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AIR DEFLECTOR FOR DRYING OVENS

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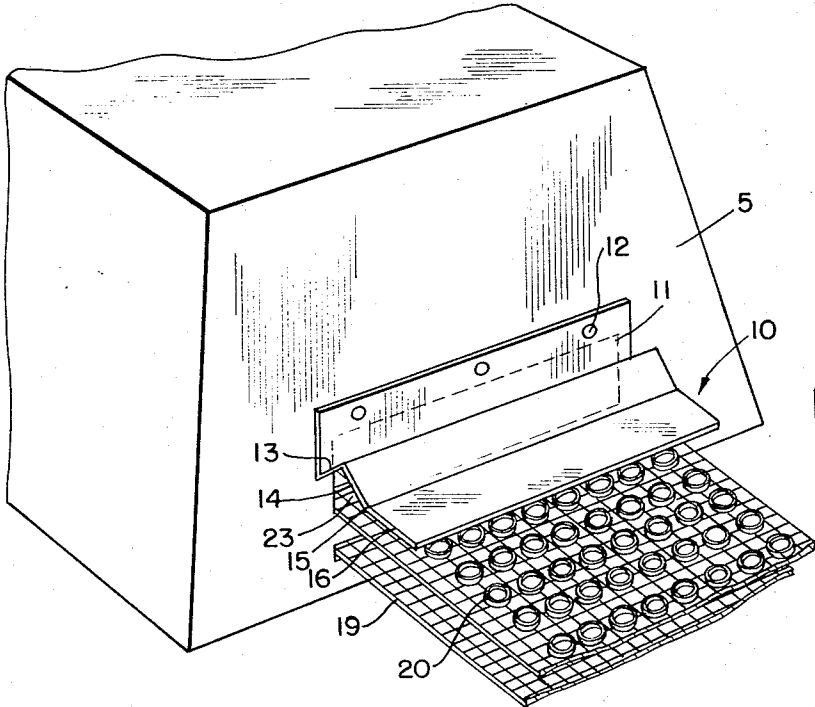


FIG. 1

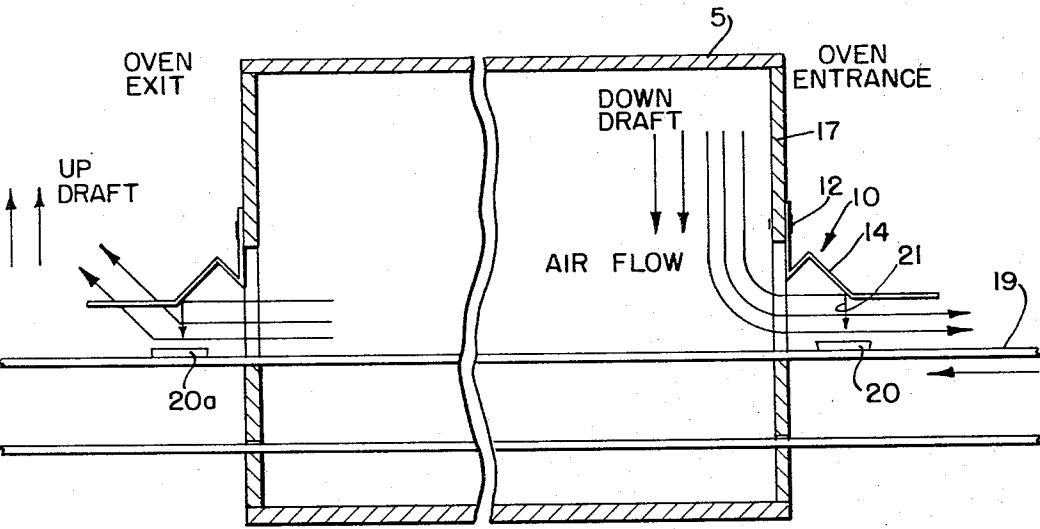


FIG. 2

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1

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AIR DEFLECTOR FOR DRYING OVENS

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This invention relates to drying ovens for container closures and particularly to an air deflector for such ovens which prevents closures entering and leaving the oven from being displaced.

Container closures are provided with gaskets by flowing a liquid composition onto the panel around the internal periphery of the closure, and, in the case of bottle crowns, over the whole internal surface. Subsequently, the suspending medium, if the composition is a dispersion or a solvent solution, must be removed. If the composition is a plastisol, then the lining must be brought up to that temperature at which the suspending plasticizer solvates the dispersed resin. Both of these operations take place in so-called "ovens."

Container closure lining ovens are quite large, and usually are equipped with an open mesh transport belt on which ranks of closures, inner side up, are placed after the liquid composition has been placed in the closure by the lining machine. The belt, which moves constantly, runs from end to end of the oven. In the most common types of ovens, heat is supplied by a gas furnace. The heated air is driven, usually downwardly, onto the closures and passes through the mesh belt to an exit duct whence it is recirculated through the furnace and the oven by a powerful fan. Necessarily, in such a system, the combustion products vent and, although the ovens are designed for substantial recirculation of the heated air, air leakage occurs inwardly at the entrance of the oven and outwardly at the oven exit.

In the case of plastisol linings, at the moment that the lining reaches fluxing temperature, the lining is a viscous liquid which will flow out of position should the closure not lie horizontally on the belt. If the closure is cocked, the liquid will flow to the lowermost point, and uneven gaskets will be produced.

