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(54) SLIDABLY ADJUSTABLE FIFTH WHEEL HITCH ASSEMBLY FOR A VEHICLE AND CONTROL SYSTEM FOR THE SAME

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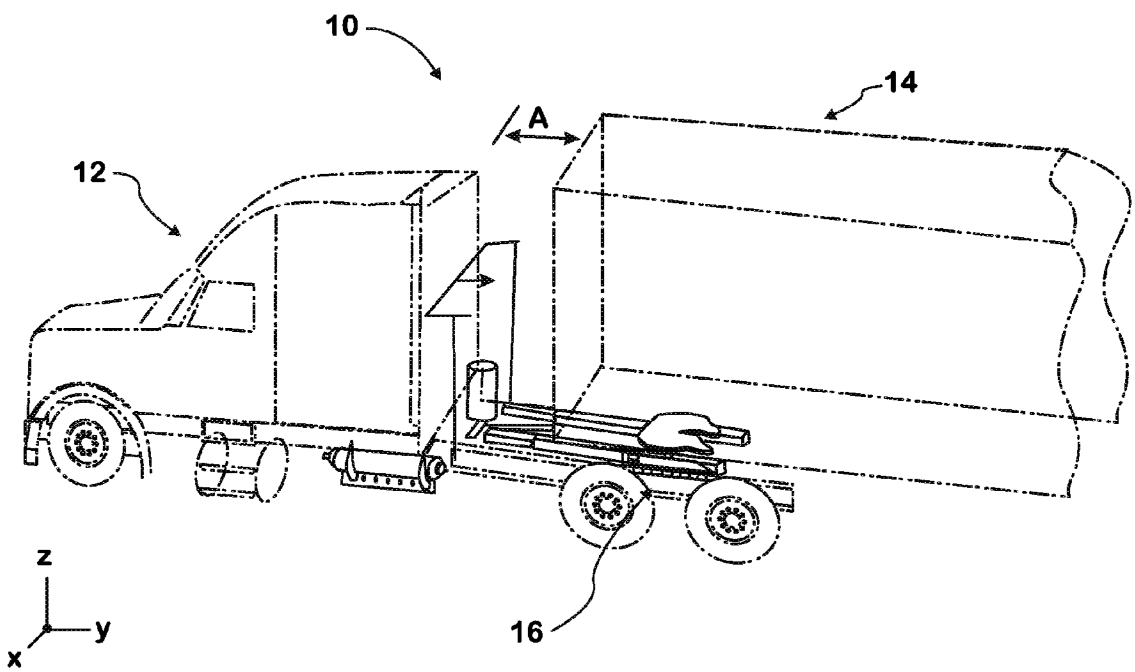
(52) **U.S. Cl.** **701/49**

(57) **ABSTRACT**

An automatically adjustable fifth wheel assembly for a vehicle and trailer combination that adjusts the position of the trailer relative to the vehicle is provided.



