May 4, 1954 W. J. BUCK 2,677,629

METHOD OF CLEANING THE INTERIORS OF VEHICLES, BUILDINGS, AND THE LIKE

Filed Sept. 14, 1951 3 Sheets-Sheet 1

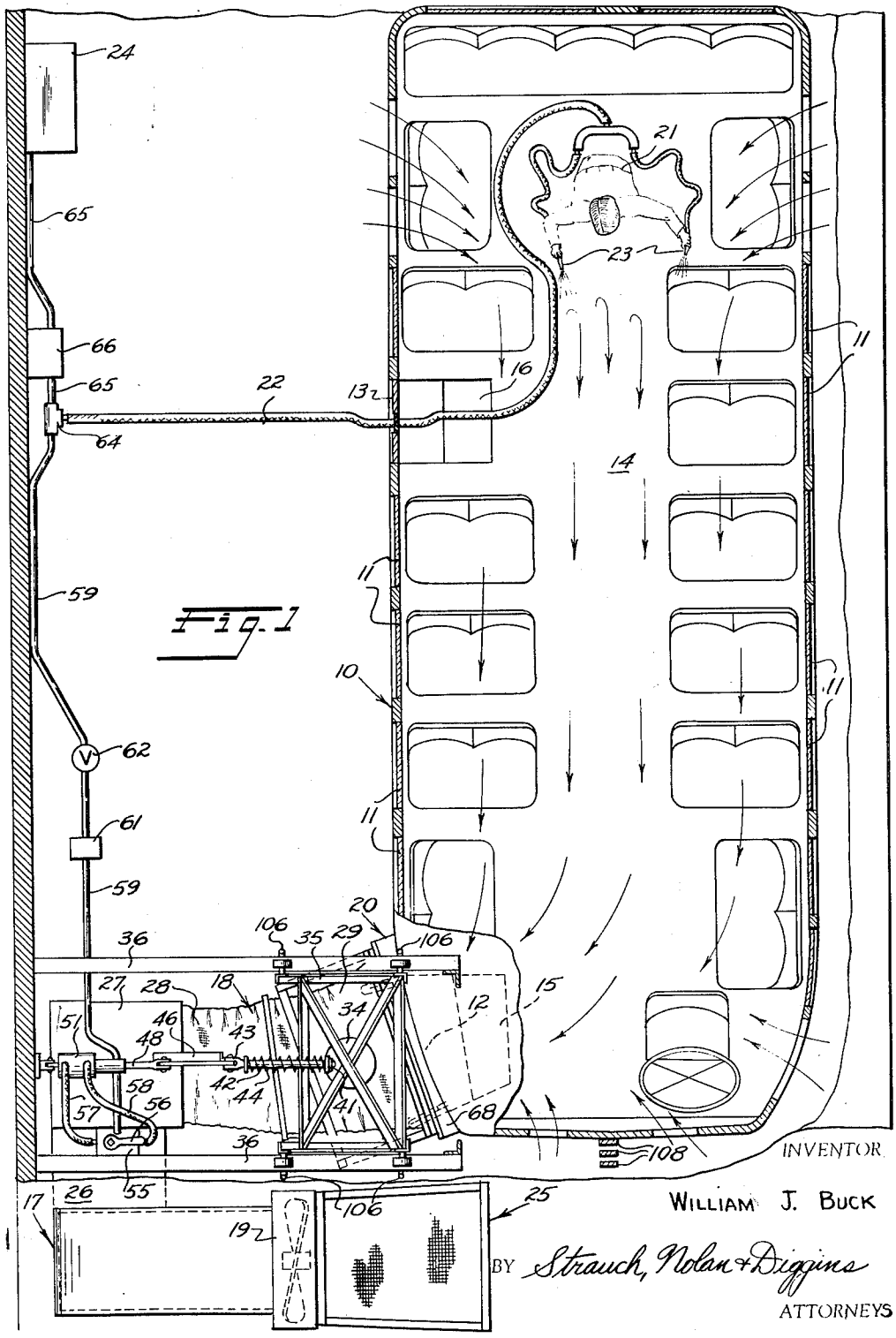


Fig. 1

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Filed Sept. 14, 1951 3 Sheets-Sheet 2

