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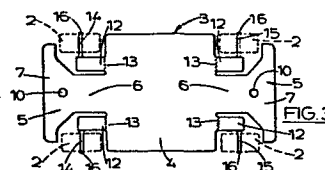
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(54) **Toy vehicles.**

(57) A toy vehicle comprises a body and body-supporting wheels (2) mounted for rotation on stub axles (14, 15). The vehicle includes at least one wheel mounting made as a unitary moulding of a plastics material. The wheel mounting comprises at least one of those stub axles and also an axle support. The axle support may have a fixed part (4) and a movable part (12) interconnected by a resilient hinge (13). When the body is depressed the hinges yield resiliently until bump stops engage the wheels. Four wheels may be mounted on a single unitary chassis plate (3). To permit variations in spacing there may be two chassis plates each with two stub axles.



TOY VEHICLES

This invention relates to toy vehicles, and is particularly, though not exclusively, concerned with toy road vehicles, such as motor cars, commercial vehicles and trailers, and with military vehicles, such as tanks. The term toy vehicles is used in this description in a broad sense and includes model vehicles.

Many existing toy vehicles are of the kind comprising a body with body-supporting wheels mounted on steel axle pins. It is usual for an integral head to be formed at each end of each axle pin and for the wheels of the vehicle to be made from plastics materials and to be snapped over the heads of the axle pins during assembly and to be retained on the axle pins by those heads.

A disadvantage of that kind of construction is that the cost of the steel axle pins is relatively high. Another disadvantage is that the arrangements for mounting the axle pins in position are often relatively complicated.

An aim of the present invention is to provide an improved construction by means of which those disadvantages can be overcome or at least reduced.

From one aspect the present invention consists in a toy vehicle comprising a body and body-supporting wheels mounted for rotation on stub axles, characterised in that the vehicle includes at least one wheel mounting which is formed as a unitary moulding of a plastics material and comprises an axle support and at least one of said stub axles.

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It is to be understood that the term body-supporting wheel is used herein to denote a wheel which in use supports part of the weight of the body of the vehicle; for example, it may be a ground-engaging wheel, with or without a tyre, or it may be a wheel around which there passes an endless ground-engaging track.

The axle support of the wheel mounting may be formed integrally with the body of the vehicle. In that case there may be no clear demarcation between the body and the wheel mounting, one merging into the other. In a preferred form of toy vehicle, however, the wheel mounting is formed separately from the vehicle body and is attached to it subsequently.

Most toy vehicles have at least four body-supporting wheels, a different one of which is disposed at one adjacent to each of the four corners of a rectangle, the wheels being rotatable about axes that are at least substantially parallel. Preferably each one of those four wheels is mounted on a stub axle constituting part of a wheel mounting which is formed as a unitary moulding of a plastics material and which also includes an axle support. There may be one or more additional body supporting wheels on some or all of the stub axles. If, in use, a toy vehicle embodying the present invention is subjected to a downward force, there is an inherent tendency for the stub axle of the wheel mounting or of each wheel mounting to tilt from its normal horizontal or substantially horizontal position. The wheel or wheels likewise tend to tilt. This tilting movement is not only uncharacteristic of the vehicles which the toy resembles, but also liable to damage the vehicle. In order to reduce this tendency, the axle support or each axle support is preferably such as to yield resiliently when a downward force is applied

to the body of the vehicle, the body moving downwards relative to the stub axle or stub axles. The stub axle or each stub axle preferably does not tilt or tilts less than would otherwise be the case when a downward force is applied to the body of the vehicle. If the axle supports are incapable of yielding in this way there is a danger that a downward force applied to the body will cause the axles to tilt in a manner that is unrealistic and that may cause them to be damaged. In a preferred arrangement the axle support or each support comprises a movable portion, from which the associated stub axle projects and which moves relative to the body when a downward force is applied to the body, a fixed portion, which remains substantially fixed relative to the body when a downward force is applied to the body, and a hinge portion integrally interconnecting said movable and fixed portions. The hinge portion preferably comprises a portion of reduced thickness between said movable and fixed portions. The hinge portion is preferably parallel to or substantially parallel to the axis of the associated stub axle. The arrangement is preferably such that when a downward force is applied to the body, causing downward movement of the body relative to the stub axle or stub axles, substantially no tilting of the stub axle or stub axles occurs. This gives the vehicle a particularly realistic appearance as well as tending to avoid damage to the stub axle or stub axles.

