Feb. 6, 1962 T. MAKINSON 3,020,071

SAND TRAP FOR VEHICLES

Filed Jan. 27, 1960 3 Sheets-Sheet 1

FIG. 1.

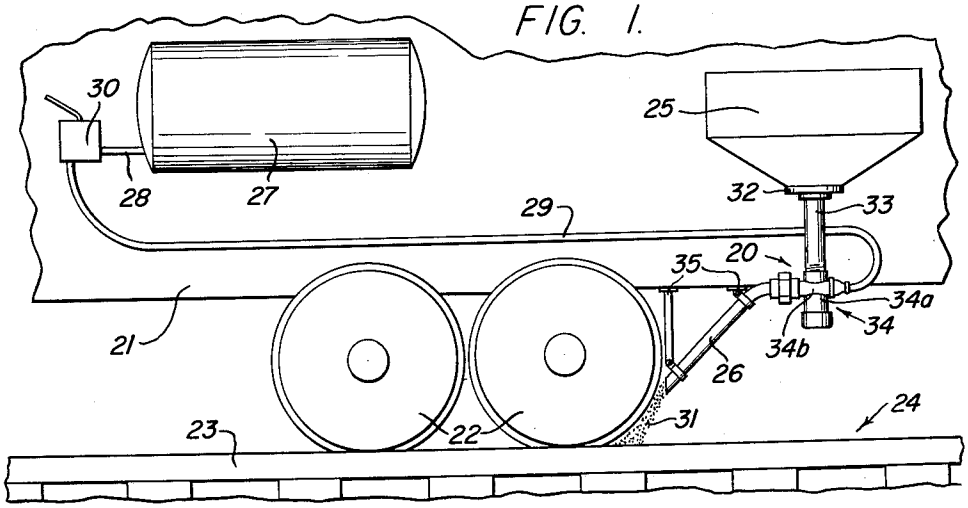
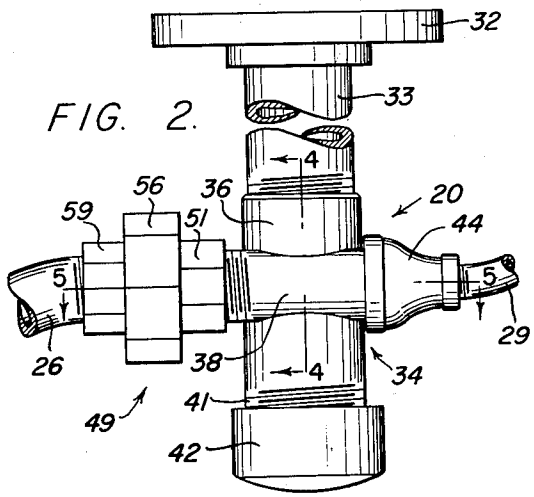


FIG. 2.



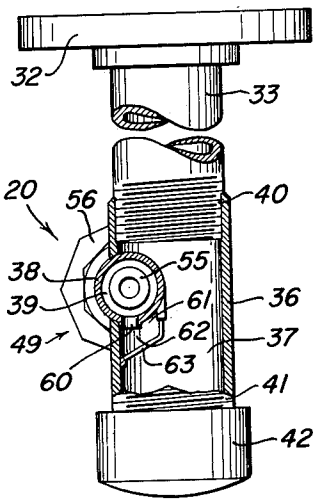


FIG. 4.

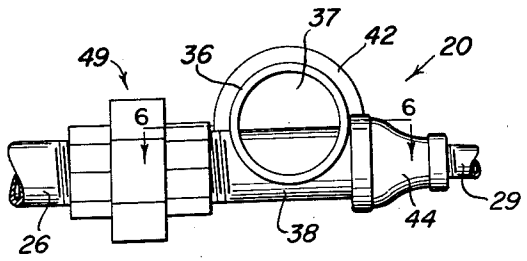


FIG. 3.

