United States Patent

Tillander et al.

[15] **3,641,945**

[45] **Feb. 15, 1972**

[54] DISCONTINUOUS OVEN

[72] Inventors: **Magnus E. Tillander; Ake B. Persson,** both of Vallingby; **Leif A. T. Johansson,** Huddinge, all of Sweden

[73] Assignee: **Ti-Pe Elmeko, Tillander & Persson,** Stockholm, Sweden

[22] Filed: **July 15, 1969**

[21] Appl. No.: **841,804**

[30] **Foreign Application Priority Data**

July 31, 1968 Sweden.....10376/68

[52] **U.S. Cl.**.....**107/60,** 312/272.5

[51] **Int. Cl.**.....**A21b 1/42**

[58] **Field of Search**.....107/55, 56, 60; 34/184–188, 194, 216, 217; 25/142 D, 142 F, 142 N; 312/272.5; 126/338, 340, 334, 335

[56] **References Cited**

UNITED STATES PATENTS

2,530,595	11/1950	Blaha	25/142 D
3,402,683	9/1968	Tillander	107/55
3,255,897	6/1966	Lacy	25/142 F
1,365,686	1/1921	Harvey	312/272.5
2,525,201	10/1950	Beywon	312/272.5
2,930,333	3/1960	Leeuwrik	107/56

FOREIGN PATENTS OR APPLICATIONS

1,008,107	8/1952	France	107/55

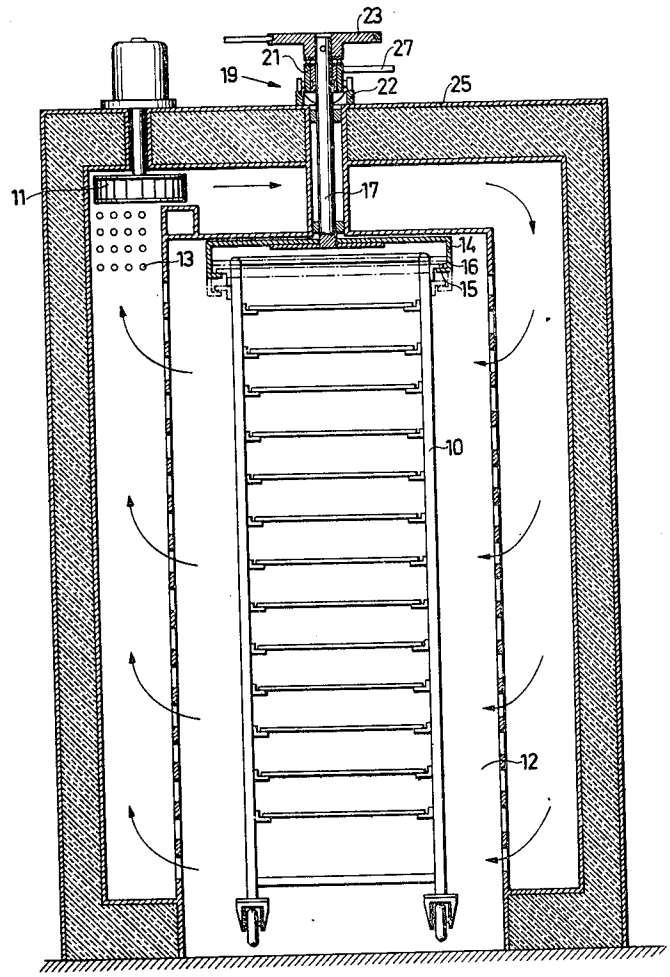
Primary Examiner—John E. Murtagh

Attorney—McGlew and Toren

[57] **ABSTRACT**

In a rack oven in which the rack can be pushed into the oven chamber and gripped and rotated or reciprocated by a driver member at the top of the oven chamber, the driver member is shiftable between a lower position for gripping the rack with the latter supported by the floor of the oven chamber and an upper position for holding the rack raised from the floor. The shifting of the rack is effected by means of an axial cam or a toggle linkage and is controlled by the opening and closing movements of the door of the oven chamber.

