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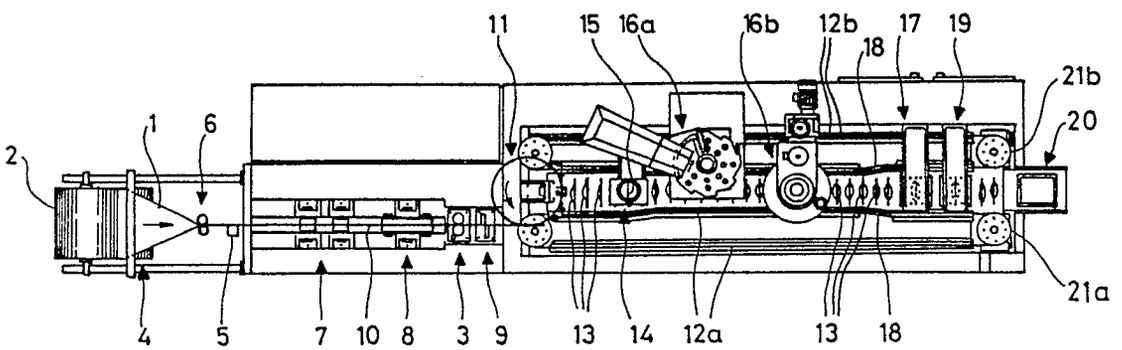
(54) Automatic horizontal bag packaging machine.

(57) An automatic horizontal bag packaging machine characterized essentially by a rotary transfer means (11) for the bags (13) containing the packaged product to deliver them, rotated by 90° relative to the previous position thereof, to conveyor chains (12a-12b), the bags have a mouth slightly preopened so that the shaping and filling can be continued.

The machine can be used in the automatic packaging of a wide range of powdered, granulated or liquid products from the pharmaceutical, chemical, food and similar fields.



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AUTOMATIC HORIZONTAL BAG PACKAGING MACHINE

Field of the Invention

The present invention relates to an automatic horizontal bag packaging machine in accordance with the preamble of claim 1. Such a machine can process bags having a wide range of shapes and sizes which may be employed in the packaging of an extensive range of products, especially in powder, granulate and/or liquid form. The packaging machine of the invention can be used in the pharmaceutical, chemical and food industries, as well as in related sectors.

Background of the Invention

Automatic bag packaging machines are known and have been in use for a long time, so that their general technology is relatively well-known among manufacturers of such machines. The bags to be packaged are generally made from a single or complex sheet material which is heat-sealable at a predetermined constant temperature and mounted in roll form on the machine. In principle, there are two types of automatic bag packaging machines which are quite different from each other, both in the way the package is formed and in the way the other steps of the process are executed. They are called horizontal or vertical packaging machines, depending on the direction of movement of the sheet material for the bag through the machine. The present specification is directed exclusively to the former type of packaging machines, i. e. to horizontal bag packaging machines.

Known horizontal packaging machines comprise a frame on which the various operative units and stations for executing the steps of the packaging process are mounted. A detailed, but not exhaustive, list of these operations would be: supporting one or more rolls; controlled unwinding of the web material from the roll; formation of a bag by longitudinal folding of the roll material web; optional production of a fourth heat seal for the bottom edge of the bag; vertical heat sealing the sides of the bag; controlled feeding of the web material; cutting of the shaped web to make individual bags; opening the formed bags and filling them with the product; and production of the top seal. Other means for carrying out additional operations, such as encoding, formation of tear notches, mechanical perforations between individual bags, discharge of severed bags on belts or on blanks for boxing machines, etc., may be optionally included.

The production capacity of such packaging machines is severely restricted by several parameters, especially the mechanical limitations caused by the inertia of the moving parts which are subjected to a continuous sequence of simple or complex reciprocating movements, and by a compromise between an increase in size, which any increase of the operation speed will require, and the consequent increase in manufacturing and maintenance costs. There are other specific factors for each particular application which may additionally limit the machine performance and likewise increase fabrication costs. Examples are the production of large size bags, especially bags having a large longitudinal dimension, or when it is necessary to have many filling stations for the packaged product or when different components of the end product have to be mixed in the bag.

Summary of the Invention

It is the object of the invention to propose a machine for making a wide range of sizes or "formats" of the bags which can package both different amounts, from very small to very large amounts, and different varieties of products. This object is achieved by the features of the characterizing part of claim 1.

