

June 16, 1964

E. P. MAIDMENT

3,137,499

DOCUMENT STACKING DEVICE

Filed Nov. 20, 1962

5 Sheets-Sheet 1

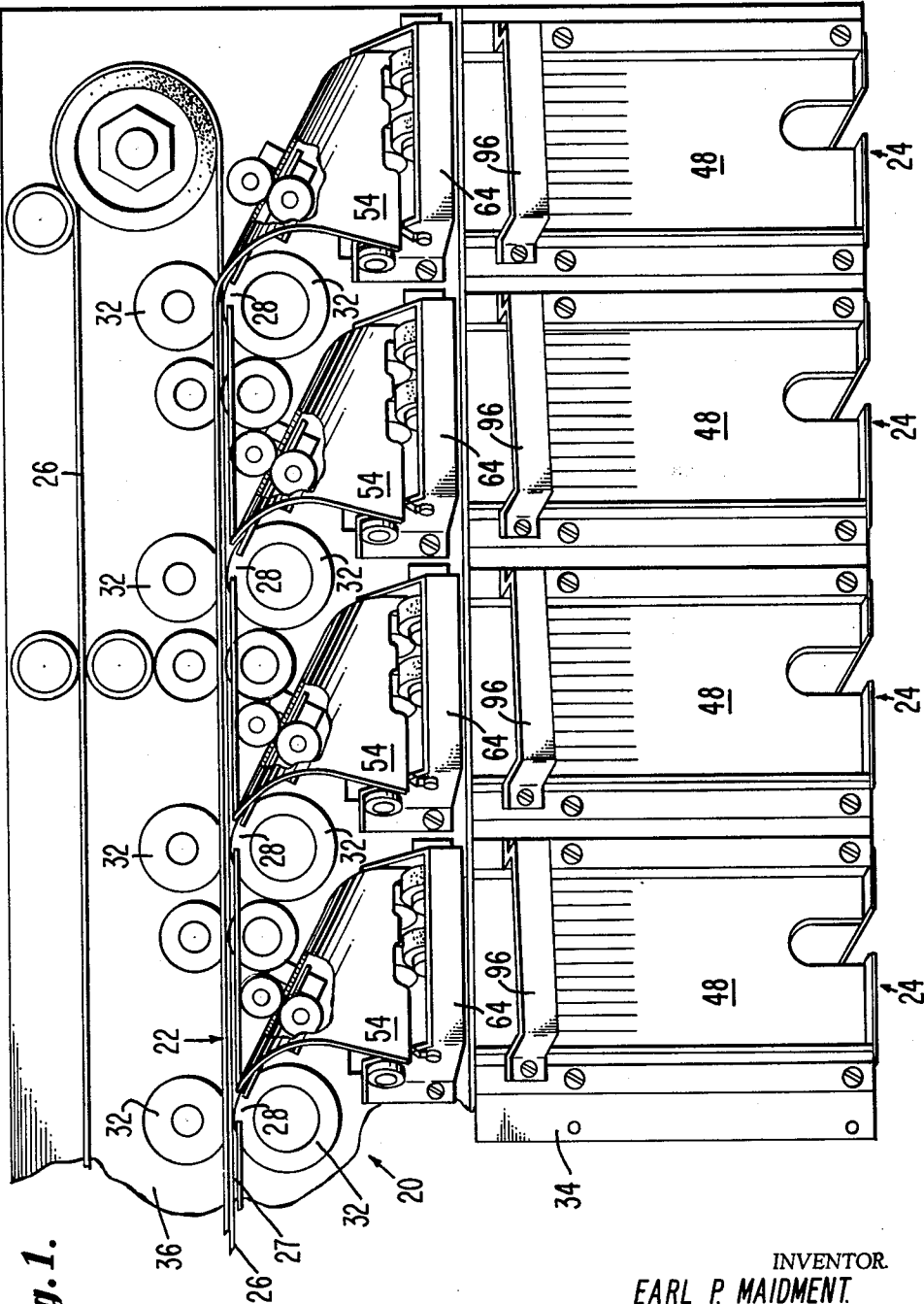


Fig. 1.

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5 Sheets-Sheet 2

Fig. 2.