2 Claims, 8 Drawing Figures

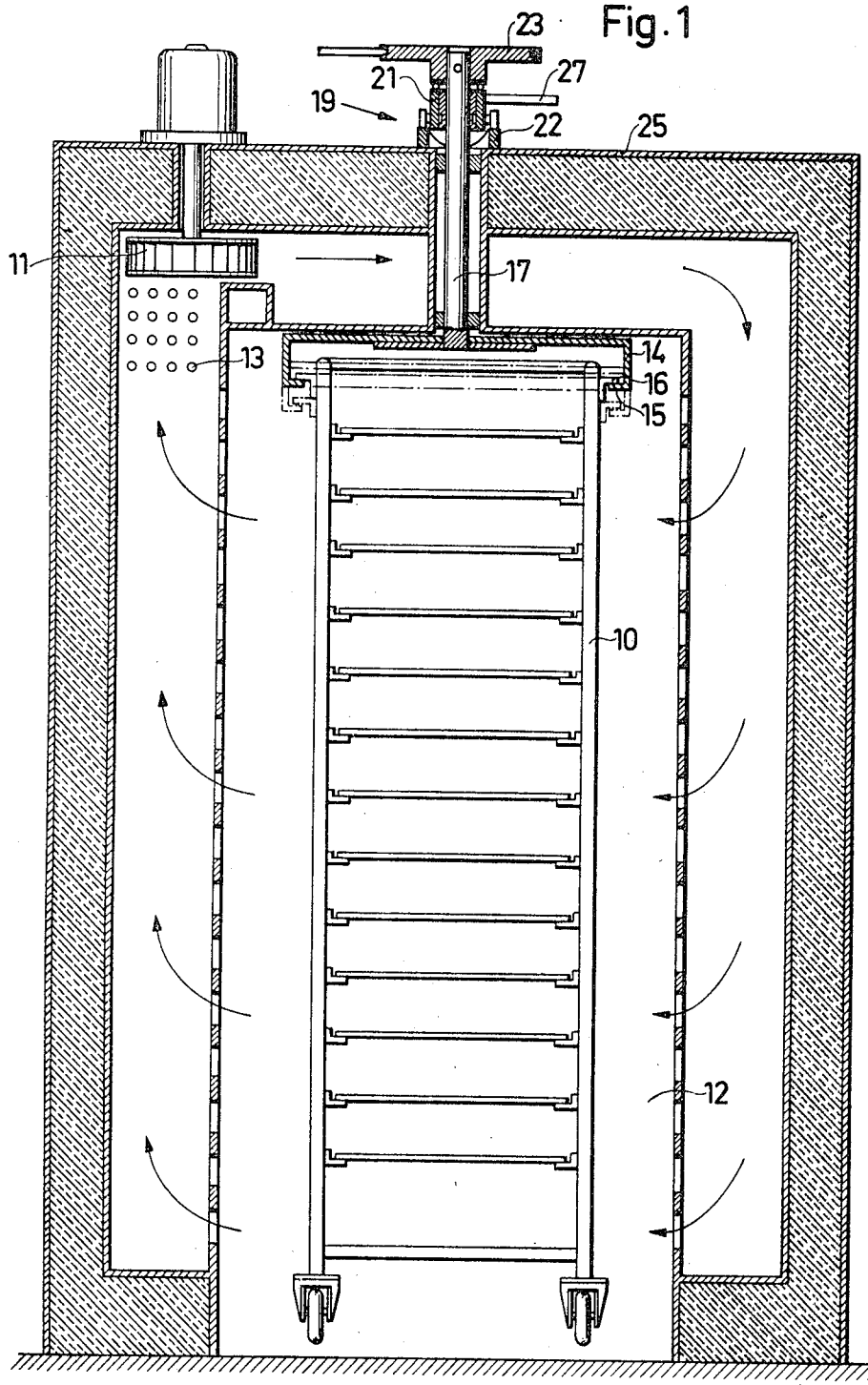


PATENTED FEB 15 1972

3,641,945

SHEET 1 OF 5

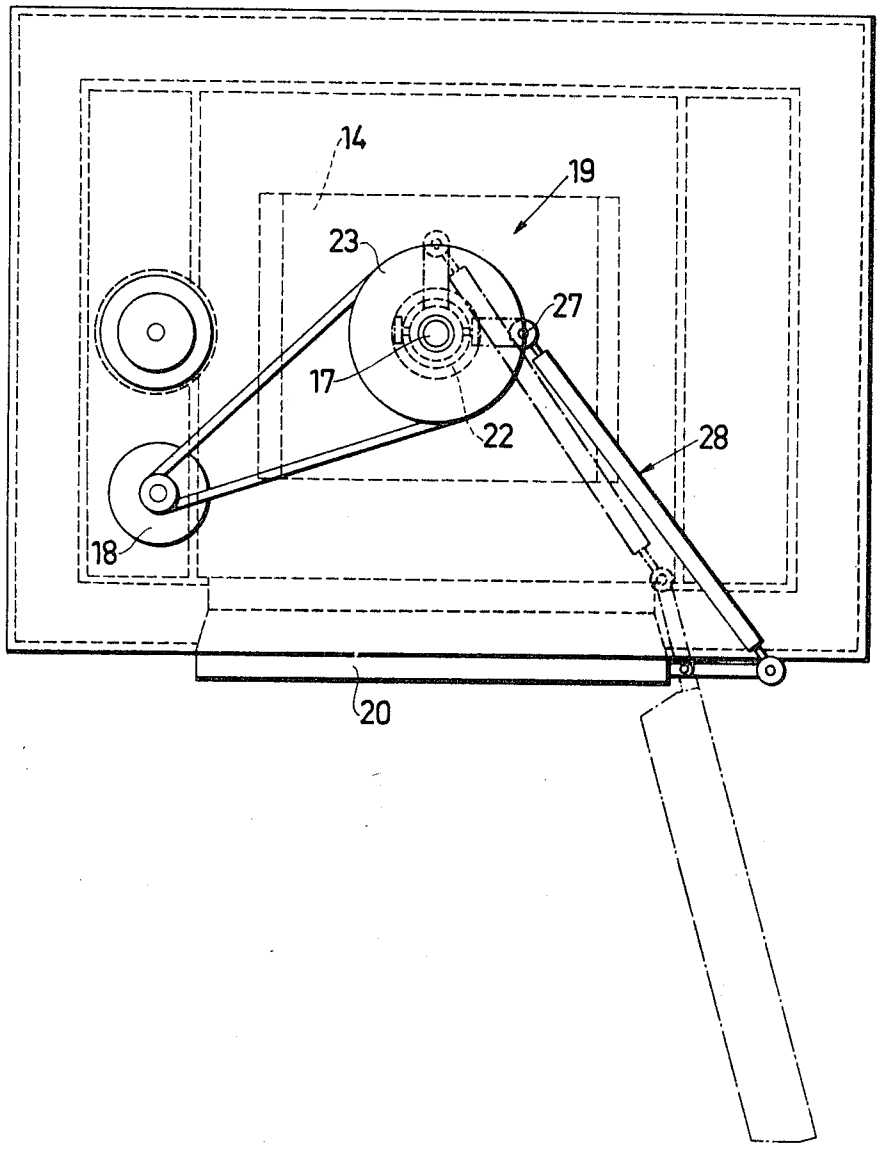
Fig. 1



INVENTORS
MAGNUS E. TILLANDER
ÅKE B. PERSSON
