May 6, 1958 J. H. BROWN ET AL 2,833,270

OVEN DOOR HINGE ASSEMBLY

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FIG. 1.

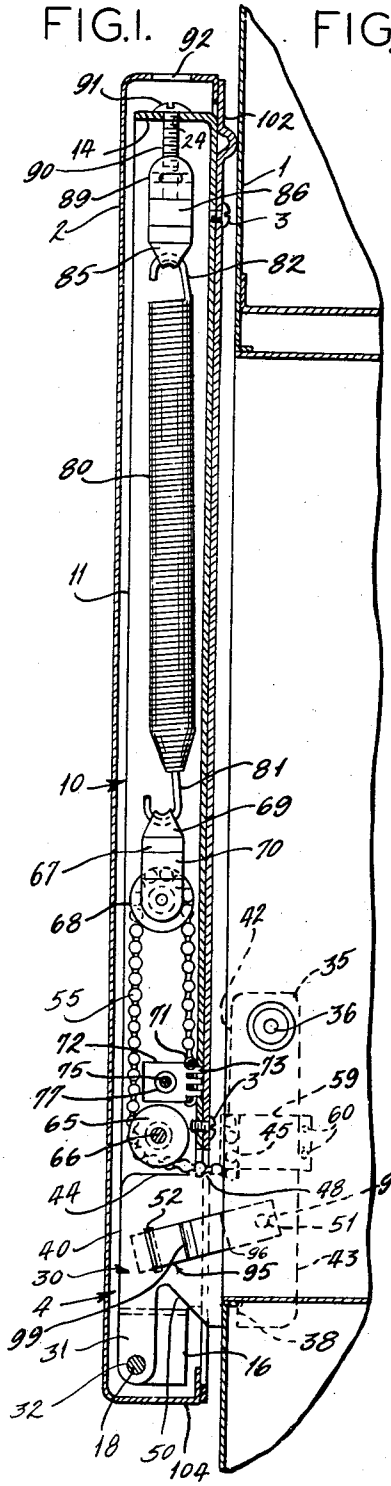


FIG. 2.

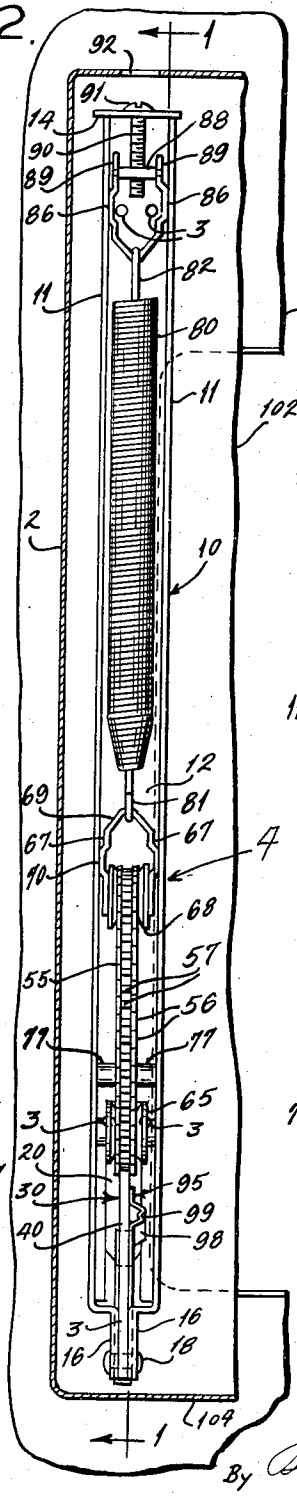
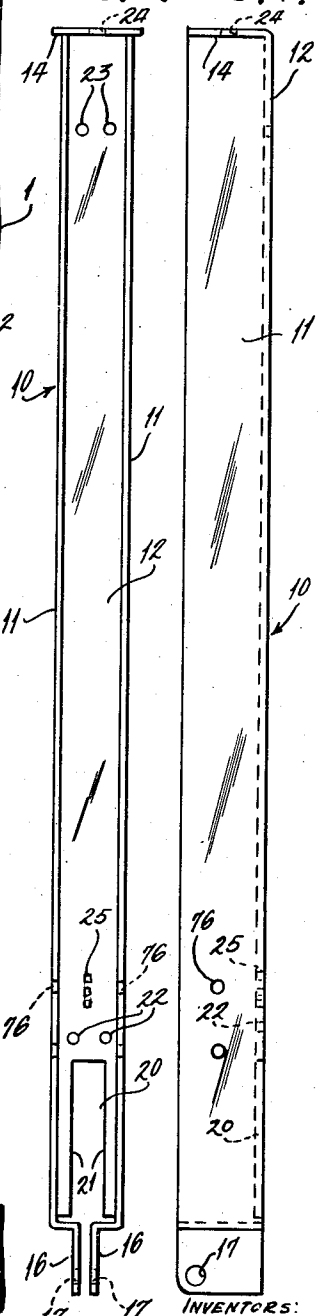


