Oct. 30, 1951 W. J. BRADFORD ET AL 2,572,980

SHEET STACKING DEVICE

Filed March 10, 1948 3 Sheets-Sheet 1

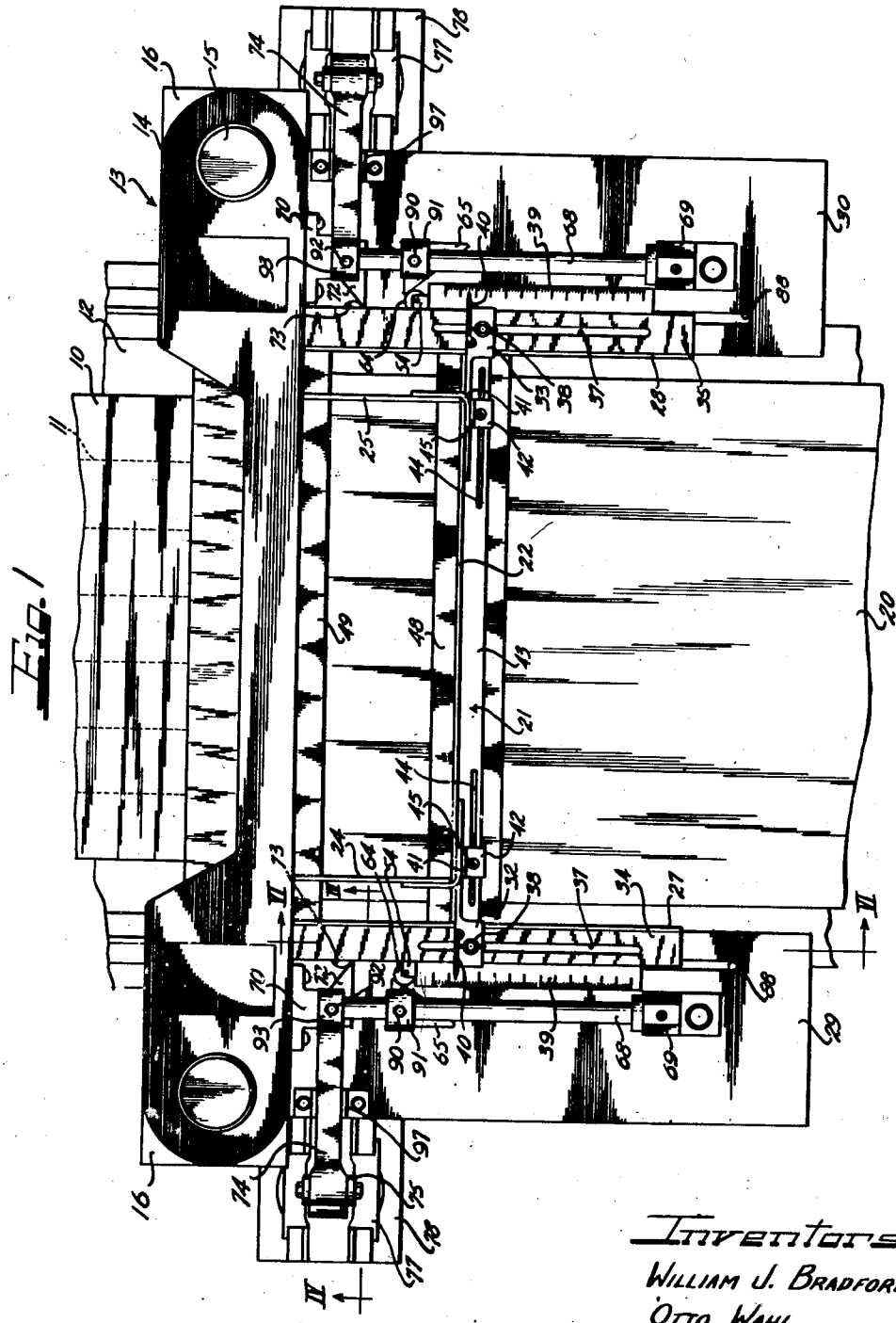


Fig. 1

