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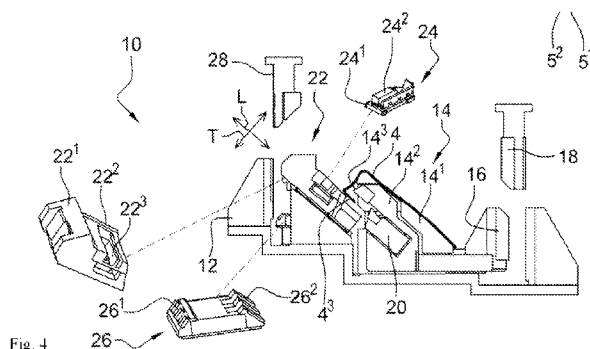
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(54) Title: PRESS TOOL WITH COMBINED SLIDES OPERATING IN A SAME PRESS STROKE



(57) Abstract: A press-tool (10) for forming a flange(4³) of a metal sheet (4) with a stamping press comprises a lower body (12) with a die (14) for receiving the sheet (4) and a first slider (22) for forming the flange (4³) of said sheet (4), an upper body with a first cam (28) for moving the first slider (22) in an operating direction (L) towards the die (14) for forming the flange (4³), and a second slider (24) on the lower body (12), configured to be moved by the first cam (28) in an operating direction (T) towards the die (14) for forming the flange (4³), said direction (T) being transverse to the operating direction (L) of the first slider (22).

PRESS TOOL WITH COMBINED SLIDES OPERATING IN A SAME PRESS STROKE

Field of the Invention

The invention is directed to the field of press-forming blanks of metal sheets such as body parts of a vehicle. More specifically the invention is directed to a press-tool for a stamping press and to a method for press-forming a metal sheet.

Background Art

Patent document published FR 3 008 910 A1 discloses a press-tool for flanging and folding at once the same edge of a metal sheet. The press-tool comprises a slide on an upper body, said slide comprising first and second working faces inclined with respect to one another. The slide is movable downwardly to allow the first working surface face to perform a flanging operation of the edge of the sheet. The slide cooperates then with a cam on a lower body to move in a direction inclined relative to the vertical direction to allow the second working face to perform a folding operation of the flange. This teaching is interesting in that it combines two operations, namely flanging and back folding, in a single press stroke. It is however limited to simple forming operations such as flanging and back folding.

Patent document published FR 2 914 571 A1 discloses a press tool for flanging and press-forming an edge of a metal sheet like a bonnet of a motor vehicle. The press-tool comprises a die with a counter-form, a flanging slide on an upper body and a punching slide on a lower body. The punching slide is moved by a cam on the upper body. Vertical

displacement of the upper body and the flanging slide from a course corresponding to realize a lateral edge flanging operation, triggers a horizontal displacement of the punching slide against the counter-form to realize the setting operation for shaping the flange. This teaching is interesting in that it combines two operations, namely a flanging operation and a press-forming operation. These two operations are however quite different in nature since the first one, i.e. the flanging operation, is achieved by a downward movement whereas the second one is done essentially horizontally.

In certain press-forming operations it can be desired to perform several operations on a same portion of a metal sheet, where that portion is already flanged. This means that these operations involve more complex movements than a mere downward movement of a flanging working surface on the upper body towards the lower body of the press-tool. It is also desirable to limit the number of operations being understood that each operation requires a specific stamping press and a transfer of the preformed blank from the previous operation to the next one.

Summary of the Invention

The invention has for technical problem to provide a solution to at least one shortcoming of the above mentioned prior art. More specifically, the invention has for technical problem to provide a solution that provides a cost effective solution for the press-forming of a flange of a blank, especially when said press-forming requires movements in different directions, said directions being transverse to a vertical direction.

The invention is directed to a press-tool for forming a flange of a metal sheet with a stamping press, said tool comprising: a lower body with a die

for receiving the sheet and a first slide for forming the flange of said sheet; an upper body with a first cam for, during a stamping process where the upper body moves downwardly towards the lower body, moving the slide in an operating direction towards the die for forming the flange; wherein the tool further comprises a second slide on the lower body, configured to be moved by the first cam, or another cam, on the upper body in an operating direction towards the die for forming the flange, said direction being transverse to the operating direction of the first slide.