The automatic horizontal bag packaging machine of the invention comprises the following components: a supply means for a heat-sealable sheet material in the form of a continuous web wound to a roll on a spool ; a servo-controlled roll unwinder; means for folding the web material in the shape of the letter "V"; a vertical sealing means; a bottom sealing means; a servo-controlled hauling means; a cutter; a rotary bag transfer means; a pair of conveyor chains; a bag and/or bottom forming means; at least one filling means; an air exhauster means; a top sealing means; a means to discharge the bags to a delivery conveyor; and, finally, a panel for the regulation and control of these components.

These components are assembled in such a way that the continuous web of heat-sealable material from the roll is pulled along by the hauling means and first passes through the unwinder, thereby forming a loop, the size of which controls in inverse proportion the speed of rotation of the roll.

The web then passes through the folding means where it is folded in the shape of the letter "V" or, optionally, the letter "W" when bellows bottom bags are to be made, and then through the vertical sealing means. Here sealing jaws, which can be longitudinally adjusted by a screw and a

graduated scale for the manufacture of bags of all sizes, form the vertical seals defining the bag edges.

Thereafter the bag material is fed through the bottom sealing means where a reinforcing seal is made at the bag bottom. It then moves to the cutter formed by scissors, the rear blade of which is fixed and the front blade of which is movable.

The longitudinal position of said scissors can be adjusted by a screw and a graduated scale to allow all sizes of bags to be made.

Downstream from the cutter the bag is picked up by the rotary transfer means which has grippers to deliver the bag to the rear conveyor chains after having been rotated by 90° relative to its previous position; simultaneously the bag mouth is slightly preopened. Said conveyor chains are driven by two intermittent rotation means or optionally by two independent servomotors on guides symmetrically arranged about a vertical longitudinal plane. A plurality of quick-acting holding grippers is used so that the bags are moved along at a preset distance from each other, independent of their size, while being held perpendicular to said symmetry plane.

If bags of a different size are to be made, the conveyor chain guides may be moved by a gear motor parallel to each other to be apart or closer together while maintaining the symmetry plane. While the bags are conveyed, the bag former finishes their opening by inserting a pivoted sheet-like tool into each bag. Thus, on reaching the filling means situated downstream from the former the corresponding filling tubes may easily be inserted into the bags and fill them.

When the bag filling operation has been terminated, the bag mouth is drawn together and the residual air is removed from the top by moving the bags through the air exhauster means. Subsequently, the bags are fed to the top sealing means where they are closed by sealing the mouth of the bag. They are then fed to the discharge means which places them on a chute, a conveyor belt or on boxing machine blanks. In the last two cases, the discharge means suitably takes the bags and rotates them to a horizontal position.

From the foregoing description, it will be understood that the automatic horizontal bag packaging machine of the invention differs notably from the horizontal bag packaging machines known up to date in that the conveyance of the bags takes place horizontally; furthermore, the speed, economy and easy use are advantageous, especially in cases where the bag format has to be changed frequently, where high production rates are required or where a large number of filling stations is needed. The main reason for these advantages is the incorporation of the new rotary bag transfer means and its movement by holding means disposed on chains guided by easily and quickly adjustable rails.

The new automatic horizontal bag packaging machine of the invention efficiently, originally and elegantly overcomes the limitations of conventional packaging machines, raising the level of the performance desired and/or required by users of such machines.

Such a packaging machine can be provided with adjustment devices covering both dynamic and static functions, i.e. adjustment of linear and angular speed and adjustment of the position in longitudinal, transverse and/or azimuthal directions.

Detailed Description of the Embodiment

The sole figure on the attached drawing sheet shows a non-limiting example of an embodiment of the automatic horizontal bag packaging machine of the present invention.

A continuous single or complex web 1 of a heat-sealable material wound to a roll 2 is intermittently pulled by a hauling means 3 from said roll 2; during its path of movement the web 1 passes through an unwinder 4, forming at least one loop.

Driven by a servomotor the roll 2 supplies the web 1 continuously; in the unwinder 4 the intermittent movements caused by the hauling means 3 are compensated by the formation of said loops which, on reaching upper and lower preset limits, send a control signal to the servomotor driving the shaft of the roll 2, so that the shaft speed is proportionately increased or reduced and said irregular movement is compensated.

To adjust and synchronise the movements of the hauling means 3, a photoelectric cell 5, the longitudinal position of which may be adjusted, detects the passage of a bag size mark suitably disposed on one edge of the continuous web 1 and initiates the start of the servomotor of the hauling means 3. No correction is needed when changing the bag size, since such a change is immediately detected by the photoelectric cell 5. The only control data supplied to the servomotor of the hauling means 3 is the time at which it must effect said hauling, said time being set from the setting and control panel (not shown in the drawing).