The arrangement is preferably such that when a downward force is applied to the body of the vehicle, the resultant downward movement of the body is limited by the engagement between parts of the body and the body-supporting wheels. In consequence, if an excessive downward force is applied to the body of the vehicle, it is transmitted to the ground or other surface beneath the vehicle by way of the body-supporting wheels; thus

the only force applied to the wheel mountings is that required to deform them sufficiently for the body to engage the wheels. The body may include projections constituting bump stops for engaging the body-supporting wheels.

It is envisaged that a vehicle embodying the present invention would usually include at least two if not four stub axles supported in the manner characteristic of the invention. It would be possible for each such stub axle to form part of a separately formed wheel mounting. In a preferred arrangement, however, two or more stub axles and their associated axle supports are formed as a unitary sub-unit which is incorporated in the toy vehicle. The sub-unit may comprise a unitary moulding of a plastics material incorporating four wheel mountings and four stub axles, two of which project outwards in opposite directions, at least substantially along one axis, and two of which project outwards in opposite directions, at least substantially along a second axis parallel with said one axis and spaced from it. In another convenient construction there is at least one sub-unit formed as a unitary moulding of a plastics material and comprising two such wheel mountings and two associated stub axles projecting therefrom, the axles being spaced apart lengthwise and being at least substantially co-axial, at least one body-supporting wheel being rotatably mounted on each of said two stub axles. Where four or more stub axles are required there may be a first such sub-unit and a second such sub-unit so disposed that the stub axles of the first sub-unit are at least substantially parallel to and are spaced from the stub axles of the second sub-unit. In addition to the first and second sub-units there may be further sub-units each of which affords a further pair of stub axles. An advantage of the use of

these sub-units is that similar sub-units can be used in the manufacture of different designs of toy vehicles, the sub-units being spaced at different distances apart lengthwise of the vehicle as required by the designs.

Where a sub-unit includes two co-axial stub axles projecting in opposite directions, the moulding may include an axle-like portion between the stub axles so that the stub axles appear to be the end parts of a single axle.

In yet another construction there is at least one sub-unit formed as a unitary moulding of a plastics material and comprising a first such wheel mounting and a second such wheel mounting, the stub axles of said first and second wheel mountings being laterally spaced apart and at least substantially parallel with each other, and at least one body-supporting wheel being rotatably mounted on each of those two stub axles. There would usually be two such sub-units, one affording stub axles on one side of the vehicle and the other affording stub axles on the other side of the vehicle. Each of the sub-units could include more than two stub axles if desired. The stub axles on each sub-unit would preferably be aligned with corresponding stub axles on the other sub-unit. An advantage of the use of these sub-units is that similar pairs of such sub-units can be used in the manufacture of different designs of toy vehicles, the sub-units being spaced at different distances apart widthwise of the vehicle as may be required by the different designs.

The stub axle or each stub axle carries at least one body-supporting wheel. The wheel or wheels can be retained on the stub axle in any suitable manner. Preferably retaining means is formed integrally with the

stub axle. The retaining means may be in the form of a head, preferably disposed at the free end of the axle. The retaining means may be formed in the initial moulding operation, in which case the wheel or wheels may be snapped over the retaining means onto the stub axle. Alternatively the retaining means may be formed or completed after the wheel or each wheel has been mounted on the stub axle. The retaining means may for example be formed by a heading, riveting or upsetting operation which may be carried out either cold or with the application of heat. In that case, the stub axle on each stub is preferably moulded in a tubular cavity in an associated-mould part and has a head formed on it subsequently to retain a body-supporting wheel or body-supporting wheels on the stub axle. With this arrangement the stub axle can be formed without the possibility of there being any longitudinally extending mould lines on the stub axle such as might adversely affect the rotation of the wheel or wheels. In alternative arrangements the retaining means is not formed integrally with the stub axle; it may, for example, comprise a spring clip attached to the stub axle.