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Feb. 6, 1962 T. MAKINSON 3,020,071

SAND TRAP FOR VEHICLES

Filed Jan. 27, 1960 3 Sheets-Sheet 2

FIG. 5.

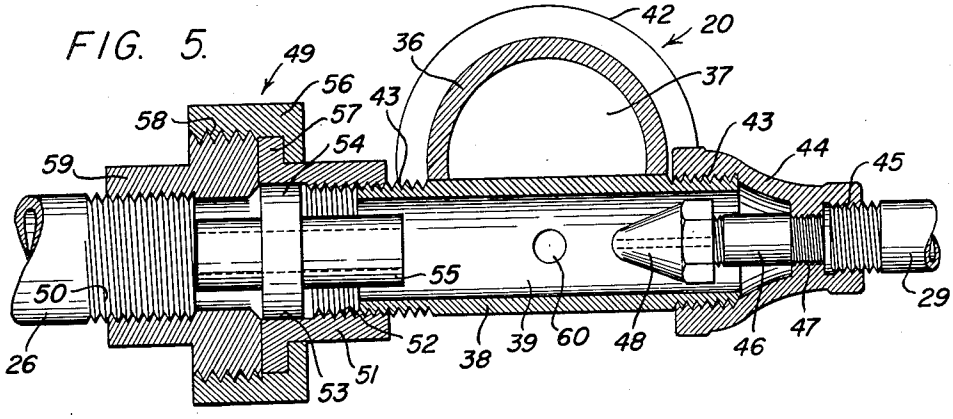


FIG. 6.

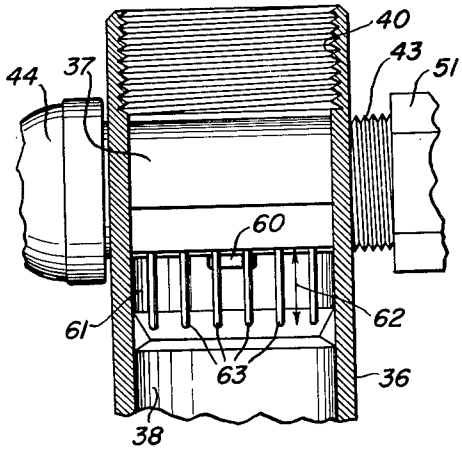
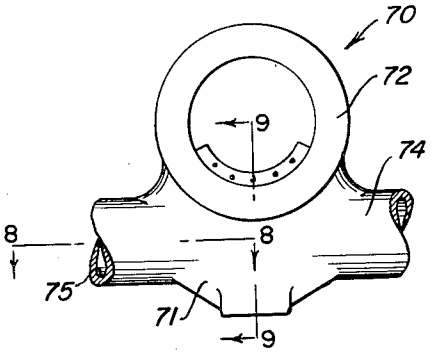


FIG. 7.



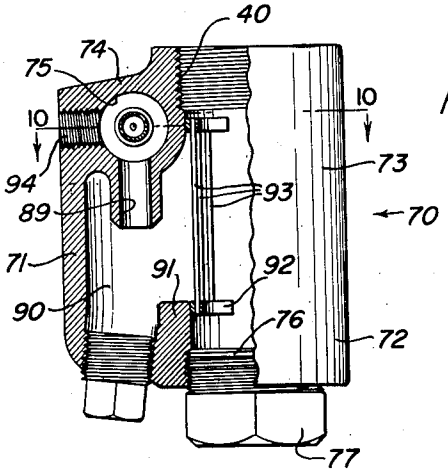


FIG. 9.

