

[54] **POWER OPERATED DOOR ASSEMBLIES  
FOR PASSENGER TRANSPORT VEHICLES**

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3,811,222 5/1974 Economou..... 49/49 X

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[52] **U.S. Cl.** ..... **49/368; 49/109; 49/49;**  
49/34

[51] **Int. Cl.<sup>2</sup>** ..... **E06B 7/16**

[58] **Field of Search** ..... 49/368, 371, 483, 366,  
49/485, 488, 109, 110, 111, 383, 49, 34

[56] **References Cited**

**UNITED STATES PATENTS**

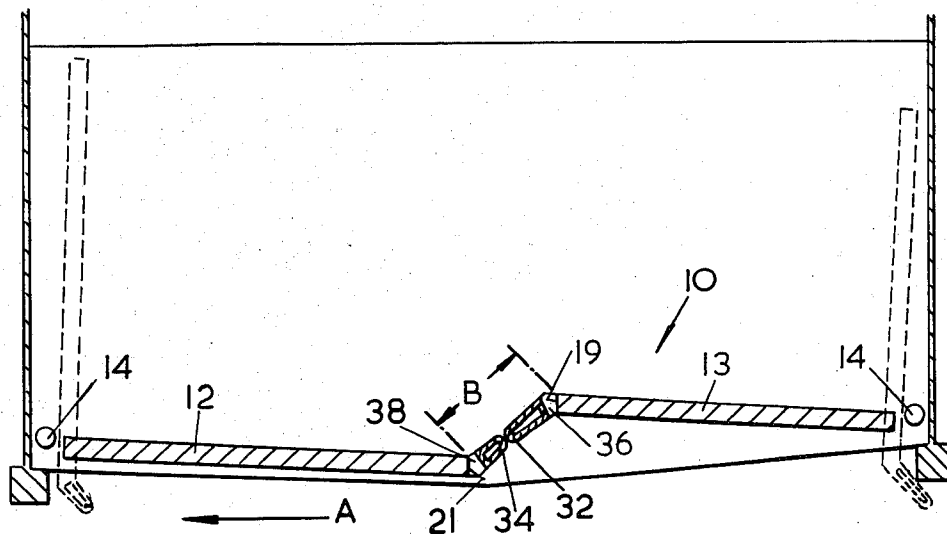
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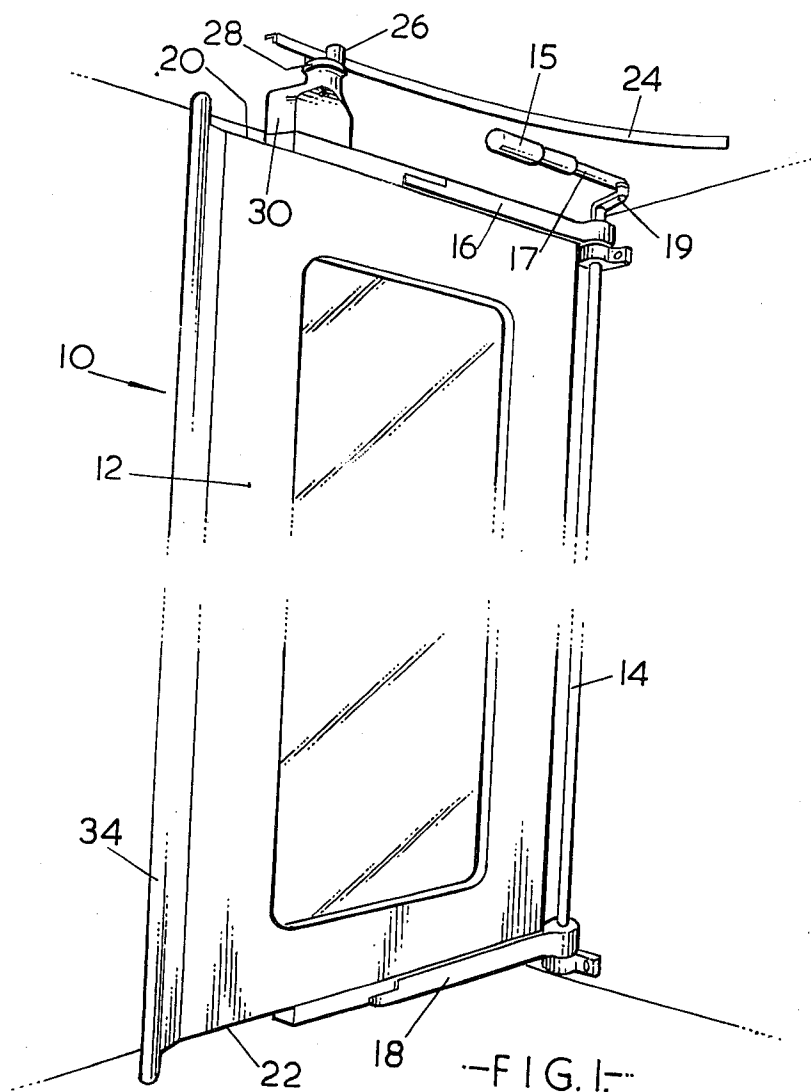
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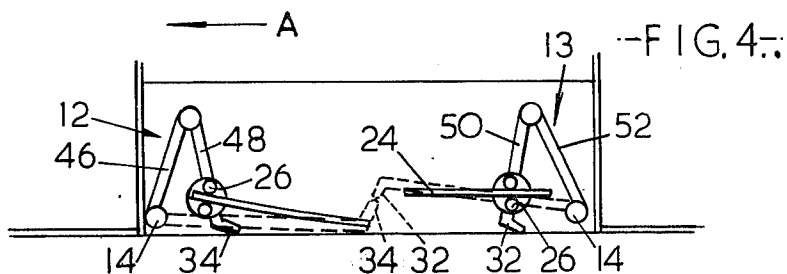
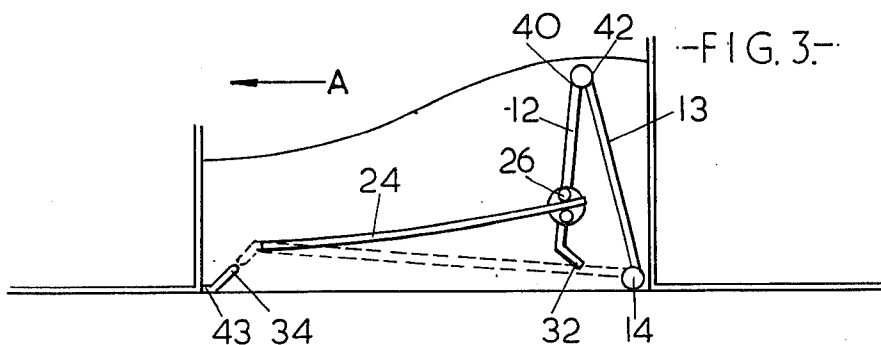
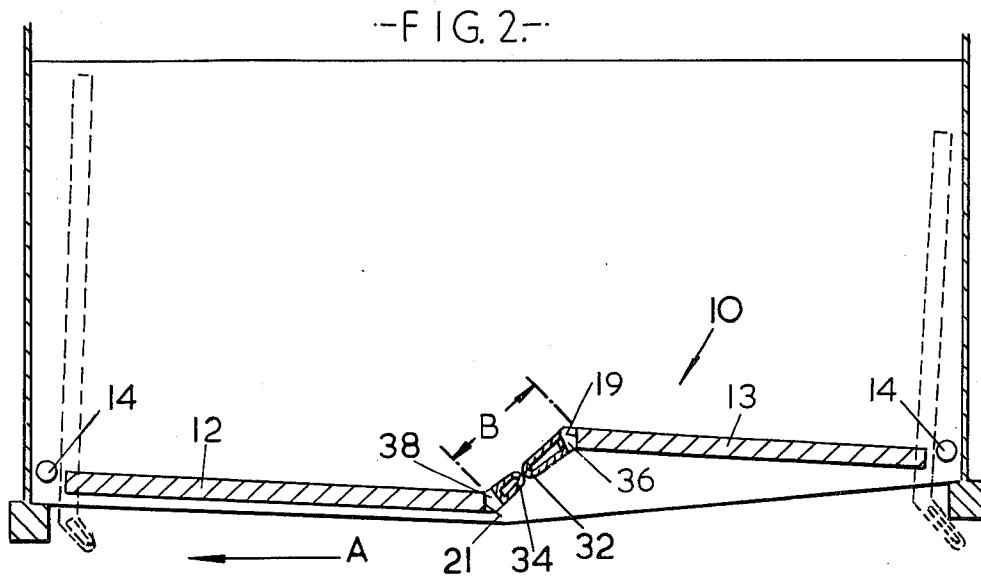
### ABSTRACT

