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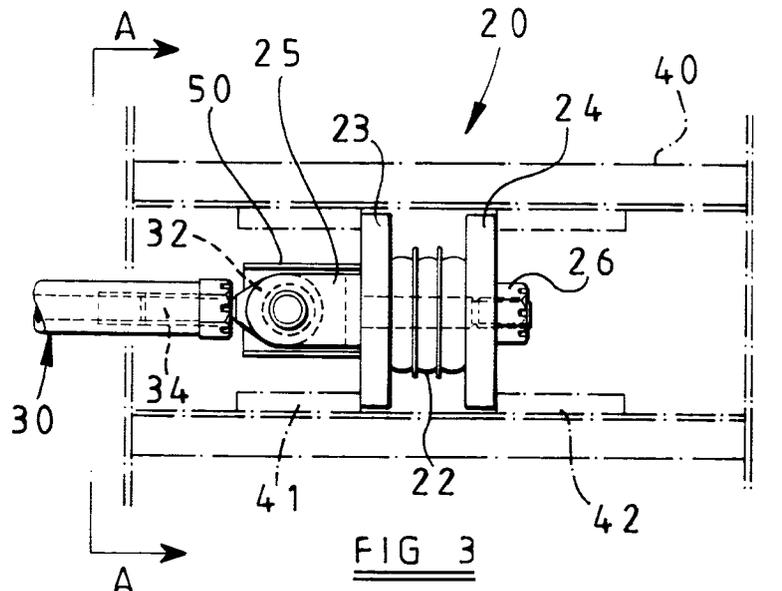
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(54) **Railway vehicle coupling systems**

(57) A railway vehicle coupling system for coupling together two railway vehicles, the system comprises a sub-assembly (20) for coupling to one of the railway vehicles, and a drawbar (30) for coupling the sub-assembly to the other railway vehicle. The sub-assembly (20) comprises mounting means (40) for connection to the railway vehicle, spring means (22) mounted on the mounting means, compression means (23, 24) movable axially relative to the mounting means to compress the

spring means in response to movement of the railway vehicles towards or away from one another. A pivotal bearing (32) connects the drawbar to the compression means (23, 24) to effect axial movement of the compression means in response to relative movement between the railway vehicles whilst permitting limited relative pivoting movement between the drawbar and the compression means. Guide means (49, 50) are provided for guiding the bearing in a manner to prevent rotational movement thereof.



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Description

This invention relates to railway vehicle coupling systems and is concerned more particularly, but not exclusively, with semi-permanent coupling systems for connecting together railway wagons.

A conventional coupling system for coupling a railway wagon to an adjacent wagon or engine comprises a linkage assembly mounted on the wagon and detachably interconnectable with a corresponding linkage assembly on the adjacent wagon, and buffers positioned on the wagon to cooperate with corresponding buffers on the adjacent wagon or fixed buffers. However such conventional coupling systems extend above the bed of the railway wagon on which they are mounted and thus restrict the length of the load carried on the wagon, as well as obstructing the passage of goods from wagon to wagon, for example by means of a conveyor belt system.

It is known to connect together two railway wagons by means of a semi-permanent coupling system incorporating a rigid drawbar coupler which does not extend above the level of the wagon bed. Such a semi-permanent coupling system allows for the required limited pivotal movement between the coupled together ends of the wagons, and incorporates a spring arrangement for taking up the buffing and drawing forces due to movement of the wagons together and apart. Such semi-permanent coupling systems are used in applications in which loads are to be carried of lengths approaching the lengths of the wagons, or in which the wagons are to be loaded or unloaded by means of an integral conveyor belt system extending over two or more wagons. However existing semi-permanent coupling systems tend to suffer from high failure rates due to the extremely high forces which are generated within each coupling, particularly on starting of a train of wagons from rest.

It is an object of the invention to provide a novel railway vehicle coupling system which can be used to overcome some of the disadvantages of known semi-permanent coupling systems.

