

Description**Technical Field of the Invention**

5 **[0001]** The present invention relates to a mechanism added to doors of different weights, which allows, by means of a movable pin, adjustment of the torque of a hinge in accordance with the weight of the door, without the need for replacement of the whole the door or the hinge.

10 **[0002]** The present invention particularly relates to a hinge, which allows increasing or decreasing the force of a hinge spring in accordance with the weight of the door, by means of the back-and-forth and up-and-down movement of the pin system comprised therein, without the need for replacement of the whole hinge.

State of the Art

15 **[0003]** An example of a conventional cooker is described in the Korean Patent Application numbered KR20050060560, and comprises a body having a cooking chamber, a door hinged to the cooking chamber for opening and closing the cooking chamber, and a handle.

20 **[0004]** The doors of the ovens have a hinged structure by means of the spring hinges found on both sides. The spring found in the hinges has a force. Said spring determines the force at which the door opens and closes, and the pressing force of the door to the seal which is the tightness element. Furthermore, it has a direct effect on the factors such as keeping the oven door fixed at certain angles in line with specific customer requests. In the application No. CN201915739 (U), a plurality of pins and two springs are arranged in a groove of the oven door hinge and the door of the furnace is maintained at an optional angle in a range from 0° to 90° degrees.

25 **[0005]** The furnaces that are used nowadays are closed cooking devices with a lid/door on the front part of the structure. Many novelties have been realized over time in accordance with the user demands regarding ovens. There are various ovens having different characteristics such as cooking more than one dish at a time, self cleaning, comprising an air curtain that doesn't give the inside temperature out, monitoring the recorded cooking time periods and temperatures. Studies being carried out nowadays are mostly focused on increasing the baking performance of ovens, meeting the demands of users in aesthetic terms and ensuring ease of use.

30 **[0006]** Doors of ovens, which have a vault type ceiling, a single opening at the front side that can be opened by a door, in which usually wood is burnt, and which is used for cooking bread, pastry products and similar food by forming equal level of heat at all sides, can be opened and closed in a controlled manner by means of hinges connected at both sides and comprising a spring in their structures. Said hinges comprise a body that is connected to the oven body or door, a bracket-like cam having a movable structure for allowing connection of this body with the oven door or body, and a spring allowing movement of the door. While the hinge body, also including said spring, is embedded and concealed within the door or the body to which it is connected, the cam is visible at the outer part. The spring found in the hinges has a force. Said spring is connected to the cam by means of a pin or a similar-structure component within the hinge body. During the opening and closing of the door, the cam moves and pushes or pulls the pin in the forward or backward direction. Said pin conveys this movement to the spring to which it is connected, in the form of tightening or loosening. Said pin, when pushed by the cam, applies pressure and tightens the spring, and when pulled, releases and loosens the spring. While loosening or tightening of said spring allows controlled movement of the door, it also determines the force at which the door opens and closes, and the pressing force of the door to the seal which is the tightness element. Said spring is selected based on the weight of the door to be used in the oven. If the door is heavier than the force that can be met by the spring, the door opening and closing operation is performed in an uncontrolled manner and the door does not work properly. On the other hand, if the force of the spring is stronger for the weight of the door, then users may have difficulty in opening and closing the door. Furthermore, it has a direct effect on the factors such as keeping the door fixed at certain angles in line with specific customer requests. Particularly, in order to be able to use the grill function, the oven door is required to be left open at a certain angle, and its position needs to be kept fixed during the cooking operation. Since replacement of the oven door hinges are made by expert service personnel, the spring or the hinge cannot be replaced by the user. In other words, the force of this spring to be used in the oven door hinge is determined together with certain characteristics of the spring during the manufacture of the oven and cannot be changed after production.

