

[72] Inventor **Swamidas K. Punwani**
Lancaster, N.Y.
 [21] Appl. No. **741,116**
 [22] Filed **July 9, 1968**
 [45] Patented **Jan. 19, 1971**
 [73] Assignee **Dresser Industries, Inc.**
Dallas, Tex.
a corporation of Delaware

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Primary Examiner—Drayton E. Hoffman
Attorney—Wilmer Mechlin

[54] **AUTOMATIC COUPLING SYSTEM FOR TRAIN
 BRAKE LINES**
17 Claims, 8 Drawing Figs.

[52] U.S. Cl. **213/76**
 [51] Int. Cl. **B61g 5/06**
 [50] Field of Search **213/76**

[56] **References Cited**
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ABSTRACT: A system for any railway car having mechanical couplers and air brakes for automatically coupling and uncoupling the air brake line, the system including an air coupler mounted for automatic coupling and uncoupling incident to mechanical coupling and uncoupling and valve mechanism which is pneumatically powered from the brake line and not only responsive to intentional mechanical coupling and uncoupling for automatically opening and closing the line, but also differentiates between intentional and accidental uncoupling for bleeding the line and producing a brake application on accidental uncoupling.

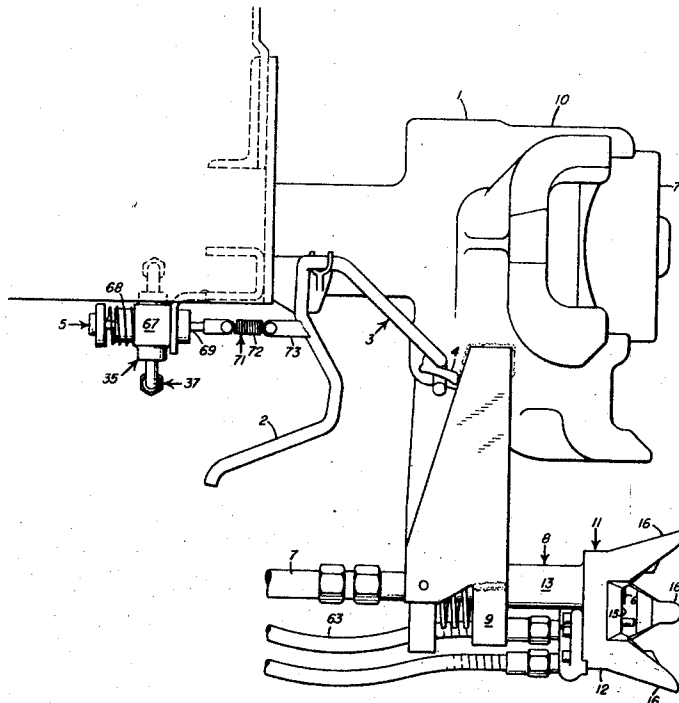


FIG. 1

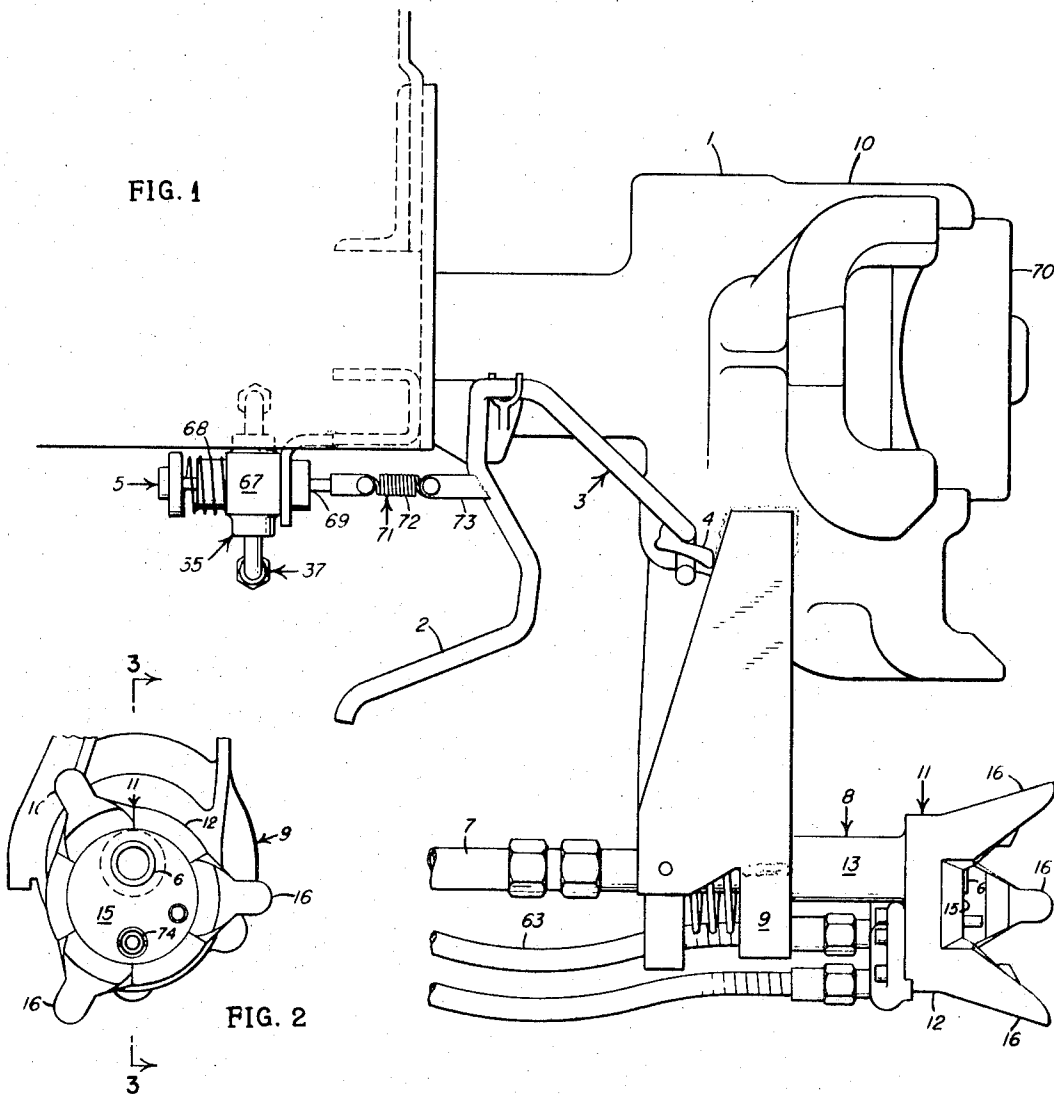


FIG. 2

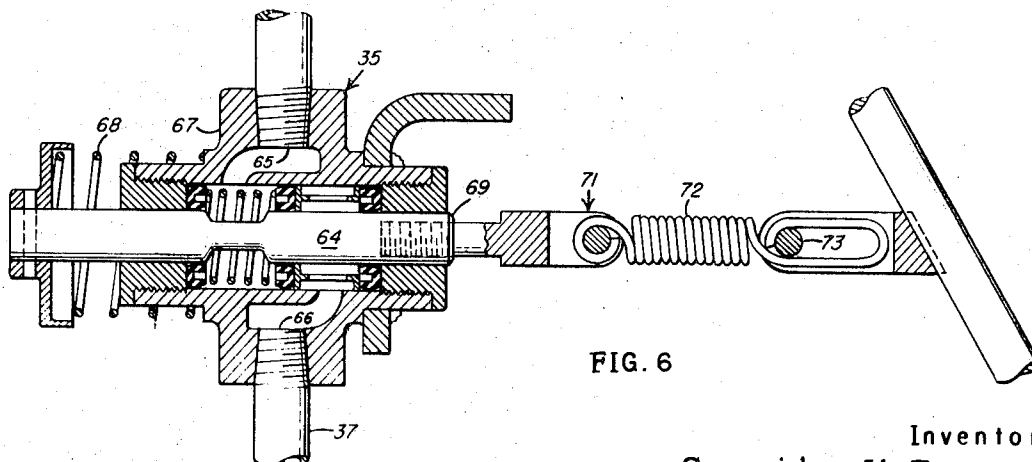


FIG. 6

Inventor:
Swamidas K. Punwani
By *Wilmer Mechlin*
his Attorney

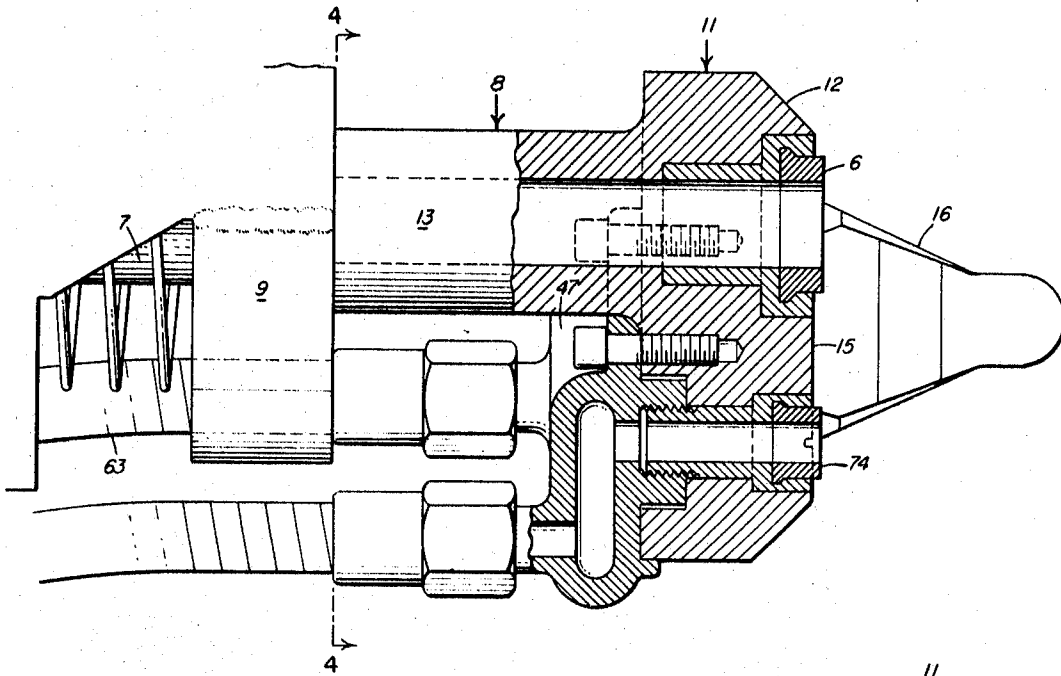


FIG. 3

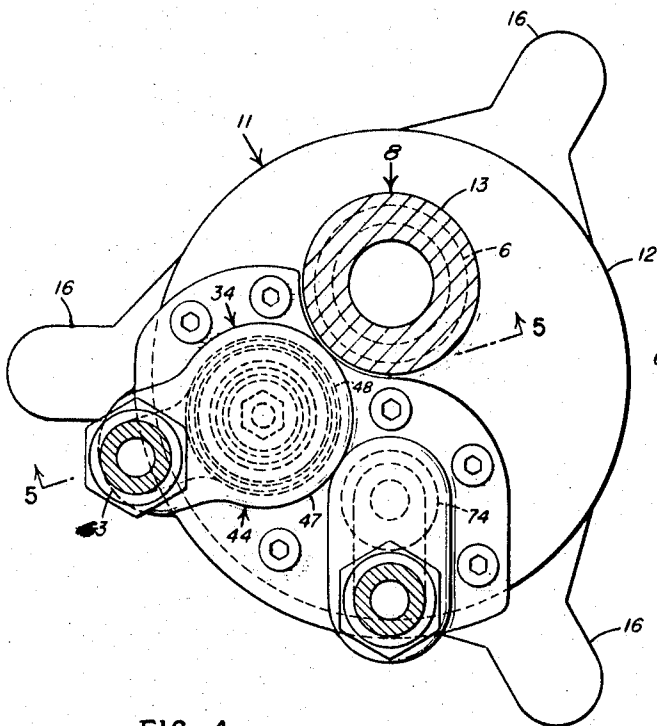


FIG. 4

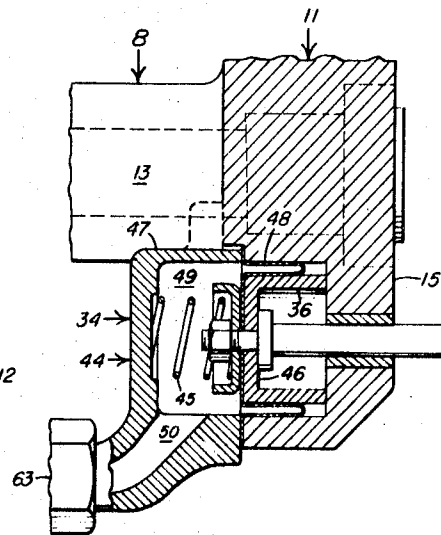
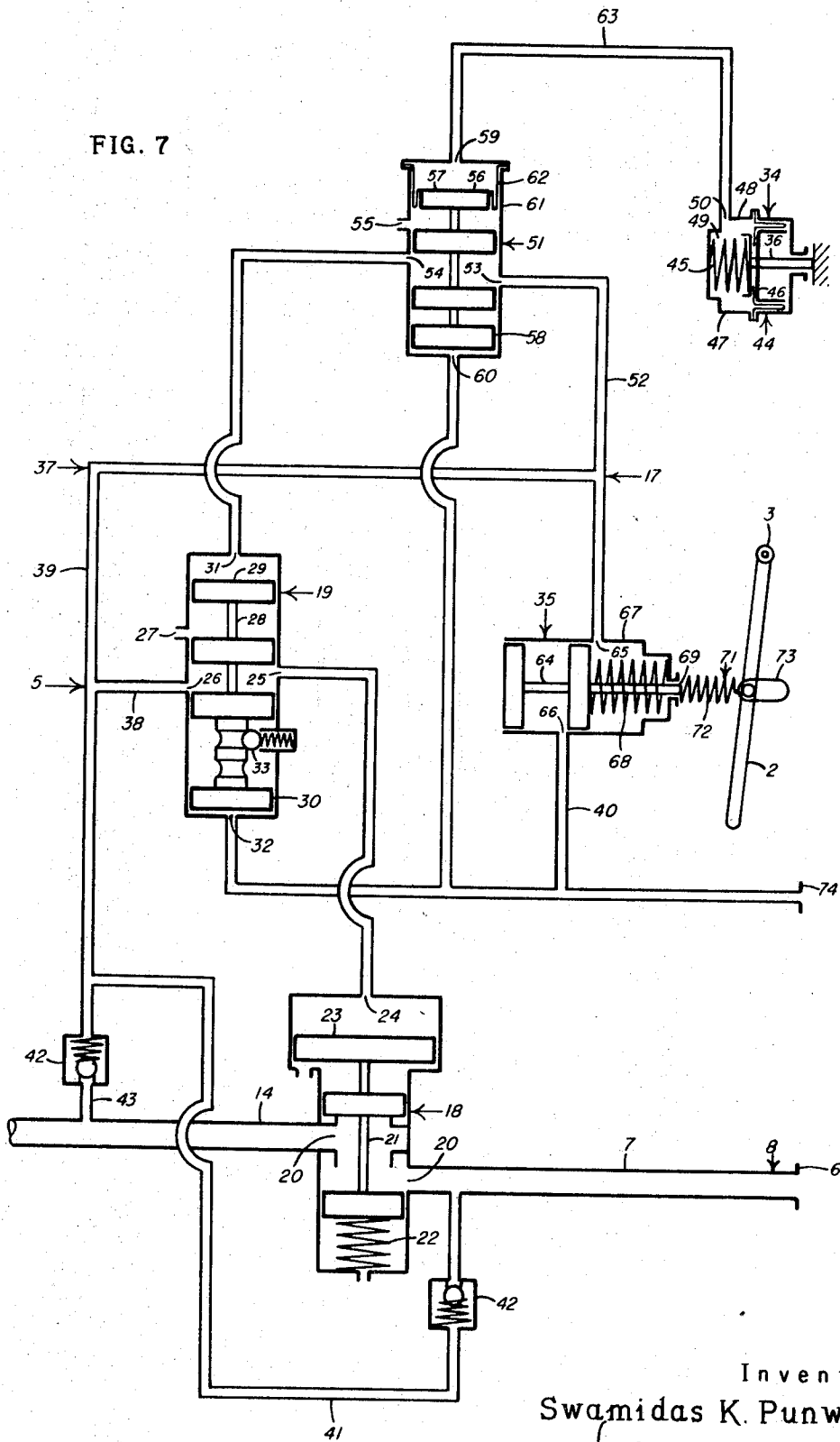


FIG. 5

Inventor:
Swamidas K. Punwani
By *Wilmer Mecklin*
his Attorney