According to the present invention there is provided a railway vehicle coupling system for coupling together two railway vehicles, the system comprising a sub-assembly for coupling to one of the railway vehicles, and a drawbar for coupling the sub-assembly to the other railway vehicle, wherein the sub-assembly comprises mounting means for connection to said one railway vehicle, spring means mounted on the mounting means, compression means movable relative to the mounting means in an axial direction to compress the spring means both in response to movement together of the railway vehicles from a relative mean position and in response to movement apart of the railway vehicles from the relative mean position, bearing means connecting the drawbar to the compression means to effect said axial movement of the compression means in response to relative movement between the railway vehicles whilst

permitting limited relative pivoting movement between the drawbar and the compression means, and guide means for guiding the bearing means relative to the compression means in such a manner as to substantially prevent relative rotational movement therebetween about said axial direction.

The provision of the guide means substantially prevents rotation of the drawbar about its axis in such a manner as to generate forces at the coupling between the drawbar and the sub-assembly which might otherwise lead to failure of the coupling system over time. Thus the provision of such guide means tends to result in an increased working life before the coupling system requires replacement or maintenance.

In a preferred embodiment of the invention the guide means comprises two oppositely facing parallel guide surfaces between which the bearing means is pivotable.

Furthermore the bearing means may comprise an annular bearing element surrounding a pivot pin so as to be pivotable with respect to the pivot pin.

The compression means may comprise two compression members between which the spring means is located such that relative movement between the compression members from the relative mean position results in compression of the spring means.

The compression members may be located between limiting end stops such that movement together of the railway vehicles from the relative mean position forces one of the compression members against at least one of the end stops and causes compression of the spring means by the other compression member, whereas movement apart of the railway vehicles from the relative mean position forces said other compression member against at least one other end stop and causes compression of the spring means by said one compression member.

Additionally the compression means may include a tailpin extending through axial apertures in the compression members and axially movable by the bearing means so as to effect movement of one of the compression members relative to the other compression member by a first shoulder on the tailpin engaging said one compression member on relative movement in one direction and so as to effect movement of said other compression member relative to said one compression member by a second shoulder on the tailpin engaging said other compression member on relative movement in the opposite direction. The first shoulder may be provided by a flange on the tailpin, and the second shoulder may be provided by a retaining nut on the tailpin.

Furthermore the tailpin may comprise upper and lower forks between which the bearing means is retained so that axial movement of the bearing means results in corresponding axial movement of the tailpin.

The invention also provides a railway vehicle coupling system for coupling together two railway vehicles, the system comprising a sub-assembly for coupling to

one of the railway vehicles, and a drawbar for coupling the sub-assembly to the other railway vehicle, wherein the sub-assembly comprises mounting means for connection to said one railway vehicle, and bearing means coupling the drawbar to the mounting means in such a manner as to permit limited relative pivoting therebetween, and wherein the bearing means and the drawbar are connected together by heat shrink connection means comprising an inner member and an outer sleeve member within which the inner member is fixedly held by virtue of the outer member being heat shrunk onto the inner member so that at least one retaining rib on one of the members is received within at least one retaining groove in the other member.

In this context it should be understood that "heat shrinking" is used to denote either cooling or heating of one of the members relative to the other member to enable the inner member to be introduced to the outer member prior to the one member reverting to ambient temperature so that the two members are locked together by the relative thermal contraction/expansion.

Such a heat shrink connection between the sub-assembly and the drawbar can be effected in such a manner as to remove chatter between the two parts of the system which would otherwise lead eventually to destruction of the bearing means.

Furthermore the invention also provides a railway vehicle coupling system in which a further sub-assembly similar to the first-mentioned sub-assembly is provided for coupling to said other railway vehicle, and the drawbar serves to couple together the two sub-assemblies.

In order that the invention may be more fully understood, a preferred embodiment of coupling system in accordance with the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 shows plan and side views of two railway wagons interconnected by the coupling system;

Figure 2 is a partially exploded view of the coupling system;

Figures 3, 4 and 5 are plan views of a part of the coupling system in the neutral position, maximum drawing position and maximum buffing position respectively;

Figure 6 is a sectional view taken along the line A-A in Figure 3; and

Figures 7 and 8 are respectively a side view and a plan view of part of the coupling system showing the maximum vertical and lateral swings of the system.

