

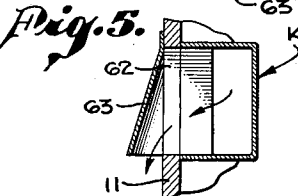
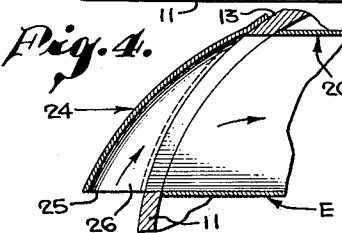
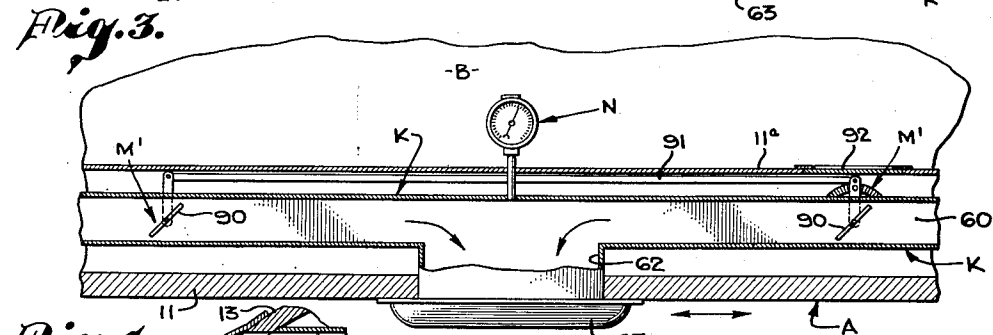
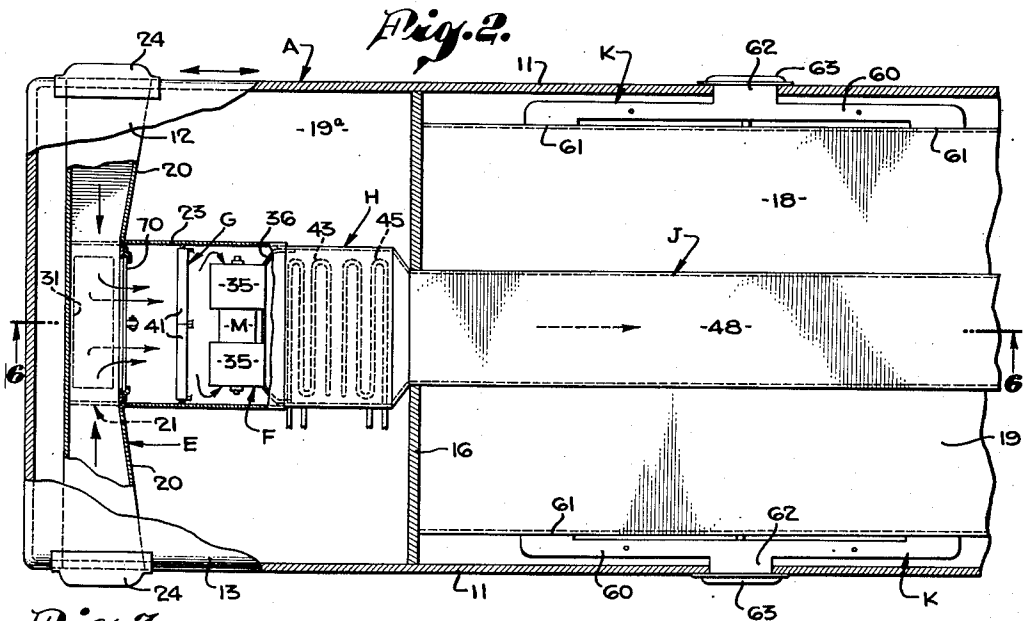
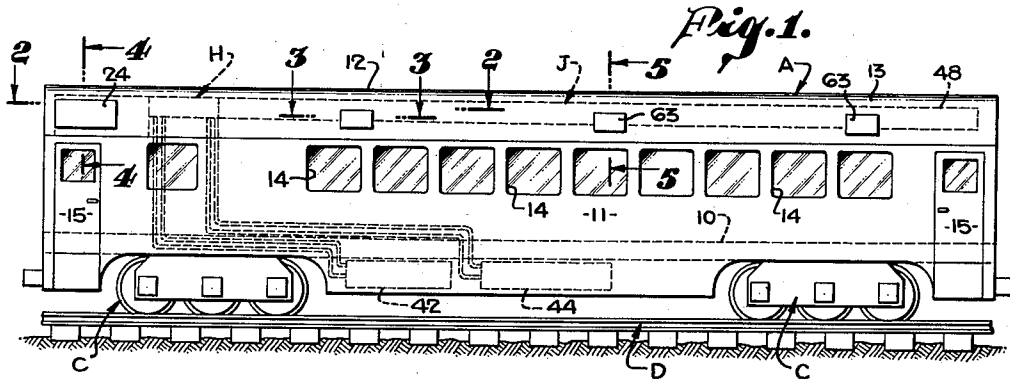
Dec. 8, 1953

