

[54] FILLING CAKES

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[57] ABSTRACT

Apparatus for filling cakes, particularly doughnuts, comprises a conveyor having a plurality of cake holders for conveying successive transverse rows of cakes horizontally, the cake holders holding a plurality of cakes side by side in each transverse row, an injecting station having a transverse row of nozzles with at least one nozzle for each cake position in the row, tilting means for tilting the cake holders adjacent the nozzles so that during injection of filling material each cake is tilted to allow a nozzle to be inserted into an exposed side wall of each cake.

11 Claims, 5 Drawing Figures

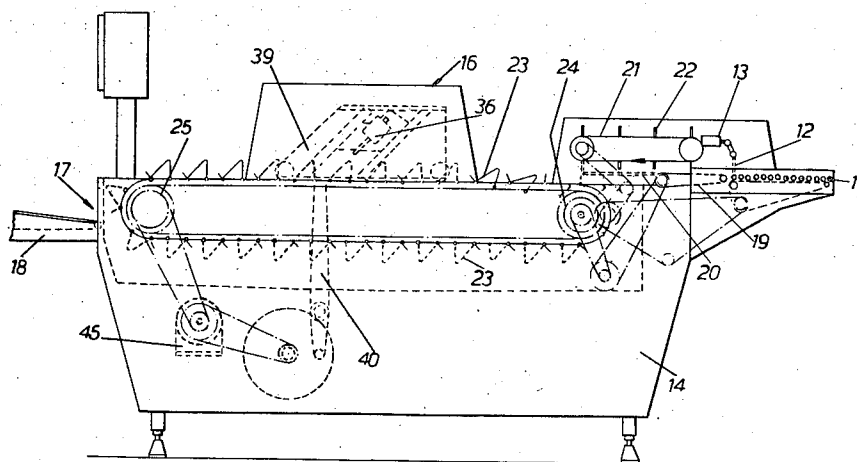
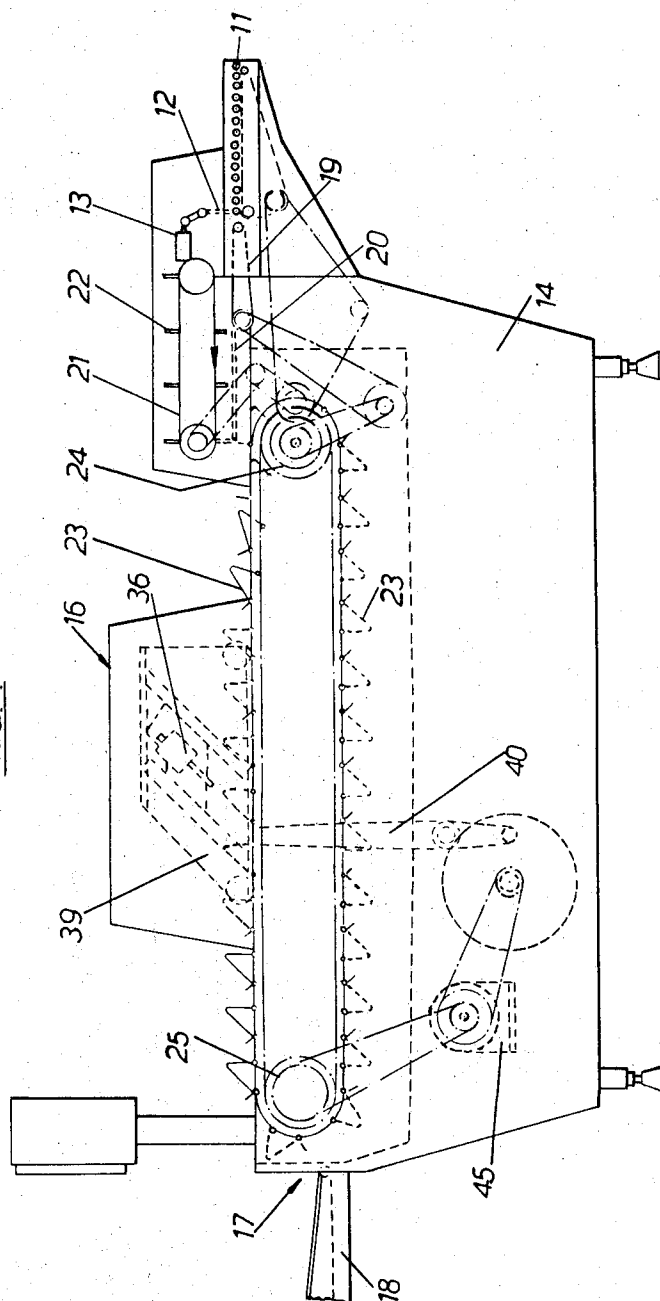
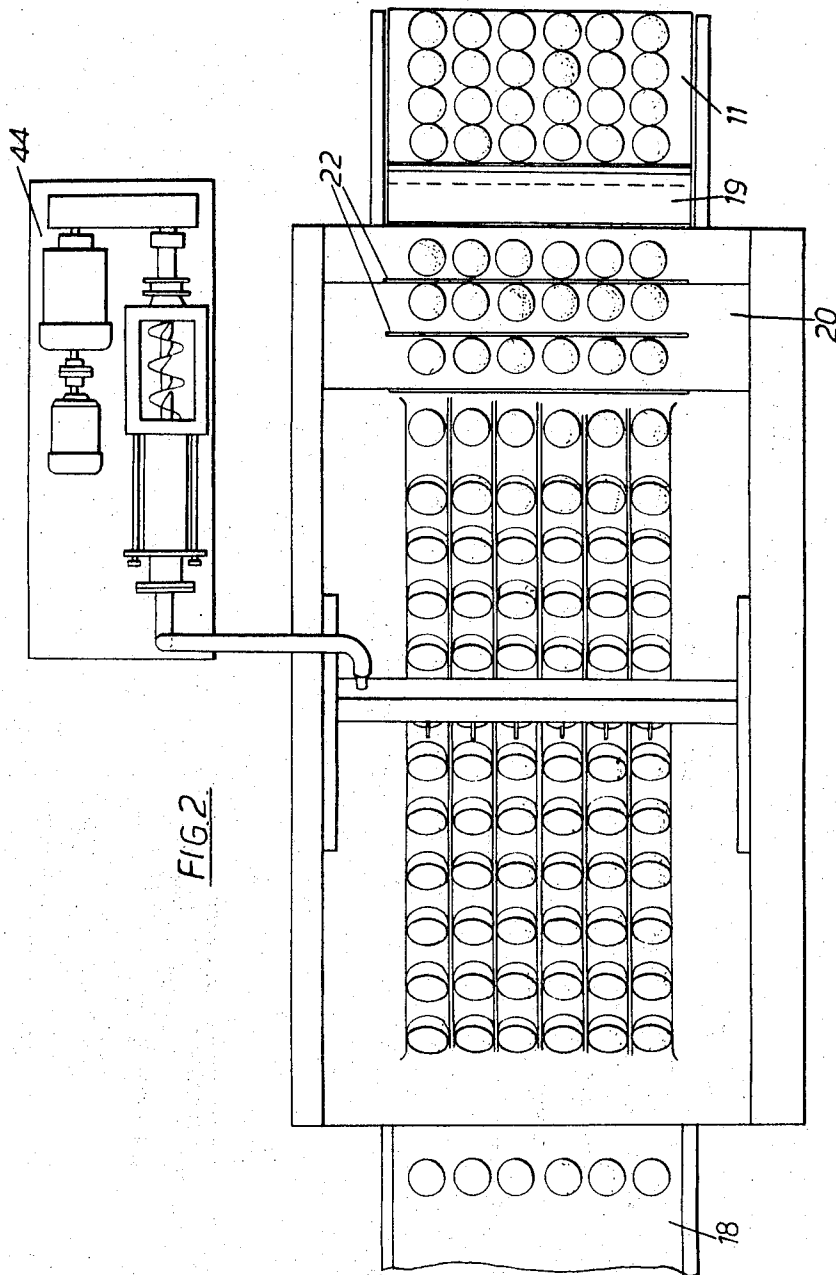
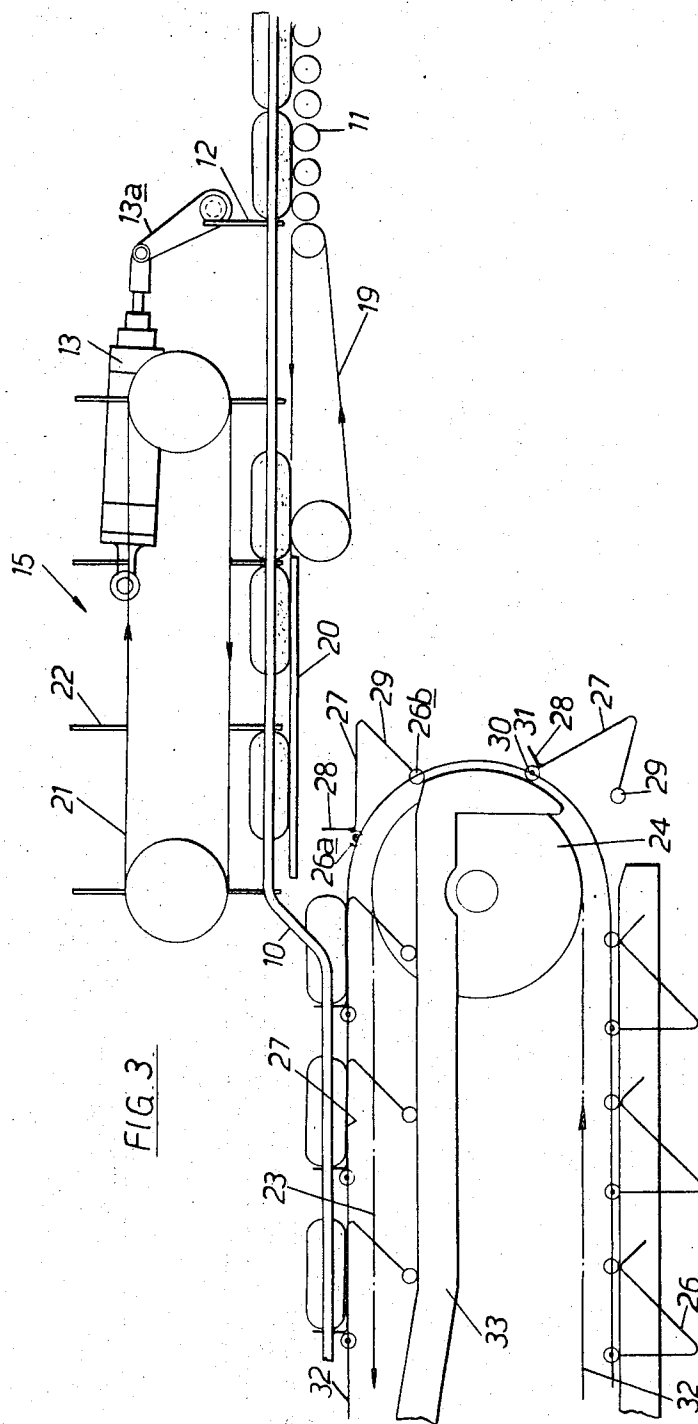
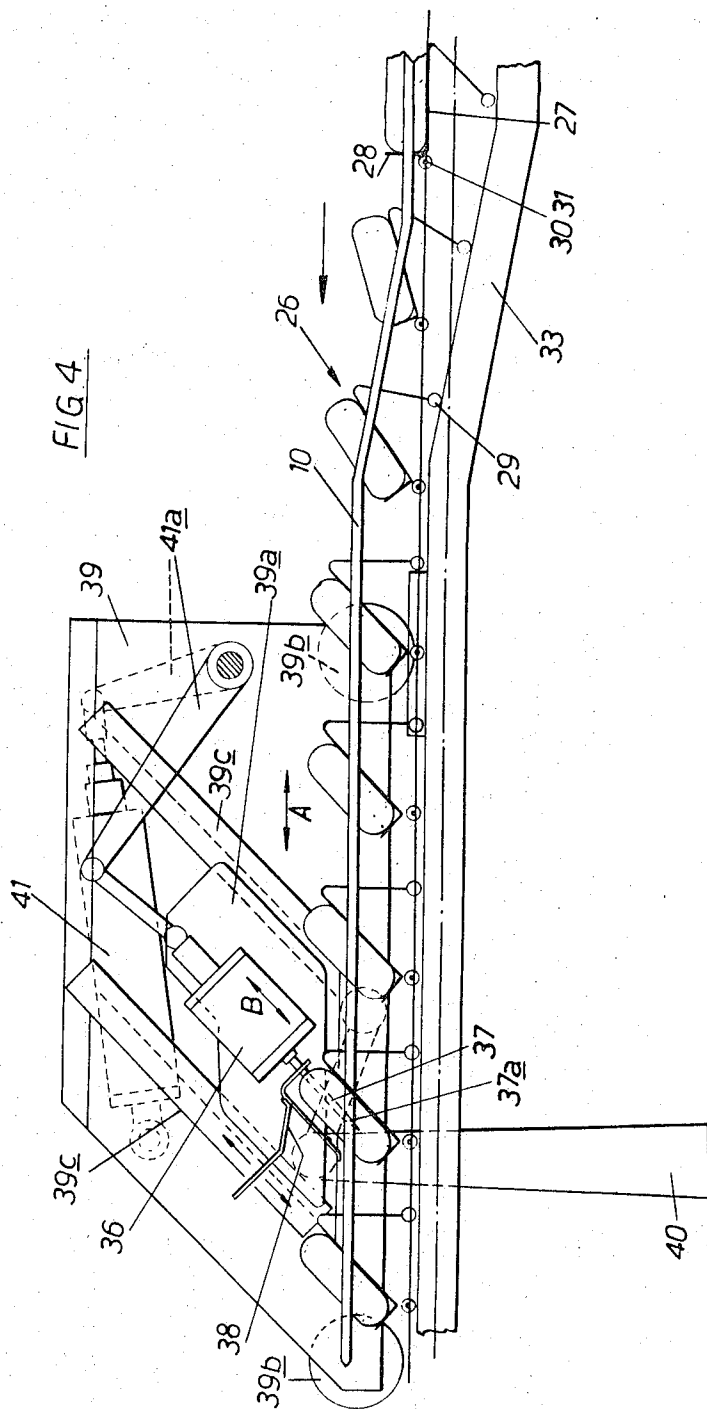


