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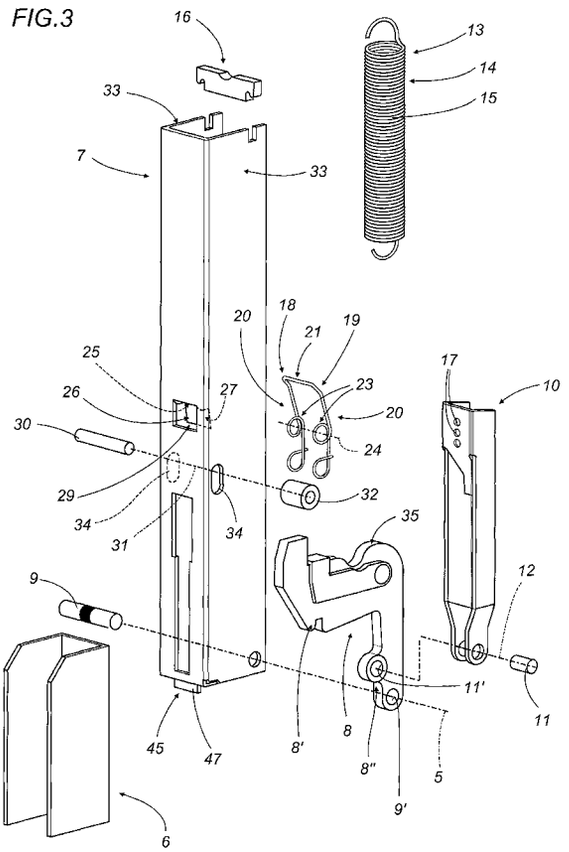
(54) A door hinge

(57) A hinge for oven doors comprising a first box-shaped structure fixed to the oven frame and a second box-shaped structure fixed to the door, a lever connecting the first and second structures which pivots on a pin integral with the lever and turns about the pin between an oven closed and an oven open position; the second structure comprising a spiral spring for adjusting door opening and able to generate a moment which opposes door opening and an elastic element, consisting of metal wire and U-shaped, whose middle portion is connected to the second box-shaped structure and supports, at the ends of the two arms, each comprising a bending spiral spring, a roller which slides on a cam profile of the lever, to generate a moment which facilitates door opening through an angle of given amplitude and prevailing over the first moment.

FIG.3



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Description

[0001] The present invention relates to a hinge for doors and in particular a hinge which can be used to attach the doors of electrical appliances, such as ovens, to the respective supporting structures.

[0002] Hinges of this type consist of two separate parts, both with a box-shaped structure and kinematically linked to one another.

[0003] More precisely, the first of these parts is fixed to the structure of the oven on one side of its rectangular opening, whilst the second part is fixed to one edge of the door, which in this way is rendered mobile, turning relative to the opening.

[0004] The above-mentioned first and second box-shaped structures are connected to one another by means of a lever, the end of a first arm of the lever being rigidly connected to the first box-shaped structure, whilst the end of a second arm of the lever is hinged to the second box-shaped structure by a pin.

[0005] As a result, during rotation of the door, in its direction of opening or the opposite, closing direction, the second box-shaped structure turns about the pin.

[0006] The second box-shaped structure also comprises part of the internal means for adjusting the door opening and, more specifically, means which, during door opening, first cause it to turn rapidly through an angle of given amplitude and then to open gradually at a slow rate, countering the weight of the door itself, until it is completely open.

[0007] These internal adjusting means, of the known type, comprise a rod mounted inside the second box-shaped structure. The bottom of the rod is connected, by a second pin, parallel with the pin for rotation of the second box-shaped structure, to the second arm of the lever.

[0008] The internal adjusting means also comprise first elastic means which press the rod onto the second pin, generating a moment of force relative to the first pin which is transmitted through the rod and the second box-shaped structure to the door in such a direction that it opposes door opening, that is to say, tending to make it turn about the first pin in the opposite direction to that of door opening.