It has been determined that the cocking or tilting of the closures on the carrier belt is caused not so much by misadjustments of the transfer mechanism but by air which may lift and tilt the closures as they enter or leave the oven. This effect is characteristic of closures formed of lightweight metals, such as aluminum.

Considering the entrance end of the oven, closures pass into it through a slot which extends across the full width of the transport belt, and is wide enough to provide ample vertical clearance for the closure. The air currents within the oven flow down its vertical face and also move in a horizontal direction. The result of this mixed flow is an upward thrust which frequently tilts the closure to some position from its normal horizontal plane.

At the exit end of the oven, air flow conditions are reversed. There is also a tilting and lifting component, for the air cannot only move out horizontally, but moves upwardly as it escapes through the slot. Cocking of closures can occur at this position also, and since the closures are hot and their linings are liquid (in the case of plastisols), uneven gaskets will be produced. Presupposing that solvent or waterbased lined closures have entered and travelled through the oven in a horizontal position, cocking at the exit, when solvent or water-based sealing compositions form the gasket body, does not cause trouble since the gasket, by the time it has reached the exit position, has become a solid substance.

It has been discovered that if a deflector plate is installed both at the entrance and exit end of the oven and

2

is so shaped as to cause a substantial component of the airflow pattern to be directed downward vertically that displacement by air of the closure does not occur.

This invention may best be understood by reference to the drawings in which

FIG. 1 is a perspective view of a deflector plate mounted to the entrance end of an oven.

FIG. 2 diagrammatically illustrates a sectional view of closures moving through a drying oven and shows the characteristic airflow patterns.

Referring to FIG. 1, a deflector, shown generally at 10 is mounted to the entrance end of oven 5 and is substantially the same at both the entrance and at the exit of the oven. The deflector comprises an angular bent sheet of metal having a vertical portion 11 which is secured to the end wall of the oven by suitable means, such as rivets 12. An upwardly directed angular portion 13 departs from the lower end of the vertical portion substantially at an angle of 45°. A longer, downwardly directed angular portion 14 extends from the upper margin of portion 13 and lies at an angle of 90° to the portion 13. At the point 15, downwardly directed portion 14 merges into a horizontal portion 16.

FIG. 2 shows a deflector supported from each of the outside walls 17 and 18 of the entrance and exit ends respectively of the oven. They are positioned so that the horizontal portion 16 lies above the moving belt 19 which passes through the oven.

When the fan (not shown) is started and deflectors are not used, leakage of air out of the entrance slot 23 from the oven as a result of the down draft established by the fan and reaction from the floor of the oven causes an upward air flow component which can displace a closure 20 placed on the open mesh transport belt 19. When the deflector is in place, the airflow pattern follows substantially the path of the arrows shown in FIGURE 2. A substantial amount of the outflowing air is intercepted by the downwardly directed surface 14 with the result that a downward vertical component indicated at 21 is given to the airflow and a downwardly directed pressure is exerted on the panel surface of the closure 20 which successfully holds the closure in a horizontal position.

In the case of the exit end of the oven with no deflector, the air leaking out of the oven has an upward component which results not only from the air being diverted upward from the floor of the oven, but from its expansion into the lower pressure air in the room. Accordingly, a closure 20a, occupying a position at the exit could be lifted and tilted.

When the deflector 10 is fastened to the end wall 18 of the exit end of the oven, the airflow pattern follows substantially that shown by the arrows. A substantial amount of flow toward the exit is made laminar by the action of the horizontal portion 16. The upper portion of this laminar flow is intercepted by the downwardly directed portion 14 with the result that a vertical component shown at 22 which exerts considerable force, exists and is directed on to the panel of a closure 20a. This force is sufficient to prevent any displacement of a closure as it passes out of the oven.

The dimensions of the air-stabilizing deflector necessarily depend upon the width of the entrance and exit passages, and will be proportioned to oven size. But as an example, it has been found in ovens which have an entrance and exit vertical dimension of 2" above the belt, the point 15 (the lowermost extent of the deflector plate) should be placed approximately 1" below the end wall and extended into and away from the oven approximately 4".

The improvement substantially eliminates uneven linings caused by the tilting of the closure and has proved

3

particularly valuable in the fluxing or drying of linings on closures which are provided with pull tabs. Such closures are inherently less stable than closures of conventional design.

We claim:

1. In an oven adapted to heat container closures having an open mesh endless-belt transport means, end walls and entrance and exit slot openings in said end walls, and where in said oven a forced air circulation is maintained, means to cause air entering and escaping from said oven through said slots to exert a vertically directed downward force upon closures occupying positions on said belt comprising air deflectors affixed to the end walls of said oven transverse to said belt comprising a plate having an airflow directing portion angularly and an airflow stabilizing portion horizontally disposed relative to said belt, the lower margin of said angular portion being positioned below the upper margin of said entrance and exit slots to intercept a portion of the flow of air entering and leaving

4

the oven, the said air intercepting portion lying at such an angle that the said air flow will be diverted substantially downwardly to exert a direct downward force upon closures disposed upon said belt, thereby preventing displacement of the closure by entering or escaping air.

2. In an oven, means according to claim 1 comprising airflow deflectors having the said airflow stabilizing portions directed outwardly from the entrance and exit ends of said oven.

References Cited

UNITED STATES PATENTS

2,647,811	4/1954	Thornburg	34—216 X
2,985,437	5/1961	Sargeant	34—242 X
3,096,162	7/1963	Jepson	34—33

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