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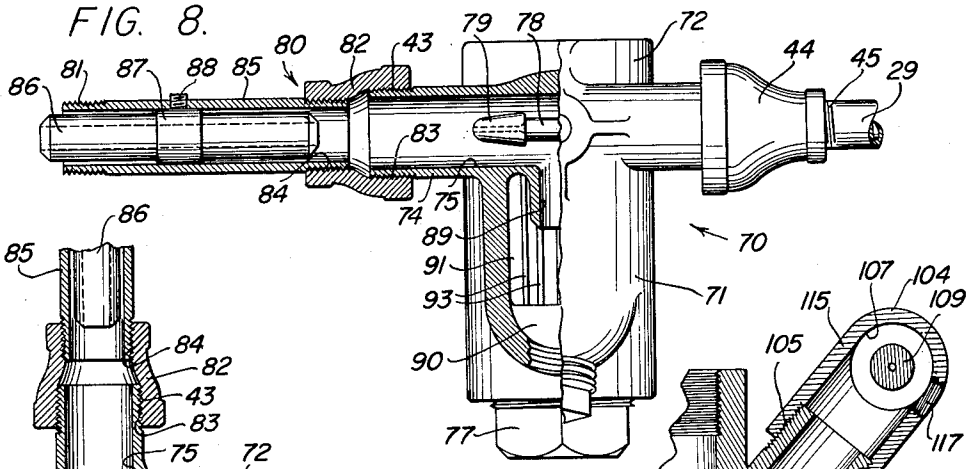
Feb. 6, 1962 T. MAKINSON 3,020,071

SAND TRAP FOR VEHICLES

Filed Jan. 27, 1960 3 Sheets-Sheet 3

FIG. 8.



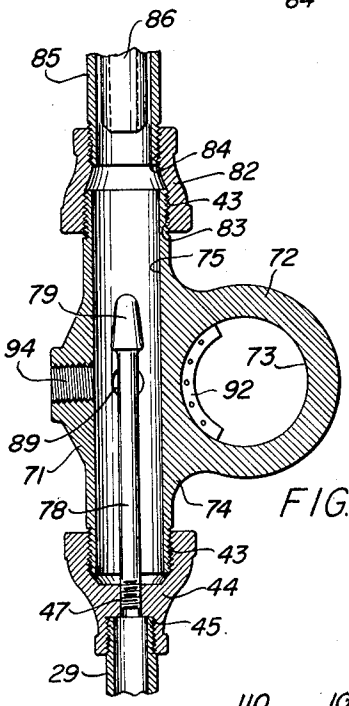


FIG. 10.

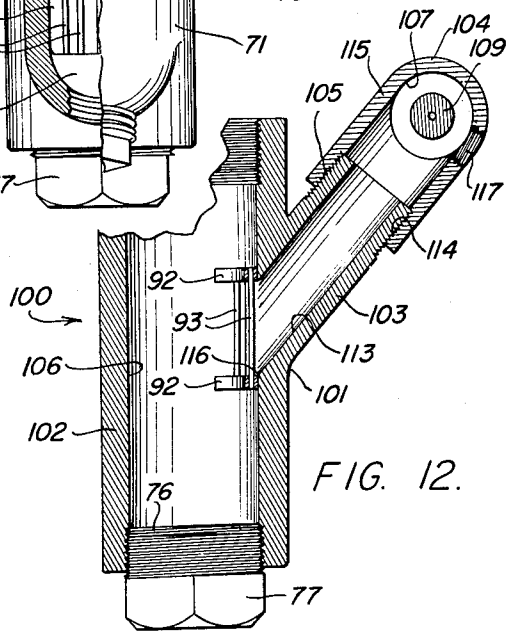


FIG. 12.

