A package supplying wheel (10) is mounted for rotation about its axis and includes carrying means for picking up and carrying along an at least partially pre-formed package at its circumference. A filling wheel (20), mounted for rotation about its axis, cooperates with the package supplying wheel at its circumference and includes carrying means for taking over a package from the package supplying wheel and carrying the same along at its circumference. Filling means are provided for filling the package with a product as it is being carried along. The machine is designed to avoid the need of intermittent movement as a product is being handled or operated upon during its passage through the machine.
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Title: Apparatus for continuously packaging a product.

This invention relates to an apparatus for continuously packaging a product, in particular to an apparatus for filling pre-fabricated packages with a product. In such an apparatus, several operations can be performed, such as, for example, picking up empty packages from a supply line, positioning and spacing the empty packages as desired, supplying dosed quantities of product being packaged, filling the packages with the product, closing the filled package, and carrying off the same. Depending on the nature of the package and the product being packaged, or on other requirements, further operations may be performed in the packaging apparatus.

Many packaging machines have been designed for continuously producing filled packages in large series in a manner in which the required movements of the empty and/or filled package in the machine are carried out intermittently. This means that, as it is being operated upon, the package is stationary in the machine, is then moved within the machine to a next operating station for undergoing a next operation, again while it stands still, etc. The many intermittent movements and treatments of the package limit the production speed of the machine.

There has also been proposed an apparatus for packaging products in a non-intermittent manner. In it, the product is conveyed in the form of an object or article on a continuously rotating drum, and then, on a second drum, wrapped with packaging material. The packaging material is supplied as an endless web, and this machine is accordingly not arranged for handling and filling pre-fabricated packages, nor is it designed for packaging some bulk products which do not permit being packaged by being wrapped with a sheet of packaging material in a commercially acceptable manner, such as, for example, compressed cut tobacco.
It is accordingly an object of the present invention to provide an apparatus that is suitable for packaging continuously and at a high rate, both objects or articles and bulk material in pre-fabricated packages.

For this purpose the present invention provides an apparatus for continuously packaging a product, characterized by a package supplying wheel mounted for rotation about its axis and including carrying means for picking up and carrying along an at least partially preformed package at its circumference; and a filling wheel mounted for rotation about its axis, said filling wheel cooperating with said package supplying wheel at its circumference and including carrying means for taking over such package from the package supplying wheel and carrying the same along at its circumference, and further including filling means for filling the package with a product as it is being carried along.

In the apparatus according to the invention, all operations on the package, including filling and closing it, are effected in an uninterrupted passage of the package through the machine, with the package continuing to move through the machine as the various operations are carried out. Owing to there being no periods of standstill, it is thus possible to achieve a high production capacity.

Owing to the use of pre-fabricated packages in the machine, delaying factors during packaging, as arise in packaging machines in which the packages are first made in these machines themselves, are also avoided.

In addition, the fact that the production of empty packages is independent of that of the filled packages greatly increases flexibility in operation and workshop layout.

The pre-formed package can be more or less stiff, for example, it may take the form of a carton. On the other hand, and unlike packaging machines of the prior
art, the apparatus according to the invention is excellently suitable for handling, at a high capacity, a flexible package that is supplied in flat condition, such as a bag or pouch. Naturally, it is not necessary in all cases for the pre-formed package to be in ready form immediately when introduced into the apparatus; if necessary, the package itself can be changed or provided with additional elements, such as, for example, closing elements, as it traverses the machine.

In the package supplying wheel and/or the filling wheel, means may be provided for performing particular operations on the empty or filled package, such as stretching/positioning elements to be inserted into the package being conveyed, folding or pleating means, and closing means.

A further important advantage of the apparatus according to the invention is that it can be extended with one or more further processing wheels cooperating with the package supplying wheel or with the filling wheel, with the uninterrupted movement of the empty and filled package throughout the entire packaging machine being maintained. Thus additionally a product wheel may be provided for cooperation with the filling wheel, which before supplying the product to the filling wheel brings it into a quantity, form or condition suitable for packaging. This product wheel may be arranged to cooperate at its circumference, like the package supplying wheel, with the filling wheel, which travels at the same peripheral velocity. Preferably, however, the product wheel is arranged coaxially with the filling wheel, and is moved at the same rotational velocity with it, for example, by the two wheels being fixedly interconnected. In this construction, the filling for the package can be introduced into the package either from a place located more centrally in the filling wheel (for example, radially to the wheel in an outward direction), or be
shifted into the package in an axial direction relative to the wheel.

