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Petersson et al.

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[54] **SUPPORTING LEG STRUCTURES**

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[52] **U.S. Cl.** ..... **280/150.5,** 254/86 H

[51] **Int. Cl.** **B60s 9/10**

[58] **Field of Search** ..... 280/150.5, 80 B, 280/421; 254/86 H, 86 R

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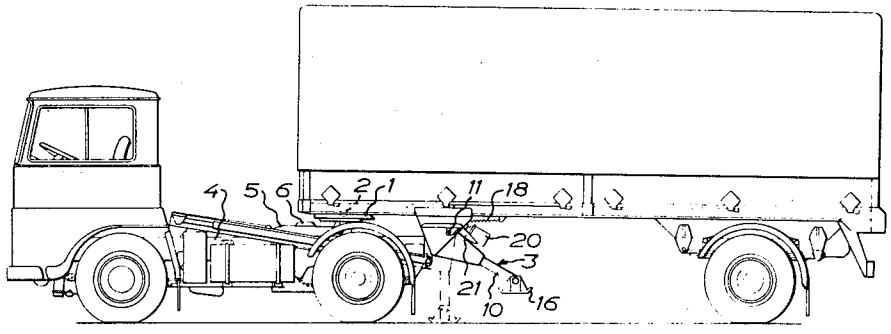
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[57] **ABSTRACT**

A semi-trailer supporting leg structure is mounted so as to permit pivotment by means of an operating mechanism between a ground engaging supporting position and a rest position in which the supporting leg structure is swung rearwardly out of contact with the ground. The operating mechanism is carried by the semi-trailer while the tractor has means for raising the front end of the semi-trailer for pivotment of the supporting leg or legs between the ground engaging position and the rest position while the supporting leg or legs are at least substantially completely relieved of the weight of the semi-trailer.