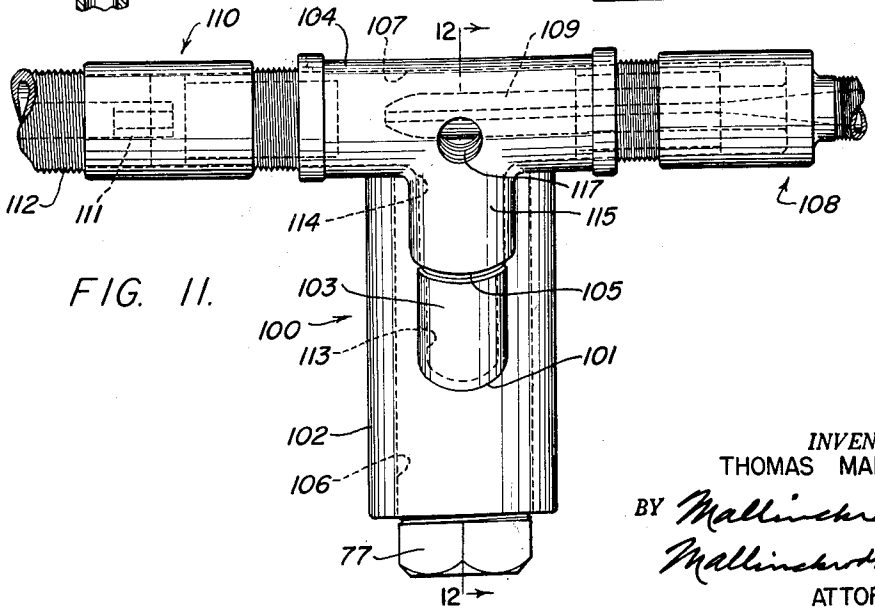


FIG. 11.

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SAND TRAP FOR VEHICLES

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4 Claims. (Cl. 291—11)

This invention relates to apparatus for increasing vehicle drive wheel traction by sanding, and is particularly directed to sand traps which provide for controlled feeding of sand from a storage bin to a pipe for delivery under the drive wheels of locomotives.

Sand traps of this type have been constructed to aspirate sand from the bottom of supply column which is in gravity flow communication with the sand storage bin. Aspiration is effected by a jet of air supplied from the compressed air system with which a locomotive is normally equipped and involves lifting sand from the bottom of the supply column through an induction passage leading into the jet. The jet is formed by passing the air through a jet passage leading into the delivery pipe.

Although these sand traps have long been used by railroads, certain operational problems have persisted through the years. For example, there has been a strong tendency for damp sand to stick in the sand supply passage and prevent normal descent of the supply column. Also, stoppages by small rocks, cigarette butts, rag fragments, and other foreign matter have been common. In instances where these sand traps have been equipped with vents, stoppages have frequently occurred by reason of the sand becoming oil soaked by oil-laden air drawn through the vents. Stoppages have been very difficult to overcome due to the narrow and devious nature of the sand supply passage in which the supply column of sand is maintained. As a consequence, only well screened sand of fine texture is normally acceptable for use.

It is, therefore, a principal object of this invention to provide sand traps which are easy to clean and service and which are substantially free from stoppage.

A feature in the accomplishment of this object is the provision of a substantially rectilinear sand-supply passage advantageously arranged with respect to the sand induction and air jet passages for cleaning purposes and having a lower end portion extending below the entrance to the sand induction passage and closed by an easily removable and replaceable member as a trap. Accordingly, wet or oil-soaked sand may be easily dislodged from any part of the passage. Pebbles and other foreign matter settle in the trap portion of the passage, where they are effectively out of the way of the inductive movement of the sand and can be easily removed when they accumulate.

Heretofore, such foreign matter has been collected at the bottom of the induction passage where undesirable aspiration or partial aspiration along with the sand has been possible.

An additional feature is the provision of a foreign matter rejecting grill guarding entrance to the sand induction passage at the opening thereof into the sand supply passage. This aids gravitation of foreign matter into the trap space.

A further object is to provide a sand trap which is relatively free from wear and erosion by sand blasting effects.

A feature of the invention for accomplishing this last object is the provision of a simple tube, generally of hardened metal, arranged to absorb most of the sand blast effect with a minimum of wear and to act as a choke for more efficient operation of the unit in the way of lower air pressure and sand economy. This tube is interchangeably mounted in a sand blast retarder assembly for easy replacement when excessively worn.

Another object is to provide for sand trap venting without introducing into the sand supply droplets of water or oil which mat the sand and tend to clog the unit.

This is accomplished by venting directly to the jet barrel chamber, i.e. air jet passage, instead of to and through the sand supply passage.