FIG. 3. FIG. 4.



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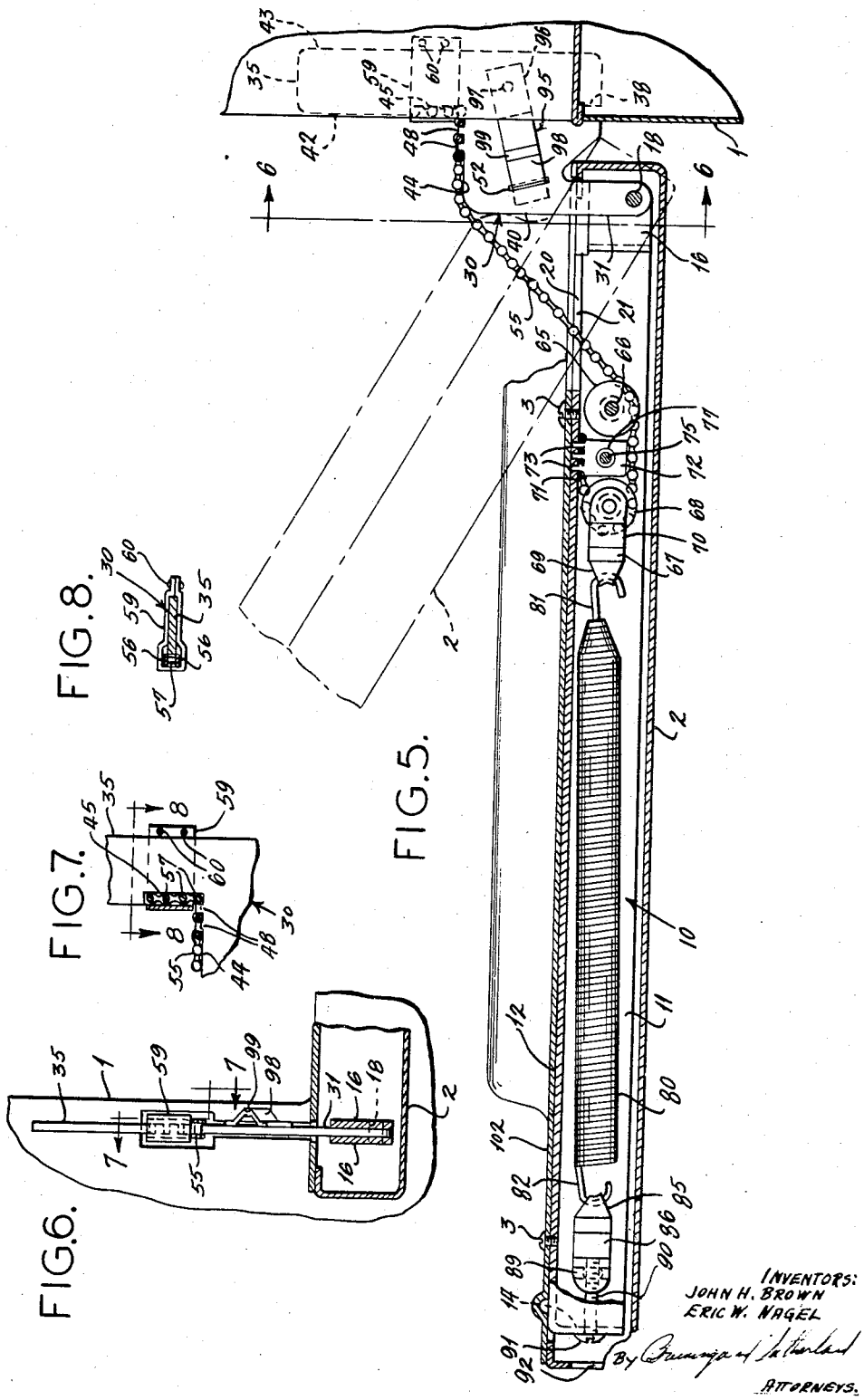