Advantageously, the second slide is housed in the first slide so as to move together with said first slide.

According to a preferred embodiment of the invention, the operating direction of the second slide forms an angle with the operating direction of the first slide that is comprised between 70° and 110° , preferably between 80° and 100° .

According to a preferred embodiment of the invention, the press-tool is configured such that the second slide moves towards the die after the first slide during the stamping process.

According to a preferred embodiment of the invention, the first slide comprises a working surface for shaping the flange and the second slide comprises a working surface for forming one or several recesses on said flange.

According to a preferred embodiment of the invention, the working surface of the second slide is configured for moving through the working surface of the first slide.

According to a preferred embodiment of the invention, the press-tool

comprises an intermediate slide configured for transmitting movement from the first cam or the other cam of the upper body to the second slide.

According to a preferred embodiment of the invention, the intermediate slide is movable in a direction that is transverse to the downward movement of the upper body and also transverse to the operating direction of the second slide, so as to convert the downward movement of the upper body into an upward movement of the second slide.

According to a preferred embodiment of the invention, the intermediate slide is movable in a direction that is horizontal or forms an angle with the horizontal direction that is less than 30° .

According to a preferred embodiment of the invention, the press-tool comprises a third slide on the lower body, said slide comprising a working surface for supporting the flange on an interior side of said flange, opposite to an exterior side to be contacted by the first and second slides, and preferably a second cam on the upper body for moving said third slide.

The invention is also directed to a method of press-forming a flange of a metal sheet with a stamping press and a press tool, comprising the following steps: (a) press-forming the sheet so as to form a folded flange; (b) press-shaping the flange; (c) further press-shaping the flange; wherein the press-tool is according to the invention, the steps (b) and (c) being carried out by a single stroke of the stamping press.

In step (a), the metal sheet is formed by flanging an edge portion so as to form a folded flange. In steps (b) and (c), the pre-shaped flange is further shaped. Step (b) can provide a curvature to the flange. Step (c) can provide one or several recesses to the flange.

The metal sheet is advantageously an outer sheet of a trunk cover of a vehicle.

The measures of the invention are interesting because they provide two press-forming operations in a single press stroke, thereby reducing the number of press-forming stations for forming the metal sheet. More particularly, the forming operations are such operations which can be carried-out after a flanging operation, meaning that these operations are along operating directions different from the vertical direction. The invention provides therefore by interesting technical measures a useful production cost reduction.

Brief Description of the Drawings

The invention will be described more in details in relation with the following figures:

- Figure 1 is a perspective view of a trunk cover of a motor vehicle;
- Figure 2 is a perspective view of the trunk cover of figure 1, the cover being upside down;
- Figure 3 is a schematic sectional view III-III of the trunk cover of figure 1;
- Figure 4 is a side view of a press-tool with a preformed blank at the beginning of the press forming movement;
- Figure 5 corresponds to figure 4 in a further step of the press forming movement;
- Figure 6 corresponds to figure 5 in a still further step of the press forming movement;

- Figure 7 corresponds to figure 6 at the end of the press forming movement;
- Figure 8 corresponds to figure 7 at the end of the press stroke.

Detailed Description of Embodiments

Figures 1 to 3 illustrate a trunk cover of a motor vehicle.

As is apparent in figures 1 and 2, the trunk cover 2 comprises essentially an outer sheet 4, an inner sheet 6 assembled to the outer sheet, and a decorative part 8 attached to the inner sheet 6.

As is apparent in figures 1 to 3, the outer sheet 4 comprises a main portion 4^1 that can be generally flat, a first bent portion 4^2 and a second bent portion 4^3 . The first bent portion 4^2 forms an angle with the main portion 4^1 that is at least approximately of 90° . It can of course have a different value, e.g. comprised between 60° and 120° . The second bent portion 4^3 forms an angle with the first bent portion 4^2 that is also at least approximately of 90° . It can of course also have a different value, e.g. comprised between 60° and 120° . The second bent portion 4^3 forms a flange with a recess 5^1 and openings 5^2 for receiving the lighting device for the number plate that is to be fixed to the decorative part 8.

