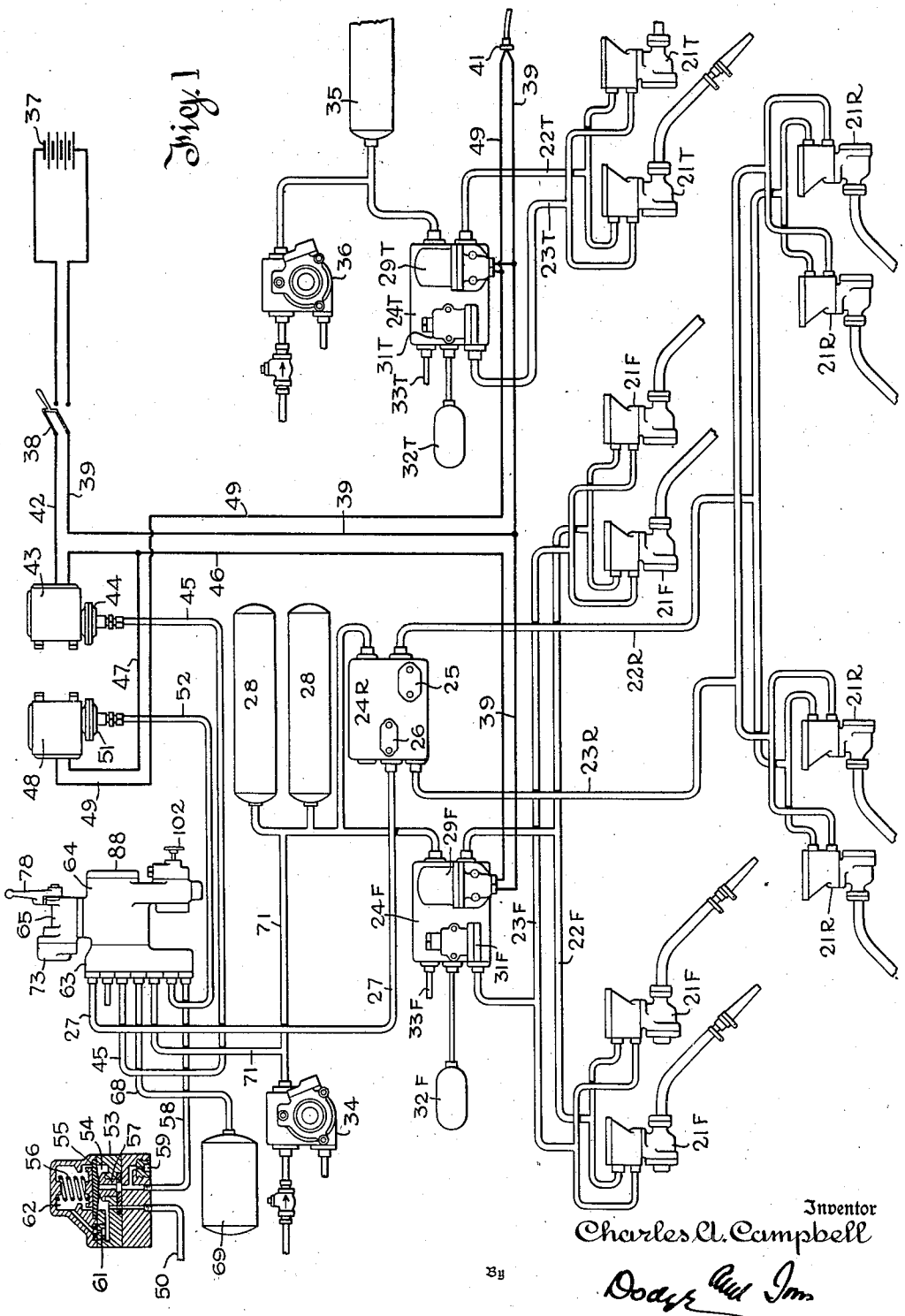
Aug. 4, 1942. C. A. CAMPBELL 2,291,874

SANDER

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Fig. 1



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Fig. 2

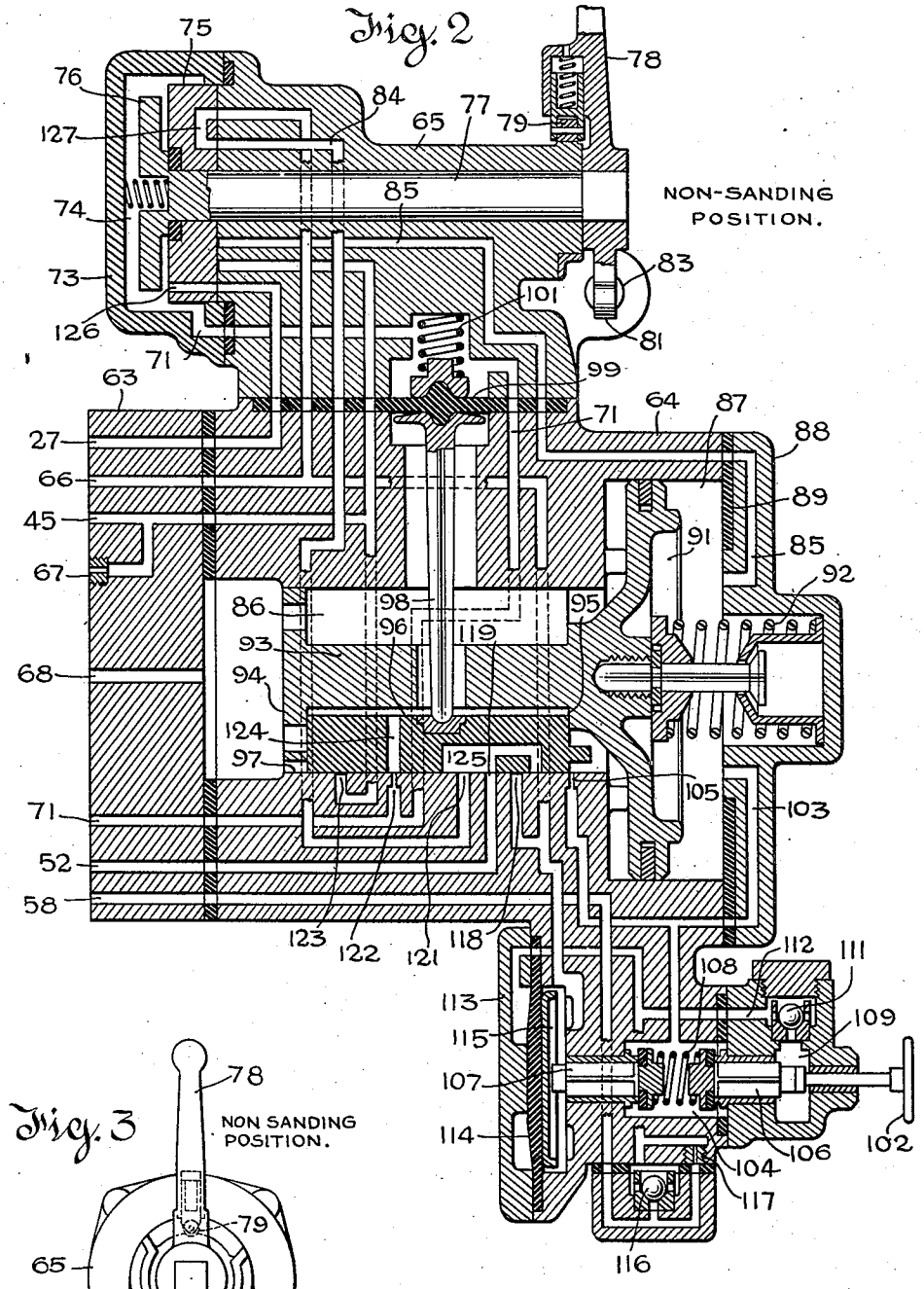


Fig. 3

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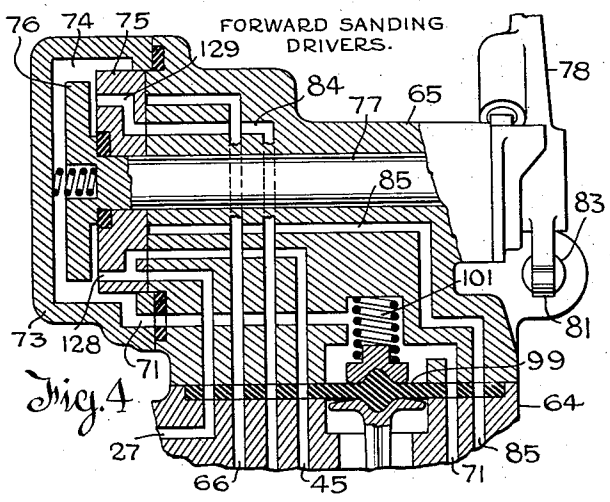


Fig. 4