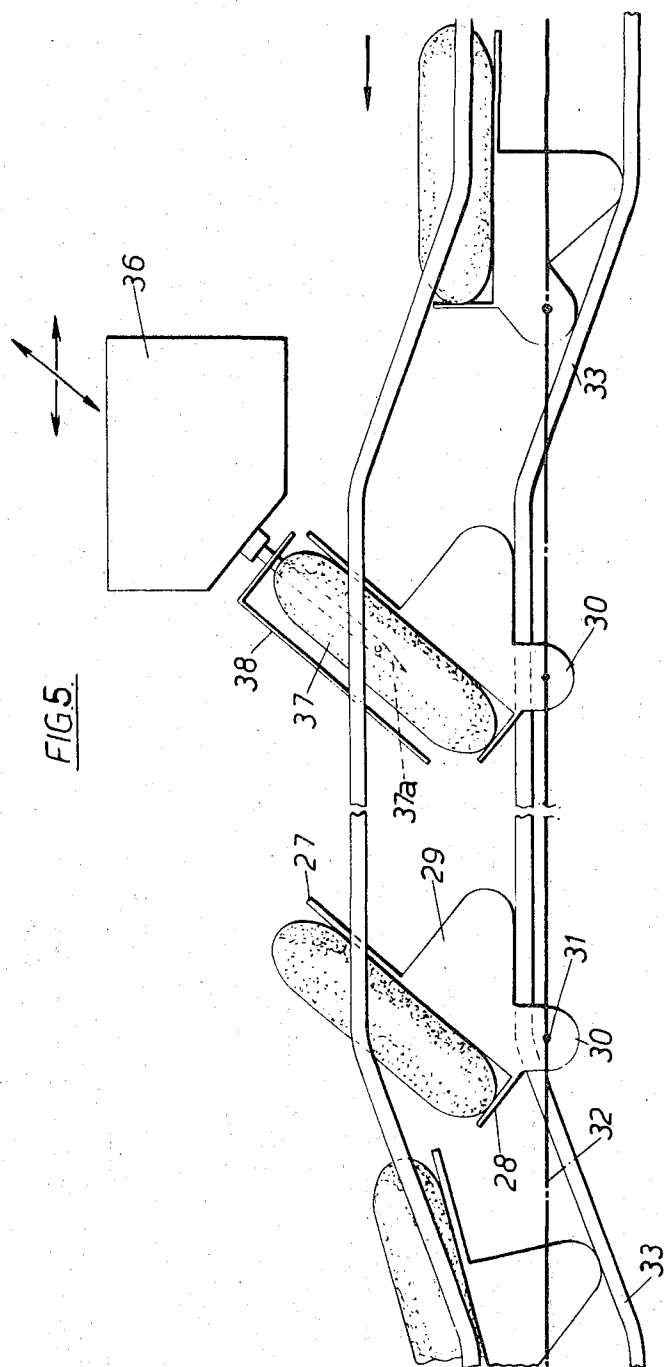
FIG. 1











FILLING CAKES

BACKGROUND OF THE INVENTION

The invention relates to apparatus for filling cakes particularly cakes such as doughnuts.

In apparatus used in the manufacture of cakes, such as apparatus for filling or coating cakes, it is desirable to convey a number of cakes side by side in transverse rows so that treatment is carried out on all cakes in a transverse row at one time. To achieve automatic operation it is necessary for the cakes to arrive at the machine in accurately aligned transverse rows, otherwise the cakes will not be in the required position at the required operating station. Furthermore, with a number of cakes arranged closely side by side in a transverse row, access to the sides of the cake is limited due to obstruction by adjacent cakes. These problems are particularly apparent in the filling of doughnuts. It is common practice for the doughnuts to pass in parallel lanes through a frying bath and although they remain in their lanes, they do not necessarily leave the bath in accurately aligned transverse rows. Furthermore, at the station where filling occurs, it is necessary for the filling material to be injected into the sides of the doughnuts as it is a normal commercial requirement that the jam or other filling should not run out of the top or bottom of the doughnut.

It is an object of the present invention to provide automatic cake filling apparatus which reduces the aforementioned difficulties and is suitable for use with doughnuts.

SUMMARY OF THE INVENTION

The present invention provides apparatus for injecting filling material into cakes, such as doughnuts, which apparatus comprises a conveyor comprising a plurality of cake holders arranged to convey successive transverse rows of cakes along a horizontal conveying path, the cake holders providing a plurality of cake positions side by side in each transverse row so that a plurality of cakes are conveyed along parallel paths, filling means located adjacent the conveyor and including a plurality of injecting nozzles extending across the conveying path with at least one nozzle adjacent each cake position, means for tilting the cake holders when adjacent the filling means so that the base of each cake in the row adjacent the filling means is inclined to the horizontal and thereby exposes an edge region of the cake, and means for effecting relative reciprocating movement between the injecting nozzles and the row of cakes adjacent the filling means to inject the nozzles into the exposed edge regions of the cakes, whereby filling material may be injected into the cakes, and then withdraw the nozzles from the cakes.

