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DEVICE FOR STACKING LETTERS AND THE LIKE

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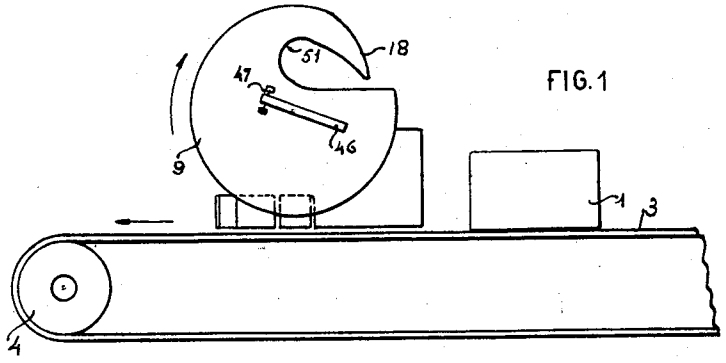


FIG. 1

FIG. 3

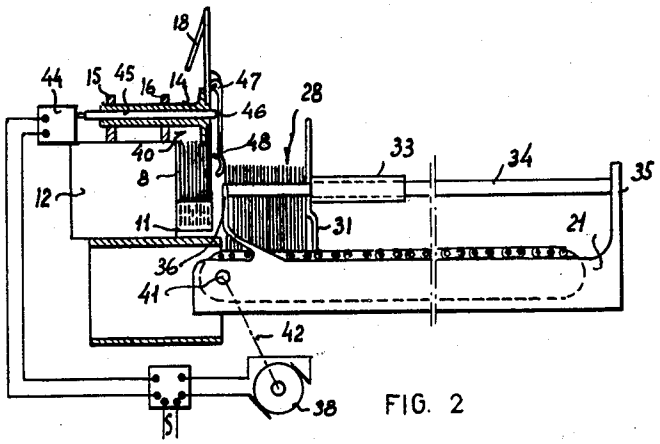
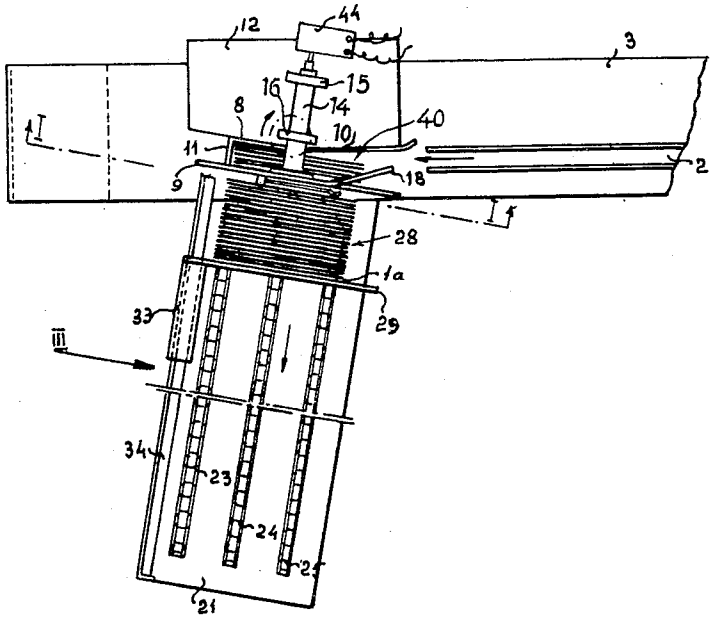


FIG. 2



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DEVICE FOR STACKING LETTERS AND THE LIKE

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This invention relates to the stacking of flat articles such as letters, cards, and the like, as they issue from machines of the types used e.g. far stamping, cancelling, or otherwise processing such articles, e.g. for postal purposes, from which machines said articles or letters normally issue, each disposed in a vertical plane.

Throughout the specification the articles handled by the stacking device of the invention will be frequently referred to as letters for simplicity, it being understood that this designation is not to be interpreted as limiting the scope of applicability of the invention, since this may well be applied to any articles of generally flat form capable of being stacked. Such articles will, in the claims, be designated as articles of the type referred to.