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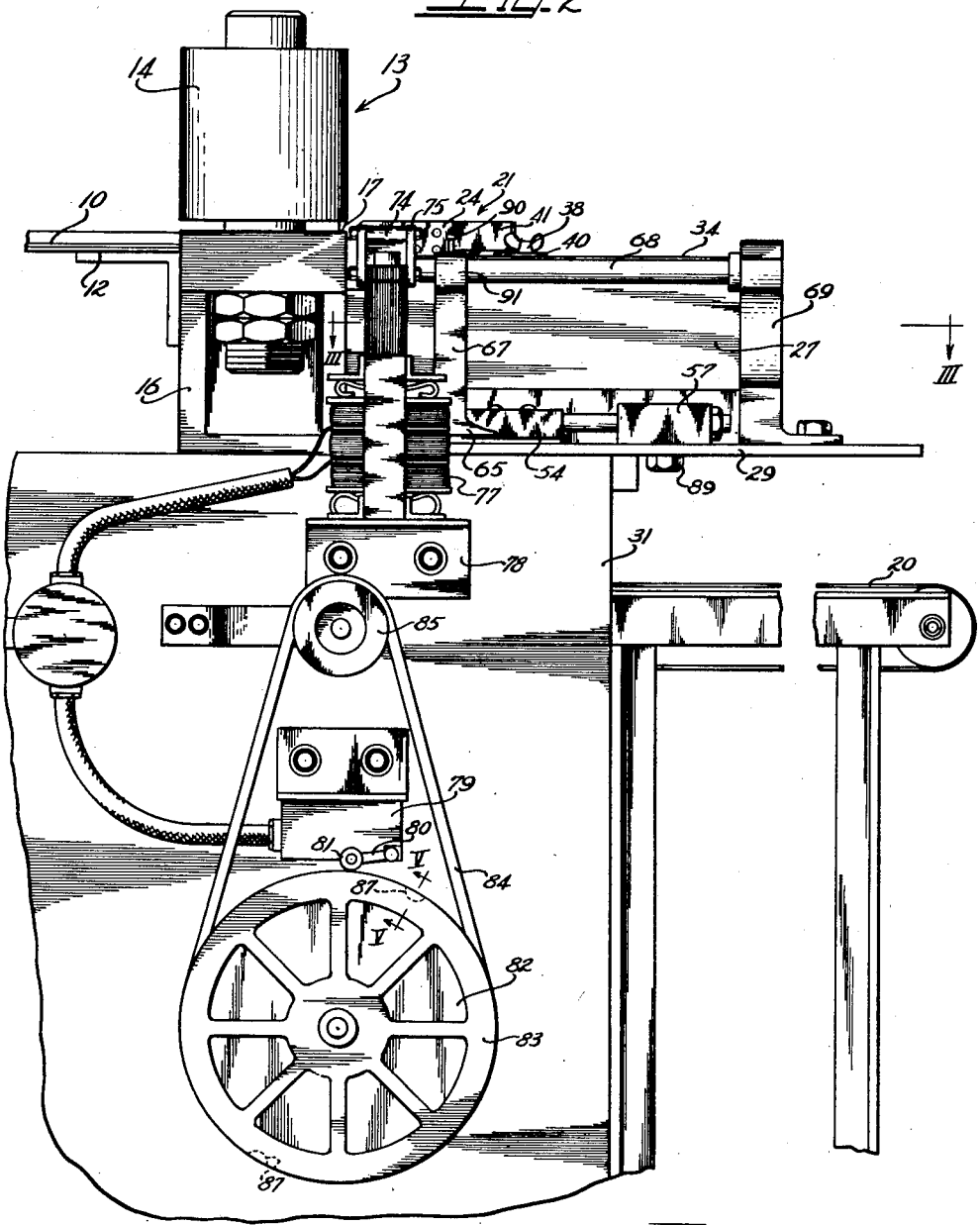
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SHEET STACKING DEVICE

