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AUTOMATIC FLUID PIPE CONNECTER TRAIN COUPLING

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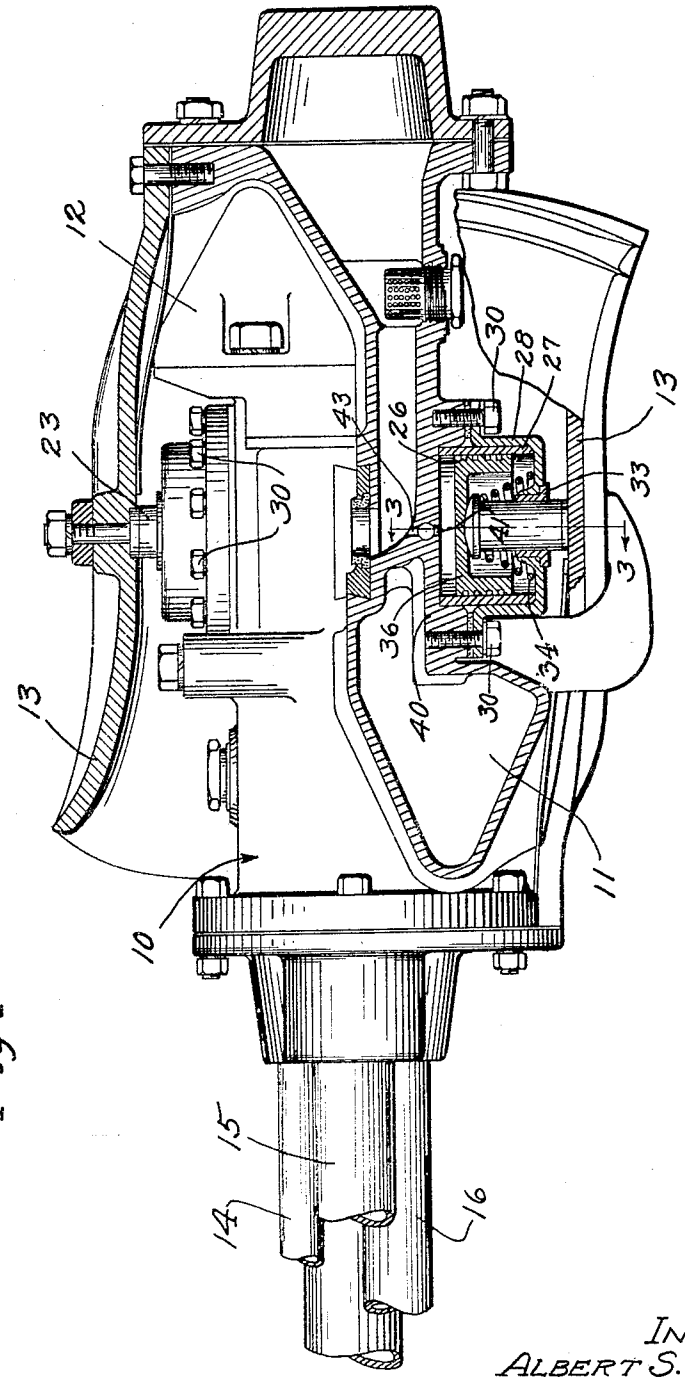

