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W. M. VAN OTTEREN

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TERMINAL FOR PNEUMATIC CARRIER SYSTEMS

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2. Sheets-Sheet 1

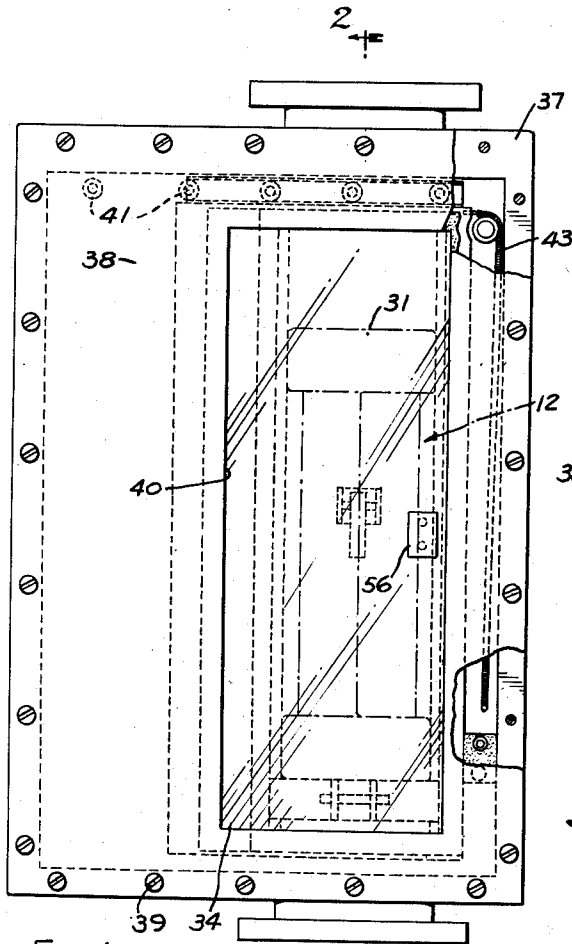


Fig. 1.

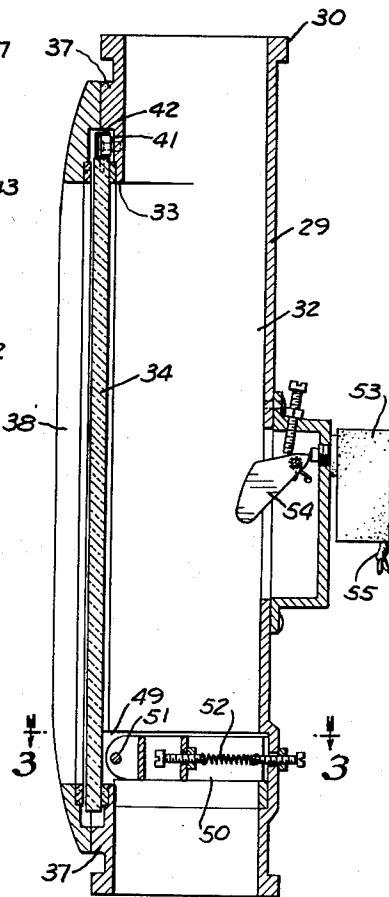


Fig. 2.

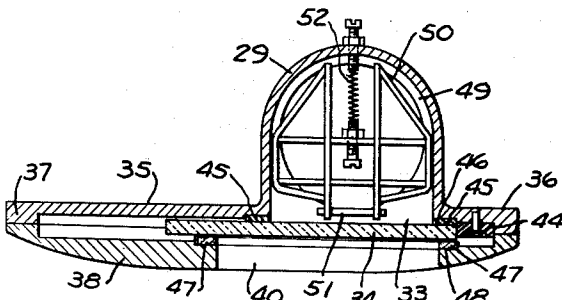


Fig. 3.

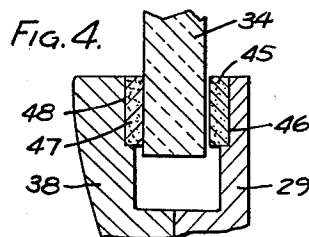


Fig. 4.

