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Front body structure for vehicle
Vorderstruktur eines Fahrzeuges
Structure avant de véhicule automobile

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BACKGROUND OF THE INVENTION

[0001] The present invention relates to a front body structure for a vehicle. More particularly, it relates to a front body structure which is adapted so as to disperse a collision load at the vehicle front collision to a body framework member through a front wheel.

[0002] Japanese Patent Application Laid-open No. 11-342869 discloses one front body structure for a vehicle, which is designed so as to moderate the concentration of a deformation force on the rear end of a reinforcement member at the connection between a front pillar and a side sill when the front wheel interferes with the front pillar and the front end of the side sill due to the collision load inputted from the front of the vehicle, in order to absorb the collision energy at the front end of the side sill.

SUMMARY OF THE INVENTION

[0003] In the above-mentioned front body structure, however, the front wheel produces a resistance force in process of its moving backward due to the front collision load since the front wheel is supported on the side of a vehicle body with a predetermined bearing rigidity. Consequently, the front wheel interferes with the side sill in the latter half of serial collision behavior.

[0004] In the former half of serial collision behavior, therefore, the load to shift the front wheel backward is collectively transmitted to a side member and an extension side member through the intermediary of a suspension arm carrying the front wheel and a suspension member.

[0005] That is, at the beginning of collision, it is difficult to sufficiently transmit or disperse the collision load to the side sill which is disposed outside the extension side member in the width direction of the vehicle and which has a high rigidity.

[0006] EP 1 138 580 A2 discloses a front body structure according to the preamble part of claim 1. JP-A-3-112788 discloses a front body structure having a pair of side sills and a suspension supporting frame. The side sills are connected to the suspension supporting frame via a torque box.

[0007] Further, DE 38 00 944 C1 discloses a bearing arrangement for a one-part wheel suspension. DE 43 26 668 A1 discloses a front body structure using lever elements to provide a straight alignment of the front wheels in case of a front collision.

[0008] In such a situation, it is the object of the present invention to provide a front body structure that allows the front wheel to move back positively due to the front collision load and interfere with the side sill in early stages of the collision, thereby allowing the collision load to be dispersed to the body.

[0009] This object is solved by a front body structure according to claim 1. The sub-claims contain preferred embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] Fig. 1 is a perspective view of an automobile to which the present invention is applied;

Fig. 2 is a schematic bottom view showing a right-and-front framework of the front body structure in accordance with the first embodiment of the invention;

Fig. 3 is a perspective view showing the right-and-front framework of the front body structure in accordance with the first embodiment of the invention;

Fig. 4 is an exploded perspective view showing a front-wheel mount on the right-and-front side of the vehicle body in accordance with the first embodiment of the invention;

Figs 5A and 5B are perspective views showing the front part of a suspension arm in the first embodiment of the invention, in which Fig. 5A shows its exploded condition and Fig. 5B shows the assembled condition;

Fig. 6 is an enlarged bottom view of a circle part A of Fig. 2;

Figs 7A and 7B are perspective views showing the rear part of the suspension arm in the first embodiment of the invention, in which Fig. 7A shows its exploded condition and Fig. 7B shows the assembled condition;

Fig. 8 is a bottom view of the front-and-right part of the vehicle body at the initial stage of collision, in accordance with the first embodiment of the invention;

Fig 9 is an explanatory view showing a load acting on the front wheel at the initial stage of collision, in accordance with the first embodiment of the invention;

Fig. 10 is an enlarged bottom view of a circle part B of Fig. 8;

Fig. 11 is a bottom view of the front-and-right part of the vehicle body at the collision in further progress, in accordance with the first embodiment of the invention;

Fig. 12 is a schematic bottom view showing the right-and-front framework of the front body structure in accordance with the second embodiment of the invention;

Fig. 13 is an enlarged bottom view of a circle part C of Fig. 12;

Fig. 14 is an enlarged bottom view of the circle part C subjected to the collision load;

Fig. 15 is a schematic bottom view showing the right-and-front framework of the front body structure in accordance with the third embodiment of the invention;
Fig. 16 is an enlarged bottom view of an attachment part of a suspension rear arm of the third embodiment of the invention;
Fig. 17 is an enlarged bottom view of a circle part D of Fig. 15;
Fig. 18 is an enlarged perspective view of the deformed attachment part of the suspension rear arm of the third embodiment of the invention;
Fig. 19 is a schematic bottom view showing the right-and-front framework of the front body structure in accordance with the fourth embodiment of the invention;
Fig. 20 is a schematic bottom view showing the right-and-front framework of the front body structure in accordance with the fifth embodiment of the invention; and
Fig. 21 is a schematic bottom view showing the right-and-front framework of the front body structure in accordance with the sixth embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0011] Referring to accompanying drawings, various embodiments of the present invention will be described below.

