The invention relates to a thermoforming machine for conditioning products (3) with packages (2) obtained from a film (22) and sealed by a welded film (25), wherein said machine (20) sequentially includes, in the direction (D) of the package transport carried out by conveying means (34); at least one conditioning station (5), a welding station (24), a marking station (6) and a package degrouping station (27). According to the invention, a viewing station (1) is provided between the welding station (24) and the marking station (6), the viewing station comprising means (31) for taking images of the packages and means (11) for piloting the marking station (6) in order to apply marks (M) on the packages (2) according to the respect or not of certain criteria; the invention is characterised in that the conveying means (34) carries out the grouped transportation of the packages (2) by the two longitudinal edges of the two superimposed films (22, 25).
FIG. 5

<table>
<thead>
<tr>
<th>Condition</th>
<th>Date</th>
<th>Icon</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>OK</td>
<td>12/05/06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NOK Interference</td>
<td>12/05/06</td>
<td>![Icon]</td>
<td></td>
</tr>
<tr>
<td>NOK Empty</td>
<td>12/05/06</td>
<td>![Icon]</td>
<td></td>
</tr>
<tr>
<td>NOK Product aspect</td>
<td>12/05/06</td>
<td>![Icon]</td>
<td></td>
</tr>
</tbody>
</table>

FIG. 6
THERMOFORMING MACHINE FOR PACKAGE CONTROL AND MAKING

[0001] This present invention concerns the technical field of the inspection or the optical checking of packs through a transparent or translucent part of the said pack containing products of different natures.

[0002] The subject matter of the invention finds particularly advantageous applications, though not exclusively so, in the field of the checking of product packs associated with food-production, pharmacy or cosmetics.

[0003] For such applications, the need has arisen, after the packaging of the products, to perform a check on the pack and/or on the packaged product so as to check that the packs and/or the packaged products comply with the previously established quality or conformity criteria. To this end, it is proposed to put in place, at the end of the production line, a viewing station that can be used to determine whether the packs and/or the packaged products comply or not with the established conformity criteria. This viewing station is associated with a sorting station, generally automated, that can be used to classify the good packs into cartons, while the failed packs are reprocessed as so to correct the fault discovered.

[0004] Although the quality check on such packs is satisfactory in practice, a difficulty arises regarding the processing of packs considered defective, since the fault is not always easy for an operator to locate. This detection difficulty is even greater when the viewing station is checking several criteria. In fact, it then becomes necessary to check all of the criteria to be satisfied by the pack in order to detect those that have not been satisfied. In the same vein, in the event of a malfunction in the sorting station, it appears not to be possible to separate out the packs considered to be good by the viewing station, from the failed packs. This situation means that all packs have to be inspected again, thus reducing the production rate.

[0005] Patent application WO 2004/072626 proposed a machine for the inspection of products in bulk by means of a camera that can be used to check the characteristics of products moving past a viewing station. This document proposes to detect the number of objects, and to compare this with a number that is read from a barcode. If the number of products does not match that desired, then a mark is placed on the pack. This machine includes two conveyors for transportation of the products, separated from each other to allow the positioning of the inspection camera. This machine requires a relatively complex transportation system, and one that is difficult to implement. Moreover, the presence of the viewing station requires extension of the conveyor line, resulting in a machine of considerable size.

[0006] The subject matter of the invention aims to correct the drawbacks of the prior art by proposing a blister pack machine for the packaging of products in packs, that includes a viewing station for optical checking of the packs, designed to control a marking station so as to place marks onto the packs in accordance with their compliance or not with previously chosen quality criteria, where such a machine, which has simple transportation means, does not increase the size of the machine.

[0007] In order to meet such an objective, the blister pack machine for the packaging of products using packs created from a film and closed off by a welded film, the machine where the machine includes, in succession, in the direction of movement of the packs as determined by the conveyor means, at least one packaging station, one welding station, one marking station and one station for separation of the packs.

[0008] According to the invention, a viewing station is placed between the welding station and the marking station, where this viewing station includes means for taking pictures of the pack, synchronised with the advance of the conveyor means and of the means for controlling the marking station, so that after determining whether the packs comply or not with the criteria, the viewing station controls the marking station so as to place marks onto the packs in accordance with their compliance or not with the criteria, and in that the conveyor means provide grouped transportation of the packs by the two longitudinal edges of the two superimposed films.

[0009] According to a preferred implementation characteristic, the viewing station performs optical checking for a group of packs advancing at a given interval in accordance with the packaging of the products.

