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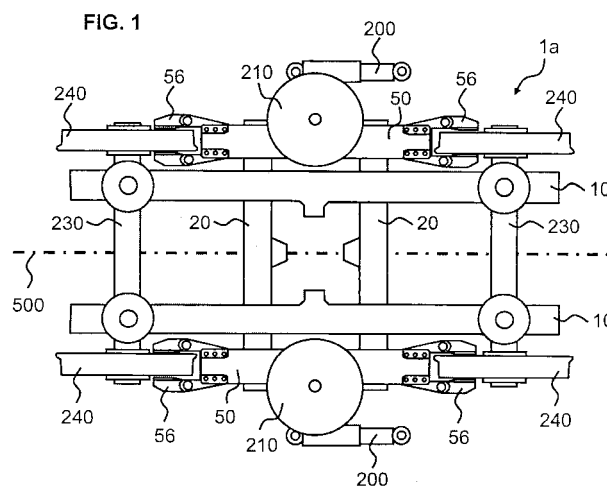
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(54) **Bogie of railway vehicle**

(57) The invention provides a bogie of a railway vehicle capable of reducing the stress applied to the welding portion between brake gear attachments and transoms, promoting weight reduction and cutting down the number of production steps. The bogie of a railway vehicle comprises a bogie frame (5a) composed of side beams (10) which are spaced apart and arranged in parallel and transoms (20) passing through the longitudinal centre portions of the side beams (10), two wheel sets each having wheels (240) attached to both ends of an axle (230),

brake gears (56) and air springs (210). Air spring bearing racks (50) are arranged so that both ends of transoms (20) pass through the longitudinal centre portion of the air spring bearing racks, so that the stress caused by the moment applied on the brake gear attachments (54a) during braking can be reduced. Furthermore, since each air spring bearing rack and brake gear attachments (54a) are formed in an integral manner, the number of steps required for manufacturing the components and the number of steps required for attaching the components to the bogie frame can be cut down.



Description

BACKGROUND OF THE INVENTION

Field of the invention

[0001] The present invention relates to a bogie of a railway vehicle comprising a bogie frame having a structure in which transoms arranged in the direction of sleepers are passed through the longitudinal centre portion of side beams arranged in the direction of the rails, capable of reducing the stress applied to the welded portion between brake gear attachments and the transoms, and promoting weight reduction and improved operability by reducing the number of components constituting the bogie frame.

Description of the related art

[0002] As disclosed in Japanese patent application No. 2006-15820 (patent document 1) and No. 4-197872 (patent document 2), the prior art bogie frames of railway vehicles generally adopt an H-shaped structure including two side beams arranged in the direction of the rails and two transoms passing through the longitudinal centre portion of the side beams in the direction of sleepers.

[0003] Although not disclosed in the above-mentioned two patent documents, in general, the transoms constituting the bogie frame are formed of steel pipes, and main motor attachments for attaching main motors are welded to the longitudinal centre portion of the transoms, and brake gear attachments for attaching brake gears are welded to the transoms at positions corresponding to the wheels.

[0004] According to the prior art bogie frame disposed on a bogie of a railway vehicle as illustrated in FIGS. 8 and 9, the brake gear attachments are attached via welding to transoms at positions corresponding to the wheels. Further, air spring bearing racks for placing air springs are positioned so that their longitudinal directions correspond to the longitudinal direction of the side beams, and attached via welding to both ends of the two transoms protruded through the side beams in the direction of the sleepers in such a manner as to connect both ends of the transoms.

[0005] FIGS. 8 and 9 show upper views of a prior art bogie 1b and a bogie frame 5b. The prior art bogie 1b of a railway vehicle shown in FIG. 8 has longitudinal ends of side beams 10 constituting the bogie frame 5b arranged at both ends of axles 230 and 230 passed through and protruding from the wheels 240 and 240. The side beams 10 are arranged in parallel on either sides of a track centre 500. In the bogie frame 5b, two transoms 20 and 20 are passed through the longitudinal centre portion of the side beams 10 and 10 spaced apart and arranged in parallel. At the centre of the transoms 20 and 20, two tie beams 25 and 25 arranged in the direction of the rails are disposed to connect the transoms 20 and 20. The

side beams 10 and 10 and the transoms 20 and 20 are connected via welding, and the transoms 20 and 20 and the tie beams 25 and 25 are connected via welding.

[0006] Longitudinal bumpstop brackets 30 and 30 are provided on the transoms 20 and 20, and similarly, lateral bumpstop brackets 40 and 40 are arranged on the tie beams 25 and 25, so as to protrude toward the space surrounded by the transoms 20 and 20 and the tie beams 25 and 25. In the space surrounded by the transoms 20 and 20 and the tie beams 25 and 25, a traction beam (not shown) attached to a centre pin provided on the vehicle body and link brackets (not shown) provided on the transoms 20 and 20 are connected via a longitudinal link (not shown) in the direction of the rails (longitudinal direction) of the vehicle body. Only when a longitudinal load exceeding the withstand load of the longitudinal link is applied, the longitudinal bumpstop brackets 30 and 30 support the centre pin directly. Similarly, in the direction of the sleepers (lateral direction), the centre pin and lateral movement damper brackets (not shown) provided on the side beams 10 and 10 are connected via a lateral movement damper (not shown). Only when a large lateral displacement exceeding the specification of the lateral movement damper occurs, the lateral bumpstop brackets 40 and 40 support the centre pin directly. The lateral movement damper suppresses the relative displacement in the lateral direction of the vehicle body and the bogie 1a caused by track irregularity when the vehicle is travelling at high speed.

[0007] With further reference to FIG. 10, brake gear attachments 54b are attached to welding portions 160b in a cantilever structure at positions corresponding to wheels 240 on transoms 20 and 20 at the track-centre 500 side of side beams 10 and 10. The brake gear attachments 54b have brake gears 56 attached thereto for generating brake force to wheels 240 through friction engagement with wheels 240. Each brake gear attachment 54b is composed of an upper panel 120, a lower panel 130 and a side panel 110. The welding portion 160b is formed in the circumference of the transom 20 at a side facing the side panel 110 at an angular range of approximately 180 degrees, for example, as shown. Further, the both ends of transoms 20 and 20 passing through the longitudinal centre portion of side beams 10 and 10 are connected via air spring bearing racks 51 and 51 for supporting air springs 210. At the centre portion of each air spring bearing rack 51 is disposed an air spring seat 52 having holes arranged annularly for reducing the weight thereof. Reference number 200 denotes a yaw damper for suppressing yawing (vibration within a horizontal plane having the bogie centre pin (not shown) arranged at the centre of rotation) of the bogie.