Another processing wheel cooperating with the filling wheel can serve for carrying out operations on the filled package before or after it has been closed. This processing wheel can be arranged so that the operations on the package are carried out from the outside of the wheel, or alternatively, from a place located closer to the wheel axis.

Although the invention has many uses, it will be described hereinafter, by way of example, with particular reference to an apparatus for packaging cut tobacco in pouches, and with reference to the accompanying diagrammatic drawings. In said drawings,

Fig. 1 gives a side-elevational overall view of the apparatus according to the invention, showing, among other parts, a package supplying wheel and a filling wheel;

Fig. 2a is a perspective view of a carrier of the package supplying wheel of Fig. 1, with the moving parts thereof in the starting position;

Fig. 2b diagrammatically shows, in side-elevational view the way in which a pouch lies on the carrier of Fig. 2a;

Fig. 3 is a perspective view of the carrier of Fig. 2a with the moving parts thereof in the end position;

Figs. 4, 5 and 6 show, in perspective view, a carrier and a filling nozzle of the filling wheel shown in Fig. 1, with the moving parts thereof, respectively, in the starting position, in an intermediate position as a pouch is being filled, and in a further position as a flap of the pouch is being folded to a perpendicular position relative to the body of the pouch;

Fig. 7 is a perspective view of a compression chamber of a product wheel cooperating with the filling wheel;

Figs. 8-10 are perspective views, showing a portion
of an operating wheel for fully folding down the flap
of a pouch, in three successive stages as the pouch
flap is being folded; and

Figs. 11-12 are perspective views, showing portions
of the operating wheel in two successive stages during
the application of a closure tape.

Referring to the drawings, Fig. 1 shows a pouch
reservoir 51 containing a stack of empty pouches 50,
stacked in flat condition, of a type as used for packaging
cut tobacco (shag). This pouch of flexible material
has a rectangular pocket portion which is to be filled
with tobacco. The back of the pocket portion is extended
and serves as a flap which is folded across the front
of the pocket portion after the pocket has been filled.
The pocket of the pouch has a rectangular bottom and
also rectangular sidewalls which in the empty, flat
pouch are folded inwardly or outwardly.

Disposed under the pouche reservoir 51 are two
continuously rotating draggers 52, which periodically,
one after the other, supply one pouch from reservoir
51 between two moving conveyor belts 53. Disposed at
the end of the conveyor belts is a gripper wheel 54,
rotatable about its axis and provided with carrier tables
55, uniformly spaced about its circumference, and each
cooperating with a movable clamp 56. Each pouch supplied
by conveyor belts 53 is held between a carrier table
and a clamp of the gripper wheel, and taken along to
a package supply wheel 10, with which the gripper wheel
54 cooperates at its circumference.

Supply wheel 10 is mounted for rotation about its
axis and rotates along with gripper wheel 54 continuously
and at the same circumferential velocity. Spaced uniformly
about the circumference of the supply wheel are carriers
11, in this case eighteen in all. The carriers, shown
in more detail in Figs. 2a and 3, have at their outward
side a plurality of suction orifices 12 that can be
connected to a source of vacuum. When a pouch conveyed by gripper wheel 54 approaches the circumference of supply wheel 10, the pouch is released by clamp 56 and taken over from carrier table 55 of the gripper wheel by the opposite carrier 11 of the supply wheel, and is retained thereon by the suction orifices.