Several embodiments of the invention representing what are presently regarded as the best modes of carrying out the invention are illustrated in the accompanying drawings.

In the drawings:

FIG. 1 represents a fragmentary side elevation of a railroad locomotive equipped with the sand trap of the invention along with a conventional sand bin, schematic representation of certain air supply components, and a sand delivery pipe;

FIG. 2, a side elevation of the sand trap, together wtih the feed nipple and mounting flange;

FIG. 3, a top plan view of the sand trap of FIG. 2 with the feed nipple and mounting flange removed;

FIG. 4, a transverse view in side elevation and partly in vertical section taken on the line 4—4 of FIG. 2;

FIG. 5, a horizontal section taken on the line 5—5 of FIG. 2 and drawn to a larger scale;

FIG. 6, a fragmentary vertical section taken on the line 6—6 of FIG. 3;

FIG. 7, a top plan view of another embodiment of the invention;

FIG. 8, a side elevation partially in vertical section taken on the line 8—8 of FIG. 7;

FIG. 9, a transverse view in side elevation and partly in section taken on the line 9—9 of FIG. 7;

FIG. 10, a horizontal section taken on the line 10—10 of FIG. 9;

FIG. 11, a view corresponding in general to that of FIG. 2 but illustrating another embodiment of the invention; and

FIG. 12, a transverse view in side elevation and partly in vertical section taken on the line 12—12 of FIG. 11.

Referring to the drawings:

A sand trap **20** embodying important features of the invention is shown in FIG. 1 mounted on a railroad diesel locomotive **21** having drive wheels **22** adapted for rolling along rails **23** of a railroad track **24**.

Sand trap **20** receives sand in conventional manner from a bin **25** and discharges sand onto a rail **23** by way of a conventional sand delivery pipe **26**. A compressed air system, including an air pressure tank **27**, airlines **28** and **29**, and an air control valve **30**, supplies pressure air under control from the cab for aspirating sand into delivery pipe **26**. The sand passes therefrom in the form of a stream **31** onto a rail **23** beneath a drive wheel **22**.

Sand trap **20** is conveniently mounted below and in gravity flow communication with sand bin **25** by means of a flange **32** and a nipple **33**. Such trap **20** comprises a body **34**, having a sand supply portion **34***a*, FIG. 1, which receives sand from bin **25** and a jet barrel portion **34***b* adapted for connection with air line **29** at one of its ends and with the sand delivery pipe **26** at its other end.

Brackets **35** mounting sand delivery pipe **26** are advantageously adjustable to provide for effective application of the sand in all instances.

Referring particularly to FIGS. 2 through 6, the sand trap body **34** is made up in this instance of a length of pipe **36**, which provides a rectilinear, sand supply passage **37** extending through the body **34** from top to bottom thereof, and a length of pipe **38** welded in place in and transversely of pipe **36** and offset laterally from the longitudinal axis thereof. Pipe **38** forms jet barrel **34***b* and provides an air jet passage **39** extending through body **34** from side to side thereof and offset laterally from the longitudinal axis of sand supply passage **37**.

Pipe **36** is provided with internal threads **40** at its top for connection with nipple **33**. External threads **41** are

provided at the lower end of pipe 36 for securing a threaded pipe cap 42 thereto, which serves as a removable bottom for the sand supply passage 37.

Even though jet barrel 38 passes through part of sand supply passage 37, there is plenty of room to afford direct clean-out access by tools throughout the length of such sand supply passage, which is very important if and when clogging of such passage does occur.

Jet barrel 38 has threads 43 at both ends thereof so that a coupling member 44 may be connected at either end, as desired. Air supply line 29 is attached to coupling member 44 by threads 45. Coupling member 44 also mounts, by means of threads 47, FIG. 5, an air jet nozzle 46 having a nozzle head 48 projecting into air jet passage 39.