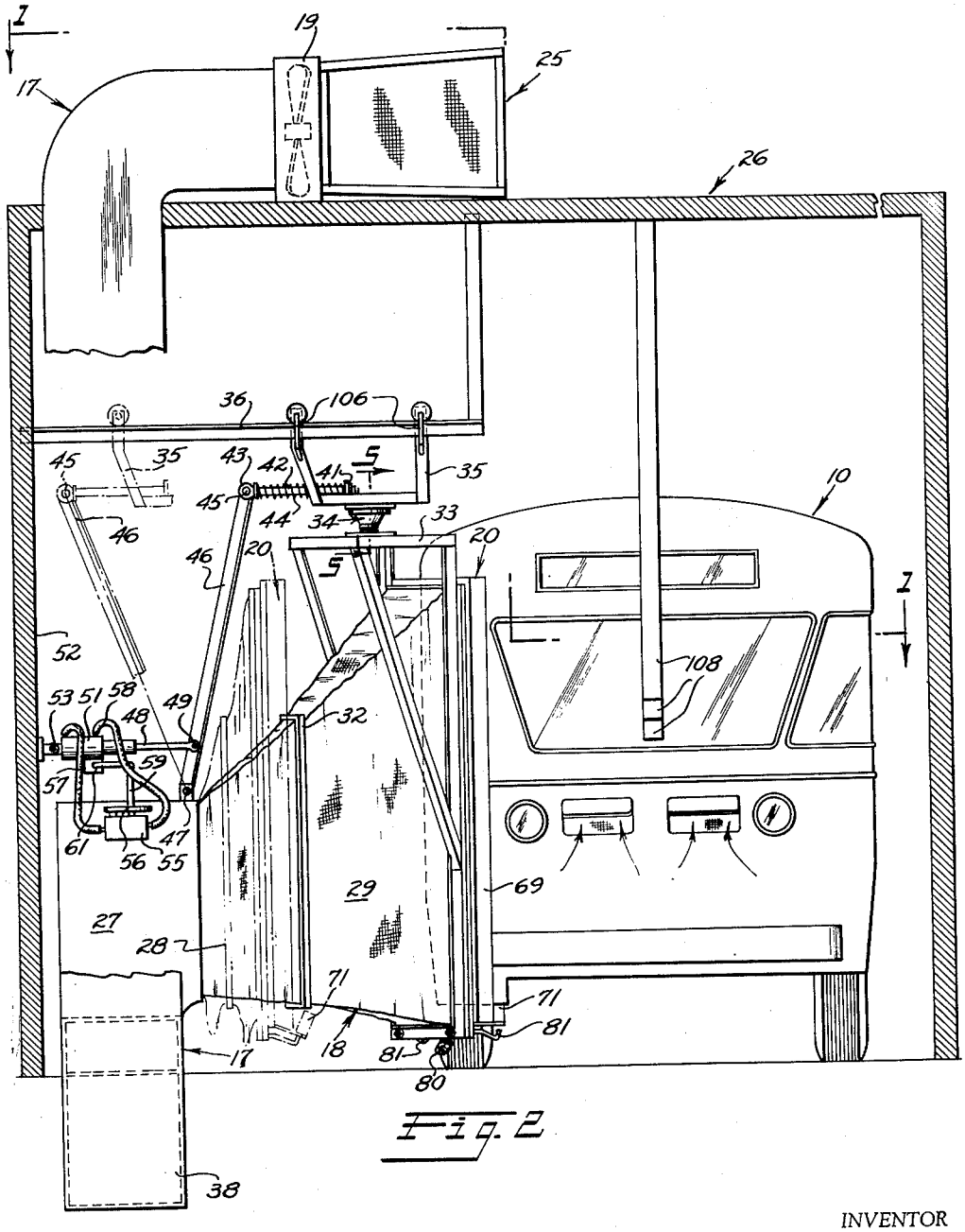


Fig. 2

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Filed Sept. 14, 1951 3 Sheets-Sheet 3