The shaping of the flange portion 4^3 of the outer sheet 4 requires several operations including the general shaping of that portion, the shaping of the recess 5^1 and the piercing of the openings 5^2 . To that end the invention encompasses the use of the press-tool that is illustrated in figures 4-8.

Figure 4 illustrates the press-tool 10 after having loaded the blank of metal sheet 4 and before the start of the press-forming process.

The press-tool 10 comprises a lower body 12 with a die 14 for receiving

the pre-formed blank of metal sheet from a previous press-forming operation. In that preformed shaped, the flange 4³ is already flanged but remains to be shaped to reach its final shape as schematically illustrated in figure 3. In the present specific example, the die 14 comprises a fixed portion 14¹ and a movable portion 14². This latter comprises a working surface 14³. The portion 14² is movable by means of a cam surface 16 that is contacted by the cam 18 on an upper body (not represented). The movable portion 14² can also comprise an auxiliary movable portion 20 the function of which will be explained in relation with figures 5 to 7.

The press-tool 10 comprises also a first slide 22 that is also illustrated separately in perspective in figure 4. This slide 22 comprises a body 22¹, a working surface 22² and an opening 22³ through said working surface 22². The press-tool 10 comprises also a second slide 24 that is also illustrated separately in perspective in figure 4. The second slide 24 is configured for moving in an operating direction that is transverse to the operating direction of the first slide 22. More specifically, the first slide 22 is configured for moving in a first direction L whereas the second slide 24 is configured for moving in a second direction T. These two directions advantageously are perpendicular or form an angle comprised between 70° and 110°, preferably between 80° and 100°. The second slide 24 is basically incorporated into the first one 22 so that the second slide 24 follows the movement of the first slide 22 along the first direction L.

Movement of the first slide 22 is operated by the cam 28 on the upper body (not represented) when said body moves down so that the cam 28 contacts the body 22¹ of the first slide 22. Movement of the second slide 24 along the direction T is operated when the cam 28 contacts the intermediate slide 26. This latter is slidable along a generally horizontal

direction and comprises a first cam surface 26^1 for contacting the cam 28 of the upper body and a second cam surface 26^2 for contacting a corresponding cam surface (not visible) on the second slide 24.

In figure 5, the upper body (not represented) carrying the cams 18 and 28 has started to move downwardly towards the lower body 12. The cam 18 is in contact with the cam surface 16 on the movable portion 14^2 of the die 14. This movable portion 14^2 has therefore moved to the left so that its working surface 14^3 contacts the interior face of the metal sheet 4, more specifically the flange 4^3 and the fold between that flange 4^3 and the portion 4^2 . In that position of the movable portion 14^2 of the die 14, the working surface 14^3 forms a support for shaping the flange 4^3 with the first and second slides 22 and 24 as this will be detailed in relation with figures 6 and 7. Still with reference to figure 5, the auxiliary movable portion 20 has been moved towards the first slide 22 by means of an actuator 30, e.g. of the hydraulic, pneumatic and/or electric type.

In figure 6, the upper body has moved further downwardly so that the cam 28 contacts the first slide 22 and moves said slide towards the die 14 along the operating direction of said slide. During that movement, the working surface 22^2 of the slide 22 has pressed the flange 4^3 against the working surface 14^3 of the die 14, so as to shape said flange 4^3 . In that position of the press-tool 10, the cam 28 has not yet reached the intermediate slide 26.

In figure 7, the upper body has moved further downwardly so that the cam 28 contacts the intermediate slide 26. This latter is moved to the right and moves the second slide 24 towards the flange 4^3 and the working surface 14^3 of the die 14. As this is visible in the blow-up view in figure 7,

the working surface 24^2 of the second slide 24 has pressed the flange 4^3 so as to form the recess (reference 5^1 in figure 3). In figure 7, the upper body has reached the lower dead position of the stamping press.