[0008] As illustrated in FIG. 10, each brake gear attachment 54b is generally joined via welding to the side surface of the transom 20 in a cantilever structure. Therefore, when the brake is operated, the moment load based on the brake force in the tangential direction of the rotating wheels 240 (the force in the longitudinal direction of

the paper plane of FIG. 10) and the length of the brake gear 56 (length of the brake gear attachment 54b in the rail direction, which is the lateral direction of the paper plane of FIG. 9) was applied on the welding portion 160b between the brake gear attachment 54b and the transom 20, so that high stress was applied on the welding portion 160b and on the respective components surrounding the same. The moment load is applied in the direction separating the welding portion 160b, that is, in the direction separating the brake gear attachment 54b from the transom 20. There was a drawback in that in order to reduce the high stress applied on the welding portion 160b, it was necessary to increase the plate thickness of the components constituting the brake gear attachment 54b or to smoothen the joint (welding portion 160b) between the brake gear attachment 54b and the transom 20. However, when the plate thickness of the brake gear attachment 54b was increased, there was a drawback in that the mass of the bogie frame 5b was also increased.

[0009] In general, since the brake gear attachments 54b and the air spring bearing racks 51 are formed as individual components, the number of components constituting the bogie frame tends to be excessive. Furthermore, since such individual components were fixed via welding to the transoms 20 constituting the bogie frame 5b, the amount of welding became excessive, and thus, the number of processes such as the processing of grooves and the welding operation became excessive.

[0010] As described, according to the prior art bogie frame for railway vehicles in which the brake gear attachments and the air spring bearing racks are formed as individual components, in addition to reducing the number of components, there were demands to solve the problems regarding the large number of processes due to the large amount of welding to be performed, the high stress applied on the welding portions of the brake gear attachments fixed via welding in a cantilever structure to the transoms constituting the bogie frame, and the increase of mass caused by increasing the plate thickness of the brake gear attachments to cope with the high stress applied thereto.

SUMMARY OF THE INVENTION

[0011] The present invention aims at solving the problems of the prior art by providing a bogie of a railway vehicle capable of reducing the number of processes by revising the design of the brake gear attachments and the air spring bearing racks, the attachment structure thereof to the bogie frame, reducing the number of components constituting the bogie frame and reducing the amount of welding required to attach these components to the bogie frame. Further, by improving the structure for fixing the brake gear attachments to the transoms, it becomes possible to provide a bogie of a railway vehicle capable of reducing the stress applied on the joint (welding portion) between the brake gear attachments and the transoms during brake operation without increasing the

mass of the brake gear attachments.

[0012] In order to solve the problems of the prior art, the present invention provides a bogie of a railway vehicle having disposed on a bogie frame including two side beams arranged in parallel and spaced apart and side beams passing through longitudinal centre portions of the side beams, a wheel set having wheels disposed on both ends of an axle, brakes for generating brake force to the wheels, air springs supporting a weight of the vehicle body, and air spring bearing racks arranged on the transoms having air springs attached to a longitudinal centre portion thereof; **characterized in that** the air spring bearing racks have brake attachments for attaching the brakes provided integrally to both ends thereof.

[0013] Further, the present invention provides a bogie of a railway vehicle mentioned above, wherein the air spring bearing racks are disposed so that their longitudinal direction corresponds to a longitudinal direction of the side beams, and are arranged at both ends of the transoms passing through the side beams and protruded toward an opposite side from a track-centre side of the side beams. Moreover, the bogie of a railway vehicle mentioned above is **characterized in that** the side beams are disposed on a track-centre side than the wheels. Further, the bogie of a railway vehicle mentioned above is **characterized in that** lateral bumpstop brackets are provided at the track-centre side of the longitudinal centre portion of the side beams near a centre pin extending downward from the vehicle body. Moreover, the bogie of a railway vehicle mentioned above can be **characterized in that** the transoms function as an auxiliary air reservoir for the air springs.

[0014] According to the present invention, a bogie of a railway vehicle comprises air spring bearing racks having brake gear attachments provided integrally thereto, so as to reduce the stress applied on the mounting portions where the brake gear attachments were attached to the transoms, to reduce the weight of the bogie and to promote further reduction of work load due to the reduction in the number of components constituting the bogie.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015]

FIG. 1 is an upper view of a bogie according to the present invention;

FIG. 2 is a perspective view of the bogie frame provided on the bogie illustrated in FIG. 1;

FIG. 3 is an upper view of the bogie frame provided on the bogie illustrated in FIG. 1;

FIG. 4 is an upper view of the air spring bearing rack provided on the bogie frame illustrated in FIG. 1;

FIG. 5 is a side view of the air spring bearing rack provided on the bogie frame illustrated in FIG. 1;

FIG. 6 is an A-A cross section of FIG. 4, or cross-sectional view of the air spring bearing rack;

FIG. 7 illustrates another embodiment of the air spring bearing rack, showing the side view of the air spring bearing rack;

FIG. 8 is an upper view of the bogie according to the prior art;

FIG. 9 is an upper view of the bogie frame of the prior art bogie; and

FIG. 10 is a B-B cross section of FIG. 9, that is, the cross-sectional view of the brake gear attachment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0016] Now, the preferred embodiments of a bogie frame and a bogie of a railway vehicle according to the present invention will be described with reference to the drawings.

[0017] One preferred embodiment of a bogie frame and a bogie of a railway vehicle according to the present invention will be described with reference to FIGS. 1 through 3. A bogie 1a of a railway vehicle illustrated in FIG. 1 is an inner frame-type bogie having two wheel sets including wheels 240 arranged on both ends of each axle 230, and side beams 10 constituting a bogie frame 5a disposed on a track-centre 500 side (inner side) than the wheels 240.

[0018] The bogie frame 5a is composed of side beams 10 and 10 arranged in parallel and spaced apart from each other, air spring bearing racks 50 and 50 longitudinally arranged in parallel with the side beams 10 and 10 at the outer sides of the side beams 10 and 10 (in the direction opposite from the track centre 500), and transoms 20 and 20 passed through the side beams 10 and 10 and air spring bearing racks 50 and 50 at the longitudinal centre area thereof. The side beams 10 and 10, the air spring bearing racks 50 and 50 and the transoms 20 and 20 are respectively joined together via welding. The shape of the bogie frame 5a in overhead view is H-shaped.

[0019] Air springs 210 are attached via air spring seats 52 on the upper surface at the longitudinal centre portion of the air spring bearing racks 50, and the air springs 210 support the weight of the car body (not shown). In order to suppress yawing (vibration within the horizontal plane having the bogie centre pin (not shown) set at the centre of rotation) of the bogie 1a during high speed running, yaw dampers 200 are disposed in a manner so as to connect the car body (not shown) and yaw damper brackets 58 arranged on the side surface at the centre of the air spring bearing racks 50.

[0020] Brake gear attachments 54a and 54a for fixing brake gears 56 and 56 are integrally disposed at both longitudinal ends of the respective air spring bearing racks 50. During braking, each brake gear 56 nips brake disks (not shown) arranged on both side surfaces of the wheel 240 with a brake shoe (not shown). Brake force is generated by the frictional force generated between the brake shoe and the brake disks during braking. In the

present embodiment, the brake gear 56 adopts a disk brake system in which the brake shoe is sandwiched between disks

arranged on both sides of the wheel 240, but the brake gear 56 can also adopt a wheel tread brake system in which a brake shoe is pressed against a wheel tread (the portion rotating on the top part of the rail) of the wheel 240.