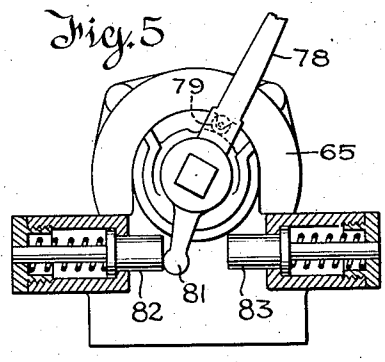


Fig. 5

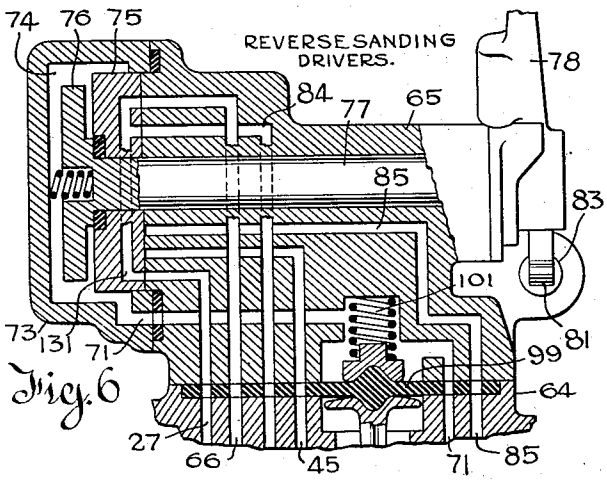


Fig. 6

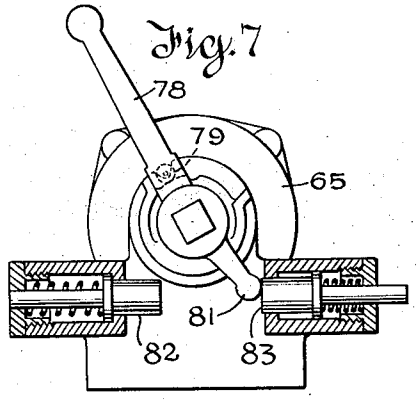


Fig. 7

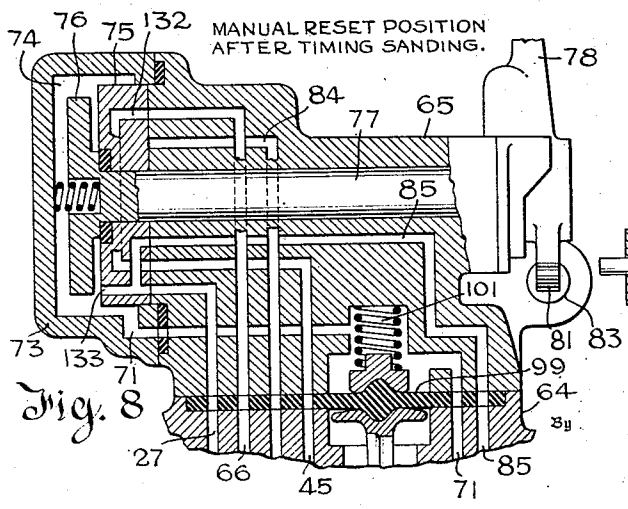


Fig. 8

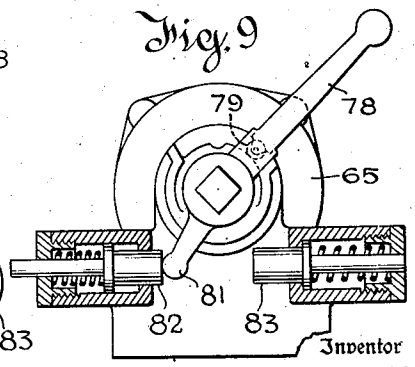


Fig. 9

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TIMING SANDING. INITIAL MANUAL ACTUATION OF TIMING SANDING BUTTON.