Threads 43, on the end of jet barrel 38 opposite that to which coupling member 44 is attached, provide for connecting the barrel to sand blast retarder assembly 49, which, in turn, is adapted for connection with sand delivery pipe 26 by threads 50.

Referring particularly to FIG. 5, sand blast retarder assembly 49 includes, a member 51 with internal threads 52 for engaging threads 43 and having a bore 53. An annular ring 54 is fitted in bore 53 and mounts hardened metal sand blast retarder tube 55, as by a press fit therethrough, to permit longitudinal adjustment of the tube. Coupling member 56 advantageously cooperates with flange 57 of member 51 and through threads 58 with an additional coupling member 59 equipped with the threads 50. This provides the completed sand blast retarder assembly 49 and structure adapted for connection of the jet barrel 38 to the sand delivery pipe 26.

Sand trap 20 is provided with an induction passage structure for upward inductive drawing of sand from sand supply passage 37. This includes an upwardly extending induction passage section 60 terminating in air jet passage 39, an entry-way 61, and an entry-way opening 62. The cross-sectional area of entry-way opening 62 is greater than the cross-sectional area of passage section 60 in order that sand inductive forces and fluid velocities will be less through opening 62 than such forces and velocities up through passage section 60. It should be noted that air jet nozzle 46 is located in the air jet passage 39 between the air supply end of jet barrel 38 and the intersection of induction passage section 60 therewith. In other embodiments hereinafter described, which are equipped with air vents to the air jet passage, the air jet nozzle is located in the air jet passage between the intersection of the inductor passage therewith and the end of the jet barrel adapted for connection with the sand delivery pipe. This would also apply to the embodiment of FIGS. 2 through 6 were it equipped with such an air vent.

Sand blast retarder tube 55 is adjustable longitudinally relative to the jet barrel 38 for positioning thereof to obtain optimum absorption of sand blast effect and to minimize wear of other parts. Longitudinal adjustment of tube 55 may also be employed to adjust the choke effect of the tube for efficient operation of the unit with lower air pressures and for improved sand economy. The choke effect of the sand blast retarder actually extends the useable range of air pressures effective for sanding. This is so because the choke effect of tube 55 gives rise to rapidly increasing turbulence with increased air supply pressures. As a result, the rate of throughflow in the jet barrel and the rate of sanding is held back from increasing, as would otherwise be the case corresponding to increased air supply pressures. Such choke-stabilized rates of air throughflow and rates of sanding and inductive flow of sand and air from sand supply passage 37 are well within acceptable rates throughout the range of air supply pressures useable. Sand traps conforming to the invention will work efficiently on air supply pressures of 90 pounds per square inch and even as low as 70 pounds per square inch and will also work quite well with air supply pressures of 120 pounds per square inch and even as high as 145 pounds per square inch. To my knowledge this cannot be said for any other sand trap.

A foreign matter rejecting grill, advantageously made up of mutually spaced and partially upright bars 63 mounted to extend up and down across entry-way opening 62, guards against induction passage of small rocks, cigarette butts, and rag fragments to jet air passage 39. Jet barrel 38 is located high enough in sand trap body 34 so that, even with the induction passage structure thereunder, induction passage entry-way opening 62 is disposed at a sufficiently high level in sand supply passage 37 to leave trap space of considerable volume in the lower portion thereof above the removable bottom provided by pipe cap 42.

In the embodiment of FIGS. 7 through 10 sand trap 70 has a molded body 71 which includes a main body portion 72 having a rectilinear, tubular, sand supply passage 73 extending therethrough from top to bottom thereof and a jet barrel 74 integrally molded therewith extending transversely thereof having an air jet passage 75 extending therethrough from side to side of the body 71. Main body portion 72, just as with main pipe portion 36 of the previously described embodiment, is provided with internal threads 40 at the top for connection with nipple 33 and sand bin 25 for gravity flow of sand into sand supply passage 73. Internal threads 76 are provided at the bottom of main body portion 72 for threaded plug 77 which provides a removable bottom for the sand supply passage 73.