INVENTOR.
WILBUR M. VAN OTTEREN
BY
Barnes, Kuselle, Laughlin & Raisch
ATTORNEYS.

Jan. 4, 1955

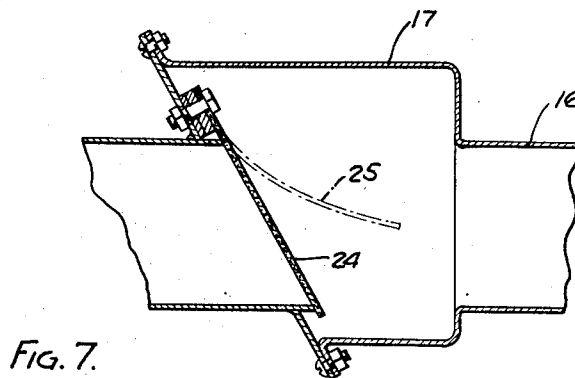
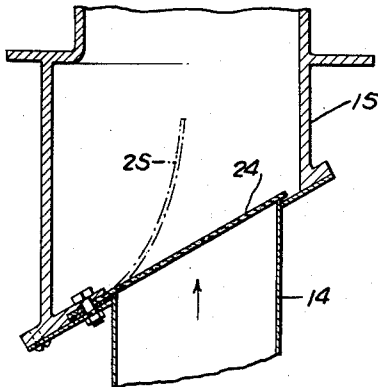
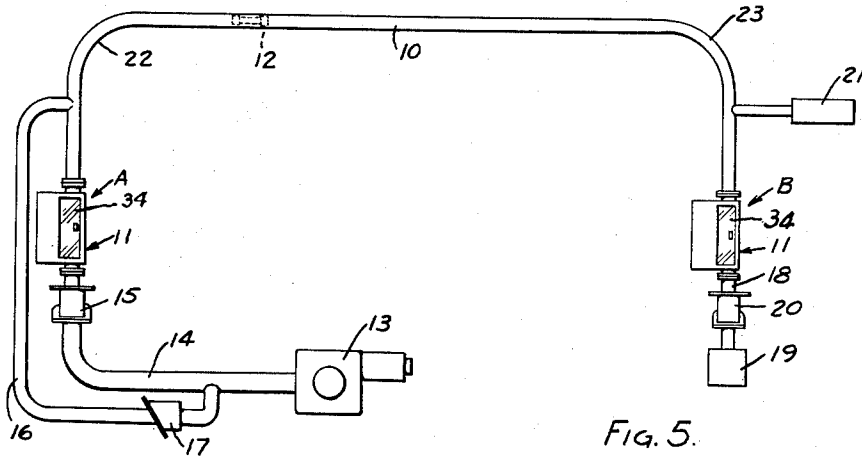
W. M. VAN OTTEREN

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TERMINAL FOR PNEUMATIC CARRIER SYSTEMS

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2 Sheets-Sheet 2



INVENTOR.
WILBUR M. VAN OTTEREN
BY
Barnes, Kisselle, Laughlin & Kirsch
ATTORNEYS.

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TERMINAL FOR PNEUMATIC CARRIER SYSTEMS

Wilbur M. Van Otteren, Detroit, Mich., assignor to The Grover Company, Detroit, Mich., a corporation of Michigan

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16 Claims. (Cl. 243—19)

This invention relates to a pneumatic carrier system and has particularly to do with a terminal for such system.

In pneumatic carrier systems wherein cylindrical carriers are dispatched through tubes by means of pressure or vacuum, there are placed at various points in the system terminals provided with door-controlled access openings for placing the carriers within the tube and for withdrawing the carrier from the tube. The door of such access opening must be capable of being effectively sealed so that there will be no leakage of air into or out of the tube around the edges of the door.

In terminals with which I am familiar latches are usually provided for securing the door in a position sealing the access opening in the terminal, gaskets usually being provided between the door and adjacent portions of the terminal surrounding the access opening therein.

