Sept. 20, 1971 C. L. HULTSTROM ET AL 3,606,420

FLUID TRACK SANDING APPARATUS

Filed Feb. 17, 1970 4 Sheets-Sheet 1

FIG. 1

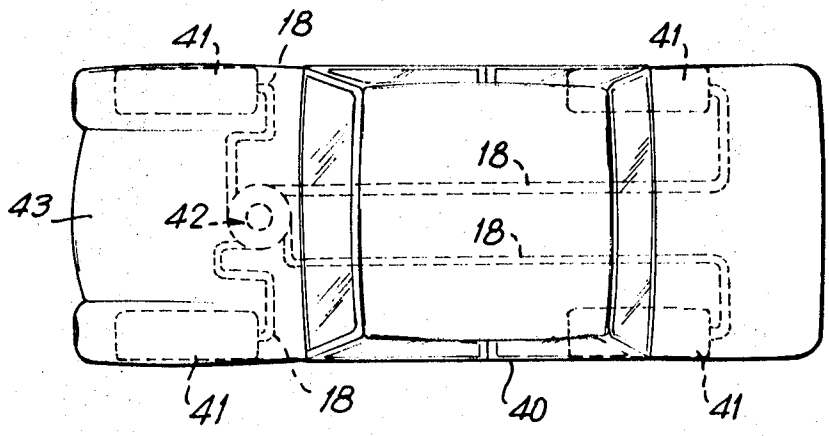
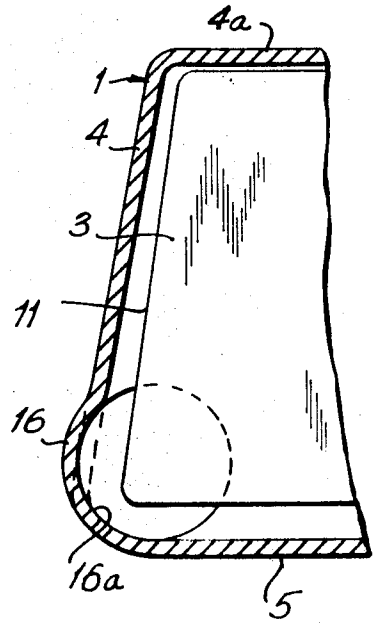