The coupling system in accordance with the invention, which will now be described by way of example, is a semi-permanent rigid drawbar coupling system 1 for connecting together the ends of two railway wagons 2 and 3 as shown in plan and side view in Figure 1. In each case the wagon 2 or 3 has at its opposite end a

conventional coupling system 4 consisting of a linkage assembly and buffers. As will be appreciated particularly from the side view of Figure 1, the semi-permanent coupling system 1 increases the area of the bed of the wagon 2 or 3 which is available for the load, as compared with an arrangement in which a conventional coupling system is provided at both ends of the wagon. Of course, it would also be possible for such a semi-permanent coupling system 1 to be provided at both ends of each wagon 2 or 3, and for a large number of wagons to be sequentially coupled together by such coupling systems.

Figure 2 shows the main components of the semi-permanent coupling system 1 consisting of a first sub-assembly 10 shown in the assembled state on the left hand side of the figure, a second sub-assembly 20 shown in an exploded view on the right hand side of the figure, and a drawbar 30 interconnecting the sub-assemblies 10 and 20. The sub-assemblies 10 and 20 are of identical construction, and accordingly only the sub-assembly 20 will be described in detail below.

The sub-assembly 20 comprises a thermoplastic elastomer compression spring pack 22 sandwiched and precompressed between two compression plates 23 and 24 by a shoulder 21 on a tailpin 25 extending through axial apertures in the spring pack 22 and the plates 23 and 24, and by a castle nut 26 provided on a screw-threaded end 27 of the tailpin 25 and held in position by a split pin 28. For example, the sub-assembly 20 may be based on the Tecspak ST-9-2 Traction Spring supplied by Miner Enterprises Inc. (Tecspak is a Registered Trade Mark). Furthermore the tailpin 25 comprises upper and lower forks 29 and 31 between which a bearing 32 is held by a pin 33 extending through apertures in the forks 29, 31 and the bearing 32, so as to permit relative pivotal movement between the bearing 32 and the tailpin 25 about a vertical axis. The bearing 32 is integrally formed with a screw-threaded rod 34 which is received within a screwthreaded bore 35 in the drawbar 30 which is in the form of a rigid tube. Optionally a nut 36 is threaded on the screwthreaded rod 34 and is tightened against the end of the drawbar 30 to prevent any relative rotary movement between the rod 34 and the drawbar 30.

It is extremely important that the rod 34 should be securely locked within the drawbar 30 in order to prevent chattering between these two components which would otherwise lead to failure of the bearing 32 with time. Accordingly it is preferred to utilise a heat shrink treatment for connecting together the rod 34 and the drawbar 30, in which the drawbar 30 is first heated to an elevated temperature at which it expands to a sufficient extent to enable the rod 34 to be screwed into the screwthreaded bore 35. Thereafter, on cooling of the drawbar 30 to ambient temperature, the drawbar 30 will contract so as to draw the screw threads on the inside surface of the bore 35 into intimate pressure contact with the screw threads on the outside surface of the rod 34. Because the screw

threads of the two components 30 and 34 intimately engage one another along both flanks in the final heat shrunk state, such a connection effectively prevents all relative axial movement between the components during application of both the high drawing forces and the high buffing forces experienced by the components in operation. This contrasts with an arrangement in which the two components are simply screwed together without heat shrinking and in which some chattering will take place due to the fact that the manner in which the screw threads engage one another will result in slight differences in relative positioning of the components depending on whether buffing or drawing forces are applied.

Clearly, in an alternative connection arrangement, such heat shrinking could be effected by cooling the rod 34 so as to shrink it to an extent to enable it to be screwed into the bore 35. On subsequent heating up of the rod 34 to ambient temperature, the rod 34 will expand so as to lock the rod 34 within the bore 35.

The operation of the coupling system will now be described with reference to Figures 3, 4 and 5 which show the sub-assembly 20 in plan view and respectively in the neutral position, the maximum drawing position and the maximum buffing position.

