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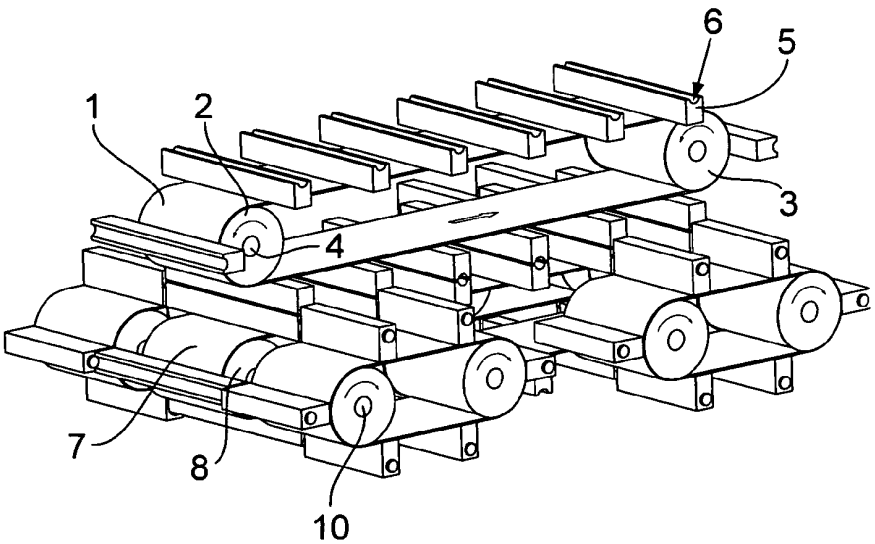
(54) **Packaging machine**

(57) The packaging machine for packing soft paste products comprises two parallel synchronously and continuously driven conveyor belts (1, 7) disposed in an horizontal fashion the one over the others ; product holders (5, 11) mounted on each said conveyor belts and uniformly distributed along the length of said conveyor belts ; said product holders (5, 11) having a cavity merging on their free end face ; said product holders being distributed along their respective conveyor belts so that at the front of the machine a product holder (5) of the upper conveyor belt (1) comes near a product holder (11) of the lower conveyor belt (7), their cavities (6, 12) matching to form a mould ; said corresponding product holders (5, 11) separating at the downstream end at the conveyor belts (1, 7).

Fig.3



EP 2 586 713 A1

Description

[0001] The present invention relates to packaging machines and more particularly to machines for packaging soft paste products typically plastic material especially gelatinous explosive material.

[0002] For purpose of wrapping or packing soft paste products or plastic masses, machines are known according to which a given volume is separated pre shaped mass of product in form of a block and, together with one end of the wrapping material, for example paper, is fed to a cell of a multicell revolving tool. In the cell at the filling station of the revolving tool, the material is compressed and, by winding mandrels, is turned for wrapping the wrapping paper. Machines of this type are disclosed for example in US patent No 3,248,847, Swiss patent No 394009 or German patent No 869171.

[0003] These known machines are mechanically complex, of difficult maintenance, and work step by step which limits the speed of packaging the product.

[0004] The present invention aimes to obviate the drawbacks of the existing packaging machines for soft paste products and particularly gelatinous explosive material.

[0005] The present invention has for its object the core of a packaging machine for soft paste products such as gelatinous explosive material receiving from front auxiliary units the material to be packed and its wrapping material and feeding an output auxiliary unit disposing of the packaged material.

[0006] The core of the packaging machine according to the invention comprises two parallel synchronously and continuously driven conveyor belts disposed in an horizontal fashion the one over the others ; product holders mounted on each said conveyor belts and uniformly distributed along the length of said conveyor belts ; said product holders having a cavity merging on their free end face ; said product holders being distributed along their respective conveyor belts so that at the front of the machine a product holder of the upper conveyor belt comes near a product holder of the lower conveyor belt, their cavities matching to form a mould ; said corresponding product holders separating at the downstream end of the conveyor belts.

[0007] The invention relates also to the fact that tools are moved synchronously and continuously with the conveyor belts and adapted to perform wrapping and sealing operations for each product contained in the cavities of two corresponding product holders during their travel from the front to the end of the conveyor belts.

[0008] These and other objects and advantages of the invention will appear more clearly from the following specification and drawings in which:

Figure 1 is a schematic side view of a packaging installation comprising upstream auxiliary units and downstream auxiliary units in between which the core of the packaging machine according to the invention is placed.

