APPARATUS FOR FORMING PACKAGES FROM CONTINUOUSLY INCOMING PRINTED PRODUCTS OR THE LIKE

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Filed: May 1, 1973

Appl. No.: 356,136

Foreign Application Priority Data
May 19, 1972 Switzerland............................. 7463/72

U.S. Cl............. 214/6 BA, 214/6 N, 214/8.5 SS
Int. Cl................................. B65G 60/00
Field of Search........... 214/6 BA, 6 N, 8.5 SS

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ABSTRACT
An apparatus for forming packages from continuously arriving or incoming printed products or the like, wherein a bottomloaded stacker follows an infeed mechanism for the printed products. A controlled deflecting element is provided at the course or line of the infeed mechanism or the stacker and this deflecting element is effective transversely with respect to the momentary conveying direction in order to place individual printed products into a laterally shifted or offset position with respect to the remaining printed products. A controlled gripper is provided in operable association with the stacker for the purpose of temporarily holding the laterally shifted printed product. Above the gripper there is arranged an ejector controlled to operate in-phase as the gripper, this ejector serving to laterally displace away, in the form of a package, the printed products located upon the held laterally shifted printed product.

10 Claims, 5 Drawing Figures
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APPARATUS FOR FORMING PACKAGES FROM CONTINUOUSLY INCOMING PRINTED PRODUCTS OR THE LIKE

BACKGROUND OF THE INVENTION

The present invention relates to a new and improved construction of apparatus for forming stacked packages from continuously arriving or incoming printed products, or, in the terminology conventionally employed in the art, relates to apparatus of the type known as a package sorter.

With known apparatuses of this type there is provided a separating element, for instance a separating blade, which from time to time engages the continuous stream of arriving printed products, in order to form a greater gap in the conveyed product stream. Following this separation element there is arranged a stacker, as a general rule a top-loaded stacker, in order to individually stack into packages the sections of the arriving stream of printed products separated by these gaps or spaces and to eject such in the form of stacked packages. The individual components of the known apparatuses thus all work exclusively cyclically, with the result that their output lies within relatively narrow limits. This is especially so for the stacker which is arranged following the separation element and which must be emptied before there can be delivered thereto the next successive section of the stream of incoming printed products.

SUMMARY OF THE INVENTION

With the foregoing in mind it is to be understood that a primary object of the present invention relates to an improved apparatus for the previously mentioned type wherein it is possible to reduce to a minimum the number of cyclically operating elements and wherein it is possible, by reducing the to-and-fro moving masses, to considerably increase the output or capacity of the apparatus without any greater technological expenditure.

Another object of the present invention relates to an improved construction of apparatus for the formation of packages from continuously arriving printed products or the like, this apparatus being relatively simple in construction and design, economical to manufacture, extremely reliable in operation, and not readily subject to breakdown or malfunction.

Now in order to implement these and still further objects of the invention, which will become more readily apparent as the description proceeds, the apparatus of the previously mentioned type proposed according to the teachings of this development is manifested by the features that following an infeed mechanism for the printed products there is arranged a bottom-loaded stacker. That in the course or line of the infeed mechanism or the stacker there is provided a controlled deflecting element which is effective transversely with respect to the momentary conveying direction, in order to bring individual printed products into a position laterally shifted or offset with respect to the remaining printed products. A controlled gripper is provided in operable association with the stacker in order to temporarly retain or hold the laterally offset printed products. Above the gripper there is arranged an ejector which is controlled to operate with the same operating rhythm as or in-phase with the gripper, in order to lat-

erally push away, in the form of a package, the printed products reposed upon the held printed product.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood and objects other than those set forth above, will become apparent when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawings wherein:

FIG. 1 is a schematic plan view of a first exemplary embodiment of the invention on the basis of which there will be discussed the general mode of operation of the apparatus;

FIG. 2 is a side view of a part of an exemplary embodiment during a first phase of the course of movement;

FIG. 3 is a plan view of the part of the apparatus depicted in FIG. 2, while omitting certain less important components; and

