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SANDING CONTROL MEANS

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Fig.1

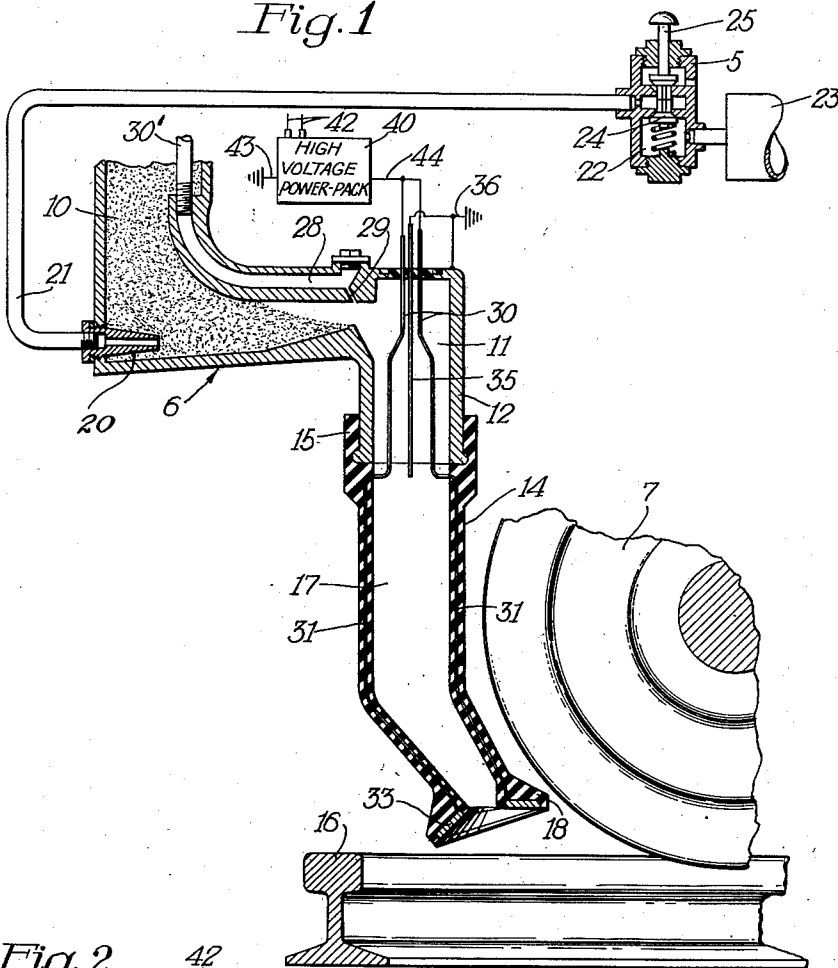


Fig. 2

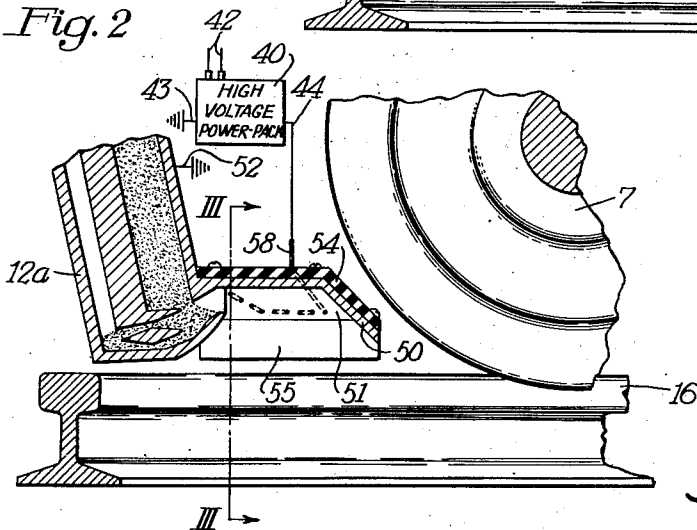
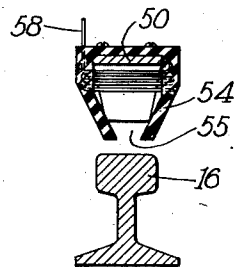


Fig. 3



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SANDING CONTROL MEANS

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16 Claims. (Cl. 291—41)

This invention relates to a method of sanding rails and to rail sanding equipments, and more particularly to a fluid pressure operated sanding device designed for high speed railway service.