FIG. 7



Inventor:
Swamidas K. Punwani
By *Wilmer Mecklin*
his Attorney

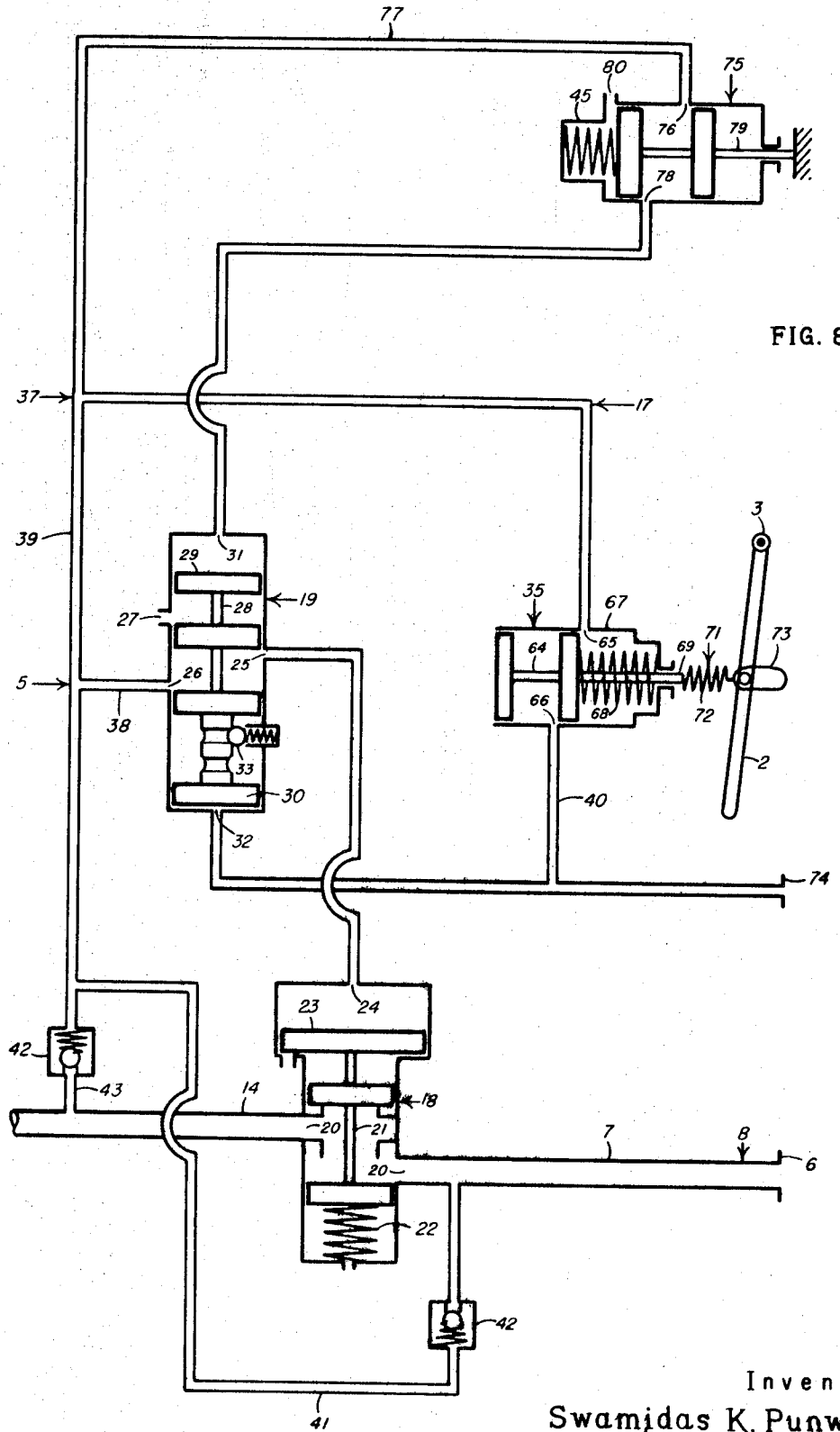


FIG. 8

Inventor:
Swamidas K. Punwani
By *Wilmer Mecklin*
his Attorney

AUTOMATIC COUPLING SYSTEM FOR TRAIN BRAKE LINES

BACKGROUND OF THE INVENTION

To meet regulations of the Interstate Commerce Commission, railway cars are equipped with air brakes which are applied in the absence and released in the presence of air pressure in the brake line and thus will be applied automatically in the case of an accidental break in the line. Conversely, when the line is intentionally separated between cars the ends of the line at both sides of the break must be closed to enable the brakes of the cars remaining in the train to be controlled and the cars uncoupled from the train to retain their mobility for humping or other purpose.