Figure 2 is a top view of the core of the packaging machine.

Figure 3 is a perspective view from the core of the packaging machine.

[0009] The core of the packaging machine consists of two parallel, synchronous and continuous moving conveyor belts onto which product holders are mounted. Upper and lower belts are arranged in an horizontal fashion. Tool carrying belts are installed on the sides of the lower conveyor belt and are also operated synchronously. Two tool stations along the lower conveyor belt. The product to be packed enters the packaging machine at the front and is held between the respective holders. The product is first in phase with the tools of first tool station where it receives the first packing operation while moving towards the rear of the machine. The product then enters the range where it is in phase of the tools of the second tool station and where it receives the packing operation of the second station and so forth. It is hence imaginable to have several of these tool stations.

[0010] Naturally, the packaging machine is accompanied by some upstream equipment such as a material feed station (not shown). This feed station has the function of separating a defined amount of product from the bulk mass, pre-forming the product so it is suitable for being inserted into the holders and inserting the product into the holders of the packaging machine.

[0011] Another upstream station provides the packing material (not shown). Its main functions are to store the packing material in bulk, if needed treat the packing material with impregnating agents or markings, separate a predefined amount of packing material and insert the packing material together or apart from the product into the packing machine.

[0012] Downstream equipment associated with the packing machine are handling stations that remove the packed product from the packing machine as well as units that may weigh and discard off-spec material, mark and assemble product into larger handling units etc.

[0013] Directly associated with the packaging machine may be operating stations that assure a perfect operation of the packaging machine. Such a station may perform a cleaning function by removing excess product from the holders and the machine in general.

[0014] Downstream equipment associated with the packaging machine comprises:

Product discharge from packaging machine.

[0015] The following operations naturally follow the packaging operation. They are well established in the industry. The sequence of operations shown here is for illustrative purposes and does not reflect a fix and mandatory sequence.

1. Extraction of wrapped product from packaging

machine :

- The extraction of packaged product preferentially occurs by gravity i.e. by means of a sloped surface.
- At higher speeds, a forced handling by means of i.e. moving grippers is needed to prevent uncontrolled product movements and difficulties with downstream handling.

2. Rejection of non conform product :

- Wrapped product is rejected based on abnormal weight and/or abnormal shape.
- None conform product is removed either manually or by means of an air jet, pivot, gripper, etc.

3. Marking and labelling :

- Product can be marked by attaching a self adhering label or by printing information onto the surface by means of an ink-jet printer.

4. Packing into bulk package:

- Finished packed product can be automatically collected and inserted into bulk boxes.

[0016] The present invention concerns the core of the packaging machine shown in figures 1 to 3 and this particular example will now be described here below.

[0017] An upper conveyor belt 1 is disposed sensibly horizontally in the embodiment shown, and is mounted between two upper drums 2, 3 one of which at least is driven by an upper driving shaft 4. This upper conveyor belt 1 supports and drives a plurality of upper product holders 5 extending perpendicularly to the conveyor belts and evenly distributed along the whole length of said upper conveyor belt 1. The frontal free face of each upper product holders 5 comprises a first cavity 6 intended to receive a given quantity of the product to be packed.

[0018] The packaging machine comprises further a lower conveyor belt 7 identical to the upper conveyor belt 1 mounted between lower drums 8, 9 one of which is driven by a lower driving shaft 10. This lower conveyor belt 7 supports and drives a plurality lower product holders 11 the free face of which is provided with a second cavity 12. The number of upper and lower products holders 5, 11 is equal and the two conveyor belts 1, 7 are so disposed the ones under the others that when the product holders 5, 11 move between the upper and lower conveyor belts 1, 7 they fit together, the first and second cavities 6, 12 of the two corresponding product holders 5, 11 matches to form a complete cylindrical cavity intended to receive a quantity of product to be packed 13 surrounded by a portion of sheet packaging material 14 both delivered to the packaging machine by the upstream equipments of said packaging machine.

[0019] The two conveyor belts 1, 7 are parallel and are driven continuously and synchronously.

[0020] The upper and lower drums 2, 3 ; 8, 9 are supported by an upper and lower structures, not shown, comprising means permitting an adjustment of the distance separating the longitudinal axes of the two conveyor belts. Furthermore the product holders 5, 11 are mounted on their respective conveyor belts 1, 7 in a removable manner. This permits to provide different sets of upper and lower product holders having different cavities 5, 12 for packaging products of soft materials such a gelatinous explosives of different volumes, shapes, etc...

