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AUTOMATIC COUPLERS FOR RAILWAY AND LIKE VEHICLES

Filed Dec. 19, 1956 3 Sheets-Sheet 1

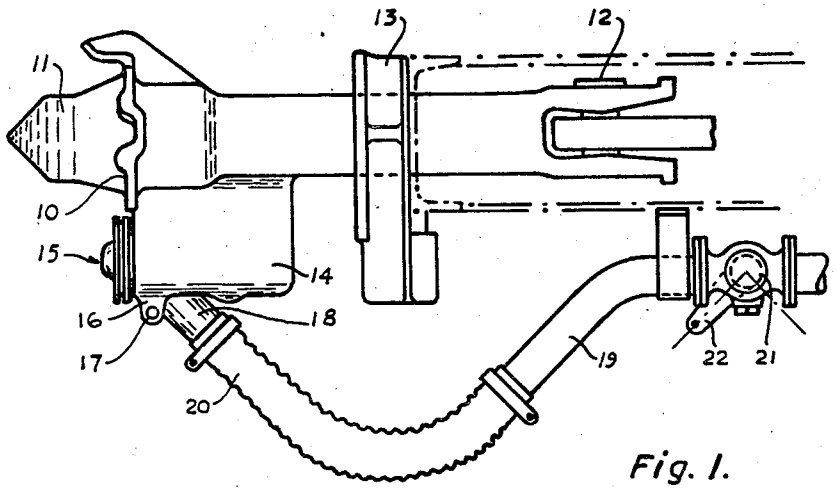


Fig. 1.

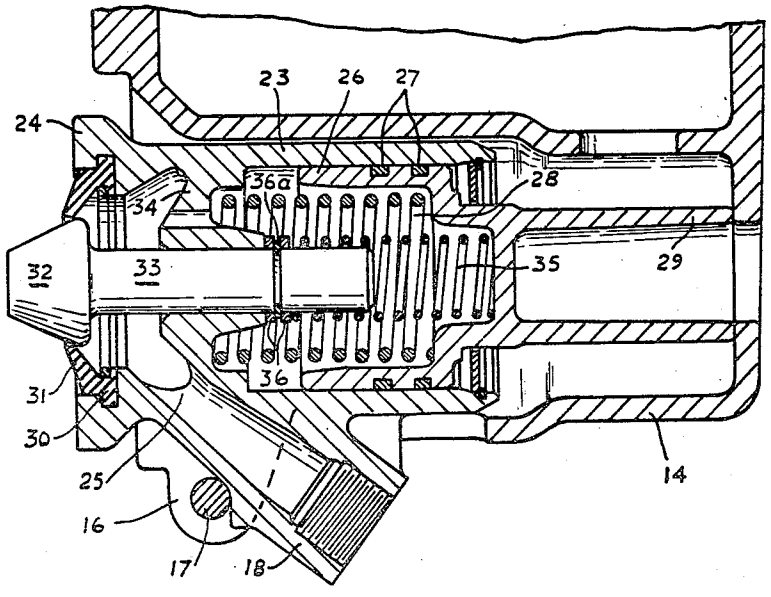


Fig. 2.

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Fig. 3a.