Carrier 11 comprises a movable carrier table 15 and a narrower fixed carrier table 14 located in opposition thereto in the middle of a long side. In the starting position of the movable table 15, the perforated top thereof is at the same, or substantially at the same level as the top of the fixed table 14, as shown in Fig. 2a. Fig. 2b shows the location of pouch 50 in this position of tables 14, 15: the pocket portion of the pouch lies on the movable table 15, with the flap side of the pouch facing up, and the flap proper resting on the fixed table 14. During the further rotation of the supply wheel, the fixed table 15 is moved slightly downwardly relatively to the fixed table 14, as a result of which the pocket portion of the pouch is opened a little. A pair of stretching fingers 13 mounted on opposite sides of the fixed table 14 are then advanced into the opened pouch pocket down to the bottom of the pocket. Subsequently, the stretching fingers are moved laterally apart up to the pocket sides. During this movement, the folds in the bottom and the sides of the pocket are unfolded into a rectangular shape. Owing to these movements of the stretching fingers 13, not only is the pouch unfolded and stretched, but also possibly shifted somewhat relatively to tables 14, 15, as a result of which the pouch comes to lie in the proper position and orientation on the carrier. This is of importance in order that subsequent operations on the pouch be carried out accurately and flawlessly, in particular on the subsequent operating wheels. Disposed on opposite sides of the movable carrier table 15 and
the fixed table 14 are a pair of folding blocks 16, which at the sides facing the tables are provided with a resilient layer 17. Blocks 16 are now moved towards the tables 14 and 15, whereby the pouch sides, both the pocket portion and the flap, are clamped between folding blocks 16 and profiled side edges of the stretching fingers 13. As a result, sharp folds are formed in these side edges. The various movements of the carrier, i.e. the movable table 15, stretching fingers 13 and folding blocks 16 are indicated by arrows in Fig. 2a, and Fig. 3 shows the position of these parts at the end of their movement. After carrying out the described operations on the pouch, the movable parts of the carrier 11 return to the starting positions illustrated in Fig. 2a. It is noted that all these operations on the pouch are carried out while supply wheel 10 rotates at a constant velocity, with the movable parts of the carriers 11 each completing a cycle during one single revolution of the wheel.

In addition to supply wheel 10 and coaxially therewith, there is arranged a filling wheel 20 cooperating with the supply wheel at its circumference and rotating at the same peripheral velocity. The filling wheel, too, is provided at its circumference with eighteen carriers 21. When a pouch on carrier 11 of the supply wheel approaches the filling wheel, the partial vacuum on the suction orifices in this carrier 11 is released, and at the same time a partial vacuum is applied to suction orifices in the carrier 21 of the filling wheel 20, rotating in opposition to the pouch, whereby the pouch is now taken along by the latter carrier.

The construction of the carrier 21 of the filling wheel is more clearly shown in Figs. 4, 5 and 6. In Fig. 4, carrier 21 comprises a carrier table 22 with suction orifices, on which lies a pouch 50. As the pouches were lying with the flap portion up on the supply
wheel, they come to lie with the flap portion down on the carrier table of the filling wheel, that is, with the pocket portion up.

Disposed under carrier table 22, in juxtaposition to each other, are a turning element or folding strip 24 and a closing strip 25, both movable towards and away from the carrier table, with the respective heads 28 and 29 of these strips sliding through slots in the carrier table. At the back of the carrier table is a movable suction bar 23 provided with a suction slit, to which a partial vacuum can be connected. Provided on opposite sides of the carrier table are two indenting fingers 26 movable towards and away from the carrier table and provided with a profiled head 27. Provided at the front of the carrier table is a filling nozzle 57 including a bottom plate 58 and a top plate 59 parallel thereto. The bottom plate 58 is fixedly arranged at a level slightly above the upper surface of the carrier table 22 and is fixedly connected on two sides with upright sidewalls 60. The top plate 59 is at one end fixedly connected to an upright slide 61, and both are movable upwardly, with the top plate 59 moving parallel to, and away from, the bottom plate 58 to form a rectangular aperture defined by the two plates 58,59 and sidewalls 60. The carrier table 22, together with suction bar 23, folding strip 24, closing strip 25 and indenting fingers 26, is movable towards and away from the filling nozzle 57. The various possible movements of the parts of the carrier and of the nozzle are indicated by arrows in Fig. 4.