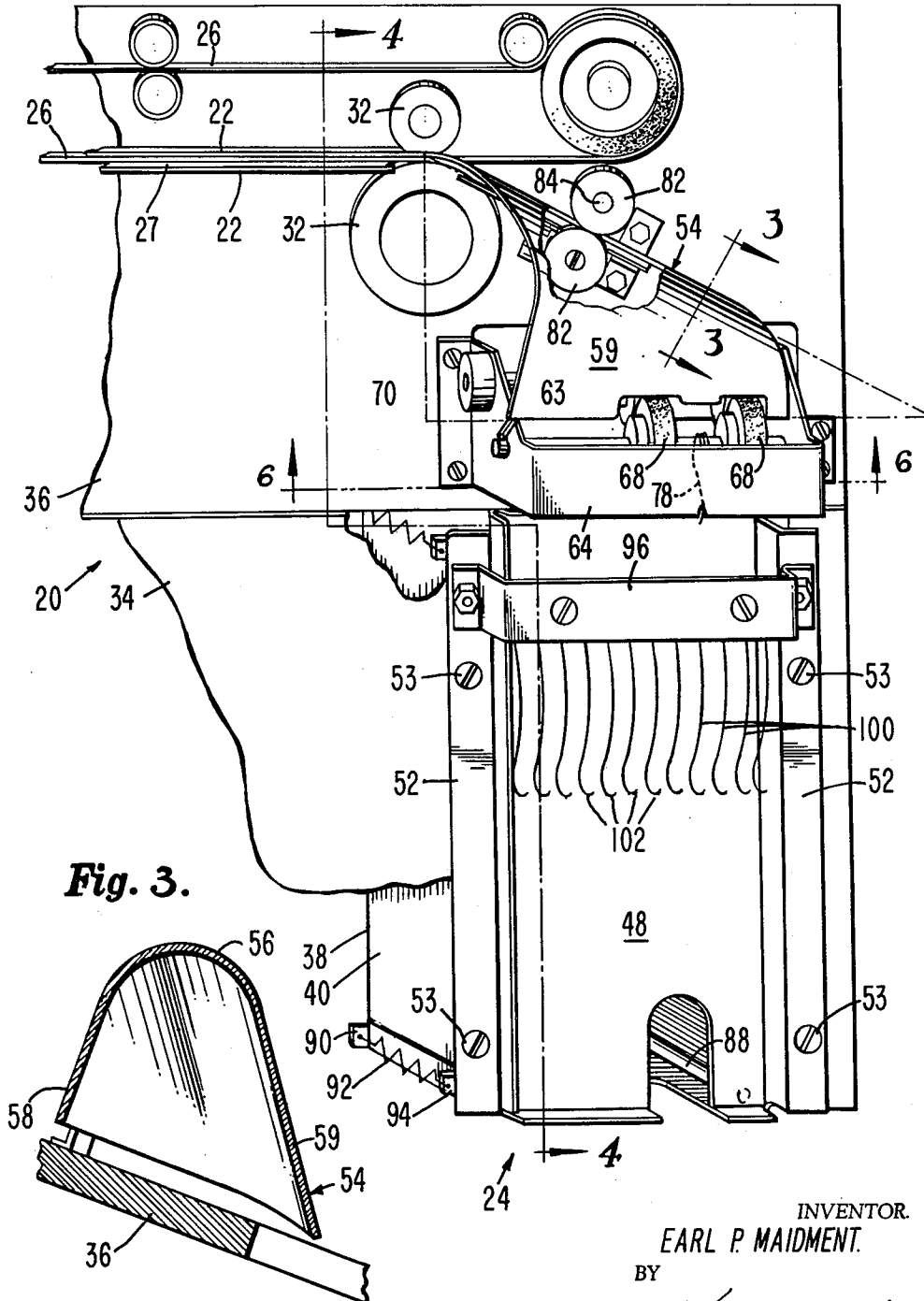


Fig. 3.