One of the difficulties experienced with terminals of this type is that, by using one or more latches on the door, the gasket is placed under considerable pressure only at localized points, and there is a tendency for leakage to occur around the door between these points of localized pressure.

It is an object of this invention to provide a terminal for a pneumatic carrier system which is of simple construction and which is provided with a door panel that does not require latches or the like and which at the same time effectively seals the access opening in the terminal both when the tube is subjected to super-atmospheric pressure and when the tube is subjected to sub-atmospheric pressure.

More specifically, the invention contemplates a terminal having an access opening, a frame-like support on the terminal surrounding the opening and a door movably mounted on the frame support for movement to and from a position overlying the access opening on the terminal. Sealing means in the form of gaskets are provided between the inner face of the door and the terminal and between the outer face of the door and the support so that, when the pressure in the tube is above atmospheric, the door is pressed into sealing engagement with the support; and when the pressure in the tube is below atmospheric, the door is drawn into sealing engagement with the casing of the terminal.

In the drawings:

Fig. 1 is an elevational view of the terminal of this invention.

Fig. 2 is a sectional view along the lines 2—2 in Fig. 1.

Fig. 3 is a sectional view along the lines 3—3 of Fig. 2.

Fig. 4 is a fragmentary sectional view.

Fig. 5 is a schematic view of a pneumatic carrier system.

Figs. 6 and 7 are sectional views of check valves employed in the system illustrated in Fig. 5.

Referring to the drawings and particularly to Fig. 5, there is shown for the purpose of illustration a pneumatic carrier system which includes a main carrier tube 10 extending between two stations designated A and B. At each of these stations there is provided a terminal generally designated 11. Terminals 11 are provided for the purpose of enabling carriers 12 to be inserted into or withdrawn from tube 10. Carriers 12 are driven through tube 10 by establishing a difference in pressure within tube 10 on the two sides of carrier 12. The system is therefore provided with a reversible motor-driven blower 13 which is connected into the system through the lower end of one of the terminals 11, such as at station A, by

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a conduit 14. A check valve 15 in conduit 14 permits air to flow through terminal 11 at station A only in one direction, that is, in a direction from blower 13 to station B. A by-pass conduit 16 connects with conduit 14 between check valve 15 and blower 13 and connects at its other end with tube 10. A check valve 17 in conduit 16 permits air to flow through conduit 16 only in a direction from tube 10 towards blower 13.

To the lower end of terminal 11 at station B there is connected a conduit 18 which communicates with an exhaust fitting 19 through a check valve 20. Check valve 20 permits air to flow through conduit 18 only in a direction outwardly through exhaust fitting 19. A pressure-relief valve 21 is connected into tube 10 above the terminal 11 at station B. The tube 10 generally extends overhead in the structure serviced by the system, and adjacent each station the tube is bent vertically downwardly as at 22 and 23 so that the terminals at stations A and B are suitably positioned for access. Conduit 16 connects with tube 10 at a point just below the bend 22 and relief valve 21 connects with tube 10 at a point just below the bend 23.

Check valves 15, 17 and 20 may be of any suitable type such as illustrated in Figs. 6 and 7. As shown, these valves include a flexible flapper member 24 which may be formed of leather, for instance, and which is arranged to flex to an open position indicated by broken lines 25 when the air travels through the valve in one direction and to seat on the end of the conduit connected with the check valve when the air tends to travel through the valve in the opposite direction.

When it is desired to send a carrier 12 from the station A to the station B, the carrier is placed within the terminal 11 and the door 34 is thereafter closed. The arrangement is such that placement of the carrier in terminal 11 at station A automatically starts blower 13 to send a stream of air through tube 10 in a direction from station A to station B. The air travels through conduit 14, check valve 15 (which opens), terminal 11 at station A, tube 10, and out of the system through pressure-relief valve 21, check valve 20 being closed at this time. Since the pressure within the system on the side of carrier 12 towards the blower is greater than the pressure in the system on the other side of the carrier, the carrier is caused to travel from terminal 11 at station A upwardly through tube 10. As the carrier travels around corner 23 and downwardly towards terminal 11 at station B, it will be observed that after the carrier passes relief valve 21, a column of air is trapped between the forward end of the carrier 12 and check valve 20. This column of air forms a cushion which prevents the carrier from falling into terminal 11 at station B with too great a force.