Some cars, notably rapid transit cars, are equipped with combined mechanical, air and electric couplers having associated electric control circuits for automatically valving the brake line open and closed respectively on intentional coupling and uncoupling and open on accidental uncoupling. However, the vast majority of railway cars are freight cars having no electric power and the few freight cars that do and the passenger cars in interchange service have no such control circuits.

Air couplers for the A.A.R. standard knuckle-type couplers used in interchange service, for automatically coupling and uncoupling train air lines between cars incident to mechanical coupling and uncoupling, have been developed, but heretofore, there has been no development of an electrically independent automatic valving system for brake lines capable of differentiating between intentional and accidental uncouplings. For lack of the latter development, the former thus has not previously been practical. Consequently, except for the relatively few cars equipped with fully automatic combine mechanical, air and electric couplers, it remains necessary in coupling and uncoupling operations for a workman to go between the cars involved and manually couple and uncouple the gladhands at the adjoining ends of the brake line and operate the angle cocks for those ends. It is to this problem that the present invention is particularly directed.

SUMMARY OF THE INVENTION

The primary object of the present invention is to provide a pneumatic coupling system applicable to any railway car equipped with mechanical couplers and air brakes for automatically coupling and uncoupling and valving the car's brake line and in valving differentiating between intentional and accidental uncoupling respectively for closing the line to prevent and bleeding it to produce a brake application.

Another object of the invention is to provide a mechanopneumatic coupling system for automatically coupling and uncoupling and valving a brake line of a railway car which not only differentiates between intentional and accidental uncoupling, but depends for operation only on the forces involved in coupling and uncoupling the associated mechanical coupler and pneumatic pressure supplied by the brake line of its own or an adjoining car.

A further object of the invention is to provide an automatic pneumatic coupling system for a brake line which, when coupled to a mating system of another car, enables the adjoining brake line valves on both cars to be closed from either car in an uncoupling operation.

Attaining the above objects, the improved pneumatic coupling system of this invention combines with an air coupler mounted on or connected to and automatically couplable and uncouplable incident to coupling and uncoupling of the mechanical coupler, valve mechanism automatically responsive to coupling and uncoupling of the mechanical coupler. The preferred valve mechanism includes a pneumatic piping circuit connected for supply only therefrom to the brake line of its own car and, when coupled, also preferably so connected to that of the adjoining car. An air-operated brake line valve of the mechanism is normally closed and adapted to

open on coupling, close on intentional uncoupling and remain open on accidental uncoupling. Operating air for this valve is supplied by one or the other of the brake lines through the piping circuit and preferably controlled in its application by an air-actuated control valve and pilot valves for controlling the actuation of the control valve, one pilot valve being mechanically responsive to coupling of the mechanical coupler for actuating the control valve to open the brake valve and the other responsive only to intentional unlocking of the mechanical coupler for actuating the control valve to close the brake valve.

A pilot line, preferably included in the piping circuit and connected on coupling to a corresponding line of the then mated system, enables the response of the second or closing-initiating pilot valve to be applied also to the line valve of the other system. The second pilot valve responding only to intentional unlocking and the piping circuit being supplied by, but not exhausting through, the brake line, the brake valve in an accidental uncoupling remains open for bleeding the brake line to atmosphere and producing the then required brake application. In the preferred embodiment, only the coupling pilot valve and the air couplers at the ends of the brake and pilot valve and the air couplers at the ends of the brake and pilot lines are required to be directly exposed to service shocks on the mechanical coupler, with consequent minimizing of the potential damage to more fragile components of the system.

The foregoing and other objects and features of the invention will appear hereinafter in the detailed description, be particularly pointed out in the appended claims, and be illustrated in the accompanying drawings, in which:

FIGURE DESCRIPTION

FIG. 1 is a fragmentary side elevational view of an application of the automatic coupler system of the present invention to a typical knuckle type mechanical coupler;

FIG. 2 is a fragmentary front elevational view of the train line connector of FIG. 1;

FIG. 3 is a fragmentary vertical sectional view on an enlarged scale, taken along lines 3-3 of FIG. 2;

FIG. 4 is a vertical sectional view taken along lines 4-4 of FIG. 3;

FIG. 5 is a fragmentary sectional view taken along lines 5-5 of FIG. 4;

FIG. 6 is a longitudinal sectional view on an enlarged scale of the uncoupling valving of FIG. 1 and its connection to the lock operating rod of the mechanical coupler;

FIG. 7 is a schematic view of a preferred embodiment of the valve mechanism of the system of the present invention; and

FIG. 8 is a schematic view of an alternate embodiment of the valve mechanism.

DETAILED DESCRIPTION

Referring now in detail to the drawings in which like reference characters designate like parts, the automatic pneumatic coupling system of the present invention is applicable to the brake line of any railway car equipped with air brakes and automatically couplable mechanical couplers, whether or not the mechanical couplers are manually or automatically uncouplable. The system thus may be applied to a car equipped with combined mechanical, air and electric couplers for pneumatically rather than electrically controlling automatic coupling and uncoupling of the brake line. However, the greatest present need for it is on freight cars in interchange service which have no electric lines and, for lack of an automatic coupling system differentiating between intentional and accidental uncoupling, must now have their brake lines coupled, uncoupled and valved by workmen going between cars, with consequent danger to the workmen and expense to the railroads. It, thus, is to a typical freight car equipped with A.A.R. standard knuckle-type freight car couplers and having as its only through train line a brake line for operating its air

brakes, that the improved pneumatic coupling system has been applied as exemplary of the invention, with the illustration and description limited to one of the independently operable duplicate systems at opposite ends of the car.

In the exemplary freight car application, the car has as its mechanical coupler 1, an A.A.R. standard knuckle-type freight coupler, suitably a Type F interlocking coupler. Coupling or locking automatically as it and a mating coupler are brought together in a coupling operation, the illustrated coupler 1 typifies knuckle-type and other conventional couplers in being uncouplable if either it or the mating coupler is unlocked. Ordinarily and on the illustrated coupler, this uncoupling or unlocking operation is performed on one of the couplers by manually applying leverage to a handle 2 at a side of the car of an operating rod 3 mounted on the end of the car and mechanically connected to the rotor 4 of the coupler's locklift assembly (not otherwise shown). However, if, as in Cope Pat. No. 3,245,553, issued Apr. 12, 1966, the coupler is unlockable by a fluid-operated uncoupling mechanism, the uncoupling or unlocking operation may be performed either manually on a handle of the mechanism at the same location or by remote control, the result of the unlocking in any case being to uncouple the couplers.