R. S. FARR ET AL
APPARATUS FOR MAINTAINING PREDETERMINED
ATMOSPHERIC CONDITIONS IN COMPARTMENTS

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2 Sheets-Sheet 1



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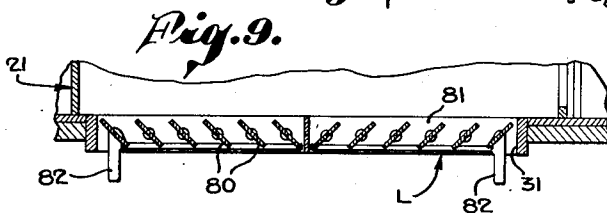
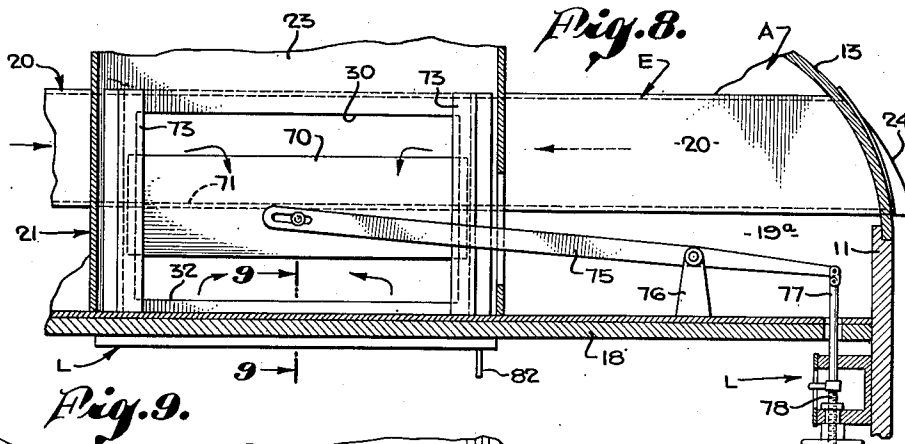
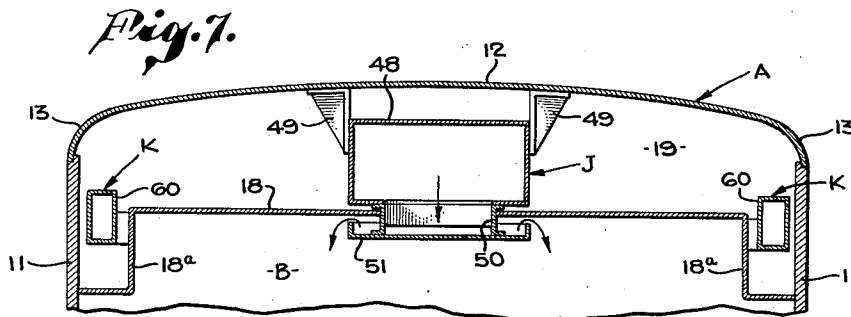
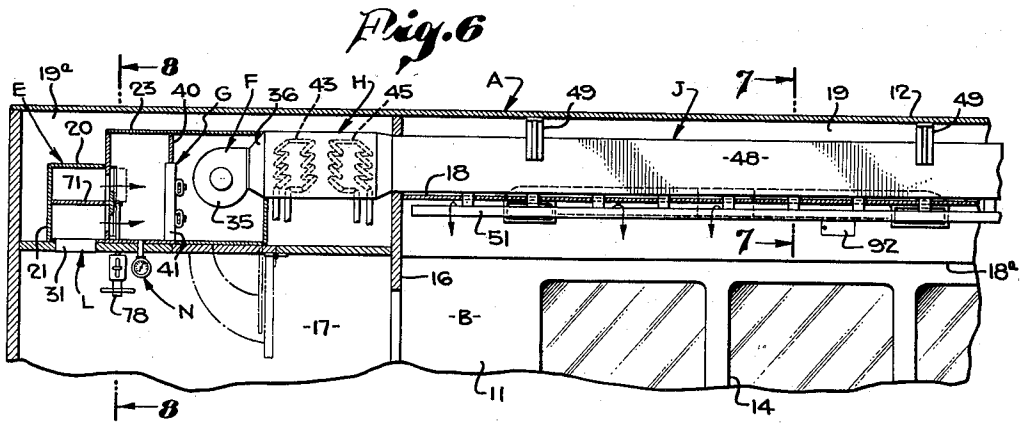
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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APPARATUS FOR MAINTAINING PREDETERMINED ATMOSPHERIC CONDITIONS IN COMPARTMENTS