Fig. 10

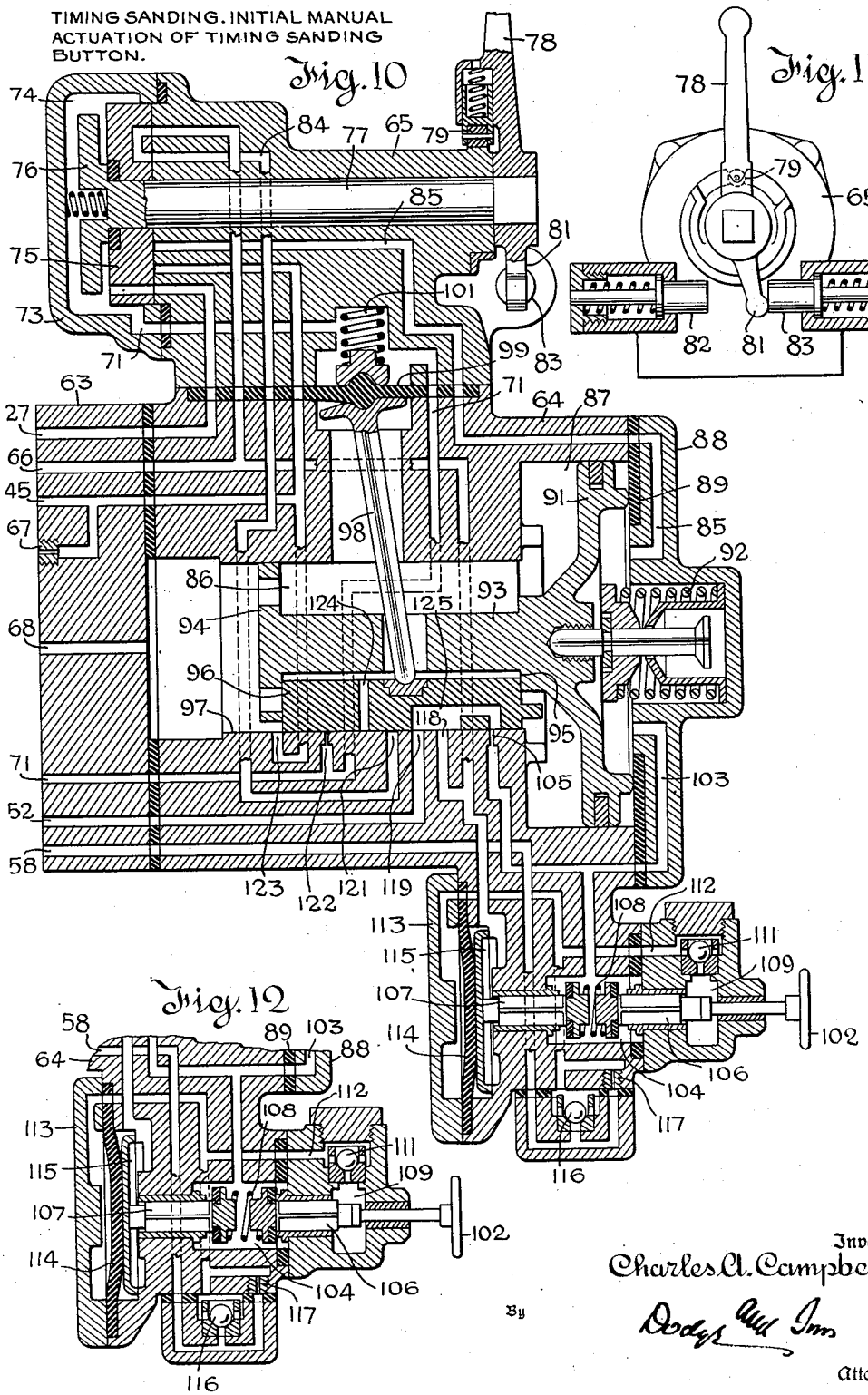


Fig. 11

Fig. 12

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Patented Aug. 4, 1942 2,291,874

UNITED STATES PATENT OFFICE

2,291,874

SANDER

Charles A. Campbell, Watertown, N. Y., assignor to The New York Air Brake Company, a corporation of New Jersey

Application July 5, 1940, Serial No. 344,148

12 Claims. (Cl. 291—3)

This invention relates to track sanders and particularly to a controlling valve mechanism adapted to be operated manually, or automatically in response to some brake-applying function of a train brake system, to cause sanding.

In a prior Patent 2,035,533, March 31, 1936, I describe and claim a valve of this type capable of being manually operated, either to sand-at-will or for a definite time period, and capable of responding to the functioning of the brake system to sand for the same definite time period. This valve has since been improved by the incorporation of means manually operable to terminate timed sanding while this is in progress.

The patented valve was designed for use on Diesel electric streamliners and has been successful. For steam locomotive service it is desirable to provide selective sanding-at-will for both forward and reverse running, and desirable that manipulation approximate that characteristic of old style systems, because of deeply rooted habits of steam locomotive drivers.

The present invention meets the above conditions, retains all the operative characteristics of the patented device, and reduces the cost of manufacture by permitting substitution of a slide valve for the expensive lapped piston valve characteristic of the earlier device.

A single rotary valve mechanism performs all the sanding-at-will functions and the reset function for timed sanding. This valve mechanism forms a distinct replaceable unit.

The timing valve and the manually actuated valve for putting it into action form another distinct unit. The timing set button which actuates the last named valve has a protected location remote from the sanding-at-will valve handle so that the risk of its unintentional actuation while sanding-at-will is virtually eliminated.

This subdivision into units is desirable. Timed sanding is used during brake applications and is active throughout the sander equipped portion of the train. In some trains all the cars are equipped with sanders. Such sanding systems are approaching standardization, but are of relatively recent origin.

Sanding-at-will is used in starting and in grade work, and is needed only on the propelling unit. Various sanders of this type are in use. To sand forward and reverse, various relay and selective arrangements are practicable and many are in use. Standardization is more difficult, in consequence. The rotary valve and seat are components which can readily be modified to meet particular conditions as to sanding-at-will without entailing any change in the timed sanding valve, and their incorporation in a separate unit affords opportunity to modify details of porting.