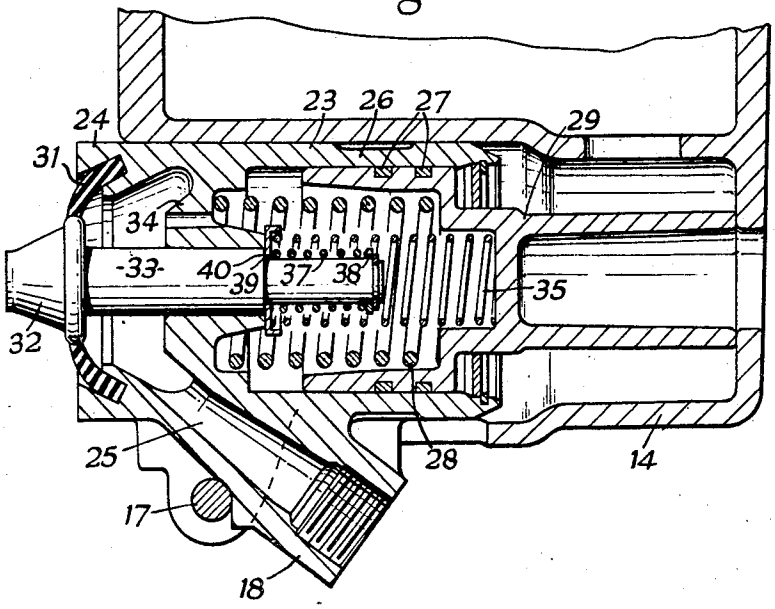
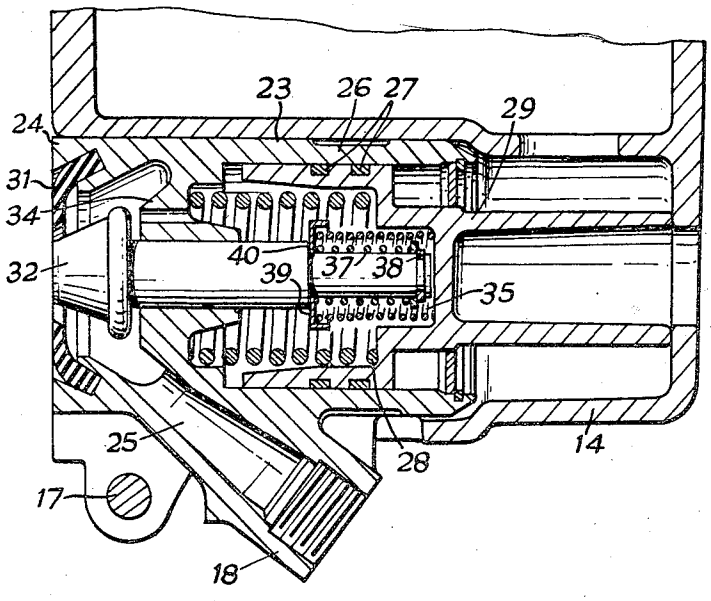


Fig. 3b.

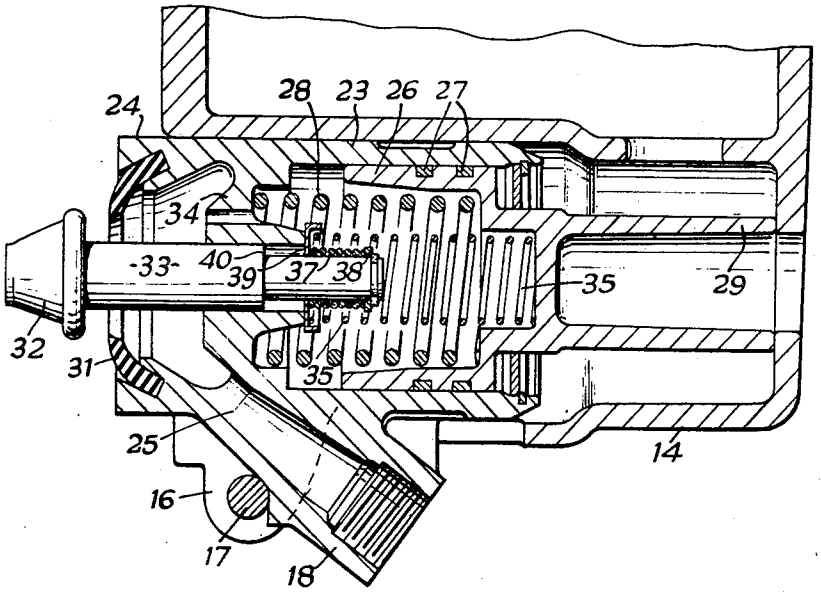


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Fig. 3c.