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3 Claims. (Cl. 98—10)

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This invention is concerned with a method and apparatus for maintaining a predetermined atmospheric condition in a compartment, and is particularly applicable and useful as applied to vehicles such, for example, as railway coaches and the like. It is a general object of the present invention to provide a uniform maintenance of a clean, tempered atmosphere in a compartment, such for example as a railway coach or the like.

It is common in the case of railway coaches and the like to provide air passages to the exterior of such structures, some for admitting air and some for exhausting air. With constructions heretofore employed it has been difficult, if not impossible, to maintain uniform or satisfactory flow into or out of such compartments and, further, undesirable dust is admitted with the inflowing air. In the case of a railroad coach, cars or rolling stock preceding the coach involved generally cause air currents that pick up dust, with the result that air available for intake is laden with dust and may be very disagreeable and even unhealthy for use. It is, of course, common to equip compartments such as railroad coaches with air conditioning equipment, as for instance heating or cooling equipment, and air circulating equipment. However, so far as we are aware, all such equipment serves primarily to temper the air thermally and under operating conditions a negative pressure is maintained in the coach, with the result that dirty or dust-laden air finds its way into the coach through innumerable cracks, crevices and passages, all of which are, in practice, impossible or impractical to seal.

It is a general object of our present invention to provide a method whereby a uniform satisfactory atmosphere is maintained in a compartment such as a railway coach or the like, which atmosphere is thermally tempered, is clean, and is under slight pressure above that at the exterior of the compartment. By maintaining a positive pressure in the compartment we effectively eliminate the contamination and disagreeable results that ordinarily result from air leaking or seeping through the many cracks, crevices and openings that exist in the usual structure being conditioned.

It is a further object of our invention to provide apparatus that is simple, dependable and practical and which is applicable to a compartment such as a railway coach or the like to handle air from the exterior of the compartment in a manner to maintain a clean, constant atmosphere in the compartment under a pressure

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somewhat above that at the exterior of the compartment.

It is another object of the present invention to provide apparatus of the general character referred to including means handling air from the compartment to mix with fresh or incoming air, to the end that the mixed air is filtered and delivered to the compartment. Through the circulation of air in the compartment cleaning it in the process of circulation and by adding a predetermined amount of fresh air, the entire body of air in the compartment is efficiently maintained in a usable or satisfactory condition.