[0010] For example, the advance interval of the machine is equal to a length that includes a series of packs.

[0011] According to one implementation variant, the marking station performs the marking of at least the “use-by” date and marks that depend on compliance or not with the criteria.

[0012] According to another advantageous implementation characteristic, the marking station places onto the packs, marks that are associated with one or more different categories, each corresponding to different criteria to be observed.

[0013] For example, for information only, the marking station performs the marking on the packs at least of the “use-by” dates alongside which are placed the marks indicating compliance or not with the criteria.

[0014] Advantageously, the marking station places coded marks that are not directly comprehensible in the absence of a table of correspondence between said coded marks and compliance or not with the criteria.

[0015] For example, as coded marks, the marking station places lines of greater or lesser length.

[0016] According to another example, the marking station places marks that are directly comprehensible.

[0017] According to a preferred application example, the viewing station performs optical checking of the packs so as to determine whether the packs comply or not with the criteria, the presence of interference with the welds of the pack, the appearance of the product, the appearance of the pack and/or the presence of the product inside the pack.

[0018] For each advance interval of the packs, the marking station preferably performs optical checking of the packs so as to attribute, to each pack, a code representing its position.

[0019] Advantageously, the marking station is followed by a station that sorts the packs from the marks placed onto the latter, and according to compliance or not with the criteria.

[0020] For example, the sorting station includes means for taking pictures of the packs in order to detect at least the marks, the “use-by” dates and the pack positions, with these picture creation means controlling a system for handling the packs, designed to place the good packs into a packing carton and to allow the failed packs to follow a processing path.

[0021] Diverse other characteristics will emerge from the description that follows, with reference to the appended drawings which show, by way of non-limiting examples, forms of implementation of the subject matter of the invention.

[0022] FIG. 1 is a block diagram that illustrates the principle of the subject matter of the invention.
FIG. 2 is a schematic view of one example of a blister-pack machine implementing the subject matter of the invention.

FIG. 3 is a view in partial perspective of a blister-pack machine that includes a viewing station according to the invention.

FIG. 4 is a view taken more-or-less along lines IV-IV of FIG. 3.

FIG. 5 is a schematic view illustrating the working principle of the blister pack machine illustrated in FIGS. 2 to 4.

FIG. 6 is a diagram illustrating different characteristics of the subject matter of the invention.

As emerges more precisely from FIG. 1, the subject matter of the invention concerns a viewing station 1 designed to perform a check or an optical inspection of packs 2 of products 3 on a packaging line of any known type. In general, a production or packaging line successively includes, in a direction of advancement or travel D of the packs 2:

- a station 5 for packaging products 3 inside packs 2,
- a station 6 for marking information on the packs 2,
- and a station 7 for sorting the packs in accordance with their compliance or with quality or conformity criteria.

According to the invention, the viewing station 1 is placed upstream of the marking station 6, and more precisely between the packaging station 5 and the marking station 6. The packaging station 5 is designed for the nature of the products 3 to be packaged and of the packs 2 used. The products 3 to be packaged can be associated with the food, pharmaceutical or cosmetics areas, for example. The packs 2 can be of any appropriate shape and is made from a material that will allow inspection by the creation of pictures. In this regard, the pack 2 includes at least one transparent side through which the optical inspection is performed, associated with a transparent or opaque opposite side.

The viewing station 1 according to the invention includes in particular the means for the creation of pictures of the packs. These pictures are processed so as to determine whether the packs comply or not with quality or conformity criteria C. It should be noted that the processing of pictures can concern the pack itself and/or the packaged product. Thus, the check on the quality or conformity criteria can concern the pack and/or the packaged product. By way of an example, it can be arranged to check the presence or not of the product inside the pack, the appearance or the dimensions of the product, the closure characteristics of the pack, etc.

The viewing station 1 also includes means 11 designed to control the marking station 6 so that the latter places onto the packs distinctive marks or signs M according to compliance or not with the previously determined criteria.

In the case where a criterion is not satisfied, a mark M is preferably placed on the pack 2. Naturally, one can envisage placing a mark M on each pack 2 when the latter complies with the previously established criterion. In this case, only the failed pack will not include such a mark. This latter implementation variant allows us to check that the inspection operation has been carried out correctly.

According to one advantageous implementation characteristic, it can be arranged to place onto the packs 2 marks that are associated with several different categories, each corresponding to different criteria to be observed. For example, if the viewing station 1 is designed to examine whether two criteria are complied with, such as the presence of products and the integrity of the pack, for example, the marking station places two different types of marks M on the pack, each corresponding to a different criterion. Naturally, the marks placed can be administered in any appropriate manner.

