A folding assembly (1), particularly for packaging machines, comprising means for folding a film in order to shape it like a duct (2) that is wrapped substantially hermetically around at least one first product (3) and a subsequent second product (4) to be packaged, the first product (3) and the second product (4) being movable sequentially along a processing line and spaced by a gap that forms a chamber (5), with which a suction device (6) for evacuating the air comprised therein is functionally associated. The suction device (6) comprises a channel that is interposed between the duct (2) and at least the second product (4), an end portion of the channel, which is at least partially flexible and protrudes inside the chamber (5), being provided along its surface with at least one suction inlet for the air contained in the chamber (5).

**Fig. 2**
FOLDING ASSEMBLY, PARTICULARLY FOR PACKAGING MACHINES

Technical field

The present invention relates to a folding assembly, particularly for packaging machines.

Background Art

As is known, automated lines designed for the packaging of cylindrical rolls of paper of the tissue type (for example, absorbent paper or toilet paper) must, in an advanced step of the packaging cycle, wrap by means of a film a predefined number of packs of rolls, which constitute the packaging unit for sale, i.e., the unit in which the consumer usually finds the product in shops.

The purpose of this operation is to obtain a wrapping that contains the packs and can be stored and transported easily before reaching the shelves where the end consumer can find it.

To achieve this result, many solutions provide for the movement of the packs of rolls (already arranged and grouped in the desired final configuration) on a processing line, along which the film heat-sealing elements operate.

More specifically, the packs of rolls slide sequentially and with appropriate spacing along the processing line, while the film is folded and wrapped around them, thus forming in an intermediate step a duct that is made to substantially adhere externally to said packs.

Along the line, between a first group of packs (intended to be contained in a first wrapping) and the next group (intended for a subsequent wrapping), a sort of chamber filled with air is thus formed which is delimited by two opposite faces of the two groups and by the film itself (in an upper region, in a lower region and on the sides).

It is indeed at this chamber, interposed between two successive groups, where the heat-sealing element operates; such element has a heat-
sealing head that surmounts the line, while a complementary head operates below such line; by moving at right angles to the direction of advancement of the packs (and optionally also in a parallel direction, in order to accompany them along their path), the head and the complementary head move closer, clamping the flaps of film until they adhere to each other, and then heat-seal them, while the chamber collapses, its volume being reduced progressively.

Once heat-sealing has been performed, a cutter finally cuts the flaps, allowing their complete adhesion to the groups of packs, the first of which can be removed from the line while the subsequent one advances and reaches the position occupied previously by the other one in order to prepare itself for the start of a new cycle.

From the description given so far, it appears evident that in order to ensure the correct execution of the heat-sealing operations it is necessary to provide for the possibility of evacuating the air contained in the chamber, so that it does not contrast the action of the heat-sealing element.

According to a first possible constructive solution, suitable angular elements arranged along the line keep the duct formed by the film slightly spaced from the groups of packs, so as to define a gap from which air can exit during heat-sealing.

However, this constructive solution is not free from drawbacks.

The amount of air that can pass through the gaps and thus be evacuated per unit time is limited; accordingly, this sets an upper limit to the handling speed of the packs, above which the chamber would swell, with negative consequences (for example, unwanted deformations) on the quality of the resulting wrapping. The application of this solution is therefore limited to the uses in which high productivity is not required.

This drawback is partially remedied by a second constructive solution, in which the duct formed by the film adheres to the groups of packs and slides together with them: a thin suction tube is inserted between
the film and one of the walls and its inlet faces the chamber, thus making it possible to evacuate the air while the heat-sealing element makes it collapse.

This solution, however, is not free from drawbacks, either.

Unless the suction inlet and the aspirated air flow-rate are sized optimally, the film is frequently aspirated by the tube, accordingly entailing the risk of breakages and deformations or more simply of an obstruction of the inlet, with consequent malfunction. Proximity between the suction inlet and the duct, which being substantially rested on the tube slides just above it, frequently causes blockage of such port with consequent malfunctioning of the device.

In order to avoid this risk, it is possible to reduce the suction force of the tube (again with limits to the productivity of the machine), but with the risk of not aspirating all the air from the chamber and obtaining an imperfect packaging of the package, which will have unwanted creases and wrinkles.

**Disclosure of the Invention**

The aim of the present invention is to solve the drawbacks described above, by providing an assembly which, during folding and heat-sealing operations, ensures optimum suction of the air from the chamber comprised between two successive groups of packs of rolls without the danger of occlusions during said suction.