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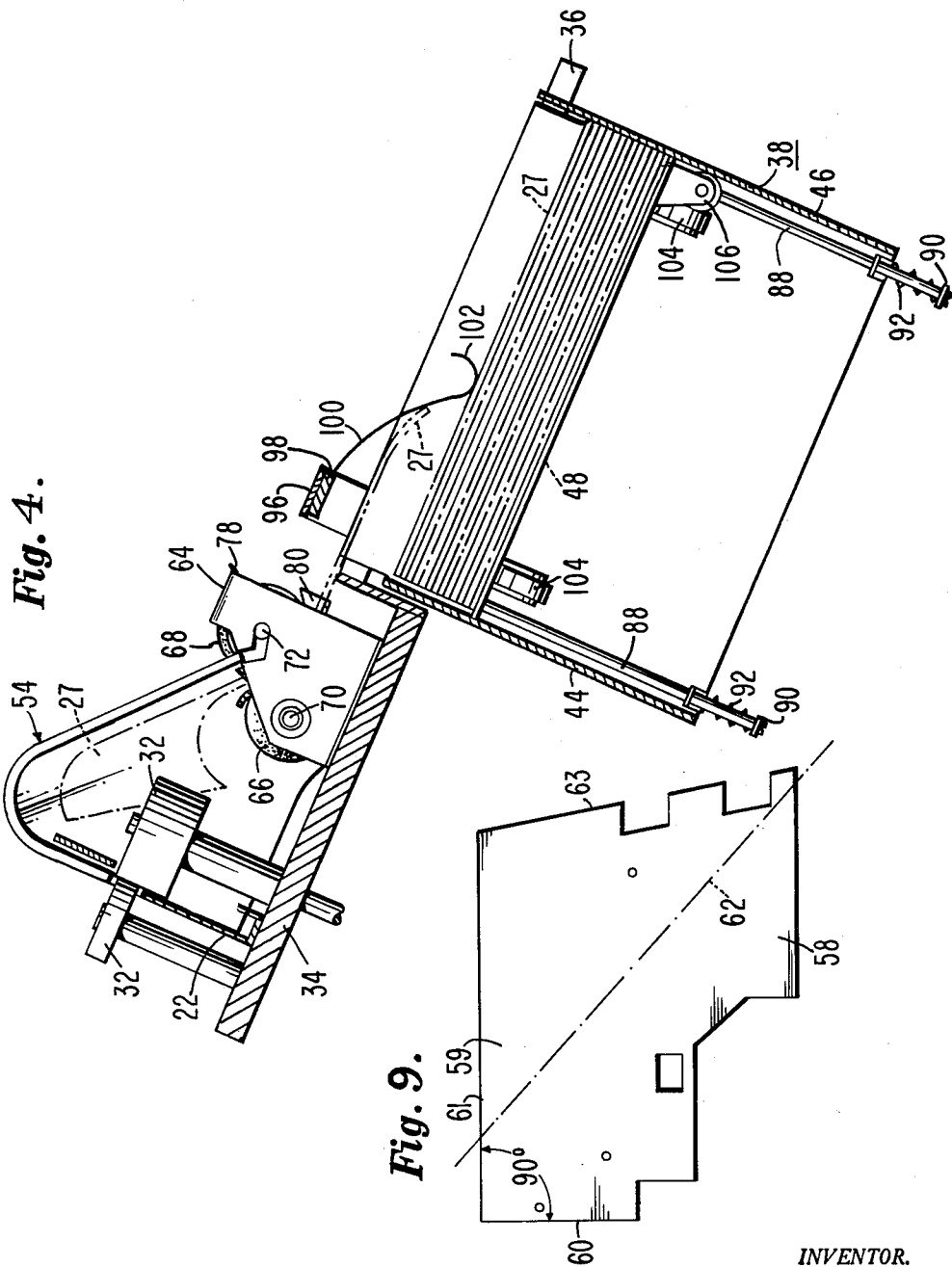
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5 Sheets-Sheet 3