[0021] As shown in FIGS. 2 and 3, longitudinal bumpstop brackets 30 and 30 and lateral bumpstop brackets 40 and 40 are disposed to protrude in the space surrounded by the side beams 10 and 10 and the transoms 20 and 20. A centre pin (not shown) is disposed vertically downward toward the direction of the sleeper at the centre of the lower surface of the car body positioned above the bogie 1a. When the car body is placed on the bogie 1a, the centre pin is positioned in the space defined by the side beams 10 and 10 and the transoms 20 and 20. Further, in the direction of the rails (longitudinal direction) of the car body, a traction beam disposed on the centre pin and a longitudinal link bracket disposed on the transom are connected via a longitudinal link. Only when a load exceeding the withstand load of the longitudinal link acts on the car body, the longitudinal bumpstop brackets 30 and 30 support the centre pin directly.

[0022] Similarly, in the direction of the sleeper (lateral direction), the centre pin and a lateral movement stopper bracket disposed on the side beams 10 and 10 are connected via a lateral movement damper. Only when a lateral displacement exceeding the specification of the lateral movement damper occurs, the lateral bumpstop brackets 40 and 40 support the centre pin directly. The lateral movement damper suppresses the relative displacement of the car body and the bogie 1a caused by rail track irregularity when the vehicle is running at high speed. In the illustrated example, the transoms 20 and 20 are composed of pipes, but the transoms 20 and 20 can also be box-shaped in which four sides of panel members are joined together.

[0023] FIGS. 4 through 7 illustrate the structure of an air spring bearing rack 50. The air spring bearing rack 50 has a four-sided structure (box-shaped structure) in which an upper panel 120, a lower panel 130 and side panels 110 are joined together via welding. Brake gear attachments 54a and 54a are integrally formed at both longitudinal ends of the air spring bearing rack 50. Further, each brake gear 56 is secured to the brake gear attachment 54a via bolts. The method for securing the brake gear 56 to the brake gear attachment 54a is not restricted to the aforementioned engagement method using bolts, and for example, the brake gear 56 can be secured to the brake gear attachment 54a by assembling together key structures respectively provided to the mounting surfaces of the brake gear attachment 54a and the brake gear 56.

[0024] An air spring seat 52 is provided at the centre area of the air spring bearing rack 50 for fixing the air spring 210. The air spring seat 52 has holes formed there-to for reducing the weight thereof. Since the weight of

the car body is supported by the air spring 210, a large perpendicular-direction load is applied to the centre portion of the air spring bearing rack 50 via the air spring seat 52. Therefore, a plurality of reinforcements 140 are provided at the centre portion of the air spring bearing rack 50 so as to ensure sufficient strength to correspond to such large load.

[0025] According to the prior art bogie 1b illustrated in FIGS. 8 through 10, in order to attach the brake gears 56 and the air springs 210 to the bogie 1b, it was necessary to fix a plurality of components including the brake gear attachments 54b and the air spring bearing racks 51 via welding to the side beams 20 and 20 constituting the bogie frame 5b. On the other hand, according to the bogie 1a of the present invention, only the air spring bearing racks 50 having the functions of both the prior art brake gear attachments 54b and the air spring bearing racks 51 are fixed via welding to both ends of transoms 20 and 20 constituting the bogie frame 5a. Therefore, since the number of components of the bogie is reduced to half compared to the prior art bogie 1b, it becomes possible to cut down both the number of steps for manufacturing the respective components and the number of steps for fixing the respective components to the side beams 20 and 20.

[0026] Furthermore, the prior art brake gear attachments 54b according to FIG. 10 were attached via welding (welding portions 160b) to the transoms 20 in a cantilever structure. On the other hand, the air spring bearing racks 50 according to the present embodiment are fixed via welding (welding portions 160a) to both ends of the transoms 20 and 20 in such a manner as to cross over both ends of the transoms 20 and 20 from above. Further, the present embodiment provides brake gear attachments 54a and 54a integrally to both longitudinal ends of the air spring bearing racks 50.

[0027] Therefore, according to the prior art bogie 1b, there were cases where during braking, the moment generated in the brake gear attachments 54b via the brake gears 56 caused excessive stress to be applied to the welding portions 160b welding the brake gear attachments 54b and the transoms 20 in the direction pulling the welding portions 160b apart. On the other hand, according to the bogie 1a of the present invention, since each welding portion 160a is formed to surround a large area, such as over 180 degrees, of the transoms 20, no excessive stress is applied on the welding portions 160a even when a moment load is applied on the brake gear attachments 54a. Therefore, according to the stress reduction effect of the bogie 1a of the present invention, it becomes possible to cut down the number of steps for smoothly finishing the welding portions 160a between the air spring bearing racks 50 having brake gear attachments and the transoms 20 and 20.

[0028] Furthermore, as shown in FIG. 7, the air spring bearing racks 50 can be attached so as to pass through both ends of the transoms 20 and 20. According to such attachment method, the welding can be performed to

cover the whole circumference of the welding portion between the transoms 20 and 20 and the air spring bearing rack 50, so that the strength of the attached portion can be further enhanced.

5 [0029] Even further, by providing lateral bumpstop brackets 40 and 40 to the side beams 10 and 10 of the bogie 1a, it becomes possible to omit the tie beams 25 and 25 required in the prior art bogie 1b. Therefore, it becomes possible to realize weight reduction of the bogie frame 5a. Furthermore, since the transoms 20 and 20 can function as auxiliary air reservoirs for supplying air to the air springs, it becomes possible to omit designated auxiliary air reservoirs from the car body, and thus, it becomes possible to reduce the number of components of the bogie and to realize weight reduction thereof.

Claims

- 20 1. A bogie of a railway vehicle having disposed on a bogie frame including two side beams spaced apart in parallel and side beams passing through longitudinal centre portions of the side beams, a wheel set having wheels disposed on both ends of an axle, brake gears for generating brake force of the wheels, air springs supporting a weight of the vehicle body, and air spring bearing racks arranged on the transoms having air springs attached to a longitudinal centre portion thereof; **characterized in that**

25 the air spring bearing racks have brake gear attachments for attaching the brake gears provided integrally to both ends thereof.
- 30 2. The bogie of a railway vehicle according to claim 1, wherein

35 the air spring bearing racks are disposed so that their longitudinal direction corresponds to a longitudinal direction of the side beams, and are arranged at both ends of the transoms passing through the side beams and protruded toward an opposite side from a track-centre side of the side beams.
- 40 3. The bogie of a railway vehicle according to claims 1 or 2, wherein

45 the side beams are disposed on a track-centre side than the wheels.
- 50 4. The bogie of a railway vehicle according to any one of claims 1 through 3, wherein

lateral bumpstop brackets are provided at the track-centre side of the longitudinal centre portion of the side beams near a centre pin extending downward from the vehicle body.
- 55 5. The bogie of a railway vehicle according to any one of claims 1 through 4, wherein

the transoms function as an auxiliary air reservoir for the air springs.