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AUTOMATIC COUPLERS FOR RAILWAY AND LIKE VEHICLES

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Application December 19, 1956, Serial No. 629,296

Claims priority, application Great Britain January 2, 1956

12 Claims. (Cl. 213—76)

The present invention relates to automatic couplers for railway or like vehicles of the kind which has a substantially vertical face adapted to abut a corresponding vertical face of a mating coupler and to be locked together in abutting relationship with the mating coupler in such a way that relative movement between the two faces is substantially prevented.

In a train of vehicles equipped with a fluid pressure operated braking system, each of the vehicles carries a section of a so-called train pipe and these sections are connected between adjacent vehicles so that the train pipe is continuous throughout the length of the train. With the braking system charged, the fluid in the train pipe is normally maintained at a predetermined pressure above or below that of the atmosphere, depending on whether the system is designed for operation by compressed fluid or vacuum, and the brakes are applied by varying the fluid pressure in the train pipe to the extent necessary to give the desired braking force.

It is already known to incorporate in a coupler means which will establish automatically a sealed connection between the train pipes of two vehicles when they are coupled together. Co-pending application No. 545,709, filed November 8, 1955, now Patent No. 2,834,481, dated May 13, 1958, describes and claims certain forms of such connecting means and it is a primary object of this invention so to improve on those forms according to the aforesaid application as to provide connecting means capable of being simply and cheaply manufactured.

More particularly it is an object of this invention to provide a simple form of connecting means suitable for use with train braking systems operable by compressed fluid, which means is adapted to allow venting of the train pipe, and hence cause application of the train brakes, in the event of parting of the couplers and also to seal the train pipe against the entry of dirt and moisture when the vehicle is uncoupled.

According to the present invention, train pipe connecting means in an automatic coupler of the kind described comprises a chamber opening at one end into the vertical face of the coupler but otherwise closed apart from a port for communication with the train pipe, a valve seat disposed at the open end of the chamber, a valve member co-operating with the valve seat, a spring opposing displacement of the valve member rearwardly into the chamber from a closed position seating on the valve seat to an open position disengaged from the valve seat, and means for the automatic displacement of the valve member from the closed to the open position by the coupling together of two couplers, said valve seat being carried by an elastically deformable element which,

when exposed on the outer side to the pressure of atmosphere and on the inner side to the pressure of compressed fluid with which the train pipe may be charged, is deformed outwardly of the chamber to dilate the valve seat and thereby to allow the escape of the compressed fluid from the train pipe to atmosphere.

More particularly, according to the present invention, a train pipe connecting unit in or for an automatic coupler of the kind described comprises a hollow body open at one end and otherwise closed apart from a port for communication between the interior of the body and the train pipe, a valve member biassed by a spring towards the open end to cooperate with a valve seat at said open end, a resilient sealing member extending around said open end and located to engage a corresponding sealing member of a mating coupler when the two couplers are coupled together, and means for the automatic opening of the valve member by the coupling together of the coupler with another, the valve seat being formed on an elastically deformable member which, when exposed on the outer side to the pressure of the atmosphere and on the inner side to the pressure of compressed fluid with which the train pipe may be charged, is deformed outwardly of the hollow body to dilate the valve seat and thereby to allow the escape of the compressed fluid from the train pipe to atmosphere. The elastically deformable member becomes exposed in this way in the event of the coupler parting accidentally from a mating coupler and the resulting release of compressed fluid in the train pipe causes the brakes to be applied. As soon as the difference in pressure between the fluid in the train pipe and the atmosphere becomes insufficient to deform the member, a closed condition of the valve seat and valve member is restored to prevent the entry of dirt into the braking system.

The elastically deformable member conveniently takes the form of a rubber annulus which is secured along its outer margin to project inwards in a generally radial direction, the inner edge of the annulus being suitably shaped to afford a seating surface for the valve member.

