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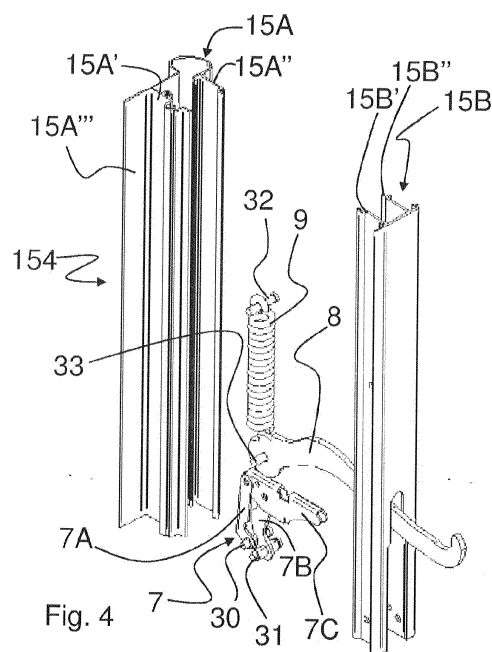
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(54) **OVEN DOOR**

(57) The present invention relates to a door (3) for household ovens, of the type adapted to close an access opening of a heated chamber (2) obtained in an oven muffle (1), and comprising a frame structure (13) with which at least one hinge (7) is associated. The latter comprises a guide means (8,80,9) for guiding the door (3) towards and away from the oven muffle (2). Both the hinge (7) and the guide means (8,80,9) are pivoted to the frame structure (13).



Description

[0001] The present invention relates to an oven door, in particular a door for household ovens, according to the preamble of the first claim.

[0002] Household ovens are usually equipped with a heated chamber (obtained in a muffle) which opens outwards and can be closed by a door: the latter typically comprises a perimetric frame structure that supports at least one thermal glass pane.

[0003] In household ovens, the door can be turned relative to the muffle through hinges that support it and guide its motion as the oven chamber is being opened or closed.

[0004] Several types of hinges exist, among which two main categories can be ideally identified within the field of household ovens: fixed-fulcrum type and variable-fulcrum type.

[0005] Some examples of variable-fulcrum hinges are described in the Italian patents granted under numbers 01238235 and 1225059 to NUOVA STAR S.r.L. and under number 1082602 to VANINI ET AL., which comprise an articulated quadrilateral for the rototranslation of the door; they also comprise a door guide means consisting of a curved arm which is rotatable relative to the door frame (to which it is pivoted) and which collaborates through a spring with a striker head secured to the oven muffle, thus slowing down or stopping the turning door.

[0006] An example of a fixed-fulcrum hinge is described in patent EP 0 737 792 to C.M.I. S.r.L.; it comprises an L-shaped bracket jutting out from the oven muffle towards the door, which is pivoted thereto (thus having a fixed fulcrum); in this case, the hinge guide means consist of a simple spring and a straight arm, but more in general they may nonetheless consist of the above-mentioned curved arm or, as will be detailed below, of two countersprings cooperating with a striker roller.

[0007] Guide means are also known which are driven by an electric motor, e.g. as described in the Italian patent application IT 1210509 by S.T.A.R. S.p.A., wherein said means comprise a toothed curved arm cooperating with a toothed striker head driven by an electric motor, thus allowing the door to open or close automatically.

[0008] In general, it should be observed that the hinges used for household oven doors (of any type) comprise a mounting section to which both the guide means and the actual hinge (whether an articulated quadrilateral or a fixed pivot) are pivoted; in its turn, the mounting section is secured to the door frame by means of screws.

[0009] In this regard, it is now appropriate to refer to Fig. 1, which shows an example of a variable-fulcrum hinge in accordance with the current state of the art: it can be seen that both the articulated quadrilateral (hinge) and the curved arm with the respective counterspring (guide means) are pivoted to the mounting section, which is secured to the door frame upright by means of a fastening screw; on the side farther from the oven muffle, the upright is closed by a trimming cover, which is typi-

cally secured thereto through suitable joints.

[0010] Likewise, in the case of a fixed-fulcrum hinge (not shown), both the spring and the straight arm will be pivoted to a mounting section, which will then be secured to the door frame structure by means of screws.