The various objects and features of our invention will be fully understood from the following detailed description of a typical preferred form and application of the invention, throughout which description reference is made to the accompanying drawings, in which:

Fig. 1 is a side elevation of a compartment equipped with the apparatus of the present invention, the compartment shown being a typical or common form of railroad passenger coach. Fig. 2 is an enlarged plan section taken substantially as indicated by line 2—2 on Fig. 1. Fig. 3 is an enlarged plan section taken substantially as indicated by line 3—3 on Fig. 1. Fig. 4 is an enlarged detailed transverse sectional view taken as indicated by line 4—4 on Fig. 1. Fig. 5 is an enlarged detailed transverse sectional view taken as indicated by line 5—5 on Fig. 1. Fig. 6 is an enlarged detailed sectional view taken as indicated by line 6—6 on Fig. 2. Fig. 7 is a transverse sectional view taken as indicated by line 7—7 on Fig. 6. Fig. 8 is an enlarged detailed transverse sectional view taken as indicated by line 8—8 on Fig. 6, and Fig. 9 is a detailed sectional view taken as indicated by line 9—9 on Fig. 8.

In accordance with the broader principles of our invention a compartment to be conditioned may be of any suitable size, shape or character. However, since the invention is most practical and can be used to great advantage in connection with mobile compartments such as railway coaches, and the like, we have for purpose of example, described in detail an application of the invention to a typical or conventional railway coach.

The particular coach illustrated in the drawings involves an elongate body A defining the compartment B to be conditioned. The coach body A is shown mounted on suitable trucks C for operation over rails D.

The coach body A may, in accordance with standard or conventional practice involve various parts and features of construction, all of which do not in any way concern the present invention and, therefore, we have, in the drawings, more or less diagrammatically illustrated only certain general parts of the body. In the drawings the coach body is shown as including a floor or bottom 10, vertical upstanding sides 11, and a top 12 joined to the upper edge portions of the sides by suitably rounded shoulders 13. The sides of the body are equipped with suitable windows or apertures 14 fitted with glass or the like, and at each end of the coach the sides are equipped with doors 15 providing access to the coach.

In accordance with common or general coach construction a partition 16 is provided in the body near one end, establishing at that end of the coach what we will term a vestibule compartment 17. Further, the coach is provided throughout its length with a false top or ceiling 18 providing a longitudinal chamber 19 in the top of the coach above the compartment B. In the particular case illustrated the ceiling is indicated as being of uniform height and contour throughout the body, except at the vestibule where it is somewhat lower than at other parts, providing above the vestibule a chamber 19^a suitable for accommodating working units of the apparatus that we have provided.

In accordance with our invention we provide air inlet means E for receiving air from the exterior of the coach and also from the interior thereof, an air circulator F, preferably a power driven blower, an air cleaner or filter G, air tempering means H, an air distributor J, air outlet means K, control means L for the air inlet means, control means M' for the air outlet means and pressure indicating means N.

The air inlet means of the present invention involves primarily one or more inlet ducts 20 for outside or fresh air, and at least one inlet duct 21 for recirculated air. In the particular case illustrated there are two inlet ducts 20 located in the compartment or chamber 19^a above the ceiling in the vestibule 17 and these ducts extend laterally of the coach opening at the exterior thereof and connecting into a single or common receiver 23. The ducts 20 are shown opening at the shoulders 13 of the coach body and in accordance with the preferred form of our invention guards in the nature of shell-like members 24 are applied to the exterior of the coach body at the shoulders overlying the outer or receiving ends of the ducts 20 and opening downwardly, as clearly illustrated in Fig. 4 of the drawings. The guard shells 24 are preferably symmetrical or uniformly shaped and serve to shed material such as rain or snow, that might otherwise enter the ducts 20, while at the same time allowing free inflow of air into the ducts. The guard shells 24 have straight or horizontally disposed lower edges 25 defining the inlet opening 26 through which air must flow to enter the ducts. With this formation of guard shells the coach can be operated in either direction with uniform flow of air into the ducts 20 and since the flow of air is upward through the inlet openings 26 foreign matter does not readily enter the ducts but will only do so if light and entrained in the air stream. In general foreign matter in the body of air through which the coach is moving is not drawn into the ducts 20 through

the guard shells 24, but rather only the cleaner air so enters the coach.