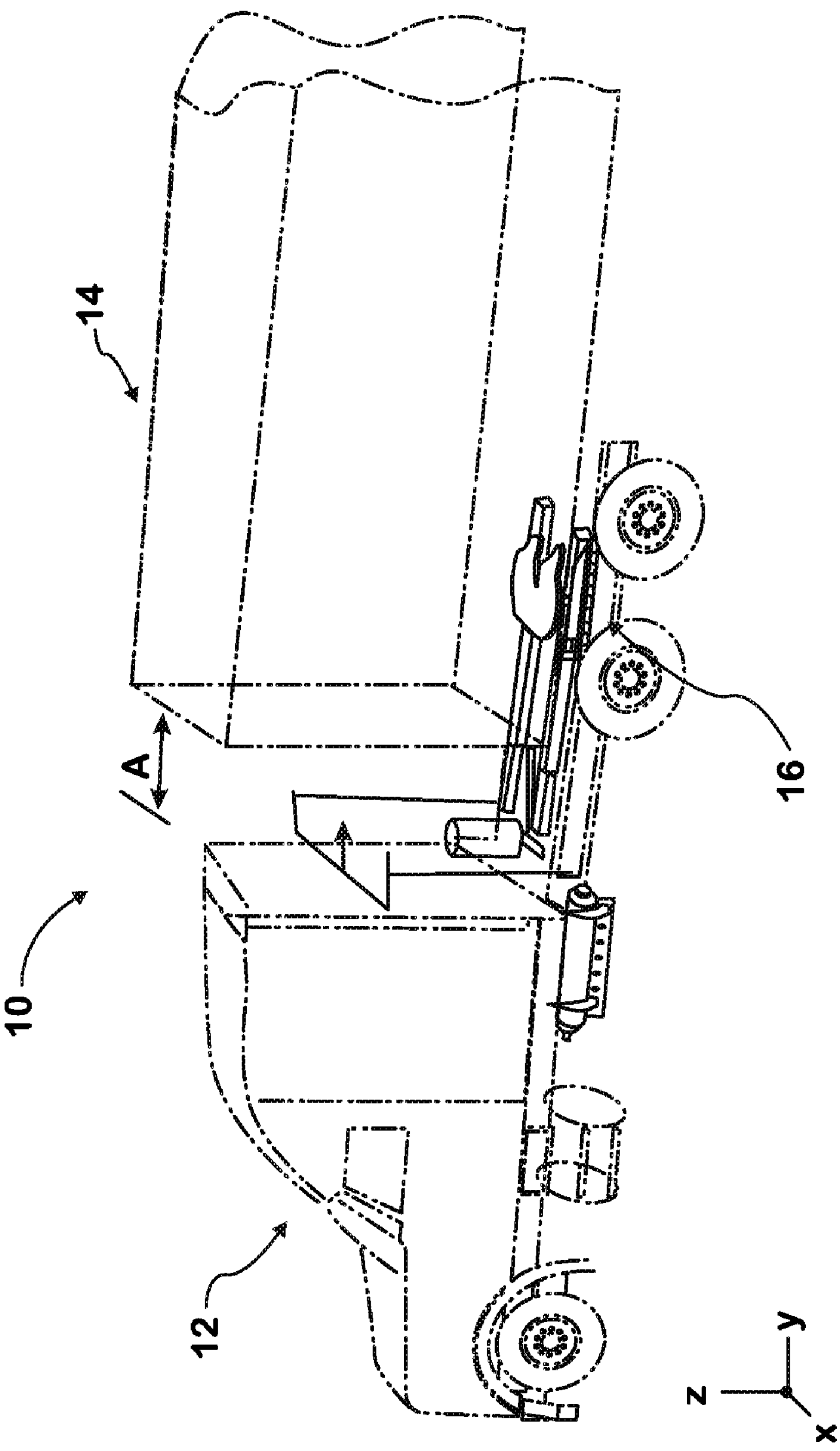


FIG. 1

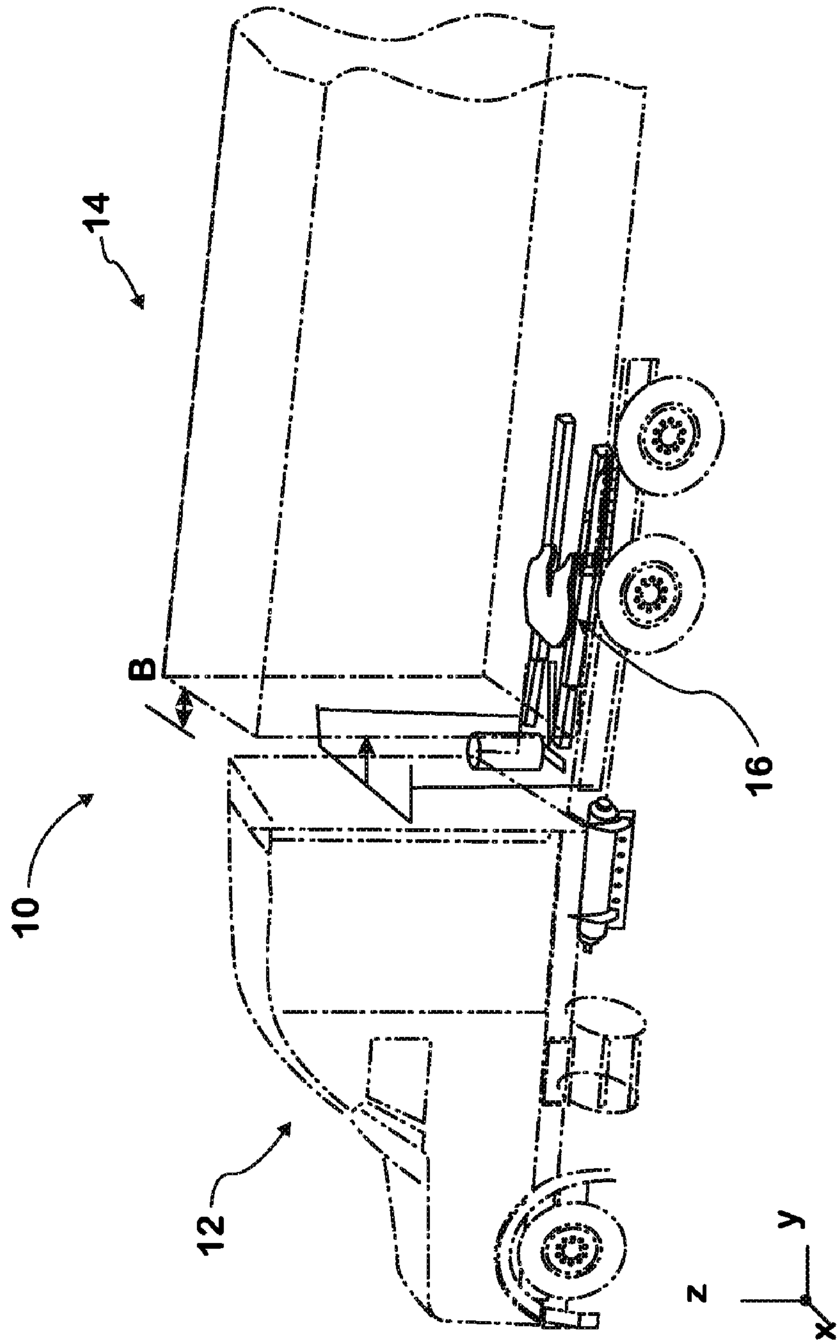


FIG. 2

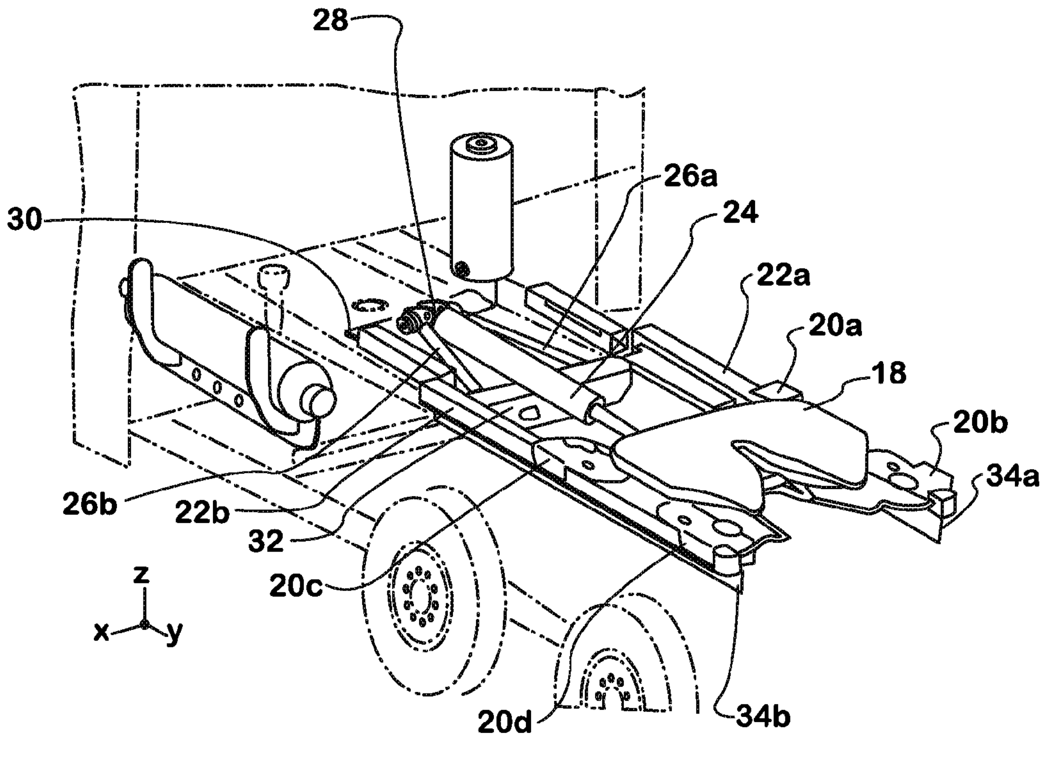


FIG. 3

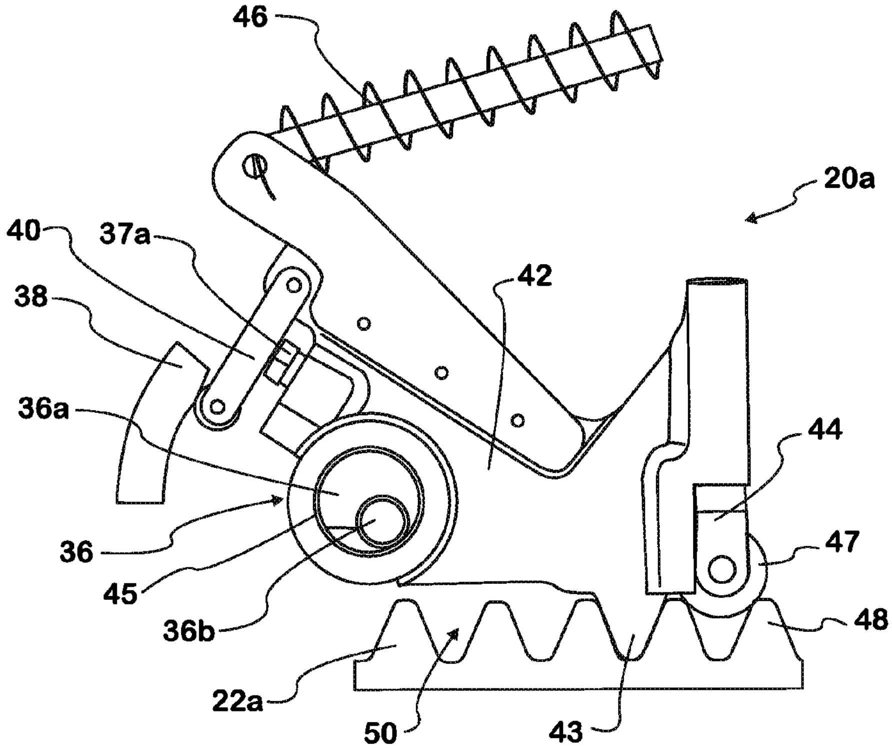


FIG. 4

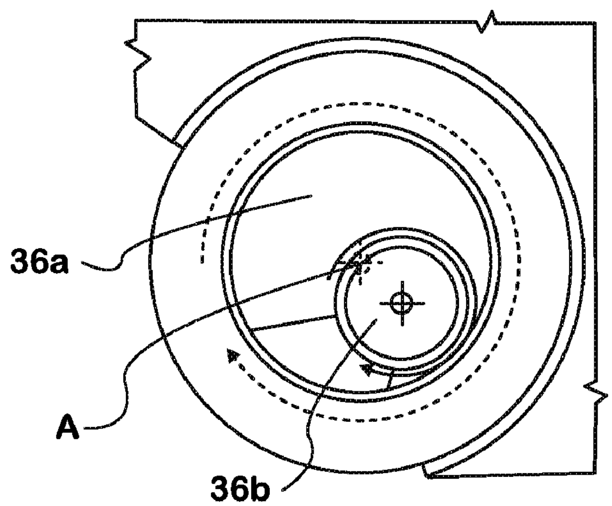


FIG. 5a

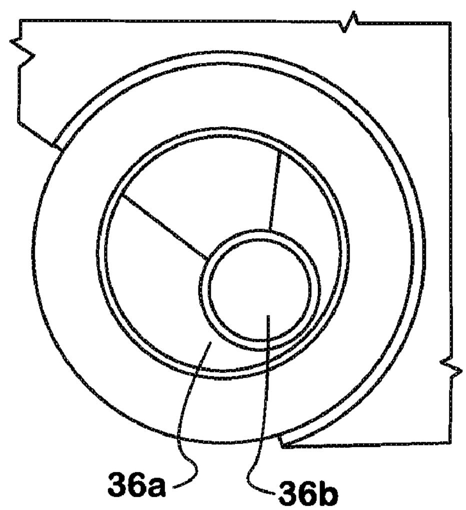


FIG. 5b

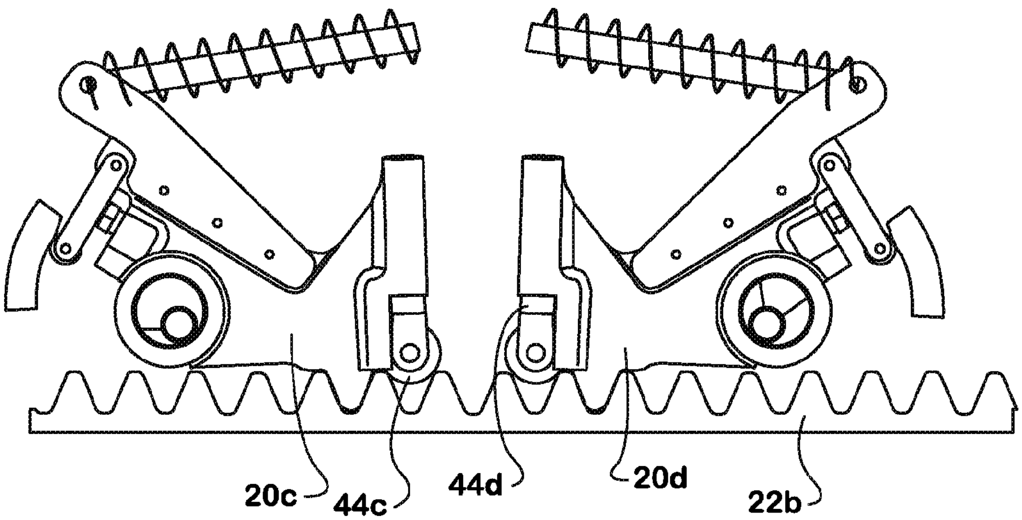


FIG. 6

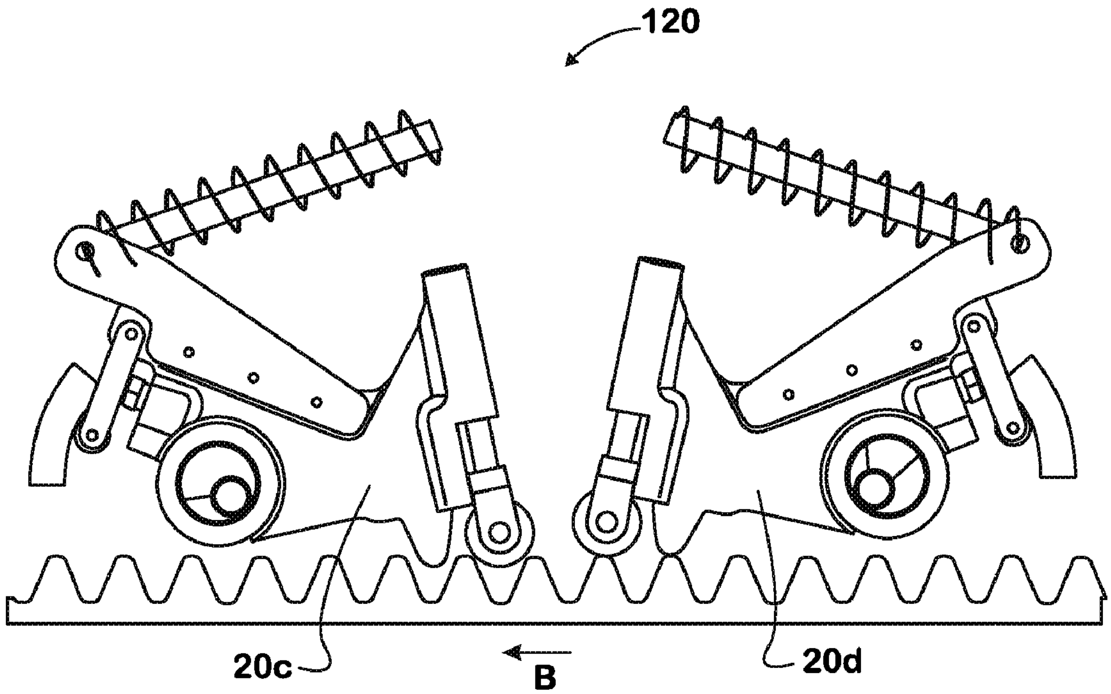


FIG. 7