3 Claims, 4 Drawing Figures



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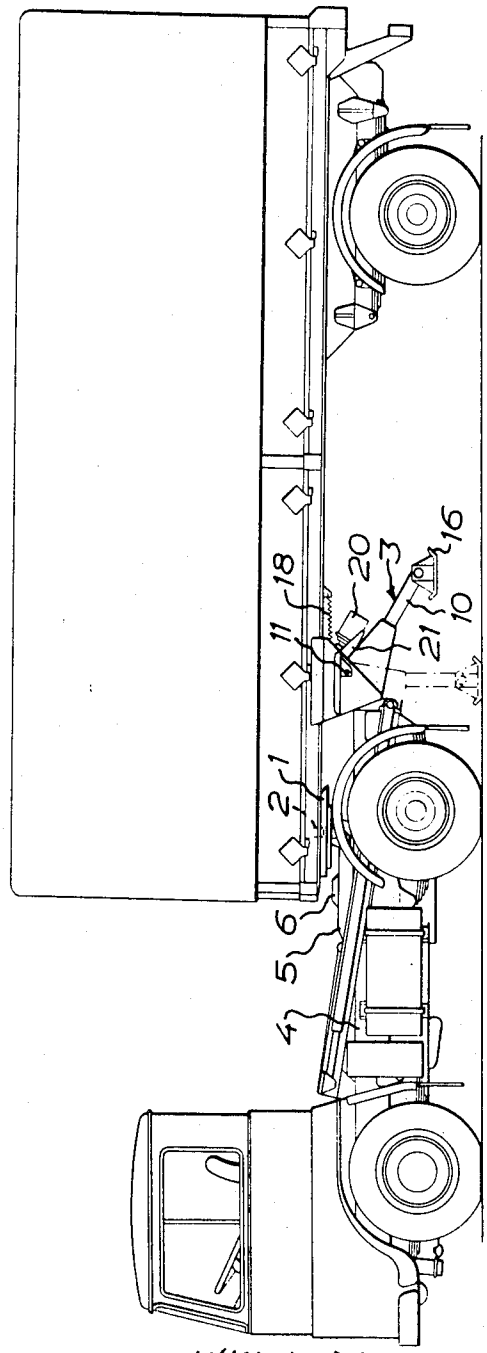
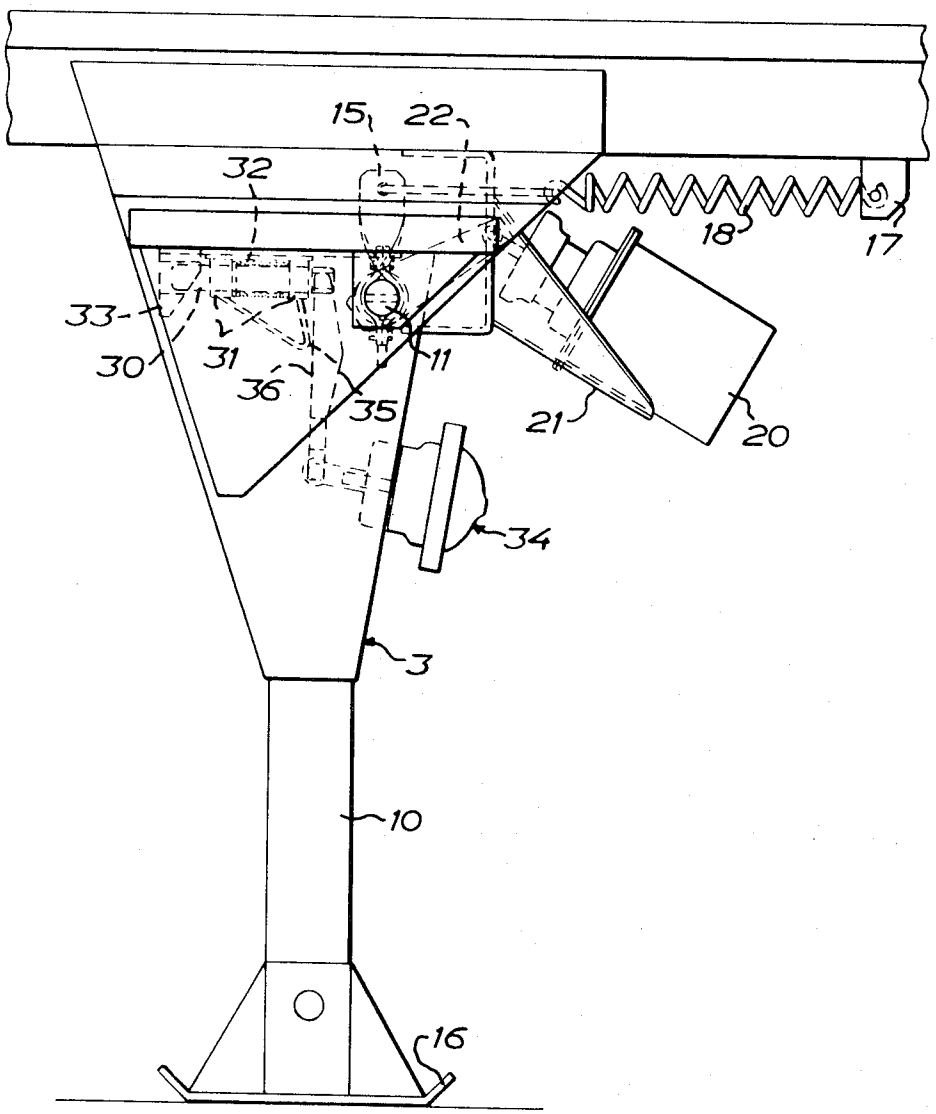