FIG. 4



FLUID TRACK SANDING APPARATUS

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FIG. 2

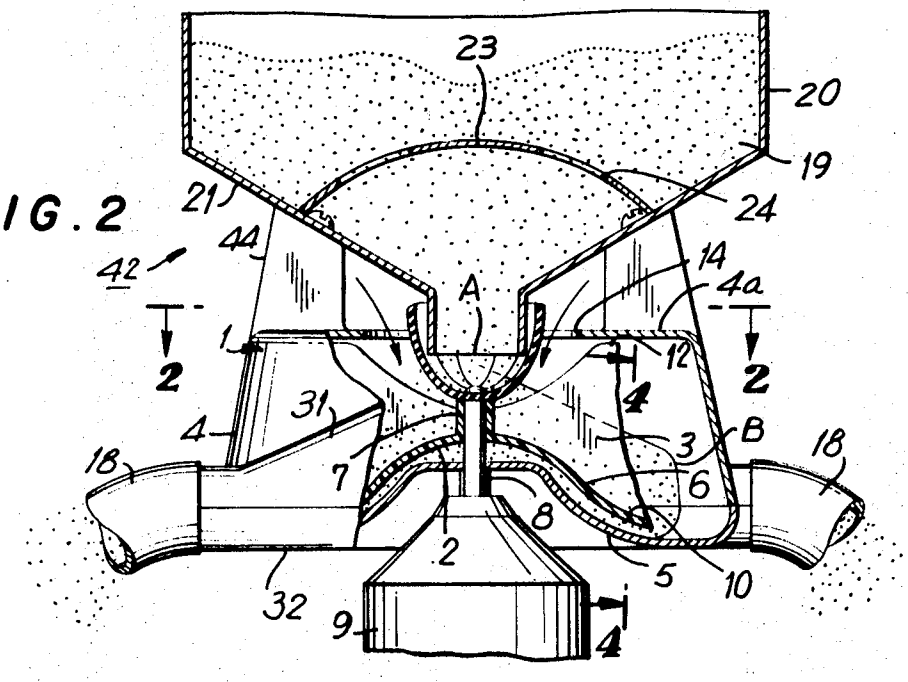


FIG. 3

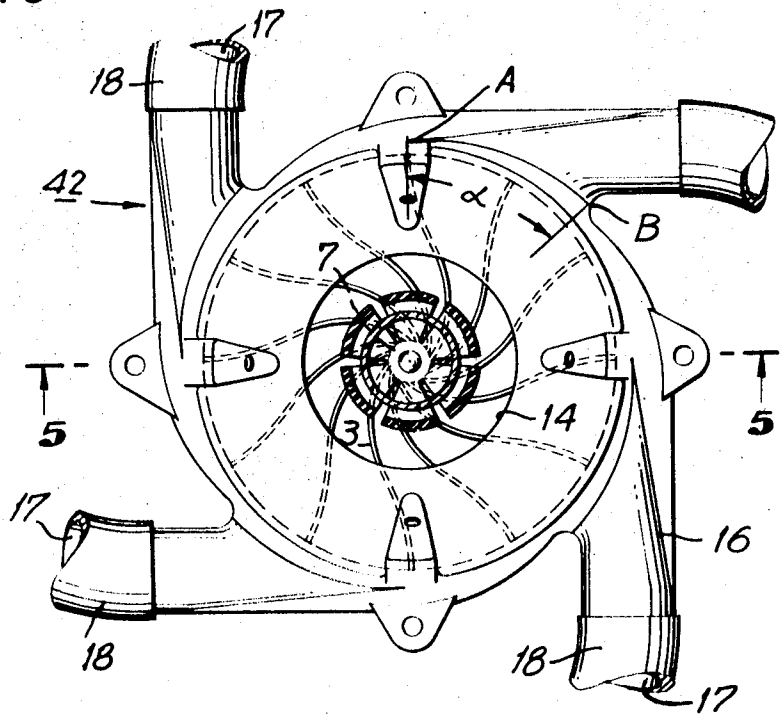


FIG. 5