In figure 8, the upper body with the cams 18 and 28 has moved back upwardly to its top dead position. The cams 18 and 28 has released the moving portion 14^2 of the die 14 and the first and second slides 22 and 24, respectively. More specifically, the moving portion 14^2 of the die 14 has moved back to the right so that the working surface 14^3 has left the flange 4^3 of the blank of sheet 4. Also, the second slide 24 has moved back downwardly and to the left so that its working surface has left the flange 4^3 . The first slide 22 has also moved back upwardly and to the left so that its working surface 22^2 has left the flange 4^3 . The sheet 4 can then be removed from the press-tool 10 for a next operation for punching the openings (reference 5^2 in figure 3).

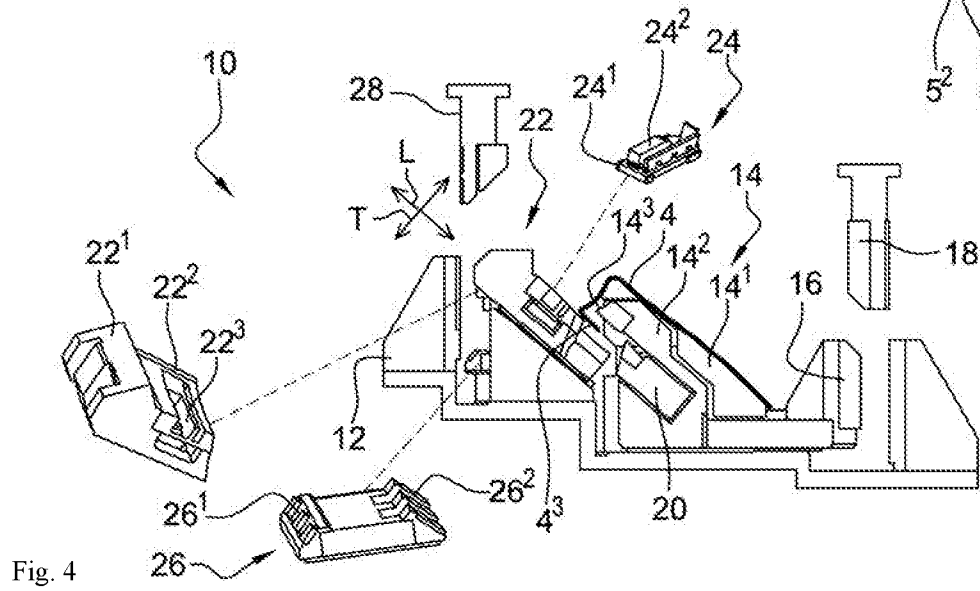
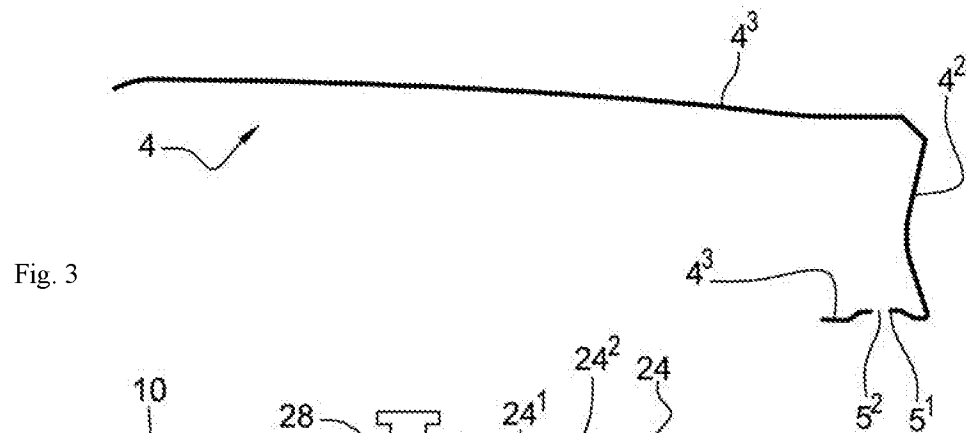
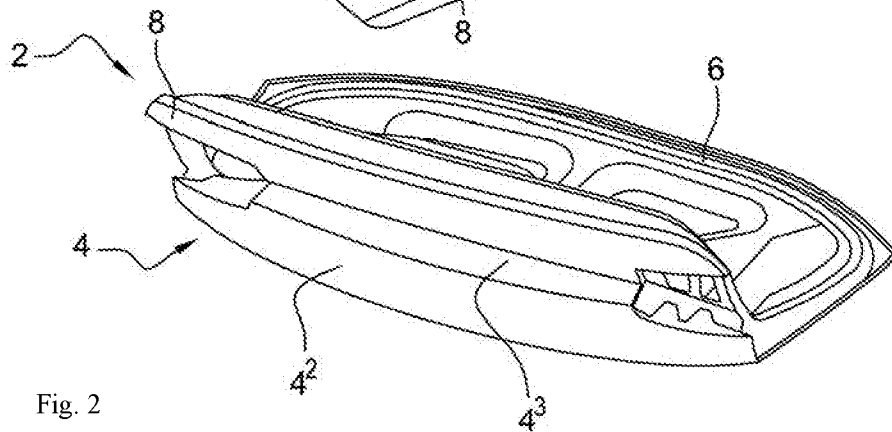
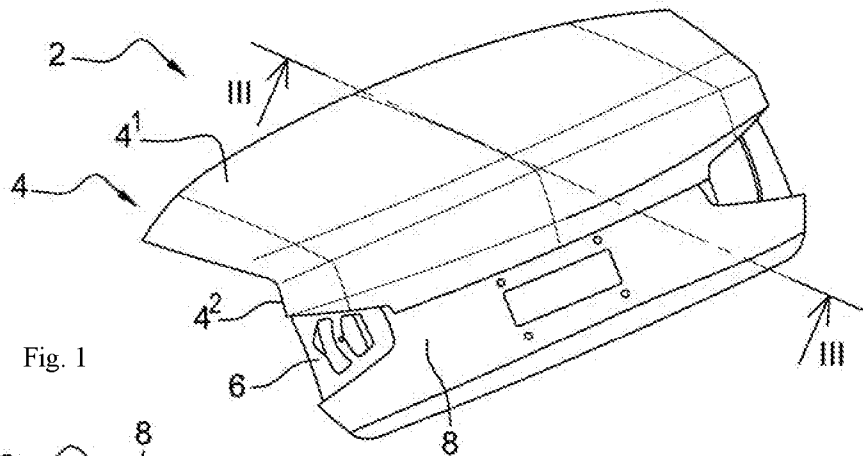
The press-tool and the related process detailed here above are particularly advantageous in that they provide a double operation during a single stamping press stroke, where each of these operations has an operating direction that is far different from the vertical direction. In other words, the invention is advantageous in that it combines several operations which are usually carried out separately, essentially because they require slides for converting the vertical operating direction of the stamping press into an appropriate direction.