FIG. 1

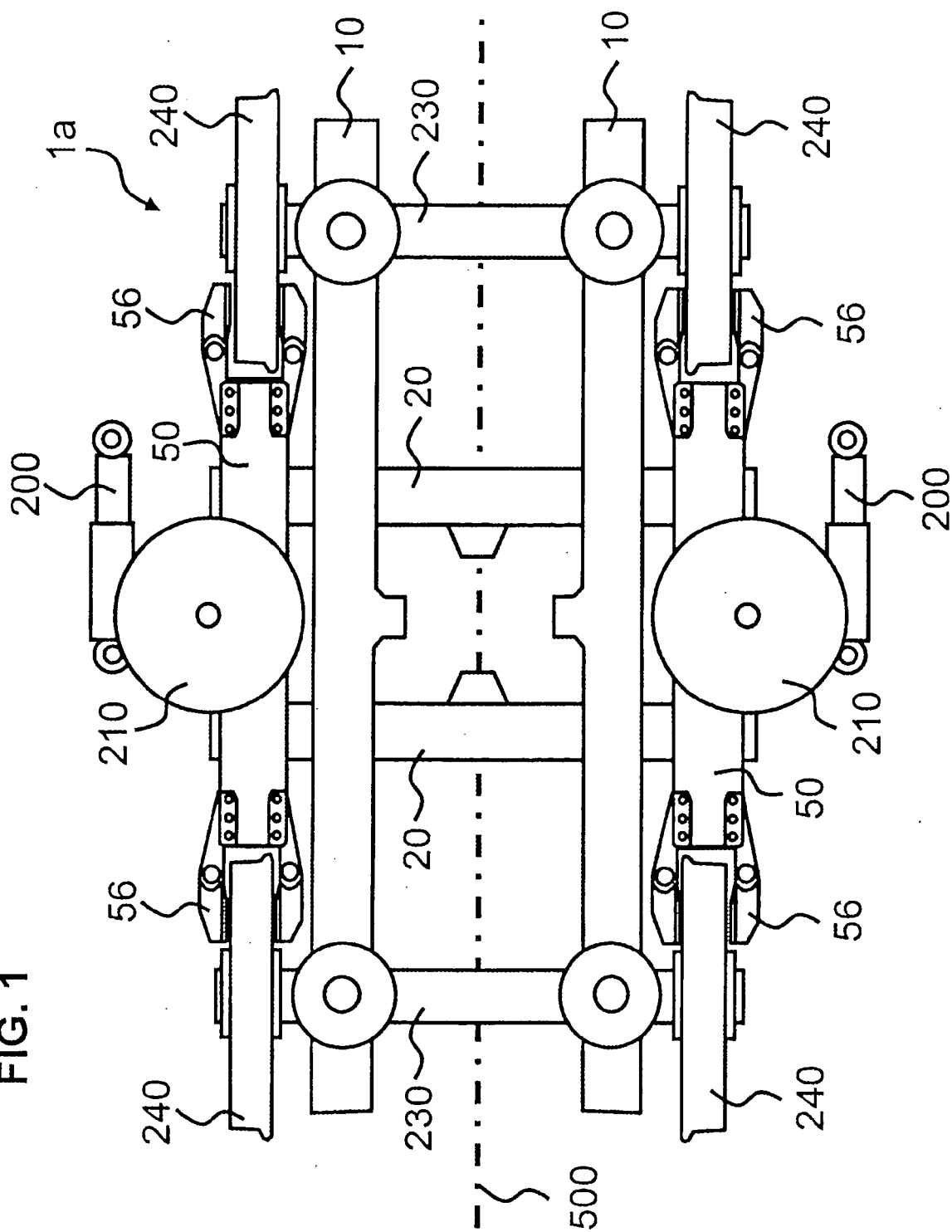


FIG. 2

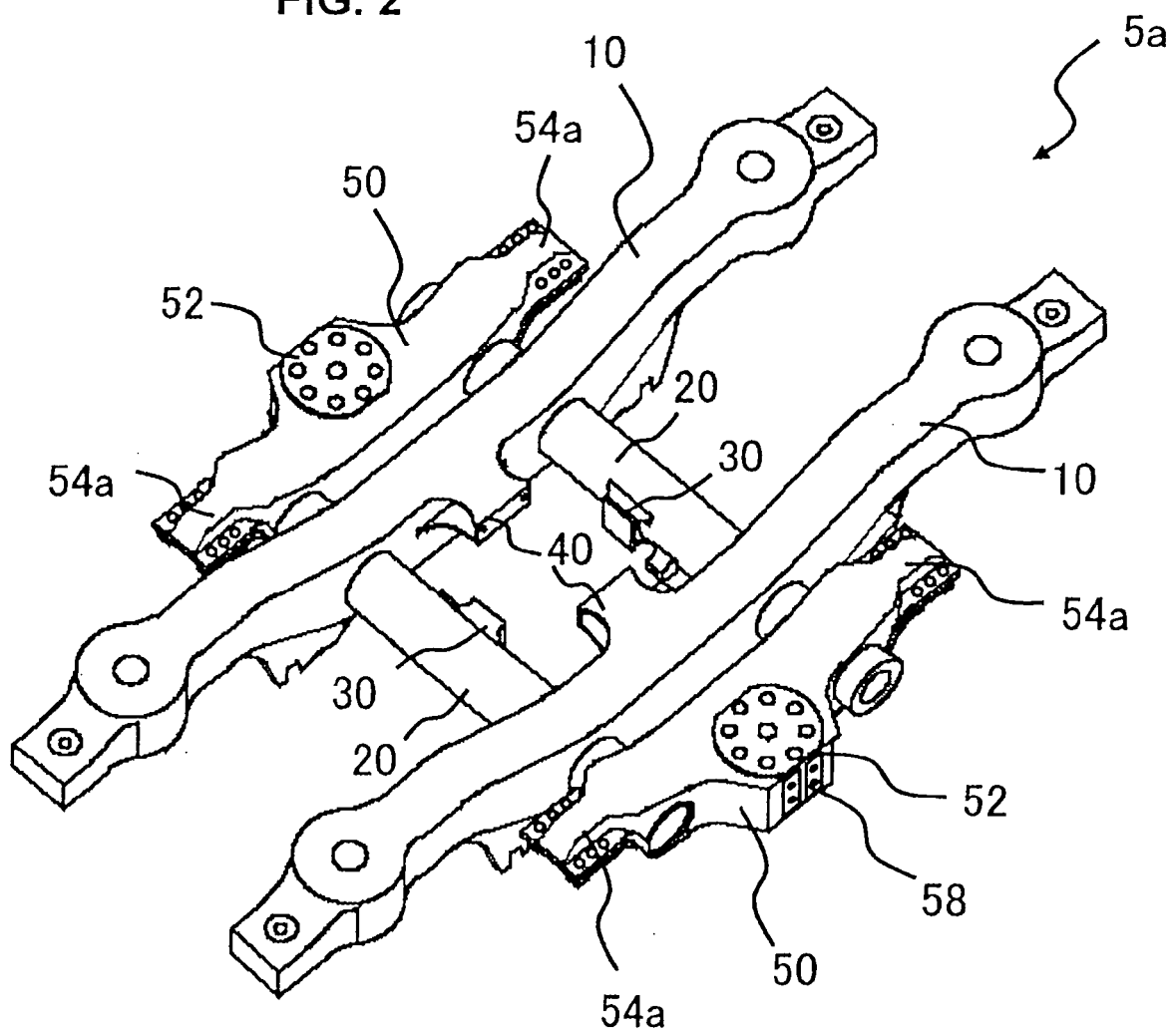