[0009] The internal means also comprise second elastic means designed to generate a second moment of force which, during the initial steps of door opening, opposes the first moment of force and overcomes it so that the door performs a rapid opening movement through the above-mentioned angle of given amplitude.

[0010] More precisely, the second elastic means consist of a spiral spring slidably wound about a spindle and located between a stop tab integral with the second box-shaped structure and a projection on the spindle.

[0011] One end of the spindle supports a third pin with an axis parallel with the axes of the above-mentioned first and second pins and whose opposite ends slide in a slot with given length made in the second box-shaped structure, being designed to guide and limit the pin stroke. An idle roller is mounted on the third pin. When the door is closed and during the initial steps of door opening, the idle roller rests on a cam profile made on the upper edge of the lever and is detached from the edge when the door has exceeded the above-mentioned angle of given amplitude.

[0012] During the step of contact between the roller and the cam, the spiral spring is compressed between the tab and the projection on the spindle.

[0013] As a result of this, the cam transmits, through the roller, the spindle, the spiral spring and the stop tab, the second moment of force to the second box-shaped structure and, therefore, to the door, which tends to make the door turn in its direction of opening.

[0014] However, in practice the connecting means for transmission of the second moment of force are relatively complex, as well as expensive with relation to their performance.

[0015] The aim of the present invention is to provide a hinge of the type described above which is free of the above-mentioned disadvantages.

[0016] Accordingly, the present invention fulfils this aim by providing a hinge for the doors or ovens or similar appliances with the characteristics described in claim 1.

[0017] The technical features of the present invention, in accordance with the above-mentioned aims, are set out in the claims herein and the advantages more clearly illustrated in the detailed description which follows, with reference to the accompanying drawings, which illustrate a preferred embodiment of the invention without limiting the scope of the inventive concept, and in which:

- Figure 1 is a schematic perspective view of an oven with a door attached to it by two hinges made in accordance with the present invention;
- Figure 2 is a schematic front view, partially in cross-section, of an embodiment of one of the two hinges illustrated in Figure 1, in several different operating conditions;
- Figure 3 is an exploded diagram of the hinge illustrated in Figure 2;
- Figure 4 is an enlarged plan view of a detail illustrated in Figure 2;
- Figure 5 is an enlarged schematic perspective view of another detail illustrated in Figure 2.

[0018] With reference to Figures 1, 2 and 3, the numeral 1 indicates as a whole an oven comprising a frame 2 to the bottom of which a door 3 is attached by two hinges 4 which allow it to turn about a horizontal axis 5.

[0019] As illustrated particularly in Figures 2 and 3, each of the two hinges 4 is a hinge made of a first box-shaped structure 6 fixed to the frame 2 of the oven 1, and a second box-shaped structure 7 fixed to the door 3. The two box-shaped structures 6 and 7 are kinematically linked by a lever 8, whose first arm 8' is rigidly attached to the first box-shaped structure 6 and whose

second arm 8'' is attached to the second structure 7, by a pin 9 passing through a hole 9' at the end of the second arm 8'' and coaxial with the axis 5. The second structure comprises a rod 10 positioned longitudinally inside the second structure 7 and connected at its lower end, by a pin 11 parallel with the pin 9 and passing in a hole 11' in a middle section of the second arm 8'' of the lever 8, to the latter, so that the rod 10 pivots about an axis 12 of the pin 11 passing through the hole 11' in the lever 8.

[0020] The second box-shaped structure 7 comprises first means 13 for adjusting the door 3 opening consisting of elastic means 14, in particular consisting of a spiral spring 15 substantially coaxial with the rod 10 and operating by traction, as described in further detail below, one end of which is connected to the upper end of the structure 7 by a crosspiece 16 while the other end is connected in a hole 17 in a side wall of the rod 10.