FIG. 5.

FIG. 8.

FIG. 7.

FIG. 6.

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OVEN DOOR HINGE ASSEMBLY

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3 Claims. (Cl. 126—191)

This invention relates to oven door hinge assemblies, and has particular application to those oven doors, known as drop-type doors, which are hinged to open downwardly.

It is desirable in a downwardly opening door of substantial size and weight such as the insulated door of a range oven to so counter-balance the door against the force of gravity that the door will neither simply drop when pulled from its closed position nor snap closed when released from its open position. Counter-balancing means known heretofore have had certain disadvantages such as being difficult to install, non-adjustable, inaccessible for replacement, or not smooth in operation.

One of the objects of this invention is to provide a counter-balancing hinge assembly which is simple, smooth in operation, quickly and easily installed, and readily accessible for replacement or repair.

Another object of this invention is to provide such a hinge assembly which permits the positive but releasable retention of a door in a partly open position.

Another object of this invention is to provide such a hinge assembly which may be mounted as a unit in a door.

Another object of this invention is to provide such a hinge assembly, the counter-balancing force of which may be adjusted after the hinge assembly is mounted in a door.

Other objects will become apparent to those skilled in the art in the light of the following description and accompanying drawings.

In accordance with this invention, generally stated, a hinge assembly is provided having a hinge plate upon which a door is pivoted. A part of the hinge plate extends beyond the door and is adapted to be connected to a door frame, as for example in an oven. A flexible member is secured at one of its ends to the hinge plate and is so mounted within the door as to permit rotation of the door with respect to the hinge plate. The flexible member makes a turn about a bearing member within the door, which bearing member may also function as a guide. Counter-balancing means within the door maintain the flexible member under constant tension.

The entire assembly may be mounted within a channel to which the hinge plate is pivoted. In this way, not only may the hinge assembly be made unitary with the door, but is mounted as a unit within the door.

A broiler stop may be mounted on the hinge plate. The broiler stop may take the form of a ribbon of resilient metal so mounted and formed as releasably to engage an edge of the door or channel at a predetermined position when the hinge plate and door are rotated with respect to one another.

When the hinge assembly is contained within a channel, a stop member for limiting the swing of the door may be so constructed as to serve also as a means for securing the end of the flexible member within the channel.

The hinge plate is formed in such a way that the part of the hinge plate extending outside the door may be installed in and removed from a door frame quickly and easily.

In the drawings:

Figure 1 is a view in side elevation of a counterbalancing hinge assembly within the door of an oven, being a sectional view taken along the line 1—1 of Figure 2;

Figure 2 is a sectional view in front elevation of the device shown in Figure 1;

Figure 3 is a view in rear elevation of a channel as shown in Figures 1 and 2;

Figure 4 is a view in side elevation of the channel shown in Figure 3;

Figure 5 is a sectional view in side elevation in a direction from one edge of a door toward the center thereof, partly broken away, showing the counter-balancing hinge assembly shown in Figure 1, with the door in which the device is mounted in its fully opened position;

Figure 6 is a sectional view taken along the line 6—6 of Figure 5;

Figure 7 is a sectional view taken along the line 7—7 of Figure 6; and

Figure 8 is a sectional view taken along the line 8—8 of Figure 7.