Filed March 10, 1948 3 Sheets-Sheet 2

Fig. 2



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SHEET STACKING DEVICE

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Fig. 3

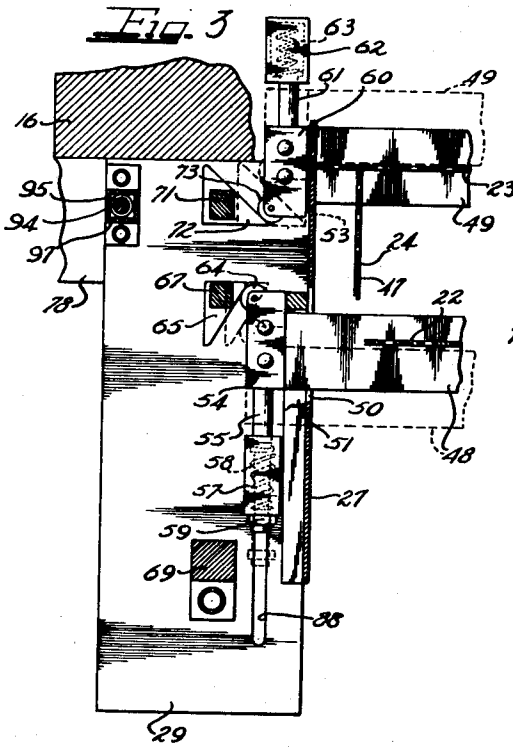


Fig. 4

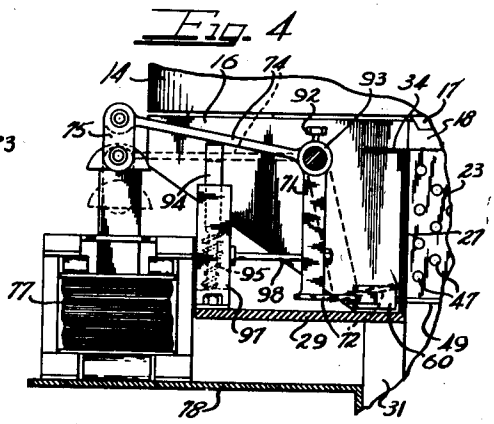


Fig. 5

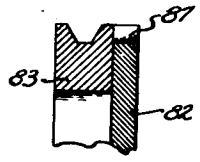


Fig. 6

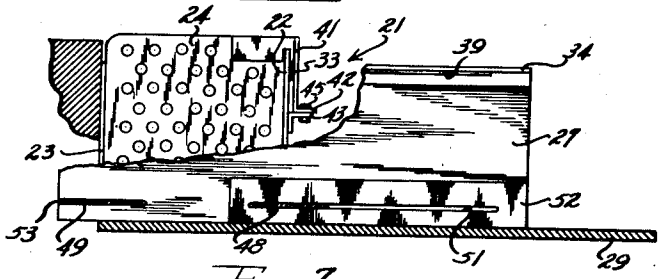
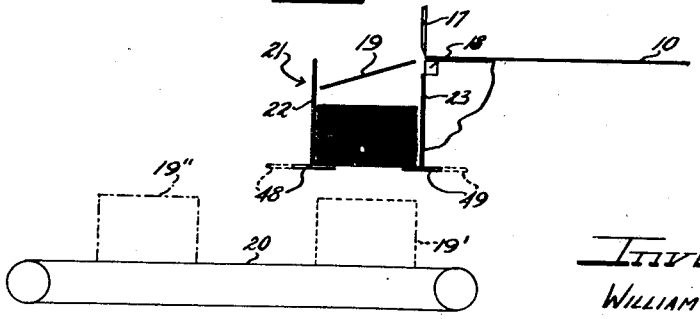


Fig. 7



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UNITED STATES PATENT OFFICE

2,572,980

SHEET STACKING DEVICE

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Application March 10, 1948, Serial No. 14,132

9 Claims. (Cl. 271—68)

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This invention relates to improvements in sheet stacking devices and more particularly concerns an improved device of this character which is adapted to be used in connection with a machine in which successive sheet blanks are processed or produced in a substantially continuous succession.

An important object of the present invention is to provide a device in which sheets are adapted to be accumulated into a stack, the device including improved means for releasably supporting the stack for delivery to a conveyor or the like after the stack has been built up to the preferred height or number of sheets.