[0021] It must be noticed that the pins 9 and 11 do not move during door 3 rotation and therefore rotation of the second box-shaped structure 7 and during rotation in both directions, between a closed limit position and a fully open limit position, the second box-shaped structure 7 turns about the axis 5 of the pin 9 and the rod 10 turns about the axis 12 of the pin 11. As illustrated in Figures 2 and 3, the reciprocal positioning of the two pins 9 and 11 is such that during door 3 opening the spiral spring 15 is subjected to traction by the inner rod 10, generating a moment of force M1, anti-clockwise in Figures 2 and 3, relative to the axis 5, opposing door 3 opening to regulate the speed of door descent as it opens.

[0022] As illustrated in Figures 2, 3 and 4, the second box-shaped structure 7 also comprises second means 18 for adjusting door 3 opening, consisting of an elastic element 19, in particular U-shaped and made of metal wire. The element comprises two arms 20 and a middle portion 21. Each of the two arms 20 forms a bending spring 22 in particular consisting of a coil with an axis 24 substantially parallel with the middle portion 21 and with the axis 5 of rotation of the hinge 4.

[0023] The middle portion 20 of the elastic element 19 is connected to the bottom wall 25 of the second box-shaped structure 7 by engagement means 26 consisting of quick release coupling means 27. In particular, the means 27 comprise a tab 28 on the wall 25 and extending towards the spring 15 to create a seat 29 for the middle portion 21 of the elastic element 19.

[0024] The ends of the two arms 20 of the elastic element 19 are wound in a ring and support the ends of a pin 30 whose axis 31 is parallel with the axis 24 and on which a roller 32 is rotatably mounted.

[0025] On the opposing side walls 33, substantially normal to the bottom wall 25 of the second box-shaped structure 7 there are two slots 34 extending along a section with given length in a direction substantially parallel with the axis of the spiral spring 15. The slots are designed to receive the opposite ends of the pin 30 which supports the roller 32 designed to slidably engage with a given portion 35 of the upper edge of the lever 8 forming a cam profile whose function is described below.

[0026] In conditions in which there is contact between the roller 32 and the portion 35 of the upper edge of the lever 8, the coils 23 of the two bending springs 22 of the elastic element 19 are subjected to bending substantially about the axis 24, generating a moment of force M2 opposite to the moment M1, (clockwise in Figures 2 and 3), relative to the axis 5 of the second box-shaped structure 7 and so relative to the door 3, making the latter turn in its direction of opening.

[0027] The numeral 36 is used to label a door 3 quick locking/release device. The device 36, of a known type, operates between the door 3 and the frame 2 and, after each manual door 3 closing operation, can keep the door closed until the device 36 is manually activated, using a control push-button 37, eliminating any impediment to door 3 opening.

[0028] In practice, with reference to European patent EP 0 632 180,the disclosure of which is incorporated herein by reference, and starting with the door 3 in the closed condition illustrated in Figure 2, in which the roller 32 makes contact with the initial section of the portion 35 of the upper edge of the lever 8, after activation of the control push-button 37 the hinges 4 first cause a relatively rapid door 3 opening rotation covering a given angular travel, then a slowed gradual opening movement, until the door 3 is completely open.

[0029] More specifically, the initial, rapid opening step occurs thanks to the prevalence of the moment of force M2 generated by the elastic element 19 over the moment of force M1 generated by the spiral spring 15. This step ends when the roller 32 detaches from the portion 35 of the upper edge of the lever 8, that is to say, when the second box-shaped structure 7 reaches the position labelled 38. In this position the ends of the pin 30 supporting the roller 32 reach the end of stroke position along the respective slots 34 and the roller 32 loses contact with the portion 35 of the upper edge of the lever 8.

[0030] At this point the door 3, under the combined action of its weight which promotes its turning descent and the braking action caused by the moment of force M1 by the spiral spring 15 completes its opening step by gradually turning to the position labelled 39 in Figure 2.

[0031] As illustrated in Figure 5, to regulate the intensity of the moment M1 and consequently its braking action on the door 3, there are means 40 for adjusting the tension of the traction spring 15. These means 40 comprise screw adjusting means 41 for the point of attachment of one of the two ends of the spring 15. The screw 42 in the means 41 may be fixed at one end to a plate 43 which has a plurality of holes 44 for the attachment of the end of the spring 15. As illustrated in Figure 2 the lower end of the spring 15 can also be attached to one of the holes 17 in the rod 10 to adjust the spring 15 tension.