When it is desired to dispatch carrier 12 from station B to station A, the carrier is deposited within terminal 11 at station B which starts blower 13 such as to draw a vacuum through tube 10. Under such conditions, valve 15 closes and valves 17 and 20 open, the air being sucked into the system through intake 19. The carrier is thus lifted out of terminal 11 at station B and drawn through tube 10. In this connection it will be observed that conduit 16 serves as a by-pass so that, after carrier 12 travels around corner 22 and past the connection between conduit 16 and tube 10, the carrier falls by gravity into terminal 11 at station A. The column of air trapped therein provides a cushion for the falling carrier.

The arrangement described above is conventional and is presented to provide a better understanding of the present invention. The invention here is directed primarily to the provision of terminals 11 of improved construction. These terminals are substantially identical in their construction and a description of one will suffice. The terminal 11 is in the form of a casing 29 having a tubular portion 30 at its upper end which is arranged to be connected with an end of the tube 10. The internal diameter of tubular portion 30 is substantially the same as the internal diameter of tube 10 and is such that the enlarged end portions 31 of carrier 12 have a snug sliding fit therewith. The casing 29 is shaped to provide a somewhat cylindrical chamber 32 adapted to receive carrier 12.

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At one side thereof the casing is provided with an access opening 33 which is arranged to be closed by a door 34. At one side of opening 33 the casing is fashioned with a laterally extending flange 35, and at the other side of opening 33 the casing is extended laterally as at 36. These lateral extensions 35 and 36 have a vertical extent slightly greater than the vertical extent of opening 33. Extensions 35 and 36 are formed with a continuously extending peripheral rib or flange 37 which defines a generally rectangular frame on the one side of casing 11. A cover plate 38 of a size corresponding to the size of the frame defined by flange 37 is secured to casing 11 as by screws 39 extending into flange 37.

Cover plate 38 and the flange 37 are machined such that a substantially air-tight joint is provided therebetween. Cover 38 is formed with an opening 40 which overlies the opening 33 in the casing. Opening 40 is smaller in size than door 34 so that, with the door in the closed position illustrated in Fig. 3, the edge portions of cover 38 around opening 40 overlap the peripheral edge portions of door 34. Extensions 35 and 36 and cover 38 cooperate to provide a support for door 34 and a chamber in which the door is slidable. A series of rollers 41 on casing 11 engages a track 42 mounted along the upper edge of door 34 and supports the door for sliding movement to and from a position closing openings 33 and 40. The extension 35 is of sufficient lateral extent such that the door may be shifted to a position to substantially entirely uncover opening 33. Door 34 is normally urged to the closed position by a spring 43. A pad 44 formed of rubber or like material provides a stop for limiting the movement of the door in the closing direction. A gasket 45 is seated within a groove 46 extending continuously around the opening 33. A similar gasket 47 is seated within a groove 48 extending continuously around the opening 40 in cover plate 38. Gaskets 45 and 47 are disposed in parallel planes which are spaced apart a distance only slightly greater than the thickness of door 34. Thus, the door 34 is freely movable to and from a position closing openings 33 and 40. Sufficient clearance is provided between rollers 41 and track 42 to permit the door to be pushed in a direction outwardly wherein the outer face of the door is engaged by gasket 47 or an inwardly direction wherein the inner face of the door is engaged by gasket 45.

At the lower end of chamber 32 the casing 11 is grooved as at 49 to provide a track for a slidable grille 50 which forms a stop adapted to support carrier 12 in chamber 32. Grille 50 is slidable in track 49 to a position projecting outwardly through openings 33 and 40 so that, when the door panel 34 is opened, grille 50 may be pulled outwardly of chamber 32 as by handle 51 to thereby enable withdrawal of carrier 12 from within chamber 32. A return spring 52 normally biases grille 50 to its innermost position in which position it forms a perforate bottom wall for chamber 32.