LEIF A. T. JOHANSSON
BY McGlew & Toren

ATTORNEYS

Fig. 2



INVENTORS
MAGNUS E. TILLANDER
ÅKE B. PERSSON
LEIF A.T. JOHANSSON
BY McGlew & Tuna

ATTORNEYS

Fig. 3

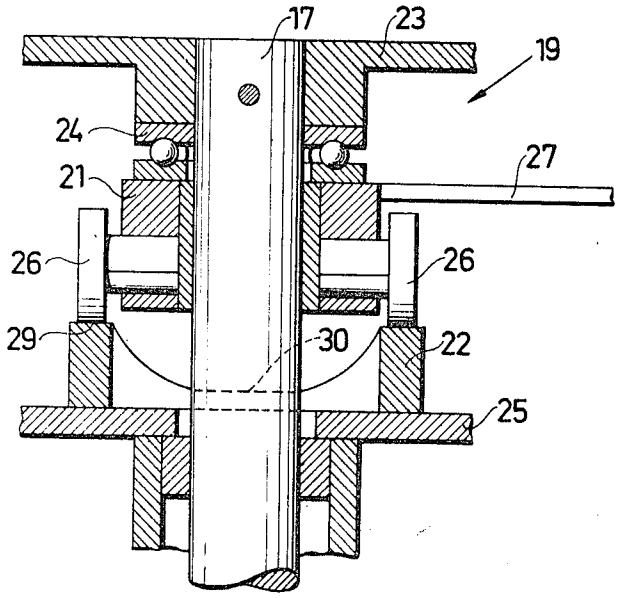
