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BAG-OPENING APPARATUS

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3 Claims

ABSTRACT OF THE DISCLOSURE

Bags, that are to be filled, are suspended on pairs of rods carried on a rotary turret. There are several pairs of rods, each pair carrying a plurality of empty bags stacked one behind another. A spring-pressed follower urges each stack radially outwardly. A compressed air chamber with a plurality of ports, each disposed just above the radially outermost bag of one stack blows compressed air downwardly into this bag to open it. The rotating turret carries the opened bags successively beneath hoppers which dispense the goods to be bagged into them. The dispensing apparatus illustrated is conventional and takes the opened bags off the turret and holds them open while being filled.

This invention relates to packaging machines, and more particularly to apparatus for opening bags that are to be filled by machine.

Machines are known which automatically weigh and package produce in bags. One such machine is manufactured by the Baker Machinery Company of Kennewick, Wash., and is known as the "Weigh-O-Matic." It has a plurality of loading funnels or hoppers traveling continuously in a closed path. Mounted beneath each funnel are two pairs of jaws, for holding opened bags while the bags are being filled from the funnels. In the past it has been necessary, depending upon the size of the machine, to employ one or more persons to feed opened bags, one by one to the jaws as each loading funnel moves past a given station. The jaws hold a bag open beneath the funnel, while produce is fed through the funnel into the bag. A weighing scale is associated with each funnel to measure and indicate the weight of the produce introduced into the bag. After the bag has been properly filled it is removed from the machine and sealed.

A major disadvantage of feeding bags manually to the jaws of such a machine is that personnel must be hired to attend the machine. Furthermore, there is always a chance that an operator will be injured when he or she inserts an open bag into the jaws beneath a funnel. Moreover, the rate at which bags can be fed manually to the machine depends upon the skill of the operator, and may vary considerably over a period of time and for different operators.

It is an object of this invention to eliminate the need for manually feeding bags to machines of the type described, or in other words to provide means for automatically feeding opened bags to the bag-gripping jaws of such machines.

Another object of this invention is to provide a bag opener and feeder which can be readily connected to, and driven by a packaging machine of the type described.

A further object of this invention is to provide for a machine of the type described a novel bag-opening and feeding apparatus, which can readily and easily be loaded with a large supply of bags so as to permit almost uninterrupted operation of the packaging machine.

Other objects of the invention will be apparent hereinafter from the specification, and from the recital of the appended claims, particularly when read in conjunction with accompanying drawings.

In the drawings:

FIG. 1 is a schematic plan view of a conventional packaging machine, such as the Baker machine referred to above, and of a bag-feeding mechanism therefor made in accordance with one embodiment of this invention.

FIG. 2 is an enlarged, fragmentary, generally sectional view taken along the line 2—2 in FIG. 1 looking in the direction of the arrows, parts however being shown in elevation;

FIG. 3 is an enlarged, fragmentary front elevational view of the packaging machine with parts thereof cut away, and showing a pair of its hoppers in their elevated or bag-releasing positions, and another funnel or hopper lowered into bag-filling position;

FIG. 4 is a fragmentary sectional view taken along the line 4—4 in FIG. 2 looking in the direction of the arrows;

FIG. 5 is a fragmentary sectional view, on a still further enlarged scale, taken along the line 5—5 in FIG. 4 looking in the direction of the arrows; and

FIG. 6 is a fragmentary front elevational view of the upper end of one of the bags, which may be used on this apparatus.

Referring now to the drawings by numerals of reference, 10 designates a conventional packaging machine, such as the Baker machine, and comprising a frame 14 supported in conventional manner on wheels 15, one of which is shown in FIGS. 2 and 3. A plurality of pivotal loading funnels or hoppers 12 are mounted on frame 14 by means of an endless chain 18 for travel in a closed path above the frame. Connected to each hopper 12 for movement therewith above the frame 14 is a weighing scale 16. The hoppers are pivoted, by means not here shown specifically, to move into and out of bag-loading position.

