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(54) **Device to keep the door of a motor vehicle in open position during the manufacturing process**

(57) This invention concerns a device to be mounted on the frame (25) of a motor vehicle and intended for interacting with a slit (70) of the sheet (3) of a its door (26) to keep said door (26) in open position during the manufacturing process, said device including a rod (1) to be inserted in said slit (70) and connected to an articulated joint (4) fastened to said frame (25), on said rod (1) being mounted a gripping bushing (2) free to slide that is fixed to the door (26) without using any fixing mean but by a rotation of a right angle of the whole device and that interact with a stopping mean (6) that lies on the rod (1) in the inner part of the door.

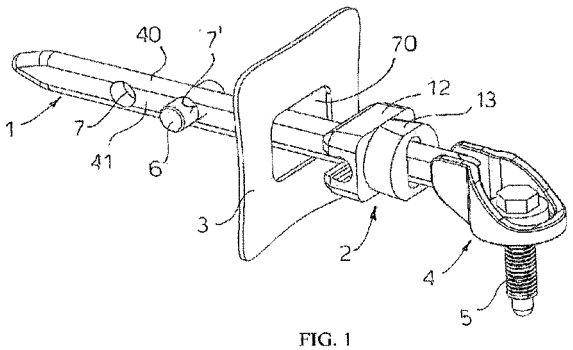

FIG. 1

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Description

[0001] The present invention concerns a device able to keep in open position the door of a motor vehicle when this undergoes the various manufacturing processes.

[0002] In the motor vehicle manufacturing, the coating of the metallic parts with antioxidant and the following painting are executed when the doors are already mounted by hinges to the metal structural covering that is fixed to the chassis (said metal covering will be called "frame" for brevity in the following). In this way it is guaranteed that:

- the painting is uniform on the whole motor vehicle;
- there are no risks scratching the already painted surface when mounting the doors to the vehicle.

[0003] During some phases of the manufacturing processes it is necessary that:

- the doors stay completely open;
- the doors stay in open position even when the vehicle is moved during the process;
- the doors can be closed and open again by the operators during the process.

[0004] Since the doors are free to rotate around hinges, without any kind of brake or stop, it is necessary to attach between the frame and the door a temporary device that allows the above conditions.

[0005] Some manufacturers use a device very similar to the one that is then permanently mounted to the vehicle and that keep the door open during the normal use of the motor vehicle. An example in the class of this kind of devices is described in DE3906041. From this document it is possible to summarize some problematic aspects of the know technology (prior art):

a) the devices are fastened by means of screws to the door and this increases the manufacturing times;

b) the devices are produced according to principles and of materials to ensure a life time comparable to the other parts of the vehicle.
Therefore they are so expensive that must be reused several times but this implies that the paint should be removed from them and a cleaning phase is needed before being reused.

c) The devices are made completely or partly of metallic components.
This can compromise the quality of the painted surfaces if the operator that remove the device from the vehicle make it inadvertently fall on the just painted parts of the vehicle, so risking to scratch the coating;

d) in order not to hamper the complete closing of the door, the devices are mounted and dismounted from the inner part of the metal sheet box that composes the door and this phase is very slow and delicate;

e) the paint that is deposited on the devices also reach its inner parts reducing the mechanical clearance between the parts of the mechanism. Even though the catalysis of the paint should not compromise the correct working of the device, makes it much noisier.
In particular the noise arises when the door is moved to any position.
Other manufactures uses a device that is described in the document DE102004034259A1. This is composed of two parts. One of them is fixed to the door of the motor vehicle without any screw. Indeed as far as the description of the said document is concerned, the part is fixed to the door by means of the protrusions 8 (for example in **Fig. 1** DE102004034259A1). To use such protrusions they must be inserted in cavities that are in the door and apart from the main cavity where the rod 2 (**Fig. 1** DE102004034259A1) can be inserted to enter the inner part of the door. As a consequence two more problems of the prior art are described below.

f) The possibility to fix the device to the door of the vehicle presupposes the existence of additional holes/cavities in the door.

g) The device fixed in this way to the door stays blocked because cannot have any type of movement that is necessary to open the door if its rotation axis is not concentric with the hole 3 (**Fig. 1** DE102004034259A1).
Other manufacturers use a device that is indented to be mounted around the axis of the hinges the doors rotate around. The document WO0034608 shows an example of this system. A Further problem with the prior art, connected with the device according to this document is the following:

h) It is not always possible to use this device to the vehicle. Indeed the hinge the door rotate around must be based on a pin and around said pin enough room is necessary to house the device.