[0032] It should be noticed that, in order to facilitate

and speed up operations for the assembly of the hinge 4 on the door 3, the second box-shaped structure 7 has quick coupling means 45 designed to operate in conjunction with receiving means in a seat 46 in the door 3 to which the second structure 7 is fitted.

[0033] In particular, the quick coupling means 45 consist of a tab 47 facing the outside of the second box-shaped structure 7.

[0034] The invention described can be subject to modifications and variations without thereby departing from the scope of the inventive concept. Moreover, all the details of the invention may be substituted by technically equivalent elements.

Claims

1. A hinge for the doors of ovens or similar appliances, of the type comprising a first box-shaped structure fixed to the oven frame and a second box-shaped structure fixed to the door, a lever connecting the first and second structures, the second structure pivoting on a pin integral with the lever and turning about the pin between an oven closed position and an open position, the second structure comprising first and second means for adjusting door opening; the first means generating a moment of force which opposes door opening and the second means generating a moment of force promoting door opening through an angle of given amplitude and prevailing over the first moment, the hinge being **characterised in that** the second adjusting means comprise a U-shaped elastic element whose middle portion is connected by engaging means to the second box-shaped structure and supporting, at the ends of the two arms, a roller which slides on at least one cam profile integral with the first structure.

2. The hinge according to claim 1, **characterised in that** each of the two arms comprises a spring.

3. The hinge according to claim 2, **characterised in that** the spring is a bending spring.

4. The hinge according to claim 2 or 3, **characterised in that** the spring is a spiral spring with at least one coil with an axis substantially parallel with the middle section.

5. The hinge according to any of the foregoing claims from 1 to 4, **characterised in that** the elastic element consists of a metal wire.

6. The hinge according to claim 1, **characterised in that** the cam profile integral with first structure is a given portion of the upper edge of the lever.

7. The hinge according to claim 1, **characterised in that** the engagement means consist of quick release coupling means.

8. The hinge according to claim 7, **characterised in that** the coupling means comprise a tab on the base of the second part, extending towards the roller and with the base forming a seat which receives the middle section of the elastic means.

9. The hinge according to claim 1, **characterised in that** the ends of the arms support the roller by means of a pin whose axis is parallel with pin used for rotation of the hinge and whose ends are attached to the side walls of the second structure by means of two guide slots.

10. The hinge according to claim 1, **characterised in that** the first means for adjusting door opening comprise a traction spring.

11. The hinge according to claim 10, **characterised in that** the spring is a spiral spring whose first end is fixed to fixing means on the second box-shaped structure, the other end being fixed to the lever by means of an inner rod inserted between them.

12. The hinge according to claim 11, **characterised in that** it comprises means for adjusting the traction spring.

13. The hinge according to claim 12, **characterised in that** the adjusting means comprise screw adjusting means.

14. The hinge according to claim 12, **characterised in that** the adjusting means comprise a plate with a plurality of holes for attachment of the end of the spring.

15. The hinge according to claim 1, **characterised in that** the second box-shaped structure has quick coupling means designed to operate in conjunction with receiving means on a seat in the door which receives the second structure.

16. The hinge according to claim 15, **characterised in that** the quick coupling means consist of a tab facing the outside of the second box-shaped structure.