FIGS. 4 and 5 illustrate the apparatus depicted in FIG. 2 in two further operational phases.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Describing now the drawings, with the exemplary embodiment of apparatus depicted in FIG. 1 there is provided an infeed or delivery mechanism 10 which continuously delivers in the direction of the arrow 20 a number of printed products Z to a stacker 11 which can be loaded from below. This bottom-loaded stacker 11 has operatively associated therewith a stationarily arranged gripper 12. After the gripper 12 there is arranged an ejector 13 which is displaceable to-and-fro in the direction of the double-headed arrow 24 and this ejector serves the purpose of pushing away parts of the stack formed by the stacker 11 laterally into the conveying region or zone of a conveyor belt or band 19 or other suitable conveying mechanism which is driven to move in the direction of the arrow 22. The infeed mechanism 10 possesses a conveyor band 17 upon which there are conveyed the printed products Z in the usual manner in the form of a so-called overlapping or fishscale product stream, in other words an arrangement of partially overlapping printed products which can be considered arranged in the manner of a linearly fanned deck of cards. Following the conveying or conveyor band 17 is a further conveyor band 18, the latter being driven at a considerably greater speed than the conveyor band 17 and this has been conveniently indicated by the arrow 21. This conveyor band 18 serves the purpose of separating into individual or single printed products the overlapping or fish-scale stream of printed products arriving from the conveyor band 17. Along the course of or in the line of the infeed mechanism 10 there is provided a deflecting element 14 controlled by a counting or counter head 15, and this deflecting element 14 through the action of its to-and-fro displaceable overhang arm 16 deflects laterally or towards the side, from the stream of printed products Z, a single printed product with respect to the momentary conveying direction, as such product has been indicated by reference character Z'.

The mode of operation of the previously briefly discussed apparatus is as follows: let it be firstly assumed that from the fish-scale or overlapping stream of printed products Z it is desired to form therefrom packages, each containing for instance forty such printed
products. Accordingly, during the course of the conveying of the products \( Z \) by the infeed mechanism 10 each fortieth printed product is laterally shifted by the displaceable arm 16, or in the terminology of the art "kicked-out." This lateral deflection occurs without interrupting the continuous conveying action undertaken by the conveyor bands 17 and 18, that is without interrupting the infeed of products to the stacker 11, and is also not made retroactive during the course of the stacking by the stacker 11 at the stacker 11 there is thus present a stack in which each fortieth product example or copy is laterally shifted, that is to say, protrudes past the lateral surfaces of the stack. Hence, at the existing stack there is thus marked the limits of the desired package by the laterally protruding printed product \( Z' \). As soon as the stack has arrived with a protruding printed product \( Z' \) at the region of the gripper 12 the latter is actuated and at the same time the ejector 13 is placed into operation. The operable ejector 13 then laterally displaces away the stacked printed products lying above the printed product \( Z' \) which is fixedly held by the gripper 12 in the direction of the arrow 23 and onto the conveyor or conveying band 19. In so doing, the printed product \( Z' \) which is fixedly retained or held by the gripper 12 serves as the support for the package which is to be displaced away and thereby prevents that the stack formed beneath the fixedly clamped or held product \( Z' \) will be disturbed by this displacement action. Directly after the work stroke of the ejector 13 such is again retracted, thereafter the gripper 12 is opened and thus the previously fixedly-held laterally shifted printed product \( Z' \) is released, so that such can be moved out of the operable range or zone of the gripper 12 by the stack which continuously is increasing in size from below. The gripper 12 is only then again closed after the arrival of the next laterally shifted printed product \( Z' \).

In the subsequently detailed description of the apparatus and for the sake of simplicity there will be dispensed with any detailed description of the deflecting element 14 and the bottom-loaded stacker 11 because these components are already well known in this particular field. For instance, a deflecting element suitable for the equipment of this development has been disclosed in U.S. Pat. 3,089,394, and a suitable bottom-loaded stacker has been disclosed in Swiss Pat. No. 518,858, to which reference may be readily had and the disclosures of which are incorporated herein by reference. It should be understood, however, that the deflection of deflecting element 14 need not be arranged along the course or line of the infeed mechanism 10. The deflecting element 14 could also be arranged along the course of the stacker 11 as will be considered more fully in conjunction with FIG. 2.

In FIG. 2 there will be recognized the upper end of a stacker 11 which has been designed according to, for instance, Swiss Pat. No. 518,858. In this figure there is also depicted the gripper or gripper mechanism 12 which is arranged after the stacker 11, and the subsequently arranged ejector 13 which delivers to the outfeeding conveying band 19 the packages, i.e., package stacks which are to be laterally displaced. At the region of the last coil or winding of the spiral or helical-shaped conveying element 25 of the stacker 11 there is arranged in this case the deflecting element 14.