The material web 1 passes through the folding means 6, shown schematically in the figure, forming a single "V"-shaped bottom, although it could optionally be replaced by a like folding means for forming "W"-shaped bottoms. Subsequently, after the bags move past the photoelectric cell 5, they reach vertical sealing means 7 where their vertical edges are sealed twice to ensure optimum sealing of said edges. Subsequently, the bags pass to the bottom sealing means 8 which heat-seals the bot-

tom of the bag. Although this latter seal is not strictly necessary in certain cases, since the web 1 is folded there, it is a detail of good finish, improves the final appearance of the bags, and increases their resistance to pressure and rough treatment which can occur during transportation of the bags to the consumer or end user.

At this stage, the automatic horizontal bag packaging machine has formed a continuous series of bags with free top ends; subsequently, the bags are individualised by corresponding vertical cuts just on the edges of the vertical seal. This operation is executed by the cutter 9 comprising scissors, the rear blade of which is fixed tangentially to the continuous web of preformed bags 10, while the front blade is movable and driven by the main power source of the machine. The position of the cutter 9 is longitudinally adjustable to allow the making of an extensive range of bag sizes. For this reason it is provided with a screw and a graduated scale with all the possible sizes recorded thereon.

On leaving the cutter 9, the preformed bags 10 are grasped one by one by holding means of rotary transfer means 11 and are brought to conveyor chains 12a - 12b rotated by 90°, so that their initial position, coplanar with the longitudinal axis of the machine, is changed to the position of a plane perpendicular to said axis. With this change of bag orientation, the general performance of the packaging machine of the invention is superior to that of conventional horizontal machines. In fact, the mechanical structure and the complexity of the machine are much simpler from this stage onwards, since to adapt it to different bag sizes, it is only necessary to operate a single control as the conveyor chains 12a - 12b are guided by rails disposed symmetrically around the longitudinal axis of the machine and therefore move in synchronism parallel to each other. Furthermore, due to the transverse position of the bags their size does not affect at all the spacing therebetween. Therefore, in comparison with conventional horizontal packaging machines, a large number of bags can be produced per unit length of the machine.

The rotary transfer means 11 delivers the preformed bags 13 with their top ends slightly open. The opening is completed when the shaping means 14 is reached, where the conveyor chain guides move slightly closer together and aid in the opening movement. There, a vertically extending pivotable sheet-like member 15 of the shaping means 14 is inserted into the bags and opens them completely.

When the bag 13 has been opened, it is ready to be filled in the filling station(s) 16a(16b) . In the shown embodiment, two filling stations are provided, but there may be only one, or three, four or more, depending on the users' needs, on the volume and on the type of packaged products. In general, endless worm or screw fillers will be used for powdered products, while a volumetric filler with vibratory devices for facilitating the product flow will be used with solid products. For liquid and pasty products, a piston filler will be required.

An important aspect of the packaging machine of the invention is that more filling stations 16 than in the hitherto known machines can be installed for the following reason: The length of the machine increases with the number of filling stations. Such lengthening involves a large cost increase in conventional machines, whereas for the inventive machine the costs are not increased.

Once the bags 13 have been filled, they are moved by the conveyor chains 12 to an air exhauster means 17 located downstream from a widened portion 18 of the rails guiding the chains; in said means 17 the mouth of the bag 13 is stretched, causing a first exhaustion of the air inside the bag. In the shown embodiment, the air exhauster means 17 comprises moving blades which press on the bag 13 from the sides along the space remaining between the filled product and the mouth of the bag 13. The air exhauster means 17 has to be adjusted upon a change of the bag size.

At the exit of the air exhauster means 17, the bags 13 reach the top sealing means 19 in which their mouths are sealed. To ensure this, a double weld is produced. A further notable feature of the top sealing means 19 is its ease of access for the cleaning of the sealing bars by a device rotating the sealing means 19 upwardly to a vertical position, leaving the sealing bars visible and accessible.

When the bag manufacture has been terminated, at the end of the machine the bags 13 are brought to a discharge means 20 which removes them by one of the conventional systems, either down a chute, placing them on a conveyor belt or by way of a transfer means. The discharge means 20 of the present invention comprises a pivoted arm which rotates inwardly by 90°; holding means, generally suction cups or grippers, may be mounted on the upper end thereof. The holding means grasp the bags and transfer them to a discharge conveyor, not shown in the drawing. The discharge means 20 is provided with means for regulating the holding means to ensure maximum possible holding of the bags 13, irrespective of the size thereof.

