



(86) Date de dépôt PCT/PCT Filing Date: 2004/11/12
(87) Date publication PCT/PCT Publication Date: 2005/06/02
(85) Entrée phase nationale/National Entry: 2006/05/18
(86) N° demande PCT/PCT Application No.: EP 2004/012859
(87) N° publication PCT/PCT Publication No.: 2005/049401
(30) Priorité/Priority: 2003/11/19 (DE103 54 141.1)

(51) Cl.Int./Int.Cl. *B61C 9/52* (2006.01),
B61C 9/44 (2006.01), *B61F 3/16* (2006.01)

(71) Demandeur/Applicant:
VOITH TURBO GMBH & CO. KG, DE

(72) Inventeurs/Inventors:
HOLZAPFEL, MICHAEL, DE;
HOEGER, BERNHARD, DE;
HANGLEITER, CHRISTOF, DE

(74) Agent: GOWLING LAFLEUR HENDERSON LLP

(54) Titre : CHASSIS PROPULSE POUR VEHICULES SUR RAILS, EN PARTICULIER POUR BOGGIES DE VEHICULES
A PLANCHER BAS

(54) Title: DRIVEN CHASSIS FOR RAIL VEHICLES IN PARTICULAR BOGIES FOR LOW-FLOOR VEHICLES

(57) **Abrégé/Abstract:**

The invention relates to a driven chassis (2) for rail vehicles (3), in particular, bogies for low-floor vehicles, comprising at least two wheels (4, 5, 6, 7), arranged one behind the other on each vehicle longitudinal side, driven by a drive unit (8, 9), each wheel being individually mounted to the chassis in particular, the body or bogie (67) by means of bearings and each drive unit comprises at least one drive motor (10, 11), at least indirectly connected to the wheel by means of an angular gear (14.1, 14.2, 15.1, 15.2) and an elastic coupling (24.1, 24.2, 25.1, 25.2). The invention is characterised in that the elastic coupling has a single plane coupling embodiment, whereby the connection between the angular gear and the wheel has no further coupling plane.

(12) NACH DEM VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES
PATENTWESENS (PCT) VERÖFFENTLICHTE INTERNATIONALE ANMELDUNG(19) Weltorganisation für geistiges Eigentum
Internationales Büro(43) Internationales Veröffentlichungsdatum
2. Juni 2005 (02.06.2005)

PCT

(10) Internationale Veröffentlichungsnummer
WO 2005/049401 A2(51) Internationale Patentklassifikation⁷: **B61F**

(21) Internationales Aktenzeichen: PCT/EP2004/012859

(22) Internationales Anmeldedatum:
12. November 2004 (12.11.2004)

(25) Einreichungssprache: Deutsch

(26) Veröffentlichungssprache: Deutsch

(30) Angaben zur Priorität:
103 54 141.1 19. November 2003 (19.11.2003) DE(71) Anmelder (für alle Bestimmungsstaaten mit Ausnahme
von US): **VOITH TURBO GMBH & CO. KG** [DE/DE];
Alexanderstrasse 2, 89522 Heidenheim (DE).

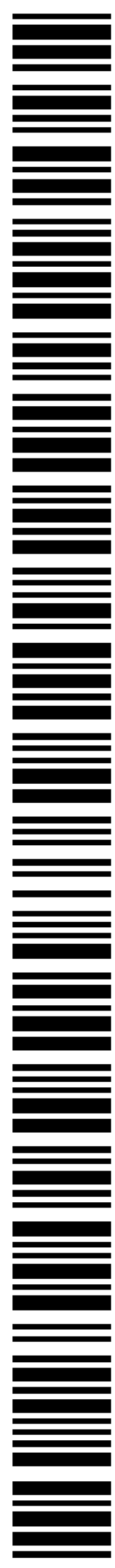
(72) Erfinder; und

(75) Erfinder/Anmelder (nur für US): **HOLZAPFEL,**
Michael [DE/DE]; Reutlinger Strasse 38/1, 89522 Heiden-
heim (DE). **HÖGER, Bernhard** [DE/DE]; Schülestrasse
61, 89522 Heidenheim (DE). **HANGLEITER, Christof**
[DE/DE]; Karlstrasse 27, 89568 Hermaringen (DE).(74) Anwalt: **WEITZEL & PARTNER**; Friedenstrasse 10,
89522 Heidenheim (DE).(81) Bestimmungsstaaten (soweit nicht anders angegeben, für
jede verfügbare nationale Schutzrechtsart): AE, AG, AL,
AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH,
CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES,
FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,
KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD,
MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG,
PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM,
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM,
ZW.(84) Bestimmungsstaaten (soweit nicht anders angegeben, für
jede verfügbare regionale Schutzrechtsart): ARIPO (BW,
GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG,
ZM, ZW), eurasisches (AM, AZ, BY, KG, KZ, MD, RU,
TJ, TM), europäisches (AT, BE, BG, CH, CY, CZ, DE, DK,
EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LU, MC, NL, PL,
PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM,
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Veröffentlicht:

— ohne internationalen Recherchenbericht und erneut zu ver-
öffentlichen nach Erhalt des BerichtsZur Erklärung der Zweibuchstaben-Codes und der anderen Ab-
kürzungen wird auf die Erklärungen ("Guidance Notes on Co-
des and Abbreviations") am Anfang jeder regulären Ausgabe der
PCT-Gazette verwiesen.

(54) Title: DRIVEN CHASSIS FOR RAIL VEHICLES IN PARTICULAR BOGIES FOR LOW-FLOOR VEHICLES

(54) Bezeichnung: ANGETRIEBENES FAHRWERK FÜR SCHIENENFAHRZEUGE, INSBESONDERE DREHSTELLE FÜR
NIEDERFLURFAHRZEUGE(57) Abstract: The invention relates to a driven chassis for rail vehicles, in particular, bogies for low-floor vehicles, comprising at
least two wheels, arranged one behind the other on each vehicle longitudinal side, driven by a drive unit, each wheel being individu-
ally mounted to the chassis in particular, the body or bogie by means of bearings and each drive unit comprises least one drive motor,
at least indirectly connected to the wheel by means of an angular gear and an elastic coupling. The invention is characterised in that
the elastic coupling has a single plane coupling embodiment, whereby the connection between the angular gear and the wheel has
no further coupling plane.(57) Zusammenfassung: Die Erfindung betrifft ein angetriebenes Fahrwerk für Schienenfahrzeuge, insbesondere für Drehgestelle
von Niederflurfahrzeugen - mit wenigstens zwei hintereinander auf jeder Fahrwerkklängsseite angeordneten und über eine Antriebs-
einheit antreibbaren Rädern; - die Räder sind einzeln am Fahrwerk, insbesondere Wagenkasten oder Drehgestell über Lagerungen
gelagert; - jede Antriebseinheit umfasst wenigstens eine Antriebsmaschine, die wenigstens mittelbar über jeweils ein Winkelgetriebe
und eine elastische Kupplung mit den Rädern verbunden ist; Die Erfindung ist durch das folgende Merkmal gekennzeichnet: - die
elastische Kupplung ist als Einebenenkupplung ausgeführt, wobei Verbindung zwischen Winkelgetriebe und Rad frei von einer wei-
teren Kupplungsebene ist.

WO 2005/049401 A2

Driven chassis for rail vehicles, especially bogies for low-floor vehicles

The invention relates to a driven carriage for rail vehicles, especially bogies for low-floor vehicles specified with the characteristics from the preamble of claim 1.

Driven chassis for rail vehicles, especially bogies for low-floor chassis are known from prior state of the art in different types. Vicegeral reference is made to the subsequent publications:

- 1) Voith: "Mechanical propulsion components for rail vehicles – reference" G 1567 d 3/2002, pages 3, 4
- 2) EP 0698540 B1

On these embodiments at least two wheels are arranged one behind the other on each vehicle longitudinal side, driven by a drive unit, i.e. wheel being individually mounted to the chassis in particular, the body or bogie by means of bearings and each drive unit, i.e. comprised of one drive motor, at least indirectly connected to the wheel by means of an angular gear and an elastic coupling. The invention is characterized in that the elastic coupling has a single plane coupling embodiment, whereby the connection between the angular gear and the wheel has no further coupling. This means no axles shaft connection exists between the wheels, whereby the freed space can be used for the subsidence of the coach floor. On the embodiment of the angular drive as a bevel gear drive, the output bevel gear wheel coupled hollow shaft is connected to the first coupling plane of the cardaned double-coupling and with a cardaned hollow shaft, which is led through the hollow shaft. This cardaned hollow shaft is coupled through a second coupling plane with the wheel. The drive units are positioned in the bogie.