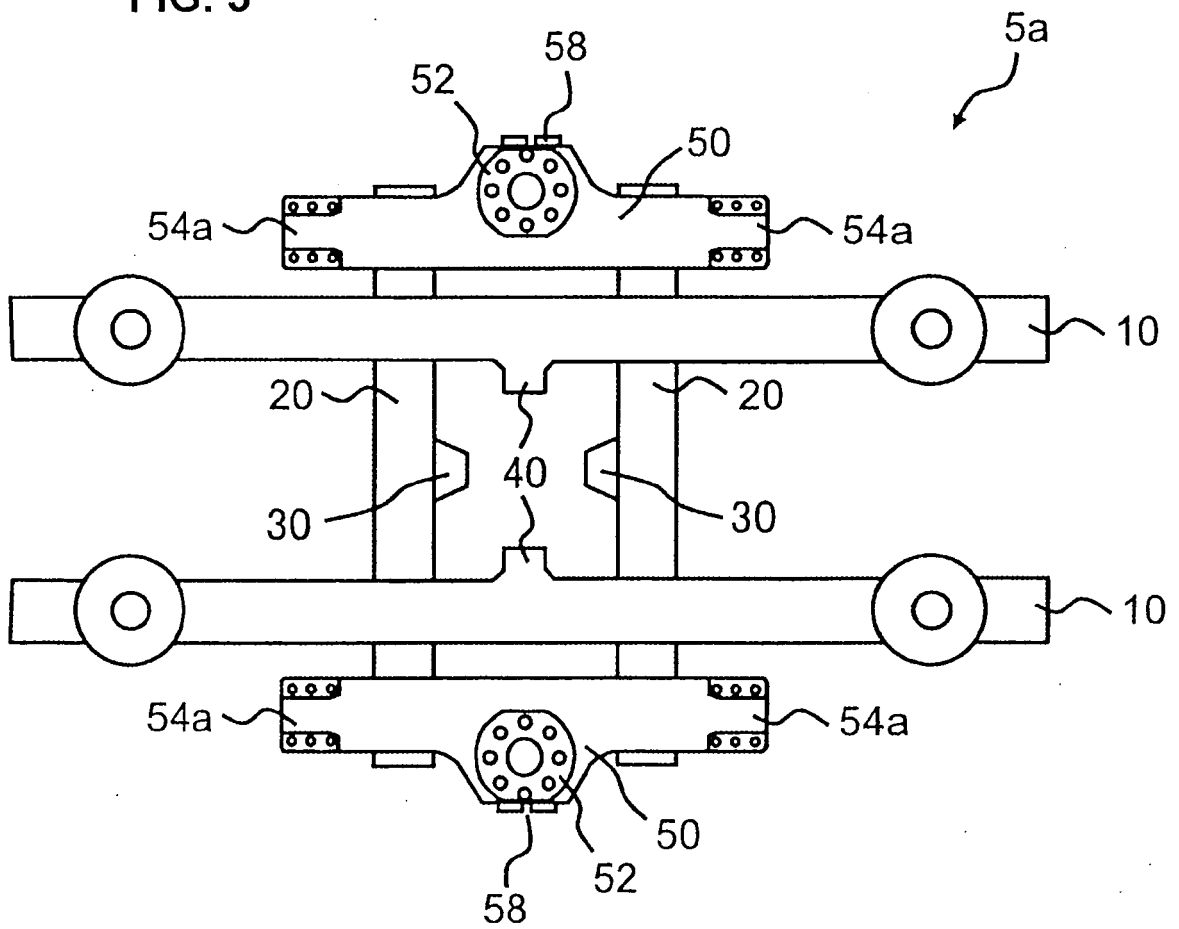
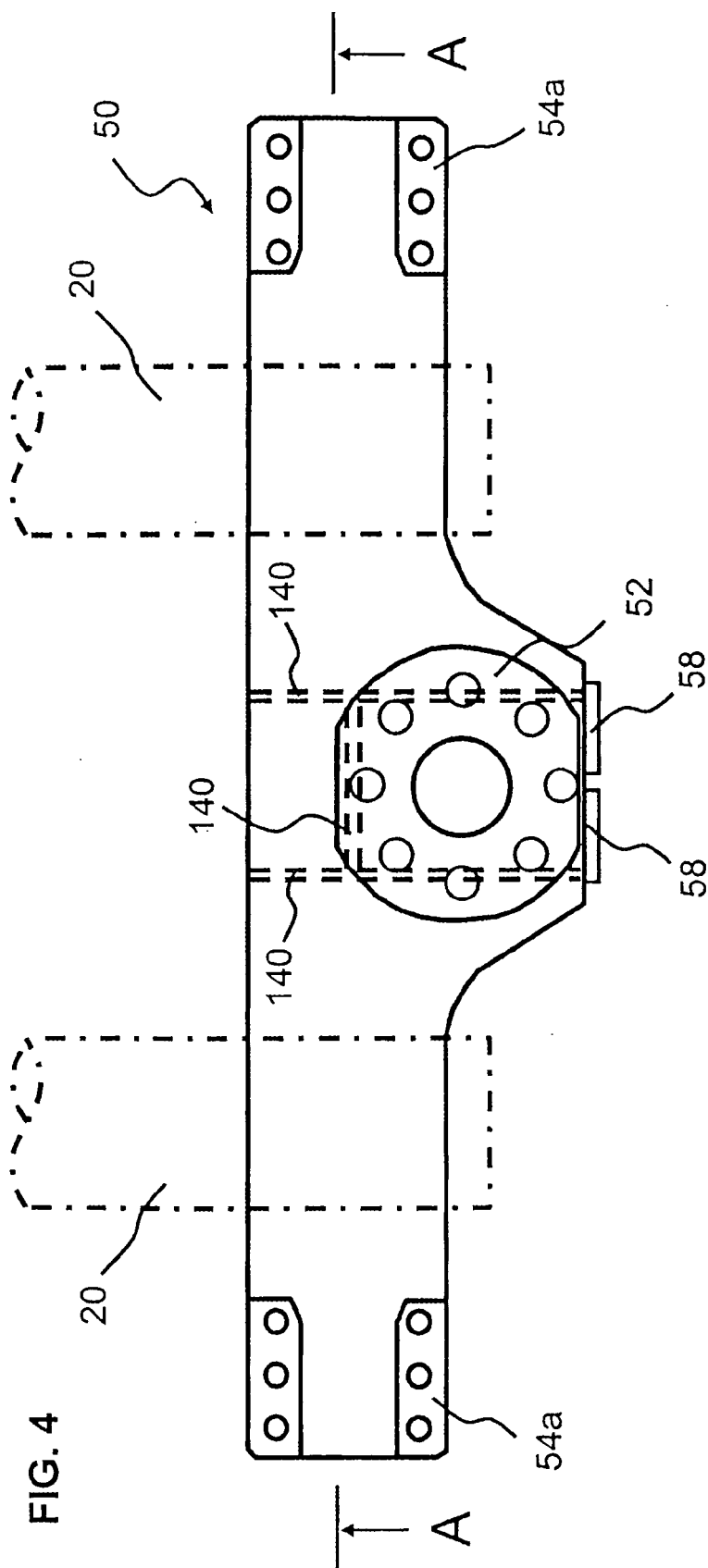
