A doughnut filling machine on which doughnuts are intermittently advanced below injector nozzles for filling with jam. A sensor element on each nozzle initiates filling only when a doughnut is present, and each sensor element assists in separating the filled doughnut from the injector nozzle.

2 Claims, 6 Drawing Figures
MULTIPOINT PRODUCT FILLING MACHINE

This invention relates to a apparatus for filling articles with a flowable material. An object of the invention is to provide an improved apparatus for filling products, for example doughnuts with jam, custard, cream or other flowable material.

According to the invention, an apparatus for filling articles with a flowable filling material comprises a conveyor including a plurality of article-conveying members, each of which is arranged transversely of the direction of movement of the conveyor to support a row of articles to be filled; means for advancing the conveyor intermittently thereby to bring each article-conveying member in turn to rest at a filling station; a plurality of injector means arranged in a row above the conveyor and movable to and from a working position in which they penetrate the articles supported on the article-conveying members; a reservoir for filling material; a plurality of sensors each one of which is positioned to detect the presence or absence of an article beneath an injector means; and means operable for supplying filling material to each injector means beneath which the presence of an article has been detected by a sensor.

The apparatus is primarily, but not exclusively, intended for the filling of ring doughnuts with jam. The article-conveying members are then in the form of slats each of which has a plurality of recesses for supporting doughnuts. Each injector preferably comprises a plurality of injector nozzles or needles arranged in a circular row.

In the accompanying drawings:

FIG. 1 is a side elevation of an apparatus for filling ring doughnuts with jam,

FIG. 2 is a rear elevation,

FIGS. 3A and 3B together form a side elevation of part of the apparatus to a larger scale, FIG. 3A illustrating the upper part of the apparatus,

FIG. 4 is a detail view of a mechanism for advancing a conveyor, and

FIG. 5 is a sectional view of a cut-off valve forming part of the apparatus.

In the illustrated embodiment of the invention, a machine for filling doughnuts with jam at a multiplicity of points comprises a wheeled frame 1 which supports a conveyor 2 on which previously cooked, but unfilled, doughnuts (not shown) can be advanced to a filling position. After filling, the doughnuts are advanced to a take-off position from which they can be removed from the conveyor.

The conveyor 2 includes a pair of spaced endless chains 3 between which are arranged a plurality of article-conveying members 4 in the form of slats. These slats 4 are made of metal and are easily removable from the chains 3 for cleaning purposes. Each slat 4 has a plurality of recesses 5, conveniently four in number, in which the doughnuts are supported. The conveyor 2 is advanced intermittently by reciprocation of a piston in the cylinder of an air motor 6 (FIG. 4). A piston rod 7 is attached to the piston and extends out of the cylinder of the motor 6. A hook 8 is pivotally mounted on this piston rod 7. When the piston rod 7 moves in an outward stroke, the hook 8 is moved about its pivot 9 against the action of a spring 10 so that the piston rod 7 and hook can move with respect to one of the chains 3 of the conveyor 2. At the end of the outward stroke of the piston, the hook 8 is urged by the spring 10 to an operative position so that during the return stroke of the piston, the hook 8 will (as shown in FIG. 3) engage one of the links of the chain 3 and advance the chain 3 thereby to advance the slats 4. In a convenient construction, the apparatus is timed so that there is one advance of the slats every six seconds. It will be appreciated that the timing can be adjusted as desired to depend on particular manufacturing requirements. The conveyor 2 is arranged to come to a halt each time a slot arrives at a filling station.