The main object of the invention is to provide a device adapted for arranging such articles into neat stacks, regardless of the number of articles and hence the depth of the resulting stack, and regardless also of the dimensions of the articles, which may differ considerably from one another.

The invention in one aspect is for apparatus for stacking flat articles comprising means for advancing the articles substantially single-file and positioned in a generally vertical plane along a path, abutment means arresting the advance of the articles at a predetermined position of the path, means defining a supporting surface adjacent said position and at an angle to said plane whereby the arrested articles will be supported against that surface in elementary stacks, and means for intermittently retracting the supporting surface and for bodily transferring the elementary stacks away from said position, and further abutment means for combining all the elementary stacks thus transferred into a common pack.

In another aspect said apparatus may comprise means for advancing the articles substantially single file, and positioned in a generally vertical plane along a first path, means defining a second path intersecting the first, abutment means on the first path beyond the intersection of both paths for arresting the articles as they are advanced to said intersection, a transfer member positioned between said paths at their intersection, means for intermittently operating said member for repeatedly transferring a number of the arrested articles from the first to the second path, and further abutment means on the second path against which all the transferred articles are adapted to be supported for combining into a common pack.

It will be appreciated that such apparatus does, in effect, handle the articles in a manner similar to the natural process used in stacking letters by hand. That is, a person's instinctive procedure is to take up a small number of letters at a time and form an elementary stack therewith and then combine each such elementary stack with the main stack previously built up.

In a preferred embodiment, the afore-mentioned means defining a supporting surface, or the transfer member, takes the form of a rotatable circular disc formed with at least one deep cutout having one side wall warped out of the plane of the disc so as to provide a vane in the general form of a portion of a helicoid, projecting from the side of the disc against which each elementary stack is to be formed, and the cooperation of the cutout and vane during rotation of the disc provide the afore-specified means

of retracting the temporary supporting surface and transferring the elementary stacks.

The elementary stacks would normally, due to gravity, tend to fall over one another and become dislocated and thus prevent the formation of a neat final stack. To avoid this, according to another feature of the invention, there is provided beyond the temporary supporting wall an horizontal table having mounted on it a movable vertical plate against which the final stack formed by the combination of the elementary stacks will be supported.

Further, in order to provide for a uniform degree of packing pressure throughout the stack from start to finish of the stacking operations, there is provided in one form of the invention automatic means for advancing the aforementioned plate supporting the main stack, which means is controlled by way of a switch actuated by a pressure-responsive element sensing the packing pressure in the main stack.

An exemplary embodiment of the invention will now be described for purposes of illustration but not of limitation with reference to the accompanying drawings, wherein:

FIG. 1 is a vertical section on line I—I of FIG. 2 through a letter stacking device according to the invention;

FIG. 2 is a corresponding view in plan; and

FIG. 3 is a side view as seen along the arrow III of FIG. 2.

Articles, e.g. letters, to be stacked, one of which is shown at 1, are fed in vertical position by way of a channel track 2, e.g. the output channel from a cancelling machine, a stamping machine, a straightening machine, or any other processing device.

In the embodiment shown the letters rest with their bottom edges upon a conveyor belt 3 supported at its ends about drums or sheaves such as the drum 4. Beyond the output end of the guide channel 2 there is provided a retainer system interposed on the path of travel of the articles. This retainer mechanism includes a pair of parallel spaced vertical guide walls 8 and 9 which as seen in a horizontal view extend at a small angle to the direction of travel of the articles as determined by the guide channel 2, and a retainer abutment or stop 11 serving as presently described for the intermittent and temporary retention of the articles issuing from channel 2.

The wall 8 forms part of a stationary wall structure 12 including as shown an entrance guide wall portion 10 in alignment with a wall of guide channel 2. Wall 9 on the other hand constitutes the temporary supporting surface previously referred to and is formed by a rotary disc member rotatable on a horizontal shaft 14 in bearings 15 and 15 mounted on the top of structure 12.