The drive device as well as the angular drive is thereby hung on the bogie. Due to this connection and support of the

ACKNOWLEDGEMENT COPY

drive unit on the bogie a deflection on the bogie effects also a corresponding deflection on the drive unit, especially the angular drive. To ensure the necessary free floor space for all functions and load conditions the theoretical maximum deflection must be taken under consideration when designing the drive. However, this means that the angular drive, especially the gear wheel collateral coupled with the wheels can not be enlarged in regards to the diameter and transferable moment. Meaning that at a preset installation space the transfer moment is limited. Another disadvantage caused by this is the lack of dependability of the angular drive and therefore of the complete system based on the related impermeability and lubrication problem. Depending on the cant of the gear during the drive on inclines or declines the dipping of the initial gear wheel into the transmission oil sump is no longer warranted. To prevent the common damage to the gear teeth, which is caused by these driving conditions, extensive additional measures to warrant the supply of the gearing with lubricant during these driving conditions are necessary. As a rule these are determined by additional constructive measures and/or the planning of additional conveyor devices.

It was therefore the task of the invention to further develop a driven chassis of the type named initially, which can avoid the mentioned disadvantages without changing the available building space. The goal is a transfer of higher torque while using the same building space or a smaller size. The constructive effort should be as low as possible and the required component amount

should be reduced. Ideal grease or lubrication conditions for the angular drive, especially the initial gearwheel, should be provided across the entire operation area and for different driving conditions.

The solution according to the invention is characterized by the features of claim 1. Preferred embodiments are reflected in the sub-claims.

The driven chassis for rail vehicles, especially for bogies of low-floor vehicles, features at least two wheels aligned in a row on each chassis longitudinal side. These wheels are driven through a drive unit, wherein the wheels are positioned individually in the chassis, especially the railcar body or bogie through corresponding suspension. Each drive unit comprises at least one main engine. This should have an angular drive that can be of different types but preferably in the form of a bevel gear drive and should be connected to the wheels by an elastic coupling.

According to the invention the elastic coupling is designed as a planate coupling, wherein the connection between the angular drive and the wheel is free of a second coupling plane.

The solution according to the invention offers the advantage that the drive unit, especially the main engine, is no longer bound to the deflection of the bogie. This is due to the mechanical decoupled arrangement of the bogie. Therefore the initial gearwheel of the angular drive, which is connected to the main engine, can be enlarged by this amount in radius. The necessary free floor space can therefore be warranted even with a larger initial gearwheel of the angular drive. The embodiment with only one coupling plane furthermore provides the advantage to forgo the necessary (arising from the state of the art with double coupling) interface between the outlet of

the angular drive and the wheel through the use of a cardan hollow shaft. Next to a built component reduction a design simplification is also possible. This is seen in the simple positioning of the hollow shaft in a preferable one-piece housing. This reduction of a coupling plane and possible axial installation space reduction has the advantage of equipping the drive unit (without additional space requirement) with additional function elements.

These function elements are, for example, means to prevent permeation of fluid, especially water and other ambient media.

Other state of the art designs could not do this without adding additional installation space.

Due to the possible enlargement of the initial gearwheel an immersion into the transmission oil sump and therefore a lubrication of the gearing over a considerably broader driving condition range is possible. This increases the reliability of the entire power train.

The main engine is preferably decoupled from the chassis, especially the bogie or the railcar body. For this purpose it is free from support on the bogie or railcar body. The support (bracing) of the main engine, which is constructed as an E-engine, occurs at least indirectly at the wheel axle of the wheels to be powered. The main engine is located quasi self-supporting between the two angular gears of the neighboring aligned wheels. These wheels are aligned in the under carriage longitudinal direction.

Thereby either of the following occurs:

- a) only the support/bracing of the main engine or
- b) the unit of main engine and angular gear on the wheel axle.

On the design according to b) the connection of main engine and angular drive on the bogie or rail car body is forgone. The main engine and angular gear block is thereby aligned in a quasi self-supporting manner between the wheels and supports itself on these. Merely the wheels are supported on the bogie.

According to a further development, the main engine is coupled with the angular gear via the guide or a support installation. This allows the angular gear or the main engine, especially their housing to be connected to the chassis. The connection to the chassis, especially the bogie or railcar body is done in the connection area of the guide. The possibility to connect through a guide also exists in the coupling of angular drives and wheels axle, whereas the latter is positioned in the bogie or railcar body. The linkage is done in the linkage areas of the components and is usually characterized by different bearing designs or connections.

According to a preferred embodiment, pivot areas are selected, which can utilize already existing linkage areas for a bogie size during the integration of the main engine. This means that independent of the dimensioning and design of the individual chassis, the same linkage area is already provided for a variety of chassis types. The main engines are thereby compatible.

According to an especially preferred embodiment the main engine is linked through a three point guide to the bogie according. Depending on the design, at least one or two attachment areas, especially linkage points for the guide to the main engine are provided, i.e. the other two

are provided on the bogie. The side of the isosceles triangle of the guide has the corresponding linkage points. The central one is either coupled with the main engine or with the bogie.

The linkage to the main engine can occur in any position. Linkage to the bogie can also be established on top or on the bottom. This solution offers the advantage that it permits tilting of the plane coupling, but no transfer of longitudinal power. The guide in the assembly system is positioned with the linkage point lateral to the chassis axle. This means that the two attachment areas on an engine are preferably aligned parallel to the chassis axle.

The used elastic coupling should preferably be a bearing package / cardan coupling with one coupling plane. Such couplings can be implemented differently as described in the following. For example, they comprise according to a first possible embodiment of a first coupling element and a second coupling element, which are connected by a bearing package, which is at least allocated to one of the coupling plane s and connected friction free (non-positive). The bearing packages can be allocated to one of the two coupling elements, it is irrelevant if the coupling element is connected to the input or output side during the use. The elastic bearing packages are preferably rubber bearing packages. These must feature a centerpiece which has both sided so-called rubber blocks. The bearing packages are applied at regular intervals in radial direction from a center member on the two coupling elements under initial tension. The bearing packages basically feature a circle segment shape if viewed in a circumference direction. It consists of a center part with rubber blocks that are allocated on both sides. The single rubber blocks are vulcanized to the center part and comprise several rubber-like elements. These elements are also vulcanized to each other. Their center part end surface is closed by plate shaped elements. The vulcanization surface of the center part and the plate

shaped element can always lie in a radial direction (viewed from the coupling axle) plane. The individual plate shaped elements can run parallel to the vulcanization surface but also with a certain tilt in order for the vulcanization surface as well as the plate shaped elements to meet in the coupling axel. The individual rubber elements would be cone shaped in this case. The plate shaped elements which close off the bearing blocks can be connected to the arm of the corresponding coupling element. An elastic coupling, especially a bearing package joint coupling according to a second especially preferred embodiment, also comprises a first and second coupling element, wherein the first and second coupling element are each torque-proof attachable with the input or output side. The first or second coupling element includes a radial element that has a center member. The connection to the input and output side is implemented through this. Arm-like elements aligned in the same intervals extend from here in the radial direction. One bearing package under initial tension is allocated between two neighboring arm-like elements. The elastic bearing package comprises a center part to which elastic bearing blocks are connected on both sides.