FIG.2

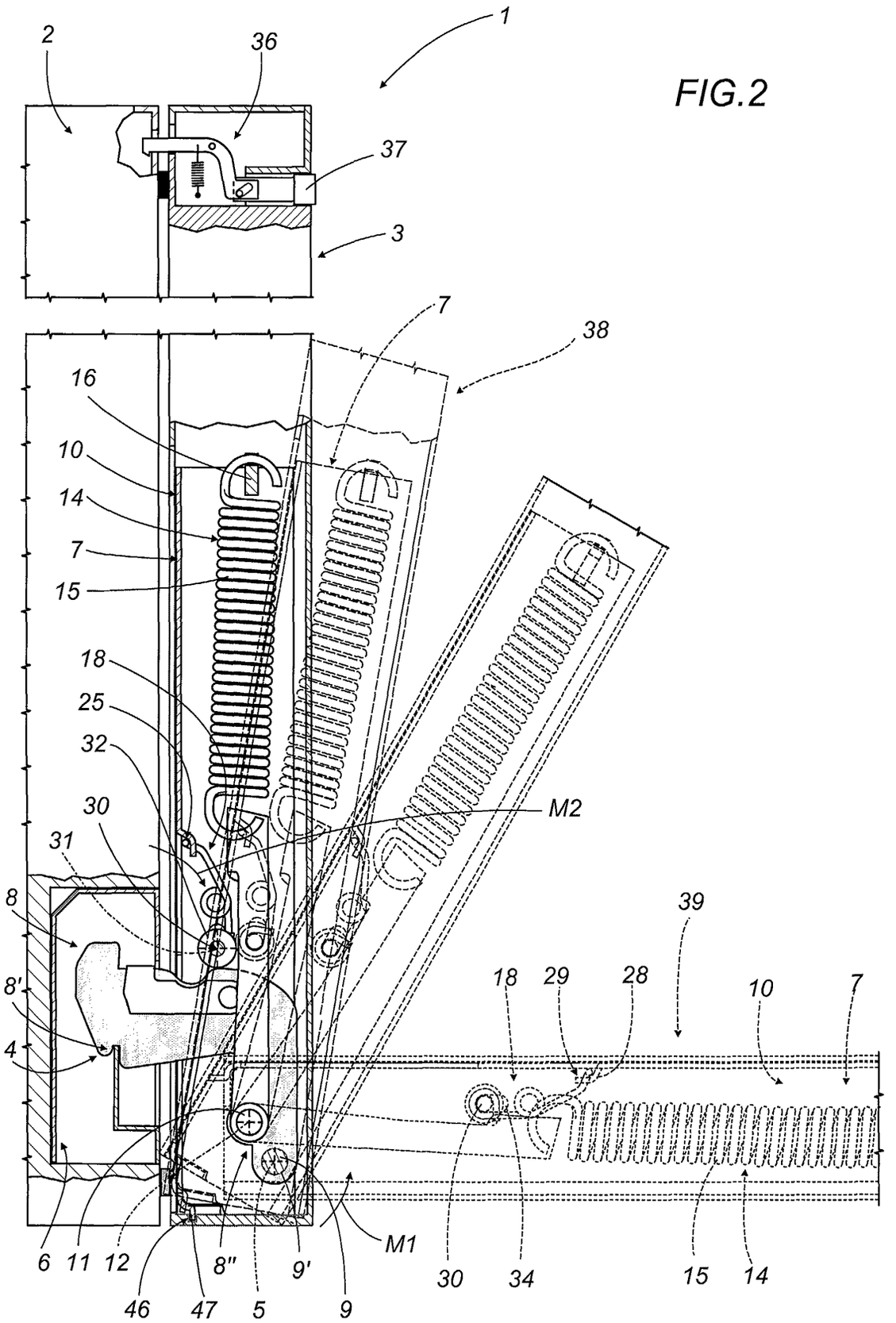
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FIG.3