What is claimed is:

1. Press-tool (10) for forming a flange (4³) of a metal sheet (4) with a stamping press, said tool comprising:
 - a lower body (12) with a die (14) for receiving the sheet (4) and a first slide (22) for forming the flange (4³) of said sheet (4);
 - an upper body with a first cam (28) for, during a stamping process where the upper body moves downwardly towards the lower body (12), moving the first slide (22) in an operating direction (L) towards the die (14) for forming the flange (4³);characterized in that the tool further comprises:
 - a second slide (24) on the lower body (12), configured to be moved by the first cam (28) or another cam on the upper body in an operating direction (T) towards the die (14) for forming the flange (4³), said direction (T) being transverse to the operating direction (L) of the first slide (22).
2. Press-tool (10) according to claim 1, characterized in that the operating direction (T) of the second slide (24) forms an angle with the operating direction (L) of the first slide (22) that is comprised between 70° and 110°, preferably between 80° and 100°.
3. Press-tool (10) according to one of claims 1 and 2, characterized in that the press tool (10) is configured such that the second slide (24) moves towards the die (14) after the first slide (22) during the stamping process.
4. Press-tool (10) according to any one of claims 1 to 3, characterized in that the first slide (22) comprises a working surface (22²) for generally shaping the flange (4³) and the second slide (24) comprises a working surface (24²) for forming one or several recesses (5¹) on said flange (4³).