Embodiments of the invention will now be described in more detail, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a side view of a toy car embodying the present invention,

Figure 2 is a view similar to Figure 1 but with parts broken away to reveal the interior and with the body of the car pressed down to its lowermost position,

Figure 3 is a plan view of a sub-unit constituting part of the toy car shown in Figures 1 and 2,

Figures 4, 5 and 6 are similar to Figure 3 but illustrate modified sub-units,

Figure 7 is a plan view, to a larger scale, of part of a wheel mounting, for incorporation in a toy vehicle embodying the present invention, and illustrates one form of wheel retaining means,

Figures 8 and 9 are similar to Figure 7 but illustrate alternative forms of wheel retaining means.

A typical toy motor car embodying the invention is illustrated in Figures 1 to 3. It has a body 1 supported on four wheels 2 and is between about 80 mm and 90 mm in length. The body 1 comprises a hollow shell formed as a metal die-casting and suitably painted. The underside of the body is closed by a substantially planar chassis plate 3 to which the body is secured. The chassis plate is formed as a unitary moulding of a plastics material. A central part 4 of the chassis plate is of rectangular shape. In the completed toy the two longer sides of that central part 4 lie immediately beneath parts of the body resembling the sides of the vehicle. Three integral projections project forwards from the front edge of the rectangular central part 4 of the chassis plate, and three similar integral projections project rearwards from the rear edge of the rectangular central part. The projections lie in the same plane as the rectangular central part. The central one 5 of the three projections, both at the front and the rear of the central part, is approximately T-shaped, having a relatively

narrow strip or stem 6, extending away from the rectangular central part of the plate, and a transverse strip 7 at the outer end of the stem. In the completed toy the transverse strips 7 lie immediately beneath the front and rear edges of the body, and they may be formed to provide or to carry the vehicle's bumpers 8. In one method of assembly a self-tapping screw 9 is inserted upwards through a hole 10 in each of the projections 5, each of the two screws entering a downwardly opening tubular boss 11 formed as part of the body 1.

Each of the other four projections 12 constitutes part of an associated wheel mounting. Each wheel mounting consists of an axle support and a stub axle. Each axle support consists of a movable portion, which in this case is the projection 12, a fixed portion, which in this case is an adjacent portion of the central part 4 of the chassis plate, and a hinge portion 13 which is integral with the movable and fixed portions and is constituted by a narrow band of reduced thickness.

As will be seen from Figure 3, two of the stub axles, 14, project outwards in opposite directions along one axis, while the other two stub axles, 15, project outwards in opposite directions along a second axis parallel with said one axis. Each of the stub axles 14 and 15 is of cylindrical shape and is formed at its outer end with a head 16 constituting wheel-retaining means. In the assembly of the toy a preformed road wheel 2 is snapped over the head 16 of each stub axle. Each road wheel may comprise a unitary plastics moulding, or it may comprise an assembly of components, in which case it may include a plastics hub portion. The four wheels 2 are freely rotatable on the stub axles and are retained on them by the heads 16. The wheels

are mounted on the stub axles before the chassis plate is secured to the body shell.

In use, if a downward force is applied to the body shell, the chassis plate yields resiliently along the hinge portions 13. The body 1 therefore moves downwards relatively to the stub axles 14 and 15, the latter remaining substantially horizontal. The relative movement continues until the uppermost parts of the wheels 2 are engaged by bump stops 17 inside the body and formed integrally with the body. This state is illustrated in Figure 2.

The chassis plate 3 described above is conveniently formed as a unitary moulding in a simple two-part mould having no moving cores. If the mould is well-made and unworn no difficulties should arise. If the mould is poorly made or becomes worn, however, flash may be produced between the mould halves, and in particular flash may be produced along one or more of the stub axles 14 and 15. Such flash could give rise to problems and might prevent the free rotation of the wheels.

In order to avoid that problem the chassis plate may be moulded in a mould of more complex form, all of the plate 3, apart from the stub axles 14 and 15, being formed as before between two simple mould halves, but each of the stub axles 14 and 15 being moulded in a cylindrical (or slightly tapered) cavity in an associated mould part that can be withdrawn laterally. When this method of manufacture is used, it is impossible to mould heads 16 or other retaining means on the stub axles. The retaining means are therefore formed subsequently.