Fig. 1

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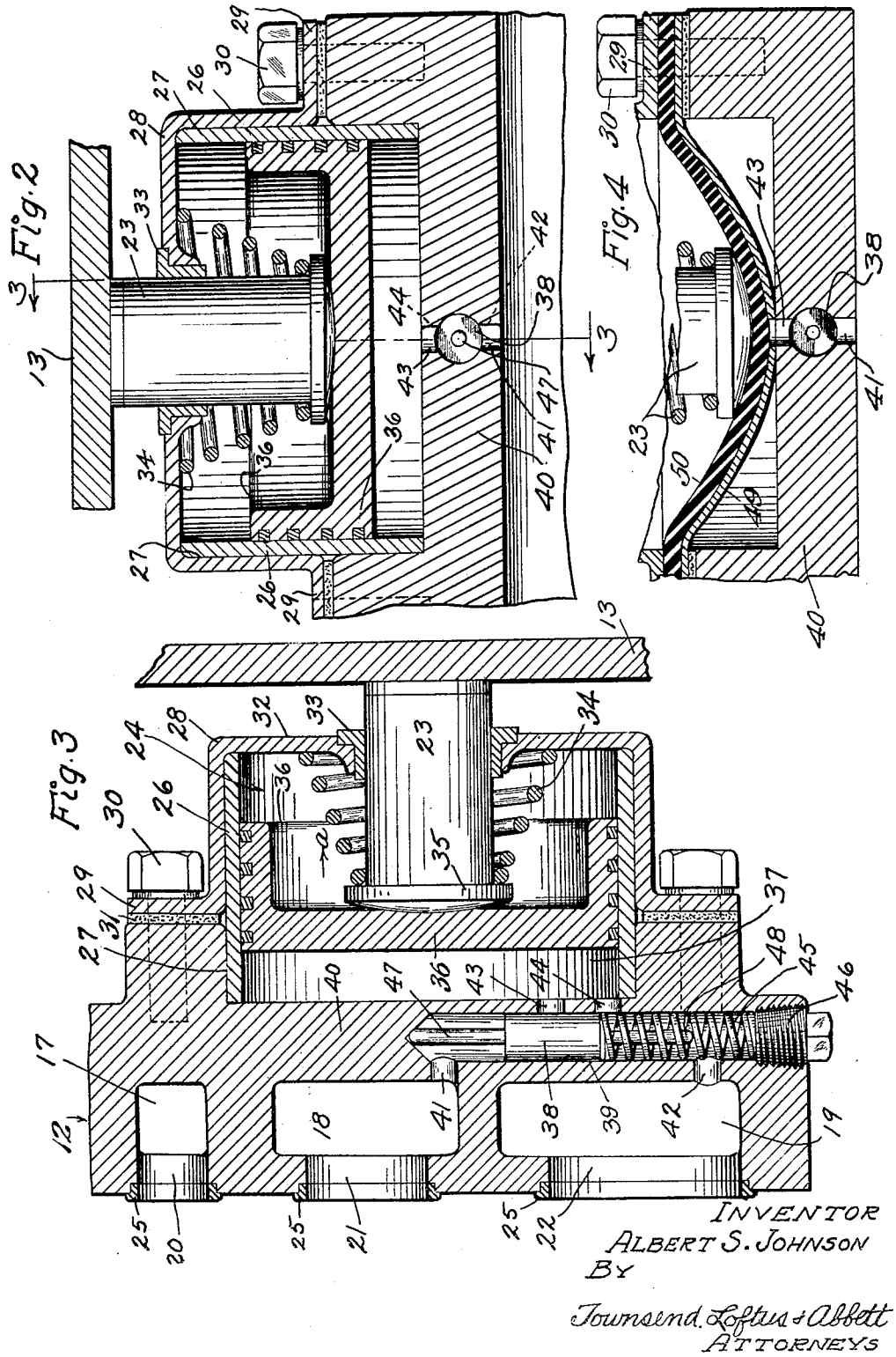

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UNITED STATES PATENT OFFICE

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AUTOMATIC FLUID PIPE CONNECTER TRAIN COUPLING

Application filed August 27, 1929. Serial No. 388,717.

This invention relates to improvements in an automatic fluid pipe connecter train coupling, and particularly pertains to means for automatically coupling the steam, air and signal lines of railway cars, as generally indicated in the United States Letters Patent No. 1,173,997, issued to J. L. Cobb, Feb. 29, 1916.