Disc 9 is formed with a deep cutout 51 one side of which is bent or warped out of the plane of the disc to provide a vane 18 of more or less helicoidal form projecting from the inner side of the disc 9 and extending generally in the sense of rotation of the disc, so that, in the operation of the device, it acts in the manner of a screw to swallow up, so to speak, the articles fed to the inner side of the disc from channel 2. The relative inclination of the vane 18 is substantially the same as the inclination of the walls 8 and 9 with respect to the direction of travel of the letters from channel 2. It is necessary that vane 18 of disc 9 move behind the articles fed to the inner side of the disc from channel 2 to bring them to the front face of disc 9 as the same rotates. There must be a free space between the sustained stacked articles and the guiding means for consecutive articles. The free space is provided by a stack forming structure defined by generally longitudinally extending wall 8 and the inner face of disc 9 which is in parallelism thereto and vertical generally transverse wall

11. Walls 8 and 11 together with the inner face of disc 9 define an article receiving trough, as clearly shown in FIGURE 3 of the drawings. The axis of disc 9 forms an angle of slightly more than 90° with the axis of channel 2 so that the flat inner face of disc 9 intersects the axis of channel 2, that is, the path of the incoming articles at a point ahead of the forward end of channel 2. The wall 8 of the article receiving trough is extended in the direction of channel 2 and by a vertical guide wall 10 in alignment with one side wall of channel 2 and this guide wall 10 forms with the trough wall 8 the same angle as that formed by disc 9 with channel 2. The entrance to the article receiving trough is thus of outwardly increasing section. It will be apparent that the above described arrangement operates to form a stack of letters or like articles in the following manner:

Each consecutive letter or the like is moved along a straight path defind by channel 2 towards the entrance formed by the tapering guide surfaces of wall 10 and disc 9. On contact between the forward edge of a letter and the oblique inner face of member 9, the letter will be slightly tilted by the inner face of member 9 to now move in the oblique direction until its front edge abuts the transverse wall 11 of the letter receiving trough-like chamber. It will be noted that the first letter only of the stack will actually contact the oblique inner face of member 9 and that the other consecutive letters will be guided in the oblique direction each by a preceding letter received in the trough-like chamber 8, 9, 11.

The tapering walls 10 and 9 provide for a clearance space sufficient to permit the vane 18 of disc 9 to move behind the stack 40.

Positioned in or approximately in the same plane as the plane of the upper surface of conveyor belt 3 is one end of a table 21 which extends in general alignment with the rotational axis of disc 9 and in the so-called forward direction i.e. the direction of feed of the articles to be stacked. A plurality of, herein three, endless chains 23, 24, 25 are disposed longitudinally of the table 21 with the upper lengths of the endless chains projecting somewhat above the top surface of the table. These chains serve to support the lower edges of the articles as the articles are stacked edgewise in a manner presently explained.

A foremost letter 1*a* of the stack generally designated 28 is applied against a plate 29 arranged parallel to the disc 9. Preferably the surface of table 21 slopes downward towards its free end so that the stack of letters will rest naturally against plate 29 by gravity. The plate 29 is displaceable along the length of table by the action of the middle chain 24 being connected with the latter through a driving connection such as a finger 31 depending from the plate and engaging between two adjacent links of the chain. A sleeve 33 projecting from a side of plate 29 is freely slidable on a rod 34 supported at its ends by a pair of arms 35, 36 projecting from the table 21, and serves to guide the plate 29 in its longitudinal displacements.

Disc 9 is driven in rotation at a suitable substantially uniform speed by any suitable motor means not shown.

The chains 23, 24, 25 are intermittently driven, e.g. from an electric motor and reducer unit 38 connected through shafting diagrammatically indicated at 42 to a shaft 41 having secured on it one of the end sprocket gears around which the endless chains are mounted.

Electric motor 38 is controlled through means responsive to the pressure of the stack of articles during the stack-forming process, so as to maintain substantially a uniform compacting pressure in the stack as the latter increases gradually in depth. For this purpose there is shown a switch 44 connected in the energizing circuit of motor 38 and actuated by an axially slidable plunger rod 45 the lower en of which is actuated by a feeler element 46 having one end pivoted on disc 9 at 47 and biassed in the direction away from said disc and from the rod 45 by a spring 48. The free end of feeler 46 is adapted to engage the free surface of the stack 28, and is so formed as to avoid any danger of fouling or damaging the articles.