[1st. Embodiment]

[0012] Figures 1 to 11 show the first embodiment of the front body structure in accordance with the present invention. The front body structure of the embodiment is applicable to a front compartment FC of a vehicle body 10 of Fig. 1. As representatively shown in Fig. 2, the front body structure is equipped with a pair of side members (only one shown) 11 extending in a fore-and-aft direction of the vehicle, on both sides of the vehicle body 10. The side members 11 have their front ends joined to a bumper reinforcement 12 forming a framework of a not-shown bumper. Noted that the bumper reinforcement 12 may be referred as "a front-end member" of the invention. The bumper reinforcement 12 has its ends 12a each positioned outside in the width direction of the vehicle to project from the closer side member 11 by a predetermined amount L outward.

[0013] Behind each of the side members 11, an extension side member 13 is formed in succession with the side member 11. Outside the side members 11 in the width direction of the vehicle, a pair of side sills 14 are arranged so as to be substantially parallel with the side members 11. On each side of the vehicle, the front end of the extension side member 13 is connected with the front end of the side sill 14 through an outrigger 15. The outrigger 15 has its outside part (in the width direction of the vehicle) inclined toward the vehicle rear part.

[0014] A floor panel 16 is laid on the extension side members 13 and joined to the side sills 14. A cabin 17 is defined above the floor panel 16. The floor panel 16 is provided, at its central part, with a tunnel part 16a which swells up while extending in the fore-and-aft direction of the vehicle.

[0015] At the front end of each side sill 14, as shown in Fig. 3, a front pillar 18 is arranged to stand upright.

[0016] On the underside of the side members 11, there is arranged a suspension member 19 forming an arm support member of the invention, as shown in Fig. 4.

[0017] The suspension member 19 has its both ends (in the width direction of the vehicle) each supported by the side member 11 and the extension side member 13 at front and rear points. As shown in Figs. 3 and 4, the suspension member 19 is joined, at the front point of each end, to an attachment part 20 fixed on the underside of the side member 11 and also joined, at the rear point of each end, to the underside of the extension side member 13.

[0018] As shown in Fig. 3, a front wheel 22 is attached to each end of the suspension member 19 through a suspension arm 21.

[0019] The suspension arm 21 is provided, on its side close to the suspension member 19, with a front arm 21a as a front attachment part and a rear arm 21b as a rear attachment part. The front wheel 22 is supported by a supporting end 21c of the suspension arm 21, which projects apart from the suspension member 19 outward.

[0020] The front arm 21a has a pair of cylindrical parts 30, 30a formed on both sides to project in the fore-and-aft direction of the vehicle, as shown in Figs. 5A and 5B. The cylindrical part 30 is engaged into a fit hole 31 formed in the suspension member 19, through a rubber bush 33. While, the other cylindrical part 30a is engaged into a fit hole 31 formed in a front coupling member 32 different from the suspension member 19, through another rubber bush 33. The front coupling member 32 is fixed to the suspension member 19 by means of a bolt 34.

[0021] In the vicinity of the fit hole 31 on the rear side of the vehicle, there is formed a U-shaped notch 35 operating as a mechanism for promoting the movement of the front wheel.

[0022] On the other hand, as shown in Figs. 7A and 7B, the rear arm 21b is provided with a joint ball 36 projecting toward the rear side of the vehicle. The joint ball 36 is fitted into a receiving part 38 formed in a rear coupling member 37 different from the suspension member 19. Similarly to the front coupling member 32, the rear coupling member 37 is fixed to the suspension member 19 by means of a bolt 39.

[0023] In this way, owing to the provision of the notch 35 in the suspension member 19, it is established that an attachment strength about the front arm 21a becomes smaller than that about the rear arm 21b.