Within this aim, an object of the invention is to provide an assembly that is suitable for lines for packaging groups of packs that operate continuously, in which the elements for movement, folding and heat-sealing are capable of following and accompanying the movement of said packs.

Another object of the invention is to provide a folding assembly that is suitable for applications requiring high productivity.

Another object of the invention is to provide a folding assembly that can be obtained easily starting from commonly commercially available elements and materials.

Another object of the invention is to provide a folding assembly that
has a low cost and is safe in application.

This aim, these objects and others that will become better apparent hereinafter are achieved by a folding assembly, particularly for packaging machines, which comprises means for folding a film in order to shape it like a duct that is wrapped substantially hermetically around at least one first product and a subsequent second product to be packaged, the first product and the second product being movable sequentially along a processing line and spaced by a gap that forms a chamber, a suction device being functionally associated with said chamber in order to evacuate the air comprised therein, characterized in that said suction device comprises a channel that is interposed between said duct and at least the second product, an end portion of said channel, which is at least partially flexible and protrudes inside said chamber, being provided along its surface with at least one suction inlet for the air contained in said chamber.

Brief description of the drawings

Further characteristics and advantages of the invention will become better apparent from the following detailed description of a preferred but not exclusive embodiment of the folding assembly according to the invention, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figures 1 to 3 are schematic side elevation views of the operation of the folding assembly.

Ways of carrying out the Invention

With reference to the figures, a folding assembly according to the invention, generally designated by the reference numeral 1, is particularly suitable for application on packaging machines of various types and comprises means for folding a film, which are adapted to shape it like a duct 2 that is wrapped substantially hermetically around at least one first product 3 and a subsequent second product 4 to be packaged.

More specifically, the first product 3 and the second product 4 can be
groups of packs of rolls of paper of the tissue type, i.e., toilet paper, absorbent paper or the like: the packs of rolls (i.e., the packaging unit in which the rolls are sold to the public) are in fact designed to be wrapped in a film of a material such as plastics or paper after being grouped according to a predefined configuration. The wrapping of the groups of packs in the film in fact makes it possible to facilitate operations for transport and storage prior to sale.

Constant reference shall be made, therefore, to this embodiment in the continuation of the present description, but the application of the folding assembly 1 according to the invention to different types of object to be packaged is not excluded (and is in any case within the protective scope defined by the appended claims).

During the activity of the machine on which the assembly 1 according to the invention is installed, the packs of rolls can move along the handling line, and two successive groups of packs are thus arranged in the arrangement of the accompanying figures: for the sake of convenience, reference shall be made to them as first product 3 and second product 4 and the cycle will be described with respect to them. Once said cycle has been completed, of course, the subsequent movement causes the second product 4 to occupy the position of the first product, while the latter is sent to the subsequent steps and a third product takes the place of the second one before starting a new cycle.

More precisely, the first product 3 and the second product 4 can move (continuously or with intermittent behavior) sequentially along a processing line and are spaced by a gap that forms a sort of chamber 5 (as is clearly evident from Figure 1), which is thus delimited by the rear face 3a (with respect to the advancement direction) of the first product 3 and by the front face 4a of the second product 4, as well as by parts of the duct 2.

A suction device 6 is functionally associated with the chamber 5, under conditions that will be described hereinafter, to evacuate the air
comprised within the chamber 5, such evacuation being necessary during subsequent steps of the packaging cycle that provide for the substantial collapse of the chamber 5 (one possible step is also described in detail in the continuation of the present description).

According to the invention, the suction device 6 comprises a channel that is interposed between the duct 2 and at least the second product 4; such channel is provided with a flexible end portion, which protrudes inside the chamber 5 and is in turn provided with at least one suction inlet for the air contained in the chamber 5.

With reference to an embodiment of substantial practical interest, described by way of non-limiting example of the application of the invention, the end portion of the channel has at least two suction inlets, which operate along at least two separate and possibly parallel axes, in order to ensure optimum suction without the risk of occlusion by said film.

More particularly, the channel substantially consists of a tube 7, which surmounts the second product 4 and is interposed between it (and more specifically rests on its upper face 4b) and the duct 2. According to this embodiment, to which reference will be made hereinafter several times, the end portion of the channel consists of an appendage 7a of the tube 7, which indeed protrudes, as can be seen from the accompanying figures, inside the chamber 5 and is provided with the suction inlets.