To bring out the above thought a system will be described in which forward sanding is caused by developing pressure on the motor element of a pressure actuated switch, and reverse sanding is caused by venting a normally charged line controlling a pneumatic relay. The rotary valve is readily designed to meet these particular conditions, and others that might be imposed.

In the drawings—

Fig. 1 is a diagram showing the valve of the present invention applied to a sanding system for a locomotive and tender having forward and reverse sanding for the locomotive devices and forward sanding alone on the tender. The tender sanding unit is typical of that on any trailing unit and could be repeated on successive cars of a train. Hence in Fig. 1 the tender typifies any trailing unit.

Fig. 2 is a diagram of the sanding control valve mechanism in running (non-sanding) position.

Fig. 3 is an elevation of the rotary valve handle in non-sanding position.

Figs. 4 and 5 correspond respectively to the rotary valve portion of Fig. 2 and to Fig. 3 but show the position for forward sanding of the drivers.

Figs. 6 and 7 are similar views showing the position for reverse sanding of drivers.

Figs. 8 and 9 are similar views showing the position for manually resetting the timing valve.

Figs. 10 and 11 correspond to Figs. 2 and 3 and show positions assumed by the piston actuated sanding valve when the timing set button is pressed.

Fig. 12 shows the positions assumed during the timed interval after release of the timing set button.

Referring first to Fig. 1, a general statement of the sand trap control, avoiding details not here material, will be given.

The forward driver sand traps appear at **21F**, the reverse driver sand traps at **21R** and the tender sand traps (forward only) at **21T**. In all cases the pipes **22F**, **22R** and **22T** convey the clean-out blast and **23F**, **23R** and **23T** the sanding air from a corresponding sanding control relay. The forward driver sanding relay appears at **24F**, the reverse driver sanding relay at **24R** and the tender sanding relay at **24T**.

The relays **24F** and **24T** are identical with each other and relay **24R** differs in that blanking plates **25** and **26** are substituted for the magnet

valve unit and for the pneumatic local control valve used with the other two relays and hereinafter described. Relay 24R has a special type of pneumatic control.

So far as is material here, relay 24R is in running (non-sanding) condition when pipe 27 is under pressure. As pipe 27 is vented, relay 24R delivers air from reservoirs 28 to its clean-out line 22R and sander line 23R and then to the latter alone. As pressure in line 27 is restored, the relay cuts off the air from sander line 23R, delivers a short blast to clean-out line 22R and then vents both lines.

The relays 24F and 24T on the other hand are normally put into action by energization of magnet valves 29F or 29T as the case may be and are put out of action by deenergization of these magnet valves. In going into and out of action they perform the same cycles above described as to relay 24R.

The pneumatic valves 31F and 31T and timing reservoirs 32F and 32T are controlled through connections 33F and 33T from local brake control valves (not shown) for operating the sanding relays locally and independently of magnet valves 29F or 29T under certain conditions of braking not here material. The reservoirs 28 are charged from a brake system reservoir (not shown) through a valve 34 and the reservoir 35 for relay 24T is similarly charged through a valve 36. The function of valves 34 and 36 is to prevent the sanding system from depleting braking air under certain conditions not here material.

The relays and certain details of their relation to the brake system and electric circuits form the subject of a prior application Ser. No. 339,387, filed June 7, 1940, and the sand traps and controls are the subject of applications Ser. Nos. 314,172 and 314,173, filed January 16, 1940. These three applications resulted respectively in Patents Nos. 2,243,244, 2,243,242 and 2,243,243, each of which issued May 27, 1941. Hence claims to these details are not presented in the present application. Further, since the present case has to do solely with control of such relays, only the ultimate functions of the relays need be stated. In short, the purpose of Fig. 1 is to offer a typical system, for which no novelty is here claimed, as a basis for disclosing the various operative functions of the sander control valve of Figs. 2–12.

In Fig. 1, battery 37 supplies current through normally closed switch 38 to the sanding circuit which has two parts, a locomotive circuit which controls the winding 29F, a train circuit which includes the tender relay winding 29T, and would also include similar windings on cars in cases where the train is made up of cars having electrically controlled sanders. To limit sanding-at-will to the drivers, without so limiting timed sanding, use is made of an interlocking switch according to the principles described and claimed in my allowed application Ser. No. 266,819, filed April 8, 1939, which issued as Patent No. 2,222,604 on November 26, 1940.

Wire 39 is a common return line connected with one terminal of battery 37 and one terminal of magnet valve 29F, one terminal of magnet valve 29T and one terminal of each of similar magnet valves (if used) on cars in the train. The connector 41 represents a connection to succeeding car circuits which may be used according to the disclosure of Patent No. 2,222,604. Since this involves merely repeated duplication of the tender unit 24T and connected parts, without change of function, detailed illustration is not considered necessary.

The wire 42 leads from the other terminal of the battery 37 through a normally open sanding switch 43 which is closed when pressure is admitted to the diaphragm motor 44 by way of the pipe 45. From the switch 43 the wire 46 leads to a second terminal of magnet valve 29F. Thus whenever sanding switch 43 is closed, the forward sanders for the drivers will operate. A branch wire 47 leads from the wire 46 through a normally closed switch 48 to the wire 49. The switch 48 is opened when pressure is admitted to the diaphragm motor 51 through the pipe 52. Switch 48 is the so-called interlocking switch. The wire 49 leads to the second terminal of the magnet valve 29T and also to the connector 41 by which the wires 49 and 39 may be connected to a train circuit extending throughout the train, as is well understood in the art. Thus, if pressure is admitted to the motor 44 and not to the motor 51, all the electromagnetic valves 29F, 29T are operative in unison so that sanding occurs on the locomotive, on the tender and, if the cars are equipped with electrically controlled sanders, also on the cars. On the other hand, if both the motors 44 and 51 are operated, sanding will occur on the locomotive only. No claim is made to this principle because it is part of the claimed subject matter of the prior application last above identified.

The numeral 50 indicates a pipe to which air is delivered during a brake application, usually only during an emergency brake application from some part of the brake system, according to principles well understood in the art. This pipe leads to an impulse valve shown in section at 53. Pipe 50 delivers to a chamber 54 beneath the diaphragm 55, which is urged by a spring 56 against a valve seat 57, the latter controlling flow to the impulse pipe 58. A choke 59 offers a constant vent from the impulse pipe 58. Within the body 53 of the impulse valve is a second choke 61 connecting the chamber 54 with the chamber 62 behind the diaphragm 55.