In this embodiment, jet barrel 74 and air jet passage 75 are offset laterally from the longitudinal axis of the sand supply passage 73 to be completely clear of passage 73.

Jet barrel 74 is adapted by threads 43 at both ends thereof for connection at either end, as desired, with coupling member 44 and thereby with air supply line 29, which is held by cooperating threads 45 at the other end of coupling member 44. An air jet nozzle 78 is mounted by threads 47 in coupling member 44 with the nozzle head 79 projecting into air jet passage 75.

Threads 43, on the opposite end of jet barrel 74 from coupling member 44, provide means for connection of the barrel to sand blast retarder assembly 80 which, in turn, is adapted for connection with sand delivery pipe 26 by threads 81.

Referring particularly to FIG. 8, sand blast retarder assembly 80 includes a member 82, having internal threads 83 and 84 adapted for coupling tube 85 to the jet barrel 74. Tube 85 is adapted for interchangeable and longitudinally adjustable mounting therein of sand blast retarder tube 86 by annular ring 87 and set screw 88. Sand blast retarder tubes in any of these embodiments may be advantageously hardened metal tubes or tubes of other material having good sand blast wearing properties.

Sand trap 70 is provided with an inductive passage structure including upwardly extending passage section 89, which terminates in air jet passage 75, entry-way 90 and entry-way opening 91. Opening 91 is advantageously greater in cross-sectional area than passage section 89 in order that sand inductive drawing forces and fluid velocities will be less through opening 91 than up through passage section 89.

A foreign matter rejecting grill 92, having upright bars 93 which extend up and down across entry-way opening 91, guards against induction passage of rocks, cigarette butts, rag fragments, and other foreign matter to jet air passage 75. Entry-way opening 91 is sufficiently high in sand supply passage 73 to leave trap space of considerable volume in the lower portion thereof above the removable bottom provided by plug 77. Foreign matter held back from passage to air jet passage 75 by grill 92 tends to gravitate down from the upright bars 93 to the trap space for subsequent removal during servicing.

This embodiment employs a jet barrel vent 94 from the outside thereof to air jet passage 75. In view thereof, air jet nozzle 78 is extended for locating the outlet of nozzle head 79 in air jet passage 75 between the intersection of the inductor passage section 89 with the air jet passage 75 and that end of the jet barrel 74 which is connected to the sand delivery tube 85. If this embodiment were altered by not having vent 94 or if the vent 94 were plugged, the outlet of nozzle head 79 would be located in air jet passage 75 between the air supply end of jet barrel 74 and the intersection of the inductor passage section 89 with the passage 75.

In the sand trap 100 embodiment of FIGS. 11 and 12 the sand trap body 101 includes a main body portion 102, having an upwardly and outwardly extended induction passage extension 103 integrally molded therewith or welded thereon. Body 101 also includes a jet barrel portion 104 in the form of a plumbing T mounted on the upper end of extension 103 by cooperating threads 105. Main body portion 102 has a rectilinear tubular, sand supply passage 106 extending therethrough from top to bottom thereof and jet barrel 104 has an air jet passage 107 extending therethrough from side to side of the body 101. Main body portion 102, just as with the other embodiments, is provided with internal threads 40 at the top for connection with nipple 33 and sand bin 25 for gravity flow of sand into sand supply passage 106. Internal threads 76 are provided at the bottom of main body portion 102 for threaded plug 77 which provides a removable bottom for the sand supply passage 106.

With the mounting of the jet barrel body portion 104 on the upper end of extension 103 air jet passage 107 is offset laterally from the longitudinal axis of the sand supply passage 106. The passage 106 is thereby left substantially free from obstruction and open for direct clean-out access by tools throughout the length thereof when threaded plug 77 is removed.

Jet barrel 104 is adapted by internal threading at both ends thereof for connection at either end, as desired, with coupling assembly 108 and thereby with air supply line 29. An air jet nozzle 109 is mounted by coupling assembly 108 to extend therefrom into air jet passage 107.