[0011] If on the one hand the mounting section allows the hinge and the guide means to be assembled together and then secured to the door by means of screws, on the other hand it suffers from a few drawbacks.

[0012] First of all, the forces acting upon the hinge (which are determined by the non-negligible weight of the door) are discharged onto the door frame through just a few fastening screws (even just one screw, as shown in Fig. 1), which therefore must be sized appropriately to withstand the stresses caused by the repeated opening and closing of the door during the whole life of the oven; in this respect, it should be noted that the number of fastening screws is normally kept as small as possible in order to facilitate the installation of the hinge on the frame.

[0013] Moreover, when only one fastening screw is used, should it come off, the section would detach from the frame, resulting in the door falling down.

[0014] A further drawback is determined by the fact that both the hinge and the guide means are housed in the same mounting section and are not therefore easily accessible: should the hinge or the guide means fail, it will be necessary to replace both by removing the section from the frame; the rather easy replacement procedure is thus counterbalanced by the fact that also properly operating parts must necessarily be replaced along with the defective one.

[0015] Yet another drawback is caused by the fact that the door upright, in order to withstand the loads transferred thereto by the hinge while at the same time housing it, is often manufactured as shown in Fig. 1, i.e. in the form of a "C" or "U" member having a square cross-section with an open side: in fact, the trimming cover does not normally perform any structural tasks, except for acting as a stop for holding the door glass pane in position; it follows that substantially all the load is carried by the upright sections, which must therefore be sized appropriately.

[0016] The technical problem at the basis of the present invention is to provide a household oven door having such structural and functional features as to overcome the aforementioned drawbacks.

[0017] The solution to this problem is to eliminate the mounting section and to pivot both the hinge and the guide means directly to the upright of the frame structure of the oven door; to this end, the upright is manufactured by using a tube having a substantially square or rectangular cross-section.

[0018] In addition to preventing any problems related to the presence of the hinge mounting section in prior-art solutions, this also improves the section modulus without increasing the dimensions of the upright, while preventing any deformation thereof.

[0019] The frame may be made of metal (aluminium, painted sheet-steel, stainless steel or the like), thermo-setting plastic material or the like.

[0020] It may also be obtained by welding, screwing or riveting together several section pieces, or by coupling together shell-wise two rectangular masks, thus obtaining the actual frame; the masks may be made of plastic or metal and, for example, they may be manufactured in the form of drawn panels.

[0021] Further advantageous features of the oven door are set out in the appended claims. These features as well as further advantages of the present invention will become apparent from the following description of an embodiment thereof as shown in the annexed drawings, which are supplied by way of non-limiting example, wherein:

Fig. 1 is an exploded view of an upright and a hinge according to the prior art;

Fig. 2 schematically shows an oven with its door;

Fig. 3 is a top view of the frame of the door of Fig. 2;

Fig. 4 is an exploded view of a two-piece upright according to the present invention with a variable-fulcrum hinge;

Fig. 5 is an exploded view of a one-piece upright according to the present invention with a variable-fulcrum hinge;

Fig. 6 shows the upright and the hinge of Fig. 4 with a guide means comprising a toothed curved arm;

Fig. 7 shows the upright and the hinge of Fig. 5 with a guide means comprising a toothed curved arm;

Fig. 8 is an exploded view of a two-piece upright according to the present invention with a fixed-fulcrum hinge;

Fig. 9 is an exploded view of a one-piece upright according to the present invention with a fixed-fulcrum hinge;

Fig. 10 is a sectional view of a fixed-fulcrum hinge.

[0022] Referring now to Fig. 2, there is shown an oven comprising a muffle 1 that contains a heated chamber 2 which can be closed in front by means of the door 3, which comprises a thermal glass pane 4 that allows to visually check the foods being cooked in the chamber 2; the door 3 is shown in the open condition, and closes the chamber by rotating in the direction indicated by the arrow.

[0023] For this purpose, the door 3 is equipped with per se known hinges like those described above, whether having a fixed or variable fulcrum, which are typically mounted on both sides of the door 3.