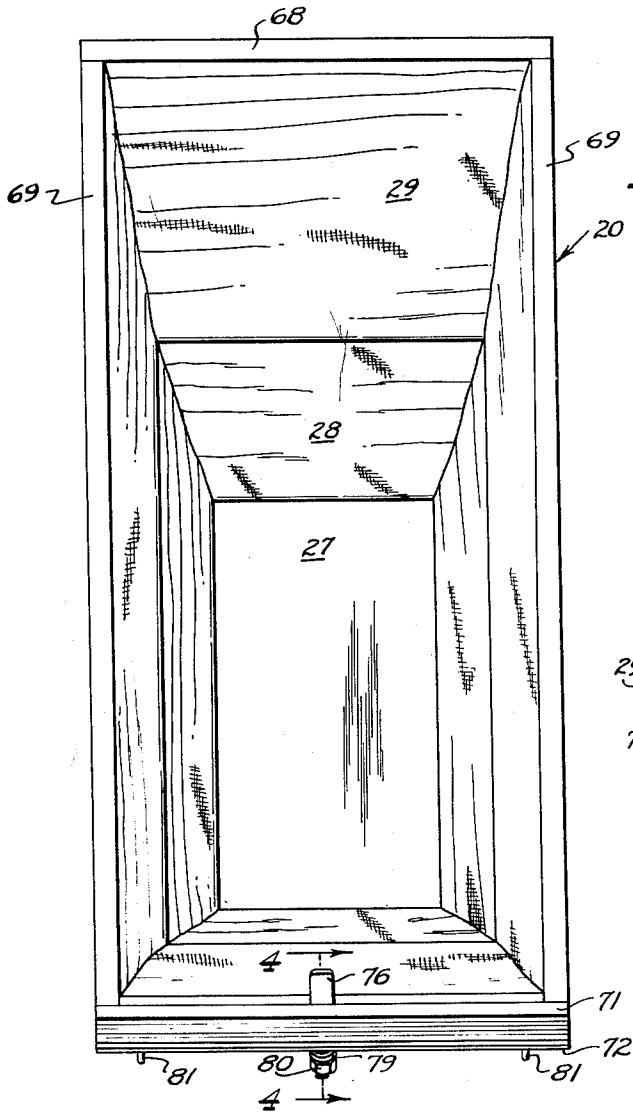


Fig. 3

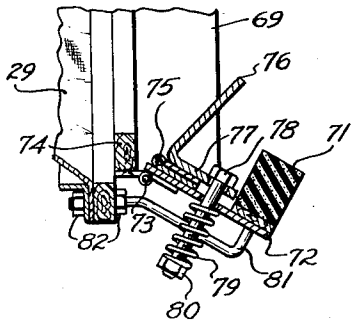


Fig. 4

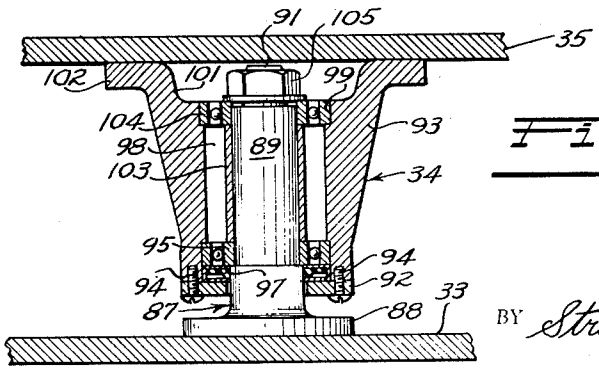


Fig. 5

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2,677,629

METHOD OF CLEANING THE INTERIORS OF VEHICLES, BUILDINGS, AND THE LIKE

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Application September 14, 1951, Serial No. 246,621

10 Claims. (Cl. 134—21)

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The present invention relates to a novel cleaning method and more particularly to a method for cleaning the interior of structures, primarily of the bus, streetcar and railcar type.

At the present time operators of bus fleets, streetcars and railcars are required to spend large sums of money for cleaning the interior of their vehicles in order to meet public utility commission regulations and provide the public with a presentable vehicle interior because of the lack of any suitable interior cleaning method and equipment. For example, companies operating such vehicles at present generally employ sweepers and sweeping equipment to clean the vehicle interiors. Such operations are extremely time consuming because of the construction and close spacing of the seats and are not satisfactory because of the inability to reach many areas of the floor and walls adjacent the seats with the conventional brooms, vacuum cleaners and the like presently used.

In addition, the cleaning personnel are subjected to highly objectionable dust conditions, because of the close quarters in which they work, are difficult to obtain because of this fact and demand inordinantly high compensation because of the objectionable nature of the work. In this connection, one of the smaller outlying bus companies in the vicinity of Washington, D. C., paid sweepers a salary of $250.00 per month and used on the average of about $100.00 worth of brooms per month in its cleaning operations before adopting the present method and apparatus. In spite of this outlay and frequent inspection in an effort to assure efficient cleaning, this company found its bus interiors to be not only unsightly because of dirt accumulations in places difficult to sweep and vacuum but smeary where brooms tended to smear the dirt along the surfaces rather than remove it and that even such unsatisfactory cleaning was unduly time consuming, required two cleaners per bus and that a continuous hiring of new cleaners was necessary to replace those quitting because of the undesirable nature of the work.

It, accordingly, is the primary object of the present invention to provide a method for satisfactorily cleaning interiors of structures quickly while eliminating the objectionable nature of the work and the costly implement expense and reducing the number of cleaners required.

It is a further important object of this invention to provide a novel vacuuming and air blast cleaning method adapted to the cleaning of structural interiors adapted for operation through the

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installation of apparatus either at a permanent location for cleaning vehicle body interiors or on truck or trailer chassis to provide portable cleaning plants usable by cleaning service companies for contract cleaning of homes and other building structures.

It is a further object of the present invention to provide a cleaning method for structural interiors comprising the steps of creating a blast or strong carrier current of air through a structure to serve as a carrier steam of dust and light dust particles, directing a blast of compressed air from a nozzle means on the interior surfaces to be cleaned in the general direction of flow of the carrier stream to dislodge the dust and dirt thereby introducing the dust and light dirt particles into the carrier stream for removal thereby and driving the heavy dirt particles and paper litter or the like toward the draft or air current creating source, and progressively moving the air blast nozzle through the structure toward the draft or air current creating source to dislodge the dust and dirt particles from successive surface areas in a manner to assure its removal into the draft or air current creating source.