Referring now to the drawings for an illustrative embodiment of the invention, 1 represents an oven upon which a door 2 is hingedly mounted for opening downwardly. Secured within the door 2 by means of bolts 3 is a counter-balancing hinge assembly 4. In the illustrative embodiment shown, the hinge assembly is mounted within a channel 10. The channel 10 is U-shaped in cross-section with a pair of side rails 11 and a central web 12. It is capped at one end, a cap 14 being integral with the central web 12 and resting upon the side rails 11. The cap 14 is provided near its center with a hole 24. At the end opposite the cap 14, the central web 12 is cut away and the side rails 11 are bent in to define a pair of parallel hinge members 16. The hinge members 16 have pintle holes 17 aligned to receive a pintle 18. Immediately above the hinge members 16, the central web is partly cut away to define a rectangular opening 20 having vertical edges 21. Above the rectangular opening 20, within the central web, are a pair of tapped holes 22 adapted to take the bolts 3 by which the channel 10 is secured within the door 2. A corresponding pair of holes 23 is provided in the central web near the capped end 14. In the central web immediately above the holes 22 are vertically aligned apertures 25.

Pivotally mounted on the pintale 18 between the hinge members 16 is a hinge plate 30. In the illustrative embodiment shown, the hinge plate 30 is provided with a downwardly extending leg 31 having a pintle hole 32 near its lower end through which the pintle 18 extends. An upwardly extending leg 35 is offset laterally from the downwardly extending leg 31 in a direction such that the upwardly extending leg 35 forms a part of the hinge plate which extends outside of the door in which the hinge assembly is mounted, and is adapted to be secured within the oven 1. To this end, in the embodiment shown, the upwardly extending leg 35 is provided with a hole 36 near its upper end through which a metal screw or the like may be passed, while the lower end of the upwardly extending leg 35 is notched at 38 as shown in Figures 1 and 5 to engage an edge of the oven body. Between the forward edges 40 of the downwardly extending leg 31 and the forward edge 42 of the upwardly extending leg 35 is a substantially horizontal shoulder 44. The shoulder 44, extending through the rectangular opening 20 in the central web 12 of the channel 10, is rounded off at its juncture with the forward edge 40 of the downwardly extending leg 31 and is provided, toward its juncture with the forward edge 42 of the upwardly extending leg 35,

with projections 48. The forward edge 42 of the upwardly extending leg 35 has a recess 45 extending from the juncture of that edge with the shoulder 44 for a short distance as shown in detail in Figure 7. Between the notch 38 and the downwardly extending leg 31, the hinge-plate 30 is formed with a roughly triangular recess 50. Above the triangular recess 50 and near the forward edge 40 of the downwardly extending leg 31, a slot 52, at an angle from the forward edge 40, extends through the hinge plate. A hole 51 is provided near the rearward edge 43 of the upwardly extending leg 35.