By tilting the cake holders when adjacent the filling means, an edge region of each cake in the row is exposed and not obstructed by the remaining cakes lying in the plane of the conveyor.

Preferably the direction of reciprocating movement to inject the nozzles is parallel to the inclined bases of the cakes.

Conveniently the cake holders each comprise an open tray member with a side wall adjacent the lower edge of each cake when tilted but no side wall adjacent the said exposed edge region of the cake. In this way, the tray member holds the cake in position when in the

inclined position without obstructing access for the nozzle.

In order that the cakes may be conveyed continuously and not stopped at the filling means, the filling means is preferably arranged to move forward in synchronism with the conveyor when the nozzles are injected into the cakes.

Owing to possible inaccuracy in transverse alignment of doughnuts leaving a frying bath, the apparatus preferably includes alignment means for aligning cakes in transverse rows before reaching the cake holders. Preferably said alignment means comprises a second conveyor before reaching the cake holders, said second conveyor including a non-driven support surface over which the cakes pass in parallel lines side by side, and a plurality of downwardly projecting indexing abutments arranged above respective lines of cakes, the abutments being driven in synchronism and arranged to abut the cakes and push them across the non-driven surface so that the cakes leave the non-driven surface in accurately aligned transverse rows.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic side view of an apparatus embodying the invention,

FIG. 2 is a plan view of the apparatus shown in FIG. 1,

FIG. 3 is an enlarged view of the transverse alignment section of the apparatus shown in FIG. 1,

FIG. 4 is an enlarged view of the filling station in the apparatus shown in FIG. 1, and

FIG. 5 is a modification of the arrangement shown in FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The apparatus described in this particular example is intended for filling doughnuts with jelly or cream. Firstly the doughnuts pass in a number of parallel lanes through a frying bath (not shown). During passage through the frying bath, the doughnuts remain in parallel lanes but they do not necessarily remain in accurately aligned transverse rows. On leaving the frying bath, the doughnuts pass to a unit 14 and are conveyed on a roller conveyor 11 towards a gate device 12. In this particular example six parallel lanes extend along the conveyor 11 and the gate 12 is operated by a piston and cylinder device 13 via a linkage 13a. When the gate 12 is raised the doughnuts arriving on the rollers 11 are stopped by the gate so that alignment in transverse rows is achieved. The gate 12 may then be raised to release one transverse row at a time. The unit 14 includes an alignment unit 15 for ensuring accurate alignment of the doughnuts in transverse rows, followed by a filling unit 16 at which cream or jelly is injected into the doughnuts and finally a discharge end 17 at which the filled doughnuts pass on to a further conveyor 18 leading to, for example, an icing machine (not shown). Throughout the main unit 14, the doughnuts are conveyed horizontally in six parallel lanes, the doughnuts remaining in aligned transverse rows. On passing the gate 12, the doughnuts pass onto an accelerating conveyor 19 arranged to introduce a space between adjacent transverse rows of doughnuts. The conveyor 19 is followed by a non-driven support surface in the form of a dead plate 20. Arranged above the conveyor 19 and dead plate 20 is an indexing system comprising a closed