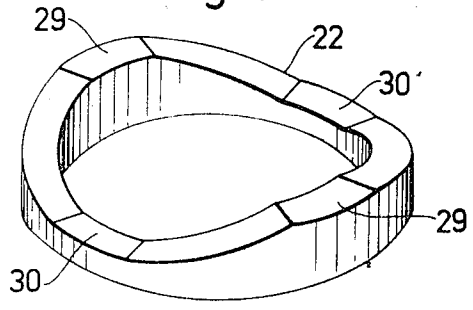


Fig. 4



INVENTORS
MAGNUS E. TILLANDER
ÅKE B. PERSSON
LEIF A.T. JOHANSSON
BY McGlew & Tuten

ATTORNEYS

Fig. 6

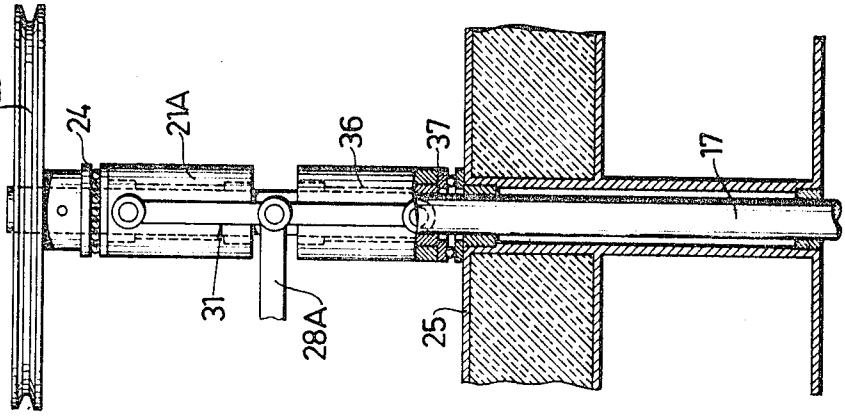
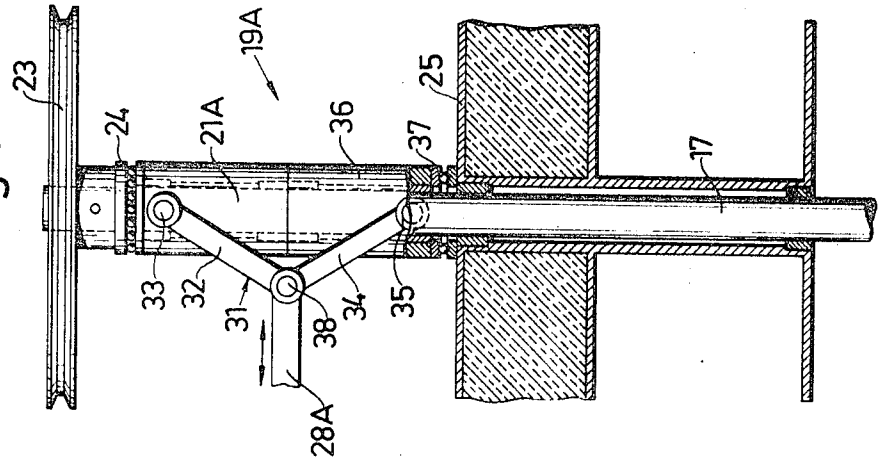