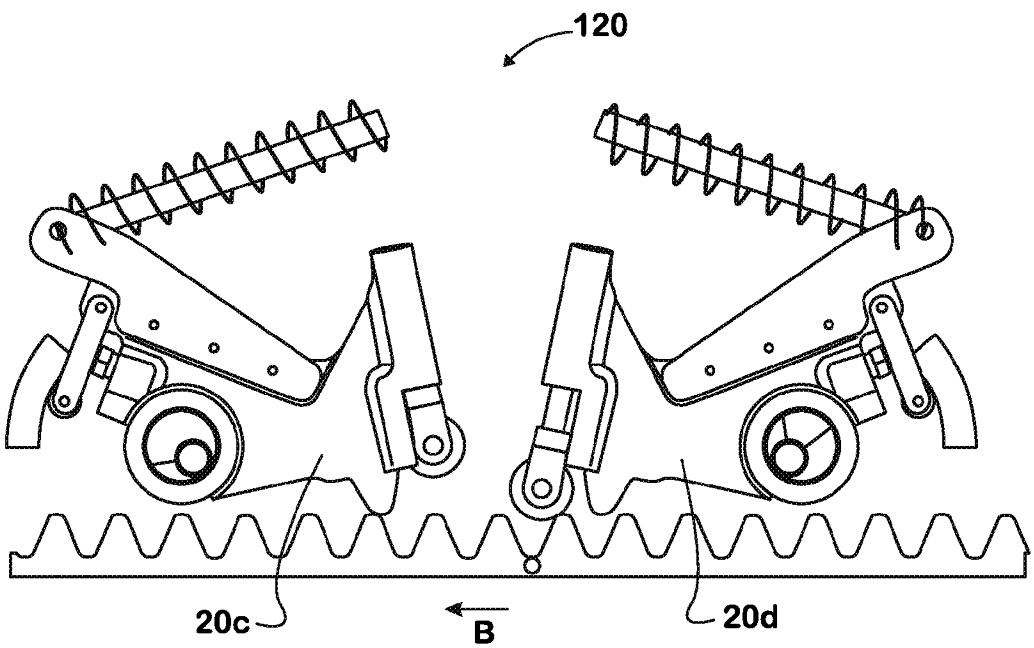


FIG. 8

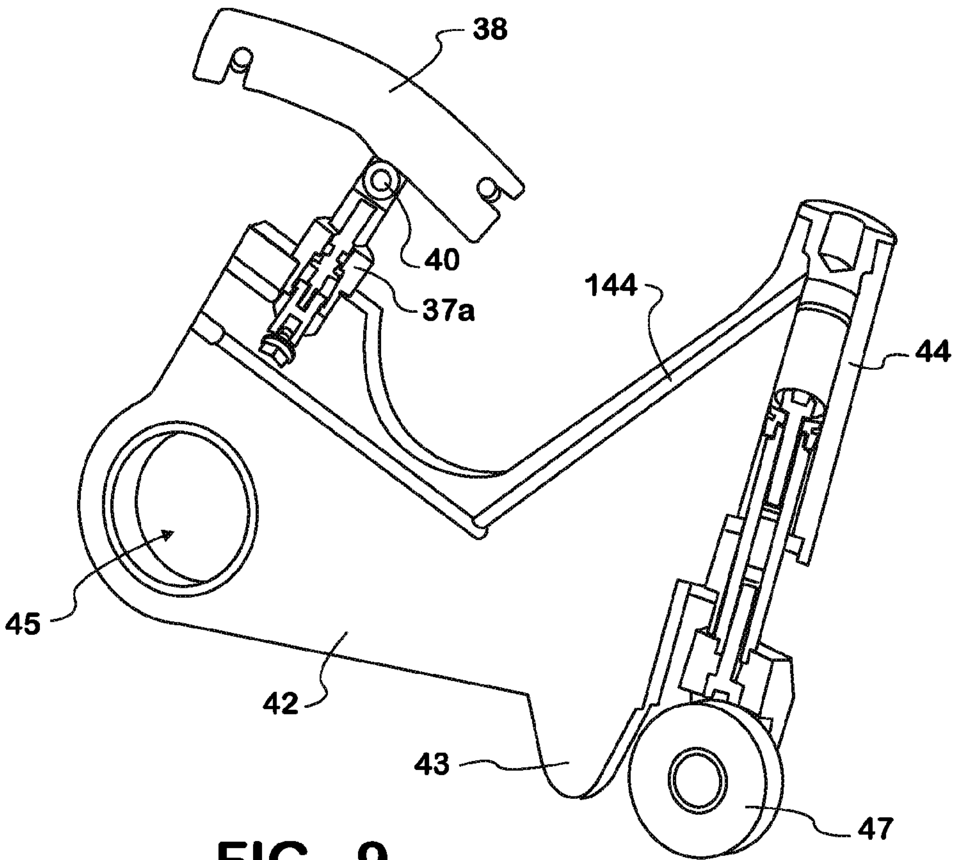


FIG. 9

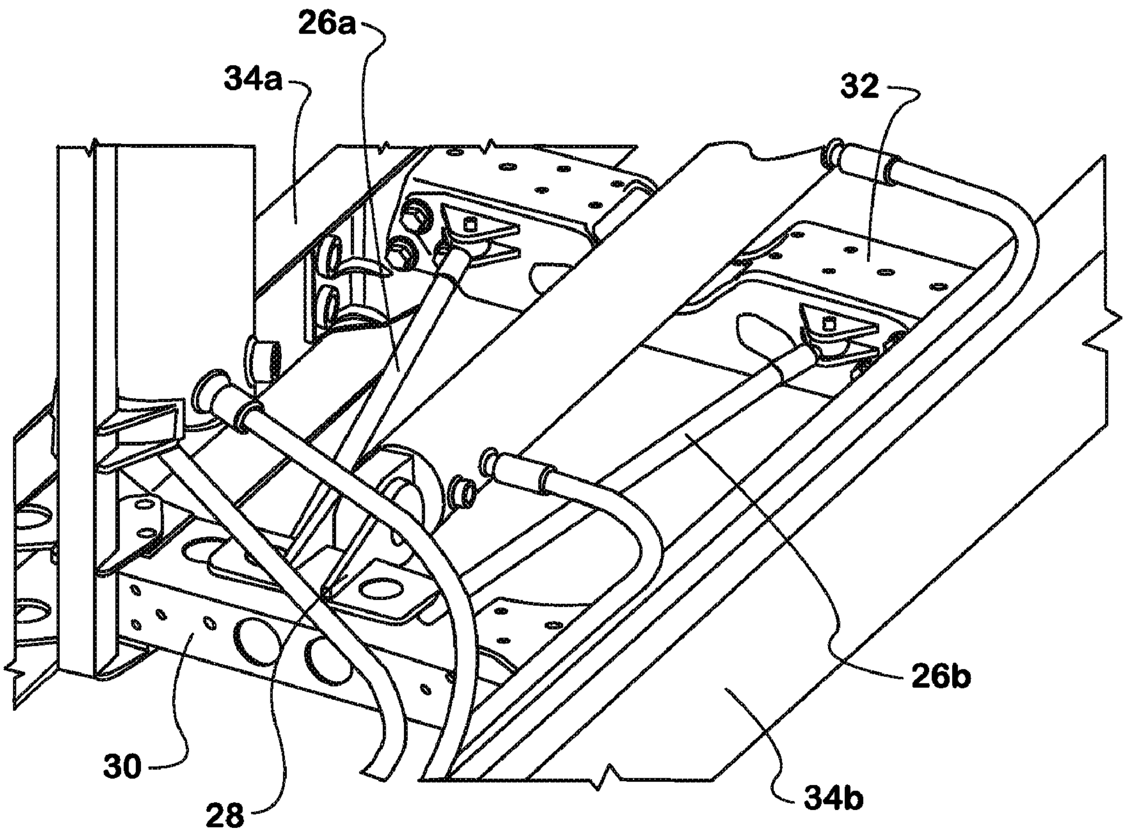


FIG. 10

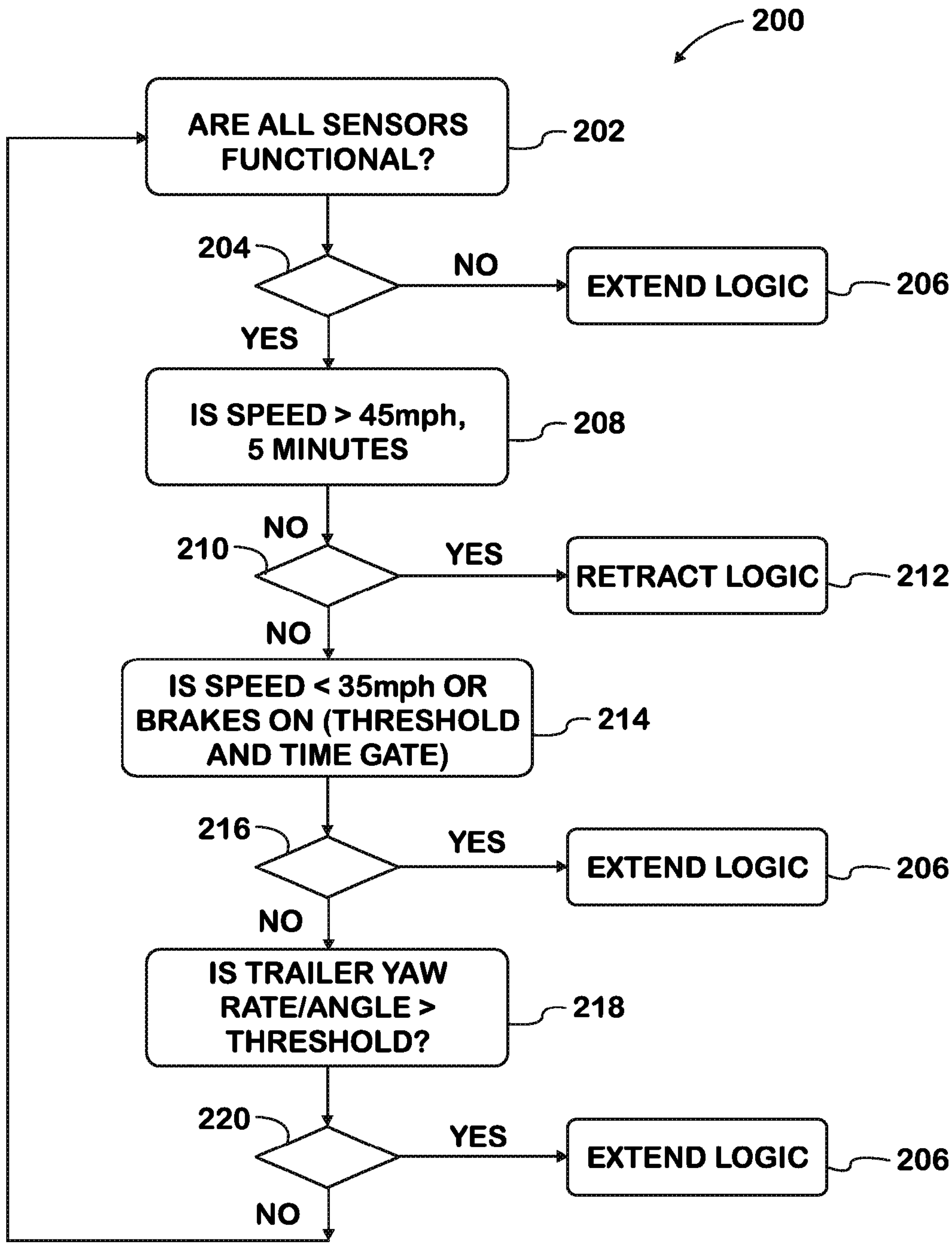

200
ARE ALL SENSORS FUNCTIONAL?
202
204
NO
EXTEND LOGIC
206
YES
IS SPEED > 45mph, 5 MINUTES
208
NO
210
YES
RETRACT LOGIC
212
NO
IS SPEED < 35mph OR BRAKES ON (THRESHOLD AND TIME GATE)
214
216
YES
EXTEND LOGIC
206
NO