loop belt 21 having downwardly projecting indexing fingers 22 arranged above each lane of doughnuts. The belt 21 is spaced above the conveyor 19 so that as doughnuts move along the conveyor 19 an indexing finger 22 on the lower surface of the belt 21 engages the rear edge of a doughnut and pushes it across the dead plate 20. By providing the dead plate 20, it is ensured that the indexing fingers 22 come into engagement with the doughnuts so that all the doughnuts in one transverse row are pushed off the dead plate 20 at the same instant by the synchronised indexing fingers associated with each line of doughnuts. On leaving the dead surface 20, the doughnuts pass onto a main conveyor 23 which consists of a closed loop conveyor passing round two end rollers 24 and 25. The conveyor consists of a plurality of transverse rows of cake holders 26. The cake holders for each transverse row are joined together as one unit having six stainless steel tray members attached to two stainless steel rods 26a and 26b extending across the width of the conveying path. Each tray member is formed from folded sheet to provide a flat base 27 on which the doughnut may rest, an up-standing front wall 28 and a downward projection 29. The rod 26a is joined to the junction of the base 27 and wall 28. The rod 26b is joined to the lower edge of the downward projection 29. The ends of each rod 26a are pivotally connected to the driving loop 32 of the conveyor. A generally horizontal guide rail 33 extends along the upper part of the conveyor 23 at each lateral edge of the conveyor. The ends of the rods 26b are arranged to rest on the rail 33 which acts as a cam surface. The rail is arranged so that the cake holders immediately adjacent the discharge end of the indexing unit 15 are horizontal. In this way the doughnuts leave the dead plate 20 and pass onto the flat bases 27 of the cake holders. The roller 24 and the drive mechanism for the belt 21 and conveyor 19 are linked so that the arrival of the doughnuts and the cake holders is synchronised and the indexing fingers 22 push the doughnuts forwards against the front wall 28 of each cake holder. Once in position on the cake holders, the doughnuts are conveyed towards the filling unit 16. A guard rail 10 extends along the side of each lane of doughnuts to retain the lanes in strict alignment. The rail 33 rises before reaching the filling unit so that as the cake holders enter the filling unit the rods 26b are raised by the rail 33 so that the cake holders pivot about the axis of the rods 26a and tilt to an angle of 45° to the horizontal as shown in FIG. 4. As will be seen from FIG. 4, it is the trailing edge of the cake holders which is raised. By tilting the doughnuts and cake holders in this way, the rear edge of each doughnut becomes exposed as there is no rear wall to the cake holders and the tilting operation raises the exposed rear edge so that it is not obstructed by adjacent transverse rows of doughnuts. While the doughnuts move continuously through the filling unit 16, jam or cream filling is injected into each transverse row of doughnuts, one row being filled at a time. This is achieved by a filling head 36 which extends transversely across the full width of the conveyor and is provided with a number of projecting needles 37 one arranged for each of the six lanes of doughnuts. The needles 37 are provided with an outlet nozzle 37a adjacent the pointed end of the needle. The head 36 carries a cake location bracket 38 which extends across the full width of the conveyor. The head 36 is slidably mounted in a frame 39 as shown

in FIGS. 1 and 4. The whole frame 39 is mounted on wheels 39b and may be moved horizontally backwards and forwards, as shown by the arrow A, in the frame 39 by means of a drive mechanism 40. The head 36 is fixed to a member 39a slidable between guides 39c so that the head 36 may be raised and lowered in the inclined direction shown by the arrow B by means of a drive mechanism 41 and linkage 41a. At the beginning of each filling operation, the member 39a is lowered with the frame 39 in the right hand position as shown in FIG. 1. This causes the head 36 and plate 38 to take up the position shown in FIG. 4 and the needles 37 which are retractable, and also inclined 45° to the horizontal, are projected forwardly so as to pass into the doughnuts through the exposed rear edge of each doughnut. The drive mechanism 40 then automatically moves the frame 39 and filling head 36 forwards in synchronism with the forward movement of the doughnuts and cream or jelly is injected through the needles 37 from a hopper and pump unit 44 shown in FIG. 2. When the required quantity of filling material has been injected, the needles 37 are retracted into the head 36, the bracket 38 thereby acting as a stripper plate. Once the needles have been retracted, the head 36 is raised to release the filling head from that transverse row of doughnuts and the filling head 36 is moved towards the right as seen in FIG. 1 so as to be in position to start the next filling operation with the next transverse row of doughnuts. Once filled, the doughnuts remain tilted until the cake holders pass over the roller 25 at the discharge end 17 of the main conveyor. The doughnuts are then tipped out of the cake holders onto the conveyor 18.

In this particular example each transverse row of cake holders is conveniently manufactured by pressing from sheet material so as to provide six open top tray members at spaced intervals along the holder.