Figure 7 shows a portion of a wheel mounting comprising an axle support 18 and a stub axle 19 with a wheel-retaining head 20. The wheel mounting is formed as a unitary moulding of plastics material, the moulding being effected in a two-part mould. The outwardly directed face of the head 20 is tapered to assist its assembly with a wheel, but its inwardly directed face is flat so as to resist subsequent removal of the wheel.

Figure 8 is similar to Figure 7 but shows a stub axle 21, in place of the stub axle 19, which is formed in an associated mould part of substantially cylindrical shape. The axle 21 is moulded with no head as the presence of a head would prevent its withdrawal from the mould part. During assembly of the toy car a wheel 22 is placed on the stub axle 21 and a head 23 is then formed on it in a cold-riveting or upsetting operation. The head 23 retains the wheel 22 on the stub axle. In a convenient method of assembly, the wheel is slipped onto the stub axle and the head is then formed at a single work-station of an assembly machine.

Figure 9 illustrates another possible modification construction. Here there is a stub axle 24 of cylindrical shape but formed with an circumferential groove nears its outer end. A wheel 25 is slid onto the stub axle and a circlip 26 or similar spring clip is snapped into the groove to retain the wheel in place.

Figure 4 illustrates an alternative design of chassis plate 27. This is generally similar to the chassis plate 3 but differs in the following respects. There are no projections corresponding to the central projections 5; this means that the bumpers, if any, must be provided on the body. The holes 28 for retaining screws are in the central part of the plate.

Projections 29 constituting a movable portions of the wheel mountings are approximately L-shaped, unlike the rectangular projections 12, so that stub axles, 30, formed integrally with them, project beyond the adjacent edges of the central portion of the plate.

A range of different toy vehicles may be produced by attaching bodies of different shapes and colourings to chassis plates of a common form. Nevertheless, the use of a single design of chassis plate does afford some restriction in that the spacing between the stub axles, and therefore, the relative positions of the wheels, remains fixed. In order to overcome that limitation it may be preferred to substitute two or more sub-units for the single chassis plate 3 or 27 described above.

Figure 5 shows two sub-units 31. Each is formed as a unitary moulding of a plastics material and comprises a rectangular central part 32, with holes 33 for securing screws formed in it, and a pair of projections 34, each of which is connected to the central part by a hinge portion 35, similar to the hinge portions 13. The projections 34 constitute the movable parts of wheel mountings and each carries an associated stub axle 36 which is integrally moulded with it. The two stub axles 36 of each sub-unit are laterally spaced apart and are parallel with each other.

The sub-units can be attached to a toy vehicle body at any desired spacing so as to enable a wide range of designs to be produced.

If desired the two sub-units 31 can be disposed one on either side of a central plate (not shown) of which the end parts resemble the central projections 5 of the chassis plate 3 shown in Figure 3.

In an alternative construction, illustrated in Figure 6, there are two sub-units 37. Each is formed as a unitary moulding of a plastics material and comprises a rectangular central part 38 with holes 39 for securing screws formed in it. A pair of projections 40 project from the central part 38 and are connected to the central part by hinge portions 41 similar to the hinge portions 13. The projections 40 constitute the movable parts of wheel mountings, the fixed parts of which are constituted by neighbouring portions of the central part 38 of the sub-unit. The two projections 40 are interconnected by an integral strap 42 and each projection carries an associated stub axle 43. The stub axle 43 are spaced apart lengthwise and are co-axial.

The use of two sub-units 37 enables the spacing between the axis of the front stub axles and the axis of the rear stub axles to be varied as between one toy vehicle and another, the spacing between the plates being varied appropriately.

Numerous other variations may of course be made without departing from the scope of the present invention.

Wheel mountings embodying the present invention may be made of any suitable plastics materials such as nylon, polypropylene or rigid pvc.

CLAIMS

1. A toy vehicle comprising a body (1) and body-supporting wheels (2; 22; 25) mounted for rotation on stub axles (14, 15; 19; 21; 24; 30; 36; 43), characterised in that the vehicle includes at least one wheel mounting which is formed as a unitary moulding of a plastics material and comprises an axle support (3, 4, 12, 13; 18; 27, 29; 31, 32, 34, 35; 37, 40, 41) and at least one of said stub axles.