The chain carrying the funnels and scales is driven in the direction of arrows 19 by a plurality of sprockets, one of which is shown at 20 in FIG. 1 as being fixed to a vertical driveshaft 22 (FIGS. 1 and 2), which is rotatably mounted on frame 14. A further sprocket 23 (FIG. 2) is fixed on shaft 22 and is connected by a chain (not illustrated) to a conventional motor (not illustrated).

Mounted beneath each hopper 12 for pivotal movement therewith, and independently thereof, are two pairs of jaws 24 and 26 (FIGS. 2 and 3).

Rotatably mounted in each of a pair of spaced, U-shaped brackets 28, which extend downwardly from each hopper 12 below the jaws 24 and 26, is a cam roller follower 30. Mounted on the front of frame 14 for engagement by the followers 30, as the hoppers 12 move with chain 18 in its endless path, is a stationary cam track 32, which may be made out of rigid pipe, tubing, or the like. Opposite ends of cam track 32 are bent downwardly as at 33 and 34 (FIG. 3). Intermediate its ends the cam track has a straight, dwell section 35. The track is carried on the upper ends of a pair of spaced, parallel, tubular legs 36. At their lower ends legs 36 are adjustably mounted in sleeves 37 (FIG. 2), which are fixed by brackets 38 to a horizontal plate 39, which is adjustably supported above the frame 14 by a plurality of legs 40 and nuts 41. Legs 40 pass through the plate and a pair of nuts thread on each leg to engage the upper and lower surfaces of the plate.

Normally each hopper 12 is disposed in a bag-loading position in which it is horizontal (for example, the position of the hopper shown at the right-hand side of FIG. 3). As each hopper 12 approaches the front of the machine 10, its leading follower 30 (right-hand follower as illustrated in FIG. 3) engages the riser section 33 of the cam track 32, thereby causing the hopper to be pivoted vertically to a tilted, bag-releasing position, as illustrated for example by the two hoppers 12 shown at the left of FIG. 3 and by the single hopper shown in FIG. 2. During this upward tilting movement of a hopper 12, its as-

sociated inner jaws 24 are moved toward one another by conventional means (not illustrated) until they are spaced from the associated outer jaws 26. After a hopper 12 has passed off the cam back 32, its trailing follower 30 (left-hand follower in FIG. 3) will ride down the falling section 34 of the cam, thereby permitting the hopper to pivot back downwardly to its normal, lowered, horizontal position. During this return movement, the associated jaws 24 of the hopper are moved outwardly away from one another to grip diametrically opposite sides of the upper end of a bag B against the outer jaws 26, thereby to secure the bag beneath and in registry with the lower end of the hopper.

All of the above structure is old. I shall now describe the bag-opening and feeding apparatus of my invention.

Mounted in front of the packaging machine 10 is a bag-opening and feeding device 42 constructed according to the present invention and comprising a two-legged table or stand 44, which is supported on a pair of wheels 43 (only one of which is shown in FIG. 2), and which is adjustably connected by a rod 45 to the packaging machine frame 14. Rod 45, which is rectangular in cross section, is fixed at one end to the stand 44, and is slidably adjustable at its opposite end in a guide 46, which is secured to the side of frame 14. A set screw 47 in bracket 46 engages the rod 45 releasably to secure it against movement in the bracket.

Rotatably mounted adjacent its lower end in spaced bearings 49 and 50 carried by vertically-spaced shelves 51 and 52, respectively, of the stand 44, is a vertical shaft 54. Secured to shaft 54 between the shelves 51 and 52 is a sprocket wheel 56, which is connected by a chain 57 to a further sprocket 58, which is secured to the lower end of shaft 22 on the frame 14. Chain 57, which is crossed between sprockets 56 and 58 as shown in FIGS. 1 and 2, is also connected to a further sprocket 59. This sprocket is rotatably mounted on a further shaft 60, which is mounted on stand 44 parallel to shaft 54. Opposite ends of shaft 60 are adjustably secured by nuts 61 in arcuate slots 62 formed in the shelves 51 and 52 coaxially of shaft 54, so that when the nuts 61 are loosened, shaft 60 may be shifted in slots 62 to create or take-up slack in chain 57.