[0024] The door 3 has a perimetric frame 13, shown schematically in Fig. 3, which consists of two side uprights 14, 15 joined together by two crosspieces 16 and 17, thus forming a substantially rectangular frame with a housing 40 for the glass pane 4.

[0025] In this regard, it should be pointed out that the side uprights and the crosspieces are section pieces

screwed, riveted or welded together to form the frame structure; alternatively, they may belong to a frame structure obtained from two rectangular masks with a centre hole (for providing the housing 40 for the glass pane 4) coupled together shell-wise, so that assembling the door frame becomes extremely quick and easy. In accordance with the teachings of the present invention, the side uprights 14 and 15 are boxed channels having a substantially square or rectangular cross-section, to which both the hinge and the guide means are pivoted; as will be described more in detail hereafter, the uprights may be obtained by using two different solutions: in two pieces 154 or in one piece 155.

[0026] More specifically, with reference to the embodiment of Fig. 4, the upright 154 can be broken up into two parts 15A and 15B, which are assembled together by interference fit. The variable-fulcrum hinge 7 comprises two arms 7A and 7B connected to the lever 7C, which is linked to the oven muffle 1 (in a known manner), thus allowing the door to rototranslate; the guide means consists of the curved arm 8 that cooperates (in a known manner) with the counterspring 9 for the purpose of adjusting the door opening speed.

[0027] It should be noted that the arms 7A and 7B, the free end of the spring, and the curved arm 8 are all directly pivoted to the second upright part 15B by means of the pins 30, 31, 32 and 33, respectively. The latter are inserted into respective holes obtained in the two fins 15B' and 15B'' of the second upright part 15B; the latter has a "C" cross-section to be coupled to the first part 15A, also having a "C" cross-section and featuring two fins 15A' and 15A'' that are coupled by interference fit to the fins 15B' and 15B'', thereby forming the square tube of the upright 154.

[0028] In the case of the above-described two-piece upright, it is appropriate to clarify that the two pieces may be each belong to a respective mask, so that the actual frame structure is obtained by joining both masks together; in this respect, it is worth mentioning that the crosspieces as well are divided into two parts, one belonging to a mask and the other belonging to the other mask, which are coupled together to produce the closed frame.

[0029] It should also be noted that the first part 15A of the upright 154 has a side fin 15A''' extending towards the frame aperture 40, thus acting as a locator for the glass pane 4 of the door.

[0030] The pins 30, 31, 32 and 33 are simple cylindrical pins to be riveted after having been inserted into the respective holes, thus being held in position.

[0031] In this case, the assembly procedure requires that the hinge and the guide means are first secured to the second upright part 15B, and then the first upright part 15A is coupled to the second part 15B to form the two-piece upright 154.

[0032] Thus, advantageously, the forces acting upon the pins are discharged directly onto the door frame; in this regard, it should be observed that, while the fastening screws used in the prior art as shown in Fig. 1 are subject

to traction, the pins applied directly to the upright discharge the forces onto both side fins 15B' and 15B" of the second upright part 15B, which are further strengthened by their interference fit with the fins 15A' and 15A" of the first upright part 15A, resulting in a stronger overall structure.

[0033] Typically there will be one hinge per side upright, so that the door is linked to the muffle through two hinges (one per side); as far as the guide means are concerned, it is conceivable to use only one of them (applied to either upright), but for force balance reasons two guide means are recommended, i.e. one per side upright 14 and 15. Furthermore, the pins 30, 31, 32 and 33 may be substituted with screws or threaded pins, thus making it easier to replace any broken parts of the hinge or guide means: in such a case, in fact, the pin that secures the defective part can simply be unscrewed and then the part can be replaced without having to replace the whole hinge and guide means (as required by prior-art solutions).

[0034] Many changes may then be made to this first embodiment shown in Fig. 4 while still implementing the idea of eliminating the mounting section and pivoting the hinge and guide means directly to the upright, which to this end is provided in the form of a boxed tube having a substantially square or rectangular cross-section.

[0035] For example, according to an alternative embodiment the upright 155 is manufactured in one piece, as shown in Fig. 5: in this case, the pins 30, 31, 32 and 33 are inserted in holes provided on the two opposite sides of the square-section upright; the assembly procedure will thus require that the hinge and guide means be inserted into the upright from below and then secured through the pins 30, 31, 32 and 33, which shall then be riveted in position.