Thus when the brake system puts pipe 50 under pressure, the diaphragm 54 rises and admits air to the impulse pipe 58. The choke 61 starts to build up pressure in the chamber 62 so that shortly the diaphragm 55 will again seat on the valve seat 57 and terminate flow to the impulse pipe 58. When this flow is terminated the choke 59 will slowly vent the pipe 58. It follows that when a brake application, and particularly an emergency brake application, occurs, pressure will be developed in the impulse pipe 58 and then dissipated. Such impulse valves are known in the art and one is described, for example, in Patent No. 2,243,244, where it performs a function similar to that performed in the device here disclosed.

The apparatus so far described involves merely one of several highly refined sanding systems applicable to locomotive and tender, or to locomotive, tender and train, and with which the sander control valve now about to be described may be used. While the system as such is not a part of the present invention, it appears necessary to develop its basic functions in order that all the operative characteristics of the sanding control valve may be fully understood.

Reference should now be made to Figs. 2 to 12 inclusive, particularly to Figs. 2 and 3.

The sander control valve mechanism is mounted on a bracket 63 to which all pipe connections are made and comprises a body 64, in which the piston actuated timed sanding valve and the timing set button mechanism are mounted, and the housing 65 removably mounted on the housing 64 and in which the rotary valve for controlling sanding-at-will and reset functions is mounted.

To the bracket 63 there are a number of pipe connections leading to ports in the bracket and in housings 64 and 65. Certain of these pipes have been and others will be identified by reference numerals on Fig. 1 and where this is the case the communicating ports in the parts 63, 64 and 65 will be given reference numerals corresponding to those applied to the pipes, of which the ports are simply continuations. In this way the flows can be traced more easily and the reference numerals can be simplified.

There is a passage 27 forming a continuation of the pipe 27 which controls reverse sanding relay 24. There is an exhaust passage 66 leading to atmosphere. There is a sander switch passage 45 forming a continuation of the sander switch pipe 45 and from this a branch passage leads to atmosphere by way of the flow restricting choke 67. There is a timing chamber passage 68 leading by way of a similarly numbered pipe to the timing chamber 69 of Fig. 1. There is an air supply port 71 connected by a similarly numbered pipe with the reservoirs 28 of Fig. 1. There is an interlocking switch passage 52 forming a continuation of the pipe 52 of Fig. 1 and there is an impulse passage 58 forming a continuation of the impulse pipe 58 in Fig. 1. The connections just described relate the sander control valve mechanism to the sanding system previously described.

Enclosed by a cap 73 mounted on the housing 65 is a chamber 74 in which is mounted the rotary valve 75, which is the valve used to perform all sanding-at-will functions and the timed sanding reset function. The valve is operated by a key 76 on the stem 77 which is shiftable by a handle 78. The handle 78 has an impositive roller latch 79 which retains the handle in its normal or non-sanding position shown in Fig. 3. From this position it may be swung forward, i. e., clockwise from the position shown in Fig. 3 to the forward sanding position shown in Fig. 5. In the last-named position an arm 81 formed integrally with the handle 78 engages the end of the spring plunger 82. Further clockwise movement is resisted by the spring plunger 82 and such further movement carries the handle 78 to manual reset position, Fig. 9. If the handle is released in the position of Fig. 9, the plunger 82 will return the handle to forward sanding position, Fig. 5.

Motion of the handle 78 rearward, i. e., counterclockwise from the position of Fig. 3, is opposed by a second spring plunger 83. If this spring plunger is overpowered, the handle moves to reverse sanding position, Fig. 7, and from this position the spring plunger 83 will restore the handle to non-sanding position, Fig. 3, if the handle is released. Thus the handle, and consequently the rotary valve, are impositively retained in non-sanding position by the latch 79. They can be moved to forward sanding position, Fig. 5, and left there, which is a desirable characteristic because in grade work continuous sanding of the drivers is occasionally desirable. If the handle is moved to reverse sanding position, it is automatically returned to non-sanding position, and if it is moved to reset position, it is automatically returned to forward sanding position.

The spring return of the valve from reset position is considered important because it would be confusing if the handle were left in that position. There is no occasion for it to remain in reset position since the reset function takes place in a very brief interval of time. The spring return from reverse sanding may not be desired in all cases and if not desired the spring plunger 83 may be omitted.

The valve 75 and handle 78 control sanding of the drivers only, as will be understood when the porting of the valve is fully explained. The interlocking switch 48 is always open or ineffective in the sanding positions of the handle 78 and valve 75, unless the timed sanding valve is then in sanding position.

The porting of the seat of the rotary valve 75 can now be explained. The reverse sanding passage 27 leads to a port in the seat of the valve, as clearly shown in the drawings. So also does the exhaust passage 66 and the sander switch passage 45. The air reservoir passage 71 leads to the chamber 74 and in certain positions of the valve 75 supplies air to the passages in the seat by way of ports in the valve.

In Figs. 2, 4, 6, 8 and 10 the porting of the valve and seat is diagrammatic to the extent that the ports are drawn as if they lay in a single plane according to a convention commonly used in the air brake and related arts. In commercial practice more compact arrangements can be had by other port locations but these are conventional matters of design.

There are two other ports in the seat of the valve 75, one communicating with the bridging passage 84 hereinafter described and the other communicating with a reset passage 85 hereinafter described. Since these two ports are related to the timed sanding slide valve and piston in housing 64, further description must be suspended until that valve has been described.

In the housing 64 is a slide valve chamber 86 and a cylinder 87. The outer end of the cylinder is closed by cap 88 which is sealed by a gasket 89, the gasket extending inward far enough to offer a seat to a flange on a piston 91 which works in the cyinder 87. The piston moves full stroke between a normally non-sanding position, shown in Fig. 2, and a sanding position, Fig. 10. It is biased toward normal position by a compression spring generally indicated at 92. A special spring assembly with retainer stem is shown, but this is simply a conventional arrangement facilitating mounting of the spring in the cap and assembly of the parts.