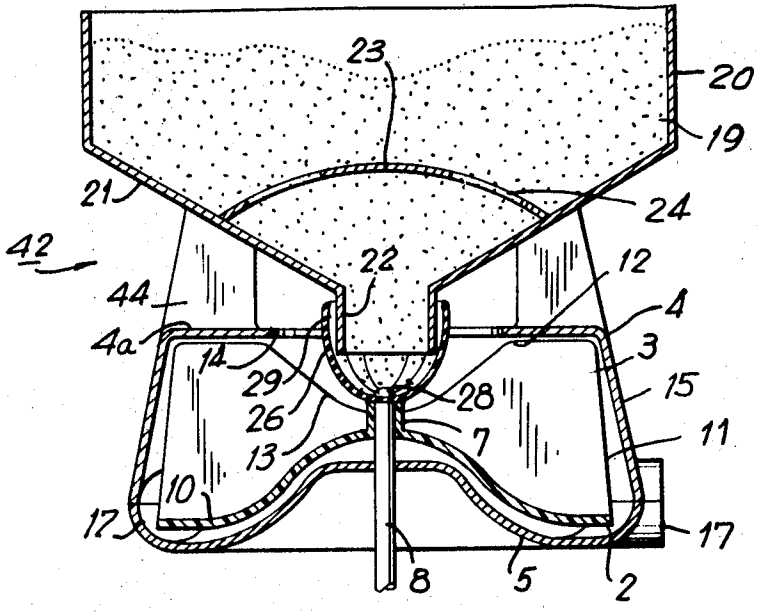


FIG. 7

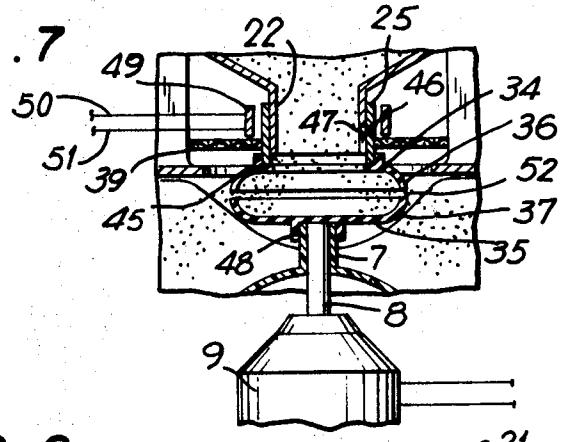


FIG. 6

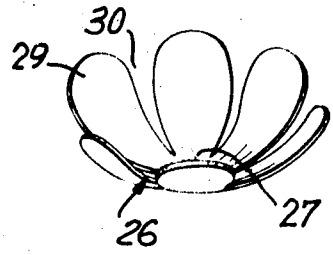


FIG. 8

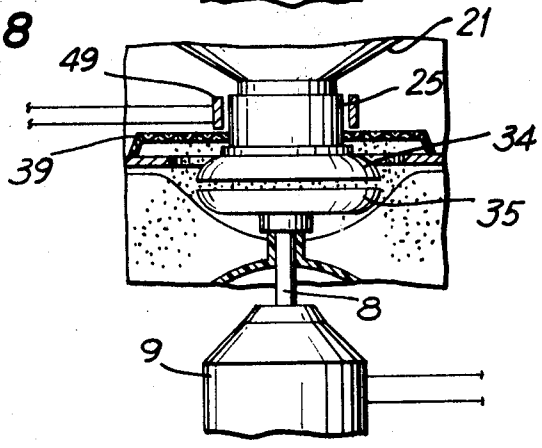
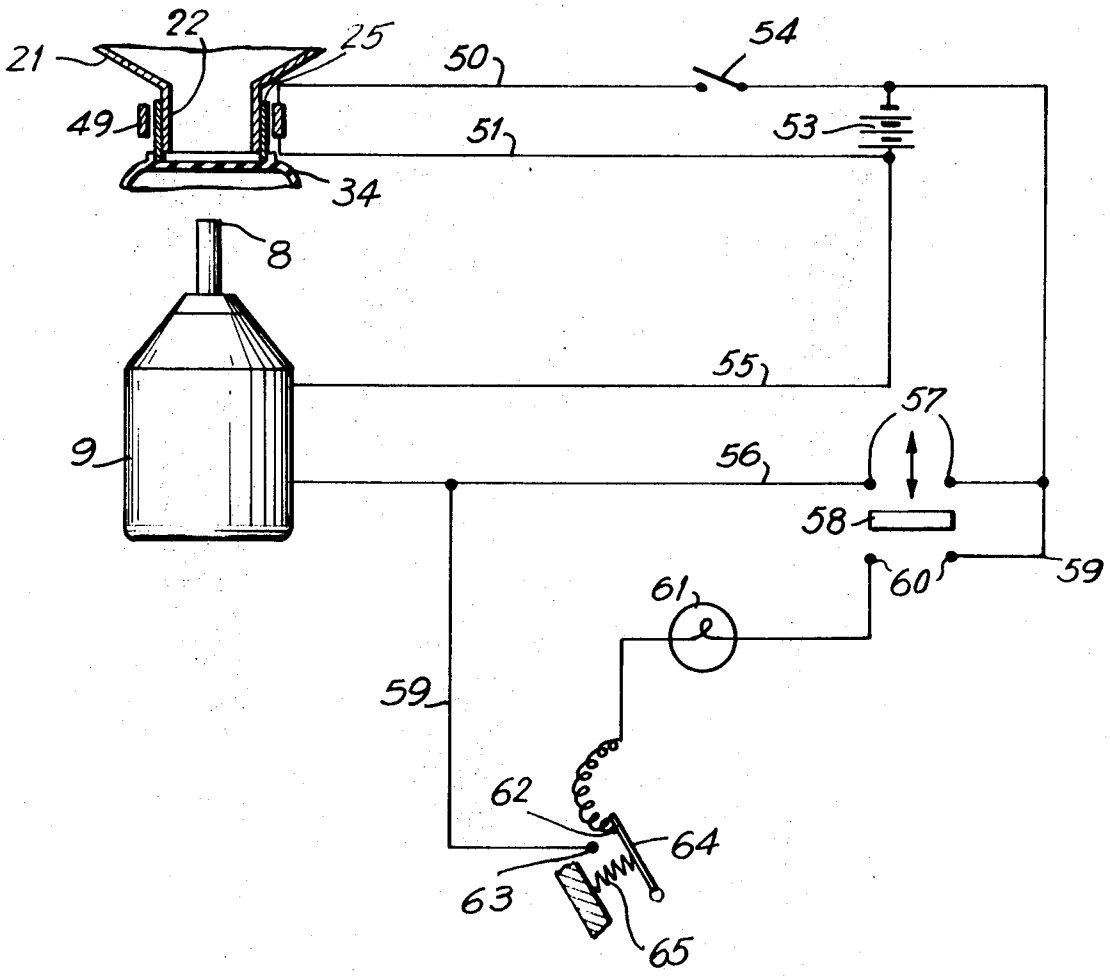