[0024] Meanwhile, as shown in Fig. 1, it is noted that the front wheel 22 is accommodated in a wheel house 10a on each side of the vehicle. Then, the front wheel 22 is also arranged between the outer end 12a of the bumper reinforcement 12 and the outrigger 15, as shown in Fig. 2.

[0025] The bumper reinforcement 12 is provided, on
its rear face of each outer end 12a opposing the front wheel 22, with a guide member 40 as a guide mechanism.

[0026] As shown in Fig. 2, the guide member 40 is formed to be a substantial triangle in plan view, having an attachment face (as the triangle base) for the bumper reinforcement 12 and an outside slanted face forming an abutment face 40a against the front wheel 22.

[0027] The above-mentioned front body structure of this embodiment operates as follows. As shown in Fig. 2, if a vehicle K has a collision with the right-and-front side of the vehicle body 10, then a collision load F1 is exerted to the outer end 12a of the bumper reinforcement 12 in the width direction of the vehicle, so that the outer end 12a is deformed forward as shown in Fig. 8.

[0028] Consequently, the abutment face 40a of the guide member 40 interferes with the front end of the front wheel 22, so that the front wheel 22 is outward steered from the condition of Fig. 2 to the condition of Fig. 8 due to the outward inclination of the abutment face 40a.

[0029] Then, the collision load F1 exerted to the front wheel 22 is transmitted to the suspension member 19 through the suspension arm 21, in the form of a dispersion load Fa in the width direction of the vehicle. Also, the same load F1 is transmitted to the extension side member 13 through the suspension arm 21, in the form of a dispersion load Fb in the axial direction of the member 13.

[0030] As to the collision load F applied on the front wheel 22 steered outward (steering angle: θ), as shown in Fig. 9, the attachment point of the front wheel 22 to the suspension arm 21 is subjected to a lateral force (component) Fx = Fsin θ and a fore-and-aft force (component) Fy = Fcos θ.

[0031] Therefore, due to the lateral force Fx, an outward transverse force Fa (see Fig. 9) is applied on the front arm 21a of the suspension arm 21. It is noted that the magnitude of the transverse force Fa amounts to dozens of gravity (G) at the vehicle collision while the same magnitude is only several gravity (G) in the normal traveling condition. Consequently, as shown in Fig. 10, the suspension member’s portion around the fit hole 31 for engagement with the cylindrical part 30 of the front arm 21a is deformed toward the notch 35, so that the front arm 21a is finally detached from the suspension member 19 due to the disengagement of the cylindrical parts 30, 30a from the fit holes 31, 31a.

[0032] Acting on the rear arm 21b, a moment M produced by the fore-and-aft force Fy allows the rear arm 21b to be deformed backward and the front wheel 22 to move back positively. Finally, the front wheel 22 interferes with the vicinity of the side sill 14 of the outrigger 15.

[0033] In addition to the above collision load F1, subsequently, when another collision load F2 (see Fig. 11) is further applied on the outer end 12a of the bumper reinforcement 12 with a further progress of collision behavior, the front wheel 22 is subjected to a great load in comparison with the load at the initial stage of collision.

[0034] Then, most of the load on the front wheel 22 is transmitted to the side sill 14. Thus, both of loads fa’ and fb’, which are respectively transmitted to the suspension member 19 and the extension side member 13 after the front wheel 22 has interfered with the outrigger 15, are respectively small in comparison with a load fc transmitted to the side sill 14 (i.e. fc > fa’, fb’). In other words, according to the embodiment, it is possible to increase a partial charge of collision load on the side sill 14.

[0035] When the partial charge of collision load on the side sill 14 is increased in this way, it is possible to disperse a load via the front wheel 22 to the other framework members effectively because the rigidity of the side sill 14 is higher than that of any other framework member, whereby the deformation of the vehicle cabin can be restricted effectively.

[0036] Additionally, according to the embodiment, there are established, during the regression of the front wheel 22, a first load-transmission route R1 where a load is transmitted from the suspension arm 21 to the side member 11 and extension side member 13 through the suspension member 19 and also a second load-transmission route R2 where a load is transmitted from the front wheel 22 to the side sill 14 through the outrigger 15.