2. A toy vehicle according to claim 1 characterised in that the axle support or each axle support is such as to yield resiliently when a downward force is applied to the body of the vehicle, the body moving downwards relative to the stub axle or stub axles.

3. A toy vehicle according to claim 2 characterised in that axle support or each axle support comprises a movable portion (12; 29; 34; 40), from which the associated stub axle (14, 15; 19; 21; 24; 30; 36; 43) projects and which moves relative to the body when a downward force is applied to the body, a fixed portion (4; 32), which remains substantially fixed relative to the body when a downward force is applied to the body, and a hinge portion (13; 35; 41) integrally interconnecting said movable and fixed portions.

4. A toy vehicle according to claim 3 characterised in that the hinge portion (13; 35; 41) comprises a portion of reduced thickness between said movable and fixed portions.

5. A toy vehicle according to any one of claims 2 to 4 characterised in that the arrangement is such that when a downward force is applied to the body, causing down-

ward movement of the body relative to the stub axle or stub axles, substantially no tilting of the stub axle or stub axles occurs.

6. A toy vehicle according to any one of claims 2 to 5 characterised in that the arrangement is such that when a downward force is applied to the body (1) of the vehicle, the resultant downward movement of the body is limited by the engagement between parts (17) of the body and the body-supporting wheels.

7. A toy vehicle according to any one of the preceding claims characterised in that there is a sub-unit (3;27) formed as a unitary moulding of a plastics material and comprising four such wheel mountings and four associated stub axles (14, 15; 30), two of which (14) project outwards in opposite directions, at least substantially along one axis, and two of which (15) project outwards in opposite directions, at least substantially along a second axis parallel with said one axis and spaced from it, at least one body-supporting wheel (2) being rotatably mounted on each of said four stub axles.

8. A toy vehicle according to any one of claims 1 to 6 characterised in that there is at least one sub-unit (37) formed as a unitary moulding of a plastics material and comprising two such wheel mountings and two associated stub axles projecting therefrom, the axles being spaced apart lengthwise and being at least substantially co-axial, at least one body-supporting wheel being rotatably mounted on each of said two stub axles.

9. A toy vehicle according to claim 8 characterised in that there are a first such sub-unit and a second such sub-unit so disposed that the stub axles of the first

sub-unit are at least substantially parallel to and are spaced from the stub axles of the second sub-unit.

10. A toy vehicle according to any one of claims 1 to 6 characterised in that there is at least one sub-unit (31) formed as a unitary moulding of a plastics material and comprising a first such wheel mounting and a second such wheel mounting, the stub axles (36) of said first and second wheel mountings being laterally spaced apart and at least substantially parallel with each other, and at least one body-supporting wheel being rotatably mounted on each of those two stub axles.

11. A toy vehicle according to any one of claims 1 to 10 characterised in that the stub axle or each stub axle has a head (16; 20) moulded on it for retaining a body-supporting wheel or body-supporting wheels on the stub axle.

12. A toy vehicle according to any of claims 1 to 10 characterised in that the stub axle or each stub axle (21) is moulded in a tubular cavity in and associated mould part and has a head (23) formed on it subsequently to retain a body-supporting wheel (22) or body-supporting wheels on the stub axle.

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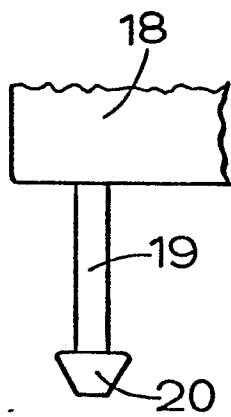


FIG. 7.

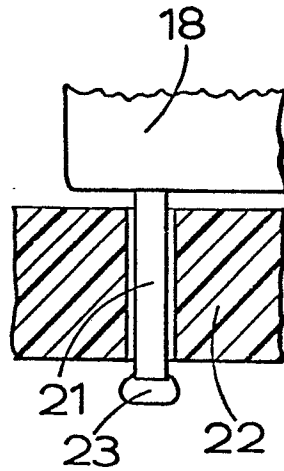


FIG. 8.