FIG. 1

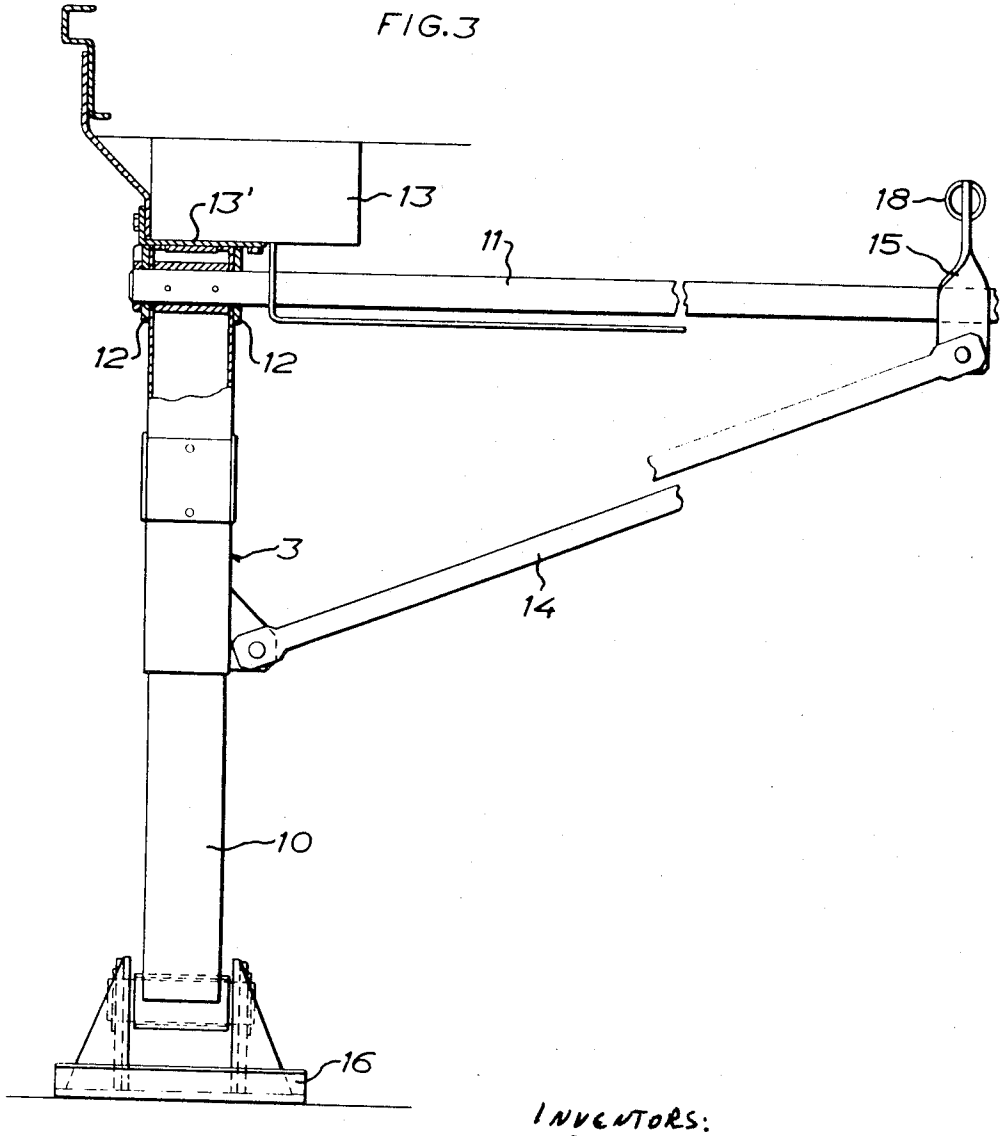
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FIG. 2



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FIG. 3



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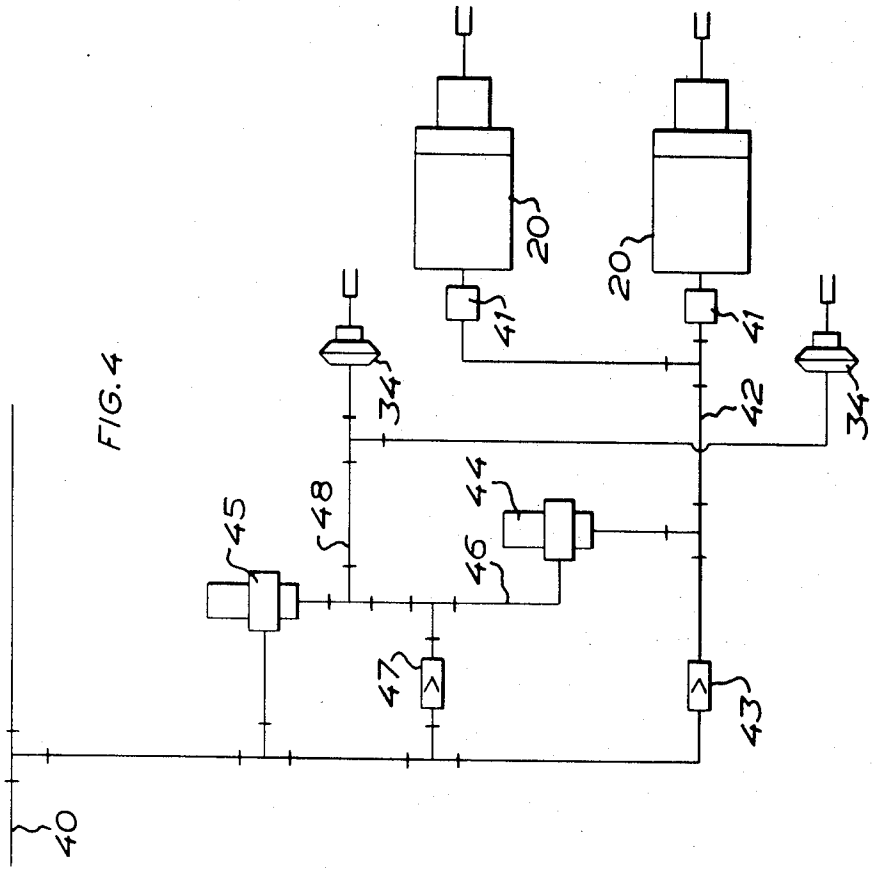