[0037] Then, when the collision loads F1, F2 act on the wheel 22, the notch 35 allows the front wheel 22 to be moved back in early stages of the collision. Consequently, there can be established the first load-transmission route R1 and the second load-transmission route R2 simultaneously. That is, since the above collision loads F1, F2 are respectively transmitted to various framework members, for example, the side member 11, the extension side member 13, the side sill 14, etc. through the first load-transmission route R1 and the second load-transmission route R2 in early stages of the collision, it becomes possible for the whole vehicle body to disperse the collision loads effectively.

[0038] According to the embodiment, since the bumper reinforcement 12 is provided, on each outer end 12a, with the guide member 40 that controls a timing of starting the backward movement of the front wheel 22 and also an inclination of the front wheel 22 in the steered direction when the load F1 is inputted to the wheel 22, it is possible to control the load-transmission route through which the collision load F1 is transmitted to the vehicle framework members, for example, the side member 11, the extension side member 13, the side sill 14, etc. precisely, whereby the dispersion efficiency about the collision load transmitted from the front wheel 22 to the vehicle framework members can be enhanced.

[2nd. Embodiment]

[0039] Figs. 12 to 14 show the second embodiment of the present invention. In the second embodiment, elements similar to those of the first embodiment are indicated with the same reference numerals respectively and their overlapping descriptions are eliminated.

[0040] According to the second embodiment, the front-
wheel movement promoting mechanism comprises an easy-deformable part 50 formed in the suspension arm 21, as shown in Fig. 12.

[0041] In detail, as shown in Fig. 13, the easy-deformable part 50 includes a V-shaped notch 50a formed in a front edge of the front arm 21a. Owing to this configuration of the easy-deformable part 50, when the collision load \( F_1 \) is exerted to the front wheel 22, a stress concentrates in the notch 50a, so that the front arm 21a is deformed backward, as shown in Fig. 14.

[0042] Similarly to the first embodiment of the invention, when the collision load \( F_1 \) is exerted to the front wheel 22, the afore-mentioned lateral force \( F_x (= F \sin \theta) \) acts on the front arm 21a, so that the notch 50a begins its deformation. Since the deformation of the notch 50a causes the rear arm 21b to be deformed, the front wheel 22 moves back. In this way, the rear part of the front wheel 22 interferes with the outrigger 15 (part) in the vicinity of the side sill 14.

[0043] In addition to the above collision load \( F_1 \), subsequently, the collision load \( F_2 \) (see Fig. 12) is further applied on the outer end 12a of the bumper reinforcement 12 with a further progress of collision behavior. Nevertheless, since the load through the front wheel 22 is mainly transmitted to the side sill 14 through the second load-transmission route \( R_2 \), both of loads \( f_a' \) and \( f_b' \), which are respectively transmitted to the suspension member 19 and the extension side member 13 through the first load-transmission route \( R_1 \), are respectively small in comparison with a load \( f_c \) transmitted to the side sill 14. In other words, according to the second embodiment, the load-dispersion can be attained corresponding to the strength of the body framework members, for example, the side member 11, the extension side member 13, the side sill 14, etc.

[0044] Furthermore, according to the embodiment, it is possible to lighten the burden of loads imposed on the first load-transmission route \( R_1 \) and the second load-transmission route \( R_2 \) since the suspension arm 21 itself is capable of partial absorption of load exerted to the front wheel 22 owing to the provision of the notch 50a.

[0045] In the modification of the above-mentioned embodiment, the notch 50a may be replaced by other means where a stress is easy to concentrate, for example, a thin-walled part provided in the suspension arm 21.

[3rd. Embodiment]

[0046] Figs. 15 to 18 show the third embodiment of the present invention. Also in the third embodiment, elements similar to those of the first embodiment are indicated with the same reference numerals respectively and their overlapping descriptions are eliminated.

[0047] According to the third embodiment, the front-wheel movement promoting mechanism comprises a rear-part deforming device 60 formed in the suspension member 19 as the arm support member of the invention, as shown in Fig. 15 and Fig. 16.

[0048] The rear-part deforming device 60 is formed in the rear coupling member 37 for attaching the rear arm 21b of the suspension arm 21 to the suspension member 19. In detail, the rear-part deforming device 60 includes V-shaped notches 60a, 60b formed in front and rear edges of the rear coupling member 37 in the vicinity of the receiving part 38 for engagement with the joint ball 36.

[0049] Additionally, a fitting strength with which the front arm 21a of the suspension arm 21 is attached to the suspension member 19 is established larger than another fitting strength with which the rear arm 21b of the suspension arm 21 is attached to the suspension member 19.