The pivot 47 of feeler 46 on disc 9 is arranged to lie in a substantially transverse direction to the relative displacement of the articles engaging the front face of disc 9 beyond the cutout 51 in said disc, considered in the direction of disc rotation, and the feeler itself extends raerward from the pivot so as to avoid fouling the articles coming into engagement with the feeler.

The device is so adjusted that, for a predetermined pressure in the stack of letters 28, the feeler 46 actuates sliding rod 45 to operate switch 44 and start the electric motor 38, thereby initiating a feed displacement of the chains 23, 24, 25.

The general operation of the system is the following:

Assume the conveyor belt 3 is operated and the disc 9 revolving. Articles, such as letters 1 are fed one by one by way of guide channel 2 and conveyed in between, the fixed retainer wall 8 and the surface of disc 9. During the time required by one revolution of the disc a small number of the letters are thus brought up and retained against the disc and form a so-called elementary stack 40 of a convenient moderate depth. At that point in the revolution of disc 9 at which the vane 18 bears down upon this elementary stack, said vane engages behind the rear side of a rearmost one of the letters in this stack and, as the vane continues its downward motion behind the elementary stack, this latter is automatically brought into engagement with the opposite side of disc 9, i.e. its front face, as it passes through the cutout 51 in the disc. Thus the cutout serves as a means for transiently retracting the active portion of the disc surface, while the vane 18 acts, owing to its inclined shape, to move the elementary stacks up against the general or final stack in process of formation.

Thus after one or more revolutions of the disc 9, the letters constituting an elementary stack are advanced towards the plate 29 and there combine with the general stack 28 of letters previously advanced. When the compacity of the letters in stack 28 has attained a prescribed value the pressure exerted by the last letter in the stack against feeler 46 acts to operate switch 44, whereupon the chains 23, 24, 25 are started in motion as previously described, and advance the plate 29 against the surface of which is applied a foremost letter 1*a* of stack 28. So long as the pressure in the pack exceeds the maximum prescribed value, motor 38 continues to be energized and the chains continue their displacement. But as the pressure drops below said value the spring 48 restores feeler 35 to its idle position and switch 44 is opened, stopping motor 38 and the endless chains. The letters continue to advance in elementary stacks at each revolution of the disc, to build up the main pack 28, and as long as the pressure in the pack has not again reached its prescribed value the chains remain stationary. However, whenever the pressure in the pack 28 becomes excessive the motor 38 is again started and advances the chains to loosen the pack by the requisite amount.

It will thus readily be understood that the letters are very quickly and neatly stacked with a uniform compacity, and that satisfactory operation will be obtained regardless of the dimensions of the letters (or other articles) and the rate of their delivery.

When the depth of the pack or stack is such as to occupy the full available length of table 21, the pack is removed, and the plate 29 is returned manually to a position adjacent disc 9 in readiness for receiving a fresh pack of letters.

The invention clearly is not limited to the specific form of embodiment illustrated and described by way of example since many modifications may be made therein without exceeding the scope of the invention, as by substituting for the revolving cut-out disc described some

other equivalent means for providing a temporary supporting wall adapted to arrest the articles to form elementary stacks, and periodically and intermittently retracting or removing such wall and allowing newly formed the elementary stack to be advanced towards and combined with a previously formed main stack or pack.

What is claimed is:

1. Apparatus for stacking flat articles comprising means supporting said articles in substantially single file and in a common generally vertical plane and for advancing the articles along a path in said plane, abutment means disposed generally transversely of the path of travel of the articles for arresting the articles at a predetermined position of said path, a rotatable disc member having a flange surface adjacent said position and at an angle to said plane whereby the arrested articles will be supported against said flange in elementary stacks, portions of said disc defining a generally radially inwardly extending cutout therein and one of said portions also defining a vane projecting from a side of said cutout towards said plane, and means for rotating said member in the direction of extension of said vane to move the same behind the arrested articles whereby at each revolution of the member an elementary stack of the articles will be drawn by said vane through said cutout and removed from said position and combined into a common pack, and further abutment means positioned to support said common pack.