IS TRAILER YAW RATE/ANGLE > THRESHOLD?
218
220
YES
EXTEND LOGIC
206
NO

FIG. 11

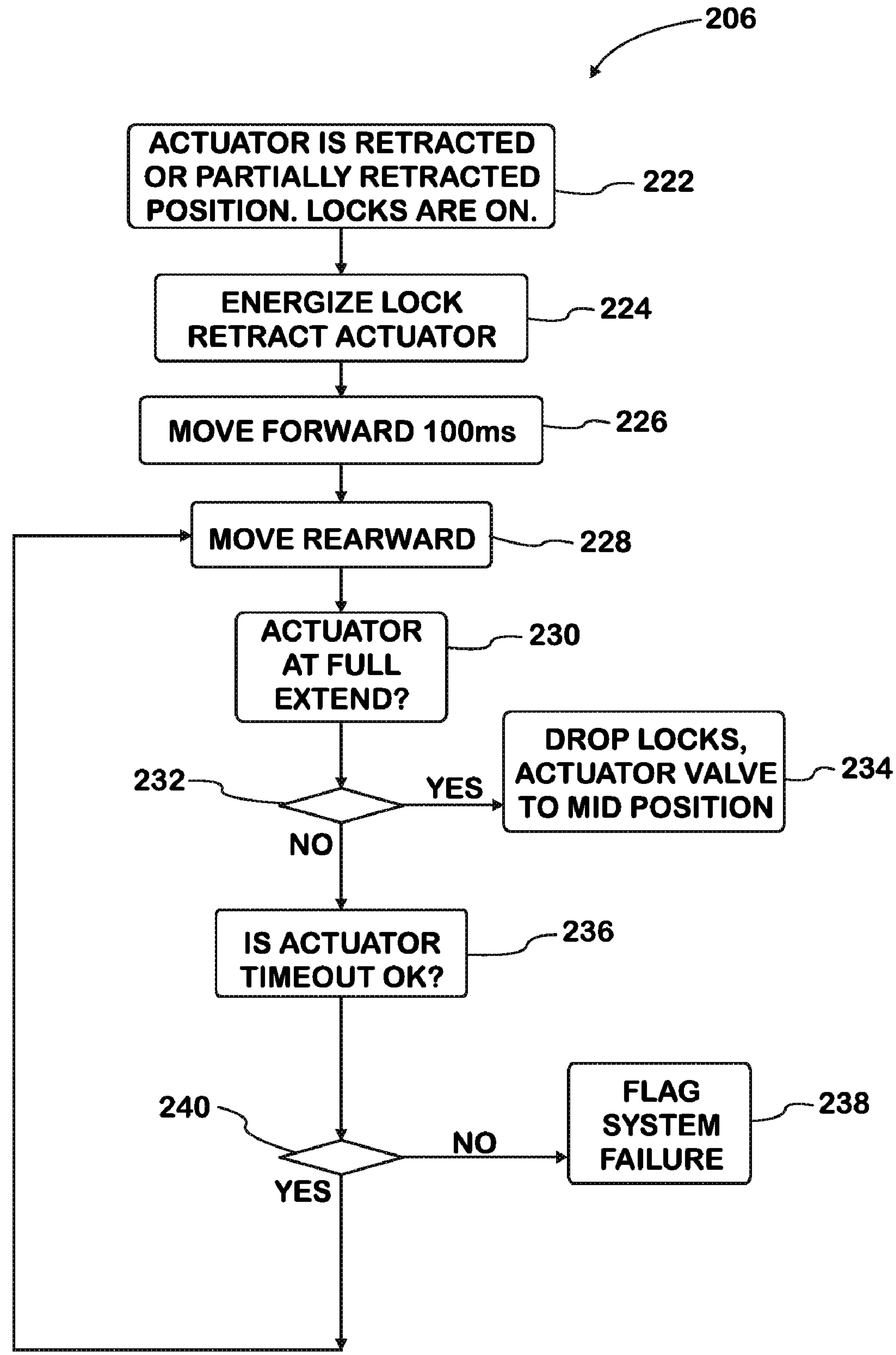

206
ACTUATOR IS RETRACTED OR PARTIALLY RETRACTED POSITION. LOCKS ARE ON.
222
ENERGIZE LOCK RETRACT ACTUATOR
224
MOVE FORWARD 100ms
226
MOVE REARWARD
228
ACTUATOR AT FULL EXTEND?
230
232
YES
DROP LOCKS, ACTUATOR VALVE TO MID POSITION
234
NO
IS ACTUATOR TIMEOUT OK?
236
240
NO
FLAG SYSTEM FAILURE
238
YES