It will be appreciated that the sub-assembly 20 is mounted on a sub-frame 40, and the spring pack 22 and plates 23, 24 are confined between front and rear stops 41 and 42, as shown in broken lines in Figures 3, 4 and 5. In the neutral position as shown in Figure 3, no substantial forces are transmitted to the sub-assembly 20 by the drawbar 30, and the precompression of the spring pack 22 biases the plates 23 and 24 into contact with the front and rear stops 41 and 42. However, when a maximum drawing force acts in the direction of the arrow 45 on the sub-assembly 20 by way of the drawbar 30 as shown in Figure 4, the drawing force acts by way of the bearing 32 to cause axial displacement of the tailpin 25 to the left in the figure in order to draw the plate 24 away from the rear stops 42 and to thereby compress the spring pack 22 between the plates 23 and 24. Furthermore, when a maximum buffing force in the direction of the arrow 46 acts on the sub-assembly 20 by way of the drawbar 30 as shown in Figure 5, the buffing force causes axial displacement of the tailpin 25 to the right in the figure in order to push the plate 23 away from the front stops whilst biasing the plate 24 into contact with the rear stops 42, thus again compressing the spring pack 22 between the plates 23 and 24. Thus it will be appreciated that the spring pack 22 serves the dual function of taking up forces acting on the drawbar 30 in both the drawing direction 45 and the buffing direction 46.

Figure 6 shows an end view of the sub-assembly 20 taken in section along the line A-A in Figure 3 and illustrates the mounting of the sub-assembly 20 within the subframe 40 which is itself mounted on a cross-member 48 of the wagon. The spring pack 22, the end plate 23 and front stops 41 are shown in broken lines in the figure, and in addition the bearing 32 with its asso-

ciated pin 33 are shown between the forks of the tailpin 25 and positioned between an upper guide member 49 on the sub-frame 40 and a lower guide member 50 fixed to the compression plate 23. The guide members 49 and 50 serve to retain the pin 33 in position, and in addition the guide member 50, which is generally U-shaped in section and has two side arms 52 and 53, acts to prevent substantial rotational movement of the bearing 32 about the axial direction (that is about the axis normal to the sheet on which the figure is drawn) whilst permitting the required limited pivotal movement about the pivot pin 33. Thus the guide member 50 serves to restrict any relative axial twisting of the drawbar 30 relative to the sub-assembly 20 and to limit the resulting wear of the bearing 32 and the pivot pin 33, with the result that the system is less prone to failure than known rigid drawbar coupling systems.

Figures 7 and 8 show the maximum vertical and lateral swings of the drawbar 30 relative to the sub-assembly 20 in operation of such a system. It will be appreciated from Figure 7 that there is sufficient play in the mounting of the bearing 32 between the forks 29 and 31 of the tailpin 25 by means of the pivot pin 33 to allow for the required vertical swing of the drawbar 30 to take up differences in height between the ends of the two wagons coupled together by the system. Furthermore Figure 8 shows that the guide 50 does not prevent the required lateral swing of the drawbar 30 about the pivot pin 33 of the bearing 32 relative to the sub-assembly 20 in order to allow for relative lateral movement between the ends of the two wagons coupled together by the system, as may be experienced when the wagons are negotiating bends, and particularly when the wagons are negotiating a S-bend.

Claims

1. A railway vehicle coupling system for coupling together two railway vehicles, the system comprising a sub-assembly (20) for coupling to one of the railway vehicles, and a drawbar (30) for coupling the sub-assembly to the other railway vehicle, characterised in that the sub-assembly comprises mounting means (40) for connection to said one railway vehicle, spring means (22) mounted on the mounting means, compression means (23, 24) movable relative to the mounting means in an axial direction to compress the spring means both in response to movement together of the railway vehicles from a relative mean position and in response to movement apart of the railway vehicles from the relative mean position, bearing means (32) connecting the drawbar to the compression means (23, 24) to effect said axial movement of the compression means in response to relative movement between the railway vehicles whilst permitting limited relative pivoting movement between the drawbar and the compres-