Claims

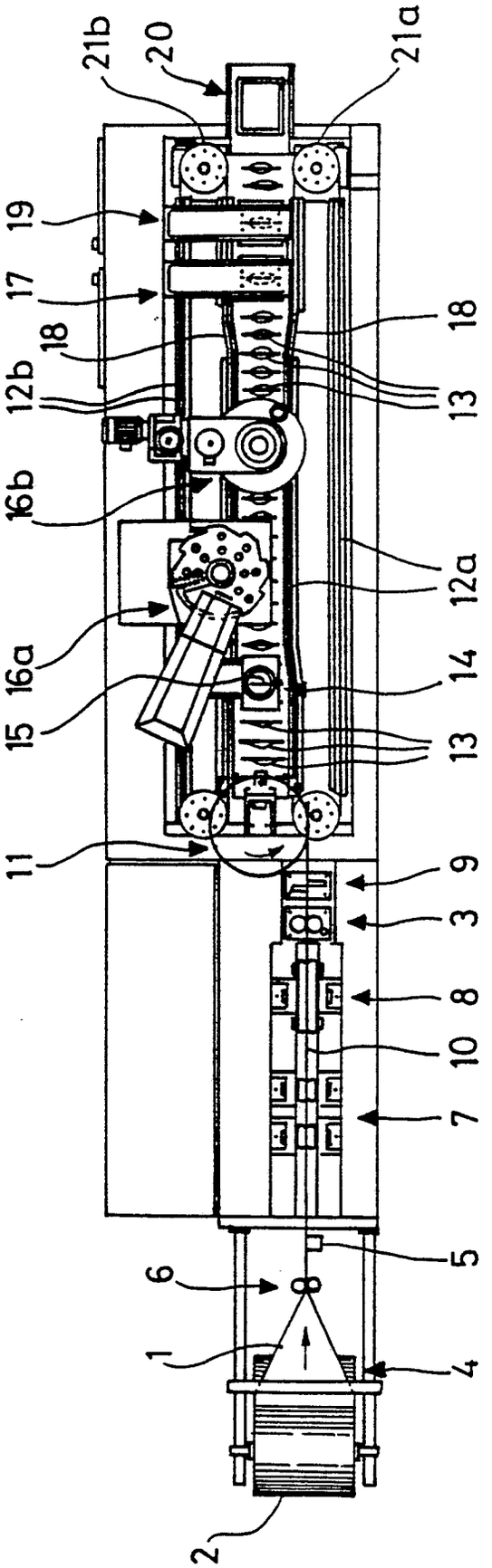
An automatic horizontal bag packaging machine comprising

- a supply means for a heat-sealable material in the form of a continuous web (1) wound to a roll (2);

- a roll unwinder (4) with servocontrol;
- means (6) for folding the web material (1) to the shape of the letter "V";
- a vertical sealing means (7);
- a bottom sealing means (8);
- a servocontrolled hauling means (3);
- a cutter (9);
- a pair of conveyor chains (12a - 12b);
- a bag and/or bottom forming means (14);
- one or more filling means (16a - 16b);
- an air exhauster means (17);
- a top sealing means (19);
- a discharge means (20) for discharging the bags (13) to a delivery conveyor; and
- a panel for the regulation and control of all the components,

characterized by the following features:

- all components including a rotary bag transfer means (11) are so assembled that the continuous web (1) of heat-sealable material from the roll (2) is pulled along by hauling means (3) and
- first passes through the unwinder (4) forming a loop, the size of which controls in inverse proportion the speed of rotation of the roll (2),
- then passes through the folding means (6), where it is folded in the shape of the letter "V" or optionally in the shape of the letter "W" , when bellows bottom bags (13) are needed,
- then passes through the vertical sealing means (7) where sealing jaws which are longitudinally adjustable by way of a screw and a graduated scale form the vertical seals for defining the bag edges,
- thereafter passes through the bottom sealing means (8) and through the cutter (9); and
- the bag (13) is grasped by the rotary transfer means (11) by means of grippers which deliver it to the conveyor chains (12a - 12b) to continue their shaping and filling.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EUROPEAN SEARCH REPORT

Application Number

EP 89 12 3703

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	US-A-4 534 158 (McCLOSKY) * Column 5, line 18 - column 10, line 25; figures 1-6; column 13, line 54 - column 14, line 10; figures 13-14 *	1	B 65 B 1/02
A	US-A-3 700 388 (JOHNSON) * Column 13, line 64 - column 14, line 22; figures 1,4,11 *	1	
A	FR-A-1 414 618 (HABRA-WERK)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B 65 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	14-03-1990	CLAEYS H.C.M.

CATEGORY OF CITED DOCUMENTS

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