The center part and the bearing blocks are designed in such a way that these elements are self-centering to each other. The center part is in an axial direction to the coupling axle and basically features a tapering design. The center part needs to be vulcanized to the bearing blocks in an axle direction together with the uneven outer surface. These are preferably equipped with a curved outer surface; this means that the system and contact surfaces can be described by at least two different direction vectors when viewed in cross section. In other words, the center parts are designed as pointing in the circumferential direction as a half round body. This means that the surfaces of the center part pointing in the circumferential direction

are curved or arched. Other curved embodiments are also possible. The bearing blocks of a bearing package which are aligned both sided on the centerpiece comprise at least two rubber elements that are separated from each other by an intermediate element. The two rubber elements are also called rubber tracks and are connected to an end piece. The end piece can be fixed to the corresponding arm by a detachable connection and forms a receiving fitting for the rubber-like element. According to the invention, the receiving fitting and the rubber-like element surfaces which come in contact with each other should be parallel in the circumferential direction pointing to the area of the center part the center part pointing to the arm or the surface pointing toward the center part of the receiving element. A bearing block preferably consists of several rubber-like elements, which are separated from each other by corresponding intermediate elements. The connection between the individual rubber-like elements, the intermediate elements and the fitting for receipt of the rubber-like elements on the corresponding arm of the coupling element or the surface of the center part pointing to the arm is done through vulcanization. The individual vulcanization surfaces are preferably arranged in parallel to each other in the installation position. In comparison to the first embodiment, the torque transfer is replaced by a positive transfer. This provides the advantage that the individual bearing packages can not move radially due to the centrifugal force. The half-bowl shaped intermediate elements between the individual rubber-like elements are also held in the radial direction, due to their shape. The bearing blocks are connected to the (neighboring in the circumferential direction) arm-shaped elements in a detachable way. The connection of the exterior halves of the bearing blocks, especially the rubber packets occurs through an attachment device. This device is allocated diagonally to the axle direction side piece of a L or U shaped end piece. Means for the radial safety of the elastic bearing packet are planned. This

is comprised of at least one positive connection. A variety of possibilities exist regarding the concrete design. A grove / spring connection is a probable embodiment for example. The half-round body of the center part preferably has a spring that grips a groove of the coupling element or vice versa. The complete bearing packet is axially secured in a non-positive way via connection screws in the center part of the bearing packet.

The individual elements of the bearing packet can be made of light metal to achieve a better heat dissipation as well as weight relief.

A variety of possibilities also exist for the embodiment of the connection options of the individual coupling elements of the elastic couplings to the input /output components, meaning the hollow shaft and the wheel and / or the wheel axle. In the simplest case the coupling elements have collar parts, which have means to implement a positive and / or force fit connection.

In the following the solution according to the invention is exemplified by figures. The following is described in detail:

Figure 1 clarifies, through an excerpt of a top view, a drivable chassis designed according to the invention;

Figure 2 clarifies, through an excerpt according to figure 1, the design of the main engine;

Figure 3a and 3b clarify a first possibility to support the main engine;

Figure 4 clarifies a second embodiment to support the main engine;

Figure 5 clarifies the three-point suspension;

Figure 6 clarifies an embodiment with mechanically coupled main engines of two drive units allocated parallel to each;

Figure 7 clarifies an alternative solution.

Figure 1 clarifies, in a schematically simplified representation (in top view), a drive configuration 1 for a driven chassis 2 for rail vehicles 3, especially bogies for low-floor vehicles. The drive configuration 1 comprises on each under carriage longitudinal side at least 2 wheels 4 and 5 or 6 and 7 aligned behind each. These wheels are driven through a main engine 8 or 9. Viewed in the drive direction, wheel 4 and 6 function as working stroke wheels, and wheels 5 and 7 as coasting wheels. Wheels 4, 5 and 6 and 7 are individually placed over the corresponding bearings on the chassis, especially the bogie or rail car body. Each drive unit 8 and 9 is comprised of a main engine 10 or 11, which are also described as central engines. Each main engine 10 or 11 thereby comprises of at least one run shaft 12 or 13, which are each connected to the wheels 4 and 5, or 6 and 7.

Run shafts are preferably planned, identified here as 12.1 and 12.2 for the coupling with the wheels 4 and 5 and through the angular gear 14.1 or 14.2 and 15.1 or 15.2 with the wheels 6 and 7. The angular gear 14.1, 14.2 or 15.1 and 15.2 are preferably arranged as bevel gear drives 16.1, 16.2 or 17.1 and 17.2. The bevels 18.1, 18.2 or 19.1 and 19.2 of the angular drive 14.1, 14.2 or 15.1 and 15.2 are each connected to each running shaft 12.1, 12.2 or 13.1 and 13.2 at least collaterally. This means directly or indirectly via a transfer element. The bevel front wheels 20.1, 20.1 or 21.1 and 21.2 intermeshing with the bevels 18.1, 18.2 or 19.1 and 19.2 function as driving gears. They are connected in a torque-proof manner to a hollow shaft 22.1, 22.2 or 23.1, 23.2 or form an integral component with this. According to the invention, this is

connected by the elastic coupling 24.1, 24.2 or 25.1, 25.2 with the wheels 4, 5 or 6 or 7 to be powered.

This elastic coupling is a bearing packet joint coupling, especially a cone packet coupling with a coupling plane. This comprises at least one coupling element 26.1, 26.2 or 27.1, 27.2, which is implemented as a hollow shaft spider 28.1, 28.2, 29.1, 29.2 and connected by rubber packs with the wheels 4, 5 or 6 and 7 connected wheels spiders 30.1, 30.2, 31.1, 31.2. The individual drive unit 8 or 9 is, according to the invention free of a gimbaled double coupling in the coupling to the individual wheels 4, 5 or 6 and 7. Only a single cone packet coupling for the connection of the individual angular drives 14.1, 14.2, 15.1 or 15.2 with each wheel 4, 5 or 6 and 7 is planned. This means that one coupling plane is completely eliminated in comparison to state of the art embodiments. It is furthermore possible through this alignment to connect the drive wheel in the form of a bevel wheel 20.1, 20.2 or 21.1, 21.2, or the hollow shaft coupled with it in a torque-proof manner 22.1, 22.1, 23.1 or 23.2 or the component (implemented in an integral construction) directly with the coupling 24.1, 24.2, 25.1 or 25.2. The interface, which is necessary on embodiments with two coupling planes in the prior state of the art, becomes obsolete.

Besides a strongly simplified embodiment this also leads to additional installation space for the layout of the angular drive 14.1, 14.2 or 15.1, 15.2 in the form of a bevel wheel 20.1, 20.2 or 21.1, 21.2. This can be dimensioned correspondingly, and the transferable torque can be increased if the installation space stays the same or is increased in an axial or vertical direction. This still ensures ground clearance. The positioning of the bevel wheels 20.1, 20.2 or 21.1, 21.2 occurs preferably in a housing 32.1, 32.2 or 33.1, 33.2. The bearing occurs for example through

an axial and radial force transferring set bearing alignment 34.1, 34.2, 35.1, 35.2. This is based on the end-piece of the hollow shaft facing away 22.1, 22.2, 23.1, 23.2 of the rotation axle of the bevel of wheel 4, 5 or 6, 7. At least one radial bearing 36.1, 36.2, 37.1, 37.2 is arranged between the bevels 18.1, 18.2 or 19.1, 19.2 and the wheel 4, 5, 6 or 7. The complete housing construction can also be designed very simply. The housing 38.1, 38.2 resp 39.1, 39.2 receiving the bevel shaft is constructed together as well as the end of the front face 40.1 or 40.2, 41.1, 41.2 facing away from the wheel in a one piece housing component 42.1, 42.2 or 43.2, which is connected to the housing 38.1, 38.2 resp 39.1, 39.2. The housing cover 44.1, 44.2, 45.1, 45.2 complete the assembly. To simplify the assembly, the hollow shaft 22.1, 22.2, 23.1, 23.2 and the bevel wheel 20.1, 20.2, 21.1, 21.2 connected to it in a torque-proof manner, the covers 46.1, 46.2 or 47.1, 47.2 as well as the bearing alignment 34.1, 34.2, 35.1, 35.2. and the housing component 42.1, 42.2 or 43.2 can be delivered as a preassembled component and installed in the drive unit 8 or 9.