55 **[0007]** The movement of the hinge is limited by the movement of the hinge parts. The user may not fully understand the limits of the hinge movement when opening the oven door, and excessive force or pressure may be applied on the spring even though the spring of the hinge is completely open. Since there are ovens manufactured with different door weights and doors of different ovens have different weights, the hinges to be used in these ovens need to be adjusted according to the oven door weight. Otherwise, incompatibilities between the hinge used and the door become a problem for both users and manufacturers. The difference in the raw materials used in the production of ovens of the same weight may cause the difference in the pressing or pulling force on the production line to go beyond the calculated weight. For

the oven and oven door which are lighter or heavier than the anticipated weight, the hinge installed on the oven body or the oven door will be incompatible with the oven. When it is desired to open the door of the oven, the momentum of the door will be greater than the momentum of the hinge, in which case the furnace door will tend to open downwardly from the body of the oven. Conversely, if the momentum of the door is more than the momentum of the hinge, the oven door will tend to close to the oven main body when the oven door is open.

[0008] In the known status of the art, Patent Application No. US3712287 (A) relates to a spring hinge used in an oven door, wherein the oven door creates a torque while opening in order to ensure balance. An oven door hinge including a lever system that compresses the spring after opening of the door is disclosed.

[0009] These situations both cause an undesired situation for the user and also leads to production problems for the manufacturer; since, in the case of a hinge to be replaced, the door and the hinge mounted on the oven are required to be removed and a new hinge is required to be mounted according to the weight of the oven.

[0010] In conventional methods, the spring force (F_{spring}) of door hinges are constant and only changes linearly with regard to the stroke length (x) according to the below given Equation 1 (k , spring constant).

$$F_{spring} = -k * x \text{ (Equation 1)}$$

[0011] According to Equation 1, if the spring is a compression spring, then the length of the spring is reduced; or if the spring is a return spring, then the length of the spring is increased, and in these situations the spring force (F_{spring}) also changes.

[0012] The springs of the hinges used are selected according to the weight of the oven door. The doors apply a torque to the axis of rotation due to their own weight. The counter-torque to meet this torque is provided by the hinge springs. For any rotational component, a certain torque can be defined depending on the force (multiplication of the mass with the acceleration of gravity) and the lever arm.

[0013] The torque (τ) is calculated as shown in equation 2. Here, r represents the force arm and F represents the rotational component force.

$$\tau = r \times F \text{ (Equation 2)}$$

[0014] Depending on the rotational movement of an oven door during opening and closing, the torque of the oven door and the hinge are calculated as shown in Equation 3 and Equation 4.

$$\tau_{door} = G * \sin \theta * L_{door} \times 9.806 \text{ (Equation 3)}$$

$$\tau_{hinge} = F * \sin \beta * L_{hinge} \text{ (Equation 4)}$$

T door: Door momentum

T hinge: Hinge momentum

G: Door Weight

θ : Door Rotation Angle

β : Hinge Rotation Angle

β : Hinge Rotation Angle

F: Hinge Force

L door: Oven door length

L hinge: hinge length

[0015] Meanwhile, the hinge torque is provided by the spring(s) of the hinge. To keep the oven door fixed at a certain

angle, the hinge mechanism and the associated spring(s) must apply the same numerical torque value with regard to the door weight.

[0016] The Oven Door Balance Equation is shown in Equation 5; where M is the oven door weight, T_{door} is the door torque, and T_{hinge} is the hinge torque.

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$$\sum M = T_{\text{door}} - T_{\text{hinge}} = 0 \text{ (Equation 5)}$$

[0017] It can be seen from Equation 5 that, due to the fact that the hinge is fixed, the hinge with the same torque cannot be used when the weight of the door changes.

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[0018] For this reason, if the same hinge is used on the oven doors of different weights, the aforementioned oven door will spontaneously close or fall down towards the floor. In order to avoid this situation, since spring forces cannot be changed after the production, spring hinges with different forces for the oven doors of different sizes and weights have to be produced or hinges used should be replaced. However, this is a disadvantage in terms of quality, production and ergonomics.

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[0019] The adjustable hinge structure according to the invention is developed in order to eliminate incompatibilities caused by the oven door and hinge weights and spring forces exceeding the tolerance level, and production problems encountered during production of ovens in the white appliance sector as a result of using hinges of different spring forces and oven doors of different weights, and by means of this developed hinge, it can be manufactured continuously, and can be mounted on ovens with different sizes and weights.