A flexible member which, in the embodiment shown, takes the form of a rollerless chain 55, is fastened at one end within the recess 45 by means of a sleeve 59. The sleeve 59 is held in position by a pair of bolts 60. The rollerless chain 55 is made up of flat links 56 and spacers 57. The sleeve 59 is so positioned with respect to the shoulder 44 of the hinge plate 30 that one or more of the projections 48 of that shoulder extend between successive spacers 57 intermediate the flat links 56 of the rollerless chain, even when the door is in its fully closed position as shown in Figure 1. The rollerless chain 55 passes through the rectangular opening 20 of the channel 10 and makes a turn about a bearing member, here in the form of a sheave 65. The sheave 65 is rotatably mounted on a pin 66 extending between the side rails 11 of the channel 10. The gorge of the sheave 65 is so formed as to serve as a guide for the rollerless chain 55 and the sheave 65 is so mounted that the chain is guided along the horizontal shoulder 44 of the hinge plate 30 when the door is opened as shown in Figure 5. After the rollerless chain 55 has made its turn about the sheave 65 it is led through a pulley block 67, around a sheave 68 supported by a shell 69. In the embodiment shown, cheeks 70 of the shell 69 are bent outwardly as shown in Figure 2 to form guides bearing loosely against the inner surfaces of the side rails 11. The remaining end 71 of the rollerless chain 55 is secured within the channel 10 by a stop 72 provided with fingers 73. The fingers 73 are so spaced as to allow them to project within the spaces between the spacers 57 intermediate the links 56 of the chain. The fingers 73 are of a length such that when they are fully inserted between the spacers 57 they project beyond the rollerless chain a distance equal to the thickness of the central web 12 of the channel 10. When the stop 72 is in place the fingers 73 extend within the apertures 25 of the central web 12 of the channel 10 and are flush with the opposite face of the central web. The stop 72 is held against outward displacement by a stop pin 75 mounted in holes 76 in the side rails 11 of the channel 10 and is prevented from moving sideways by a pair of collars 77 around the stop pin 75 on either side of the stop 72.

A spring 80 is connected by a hook 81 at its lower end to the shell 69 of the block 67. The other end 82 of the spring 80 engages a yoke 85. The yoke 85 is shaped much like the shell 69, having a pair of bearing surfaces 86 closely adjacent the inner surface of the side rails 11 and of substantial width so as to guide the yoke 85 and to prevent its rotation. The yoke 85 is provided with an internally threaded cross piece 88 between the legs 89 of the yoke. A bolt 90 with a slotted head 91 extends through the hole 24 in the cap 14 of the channel 10 and takes into the internally threaded cross piece 88. A port 92 in the oven door 2 is positioned directly above the slotted head 91 of the bolt 90 to allow access to the slotted head 91 with a screw driver or the like.

A door stop of the kind known in the art as a broiler stop 95 is mounted on the hinge plate 30. The broiler stop 95 consists of a ribbon 96 of resilient metal fastened at one end by a bolt 97 taking into the hole 51 in the hinge plate and mounted for limited lengthwise movement at its other end in the slot 52. For the latter purpose, the end of the ribbon 96 is bent downwardly, then outwardly, to form a kind of step, the riser of which extends through

the slot 52 and the tread of which extends along the side of the hinge plate opposite the remainder of the ribbon. Between the slot 52 and the end secured by the bolt 97 the ribbon 96 is formed with a hump 98. Atop the hump 98 and extending athwart the ribbon 96 is a depression 99.

The broiler stop 95 lies at an angle to the horizontal complementary to the angle at which it is desired that the oven door remain part way open, and since the depression 99 lies at right angles to the long axis of the ribbon 96 the depression 99 lies at the same angle from the horizontal as the angle at which the door is desirably kept part way ajar. Moreover, the positioning of the depression 99 is such that when the door has reached that angle, the edges 21 in the central web 12 of the channel 10 are aligned with the depression 99. The hump 98 is of such height that the ribbon 96 engages and is deflected by one of the edges 21 before the top of the hump 98 is reached.

In assembling the counter-balancing hinge assembly described, the channel 10, formed as shown in Figures 3 and 4 and as described above, may be detached from and outside of the door 2. The hinge plate 30 is mounted in the channel 10 by means of the pintle 18. The sheave 65 is mounted on its pin 66, which, like the pintle 18, may be swedged or otherwise permanently mounted, may take the form of a bolt, or may be provided with a cotter pin or the like to maintain it in position. The spring 80 with the pulley block 67 at one end and the yoke 85 at the other may be placed within the channel. One end of the rollerless chain 55 is placed within the recess 45 and the sleeve 59 is fitted thereover and clamped tightly by means of the bolts 60. When the sleeve 59 is positioned, one or more of the projections 48 of the shoulder 44 extend between the spacers 57 of the chain 55. The chain is led through the opening 20 and around the lower side of the sheave 65 within its gorge and thence through the pulley block 67 between the shell 69 and the sheave 68 and back down along the central web 12 until the end 71 of the chain 55 overlies the apertures 25 in that web. The fingers 73 of the stop 72 are then inserted between the spacers 57 and through the apertures 25. The collars 77 are placed on either side of the stop and the stop pin 75 is inserted through a hole 76, a collar 77, the stop 72, the second collar 77 and the hole 76 in the opposite rail 11. The stop pin 75 may take the form of a bolt, and one of the holes 76 may be tapped to take the bolt.