Figure 2 once again clarifies by means of an excerpt of the drive unit 8 according to figure 1, the enlarged schematic representation of the basic set-up of the mechanical coupling (according to the invention) between the main engine 10 and the wheel 4 to be driven. The running shaft 12.1 of the main engine 10 is recognizable. It is connected at least indirectly in a torque-proof manner to the bevel shaft 48 of the angular drive 14.1. This means directly or through other transfer elements, for example claw couplings or membrane couplings. The running shaft 12.1 is may be connected in a torque-proof manner with the flange range building hollow shaft. This in turn is connected in a torque-proof, detachable manner, to at least one flange surface 50 supporting element 51. Element 51 in turn is connected torque-proof to bevel shaft 48 or is

formed by this. The bevel 18.1 in itself is preferably an integral component of the bevel shaft 48. The bevel shaft 48 is located through a bearing arrangement 52 in housing 32.1. Also in housing 32.1 is the hollow shaft 22.1 as the torque-proof connected bevel wheel 20.1 or the integral construction unit forming the bevel wheel. The hollow shaft extends in a one-piece embodiment through the housing and is furthermore connected to a housing part 42.1 which is connected to the housing 32.1. The hollow shaft has a front face 53 pointing to the wheel and a flange surface 54. This serves as a torque-proof connection to the first coupling element 55 of the elastic coupling 24.1 in the form of a hollow shaft spider 28.1. The coupling is done for example in the circumferential direction through a face gear 56, implemented preferably in the form of a hollow shaft spider 28.1. This allows an alignment in circumferential direction as well as radial direction. The coupling in the axial direction is done through an attachment element 57, preferably in the form of screws. Other connections between the hollow shaft 12.1 and the first coupling element 55 are also plausible in an integral embodiment of a hollow shaft and a first coupling element in the form of a component. The hollow shaft spider 28.1 is in turn connected to the second coupling element 58 of the elastic coupling 24.1. This is in turn connected in a torque-proof manner to the driven wheel 4 to be driven, or one of the coupled but not further represented axle 59. The second coupling element 58 is also described as wheel spider 30.1. The elastic elements are thereby arranged between the first and second coupling element 55 and 58, wherein depending on the embodiment of the elastic coupling the elements can be cone shaped or in another corresponding form. There is a variety of possibilities regarding the block packet coupling embodiment. Reference is made representatively to **DE 199 58 367 A1**.

The disclosure content of this document regarding the design of the packet coupling is hereby completely adopted in the claim.

There are several options for supporting the drive unit 8 or 9. These are represented in the following very strongly schematic representations in figures 3 to 6. Figure 3 a for example clarifies the arrangement of possible linkage points by means of a top view excerpt of a drive unit 8 according to figure 2. There is also a variety of possibilities regarding the geometric arrangement. Here it is mostly important to indicate, at least purely functionally, on which element a linkage is theoretically possible. On the embodiment according to figure 6 a linkage of the main engine 10 to the bogie or the rail car body is completely renounced. According to a first embodiment in figure 3 a linkage occurs at least indirectly through the angular drive 14.1 on the bogie or railcar body. At least a first link area 60 is planned on the angular drive 14.1, which can be connected or coupled with the bogie in any way. To prevent unnecessary stress on analog embodiment of the main engine 8 with the indicated linkage points on the bogie according to the state of the art, a linkage point or linkage area 61 on the main engine 10, especially its housing is selected that is connected to the linkage area 60 to the drive 14.1 through the guide 62, wherein the latter is linked to the bogie. In this case no direct connection exists between the main engine 8 and the bogie. The drive, especially the housing, is hung in this case in the linkage areas of the bogie. The main engine 10 is thereby indirectly coupled through the guide to the bogie 67. Another possibility involves the linkage area 61 of the main engine 10 being directly attached to the bogie 67, wherein the drive is free of a direct connection with the bogie. The first possibility is represented here in a strongly schematic manner. The bogie or the railcar body are only indicated and identified as 67. Another possible

embodiment according to figure 4 involves constructing the main engine completely free of a linkage area, wherein the linkage of the unit consisting of main engine 10 and the connected angular drive 14.1 occurs through a connection in the form of a guide 63, for example. This is done between the linkage area 60 on the angular drive 14.1 and the linkage area 64. The guide 64 is designed for the linkage of the wheel 4 or the wheel axle 65. The linkage to the bogie and railcar body also occurs here. The linkage area 64 can occur, depending on arrangement related to the wheel axle, between the angular drive 14.1 and the wheel 4 or as indicated in figure 4, behind the wheel 4. This means on the side of the wheel 4 pointing away from the angular drive 14.4. The bearings or linkage areas are thereby used for the support of the wheels on the bogie or railcar body 67.

The linkage can occur through corresponding bearings, especially on bearings or connections of the wheel axle to the chassis. Other coupling possibilities are possible. The precise choice for the purpose of support is at the discretion of the specialist.

Figure 5 clarifies an especially preferred embodiment in the form of a three-point suspension 73. A three-point guide 74 can be seen which shows three attachment or linkage points in the form of a triangle, which can be connected to the corresponding connection areas of the main engine and the bogie 67. In the represented case two are planned on the bogie 67 or one of the connected elements. These are identified as 76 and 77. The third attachment 75 is planned on the main engine 11. Furthermore, a coupling takes place between the main engine 11 and the guide 74. Another possibility would be the attachment of the main engine 11 on two attachment areas and the bogie or chassis with only one attachment point, i.e. two attachment points resp

linkage point on the three-point guide 74 are planned for the connection to the main engine, while the third one connects the guide 74 to the bogie 67. The location allocation of the attachment area and individual elements – main engine and bogie – can be differently selected.

Possibilities are linkages of the three-point guide 74 on top on the bogie 67, below on the bogie 67 and / or any location on the main engine 10 or 11.

Since the main engine 10 or 11 according to the invention is preferably free of linkage to the railcar body or the bogie, it supports itself at least indirectly on the wheels to be driven or wheel axle. Reference is made to the embodiment according to figure 6. On self-supporting embodiments according to figure 6 the connection between the main engine 10 and 11 and the angular drive 14.1 resp 15.1 and 15.2 is through a guide rod to prevent the tilting of the drive and main engines 10,11. The guide rod F is arranged diagonally to the vehicle. This guide rod or guide element 66 preferably connects the two main engines 10 and 11 in a lower area (viewed in a vertical direction the installation space). This means preferably below the running axle A_L of the main engine 10 or 11.

Figure 7 clarifies another approach to limit the disadvantages stated initially by using a non-cardan acting double coupling 69 by means of an excerpt from a main engine 9, which serves an arranged wheel 4. The wheel is preferably arranged on a stiff axle 68. The drive occurs through a main engine that is installed preferably lengthwise and connected through the angular drive 14 with the wheel 6. In its simplest form it is a bevel gear as already described in the previous figures. The output comes from the output bevel gear 20. This is connected by the first

coupling plane 70.1 with the wheel 6, as described for the connection between wheel and angular drive according to figure 1 to 6. The connection of the axle 68 with the output of the angular gear 14 and the wheel 6 takes place through the hollow shaft 22 supporting the bevel gear 20. The individual couplings of the double coupling 69 furthermore feature a first coupling element 71.1 or 71.2 which is connected in a torque-proof manner to the hollow shaft or forms a structural unit with it. It also features a second coupling element 72.1. which at least indirectly comes in connection with those and is connected in torque-proof manner to the wheel 6 and the axle 68. The second coupling element 72.1 or 72.2 is therefore designed as an axle spider with four or several spider-shaped arms. A connection is then formed through elastic bearing packets, especially rubber bearing packets to the hollow shaft. The hollow shaft is designed in such a way that it encloses the axle 68. The hollow shaft is connected to the first coupling element 71.1, 71.2 in the form of a hollow shaft spider. The individual coupling elements can thereby be carried in electro-mechanical drive units by the grounding brushes.

Reference list

1	Drive configuration
2	Driven chassis
3	Rail vehicle
4, 5, 6, 7	Wheels
8	Drive Unit
9	Drive Unit
10	Main engine

11	Main engine
12.1, 12.2	Run shaft
13.1, 13.2	Run shaft
14.1, 14.2	Angular gear
15.1, 15.2	Angular gear
16.1, 16.2	Bevel gear drive
17.1, 17.2	Bevel gear drive
18.1, 18.2	Bevel
19.1, 19.2	Bevel
20.1, 20.2	Bevel front wheel
21.1, 21.2	Bevel front wheel
22.1, 22.2	Hollow shaft
23.1, 23.2	Hollow shaft
24.1, 24.2	Elastic coupling
25.2, 25.2	Elastic coupling
26.1, 26.2	Coupling
27.1, 27.2	Coupling
28.1, 28.2	Hollow shaft
29.1, 29.2	Hollow shaft
30.1, 30.2	Wheel spider
31.1, 31.2	Wheel spider
32.1, 32.2	Housing
33.1, 33.2	Housing

34.1, 34.2	Bearing alignment
35.1, 35.2	Bearing alignment
36.1, 36.2	Radial bearing
37.1, 37.2	Radial bearing
38.1, 38.2	Housing
39.1, 39.2	Housing
40.1, 40.2	Front face
41.1, 41.2	Front face
42.1, 42.2	Housing component
43.1, 43.2	Housing component
44.1, 44.2	Housing cover
45.1, 45.2	Housing cover
46.1, 46.2	Cover
47.1, 47.2	Cover
48	Bevel shaft
49	Flange element
50	Flange surface
51	Carrying element
52	Bearing arrangement
53	Front face
54	Flange surface
55	First coupling element
56	Face gear