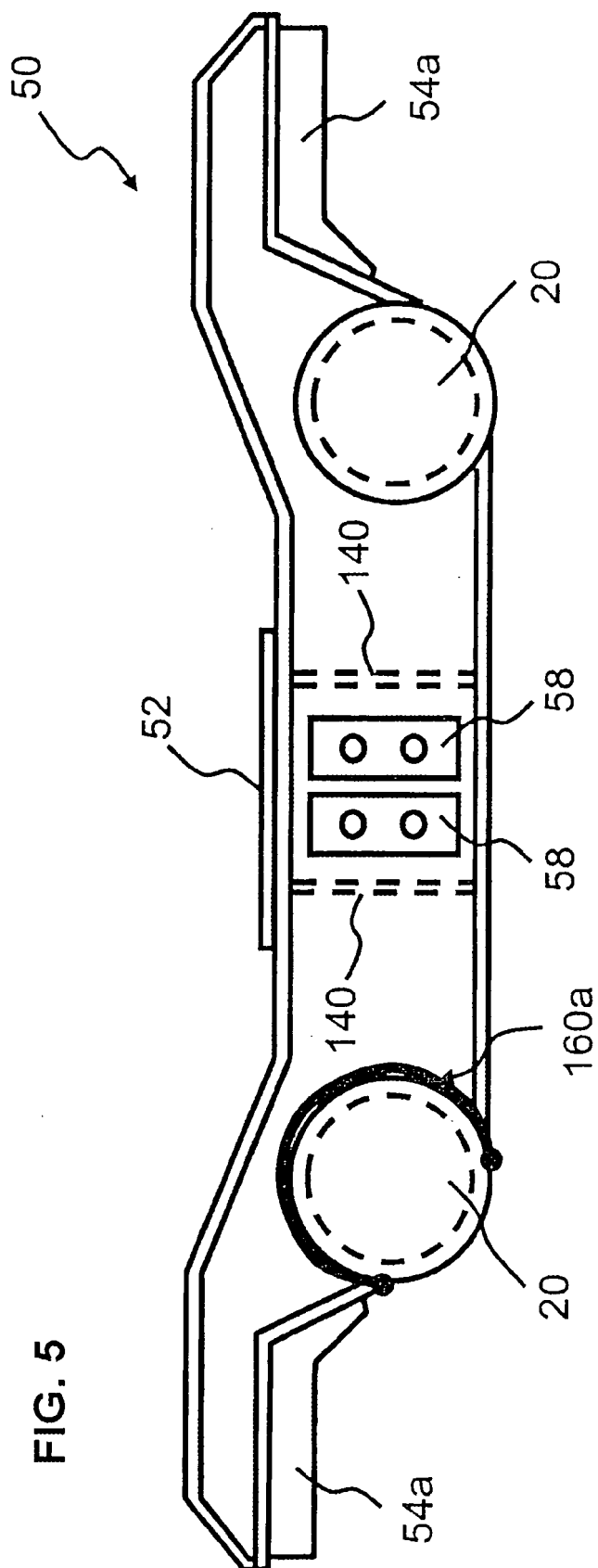
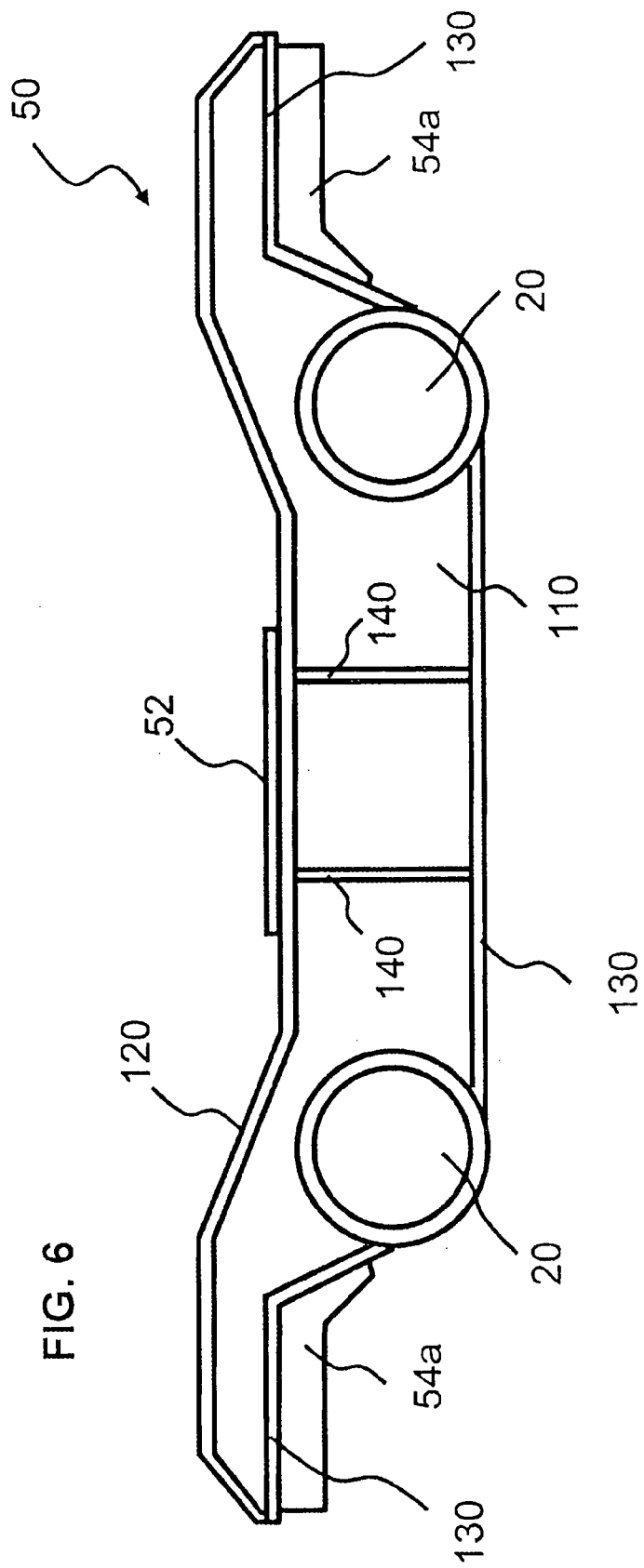