[0036] In this case as well, it is worth mentioning that the riveted pins may be replaced with screws or threaded pins which will make the hinge and guide means more easily disassemblable.

[0037] Likewise, it is conceivable to use a guide means driven by an electric motor (per se known) and comprising for this purpose a toothed curved arm 80, as shown in Figs. 6 and 7, wherein the same reference numerals designate the same parts, which will not be described any further for simplicity's sake.

[0038] In this respect, it will be sufficient to point out that in Fig. 6 the upright 154 consists of two parts 15A and 15B which are assembled together by interference fit, thus forming an upright having a substantially square cross-section, whereas in Fig. 7 the upright 155 is manufactured as one piece. The upright 14 may be provided in the same manner.

[0039] While Figs. 4 to 7 illustrate different embodiments of a variable-fulcrum hinge, Figs. 8 and 9 show two embodiments of a fixed-fulcrum hinge 70, a detailed sectional view of which is provided in Fig. 10.

[0040] In this case, the simplest type of fixed-fulcrum hinge has been chosen as an example, which consists

of an L-shaped bracket 71 pivoted to the door frame through a pin 34.

[0041] The same reference numerals designate equivalent parts of a variable-fulcrum hinge, which parts will not therefore be described any further; it should suffice to point out that in this case the articulated quadrilateral made up of the lever and the arms 7A, 7B, 7C is replaced by the bracket 71, which has a hole for the pin 34 about which the door can rotate.

[0042] In addition, in this case the guide means consist of the arm 8' that holds in position the movable pin 38 with which the two countersprings 9' and 9" cooperate for the purpose of guiding the door opening movement through the roller 72, which discharges the force onto the bracket 71 by following the profile thereof as the door is being opened; to this end, the spring 9' is secured to the frame by means of the pin 32.

[0043] Likewise, the pins 34 and 32 are inserted into respective holes in the upright, thus staying pivoted to the latter.

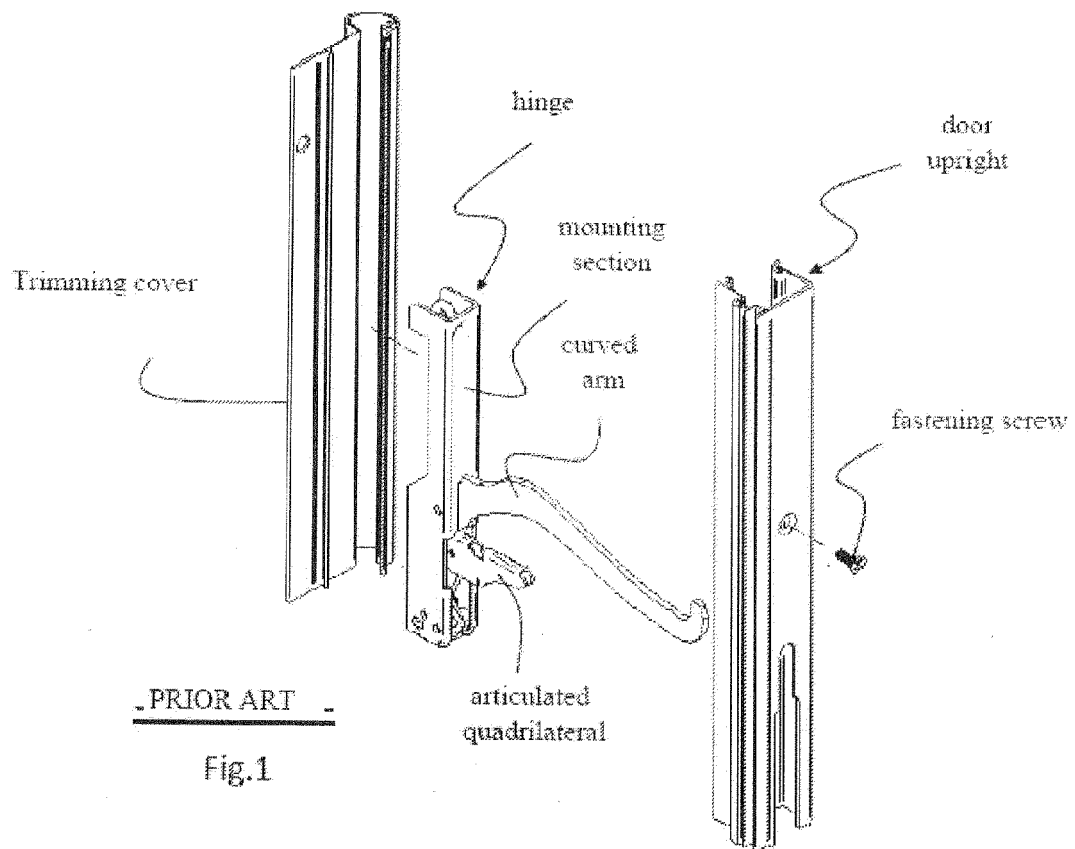
[0044] The solutions with a one-piece or two-piece upright, respectively illustrated in Figs. 9 and 8, are similar to those described previously; the pins 32 and 34 may be screwed into the upright in this case as well.

