(57) Abstract: A method for feeding blanks (2) to a boxing machine (AS), includes picking up, one by one, groups (20) of blanks (2) in flat configuration from a support surface and transporting, one by one, the groups (20) to a line (1) for continuously feeding the blanks (2) to the boxing machine (AS) in a predetermined forward movement direction (A). The transport step includes releasing each group (20) of blanks (2) between two adjacent prongs (13) defining a pocket (V) of a horizontal pocket conveyor (10, 11) of the feeding line (1). The releasing is performed by depositing the group (20) onto receiving and supporting means (23), which move from and to the conveyor (10, 11), in a direction crosswise to the forward movement direction (A), between a position, in which the receiving and support means (23) are slightly raised with respect to the surface (P), defined by the feeding line (1), and a position, in which the receiving and support means (23) are slightly lowered with respect to the surface (P), and a subsequent moving of the receiving and support means (23) from the raised position to the lowered position.
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.
METHOD FOR FEEDING BLANKS TO A BOXING MACHINE

TECHNICAL FIELD

The present invention relates to feeding blanks to an automatic machine, in particular a boxing machine.

BACKGROUND OF THE INVENTION

Automatic boxing machines currently used pack articles into containers or boxes obtained by opening or erecting blanks of paper material stored in flat configuration.

The blanks in flat configuration are loaded onto a conveyor of the boxing machine feeding line, which transports them up to a gripping head, which picks them up and erects the flat blanks to the open configuration.

The blanks in flat configuration are usually loaded onto the conveyor arranged in horizontal piles, each pile being formed by a bunch of blanks arranged one beside another and vertically erected, called group of blanks hereinafter.

Each group of blanks is usually loaded manually by an operator onto the horizontal inlet conveyor, which defines the feeding line of the boxing machine.

Obviously, loading operation must be performed with such a frequency that ensures the continuity of the feeding of blanks and avoids interruptions in the boxing machine operation.

The development of modern boxing machines has allowed very high working speeds, which makes it very difficult, thus giving a burden to the operators to load manually
the above groups of blanks onto the feeding line of the boxing machine.

Therefore, machines have been proposed which transfer automatically the groups of blanks to the feeding line of the boxing machine, by robotized means, which take single groups of blanks and load them onto the conveyor.

The use of the robotized means has solved the problem of continuous and effective feeding of the blanks to the boxing machine only partially.

Actually, although the robotized means are capable of loading efficiently and continuously the groups of blanks onto the conveyor of the boxing machine feeding line, they cannot ensure the maintenance of the correct mutual position of the blanks of two groups loaded one after the other, without displacements or overturning of the blanks, which could cause jamming and thus do not permit the continuity of the feeding of the blanks to the above gripping head, which would result in frequent and unproductive off-times of the boxing machine.

SUMMARY OF THE INVENTION

The object of the present invention is to propose a method for feeding blanks to a boxing machine, which solves the above described problems and ensures the continuity of the boxing machine operation, in particular during the steps with the machine high production rate.

In accordance with the present invention, a method is proposed for feeding blanks to a boxing machine, the method including picking up groups of blanks in flat configuration, one after another, from a support plane and transporting them, one after the other, onto a line
for continuously feeding the blanks to said boxing machine in a predetermined forward movement direction; 
the method being characterized in that said transport step includes releasing each group of blanks between two 
adjacent prongs defining a relative pocket of a horizontal pocket conveyor of said feeding line, said releasing being performed by depositing said group onto receiving and supporting means, which move from and to said conveyor, in a direction crosswise to said forward movement direction, between a position, in which said receiving and support means are slightly raised with respect to said surface, defined by said feeding line, and a position, in which said receiving and support means are slightly lowered with respect to said surface, and a subsequent moving of said receiving and support means from said raised position to said lowered position.

BRIEF DESCRIPTION OF THE DRAWINGS

The characteristic features of the invention are pointed out in the following detailed description, with particular reference to the enclosed drawings, in which:

- Figure 1 is a lateral schematic view, with some parts removed for sake of clarity, of a preferred but not limiting embodiment of a unit for feeding blanks to a boxing machine, which carries out the method proposed by the present invention;

- Figures 2, 3 and 4 are lateral views of the unit of Figure 1 in subsequent working steps;

- Figure 5 is a lateral detailed view of an enlarged particular of the unit of Figure 1;

- Figure 6 is a corresponding plan view of Figure 5;
Figures 7A and 7B are section views of the proposed unit taken along the broken line VII-VII of Figure 6, in different working steps.

5 BEST MODES OF CARRYING OUT THE INVENTION

With reference to Figure 1, reference letter U indicates a unit for feeding blanks 2 to a boxing machine AS.