According to a preferred implementation variant, the placed distinctive marks or signs M are coded so that they are not directly comprehensible by a person, in the absence of a table of correspondence between the said coded marks and the criteria. As a coded mark M, it can be arranged to place lines of greater or lesser length at different characteristic points on the pack, as will be explained in the remainder of the description. Naturally, the placed marks M can be administered in clear, meaning that are directly comprehensible by a person.

The marking station 6 is followed by a station 7 for sorting the packs according to their compliance or not with the quality or conformity criteria. The sorting station 7 is used to separate the good packs from the bad packs according to the previously placed marks M. This sorting, which can be performed manually or automatically, is first designed to place the good packs into a carton so that they can be shipped, and secondly to process the defective packs.

The viewing station 1, as described above, finds an application in the packaging of food products inside trays that are closed by a welded film. The viewing station 1 is designed to be employed on a packaging line using a blister pack machine. The incorporation of a viewing station 1 into a blister pack machine is particularly suitable for determining whether the packs comply or not with given criteria, the presence of interference with the welded pack, the appearance of the product, the appearance of the pack and/or the presence of the product inside the pack. Thus, the viewing station 1 is particularly suitable for inspecting the product packs in the meat products, cheese products, catering or any other areas.

FIGS. 2 to 5 illustrate a blister pack machine 20 according to the invention that includes a viewing station 1 placed between the packaging station 5 and the marking station 6. The packaging 5 and marking 6 stations of the blister pack machine 20 will be described in a succinct manner, since they are well known to a person skilled in the art. The blister pack machine 20 thus includes a station 21 for the production packs 2 made from a plastic film 22. In the example illustrated, the station 21 performs the formation on the width of the film 22, of two packs 2 side by side, such as food trays for example, so that the packs 2 lie along two rows as shown clearly in FIGS. 3 and 4. Naturally, the blister-packing station 21 can make the packs in various configurations or positions other than those illustrated. The food trays thus created are conveyed to a filling station 23 where the products 3 are placed in the packs 2. It should be noted that the food trays are moved in a grouped manner, insofar as all the food trays are linked to each other by the film 22. The advance of the film in the direction of travel D by any appropriate means allows the packs 2 to be routed in succession to the different stations of the blister pack machine.

The food trays thus filled are conveyed to a welding station 24 designed to close the packs by means of a closure film 25 applied to the top of the food trays. Before the closure of the packs 2, the vacuum is created inside the tray before the introduction of an inert gas. The welding station 24 performs the sealed closure of the packs by the creation of a weld bead around the whole periphery of each pack 2. The closed packs 2 are then conveyed to the viewing station 1 according to the invention, then to be taken to the marking station 6 before arriving at a cutting-out station 27 used to separate the packs 2.
Conventionally, the marking station 6 includes one or more inkjet printers, used to place information of every nature onto the packs. According to one advantageous implementation characteristic, the marking station 6 in particular places the “use-by” date (Use-By Date) of the packaged products 3.

As emerges more precisely from FIGS. 3 and 4, the viewing station 1 includes means for the creation of pictures 31 of at least the part of the pack that is used to determine whether the pack complies or not with the chosen conformity criteria. According to a preferred implementation characteristic, the means 31 take pictures of the weld welds on the packs 2 so as to detect the presence of any interference or foreign bodies in these weld beads. The presence of interference in the head-welded beads result, firstly, in damage to the quality of the weld from the sealing viewpoint, and secondly, and damage to the aesthetic appearance of the product and the pack.

Conventionally, the quality of the weld beads can be checked from the front or the back of the packs, to the extent that this rear face is transparent, and the closure film 25 that forms the rear face is generally of an opaque character. In a blister pack machine, the packs 2 are advantageously conveyed between the welding station 24 and the marking station 6, with the front face directed upwards and the rear face directed downwards. In addition, it should be noted that the packs 2 are transported between the welding 24 and marking 6 stations, by conveyor means 34 that leave the rear face of the packs clear. In fact, as emerges from FIGS. 3 and 4, the conveyor means 34 hold the packs 2 by the two longitudinal edges of the two superimposed films 22, 25. For example, these conveyor means 34 include two sets of slides and superimposed between them are engaged the longitudinal edges of the films 22, 25. These conveyor means 34 are controlled to have a given advance interval, as will be explained in the remainder of the description.