Between the shaft 22 and the stand 44 the chain 57 is housed in an elongate, sheet metal guard 64. Guard 64 is secured at one end to stand 44, and at its opposite end is slotted as at 65, and is slidably mounted on the side of frame 14 so that it can be adjusted toward or away from shaft 22, when stand 44 is adjusted relative to frame 14.

Shaft 54 extends upwardly through one end of a plenum or fan housing 96, which is secured on top of stand 44. A fan 97 is mounted in the opposite end of this housing for rotation by a motor 98, that is mounted beneath the upper shelf 52 of the stand 44. Fan 97 draws air into housing 96 through an opening 99 therein.

Secured to shaft 54 above housing 96 are two, axially spaced spiders 66, each of which has a plurality of angularly spaced, radial spokes 67. These spokes are secured at their outer ends to the inner surface of a rotatable tube or sleeve 68, which surrounds shaft 54 coaxially thereof, and which projects at its lower end into the top of housing 96.

Secured to the top of the tube 68 coaxially thereof is a disc-shaped plate 72, which has a central opening there-through that registers with the bore of the tube 68. A dome-shaped cover or cap 70 is secured around its marginal edge to the periphery of the plate 72 to form thereover a chamber 74.

At each of several equi-angularly spaced points around their peripheries (at six points or stations in the illustrated embodiment) the cap 70 and plate 72 have registering openings or notches 76 and 78, respectively, to provide six ports which communicate with the chamber 74.

Secured at its upper end to the plate 72, and extending downwardly through each of the openings 78 therein is a bracket 80 (FIGS. 2 and 5). Radially spaced inwardly

from brackets 80 are six further brackets 82 (FIGS. 2 and 4), which project downwardly from the plate 72 at equi-angularly spaced points thereabout to register with the outer brackets 80. Mounted between each pair of registering brackets 80 and 82 for reciprocation radially of tube 68 is a pusher plate 83. Each plate 83 is secured to the forward ends of a pair of rods 84 that are slidable in spaced apertures in each bracket 82. Each plate 83 is urged radially outwardly by springs 85, which surround the rods 84 between each plate 83 and the associated bracket 82. Secured to the rear end of each rod 84 is a nut 86, which limits the outward movement of the rod and its associated plate 83.

Removably and slidably mounted in a pair of spaced apertures 88 in each pusher plate 83 are the legs 89 of a U-shaped, bag-supporting wicket 90 (FIG. 5). The closed end of each wicket 90 is removably seated on the upper surface of a narrow, lateral ledge 92 which projects from the inside wall of the associated bracket 80 at the lower end thereof.

Each wicket 90 is adapted to support a plurality of bags B, as shown for example by broken lines in FIGS. 2 and 5. The rear wall of each bag extends slightly above its front wall as denoted at 102 (FIG. 6), and contains a pair of spaced openings 103 (FIG. 6) for accommodating the legs 89 of a wicket 90. Each flap 102 is perforated along spaced, parallel lines 104 between these openings and the upper edge of the flap. Bags are loaded on a wicket by removing the closed end of the wicket from its ledge 92, withdrawing its legs from the associated pusher plate 83 and inserting them through the registering openings 103 in the upper ends of a stack of bags B, reinserting the wicket legs in the pusher plate so that the latter engages the back of the stack of bags, and then reseating the closed end of the wicket on the ledge 92 of the associated bracket 80.

The spring-loaded pusher plates 83 force the wickets, and the bags that are suspended therefrom, radially outwardly against the associated bracket 80, so that the upper, open end of the radially-outERMOST bag of each stack will be forced outwardly beneath this bracket.

An arcuate leaf spring 93 (FIGS. 2 and 5) is secured to, and projects downwardly from, each pusher plate 83 to engage the back of a stack of bags B. Each spring 93 is connected by a chain 94 to the tube 68 to limit the outward movement of the lower end of the spring.