[0021] The packaging machine comprises further at least one, two in the example shown, but more if necessary, groups of two tool carrying belts. Each group of tool carrying belts comprises two tool carrying belts each located at one side of the lower conveyor belt 7.

[0022] In the illustrated embodiment the machine comprises a first group of two tool carrying belts 15, 16 located on each side of the lower conveyor belt 7 and driven synchronously with said lower conveyor belt 7. These tool carrying belts 15, 16 of the first group supports tools 17, 18 uniformly distributed along the length of their respective tool belts and separated from each other by a same distance as the product holders 5, 11 are. These tool belts 15, 16 are driven by the same drive shaft 8 as the lower conveyor belt 7.

[0023] The second group of tool carrying belts comprises two tool carrying belts 19, 20 each located at one side of the lower conveyor belt 7 but at a portion of it which is longitudinally displaced with respect to the first group of tool carrying belts 15, 16. The tool carried by said tool belts 19, 20 of the second group are different from the tools carried by the first group of tool belts and are intended to carry out different operations.

[0024] There are so many groups of tool carrying belts as different operations are necessary to wrap the extremities of the packing of the product to be packed.

[0025] The tools carried by the tool carrying belts are wrapping tools known in the art and perform the following operations:

1. Pre-shaping lateral guides:

- The closing action of the product holders at the inlet of the machine gives the product a first round shape. At the same time, lateral guides prevent the spilling of product in lateral direction and assure a well filled form.

2. Wrapping tools:

- Wrapping tools are now synchronized with the product movement and enter laterally on both sides, holding overlapping parts of the wrapping papers firmly between two wrapping wheels.
- The wrapping tools now perform a wrapping function by sliding the packaging material be-

tween a stationary and a rotating wrapping wheel. Thereby spinning the product around its axis as well as wrapping the packaging material firmly around the round product cylinder. The shape of the product holders here act as guides.

3. Closing tools:

- After disengagement of the wrapping tools, the closing tools are synchronized with the product along the conveyor belt. The closing tools fold excess wrapping paper towards the center of the product cylinder, thereby closing the product cylinder's side surfaces.

[0026] Other possible wrapping operations could be:

- Lateral insertion of confectioning material such as: product tracing aids, mechanical stabilization aids, hollow cylinders, pre-forming of use holes, etc.
- Application of glue for assuring perfect closing.

[0027] The particularity and novelty of this packaging machine is, among others, the fact that the wrapping tools move synchronously with the upper and lower conveyor belts. In the prior art the wrapping tools are fixed and do not move with the product to be packed.

[0028] As an example, the packaging machine described as a whole and the individual tool stations I and II in particular may perform the following sequence of operations:

1. Insertion of product and packaging material into the packing machine by upstream equipment:

a. Separate an adequate amount of packing material from the bulk packing material and insert it into the packaging machine.
b. Separate a rectangular shaped bar from the product bulk mass and insert it together with the packing material into the holders 5, 11 at the entrance of the packaging machine. The insertion is done so that the packing material is placed between the holders 5, 11 and the product bar in a precise fashion.

2. Due to the synchronous movement of the conveyor belts 1 and 7 and hence the holders 5, 11, the holders close around the product bar and the product is pressed into a round form of defined diameter and length.
3. Once the pre-deformed product is in phase with the first tool station, the tools of said station grip the packing material laterally and rotate the product inside holders 5, 11 by spooling the packing material around the product. This wrapping function is finished as the product bar has progressed to the end of the first tool station. It results a round product bar wrapped into the packing material.
4. Once the wrapped product bar has progressed further it becomes aligned with the tools of the record tool station. Here, the lateral over-lengths of packing material is pressed from both sides onto the wrapped product bar, thereby completely enclosing the product inside the packing material.
5. The continuous motion of the conveyor belts now transport the wrapped product beyond the record tool station and to the end of the packaging machine, where holders 5, 11 are opened, thereby releasing the product from the packaging machine. The product is now removed by downstream equipment, weight, labelled and compounded into larger selling units.