The receiver 23 located in chamber 19^a is a chest or box-like structure joined to one side of the transversely extending duct structure formed by the two ducts 20, there being an inlet opening 30 in the wall of the duct structure where the receiver occurs, so that air flowing inwardly from the two ducts is freely admitted into the receiver.

The single inlet duct 21 provided for handling recirculated air has an inlet opening 31 opening into or in communication with the interior of the coach at any suitable point. In the case illustrated the opening 31 is in direct communication with the vestibule portion 17 of the coach chamber B. The duct 21 has one side adjacent the receiver 23 and an opening 32 is provided in this side of the duct 21 to admit air freely into the receiver. It will be apparent from the drawings that air from the ducts 20 and 21 upon entering the receiver mingles or mixes to be thereafter handled as a common stream. The air circulator F is preferably located in the receiver 23 and in practice it is preferably a power driven blower. In the drawings we have indicated a circulator involving a motor M driving two like blowers 35 with inlets receiving air from the receiver 23 and with outlets 36 delivering air to the tempering means H.

In accordance with the broader principles of our invention the air cleaner G may be located at any suitable point in the system where air is flowing or is such that it can be effectively handled by a filter, or the like. In the preferred arrangement, however, the means G is located in the receiver 23 ahead of the circulator F. In the drawings we have shown the receiver 23 equipped with a transverse partition 40 in which a suitable filter 41 is installed, the structure being such that all air passing through the receiver must circulate through the filter 41 before reaching the circulator F. It is to be understood that we may, in practice, use any suitable form or type of air filter, although it is preferred to use a filter in which there are filter packs, say for instance, metallic packs through which the air passes and which serve to trap dust, and the like, which packs are removable for cleaning when necessary.

The air tempering means H is preferably located immediately adjacent the circulator F, as shown in Fig. 6 of the drawings, so that air, as it is delivered by the circulator, is cooled or heated, as circumstances require. In the drawings we have more or less diagrammatically indicated a heating unit at 42 connected with a radiating element 43 in the means H and we have shown a cooling unit 44 with an absorbing unit 45 in the means H. It is to be understood that my present invention is in no way concerned with the type, form, or details of the heating and cooling apparatus employed, nor is it concerned with the controls that are commonly provided in connection with such apparatus, it being sufficient for the purpose of the present invention that the means H include or be related to apparatus whereby the air handled by our construction is either heated or cooled, as desired.

The air distributor J may serve to merely discharge air into the space 19 between the ceiling 18 and the top of the coach to be allowed to pass therefrom into the chamber B of the coach, although it is preferred that the means J be such as to include an elongate distributing duct 48

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coupled to the outlet or delivery end of means H which duct extends substantially the entire length of the coach and discharges air at suitable intervals lengthwise of the coach. In the case illustrated the duct 48 is shown mounted in the space 19 through suitable mounting brackets 49 and at suitable intervals it has downspouts 50 engaged through the ceiling 18 and the downspouts are equipped with baffles or distributors 51 which serve to effect uniform distribution of air in the compartment B.