5. Press-tool (10) according to claim 4, characterized in that the working surface (24²) of the second slide (24) is configured for moving through the working surface (22²) of the first slide (22).
6. Press-tool (10) according to any one of claims 1 to 5, characterized in that press-tool (10) comprises an intermediate slide (26) configured for transmitting movement from the first cam (28) or the other cam of the upper body to the second slide (24).
7. Press-tool (10) according to claim 6, characterized in that the intermediate slide (26) is movable in a direction that is transverse to the downward movement of the upper body and also transverse to the operating direction (T) of the second slide (24), so as to convert the downward movement of the upper body into an upward movement of the second slide (24).
8. Press-tool (10) according to one of claims 6 and 7, characterized in that the intermediate slide (26) is movable in a direction that is horizontal or forms an angle with the horizontal direction that is less than 30°.
9. Press-tool (10) according to any one of claims 1 to 8, characterized in that the press tool (10) comprises a third slide (14²) on the lower body (12), said slide (14²) comprising a working surface (14³) for supporting the flange (4³) on an interior side of said flange, opposite to an exterior side to be contacted by the first and second slides (22, 24), and preferably a second cam (18) on the upper body for moving said third slide (14²).
10. Method of press-forming a flange (4³) of a metal sheet (4) with a stamping press and a press tool, comprising the following steps:
 - (a) press-forming the sheet (4) so as to form a folded flange (4³);
 - (b) press-shaping the flange (4³);

(c) further press-shaping the flange (4³);
characterized in that the press-tool (10) is according to any one of claims 1 to 9, the steps (b) and (c) being carried out by a single stroke of the stamping press.