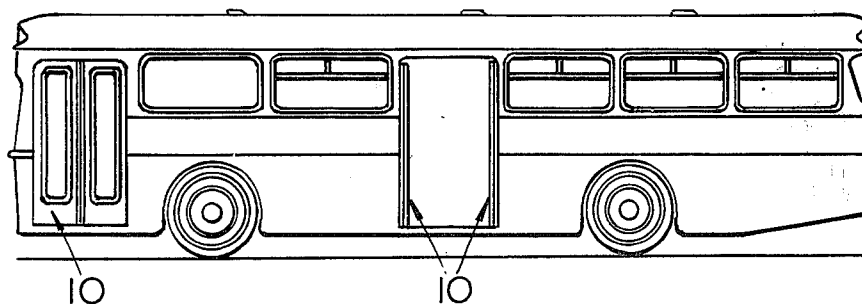
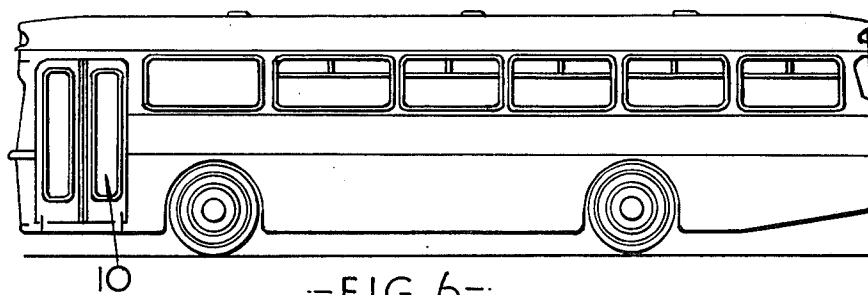
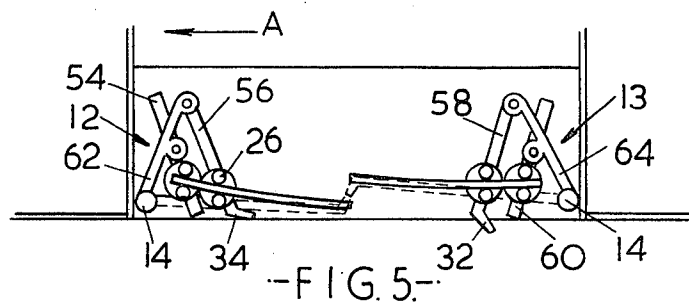
The present invention provides a door assembly for a public transport vehicle, the door assembly comprising a door which is mechanically drivable toward and away from a cooperating closure member, the door and the closure member having respective parallel closing edges which, in a closed position of the door, are laterally separated and lie in a plane inclined to the plane of the door, at least one of the closing edges carrying a yieldable sealing member for bridging the separation between the closing edges.

**7 Claims, 7 Drawing Figures**









## POWER OPERATED DOOR ASSEMBLIES FOR PASSENGER TRANSPORT VEHICLES

This invention relates to door assemblies and in particular to power operated door assemblies for passenger transport vehicles.