The piston 91 has a stem 93 which is guided by a ported spider 94 in a portion of the valve chamber 86. Between the spider 94 and the shoulder 95 on the stem 93 a slide valve 96 is confined, so that it partakes of all of the motions of piston 91. This valve 96 is held to its seat 97 by a thrust pin 98 which seats at its upper end against the rubber-like element 99 which serves not only as a gasket between the housings 64 and 65, but also as a flexible diaphragm reacting downward on the stem 98. The portion which serves as a diaphragm is subject on its upper side to air reservoir pressure communicated by passage 71. The diaphragm is further loaded by a coil compression spring 101. Thus whether the valve cham-

ber 86 is or is not under pressure, the valve 96 is properly held to its seat 97.

The reset passage 85 previously described is of substantial flow capacity and leads to the space at the outer side of the piston 91. The space to the left of the piston and within the valve chamber 86 is connected by the passage 68 with the timing reservoir 69, which under normal or running conditions is charged to the same pressure as are the reservoirs 28. When the space to the right of the piston 91 is vented, the piston moves outward full stroke to the position of Fig. 10, at which time the slide valve chamber 86 and reservoir 69 are vented to atmosphere at a restricted rate by way of choke 67, with the result that, when the pressure falls sufficiently, the spring 92 will restore the piston 91 and the valve 96 to the non-sanding or normal position of Fig. 2. It is thus that timed operation of the valve 96 is had.

The space to the right, that is on the outer side of the piston 91, may be vented by the manual operation of the timed sanding set button 102 or by the admission of pressure fluid to the impulse connection 58. Either of these actions may be momentary but each sets into action a train of events which continues until the piston 91 has completed its outward and inward cycle of motion either over the timing period or over some shorter period terminated by manipulation of handle 78 to the reset position of Fig. 9.

The means for putting the timing sanding mechanism into action will now be described. Refer particularly to Figs. 2, 10 and 12.

A passage 103 leads from the space to the right of piston 91 to the chamber 104 and to the restricted equalizing port 105 in the seat 97 for slide valve 96. Opening inward into chamber 104 are two opposed poppet valves 106 and 107. These valves are both urged closed by compression spring 108. Valve 106 may be forced from its seat by timing button 102 opening communication to chamber 109 beneath ball check valve 111. From the upper side of check valve 111 a passage 112 leads to the space within cap 113 on the outer side of diaphragm 114.

Diaphragm 114 is clamped at its periphery by cap 113 and at its center reacts through thrust disc 115 upon valve 107 to open the same. Impulse passage 58 leads to passage 112 through a check valve 116 and constantly open choke 117. The space to the right of diaphragm 114, into which valve 107 discharges, is connected to exhaust passage 66.

Thus if a pressure impulse is delivered to pipe and passage 58 by impulse valve 53 as the result of a brake application (usually an emergency application), diaphragm 114 is forced inward, opening valve 107, which vents the space to the right of piston 91 to atmosphere. The piston 91 and slide valve 96 assume the positions of Fig. 10.

Similarly, if set button 102 is pressed in, valve 106 opens and air from the space to the right of piston 91 flows through valve 111 and passage 112 to the space to the left of diaphragm 114, forcing this in (see Fig. 10). The check valve 116 closes and the choke 117 delays dissipation of pressure on the diaphragm so that release of the set button 102 leaves the parts temporarily in the position of Fig. 12.

Thus the piston 91 moves out in response to a pressure impulse delivered to passage 58, or to depression of set button 102, as the case may be.

The seat 97 for slide valve 96 has in addition to port 105, an exhaust port 118 connected with exhaust passage 66, a port 119 leading to interlocking switch passage 52, a port 121 in communication with bridging passage 84, a restricted charging port 122 in communication with reservoir passage 71, and a port 123 in communication with sanding switch passage 45.

The slide valve 96 has a through charging port 124 and a cavity 125 so arranged that in running position reservoir port 122 is connected in charging relation with the slide valve chamber, the sander switch port 123 and exhaust port 118 are blanked and interlocking switch passage 52 and bridging passage 84 are connected with each other by the connection of ports 119 and 121. Port 105 is exposed by the outer end of the slide valve 96.

However, in timed sanding position (Fig. 10) sander switch port 123 is exposed, ports 121 and 122 are blanked, while ports 119 and 105 are connected to exhaust port 118. Thus when piston 91 moves to its outermost position, the space to its right is vented at a restricted rate to atmosphere (via port 105), while slide valve chamber 86 and connected timing chamber 69 are connected to sander switch passage 45, from which the bleed choke 67 leads to atmosphere. Thus the piston stays outward until the pressure in slide valve chamber 86 falls low enough for spring 92 to return the piston. When this occurs ports 122 and 124 start to charge chamber 86 and reservoir 69, and port 105 starts charging flow from the slide valve chamber to the space at the right of piston 91.

To understand the operation of the rotary valve 75, it should be observed that in the non-sanding position of piston 91 and valve 96, bridging passage 84 is simply a continuation of the interlocking switch passage 52.

Non-sanding position.—Fig. 2. Piston 91 is inward. Through port 126 in valve 75 subjects passage 27 to pressure. Hence relay 24R is inert. Passage 45 is blanked by valve 75 and vented at 67. Hence sanding switch 43 is open. Passage 84 is vented by cavity 127. Hence interlocking switch 48 is closed so that if piston 91 moves out, both magnet valve circuits will be energized. Reset passage 85 is blanked.

Forward sanding-at-will.—Drivers only. Fig. 4. Port 128 puts passages 27 and 45 under pressure. Hence relay 24R is inert and sanding switch 43 is closed. Passage 84 is put under pressure by port 129. Hence interlocking switch 48 is opened and sanding is confined to drivers since only magnet valve 29F will be energized. Reset port 85 is blanked.

Reverse sanding-at-will.—Drivers only. Fig. 6. Port 131 vents passages 27 and 84. Hence relay 24R is active, but it controls only driver reverse sanding. Interlock switch remains closed so that if piston 91 should move outward, all forward sanders could operate. Passages 45 and 85 are blanked.

Timed sanding.—All forward sanders. Fig. 10. If depression of set button 102 or delivery of air impulse to pipe 58 as the result of an emergency application should occur while the valve 75 is in the positions of Fig. 2 or 6, interlocking switch will be closed. If it occurs with valve 75 in the position of Fig. 4, the interlocking switch 48 will be initially open but only until the shift of slide valve 96 to the position of Fig. 10 causes it to close. In this latter position air from the normally charged timing reservoir 69 holds sanding switch 43 closed until the pressure is dissipated by flow through choke 67. Then piston 91 will automatically reset, recharging reservoir 69.