Fig. 5



INVENTORS
MAGNUS E. TILLANDER
AKE B. PERSSON
LEIF A.T. JOHANSSON
BY McGlew & Tolan
ATTORNEYS

Fig.8

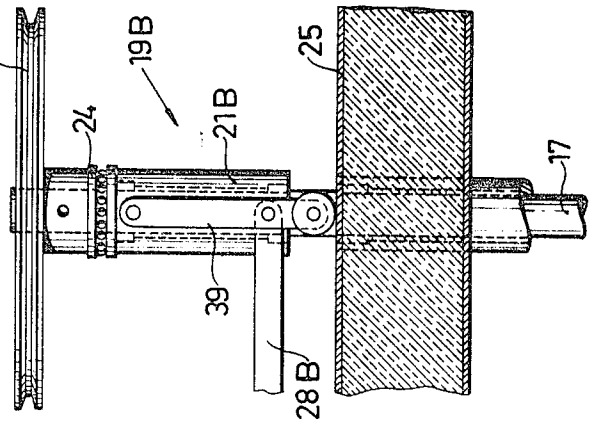
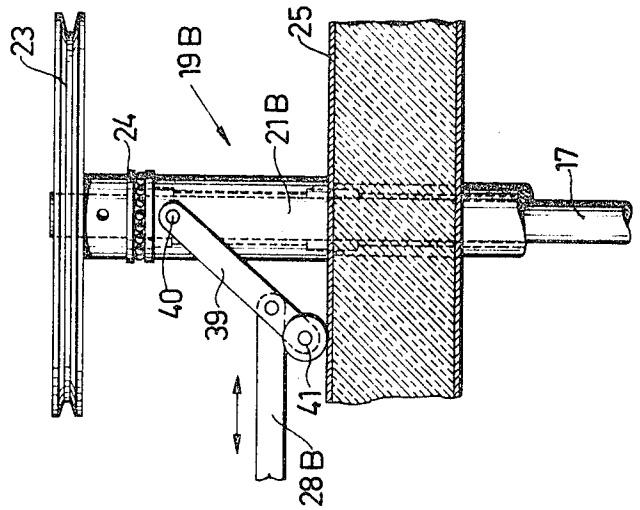


Fig.7



INVENTORS
MAGNUS F. TILLANDER
ÅKE B. PERSSON
LEIF A. T. JOHANSSON
BY McGlew & Toren

ATTORNEYS

DISCONTINUOUS OVEN

This invention generally relates to what is often referred to as rack ovens, that is discontinuous ovens having an oven chamber for receiving a rack loaded with goods to be treated. More particularly, the invention is concerned with an oven of this class having at the top of the oven chamber a driver member adapted to impart a rotary or reciprocatory motion to the rack. The invention is particularly useful in connection with convection ovens (that is ovens in which the goods to be treated are heated directly by flowing hot air) for heat treatment of food, such as baking or thawing.

In rack ovens of this type the rack is rotated or reciprocated during the treatment in order that a uniform treatment of the goods may be ensured even if the heat distribution in the oven chamber is uneven.

The driver member may consist of a frame or the like having a pair of spaced parallel rollerways between which the rack, which is usually provided with wheels, can be pushed in with parallel, horizontal flanges on the rack sliding on the rollerways. To cause the rack to be lifted from the floor of the oven chamber as it is pushed into the chamber between the rollerways, the flanges may be bent slightly upward at their ends. The driver member and the parts cooperating therewith may be embodied in other ways, but inconveniences connected with all the embodiments known to us are that the introduction of the rack into the oven chamber and the raising of the rack from the floor of the oven chamber require some effort and, moreover, may subject the rack to impacts which may cause the goods on the rack to be displaced or to fall off. Of course, the heavier the rack and the goods thereon are, the more severe these inconveniences are.

The general object of the invention is to alleviate the above-explained inconveniences, and a more specific object is to provide an oven in which the rack is not lifted until it has been completely pushed into the baking chamber.

According to the invention the driver member is shiftable between a lower position for gripping the rack with the rack supported by the floor of the oven chamber and an upper position for holding the rack lifted from the floor of the oven chamber. The shifting of the driver member may be effected by a device operating in response to the opening and closing of the door of the oven chamber so that the driver member is automatically shifted to its lower position when the door is opened and shifted to its upper position when the door is closed.

The above and other objects, features and advantages will appear more clearly from the following detailed description of preferred embodiments of the invention with reference to the accompanying drawings.