Door assemblies for passenger transport vehicles are known which have two doors which are drivable towards and away from one another. The doors have respective closing edges, both of which carry respective sealing members which bridge a gap between the closing edges of the doors when the latter are in their closed positions. The sealing members are flexible and are intended to enable a boarding passenger whose arm, for example, is trapped between the closing edges of the doors when the latter close, to pull his arm free with little difficulty.

In known door assemblies of this type, the doors are in line with one another when in closed positions, so that the assemblies suffer from a disadvantage that the passenger whose arm is trapped must pull his arm in a direction substantially at right angles to the face of the closed doors to be certain of freeing his arm quickly and safely. However, it can occur that a driver of the vehicle is unaware of the predicament of the trapped passenger and sets the vehicle in forward motion before the passenger is able to free himself. The forward motion of the vehicle acts to prevent the passenger from freeing his arm by effectively pinching it between the closing edges of the doors and he may eventually suffer considerable injury.

An object of the present invention is to provide a door assembly for a passenger transport vehicle which enables a boarding passenger to free a trapped limb easily when the vehicle is in forward motion.

According to the present invention there is provided a door assembly for a public transport vehicle, the door assembly comprising a door which is mechanically drivable towards and away from a cooperating closure member, the door and the closure member having respective parallel closing edges which, in a closed position of the door, are laterally separated and lie in a plane inclined to the plane of the door, at least one of the closing edges carrying a yieldable sealing member for bridging the separation between the closing edges.

Advantageously the door assembly has two cooperating doors, one of which doors serves as the closure member.

The doors, when in closed positions have their closing edges offset relative to one another such that the outer surfaces of the sealing members, which bridge the gap between the closing edges, face in a direction opposing the direction of forward travel of a vehicle on which the assembly is mounted.

A door assembly constructed in accordance with the invention has an advantage that because the closing edges are offset, a trapped limb is not pinched between them as the vehicle in which the door assembly is incorporated is put into forward motion.

Conveniently the door assembly has a door jamb which serves as the closure member.

Preferably both closing edges have sealing members.

The invention is further described hereinafter, by way of example, with reference to the accompanying drawings, in which:

FIG. 1 is a perspective view of a leading door of a door assembly constructed in accordance with the invention;

FIG. 2 is a partially sectioned plan view of a door assembly incorporating the door of FIG. 1;

FIG. 3 is a plan view of a second embodiment of a door assembly in accordance with the invention;

FIG. 4 is a plan view of a third embodiment of a door assembly in accordance with the invention;

FIG. 5 is a plan view of a fourth embodiment of a door assembly in accordance with the invention;

FIG. 6 is a side elevation of a public transport omnibus incorporating a door assembly constructed in accordance with the invention, and

FIG. 7 is a side elevation of a further public transport omnibus incorporating a door assembly constructed in accordance with the invention.

FIGS. 1 and 2 show a door assembly 10 of the two door side glider type mounted on a public transport omnibus (only partially shown) with the doors 12, 13 in their closed positions, one of which doors 12, 13 serves as a closure member for the other. As can be seen from FIG. 2 the doors are laterally offset relative to one another when the doors are closed whereby to provide a distance B between respective closing edges 19, 21 to enable a person to easily withdraw a limb, for example an arm, caught between the closing edges 19, 21 when the omnibus is set into forward motion, the direction of forward motion being indicated by arrow A.

The operating mechanism of each door 12, 13 is conventional and each door 12, 13 is mounted on the omnibus in the same manner, the operating mechanism and mounting being described below with respect to the leading door 12 of FIG. 1 for reasons of clarity.

The trailing door 12 is pivotally attached to a rotatable rod 14 by way of pivot arms 16, 18 each of which has one end secured to the rod 14 and its other end pivotally attached to an upper edge 20 and a lower edge 22 respectively of the door 12. The pivot arms 16 and 18 maintain the door 12 in a substantially vertical attitude during pivoting of the door between its closed position and an open position.