Another object of the invention is to provide an improved sheet stacking device having novel means for releasably supporting an accumulating stack of sheets and for releasing the stack in coordinated relation to a continuously operating machine with which the device may be associated.

A further object of the invention is to provide in a sheet stacking device improved stack release mechanism.

Still another object of the invention is to provide in a sheet stacking assembly a novel arrangement for adjusting the mechanism of the assembly to accommodate a large variety of sizes of sheets.

Other objects, features and advantages of the present invention will be readily apparent from the following detailed description of a preferred embodiment thereof taken in conjunction with the accompanying three sheets of drawings, in which:

Figure 1 is a fragmentary top plan view of a machine organization showing a stacking device embodying the features of the present invention;

Figure 2 is a fragmental side elevational view of the machine organized showing the stacking device of the present invention;

Figure 3 is a fragmentary horizontal sectional view taken substantially on the line III—III of Figure 2, certain parts being broken away for clarity of illustration;

Figure 4 is a fragmentary vertical sectional view taken substantially on the line IV—IV of Figure 1;

Figure 5 is a fragmentary enlarged scale sectional detail view taken in the plane of line V—V of Figure 2;

Figure 6 is a fragmentary vertical sectional view taken substantially on the line VI—VI in Figure 1; and

Figure 7 is a schematic view depicting the operation of the stacking device in a general sense.

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A stacking device embodying the features of the present invention has been found to be of special value for accumulating in stacks of predetermined quantity paper blanks or sheets processed in or produced by a machine in which the sheets undergo certain treatment in continuous succession. For example, such a machine may comprise apparatus (not shown) in which a paper web 10 (Figures 1 and 2) of a fairly heavy grade of paper, such as may be used for candy bar trays or the like, is processed as by forming the same with a plurality of subdividing scores 11 as the paper web is fed through the machine. A table 12 supports the paper web as it is fed to a cut-off station 13 of more or less conventional character including a horizontal head block 14 vertically reciprocally movable on stationary guide posts 15 carried by supports 16 and carrying a cut-off knife 17 (Figures 2, 4 and 7) co-operable with a stationary shearing edge 18 at the end of the table 12 and operated in timed sequence to the other processing apparatus of the machine to cut off predetermined lengths of the web 10 into blanks or sheets 19.

It is to receive and accumulate the successive sheets 19 in stacks of predetermined quantity or height and the delivery of the stacks to receiving means such as conveyor 20 that the present invention is particularly addressed.

As each of the blanks or sheets 19 leaves the conveyor 10 and is cut off to become a separate entity, it drops off into an accumulator or stacker hopper 21, one sheet falling upon another in horizontal position. Confinement of the sheets 19 to the stack is accomplished by respective front and rear wall members 22 and 23 and respective side wall members 24 and 25 cooperatively related as part of the stack receiver 21 to form a stack well.

The front wall 22 is adjustably supported for accommodating sheets variously dimensioned as to length and the side walls 24 and 25 are adjustably supported by the front wall 22 to accommodate sheets of various widths. To this end the front wall 22 comprises a vertical plate which is of appropriate height and of a length to extend closely between a pair of stationary, vertical parallel supporting panels 27 and 28 which flank the opposite sides of the path of stack forming and delivery activity with ample spacing therebetween for a full range of stack widths. The supporting panels 27 and 28 are mounted on coplanar, horizontal, laterally extending respective platforms 29 and 30 at opposite sides of the stacker arrangement. The platforms 29 and 30 are, in

turn, supported in any suitable fashion or upon any suitable framework which may be separate from or part of the general machine organization with which the stacking device is associated. As shown, the supporting structure for the platforms comprises framework 31 forming part of the general machine organization.

Secured to the opposite ends adjacent the upper edge of the front wall 22 are respective laterally projecting attachment brackets 32 and 33 which are slidably received upon laterally outwardly projecting upper edge flanges 34 and 35 on the upper margins of the supporting plates 27 and 28, respectively. Each of the flanges 34 and 35 has a longitudinal slot 37 therein by which respective thumb screws 38 are adapted to secure the front wall supporting brackets 32 and 33, in predetermined adjusted position longitudinally of these flanges. For quick visual gauging of the adjustment of the front wall to predetermined sheet sizes, each of the flanges 34 and 35 may carry an adjustment scale 39 with which an index pointer 40 on each of the front wall supporting brackets 32 and 33 is cooperative.