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[0020] To solve this problem, a new hinge system has been designed in which the nominal size of the spring can be changed.

Purpose of the Invention

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[0021] The purpose of the invention is to use oven doors of all sizes and weights by means of a new hinge mechanism in which the nominal size of the spring can be changed.

[0022] Another purpose of the invention is to provide an increase and decrease of the force of the hinge spring as required by a new hinge mechanism in which the nominal size of the spring can be changed.

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[0023] Another purpose of the invention is to provide the numerical application of the same torque value to the hinge mechanism and the respective springs due to the door weight to keep the door fixed at a certain angle by means of a new hinge mechanism in which the nominal size of the spring can be changed.

[0024] Another purpose of the invention is to provide a means of eliminating the need to replace the hinge with the change of the door weight due to the change in the nominal length of the spring in the hinge mechanism.

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[0025] The structural and characteristic features of the invention and all of its advantages shall be understood better with the figures and the detailed description given below in reference to the figures, and therefore, the assessment should be made by taking into account the said figures and detailed explanations.

[0026] Another purpose of the invention is to control and adjust the spring force in the developed hinge mechanism by eliminating the need to produce hinges separately for each oven door weight, thus providing a single hinge mechanism to be installed on different furnace doors, thereby providing an advantage in terms of production, quality, and ergonomics. Another purpose of the invention is to enable the adjustment of the preloading values of the return spring by means of the adjustment pin which is attached to the hinge mechanism.

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[0027] Another purpose of the invention is to enable the adjustment pin to be connected to the return spring by means of the pin attached to the hinge mechanism.

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[0028] Another purpose of the invention is to provide balancing and facilitate back and forth movement of the adjustment pin by means of the compression spring positioned in the hinge mechanism.

[0029] Another purpose of the invention is to enable the adjustment of the up and down movement of the adjustment pin by means of a second spring which is positioned in the hinge mechanism and which is smaller than the compression spring.

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[0030] Another purpose of the invention is to provide an easy and balanced movement of the adjustment pin in the back-and-forth direction by means of the housing positioned at the top of the body of the hinge mechanism.

[0031] Another purpose of the invention is to ensure, if the hinge force in the hinge mechanism is inadequate or more than required, that the oven door can be kept fixed at the desired position by eliminating the problems of falling down or not being able to keep the oven door at a fixed position.

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[0032] Another purpose of the invention is to ensure fixing the position of the adjustment pin in order to increase or decrease the preloading value of the return spring by means of the holes positioned in the hinge mechanism.

[0033] Another purpose of the invention is to reduce the return spring preloading value by means of loosening the return spring as a result of pulling and shifting the adjustment pin found in the hinge mechanism when its hinge force is

more than required, and thus ensuring keeping the oven door fixed.

Brief Description of the Figures

5 **[0034]** For better understanding of the embodiment of the present invention and its advantages with its additional components, it should be evaluated together with below described figures wherein;

Figure 1; is a schematic general view of the hinge mechanism,

10 **Figure 2;** is a schematic general view of the mounted state of the hinge mechanism to the oven door,

Figure 3; is a schematic general view of the hinge mechanism from below.

Reference Numbers

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[0035]

- 10. Hinge
- 10'. Hinge body
- 20 11. Cam connection
- 12. Return spring
- 121. Return spring hook
- 13. Adjustment pin
- 14. Connecting pin
- 25 15. Pin
- 16. Compression spring
- 17. Spring
- 18. Holes
- 19. Slot
- 30 20. Body
- 30. Door

Description of the Invention

35 **[0036]** In this detailed description, the hinge (10) according to the invention which allows adjustment of the torque of product doors (30) of different weights are only described illustratively for better understanding of the topic and without forming any limitation.

[0037] The invention relates to a hinge mechanism (10) which can be used for any product having a body and a hinged door. Said hinge (10) and its components are possible to be used in products of different weights and sizes.