When the carrier table 22 has taken a pouch from the supply wheel, the condition of carrier 21 and filling nozzle 57 is as shown in Fig. 4, with the opening of the pouch being directed to the filling nozzle. The carrier 21 is then moved towards the filling nozzle, and during a first part of this movement carrier table 22 is shifted to move the flap part of the pouch under
the bottom plate 58 of the filling nozzle. During this movement, the suction bar 23 is also swung over the carrier table carrying the pouch, so that the suction slit of the suction bar comes to rest on the upper edge of the pouch pocket. After subatmospheric pressure has been connected to the suction slit, the suction bar 23 is lifted a little to open the pouch pocket. During further movement of the carrier to the filling nozzle 57, the pouch pocket is shifted over both plates 58, 59 until the front sides of these plates reach the bottom of the pouch pocket. After the suction bar 23 has returned to its starting position, the top plate 59 is removed from the bottom plate 58, whereby the filling nozzle is opened and the pouch pocket is tensioned over plates 58, 59. Through the resulting rectangular filling opening, a weighed quantity of tobacco is shifted by an ejector 31 (Fig. 6) up to the bottom of the pouch. The situation is then as illustrated in Fig. 5. Subsequently, the tobacco is shifted further by the ejector and at the same time the carrier member 21 is returned from the filling nozzle to its starting position, and the now filled pouch moves off plates 58, 59. The closing strip 25 is moved upwards, whereby the head 29 slides upwards through the slot in the carrier table 22 to above the surface of carrier table 22. At the same time, the suction bar 23, now serving as a closure strip, is swung away, and the pouch is pinched shut behind the tobacco filling therein between the suction bar 23 and closing strip 25. The indenting fingers 26 are then moved towards the pouch, and the heads 27 form a dent in the sides of the filled pouch a short distance under the closed edge thereof. During this indentation, air can escape from the pouch pocket through the edge which is not yet completely pressed shut at this moment; thereafter the pocket edge is completely pinched shut between closing strip 25 and suction bar 23, and is
sealed air-tight by electrically heating the head of the closing strip 25.

Before the closing strip 25 and suction bar 23 return to their starting positions, the folding strip 24 is moved upwardly, whereby the head 28 rises above the surface of the carrier table. As a result the pouch flap is turned up to a position at right angles to the pocket portion between suction bar 23, closing strip 25 and folding strip 24, and the situation as illustrated in Fig. 6 is reached. Before the pouch is now transferred from the filling wheel 20 to an operating wheel 40 to be described hereinafter, the closing strip 25, the suction bar 23 and the folding strip 24 are returned to their starting positions.

The tobacco shifted into the pouch comes from a product wheel 30 disposed coaxially with, and next to the filling wheel 20, and has the same rotational velocity as the filling wheel. The product wheel contains eighteen identical compression chambers 32 (Fig. 1) spaced uniformly about its circumference and each cooperating with a carrier 21 of the filling wheel. Details of a compression chamber 32 are shown diagrammatically in Fig. 7.

The compression chamber comprises a stationary frame 62 which includes a bottom plate 33. The front part 33a of bottom plate 34 constitutes the bottom of a compression space. Resting on bottom plate 33 is ejector 31, already described with reference to Fig. 6. At the level of the front bottom plate portion 33a, there is arranged a compression frame 34, of inverted-U shape, which is movable vertically up and down. Provided at the front of the compression frame 34 is a wall plate 35, which is stationary relatively to the compression frame and is provided at its lower end with a rectangular outlet 36. During the vertical movement of the compression frame 34, it slides at the front past wall plate 35,
with the insides of the long legs of the U-shape along the sides of bottom plate 33, and at the rear along the two upright walls of frame 62. (For clarity, the left-hand sidewall of frame 62 has been omitted in Fig. 7).

The compression chamber further comprises a closure flap 37, which pivots about a shaft 38, and is shown in Fig. 7 in the open position. Ejector 31 can be moved to and fro between bottom plate 33 and flap 37. In the closed position of flap 37, after rotation about its shaft 38, flap 37 together with the front of ejector 31 closes frame 32 at the rear. In this way the actual compression chamber or compression space is formed, which is defined by the inner walls of frame 34 and wall plate 35, the front part 33a of bottom plate 33, the front of ejector 31, and flap 37. This compression space is then closed, except for aperture 36, which however is also closable at the front of wall plate 35 by means of slide 61 (Fig. 6) of top plate 59. Frame 34 further comprises a pair of T-shaped side compression rams, mounted in the long legs of the compression frame so as to be retractable and extendable in the horizontal direction. In the retracted position (shown in Fig. 7), the front of each ram 39 is flush with the inner wall of the relevant long leg of frame 34. Preferably, the length of stroke of frame 34 and/or rams 39 is adjustable from the outside, for example, by means of a hand wheel or servomotor. Preferably, the stroke rate is also controllable, in particular of the compression frame. It is possible to measure the thickness of the ultimately produced filled pouch at one or more places, using a measuring means which passes this data to the servomotor or other control means which controls the degree of compression of the product in the compression chambers depending on the thickness of the pouch measured by the measuring means.
Secured on top of frame 62 is a magnetic ring 63, which gives access to a filling space defined by the upright walls of frame 62 and the opened flap 37. The magnetic ring 63 serves as a dragger for picking up and carrying along a transport container which can be retained on the ring by magnetic force.