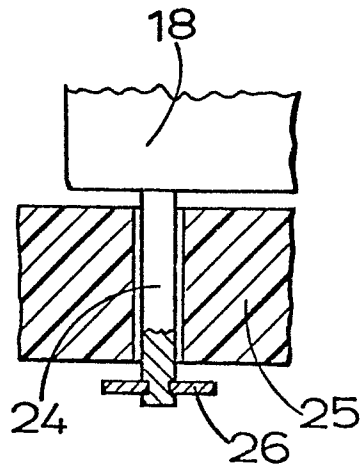


FIG. 9.

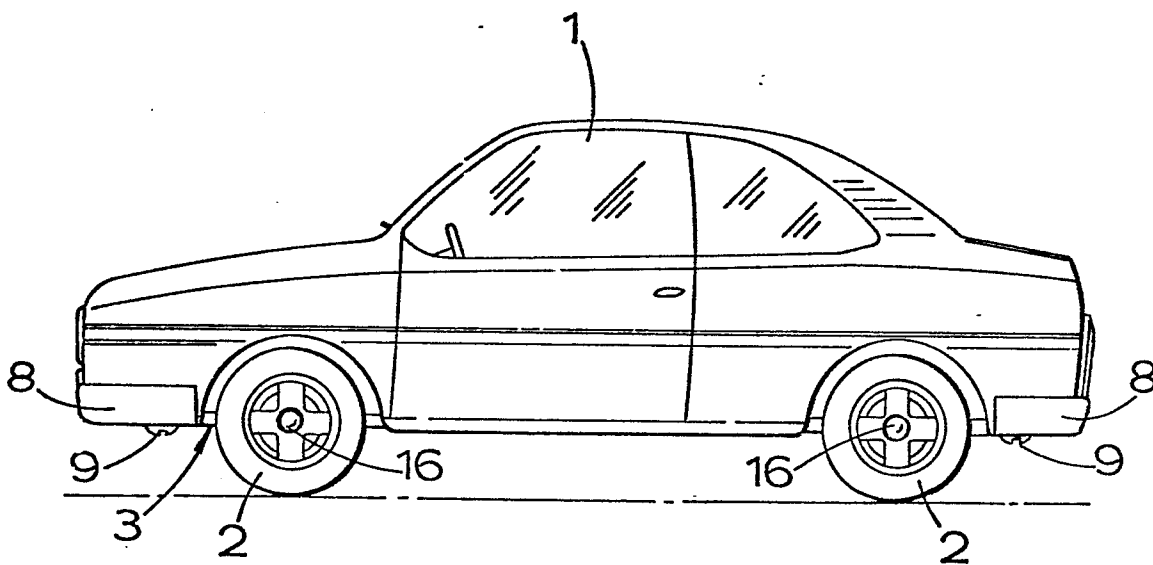


FIG. 1.