[0006] Other manufacturers use a spacer to be hooked manually every time that the door is open, a kind of distance piece that allows that the door cannot close. An obvious problem in this case is that:

i) The operator is supposed not to simply open the door but must ensure manually that it is kept open when the spacer is inserted. In other words the device cannot be activated in an automatic way.

[0007] This invention aims at removing the above mentioned drawbacks of the prior art, providing a device to keep the door of a motor vehicle in open position during the manufacturing process, that is both simple to product and not expensive and simple and quick to install.

[0008] This aim is accomplished by the device according to this invention, which includes the features of the attached independent claim 1. Advantageous features of this invention are disclosed in the attached dependent claims.

[0009] Basically the device according to this invention, that allows to keep in open position a door to a specified distance from the frame during the manufacturing processes (for example painting process) of a motor vehicle, includes a rod around which a gripping bushing that can slide is housed.

[0010] Said rod is fixed to a joint in one end with the freedom to axially rotate.

The joint can be fastened by a bolt to the frame of the motor vehicle.

[0011] The gripping bush can be housed in the metal sheet of the door through a rectangular slit and will grip a pin on the rod after applying a suitable force to the door.

[0012] Once the bushing is inserted in the rectangular slit, the device can be rotated around the axis of rod due to the design of the bushing. The device according to this invention is used during all the phases of surface treatment the vehicles (frame, metal cover and door) undergo. In particular:

- It is fixed to the frame of the vehicle before proceeding with the cataphoresis and painting phases.
- It is removed at the end of the process.
- It guarantees the keeping in the open position even though the vehicle is moved during the process at low speed.
- Allows the operators to move the door to the open position by using a suitable opening force.
- Allows the robot to open the doors and close them again during the various phases of the process.
- Allows a quite soft interaction with the surfaces of the vehicle, so not to damage them even if are just coated by antioxidant and paint.
- Allows the above mentioned functions within the dimensional errors of doors, frame and their relative position.

[0013] Further features of the invention will result clearer from the detailed description that follows. It concerns forms purely illustrative of the invention, so not restrictive, showed in the attached draws, in which:

- **Fig. 1** is a perspective view of the device.
- **Fig. 2** is a exploded view of the device in **Fig. 1.**
- **Fig. 3** is a section view of the gripping bushing.
- **Fig. 4** is a schematic view of the frame and door of a motor vehicle, indicating the area where the device is to be mounted.
- **Fig. 5** shows the configuration of the device attached to the door when this is in closed position.
- **Fig. 6** shows the configuration of the device attached to the door when it is in open position.

[0014] The device in the subject of this invention allows keeping in open position a door of a motor vehicle, to a specified distance from the frame, during the processes of surface treatment.

[0015] It includes a rod 1 made of thermoplastic material loaded with glass fibers. Its section is rectangular with blends 8 at vertex on the short side 40 of the section. On the one end the rod 1 terminates with a tip 9 and on the other end there is a through hole 10, perpendicular to the long side 41 of the section of the rod and an inclined plane 11 in the direction of the axis of the rod. To a specific distance by the tip 9 there are through holes (7, 7'), both perpendiculars to the long side 41 of the section of the rod. In one of them, for example 7' a pin 6 is inserted.

[0016] Around the rod 1 a gripping bushing can slide. Said bushing is produced in a single piece of thermoplastic material that can undergo one hour cycles at 200°C and is highly tough. It is sketched in two parts.

[0017] The first one is a rear body 12 (**Fig. 3**) which is a parallelepiped with chamfers 18 on the edges of the external face and with the short edges 19 blended. In the core of this body 12 there is a cylindrical through cavity whose symmetry plane is parallel to the long side of the parallelepiped. The profile of the cavity starts with a portion of a circumference 20 with diameter equal to the one of the pin 6 (**Fig. 1**), then a shrinkage 21 and at last widens again with a chamfer 22.

[0018] The second one is a front body 13 that is essentially a tapered cylinder that rests on the back face of the parallelepiped 12. It starts from the long side of said face and enlarge with an inclination of about eight degrees.

[0019] On the long side of the face where the body 13 lies an undercut 24 results.

[0020] In said front body 13 a cavity 14 exists that is through cavity for the whole bushing 2. It has a similar profile to the section of the rod 1 but it is wider laterally. As it is showed in **Fig. 3**, it narrows of about five degrees, till to terminate with the profile 23 that is just a few decimillimetres larger that the section of the rod 1.