In structures embodying complementary coupler heads for establishing communication between lines carrying fluids under pressure, as commonly occurs in a railway brake, it is desirable to provide means whereby the pressure of the fluid in the lines being coupled shall act to maintain the complementary coupling heads in their interlocked positions, and to at the same time permit substantially universal movement of the two heads as a unit due to grades and curves negotiated by the coupled cars.

In some instances one of the fluids has been utilized to provide the pressure for holding the complementary heads in interlocked position, and it has been found that when the pressure of this fluid is less than the pressure of the other fluid passing through the other connected conduits, the pressure of this second fluid will be sufficiently great to separate the complementary coupler heads and will cause all conduits to leak at their joints; and it is the principal object of the present invention to provide means incorporated in the complementary coupler heads of an automatic fluid conduit connecter train coupling whereby the fluid having the dominating pressure will act to hold the coupler heads in their interlocked positions, irrespective of variation in the pressure of the fluids in their respective conduits, or with relation to each other.

The present invention contemplates the provision of complementary coupler head members, suitably suspended with relation to the draw-bar couplers of railway cars, and which members may automatically move to an interlocked position when the draw-bar couplers are connected, and will thereby establish communication between the fluid conduits usually provided on railway cars for air, steam and signal air; said heads being provided with pressure means which close the heads and hold them in interlocked relation with each other; said pressure means being actuated by the pressure of either the steam or the air in the train lines.

The invention is more particularly described by way of example in the accompanying drawings, in which—

Fig. 1 is a fragmentary view in horizontal section and elevation showing the coupler head units in their interlocked position and showing in detail one of the expansion units.

Fig. 2 is an enlarged view in horizontal section showing one form of closing unit adapted to be actuated alternately by steam or air.

Fig. 3 is a view in vertical section through the portion of the structure shown in Fig. 2, and discloses the slide valve member by which the fluid of greater pressure will actuate the closing members.

Fig. 4 is a view in horizontal section showing a fragmentary portion of the structure as indicated in Fig. 2, but with the parts interchanged to provide diaphragm actuating means as would be adequate when only one fluid is required, as for instance, on freight cars.

Referring more particularly to the drawings, 10 and 11 indicate complementary coupling heads. Each of the coupler heads includes a tongue 12 and a guide structure 13. The tongues are formed with a plurality of longitudinal compartments providing passageways with which the air signal line 14, the air brake line 15 and the steam line 16 communicate. These compartments are indicated at 17, 18 and 19 in Fig. 3 of the drawings, where it will be seen that the air signal line compartment 17 has a port 20 in the vertical face of the tongue 12; that the air compartment 18 has a port 21 in the face of the tongue, and that the steam compartment 19 has a port 22. It will be understood that when the tongues 12 of the complementary coupler heads 10 and 11 are in interlocking and overlapping relation with each other as guided by the guide members 13, that the ports 20, 21 and 22 in the abutting faces of the tongues will be in register, and the present invention is particularly concerned with means for maintaining this register irrespec-

tive of angular movement of the coupler head in a vertical or horizontal plane.

The present invention contemplates means actuated by the pressure of the fluids delivered through conduits 15 and 16 to the compartments 18 and 19, to hold the abutting faces of the tongues in contact with each other, and with the ports in exact register so as to insure that the fluids will not leak through the joint between the tongues. This tight joint is brought about by pressure members 23 mounted within expanding chambers 24; wherein the pressure members are expanded outwardly from the opposite sides of the complementary tongues and are thereby forced against the vertical walls of the guides 13. The guides are so constructed as to be substantially non-yielding to the force against them exerted by the pressure members 23 and will thus force the complementary tongues 12 together and will maintain the ports 20, 21 and 22 in register with each other and their gaskets 25 in intimate contact to prevent leakage.

The expansion chamber 24 includes a cylindrical bushing 26 which extends into a cylindrical bore 27 in the outer face of each of the tongues 12. The outer end of the bushing 26 is housed within a cap 28 which fits down over the extending end of the bushing and has a bolting flange 29 by which it may be secured to the side wall of the tongues by a series of bolts 30. A suitable packing gasket 31 is interposed between the bolting flange 29 and the side wall tongues to prevent leakage.