The means for the creation of pictures 31 are therefore placed below the packs, between the welding 24 and marking 6 stations so as to check the rear face of the pack. It is clear of course that one can equally well envisage inspecting the rear face of the pack, if this face, created from film 25 is of a transparent character. Inspection of the rear face of the pack is possible since the conveyor means 34 also leave the rear face of the pack clear.

For example, the means for the creation of pictures 31 include at least one camera, and in the illustrated example three cameras 311, placed transversally in relation to the direction of movement D of the packs. These means for the creation of pictures 31 also include two light sources 312 placed on either side of the cameras, and that can be used to illuminate the rear face of the packs. This detection station 1 also includes means for processing the pictures taken so as to determine whether the packs comply or not with the previously chosen quality criteria. These processing means are linked to the means 11 that transfer, to the marking station 6, the necessary information so that the latter places the marks M onto the packs according to the result of the picture processing.

FIG. 5 enables us to better understand the operation of a blister pack machine 20 as described above. It should be noted that a blister pack machine 20 of this type works with an advance interval that depends in particular on the welding and heat-forming operations. In the example illustrated, it is considered that the advance interval P1, P2, P3, P4 of the machine is equal to a length that covers four packs 2 so that each station of the machine effects its operation simultaneously on eight packs. Naturally, each station on the machine is designed to effect its operation on a different number of packs, equal to n in the general sense. The duration of the processing or of the pause between two advance intervals of the packs is the longest duration of the operations on the blister pack machine 20. Thus, the means for the creation of pictures 31 are synchronised to the advance of the conveyor means 34.

After the simultaneous filling of the packs 2 with the products 3 (eight in the example illustrated), these packs 2 are transferred with an interval P1 into the welding zone Z1. After a given processing time, the packs are transferred into a viewing zone Z2, in which the viewing station 1 is located. The pictures are taken on the fly during the passage of the packs 2 in front of the cameras 31. In other words, the taking of the pictures is synchronised to the advance interval of the conveyor means 34. The packs are then moved by an interval P2 into a marking zone Z3. At the end of this advance interval, the pictures taken are processed in order to determine whether the packs comply or not with the specified criteria. The result of this processing is transmitted to the marking station 6 to allow placement the marks M onto the packs concerned. During the advance interval P3, the packs 2 moved so that they pass in front of the marking station 6. The marking station 6 is designed to place onto the packs the marks M corresponding to compliance or not with the criteria chosen for the packs and, where appropriate, information of a general character such as the “Use-By” date.

The packs then pass in front of the transverse and longitudinal cutting-out station 27 that is used to separate the packs 3 with a view to their transportation to the sorting station 7. Conventionally, the sorting station 7 includes an optical checking system that can be used to check that the packs are correct or not. This optical checking system in particular verifies the presence or not of the marks M. It should be noted that this optical checking system is also able to check others characteristics of the pack.

According to a preferred implementation example, the optical checking system includes at least one system for the creation of pictures, designed to detect the presence or the absence of the marks M. In addition, this optical checking system can be designed to discern the type of criteria that are not complied with. This optical checking system is advantageously coupled to a manipulation system like a robot that can be used to take away the packs that are not defective so as to place them in the shipping cartons. The defective packs, namely those that have a mark M in the example illustrated, are processed to correct their faults. In this regard, the manipulation robot can be controlled by the optical checking system in order to separate the defective packs according to the nature of their faults. In the example described above, the sorting of the packs is accomplished automatically, but it is clear that the sorting operation can be carried out by operators who directly identify the defective or correct packs from the presence or the absence of the marks M. The sorting station can thus include a system for the ejection of defective packs.

According to a preferred implementation characteristic, illustrated in FIG. 6, the marks M are placed close to the “use-by” date. According to another preferred characteristic, the marks M are encoded so as not to be comprehensible directly by a person who is not in possession of a table of correspondence between the marks M and the chosen criteria. For example, it can be arranged to represent the marks by lines of different length.

Thus, in the case where one of the checked criteria concerns the presence or the absence of interference with the weld beads, it is chosen not to place a mark M to the right of
the Use-By date if the pack is correct, while if the viewing station 1 detects a fault linked to the presence of interference with the weld bead, a mark M is placed to the right of the Use-By date. For example, it can be decided that a short line that corresponds to this type of fault. In the case where the viewing station 1 verifies the presence or not of products inside the packs, the detection of an empty pack leads the marking station 6 to place a mark M to the right of the Use-By date that is different from the mark M characterising interference with the welds. For example, it can be decided that a long line will characterise such an absence-of-product fault. In the same way, if the viewing station 1 verifies the appearance of the packaged product, it can be arranged, in the event of non-compliance with the rule considering the product to be acceptable, to place a short line, indicating a defective packaged product, to the left of the Use-By date.