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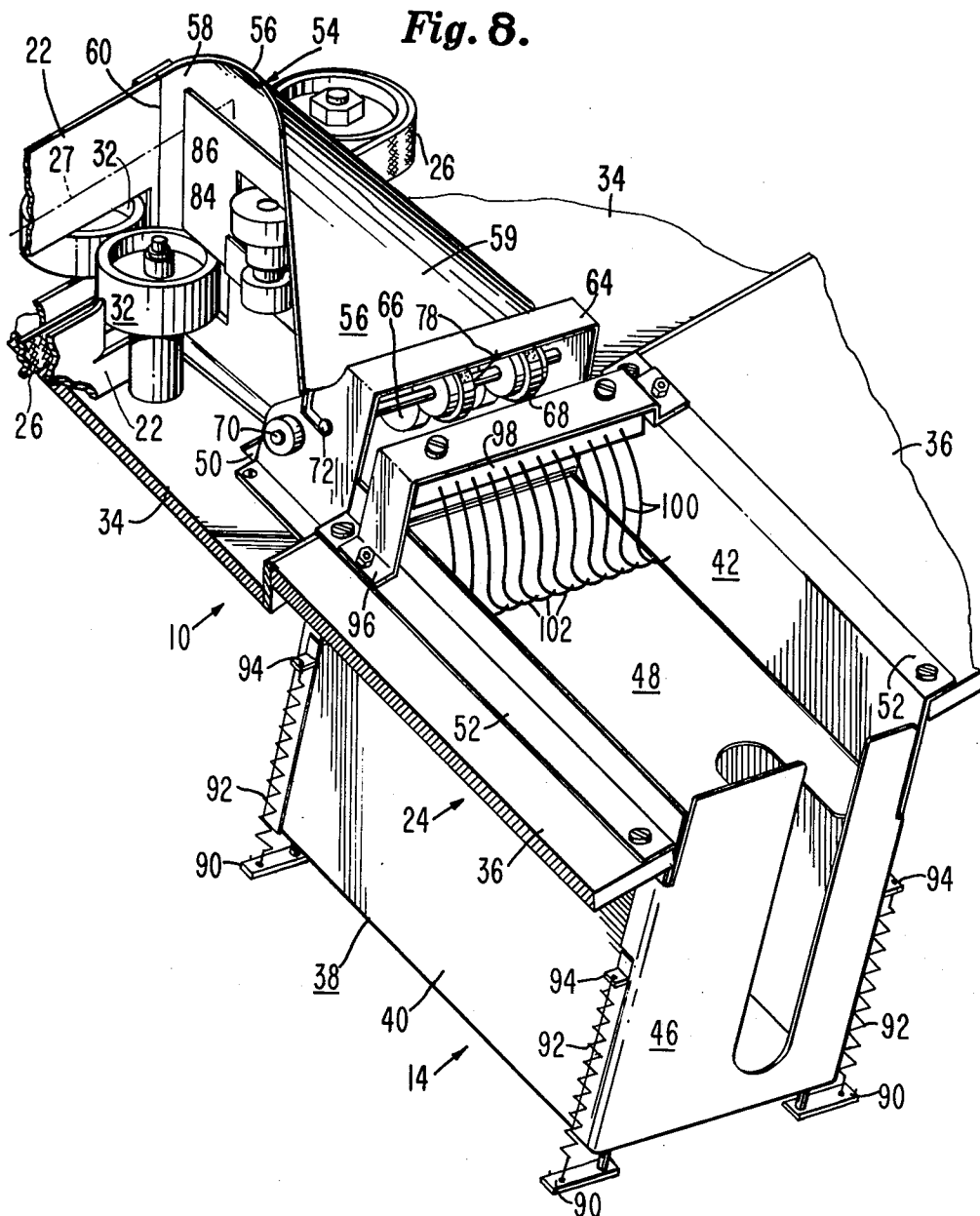
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5 Sheets-Sheet 5

Fig. 8.



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3,137,499

DOCUMENT STACKING DEVICE

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7 Claims. (Cl. 271-71)

This invention relates generally to sheet transporting apparatus and particularly to a sheet stacking device therefor.

It is an object of the invention to provide an improved sheet stacking device in which the top of the stack remains at a predetermined substantially constant level without need of the usual stack positioning mechanism and controls therefor.

Another object of the invention is to provide for a sheet handling apparatus having a sheet raceway from which sheets are ejected singly, an improved sheet stacking device including a sheet receiving bin of a structural character to maintain the uppermost sheet of the stack at a predetermined desired height with respect to the path of travel of the ejected sheets.