Preferably the elastically deformable member acts also as the resilient sealing member by standing out slightly beyond the open end of the hollow body, and the latter is in turn urged by a spring to a position projecting slightly beyond the plane of the vertical face of the coupler.

In order to afford a large area for the escape of air past the valve member when the valve is opened in an emergency, the valve member may be arranged for movement outwardly of the hollow body from the closed position against the action of a second biassing spring so that the valve member can be forced through and beyond the valve seat by the pressure of the compressed fluid in the train pipe to a release position outside the body and well clear of the valve seat in the event of the coupler parting.

The invention will be further described by way of example with reference to the accompanying drawing in which:

Fig. 1 is a sketch showing a preferred arrangement of a train pipe connecting unit in an automatic coupler of the kind described, other parts appertaining to the installation of the coupler in a vehicle being shown to illustrate the general arrangement;

Fig. 2 is a sectional view taken on the longitudinal axis of one form of train pipe connecting unit, and

Figs. 3*a*, 3*b*, 3*c* are respectively diagrammatic sectional views of another form of train pipe connecting unit in three different positions.

The coupler shown in Fig. 1 is of usual construction as regards coupling features, being formed with a substantially vertical face **10** presenting a rounded nose **11** and a recess to accommodate the nose of a mating coupler. Angular movement of the coupler about the pivot **12** fixed on the vehicle is limited to the length of a horizontal slot which is defined by structure **13** and through which the coupler passes. The head of the coupler is extended downwards to provide an internal housing **14** for the train pipe connecting unit indicated generally as **15**, although alternatively the housing may be formed as a separate part and be secured to the head of the coupler. The housing is split longitudinally at the bottom and provided with lugs **16** on either side of the split. A bolt **17** retained in the lugs **16** prevents withdrawal of the connecting unit by abutment with a pipe connecting piece **18**, as will be more apparent from Fig. 2. Joining the connecting piece **18** with the section of train pipe **19** carried by the vehicle is a length of flexible hose **20**. An isolating cock **21** is introduced into the train pipe section **19** adjacent each end thereof, the cock being adjustable to the "on" or "off" position by an arm **22**.

Referring to Fig. 2, a hollow cylindrical body **23** of the train pipe connecting unit is slidable in a cylindrical bore of the housing **14**, the axis of the bore being normal to the plane of the vertical face **10** of the coupler so that, when the coupler is coupled with another, the respective hollow bodies **23** are coaxially aligned. The body is open at the end **24** which is directed outwardly of the housing bore and is otherwise closed apart from a port **25** opening into the connecting piece **18** and hence communicating with the train pipe. Remote from the end **24**, closure of the body is effected by a piston **26** slidable in the body and provided with packing rings **27** to establish a fluid tight seal. A spring **28** is interposed in compression between the body **23** and the piston **26** thereby forcing a tubular extension **29** of the piston rearwardly into engagement with the rear wall of the housing and the body forwardly to a position, determined by abutment of the connecting piece **18** with the bolt **17**, in which the open end **24** projects slightly beyond the vertical face of the coupler. The rearwardly directed thrust of compressed air filling the hollow body is imparted to the piston **26** and hence, through the tubular extension **29**, to the housing **14**; there is therefore only the forwardly directed thrust acting on the body.

An annular element of elastically deformable material, such as rubber, is mounted at the open end **24** of the body by a radial rim **30** of the element being fitted in a groove in the body. This element presents an annular lip **31** projecting inwardly in a generally radial direction, the inner edge being suitably shaped to afford a seating surface for a valve member **32**. The valve member is formed on a stem **33** guided axially within the hollow body by a perforated boss or spider **34** formed integral with the body. The valve member **32** is biassed towards a closed position seating on the annular lip **31** by a spring **35** extending between the piston **26** and a combined stop and spring seat formed by washers **36** retained by a spring ring **36***a* in a groove in the stem **33**. On account of the elastic nature of the lip, the valve member is relieved of the force of this spring when seated in sealing contact with the lip by abutment of one of the washers **36** with the boss **34**. The valve member **32** is formed with an extension or nose protruding beyond the lip **31**.