Still further objects will appear from the following description when read in conjunction with the appended claims and attached drawings wherein:

Figure 1 is a fragmental horizontal sectional view taken substantially on the line 1—1 of Figure 2 illustrating a preferred form of apparatus adapted for use in applying the novel cleaning method of this invention to the cleaning of a vehicle such as a bus;

Figure 2 is a vertical sectional view of the apparatus disclosed in Figure 1 illustrating the manner in which the apparatus cooperates with a bus or other vehicle, and shows certain parts broken away and certain other parts in dot-and-dash line positions, to more clearly illustrate the apparatus of this invention;

Figure 3 is an end view of the flexible conduit section and inlet nozzle provided to assure sealed engagement between the object to be cleaned and the air exhaust duct;

Figure 4 is a sectional view taken on line 4—4 of Figure 3, and illustrating the hinged sealing element provided on the bottom of the inlet nozzle mouth to sealingly cooperate with the under portion of the vehicle step and adapting the method of the present invention for use in vehicle cleaning; and

Figure 5 is a vertical sectional view taken substantially on line 5—5 of Figure 2 and illustrat-

ing a suitable form of swivel mounting for supporting the inlet nozzle for automatic alignment with a side wall of the structure to be cleaned.

With continued reference to the drawings wherein like reference numerals are used throughout to indicate the same elements or parts, the method of the present invention contemplates a structure, such as a bus 10 having window openings, adapted to be closed by windows 11 located at spaced points throughout the structure, and doorways 12 and 13 extending to the level of the floor 14 or stairwells 15 and 16, customarily provided therein. The method of this invention further contemplates a large capacity exhaust duct system 17, including a flexible duct section 18 at the end opposite a fan 19 terminating in a rimlike frame member or inlet nozzle mouthpiece 20 adapted to sealingly enclose a doorway opening such as 12. The invention further contemplates an operator indicated generally by the numeral 21 and a flexible compressed air hose 22 fitted with one or more nozzles 23 connected to a suitable source of compressed air, such as an air compressor 24, through conventional hose and pipe connections. As clearly shown in Figures 1 and 2, the outlet of fan 19 leads to a collection basket or the like 25 located at a point remote from the inlet nozzle mouthpiece for collecting the paper litter and if desired, the dust and dirt particles during the cleaning operation. As illustrated in the drawing, the fan 19 and collection basket 25 are located on the roof 26 of the garage building where the cleaning of the vehicles is accomplished.

In practicing the cleaning method of the present invention, the inlet nozzle mouthpiece 20 is placed in sealing engagement with the structural surface defining the doorway 12, the windows 11 of the structure, except for the two windows at each side at the point farthest removed from the doorway opening 12 are closed and fan 19 is started to create a current of air through the vehicle structure as indicated by the arrows in Figure 1 and through the duct structure 17 to the collection basket 25. To assure effective operation of the cleaning method, it is desirable that fan 19 have adequate capacity to assure a high velocity air stream through the duct system 17 and that the cross-sectional area of the duct system 17 be substantially less than the cross-sectional area of the structure to be cleaned so that the air velocity through the structure to be cleaned is sufficiently low to permit breathing of the operator yet strong enough to pick up and remove dust and light dirt particles agitated into the air current through the structure by the operator. The detailed description now to be given has reference to a particular installation which has been found satisfactory in cleaning of buses.

The system as installed preferably consists of two 28-inch fans mounted side by side and powered by a five horsepower motor running at an estimated fan speed of twelve hundred and fifty R. P. M. to create a tornadial-like air blast through the structure being cleaned of the order of 30 miles per hour. These fans are connected to an air duct having an average cross-sectional area of approximately four square feet leading to a stationary box-like terminal connection 27. Connection 27 has a rectangular opening of one foot eight inches by three feet two inches. This box-like terminal connection has a flexible inlet conduit section 18 consisting of two tapering canvas sections 28 and 29 connected to each other

through a framework 32 of wood with the small end of the canvas section 28 sealingly connected around the opening in the rectangular box-like terminal connection. The opposite large end of canvas section 29 is suitably connected to rimlike frame member 20 which is supported through a suitable metal framing 33 from a swivel connector 34 carried by a reciprocable carriage 35 supported on a trackway 36 mounted in the walls and ceiling of the garage building. The rimlike frame member 20 defines a rectangular opening of approximately three feet, four inches by five feet eleven inches and on its outwardly facing edges is provided with a suitable sealing material, such as foam rubber of a depth of four inches and a width of two inches, adapted to sealingly engage the surface of the vehicle surrounding the doorway 12. While this sealing element is here disclosed as foam rubber, it is to be understood that any other suitable material which will readily conform to irregularities around the door openings and not mar the finish of the vehicle can be used. It will further be understood that the present method of cleaning can be carried out with apparatus differing widely from that just described in general and applied to cleaning other structural interiors, the only requisites being that a high velocity air suction system be provided to create a current of air through the structure to be cleaned and compressed air hoses be provided for progressive movement through the structure to be cleaned in the direction of the flow of the current of air.