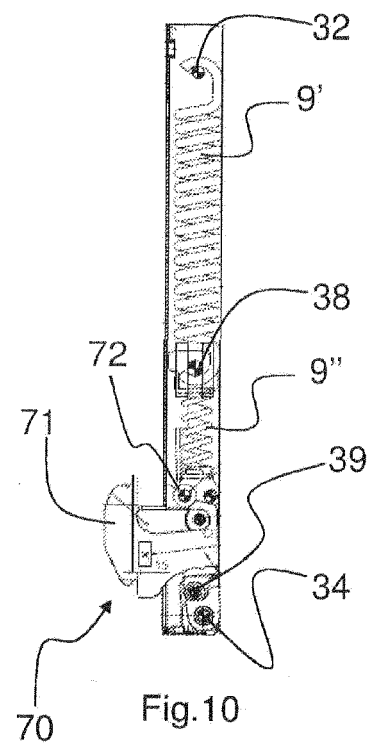
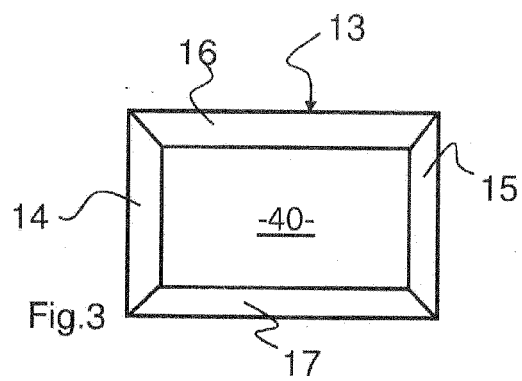
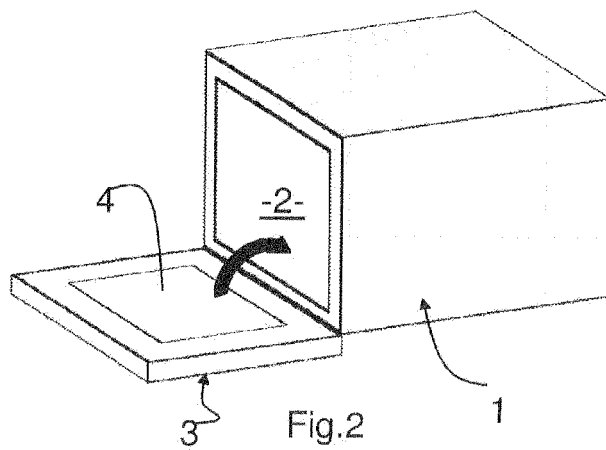
[0045] It is worth underlining that the use of a frame structure obtained from two coupled masks (as described above), wherein both the hinge and the guide means are pivoted to the uprights thereof, offers significant advantages in terms of short assembly times. Furthermore, when the uprights or the entire frame are made of plastic (of a type capable of withstanding the thermal load involved in the application thereof to an oven door frame, of course), an additional production advantage is attained because the pin holes are easier to drill. Furthermore, when the frame is obtained from two hollow rectangular masks, which are manufactured by moulding a plastic material and are then coupled together shell-wise, the glass pane can be integrated into the frame itself, e.g. by moulding one of the two masks over a thermal glass pane, thus shortening the production times even further: in such a case, in fact, after the glass pane has been positioned appropriately, a plastic overmoulding process can be carried to form one of the frame masks, after which the hinge and the guide means are secured to the frame by pivoting them directly into the holes previously made during the moulding step; the frame is then coupled shell-wise to the other mask, thereby obtaining a number of synergic advantages that result in a considerable reduction of the door production times.