As shown in Fig. 1, disposed under product wheel 30 is a worm 65, which serves to supply transport containers 64, each filled with a weighed quantity of tobacco. These containers are of cylindrical shape with a closed bottom and an open top. The cylindrical wall of containers 64 rests against worm 65 in the helices thereof, and their bottoms slide over a guide 66. As the worm rotates, containers 64 are moved to the forward end of the worm in equidistantly spaced relationship and at the same uniform velocity. The arrangement is such that the container at the forward end of the worm is picked up from guide 66 by the magnetic ring 63 of the compression chamber of the product wheel which is just over this container.

The rotational speeds of worm 65 and product wheel 30 are attuned to each other so that each next container advanced by the worm is taken up by the next compression chamber of the product wheel. A container conveyed by the product wheel rotates with the wheel upwardly, whereby the container is reversed, i.e., it comes to be with the open end down. The compression chamber 32 is then in a situation as illustrated in Fig. 7, in which flap 37 is opened and the opening 36 at the front of wall plate 35 is closed by the slide 61 of the top plate 59 of the filling nozzle. The tobacco falls from the container into the open compression space, whereafter the flap 37 is closed. As the flap is closed, the tobacco is already compressed somewhat, mainly in the forward direction against the rear wall of plate 35. The tobacco is now fully confined within the compression chamber. Subsequently, frame 34 is moved downwards in a direction
towards the centre of the product wheel, whereby the
tobacco is compressed further in the same direction.

Preferably, the compression frame is first moved
down relatively rapidly, whereafter in a slower movement
the tobacco is more strongly compressed. If desired,
the compression frame is thereafter moved upwards a
few millimeters. When the compression frame occupies this
deepest or nearly deepest position, the side rams 39
are moved towards each other into the compression chamber,
whereby the tobacco is also compressed in a lateral
direction. The result is that ultimately the tobacco
has been pressed in three directions essentially perpendicular
to each other.

At this moment the opening 36 at the outside of
the plate is opened by lifting top plate 59 with slide
61 to a position as shown in Fig. 6. Thereafter, the
ejector 31 is moved forwardly, whereby the compressed
tobacco is shifted from the compression chamber through
opening 36 between the top and bottom plates 58, 59 of
the filling nozzle, and then into a tobacco pouch as
described hereinbefore with reference to Fig. 6.

Finally, top plate 59, frame 34, side rams 39,
ejector 31, and flap 37 are returned to their starting
positions as illustrated in Fig. 7.

It is noted that all of the above operations take
place as the wheel is rotating at a constant speed,
namely, each during a portion of a revolution thereof.
The empty container 64 still present on the compression
chamber is removed during the downcoming movement of
the compression chamber and of the product wheel, whereafter
the container returns to a weighing machine, where it
is re-filled with a weighed quantity for it to be ultimately
re-placed on guide 66 for a new cycle.

Forms of the compression chamber other than that
shown are possible. For example, the filling opening
may be at the side rather than at the top of frame 62.
In that case, naturally, the magnetic ring 63 is also disposed at the side of frame 62, and the containers on the various compression chambers have a horizontal and mutually parallel position. The tobacco should then be positively discharged from the container into the compression chamber. This construction may be attractive to limit the radial dimensions of the product wheel with the containers placed thereon.

In another possible embodiment, the containers are placed at the side of the compression chambers facing the wheel axis, and the tobacco falls from a full container into the compression chamber in a low position of the compression chamber on the product wheel.

Returning now to the filled pouches with a perpendicularly folded flap, contained in the filling wheel 20, these pouches are transferred from the filling wheel to an operating wheel 40 (Fig.1) rotating along with the filling wheel at the same peripheral velocity, and in which the pouch flap is folded fully against the pocket portion of the pouch and subsequently fixed thereon with a short piece of adhesive tape. The operating wheel 40 comprises eighteen pouch carriers 41 uniformly spaced over its circumference. Trained about rollers outside the operating wheel is an endless compression belt 42, which is in contact with a portion of the circumference of wheel 40, at which point it travels along with the wheel at the same velocity.