[0021] On the end opposite the tip 9 of the rod 1 there is the joint 4. It is made of thermoplastic elastic material

and is designed as a support with a through hole 15 to fasten the device to the frame 25 by means of a bolt 5, two opposing flexible flanges 17, two cylindrical pins 16 lying internally to said flanges, that have a slight chamfer as indicated in **Fig. 2** and a diameter of a few decimillimetres less than the diameter of the hole 10 through the rod 1.

[0022] The device is assembled from the component showed in **Fig. 2** by manual or robotic operations. The device is assembled in the folowing order:

- Insert the pin 6 in the rod 1 (the choice of which of holes (7, 7') as in **Fig. 2** depends on the vehicle version).

- Insert the bushing 2 along the rod 1 in the direction showed in **Fig. 2.**

- Insert the joint 4 on the rod 1 making the flanges 17 bend against the inclined plane 11, till the pins 16 house the through hole 10.

- The bolt 5 is inserted in the hole 15 directly by the operator before fastening the device to the frame of the vehicle.

[0023] The device is fastened to the frame 25 (**Fig. 4**) of the motor vehicle in zone 27 dedicated to house the permanent device to keep the door open. The operator opens the door as showed in **Fig. 4.** Then he introduces the device in the rectangular slit 70 that is part of the metal sheet 3 of the door 26, as showed in **Fig. 1,** until the body 12 has entered entirely the slit 70.

[0024] The dimensions of the slit 70 used to anchor the permanent device, characterizes the dimensions of the body 12. This can enter the slit 70 because it is a few decimillimetres less than the slit 70.

[0025] Then the operator rotates the whole device of a right angle around the long axis of the rod 1. The device can rotate because the body 12 is completely inside the slit 70, which is in contact with the front side of the bushing 2. After that rotation, the bushing 2 is constrained to the slit 70 as showed in **Fig. 5**, because:

- in the perpendicular direction to the plane of the slit 70, according to the vector 28 (**Fig. 5**), the bushing 2 is blocked against the metal sheet 3 of the door 26 by means of the undercut 24 (**Fig. 3**);

- in the perpendicular direction to plane of the slit 70, according to vector 29 (**Fig. 5**), the bushing is blocked against the edge of the slit 70 by means of the tapered face of the cylinder 13;

[0026] In other words, in the position of **Fig. 5,** the bushing 2 and the metal sheet 3 of the door 26 cannot have relative motion along the long axis of the rod 1. But the bushing 2 can move just on the plane of the slit 70.

[0027] The last operation to be done by the operator is the fastening of the device to the frame 25 of the vehicle in the zone 27 where there is a threaded hole, intended for the permanent device, where it can be fastened by means of the bolt 5.

[0028] As a consequence of the fastening, the rood 1 results attached to the frame 25 but rotations around the hole 10 are allowed.

[0029] In **Fig. 5** the relative position is showed between the metal sheet 3 and the device when the door is completely closed. The **Fig. 6** shows the relative position between the metal sheet 3 and the device when the door has been open completely. It should be noted that the **Fig. 6** is purely indicative because the actual relative angles between rod 1 and metal sheet 3 or between rod 1 and joint 4 are not replicated to the figure.

[0030] In the slit 70 of the metal sheet of the door 26 the bushing 2 can translate of small distances parallel to the sheet 3 and the rod 1 can just rotate around the through hole 10. Thanks to the tapered through cavity 14, the combination of these two motions allow to the bushing 2 to move along the rod when the door rotate around its own axis. Is to be noted that the distance between the rotation axis of the door and the axis of hole 10 is typically of several centimeters, fifteen for example, therefore the rotation of the door triggers a rototranslation of the bushing 2.

[0031] When the door is open at a certain extent, the chamfer 22 in the rear body 12 comes in contact with the pin 6. If the door is open further the rear body 12 bends enlarging enough that the pin 6 can fit perfectly in the cavity in the rear body 12. At this stage the door is open and a certain extra force is needed to close it. At device level, the pin 6 has to be detached by the bushing 2 or, in other words, the gripping force exerted by the narrowing 21 on the pin 6 should be overcome. It is to be noted that in open position the device doesn't hamper the operations to paint the sheet 3. Indeed the tapered cylinder 13, even though is a stopping element, doesn't create shadow against the paint flux on the portion of the sheet that is exposed.