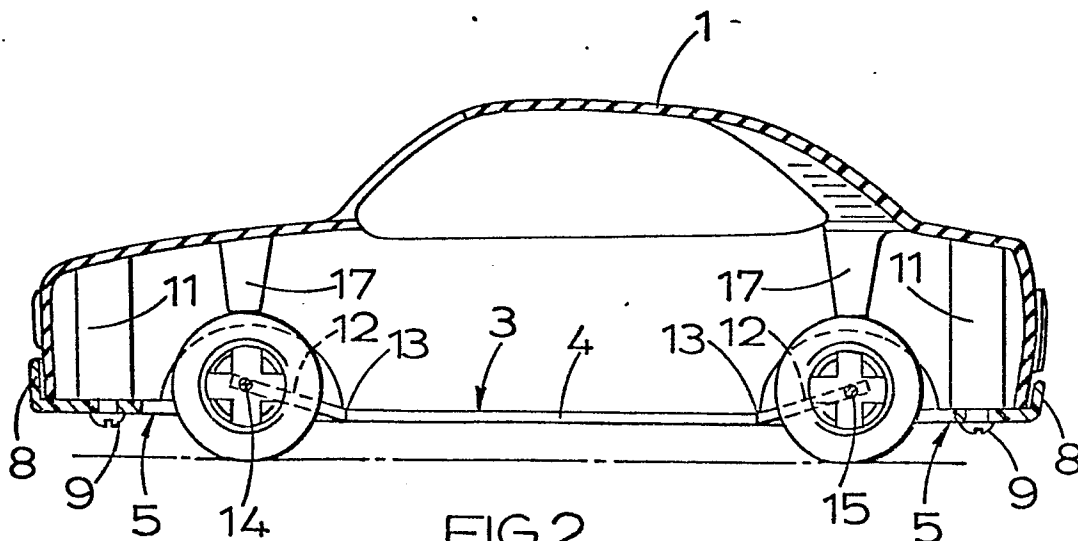
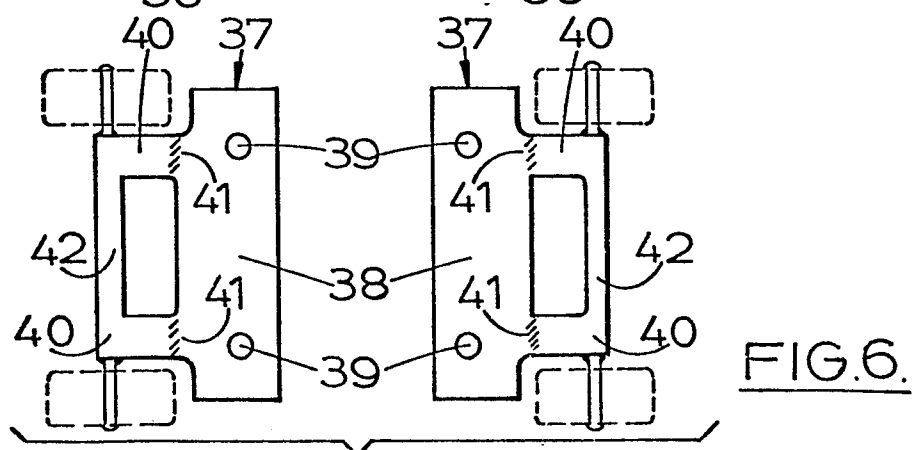
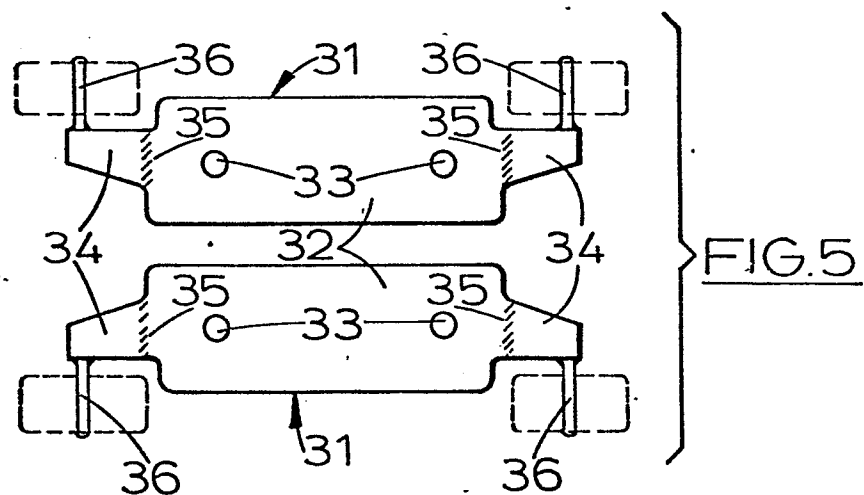
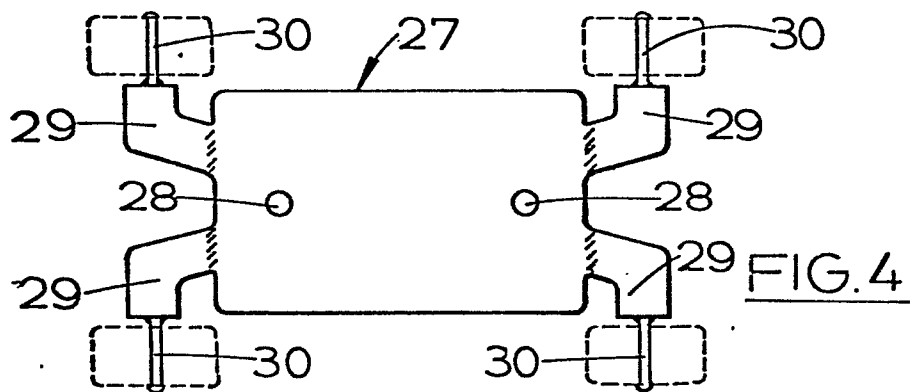
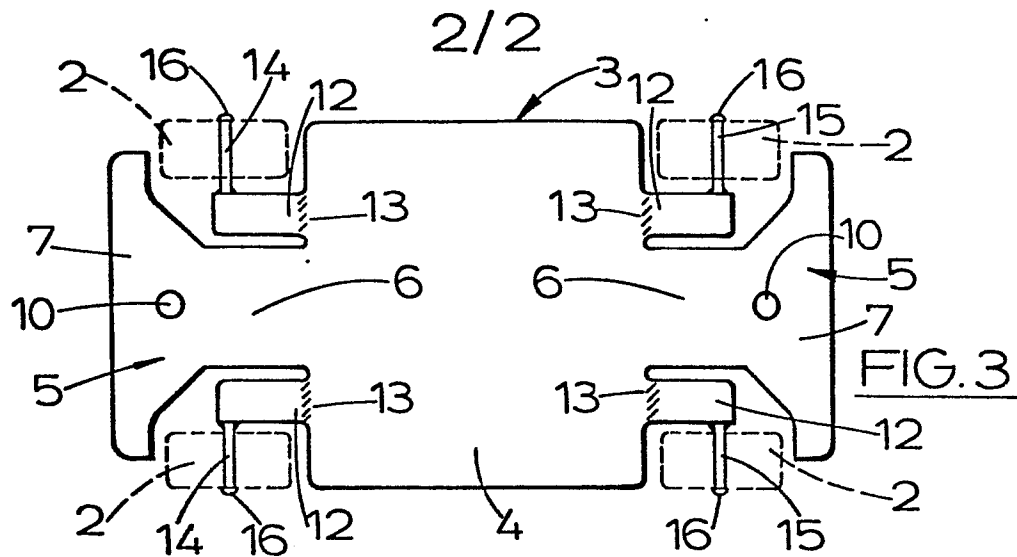