When two couplers are brought together for coupling, the noses of the valve members of the corresponding pipe connecting units engage one another and the valve members are displaced rearwardly from their respective

valve seats to establish communication between the two units. To act as a seal between the two units, a resilient sealing member is provided on each unit, either by a ring which is separated from the elastically deformable element and is mounted encircling the open end of the hollow body on the front face thereof, or, as is preferred, by the element itself. The latter case is shown in Figure 2, the lip **31** being slightly conical in the free condition to stand out slightly beyond said front face. With the two couplers coupled, the hollow body assumes a retracted position wherein the forwardly directed thrust of the compressed air within the hollow body **23** and the force of the spring **28** act to maintain a fluid-tight seal between the resilient sealing members of the pipe connecting units.

Should the two couplers part when the train pipe of the braking system is charged with compressed air, the lip **31** of the elastically deformable element then becomes exposed to atmospheric pressure on the outer side thereof and, with the pressure of the compressed air acting on the other inner side, is deformed outwardly to dilate the valve seat and allow the compressed air to escape to atmosphere, even though the valve member **32** is returned to the closed position by the action of its biassing spring **35**. As the pressure in the train pipe decreases, the lip **31** gradually closes about the valve member until finally, when the pressure in the train pipe is no longer sufficient to deflect the lip from the surface of the valve member, the seal against the entry of dirt or moisture into the unit is once more established.

According to the arrangement shown in Figure 3*a*, the valve member **32** is movable outwardly of the hollow body **23** under the action of the escaping compressed air, such movement being against the opposition of an adidtional valve biassing spring **37**. This spring extends between a fixed spring seat **38** retained adjacent the end of the valve stem by a spring ring and a spring seat **39** which is slidable over a section of the stem. The spring **35** also abuts the spring seat **39**. The spring seat **39** is normally engaged by the action of the springs **35** and **37** with a shoulder **40** formed in the valve stem so that the operation of the pipe connecting units on the coupling of two couplers is the same as in the form of unit described previously. This is demonstrated by Figures 3*a* and 3*b* which show respectively the position assumed by the valve member in the normal uncoupled condition of the coupler and that assumed when the coupler is coupled with another.

The boss **34** is formed to present an abutment surface which limits the forward travel of the spring seat **39** and is so located that when the seat is in abutting contact with both the abutment surface and the shoulder **40** of the stem the valve member assumes the closed position seating on the valve seat of the lip **31**. This condition appears in Fig. 3*a* and it will be evident that when the valve member is in the closed position it is not subject to loading by either of the springs **35** and **37**.

If the coupler is parted with the braking system charged with compressed air, the pressure of the compressed air acting behind the valve member forces it through the elastic valve seat formed by the lip **31** to a release position outside and well clear of the open end **24** of the body, the valve seat being yieldable to allow the passage of the valve member therethrough in such circumstances. Forward travel of the spring seat **39** from the position corresponding to the closed position of the valve member being blocked by the abutment surface of the boss **34**, the spring seat **39** is unable to move in company with the stem so that displacement of the valve member to the release position is opposed by the spring **37** which is further compressed by such displacement. Fig. 3*c* illustrates the release position of the valve member. As soon as the pressure of the compressed air has diminished to a value insufficient to overcome the force of the spring **37**, the valve member is retracted into contact with the

lip 31 and so seals the unit against the entry of unwanted matter.

For normal operation, the valve member will require to be pushed past the lip 31 but this inevitably occurs on recoupling of the coupler and may conveniently be deferred until then.

It will be appreciated that the isolating cock denoted 21 in Fig. 1 is provided in order to close the train pipe at the end of a vehicle from which another is to be uncoupled, so that the uncoupling does not result in venting of the train pipe to atmosphere.