Combined with the illustrated or other suitable mechanical coupler 1, the automatic pneumatic coupling system of this invention, designated as 5, is comprised of an air coupler 6 on the adjoining end of the car's brake line 7. Suitably a rubber or like grommet or bushing, the air coupler 6 is intended to couple and uncouple automatically on or incident to coupling and uncoupling of the mechanical coupler. How this is accomplished will depend somewhat on the form of the mechanical coupler. Thus, with a mechanical coupler of the automatic hook-type, the air coupler can readily be mounted directly on the mechanical coupler by insetting it in the coupler's flat front face, while, with a knuckle or other type of mechanical coupler not having such a face, the air coupler is more conveniently mountable on a separate train line connector itself mounted either on the mechanical coupler or independently on the adjoining end of the car and connected therethrough to the mechanical coupler. Consistently, the preferred mounting of the air coupler 6 for the illustrated automatically coupling Type F knuckle coupler is on a train line connector 8 generally similar to that disclosed in Geoffrey W. Cope application Ser. No. 706,484, filed Feb. 19, 1968, in having a housing 9 fixed to and suspended from the head 10 of the coupler 1 and a coupler member 11 gimbal-mounted for relative longitudinal and universal movement in the housing. As in the Cope application, the coupler member 11 has a head 12 positioned forwardly of the housing and a hollow shank 13 extending from the head rearwardly through the housing and flexibly connected to the usually rigid within-car section 14 of the brake line 7. Also similarly, the coupler member 11 has a flat circular front face 15 surrounded by integral gathering wings 16 and the air coupler 6 is inset in that face at the front end of the hollow shank 13 which forms the front or outer side of the brake line.

For automatically valving, as well as coupling and uncoupling the adjoining end of the brake line, the coupling system 5 includes a valve mechanism or assembly 17 which not only opens and closes automatically in response to coupling and intentional uncoupling, but also automatically differentiates between intentional and accidental uncoupling of the coupler 1 or coupler member 9, respectively, for closing the brake line to hold pressure and bleeding it to atmosphere to produce the brake application required in such case. Depending for its automatic operation entirely on the coupling and uncoupling operations of the mechanical coupler 1 and brake line air pressure, the preferred valve mechanism is essentially an assembly of pneumatic or, more simply, air valves, powered in part by brake line pressure and responsive to the condition of the mechanical coupler for opening or closing communication with the brake line 7 through the air coupler 6, as appropriate to that condition.

As its basic components, the preferred valve mechanism 17 has a normally closed, air-operated or piloted brake or brake line valve 18 in the end portion of the brake line 7 for opening and closing communication therewith through the air coupler 6, an air-actuated or piloted control valve 19 for controlling application of operating air to the brake valve and valving controlled by and responsive to coupling and intentional uncoupling of the mechanical coupler for pneumatically controlling the condition of the control valve and therethrough that of the brake valve. Suitably, the brake valve 18 may be a two-way, air-opened, spring-closed valve, that illustrated being of the poppet type with side or inlet and outlet ports 20 for connection in the brake line, a valve member 21 balanced against pressure in the brake line for closing and opening communication between the side ports, a return spring 22 for shifting the valve member in a closing direction and, as an air pilot for shifting the valve member in the opposite direction against the spring, a head 23 on the end of the member and presented or exposed to operating air admitted through an operating air port 14 in the corresponding end of the valve.

As illustrated, the companion control valve 19 for controlling the operation of the brake valve 18, suitably is a three-way, double-piloted actuated and detented valve of the spool type having for air for operating the brake valve 18 an outlet port 25 connected to the operating air port 14 of the brake valve and inlet and exhaust ports 26 and 27 alternately connectable to the outlet port. For making the alternate connections, while balancing the pressure upon it of the operating air, the preferred valve member 28 of the control valve is a multiheaded spool, appropriately headed for bracketing the flow controlling ports 25, 27 and 26 and having at opposite ends to serve as the double air pilots of the valve a coupling head 29 and an intentional uncoupling head 30 presented or exposed to actuating air admitted respectively through a coupling air port 31 and an intentional uncoupling air port 32 at or in the corresponding ends of the valve. Shiftable in one direction to a coupling position by air pressure applied to its coupling head 29 and in the opposite direction to an uncoupling position by air pressure applied to its uncoupling head 30, the valve member 28 is adapted to be yieldably held in either position by a spring-pressed ball or other suitable locking detent or device 33.

The coupling and uncoupling valving, responsive to coupling and intentional uncoupling of the mechanical coupler 1 and responsible for operating the brake valve 18, preferably includes separate coupling and uncoupling valves 34 and 35 directly responsive respectively to coupling and intentional uncoupling of the mechanical coupler and on their outlet sides connected or connectable respectively to the coupling and uncoupling air ports 31 and 32 of the control valve 19. For any type of mechanical coupler, the coupling valve 34 suitably is of the spring-pressed or returned, plunger type and mounted in the head 10 or 12 of the mechanical coupler or the separate train line connector 8, depending on the form of the mechanical coupler, with its plunger 36 normally spring-projected and presented for engagement with and depressing, telescoping or actuating by the mating coupler or coupler member. In turn, the uncoupling valve 35 will be actuated mechanically or otherwise, as appropriate to the lock operating mechanism by which the mechanical coupler is unlocked or uncoupled. For the illustrated mechanically unlocked mechanical coupler 1, the coupling and uncoupling valves 34 and 35 are both suitably mechanically actuated, each for applying actuating air to the corresponding end of the control valve 19.

While a reservoir or other suitable pressure source may be also used on cars so equipped for universal application, brake line pressure, usually in the range of 80—90 p.s.i., is contemplated to be used for supplying or powering the valve mechanism 17 with compressed air for actuating or operating at least the brake and control valves 18 and 19. For such supply, the valve mechanism conveniently includes a pneumatic piping circuit 37 in which its several valves are directly

or indirectly connected and which taps the brake line 7 for air pressure. This circuit preferably has at least two branch lines, one 38 for direct supply of brake line air or air pressure to the control valve 19 for operating the brake valve 18 and the other 39 having the uncoupling valve 35 connected therein for supplying the same pressure through that valve to the uncoupling port 32 of the control valve. A bypass line 41 from the air coupler 6 to the piping circuit 37 around the brake valve 18 also preferably is provided for supplying or powering the piping circuit with pressure from the brake line of a car coupled to its end of its own car in case its own brake line is for some reason uncharged, unpressurized, or dead at a time when supply of air power is demanded. Further, for enabling the piping circuit to be supplied, charged, or powered with brake line pressure, without losing pressure to its own or the adjoining brake line on subsequent pressure fluctuations in or unpressurizing or exhausting of the latter, check valves 42 are provided in the bypass line 41 and in the lead or tap 43 of the piping circuit to its own brake line 7 beyond its connection to the bypass line.