57	Attachment element
58	Second coupling element
59	Axle
60	Linkage area
61	Linkage area
62	Guide
63	Guide
64	Linkage area
65	Wheel axle
66	Guide element
67	Railcar body, Bogie
68	Axle
69	Double coupling
70.1, 70.2	First coupling plane
71.1, 71.2	First coupling element
72.1, 72.2	Second coupling element
73	Three-point suspension
74	Three-point guide
75, 76, 77	Attachment element
A _L	Running axle
F _L	Chassis longitudinal axle

Patent Claims

1. Driven chassis (2) for rail vehicles (3) especially for bogies of low-floor vehicles
 - 1.1 with at least two powerable wheels (4, 5, 6,7) arranged behind each other via a drive unit (8,9);
 - 1.2 the wheels (4, 5, 6, 7) are positioned individually on the chassis, especially the railcar body or bogie (67) through bearings;
 - 1.3 each drive unit (8, 9) comprises at least one main engine (10, 11) which is at least indirectly connected by an angular gear (14.1, 14.2, 15.1, 15.2) and an elastic coupling (24.1, 24.2, 25.1, 25.2) with the wheels (4, 5, 6, 7);

characterized by the following criteria:

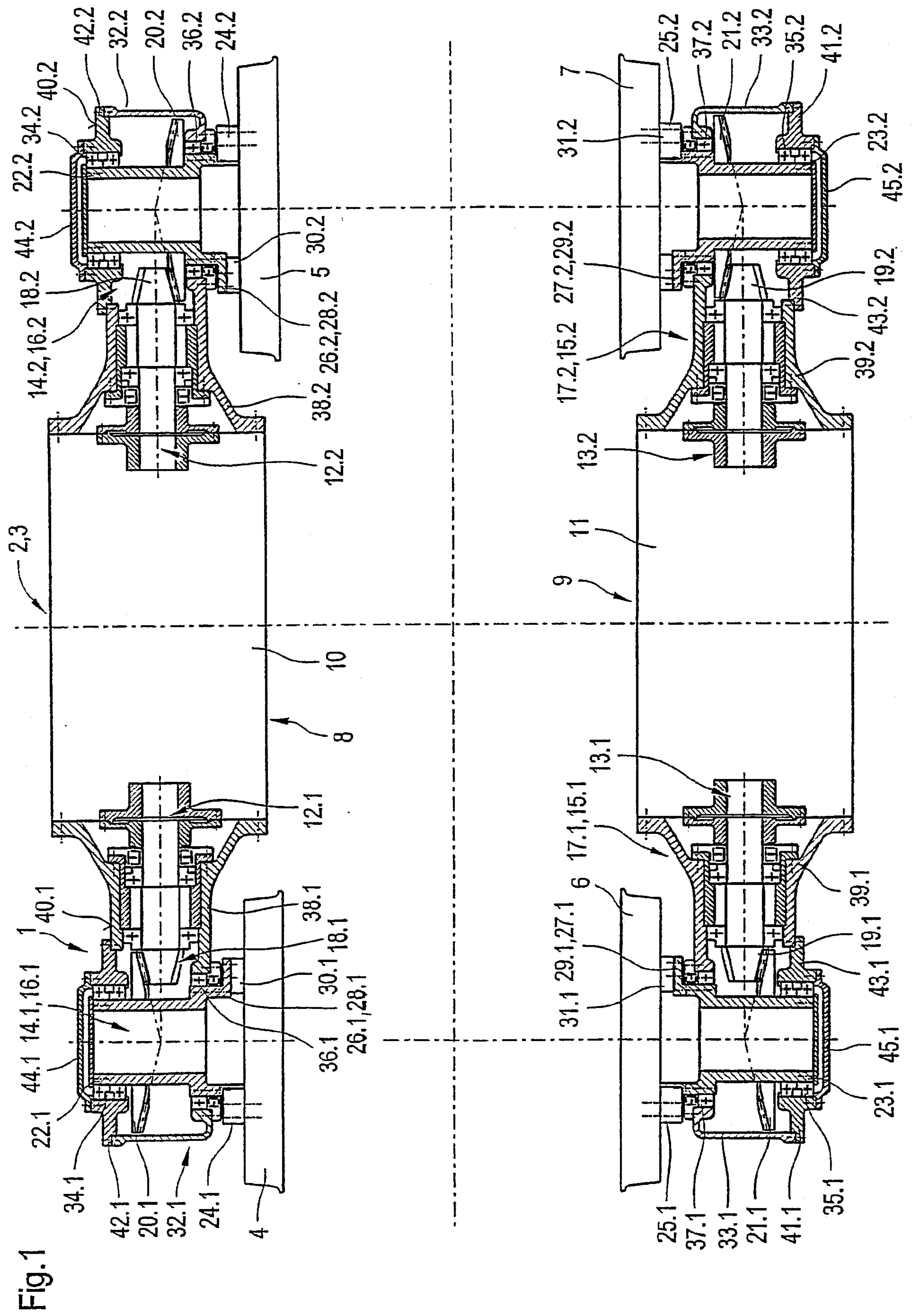
- 1.4 the elastic coupling (24.1, 24.2, 25.1, 25.2) is designed as a one plane coupling, wherein the connection between the angular drive (14.1, 14.2, 15.1, 15.2) and the wheel (4, 5, 6, 7) are free of another coupling plane.
2. Driven chassis (2) according to claim 1, wherein the main engine (10, 11) is free of support / bracing on the bogie (67) or railcar body.
3. Driven chassis (2) according to claim 1 or 2, wherein the main engine (10, 11) of the two drive units (8, 9) are mechanically connected by at least one solid guide element (66) that is aligned diagonally to the vehicle longitudinal axle.

4. Driven chassis (2) according to claim 3, wherein the connection between the two main engines (10, 11) in the installation position is below the axle of the running shafts (12.1, 12.2, 13.1, 13.2) of the main engines (10, 11).
5. Driven chassis (2) according to claim 1 to 4, wherein the main engines (10, 11) are at least indirectly connected to the wheel (4, 5, 6, 7) or are braced on the bogie or railcar body situated wheel axle.
6. Driven chassis (2) according to claim 1 or 2, wherein the housing of the main engines (10, 11) is connected by a guide (62) with the angular drive (14.1, 14.2, 15.1, 15.2).
7. Driven chassis (2) according to claim 6, wherein the angular drive (14.1, 14.2, 15.1, 15.2) or the main engines (10, 11) are linked at the bogie, wherein the power unit coupled through the guide – main engine or angular drive - are free of any linkage to the bogie.
8. Driven chassis (2) according to claim 7, wherein the linkage of the angular drive or main engine is done on the bogie in the area of the guide.
9. Driven chassis (2) according to claim 1 or 2, wherein the angular drive (14.1, 14.2, 15.1, 15.2) is connected by a guide (63) with the wheel axle (65) or the bearing of the wheel axle.

10. Driven chassis (2) for rail vehicles (3) according to claim 1), wherein the main engine (10, 11) is linked to the bogie by a three-point suspension.
11. Driven chassis (2) according to claim 1 to 10, wherein the outlet of the angular drive (14.1, 14.2, 15.1, 15.2) is coupled in a torque-proof manner with an output gear element or a structural unit forming a hollow shaft.
12. Driven chassis (2) according to claim 11, characterized by the following criteria:
 - 12.1 with a one-piece housing (32.1, 32.2, 33.1, 33.2) allocated to an angular drive (14.1, 14.2, 15.1, 15.2)
 - 12.2 the hollow shaft (22.1, 22.2, 23.1, 23.2) is positioned in the housing (32.1, 32.2, 33.1, 33.2) over at least one fixed bearing and one radial bearing.
13. Driven chassis (2) according to claim 1 to 12, wherein the elastic couplings (24.1, 24.2, 24.5, 25.2) are arranged directly between the exit of the angular drive (14.1, 14.2, 15.1, 15.2) and the wheel (4, 5, 6, 7).
14. Driven chassis (2) according to claim 1 to 13, wherein the elastic coupling (24.1, 24.2, 24.5, 25.2) is implemented as a bearing packet joint coupling.
15. Driven chassis (2) according to claim 11, characterized by the following criteria:

- 15.1 the elastic coupling (24.1, 24.2, 24.5, 25.2) comprises a first coupling element (55) and a second coupling element (58);
- 15.2 The first coupling element (55) is connected in a torque-proof manner to the hollow shaft (22.1, 22.2, 23.1, 23.2)
- 15.3 The second coupling element (58) is connected to the wheel (4, 5, 6, 7).
- 16. Driven chassis (2) according to claim 15, characterized by the following criteria:
 - 16.1 the first and second coupling elements (55, 58) comprise at least one center part with arm-like elements reaching in the radial direction;
 - 16.2 between two arm-like elements arranged next to each other in the circumferential direction, an elastic bearing packet is arranged;
 - 16.3 each coupling element bearing packet – first or second bearing element (55, 58) – comprises an intermediate piece (viewed in profile in the axial direction) in the area of the center circumference, which is connected in a detachable manner to the other coupling element – second or first coupling element. Bearing blocks with exterior end pieces are symmetrically vulcanized on both sides, which are connected in a detachable manner to the arm-like elements.
- 17. Driven chassis (2) according to claim 16, characterized by the following criteria:
 - 17.1 the bearing blocks comprise two rubber-like elements with intermediate elements which are arranged in between the bearing blocks;

- 17.2 the form of the contact surfaces (pointing in the circumferential direction) between the individual elements of the bearing block is designed in such a way that the intermediate elements and the rubber-like elements are self-centering;
 - 17.3 the contact surface of the intermediate elements can be described at least by two different direction vectors viewed in profile;
 - 17.4 with means to implement a positive connection between the first and second coupling elements planned intermediate piece and the second or first coupling element.
-
- 18. Driven chassis (2) for rail vehicles (3) especially for bogies of low-floor vehicles
 - 18.1 with at least one driven wheel (6) powered by a drive unit (9) which is arranged on an axle (68);
 - 18.2 each drive unit (9) comprises a main engine (11) that is at least indirectly connected by the angular gear (14) and an elastic coupling with the wheels (4, 6);
- characterized by the following criteria:
- 18.3 the exit of the angular gear (14) is formed by a hollow shaft (22), which is connected by a non-cadanic effective double coupling (69) directly to the wheel (6) and the axle (68).