Now at a vertically disposed carrier or support 26, which in profile is approximately box-shaped, and which carrier 26 is connected in any suitable manner to the non-depicted machine frame, there is connected to both sides of such carrier 26 a respective protruding bearing plate or shield 27 and 28 (FIG. 3). At the protruding end of each such bearing or mounting plate 27 and 28 there are hingedly connected by means of the pivot pins 29, 30, 31, and 32 respectively, the one respective end of two respective guides or guide links 33, 34 and 35, 36. At the other ends of such guides 33, 34 and 35, 36 there are hingedly connected by means of further pivot pins 37, 38, 39, and 40 respectively, a gripper block 41. It should be recognized that owing to this mounting or suspension of the gripper block 41 the latter can approximately follow over a limited extent or path the conveying direction 42 of the stacker 11. In the gripper block 41 there is displaceably mounted for to-and-fro movement, under the action of a non-illustrated pressure spring which acts towards the left of FIG. 2, a gripper mechanism 45 equipped with two gripper jaws 43, 44, and this displacement is carried out in such a manner that with retracted gripper mechanism 45 the gripper jaws 43, 44 are in the open position and with the gripper mechanism 45 advanced the gripper jaws 43, 44 assume their closed position.

In order to retract the gripper mechanism 45 there is secured thereto a traction or pull rod 46, at the free end 46a of which there is rotatably mounted an entrainment roller 47 which bears against one side or face of a single-arm pivotal lever 48 hingedly connected at hinge location 49 with the carrier 26. Owing to the action of the already-mentioned pressure spring of the gripper mechanism 45 there is exerted a force upon the lever 48 by means of the traction or pull rod 46 with the roller 47, and this force strives to rock the lever 48 in counterclockwise direction of FIG. 2. In FIG. 2, however, the lever is hindered in carrying out this pivotal movement by means of a further pivotal lever 52 which acts by means of a roller 51 at the other side or face of the pivotal lever 48. This pivotal lever 52 is hingedly connected by means of a pivot pin 53 and via a bracket 54 at the upper end of the carrier or support 26, and as will be described more fully hereinafter, is actuated by the to-and-fro movement of the ejector 13. In order to render possible the free play of the levers 48 and 52 there is machined or otherwise formed at the rear wall of the carrier 26 a recess 50.

The construction of the reciprocatory or to-and-fro displaceable ejector 13 is particularly apparent from the showing of FIGS. 2 and 3. At a guide frame 55 which is stationarily anchored in any suitable and therefore not particularly illustrated manner there are clamped two superimposed guide columns 56 and 57, at the respective ends of which there are mounted the respective rubber buffers or abutments 58, 60 and 59, 61. A carriage 62 is guided at both of the guide columns 56, 57 and is mounted so as to be displaceable to-and-fro. A flange 63 is secured to the carriage 62, and an overhang arm 64 depends from the flange 63, the overhang arm 64 extending into the region of the carrier or support 26. Additionally, a traction or pull rod 66 is secured to the carriage 62 by means of nut members 65. This traction rod 66 simultaneously constitutes a piston rod of a piston which is arranged within a hydraulically long-stroke cylinder 67. The cylinder 67 is attached by means of a connection flange 68 at one side of the guide frame 55. The long-stroke cylinder 67 is provided with a piston (not visible) which can be im-
pinged with a pressurized fluid medium at both faces, and is connected via non-illustrated connection conduits and a non-illustrated controlled valve arrangement with a hydraulic pump, none of which components have been shown since they are conventional and not absolutely necessary for understanding the inventive concepts. At the free end of the overhang arm member 64 there is secured a bearing block 69 at which there is hingedly connected by means of a pin 70 an arm member 71. This arm member or arm 71 extends parallel to the guide columns 56, 57 and in a direction away from the carrier 26, and furthermore carries at the left-hand end appearing in FIG. 2 a push rod 72 which extends vertically and in profile possesses a substantially U-shaped configuration. As will be further apparent by referring to FIG. 2 the push rod 72 extends down to the region of the gripper block 41.

At the lower end of the push rod 72 neighboring the gripper block 41 there is secured thereto two brackets 73, 74 which extend towards the right of FIG. 2, and at the protruding ends of which there is connected a pin 75 at which there is rotatably mounted a roller 76. Consequently, it should be apparent that the push rod 72, although only hingedly connected via the pin 70 at the bearing block 69, is supported in its vertical position by the roller 76 upon the gripper block 41 and therefore is guided by such block. At the rear end of the bearing block 69 there is secured a projection or extension 77 which extends towards the right of FIG. 2, and this projection or extension 77 serves to run onto or contact the lever 52 at the end of the work stroke of the piston rod 66, that is to say, at the end of the return stroke of the carriage 62 and therefore the push rod 72 can thus rock such lever 52 in the counterclockwise direction, resulting in pivoting of the lever 48 in the clockwise direction. In other words, with the completely retracted push rod 72 the gripper jaws 43, 44 of the gripper 12 are automatically opened through the action of the hinge or toggle drive formed by the levers 52, 48 and the traction or pull rod 36.