A filling head straddles the conveyor at the filling station. The filling head includes a carriage 11 which is guided for movement up and down. This carriage 11 is connected with piston rods 12 of two air pressure motors 13 arranged on opposite sides of the carriage 11. Thus, movement of the piston rods 12 raises and lowers the carriage 11. The carriage 11 also supports a plurality of rings of injector nozzles or needles 14, these rings being arranged in a row extending transversely of the direction of movement of the conveyor. When a slot 4 of the conveyor comes to rest beneath the filling head, the carriage 11 will be lowered by the action of its air pressure motors 13 so that the injector nozzles or needles 14 penetrate into the doughnuts supported in the recesses 5 of the slats 4. The filling head also includes a row of filling plungers 15 each one of which is operable to supply jam to one injector means in the form of a ring of injector nozzles or needles 14. When the needles or needles 14 have penetrated the doughnuts, the plungers 15 are operable to force jam through the needles or needles 14 into the doughnuts.

Each filling plunger 15 is operated by its own individual air motor 16. Each plunger 15 has at its upper end a quick release coupling 17 with one end of a rock shaft 18. The rock shaft 18 is pivoted on a pivot 19 intermediate its ends and the other end of the rock shaft 18 is connected by a clevis joint 20 with a piston rod 21 of the air motor 16 associated with that plunger. Each air motor 16 is a fixed stroke motor, but the clevis joint 20 permits an adjustment to be made so that the length of the stroke of the plunger 15 can be adjusted by altering the position at which the rock shaft 18 is connected to the piston rod 21. This provides a coarse adjustment of the plunger stroke.

The effective length of each plunger 15 is adjustable. For this purpose, each plunger 15 is connected with its quick release coupling 17 by a screw 22 working in a screw threaded tube 23 on the quick release coupling. A lock-nut 24 is provided for maintaining a desired position of the plunger. This arrangement provides a fine adjustment of the effective length of the plunger stroke.

The filling head also includes a jam hopper or reservoir 25. The plungers 15 are movable in this reservoir 25. The lower end of the jam reservoir 25 terminates in a valve block 26 which is provided with a plurality of cylindrical discharge chambers 27. One of these chambers 27 is provided for each recess 5 in one slot 4 of the conveyor 2 and the chambers 27 are positioned to be immediately above a recess 5 in the slot when the conveyor comes to a halt at the filling station. A discharge piston arrangement is arranged in each of these cylindrical chambers 27. This piston arrangement includes a circular disc 28 which is freely movable up and down on the plunger 15 and a spoke wheel 29 which is fixed above the disc. Jam to pass from one side of the spoke wheel to the other through spaces 30 between
the spokes, the jam flow being indicated by arrows 31. As the plunger 15 moves down, it will in the first part of its movement, open a valve 32 (FIG. 4) as heretofore described, to enable jam to pass from the interior of the cylindrical chamber to the injector nozzles or needles carried by the carriage. This valve 32 is omitted from FIG. 2 for the sake of clarity. During this part of movement of the plunger 15, the disc 28 which is freely moveable on the plunger 15 cannot move downwards because of the resistance to the jam in the chamber 27. However, by the time this part of the motion of the plunger 15 has been completed, the spoked wheel 29 will be immediately on top of the disc 28 so that further downward motion of the plunger 15 will force the disc 28 downwards. The disc 28 then acts as a piston to force jam through the open valve 32 and through the injector needles or nozzles 14 into the doughnut. A stop, such as a locknut 33 is provided to limit the amount of movement by which the disc 28 can move away from the spoked wheel 29. This permits the length of the effective stroke of the plunger 15 to be adjusted since the effective stroke is the full stroke of the plunger less the maximum permissible spacing between the disc 28 and the spoked wheel 29, i.e., the amount of "lost motion."

A plurality of sensors are carried by the filling head. One of these sensors is provided in association with each plunger 15. Each sensor includes a sensor element which is a ring 34 which surrounds the injector nozzles or needles 14 carried by the plunger 15. Each sensor ring 34 is carried by an operating lever 35 which is pivotally mounted on the filling head. The lever 35 is loaded by a spring 36 to maintain the sensor rings in their lowest positions. If a doughnut is present in a recess 5 of a slat 4 which has been advanced to the filling station, the lever 35 attached to the sensor ring 34 will be pivoted upwards as the carriage 11 is lowered. If no doughnut is present, the lever will not be pivoted. As previously stated each plunger 15 is driven by its own air motor 16. These air motors 16 will not be energized unless a switch 37 is actuated by pivotal movement of a sensor ring 34. Thus, if no doughnut is present in a recess 5 in a slat 4 of the conveyor 2, the plunger 15 and injectors 14 arranged immediately above the doughnut-free recess will not be operated.