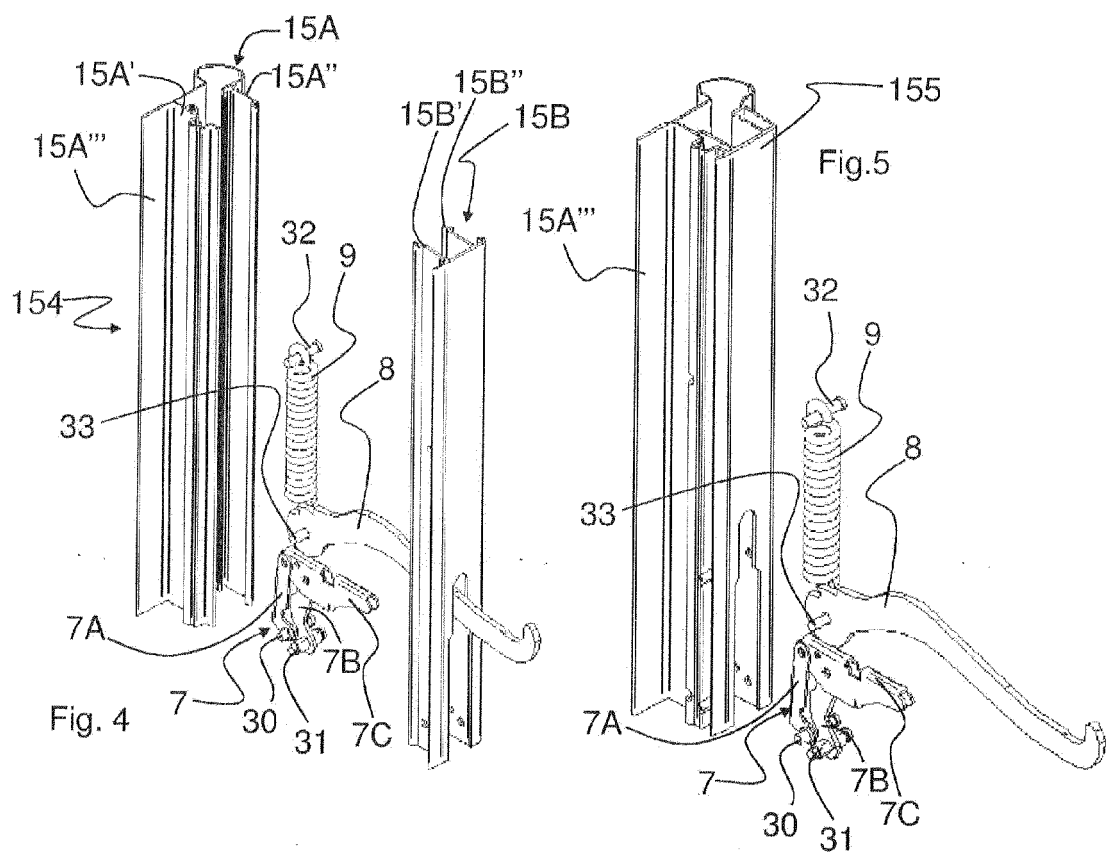
Claims

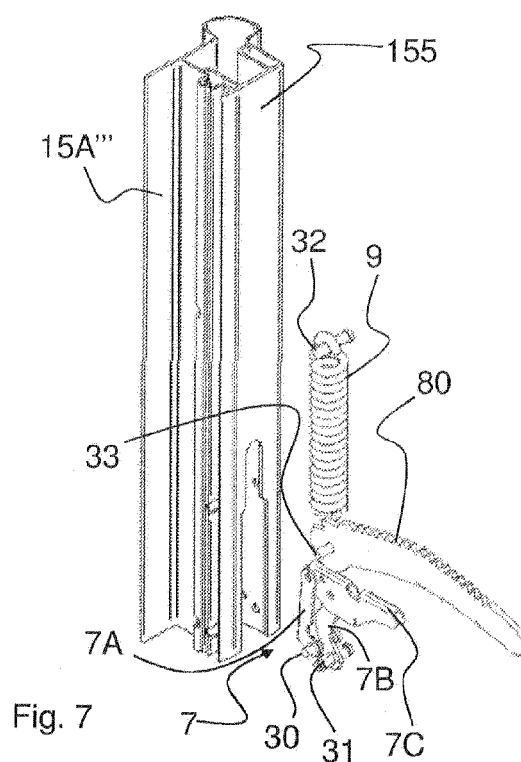
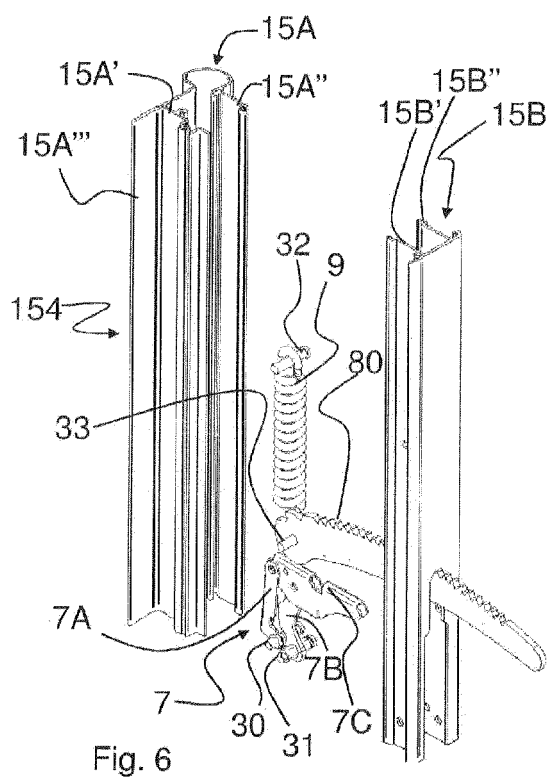
1. Door (3) for household ovens, of the type adapted to close an access opening of a heated chamber (2) of a muffle (1), comprising a frame structure (13) with which at least one hinge (7) adapted to allow the door (3) to turn when opening or closing the chamber