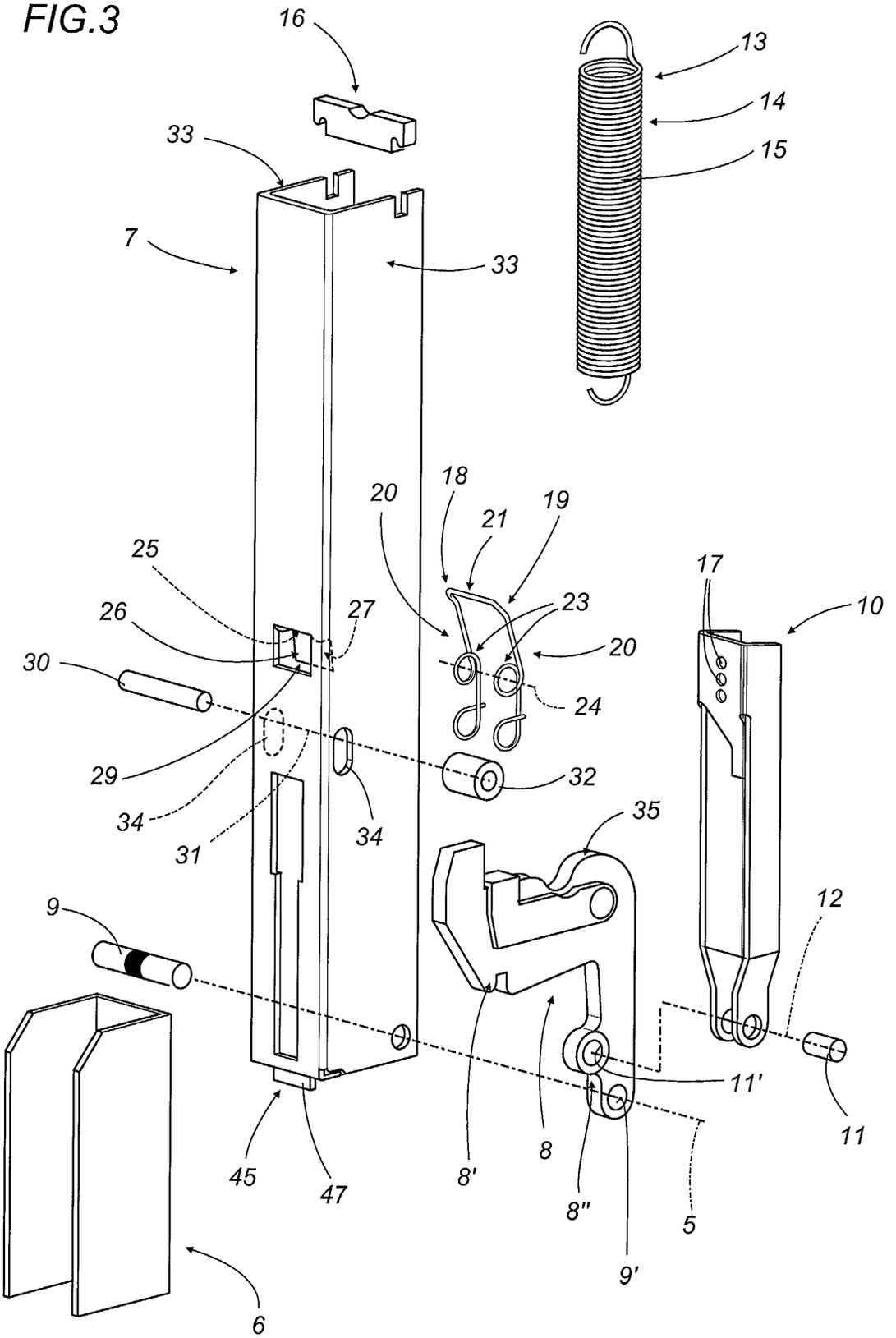
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FIG.1