[0050] It is noted that the magnitude of the load \( F_1 \) applied on the front wheel 22 amounts to dozens of gravity (G) at the vehicle collision while the same magnitude is only several gravity (G) in the normal traveling condition. Therefore, as shown in Figs. 17 and 18, the fore-and-aft force \( F_y (= F \cos \theta) \) (see Fig. 9) causes the rear coupling member 37 to be broken through the notches 60a, 60b.

[0051] Consequently, as shown in Fig. 15, the suspension arm 21 is greatly bent while concentrating a stress on the front arm 21a, so that the front wheel 22 is shifted backward to interfere with the outrigger 15 (part) in vicinity of the side sill 14.

[0052] Thus, according to the third embodiment, it is possible to disperse a load transmitted through the front wheel 22 with a relationship of:

\[
f_c \gg f_a' > f_b'
\]

[0053] Particularly, when the strength of the side member 11 is larger than that of the extension side member 13, the effect of the third embodiment is enhanced furthermore.

[0054] According to the embodiment, it is possible to lighten the burden of loads imposed on the first load-transmission route \( R_1 \) and the second load-transmission route \( R_2 \) since the suspension arm 19 is capable of partial absorption of a load exerted to the front wheel 22 owing to the deformable function of the rear-part deforming device 60 as the front-wheel movement promoting mechanism. In addition, it is possible to improve a load-dispersion efficiency without changing the load-transmission ratio of the front arm 21a of the suspension arm 21 to the rear arm 21b.

[4th. Embodiment]

[0055] Fig. 19 shows the fourth embodiment of the present invention. In the fourth embodiment, elements similar to those of the first embodiment are indicated with the same reference numerals respectively and their overlapping descriptions are eliminated.

[0056] According to the fourth embodiment of the in-
vention, the suspension arm 21 is provided, at its supporting end 21c for supporting the front wheel 22, with a mid-arm 70 as the front-wheel movement promoting mechanism of the invention. Further, as the guide mechanism of the invention, there is provided the guide member 40 which is formed so as to steer the front wheel 22 into the fore-and-aft direction of the vehicle.

[0057] By adopting an appropriate measure, for example, reducing a ratio of its width to the length, the mid-arm 70 is constructed so as to be deformable by an input of the collision load F1. While, the guide member 40 is provided, on its rear end, with a recess 40b for receiving the front wheel 22. The recess 40b has a bottom face perpendicular to the fore-and-aft direction of the vehicle.

[0058] Therefore, since the input of the collision load F1 allows the front wheel 22 to move substantially backward, it becomes possible to control the load-dispersion ratio of the above first load-transmission route R1 to the second load-transmission route R2 more certainly.

[0059] As a result, without changing the load-sharing ratio of the load fa acting on the side member 11 through the suspension arm 21 to the load fb acting on the extension side member 13 greatly, the load-dispersion efficiency to the framework members can be enhanced furthermore.

[5th. Embodiment]

[0060] Fig. 20 shows the fifth embodiment of the present invention. In the fifth embodiment, elements similar to those of the first embodiment are indicated with the same reference numerals respectively and their overlapping descriptions are eliminated.

[0061] According to this embodiment, there is provided a reinforcement 80 which connects the outrigger 15, the side sill 14 and the extension side member 13 with each other, as shown in Fig. 20.

[0062] Therefore, owing to the provision of the reinforcement 80, it is possible to improve a load-working point with which the front wheel 22 does interfere, in other words, the strength of the outrigger 15. Additionally, it is possible to transmit the collision loads F1, F2 to the side sill 14 and the extension side member 13 widely, whereby the dispersion-area of the loads (fc, fb') can be enlarged.

[6th. Embodiment]

[0063] Fig. 21 shows the sixth embodiment of the invention. Also in this embodiment, elements similar to those of the first embodiment are indicated with the same reference numerals respectively and their overlapping descriptions are eliminated.

[0064] In the sixth embodiment of the invention, the front body structure is provided, on the front side of the outrigger 15 opposing the front wheel 22, with a receiver (receiving member) 90 which interferes with the front wheel 22 moved backward by the above collision loads F1 and F2 thereby receiving the front wheel 22 while being deformed.