Conveniently, the end portion has a plurality of such inlets, which are distributed according to one among several possible configurations, for optimum suction of the air contained in the chamber 5. Therefore, depending on the specific requirements of the application, it is possible to provide assemblies 1 in which the inlets are distributed according to a plurality of and different predefined configurations which are more or less regular; further, on the appendage 7a such inlets can be oriented according to axes which are parallel or not, and in the latter case can be directed for example partly toward the front face 4a of the second product 4 and partly
toward the rear face 3a of the first product 3.

According to an alternative embodiment, the end portion has a surface slot, which is provided according to one among a plurality of possible shapes; said slot thus forms the suction inlets.

With reference to this last embodiment, the possibility is provided, and is mentioned by way of non-limiting example, of forming on the tube 7 (or other different types of channels) slots consisting of helical notches that run along the lateral surface of the appendage 7a or, as an alternative, slots consisting of axial notches that affect the end of the appendage 7a and extend over a predefined depth, thus forming suction inlets also along the lateral surface of the tube 7.

According to the preferred embodiment, which is presented in the accompanying drawings by way of non-limiting example of the application of the invention, at least the end portion 7a of the tube 7 substantially consists of a plurality of mutually articulated links 8: accordingly, they form a plurality of inlets directed toward the chamber 5 and a passage for the air thus aspirated.

It is further possible to provide a channel that consists entirely of links 8, which are optionally inserted, at least partially, within a protective sheath 9, as in the example of the figure.

Advantageously, the folding assembly 1 according to the invention comprises a heat-sealing element 10, which is provided with a heat-sealing head 11a and with a complementary head 11b, which are arranged on opposite sides of the duct 2.

The head 11a and the complementary head 11b can move along at least one first direction that is substantially perpendicular to the line for clamping the duct 2 and heat-sealing the corresponding flaps of film at the chamber 5. It is therefore during the mutual approach of the head 11a and the complementary head 11b that the suction device 6 operates: the chamber 5 in fact collapses, and therefore removal of the air contained therein is
required in order to allow heat-sealing.

With reference to the embodiment that provides for continuous movement of the packs, the head 11a and the complementary head 11b also can move in a second direction that is substantially parallel to the handling line. This allows them to accompany the advancement along such line of the first product 3 and of the second product 4 (as mentioned above, in particular in the case of continuous operation). The advancement of the second product 4, after heat-sealing and suction, makes it abut against the end portion of the channel to then lift it (thanks to its flexibility). Accordingly, this allows the passage of the second product 4, while the end portion slides along its upper face 4b until the second product 4 moves beyond it. Simultaneously, the advancement occurs of a third product that follows the second one, with the end portion repositioning itself between these last products (in a new chamber 5), restoring the conditions required for the start of a new wrapping cycle.

The operation of the folding assembly according to the invention is as follows.

In order to proceed with heat-sealing, the head 11a and the complementary head 11b, which face each other and are initially spaced from the duct 2, move toward it (as in Figure 2) until they clamp it on opposite sides at the chamber 5 (as in Figure 3). This produces the collapse of the chamber 5 and during this action the device 6 is activated and, by means of the appendage 7a of the tube 7, aspirates the air contained in the chamber 5, preventing it from hindering the heat-sealing operations (or other steps that in any case provide for a collapse of the chamber 5).

The choice of resorting to a tube 7 (or other channel) that protrudes with a flexible appendage 7a thereof (or other end portion) into the chamber 5 and has on its appendage 7a at least one suction inlet avoids the danger of occlusions and ensures correct evacuation of the air. Other than what occurs in known devices, the suction port is in fact spaced from the duct 2 and
therefore the risk that the film might block the inlet during suction is lower.

The flexibility of the appendage 7a prevents it from constituting an obstacle to the movement of the packs along the line, as will be described in greater detail shortly hereafter in the present description.

The presence of several inlets, which operate along at least two distinct axes, is a further guarantee of optimum operation of the device 5, since even in case of occlusion of one of the inlets during the collapse of the chamber 5 the others ensure suction. Moreover, with reference to the preferred embodiment that resorts to a plurality of inlets, it is possible to reduce the speed of the air and further reduce the danger that during suction the flaps of film might obstruct the air passage, compromising the success of the operation.

It should also be noted that the guarantee of always having at least one suction inlet makes it possible to adjust at will the aspirated air flow-rate (therefore also ensuring the possibility to reach high values), thereby allowing usage of the assembly 1 also for applications in which high productivity is required.