The jet barrel 104 is connected, at the opposite end of the barrel from coupling assembly 108, to a sand blast retarder assembly 110, which also serves as a connection with sand delivery pipe 26. Referring particularly to FIG. 11, a sand blast retarder tube 111 is mounted for longitudinal adjustment in and/or with threaded element 112 of sand blast retarder assembly 110.

The inductive passage structure of this embodiment includes passage section 113 in body extension 103 and passage section 114 in the T stem 115 of jet barrel portion 104 which terminates in air jet passage 107. Entry-way opening 116 of passage section 113 at the sand supply passage 106 is advantageously greater in cross-sectional area than passage section 89 in order that sand inductive drawing forces and fluid velocities will be less through the opening 116 than up through passage section 113. A foreign matter rejecting grill 92 having upright bars 93, which extend up and down across entry-way opening 116, guards against induction passage of rocks, cigarette butts, rag fragments and other foreign matter to jet air passage 107. Entry-way opening 116 is sufficiently high in sand supply passage 106 as to leave trap space of considerable volume in the lower portion thereof above the removable bottom provided by plug 77.

Since this embodiment employs a vent 117 to the air jet passage 107, just as in the embodiment of FIGS. 7 through 10, the outlet end of air jet nozzle 109 is located between the intersection of the induction passage section 114 with the air jet passage 107 and the end of the jet barrel 104 connected to the sand delivery pipe 26.

Whereas there are here illustrated and described certain preferred constructions which I presently regard as the best mode of carrying out my invention, it should be understood that various changes may be made without departing from the disclosed inventive subject matter particularly pointed out and distinctly claimed herebelow.

I claim:

1. A sand trap for controlled feeding of sand under a drive wheel of a vehicle equipped with a sand bin, a compressed air system, and a sand delivery pipe, comprising a body having a substantially rectilinear sand supply passage extending therethrough from top to bottom thereof with means at its upper end for connection with the sand bin so that sand will flow thereinto by gravity, an air jet passage offset laterally from the longitudinal axis of said sand supply passage and extending transversely thereof from side to side of said body with one end adapted for connection with an air supply line of said air system and with the opposite end adapted for connection with said sand delivery pipe, and a sand induction passage leading to said air jet passage from said sand supply passage at a location above the lower end of the latter, leaving trap space in said lower end for the accumulation of foreign matter carried by the sand; a closure element normally secured to said body at the lower end of the sand supply passage as a removable bottom for said trap space affording direct clean-out access throughout the length of the sand supply passage; a jet nozzle in the air jet passage; and a foreign matter rejecting grill guarding entrance to the induction passage at the opening thereof into the sand supply passage, the inflow side of said grill being above and in direct communication with said trap space so that foreign matter caught by the grill will gravitate into the trap space.

2. The sand trap of claim 1, wherein the sand induction passage includes an entry-way opening into the sand supply passage, and a smaller passage extending from said entry-way into the air jet passage, the grill extending over the opening between said sand supply passage and said entry-way.

3. A sand trap for controlled feeding of sand under a drive wheel of a vehicle equipped with a sand bin, a compressed air system, and a sand delivery pipe, comprising a body having a substantially rectilinear, sand supply passage extending therethrough from top to bottom thereof with means at its upper end for connection with the sand bin so that sand will flow thereinto by gravity, an air jet passage offset laterally from the longitudinal axis of said sand supply passage and extending transversely thereof from side to side of said body with one end adapted for connection with an air supply line of said air system and with the opposite end adapted for connection with said sand delivery pipe, and a sand induction passage leading to said air jet passage from said sand supply passage; a jet nozzle in the air jet passage; and a sand blast retarder in the form of a sand blast resistant tube section of substantially uniform internal diameter smaller than the diameter of the air jet passage and disposed at the end of said passage leading into said sand delivery pipe.

4. The sand trap of claim 3, wherein the sand blast retarder tube section is mounted for longitudinal adjustment.

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