The control, that is to say, the charging of the long-stroke cylinder 67 occurs, for instance, as a function of the actuation of the deflection element 14, and is the path which the laterally shifted printed product Z' must move through between the position of the deflecting element 14 and the gripping zone or region of the gripper jaws 43, 44—in FIG. 2 this path corresponds to the discharge or running-out region of the stacker 11—is essentially constant, so that, while assuming a constant drive speed of the stacker 11, and a constant thickness of the printed products the time-interval also remains constant until the laterally shifted printed product Z' is capable of being seized by the gripper jaws 43, 44. On the other hand, the control can be carried out also in that the shifted printed product Z' can be ascertained by a scanning switch or a light barrier arrangement arranged at the region of the gripper or grippers and thus triggers a complete working cycle of the ejector and the gripper.

The position in which the equipment has been depicted in FIG. 2, corresponds to the position directly prior to the time that the long-stroke cylinder 67 is charged i.e. impinged with fluid medium, in such a way that the piston rod 66 begins its return stroke and therefore the push rod 72 its work stroke. At the beginning of such stroke the projection 77 releases the lever 52 and the latter releases the lever 48, so that the traction rod 46 can shift towards the left under the action of the pressure spring of the gripper mechanism 45, so that the gripper or clamp jaws 43, 44 close and clamp therebetween the laterally shifted printed product Z'. This condition has been depicted in FIG. 4. By referring to this Figure there will be recognized the carriage 62 which has been shifted towards the left along the guide columns 56, 57 by means of the piston rod 66 of the cylinder 67, and therefore the push rod which has been displaced to the region of the printed products of the stack which have been stacked by the stacker as well as the projection 77 which has been retracted from the lever 52. Consequently, the lever 52 has been released or freed and along with such lever 52 also the lever 48 and the traction rod 46, so that the gripper mechanism 45 has displaced towards the left of FIG. 4 with respect to the gripper block 41, and the gripper jaws 43, 44 have seized the laterally shifted printed product Z'. The topmost copy Z'' of the printed products which rest above the fixedly retained or held printed product Z' is still laterally shifted from the preceding work cycle, and its lateral displacement is rendered retroactive by the work stroke of the push rod 72 which occurs at this period of time, that is to say, the printed product Z'' is again aligned with respect to the stack package resting upon the printed product Z'. It is to be observed that the push rod 72 due to the rolling-off of the roller 76 upon the upper planar side or face of the gripper block 41 is guided just as always in vertical position.

In FIG. 5 there is illustrated the described apparatus at the end of the work stroke of the push rod 72. In this Figure there will be recognized the still closed gripper jaws 43, 44 which fixedly hold the laterally shifted printed product Z'. Since such in the meantime has been slightly raised by the new printed product which has been further introduced from below, the gripper jaws 43, 44 and therefore the gripper block 41 are raised, which by virtue of the parallelogram-type suspension of the gripper block 41 by the guides 33-36 is readily possible. In the meantime the push rod 72 has laterally shifted the package P reposed upon the fixedly held printed product Z' into the conveying region of the outfeeding conveyor band 19. It is to be observed that the work stroke of the push rod 72 does not extend over the entire upper surface of the stack formed by the stacker 11. In reality it is sufficient if the package P which has been pushed away comes to bear with its center of gravity upon the conveyor band 19, so that such completely pulls away the package P from the stack during such time as the push rod 72 has already begun its return stroke. Furthermore, it is to be observed that during the course of the work stroke of the push rod 72 the roller 76 shifts or jumps from the upper side of the gripper block 41 and the spine or back of the gripper jaw 44 onto the fixedly held printed product Z', which thus not only serves as a supporting surface or support for the pushed-away package P but also as an elevational guide for the push rod 72.