The same in the foregoing respects, the main, primary or first and the alternate, secondary or second embodiments of the valve mechanism 17, illustrated as exemplary of the invention, differ in the particulars now to be described. In the main embodiment shown in FIG. 7, the coupling valve 34 is so-called puffer or one-way valve 44 capable itself of developing or producing a charge of compressed air on actuation or depressing of the plunger 36 against the force of the latter's return spring 45. This charge is developed by a piston or pressure head 46 on the rear end of the plunger and suitably sealed to the valve body 47 by a rolling diaphragm 48, in a pressure chamber 49 in the body rearward of the head. The puffer 44 has as its only port an outlet port 50 leading from the pressure chamber 49.

The puffer 44 is rugged and, since developing its own charge and not dependent for supply on brake line pressure, is readily mountable either in the head of a suitable mechanical coupler, such as the automatic hook type, or, as illustrated, in the head 12 of the coupler member 11 of a separate train line connector 8 with its plunger 36 normally projected by the spring 45 for engagement with the mating coupler or member and without risk of damage to itself or its connection to the balance of the valve mechanism 17 from service shocks on the mechanical coupler. However, as the pressure charge it is capable of developing is low relative to brake line pressure and usually around 5 p.s.i., the puffer is not readily adapted to actuate the control valve 19 directly and, instead, ordinarily must act as a primary pilot valve for actuating or operating a secondary pilot or fluidic interface valve 51, sensitive in actuation to the puffer's low pressure and supplied brake line pressure on its inlet side through branch line 52 of the piping circuit 37 to which its inlet port 53 is connected. Except for its sensitivity in actuation to low pressure, the secondary pilot valve 51 suitably is a double-piloted valve similar to the control valve 19 in having an outlet port 54 alternately connectable to the inlet port 53 and an exhaust 55, with the ports so connectable by a multiheaded spool or valve member 56 balanced against operating air passing between the ports and having as air pilots coupling and uncoupling actuating heads 57 and 58, exposed or presented to actuating air admitted through coupling and uncoupling air ports 59 and 60 at corresponding ends of the valve. For sensitivity preferably sealed against leakage to the body 61 of the secondary pilot valve 51 by a rolling diaphragm 62, the coupling head 57 is exposable to a pressure charge from the puffer 44 applied through a line 63 connecting the puffer's outlet port 50 to the coupling port 59 of the secondary pilot valve. In turn, the outlet port 54 of the latter valve is connected to the coupling port 31 of the control valve 19 for alternately supplying actuating air at brake line pressure to and bleeding the air from the coupling pilot end of the control valve.

Connected in series in the piping circuit 37, the secondary pilot valve 51, control valve 19 and brake valve 18 are auto-

matically pneumatically operated or actuated in series or sequence and substantially simultaneously and instantaneously on mechanical actuation of the puffer 44 in a coupling operation, the secondary pilot valve opening in response to the pressure charge from the puffer for supplying actuating air at brake line pressure for opening the control valve and therethrough applying operating air at the same pressure to the brake valve for opening the latter. In process, the valve member 28 of the control valve 19 will have been shifted to coupling position to connect the inlet and outlet ports 26 and 25 and then yieldably held or locked in that position by the locking detent 33, regardless of continued application of pressure to its coupling head 29, and in that position causes the brake valve 18 to be opened and held open by the brake line pressure supplied through the piping circuit 37. Conversely, in an intentional uncoupling operation, the brake valve must be closed by bleeding the operating air on its operating head 23 for enabling its valve member 21 to be shifted to closed position under force of the spring 22. This action is produced automatically through the uncoupling valve and pneumatic connections on its outlet side to the control valve 19 and secondary pilot valve 51, by connecting the uncoupling valve to the lock operating mechanism of the mechanical coupler 1 for operation or actuation thereby.

If, as in the illustrated embodiments, the associated mechanical coupler 1 is unlocked by manual operation or actuation of the operating rod 3 of its mechanical lock operating mechanism through the rod's handle 2, the uncoupling valve 35 conveniently is connected to the handle for mechanical actuation thereby as the handle is swung to unlock the mechanical coupler. Suitably for the purpose, the illustrated uncoupling valve is a two-way, so-called stop or on-off valve, whose valve member 64 is necked to pass air between inlet and outlet ports 65 and 66 in the body 67 of the valve and normally is held in position to close or block access between those ports by a return spring 68. For shifting it to open position against the force of the spring 68, the valve member 64 has a stem 69 projecting through and beyond one end of the valve body 67 and conveniently clevised at its outer end for mechanical connection to the handle 2 of the operating rod 3 intermediate the handle's ends and outwardly of or away from its swinging axis. To prevent accidental actuation or operation of the uncoupling valve 35 by limited swinging of the handle 2 under service forces on the car and delay but ensure full actuation by the time the lock (not shown) of the illustrated knuckle type coupler 1 has reached lock-set or unlocked position preparatory to throwing open the knuckle 70, as well as to minimize the stress on the valve member 64 if the handle is overswung, the preferred connection is a combined spring and lost motion connection 71 connected at its ends to the stem 69 and the handle. Combining a spring 72 and a pin-and-slot lost motion connection 73 arranged in tandem, the connection 71 takes up accidental swinging in lost motion and the actual actuation and any overswinging in the spring. Thus, for the illustrated Type F coupler with an arc of swing of the handle of about 50° to lockset position, the pin-and-slot connection 73 suitably can take up the first 40° of the handle's swing and the spring 72 the balance.

So connected for actuation to the unlocking mechanism of the mechanical coupler 1, the uncoupling valve 35 is connected in the uncoupling branch or pilot air line 40 of the piping circuit 37 with its inlet port 65 open to brake line pressure and its outlet port 66 connected through separate leads to uncoupling ports 32 and 60, respectively, of the control valve 19 and secondary pilot valve 51. Thus, on opening of the uncoupling valve, brake line pressure will be applied to the uncoupling heads 30 and 58 of the control and secondary pilot valves. The opposing pressure in the secondary pilot valve 51 being the relatively low pressure produced by the puffer 44, the line pressure on the uncoupling head 58 of that valve will shift its valve member 56 to the position in which its outlet port 54 is connected to its exhaust port 55 and thereby exhaust the operating air from the coupling head 29 of the con-

trol valve. Thereupon unopposed, the brake line pressure on the uncoupling head 30 of the control valve 19 will shift its valve member 28 to a position to connect its outlet port 25 to its exhaust port 27. Locked in that exhausting position by its locking detent 33, the control valve, by bleeding or exhausting through it the operating air from the actuating head 23 of the brake valve 18 will cause the latter to close under force of its spring 22 and prevent escape of air from the brake line 7 through the air coupler 6 when the latter and its mating coupler are uncoupled or separated.