FIG. 4

SUPPORTING LEG STRUCTURES

This invention relates to a semi-trailer supporting leg structure which comprises at least one supporting leg mounted to the front portion of the semi-trailer and adjustable between a ground engaging supporting position and a rest position out of contact with the ground when the semi-trailer is respectively disconnected from and connected to a pulling tractor or truck, and a device for adjusting the supporting leg between these positions.

Telescopically extensible supporting legs provided with a hydraulic, pneumatic or mechanic device for raising the lower portions of the supporting legs from a ground engaging position to a rest position on driving are usually employed to support semi-trailers in parking position, that is when they are disconnected from the tractor. Extensible supporting legs and devices for operating these supporting legs invariably lead to a heavy and difficult-to-operate supporting leg structure in which the weakest part (for instance a rack or an inner telescoping rod) has to be sufficiently strong to withstand any prevailing loads.

The primary object of the present invention is to provide a relatively light-weight, but very strong, simple and reliable supporting leg structure of the type indicated which is suited for pneumatic but also for e.g. hydraulic and preferably automatic adjustment between a ground engaging position in which the front end of the semi-trailer is supported, and a rest position out of contact with the ground, when the semi-trailer is coupled to the pulling tractor or truck. To this end, the invention has for its specific purpose to make the supporting leg structure cooperate in such a way with a mechanism for raising and lowering the semi-trailer at the front end thereof as to facilitate operation of the supporting legs, whereby a pivoting but otherwise rigid supporting leg structure can be used.

These objects have been fully attained by the supporting leg structure suggested by the present invention, which is pivotally mounted so as to permit pivotment between the ground engaging position and a rest position, in which the supporting leg structure is swung rearwardly out of contact with the ground, by means of an operating mechanism carried by the semi-trailer, while the tractor is equipped with means for raising the front end of the semi-trailer to permit pivotment of the supporting leg between said positions while being at least substantially completely relieved of the weight of the semi-trailer.

The invention will be more fully described hereinbelow with reference to the accompanying drawings in which:

FIG. 1 is a side elevation of a tractor with a semi-trailer coupled thereto and equipped with the supporting leg structure according to the invention;

FIG. 2 is a side elevation of a supporting leg according to the invention and the adjoining portion of the semi-trailer as well as part of the pneumatic operating mechanism for the supporting legs;

FIG. 3 is a front view of the supporting leg shown in FIG. 2; and

FIG. 4 is a diagrammatic view of the pneumatic supporting leg operating system.

The tractor illustrated in FIG. 1 has a so-called fifth wheel coupling 1 for engagement with a king pin 2 whereby the semi-trailer in its coupled state is supported at the front end by the fifth wheel 1 of the tractor. At the front end the semi-trailer has a supporting leg structure 3 which is mounted at the front portion of the trailer subframe to support the semi-trailer on the ground when the semi-trailer is uncoupled from the tractor. In accordance with the invention, and as will appear from the following, a functional connection is established between the semi-trailer coupling and the supporting leg structure 3 to facilitate operation of said structure and to realize a simple and strong supporting leg construction.