FIG. 9



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FLUID TRACK SANDING APPARATUS

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U.S. Cl. 291—3 11 Claims

ABSTRACT OF THE DISCLOSURE

This invention relates to apparatus for sanding the regions of a road or passage adjacent to the wheels of a vehicle to prevent skidding. Sand is conducted by gravity from a downwardly directed spout of a hopper to the air inlet of the casing of a centrifugal blower having a motor driven bladed rotatable member therein. A plurality of air outlets are distributed about the periphery of the casing. The sand is substantially uniformly divided between the air outlets and propelled by air under pressure through hose connections to the regions of the road or passage adjacent to the wheels of the vehicle, a separate hose connection being provided from each air outlet to a different one of the regions of the road or passage. In order to prevent sand moving by gravity from the hopper into the air inlet of the casing and filling the latter with sand before the motor is energized to drive the bladed rotatable member, a single valve structure is provided at the spout of the hopper. The valve structure is closed, when the rotatable member is stationary and is opened when the rotatable member is running.

BACKGROUND OF THE INVENTION

(1) Field of the invention

This invention relates to apparatus for sanding the regions of a road or passage adjacent to the wheels of a vehicle to prevent skidding.

(2) Description of the prior art

In known sanding apparatus for vehicles of the kind heretofore provided, an individual hopper for sand has been provided for each wheel. With this arrangement difficulties are encountered in delivering the same quantity of sand to the vicinity of each vehicle wheel. Movement of sand by gravity from each hopper is controlled by separate valve structure located either at the outlet spout of the hopper or at the outlet end of a hose connection leading to a region of the road or passage adjacent to one of the vehicle wheels. Sand often becomes clogged at one valve structure while moving freely past another valve structure. This is objectionable because sand is not distributed uniformly to all regions adjacent to the different vehicle wheels.

SUMMARY OF THE INVENTION

Our invention relates to improved apparatus for uniformly sanding the different regions of a road or passage adjacent to all of the wheels of a vehicle to prevent skidding.

We accomplish this by providing a single hopper for holding a body of sand from which sand is discharged by gravity through a downwardly directed spout into the air inlet of a centrifugal blower including a casing at the periphery of which a plurality of air outlets are provided. A motor driven bladed rotatable member is disposed within the casing. The sand is substantially uniformly divided between the air outlets and propelled by air under pressure through conduit or hose connections to the regions of the road or passage adjacent to the wheels of the vehicle, a separate conduit or hose connection being employed from each air outlet to a different one of the regions of the road or passage.

