Bag Packaging Apparatus with Protective Atmosphere

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References Cited

UNITED STATES PATENTS

3,619,975 11/1971 Johnson et al. 53/110 X

ABSTRACT

There is disclosed a packaging apparatus for filling and closing packaging containers in the form of flat bags to produce packages having low oxygen content. The low oxygen content is achieved by locating appropriate work stations of the packaging apparatus under a hood which confines a protective gas in and around the packaging containers during processing. The hood is divided into a plurality of regions and chambers with each region having an independently adjustable gas supply line connected thereto. Thus, the amount of protective gas supplied to each region may be regulated as needed to minimize total gas consumption of the packaging apparatus.

4 Claims, 8 Drawing Figures
The invention relates generally to an apparatus for filling and closing packaging containers, such as bags which are produced in the flat form and are opened prior to filling, within a protective gas atmosphere to ensure a low oxygen content in the sealed containers. A packaging apparatus has already been disclosed for filling, pre-closing and exhausting packaging containers in a protective gas atmosphere to produce tubular packages having low oxygen content, see co-pending U.S. application, Ser. No. 367,645, filed on June 3, 1973, by one of the present co-inventors and assigned to the same assignee. The tubular packaging containers used in the earlier apparatus are made on forming mandrels and are self-supporting. The protective gas atmosphere is supplied through a hood, or distributing duct, extending over the path of travel of the packaging containers generally from the filling station to the packaging closing station. At a work station preceding the closing station the apparatus is provided with a member having a plurality of hollow needles, or small tubes, which extend into the head area of the packaging containers and, if necessary, into the fill goods in the container. Protective gas is flushed through the packaging via the hollow needles in order to reduce the oxygen content prior to the closing operation. While this apparatus produces low oxygen content packages with relatively low amounts of protective or flushing gas, it does provide for a gas evacuation station.

Based on the above approach an apparatus for producing, filling and closing flat bags, for instance of the type shown and described in German Pat. Publication DOS No. 2,160,459, and U.S. Pat. application, Ser. No. 96,006, filed on Dec. 8, 1970, was tested, with means for flushing of the type described above, wherein, however, the evacuation station was excluded. Tests did show, however, that for such bags (and appropriate packaging machines) the amount of protective gas required to produce packages of suitably low oxygen content was greater than expected and desired for utmost efficiency.

It is therefore the primary object of the present invention to provide an improved gas flushing device for conventional packaging machines in order to substantially reduce the consumption of protective or flushing gas used in such apparatus for providing filled bags with low oxygen content.

A further and more specific object of the invention is to provide a packaging apparatus especially for flat bags having a subdivided hood for protective gas over certain work stations of the apparatus, with individual flow controlled gas lines going to individual parts of the hood — from a common source of supply — so that the amount of gas in the different regions of the hood can be varied to achieve the desired gas saving.

A further and more specific object of the present invention resides in providing an apparatus of the category indicated above in which the protective gas supply lines are flow controlled so that despite a temporary standstill or slowdown of the apparatus a reduced amount of gas still flows to the critical work regions. In line with this object it is also desired to selectively provide a controlled amount of gas corresponding to the normal operating requirements or, alternatively, during periods of temporary standstill a lesser amount of protective gas for the regions requiring such gas. The most frequent temporary standstills occur at regular intervals when a new roll of paper has to be inserted into the automatic packaging machine.

An aspect of the present invention resides in providing a packaging apparatus which has a plurality of work stations, for instance for filling, measuring, and closing packaging containers including those that are referred to as "flat bags" as compared to "tubular bags." The apparatus provides a protective atmosphere during operation and for this purpose includes a hood arrangement which extends over a plurality of the work stations. This hood arrangement is divided into a number of regions with each region being adapted to receive independently of the other regions a volume controlled flow of protective gas. The hood arrangement further includes a plurality of gas distributing chambers with each thereof being located in one or more of the regions referred to above. A separate protective gas supply conduit or pipe connects to each region to supply the gas and these conduits are connected to a source of protective gas such as a storage tank. Between the individual conduits and the storage tank there is disposed a gas flow control arrangement whereby the quantitative flow of gas through a plurality of the regions can be controlled.