The apparatus disclosed herein constitutes a preferred form of apparatus for carrying out the method of this application and forms the subject matter of and is claimed in copending application Serial No. 414,465, filed March 5, 1954, as a division of this application.

Assuming the air duct system to be connected to a bus as just described and as illustrated in Figures 1 and 2 of the drawing, fan 19 is started initiating a current of air through the bus from the rear windows forwardly to and through the front door. An operator then enters the vehicle through the rear door 13 carrying with him the compressed air hose 22. While hose 22 is shown passing through the rear doorway, it will be understood that the hose might be passed through one of the open rear windows if desired.

After the operator has entered the vehicle he moves to the extreme rear end, and standing at one side of the vehicle, plays the air blast from the hoses along the back seats, wall surfaces and floor generally toward the other side thereby driving the dust and light dirt particles from the vehicle surfaces into the suction current created by fan 19 and heavy dirt and paper litter onto and along the vehicle floor. After completing the cleaning of the rear portion of the bus in this manner, the operator turns facing the forward end of the vehicle and progressively moves the air hoses forwardly through the bus aisle toward the front door 12 while playing the air blast from the nozzles 23 under the seats and over the seat, floor and wall surfaces generally in the direction of flow of the suction current through the vehicle. These air blasts loosen the dust and dirt particles from these surfaces, float the dust and light dirt particles into the air stream to be carried thereby into the duct work and thence to the collection basket 25. The heavy dirt particles or pieces of paper and the like, which cannot be carried by the suction current, are blown onto and along the floor

by the air blasts from the hoses as the operator moves forwardly in the vehicle and are finally washed out of the front doorway by the jets of compressed air played against the floor and the interior surfaces of the bus.

It will be appreciated that the operator at all times stands to the rear of the compressed air nozzles and plays the air blast from the nozzles away from him into the circulating current of air produced by fan 19. As a consequence, the dust and dirt particles are always driven away from the operator and into the air current which is moving past and away from the operator and the operator always stands in a position where he is surrounded by clean, fresh air. Since dust and light dirt particles removed from the interior surfaces by the air blasts from nozzles 23 are introduced into the current of air produced by fan 19 generally in a direction forwardly toward the door opening 12, it will be appreciated that any settling out of the dust and light dirt particles will occur always ahead of the operator. Consequently it will be again blasted into the air stream in the direction of the door opening 12 as the operator progresses forwardly in the bus and will never be able to settle behind the operator on a cleaned surface. Any heavy particles will also be flushed along the vehicle floor toward door opening 12 by the air streams from the nozzles and eventually will be driven through the door opening into the rectangular box-like connection member 27, where they will be subjected to the high velocity air current in the duct 17 and carried thereby to the collection basket 25.

In event the operator cleaning a bus comes across any bottles, heavy cartons or the like, these will, of course, have to be picked up, carried forwardly to the door opening 12 as he moves through the bus and deposited in a refuse bin preferably a bin 38 opening through the bottom of the rectangular box-like connection 27 and disposed below the ground level as indicated in Figure 2 in position to receive heavy articles which cannot be carried to basket 35 by the high velocity air current.

By combining the suction draft of fan 19 and the air blast from nozzles 23, the entire interior of the bus or other structure to be cleaned, including any seats or furniture therein, are satisfactorily cleaned by the beating action of the air blast, which, due to its being directed in the general direction of flow of the air current from fan 19 not only frees the dust and dirt particles from the vehicle surfaces but drives the dust and dirt particles forwardly in the direction of flow of the air current so the dust and light dirt particles are carried along by the air current and have no opportunity to resettle upon the seat or other surfaces being subjected to the air blast. This assures perfect cleaning of the interior surfaces and eliminates frictional wear of the interior surfaces inherent in the use of brooms, dustcloths, dusters and the like.

The method of cleaning, disclosed by this invention, furthermore, eliminates entirely the smearing of the interior surfaces with the dirt so often producing an unsightly surface when brooms, cloths and mops are used in cleaning vehicle interiors. Since the operator can play the air stream beneath the seats and between the seats and wall surfaces without the necessity of inserting the nozzle between the supporting frame members and the wall and floor surfaces, it will be appreciated that adequate cleaning of all portions of the vehicle interior can be effected with the minimum of effort on the part of the operator and much more rapidly than would be possible if brooms, dustcloths and the like had to be applied to these surfaces in succession. It will furthermore be appreciated that damage to the interior surfaces by bumping of brooms and the like against the surfaces is wholly eliminated by this cleaning method.