The fifth wheel 1 is carried on the rear end portion of a frame 5 pivotally supported by the main frame 4 of the tractor and pivoted to the main frame 4 at the front end. To raise and lower the fifth wheel 1 said frame 5 can be swung at its rear end by means of a pneumatic bellows unit 6 acting between the main frame 4 and the swingable frame 5. The possibility of raising and lowering the fifth wheel 1 will facilitate coupling of the semi-trailer to the tractor, and after coupling has been realized the semi-trailer can be elevated to a suitable height at the front end with the aid of the fifth wheel 1. By this arrangement it is possible to use a pivoting supporting leg structure instead of a raisable and lowerable one, which in turn has made it possible to realize the above-described contemplated improvement of the supporting leg structure.

The supporting leg structure illustrated in the drawings comprises two supporting legs 10 which have their upper ends connected to a shaft 11. The shaft 11 is rotatably mounted at either end in a pair of suspension plates 12 which are connected to brackets 13 fixed to the semi-trailer sub-frame and provided with supporting surfaces against which bear the planar upper end surfaces 13' of the supporting legs 10 when said legs are lowered into their ground engaging supporting position. The supporting legs are shown in this position in FIGS. 2 and 3, and in FIG. 1 this position is indicated by dotted lines.

The supporting legs 10 which are of a strong, but relatively light-weight construction, for instance box-type design, are stiffened by braces 14 which extend from the mid portion of the respective supporting leg to a brace fastening 15 at the mid portion of the shaft 11. At their lower ends the supporting legs have foot plates 16 which are mounted so as to permit pivotment at a certain angle between abutments and have such a weight-distribution balance that they tend to be kept horizontal on raising and lowering of the supporting legs.

Being pivotally mounted by means of the common shaft 11, the supporting legs 10 can be swung between the ground engaging position in which they are substantially vertical, and a rest position in which they extend obliquely rearwardly and have the foot plates raised a fair distance from the ground so as always to go free of the ground on driving.

In the embodiment illustrated two strong tension springs 18 which tend to swing the supporting leg structure 3 to lowered position (FIGS. 2 and 3) are interposed between the brace fastenings 15, which are in the form of levers and are secured to the shaft 11, and spring brackets 17 at the sub-frame of the semi-trailer. For upward and rearward pivotment of the supporting leg structure 3 use is made of two pneumatic lifting cylinders 20 which are placed symmetrically on either side of the longitudinal axis of the semi-trailer at the inside

of and near each supporting leg. Each cylinder 20 is suspended in a bracket 21 connected to the semi-trailer sub-frame and has its piston rod hinged to a lever 22 attached to the shaft 11 (see FIG. 3). Like the levers 15, the levers 22 are secured to the shaft 11 at an angle suitable for the respective operating means. Upon outward movement of the pistons in the cylinders the shaft 11 rotates counter-clockwise, the supporting legs 10 being swung towards their rest positions against the action of the springs 18 which are thereby tensioned. In the preferred embodiment the two cylinders 20 are so dimensioned that whenever necessary they can individually operate the supporting leg structure 3 and that they can individually retain the supporting leg structure 3 in the rearwardly swung position of rest.

Compressed air to the cylinders 20 can be supplied by a compressed air connection which is automatically established when the coupling member 1 on the tractor is engaged with the coupling member 2 on the semi-trailer. These couplings which are preferably constructed as described in U.S. Pat. No. 3,734,537 (Pat. Appln. Ser. No. 63,174, filed Aug. 12, 1970) include connector members for the supply of both electric power and compressed air from the tractor to the semi-trailer. These electric power and compressed air connections are automatically established and interrupted upon coupling and uncoupling of the semi-trailer.

The lifting cylinders 20 can be operated from the tractor via the compressed air connection through the coupling 1, 2 but the semi-trailer may be equipped with means for operating the cylinders 20 by compressed air from a compressed air container disposed on the semi-trailer. Such means makes the operation of the supporting leg structure 3 between ground engaging position and rest position independent of the compressed air supply of the tractor, and by complementary means of this kind disposed on the semi-trailer the latter can be used independently of a particular pulling tractor, which facilitates for instance shunting of the semi-trailer in a loading or unloading terminal without the help of the usual tractor.