Reset during timed sanding.—Fig. 8. In this position port 132 vents the sanding switch passage 45 to end sanding by opening the switch 43. Port 133 charges passage 27 to hold relay 24R inactive and charges reset passage 85 to force piston 91 inward, where it will remain. Observe that if the engineer is sanding in the position of Figs. 4 and 5, when an emergency brake application occurs, he cannot terminate sanding by shifting to running position of Fig. 2, for flow through ports 128 and 45 will have held the charge in timing reservoir 69, and sanding will continue for the set time after he shifts to the position of Fig. 2. He should first shift to reset position, Fig. 8, and then to running position, Fig. 2. This amounts to saying that if timed sanding starts it will run its course unless reset position is used to terminate it sooner.

General considerations.—It will be observed that the switch 43 is an activator capable of putting all the forward sanding units into operation, and that the switch 48 is an inhibitor which prevents the operation of the units other than the driver units. Because the invention is broader than any specific apparatus for putting it into effect, these terms will be used generically in certain of the claims.

The important factor in the operation of the device is that the timed sanding valve is the primary control. It operates all forward sanders and does so even though the manual sanding valve be set to operate the driver sanders and inhibit the operation of other sanders. Thus if the engineer is sanding forward or reverse on the locomotive, a condition which would normally inhibit sanding throughout the train, and if at that time an emergency application caused the timed sanding valve to respond, the timed sanding valve would cut the manual control valve out of control of the inhibitor and terminate the action of the inhibitor so that sanding would immediately occur throughout the train. The only thing the engineer can do when these circumstances arise is to operate the manual sanding valve to reset position. If he does, he can terminate all sanding, but he has only the option of permitting sanding to continue throughout the train or to suspend it completely. This is an important point because the engineer should be protected against accidental interference with sanding caused by an emergency application. The safeguard is accorded by the relationship of the ports 118, 119, 121 and 125 (see Figs. 2 and 10).

As explained, automatic sanding systems for trains are of relatively recent origin and are tending to become standardized. Driver sanding units have long been in use and have assumed various forms, only one of which is illustrated in the present application. The rotary valve 75 and its seat can be variously ported to meet the requirements of particular sanding systems and except as specifically recited in the claims the details of porting are intended to be illustrative and not limiting.

I claim:

1. The combination of a pneumatically actuated sanding control valve; means for putting said valve into action; timing means rendered active by the initial operation of said valve to maintain it active for a definite time period; a manually actuated independent sanding control valve having a running position, a forward sanding position and a reverse sanding position on opposite sides of running position in each of which it causes sanding independently of the pneumatically actuated valve, and a reset position in which it serves to reset the pneumatically actuated sanding control valve if then active and without regard to the termination of said time period.

2. The combination of a pneumatically actuated sanding control valve; means for putting said valve into action; timing means rendered active by the initial operation of said valve to maintain it active for a definite time period; and a manually actuated independent sanding control valve having a running position, a forward sanding position and a reverse sanding position on opposite sides of running position in each of which it causes sanding independently of the pneumatically actuated valve, and a reset position in which it serves to reset the pneumatically actuated sanding control valve if then active and without regard to the termination of said time period; and two yielding stops, one resisting motion of the independent sanding control valve from running to reverse sanding position and the other resisting its motion from forward sanding position to reset position, said valve moving without resistance by said stops between running and forward sanding positions.

3. In a sanding system for a vehicle or train of vehicles having driving wheels and free running wheels, the combination of an electrically controlled sanding unit for sanding driving wheels in forward running; at least one electrically controlled sanding unit for sanding free running wheels in forward running; a pneumatically controlled sanding unit for sanding driving wheels in reverse running; a normally open pressure actuated sanding switch for energizing both said electrically controlled units; a normally closed pressure actuated interlock switch for disconnecting the second named electrically controlled unit to inhibit its actuation by said pressure actuated sanding switch; a primary sanding control valve having an inactive position in which both pressure actuated switches are vented; and a sanding position in which the pressure actuated sanding switch is subjected to pressure to cause it to close and the pressure actuated interlock switch is vented so that it remains closed; timing means rendered active by motion of the primary sanding control valve to sanding position and serving to maintain said valve in such position for a definite time period; means operable to shift said primary sanding control valve to sanding position; pressure operable reset means for restoring said primary sanding control valve to inactive position; and a manually operable sanding-at-will valve capable of functioning independently of said primary sanding control valve and having a forward sanding position in which it delivers pressure fluid to both said pressure actuated switches and maintains said pneumatically controlled sanding unit inactive, a neutral position, a reverse sanding position in which it renders said pneumatically controlled sanding unit alone active; and a reset position in which it vents said pressure actuated sanding switch to cause said switch to open and delivers pressure fluid to said pressure operated reset means.

4. In a sanding controller, the combination of a primary sanding control valve comprising means forming a combined timing and valve chamber and associated cylinder, a piston reciprocable in said cylinder and subject on its opposite sides to pressures in said chamber and pres-

sure in a reset chamber in the outer end of said cylinder, a spring biasing said piston toward said timing chamber, a valve seat in said timing chamber, a valve coacting with said seat and connected with said piston to be shifted thereby between a running position to which the spring urges the piston and valve when pressures on the piston are equalized and a sanding position to which the piston moves when the reset chamber is vented, said valve and seat controlling ports as follows, a charging port to the timing chamber and a restricted equalizing port from the timing chamber to the reset chamber, both open in running and closed in sanding position, a sanding port leading from the timing chamber closed in running and open in sanding position, and bridging, interlocking and exhaust ports, the first two of which are connected and the third blanked in running position, whereas the first is blanked and the second and third connected in sanding position; means for venting said reset chamber to put said primary sanding control valve into action; and a manually operable secondary sanding control valve shiftable independently of said primary control valve and having a sanding position in which it delivers air under pressure simultaneously to said sanding and bridging ports.