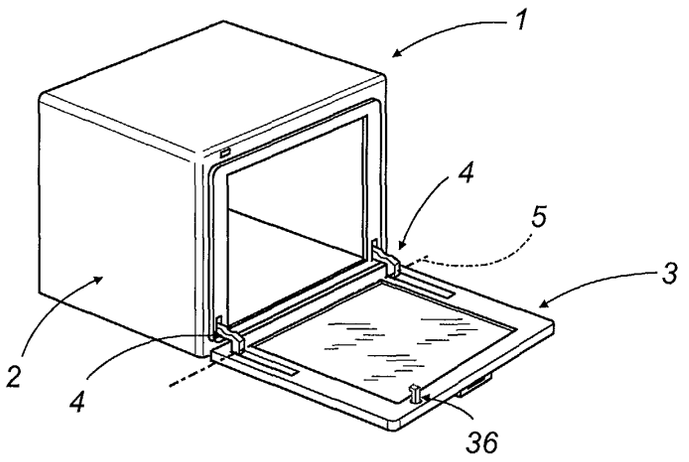


FIG.4

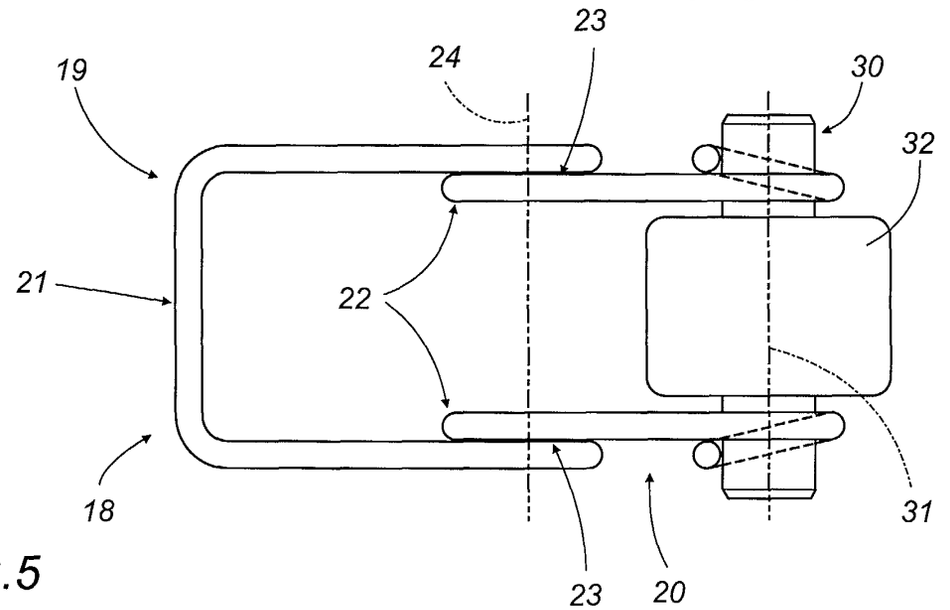
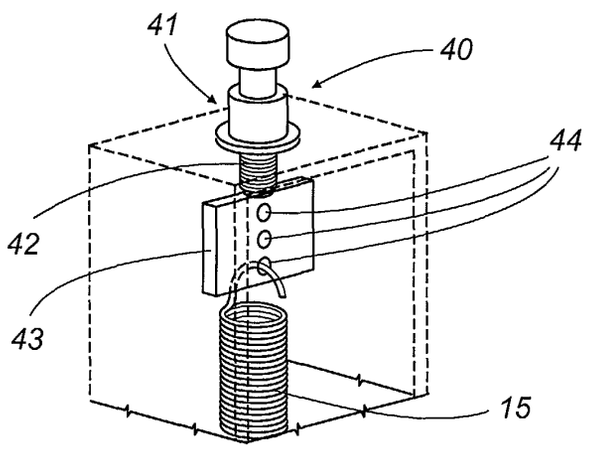


FIG.5



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EUROPEAN SEARCH REPORT

Application Number
EP 02 42 5779

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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A	FR 1 157 256 A (ANT COSTE CAUMARTIN SA DES ETS) 28 May 1958 (1958-05-28) * page 2, column 1 - column 2 *	1-16	
A	FR 1 453 388 A (CSF) 3 June 1966 (1966-06-03) * the whole document *	1-16	
A	FR 2 170 070 A (NEFF WERKE) 14 September 1973 (1973-09-14) * the whole document *		
A	EP 0 748 987 A (FARINGOSI HINGES SRL) 18 December 1996 (1996-12-18) * the whole document *		
A	US 3 820 866 A (KALDENBERG H) 28 June 1974 (1974-06-28) * the whole document *		TECHNICAL FIELDS SEARCHED (Int.Cl.7) F24C A47L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	14 May 2003	Merkt, A

CATEGORY OF CITED DOCUMENTS

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