Directly after reaching the position depicted in FIG. 5 the impingement of the piston in the long-stroke cylinder 67 is reversed, so that the piston rod 66 begins its forward stroke and therefore the push rod its rearward stroke. In so doing, the gripper jaws 43, 44 remain closed for such length of time until, owing to run-on or contact of the projection or extension 77 at or with the lever 52, that is to say, with completely retracted push
rod 72, these jaws are opened. Consequently, it should be recognized to those skilled in the art that the stack which is in the process of being formed beneath the fixedly held printed product Z', during the lateral pushing-away or shifting of the package P and during the return stroke of the push rod 72, can readily grow or increase since both the gripper jaws 43, 44 as well as also the push rod 72 hinged via the arm 71 and the pin 70 strive to follow the growing or increasing height of the laterally shifted printed product Z'. At the end of the return stroke of the push rod 72 there is established the position depicted in FIG. 2, that is to say, the gripper jaws 43 and 44 open, release the previously fixedly held printed product Z', the gripper block 41 returns back into its lowest position and again rotates the push rod 72 back into its vertical starting position. The equipment remains in this position until the previously fixedly held printed product Z' in the laterally offset or shifted position has reached the height of the laterally offset printed product Z'' shown in FIG. 2, that is to say, until a new laterally shifted printed product has arrived at the gripper zone of the grippers 43, 44. Thereafter, the previously discussed course of movement can begin anew.

Although with the illustrated apparatus the push rod 72 can displace the package P away from the closed gripper jaws 43, 44, it should be readily understood that with an appropriately constructed gripper mechanism 45, that is to say, with the gripper mechanism 45 equipped with pairs of grippers or with lengthwise extending grippers the lateral shifting of the package can also occur perpendicular to the illustrated direction. Similarly, the control and/or drive of the gripper jaws 43, 44 on the one hand and the push rod 72 on the other hand, can occur in a different manner than through the use of a hydraulic-mechanical system. Furthermore, it is not necessary that the height of the push rod 72 exceed that of the package P, although with the illustrated exemplary embodiment, where such height of the push rod exceeds that of the package P, there is present the already discussed advantage of the shifting back of the laterally shifted printed product Z'' which is no longer needed as the support of a stacked package. From what has been discussed above it should be apparent that the illustrated and described apparatus, with a minimum expenditure of to-and-fro or reciprocating masses, is capable of reliably and positively subdividing into clean stacked packages a continuously arriving quantity of printed products Z, without having to form at the continuous stream of printed products large gaps or spaces, which could have the result that the next successive stream of printed products must dam up.

While there is shown and described present preferred embodiments of the invention, it is to be distinctly understood that the invention is not limited thereto, but may be otherwise variously embodied and practiced within the scope of the following claims. Accordingly, What is claimed is:

1. An apparatus for forming packages from continuously incoming printed products, comprising an infeed mechanism for the printed products, a bottom-loaded stacker arranged after the infeed mechanism, a controlled deflecting element effective substantially transversely with respect to the momentary conveying direction in order to bring individual printed products into a laterally shifted position with respect to the remaining printed products, a controlled gripper provided at the region of the stacker for momentarily fixedly holding a laterally shifted printed product, and an ejector controlled to operate in-phase with the gripper arranged above said gripper in order to laterally push away the printed products in the form of a package which are reposing upon the fixedly-held laterally shifted printed product.

2. The apparatus as defined in claim 1, wherein the deflecting element is arranged along the course of the infeed mechanism.

3. The apparatus as defined in claim 1, wherein the deflecting element is arranged along the course of the stacker.

4. The apparatus as defined in claim 1, wherein the stacker is equipped with at least one conveying spiral, the conveying action of which is effective from the bottom towards the top of the stacker, the deflecting element being arranged at the region of the last spiral of said conveying spiral.

5. The apparatus as defined in claim 1, further including means for driving the ejector in a direction which is directed away from the gripper.

6. The apparatus as defined in claim 4, wherein the gripper comprises a gripper block and means for movably suspending the gripper block in the conveying direction of the stacker.

7. The apparatus as defined in claim 5, wherein said suspending means comprises a pair of parallel guides for the gripper block and said gripper block possessing at least one pair of gripper jaws which can be brought from an open position into a closed position, the gripper block forming a linear roller track when the gripper jaws are in closed position.

8. The apparatus as defined in claim 7, wherein the ejector comprises a push rod, said push rod being displaceably mounted at a to-and-fro displaceable bearing block about a horizontal pivot axis and being supported by means of a trailing roller at said roller track.

9. The apparatus as defined in claim 1, further including lever drive means for coupling the gripper with the ejector and for actuating the gripper by means of said ejector.

10. The apparatus as defined in claim 1, further including a pre-selection counter for counting the incoming printed products, said pre-selection counter being arranged upstream of said deflecting element with respect to the direction of movement of the printed products and activating said deflecting element.