

April 17, 1956

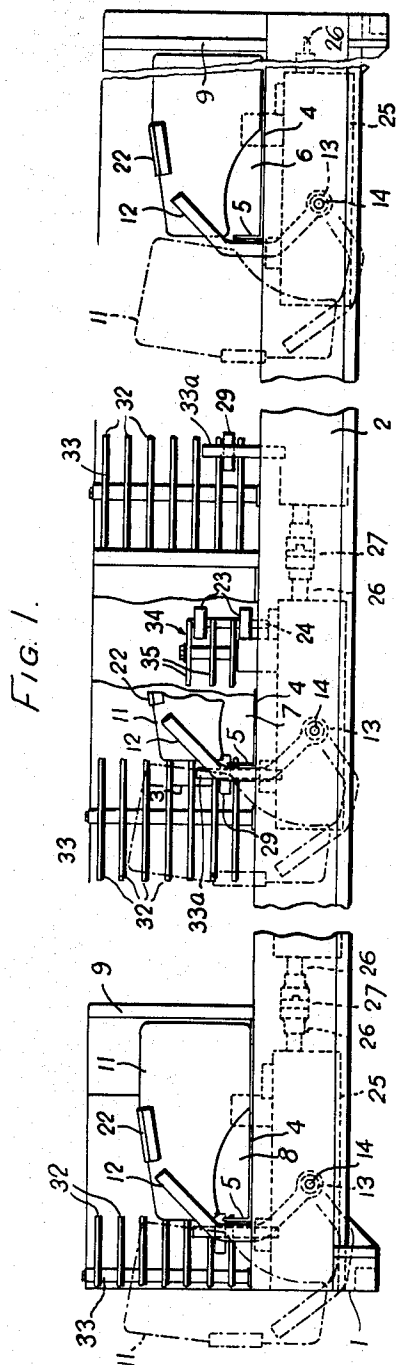
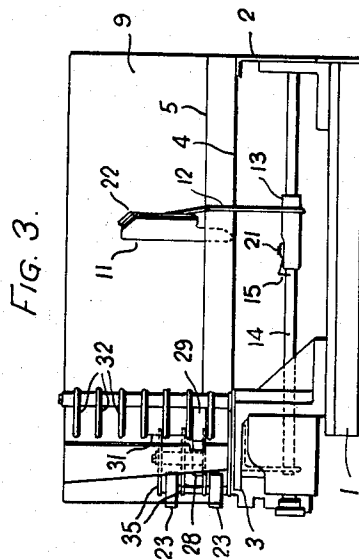
J. WILLIAMS ET AL