In use, motor 98 drives fan 97 so that air is blown thereby into the bottom of tube 68, and upwardly into chamber 74, where it is directed radially outwardly by the curved inner surface of the cap 70 toward the six ports formed by the registering notches 76 and 78 in the marginal edges of cap 70 and plate 72. The air blown downwardly through these ports causes the outermost bag B at each of the six stations to be blown open as illustrated in FIG. 2.

Also at this time, the motor (not illustrated) which drives shaft 22, is energized by conventional means and through chain 57 rotates the shaft 54. Because chain 57 is crossed, shaft 54 rotates oppositely to shaft 22, or in the direction indicated by the arrow 106 in FIG. 1. Shaft 54 in turn rotates the turntable 72, and the cap 70 secured thereto. This rotational movement is synchronized with the advance of the hoppers 12 across the front of the machine 10, so that each of the six groups of bags suspended beneath the turntable 72 registers one after another with successive hoppers 12 at the point where each hopper begins to tilt downwardly after passing the cam 32. For example, as the trailing follower 30 of a hopper 12 commences to roll down the portion 34 of cam track 32, turntable 72 rotates the open, upper end of a bag B into registry with a downwardly tilting hopper 12, so that the two jaws 24 associated with the hopper descend into the upper end of the bag. Thereafter by the mechanism incorporated in the packaging machine, and not here illustrated because it forms no part of the present invention,

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the two jaws 24 move away from one another and toward the cooperating outer two jaws 26. By the time this hopper has been advanced by the chain 18 far enough to disengage the cam 32, its associated jaws 24 and 26 will have gripped the bag B as shown at the right in FIG. 3. As the chain 18 continues to advance the hopper, the gripped bag is torn from its associated wicket 90 by operation of the mechanism of the packaging machine and forming no part of the present invention. This bag will then be filled by the packaging machine. The upper, open end of the next outermost bag on the wicket will then be exposed to the air being blown downwardly from cover 70. As a consequence, as soon as the old bag is torn off, the new bag is blown open, and remains open, as illustrated in FIG. 1, until it is rotated about the axis of shaft 54 and beneath another one of the hoppers 12.

As the hoppers 12 carry the bags B around toward the rear end of machine 10, produce, or the like, is fed into the upper end of each funnel 12, and is guided thereby into the bag B gripped therebeneath. The bag is automatically weighed by the associated scale 16, and is thereafter removed, when the hopper passes a further cam 32 (not illustrated), which can be located at any desired point around frame 14, or, when the hopper finally has traveled far enough around the machine 10 once again to engage the riser section 33 of the illustrated cam 32. As the leading follower 30 of a hopper commences to ride up the cam section 33, the hopper is pivoted upwardly, and its jaws 24 begin to retract toward one another, and away from the jaws 26, until they reach the positions illustrated by the jaws 24 on the two hoppers shown at the left in FIG. 3. These jaws are then ready to grip a new bag B as described above.

From the foregoing it will be apparent that the novel bag-feeding mechanism disclosed herein can be operated completely automatically, and as a consequence eliminates the need for manually feeding bags to the gripping jaws of the hoppers of a packaging machine. In practice, the six stations supporting the bags B can be loaded or reloaded within two or three minutes with up to six thousand bags. The lines of perforations 104 in the upper lip of each bag prevent any undesirable ripping of the bag, when it is pulled from its supporting wicket 90.

As the number of bags on a wicket decreases during operation of the bag-opening apparatus, the air which is blown downwardly through the registering port 76, 78 tends to blow the upper end of the outermost bag rearwardly beneath the associated bracket 80, so that the jaws 24 on a descending hopper may not properly enter and grip the bag. The springs 93, however, prevent this by pushing outwardly at their lower ends on the rear of each stack of bags, thus preventing the stacks from pivoting inwardly beneath plate 72. The lower edges of the springs 93 are beveled or rounded to prevent damage to the bags B engaged thereby.

Since frames 14 and 44 are mounted on wheels, they can be easily moved from one place to another. This also expedites the adjustment of frame 14 relative to frame 44, when the set screw 47 is released from locking engagement with rod 45.

