. The stopping device is shown for use at a wayside stopping station of a "power and free" conveyor. The carrier 12 is propelled along a carrier track 14 by a pusher 16 of a propelling device 17. In a power and free conveyor, the propelling device 17 and pusher 16 are continuously driven along a conveyor track known as a "power line" (not shown).

As shown in FIG. 1, the load carrier 12 is supported for movement on the carrier track 14 by a trolley 18 having four wheels 20. The trolley 18 and carrier 12 are moved in the direction of the arrow A along the track 14 by the pusher 16 which engages a driving mechanism mounted on the trolley 18. The driving mechanism includes a driving dog 22 and a hold-back dog 24. As is known in the art, and disclosed in U. S. Patent No. 3,559,585, the driving dog 22 may be depressed to disengage the pusher 16 from the driving device and stop the trolley 18.

As shown in FIG. 1, the corner 13 is disengaged by the stopping device 10. The stopping device 10 includes a housing having a stop plate 26 which is movable outwardly from the housing 28 to depress the driving dog 22 and release the pusher 16 from the driving mechanism of the trolley 18. The housing 28 includes a U-shaped channel member 30 and a cover plate 32. The channel member may be formed in one piece as an extrusion or fabricated from bar and plate stock. The channel member 30 has a pair of side walls 34 extending upwardly from a bottom 36. As best shown in FIGS. 1 and 5, each of the side walls 34 includes
a longitudinal slot 38 formed between a pair of rails 39 to accept the stop plate 26 for sliding movement therein. The bottom 36 of the housing includes a pair of spaced apart holes 40, 41 (FIGS. 2 and 4) which are disposed on a longitudinal center line of the housing. The holes 40, 41 are formed to accept a locking pin 42 extending from the stop plate 26 as is discussed more fully below.

As shown in FIGS. 1 and 5, the cover plate 32 extends between the side walls 34 of the channel member 30. The cover plate is affixed to the channel member 30 in a suitable manner, such as machine screws 44. Mounted to an underside 46 of the cover plate 32 is a stator 48. The stator 48, together with a reactor plate 50 which is mounted on the stop plate 26 and a controller 56, form a linear induction motor (LIM).

The stator 48 is fixed to the cover plate 32 by four bolts and nuts 54 and is connected by a wire 52 to the controller 56 which is located at a suitable remote location. As is known, A/C currents are supplied from the controller 56 to the stator 48 to produce an electromagnetic field which may be moved linearly. The moving magnetic field interacts with the currents it induces in the reactor plate 50 to provide a driving force to the reactor plate 50 to move the stop plate 26. By controlling the phase order, frequency and magnitude of the A/C currents supplied to the stator 48, the controller can precisely control the velocity, acceleration and position of the reactor plate 50 and stop plate 26.

As shown in FIGS. 1, 2 and 4, the stop plate 26 is mounted for sliding movement in the slots 38 of the side walls 34. The stop plate 26 is formed of a suitable rigid material, such as steel. The stop
plate 26 has a top surface 60 and bottom surface 62 extending between a front side 64 which extends in a parallel relationship with a rear side 66. The rear side 66 has an edge portion 70 which angles inwardly from the rear side 66 to an outer edge 68. The stop plate has an inner portion 72 positioned within the housing 28 and an outer portion 74 extending outwardly from the housing 28. The outer portion 74 of the stop plate 26 is formed to engage and depress the driving dog 22 to release the pusher 16. The outer edge 68 of the stop plate 26 is angled outwardly with respect to the housing from the front side 64 and the rear side 66.

As best shown in FIG. 3, the reactor plate 50 is mounted to the top surface 76 of the inner portion 72 of the stop plate adjacent the stator 48. The reactor plate 50 is of a known type suitable for influence by the magnetic force of the stator.

A throughbore 78 is formed in the stop plate beneath the reactor plate 50 for accepting the locking pin 42. The locking pin 42 has a head 80 and a downwardly extending cylindrical portion 82. A keeper plate 84 having a throughbore 86 is mounted to the bottom surface 88 of the stop plate. The throughbore 86 of the keeper plate has a diameter larger than the cylindrical portion 82 of the locking pin 42 but smaller than the outer diameter of the head 80 to maintain the head 80 of the locking pin 42 within the throughbore 86 of the stopping plate 26. The locking pin 42 is formed of a magnetic material, such as steel.