5. In a sanding controller, the combination of a primary sanding control valve comprising means forming a combined timing and valve chamber and associated cylinder, a piston reciprocable in said cylinder and subject on its opposite sides to pressures in said chamber and pressure in a reset chamber in the outer end of said cylinder, a spring biasing said piston toward said timing chamber, a valve seat in said timing chamber, a valve coacting with said seat and connected with said piston to be shifted thereby between a running position to which the spring urges the piston and valve when pressures on the piston are equalized and a sanding position to which the piston moves when the reset chamber is vented, said valve and seat controlling ports as follows, a charging port to the timing chamber and a restricted equalizing port from the timing chamber to the reset chamber, both open in running and closed in sanding position, a sanding port leading from the timing chamber closed in running and open in sanding position, and bridging, interlocking and exhaust ports, the first two of which are connected and the third blanked in running position, whereas the first is blanked and the second and third connected in sanding position; means for venting said reset chamber to put said primary sanding control valve into action, said means comprising a pressure operated vent valve; and a manually operable secondary sanding control valve operable independently of said primary sanding control valve and having a sanding position in which it delivers air under pressure simultaneously to said sanding and bridging ports.

6. In a sanding controller, the combination of a primary sanding control valve comprising means forming a combined timing and valve chamber and associated cylinder, a piston reciprocable in said cylinder and subject on its opposite sides to pressures in said chamber and pressure in a reset chamber in the outer end of said cylinder, a spring biasing said piston toward said timing chamber, a valve seat in said timing chamber, a valve coacting with said seat and connected with said piston to be shifted thereby between a running position to which the spring urges the piston and valve when pressures on the piston are equalized and a sanding position to which the piston moves when the reset chamber is vented, said valve and seat controlling ports as follows, a charging port to the timing chamber and a restricted equalizing port from the timing chamber to the reset chamber, both open in running and closed in sanding position, a sanding port leading from the timing chamber closed in running and open in sanding position, and bridging, interlocking and exhaust ports, the first two of which are connected and the third blanked in running position, whereas the first is blanked and the second and third connected in sanding position; means for venting said reset chamber to put said primary sanding control valve into action, said means comprising a pressure operated vent valve, and a manually operable valve serving when actuated to deliver operating pressure fluid thereto; and a manually operable secondary sanding control valve operable independently of said primary sanding control valve and having a sanding position in which it delivers air under pressure simultaneously to said sanding and bridging ports.

7. The combination of a pneumatically actuated sanding control valve; means for putting said valve into action; timing means rendered active by the initial operation of said valve to maintain it active for a definite time period; a manually actuated independent sanding control valve having a running position, a forward sanding position and a reverse sanding position on opposite sides of running position in each of which it causes sanding independently of the pneumatically actuated sanding control valve, and a reset position in which it serves to reset the pneumatically actuated sanding control valve if then active and without regard to the termination of said time period; and yielding means serving to move the manually actuated valve from said reset position.

8. In a sanding system for a vehicle or train of vehicles having driving wheels and free running wheels, the combination of at least one sanding unit for driving wheels and at least one sanding unit for free running wheels; a pneumatically actuated sanding control valve arranged to operate all said sanding units; automatic means for putting said sanding control valve into action; timing means rendered active upon operation of said sanding control valve to maintain it in action for a definite time period; and an independent manually operable control valve connected to actuate the sanding unit for the driving wheels and also connected with said pneumatically actuated sanding control valve, said independent valve having a sanding position in which it operates the sanding unit for the driving wheels and a distinct reset position in which it serves to reset the pneumatically actuated valve if then active, without regard to the termination of said time period.

9. In a sanding system for a vehicle or train of vehicles having driving wheels and free running wheels, the combination of at least one sanding unit for driving wheels and at least one sanding unit for free running wheels; a pneumatically actuated sanding control valve arranged to operate all said sanding units; timing means rendered active upon operation of said sanding control valve to maintain it in action for a definite time period; automatic means for putting said sanding control valve into action; manually operable means for putting said sanding control valve into action; and an independent manually oper-

able control valve connected to actuate the sanding unit for the driving wheels and also connected with said pneumatically actuated sanding control valve, said independent valve having a distinct reset position in which it serves to reset the pneumatically actuated valve if then active, without regard to the termination of said timing period.

10. In a sanding system for a vehicle or train of vehicles having driving wheels and free running wheels, the combination of at least one sanding unit for driving wheels and at least one sanding unit for free running wheels; pneumatically operable activating means for said sanding units comprising two pressure operated devices so arranged that supply of pressure fluid to both or only one thereof respectively causes operation of the sanders for all wheels or of the sanders for the driving wheels only; a pneumatically actuated sanding control valve connected to deliver pressure fluid to said activating means to operate the sanders for all wheels; timing means rendered active upon operation of said sanding control valve to maintain it in action for a definite time period; means for putting said sanding control valve into action; and an independent manually operable control valve arranged to deliver pressure fluid to said activating means to cause operation of the sander for the driving wheels only, the parts being so arranged that when both the pneumatically and the manually actuated sanding control valves are in sanding position the sanders for all wheels will be operated.

11. In a sanding system for a vehicle or train of vehicles having driving wheels and free running wheels, the combination of at least one sanding unit for driving wheels and at least one sanding unit for free running wheels; a pilot unit comprising a normally inert activator and an inhibitor so arranged that when the activator is inert all sanders are inactive, when the activator is active and the inhibitor inactive all sanders are operated, and when both activator and inhibitor are active the sanders for the driving wheels alone are operated; a primary controller connected with the pilot unit and operable to render the activator alone active; automatic means for putting said primary controller into action; a manually operable secondary controller connected with the pilot unit and operable to render both said activator and inhibitor simultaneously active; and intercepting means effective in the sanding position of the primary controller to render the inhibiting means inert irrespective of the action of the secondary controller.

12. In a sanding system for a vehicle or train of vehicles having driving wheels and free running wheels, the combination of two independent sanding units; a pilot unit comprising a normally inert activator and a related inhibitor so arranged that when the activator is inert both sanders are inactive, when the activator is active and the inhibitor inactive, both sanders are active, and when both activator and inhibitor are active, one only of said two sanding units is active; a primary controller connected with the pilot unit and operable to render the activator alone active; a secondary controller connected with the pilot unit and operable to render both said activator and inhibitor simultaneously active; and intercepting means effective in the sanding position of the primary controller to render said inhibiting means inert irrespective of the position of the secondary controller.

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