In order to prevent sand moving by gravity from the hopper into the air inlet of the casing and filling the latter with sand before the motor is energized to drive the rotatable member therein, a single valve structure is provided at the spout of the hopper which closes the spout when the rotatable member is stationary and automatically opens responsive to rotating movement imparted thereto by the motor.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing FIG. 1 more or less diagrammatically illustrates an automobile provided with sanding apparatus embodying our invention;

FIG. 2 is an elevational view, partly broken away and in section, of the sanding apparatus shown in FIG. 1;

FIG. 3 is a view taken at line 2—2 of FIG. 1;

FIG. 4 is a fragmentary sectional view taken at line 4—4 of FIG. 2;

FIG. 5 is a sectional view taken at line 5—5 of FIG. 3;

FIG. 6 is a perspective view of a part shown in FIGS. 2 and 5 which illustrates it in a different position;

FIG. 7 is a fragmentary sectional view of parts like those shown in FIGS. 2 and 5 illustrating another embodiment of the invention;

FIG. 8 is an elevational view, partly in section, of parts like those shown in FIG. 7; and

FIG. 9 is a diagrammatic illustration if an electrical system for controlling the sanding apparatus shown in FIGS. 7 and 8.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1 we have shown our invention in connection with an automobile **40** having front and rear wheels **41** to the vicinities of which sand is adapted to be propelled through conduits or hose connections **18** from sanding apparatus **42** which embodies our invention and desirably is mounted under the hood **43** of the automobile for reasons that will be explained hereinafter.

Referring to FIGS. 2, 3 and 5, the sanding apparatus **42** includes a centrifugal blower **1** comprising a casing **4** formed with a top air inlet opening **14** and a plurality of bottom air outlet ducts **16** equally spaced from one another about the periphery of the casing. An electric motor **9** is supported concentrically with respect to the casing **4** and beneath the latter in any suitable manner (not shown). The motor **9** is provided with a shaft **8** which extends upward within the casing **4** through an

opening in the bottom wall **5** thereof. A rotatable member **2**, which is secured to the shaft **8** by its hub **7**, has a plurality of curved blades or vanes **3** extending radially outward from the hub toward the vertical side wall **15** of the casing.

As seen in FIG. 3, the inner ends of the blades **3** are tangential to the peripheral surface of the hub **7**. Further, the outer portions of the blades **3** extend vertically downward from the top wall **4***a* of the casing **4** to the bottom wall **5** thereof. Also, the outer peripheral edges **11** of the blades **3** are more or less parallel to the vertical axis of the shaft **8**. The upper portions **12** of the blades **3** of the blower wheel **2** are in the radially outer portions straight and perpendicular to the shaft **7** of the blower wheel **2**.

The bottom edges of the blades or vanes **3** are curved and conform to the shape of the top convex side of a dished member or plate **6**. The bottom edges **10** of the blades **3** are fixed to the top convex side of the dished plates **6**, the peripheral edges **11** of the blades terminating at the periphery of the plate **6**. The radial inner portions **13** of the blades **3** decline towards the shaft **7** of the blower wheel **2** under the air inlet **14** to the blower. The rotatable member **2** can be formed of a suitable light weight material like plastic, for example, with the plate **6** and blades **3** integrally joined to one another.

The inner end of each duct **16** is in communication with the outer side wall **15** of the casing **4** through an angle α extending from point A to point B at the side wall **15**, as indicated in FIG. 3. The corresponding distance between points A and B also is indicated in FIG. 2. The side wall **15** of annular form slopes radially outward from the top **4***a* to the bottom **5** thereof. To promote flow of sand from the casing **4** and effect uniform distribution of the sand through the several outlet ducts **16** to the openings **17**, the outlet ducts, which are slightly curved and extend horizontally about the side wall **15**, have top walls **31** which slope downward from the points A to points B and bottom walls **32** which are more or less in the horizontal plane of the bottom wall **5** of the casing **4** at the periphery thereof.

With this construction of the blower **1** the sand discharged from the casing **4** is propelled downward by air under pressure at the inner ends of the outlet ducts **16** through successive portions thereof which become progressively wider by reason if the outward sloping side wall **15**. At the points B the air ducts **16** are substantially round, as indicated at **16***a* in FIG. 4, so that continued free flow of sand is promoted by air discharged at a high velocity from the casing through the air ducts **16** and conduits or hose connections **18** to the regions of a road or passage adjacent to the wheels of the vehicle **40**.