Another object of the invention is to provide for a sheet handling apparatus having a sheet raceway from which sheets are ejected singly, an improved sheet stacking device including a sheet receiving bin of a structural character to effect incremental descent of the stack in response to the increasing weight of accumulating sheets so as to maintain proper relationship between the top of the stack and the path of travel of the ejected sheets.

Another object of the invention is to provide for a sheet handling apparatus having a sheet raceway along which sheets travel singly on edge to a sheet ejecting point, an improved guide member at the sheet ejection point to change the direction of sheet travel and at the same time change the attitude of the sheet to direct the sheet flat onto the top of the stack.

Another object of the invention is to provide a sheet stacking device of the above mentioned character having provisions for directing the sheets downwardly, flat against the top of the stack and at the same time cause air between sheets to be expelled.

Another object of the invention is to slightly crease and thus rigidify each sheet just prior to its being fed into the bin.

A further object of the invention resides in the arrangement of the bin at a compound angularity to utilize gravity in neatly stacking the sheets with their side and end edges abutting respectively one side and adjacent end of the bin.

Other objects of the invention will become apparent from the following detail description taken in connection with the accompanying drawings in which:

FIG. 1 is a fragmentary plan view of a sheet or check sorting machine embodying my improved check stacking device;

FIG. 2 is an enlarged fragmentary plan view of one of a number of check stacking devices of the machine of FIG. 1;

FIG. 3 is a cross sectional view, taken along the line 3-3 of FIG. 2;

FIG. 4 is a cross sectional view, taken along the line 4-4 of FIG. 2;

FIG. 5 is an end view partly broken away and in section of the check stacking device of FIG. 2;

FIG. 6 is a sectional view, taken along the line 6-6 of FIG. 2;

FIG. 7 is another sectional view, taken along the line 7-7 of FIG. 6;

FIG. 8 is a perspective view, and

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FIG. 9 is a view of a blank for making a part of the document guideway.

Referring to the drawings by characters of reference and first to FIG. 1, the invention is illustrated in connection with a sheet or check sorting apparatus comprising, in general, an elongated supporting member or bed 20, a check guide or raceway 22, and a plurality of check stacking devices 24. The raceway 22 and the check stacking devices 24 are mounted on the bed, the raceway extending longitudinally of and near the rear of the bed and the check stacking devices laterally positioned forwardly of the raceway in spaced apart relationship along the front of the bed. A feed belt 26, or other suitable feed means, may be provided to feed checks, as at 27, along the raceway 24 at high velocity and be arranged to feed the checks on edge or in upright attitude. The raceway 22 is provided with a plurality of outlets 28 for the ejection of checks from the raceway respectively to the stacking devices 24, the raceway having at each of the outlets 28 a pair of check feed rollers 32.

Check sorting apparatus of the type shown usually have associated with the raceway 22 a number of check deflector members respectively for the outlets 28 and selectively operating means therefor which are not shown or described herein as they form no part of the present invention. For a complete understanding of one type of check sorter having check deflectors and control system therefor, reference may be had to the copending application of Harold M. Frederick, of common assignee, S.N. 857,960, filed December 7, 1959, now Patent No. 3,067,886.

In the present construction, the bed 20 is a two level bed comprising a lower plate 34 at the rear of the structure and an upper plate 36 at the front of the structure. As shown, the bed plates 34 and 36 are disposed in parallel planes which are inclined downwardly from the back to the front of the structure for the purpose of inducing sheets to stack neatly in the stacking devices 24, as will be hereinafter more clearly understood. The angle of inclination of the bed plates 34, 36 may be about 20°.

Since the check stacking devices 24 are alike, as will be apparent from the drawings, the following detail description is limited to one of them for convenience and to avoid unnecessary repetitious description. The check stacking device 24 includes a box-like bin 38 having side walls 40 and 42, end walls 44 and 46 and a bottom wall 48. The bin 38 is received in a clearance opening 50 in the bed plate 36 and is suspended below the plate, as shown for example, in FIG. 2, by out-turned side flanges 52 which seat on and are secured to the bed plate, such as by screws 53. As shown, the bin 38 is arranged with its end wall 44 at the offset between bed plates 34 and 36 in a plane parallel to the plane of travel of the checks in the raceway 22 and beyond, or to the right of the raceway check outlet 28.