A micro switch 53 is supported on casing 29 and is operated by a pivotally supported cam 54 which projects into chamber 32 such that it is engaged by carrier 12 to actuate switch 53 when the carrier is disposed within chamber 32. Switch 53 is connected as by conductors 55 with the motor of blower 13.

Switch 53 on terminal 11 at station A is arranged upon successive actuations thereof to stop blower 13 and to set blower 13 in operation so as to blow a stream of air through tube 10 in a direction toward station B. Switch 53 at station B is arranged such that on successive actuations the switch stops the operation of blower 13 and sets the blower in operation such as to draw a stream of air through tube 10 in a direction from intake 19 towards the blower.

Assuming that the blower is not in operation and it is desired to dispatch a carrier from station A to station B, the door 34 of the terminal at station A is opened as by the handle 56 to uncover opening 33. The carrier is then placed within chamber 32 with its bottom end resting upon the grille 50, and the door 34 is permitted to slide back to the closed position under the influence of spring 43. When the carrier is placed within chamber 32 on grille 50, the side wall of the carrier pivots cam 54 in a direction downwardly to thereby start blower 13. The pressure within the system and especially on the blower side of carrier 12 is substantially increased. This pressure displaces door panel 34 in a direction outwardly into

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coplanar engagement with gasket 47, and the door panel 34 is thereby maintained in a sealed condition with respect to opening 40. This pressure causes the carrier 12 to travel from station A to station B, and when the carrier falls into the chamber 32 of the terminal at station B, the micro switch 53 is actuated to stop the operation of the blower. This relieves the pressure within the system and enables the door 34 on the terminal at station B to be readily opened in order to withdraw carrier 12 from the terminal.

When it is desired to dispatch a carrier from station B to station A, the carrier is deposited in the terminal at station B as above described with reference to station A. The switch 53 is thereby actuated to start blower 13 in operation such as to draw a vacuum in the system on the blower side of the carrier. Since the pressure within the chamber 32 is less than the pressure without the chamber, the drop in pressure in the system causes the door panel 34 to be drawn firmly into engagement with the gasket 45 surrounding opening 33.

Thus, the door panel of the terminal is automatically sealed by the pressure differential across the door. When the pressure in the terminal casing is increased to a value above atmospheric, the door panel is brought into sealing engagement with the gasket on cover 38; and when the pressure within the terminal casing drops to a value below atmospheric, the door panel is brought into sealing engagement with the gasket surrounding the opening 33 on the casing. The pressure differential across door panel 34 is uniform over the entire area of the door, and therefore the gaskets 45 and 47 will be subjected to uniform pressure around their entire extent.

I claim:

1. A terminal for depositing a carrier in and for withdrawing the carrier from within the conduit of a pneumatic carrier system comprising a casing adapted to be connected with the conduit and having an access opening therein, a door for closing said opening, and a support on the casing overlying the edges of the door when in a position closing said opening, said support having a peripheral edge portion extending continuously around the entire periphery of said opening and in sealed engagement with said casing, said door when in the closed position being movable in a direction generally perpendicular to the plane thereof into sealing engagement with the casing or with the support in response to a difference in pressure on opposite sides of the door.

2. The combination set forth in claim 1 including sealing means surrounding said opening and disposed between the door and the casing and between the door and the support.

3. The combination set forth in claim 1 wherein the door is slidable with respect to the support.

4. A terminal providing means for depositing and for removing a carrier from within the conduit of a pneumatic carrier system, said terminal comprising a casing adapted to be connected with the conduit and having an access opening therein, a support on said casing having a portion extending around the entire periphery of said opening and in sealed engagement with said casing, said support having an opening therein corresponding in position with the opening in said casing, a door mounted between said casing and said support and being movable to a position closing said openings, and means for sealing the door in a position overlying the opening in the conduit so as to prevent the leakage of air around the edges of the door comprising a sealing member surrounding the opening in the casing and disposed between the casing and the inner face of the door and a second sealing member surrounding the opening in the support and disposed between the support and the outer face of the door.