As shown in FIG. 2, when the stop plate is in a retracted position, the locking pin 42 rests on the keeper plate 84 in the locking hole 40 in the bottom of the housing. As shown in FIG. 4, the locking pin
42 is positioned in locking hole 41 to lock the stop plate 26 in an extended position for disengaging the pusher 16 of the load carrier 42.

When the stator 48 is energized, the locking pin 42 is drawn upward by the magnetic force of the stator and withdrawn from one of the holes 40, 41 of the housing, as shown in FIG. 3, to release the stop plate and permit the linear induction motor to thrust the reactor plate 50 and stop plate 26 in the desired direction.

The operation of the stopping device is controlled by the controller. To engage the pusher 16 with the load carrier 12, the stator 48 is energized to lift the lock pin 42 from the hole 41 and move the stop plate 26 to the retracted position as shown in FIG. 2. When the stator is deactivated the locking pin 42 falls into hole 40. To disengage the carrier, the stator 48 is reactivated by the controller 54. The locking pin 42 is again attracted to the stator which then causes the stop plate 26 to move to the extended position, shown in FIG. 4. Upon deactivation of the stator 48, the locking pin 42 drops down into a locked position within hole 41 of the channel member 25.

Having described my invention, however, many modifications thereto will become apparent to those skilled in the art to which it pertains without deviation from the spirit of the invention
The claims defining the invention are as follows:

1. A stopping device for a conveyor system having a carrier selectively engageable with a propelling member, said stopping device comprising:
   a housing;
   a stop plate slidably mounted to said housing for disengaging the propelling member from the carrier, said stop plate reciprocally movable between an extended position and a retracted position;
   magnetic means for moving said stop plate between said extended position and said retracted position; and
   locking means for selectively locking said stop plate in said extended position and said retracted position; and

2. The carrier stopping device defined in claim 1, said magnetic means further comprising a linear induction motor having a stator and a reactor element.

3. The carrier stopping device defined in claim 2, wherein said reactor element is mounted on said stop plate and is movable relative to said stator.

4. The carrier stopping device defined in claim 2, said stop plate further comprising means for supporting said locking means in said activated position.

5. The carrier stopping device defined in claim 1, said housing further comprising a U-shaped channel having means for slidably supporting said stop plate.

6. The carrier stopping device defined in claim 5, said housing further comprising a pair of holes formed for accepting said locking pin.
7. A carrier stopping device for a conveyor having a carrier and a propelling member, said stopping device comprising:

- a housing;
- a stop member mounted within the housing for disengaging said propelling member from said carrier;
- said stop member reciprocally moving between an extended position where said stop member is in contact with said carrier and a retracted position; and
- a linear induction motor comprising a stator and a reactor element for activating and deactivating said stop member.

8. The carrier stopping device as defined in claim 7, further comprising a means for selectively locking said stop member in said extended and retracted positions.

9. The carrier stopping device defined in claim 8, said selectively locking means further comprising means reactive to said linear induction motor.

10. The carrier stopping device defined in claim 7, wherein said reactor element is mounted on said stop plate and is moveable relative to said stator.

11. The carrier stopping device defined in claim 8, said magnetic means further comprising a steel pin.

12. The carrier stopping device defined in claim 9, said stop member further comprising a keeper plate to support said locking pin.

13. The carrier stopping device defined in claim 7, said housing unit further comprising a U-shaped channel having means for slidingly supporting said stop member.
14. A carrier stopping device as defined in claim 1 wherein said stop plate includes first and second spaced apart bores, said first bore being aligned with said pin bore when said plate is in said extended position and said second bore being aligned with said pin bore when said plate is in said retracted position.

15. A carrier stopping device as defined in claim 14 including shifting means for selectably shifting said pin between said first position and said second position.

16. A carrier stopping device as defined in claim 15 wherein said pin in said second position extends from said pin bore into one of said first or second stop plate bores.

17. A carrier stopping device as defined in claim 16 wherein said shifting means comprises said magnetic means.

18. A stopping device for a conveyor system, substantially as described herein with reference to the drawings.

DATED this Fifth Day of May 1998

Jervis B. Webb International Company

Patent Attorneys for the Applicant

SPRUSON & FERGUSON
Linear Induction Motor Actuated Stop

ABSTRACT

The present invention provides a carrier stopping device (10) for a conveyor having a disengageable propelling member (17) such as a power and free conveyor. The stopping device (10) preferably utilizes a linear induction motor (48,50,56) to activate a stop plate (26) of the stopping device (10). The stop plate (26) is locked in an extended position and a retracted position by a locking pin (42) which reacts to the electromagnetic force of the linear induction motor (48,50,56).