The outer end of the bushing 26 rests against the end wall 32 of the cap 28, thus making a complete cylinder for the reception of a fluid under pressure. The pressure member 23 reciprocates longitudinally of the bushing 26 and extends through a guide bushing 33, carried in the end wall 32 of the cap 28. A compression spring 34 encircles the pressure member 23 and rests at one end against the end wall 32 of the cap 28, while being disposed at its opposite end beneath the head 35 of the pressure member 23. This spring acts to return the closing member from expanded to normal position. The head 35 rests against the end wall of a piston 36, which piston reciprocates within the bushing 26.

This reciprocable movement is brought about by the pressure of a fluid delivered to the chamber 37 from either the air compartment 18 or the steam compartment 19. It is to be understood, that it is necessary that when the heads are in their coupled condition, the members 23 exert a sufficient pressure against the guides 13 to insure that the abutting faces of the tongues are held in this position to prevent leakage. It will also be understood that if the closing unit in one of the heads should for any reason fail to function the construction is such that the operative unit in the other head will exert sufficient closing force to keep all ports tight.

It has been found in practice that at some times during the operation of the devices, the air pressure exceeds that of the steam pressure, and it is desirable that this pressure shall be used to hold the tongues in their interlocked condition. If however, the air pressure drops and the steam pressure exceeds that of the air pressure, it is intended that the steam pressure shall act upon the piston 36, to force the pressure members 23 outwardly, and maintain the connection between the tongues without leakage. This is accomplished by a piston valve member 38 mounted in a valve bore 39. This bore extends upwardly with its axis vertical within the wall 40 which divides the expansion chamber 37 from the fluid compartments 17, 18 and 19. An inlet air port 41 establishes communication between the air compartment 18 and the upper end of the bore 39, and an inlet steam port 42 establishes communication between the steam compartment 19 and the lower end of the bore 39. Outlet air ports 43 and 44 are formed in the side wall of the bore 39 opposite from the ports 41 and 42. These outlet ports establish communication between the bore 39 and the expansion chamber 37. It is intended, however, that the piston valve 38 shall be actuated by pressure of one of the fluids to move the piston valve so that at any one time communication is established between the fluid compartment of one fluid and the expansion chamber 37.

A spring 45 is mounted within the bore 39 and is held by the plug 46. This spring normally holds the piston valve 38 so that communication will be established with the steam compartment 19 through ports 42 and 44. Stems 47 and 48 are formed on the opposite ends of the piston valve 38, and limit the longitudinal movement of this valve under pressure, so that proper cut-off of the ports will at all times be insured.

It is common practice to equip passenger trains with both air for air brakes, and steam for heating purposes. It will be evident that it is not necessary nor usual to provide steam lines for freight trains. Due to this usage, it is only necessary to provide the structure previously described for use on passenger trains. When, however, the coupling is to be used on freight trains, the bushing 26 and its associated structure may be removed and an arcuate seat 49 positioned within the bore 27. Disposed above this seat and clamped by the bolting flange 29 is a diaphragm 50. This diaphragm is actuated by air pressure delivered from the compartment 18 to flex the diaphragm and force the pressure member 23 outwardly as and for the purposes previously described.

In the operation of the form of the invention shown in Figs. 1, 2 and 3, inclusive,