In order to conduct checks from the raceway outlet 28 to the check stack bin 38 such that the checks will stack flat in the bin, I provide a check guide member 54 having a particular check guiding surface contour which changes the direction of travel of the check about 90° to divert it toward the bin and at the same time changes the attitude of the check about 90° so that the check is directed over the bin end wall 44 in a plane substantially parallel to the bin top. Thus the guide member may be termed a check diverter-attitude changer. The guide member 54 may be made of any suitable smooth surface sheet material, such as polished sheet steel, and is formed having a rounded or curved portion 56 and flat portions or legs 58 and 59 tangential to the curved portion. In the forming of the guide member 54, it is critical that leg 58 positions in the upright plane of the raceway 22 and the leg 59 in

a plane above and parallel to the plane of the top of bin 38. The edge, as at 60, of the leg 58 may be butt welded, or be otherwise suitably secured to the end of the outer rail of raceway 22 to support the guide member 54.

The guide member 54 may be made by first developing and forming a blank, as shown in FIG. 9, which may be in the shape of a trapezium although the shape is not critical. Edge 60 of the blank and edge 61 can be square, or form a right angle, and substantially from the corner of the right angle diagonally to substantially the opposite corner of the blank, a dot and dash line 62 represents the axis of curvature of the rounded portion 56 of the guide member 54. The blank is bent over a form which preferably provides a curvature of uniform radius along line 62 although, if desired, the curvature may be progressive, as a conical surface. In either case, the legs 58 and 59 are bent to the proper angles that will relatively position them such that leg 58 will align with the end of the raceway 22 and leg 59 will lie in a plane parallel to and above the plane of the bin top with edge 63 disposed toward the bin.

Interposed between the end 63 of the check guide member 54 and the bin end wall 44 there is a check feed device comprising a pair of lower axially spaced driven rollers 66, and a pair of upper axially spaced pressure rollers 68. The driven rollers 66 are affixed to a rotatable shaft 70 journaled in the opposite sides of a U-shaped bracket 64 and the pressure rollers 68 are rotatable on a fixed shaft 72 affixed to the opposite sides of the bracket. The driven rollers 66 and the pressure rollers 68 form a bight adjacent the edge 63 of the check guide member 54. These rollers feed the checks into the bin 38 over the bin end wall 44. Between the rollers 66 is an arm 74 having an upper end pivoted on shaft 72 and a lower end carrying a check creasing roller 76. A torsion spring 78 biases the arm 74 in a clockwise direction, facing FIG. 4 to press a check downwardly against a form plate 80, the purpose being to slightly crease the checks to give them added rigidity.

Intermediate the feed rollers 32 and the feed rollers 66, 68, there is preferably provided an additional pair of feed rollers 82. The feed rollers 82 are positioned respectively on opposite sides of the check guide member 54 and are mounted on upright shafts 84 which in turn are rigidly mounted on the bed plate 36, the rollers being in engagement through a clearance aperture 86 in guide member 54.

Further in accordance with the invention, the bottom wall 48 of the check stacking bin 38 is spring suspended from the bin proper for downward incremental movement under the increasing weight of accumulating checks, the purpose being to maintain the top of the check stack at a desired predetermined level below the feed rollers 66, 68. To this end, the bottom wall 48 of the bin is rigidly secured, such as by welding, to the upper ends of four rods 88, located within the bin at the four corners respectively of the bottom wall. Extending downwardly from the bottom wall 48 the rods 88 are respectively slidably guided axially in guide members 90, which may be welded to the bin side walls 40 and 42, adjacent the lower edges thereof. Extending downwardly below the bin 38, the rods 88 have anchor members 90 rigidly secured respectively to the lower ends thereof. To each of the anchor members is anchored the end of a light helical coil spring 92. The upper ends of the springs 92 are anchored to brackets 94 which are secured to the bin side walls 40 and 42 near the corners of the bin. It will thus be seen that the springs 92 are placed under increasing tension by the increasing weight of the stack, the light springs yielding to maintain the top of the stack at a substantially constant level.