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APPARATUS FOR STACKING LETTERS AND LIKE ARTICLES

Filed June 29, 1951

4 Sheets-Sheet 1



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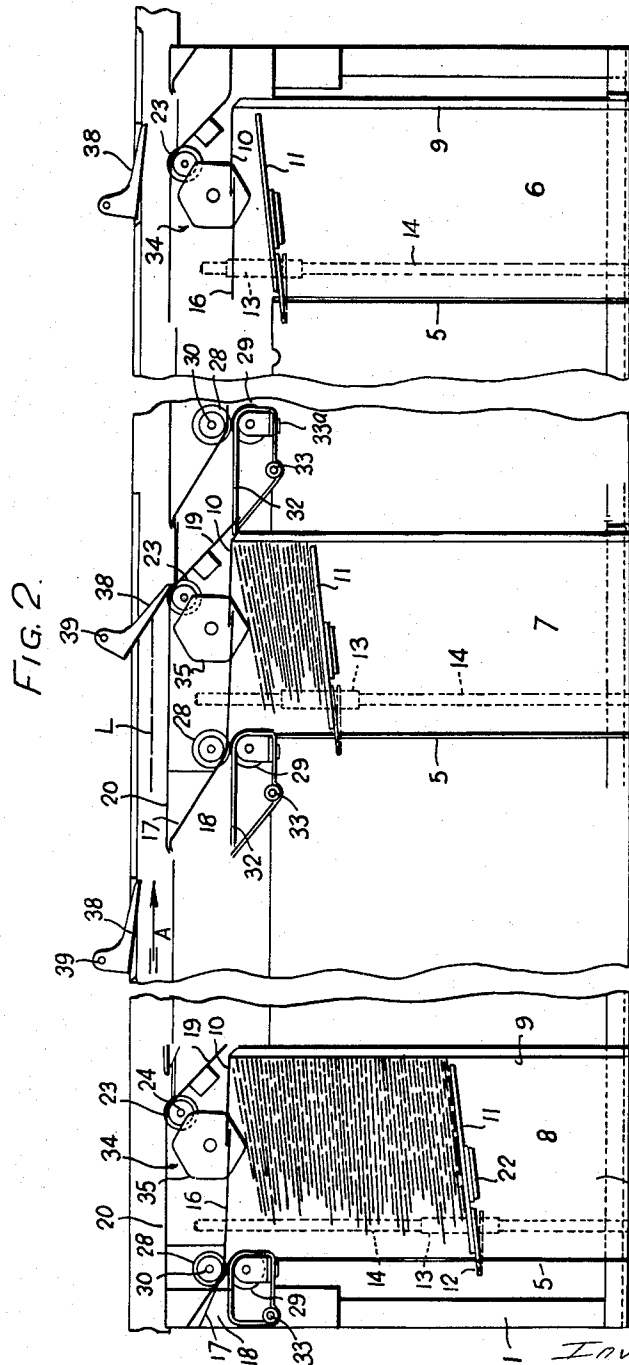