It can be seen that the positioning and securing of the flexible member may also be accomplished by following the steps recited in reverse order.

The bolt 91 is slid through the hole 24 in the web 14 and the yoke 86 is pulled to such a position in the direction of the cap 14 as will allow the bolt to be screwed into the internally threaded cross piece 88.

The door stop 95 may be mounted on the hinge plate 30 before or after the flexible member 55 is connected to the hinge plate 30. In either event, the hinge plate 30 may be swung into a position like that shown in Figure 5, with respect to the channel 10. The stepped end of the ribbon 96 is inserted within the slot 52 in the hinge plate, which slot is wide enough to permit the tread member to be sprung into position. The ribbon 96 is then dropped until the other end rests against the hinge plate 35 over the hole 51 therein. The bolt 97 is inserted and tightened to complete the mounting of the broiler stop. A downwardly extending lip may be provided at the end of the ribbon adjacent the bolt 97 to fit into a second slot in the hinge plate 30 if desired.

The entire hinge assembly may now be mounted within the door 2. In the embodiment shown the door 2 is provided with a plate 102 removably secured upon the inside of the door. In this embodiment the channel 10 is shown as bolted to such an inside plate 102 by means of bolts 3. The inside plate 102 is provided with an opening similar to the opening 20 of the central web 12 of

the channel 10, to allow for the passage therethrough of the hinge plate 30 and the flexible member 55.

After the channel 10 is mounted within the door 2, the hinge plate 30 is swung outwardly against the tension of the spring 80 to a position roughly as shown in Figure 5. As the hinge plate 30 is rotated it can be seen that the rollerless chain 55 is engaged by all of the projections 48 of the shoulder 44 and as the rotation is continued the chain is supported by that shoulder as shown in Figure 5. The provision of the projections 48 against which the chain pulls at right angles relieves the collar 59 from strain and insures that the chain 55 will not pull out of the recess 45. A block of wood or the like may be placed beneath the chain 55 between the outside face of the plate 102 and the edge 40 of the downwardly depending leg 31 of the hinge plate to hold the hinge plate in its outwardly swung position. The bottom 104 of the door 2 in this position extends into the recess 50 which is so designed as to permit the hinge plate to clear the door bottom through the whole of their relative travel. The upwardly extending leg 35 of the hinge plate 30 is now in such a position as to be readily inserted within a slot in the face of the oven where in the embodiment shown the notch 38 engages a wall of the oven body and the hole 36 is aligned with a corresponding hole in the oven wall through which a metal screw is driven to fasten the hinge plate securely within the oven, as shown in Figures 1 and 5.

The tension of the spring 80 may now be regulated by inserting a screw driver within the port 92 in the oven door and screwing or unscrewing the bolt 90.

It can be seen that the arrangement of the pulley block 67 and flexible member 55 is such as to give a purchase ratio of substantially 2 to 1 so that the distance through which the spring is stretched is only one-half the length of the flexible member payed out. This permits the use of a relatively long spring between the pulley block 67 and the yoke 85, which contributes to the smooth working of the door and makes adjustment of the spring tension less critical. The downward travel of the oven door is limited by the stop 72 abutting the sheave 68 of the pulley block 67. The tendency of the door to open increases from zero when the door is vertical to a maximum when the door is horizontal, as the sine of the angle of the door from the vertical. The tension of the helical spring shown is directly proportional to its elongation, which increases as the door is opened.