The unit U includes a feeding line L, which in turn includes a conveyor 1 formed by belts 3 (four parallel belts as shown in Figures 6, 7A and 7B), which are mounted on a series of pulleys 4, suitably power-driven, along a close-loop path which defines an active upper run extending horizontally, for better clarity later on indicated with 1A, and which defines a horizontal transport surface P. The belts are continuously operated.

The upper run 1A of the conveyor 1 moves forward the blanks 2 in flat configuration, arranged one beside another, leaning against a side and inclined from down upwards with respect to the forward movement direction A.

The blanks 2 are gathered at the outlet of the upper run 1A of the conveyor 1, maintaining the same inclination, in a magazine 5, situated therebelow, from which they are picked up one by one for further packaging steps.

The unit U includes also a pick up and transfer device 6, including in turn a head 7, carried by cartesian-coordinate operated robot means, which move along three orthogonal axes.

The head 7 picks up groups 20 of blanks 2, one after another, according to known procedures, from a support surface (known and not shown, e.g. a loading platform or
pallet), and transports the groups of blanks, still one after the other, to the above feeding line 1.

In particular, the head 7 carries a pair of gripping arms 8A, 8B, respectively a fore arm and a rear arm, with reference to the direction A, which grip, between themselves, each group 20 of flattened blanks 2.

The gripping arms 8A, 8B are pivoted at top to the head 7 about respective parallel and horizontal pins 50, 51, crosswise to the direction A (Figures 2 - 4).

According to what is shown in Figure 5, the head 7 carries also a plurality of idling rollers 9, arranged one beside another on a horizontal plane and rotating about axes orthogonal to the above direction A.

The conveyor 1 with belts 3 cooperates with a further conveyor 10 with belts 11 (three belts as shown in Figures 6, 7A and 7B), which is trained around relative pulleys 12 along a close-loop path, which defines an active upper run, for better clarity indicated with 10A, extending horizontally below the transport surface P (Figure 5) defined by the run 1A of the conveyors 3 of the line 1.

The conveyor 10 is moved continuously in the same direction (direction A) and with the same peripheral speed as the conveyor 1, and likewise it is a pocket conveyor, with the belts 11 carrying, hinged and regularly spaced apart, a plurality of prongs 13, with the upper part inclined forward with respect to the forward movement direction A, like the blanks 2 already present on the upper run 1A, so that a corresponding pocket V is defined between two consecutive prongs 13, to receive, as will be explained in the following, a group 20 of blanks 2 in flat configuration.
According to Figure 5, in the region corresponding to the upper active run 10A, the prongs 13 of the conveyor 10 protrude in a direction substantially radial with respect to the corresponding upper active run 1A of the conveyor 1.

Moreover, according to what has been better shown in Figure 5, the pocket conveyor 10 cooperates actively with the conveyor 1, in the region corresponding to the upper run 1A, along a common section T, which corresponds to its whole upper run 10A.

The above mentioned prongs 13 pass through corresponding longitudinal slots 21 made along a support surface 22 of the surface P, on which the belts 3 slide in the region corresponding to the upper run 1A of the conveyor 1 (Figure 6).

More precisely, according to what has been shown in Figure 5, the prongs 13 are fastened to the belts 11 by respective oscillating supports 14 with rollers 19, hinged on relative pins 15.

The rollers 19 of the above mentioned supports 14 are aimed at following an upper longitudinal guide 16, which is aimed at maintaining the inclination imposed by the prongs 13; this inclination is maintained during use also in the region corresponding to the fore section of the conveyor 10, because the rolls 19 engage with a suitable abutment 17.

A lower guide 18 determines lowering of the prongs 13 in a spread position in order to avoid interferences.

In the area where the groups 20 of blanks 2 are loaded onto the feeding line 1, the unit U includes also a device 23 for receiving and supporting the groups 20 of blanks 2.
According to what has been better shown in Figures 7A and 7B, the device 23 includes a plurality of strips 24, suitably spaced apart, parallel to one another and to the line 1; the rear ends of the strips 24 are fastened to cross-bar 25.

The device 23 is aimed at being reciprocated, by a known actuator 26, crosswise to the direction A, between a raised position, in which the strips 24 are placed slightly above the transport surface P of the line 1, so as to receive and support each group 20 of blanks 2 released by the head 7 between two successive prongs 13 defining a pocket of the conveyor 10 (Figure 2 and 7A), and a lowered position, in which the strips 24 are placed slightly below said transport surface P (Figure 7B), so that the group 20 of blanks 2 rests upon the belts 3 of the conveyor 1.

Operation of the unit U is in accordance with the following working mode.