To permit swinging the supporting legs 10 from the ground engaging position in which they support the semi-trailer to the rest position it may be possible to elevate the front end of the semi-trailer to relieve the supporting legs of load. In their preferred construction the supporting legs are so arranged that the semi-trailer by reason of its weight tends to swing the supporting legs forwardly when the semi-trailer is supported by them. Through this tendency of swinging the supporting legs forwardly the upper end surfaces thereof are firmly pressed against the supporting surfaces formed on the brackets 13, providing a stable support for the semi-trailer against the ground. With this arrangement of the supporting legs the semi-trailer must permit being elevated a considerable distance at the front end to permit swinging the supporting legs 10 rearwardly into position of rest. This is rendered possible, however, by the described arrangement of the fifth wheel 1, the lifting bellows 6 and the pivoting frame 5 of the tractor.

For coupling together the tractor and the semi-trailer which is supported at its front end by the supporting leg structure 3 the tractor is backed up in the usual way against the front end of the semi-trailer so that the king pin 2 at the front end of the semi-trailer passes through a guide opening in the fifth wheel 1 into correct coupling position, which automatically establishes the mechanical coupling and the connection of the electric power and compressed air connector members. As already mentioned, this coupling operation is facilitated by the possibility of elevating or lowering the fifth wheel 1 to a suitable level with respect to the king pin 2. After coupling has been accomplished the front end of the semi-trailer is elevated somewhat with the aid of the bellows 6 and the fifth wheel 1 on the tractor so that the supporting legs 10 are raised a sufficiently large distance from the ground to permit being swung rearwardly by means of the lifting cylinders 20. The springs 18 are tensioned during this rearward swinging of the supporting legs. The semi-trailer can then be lowered if necessary to the suitable transport position. During driving of the tractor and semi-trailer combination the air bellows 6 disposed on the tractor can be used as an air spring for the semi-trailer.

Upon uncoupling of the semi-trailer from the tractor air is released from the cylinders 20, the springs 18 automatically pivoting rhe supporting legs 10 downwards into ground engaging position. If desired, this operation can be preceded by a height adjustment of the front end of the semi-trailer with the aid of the bellows 6. After downward pivotment of the supporting legs into ground engaging position the tractor can be uncoupled and driven aside. A locking mechanism having one lock bolt 30 for each supporting leg serves to lock the supporting legs 10 in their ground engaging position. The lock bolt 30 is movable in guides 31 at the upper end of the respective supporting leg and is biased by means of a spring 32 towards a locking position in engagement with a locking lug 33 on the bracket 13. The lock bolt 30 can be moved out of engagement with the locking lug 33 by a lock opening device 34 including a pneumatic lock opening cylinder the piston of which is connected via a piston rod to a lever 36 pivoted to a support 35 and having its upper end pivoted to the rear end of the lock bolt 30. The lock bolt 30 can be retracted by means of said lock opening device 34 from its engagement with the locking lug 33 to permit rearward pivotment of the supporting legs. Operation of the lock opening device 34 is realized by means of compressed air, and in the preferred embodiment the two lock opening devices are contained in the same pneumatic system which includes the lifting cylinders 20 and the wheel brake cylinders of the semi-trailer.

Such a pneumatic system is illustrated by way of example in FIG. 4.

In FIG. 4, 40 designates a supply line which after engagement of the coupling members 1 and 2 on the tractor and the semi-trailer, respectively, is supplied with air from the tractor. The two lifting cylinders 20 are connected in parallel each via a quick venting valve 41 to a line 42 which in turn is connected to the supply line 40 over a non-return valve 43 and two series-connected pressure-controlled valves 44, 45. The line 46 connecting the pressure-controlled valves 44, 45 is connected over a non-return valve 47 to the supply line 40 and over a line 42 to the two lock opening cylinders 34. This arrangement functions in such a way that when the supply line 40 conducts compressed air after engagement of the coupling members 1 and 2 on the tractor and the semi-trailer, respectively, compressed air is transmitted to the two non-return valves 43 and 47, which are, however, closed in the direction away from the supply line 40, and to one pressure-controlled valve