In order to ensure safe control of trains operated in high speed service, fluid pressure actuated sanding devices are usually provided on both the locomotives and the cars, together with automatic control means for causing the sanding devices to deposit sand on the rails when the train brakes are applied. When an adequate supply of sand can be deposited on the rails, the degree of retarding force which may be safely applied to the wheels of fast moving cars without inducing undesirable sliding of the wheels is far greater than is the case when the rails are not properly sanded. Although sanding of the rails is thus known to be desirable, it is in practice difficult to operate the usual sanding apparatus in a manner that will ensure depositing of sand on the rails and retention of the sand in place long enough to permit contact with the wheels of the train, particularly when the train is operated at a high speed.

One object of my invention is to provide an automatic rail sanding equipment embodying means for causing sand supplied thereby to cling to the rails.

Another object of the invention is to provide a sanding equipment including an electrostatic means operative to ionize the separate particles of sand prior to contact thereof with the rails, so that the sand particles are thus given an electrostatic charge effective to cause retention of the sand on the rails.

Other objects and advantages of the invention will appear in the following more detailed description thereof, taken in connection with the accompanying drawing, in which

Fig. 1 is a diagrammatic sectional view of a portion of a sanding equipment embodying the invention;

Fig. 2 is a fragmentary sectional view of a different form of sanding apparatus constructed in accordance with the invention; and

Fig. 3 is a fragmentary sectional view taken along the line 3—3 of Fig. 2.

According to the invention as disclosed in Fig. 1 of the drawing, a sanding equipment is provided which includes a sanding valve device 5, and a sanding unit 6, which is adapted to be mounted on a vehicle adjacent a wheel 7 thereof. The sanding unit 6 comprises a metal casing structure having a sand hopper chamber 10, which is adapted to be supplied with sand by

gravity flow, and an ionizing chamber or passageway 11, which is preferably formed in a substantially vertically disposed conduit portion 12 of the casing structure. Extending downwardly from the conduit portion 12 of the casing structure is a tubular member 14 having a passageway 17, which member is preferably made of an insulating material, such as rubber composition, and has an enlarged flange portion 15 suitably secured to the lower end of the casing portion 12. It will be understood that the tubular member 14 is adapted to deliver sand to the rail in advance of the wheel 7, and for this purpose the lower open end 18 of the member is disposed a short distance above the rail 16, as viewed in Fig. 1.

The casing structure of the sanding unit 6 is provided with the usual compressed air nozzle, which communicates with a pipe 21 leading to the sanding valve device 5. The sanding valve device 5 may be of any suitable construction, and as illustrated includes a casing having a valve chamber 22 communicating with a compressed air supply reservoir 23 and containing a valve element 24, which is operable by means of a manually controlled plunger 25 to supply air under pressure through the pipe 21 and nozzle 20 to the sand hopper chamber 10, for discharging sand therefrom by way of the ionizing chamber 11 and passageway 17 to the rail.

An auxiliary air blast means is provided for facilitating the cleaning of the ionizing chamber 11, comprising a conduit 28 formed in the casing structure of the sanding unit 6 and communicating with the ionizing chamber by way of a port 29. The conduit 28 is connected by means of a compressed air supply pipe 30 to a suitable control valve, not shown, which may be operated when necessary to effect blowing out of sand particles that may have accumulated within the ionizing chamber 11.

According to the invention, the sanding equipment further comprises electrostatic means operative to effect ionization of sand particles as sand is discharged through the ionizing chamber 11 and the passageway 17 toward the rail. One form of apparatus designed to produce a corona discharge or electrostatic field for ionizing sand is illustrated diagrammatically in Fig. 1 as comprising one or more vertically disposed, relatively fine wires 30, which are suitably insulated from the casing structure of the sanding unit 6 and are arranged in spaced relation within the ionizing chamber 11. In this embodiment of the invention the wires 30 are also connected by means

of conductors 31 carried within the insulated tubular member 14 to an annular plate 33 secured to the lower surface of the end portion 18 a short distance above the rail 16.