FIG. 1 is a view in vertical section of a convection rack oven and illustrates a first embodiment of the invention;

FIG. 2 is a top plan view of the oven in FIG. 1;

FIG. 3 shows, on a larger scale, a portion of FIG. 1;

FIG. 4 is a perspective view of a detail in FIG. 3;

FIGS. 5 and 6 are similar views in vertical section of a second embodiment of the invention with the driver member in its lower and upper positions, respectively;

FIGS. 7 and 8 are sectional views corresponding to FIGS. 5 and 6 and illustrate a third embodiment.

The convection oven shown in FIGS. 1 and 2 is of the type having a rotary rack 10 for goods to be treated, such as bread, for instance. The goods, not shown, are placed on superposed pans or other suitable supports in the wheeled rack and heated by flowing hot air which is driven substantially horizontally through the oven chamber 12 by a fan 11 and heated by a heater 13.

At the top of the oven chamber 12 there is a rotatably mounted driver member 14 in the form of a yoke having two parallel horizontal flanges 15 directed inwardly and adapted to underlie two flanges 16 on the rack 10 to keep the latter lifted from the floor of the oven chamber, as shown in FIG. 1. The driver member 14 is supported by the lower end of a rotatable shaft 17 driven by a motor 18 and a V-belt to rotate the driver member and the rack held thereby. The driver

member 14 is shiftable vertically between the upper position shown in full lines in FIG. 1, in which the rack 10 is kept lifted from the floor of the oven chamber, and the lower position shown in dash-dot lines, in which the rack is supported directly by the floor of the oven chamber, so that it can be pushed in horizontally between the flanges 15 of the driver member 14 without being in any way obstructed by the latter.

The shifting between the two positions is effected by a shift mechanism 19 operated by a door 20 of the oven chamber in such a way that the driver member is shifted to its lower position when the door is opened and to its upper position when the door is closed. Thus, when the door is open, the rack 10 can be freely pushed into or pulled out of the oven chamber 12 in horizontal direction, and when the door is closed, the rack is automatically lifted from the floor of the oven chamber so that it can rotate without sliding or rolling on the floor. Conveniently, the driving motor 18 is connected to a switch actuated by the door in such a way that the motor is stopped as soon as the door is moved in the opening direction and started as soon as the door has been fully closed.

The shift mechanism 19 comprises a collar 21 which surrounds the shaft 17 and is rotatable independently of the shaft. The upper end of the collar 21 supports the shaft 17 and the associated parts, i.e., primarily the driver member 14 and the rack, and the lower end is supported by a stationary axial cam surrounding the shaft. When the collar 21 is rotated, it is moved upwards or downwards in accordance with the shape of the axial cam 22 and the shaft 17 and, accordingly, the driver member 14 follows its movements.

The shaft 17 is supported by the upper end of the collar 21 via a pulley 23, by means of which the shaft is driven from the motor 18, and an intermediate thrust bearing 24. The collar, in turn, is supported by the axial cam 22, which is positioned on the top wall 25 of the oven and the shape of which is best shown in FIG. 4, by means of rollers 26 disposed on either side of the collar and having horizontal stub axles.

As apparent from FIG. 2, the collar is provided with a radial arm 27 which is, via a linkage 28, connected to the door 20 of the oven chamber. When the door 20 is closed, the rollers 26 of the collar 21 engage two diametrically opposed high cam segments 29 of the axial cam 22, as shown in FIGS. 1 and 3, and the shaft 17 and the driver member 14 are held in their upper position. When the door is swung to its fully open position, as shown by dash-dot lines in FIG. 2, the arm 27 and the collar 21 are rotated approximately 90° so that the rollers 26 of the collar 21 roll down onto two low cam segments 30. The shaft 17 and the driver member then slide down by their own weight to the lower position shown by dash-dot lines in FIG. 1.

The shift mechanism 19A shown in FIGS. 5 and 6 differs from the shift mechanism 19 in FIGS. 1 to 4 in that the collar 21A is shifted by means of a toggle linkage 31 instead of by an axial cam. One end of one link 32 of the toggle linkage 31 is pivoted on a horizontal pin 33 on the collar 21A and one end of the other link 34 is pivoted on a horizontal pin 35 on a stationary second collar 36 which is supported by the top wall 25 via a thrust bearing 37. A push rod 28A, which may form part of a linkage similar to the linkage 28 in FIG. 2, is connected to a common pivot pin 38 pivotally connecting the ends of the toggle links 32 and 34 remote from the pins 33 and 35 to each other.