Each of the side wall members 24 and 25 is in the form of a vertical plate and is carried by the front wall member 22. An attachment bracket 41 on each side wall member includes a flange 42 which rests upon a horizontal attachment flange 43 carried by the outer face of the front wall member 22. Respective longitudinal slots 44 in the flange 43 enable the bracket flanges 42 to be secured in selected positions of transverse adjustment of the side members 24 and 25 through the medium of fastening members such as respective bolts 45. Through this arrangement, either of the side members 24 and 25 may be independently adjusted or the plates may be relatively adjusted to accommodate a wide range of sheet widths.

All of the front, rear, and side members 22, 23, 24 and 25, respectively, are preferably formed with patterns of apertures 47 for quick relief or dissipation of air from under the successive sheets 19 as they drop into the receiver 21 so as to avoid any interference with prompt settling of each sheet onto the stack.

The bottom of the sheet receiver 21 is formed by a transverse pair of horizontal bar-like plates 48 and 49 mounted in coplanar spaced relation at the front and rear, respectively, of the receiver below the front and rear plates 22 and 23, respectively. Each of the bottom plates 48 and 49 projects to only a limited extent inwardly relative to the superposed vertical wall member of the sheet receiver so as to afford limited but none the less adequate support for the stacked sheets.

The bottom plates are mounted for movement into a retracted position clear of the front and rear walls of the receiver to release the stack of sheets to drop down upon the conveyor 20 which is located in a sufficient spaced relation therebelow to receive the stack of sheets clear of the stacker. To this end, having reference to Figures 3 and 6, the front bottom plate 48 is of a length to extend slidably through horizontal guide slots 50 formed in the lower forward end portions of the side support panels 27 and 28. In Figures 3 and 6 the slot 50 in the support panel 27 only is shown but it will be understood that the slot 50 in the side panel 28 will be identical. The respective opposite ends of the bottom bar or plate 48 extend beyond the support panels 27 and 28 through the slots 50 and through registering horizontal slots 51 in reinforcing bars 52 which are appropriately secured at the corner juncture between the respective side panels 27 and 28 and the supporting platforms 29 and 30, respectively.

The rear bottom bar or plate 49 is slidably supported in and has the opposite ends thereof projecting outwardly beyond horizontal guide slots 53 formed in the lower rear end portions of the support panels 27 and 28. As shown the slots 53 may open through the rear edges of the panels 27 and 28, only the panel 27 being shown in Figure 6, but it being understood that the identical condition is present in the support panel 28. Through this arrangement, the bottom plates 48 and 49 of the stack receiver are adapted to be slid in a horizontal plane into and out of stack supporting relation to the vertical walls of the receiver.

Means are provided for normally urging the bottom plates 48 and 49 into the stack receiving respective positions thereof. To this end, each opposite end of the bottom plate 48 is equipped with an end bracket 54 to which is secured a forwardly projecting rod 55 having a reduced diameter forward end portion extending into a hollow block 57 within which a spring 58 acts on the rod for normally urging it rearwardly. The forward extremity of the rod 55 extends beyond the block 57 and has a stop nut 59 thereon for limiting the rearward movement of the rod under the influence of the spring 58.

Similarly, the rear stack-receiving bottom plate 49 has at its respective opposite ends where they project beyond the support panels 27 and 28, a bracket 60 to which is secured a rearwardly extending rod 61 projecting into a hollow block 62 within which a spring 63 acts to urge the rod 61 normally forwardly and thus the plate 49 into the stack-receiving position. It will thus be apparent that both of the bottom stack-receiving plates 48 and 49 are yieldably urged into the stack-receiving position and that in order to shift the same from the stack-receiving position all that need be done is to push the same apart in the horizontally guided plane thereof in opposition to the return springs 58 and 63, the springs acting to return the plates promptly to stack-receiving position upon release of the plate shifting or releasing pressure or force.