We claim:

1. In an automatic coupler of the kind having a substantially vertical face adapted to abut a corresponding vertical face of a mating coupler and to be locked in abutting relationship therewith, train pipe connecting means adapted to register, and to establish a sealed connection, with the corresponding means of a mating coupler, said train pipe connecting means defining a chamber opening at one end thereof into said vertical face but otherwise closed apart from a port for communication with the train pipe and said train pipe connecting means comprising a valve seat disposed at the said open end of said chamber, a valve member co-operating with said valve seat, spring means within said chamber opposing displacement of said valve member rearwardly into said chamber from a closed position seating on said valve seat to an open position disengaged from said valve seat, and abutting means for the automatic displacement of said valve member from the closed to the open position by the coupling together of two couplers, said valve seat being carried by an elastically deformable member adapted, when exposed on the outer side thereof to the pressure of atmosphere and on the inner side thereof to the pressure of compressed fluid with which said train pipe may be charged, to deform elastically outwardly of said chamber to dilate said valve seat and thereby to allow the escape of compressed fluid from the train pipe, past the valve member to atmosphere.

2. The train pipe connecting means as set forth in claim 1, further characterised by said elastically deformable element being in the form of an annulus of rubber, said annulus being secured in said connecting means along its outer margin to project inwards in a generally radial direction and the free inner edge of said annulus being suitably shaped to present said valve seat for said valve member.

3. In an automatic coupler of the kind having a substantially vertical face adapted to abut a corresponding vertical face of a mating coupler and to be locked in abutting relationship therewith, train pipe connecting means adapted to register, and to establish a sealed connection, with the corresponding means of a mating coupler, said train pipe connecting means defining a chamber opening at one end thereof into said vertical face but otherwise closed apart from a port for communication with the train pipe and said train pipe connecting means comprising a valve seat disposed at said open end of said chamber, a valve member co-operating with said valve seat, spring means within said chamber opposing displacement of said valve member rearwardly into said chamber from a closed position seating on said valve seat to an open position disengaged from said valve seating, abutting means for the automatic displacement of said valve member from the closed to the open position by the coupling together of two couplers, and a resilient sealing member extending around said open end and located for engagement with the corresponding member of a mating coupler, said valve seat being formed on said resilient sealing member and said resilient sealing member being so adapted that, when exposed on the outer side thereof to the pressure of atmosphere and on the inner side thereof to the pressure of compressed fluid with which said train pipe may be charged, said member is deformed elastically outwardly of said chamber to dilate said valve seat and thereby to allow the escape of compressed fluid from the train pipe, past the valve member to atmosphere.

4. In an automatic coupler of the kind having a substantially vertical face adapted to abut a corresponding vertical face of a mating coupler and to be locked in abutting relationship therewith, train pipe connecting means adapted to register, and to establish a sealed connection, with the corresponding means of a mating coupler, said train pipe connecting means defining a chamber opening at one end thereof into said vertical face but otherwise closed apart from a port for communication with the train pipe and said train pipe connecting means comprising a valve seat disposed at said open end of said chamber, a valve member co-operating with said valve seat, spring means within said chamber opposing displacement of said valve member rearwardly into said chamber from a closed position seating on said valve seat to an open position disengaged from said valve seat, abutting means for the automatic displacement of said valve member from the closed to the open position by the coupling together of two couplers, and a resilient sealing member extending around said open end and located for engagement with the corresponding member of a mating coupler, said valve seat being formed on, and of the material of, said resilient sealing member.

5. The train pipe connecting means as set forth in claim 4, further characterised by said resilient sealing member being in the form of a rubber annulus, said annulus being secured in said connecting means along the outer margin thereof to project inwards in a generally radial direction and to stand out slightly beyond said vertical face of said coupler, and the free inner edge of said annulus being suitable shaped to present said valve seat for said valve member.