A hopper **20** adapted to hold a body **19** of sand is supported by upright angle members **44** on the top **4***a* of the casing **4**. The bottom **21** of the hopper **20** is of conical form and its lower end terminates in an outlet spout or discharge nozzle **22** which is disposed axially of the motor shaft **8** and projects downward below the air inlet **14**. Although not to be limited thereto, the diameter of the spout or nozzle **22** desirably is about one-half of the diameter of the air inlet **14**.

Within the conical bottom **21** of the hopper **20** we provide a dome-shaped member **23** having a top convex surface, such member being formed with a plurality of slots **24** at the outer peripheral portion thereof which radiate radially outward from the center of the member. This prevents the sand in the hopper **20** from building up a solid mass which completely bridges the lower part of the conical bottom **21**. The building up of such a solid mass of sand is objectionable because such a bridge of packed sand will not readily discharge from the hopper **20**.

In accordance with our invention, in order to prevent sand from flowing from the hopper **20** into the casing **4** and filling the latter with sand before the motor **9** starts to drive the rotatable member **2**, we provide a valve **26** at the spout or discharge nozzle **22** which closes the latter when the rotatable member **2** is stationary and automatically opens responsive to rotating movement imparted thereo by the motor **9** when the latter is energized.

The valve **26** comprises an open bowl-shaped member having its bottom **27** fixed at **28**, as by a screw, to the upper end of the motor shaft **8**. The bowl-shaped member is formed of an elastomeric material and has a plurality of leaves or sections **29** that are upright and abut one another and are disposed about and hug the outlet nozzle or spout **22** of the hopper **20** when the motor shaft **8** is stationary. This position of the leaves **29** of the bowl-shaped member **26** is shown in FIGS. 2 and 5. Under these conditions sand cannot flow from the outlet nozzle or spout **22** into the casing **4** of the air blower **1** when the motor **9** is not functioning to drive the rotatable member **2**.

When the motor **9** is connected to a source of electrical energy and rotating movement is imparted to the bowl-shaped member **26**, the leaves **29** will be subjected to centrifugal force and move from the positions shown in FIGS. 2 and 5 to the positions shown in FIG. 6. In FIG. 6 the leaves 29 are separated from one another by gaps **30**. Moreover, leaves **29** no longer will be in intimate physical contact with the outlet nozzle **22**, so that sand can flow by gravity from the hopper **20** into the casing when the blower wheel **2** is being driven by the motor shaft **8**. To promote movement of the leaves **29** of the valve **26** from their upright positions in FIGS. 2 and 5 to their spread apart positions in FIG. 6, the center portion of the valve, at the region it is fixed at **28** to the shaft **8**, may be more resilient than portions of the leaves **29** more removed from the center portion.

By employing a relatively great number of blades or vanes **3** on the rotatable member **2** the latter literally grinds the sand introduced into the casing from the hopper **20**. In this way any lumps in the sand are readily broken up to insure a uniform distribution of sand at the outlet ducts **16** and free movement therefrom through the hose connections **18** to all regions of the road or passage adjacent to the wheels **41** of the vehicle **40**.

In FIGS. 7 and 8 we have shown another embodiment of our invention in which a single valve structure **34**, **35** is provided for controlling the flow of sand from the hopper **20** into the casing **4**. The valve structure in FIGS. 7 and 8 comprises a pair of disks or diaphragms **34** and **35** formed of elastomeric material like rubber, for example, the diaphragms being dish-shaped and having outer peripheral edge portions **36** and **37** which are rounded or curved and extend toward one another.