A further aspect of the present invention resides in providing a packaging apparatus with a protective atmosphere of the type generally described in the preceding paragraph in which there is interposed between the individual conduits and the storage tank a manifold or gas line. In turn, between the manifold and the storage tank there is provided a main and secondary (or bypass) flow control arrangement, both of these arrangements being responsive to a slowdown or temporary shut-down of the apparatus so that the secondary gas flow control line will act as a bypass to supply gas at reduced pressure to the hood regions when such slowdown or temporary shutdown occurs.

For a better understanding of the present invention, together with other and further objects thereof, reference is had to the following description taken in connection with the accompanying drawings, and its scope will be pointed out in the appended claims.

In the drawings:

FIG. 1 is a schematic illustration of the side elevation of the packaging machine and hood in accordance with the invention;
FIG. 2 is a plan view basically of the hood shown in FIG. 1;
FIG. 3 to 7 are cross-sectional views taken, respectively, along the lines III—III, IV—IV, V—V, VI—VI and VII—VII of FIG. 2;
FIG. 8 is a diagram of the protective gas supply system in accordance with the invention.

Referring now to the drawings, there is shown in FIG. 1 a packaging apparatus 1 for filling and closing packaging containers in the form of flat bags. For more specific details of such machines, reference may be had to the following U.S. Pat. Nos.: 2,745,583 and 2,649,674.

Entering the packaging apparatus 1 from the left side, as shown in FIG. 1, is an endless web or strip 2 of packaging material folded along its centerline and positioned with the fold down. The strip 2 is provided with vertical sealing seams, not shown, in accordance with a predetermined pattern, after which it is cut into indi-
individual bags. The bags are placed between pairs of conveyor tongs 4, 5 of a double track conveyor arrangement 6 in such a manner that the bags 3 are gripped by the tongs 4, 5 in the vicinity of their upper corners 7 and, thus suspended, are conveyed along a conveyor arrangement 6 to successive work stations of the packaging machine 1. Conventional tongs or clamping tongs and movement control devices therefor, such as shown in FIGS. 5 and 7 of U.S. application, Ser. No. 96,006 filed on Dec. 8, 1970, can be utilized.

In the preferred embodiment such as shown in FIG. 2, a conveyor system 6 has a double track 8,9, which extends parallel to each other. The system can include an endless chain or belt type, in either situation, however, the adjacent bags on the two conveyors do not necessarily pass through a work station simultaneously. Generally, physical considerations of some work stations preclude such positioning. The bags 3 on the conveyors 8,9 pass through or under a station or arrangement 10 for opening the bag 3, devices 11,12 for metering the goods and filling them into the bag; a station 13 for cleaning the seam of the bag, as well as a work station provided with tools 14 for closing the bag.

More specifically, the bags 3 are thus conveyed along the parallel opening tracks 8,9 to and below a bag opening station 10, see FIG. 4, equipped with vertically suspended forming mandrels or formers 15 which can be lowered into the bags 3 to give them the required shape. Each former 15 is provided with a centrally located duct or conduit 17 extending the axial length thereof to a lower end 16 of the former 15. A protective gas is blown into the bags 3 through the ducts 17 at least while the formers 15 are being withdrawn from the bags 3. To receive the gas, ducts 17 are connected through a magnetic (electrically operable) valve 18 to a protective gas storage container 20. In order to inhibit or control the gas flow to each duct 17, an adjustable throttling valve 21 is inserted in the supply line after the valve 18. The bags 3 are opened to receive the formers 15 by moving the conveyor tongs 4,5 toward each other, and, if necessary, by suction devices, not shown, applied to the outside of the bags.

Extending from the station 10 to station 14 above the conveyor lines 8,9 for moving bags 3 is a hood 22, see FIG. 1, which has a plurality of regions 23,24,25,26,27 and 28, with one or more regions sharing a common protective gas distribution chamber 30,33,34 as herein-after further defined. The individual regions (23 to 28) or chambers within the region of the hood 22 may be separated in the direction of travel or at right angle thereto, as shown in FIGS. 1 and 2. The term "hood" or "hood arrangement" is used in this application in a generic sense to cover all those gas flushing regions that perform substantially the same function although two adjacent regions may be physically separated.