6. In an automatic coupler of the kind having a substantially vertical face adapted to abut the corresponding vertical face of a mating coupler and to be locked in abutting relationship therewith, train pipe connecting means adapted to register, and to establish a sealed connection, with the corresponding means of a mating coupler, said train pipe connecting means defining a chamber opening at one end into said vertical face but otherwise closed apart from a port for communication with the train pipe and said train pipe connecting means comprising a resilient valve seat formed at the open end of said chamber, a valve member co-operating with said valve seat, first spring means within said chamber opposing displacement of said valve member rearwardly into said chamber from a closed position seating on said valve seat to an open position disengaged from said valve seat, abutting means for the automatic displacement of said valve member from the closed to the open position by the coupling together of two couplers, and second spring means within said chamber opposing displacement of said valve member forwardly out of said chamber from said closed position to a release position to which latter position said valve member is adapted to move when exposed on the outer side thereof to the pressure of atmosphere and on the inner side thereof to the pressure of compressed fluid with which said train pipe may be charged.

7. In an automatic coupler of the kind having a substantially vertical face adapted to abut the corresponding vertical face of a mating coupler and to be locked in abutting relationship therewith, train pipe connecting means adapted to register, and to establish a sealed connection, with the corresponding means of a mating coupler, said train pipe connecting means defining a chamber opening at one end into said vertical face but otherwise closed apart from a port for communicating with the train pipe and said train pipe connecting means comprising a resilient sealing member extending around said open end of said chamber and located for engagement with the corresponding sealing member of a mating coupler, a valve seat formed on, and of the material of, said resilient sealing member, a valve member co-operating with said valve

seat, first spring means within said chamber opposing displacement of said valve member rearwardly into said chamber from a closed position seating on said valve seat to an open position disengaged from said valve seat, abutting means for the automatic displacement of said valve member from the closed to the open position by the coupling together of two couplers, and second spring means within said chamber opposing displacement of said valve member forwardly out of said chamber from said closed position to a release position to which latter position said valve member is adapted to move when exposed on the outer side thereof to the pressure of atmosphere and on the inner side thereof to the pressure of compressed fluid with which said train pipe may be charged.

8. The train pipe connecting means as set forth in claim 7 characterised by respective ends of said first and second spring means abutting a common spring seating member slidable on a stem of said valve member and normally located against a shoulder thereof under the action of said first and second spring means, the other ends of said first and second spring means abutting respectively a stationary part of said connecting means and a part on said stem, means constituting a fixed component of said connecting means acting as an abutment surface for said common spring seating member to block displacement of that member in company with said stem over the range of displacement of said valve member from said closed position to said release position, whereby, in the closed position with the common spring seating member resting against both the shoulder and the abutment surface, the valve member is not subject to loading by said first and second spring means.

9. In an automatic coupler of the kind having a substantially vertical face adapted to abut a corresponding vertical face of a mating coupler and to be locked in abutting relationship therewith, a train pipe connecting unit adapted to register, and to establish a sealed connection, with the corresponding unit of a mating coupler and comprising a hollow body slidable axially within a housing of the coupler in a direction normal to the plane of said vertical face, said body defining a chamber opening at one end thereof into said vertical face but otherwise closed apart from a port for communication with said train pipe, a resilient sealing member extending around said open end of said body and located for engagement with the corresponding sealing member of a mating coupler, spring means positioning said body, when the coupler is not coupled, with said open end projecting slightly beyond said vertical face whereby when two couplers are coupled said spring means is further stressed to provide sealing pressure between the sealing members, a valve seat formed on, and of the material of, said resilient sealing member, a valve member co-operating with said valve seat, first spring means within said chamber opposing displacement of said valve member rearwardly into said chamber from a closed position seating on said valve seat to an open position disengaged from said valve seat, abutting means for the automatic displacement of said valve member from the closed to the open position by the coupling together of two couplers, and second spring means within said chamber opposing displacement of said valve member forwardly out of said chamber from said closed position to a release position to which latter position said valve member is adapted to move when exposed on the outer side thereof to the pressure of atmosphere and on the inner side thereof to the pressure of compressed fluid with which said train pipe may be charged.