Spanning the sides 40, 42 of the bin adjacent the bin end wall 44 there is a U-shaped bracket 96, secured to the bin flanges 52. Secured to the underside of the web of the bracket 96 there is a supporting block 98 preferably

of plastic material, and securely set in the block are end portions of a plurality of metal spring fingers 100. The spring fingers 100 extend from the block in the direction of sheet travel and curve downwardly to rounded ends 102 which bear against the upper sheet of the stack. These spring fingers guide a check downwardly to the top of the stack and in addition thereto function to press the top check downwardly to expel the air from between the checks.

As previously mentioned, the bin 38 is mounted on a compound angle to the horizontal so that the checks will tend by gravity to stack neatly against the bin end wall 46 and bin side wall 42. To relieve the tendency of the bottom wall 48 to bind, as a consequence of the compound angularity of the bin 38, I provide a pair of friction reducing rollers 104 on bottom wall 48 to engage bin side wall 42 and a single roller 106 on bottom wall 48 to engage the lower end wall 46.

Operation

In operation, a check 27 is propelled at high velocity on edge, or in an upright attitude along the raceway 22 by the feed belt 26 which feeds the check to the bight of the feed rollers 32 at the outlet 28 of the raceway 22. Proceeding from the feed rollers 32, the check then traverses the inner surface of the check guide member 54 and the check is guided thereby to turn at about 90° to the raceway 22 toward the bin 38 and at the same time to change attitude by about 90° so as to deliver the check for stacking flat in the bin. As the check traverses the surface of the guide member 54, the feed rollers 82 aid in keeping the check on course following which the lead edge of the check is fed into the bight of feed rollers 66, 68. At this point, the check is fed downwardly against the forming plate 80 and under the pressure of roller 76, the check is slightly creased to increase its rigidity. The check is then guided by the forming plate 80 into the bin 38, over the bin end wall 44. As the check proceeds into the bin the check leading edge engages the spring fingers 100 which yieldingly forces the check downwardly against the top of the stack to dispel air from between the checks 27 so that only the weight of the checks will be applied to the light springs 92 that support the descendable bottom wall 48 of the bin. Consequently, as the weight of the stack increases with the accumulation of checks in the bin, the stack descends with the bottom wall, thus the top of the stack is maintained at a predetermined substantially constant level below the path of travel of the checks into the bin.

While I have shown and described my sheet stacking device in considerable detail, it will be understood that many variations and changes may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. In a sheet handling apparatus, a sheet guideway along which sheets are transported on edge in an upright attitude and having an outlet, a sheet stack supporting member laterally positioned from said guideway in laterally spaced relation to the sheet outlet, and a sheet guide member between said outlet and said supporting member and curved to change the attitude of the check from the said upright attitude to an attitude transversely to the plane of said upright attitude and at the same time changing the direction of the sheet travel laterally of said guideway toward said sheet stack supporting member.

2. In a sheet handling apparatus, means defining a vertical sheet guideway along which a sheet is transported on edge in an upright attitude, said guideway having an open end for ejection of a sheet, a sheet stack supporting member positioned laterally of the said end of the guideway, a pair of feed rollers between said guideway and said sheet stack supporting member and operable to feed a sheet flat onto the latter, rollers having a bight in a plane transverse to said guideway, and a curved guide member having one end in horizontal registry

with the bight of said feed rollers to change the direction of travel toward said sheet supporting member and at the same time change the sheet attitude.

3. In a sheet handling apparatus, a linearly extending sheet guideway defining a vertical path of travel along which a sheet is transported on edge in an upright attitude and discharged from one end of the guideway, a first pair of feed rollers at the one end of said guideway having a vertically disposed bight, a sheet stack supporting member positioned laterally of the one end of said guideway for the flat stacking of sheets thereon, a second pair of sheet feeding rollers between said guideway and said sheet stack supporting member, said second feed rollers having a bight above the top of said sheet stack supporting member in a plane transverse to the plane of the vertical path of travel of a sheet along said guideway, and a curved sheet attitude and direction changing guide member having one end vertically disposed in registry with the bight of said first pair of rollers and the opposite end in registry with the bight of said second pair of rollers.