Means are provided for automatically accomplishing the stack-releasing separational movement of the stack receiving plates 48 and 49 at timed intervals coordinated with operation of the machine with which the stacker is being used. To this end, each of the brackets 54 carried by the front plate 48 has mounted at and projecting beyond the rear outer corner thereof a vertical axis anti-friction roller 64 engaged in each instance by a kick-out member in the form of a diagonal edge cam foot 65 carried by a depending leg 67 supported upon a rock shaft 68. Each of the shafts 68 is mounted parallel to the adjacent support panel 27 or 28, as the case may be, at an elevation to afford ample throw for the leg 67 in response to a relatively small rotational movement of the shaft to drive the cam foot 65 a sufficient distance inwardly to kick the contiguous bracket 54 through the medium of the anti-friction roller 64 forwardly a sufficient distance to retract the plate 48 from the stack-supporting position thereof.

Rotary bearing for each of the shafts 68 is provided at the forward end thereof by a journal bracket 69 extending up from the respective platforms 29 and 30, and at the rear end thereof by a journal flange or bracket 70 which is appropriately attached to a stationary contiguous por-

tion of the machine with which the stacker is associated such as the cut-off support 16.

For retracting the rear bottom plate 49, the shaft 68 in each instance carries a depending lever leg 71 adjacent its rear end and on the lower end of which lever leg is a diagonal edge cam foot 72 which engages an anti-friction roller 73 mounted on a vertical axis at the forward outer corner of the bracket 60 at each respective end of the plate 49. Thus, by rocking rotation of the shafts 68, the plate kickout legs 67 and 71 which are rigid therewith will act simultaneously to drive the respective kickout cam feet 65 and 72 thereof in plate-retracting relation to the anti-friction rollers 64 and 73, respectively, on the plate end brackets.

Herein means are provided for actuating both of the plate kickout shafts 68 simultaneously. For this purpose each of the shafts has rigid therewith, and preferably integral in bellcrank fashion with the respective kickout legs 71, an actuating arm 74 which projects outwardly and is connected by links 75 to the armature of a solenoid 77 (Figures 1, 2 and 4). Each of the solenoids 77 is mounted on a shelf bracket 78 secured to the frame structure 31 of the machine.

The construction and arrangement is such that the solenoids 77 are periodically automatically energized simultaneously in coordinated relation to operation of the machine organization with which the stacker is associated. To this end, a convenient operation controlling structure includes any preferred type of switch mechanism housed in a casing 79 (Figure 2) mounted at an appropriate point as on the framework 31 and including an operating lever 80 having a follower roller 81 riding on the periphery of a control disk 82 appropriately attached to a drive wheel 83 (Figures 2 and 5). The wheel 83 may be a large pulley having a drive belt 84 trained thereover by which a conveyor actuating pulley 85 is driven. In the periphery of the control disk 82 are one or more notches 87 so disposed as periodically to receive the follower roller 81 whereby to swing the switch lever 80 into switch closing position momentarily to close the energizing circuit for the solenoids 77. This effects retraction of the solenoid armatures and corresponding swinging of the kickout arms 74 and turning of the shafts 68 to drive the kickouts 65 and 72 to retract or open the bottom plates 48 and 49 of the stacker to drop a stack of accumulated sheets down upon the conveyor 20. By preference, the control disk 82 is removably attached to the pulley wheel 83 in such manner that it may be conveniently replaced by other disks having greater or less number of control notches 87 in the periphery thereof, depending upon requirements.

In order to accommodate adjustments for various sizes of sheets to be handled by the stacker, the front retractable stack supporting plate 48 is adjustable in a horizontal plane, and the kickout member 65 with its supporting leg 67 is also adjustable longitudinally of the respective supporting swing shaft 68. For this purpose, the registering slots 50 and 51 in which the plate 48 is accommodated are elongated horizontally to a substantial extent. The respective platforms 29 and 30 are formed with longitudinal adjustment slots 88 (Figures 1, 3 and 6) to accommodate longitudinal parallel adjustment of the plate-biasing and return-mechanism blocks 57 through the medium of attachment and retaining bolts 89 which, as best seen in Figure 2, extend up through the respective slots 88 from beneath the platforms 29 and 30. Thus, by loosening the bolts 89, the blocks 57 can be shifted longitudinally parallel with the sides of the stacker for adjusting the position of the plate 48. Corresponding adjustment of the kickouts 65 is effected by loosening of respective set screws 90 by which attachments eyes 91 at the tops of the corresponding kickout legs 67 are secured on the associated rock rod 68, then moving the kickout longitudinally of the rod into the adjusted position and retightening the set screw 90. It may also be noted that by this arrangement proper angular adjustment of the kickout arm 67 is attainable for optimum operational relation of the kickout member 65 in each instance.