A vertically disposed electrode 35 is mounted within the ionizing chamber 11 intermediate the wires 30, suitable means, not shown in detail, being provided for supporting the electrode. Both the casing structure of the sanding unit 6 and the electrode 35 are provided with a ground connection, indicated by the reference character 36.

The vehicle with which the sanding apparatus is equipped is provided with means for generating electrostatic power involving unidirectional high voltage, which in practice may be in the neighborhood of thirteen thousand volts. In Fig. 1 the reference character 40 indicates a high voltage power-pack or high voltage power supply unit, which may be of any suitable construction and may consist of a transformer, rectifier tubes, and condensers, the details of which form no part of the present invention and are thus not illustrated. It will be understood that the power-pack 40 is operable to convert electrical energy, which may be delivered thereto by way of conductors 42, into the necessary high potential D. C. power, for creating the corona discharge or electrostatic field in the ionizing chamber 11. One high potential terminal of the power-pack 40 may be connected to the ground, indicated at 43, by way of the vehicle frame and wheels to the track 16, and the other high potential terminal 44 is connected to the wires 30.

When the high direct current voltage created by the power-pack 40 is impressed on the wires 30, a corona discharge is set up between the wires and the grounded electrode 35 and casing portion 12. A similar electrostatic field also is created between the plate 33 and the rail 16. The charge impressed by the power-pack 40 on the wire 30 may be either negative or positive, as determined by the construction of the power-pack, it being understood that in any event a charge of opposite polarity is at the same time created on the grounded elements and locally in the rail 16.

If the sanding valve 5 is now operated to cause discharge of loose sand from the hopper chamber 10 through the ionizing chamber 11 and passage-way 17, the high local electrostatic field maintained in the ionizing chamber and between the plate 33 and the rail causes accumulation of an electrical charge on each of the sand particles passing through the regions of corona discharge. As the charged particles of sand are ejected from the lower end 18 of the member 14, they are attracted to the rail 16, and tend to adhere thereto for an interval of time long enough to permit the wheel 7 to overrun the portion of rail covered with sand.

It will thus be seen that with the sanding apparatus constructed in accordance with the invention, particles of sand are electrostatically charged, during their traverse from the sand hopper to the rail, first by contact with the corona discharge field set up within the ionizing chamber 11 and then by being further subjected to the corona discharge field maintained between the plate 33 and the rail 16, and that as a result a large proportion of the total number of sand particles deposited on the rail 16 will adhere thereto, at least temporarily. Sanding of the rail is therefore accomplished more efficiently than is the case under ordinary con-

ditions, so that the quantity of sand required for conditioning the rail during high speed operation of the vehicle will be less than that required for older types of sanding equipment.

It will further be understood that the amount of electrical energy required for charging the sand particles will be quite small, since only a limited current flow is effected in producing the corona discharge between the charged wires and the grounded electrode elements of the ionizing system.

Referring to Fig. 2 of the drawing, the different form of sand ionizing apparatus there illustrated comprises a metal sand conduit 12a, which may be an extension of a portion of a casing structure such as the tubular portion 12 shown in Fig. 1. The sand conduit 12a terminates in an extension 50, which together with the conduit is grounded as indicated at 52. Secured to and enclosing the extension 50 is a housing member 54, which is made of a suitable insulating material and has formed therein an ionizing chamber 51 having a lower opening 55 that is disposed directly above the rail 16. Secured to the insulating housing member 54 is a fine wire 58, which may be bent and secured at a number of points to the housing member so as to form a screen crossing the opening 55, as shown in Fig. 3. The wire 58 is adapted to be connected to the charging terminal 44 of the high voltage power-pack 40, which is operative in the manner already explained in the connection with Fig. 1.