The hood region 23, see FIGS. 2 and 5, is comprised of a gas distribution chamber 30 to which is connected a gas supply line 29. The bottom of the chamber 30 is defined by a plate 31 positioned vertically in close proximity to and above the bags 3. The vertically extending side walls 30a defining chamber 30 extend below the plate 31 and form a U-shaped hood-like bag receiving tunnel. The plate 31 is formed with a plurality of closely spaced gas outlet apertures 32 which permit a gas flow from the chamber 30 into and around the bags 3. A wire fabric or the like may be substituted for the plate 31. FIG. 5 also illustrates schematically the clamping tongs or tools 4 secured to the transverse end of bags 3.

Adjacent to the region 23 in the direction of conveying are the two regions 24,25, see FIG. 2, and as more specifically depicted in FIG. 6. Each of the regions 24, 25 is comprised of an independent gas distribution chamber 33, 34 with a separate gas supply line 35, 36, respectively, connected thereto. The bottom of each chamber 33, 34 is formed with a plate 37 arranged vertically above the bags 3 and also having a plurality of gas outlet apertures 32.

Extending into each region 24, 25 are hoppers 38, 39, respectively, see FIG. 1, arranged to feed metered quantities of the fill material into the bags 3. Located above the hoppers 38, 39 are conventional devices 11, 12 preferably in the form of worm metering devices, for instance see co-pending application, Ser. No. 228,900, now U.S. Pat. No. 3,790,040. The metering devices 11, 12 have fill material outlets 40, 41. These outlets are enclosed by hoods 42, 43 which connect to the hoppers 38, 39. Leading to the hoods 42, 43 are gas supply lines 44, 45 so that an atmosphere of protective gas may be provided within the hoppers 38, 39. Because of the size of the metering device 11, 12 and the relatively narrow distance between the bags 3, the positions of the devices 11, 12 along the tracks 8, 9 are longitudinally offset relative to each other. For the purpose of flushing oxygen from the fill material in the metering devices 11, 12 either during or immediately before the metering operation, the metering devices 11, 12 may be provided in a conventional manner with gas supply lines 46, 47 as shown in FIG. 1.

The region 26, see FIGS. 2 and 7, adjacent to the regions 24, 25 of the hood 22 along the direction of conveying encloses a seam cleaning station 13. The station 13 comprises fingers 48 extending radially on a rotating wheel 48a under which upper edges 49 of the bags 3 are passed. The fingers 48 strike the edges 49 so that any material adhering thereto drops off. To prevent ambient air from entering the bags 3 during the cleaning and particularly the striking step, protective gas is fed to the area 26 surrounding the fingers 48 by means of a gas supply line 50. As the bags 3 approach the seam cleaning device, the tongs 4, 5 are brought to their original spacing which causes the upper edges 49 of the bags 3 to come together.

Following the seam cleaning station 13 along the direction of conveying are the bag closing tools 14. The tools 14 are located along the parallel tracks 8, 9 in a stepped or staggered arrangement as shown in FIG. 2. Located between the tools 14 and the region 26 are the two regions 27, 28 of the hood 22, see FIGS. 1 and 2. The regions 27, 28 are arranged parallel to each other above the tracks 8, 9 and the difference in length between them corresponds approximately to the longitudinal length of one pair of bag closing tools 14. Each of the parallel regions 27, 28 has its own gas supply line 52, 51, respectively. Since the upper edges 49 of the bags 3 are already abutting as they pass below the regions 27, 28, these regions are formed quite narrowly in order to economize on gas.

Referring now to FIG. 8, the protective gas is supplied to the hood 22 and the individual regions 23 to 28 form a gas storage container 20. The gas flows from the container 20 through a supply line connected, successively, to a pressure reducing valve 54, a total system flow meter 55, a magnetic valve 56 which is normally
open while the apparatus 1 is in operation, and a gas distributor or manifold 57. Connected to the manifold 57 are adjustable throttling valves 58, each followed by a flow meter 59. The flow meters 59 are connected, respectively, to the supply lines 29, 35, 36, 50, 51, 52, 44, 45, 46, 47.