- sion means, and guide means (49, 50) for guiding the bearing means (32) relative to the compression means in such a manner as to substantially prevent relative rotational movement therebetween about said axial direction.
2. A coupling system according to Claim 1, wherein the guide means comprises two oppositely facing parallel guide surfaces (49, 50) between which the bearing means (32) is pivotable. 5
 3. A coupling system according to Claim 1 or Claim 2, wherein the bearing means comprises an annular bearing element (32) surrounding a pivot pin (33) so as to be pivotable with respect to the pivot pin. 10
 4. A coupling system according to any of the preceding claims, wherein the compression means comprises two compression members (23, 24) between which the spring means (22) is located such that relative movement between the compression members from the relative mean position results in compression of the spring means. 15
 5. A coupling system according to Claim 4, wherein the compression members (23, 24) are located between limiting end stops (41, 42) such that movement together of the railway vehicles from the relative mean position forces one of the compression members against at least one of the end stops and causes compression of the spring means (22) by the other compression member, whereas movement apart of the railway vehicles from the relative mean position forces said other compression member against at least one other end stop and causes compression of the spring means by said one compression member. 20
 6. A coupling system according to Claim 4 or Claim 5, wherein the compression means include a tailpin (25) extending through axial apertures in the compression members (23, 24) and axially movable by the bearing means (32) so as to effect movement of one of the compression members relative to the other compression member by a first shoulder (21) on the tailpin engaging said one compression member on relative movement in one direction and so as to effect movement of said other compression member relative to said one compression member by a second shoulder (26) on the tailpin engaging said other compression member on relative movement in the opposite direction. 25
 7. A coupling system according to Claim 6, wherein the first shoulder (21) is provided by a flange on the tailpin, and the second shoulder (26) is provided by a retaining nut on the tailpin. 30
 8. A coupling system according to Claim 6 or Claim 7, wherein the tailpin comprises upper and lower forks (29, 31) between which the bearing means (32) is retained so that axial movement of the bearing means results in corresponding axial movement of the tailpin. 35
 9. A railway vehicle coupling system for coupling together two railway vehicles, the system comprising a sub-assembly (20) for coupling to one of the railway vehicles, and a drawbar (30) for coupling the sub-assembly to the other railway vehicle, characterised in that the sub-assembly comprises mounting means (40) for connection to said one railway vehicle, and bearing means (32) coupling the drawbar to the mounting means in such a manner as to permit limited relative pivoting therebetween, and in that the bearing means (32) and the drawbar (30) are connected together by heat shrink connection means comprising an inner member (34) and an outer sleeve member (35) within which the inner member is fixedly held by virtue of the outer member being heat shrunk onto the inner member so that at least one retaining rib on one of the members is received within at least one retaining groove in the other member. 40
 10. A coupling system according to Claim 1 or Claim 9, wherein a further sub-assembly similar to the first-mentioned sub-assembly (20) is provided for coupling to said other railway vehicle, and the drawbar serves to couple together the two sub-assemblies. 45