FIG. 12

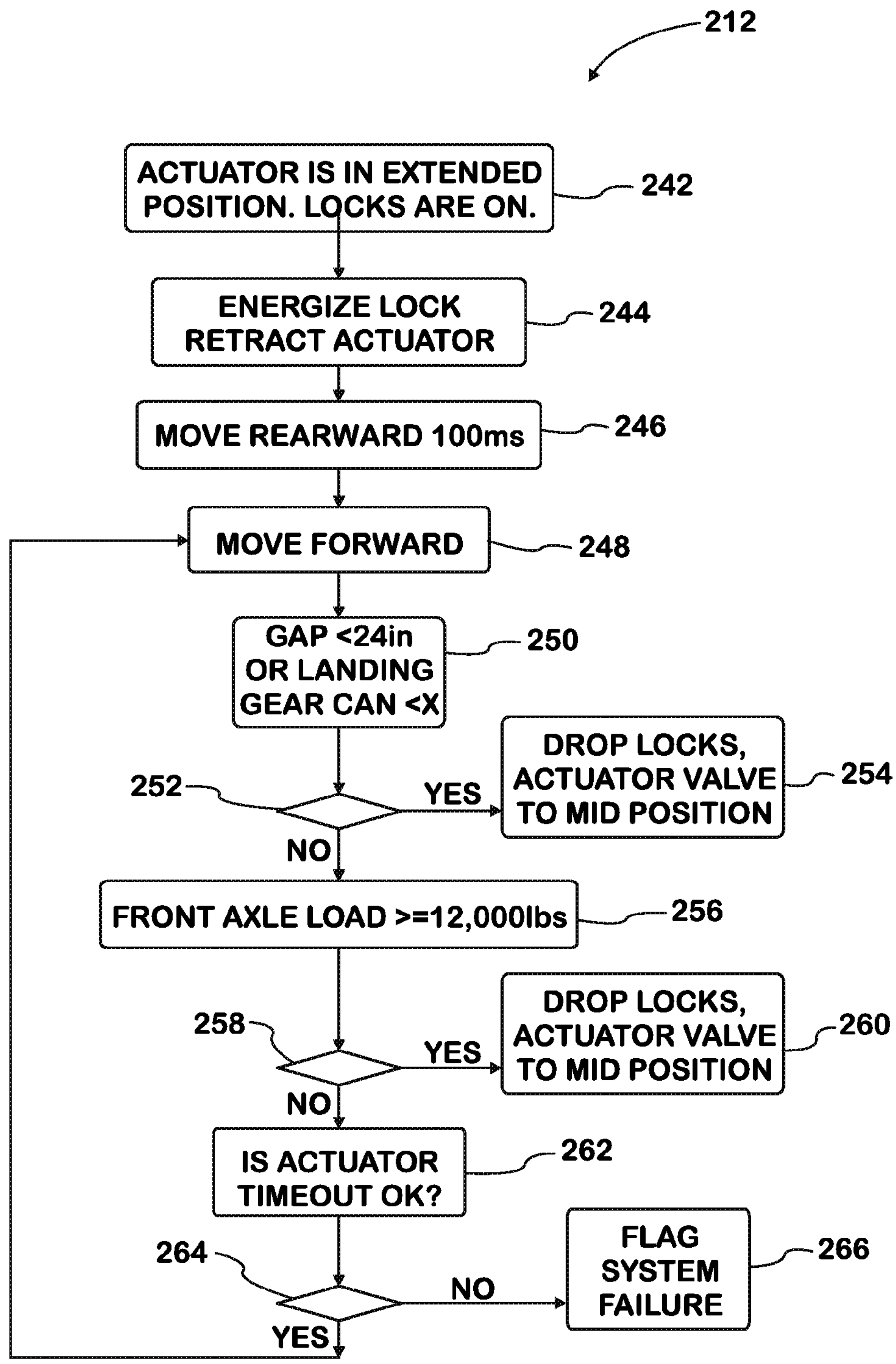

212
ACTUATOR IS IN EXTENDED POSITION. LOCKS ARE ON.
242
ENERGIZE LOCK RETRACT ACTUATOR
244
MOVE REARWARD 100ms
246
MOVE FORWARD
248
GAP <24in OR LANDING GEAR CAN <X
250
252
YES
NO
DROP LOCKS, ACTUATOR VALVE TO MID POSITION
254
FRONT AXLE LOAD >=12,000lbs
256
258
YES
NO
DROP LOCKS, ACTUATOR VALVE TO MID POSITION
260
IS ACTUATOR TIMEOUT OK?
262
264
NO
YES
FLAG SYSTEM FAILURE
266

FIG. 13

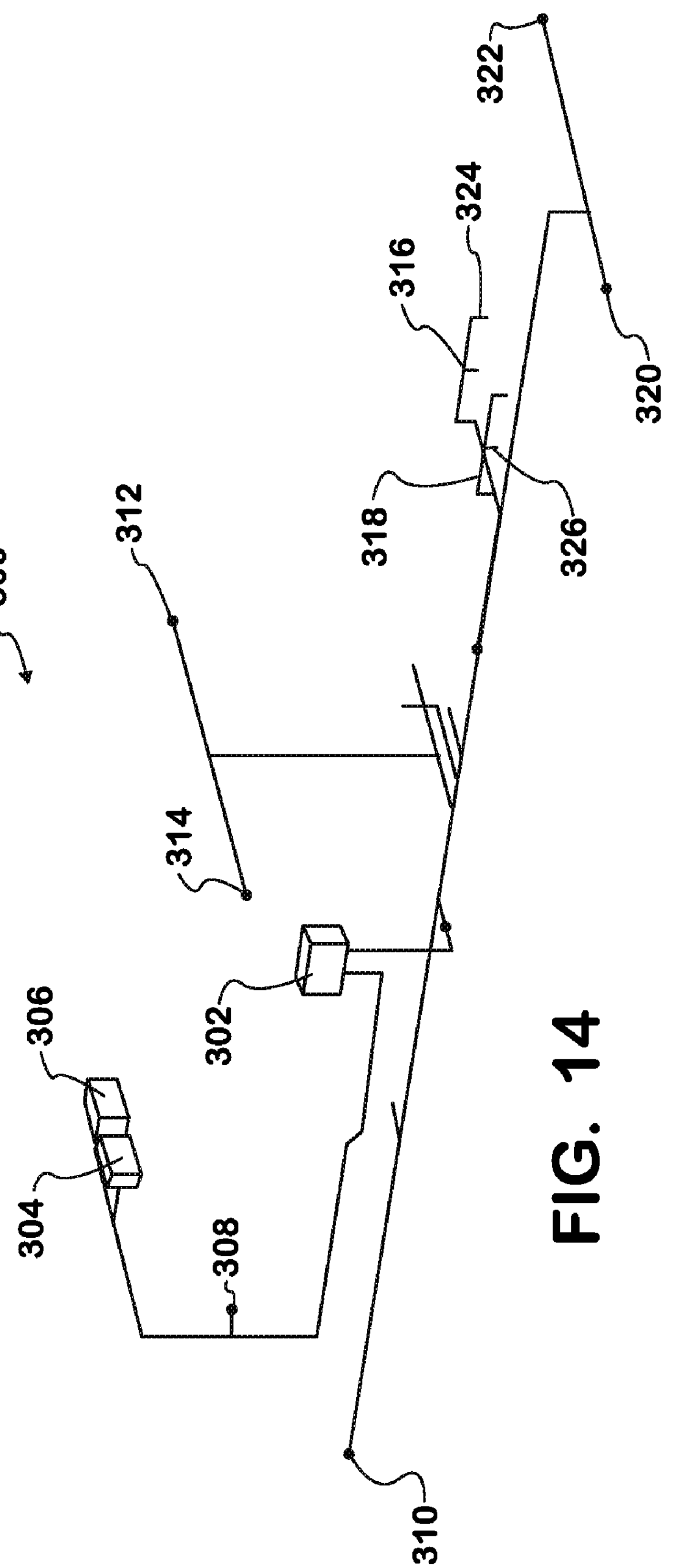


FIG. 14

SLIDABLY ADJUSTABLE FIFTH WHEEL HITCH ASSEMBLY FOR A VEHICLE AND CONTROL SYSTEM FOR THE SAME

RELATED APPLICATIONS

[0001] The present application claims priority to U.S. Provisional Patent Application No. 61/244,472 filed on Sep. 22, 2009, which is herein incorporated by reference in its entirety.

TECHNICAL FIELD

[0002] The present disclosure relates to a moveable fifth wheel assembly for a vehicle and a control system for the same. More particularly, the disclosure relates to a fifth wheel assembly for a vehicle that automatically adjusts the distance between a trailer and the vehicle under certain appropriate operating conditions.

BACKGROUND

[0003] Over the last several years vehicle manufacturers and vehicle operators have worked to improve fuel efficiency of vehicles, so that vehicles may be less expensive to operate and meet more stringent fuel economy regulations. In some heavy-duty vehicles, such as semi trucks, or tractor-trailers, a vehicle is used to pull a trailer that contains cargo, and the location where the trailer connects to the vehicle is often referred to as a fifth wheel. One approach to improving fuel economy involves decreasing the distance between the vehicle and the trailer during certain operating conditions by moving the fifth wheel. Positioning the trailer in closer proximity to the vehicle improves aerodynamics of the vehicle and trailer combination, thus increasing fuel economy of the vehicle. However, in other operating conditions, it may be a disadvantage to position the trailer close to the vehicle, such as during a turn, during rapid deceleration, during low speed operations, or if the trailer is loaded in a manner that positioning the trailer closer to the vehicle would violate axle weight restrictions set by government regulations.

[0004] Therefore, a need exists for a system and method that is capable of automatically positioning a trailer relative to a vehicle by moving a fifth wheel assembly based upon operating conditions of the vehicle and trailer.

SUMMARY

[0005] According to one process, a method, executed by a control system, for automatically moving a fifth wheel actuator of a heavy duty vehicle having a cab between a forward position in which the fifth wheel actuator is in its closest position to the cab and a rearward position in which the fifth wheel actuator is in its farthest position from the cab is provided. A plurality of vehicle parameter sensors are monitored to determine whether at least one of the plurality of parameter sensors is nonfunctional and generate a movement event output signal when at least one of the plurality of parameter sensors is nonfunctional. A vehicle speed is monitored over a predetermined time interval. The monitored vehicle speed is compared to a first speed threshold value and generates a movement event output signal when the vehicle speed exceeds the first predetermined speed threshold value. The monitored vehicle speed is compared to a second speed threshold value and generates a first movement event output signal when the vehicle speed is below the second predetermined speed threshold value. A vehicle yaw is determined The monitored vehicle yaw is compared to a yaw threshold value and generates a second movement event output signal when the vehicle yaw exceeds the yaw threshold value. The fifth wheel actuator automatically moving in response to the first or second generated movement event output signal.

[0006] According to another process, a method, executed by a control system, for automatically moving a fifth wheel actuator of a heavy duty vehicle having a cab between a forward position closest to the cab and a rearward position farthest from the cab is provided. A vehicle speed is monitored over a predetermined time interval and generates vehicle speed data indicative of the monitored vehicle speed over the predetermined time interval. A vehicle acceleration is monitored and generates vehicle acceleration data indicative of the monitored acceleration. At least one of a vehicle steer angle, steer rate, articulation angle and articulation rate is monitored and generates vehicle yaw data indicative of the monitored vehicle steer angle, steer rate, articulation angle and articulation rate. A movement event output signal is generated when the vehicle speed data, vehicle acceleration data and vehicle yaw rate data meet predetermined vehicle parameters. The fifth wheel actuator automatically moves in response to the generated movement event output signal.