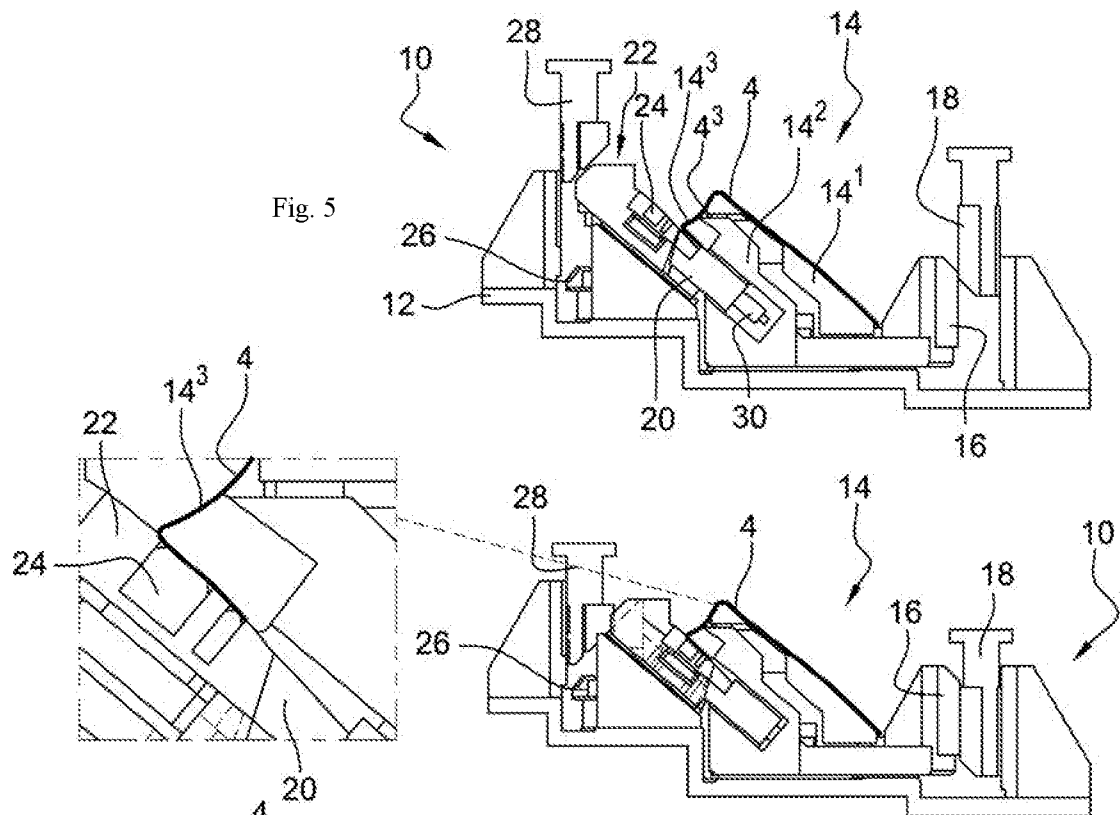


Fig. 5

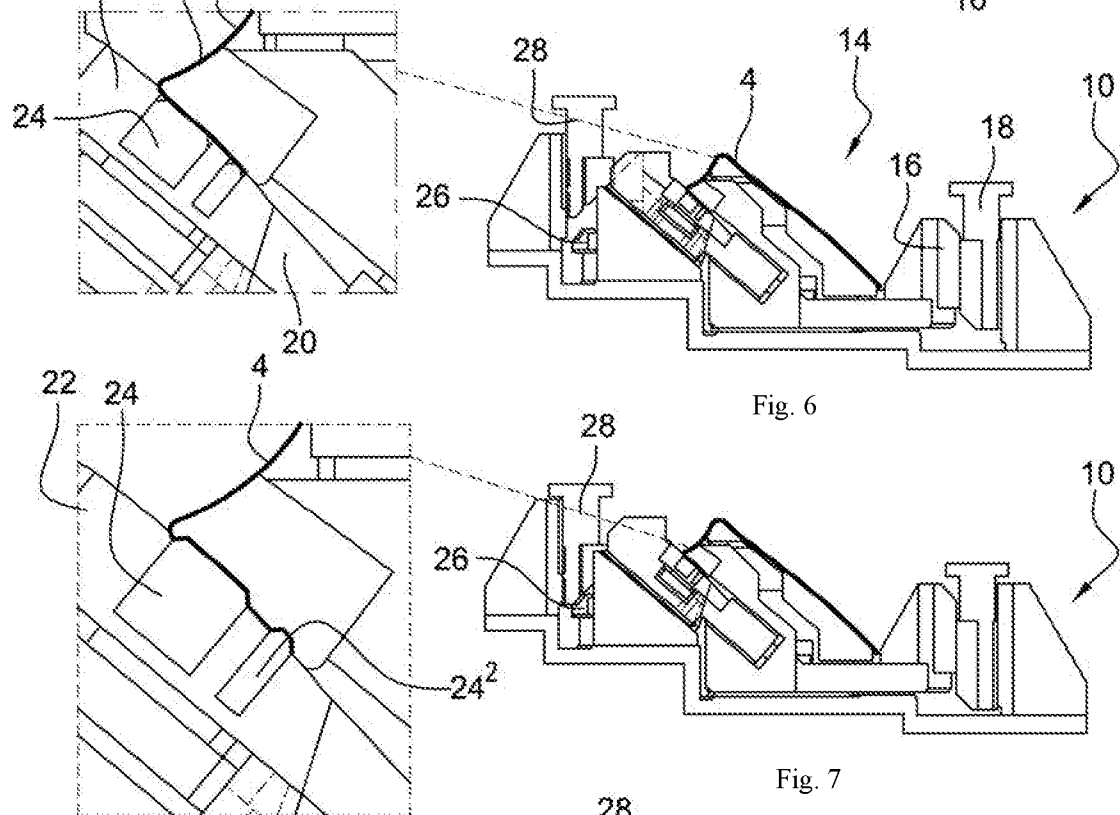


Fig. 6

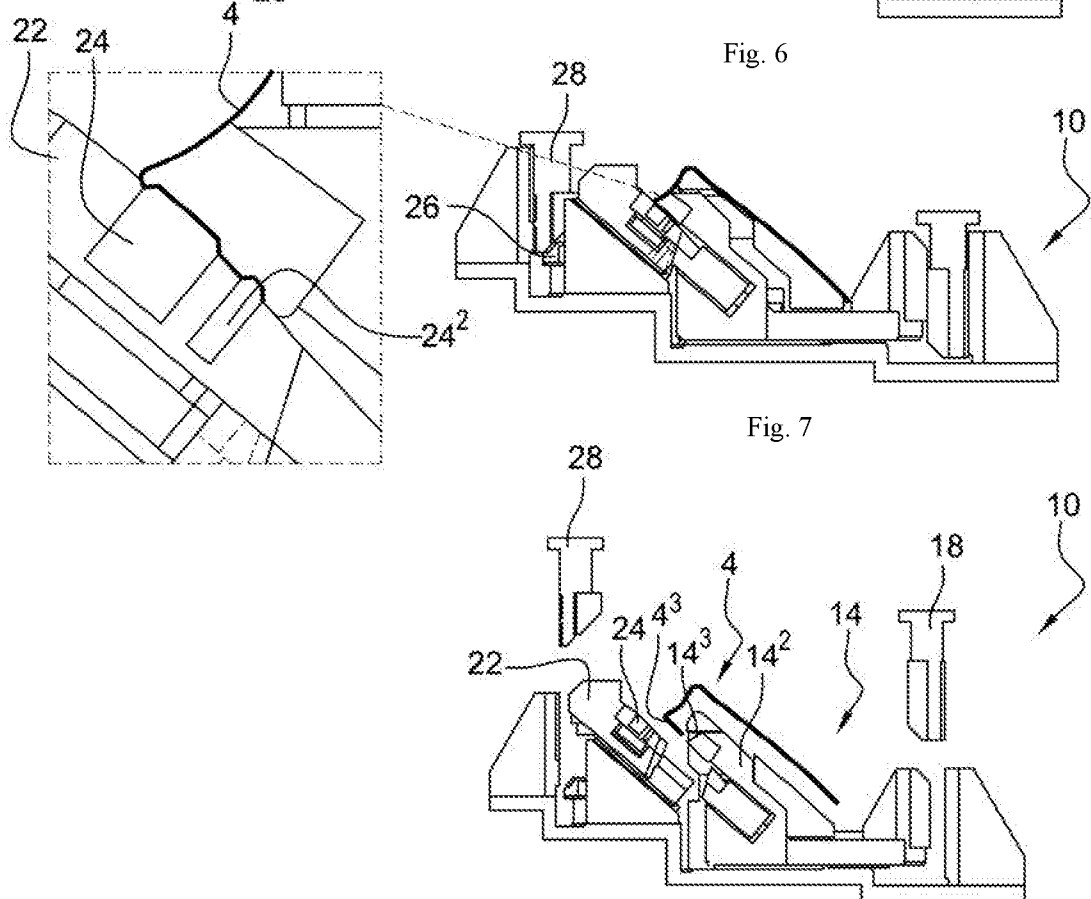


Fig. 7

Fig. 8

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2015/098053

A. CLASSIFICATION OF SUBJECT MATTER

B21D 22/22(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B21D;; B62D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNABS;VEN; EPODOC; WPI: flange, slider, vehicle, sliding, cam

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR 2924366 A1 (PEUGEOT CITROEN AUTOMOBILES SA) 05 June 2009 (2009-06-05) description, page 3, line 5 to page 8, line 20, and figures 1-3	1-10
A	CN 104080554 A (PEUGEOT CITROEN AUTOMOBILES SA) 01 October 2014 (2014-10-01) the whole document	1-10
A	FR 2914571 B1 (PEUGEOT CITROEN AUTOMOBILES SA) 04 September 2009 (2009-09-04) the whole document	1-10
A	FR 3008910 A1 (PEUGEOT CITROEN AUTOMOBILES SA) 30 January 2015 (2015-01-30) the whole document	1-10
A	FR 3021883 A1 (PEUGEOT CITROEN AUTOMOBILES SA) 11 December 2015 (2015-12-11) the whole document	1-10



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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Date of the actual completion of the international search

15 August 2016

Date of mailing of the international search report

05 September 2016

Name and mailing address of the ISA/CN

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

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Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
FR	2924366	A1	05 June 2009	None			
CN	104080554	A	01 October 2014	EP	2790848	A1	22 October 2014
				WO	2013088011	A1	20 June 2013
				FR	2984189	A1	21 June 2013
FR	2914571	B1	04 September 2009	None			
FR	3008910	A1	30 January 2015	None			
FR	3021883	A1	11 December 2015	None			