APPARATUS FOR DETERMINING THE OXYGEN CONTENT OF FILLED PACKAGING CONTAINERS

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ABSTRACT
A packaging machine having a plurality of work stations including a protective gas confining cover between certain stations. The machine includes an apparatus for determining the oxygen content of a packaging container filled and sealed within the protective gas environment and comprises a gas analyzer means having an indicating instrument connected to a suction tube through a controllable valve. The inlet end of the suction tube is structured and positioned to draw gas from the vicinity of the unsealed openings of the filled containers as they are moved by a conveying means through the protective gas atmosphere.

5 Claims, 2 Drawing Figures
1 APPARATUS FOR DETERMINING THE OXYGEN CONTENT OF FILLED PACKAGING CONTAINERS

The invention relates generally to automatic packaging machines and, more particularly, to machines of this type having means for controlling and determining the oxygen content of filled packaging containers.

This application is a continuation-in-part application of my co-pending application, Ser. No. 367,645, filed June 6, 1973. While the aforementioned related application is concerned with a complete packaging machine for producing low-oxygen content packages, the present application is specifically concerned with determining the oxygen content of filled packaging containers.

For automatically packaging certain goods, it is desirable to control the oxygen content of the filled packages. This requires that the packaging machine provides a protective environment for certain portions of the work cycle. In order to establish a measure of control over the gaseous composition of the filled packages, it is necessary to determine the composition as accurately as possible.

In the prior art it is already known to use a manual method of spot checking the atmosphere in sealed packages. A very thin, sharply pointed tube is pushed through the wall of the sealed package and a sample of the gas content is drawn off. However, this method destroys the package unless the puncture is sealed off immediately after the sampling operation. The foregoing method does permit the checking of packages produced by tubular bag machines, i.e. closed packaging containers which have been fed individually in the prefabricated condition to a filling station and then to a closing device.

In another approach, the gas sample is taken by means of a probe which is adapted to be inserted for a short time into the opening of the containers. However, because of the high speed at which such packaging machines operate, the probe must be of a large cross section to permit an adequate sample to be drawn off in the short time available.

The large cross section probe has the disadvantage that when it is inserted into the container, gas will be expelled therefrom. Then, when the probe is withdrawn from the container, atmosphere with normally a higher proportion of oxygen will be drawn into the container. Thus, the proportion of oxygen in the gas enclosed in the container after the test may be substantially higher than indicated by the gas analyzer.

Accordingly, it is the primary object of this invention to provide an apparatus for predicting the composition of the gas contained in a prefabricated and sealed packaging container.

A primary aspect of the present invention resides in providing an automatic packaging machine having a plurality of work stations for filling packages and substantially predetermining the gaseous content of the packages. The machine includes a conveyor system for moving the packages along the work stations and a gas carrying cover such as a conduit or hood which extends over a certain path of travel of the packages between the work stations; this cover is constructed and arranged to receive and distribute an inert or protective gas. A gas analyzer system is provided which includes an indicator instrument for determining the gaseous content of the packages and a stationary suction tube extends into the cover and connects to the instrument and is effective to draw gas from the proximity of the path of travel of the unsealed openings of the packages.

A more specific aspect of the present invention resides in providing an apparatus or machine or the type described in the preceding paragraph in which the suction tube is directly or indirectly arranged with an umbrelia-like gas-deflecting member for enveloping the unsealed ends, or openings, of the packages.

It is a still further aspect of the present invention to provide an apparatus or machine of the type described briefly above in which the gas analyzer system includes a control valve and gas pump arranged within the conduit system extending between the indicating instrument and the suction tube.

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 plan view of a packaging machine showing the general arrangement of the work stations;

FIG. 2 is a schematic drawing of an apparatus for determining the oxygen content in a packaging container in accordance with the invention.

Referring now to the drawings, there is shown part of a packaging machine comprising work stations for forming, filling and gas-flushing, evacuating, and sealing tubular bags. A work station 10 is arranged at one end of a packaging machine 9. The work station 10 has a plurality of forming mandrels 11 around which bag-like packaging containers 6 are formed from gas-tight foil drawn from a storage roll 12. The containers 6 are erected and inserted on a conveyor 5 by a transfer device 13. The conveyor 5 transfers the containers 6 to a gas-flushing station 14 where the air in the container 6 is at least partly replaced with an inert gas before the container 6 moves on to a filling station 1. The filling station 1 has a gas inlet 15 through which the flushing gas is introduced into a filler material 16 during the filling operation. The flushing gas is directed in such a manner that it flows counter to the direction of the filler material 16 and purges the air therefrom.

The conveyor 5 is provided with a cover 2 extending from the vicinity of the filling station 1 approximately to an evacuating station 4 having at least one chamber located at the opposite end of the packaging machine 9 from the bag forming station 10. As the containers 6 are moving on the conveyor 5 to the evacuating station 4, an opening 17 and a head-space 18 of the container 6 are covered and substantially confined by the cover 2.