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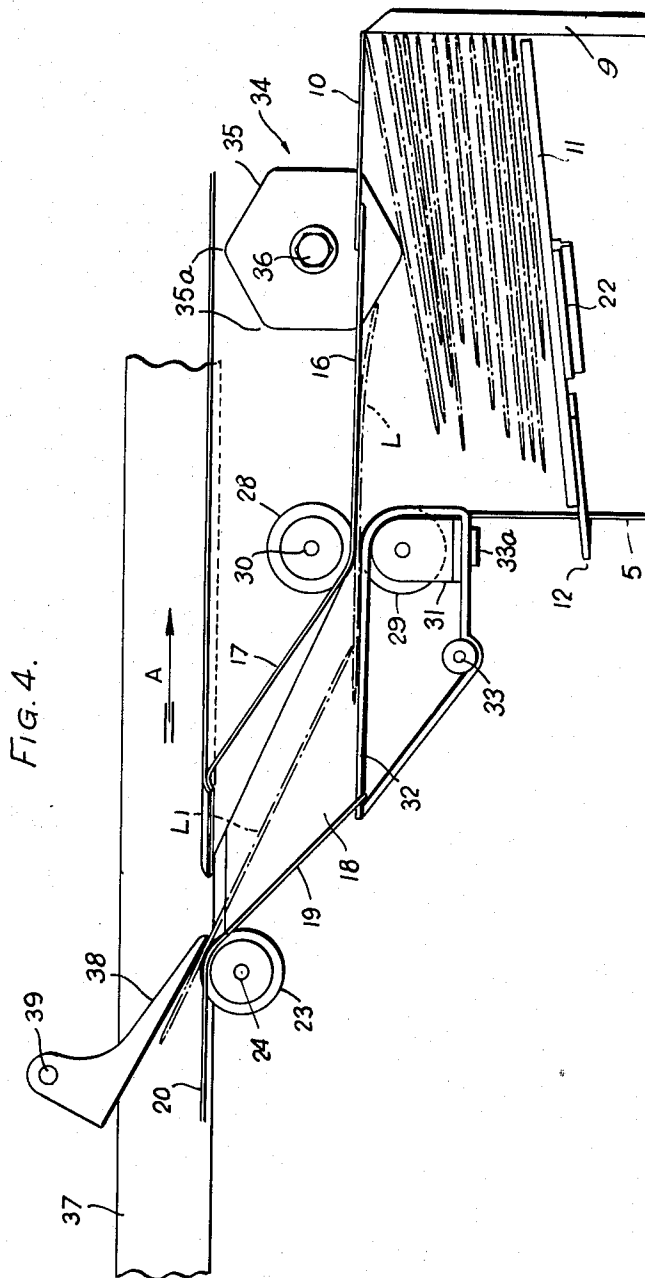
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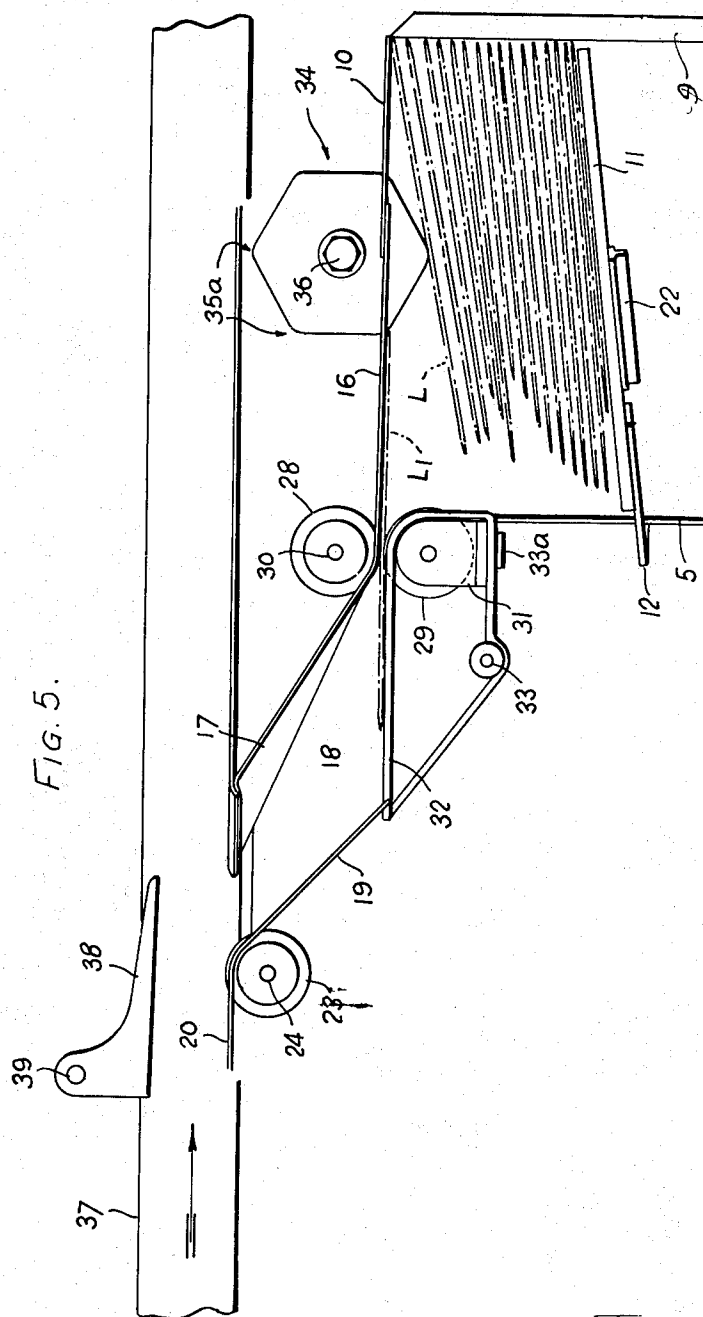
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APPARATUS FOR STACKING LETTERS AND LIKE ARTICLES