When the oven door is open, the toggle linkage 31 is in the retracted position shown in FIG. 5 with the lower end of the collar 21A abutting the upper end of the collar 36. The shaft 17 and the driver member carried thereby are then in their lower position. When the door of the oven chamber is closed, the push rod 28A is actuated to move the toggle linkage 31 to the extended position shown in FIG. 6, in which the shaft 17 and the driver member are in their upper position.

The shift mechanism 19B shown in FIGS. 7 and 8 resembles the shift mechanism 19A but instead of a complete toggle linkage it has a support arm 39, one end of which is pivoted on a horizontal pin 40 on the collar 21B and the other end of which is supported by the top wall 25 via a roller 41. A push rod 28B

similar to the push rod **28A** in FIGS. **5** and **6** is pivoted to the support arm **39** and adapted to move the support arm from the position shown in FIG. **7**, in which the support arm is at an angle to the axis of the collar **21B** and the shaft **17** and the lower end of the collar is supported directly by the top wall of the oven, to the position shown in FIG. **7**, in which the support arm is substantially parallel to the collar and the shaft and keeps them lifted.

It should be noted that the invention is not limited to the embodiments shown and described as examples which all relate to a convection oven having a rotary rack for the goods to be treated. For instance, if it is desired to avoid that the pulley **23** follows the shifting movements of the driver member, the driver member may be secured to a tube surrounding the shaft **17** and connected to the shift mechanism. In this case, the shaft is connected to the driver member by means of splines or the like and axially fixed. Another possibility is to make the shaft **17** movable axially with respect to the pulley so that the latter can always be kept at the same level. Normally, these arrangements are unnecessary, however, as the pulley and the shaft need rotate only when they are in their upper position, i.e., when the door of the oven chamber is closed. In this position the pulley may be on the same level as the pulley of the motor **18** and the small displacement (about one inch, for example) taking place upon the shifting to the lower position is quite permissible as the motor **18** stops as soon as the shifting operation starts.

Nor is it necessary to actuate the shift mechanism mechanically by means of the door of the oven chamber as shown in the drawings, although this may be preferable for reasons of economy. For instance, the shift mechanism may be actuated by means of the driving motor **18** or a separate motor. Although not absolutely necessary, it is convenient to cause the closing and opening movements of the oven door to control the shift mechanism. It should also be noted that the invention is applicable also to ovens in which the rack is reciprocated during the treatment instead of being rotated, as shown and described in U.S. Pat. No. 3,402,683 issued Sept. 24, 1968.

Thus, it will be understood that the invention may be embodied otherwise than herein illustrated or described, and that certain changes in the form and arrangement of parts may be made within the scope of the appended claims.

What we claim is:

1. A discontinuous oven comprising walls forming an oven chamber having a floor therein and a door for opening the oven chamber and placing racks loaded with goods in said oven and the racks being supported on the floor when they are placed in said oven, a driver member positioned in the top of said oven chamber, means for displacing said driver member between a lower position in which it engages the rack while it is supported on the floor and an upper position in which it lifts the rack above the floor of said oven chamber, means for imparting motion to said driver member and the rack when said driver member is in its upper position, said means for displacing said driver member comprises a vertically arranged axially movable shaft extending through the top of said oven chamber, said driver member positioned on the lower end of said shaft, a collar secured to the upper end of said shaft exteriorly of said chamber, a shift mechanism arranged to lift and lower said collar and thereby axially move said shaft, said shift mechanism comprises an axially extending stationary annular member disposed about said shaft and having an annular cam surface thereon, means for supporting said collar on the annular cam surface of said annular member, and a linkage arm affixed at one end to said door of said oven chamber and at its other end to said means for supporting said collar for pivoting said means on the annular cam surface of said annular member for lifting said driver member when the door of said oven chamber is closed and for lowering said driver member when the door of said oven chamber is opened.

2. A discontinuous oven, as set forth in claim **1**, wherein said shift mechanism comprises a suspension member positioned about said shaft between said collar secured to the upper end of said shaft and said annular member, said suspension member being journaled for rotation on the annular cam surface of said annular member for axially displacing said shaft and moving said driven member between its upper and lower position.

* * * * *