By use of the above example, a plurality of lanes of doughnuts may be automatically filled. The indexing unit 15 ensures accurate alignment in transverse rows. Furthermore, the tilting mechanism at the filling unit enables injection of filling material to take place in several parallel lanes of doughnuts simultaneously. It is commercially necessary to inject filling through the side wall of doughnuts rather than the top or bottom and this tilting mechanism allows injection through the side walls of several parallel lanes of doughnuts simultaneously.

The synchronism of movement between the drive devices 40 and 41 and the conveyor 23 is achieved by using a common electric motor 45 to drive them all.

The invention is not limited to the details of the foregoing example.

FIG. 5 shows a modified arrangement of the cake holders and guide rail. Similar reference numerals have been used for similar parts to those previously described. In this case, the guide rail 33 drops again shortly after passing the filling station so that the cake holders are restored to the horizontal position before reaching the end roller 25. Furthermore, in this case each transverse row of trays 26 has at its opposite ends a lug 30 pivotally connected to the conveyor instead of the rod 26a, and a downwardly projecting plate 29 which engages the rail 33 instead of the rod 26b. The bracket 38 is in this case shaped to act as a lid for the cake holders during the filling operation so that each doughnut is sandwiched between the base 27 and the

parallel part of the bracket 38. This prevents excessive expansion in thickness during the filling operation.

I claim:

1. Apparatus for injecting filling material into cakes, such as doughnuts, which apparatus comprises a conveyor comprising a plurality of cake holders arranged to convey successive transverse rows of cakes along a horizontal conveying path, the cake holders providing a plurality of cake positions side by side in each transverse row so that a plurality of cakes are conveyed along parallel paths, filling means located adjacent the conveyor and including a plurality of injecting nozzles extending across the conveying path with at least one nozzle adjacent each cake position, means for tilting the cake holders when adjacent the filling means so that the base of each cake in the row adjacent the filling means is inclined to the horizontal and thereby exposes an edge region of the cake, and means for effecting relative reciprocating movement between the injection nozzles and the row of cakes adjacent the filling means to inject the nozzles into the exposed edge regions of the cakes, whereby filling materials may be injected into the cakes, and then withdraw the nozzles from the cakes.

2. Apparatus according to claim 1 in which the direction of reciprocating movement to inject the nozzles is parallel to the inclined bases of the cakes.

3. Apparatus according to claim 1 in which the cake holders each comprise an open tray member having a side wall adjacent only the edge of each cake remote from the nozzles when tilted.

4. Apparatus according to claim 1 in which the row of cake holders is tilted about a horizontal axis transverse to the conveyor so as to raise the trailing edge of the row of cakes.

5. Apparatus according to claim 1 in which the cake holders are pivotally mounted on the conveyor and each row of holders is provided with one or more cam devices arranged to engage an abutment member adjacent the filling means so as to pivot the cake holders.

6. Apparatus according to claim 1 in which the filling means extends above the conveyor and includes a plurality of reciprocating nozzle members projecting downwardly at the same angle as the inclination of the cake holders.

7. Apparatus according to claim 1 in which the filling means is arranged to move forward in synchronism with the conveyor when the nozzles are injected into the cakes.

8. Apparatus according to claim 1 including alignment means for aligning the cakes in transverse rows before reaching the cake holders.

9. Apparatus according to claim 8, in which said alignment means comprises a second conveyor before reaching the cake holders, said second conveyor including a non-driven support surface over which the cakes pass in parallel lines side by side, and a plurality of downwardly projecting indexing abutments arranged above respective lines of cakes, the abutments being driven in synchronism and arranged to abut the cakes and push them across the non-driven surface so that the cakes leave the non-driven surface in accurately aligned transverse rows.

10. Apparatus according to claim 9, in which the indexing abutments are arranged on one or more belt conveyors spaced above the non-driven surface.

11. Apparatus according to claim 9 in which the non-driven surface is preceded by a driven conveyor.

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