[0065] That is, owing to the deformation of the receiver 90 at the interference with the front wheel 22 moving back, the collision energy can be absorbed by the receiver 90 partially. Additionally, by adjusting a projecting amount of the receiver 90, it is possible to control a timing when the front wheel 22 moving back interferes with the outrigger 15.

[0066] Noted that although the reinforcement 80 and the receiver 90 of the above-mentioned embodiments are embodied in the front body structure of the first embodiment, these elements are applicable to the front body structure of the second embodiment, the third embodiment or the fourth embodiment, of course.

[0067] Besides these embodiments, various changes and modifications may be made to the present invention without departing from the scope of the invention. For example, although the arm support member of the invention is illustrated by the suspension member 19, it may be replaced by a sub-frame on condition that a power unit is mounted on the sub-frame.

Claims

1. A front body structure for a vehicle, comprising:

   a pair of side members (11) arranged on both sides of a front compartment (F-C) of the vehicle to extend in a fore-and-aft direction of the vehicle;
   a front end member (12) connected to respective front ends of the side members (11) so as to be laid across the side members (11);
   an extension side member (13) arranged behind each of the side members (11) in succession; a side sill (14) arranged outside the extension side member (13) in a width direction of the vehicle so as to extend in substantially parallel with the extension side member (13); an outrigger (15) connected to both a front end of the extension side member (13) and a front end of the side sill (14); a suspension arm (21) attached to each of the side members (11) through an arm support member (19); and a front wheel (22) supported by the suspension arm (21) and disposed between the outrigger (15) and one outer end of the front end member (12) in the width direction of the vehicle;

characterized by

a from-wheel movement promoting mechanism (35,50,60,70) arranged between the front wheel (22) and the arm support member (19), for promoting a backward movement of the front wheel (22), the backward movement being caused by a collision load acting on the front wheel (22) while being ac-
The front body structure of any one of claims 1, further comprising a receiving member (90) arranged on a front side of the outrigger (15) opposing the front wheel (22) to interfere with the front wheel moving backward due to the collision load, thereby receiving the front wheel (22) while being deformed.

**Patentansprüche**

1. Vorderer Karosserieaufbau für ein Fahrzeug, umfassend ein Paar von Seitenelementen (11), die auf beiden Seiten einer vorderen Zelle (F.C) des Fahrzeugs angeordnet sind, um sich in einer Vorne-und-Hinten-Richtung des Fahrzeugs zu erstrecken; ein Vorderendelement (12), das mit den jeweiligen vorderen Enden der Seitenelemente (11) verbunden ist, wobei es quer über die Seitenelemente (11) gelegt ist; ein Verlängerungsseitenelement (13), das in Verlängerung hinter jedem der Seitenelemente (11) angeordnet ist; einen Seiten schweller (14), der in einer Breitenrichtung des Fahrzeugs außerhalb des Verlängerungseitenelementes (13) so angeordnet ist, dass er sich im wesentlichen parallel zu dem Verlängerungsseitenelement (13) erstreckt; einen Auslegerträger (15), der mit einem vorderen Ende des Verlängerungsseitenelementes (13) und einem vorderen Ende des Seitenschwellers (14) verbunden ist; einen Aufhängungsarm (21), der über ein Armabstützelement (19) an jedem der Seitenelemente (11) befestigt ist; und ein Vorderrad (22), das durch den Aufhängungsarm (21) abgestützt wird und in der Breitenrichtung des Fahrzeugs zwischen dem Auslegerträger (15) und einem äußeren Ende des Vorderendelementes (12) angeordnet ist; gekennzeichnet durch eine Vorderrad-Bewegsbegünstigungseinrichtung (35, 50, 60, 70), die zwischen dem Vorderrad (22) und dem Armabstützelement (19) angeordnet ist, um eine nach hinten gerichtete Bewegung des Vorderrads (22) zu begünstigen, wobei die nach hinten gerichtete Bewegung durch eine Kollisionslast verursacht wird, die auf das Vorderrad (22) einwirkt, wobei sie von einer nach hinten gerichteten Verformung des äußeren Endes des Vorderendelementes (12) begleitet wird; und eine Leiteinrichtung (40), die zwischen dem Vorderrad (22) und dem äußeren Ende des Vorderendelementes (12) angeordnet ist, um ein Timing für den Beginn der nach hinten gerichteten Bewegung des Vorderrads (22) zu steuern, wenn die Kollisionslast auf das Vorderrad (22) ausgeübt wird, und ferner eine Schrägstellung des Vorderrads (22) in der ge-
lenkten Richtung zu steuern, wenn die Kollisionslast auf das Vorderrad (22) ausgeübt wird.