The air outlet means K may vary widely in form and construction and is provided primarily as a means of allowing for escape of air from the compartment B to the exterior thereof. In accordance with the preferred form of the invention the outlet means K includes a plurality of outlet units spaced longitudinally of the coach and located at each side thereof, preferably at the shoulder portion of the body in the chamber or space 19 above the ceiling 18. Each outlet unit is shown as including a longitudinally disposed duct at 60 with a plurality of inlet openings 61 spaced longitudinally of the ceiling and located in the edge portions of the ceiling, preferably in a cornice-like portion 18^a of the ceiling. Each unit or duct 60 is provided with a single outlet 62 that extends through the wall of the coach preferably the shoulder portion 13 thereof, to allow air to flow out of the coach. In accordance with our invention we provide a guard or shell 63 over each outlet opening 62 or where each duct 60 discharges from the coach, which guard or shell may be similar in character, generally, to the guard shells 24 hereinabove described.

The means L provided to control the inlet air serves primarily to control the amount of air admitted from the inlet ducts 20 and the amount of air admitted from the inlet duct 21. In the particular form of the invention illustrated a single damper 70 is mounted where the ducts join the receiver and is cooperatively related to the inlet opening 30 from the ducts 20 and the inlet opening 32 from the duct 21. In the arrangement illustrated the openings 30 and 32 are located one above the other, the opening 30 being located above the opening 32, the two openings being separated by a duct wall 71 which separates the ducts 20 from the duct 21.

The damper 70 is shown as a simple plate mounted in guideways 73 to be shiftable vertically and it is of such vertical extent that it may be shifted to an up position where it fully closes the opening 30 or to a down position where it fully closes the opening 32. In an intermediate position such for example as is shown in Fig. 8 of the drawings, the damper partially closes each opening and by being shifted in either direction from a position such as is shown in Fig. 8 the proportioning of air admitted from the ducts 20 and 21 may be varied as desired. In the case illustrated the means L includes an operating mechanism for the damper 70 which mechanism involves a lever 75 pivotally carried by a bracket 76 and an operating rod 77 depending from the lever to a point accessible in compartment B, preferably in the vestibule portion thereof, where a screw means 78 is provided, which screw means is operable to effect vertical movement of the rod. As the rod 77 is shifted vertically through the means 78 the damper 70 is shifted to change its relationship to the inlet openings 30 and 32.

The means L may further include a damper construction in connection with the inlet duct 21, for instance, as shown in the drawings, a plu-

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ality of dampers 80 is supported by a suitable carrier 81 in the inlet opening 31 of duct 21. The dampers 80 are operable in unison by an operating lever 82 accessible from the compartment B. The dampers 80 may be positioned to allow free or unobstructed flow through the inlet opening 31 or they may be positioned to shut off flow through opening 31. Normally the dampers 80 will be set in an intermediate position where they partially cut off or serve to restrict flow through the duct 21.

The control M' provided for the outlet means K is preferably a damper means serving to regulate the outflow through the duct construction hereinabove described. Where the units of means K involve ducts 60 with a plurality of inlets 61 it is preferred to provide dampers 90 in the ducts 60 between each inlet 61 and the outlet 62. The dampers 90 are preferably interconnected as by a connecting rod 91 so that when one damper is adjusted the other is correspondingly adjusted. In the particular case illustrated it is preferred that the dampers 90 be set in what may be considered a permanent position, since when they are once properly set it will rarely be necessary to adjust them. In the case illustrated an access opening is shown provided in the cornice portion 18^a of ceiling 18 at each unit of means K and suitable closures 92 normally close the access openings. When the closures 92 are removed the dampers 90 can be adjusted as desired.

The pressure indicating means N is provided primarily to indicate the pressure in ducts 60 from which it is possible to determine the differential between the inside of the coach, or between the compartment B of the coach and the exterior of the coach. In the case illustrated we have shown a pressure gauge N coupled into one of the ducts 60 of a unit of means K at or opposite the outlet 62 thereof and in communication with the chamber B within the body of the coach, the gauge being such as to indicate the pressure differential between the outlet 62 and the chamber B.