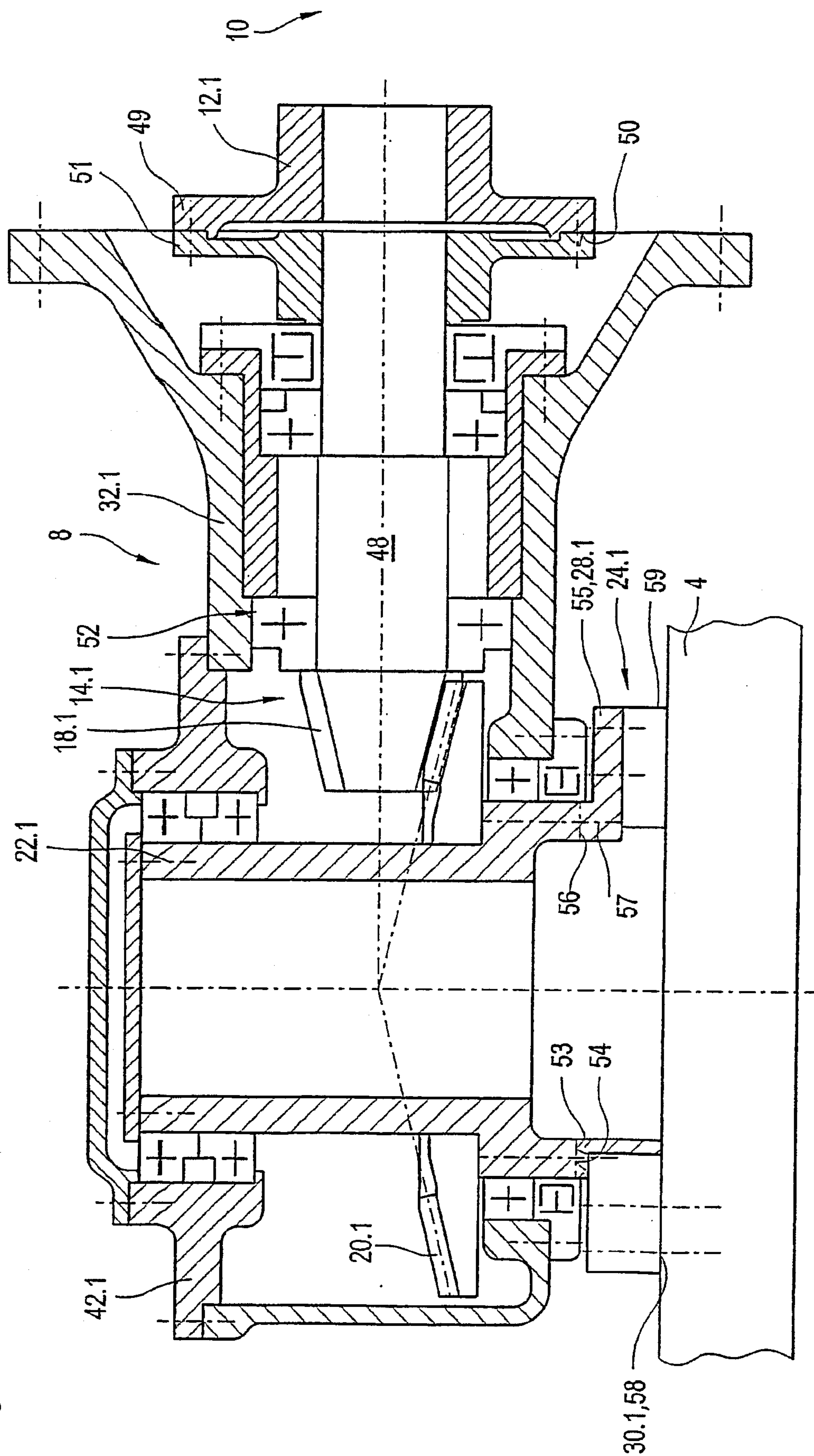
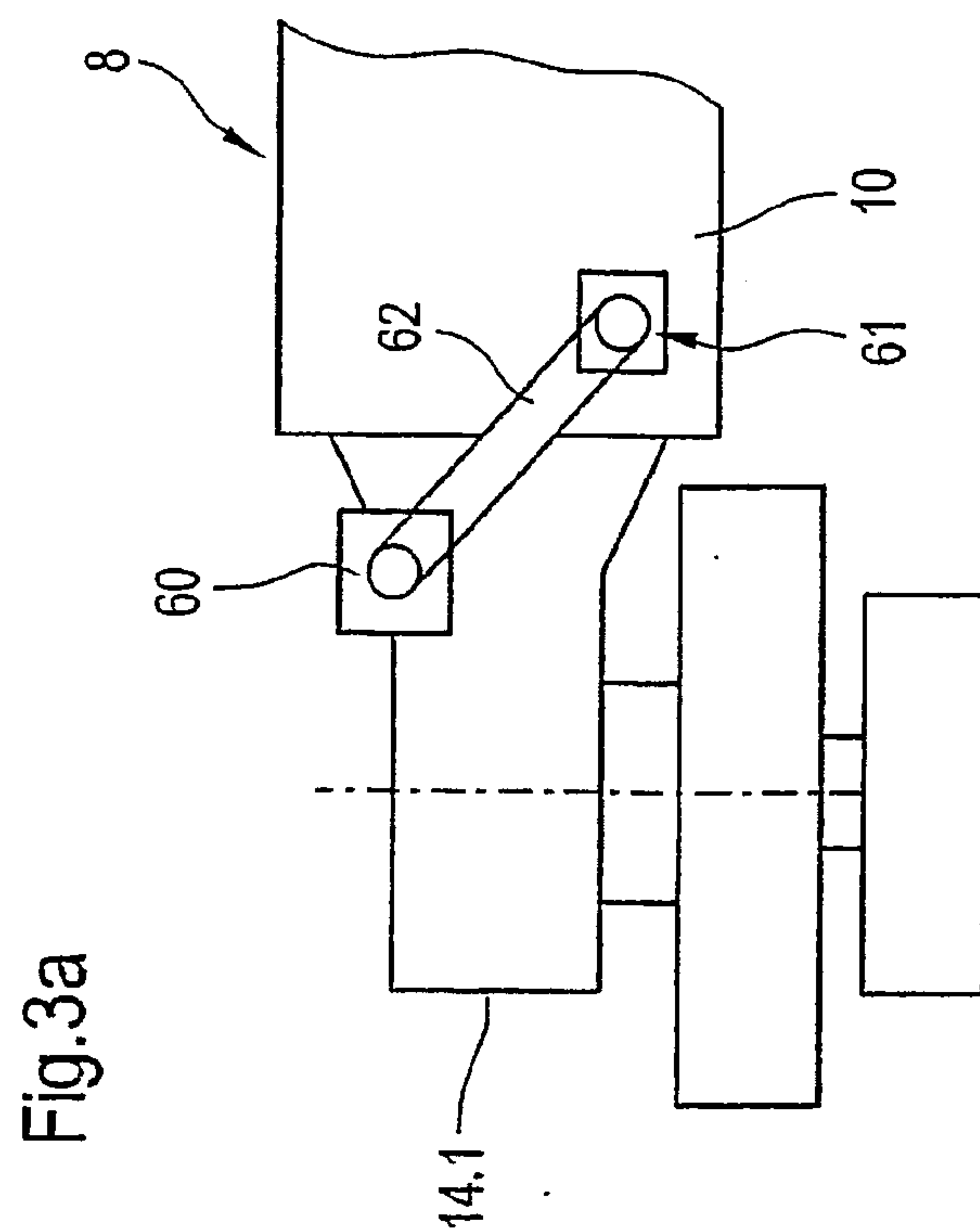
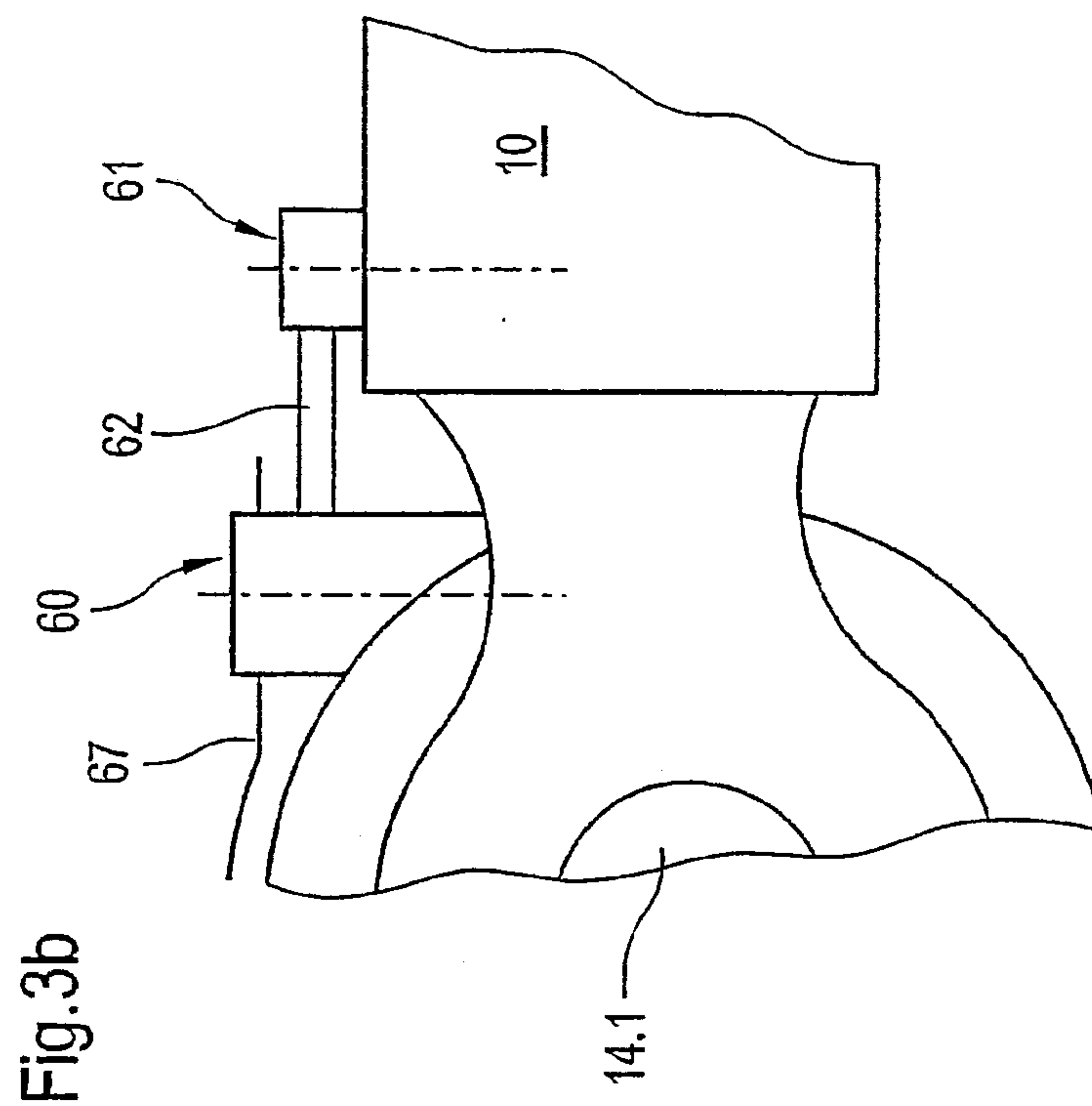
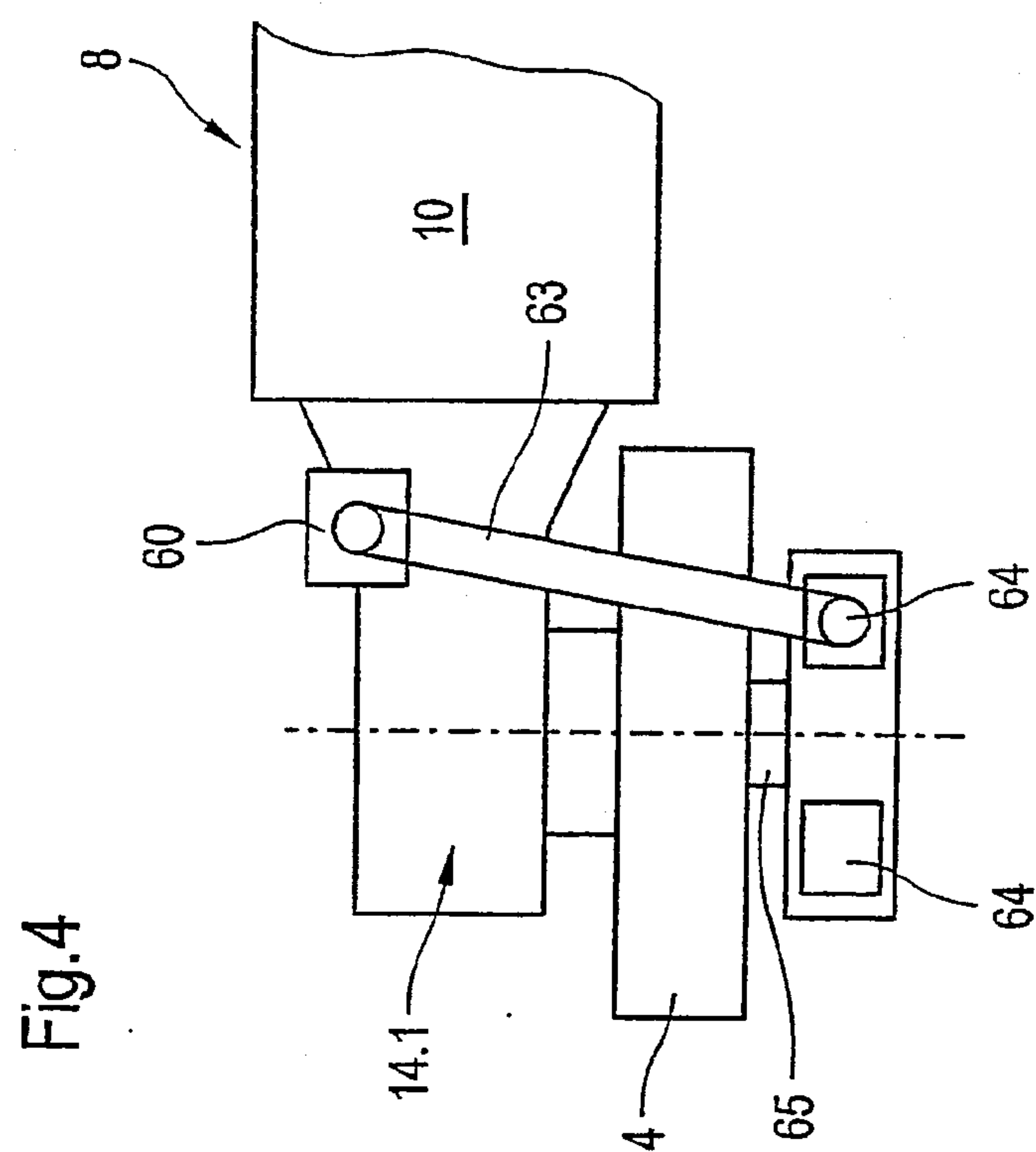