[0007] According to one embodiment, a system for controlling actuation of a fifth wheel actuator of a vehicle comprises a plurality of sensors, a controller and a fifth wheel actuator. The plurality of sensors are each associated with at least one of the vehicle cab and trailer. The plurality of sensors are provided to gather data indicative of the vehicle speed, vehicle acceleration, vehicle yaw and fifth wheel actuator position. The controller is in communication with the sensors. The controller is provided to evaluate vehicle speed over a predetermined time interval, vehicle acceleration, steer angle, steer rate, articulation angle and articulation rate. The controller is further provided to generate a movement event output signal resulting from the evaluated vehicle speed over a predetermined time interval, vehicle acceleration, steer angle, steer rate, articulation angle and articulation rate. The fifth wheel actuator moves between a forward position in which the fifth wheel actuator is closest to the cab of the vehicle and a rearward position in which the fifth wheel actuator is farthest from the cab of the vehicle. The fifth wheel actuator is responsive to generation of the movement event output signal by the controller.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. **1** is a perspective view of a vehicle having a slidably adjustable fifth wheel hitch assembly in a first position with an attached trailer;

[0009] FIG. **2** is a perspective view of a vehicle having a movable fifth wheel assembly of FIG. **1** in a second position with an attached trailer;

[0010] FIG. **3** is a detailed perspective view of the fifth wheel assembly of FIG. **1**;

[0011] FIG. **4** is side view of a latch mechanism of an adjustable fifth wheel assembly according to one embodiment;

[0012] FIGS. **5***a* and **5***b* are detailed views of an over-center pivot for a latch mechanism;

[0013] FIG. **6** is a side view of a latch pair assembly in a latched position according to one embodiment;

[0014] FIG. **7** is a side view of a latch pair assembly in an unlatched position according to one embodiment;

[0015] FIG. **8** is a side view of a latch pair assembly in an unlatched position according to another embodiment;

[0016] FIG. **9** is a sectional view of a latch mechanism according to one embodiment;

[0017] FIG. **10** is a perspective view of a cylinder mount assembly for a slidably adjustable fifth wheel hitch assembly according to one embodiment;

[0018] FIG. **11** is a block diagram showing a method moving a slidably adjustable fifth wheel hitch assembly;

[0019] FIG. **12** is a block diagram showing a first sub-method of the method of FIG. **11**;

[0020] FIG. **13** is a block diagram showing a second sub-method of the method of FIG. **11** and;

[0021] FIG. **14** is a perspective view of an electrical and control system of a vehicle having a slidably adjustable fifth wheel hitch assembly according to one embodiment.

DETAILED DESCRIPTION

[0022] FIG. **1** shows a vehicle and trailer combination **10** having a vehicle **12** and a trailer **14**. The vehicle has a slidably adjustable fifth wheel hitch assembly **16**. As shown in FIG. **1**, the slidably adjustable fifth wheel hitch assembly **16** is disposed in a first position. In the first position, the trailer **14** is separated from the vehicle **12** a distance A. The distance A is sufficient to allow the vehicle **12** to turn without contacting the trailer **14**.

[0023] FIG. **2** shows the vehicle and trailer combination **10** of FIG. **1**, with the slidably adjustable fifth wheel hitch assembly **16** disposed in a second position. In the second position, the trailer **14** is separated from the vehicle **12** by a distance B. The distance B is less than the distance A of FIG. **1**. In the second position with the trailer **14** closer to the vehicle **12**, the aerodynamics of the vehicle and trailer combination **10** is improved. The improved aerodynamics of the vehicle and trailer combination **10** reduce the fuel consumption of the vehicle and trailer combination **10**. The distance B between the vehicle **12** and the trailer **14** limit the allowable movement between the vehicle **12** and the trailer **14**, such that some turns require that the trailer **14** be moved away from the vehicle **12** to prevent contact between the vehicle **12** and the trailer **14**.

[0024] FIG. **3** depicts a detailed perspective view of the slidably adjustable fifth wheel hitch assembly **16**. The slidably adjustable fifth wheel hitch assembly **16** has a fifth wheel hitch member **18** adapted to receive a pin from the trailer **14** in order to attach the trailer **14** to the vehicle **12**. The fifth wheel hitch member **18** has a plurality of latch mechanism assemblies **20***a*-**20***d* that releasably attach the fifth wheel hitch member **18** to a first rack **22***a* and a second rack **22***b*. As shown in FIG. **3**, a first latch mechanism assembly **20***a* and a second latch mechanism assembly **20***b* releasably attach the fifth wheel hitch member **18** to the first rack **22***a*, while a third latch mechanism assembly **20***c* and fourth latch mechanism assembly **20***d* releasably attach the fifth wheel hitch member **18** to the second rack **22***b*.

[0025] A fifth wheel actuator, such as a hydraulic cylinder **24**, is provided to adjust the slidably adjustable fifth wheel hitch assembly **16** in a direction generally parallel to a longitudinal axis of the vehicle **12**. It is additionally contemplated that the fifth wheel actuator may be a pneumatic actuator, an electric motor, an electromagnetic device, a chain driven actuator, a pulley system, or other known actuator types, not just a hydraulic cylinder **24**. The hydraulic cylinder **24** moves the slidably adjustable fifth wheel hitch assembly **16** when at least some of the plurality of latch mechanisms **20***a*-**20***d* are released from the first and second racks **22***a*, **22***b*.

[0026] The hydraulic cylinder **24** attaches via a cylinder mount assembly **28** to a first frame cross member **30** that connects to a first frame rail **34***a* and a second frame rail **34***b*, as is additionally shown in FIG. **10**. The cylinder mount assembly **28** is adapted to move laterally along the first frame cross member **30**, such that additional torsional stress is not delivered to a first frame rail **34***a* and a second frame rail **34***b* of the vehicle **12** by the slidably adjustable fifth wheel hitch assembly **16**.

[0027] The cylinder mount assembly **28** is constrained from movement in a longitudinal direction relative to the first frame cross member **30** by a first longitudinal support **26***a* and a second longitudinal support **26***b*. The first longitudinal support **26***a* and the second longitudinal support **26***b* connect the cylinder mount assembly **28** to a second frame cross member **32**. The first frame cross member **30** connects to the first frame rail **34***a* and the second frame rail **34***b*. The second frame cross member **32** additionally connects to the first frame rail **34***a* and the second frame rail **34***b*. The first longitudinal support **26***a* and the second longitudinal support **26***b* distribute a longitudinal load placed on the cylinder mount assembly **28** to the second frame cross member **32**. The first longitudinal support **26***a* connects to the second frame cross member **32** near the first frame rail **34***a*. The second longitudinal support **26***b* connects to the second frame cross member **32** near the second frame rail **34***b*. Therefore, the first and second longitudinal supports **26***a*, **26***b* distribute longitudinal loads from the hydraulic cylinder **24** to frame rails **34***a*, **34***b* of the vehicle **12**, avoiding a concentration of stress along the first frame cross member **30**.

[0028] Turning now to FIG. **4**, the first latch mechanism assembly **20***a* is shown in greater detail. The second, third and fourth latch mechanism assemblies **20***b*-**20***d* function similarly to the first latch mechanism **20***a*. While the first latch mechanism assembly **20***a* is described in use with the slidably adjustable fifth wheel hitch assembly **16**, it is additionally contemplated that the first latch mechanism assembly **20***a* may be utilized with other systems for moving equipment along an axis.

[0029] The first latch mechanism assembly **20***a* has a latch body **42** and is removably connected to the first rack **22***a* by a latching tooth portion **43** that interacts with a plurality of rack teeth **48**. A locking space **50** is formed between each of the rack teeth **48**, such that the latching tooth portion **43** is disposed within the locking space **50** when the latch mechanism **20***a* is engaged. The latching tooth portion **43** of the latch body **42** is disposed at a first end of the latch body **42**.

[0030] The latch body **42** additionally has a crank opening **45** formed within the latch body **42**. The crank opening **45** is disposed at a second end of the latch body **42**. An over-center pivot **36** is disposed within the crank opening **45** of the of latch body **42**. The latch body **42** is adapted to pivot about the over-center pivot **36**. The over-center pivot **36** comprises a crank portion **36***a* and a ground portion **36***b*. The crank portion **36***a* pivots about the ground portion **36***b* to allow the latch body **42** to pivot about the over-center pivot **36**.

[0031] As shown in FIG. **5***a* and FIG. **5***b*, the crank portion **36***a* rotates in the direction of arrow A about the ground portion **36***b* in order to lock the over-center pivot **36** and prevent the latch body **42** from pivoting about the over-center pivot **36**. However, when the crank portion **36***a* has pivoted about the ground portion **36***b* as shown in FIG. **5***b*, the latch body **42** may rotate about the over-center pivot **36**.

[0032] Turning to FIG. **4** and FIGS. **6-8**, a roller actuator assembly **44** is disposed the first end of the latch body **42**. The roller actuator assembly **44** has a wheel **47**. The wheel **47** is sized to be partially disposed within the locking space **50**. The roller actuator assembly **44** is hydraulically operated to position the roller actuator assembly **44** between an extended position, as shown in FIG. **7**, and a retracted position, as shown in FIG. **6**. The movement of the roller actuator assembly **44** to the extended position causes the crank portion **36***a* to rotate about the ground portion **36***b* of the over-center pivot **36** to allow the latch body **42** to rotate about the over-center pivot **36**. Once the roller actuator assembly **44** is in the extended position, the latching tooth portion **43** of the latch mechanism **20***a*-**20***d* is removed from the locking space **50**, and the slidably adjustable fifth wheel hitch assembly **16** may be moved longitudinally.