As the unlocking of one of a pair of coupled mechanical couplers generally suffices for uncoupling them, the uncoupling pilot line 40 preferably is extended forwardly to the coupler 1 or coupler member 11 mounting the brake line air coupler 6 and has at its front end a similar and similarly mounted air coupler 74 for coupling in a coupling operation with a mating pilot line air coupler of the control system on the adjoining end of the other car. This enables opening of the uncoupling valve 35 on either car automatically to produce closing of the adjoining brake valves 18 on both cars through the control valves 19 and secondary pilot valves 51 of the two systems. As its air coupler 74 in an intentional uncoupling uncouples or separates from that of a mating system, the pilot line 40 bleeds the uncoupling pressure applied through the uncoupling valve 35. This and the simultaneous release of the plunger 36 of the coupling valve 34, automatically readies or presets the system for the next coupling operation.

As in Cope application Ser. No. 706,484, the illustrated coupler member 11, in whose head 12 the air couplers 6 and 74 and puffer 44 are mounted and from whose front face 15 the air couplers and the plunger 36 of the puffer project, has its front face 15 normally projecting forwardly of the coupling line of the associated mechanical coupler 1, to release the coupler member for angling relative to its housing 9 into alignment with the mating coupler member prior to completion of mechanical coupling and thus ensure proper coupling of the air couplers and actuation of the puffer.

The alternate or second embodiment of the valve mechanism 17, shown in FIG. 8, is identical with the main or first embodiment except that in a coupling operation it is, adapted to apply brake line pressure directly from the mechanically actuated coupling valve 34 to the coupling head 29 of the control valve 19 without changing the action of the control valve in coupling and intentional uncoupling operations. This it accomplishes by employing as its mechanically actuated coupling valve a three-way, plunger-actuated valve 75 which replaces both the puffer 44 and the secondary pilot valve 51 of the first embodiment and is like the puffer in being mounted in the head 10 or 12 of the mechanical coupler, or, as illustrated, the coupler member 11 of the separate air connector 8 and having for actuation the coupling valve plunger 36 normally spring-projected forwardly from an appropriate part of the mechanical coupler or the front face 15 of the coupler member for engagement in a coupling operation with and retraction or telescoping by the mating coupler or coupler member.

Instead of developing its own pressure, the coupling valve 75 has an inlet port 76 connected to a branch line 77 of the pneumatic piping circuit 37 for supply of brake line pressure therefrom and an outlet port 78 connected to the coupling air port 31 of the control valve 19. Normally blocked or closed from the inlet port 76 by a valve member 79, of which the plunger 36 is the forwardly projecting stem, and then connected to the exhaust port 80, the outlet port 78, when the plunger is retracted or depressed, is connected to the inlet port for passing brake line pressure through the then open but normally closed valve to the coupling head 29 of the control valve 19. As the plunger 36 will be held against spring projection by the mating coupler or coupler member, when the uncoupling valve 35 is actuated in an uncoupling operation, at that time the pressure on the coupling head 29 of the control valve 19 cannot exhaust and both that head and the uncoupling head 30 are exposed or subjected to brake line pres-

sure. Consequently, to enable it to shift under the pressure on the uncoupling head to exhausting position for bleeding the operating air from and closing the brake valve 18, the valve member 28 of the control valve 19 in this embodiment is a differential piston with its uncoupling head larger in presented area than the coupling head by a difference sufficient to shift the valve member to exhausting position against the pressure on the coupling head and the initial resistance of the locking detent 33. As in the first embodiment, the actuating air pressure applied by the coupling valve 34 or 75 is relieved in an intentional uncoupling simultaneously with exhausting of the uncoupling air pressure in the pilot line 40, in this case by bleeding or exhausting through the exhaust port 80.

Operating basically in the same way, both of the embodiments of the valve mechanism 17, under pneumatic actuation by brake line pressure except for the actuation of the coupling and uncoupling valves 34 and 35, automatically will open the brake valves 18 of its own and the mating control system in a coupling operation and close those brake valves in an intentional uncoupling operation and require for such automatic action only that the piping circuit 37 be charged with brake line pressure either through the tap 43 from its own brake line 7, or through the bypass line 41 from the brake line of the adjoining car. In fact, for automatically opening the brake valves it is not essential that the piping circuit or brake line of either car be pressurized at the time they are mechanically coupled, since the depressing of the plunger 36 of the coupling valve of either embodiment incident to the mechanical coupling will automatically open the brake valves in the manner described the moment pressure is supplied to either brake line. Additionally, and of vital importance for compliance with I.C.C. regulations, either embodiment on an accidental uncoupling or separation of the brake line 7 from that of the adjoining car, either at the air couplers 6 or elsewhere between the brake valves 18, will differentiate such uncoupling from the intentional uncoupling and automatically bleed or exhaust the brake lines of both cars and produce an emergency brake application throughout the train. The reasons for this are twofold, one that the brake valve, once opened, is closed by exhausting its operating air only when the uncoupling valve 35 is actuated and the other that the brake line pressure is preserved in the piping circuit 37, regardless of the condition of the compressed air in its own or the adjoining brake line, by the check valves 42 through which it is connected thereto. No actuation of the uncoupling valve 35 then occurring and the piping circuit 37 then being charged, the brake valve 18 will remain open on an accidental uncoupling, so as to bleed or exhaust therethrough to atmosphere pressure in the brake line and produce automatically an emergency brake application.

While the first embodiment has the advantage over the second of requiring no line under brake line pressure to be connected to the coupling valve 34 and thus exposed to service shocks on the mechanical coupler, neither embodiment requires its other valves or the balance of the piping circuit 37 to be exposed to such shocks or even mounted on the end of the car and, instead, permits them to be mounted within the bounds of the car in the positions in which they are protected by the car's cushioning mechanism from coupler shocks. Also, if desired, a car equipped with the automatic coupling system of this invention can be adapted for coupling of its brake line 7 to that of a car with conventional manual brake line 7 to that of a car with conventional manual brake line coupling simply by providing a bypass around the brake valve 18 from the within-car section 14 of the brake line 7 and fitting the bypass with the usual angle cock and gladhand.

From the above detailed description, it will be apparent that there has been provided a coupling system for a brake line of a railway car which requires for automatic operation and differentiation between intentional and accidental uncoupling, only the availability of brake line pressure. It should be understood that the described and disclosed embodiments are merely exemplary of the invention and that all modifications are intended to be included that do not depart from the spirit of the invention and the scope of the appended claims.

I claim:

1. An automatic coupling system for a brake line of a railway car having air brakes and mechanical couplers, comprising air-operated brake valve means in said line for opening and closing communication therewith through an end thereof, a control valve means connected between said brake valve means and a source of operating air to be air-actuated between a first operating condition for supplying operating air to said brake valve means to effect its opening and a second operating condition for exhausting operating air from said brake valve means to effect its closing and actuating means pneumatically circuited in an automatic arrangement with said control valve means to be automatically responsive to coupling and intentional uncoupling of an adjoining mechanical coupler for actuating said control valve means between said first and second operating conditions on coupling and uncoupling of said mechanical coupler; said actuating means being nonresponsive for actuating said control valve means on accidental uncoupling of said mechanical coupler permitting said control valve means to hold said brake valve means open to exhaust said line therethrough and produce an application of said brakes.