The operating mechanism of the door 12 comprises a pneumatically operated double acting piston cylinder assembly or door engine 15 secured adjacent the upper edge 20 of the door 12 to the framework of the vehicle. A pneumatically adjustable member 17 of the piston cylinder assembly 15 is coupled to the rod 14 by way of a linkage 19 so as to rotatably drive the rod 14 when the piston cylinder assembly 15 is actuated.

The door is guided during pivoting by means of an upper guide track or runner 24 engaging between two rollers 26 which are mounted on a plate 28. The plate 28 is mounted on a bracket 30 secured to the upper edge 20 of the door and is pivotable about a substantially vertical axis relative to the bracket 30 to allow free engagement of the rollers 26 with the track 24 during pivoting of the door 12.

To enable the doors 12, 13 to take up their closed positions as shown in FIG. 2 the track 24 of the trailing door 13 has its end portion adjacent the leading door horizontally offset towards the interior of the omnibus.

Referring to FIG. 2, when the piston cylinder assemblies 15 of both doors 12, 13 are operated to close the doors 12, 13 the latter, being guided by their respective tracks 24, are swivelled from their respective open positions, shown by the dotted lines, into their respective closed positions, wherein the closing edges 19 and 21

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of the doors 12, 13 are separated by the previously mentioned distance B.

A respective sealing member 32, 34 is attached to each closing edge 19, 21 by way of a respective elongate mounting bracket 36, 38, each sealing member 32, 34 extending along substantially the whole length of the respective closing edge 19, 21 and being made of a resiliently deformable material such as rubber. The interior of each sealing member is preferably hollow to improve the flexibility of the sealing member.

The sealing members 32, 34 are laterally inclined to the respective doors 13, 12 such that when the doors 13, 12 are in their illustrated closed positions the sealing members 32, 34 extend towards one another to bridge the separation B existing between the respective closing edges 19, 21 of the doors.

This assembly has the advantage that if the doors close on, for example, the arm of a person who is about to board the vehicle and the driver puts the vehicle into forward motion, the force which normally would tend to drag the person forward and pinch his or her arm between the closing edges of the doors thus preventing his freeing the arm, will, instead, act to aid his freeing the arm.

The doors of the door assemblies of FIGS. 3, 4 and 5 are mounted in a similar manner to the doors of the door assembly of FIGS. 1 and 2 and have similar operating mechanisms. Parts similar to those of FIGS. 1 and 2 are numbered in like manner. In each of these Figures arrow A shows the direction of forward motion of the omnibus on which the door assemblies are mounted.

FIG. 3 shows a single folding door assembly in which two doors 12 and 13 are hinged together at respective adjacent edges 40 and 42, and a door jamb 43 serves as a closure member. The right-hand door 13 is rigidly secured to a rod 14 and is pivoted about the axis of the rod 14 when the latter is rotatably driven by the operating mechanism of the door, which in this embodiment comprises only one piston cylinder assembly or door engine (not shown).

The left-hand door 12 carries rollers 26 which engage with a track 24 which guides the doors 12, 13 into their closed or open positions during pivoting of the doors, the closed positions of the doors being indicated by dotted lines. The left-hand door 12 carries a sealing member 32, laterally inclined to the door 12, which abuts against a sealing member 34 carried by the door jamb 43 when the doors are in their closed positions. The sealing member 34 extends inwardly of the omnibus.

FIG. 4 shows a double-folding door assembly in which each door 12, 13 is formed by two half doors 46, 48 and 50, 52 respectively, the door 12 serving as the closure member and each pair of half doors being hinged together along adjacent edges. The half doors 46 and 52 are rigidly secured to respective rods 14 which are rotatably driven by either respective piston cylinder assemblies or a single piston cylinder assembly (not shown).