When the wire 58 is charged, an electrostatic field is set up between the portion of the wire disposed within the ionizing chamber 51 and the grounded metal extension 50, and also between the wire and the rail 16. Sand particles discharged from the sanding conduit 12a toward the rail are thus ionized as hereinbefore explained, for causing the desired adhesion thereof to the rail.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a rail sanding apparatus, in combination, conduit means including an insulated portion through which loose sand can be conducted to the rail, electrostatic means mounted in the path of sand passing through the conduit means, and an electrostatic power source constructed and arranged to impress high unidirectional voltage on said electrostatic means, whereby a corona discharge or electrostatic field is generated for ionizing the sand particles as they approach the rail.

2. In a rail sanding apparatus, in combination, conduit means including an insulated portion through which loose sand can be conducted to the rail, electrostatic means mounted within said conduit means in the path of sand passing therethrough, and an electrostatic power source constructed and arranged to impress high unidirectional voltage on said electrostatic means, whereby a corona discharge or electrostatic field is generated within said conduit means for ionizing the sand particles as they approach the rail.

3. In a rail sanding apparatus, in combination, conduit means including an insulated portion through which loose sand can be conducted to the rail, electrostatic means mounted in the path of sand passing through the conduit means, and disposed in close proximity to said rail, and an electrostatic power source constructed and

arranged to impress high unidirectional voltage on said electrostatic means, whereby a corona discharge or electrostatic field is generated between said electrostatic means and said rail for ionizing sand particles as they approach the rail.

4. In a rail sanding apparatus, in combination, conduit means including an insulated portion through which loose sand can be conducted to the rail, electrostatic means mounted within said conduit means in the path of sand passing there-through, other electrostatic means disposed in close proximity to said rail, and an electrostatic power source constructed and arranged to impress high unidirectional voltage on both said electrostatic means, whereby a corona discharge or electrostatic field is generated within said conduit means and also between said other electrostatic means and said rail for ionizing sand particles approaching said rail.

5. In a rail sanding apparatus, in combination, conduit means including an insulated portion through which loose sand can be conducted to the rail, electrostatic means mounted in the path of sand passing through the conduit means, electrostatic power means constructed and arranged to impress high unidirectional voltage on said electrostatic means, whereby a corona discharge is generated for ionizing sand particles passing therethrough, and fluid pressure means operative to blow sand through said conduit means to the rail.

6. In a rail sanding apparatus, in combination, conduit means including an insulated portion through which loose sand can be conducted to the rail, electrostatic means mounted within said conduit means in the path of sand passing there-through, an electrostatic power source constructed and arranged to impress high unidirectional voltage on said electrostatic means, whereby a corona discharge or electrostatic field is generated within said conduit means for ionizing sand particles passing therethrough, and fluid pressure means operative to blow sand through said conduit means.

7. In a rail sanding apparatus, in combination, conduit means including an insulated portion through which loose sand can be conducted to the rail, electrostatic means mounted in the path of sand passing through the conduit means and disposed in close proximity to said rail, an electrostatic power source constructed and arranged to impress high unidirectional voltage on said electrostatic means, whereby a corona discharge or electrostatic field is generated for ionizing sand particles passing between said electrostatic means and said rail, and fluid pressure means operative to blow sand through said conduit means toward the rail.

8. In a rail sanding apparatus, in combination, conduit means including an insulated portion through which loose sand can be conducted to the rail, electrostatic means mounted within said conduit means in the path of sand passing there-through, other electrostatic means supported by said conduit means and disposed in close proximity to said rail, an electrostatic power source constructed and arranged to impress high unidirectional voltage on both said electrostatic means, whereby a corona discharge is generated in said conduit means and also between said other electrostatic means and said rail, and fluid pressure means operative to blow sand through said conduit means toward said rail.

9. In a rail sanding apparatus, in combination, an ionizing chamber, means for discharging loose

sand through said chamber to the rail, a source of unidirectional high voltage electrostatic energy, grounded electrode means associated with said chamber, and a wire supported in insulated relation within said chamber and adapted to carry an electrostatic charge with respect to said grounded electrode means, imposed on said wire from said source.