[0032] This invention includes some advantages that are basically the overcoming of the problems with the prior art previously listed and commented. Below there are the detailed reasons for each problem previously listed, following the same order and letter used for the previous list:

a) This invention doesn't have this problem because it is not attached to the door with additional elements (for example screws).

b) This invention doesn't have this problem. Indeed only the portion of the rod that is outside the metal box composing the door is covered by the splashes of the paint, while the portion 12 of the bushing 2 that is the gripping part, stays inside the door, so completely protected and clean. Anyhow, the device is

mould integrally of plastic, so cheap enough to be used once.

c) This invention doesn't have this problem because it is made integrally of plastic.

d) This invention doesn't have this problem because it is mounted from outside not from the inner of the metal box of the door of the motor vehicle.

e) This invention doesn't have this problem because there is a large tolerance between rod 1 and the cavity 14 and the only noise connected to the working parts is the "snap" of the gripping bushing 2 on the pin 6.

f) This invention doesn't have this problem because it exploits only the slit 70 to anchor the bushing 2 to the metal sheet 3 of the door.

g) This invention doesn't have this problem because the bushing 2, even if is anchored to the sheet 3, is free to move a few millimeters on the plane on the slit 70 in both directions of the long side of the slit 70.

h) This invention doesn't have this problem because it exploits the common slits to house the permanent rod used for holding the door in the normal use of the motor vehicle.

i) This invention doesn't have this problem because, once it is mounted on the vehicle, it doesn't require any further maneuver or specific phase to be activated.

[0033] The advantages of this invention previously described are the consequence of the innovative features of the invention compared with the prior art. These are basically the following:

- The bushing 2 is anchored to the door by a very simple and quick action. This feature guarantees that there are no high costs for mounting/removing the device to/from the vehicle.

- The device can be used for both the front and back doors in the motor vehicles having five doors, depending what hole (7,7') is used to mount the pin 6. This feature guarantees versatility of the device.

- The device can be used also for other car models because it exploits the slit 70 in the metal sheet 3 of the door. This feature guarantee versatility of the device but the profile of the part 12 of the bushing 2 must be redesigned and adapted to the profile of the slit in the metal sheet of the door.

[0034] Of course this invention is not restricted to the specific form previously described and showed in the attached figures but many modifications can be conveniently introduced without straying from the subject of the invention itself defined by the attached claims.

Claims

1. Device to be fixed to the frame (25) of a motor vehicle and intended to interact with a slit (70) of the metal plate (3) of a door (26) to keep said door (26) in open position during the manufacturing process, said device includes a rod (1) inserted in said slit (70) and connected free to articulate to a joint (4) that is fastened to said frame (25), on said rod (1) a gripping bushing (2) is mounted being free to slide and hooked to the door (26) without using any additional fixing mean, said bushing (2) can grip the slide-stopping element (6) placed on said rod (1) and inside the door, **characterized in that** said bushing (2) includes a rear body (12) whose section has the same profile of the slit (70) where it is intended to fit in and a front body, cylindrical in shape and tapered, which is intended to stay externally to the plate (3) that after a rotation of the device by a right angle around the longitudinal axis of the rod (1) stays hooked between the undercut (24) and the tapered face of the front body (13).

2. The device according to claim 1, **characterized in that** said slide-stopping element (6) is a pin inserted in one of a plurality of holes (7,7') provided in said rod (1) in positions that result in different angles of opening of the door.

3. The device according to claim 1, **characterized in that** said rear body (12) of the bushing (2) has a seat (20), having a profile substantially identical to the arrest pin (6), which is tapered towards the opening to house said arrest pin (6) by snap action.

4. The device according to any one of the preceding claims, **characterized in that** said bushing (2) has a through cavity (14) with the same profile of the cross section of said rod (1) but is tapered along the longitudinal axis of the rod (1) to allow slight rotations to the latter.

5. The device according to any one of the preceding claims, **characterized in that** said joint (4) has a pair of opposed elastically compliant flanges (17), which bear inside the respective cylindrical pins (16), which are designed to fit by snap action into a hole (10) having its axis parallel to the axis of said holes (7, 7') and provided in the proximity of the end of said rod

(1) to enable the latter to articulate.

6. The device according to any one of the preceding claims, **characterized in that** said joint (4) has a hole (15) for the insertion of a bolt (5) for fastening the device to the frame (25).

7. The device according to any one of the preceding claims, **characterized in that** all or part of the elements that are included in said device and in particular the rod (1), the bushing (2), the pin (6) and the joint (4) can be made of plastic material with different mechanical properties from each other