of the drawings, the complementary coupling heads 10 and 11 will move together, and the adjacent vertical faces of the tongues 12 will be brought to coincide in a common vertical plane. As soon as the fluid lines are opened the fluids will flow from the conduits through their respective air compartments, and pass into the complementary air compartments of the adjacent coupling tongue, through ports 20, 21 and 22. As the lines are being built up with the pressure of the fluids contained within them, the fluids will at the same time pass through ports 41 and 42, into the opposite ends of the valve bore, 39. The fluid of predominating pressure will then act upon the piston valve 38 to move that valve so as to establish communication between the expansion chamber 37 and the compartment containing the fluid of dominating pressure. For example, in the event that the air pressure is greater, the air passing from the compartment 18 through the port 41 to the upper end of the valve bore 39, will cause the piston valve 38 to move downwardly until it uncovers the port 43, at which time communication will be established from the air compartment 18 to the expansion chamber 37. The fluid under pressure within the expansion chamber 37 will move the piston 36 in the direction of the arrow "*a*", as indicated in Fig. 3 of the drawings, and this in turn will exert a considerable force upon the member 23, to create pressure against the vertical wall of the guides 13, thereby reacting to hold the abutting faces of the tongues in fixed relation to each other, and the fluid ports in a non-leaking condition.

In the event that the air pressure should be lowered to a degree less than the steam pressure, or that the steam pressure should increase to a degree greater than the air pressure, the steam pressure will act to force the piston valve 38 upwardly, thereby cutting off the port 43 and uncovering port 44 to establish communication from the steam compartment 19 to the expansion chamber 37 through ports 42 and 44. By this arrangement it will be insured that the maximum pressure of either fluid in the coupler head will be at all times exerted within the expansion chamber to force the pressure members 23 outwardly, and that the structure insures an automatic compression so that the fluid of dominating pressure will be rendered effective.

Attention is directed to the fact that the expansion spring 45 normally holds the piston valve 38 upwardly so that the steam will be free to flow into the expansion chamber initially. Pins 47 and 48 extend longitudinally from the opposite ends of the piston valve 38, and prevent extreme movement of the piston valve which might cause sticking, or otherwise render the valve mechanism inoperative.

The arrangement whereby the steam ports are at the lower end of the piston bore 39, insures that any condensation in the steam would drain out through the drain duct in the plug 46.

Another important function of said valve is to permit release of pressure on the closing member so this may instantly resume its normal position by action of the compressing spring 34 the moment fluids are shut off (so that the connecting heads may be separated without any friction on their port gaskets.

In the form of the invention shown in Fig. 4 of the drawings, the structure is only concerned with the use of air under pressure as provided for operation of the brakes, in which instance, it may be desirable to eliminate the metal piston and its structure as required when steam is used, and to substitute therefor a simple flexible diaphragm which will act in the same manner as the piston 36, and will force the pressure member 23 outwardly to hold the tongues of the coupling heads in their interlocked positions.

It will thus be seen that the device here disclosed, while simple in operation, provides an effective means for holding a fluid coupling in a connected and non-leaking condition by utilizing the pressure of the fluid passing through the coupling, and by means for increasing the closing force of said fluids to act against the tendency of the expanding force of said fluids to escape, and particularly where the conduits of two fluids are connected, the fluid of predominating pressure will at all times provide the expansive force for holding the couplers together.

While I have shown the preferred form of my invention as now known to me, it will be understood that various changes might be made in the combination, construction and arrangement of all parts without departing from the spirit of the invention as claimed.

Having thus described my invention, what I claim and desire to secure by Letters Patent is.

1. In train line pressure fluid couplers adapted to conduct more than one pressure fluid, separate lines for conveying the pressure fluids to said couplers, pressure actuated means to maintain said couplers in positive engagement under action of said fluids, and automatic means to direct the fluid having predominating pressure to actuate said pressure means to maintain said couplers in sealed relation.

2. In train line pressure fluid couplers which are adapted to conduct variable pressure fluids, separate lines for carrying said fluids to the conveying elements, pressure actuated means to maintain said couplers in sealed relation, and automatically selective means to employ the fluid having the predominating pressure to actuate said means to maintain said couplers in sealed relation.

3. In train line pressure fluid couplers, pipes connected therewith and adapted to conduct fluids under variable pressures, a piston adapted to maintain said couplers in sealed relation, and automatic means acting to select the fluid of predominating pressure to actuate said piston.