FIG. 2.





DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X,Y	US - A - 2 597 588 (J. MANOIL) * claims 1, 2 ; fig. 1 to 3 *	1-3, 5-8,11	A 63 H 17/26
Y	FR - A - 1 309 964 (M. GRAND-CLEMENT) * whole document *	1-3, 5,6	
Y	FR - A - 1 342 973 (M. GRAND-CLEMENT) * abstract *	1,5,7	
Y	FR - A - 2 115 767 (MATTEL INC.) * page 2, lines 3 to 8 ; page 5, lines 25 to 40 ; page 6, lines 1 to 3, 20 to 25 ; fig. 2 to 4 * & US - A - 3 694 958	1,5,7	TECHNICAL FIELDS SEARCHED (Int.Cl. 3)
Y	US - A - 3 651 764 (G.P. DENNIS et al.) * column 3, lines 25 to 35 ; fig. 2 *	8	A 63 H 17/00
A	US - A - 3 720 017 (L. ERSILIO) * claims 1, 2 ; fig. 1 *	1	
A	DE - U - 1 973 338 (METTOY CO. LTD.) * claim 1 ; page 6, last paragraph ; fig. 4 *	4	
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons
			&: member of the same patent family, corresponding document
X The present search report has been drawn up for all claims Place of search Berlin Date of completion of the search 19-11-1982 Examiner CLOT			



DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	<u>FR - A - 1 133 910</u> (H. STEINER K.G.) * page 3, left-hand column, lines 27 to 33 ; fig. 4 *	11	
A	<u>US - A - 3 811 218</u> (R.W. SALMON et al.) * column 6, lines 31 to 34 ; fig. 1 *	12	TECHNICAL FIELDS SEARCHED (Int. Cl.)