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8 Claims. (Cl. 271—64)

This invention relates to apparatus for stacking, letters, cards, thin packets, cheques and like articles, hereinafter referred to as "letters," which are ejected or fed one by one in a generally vertical orientation and, for example, by a generally horizontal movement in a plane normal to the plane of the letter, from a machine or other device for handling or treating the letters. Such a machine may, for example, be a stamp cancelling machine or sorting machine.

The object of the invention is to facilitate the formation of flat articles such as letters into a stack as they are fed from a conveyor belt forming part of postal sorting equipment dealing with large quantities of spaced letters.

According to the present invention, the letters to be stacked are passed between stack-feeding rollers rotating at a peripheral speed which is less than the speed at which the letters travel towards the stack-feeding rollers and the letters thereby presented for engagement by a projecting portion or portions of at least one rotating letter-stacking member which rotates about an upwardly extending axis and co-operates with an abutment or stop member and a stack-supporting means to cause the letters to form a stack.

Guide means are provided to cause the letters to approach the stack-feeding rollers and rotating letter-stacking member or members in the required manner.

According to one feature of the invention, the rotating letter-stacking member or each such member may comprise a substantially disc-like member having at least one portion of its peripheral edge projecting so as to thrust against the faces of the letters opposed thereto and force each letter in turn into the stacking position. Alternatively, an elongated roller with an appropriately contoured peripheral surface may be used instead of a plurality of disc-like letter-stacking members.

In order that the invention may be clearly understood and readily carried into effect, one constructional embodiment thereof will hereinafter be described by way of example and with reference to the accompanying drawings in which:

Fig. 1 is a part broken away from elevational view of a stacking unit comprising three stacking or destination boxes and means adapted to operate in accordance with the present invention for stacking letters therein;

Fig. 2 is a plan view thereof;

Fig. 3 is an end elevational view looking in the direction of the arrow III (Fig. 1);

Fig. 4 is an elevational detail view, drawn to a larger scale, of a single destination box and the letter stacking mechanism associated therewith shown diverting a letter to the destination box; while

Fig. 5 is a view similar to Fig. 4 but showing a different operative stage in feeding the diverted letter to the stacking position.

As shown in Figs. 1, 2 and 3, the stacking unit is mounted upon a rectangular base structure comprising a horizontal front rail 2 of inverted L-section and horizontal rear rail 3 of double angle section rigidly con-

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nected together by angle section end rails 1 so that the upper flanges of the front and rear rails lie in a common horizontal plane to support destination boxes 6, 7 and 8. Each destination box is formed by a substantially rectangular horizontal floor 4 bounded on one side by a narrow upstanding guide wall 5 and upon the opposite side by a vertical wall or stop plate 9 and the rear end 10 of the latter is bent at right angles to form part of an end wall which closes the rear end of the box. The front end of each destination box is closed by a displaceable stack-supporting plate 11.

The side walls 5 and 9 of each stacking or destination box 6, 7 and 8 extend across the base frame structure substantially at right angles to the front and rear rails thereof, while the stack-supporting plate 11 is set at an angle between the side walls of the box for a purpose hereafter described.

Each plate 11 is carried in an upright position by a cranked bracket arm 12 which is rigidly secured to and extends upwards from a sleeve 13 mounted to slide upon a slide bar 14. Each slide bar 14 extends parallel and longitudinally with respect to the floor of the corresponding destination box and is mounted therebeneath in the base frame structure.

Each sleeve 13 carries a blade spring 15 (Fig. 3) adjustably secured to the sleeve by set screw means 21 and having its free end inwardly bent and notched to drag along the bar 14 and act as a friction brake thereon.

The stack-supporting plates 11 each have a grip or handle 22 fixed thereto to provide a means for manually swinging the stack-supporting plate about the longitudinal axis of the slide bar, thus to move the plate clear of the destination box and away from the front end of the stack of letters in the destination box, when it is desired to remove the letters. The bottom edge of the plates 11 are suitably cut away to clear the top edge of the low side wall 5 as they are swung out of and into the stack-engaging position.

The rear end wall of each destination box is completed by a plate 16 which is offset from the rear end of the side wall 5 of the destination box and extended to form one upwardly extending wall 17 of a guideway 18 leading to the rear end of the box. The opposite upright wall of each guideway 18 is formed by the inwardly diverted end 19 of a fence plate 20 extending above and parallel to the rear horizontal rail 3.

Pairs of diverting rollers 23, mounted to rotate about vertical axes, are disposed at the points of deflection of the guideway walls 19 from the fence plates 20, i. e. at the letter-receiving mounts of the guideways 18, so that the travelling peripheral surfaces of the rollers 23 project outwards through clearance slots provided in the corresponding curved faces of the guideway walls 18. Each pair of rollers 23 is mounted upon a vertical driven spindle 24 which is mounted upon and extends upwards from the top of the casing 25 of a driving gearset. The lower end of each spindle 24 projects into the casing 25 and carries a sprocket (not shown) adapted drivingly to mesh in the gearset contained therein.

The horizontal main drive shafts 26 of the gearsets are coupled together by flexible couplings 27 and driven from any suitable power unit, e. g. an electric motor (not shown).

A pair of co-operating inversely rotating stack-feeding rollers 28, 29, mounted to rotate about vertical axes, are disposed at the exit end of each guideway 18, in diagonally opposite relation to the diverting rollers 23, to form a feed throat through which the letters are positively fed to the corresponding destination box. Although not shown in the drawings, the axis of the roller 29 is preferably slightly offset from that of the roller 28 in the direction of travel of incoming letters, the purpose being

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to speed up the swinging round of the tail of a letter passing through these rollers, out of the path of a following letter.