10. A rail vehicle carried sanding equipment for depositing sand on a rail, comprising in combination, an electrically grounded casing having an ionizing chamber through which loose sand can be conducted to the rail, a wire mounted in insulated relation within said chamber and spaced from the wall of said grounded casing, and an electrostatic power-pack for impressing unidirectional high voltage on said wire to establish a corona discharge therefrom with respect to said grounded casing, whereby sand particles passing through said ionizing chamber will be given an electrostatic charge to effect adhesion of the sand to said rail.

11. A rail vehicle carried sanding equipment for depositing sand on a rail, comprising in combination, an electrically grounded casing having an ionizing chamber through which loose sand can be conducted to the rail, a plurality of electrode elements mounted in insulated relation within said chamber and spaced from the wall of said casing, and an electrostatic power-pack for impressing unidirectional high voltage on said electrode elements to establish a corona discharge field between said elements and said grounded casing, whereby sand particles passing through said ionizing chamber will be given an electrostatic charge to effect adhesion of the sand to the rail.

12. A rail vehicle carried sanding equipment for depositing sand on a rail, comprising in combination, a casing having an ionizing chamber through which loose sand can be conducted to the rail, at least one electrically grounded electrode mounted within said chamber, at least one wire mounted in insulated relation therein and spaced in parallel relation to said electrode, and an electrostatic power-pack for impressing unidirectional high voltage on said wire to establish a corona discharge therefrom with respect to said grounded electrode, whereby sand particles passing through said ionizing chamber will be given an electrostatic charge to effect adhesion of the sand to the rail.

13. A vehicle carried sanding equipment for depositing sand on a rail, comprising in combination, an electrically grounded casing structure including a sand conduit portion terminating in an open ionizing chamber disposed in close proximity to the rail, said conduit portion and ionizing chamber being adapted to conduct sand supplied thereto under pressure to said rail, a wire carried within said ionizing chamber and mounted in insulated relation on said casing structure, said wire being disposed a short distance above said rail, a source of electrostatic power operable to impress high unidirectional voltage on said wire, whereby a corona discharge or electrostatic field is maintained between said wire and said grounded casing and rail, and means for forcing sand through said conduit portion and said ionizing chamber to the rail.

14. A rail vehicle carried sanding equipment for depositing sand on a rail, comprising in combination, an electrically grounded casing having a passageway through which loose sand can be conducted, a tubular member made of non-con-

ductive material depending from said casing for directing sand to the rail, sand supplying means operative to force sand through said passageway and said tubular member, an electrostatic power source, and electrostatic means associated with said casing and constructed and arranged for energization by said power source to generate a corona discharge or electrostatic field in the path of sand particles traveling through said passageway, whereby such sand particles are given an electrostatic charge to effect adhesion to the rail,

15. A rail vehicle carried sand equipment for depositing sand on a rail, comprising in combination, an electrically grounded casing having an ionizing chamber, a tubular member made of insulating material having one end secured to said casing and the other end disposed adjacent the rail, sand supply means operative by fluid pressure to blow sand through said ionizing chamber and tubular member to the rail, at least one electrode carried by said casing within the path of sand passing through said ionizing chamber, an electrostatic power source constructed and arranged to impress high unidirectional voltage on said electrode for generating a corona dis-

charge in said ionizing chamber, and auxiliary fluid pressure means adapted for operation to blow out sand particles adhering to surfaces within said ionizing chamber.

5 16. A rail vehicle carried sand equipment for depositing sand on a rail, comprising in combination, an electrically grounded casing having an ionizing chamber, a tubular member made of insulating material having one end secured to said casing and the other end disposed adjacent the rail, sand supply means operative by fluid pressure to blow sand through said ionizing chamber and tubular member to the rail, at least one electrode carried by said casing within the path of sand passing through said ionizing chamber, secondary electrode means carried at the end of said tubular member adjacent the rail and electrically connected to the first mentioned electrode, and a source of unidirectional high voltage electrostatic energy operative to impress a charge on both said electrode and said electrode means, whereby a dual electrostatic field is established for charging sand particles about to be deposited on the rail.

25 JOHN CANETTA.