The top diaphragm **34** is formed with an opening **38** and fixed at **45** to the lower edge of a hollow sleeve **25** which is disposed about the spout **22** and vertically movable thereon. The bottom diaphragm **35** is imperforate and fixed at **48** to the upper end of the motor shaft **8**. An electromagnet **49**, which is disposed about the hollow sleeve **25**, is connected by conductors **50** and **51** to a source of electrical energy in a manner that will be explained presently. When the electromagnet **49** is energized the hollow sleeve **25** and top diaphragm **34** are raised to their positions shown in FIGS. 7 and 8 to provide a vertical gap **52** between the peripheral edge portions **36** and **37** of the diaphragms **34** and **35**. When the electromagnet **49** is deenergized the hollow sleeve **25** and top diaphragm **34** move downward by gravity with the peripheral edge of the diaphragm **34** coming in intimate physical contact with the peripheral edge of the bottom diaphragm **35**.

When the top diaphragm **34** is in its raised position shown in FIGS. 7 and 8 and rotating movement is imparted to the bottom diaphragm **35** by the motor shaft **8**, sand can freely flow from the hopper **20** through the spout **22** onto the bottom diaphragm **35** from which the sand is thrown into the casing **4** by centrifugal force. In order

to prevent sand from blowing out of the casing **4** at the air inlet **14** under these conditions, a strainer **39**, which is disposed about the sleeve **25**, is provided at the air inlet **14**.

When the top diaphragm **34** is in its lower position and in physical contact with the bottom diaphragm **35** and the latter is stationary, the diaphragms **34** and **35** cooperate with one another to provide a single valve structure which functions to stop flow of sand from the hopper **20** into the casing. Under these conditions the sand introduced into the space formed within the diaphragms simply packs therein and blocks the continued flow of sand through the spout **22**.

In FIG. 9 we have diagrammatically illustrated the electromagnet **49** connected by conductors **50** and **51** to a source of electrical energy, such as, for example, the battery **53** of the vehicle **40**. A hand operated switch **54** is connected in the conductor **50**. The electric motor **9** is connected by conductors **55** and **56** to the battery **53**, the conductor **56** having contacts **57** adapted to be closed by a manually movable bar **58**. The electric motor **9** also is connected to the battery **53** by a parallel circuit including conductors **55** and **59**, the conductor **59** having contacts **60** adapted to be closed by the manually movable bar **58**. Further, the conductor **59** also includes a brake lamp **61** and contacts **62** and **63** associated with a brake pedal **64**, the contacts **62** and **63** closing when the pedal is depressed against the upward biasing action of a spring **65** to apply the brakes of the vehicle **40**.

When the vehicle **40** is being driven on a road or passage having slippery conditions caused by ice, for example, the driver closes the switch **54** which energizes the electromagnet **49**, thereby raising the sleeve **25** and top diaphragm **34** to permit sand to flow from the hopper **20** to the bottom diaphragm **35**. The driver then actuates the bar **58** to close the contacts **60**. Thereafter, the electric motor **9** will be energized automatically each time the driver depresses the brake pedal **64** which applies the vehicle brakes and at the same time closes the contacts **62** and **63**. Therefore, when driving the vehicle **40** under icy road conditions the motor **9** will be energized and drive the bottom diaphragm **35** each time the brake pedal **64** is depressed, whereby sand will be thrown from the bottom diaphragm **34** into the casing **4** by centrifugal force when the vehicle brakes are applied. The blower **1** can be of a type which operates at a speed of about 3500 r.p.m. and can reach this speed very quickly so that sand will be effectively propelled by the blower **1** through the hose connections **18** to the vicinities of the wheels **41** when it is needed.

When starting the vehicle **40** under icy road conditions or driving uphill at such a time, the bar **58** can be actuated to close the contacts **57** to complete a circuit for the motor without the need to operate the brake pedal **64**.

It is desirable to fill the hopper with sand that is free of foreign matter like stones, for example. By locating the sanding apparatus **41** under the hood **43**, as diagrammatically illustrated in FIG. 1, heat radiated from the engine of the vehicle **40** can be effectively used to keep the sand dry and free from moisture.