3. An automatic coupling system according to claim 2, wherein the control valve means for obtaining brake line air as operating and actuating air is connectable for supply only to the brake lines of its own car and a car coupled thereto.

4. An automatic coupling system according to claim 1, wherein the brake valve means is normally closed, and including an air coupler on the end of the brake line and connected to the adjoining mechanical coupler for automatically coupling and uncoupling respectively on coupling and uncoupling of the mechanical coupler.

5. An automatic coupling system according to claim 4, wherein the control valve means is shiftable by said actuating means between said first and second operating conditions, and said actuating means includes coupling and uncoupling valve means automatically responsive respectively to coupling and intentional uncoupling of the mechanical coupler for applying actuating air to the control valve means for shifting thereof respectively to coupling and uncoupling positions.

6. An automatic coupling system according to claim 5, including a piping circuit connecting the valve means and supplying brake line air as operating air for the brake valve means and actuating air for the control valve means.

7. An automatic coupling system according to claim 6, wherein the piping circuit on coupling of the end of the brake line to an end of the brake line of another car is connected for supply only to both brake lines.

8. An automatic coupling system according to claim 7, wherein the coupling valve means includes a valve having a normally spring-projected plunger and mechanically actuated by depressing of said plunger in coupling of the adjoining mechanical coupler to a mating mechanical coupler, and the uncoupling valve means is a valve operatively connected to unlocking mechanism of the mechanical coupler for applying actuating air to shift the control valve means to uncoupling position on operation of said unlocking mechanism.

9. An automatic coupling system according to claim 7, wherein the coupling valve means is mechanically actuated in coupling of the adjoining mechanical coupler to a mating mechanical coupler for automatically opening said brake valve means on pressurizing of either brake line.

10. An automatic coupling system for a brake line of a railway car having air brakes and mechanical couplers, comprising a normally closed air-operated brake valve in the brake line for opening and closing communication therewith through an end thereof, first valve means responsive to coupling of the adjoining mechanical coupler for effecting a supply of operating air to and opening said brake valve, and second valve means responsive only to unlocking of the mechanical coupler in an intentional uncoupling operation for effecting a closing of said brake valve by bleeding said operating air therefrom, said first and second valve means each being pneumatically circuited in an automatic arrangement with respect to said brake valve.

11. An automatic coupling system for a brake line of a railway car having air brakes and mechanical couplers, comprising air-operated normally closed brake valve means in said line for opening and closing communication therewith through an end thereof, and air-actuated control valve means connected between said brake valve means and a source of operating air therefor and automatically shiftable by air actuation in response to coupling and intentional uncoupling of an adjoining mechanical coupler between a coupling position for supplying operating air to the brake valve means to effect opening thereof and an uncoupling position for exhausting operating air from the brake valve means to effect closing thereof, said control valve means being releasably locked in each of its coupling and uncoupling positions and being non-responsive to accidental uncoupling of said mechanical coupler for then holding said brake valve means open to exhaust said line therethrough and produce an application of said brakes, a piping circuit connecting the valve means and supplying brake line air as operating air for the brake valve means and actuating air for the control valve means, said piping circuit on coupling of the end of the brake line to an end of the brake line of another car being connected for supply only to both brake lines, an air coupler on the end of the brake line and connected to the adjoining mechanical coupler for automatically coupling and uncoupling respectively on coupling and uncoupling of the mechanical coupler, and coupling and uncoupling valve means automatically responsive respectively to coupling and intentional uncoupling of the mechanical coupler for applying actuating air to the control valve means for shifting thereof respectively to coupling and uncoupling positions, said coupling valve means comprises a valve having a normally spring-projected plunger and mechanically actuated by depressing of said plunger in coupling of the adjoining mechanical coupler to a mating mechanical coupler, and said uncoupling valve means comprises a valve operatively connected to unlocking mechanism of the mechanical coupler for applying actuating air to shift the control valve means to uncoupling position on operation of said unlocking mechanism.

12. An automatic coupling system according to claim 11, wherein the piping circuit includes a pilot line connecting an outlet side of the uncoupling valve means to an uncoupling side of the control valve means and having a normally open outer end carrying an air coupler automatically couplable with and uncouplable from a pilot line air coupler of a mating system respectively on coupling and uncoupling of the associated mechanical couplers, the uncoupling valve means is a normally closed on-off valve automatically closing after unlocking of the mechanical coupler, and actuating air supplied through the uncoupling valve for shifting the control valve means to uncoupling position is bled through the air coupler at the end of the pilot line on separation thereof in an intentional uncoupling from the pilot line air coupler of the mating system.

13. An automatic coupling system according to claim 12 wherein the mechanically actuated coupling valve and the brake and pilot line air couplers are carried in spaced relation by a head of the mechanical coupler.

14. An automatic coupling system according to claim 13, wherein the mechanical coupler is an automatically couplable knuckle-type coupler, the mechanically actuated coupling valve and brake and pilot line air couplers are mounted directly on a head of a coupler member suspended from the head of the mechanical coupler, and the uncoupling valve is connected for mechanical actuation to a lock operating rod of the mechanical coupler.

15. An automatic coupling system according to claim 12, wherein the mechanically actuated coupling valve is a puffer developing a low-pressure air charge on depressing of its plunger, and the coupling valve means includes an air-actuated secondary pilot valve alternately responsive to the charge from the puffer and air from the uncoupling valve respectively for supplying air at brake line pressure for actuating the control valve means to coupling position and for bleeding the supplied air to atmosphere.

11

16. An automatic coupling system according to claim 12, wherein the mechanically actuated coupling valve is a three-way valve supplied with air at brake line pressure for supplying said air directly to the control valve means for actuation thereof to coupling position on depressing of the plunger and bleeding the applied air to atmosphere on release of the plunger, and the control valve means has a differential piston for shifting to uncoupling position under the same pressure on both ends.

17. An automatic coupling system for a brake line of a railway car having air brakes and mechanical couplers, comprising

12

ing a normally closed air-operated brake valve in the brake line for opening and closing communication therewith through an end thereof, pneumatically self-generating first valve means responsive to coupling of the adjoining mechanical coupler for effecting a supply of operating air to and opening said brake valve, and second valve means responsive only to unlocking of the mechanical coupler in an intentional uncoupling operation for effecting a closing of said brake valve by bleeding said operating air therefrom.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,556,314 Dated January 19, 1971
Inventor(s) Swamidas K. Punwani

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 9, after line 22, insert --

2. An automatic coupling system according to claim 1, wherein the brake valve means is normally closed, and the operating air for the brake valve means and actuating air for the control valve means is brake line air. --

Signed and sealed this 18th day of May 1971.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

WILLIAM E. SCHUYLER,
Commissioner of Patents