The rollers 28 of each stack-feeding pair is fixed to a vertical spindle 30 which is mounted upon the top of the corresponding gearset casing and has a sprocket (not shown) fixed to the lower end thereof and meshing with the driving gearset. The gear ratios of the driving gearsets are selected to drive the stack-feeding rollers 28 at a peripheral speed which is approximately one third of the peripheral speed of the diverting rollers 23.

The co-operating roller 29 of each stack-feeding pair is mounted freely to rotate in a bearing bracket 31 which is carried upon a grid-like structure disposed at the front end of each guideway 18. Each grid-like structure comprises a series of horizontal frames 32 fixed in vertically spaced relation upon a vertical post 33 which is mounted upon and extends upwards from the rear rail 3. The grid like structures are disposed so that the outer side of each frame 32 thereof normally extends in parallel, slightly offset relation to the rear walls 10, 16 of the destination box associated therewith. The outer sides of the grid frames 32 thus form a flat grid with which the letters are brought into contact, upon being diverted through the guideways 18, and thereby re-directed to travel in a direction parallel to the longitudinal rear fences of the unit, i. e. at right angles to the longitudinal side walls of the destination boxes. The grid-like structure of the letter re-directing means prevents the impedance of the letters by air resistance in being swung towards the said re-directing means.

The roller 29 of each stack-feeding roller pair is disposed to project from between the spaced grid frames 32 so as to co-operate with the positively driven roller 28 of the pair and the grid-like structures are adapted to pivot about their posts 33 to permit the rollers 29 to move away from the rollers 28 so as to yield to the passage of letters of various thicknesses between the rollers. Loading spring means 33a are provided for yieldingly maintaining the grid-structures in the normal letter re-directing positions.

Rotary letter-stacking devices 34 are disposed at the rear ends of the destination boxes to engage the letters as they leave the stack-feeding rollers and force the letters forwardly along the boxes in stack formation. Each device 34 comprises three co-axial vertically spaced horizontal discs 35 fixed upon a spindle 36 which is mounted upon and extends vertically upwards from the top of the corresponding gearset casing 25, behind the rear walls 10, 16 of the destination box; the lower end of the spindle projecting into the casing and carrying a sprocket (not shown) which drivingly meshes in the gearset.

Each disc 35 is shaped so that its edges form a regular polygon, e. g. a hexagon, with the corners 35a thereof rounded with curves of comparatively small radius. The flattened edges of the discs are smooth finished and the rounded corners thereof preferably highly polished so that the rotating edges of the discs which project through clearance slots in the rear walls 10, 16 of the destination box, can be engaged with the letters and the rounded corners 35a of the disc caused to further the movement of the letters without in any way damaging the letters.

Alternatively, an elongated bar or tube of hexagonal, octagonal or any polygonal cross section may be used in place of a plurality of the disc-like members 35, providing that, in equipment including several destination boxes, the diverting rollers of a following stacker are accommodated.

In the operation of the above described letter-stacking unit the letters are conveyed thereto by a horizontal travelling conveyor belt 37 which travels from end to end of the letter stacking unit and in close proximity and parallel relation to the rear fences 20 thereof. Thus, the conveyor belt 37 travels in the direction of the arrow A

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(Fig. 2) past the rearwardly opening letter-receiving mouths of the guideways 18 and its direction of travel is at right angles to the side walls of destination boxes so that the letters L, which are carried thereon in substantially erect edgewise position, approach and pass each pair of deflecting rollers 23 prior to passing across the rearwardly opening mouth of the guideway 18 associated therewith.

Electro-magnetically operated letter-diverting devices which may be manually operated to sort letters into various stacks at the will of the operator are provided to divert the letters L from the conveyor belt 37. Each diverter device comprises a substantially vertical vane or blade 38 fixed to a pivotally mounted spindle 39 disposed upon the outer or rear side of the letter conveyor belt at a point adjacent to the rear mouth of the corresponding guide way 18, so that the vane or blade may either be withdrawn from and clear of the conveyor belt (as shown in the case of the two end diverter blades in Fig. 2) or swung across the upper face of the conveyor belt so as to intercept and divert the letters carried upon the conveyor belt (as shown in the case of the intermediate vane or blade, Fig. 2). The length of each diverter vane or blade is such that the free end thereof extends past and is brought into letter-engaging relation to the outwardly projecting peripheral edges of the deflecting rollers 23 when the vane or blade is swung into the letter-diverting position.