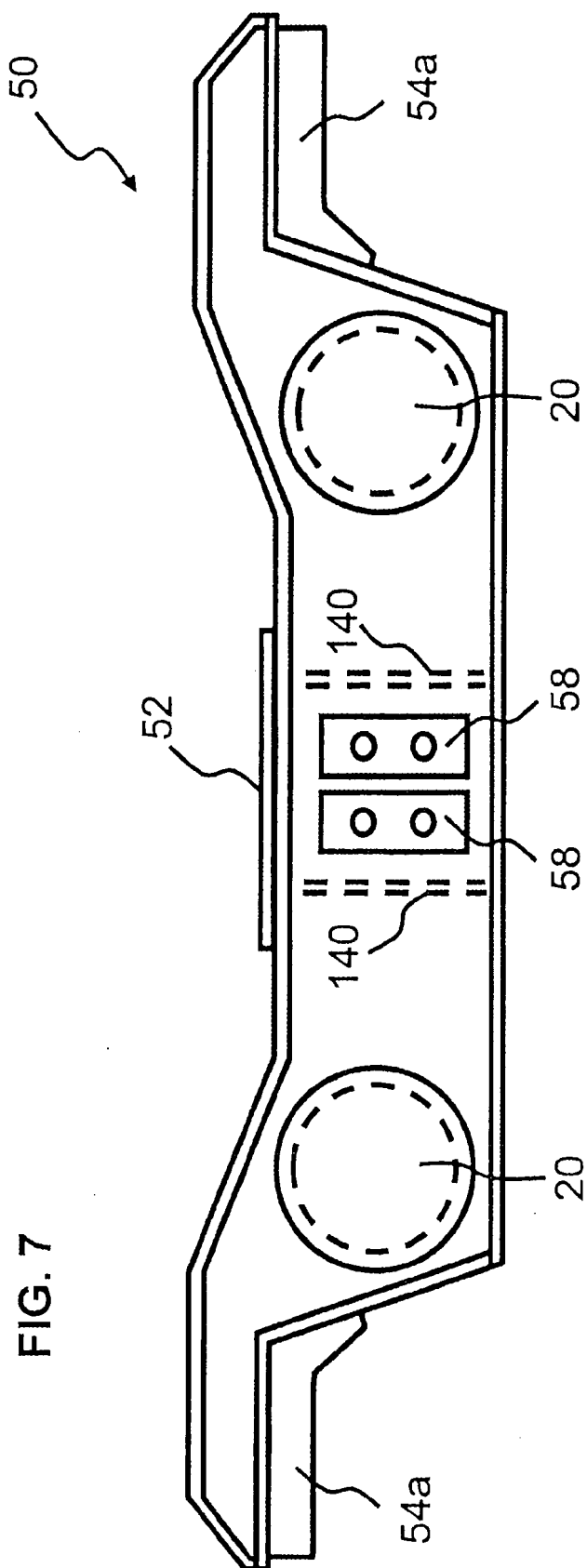
FIG. 3











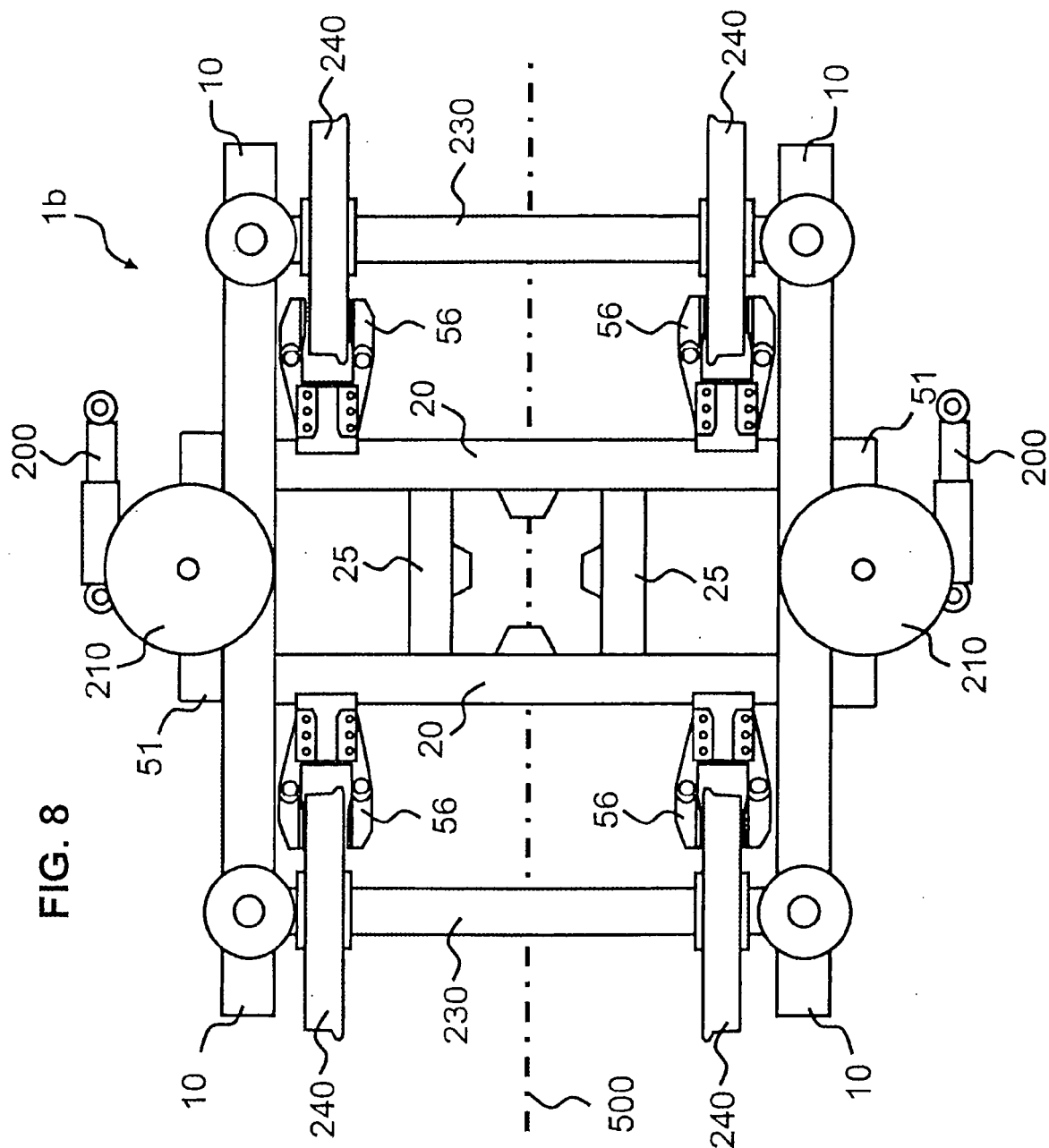


FIG. 9

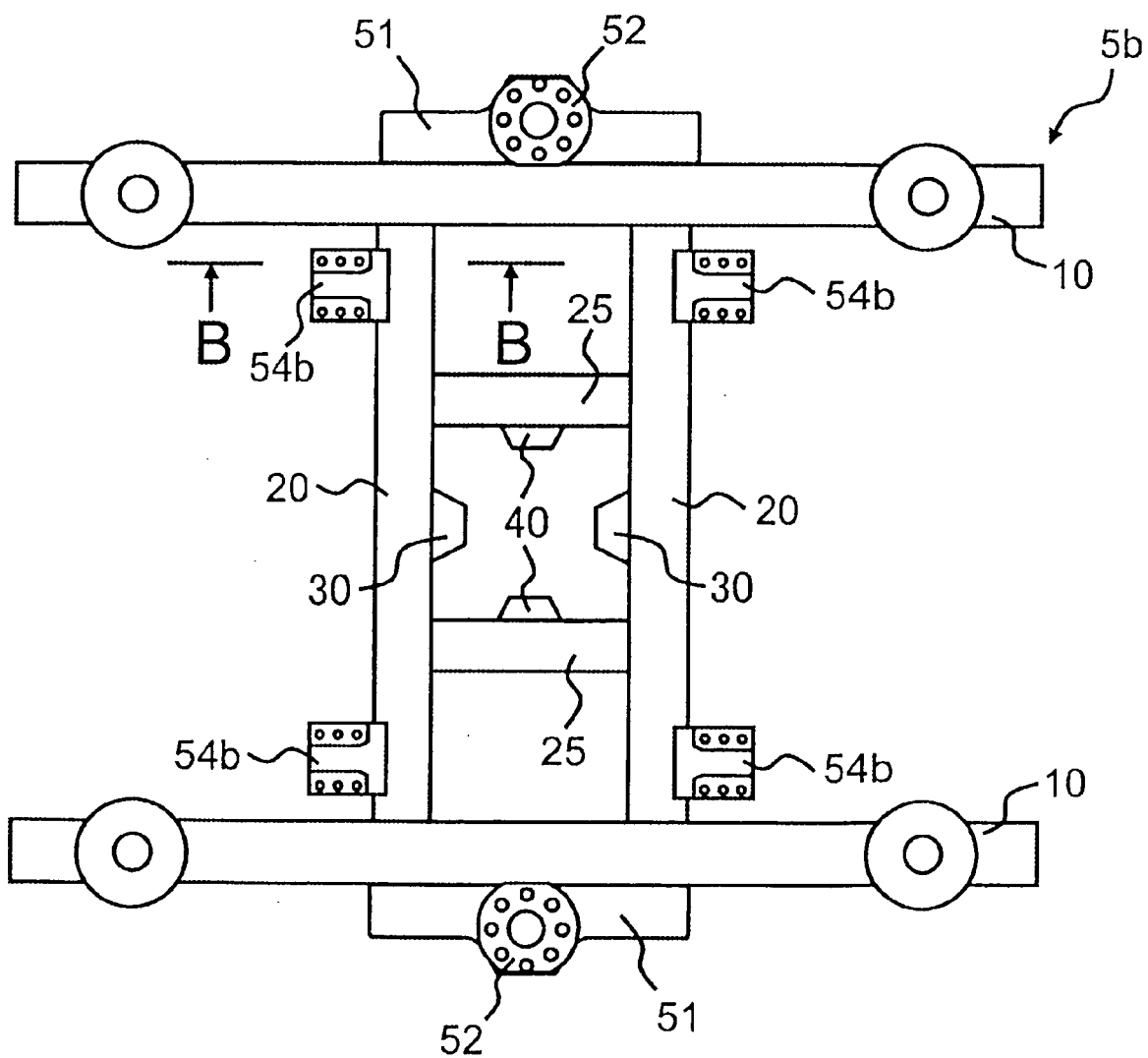