[0029] This packaging machine is very advantageous over the existing machines particularly for the following reasons:

1. The packaging machine is very simple, easy to built, necessitates less maintenance and is very robust.
2. Due to the amovibility of the product holders and of the simple way of modifying the distance between the upper and lower conveyor belts, it is possible to change rapidly and easily the product holders for packaging the product in another form, i.e. cylindrical or polygonal bars of different lengths and cross sections. The modifications of the machine to change the shape and volume of the packed product are done in a few hours instead of days and this has a considerable impact on the performance and rentability of the packaging machine.
3. The upstream and downstream equipment of the core of the packaging machine are standard ones and existing packaging machine can be modernized and ameliorated by simply changing the core portion of the machine.
4. The number of tool stations or groups can be modified according to the operations necessary to seal the product package.
5. It is also possible to modify and adapt the machine to other product cross section or length by changing only the product holders, the conveyor belts inter-distance and width remaining unchanged.
6. The movement of the product to be packed is continuous and uniform. No limitation due to acceleration and deccelaration forces.
7. All the belts, product conveyor belts, and tool belts, are synchronised this enabling a higher quality of transformation and a better accuracy for the wrapping of the product.
8. The packaging machine is mechanically simpler, of lower cost, necessitates less maintenance and facilitate its cleaning.
9. The packaging machine has a higher production, less time is necessary to adapt the machine from

one product shape to another.

[0030] Typically a packaging machine according to the invention can have the following characteristics:

- The conveyor belts inter-distance can vary from 200 mm to 100 mm and be preferably between 100 mm and 150 mm.
- The product shape can be round with a diameter varying between 18 mm and 80 mm, preferably 25 mm to 50 mm.
- The product can be of different cross-sections for example square, polygonal or shapeless.
- The product length can be comprised between 100 mm and 400 mm.
- The product types to be packed are gelatinous pastes such as explosives, food products, cosmetic products etc.

[0031] In a variant of execution of the packaging machine the lateral tool belts can be replaced by indexable, rotative tool heads carried by the lower or the upper conveyor belt disposed between the product holders of the conveyor belt. During the transportation of a product bulk between a product holders from the upper conveyor belt and a product holder of the lower conveyor belt, the tool heads are rotated step by step to perform the different sealing and wrapping operations which are necessary.

[0032] Finally at the end of the upper and lower conveyor belts the upper and lower products holders separates and the packed product 21 is delivered to the downstream equipment for collecting the packed products.

Claims

1. Packaging machine for packing soft paste products **characterized by** the fact that it comprises two parallel synchronously and continuously driven conveyor belts (1, 7) disposed in an horizontal fashion the one over the others ; product holders (5, 11) mounted on each said conveyor belts and uniformly distributed along the length of said conveyor belts ; said product holders (5, 11) having a cavity merging on their free end face ; said product holders being distributed along their respective conveyor belts so that at the front of the machine a product holder (5) of the upper conveyor belt (1) comes near a product holder (11) of the lower conveyor belt (7), their cavities (6, 12) matching to form a mould ; said corresponding product holders (5, 11) separating at the downstream end at the conveyor belts (1, 7).

2. Packaging machine as claimed in claim 1 **characterized by** the fact that tools are moved synchronously and continuously with the conveyor belts (1, 7) and adapted to perform wrapping and sealing operations for each product contained in the cavities (6, 12) of two corresponding product holders (5, 11) during their travel from the front to the end of the conveyor belts.

3. Packaging machine as claimed in claim 1 or 2 **characterized by** the fact that the upper product holders (1) are mounted in a removable fashion onto the upper conveyor belt (1) and by the fact that the lower product holders (5) are removably mounted on the lower conveyor belt (7) so that they can easily be replaced by an other set of product holders (1, 5) having different shapes and/or cavities (2,6).

4. Packaging machine as claimed in one of the preceding claims **characterized by** the fact that it comprises, on each side of the lower conveyor belt (7) at least a first lateral tool belt driven continuously and synchronously with said lower conveyor belt (7).

5. Packaging machine as claimed in claim 4 **characterized by** the fact that said first lateral tool belts (15) supports a plurality of identical tools separated by a distance equal to the distance separating two neighboured lower product holders (11) and located such as to be in alignment, during part of the revolution of the tool belt to which they are mounted, with lower product holders (11).

6. Packaging machine as claimed in claim 5 **characterized by** the fact that the said first lateral tool belts (15) and their tools form a first tool station performing a first wrapping and/or sealing operation of the packing material surrounding the products during part of their transport by the conveyor belts (1, 5).

7. Packaging machine as claimed in claim 6 **characterized by** the fact that it comprises further tool stations performing further wrapping and/or sealing operations during the transport of the products by the conveyor belts, the tool of each tool stations being all identical but different from those of the other tool stations; said further tool stations being disposed the one behind the others along the conveyor belts (1, 7).