Arranged stationary within operating wheel 40 is a closure tape unit 70, which contains a plurality of supply rolls 71 with webs of closure tape material and a sticking apparatus 72. The entire unit 70 is secured to pivoting arms 73, which are pivotable about a vertical shaft 74 mounted aside of the wheel. As a result, the entire closure tape unit 70, can be pivoted to the outside through the open side of the operating wheel, which renders the unit readily accessible, for example, for
placing fresh supply rolls in it.

The pouch in recess 44 (Fig. 8) rests partly on an edge 47 at the underside of the carrier table, and for another part on a carrying strip 46 which is movable relatively to the carrier table. As a full pouch laid in recess 44 stands slightly proud of the top surface of the carrier table, the pouch is held down against the carrier strip 46 and the lower edge 47 of the carrier table by the compression belt 42, which presses against the carrier table and rotates along with it. The carrier table further comprises a movable folding strip 45 for completing the folding of the flap onto the pouch pocket.

A filled pouch with a perpendicularly folded pouch flap is transferred by the carrier table 22 from the filling wheel 20 into recess 44 of the carrier table of the operating wheel 40. This takes place at a position slightly upstream of the point where the compression belt 42 comes to contact the operating wheel, so that the pouch can be freely laid into the carrier table, but immediately thereafter is firmly held by the compression belt. As the pouch is being placed on the operating wheel, the pouch flap points in a direction towards the wheel centre. The carrier strip 46 supports the pouch at a position close to the flap. This situation shortly after placing the pouch into the operating wheel is illustrated in Fig. 8.

The folding strip 45 is now moved to the pouch and tilted whereby the pouch flap is folded until it makes an acute angle with the pouch pocket (Fig. 9). The movement of the folding strip 45 is now temporarily interrupted, and the carrier strip 46 is removed from under the pouch to an ultimate position under edge 47 of the carrier table. This causes the pouch to rest on the folding strip 45 and the lower edge 47 of the carrier table. The folding strip is now again rotated further until the pouch flap fully contacts the pouch
pocket, whereby the position of Fig. 10 is reached.

As the pouch rotates further along on the operating wheel, while being held by the compression belt 42, the pouch flap is taped to the pouch pocket by the sticking apparatus 72 of the closure tape unit 70.

As shown in Fig. 11, the sticking apparatus 72 comprises a rotating drum formed by a pair of segments 75, each in the form of a half ring, and a slide 76 reciprocatable radially between the two segments 75, which slide is provided on opposite sides with heads 87 and 88. The circumference 77 of the segments and the end faces 84 and 85 of the slide heads are provided with apertures which are connected to a source of vacuum to retain adhesive tape material on to these parts. Disposed aside of the segments and the slide is a cutting wire 79, gripped between two grips and arranged to be electrically heated. The wire makes a circular movement towards and away from the segments. Fig. 11 also shows the pouch carrier 51 of Fig. 10, viewed from a bottom position.

A web of adhesive tape 80 is supplied to segments 75, and held thereon by a partial vacuum. This web, which is composed of separate sheets of material taken from supply roll 71, is provided with an adhesive on the side away from the segments, except for a narrow marginal strip 81. The cutting wire 79 serves to cut off a piece 82 from the tape 80 at the moment when the forward end of this tape is one of the heads 78 of the slide. In Fig. 11, adhesive tape 82 with a non-adhesive gripping portion 83 is held on the end face 84 of head 87 by partial vacuum and taken along. During this rotating movement of the slide, head 87 is also moved radially outwardly between the segments 75. In the outermost position of head 87, the latter presses the adhesive tape in the middle of the pouch over and into contact with the pouch flap and the pouch pocket, and sticks it thereto. To enable the slide head to stick the adhesive
tape to the pouch, holes for the passage of the slide head are provided in folding strip 45 and carrier table edge 47.

Fig. 12 shows the situation at the moment when the adhesive tape is being pressed against the pouch by the slide head 87. The opposite slide head 88 is then in a position in which, at this moment, the upper surface is flush with the circumferential path of segments 75. The leading end of the web of adhesive tape 80 thus lies flat against the outer circumference of the segments 75 and slide head 88.