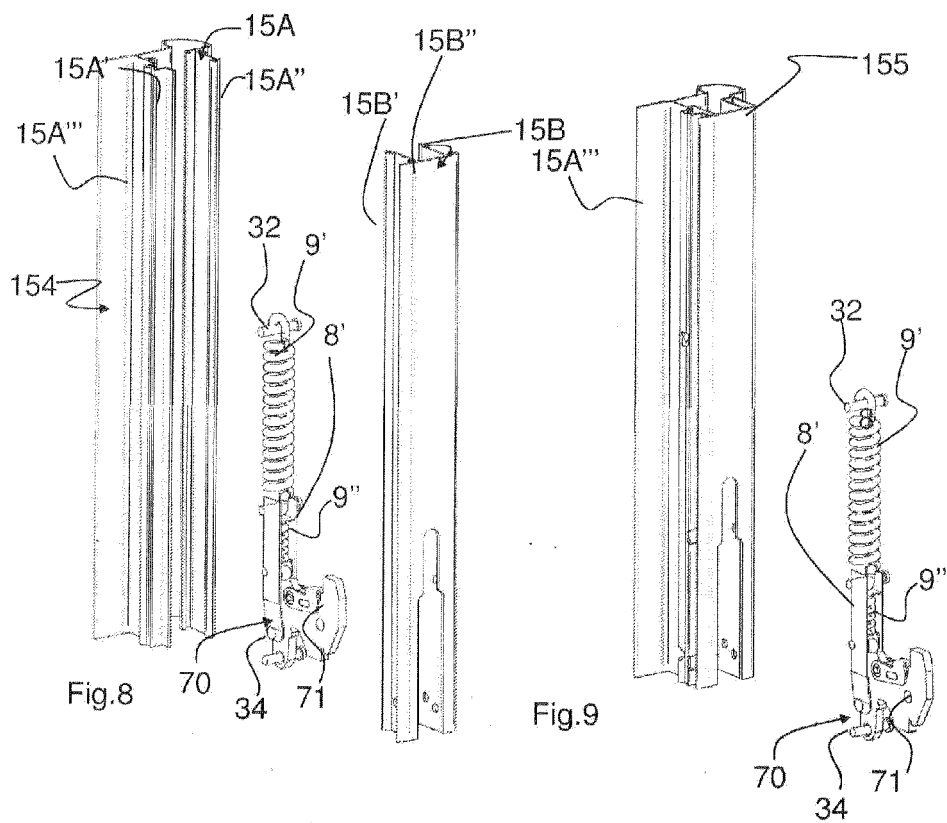
- (2) and at least one guide means (8,80,9,9',9",8') adapted to guide the turning door (3) are associated, wherein the hinge (7) and the guide means (8,80,9,9',9",8') are pivoted to the frame structure (13), **characterized in that** the frame structure (13) comprises two uprights (14,15,154,155) joined by two crosspieces (16,17), and wherein the hinge (7) and the guide means (8,80,9,9',9",8') are pivoted to each upright (14,15,154,155), wherein the door (3) comprises a glass pane (4) and the upright (154,155) further comprises a side fin (15A'') acting as a stop for said glass pane (4).
2. Door (3) according to claim 1, wherein each upright (14,15,154,155) has a hollow tubular cross-section.
 3. Door (3) according to claim 1 or 2, wherein the upright (155) is provided in one piece.
 4. Door (3) according to claims 1, 2 or 3, wherein the upright (154) is made up of a first part (15A) and a second part (15B) which can be associated with each other by interference fit.
 5. Door (3) according to claim 4, wherein the first (15A) and second (15B) parts of the upright (154) have a substantially C-shaped cross-section and comprise two fins each (15A',15A'', 15B',15B'') allowing the first and second parts to be coupled to each other by interference fit, and wherein the hinge (7) and the guide means (8,80,9,9',9",8') are pivoted to the fins (15B',15B'') of the second upright part (15B).
 6. Door (3) according to any of the preceding claims, wherein the hinge is a variable-fulcrum hinge (7) that comprises an articulated quadrilateral having two arms (7A,7B) connected to a lever (7C) linked to the oven muffle, thus allowing the door (3) to rototranslate.
 7. Door (3) according to claim 6, wherein the arms (7A,7B) are pivoted to the upright by means of respective pins (30, 31) inserted into matching holes in the upright (14,15,154,155).
 8. Door (3) according to any of claims 1 to 7, wherein the hinge is a fixed-fulcrum hinge (70) that comprises a bracket (71) with a pin (34) housed in the upright and pivoted thereto, thus allowing the door (3) to rotate.
 9. Door (3) according to any of the preceding claims, wherein the guide means comprises a curved arm (8,80) that cooperates with a counterspring (9) to adjust the door opening speed, and wherein the spring (9) and the curved arm (8,80) are pivoted to the upright through respective pins (32,33) inserted into matching holes in the upright (14,15,154,155).
 10. Door (3) according to any of claims 1 to 8, wherein the guide means comprises an arm (8') that holds in position a movable pin (38) with which two countersprings (9',9'') cooperate for the purpose of guiding the door opening movement through a roller (72) acting upon the bracket (71), and wherein one spring (9') is secured to the frame through a pin (32) and the arm (8') is secured to the bracket (71).
 11. Door (3) according to claim 7, 8, 9 or 10, wherein said pins (30,31,32,33,34) are secured in the respective holes through a threaded connection.
 12. Door (3) according to any of claims 8 to 11, wherein the curved arm (80) has a toothing which allows it to be driven by a toothed wheel, a chain or the like, so that the door can be opened or closed by means of an electric motor.
 13. Door (3) according to any of claims 8 to 11, wherein the frame structure is manufactured by coupling together shell-wise two rectangular moulded plastic masks comprising a housing for the glass pane.













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Application Number
EP 14 19 9884

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 19 May 2015	Examiner Merkt, Andreas
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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