Once suction has ended, the second product 4 can advance along the line, pushing and lifting the appendage 7a (which is flexible); the appendage 7a, as already noted, thus slides along the upper face 4b of the second product 4 and then falls at the rear, thus occupying a new chamber 5 which forms between the second product 4 and a third product (thus allowing the start of a new cycle).

The proposed embodiment, as is clearly evident from what has been described, can thus be applied positively to lines for continuous handling, i.e., lines in which there is a continuous movement of the packs and/or of the elements assigned to their handling, folding and heat-sealing. With reference for example to the heat-sealing element 10, the head 11a and the complementary head 11b, as mentioned, can be optionally provided with the possibility to perform translational motion along the advancement direction,
in order to accompany the packs and thus reduce cycle times (by eliminating intermediate stops), while at the same time the suction device 6 ensures air evacuation.

In practice it has been found that the folding assembly according to the invention fully achieves the intended aim, since the choice to resort to a channel provided with an at least partially flexible end portion that protrudes within the chamber and is provided with at least one suction inlet makes it possible to obtain optimum air suction without the danger of occlusion of the channel.

The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims; all the details may further be replaced with other technically equivalent elements.

In the exemplary embodiments shown, individual characteristics, given in relation to specific examples, may actually be interchanged with other different characteristics that exist in other exemplary embodiments.

Moreover, it is noted that anything found to be already known during the patenting process is understood not to be claimed and to be the subject of a disclaimer.

In practice, the materials used, as well as the dimensions, may be any according to requirements and to the state of the art.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.
CLAIMS

1. A folding assembly (1), particularly for packaging machines, comprising means for folding a film in order to shape it like a duct (2) that is wrapped substantially hermetically around at least one first product (3) and a subsequent second product (4) to be packaged, the first product (3) and the second product (4) being movable sequentially along a processing line and spaced by a gap that forms a chamber (5), a suction device (6) being functionally associated with said chamber (5) in order to evacuate the air comprised therein, characterized in that said suction device (6) comprises a channel that is interposed between said duct (2) and at least the second product (4), an end portion of said channel, which is at least partially flexible and protrudes inside said chamber (5), being provided along its surface with at least one suction inlet for the air contained in said chamber (5).

2. The folding assembly according to claim 1, characterized in that said end portion of said channel has at least two of said suction inlets, said inlets operating along at least two distinct and possibly parallel axes.

3. The folding assembly according to claims 1 and 2, characterized in that said channel substantially consists of a tube (7), which surmounts the second product (4) and is interposed between the latter and said duct (2), said end portion of said channel consisting of an appendage (7a) of said tube (7), which protrudes inside said chamber (5) and is provided with said suction inlets.

4. The folding assembly according to one or more of the preceding claims, characterized in that said appendage (7a) has a plurality of said inlets, which are distributed along one of a plurality of possible configurations, for optimum suction of the air contained in said chamber (5).

5. The folding assembly according to claims 1 and 3 and as an alternative to claim 4, characterized in that said appendage (7a) has a surface slot, which is provided according to one of a plurality of possible
configurations, said slot forming said suction inlets.

6. The folding assembly according to one or more of the preceding claims, characterized in that at least said appendage (7a) of said tube (7) substantially consists of a plurality of mutually articulated links (8), which form a plurality of said inlets that are directed toward said chamber (5) and a passage for the air aspirated from it.

7. The folding assembly according to one or more of the preceding claims, characterized in that it comprises a heat-sealing element (10), which is provided with a heat-sealing head (Ha) and with a complementary head (lib), which are arranged on opposite sides of said duct (2) and can move along at least one first direction, which is substantially perpendicular to said line, in order to clamp said duct and heat-seal the corresponding flaps of film at said chamber (5), said suction device (6) operating during the mutual approach of said head (1Ia) and said complementary head (1Ib).

8. The folding assembly according to one or more of the preceding claims, characterized in that said head (Ha) and said complementary head (lib) can move along a second direction, which is substantially parallel to said handling line, in order to accompany the advancement, along said line, of the first product (3) and of the second product (4), the advancement of the second product (4), after heat-sealing and suction, causing said second product (4) to abut against said end portion and to lift it, thus allowing the passage of the second product (4), the advancement of a third product that follows the second product, and the repositioning of said end portion between said second and third products.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65B9/06 B65B31/04 B65B51/30

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
B65B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of Box C

See patent family annex

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Date of the actual completion of the international search: 13 April 2010

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Name and mailing address of the ISA:
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Authorized officer: Phi 1ippon, Daniel
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