The supply velocity of the adhesive tape 80 is considerably lower than the circumferential velocity of the segments and the slide, as a result of which these elements slide under the tape. In each complete revolution of the segments, the forward displacement of the adhesive tape is, all in all, only about equal to twice the width of the piece of tape 82 to be severed.

At the moment when the slide head 88 has come under the leading end of the adhesive tape, cutting wire 79 moves downwards through tape 80 into a slot 86 formed in the slide head. Thus a piece of tape 82 is cut off, whereby, owing to a loop reduction in the supply of the tape the latter, at the moment of cutting, has a velocity equal to that of the segments at the circumference. Subsequently, the situation is repeated as described with reference to Fig. 11.

Next to, and rotating along with, operating wheel 40 is a take-out wheel 90, provided along its circumference with ten take-out members 91, each provided with suction heads 92 connected to a source of vacuum. A filled and closed pouch is taken from operating wheel 40 by a take-out member 91 passing opposite the pouch at the moment when the pouch comes clear of compression belt 42. The take-out member turns the pouch 180° about its longitudinal axis, the vacuum is released in the
take-out member, and the pouch is discharged onto a belt or chain conveyor travelling under the take-out wheel.

It will be clear that, in the above example, the carriers are in fact combined carrying and operating means.

As stated before, the apparatus according to the invention is excellently suitable for being extended by ancillary operating wheels, for example, an additional wheel for applying an inner seal along the top of the pocket portion of the pouch.

Although, in the example described, the pouch is situated in a horizontal position at the circumference of the wheels concerned, the apparatus can be so modified, without departing from the scope of the invention, that the pouch is held at the circumference of the wheels in an upright position.
CL A I M S

1. Apparatus for continuously packaging a product, characterized by a package supplying wheel mounted for rotation about its axis and including carrying means for picking up and carrying along an at least partially pre-formed package at its circumference; and a filling wheel mounted for rotation about its axis, said filling wheel cooperating with said package supplying wheel at its circumference and including carrying means for taking over such package from the package supplying wheel and carrying the same along at its circumference, and further including filling means for filling the package with a product as it is being carried along.

2. Apparatus as claimed in claim 1, characterized in that the carrying means of the supply wheel include a portion that is movable relatively to the remaining portion for at least partially opening the package carried by the carrying means.

3. Apparatus as claimed in claim 1 or 2, characterized in that the supply wheel is provided adjacent each carrying means with stretching elements movable towards and away from each other in the package on the carrying means for bringing the package into a desired position relative to the carrying means.

4. Apparatus as claimed in claim 3, characterized in that the supply wheel further comprises folding elements cooperating with said stretching elements for folding a portion of the package located between a stretching and a folding element.

5. Apparatus as claimed in any of claims 1 to 4, characterized in that the filling means comprise a filling nozzle for filling the package to be shifted about the filling nozzle.

6. Apparatus as claimed in claim 5, characterized in that the filling nozzle comprises filling elements.
movable away from each other for pulling the package
shifted about the filling elements into a taut condition.

7. Apparatus as claimed in any of claims 1 to 6,
characterized in that the filling wheel comprises closing
means for closing the filled package.

8. Apparatus as claimed in any of claims 1 to 7,
characterized in that the filling wheel comprises indenting
fingers for folding portions of the formed package inwardly.

9. Apparatus as claimed in any of claims 1 to 8,
characterized in that the filling wheel comprises a
turning element for at least partially folding a closure
flap of the filled and closed package.

10. Apparatus as claimed in any of the preceding
claims, characterized in that the apparatus further
comprises a product wheel rotatable about its axis and
including compression chambers for receiving the product
in units to be packaged and compressing the same, and
discharge means for removing the compressed product
from the compression chambers to the filling wheel.

11. Apparatus as claimed in claim 10, characterized
in that the compression chambers at the circumference
of the product wheel are each provided with dragging
means for picking-up and carrying along a transport
container filled with product, supplied to the product
wheel.

12. Apparatus as claimed in claim 11, characterized
by a worm disposed in the vicinity of the product wheel
for the transportation of the containers in equidistantly
spaced relationship and at the same velocity in the
helices of the worm to the product wheel.