4. In a sheet handling apparatus, a linearly extending guideway defining a vertical path of sheet travel along which a sheet is transported on edge in an upright attitude and discharged from an outlet of the guideway, a first pair of sheet feed rollers disposed at the said outlet of said guideway having a substantially vertically disposed bight, a sheet stack supporting member spaced from and positioned laterally of said guideway, a second pair of sheet feed rollers between said sheet stack supporting member and said first pair of rollers, and having a bight in a plane transverse to the plane of the path of sheet travel defined by said guideway, a curved guide member having one upright edge adjacent and in registry with the bight of said first pair of sheet feed rollers and an opposite edge adjacent and in registry with the bight of said second pair of sheet feed rollers, said curved guide member having a twisting sheet engaging contour to change both the direction of sheet travel and attitude of a sheet between said first and second pairs of rollers to direct a sheet into position for horizontal stacking on said sheet stack supporting member, and a third pair of sheet feed rollers between said opposite edges of said curved guide member to overcome the braking affect of the latter as the sheet is forced to change its direction of travel and attitude.

5. In a sheet handling apparatus, a linearly extending guideway defining a vertical path of sheet travel along which a sheet is transported on edge in an upright attitude and discharged from a sheet outlet, a first pair of sheet feed rollers at the said outlet of said guideway and having a substantially vertically disposed bight, a sheet stacking bin spaced from and extending laterally of said guideway, a second pair of sheet feed rollers between said first pair of rollers and said bin and having a bight in a plane transverse to the vertical path of sheet travel defined by said guideway, a curved guide plate having one upright edge adjacent and in registry with the bight of said first pair of sheet feed rollers and an opposite edge adjacent and in registry with the bight of said second pair of sheet feed rollers, said curved guide plate operable to change both the direction of travel and attitude of a sheet between said first and second pairs of rollers to direct a sheet into position for horizontal stacking in the bin, and a plurality of sheet deflecting fingers overlying said bin in the path of sheet travel from said second pair of sheet

feed rollers and having free ends extending downwardly into the bin.

6. In a sheet handling apparatus, a linearly extending guideway defining a vertical path of sheet travel along which a sheet is transported on edge in an upright attitude and discharged from a sheet outlet, a first pair of sheet feed rollers disposed at the said one end of said guideway having a substantially vertically disposed bight, a sheet stacking bin spaced from and extending laterally of said guideway, a second pair of sheet feed rollers adjacent said bin between the latter and said first pair of rollers and having a bight in a plane transverse to the vertical plane of the path of sheet travel of said guideway, a curved guide plate having one upright edge adjacent and in registry with the bight of said first pair of sheet feed rollers and an opposite edge adjacent and in registry with the bight of said second pair of sheet feed rollers, said curved guide plate changing both the direction of travel and attitude of a sheet between said first and second pairs of rollers to direct a sheet into position for horizontal stacking in the bin, a V-shape plate below one of the rollers of said second pair of rollers and extending toward said bin, and a roller cooperable with said plate to crease and rigidify the sheet prior to flight of the sheet into said bin.

7. In a sheet handling apparatus, a linearly extending guideway defining a vertical path along which a sheet is transported horizontally on edge in an upright attitude and discharged from a guideway outlet, a first pair of sheet feed rollers disposed at the outlet of said guideway having a substantially vertically disposed bight, a sheet stacking bin spaced from and extending laterally of said guideway, a second pair of sheet feed rollers adjacent the said bin between said bin and said first pair of rollers and having a bight above said bin in a plane transverse to the plane of the path defined by said guideway, a curved guide plate having one upright edge adjacent and in registry with the bight of said first pair of sheet feed rollers and an opposite edge adjacent and in registry with the bight of said second pair of sheet feed rollers, said curved guide plate changing both the direction of travel and attitude of a sheet between said first and second pairs of rollers to direct a sheet into position for horizontal stacking in the bin, a plurality of sheet deflecting spring fingers overlying said bin in the path of sheet travel from said second pair of sheet feed rollers and having free ends extending downwardly into the bin, a V-shape plate below one of the rollers of said second pair of rollers and extending toward said bin to guide a sheet to the bin, a roller cooperable with said V-shaped plate to crease and rigidify the sheet prior to flight of the sheet into said bin, and a third pair of sheet feeding rollers between said first and second pairs of rollers to overcome the friction between a sheet and said curved plate developed by the change in direction and attitude of a sheet.

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