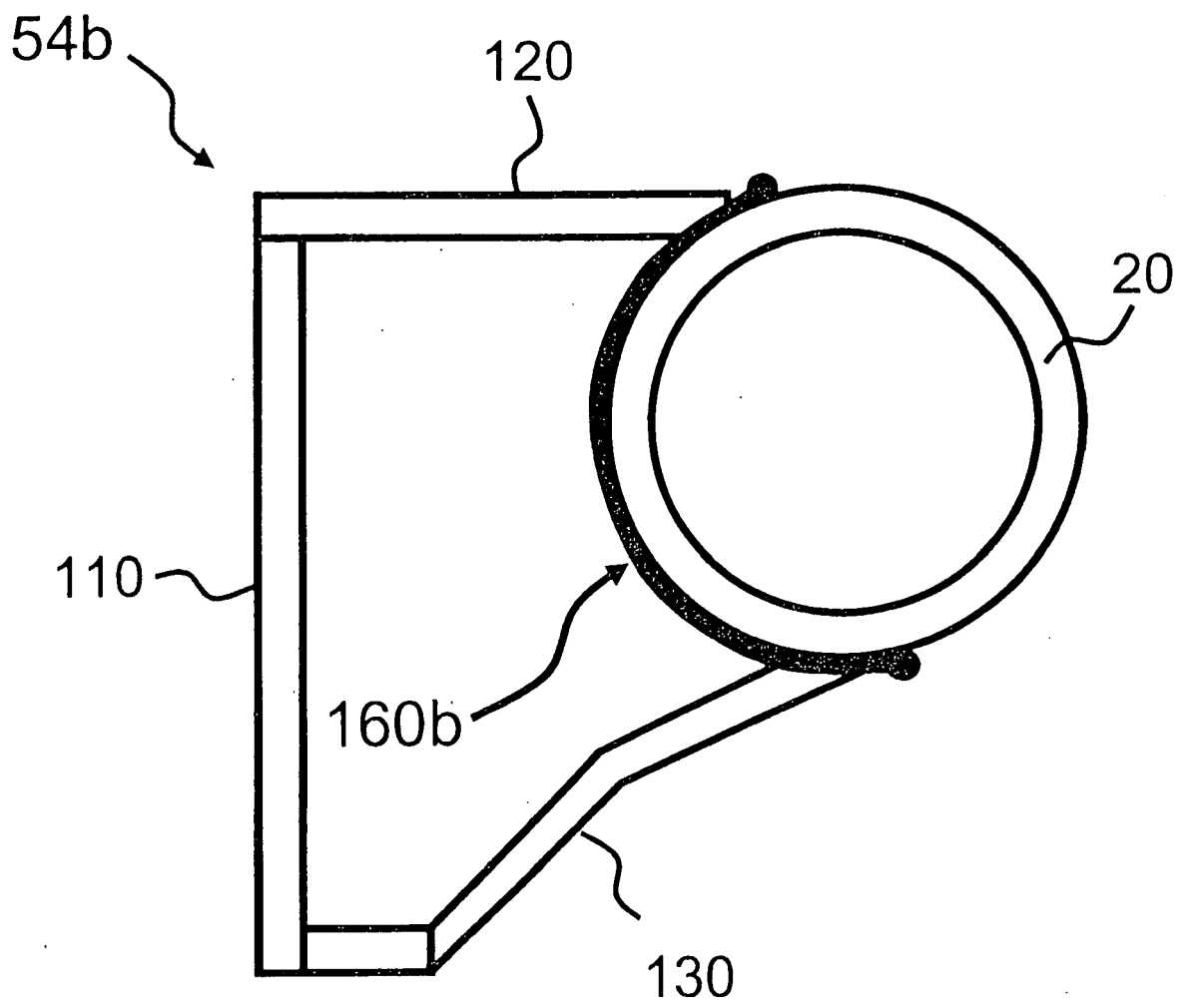


FIG. 10



REFERENCES CITED IN THE DESCRIPTION

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