Thus, a letter L brought into contact with a letter-diverting vane or blade 38, as shown in larger detail in Fig. 4, will be diverted to travel between the diverting blade and positively driven deflecting rollers 23 which are driven at a peripheral speed equal to the speed of travel of the letter conveyor belt 37. The letter will thereupon be positively driven through the guideway 18 and towards the stack-feeding rollers 28, 29 which will engage the leading end of the letter therebetween after the said letter has passed between and clear of the deflecting rollers 23 and diverting blade 38. The relative disposition of the rollers 28, 29 and outer bars of the grid structures 32 is such that the trailing end part of the letter engaged between the rollers 28, 29 is swung against the grid members and the letter thereby re-directed to travel in the same direction and in a path parallel to its direction and path of travel prior to being diverted from the letter conveyor belt.

The letter will leave the stack-feeding rollers and pass into the destination box at a speed which is considerably less than the speed of approach to the stack-feeding rollers. Thus, the letter-diverting arrangement above described enable "tiling" of the letters to be achieved. That is to say, if the letter L passing between the stack-feeding rollers 28, 29 is followed by another letter L1 immediately diverted from the letter conveyor and towards the same destination box, as shown in Fig. 5, the leading end of the second letter L1 will neatly overlap the rear end of the first letter L before the latter is engaged by the letter-stacking discs 35.

On leaving the rollers 28, 29, the leading end of the letter L will move into engagement with the moving peripheral edges of the letter-stacking discs (as shown in Fig. 4), and will be deflected forwards and then engaged by the rounded corners 35a of each rotating disc which will further the movement of the letter towards the opposite side wall or stop plate 9 of the destination box when the letter has passed clear of the stack-feeding rollers. In this manner, the leading end of the letter is brought up against the side wall or stop plate of the destination box into which it is fed. The discs 35 will also act to press the letter forwards against the slidable stack-supporting plate 11 or against the rearmost letter of the letters already stacked against the plate 11.

The trailing ends of the letters stacked against the inclined plate 11 are forwardly offset from the path of travel of the following incoming letters, as shown in Fig. 2,

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which obviates the risk of the leading end of an incoming letter being forced under the trailing end of the rearmost stacked letter.

The letters thus stacked against the stack-supporting plate 11 by the combined efforts of the letter-stacking discs 35 and side wall or stop plate 9 gradually force the plate 11 forwards against the braking effect of the spring 15 pressing against the slide bar 14 until the plate 11 reaches the limit of its forward displacement or, for other reasons, it is desired to remove the stacked letters from the destination box. The plate 11 is then swung upwards and away from the destination box by a hand applied to the grip or handle 22, and the stack of letters then removed from the front of the box.

As clearly shown in Fig. 2, the opposite extremities of the stacking unit are provided with complementary parts of a stacking box and associated letter diverting and stacking means and are adapted to be coupled together so that two or more of the units may be assembled in line to increase the number of destination boxes available to receive and stack letters diverted from one and the same conveyor belt and the meeting ends of any two units so coupled together will combine to form a destination box complete with associated letter-diverting and stacking means.

Although the invention has been more particularly described above with reference to a construction in which the letter conveying and supporting surfaces are substantially horizontal, it will be understood that the invention can also be carried into effect with other forms of apparatus in which the letter supporting surfaces are inclined to the horizontal.