2. Vorderer Karosserieaufbau gemäß Anspruch 1, wobei die Vorderrad-Bewegungsbegünstigungseinrichtung (35, 50, 60, 70) in einem Anbringungsteil des Aufhängungsarms (21) zum Anbringen des Aufhängungsarms (21) an der Fahrzeugkarosserie oder dem Armabstützetelement ausgebildet ist.

3. Vorderer Karosserieaufbau gemäß Anspruch 1, wobei die Vorderrad-Bewegungsbegünstigungseinrichtung (35, 50, 60, 70) in dem Aufhängungsarm (21) ausgebildet ist.

4. Vorderer Karosserieaufbau gemäß Anspruch 1, wobei die Vorderrad-Bewegungsbegünstigungseinrichtung (35, 50, 60, 70) in dem Armabstützetelement ausgebildet ist.

5. Vorderer Karosserieaufbau gemäß Anspruch 1, wobei die Leiteinrichtung (40) dafür ausgelegt ist, das Vorderrad (22) in die Vorne- und Hinten-Richtung des Fahrzeugs zu lenken, wenn die Kollisionslast auf das Vorderrad (22) aufgebracht wird.

6. Vorderer Karosserieaufbau gemäß Anspruch 5, wobei die Leiteinrichtung (40) ein Leitelement (40) aufweist, das an einer hinteren Fläche des Vorderendelements (12) angebracht ist, wobei das Leitelement eine Aussparung aufweist, die mit einer unteren Fläche senkrecht zu der Vorne-und-Hinten-Richtung des Fahrzeugs ausgestattet ist, um das Vorderrad (22) aufzunehmen.

7. Vorderer Karosserieaufbau gemäß Anspruch 1, wobei die Vorderrad-Bewegungsbegünstigungseinrichtung (35, 50, 60, 70) dafür ausgelegt ist, zu ermöglichen, dass das Vorderrad (22) sich aufgrund der Kollisionslast nach hinten bewegt, um sich an das vordere Ende des Seitenschwellers (14) anzulegen.

8. Vorderer Karosserieaufbau gemäß Anspruch 1, wobei die Vorderrad-Bewegungsbegünstigungseinrichtung (35, 50, 60, 70) dafür ausgelegt ist, zu ermöglichen, dass das Vorderrad (22) sich aufgrund der Kollisionslast nach hinten bewegt, um sich an die Umgebung eines Verbindungsteils des Auslegerträgers (15) mit dem Seitenschweller (14) anzulegen.

9. Vorderer Karosserieaufbau gemäß Anspruch 1, ferners ein Verstärkungselement (80) umfassend, das den Auslegerträger (15), den Seitenschweller (14) und das Verlängerungsseitenelement (13) miteinander verbindet.

10. Vorderer Karosserieaufbau gemäß Anspruch 1, ferners ein Aufnahmeelement (90) umfassend, das an einer vorderen Seite des Auslegerträgers (15), die dem Vorderrad (22) gegenüberliegt, angeordnet ist, um mit dem aufgrund der Kollisionslast sich nach hinten bewegenden Vorderrad zusammen zu treffen, wodurch es das Vorderrad (22) aufnimmt während es verformt wird.

Revendications

1. Structure avant de carrosserie pour un véhicule, comprenant :

- une paire d’éléments latéraux (11) agencée de part et d’autre d’un compartiment avant (F - C) du véhicule de façon à s’étendre selon une direction d’avant en arrière du véhicule ;
- un élément d’extrémité avant (12) raccordé aux respectives extrémités avant respectives des éléments latéraux (11) de façon à s’étendre transversalement par rapport aux éléments latéraux (11) ;
- un élément d’extension (13) agencé dans le prolongement arrière de chacun des éléments latéraux (11) ;
- un bas de caisse (14) agencé à l’extérieur de l’élément d’extension selon la direction suivant largeur (13), de façon à ce qu’il s’étende de manière sensiblement parallèle à l’élément d’extension (13) ;
- une patte transversale (15) raccordée à la fois à une extrémité avant de l’élément d’extension (13) et à une extrémité avant du bas de caisse (14) ;
- un bras de suspension (21) raccordé à chacun des éléments latéraux par l’intermédiaire d’un élément de support de bras (19) ; et
- une roue avant (22) supportée par le bras de suspension (21) et disposée entre la patte transversale (15) et une extrémité extérieure de l’élément d’extension avant (12) selon la direction suivant la largeur du véhicule ;

caractérisée par :