40 **[0038]** With the hinge (10), gradual and/or angular opening of a hinged door (30) according to user needs is ensured in order to reach the main body (20) and the interior chamber of this body (20) of products having an interior chamber, and the door can be kept at the opened position and angle, and the force of the return spring (12) can be adjusted by changing the nominal length of the return spring (12) by means of the hinge mechanism (10) in accordance with the weight of the product door (30).

45 **[0039]** The hinge mechanism (10) is mounted to the body (20) or the door (30) according to the product to be used. If the hinge (10) is mounted to the body (20), mounting of the cam connection having a movable connection mechanism is made with the door (30). If the hinge (10) is connected to the door (30), mounting of the cam connection with a movable connection mechanism is made to the body (20).

50 **[0040]** In Figure 1, general view consisting of the hinge body (10') and the hinge (10) is given, wherein the cam connection (11) is mounted to the door (30) if the hinge body (10') is mounted on the body (20). Similarly, if the hinge body (10') is mounted to the door (30), then the cam connection (11) is mounted to the body. Figure 2 shows the hinge body (10') mounted to the product body (20) and the cam connection (11) mounted to the door (30).

55 **[0041]** The cam connection (11) is connected to the fixed hinge body (10') by means of a pin or a similar connection apparatus, and it can perform rotational motion with regard to the product body (10') around the connection apparatus. At the hinge body (10'), a return spring (12) rotating the door (30) to the desired position during opening and closing of the door (30) is connected to the cam connection (11) by means of a cam connecting pin (14). On both ends of the return spring (12), return spring hooks (121) are found in a single piece form with the spring. By means of the return spring hooks (121), the return spring (12) is connected to the connecting pin (14) at one end and to the pin (15) at the other end.

[0042] The hinge (10) shown in Figure 1 allows the return spring (12) force to be increased or decreased in accordance with the need, by positioning of the adjustment pin (13) comprised therein at the front or at the back. Said hinge (10) comprises a cam connection (11) for allowing opening and closing of the door (30) by being connected to the door (30) or the body (20), a connecting pin (14) connected at one end to the cam connection (11) and at the other end to the return spring (12), a return spring (12) allowing opening and closing of the door (30), a pin (15) connected to this return spring (12) and in which an adjustment pin (13) moves, the adjustment pin (13) which allows adjustment of the return spring (12) and which can make back-and-forth and up-and-down movement, and a compression spring (16) allowing balanced back-and-forth movement of this adjustment pin (13). On said adjustment pin (13), a spring (17) is also positioned, which has a smaller structure than the compression spring (16), and which ensures balanced up-and-down movement of the adjustment pin (13).

[0043] The hinge (10) shown in Figure 2 comprises a return spring (12) which allows the door (30) to be rotated to the desired position, or in other words, allows the door (30) to be opened and closed. In order to adjust the preloading values of said return spring (12), an adjustment pin (13) is positioned, which is connected to the return spring (12) by means of the pin (15) and allows changing the return spring (12) force by means of its back-and-forth and up-and-down movement. The return spring (12) is connected to the cam connection (11) by means of a connecting pin (14). The connecting pin (14) compresses or loosens the return spring (12) by being pushed or pulled by the cam connection (11) that moves together with the door (30) when the movable part of the hinge mechanism (10) is embedded in the body (20). When the movable part of said hinge mechanism (10) is embedded in the door (30), the cam connection (11) remains fixed at the body (20) to which it is connected, and the connecting pin (14) moves together with the product door (30). During this movement, the connecting pin (14) is stopped by the cam connection (11) which is fixed at the body (20), or in other words, the movement of the connecting pin is restricted. As a result of being restricted, the connecting pin (14) applies pressure on the return spring (12) or loosens the same via pulling. The adjustment pin (13) is connected to the return spring (12) by means of the pin (15), and in order to balance and facilitate the horizontal axis back-and-forth movement and the vertical axis up-and-down movement of the adjustment pin (13), a second spring (17) with a smaller structure is positioned on the adjustment pin. The adjustment pin (13) shown in Figure 13 performs its back-and-forth movement within the housing (19) formed at the upper part of the hinge mechanism (10). Said adjustment pin (13) performs its up-and-down movement by going through the holes (18) formed at the lower part of the hinge mechanism (10).