[0053] It emerges from the above example that the presence or the absence of marks M enables us to identify the character, correct or not, of the packs and/or of the packaged products. Moreover, the position of these marks and/or their presentation allows us to directly see the type of character not complied with, by knowing the table of correspondence between the types of fault and the marks. Naturally, one can envisage other types of mark or signs to indicate defective packs. It can be arranged to resort to the use of letters that can be, for example, initials of the faults, symbols, or drawings. For certain applications, we can envisage placement of the marks in clear, meaning that are directly comprehensible by an operator.

[0054] According to another characteristic of the subject matter of the invention, the viewing station 1 is designed to identify the position of each pack advancing in a given interval. In the example illustrated, the viewing station 1 is designed to determine the position of eight packs at each advance interval. This information is transmitted to the marking station 6, which is then able to place onto each pack a mark corresponding to the pack position in each advance interval. This position is preferably encoded in binary by points of different weight. Knowledge of the pack position in each advance interval allows us to correlate the information with the type of fault, and to trace back to the origin of the fault. For example, if the No. 1 packs of several successive intervals are found to be empty, it can be concluded that the product feeding system of pack No. 1 is defective.

[0055] The invention is not limited to the examples described above, and represented, since various modifications can be made to it without moving outside of its scope.

1. A blister-pack machine for the packaging of products (3) in packs (2) that are created from a film (22) and closed by a welded film (25), where the machine (20) successively includes, in the direction (1) of transportation of the packs led by the conveying means (34), at least one packaging station (5), one welding station (24), one marking station (6) and one pack separating station (27), characterised in that a viewing station (1) is placed between the welding station (24) and the marking station (6), with the viewing station including means (31) to take pictures of the pack, synchronised with the progression of the conveying means (34), and means (11) for controlling the marking station (6), so that after determining whether the packs are meeting the set criteria or not, the viewing station (1) commands the marking station (6) in order to place marks (M) onto the packs (2) according to compliance or not with the set criteria, and in that the conveying means (34) effect the grouped transportation of the packs (2) by the two longitudinal edges of the two superimposed films (22, 25).

2. A packaging machine according to claim 1, characterised in that the viewing station (1) effects optical monitoring for an advancing group of packs at a given pitch according to the packaging of the products.

3. A packaging machine according to claim 2, characterised in that the progression pitch of the machine is equal to a length that includes a series of packs (2).

4. A packaging machine according to claim 1, characterised in that the marking station (6) effects the marking of at least the “best before” date, and of marks (M) showing compliance or not with the set criteria.

5. A packaging machine according to claim 1, characterised in that the marking station (6) places onto the packs (2) marks (M) relating to one or more different categories, each corresponding to different criteria to be respected.

6. A packaging machine according to claim 1, characterised in that the marking station (6) effects the marking onto the packs (2), for information purposes, of at least the “best before” dates, close to which it places the marks (M) indicating compliance or not with the set criteria.

7. A packaging machine according to claim 1, characterised in that the marking station (6) places coded marks (M) that are not directly comprehensible in the absence of a table of correspondence between the said coded marks and compliance or not with the set criteria.

8. A packaging machine according to claim 7, characterised in that the marking station (6) places, as the coded marks (M), lines of greater or lesser length.

9. A packaging machine according to claim 5, characterised in that the marking station (6) places marks (M) that are directly comprehensible.

10. A packaging machine according to claim 1, characterised in that the viewing station (1) performs an optical check on the packs (2) so as to determine whether the packs respect the set criteria or not, regarding evidence of tampering with the welds on the pack, the appearance of the pack, and/or the presence of the product within the pack.

11. A packaging machine according to claim 10, characterised in that, at each forward step of the packs (2), the marking station (6) performs an optical check on the packs so as to attribute to each pack a code representing its position.

12. A packaging machine according to claim 1, characterised in that the marking station (6) is followed by a station (7) for sorting the packs, based on the marks placed on the packs according to compliance or not with the set criteria.

13. A packaging machine according to claim 12, characterised in that the sorting station (7) includes means to take pictures of the packs, in order to detect at least the marks (M), the “best before” dates, and the position of the packs, with these picture-taking means then controlling a system for grasping the packs that is designed to place the good packs in a packing case, and to allow the bad packs to follow a processing track.