- un mécanisme de favorisation de mouvement de roue avant (35, 50, 60, 70) agencé entre la roue avant (22) et l’élément de support de bras (19) de façon à favoriser un mouvement en arrière de la roue avant (22), le mouvement en arrière étant occasionné par la transmission d’une charge sur la roue avant (22) lors d’une collision tout en s’ac-
compagnant d’une déformation vers l’arrière de l’extrémité extérieure de l’élément d’extrémité avant (12) ; et un mécanisme de guidage (40) agencé entre la roue avant (22) et l’extrémité extérieure de l’élément d’extrémité avant (12) dans le but de contrôler un moment de début du mouvement en arrière de la roue avant (22) quand la charge de la collision s’exerce sur la roue avant (22), et dans le but de contrôler par ailleurs une inclinaison de la roue avant (22) dans la direction de conduite quand la charge de la collision s’exerce sur la roue avant (22).

2. Structure avant de carrosserie selon la revendication 1, dans laquelle le mécanisme de favorisation de mouvement de roue avant (35, 50, 60, 70) est formé dans une partie de fixation du bras de suspension (21) pour fixer le bras de suspension (21), soit à la carrosserie du véhicule, soit à l’élément de support de bras (19).

3. Structure avant de carrosserie selon la revendication 1, dans laquelle le mécanisme de favorisation de mouvement de roue avant (35, 50, 60, 70) est formé dans le bras de suspension (21).

4. Structure avant de carrosserie selon la revendication 1, dans laquelle le mécanisme de favorisation de mouvement de roue avant (35, 50, 60, 70) est formé dans l’élément de support de bras (19).

5. Structure avant de carrosserie selon la revendication 1, dans laquelle le mécanisme de favorisation de mouvement de roue avant (35, 50, 60, 70) est formé dans une extrémité de support du bras de suspension (21) pour supporter la roue avant (22), et le mécanisme de guidage (40) est adapté de façon à diriger la roue avant (22) selon la direction d’avant en arrière du véhicule quand la charge de collision s’exerce sur la roue avant (22).

6. Structure avant de carrosserie selon la revendication 5, dans laquelle le mécanisme de guidage (40) comporte un élément de guidage (40) qui est fixé à une face arrière de l’élément d’extrémité avant (12), l’élément de guidage comprenant un renforcement pourvu d’une face inférieure qui est perpendiculaire à la direction d’avant en arrière du véhicule, pour recevoir la roue avant (22).

7. Structure avant de carrosserie selon l’une quelconque des revendications 1, dans laquelle le mécanisme de favorisation de mouvement de roue avant (35, 50, 60, 70) est adapté de façon à permettre à la roue avant (22) de se déplacer vers l’arrière en raison de la charge de la collision de façon à venir en butée contre l’extrémité avant du bas de caisse (14).

8. Structure avant de carrosserie selon l’une quelconque des revendications 1, dans laquelle le mécanisme de favorisation de mouvement de roue avant (35, 50, 60, 70) est adapté de façon à permettre à la roue avant (22) de se déplacer vers l’arrière en raison de la charge de la collision de façon à venir en butée à proximité d’une partie de raccordement de la patte transversale (15) avec le bas de caisse (14).

9. Structure avant de carrosserie selon l’une quelconque des revendications 1, comprenant par ailleurs un élément de renfort (80) qui relie la patte transversale (15), le bas de caisse (14) et l’élément d’extension (13) les uns aux autres.

10. Structure avant de carrosserie selon l’une quelconque des revendications 1, comprenant par ailleurs un élément de réception (90) agencé sur un côté avant de la patte transversale (15) opposé à la roue avant (22) de façon à interférer avec le mouvement vers l’arrière de la roue avant en raison de la charge de la collision, recevant par là même la roue avant (22) lors de sa déformation.
FIG. 6
FIG. 15
REFERENCES CITED IN THE DESCRIPTION

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