From the foregoing description it will be apparent that we have by our invention provided a method of effectively maintaining air in the coach compartment B in a most desirable or satisfactory condition. In accordance with our method the apparatus as hereinabove described is set and operated so that air flows in through ducts 20 to the receiver 23 where it is cleaned by the means G and then forced by the means F through the tempering means H, the duct 48, and finally into the chamber B from which it has no escape except through the several units of means K, or possibly through the duct 21 to be recirculated, in which case it does not, in fact, escape. The dampers or control means M' of means K restrict outflow through the means K so that pressure develops or builds up within the compartment B and is maintained in excess of that at the exterior of the coach. By thus establishing and maintaining a positive pressure inside the coach air from the interior of the coach B will maintain an outward flow or seepage through all of the various minor or minute openings, passages, cracks, and crevices through which air under ordinary conditions finds its way into the coach. It will be apparent that by cleaning or filtering the air entering the coach through the ducts 20 the air entering to replenish that which finds its way out of the coach through the means K and the cracks and crevices is clean, with

the result that the air in the coach is at all times maintained clean and free of dust. In practice we have found that a very slight pressure differential is all that needs to be maintained between the inside and the outside of the coach for our method to work satisfactorily. When there is but a slight pressure differential, say for instance about .06 inch water gauge, the doors of the coach can be opened and closed in the manner to normal usage of the coach without materially disturbing the condition within the coach.

It is also to be observed that by providing the inlet duct 21 we are able to recirculate any desired proportion of air in the coach, and since the air drawn from the interior of the coach has been tempered, that is, either heated or cooled, we can, by proper setting of the controls L, gain highly efficient operation of the system.

Having described only a typical preferred form and application of our invention, we do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to ourselves any variations or modifications that may appear to those skilled in the art and fall within the scope of the following claims.

Having described our invention, we claim:

1. In combination, a vehicle body defining a compartment, an air receiver, a first air inlet duct having an inlet opening at the exterior of the body and a receiver opening for admitting fresh air from the exterior of the body to the air receiver; a second air inlet duct having an inlet opening communicating with the compartment and a receiver opening for admitting air from the compartment to the air receiver, said receiver openings being adjacent each other, a movable damper located adjacent said receiver openings, said damper, in one position, completely blocking flow of air through one of said receiver openings to said air receiver and permitting flow of air through the other of said receiver openings, and in another position completely blocking flow of air through the other of said receiver openings to said air receiver and permitting flow of air through said one of said receiver openings, and said damper being positionable between said completely blocking positions to proportion the amount of air admitted to said air receiver through said receiver openings; a control means in the inlet opening of said second duct for governing air flow through said duct; an air filter in the receiver; a blower receiving air from the receiver and delivering it into the compartment under pressure; and an air outlet remote from the inlet ducts, control means, and damper, and passing air from the compartment to the exterior thereof at a point remote from the blower.

2. In combination, a vehicle body defining a compartment, an air receiver, a first air inlet duct having an inlet opening at the exterior of the body and a receiver opening for admitting

fresh air from the exterior of the body to the air receiver; a second air inlet duct having an inlet opening communicating with the compartment and a receiver opening for admitting air from the compartment to the air receiver, said receiver openings being adjacent each other, a movable damper located adjacent said receiver openings, said damper, in one position, completely blocking flow of air through one of said receiver openings to said air receiver and permitting flow of air through the other of said receiver openings, and in another position completely blocking flow of air through the other of said receiver openings to said air receiver and permitting flow of air through said one of said receiver openings, and said damper being positionable between said completely blocking positions to proportion the amount of air admitted to said air receiver through said receiver openings; a control means in the inlet opening of said second duct for governing air flow through said duct; an air filter in the receiver; a blower receiving air from the receiver and delivering it into the compartment under pressure; means thermally tempering air delivered to the compartment, and an air outlet remote from the inlet ducts, control means, and damper, and passing air from the compartment to the exterior thereof at a point remote from the blower, and control means in the outlet between the compartment and the exterior thereof for governing the flow of air through the outlet.

3. The combination as claimed in claim 2 wherein said receiver openings are disposed one above the other and said damper consists of a flat, rectangular member movable in a vertical plane between an upper blocking position and a lower blocking position.

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