Proper angular adjustment of the kickout 72 in each instance is adapted to be effected in similar fashion by the provision of a set screw 92 by which a rod-engaging eye 93 at the upper end of the kickout leg and arm lever 71—74 is adapted to be adjustably secured in fixed relation to the rock rod 68.

Upon deenergizing of the solenoids 77 after a stack releasing operation thereof, the return bias afforded by the respective springs 58 and 63 associated with the stack supporting bottom plates, acting upon the kickouts 65 and 72 through the medium of the rollers 64 and 73, tends to swing the kickouts back to the starting position. At the same time, and in order to assure positive return of the kickout assembly, a spring-urged plunger 94 (Figures 3 and 4) is adapted to work up against the actuating arm 74 at an intermediate leverage point thereon, under the influence of a biasing spring 95 placed under load as an incident to the downward kickout swinging of the arm 74. In the full kickout position, as shown in dash outline, the plunger 94 serves as a limit stop upon over-running of the kickout assembly. The plunger and spring assembly may be conveniently supported in a socket member 97 mounted at a convenient point on the respective platforms 29 and 30, in each instance.

Over-return of the kickouts is prevented by suitable stop means such as a pin or rod 98 carried by the kickout leg 71 and arranged to abut the socket member 97.

By way of recapitulation, reference may be had to Figure 7 wherein is shown diagrammatically how, as the web of paper 10 is advanced a sheet or blank length interval beyond the cooperating shearing blade structures 17 and 18, the latter sever the same into the blanks 19 which drop into the receiver 21 onto the retractable stack-supporting plates 48 and 49. At predetermined intervals the plates 48 and 49 are retracted from the full line position to the dash line position shown and the stack is dropped onto the conveyor 20 therebelow clear of the plates 48 and 49 which then return to the stack-supporting position to receive another stack. The newly deposited stack of sheets 19' moves with the conveyor on beyond the stack receiver 21 to a position indicated by the outline 19'' and clears a place on the conveyor to receive the next stack. This continues as long as the associated sheet processing machine continues in operation.

Dumping of the stack is preferably coordinated with operation of the cut-off 13 to occur as the last sheet 19 of a stack is severed from the web so that the stack clears the receiver 21 and the bottom plates 48 and 49 return in the interval while a succeeding blank to form the first sheet 19 of a new stack is advanced and severed.

It will, of course, be understood that various details of construction may be varied through a substantial range without departing from the principles of this invention, and it is, therefore, not the purpose to limit the patent granted hereon otherewise than necessitated by the scope of the appended claims.

We claim as our invention:

1. In a combination in a sheet stack device of the character described, means providing sheet confining vertical walls, a pair of operatively horizontally disposed stack supporting plates cooperating with the lower portions of said walls to receive and support an accumulating stack of sheets thereon, said plates including means for normally biasing the same into the stack-receiving position and being retractable for accommodating movement of the plates into stack-dumping position, said biasing means including anti-friction rollers, and kickout members having cam surfaces engaging said rollers, said kickout members including arms mounted to swing the kickout members into and out of position to drive against said rollers to oppose the biasing means and retract the plates from under the supported stack of sheets.

2. In combination in a sheet stacking device of the character described, means defining a vertical stack supporting well, a pair of elongated flat plates mounted in coplanar horizontal spaced relation and movable toward and away from each other into and out of stack supporting relation at the bottom of the well, each of said plates having at the ends thereof means for normally biasing the plates toward one another into the stack supporting relation, the ends of the plates also having anti-friction rollers thereon, cam kickout elements engaging said rollers, supporting legs for said kickout elements, rock shafts supporting said legs, and means for rocking said shafts simultaneously to actuate said kickout elements and retract the stack-supporting plates in opposition to said biasing means.