[0044] The hinge (10) eliminates the problems of the movement of the door (30) if the hinge force is inadequate or more than required. In cases where the hinge (10) force is inadequate, the door (30) cannot be kept fixed and it has a tendency to fall downwards. This is because the momentum of the door (30) is greater than the momentum of the hinge (10). In order to keep the door (30) fixed in the desired position and to prevent it from falling down, the adjustment pin (13) is pulled upwards on the vertical axis and is shifted back and forth in the horizontal axis to tighten the return spring (12). The small holes (18) below the hinge (10) ensures fixing the position of the adjustment pin (13) in the horizontal axis in order to increase the preloading value of the return spring (12). Therefore, after the adjustment pin (13) is pulled forward and thus the return spring (12) is tightened, the adjustment pin (13) is then fitted into one of the holes (18) that correspond to its position so that loosening of the return spring (12) can be prevented. In this way, the hinge force is increased and the door (30) is kept fixed at the desired position. In cases where the hinge (10) force is more than required, the product door (30) cannot be kept fixed and tends to close. In order to prevent the product door (30) from being closed spontaneously and to keep the door fixed at the desired position, the adjustment pin (13) is pulled upwards in the vertical axis and moved backwards in the horizontal axis so that the return spring (12) can be loosened. Loosening of the return spring (12) causes weakening of the return spring (12). Again, with the aid of the small lower holes (18), the position of the adjustment pin (13) in the horizontal axis is fixed. Therefore, after the adjustment pin (13) is pushed backward and thus the return spring (12) is loosened, the adjustment pin (13) is then fitted into one of the holes (18) that correspond to its position so that tightening of the return spring (12) can be prevented. As a result, the return spring (12) is loosened so that its preloading is reduced, and the product door (30) is prevented from closing spontaneously and kept fixed at the desired position.

[0045] The present invention hinge (10) can be mounted on various kinds of products having hinged doors (30) used in various fields, and preferably it is used in cooking groups, cooler groups, industrial or domestic type cabinets, and especially in ovens.

Claims

1. A hinge (10) allowing adjustment of the torque of doors (30) of different weights, **characterized in that**; it comprises an adjustment pin (13) which allows increasing or decreasing of the return spring (12) preloading values, and thus the force thereof, by being positioned at the front or back.
2. Hinge (10) according to Claim 1, **characterized in that**; it comprises a pin (15) connecting the adjustment pin (13)

to the return spring (12).

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3. Hinge (10) according to Claim 1, **characterized in that**; it comprises a compression spring (16) which ensures balancing and facilitating the backward and forward movement of the adjustment pin (13).

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4. Hinge (10) according to Claim 1, **characterized in that**; it comprises a spring (17) which ensures balancing and facilitating the upward and downward movement of the adjustment pin (13).

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5. Hinge (10) according to Claim 1, **characterized in that**; it comprises a housing (19), in which the adjustment pin (13) performs its back-and-forth movement, and which is formed at the upper part of the hinge mechanism (10).

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6. Hinge (10) according to Claim 1, **characterized in that**; it comprises holes (18) formed at the lower part of the hinge (10), in which the adjustment pin (13) performs its up-and-down movement, and which ensure fixation of the adjustment pin (13).

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7. A hinge (10) for eliminating the problems encountered in the motion of the door (30) when the hinge (10) force is inadequate or excessive, and it is **characterized in that**; it comprises the process steps of:

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- if the hinge force is inadequate, pulling the adjustment pin (13) and sliding the same backwards in order to increase the hinge (10) force by tightening the return spring (12) so as to keep the door (30) fixed, and
 - if the hinge (10) force is excessive (more than required), pulling the adjustment pin (13) upward and then moving the same forward in order to attenuate and reduce the preloading of the return spring (12) so as to keep the door (30) fixed.
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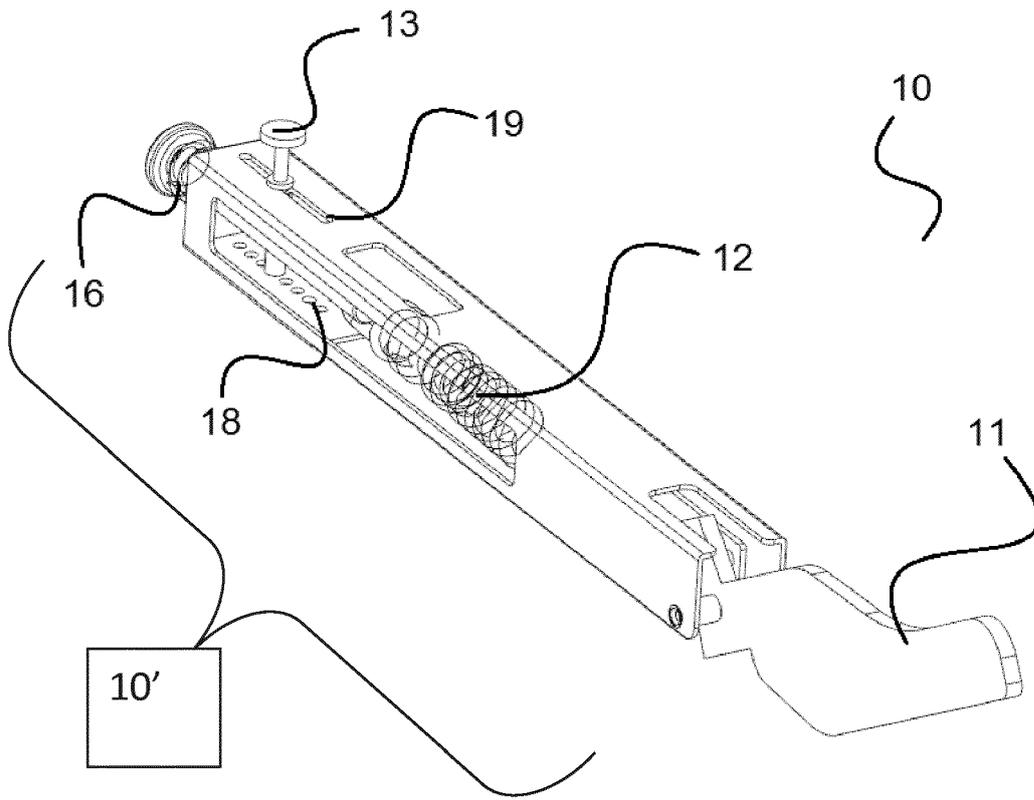