The cover 2 is comprised of a protective-gas distributing duct 19 in the upper portion thereof. The lower surface of the duct 19 is a gas-permeable plate 20 arranged just above the filling opening 17 of the container 6. The plate 20 contains finely spaced apertures 21 which permit gas to flow from the duct 19 into the head-space 18 of the containers 6. Sufficient flow of the protective gas prevents entry of ambient air, and oxygen, into the containers 6. The gas is substantially confined by a skirt depending from the duct 19 and telescoped over the containers 6.

The portion of the conveyor 5, between the flushing station 14 for empty containers and the filling station
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1, may also be covered by a cover 2a. In both the covers 2 and 2a, the gas-permeable plate may be replaced by a close meshed wire fabric, sintered ceramic plate, or the like.

The conveyor 5 transfers the containers 6 to a weight-checking station 22 and then to an ejecting station 23 arranged along the conveyor 5. The ejecting station 23 removes incorrectly filled containers 6. Since ambient air may enter the head-space 18 of the containers 6 when the supply of protective gas confined by the cover 2 is low, or when the container 6 "breathes" during the weight-checking operation, a protective-gas flushing station 3, arranged after the ejecting station 23, flushes more protective gas into the container 6.

After the flushing operation, the container 6 may be transferred, if necessary, by the conveyor 5 to a pre-closing station 32 of a conventional type. The container 6 is pre-closed to such an extent that only evacuating openings are left which are relatively easy to close while still allowing access to the gaseous contents. At the same time, the flow of ambient air into the container 6 is inhibited because of the small evacuating openings.

The container 6 is moved from the pre-closing station 32 by the conveyor 5 to a device 7 which transfers the container 6 from the conveyor 5 to the evacuation station 4, after which the container or bag 6 is completely sealed and then transferred by device 8 back to the conveyor 5. The container 6 is then moved to an exit location of the packaging machine 9.

The present invention provides that along the cover 2 there are arranged one or more suction tubes 26 for withdrawing gas samples from the path of the container 6 in the vicinity of their openings.

Referring now particularly to FIG. 2, there is shown an apparatus for determining the oxygen content of the atmosphere in the packaging container 6. The sampling apparatus of the present invention includes an indicating instrument 30 connected to a pump 24 which draws gas for analysis through a valve 25 and the suction tube 26 from the protective atmosphere contained in the cover 2.

The suction tube 26 is arranged in such a manner that a lower opening 27 is positioned in close proximity to an opening 17 in the container 6. Depending on the shape of the opening 17, however, more than one opening 27 may be provided and an umbrella-like, gas-deflecting member 28 may be arranged around the opening 27. The purpose of the member 28 is to draw gas for analysis both from within and around the opening 17 of the container 6. The analysis thus obtained provides a very accurate prediction of the composition of the atmosphere which will be sealed within the container 6. This can be demonstrated by sampling the contained gas with a very thin pointed tube as discussed earlier.

If, as in the present example, the container 6 is not stiff but is in the form of a flat bag, the conveying means 5 may be provided with gripping means such as tongs 29 movable relative to each other. The tongs 29 are adapted to grip the necks of the bags and they may be moved apart while the gas is being drawn off so that the necks of the bags become restricted of almost flattened. The flow of surrounding gas into the bag would thus be inhibited.

The valve 25, located between the suction tube 26 and the indicating instrument 30, is controllable to prevent gas from being withdrawn when there is no container 6 under the opening 27. This prevents unnecessary errors in the analysis.

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.

I claim:

1. In an automatic packaging machine for providing controlled atmosphere content packages and having a plurality of work stations for filling the packages:
   a. conveyor means for moving said packages along the work stations;
   b. gas carrying cover means over the path of said packages between the work stations, said cover means being constructed and arranged to receive and distribute an inert or protective gas;
   c. gas analyzer means including an indicating instrument for determining the gaseous content of said packages;
   d. a stationary suction tube connected to said gas analyzer means and extending into said cover;
   e. a controllable valve connected between said suction tube and said indicating instrument;
   f. a pump interposed between said valve and said indicating instrument;
   g. a gas-deflecting member arranged on said suction tube proximate to the terminal end thereof for enveloping the unsealed ends, or openings, of said packages;
   h. said tube being effective to draw gas from within and around the unsealed openings of said packages.

2. A packaging machine according to claim 1, and gripping means arranged proximate to said suction tube to flatten the unsealed opening of said containers while the gas is drawn off by the suction tube.

3. A packaging machine according to claim 1, wherein said cover includes a gas supply channel or conduit and a gas distributing duct, the latter having a plurality of apertures; said suction tube extending through said supply channel and terminating adjacent to said apertured distributing duct.

4. A packaging machine according to claim 1, wherein said gas deflecting member is substantially concentrically disposed with respect to the terminal end or opening of said suction tube.

5. A packaging machine according to claim 4, wherein said gas deflecting member includes an umbrella-like portion positioned proximate to said terminal end.

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