3. In combination in a sheet stacking device of the character described, means defining a sheet receiver, a pair of plates adapted to support a stack of sheets in said receiver and being relatively movable for releasing the stack of sheets, each of the plates having a cam follower, respective kickout cams engaging said followers, each of the kickout cams having an actuating leg, a rock shaft supporting said legs, an actuating arm extending from said rock shaft, a solenoid having the armature thereof connected to said arm, and means including an electrical circuit having a switch therein operable to close the circuit for energizing the solenoid to rock said shaft and thereby actuate said kickout cams to retract said plates from the stack-supporting position.

4. In combination in a sheet stacking device of the character described, means defining a sheet receiver, a pair of plates adapted to support a stack of sheets in said receiver and being relatively movable for releasing the stack of sheets, each of the plates having a cam follower, respective kickout cams engaging said followers, each of the kickout cams having an actuating leg, a rock shaft supporting said legs, an actuating arm extending from said rock shaft, a solenoid having the armature thereof connected to said arm, means including an electrical circuit having a switch therein operable to close the circuit for energizing the solenoid to rock said shaft and thereby actuate said kickout cams to retract said plates from the stack-supporting position, and means for limiting the operative rocking range of said shaft.

5. In combination in a sheet stacking device of the character described, means defining a sheet stack well, horizontally reciprocably mounted stack supporting members movable toward and away from one another for respectively stack supporting and releasing, biasing springs normally urging said members toward one another into stack supporting relation, respective cam followers on said members, a rock shaft rockably mounted at an elevation above said members and extending in the direction of movement of the members, arms depending from said rock shaft adjacent to said cam followers, cam elements on said arms engaging said cam followers, and means for rocking said rock shaft to swing said arms toward said cam followers and thereby actuate said stack supporting members for driving said members apart in opposition to said biasing springs and thereby effect release of a stack of sheets on the members.

6. In combination in a sheet stacking device of the character described, means defining a stack well comprising a supporting structure, spaced parallel upstanding supporting members on said structure, horizontal flanges on the upper portions of said members extending outwardly and disposed in a common plane, said flanges having longitudinal slots therein, a wall member extending between said upstanding members and having flanges projecting from the upper portions of the ends thereof endwise from the wall member and supported upon said slotted flanges, and thumb screws engaging through said slots and with said wall member flanges and securing said wall member in selectively adjusted position longitudinally of said slotted flanges.

7. In combination in a sheet stacking device of the character described, means defining a stack well comprising a supporting structure, spaced parallel upstanding supporting members on said structure, horizontal flanges on the upper portions of said members extending outwardly and disposed in a common plane, a wall member extending between said upstanding members and having flanges projecting from the upper portions of the ends thereof endwise from the wall member and supported upon and secured to said horizontal flanges, and a pair of side wall members supported by said first mentioned wall member and relatively adjustable to modify the spacing between said side wall members.

8. In combination in a sheet stacking device of the character described, a stack-supporting structure including displaceable stack bottoming means movable into and out of stack-supporting position, said means being adjustable to accommodate sheets of various sizes, a kickout member operable to move said means out of stack-supporting position, said kickout member including an elongated supporting arm, a rock shaft carrying said arm, and means for rocking said shaft to swing said arm and thereby move said kickout member into and out of operative position with respect to said stack-supporting means, said arm being longitudinally shiftable on said shaft for adjustment conformable to adjustments of said stack-supporting means to accommodate various size sheets.

9. In combination in a sheet stacking device of the character described, means defining a sheet-receiving well, a stack-supporting means at the bottom of said well movable into and out of sheet-supporting position, a rock shaft mounted trans-

versely relative to the direction of movement of said stack-supporting means, a kickout member supported swingably by said rock shaft and movable by rocking of said shaft to swing said kickout member into operative position to move said stack-supporting means out of stack-supporting position, a lever carried by said rock shaft, means for swinging said lever to rock said shaft, and a biasing plunger spring-urged against said lever normally to return said lever and thereby said rock shaft and said kickout member to inactive position.

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