After the picking up head 7 had picked up a group 20 of blanks 2 from the support surface (loading platform or pallet), clamping the group between the arms 8A and 8B, it moves the group 20 and releases it on the strips 24, shifted to their raised position, in such a way that the group is placed in the pocket defined between two prongs 13 of the conveyor 10.

The group 20 is released by a first rotation or opening of the fore gripping arm 8A of the head 7 and then a subsequent rotation or opening of the rear gripping arm 8B of the head 7, so as to determine a substantially controlled expansion of the blanks 2 of the group 20, between and against the prongs 13, as pointed out in sequence in Figures 2 and 3; thus, there is no
possibility that any blank 2 moves in an undesired way or even overturns hindering consequently the line 1.

Simultaneously, the head 7 is moved forward in a direction parallel to the direction A and with the speed suitably higher than the speed of the line 1, so as to operate, by a group of rollers 9, a rolling step for the tops of the blanks 2 in order to make the arrangement of the blanks 2 uniform.

Afterwards, the strips 24 are moved from the raised position to the lowered position, so that the group 20 rests upon the belts 3 moving in the feeding direction A, still placed between the inclined prongs 13 of the conveyor 10, which cooperates with the belts 3 along the whole common section T.

In the region corresponding to the terminal part of the section T, the fore prong 13 carried by the belts 11 disappears gradually due to the descent of the fore area of the conveyor 10 (maintaining the inclination assumed previously, as a consequence of the engaging of the supports 14 with the rollers 19 with the abutment 17), and then the group 20 becomes, as a matter of fact, an integral part of the magazine 5 of blanks 2, which feeds correctly in step relation the boxing machine AS, with the blanks 2 going down into the magazine 5 maintaining the same inclined orientation.

Thus, the blanks 2 are fed efficiently and continuously without inconvenient stops of the boxing machine AS caused by jamming of the blanks 2.

The proposed method allows high production rates, therefore it is adequate to the characteristics of the modern boxing machines.
CLAIMS

1. A method for feeding blanks (2) to a boxing machine (AS), including picking up, groups (20) of blanks (2) in flat configuration, one by one, from a support platform, transporting the groups (20), one by one, to a line (1) for continuous feeding blanks (2), in a predetermined forward movement direction (A), to said boxing machine (AS);

the method being characterized in that said transport step includes releasing each group (20) of blanks (2) between two adjacent prongs (13) defining a relative pocket (V) of a horizontal pocket conveyor (10,11) of said feeding line (1), said releasing being performed by depositing said group (20) onto receiving and supporting means (23), which move from and to said conveyor (10,11), in a direction crosswise to said forward movement direction (A), between a position, in which said receiving and support means (23) are slightly raised with respect to said surface (P), defined by said feeding line (1), and a position, in which said receiving and support means (23) are slightly lowered with respect to said surface (P), and a subsequent moving of said receiving and support means (23) from said raised position to said lowered position.

2. A method according to claim 1, characterized in that said picking up of the blanks (2) is performed by gripping each group (20) of blanks, obtained by clamping the group between at least one pair of gripping arms (8A,8B) of a picking up head (6,7), the arms being pivoted on respective rotation pins (50,51); said
depositing of each group (20) of blanks (2) onto said pocket conveyor (10,11) being performed by a rotation of a fore gripping arm (8A) with respect to said direction (A) and a subsequent rotation of a rear gripping arm (8B) with respect to said direction (A), so as to bring the blanks (2) of said group (20) to spread between said prongs (13) of said pocket.

3. A method according to claim 1 or 2, characterized in that it includes a further step including transferring said group (20) of blanks (2) from said pocket conveyor (10,11) to a second conveyor (1,3) of said feeding line (1), said pocket conveyor (10,11) moving in the same forward movement direction (A) and with the same speed of said second conveyor (1,3);

said pocket conveyor (10,11) cooperating with said second conveyor (1,3) along a predetermined common section (T).

4. A method according to claim 3, characterized in that said pocket conveyor (10,11) and second conveyor (1,3) are belt conveyors (11,3) featuring respective active runs (10A,1A) extending parallel to each other and to said forward movement direction (A);

said common section (T) corresponding to the whole active run (10A) of said pocket conveyors (10,11).

5. A method according to any of claims from 2 to 4, characterized in that the picking up head (7) moves forward, due to the releasing of said group (20) of blanks (2), in a direction parallel to said forward movement direction (A) and with a relative speed with
respect to said feeding line (1), so as to carry out, by
a plurality of rollers (9), the rolling of the tops of
said blanks (2) of the group (20) in order to uniform the
arrangement of the blanks (2) between said prongs (13).
A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B65H1/30

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

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B65H

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of box C. Patent family members are listed in annex.

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