We claim:

1. Apparatus for sanding the regions of a road adjacent to the wheels of a vehicle to prevent skidding comprising

(a) a centrifugal blower including a casing formed with a top air inlet and a plurality of air outlets distributed about the periphery thereof,

(b) a rotatable shaft projecting upward within said casing from the bottom thereof,

(c) a bladed member mounted for rotation on said shaft within said casing,

(d) means for driving said shaft,

(e) a hopper above said casing adapted to hold a body of sand, said hopper having a discharge nozzle which is directed downward therefrom for conducting sand to the air inlet of said casing,

(f) conduit means conducting sand from each of the air outlets to the region of the road or passage adjacent to a different one of the wheels of the vehicle, and

(g) a single valve means controlling the movement of sand from the discharge nozzle of said hopper to the air inlet of said casing,

(h) said casing and said bladed rotatable member being so constructed and formed that the sand is substantially uniformly divided between the air outlets and propelled by the air through said conduit means to all of the regions adjacent to the wheels of the vehicle.

2. Apparatus as set forth in claim **1** in which said hopper is positioned under the hood of the vehicle.

3. Apparatus as set forth in claim **1** in which said single valve means comprises a part which is fixed to the upper end of said shaft and rotatable therewith, said part when rotating movement is imparted thereto functioning to receive sand from said discharge nozzle and throw such sand radially outward therefrom into said casing by centrifugal force.

4. Apparatus as set forth in claim **3** in which said valve means part comprises an open bowl-shaped member having its bottom fixed to the extreme upper end of said shaft, said member being formed of elastomeric material and having a plurality of upright sections or leaves which abut one another and are disposed about and hug said discharge nozzle when said shaft is stationary, said leaves being subjected to centrifugal force when rotating movement is imparted to said member by said shaft, whereby said leaves are separated from one another and move out of physical contact with said discharge nozzle.

5. Apparatus as set forth in claim **4** in which said member is of greater resiliency at the region it is fixed to said shaft than at portions of said leaves radially removed from said region.

6. Apparatus as set forth in claim **1** in which said single valve means comprises top and bottom disks, said bottom disk being fixed to the upper end of said shaft and rotatable therewith, said top disk having an opening, a hollow sleeve disposed about and vertically movable on said discharge nozzle, means connecting the lower end of said sleeve to said top disk at the opening therein, said valve means stopping flow of sand from said discharge nozzle when said top disk is in a first lower position and coacts with said bottom disk and enabling sand to flow from said discharge nozzle onto said bottom disk when said top disk is vertically removed from said bottom disk and in a second upper position, and, when said top disk is in its second upper position, said bottom disk functioning to throw sand radially outward therefrom by centrifugal force when rotating movement is imparted thereto by said shaft.

7. Apparatus as set forth in claim **6** in which said top and bottom disks are formed of elastomeric material.

8. Apparatus as set forth in claim **6** in which the peripheral edge portions of said top and bottom disks are curved and rounded and extend toward one another, said peripheral edge portions physically contacting one another when said top disk is in its first lower position.

9. Apparatus as set forth in claim **6** which includes a strainer disposed about said hollow sleeve and overlying the top of said casing at said air inlet.

10. Apparatus as set forth in claim **6** including means operable to raise said hollow sleeve on said discharge nozzle and move said top disk to its second upper position, said means for driving said shaft comprising an electric motor, an electrical circuit for connecting said motor to a source of electrical energy, said circuit including first and second branches connected in parallel, each of said branches having a switch and a common actu-

ating member therefor, said actuating member being movable from a first "off" position to "second" and "third" positions for respectively closing the switches in said first and second branches, said first branch completing a circuit for said motor to the source of electrical energy when said actuating member is moved from its first "off" position to its "second" position, a brake pedal for the vehicle which is movable between an upper "off" position and a depressed "on" position, said second branch including a pair of cooperating contacts operatively associated with said brake pedal and completing a circuit for said motor to the source of electrical energy when said actuating member is moved from its "off" position to its "third" position and said brake pedal is depressed.

11. Apparatus as set forth in claim **10** in which said scond branch of said circuit includes a brake lamp.

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U.S. Cl. X.R.

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