As previously stated, the supply of jam from the cylindrical compartments 27 in the valve block 26 is controlled by the cut-off valve 32 illustrated in FIG. 4. This cut-off valve includes a shutter plate 38 which is rotatable on the bottom of each cylindrical compartment 27. This bottom is provided with a circular row of apertures 39 containing the upper ends of the injector needles or nozzles 14 and these apertures 39 are normally covered by the shutter plate 38. However, the shutter plate 38 has a corresponding number of apertures 40 which, when the shutter plate 38 is positioned in its open position, register with the outlet apertures 39 from the cylindrical compartments 27. The lower end of the plunger 15 is provided with a cam pin 41 which can move in a helical cam track in the form of slot 42 in a boss 43 attached to the shutter plate 38. As the plunger 15 descends, it moves in the helical cam slot 42 to rotate the shutter plate 38 to the desired position. This opens the valve 32. During the return stroke of the plunger the pin 41 moves in the cam slot 42 to close the valve. This arrangement prevents the dripping of jam from the nozzles.

All parts of the machine are made removable and cleanable for ease of cleaning as desired.

During the return stroke of the plunger 15 and injector needles or nozzles 14, the doughnuts will often rise with the needles or nozzles. In order to eject the doughnuts from the nozzles or needles 14, the sensor rings 34 also act as ejector members. For this purpose, the filling head is provided with a fixed stop bar 43 which limits upward movement of the sensors 34. The stop bar 43 engages the operating levers 35 of the sensors 34 and this will have the effect that the sensor rings 34 are fixed relative to the injector needles or nozzles 14 during their upward movement. Consequently, any doughnut remaining impaired on the needles or nozzles will be forced off.

The wheeled frame also carries an air compressor 44 and an air reservoir tank 45. Alternatively, the apparatus can be arranged to operate from a factory compressed air line where such is provided. Although the apparatus is preferably designed for operation with air pressure motors, it will be appreciated that hydraulic motors could alternatively be used if desired.

What I claim is:

1. Apparatus for filling ring doughnuts with a flowable filling material comprising a conveyor including a plurality of circular recesses therein each having an outer predetermined diameter and arranged in rows transverse to the direction of movement of said conveyor; each said recess having an annular configuration for receiving one of said ring doughnuts; a plurality of filling stations vertically spaced above said conveyor and aligned in a row, said stations corresponding in number to the number of said recesses in each recess row; means for advancing said conveyor intermittently to bring a respective one of said rows into vertical alignment with said filling stations; a plurality of filling injector means corresponding in number to said filling stations and located respectively in each said filling station; each of said injection means having a plurality of injector needles arranged in a circular pattern with a diameter less than said predetermined recess diameter; means providing vertical movement of said injector needles into and out of said recesses; a plurality of sensor means corresponding in number to said plurality of injector means and associated respectively therewith; each said sensor means comprising a ring element surrounding said plurality of injector needles at each filling station, and pivotal lever means mounted on said apparatus to which said ring element is attached; and stop means mounted on said apparatus against which said lever means is adapted to abut to prevent upward movement of said ring element as said plurality of injector needles is withdrawn from said recesses to thereby remove any ring doughnuts impaired on said injector needles.

2. Apparatus according to claim 1 wherein a plurality of filling discharge chambers are provided to supply filling material to said injector needles, and said ring element is positioned to make contact with a ring doughnut in said recess to cause pivoting of said lever means for operating said discharge chambers.

* * * * *