45 which is set to open for instance at a pressure of 4.5 kp/sq.cm. When this valve 45 is opened air is passed to the lock opening cylinders 34 which thereby release the lock bolts 30 so that the supporting legs can be swung rearwardly. Compressed air from the pressure-controlled valve 45 is passed also to the second pressure-controlled valve 44 which is, however, set for a higher opening pressure, for instance 5 kp/sq.cm. Opening of the lock bolts 30 shall have been accomplished before the second pressure-controlled valve 44 is opened. When the opening pressure for the second pressure-controlled valve 44 is reached and this valve is opened, compressed air flows through the line 42 to the lifting cylinders 20 which pivot the supporting legs 10 rearwardly against the action of the springs 18. Owing to the pressure in the supply line 40 the pistons in the lifting cylinders 20 are kept fixed, thereby maintaining the supporting legs 10 in their rearwardly swung position. Should any of the two cylinders 20 unintentionally be emptied through some fault in the line connections or because of leakage, the other lifting cylinder alone is capable of maintaining the supporting legs in their rearwardly swung position. Lowering of the supporting legs into ground engaging position is performed by the lifting cylinders being emptied. This can be realized by interrupting the air connection in the coupling 1, 2 or by opening the valves 41. The valves 41 can be arranged so as to be opened electrically from the tractor or mechanically by means located on the semi-trailer.

The embodiment described in the foregoing provides a relatively simple and practical supporting leg structure for the semi-trailer, and such a structure can be given a relatively light-weight, but nevertheless very strong construction and can be operated wholly or partly automatically or by pulses from a central operating stand, such as and preferably the driver's cab of the tractor.

It will be obvious to those skilled in the art that the supporting leg structure of the present invention can be modified in various ways within the scope of the appended claims. Such conceivable modifications are not restricted to the number of cylinders and biasing springs nor to the detailed design of the supporting legs and their suspension, but also comprise for example the type of operating means for raising and lowering the supporting legs. Instead of pneumatical operating means and springs use can be made of for instance hydraulical operating means. Finally, other facilities on the tractor than those described can be used for raising the semi-trailer the requisite distance at the front end.

What we claim and desire to secure by Letters Patent is:

1. Supporting leg structure for the front end of a semi-trailer having at its front end a semi-trailer coupling to be coupled to and supported at said front end by supporting and mating semi-trailer coupling means mounted on a tractor, said supporting leg structure being pivotably mounted to the front end portion of the sub-structure of said semi-trailer and including a power-driven operating mechanism connected between said supporting leg structure and said semi-trailer sub-structure for pivoting said supporting said leg structure between a substantially vertical operative supporting position for supporting the semi-trailer at its front end when the semi-trailer is disconnected from said tractor and an inoprerative position, in which the supporting leg structure is swung rearwardly out of contact with the ground to permit undisturbed travel of said semi-trailer in its coupled and front end supported condition in relation to said tractor; wherein said supporting means on the tractor is raisable and lowerable and said tractor has a power supply and a power driven operating mechanism connected to said power supply by selectively controllable conduit means supported on the tractor and by which said supporting means on the tractor is selectively raisable and lowerable for adjusting the height of the front end of the semi-trailer in its coupled and supported position thereof in relation to the tractor; wherein said operating mechanism for supporting said supporting leg structure between said positions is connected to, and disconnected from, said selectively controllable conduit means on the tractor upon coupling and uncoupling, respectively, of said coupling means on the tractor and on the semi-trailer such that said operating mechanism on the semi-trailer is operable by power from said power supply on the tractor for pivoting the supporting leg structure to at least one of said operative and inoperative positions thereof when the semi-trailer is connected to and supported in a raised position of its front end by said supporting means on the tractor; and wherein the supporting leg structure includes a locking and unlocking system comprising a locking means adapted to automatically lock the supporting leg structure in its operative supporting position to said sub-structure of the semi-trailer upon pivoting the supporting leg structure into said operative position, and a power-operated unlocking mechanism associated with said locking means and adapted to be connected to, and controllable by, said selectively controllable conduit means on the tractor, said conduit supplying selectively to all said operating mechanisms, said locking and unlocking systems being, upon coupling of the semi-trailer to the tractor, connected to said conduit means and said conduit means being selectively controllable to transmit operating power also to the unlocking mechanism for unlocking the locking means before operating power is transmitted to said supporting leg structure operating mechanism.

2. Supporting leg structure as claimed in claim 1, wherein said locking mechanism includes a locking bolt and a locking leg, one of which is connected to the supporting leg structure and the other to the sub-frame semi-trailer sub-structure, and wherein said power-operated unlocking means opens the lock bolt against the action of a spring tending to move the locking bolt into locking position engagement with the locking leg.

3. Supporting leg structure as claimed in claim 1, wherein said operating mechanism on the tractor as well as said supporting leg structure operating mechanism on the semi-trailer and said unlocking mechanism are compressed air actuated operating mechanisms.

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