We claim:

1. Apparatus for receiving letters supported edgewise upon, and selectively diverted from, a moving letter conveyor means and for stacking the diverted letters edgewise in a stacking box, comprising a guideway leading from the said conveyor means to the stacking box, a diverting roller positioned at the entrance to the guideway adjacent the conveyor means and adapted to co-operate with a diverter device having a vane or blade movable from a first position extending to one side of and in the direction of movement of the conveyor means, to a second position extending across the conveyor means and engaging the said diverting roller, means for rotating the diverting roller so that the peripheral speed thereof is substantially equal to that of the conveyor means whereby a letter travelling on the said conveyor means is deflected by said vane or blade in the said second position to be engaged between the vane or blade and the diverting roller and thereby discharged into the guideway, a pair of stack feeding rollers positioned at the exit of the guideway adjacent the stacking box, the said stack feeding roller being relatively displaceable and adapted to receive the letter therebetween to feed the letter into the stacking box in a direction transversely thereof, and means for rotating the said stack feeding rollers in opposite directions at a peripheral speed less than that of the diverting roller whereby a letter discharged into the guideway by said diverting roller at the speed of the conveyor means is fed into the stacking box at a reduced speed, the said stacking box comprising an elongated stack supporting floor extending lengthwise laterally of the conveyor means in the plane thereof upon which floor the letters are stacked edgewise, an abutment extending upwardly from said floor and forming one longitudinal wall of the stacking box, a displaceable backing support for said stack extending transversely of the floor of the stacking box, and a rotatable stacking member adapted to be rotated about an upwardly extending axis in the path of a letter fed to the stacking box by the stack feeding rollers so that the said member engages the letters as they are fed into the stacking box and urges each letter in turn along the

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floor of the box to bring the leading vertical edge of the letter into engagement with the said longitudinally extending abutment.

2. Apparatus as claimed in claim 1, wherein the said guideway is inclined to the longitudinal direction of the said stacking box and to the direction of travel of the said conveyor means so that the direction of travel of each said letter is changed when it is diverted from the said conveyor means, a letter re-directing means being disposed between the said diverting roller and said stack feeding rollers to re-direct the said diverted letters to travel in a direction at right angles to the longitudinal direction of the said stacking box when engaged by the said stack-feeding rollers.

3. Apparatus as claimed in claim 1, wherein said guideway is inclined to the longitudinal direction of the said stacking box and to the direction of travel of the said conveyor means so that the direction of travel of each letter is changed when it is diverted from the said conveyor means, and a letter re-directing means is disposed between the said diverting roller and said stack-feeding rollers to re-direct the diverted letters to travel in a direction at right angles to the longitudinal direction of the said stacking box when engaged by the said stack-feeding rollers, said letter re-directing means comprising a grid-like structure which ensures that the movement of the letters towards the said letter re-directing means is not impeded by air compression there-between.

4. Apparatus as claimed in claim 1, wherein the said rotating letter-stacking member comprises a substantially disc-shaped member shaped as a regular polygon and having the corners thereof rounded.

5. Apparatus as claimed in claim 1, wherein the said rotating letter-stacking member comprises an elongated roller with an appropriately contoured peripheral surface.

6. Apparatus as claimed in claim 1, wherein said guideway is inclined to the longitudinal direction of the said stacking box and to the direction of travel of the said moving conveyor means so that the direction of travel of each said letter is changed when it is diverted from the said moving conveyor means, and a letter re-directing means is disposed between the said diverting roller and said stack-feeding rollers to re-direct the said diverted letters to travel in a direction at right angles to the longitudinal direction of the said stacking box when engaged by the said stack-feeding rollers, said letter re-directing means being displaceable and carrying one of the said stack-feeding rollers so that the said letter re-directing means is moved by the said one stack-feeding roller when the latter is displaced relatively to the other said roller of the stack-feeding pair upon engagement of a letter there-between.

7. Apparatus as claimed in claim 6, wherein the said letter re-directing means comprises an openwork letter re-directing structure disposed between the said diverting roller and said stack-feeding rollers and forming in conjunction with the said stack-feeding rollers a discharge throat through which the letters pass to the said stacking box, said re-directing structure being mounted to pivot about an upwardly extending axis and having the said displaceable roller of the said stack-feeding pair mounted therein so that the said letter re-directing structure is re-orientated when the said displaceable stack-feeding roller is displaced relatively to the other roller of the said stack-feeding pair, thereby to cause the said diverted letters to travel in a direction at right angles to the longitudinal direction of the said stacking box when engaged by the said stack-feeding roller pair.

8. Apparatus as claimed in claim 1, embodied in a unit comprising a plurality of stacking boxes placed side by side in parallel relation so as to be served by the said moving conveyor means travelling in a direction at right angles to the longitudinal sides of the said stacking boxes, said unit being arranged for coupling to at least one other

similar unit served by the same said moving conveyor means.

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