Each half door 48, 50 carries rollers 26 which engage with a respective track 24 to guide the doors 12, 13 into their open and closed positions, the latter positions being shown by dotted lines. The half doors 48 and 50 also carry respective sealing members 34 and 32 on their edges adjacent one another.

FIG. 5 shows a double glide-fold door assembly in which each door 12, 13 is formed by two half doors 54, 56 and 58, 60 respectively, the door 12 serving as the

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closure member. Each pair of half doors 54, 56 and 58, 60 is pivotally coupled at their upper and lower edges to respective pivot arms 62 and 64, the latter being rigidly secured to respective rods 14.

Each pair of half doors has a cooperating track 24 which guides the half doors by way of engaging rollers 26 carried on the respective upper edges of the half doors. The arrangement is such that the doors of each pair of half doors are maintained in substantially parallel planes during pivoting of the doors 12 and 13.

The half doors 56 and 58 carry respective sealing members 34 and 32 which abut when the doors 12 and 13 are in their closed positions shown by the dotted lines.

In further embodiments (not shown) having two driven doors only one piston cylinder assembly is provided to operate both doors.

The piston cylinder assemblies may be hydraulically or electrically operated.

The sealing members may be pivoted to the respective closing edges.

The door or door assemblies constructed in accordance with the present invention may include lower tracks, in vertical alignment with the respective upper tracks, for guiding a lower portion of each door in addition to the upper tracks. Further the doors may be of the outward opening glider type, of the concertina or glider type or rigid, and may be multi leaf or single leaf or of any other assembly type.

In door assemblies, in accordance with the invention, which are guided in upper and lower tracks, the doors may be sliding doors which are drivable along the tracks toward and away from one another or, in the case of door assemblies having single doors, toward and away from a closure member such as a door jamb. Preferably the upper and lower tracks of each door are rectilinear and lie in the plane of or in a plane substantially parallel to the plane of the respective door.

An omnibus as shown in FIGS. 6 and 7 may have either a front door assembly or a front and centre door assembly constructed in accordance with the invention.

I claim:

1. A door assembly adapted to be mounted on the side of a public transport vehicle having a front, a rear and said door assembly being characterized by:

a. two cooperating closure members composed of a first closure member and a second closure member that is disposed substantially entirely to the rear of said first closure member,

b. each of said closure members having a substantially vertical closing edge,

c. means for varying the horizontal distance between said closing edges so that the door assembly can be changed from a closed condition to an open condition,

d. said closure members being mounted so that when the door assembly is in its closed condition said closing edges approach each other most closely, but leave between them a planar gap that extends rearwardly and inwardly with respect to the closing edge of said first closure member, and

e. at least one yieldable sealing member attached to at least one of said closure members so as to extend across and close said planar gap when the door assembly is in its closed condition,

whereby any limb that becomes caught in said gap upon the closing of the closure members may be rather easily removed by pulling the limb backwardly in a di-

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rection generally perpendicular to the plane of said gap.

2. A door assembly according to claim 1 having a sealing member attached to each of said closing edges.

3. A door assembly according to claim 1 in which at least one of said sealing members is made of resiliently deformable material.

4. A door assembly according to claim 1 in which at least one of said sealing members is substantially flat and elongate and when said door assembly is in a closed

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condition lies in said plane which is defined by said closing edges.

5. A door assembly according to claim 1 in which at least one of said sealing members defines a cavity therein extending substantially the length of said sealing member.

6. A door assembly according to claim 1 in which at least one of said closure members is a single leaf door.

7. A door assembly as claimed in claim 1 in which at least one of said closure members is a multi-leaf door.

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UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

PATENT NO. : 3,919,809  
DATED : November 18, 1975  
INVENTOR(S) : ERNEST HAUGHTON

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

[30] Foreign Application Priority Data  
March 22, 1973 Great Britain 13759/73

Signed and Sealed this  
twenty-seventh Day of April 1976

[SEAL]

*Attest:*

RUTH C. MASON  
*Attesting Officer*

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