It has also been found that the cleaning of a bus can be accomplished in much less time using this combined suction current and air blast method than has heretofore been possible with the brush and broom method and that a single operator may do the cleaning whereas it was found desirable, because of time requirements, to use two sweepers in the old broom and dustcloth method. Cost records indicate that buses can be cleaned at a cost of one dollar ($1.00) per bus per week using the present air blast, suction draft method, whereas the old broom and dustcloth method cost about two dollars ($2.00) per bus per week and did not produce nearly as satisfactory a cleaning job.

It will, furthermore, be appreciated that the present cleaning method is readily adapted to the cleaning of streetcars and railcars, with much the same type of cleaning apparatus herein disclosed, and that the method lends itself to contract housecleaning, since the suction fans, compressors and so forth may be readily mounted upon a truck or trailer chassis and connected through a suitable flexible conduit to a house doorway or the like.

While any suitable apparatus having the foregoing general features may be used, the present invention contemplates a canvas duct section 18 or shroud, accordion pleated, if desired, and a rim-like frame member 20 at the free end to be reciprocated back and forth by power means to conserve the operator's energy. To this end, carriage 35 is provided with an upstanding ear 41 for slidably receiving a push bar 42 having a clevis 43 at its free end and a coil spring 44 surrounding the rod 42 between clevis 43 and ear 41. Clevis 43 of rod 42 is suitably connected by a pin 45 to a lever 46 pivoted at 47 on rectangular box-like connection member 27, and connected through a piston rod 48 pivoted at 49 to lever 46 and connected at its other end to the piston (not shown) of a suitable air motor 51. Motor 51 is mounted at any convenient point to the wall 52 of the garage or member 27 through a pivot connection 53 so as to be freely operable to oscillate lever 46 around its pivot 47 and reciprocate carriage 35 back and forth along tracks 36.

Control of the air motor 51 is effected through a suitable control valve 55 having an operating handle 56 for moving the valve to supply the opposite ends of the piston motor alternately with compressed air through suitable hoses 57 and 58 respectively. The construction of valve 55 may be of any well known construction adapted to alternately connect the opposite ends of the air motor to the source of compressed air through pipe line 59 or to exhaust in a well-known manner. The pipe line 59 may be provided with an air filter 61 and a main cut-off valve 62 for operational and installational convenience. Line 59 is connected through T-connection 64 to supply line 65 provided for supplying compressed air through the compressed air hose 22 as well as line 59. Line 59 leads to compressor 24 and

preferably is provided with a watertrap 66 in well known manner.

As clearly seen in Figure 3, the foam rubber sealing members comprise a horizontally directed top strip 68 extending from side to side of the rim-like member 20, vertically extending side strips 69 extending the full height of the rim-like member, and a horizontally directed sealing strip 71, carried by a horizontally extending hinged plate 72, supported by spaced hinges 73 fastened to the lower edge of the wooden frame backing member 74. Plate 72, on its upper face intermediate its ends, is provided with a hinge 75 having one leaf suitably secured to plate 72 and carrying on its other leaf an L-shaped strap 76. One leg 77 of strap 76 parallels hinge 72 in the normal closed position of hinge 75 and is provided along with plate 72 with aligned apertures for slidably receiving a bolt 78 which extends through and below plate 72 and is encircled by a coiled spring 79. A spring securing nut 80 compresses spring 78 against the underside of plate 72 thereby resiliently constraining plate 72 to move with leg 77 of L-member 76 and remain parallel thereto. Suitable stop rods 81 are provided adjacent each end of frame member 74, suitable nuts 82 being used to secure the stop rods to the frame member with their free ends in position to normally support plate 72 at an obtuse angle to the plane of rim-like member 20. This lower sealing construction in normal operation serves to seal the undersurface of the vehicle door opening, and functions as follows.

As motor 51 projects the flexible conduit section 18 and rim-like member 20 toward the vehicle to engage sealing member 68 and sealing members 69 with the doorway defining portions of the vehicle body, one end of member 68 and only one member 69 may initially engage the vehicle body. In such a case the frame 33 will swivel bringing the remainder of member 68 and the other member 69 into engagement with the vehicle wall structure, and the upstanding leg of member 76 into contact with the edge of the vehicle step. As the motor and spring 44 press the frame member into sealing engagement, the member 76 through its nut bolt and spring connection to plate 72, will be rotated in a counter-clockwise direction toward the frame member and draw plate 72 and its associated sealing strip 71 in a counter-clockwise direction around hinges 73 into sealing engagement with the under surface of the doorstep and simultaneously engage the ends of the surface of plate 72 sealingly with the lowermost ends of the vertical sealing strips 69. As a consequence, a complete and tight seal around the vehicle door opening is assured.