The valves 58 are adjusted so that each region 23 through 28 of the hood 22 receives an adequate amount of protective gas for normal operation of the apparatus 1. The amount of gas supplied to each region 23 of the hood 22 is affected by the extent of the covered area and interferences to gas flow in each region. In the case of region 23 which is immediately adjacent to the bag opening station 10 in which considerable turbulence is caused by the formers 15 entering the bags 3 and gas emerging therefrom, the supply of gas must be adjusted so that a larger amount is supplied than is required in subsequent regions of the hood. To minimize the consumption of the protective gas in the first region 23, a blower 62, see FIGS. 1, 2 and 3, is arranged ahead of region 23 to reduce the amount of gas carried along by the conveying of the bags 3. The suction effect of the blower 62 retains protective gas surrounding the bags, which otherwise would be taken with the bags in their conveying motion.

The valve 56 may be bypassed by a second magnetic valve 60 cooperating with a throttling valve 61. This second valve 60 is used to feed protective gas at a selectable pressure drop through the throttling valve 61 to the manifold 57 whenever the valve 56 is closed because of a temporary stoppage of the apparatus 1. Thus, even when the apparatus 1 is stopped, a sufficient supply of protective gas is directed to the gas distributing regions of the apparatus 1 to maintain an adequate, even if reduced, gas supply therein to maintain a protective atmosphere within the apparatus to provide a "ready to operate" condition. This alternate gas supply arrangement may also be used to adjust the amount of gas flow when the apparatus 1 is operating, for instance, at half of its normal output. The valves 60 and 61 can be replaced by an adjusting motor, not shown, acting upon a spindle 63 cooperating with a pressure reducing valve 54.

While there have been described what are at present considered to be the preferred embodiments of this invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and it is aimed, therefore, in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

We claim:
1. Packaging apparatus having work stations for filling, measuring, and closing packaging containers, including flat form bags, in a protective atmosphere, comprising:
   a hood means extending over a plurality of work stations and including a plurality of regions with each
   region being adapted to receive independently of the other regions a controlled flow of protective gas;
   a hood means further including a plurality of gas distributing chambers with each thereof being located in one or more of said regions;
   a separate protective gas supply conduit connecting to each said region;
   protective gas storage means connected to the conduits;
   gas flow control means between each individual conduit and said storage means whereby the quantitative flow of gas to a plurality of regions can be controlled;
   a manifold or main gas line between said gas storage means and said individual conduits;
   said main and secondary gas flow control means interposed between said manifold and said storage means, said main and secondary gas flow means both being responsive to a slowdown or temporary shut down of said apparatus whereupon said secondary gas flow means causes to act as a gas bypass to supply gas at reduced pressure to said regions.
2. A packaging apparatus according to claim 1, wherein said main gas flow control means comprises a throttle valve and a magnetic valve arranged in parallel to said secondary gas flow control means.
3. A packaging apparatus according to claim 1, wherein said secondary gas flow control means comprises a magnetic valve.
4. Packaging apparatus having work stations for filling, measuring, and closing packaging containers, including flat form bags, in a protective atmosphere, comprising:
   a hood means extending over a plurality of work stations for filling said containers, said hood defining a plurality of gas distribution chambers with each chamber being adapted to receive independently of the other chambers a controlled flow of protective gas,
   said hood providing a tunnel for receiving thereafter said containers and comprises a protective gas distribution member having a network of vertically extending apertures with said distributing member being arranged within the tunnel spaced from the top of the tunnel and substantially all across the tunnel in each chamber with its bottom face being located vertically spaced from and out of physical contact with said containers when said containers pass through said tunnel;
   a separate protective gas supply conduit connecting to each chamber; protective gas storage means connected to the conduits; and gas flow control means including an adjustable throttle valve between each individual conduit and said storage means.

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