[0033] As the roller actuator assembly **44** is extended, the latching tooth portion **43** moves up and out of the locking space **50** as the latch body **42** pivots about the over-center pivot **36**. The roller actuator assembly **44** is disposed in the locking space **50** adjacent the locking space **50** containing latching tooth portion **43**. The latching tooth portion **43** may contact one of the rack teeth **48** as the latching tooth portion **43** moves out of the locking space **50**. The latching tooth portion **43** and the roller actuator assembly **44** are designed to prevent contact between a tip of the latching tooth portion **43** and tips of the rack teeth **48** to limit stress between the latching tooth portion **43** and the rack teeth **48**. Once the roller actuator assembly **44** has moved to an adjacent locking space **50**, the roller actuator assembly **44** may retract, and the latching tooth portion **43** reengages with an adjacent locking space **50**.

[0034] As shown in FIGS. **6-8**, the third latch mechanism assembly **20***c* and the fourth latch mechanism assembly **20***d* are shown forming a latch pair assembly **120**. As shown in FIG. **6**, the roller actuator assembly **44***d* of the fourth latch mechanism assembly **20***d* and the roller actuator assembly **44***c* of the third latch mechanism assembly **20***c* are in the retracted position.

[0035] As shown in FIG. **7**, the roller actuator assembly **44***d* of the fourth latch mechanism assembly **20***d* and the roller actuator assembly **44***c* of the third latch mechanism assembly **20***c* are in the extended position. Once the roller actuator **44***d* of the fourth latch mechanism assembly **20***d* is in the extended position, the latch pair assembly **120** may be moved in the direction of arrow B.

[0036] As shown in FIG. **8**, the roller actuator assembly **44***d* of the fourth latch mechanism assembly **20***d* is in the extended position, while the roller actuator assembly **44***c* of the third latch mechanism assembly **20***c* is in the retracted position. Similarly, once the roller actuator **44***d* of the fourth latch mechanism assembly **20***d* is in the extended position, the latch pair assembly **120** may be moved in the direction of arrow B.

[0037] As shown in FIGS. **7** and **8**, only the roller actuator assembly **44***d* of the fourth latch mechanism assembly **20***d* is required to be placed into the extended position to allow the latch pair assembly **120** to move in the direction of arrow B. Conversely, only the roller actuator assembly **44***c* of the third latch mechanism assembly **20***c* is required to be placed into the extended position to allow the latch pair assembly **120** to move in an opposite direction of arrow B. This is because the shape of the rack teeth **48** form a generally concave surface, such that latching tooth portion **43** of the latch mechanism assemblies **20***a*-**20***d* may cam out of the locking space **50** in one longitudinal direction, but will remain within the locking space in the other longitudinal direction. Therefore, the use of a latch pair assembly **120** prevents movement of the slidably adjustable fifth wheel hitch assembly **16** in a longitudinal direction unless at least one of the roller actuator assemblies **44***c*, **44***d* is in the extended position.

[0038] Turning back to FIG. **4**, the first latch mechanism assembly **20***a* additionally comprises a latch valve assembly that comprises a hydraulic valve **37***a* disposed at the second end of the latch body **42** that is connected to a cam follower **40** that follows a cam surface **38**. The hydraulic valve **37***a* has an open position and a closed position. The hydraulic valve **37***a* controls flow of hydraulic fluid to the roller actuator assembly **44**. As the cam follower **40** moves along the cam surface **38**, the hydraulic valve **37***a* closes, cutting off the flow of hydraulic fluid to the roller actuator assembly **44**. As the roller actuator assembly **44***a* reaches the next locking space **50**, the latching tooth portion **43** of the latch body **42** is returned to an adjacent locking space **50** to prevent additional movement of the slidably adjustable fifth wheel hitch assembly **16**, unless the roller actuator assembly **44** is reactivated. In this way, the hydraulic valve **37***a* acts as a safety mechanism to secure the latching tooth portion **43** into a locking space **50** should a hydraulic failure occur, as a biasing member **46** is adapted to rotate the latch body **42** about the over-center pivot **36** so that the latching tooth portion **43** enters the locking space **50**. As shown in FIG. **9**, a hydraulic passageway **144** connects the hydraulic valve **37***a* with the roller actuator assembly **44**, such that the closing of the hydraulic valve **37***a* deactivates the roller actuator assembly **44**.

[0039] A biasing member **46** is provided to bias the latch mechanism assembly **20***a* towards a latched position. As shown, the biasing member **46** is a spring, however, it is contemplated that an elastomeric biasing member may be utilized. Should a hydraulic failure occur with the roller **44** extended, the biasing member **46** will bias the latching tooth portion **43** of the latch mechanism assembly **20***a* towards an engaged position, such that the latching tooth portion **43** will reenter a locking space **50**, securing the latch mechanism **20***a*.

[0040] FIG. **14** shows an electrical and control system **300** for a vehicle having a slidably adjustable fifth wheel hitch assembly **16** according to one embodiment. The electrical and control system comprises a controller **302** that is in communication with a plurality of sensors to monitor and control operation of the slidably adjustable fifth wheel hitch assembly **16**. The controller **302** is additionally in communication with a display **304** and a power control unit **306** that supplies and regulates power to the electrical and control system **300**. A steering sensor **308** is provided to monitor a steering rate of the vehicle. A wheel angle sensor **310** is provided to monitor the steering angle of the vehicle.

[0041] A first rear cab sensor **312** and a second rear cab sensor **314** are additionally provided. The first rear cab sensor **312** and the second rear cab sensor **314** determine a distance between a vehicle and a trailer, such as the distance between the rear of a vehicle cab and a front surface of the trailer. The controller **302** may additionally utilize a difference in the distance between the vehicle and the trailer indicated by the first rear cab sensor **312** and the second rear cab sensor **314** to determine an articulation angle of the trailer relative to the truck as well as a yaw rate of the trailer.

[0042] A plurality of sensors are provided near the slidably adjustable fifth wheel hitch assembly **16** including a first slidably adjustable fifth wheel hitch assembly position and status sensor **316** and a second slidably adjustable fifth wheel hitch assembly position and status sensor **318**. The first fifth wheel hitch assembly position and status sensor **316** monitors whether a first pair of latch mechanisms are in a latched or released state and monitors the longitudinal position of the fifth wheel hitch assembly **16**. Similarly, the second fifth wheel hitch assembly position and status sensor **318** monitors whether a second pair of latch mechanisms are in a latched or released state and monitors the longitudinal position of the fifth wheel hitch assembly. The controller **302** thus may control an actuator, such as a hydraulic cylinder, to move the slidably adjustable fifth wheel hitch assembly **16**.

[0043] A first axle load sensor **324** and a second axle load sensor **326** are additionally provided. The first axle load sensor **324** monitors a load on a first rear axle of the vehicle, while the second axle load sensor **326** monitors a load on a second rear axle of the vehicle. The controller **302** monitors the load on the first rear axle and the second rear axle to ensure that the vehicle does not exceed an axle weight limit in place where the vehicle is operating.

[0044] A first rear vehicle sensor **320** and a second rear vehicle sensor **322** are additionally provided. The first rear vehicle sensor **320** and the second rear vehicle sensor **322** additionally determine a distance between the vehicle and the trailer, such as the distance between the rear of the vehicle and an undercarriage of the trailer. The controller **302** may additionally utilize a difference in the distance between the vehicle and the trailer indicated by the first rear vehicle sensor **320** and the second rear vehicle sensor **322** to determine an articulation angle of the trailer relative to the truck as well as a yaw rate of the trailer. The articulation angle and yaw rate based upon the rear vehicle sensors **320**, **322** may be compared by the controller **302** to the articulation angle and the yaw rate based upon the rear cab sensors **312**, **314** to serve as a additionally parameter the controller utilizes to control the actuator to move the slidably adjustable fifth wheel hitch assembly **16**.

[0045] While sensors determining the distance between the vehicle and the trailer have been described as being disposed on the vehicle, it is additionally contemplated that sensors may be located on the trailer to determine the distance between the vehicle and the trailer and the articulation angle and yaw rates of the trailer. It is further contemplated that sensors may be found on both the vehicle and the trailer to determine the distance between the vehicle and the trailer and the articulation angle and yaw rates of the trailer.

[0046] Turning now to FIG. **11**, a method **200** of controlling a slidably adjustable fifth wheel hitch assembly **16** is depicted. As shown at block **202**, the method determines if all sensors are functioning. A decision block **204** directs the slidably adjustable fifth wheel hitch assembly **16** to a push back position block **206**, i.e., away from a vehicle front, if not all of the sensors are functioning. However, if all sensors are functioning, the method progresses to block **208** to determine if the vehicle speed is more than a first predetermined speed and has been for a first preset time period, such as 45 miles per hour for a 5 minute time period. A decision block **210** directs the slidably adjustable fifth wheel hitch assembly to a pull forward position block **212**, i.e., towards a vehicle front, if the vehicle is traveling at a speed above the first predetermined speed for the first preset time period. If the vehicle speed does not satisfy the first predetermined conditions, the decision block **210** moves the method to block **214**, where it is determined if the vehicle speed is below a second predetermined speed for a second preset time period, or if the brakes are being applied. A decision block **216** determines if the conditions of the second predetermined speed and preset time period are met, or if the vehicle's brakes are being applied, the method again enters the push back position block **206**. However, if the decision block **216** does not meet the conditions of block **214**, the method determines if trailer movement exceeds preset ranges **218**. At decision block **220**, push back block **206** is selected if the trailer movement exceeds preset ranges, while the method returns to block **202** if the trailer movement does not exceed preset ranges.