4. In train line pressure fluid couplers, pipes connected therewith and which are adapted to conduct fluids under variable pressures, means in said couplers to operatively interlock said couplers, a piston adapted to maintain said interlocking means in locked position, and automatic means to direct the fluid in the pipe which is of predominating pressure to actuate said piston, whereby said couplers will be maintained in positive connection.

5. In train line couplers for fluids under variable pressures, fluid pressure pipes connected with said couplers, means to cause ports in said couplers to be aligned one with the other, a piston, a piston actuated plunger to exert pressure to maintain said couplers in sealed relation, and auto-selective means to direct the fluid in the pipe which is of predominating pressure to actuate said piston, whereby said couplers will be maintained in positive interlock.

6. In train line couplers for fluids under variable pressures, fluid pressure pipes connected with said couplers, means to cause fluid ports in said couplers to be self aligned, a piston actuated plunger to effect positive union between aligned fluid ports and auto-selective means to direct the fluid in the pipe which is of predominating pressure to actuate said plunger, said selective means being a pilot piston whose operating cylinder is in communication with said fluid ports and the chamber in which said piston operates and which pilot piston is adapted to cover a port from said cylinder to said chamber.

7. In train line couplers for fluids under variable pressures, fluid pressure pipes connected with said couplers, means to cause ports in said couplers to be self-aligned, a piston actuated plunger to effect positive union between said aligned ports, and auto-selective means to direct the fluid in the pipe which is of predominating pressure to actuate said plunger, said means being a pilot piston adapted to move in response to preponderant pressure whereby ports in said coupler will be uncovered to permit said preponderant pressure to actuate said plunger to force and to maintain said aligned ports in positive sealed relation.

8. In train line couplers for fluids under variable pressures, fluid pressure pipes connected with said couplers, means to cause ports in said couplers to be self-aligned, a piston actuated plunger to effect positive union between said aligned ports, auto-selective means to direct the fluid in the pipe which is of predominating pressure to actuate said plunger, said means being a pilot piston adapted to move in response to a preponderant pressure to uncover a port in the coupler whereby said preponderant pressure may flow to actuate said piston actuated plunger, and means to so position said pilot piston that an effective pressure is constantly maintained on said couplers whereby to seal said aligned fluid pressure ports.

9. In train line couplers for fluids under variable pressures, fluid pressure pipes connected with said couplers, means to cause ports for said fluids to be self-aligned, a piston actuated plunger to effect positive union between said aligned ports, auto-selective means to direct the fluid in the pipe which is of predominating pressure to actuate said plunger, said means being a pilot piston adapted to move in response to a preponderant pressure to uncover ports in the coupler whereby said preponderant pressure may flow to actuate said piston actuated plunger, means to so position said pilot piston that an effective pressure is constantly maintained on said piston whereby said fluid pressure ports will be positively seated, and means to limit the movement of said pilot piston.

10. In train line couplers for fluids under variable pressures, fluid pressure pipes connected with said couplers, means to cause ports for said fluids to be self-aligned, a piston actuated plunger to effect positive union between said aligned ports, auto-selective means to direct the fluid in the pipe which is of predominating pressure to actuate said piston plunger, said means being a pilot-piston adapted to move in response to a preponderant pressure to uncoved ports in the coupler whereby said preponderant pressure may flow to actuate said piston actuated plunger, means acting to maintain a pressure source in constant engagement with said piston and means to return said piston to inoperative position when said pressure fluids have been cut off from said train line.

11. A train coupler comprising complementary coupling members adapted to be moved to interlocking positions, fluid pressure pipes carried by each coupling member, fluid pressure actuated means for holding said coupling members in their interlocking positions and an automatically acting valve adapted to control the flow of fluid under pressure to said fluid pressure actuating means, said valve being simultaneously acted upon by the fluid in two of said fluid pressure lines when the coupling members are connected and in a manner whereby the flow of the fluid having the predominating pressure will at all times be maintained in said fluid pressure actuating means.

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