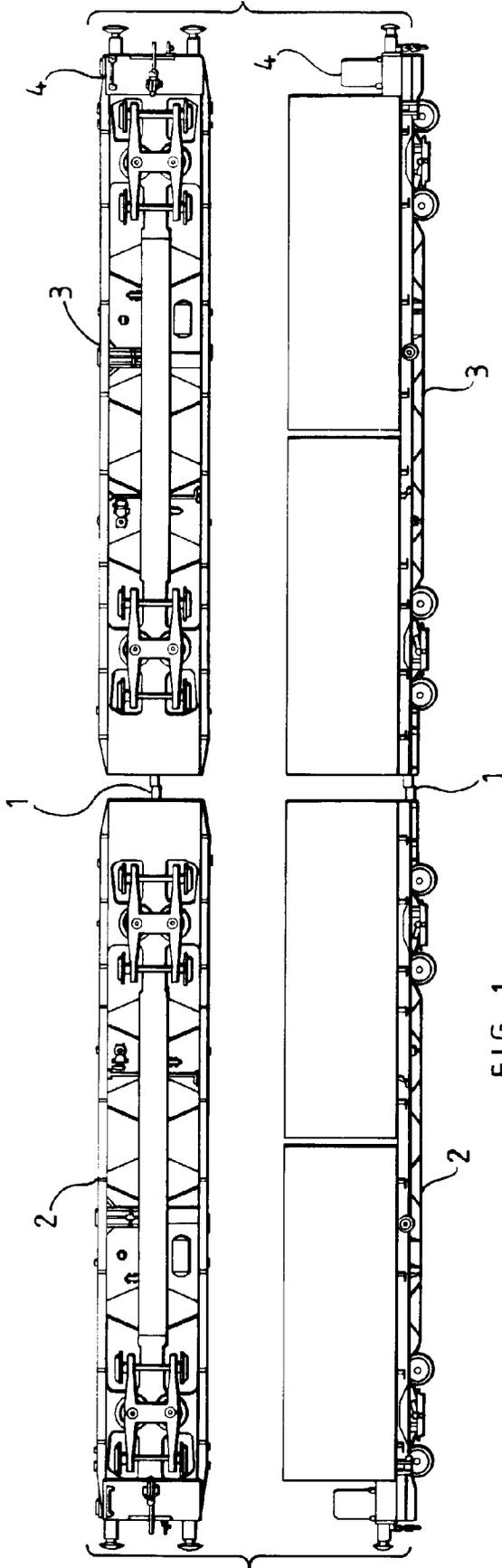


FIG 1

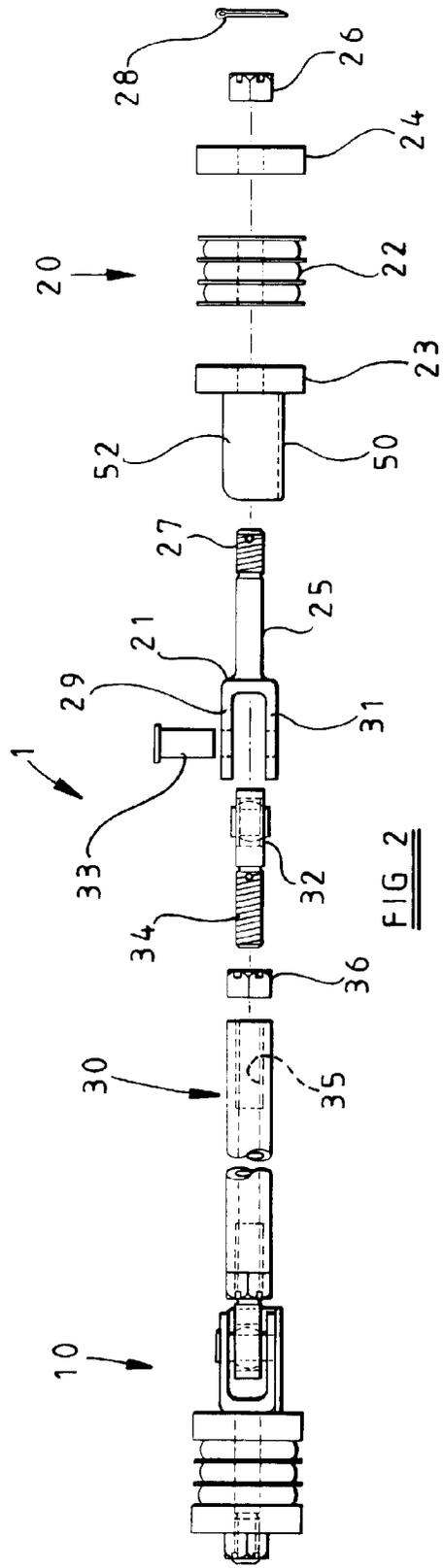