Fig. 2





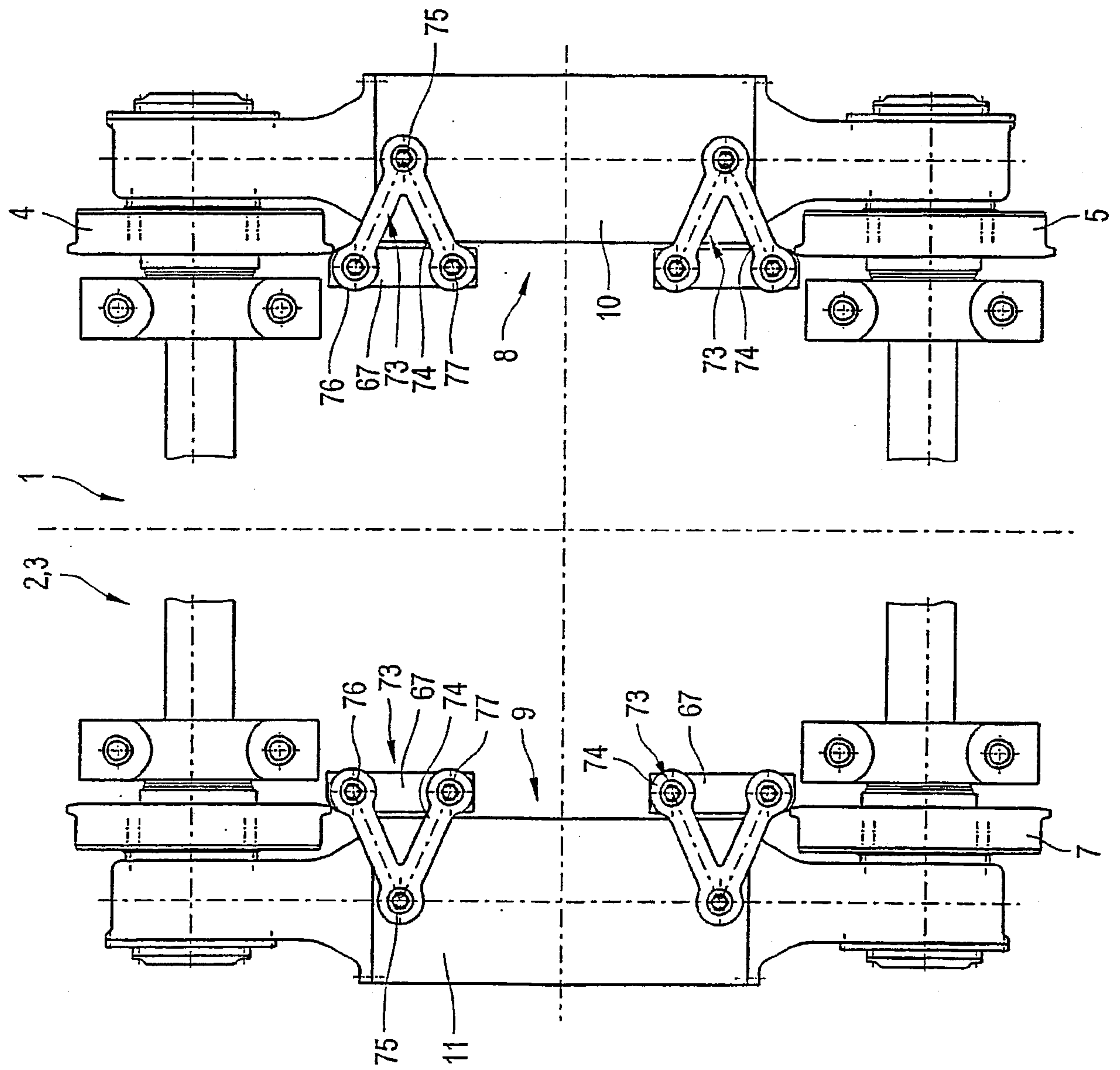


Fig. 5

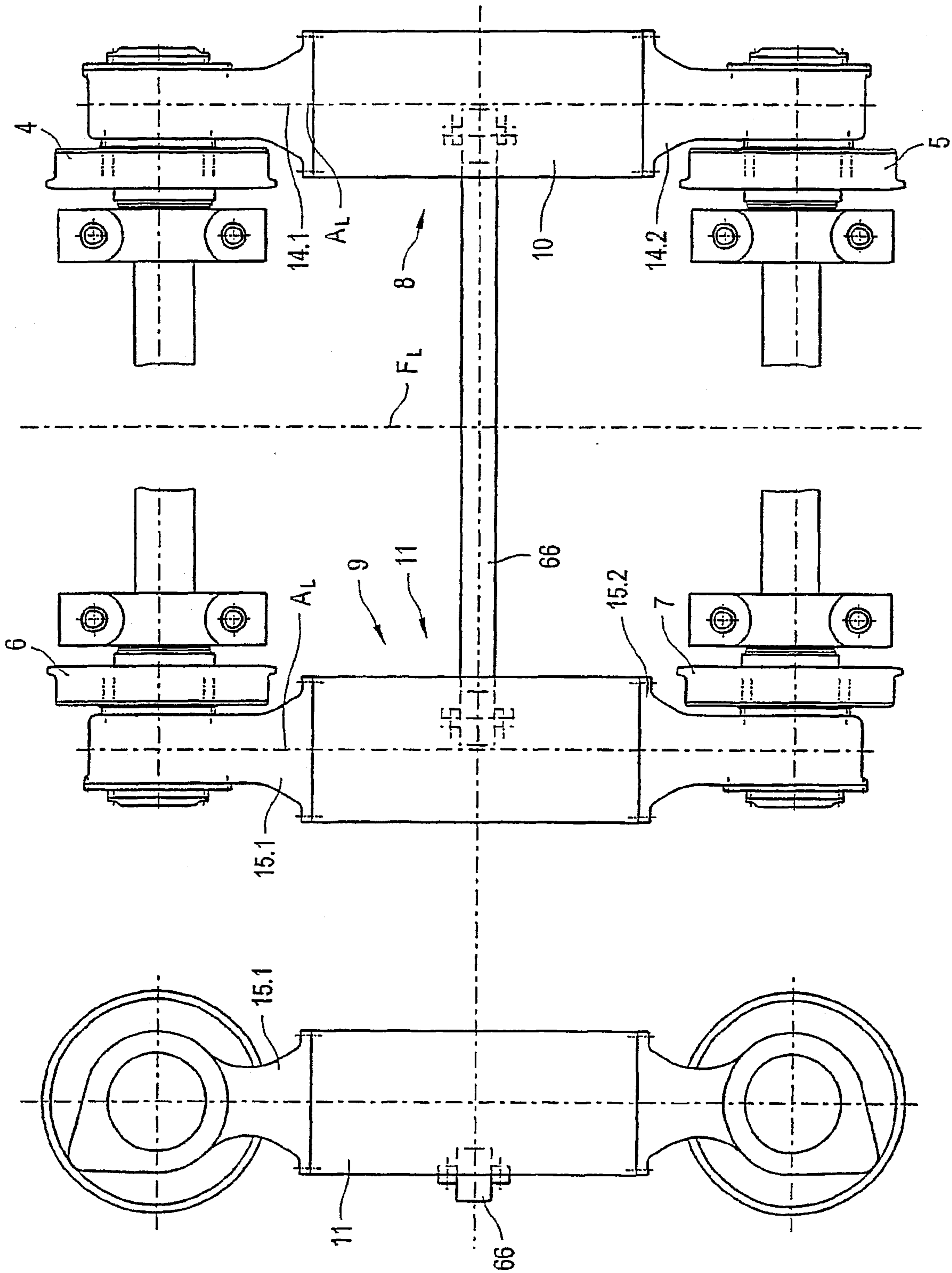


Fig.6