2. Apparatus for stacking flat articles comprising means for advancing the articles substantially single-file in a generally common vertical plane along a first path, means defining a second path intersecting the first path at an angle greater than 90° and means for supporting the articles in stacked condition in parallel planes transverse to the second path to constitute a main pack, an abutment on the first path beyond the intersection of said paths and generally transversely disposed relative to said first path to arrest successive articles as they advance to said intersection, a rotatable disc member having a surface adjacent said intersection and at an angle to said plane, portions of said disc defining a generally radially inwardly extending cutout therein and one of said portions also defining a vane projecting from a side of said cutout towards said plane, and means for rotating said disc member in the direction of extension of said vane to move the same behind the articles arrested at said intersection whereby at each revolution said articles will be transferred from said first path to the second path for building up said main pack thereon.

3. The apparatus claimed in claim 2 wherein said means for supporting the articles in parallel stacked planes to constitute a main pack comprise an abutment member displaceable along said second path, means sensing the packing pressure in said main pack, and means operated in response to the sensing means for displacing the abutment member to maintain the packing pressure within a prescribed range.

4. The apparatus claimed in claim 3 wherein said sensing means comprise a movable feeler element connected to said flanged member and engaging an end article of said main pack so as to be moved in one direction on an increase in the pressure in said pack, means biassing said feeler element in the opposite direction, and motor means operable to displace said abutment member and connected for control in response by the position of said feeler element.

5. An apparatus for stacking flat articles comprising conveyor means to support said articles in substantially single file and in a common generally vertical plane and to advance the articles along a path in said plane, first abutment means angularly disposed relative to the path of travel of said articles to stop the same at a predetermined poistion to form a group thereof, a wall extending at right angles to said first abutment means and in a direction toward the path of travel of said articles, a rotatable disc positioned adjacent said first abutment means and having a planar face in parallel relation to said articles forming the group and to said wall, a vane extending from said disc and engageable with the articles upon rotation thereof to transfer the articles of the group to a table, means adjacent said conveyor to form a main group, a plate on said support means to support the main group of articles, said plate movable relative to said table in response to the pressure of the main group of articles, and means to detect the pressure of said main group to effect movement of said plate.

6. An apparatus for stacking flat articles as defined in claim 10, wherein said table includes a plurality of longitudinally extending endless chains in spaced parallel relation to each other, rotatable axles mounted in said table and having sprockets fixed thereon around which said endless chains are mounted, said plate having means operatively connecting the same to one of said endless chains, and means responsive to said pressure detecting means to drive said axles and endless chains.

7. An apparatus for stacking flat articles comprising conveyor means to support said articles in substantially single file and in a common generally vertical plane and to advance the articles along a path in said plane, first abutment means angularly disposed relative to the path of travel of said articles to stop the same at a predetermined position to form a group thereof, a wall extending at right angles to said first abutment means and in a direction toward the path of travel of said articles, a rotatable disc positioned adjacent said first abutment means and having a planar face in parallel relation to said articles forming the group and to said wall, a vane extending from said disc and engageable with the articles upon rotation thereof to transfer the articles of the group to a table, means adjacent said conveyor to form a main group, a plate on said support means to support the main group of articles, said plate movable relative to said table in response to the pressure of the main group of articles, and means to detect the pressure of said main group to effect movement of said plate, said rotatable disc further including portions defining a centrally disposed opening therein, a tubular axle fixed to said disc and having one end thereof positioned in said opening, said pressure detecting means comprising a feeler element pivotally mounted on said disc and having a portion thereof extending transversely of said opening, means to bias said feeler element away from said disc and into engagement with the main group of articles, a switch adjacent the free end of said tubular axle and operatively connected to said drive means for said axles and endless chains, a plunger rod slidably mounted in said tubular axle, one end of said plunger rod being in engagement with said feeler element, the other end of said plunger rod in engagement with said switch, said feeler element pivoted in response to an increase in depth of said main group of articles to cause movement of said plunger rod to actuate said switch to operate said axle and endless chain drive means.

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