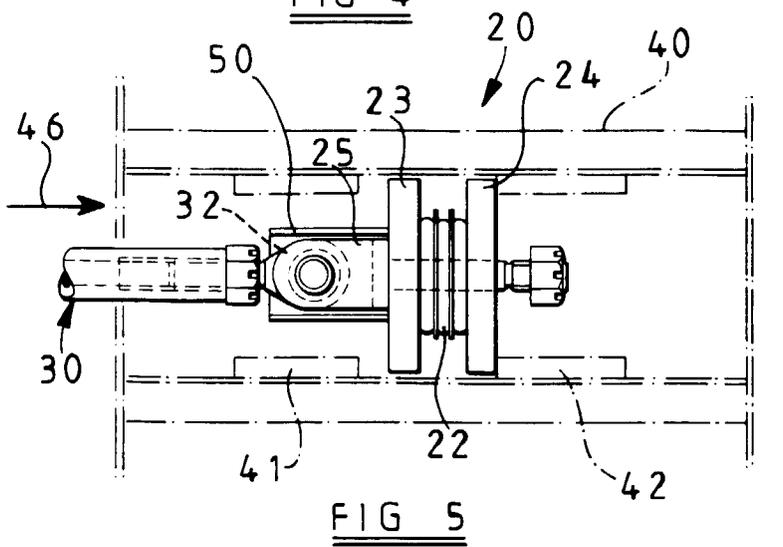
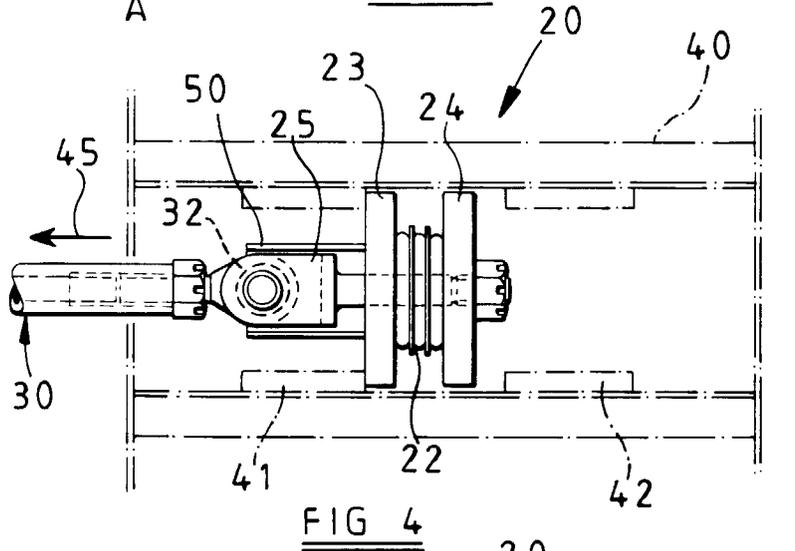
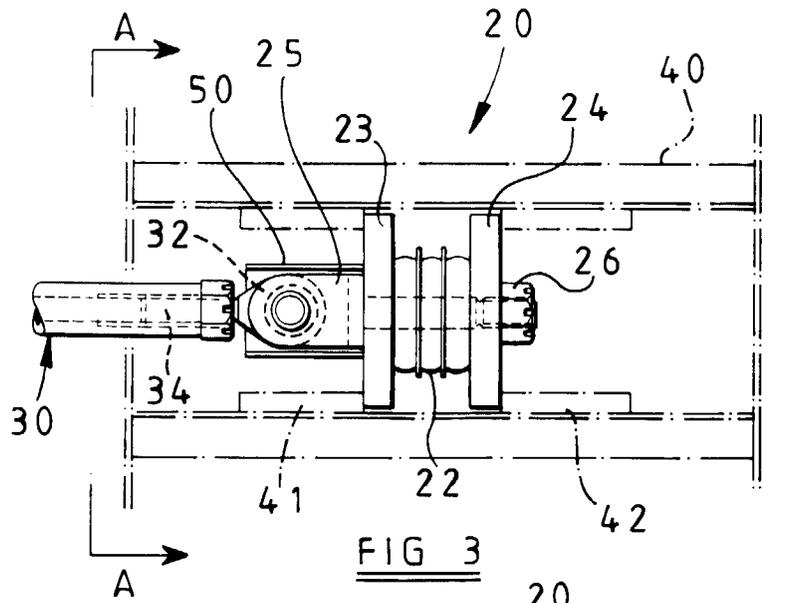