8. Packaging machine as claimed in claim 3 **characterized by** the fact that the different tools for wrapping and/or sealing the packed products are carried by rotatable and indexable tool heads fixed on one of the conveyor belts (1, 7) between each of the upper or lower product holders (5, 11).

Fig.1

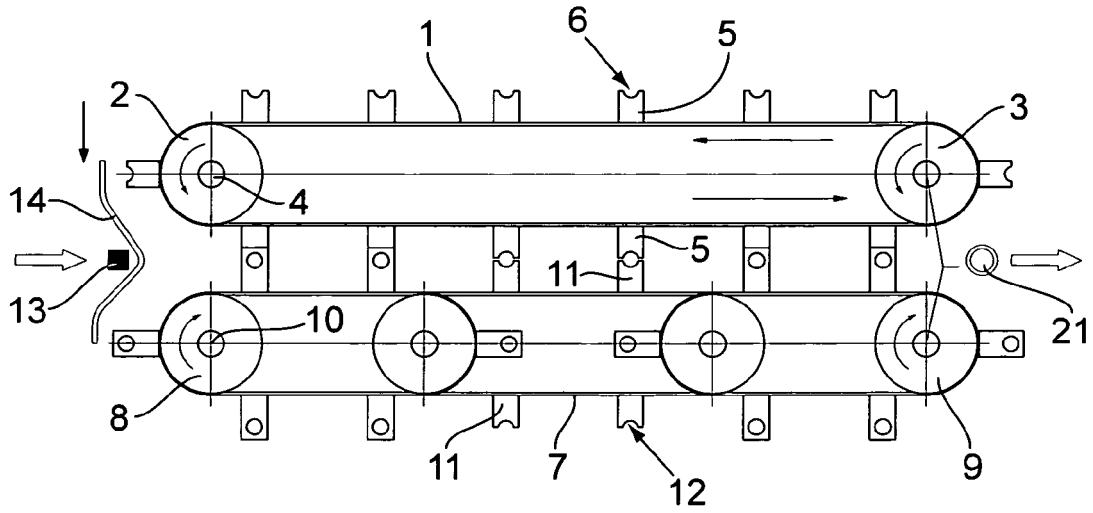


Fig.3

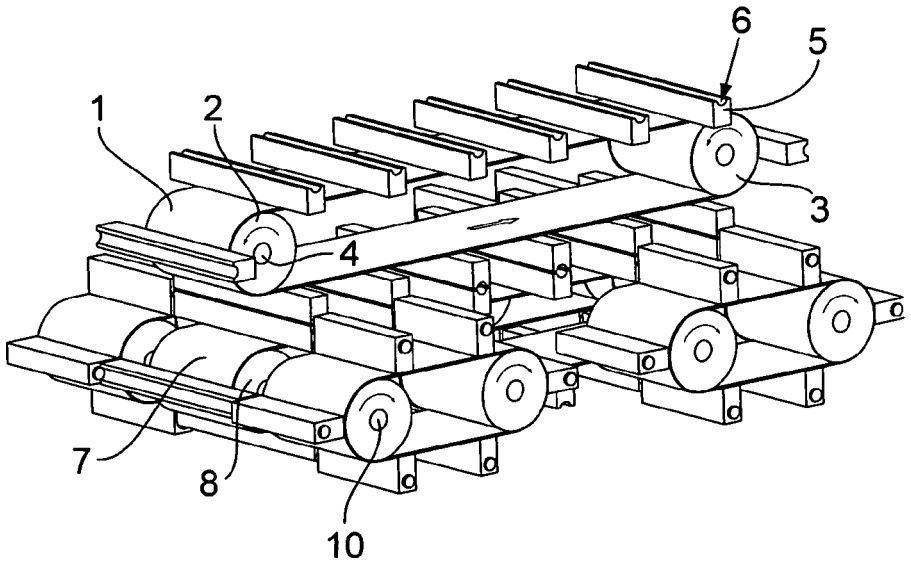
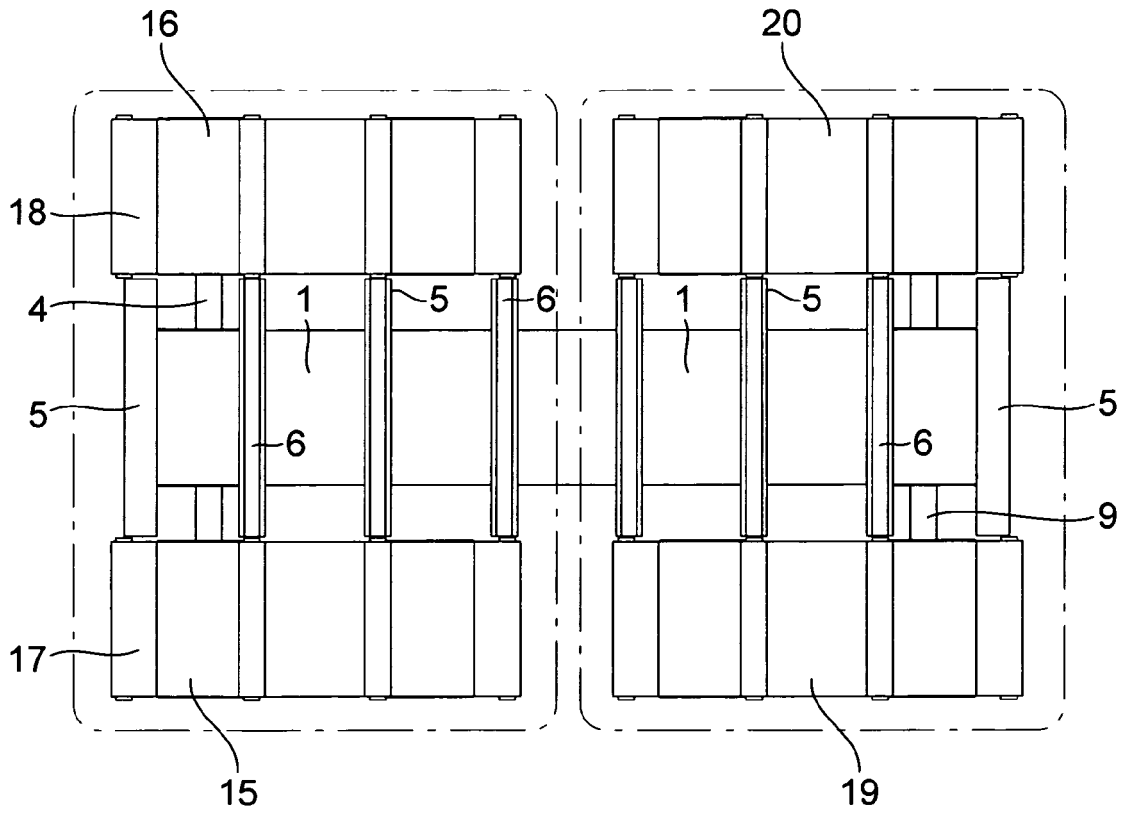


Fig.2



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EUROPEAN SEARCH REPORT

Application Number
EP 12 00 2483

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	US 3 501 892 A (PIKAL HARRY) 24 March 1970 (1970-03-24) * column 2, line 11 - column 4, line 23; figures 3-5 *	1,3 2,4-8	INV. B65B11/14 B65B49/14
Y	US 2 047 486 A (GUNTHER MEYER-JAGENBERG) 14 July 1936 (1936-07-14) * figures 12-15 *	2,4-6	
Y	US 1 743 666 A (PAUL GANGLER) 14 January 1930 (1930-01-14) * the whole document *	2,4-6	
Y	EP 1 518 787 A1 (TISSUE MACHINERY CO SPA [IT]) 30 March 2005 (2005-03-30) * paragraph [0003] - paragraph [0009]; figures 1-8 *	2,4-7	
Y	US 3 990 210 A (MCDONOUGH DAVID R ET AL) 9 November 1976 (1976-11-09) * column 9, line 7 - line 40; figures 10,25,26 *	8	

TECHNICAL FIELDS SEARCHED (IPC)

B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	31 January 2013	Yazici, Baris

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

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Application Number
EP 12 00 2483

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 12 00 2483

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1, 2, 4-7

   Invention 1 relates to a packaging machine wherein the lateral sides of the package are wrapped and sealed using different tooling stations which are driven by tool belts located laterally and driven synchronously with the transport of products.

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2. claims: 3, 8

   Invention 2 relates to a packaging machine wherein the product holders, wrapping and sealing tools can be adapted to different sizes or shapes of packages.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 12 00 2483

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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31-01-2013

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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 3248847 A **[0002]**
- CH 394009 **[0002]**
- DE 869171 **[0002]**