While any suitable swivel member 34 may be employed, the present invention contemplates a journal pin 87 having a flange plate 88 welded to one end and to the supporting frame 33 and a bearing section 89 of reduced diameter extending upwardly and terminating in a further reduced threaded section 91. This pin is adapted to project through a center opening in a plate 92 secured to an annular swivel body 93 by suitable cap screws 94 threaded into the end of body section 93. Closure plate 92 clamps the outer race of a combined antifriction and end thrust bearing 95 between a bearing seat 96 in body 93 and bearing seal 97 disposed between the bearing and plate 92. The reduced section 89 of shaft 87 closely fits the inner race of bearing 95 and extends upwardly through an enlarged aligned bore 98 and counter bored bearing seat 99 in body 93. Bearing seat 99 opens into an enlarged counter bore 101 formed in the other end of body member 93 and defined by a securing flange 102 adapting the swivel body member 93 for attachment to carriage 35 through suitable nut-and-bolt assemblies (not shown). Before attaching body member 93 to carriage 35, a suitable antifriction sleeve 103 is dropped over the reduced section 89 of pin 87 and a combined antifriction and end thrust bearing 104 is disposed in bearing seat 99 with its outer race snugly engaged therein. A suitable nut and lock washer assembly 105 is threaded on the end 91 of pin 87 and tightened to clamp the inner races of bearings 95 and 104 between the shoulder formed at the opposite end of reduced section 89 and the washer of the nut and lock washer assembly 105. In this way, pin 87 is clamped to the inner races of bearings 95 and 104 and the bearings are preloaded to take up any end play and assure accurate rotation of pin 87 in body 93.

As a result of this antifriction journal, rim-like member 20 is freely swiveled so that, should the wall of the vehicle to be cleaned be disposed at an angle to the path of movement of carriage 35, rim-like member and its flexible canvas conduit section may readily swivel in body 93 to assure a proper and complete annular sealing of the door opening. To prevent any possibility of this swivelling movement derailing carriage 35, the upstanding wheel support members of carriage 35 are, along their respective outer faces provided with rod-like members 106 offset transversely into overlapping relation to the outer edges of rails 36. As a consequence, lateral shifting of carriage 35 with respect to rails 36 is prevented.

In order to assure proper positioning of a bus with respect to the suction duct, a simple tell tale indicator visible to the driver is preferably employed. While any suitable device may be used the present invention contemplates weighted rubber or fabric straps 108 depending from the ceiling and adapted to contact the transverse center of the windshield. Since the forward door on different makes of buses is located different distances rearwardly of this center point of the windshield three or more straps 108 (Figure 1) have been found to be necessary. These straps are preferably located empirically in any particular installation. In order to assure selection of the proper tell tale strap 108, the straps may be made of different length for the various buses to be serviced or may be provided with differentiating indicia.

It will be noted from reference to Figure 1 that the principal air current through the bus follows a path from the open rear windows forwardly to a point opposite the open doorway 12 and then transversely across the front of the bus. Additional paths of air flow may also be produced as a result of ventilation passages provided in the bus bodies of an open or partially open window adjacent the driver's seat. These additional paths of flow are, however, generally of relatively small volume and do not normally interfere with proper operation of the method. In event, these additional flow paths do reduce the primary current to a material extent, the ventilating openings may be readily covered to eliminate the deleterious effects.

The invention may be embodied in other specific forms without departing from the spirit

or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. The method of cleaning the interior of housing or vehicle structures comprising the steps of closing the window, door and other openings in the structure except for a first opening extending to the floor level and a second opening remote from said first opening; substantially sealingly engaging a large capacity suction duct with the portions of the structure surrounding said first opening to create a relatively strong current of air through said structure from said second opening through said first opening and said suction duct; and passing one or more compressed air hoses progressively through said structure from said second opening toward said first opening while playing the air stream from said hoses on the interior surfaces, including the seat surfaces, in the general direction of flow of said current of air through said structure thereby removing the dust and dirt particles from said interior surfaces and introducing the dust and light dirt particles into said current of air for removal thereby and driving the heavy dirt particles, paper litter, and the like along the structure's floor toward and through said first opening into said suction duct where it is acted upon by the air current passing therethrough and carried with the dust and light dirt particles to a point of discharge.

2. The method defined in claim 1 wherein the compressed air hoses are passed through the structure by an operator facing in the downstream direction of flow of said air current and playing the air stream from said hoses in a direction generally ahead of him whereby the operator is at all times located in an area of the structure upstream from the dust and dirt ladened air where he will be supplied with clean, fresh air for breathing.

3. The method defined in claim 2 wherein the current of air passing through said suction duct is confined to a cross-sectional area substantially smaller than the cross-sectional area of the structure to assure an air current in said duct sufficiently strong to carry the heavy dirt particles, paper litter and the like therethrough and at the same time assure a current of air through the structure sufficiently strong to carry the dust and light dirt particles yet low enough to permit normal breathing of the operator.