10. In an automatic coupler of the kind having a substantially vertical face adapted to abut the corresponding vertical face of a mating coupler and to be locked in abutting relationship therewith, a train pipe connecting unit adaped for use with a braking system operable by compressed fluid and comprising a hollow body slidable axially within a housing of the coupler in a direction normal to the plane of said vertical face and having a port to establish permanent communication between the interior of said body and the train pipe, a piston slidable within said body to close one end thereof and leave open the other end facing outwardly of the coupler, said piston being adapted to abut in a rearward direction a portion in fixed relationship with said housing in order to relieve said body of rearwardly directed thrust due to a compressed fluid contained therein, resilient sealing means extending around said open end of said body and located for engagement with the corresponding sealing means of a mating coupler, spring means positioning said body within said housing, when the coupler is not coupled, with said open end projecting slightly beyond said vertical face whereby when two couplers are coupled said spring means is further stressed to provide sealing pressure between the sealing means, a valve seat formed on, and of the material of, said resilient sealing means, a valve member co-operating with said valve seat, first spring means opposing displacement of said valve member rearwardly into said chamber from a closed position seating on said valve seat to an open position disengaged from said valve seat, means for the automatic displacement of said valve member from the closed to the open position by the coupling together of two couplers, and second spring means opposing displacement of said valve member forwardly out of said chamber from said closed position to a release position to which latter position said valve member is adapted to move when exposed on the outer side thereof to the pressure of atmosphere and on the inner side thereof to the pressure of compressed fluid with which said train pipe may be charged.

11. A detachable train pipe connecting unit for installation in an automatic coupler for the purpose of establishing in conjunction with the corresponding unit of a mating coupler a sealed connection between the train pipes of coupled vehicles, said unit comprising a hollow body defining therein a chamber open at one end and otherwise closed apart from a port for communication with said train pipe, said body being insertable open end outwards into a housing of the coupler, a valve seat disposed at said open end of said chamber, a valve member co-operating with said valve seat, spring means opposing displacement of said valve member rearwardly into said chamber from a closed position seating on said valve seat to an open position disengaged from said valve seat, means for the automatic displacement of said valve member from the closed to the open position by the coupling together of two couplers, and a resilient sealing member extending around said open end and located for engagement with the corresponding member of a mating coupler, said valve seat being formed on said resilient sealing member and said resilient sealing member being so adapted that, when exposed on the outer side thereof to the pressure of atmosphere and on the inner side thereof to the pressure of compressed fluid with which said train pipe may be charged, said member is deformed elastically outwardly of said chamber to dilate said valve seat and thereby to allow the escape of compressed fluid from the train pipe, past the valve member to atmosphere.

12. A detachable train pipe connecting unit for installation in an automatic coupler for the purpose of establishing in conjunction with the corresponding unit of a mating coupler a sealed connection between the train pipes of coupled vehicles, said unit comprising a hollow body defining therein a chamber open at one end and otherwise closed apart from a port for communication with said train pipe, said body being insertable open end outwards into a housing of the coupler, a resilient valve seat formed at said open end of said chamber, a valve member co-operating with said valve seat, first spring means opposing displacement of said valve member rearwardly into said chamber from a closed position seating on said valve seat to an open position disengaged

from said valve seat, means for the automatic displacement of said valve member from the closed to the open position by the coupling together of two couplers, and second spring means opposing displacement of said valve member forwardly out of said chamber from said closed position to a release position to which latter position said valve member is adapted to move when exposed on the outer side thereof to the pressure of atmosphere and on the inner side thereof to the pressure of compressed fluid with which said train pipe may be charged.

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