The shoulder 44 acts as a cam surface to vary the displacement of the spring as the door is opened and closed and may be so made as to counter-balance the tendency for the door to open at every position with mathematical exactness. However, the construction shown, with a substantially horizontal shoulder, is sufficient in practice to allow the door to be balanced with one adjustment of the spring 80 so as to remain suspended in any position intermediate the open and closed positions.

In order that the door may be positively held partly open at one particular angle the so-called broiler stop 95 is provided. As has been described an edge 21 of the opening 20 in the channel 10 first deflects downwardly the hump 98 of the broiler stop and then is engaged by the depression 99. In order to pass the depression 99 either in opening or closing the door the door need only be given an extra push or pull as the case may be to cause the edge 21 to deflect the hump 98 of the resilient ribbon 96 and clear the depression 99.

A hinge assembly of the character described may be used on either or both sides of an oven door.

Numerous variations in construction of the device of this invention within the scope of the appended claims will appear to those skilled in the art in the light of the foregoing description. For example, other flexible members such as roller chain, strap, ball chain and cable may, with suitable modifications of securing, guiding and supporting members, be used in place of the rollerless chain of the illustrative embodiment; and different counter-balancing arrangements such, for example, as one in which a spring is compressed rather than elongated or which utilize a different pulley arrangement, may be used. Subject to space limitations, the flexible member may be connected directly to a spring. The counter-balancing means, particularly the long spring of the illustrative embodiment need not be made adjustable. For example, a rivet may replace the adjusting bolt 90 of the illustrative embodiment shown.

It can be seen that in being self-contained within the door of an oven, and as a unit therewith, the hinge assembly of this invention offers many advantages in the assembling of range ovens and the like. It is also easily and quickly removed from an oven and from a door. It may be made adjustable when assembled in a door on an oven. It is smooth, quiet and efficient in operation.

Having thus described our invention what is claimed and desired to be secured by Letters Patent is:

1. The combnation with an oven having a door opening, of a drop-type door having a hollow space therein, and a counter-balancing hinge assembly for the said door comprising a channel mounted within said door, said channel being C-shaped in cross section, with two sides and a central web, a hinge plate to which said channel is pivoted, said hinge plate having a part extending through a slot in the central web of said channel, beyond said channel and outside of said door, said part of said hinge plate being mounted on said oven, and a door stop mounted on said hinge plate, said door stop having a hump and a depression athwart said door stop atop said hump, said hump being of an elevation to engage an edge of the slot in the central web of said channel and said depression being positioned to receive said edge so as releasably to maintain said door in a partly ajar position with respect to said oven.

2. In an oven door pivoted to a hinge plate, said door having a slot defined by at least one substantially straight side into which slot said hinge plate extends when said door is closed, the combination with said hinge plate of a door stop comprising a ribbon of resilient material having a hump intermediate its ends of a height greater than the distance between said hinge plate and said side, and a depression atop said hump and athwart said ribbon, and means adapted to permit the mounting, for limited lengthwise movement, of said ribbon on said hinge plate with said hump extending away from said hinge plate.

3. The combination with an oven having a door opening, of a drop-type door, having a hollow space therein, and a counter-balancing hinge assembly for the said door comprising a channel member mounted within said door, a hinge plate to which said channel member is pivoted, said hinge plate having a part extending outside of said channel and of said door and being mounted on said oven, a chain having links, one end of said chain being secured to said hinge plate and its other end secured within said channel member, a sheave rotatably mounted on and within said channel and about which said chain makes a turn, a pulley block within said channel member through which said chain extends, a spring within said channel member, one end of said spring engaging said pulley block, the other end of said spring being supported by said channel member, and a stop, fixedly mounted on and within said channel between said sheave and said pulley block, and adapted to limit the movement of the pulley block, against the tension of the spring, toward the sheave, said stop being provided along one of its edges with projections extending intermediate the links of said chain and beyond said chain into holes provided in the channel member.

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