[0047] Turning now to FIG. **12**, push back position block **206** is shown. The method **206** confirms that the slidably adjustable fifth wheel hitch assembly **16** is in at least a partially retracted position at block **222**. The method unlatches the latch mechanisms **20***a*-**20***d* at block **224**. The method moves the slidably adjustable fifth wheel hitch assembly forward for a short predetermined period of time at block **226**. The method then moves the slidably adjustable fifth wheel hitch assembly **16** backward at block **228**. At block **230**, the method determines if the slidably adjustable fifth wheel hitch assembly **16** is at a fully extended position. A decision block **232** reengages the latch mechanisms **20***a*-**20***d* if the slidably adjustable fifth wheel hitch assembly **16** is fully extended. If the slidably adjustable fifth wheel hitch assembly **16** is not fully extended, the method determines if a predetermined period of time has been exceeded during the movement of slidably adjustable fifth wheel hitch assembly **16**. A decision block **240** generates an error condition at block **238** if the predetermined period of time has been exceeded, or returns to block **228** to continue to move the slidably adjustable fifth wheel hitch assembly backward.

[0048] Turning to FIG. **13**, pull forward position block **212** is depicted. The method **212** confirms that the slidably adjustable fifth wheel hitch assembly **16** is in an extended position at block **242**. The method unlatches the latch mechanisms **20***a*-**20***d* at block **244**. The method moves the slidably adjustable fifth wheel hitch assembly **16** backward for a short predetermined time at block **246**. The method then moves the slidably adjustable fifth wheel hitch assembly **16** forward at block **248**. The method determines if the trailer is within a predetermined distance of the cab at block **250**. A decision block **252** reengages the latch mechanisms **20***a*-**20***d* if the trailer is within the predetermined distance of the cab. If the trailer is not within the predetermined distance of the cab, the method determines if an axial load of the vehicle exceeds a predetermined threshold at block **256**. A decision block **258** reengages the latch mechanisms **20***a*-**20***d* if the axial load of the vehicle exceeds the predetermined threshold. If the axial load of the vehicle does not exceed the predetermined threshold, the method determines if a predetermined period of time has been exceeded at block **262**. A decision block **264** generates an error condition at block **266** if the predetermined time has been exceeded, or returns to block **248**.

[0049] It will be understood that a control system may be implemented in hardware to effectuate the method. The control system can be implemented with any or a combination of the following technologies, which are each well known in the art: a discrete logic circuit(s) having logic gates for implementing logic functions upon data signals, an application specific integrated circuit (ASIC) having appropriate combinational logic gates, a programmable gate array(s) (PGA), a field programmable gate array (FPGA), etc.

[0050] When the control system is implemented in software, it should be noted that the control system can be stored on any computer readable medium for use by or in connection with any computer related system or method. In the context of this document, a "computer-readable medium" can be any medium that can store, communicate, propagate, or transport the program for use by or in connection with the instruction execution system, apparatus, or device. The computer readable medium can be, for example, but is not limited to, an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, device, or propagation medium. More specific examples (a non-exhaustive list) of the computer-readable medium would include the following: an electrical connection (electronic) having one or more wires, a portable computer diskette (magnetic), a random access memory (RAM) (electronic), a read-only memory (ROM) (electronic), an erasable programmable read-only memory (EPROM, EEPROM, or Flash memory) (electronic), an optical fiber (optical), and a portable compact disc read-only memory (CDROM) (optical). The control system can be embodied in any computer-readable medium for use by or in connection with an instruction execution system, apparatus, or device, such as a computer-based system, processor-containing system, or other system that can fetch the instructions from the instruction execution system, apparatus, or device and execute the instructions.

What is claimed is:

1. A method, executed by a control system, for automatically moving a fifth wheel actuator of a heavy duty vehicle having a cab between a forward position in which the fifth wheel actuator is in its closest position to the cab and a rearward position in which the fifth wheel actuator is in its farthest position from the cab, the method comprising:

monitoring a plurality of vehicle parameter sensors to determine whether at least one of the plurality of parameter sensors is nonfunctional and generating a movement event output signal when at least one of the plurality of parameter sensors is nonfunctional;

monitoring a vehicle speed over a predetermined time interval;

comparing the monitored vehicle speed to a first speed threshold value and generating a movement event output signal when the vehicle speed exceeds the first predetermined speed threshold value;

comparing the monitored vehicle speed to a second speed threshold value and generating a first movement event output signal when the vehicle speed is below the second predetermined speed threshold value;

determining a vehicle yaw;

comparing the monitored vehicle yaw to a yaw threshold value and generating a second movement event output signal when the vehicle yaw exceeds the yaw threshold value; and

automatically moving the fifth wheel actuator in response to the first or second generated movement event output signal.

2. The method of claim **1**, wherein the fifth wheel assembly is moved toward its rearward position in response to generation of a movement event output signal when at least one of the plurality of sensors is nonfunctional.

3. The method of claim **1**, wherein the fifth wheel assembly is moved toward its rearward position in response to generation of a movement event output signal when the vehicle speed is below the second speed threshold value.

4. The method of claim **1**, wherein the fifth wheel assembly is moved toward its rearward position in response to generation of a movement event output signal when the trailer yaw exceeds the first yaw threshold value.

5. The method of claim **1**, wherein the yaw threshold value is based on at least one of a threshold steer rate, a threshold steer angle, a threshold articulation rate, and a threshold articulation angle.

6. The method of claim **1**, further comprising:

determining the position of the fifth wheel actuator; and

generating a third movement event output signal when the fifth wheel actuator is in its rearward position.

7. A method, executed by a control system, for automatically moving a fifth wheel actuator of a heavy duty vehicle having a cab between a forward position closest to the cab and a rearward position farthest from the cab, the method comprising:

monitoring a vehicle speed over a predetermined time interval and generating vehicle speed data indicative of the monitored vehicle speed over the predetermined time interval;

monitoring a vehicle acceleration and generating vehicle acceleration data indicative of the monitored acceleration;

monitoring at least one of a vehicle steer angle, steer rate, articulation angle and articulation rate and generating vehicle yaw data indicative of the monitored vehicle steer angle, steer rate, articulation angle and articulation rate;

generating a movement event output signal when the vehicle speed data, vehicle acceleration data and vehicle yaw rate data meet predetermined vehicle parameters; and

automatically moving the fifth wheel actuator in response to the generated movement event output signal.

8. The method of claim **7**, wherein the fifth wheel actuator is automatically moved toward its forward position in response to generation of a movement event output signal when the vehicle speed exceeds a predetermined speed threshold over the predetermined time interval, the yaw rate is less than a predetermined yaw threshold value, the vehicle acceleration is less than a predetermined acceleration threshold value and the fifth wheel actuator is in its rearward position.

9. The method of claim **7**, wherein the fifth wheel actuator is automatically moved toward its rearward position in response to generation of a movement event output signal when the vehicle speed is less than a predetermined speed threshold.

10. The method of claim **7**, wherein the fifth wheel actuator is automatically moved toward its rearward position in response to generation of a movement event output signal when the yaw rate exceeds a predetermined yaw threshold value.

11. The method of claim **7**, wherein the fifth wheel actuator is automatically moved toward its rearward position in response to generation of a movement event output signal when vehicle acceleration exceeds a predetermined acceleration threshold value.

12. The method of claim **7**, further comprising monitoring the plurality of sensors to determine whether at least one of the plurality of sensors is nonfunctional and generating a movement event output signal when at least one of the plurality of sensors is nonfunctional, wherein the fifth wheel actuator is automatically moved toward its rearward position in response to generation of a movement event output signal when at least one of the plurality of sensors is nonfunctional.

14. The method of claim **7**, wherein the fifth wheel actuator is prevented from moving toward its rearward position when the vehicle speed is less than a predetermined speed threshold.

15. The method of claim **7**, wherein at least one of the predetermined vehicle parameters is a predetermined speed threshold value of 45 mph over a time interval of 5 minutes, and wherein the fifth wheel assembly is moved toward its forward position in response to generation of a movement event output signal when the vehicle speed is less than 45 mph for a time interval of greater than a 5 minutes.

16. The method of claim **7**, wherein at least two of the predetermined vehicle parameters is a threshold steer angle value of approximately 30 degrees and a threshold steer rate value of approximately 30 degrees per second, and wherein the fifth wheel assembly is moved toward its rearward position in response to generation of a movement event output signal when one of either the threshold steer angle value is greater than approximately 30 degrees and the threshold steer rate value is greater than approximately 30 degrees per second.

17. The method of claim **7**, wherein at least two of the predetermined vehicle parameters is a threshold articulation angle value of approximately 10 degrees and a threshold articulation rate value of approximately 10 degrees per second, and wherein the fifth wheel assembly is moved toward its rearward position in response to generation of a movement event output signal when one of either the threshold articulation angle value is greater than approximately 10 degrees and the threshold articulation rate value is greater than approximately 10 degrees per second.

18. A system for controlling actuation of a fifth wheel actuator of a vehicle, the system comprising:

a plurality of sensors each associated with at least one of the vehicle cab and trailer, the plurality of sensors provided to gather data indicative of the vehicle speed, vehicle acceleration, vehicle yaw and fifth wheel actuator position;

a controller in communication with the sensors, the controller being provided to evaluate vehicle speed over a predetermined time interval, vehicle acceleration, steer angle, steer rate, articulation angle and articulation rate, the controller further being provided to generate a movement event output signal resulting from the evaluated vehicle speed over a predetermined time interval, vehicle acceleration, steer angle, steer rate, articulation angle and articulation rate; and

a fifth wheel actuator movable between a forward position in which the fifth wheel actuator is closest to the cab of the vehicle and a rearward position in which the fifth wheel actuator is farthest from the cab of the vehicle, the fifth wheel actuator being responsive to generation of the movement event output signal by the controller.

19. The system of claim **18**, wherein a movement event output signal is generated when the vehicle speed exceeds a predetermined speed threshold over the predetermined time interval, the yaw rate is less than a predetermined yaw threshold value, the vehicle acceleration is less than a predetermined acceleration threshold value, and the fifth wheel actuator is in its rearward position.

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