5. The combination set forth in claim 4 wherein the door is slidably mounted for movement in a plane between the plane of the opening in the support and the plane of the opening in said casing.

6. A terminal for depositing and withdrawing a carrier from the conduit of a pneumatic carrier system comprising a casing adapted to be connected with the conduit, said casing having an access opening therein, a support on said casing surrounding said opening on all sides and having a portion thereof defining an opening in the support which registers with the opening in said casing, a door movable on said support to a position closing both

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of said openings, said support having its edge portion in sealed engagement with said casing, and sealing members surrounding said openings and disposed between the door and the casing and between the door and the support whereby, when the door is disposed in a position closing said openings and the pressure within the casing is above atmospheric, the door is pressed into sealing engagement with the support and, when the pressure in said casing is below atmospheric, the door is drawn into sealing engagement with said casing.

7. A terminal for depositing and withdrawing a carrier from within the conduit of a pneumatic carrier system comprising a casing adapted to be connected with the conduit, said casing having an access opening therein, a support on said casing surrounding said opening on all sides and having a portion thereof defining an opening in the support, said support having an edge portion which surrounds the opening in said support on all sides and which is in sealing engagement with said casing, a door movable on said support to a position closing both of said openings, and sealing members surrounding said openings and disposed between the door and the casing and between the door and the support whereby, when the door is disposed in a position closing said openings and the pressure within the casing is above atmospheric, the door is pressed into sealing engagement with the support and, when the pressure in said casing is below atmospheric, the door is drawn into sealing engagement with said casing.

8. The combination set forth in claim 7 wherein said sealing members each comprise gaskets, one of said gaskets extending around the opening in the casing and another gasket extending around the opening and the support.

9. The combination set forth in claim 8 wherein the door is slidably supported for movement in a plane disposed between the plane of the opening in the casing and the plane of the opening in the support.

10. A terminal for depositing and withdrawing a carrier from within the conduit of a pneumatic carrier system comprising a casing adapted to be connected with a conduit and having an access opening therein, a support on said casing surrounding said opening on all sides, a cover plate on said support and in sealed engagement therewith, said cover plate cooperating with said support to provide an elongate chamber on said casing adjacent said opening, a door movable in said chamber to and from a position closing said opening, said cover plate also having an opening therein corresponding generally in position with the opening in said casing, said door also being movable in said chamber in a direction generally perpendicular to the plane thereof into sealing engagement with

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said support or said cover plate in response to a difference in pressure on opposite sides of the door.

11. The combination set forth in claim 10 wherein said chamber is completely sealed except for the opening in said casing and the opening in said cover plate.

12. The combination set forth in claim 11 including gasket means positioned between the inner face of the door and the casing and between the outer face of the door and said cover plate.

13. The combination set forth in claim 12 wherein said gasket means comprises a first gasket extending around the periphery of the opening in said casing and a second gasket extending around the periphery of the opening in said cover plate.

14. The combination set forth in claim 13 wherein said door is slidable in said chamber in a plane disposed between the plane of the opening in the casing and the plane of the opening in the cover plate.

15. The combination set forth in claim 14 wherein the chamber has a dimension in a direction perpendicular to the plane of the door only slightly greater than the dimension of the door in said last mentioned direction.

16. A terminal for depositing and withdrawing a carrier from within the conduit of a pneumatic carrier system comprising a casing adapted to be connected with the conduit and having an access opening therein, a door slidably arranged on said casing for movement to and from a position closing said opening, a plate member mounted on said casing and cooperating therewith to form a chamber which encloses said door in both positions thereof, said plate member having a sealed connection with said chamber around the edges thereof, said plate member also having an opening therein corresponding generally in position with the opening in said casing, said chamber having a dimension in a direction perpendicular to the plane of the door only slightly greater than the dimension of the door in said last mentioned direction, said door being movable in said last mentioned direction in response to a difference in pressure on opposite sides of the door into sealing engagement with either said casing or said plate member.

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