While the invention has been described in connection with a specific embodiment thereof, it will be understood that it is capable of further modification, and this application is intended to cover any variations, uses, or adaptations of the invention following, in general, the principles of the invention and including such departures from the present disclosure as come within known or customary practice in the art to which the invention pertains and as may be applied to the essential features hereinbefore set forth, and as fall within the scope of the invention or the limits of the appended claims.

Having thus described my invention, what I claim is:

1. Apparatus for opening and feeding bags comprising

a turntable mounted for rotation about a vertical axis,

means for suspending a plurality of bags from said turntable at each of a plurality of stations angularly spaced around the periphery of said turntable, with the open ends of said bags facing upwardly, and with the bags at each of said stations positioned one behind the other radially of said axis,

a source of air under pressure,

means for directing air from said source into the upper end of each of the radially outermost of said bags at each station thereby to hold said outermost bags open,

said directing means comprising

a cover member mounted over said turntable to form a chamber between said cover member and turntable,

means connecting said chamber to said source to receive air therefrom,

said turntable having therein a plurality of angularly spaced ports, which register with said stations,

said cover member being operative to direct air from said chamber through said ports, and into said outermost bags,

said connecting means comprising a tubular member connected at its upper end to a central opening in said turntable coaxially thereof, and connected adjacent its lower end to said source for conveying air upwardly therefrom to said chamber,

said ports being disposed around the periphery of said turntable,

said cover member being dome-shaped to direct air in said chamber radially outwardly and downwardly to said ports,

a stand,

a shaft rotatably mounted on said stand,

means mounting at least one of said members on said stand for rotation by said shaft coaxially of said axis,

said one member being connected to said turntable to rotate the latter in response to the rotation of said shaft,

a second stand adjacent to the first-named stand,

a plurality of hoppers mounted on said second stand for travel about a second vertical axis,

a cam mounted on said second stand adjacent the end thereof facing said first-named stand,

drive means for advancing said hoppers continuously and in one direction around said second stand, and successively into operative relation with said cam,

follower means carried by said hoppers and operative when each hopper is in operative relation with said cam to grip an opened bag and remove it from said bag suspending means for filling said bag,

means adjustably connecting said stands to one another, and

means connecting said shaft to said drive means for rotation thereby.

2. The combination as defined in claim 1, wherein said hoppers are mounted on said second stand for pivotal movement by said cam from lowered to raised positions and vice versa,

two pairs of jaws are mounted beneath each hopper for movement therewith between raised and lowered positions,

said turntable is mounted to move one of its stations into registry with one of said hoppers during the movement of the latter to its lowered position,

said bag suspending means includes resilient means urging the bags at each station radially outwardly to that the open end of the outermost bag at said one station is disposed beneath the jaws on said one hopper during the downward movement thereof,

two of the jaws on said one hopper are moveable downwardly around the outside of the last-named bag adjacent the upper end thereof, and the two other jaws on said one hopper are movable downwardly

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into the upper end of said last-named bag, and then outwardly toward the jaws at the outside of the bag, when said one hopper moves to its lowered position, thereby to grip diametrically opposite sides of the bag, and to hold it in registry with said one hopper.

3. Apparatus for opening and feeding bags, comprising
- a turntable mounted for rotation about a vertical axis, means for hanging a plurality of bags one behind the other from said turntable at each of a plurality of stations angularly spaced around the periphery of said turntable, with open ends of said bags facing upwardly, and with the closed ends thereof suspended freely beneath the turntable,
- means for directing air under pressure into the upper end of each of the outermost of said bags at each station to hold said outermost bags open,
- a stand mounted adjacent said turntable,
- a plurality of hoppers mounted on said stand for movement in a closed path substantially tangential to said turntable,
- means for rotating said turntable in timed relation to the movement of said hoppers to bring said stations successively into registry with successive hoppers,
- a cam mounted on said stand adjacent the point of

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tangency of said turntable and the path of travel of said hoppers,

bag-gripping means mounted beneath each of said hoppers, and follower means associated with each bag-gripping means for engagement with said cam, when each hopper is moved into registry with said cam, and operative to cause the associated gripping means to grip an open bag from the registering station to remove said open bag from its station and to suspend it beneath the associated hopper.

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