Figure 1

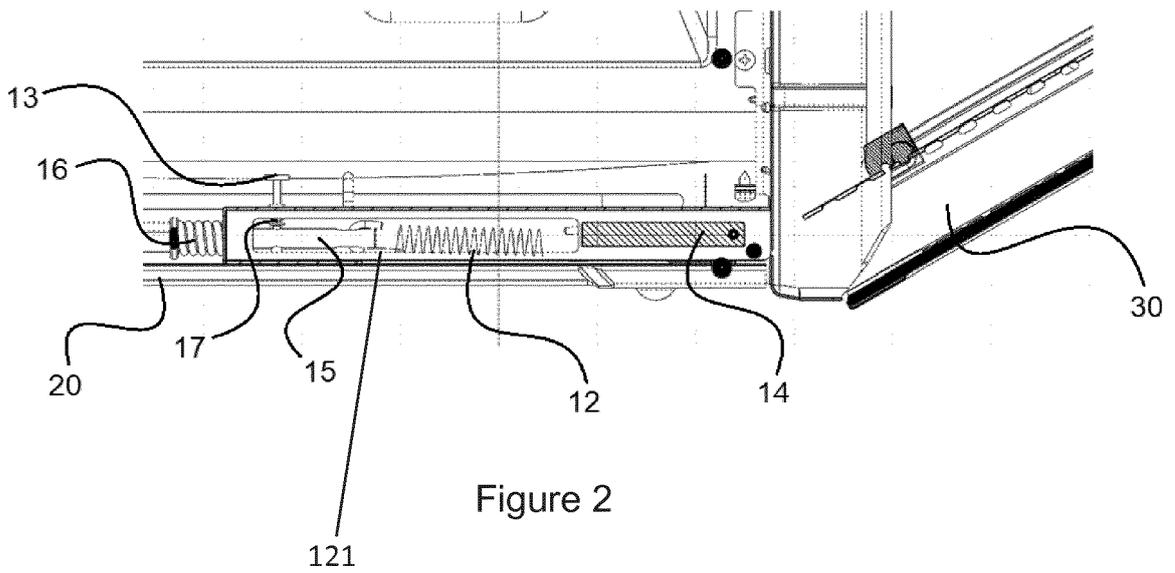


Figure 2

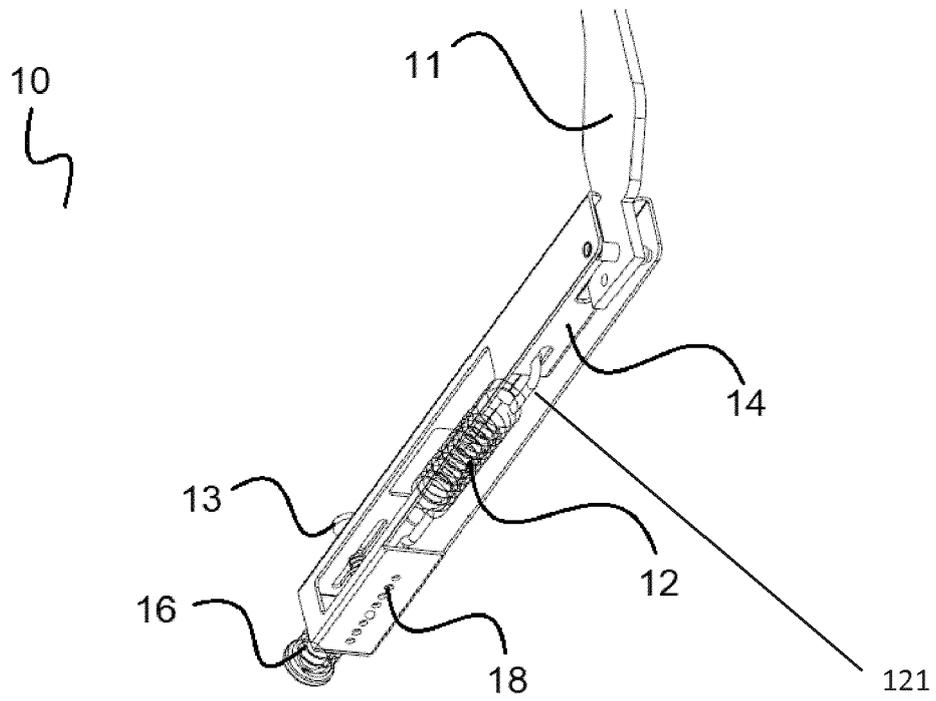


Figure 3



EUROPEAN SEARCH REPORT

Application Number
EP 19 17 1066

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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	CN 105 507 706 A (HU GUOHENG) 20 April 2016 (2016-04-20)	1,4,6,7	INV. F24C15/02 E05F1/12
Y	* paragraph [0035]; figures * -----	2,3,5	
X	GB 2 262 601 A (STOVES LTD [GB]) 23 June 1993 (1993-06-23) * figure 3 *	1,6,7	
Y,D	CN 201 915 739 U (N.N.) 3 August 2011 (2011-08-03) * figures *	2,3,5	
A	CN 107 630 614 A (WESTA ELECTRIC APPLIANCES CO LTD OF FOSHAN) 26 January 2018 (2018-01-26) * figure 4 * -----	1-7	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			F24C E05D E05F
Place of search		Date of completion of the search	Examiner
The Hague		8 October 2019	Verdoodt, Luk
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	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 19 17 1066

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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08-10-2019

10	Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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15	GB 2262601 A	23-06-1993	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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- CN 201915739 U [0004]
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