4. The method of cleaning the interior of a bus, streetcar, railcar or the like comprising the steps of closing the window, door and other openings in the vehicle body except for a first opening extending to the floor level at one end and a second opening at the other end; substantially sealingly engaging a large capacity suction duct with the portions of the vehicle body surrounding said first opening to create a relatively strong current of air through said vehicle body from said second opening through said first opening and said suction duct; and passing one or more air hoses progressively through said vehicle body from said second opening toward said first opening while playing the air stream from said hoses on the interior surfaces, including the seat surfaces, in the general direction of flow of said current of air through said vehicle body thereby removing the dust and dirt particles from said interior surfaces and introducing the dust and light dirt particles into said current of air for removal thereby and driving heavy dirt particles, paper litter, and the like along the vehicle floor toward and through said first opening into said suction duct where it is acted upon by the air current passing therethrough and carried with the dust and light dirt particles to a point of discharge.

5. The method defined in claim 4 wherein the compressed air hoses are passed through the vehicle body by an operator facing in the downstream direction of flow of said air current and playing the air stream from said hoses in a direction generally ahead of him and against the seat and other crevice forming surfaces to beat the surfaces, clear the crevices of dirt, and agitate the dust and light dirt particles into the air current passing through the vehicle body ahead of the operator whereby the operator is at all times located in an area of the vehicle body upstream of the dust and dirt ladened air where he will be supplied with clean, fresh air for breathing.

6. The method of cleaning the interior of a bus, streetcar, railcar or the like having window openings spaced along the sides of the vehicle body and at least one door opening extending downwardly to the entrance level into the body comprising the steps of closing all openings except said one door opening and a window opening at each side of the vehicle body remote from said one door opening; substantially sealingly engaging a large capacity suction duct with the portions of the vehicle body surrounding said one door opening to create a relatively strong current of air through said vehicle body from said window openings through said one door opening and said suction duct; and passing one or more compressed air hoses progressively through said vehicle body from said window openings toward said one door opening while playing the air stream from said hoses on the interior surfaces, including the seat surfaces, in the general direction of flow of said current of air through said vehicle body thereby removing the dust and dirt particles from said interior surfaces and introducing the dust and light dirt particles into said current of air for removal thereby and driving the heavy dirt particles, paper litter, and the like along the vehicle floor toward and through said one door opening into said suction duct where it is acted upon by the air current passing therethrough and carried with the dust and light dirt particles to a point of discharge.

7. The method described in claim 6 wherein the compressed air hoses are passed through the vehicle body by an operator facing toward the portion of the vehicle containing said one door opening and playing the air stream from said hoses in a direction generally downstream of said flowing current of air whereby the operator is at all times enveloped by and located to breathe the clean, fresh air upstream from the dust and dirt ladened air.

8. The method defined in claim 7 wherein the current of air passing through said vehicle body is maintained sufficiently strong to carry the dust and light dirt particles through the vehicle body without any appreciable settlement thereof out of the air current yet is low enough to permit normal breathing of the operator and eliminate

any possibility of physical discomfort of the operator.

9. The method of cleaning the interior of housings or vehicle structures comprising the steps of closing the window, door and other openings in the structure except for a first opening extending to the floor level and a second opening remote from said first opening, connecting a large capacity suction creating means in substantially sealed engagement with the portion of said structure surrounding said first opening and operating it to create a relatively strong current of air moving through said structure from said second opening through said first opening to said suction means, moving at least one stream of compressed air progressively through said structure from said second opening toward said first opening while directing such air stream on the floor and interior surfaces of and within said structure in the general direction of flow of said current of air through said structure, thereby removing the dust and dirt particles from said interior surfaces and introducing the dust and light dirt particles into said current of air for removal thereby, and driving the heavy dirt particles, paper litter, and the like along the structure's floor with said air stream toward and through said first opening into said suction creating means where it is acted upon by said air current passing therethrough and carried with the dust and like dirt particles to a point of discharge.

10. The method of cleaning the interior of a bus, streetcar, railcar or like vehicle, comprising the steps of closing the windows and doors and other openings in the vehicle body except a door opening extending to the floor level at one end and a second opening adjacent the other end of said vehicle, providing a large capacity suction creating means in substantially sealed engagement with the door way surrounding the door opening of said vehicle and creating a relatively strong current of air through said vehicle flowing from said second opening through said door way to said suction creating means, moving at least one stream of compressed air progressively through said vehicle from said second opening toward said door way while directing such air stream on the floor and interior surfaces of and within said structure including seat surfaces, in the general direction of flow of said current of air through said vehicle body, so that dust and light dirt particles are removed from said interior surfaces and entrained in said current of air for removal thereby, and driving heavy dirt particles, paper litter, and the like along the vehicle floor with said air stream towards said door way and said suction creating means where it is acted upon by said air current passing therethrough and carried with the dust and like dirt particles to a point of discharge.

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