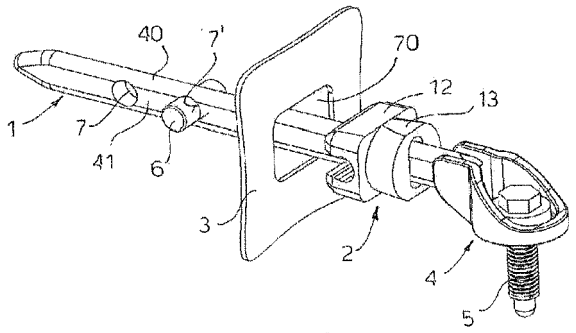

FIG. 1

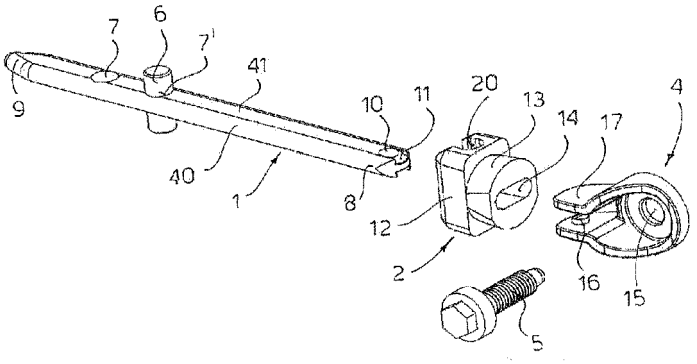

FIG. 2

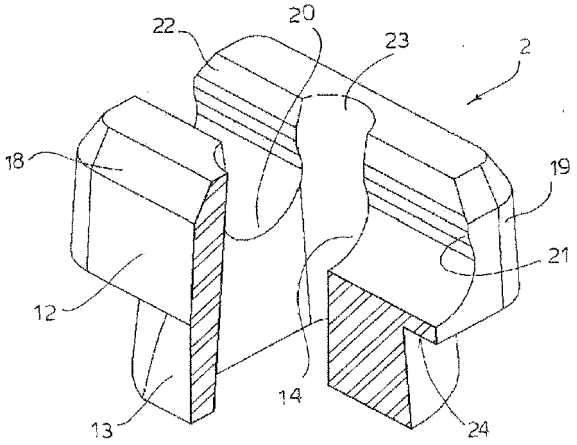

FIG. 3

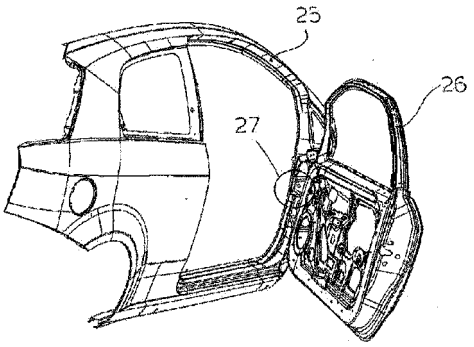

FIG. 4

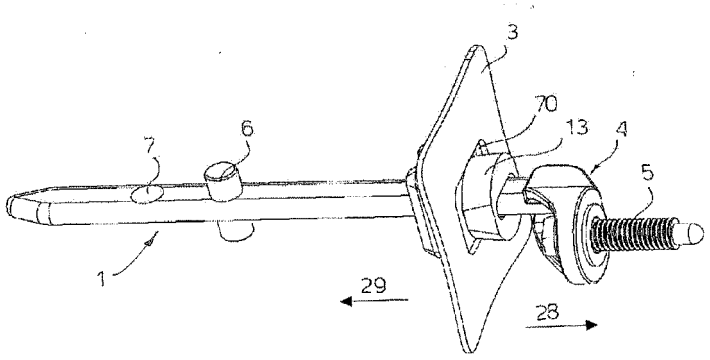

FIG. 5

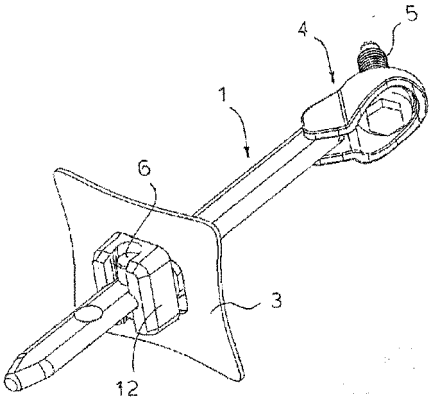

FIG. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 09 01 2745

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X,D	DE 10 2004 034259 A1 (EDSCHA AG [DE]) 3 February 2005 (2005-02-03) * paragraph [0036] - paragraph [0037] * * figure 1 * -----	1,4,6,7	INV. E05B17/00 E05C17/04 E05C17/20

TECHNICAL FIELDS SEARCHED (IPC)

E05B
E05C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	23 March 2010	Bitton, Alexandre

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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23-03-2010

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 102004034259 A1	03-02-2005	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- DE 3906041 **[0005]**
- DE 102004034259 A1 **[0005]**
- WO 0034608 A **[0005]**