FIG 2



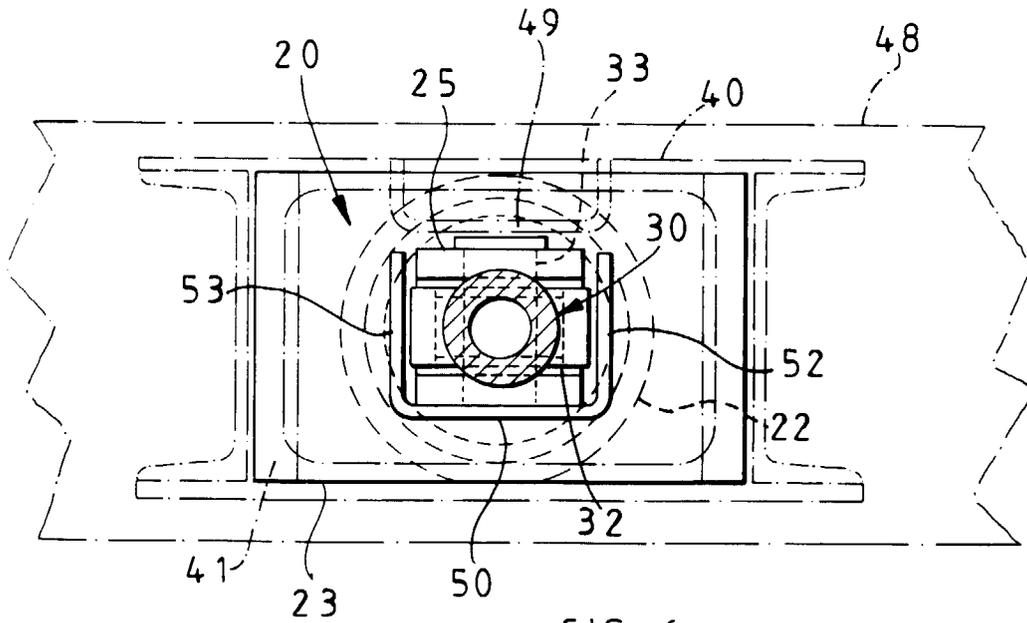


FIG 6

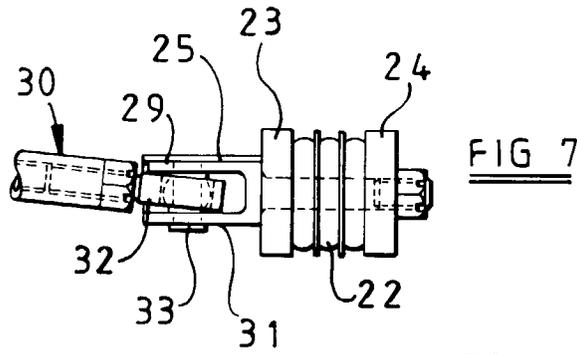


FIG 7

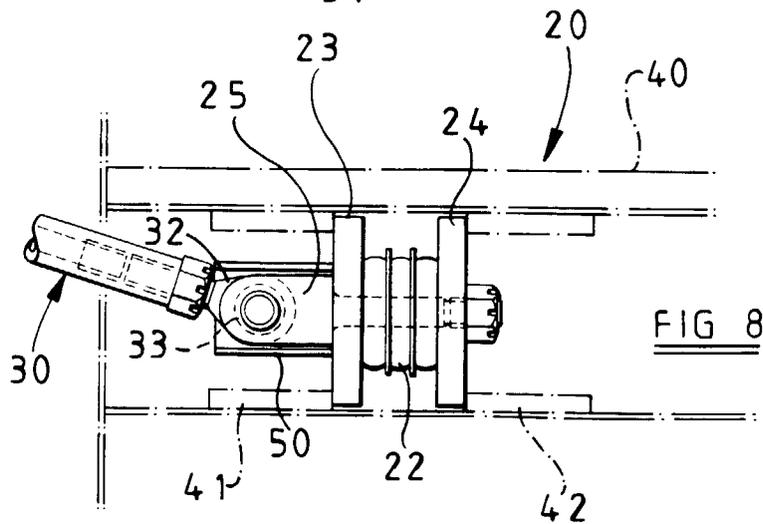


FIG 8



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 97 30 8101

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X A	EP 0 551 824 A (DUEWAG AG) 21 July 1993 * the whole document * ---	1 9	B61G1/22 B61G5/02
X A	DE 36 01 199 A (NIESKY WAGGONBAU VEB) 24 July 1986 * page 4, line 20 - page 5, line 22; figures 1-3 * ---	1 9	
A	FR 2 691 693 A (SOGEA) 3 December 1993 * page 4, line 25 - page 8, line 32; figures 1-11 * -----	1,9	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B61G
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 21 January 1998	Examiner Chlosta, P
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