13. Apparatus as claimed in any of claims 10 to
12, characterized in that the compression chambers include
one or more movable means for opening and closing the
compression chambers.

14. Apparatus as claimed in any of claims 10 to
13, characterized in that the compression chambers include
a reciprocating compression member for compressing the product within the compression chamber.

15. Apparatus as claimed in claim 14, characterized in that the compression chambers include a second compression member for compressing the product within the compression chamber in a direction perpendicular to the direction in which the product is first compressed.

16. Apparatus as claimed in claim 14 or 15, characterized in that one or more of the compression members is or are coupled to an adjusting mechanism for adjusting the length of stroke of the compression member.

17. Apparatus as claimed in claim 16, characterized in that the adjusting mechanism includes control means for controlling different stroke velocities of the compression member over different portions of the length of stroke thereof.

18. Apparatus as claimed in claim 10, characterized in that said discharge means include an injector for removing the compressed product from the compression chamber.

19. Apparatus as claimed in any of claim 10 to 18, characterized in that the product wheel is disposed coaxially with the filling wheel.

20. Apparatus as claimed in any of the preceding claims, characterized in that the apparatus further comprises an operating wheel rotatable about its axis and cooperating at its circumference with the filling wheel for taking over the filled package from the filling wheel and performing operations thereon as it is carried along by the operating wheel.

21. Apparatus as claimed in claim 20, characterized by an endless compression belt disposed in the vicinity of the operating wheel for holding the package between the travelling compression belt and the rotating operating wheel over a portion of the circumference of this wheel.

22. Apparatus as claimed in claim 20 or 21, character-
ized in that the operating wheel comprises a folding member for pressing a closing flap of the package against the filled package.

23. Apparatus as claimed in claim 22, characterized by a taping apparatus disposed stationarily within the circumference of the operating wheel for applying adhesive tape to the package and the closure flap thereof at the side of the package facing the wheel axis.

24. Apparatus as claimed in claim 23, characterized in that the taping apparatus is secured to a pivoting arm disposed outside the operating wheel for pivoting the taping apparatus into or out of the operating wheel.

25. Apparatus as claimed in any of claims 20 to 24, characterized in that the apparatus further comprises a take-out wheel mounted for rotation about its axis and cooperating with the operating wheel at its circumference, said take-out wheel comprising means for taking over the package from the operating wheel and depositing the same on to a belt or chain conveyor.

*****
INTERNATIONAL SEARCH REPORT

International Application No PCT/NL 87/00022

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC:

B 65 B 43/60; B 65 B 43/50

II. FIELDS SEARCHED

Classification System

Minimum Documentation Searched

Classification Symbols

IPC B 65 B

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched

III. DOCUMENTS CONSIDERED TO BE RELEVANT

Category

Citation of Document, with indication, where appropriate, of the relevant passages

Relevant to Claim No.

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<td>FR, A, 2493805 (THIMON) 14 May 1982 see page 4, line 1 - page 8, line 24; page 9, line 18 - page 10, line 5; figures 1,2,5A-5E</td>
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* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but after the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"A" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search

16th December 1987

International Searching Authority

EUROPEAN PATENT OFFICE

Date of Mailing of this International Search Report

15 MAR 1988

Signature of Authorized Officer

R.G. VAN DER PUTTEN
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FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

VI. OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE

This International search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. Claim numbers............., because they relate to subject matter not required to be searched by this Authority, namely:

2. Claim numbers............., because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claim numbers............., because they are dependent claims and are not drafted in accordance with the second and third sentences of PCT Rule 6.4(a).

VII. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

This International Searching Authority found multiple inventions in this international application as follows:

Claims 1-4
Claims 1, 5-9 Please refer to Form PCT/ISA 206 dated
Claims 1, 10-19 28th December 1987
Claims 1, 20-24
Claims 1, 25

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.

2. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

4. As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

☑ The additional search fees were accompanied by applicant's protest.
☐ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (supplemental sheet (2)) (January 1985)
### ANNEX TO THE INTERNATIONAL SEARCH REPORT

**ON INTERNATIONAL PATENT APPLICATION NO. NL 8700022**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.

The members are as contained in the European Patent Office EDP file on 23/02/88.

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**US-A- 3382974**

None

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